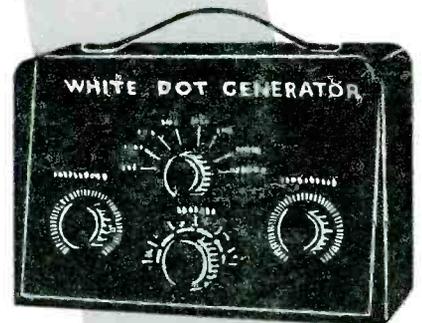
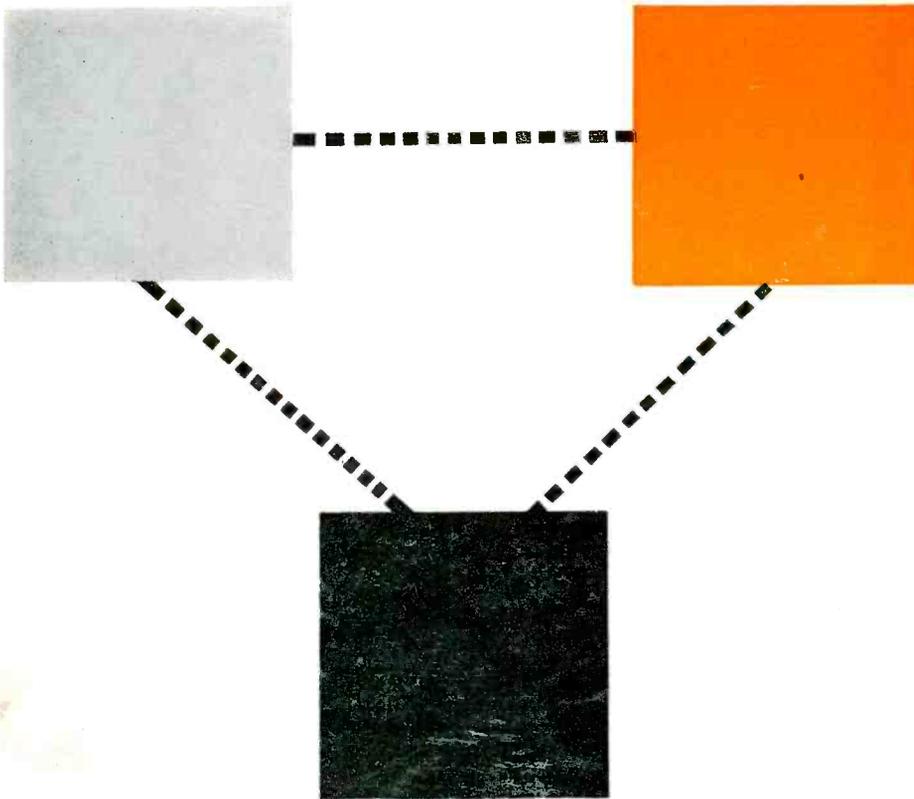


AUGUST 1955

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*Radio-Television*  
**SERVICE  
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TV-AM-FM-RADIO-ELECTRONICS



**WHITE DOT GENERATORS**

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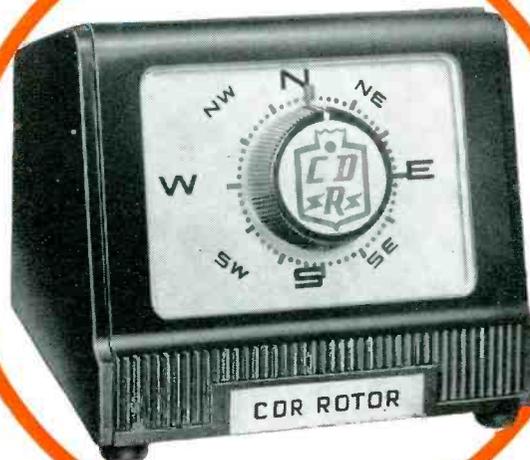
the complete line... a model

**TR-4** the heavy duty rotor complete with handsome modern cabinet with METER control dial, uses 4 wire cable.

**TR-2** the heavy duty rotor with plastic cabinet featuring "compass control" illuminated perfect pattern dial, uses 8 wire cable...

**TR-12** a special combination value consisting of complete rotor, including thrust bearing. Handsome new modern cabinet with meter control dial, uses 4 wire cable.

**TR-11** same as TR-12 without thrust bearing.



AR-1

AR-2



AR-22



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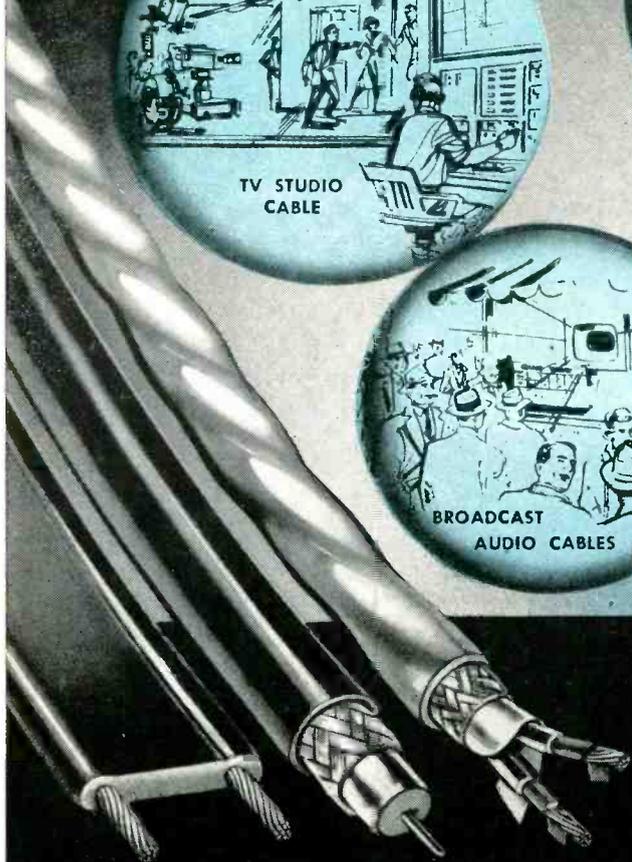
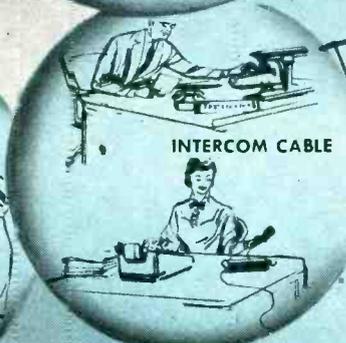
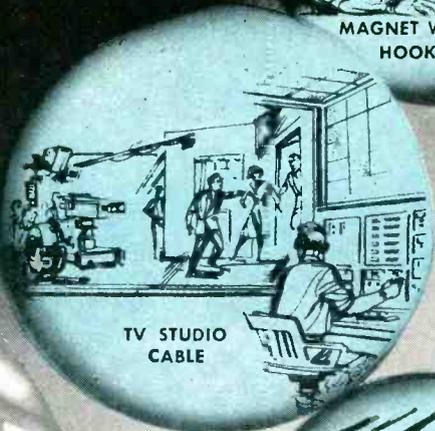
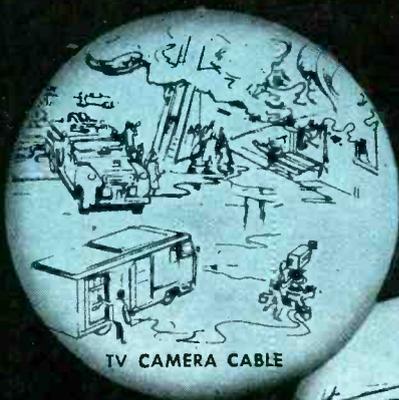
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We are going to make this the BIGGEST rotor year you've ever had! The CDR ROTOR line is COMPLETE in every detail... featuring SEVEN MODELS... A TYPE FOR EVERY NEED! And backing up this is the BIGGEST and most extensive consumer campaign in all our history! Millions of TV viewers will see the CDR rotor announcements on TV, pre-selling them for you. And a complete promotional kit of dealer aids to help you sell and feature CDR ROTORS! Plan now... for the BIGGEST CDR ROTOR year ever!



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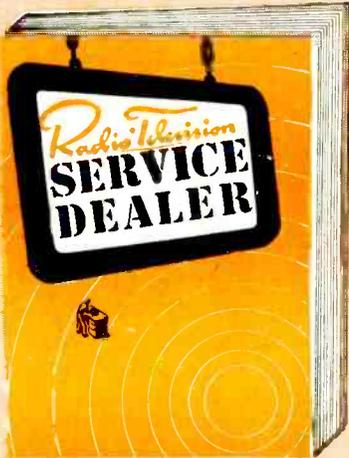
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SINCE 1902

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Receives SERVICE DEALER Monthly  
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**COWAN PUBLISHING CORP., 67 West 44th Street, New York 36, N. Y.**

VOL. 16, NO. 8

AUGUST, 1955

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RADIO-TELEVISION SERVICE DEALER is published monthly by Cowan Pub. Corp., 67 West 44th St., New York 36, N. Y. Subscription price: \$1.00 per year in the United States, & U.S. Poss. Elsewhere \$1 per year additional. Single Copies 25c. Second Class mail privileges authorized at New York, N.Y. Copyright 1955, Cowan Publishing Corp.

POSTMASTER: SEND FORM 3579 TO RADIO-TELEVISION SERVICE DEALER  
67 WEST 44th ST., NEW YORK 36, N. Y.

*If you want  
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 fuses in all  
 sizes and  
 types —*  
**TURN  
 TO BUSS!**

You can depend on BUSS fuses to operate properly under all service conditions. This means that BUSS fuses will open and prevent further damage to your customers' equipment when there is trouble on the circuit.

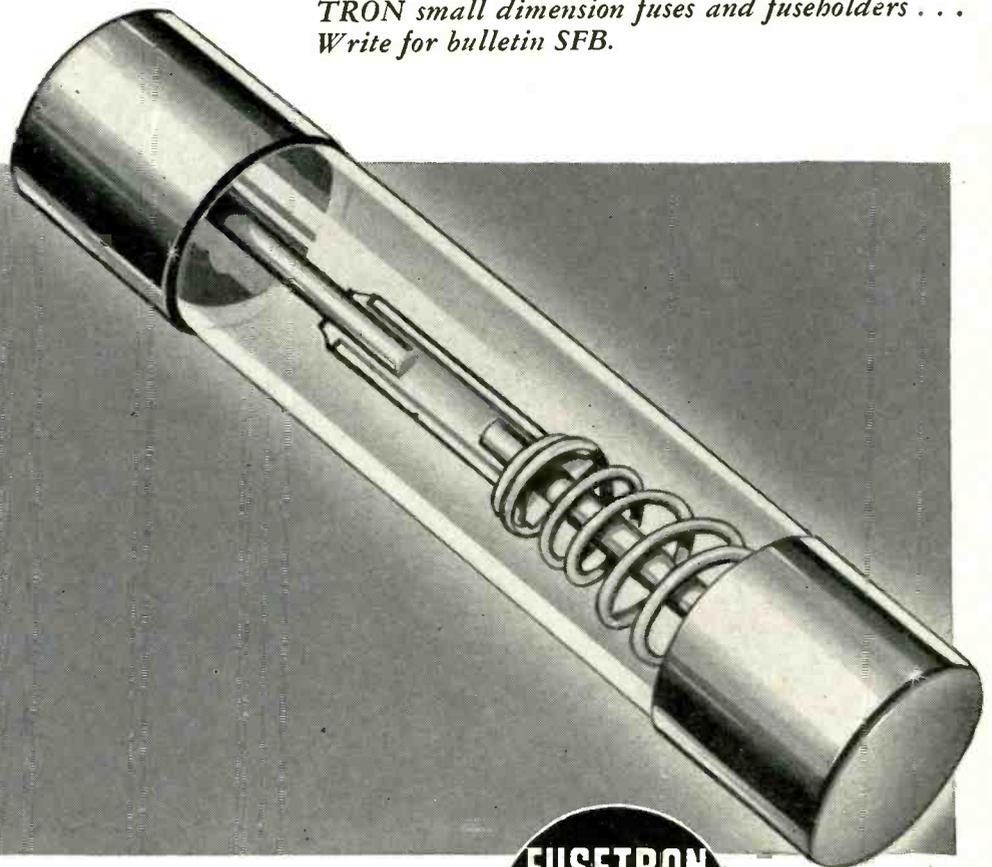
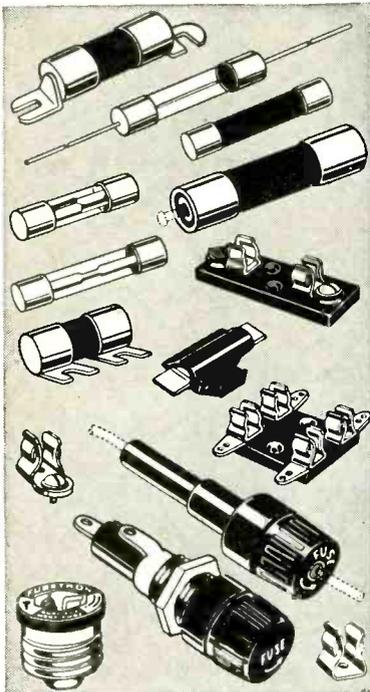
And just as important, BUSS fuses won't blow when trouble doesn't exist. Users are not annoyed with useless shutdowns caused by needless blows.

To make sure of this "trouble-free" operation — every BUSS fuse normally used by the Electronic Industries is tested in a sensitive electronic device. Any fuse not correctly calibrated, properly constructed and right in all physical dimensions is automatically rejected.

**A complete line of fuses is available.** Made in dual-element (slow blowing), renewable and one time types . . . in sizes from 1/500 ampere up — plus a companion line of fuse clips, blocks and holders.

When it's a fuse you need — think first of BUSS. You will be protecting both the product and your good name against troubles and complaints often caused by use of poor quality fuses.

*For more information on BUSS and FUSE-TRON small dimension fuses and fuseholders . . . Write for bulletin SFB.*



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# EDITORIAL... by S. R. COWAN PUBLISHER

## Don't Overlook Hi-Fi

Hi-Fi installation and servicing is a natural arm of the radio-television servicing industry. This field is expanding with tremendous acceleration and at present boasts an annual volume approaching \$100 million, excluding records and fringe or pseudo hi-fi.

Who, more than the radio-television serviceman, who has worked with FM circuits and the involved circuitry of television from the early days to date, is qualified to judge the merits of the various equipments and components on the market today so that recommendations may be made; and who more than that serviceman can install, service and adjust hi-fi equipments and systems to satisfy a music lover in his own area?

Even as television has expanded and offered more opportunity to the servicing profession now hi-fi brings that additional opportunity to earn more and perform a service that is much needed and is expanding at a rapidly increasing rate. Radio-TV servicemen will do well to learn as much as they possibly can about the new hi-fi equipments, components, accessories, and the circuits contained therein. We have such articles on our agenda so don't miss them. Don't let hi-fi business go by the wayside. The manufacturers who, up to this point, have had the burden of servicing hi-fi equipment in their own licensed specialty depots are now eagerly awaiting your coming in to take this burden away from them. Visit the various Audio and Hi-Fi Fairs in your particular area. See what's available. Contact your customers. You will find them more than ready for preliminary suggestions on possible hi-fi installations as well as the adjustments and servicing of the installations now in homes.

A lucrative market is open. Be astute enough to recognize this opportunity for greater earnings and pleasurable work in performing that service.

## What's Happening With Color TV

Color TV today is in a peculiar stalemate and all because there are no color programs being presented to the public. This is an injustice to those who have purchased color television receivers, to those servicemen who are trying to bolster their techniques and knowledge of color television circuitry operation and adjustment, and to the many millions of dollars that has been invested in its development as well as to the many millions of

man hours of labor and research already expended.

The reason seems fairly simple—color TV programs are very expensive to produce. With a limited number of color TV receivers out in the field at present, advertisers refuse to invest large sums of money for program material. The result: no color programs, no color TV sales, no sales of color TV test equipment and a letdown on the part of the serviceman to spend his time in learning color.

From the point of view of economics, we don't blame the advertiser for not spending huge sums on a small audience. However, from the point of view of the radio-TV manufacturing industry, which has invested so heavily in color, it seems foolish that no unified effort is made to provide at least some semblance of color programming. It is a sad commentary that this phase of the industry, which is actually lying dormant, is not encouraged and further promoted. We suggest that some program be worked on by RETMA to get together the various facets of the industry interested in color, including manufacturers of color TV receivers, manufacturers of color TV equipment, and the broadcasters, so that some programs be made available. These need not necessarily be "live" but can be color films, of a quality that will permit the pulse of color TV to continue beating rather than be cut off completely as is the case at present.

## Nation-Wide Servicemens' Association

The editorial "Our Field Needs To Be United" (page 4 July, 1955 "Service-Dealer"), has to date brought us favorable comment from over two-score solidly established servicemens' associations. All concur that the time has arrived when servicemen everywhere must begin to work together on a local, state-wide and national basis.

Happily we can report that on August 7th, 1955 at 9 a.m. at the Sherwyn Hotel, Pittsburgh, Pa., the first organizational meeting will be held to attempt to found a "Congress of Servicemens' Associations" somewhat in pattern with what our editorial proposed. Bert Bregenzer, President of FRSA, supported by other groups such as ESFE-TA and NETSDA made the preliminary arrangements. Invitations to 181 associations were mailed and already many have accepted. It might be pertinent to read the views of John A. Wheaton, President of the Empire State Federation of Electronic Technicians Associations, in this connection, as they appear in this issue of "Service-Dealer's" Association News department.

# KINGS of the TV FRONTIER!

## Unmatched for power and performance!

This extraordinary fringe-area powerhouse is still the most sensitive all-channel antenna made today—bar none! The SUPER RAINBOW's many "years-ahead" engineering features include the triple-powered Tri-Pole, separate high and low band operation, 100% aluminum construction, and "Snap-Lock" pre-assembly. Also in great demand . . .

The RAINBOW, Model No. 330.

## Extra elements, extra performance!

There may be antennas that resemble our TRAILBLAZER, but none can top its blazing performance. The TRAILBLAZER features extra High and Low Band directors, and full-wave directors on the High Band. It installs faster than any similar antenna, and—it's all aluminum! Especially recommended for areas with front-to-back interference problems, particularly on the Low Band. Count the elements . . . then compare the prices!

## Advanced design — and "Super-Sembled"

Look to the LANCERS for Channel Master "extras": extra elements and extra gain — at no extra cost. Completely "Super-Sembled." The SUPER LANCER gives 1½ db more gain on both the Low Band and the High Band than similar types. The LANCER, Model No. 333, has an extra director that provides 1½ db more Low Band gain. Count the elements . . . then compare the prices!

# CHANNEL MASTER<sup>®</sup>

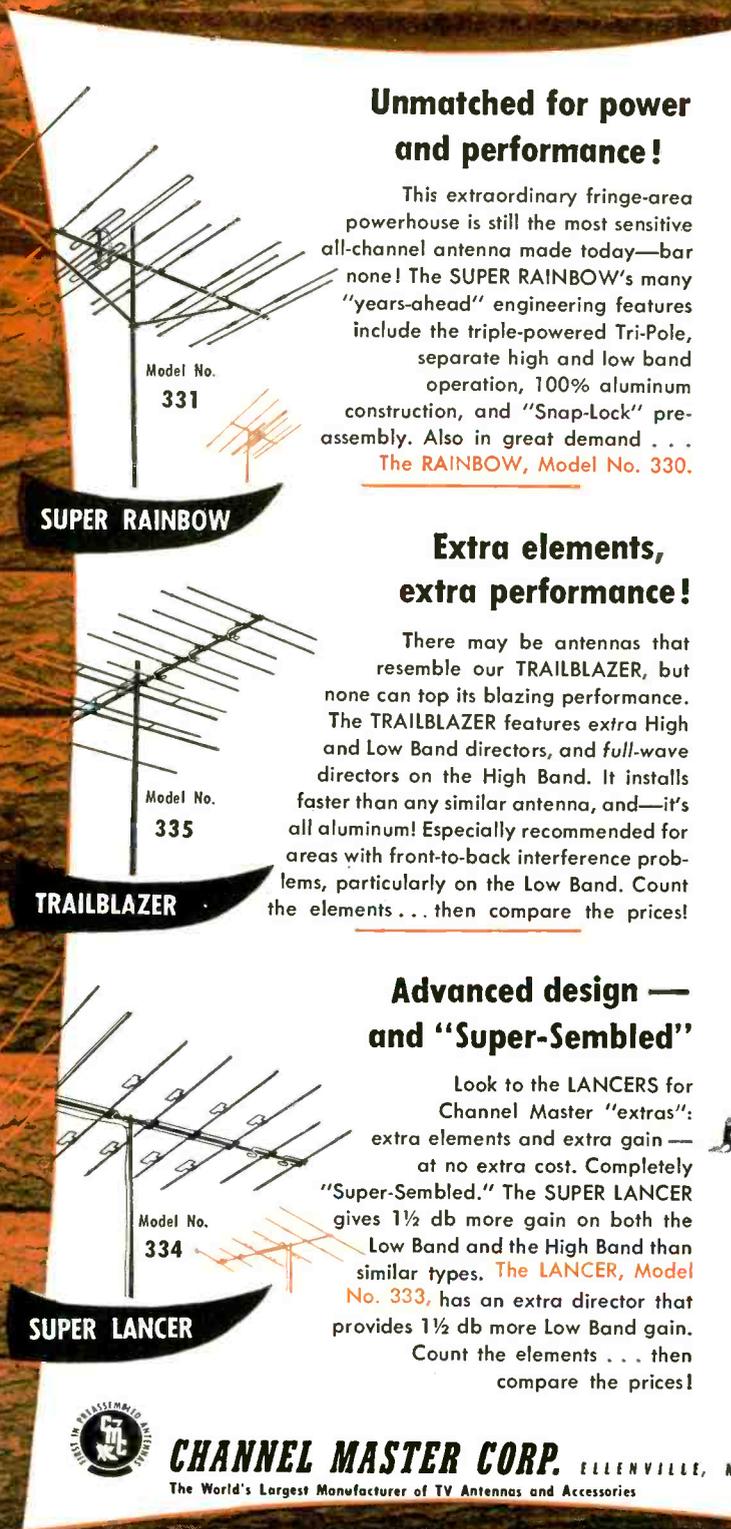
## All-Channel Yagis

## Unrivalled for power, popularity and price!

Servicemen everywhere are discovering an entirely new answer to the problem of multi-channel fringe-area reception: Channel Master all-channel yagis. These are the antennas that have what it takes to bring top TV performance to the most distant, isolated locations. And, they're ready for color, too!

Today's leading all-channel yagis are designed — and improved — in the Channel Master Antenna Development Laboratories. Isn't it logical to use Channel Master's famous engineering skill to solve your reception problems?

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**CHANNEL MASTER CORP.** ELLENVILLE, N. Y.  
 The World's Largest Manufacturer of TV Antennas and Accessories

# ASSOCIATION NEWS

by Samuel L. Marshall

## Empire State Federation of Electronic Technicians Associations

July 13, 1955

Dear Sam:

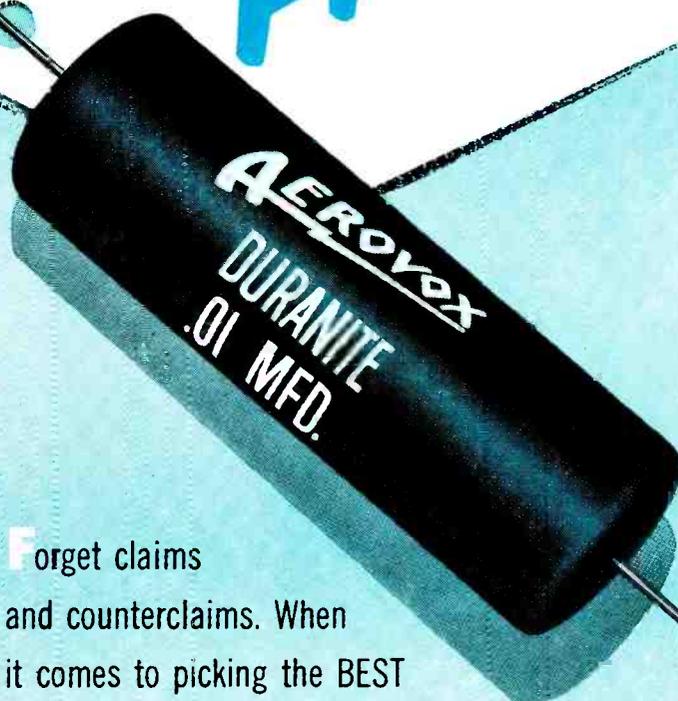
Just letting off a little steam in this commentary on the service business. If you can use it in a letter to the editor or something, fine.

Various groups in electronic service waste a lot of good time criticizing rival groups; many in official capacity are too bent on promoting their own position to think of the men they are supposed to be representing; some individuals so concerned with doing things their own way become disgruntled with an existing organization's way of doing things and promote disunity and duplicate effort by forming rival organizations; and worst of all, too many men are more concerned about day to day problems than to even support an organization in the first place.

One only has to look to other fields to see what can be accomplished by a strong UNIFIED trade association. Just for one example, the National Retail Hardware Association, composed of thirty-seven state and regional associations; has 23,000 members; a full time managing director; a full time trade relations man; puts out a monthly magazine almost a half inch thick, a yearly list of manufacturers and distributors in the hardware field; supplies over twenty different aids and services on national or state levels, to its members, all for the yearly dues of ten dollars. Of course, they have the advantage of years, having been established over fifty years ago. However, here is one pattern to be followed in the electronic service field. If all electronic service associations in the country will give thought to what can be accomplished by banding together in one strong group, and forward their suggestions to, or at the meeting taking place in Pittsburgh, August 7, perhaps the ground work can be laid for a unified national electronic service trade association. The accomplishment of unity will result immediately in a tremendous increase in the prestige of the servicing industry in the eyes of the manufacturers and the distributors, and eventually the consumer. It has been stated that the service industry is now bigger than either the

[Continued on page 52]

# TRY ONE FREE!



Forget claims and counterclaims. When it comes to picking the BEST molded plastic tubular, there's only one sure way — your own tests. That's why Aerovox offers you a free DURANITE.\* You be the judge and jury.

\*Trade-mark



**AEROVOX CORPORATION**

**DISTRIBUTOR SALES DIVISION**

**NEW BEDFORD, MASS.**

**FILL OUT AND PRESENT THIS COUPON TO YOUR LOCAL AEROVOX DISTRIBUTOR . . .**

I'm trying a DURANITE for myself . . .

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FIRM \_\_\_\_\_

ADDRESS \_\_\_\_\_

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

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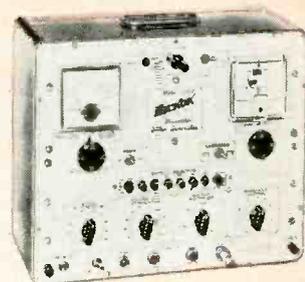
# white



*Philco*



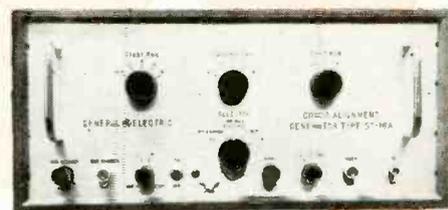
*Jackson*



*Hickock*



*Heathkit*



*GE*



*Simpson*



*Win-Tronix*



*Triplet*

**W**HITE Dot generators are designed to provide a dot pattern on the face of the picture tube primarily for adjustments of static and dynamic convergence. It is reasonably safe to predict that anyone engaged in servicing and installing color TV receivers will find that convergence adjustments will be most common, and that unless he has available a white dot generator he will be unable to render such service.

Basically, the dot generator consists of synchronized vertical and horizontal oscillators the outputs of which are fed into suitable circuits which are gated to produce dots instead of a cross-hatched pattern. This signal is then applied through a modulator to an *rf* oscillator which may either have a fixed frequency depending on the desired channel, or the *rf* oscillator may be tuneable through any of the *vhf* channels, from 2 to 6 or from 2 to 13.

#### Extra Functions

Various manufacturers make available vertical and horizontal bars and cross-hatch patterns for adjustment of linearity. These vertical bars are not to

be confused with color bars which are included in some generators. Color bars are signals representing color sequences of predetermined hue and saturation. The products shown on the adjoining page are generators which have been chosen because they *do* provide a white dot pattern. The fact that some of these generators provide additional signals is incidental to this presentation.

#### Stability

One of the most important qualities to look for in a White Dot generator is dot stability. Unless the dot display is stationary, free from jitter, weaving, fading, streaking, etc., adjustment can be a most frustrating endeavor. Needless to say freedom from these distractions depends on the care and additional control circuits a manufacturer provides in his instrument. A further precaution that the user may have to resort to is the use of some sort of voltage regulator, especially in areas where the demand loads vary considerably during the course of a day. One cannot stress too much the desirability of a firmly locked dot pattern when making convergence adjustments.

#### Dot Size

Instruments generally provide adjustments for varying the dot size and number. The dot size should be adjusted so that optimum accuracy of adjustment may be made. Too small a dot prevents observation of overlapping of the color dots, and too large a dot results in a high degree of mutual reaction of the magnetic structure corresponding to the dots rendering the ultimate adjustment inaccurate. A good practical dot size is about 1/16 inch. The number of dots vary between eight and twenty, horizontally and vertically.

#### Connections to Receiver

Connections to the receiver may be made directly to the antenna by means of a modulated *rf* signal available for a particular channel, or for any of six or twelve variable channels, depending on the manufacturer. In some instruments additional provisions are made for connecting the dot signal to the receiver directly into the video amplifier. In the first case, that is using a modulated *rf* signal, convenience of connection is the motivating factor. Where direct connection can be made to the video amplifier it may be found that the dots are much crisper.



**Kay**



**Hycon**

# generators

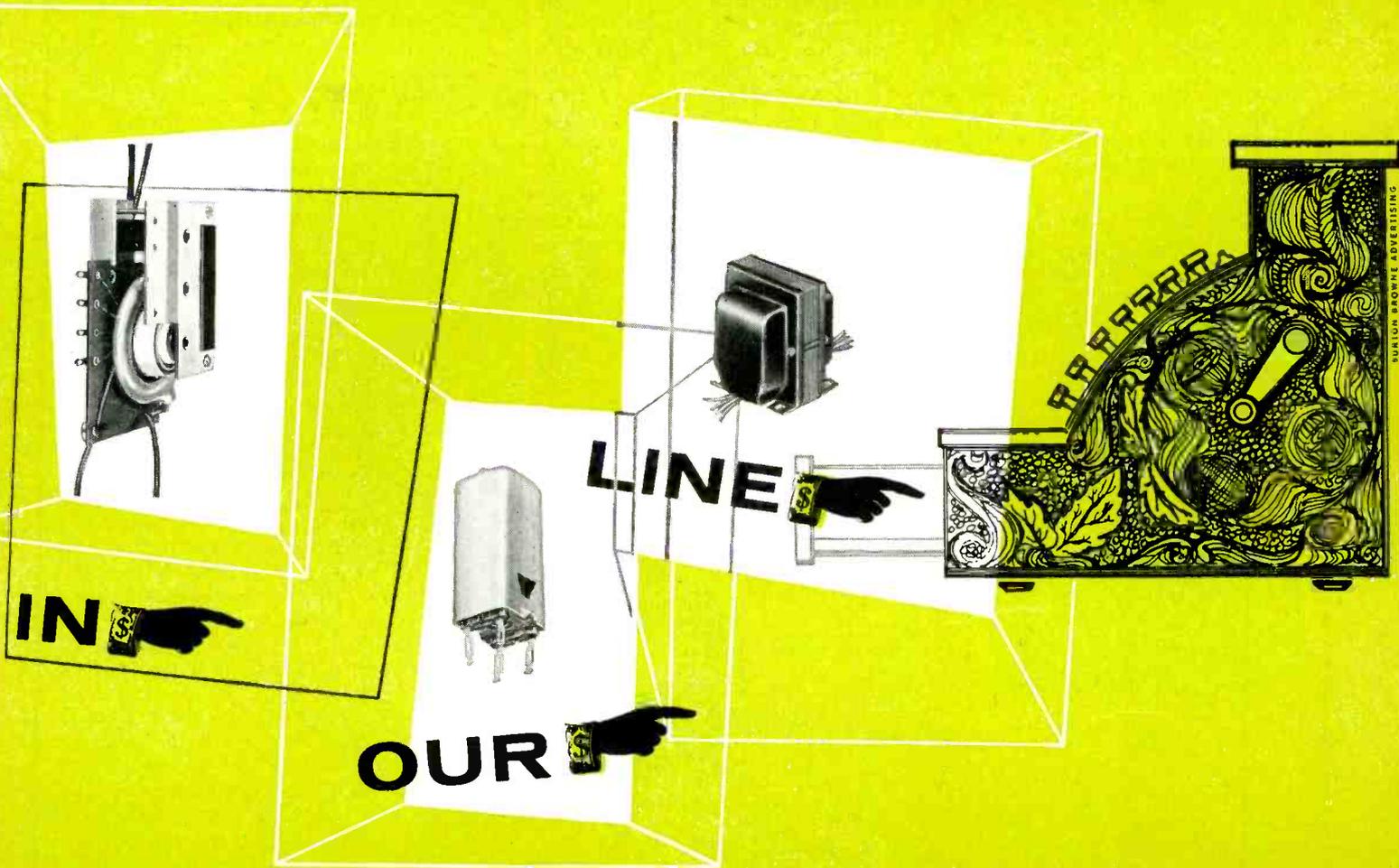


**RCA**



**EMC**

# NO DUST CATCHERS



SURTON BROWNE ADVERTISING

... 101 new items added in the last 300 days keep Merit's line of coils and transformers *the most complete* replacement line in the TV-Radio field ... and that's why more and more servicemen come to Merit for their "Single Source"!

Merit products are listed in Howard Sam's Photofacts and Counter Facts.



MERIT COIL & TRANSFORMER CORPORATION  
4427 North Clark Street, Chicago, Illinois

# color signal

# output systems

## Part 3

by Bob Dargan  
and Sam Marshall

from a forthcoming  
book entitled  
"Fundamentals of Color Television"

Circuit analyses and tracking procedures for Equal Drive R-Y/B-Y video output circuits in color receivers are discussed in this installment on output systems.

COLOR circuitry involving the color video output stages following the demodulator section is progressively simplified for the three types of demodulators used. Earlier installments in this series categorized these types as follows:

1. I/Q
2. R-Y/B-Y (low level)
3. High level (two triode or three triode)

In the preceding installment an analysis was made of the video output stages involved in an I/Q receiver. In

this installment we will describe the action taking place in the video output stages of a typical low-level R-Y/B-Y receiver and in a high level 2-triode demodulator receiver.

### Low-level R-Y/B-Y Video Output Analysis

A simplified circuit of the video output section of an R-Y/B-Y receiver is shown in Fig. 1. Observe that the outputs of the R-Y and B-Y demodulators are fed into separate amplifiers. The B-Y amplifier has a variable gain control (Blue Gain), while the gain of the R-Y amplifier is fixed. The outputs of these amplifiers then take two paths. First they are fed into the respective red and blue grids of the picture tube and at the same time fed into a matrix network,  $R_1$ ,  $R_2$ , and  $C_1$ . These components are selected so as to obtain proper mixture of the R-Y and B-Y color video information to produce G-Y. Capacitor,  $C_1$  is inserted in the R-Y leg to improve the bandwidth of the R-Y signal at this point.

The G-Y signal is developed in accordance with the formula:

$$G-Y = -.51(R-M) - .19(B-M)$$

The G-Y output of this matrix is then fed into a G-Y amplifier, the output of which feeds the green grid of the picture tube. A Green Background control varies the bias and hence the illumination of the green gun. Thus, variable gain is provided for both the blue and green amplifiers, and fixed gain for the red amplifier. This arrangement allows for the application of the correct ratio of R-Y, B-Y, and G-Y signals on the

[Continued on page 15]

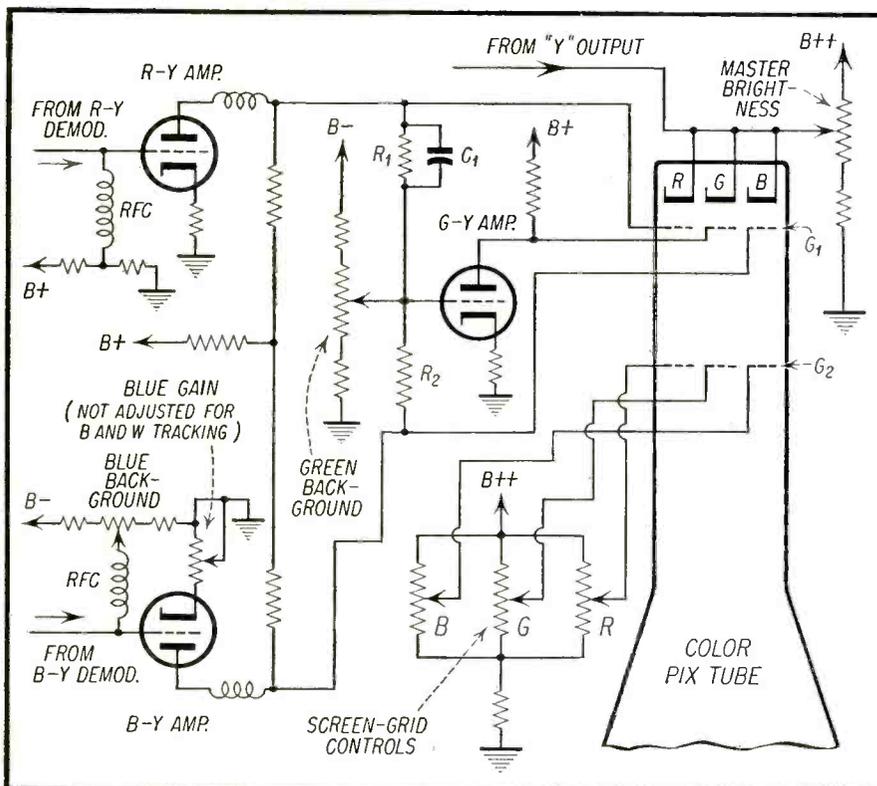


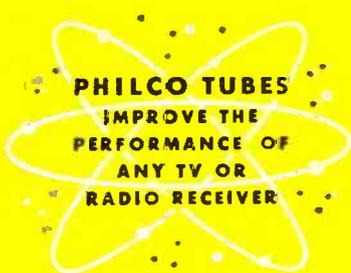
Fig. 1—Simplified circuit diagram of video output stages of an R-Y/B-Y color receiver. In contrast to the red amplifier gain which is fixed, the blue and green amplifier gains are made variable. This expedient results in only two variable controls being needed for gain adjustments.

*NOW!*

**PHILCO**



MODEL 7100



**PHILCO**  
UNIVERSAL  
Color Bar and Dot Bar  
**GENERATOR**

# Puts You in the Color Service Business with One Instrument!

## A COMBINED COLOR-BAR AND DOT-BAR GENERATOR PLUS A DYNAMIC WHITE BALANCE TEST

From Philco laboratories comes one compact generator with all Color Bar and Dot Bar Generator features—a new versatile instrument that meets all color service requirements . . . on the bench or in the field! Used in conjunction with present monochrome test equipment, the Philco Model 7100 Universal Color Generator fully equips the service man to completely trouble-shoot circuits associated with color reproduction and make accurate convergence adjustments . . . in any color receiver made. The full-screen 10 bar color pattern was developed to provide rapid, accurate servicing. See the Philco Universal Color Bar and Dot Bar Generator at your Philco distributor's.

### Look at These Special PHILCO Features!

1. Signals for checking and setup of: Static and Dynamic Convergence; Dynamic White Balance, Frequency of Color Oscillator; Phase of Demodulators; Matrix Circuits; Color and black and white linearity.
2. Four crystals control picture and sound carriers.
3. Two additional crystals control internally generated color signals and horizontal sync pulses.
4. Fully regulated Power supply.
5. Visual markers simplify identification of color bars.

**SAVE UP TO \$130.00**

By buying PHILCO, you save up to \$130.00 over other equivalent types of equipment that give you the same service functions. This compact Philco Color Bar and Dot Bar Generator gives you the features of *two* generators . . . at a much lower cost!

COMPLETE PRICE ONLY

**\$269.50**

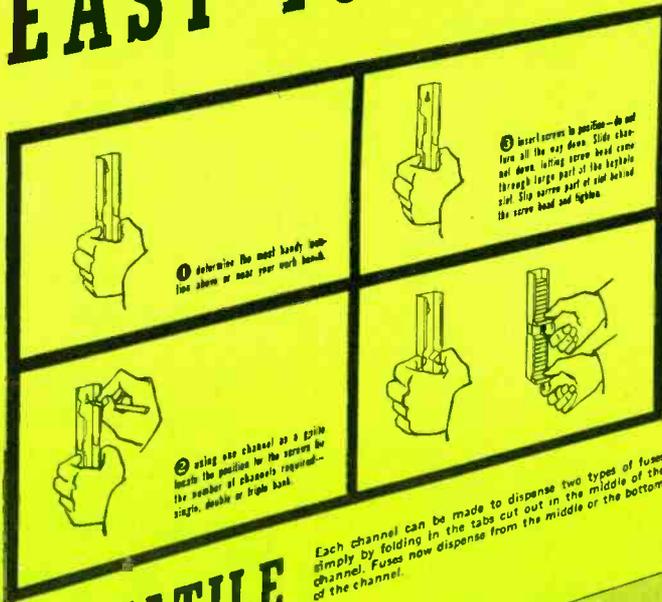
**Compare Value! Performance! Features!**

PHILCO CORPORATION *Accessory Division*  
"A" & Allegheny Avenue, Philadelphia 34, Pa.



LITTELFUSE

EASY TO MOUNT



VERSATILE

Each channel can be made to dispense two types of fuses simply by folding in the tabs cut out in the middle of the channel. Fuses now dispense from the middle or the bottom of the channel.

To serve you ... to increase your profits...

LITTELFUSE

again streamlines your fuse service operation with a program that makes sure you have the right fuse at your fingertips at all times—time saved, effort saved build up your service profits.

ASK YOUR JOBBER about the Littelfuse Single Channel Fuse "Stocker" Package: 10 single (double dispensing) fuse channels, 10 boxes (50) 3 AG 1/4 fuses and 10 boxes (50) 3 AG 1/2 fuses in one complete package FOR THE COST OF THE FUSES ALONE.

red, blue, and green picture tube grids respectively.

The "Y" signal is fed from the "Y" amplifier into the three externally connected cathodes of the picture tube where it mixes with the color-difference signals to provide the individual red, green, and blue signals for each of the three color guns. Thus:

$$(R-Y) + Y = R$$

$$(B-Y) + Y = B$$

$$(G-Y) + Y = G$$

The correct amounts of "Y" signal for this purpose may be obtained by varying the contrast control. Note that the same amplitude of video brightness signal is being fed into the cathodes, and inasmuch as no chrominance signals enter into the black and white tracking adjustments that follow, equal video brightness signals are being applied to all three guns. This technique gives rise to the term, "Equal Drive".

Overall correct background brightness may be obtained by varying the Brightness Control as will shortly be obvious. It will also be shown that the adjustment of the various controls just mentioned are vitally affected by the individual screen grid ( $G_s$ ) control settings. These controls, as discussed in previous installments, are designed to compensate for the unequal light output efficiencies of the red, blue, and green phosphors (see June 1955 RTSD, p. 10, Fig. 5; and July 1955 RTSD, p. 11-13).

### High Level Color Video Output Circuit

The color video output circuit of a High-Level receiver is relatively simple when compared to I/Q and Low-Level R-Y/B-Y receivers. Thus, referring to Fig. 3 we observe that the outputs of the R-Y and B-Y demodulators are connected to the respective grids of the picture tube directly. The G-Y signal, derived at the cathodes of the R-Y and B-Y demodulators, is fed directly into the green grid of the picture tube.

A "Y" signal from the brightness section is fed into the tied-together cathodes of the picture tube. Electronic mixing of the color-difference and the "Y" signals then results in the three color signals R, G, and B.

The number of controls used in this system, as compared to the previously described systems, have been reduced considerably. Thus, one set of screen controls provides complete adjustment of the required relative screen grid potentials, and one set of picture tube bias controls provides complete adjustment of the required relative control grid potentials on the picture tube grids. The "Y" signal amplitude is adjusted by means of a contrast control (not shown). Together, these controls pro-

vide adjustments for obtaining satisfactory black and white and color pictures at all settings of the brightness control.

### Tracking Analysis of Equal Drive Systems

Equal Drive systems are generally used in low-level R-Y/B-Y and high-level 2-triode demodulator receivers. On the other hand Unequal Drive systems are generally associated with I/Q receivers. In last month's installment we discussed black and white tracking (maintaining a black and white picture as the brightness control is varied) for an Unequal Drive system. We will now do the same for an Equal Drive system.

Let us take inventory of the controls we have available to adjust for black

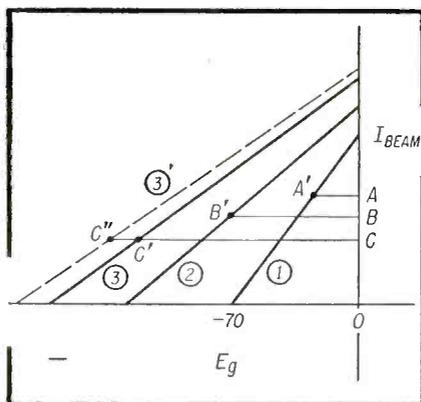


Fig. 2—Curves showing beam current versus grid voltage for the three guns of the picture tube. Curve 1 corresponds to the red beam, curve 2 to the green beam, and curve 3 to the blue beam.

and white tracking in a typical R-Y/B-Y low level receiver as shown in Fig. 1. These are:

1. Screen Grid ( $G_s$ ), of which there are three.
2. Blue Background, for controlling the  $G_1$  bias on the blue gun with reference to the cathode of the picture tube.
3. Green Background, for controlling the  $G_1$  bias on the green gun with reference to the cathode of the picture tube.
4. Master Brightness, for controlling the  $G_1$  bias on all guns by varying the common cathode potential of all three guns simultaneously.

We must first establish an initial condition against which subsequent adjustments may be referred. A simple technique is to apply a fixed potential on the red  $G_1$  in the order of approximately -70 volts (see Fig. 2). This may be done by setting the Master Brightness control to the middle of its range. This voltage becomes the cutoff

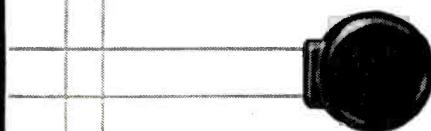


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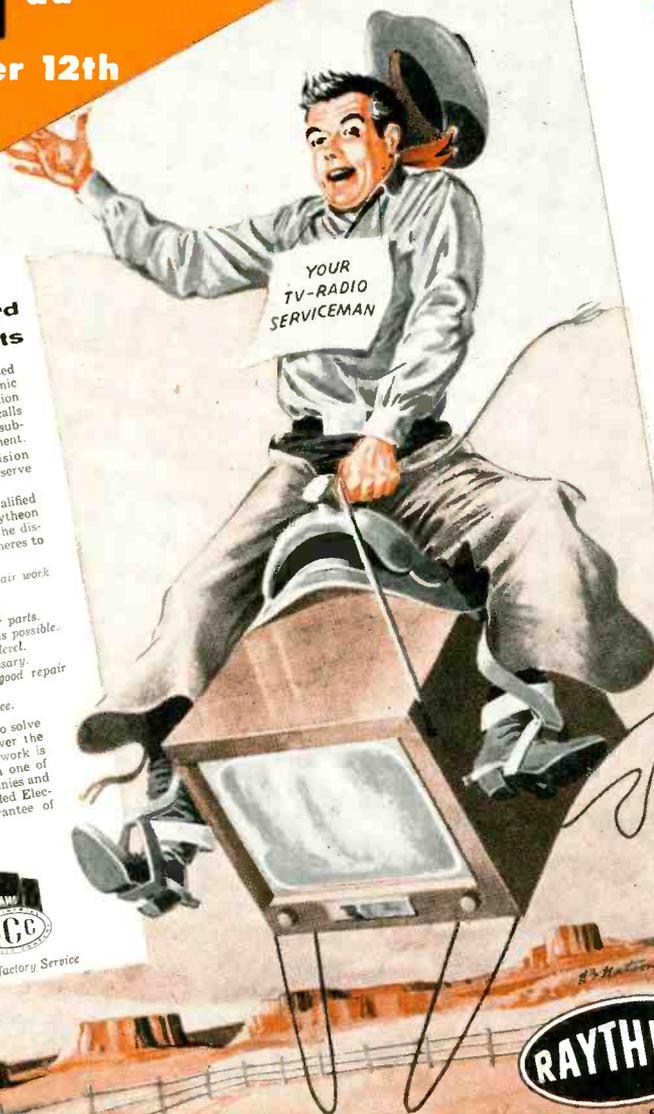
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[from page 15]

potential of the red gun by adjusting the red  $G_2$  control as follows:

1. Tune in and adjust the contrast control for a satisfactory bar pattern representation providing a black, a gray, and a white bar. A standard monochrome transmission may also be used for this purpose by the experienced serviceman.

2. Cut off the blue and green guns by turning the blue and green  $G_2$  controls counter clockwise.

3. Adjust the red  $G_2$  so that a black bar is barely visible. The operating characteristic of the red gun has now been set as indicated by curve 1 in Fig. 2.

4. Adjust the blue and green  $G_2$  controls to the middle of their ranges. Now adjust the blue and green  $G_1$  controls simultaneously to present the gray bar free of tint. We have now established a set of conditions so that the beam currents in each of the three guns are in the proper ratio required to present the gray bar free of tint. Thus, the beam current for the red gun shown by curve 1 is A units, corresponding to point A' on line 1. For the green and blue guns the beam currents B' and C' correspond to the characteristic curves, 2 and 3.

These curves were established by virtue of the screen grid voltages for the blue and green guns which we adjusted initially in Step 4. However, they may or may not be correct inasmuch as the original settings of the blue and green  $G_2$  controls were arbitrary. The test of whether or not these two operating curves (lines 1 and 2) are the proper ones is to examine the white bar for color tinting. If the white bar is in fact "white" then the job is finished; if not, we will observe a contaminating tint indicating that one or both curves are in error.

As an example, suppose that a blue tint is observed in the white bar. At the outset it must be kept in mind that as the  $G_2$  voltage of a particular beam is increased its corresponding slope is decreased. Thus, curve 1 has the lowest screen potential and curve 3 the highest. Keeping this in mind and observing that white has been tinted blue we should realize that with the increase in video drive in going from gray to white (using the same drive voltage on all three guns) the blue beam current has increased too rapidly, thereby upsetting the beam current ratios or tracking. This means that the blue screen voltage was too low, requiring an increase in  $G_2$ . Now, on making this increase we will observe an untinted white.

However, on reexamination of the

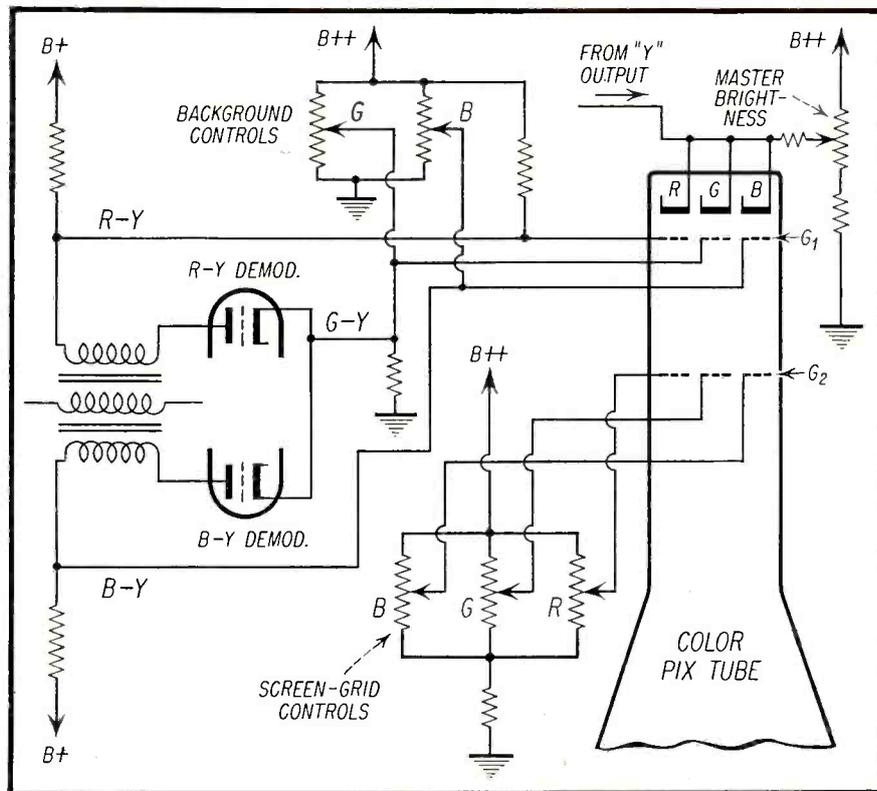


Fig. 3—Simplified circuit diagram of video output stages of a high level 2-triode color receiver. Observe that the controls are the same in number and function as in Fig. 1.

gray bar we will observe that the gray bar is now tinted blue because of the adjustment just made. We now adjust the blue  $G_1$  again by increasing the bias on the blue gun. The new blue gun characteristic curve is now curve 3' in Fig. 2. The gray bar beam current for the blue gun is still C units but corresponds to point C' on curve 3'. If this readjustment has been made properly, examination of the white bar will reveal no color tinting, and we have established proper tracking.

The final test of course is to manipulate the contrast and brightness controls throughout their entire ranges for observation of black and white reception without tinting. Although the previous illustration indicated simple blue contamination, in practice a careful observation of the white bar contamination will generally reveal a complex tint. This requires careful readjustments of the blue and green controls.

#### Summary of Adjustments

To summarize, in brief, the adjustments required for correct black and white tracking of an R-Y/B-Y receiver we proceed as follows:

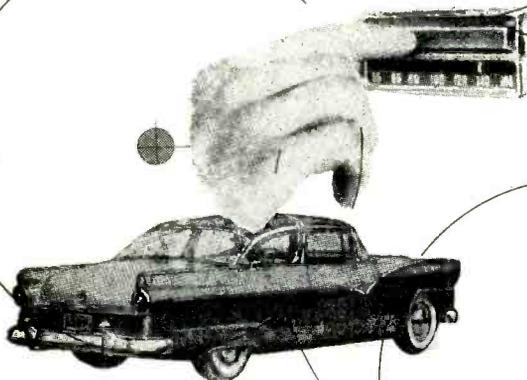
1. Set Master Brightness Control to middle of its range.
2. Tune in a bar pattern.
3. Cut off the blue and green  $G_2$ .
4. Adjust the red  $G_2$  for a low luminance black bar.

5. Adjust the blue and green  $G_2$  controls to the middle of their ranges.
6. Adjust the blue and green  $G_1$  controls for a tint free gray bar.
7. Examine white bar for contamination.
8. Increase  $G_2$  potential corresponding to contaminating color.
9. Readjust  $G_1$  for same color to reestablish gray bar.
10. Recheck white bar.

#### High Level 2-Triode Output System

Referring to Fig. 3 we observe a basic simplified High Level 2-Triode video output circuit showing connections to the picture tube and associated controls. Note that the controls shown are in exact correspondence with respect to type, location, number, and function with the controls indicated in Fig. 1. Hence it follows that as far as the picture tube is concerned the internal matrixing and tracking requirements are identical in the two systems. From this we have only one conclusion, namely, that the black and white tracking procedure outlined previously holds true identically for the high level system. As a matter of fact regardless of the possible variations that might be developed in the future for B-Y/R-Y designs utilizing Equal Drive and matrixing in the picture tube, this procedure will in all likelihood be applicable.

# SIGNAL SEEKING



*in auto radios*

## PART TWO

by Steve Travis

**This installment describes the mechanical and electrical action taking place in the new 1955 Delco "Signal Seeking" Auto Radios.**

ALL of the 1955 General Motors cars can be equipped with the new Delco "Signal Seeking" radios. These latest radios provide a variety of tuning methods. The user can employ the station selector bar and make use of the "Signal Seeking" electronic and mechanical device to change programs or he can press a "Favorite Station" push button to select a particular radio channel, or he has the additional option of manually tuning the radio. Besides this, a foot switch may be incorporated, if desired, to provide another means of changing stations. With the foot switch it is not necessary to remove the hand from the steering wheel to accomplish the station change. The foot tread can be used to switch to the next broadcast station higher in frequency or it can be held depressed until the dial indicator approaches the particular station desired. Then, the foot switch is released and the station seeking function causes the tuning mechanism to stop at the desired radio station. This feature combines safety with convenience.

### Sensitivity Control

The sensitivity control, a four position switch, permits the operation to determine the number of stations that will be search-tuned by setting the level of gain of the *rf* and *if* stages. Thus, the number of stations receivable can be changed so that in the minimum sensitivity position only the four or five very strong stations will be automatically tuned. As the sensitivity is increased by changing the switch position more stations will be received of sufficient level to trigger the relay tube.

### Tuner Mechanical Movement

The Delco tuner is not activated with an electric motor as are some other tuners but it is caused to sweep across the radio band through the use of energy stored in a stretched spring. The power spring as shown in Fig. 2 couples its motivating force to a gear train and a planetary arm. Connected to the planetary arm is the core bar which has fastened to it one end of the tuning cores. Thus, mechanically, the core bar

controls the movement and position of the *rf* and oscillator tuning cores in the inductance tuning process. The gear train has at its end a nylon paddle wheel. This paddle wheel performs two functions; that of acting as an air vane and thereby restricting the gear train to a relatively constant speed plus that of providing a means of stopping the movement of the gear train by the engagement of a relay arm in the paddle wheel. This can be noted in the block diagram of the electrical components together with the mechanical items comprising the "Signal Seeking" control unit as shown in Fig. 1.

### Sequence of Mechanical Operation

When the station selector bar is depressed the relay is energized removing the relay arm from the paddle wheel. The power spring, due to the energy stored in it slowly moves the planetary arm to which is attached the core bar and tuning cores. The planetary arm is swung on its pivot and the cores are withdrawn from the *rf* and oscillator coils tuning them to higher radio frequencies. This movement of the arm causes the gear train and paddle wheel to revolve. At the same time the dial pointer, linked indirectly to the planetary arm, moves across the scale towards the high frequency end of the scale.

When a radio signal is reached the trigger tube conduction is blocked and the relay is opened. The spring loaded relay arm drops into the paddle wheel stopping the gear train and the movement of the planetary arm with the tuning cores. A drawing of the paddle wheel, relay arm and relay is shown in Fig. 3.

### At the High Frequency End

In the "Signal Seeking" operation the tuning and dial indicator travel is from the low frequencies of the radio broadcast band to the high frequency end. When the contraction of the power spring has caused the tuning to reach the limit of the higher frequency tuning a switch operating cam engages a tuner return switch causing it to be closed. Battery voltage is thereby applied to the solenoid causing its plunger to be drawn into the solenoid windings. The solenoid linkage attached to the plunger causes the power spring to be again expanded and placed under maximum tension. During this time the tuning mechanism comprising the planetary arm, dial pointer and core bar is returned to the position of the low frequency end of the broadcast band where the searching operation is resumed. During the recocking of the power spring a ratchet disengages the gear train permitting the power spring to be expanded without having to reverse the gear train movement and revolve the gears.





# Circuit

# Analysis

by Radio Television  
Service Dealer  
Technical Staff

**This Month's Circuit—**  
Horizontal afc phase detector  
Motorola TS-531 and TS-609 Ch.

**T**HE circuit chosen for analysis in this issue is that of a triode horizontal afc phase detector. The particular circuit chosen is from the Motorola TS-531 and TS 609 chassis. It is frequently used in other models and by other manufacturers. Fig. 1 is a schematic of the circuit under consideration. Fig. 2 is its block diagram.

### Block Diagram Analysis

Referring to the block diagram, we can see that basically, the operation of the circuit is similar to that of most other afc circuits. The phase detector stage receives three input signals. These are a positive sync pulse from the 2nd sync clipper, a negative sync pulse from the same source, and a sawtooth wave derived from the horizontal output stage. By operating the 2nd sync clipper as a phase splitter, the positive sync pulses are obtained from the plate circuit, while the negative pulses are simultaneously developed in the cathode circuit.

The output of the phase detector is a dc control or correction voltage. The frequency of the input sync pulses must be correct, at 15,750 cps, since they are derived from the transmitted signal. The frequency or phase of the sawtooth wave may or may not be correct due to instability of the horizontal oscillator. If the frequency and phase of the sawtooth input match those of the input sync pulses, the control voltage at the output of the phase detector will be zero. If the sawtooth is off frequency, or out of phase, or both, a control voltage will be developed which will be either positive or negative and of a value which depends on how far off frequency or off phase the sawtooth may be. Keep in mind of course, that

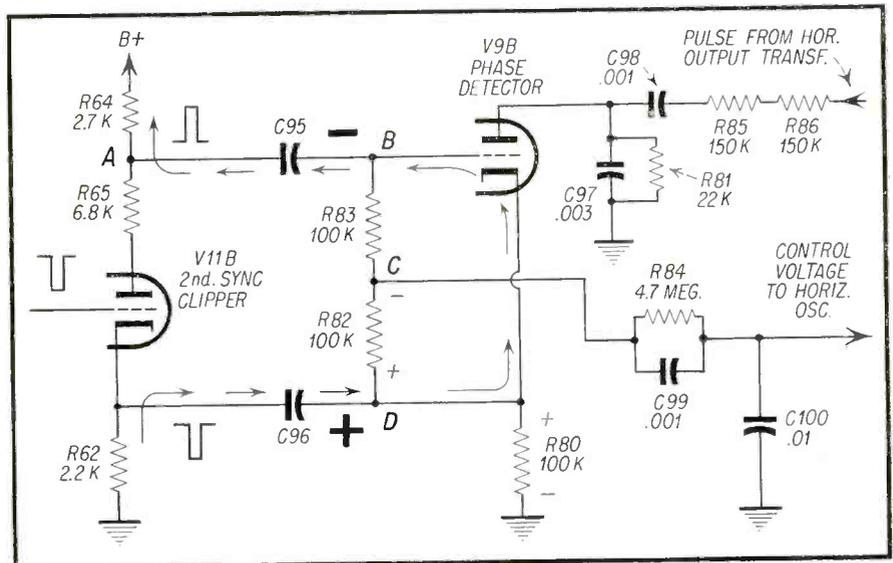


Fig. 1—AFC circuit of Motorola TS-531 and TS-609.

this sawtooth represents the frequency and phase of the oscillator.

The control voltage is now fed into the oscillator. A zero control voltage has no effect, which is as it should be, since this indicates that the oscillator is on frequency and in phase. Any value of control voltage other than zero acts in such a way as to bring the oscillator back to the correct frequency and phase thus accomplishing the function of an afc circuit.

### Detailed Circuit Analysis

Referring to Fig. 1, we observe that the sync pulses at the input to the 2nd sync clipper are negative in polarity. As a result, we have positive pulses at the plate and negative pulses at the cathode of V11B.

Resistors R64 and R65 in the plate circuit of V11B form a voltage divider so that the positive pulse taken off at the junction of these resistors is equal in magnitude to the negative pulse at the cathode. The positive pulse is coupled to the grid of the phase detector V9B, via C95 and the negative pulse is coupled to the cathode of V9B via C96.

Since, this pulse makes the grid positive with respect to its cathode, a grid current flows through V9B as indicated by the light arrows. This action occurs only at the time of the sync pulse. Since the grid to cathode path is one of low resistance, C95 and C96 charge up quickly to the peak value of the sync pulses. The polarity of these condenser charges are as indicated in Fig. 1, so

## ADJUSTMENTS

### FOCUS

The focus control is located on the back of the chassis. With the brightness and picture controls set at their normal operating positions, the focus control should be adjusted for best focus.

### CENTERING

Centering is accomplished by rotating the centering magnet adjusting rings clockwise or counterclockwise as required. The two adjustment rings are located on the back of the deflection yoke. A tab projection on each of the rings serves to facilitate adjustment. If difficulty is experienced in centering the picture or eliminating "neck shadows," make certain the CRT cushion is tight against the flare in the CRT. Also make certain that the deflection yoke is as far forward as possible.

### CATHODE RAY TUBE CUSHION

The CRT cushion must fit snugly against the flare of the CRT in order that the rear of the tube will be supported firmly. If this condition is not obtained, loosen the CRT cushion adjustment screws and the deflection yoke adjustment screw, slide the CRT cushion forward as far as possible, and re-tighten the screws.

### HORIZONTAL RINGING COIL

The horizontal ringing coil (L400) should be adjusted as follows:

1. Short out the ringing coil with a short jumper wire.
2. Set the horizontal hold control to the middle of its range, and leave it in this position during the steps that follow.
3. Connect a VTVM to the pin #2 grid circuit of the horizontal multivibrator, so as to measure the DC voltage between this point and ground.
4. With the receiver tuned to a TV station, adjust C421 (located on the rear of the chassis) for zero voltage on the meter. If zero voltage can be approached but not quite reached at one extreme of the C421 adjustment, it may be necessary to set the horizontal hold control slightly to one side of mid-position to obtain zero voltage.
5. Remove the jumper from across the ringing coil.
6. Adjust the ringing coil for zero voltage on the meter, and check the adjustment by switching to another channel and then back again. The receiver should pull into horizontal synchronization on all channels.

### SOUND ALIGNMENT PROCEDURE

To use an "air" signal for alignment:

1. Tune the receiver to a TV station and connect an attenuator between the receiver and the antenna so that the strength of the

signal can be varied from weak to strong.

2. Set the quieting control located on the back of the chassis approximately to its mid-position.
3. Adjust the 4.5 mc. I-F slugs (L200 and L201) for maximum program sound. If peaks occur at two different positions of the slug, use the peak that occurs when the slug is farthest counterclockwise. Reduce the signal to its lowest usable level and recheck the adjustments.
4. Apply a strong signal to the receiver, and adjust the quadrature coil (L202) for maximum program sound. If peaks occur at two different positions that are widely separated, use the one that occurs with the slug farthest counterclockwise. If two peaks occur within a narrow range of adjustment, sufficient signal is not being applied to the receiver or the quieting control is not set at the desired position.
5. Apply a very weak signal that allows noise to be heard and adjust the quieting control for minimum noise. The position at which the noise is minimized depends on the strength of the signal; therefore, the weakest usable station in the area should be used for this adjustment. This control determines the AM rejection characteristics of the sound system, and its correct setting is normally about mid-position. *Do not leave the quieting control set at its maximum counterclockwise position.*

### AGC CONTROL

Allow the receiver to warm up for at least five minutes before adjusting the AGC control. With the receiver tuned to the strongest signal in the area, rotate the AGC control clockwise until the receiver begins to overload or, if the signal is weak, until snow on the picture becomes more pronounced. Then rotate the control counterclockwise to the position where best picture with minimum snow and no sign of overload is obtained. Make certain that overload does not occur on any channel. If evidence of overload is noticed, rotate the AGC control counterclockwise until the condition disappears.

It is recommended that the strongest signal in the area be used when adjusting the AGC control. If a weak signal is used during the adjustment, the control may be set too far in a clockwise direction to permit reception of a strong signal without overload.

### QUIETING CONTROL

The quieting control is located on the back of the receiver and is adjusted by means of a screwdriver inserted through the hole in the back cover. This control, which determines the AM rejection characteristics of the sound system, is normally adjusted during alignment of the sound system, and will not ordinarily require further adjustment. In very weak signal areas, however, a reduction in noise or hiss on the sound may be obtained by slightly re-adjusting the control.

## WESTINGHOUSE TROUBLE SHOOTING CHART

### ENGRAVED EFFECT IN PIX

Tuner fine tuning  
Contrast con.  
V2, V3, V4, V5, V6, V7, V17  
Check Vid. Det. xtal (CK704, IN60 or IN64)  
AGC con.  
Check Vid. Det. and Amp. peaking coils

### VERT. BARS

Hor. Drive con.  
V14, V16  
Check 51  $\mu\text{f}$  cap. connected to yoke terminals  
Defl. yoke ringing

### PIX BENDING

Hor. Hold and Freq. con.  
V12, V13, V14  
Check 0.005 and 0.01  $\mu\text{f}$  caps. connected to pin 2 of V13

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

Tuner fine tuning  
V1, V2, V3, V4, V5, V6, V7  
Check Vid. Det. xtal (CK704, IN60 or IN64)  
RF and IF alignment

### EXCESSIVE RASTER (PIX SIZE)

Hor. Drive con. Size  
Hor. and Vert. con.  
V14, V15, V16, V17  
connected to pin 4 of V14

### RASTER BLOOMING

Hor. Drive con.  
V14, V15, V17  
Check HV Filter cap.  
Check 330k $\Omega$  Res. connected to HV Filter cap.

### INSUFFICIENT RASTER WIDTH

Hor. Drive and Size con.  
V13, V14, V16, V18, V19  
Check 0.01  $\mu\text{f}$  cap. connected to pin 6 of V13  
Hor. Out trans.  
Low line voltage

### NO RASTER—SOUND OK

Brightness con.  
Check HV Fuse F400 (0.25 Amps.)  
Ion trap  
V13, V14, V15, V16, V17  
HV trans. Hor. yoke CRT connections

### POOR HOR. LIN.

Hor. Lin. and Drive con.  
V14, V16  
Check 0.005 and 0.04  $\mu\text{f}$  caps. connected to Hor. Lin. coil  
Hor. Out trans.

### POOR VERT. LIN.

Vert. Size and Lin. con.  
V10, V11  
Check 0.05  $\mu\text{f}$  cap. connected to pin 5 of V10  
Check 0.1  $\mu\text{f}$  caps. connected to pin 2 of V11  
Check 150  $\mu\text{f}$  Elec. cap. connected to pin 3 of V11  
Vert. Out. trans.

### PIX JITTER UP & DOWN

Vert. Hold and Contrast con.  
V7, V8, V9, V10  
Check 0.01  $\mu\text{f}$  cap. connected to pin 4 of V10  
AGC con.

### SMEARED PIX

Tuner fine tuning  
Contrast con.  
V3, V4, V6, V6, V7  
Check Vid. Det. and Amp. peaking coils  
Check Vid. Det. xtal (CK704, IN60 or IN64)  
IF and RF alignment  
AGC con.

### SOUND BARS IN PIX

Tuner fine tuning  
V1, V2, V3, V4, V5  
Check adjustment of L200  
Check Vid. Det. xtal (CK704, IN60 or IN64)  
IF and RF alignment

### INSUFFICIENT RASTER HEIGHT

Vert. Size and Lin. con.  
V10, V11, V18, V19  
Check 0.1  $\mu\text{f}$  caps. connected to pin 2 of V11  
Check 0.05  $\mu\text{f}$  cap. connected to pin 5 of V10  
Vert. Out. trans.  
Low line voltage

### NO VERT. DEFL.

V10, V11  
Check 0.1  $\mu\text{f}$  cap. connected to pin 2 of V11  
Check 0.05  $\mu\text{f}$  cap. connected to pin 5 of V10  
Check 0.01  $\mu\text{f}$  cap. connected to pin 4 of V10  
Vert. Defl. coils (yoke)  
Vert. Out. trans.

### NO SOUND—PIX OK

Tuner fine tuning  
Vol. con.  
V20, V21, V22, V23, Quieting con.  
Speaker (open voice coil or defective connection)  
Sound and Vid. IF alignment L200, L201  
Det. alignment L202



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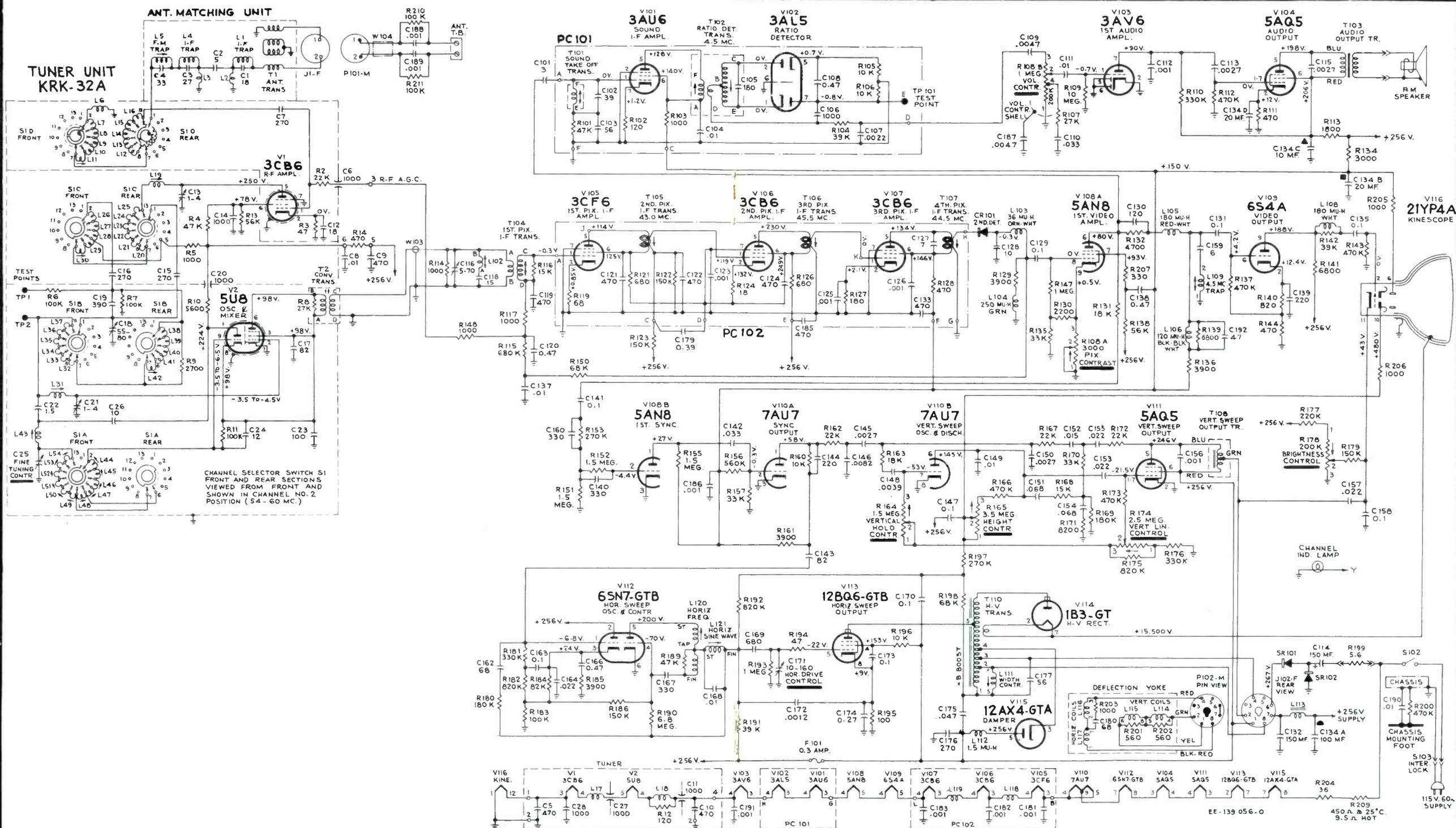
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John F. Rider

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
C14	77252	Capacitor—Fixed, ceramic, 1000 mmf., +100—0%, 500 v. DC	R9	502227	Resistor—Fixed, composition, 2700 ohms, ±10%, ½ w. Part of S2	C128	33098	Capacitor—Fixed, ceramic, 10 mmf., ±1 mmf., 500 v. DC	C174	73786	Capacitor—Fixed, paper, 0.27 mf., ±10%, 200 v. DC
C15	77838	Capacitor—Fixed, ceramic, 270 mmf., ±20%, 500 v. DC. Part of S3	R10	502256	Resistor—Fixed, composition, 5600 ohms, ±10%, ½ w.	C129	73784	Capacitor—Fixed, paper, 0.1 mf., ±20%, 200 v. DC	C175	73597	Capacitor—Fixed, paper, .047 mf., ±10%, 1000 v. DC
C16	77838	Capacitor—Fixed, ceramic, 270 mmf., ±20%, 500 v. DC. Part of S2	R11	502410	Resistor—Fixed, composition, 100,000 ohms, ±20%, ½ w.	C130	71614	Capacitor—Fixed, ceramic, 120 mmf., ±10%, 500 v. DC	C176	79022	Capacitor—Fixed, mica, 270 mmf., ±20%, 1000 v. DC
C17	78603	Capacitor—Fixed, ceramic, 82 mmf., ±10%, 500 v. DC	R12	502112	Resistor—Fixed, composition, 120 ohms, ±10%, ½ w.	C131	79149	Capacitor—Fixed, paper, 0.1 mf., ±20%, 600 v. DC	C177	79830	Capacitor—Fixed, ceramic, 56 mmf., ±10%, 600 v. DC
C18	79551	Capacitor—Trimmer, 55-80 mmf.	R13	502356	Resistor—Fixed, composition, 56,000 ohms, ±10%, ½ w.	C132	100043	Capacitor—Fixed, electrolytic, 150 mf., —10 +100%, 350 v. DC	C179	79318	Capacitor—Fixed, paper, 0.39 mf., ±10%, 200 v. DC
C19	75641	Capacitor—Fixed, ceramic, 390 mmf., ±10%, 500 v. DC. Part of S2	R14	502147	Resistor—Fixed, composition, 470 ohms, ±20%, ½ w.	C133		Same as C122	C180		Part of Yoke
C20		Same as C6	S1	79722	Stator—Oscillator stator complete with rotor and coils. Includes L43 to L54 Incl.	C134A to D	100044	Capacitor—Fixed, electrolytic, 100/20/10/20 mf., —10 +100/100/100/250%, 350/350/350/50 v. DC	C181		Same as C123
C21		Same as C13	S2	79723	Stator—Mixed stator complete with rotor, capacitors, coils and resistors. Includes R6, R7, R9, C16, C19, C22, L31 to L42 Incl.	C135	73557	Capacitor—Fixed, paper, 0.1 mf., ±20%, 600 v. DC	C182		Same as C126
C22	71500	Capacitor—Fixed, headed-lead type, 1.5 mmf., ±10%, 500 v. DC. Part of S2	S3	79726	Stator—R.F. plate stator complete with rotor, capacitors, coils and resistors. Includes R5, C15, L19 to L30 Incl.	C136	78905	Capacitor—Fixed, paper, 0.22 mf., ±20%, 200 v. DC	C183		Same as C123; Part of PC102
C23	79735	Capacitor—Fixed, ceramic, 100 mmf., +100—0%, 500 v. DC	S4	79724	Stator—R.F. grid stator complete with rotor, capacitors, and coils. C7, L7 to L16 Incl.	C137	73960	Capacitor—Fixed, ceramic, .01 mf., +100—0%, 500 v. DC	C185		Same as C122; Part of PC102
C24	79710	Capacitor—Fixed, ceramic, 12 mmf., ±5%, 500 v. DC	T1	79733	Transformer—Antenna matching transformer complete with capacitors and coils. C1 to C4 Incl.; L1 to L5 Incl.	C138		Same as C128	C186	77252	Capacitor—Fixed, ceramic, .001 mf., +100—0%, 500 v. DC
C25	79192	Capacitor—Fine tuning capacitor, plunger type	T2	79734	Transformer—Converter transformer	C139	71920	Capacitor—Fixed, ceramic, 220 mmf., ±10%, 500 v. DC	C187	100125	Capacitor—Fixed, ceramic, .0047 mf., +100—0%, 1000 v. DC
C26	77865	Capacitor—Fixed, ceramic, 10 mmf., ±1 mmf., 500 v. DC			CHASSIS ASSEMBLIES KCS93B	C140	100123	Capacitor—Fixed, ceramic, 330 mmf., ±10%, 500 v. DC	C188, C189	100124	Capacitor—Fixed, ceramic, .001 mf., +100—0%, 1000 v. DC
C27		Same as C6				C141	73551	Capacitor—Fixed, paper, 0.1 mf., ±20%, 400 v. DC	C190	73594	Capacitor—Fixed, paper, moulded, .01 mf., ±20%, 600 v. DC
C28	77252	Capacitor—Fixed, ceramic, 1000 mmf., +100—0%, 500 v. DC				C142	73552	Capacitor—Fixed, paper, .033 mf., ±20%, 400 v. DC	C191	77252	Capacitor—Fixed, ceramic, .001 mf., +100—0%, 500 v. DC
L1 to L5 Incl.		Part of antenna matching transformer	C101	76507	Capacitor—Fixed, ceramic, 3 mmf., ±1 mmf., 500 v. DC	C143	76473	Capacitor—Fixed, mica, 82 mmf., ±10%, 1000 v. DC	C192	39042	Capacitor—Fixed, ceramic, 47 mmf., ±10%, 500 v. DC
L6	77859	Connector—R.F. grid switch return connector	C102	79323	Capacitor—Fixed, ceramic, 39 mmf., ±10%, 500 v. DC. Temp. coeff. N330. Part of PC101	C144	96518	Capacitor—Fixed, mica, 220 mmf., ±10%, 500 v. DC	CR101	79985	Crystal—2nd detector crystal
L7		Part of S4	C103	79324	Capacitor—Fixed, ceramic, 56 mmf., ±10%, 500 v. DC. Temp. coeff. N750. Part of PC101	C145		Same as C113	F101	78214	Fuse—3 amp. fuse
L8	79728	Coil—Channel #3 R.F. grid coil. Part of S4	C104	73960	Capacitor—Fixed, ceramic, .01 mf., +100—0%, 500 v. DC. High "K" disc. Part of PC101	C146	79019	Capacitor—Fixed, paper, .0082 mf., ±10%, 400 v. DC	J101		Plug—Deflection yoke plug—female
L9	79716	Coil—Channel #4 R.F. grid coil. Part of S4	C105		Part of PC101	C147		Same as C141	L102	78204	Coil—1st I.F. grid trap
L10	79714	Coil—Channel #5 R.F. grid coil. Part of S4	C106	53300	Capacitor—Fixed, mica, 1000 mmf., ±10%, 500 v. DC. Part of PC101	C148	78221	Capacitor—Fixed, paper, moulded, .0039 mf., ±5%, 600 v. DC	L103	76011	Coil—Peaking coil—36 microhenries
L11	73461	Coil—Channel #6 R.F. grid coil. Part of S4	C107	73595	Capacitor—Fixed, paper, .0022 mf., ±10%, 600 v. DC. Part of PC101	C149	73594	Capacitor—Fixed, paper, .01 mf., ±10%, 600 v. DC	L104	71526	Coil—Peaking coil—250 microhenries
L12	79727	Coil—Channel #8 R.F. grid coil. Part of S4	C108	79148	Capacitor—Fixed, paper, 0.47 mf., ±10%, 200 v. DC. Part of PC101	C150		Same as C113	L105	74214	Coil—Peaking coil—180 microhenries. Includes R133
L13	71469	Coil—Channel #9 front or rear oscillator coil. Part of S4	C109	79017	Capacitor—Fixed, paper, .0047 mf., ±20%, 400 v. DC	C151	79543	Capacitor—Fixed, paper, .068 mf., ±10%, 600 v. DC	L106	100131	Coil—Peaking coil—120 microhenries—6800 resistance. Includes R134
L14	79713	Coil—Channel #10 R.F. grid coil. Part of S4	C110	73552	Capacitor—Fixed, paper, .033 mf., ±10%, 200 v. DC	C152	73797	Capacitor—Fixed, paper, .015 mf., ±10%, 400 v. DC	L108	71528	Coil—Peaking coil—180 microhenries. Includes R142
L15	71472	Coil—Channel #11 rear oscillator coil. Part of S4	C111	79014	Capacitor—Fixed, paper, .01 mf., ±20%, 200 v. DC	C153	73798	Capacitor—Fixed, paper, .022 mf., ±20%, 600 v. DC	L109	79157	Coil—4.5 M.C. trap
L16	79712	Coil—Channel #12 R.F. grid coil. Part of S4	C112	75643	Capacitor—Fixed, paper, .001 mf., ±10%, 600 v. DC	C154	79016	Capacitor—Fixed, paper, .068 mf., ±10%, 200 v. DC	L111	79144	Coil—Width coil
L17	73477	Coil—Filament choke coil	C113	73599	Capacitor—Fixed, paper, .0027 mf., ±10%, 600 v. DC	C155	73798	Capacitor—Fixed, paper, .022 mf., ±10%, 600 v. DC	L112	76640	Choke—R.F. insulated choke, 1.5 microhenries
L18	79720	Coil—Filament choke coil	C114	100045	Capacitor—Fixed, electrolytic, 150 mf., —10 +100%, 200 v. DC complete with mounting strap	C156	73849	Capacitor—Fixed, paper, .001 mf., ±20%, 1600 v. DC	L113	77676	Choke—Filter choke
L19	77921	Coil—Channel #13 R.F. plate coil. Part of S3	C115	79020	Capacitor—Fixed, paper, .0027 mf., ±10%, 1000 v. DC	C157		Same as C153	L114 to L117		Part of Yoke
L20 to L25 Incl.		Part of S3	C116	78220	Capacitor—Variable mica, 5-70 mmf.	C158		Same as C141	L118, L119	73477	Coil—2nd and 3rd I.F. choke coil. Part of PC102
L26	79731	Coil—Channel #2 R.F. plate coil. Part of S3	C117	39044	Capacitor—Fixed, ceramic, 15 mmf., ±5%, 500 v. DC	C159	77364	Capacitor—Fixed, ceramic, 6.0 mmf., ±1 mmf., 500 v. DC	L120	79534	Coil—Horizontal frequency coil
L27	79727	Coil—Channel #3 R.F. plate coil. Part of S3	C118	77293	Capacitor—Fixed, ceramic, 470 mmf., +100—0%, 500 v. DC	C160		Same as C140	L121	79164	Coil—Horizontal sine wave coil
L28	79717	Coil—Channel #4 R.F. plate coil. Part of S3	C119	73787	Capacitor—Fixed, paper, 0.47 mf., ±20%, 200 v. DC	C161	76475	Capacitor—Fixed, mica, 68 mmf., ±5%, 1000 v. DC	P101	77726	Connector—Antenna cable connector
L29		Part of S3	C120	78622	Capacitor—Fixed, ceramic, 470 mmf., ±20%, 500 v. DC. Part of PC102	C162		Same as C141	PC101	100041	Circuit—I.F. sound printed circuit assembly
L30	73460	Coil—Channel #6 R.F. plate coil. Part of S3	C121	77293	Capacitor—Fixed, ceramic, 470 mmf., +100—0%, 500 v. DC. Part of PC102	C163		Same as C141	PC102	79479	Circuit—Printed I.F. picture assembly complete
L31	73461	Coil—Channel #6 mixer coil. Part of S2	C122	79020	Capacitor—Fixed, paper, .0027 mf., ±10%, 1000 v. DC	C164	73562	Capacitor—Fixed, paper, .022 mf., ±20%, 400 v. DC	R101 to R106 Incl.		Part of PC101
L32 to L37 Incl.		Part of S2	C123	77252	Capacitor—Fixed, ceramic, .001 mf., +100—0%, 500 v. DC. Part of PC102	C165		Same as C120	R107	503327	Resistor—Fixed, composition, 27,000 ohms, ±10%, ½ w.
L38	79727	Coil—Channel #2 mixer coil. Part of S2	C124		Same as C121; Part of PC102	C166		Same as C120	R108A, B	79699	Control—"On-Off" volume and picture control. Includes S102
L39	79715	Coil—Channel #3 mixer coil. Part of S2	C125		Same as C123; Part of PC102	C167	76474	Capacitor—Fixed, mica, 330 mf., ±5%, 1000 v. DC	R109	503610	Resistor—Fixed, composition, 10 megohms, ±20%, ½ w.
L40	71469	Coil—Channel #4 mixer coil. Part of S2	C126	78623	Capacitor—Fixed, ceramic, .001 mf., ±20%, 500 v. DC. Part of PC102	C168	73594	Capacitor—Fixed, paper, moulded, .01 mf., ±5%, 600 v. DC	R110	503433	Resistor—Fixed, composition, 330,000 ohms, ±20%, ½ w.
L41	79729	Coil—Channel #5 mixer coil. Part of S2	C127	79809	Capacitor—Fixed, ceramic, 7 mmf., ±0.5 mmf., 500 v. DC. Part of PC102	C169	78796	Capacitor—Fixed, mica, 680 mmf., ±10%, 1000 v. DC	R111	513147	Resistor—Fixed, composition, 470 ohms, ±10%, 1 w.
L42		Part of S2				C170		Same as C141	R112	503447	Resistor—Fixed, composition, 470,000 ohms, ±20%, ½ w.
L37 Incl. L54 Incl.		Part of S1				C171	100034	Trimmer—Horizontal drive 10-160 mmf.	R113	523218	Resistor—Fixed, composition, 1800 ohms, ±10%, 2 w.
R2	502322	Resistor—Fixed, composition, 22,000 ohms, ±20%, ½ w.				C172	76995	Capacitor—Fixed, paper, .0012 mf., ±5%, 600 v. DC	R114	503210	Resistor—Fixed, composition, 1000 ohms, ±20%, ½ w.
R3	502047	Resistor—Fixed, composition, 47 ohms, ±10%, ½ w.				C173	73557	Capacitor—Fixed, paper, 0.1 mf., ±20%, 600 v. DC	R115	503468	Resistor—Fixed, composition, 680,000 ohms, ±10%, ½ w.
R4	512347	Resistor—Fixed, composition, 47,000 ohms, ±10%, 1 w.									
R5	502210	Resistor—Fixed, composition, 1000 ohms, ±20%, ½ w. Part of S3									
R6, R7	502410	Resistor—Fixed, composition, 100,000 ohms, ±20%, ½ w. Part of S2									
R8		Part of T2									

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RCA



THE CHASSIS OF THESE RECEIVERS ARE CONNECTED TO ONE SIDE OF THE AC SUPPLY. SERVICE SHOULD NOT BE ATTEMPTED BY ANYONE NOT THOROUGHLY FAMILIAR WITH THE PRECAUTIONS NECESSARY WHEN WORKING ON THIS TYPE EQUIPMENT.

1. AN ISOLATION TRANSFORMER SHOULD BE INSERTED IN THE POWER LINE BETWEEN THE RECEIVER AND THE AC SUPPLY, BEFORE ANY SERVICE IS PERFORMED ON THE RECEIVER, INCLUDING TUBE REPLACEMENT.
2. R-F OSCILLATOR ADJUSTMENT REQUIRES REMOVAL OF THE GUARD BEHIND THE FINE TUNING KNOB. BE SURE THIS GUARD IS REPLACED AFTER MAKING ADJUSTMENTS.
3. REPLACEMENT OF THE CHANNEL SELECTOR DETENT AND FINE TUNING SHAFT, MUST BE MADE ONLY WITH THE PROPER INSULATED TYPE SHAFTS.
4. REPLACEMENT OF THE ANTENNA LEAD, BETWEEN THE TUNER AND THE ANTENNA TERMINALS, MUST BE MADE WITH THE CORRECT CABLE. THE ISOLATING RESISTORS AND CAPACITORS MUST BE IN SERIES WITH THIS LEAD.

5. ALL FRONT OPERATING CONTROLS ARE ISOLATED FROM THE CHASSIS. WHERE CONTROL REPLACEMENT IS NECESSARY, THE INSULATORS MUST BE REPLACED.

6. DO NOT REMOVE, OR FAIL TO REPLACE IF REMOVED, THE ISOLATING RESISTOR AND CAPACITOR BETWEEN THE CHASSIS AND THE METAL GROUNDING FOOT. BE SURE THE CHASSIS BOLT THROUGH THE GROUNDING FOOT IS SECURELY FASTENED.

7. IT IS RECOMMENDED THAT THE RECEIVER POWER PLUG BE INSERTED IN THE PROPER DIRECTION, TO CONNECT THE CHASSIS TO THE GROUND SIDE OF THE AC SUPPLY. CHECK WITH AN AC VOLTMETER BETWEEN THE CHASSIS AND THE POWER OUTLET PLATE, OR THE MOUNTING SCREWS IF THE PLATE IS NOT METAL. NO READING SHOULD BE OBTAINED. IF A READING IS OBTAINED, REVERSE THE POWER PLUG AND RECHECK FOR ZERO METER READING.

8. A FINAL CHECK SHOULD BE MADE WHEN SERVICING THE RECEIVER, TO INSURE THAT NO LOOSE METAL OBJECT IS SHORTING BETWEEN THE RECEIVER CHASSIS AND THE CABINET.

**Important  
Warning  
and  
Service  
Precautions . . .**

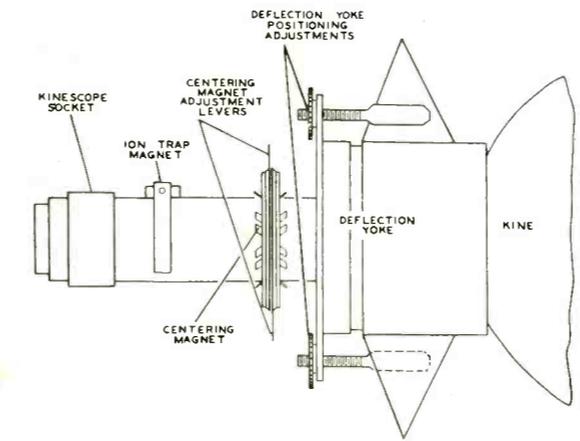
John F. Rider

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
R116	503315	Resistor—Fixed, composition, 15,000 ohms, ±10%, 1/2 w.	R171	502282	Resistor—Fixed, composition, 8200 ohms, ±10%, 1/2 w.
R117		Same as R114	R172	502322	Resistor—Fixed, composition, 22,000 ohms, ±5%, 1/2 w.
R118	503456	Resistor—Fixed, composition, 560,000 ohms, ±10%, 1/2 w.	R173		Same as R166
R119	502068	Resistor—Fixed, composition, 68 ohms, ±10%, 1/2 w. Part of PC102	R174	100040	Control—Vertical linearity control
R121	502168	Resistor—Fixed, composition, 680 ohms, ±20%, 1/2 w. Part of PC102	R175	502482	Resistor—Fixed, composition, 820,000 ohms, ±5%, 1/2 w.
R122, R123	502415	Resistor—Fixed, composition, 150,000 ohms, ±5%, 1/2 w. Part of PC102	R176	502433	Resistor—Fixed, composition, 330,000 ohms, ±10%, 1/2 w.
R124	502018	Resistor—Fixed, composition, 18 ohms, ±20%, 1/2 w. Part of PC102	R177	502422	Resistor—Fixed, composition, 220,000 ohms, ±10%, 1/2 w.
R126		Same as R121; Part of PC102	R178	100149	Control—Brightness control
R127	502118	Resistor—Fixed, composition, 180 ohms, ±5%, 1/2 w. Part of PC102	R179	502415	Resistor—Fixed, composition, 150,000 ohms, ±20%, 1/2 w.
R128	502147	Resistor—Fixed, composition, 470 ohms, ±20%, 1/2 w. Part of PC102	R180		Same as R169
R129	502239	Resistor—Fixed, composition, 3900 ohms, ±5%, 1/2 w.	R181		Same as R176
R130	503222	Resistor—Fixed, composition, 2200 ohms, ±10%, 1/2 w.	R182	503482	Resistor—Fixed, composition, 820,000 ohms, ±10%, 1/2 w.
R131	503318	Resistor—Fixed, composition, 18,000 ohms, ±10%, 1/2 w.	R183	502410	Resistor—Fixed, composition, 100,000 ohms, ±5%, 1/2 w.
R132	503247	Resistor—Fixed, composition, 4700 ohms, ±10%, 1/2 w.	R184	502382	Resistor—Fixed, composition, 82,000 ohms, ±5%, 1/2 w.
R133		Part of L105	R185	503239	Resistor—Fixed, composition, 3900 ohms, ±10%, 1/2 w.
R134	100121	Resistor—Fixed, w.w., 3000 ohms, ±10%, 7 w.	R186	512415	Resistor—Fixed, composition, 150,000 ohms, ±5%, 1 w.
R135	503333	Resistor—Fixed, composition, 33,000 ohms, ±10%, 1/2 w.	R189	503347	Resistor—Fixed, composition, 47,000 ohms, ±10%, 1/2 w.
R136	503239	Resistor—Fixed, composition, 3900 ohms, ±10%, 1/2 w.	R190	502568	Resistor—Fixed, composition, 6.8 megohm, ±10%, 1/2 w.
R137		Same as R112	R191	512339	Resistor—Fixed, composition, 39,000 ohms, ±10%, 1 w.
R138	513356	Resistor—Fixed, composition, 56,000 ohms, ±10%, 1 w.	R192		Same as R182
R139		Part of L106	R193	503510	Resistor—Fixed, composition, 1.0 megohm, ±10%, 1/2 w.
R140	503182	Resistor—Fixed, composition, 820 ohms, ±10%, 1/2 w.	R194	503047	Resistor—Fixed, composition, 47 ohms, ±20%, 1/2 w.
R141	512268	Resistor—Fixed, composition, 6800 ohms, ±5%, 1 w.	R195	74015	Resistor—Fixed, composition, 100 ohms, ±5%, 2 w.
R142		Part of L108	R196	523310	Resistor—Fixed, composition, 10,000 ohms, ±10%, 2 w.
R143		Same as R112	R197		Same as R153
R144	503147	Resistor—Fixed, composition, 470 ohms, ±10%, 1/2 w.	R198		Same as R150
R147	503510	Resistor—Fixed, composition, 1 megohm, ±20%, 1/2 w.	R199	100117	Resistor—Fixed, w.w., 5.6 ohms, ±10%, 5 w.
R148		Same as R114	R200	502310	Resistor—Fixed, composition, 10,000 ohms, ±20%, 1/2 w.
R150	503368	Resistor—Fixed, composition, 68,000 ohms, ±20%, 1/2 w.			Part of Yoke
R151, R152	503515	Resistor—Fixed, composition, 1.5 megohm, ±10%, 1/2 w.	R 201 to } R203 incl. }		
R153	503427	Resistor—Fixed, composition, 270,000 ohms, ±10%, 1/2 w.	R204	100122	Resistor—Fixed, w.w., 36 ohms, ±5%, 20 w.
R155		Same as R151	R205, R206		Same as R114
R156		Same as R118	R207	503133	Resistor—Fixed, composition, 330 ohms, ±12%, 1/2 w.
R157		Same as R135	R209	100118	Resistor—Surge resistor Hot: 9.5 ohms, ±10% Cold: 442 ohms, ±30%
R160	512310	Resistor—Fixed, composition, 10,000 ohms, ±10%, 1 w.			Same as R200
R161		Same as R129	R210, R211		
R162	502322	Resistor—Fixed, composition, 22,000 ohms, ±10%, 1/2 w.	SR101 } SR102 }	100035	Rectifier—Selenium rectifier
R163		Same as R131	T101	79140	Transformer—Sound take-off transformer
R164	100148	Control—Vertical hold control	T102	79141	Transformer—Ratio detector transformer. Includes C105
R165	100039	Control—Height control	T103	100037	Transformer—Audio output transformer
R166	502447	Resistor—Fixed, composition, 470,000 ohms, ±10%, 1/2 w.	T104	78203	Transformer—1st I.F. grid transformer
R167		Same as R162	T108	79143	Transformer—Vertical output transformer
R168	502315	Resistor—Fixed, composition, 15,000 ohms, ±5%, 1/2 w.	T110	79736	Transformer—High voltage transformer
R169	502418	Resistor—Fixed, composition, 180,000 ohms, ±10%, 1/2 w.		79868	Yoke—Deflection yoke assembly. (Includes C180, L114, L115, L116, L117, R201, R202, R203)
R170	502333	Resistor—Fixed, composition, 33,000 ohms, ±5%, 1/2 w.			SPEAKER ASSEMBLY 972308-2
				79696	Speaker—4" P.M. speaker complete with cone and voice coil (3.2 ohms)

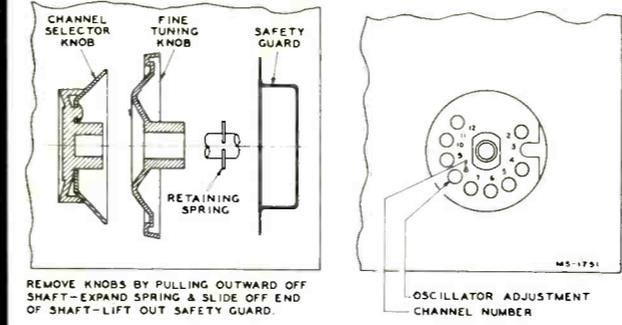
# RADIO-TELEVISION SERVICE DEALER COMPLETE TV SERVICE INFORMATION SHEETS



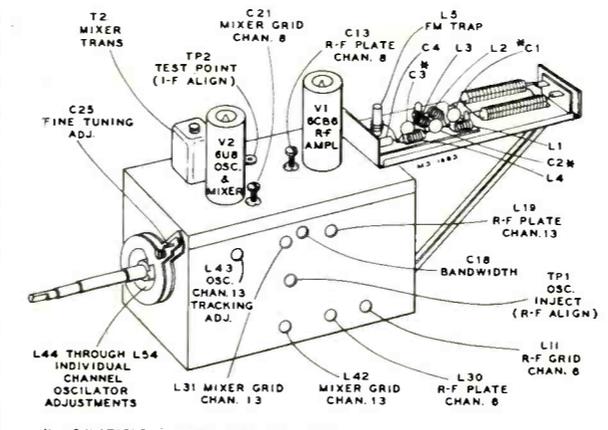
Model 21-S-500R  
chassis KCS93B



YOKE AND CENTERING MAGNET



R-F OSCILLATOR ADJUSTMENTS



KRK32A TUNER

**ELECTRICAL SPECIFICATIONS**

POWER INPUT	115 volts AC, 60~
POWER RATING	175 watts
AUDIO POWER OUTPUT RATING	1.5 watts max.
VIDEO RESPONSE	To 3.2 mc.
SWEEP DEFLECTION	Magnetic
FOCUS	Electrostatic
ANTENNA INPUT IMPEDANCE	300 ohms balanced

## INSTALLATION CHECK LIST

Connect the antenna transmission line to the receiver antenna terminals.  
Plug the power cord into the 117V. AC outlet and turn the receiver "ON". The receiver should operate normally. However, a check of the following adjustments should be made.

1. Check position of ion trap magnet and readjust for maximum raster brightness, if necessary.
2. Check raster for proper framing (tilt) in mask. Adjust yoke position by rotating.
- \*3. Check for normal operation of horizontal (freq.) control. Should hold sync for two full turns or more of the control.
4. Check centering of picture. Adjustment is made with the centering lever on the focus magnet.
5. Check width and horizontal linearity, readjust width and drive controls, if necessary.
6. Check height and vertical linearity, reset controls where required.
7. Check R-F oscillator adjustment on all channels. Readjust if necessary, starting at the highest frequency channel, proceeding to the lowest. Be sure to replace the guard behind the fine tuning knob.
8. Adjust the FM trap—where FM interference is encountered—for minimum interference in the picture.

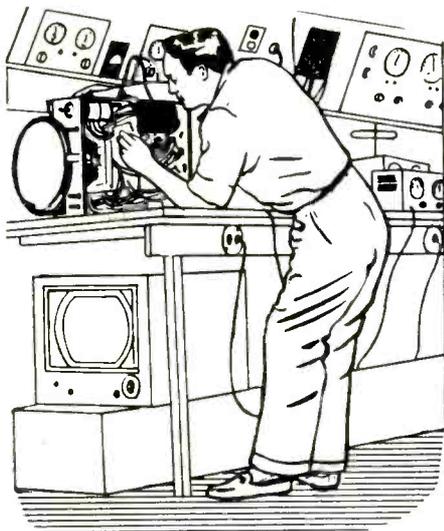
### \*Horizontal Sinewave Adjustment

It is possible to adjust the horizontal oscillator in the field by the following method when such adjustment is indicated.

- A. Set horizontal drive trimmer one turn from fully-clockwise.
- B. Set width coil stud (L111) flush with edge of chassis.
- C. Set sinewave coil L121 fully counter-clockwise.
- D. Turn horizontal (freq.) control to the left, out of sync, to the point where interrupted oscillation occurs.
- E. Adjust sinewave coil, as the horizontal (freq.) control is rotated to the left beyond the locked in position, for 3 to 4 bars between the fall-out point and interrupted oscillation.

### RCA TUBE COMPLEMENT

Tube Used	Function
Tuner KRK32A	
(1) RCA 3CB6	R-F Amplifier
(2) RCA 5U8	R-F Oscillator and Mixer
Main Chassis	
(1) RCA 3CF6	1st Picture I-F Amplifier
(2) RCA 3CB6	2nd Picture I-F Amplifier
(3) RCA 3CB6	3rd Picture I-F Amplifier
(4) RCA 5AN8	1st Video Ampl. & 1st Sync.
(5) RCA 6S4A	Video Output
(6) RCA 3AU6	Sound I-F Amplifier
(7) RCA 3AL5	Ratio Detector
(8) RCA 3AV6	1st Audio Amplifier
(9) RCA 5AQ5	Audio Output
(10) RCA 7AU7	Sync. Out. & Vert. Osc. and Disch.
(11) RCA 5AQ5	Vertical Sweep Output
(12) RCA 6SN7GTB	Horiz. Sweep Osc. and Control
(13) RCA 12BQ6GTB	Horizontal Sweep Output
(14) RCA 12AX4GTA	Damper
(15) RCA 1B3-GT	High Voltage Rectifier
(16) RCA 21YP4A	Kinescope



# The Work Bench

by PAUL GOLDBERG

This Month:

"BUTCHERED" RECEIVERS

## General Electric 16T1

The receiver was turned on and it was observed that there was no brightness. Varying the brightness control had no effect whatsoever. A healthy arc was drawn from the filament of the 1X2 indicating that the high voltage was satisfactory. Measurements with respect to B- were taken at the grid, cathode and screen of the 16KP4. The voltage at the grid, Pin #2 of the 16KP4 measured zero which was correct. The voltage at the cathode measured about 30 volts positive at a normal setting of the brightness control which was also correct. The screen pin #10 measured about 105 volts positive—this was incorrect. It should measure 300 volts.

Studying the diagram, it was observed that the screen obtains its voltage from the boost supply at the 25W4 damper. A voltage measurement was next taken at the junction of R320—100K and R378—3.3K. Here the meter read about 300 volts which was close enough for accuracy. R320 was next resistance checked and was found to check properly at about 100K. C313 and R321 were next clipped out of the circuit at point "X" to determine, by the process of elimination, if this circuit was the cause of the trouble. The screen voltage, however, remained the same at 105 volts.

The lead at point "Z" was now clipped to eliminate the possibility of the plate circuit of V9, pin #2 causing any trouble. As soon as this was done brightness appeared on the face of the picture tube. However, there was only a small amount of vertical sweep. The voltage was next measured at the screen, pin #10, of the 16KP4. The meter now read 300 volts. Thus, the plate circuit, pin #2, of V9, 12SN7 was the cause of the trouble.

Point "Z" was now resoldered. Pin #2 the plate of the 12SN7 was now measured at about 105 volts positive.

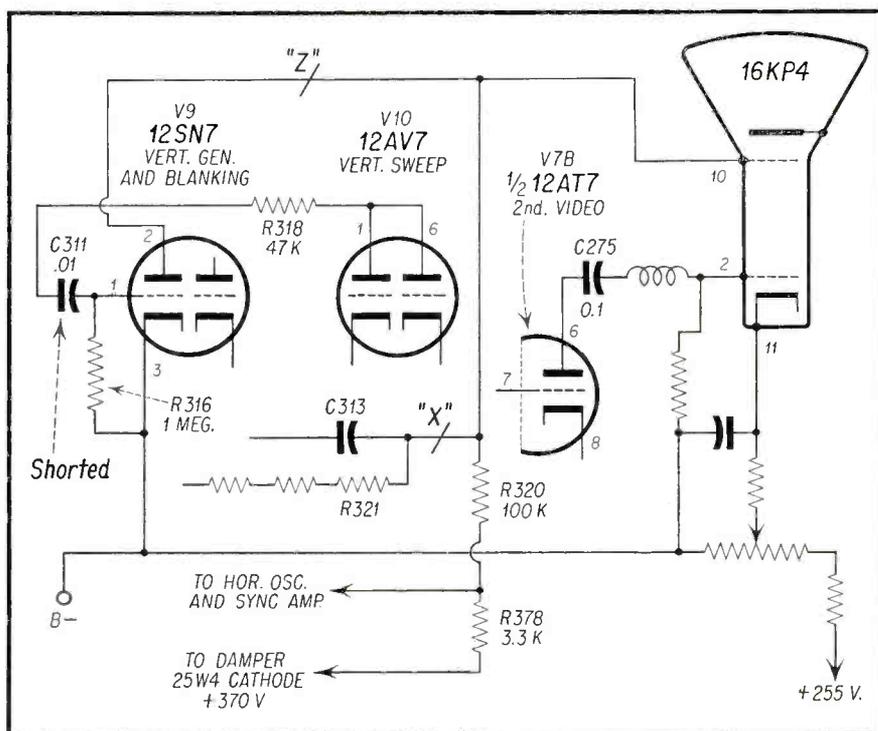


Fig. 1—Partial schematic of General Electric 16T1. Shown above is vertical section of the receiver.

The correct voltage at pin #2 is 300 volts. V9, 12SN7 was replaced but had no effect. Studying the diagram, it was observed that if C311—.01  $\mu$ f were shorted, the positive voltage on the grid, pin #1, of V9 would cause the plate voltage, pin #2, to drop considerably. C311 was now clipped out of the circuit and checked. It was found to be completely shorted. When C311 was replaced and point "X" resoldered the receiver operated correctly with the proper brightness. Thus it is seen how a shorted condenser in the vertical section of the receiver may cause a no brightness condition.

## Techmaster 1631

The picture on this receiver indicated video overload. First, the video *if* tubes, and the *rf* tube in the tuner were replaced individually. No change. Then, the 6AU6, *agc* control tube was replaced. Still no change. The receiver was then turned on its side, and a voltage measurement of the *agc* was taken at point "D." The voltage, instead of measuring a few volts negative, measured zero.

A resistance measurement was then taken from point "D" to ground. The reading was about 80K. Referring to the diagram, it can be seen that 80K

is too low a reading to ground. By further resistance measurements, it was discovered that pin #5 of the *agc* control tube measured zero ohms to ground. This tube had been previously replaced and as nothing could be found at pin #5 to cause such a reading, we were a bit baffled. V132 was then removed and a resistance measurement was taken from pin #5 to ground. It now measured about 315K. Another 6AU6 was then obtained and again replaced on the assumption that the first 6AU6 was defective. A reading was taken again from pin #5 to ground. It read zero ohms. It was finally realized that pin #5 was shorting in the socket to ground whenever the tube was inserted.

The ground connection was next clipped from pin #4, this being the nearest grounded terminal pin to #5. This was done in an attempt to verify our suspicions. As soon as this was done, the reading from pin #5 to ground no longer read zero ohms, but read about 315K. Referring to the diagram it will be noticed that this is the approximate total resistance of R259, R260, and R255. The socket of V132 was then replaced and the receiver functioned properly.

This problem is rather unusual. More frequently however a defect will develop in the width coil, or the *agc* winding on the width coil, causing this type of *agc* trouble. Conduction in the *agc* control tube depends on the voltage developed across the *agc* winding, and the output of the first video amplifier V115, (6AU6) which is fed to the grid. Without either of these voltages, V132 will not conduct. Thus, the first voltage measurement at point "D" is very important. A measurement of a few volts negative will tell you immediately that the *agc* control tube is conducting.

### Motorola TS 101

The receiver was turned on and it was immediately seen that there was no picture and no sound. The raster,

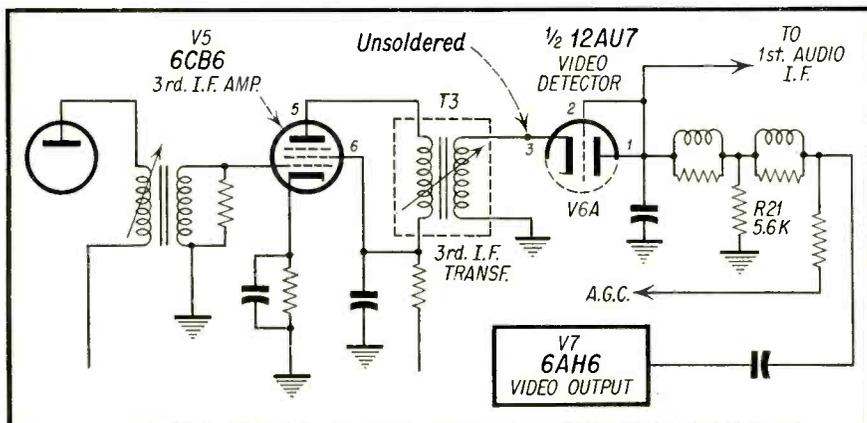


Fig. 3—Partial schematic of Motorola TS 101 receiver.

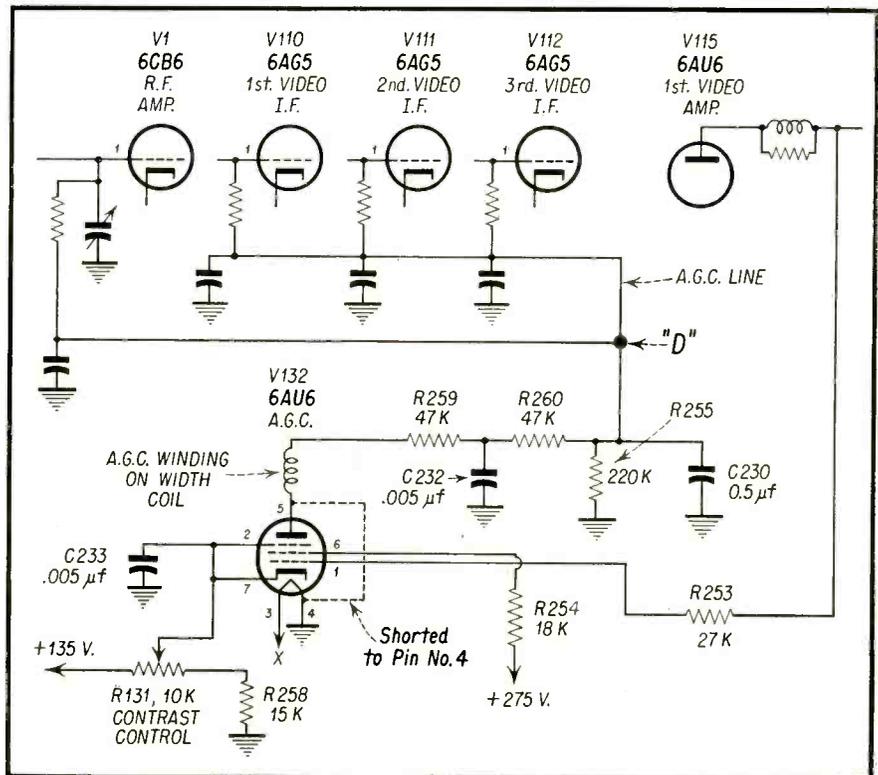


Fig. 2—Partial schematic of Techmaster 1631 showing how *agc* line is connected to *rf* and *if* returns. The *agc* circuit has been redrawn so that the control of bias on the *rf* and *if* tubes is plainly obvious.

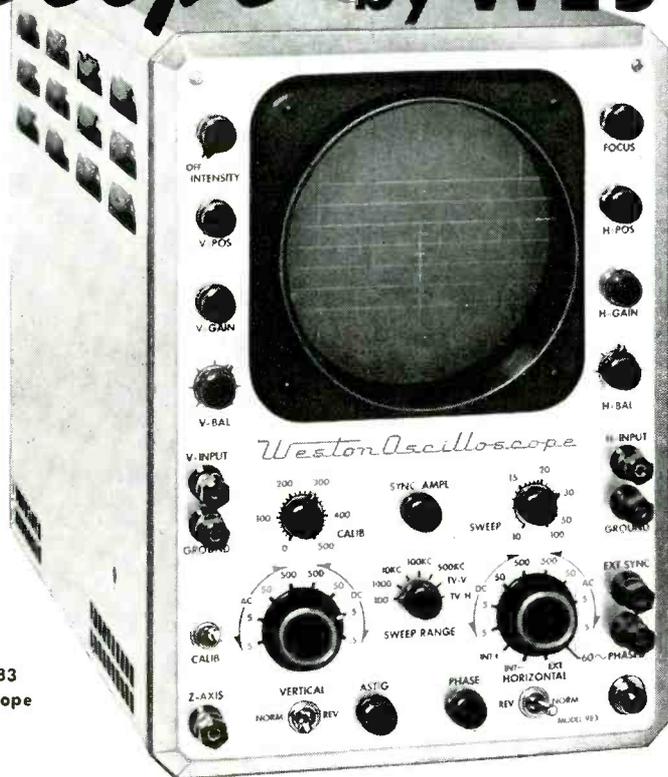
however, was okay. Before replacing any tubes, the diagram was studied. It was noted that the sound was taken off at the plate of V6A, 12AU7, video detector. This eliminated the 6AH6, V7, video amplifier, as a possibility because of the "no sound" condition. Next, all the *rf*, *if*, oscillator, and video detector tubes were replaced individually, but none had any effect on the trouble. Next the *rf* signal generator was set up at the video *if* frequency (about 26 mc) modulated at 400 cycles.

Black bars will appear on the face of the picture tube when the signal generator output reaches the control grid

of the picture tube. First the signal generator was connected to the third *if* control grid, V5, 6CB6, but no decent black bars appeared on the face of the picture tube. We had eliminated the 6AH6 circuit as a possibility because of the no sound condition. Therefore, the trouble seemed to be located either in V6A, 12AU7 circuit or V5, 6CB6 circuit. A voltage check was next made at the plate screen and cathode of V5, 6CB6. However, all voltages were approximately correct. A voltage check was next made across R21, 5.6K to determine if V6A, the video detector was conducting. A zero voltage reading was obtained. Thus V6A was not conducting. L16 and R21 were next resistance checked, but were found to be okay. To be positive, a resistance measurement was made from pin #1 of V6A to ground. The meter read about 5.6K which was correct. A resistance measurement was next taken from pin #3, the cathode of V6A to ground. The meter now read infinite. Here was the trouble. The third *if* transformer T3 was now examined. After a close check, it was noted that the pigtail of T3's secondary was wrapped around the terminal #3 of V6A but was not soldered. Terminal #3 was next soldered and the receiver was turned on. We were gratified to see the receiver now functioning properly.

# NOW...the All-purpose 'Scope by WESTON

Weston  
Model 983  
Oscilloscope



Model 983 is a high gain, wideband Oscilloscope designed to accurately reproduce waveforms comprising a wide band of frequencies. High sensitivity of 15 millivolts per inch RMS makes this "scope ideal for—SETTING RESONANT TRAPS... SIGNAL TRACING IN LOW LEVEL STAGES... AS A GENERAL NULL INDICATOR... for PHASE CHARACTERISTIC MEASUREMENT IN INDUSTRIAL APPLICATIONS... and for SWEEP FREQUENCY VISUAL ANALYSIS.

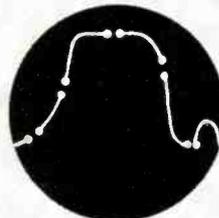
The 'scope contains identical vertical and horizontal push-pull amplifiers with a choice of AC or DC coupling without affecting either sensitivity or band width. Both amplifiers have compensated step attenuators and cathode follower input. It has excellent square wave reproduction with overshoot of only 2 to 5%, with a rise time of 0.1 microsecond. The 'scope response is essentially flat throughout the specified range of 4.5 mc and is usable to 6 mc.

The unit has provisions for internal calibration, internal phased sine wave, and Z-axis intensity modulation. Reversal of polarity of both horizontal and vertical signals is easily accomplished by means of toggle switching. Tube replacements are non critical, and etched circuitry facilitates quick and rapid maintenance.

The Model 983 Oscilloscope is now available through local distributors. For complete literature write WESTON Electrical Instrument Corporation, 614 Frelinghuysen Avenue, Newark 5, New Jersey.

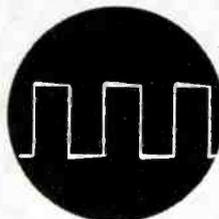
## WESTON Instruments

### WAVEFORM ANALYSIS



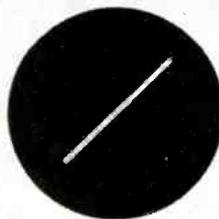
Response curves accurately displayed. Ideal for use with Weston intensity marker display. A fast, retrace sweep circuit with cathode follower output prevents pattern distortion.

### SQUARE WAVE RESPONSE



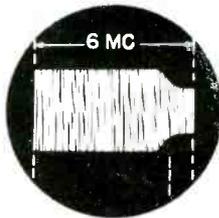
Overshoot is only 2 to 5%. Rise Time is 0.1 Microsecond. Square wave depicted 250 kc.

### PHASE MEASUREMENTS



Phase shift between horizontal-vertical amplifiers, 0-500 kc-0°, to 1 mc within 2°; by internal adjustment with gain controls at max 0° phase shift possible on any specific frequency to 6 mc.

### RESPONSE CHARACTERISTIC



Note flatness throughout specified range; to 3.6 mc down 1.5 db, at 4.5 mc down 3 db, at 6 mc down 6 db.

Mr. Answer Man:

In my shop I have a Motorola TS-525 chassis that has brought me no end of grief. The set plays very well except that the horizontal hold is unusually critical.

I could possibly take out the 250K horizontal hold control and replace it with a control of much smaller resistance change along with a series resistance of the proper value. This will probably provide a better lock-in action but I feel that there is something definitely wrong with the circuit and I don't want to gimmick it up. I'd rather find the trouble if I can.

One more bit of information. The stabilizing coil and condenser have been replaced. Also the pulses of horizontal sync information supplied to the phase detector appears to be of about the correct amplitude.

J. C.  
Salt Lake City, Utah

One of the best tests that can be made of the phase detector circuit is a voltage check at the output. At the grid of the horizontal multivibrator, Pin #1 of the 6SN7 in Fig. 1 a dc voltage should be measurable. This voltage should vary (by adjusting the horizontal hold control) from plus 2 volts to negative 2 volts with the picture remaining in horizontal sync. This provides information that the phase detector action is working properly. The proper position of the horizontal hold control is in the approximate center of this swing or at about zero volts dc. At this voltage the components of the circuit are designed so that the multivibrator frequency is 15,750 cycles per second.

This test will most probably reveal that there is insufficient voltage swing at this grid and therefore an insufficient control by the phase detector circuit. Most probably the horizontal sync pulses are of proper amplitude so the difficulty undoubtedly lies somewhere else.

For proper operation of this circuit signal pulses are supplied to the grid and plate of the phase detector. There is not much that can go wrong as far as the signal to the grid is concerned, but as far as the signal fed to the plate is concerned much can go wrong. The signal for this purpose is taken from the cathode of the damper tube and changed into a sawtooth by a network so that it has the correct shape for the comparing action. This cathode point has a potential of about 520 volts dc as well as a large rf pulse voltage associated with the deflection system. Voltages of this magnitude can easily cause damage to small components such as the 150K resistors, R82 and R83, as well as to the .001 μf condenser, C87.

I suspect that the .001 μf condenser has opened up, or one (or possibly

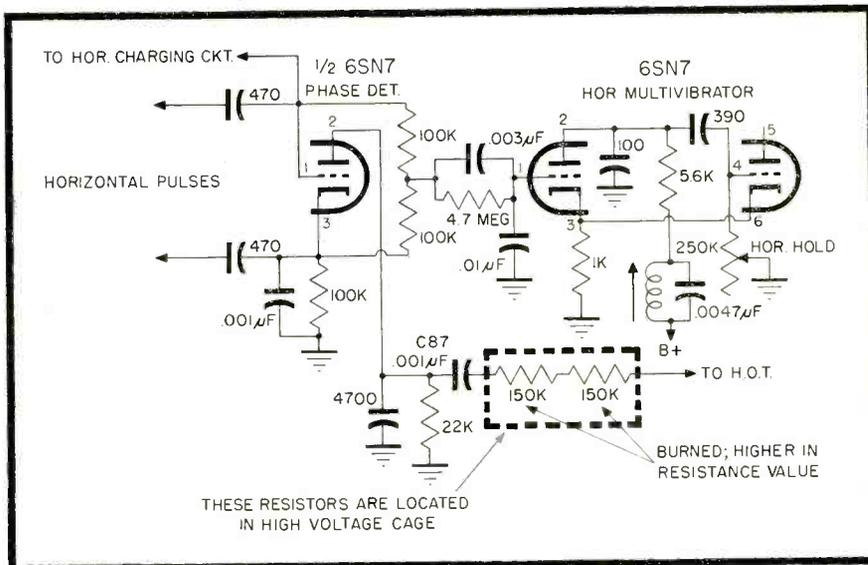
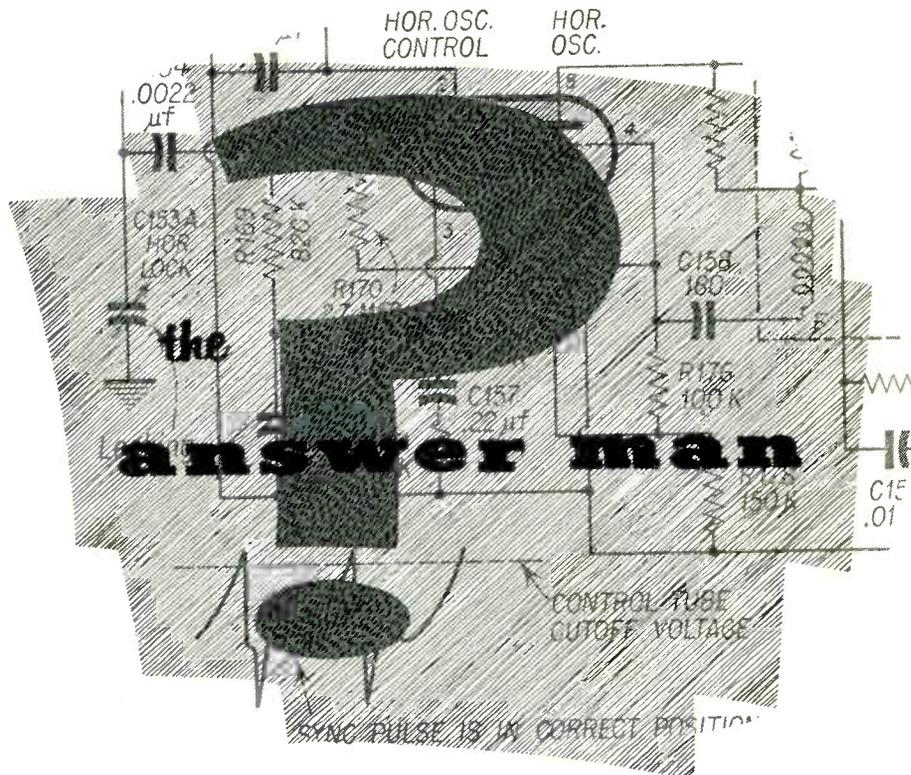


Fig. 1—Partial schematic of Motorola TS 525 chassis showing phase detector and horizontal multivibrator.

both) of the 150K resistors has increased considerably in value. This would result in an insufficient pulse voltage for phase comparing, causing inadequate horizontal sync lock-in action. These resistors can easily be overlooked because they are located in the high voltage cage, an unlikely place to look for troubles such as unstable horizontal sync.

Dear Sir:

I have a CBS-Columbia chassis 921-14 in which there is no sound and the picture is normal and good. I have changed the FM detector transformer and checked about everything in the

circuit. I know that a 400 cycle signal will pass through the audio amplifiers so the trouble isn't in that portion of the receiver. I can also pass a 4.5 mc signal through the sound if stages which would seem to indicate that these stages are normal. Concerning the (video) if strip, I have been unable to get any response when I feed in a signal at the sound if carrier frequency. Whether this indicates the trouble is in the if strip or not I don't know.

Can you give me some ideas on this?

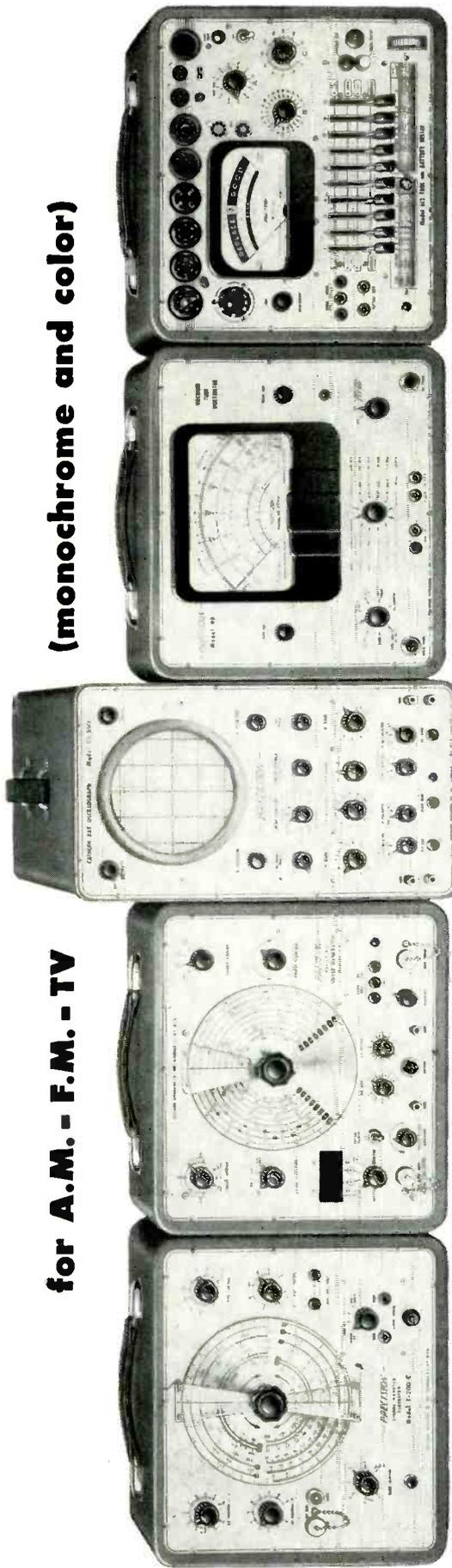
T. F.  
St. Louis, Mo.

From your stated facts it seems that

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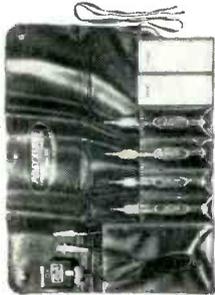
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the 15  $\mu\text{f}$  condenser shown in Fig. 2 is open. The reason for this conclusion will become evident if we reconsider the facts stated above.

It has been stated that the audio system is working normally, and it is presumed that when the 400 cycle voltage was applied for testing that the generator was connected at the top of the volume control thereby eliminating the possibility of the volume control being open. This could be possible and not be detected if the generator were inserted at the variable arm or at the grid of the audio amplifier. The use of a generator is certainly a more satis-

factory method of checking an audio system than using the disturbance method of shocking or grounding tube elements. Disturbance tests are too often misleading and occasionally result in erroneous assumptions that circuits are working when actually the gain is low.

Feeding a signal at the sound *if* frequency into the video *if* strip will not give an indication at the FM detector since an intercarrier system is employed which necessitates two signals beating together in the video detector. Only this way will the 4.5 *mc* difference signal that contains the frequency modulation be produced. Therefore, the test

you describe is of no value as it reveals nothing with respect to the video *if* strip.

Since the picture is normal it is reasonable to assume that the whole *if* section is functioning normally. Looking at Fig. 2 there seems to be an answer to the problem since basically we can feel fairly sure the following facts are correct. The video *if* strip is functioning normally, the audio system is proper and the FM detector circuits working as they should. This leaves one item that can be defective and yet not have revealed itself in the tests you made.

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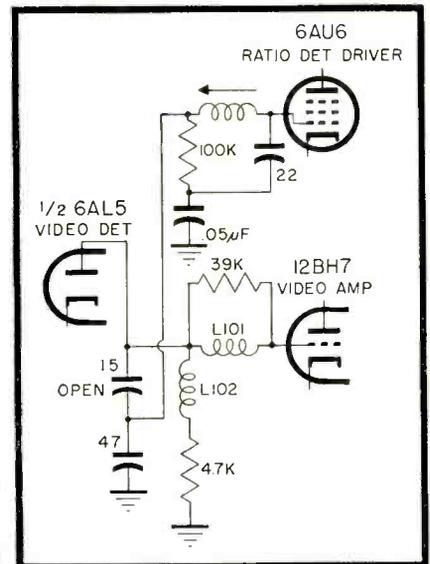


Fig. 2—Partial schematic of Columbia chassis 921-11, -13, -14.

The culprit is the 15  $\mu\text{f}$  condenser as shown in Fig. 2. Most probably the 4.5 *mc* signal was applied in checking the sound *if* and FM detector circuit at either the 47  $\mu\text{f}$  condenser or at the grid of the 6AU6 ratio detector driver tube. Under these conditions nothing is revealed about the state of the 15  $\mu\text{f}$  condenser in the capacity voltage divider network. Therefore, if the generator is placed at pin 7 an output indication at the FM detector will not be available, indicative that this 15  $\mu\text{f}$  condenser is open.

This is an excellent example of where a condenser checker can be put to quick and efficient use.

Dear Sir:

I understand that some manufacturers of TV receivers have provided a means of replacing the individual coils on a flyback transformer thus eliminating the necessity of installing a completely new transformer when a winding shorts or burns.

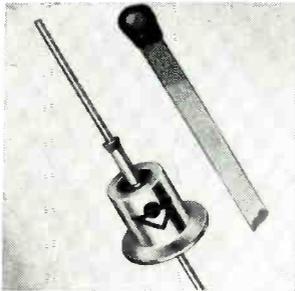
M.A.  
Arcadia, Calif.

[Continued on page 54]

# NEW

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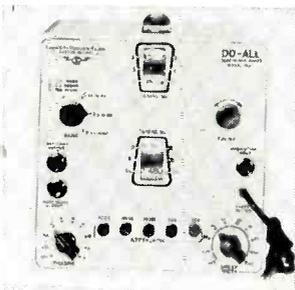
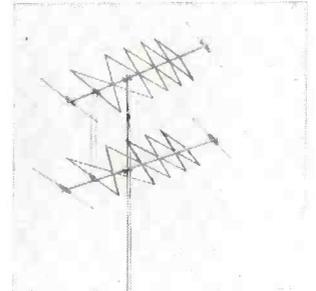


### IRC Germanium Diodes

International Rectifier Corporation, 1521 E. Grand St., El Segundo, California, has announced the availability of its new germanium diffused junction power diodes, which offer exceptionally low leakage and high rectification efficiency. Reliability is featured in the design of these diodes as a result of complete hermetic sealing of the housing, consisting of glass-to-metal and welded metal-to-metal seals throughout.

### JFD Yagi-Helix

JFD Manufacturing Company, Inc., 6101 16th Ave., Brooklyn 4, N.Y., announced this week that a new high-band antenna, JFD Yagi-Helix, is now available for deep fringe reception. This Model YH713, is shipped 2 to a carton, complete with a Free stacking transformer. It purportedly gives high band performance equivalent to 7 separate 10-element single-channel high band yagis, yet it is only 5 feet long, and stacks only 3 feet apart.

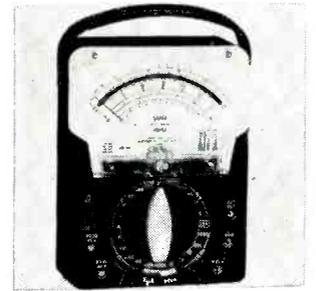


### RCP Sweep Generator

Model #780 "Do-All" Electronic Sweep Generator for checking TV community antenna systems and aligning front end TV circuits, has been announced by the Radio City Products Company, Inc., Easton, Pennsylvania. A new 34 mc. sweep width having amplitude linearity within +2 DB at 54 to 88 mc. has been incorporated, along with continuous tuning with no skips—triple-shielded high-quality attenuator with push-button fixed positions in addition to additive combinations.

### Triplett VOM

A new volt-ohm milliammeter, Model 630-NA, is now being manufactured by the Triplett Electrical Instrument Company of Bluffton, Ohio, which has meter protection against overloads; 70 ranges, and frequency compensation up to 20 kc. providing for accurate readings over the entire audio range. In addition, it has high accuracy on the same scale for ac and dc—1 1/2% dc to 1.200 volts, 3% ac to 1.200 volts, and temperature compensation, giving complete accuracy within a wide range of temperatures.



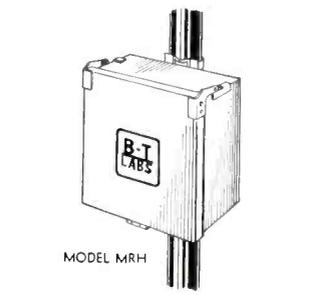
### Simpson Line Current-Capacity Tester

An instrument for testing the adequacy—or inadequacy—of a 115 volt power line to furnish any value of motor starting current from 13 to 50 amperes is being marketed by Simpson Electric Company, 5200 W. Kinzie St., Chicago 44, Ill. Their Line Current-Capacity Tester Model 397 can check line quality before the unit in question is put into the circuit.



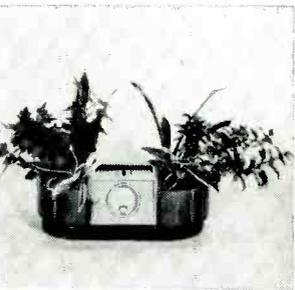
### B-T TV Housing and Line Filter

An all-purpose housing offering complete weather and radiation protection is in production at Blonder-Tongue Laboratories of 526-536 North Ave., Westfield, N. J. The new unit provides ample mounting surface and full ventilation for all antenna or line Master TV equipment. The Model MRH features a sealed, front opening door with a locking hasp, and also includes facilities for B-T Model MC coax feedthrus and the B-T Power Line Filter.



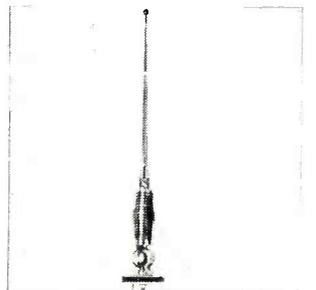
### Crown Accessories

A new planter specially designed for use with the Crown CAR6B Tenn-A-Liner Antenna Rotator has been introduced by Crown Controls Co., Inc., New Bremen, Ohio. The planter will be available to all Crown dealers for promoting "The Beautiful Way to Enjoy Good TV Reception."



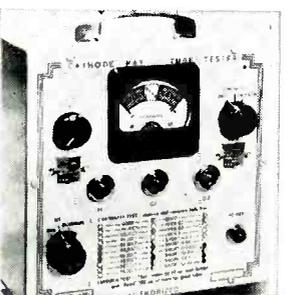
### Snyder Antennas

Two new "glamorized" rear-mount Communications Antennas for automobiles, which can be adapted to AM automobile radio, automobile telephone or short wave communications by professionals or amateurs, are being introduced by Snyder Mfg. Co. of 22 & Ontario Sts., Philadelphia, Penn. These models feature cadmium plated and stainless steel masts with adjustable swivel ball joint molded bakelite insulator mounting plates.



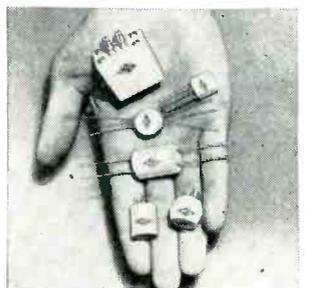
### Authorized CRT Rejuvenator

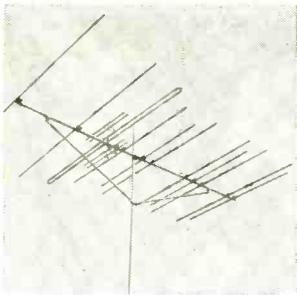
Authorized Manufacturing Company, 919 Wyckoff Avenue, Brooklyn 27, New York, has introduced the new Model #101F rejuvenator-CRT tester, with an indicator which tells automatically when the rejuvenation process is sufficient. The rejuvenation process has been engineered to provide safer and greater assurance of rejuvenation accuracy, with grid structures positively unharmed during processing.



### Pulse Transformers by Acme

Two distinct types of miniature pulse transformers have been developed by the Los Angeles plant of Acme Electric Corporation, according to information covered by the Company's Bulletin PT-301. One group is available in a series of metal case designs, with approved type glass seal terminal header plates. The second group is encapsulated in molded epoxy resin with several types of terminal connections.





#### Channel Master Super Rainbow

Some of the unique features of Channel Master's new SUPER RAINBOW are easily seen in this photo. The elements with insulating sleeves are the High Band elements, actually three elements in one. The others are the Low Band Elements. Note the unorthodox spacing on the crossarm, which carries both independent parasitic systems, High and Low Band. For info, write Channel Master Corp., Ellenville, N.Y.



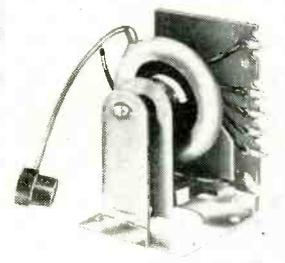
#### WEN Soldering Gun

A new "Quick Hot" soldering gun home utility kit has been marketed by Wen Products, Inc., 508 Northwest Highway, Chicago. With the "Quick Hot" Model 199, the user has but to press the trigger and in three seconds the gun is ready to do a soldering or plastic cutting job. The convenient home utility kit includes: model 199 gun, with soldering tip; plastic tile cutting and putty removing tip; flat iron tip. For removing dents from wood and other uses, and 5' of rosin core solder.



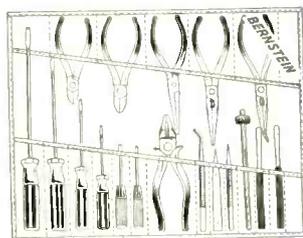
#### Eico Battery Tester

EICO Model 584 Battery Tester, just released by Electronic Instrument Co., Inc., 84 Withers St., Brooklyn 11, New York, accurately tests all A and B portable radio batteries and equivalent types under actual receiver conditions without requiring them to be installed in the equipment. It will also test hearing-aid lantern and radiation counter batteries, and has a spare position for adaption to testing other types.



#### Stancor Flybacks

Two new Stancor exact replacement flyback transformers have been announced by Chicago Standard Transformer Corporation, Addison & Elston, Chicago 18, Ill. These two units are built from original manufacturers specs and are duplicates of the flybacks they replace. A-8138 replaces Emerson 738079 and 738084 in 60 models and chassis. A-8261, exact replacement for Majestic and Muntz C9.253-1, -2, -E and C9.259, is used in over 48 models and chassis.



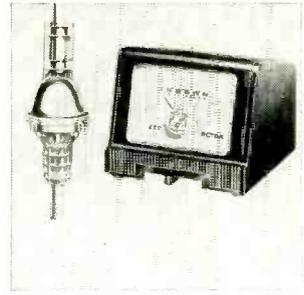
A set of tools designed especially for the Radio and Television technician and repairman is being offered to the Electronic Industry. These tools designed for TV servicing and offered by Sound Apparatus Company of Stirling, N. J. are made of the finest Solingen Steel, nickel-plated and with amber colored handles insulated for 10,000 volts. Three sets are available including a pocket kit containing two screwdrivers, a pair of nippers, flat nosed pliers, file and tweezers.

#### Ronette Cartridge

A series of single needle Ronette "Fonofluid" Type RA-284, for use with microgroove records only, has been introduced by the Ronette Acoustical Corporation. This cartridge has extremely low intermodulation distortion and is a constant velocity type when loaded with the correct load resistance of 120K ohms. It is designed to feed into any magnetic level input. Other models are the Hi-Fi Model RA-2840V for converting small amplifiers for better reproduction, and the High-Output Model RA-284T.

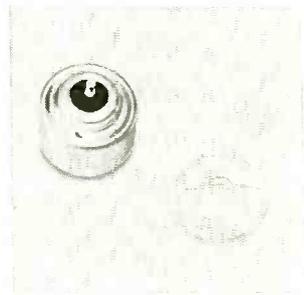


This CDR Rotor model TR-4 uses 4-wire cable and is a meter control dial cabinet version of the TR-2. Other features: load capacity of 150 pounds, streamlined, weatherproof design, 12 heavy duty ball bearings in two 6 1/2 inch races, reinforced die cast housing, heavy duty precision gears; reversible clamps for 7/8" to 2" masts, magnetically controlled mechanical brake, heavy duty motor that reverses instantly, and 3 heavy duty guy wire lugs.



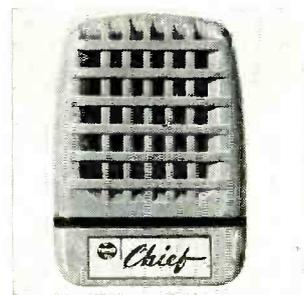
#### C-D Tantalum Capacitors

Cornell-Dubilier announces development of a Tantalum slug type electrolytic capacitor designed to operate under wide temperature ranges. These new type "TH" Tantalums are rated from -55°C to +125°C. These capacitors are ideally suited for operation under conditions of high G shock, high thermal cycling, and severe vibration. They range from 25 to 120ufd. with a voltage range of 18 to 100 vdc. Higher capacitances and voltages can be supplied. For information send for Engineering Bulletin 529 to Cornell-Dubilier Electric Corporation, South Plainfield, N. J.



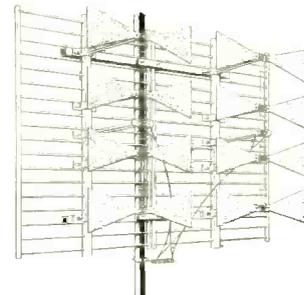
#### Turner Desk Mike

The Chief—a new low-cost desk microphone with crystal, ceramic or magnetic interior—has recently been put on the market by the Turner Company, 937 17th St. N.E., Cedar Rapids, Iowa. Turner engineers recommend the mike for amateur P.A., tape recording and similar uses. According to the manufacturer, the Chief is particularly suited by design and performance to use as original or replacement equipment for tape recorders.



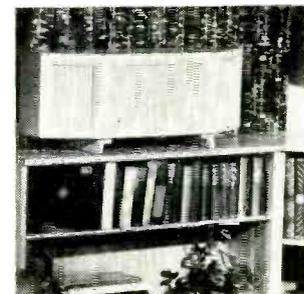
#### Clear-Beam UHF Array

Designated the Duo-Quad UHF Radar, a new antenna (the UF40) for the UHF fringes has been announced by Clear Beam Antenna Corp. The antenna is composed of a four stack bow tie with cross polarized dipole fans. For positive ghost rejection a closely spaced all aluminum reflector screen is utilized. The array is designed for all-channel UHF reception. For complete information write Clear Beam Antenna Corp., 21341 Roscoe Blvd., Canoga Park, California.



#### Electro-Voice Skylark

Electro-Voice has introduced a complete three-way loudspeaker system housed in a compact cabinet that can be placed on a table, in a bookcase, or on the wall. The Skylark incorporates two tapered horn ports which load properly the SP8C low-frequency and mid-range reproducer from 70 to 3500 cps. E-V's super T35B very-high-frequency tweeter takes over at 3500 cps to beyond audibility.



#### Win-Tronix Rainbow Generator

A Color Television Pattern Generator, the Model 150 Rainbow Generator now being manufactured by Winston Electronics, Inc., of 4312 Main Street, Philadelphia, Pa. may function both as a color television demonstrator for a sales department, and a servicing tool. Service applications: adjustment of the Reference Oscillator, the Master Phase Control and the Color Demodulator phases, matrixing and chroma circuit gains; isolation of chroma trouble and testing and aligning chroma circuits.



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G-610 *Triaxial*



H-530 coaxial



H-520 coaxial



H-222 coaxial



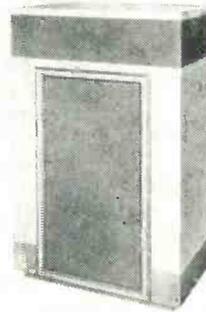
K-310A coaxial



K-210 coaxial



PR-100 *Imperial*



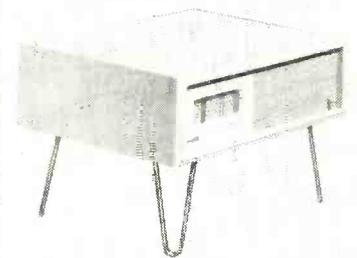
RS-100  
Laboratory Standard



TP-200 *Tri-Plex*



CT-100 *Concerto*



DU-500 TV *Duetto*



DU-300 *Duetto*  
*Treasure Chest*

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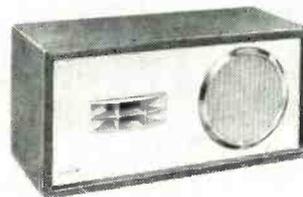
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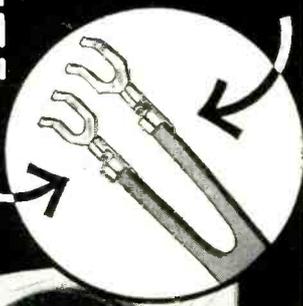
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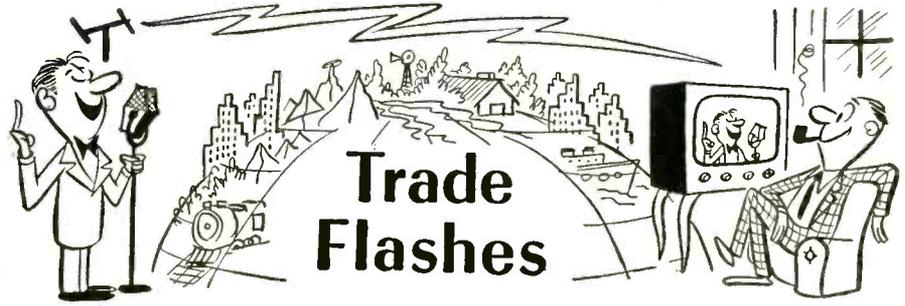
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## Trade Flashes

Radio and television set manufacturers and their component suppliers are optimistic about the outlook for continuing high sales of both black and white TV sets and radios, according to an unofficial poll announced by RETMA. During the Association's recent convention in Chicago, informal "guess-estimates" by these manufacturers indicated that the prevailing crystal ball expectations for retail sales in 1955 and 1956 are as follows:

7 to 7.3 million black and white television receivers and 12.5 to 13 million radios, including 4.5 to 5 million auto sets, in 1955; and 6.5 to 7 million black and white TV receiver sales in 1956. In color, "guess-estimates" ranged widely and were conditional on the extent of color TV broadcasting, but the prevailing view expressed was that around 35,000 color TV receivers will be sold in 1955 and between 250,000 and 300,000 in 1956.

Acknowledging the importance of competent television servicemen being readily identified by set owners, the Radio-Electronics-Television Manufacturers Association recently issued a new booklet detailing a plan whereby technically competent TV technicians can be accredited as such and, thereby, made known to the public. The booklet, "Suggested Accreditation Program for TV Receiver Service Technicians," points out that a plan of accreditation will help the TV set owner identify technically competent technicians and also induce the technicians to upgrade themselves in order to receive recognition and promote their services. The accreditation certificates or diplomas will carry RETMA endorsement.

A new book, entitled "Transistor Applications" has just been published by RAYTHEON Manufacturing Company. The 116-page illustrated manual describes constructional details on 50 different types of transistorized equipment. It fills the need for a source of circuits that will help the builder to study the many facets of transistors—

their properties, performance and adaptability. Complete component, construction, and test information is supplied with each article. Emphasis is placed on practical applications and basic transistor theory is discussed in many of the articles. Complete data is supplied for the popular low-cost RAYTHEON Transistors, and pertinent information included for 11 types in the RAYTHEON Transistor Line.

Copies of the book "Transistor Applications" may be obtained for 50 cents each from RAYTHEON tube suppliers throughout the country or directly from Dept. P-7, RAYTHEON Manufacturing Company, Receiving and Cathode Ray Tube Operations, 55 Chapel Street, Newton 58, Mass.

An expanded line of Delco automotive antennas was announced recently by United Motors Service Division of General Motors, along with an attractive sales stand designed for distributors use to serve as a constant "display salesman" for Delco automobile aerials.

The new United Motors Service line of Delco auto aerials includes four new and improved models which have been added to the UMS line. The four new aerials includes a new universal top mount aerial for one man installation on cowl or fender; a new modern streamlined aerial with windstream top mount; a new rugged aerial designed for side cowl mount for truck application or older aerial replacement; and a new dual rear mount aerial for installation on rear fenders or rear deck.

Officials of Astron Corporation, 255 Grant Avenue, East Newark, New Jersey, leading manufacturer of Capacitors and R. F. Noise Suppression Filters for all electronic applications, have announced that their extensive new expansion program, announced a short time ago, is being initiated immediately by the addition of 20,000 sq. ft. of new manufacturing floor space to the production facilities at their present location. The addition of this new space will also be accompanied by a consider-

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### TUBE PLACEMENT CHARTS

14. Top and bottom views are shown. Top view is positioned as chassis would be viewed from back of cabinet.
15. Blank pin or locating key on each tube is shown on placement chart.
16. Tube charts include fuse location for quick service reference.

### TUBE FAILURE CHECK CHARTS

17. Shows common trouble symptoms and indicates tubes generally responsible for such troubles.
18. Series filament strings are schematically presented for quick reference.

### COMPLETE PARTS LISTS

19. A complete and detailed parts list is given for each receiver.
20. Proper replacement parts are listed, together with installation notes where required.
21. All parts are keyed to the photos and schematics for quick reference.

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The company has long been one of the major suppliers of the leading electronic manufacturers of radio, television and communication equipment for all industries including the aircraft and allied fields.

Henry C. Bonfig was recently appointed President of CBS-Columbia, the television and radio receiver manufacturing division of the Columbia Broadcasting System. His offices are at the division's headquarters, Long Island City, New York. He is also a Vice

President and Director of Columbia Broadcasting System.

An entirely new concept in Automotive Rear Deck Sound systems and controls was introduced to the trade by Utah Radio Products Co., Inc. at the recent Electronics Parts Show in Chicago. Featuring ease of installation and simple, trouble free operation, the new line includes three complete, rear deck auto kits, the "RT" Series, "RQ" Series and the "RF" Series. All of these kits are available complete with either a 5" x 7" or 6" x 9" speaker, control

panel, control knob, hardware and wire for installation, mounting ring and grill to match and blend with any car interior.

The Hallicrafters company recently became another major television manufacturer to introduce a 17-inch table model television receiver priced at under \$100.

Blonder-Tongue Laboratories has recently been granted two U. S. patents covering wide-band RF amplifying circuits. The circuits are particularly related to simultaneous amplification of the LO and HI VHF TV bands, but also apply to any separated RF ranges.

The circuits and associated amplifier tubes cover any desired combination of double and/or single resonant responses in two bands, offering a uniform low impedance to the desired frequencies and a high impedance or attenuation to unwanted signals. No switching or adjusting is necessary to achieve this broadband amplification.

A new combination needle storage and display cabinet by Jensen Industries will simplify the selling and restocking of phono needles for both jobbers and dealers. The red-leatherette cabinet with gold lettering holds a maximum of 360 needles with each type of needle classified in drawer pockets. One needle can be removed without touching any other or without readjusting the index tab. In taking inventory it is only necessary to check the empty pockets to bring the stock up to maximum for each needle type.

Another large area came into use in the production, warehousing and shipment of Taco TV antennas. The additional area is being devoted to storage. A leading TV antenna manufacturer, Taco Appliance Corp. of Sherburne, N. Y. carries an outstanding inventory of raw materials, products in process, and finished stock for prompt delivery. The latest addition rounds out the plant which now exceeds 70,000 square feet all on one floor, plus auxiliary operations such as plating, and outlying engineering buildings.

A television service meeting was held June 14th, at the Penn Sherwood Hotel, Philadelphia, Pa., to introduce the new Liberty Bell antenna custom-engineered for the Philadelphia area. JFD Manufacturing Company sponsored the confab in cooperation with local JFD distributors, Station WPHH-TV (chan-

[Continued on page 51]

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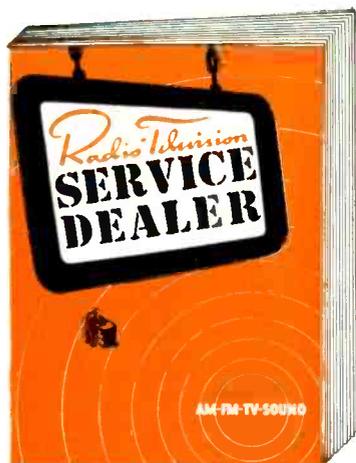
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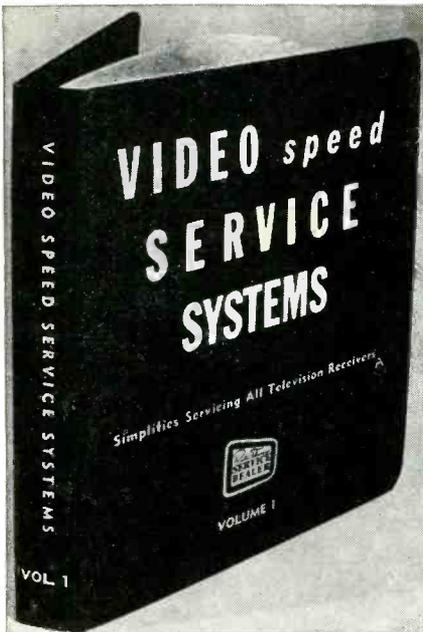
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## TRADE FLASHES

[from page 48]

nel 12) from Wilmington, Del., and the Council of Radio and Television Service Assns.

The meeting was attended by over 150 dealers and distributors who were either independent servicemen or members of the following groups, which participated in the meeting: Television Service Dealers Assn. of Philadelphia, Television Service Dealers Assn. of Delaware County, Allied Radio & Television Technicians Assn. of New Jersey, Television Contractors Assn., PRSMA, and North East Television Service Dealers Assn. All of these organizations are members of the Council of Radio and Television Service Assns.

The entry of Du Mont into the manufacture and sale of two new lines of consumer products—high fidelity phonographs, radios, and clock radios—was announced recently by William C. Scales, manager of the Television Receiver Sales Division of Allen B. Du Mont Laboratories, Inc. Entry of Du Mont into a more diversified field points up the company's constant growth over the past 25 years. Continuing this growth, a new West Coast electronics center for Allen B. Du Mont Laboratories, Inc., is being constructed in Los Angeles, California, to handle the increased West Coast electronics activity of the Company. The announcement was made by Dr. Allen B. Du Mont, president.

In addition to sales and research developments, these facilities will be available for Du Mont's Cathode-ray Tube Division. Du Mont will continue to occupy its present West Coast headquarters at 11845 Olympic Boulevard until the new building is completed.

A 17" television set to retail at less than \$100 is one of the highlights of the new 1956 line of popular priced television, radio, phonograph and high fidelity sets unveiled here today by Trav-Ler Radio Corporation, during its semi-annual nationwide meeting of dealers and distributors in the company's general offices and at the Sarah Siddons Room at the Ambassador East Hotel. This set will retail for \$99.95.

Shure Brothers, Inc., Chicago, announces a new series of small 1-inch controlled-reluctance microphones, for applications where size and weight are determining factors, and portability is extremely important.

## TRADE LITERATURE

The 1955 Microtran Company Miniature Transformer Catalog gives detailed specs on hundreds of miniature transformers designed for applications in transistor circuitry, radio paging, airborne applications. Available in hermetically sealed, molded, encapsulated, or impregnated construction. Send letterhead request to Microtran Company, 84-11 Boulevard, Rockaway Beach, N. Y.

The Centralab catalog #29 contains new Fastatch Dual Controls, Snap-Tite Controls, complete line of 1000 volt rated Disc Capacitors, new Switch, Capacitor and P.E.C. kits, negative 330 and 1500 TC Tubular Capacitors, and others. Copies may be obtained by writing Centralab, 900 E. Keefe Ave., Dept. A44, Milwaukee 1, Wis.

A new general catalog covering microphones, phonograph pickup cartridges, microphone interiors and microphone accessories is now available from the Turner Co. The manufacturer has listed the names and addresses of all Turner representatives on the front cover. The catalog (#961-A) is available on request from the Turner Company, 937 17th Street N.E., Cedar Rapids, Iowa.

A new Components Catalog (#55) just issued by Herman H. Smith Inc., manufacturers of Electronic Components, at 2326 Nostrand Ave., Brooklyn 10, N. Y., lists a complete line of plugs, jacks, connectors, switches, terminals, and other components and accessories. Exhaustive schematic dimensional diagrams throughout the book make this an important guide for the engineer as well as the purchasing agent.

CBS-Hytron, a division of Columbia Broadcasting System, Inc., has just announced the Second Edition of its comprehensive CBS-Hytron Reference Guide for Television Picture Tubes. Guide lists all magnetically deflected picture tubes to date—monochrome or color—including those made by other manufacturers as well as by CBS-Hytron. The new TV Picture Tube Guide is available free from CBS-Hytron distributors.

A new consumer education publication, "Your Television Antenna System," has been prepared for distribution by RETMA. The booklet is designed to acquaint the public with the importance of antennas for good television reception and the need for keeping an antenna properly serviced. It provides the consumer with a brief explanation of the need for a television antenna, a description of basic types of antennas, a discussion of good installation practices and the reasons for periodic inspection or maintenance of antenna systems. Bulk orders will be filled through the National Better Business Bureau, New York City, at 3 cents per copy f.o.b. New York, and single sample copies of the booklet are available through RETMA headquarters in Washington, D. C.

Three new brochures in the electronics field, and now ready for distribution, have been announced by Sylvania Electric Products Inc. The first is a wall chart brochure which lists Sylvania's complete line of 600 ma tubes for series string television; the second lists Sylvania's gas tubes for use in control mechanisms by industrial customers, and the third is a new folder listing Sylvania crystal diodes. Copies available upon request to Sylvania Electric Products Inc., Central Advertising Distribution, 1100 Main Street, Buffalo 9, N. Y.

A new 8-page Stancoer Auto Radio Transformer Replacement Guide lists both vibrator power and audio output replacements for over 540 car radios.



**\$23.50**  
including sturdy  
metal cabinet  
Suggested net price

## New Centralab service kit saves time, saves job delays

Centralab's handy **Fastatch® FR-22A Kit** gives you a practical, working stock of carbon dual-concentric control replacements for all popular TV, radio, and auto sets

At your fingertips — everything you need to replace the carbon dual-concentric controls you run up against most often. You get 11 Fastatch front units, 11 Fastatch rear units, 4 Fastatch switches, and 2 auto-type adapter bushings — all 100% tested and guaranteed by Centralab.

The front and rear units snap together to give you 11 controls out of a possible 121 combinations of resistance and taper. So, now, you never have to be out of the right replacements for "hot" jobs.

See the FR-22A at your Centralab distributor. Or, send coupon for bulletin 42-223.

**It's a snap** to get the right replacement for practically any dual control

No loose parts! No lugs to bend! No tricky assembling!

**SNAP FRONT UNIT...**  
(with outer shaft cut to length)



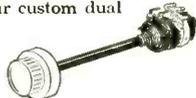
**TO REAR UNIT...**  
(with blue shaft cut to length)



**SNAP ON SWITCH...**  
(from Fastatch KB series)



**ADD THE KNOBS**  
— and there's your custom dual



# Centralab

A DIVISION OF GLOBE-UNION Inc.

944H E. Keefe Ave., Milwaukee 1, Wis.

The Fastatch FR-22A Kit sounds like a good deal.  
Send me bulletin 42-223 that describes it further.

Name.....  
Company.....  
Address.....  
City..... Zone..... State.....

B-455

## ASSOCIATIONS

[from page 7]

manufacturing or distributing industries; if this be so, then it is time the electronic service dealers and technicians grew up too.

Sincerely,

John A. Wheaton  
Pres. ESFETA

### Radio and TV Servicemen's Assoc. (Pittsburgh, Penna.)

The annual election for officers of the RTSA of Pgh. Inc. was held on June 14, 1955 at the regular business meeting. John F. Cochran was reelected President. Philip J. Polito, formerly second Vice President, was reelected to the position of first Vice President. Mr. John Gonsowski was elected second Vice President. Both Secretary Tom Ging and Treasurer Edmund Roberts were reelected for new terms.

The annual election of the Beaver Valley Chapter of the RTSA of Pgh. Inc. was held on June 16, 1955. Mr. Raymond Blackwood was elected to the office of Chairman. Vice Chairman Richard Cummiskey, Secretary Leroy Bruce and Treasurer Curtis Barrett were reelected for new terms.

### TELSA (Connecticut)

This communication (*in part*) appeared in the June 22 issue of TELSAs NEWS:

Appearing all over the country in newspaper advertising are discount ads not only pertaining to the appliances and parts we sell such as white goods, TV Radios, Tubes, and batteries but also now the discount house for labor.

Service is strictly in the labor category and any person not even knowing the TV business has to drive his car which means wear and tear and fuel.

You and I know that it is impossible to cut price labor, employees must receive their wages, we also know that it is impossible for the cut-price servicemen to find it lucrative to make a living full or part time at low price service calls.

It is up to us to inform the public of that fact in any way, shape, or form that we can. . . .

It is high time we informed the public of this, the best way to illustrate such a program is to institute a "rate chart" such as the automobile manufacturers use and adhere to it! . . .

F. E. Silverman  
Pres. TELSAs

### NATESA

A proclamation has been issued by Governor Stratton of Illinois on the occasion of the Sixth Annual NATESA Convention to be held at the Morrison

Hotel in Chicago, August 19th through 21st, 1955. This is the second proclamation, the first was by Mayor Daley of Chicago. A proclamation by President Eisenhower is in process of preparation. Thus, official recognition of the independent service industry has been given by the top leaders in the nation.

#### Federation of Radio Servicemen's Assoc. of Penna.

Plans for the unity meeting to be held in Pittsburgh are progressing. Federation of Radio Servicemen's Association of Penna., Empire State of New York. NETSDA and other state groups have signified the attention to attend.

#### Texas Radio-TV Dealers and Servicemen

Gentlemen:

We take pleasure in announcing our third Annual T.E.A. Clinic and Electronics Fair to be held at the Gunter Hotel in San Antonio, Texas, August 26-27-28, 1955.

Through the two previous successful clinics that T.E.A. has presented, we feel this clinic is what everyone connected with the electronics industry is looking forward to, in order to plan his business for the electronics progress of the present and future.

This serves as our first official notice of the clinic, and you may be assured that the program committee will endeavor to do their utmost to bring you the latest information concerning color, transistors, service, management, test equipment, and last but not least, a good panel of discussion.

Of course there will be plenty of exhibitors, factory representatives, parts distributors, and set distributors. This

will bring you up to date on any and everything pertaining to electronics.

Make your plans now to attend Texas' greatest annual Electronics Clinic and Fair, August 26-27-28, 1955, Gunter Hotel, San Antonio, Texas.

Sincerely,  
A. R. "Al" Niehaus  
1955 Clinic Chairman

#### California Television Men Meet in Convention

Radio and Television Associations of the Bay Area, and the Central Valleys of California met in convention at the Civic Auditorium of Richmond, California, May 16, 1955, in an initial attempt to foster cooperation between the existing associations throughout the area. Host to the convention was the Radio and Television Servicemen's Association of Contra Cost County. Mr. Ken Jackson, President of the Host Association was temporary Chairman, and presided until Mr. Thomas Lawson, Tri-County Radio and Television Association, was elected and assumed Chairmanship.

#### Television Installation Service Association (Chicago)

Now, after long study of many complaints filed by TV set owners regarding service on their sets with TISA-Chicagoland, a licensing authority has been created. Under this plan, any service company in the Chicago area which is willing to submit to an investigation of its facilities, its methods, and history, and which is willing to abide by the TISA Professional Code of Ethics and the Better Business Bureau Advertising Code may become TISA licensed. This will assure recourse to the Licensing Authority's Investigation Board. In the past, every case referred to this Board has resulted in satisfaction to all concerned. Should a licensee be found to be in error, they will be expected to correct the situation under penalty of prosecution and expulsion from the License Plan.

It is hoped to turn the plan over to the State of Illinois Department of Education & Registration for enforcement as soon as it is operating fully. In the meantime, set owners are urged to look for the above sticker which will assure fair and intelligent treatment.

#### Middle Tennessee TV Technicians Assn.

Something new has been added—the board of directors of MTTTA recently came up with something we have needed for some time. An investigating committee has been appointed to promote better customer-shop owner relations. On occasion the association has received

Stock — Display — Sell

**KRYLON**®

**AEROSOL**

**Protective Coatings**

... the brand with demand coast-to-coast



... preferred by Servicemen Everywhere

"Krylon-izing" is standard procedure for TV servicemen ... dries in a few minutes to form a hard, waterproof coating that seals and lasts. Resists climatic conditions, prevents many causes of picture fading and high-voltage section losses.

#### Krylon Dulling Spray ENDS GLARE IN TV STUDIO

... covers in seconds with fine dull spray that subdues bothersome highlights, simplifies lighting and arranging problems. Dries in a very few minutes. Easily removed by simply wiping. Available in 12-oz. only (\$1.95 list)

#### Krylon Spray Enamels IN 15 BEAUTIFUL COLORS

... just push the button and spray—for those tedious, hard-to-get-at jobs and touch-up use. No paint to mix or mess to clean up. Handy for TV service use and touch-up ... or 1001 uses around the home—inside or outside. Available in 6-oz. (.98 list) and 12 oz. (\$1.69 list)

KRYLON—America's Fastest Selling Spray Enamels

- featured in stores, coast to coast
  - nationally advertised and publicized
  - attractive, point-of-sale merchandising
  - minimum investment—maximum profits
- Contact Your Jobber or Write

**KRYLON, Inc.**

2038 Washington Ave., Phila. 46, Pa.

DON'T JUST SAY CAPACITORS

DON'T JUST SAY CAPACITORS

Ask For Sprague By  
Catalog Number

Know what you're getting  
... get exactly what you  
want. Don't be vague ...  
insist on Sprague. Use Com-  
plete radio-TV service cata-  
log C-610. Write Sprague  
Products Company, 71  
Marshall Street, North  
Adams, Massachusetts.

SPRAGUE®

WORLD'S LARGEST  
CAPACITOR MANUFACTURER

complaints from set owners regarding either quality of service or the amount of the bill presented them by shop owners after servicing their set. Fortunately, these grievances are often merely petty misunderstandings which can be cleared up by nothing more than a diplomatic explanation to the set owner by a shop owner or a representative of his firm.

## ANSWERMEN

[from page 42]

Several manufacturers such as Motorola and Zenith have designed their flyback transformers so that they can be easily dis-assembled and a defective winding replaced without installing a completely new transformer. The individual windings are made available and the cost is considerably less than the flyback assembly. It provides a simple means of servicing the receiver with a large reduction in cost.

The replacement of the windings can be accomplished without removing the transformer from the chassis. Since there will be fewer connections to be soldered in this operation the service time is greatly reduced, being considerably less than that required to exchange the entire unit.

As can be seen in Fig. 3 the top section of the core is removable which

permits either winding to be slipped off after the leads have been disconnected. It then becomes only a matter of placing the new coil in place, reassembling the core section and soldering the terminal leads to complete the job.

Naturally in this operation, as in soldering connections in any high voltage transformer circuit, care must be

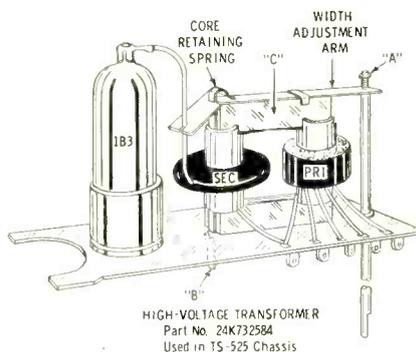


Fig. 3—View showing removable HV transformer windings.

observed in soldering the leads. All joints should be rounded with no sharp points protruding. It is desirable to use a high voltage compound or insulating wax to prevent any corona leakage. Also, the use of these compounds provides additional strength to the leads.

## CIRCUIT ANALYSIS

[from page 22]

in such a way as to lower its frequency back to the correct value.

Referring again to Fig. 3, note that the conditions just described would be similar if the oscillator were at the correct frequency but out of phase so as to cause the retrace to lead the sync pulse. The same action would take place, slowing down the oscillator until it is back in phase.

### Oscillator Frequency Too Low

The time relationship between the negative sync pulse at the cathode and the voltage at the plate of V9B when the oscillator frequency is too low, is indicated by the dotted sawtooth wave of Fig. 3. In this case the plate voltage will be less than that at normal frequency. The plate current decreases and so therefore does the drop across R80. The combination of the negative drop across R82 with a smaller positive drop across R80 now results in a control voltage at point D which is negative in polarity. This has the reverse effect of what occurred in the previous case and the oscillator is brought up to the correct frequency. If the frequency is correct but the phase lagging, the oscillator would be brought back into phase as before.

# SPECIAL OFFER TO OUR READERS!

By special arrangement with John F. Rider Publisher, Inc., RADIO-TV SERVICE DEALER now brings you a COMPLETE diagram service to help you do a faster, easier servicing job!

**ALL COMPLETE! ALL FACTORY PREPARED! ALL FACTORY AUTHORIZED!**

- ✓ Just \$1.25 for COMPLETE SERVICING INFORMATION on any TV receiver . . . any year, any make, any model . . . from 1946 on!
- ✓ Just 75¢ for COMPLETE SERVICING INFORMATION on any radio . . . any year, any make, any model . . . from 1941 on!

TAKE ADVANTAGE OF THIS SPECIAL OFFER . . . MAIL THE COUPON TODAY!

Radio-TV Service Dealer, 67 W. 44 Street, New York 36, N. Y.

Please RUSH me the following diagrams:

RADIO DIAGRAMS @ 75¢ EACH		
CHASSIS #	MAKE	MODEL #

TV DIAGRAMS @ \$1.25 EACH		
CHASSIS #	MAKE	MODEL #

MAKE ALL CHECKS & MONEY ORDERS PAYABLE TO Radio-TV Service Dealer  
(For all New York City orders, please submit additional 3% sales tax.)

Name .....

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# MOVING?



Please  
Mail Us  
Your Change  
of Address  
Today

## The NEW YEATS "Shorty" STATION WAGON & PANEL PICK-UP APPLIANCE DOLLY



Only 47" tall, this new Yeats dolly is designed for TV and appliance men who make deliveries by station wagon or panel delivery. No need to detach appliance for loading... the YEATS "Shorty" will slide into your vehicle with ease. Has same aluminum alloy frame, 30 second strap ratchet and caterpillar step glide as the standard size YEATS dolly! See your dealer today!



### YEATS "Everlast" COVERS & PADS



Furniture  
Pad

Washer  
Cover

SEND postcard for full information  
on our complete line TODAY!

**YEATS** appliance  
dolly sales co.

2133 N. 12th St.

Milwaukee 5, Wis.

## Don't just say capacitors

Ask For Sprague By  
Catalog Number

Know what you're getting... get exactly what you want. Don't be vague... insist on Sprague. Use complete radio-TV service catalog C-610. Write Sprague Products Company, 71 Marshall Street, North Adams, Mass.

**SPRAGUE**  
WORLD'S LARGEST  
CAPACITOR MANUFACTURER

## AUTO RADIOS

[from page 20]

might not be receivable in normal "Signal Seeking" tuning.

In setting up the push button mechanism the radio is tuned to the desired station. There are five selector tabs for pre-setting the button operation to the favorite stations. The tab is positioned so that it will be in line with (directly under) the dial pointer when the pointer reaches the position on the dial where the station is located. The dial pointer has a wiper contact associated with it and when it touches the proper selector tab it completes the cathode return circuit of the *if* and *rf* amplifier stages.

The five station selector tabs have a red portion that extends up in back of the dial glass permitting the operator of the radio to note their position on the dial scale. This is often not known to technicians when first attempting to service one of these radios. The location of these tabs for adjustment purposes is not readily evident until close examination reveals a small hinged cover on the front of the radio. This cover hides the button end of the tabs from view and it is only a matter of opening the cover to expose the access hole for the five tabs. The tabs are slid horizontally and placed slightly previous to or lower in frequency than the desired station.

### Manual Tuning

Manual tuning is made available through the use of a worm gear that connects into a manual drive gear in the train. The tuning is accomplished because the paddle wheel is held immovable by the relay arm at this time and the planetary arm moves in either direction with the rotation of the manual tuning shaft. During signal search tuning the worm gear holds the manual drive gear from moving and the planetary arm "walks around" the periphery of the manual drive gear.

### Foot Switch Operation

When a foot switch is installed there is minor difference in the manner in which the muting is accomplished. It can be seen in Fig. 4 that the voice coil of the speaker is shorted out by the foot switch. Clicks or popping sounds caused by the closing of B plus circuits are therefore prevented from activating the speaker.

### Servicing

Car radios with the added feature of "Signal Seeking" are becoming in greater evidence as the public learns to appreciate this convenience. Need for service technicians with an understanding of their operation is continually growing.

**Snyder**  
PHILADELPHIA

# Auto Antennas

WORLD'S  
MOST  
COMPLETE  
LINE

40 MODELS +

**EICO® SAVE 50% - BUILD EICO KITS!**

Sig. Gen. \$19.95

**OVER ONE-HALF MILLION IN USE!**

EICO KITS are top-quality professional TV-radio-electronic test instruments — embody latest performance-proven design. Complete with all components, pre-punched chassis, deep etched aluminum panel, rugged steel case. Easy-to-build with step-by-step instructions. Lifetime service guarantee.

5" Scope \$44.95

VTVM \$25.95

Tube Tester \$34.95

VOM \$12.90

See EICO's 38 Kits & 42 Wired Instruments in stock at your local jobber. Write for Catalog D8

Prices 5% higher on West Coast.

**EICO** 84 WITHERS STREET, BROOKLYN 11, N. Y.

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*"It just isn't fair... she's using JENSEN NEEDLES!"*

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**DON'T JUST SAY CAPACITORS**

Ask For Sprague By Catalog Number

Know what you're getting . . . get exactly what you want. Don't be vague . . . insist on Sprague. Use complete radio-TV service catalog C-610. Write Sprague Products Company, 71 Marshall Street, North Adams, Massachusetts.

**SPRAGUE®**  
WORLD'S LARGEST CAPACITOR MANUFACTURER

nobody... but **NOBODY!**

makes a product which will clean front ends like

**Nu-Tuner**



by the makers of GEMCO 2-set couplers  
The lowest loss couplers in the industry!



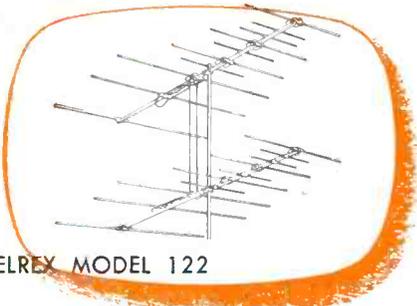
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B'klyn 12, N. Y.

## CONQUERORS OF DISTANCE!

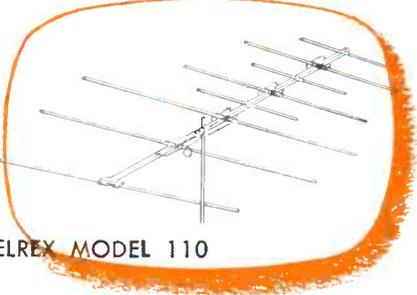
# telrex THUNDERBIRDS

HI-STRENGTH ALUMINUM,  
QUICK-RIG CONSTRUCTION

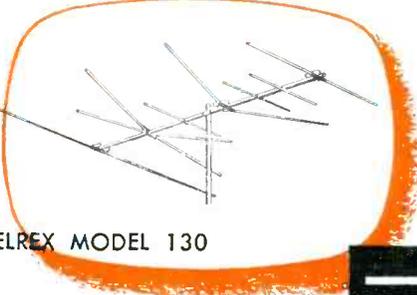
For high performance,  
low cost, permanent installation,  
choose a Telrex "Thunderbird"—



• TELREX MODEL 122

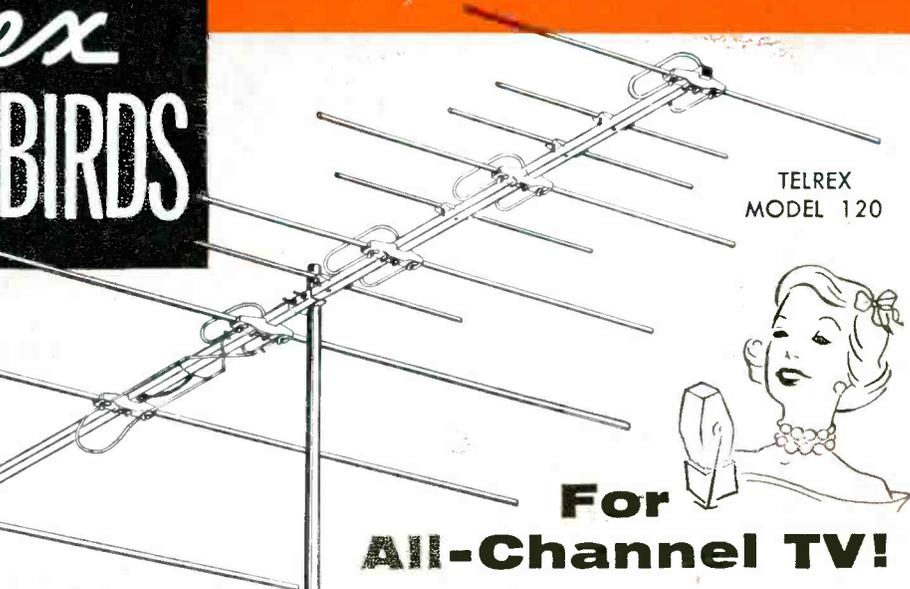


• TELREX MODEL 110



• TELREX MODEL 130

Producers of famous "BEAMED POWER"  
Communication Rotaries. Call or write  
for new catalogs on TV Antennas,  
Commercial Arrays or Amateur Rotaries.



TELREX  
MODEL 120

For  
**All-Channel TV!**

- DUPLEXED ELEMENTS FOR MAXIMUM GAIN
- COMPENSATED "TROMBONE" MATCHING SECTIONS FOR MAXIMUM EFFICIENCY
- FULL VIDEO, AUDIO BANDWIDTH FOR MAXIMUM BLACK AND WHITE AND COLOR FIDELITY

The new Telrex "THUNDERBIRD" multi-element wide-band Beamed Power arrays are engineered for fringe and "sub-fringe" area reception, and for all receiving conditions requiring exceptionally good directivity and high sensitivity.

Super Thunderbird Model T-120 is the finest wide-band, multi-element array ever developed. A system of variable impedance phasing loops permit precision tuning and the duplexing of element functions to provide the equivalent of 6 operating elements on the LO channels; 13 elements on the HI channels. Element for element, they develop greater gain and directivity than many single channel arrays. Model T-120 is accurately matched to 200-300 ohm transmission line for both HI and LO channels with compensated "trombone" sections to yield exceptionally high gain and optimum signal transfer efficiency. LO band gain averages better than 5.5 db; HI band gains exceed 12 db, while front-to-back ratios range to 25 db.

For brilliant, interference-free signals under toughest reception conditions, choose the Telrex Super Thunderbird 120! Available also in 2 bay units—Model T-122, 1/4-wave stacked for gain increases averaging 3 db on all channels; and Model T-122S, 1/2-wave stacked to provide gain increases up to 4.5 db on LO channels, over single bay units.

Thunderbird Model T-110 incorporates all the high-performance features of the Super Thunderbird T-120 including variable impedance loop phasing, compensated "trombone" matching sections and in-line, low wind resistance configuration plus high strength, all

aluminum, quick-rig construction for dependable, high performance, low cost, long lasting installations. Duplexed elements are equivalent to 5 effective elements on LO channels for average gains exceeding 5 db; and 11 operating elements on the HI channels for gains exceeding 10 db. Front-to-back and front-to-side ratios of better than 22 db minimize interference.

Available stacked 1/4-wave, Model T-112, for all channel gain increases of 3 db; and 1/2-wave stacked, Model T-112S, for increased gains to 4.5 db on LO channels.

Thunderbird T-130 employs Conical Dipole and "V" Beam quadrature phased driven elements to achieve virtually flat, stepless gain characteristics on all VHF channels with minimum number of elements. Model T-130 also employs variable impedance phasing loops, duplexed elements and Telrex compensated "trombone" matching sections. Four effective LO channel elements; 9 operating elements on HI channels, produce gains to 5 db on 2-6, and up to 11 db on channels 7-13. Special trap circuitry used in all Thunderbirds, attenuates interference arising outside the assigned TV bands to assure crisp, smear-free picture quality and full sound response.

Model T-132, stacked 1/4-wave gives average gain increase of 3 db on all channels; 1/2-wave stacked Model T-132S provides up to 4.5 db gain on LO channels over single bay.

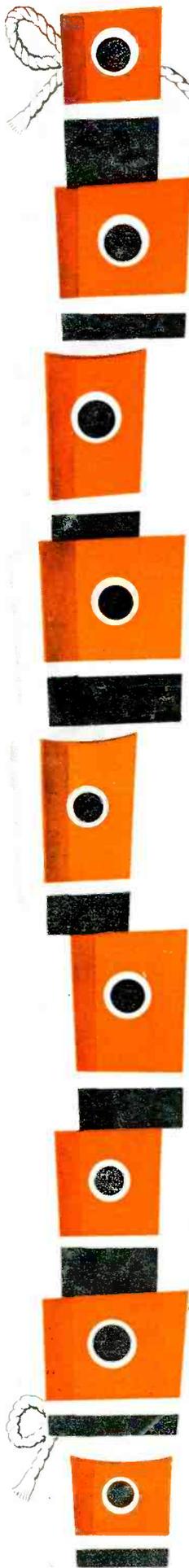


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STANDARD OF  
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Tel. P.Rospect 5-7252

Canadian Distributor:  
DELHI METAL PRODUCTS,  
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\*"Conical-V-Beams" are produced under U. S. Patent No. 23,346, Canadian Patent No. 500,436 and British Patent No. 691,485 — other patents pending. Sold only through authorized distributors.



**Hear the game BETTER**  
 Wherever you go...  
 USE **RCA BATTERIES**  
*radio required for extra listening hours*



*For summertime listening fun...*  
 WHEREVER YOU GO  
 USE **RCA BATTERIES**  
*available for all leading portables*



*Wherever you go...*  
 listen longer,  
 better with  
**RCA BATTERIES**

**STOP LISTEN STOP**

stop here  
 for a fresh supply  
 for all  
 leading portable radios

**RCA**  
 RADIO ENGINEERED  
 FOR EXTRA LISTENING HOURS



**VACATION TIME**  
 portable radio  
 Don't  
 miss a moment

**DON'T WAIT**

DEALER IMPRINT

**YOU  
 CAN SELL  
 THEM**

**...IF YOU  
TELL THEM**

You can sell your customers portable-radio batteries only if you tell them that you sell them. And doesn't it stand to reason that you can sell them easier if you tell them you sell the best?

RCA Batteries carry the selling power of the greatest name in radio. And only RCA backs this selling power with the most colorful, the most varied group of display materials and merchandising aids ever created for this business of selling batteries. Start boosting your battery profits now with RCA Battery window streamers, displays, and advertising aids. Use them to tell your customers that you carry fresh, long-life RCA Batteries for every leading portable on the market today.

Your RCA Distributor is ready now to help you promote bigger sales for bigger profits with RCA Batteries. See him soon, and ask for your free copy of "This Business of Selling Batteries." It's filled with business tips, selling hints, and sure-fire promotional ideas. Or write directly to RCA Commercial Engineering, Section H42N, Harrison, New Jersey.



**RADIO CORPORATION of AMERICA**  
 RADIO BATTERIES HARRISON, N.J.