

**THE USE OF
AN AM
SIGNAL
GENERATOR**



Techni-talk
on AM, FM, TV Servicing

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... IN PLACE OF A CROSS-HATCH GENERATOR

In some areas TV stations have either reduced "test-pattern time" to only a few minutes a day or the time is such, that when the test pattern is on, very few if any receivers can be installed and adjusted. Several manufacturers of test equipment are producing cross-hatch generators which can be conveniently used to adjust the height, width and linearity controls. These instruments should be used whenever available since they are designed for this particular application. Some service-technicians may not as yet have acquired one of these instruments or in a large service organization there may not be a sufficient number to go around. If a cross-hatch generator is not available an ordinary AM signal generator can be used for the same purpose.

The vertical linearity and height controls can be checked and adjusted by setting the channel selector to some channel not used in your area. This should probably be one of the lower channels since most of the older signal generators do not cover the high TV channel frequencies. The RF output cable of the signal generator should be connected to the antenna terminals of the receiver. The output of the signal generator must be modulated since it is the frequency of the modulation which is visible on the picture tube screen. Most signal generators have provision for 400-cycle modulation which produces a bar pattern similar to that shown in Figure 1. The output of some signal generators such as the General Electric YGS-3 can be modulated by a 60-cycle or 400-cycle fixed frequency, or by any frequency within the variable frequency range of 100 to 12,000 cycles. The 60-cycle modulation produces a pattern consisting of two horizontal bars as shown in Figure 2. The positive half of the sine wave produces the bright bar, while the negative half produces the black bar. The 400-cycle modulation produces six bright bars and five dark bars as shown in Figure 1. The number of black and white bars will vary depending on the frequency of the audio modulation. If the frequency of the audio modulation is increased to 1500 cycles, the number of black and white bars will increase to 25 as shown in Figure 3. The number of bars which appear on the screen can also be varied

somewhat by adjusting the vertical hold control which changes the frequency of the vertical oscillator.

The vertical linearity and height controls can be adjusted with either 400-cycle modulation or some higher frequency such as 1500 cycle. A squeezing at the top is shown with 400-cycle modulation in Figure 4 and with 1500-cycle modulation in Figure 5. The controls should be adjusted until the spacing between each bar is the same, keeping in mind, of course, that the top and bottom should not extend more than one-half inch beyond either the top or bottom of the screen.

Reasonably good vertical adjustments can also be made without instruments by checking the scanning lines for crowding either near the top or bottom of the screen. This type of adjustment can be made somewhat easier if the vertical hold control is adjusted so that the vertical scan lines for each frame pair up or overlap. If a receiver has good "interlace" this point may be very close to the position where the vertical loses

sync. Another method which can be used is to adjust the vertical hold control so that the vertical rolls slowly. The height of the blanking bar between frames can be observed as it moves from the top to the bottom of the screen. If the height of this bar changes either near the top or near the bottom of the screen the picture will be affected in the same way at the same point. The height and vertical linearity controls should then be adjusted until the height of the blanking bar is uniform regardless of its position on the screen.

Although the vertical height and linearity controls can be adjusted for reasonably good linearity without a test pattern or test equipment, the adjustment of the horizontal linearity control does require some type of a pattern on the screen. An incorrect adjustment of the height and vertical linearity controls is more noticeable on the ordinary program than is an incorrect adjustment of the horizontal controls. This does not mean that horizontal adjustments can be overlooked, however, since the owner will see a number of programs on which a circle will be



Figure 1. Pattern produced by signal generator with 400-cycle modulation.

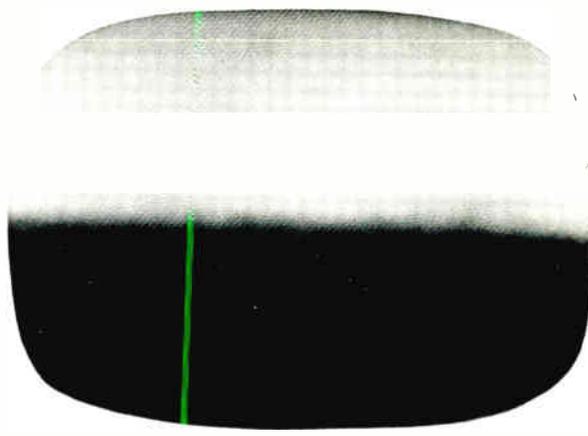


Figure 2. Pattern produced by signal generator with 60-cycle modulation.



Figure 3. Pattern produced by signal generator with 1500-cycle modulation.



Figure 4. 400-cycle modulation with poor vertical linearity

TECHNI-TALK

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R. G. KEMPTON—Editor



Figure 5. 1500-cycle modulation with poor vertical linearity.

used, and if this is not a reasonably true circle a return service call will probably be required.

The signal generator can also be used to make this adjustment without removing the chassis from the cabinet. The only additional items required are a .01 mfd capacitor and a piece of thin spaghetti. The location of the first video amplifier tube must also be known. This tube can, of course, be identified if a circuit diagram is available. If a diagram is not on hand, the tube layout will ordinarily indicate the video amplifier tube or this tube may be recognized by its location on the chassis.

A number of manufacturers are also including test jacks located at various points in the circuit which can be used for trouble-shooting or signal insertion. One of these test jacks is usually located at the output of the video detector or the input to the first video amplifier. If a test jack is available the output of the signal generator can be connected to this point through a

.01 mfd capacitor by inserting one end of the capacitor, bent to make proper contact, into the test jack.

If a test jack is not available at this point in the circuit, contact can be made by connecting the .01 mfd capacitor to the grid pin on the first video amplifier tube. A piece of thin spaghetti should cover both of the capacitor terminal wires so that only about one quarter inch of wire is exposed at the end of each wire. One end can then be bent so that it will fit snugly over a miniature pin, and the other end can be bent to fit over an octal pin. Either end can then be used depending on the tube used in the receiver. The spaghetti will prevent a "short" either to the chassis or to some other tube pin. The channel selector should be set on a blank channel and the RF output cable of the signal generator connected to the unused end of the .01 mfd capacitor. The output of the signal generator should be unmodulated and the frequency

adjusted for some harmonic of the horizontal sweep frequency of 15,750 cycles, such as the tenth harmonic which is 157,500 cycles or 157.5 KC. This will produce about ten vertical dark and light bars across the screen as shown in Figure 6. The spacing of these bars can then be used to adjust the horizontal linearity control. If more bars are preferred the frequency of the signal generator can be increased; if fewer bars are desired the frequency can be decreased. The vertical bars will "sync in" at harmonics of the horizontal sweep frequency. If the audio modulation is not turned off the bars will be wavy as shown in Figure 7.

If either a cross-hatch generator or an AM signal generator must be used, it should be remembered that these instruments are only substitutes for the test pattern. If a test pattern can be used it should be preferred although reasonably close linearity adjustments can be made with instruments.

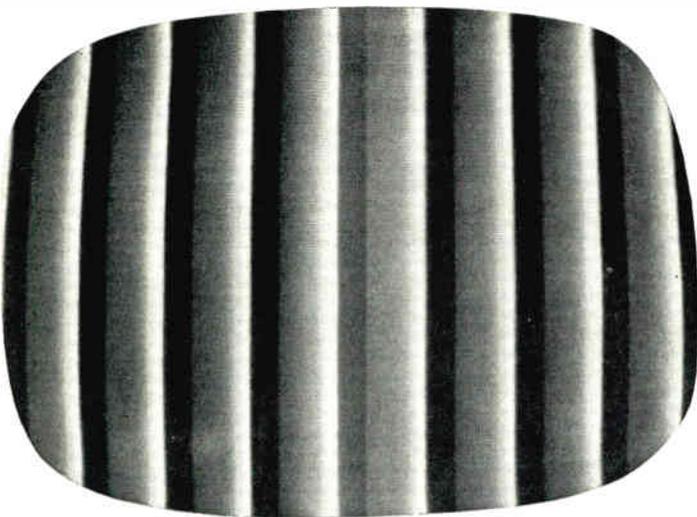


Figure 6. Pattern produced by signal generator with 157.5 KC unmodulated output.

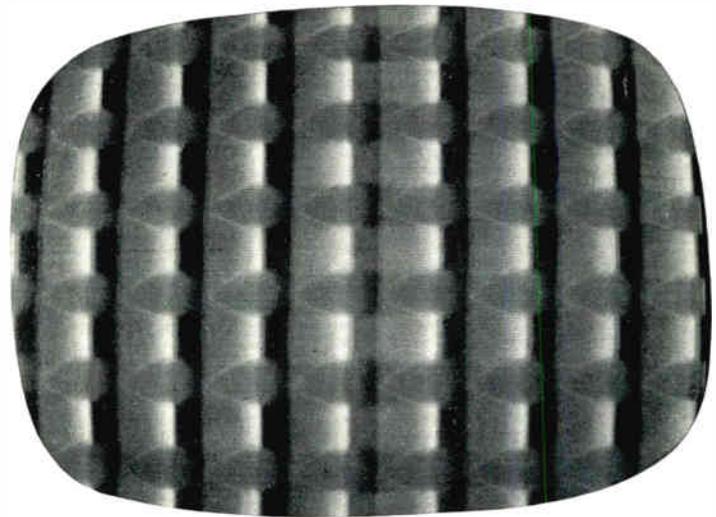


Figure 7. Pattern produced by signal generator with 157.5 KC modulated by 400-cycle audio.

CONVERSIONS—630TS TO 20 INCH

This is the ninth of a series of articles on converting TV receivers to use larger picture tubes. In this issue an RCA Model 630TS was converted from a ten-inch round to a twenty-inch rectangular picture tube.

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 the manufacturer's warranty.

The RCA model 630TS shown in Figure 1 was originally a ten-inch receiver. This was converted to use a 20CP4 picture tube although sufficient sweep was available to use either a 21EP4 or a 24AP4 picture tube. Since the completed conversion could not be mounted in the original cabinet no cabinet information is given. This conversion would be particularly suitable for a custom installation or it could be mounted in a number of different cabinets which are available from radio supply houses.

The circuit used in this model has also been used in a considerable number of other receivers. Therefore the same circuit changes which were used on this model should also work on other receivers using the same type circuit. While making the conversion both horizontal and vertical retrace elimination circuits were added. The horizontal retrace elimination circuit consists of a piece of 75-ohm twin lead connected as shown in Figure 2. This eliminated a slight foldover which appeared at either side depending on the adjustment of the horizontal hold control. The vertical retrace elimination circuit consists of one .02 mfd and one .05 mfd 600-volt capacitors and one 2700-ohm and one 4700-ohm one-watt resistors connected as shown in Figure 3. This eliminated the vertical retrace lines which allowed the brightness control to be advanced beyond the point where these retrace lines normally appeared.

The following parts were used to make this conversion:

- 1—General Electric 20CP4 picture tube.

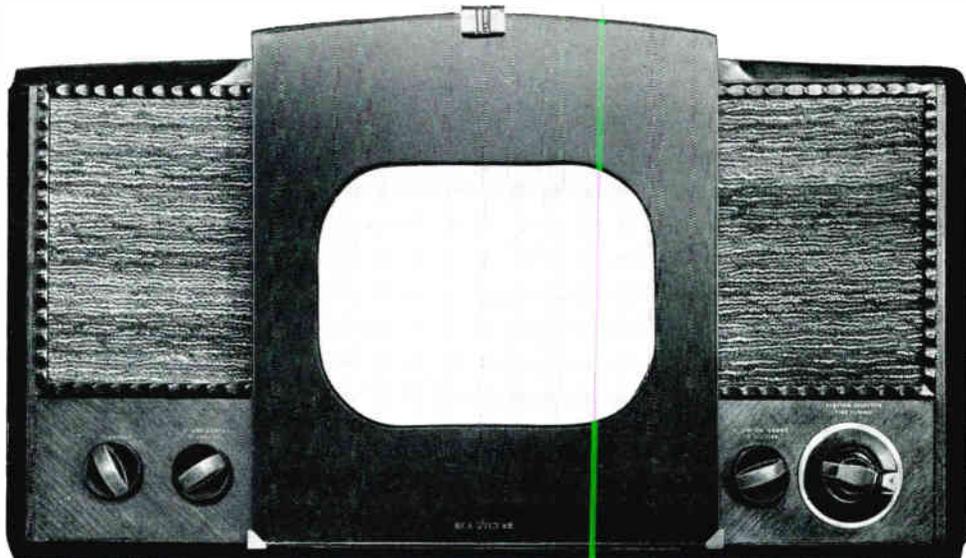


Figure 1. RCA ten-inch Model 630TS TV receiver before conversion.

- 1—General Electric RTO-085 horizontal sweep transformer.
- 1—General Electric RLD-025 deflection yoke.
- 1—General Electric RET-003 ion trap magnet.
- 1—General Electric 6V6-GT tube.
- 1—General Electric 6CD6-G tube.
- 1—General Electric RLD-014 width/linearity control
- 1—1000-ohm one-watt resistor.
- 1—1000-ohm two-watt resistor.
- 1—1200-ohm one-watt resistor.
- 1—2700-ohm one-watt resistor.
- 1—4700-ohm one-watt resistor.
- 1—10,000-ohm one-half-watt resistor.
- 2—500 mfd 20 KV capacitors.
- 1—.02 mfd 600-volt capacitor.
- 2—.05 mfd 600-volt capacitors.
- 1—Ten-inch piece of 72-ohm twin lead.
- 1—HV extension lead.

List prices of the foregoing parts, at date of publication, totaled \$94.60. However, allowance should be made for any local differences due to transportation costs, etc.

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 deflection yoke and focus coil mounting brackets were removed and discarded.
2. The leads to the picture tube socket with the exception of the lead going to pin 10 were lengthened. The wire going to pin 10 was cut and the receiver end taped. The socket end of this wire was connected as described in step 11 to the deflection yoke as part of the horizontal retrace elimination circuit. The focus coil leads were also lengthened and the length of the high voltage lead was increased by using

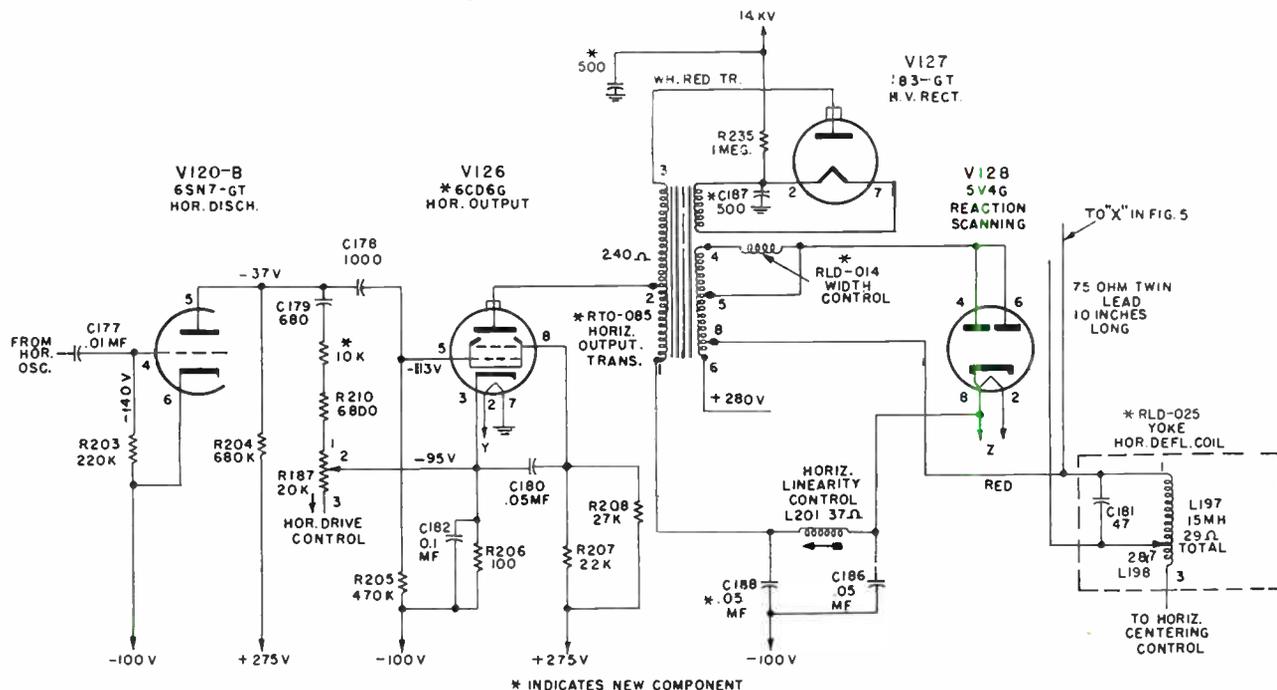


Figure 2. Horizontal output and HV section of RCA 630TS showing the changes made to use a General Electric 20CP4 picture tube.

one of the extension cables available at most General Electric tube and parts distributors.

3. The original deflection yoke was removed and replaced with a General Electric RLD-025 70° yoke. These leads were also lengthened when this replacement was made.
4. The original horizontal sweep transformer was removed and replaced with a General Electric RTO-085 and connected as shown in Figure 2. This was mounted to the side of the HV cage with an angle bracket bent and drilled as shown in Figure 3. If you do not have suitable material available to make this angle, the transformer can be mounted to the chassis with ordinary machine screws. If this method of mounting is used new holes will have to be drilled in both the transformer and the chassis. The 1B3-GT filament dropping resistor R233 was removed. A resistance check should be made of R235 in the HV lead, and if the resistance is off more than ten percent, it should be replaced.
5. The 500 mmfd capacitor was replaced with one having a 20 KV rating, and a second 500 mmfd 20 KV capacitor was connected between the chassis and the output end of R235 as shown in Figure 2. If a 20CP4-A or one of the twenty-one inch tubes having an external conductive coating is used, the second 500 mmfd filter capacitor can be omitted since this conductive coating acts as a filter capacitor when grounded.
6. Damping resistor R209 should be removed from the circuit and discarded.
7. The original width coil was removed and replaced with a General Electric RLD-014 which was connected as shown in Figure 2. This was mounted in an enlarged hole on the original mounting bracket.
8. The 6BG6-G horizontal output tube was replaced with a General Electric 6CD6-G tube.
9. Capacitor C188 was removed and replaced with a .05 mfd 600-volt capacitor. This capacitor is connected to one end of the horizontal linearity control.
10. A 10K two-watt resistor was inserted between R210 and R187 in the horizontal drive control circuit.

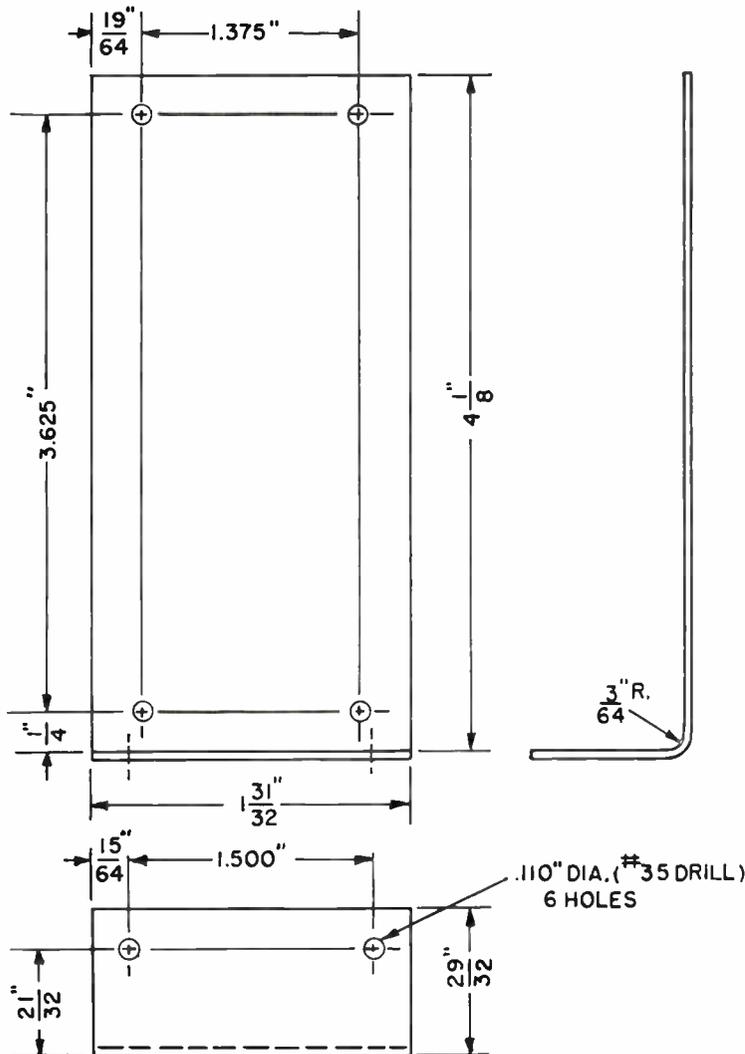


Figure 3. Dimensions of bracket used to mount General Electric RTO-085 horizontal sweep transformer to side of HV compartment.

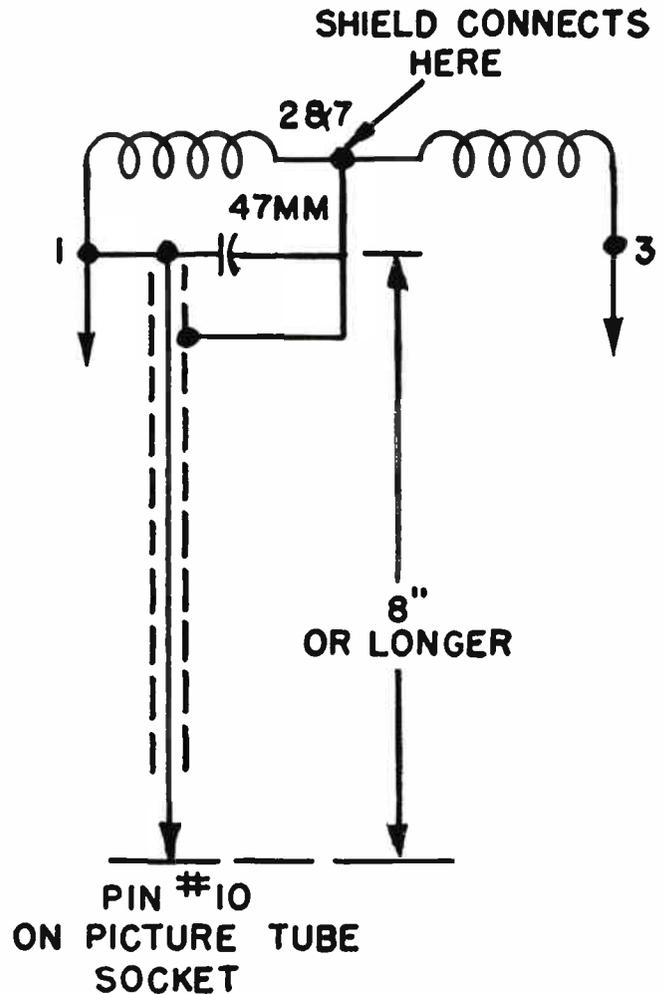


Figure 4. Horizontal retrace elimination circuit used when insulated shielded cable is used in place of 75 ohm twin lead.

11. A ten-inch piece of 75-ohm twin-lead was connected across capacitor C181 as shown in Figure 2. This capacitor is across a portion of the horizontal coils in the deflection yoke. If 75-ohm twin-lead is not available a piece of outside insulated shielded wire can be used. This type wire should be connected as shown in Figure 4. Be sure that the wire which originally supplied 275V to pin 10 on the picture tube is removed from the 275V source as described above in step No. 2.
12. The vertical output tube was changed from a 6K6-GT to a 6V6-GT tube.
13. The 2700-ohm resistor R177 in the cathode circuit of the vertical output tube was removed and replaced with a 1200-ohm one-watt resistor as shown in Figure 5.
14. The 10K ohm resistor R179 in the plate return lead of the vertical output tube was removed and replaced with a 1000-ohm two-watt resistor.
15. The vertical retrace elimination circuit which consists of two resistors, one 2700-ohm and one 4700-ohm, and two capacitors, one .02 mfd and one .05 mfd, was connected between the vertical output transformer and the cathode of the picture tube as shown in Figure 5. The cathode lead which was originally connected to the chassis was removed and the 4700-ohm resistor connected between this point and the chassis. The value of this resistor can be increased if any evidence of retrace lines remain.
16. The 1800-ohm resistor R183 across the focus coil was removed and a 1000-ohm resistor was inserted between the focus control R184 and R182 as shown in Figure 5.
17. The picture tube was placed in a Deity Tube Cradle, and the deflection yoke, focus coil and ion trap were placed on the neck of the tube as shown in Figure 6. The Deity Tube Cradle is very useful

**Tele-Clue Sheet Not Included
In This Issue**

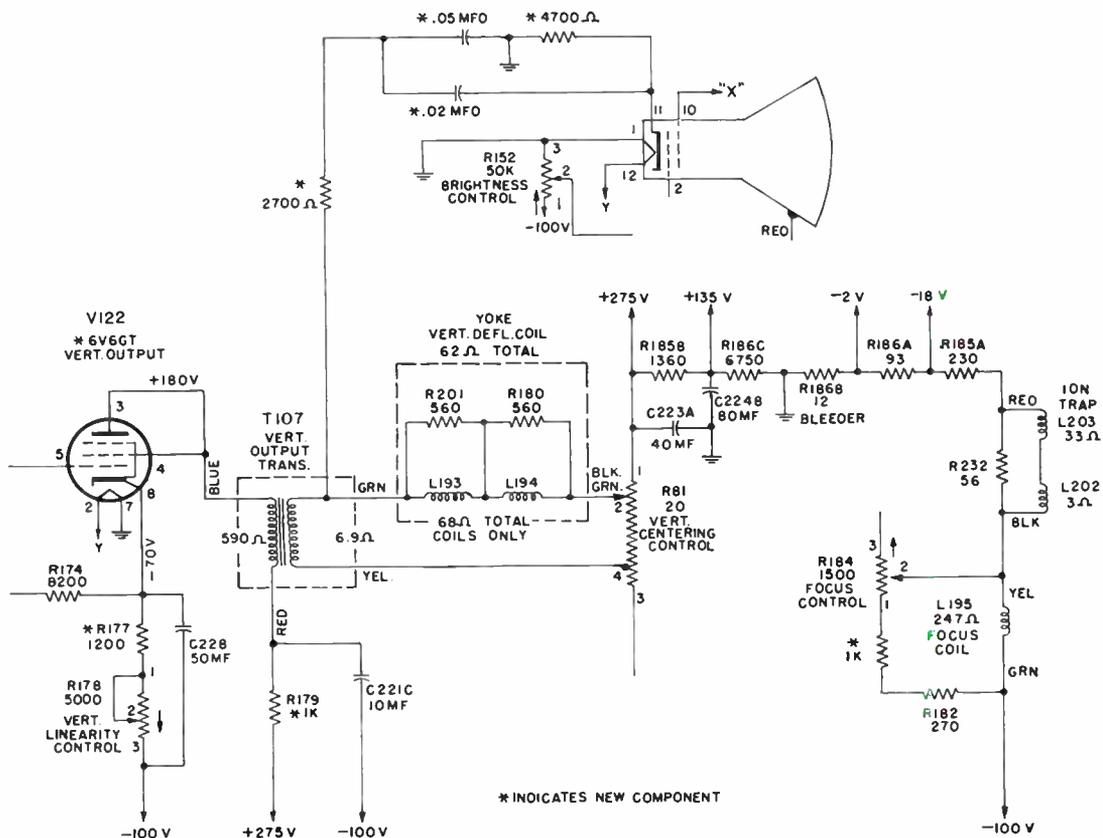


Figure 5. Vertical output circuit showing the conversion changes plus the vertical retrace elimination circuit.

when making conversions or when servicing receivers which do not have the picture tube mounted on the chassis. This cradle is manufactured by the Deity Miracle Lens Company, Passaic, New Jersey, 18. The width, horizontal drive, height and linearity controls were adjusted to produce a linear test pattern.

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 forthcoming issues conversion information on other television receivers will be included.

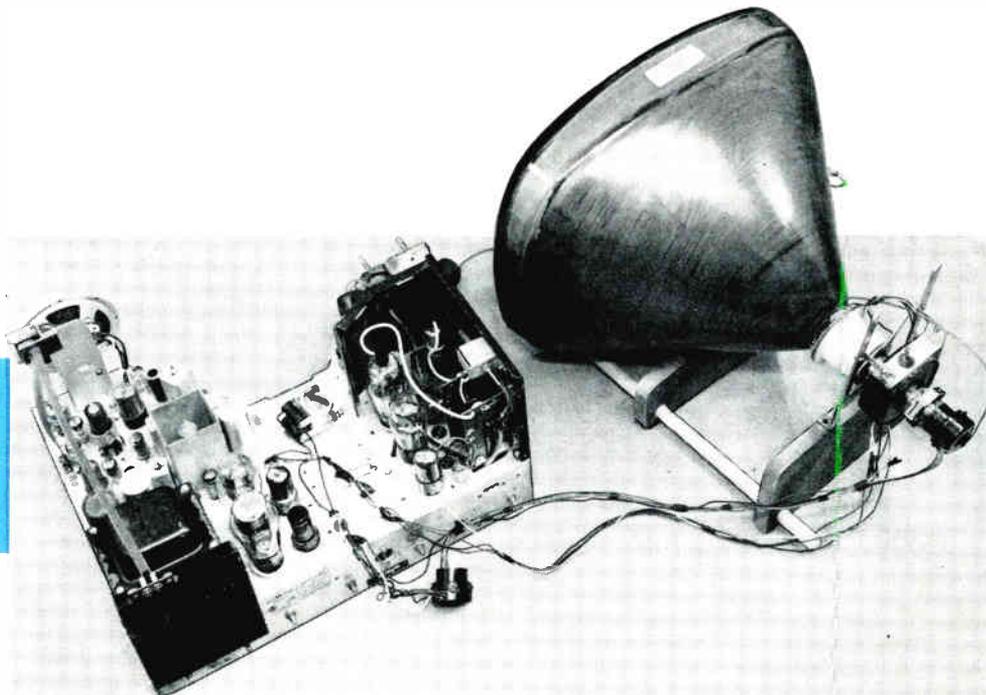


Figure 6. Completed conversion ready for installation in a new cabinet or wall.

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 Department, General Electric Company, Schenectady 5, N. Y.

ELUSIVE TV INTERFERENCE

I came across a TV interference problem that caused considerable amount of spark or are type of interference both in pix and sound on all channels throughout the day and evening. This would occur about every 30 minutes with a 30 second duration, causing the pix to lose both vertical and horizontal sync. It would penetrate the sound to quite a degree no matter how good the discriminating action.

After several weeks of trying everything in the books, plus searching the neighborhood, I was about to give up and tell the customer I could not help him, when a thought came to me that it might be some piece of electrical equipment in the house.

The only thing that was operating 24 hours a day was the refrigerator. I unplugged it and the interference cleared. After several minutes, I started it again, but the interference did not appear until several minutes later.

I came to the conclusion that the refrigerator motor was not causing the interference, but something else in the refrigerator electrical system. The only thing left was the automatic butter keeper, which I disconnected. THAT WAS IT. To alleviate this interference, I put in series with the A.C. line an Aerovox filter No. 1N28 which did the job perfectly.

Since that time, I have come across several similar cases, which were cured in the same manner.

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Lordship
Stratford, Connecticut

LOSS OF HIGH VOLTAGE

In troubleshooting loss of high voltage in Philco models No. 50-1400 series and some No. 49-1200 series, it may be found that every component associated with the high voltage circuit checks normally yet the set will not develop any high voltage. This is due to the use of 1B3-GT high voltage rectifiers that have pins 3, 5, and 8 internally connected to the filament pins 2 and 7. In these models one of the pins (3, 5, or 8) was used as a tie point for the filament circuit of the 1B3-GT. If a 1B3-GT that has these pins internally connected is used, the filament circuit will be shorted. To remedy this condition and still use this tube, cut off pins 3, 5, and 8.

John N. Cheperak
64-28 Madison Street
Brooklyn 27, N. Y.

MAKE YOUR OWN KNOB SPRINGS

Quite frequently the springs in knobs on TV and radio sets break, leaving the knob so loose that it falls off.

After trying many things which never seemed quite the answer, I went to a local jeweler and asked for an old broken mainspring from an alarm clock. The idea is to get one the approximate width, and then cut it just a little longer than the slot in which it is to be used. Arc it just a bit upon insertion and the knob will be as good as new.

Lowell P. Gessert
5401 Wilson Avenue
Chicago 30, Illinois

CONTACT CLEANER

I have found a rubber eraser to be the best cleaning agent so far for cleaning contact points on turret type tuners. By rubbing an eraser over contacts, it restores them to a brand new condition. It also proves to be better than chemical cleaners, as it does not leave a film.

A. E. Seymour
4224 S. Union St.
Chicago 9, Illinois

What's new!

6AJ4

The 6AJ4 is a 9-pin miniature, medium- μ triode designed primarily for use as a grounded-grid amplifier in television receivers which operate at ultra-high-frequencies as well as at very-high-frequencies.

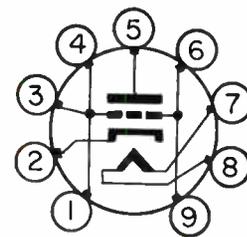
LOW NOISE LEVEL.—noise figure of 15 db at 900 mc bandwidth.

HIGH SIGNAL GAIN.—6AJ4 is rated 7 db power gain at 900 mc for 10 mc bandwidth.

CHARACTERISTICS AND TYPICAL OPERATION

Average Characteristics	
Plate Voltage	125 Volts
Cathode Bias Resistor*	.68 Ohms
Amplification Factor	.42
Plate Resistance (Approx)	4200 Ohms
Transconductance	10,000 Micromhos
Plate Current	.16 Milliamperes
Grounded-Grid Amplifier—900 Megacycles	
Plate Voltage	125 Volts
Cathode Bias Resistor	.68 Ohms
Plate Current	.16 Milliamperes
Bandwidth (Approx)	10 Megacycles
Power Gain (Approx)	7 Decibels
Noise Factor (Approx)	15 Decibels

*Operation with fixed bias is not recommended.



6AM4

The 6AM4 is a miniature high- μ triode designed for use as a grounded-grid mixer in television receivers which operate in the ultra-high-frequency region. Its sharp-cutoff and high transconductance, coupled with its excellent isolation between input and output, make the 6AM4 well suited for grounded-grid mixer service over the entire range of VHF-UHF television frequencies.

AVERAGE CHARACTERISTICS	
Plate Voltage	150 Volts
Cathode Bias Resistor†	100 Ohms
Amplification Factor	.90
Plate Resistance (Approx)	10,000 Ohms
Transconductance	9000 Micromhos
Plate Current	7.5 Milliamperes
Grid Voltage (Approx)	—5 Volts
for $I_b = 10$ Microamperes	

†Operation with fixed bias is not recommended.

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