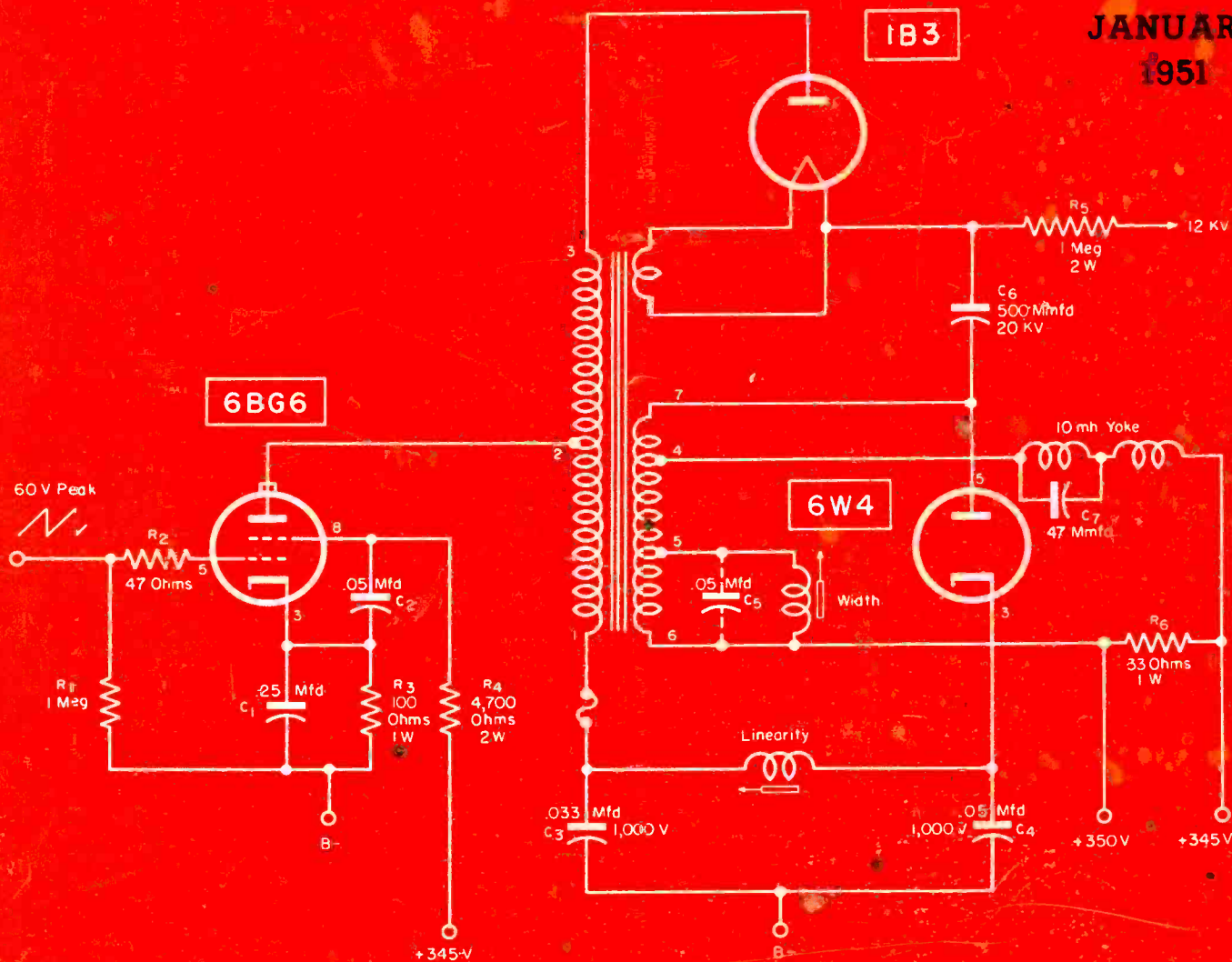


# SERVICE

JANUARY  
1951



Wide-angle deflection system employing a ceramic-core flyback transformer.

(See page 21)



# THE GREATEST

## DEVELOPMENT IN TUBULAR

### CAPACITORS IN 25 YEARS



another

C-D first!

now available in "**BLUE CUB**"\*

paper tubular capacitors

Only C-D moulded tubulars have welded leads!

- Sturdy welded joints between wire leads and foil of capacitor section results in permanent connections; no intermittents; no open-circuit defects!
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That's why "Blue Cubs"\* have become the fastest selling moulded tubular on the market today. In addition to "Leadweld"\* terminals you get all these plus features:

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The only tubular cast in plastic after Vikane\* impregnation. No heat or pressure to pinch, distort or injure unit.

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Will withstand temperatures up to 300° F. without softening.

#### VIKANE\* IMPREGNATION—

Only C-D tubular capacitors are Vikane\* impregnated. This superior impregnant provides high stability of all electrical characteristics during long service life with exceptionally high insulation resistance, low power factor, and great durability under voltage stress.

*For fewer servicing headaches, more satisfied customers and greater profits—insist on C-D "Blue Cubs"! Best by Field Test!*

CORNELL-DUBILIER ELECTRIC CORPORATION, Dept. S-11, South Plainfield, New Jersey. Other plants in New Bedford, Brookline and Worcester, Mass.; Providence, R. I.; Indianapolis, Ind., and subsidiary, The Radiart Corp., Cleveland, Ohio.

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1910-1951

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CAPACITORS • VIBRATORS\* • ANTENNAS • CONVERTERS



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**SERVICE**

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Including *Radio Merchandising and Television Merchandising.*  
Registered U. S. Patent Office

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Capacitor  
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The wise serviceman insists upon Kester Solder from his jobber. By using Kester, the solder used in making the original equipment, he will do his best work.

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EASIER TO USE  
MADE FROM VIRGIN METALS  
FASTER  
ELIMINATES REJECTS  
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# TV SERVICE Campaign ever launched!

HERE'S the hardest hitting . . . and the most complete advertising campaign ever planned, to bring service business to every dealer who displays the Sylvania emblem.

All during 1951, your prospects are certain to SEE, HEAR, and READ about your expert service in magazines, on television, and through window displays.



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You get FREE giant, full-color displays of the featured stars. You get counter cards . . . bright window streamers . . . spot radio announcements . . . mailing pieces . . . all designed to identify you as the Sylvania Service Dealer advertised on television and in the national magazines.

Ask your jobber for full information about the bigger-than-ever 1951 Service Dealer Advertising Program. If he can't give you all the facts, mail the coupon now!



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# ELECTRIC

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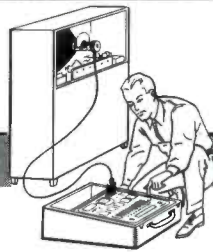
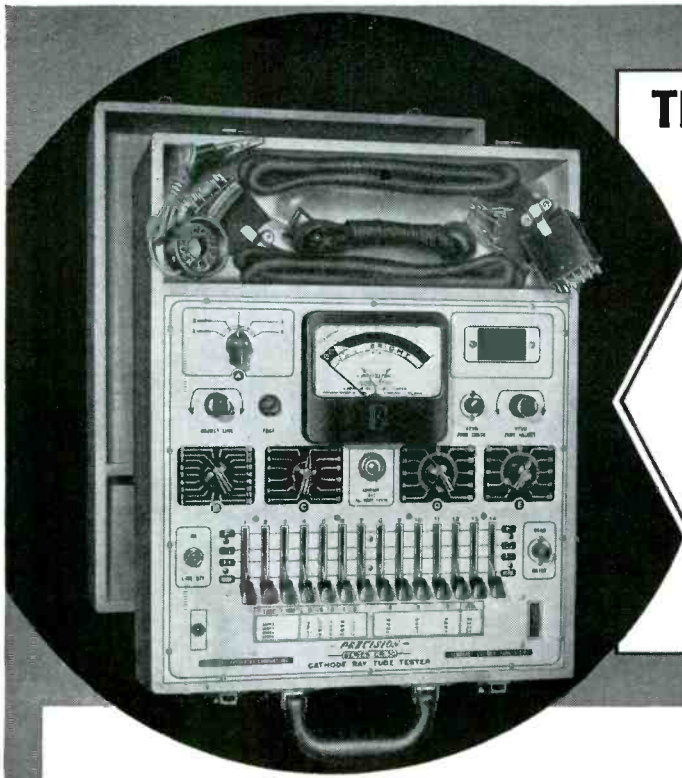
# THE NEW PRECISION CR-30 CATHODE RAY TUBE TESTER

## TESTS ALL TV PICTURE TUBES

(MAGNETIC AND ELECTROSTATIC)

### 'SCOPE TUBES AND INDUSTRIAL CR TYPES

for True Beam Current (Proportionate Picture Brightness)  
Tests ALL CR Tube Elements—Not Just a Limited Few



**IN FIELD OR SHOP**  
Tests CR Picture Tubes  
Without Removal from  
TV Set or Carton!

The new Precision CR-30 fills an obvious gap in the test equipment facilities employed by TV service and installation technicians.

Because of the absence of a reliable cathode ray tube tester, up to 50% of so-called "rejected tubes" are found to be fully serviceable and should rightfully never have been "pulled out."

Proven product of extended development, the CR-30 has been

specifically engineered to answer the question, "Is It the TV Set or is it the Picture Tube?"

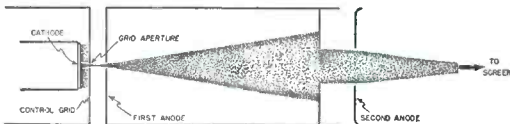
The Precision CR-30, a complete and self-contained *Electronic Instrument*, incorporates a TRUE BEAM CURRENT Test Circuit. The CR-30 checks overall electron-gun performance for proportionate picture brightness as well as additional direct testing facilities for accelerating anodes and deflection plate elements.

The Precision CR-30 should not be confused with mere adapters connecting to ordinary receiving tube testers which were never designed to meet the very specialized needs of CR tube checking. Similarly, it is not to be confused with neon-lamp units or similar devices of limited technical merit and which do not check all CR tubes or all tube elements.

### GENERAL AND TECHNICAL SPECIFICATIONS

- ★ Tests All Modern Cathode Ray Tubes:—Magnetic and Electrostatic, 'Scope Tubes and Industrial Types.
- ★ Tests All CR Tube Elements:—Not just a limited few.
- ★ Absolute Free-Point 14 Lever Element Selection System, independent of multiple base pin and floating element terminations, for Short-Check, Leakage Testing and Quality Tests. Affords maximum anti-obsolescence insurance.
- ★ True Beam Current Test Circuit checks all CR Tubes with Electron-gun in operation. It is the Electron Beam (and NOT total cathode emission) which traces the pictures or pattern on the face of the CR tube.
- ★ Voltage Regulated, Bridge Type VTVM provides the heart of the super-sensitive tube quality test circuit. Such high sensitivity is also required for positive check of very low current anodes and deflection plates.
- ★ Micro-Line Voltage Adjustment  
Meter-monitored at filament supply.
- ★ Accuracy of test circuits closely maintained by use of factory adjusted internal calibrating controls; plastic insulated, telephone type cabled wiring; highest quality, conservatively rated components.
- ★ Built In, High Speed, Roller Tube Chart.
- ★ Test Circuits Transformer Isolated from Power Line.
- ★ 4½" Full Vision Meter with scale-plate especially designed for CR tube testing requirements.
- ★ Heavy Gauge Aluminum Panel etched and anodized.
- ★ PLUS many other "PRECISION" details and features.

Total cathode emission can be very high and yet Beam Current (and picture brightness) unacceptably low. The CR-30 will reject such tubes because it is a true Beam Current tester. Conversely, total cathode emission can be low and yet Beam Current (and picture brightness) perfectly acceptable. The CR-30 will properly pass such tubes because it is a true Beam Current tester. The significance of the above rests in the fact that Beam Current (and picture brightness) is primarily associated with the condition of the center of the cathode surface and not the overall cathode area. (See illustration below)



SERIES CR-30—In hardwood, tapered portable case, with hinged removable cover. Extra-Wide Tool and Test Cable Compartment. Overall Dimensions 17¼ x 13¾ x 6¾". Complete with standard picture tube cable, universal CR Tube Test Cable and detailed Instruction Manual.

Shipping Weight:—22 lbs. Code: Daisy  
NET PRICE:—\$99.75

See the new CR-30 on display at leading electronic equipment distributors. Place your orders now to assure earliest possible delivery.



## PRECISION APPARATUS CO., INC.

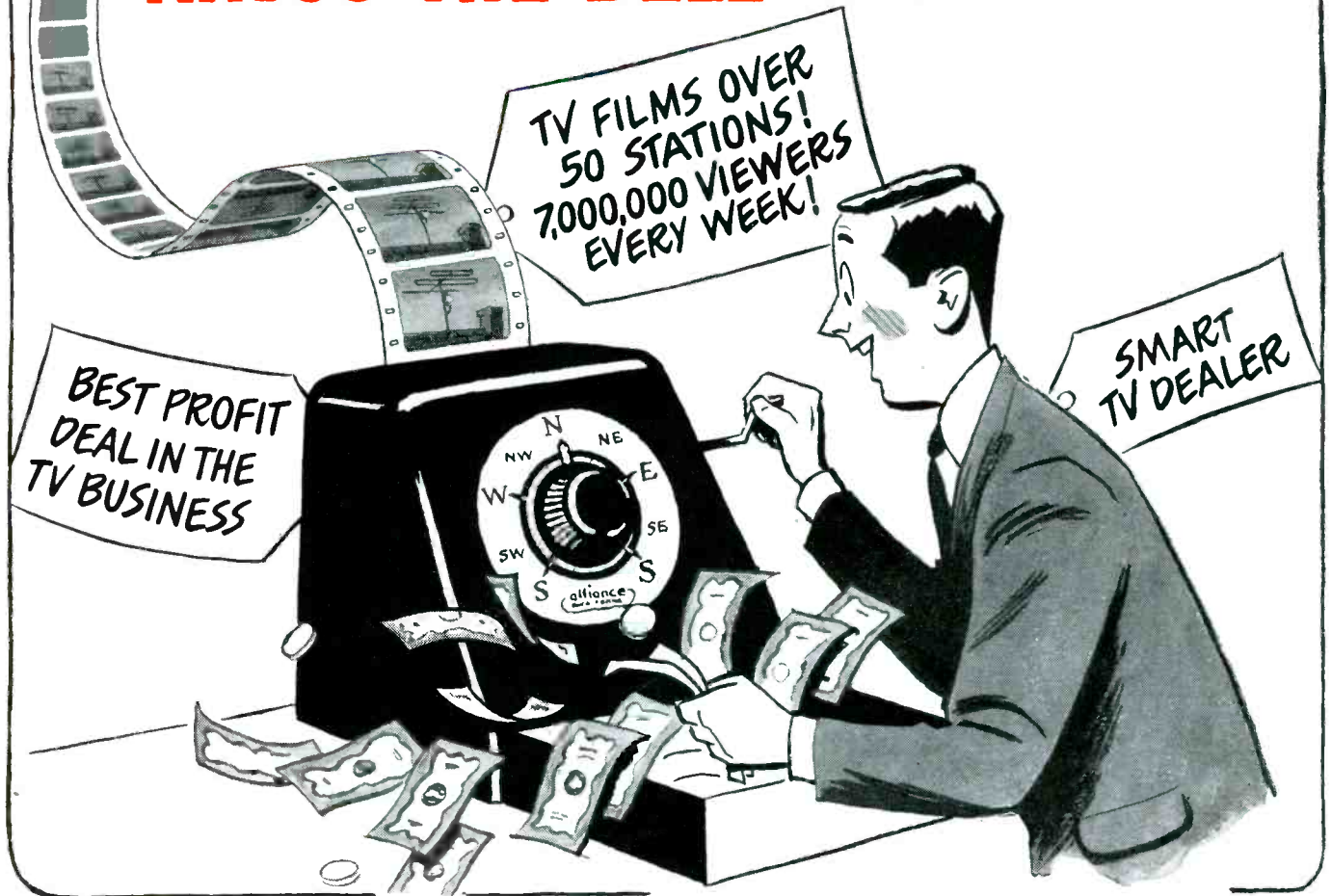
92-27 Horace Harding Boulevard, Elmhurst 6, New York

Export Division: 458 Broadway, New York, U.S.A. • Cables—Morhanex  
In Canada: Atlas Radio Corp., Ltd., Toronto, Ontario



# ALLIANCE TENNA-ROTOR

## RINGS THE BELL for smart TV dealers!



### Be Sure You Have This Winning Combination



Model HIR Tenna-Rotor

#### TENNA-ROTOR

The only fully automatic rotator. Just set it and forget it! Set the pointer . . . the antenna turns to that position and stops. North—East—South—West—direction indicator dial shows exact antenna position at all times.



Tenna-Scope

#### ALLIANCE TENNA-SCOPE

The new TV booster with one simple control. Gives maximum uniform high gain on all channels. Automatic on-off switch. Easy to install. An excellent companion item to Tenna-Rotor.

### THE SALES ARE 'SET UP' FOR YOU!

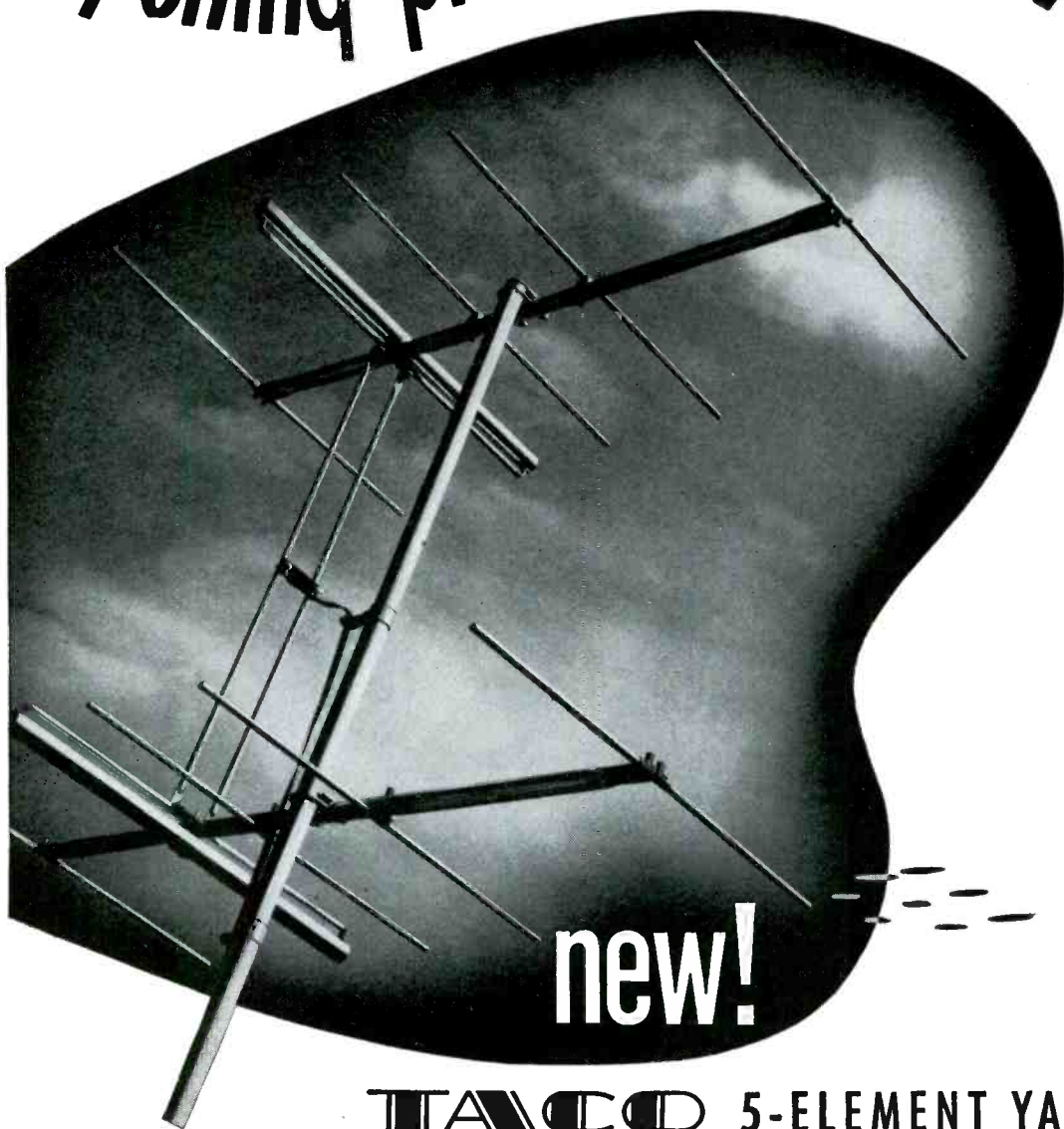
*Nation-wide TV Advertising delivers  
Thousands of Sales—Every Week!*

Seven million viewers see Alliance Tenna-Rotor demonstrated on 50 key TV stations every week. Tenna-Rotor is the only TV accessory backed by a consistent, powerful national TV campaign. Hundreds of thousands of Alliance Tenna-Rotors are in use! ● Alliance Tenna-Rotor offers faster installation with 4-conductor "Zip" cable. Works in all weather. Guaranteed for one year. Approved by Underwriters Laboratories.

**NEW DELUXE MODEL HIR IS FULLY AUTOMATIC!**

## ALLIANCE MANUFACTURING COMPANY • Alliance, Ohio

# Opening profitable new TV areas.



## TACO 5-ELEMENT YAGI

**O**PENs TV sales areas beyond present limits. Picks up where 4-element antennas leave off in fringe area reception. Extra director steps up gain and minimizes interference. Two-diameter antenna element increases bandwidth.

Available for any channel—high or low-band.

High-band is "Click-Rig" assembled (snaps in place in less than 1 second). Low-band is TACO "Jiffy-Rig" assembled. Can be stacked for extra-high gain. Special harness available to permit use of one lead-in for several high and low-band antennas.

RADIO & ELECTRONIC EQUIPMENT

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TECHNICAL APPLIANCE CORPORATION



**SEND TODAY  
FOR CATALOG 32.**

Complete technical information on antenna types. Curves and directivity patterns.

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ON LONG ISLAND

**817** EXPERTS

**SPECIFY**



**PETE CHANKO SAYS:**  
Chanrose Distributors  
Jamaica, N. Y.

Servicemen and Service Dealers are our customers and we carry the products they want. From the very beginning, we have featured N. U. tubes because N. U. pioneered in designing and building tubes to meet the serviceman's strictest requirements. Uniform, reliable, properly designed for interchangeability, N. U. tubes solve every service problem. And, backed by N. U.'s cooperative management, helpful service aids and advertising, N. U. tubes are profit-makers for both us and our 817 customers.

**renew**  
*with* **N.U.**  
**premium quality tubes**

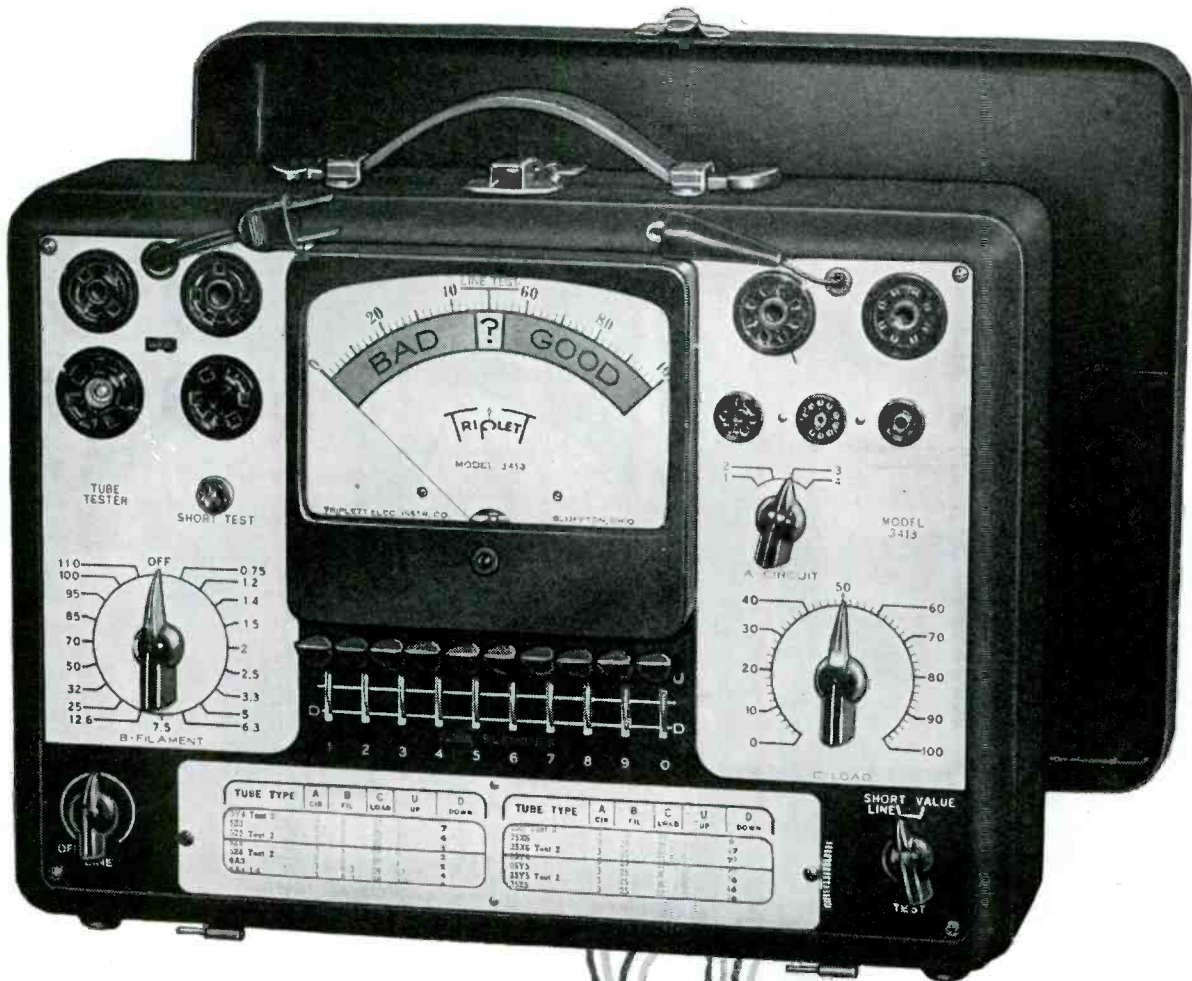
- RADIO AND TELEVISION RECEIVING TUBES
- VIDEOTRON TELEVISION PICTURE TUBES
- PANEL LAMPS
- TRANSMITTING AND SPECIAL PURPOSE TUBES



**NATIONAL UNION RADIO CORP.**

Main Office: 350 Scotland Rd., Orange, N. J.

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ASSURES YOU the most complete tests of all tubes including television.

ACTUALLY APPLIES 19 separate filament voltages—eliminates usual compromises.

TESTS OVER 700 tubes listed on roll chart—Many thousand tubes used to properly evaluate correct settings.

POSITIVE INDIVIDUAL test of each element.

SPECIAL CIRCUIT feature accurately compensates to provide correct voltages on each tube test.

IMPROVED LEVER switching originated by Triplet for complete control of each tube element.

EACH ELEMENT quickly and conclusively tested for shorts by a flip of the switch.

ILLUMINATED SPEED-ROLL chart with latest tube listings. Kept up-to-date.

LARGE 6" meter—RED-DOT Life-time Guaranteed.

FOR COUNTER or portable use.

**TRIPLET**

MODEL 3413  
TUBE TESTER

*Only*  
**\$69<sup>50</sup>**

COMPLETE WITH ACCESSORIES  
AND INSTRUCTION MANUAL

In Canada: Triplet Instruments of Canada,  
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FOR THE MAN WHO TAKES PRIDE IN HIS WORK

**Triplet**

TRIPLET ELECTRICAL INSTRUMENT COMPANY - BLUFFTON, OHIO, U.S.A.



# NEW INDICATOR ION TRAP

*A  
Rauland  
"Exclusive"*



## Speeds Service — Builds Profits

Rauland's new Indicator Ion Trap is winning the cheers of more service men and dealers every day—because of the time and trouble it saves in Ion Trap Magnet adjustment, and because it eliminates mirrors and guesswork.

Now it's a matter of seconds to adjust the ion trap magnet with absolute precision. The service man simply moves the magnet until the signal glow is reduced to minimum.

This important new Rauland development is incorporated in all Rauland tubes produced today—as a feature of Rauland's new Tilted Offset Gun. This gun offers the additional advantages of giving only a single Ion Trap Magnet and of maximum sharpness of focus.

Only Rauland offers this advanced feature—one of half a dozen post-war developments from Rauland.

For further information, write to . . .

### **RAULAND**

**The first to introduce commercially these popular features:**

**Tilted Offset Gun**

**Indicator Ion Trap**

**Luxide (Black) Screen**

**Reflection-Proof Screen**

**Aluminized Tube**

## **THE RAULAND CORPORATION**



*Perfection Through Research*

4245 N. KNOX AVENUE • CHICAGO 41, ILLINOIS



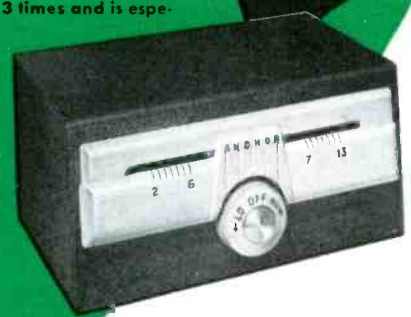
# ANCHOR is your answer!

**THE TV BOOSTERS FOR....**  
 ... faster profits  
 ... better TV reception  
 ... satisfied customers  
 ... simple, easy installations  
 ... fringe area TV sales



### The Suburbanite

ANCHOR'S SINGLE-STAGE BOOSTER—Model ARC 101-75 will increase original TV signal strength 3 times and is especially recommended for low signal areas in or near cities where there may be any number of interference problems. Assures consistently good reception up to 75 miles. **\$37.50** List Price.



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The ANCHOR TWO-STAGE BOOSTER—Model ARC 101-100 increases original TV signal strength 5 times and is recommended for distant rural areas. Consistently good reception over 100 miles.

**\$49.50** List Price.

TELL THIS STORY  
 TO YOUR  
 TV SERVICE MAN  
 OR YOUR  
 INSTALLATION AGENCY



BE SURE YOU KNOW ALL THESE FACTS

Only ANCHOR can provide your customers with ALL of the most Ultra-Modern advantages for consistent, top-notch, long-range TV reception. Here's why!

- ANCHOR has the highest gain of any TWO-STAGE BOOSTER.
- ANCHOR has the highest Signal to Noise Ratio.
- ANCHOR is the only non-regenerative unit available. The unit that is not returned.
- ANCHOR'S Single Knob Construction is so convenient for Booster is turned on and can be switched and tuned all on the same knob.
- ANCHOR'S New and Revolutionary method of construction of the RF Stage (Pat. Pend.) is the only real engineering advance in Boosters in recent years.
- ANCHOR'S TWO-STAGE BOOSTER is modernly styled with streamlined plastic escutcheon, soft mahogany leatherette finish.
- IMPORTANT ANCHOR'S TWO-STAGE BOOSTER is often the answer to installation difficulties well within the normal TV areas where their New Single Stage Model fails to give complete satisfaction.

Expensive high towers—still unsatisfactory reception.

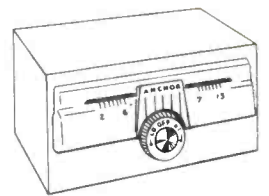
Hazardous installations subject to damage and repair.

Many trips to repair or maintain faulty installation.

Dissatisfied customer complaints costly.



SAME  
 \$  
 PROFIT



- ONE SALE
- ONE UNIT
- ONE CALL
- ONE satisfied customer.

If you are a dealer and have your own service men who make the installations on the TV sets you sell, it stands to reason that an installation of one of the many fine simple-to-install antennas, plus an ANCHOR BOOSTER will make a faster and more profitable installation for you, or your service agency, as well as a completely satisfied customer. REMEMBER, return calls due to dissatisfaction cost you money. **SERVICE MEN: take an ANCHOR BOOSTER with you on every installation.**

ORDER FROM YOUR JOBBER TODAY

**ANCHOR RADIO CORP.**  
 2215 SOUTH ST. LOUIS AVENUE • CHICAGO 23, ILLINOIS

ANCHOR ENGINEERING ALWAYS A YEAR AHEAD!





### **Auto Radio Servicing**

WITH LISTENING-IN WHILE YOU RIDE now firmly accepted as a four-season habit, and over 18-million involved in dial spinning, auto radio servicing has become quite a round-the-year affair, with both installation and servicing sharing the limelight. Installation has, of course, centered around the older cars, with or without chassis, although there have been many, many models which have found their way to the sales rooms without sets. With receiver makers now producing streamlined lines of universal mounting type chassis featuring manual or electric push button tuning, it is really no longer too complex a task to install the equipment.

### **Accelerated Programs**

Around servicing, most of the activity has revolved, with carefully conceived techniques adopted to simplify and accelerate repair. Featured in this program has been the use of such special items as matched antennas, dial drives which might use magnetic or friction clutches, remote control cables, fittings and splines, as well as parts with closely-held tolerances. The latter has been found to be an extremely important factor, in view of the auto receivers' high-sensitivity requirements. Unlike the home sets, auto radio designs provide for a substantial increase in pick-up, a feature, of course, necessary to insure consistent reception during travel.

The servicing programs have also spotlighted problems for noise which can be quite troublesome, coming as it might from the set itself or some part of the car, or perhaps the wheels. The use of separate speakers and rear-seat types has been found to be another source of auto-repair activity.

Auto servicing, once considered a petty chore unworthy of any particular attention, has grown to be a strik-

ing, profitable phase of the servicing business, offering bright income-building possibilities throughout the year.

### **Profits in the Small-Shop**

IN RUNNING A MEDIUM-SIZED service station, staffed by from one to four men, it is as necessary to follow a strict pattern of operation as if there were a large payroll to meet. In fact, the task is even a bit more complex because of the time element and other limitations involving manpower, overhead, etc.

Small shops can be quite successful, but those who man them must have many unique qualifications. In addition to being competent Service Men, the shop operators must have an attitude toward their work which is flexible and adaptable to a variety of situations. They must also be quick and resourceful, and be able to discriminate between a good-paying and a poor-paying job. Particularly important is the high degree of self-discipline that is required. There are often occasions when the repair jobs begin to rile because they involve perhaps overtime and extensive testing. Attitudes of disdain or distaste must be avoided; the problems, however awkward they may be, must be accepted as part of the business.

### **Small-Business Opportunities**

To increase, beyond the limits of a few-man shop, demands a division of work and responsibility. This does offer an advantage in that each man can do a better and more efficient job since he only has one function to fill. However, the factor of improved operations with fewer functions per man can have its limits too, and growth may not be directly proportional to the number of men involved in the enterprise. Whether the shop be small or large, it is important that a high degree of efficiency or output be main-

tained by each member of the crew. Such coordination can not help but assure success at the bench and in the field.

There are endless opportunities for the small-shop operator, provided he is willing to accept the many variables that must prevail in such an operation, and adopt a code stressing rugged perseverance.\*

### **Mobile Service**

SERVICE AT THE DOORSTEP, which has become quite a standard-receiver activity in the rural areas, has now become a popular practice for TV repair. The method has been found to be particularly effective for large chassis servicing which ordinarily would be a shop routine.

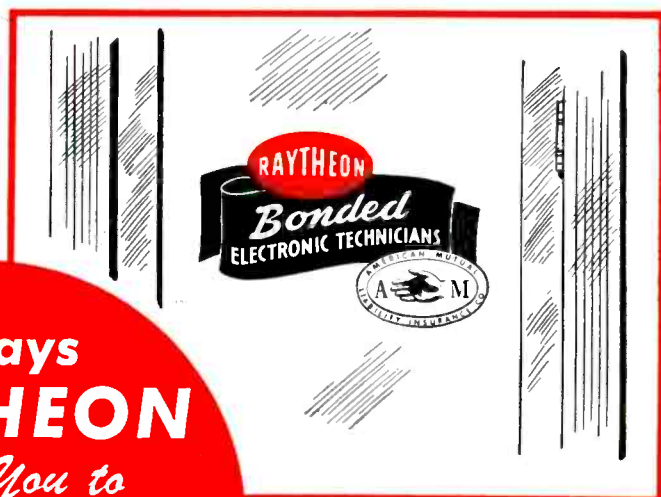
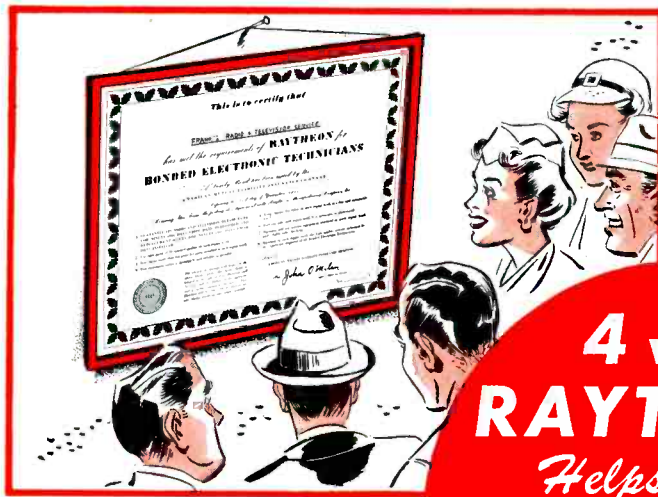
In Chicago the procedure has been adopted by not only service shops, but distributors with servicing departments. In one instance, three trucks have been completely equipped with a work bench featuring a complete set of tools, signal generator, vtvm and a 'scope. For power either an auto generating system is used or house current, the latter being fed through a 100-foot length of power cord. Where it is not possible to use car power or secure house voltage, there are provisions for removal of the test equipment into the home.

The trucks are also stocked with a complete assortment of parts, selected to take care of most of the replacement problems normally met on the road.

The mobile operation has been found to not only accelerate repair, but minimize costs to the consumer, as well as to the operator.

With TV winning the interest of more and more urbanites, the mobile method of servicing may become the standard practice for rural servicing. —L.W.

\* Based, in part, on comments presented by ART-RETA, Canada.



4 ways  
**RAYTHEON**  
*Helps You to*  
**WIN FRIENDS and**  
**INFLUENCE**  
**CUSTOMERS**



The RAYTHEON *Bonded* ELECTRONIC TECHNICIAN PROGRAM provides four compelling ways to create customer confidence—Certificates, Identification Cards, Creed Displays and Decals. Bonded Dealers who use these service-business builders to identify themselves as capable, dependable technicians are finding them positive protection against the recent attacks on the integrity of Television and Radio Service companies.

If you're a Raytheon *Bonded* Dealer, prominently display your *new* 1951 Certificate—be sure your men use their *Identification Cards*. Ask your

Raytheon Distributor for more *Creed Displays* for window and counter use, and get enough *Bonded Decals* to adorn every window and door. These *Bonded* pieces are as important to your business as the tools in your kit.

If you're not a Bonded Dealer, better get in touch with the Raytheon Distributor in your locality. Find out if you can qualify for the Bond! If you can, this great program that cash-protects your 90-day guarantee on TV and Radio repairs is yours *absolutely free*, because *the Bonded Program is Raytheon's investment in your future!*

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 SPECIAL PURPOSE TUBES • SUBMINIATURE TUBES  
 MICROWAVE TUBES



# SERVICE... *The National Scene*

RECTANGULARS NOW SETMAKERS CHOICE--In practically all of the chassis now coming off the line, rectangular picture tubes are being installed with 14- and 17-inchers leading the parade. The spring should see 19's, 20's and perhaps 24's coming along at quite a pace, if material restrictions do not interfere. Set owners have become so rectangular tube conscious that they've flooded Service shops with requests for conversions. So we decided to lend a hand, and in this issue there appear three articles which we feel will facilitate not only conversions, but installation and servicing work. You'll find these articles on pages 24, 38 and 46. Hope you'll like 'em.

INSTALLATION AND SERVICING BILLS STILL BEING INTRODUCED--Although numbers of bills, ordinances and resolutions, which would control many phases of TV servicing, have been introduced and promptly shelved or vetoed in many legislatures or councils, the boys are still trying to get their pet measures legalized. Up in Albany, two bills have been introduced, one of which provides that moneys paid under contract should constitute a trust fund, with no more than 50% to be used by the servicing agency, except that withdrawal could be made monthly in proportion to the remaining term of the contract. In lieu of the trust fund, a bond could be filed. The second bill would permit tenants to install an antenna as an incident to tenancy, making void provisions of a lease for additional rent for such an installation. This bill appears to have many approvers and stands a good chance of reaching the chief executive's desk. In Worcester, Mass., there's a proposed ordinance calling for the mounting of guy wires at least eight feet above the roof, a lightning arrester and ground connector on every installation, and the installation of all antennas away from electric light wires or over public streets. In Manitowoc, Wisconsin, the City Council is studying a resolution providing for the supervision of all antenna installations and a close inspection of those now up.

SERVICE CONTRACT RENEWALS SLOWING UP--In a census\* of a typical videotown, it was found that service contracts are not being renewed by owners of older sets. Specifically, only between 28 and 32% of those who bought sets before '49 were reported to be holding contracts.

ROOM REFLECTIONS ROUTED--Reflections on TV screens, which can cause eye-wearing glare, are said to have been banished by a new screen employing an invisible front-window design approach. Developed by Motorola, the elimination of reflections is claimed to have been accomplished in two ways: Instead of placing a flat piece of glass in front of the viewing tube, screens have been concave shaped, thus directing light rays to the floor, away from the eyes, and also reducing the area of reflection.

COLOR TV WAREHOUSED--Mechanical color which was supposed to go commercial in late '50, but was restrained by a court order, now appears to be parked for an indefinite stay. The Chicago court ruling, indicating that the Supreme Court will have to pass final judgment sometime during the spring, has been one of the reasons for the halt, but NPA appears to be playing an even greater role in the shelving of color. With disk-type receivers requiring five times more critical material than present models, and availability of these materials scheduled to become a problem, NPA might find it necessary to forbid general scheduling of material for color. One group, in Washington, the Radio, TV and Home Appliance Wholesalers, petitioned NPA to delay any color receiver production, if it interfered with black and white receiver making.

-----  
\* Prepared by Cunningham & Walsh, Inc.

# SERVICE... *The National Scene*

A WONDERFUL DEED BY TCA--In an unprecedented move, the Television Contractors Association of Philadelphia announced that it would assume responsibility for all unexpired service contracts sold by a member company who recently went into bankruptcy. A statement by the association's executive secretary, Paul Forte, disclosed that the association had made standby plans several months ago in anticipation of such an eventuality. He also indicated that there is underway a project for a pool of funds, which would be set aside to guarantee all service contracted by members, the money to come from a tax assessed on each contract, as it is written.

AN INTERESTING TV SCHOOL--Over in Hackensack (N.J.), there's an unusual school devoted to training in quite an unorthodox manner. Students, graduates of commercial TV schools in the main, are required to pass a four-point program centering around an obstacle-type course. Students are asked to repair a set with all types of problems, then proceed to show that he can trace a diagram and install suggested correction modifications, and finally probe a new model for which there might or might not be a complete circuit diagram available. The course is said to provide Service Men who really know their business from stem to stern.

PRICE CONTROL RECORDS--When and if price controls become an actuality, records will be more important than ever. According to the Business Information Service of the Department of Commerce, the following price-record information will be required: sales slips, purchase orders, receipts, invoices, bills of lading, price lists received and issued, discount schedules, special allowance details, and contracts containing price data. In addition, the Service Man should have on hand appropriate description or identification of items sold or service rendered during the base period of May 24-June 24, 1950.

NO STRIPPED TV CHASSIS YET--When the emergency rulings started bouncing around there were fears that stripped chassis, using fewer tubes and less parts, would become the typical chassis for '51. It appears now as if the major producers will not produce such chassis since it is felt that receivers with fewer tubes (14-16) would be hazardous to performance and lead to service complications. There are some setmakers who have stripped chassis ready for production, but until there is no alternative when parts become extremely scarce, these sets will sit in the lab and the minimum standard 19-tube type receivers will continue to be made.

CONVERSION ARTICLE APPLAUSE--The Racker-Selvaggi article on Conversion to Large Screen TV, which appeared in the November issue of Service, was found to be so informative by Rauland, that they reprinted a portion of it for distribution to those interested in conversion practices.

TRIBUTE--In letters to ye editor, Service Men have made some interesting comments about Service, about which we're quite proud. Earl O. Gramer of Lexington, Mich., told ye editor that... "I do the technical and consultant work for most of the better TV and appliance dealers in this area, and believe me I insist on a copy of Service on every work bench." According to J. A. Redway of Reading, Pa., Service contained... "A diagram I searched for some time... I am well pleased." Thanks, gentlemen!--L. W.



# QUALITY

You Can Always Depend On

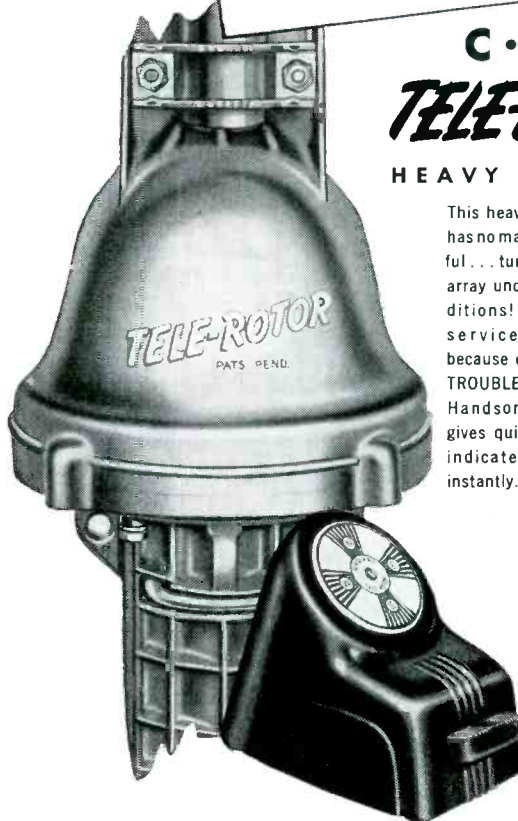
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## C·D·R TELE-ROTOR

HEAVY DUTY MODEL

This heavy-duty TELE-ROTOR has no match! It's more powerful... turns any TV antenna array under any weather conditions! Recommended by servicemen everywhere because of its dependable, TROUBLE-FREE performance. Handsome control cabinet gives quick, easy control... indicates antenna position instantly.



**Model TR-2**... rotator with "Compass Control" cabinet having illuminated "perfect pattern" dial... (Uses 8 wire cable)  
..... \$44.95

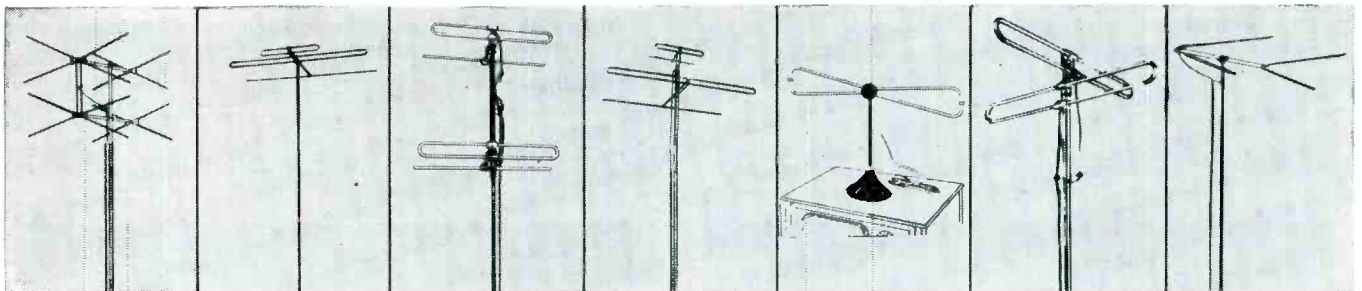
**Model TR-1**... rotator and control cabinet with end of rotation light... (Uses 4 wire cable)  
..... \$39.95

## C·D·R TELE-ROTOR CUB

New TELE-ROTOR CUB for average installations. Same husky motor as heavy-duty TELE-ROTOR. **FASTEST, EASIEST ROTATOR TO INSTALL.** All-In-Line design... with true in-line thrust between antenna and mast. 3/4" STEEL shaft rotates on case hardened steel ball... in-line reamed oilless bearings. Plastic control cabinet offers easy, accurate control.

**Model 502-A**... rotator with control cabinet having indicating meter for "hairline" tuning. (Uses 5 wire cable)  
..... \$44.95

**Model 501-A**... rotator with control cabinet having end of rotation signal. Light flashes every 7.2° showing antenna is turning. (Uses 5 wire cable)  
..... \$34.95



"Lazy-X" Conicals

"Strate-Line" Antennas

Double-Stacked Arrays

"Hi-Lo" Antennas

Indoor Antennas

FM Antennas

"Super-Vee" Antennas

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IT'S TOPS



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- ROTATORS
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- POWER SUPPLIES

# SAVING TIME and LABOR

by **HUGH P. McTEIGUE**

*Training Manager*  
*RCA Service Company*



Fig. 1. Orienting the antenna with a rotator.

tion. The latter study led to the adoption of several new tools and accessories as standard equipment for our Service Men. These include a chimney mount, a special antenna designed for rapid assembly, snap-on standoffs, cradles for *bright picture* transmission line reels, and a special adapter which enables the Service Man to attach quickly and detach an automatic rotator with which the antenna is oriented.

On the basis of this study, we established a sequence of operations for standard antenna installation. Each of our antenna installation men has been thoroughly schooled in the pattern, and it has been made a part of our training program for new employees. By following this pattern, it has been found that one man can now safely, quickly, and efficiently complete any *standard* home television antenna installation.

Many of the operations may seem to be of a type that should be taken for granted, but because they are fundamental and basic to good servicing procedure they are emphasized.

Of primary importance to the one-man operation is the antenna rotator. This instrument, coupled with a special adaptor, which permits rapid attachment to and removal from the antenna mast mounting, enables a Service Man to tune the set to the antenna without the aid of another technician. Heretofore, the usual practice was to

WHILE THERE is no substitute for good Service Men, it has been found and proved by experience that it is prudent to adopt standard operational procedures which not only serve to accelerate installation, but provide a more efficient service at a minimum cost to the public.

In an effort to probe the best possible pattern which we could employ there was initiated some months ago an experimental study program at our branches in Bayonne and Rahway,

New Jersey. Extensive on-the-job studies of installation procedures were conducted to determine how the work could be done faster and more easily through reduction of the number of steps and elimination of trips up and down ladders and to and from the truck. Another purpose of the study was to determine the efficiency of tools on the job, and to determine whether new types of tools or improved versions of standard tools could increase the efficiency and speed of the opera-

Fig. 1a. Performing antenna assembly work at the truck, involving assembly of antenna, attaching to mast, and attaching standoffs to mast.

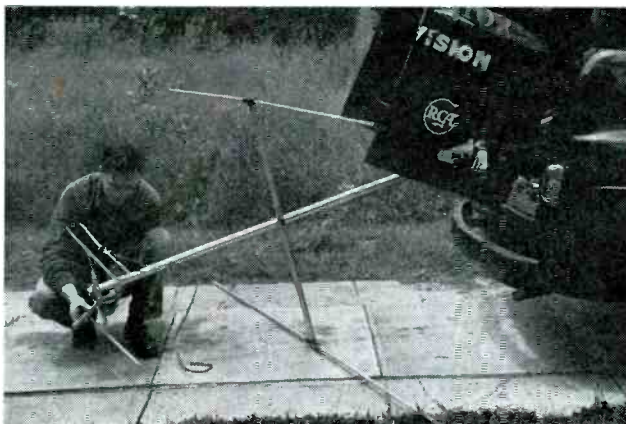


Fig. 2. While at the truck, and after antenna has been assembled, transmission line should be connected to the antenna.





# in TV Servicing

## Use of Tested Operational Procedures Featuring Application of Antenna Rotator Found to Accelerate Installation and Minimize On-the-Job Costs.

place one man at the receiver and another on the roof, with the latter adjusting the antenna according to directions communicated to him by the technician aligning the receiver. The rotor permits the man at the receiver to rotate the antenna to correct position by remote control.

In our step-by-step operational pattern, there are three vital considerations: safety, familiarization with what has to be done and, equally important, *doing first things first*.

Before starting out for the job, our Service Men must make certain that he is ready to start; that is, that he has all the tools and equipment he will require, that he knows exactly where he is going and the quickest way to get there, and that his truck is ready to get him there and back. It is costly in time and money to return for overlooked tools, to seek directions while on the way to the job, and to take chances on a truck that is not in perfect running condition. The technician who gets the habit, who automatically makes certain that he is fully prepared before he leaves the shop, will keep costs down and efficiency up.

From the moment the Service Man arrives on the job, he can save time and effort by doing first things first. He knows he will need certain tools and materials for his work within the house. By carrying this equipment—

Fig. 4. In drilling hole to basement, drill should be grounded.



Fig. 3. Use of a transmission line reel-holder which allows the line to unwind freely as antenna assembly is carried to the roof.

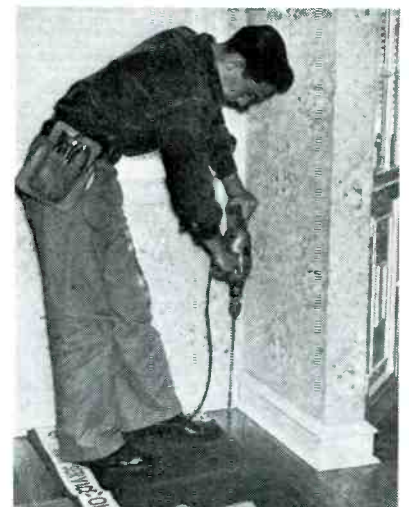
tool pouch, drop cloth, polishing cloth, plastic wood—on his initial trip to the house, he will save a return trip to the truck.

The greatest time and labor saver in antenna installation is a complete preliminary survey inside and outside the house to determine where and how the antenna installation will be made, where the wires will run, and the final appearance of the proposed installation. Before the receiver can be located, the technician must ascertain that the proposed location is a practical one from an installation point of view. Before the first wire hole is drilled in the living room, he must know the basement layout, the picture wire run, and the location of a cold water pipe, and all of these factors must be considered with the location of the receiver in mind. The Service Man can save steps and time by also estimating, during this basement survey the length of picture wire he will require.

Outside, the Service Man must survey the roof and all sides of the house to determine the most practical, most

convenient, and best looking location for the antenna. Only after he has completed this interior and exterior survey is he ready to go to work. To locate the receiver without knowing how the basement will be wired, or to  
(Continued on page 50)

Fig. 5. After drilling hole in the house, a piece of ground wire should be inserted so that location can be found easily from the basement.



# AUDIO *installation and service*

## *Phono-Tape-Wire-PA-Amplifiers-Speakers*

by **KENNETH STEWART**

WITH THE USE OF LONG-PLAYING records mounting daily and the interest in hi-fi reproduction, of which many of the records are capable, keeping pace, more and more of those in the shop, lab as well as those at home have become extremely conscious of the possibilities of those accessories which can be installed to assure better reproduction. As a result, manufacturers have strived to provide an assortment of hi-fi products to meet a variety of conditions. For instance, there has been developed a series of preamp-equalizers<sup>1</sup> specifically for the magnetic or constant velocity type of phono pickups, which feature an additional turnover step for low-frequency equalization of the *lp* records.

### **Three Stages of Amplification**

A three-stage amplifier, a 12AY7 low-hum, non-microphonic dual triode is used for initial stages and a 6C4 for output stage. Features use of a power socket to fit under 6L6 or 6V6 output tubes. A special socket is available for triode amplifiers.

Gain is said to be  $90 \times$  (39 db voltage gain), which permits use of low-output dynamic pickups. Has a screw-driver-adjusted gain control for setting of gain to suit pickup used. Output impedance is 20,000 ohms, which al-

lows use of longer cable for output without loss of highs.

Power supply uses a selenium high-voltage rectifier.

### **Electronic Mixing**

In another contribution to better reproduction, at the recording end, a professional type electronic mixer<sup>2</sup> for all audio systems has been announced. Multiple mike recording on tape, wire or disc, or for public address systems are possible with this unit.

### **Six Inputs Provided**

The mixer has four individual controls which permit a range of audio blending applications on each of its four channels simultaneously. Provided are six high impedance inputs; four microphone, two phonograph. Microphone gain is 8 db; phono gain, -22 db. Uses a selenium rectifier and two 12AX7s. May also be used with 12AY7 low noise level tubes. Frequency response said to be 20 to 20,000 cycles.

### **Portable Automatic Record Player and Public Address System**

For those who need *lp* and standard-record reproduction at high output,

Pentron Audio-Mix system.

there is now available a 15-watt *pa* system<sup>3</sup> with 3-speed record changer and 12" speaker, self-contained in a single carrying case.

### **Dual Cartridge Used**

The 3-speed automatic changer is equipped with a dual-type crystal cartridge, and is designed to play all types of records up to 12". Has a built-in preamplifier which permits conversion to magnetic type pickup.

### **Provision for Mixing**

The 15-watt amplifier, a hi-fi unit, has separate bass and treble tone controls, with controls for microphone and phono; permits mixing of mike program with phono background. The amplifier has 3 output receptacles; can be used also with 2 external speakers.

### **Transcription System**

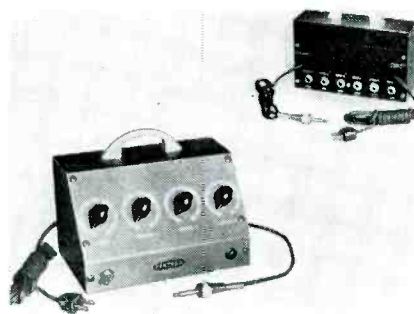
Also available is a model<sup>4</sup> equipped with 3-speed phono motor and transcription type pickup arm (with dual-crystal cartridge). Plays all types of records up to and including 16" tran-

<sup>1</sup>MM-1, *Audio-Mix*; The Pentron Corporation, 221 East Cullerton Street, Chicago 16.

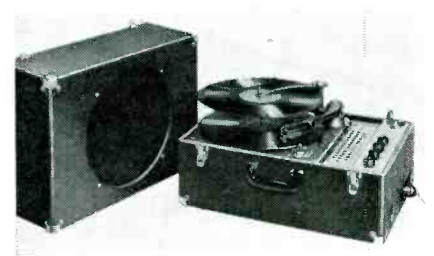
<sup>2</sup>Model 1254; Rauland-Borg Corp., 3523 Addison St., Chicago 18, Ill.

<sup>3</sup>Model 1253; Rauland-Borg.

Brociner preamp-equalizer



Rauland-Borg *pa* and 3-speed changer system.

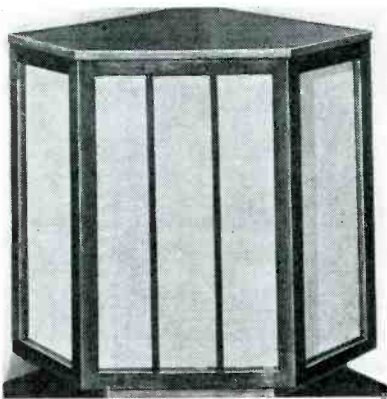




**Preamp-Equalization Systems . . . Hi-Fi Record Player-Amplifier Combinations . . . Mixers . . . Replaceable and Turnover Pickups . . . Three-Speed 7 to 17-Inch Record Players . . . Corner Speakers**



Audio Master playback unit.



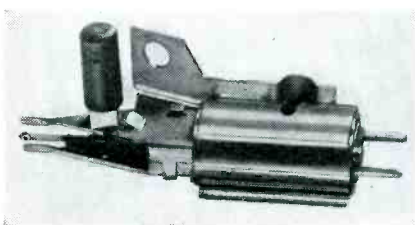
Reflexed corner horn enclosure, with provisions for a 15" speaker. Cabinet is 34" high, 36" wide and 26" deep. Enclosure is said to provide a gain of 3 db through the use of a 4½' long reflexed-exponential horn coupled to the rear of the speaker cone. (Courtesy Electronics of Staten Island, N. Y., 363 Victory Boulevard, Staten Island 1, N. Y.)

Below:

Sonotone turnover cartridge with provision for 1 and 3-mil needle points for lp and standard records.

Right:

Sonotone playall pickup with which three types of needles can be used: 1, 3 or 2.3-mil, the latter being of truncated design.



scriptions. Constant speed motor has control lever for change to speed desired.

**Phono Pickups**

Development of pickups for lp and 78 work has been keen, too. Recently two novel types for this application were announced; one employing a replaceable needle<sup>5</sup> and the other a turnover type of needle.<sup>6</sup>

**Provision for Three Needles**

The replaceable unit can be used with three types of needles. With a three-mil sapphire needle, it plays 78-rpm recordings. A one-mil sapphire needle is for use with 33½ and 45 rpm recordings. All three types of recordings can be played with a 2.3-mil truncated osmium needle.

**Turnover Features**

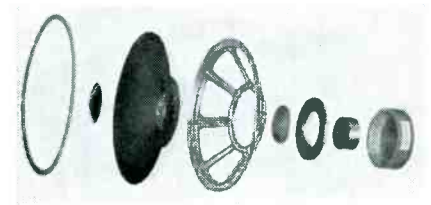
Either a diamond or sapphire needle can be used with the *turnover*, which plays all three speeds. The turnover design provides two separate needle points—a one-mil for 33½ and 45 rpm recordings and a three-mil for 78 rpm. The point desired can be put in position by flicking a lever.

Pickups use a piezoelectric ceramic element.

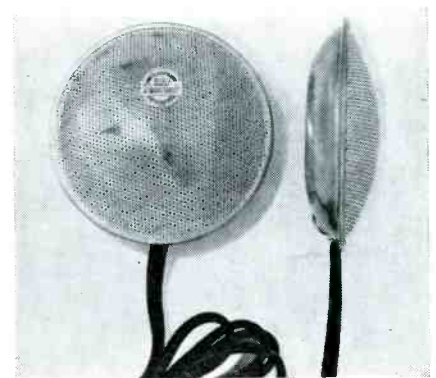
**Three-Speed Transcription-Type Playback Machine**

For those who require transcription quality there has been produced a

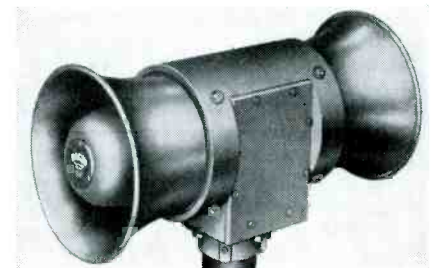
<sup>5</sup>Playall, <sup>6</sup>Turnover; Sonotone Corp.; Elmsford, New York.



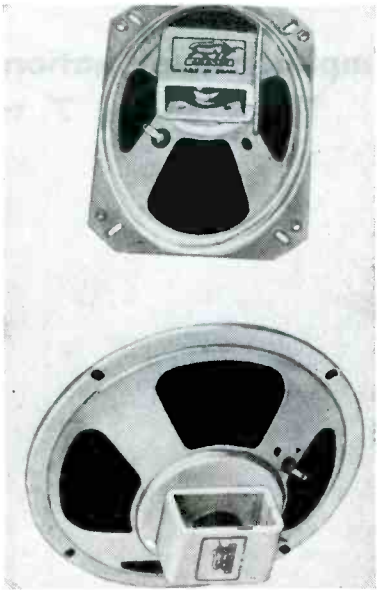
Parts which comprise a hi-fi type of speaker. (Courtesy James B. Lansing Sound, Inc., 2439 Fletcher Drive, Los Angeles, Calif.)



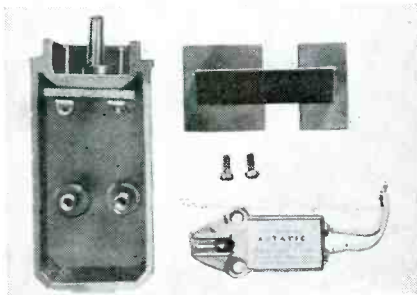
Under-pillow speaker, 3" in diameter and ¼" thick, which can also be used as a dynamic microphone, requiring two stages of amplification. Features pressed stainless steel construction. Four models are available: Model 300, voice coil impedance of 3.2 ohms; model 300 A, 2,000; model 300 B, 10,000 ohms; and model 300 C, 100,000 ohms. A waterproof impregnated cone and an alnico V magnet are used. (Wright-Zimmerman, Inc., New Brighton, Minn.)



Dual speaker, designed primarily for railroad sound and other industrial installations, such as open pit mines, steel mills, factories, etc. Consists of a non-corrosive center aluminum casting with a weatherproof steel-bell reentrant speaker at each end of the opening. Velumoid gaskets between each cover plate and the casting are said to prevent any water seepage. Diaphragm is of bakelized linen. Magnet material is alnico 5. Voice coils are wound with aluminum wire. Diaphragm sensitivity is said to permit talk-back at distances up to 100'. Voice coil leads are beryllium copper gauze to relieve fatigue, and are welded. Dispersion angle per speaker is 45°. Frequency range, 350-6,000 cycles; total operating capacity, 40 watts; peak capacity, 70 watts. Impedance (speakers in parallel), 8 ohms. (Model RR-40; Racon Electric Co., Inc., 52 East 19th St., New York 3, N. Y.)

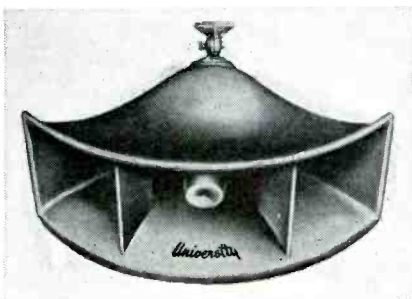


Weatherproof type speaker recently announced. (Courtesy Oxford Electric)



Parts of crystal cartridges for plug-in changer heads. Cartridge is said to be *internally equalized* to follow Columbia Records ideal frequency response for the recording characteristics of *lp* records (30 to 11,000 cycles). Cartridge has a small, lightweight aluminum housing with standard 1/2" mounting holes to fit most tone arms. It is furnished with an adapter plate to permit mounting in RCA and similar 45-rpm record changers. Output is listed at approximately .6 volt at 1,000 cycles per second on Columbia No. 103 test record and one volt on RCA 12-5-31-V test record. One type, CAC-W-J has a 1-mil sapphire needle tip to play both 33 1/3 and 45 records. Another, CAC-78W-J has a three-mil sapphire needle tip radius for 78s. (Courtesy Astatic)

Paging type speaker with a power input capacity of 12 watts continuous, and a frequency response of 250-10,000 cps. Said to incorporate the advantages of the reflex formula plus the effectiveness of a *cobra* shaped horn. Dispersion, 120° x 60°. (Cobra-12; University Loudspeakers, Inc.)



3-speed player with a 4-tube amplifier.<sup>7</sup> The unit not only plays all speeds, but all size records from 7" to 17 1/2" and all kinds of discs, including transcriptions. Has a detachable 8" loudspeaker with a 10' cord and a *twist-crystal* cartridge fitted with two permanent needles.

### Speakers

Eight new models of speakers have been announced by the Oxford Electric Corp., 3911 S. Michigan Ave., Chicago 15, Ill.

These are: models 3 CMWS and 6CMWS weatherproof speakers; 82EVS pin cushion type for auto replacement; 46V45S, 60A45S, 80A45S, 10E45S, and 12E45S electrodynamic speakers.

### Audio Literature

The past few weeks have witnessed the release of many types of data on audio systems. From Sun Radio,<sup>8</sup> for instance, has come a 100-page audio equipment catalog with information on the principles involved in fine music reproduction. A large section of the book is devoted to questions and answers most common to high-fidelity aspirants, or owners. The balance of the handbook contains listings, prices and information on components and sub-assemblies relative to hi-fi music reproduction.

### Phono Accessory Data

A 16-page G. E. phono accessory catalog, with descriptions and data on variable reluctance cartridges, replacement baton styli, tone arms and phono preamplifiers, has been prepared by the parts section of the G. E. receiver division.

### Needle . . . Tape Recorder . . . Speaker Bulletins

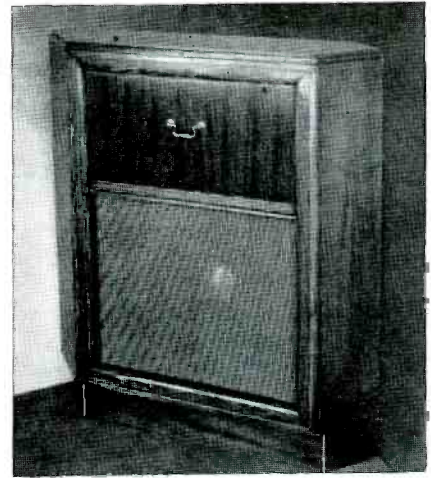
Also available is a 4-page leaflet on diamond styli, published by Pickering<sup>9</sup>; an 8-page booklet on tape recorders, amplifiers and mixers with specifica-

<sup>7</sup>Model '51; Audio-Master Co., 341 Madison Ave., N. Y.

<sup>8</sup>122-124 Duane Street, N. Y. C.

<sup>9</sup>Pickering and Co., Inc., Oceanside, L. I., N. Y. <sup>10</sup>Sonar Radio Corp., 59 Myrtle Ave., Brooklyn, N. Y. <sup>11</sup>University Loudspeakers, Inc., 30 South Kensico Ave., White Plains, N. Y.

<sup>12</sup>Jensen Industries, Inc., 329 S. Wood St., Chicago 1, Ill.



Two-way corner speaker system featuring use of an 8-inch tweeter and a 12-inch woofer, which are placed back to back in housing. Cabinet is 36" high, 30" wide and 18" deep. Match for amplifiers with impedance of 4 to 16 ohms provided. (Courtesy Sun Radio)

tions on three-channel mixers and third-head preamps, and tape power amplifiers, released by Sonar<sup>10</sup>; a 6-page bulletin describing tweeters, high-pass filters, coax tweeter adapters, frequency dividing networks, cobra-horn tweeters, etc., prepared by University Loudspeakers.<sup>11</sup>

### Installation Instructions for Phono Needles

The complete line of Jensen<sup>12</sup> replacement phono needles, consisting of 89 types, are now packaged with individual *how to install* instructions.

Simple diagrams are used to explain the step-by-step procedure in installing the new needle in the cartridge.

Checking a stylus on a Shadowgraph which provides a magnification of 500 times. Needle wear test study available at Sun Radio as an audio studio service.

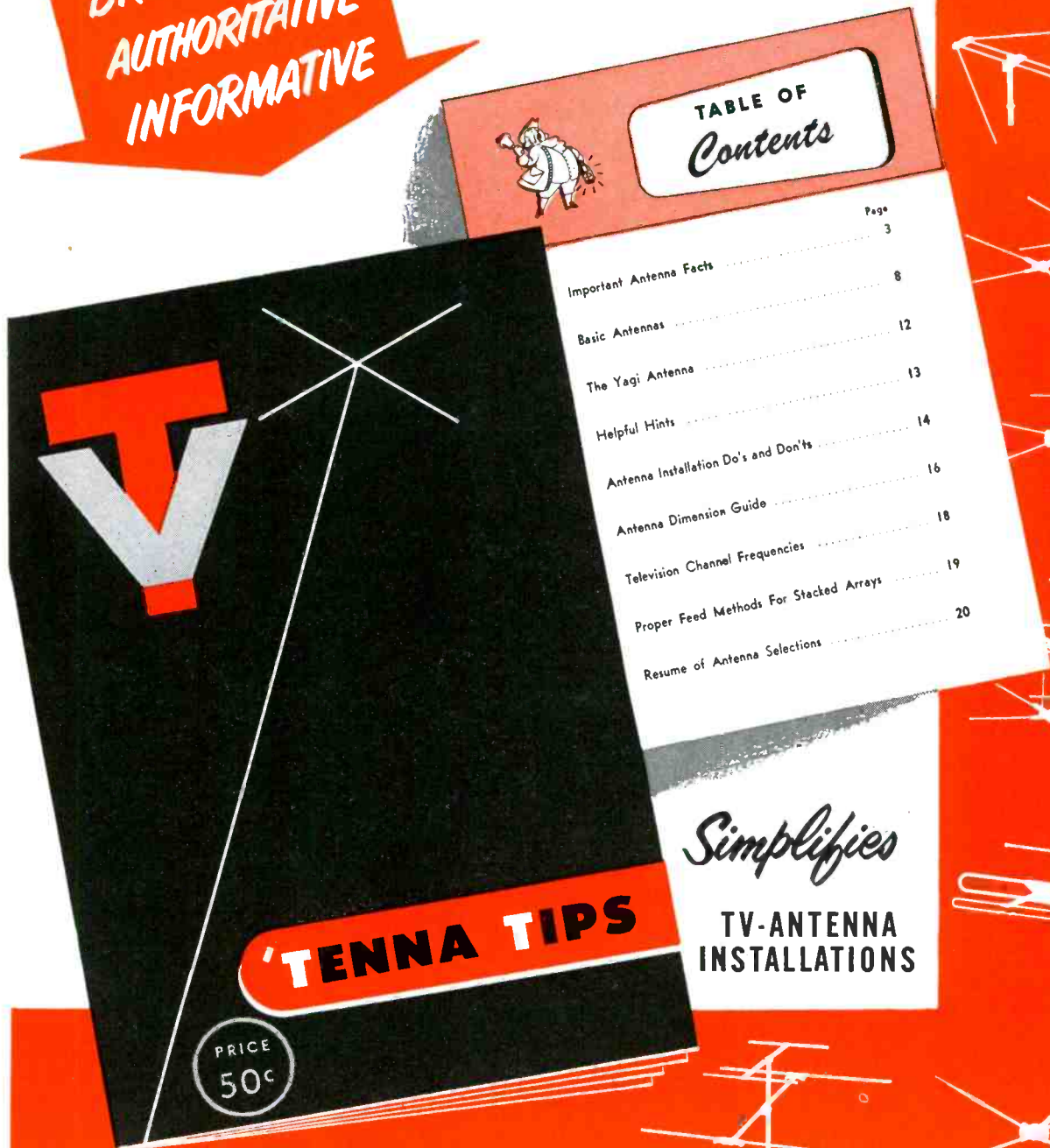




# THE LAST WORD IN TV TENNA

BRAND NEW  
AUTHORITATIVE  
INFORMATIVE

## INSTALLATIONS



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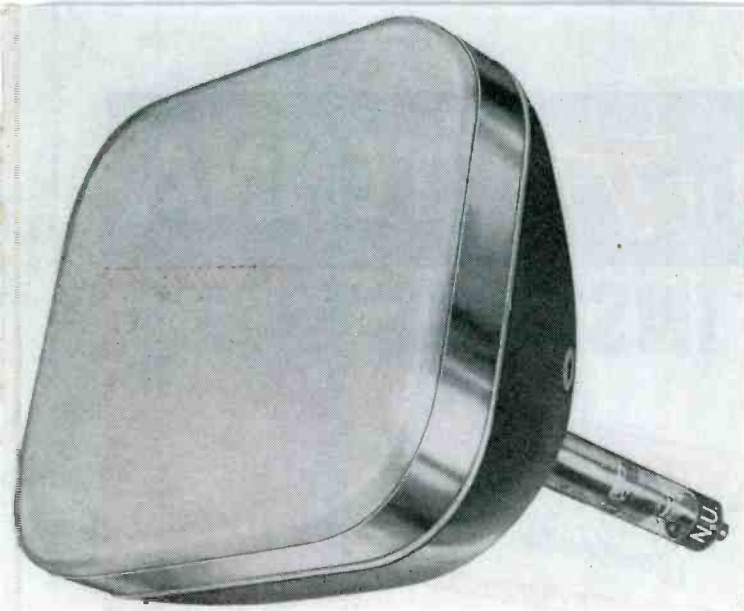
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# WIDE-ANGLE DEFLECTION CONVERSION

## Techniques for Rectangulars

by WALTER H. BUCHSBAUM\*

SINCE THE BEGINNING of '50 the trend in TV design has been towards more compact receivers and, therefore, the use of shorter picture tubes, especially rectangular tubes, has greatly increased. For the Service Man the use of these picture tubes means a different deflection system to troubleshoot and the possibility of converting small screen receivers for use with the new, rectangular picture tubes.

### Deflection Angle

The electron beam inside the picture tube is deflected from left to right and from top to bottom. The arc described by the beam in its movement from left to right is the horizontal deflection angle and the one from top to bottom the vertical angle. The latter is much less than the horizontal angle, since

[See Front Cover]

the picture is wider than it is high. Because the vertical sweep is relatively slow, its angle is of no great concern. In general, when deflection angles are discussed it is the horizontal angle that is being considered.

To reduce the length of the picture tube and maintain the same screen diameter, the deflection angle must be increased. In the 10-inch tube this angle was approximately 53°, in the 12LP4 it is 55°, in the 16RP4 it is 65°, and in the 22AP4 it is 70°. This angle is measured horizontally and the diagonal angle is, of course, larger. When the electron beam is swept through a larger angle, more power is needed. When, at the same time the second

anode voltage is raised, still more deflection power must be supplied. In all rectangular picture tubes the second anode voltage must be at least 12 to 14 kv for good brilliance and focusing. That is why new and different deflection circuits are required for these wide-angle tubes.

Special deflection yokes must be used to avoid neck shadow on wide angle tubes, as shown in Fig. 2; p. 26. The effective length of the deflection yoke for a 70° tube is  $\frac{3}{8}$ " shorter than for a 53° tube. Other changes also are required in the yoke to make it more efficient, such as the use of ferrite as core material and higher yoke inductances. The old type yokes had inductances of 8.3 mh in the horizontal coils, while many wide angle yokes have either 10 or 18 mh.

The vertical sweep of many 10 or 12-inch receivers is capable of handling the rectangular tubes without major changes. The primary object in conversions is therefore the horizontal flyback circuit.

In addition to a new deflection yoke, rectangular picture tubes also require a different focus coil than the older types. Because the anode voltage is

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**Increased Deflection Power and Higher Voltage Needed For Wider Angle Tubes Requires Modified Horizontal Flyback With a Ceramic Core Flyback Transformer, Suitable Deflection Yoke and Circuit Changes to Provide Drive Signal and Operating Voltages Necessary for Satisfactory Performance.**

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(Above: Left)

A typical 16-inch rectangular picture tube.  
(Courtesy National Union; Type 16RP4)

\* Author of Television Servicing; Prentice-Hall, 1950.



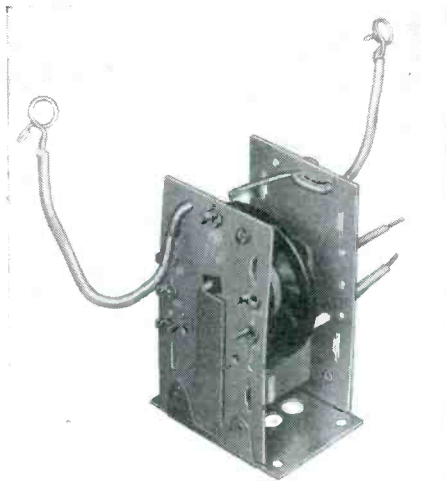


Fig. 1. G.E. 77J1 horizontal flyback transformer.

higher, more focus power is needed. The new focus coils are either of the large round type, or else a combination *em-pm* coil or an-all *pm* focus ring.

#### High Efficiency Sweep

To increase the deflection power and the high voltage without increasing the *B+* power consumption, the flyback circuit efficiency must be improved. This is accomplished largely in the flyback transformer by using a more efficient core material and different winding ratios. In Figs. 1 and 5 are illustrated two different types of high-efficiency flyback transformers. Both are suitable for use in conversion jobs. The unit shown in Fig. 1 uses a Ferrite core which is insulated from ground. To further reduce losses due to capacity to ground, the mounting plate underneath the core is perforated and must be mounted over a 1½" hole in the chassis.

When connected in a circuit as shown in Fig. 3, the transformer will give full sweep with at least 13 kv on even a 22-inch rectangular picture tube. It should be kept in mind, however, that a wide angle deflection yoke, preferably with a Ferrite core, is required. In this circuit a 6BQ6 is shown as output amplifier, but a 6BG6 or 6CD6 could also be used. In this case the grid and screen resistors would have to be changed to conform with the individual tube characteristics.

A special feature of the high-efficiency flyback circuit is the additional power feedback voltage due to the step-up between 4 and 5 on the transformer. This steps up the flyback pulses rectified by the 6W4 damper and therefore gives more boost voltage to drive the plate of the 6BQ6. With

(Continued on page 26)

G.E. 77J1.

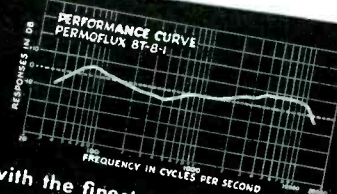


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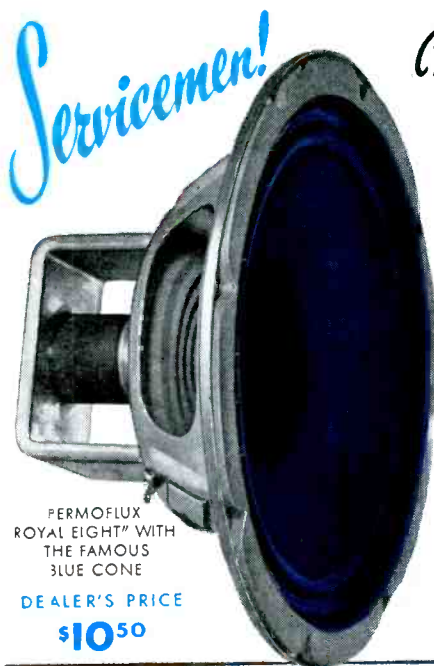
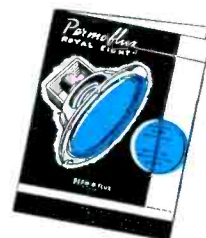
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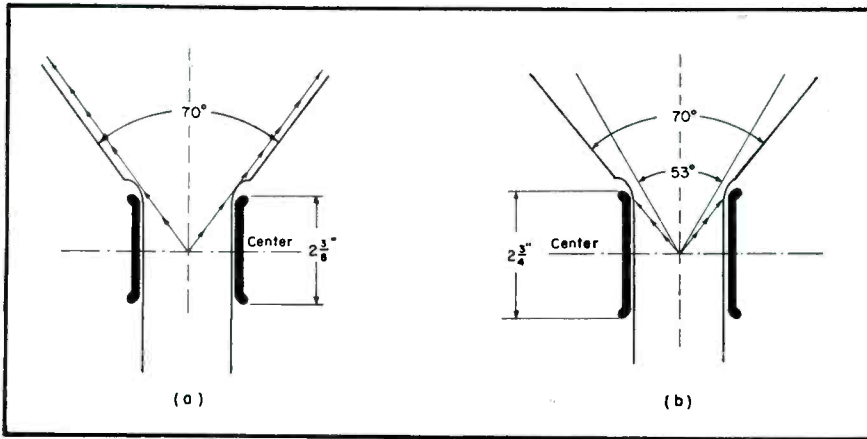


Fig. 3. G.E. horizontal flyback circuit with a 77J1 transformer.

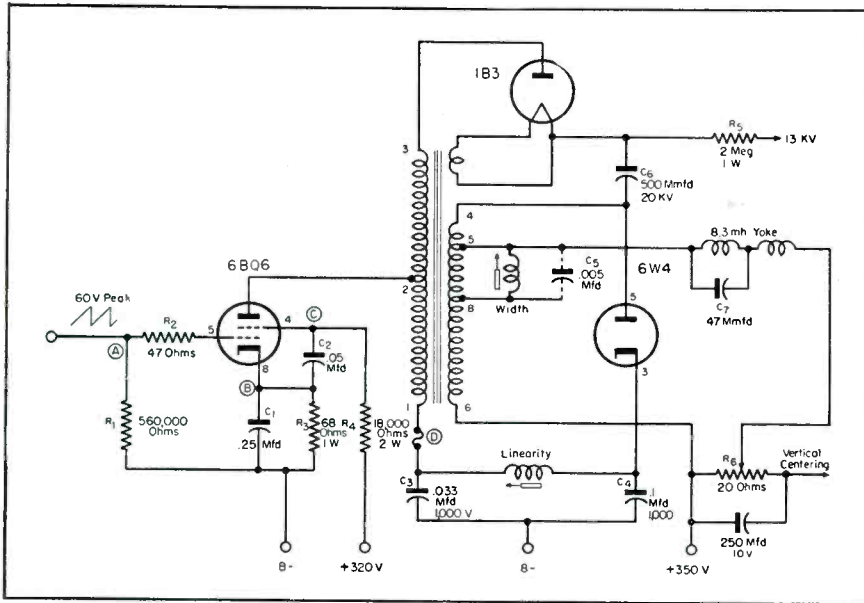
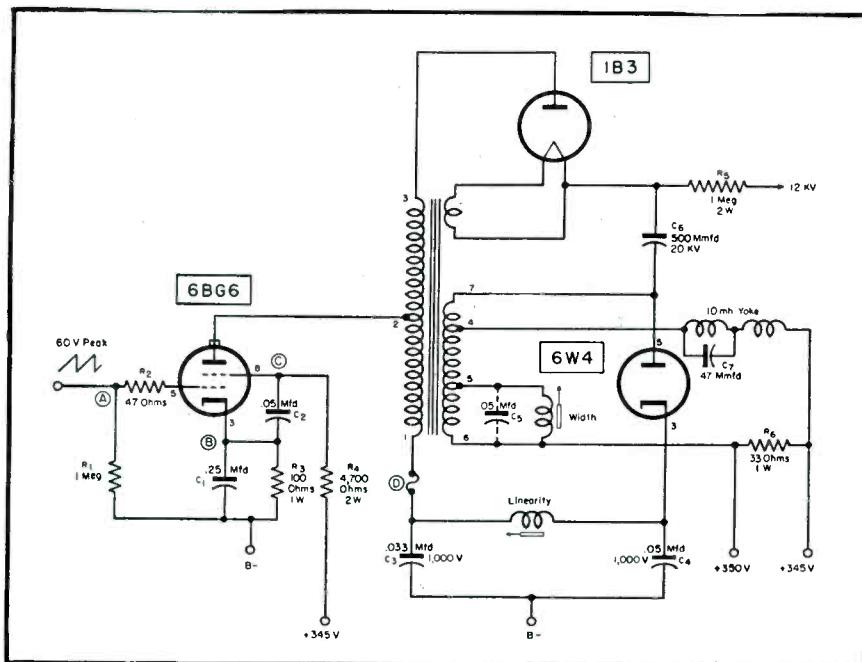


Fig. 4. Flyback circuit using a transformer which has a grounded ceramic core. (This is similar to the circuit shown on the cover, with one exception; the A, B, C and D points were omitted in the cover diagram.)



(Left)  
Fig. 2. Why special deflection yokes must be used to avoid neck shadow on wide angle tubes.

the voltages, as shown, this boost voltage should be about 500, a 150-volt boost above  $B+$  supply.

The width and linearity coils used with this transformer are different from those commonly found with powdered iron core flybacks. If insufficient width is encountered, the width coil can be shunted with a .005 to .05-mfd capacitor. This will reduce the high voltage slightly, but increase the width substantially. The centering control shown is like those used in the RCA 630 and many similar sets. If a mechanical centering device is used, a fixed resistor can be substituted, a procedure employed in the circuit of Fig. 4.

Several different grades of Ferrite are used in this type of flyback and the efficiency of the transformer can be gauged by knowing the grade of Ferrite used. The lowest grade is usually color-coded green and a small  $U$  is stamped on the transformer. Next is a red core with either  $E$  or  $EE$  marked on the mounting bracket. The best core grade is black and has an  $EE$  to indicate double excellence. For wide-angle deflection the green or  $U$  flybacks are *not* suitable. Only red or black, preferably the latter, with  $EE$  stamped on it will give sufficient sweep and high voltage for rectangular picture tubes.

Once the new high efficiency circuit is wired in, the Service Man might find that it does not operate as well as it should. After checking connections to make sure the wiring is correct, a few simple voltage checks will indicate just where the defect lies. Measuring across  $R_1$ , in Fig. 3, from point  $A$  to  $B$ , about 18 volts negative should be found. A 'scope measurement should show at least 60 volts peak-to-peak of sawtooth at  $A$ . Unless these voltages are present at  $A$ , the rest of the circuit cannot function correctly. In many receivers the output of the horizontal oscillator or the discharge tube is less than 60-volts peak and this must therefore be increased. In receivers using RCA 630 type of *synchrolock* circuit, the discharge capacitor should be made smaller and the resistor larger in value. Where the *synchroguide* system is used, a reduction of the plate resistor of the oscillator will accomplish the same. Increasing the coupling capacitor which brings the sawtooth voltage to the output grid will also

(Continued on page 57)



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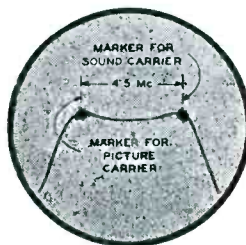
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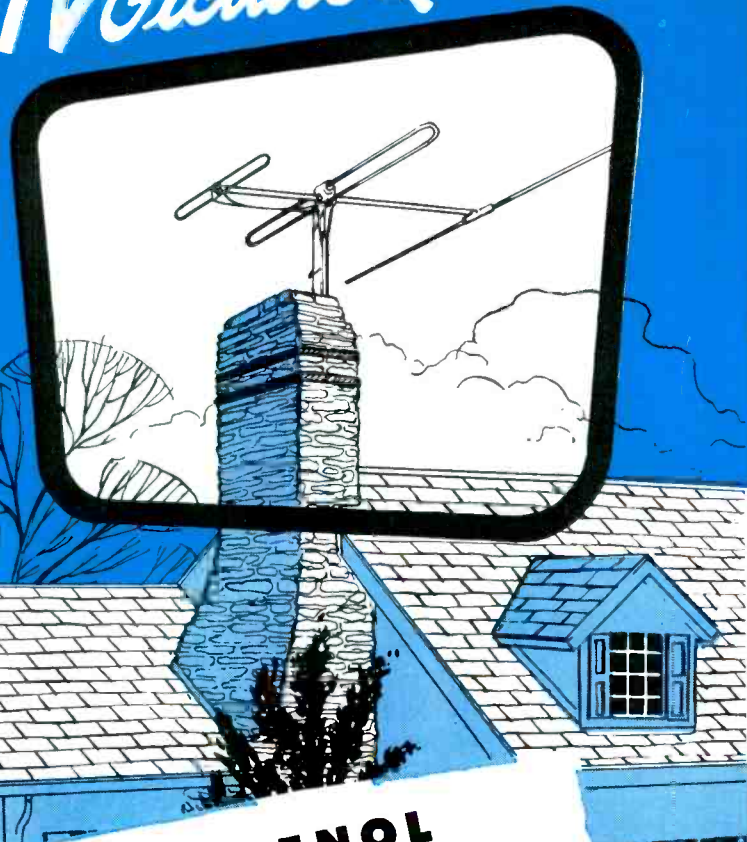
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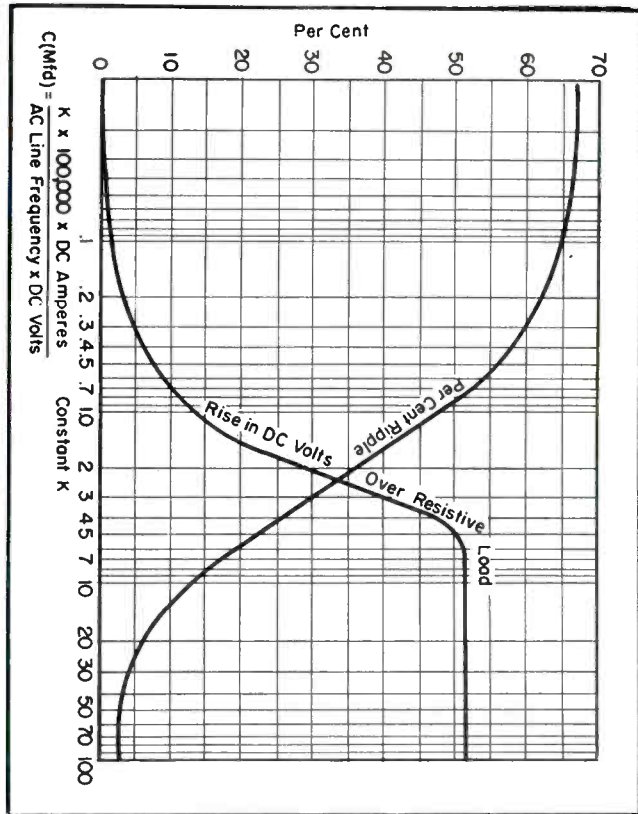
# Auto

THE SERVICING OF AUTO RADIOS has been found to be a dreaded item on the work calendar of many a Service Man, and oddly enough not because of a lack of knowledge or skill, but because of the storage battery or power source. So many of the boys have had unpleasant experiences in attempting to maintain a charge on the wet storage battery, while others have been stumped because of the lack of an adequate power supply. Many have attempted to design and construct a suitable power supply. However, these design and construction projects have usually resulted in failure. The improper choice of the components required to obtain the voltage regulation required in servicing receivers of different current drain, has been one of construction problems. The design of a suitable and inexpensive filter has been another difficulty. Usually, home constructed jobs have been either inadequate for the expectant duty or so over-designed that the final costs have been staggering.

To meet the majority of the requirements necessary in servicing auto radios, several types of power supplies have been developed. In Fig. 1 appears the circuit of one model<sup>1</sup> with many attractive features.

The supply provides a reliable source of well-filtered dc power, conservatively rated at 10 amperes contin-

Fig. 2. Curves used to determine filter caacitor values.





# BENCH POWER SUPPLY

by J. T. CATALDO

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uous and 20 amperes intermittent duty. The output voltage is infinitely variable by a front panel control from 0 to 8 volts. The unit is capable of supplying sufficient power to operate the largest auto sets with any type of tuning mechanism. A voltmeter and an ammeter mounted on the front panel permits a continuous check of the input voltage to the receiver as well as its current drain. Damage to the power supply due to a short circuit in the receiver under test is prevented by means of a self-resetting bi-metallic overload relay. In addition, a conventional fuse in the 115-volt primary winding prevents damage to the shop wiring.

The circuit consists essentially of a step-down transformer, a single-phase bridge metallic rectifier, and an electrolytic capacitor. The transformer employed is of a unique design. Unlike the variable auto-transformer

(known under the trade name of *variac*), the variable secondary is isolated from the 115-volt line winding, thereby affording isolation from the line when desired. The metallic rectifier used is the *magnesium-copper sulphide* type which is ideal for low voltage, high current applications.

### Capacitor For Filtering

Further examination of the circuit reveals that no choke is employed in the filter circuit. A choke for this application would be an expensive item since it would require large gauge wire to handle the current desired. However, it has been found that reasonable filtering may be obtained by the proper choice of a capacitor. A set of curves, empirically developed from numerous tests, has been found to make the selection of the capacitor

size simpler. From these curves, Fig. 2, the value of  $K$ , to substitute in the formula below, can be obtained:

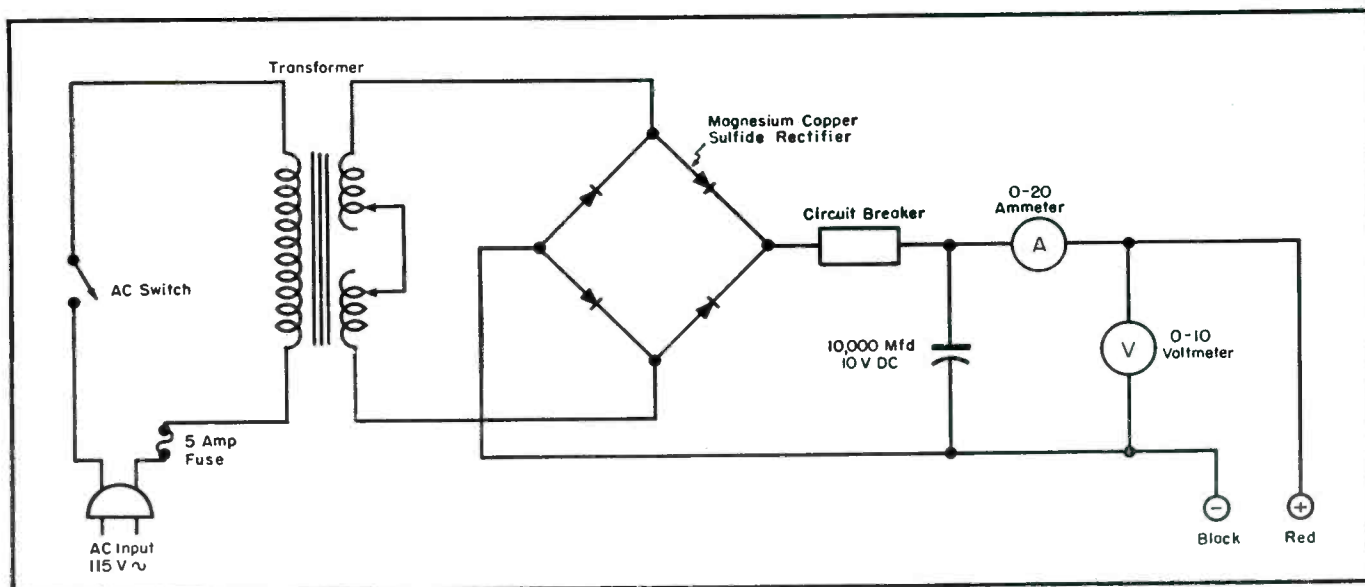
$$C_{mfd} = \frac{K \times 100,000 \times dc \text{ amperes}}{ac \text{ line frequency} \times dc \text{ volts}}$$

In any electronic equipment employing a capacitor for filtering, it is desirable to keep the ripple voltage as low as possible. A large value of ripple voltage will heat the capacitor and eventually damage it. Examination of the per cent ripple curve discloses that a  $K$  value of 70 results in the least amount of ripple. Substituting 70 in the equation for 10-ampere load, we find that the value of capacitance required would be 194,000 mfd, not a very economical size capacitor. Moreover, no gain in increased output voltage would be obtained by the use of this size capacitor. In fact, the output voltage would increase very

(Continued on page 53)

<sup>1</sup>Mallory 6RS10.

Fig. 1. Circuit of filtered rectifier power supply.



# Finding Your Way Around a TV Chassis

by CYRUS GLICKSTEIN

American Radio Institute

---

## Part II . . . Defect Results Which Serve to Identify Troubles in Horizontal Sweep Circuits and Sync Systems . . . Use of Tube Withdrawal Procedures to Check Problems . . . Tracing With Chassis In and Out of Housing . . . Table of Clues for Identifying TV Stages.

---

ANOTHER COMPONENT which can facilitate location of a circuit defect is the audio *if* discriminator. This and the first audio stages are almost always close to each other and the power amplifier usually follows closely. However, in some sets, the *pa* may be some little distance from the first audio stage.

### High-Voltage Section

The high-voltage section is in the high-voltage cage. Here usually will be found the kickback transformer, the horizontal output tube, horizontal damper, high-voltage rectifier and sometimes the horizontal oscillator, in kickback sets. The damper or oscillator may sometimes be found outside the cage, but close by. In *rf* high-voltage systems, the high-voltage rectifier and coil are usually inside the cage, with the *rf* oscillator tube outside.

The low-voltage rectifier(s) will be found close to the power transformer.

### Vertical Sweep Circuits

Vertical sweep circuits may be anywhere on the chassis. Since they are usually 6SN7 or a 6SN7 plus a power tube, the search can be narrowed considerably.

Sync circuits also are not found at any particular place on the chassis, and

identification would have to be made by tube type, the process of elimination, and tube withdrawal.

Some horizontal sweep circuits have a ringing coil as part of the frequency control system. This is usually in a can on top of the chassis and since the frequency is lower, the coil and therefore the can is larger than any of the *if* cans, with a thumbscrew adjustment on top rather than a slit bolt for a screwdriver adjustment. The horizontal oscillator tube is usually alongside.

### Tube Withdrawal Checks

*Tube withdrawals to check identification:* To check further, where there may be some question about the stage, the tube can be taken out while the set is on. (This is true only in transformer sets. In sets with series-parallel filaments, the tube can be taken out, a small loop of wire put around the grid pin (or cathode or plate of a diode detector), the tube is then reinserted, and the grid shorted to the chassis directly or through a .1-mfd capacitor.)

### Typical Withdrawal Tests

For example, if the tube is removed and leaves only a horizontal line, obviously it is in the vertical sweep section. If the tube is taken out and the picture rolls in both directions, it is in

one of the sync stages. If the picture rolls horizontally only, it must be in the horizontal *afc* circuit. Or, if sound disappears but the picture remains, the tube is in the audio strip. If both sound and picture disappear, but the raster remains, the tube is either in the front end or common *if* stage or common detector, etc.

### System's Practicability

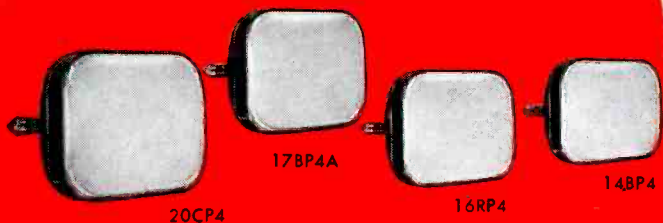
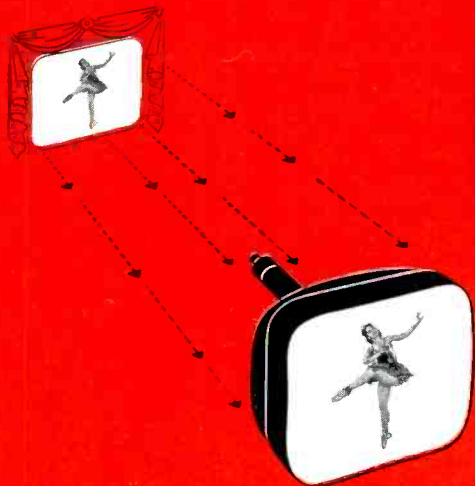
Some may wonder about the virtues of the latter method, for if there is both picture and sound, there probably is no need to service. Or, if there is no picture or no sound or neither, what good is this system, and how can it be used on an unfamiliar set?

### Proving Value of Test

Shop and in-the-home experiences have disclosed that there are often servicing problems to solve, even where there are both picture and sound. Either or both may be defective, though not entirely absent. Or both may be good and the fault is distortion in the sweep circuits, incorrectly functioning sync circuits, etc. Even when only part of the set is functioning, tubes can be taken out to check, learning which are responsible for that portion of the operation. They are then eliminated from consideration of other types of functions. This step, together



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- 3 **You get A COMPLETE LINE.** Hytron offers you 14-, 16-, 17-, and 20-inch *studio-matched* rectangulars. All the popular rectangulars (and the popular types of round tubes too).
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with the other methods of checking, may be enough to identify the remaining stages.

### First Steps in Checking

Actually, the first step in servicing any receiver is to check the information on the screen and from the loudspeaker. Controls and channel selector are manipulated to see if the fault is due to a mis-setting of the controls. On the basis of this information, the Service Man can decide which section is likely to be defective. The inside of the chassis can then be examined to see if one or more tubes are unlit. If any are, they can be replaced. If several are out in a set of series filaments, possibly one in the string is open. It will then be necessary to check each one for continuity and replace the defective one(s). If all tubes are lit, or in the case of metal tubes, felt and found to be warm, the next step would still be to substitute new tubes for the ones in the defective section, which can be located by the methods previously outlined when the set is unfamiliar. While any of the foregoing methods may not in themselves be definite, the use of all of them to-

gether can provide fairly conclusive information.

Of course, once the chassis is out of the cabinet, there are other important landmarks, chiefly controls and also easily recognizable components which are associated with definite stages. This information is summarized in columns 3, 4 and 5 in Table II.

The connections from the control or component are simply followed until it is found to which stage the wire is connected.

### Stage-to-Stage Studies

Also, it is easy to trace from one stage to the next under the chassis, either forward or back. If the plate goes to a coil or transformer, it is wise to look for the lead on that component going to the next grid. Or, working back, the grid connection can be followed to the plate of the preceding tube, whether through a transformer or a coupling capacitor.

Since many new sets coming out do contain duplicate type circuits and the trend is to have the same general design and performance with fewer stages, stages can be serviced on the

basis of previous information at the disposal of the Service Man. Tube substitutions always can be made. Voltages can be checked around sockets. Even if there is no record of the correct voltages to help, it is always possible to spot a plate or screen with no or very little voltage as an obvious source of trouble. Resistance readings may show up shorts or opens in places where they obviously don't belong. Signal injection with a generator is possible in the signal circuits and the 'scope can be used in the sweep, sync, and video detector and amplifier circuits to check operation, as compared to that in similar, earlier models.

### Merit of Clue Suggestions

There is no doubt that the more technical information the Service Man has at his disposal, the faster and better job he can do. But where there is no choice about the matter and there is no printed information available, it is still possible to fall back on knowledge, experience, ingenuity, test equipment and perhaps some of the foregoing suggestions.

Table II

Some clues for identifying TV stages (kickback type)

(1) Stage or Section	(2) Most Popular Tube(s)	(3) Usually Connected to Control	(4) Usually Connected to Following Large Component*	(5) Identifying Features of Components in Col. (4)	(6) Outline of Tube in Col. (2)
Front end	6AG5 6J6	(a) Channel selector (b) Fine tuning	IF coils	_____	_____
Video <i>ifs</i> (or common <i>ifs</i> if inter-carrier video detector)	6AG5 or 6AU6 6AL5	_____	Input: IF coils Output: Peaking coils	(a) Bolt protruding above chassis. (b) IF can on chassis (Input) See (a) and (b) (Output) Coil on resistor	Fig. 1b** Fig. 1a** Fig. 1c**
Video amplifiers	12AU7 or miniature pentode and power tube	_____	Peaking coils	Small coil wound on resistor	Standard GT
Sound <i>ifs</i> and limiter	6AU6	_____	IF coils	Usually <i>if</i> can on chassis	Fig. 1b**
Sound disc and first audio	6T8 or 6AL5 plus miniature pentode	Volume control	Input: IF coils	Usually <i>if</i> can on chassis	Fig. 1c**
Sound <i>pa</i>	6K6	_____	Output transformer	Small transformer usually mounted on speaker	Standard GT
Sync amp and clippers	6SN7 and 12AU7	_____	_____	_____	Standard GT
Vert osc and amp	6SN7	Osc: vert hold and vert size amp, vert linearity	Blocking osc transformer Vert output transformer	Small, similar to output transformer Large, oversize model of output transformer	Standard GT
Hor <i>afc</i>	6AL5	_____	_____	_____	Fig. 1a**
Hor osc	6SN7	Hor hold.	Blocking osc transformer	Small, similar to output transformer	Standard GT
Hor output	6BG6 or 6BQ6	If hor drive is trimmer, goes to grid	Kickback transformer	Usually in hv cage	See text
Hor damper	5V4 or 6W4	Hor lin control	_____	_____	See text
Hv rect	1B3 or 1X2	_____	Kickback transformer	Usually in hv cage	See text
Lv rect	5U4	_____	Power transformer	Largest transformer in set	See text

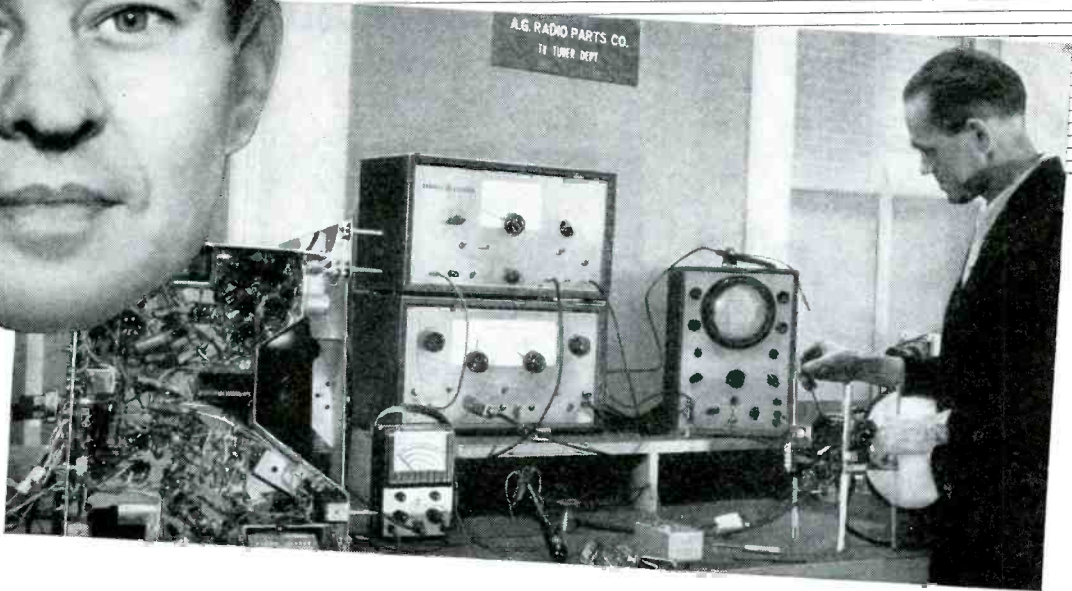
\*May be either above or below chassis. \*\*SERVICE; December, 1950.





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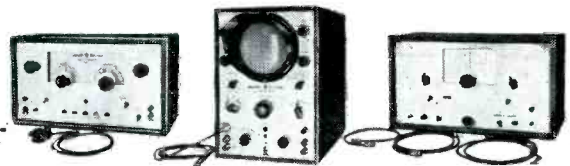


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can be installed in the existing hole near the center of the chassis.

### Corona and Arcing\*

Where high voltage sources are required, as in a television receiver, it is necessary to guard against possible corona or arcing.

In locations where the humidity is high, corona conditions become aggravated due to the lowered dielectric constant of the air surrounding the high voltage source. When the air contains a high percentage of moisture, ionization takes place and corona forms at points of small surface area which are subject to a high potential much more readily than under less humid conditions. Corrective measures involve increasing the surface area at the points where corona exists. Corona can also emanate from particles of grit or dust adhering to high voltage conductors and components which provide points of high potential and small surface area and may form a path for arcing.

Arcing occurs only when the insulation resistance between two points of high potential becomes lower than the critical insulation resistance necessary for the potential involved. Arcing, therefore, is corrected by increasing the insulation resistance between the two offending points, either by spacing or introducing a high dielectric material such as polyethylene sheet, etc.

Corona is actually a blue or violet discharge emanating from *hw* sources, characterized by a hissing sound. Arcing is a periodic or sustained breakdown between two points of different potential, characterized by a snapping and popping sound.

A darkened room will often prove to be of value when looking for corona, depending upon the magnitude of the corona discharge. In cases where the

\*Based on notes from the service department of Westinghouse Electric.

## Increasing Sync Stability of RCA 16 and 19-Inch Chassis for Improved Fringe Area Reception . . . Isolation and Suppression of Corona Conditions . . . Stromberg-Carlson Service Hints: Changing 6AC7 in Video Amplifier to 6AG7; Picture Tube Protective Steps; Eliminating Signal Overload; Horizontal Phase Detector Circuit Modifications; Remedies for Bifilar IF Coil Failures; Avoiding Horizontal Picture Pulling and Kinking.

discharge is difficult to locate visually, it is often possible to detect the corona source by carefully probing points in question with a blunt rod of non-conducting material. When the blunt instrument contacts the corona source the hissing sound will change pitch or be interrupted. The magnitude of the corona discharge may be increased to facilitate location by using a *variac* to increase the line voltage. Corona may occur at sharp solder points, around excessive rosin, sharp bends in wiring, etc.

An arc can usually be located by visual inspection of the high voltage sources. A darkened room may be useful where the arc is very small. Increasing the arc by using a *variac* to raise the line voltage may also be of assistance.

### Correcting Corona

(1) Eliminate all sharp points, such as the junction of two components, by soldering connections heavily and

forming smooth rounded joints free from sharp burrs and excessive rosin.

(2) If corona is emanating from insulating material, apply a coat of insulating varnish<sup>1</sup>. (It is imperative to use a varnish which will not form bubbles while drying.) Where necessary, several coats should be applied.

(3) Clear all *hw* areas of accumulated dust, grit, and residue. To wipe residue from connections and insulating surfaces, a cloth moistened with carbon tetrachloride is recommended.

(4) When corona appears at the termination of a wire, it may be suppressed by wrapping the wire-end with scotch tape.<sup>2</sup>

(5) Corona about an *hw* capacitor may be due to metallic paint on the capacitor. The paint should be removed with lacquer thinner or paint remover.

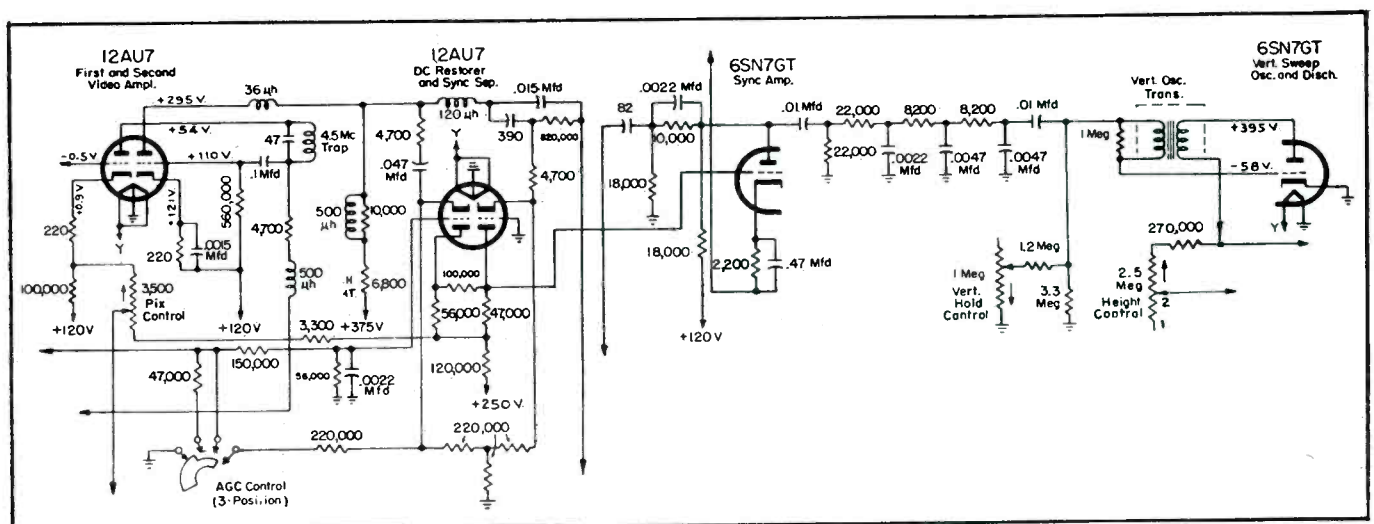
(6) Corona at tube pins and socket contacts (1V2, 1X2, 1X2A) can be

<sup>1</sup>Tuffnell Westinghouse BT-2243 or equivalent (1/2 pint).

<sup>2</sup>Scotch Acetate Woven Tape or Permacel Industrial Tape.

<sup>3</sup>Lubriplate (Fiske Bros. Refining Co., Newark, N. J.).

Fig. 3. Modified sync, dc restorer and vertical oscillator circuits for improved sync stabilization.



corrected by filling tube socket contacts with *Lubriplate*<sup>3</sup> and reinserting tube.

### Correcting Arcing

Arcing can usually be corrected by proper lead dress and spacing of *hv* leads and removal of dust and residue from insulators and components.

### Stromberg-Carlson Notes

**Model 17 . . . Change of 6AC7 in Video Amplifier to 6AG7:** To accomplish the change, the following changes are being made. (Direct substitution of tubes is not possible.)

- (1) Part 114,690 peaking coil in the  $L_{14}$  position (video amplifier plate circuit) has been replaced with a new 114,704 peaking coil.
- (2) Part 114,691 peaking coil in the  $L_{15}$  position (video amplifier plate circuit) has been replaced with a new peaking coil (114,705).
- (3)  $R_{116}$ , 2,200-ohm 2-watt resistor in plate circuit has been removed.
- (4) In the video amplifier bias resistor network, the  $R_{92}$  and  $R_{11}$  positions have been interchanged.  $R_{11}$ , 22-ohm resistor has replaced  $R_{92}$  (12 ohms) and  $R_{92}$  has replaced  $R_{11}$  on the ground side of the chain. The movable tap on the contrast potentiometer in the cathode circuit has been connected to the junction of  $R_{11}$  and  $R_{92}$ .
- (5) Wiring connections to the tube socket remain unchanged.

### Picture Tube Protection

**Model 17 . . . Picture Tube Protection:** Some 17AP4 and 17BP4 picture tubes have enlarged glass envelopes. Since the enlarged portion of the envelope comes close to the metal chassis edge in subject models, strips of rubber are being cemented to the chassis at this point to act as protective bumpers. When replacing a picture tube with one of the newer enlarged envelopes, it is recommended that rubber strips be inserted as protective bumpers if the chassis is not so equipped.

### Signal Overload

**Models 116 and 17 . . . Signal Overload:** Signal inputs of too high levels may produce overload, in turn causing low contrast, washed-out milky pictures accompanied by sound beats in the picture and buzz in the audio. The

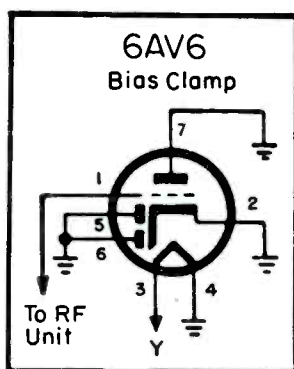


Fig. 4. Additional bias clamp circuit required in RCA sync alteration.

signal can be attenuated by inserting a resistor network pad in series with the antenna lead to the receiver which will reduce the overload condition. Resistor values for this pad are suggested in the installing instruction sheets attached to the rear panel of each receiver when packed.

### Phase Detector Modifications

**Models 116, 17, 117, and 119 . . . Horizontal Phase Detector Circuit Modifications and Associated Changes:** The design of the circuit which samples pulses from the horizontal sweep system for the phase detector has been revised as follows:

- (1) The *afc* sawtooth coil has been removed ( $T_{18}$ —116 and 17 series and  $T_6$ —117 and 119 series) from the circuit.
- (2) The 4.7-ohm, 1-watt resistor ( $R_{230}$ —117 and 119 series,  $R_{113}$ —116 and 17 series) has been removed and a direct connection made across where the resistor connected. The .22-mfd capacitor ( $C_{50}$ —116 and 17 series,  $C_{234}$ —117 and 119 series) now runs directly between the No. 3 terminal on the horizontal output transformer and the side of the horizontal deflection yoke previously connected to the 4.7-ohm resistor.
- (3) The  $C_{230}$ , .0047-mfd capacitor which was recently added across the secondary of the *afc* sawtooth coil to improve picture centering, has been removed.
- (4) Also, to the No. 3 terminal of the horizontal output trans-

former (the boosted *dc* point),  $C_{235}$ , a .068-mfd capacitor in the 117 and 119 series receivers, has been connected. In the 116 and 17 series receivers two .22-mfd capacitors ( $C_{47}$  and  $C_{61}$ ) were originally specified in series at this point, later replaced by a single .01-mfd capacitor and now replaced by a .068-mfd capacitor, the same as in the 117 and 119 series receivers.

- (5) Where the bottom sides of these .068-mfd capacitors were previously grounded, a 33-ohm, 2-watt resistor is now connected between the .068-mfd capacitor and ground.
- (6) The feed connection to the No. 1 and 2 pins of the 6AL5 phase detector (*afc*) now connects to the junction of the .068-mfd capacitor and 33-ohm resistor.

### IF Coil Problems

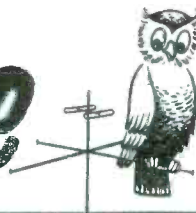
**All Current Models . . . Failure of the Bifilar IF Coils:** Some failure of the bifilar *if* coils have been reported from the field where the primary and secondary windings short together under high humidity and temperature or excessive dampness conditions. Examination of these failures reveals that in most cases open bubbles in the nylon wire insulation has permitted moisture to be absorbed by the nylon insulation, thus causing breakdown between primary and secondary windings. Present production of these coils using nylon insulated wire are being wax-impregnated to effectively seal off the windings against moisture. Coils (*if*) are also being used with *formvar*, a varnish insulated wire, which are satisfactory without the wax-impregnation.

### Picture Defects

**Models 16, 117, and 17 . . . Horizontal Picture Pulling or Kinking:** Recent field reports suggest that horizontal picture pulling, picture kinking, and critical action of the horizontal hold control can often be corrected by replacing the 6AH6 in the fourth *if* stage. Other than these symptoms, the operation of the faulty 6AH6 tubes appears normal.



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## Analysis of Admiral and Motorola TV Models Using 14-Inch Rectangulars.

RECTANGULAR PICTURE TUBES, featured in practically all of the current TV chassis, have been responsible for many modifications in receiver circuitry, particularly in the deflection systems because of the wider angles of deflection.

In the Admiral run of sets, for instance (20T1, 20V1 and 3C1 chassis), the 6BQ6GT is used to meet the new power requirements of the picture tube.

This beam power amplifier, in the horizontal output circuit, has the dual function of providing driving power for the horizontal deflection coils and a high voltage pulse for a 1B3GT second anode rectifier. The 6BQ6GT tube is used since its compact physical structure (short internal leads) is less subject to parasitic oscillation.

The output of the horizontal amplifier is transformer coupled to horizontal deflection coils. A 47-mmfd capacitor ( $C_{428}$ ) and 1000-ohm resistor ( $R_{442}$ ) are used across one of the horizontal deflection coils to make two coils appear identical electrically, due to slight differences in mechanical structure (proximity to vertical coils, etc.). A .1-mfd capacitor ( $C_{430}$ ) prevents *dc* flow through the deflection coils. High-efficiency *ceramic iron* cores are used in both the horizontal output transformer and the deflection yoke in order to obtain the required sweep and 12 kv second anode voltages.

A slug-adjusted coil ( $L_{402}$ ) varies the loading on a section of a secondary winding on the horizontal output transformer ( $T_{405}$ ) and functions as a width control.

### Second Anode Supply

Pulsed voltage in the plate circuit of the horizontal output amplifier is stepped up by the auto-transformer type primary of horizontal output transformer.

A 1B3GT is connected as a conventional half-wave rectifier with its filament power supplied by a separate sec-

ondary winding on  $T_{405}$ . Due to the light loading and relatively high ripple frequency, a 500-mmfd/1 megohm *rc* filter ( $C_{427}$  and  $R_{441}$ ) and the capacity between the graphic coatings on the bell of the picture tube provides adequate filtering for the second anode supply.

### Damper

The main reason for using the damper tube is to suppress oscillation in the horizontal section of the deflection yoke circuit. It is also used to increase the plate supply voltage for some circuits in the television chassis.

The connections of horizontal output transformer  $T_{405}$  are such that the *dc* plate supply and horizontal sweep voltage are in series. This provides a high peak plate voltage for the 6W4GT damper tube. Conduction of the damper tube charges three capacitors of .22, .047 and .02-mfd value ( $C_{424}$ ,  $C_{425}$  and  $C_{426}$ ) to approximately this peak voltage (400 volts). This provides a plate supply voltage that is considerably higher than the voltage delivered by the conventional power supply of the receiver.

A horizontal linearity control,  $L_{403}$ , varies the characteristics of a linearity control filter ( $L_{408}$ ,  $C_{424}$ ,  $C_{425}$  and  $C_{426}$ ). This varies the current flow (wave form) through the damper tube and the horizontal output tube, which results in a change in linearity.

The horizontal-oscillator circuitry of these receivers is quite interesting, too. One-half of a dual triode (6SN7GT) functions as a horizontal oscillator control tube. Feedback necessary for the triode to oscillate, is obtained by a coil,  $T_{404}$ . A tuned circuit consisting of  $L_{401}$  and  $C_{419}$  (.01 mfd) is connected in series with the oscillator feedback coil. When the oscillator tube grid momentarily reaches a high negative value and plate current ceases to flow, an oscillatory current flows in the resonant circuit composed of  $L_{401}$  and

$C_{419}$ . When the tube again conducts, the oscillatory voltage developed across  $L_{401}$  and  $C_{419}$  is in series with the B+ and aids in maintaining a stable horizontal sweep. A 22,000-ohm resistor,  $R_{432}$ , holds the amplitude of the oscillatory voltage across  $L_{401}$  and  $C_{419}$  at the correct value. A 33,000-ohm load resistor,  $R_{434}$ , and .001-mfd capacitor,  $C_{421}$ , provide a sawtooth waveform at the grid of the horizontal output tube. A 470-mmfd and 40 to 370-mmfd trimmer ( $C_{420}$  and  $C_{414B}$ ) form a voltage divider so that the drive to the horizontal output tube grid may be varied.

The horizontal oscillator control tube controls the horizontal oscillator frequency by a method called *pulse width modulation*. This circuit functions as follows: The grid (pin 1) of the horizontal control tube ( $\frac{1}{2}$  of 6SN7GT) is connected through a 2.7 megohm resistor,  $R_{429}$ , to the grid (pin 4) of the horizontal oscillator tube. When no picture is being received, the negative bias developed by the oscillator grid, maintains the horizontal control tube at cutoff. Two pulses are applied to the grid of the horizontal control tube at all times, one from the plate of the damper tube and one from the plate load  $R_{434}$  (33,000 ohms) of the horizontal oscillator tube. The amplitude of these positive pulses (which is set by *horizontal lock-in range* trimmer  $C_{414A}$ ; 10 to 60-mmfd trimmer) is not sufficient to cause the horizontal control tube to draw plate current, so it is effectively out of the circuit. When a picture is being received, a third pulse from the plate of the sync clipper tube is applied to the control tube grid and plate current will then flow. The plate current flow causes a voltage drop across the resistors in the control tube cathode circuit. This positive voltage is then applied

(Continued on page 54: Circuit of Motorola 19-tube chassis using rectangular tube appears on page 42; analysis is on page 54.)





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2 B-70	1 meg	3 B-70-S	1 meg
2 BSK-60	½ meg	3 BSK-60-S	½ meg
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1 B-31	50,000 ohms	C1
1 B-40	100,000 ohms	C1
1 B-51	250,000 ohms	C2
1 B-59	½ meg	C1
1 B-60	½ meg	C2
1 BT-67	½ meg	C13 tapped
1 B-70	1 meg	C2
1 BT-73	1 meg	C13 tapped
1 B-76	2 meg	C2
1 BT-80	2 meg	C13 tapped
1 Metal Cabinet		

#### SWITCH TYPE

1 B-31-S	50,000 ohms	C1
1 B-40-S	100,000 ohms	C1
1 B-51-S	250,000 ohms	C2
1 B-59-S	½ meg	C1
2 B-60-S	½ meg	C2
1 BT-67-S	½ meg	C13 tapped
2 B-70-S	1 meg	C2
1 BT-73-S	1 meg	C13 tapped
1 B-76-S	2 meg	C2
1 BT-80-S	2 meg	C13 tapped

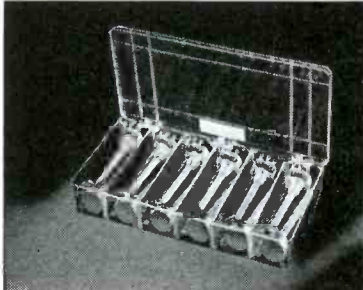
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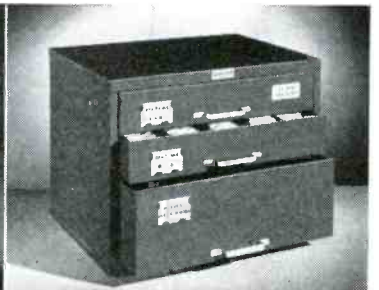
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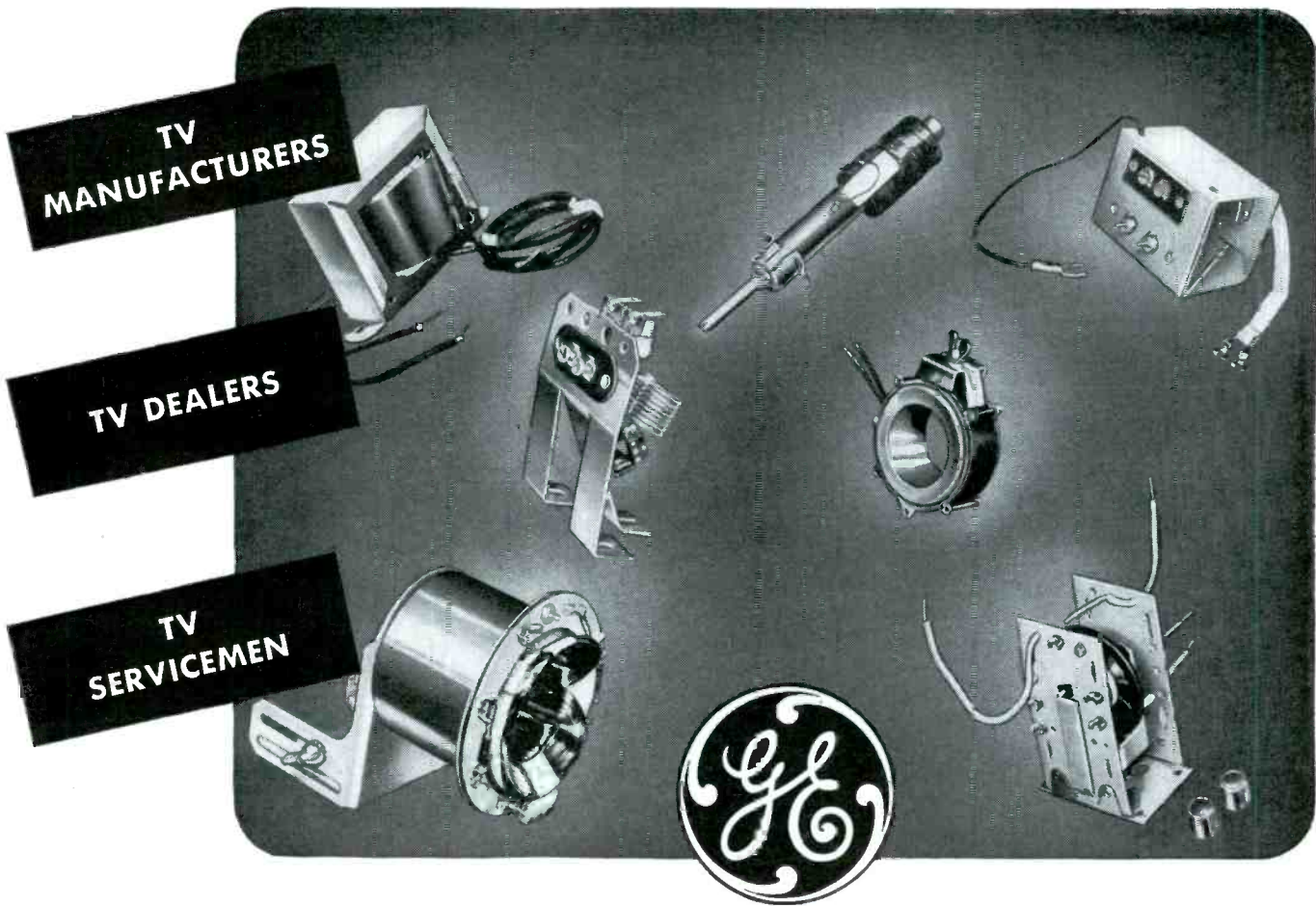
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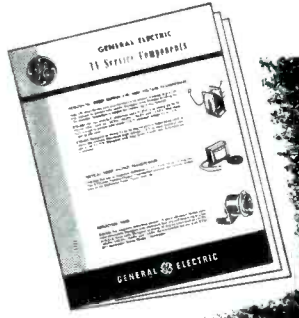


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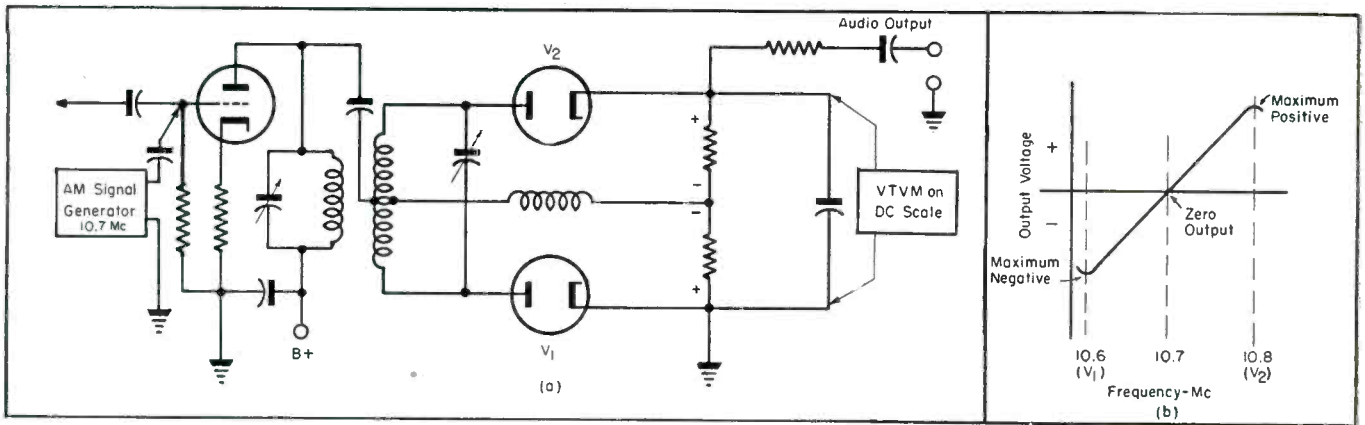
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Fig. 1. Discriminator alignment setup with an AM signal generator and a *vtrm*. At right appears a plot of the output voltage from a discriminator.



# Servicing *FM* Detectors

by **ALLAN LYTEL**

Temple University Technical Institute

THE RADIO DETECTOR, as indicated in part II\*, provides identical results whether we consider negative or positive polarity. If two load resistors produce voltages of  $+6$  and  $-3$ , the output will be  $+2$  volts, which is the ratio of  $6$  to  $3$ . If an increase in signal amplitude doubles these voltage outputs, we would have  $+12$  and  $-6$  or a  $+6$  volts for a discriminator and an unchanged  $+2$  volts from the ratio detector.

If the amplitude of this signal is increased by a factor of  $2$  again, the ratio detector still stays at a  $+2$  volts output, but the discriminator output would double to  $+12$ . As the intermediate frequency signal remains constant in frequency, but increases in amplitude, we have seen there will be an increase in the discriminator output but not in the case of the ratio detector. The discriminator, therefore, is responsive to amplitude variations in signal, while the ratio detector, because of the capacitor across the load acts as a battery and produces only a ratio of the output voltages which does *not* change with a different amplitude signal.

## Alignment of Frequency Modulation Detectors

The *if* stages of the FM receiver are aligned first in a manner quite similar to the ordinary AM receiver. In the cases where overcoupled transformers are used, a slight change is required

## Part III . . . Alignment of Frequency-Modulation Detectors . . . Three Ways to Use a VTVM in Alignment . . . Connecting Up a VTVM and Signal Generator in a Ratio-Detector System.

in the alignment technique; the manufacturer's data are the most reliable indication of the proper procedure in this case. Intermediate frequencies may vary somewhat from the standard  $10.7$  mc;  $9.1$  and  $4.3$  mc are quite often found as intermediate frequencies in FM receivers. After the *if* stages have been aligned, the limiter (if one is present) is next aligned. A *vtrm* is connected across the grid resistor of the limiter circuit and the trimmers of the transformer feeding the stage are adjusted for maximum reading on the *vtrm*, with a signal generator providing the *if* signal on the grid of the stage preceding the limiter.

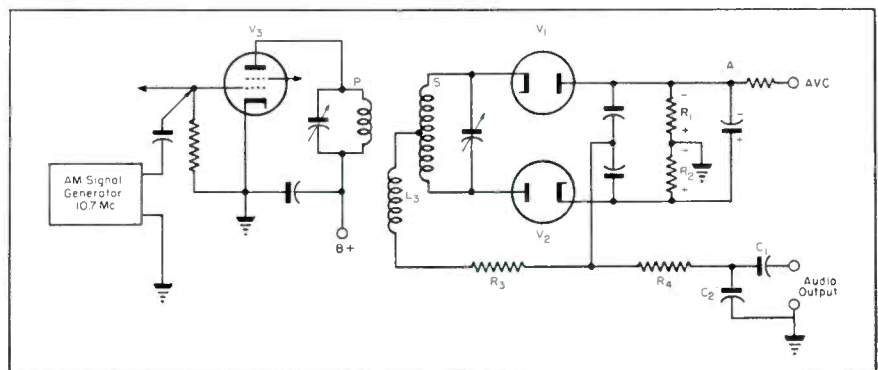
The discriminator may be aligned

by connecting the *vtrm* between the high end of the load resistors and ground. A signal generator is adjusted to feed a signal onto the grid of the last *if* stage. The signal generator then has its output varied above and below the intermediate frequency by slowly changing the tuning dial position. The *vtrm* should read first positive and then negative as the signal generator frequency is shifted. If a higher frequency produces a positive output, a lower frequency should produce a negative output.

The *vtrm* can be used in three ways: If a center-reading scale is available,

(Continued on page 55)

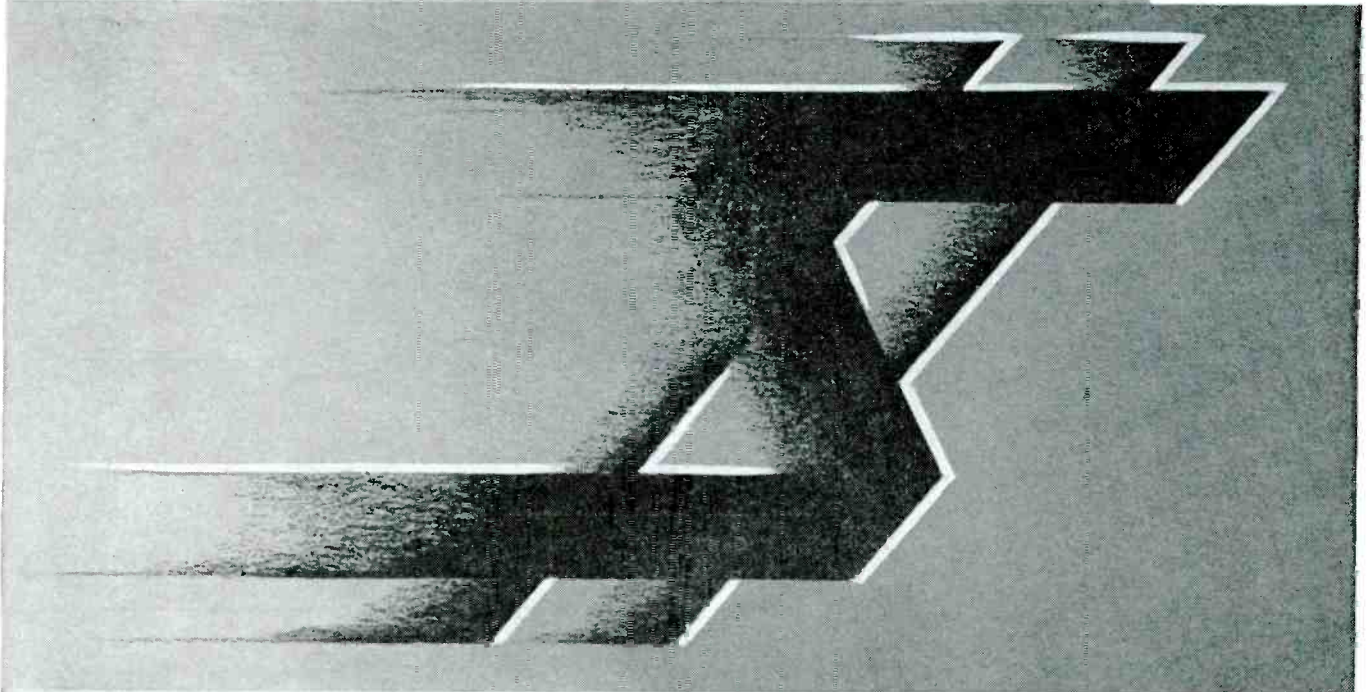
Fig. 2. Ratio-detector alignment arrangement.



\*SERVICE, December, 1950.



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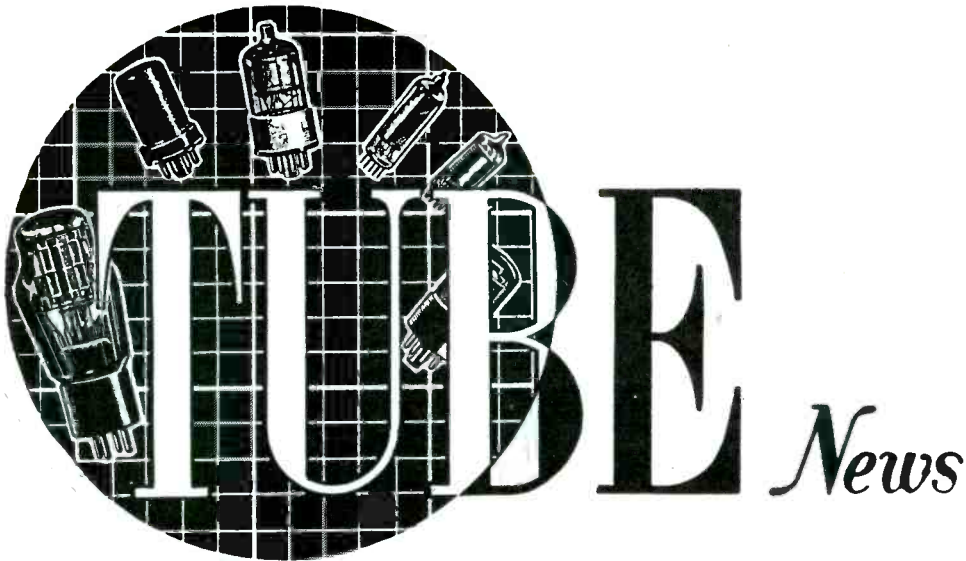
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# TUBE News

by L. M. ALLEN

## Characteristics of 17 and 20-Inch Rectangulars . . . Wide-Angle Vertical Deflection Double Triode.

## Thyratron Tubes . . .

RECTANGULAR PICTURE TUBES are now coming off the line in a variety of sizes, including 17 and 20-inch types. Recently, twenty-inch rectangular picture tubes were announced by DuMont and G.E. Both are coded 20CP4.

The DuMont tube has a bent-gun and a dark face plate.

General characteristics are: Overall length, 21 7/16"; screen size, 17" wide by 12 3/4" high; deflection angle, 70°. Heater voltage is 6.3, while the heater current is .6 amp. Maximum anode voltage is 18,000.

G. E.'s tube has been designed for an external single-field ion-trap magnet. It also has a neutral-density face-plate.

Maximum ratings of the tube are: anode voltage, 18,000; grid—No. 2

voltage, 410; grid No. 1, negative-bias value, 125; positive-bias value, 0; positive-peak value, 2.

A 17-inch rectangular, type 17BPA4, is now available from National Union Radio Corp.

Tube affords a 11 3/4" x 14 1/4" rectangular picture having the standard 3 x 4 aspect ratio. It features a face plate having an integral neutral gray filter.

Tube is electrically similar to the N.U. 16KP4/16RP4.

Has a tetrode-type electron gun for use with an external, single-field ion-trap magnet; an external conductive

coating, which when grounded, functions as a filter capacitor and also serves as a shield against external electrostatic fields.

Deflecting angle (approximately), 70°. Anode voltage, 16000 volts *dc*; maximum. Grid 2 voltage, 410 volts *dc*, maximum.

Under typical operating conditions anode voltage is 12000 volts *dc*; grid number 1 voltage, 33 to 77 volts *dc*, and grid number 2 voltage, 300 volts *dc*.

### Thyratron Tube

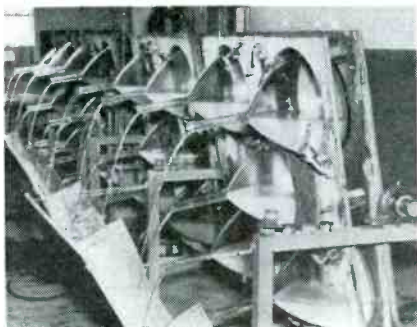
A three-electrode inert gas-filled thyratron designed mainly for general control-circuit applications, and featuring a quick-heating cathode which is said to take a minute to reach operat-

(Continued on page 52)

Murray M. Shindel, sales manager, and Meyer Bonuck, president, Zetka Television Tube Corp., inspecting a section of their expanding plant.

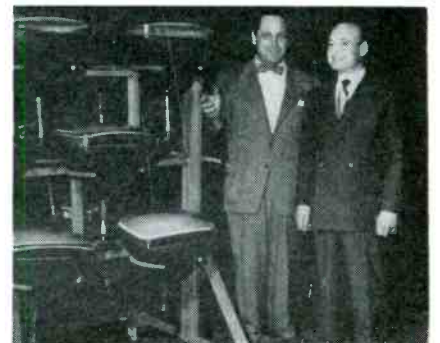
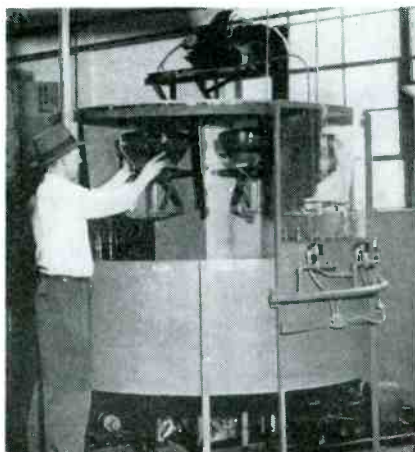
Tilt tables used in picture-tube screen-setting operation.

(Courtesy Tel-O-Tube Corp. of America)



Automatic picture-tube washing machine which washes and cleanses tubes prior to application of screen coatings.

(Courtesy Tel-O-Tube Corp. of America)



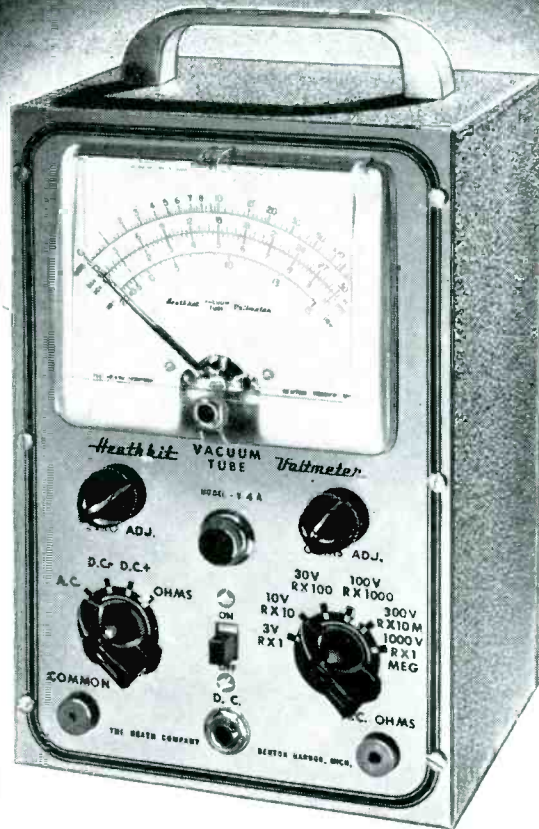


New 1951 • • MODEL V-4A

# Heathkit VTVM KIT

HAS EVERY EXPENSIVE Feature

- ★ Higher AC input impedance, (greater than 1 megohm at 1000 cycles).
- ★ New AC voltmeter flat within 1 db 20 cycles to 2 megacycles (600 ohm source).
- ★ New accessory probe (extra) extends DC range to 30,000 Volts.
- ★ New high quality Simpson 200 microampere meter.
- ★ New 1/2% voltage divider resistors (finest available).
- ★ 24 Complete ranges.
- ★ Low voltage range 3 Volts full scale (1/3 of scale per volt).
- ★ Crystal probe (extra) extends RF range to 250 megacycles.
- ★ Modern push-pull electronic voltmeter on both AC and DC.
- ★ Completely transformer operated isolated from line for safety.
- ★ Largest scale available on streamline 4 1/2 inch meter.
- ★ Burn-out proof meter circuit.
- ★ Isolated probe for dynamic testing no circuit loading.
- ★ New simplified switches for easy assembly.



New  
LOW PRICE **\$23<sup>50</sup>**

The new Heathkit Model V-4A VTVM Kit measures to 30,000 Volts DC and 250 megacycles with accessory probes — think of it, all in one electronic instrument more useful than ever before. The AC voltmeter is so flat and extended in its response it eliminates the need for separate expensive AC VTVM's. + or - db from 20 cycles to 2 megacycles. Meter has decibel ranges for direct reading. New zero center on meter scale for quick FM alignment.

There are six complete ranges for each function. Four functions give total of 24 ranges. The 3 Volt range allows 33 1/3% of the scale for reading one volt as against only 20% of the scale on 5 Volt types.

The ranges decade for quick reading.

New 1/2% ceramic precision are the most accurate commercial resistors available — you find the same make and quality in the finest laboratory equipment selling for thousands of dollars. The entire voltage divider decade uses these 1/2% resistors.

New 200 microampere 4 1/2" streamline meter with Simpson quality movement. Five times as sensitive as commonly used 1 MA meters.

Shatterproof plastic meter face for maximum protection. Both AC and DC voltmeter use push-pull electronic voltmeter circuit with burn-out proof meter circuit.

Electronic ohmmeter circuit measures resistance over the amazing range of 1/10 ohm to one billion ohms all with internal 3 Volt battery. Ohmmeter batteries mount on the chassis in snap-in mounting for easy replacement.

Voltage ranges are full scale 3 Volts, 10 Volts, 30 Volts, 100 Volts, 300 Volts, 1000 Volts. Complete decading coverage without gaps.

The DC probe is isolated for dynamic measurements. Negligible circuit loading. Gets the accurate reading without disturbing the operation of the instrument under test. Kit comes complete, cabinet, transformer, Simpson meter, test leads, complete assembly and instruction manual. Compare it with all others and you will buy a Heathkit. Model V-4A. Shipping Wt., 8 lbs. Note new low price, \$23.50



## New 30,000 VOLT DC PROBE KIT

Beautiful new red and black plastic high voltage probe. Increases input resistance to 1100 megohms, reads 30,000 Volts on 300 Volt range. High input impedance for minimum loading of weak television voltages. Has large plastic insulator rings between handle and point for maximum safety. Comes complete with PL55 type plug.

No. 3366 High Voltage  
Probe Kit.  
Shipping Wt.,  
2 pounds.

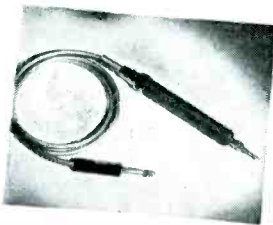
**\$550**

## Heathkit RF PROBE KIT

Crystal diode probe kit extends range to 250 megacycles = 10% comes complete with all parts, crystal, cable and PL55 type plug.

No. 309 RF Probe Kit.  
Shipping Wt., 1 lb.

**\$550**

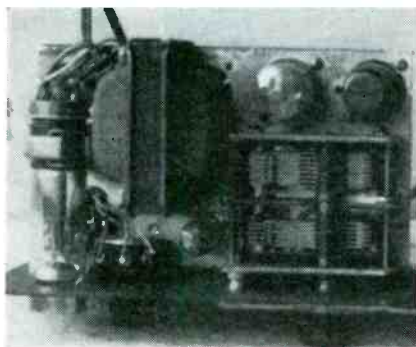


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The **HEATH COMPANY**

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Fig. 1. Top view of *rf* test circuit chassis.



IN APPLYING an *rf* type of test instrument<sup>1</sup> for inductance checking, the Service Man will find that many important trouble spots can be located. An open coil cannot give an inductance reading, and a shorted coil, whether the short is in the coil itself or in a tuning capacitor connected across it, will give a zero inductance reading. Where a variable or adjustable capacitor across a coil shorts at any setting, this effect can be noted by the sudden change of the inductance reading.

Defective circuit components rarely fail by a slight percentage change in capacitance or inductance value. Common failures are opens, shorts, intermittent circuit breaks, leakages, and the development of excessive *rf* resistance. The major service advantage of the *rf* tester has been found to be the ability to find these common failures, except capacitor leakage, and this ability goes along with *rf* resonance measurement conditions. Capacitor leakage is best tested with a *vtvm*; this instrument does contain an elementary *vtvm* which can be made externally useful for leakage indications.

#### Q Indications

Although actual measurement of *Q* values is not possible, relative indications can be obtained with the unit. It is known that any appreciable amount of *rf* resistance inserted in test circuit *B*<sup>1</sup> will reduce the resonance voltage applied to the *vtvm*. If an eye tube indicator (6E5) is used for resonance showings and is set for exact closing when testing an efficient coil, a similar coil having poor efficiency will not close the eye equally well and, in some cases, not at all. Observance of these relative *Q* indications, which are not difficult to note after the operator becomes familiar with the instrument, is often a quick way of finding defective or sub-standard parts.

Comparison testing or practice in checking units known to be new and in good condition is the easiest way to learn to make effective use of *Q* indi-

<sup>1</sup>SERVICE; December, 1950.

# RF Testing Procedures

by PHILIP H. GREELEY

---

## Checking *Q* of Coils and Capacitors with RF Test Instrument . . . Tracing Wiring and Locating Shorts.

---

cations. Such units as do not give the relatively snappy resonance indications of their (good) counterparts must be considered sub-standard. Account should be taken of the effect of a resistor across a coil, as used in some applications such as a grid resistor in series with a fixed capacitor across an oscillator coil, which normally will reduce the *Q* showing a little. Coils having *Q* values of 70 or more will give sharp resonance showings, while coils which have deteriorated by moisture absorption or even a very minor change in the ohmic resistance of the wire do not resonate well if at all.

Paper capacitors normally give good *Q* indications, but the smaller values sometimes used in AM oscillator circuits as padders, often do not show up as well as mica or ceramic capacitors of like values. Where an oscillator circuit does not work too well and includes a series paper capacitor, testing may show that a mica or ceramic substitute capacitor will improve performance.

Electrolytic capacitors give interesting results on an *rf* test. Actually, capacitor values of 8 mfd or more appear as an infinite capacity or a short circuit, with respect to the value reading range of the instrument; but the effect of the series resistance of different electrolytics will give wide changes in the *Q* indications. Good *dry* and *FP* type electrolytics generally have small effective series resistance to *rf* and give a reasonably sharp resonance showing. As an electrolytic ages and deteriorates to the point of uncertain or erratic performance, even though there may be no serious change

in capacity value, the effective series resistance increases and is readily noted by a wide change in the *Q* indication. Reasonably, deterioration of the electrolyte or imperfections in the aluminum foil-to-terminal contact will likely show first as an increase in the effective series resistance of the capacitor. In practical service work, in a great number of 20-20 mfd electrolytics in *ac/dc* models, capacitors which gave a poor *rf* test had been found to be causing partially unsatisfactory receiver performance, performance improving when the capacitor unit was replaced. This *rf* test of electrolytics has been found to work satisfactorily without need for making any circuit disconnection.

The *rf* instrument can also be used for tracing wiring and the locating of direct connections or short circuits. By setting the instrument on an inductor scale and shorting the test leads, the oscillator can be set for zero inductance reading and the eye indicator adjusted for exact closing. Any inductance or capacity value inserted between the test leads will open the eye completely, and even a fraction of an ohm resistance will open the eye somewhat. A low resistance short in a filament circuit or which side is grounded can be readily found even though several cold tubes may be left in their sockets. Shorts and grounds in low resistance circuits, such as filament and speaker voice coil, are difficult to trace with an ohmmeter, but can be located with the *rf* test. Where waveband change or other switching is employed, wiring can be traced and particular contacts which are defective can be noted.



# New TV Parts . . . Accessories

## NEO HAND OPERATED ANTENNA ROTATOR

A hand operated TV antenna rotator, the *Select-A-Beam*, has been announced by Neo Products Corporation, Erie, Mich.

Of aluminum construction. Has weather sealed ball bearing and steel spring working parts.

A worm gear, control box for attachment to the outside of the house turns the antenna 360° and may be operated from either the outside or inside. Positions lock automatically. Mechanical, metering device featured.

Weighs three pounds and is said to fit any standard antenna.



\* \* \*

## PHILCO ISOLATION TRANSFORMER-VIBRATOR TEST KIT

A vibrator test kit for checking auto radio vibrators and an isolation transformer, 45-9600, have been announced by the Accessory Division of Philco Corp.

The isolation transformer is used in the Philco 51-PT1207, 1208, 1282 series TV receivers and *line connected* radio sets. Rated at 250 volt amperes. Has direct wiring for bench test outlet and leads with connecting plugs.

\* \* \*

## WALSCO ANTENNA

A TV antenna, the *Silver King*, featuring a signal director, that is said to improve gain on high-band channels and eliminate ghosts, has been announced by Walter L. Schott Co., 9306 Santa Monica Blvd., Beverly Hills, Calif.

Provides for stacking.

A patented insulator is said to be unbreakable under all operating conditions, and its dielectric properties unaffected by climate.

## PRECISION 'SCOPE-PICTURE TUBE TESTER

A *crt* tester, model CR-30, which it is said, will test all picture tubes (electrostatic as well as electromagnetic,) 'scope tubes and industrial *crt's*, has been announced by Precision Apparatus Co., Inc., 92-27 Horace Harding Boulevard, Elmhurst, L. I., N. Y.

Instrument is said to provide tests without removing the tube from TV set or tube carton.

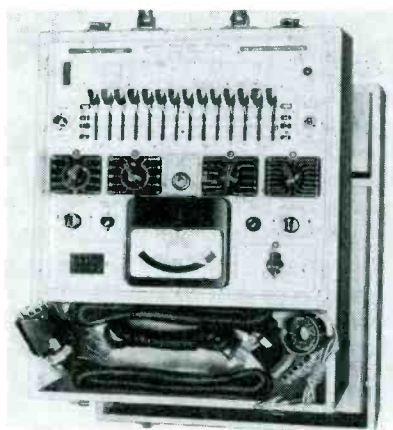
Features a *true beam current test circuit* which is said to check all *cr* tubes with electron-gun in operation, giving indication of proportionate picture brightness and tube condition.

A voltage regulated, bridge type *vtom* provides tube quality indications. With test circuits at high sensitivity position, a beam current change of 1/10th of one microampere will create a change in meter indication of approximately five divisions on a 120-division scale.

Also available is a 14 lever, selector system. Micro-line voltage adjustment via a continuously variable line voltage input potentiometer; test parameters are monitored at filament supply. Provided, too, is a built-in geared roller tube chart for selection of tube types to be tested.

Has a 4 $\frac{5}{8}$ " full vision meter with special scale plate for *cr* tube testing requirements, telephone type cabled wiring, heavy gauge, etched and anodized aluminum panel, transformer isolated test circuits.

Measures 13 $\frac{3}{4}$ "x17 $\frac{1}{4}$ "x6 $\frac{3}{4}$ ".



\* \* \*

## CENTRALAB CERAMIC CAPACITOR

A tubular, ceramic capacitor, TV6, rated at 6000 volts *dc*, has been announced by the Centralab Division of Globe-Union Inc., 900 E. Keefe Ave., Milwaukee 1, Wis.

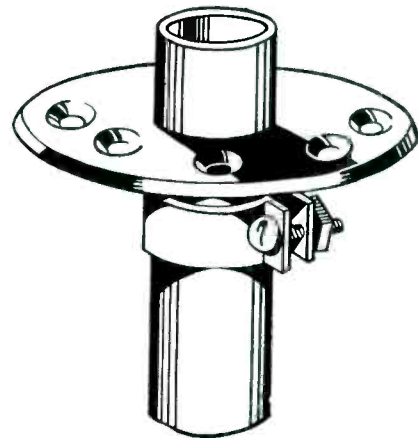
Capacitor is  $\frac{3}{4}$ " in diameter and 2 $\frac{3}{4}$ " long. Can be used for coupling the deflection amplifier's output to the high potential, vertical and horizontal plates of an electrostatic picture tube. Available in .005-mfd capacity.

Said to be insulated adequately against shorts from other components. Terminals are flexible and cadmium plated.

## TACO GUY ANCHOR

A guy anchor, No. 867, that is said to allow free rotation of the mast after guy wires are attached, is now available from Technical Appliance Corp., Sherburne, N. Y.

Without removing any of the guys, anchor is said to permit rotation of the antenna mast without relocating guy wires on the roof. Guy-wire turnbuckles can be tightened and the circular plate pulled down on the mast collar.



\* \* \*

## SPICO FIXED LENGTH INDOOR ANTENNA

An indoor TV and FM antenna, model TV-501, has been announced by Spirling Products Co., Inc., 62 Grand St., New York 13, N. Y.

Fixed length dipoles are 13 $\frac{1}{2}$ " long. A matching stub is said to provide optimum initial matching to any TV set. Has an *adjusta-knob*, which is said to permit fine tuning.

\* \* \*

## ERIE RESISTOR CAPACITOR SERVICE KITS

Ceramics in plastic *service kits* have been announced by the Erie Resistor Corp., Erie, Penna. Kits are covered and transparent. Three kits are being offered, one containing *GP* ceramics for bypass and coupling applications, another containing disc and plate *ceramics* used in television receivers, and a third containing *NPO zero-temperature-coefficient* ceramics.

\* \* \*

## RMS WALL MOUNT

A wall mount for TV antenna masts, model WM-10, has been developed by Radio Merchandise Sales, New York 59, N. Y. Has double rib sections which it is said provide mechanical strength. Unit is plated for resistance to corrosive attack.

Mast can be mounted 6" from the wall, using gripping pressure of U-bolts which accommodate masts up to 1 $\frac{3}{4}$ " in size.

# PHOTOFACT Users Write Our Best ADS!

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## TV Servicing

(Continued from page 19)

determine the wiring of the basement without first determining the most suitable location for the antenna, can easily result in the discovery, after considerable labor, that the receiver or antenna or both may have to be relocated because of installation difficulties.

The survey completed, the installation pattern clear in his mind, the Service Man is then, and only then, ready to proceed with the actual installation. This begins with the erection of the extension ladder. In our training course, technicians are specifically coached on proper and safe methods of using the ladder. They are instructed never to make an installation on a peaked roof during high winds, or when roofs are slippery due to ice or snow. Our ladders are equipped with safety shoes—spiked ends for use on soft surfaces, and flat rubber feet for use on hard surfaces. An extension ladder should be placed so that the base is extended one-fourth of the ladder's length from the object supporting it and at least four rungs should extend above the point of contact with the building. The ladder should be securely lashed in place, and it should never be set up directly in front of a window.

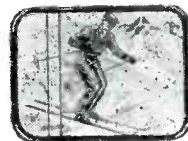
With the extension ladder positioned against the building, adjusted for height, and lashed securely, the Service Man should then obtain the hook ladder which is used for scaling sloping roofs, carry it to the roof, and position it with the hooks fixed securely over the peak of the roof. The man who works on a sloping roof without a hook ladder places his life in jeopardy.

Whether a hook or an extension ladder is used, certain safety rules apply. The user should face the ladder during both ascent and descent. He

Fig. 6. Installing a lightning arrester on the cold water pipe in the basement.



## GET RID OF B. O.\* in TV Pictures!



### \*BARKHAUSEN OSCILLATION

When vertical black bars appear in TV pictures, as shown above, they are the result of Barkhausen Oscillation occurring in the horizontal sweep output tube (such as the 25BQ6, 6BQ6, 6EV5, 25EV5, 6AU5, or 25AU5, etc.). To correct this difficulty our engineers have developed the

## PERFECTION B.O.\*ELIMINATOR



B.O. ELIMINATOR  
(Actual Size)



**EASY TO INSTALL**  
Just slip the B.O. Eliminator over the tube, move down, or up, or turn until the dark vertical bars disappear from the picture. Spring grip holds the Eliminator in place.

This compact device fits over the horizontal sweep output tube, and because it brings a concentrated magnetic field near the source of the Barkhausen Oscillation—namely the screen grid—it usually eliminates the oscillation and the black

lines on the face of the picture tube. Service men who have used the B.O. Eliminator say it is the simplest and most positive method of getting rid of the vertical bars that they have ever known. They see a big demand by service men in maintaining the 10,000,000 TV sets now on the market.

Order Today from Your Supplier!

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should always have one hand free while on the ladder. He should never use a ladder that is not in perfect condition.

With ladders in position, the technician should return to the truck to collect all the equipment he will require for his work outside. His immediate need is the antenna mounting bracket, usually of the chimney type. But whether it is a chimney, wall, or roof bracket, it should be completely assembled at the truck and carried to the roof ready for mounting. While he will not need them until much later during the installation period, he should also bring from the truck, with the bracket, a ground wire, stake, extension cord, electric drill, and hammer. This will save a return trip to the truck later on.

Back on the roof to mount the chimney bracket, the Service Man will find his job faster and easier if he is equipped with an extra piece of wire which he can loop over the chimney to hold the bracket temporarily while the strap is being installed. It is necessary, of course, to make certain that the strap is level and that the corner pieces fit snugly at all points around the chimney. Chimney straps should be used wherever possible. Use of the strap eliminates the more dangerous job of standing on the ladder to drill holes into the wall or roof as a means of mounting the bracket.

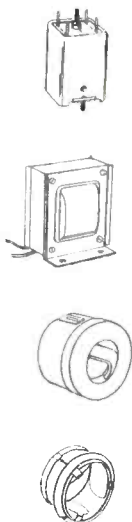
Following our sequence of operations, the Service Man then returns to the truck to assemble the antenna and attach the mast. The complete operation should be performed at the truck, from attaching the antenna and standoffs to the mast to connecting the transmission line to the antenna. In carrying the completed antenna to the roof, the Service Man should make use of a portable line reel-holder, placed on the ground, which allows the connected transmission line to unwind freely as he climbs the ladder. In mounting the antenna, the technician should make a preliminary orientation, based on other antennas in the immediate area and on his own judgment.

The transmission line running from the antenna to the point of entry into the house should be as direct as possible, and should be fixed to the wall with standoffs placed approximately six feet apart. Our technicians are instructed to observe certain basic rules; horizontal runs should not be made unless absolutely necessary; transmission lines should not run down the front of the house, across windows, or within six inches of telephone or electrical wires; the line should contain

(Continued on page 52)



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*Performance-proved* in millions of television receivers of many makes—RCA "original" TV components will cut your service call-backs and insure customer satisfaction. That's because RCA TV components are designed to work perfectly with the tube types and circuits used in the top television receivers...and rated to withstand abnormally high peak voltages.

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FOR "ORIGINAL" RCA TV COMPONENTS



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

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# PHOENIX

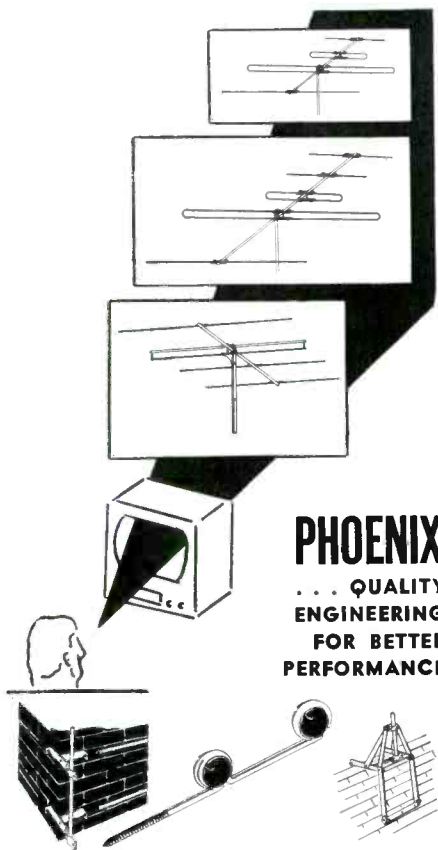
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... AND FOR EASIER, FASTER INSTALLATIONS

# PHOENIX

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ENGINEERING  
FOR BETTER  
PERFORMANCE

**PHOENIX ELECTRONICS**  
INC.  
LAWRENCE, MASS.

# TV Servicing

(Continued from page 51)

approximately one full twist per linear foot.

With the transmission line strung, the technician can then prepare for its entry into the house. In drilling a hole to the basement from the outside, it is necessary to make certain that the electric drill is grounded and that safety glasses are worn. The transmission line can then be cut to size for the basement run and threaded through the hole.

It is now necessary to drill a hole for the entry of the wire into the living room from the basement. This is drilled from the living room, with the hole placed so that it will be concealed by the receiver. A piece of ground wire should be inserted in the hole so that it can be easily located from the basement.

This done, the Service Man can return to the basement and string the transmission wire on a direct line to the hole leading to the living room. A lightning arrester should be attached to the cold water pipe. At this point the return trip to the living room can be made and the installation completed by connecting the leads to the receiver, adjusting the controls, and checking sound and picture reception on each channel within normal range.

When it is necessary to further orient the antenna, the automatic rotator can be used. The control box for the rotator can be taken into the house and plugged into the television receiver.

By operating the control box, the technician can rotate the antenna for best reception of low-frequency channels. He can then return to the roof and fix the station bearing by marking the top mast clamp of the chimney bracket to indicate the proper low-frequency antenna position.

He can then return to the set and repeat the procedure for high-frequency

channel reception. On his final trip to the roof, the mast position for high-frequency orientation is marked, the rotor removed, and the mast tightened in the bracket according to the marking. The low-frequency antenna mast clamp can then be loosened and the antenna rotated to the proper position, according to his first rotor test.

The receiver can then be installed and the antenna properly aligned. By following the standard procedure, it has been found that one man can do the work that formerly required two.

From our own experience, we believe that service organizations employing a similar procedure will find that this approach results in a considerable saving of manpower and on-the-job time.

## Tube News

(Continued from page 46)

ing temperature, has been developed by G.E.

Designated as the GL-5855, the thyatron has a commutation factor rating of 200. Thus it can be used in motor control without the need for snubber circuits and without the occurrence of gas clean-up. (Commutation factor is the product of the rate of current decay in amperes-per-microsecond just prior to commutation and the rate of inverse voltage rise in volts-per microsecond just after commutation).

### Maximum Ratings

Maximum ratings include maximum peak anode voltage, 1500; maximum cathode current, peak 150 amperes, average, 12.5 amperes; maximum negative control-grid voltage, 250 before conduction and 10 volts during conduction.

### Double Triode for Wide-Angle Vertical Deflection

A double triode, 6BL7GT, designed particularly for wide angle vertical deflection in large TV picture tubes, has been announced by Sylvania Electric.

The tube includes two identical triode sections. The tube is said to have a rigid low center of gravity element structure mounted on a circular glass header similar to that used in lock-in types.

Heater voltage, *ac* or *dc*, 6.3; heater current amps, 1.5; plate voltage, *dc*, 450. Cathode-bias resistor, ohms, 1200.



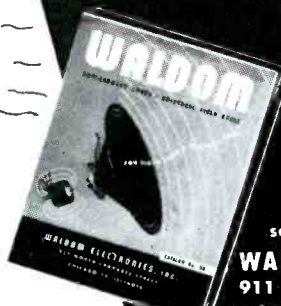
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911 N. Larrabee St., Chicago 10, Ill.



## Auto Bench Supply

(Continued from page 29)

little from a  $K$  of 4 to 100. For a practical and economical solution, it has been found a  $K$  value of 4 can be used. This value, when substituted in the equation, results in a capacitance value of 11,000 mfd for a 10-ampere load with a 60-cycle input voltage, the value used in this power pack.

### Mefer Features

The voltmeter scale is calibrated from 0 to 10 volts. The scale of the ammeter has a 0 to 20-ampere reading, with the portion 10 to 20 colored in red to indicate that this is the intermittent duty range of the supply.

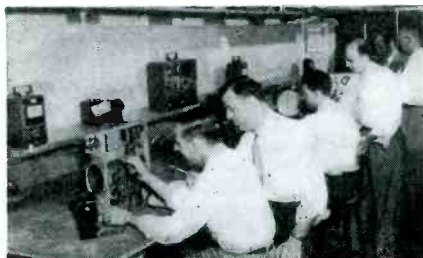
### Using the Power Supply

After the line of the power supply has been plugged into an outlet and the set under test has been connected to the output terminals, snapping the power switch on results in instant voltage at the terminals. There is no warming-up time required. This is typical of any power supply employing metallic rectifiers, such as copper oxide and selenium.

When using this supply to service certain model auto radio sets, the  $A$  connection to the chassis of the radio set under test must be grounded to a water pipe or direct earth ground. The physical and electrical layout of some sets is such that considerable  $rf$  hash will be encountered if this ground is omitted.

With this power supply on his bench (or wall), the Service Man has a trouble-free source of  $A$  power available for testing 2, 4, and 6-volt powered auto, portable, and home radio sets. It can also be used as a source of power for the vibrator tester which is usually marketed without a power supply. Moreover, this supply can be used as a source of power for the demonstrating of auto radio sets in show rooms, thus eliminating the trouble of charging batteries and avoiding dangers of damage by battery acid.

### SHOBE'S SERVICE DEPARTMENT



View of the television and radio section of the service department at Shobe, Inc., distributor of Philco products in the Memphis, Tenn., area.

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Model	List Price	Minimum Needle Pressure	Output Voltage 1000 c.p.s. 0.5 Meg Load	Frequency Range c.p.s.	Needle Type	For Record	Code
AC-78-J	\$ 8.90	6 gr.	1 0*	50-10,000	A-3 (3-mil sapphire tip)	Standard 78 RPM	ASWYN
AC-J	8.90	5 gr.	1 0**	50-10,000	A-1 (1-mil sapphire tip)	33-1/3 and 45 RPM	ASWYJ
AC-AG-J	8.90	6 gr.	1 0**	50-10,000	A-AG+ (Sapphire tip)	33-1/3, 45 and 78 RPM	ASWYH
<b>DOUBLE NEEDLE TURNOVER MODELS:</b>							
ACD-J	9.50	6 gr. either needle	1 0**	50-6,000	A 1 and A-3 (sapphire tips)	33-1/3, 45 and 78 RPM	ASWYL
ACD-1J	9.50	(Same as ACD-J except equipped with spindle for turnover knob. Replacement cartridge for ACD-2J assembly.)					
ACD-2J	10.00	(Same as ACD-J except equipped with complete assembly turnover and knob.)					

\*"ALL-GROOVE" Needle tip of special design and size to play either 33-1/3 and 45 RPM (narrow groove) or 78 RPM (standard groove) records.

\*Audiotone 78-1 Test Record.  
\*\*RCA 12-5-31V Test Record

Astatic Crystal Devices manufactured under Brush Development Co. patents

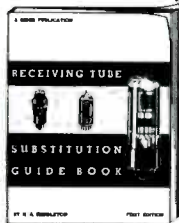
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6

## Ser-Cuits

(Continued from page 38)

through  $R_{27}$  (100,000 ohms) to the grid of the horizontal oscillator and causes a change in phase or frequency. The three pulses applied to the control tube grid, remain constant in amplitude, but due to the difference in waveforms, a change in phase between the pulses results in a change of the resultant pulse width. Due to the filter network in the cathode circuit, the cathode voltage will vary, with a change in pulse width at the control tube grid.

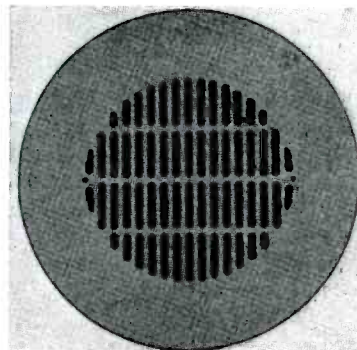
The horizontal hold control ( $R_{420}$ ; 50,000 ohms) changes the plate voltage on the plate of the control tube and the resulting voltage change at the cathode will change the frequency of the horizontal oscillator.

The Motorola receivers (chassis TS-88; p. 42) also employ rectangular tubes and novel horizontal output systems. Here, too, we find the 6BQ6.

A combination sawtooth and pulse waveform developed across  $C_{77}$  (680) and  $R_{61}$  (1500) by a multivibrator circuit, is fed to the grid of the 6BQ6 horizontal output tube. It will be noted that in this system an auto-transformer is used. In the horizontal scan, it is necessary that retrace be completed in about 7 microseconds. To accomplish reversal of current in the inductance of the output transformer and the yoke in this short a time, it is necessary to make this circuit resonant at such a frequency that the half cycle time will equal 7 microseconds, because only by shock exciting such a circuit into oscillation will retrace be accomplished in the time allowed. This circuit is made resonant by the inductance of the output transformer and yoke, the distributed capacity and the tube capacity.

To properly match the yoke inductance to the required output inductance for the tube, the yoke is connected to a tap on the winding which effectively makes an auto-transformer of this section. The positive pulse of voltage at this tap is coupled to the yoke through  $C_{65}$  (.1) and results in a sawtooth of current through the yoke.

A small additional winding, one terminal of which is connected to chassis while the other terminal is connected to B— through  $C_{64}$  (.03) is used to cancel the pulse of voltage which is placed on the chassis by induction from the output transformer. By connecting this winding in such a way as to place a pulse of suitable amplitude on the chassis 180° out of phase with the in-



Model 10-P

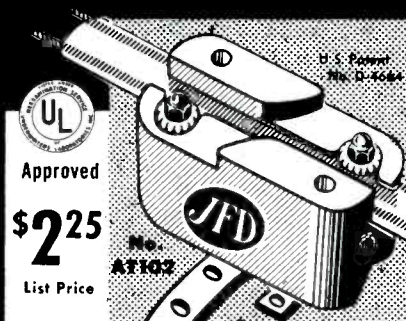
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duced voltage, cancellation of the induced voltage will take place.

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To take advantage of the large voltage pulse developed across the output inductance by the heavy current flow caused by the retrace oscillation, the plate winding is made the primary of an auto-transformer whose step-up ratio is such as to develop pulses of about 14 kv at its high end. These pulses are rectified by  $V_{10}$  (1B3) and the resulting  $dc$  is applied to the second anode of the picture tube. The filament voltage for the 1B3 rectifier is obtained from an additional winding on the output transformer.

### FM Detectors

(Continued from page 44)

this should be employed so that both positive and negative readings can be obtained on a single scale. If this is not available on a particular meter, there is usually a choice on the selector switch which provides for either a positive or negative reading on the voltage scale. The third method involves the *zero adjust control* on the *virm*. This control is changed until the meter reading is somewhere near center scale with no applied voltage. It will then read both positive and negative voltage depending on the needle deflection.

The signal generator is then adjusted to provide the intermediate frequency and the secondary of the transformer is adjusted to read *almost zero*. If an exact zero reading is obtained, the secondary should be slightly detuned. Next, the primary of the discriminator transformer must be adjusted to produce a maximum reading on the *virm*. This assures that the primary is tuned to resonance with the intermediate frequency. When this has been obtained, the secondary adjustment may now be changed to produce zero output on the *virm*.

If the 10.7 mc *if* produces a zero voltage output on the *virm*, the signal generator is now adjusted to 10.8 mc. This should be either a positive or a negative maximum; the polarity depends on the circuit arrangement. We can assume that 10.8 mc provides a positive maximum as in Fig. 1a, and the signal generator is then adjusted for 10.6 mc, which should produce a negative voltage maximum. If these conditions obtain, the discriminator can be considered as properly aligned. A further check on the linearity of

(Continued on page 56)

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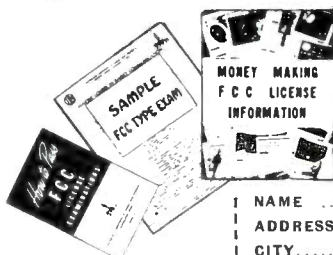
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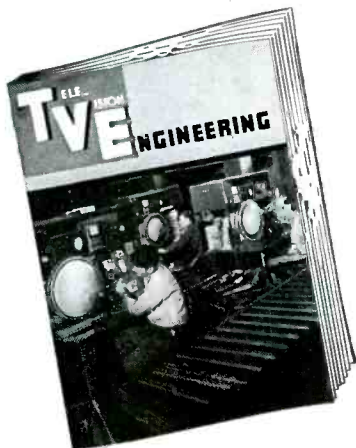
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(Continued from page 55)

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output can be obtained by adjusting the signal generator for various frequencies between 10.6 and 10.8 and plotting the result in a graph. This drawing should be an S-shaped curve with a straight line portion between peaks. The visual alignment technique has been found to be faster, but it is not essential for the alignment of a discriminator in an FM receiver.

The ratio detector (which normally does not use a limiter stage) may be aligned by connecting the *vtrm* from point *A* to ground, as shown in Fig. 2 This is the negative end of the load resistor output in the circuit as shown and with the *vtrm* connected from here to ground, the preceding intermediate stages may be aligned by using the signal generator operating at the 10.7-mc frequency. With the signal generator applied to the grid of *V<sub>s</sub>*, as shown in the circuit, the primary of the ratio detector can be adjusted for maximum reading on the *vtrm*.

To properly align the secondary of the ratio detector transformer, the voltmeter must be connected from point *B* to ground, which is the audio-frequency output. *C<sub>1</sub>* in the circuit is the coupling capacitor to the next audio stage. The secondary adjustment should be made so that the *vtrm* reads zero volts. With the signal generator set at 10.7 mc, there should be no audio output from the ratio detector; hence there should be no voltage output from point *B* to ground. The ratio-detector circuit in Fig. 2 is somewhat different than the types discussed in the initial installment<sup>1</sup>; a third winding of the discriminator transformer, *L<sub>3</sub>*, has been used to replace the coupling capacitor between primary and secondary of the earlier ratio detector described. The midpoint between the two load resistors, *R<sub>1</sub>* and *R<sub>2</sub>* is now at ground potential and *R<sub>3</sub>* has replaced the *rf* choke, which connects the midpoint of the two filter capacitors to the midpoint of the transformer secondary. *R<sub>1</sub>* and *C<sub>2</sub>* together form the deemphasis circuit. This is only one of many commercial modifications of the basic ratio-detector circuit.

It is always good practice to follow the manufacturer's data in aligning any equipment and this is particularly true of the FM detector. There are many variations of circuit wiring, all of which bear the name of ratio detector. Mistakes can be avoided by following the manufacturer's alignment techniques recommendations. There are some ratio detectors, for example, in which the midpoint of the

<sup>1</sup>SERVICE; November, 1950.



load resistor output is not grounded. To align the secondary of the ratio detector transformer for zero output, at the *if*, two resistors in series may be added across the load resistor. The midpoint of these resistors is used for a connection to the *warm* whose other lead is connected to ground. The use of these two additional resistors, whose value should be relatively high compared to the load resistor, effectively provides a center tap in order to adjust the secondary for a zero output voltage.

Using the methods outlined and the manufacturer's recommendations, frequency modulation detectors can be aligned without the visual trace technique, which needs a scope. However, visual alignment must not be discounted, since it is an important procedure and fundamental to the operation of any up-to-date shop. At the same time, the techniques of the single-frequency alignment procedure discussed not only are simple, but they relieve other equipment such as scopes and sweep generators for other major applications in the shop.

## Wide-Angle Deflection

(Continued from page 26)

help to increase the sawtooth amplitude.

Assuming the voltage and signal at the grid of the horizontal output tube to be correct, the next check point is at *B*, the cathode. The positive voltage at this point is an indication of the total current through the output tube. For example, if 6 volts are measured across the 68-ohm resistor,  $R_3$ , the current must be 88 ma through this resistor. Different output tube types have different current requirements, like the 6BQ6 in Fig. 3, which should not draw more than about 100 ma. A 6BG6 can be operated with 130 ma through it without damaging the tube and a 6CD6 has an even higher rating.

Point *C*, the screen of the output amplifier, is another voltage check point which can indicate improper operation. Just as the current ratings of tubes vary so do the screen voltage and screen current. The 6BQ6 in Fig. 3 should never have more than at the most 200 volts at the screen with less than 15 ma screen current. On the 6BG6 or the 6CD6 the screen voltage should range between 250 and 350 with somewhat larger screen currents, up to 25 ma, permissible.

The final check on the operation of the flyback circuit consists of a voltage measurement at point *D*, the power feedback or boost voltage from the

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damping diode. The voltage at this point should be at least 80 to 100 volts higher than the  $B+$  voltage supplied to the secondary of the flyback transformer. In the circuit shown in Fig. 3, with a 6BQ6, less plate current is required than, for example, a 6BG6 or 6CD6, and therefore the current drain through the damping diode will be less. This results in a higher boost voltage and more efficient operation for the output amplifier. In some cases the boost voltage may go as high as 600 volts.

A word should be said about the use of different damping diodes when con-

verting a small-screen receiver. In most cases it is simpler to use the same tube type as was used in the original set, but since the damper tube in the set may be aged and somewhat worn out it is generally advisable to substitute a new one when the high efficiency circuit is installed. In those receivers using a 6AS7 power triode as damper tube it is best to rewire the socket for use with a 6W4, since triode damping will not give the same boost and efficiency as the circuit shown in Fig. 3. Another point is the use of a damping resistor as found

(Continued on page 58)

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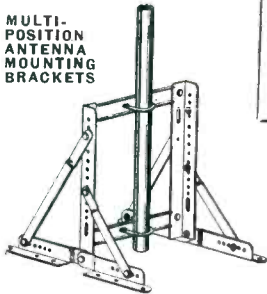
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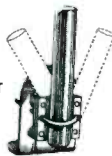
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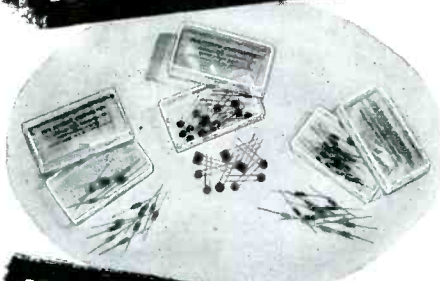
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(Continued from page 57)

in many 630 type receivers. This resistor is required only in conjunction with the original flyback and should be removed completely when the high efficiency circuit is installed.

The circuit shown in Fig. 3 was designed for use with a 8.3-mh deflection yoke. When a higher impedance yoke, such as an 18-mh yoke, is used, one side of it must be connected to terminal 4 on the flyback, instead of 5 as shown here. The plate of the damper tube can be connected either to 4 or 5, whichever provides the best picture.

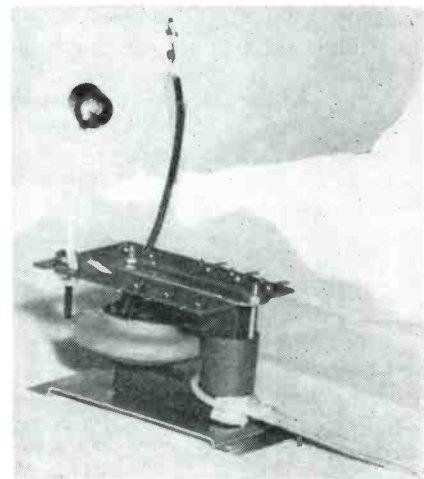
The high-voltage filter is connected to terminal 4 instead of ground to obtain more high voltage; 4 is at about 1,000 volts with respect to the ground at the peak of the flyback pulse, therefore by adding this 1,000 volts to the second anode voltage. In many instances, the high-voltage compartment is so constructed as to make this connection difficult and then it is more practical to do without the extra voltage and leave one side of the capacitor connected to the chassis.

### Simple Sweep System for Conversions

The Ferrite-type transformer affords good results in the chassis for which it was designed as well as when used to convert small screen receivers for use with rectangular tubes. In many instances, however, this flyback may be found cumbersome to use because of the space and mounting arrangement in the original high voltage compartment. Installing new and different width and linearity coils as required for this system also adds to the expense of the conversion. For these reasons some Service Men prefer to use the Fig. 5 type of flyback.

This transformer, manufactured by the Ram Electronics Corp., and several others, can be mounted in the same space as such powdered iron core fly-

Fig. 5. Ram Electronics X030 flyback transformer





backs as the RCA 211T1, 211T3, etc. Even the mounting holes match and no mechanical changes are required in the high voltage compartment of most small-screen television receivers. This unit has a ceramic core which is grounded. However, the  $Q$  and efficiency of this transformer has been found to be as good as the ferrite type.

In addition to mechanical similarities, this new type also uses the same width and linearity coils as the older transformers. Thus, when this unit is used in a conversion job, it is often possible to exchange only the flyback, yoke and focus coils.

The circuit for this transformer is shown in Fig. 4 and on the cover, and although a 6BG6 is used here, a 6BQ6 could be substituted with minor changes. The basic circuit is similar to the ferrite-unit system, but connections have been somewhat juggled around. Again a higher tap is used for the plate of the damper than for the deflection yoke to obtain a higher boost voltage for the plate of the output amplifier. The practice of connecting the low side of the high-voltage capacitor to the highest tap on the transformer is followed again to get maximum high voltage. This transformer has been designed to work with either a 10-mh or an 18-mh deflection yoke, and in the latter case the yoke connection would go to 7 instead of 4 as shown; 5 and 6 are terminals for a width control coil of the type used with the RCA 211T1 or 211T3 flyback transformer. The  $B+$  connection can be made to either 5 or 6 without materially changing the performance of the circuit. To get more width with a slight reduction of high voltage the width coil can be either disconnected entirely or else shunted with a .05 to .1-mfd paper capacitor.

In this circuit a fixed resistor,  $R_6$ , takes the place of the horizontal centering control shown in Fig. 3. In either case the entire  $B+$  current for the receiver goes through the centering resistor and deflection yoke. This is applicable where mechanical centering is used. If the centering resistor were not in the circuit, the picture would appear to one side and difficulty would be encountered in centering it. It is sometimes desirable to stop the passage of the  $dc$  through the yoke. In this case the centering resistor is omitted and the low side of the yoke is connected to  $B+$  through a .5-mfd 400-volt capacitor.

This flyback transformer can be used with the same output amplifier tubes as the ferrite type. Voltage and current ratings apply to both circuits. The operating voltages at points  $A$ ,  $B$ ,  $C$ , and  $D$ , in Fig. 4, are substantially the



### with General Industries' Model 250 TAPE-DISC RECORDER ASSEMBLY

There's literally no end to the merchandising possibilities of all-purpose recorders in which this GI Tape Disc Assembly is used. In home entertainment units . . . in straight recorders for professional men . . . as an aid to overall business efficiency . . . it has excellent profit potential.

Designed and built to General Industries' customary high quality standards, the Model 250 incorporates many novel, fool-proof operating features. Its cost is amazingly low.

Write *today* for a catalog sheet containing a full description of *all* the recording and play-back features of this popular new tape-disc recorder assembly.

When connected with suitable amplifier, the Model 250 records on discs . . . records on tape . . . records from tape to disc or disc to tape . . . plays back both tape and discs . . . plays 78 R.P.M. records. A complete service manual, included with each unit, contains a suggested amplifier circuit and complete amplifier parts list.

**The GENERAL INDUSTRIES Co.**



Department O • Elyria, Ohio

same as given for the circuit in Fig. 3. With Fig. 4 transformer the peak voltage at  $A$  can sometimes be increased up to 100 volts without getting an overdrive bar. Unlike the ferrite transformers, this transformer is not made in differently colored and graded core types; a single, high  $Q$  type of core is used in all transformers. In comparing these two transformers as to their use in conversion jobs, the following points were found to be true *in general*:

(1) The 77J1 usually gives a higher voltage and slightly less width than the X030; 14 kv and 16½-inch sweep for

the 77J1 and 12.5 kv with 18 inches of sweep are typical results obtained on a 16RP4.

(2) The 77J1 is somewhat awkward to mount and might require moving other components and drilling new holes in the high voltage compartment. The X030 needs no mechanical change.

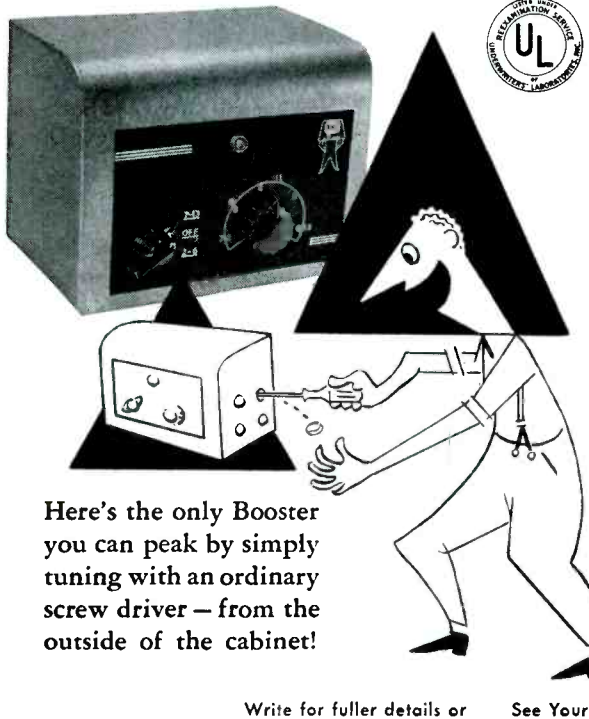
(3) The 77J1 bakelite pieces can break easier under rough handling.

(4) The X030 works well with a 6BG6 and a 6BQ6, but not so well with a 6CD6. The 77J1 flyback appears satisfactory with all these tube types.

**[To Be Concluded in February]**

<sup>2</sup>Ram Electronics; X030.

# PEAK FOR PERFORMANCE *on your channels* with the new **RMS BOOSTER SP-5**



Here's the only Booster you can peak by simply tuning with an ordinary screw driver — from the outside of the cabinet!

Write for fuller details or See Your Jobber

**Has an edge in engineering!**

Wide band width  
Lowest insertion loss  
Greatest signal to noise ratio.

**Has an edge in styling and simplicity!**

All metal cabinet in mahogany ripple finish — blends with all furniture.

Gear driven for velvet-smooth, 1-knob tuning.



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## New Parts - Tools - Instruments

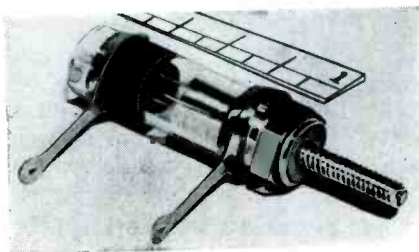
### JFD PISTON TYPE VARIABLE CAPACITORS

A piston type variable trimmer capacitor has been announced by the JFD Manufacturing Co., Inc., 6101 Sixteenth Ave., Brooklyn 4, N. Y.

Tubular in design and one inch in length, it is said to deliver uniform change of capacitance in relation to rotation. Thread wear is automatically taken up.

Capacitor is said to have zero temperature coefficient; Q rating of over 1,000 at 1 mc; 55° c to plus 100° c operating temperature; 10,000 megohms insulation resistance, single unit movable electrode and adjustment screw with a low temperature coefficient.

Capacitor specifications when measured at 0.1 to 1 mc: No. VC3, maximum 0.3 mmfd at minimum setting and minimum 3 mmfd at maximum setting; No. VC5, maximum 0.5 mmfd at minimum setting and minimum 5 mmfd at maximum setting; VC11, maximum 1.5 mmfd at minimum setting and minimum 11 mmfd at maximum setting.



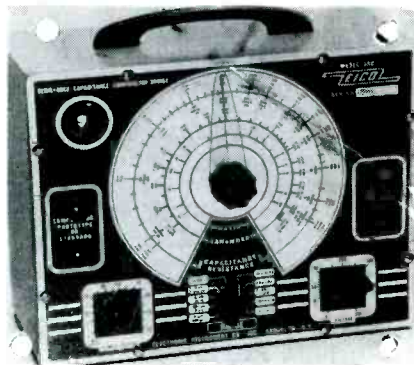
### EICO R-C-L COMPARATOR BRIDGE KIT

An R-C-L comparator bridge kit, 950K, has been announced by the Electronic Instrument Co., Inc., 276 Newport Street, Brooklyn 12, N. Y.

Comparator range permits comparison of resistance, capacitance or inductance with complementary component as a given standard. Has a range of 400:1.

Tests resistors over the range of .5 ohm to 500 megohms, in four steps; 0.5-500 ohms; 50-50,000 ohms; 5,000 to 5 megohms and 5 megohms to 50 megohms.

Capacitance range tests papers, micas, and electrolytics—over the range of 10 mmfd to 5,000 mid, in four steps: 10 mmfd-5,000 mmfd; .001-5 mfd; .1-50 mfd; and 50-5,000 mid.



## Association News

### TSCA, Detroit

THE TELEVISION SERVICE CONTRACTORS Association, Inc., of Detroit, protested recently before the City Council against the provisions of an ordinance for regulating the business of installing and servicing equipment, declaring that a rewritten ordinance would be submitted to the council and TSCA members. Those appearing for TSCA were E. J. Barton, president and head of Barton Radio & Television Co.; L. Wolfgang, Poly-tek Radio, and R. M. Shock, association executive director.

The tabled ordinance covered licensing, appointment of a board of examiners, and penalties for violations.

### TCA, Philadelphia

CONTRACT SERVICING was the subject of an interesting talk by Albert M. Haas, president of the Television Contractors Association, before the Philadelphia TV Town Meeting at the Bellevue Stratford Hotel.

Describing the problems that are often encountered in the handling of a contract, Haas declared that . . . "Today's shortage of capable Service Men and parts is so great that we are unable to give the customer the kind of service he expects, or is being led to expect."

Haas felt that the situation should be explained carefully to customers so that no unnecessary demands would be made. It is also necessary, according to Haas, that the contractor have the understanding and complete support of the intelligent, honest and progressive dealer. "When we have it," continued Haas, "when we work together cleaning out our stables, we will all have a business that is satisfying and profitable."

### TEN YEARS AGO

From the Association News Page of **SERVICE, January, 1941**

RTG of Boston held its annual get-together. . . . The Texas Radio Service Association presented a dinner-demonstration floor show, which featured a talk by E. G. Perkins of Supreme Instruments Corp., who discussed *New Service Procedure for Today and Tomorrow*. . . . H. H. Fillman was elected president of the Lehigh Valley Radio Service Association. Other new officers included S. P. Gruit, vice president; R. P. Abbott, secretary; Russell Buss, financial secretary, and J. A. Muthart, treasurer.

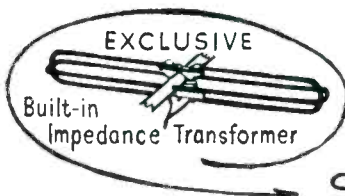


# Rep Talk

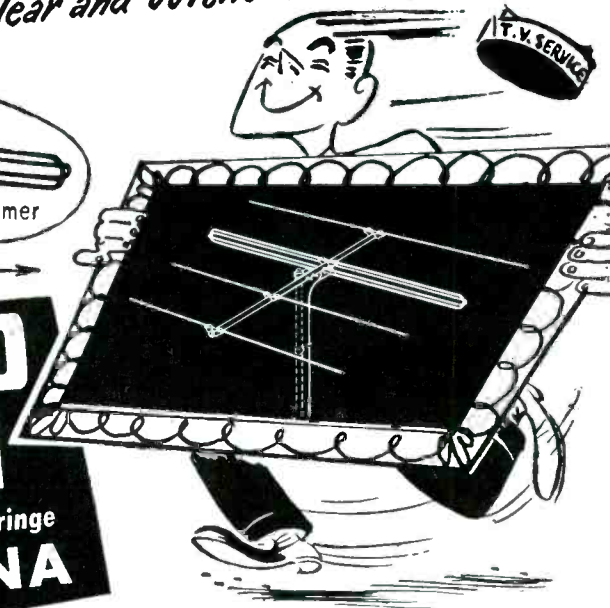
ROBERT C. DORRIS has joined Gawler-Knoop Co., 1060 Broad St., Newark, N. J., as district sales engineer for the Southern New Jersey-Pennsylvania territory. Dorris will work out of the office at 407 Greenwood Ave., Wyncote, Pa. . . . Harry Miller is now a Triad Transformer Manufacturing Co. rep for New York State, including Metropolitan New York and Northern New Jersey. . . . F. C. Somers & Company, City Bank Building, 18th and Grand Avenue, Kansas City 8, Mo., has become a Brach rep covering the states of Missouri, Kansas, Nebraska, Iowa and southern Illinois. . . . Neely Enterprises, Hollywood, have been named American Microphone reps for northern California (north of Fresno), Arizona, New Mexico and Nevada. . . . The Los Angeles chapter of *The Reps* has elected E. V. Roberts, '51 president. John B. Tubergen has been named vice president and John T. Hill, secretary-treasurer. H. A. Kittleson, retiring president, has become chairman of the board of governors and Dr. Ralph L. Power, executive secretary-treasurer was reappointed. . . . John O. Olsen Co., 1456 Waterbury Road, Cleveland, O., will handle the Du Mont Inputuner and other TV component sales in the territory including Ohio, Kentucky and West Virginia; Pennsylvania excluding all territory east of Harrisburg; and Garrett, Allegany and Washington Counties in Maryland. L. D. Lowery, Inc., 1343 Arch St., Philadelphia, Pa., have been assigned the territory including New Jersey south of and including Trenton; Pennsylvania east of but excluding Harrisburg; Delaware; Maryland excluding Garrett, Allegany, and Washington Counties; the District of Columbia, and Virginia. . . . Charles N. Hoemig and his Hoemig Sales Co., 1730 Clover Lane, Fort Wayne 7, Indiana, has been named to represent Jensen Industries in Indiana. Jensen is represented in Michigan by Jack M. Thorpe, who makes his headquarters at 4390 Haverhill Avenue, Detroit 24. . . . Gertsch Products, Inc., Los Angeles, has appointed Alfred Crosley and Associates, Chicago, to cover Wisconsin, Iowa, Illinois, Indiana and parts of Ohio; and Bivens and Caldwell, High Point, N. C., for Virginia, West Virginia, Tenn., N. and S. Carolina, Georgia and Alabama. . . . Jack Goss Co., Boston, Mass., has become sales rep for the Oak Ridge line covering the New England territory. . . . William M. Ferguson, 117 Fayette St., Manlius, N. Y., has been elected to associate membership in the Empire State Chapter of *The Representatives*. Ferguson covers upper New York State for Art Cerf & Co., 744 Broad St., Newark, N. J. . . . Robert M. Karet, 510 North Dearborn St., Chicago 10, has been elected to senior membership in the *Chicagoland Rep* chapter. Karet is associated with Oden F. Jester and John Margolin. . . . Charles Edward Pheasant, 18 N. Bolton Ave., Indianapolis 19, Indiana, has been elected to associate membership in the *Hoosier Reps* chapter. Pheasant represents Duotone, Vaco Products, JFD, Electric Soldering, American Television and Radio, Rek-O-Kut, Inc. . . . Robert V. Curtin, Box 196, Meriden, Connecticut, has been elected to associate membership in the *New England Reps* chapter.

# BRINGS IN THE PICTURE!

*Bright... Clear and Without Interference*



**WARD  
YAGI**  
Fringe and Super-fringe  
**ANTENNA**



**DR. YAGI,  
Originator of  
Yagi Antenna,  
PRAISES  
WARD  
ENGINEERING**

"The low numerical value of Voltage Standing Wave Ratio as recorded is . . . the proof of the exact matching between circuit elements. In this regard, I highly esteem the excellent ability of your engineers."

Yours very truly,  
I/s/Hidetogugu Yagi

WARD YAGIs are producing amazing results! In many cases, acceptable pictures now enthuse set owners, where no image could be obtained by other antennas. Increased sensitivity and exceptionally high gain is developed through Ward's exclusive built-in impedance transformer. Having perfect match to a 300 ohm line, full signal strength is transmitted to the set. Designed with high front to back ratio, a clear, sharp signal is picked up, without co-channel interference. Being closely tuned to each channel, this highly directive antenna has a narrow, angular pattern cutting foreign interference and noise to the minimum.

Ward's Yagi is a highly specialized antenna, designed without compromise specifically for long distance TV reception. In distant areas, and areas intermediate between transmitting centers, where weak signals and co-channel interference obstruct reception, stacking of Ward Yagis enables the selection and maximum energy reception of the desired station.

Order a supply of Ward Yagis today. Satisfied customers make WARD your most profitable antenna.

only **WARD** OFFERS  
TV-FM-AUTOMOTIVE-AM-SPP  
**ANTENNAS**

**THE WARD PRODUCTS CORP.**  
Subsidiary of the Gabriel Co.  
1523 East 45th St., Cleveland 3, Ohio



At a dinner, in Los Angeles, during which Kierulff and Company played hosts to The Representatives in Southern Calif. Among those present were: Wes Alderson, H. P. Bailey, Herb Becker, Alto Busse, Bill Cavanaugh, D. P. Cady, Jim Condron, George Davis, Michael Day, Al Dowers, H. Feldman, W. J. Fitzpatrick, Tom Gibbons, R. E. Greenwood, C. Cuthell, Jack Hachten, V. Hamilton, W. S. Harmon, O. L. Heeger, J. T. Hill, Jim Hill, John L. Jones, Cap Kierulff, C. R. Kierulff, H. A. Kittleson, W. B. Knight, J. Lockhead, L. Lindsey, C. R. Lynch, Robert Lynch, J. W. Marsh, D. Marshank, G. Marshall, B. E. McKnight, Jay Millen, C. T. Nystrom, Lee Owens, Dick Osborne, R. F. Page, J. Perlmuth, Elwood Reeves, Vern Rupp, H. M. Saul, E. Skahill, C. R. Strassner, R. A. Strassner, C. A. Stone, R. L. Stone, George Tivy, J. Tubergen, Karl Turner, D. C. Wallace, Max E. Webb, and Ash Wood.

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OLYMPIC

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RCA VICTOR  
REGAL ELECTRONICS  
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STEWART  
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ZENITH

Order today from your supplier!

### PERFECTION ELECTRIC COMPANY

2641 South Wabash Ave., Chicago 16, Ill.

Makers of Perfection Speakers and BeamaJuster TV Centering Controls



### RAYTHEON STARTS BONDED DEALER PROGRAM

The first of a series of Raytheon bonded dealer meetings, sponsored by the Electrical Supply Corp., 1739 Massachusetts Ave., Cambridge, Mass. was held recently. Speakers included Lewis A. Crosby, president of Electrical Supply, Addison Sandford, Electrical Supply sales manager and A. E. Akeroyd, rep for Raytheon tubes in the New England area.

\* \* \*

### WARNER JOINS VEE-D-X

Sidney E. Warner has been appointed director of engineering and research of La Pointe-Plascomold Corp., Windsor Locks, Conn.

Warner was formerly partner and chief engineer of Aircraft Electronic Associates.



Sidney E. Warner

\* \* \*

### SAMS' AUTOMATIC RECORD CHANGER MANUAL

The third edition of the Sams' Automatic Record Changer Manual, with 286 pages of copy on forty-four models of changers made in '49 and '50, as well as multiple-speed changers and wire and tape recorders, has been released.

Offered are cycle data, information on adjustments, needle landing data, hints and kinks, parts lists, exploded diagrams of the systems, etc.

Priced at \$3.00.

\* \* \*

### FRED LESTER JOINS ELECTRO-VOICE

Fred Lester, has been appointed factory manager of Electro-Voice, Inc., Buchanan, Mich. Lester, formerly general manager of Meissner, will direct all manufacturing processes.

# DRAKE PeeWee

the mighty mite with a PROFITABLE future



ACTUAL SIZE 7 1/2 IN.

Yes sir! PeeWee in your kit means saved time—extra profits. A full 35 watts, with 3/16" tip, the Drake PeeWee is chrome plated—has baffle plates to keep handle cool. Order from your distributor now.

**DRAKE ELECTRIC WORKS, INC.**  
3656 LINCOLN AVE. CHICAGO 13

### RAY F. SPARROW NAMED MALLORY SENIOR VP

Ray F. Sparrow has been named senior vice president of P. R. Mallory & Co., Inc., Indianapolis, Ind.

Sparrow has been vice president in charge of sales since '31 and a member of the board for many years.

\* \* \*

### WALDOM HANDLING CRONAME COMPONENTS

Waldom Electronics, Inc., 911 N. Larabee St., Chicago, Ill., are now distributing Croname components.

Products include auto radio controls, panel kits, auxiliary drives, dial plates, panels, instrument dials, tuners, title plates, tuning plates, knobs and other TV and electronic components.

### Headquarters of New Dallas Jobber



New building, at the corner of Ross Avenue and the Dallas Expressway, being constructed for use as a radio-TV parts distribution center for Wholesale Electronic Supply, Dallas, Tex. M. B. Patterson and John N. Leedom, are co-owners of the new jobber house.

### Do you need REJUVENATING?

Maybe you don't, but Millions of Picture Tubes DO!

## The H.O.T. REACTIVATOR Adds New Life to Picture Tubes (and your profits)

You'll give your earnings the needle when you see how easily, quickly and profitably TV picture tubes are rejuvenated. With our newest and H.O.T. test little number—The REACTIVATOR—picture tubes suffering from poor emission are given new brightness without removing the tube from the cabinet or chassis. The entire treatment takes only minutes. No parts or materials are required—simple and rejuvenating job is clear profit! Pocket size and lightweight REACTIVATOR for every service truck and on every bench!

Start REJUVENATING Your Own Profits Picture—Order H.O.T. REACTIVATORS From Your Jobber Today! Immediate Delivery—Limited Quantities.



Another H.O.T. item by the pioneer TV accessories manufacturer.

easy to operate—every you'll need a H.O.T.

**\$17.95** Dealer Net

## THE HOUSE OF TELEVISION, INC.

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NEW YORK 12, N. Y.



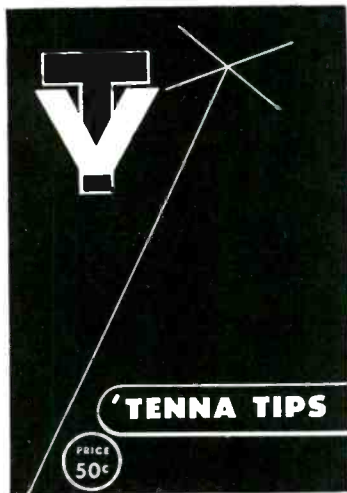
### SNYDER TV ANTENNA INSTALLATION BOOK

A TV antenna installation book, *Tenna Tips*, has been published by the Snyder Manufacturing Co., Philadelphia, Penna.

Book, prepared by Edward M. Noll, lecturer in electronics at Temple University, and Matthew Mandl, also at Temple as director of electronics, was prepared in cooperation with Charles A. Trowbridge, chief design engineer of Snyder.

Topics covered include basic antennas, yagis, channel frequencies, do's and don't's, feeds, etc.

Available from distributors, free.



\*\*\*

### GENERAL CEMENT EXPANDS

A new plant of over 30,000 square feet has been added to the facilities of the General Cement Manufacturing Co., Rockford, Ill.

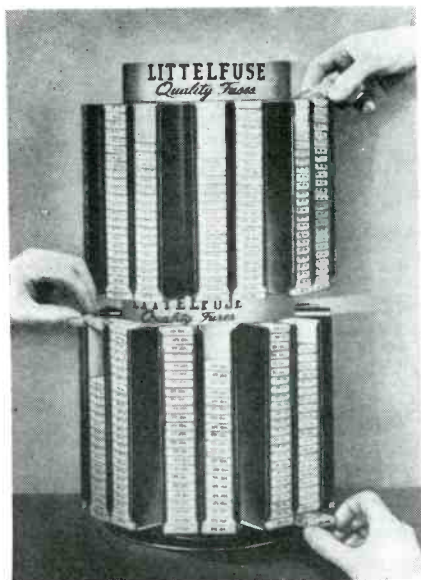
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### LITTELFUSE COUNTER DISPENSER

A revolving counter dispenser which will hold up to 3,600 fuses is now available from Littelfuse, Inc., Chicago, Ill.

Dispenser consists of two metal frame drums with slide channels which dispense fuses from either top or bottom. Two sections revolve independently in order to permit selection of 72 varieties of fuses.

Open channels, which show all fuse stock, provide automatic visual inventory for stock room shelves. Size: 24" high and 11" in diameter.



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# OUTSTANDING

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Constant research and development have made each and every OXFORD SPEAKER the outstanding unit of the industry. This is proved by the fact that over 77 television and radio manufacturers have used millions (yes — millions) of OXFORD SPEAKERS in the last 25 years.

The excellent engineering skill, fine sound reproduction, quality of components and durability of design, are just a few of the many reasons that make OXFORD SPEAKERS worthy of your consideration.

Precision-built for every sound application with the guarantee of unsurpassed performance, truly make Oxford Speakers **OUTSTANDING**.

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Leading jobbers carry OXFORD SPEAKERS for TV, FM, AM, AUTO and PA.

See us at the Parts Show, Booth No. 515, Display Room No. 507A, Stevens Hotel



See us at the Parts Show, Booth No. 515, Display Room No. 507A, Stevens Hotel

## OXFORD ELECTRIC CORPORATION

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EXPORT: ROBURN AGENCIES, NEW YORK CITY

### SIMPSON INSTRUMENT PAMPHLET

A pamphlet describing six instruments for FM and TV servicing (plate conductance tube tester, model 335; field strength meter, model 488; microscope, model 476; vacuum tube volt-ohmmeter, model 303; ac-dc-volt-ohm-milliammeter, model 260, and the Genescope, model 480) is now available from Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill.

### Two-TV-Sets-in-Every-Home Promotion

Right: Meeting of Brach jobbers in N. Y.-N.J. area arranged to discuss a 2-set-for-every-home program. Left to right, standing: Sol Verter and Frank Cowley of Burlingame Associates; Red Goldenberg, Sherwood Distributors; Ira Kamen, Brach; George Wentzel and Max Barnett of Island Radio Distributors; Ruby Green and Hyman Morgenlander of Green Radio Distributors. Seated: Jerry Berger, Brach; Jack Grand, Burlingame Associates; Herb Schneur and Seymour Wiedenbaum of National Radio Distributors.

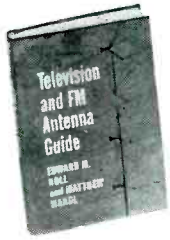
### TV Receiver Test Belt



Slat type conveyor belt, moving along between two rows of TV chassis test booths. Booths are completely equipped with test equipment, suitable for conducting final tests on chassis. After tests are completed, sets go down slat conveyor to cabinet section. (Courtesy DuMont)



# Ready in January



## TELEVISION AND FM ANTENNA GUIDE

by E. M. Noll & M. Mandl

Here is all the information and practical instruction you need in order to be sure of getting the most out of any antenna system, with a minimum of testing and readjustment. It gives—

- The characteristics, dimensions, and special advantages and disadvantages of ALL VHF and UHF antennas and allied equipment.
- NEW information on NEW types of antennas recently tested by the authors.
- Definite installation procedures—how to determine the right type of antenna for the particular site; how to locate space loops; how to determine signal strength, etc.
- Practical directions for mounting antennas on different types of roofs or on window sills; how to install transmission lines to minimize noise and avoid standing waves; use of booster amplifiers, input systems, etc.
- Clear, practical explanation of all essential principles—impedance matching, loss factors, etc. Handy tables and all other information useful in selecting and installing any type of antenna for best results.

# Have you seen



## RADIO & TELEVISION MATHEMATICS

A Handbook of Problems and Solutions

by Bernhard Fischer

Completely worked-out samples of every calculation commonly required in radio, television, and industrial electronics work of all kinds. Shows what formulas to use, what numerical values to substitute, each step in solution. Conveniently arranged and fully indexed for quick reference on any problem.



## TELEVISION FOR RADIOMEN

by E. M. Noll

The outstanding book on television for servicemen. Clear, non-mathematical explanations of the operating principles and function of every part and circuit; complete instruction in installation, alignment, adjustment, and trouble-shooting.

### SEE THEM ON APPROVAL

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Please send me a copy of the books checked below. I agree to remit in full or return the books within ten days without further obligation.

- TV & FM Antenna Guide, \$5.75 (prob.)
- Radio & Television Mathematics, \$6.00
- Television for Radiomen, \$7.00

Signed .....

Address ..... S

# JOTS AND FLASHES

BIGGER AND BIGGER PICTURE TUBES appear to be the theme of industry for '51. At Seneca Falls, N. Y., Sylvania has already begun to produce 24-inch tubes on a regular production basis. Other plants are planning similar large-tube production schedules. . . . Kendrick Lippitt, chief engineer of Technical Appliance Corp., Sherburne, N. Y., is now a member of the RTMA committee on receiving antennas. . . . Electronic Measurements Corp., 423 Broome St., N. Y. C., will soon move to a new enlarged factory site at 280 Lafayette St., New York 12, N. Y. . . . John Adams Kuneau is now director of public relations at Philco. . . . A hi-fi catalog has been published by Hudson Radio & Television Corp., 212 Fulton St., New York 7, N. Y. . . . Thomas Electronics, Inc., will soon add 100,000 square feet of floor space to their plant. . . . Electro-Voice, Inc., Buchanan, Mich., is now participating in the engineering services of Howard W. Sams & Co., Indianapolis, Ind. . . . A new carton, featuring a bluish-green color, is now being used by Clarostat Mfg. Co., Inc. . . . Captain David R. Hull, USN (Ret.), is now a vice president of Raytheon. . . . U. S. Electronics Corp. has moved from Los Angeles to 2038 Broadway, Santa Monica, Cal. R. G. Leitner is vice president and chief engineer of the company. . . . Best Vue Products are now located at 240 N. 10th St., Brooklyn, N. Y. . . . Robert Hertzberg has prepared a pocket sized book entitled *How to Repair Electrical Appliances and Circuits* for Superior Publishing Co., 227 Fulton St., N. Y. 7, N. Y. It is priced at 25 cents. . . . The T. V. Development Corp., 2505 Surf Ave., Brooklyn 24, N. Y., have released a four-page bulletin describing plastic masks, TV turntables, TV knobs, boosters, filters, and tubular selenium rectifiers. . . . Seymour Mausner is now sales promotion manager of the Franklin Airloop Corp., 43-20 34th St., Long Island City 1, N. Y. . . . Major Ray A. Morris has been named assistant sales manager of IDEA, manufacturers of Regency boosters. . . . N. C. Henry is now manager of TV and radio distribution of Bendix Radio. . . . The fourth annual TV symposium of the New York section of the IRE will be held on Feb. 3, in the main auditorium of the Engineering Societies Building, 33 W. 39th St., N. Y. C. Topics to be covered include color TV, interference, etc.

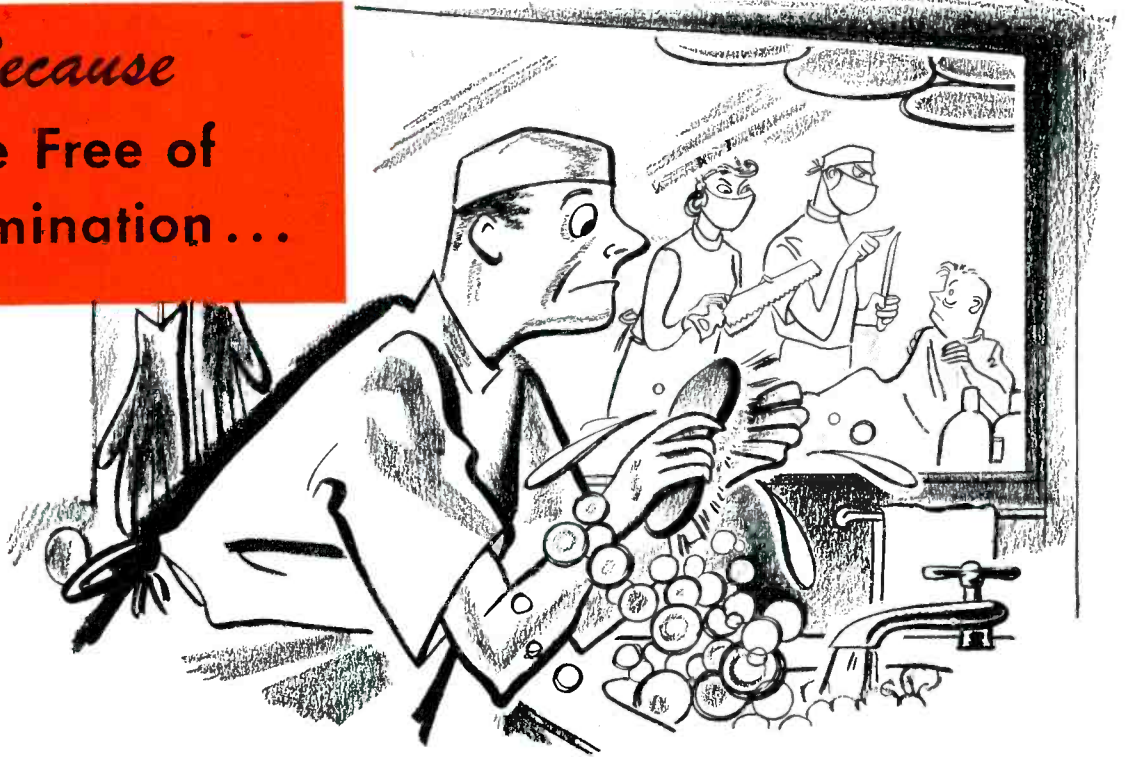
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*Because*  
**They're Free of  
Contamination . . .**



## MALLORY CAPACITORS

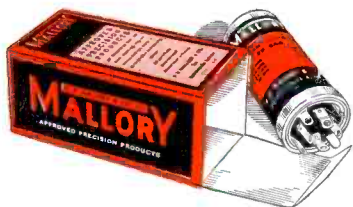
### Give Long, Continuous Service!

One reason why Mallory Capacitors deliver full rated capacity throughout their long life is the unusual care taken in production to prevent contamination, which is the source of corrosion and shortens the life of capacitors.

Even at high temperatures, Mallory Capacitors operate perfectly over extremely long periods of time. Tests consistently show dependable performance for more than 2000 hours at temperatures up to 185°F (85°C). Special design and meticulous production methods make such records possible.

Mallory Capacitors have set new long-life standards for the industry, yet cost no more. You will find it pays to rely on the complete Mallory Capacitor line . . . electrolytic, plastic tubular, paper, mica and ceramic.

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# Extra Performance

as a matter of course... with RCA tubes

EXPERT ENGINEERING and careful quality control are inseparable ingredients that contribute to the *extra* performance of RCA tubes. A case in point is the *double helical coil heater*... developed by RCA. By its use, hum level is greatly reduced. This feature has made possible the design of amplifier tubes having greatly increased sensitivity.

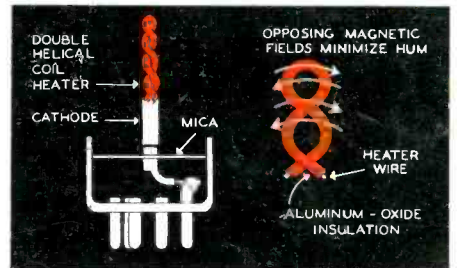
The double helical coil heater—shown in red—is designed so that the heater current flows in one circular direction to the top of the heater and in a reverse circular direction to the bot-

tom of the heater. Thus, the current flowing through the heater sets up opposing magnetic fields which effectively neutralize each other.

In addition to the helical coil construction, each tungsten or tungsten-alloy heater is coated with a pure aluminum oxide having extremely high insulation qualities, and pioneered by RCA. The use of this insulation is a major factor in reducing heater-cathode leakage—another cause of hum.

Though it adds to the complexity of manufacture, the double helical coil heater is incorporated in the design of

all RCA high-gain tubes of the 6.3-volt, 0.3-ampere, heater type intended for audio use. This is another reason why you can count on *extra* performance and long life from RCA tubes.



*Keep informed—stay in touch with your RCA Tube Distributor*



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ELECTRON TUBES

HARRISON, N. J.