JANUARY, 1954

# Radio-Television SERVICE DEALER

TV - AM - FM - SOUND

Includes: "VIDEO SPEED SERVICING" & "TV FIELD SERVICE" Data Sheet Sections

The Professional Radio-TVman's Magazine

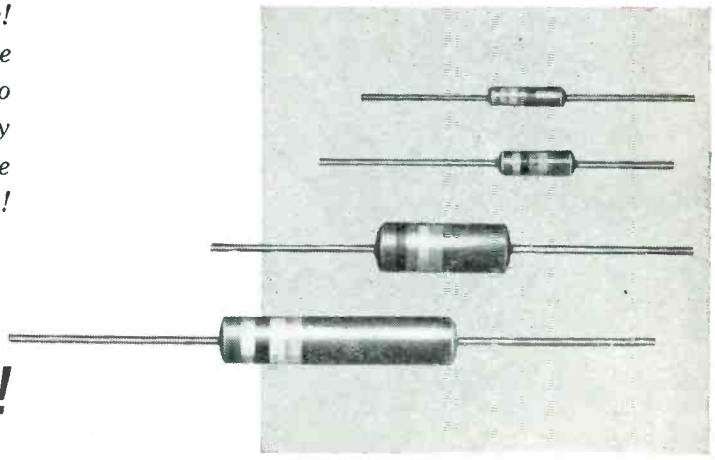
Reaching Every Radio TV Service Firm Owner in the U.S.A.

# NO.1 CHOICE

*of* **ALL** *Fixed Composition Resistors by almost*

# 3 to 1*...

**Not Claims! Not Predictions! But Plain Facts!* *Unbiased, authoritative, independent surveys (made regularly since 1930) show IRC BT RESISTORS to be the Service Technicians' choice by a continually increasing margin. Today, BT RESISTORS are preferred over the total of all other brands combined!*



## Ask for IRC BT's...
## Most Service Technicians Do!

IRC

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Wherever the Circuit Says ~~~

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BUSS is the one source for any fuse you need: — standard type, dual-element (slow blowing), renewable and one-time types . . . in sizes from 1/500 ampere up.

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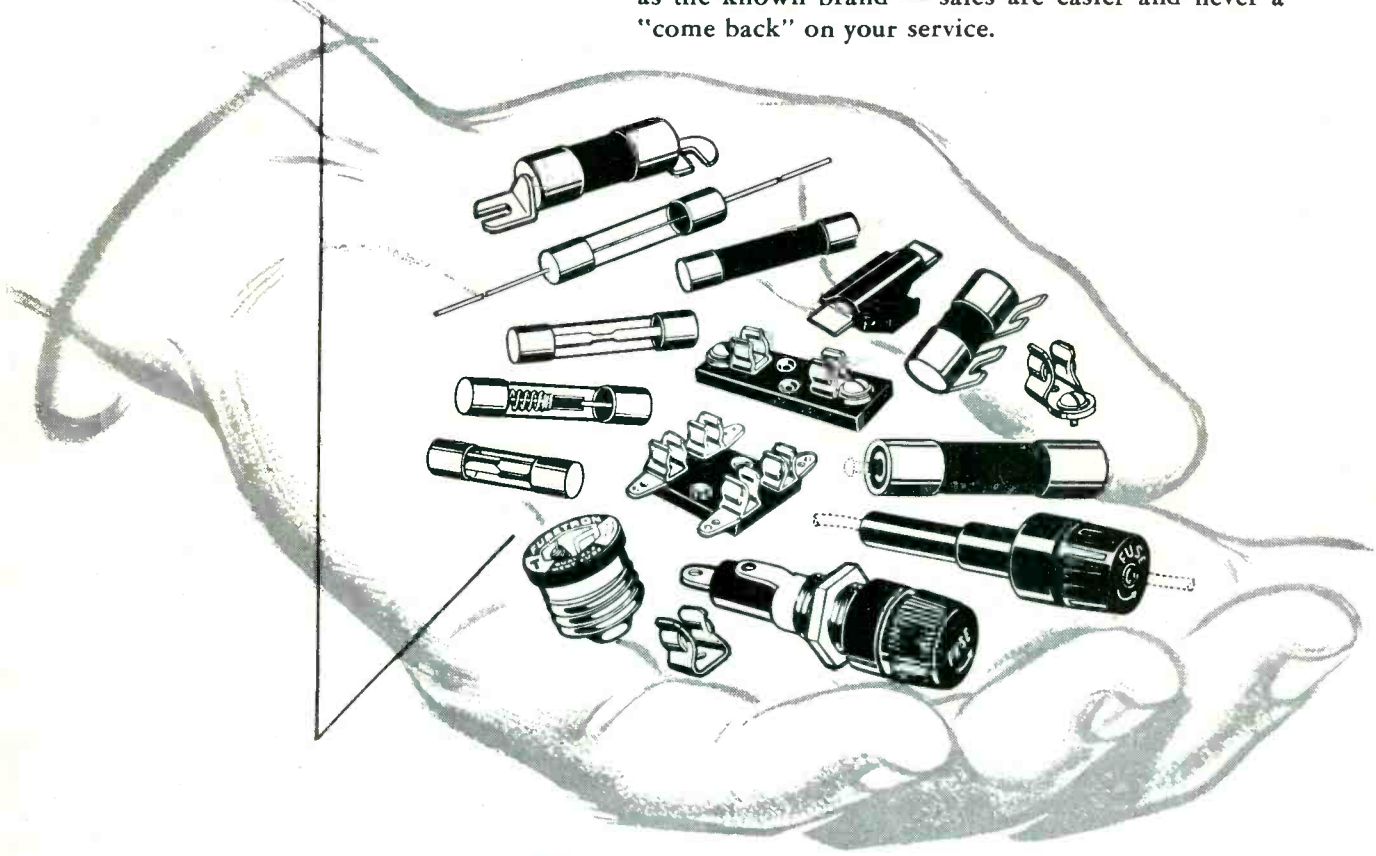
That's why manufacturers and service organizations for over 38 years have turned to BUSS for their fuse needs — no matter how exacting.

And a customer instantly recognizes quality when he sees BUSS Fuses. Millions of fuses for home, farm, commercial and industrial use have established BUSS as the known brand — sales are easier and never a "come back" on your service.



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TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

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BUSSMANN Mfg. Co. (Division of McGraw Electric Co.)
University at Jefferson, St. Louis 7, Mo. SD-154

Please send me bulletin SFB containing facts on BUSS small dimension fuses and fuse holders.

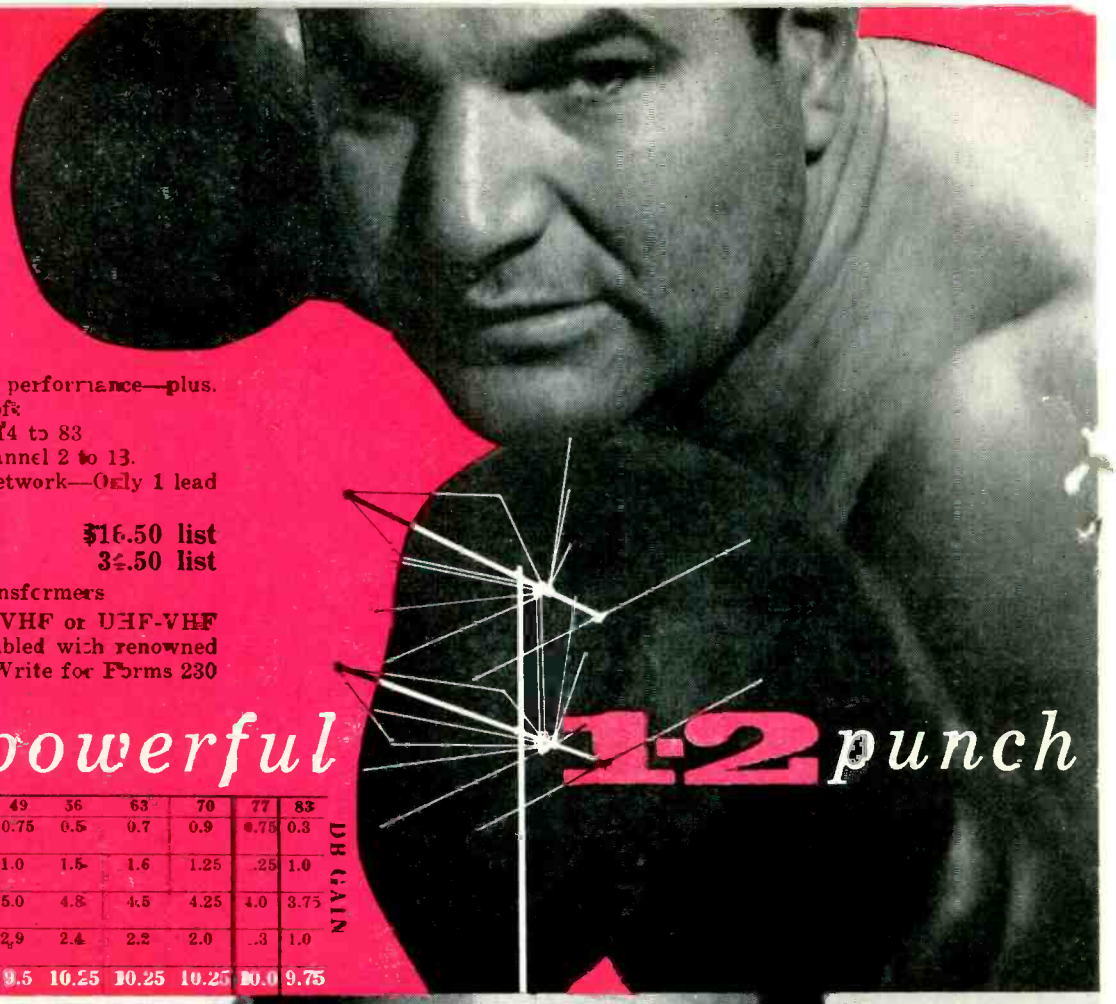
*Name*_____

*Title*_____

*Company*_____

*Address*_____

*City & Zone*_____ *State*_____ 154



## JFD JeTOMIC

Produces brilliant deep fringe UHF performance—plus.
Produces heretofore unachieved gain of:
Stacked* UHF Rhombic on Channels 14 to 83
Stacked JeT conical on every VHF Channel 2 to 13.
Featuring exclusive no-loss isolation network—Only 1 lead to set.

**Model JeT 454** Single $16.50 list
**Model JeT 454 S*** Stacked 34.50 list

* complete with stacking transformers

Guaranteed to out-perform any other VHF or UHF-VHF antenna. Both units factory pre-assembled with renowned Jet-action all-aluminum construction. Write for Forms 230 and 241.

# the most powerful 1-2 punch

| Channels | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 | 77 | 83 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Competitor A Conical with Bowtie (2 stack) | 4.0 | 3.25 | 2.0 | 1.0 | 1.0 | 0.75 | 0.5 | 0.7 | 0.9 | 0.75 | 0.3 |
| Competitor B Bedspring with UHF | 0.75 | 0.75 | 0.9 | 1.0 | 0.8 | 1.0 | 1.5 | 1.6 | 1.25 | .25 | 1.0 |
| Competitor C Conical with V (2 stack) | 3.0 | 3.3 | 4.0 | 4.6 | 4.9 | 5.0 | 4.8 | 4.5 | 4.25 | 4.0 | 3.75 |
| Competitor D Filter type with attached "V" | 2.0 | 2.0 | 2.5 | 2.75 | 2.9 | 2.9 | 2.4 | 2.2 | 2.0 | .3 | 1.0 |
| JFD JeT 454 S | 7.0 | 7.25 | 7.4 | 8.5 | 9.0 | 9.5 | 10.25 | 10.25 | 10.25 | 10.0 | 9.75 |

DB GAIN

## JFD SUPER-JeT

Delivers Spectacular Deep fringe VHF performance—plus.
Packs Unprecedented gain of:
Single 10-Element VHF Yagi on each channel from 2 to 13.
Stacked UHF Bowtie-Reflector off side lobes on Channels 14 to 83.

**Model JeT 213** Single $20.75 list
**Model JeT 213 S*** Stacked 42.50 list

* complete with stacking transformers

JFD Electronics

Burton browne advertising

JFD Manufacturing Company
Brooklyn 4, N. Y.

# in antenna history!

| CHANNELS | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Competitor A Mattress (4 Stack) | 4.0 | 5.0 | 7.0 | 6.25 | 5.0 | 5.25 | 6.0 | 5.25 | 7.25 | 9.25 | 6.5 | 7.0 |
| Competitor B Radar Screen Type A | 0.0 | 3.0 | 4.0 | 3.25 | 3.0 | 4.5 | 7.0 | 7.0 | 8.0 | 10.0 | 10.0 | 9.0 |
| Competitor C Radar Screen Type B | 0.75 | 3.25 | 4.5 | 3.5 | 3.5 | 6.0 | 7.0 | 6.5 | 7.75 | 8.0 | 7.5 | 6.0 |
| Competitor D CHS 2-13 YAGI | 4.50 | 5.00 | 5.75 | 3.00 | 2.50 | 3.50 | 1.00 | 0.0 | .875 | .875 | .50 | .75 |
| JFD JeT 213 S | 6.0 | 7.5 | 8.75 | 7.75 | 6.75 | 10.0 | 9.0 | 7.0 | 9.0 | 10.0 | 11.0 | 9.75 |

DB GAIN

| | 1" Square Crossarm | Completely Preassembled | LIST PRICE |
|---|---|---|---|
| Competitor A | NO | YES | $55.00 |
| Competitor B | NO | NO | $34.95 |
| Competitor C | NO | NO | $47.50 |
| Competitor D (2 STACK) | NO | NO | $65.90 |
| JFD JeT 213 S | YES | YES | $42.50 |

World's largest manufacturers of TV antennas and accessories.




COWAN PUBLISHING CORP., 67 West 44th Street, New York 36, N. Y.

VOL. 15, NO. 1 JANUARY, 1954

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# CHANNEL MASTER

*introduces a*

## basically new type of VHF antenna

## the CHAMPION*

**the highest gain all-channel VHF antenna ever developed!**

*Featuring the unique new "Tri-Pole"*

**TRIPLE-POWERED DIPOLE**

The "Tri-Pole" is a new antenna system in which the Low Band folded dipole also functions as three folded dipoles tied together in phase on the High Band. This is the heart of the Champion, the secret of its phenomenal performance on all 12 VHF channels.

The **CHAMPION** is another great development of the world famous Channel Master laborctories.

*Pat. Pending

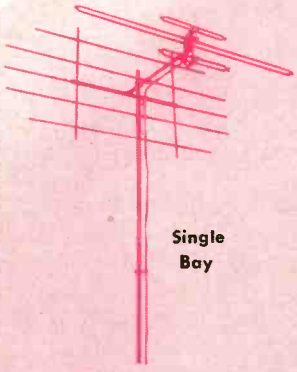
# the CHAMPION is the most sensitive all-channel VHF antenna ever designed!

**Stacked *CHAMPION* provides:**
**11-13 D B High Band gain**
**6½-7½ D B Low Band gain**

Here is a totally NEW kind of antenna, completely different — in principal and performance — from any VHF antenna you've ever seen! Since the lifting of the TV freeze means a gradual disappearance of the single-channel VHF area, the VHF antenna of the future will be a *multi-channel* antenna. Prepare now for outstanding reception on *all* VHF channels — present and future — with Channel Master's super-sensitive CHAMPION! Outperforms every all-channel VHF antenna made today — and many Yagis, too!

## COMPARE these features with the antenna you are now using:

- **Folded dipoles throughout — give close to 300 ohms impedance across the entire band.**
- **Screen-type reflector provides high uniform gain on every channel, 2 through 13. *Not* frequency sensitive — this reflector provides more than twice as much extra gain as straight bar reflectors.**
- **Phase-correcting harness is built-in and fully assembled; the only wiring you do is to attach the lead-in.**
- **All-aluminum construction . . . lightweight, durable, non-corrosive.**



Single Bay

## MARVEL OF PRE-ASSEMBLY

**assembles faster than a 5-element yagi!**

Collapsed "Pop-Up" screen opens instantly — no loose rods, elements or hardware. "Tri-Pole" assembly features automatic Spring Lock Action — all dipoles snap permanently into place without wing nuts or any other hardware.

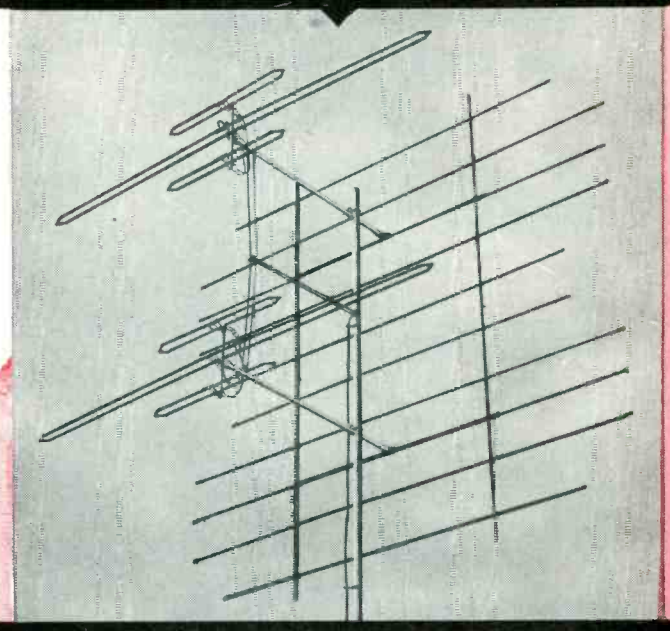
**It's a *CHAMPION* in any area!**

1-bay—*local areas*
2-bay—*secondary and fringe areas*
4-bay—*super-fringe areas*

4-Bay



## THIS ANTENNA...



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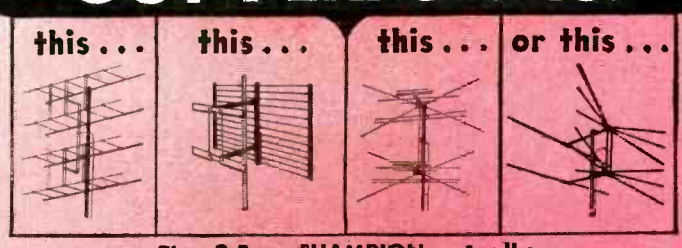
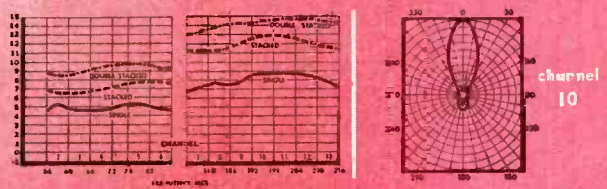



**The 2-Bay CHAMPION actually gives you the performance of:**

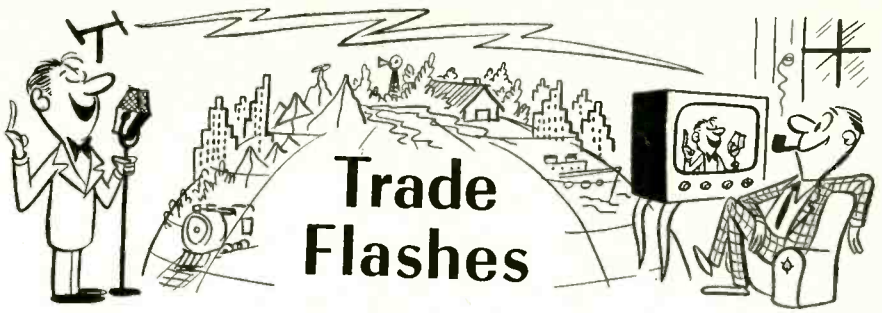
- **Separate 5-element Yagis for every Low Band channel!**
- **Separate 10-element Yagis for every High Band channel!**




| Model No. | | List Price |
|---|---|---|
| 325 | Single Bay | $20.83 |
| 325-2 | 2-Bay | $42.36 |
| 325-4 | 4-Bay | $88.89 |
| **Separate Stacking Harness** | | |
| 325-3 | 2-Bay Harness | $ 2.08 |
| 325-5 | 4-Bay Harness | $ 4.15 |

Send for complete technical literature.

**CHANNEL MASTER CORP.**
ELLENVILLE, N. Y.



# Trade Flashes

## Industry Leaders Differ on Number Of Color TV Sets for 1954

The Radio - Electronics - Television Manufacturers Association (RETMA) estimates about 192,600 color TV sets will be produced in 1954, it is reported. This figure is an average estimate; high guess was 650,000 sets and low guess was 50,000 sets.

The low guess is more in keeping with the estimate released by J. B. Elliott, RCA's vice-president in charge of consumer products. Mr. Elliott figures between 50,000 and 75,000 color TV sets will be produced in 1954.

An even lower estimate is offered by Edward S. White, Chief Engineer of the Advanced Development Department of CBS-Columbia. Mr. White has stated that the first color TV receivers would cost about $1,000 and that the industry could conceivably make 30,000 to 50,000 sets in the first year following FCC approval. Mr. White counsels the public not to expect too many marvels overnight. He said: "It is true that television and electronics have made tremendous strides but behind the startling announcements were always years of research . . . We are engaged in making better use of electronics, not newspaper headlines."

Despite difference of opinion on color TV, there is widespread agreement on the promise of 1954 for black-and-white TV. Mr. White has emphasized that this form of programming would continue to be the backbone of the nation's video system for many years to come. RCA's Mr. Elliott has asserted that many millions of black-and-white TV receivers may be sold in 1954. The RETMA estimates close to 5,000,000 black-and-white TV sets will be made and sold in the U. S. A. in 1954.

## NEDA Numbers to Appear On Burgess Battery Cartons

Burgess Battery Company announces that their unit and master shipping cartons for Burgess portable radio batteries will carry NEDA numbers as well as their own. Copies of the index are available on request. Write to National Electronic Distributors Association, 228 North LaSalle Street, Chicago 1, Illinois.

## Service Dealers Attend Raytheon Meetings

Over 1,000 service dealers attended Raytheon "Service Saver" meetings in Springfield, Mass; Manchester, N. H.; and Boston Mass. recently. Sponsoring the New England meetings were the following Raytheon distributors: L. L. Del Padre Associates, De Mambro Radio Supply Company, Electrical Supply Corporation, Graybar Electric Company, Hatry and Young of Mass. Inc., Lincoln Electronic Supply Corporation, A. W. Mayer Company and Willett Radio Supply, Inc.

Largest attendance was registered at the Boston meeting where 850 service dealers were on hand to hear Bill Ashby's presentation of the Raytheon "Service Saver" plan at the John Hancock Hall, Wednesday evening, October 28th.

At the meetings conducted by Mr. Ashby, a slide-illustrated talk reviewing U.H.F. installations and servicing problems was given. He further developed the Raytheon "Service Saver" plan, also illustrated with slides, built around the T.V. Owner's Guide and the dealer's Service Saver Manual and wall chart (described in the November issue of RTSD). Attending service dealers were most enthusiastic in their response to the informative and educational talks.

## Hi Fi Expected To Stimulate Sales

The tremendous upsurge of public interest in high fidelity music reproduction for the home may lead to increased phonograph and equipment sales of between 200 and 300 million dollars in 1954, it is estimated by Henry G. Baker, vice president of R.C.A.

"If our industry is alert to this great demand for enjoyment of the finest musical reception I think it will be able, by the end of next year, to put high fidelity equipment in from five to ten times as many American homes

# 3 great, new UHF antennas

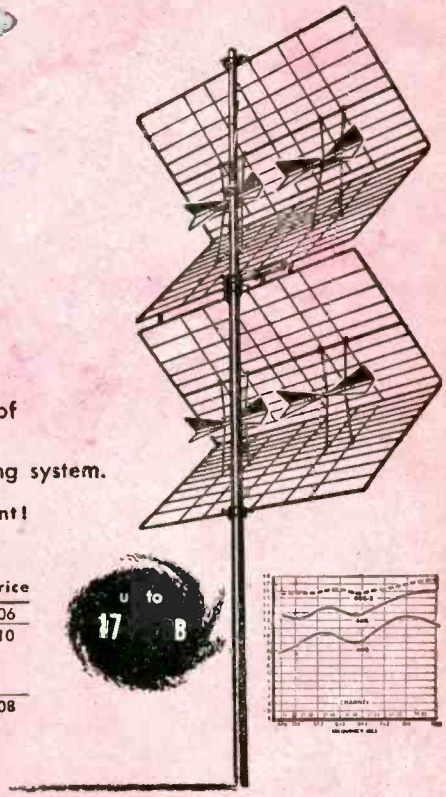
## by CHANNEL MASTER

## STACKED TWIN CORNER REFLECTOR model no. 406-2

**The most powerful UHF fringe area installation you can make today!**

- Broad Band coverage — yet out-performs most stacked Yagis.
- Covers every UHF channel, *not* just segments of the band.
- New impedance-matching, two-stage stacking system.

**Another original Channel Master development!**








| Model No. | Description | List Price |
|---|---|---|
| 406 | Twin Corner Reflector | $18.06 |
| 406-2 | 2-Bay Twin Corner Reflector. Stacking harness furnished free. | 36.10 |
| 406-3 | Stacking harness only, furnished separately. | 2.08 |

*powerful new antennas span vast distances*

only $9.03 list

## the first UHF CORNER REFLECTOR with optional "2-way" mounting!

mounts this way . . . or this way

**model no. 409**

Only CHANNEL MASTER'S CORNER REFLECTOR can be adapted to any kind of UHF installation — with or without VHF — at no extra cost. Every antenna contains all necessary hardware and braces for BOTH popular types of mounting. Sharp directivity and unusually high gain across entire UHF band.

***Installs instantly!*** Original Channel Master assembly feature: Screen swings open like a book — dipole assembly snaps into place.

## "SWEET 16" The World's First 16-Element UHF Yagi!

- Custom-designed for *your* particular area.
- Super-power! Sensational fringe area reception.
- Delta-Weld design. Elements WELDED to crossarm. Delta-matched dipole gives uniform impedance.
- Wide band coverage, up to 21 channels.
- Average gain: 13 DB single
  16 DB stacked

**model no. 420**

**$8.20**

CHANNEL MASTER CORP.
ELLENVILLE, N. Y.

Send for technical

as now have it," Mr. Baker said at a recent high fidelity symposium.

George R. Marek, director of the artists and repertoire division of RCA Victor records, predicted that the record industry's sales volume would increase from its present $225 million annually to more than $300 million within the next five years. The bulk of the increase, he stated, would come from sales of classical records stimulated by the expanding high fidelity market.

### Finney Wins "Unfair Competition" Lawsuit

The Finney Company, Cleveland, Ohio, manufacturers of a fringe area antenna line, have obtained a court judgment for damages and a permanent injunction against a Canton, Ohio service company that had been selling an unnamed antenna which they represented as being a genuine Finco antenna.

The following quotation is reproduced from a decision of the Court of Common Pleas, Stark County, Ohio, November 6, 1953:

"being fully advised in the premises and by agreement of the parties hereto, the Court finds that the defendant has engaged in unfair competition, as in said petition complained of, by passing off unto its customers, as "Finco" antenna, other antennas of similar appearance which were not genuine and which were not products of the plaintiff, and that plaintiff is entitled to an award of damages and a final and permanent order restraining defendant from further unfair competition with the plaintiff."

Mr. M. L. Finneburgh, Vice President of The Finney Company, stated in a general release to the trade press, "I believe we are the first manufacturer ever to carry a case of misrepresentation by a service company into the courts of the United States."

### RMS Gains Control Of Ames and JEB

Sidney Pariser, President of Radio Merchandise Sales, Inc., 2016 Bronxdale Avenue, N. Y. 62, announces that RMS has now acquired the controlling interests in the Ames Mfg. Corp., manufacturers of a complete line of wire products, and in the JEB Sales Corporation, producers of the JEB rotator.

The sales program for all three companies will be handled by Martin Bettan, present Sales Manager of RMS, and in almost every instance Mr. Bettan reports that the present RMS representatives have arranged to handle all three lines. RMS, Ames and JEB

[Continued on page 47]

You can't do without...

# SYLVANIA'S SEE-WELL TOOL KIT

## A NEW, TIME-SAVING TOOL-SENSATION!


YOUR 3 MOST NEEDED TOOLS IN 1 KIT - MAGNETIC PHILLIPS AND FLATHEAD SCREWDRIVERS, NYLON ALIGNMENT TOOL - PLUS POWERFUL FLASHLIGHT!

Break-resistant lucite spotlights work.

Stainless steel handle with built-in flash-light. Uses 2 pencil light batteries of *any size* (not included in kit).

Magnetized tempered steel Phillips screwdriver head embedded in clear lucite shaft.

Nylon, non-conductive alignment tool on lucite rod, to reach and see what you're doing.

Flat screwdriver, magnetized tempered steel, clear lucite shaft for tight fitting handle.

This $7.95 VALUE for only 15 Sylvania Premium Tokens.

NO MORE FUMBLING inside dark radio and TV cabinets. At the flick of a switch, a bright light automatically focuses right at the spot you're seeking. Saves your time . . . improves your work.

*3 Handy Tools in 1.* Magnetized Phillips and Flathead screwdrivers, nylon alignment tool — all 3 built into break-resistant lucite shafts perfectly fitted to flashlight handle.

Without doubt, this SEE-WELL Tool Kit is one of the slickest, quickest service tools ever built!

*See your Sylvania Distributor Today!* He has this remarkable tool kit for you now — you need only 15 Sylvania Premium Tokens. The time to get this valuable Sylvania See-Well Tool Kit is NOW — so don't delay, order high quality Sylvania tubes TODAY.

Remember, you get 1 token with every 25 Sylvania Receiving Tubes or every Sylvania TV Picture Tube you buy.

# SYLVANIA

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In Canada: Sylvania Electric (Canada) Ltd.
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*LIGHTING • RADIO • ELECTRONICS • TELEVISION*

# EDITORIAL...

by S. R. COWAN
PUBLISHER

## COLOR TV MERCHANDISING

SOME Service Dealers feel that the slight slowdown of TVset buying in major cities has been occasioned by the publicity given to the imminence of color TV, and our own survey in this regard bears them out. However, we still believe that the sale of color TVsets in any appreciable volume is a matter for very late 1954 or early 1955 at best. We doubt that there will be over 50 thousand color TVsets produced within the next 12-month period, or up until March 1955.

Several "bright" Service Dealers have started to use a clever merchandising "angle" in order to keep black & white TVset sales volume up. They are offering present b & w model TVsets for sale now with a guarantee that the full purchase price will be allowed against the purchase of a color TVset when they first become available. Knowing that color TVsets, when initially offered, will sell in the $800 to $1,000 price range, the Service Dealers who are using this gimmick figure that on a subsequent trade-in-deal the presently-sold TVset, (in the $200-$300 price range), represents no more than a "normal" discount or allowance against the new color TVset. They can't lose, dollarwise, and they keep the present b & w buyer in a complacent frame of mind during the interim. We like the idea, but soon the public may get wise to it. Meanwhile, anyone who fails to buy a b & w TVset now just because he would rather wait for color is only cheating himself of good entertainment, worth far more than he pays for.

Just before closing out this discussion about color TV, let us reiterate what has been said in these columns before concerning technical text material on color TVsets. At this moment the very biggest TVset manufacturers, RCA, Sylvania, G. E., Philco, Emerson, Raytheon, Zenith and others are working night and day trying to compile worthwhile data that would help TV servicemen learn all the why's and wherefore's about servicing color TVsets— and not one of these firms has as yet released such service data to their own service departments because the material they have on hand is still not complete or practicable. We will NOT kid you in our editorial columns about such a vital subject nor will we attempt to "window-dress" articles to delude you that we are covering color TV service problems now. The time is not ripe, and that is that! It's better that we give you no information about the technical aspects of color TV rather than give you false information, or data that is not worthwhile.

## THE CUSTOMERS WRITE

OUR circulation department has been on the verge of going "batty" these past few weeks. Thousands of owners of legitimate service shops have sent in their Free Subscription Order Forms, clipped from this magazine, and properly filled in—but they failed to enclose one of the three types of supporting proof that we asked for, such as: 1)—the page from the Tel. Co. Classified Directory showing their service firm's listing under either "Radio Service" or "Television Service"; or 2)—a letterhead or business card; or 3)—an old invoice showing that the firm does business with a Parts Jobber. Fellows, please take care of this little detail hereafter to save us a lot of unnecessary correspondence and to expedite correcting your stencil if it is wrong.

Also, despite the fact that we state clearly that "Under our new policy any legitimate service shop owner whose name is not already on our list who sends us the proper proof of his status (as outlined in the above paragraph) need not pay for his subscription"—hundreds of such shop owners have sent us money along with notes saying that they like *Service Dealer* so much they insist that we accept their dollar and consider them as paid subscribers rather than as free qualifiers. No finer compliment could be paid us and we are very appreciative.

## OPINIONS—PRO AND CON

WE have asked service shop owners in all parts of the country the simple question, "How's Business?" In new TV areas they report, "Wonderful!" In major cities like New York, Chicago, Los Angeles, etc., where TV has become somewhat commonplace, they report with less enthusiasm the concensus: "It could be much worse."

In major cities most old, small-screen TVset owners who have purchased new big-screen models during the past two years have kept their old sets as the 2nd or 3rd set in the home. And these old sets, despite the fact that they get less use than heretofore, because of aging, are providing a comfortable volume of service business.

In this connection, statistics about the number of homes having TVsets in them are a factor worth considering. Although over 27 million TV sets have been sold to date, only 15 million homes have TV sets in them. Some homes have two, and others have three sets. Thus the fear, that TV might soon reach a saturation point causing new set sales to drop off sharply, is unjustified. Remember that upwards of 35 million homes still did NOT have a TVset as of January 1st, 1954.


It was way back in 1945 that Raytheon, the first tube manufacturer to recognize the Service Dealers' need for help in combating public mistrust, provided that help through the *Raytheon Bonded Electronic Technician Program.*

For the past nine years this Raytheon support has helped many thousands of Service Dealers gain customer confidence and good will — substantially increase their volume and profit.

Today, with the addition of television, the Raytheon Bond is more important than ever. And today, as always, if you can qualify for it, your status as a Raytheon Bonded Electronic Technician *costs you not one cent.* It is *Raytheon's* investment in *your* future.

If you're interested in making more money, ask your Raytheon Tube Distributor to tell you about the Raytheon Bonded Program. He'll be pleased to tell you how this powerful sales stimulator can help you.


RAYTHEON®

**RAYTHEON MANUFACTURING COMPANY**

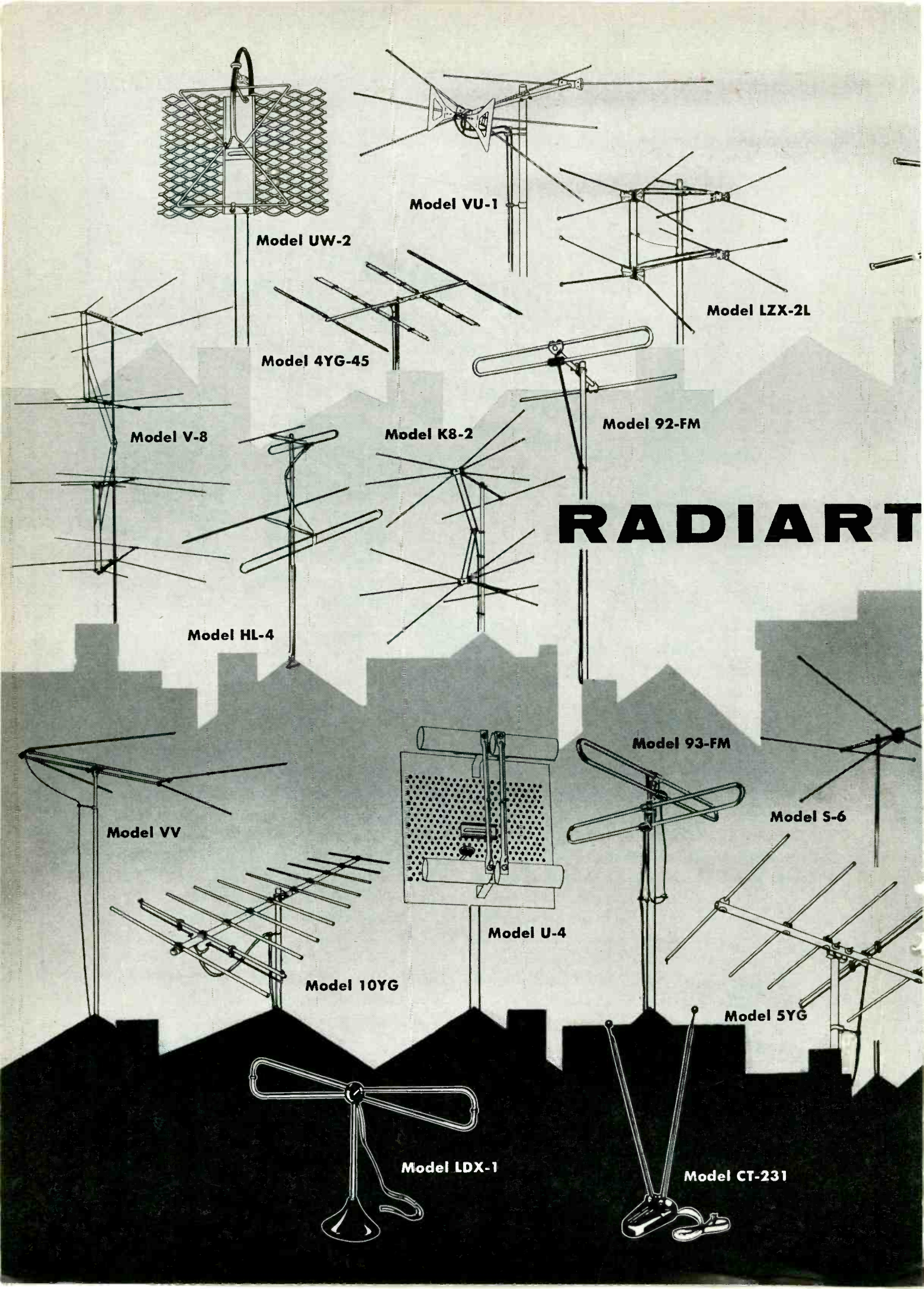
*Receiving Tube Division*

Newton, Mass., Chicago, Ill., Atlanta, Ga., Los Angeles, Cal.

*Excellence in Electronics*

RAYTHEON MAKES ALL THESE:

RELIABLE SUBMINIATURE AND MINIATURE TUBES • SEMICONDUCTOR DIODES AND TRANSISTORS • NUCLEONIC TUBES • MICROWAVE TUBES • RECEIVING AND PICTURE TUBES


Model UW-2
Model VU-1
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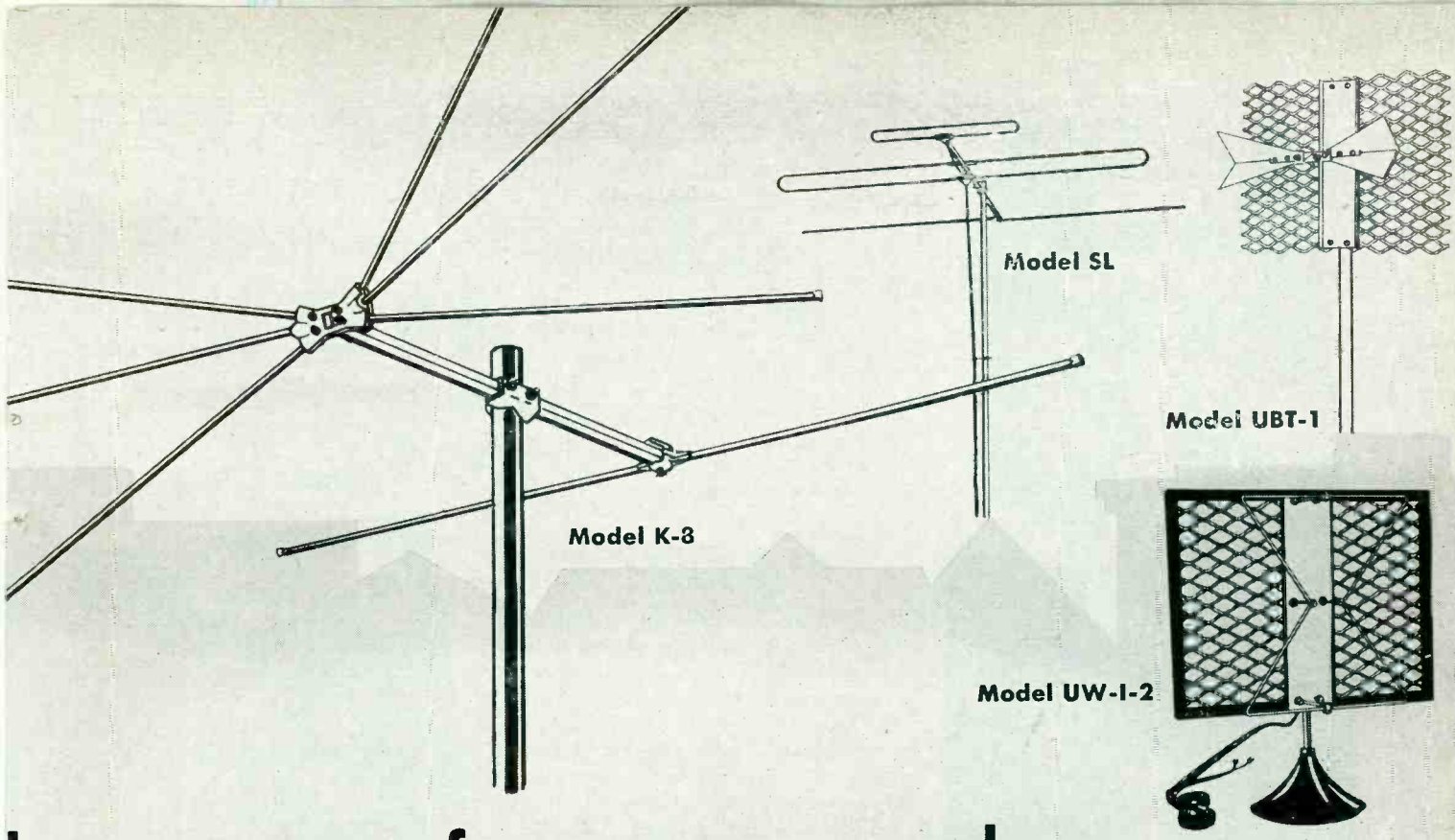





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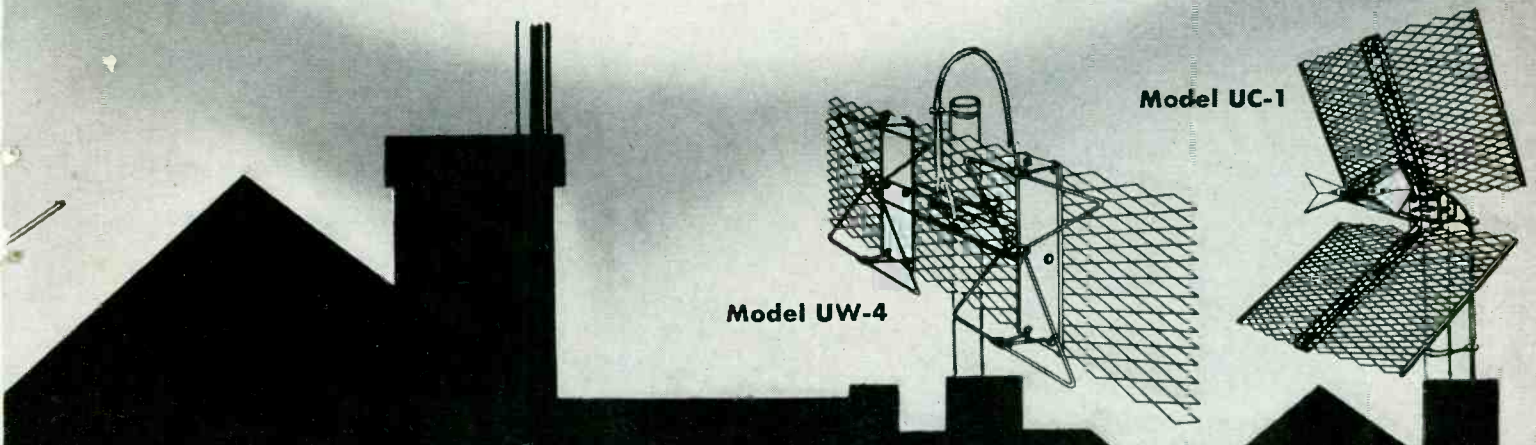


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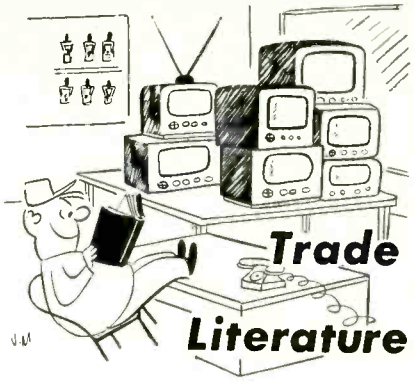


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## New Books

(J. Richard Johnson, **How To Troubleshoot a TV Receiver**, John F. Rider Publisher, Inc., N.Y., 128 pp., $1.80.)

Aimed at the servicing technician, this attractive volume presents certain basic lines of approach to repairing sets. The book re-defines standard procedures such as the use of schematics and test-patterns. In addition, the author provides some interesting new twists on common problems that plague servicing work. The book is replete with examples of real trouble-shooting problems. Amply illustrated and indexed, *How To Troubleshoot a TV Receiver* should be a welcome addition to any man's tech library.

* * *

The *Radio Designers Handbook*, fourth edition [reproduced and distributed by Radio Corporation of America; price, $7.00] is a result of the combined efforts of thirty-three author-engineers. This virtual encyclopedia contains 1,500 pages of information pertaining to circuit design and applications of most every circuit used in radio receivers.

For those who must refer occasionally to authoritative sources on circuitry, this book is a must. For the practicing technician, a world of information is available on circuit operation and adjustment. In addition, many valuable charts and reference sources are included.

The reviewer believes this book to be the most complete compilation to date on the subject of radio receiver circuitry.

* * *

Special monographs dealing with various aspects of television engineering are being published by Philips' Technical Library of Holland. Available so far is volume 1, "I.F. Stages" which deals with the application of the pentode in TV receivers, and volume 2, "Flywheel Synchronization of Saw-Tooth Generators" which analyzes the flywheel action of resonant circuits, discusses automatic phase control and practical flywheel circuits for TV receivers. The general title for the series

is *Television Receiver Design*. For further information, write the American distributor, Elsevier Press, Inc., at 402 Lovett Blvd, Houston 6, Texas, or at 155 East 82nd Street, New York 28, N. Y.

• • •

**Catalogs, Bulletins, and Guides**

J. W. Miller Company's Catalog No. 154, titled *TV Technician's Coil Replacement Guide*, is available from the manufacturer. 20 pages profusely illustrated, the catalog contains valuable data on such Miller products as pix *if* transformers, sound transformers, horizontal oscillator and sync control coils, adjustable ion trap, video peaking coils, and adjustable linearity and width controls.

• • •

A catalog describing *Plastic Capacitors* can be obtained by writing to Plastic Capacitors, Inc., 2511 W. Moffatt St., Chicago 47, Ill. The catalog describes the background of plastic capacitors and lists specifications for various types available.

• • •

Comprehensive data on characteristics, applications, tolerance, windings, terminations, dimensions, insulation, charts and graphs, etc, is contained in *Catalog Bulletin B-8*. For your copy, write International Resistance Company, 401 North Broad Street, Philadelphia 8, Pennsylvania, for Catalog Bulletin B-8.

• • •

Just off the press is new *Bud Catalog of Sheet Metal Products and Electronic Components*. This 52 page catalog illustrates and describes the complete Bud line. Copies may be obtained by writing to Bud Radio, Inc., Dept. *C9*, 2118 East 55th Street, Cleveland 3, Ohio.

• • •

LaPointe Electronics Inc., Rockville, Connecticut, has released to its national distributors a completely new and revised twenty-page catalog. All pages are punched and bound into a handsome cover featuring the new VEE-D-X mobile point-of-sale display piece. Catalog sheets follow N.E.D.A. recommendations for specification data and include gain charts as well as shipping weights and other detailed information on antennas and accessories.

• • •

Ten new bulletins issued by the General Electric Commercial Equipment Department in Syracuse, N. Y., describe latest improvements in many of the company's radio communication equipments for industrial and civil defense applications, taxicabs, utilities, police and fire departments.

The new bulletins cover six base station combinations and four mobile combinations.

The new bulletins are available from the Inquiry Section, G-E Electronics Division, Electronics Park, Syracuse, N. Y.

• • •

Snyder Manufacturing Company of Philadelphia has issued its new *1954 Catalog* containing the company line of television antennas and accessories. Completely revised in content and appearance, the catalog is brightly printed in three colors and has been edited for simplicity and easy reference. Contained within a separate cover, the pages of the new Snyder catalog describe and illustrate the company's line of television antennas including the outdoor and indoor Directronics, the Head-Line and Redi-Mount conicals, UHF antennas, Yagis, folded and line-up antennas and the indoor antenna series. Also included is a catalog page on Snyder television antenna masts, accessories and 2-set coupler, plus a page on Snyder sales aids.

A new feature of the Snyder catalog this year is an attractive cover for executives' desks. Copies of the catalog may be obtained by writing to sales-manager Dick Morris at Snyder Manufacturing Company. Philadelphia 40, Pa.

# Guest Editorial


EDWARD F. MORGAN
Service Manager,
CBS-Columbia, Inc.


IT has always been a television manufacturer's Service Manager's function to supply the service dealers, agencies and servicemen with schematics and service manuals. Since the start of television, elaborate manuals were available from manufacturers which contained schematics, parts lists, detailed circuit description and analysis, alignment procedures, service hints and latest circuit changes, in addition to such basic installation information as ion trap adjustments, antenna connections and information on procedures for replacing the picture tube.

When all this information was printed, it would often result in a booklet of considerable size which was expensive to publish in limited quantity and therefore had to be sold at a price. A technician who merely needed a schematic was forced to buy literature in excess of his needs. When a circuit change came along, supplementary manuals had to be printed, which only added to the confusion of the service man.

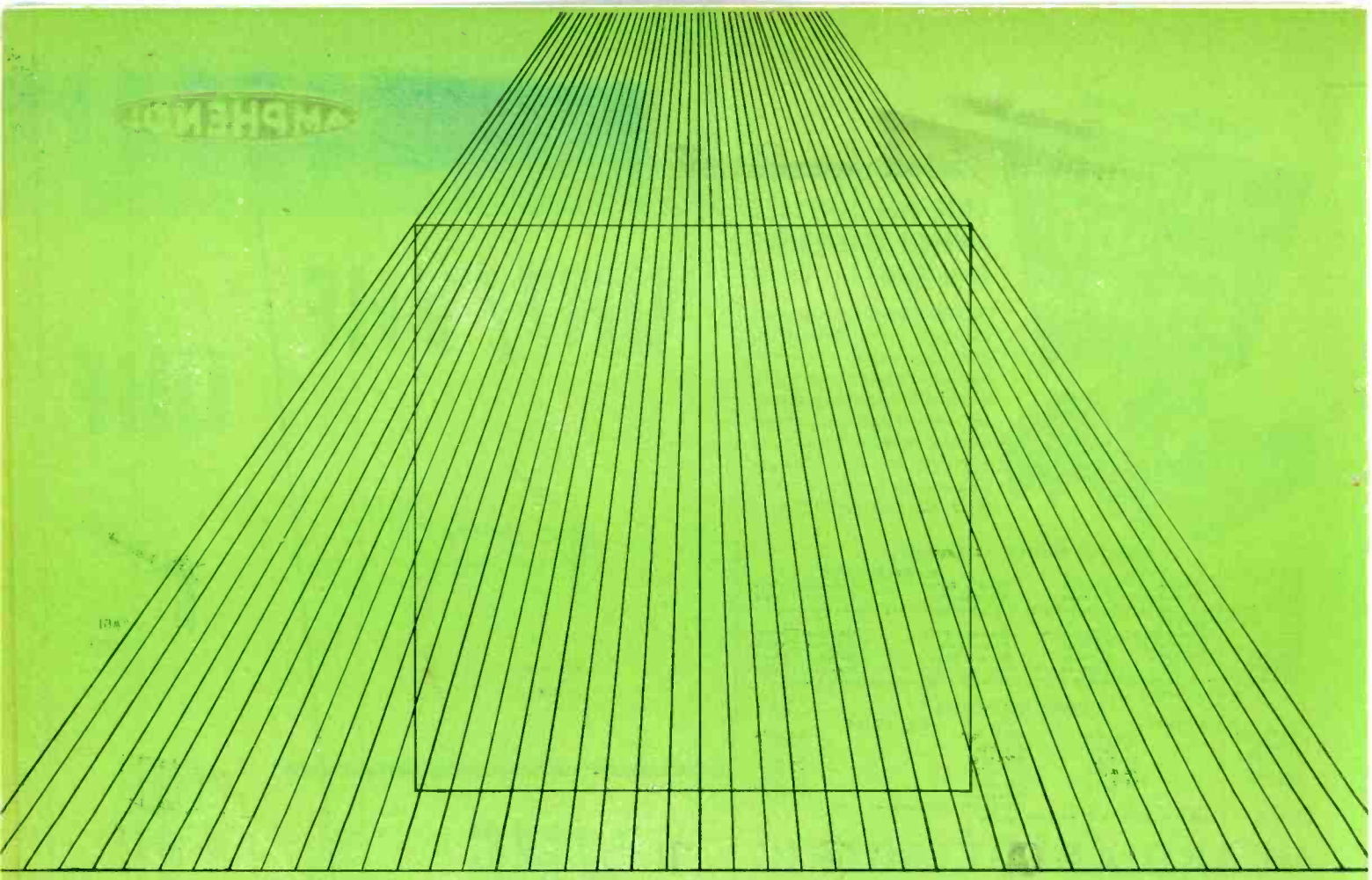
CBS-Columbia Inc., in recognizing this problem, has condensed all service manuals to a point where they contain only data peculiar to any one particular chassis. This deletes information which, in the past, comprised the bulk of a service manual and which today is considered "standard operating procedure" by the trained technician.

Our service manuals now consist of the following essential items:

1. Schematic of the chassis in question.
2. Voltage and wave form charts. (Often included as part of the schematic.)
3. Alignment procedure.
4. Parts lists, including cabinet hardware.
5. Top and bottom view of chassis.
6. Special service notes pertaining to the particular chassis.

This reduced the manual to such small proportions that the cost of printing became neglible. Now it became possible to provide this information to every set owner by inserting it with the instruction book in each television carton. As a result, it is no longer necessary for individual servicemen to write to the factory for service data, which process always resulted in service delay and customers' dissatisfaction.

When circuit changes become necessary, they are printed first in a service bulletin which is made available to the trade. When the improved version of the chassis appears as a production run, immediately a new condensed manual will accompany it on its way to the consumer. This eliminates the necessity of explaining the circuit changes (which were necessary to accomplish the improvements) in a supplementary manual.



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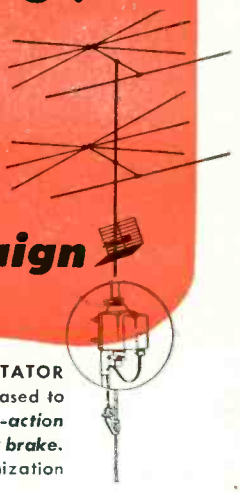


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**2** **$500,000 ad campaign sends sales your way!** Alliance keeps spring promises!

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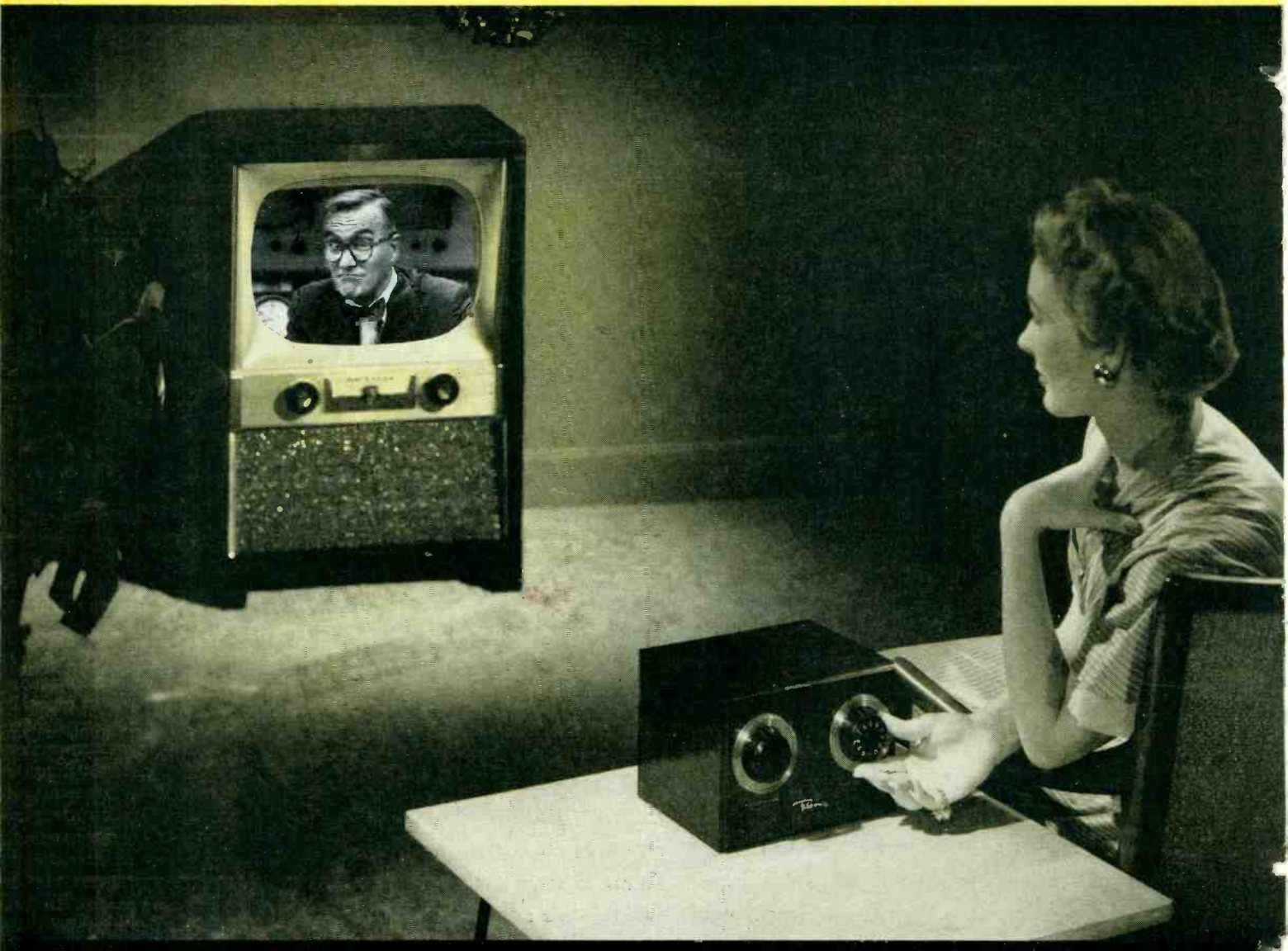

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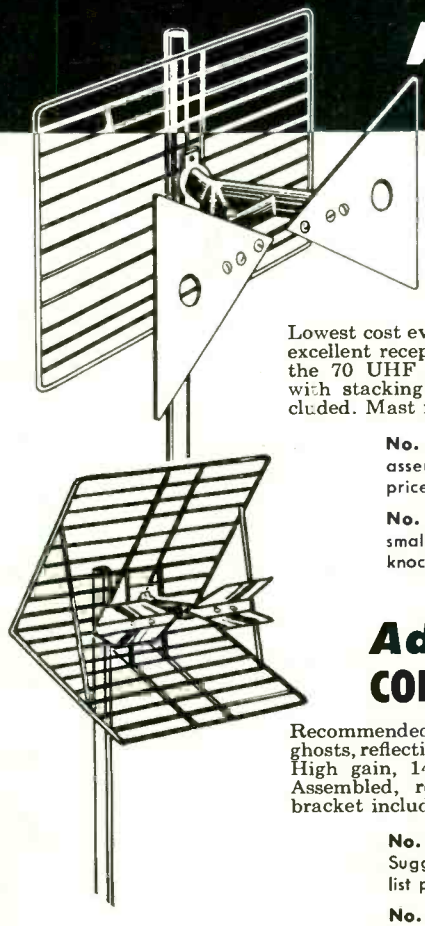

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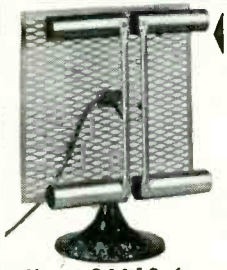

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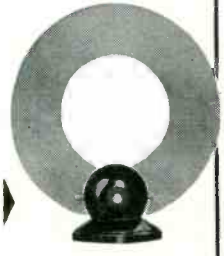

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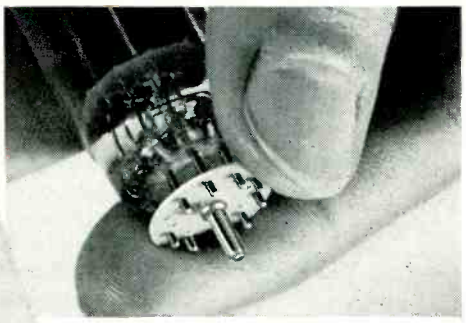

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# COLOR TV

by LEONARD LIEBERMAN

**Part 3 of this series explains more details of the color TV transmitter and begins a discussion of the receiver.**

FIGURE 1 is a partial block diagram of the transmitter section. For the purpose of refreshing our memory, let us re-list the component parts of this section. These are: a three-color-sensitive camera; a system for treating the camera outputs so that they may be added; a luminance channel for modulating the video r-f carrier; a color encoding section with a two channel output ($E_Q$ and $E_I$); a color sub-carrier oscillator; a system for modulating this frequency in both phase and amplitude by the outputs of the color encoder which are 90° apart; a color-phase sync signal generator (color burst generator) to provide a reference phase signal; a line and frame sync generator; a power output stage; and the radiating antenna.

### Camera Tube

*Figure 2* shows a camera having all the scanning tubes in one housing. The units in front of the scanner tubes are dichroic mirrors. (This mirror is one in which the back is coated so that it reflects one color while permitting all the other colors through.) The result is that the mirrors reflect only the desired color to the corresponding scanning tube.

### Matrixing and Gamma Correction

The output of each camera is an electrical waveform whose amplitude represents that portion of the scanned picture output containing the particular color to which it is sensitive. The pickup tube output is gamma, corrected matrixed, so that when the reference white *Illuminant C* is being scanned, the red tube output represents 30%, the green tube output represents 59%, and the blue tube output 11% of the value of the total signal.

Matrixing can be performed in several ways. Matrixing is the transformation of several independent signals into other signals. The resultant signals have for their components predetermined percentages of the original signals. A matrixing circuit combines the outputs of two circuits. Channel 1 has a certain amount of non-linearity. By adding a certain amount of Channel 2 to the Channel 1 output in the matrixing tube, the result is a linear signal.

### Chroma Signals

The outputs of this gamma correction and mixing circuit are three signals. These are the luminance ($E_Y$) and the two color difference ($E_R$-$E_Y$; $E_B$-$E_Y$) channels. The latter two signals plied to a low pass filter. In the $E_I$ are then matrixed again. The results of this matrixing are the $E_Q$ and $E_I$ signals previously discussed.

The two chroma signals are then applied to a low pass filter. In the $E_I$ channel, the bandpass is 0-1.5 *mc*. The $E_Q$ channel has a 0-600 *kc* band-pass. The signals are each fed to the input of a separate modulator tube. The outputs of these tubes are 90° out of phase.

### Sub-Carrier

These output signals now modulate the output of a sub-carrier 3.579545 *mc* oscillator. The matrixing and the phase relationships are such that if

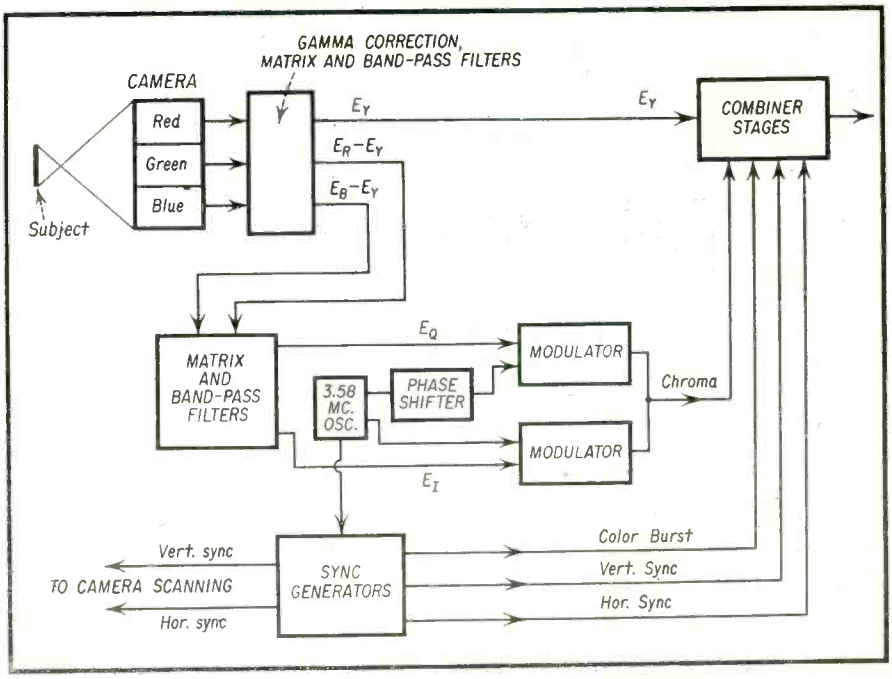



Fig. 1—Partial block diagram of color TV transmitter.

saturated blue is set in phase with the oscillator burst phase, saturated red lags the oscillator burst phase by 103.6° and, saturated green lags the oscillator burst phase by 243.5°.

### Color Burst

A portion of the unmodulated oscillator signal is taken off and, by means of suitable frequency dividers, is used to generate the line and frame sync signals. Some of this unmodulated signal is also applied to a gated circuit. The output of this circuit is a sine wave at the sub-carrier frequency and locked in phase with it. This burst is added to the "back porch" of the horizontal sync pedestal. *(Fig. 3)*

### Combing Signals

All the parts of the total signal, the luminance channel, the chroma channel and the combined sync signals are combined in a circuit similar to that shown in *Fig. 4*. Note that the combining is done by means of common plate impedances in the 6AH6 and 7AD7 tubes. The final combined signal is then used to modulate the video *rf* carrier. After this operation, the signal moves in a straightforward way to the output stage and the transmitting antenna.

### The Receiver

At the color receiver, *Fig. 5*, the signal is received at the antenna, and fed to the *rf* amplifier. Then it is heterodyned with the local oscillator, goes through several stages of i-f amplification, and is rectified at the second detector in exactly the same way as in the present monochrome set. The audio portion of the signal is treated in a manner similar to current design.

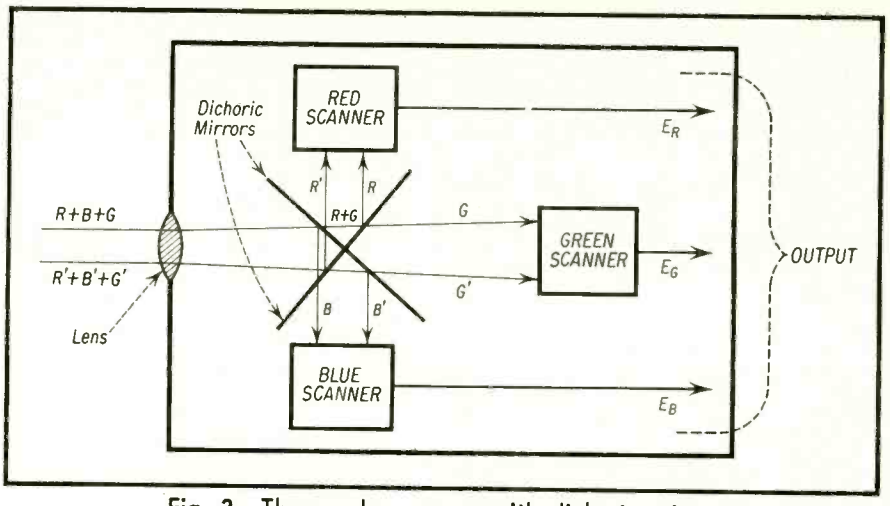



Fig. 2—Three color camera with dichroic mirrors.

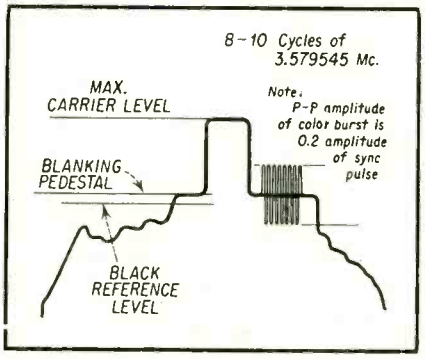



Fig. 3—Horizontal sync pulse with color burst added to "back porch."

The sweep syncs are taken off following the second detector. With some modifications, the vertical and horizontal scanning sections resemble those used now.

### Color Burst

The information for the color or chroma section is taken off after the video detector. Using the output of the second detector, the color burst is separated from the composite signal. The derivation of the color burst is similar to keyed *agc*, as can be seen from the following. To insure that only the color burst reference pulses are used, the input of the burst amplifier is opened or made operative by a pulse from the horizontal output transformer. This pulse occurs during the retrace time so that only the 8 cycles of the reference 3.58 *mc* on the blanking pedestal is present in the gated output.

By means of a phase detector and a reactance tube, *Fig. 6*, the 3.58 *mc* local oscillator in the receiver can be made to lock at the reference phase from the transmitter in a very short time. There are, at present, several different types of *APC* (Automatic Phase Control) Systems. It has been found by the NTSC Field Test Panels that, even at this early stage of the color TV art, the different APC systems hold the oscillator in phase even when the input signal to noise ratio is as high as unity.

### $E_Q$ and $E_I$ Signals

The output of the 3.58 *mc* oscillator is fed directly to one synchronous demodulator. It is also applied to the second demodulator through a 90° phase shift network. The color subcarrier modulation present in the detected video signal is fed simultaneously to the synchronous demodulators. This modulation has a low-frequency band-pass characteristic. (See RTSD, Dec. '53.) It is separated from the total video signal by means of a low pass filter.

In a synchronous demodulator, a signal containing two phases of a carrier is mixed with another signal con-

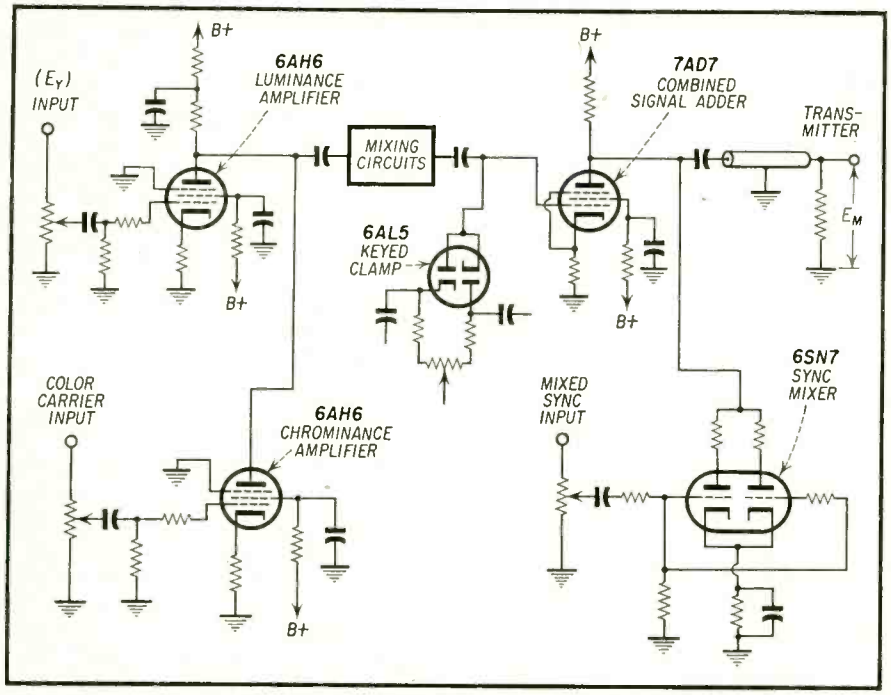



Fig. 4—Combiner circuit for color TV transmission.

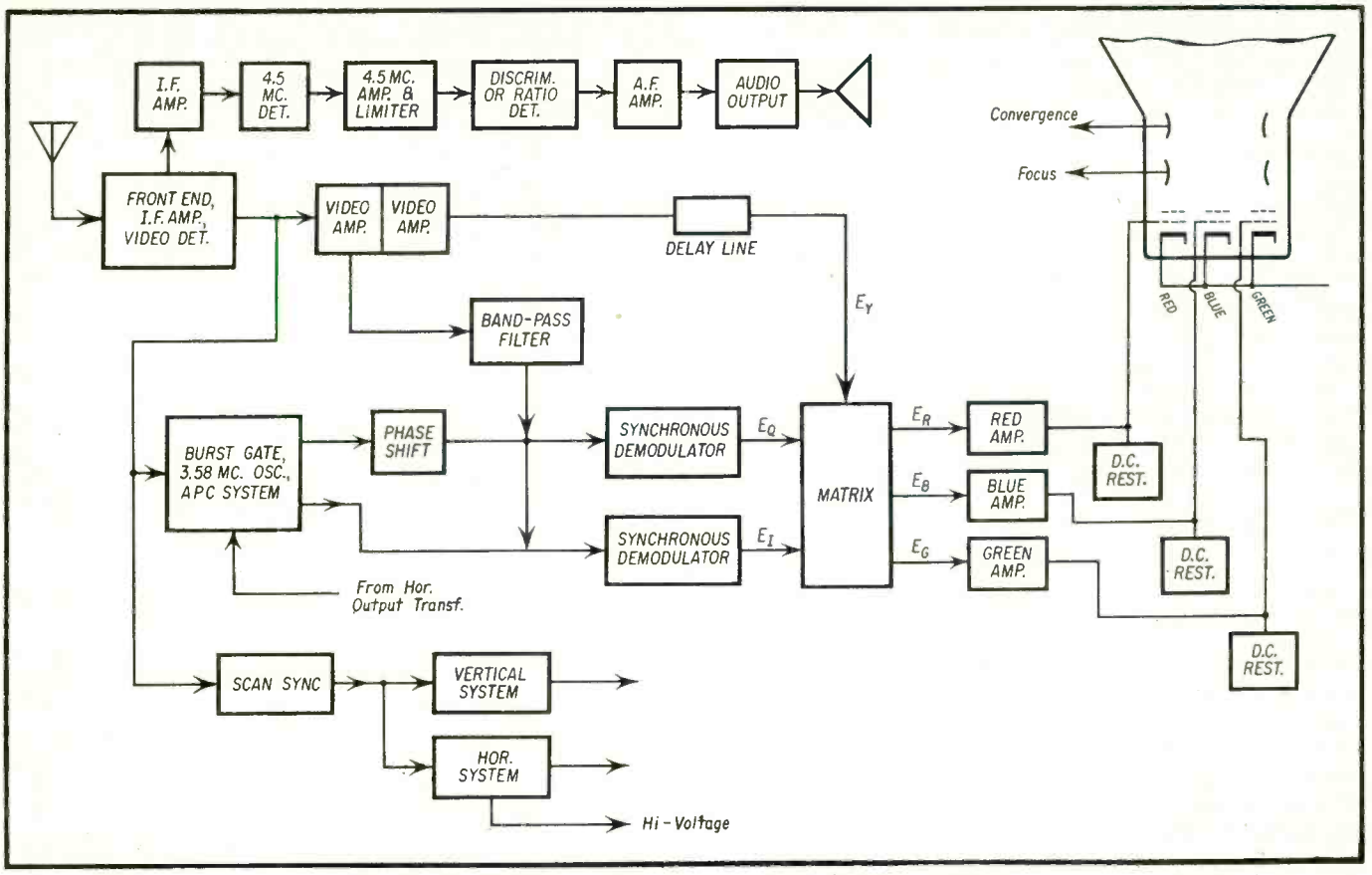



**Fig. 5—Block diagram for general color television receiver.**

taining only one phase of the same carrier. The output of the demodulator is that portion of the complex signal whose original phase was the same as the mixing signal. By applying the local 3.58 *mc* oscillator in suitable phase to each of the demodulators, the single signal from the luminance channel can be broken up into its original $E_Q$ and $E_I$ components.

### $E_R$ $E_B$ and $E_G$ Signals

The $E_Q$ and $E_I$ signals are themselves composed of different proportions of the $E_R$-$E_Y$ and $E_B$-$E_Y$ signals. The recovered $E_Q$ and $E_I$ signals are, therefore, fed to a matrixing system. The output of this matrixing system, when the $E_Y$ signal is added at the inputs of the $E_R$, $E_B$, and $E_G$ adder tubes, contains the original three colors. They are in the voltage ratio to each other which existed at the output of the scanning cameras.

### DC Restoration

The need for accurate reproduction of the brightness level which exists at the camera has been discussed in detail previously (RTSD, Nov. '53). Because this requirement is so stringent, it is very likely that the d-c restorer tube will again appear in color TV sets.

### Delay Line

Note that before the luminance signal is added to the color difference signals at the adder input, a delay line is inserted. This unit is necessary as a result of the different frequency bandpass characteristics of the luminance and chrominance channels. If the delay were not inserted, the luminance signal, as a result of its higher frequency response, would be present at the adder input before the chrominance signals.

### 4.5 Mc Trap

To keep the design non-critical as far as linearity and signal compression are concerned, most of the developmental designs use two or three video amplifiers. In addition to this feature, there is another to be found in the sound system. Here again, to prevent critical operation, while keeping the advantages of intercarrier sound, an extra circuit is included. Just before the video detector, an additional *if* stage is added. This *if* amplifier feeds an additional detector. The output of this detector is the familiar 4.5 *mc* signal, which in monochrome sets, is present at the video detector output. Because the 4.5 *mc* is detected at this stage rather than at the video detector, it is possible to use very sharp 4.5 *mc* rejection traps before, instead of after, the video amplifier. In this way sound interference can be kept out of the picture channel very effectively. The 4.5 *mc* sound signal is then limited and applied to a sound FM detector.

[*Continued on page 52*]

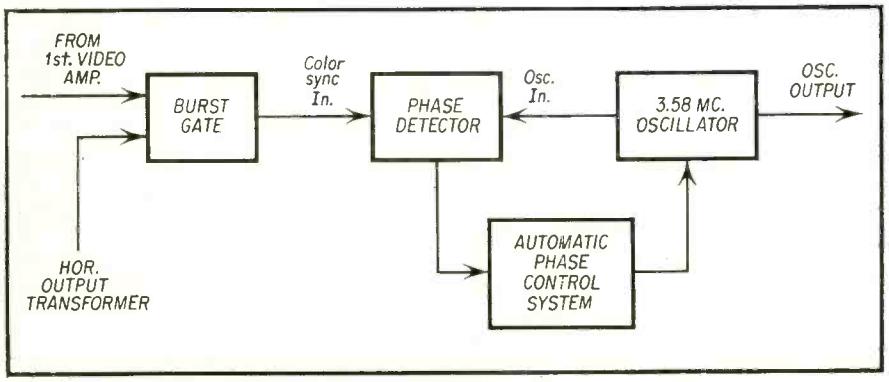
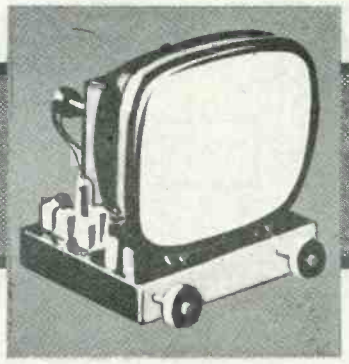



**Fig. 6—Block diagram, automatic phase control loop.**

# TV TROUBLE SHOOTING

## USING Key Test Points



by BOB DARGAN

**PART 2**

**This article discusses the key test points to be found in the *if* section and video detector. The operation and checking of germanium rectifiers is also explained.**

THE purpose of this section is to cover the key test points in the *if*, video detector, amplifier, and output stages of a TV receiver. The manner in which the background circuit should be checked will also be discussed. Many of these stages can be serviced with a signal generator and scope. These are important items *when necessary*, but a great deal of service work can be performed without them.

It is through the use of these checks, as will be emphasized, that the technician can achieve speed in servicing of receivers. Speed means more receivers serviced and thus more income. Anything that wastes the serviceman's time costs him money. More work could be performed if more speed in servicing is acquired.

### Tubes

One of the most serious causes of waste of a serviceman's time and energy is neglect of checking for defective tubes before actual mechanical servicing a receiver. The first and most important check a serviceman should make on any receiver is the condition of the vacuum tubes. It is wrong to do any other checking until it has been determined that all the tubes are good.

Are all the tube filaments lit? This is an obvious question. It is also the easiest and first step in the repair operation. The next step is to determine beyond any question that the tubes in the circuits that could possibly be responsible for the trouble are in good condition. It is useless to start checking the Key Test Points until this has been done. This is of the utmost importance. It is where many technicians fall down.

The vast majority of troubles in a television receiver are usually due to one or more tubes having developed a defect. Too many technicians immediately dig into a television chassis before making certain that the tubes are not at fault. Many technicians will smile at this because they realize they have made the same error. Probably we all have at some time or other.

Don't be caught spending several hours tearing apart circuits only to find that a tube is gassy. You will groan at your carelessness when it happens, and it happens all too often to far too many technicians.

Another point about tubes concerns the ones carried in the tube kit. Be absolutely sure that all tubes carried are good tubes. Extreme care should be exercised against letting old or defective tubes become mixed in with the new or good tubes. This happens every day with even some of the most cautious technicians and it is another cause of a great many hours of lost labor.

In fact, it is an excellent idea to have a set of tubes in the shop which have been thoroughly checked and are therefore definitely known to be good. These tubes can be kept apart from all others and used only for checking purposes, always removing the test tubes from the set after the check has been performed. These tubes can be marked in some manner which will permit easy identification and prevent them from being mixed up with the defective or customer's tubes. A simple method is to put a label or a daub of

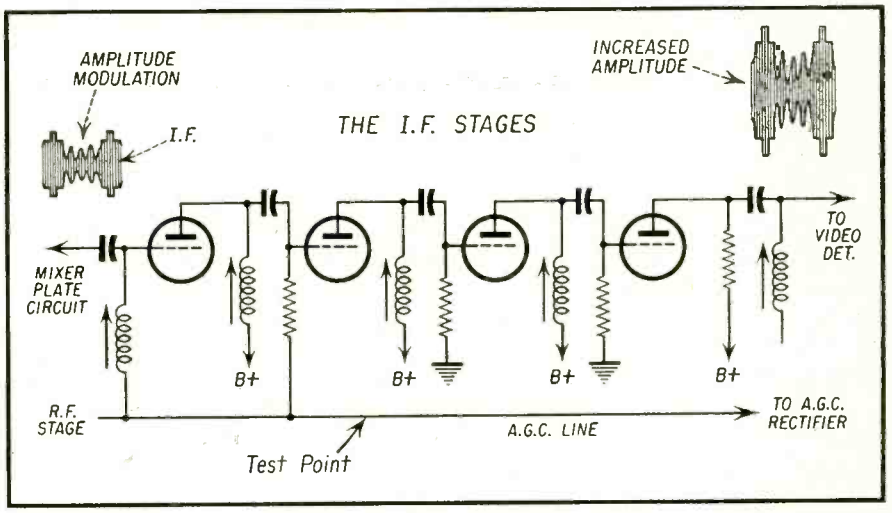



Fig. 1—In the above partial schematic the video signal is increased in peak to peak amplitude in the *if* stages.

paint on each test tube. This procedure may appear to be expensive and require a quantity of tubes to be set aside for this purpose; but consider the cost in time, which is money to the serviceman, if one defective tube is used in testing a receiver. Remember also, that *even new tubes can be defective.*

Another point about tubes: many technicians have developed the ability to determine if a tube is conducting by the amount of heat on the envelope. This means not just the amount of heat from the filament lighting the tube, but the additional heat caused by conduction in the tube and plate dissipation. If the tube is only lighted with filament voltage and is not drawing *dc,* the heat of the envelope will not be nearly as great as when current is being conducted. This can be borne out by the many technicians who have had to reinsert hot tubes.

From this point on, in this discussion, we will assume that all tubes in the circuits discussed are known to be good. The possibility of a defective tube existing in the receiver will not even be considered. The cardinal rule, which should be understood without saying for all technicians, is that all the tubes have been substituted for with known good tubes in those circuits and stages where the trouble could exist.

### The IF Section

The purpose of the *if* section is to amplify the signal to a proper level for video *if* detection. The *if* signal is the result of superheterodyning the *rf* signal to a lower or intermediate frequency because it is easier to achieve amplification at the lower frequencies. Three or four tuned stages are usually employed with the gain of several of the stages governed by a negative automatic gain control *(agc)* voltage (see *Fig. 1*). The output of the *if* strip is rectified or detected in a diode circuit so that the video modulation or picture information is removed for further amplification in the video stages.

In checking the *if* circuits, the first test is on the picture tube. If there is snow or noise in the raster, the *if* strip is probably good and the trouble is up in the tuner. This can be confirmed if a considerable amount of noise is available from the speaker when the volume control is increased to the maximum audio position. If the picture has snow in it, the trouble is more than likely in the tuner. If the picture is weak but does not contain snow, the trouble will most likely be localized to the *if* video detector or video amplifier stages.

One of the next steps in the location of the trouble in a receiver is to examine the sound available from the receiver. If the transmitted audio is heard, there is no question about the stages from the tuner through the *if* strip to the video detector. That is, provided the receiver is of the current intercarrier vintage. Therefore, the trouble in the receiver must lie between the sound take-off point and the picture tube. If the receiver is of the older type and sound is present, the circuits common to video and sound in the receiver are working and the difficulty is after the take-off point for the sound.

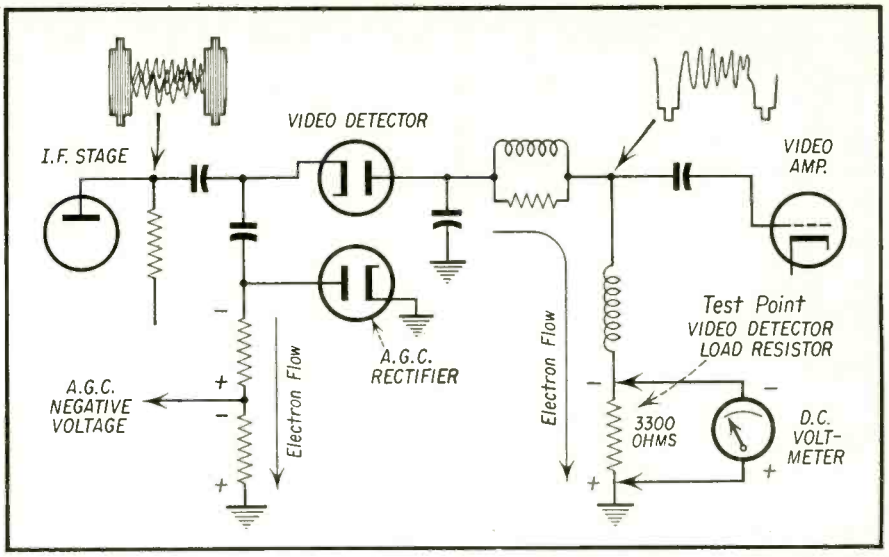



Fig. 2A—Measure the negative *dc* voltage across the 3300 ohm video detector load resistor to determine if the signal information is reaching the video detector

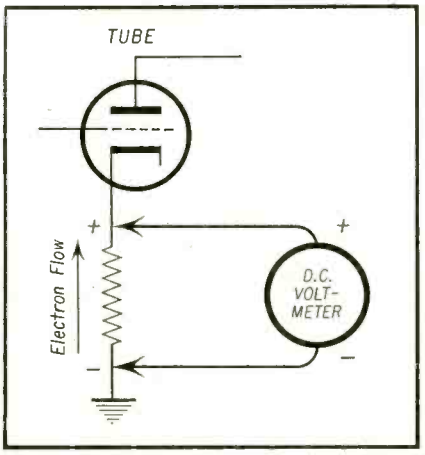



Fig. 2B—Measuring the *dc* voltage drop produced across a resistor.

In the *if* circuits, there are a number of ways to determine whether signals can pass through the *if* stages to the video detector, picture tube and speaker. If the chassis hasn't been removed from the cabinet, the tubes can be plugged in and out of their sockets starting at the video detector and working towards the front end. This should locate a stage through which the shocked signal will not pass, and therefore no effect will be visible on the raster and heard from the speaker when the tube is clicked in and out of the socket.

If the chassis is on the bench, scratching the *if* tube grid terminals with a screwdriver or sparking the plate terminals to chassis can provide an indication as to which stage in the *if* section

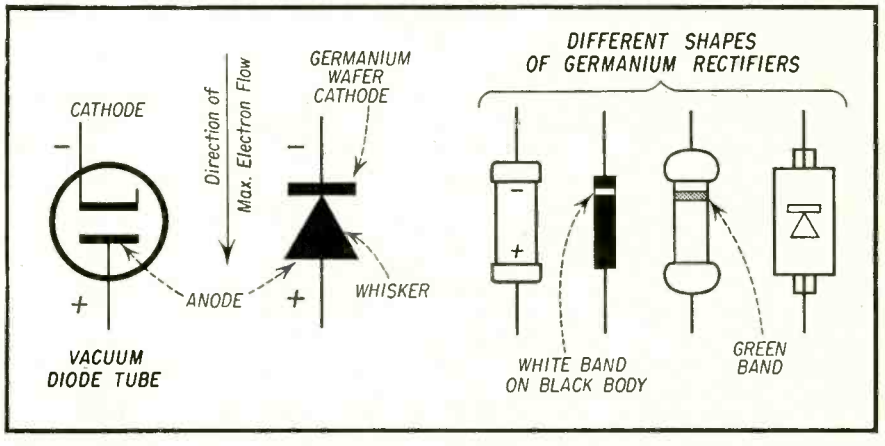



Fig. 3—The direction of maximum electron flow is shown for the vacuum tube and the germanium crystal.

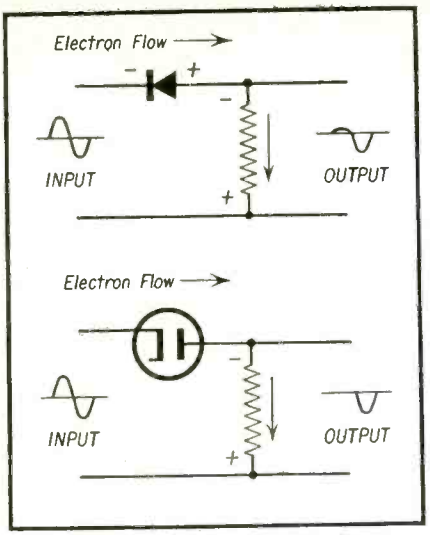



**Fig. 4—Comparing the direction of electron flow in a vacuum tube diode with a germanium crystal.**

is open as far as the signal path is concerned.

This same shocking of the *if* circuits can be just as easily accomplished by connecting the voltmeter lead to the plate and grid circuits. The contacting and opening of the meter leads in the circuit will cause flashes in the picture and static from the speaker as with the other methods. This type of circuit disturbance check is very useful in testing almost any electronic circuit. As with other discussions, a number of methods of checking signal continuity are provided and it is up to the individual technician to adopt and make his own the particular method he finds most suitable.

### The Video Detector Load Resistor

The key check point for the *if* strip is at the video detector load resistor. Every video detector stage must have a load resistor. This resistor is low in value, about 3300 ohms, and is in series with a peaking coil. If the *if* signal is reaching the video detector circuit, the composite video signal will be developed across the load resistor. This negative *dc* voltage can be measured only when the video detection is occurring to the *if* signal. It is therefore an excellent test point (see *Fig. 2A*).

The negative *dc* voltage measured across the load resistor is usually about 2 volts, and the *agc* system should control the *if* and *rf* stage gains so that the voltage will be maintained at this level under strong signal conditions. The fluctuating *dc* voltage of the detected composite signal is averaged out and the voltmeter shows a steady negative *dc* voltage.

If this voltage is not present across the video detector load resistor, it indicates that the *if* signal is not reaching the detector circuit. Therefore, this is the key test point or dividing point in the receiver as far as the received signal is concerned.

The video detector voltage must be measured across the resistor because in some receivers a variable delay *agc* system is employed which connects a positive voltage to the detector circuit. Concerning this, one of the least understood or remembered facts in electronic theory, is the direction in which electrons flow in a circuit or resistor. Electrons are negative in potential and always flow towards a more positive potential (or less negative). B plus voltage is a potential which attracts the negative electrons because of the deficiency in negative electrons in the B plus supply. Therefore electrons always flow to the B plus supply. Through resistors, the electron flow will be as shown in *Fig. 2B*. The end of the resistor towards which the electrons will flow must be positive with respect to the other end of the resistor. This is even more definitely brought out if it is considered around the circuitry of a triode tube with a resistor in the cathode circuit. It can easily be seen that the electron flow in the tube is from the cathode to the plate and the electron flow in the resistor must be in the same direction, toward the cathode, as indicated. This will be confirmed if the voltage drop across the cathode resistor is measured. Notice that the positive lead of the meter is connected to the positive potential point at the resistor and the negative lead is connected to the negative potential end. This should be applied to the video detector load resistor and it can be seen why the voltage at the resistor will be negative with respect to ground.

### Germanium Rectifiers

Within the past several years germanium crystal rectifiers have replaced the vacuum tube diode as the means of accomplishing video detection. There are many advantages in the use

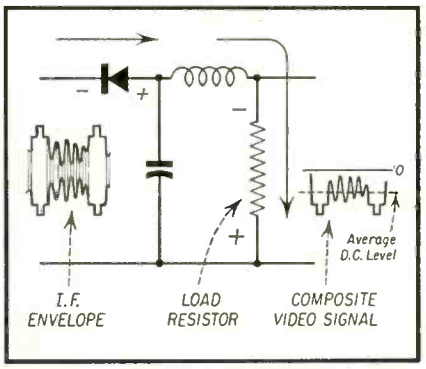



**Fig. 5—A video detector circuit showing the input *if* signal and the output composite signal.**

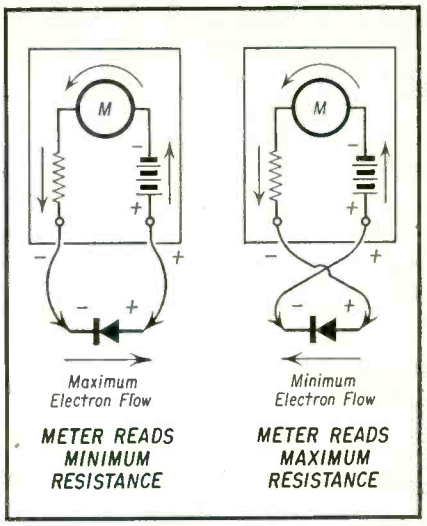



**Fig. 6—Testing germanium rectifiers using an ohmmeter.**

of a light, small crystal over the vacuum diode that required a socket and filament voltage.

Germanium crystal rectifiers have the ability to conduct more current in one direction than in the other. The direction of maximum current flow is shown in *Fig. 3*. Note that the direction of maximum current flow is opposite to that indicated by the arrow in the electrical symbol. When an alternating voltage is applied, the germanium rectifier allows electrons to flow from the germanium wafer to the whisker during one portion of the cycle and blocks the electron flow for the other portion. This action is repeated for each cycle (see *Fig. 4*). A small amount of current does flow in the inverse direction of the germanium rectifier as can be noted in *Fig. 4*. A comparison of the crystal versus the vacuum diode reveals that they are very similar in their action. Also shown in *Fig. 4* are some of the different shapes of germanium rectifiers being used in television receivers.

When the *if* signal is applied to the crystal detector, it is in the form of the *rf* envelope except that the *if* frequency is lower. *Fig. 5* shows the output of the video detector circuit which is the composite video signal containing the sync and picture information.

### Checking Germanium Rectifiers

In checking germanium crystal rectifiers with a meter, the forward to back resistance ratio is sometimes used as an indication of their condition as shown in *Fig. 6*. Of course, the crystal should be disconnected from the circuit at one end so that the circuit components will not affect the test. Measuring the resistance in the forward direction or maximum conduction di-

[*Continued on page 51*]

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# "The Answer Man"

by BOB DARGAN

**Do you have a vexing problem pertaining to the repair of some TV set? If so, send it in to the Answer Man, care of this magazine. All inquiries acknowledged and answered.**

*Dear Answer Man:*

In a Crosley Model DU-21, chassis 357-1, I do not have sufficient range of the focus control to go through a clean-cut focus of the picture. Is there anything that can be done without going through an extensive modification in the chassis? Everything seems to be normal in the receiver.

*J. B. E.*
*Philadelphia, Pa.*

*Dear J. B. E.:*

To change the amount of current flow through the focus coil, disconnect the green lead at the focus coil as shown in *Fig. 1* but do not cut the

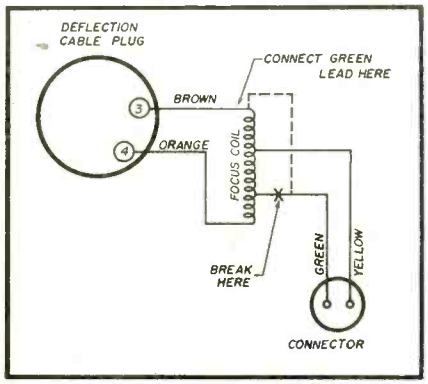



**Fig. 1—Crosley DU-21, chassis 357-1, changing current through focus coil.**

lead too short. Wrap a piece of electric tape over the exposed wire. It may be desirable to reconnect the lead at some future date. If the picture tube is replaced, the original connection might be desirable.

●

*Dear Answer Man:*

I have a customer who owns an R.C.A. TV Model No. 2-T-51. The set will operate O.K. for about ten minutes and then the picture narrows horizontally thus causing about one inch of black to show on each side.

I have tried new tubes which do not help in the least. I suspect that the selenium rectifiers may be getting weak but as the customer does not care to spend any amount of money for a fix I wonder if you could help me out.

Would reversing the leads on the width control give me any more width? Line voltage is 124 volts. Any information which you may be able to furnish me will be appreciated very much. P.S. Would changing the value of a resistor in this set give more width?

*V.G.A.*
*Walworth, N. Y.*

*Dear V.G.A.*

In reference to the width problem on the R.C.A. Model 2-T-51, your suspicion concerning the selenium rectifiers is very likely correct. If you will measure the B plus voltage when the reduction in width occurs you will undoubtedly find that the voltage had dropped lower than normal. The only correct answer to this problem is to replace the selenium rectifiers if they are at fault. Selenium rectifiers will not improve in their rectifying ability once the rectification efficiency is reduced. The width will probably become even more narrow and the height will be reduced.

If the height is unaffected, the trouble is more than likely in the horizontal output circuit. The width potentiometer is in series with the deflection yoke and the boost charging condenser that develops the boost voltage. When the resistance is introduced in this series arrangement as shown in *Fig. 2* by positioning the width control awav from the top point on the control there will be a voltage drop across this resistance which will reduce the width. The boost B plus voltage fed to the 6AU5 horizontal output tube plate will be reduced. At the same time the deflection voltage will divide between the yoke and the series resistance of the width control. This arrangement permits varying the width within a designed range. However, under the circumstances you relate, the width control is probably in the position of maximum width and therefore minimum resistance.

On the basis of this understanding of the circuit it can be seen that if the .033 $\mu f$ or .027 $\mu f$ condensers develop a leak after the receiver warms up, the above symptoms will occur. But the height would be relatively unaffected or, if anything, would increase with the decrease in high voltage.

The screen circuit of the 6AU5 tube should be examined to determine that the screen voltage is the proper value, 185 volts. Defects in the components of the screen circuit could cause this type of trouble. If the 6800 ohm resistor increases in value with heat, or

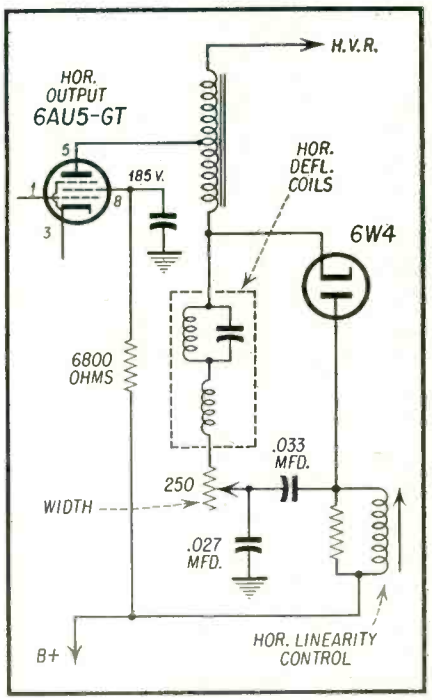



**Fig. 2—RCA 2T51, KCS45, horizontal width control circuit, showing all points to be checked for trouble.**

the screen bypass .047 $\mu f$ condenser develops a leak, a reduction in screen voltage would occur which would also reduce the output deflection voltage.

These two components should be thoroughly investigated.

If it is convenient to change a component value in the receiver, the screen dropping 6800 ohm resistor might be lowered in resistance. This would provide more screen voltage which in turn would give more output deflection voltage up to the point where secondary emission becomes excessive, thereby reducing the output deflection voltage. However, it would be unwise to make changes in the receiver to correct for a trouble that exists and will only have to be corrected in the long run.

●

*Dear Answer Man:*

I have a 19 inch Admiral, chassis 21J1, which has insufficient width. The width is only slightly narrow but I have been unable to find anything wrong with the receiver. All voltages are normal and all tubes have been checked.

*L. S.*
*Brooklyn, N. Y.*

*Dear L. S.:*

At the winding on the horizontal output transformer there is a winding for the width coil and at the junction of the winding and width coil is a take-off point for the voltage to be used in the sync discriminator, 6AL5 tube. Also, at this junction, as shown in *Fig. 3,* is a condenser which bypasses some of the deflection voltage to chassis. This condenser may be either a .002 *μf* or a .005 *μf* in capacitance. Increase the value of this capacitance by connecting in parallel with it another .002 or .005 *μf* condenser. Naturally the smallest capacitance should be used that will provide proper width as it will slightly reduce the brightness and high voltage. However, there will probably be more than enough brightness and high voltage with this change.

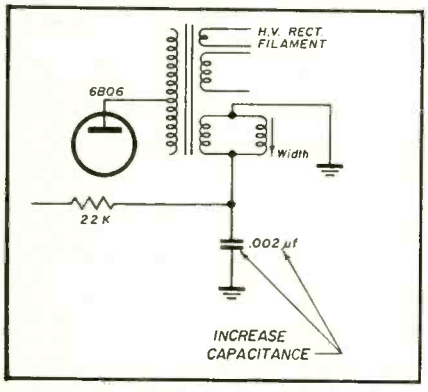



**Fig. 3—Increasing value of by-pass condenser in h.o.t. circuit will improve pix width in Admiral 21J1.**

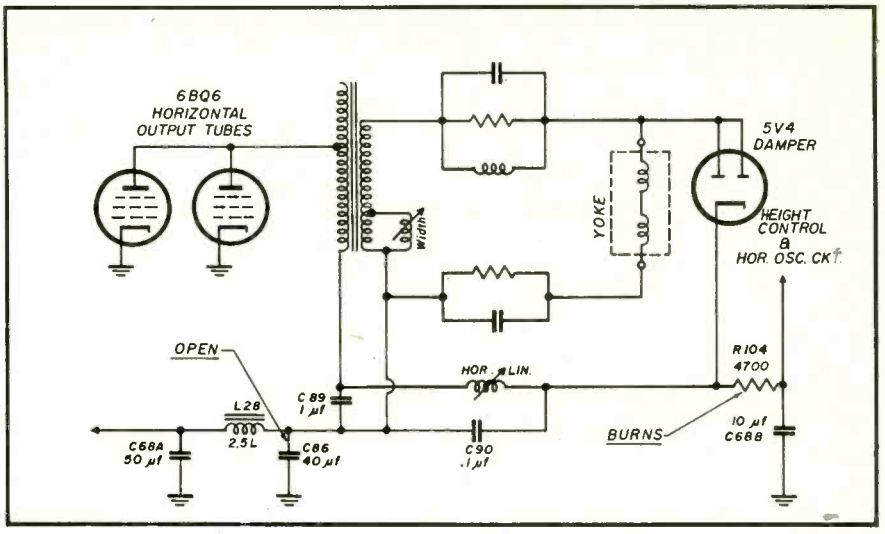



**Fig. 4—Philco 1600, horizontal circuit. If C86 opens, RF currents flow via R104 to C86B where they are by-passed to chassis.**

●

*Dear Answer Man:*

I have a Philco Model 1600 with which I am having a great deal of difficulty. I have no high *dc* voltage although I can draw a small *rf* arc at the high voltage rectifier plates. There is insufficient deflection field built up in the horizontal output transformer to light the high voltage rectifier filament. The horizontal output transformer, yoke and all tubes have been changed along with a number of condensers. I am at a loss as to what to do next.

P. S. There is one other symptom. The 4700 ohm resistor burns but there is no short in the vertical circuits and no visible cause for the overheating of this resistor.

*H. A.*
*Bronx, N. Y.*

*Dear H. A.:*

From your description of the difficulty and after examining the schematic it appears that the output filter condenser in the power supply is open. This condenser is *C86,* 40 *μf* and places the B plus line at *rf* ground potential with respect to the horizontal deflection voltages at the bottom of the transformer and linearity. The condenser actually bypasses these voltages at the bottom of the transformer and linearity condensers to chassis ground.

If *C86* opens, the *rf* current in the horizontal deflection system is blocked by the high reactance of the filter choke at the 15,750 cycle deflection frequency and follows the path of least resistance which is through the 4700 ohm resistor to the 10 *μf* condenser, *C68B,* where it is bypassed to chassis. This additional *rf* current through the 4700 ohm resistor causes it to burn.

This type of trouble has happened in a number of television receivers of different makes and always has been a difficult problem because a condenser in the power supply is the least likely component to suspect until the full situation is realized.

●

*Dear Answer Man:*

I have a Philco TV receiver in the shop for repairs that I gave up on and I was just wondering if you had the answer for it.

The chassis is a 71 RF (run 12) and deflection chassis G1 (run 10) from a Model 52-T2252. When this receiver is turned on the picture is down from the top and up from the bottom about 2 inches, and after about 5 minutes it gives a full picture.

There is no foldover.

During this 5 minutes if the station happens to show a blank raster the raster will expand to full size then shrink again when the picture comes back on.

This happens only in the first 5 minutes after which the picture is normal as long as the receiver is on.

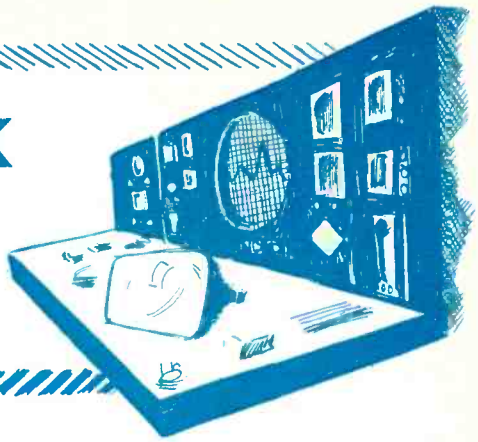
Also if at any time the receiver is turned off, regardless of how long it had been on, and left off for one minute and then turned on again, the small picture is there again.

So the trouble is only during the first 5 minutes of operation. There is plenty of adjustment on the rear controls to give a full picture when the set is first turned on, but after 5 minutes the picture will be too big. This is vertical trouble only. Changing tubes does not help as I tried several complete sets of new tubes. I changed the 21EP4A tube several months ago to a 21EP4B but the picture was normal

[*Continued on page 51*]

# THE WORK BENCH

BY PAUL GOLDBERG



**An experienced serviceman relates some of his troubleshooting experiences on typical sets in RTSD's new department.**

## Dumont RA 103D—insufficient height

WHEN turning on the receiver, a loud pop was heard, and what looked like steam poured out of something beneath the set. The plug was pulled out and the set turned over. It was observed that two horizontal centering control bypass electrolytic condensers had burst at the top and that the dielectric was pouring out.

Because this had happened to other RA103D's on several occasions, some of these condensers were already in stock. The horizontal centering control was checked to see if it was open or bad in any way. It was O.K. The two condensers were replaced and the set turned on again. As it came on, the vertical spread way out and then came back to normal. However, it did not stop here; it kept on shrinking until it was about two inches from top and bottom.

A check was made on connections to the two condensers just replaced, and over the entire area for solder drippings and bad connections, but everything was found in order. Both 6SN7's were replaced, but still the vertical kept shrinking. A check was then made on the vertical output stage. The writer knew from experience on this set that occasionally vertical shrinkage occurred when *C208A*, the 30 *uf* condenser off the vertical output transformer, was leaky. Another 30 *uf* condenser was jumped across it, but with no effect. The old one was clipped out and replaced with the new one, but again no effect.

A check was then made from grid to ground off the vertical output tube V217 for the positive voltage that would be there if *C258* were leaky. It was O.K. *R327-3.3K* was then checked for a positive voltage which would result if *C257*-.1 *μf* were leaky. (These condensers sometimes get leaky in the RA103.)

The set was then turned off, and thought was given to the possibility that the vertical output transformer might be defective; but this was very uncommon, and no replacement was made. The vertical blocking oscillator transformer is a very common source of vertical trouble in this set. When the primary opens on these transformers, it affects the vertical hold. However, in this case, the hold was O.K.

At this point a check was made on the two 10K resistors, *(R217* and *R218)* off the vertical output transformer to see if they had increased in value. They checked on the nose. The writer never had seen a resistor in the RA103 change value, unless some other component had shorted. Now, *R276*-470K, the load resistor which changes value in so many other sets, was checked and found O.K.

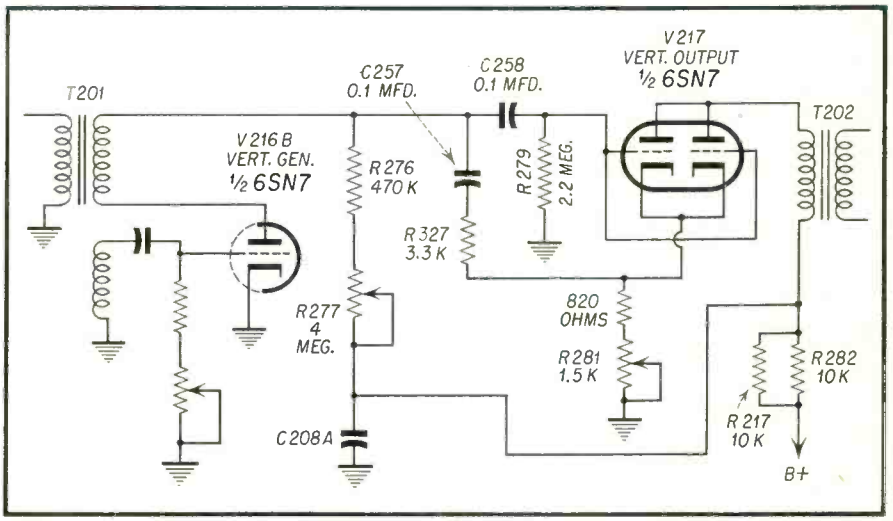



Fig. 1—Du Mont RA103D, partial schematic of vertical section. The solution to this problem was unusual (see text).

The vertical linearity and the height controls were then measured and found O.K. These controls have gone bad on occasions. The height control, usually because it remains in one position for too long, becomes intermittent in this particular spot; while the vertical linearity control usually goes bad because of a bad tube pulling too much current, or a shorted component causing the same thing.

At this point *R279*, the 2.2 meg. grid resistor off V217, was checked. The meter read 1 meg. It was thought that the cathode of V217 might still be warm, so V217 was pulled out. *R279* still read 1 meg. Recalling that *C258* was checked before and found not leaking, we were baffled by this development. *C258* was clipped out of the circuit anyway; and the reading from grid to ground again taken; it still read 1 meg. The 2.2 meg resistor was clipped out of the set entirely and measured on the bench. It *read exactly 2.2 meg—oh!*

Now the *"Piece de Resistance"*: With the 2.2 meg out of the set, the .1 *uf* clipped out of the circuit, and V217 removed, a check was made from grid to ground on the V217 socket. It measured approximately 2 meg. It was then noticed that a wire was going from the grid connection to a terminal lug to which *C258* was previously soldered. This was removed and again a resistance between ground and lug was measured and found to be 2 meg (refer to *Fig. 2*). On further examination of the terminal lug, it was found that some of the dielectric of the condensers that had burst before had dripped down between the tiepoint lug and the ground lug. It

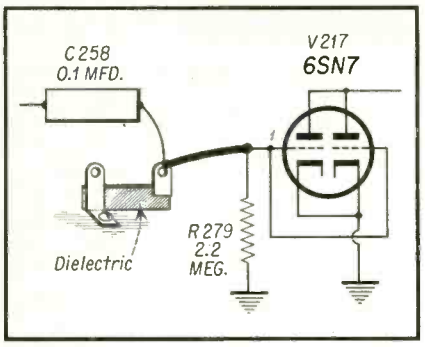



**Fig. 2—Partial schematic of V217, showing dielectric trouble point.**

was barely noticeable. This dripping was then scraped off, and sure enough, the reading between the tie point lug and ground was now infinity. *C258* was then soldered directly to pin 1 of V217 eliminating the tie lug. The set was then turned on and observed for eight hours. No shrinkage. A bill was then made out and good riddance!

**Motorola TS60—loss of two channels after replacing fine tuning shaft**

The set came into the shop with a broken fine tuning shaft. This usually happens when the fine tuning knob gets worn and the customer decides to use a screwdrive by wedging it be-

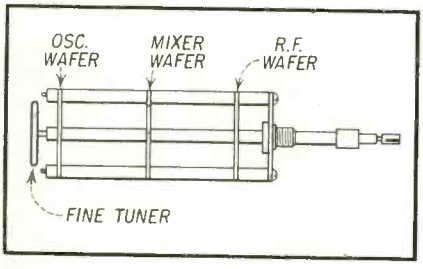



**Fig. 3—Motorola TS60, station selector switch assembly TT-14, side view.**

tween the split shaft of the fine tuner. In this repair you don't replace the fine tuner by itself. You replace the entire station selector switch assembly. You will notice in *Fig. 3* that the station selector switch is mounted separately from the tuner tubes. By removing five or six components, wires, and the nut and lock washer, the station selector switch assembly comes out fairly easy.

An assembly was picked up from Motorola, and the repair was started. These tuners are not prealigned and sometimes there is difficulty. The new station selector switch was installed easily enough, and the set turned on. All stations came in except channels 11 and 13. All connections were gone over again and found to be okay. Spreading *L7* and adjusting *C-12*, the oscillator trimmer, seemed to be of no avail.

Now, this particular station selector switch was the revised type "TT-14." Therefore, there was an extra coil which affected the high frequency channels; looking at *Fig. 4* you see it is L-4M. But spreading this coil didn't help either. It was then decided to resolder all the conections on the oscillator tube 12AT7, V-2B. After doing this the sound on Channel #11 barely came in, but no Channel 13.

Next the various oscillator condensers were moved slightly into different

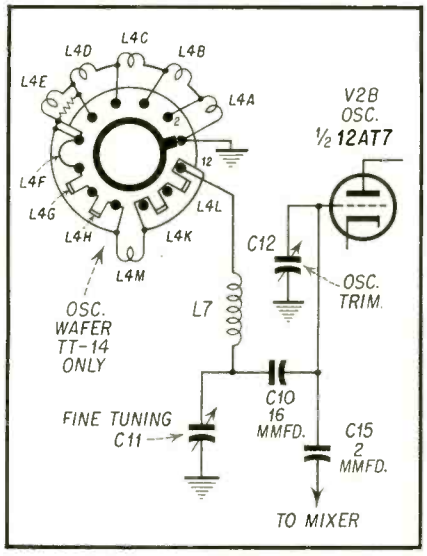



**Fig. 4—Motorola TS60, schematic of oscillator wafer of selector switch.**

positions. Moving *C16*-10 $\mu\mu f$ brought in Channel 11. *C16* was then removed and its leads made as short as possible. It was then reconnected and run as close to the chassis as possible. The set was turned on and Channel 13 and 11 came in perfectly. *C16*, being the grid leak condenser for the oscillator, naturally has a tremendous effect at these frequencies. Therefore, in the future, the writer will certainly make sure that all tuner component leads are made as short as possible. Of course the best procedure is to duplicate exactly the original lead dress.

**RCA KCS47A—Intermittent H.V.**

When the set was first turned on it played fine; so it was put on the cooking bench. Three-quarters of an hour later, the 6W4 began to glow red, and a sizzling noise followed by a click was heard. The H.V. fuse blew and the high voltage was gone.

The 6W4 was changed and a reading taken from ground to plate and cathode on the 6W4 socket, but no short was found. What seemed to baffle the writer was the sizzling noise heard before the H.V. went out. It seemed to come from the power transformer.

The ¼ amp H.V. fuse was jumped, and the set turned on again. After 15 minutes, again the power transformer began to sizzle, the 6W4 glowed red, and the H.V. went out as before. However, by drawing a spark off the plate cap of the 1B3 with a screwdriver, the H.V. came on again.

It was then decided to check the 6W4 filament section of the power transformer as this was the only section of the power transformer directly related to the H.V. The filament leads going to the 6W4 were clipped and measured with respect to ground. They measured 1.5 meg.

Many RCA KCS 47's have this trouble in which the H.V. insulation around the 6W4 filament winding breaks down. RCA provides another power transformer for replacement with proper insulation. However, it is not necessary to replace the power transformer in this particular case.

[*Continued on page 51*]

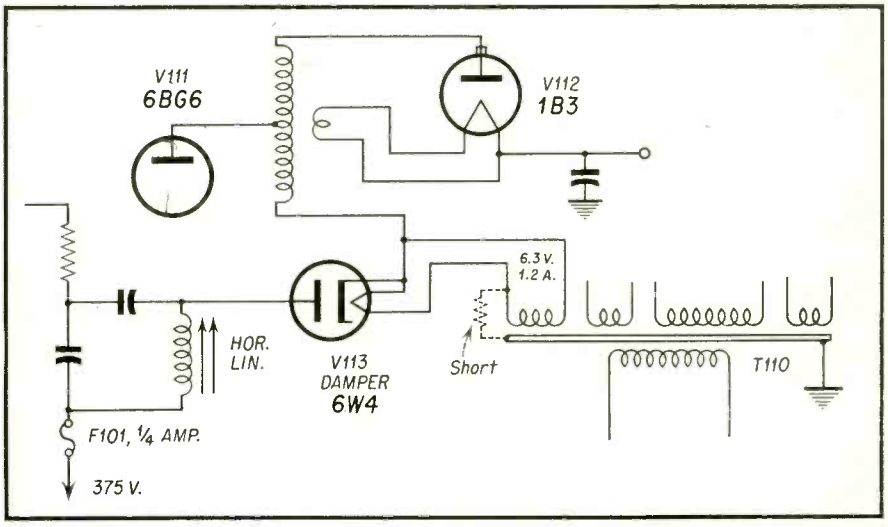



**Fig. 5—RCA KCS47A, partial schematic of h. v. circuit**

**Mfr.** G. E. **Model No.** 830 "R"

**Card No.** GE830-1

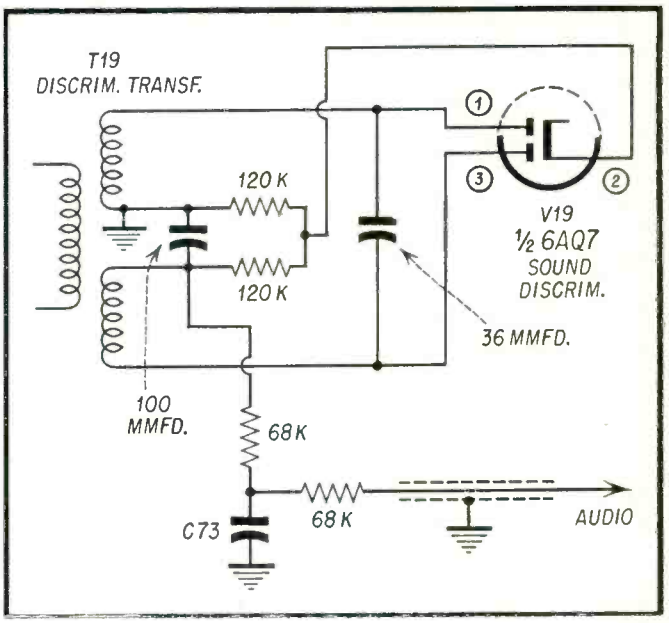
**Section Affected:** Sound

**Symptom:** No sound.

**Cause:** Component failure.

**What To Do:**

Replace: *C73* (150 $\mu\mu f$)—shorted.




**Mfr.** G. E. **Model No.** 830 "R"

**Card No.** GE830-2

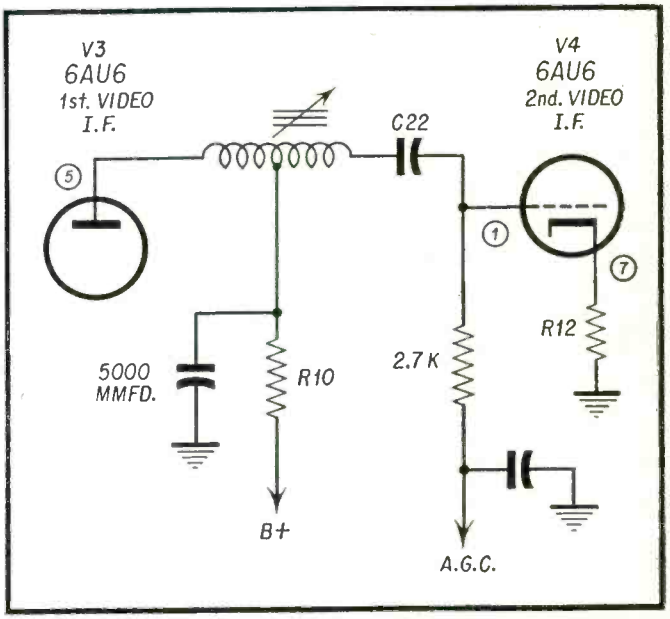
**Section Affected:** Pix

**Symptom:** AGC overload.

**Cause:** Component failure.

**What To Do:**

Replace: *C22* (100 $\mu\mu f$)—shorted.
*Also, R10* (1K) and *R12* (47 ohms)—burned.




**Mfr.** G. E. **Model No.** 830 "R"

**Card No.** GE830-3

**Section Affected:** Pix

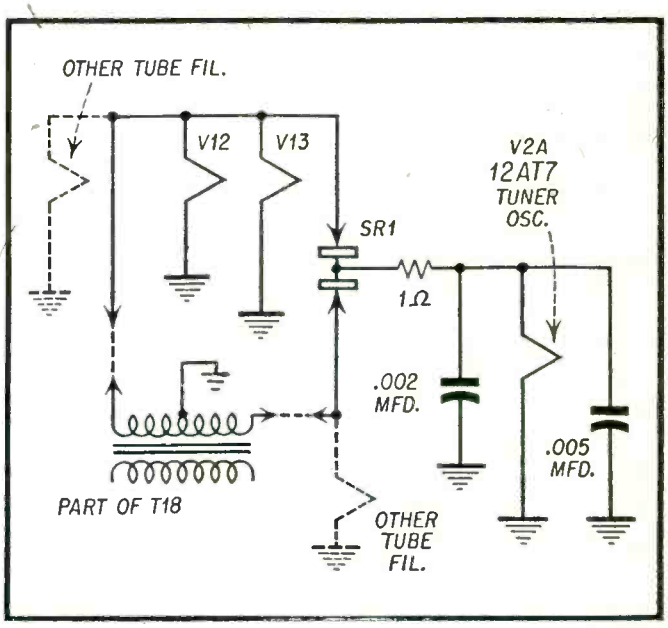
**Symptom:** Can't get Channels 11 and 13.

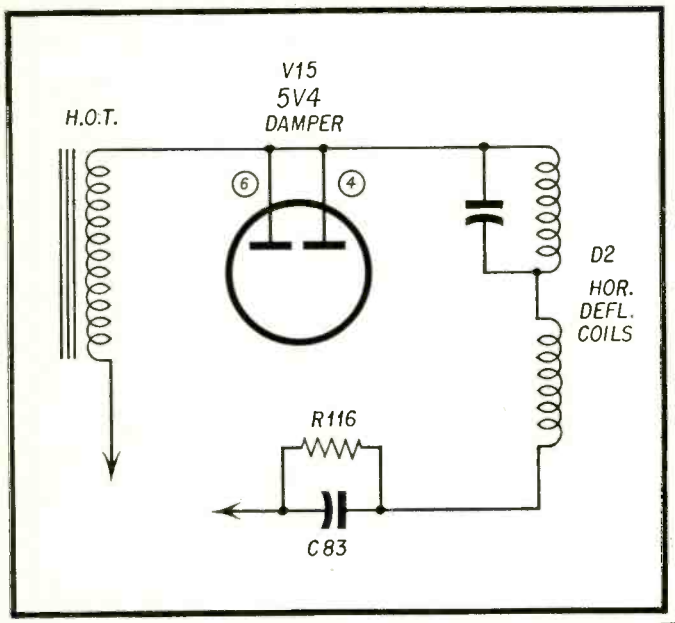
**Cause:** Component failure.

**What To Do:**

Tighten: *SR1* selenium rectifier which supplies 6 volt *dc* filament—voltage drops when loose.

Check: *SR1* output—should be at least 6 volts; if not, replace.






**Mfr.** G. E. **Model No.** 830 "R"

**Card No.** GE830-4

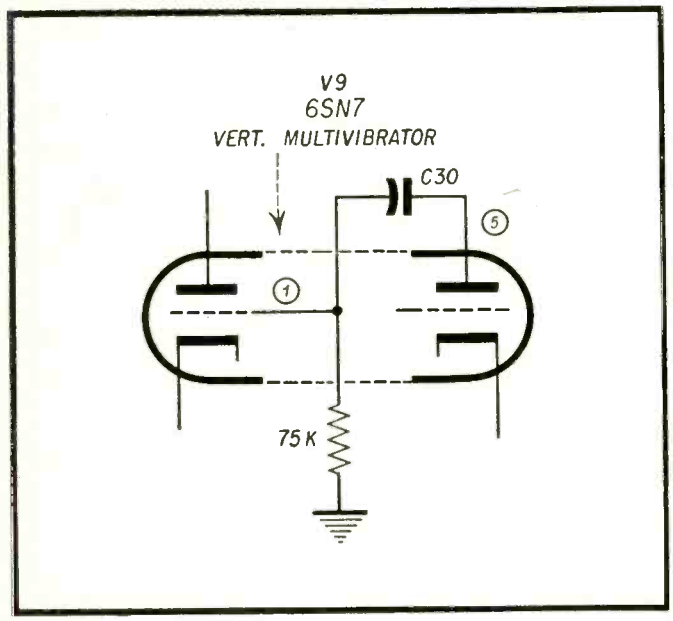
**Section Affected:** Raster

**Symptom:** White vertical line down center. *R116* burned.

**Cause:** Component failure.

**What To Do:**

Replace: *C83* (.5 *μf*)—open.
*Also, R116* (350)—burned.




**Mfr.** G. E. **Model No.** 830 "R"

**Card No.** GE830-5

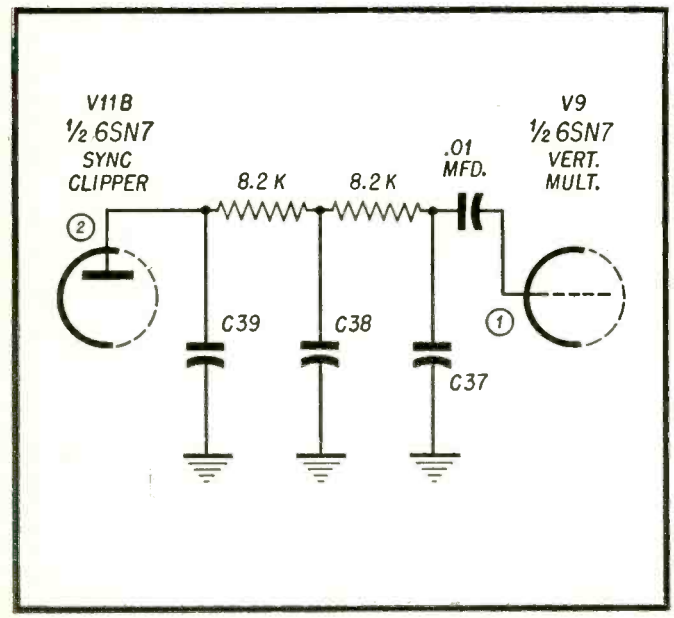
**Section Affected:** Pix

**Symptom:** Insufficient height.

**Cause:** Component failure.

**What To Do:**

Replace: *C30* (.002 *μf*)—leaky.




**Mfr.** G. E. **Model No.** 830 "R"

**Card No.** GE830-6

**Section Affected:** Pix

**Symptom:** Insufficient height.

**Cause:** Component failure.

**What To Do:**

Replace: *C39* (.05 *μf*), *C38* (.01 *μf*), and *C37* (.01 *μf*)— shorted or will short eventually.

**Mfr.** Tele-King **Model No.** 812

**Card No.** TK812-1

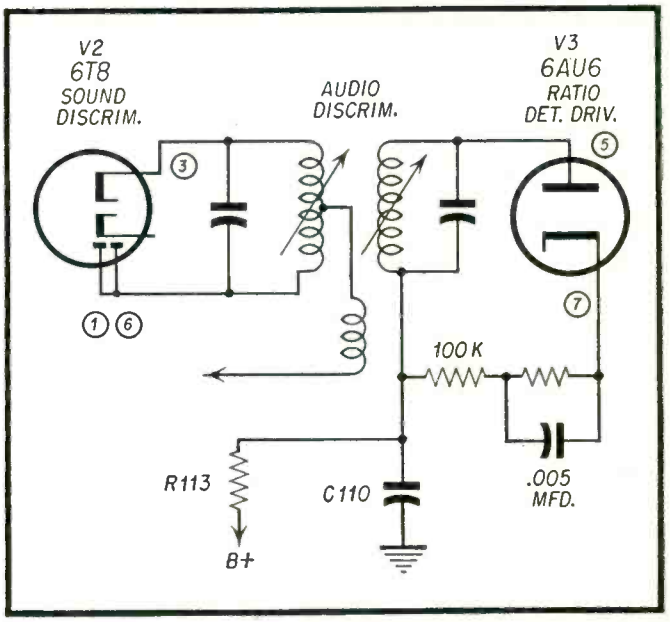
**Section Affected:** Sound

**Symptom:** No sound, *R113* burns.

**Cause:** Component failure.

**What To Do:**

Replace: *C110* (.02 *μf*)—shorted.
*Also, R113* (1K)—burned.

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**Mfr.** Tele-King **Model No.** 812

**Card No.** TK812-2

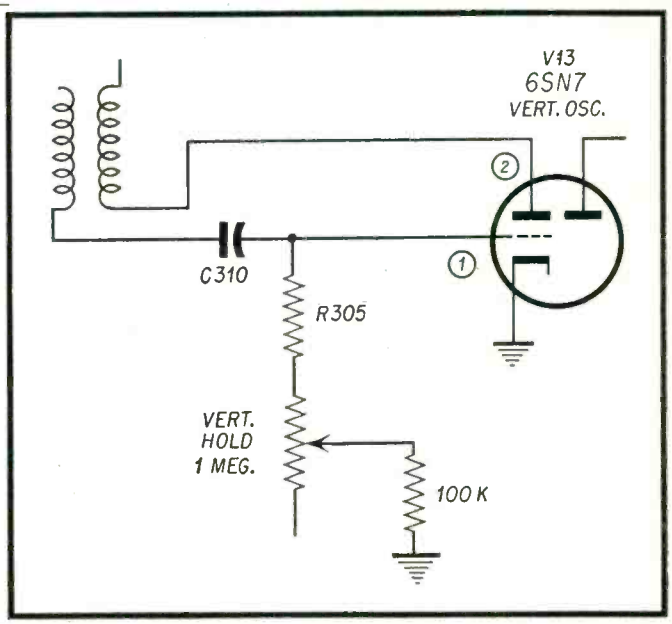
**Section Affected:** Sync

**Symptom:** Vertical hold out of range.

**Cause:** Component failure.

**What To Do:**

Replace: *C310* (.005 *μf*)—leaky.
*Also, R305* (1 Meg)—increases in value.

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**Mfr.** Tele-King **Model No.** 812

**Card No.** TK812-3

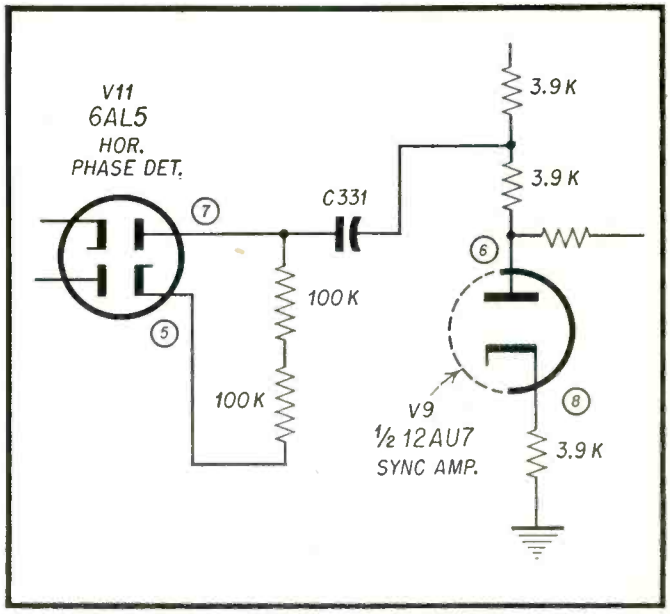
**Section Affected:** Sync

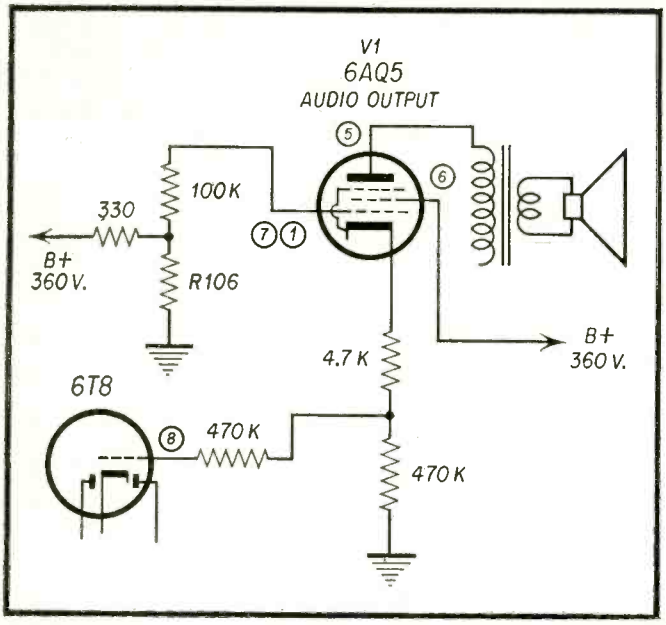
**Symptom:** Critical horizontal hold-affects vertical hold slightly.

**Cause:** Component failure.

**What To Do:**

Replace: *C331* (.001 *μf*).






**Mfr.** Tele-King **Model No.** 812

**Card No.** TK812-4

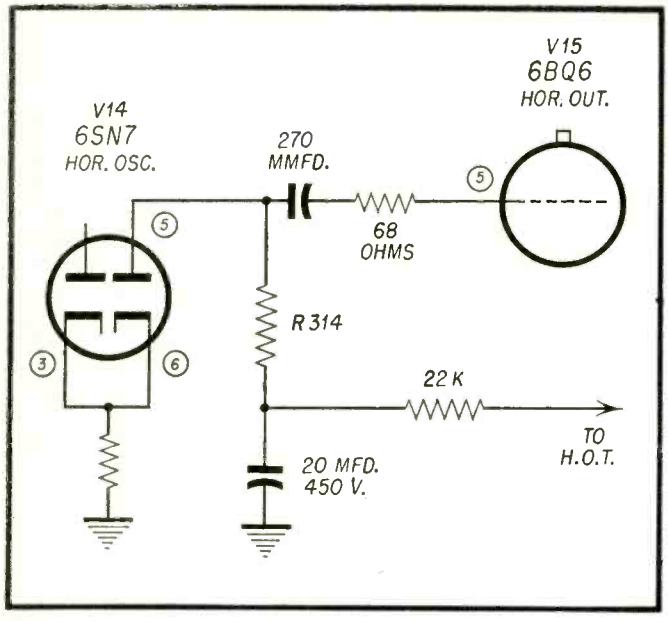
**Section Affected:** Sound

**Symptom:** Sound low and nasal.

**Cause:** Component failure.

**What To Do:**

Replace: *R106* (180K)—increases in value.




**Mfr.** Tele-King **Model No.** 812

**Card No.** TK812-5

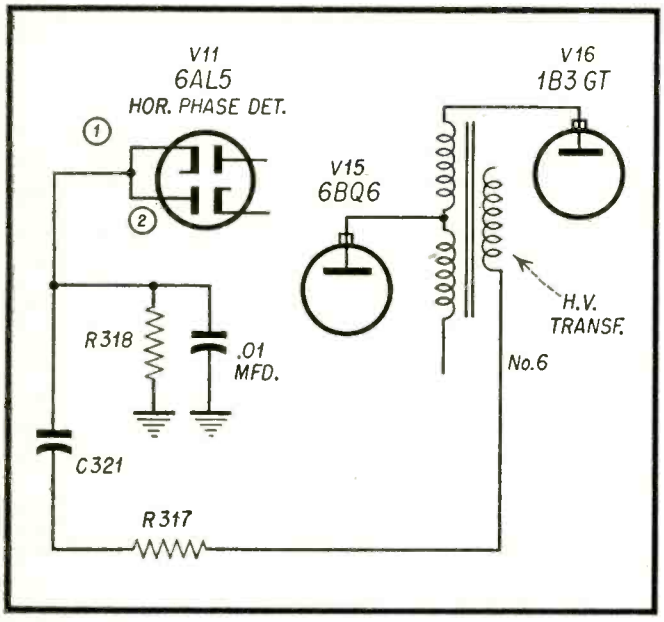
**Section Affected:** Raster

**Symptom:** Insufficient width.

**Cause:** Component failure.

**What To Do:**

Replace: *R314* (270K)— increases in value.




**Mfr.** Tele-King **Model No.** 812

**Card No.** TK812-6

**Section Affected:** Sync

**Symptom:** No raster.

**Cause:** Component failure.

**What To Do:**

Replace: *C321* (.05 μf)—shorted.
*Also, R317* (4.7K)—burned.
*Also, R318* (27K)—burned.

# CIRCUIT COURT

## Sylvania 1-518: Video Amp., Sync, Keyed AGC

The Sylvania 1-518, while generally straightforward in design, has several variations from the usual which are worth examining. In the video amplifier circuit *(Fig. 1)*, the grid of the amplifier is direct-coupled to the crystal second detector. The plate of the 12BY7 is direct-coupled to the CRT. The direct coupling all the way through eliminates the need for a *dc* restorer circuit and also eliminates the low frequency phase shift caused by the coupling condensers. The cathode of the 12BY7 is returned through a potentiometer to a 4.5 ohm resistor in the cathode of the 6BQ6 horizontal output amplifier. The result is that a minimum cathode bias is established on the 12BY7 for any setting of the contrast control.

In the sync and *agc* systems *(Fig. 2)*, there are several departures from usual circuitry. We find V15a diode-connected and used as a sync input gate, two sync separators (V14A and V14B) acting in parallel, and a keyed *agc* system in which the keyer tube also acts as an *agc* amplifier.

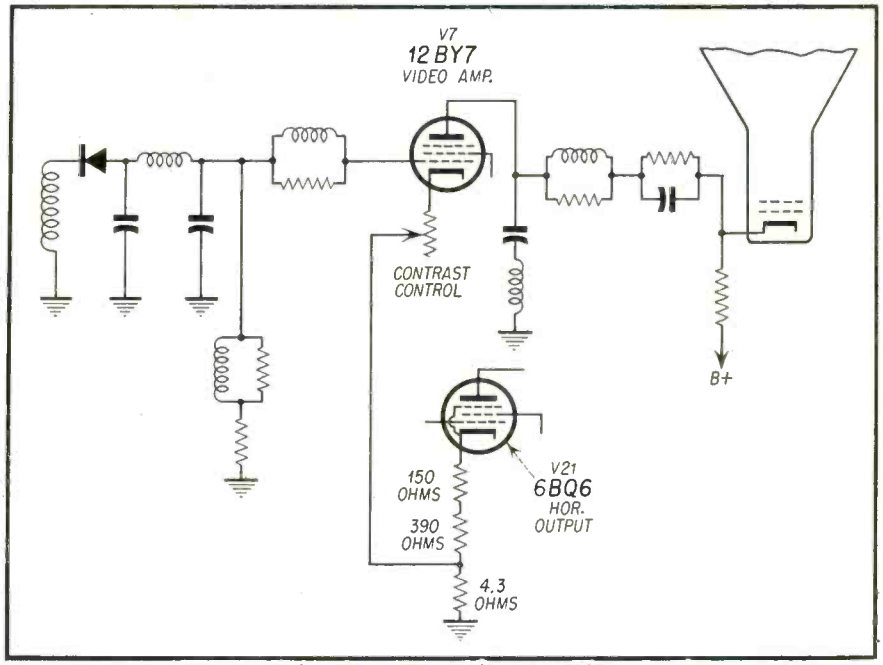



Fig. 1—Sylvania 1-518, video amplifier circuit.

### Sync Action

Discussing first the sync action: the plate voltage of V15a is set so that any noise pulses on the sync pulse cause the diode V15a to stop conducting because the cathode will become positive with respect to the plate. The result is that only the composite video signal is passed to the sync separators. This signal is then applied to the grids of V14a and V14b in parallel. In the cathode of V14a are C201 and R202. The time constant of C201 and R202 is such that C201 charges to the average value of the sync pulse. This voltage acts as a bias for V14a so that the tube only conducts on the sync portion of the signal. In addition, the voltage on the V14a resistor, *R202*, is used to bias the *agc* keyer. Since the cathode of the keyer is at +60 volts and the positive voltage on the grid is lower, the grid to cathode bias is established.

V14b acts as a grid lead detector. Its sync pulse output is added to that of V14a and the added output is impressed on the grid of V15b. V15b clips the negative going sync pulse in its grid circuit and because of its low plate voltage limits in the plate circuit, thereby removing any remaining video signal.

As far as the keyed *agc* action is concerned, V13, the 6AU6, is keyed by a pulse from a transformer in the high voltage circuit. The tap on R202 not only sets the *dc* bias on the keyer, but also the amplitude of the sync pulse fed to the keying tube. The *agc* for the *rf* grids is taken off R137. V11 (6AV6) acts as a bias clamp. The *if* grid *agc* is taken off R143.

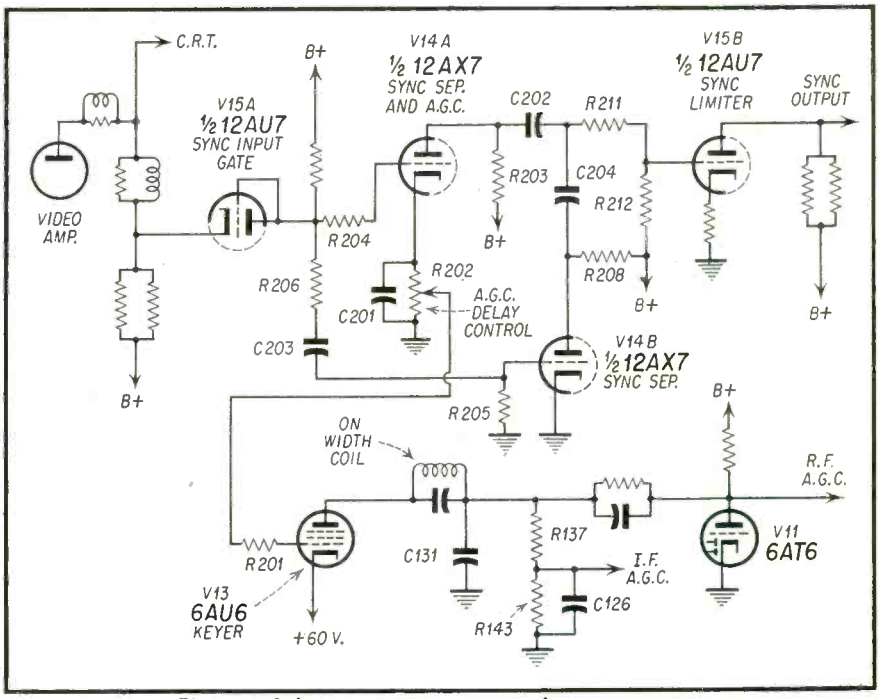
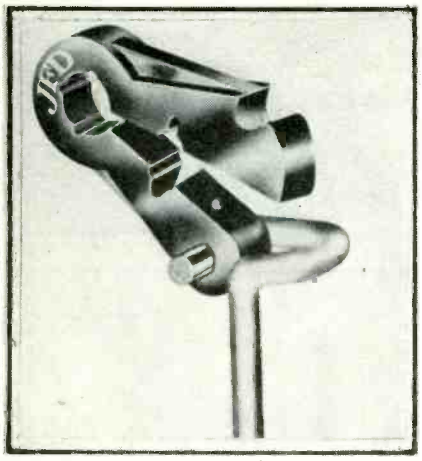



Fig. 2—Sylvania 1-518, sync and *agc* systems.



**J.F.D. Engineers Explain:**

# *Stand-off Insulators And U.H.F.*

BY DOUGLAS H. CARPENTER
AND DAVID B. TOLINS, JR.

MANY television antenna installers in *uhf* areas find a substantial signal loss, even after trying higher gain antennas designed for fringe reception. A common cause for this loss in installations where location requires an inexpensive low-gain antenna, is the stand-off insulator. The standard metal-encircled polyethylene grommet causes a serious voltage loss, due mainly to violation of the proper distance between the line and the metal grommet holder. The metal ring that secures the grommet produces a capacitive short. Close proximity of metal to a conductor of voltage causes some degree of loss at any frequency, but becomes a serious problem when it comes to *uhf* reception.

A metal-encircled stand-off insulator, or a metal-free insulator too close to the stand-off anchor frame, will create a standing wave. The stand-off in *Fig. 1* has been successfully used for years at *vhf* frequencies. However, when used in *uhf* installations a loss results which the installer cannot put his finger on. Although harmless in appearance with a well-molded grommet, it is a factor causing line unbalance and signal loss. When a transmission line is passed through the grommet, the impedance of the line fluctuates in a series of discontinuities directly proportional to the number of stand-off insulators used.

Increasing the frequency and increasing the number of points of impedance mis-match increases the standing wave ratio. Even the relative position of one stand-off insulator to another will affect the net signal loss. If the installation happens to contain two stand-offs a distance apart equal to half the wavelength of the frequency transmitted, the signal would be stifled almost entirely. If oval and flat polyethylene lines are used, half a wavelength would be 83% of half a wavelength in free air dielectric, due to the slower travel of the wave through polyethylene.

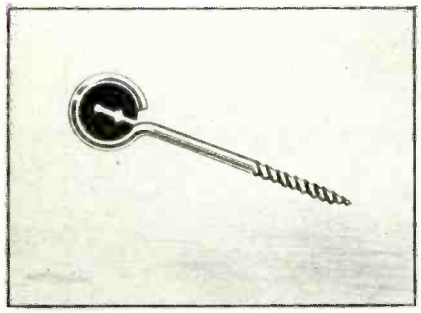


Fig. 1—VHF type insulator causes signal loss when used for UHF.

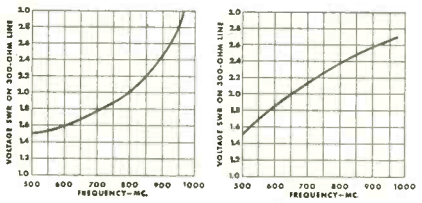



Fig. 2 Fig. 2A

Fig. 2—Standing wave ratios plotted as test results of six grommets.

Examples of increased standing wave ratio shown in *Figs. 2* and *2A* are the plotted results of tests with 6 metal-encircled grommets spaced a half-wavelength apart at several test frequencies. A marked improvement was achieved by spacing the stand-offs in an exact relationship determined by many tests. This method would take too much time, however, to be worthwhile for the installer. Since the first insulator becomes a shunt capacity, the one nearest to it may be placed slightly under a quarter wave away to nullify the capacitive effect.

To assure optimum distance between conductor and metal stand-off in a mass-produced stand-off insulator, JFD's mechanical design laboratories set out to adapt mechanical construction to electrical requirements. The metal-encircled grommet, aside from its electrical shortcomings, requires the cumbersome threading of the oval line through the stand-off to the point of connection, or the grommet must be removed to insert the line and then replaced in the metal ring.

Metal-free stand-off insulators had had been developed previously. However, in one model, the grommet had a tendency to slip out of the stand-off frame. In another, the metal nail was too close to the line.

Combining electrical efficiency with mechanical convenience, the end product derived is shown in *Fig. 3*. The stand-off utilizes a pivot-action-lock principle from which is derived the JFD "PAL" name.

The shoulder of the molded polyethylene grommet snaps under the metal stand-off frame, compressing and holding firmly flat ribbon line in the slot, or low loss oval line in the circular end. The necessity to remove the grommet entirely from the stand-off frame or to thread the line through the stand-off is eliminated entirely. The "PAL" in wide-open position is shown at the top of this page. The line is slipped into the proper place. Then, the cam type latch slips into the metal frame. Added pressure from a polyethylene button on the anchor finger of the grommet locks the grommet latch securely in the frame.

In *Fig. 3*, a dimension "D" indicates the relative distance between the conductor and any metal. For *uhf* signal transfer, this is the minimum dimension that must be maintained to insure zero signal loss. As with all basic improvements, dimensions are important. The critical dimension must be maintained, or any variation will result only in loss of signal, thus defeating the entire purpose of the design.

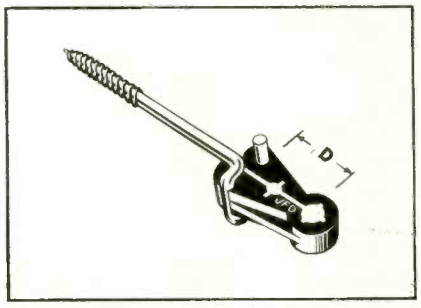



Fig. 3—New type stand-off insulator assures minimum loss in UHF.

# RCA



Chassis: KCS74 and KCS74M1
Model: 17T250DE and 17T261DE
17T250DE "Brett"
17T261DE "Ainsworth"

## TUBE COMPLEMENT

| SYMBOL | TUBE | FUNCTION |
|---|---|---|
| V1 | 6X8 | RF Osc. and Mixer |
| V2 | 6BQ7 | RF Ampl. |
| V101 | 6AU6 | 1st Sound IF Ampl. |
| V102 | 6AU6 | 2nd Sound IF Ampl. |
| V103 | 6AL5 | Ratio Detector |
| V104 | 6AV6 | 1st Audio Ampl. |
| V105 | 6AQ5 | Audio Out. |
| V106 | 6AU6 | 1st Picture IF Ampl. |
| V107 | 6CB6 | 2nd Picture IF Ampl. |
| V108 | 6CB6 | 3rd Picture IF Ampl. |
| V109 | 6CB6 | 4th Picture IF Ampl. |
| V110 | 6CL6 (6AG7) | Video Ampl. |
| V111 | 6CB6 | AGC Ampl. |
| V112 | 6SN7GT | Horiz. Sync Ampl. |
| V113 | 6SN7GT | Sync Separator |
| V114 | 6SN7GT | Vert. Sync. Ampl. and Vert. Sweep Osc. |
| V115 | 6AQ5 | Vert. Sweep Out. |
| V116 | 6AN7GT | Horiz. Sweep Osc. and Control |
| V118 | 1B3/8016 | High Voltage Rectifier |
| V119 | 6W4GT | Damper |
| V120 | 17QP4 | Kinescope |

### *Key Voltages*

All voltages are measured with respect to chassis ground.

| | | |
|---|---|---|
| B+ voltage, Plate of Damper tube V119 | pin 5 | 280VDC |
| Boosted B+ voltage, V120 (C.R.T.) | pin 10 | 560VDC |
| Plate voltage of Vert. Osc. V114 | pin 2 | 70VDC |
| Plate voltage of Vert. Out. Ampl. V115 | pin 5 | 267VDC |
| Plate voltage of Hor. Osc. V116 | pin 5 | 197VDC |
| Plate voltage of Hor. Control tube V116 | pin 2 | 228VDC |
| Grid voltage of Hor. Out. Ampl. V117 | pin 5 | —15.3VDC |

## ADJUSTMENTS

### *Ion Trap Magnet Adjustment*

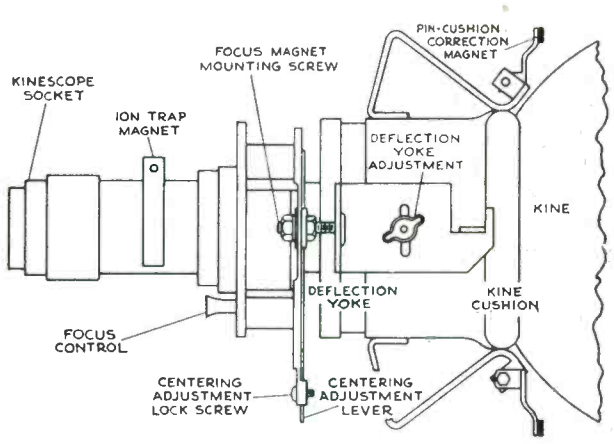
Set the ion trap magnet approximately in the position shown below. Starting from this position immediately adjust the magnet by moving it forward or backward at the same time rotating it slightly around the neck of the kinescope for the brightest raster on the screen. Reduce the brightness control setting until the raster is slightly above average brilliance. Turn the focus control until the line structure of the raster is clearly visible. Readjust the ion trap magnet for maximum raster brilliance. The final touches of this adjustment should be made with the brightness control at the maximum clockwise position with which good line focus can be maintained.

### *Deflection Yoke Adjustment*

If the lines of the raster are not horizontal or squared with the picture mask, rotate the deflection yoke until this condition is obtained. Tighten the yoke adjustment wing screw.

### *Picture Adjustments*

It will now be necessary to obtain a test pattern picture in order to make further adjustments. Connect the antenna transmission line to the receiver.




*Yoke and Focus Magnet Adjustments*

If the Horizontal Oscillator and AGC System are operating properly, it should be possible to sync the picture at this point. However, if the AGC control is misadjusted, and the receiver is overloading, it may be impossible to sync the picture.

If the receiver is overloading, turn AGC control on the rear apron counter-clockwise until the set operates normally and the picture can be synced.

### *Check Of Horizontal Oscillator Alignment*

Turn the horizontal hold control to the extreme counter-clockwise position. The picture should remain in horizontal sync. Momentarily remove the signal by switching off channel then back. Normally the picture will be out of sync. Turn the control clockwise slowly. The number of diagonal black bars will be gradually reduced and when only 2 or 3 bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional clockwise rotation of the control. Pull-in should occur before the control has been turned 120 degrees from the extreme counter-clockwise position. The picture should remain in sync for approximately 90 degrees of additional clockwise rotation of the control. At the extreme clockwise position, the picture should remain in sync and should not show a black bar in the picture.

If the receiver passes the above checks and the picture is normal and stable, the horizontal oscillator is properly aligned. Skip "Alignment of Horizontal Oscillator" and proceed with "Focus Magnet Adjustment."

[*Continued on page 44*]

## RCA TROUBLESHOOTING CHART

**NO SOUND—NO RASTER**
- Power input circuit
- Check Selenium rectifiers
- Check B+ Filter Network
- Phono-TV Switch

**NO RASTER—SOUND OK**
- Brightness control
- Check HV Fuse F101 (0.25 Amp)
- Ion trap
- V110, V116, V117, V118, V119, V120
- HV xformer Hor. yoke CRT connections

**WEAK PIX—SOUND AND RASTER OK**
- Tuner fine tuning
- Picture control
- V1, V106, V107, V108, V109, V110, V111

**POOR HOR. LIN.**
- Hor. Lin. and Drive controls
- V117, V119
- Check 0.022 and 0.027 mf caps. connected to terminal 3 of Hor. Out. Trans.
- Hor. Out. Trans.

**POOR VERT. LIN.**
- Vert. Lin. and Height controls
- V114, V115
- Check 0.033 mf cap. connected to pin 2 of V114
- Check 0.0022 mf cap. connected through 0.033 mf cap. to pin 2 of V114

**PIX JITTER SIDEWAYS**
- Hor. Hold and Locking Range controls
- Hor. Osc. Trans. Adj. (T113)
- V116, V117
- Check 0.001 mf and 68 mmf caps. connected to pin 1 of V116

**SMEARED PIX**
- Tuner fine tuning
- Picture and A.G.C. controls
- V1, V106, V107, V108, V109, V110
- Check Vid. Det. crystal CR101 (Part of T109)
- Check Vid. Det. and Amp. peaking coils
- IF and RF alignment

**POOR PIX DETAIL**
- Tuner fine tuning
- Focus control
- V106, V107, V108, V109, V110
- Check Vid. Det. crystal CR101 (Part of T109)
- IF and RF alignment

**SOUND BARS IN PIX**
- Tuner fine tuning
- Check alignment of T110
- Picture and A.G.C. controls
- Check Vid. Det. crystal CR101 (Part of T109)
- V1, V2, V106, V107, V108, V109
- IF and RF alignment

**SNOW IN PIX**
- A.G.C. control
- V2, V106, V107, V108, V109
- Antenna and transmission line

**AC IN PIX (DARK HOR. BAR)**
- V1, V2, V106, V107, V108, V109, V110, V111

**ENGRAVED EFFECT IN PIX**
- Tuner fine tuning
- Picture and A.G.C. controls
- V1, V106, V107, V108, V109, V110, V111
- Check Vid. Det. crystal CR101 (Part of T109)
- Check Vid. Det. and Amp. peaking coils

**VERT. BARS**
- Hor. Drive and Width controls
- V117, V119
- Check damping network connected to terminals 3 and 7 of Defl. yoke
- Defl. yoke ringing

**PIX JITTER UP AND DOWN**
- A.G.C. control
- Vert. Hold control
- V111, V112, V113, V114, V115
- Check 0.001 mf cap. connected to pin 1 of V114 through a 68K res.

**PIX BENDING**
- Hor. Hold and Locking Range controls
- Hor. Osc. Trans. (T113) Adj.
- A.G.C. control
- V111, V112, V116, V117
- Check 0.47 and 0.1 mf caps. connected to pin 3 of V116
- Check Vid. Det. crystal CR101 (Part of T109)

**AUDIO HUM IN SOUND**
- V101, V102, V103, V104, V105

**DISTORTED SOUND**
- Tuner fine tuning
- V1, V101, V102, V103, V104, V105
- Check 0.01 mf cap. connected to pins 1 and 7 of V105
- Ratio Det. Balance control
- Sound and Vid. IF alignment T101, T110
- Det. alignment T102

**NO SOUND—PIX OK**
- Tuner fine tuning
- V101, V102, V103, V104, V105
- Volume control
- Speaker (open voice coil or defective connection)
- Sound and Vid. IF alignment T101, T110
- Det. alignment T102

**WEAK SOUND—PIX OK**
- Tuner fine tuning
- Volume and Ratio Det. Balance controls
- V1, V101, V102, V103, V104, V105
- Sound and Vid. IF alignment T101, T110
- Det. alignment T102

**NOISY SOUND—PIX OK**
- Volume control
- V101, V102, V103, V104, V105
- Check sound system for loose connections
- Speaker
- Sound IF and Det. alignment T101, T102, T110

**SYNC. BUZZ IN SOUND**
- Tuner fine tuning
- A.G.C. and Ratio Det. Balance controls
- V101, V102, V103, V111
- Check Vid. Det. crystal CR101 (Part of T109)
- Sound IF and Det. alignment T101, T102, T110

**INTERMITTENT SOUND—PIX OK**
- V101, V102, V103, V104, V105
- Poor connections in sound system

**WEAK OR NO PIX—**
**SOUND WEAK—RASTER OK**

Tuner fine tuning
A.G.C. control
V1, V2, V106, V107, V108, V109, V110, V111
Check Vid. Det. crystal CR101 (Part of T109)
RF and IF alignment

**INTERMITTENT RASTER—**
**SOUND OK**

Brightness control
V116, V117, V118, V119, V120
HV xformer

**RASTER BLOOMING**

Hor. Drive control
V117, V118, V119, V120
Check Selenium Rectifiers
Check 680 mmf cap. connected to terminal "D" of T113

**INSUFFICIENT BRIGHTNESS**

Ion trap
Brightness and Hor. Drive controls
V117, V118, V119, V120
Check 10K ohms res. connected to pin 4 of V117
Check Selenium Rectifiers
Low line voltage

**EXCESSIVE RASTER (PIX SIZE)**

Hor. Drive and Width controls
Height control
V117, V118

**INSUFFICIENT RASTER WIDTH**

Hor. Drive and Width controls
V116, V117, V119
Check Selenium Rectifiers
Check 0.0012 and 0.00068 mf cap connected to terminal "D" of T113
Low line voltage

**INSUFFICIENT RASTER HEIGHT**

Height and Vert. Lin. controls
V114, V115
Check 0.1 and 0.033 mf caps. connected to pin 2 of V114
Low line voltage

**NO VERT. DEFL.**

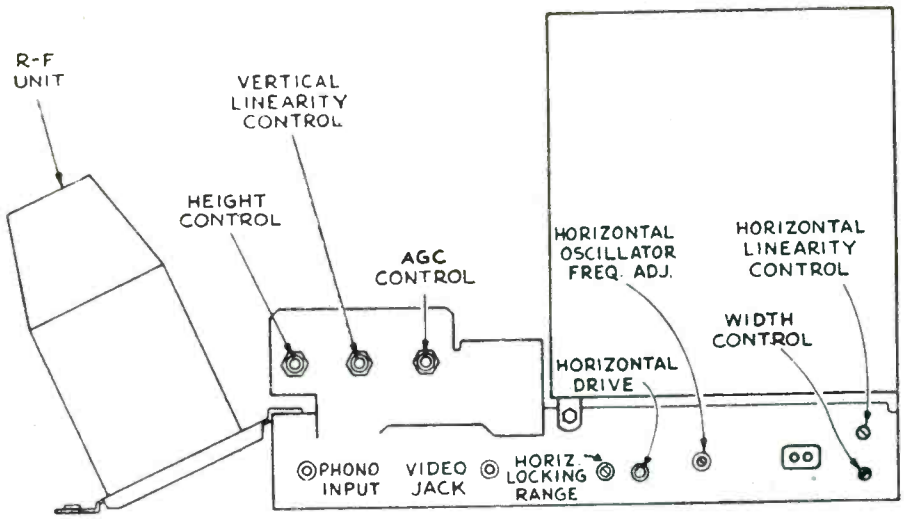
V114, V115
Check 0.1 mf cap. connected to pins 1 and 7 of V115
Vert. Defl. yoke
V. O. T.

**NO VERT. SYNC.—**
**HOR. SYNC. OK**

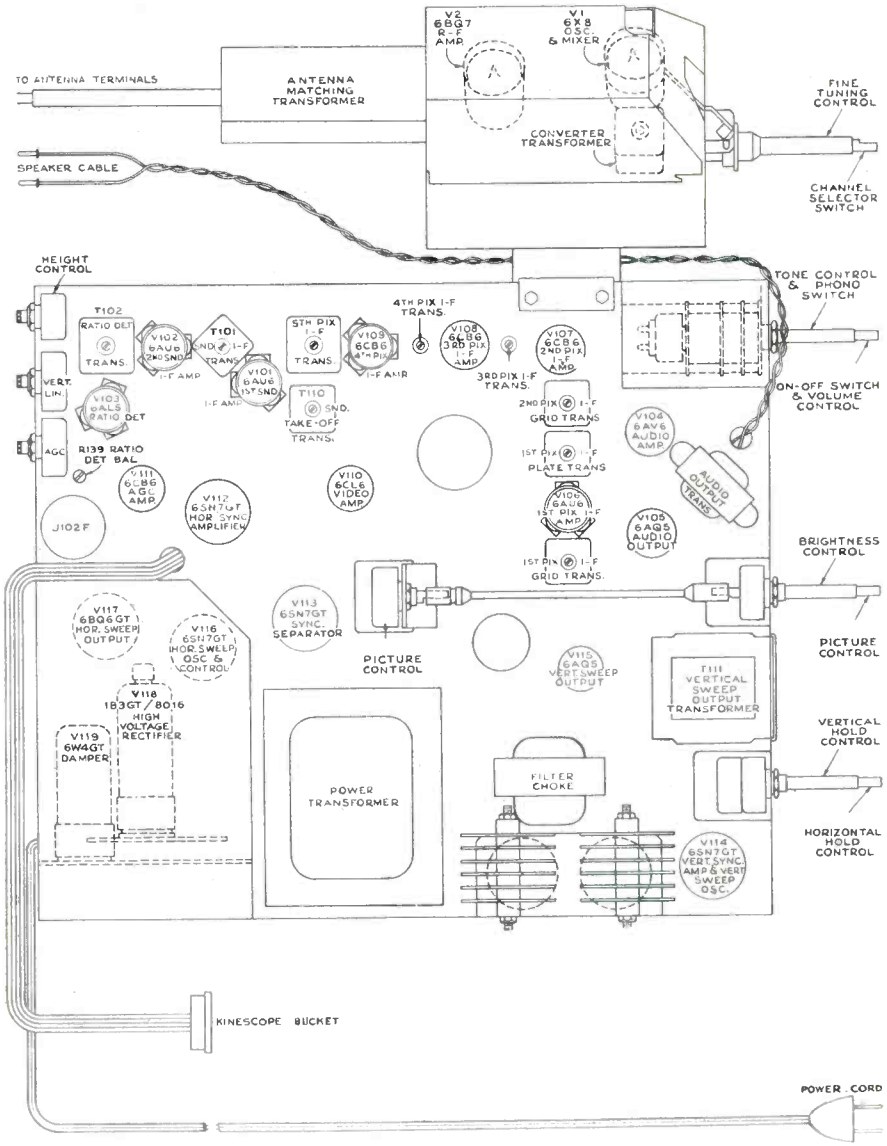
Vert. Hold control
V114, V115
Check Vert. Int. network
Check 0.001 and 0.1 mf caps. connected to pin 1 of V114

**NO HOR. OR VERT. SYNC.—**
**PIX SIGNAL OK**

A.G.C. control
V11, V112, V113




*Rear Chassis Adjustments*




*Chassis Top View*

[from page 41]

### Horizontal Frequency Adjustment

Turn the horizontal hold control to the extreme clockwise position. Tune in a television station and adjust the horizontal frequency adjustment at the rear of the chassis until the picture is just out of sync and the horizontal blanking appears as a vertical or diagonal black bar in the raster. Then turn the core until the bar moves out of the picture leaving it in sync.

### Horizontal Locking Range Adjustment

Set the horizontal hold control to the full counter-clockwise position. Momentarily remove the signal by switching off channel then back. The picture may remain in sync. If so turn the Hor. Osc. Transformer rear core slightly and momentarily switch off channel. Repeat until the picture falls out of sync with the diagonal lines sloping down to the left. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.

If more than 3 bars are present just before the picture pulls into sync, adjust the horizontal locking range trimmer slightly clockwise. If less than 2 bars are present, adjust Hor. Locking Range Trimmer slightly counter-clockwise. Turn the horizontal hold control counter-clockwise, momentarily remove the signal and recheck the number of bars present at the pull-in point. Repeat this procedure until 2 or 3 bars are present.

Repeat the adjustments under "Horizontal Frequency Adjustment" and "Horizontal Locking Range Adjustment" until the conditions specified under each are fulfilled. When the horizontal hold operates as outlined under "Check of Horizontal Oscillator Alignment" the oscillator is properly adjusted.

### AGC Threshold Control

The AGC threshold control is adjusted at the factory and normally should not require readjustment in the field.

To check the adjustment of the AGC Threshold Control, tune in a strong signal and sync the picture. Momentarily remove the signal by switching off channel and then back. If the picture reappears immediately, the receiver is not overloading due to improper setting of AGC Threshold Control. If the picture requires an appreciable portion of a second to reappear, or bends excessively AGC Threshold Control should be readjusted.

### Centering Adjustment

No electrical centering controls are provided. Centering is accomplished by means of a separate plate on the focus magnet. The centering plates include a locking screw which must be loosened before centering. Up and down adjustment of the plate moves the picture side to side and sidewise adjustment moves the picture up and down.

If a corner of the raster is shadowed, check the position of the ion trap magnet. Reposition the magnet within the range of maximum raster brightness to eliminate the shadow and recenter the picture by adjustment of the focus magnet plate. In no case should the magnet be adjusted to cause any loss of brightness since such operation may cause immediate or eventual damage to the tube. In some cases it may be necessary to shift the position of the focus magnet in order to eliminate a corner shadow.

### Focus Magnet Adjustment

The focus magnet should be adjusted so that there is approximately three-eighths inch of space between the rear cardboard shell of the yoke and the flat of the front face of the focus magnet. This spacing gives best average focus over the face of the tube.

The axis of the hole through the magnet should be parallel with the axis of the kinescope neck with the kinescope neck through the center of the opening.

### Pin-Cushion Correction

Two pin-cushion correction magnets are employed to correct a small amount of pin-cushion of the raster due to the lens effect of the face of the kinescope. These magnets are mounted on small arms, one on each side of the kinescope as shown. The arms hinge in one plane on self tapping screws which act both as a hinge and an adjustment locking screw. When the magnets are swung towards the tube, maximum correction is obtained. Minimum correction is obtained when the arms are swung away from the tube. To adjust the magnets, loosen the two self tapping screws and position the magnets until the sides of the raster appear straight. Tighten the screws without shifting the position of the magnets. In some cases it may be necessary to twist or bend the magnet support arms to obtain the appearance of straight raster edges.

### Width, Drive And Horizontal Linearity Adjustments

Adjustment of the horizontal drive control affects the high voltage applied to the kinescope. In order to obtain the highest possible voltage hence the brightest and best focused picture, adjust horizontal drive trimmer C191B counter-clockwise until the picture begins to wrinkle" in the middle then clockwise until the "wrinkle" disappears.

Turn the horizontal linearity control L107 clockwise until the picture begins to "wrinkle" on the right and then counter-clockwise until the "wrinkle" disappears and best linearity is obtained.

Adjust the width control L106 to obtain correct picture width.

A slight readjustment of these three controls may be necessary to obtain the best linearity.

Adjustments of the horizontal drive control affect horizontal oscillator hold and locking range. If the drive control was adjusted, recheck the oscillator alignment.

### Height And Vertical Linearity Adjustments

Adjust the height control (R199 on chassis rear apron) until the picture fills the mask vertically. Adjust vertical linearity (R211 on rear apron), until the test pattern is symmetrical from top to bottom. Adjustment of either control will require a readjustment of the other. Adjust centering to align the picture with the mask.

### Chassis Removal

To remove the chassis from the cabinet for repair or installation of a new kinescope, remove the control knobs, the cabinet back, unplug the speaker cable, the kinescope socket, the antenna cable, the yoke and high voltage cable. Take out the chassis bolts under the cabinet. Withdraw the chassis from the back of the cabinet.

# WAVEFORM ANALYSIS in Sync Circuits

BY GEORGE HOLMES

SQUARE waves are frequently applied across RC networks in TV receivers as, for example, in vertical and horizontal blanking pulses in the sync amplifier circuit. This causes many of the peculiar waveforms frequently observed by the technician.

To understand the manner in which these waveforms are developed, we'll first apply a square wave $E_A$ of 2000 cycles to the circuit in *Fig. 1*. Then we'll follow the path of charge and discharge across the condenser, examining the resultant wave shape $E_R$ across R.

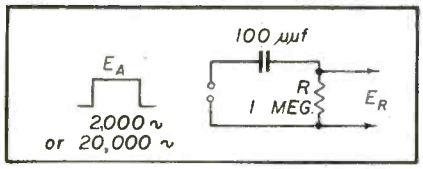



Fig. 1—Simple circuit for studying RC action on 2000 cps square wave.

The formula T = RC (where R and C are in ohms and farads respectively) explains the amount of time it takes a capacitor to charge up to 62.8% of the applied voltage. In other words, if we apply 10 volts to a condenser, it would charge up to 6.28 volts in T time (refer to *Fig. 2*).

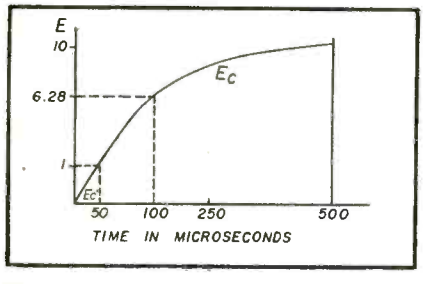



Fig. 2—Curve showing how voltage charges up condenser in Fig. 1.

The curve in *Fig. 2* indicates how the voltage is developed across the condenser as it charges up. Because the curve is exponential, it will take an infinite amount of time for the condenser to become fully charged. However, for purposes of explanation and simplicity, let us designate 5T as the time it takes for the condenser to become fully charged.

Now we can use our formula:

$$T = RC$$
$$= 1{,}000{,}000 \times 100 \times 10^{-12}$$
$$= 100\ \mu\text{secs.}$$

Therefore:

$$5T = 500\ \mu\text{secs.}$$

Observe that the 2000 cycle square wave $E_A$ mentioned above also makes one complete cycle in $1/2000 = 500$ μsecs. This is the time it takes the condenser to become fully charged. Therefore, the 2000 cycle wave will just about charge the condenser in *Fig. 1* in 500 μsec.

Referring to *Fig. 3*, we are now going to follow $E_A$, the applied voltage, and $E_R$, the voltage across the resistor. From point G which is at zero voltage level, $E_A$, because of the square wave characteristic, rises instantaneously to 10 volts. This is equivalent to a voltage of infinite frequency being applied

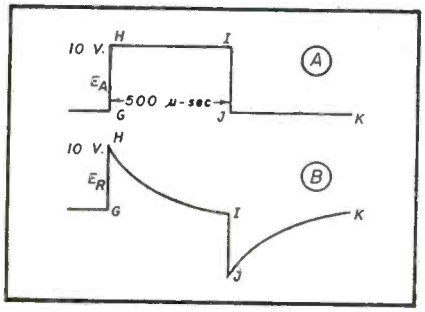



Fig. 3—Waveforms of applied voltage and for voltage across resistor.

to a condenser. The reactance, $X_c$, offered by the condenser to a signal of infinite frequency is zero ($X_c = -\frac{1}{2\pi fc}$). Therefore, the voltage across the resistor will rise instantaneously to 10 volts. This is shown as point H in *Fig. 3B*.

Notice that $E_A$ stays at 10 volts for 500 micro-seconds until point I is reached. During this time, the condenser will charge to the full value of 10 volts. $E_R$ as shown in *Fig. 3B*, which was at 10 volts initially will drop exponentially to zero. Now, $E_A$ drops instantaneously to zero. This corresponds to points I and J. Here is where confusion usually takes place. If the applied voltage drops to zero and there is 10 volts across the condenser; and if the sum of all the voltages around a series circuit equals zero, then there must be 10 volts across the resistor at this instant to balance the 10 volts across the condenser. Referring to *Fig. 4* we see that the condenser at this instant becomes the generator and applies its 10 volts instantly across the resistor at an opposite polarity. Adding up the voltages shown in *Fig. 4*, we observe that $+10 - 10 = 0$.

Referring again to *Fig. 3A*, point J corresponds to an applied voltage of zero volts. The condenser now discharges exponentially through the resistor in 5T or 500 μsecs. as shown in *Fig. 3B*, J to K.

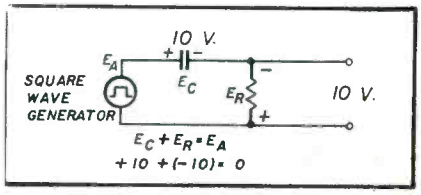



Fig. 4—For an instant, the condenser generates a 10 volt square wave.

Now let us see what happens when we apply a 20,000 cycle square wave to the circuit shown in *Fig. 1*. In this case:

$$T = 1/f$$
$$= 1/20{,}000$$
$$= 50\ \mu\text{secs.}$$

Referring to *Fig. 5*, where $E_A{}^1$ rises to 10 volts instantaneously $E_R{}^1$ will also rise instantaneously to 10 volts for the reasons discussed previously. We are now at point L *(Fig. 5B)* and $E_A{}^1$ levels off at 10 volts for 50 μsecs to point M.

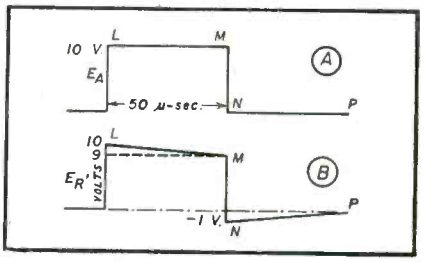


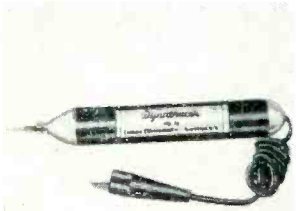

Fig. 5—Waveforms for applied voltage and for voltage across resistor.

The components used in *Fig. 1* (R = 1 meg, C = 100 μμf) will permit the condenser to charge up fully in 500 μsecs. Since the incoming wave has a duration of only 50 μsecs it will charge up the condenser to only 1 volt as shown in *Fig. 2*. (We use 1 volt in this case for simplicity of explanation and calculation.)

Referring to *Fig. 5*: since at point M the capacitor is charged up to 1 volt,

[Continued on page 53]

# New Products



### TV "Dynatracer"

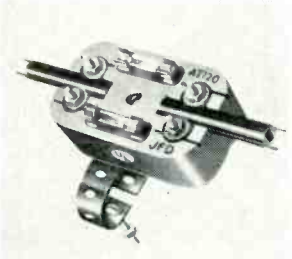
The new TV "Dynatracer" (Century Electronics Co., Bklyn, N.Y.) is a portable, self-powered quality instrument designed to trace TV signals through any sound, sync, afc, vertical or horizontal sweep circuit. It picks up its signal from one section of the receiver and feeds it to other portions of the set. It will also trace voltages and locate defective parts.

### Screwdriver Illuminates Close Work

A screwdriver in the new Rosco Flash Kit features a handle with built-in light. Three interchangeable screwdriver blades are magnetized. The complete kit contains: a spring-chuck illuminated handle; #1 Crosspoint blade for Phillips-Type screws; a regular screwdriver blade; a fine works blade and a standard bulb and battery. For further information, write Rosenberg Brothers & Co., Smithtown, L.I., N.Y.

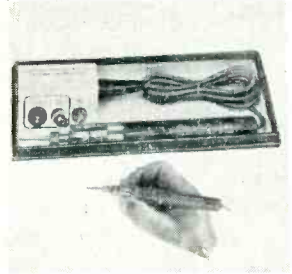
### "See-Thru" Drawers

The Model J-20 "See-Thru" drawer consists of twenty plastic drawers in a welded all-steel cabinet. Overall size is 10¼"H x 12½"W x 6"D Adjustable drawer dividers and identification labels are included. Other models range from 8 to 128 drawers, with larger drawers, and portable models with carrying handles. General Industrial Co., 5738 N. Elston Ave., Chicago 30, Ill. will send additional information on request.



### New JFD Lightning Arrester

JFD Manufacturing Co., Brooklyn, New York, has announced the new patented "Lightning Sentry" lightning arrester and static discharger, model AT120. The Lightning Sentry includes both an internal resistor network and two replaceable fuses. The resistor network will bypass all regular picture-smearing static charges to ground, as well as lightning charges.



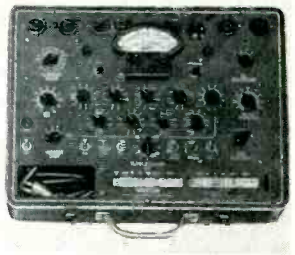
### New Desco Circuitracer

The new Circuitracer, made by the Desco Mfg. Co., 605 E. Walnut Street, Pasadena, Calif., tests live circuits as low as 2 volts or as high as 600 volts. It can locate grounds, opens or shorts in dead or live circuits. A simple conversion makes the Desco a low voltage tester or a high voltage tester for live circuits, or a continuity tracer for dead circuits. Weight is 2½ oz.

### New Weston Tubechecker

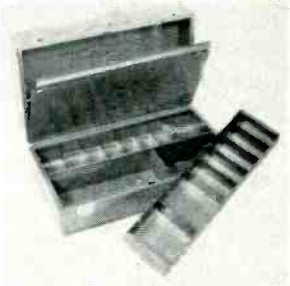
The Model 981 Type 2 tubechecker provides for rapid measurement of proportional mutual conductances, emission characteristics of rectifiers and diodes, and the firing potential limits of voltage regulators and low power thyratrons.

Complete information including ranges, prices, etc., can be obtained directly from Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark 5, N.J.



### New Case For Servicemen

An all-steel case designed for servicemen features six plastic-clear boxes for small parts, a seven partition removable metal tray, four bins on one side, two extra large on the other. It is made of heavy gauge metal with full-length hinge, lock, catches, and handle. Overall size is 21 by 12 by 7½ inches. For further information, write to Hardware Dept., Sears, Roebuck & Co., 403 South State St., Chicago 5, Ill.

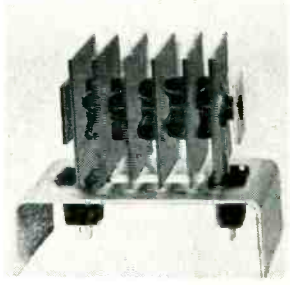


### Webcor 3-Speaker Tape Recorder

Webcor's Model 2030, features three PM speakers: one 4-inch mounted in front, and two 6-inchers on the sides of the chassis. This speaker system is also used in Webcor's "Musicale" phonograph. The Model 2030 contains a four-pole shaded motor, two-speed recording, inputs for mike, phono and radio, amplifier with push-pull output, bass and treble boost and bass-compensated volume control. Distortion is said to be negligible.

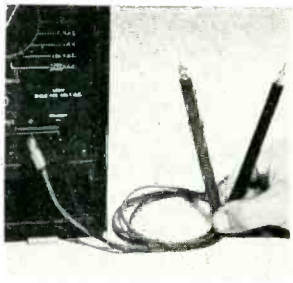
### Plug-In Selenium Rectifier

This item facilitates field replacement of selenium rectifiers, particularly the types commonly used in radio and TV receivers. Lugs are polarized for proper circuit connection. Vibration or shock will not cause the rectifiers to fall out of the socket. It is possible to mount in a conventional manner and solder to the lugs. Write to Cinch Manufacturing Co., Chicago for data.



### Insuline Lucite Test Leads

A new pair of Lucite Handle Test Leads, intended for use with standard voltmeters, multimeters, vacuum-tube voltmeters, etc. has been introduced by the Insuline Corporation of America, Long Island City 1, N.Y. Ends are fitted with small threaded chucks which take phonograph-needle test tips. The handles carry 45-inch lengths of leads with molded right-angle phone tip plugs.



# TRADE FLASHES

[from page 68]

### Trailers (Mobile Homes) With Built-in TV Sets

CBS-Columbia, the television manufacturing division of the Columbia Broadcasting System, announced recently that it had completed negotiations to provide television receivers as standard built-in equipment for the Pacemaker Trailer Company of Elkhart, Ind.

The CBS-Columbia television-equipped trailers are currently on display at the 17th Annual Mobile Homes Manufacturers Association Convention in Cleveland.

### Photographic Method For Pix Tube Screen

In a color television picture tube screen, three different phosphor materials may be placed in an interspersed dot pattern on a glass plate, a phosphor for each of three primary colors, red, blue, and green. Here D. J. Bracco, engineer at Sylvania Research Laboratories, uses a photographic method of forming the complex screen. Light from the point source zirconium lamp passes through an aperture plate containing more than 200,000 precisely spaced small holes. Rays of light fall in the desired dot pattern on a photographic emulsion containing the color phosphor. After controlled exposure and processing, only the phosphor remains in the pattern. The process is repeated for the other two phosphors with the screen and aperture plate moved slightly to permit the new dots to fall between those previously formed. A full color picture is produced by each of three electron streams being made to fall on the appropriate set of color phosphor dots.

# ASSOCIATION NEWS

### Chicagoland REPS

Annual election of officers of the Chicagoland Chapter of "THE REPRESENTATIVES" will take place at the May meeting of the chapter each year instead of at the December meeting, following the passage of an amendment to the chapter's By-Laws conducted by mail here last month, according to Roy J. Magnuson, who heads the By-Laws Committee. The purpose of the change is to enable new officers to take over their duties during the summer months, giving them more time to plan the entire business year program, including the appointment of committees. Installation of duly elected officers will take place at the chapter's June meeting.

### RETMA Symposium

Preliminary plans for the fifth government-industry conference designed to spur the continued improvement in quality of all electronic components indicate a new technique will be used in bringing together government and industry experts on electronics on May 4-6, 1954. The three-day technical meeting will be held in the auditorium of the U. S. Department of Interior in Washington.

The conference is sponsored by the American Institute of Electrical Engineers, the Institute of Radio Engineers, the Radio-Electronics-Television Manufacturers Association and the West Coast Electronics Manufacturers Association with the active participation of the U. S. Department of Defense and the National Bureau of Standards.

The technical committee, under Mr. Rogers, is introducing a new concept into the electronic symposium field. The program of the forthcoming meeting is designed to emphasize quality and reliability of components in electronic systems as distinguished from the former emphasis placed on the individual components. The committee is carrying the problem a step further in concerning itself with the development, fabrication and application of component parts into "black boxes" or electronic systems.

### LIETA

The board of directors of the Long Island Electronic Technicians Association recently toured the David Sarnoff Experimental Labs at Princeton, N.J., as guests of RCA. Described as a "heaven for the electronic tech-

nician" the labs featured a complete color TV set-up, from transmitter and camera to receiver. Other items of interest was RCA's well-stocked tech library of over 9,000 volumes; a glass-blowing apparatus for tubes; the field sound room for mikes and speakers; the making of germanium transistors.

On December 3rd, LIETA members heard a lecture on "the latest techniques on the color synchronization channel circuits by Mr. C. E. Page, engineer from the Hazeltine License Labs.

The LIETA NEWS, monthly publication of LIETA, features an employment exchange for technicians, who can register with Dick Carey, Chairman, 179 Seventh St., Garden City, N.Y.

### Missouri Valley REPS

The "Heart of America Chapter" has been chosen by members of the Missouri Valley Chapter as being more indicative of the area served by its members and, effective January 1, 1954, it will become the official name of the chapter now known as the Missouri Valley Chapter of "THE REPRESENTATIVES."

Annual election of officers took place recently. Clyde H. Schryver was elected president to succeed Zell S. Myers. Fred Somers, Jr., 1953 secretary and treasurer, rose to the vice presidency, taking over the post from Mr. Schryver. G. L. Koenig was elected secretary and treasurer for the coming year.

### NEDA-Chicago

At a recent meeting of the Chicago Chapter of the National Electronic Distributors Association held in Ray Foley's Club, J. E. Bowman, J. G. Bowman & Co., and Ralph E. Walker, Walker-Jimieson, Inc., gave a resume of the accomplishments made by the Association during the past several years. They emphasized that trade organizations are definitely a part of the American business system and that the electronics industry was organized from top to bottom at every level from the manufacturer to the service dealer.

The speakers reviewed the work done by NEDA against licensing legislation as well as its support of the Broyhill bill. Stressed too was the fact that NEDA was responsible for materials being available to electronic parts distributors during World War II and during the Korean hostilities in 1951.

The co-chairmen emphasized representation of distributors in the Association before administrative bodies such as NEDA's appearance before the Interstate Commerce Commission in the case now pending to obtain cancellation of the $1.50 surcharge on

LTL truck shipments. Other NEDA services discussed included the reduction of rail rates on the return of defective picture tubes to manufacturers; NEDA's uniform Battery Index; study of office methods, procedures and equipment in conjunction with ten other national wholesale associations; present cooperation with the Government in the disposition of surplus government electronic materials, and the activities of the Association regarding excise tax liability on rebuilt tubes.

### Annual Report—N.Y. I.R.E.

In accordance with the Section by-laws, the Annual Report for the 1952-1953 year has been made available by the Secretary of the New York section of the I.R.E. For information or copies, contact A. S. Beck, Secretary, Bell Telephone Labs., P. O. Box 107, Red Bank, N. J. If telephoning, call CH 3-1000 and ask for a Red Bank line.

### Pa. State Federation Servicemen's Associations

Plans have been made for the Federation's part in the proposed Eastern Conference scheduled for April 2, 3, and 4 in Philadelphia, it is announced by L. J. Helk, Federation secretary. In conjunction with the conference will be a three-day color TV symposium which will include lectures by eminent authorities. The first 3-D TV lecture screen will be presented and used during the symposium. All servicing groups in the East are to be invited, with both the national service organizations—NATESA and NETSDA—taking part. Mr. Bert Bregenzer, of the Pittsburgh chapter, announced that the Washington, Pa. Association had voted for Federation affiliation. Mr. Joseph Zapracki, heading the Luzerne chapter, was appointed to the nominating committee.

## ANSWER MAN

[*from page 32*]

then and this trouble showed up a couple of months after the tube was changed. I can find nothing wrong with the receiver. I changed the two selenium rectifiers on a chance they were weak but no change in operation resulted. I then changed condenser *C703* on the schematic which didn't help any so I gave up as I have no idea what is wrong and neither does any other TV man around here.

As I figure it "Heat" must be the answer but just which part or parts is it? Can you answer this sticker?

*J.W.L.*
*Wayne, W. Va.*

*Dear J.W.L.*

In reference to the vertical deflection troubles you are experiencing in the deflection chassis G1, it is felt that the selenium rectifiers should be re checked. Probably the substitution was made with the same current rating selenium rectifier as are in the TV receiver, which is 350 milliamps. Try 450 milliamp selenium rectifiers before going any further.

There are a number of other possibilities for the cause of this vertical trouble. The next preliminary step that should be taken is to substitute the 6BQ6 and 6V3 tubes with tubes known to be good. This may have been already done. Naturally, it assumed that several 6AH4 vertical output tubes have been tried.

Check the following resistors.

*R819*—120K
*R818*—150K
*R702*—330K
*R706*—2.5 meg height control (by substitution)
*R703*—8.2K

Check the 10 $\mu f$, 450 volt condenser, *C815*.

Check *C702—.1μf* & *C701—.047μf*.

Check the 17 inch piece of #24 size wire that is used for a voltage dropping resistor for a poor solder connection. In fact, all the solder connections associated with the vertical oscillator and vertical output stages should be heated and checked for a resin joint.

Finally, there is the remote possibility that the trouble may resolve itself into either the vertical output transformer or even the yoke. But since the trouble is experienced only for the first five minutes it would really not be necessary to change these items for this minor difficulty.



## WORKBENCH

[*from page 34*]

Filament transformers (6.3V) are made expressly with a 1/1 ratio for this purpose.

In many KC6 47's, it has also been noticed that the filament leads are pushed under a metal chassis wedge to hold them in place as they run from the 6W4 to the power transformer. These filament leads are through to the wedge. By simply letting the leads run loosely along the side of the chassis, a lot of trouble can be avoided.

## KEY TEST POINTS

[*from page 29*]

rection can show resistances as low as 400 ohms. The reverse direction resistance should be 10,000 ohms or more. The ratio of the forward to back resistance ratio will therefore usually be 1 to 25 or greater. However, this does not always provide conclusive proof that the crystal is good. It does confirm whether the crystal is open or shorted. When in doubt about the crystal, substitution is the quickest and most confirming check.

In the substitution, the correct polarity of the crystal must be observed when connecting in the crystal. Some technicians have attached a test crystal to a spring clothespin or alligator clips for quick connection in place of the suspected crystal. If the crystal is soldered into the circuit, two points are very important. Don't connect the pigtails to the terminal so that there is any tension on the crystal and apply only as much heat as is necessary to accomplish the soldering of the mechanical connection. The pigtails of the crystal can be held with a long-nose pliers so that the heat will not travel to the crystal but will be blocked and absorbed by the long-nose pliers.

Washed out pictures or overdriven pictures can often be traced to defective germanium crystals. The key test point at the video detector load resistor should be employed to determine the condition of the crystal. If the voltage is too great or too small across the load resistor, the crystal can very well be suspected.

## COLOR

[*from page 25*]

### Scanning

The major variations from standard monochrome circuitry are in the scanning circuits. These changes are made necessary by the fact that each color beam has its own screen element. The deflection coils must, therefore, move the beam for each color in a slightly different manner. In the single gun tube, the beam must be oriented differently for each color. In the three gun tube, none of the beams moves through the direct center of the deflection or focusing fields. All three beams are being deflected at the same time. They must be kept in proper relationship to each other and to the color element mask. This requirement makes additional circuits necessary to insure uniform focusing of the beams across the entire face of the tube.

### Power Supply

Variations in CRT beam current show up as changes in brightness. The high voltage must, therefore, have very good regulation. The type of "blooming and breathing," which can and does exist on monochrome sets when the brightness or contrast levels are changed, cannot be tolerated. As a result, a number of the experimental designs have a voltage regulator system incorporated. The high voltage required for color CRT's is approximately 20 to 25 *kv*. To get this voltage, a voltage doubler system is generally used.

[*To Be Continued*]

## WAVEFORM ANALYSIS

[from page 45]

the voltage across the resistor is $10 - 1 = 9$ volts.

Now as before, $E_A{}^1$ drops instantaneously to point N. At point N, we have an applied voltage of zero and a condenser charged up to 1 volt. Again the condenser becomes the generator with a potential of 1 volt, and is ready to discharge across the resistor. Remember, when the applied voltage drops to zero as before, the condenser becomes the generator in the circuit and instantaneously applies its own voltage across the resistor. Again the sum of the voltages will equal zero, and $E_R{}^1$ will equal one volt negative. See *Fig. 6*.

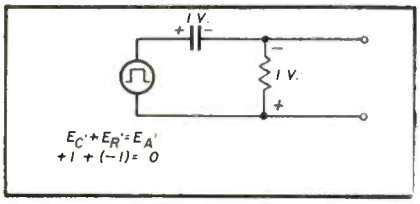



Fig. 6—Discharge of C after having been charged up with 1 volt.

If we look at *Fig. 5B* again, we see the negative one volt at point N in the $E_R{}^1$ wave shape. $E_A{}^1$ will remain at zero level to point P. Thus, the condenser, which has a one volt charge, can discharge itself through the resistor; it does so exponentially to point P.

Now that we have discussed the two different resultant wave shapes, let us see where this knowledge can be used. *Fig. 7* shows part of the sync circuit used in an RCA 630. Let us

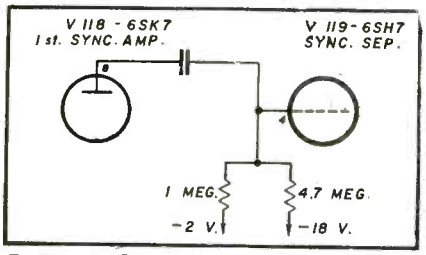



Fig. 7—RCA 630 sync circuit (partial schematic); 6SK7 acts as generator.

assume that the 6SK7 is the generator, and that the total resistance in the circuit plus the capacity will give us an RC time which we can compare to the RC time of the network in our previous discussion. Thus by applying the 60 cycle vertical blanking pulse to this network, we should get *approximately* a resultant wave shape as in *Fig. 3* where we applied 2000 cycles. Also, when we apply the 15,750 cycle horizontal blanking pulse to this network, we should get approximately the same wave shape as we did in *Fig. 5*, where we applied 20,000 cycles.

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★

**Your Complete Guide to the Past Year's Material**

★


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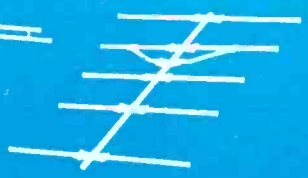

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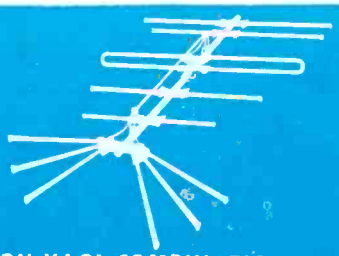

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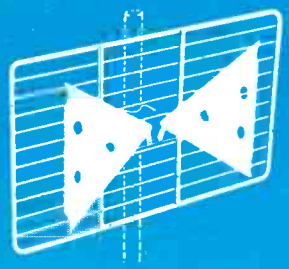

UHF

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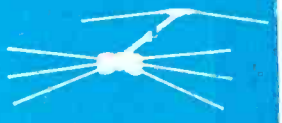

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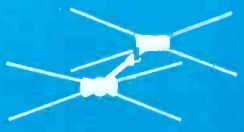

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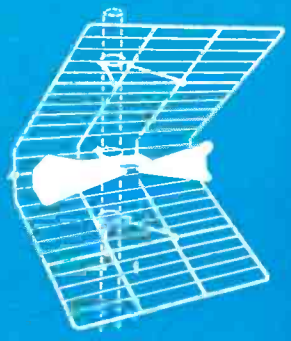

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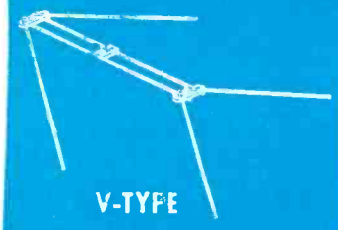

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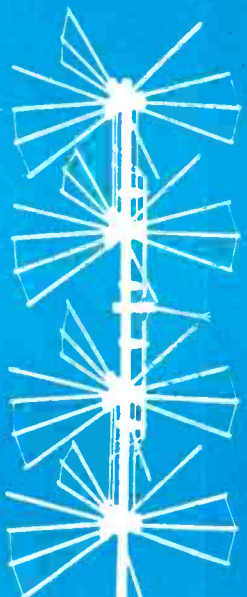

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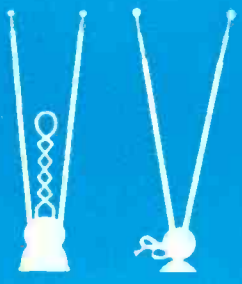

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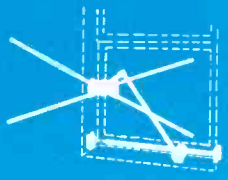

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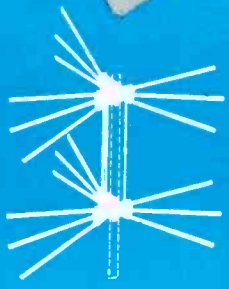

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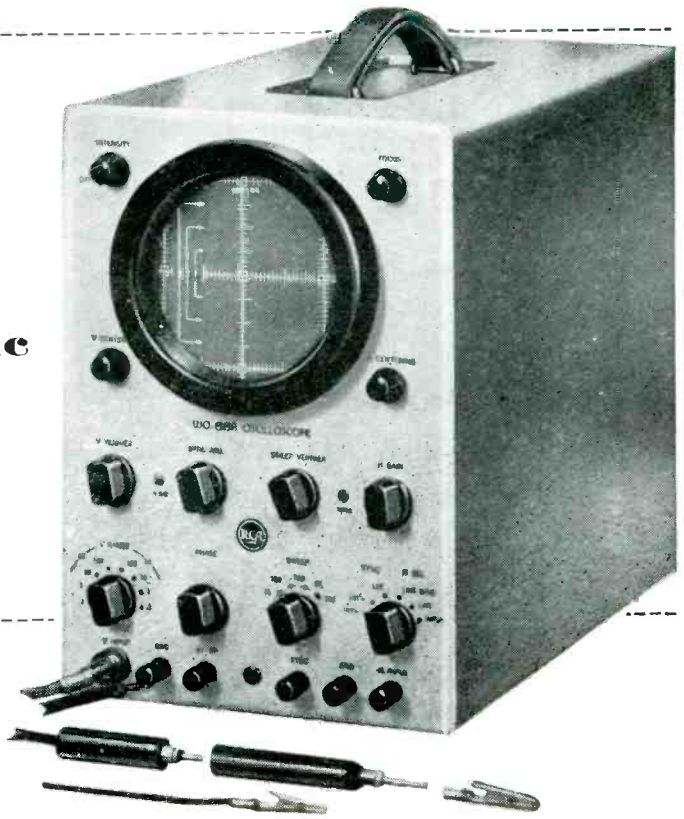

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- Direct-coupled vertical amplifier
- 5″ Cathode-ray tube with magnetic shield
- 60-cycle sweep with wide-angle phasing control
- Frequency-compensated attenuators
- "Voltmeter-type" vertical attenuator
- "Voltmeter-scale" type graph screen
- 1-volt peak-to-peak calibrating voltage
- 'Scope is completely stable—even at maximum sensitivity of 25 millivolt-per-inch
- Quick "recovery" time, freedom from line "bounce"
- Completely shielded input cable eliminates hum and noise pickup

**Specifications—**

- **Deflection Sensitivity:** (vertical amplifier) 25 rms millivolts or better per inch.
- **Vertical-Amplifier Frequency Response:** Flat from dc to 100 Kc; within —3 db at 500 Kc; within —10 db at 1 Mc.
- **Input Resistance and Capacitance:** 10 megohms and 9.5 uuf with WG-216B Low-Capacitance Probe.
- **Sweep-Circuit Frequency (four ranges):** 15 cps to 30 Kc.
- **Square-Wave Response:** Negligible tilt and overshoot.
- **Average Rise Time** (Vert. Amp.): 0.5 microsec.
- **Power Supply:** 105-125 volts, 50-60 cycles.
- Size 13½″ high, 9″ wide, 16½″ deep. Weight only 25 lbs. (net).

The WO-88A has *built-in* voltage calibrating facilities which permit *simultaneous* waveshape display and peak-to-peak voltage measurements. Frequently, the *shape* of the TV waveform under observation will be correct but its *amplitude* will be low and, consequently, cause improper operation. Therefore, a TV 'scope is complete only if it can measure the peak-to-peak voltage of the displayed waveform. *Check this feature on the "88"!*

On the WO-88A, sync polarity may be reversed instantly by simply clicking a front-panel switch. This feature is important because TV pulses may be either positive or negative, depending upon where the 'scope is connected. To avoid waveshape "jitter" or distortion, use a 'scope which will "lock in" readily on all types of TV waveforms. *Check this feature on the "88"!*

When you use the low-capacitance probe supplied with the WO-88A, the over-all input resistance is raised to 10 megohms! Because many TV circuits are extremely sensitive to resistive loading, normal circuit operation may be seriously disrupted by loading of the average 'scope. With the low-capacitance probe, however, loading problems are minimized. *Check this feature on the "88"!*

In addition, the low-capacitance probe supplied with the WO-88A decreases the over-all input capacitance to less than 10 uuf! Excessive capacitance loading can cause the horizontal oscillator to change frequency or stop oscillating. When the WO-88A is connected, the low over-all input capacitance leaves receiver operation essentially unaffected. *Check this feature on the "88"!*

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