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Electronic Techni-talk on AM, FM, TV Servicing

CONVERSIONS—

COMPLETE INDEX PLUS PROJECTION MODEL 910 AND 630TS

This is the seventh of a series of articles on the conversion of TV receivers to use larger sized picture tubes. In this issue a General Electric 910 model was converted from a 5 inch 5TP4 projection type picture tube to a 24AP4 direct view type. An RCA 10 inch model 630TS was also converted to use a General Electric 14CP4 picture tube in the original cabinet.

The following discussion is a description of the procedure followed which produced satisfactory results with respect to the particular model converted. If a conversion is attempted on a similar model of an earlier or later date or on a different model from the same manufacturer, then additional adjustments and steps may be necessary. The changes which were made have not been approved by the manufacturer and may therefore invalidate Underwriters' approval and the manufacturer's warranty.

GENERAL ELECTRIC MODEL 910

The General Electric Model 910 was a projection type receiver designed for a custom installation. This model has a receiver chassis and a power unit chassis. The model 901 receiver used these same chassis plus a record changer and these units were assembled in a cabinet. This model was very easy to convert to a direct view picture tube which resulted in a definite improvement in both definition and brightness.

The following parts were used to make this conversion:.

1—General Electric 24AP4 picture tube
1—General Electric RET-003 ion trap magnet
1—General Electric RLD-025 deflection yoke
1—General Electric 6BL7-GT tube
1—470K 2 watt resistor
1—1000 mmfd 1600 v. capacitor
1—Quam QF2 Focalizer
1—24-inch plastic mask measuring 20½ inches by 25 inches. (Manufactured and distributed by Hollywood Plastic Arts, 501 West Olympic Blvd., Los Angeles, 15 California.)
1—Plastic sleeve and rim for metal cone of 24AP4.

List prices of the foregoing parts at the date of publication totaled $150.30. However, allowance should be made for any differences due to transportation costs, etc.

The receiver chassis and the power unit were both removed together with the optical system and viewing screen.

The following changes were then made.

1. The leads from pins No. 5 and No. 6 on P14 shown in Figure 1 were disconnected to facilitate the removal of the original yoke.
2. The General Electric RLD-025 deflection yoke was then wired up as follows:
   1. Pin 5 on P14 to lug No. 6 on yoke.
   2. Pin 6 on P14 to lug No. 4 on yoke.
   3. P6 on the power supply chassis to lug No. 1 on yoke.
   4. P7 on the power supply chassis to lug No. 3 on yoke.
3. The anode requirements of the 24AP4 is between 13 and 16 Kv while the 5TP4 is operated at about 27 Kv. The lower voltage can be tapped off at either the filament of V208 or V209 as shown in Figure 2. It was found that the voltage was a little too low on V208 so a 470K 2 watt resistor was placed between pin 7 of V209 and the top of R245. The anode voltage, which was about 15 Kv, was taken off at this point. V210, C213, R227, 228, 229 and 230 were

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Model Converted	Some or Similar Chassis Used in These Models	Described in Techni-talk
GENERAL ELECTRIC		
802	801, 803	Vol. 3, No. 3
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630TS Chassis KCS-20A	630 TCS chassis KCS-20B-1, KCS-20D-2 630 TS chassis KCS-20C-2	Vol. 3, No. 5
STROMBERG-CARLSON		
TV-12 Series 11	T510 TV12 H1M ch. 112040 TV12 H2A ch. 112040 TV12 H2M ch. 112040 TV12 LM ch. 112035 TV12 M5M ch. 112034 TV12 PGM ch. 112034	Vol. 3, No. 2

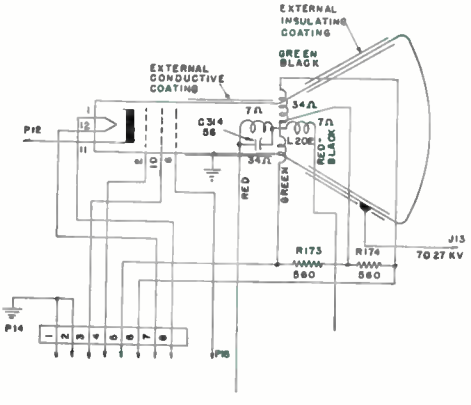

Figure 1. Wiring diagram of P14 and picture tube assembly showing original connections used in General Electric Model 910 projection type receiver.

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on AM, FM, TV Servicing

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GENERAL ELECTRIC

SCHENECTADY 5, N. Y.

R. G. KEMPTON—Editor

removed. The original HV lead could be used. However, a lighter piece of cable was used for this installation.

4. The connection between pin 7 of V207 and R231 was also removed and taped. This was the point where the focus voltage was originally taken off. The cable and connections in the focus voltage supply circuit were left in although they could have been removed.
5. The picture tube deflection yoke and PM focus coil were mounted on a piece of ⅝-in. plywood as shown in Figure 3.
6. A 1000 mmfd 1600V capacitor was connected across the horizontal coils to increase the width. The horizontal size linearity and the excitation controls were also adjusted for the best width and linearity.
7. The height was increased with good linearity by replacing the 6SN7-GT (V11 Vert. sweep generator) with a 6BL7-GT.
8. The plastic mask shown in Figure 4 was installed in place of the viewing screen and the 24AP4 picture tube and mounting assembly were centered and placed in back of the mask. This completed the conversion.

RCA MODEL 630TS

The next receiver converted was an RCA 10-inch model 630TS shown before conversion in Figure 5. This same receiver is shown in Figure 6 after it was converted to use a General Electric 14CP4 picture tube. The circuit used in this model has also been used in a number of other receivers. The Crosley Model 307TA and the Fada Model 799 both use practically the same chassis in cabinets that are very similar in appearance.

The following parts were used to make this conversion:

1—General Electric 14CP4 picture tube.
1—General Electric RET-003 ion trap magnet.
1—Stancor DY-7, Merit MDF-70 deflection yoke or equivalent.
1—14-inch plastic mask shown at the bottom of Figure 7. This mask was designed for use on the type cabinet shown in Figure 5. The mask shown at the top of Figure 7 was designed for use on cabinets similar in appearance but with a flat top instead of curved. Both types of masks are manufactured by the Deitz Miracle Lens Company, 141 President Street, Passaic, New Jersey.
1—4000 ohm 10 watt resistor.
1—.05 mfd 600 volt capacitor.
6—¾-in. spacers to raise deflection yoke and focus coil mounting brackets. These can be cut from a piece of ⅜-in. or ½-in. aluminum tubing similar to that used on the ordinary FM or TV antenna.

List prices of the foregoing parts at date of publication totaled $54.70. However, allowance should be made for any differences due to transportation costs, etc.

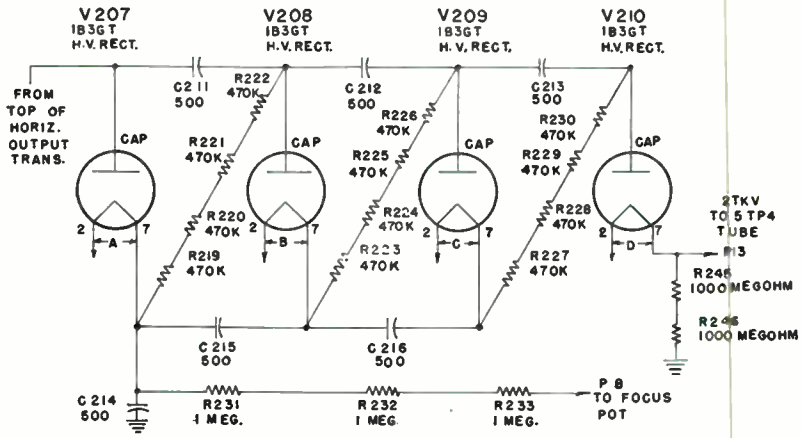


Figure 2. Original wiring used in HV rectifier section of General Electric Model 910 receiver.

CHASSIS CHANGES

The center section of the cabinet top was removed by loosening the two screws at the rear top of the cabinet. The two flat head wood screws which held the front in place were also removed. It was then possible to lift out the safety glass and front panel. These steps were necessary because the picture tube had to be removed from the front before the chassis could be taken out of the cabinet. The following circuit changes were then made:

1. The original deflection yoke was replaced with a Merit MDF-70. The rubber bumpers around the front of the yoke frame were then removed. This allowed the yoke to fit close to the bell of the 14CP4 picture tube.
2. R207 and R208 in Figure 8 were removed and replaced with a 4000 ohm 10 watt resistor.
3. C180, in the 6BG6-G screen circuit, was removed.
4. R209 was disconnected and removed. This is the resistor across the 5V4G damper tube.
5. R210, in the horizontal drive circuit, was shorted out and the drive control adjusted for maximum width with good linearity.
6. A .05 mfd capacitor was connected across the width control. This increased the width.
7. Another .05 mfd capacitor was connected across C186 in the horizontal linearity control circuit to make the total capacity .1 mfd.
8. The two screws which held the yoke mounting bracket to the chassis and the four screws which held the focus coil assembly to the chassis were removed. ¾-in. spacers and 1¼-in. self-tapping screws were used to remount both assemblies ¾-in. higher than their original position.
9. The speaker mounting bracket was moved to the left ¼-in. The top screw in the vertical oscillator transformer was removed, which allowed the transformer to be tipped toward the left side of the chassis. These changes were necessary to obtain adequate space for the 14-in. picture tube.
10. The original electro-magnetic double magnet ion trap couldn't be used. It was not removed from the circuit, however, but was taped to the side of the focus coil bracket. A new General Electric RET-003 single magnet ion trap was placed on the 14-in. picture tube and adjusted for maximum brightness.

In the receiver converted, it was not necessary to replace the horizontal sweep output transformer due to the changes which were made in the *horizontal output* circuit and the *reactor scanning* circuit. If difficulty is experienced in obtaining sufficient width, it may be necessary to replace the horizontal sweep transformers with a Stancor A-8129 or equivalent.

CABINET CHANGES

The cabinet work on this model was quite simple due to the custom fit mask which takes the place of the entire center portion. A template about $\frac{1}{16}$-in. larger than the faceplate of the picture tube was centered horizontally and placed $1\frac{5}{16}$-in. above the slotted baseboard of the cabinet. This area was marked off with a scriber and cut out with a keyhole saw. The underside of the 2-in. wide board across the top inside the cabinet was sanded down to about one-half the thickness to accommodate the bell of the new picture tube. A No. 50 Edwards sander attachment in a ¼-in. electric drill was used for the operation.

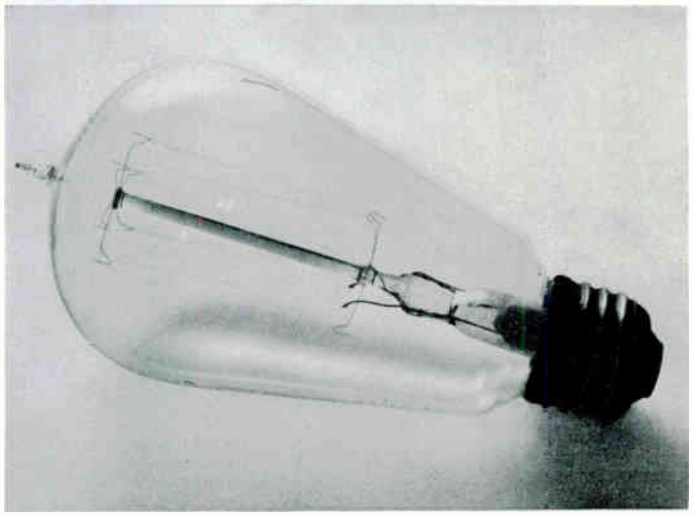
The bottom of the plastic mask was then placed in the slot on the baseboard. It was necessary to drill two holes in the top of the plastic mask in opposite corners. Two 1¾-in. oval head screws with cup washers were used to hold the mask securely in place. If these screws cannot be obtained in either blue or black, the head and cup washer can be covered with a little black paint to match the picture tube mask.

While these circuit modifications have been carefully tested, the General Electric Company can, of course, assume no responsibility for the application of these suggestions to the conversion of any particular receiver. General Electric offers this article as a suggestion of one possible way of making the conversion, but it does not represent that this is the only way or the best way of accomplishing the conversion.

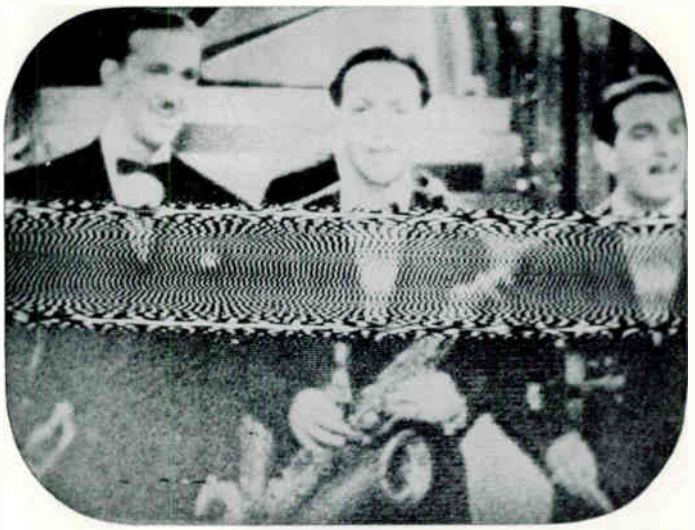
In the next issue conversion information on two more television receivers will be included.

Tele-Clues

FILE THIS SHEET IN YOUR TELE-CLUE BINDER



Tele-Clue No. J97. This is a photograph of a typical straight wire incandescent lamp, which may cause interference in the 60 to 70 megacycle frequencies (Channels 2, 3 and 4). Lamps of this type have not been manufactured since about 1925, however, a considerable number are still in use in such places as attics, fruit cellars, closets, etc. It is very rare for a modern General Electric lamp to cause interference; however, the type shown above may produce a high frequency oscillation. The main points of identification are the filament shape, the clear glass bulb and the tip.

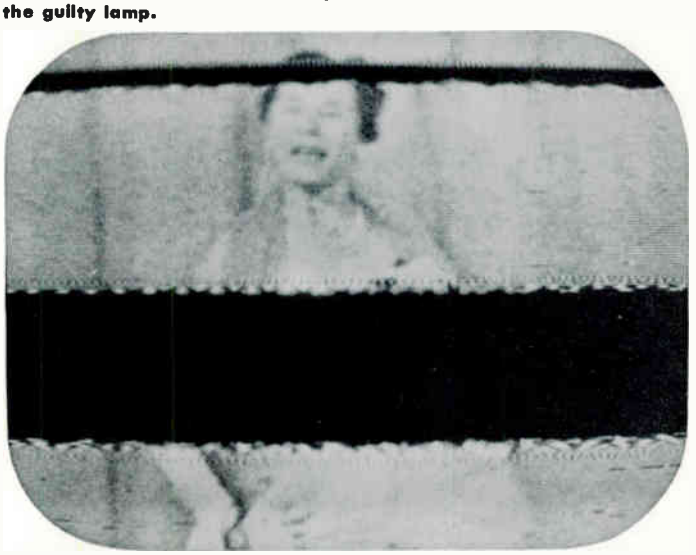


Tele-Clue No. J98. This shows one type of interference pattern produced by the lamp shown in Tele-Clue No. J97. Due to these lamps being used intermittently in such places as porch lights, closets, etc., they may be rather difficult to locate. Another factor is that this type of interference may cover a radius equivalent to two city blocks, particularly in low signal areas. In some cases the interference pattern may move either up or down on the screen until it is no longer visible. The radiation from a lamp of this type can be shielded or dissipated by use of metal reflectors but no one recommendation will apply to all installations. Therefore, the simplest remedy is to find and replace the guilty lamp.

Tele-Clue Nos. J99 and J100. Two more interference patterns produced by the type of lamp shown above. The black bands in the photograph on the right are the result of operating the lamp close to the receiver.

The high frequency oscillation in the lamp is not produced by any of the conventional methods. In principle, it relies on what is called the Barkhausen theory.

The Barkhausen theory requires several conditions and a certain geometry of the parts and layout in order to produce oscillations. In an incandescent lamp of the type shown, the ends of the filament wire act as a cathode and then an anode on each successive half cycle of the alternating current. Assuming one side to be negative, the filament emits electrons which are attracted by the opposite wire which is positive. The electrons accelerate toward the wire, with most electrons passing the anode. The inside glass surface of the bulb builds up a negative charge and as the electrons approach the glass they are repelled. In addition, the anode is still positive, attracting the electrons, and causing them to return in the direction of the anode. On returning to the anode the process is repeated, the electrons overshoot the wire anode and enter a negatively charged cathode field. The electrons take an elliptical path about the anode which creates a high frequency current in the anode.



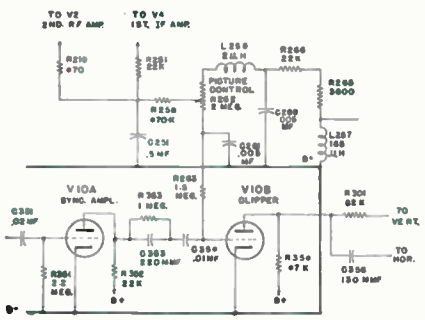
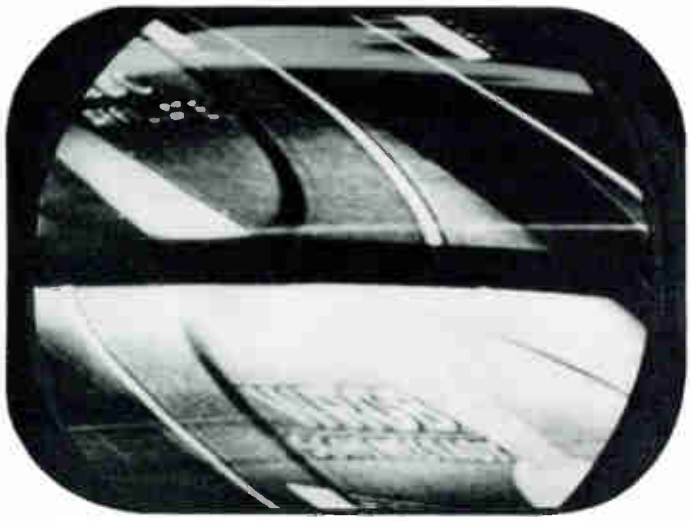


Figure 1. Sync amplifier and clipper circuit used in a number of General Electric TV receivers.

This page of Tele-Clues has been punched for insertion in your Tele-Clue binder. These binders which contain ninety-six Tele-Clues and an index sheet are available through your local G-E tube distributor.

The letter which precedes each Tele-Clue number identifies the circuit in which the defect exists. Please enter the Tele-Clue number in the proper column on the index sheet according to the key letter which precedes each number. Tele-Clues pertaining to THE AGC CIRCUIT will be coded with the letter M. Please write this reference above the letter M on the index sheet in your binder.

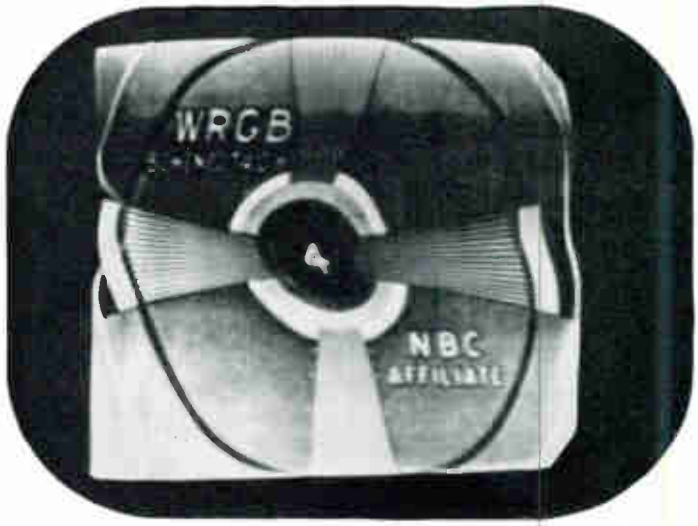


Tele-Clue No. K101. The above photo illustrates the effect of losing both horizontal and vertical synchronization. This defect was due to an open C-354 in Figure 1. However, it could be due to any of the following:.

1. **C351 open.**
2. **Defective V10A or V10B.**
3. **Loss of plate voltage on V10A or V10B.**
4. **Incorrect value of R354.**
5. **Insufficient amplitude of composite signal applied to sync amplifier from video amplifier, check video amplifier circuit. A scope will prove invaluable when used as a signal tracer in this circuit. The wave form and amplitude should be compared with the manufacturer's service notes.**

Tele-Clue No. F103. This photo indicates a defective component which reduces the output B+ voltage. This reduced B+ voltage will affect both horizontal and vertical sweep and will also give reduced picture brilliance. The ripple and shadow through the picture is due to inadequate filtering of the "B" supply. This was caused by an open C452 in Figure 2.

Tele-Clue No. M102. This condition is typical when a component fails in the AGC circuit. It may result in the contrast control having little or no effect on the picture. If the contrast control has little control, it may be due to leakage in one of the capacitors such as a C261 or C251. Since the impedance of the circuit is high, leakage in the order of 1 megohm or less may cause trouble. A completely inoperative control may be the result of a shorted capacitor or a ground in the AGC system. This was caused by a shorted C251 in Figure 2, however, a short in C261 or an open in L258 may result in a similar condition.



Tele-Clue No. F104. This illustrates another defect due to inadequate filtering. The dark shaded bar is caused by hum in the picture tube grid circuit, while the waviness in the raster edge is the result of hum in the horizontal deflection circuit. This was caused by an open C453 in Figure 2.

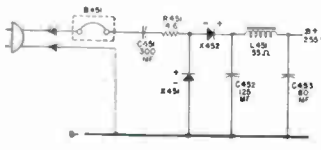


Figure 2. Selenium rectifier type B+ power supply used in a number of General Electric TV receivers.

TELE-TIPS

No. 48. Receivers using plug-in segments in the head-end may develop intermittent oscillator operation. This may cause the HF oscillator to shift frequency or stop oscillating entirely. In many cases this can be cured by removing the segment and resoldering each connection.

No. 49. A shift in the HF oscillator frequency resulting in the picture either fading or disappearing completely on some General Electric receivers may be due to the 12 mmfd capacitor (C212). This capacitor is connected between the channel switch rotor in the oscillator grid circuit and B−. This can be replaced without removing the head-end although at first it may appear to be impossible. It will probably be necessary to replace the 10K resistor (R216) as this is connected in parallel with C212 with the ends soldered together. First clip the end of these two components which goes to the front section of the channel switch. This should be pushed back so that the clipped end doesn't touch anything "hot." The two new components should be connected in parallel between the switch terminal and the B− lug which is only about one inch away and easily accessible. This lug is located on the head-end chassis near the vertical output transformer.

No. 50. A General Electric TUBE PULLER will protect your fingers when removing hot tubes. It is made of ⅛-in. sponge rubber with a raised rib to guide you when inserting miniatures. Fits all types —glass, metal, seven-and-nine-pin miniatures. See your distributor.

No. 51. When using a built-in antenna on a TV receiver with a metal back cover, be sure the leads are connected from the outside. In some cases r-f interference similar to Tele-Clue J90 may appear if the leads are run inside the metal back cover.

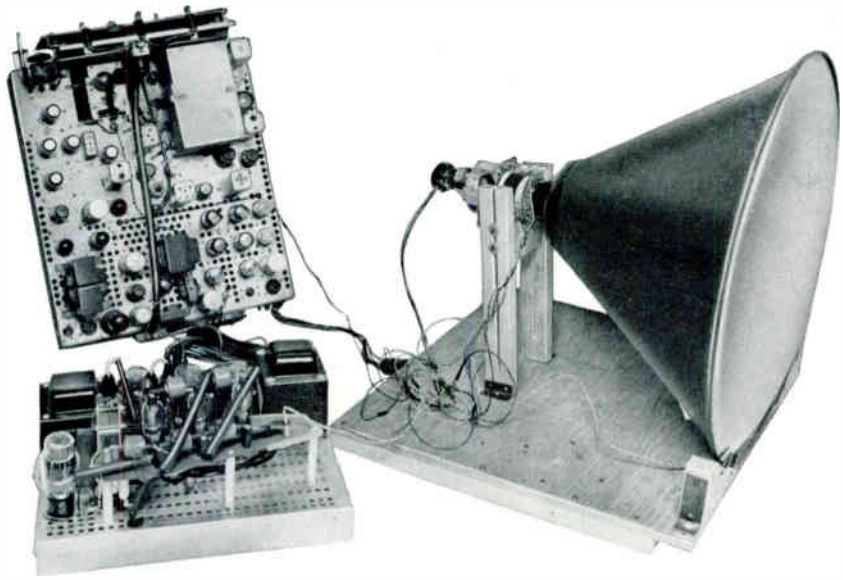


Figure 3. General Electric Model 910 receiver converted to use a 24AP4 picture tube.

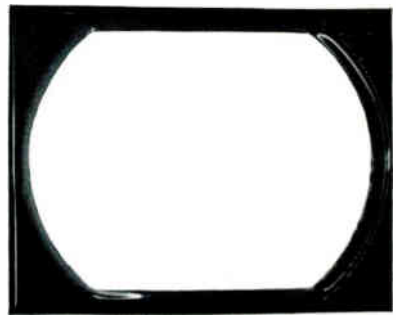


Figure 4. Twenty-four inch plastic mosk used to replace viewing screen on General Electric Model 910 receiver.

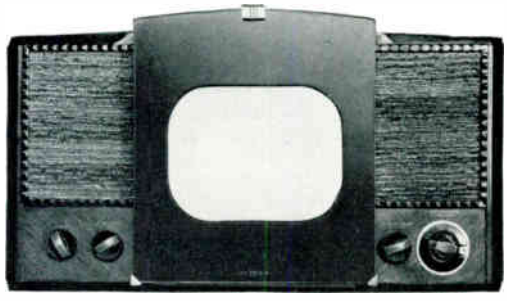


Figure 5. RCA ten inch Model 630TS TV receiver before conversion.

Figure 7. Two plastic masks specially designed for use on 630 type cabinets. The mask on the top is used on flat top cabinets and the one on the bottom on cabinets with a curved top as shown in Figure 5.

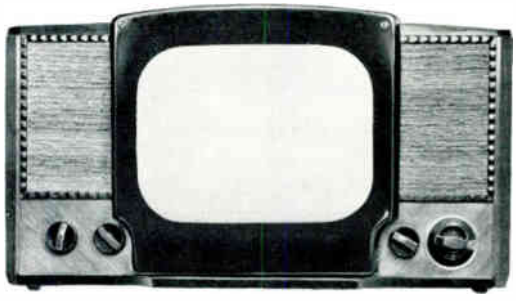


Figure 6. The same receiver shown in Figure 5 after being converted to use a General Electric 14CP4 picture tube.

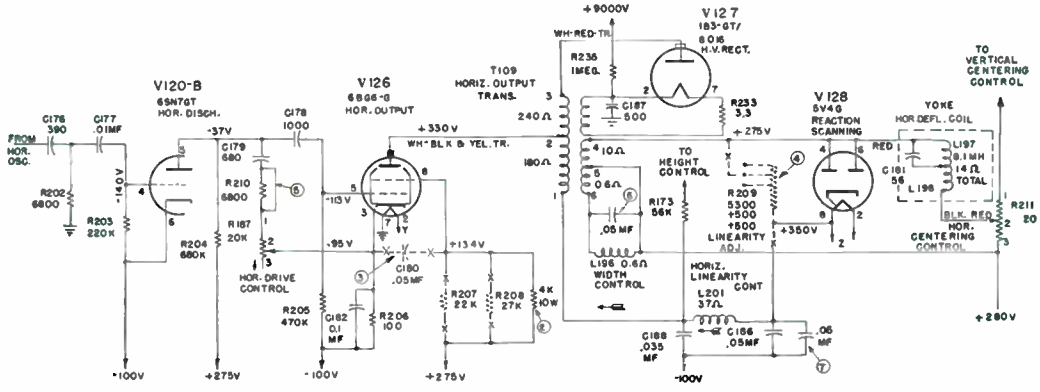


Figure 8. Horizontal output and HV section of RCA 630TS showing changes made to use a General Electric 14CP4 picture tube.

BENCH NOTES

Contributions to this column are solicited. For each question, short cut or chronic-trouble note selected for publication, you will receive $10.00 worth of electronic tubes. In the event of duplicate or similar items, selection will be made by the editor and his decision will be final. The Company shall have the right without obligation beyond the above to publish and use any suggestion submitted to this column. Send contributions to The Editor, Techni-talk, Tube Division, General Electric Company, Schenectady 5, New York.

REPAIRING PLASTIC ESCUTCHEON DOORS

Escutcheon doors on table models such as Admiral 16R12 are easily damaged and usually break off at the hinge. The hinge studs are only a quarter of an inch long and are located on each side of the door. These studs are the thickness of an average nail. I replaced many of these broken plastic studs with metal ones at a very low cost. After selecting a proper nail or rod of the correct thickness, I cut off a piece one half inch in length with a pair of cutters. I then heated this nail or rod with a soldering iron and pressed it into the door to replace the broken stud. This melts into the plastic door very quickly, and when assembled the door is as good as new.

John P. Ferencz
16 May St.
Ansonia, Conn.

FIXING SCUFFED OR MARRED FINISHES

When panels, which have a smooth or wrinkle finish are scratched, obtain a wax crayon (the color of the finish to be repaired) and apply by rubbing with a circular motion over the scratch. Then take a cloth and dip it in linseed oil (I find that the pure grade does a better job than the cheaper grades on the market) and apply sparingly over the crayon. If a wrinkle finish is very badly chipped, do not use the above method, but take a hard brush and brush on a thin coat of a matching lacquer. If the coating is thin enough, it will retain the wrinkle finish. This method can also be used to "build-up" a thin coat of wrinkle finish that has worn down.

Jeffrey Lowenthal
657 W. Buena Avenue
Chicago 13, Illinois
Apartment 1

SERVICE HINTS

1. On RCA Type 630 chassis, if you experience interference on channel 13 which appears as FM, retune primary of 3rd sound I.F. transformer and it will clear up. It seems, that unless this stage is properly tuned, it radiates a signal which is picked up by the head-end. This has been very noticeable on a number of sets using 21.25 mc sound I.F. This only appeared on channel 13.
2. Receivers using RCA Syncrolock (Horizontal A.F.C.), may be unstable during the warm up period and require retuning of the secondary of the horizontal sync. discriminator transformer. This can usually be corrected by replacing the 39K and 27K 1-watt resistors connected to plate of the 6AC7 horizontal control tube. Although these resistors measure O.K. hot or cold, they apparently change resistance under load.

Melvin C. Roppelt
1419 Kenhill Ave.
Baltimore 13, Md.

HANGER FOR RECORD CHANGERS

Instead of using some form of bench stand for record player repair, I have purchased some light chain and four small hooks from the local hardware store and divided the chain into four equal lengths. To the end of each length of chain I attached one hook. I then mounted two fairly large screw eyes in the ceiling four feet apart. To each screw eye I attached two chains so the ends with the S hooks attached hang downward.

Now, when a record changer is under repair it hangs from the ceiling suspended from each corner by a hook. The length of the chains will be determined by the amount of height desired to make underneath viewing of the changer convenient.

I believe this system to be better than any stand since it can be hung at least three feet above the bench without sway or light obstructions.

Robert W. Dambach
Nelson's TV and Radio Service
44 West Main St.
Fredonia, N. Y.

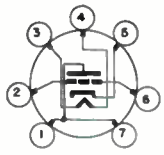
What's new!

6AF4

The 6AF4 is a miniature medium-mu triode designed for use as the local oscillator in television receivers which operate in the ultra-high-frequency region. Features of the tube include close spacing of the elements to reduce electron transit time and double connections to the plate and grid to reduce internal lead inductance.

AVERAGE CHARACTERISTICS

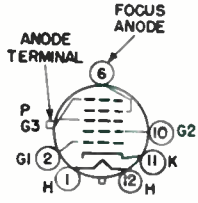
Plate Voltage	80 Volts
Cathode Bias Resistor	150 Ohms
Amplification Factor	15
Plate Resistance	2270 Ohms
Transconductance	6600 Micromhos
Plate Current	16 Milliamperes



17VP4

The 17VP4 is an electrostatic-focus and magnetic-deflection, direct-view picture tube for television applications. It provides a 10¾ by 14½-inch picture. Features of this tube are an electron gun designed for zero focusing voltage and current and used with an external ion-trap magnet, a neutral-density face plate which increases picture contrast and detail under high ambient light conditions. The space-saving rectangular faceplate has a cylindrical front surface which materially reduces reflections.

Focusing Method—Electrostatic	
Deflection Method—Magnetic	
Deflection Angle, approximate	
Horizontal	66 Degrees
Diagonal	70 Degrees
Focusing Voltage	0 Volts



Electronics Department
GENERAL ELECTRIC Company
Schenectady 5, N. Y.