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
2. General Electric RET-003 ion trap magnet
3. General Electric RLD-025 deflection yoke
4. General Electric 6BL7-GT tube
5. 1-470K 2 watt resistor
6. 1-1000 mmfd 1600 v. capacitor
7. Quam QF2 Focalizer
8. 1-24-inch plastic mask measuring 20 1/2 inches by 25 inches. (Manufactured and distributed by Hollywood Plastic Arts, 501 West Olympic Blvd., Los Angeles, 15 California.)

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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Figure 1. Wiring diagram of P14 and picture tube assembly showing original connections used in General Electric Model 910 projection type 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. 1/4-in. spacers and 1/4-in. self-tapping screws were used to remount both assemblies 1/4-in. higher than their original position.

9. The speaker mounting bracket was moved to the left 1 1/4-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-001 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 5/8-in. larger than the fairplate of the picture tube was centered horizontally and placed 1 1/2-in. above the slotted baseboard of the cabinet. This area was marked off with a scriber and cut out with a keyhole saw. The undersides 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 1/4-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 1/4-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-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 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.

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.

Figure 1. Sync amplifier and clipper circuit used in a number of General Electric TV receivers.
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 V1OA or V1OB.
3. Loss of plate voltage on V1OA or V1OB.
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 waveform and amplitude should be compared with the manufacturer's service notes.

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. 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 C453 in Figure 2.

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 ohm 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. The 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 3/4-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 5. RCA ten inch Model 630TS TV receiver before conversion.

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

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

Escutcheon doors on table models such as Admiral I6R12 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 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. Ference
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 be also be used to "build-up" a thin coat of wrinkle finish that has worn down.

Jeffrey Lowenthal
637 W. Buena Avenue
Chicago 13, Illinois

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 lengths of chain are equal. I then heated and bent the chains into a large semi-circle. I then 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 lengths of chain are equal. I then heated and bent the chains into a large semi-circle. I then attached one hook. To each hook I attached a fairly large hook. I was then able to lift the changer from the floor or bench and turn it around quite easily.

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

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17VP4

The 17VP4 is an electrostatic-focus and magnetic-deflection, direct-view picture tube for television applications. It provides a 10% by 14% inch picture. Features of this tube are an electron gun designed for zero focusing voltage and current and used with an external iron-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 | 60 degrees
Vertical | 70 degrees
Focusing Voltage | 0 Volts

Hanging Picture Tube

Jeffrey Lowenthal
637 W. Buena Avenue
Chicago 13, Illinois

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See Your Distributor!