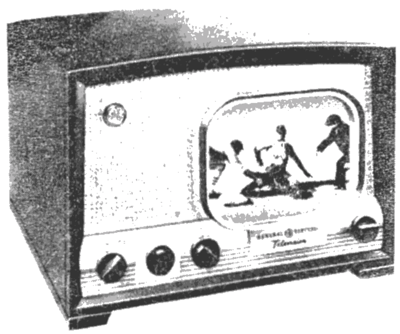
GENERAL ELECTRIC CO.



ELECTRICAL RATING:

Frequency	60 cycles
Voltage	115 volts
Wattage	220 watts

R-F FREQUENCY RANGE:

Channel Selector Position	Frequency Range	Picture Carrier	Sound Carrier
#2	54–60 MC	55.25	59.75
#3	60–66 MC	61.25	65.75
#4	66–72 MC	67.25	71.75
#5	76–82 MC	77.25	81.75
#6	82–88 MC	83.25	87.75
#7	174–180 MC	175.25	179.75
#8-9	180–186 MC	181.25	185.75
#8-9	186–192 MC	187.25	191.75
#10-11	192–198 MC	193.25	197.75
#10-11	198–204 MC	199.25	203.75
#12-13	204–210 MC	205.25	209.75
#12-13	210–216 MC	211.25	215.75

INTERMEDIATE FREQUENCIES:

Video (Carrier Equivalent)	26.3 mc
Audio	21.8 mc

AUDIO OUTPUT:

Undistorted	1.5 watts
Maximum	4.0 watts

LOUDSPEAKER:

Type	Alnico PM Dynamic
Cone Diameter	5¼ inches
Voice Coil Impedance (400 cycles)	3.2 ohms

PICTURE SIZE:

Height	6½ inches
Width	8½ inches

ANTENNA REQUIREMENTS:

Type	Folded dipole or equivalent
Impedance	300 ohms

TUBE COMPLEMENT (22, INCLUDING RECTIFIERS)

Symbol	Purpose	Type
V1	R-F Amplifier	6AU6
V2	Converter-Oscillator	12AT7
V3	1st Video I-F Amplifier	6AU6
V4	2nd Video I-F Amplifier	6AU6
V5	3rd Video I-F Amplifier	6AU6
V6	Video Detector—Clipper Rectifier	6AL5
V7	Video Amplifier—Limiter	12AU7
V8	Picture Tube	10FP4
V9	Vertical Sweep Generator	6SN7GT
V10	Vertical Sweep Output	6V6GT
V11	Phase Inverter—Clipper	6SN7GT
V12	Horizontal AFC—Sweep Generator	6SN7GT
V13	Horizontal Sweep Output	6BG6-G
V14	High Voltage Rectifier	1B3GT/8016
V15	Horizontal Damping	5V4G
V16	Rectifier	5U4G
V17	Audio I-F Amplifier	6AU6
V18	Audio I-F Limiter	6SH7
V19	Audio Discriminator—Amplifier	6AQ7GT
V20	Audio Output	6K6GT/G
V21	Rectifier	5Y3GT
V22	Audio I-F Amplifier	6AU6

GENERAL INFORMATION

The General Electric Model 810 television receiver is a table model type, using 22 tubes to provide reception in the 12 commercial television channels. The television picture is reproduced on a 10-inch electromagnetically deflected picture tube.

Features of the television receiver include a constant input impedance r-f amplifier with a balanced input, safe high-voltage power supply, automatic frequency control for horizontal synchronization, ten-inch picture tube with aluminumized screen and a high fidelity FM audio system.

CAUTION NOTICE

THE REGULAR B+ VOLTAGES ARE DANGEROUS AND PRECAUTIONS SHOULD BE OBSERVED WHEN THE CHASSIS IS REMOVED FROM THE CABINET FOR SERVICE PURPOSES. THE HIGH VOLTAGE SUPPLY (9000 V.) AT THE PICTURE TUBE ANODE WILL GIVE AN UNPLEASANT SHOCK BUT DOES NOT SUPPLY ENOUGH CURRENT TO GIVE A FATAL BURN OR SHOCK. HOWEVER, SECONDARY HUMAN REACTIONS TO OTHERWISE HARMLESS SHOCKS HAVE BEEN KNOWN TO CAUSE INJURY. SINCE THE HIGH VOLTAGE IS OBTAINED FROM THE B+ VOLTAGE, CERTAIN PORTIONS OF THE HIGH VOLTAGE GENERATING CIRCUIT ARE DANGEROUS AND EXTREME PRECAUTIONS SHOULD BE OBSERVED.

THE PICTURE TUBE IS HIGHLY EVACUATED AND IF BROKEN, GLASS FRAGMENTS WILL BE VIOLENTLY EXPELLED. IF IT IS NECESSARY TO CHANGE THE PICTURE TUBE, USE SAFETY GOGGLES AND GLOVES. ALWAYS WEAR GOGGLES WHEN CHASSIS IS REMOVED FROM CABINET.

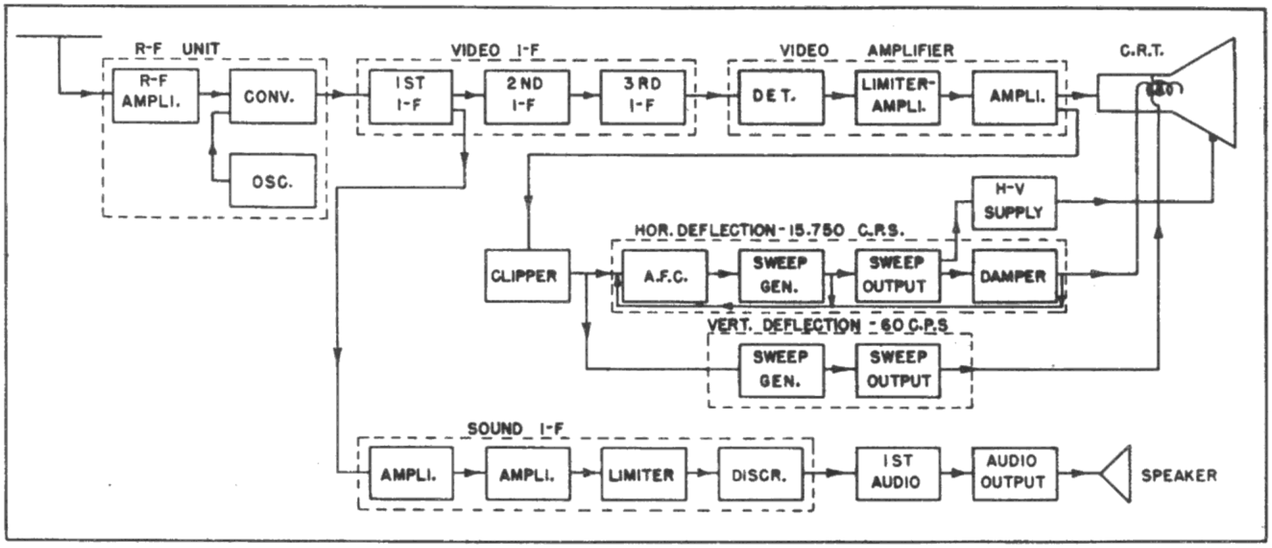


Fig. 1. Block Diagram, Model 810

DESCRIPTION—TELEVISION CIRCUITS

The receiver circuits are divided into the following sections:

1. R-F amplifier, converter and oscillator.
2. Video and audio i-f amplifier.
3. Video detector and amplifier.
4. Sync separation.
5. Horizontal sweep generator and AFC sync.
6. Horizontal sweep output.
7. Vertical sweep generator and output.
8. High voltage power supply.
9. Low voltage power supply.

A brief description of the operation of each section is described in the following paragraphs. This is supplemented by simplified circuit diagrams of each portion of the circuit under discussion. Reference is also made to the complete schematic diagram as shown in Figure 21.

A block diagram of the complete Model 810 receiver is shown in Figure 1 to assist in signal tracing and to better visualize the operation of the receiver as a whole.

1. R-F AMPLIFIER, CONVERTER AND OSCILLATOR (SEE FIGURE 2)—The r-f amplifier makes use of a Type 6AU6 pentode tube connected as a triode grounded grid amplifier. The antenna is connected into the cathode circuit of the tube through a transformer, T1, so as to provide a substantially constant input impedance of 300 ohms to the antenna and lead-in at all frequencies. The transformer, T1, is balanced to ground in the primary winding providing cancellation of noise pick-up on the antenna lead-in. An electrostatic shield is incorporated between the primary and secondary windings to prevent noise being transferred from primary to secondary by capacity effect. R1 is the normal bias resistor for V1. A choke (L_K in Figure 2) is placed in series with this cathode resistor to prevent the input impedance from being lowered by the shunting effect of the cathode bias resistor and by-pass capacitor, R1 and C2. It also neutralizes the total cathode capacity, thus preventing it from affecting the input impedance. The choke value is changed when switching from the lower five to the upper seven channels. L1 is a series compensating choke which prevents a loss in gain on the high frequency channels.

The r-f amplifier is coupled to the converter tube by a wide-band transformer consisting of windings L_p and L_s. The windings are self-tuned by the distributed and tube capacities to provide optimum gain. Variable trimmers C5 and C6 are shunted across the primary and secondary windings, respectively, of the r-f transformer to permit compensation for misalignment resulting from differences of tube capacities when a tube change is necessary. On Channel No. 2, the transformer is triple tuned to provide better image frequency attenuation of the 88–108 mc FM band. Three of the transformers, T8, T9, and T10, are used to cover the upper six channels. Each transformer is made sufficiently broad-band to accept two television channels.

The triode converter is one section of a Type 12AT7 dual triode, V2B. Bias for this tube is developed by the oscillator voltage appearing in the grid of V2B, causing grid rectification charging the grid resistor-capacitor combination, R4 and C7.

The oscillator makes use of the remaining half of the Type 12AT7 tube, V2A, and is capacity coupled to the converter tube through the capacitor, C8. The oscillator is a modified Colpits oscillator, oscillation being produced by the grid-to-cathode capacitor, C32, and the plate-to-cathode interelectrode capacity, C_p, of the oscillator tube. The choke, L4, provides a d-c ground to the cathode of the oscillator tube and maintains the cathode off-ground at the r-f frequencies. The oscillator operates on the high frequency side of the r-f signal on all channels. Three oscillator coils, L11, L12 and L13, are used to cover the upper six channels, the frequency range of the oscillator circuit at each coil switching being sufficient to tune two channels.

To prevent hum modulation by the local oscillator when operating on the high frequency channels, the filament supply to V2A is rectified by the selenium rectifier SR1 and filtered by C102.

The r-f amplifier, converter and oscillator section is constructed as a complete unit sub-assembly which can be readily demounted from the main chassis.

2. VIDEO AND AUDIO I-F AMPLIFIERS (SEE FIGURE 3)—The video i-f amplifier makes use of a three-stage bandpass amplifier using three Type 6AU6 tubes. The transformers, T11, T12, T13, and T14, are overcoupled and then loaded with resistance in the

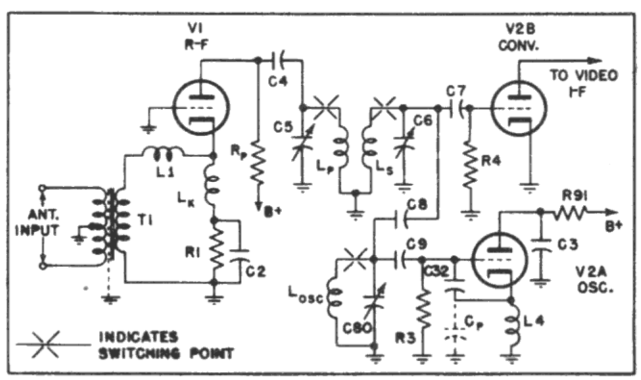


Fig. 2. R-F Amplifier, Converter and Oscillator

secondary circuits to give an adequate bandpass frequency characteristic. A single movable powdered iron core is used in transformers, T11, T12 and T13, for tuning. This adjusts the secondary side. The transformer T14 uses two tuning slugs to tune both primary and secondary. A tertiary winding is incorporated on T11 which connects to a series resonant trap circuit to permit adjustment of the slope of the high frequency end of the band-pass. It is adjusted so that 26.3 mc falls at the 50 per cent point on the curve to compensate for the sesqui-sideband transmission of the video carrier frequencies.

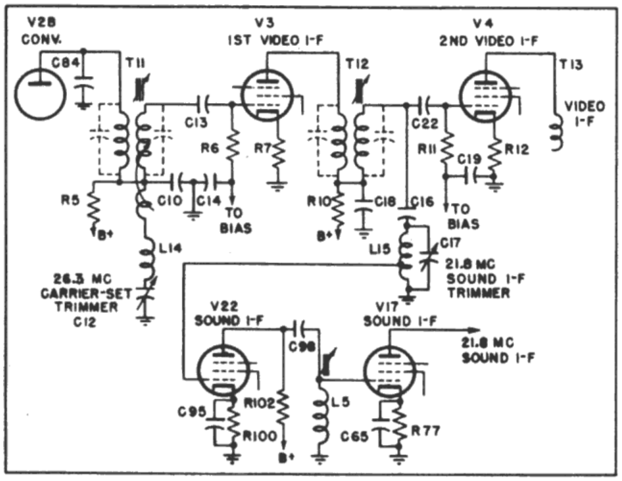


Fig. 3. Video and Audio I-F Amplifier

A series-tuned trap circuit consisting of C16, and the parallel combination of L15 and C17 is connected across the secondary of T12 and tuned for maximum attenuation of 21.8 mc in the video amplifier. This affords the necessary attenuation of the accompanying sound i-f from being passed through the video i-f and in addition is used to take-off the sound i-f for the audio i-f channel. The audio i-f is taken off at a tap on the inductance, L15, and then applied directly to the grid of the audio i-f amplifier tube V22. Additional i-f gain and selectivity is provided by two stages of single tuned impedance coupled amplification. Since the television audio is frequency modulated, the transformer T19 functions with the diode section of V19 as the discriminator.

Bias voltage derived from the grid return circuit of the horizontal blocking oscillator, is applied to the grid circuits of the video i-f amplifier tubes, V3, V4 and V5. A potentiometer (Contrast) control, permits this voltage to be changed on V3 and V4 so as to vary the gain of the video i-f amplifier.

3. VIDEO DETECTOR AND AMPLIFIER (SEE FIGURE 4)—The video i-f amplifier output is applied to one section of a 6AL5 dual diode, V6A, which is connected as a shunt diode so as to develop a negative-going signal across the diode load resistance, R19. The signal is then amplified by two triode amplifier stages using a Type 12AU7 dual triode tube, V7. L16 and L23 are series compensating coils, while L22 and L17 are shunt compensating coils. These are used to obtain good high frequency response and provide sharp cut-off at frequencies above the usable pass band. L16 also helps prevent harmonics of the i-f frequency from being passed through the video amplifier.

In addition to amplification, the first video amplifier tube, V7A, operates as a noise limiter. The B+ voltage applied to the plate circuit is low and the video signal from the detector is negative-going. Any large excursions of voltage above sync level such as introduced by transient noise, will drive the grid to plate current cut-off. Thus, the interference will be limited close to the level of the super-sync signal. This improves the signal to transient noise interference ratio without affecting the video signal.

With the use of capacity coupling in the video amplifier, the d-c component of the video signal must be restored to maintain proper background illumination. This is accomplished in the grid circuit of V7B. The video signal at this grid is positive-going so that with the resultant grid current flow, the capacitor C28 charges up to the peak value of the sync pulse. Since this charge will vary with the amplitude of the pulse, the resulting bias change will provide the required restoration of the d-c. This restoration in the grid circuit of V7B, necessitates direct coupling of the picture tube, V8, grid to the plate circuit of V7B. By connecting the cathode of V8 to a variable B+ source, the proper bias may

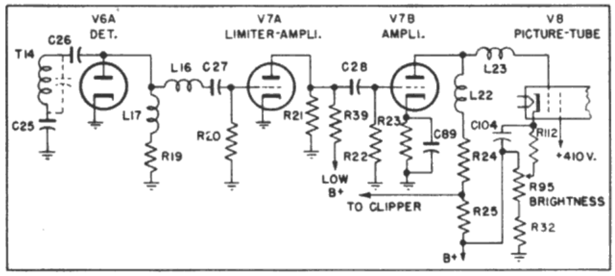


Fig. 4. Video Detector and Amplifier

be maintained on the picture tube and the brilliance may be changed.

4. SYNC SEPARATION (SEE FIGURE 5)—Amplification and separation of the sync pulse from the composite video signal is accomplished by tube sections, V11A, V6B, and V11B.

Triode section, V11A, is used to amplify and invert the phase of the composite video signal applied to its grid circuit and also to further limit the transient noise. This produces a video signal in the plate of V11A wherein the sync pulses are the most positive portion of the voltage waveform. This positive-going signal is applied across the diode section, V6B, which rectifies the positive portion and charges the capacitor C42 negatively in proportion to the amplitude of the sync pulses. This diode thus establishes a bias for tube V11B and also clamps the sync so that each recurring pulse originates at the zero voltage axis.

The clamped composite video waveshape applied to the grid of tube section V11B, which is biased by the diode V6B, causes the negative portion of this waveshape to be cut off in the cathode and plate circuits of V11B, leaving only the sync pulses. The horizontal synchronizing pulses are developed across R92 in the cathode of V11B and are positive-going. The vertical pulses are developed at the plate of V11B and are negative-going.

An integrating network consisting of C39, R37, C38, R36, and C37, is used to separate the horizontal sync from the vertical sync pulses before passage of the sync signal to the vertical sweep generator.

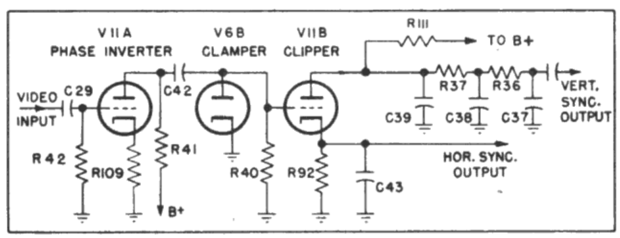


Fig. 5. Sync Separator Circuit

5. HORIZONTAL SWEEP GENERATOR AND AFC SYNC (SEE FIGURE 6)—The horizontal sawtooth generator makes use of one section of a Type 6SN7GT tube, V12B, connected in a blocking oscillator circuit. Instead of its frequency being controlled directly by the horizontal sync pulses, it is controlled by a d-c voltage on its grid, which is the resultant of the phase difference between the incoming sync signal and a voltage wave derived from the output of the sweep generator. The resultant d-c voltage produced by the tube V12A is called an automatic frequency control (AFC) voltage.

The tube V12A obtains its operating bias through its connection to the grid circuit of the blocking oscillator tube, V12B, through resistor, R51. The blocking oscillator produces a large negative bias in its grid circuit during its normal operating cycle. When the horizontal sync pulses or the combined output voltage (shown at lower left of Figure 6) are impressed separately on the grid of tube V12A, they do not have sufficient positive amplitude to cause appreciable plate current flow in tube V12A. However, if they are combined and phased properly as shown in Figure 7A, 7B, or 7C, their composite amplitude is sufficient to cause plate current to flow during that portion of the cycle where the waveshape is above the dash line axis in Figure 7. During the time that conduction takes place, the capacitors C86 and C78 become charged positive in respect to ground, the magnitude of the charge and the resultant voltage thereon, being dependent upon the duration of the flow of plate current in tube V12A.

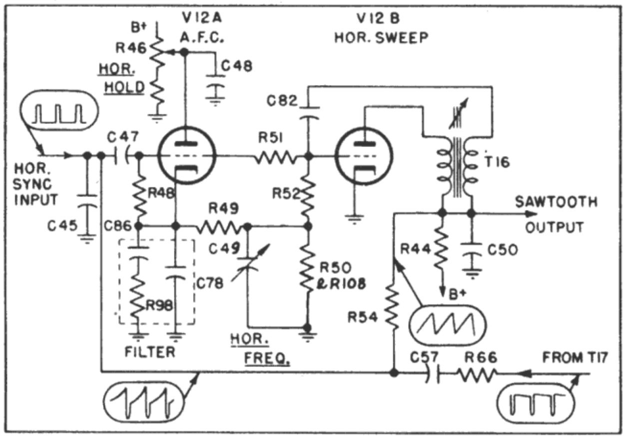


Fig. 6. Horizontal Sweep and A.F.C. Sync

Since the resistor R50 is in the bleeder circuit across the filter and also forms a part of the grid return circuit for the sweep generator tube V12B, any change in voltage across R50 will thus result in a change of frequency in the sweep generator. Thus if the contributing voltage of R50 makes the grid of V12B less negative, the frequency will be raised; likewise, if the contributing voltages make the grid of V12B more negative, the frequency will be lowered. Thus, it will be seen that the longer the conduction period of tube V12A, the higher will be the frequency of the blocking oscillator and its sawtooth output.

Referring to Figure 7, the (B) curve shows a sync pulse phased so that about 50 per cent of the pulse width is riding on top the integrated sawtooth, while the remainder of the pulse after point (x) falls down into the trough, making the conducting portion have a width which is an average between curves represented by (A) and (C). If each successive sync pulse falls in the same phase relation as shown in curve (B), the Horizontal Hold control which controls the amount of current flow through V12A is set so that this phase relation does not change. This would cause the sweep generator V12B to be running at the same frequency as that of the transmitted signal. Under this condition, if the sweep generator tends to run slower than the incoming sync signal, the conduction period will be made longer through tube V12A because the pulse will move forward in relation to the integrated sawtooth wave with a result as shown in Figure 7 (A). It will be noted that the conduction pulse is of greater duration (wider) than in curve (B). Therefore, tube V12A will conduct for a greater period of time, thus raising the positive potential across R50. This greater conduction period causes the sweep generator to speed up until it attains the condition in (B). Likewise, if the sweep generator is operating at too high a frequency, the pulse will advance along the integrated sawtooth wave until a large portion of it falls down into the trough of the waveshape, as shown in Figure 7 (C), with the resultant shortening (narrowing) of the conducting pulse. This causes the frequency of the sweep generator to be reduced until the condition in Figure 7 (B) is again restored.

The Horizontal Frequency Control, C49, is a capacitor that forms a part of the discharge circuit in the grid of the blocking oscillator, V12B. By varying its value, the free running speed of this oscillator can be adjusted to supplement and act as a course control for the Horizontal Hold control on the front panel.

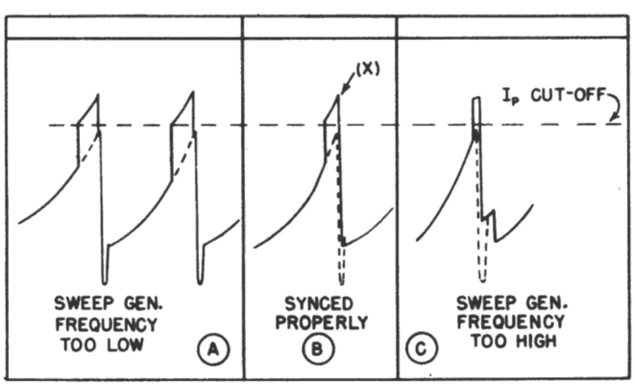


Fig. 7. A.F.C. Waveshapes

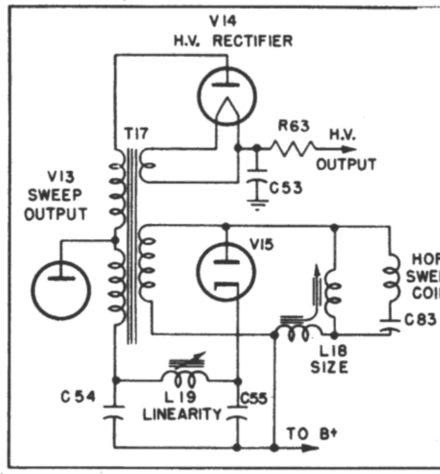


Fig. 8. Horizontal Sweep Output

The free running speed of the blocking oscillator is also adjusted by the inductance variation of the blocking oscillator coil, T16.

6. HORIZONTAL SWEEP OUTPUT (SEE FIGURE 8)—The horizontal sawtooth voltage generated by the blocking oscillator, V12B, is shaped and then amplified by a Type 6BG6G tube, V13. The output of this tube is coupled to the horizontal deflection coils, D2, through an impedance matching transformer, T17. The damping tube diode, V15, is used principally to remove a transient oscillation created by the rapid retrace of the current in the high inductance of T17 and still retain the positive overshoot in the primary winding for use in the high voltage supply. It also is used to provide a linear trace and to recover some of the energy from the inductive kick-back and use it to help supply the B+ requirements of the output tube. During conduction of V15, capacitors C54 and C55 are charged up and since they are in series with the B+ voltage to tube V13, they contribute a sizeable portion of the plate voltage. The variable inductance, L19, and C54 constitute a phase shift network which alters the phase of the ripple voltage developed across C55. This means of changing the ripple voltage which also supplies part of the B+ to the output tube provides a method of controlling the linearity.

A horizontal drive control, C81, forms a capacity voltage divider in conjunction with capacitor C51 so as to control the amount of sawtooth voltage supplied to the grid of V13. This permits adjustment of the grid sawtooth voltage to compensate for variations in output tubes.

The Horizontal Width Control, L18, forms a series-parallel circuit in respect to the output to the yoke. The inductance is variable in both coils of this control; the inductance of the series choke is maximum when the parallel choke is minimum and vice-versa. The parallel circuit shunts the current around the deflection coil, depending upon its inductance, and the series coil attenuates the current by changing the impedance of the series circuit. This type of control provides a uniform impedance to the output transformer over a wide range of adjustment.

7. VERTICAL SWEEP GENERATOR AND OUTPUT (SEE FIGURE 9)—The vertical sawtooth voltage is generated by a Type 6SN7GT tube, V9, connected as a multivibrator. This voltage is coupled directly to a Type 6V6G vertical sweep output amplifier tube,

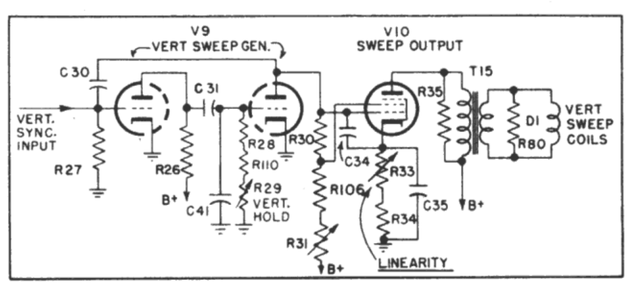


Fig. 9. Vertical Sweep and Output

V10, and then to the vertical sweep yoke, D1, through the impedance matching transformer, T15. Vertical speed is controlled by changing the time constant of the multivibrator grid circuit by the potentiometer, R29. Sweep size or height of picture is changed by the potentiometer, R31, which changes the B+ voltage applied to the charging network (R30, C34) of tube V9 simultaneously with the screen voltage on tube V10. Vertical linearity is controlled by feeding back correcting voltage developed in the cathode circuit of V10 through C34 into the grid circuit of the output tube, V10. The cathode voltage of V10 which is fed back through C34 has an opposite curvature corresponding to the non-linear portion of the generated sawtooth output of V9 so that by combining these voltages in the grid of V10 correction may be affected. The amount of the correction voltage is controlled by the Vertical Linearity potentiometer, R33, in the cathode of V10.

8. HIGH VOLTAGE SUPPLY (SEE FIGURE 8)—The high voltage for the second anode of the picture tube is derived by making use of the inductive "kick" voltage produced during retrace in the horizontal output transformer, T17. This kick voltage has a magnitude of several thousand volts and is positive-going, appearing between the plate of V13 and ground. Since this voltage in itself is not sufficient to produce the required anode potential, an additional winding connected electrically and magnetically with the primary is added to provide further step-up of this voltage. The top of this autotransformer is connected to the plate of a rectifier tube, V14. This tube is a Type 1B3GT/8016 which derives its filament voltage from the horizontal sweep transformer T17 by a single turn around the core. Since the frequency supplied the rectifier tube is high (15,750 cps), a 500 mmf. filter capacitor is more than adequate to give a smooth d-c output. Due to the small capacity of the filter, this supply is relatively safe to handle.

9. LOW VOLTAGE POWER SUPPLY—Two rectifier tubes, V16 and V21 (type 5U4G and 5Y3GT respectively), are used to supply the required plate current for the receiver. Each tube is used in a separate and complete rectifier circuit to supply two values of output B+ voltage, 290 volts and 360 volts. The Focus coil which is a combination permanent and electro magnet is connected in series with a portion of the output current path for the lower voltage supply, the current through it being controlled by the Focus Control potentiometer, R72.

CIRCUIT ALIGNMENT

GENERAL—A complete alignment of the receiver tuned circuits consists of the following individual alignment procedures. These are listed below in the correct sequence of alignment. However, any one section alignment may be performed without the necessity of realignment of any one of the other sectional alignments.

1. Sound I-F Alignment.
2. Video I-F Alignment.
3. R-F Alignment.
4. Oscillator Adjustments.

The alignment procedure is shown in table form on pages 9 through 11. Read the following detailed instructions before attempting alignment as given in the table.

TEST EQUIPMENT—To provide alignment as outlined above, the following test equipment is required:

1. *R-F Sweep Generator.*
   (a) Frequency Requirements.
      20 to 30 mc with 10 mc sweep width.
      40 to 90 mc with 15 mc sweep width.
      170 to 220 mc with 25 mc sweep width.
   (b) Constant output over sweep width range.
   (c) At least 0.1 volt output.

2. *Signal Generator*—Must have good frequency stability and be accurately calibrated. It should be capable of tone modulation over the following frequency ranges.
   21.8 mc for sound i-f.
   22.9 mc for video i-f marker.
   23.4 mc for video i-f marker
   25.55 mc for video i-f marker.
   26.3 mc for video i-f marker.
   45–88 mc and 174–216 mc for oscillator adjustment and markers for the r-f channel bandwidth measurements.

3. *Oscilloscope*—This oscilloscope should preferably have a 5-inch screen and have good wide-band frequency response on the vertical deflection. Although the high frequency response is unnecessary for alignment, it will be useful when making the waveform measurements

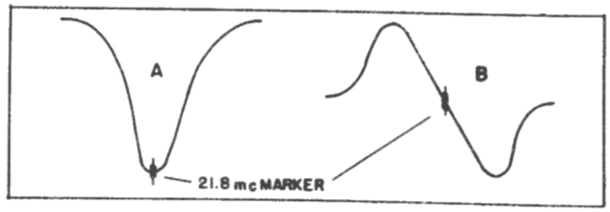


Fig. 10. Audio I-F Curves

4. *Crystal Calibrator*—This unit is essential to establish calibration check points for the signal generator so as to provide good accuracy of calibration.

5. *Wavetraps*—Accurately calibrated wavetraps may be used to supply markers in place of the signal generator for video i-f and r-f alignment purposes.

ALIGNMENT SUGGESTIONS—All alignment adjustments in the sound and video i-f amplifier, are available from the top of the chassis with the exception of the sound discriminator secondary adjustment and the last video i-f stage. The location of the adjustments is shown in Figure 16. Remove the chassis from the cabinet. When it is necessary to make adjustment from the bottom of the chassis, the chassis may be rested on its side so that the power transformer is down. The following suggestions apply to each individual alignment procedure.

1. *Sound I-F Alignment*—The sweep generator is connected through a 500 mmf. capacitor to the grid of the tube preceding the sound i-f coil to be aligned. Connect the oscilloscope through a 100,000-ohm resistor across the resistor, R104, in the limiter tube, V18 grid. Insert a 21.8 mc marker signal from an unmodulated signal generator into the grid of V3. Keep the marker signal attenuated so that it just shows a marker on the sweep curve. Adjust L21 and L5, respectively, as you advance progressively one stage at a time, for maximum gain and symmetry of the response curve about the 21.8 mc marker. The curve should be similar to that shown in Figure 10(A). With input at the 1st audio i-f, V22, the bandwidth should be approximately 500 kc at the 70% response point.

Keep the input of the sweep generator low enough so that the sound i-f amplifier does not overload, otherwise the response curve will broaden out permitting slight misadjustment. Check by increasing the output of the sweep; the response curve on the scope should increase in size proportionally. Set Contrast control at the half-advance position.

For discriminator alignment, the secondary core of the discriminator transformer, T19, is aligned by using a tone modulated 21.8 mc amplitude modulated signal and listening to the tone at the loudspeaker. This adjustment is made for a minimum tone signal output. Apply the signal generator input to the grid of V22. If the sweep is used for the secondary alignment, the cross-over should be symmetrical about a 21.8 mc marker and should be a straight line between the alternate peaks as shown in Figure 10(B). For the discriminator transformer primary alignment, connect the oscilloscope to the junction of C74 and R86. With the same sweep input as in Step 1, adjust the primary adjustment screw for a maximum peak-to-peak amplitude of the response curve as shown in Figure 10(B).

2. *Video I-F Alignment*—The video i-f amplifier uses transformers which are coupled and loaded to give the proper band-pass characteristics.

Stage-by-stage alignment should be performed so as to duplicate as closely as possible the curves as shown in Figure 11A, B, C, and D. The markers supplied by an accurately calibrated signal generator are used to establish the correct bandwidth and frequency limits. Set contrast control at approximately its mid-position.

Connect the sweep generator to the tube grid preceding the transformer to be aligned. Adjust the sweep width for a minimum of 10 mc about the center frequency of the video response curve. The sweep output cable should be shielded and preferably terminated in its characteristic impedance and then connected with as short a lead as possible through a 500 mmf. capacitor; the ground lead of the cable should be short and grounded to the chassis as near as possible to where the signal is applied. Sufficient marker signal may be supplied in most cases, except at the last stage by merely connecting the high side of the signal generator to the television chassis. At last stage, couple the marker generator through a small capacitor in parallel with the sweep input; keep the input low enough so that it doesn't influence the shape of the response curve.

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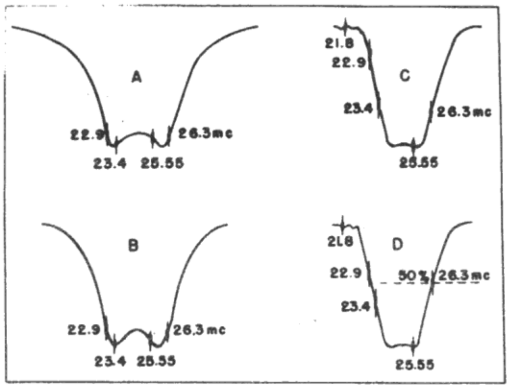


Fig. 11. Video I-F Curves

signal is applied will act as a tuned trap, placing a dip in the alignment curve as viewed on the scope, unless it is detuned sufficiently to throw it out of the video i-f pass-band. To detune this transformer merely remove the tube which feeds the primary winding, as indicated in Steps 1, 2 and 4. *Be sure to replace the tube after the stage is aligned.* Another method of detuning is to slip an iron core slug in the primary side of the i-f transformer. The audio take-off trap trimmer C17 should be aligned for minimum 21.8 mc audio i-f frequency in the video i-f amplifier, as in step 3 of video i-f alignment.

Keep the output of the sweep generator as low as possible so as not to overload the video i-f amplifier. The Contrast control should be set at about its mid-position during alignment. Prior to the alignment of transformer T11 in step (5), turn the carrier set trimmer, C12, to its minimum capacity.

The response curves shown in Figure 11 are obtained on an oscilloscope connected at the junction of L22 and R24. Use a 10,000 ohm resistor in series with the input lead to the oscilloscope for isolation purposes. Set the Channel Selector switch to receive channel #4.

If the response is peaked on low frequency end of response curve and cannot be brought down to the proper relationship with high frequency end by means of the tuning slug, change the 6AU6 tube into which the signal is fed. It may be that the 6AU6 has an above average plate capacity which would cause this trouble.

3. R-F Alignment—The r-f coil and switch assembly is designed for stable band-pass operation and under normal conditions will seldom require adjustment. In cases where it is definitely known that alignment is necessary (such as when the present coil is damaged and has been changed), do not attempt the adjustment unless suitable equipment is available.

The minimum requirements for correct r-f alignment are (1) to provide the correct bandwidth, (2) for the response curve to be centered within the limit frequencies shown for each of the individual channels as in Figure 14, and (3) for the response curve to be adjusted for maximum amplitude consistent with correct bandwidth. To provide these minimum requirements, the r-f coils are overcoupled and loaded with resistance. Tuning of the coils is affected by changing inductance of the individual coils. Except for the Channels #2 and #3 coils, the coupling is fixed by the design of the coil and switch wafers.

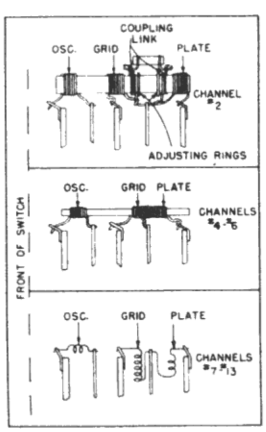


Fig. 12. R-F Coil Assembly

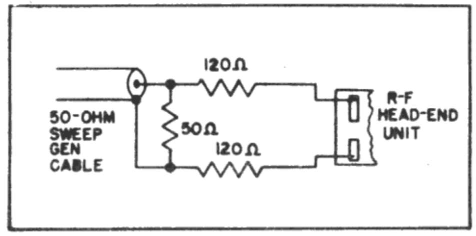


Fig. 13. Sweep Generator Termination

The physical assembly of the coils in the band switch locates the r-f amplifier plate coil at the rear of the switch assembly, while the oscillator coil is switched by the front wafer. Three different types of coils are used. These are shown in Figure 12. On all channels except Channels #7 through #13, the r-f, converter, and oscillator coils are wound on a single coil form. Mutual inductance between turns of the converter and r-f coils provides the desired coupling. On Channel #2, the converter and r-f coils are spaced for loose coupling and the mutual is increased by inserting a tertiary link winding between the coils. By adjusting the link, the mutual can be changed and better image rejection of the FM band (88 to 108 mc) signals results. Tuning of the link circuit is accomplished by adjusting two movable copper rings. The Channel #3 plate and grid coils are overcoupled by spacing of the two coils in relationship to each other and are tuned by spacing of the component turns. The Channels #4 through #6 transformers are wound so that the converter and r-f coils are wound as a continuous winding, the a-c ground return for the two coils being a tapped turn on this winding. This tight spacing affords a good uniformity in mutual coupling. The tuning is accomplished by moving turns. The upper six channels, #7 through #13, are tuned by four sets of coils. Each converter and r-f coil is overcoupled to give adequate bandpass so that two channels may be covered by each set of coils except channel #7. Instead of magnetically coupling the r-f and converter coils in relation to each other, they are physically located on the channel switch so that the only coupling is afforded by the common a-c ground return of each coil. This ground return is made through a special shaped metal wafer on the channel switch.

The input sweep signal is applied to the antenna terminal board at the r-f unit. Disconnect the 300-ohm cable between the antenna terminal board and the r-f amplifier input. To prevent distortion of the r-f response curve by standing waves, the unbalanced shielded cable of the signal generator should be terminated as shown in Figure 13. The resistors used should be non-inductive. The marker signal generator may be loosely coupled through a small capacitor to the same point of input as the sweep generator.

The output r-f response curve is taken off at the junction of R5 and C10 through a 10,000 ohm resistor. Disconnect C10. The Contrast control is set for a minimum for all r-f alignments.

For Channels #2 and #3, the r-f coils should be aligned to give approximately the curve shown in Figure 14(A) and 14(B). The "P" marker represents the video carrier marker, while the "S" marker is the sound marker. The frequency of these markers is indicated for each step of the alignment procedure. Adjustment of the bandwidth is made by moving the plate coil closer to the grid coil or vice-versa. On Channel #2, the sliding of the copper rings will give both the required bandwidth and the frequency adjustment. Spread or squeeze turns in plate and grid coils to change frequency. Spreading turns results in a raising of the frequency; while squeezing turns lowers the frequency.

For Channels #4 through #6, the coupling is fixed by the tight coupling between the primary and secondary turns. How-

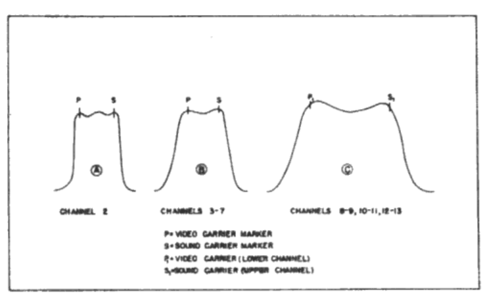


Fig. 14. R-F Alignment Curves

ever, this can be controlled to a certain degree along with the frequency by either spreading or squeezing the end turns of the combination converter and r-f coil. On the upper four coil assemblies covering the channels #7 through #13, the coupling cannot be changed as it is fixed by the common ground wafer located between the r-f and converter coil switching wafer. This ground wafer is cut to give the proper amount of coupling at the time of manufacture. Tuning of these upper frequency coils is affected by the brass adjustment screws which form a shorted turn in the coil. The further the screw is introduced into the coil field, the higher will be the frequency and vice-versa.

The variable capacitors C5 and C6 are used to compensate for the slight differences in tube capacities which affect tuning when it is necessary to change the r-f or converter tube in the field. These trimmers are adjusted for Channel #6, as indicated in the Alignment Table, and then are not readjusted until a new tube is substituted for either V1 or V2.

> *Note:* When making r-f alignment, the tuning control should be set so that the oscillator frequency is approximately correct. This may be checked by uning in the sound frequency for that particular channel for maximum audio output. A 200 to 300 ohm resistor should be shunted across the primary of T11 or R103. This is done to prevent the oscillator voltage from upsetting the r-f alignment curve.

4. Oscillator Adjustments—The oscillator coils for Channels #2 through #7 are adjusted so that the Tuning control, C80, will tune the station at the mid-rotation position for each of these channels. Since the other remaining six channels, #8 through #13, are combined so as to be covered by only three switching positions, the oscillator coils are adjusted so that the Tuning control will tune in the two channels assigned each switch position at two points equi-distant from the two extremes of its rotation. With the Tuning control set to its mid-position, the oscillator coil is adjusted to give a maximum output when a modulated r-f signal at the test frequency specified is fed into the antenna terminals. The oscillator coils are adjusted by spreading turns to raise frequency or compressing turns to lower frequency.

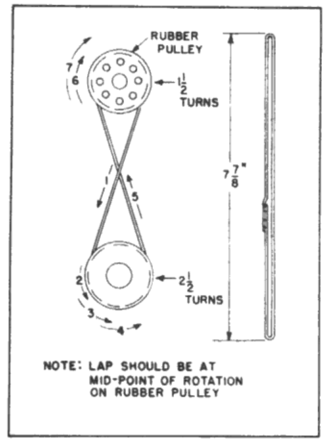


Fig. 15. Focus Control Stringing

Apply the signal generator with tone modulation to the antenna input terminals and set the generator to the frequency specified in the Alignment Table for each switch position. The signal generator must be very accurately calibrated. This can be done by beating its output against a known channel carrier, or use a station operating on the channel and then tune in the sound.

For output indication, advance the volume control about to mid-position so that the tone modulation or audio modulation on the station may be heard through the loudspeaker.

The oscillator coil is located on the coil form or switch assembly nearest to the front of the r-f unit. This is shown in Figures 12 and 17.

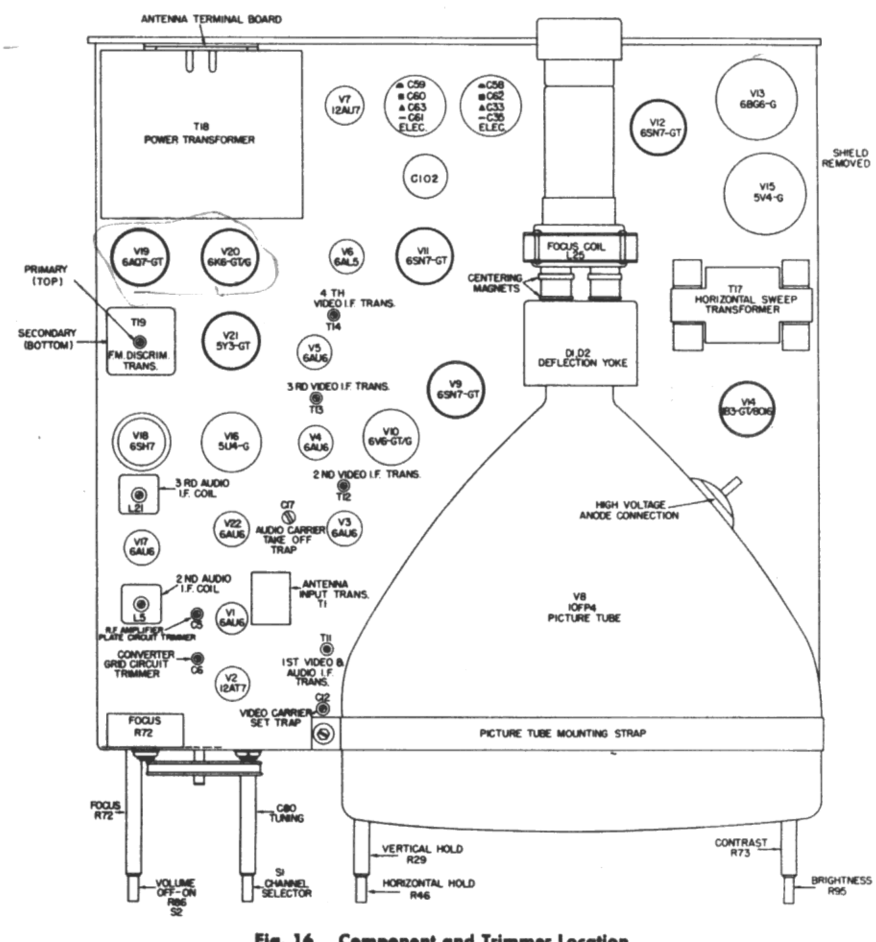


Fig. 16. Component and Trimmer Location

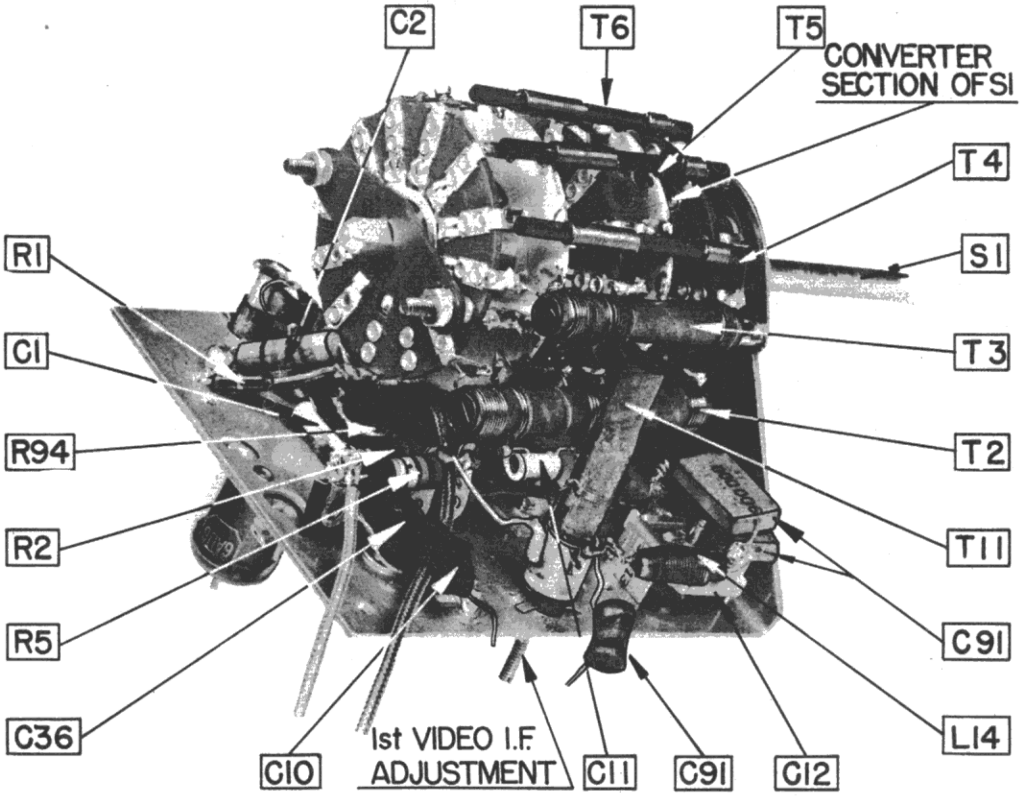


Fig. 17. R-F Head-end Assembly, Oblique View

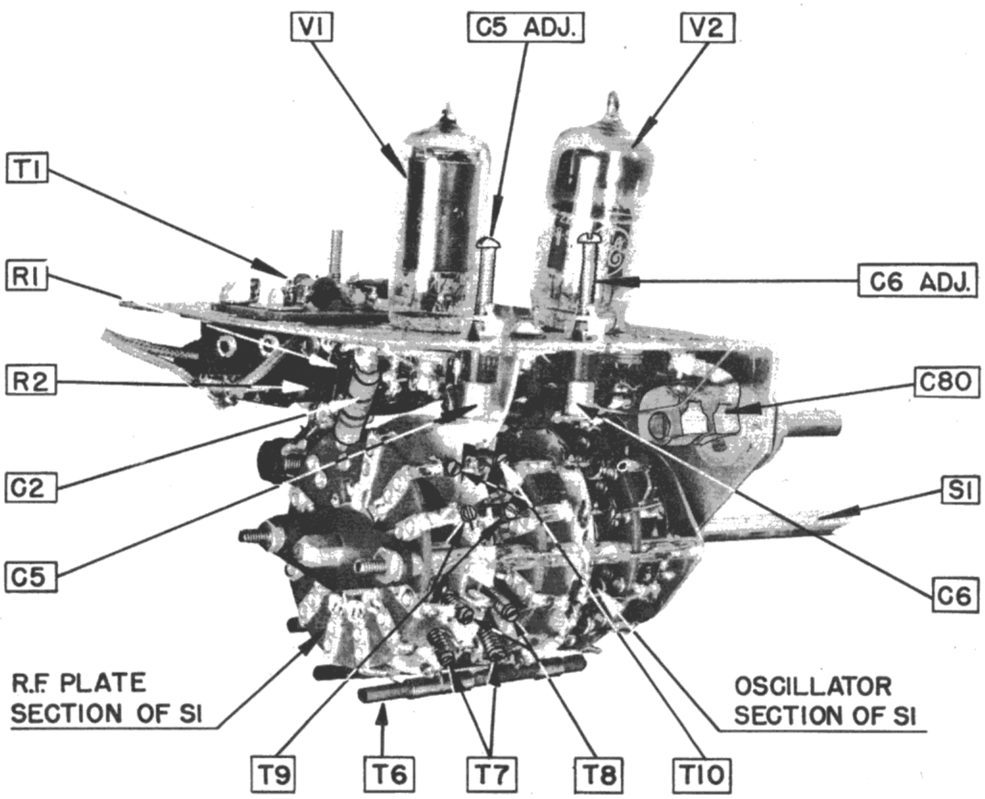


Fig. 18. R-F Head-end Assembly, Side View

ALIGNMENT TABLE

Before attempting the following tabular alignment procedure, read the preceding section "Alignment Suggestions"

STEP NO.	SIGNAL GEN. FREQ.	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT	CONNECT OSCILLOSCOPE TO CHASSIS AND	CHANNEL SWITCH	ADJUST	REMARKS
			(1) SOUND I-F ALIGNMENT				
1	21.8 mc marker	21.8 mc with 1 mc sweep	Grid (1) of V17 thru 500 mmf.	Junction R104 and C100 thru 100K ohm resistor	Channel #4	L21 for max. amplitude and symmetry about marker.	See Fig. 10A for resultant curve.
2	21.8 mc marker	21.8 mc with 1 mc sweep	Grid (1) of V22 thru 500 mmf.	Junction R104 and C100 thru 100K ohm resistor	Channel #4	L5 for max. amplitude and symmetry about marker.	
3	21.8 mc with modulation	Not used	Grid (1) of V22 thru 500 mmf.	C74 and R86 thru 10,000-ohm resistor	Channel #4	Secondary slug of T19 for min. sine wave amplitude or listen for min. tone.	Turn Volume control half-way up.
4	Not used	21.8 mc with 1 mc sweep	Grid (1) of V22 thru 500 mmf.	C74 and R86 thru 10,000-ohm resistor	Channel #4	Primary slug of T19 for max. peak-to-peak amplitude and symmetry of peaks about base line.	See Fig. 10B for resultant curve.
5	Recheck Steps 3 and 4.						
			(2) VIDEO I-F ALIGNMENT				
1	22.9 mc, 26.3 mc	20–30 mc	Grid (1) of V5 thru 500 mmf.	L22 and R24 thru 10,000-ohm resistor	Channel #4	Adjust primary and secondary slugs of T14 for max. amplitude and flat response with markers as shown in Fig. 11A.	Contrast control at mid-position. Remove tube V4.
2	22.9 mc, 25.55 mc, 26.3 mc	20–30 mc	Grid (1) of V4 thru 500 mmf.	L22 and R24 thru 10,000-ohm resistor	Channel #4	Adjust slug of T13 for max. amplitude and flat response with markers as shown in Fig. 11B.	Remove tube V3 and replace V4.
3	21.8 mc with 400 cycle modulation	—	Grid (pin 1) of V3 thru 500 mmf.	L22 and R24 thru 10,000 ohm resistor	Channel #4	Adjust C17 for minimum 400 cycle amplitude.	—
4	22.9 mc, 23.4 mc, 25.55 mc, 26.3 mc	20–30 mc	Grid (1) of V3 thru 500 mmf.	L22 and R24 thru 10,000-ohm resistor	Channel #4	Adjust slug of T12 for max. amplitude and flat response with markers as shown in Fig. 11C.	Remove tube V2 and replace V3.
5	22.9 mc, 23.4 mc, 25.55 mc, 26.3 mc	20–30 mc	Grid (7) of V2 thru 500 mmf.	L22 and R24 thru 10,000-ohm resistor	Channel #4	Adjust slug of T11 for max. amplitude and flat response with markers as shown in Fig. 11C.	Turn carrier set trimmer C12 to minimum capacity. Replace tube V2.
6	22.9 mc, 23.4 mc, 25.55 mc, 26.3 mc	20–30 mc	Grid (7) of V2 thru 500 mmf.	L22 and R24 thru 10,000-ohm resistor	Channel #4	Adjust C12 until 26.3 mc marker is 50% above baseline. 25.55 mc and 22.9 mc markers should be as shown in Fig. 11D.	
			(3) R-F ALIGNMENT				
1	83.25 mc and 87.75 mc	Channel #6 with 15 mc sweep	Antenna terminals at r-f amplifier	R5 and C10 thru 10,000-ohm resistor. Disconnect C10.	Channel #6	C5 and C6 for max. amplitude and flat response with correct markers location.	See Fig. 14B for resultant alignment curve.

GENERAL ELECTRIC CO. MODEL 810

ALIGNMENT TABLE (Continued)

STEP NO.	SIGNAL GEN. FREQ.	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT	CONNECT OSCILLOSCOPE TO CHASSIS AND	CHANNEL SWITCH	ADJUST	REMARKS
			(3) R-F ALIGNMENT (Continued)				
2	77.25 mc and 81.75 mc	Channel #5 with 15 mc sweep	Antenna terminals at r-f amplifier	R5 and C10 thru 10,000-ohm resistor. Disconnect C10.	Channel #5	Check and adjust inductance if necessary for max. amplitude and flat response with correct markers.	See Fig. 14B for resultant alignment curve.
3	67.25 mc and 71.75 mc	Channel #4 with 15 mc sweep	Antenna terminals at r-f amplifier	R5 and C10 thru 10,000-ohm resistor. Disconnect C10.	Channel #4	Check and adjust inductance if necessary for max. amplitude and flat response with correct markers.	See Fig. 14B for resultant alignment curve.
4	61.25 mc and 65.75 mc	Channel #3 with 15 mc sweep	Antenna terminals at r-f amplifier	R5 and C10 thru 10,000-ohm resistor. Disconnect C10.	Channel #3	Check and adjust inductance if necessary for max. amplitude and flat response with correct markers.	See Fig. 14B for resultant alignment curve.
5	55.25 mc and 59.75 mc	Channel #2 with 15 mc sweep	Antenna terminals at r-f amplifier	R5 and C10 thru 10,000-ohm resistor. Disconnect C10.	Channel #2	Check and adjust inductance if necessary for max. amplitude and flat response with correct markers.	Adjust inductance by moving copper rings. See Fig. 14A for resultant alignment curve.
6	175.25 mc and 179.75 mc	Channel #7 with 15 mc sweep	Antenna terminals at r-f amplifier	R5 and C10 thru 10,000-ohm resistor. Disconnect C10.	Channel #7	Check and adjust inductance if necessary for max. amplitude and flat response with correct markers.	Adjust inductance by brass screws in coils. See Fig. 14B for resultant curve.
7	181.25 mc and 191.75 mc	186.5 mc with 25 mc sweep	Antenna terminals at r-f amplifier	R5 and C10 thru 10,000-ohm resistor. Disconnect C10.	Channel #8–#9	Check and adjust inductance if necessary for max. amplitude and flat response with correct markers.	Adjust inductance by brass screws in coils. See Fig. 14C for resultant curve.
8	193.25 mc and 203.75 mc	198.5 mc with 25 mc sweep	Antenna terminals at r-f amplifier	R5 and C10 thru 10,000-ohm resistor. Disconnect C10.	Channel #10–#11	Check and adjust inductance if necessary for max. amplitude and flat response with correct markers.	Adjust inductance by brass screws in coils. See Fig. 14C for resultant curve.
9	205.25 mc and 215.75 mc	210.5 mc with 25 mc sweep	Antenna terminals at r-f amplifier	R5 and C10 thru 10,000-ohm resistor. Disconnect C10.	Channel #12–#13	Check and adjust inductance if necessary for max. amplitude and flat response with correct markers.	Adjust inductance by brass screws in coils. See Fig. 14C for resultant curve.
			(4) OSCILLATOR ADJUSTMENTS				
1	59.75 mc with tone modulation	—	Antenna terminals	—	Channel #2	Squeeze or spread turns of osc. coil of T2	Volume control at mid-position. Set Tuning control at mid-position of travel. Use sound output as indicator.
2	65.75 mc with tone modulation	—	Antenna terminals	—	Channel #3	Squeeze or spread turns of osc. coil of T3	
3	71.75 mc with tone modulation	—	Antenna terminals	—	Channel #4	Squeeze or spread turns of osc. coil of T4	
4	81.75 mc with tone modulation	—	Antenna terminals	—	Channel #5	Squeeze or spread turns of osc. coil of T5	
5	87.75 mc with tone modulation	—	Antenna terminals	—	Channel #6	Squeeze or spread turns of osc. coil of T6	

ALIGNMENT TABLE (Continued)

STEP NO.	SIGNAL GEN. FREQ.	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT	CONNECT OSCILLOSCOPE TO CHASSIS AND	CHANNEL SWITCH	ADJUST	REMARKS
(4) OSCILLATOR ADJUSTMENTS (Continued)							
6	179.75 mc with tone modulation	—	Antenna terminals	—	Channel #7	Squeeze or spread turns of osc. coil of L10	Volume control at mid-position. Set Tuning control at mid-position of travel. Use sound output as indicator.
7	188.75 mc with tone modulation	—	Antenna terminals	—	Channel #8–#9	Squeeze or spread turns of osc. coil of L11	
8	200.75 mc with tone modulation	—	Antenna terminals	—	Channel #10–#11	Squeeze or spread turns of osc. coil of L12	
9	212.75 mc with tone modulation	—	Antenna terminals	—	Channel #12–#13	Squeeze or spread turns of osc. coil of L13	

MISCELLANEOUS INSTALLATION AND SERVICE ADJUSTMENTS

NOTE: The unpacking, set-up instructions, antenna installation, and installation adjustments for the Model 810 receiver, are covered in the INSTALLATION INSTRUCTIONS, ER-A-810. Some of this data is repeated in this publication.

REPLACEMENT OF PICTURE TUBE.

To replace the picture tube it is necessary to remove the chassis from the cabinet. Remove the picture tube socket, the high-voltage anode cap, and then partially loosen the setscrews that clamp the picture tube front mounting strap. The fiber centering gasket (see Figure 20) should be slid off from the neck of the picture tube. Carefully pull the picture tube out through the focus and deflection coils.

Install the new picture tube from the front of chassis by inserting the base of tube through the deflection yoke and focus coil assembly. The tube should be moved back so that the front surface of the picture tube is approximately 1⅝ inches in front of the chassis front apron. The rim of the bulb should rest on the channel rubbers and then the tube is clamped firm but not tight in place by the picture tube mounting strap. The picture tube should be rotated until the keyway at the base of the tube points approximately towards the Vertical Linearity control, as shown in Figure 20. Install the high voltage anode cap onto the high voltage anode of the picture tube.

Replace the chassis in the cabinet and secure by the cabinet mounting screws. Now push the picture tube forward on the chassis until the face of the tube is tight within the picture tube mask. Push the deflection yoke assembly forward as far as it will go. The front of the deflection coil should butt up against the bulb portion of the picture tube. Insert the fiber gasket between the neck of the picture tube and the focus coil, as shown

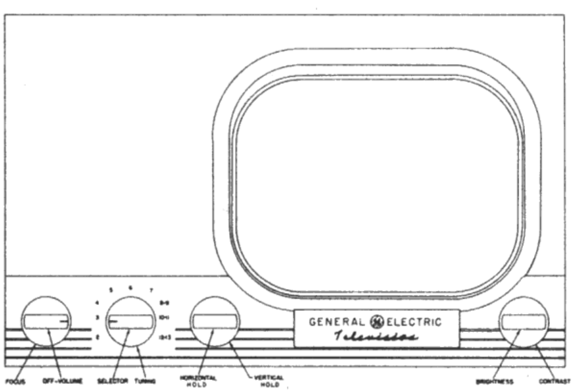


Fig. 19. Knob Control Location

in Figure 20. This centers the neck of the tube where it passes through the deflection yoke assembly. Install the picture tube socket onto the base of the picture tube.

Wipe the screen surface of the picture tube so as to remove finger marks and dirt. *Precaution—Do not handle, remove, or install a picture tube unless shatterproof goggles and heavy gloves are worn.*

VENTILATION PRECAUTION.

Air circulation about the chassis is provided through ventilation slots cut in the bottom, side, and back cover of the cabinet. Do not cover or partially obstruct these slots in any way.

ANTENNA.

The proper antenna and lead-in installation is of the utmost importance in order to obtain optimum signal strength with freedom from noise and clarity of picture. This installation is covered thoroughly in the Installation Instructions, ER-A-810, and the booklet accompanying each G-E television antenna. This receiver is designed for use with a 300 ohm balanced antenna and lead-in system. Any one of the following G-E antennas with the G-E 300-ohm television transmission line may be used.

Stock No. UKA-005 is a simple folded dipole which is easy to install and provides good reception from all twelve channels in medium and high signal strength areas.

Stock No. UKR-005 makes use of the above antenna with a reflector added. This provides better attenuation if reflections are encountered and provides more signal gain and noise immunity.

Stock No. UKR-007 is a stacked array antenna which gives considerable signal gain over the above antennas. This antenna gives uniform reception of most of the lower frequency channels and is used on fringe areas where the above antennas are not quite adequate.

A lightning arrestor, Stock No. REM-001, should be installed for each antenna installation made on the outside of the house. If the mast is metal, this should be grounded as directly as possible. Use a metal strap or a heavy cable for grounding.

PICTURE CENTERING ADJUSTMENT.

The cabinet back cover must be removed to make this adjustment. The centering magnet assembly is located between the Focus Coil and Deflection Yoke, as shown in Figure 20, and is used to center the picture within the tube mask. They have a dual adjustment, as follows. Rotation of the magnet assembly causes a change in the direction of centering correction, while the movement of the magnets in respect to each other changes the magnitude of correction. The larger ring magnet is free to move towards or away from the fixed smaller magnet; the closer the two magnets are to each other, the greater will be the correction, or vice-versa. If the picture is not centered on the screen, first move the magnets apart. If this does not center

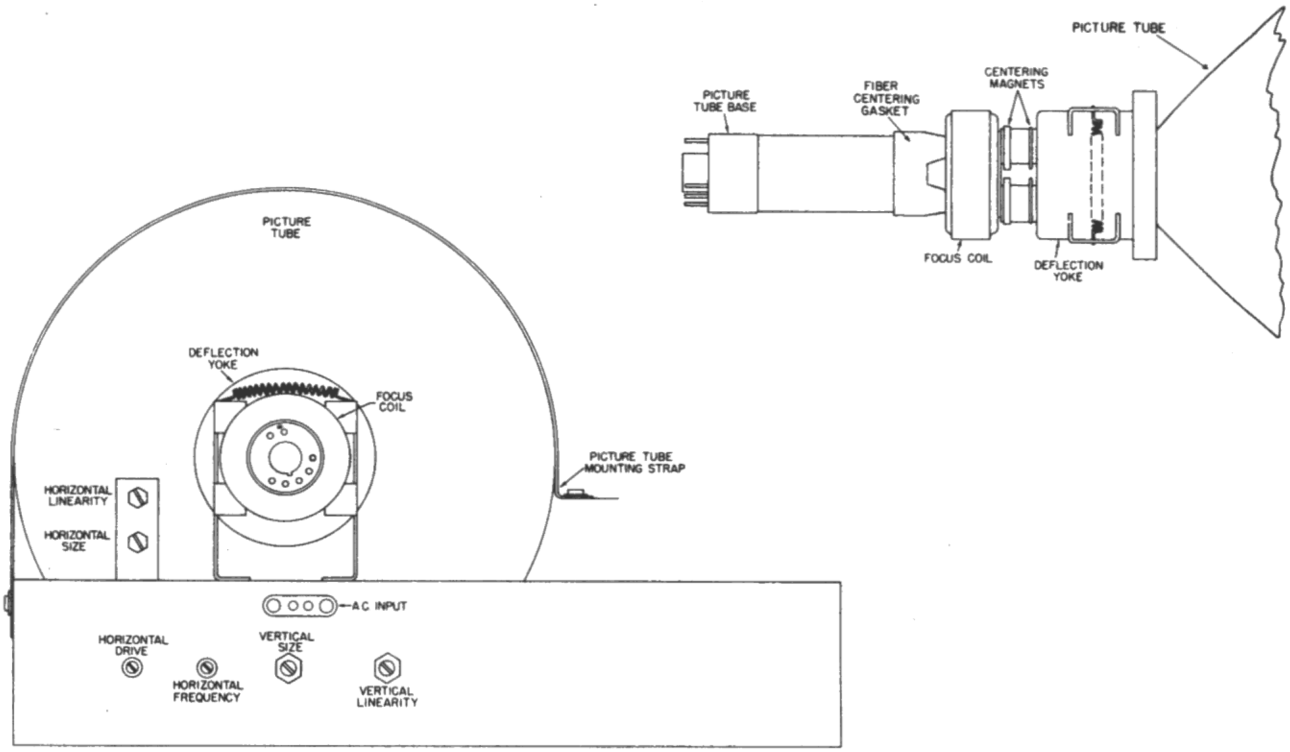


Fig. 20. Location of Preset Adjustment Controls

the picture, then rotate the assembly and when it moves in the direction desired for correction, separate or close the magnets in respect to each other until the magnitude of the correction is sufficient.

Late Models 810 use a new type centering adjustment which is adjusted as follows. The larger magnet ring can be rotated 180° and pushed closer to or farther from the smaller ring magnet which is soldered inside of the sleeve. In one position the outside magnet is aiding the inside magnet and rotated 180° it is opposing the inside magnet. To get maximum deflection of the electron beam, it is necessary to have the two magnets aiding and close together. To get minimum deflection, the outside magnet must be rotated 180° (opposing). Therefore, to center the electron beam, move the outside magnet away from the inside magnet (towards the focus coil). Rotate the whole centering assembly until the beam moves in the proper direction, then move the magnets together, either aiding or opposing until the desired correction is obtained.

TILT CONTROL.

This adjustment must be made with the cabinet back removed. If the picture is slightly tilted and does not square with the picture tube mask, rotate the deflection yoke in its clamp bracket until it is aligned. The deflection yoke is held in its clamp bracket by spring pressure.

HORIZONTAL LINEARITY AND HOR. DRIVE.

These controls are used to adjust the linearity. First, adjust the Hor. Drive control to minimum capacity setting (full counter-clockwise). With Horizontal Size at approximately its correct setting, adjust the Horizontal Linearity until the picture shows correct horizontal proportions. A maladjustment shows up as an elongation or crowding of either side of the picture. This is best adjusted when a test pattern is being broadcasted by adjusting the control until the distance from the center of the test pattern to the left-hand and right-hand edges measures the same. If the Horizontal Linearity control will not give the proper linearity adjustment, turn the Hor. Drive control slightly clockwise and repeat adjustment of Hor. Linearity. Always leave the Hor. Drive control at maximum counterclockwise position consistent with good linearity. If there is any fold-over of pattern at center of picture which shows up as a lighter area about ¼ to ½ inch wide running vertically on screen, the Hor. Drive control should be turned clockwise until it disappears.

HORIZONTAL SIZE.

This control changes the horizontal size of the picture. When adjusted to the recommended width, the picture should extend for approximately ⅛ inch beyond the edge of the picture tube mask so that the left and right edges of the picture are not visible. In the picture showing incorrect adjustment of the Width control, it will be noted that this condition makes the inner circle of the test pattern an egg shape instead of a perfect circle.

VERTICAL LINEARITY.

This control gives the proper vertical proportions to the picture. Improper adjustment will either crowd the lower or upper half of the picture as shown in the illustration. This is best adjusted on the test pattern by adjusting the Vertical Linearity control until the distance from the center of the test pattern to the top or bottom edges measures the same. The adjustment of this control will alter the height of the picture slightly so as to necessitate the adjustment of the Vertical Size control simultaneously with it.

VERTICAL SIZE.

This control changes the picture height. When adjusted to the correct height, the picture should extend for approximately ⅛ inch beyond the edge of the picture tube mask so that the top and bottom edges of the picture are not visible.

HOR. FREQUENCY.

This is a coarse adjustment that supplements the Horizontal Hold control adjustment on the front panel. It is adjusted to the position which permits the Horizontal Hold control on the front panel to go through its proper adjustment at about its mid-rotation position.

T16 ADJUSTMENT.

The core of the blocking oscillator transformer T16 changes the frequency of this circuit. Its adjustment is made as follows: Connect a VTVM to measure the voltage from the junction of R74 and potentiometer R73 to ground. Tune the receiver to any suitable television signal. Set the front panel Horizontal Hold control, R46, to the midpoint of its resistance range, then adjust the iron core of the blocking oscillator transformer T16 and the setting of the Horizontal Frequency control trimmer C49 to bring the picture into horizontal synchronization and to develop -12 ± 1.0 volts across the contrast control as measured by the VTVM. The iron core adjustment and the trimmer setting are interlocking and, therefore, it will be necessary to readjust each of these controls in turn to bring the picture in sync and also to obtain -12 volts.

The sync range should fall in the approximate center of the front panel Horizontal Hold control range, and it should be possible to throw the circuit out of sync by turning the control to either end of its range.

OPERATING CONTROLS

OFF-VOLUME.

Turns the receiver power on or off and adjusts the sound volume to the required listening level. In the extreme counterclockwise position, the power is "off." Rotation clockwise from this position turns the power "on" and progressively increases volume as the control is turned clockwise. Note—It takes several seconds for the tubes to warm up after the receiver is first turned "on" so that a picture will not appear or the sound be made available instantaneously.

FOCUS.

The focus control should be checked to see that the receiver will focus at least 30° away from either end of the focus control. If the control focuses at the end of its rotation or within 30° from the clockwise end, the focus coil and centering rings should be slid back until the tube will focus at least 30° from the control end. In no case should the coil be pushed back more than 3/16 of an inch.

SELECTOR.

The nine positions of this switch permit selection of the present twelve commercial television program channels. The switch positions numbered No. 2 through No. 13 correspond to the channel numbers assigned to the stations as they appear in the newspaper. It is merely necessary to turn the switch so that the index is adjacent to the channel number desired. NOTE—The three extreme clockwise positions are dual in that they will preset the tuned circuits for either of two channels at each position of switch.

The assigned channel numbers and their frequency coverage are given below.

SELECTOR POSITION	CHANNEL	FREQUENCY BAND
2	2	54–60 mc
3	3	60–66 mc
4	4	66–72 mc
5	5	76–82 mc
6	6	82–88 mc
7	7	174–180 mc
8–9	8	180–186 mc
8–9	9	186–192 mc
10–11	10	192–198 mc
10–11	11	198–204 mc
12–13	12	204–210 mc
12–13	13	210–216 mc

TUNING.

This control adjusts the frequency of the receiver to the television band being received. Correct adjustment is essential for optimum picture detail and satisfactory sound reproduction.

With the Selector switch set to receive the desired channel, turn the Volume control about half-way up: then adjust the Tuning control to that point where the sound reproduction of the program is the clearest. It is possible to receive sound at three adjacent tuning points of the control. Tune to the center peak. This will give the loudest and best quality to the sound reproduction. Should this adjustment produce excess sound volume, reduce the Volume control setting; *never reduce volume by detuning*.

HORIZONTAL HOLD.

Locks in picture from left to right. It should be adjusted until the picture does not move sideways and is centered in the picture viewing frame.

VERTICAL HOLD.

Locks in the picture in a vertical direction. It should be adjusted until the picture no longer moves up or down.

CONTRAST.

The correct setting of this control is dependent upon the location of the receiver in respect to the transmitter. For a weak signal, this control may have to be operated nearly full clockwise while for a strong local station the control may be operated almost fully counterclockwise or at a minimum. As the name implies, this control adjusts the black and white contrast between the various picture elements. Too much contrast is apparent when the picture is lacking in gradations between black and whites or the picture loses form. Too little contrast causes the picture to appear faded so that it seems composed entirely of grays.

BRIGHTNESS.

This control has to be adjusted simultaneously with contrast as it regulates the brilliance of the received picture. Too much brilliance will have the same effect as too little contrast, making it advisable to strike a proper balance between the Contrast control and Brightness control settings.

CRITICAL LEAD DRESS AND COMPONENT REPLACEMENT

Since the operating frequencies are relatively high in a television receiver, it is essential that all components be replaced in exactly the same position they occupied when they left the factory, all leads be made as short as possible and exact replacement parts be used when service is required. Leads in wiring between components are usually critical as to placement against chassis or proximity to other components. Some of critical wiring precautions are listed below:

1. *Discriminator (T19) Leads*—Dress primary and secondary leads of the discriminator transformer close to chassis.

2. *Head-end Unit*—All leads which run between head-end unit coil assembly and front apron of chassis should be dressed as far as possible from the oscillator coils.

3. *Plate Lead of 6K6*—The plate lead (blue) of 6K6 should be dressed as far away from the 6AQ7GT 1st audio circuit as possible.

4. *Electrolytic C102*—When replacing this V2 filament rectifier electrolytic capacitor, C102, connect the ground lug of the capacitor as directly to chassis ground as possible.

TROUBLE SHOOTING

The following is a listing of possible troubles and their cures. This is not intended as a comprehensive coverage but will merely serve as a guide in locating some of the more difficult problems that may be experienced. From time to time this information will be supplemented by a service bulletin.

1. NO RASTER ON PICTURE TUBE.

(a) Check for waveform on oscilloscope at output of T17. If present, the trouble is probably in the Type 1B3GT rectifier tube, filter circuit, or picture tube. Check for open circuit in high voltage winding or R62 of T17. If the filament of V14 glows orange, high voltage is being generated and the trouble will possibly exist in the picture tube, V8.

(b) If there is no waveform at output of T17, check operation of V13, and sawtooth generator, V12B, by oscilloscope waveform measurement.

(c) Check that high voltage anode cap is contacting the anode terminal of the picture tube.

(d) Open in Brightness control, R95 or R32 or R43.

(e) Defective V7B tube.

(f) If anode voltage is very low, check deflection yoke for continuity or shorted turns, check Hor. size control for continuity.

2. RASTER NORMAL, NO PICTURE OR SOUND.

(a) Oscillator V2A defective, or oscillator coil resonates outside of channel.

(b) Defective antenna or lead-in. With contrast full up if antenna system is working satisfactorily, noise pattern should be seen on screen and heard in speaker.

(c) Converter, r-f amplifier, or first video i-f amplifier stage defective.

3. PICTURE NORMAL, NO SOUND.

(a) Audio i-f amplifier, audio discriminator detector, or audio amplifier defective.

(b) Defective speaker.

(c) Oscillator V2A off frequency.

4. RASTER NORMAL, SOUND NORMAL, NO PICTURE.

(a) Video i-f amplifier (after 1st i-f) inoperative.

(b) Video amplifier tube V7 defective.

(c) Grid lead to picture tube open.

5. NORMAL PICTURE AND SOUND, NO. HOR. OR VERT. SYNC.

(a) Check for signal waveform at grid (4) of V11A and grid (1) of V11B.

(b) Tube V7A plate circuit components improper value.

6. PICTURE NORMAL, NO VERTICAL SYNC.

(a) Check grid (1) of V9 for vertical sync pulses.

(b) Check frequency of vertical sweep generator. This should be capable of free running frequency of slightly less than 60 cps.

(c) Check sweep generator tube, V9, components.

7. PICTURE NORMAL, NO HORIZONTAL SYNC.

(a) Check grid (4) of V12A for horizontal sync pulse. Disconnect leads from R54 and C57 to examine this.

(b) Check tube V12A and its circuit components.

(c) Check sweep generator V12B and circuit components.

8. RASTER EDGE NOT STRAIGHT—KEYSTONING.

(a) Defective deflection yoke.

(b) Defective sweep transformer.

9. PICTURE JUMPY.

(a) Operation at too high a Contrast control setting.

(b) Gassy or noisy 6BG6G (V13) or 6V6GT (V10) tubes.

(c) Noisy sweep or sync circuit tubes.

(d) Excess noise received by antenna system.

10. POOR PICTURE DETAIL.

(a) Mismatch in antenna and lead-in system.

(b) Misalignment of i-f and r-f circuits.

(c) Defective video chokes.

(d) Make sure focus control goes through focus.

(e) Overload of video amplifier. Check Contrast control operation.

11. AUDIO MOTOR BOATING.

(a) Dress V20 plate lead (blue) as far away as possible from V19B tube circuit components.

12. HUM MODULATION.

(a) Defective filter capacitor, C102.

(b) Defective rectifier, SR1.

WAVEFORM MEASUREMENTS

The waveform shown in Figures 36 through 52 represent measurements on an average receiver wherein the controls have been adjusted for a normal picture with correct Contrast, Height, Width and Linearity. Most measurements must be made when a signal is being received.

The oscilloscope where the vertical deflection amplifier has been precalibrated is used to make measurements at the point indicated in the wave form boxes. The oscilloscope sweep frequency is indicated in the waveform title.

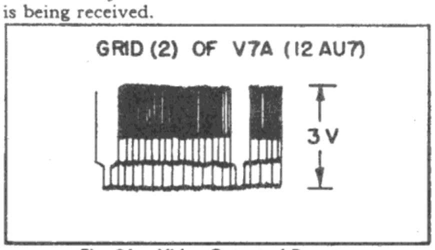


Fig. 36. Video Output of Detector
(Osc. Synced at Half of Vertical Sweep Speed)

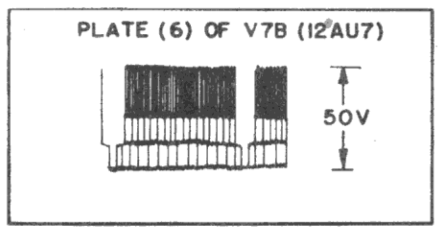


Fig. 37. Video Output
(Osc. Synced at Half of Vertical Sweep Speed)

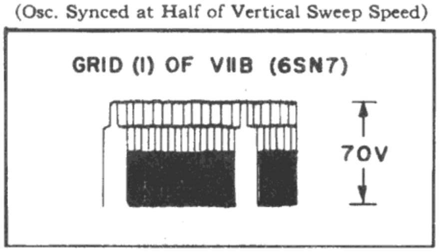


Fig. 38. Clipper Grid
(Osc. Synced at Half of Vertical Sweep Speed)

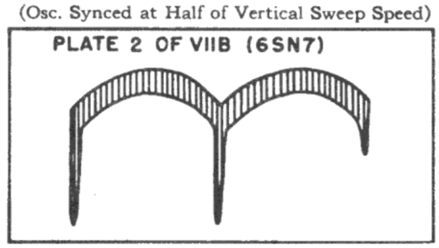


Fig. 39. Clipper Vert Sync. Pulse
(Osc. Synced at Half of Vertical Sweep Speed)

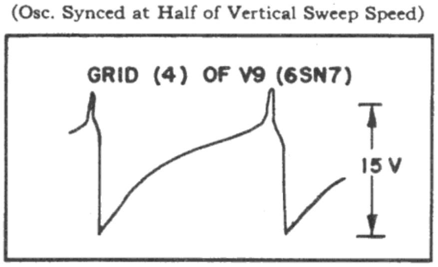


Fig. 40. Vertical Multivibrator
(Osc. Synced at Half of Vertical Sweep Speed)

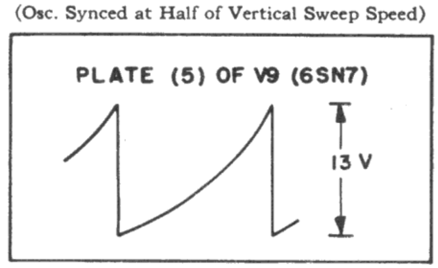


Fig. 41. Vertical Multivibrator
(Osc. Synced at Half of Vertical Sweep Speed)

WAVEFORM MEASUREMENT (Cont'd)

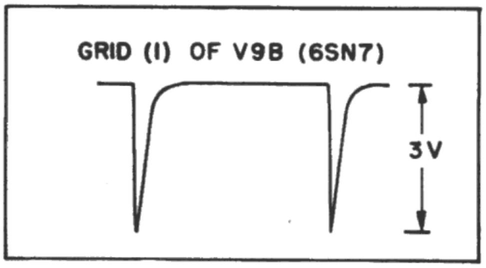


Fig. 42. Vertical Multivibrator
(Osc. Synced at Half of Vertical Sweep Speed)

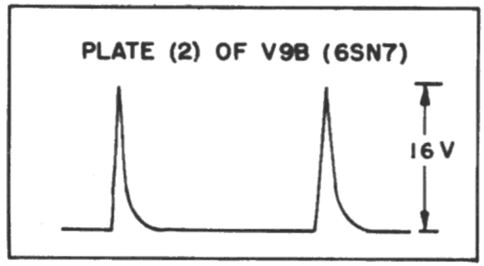


Fig. 43. Vertical Miltivibrator
(Osc. Synced at Half of Vertical Sweep Speed)

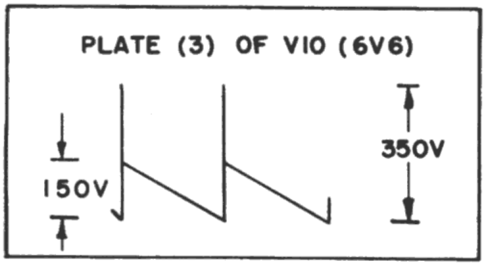


Fig. 44. Vertical Sweep Output
(Osc. Synced at Half of Vertical Sweep Speed)

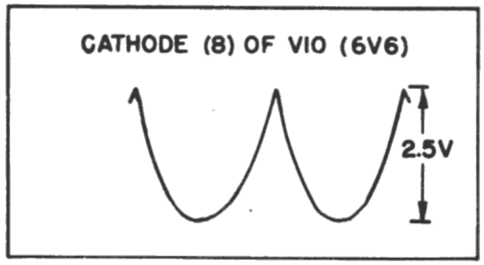


Fig. 45. Cathode of Vertical Output
(Osc. Synced at Half of Vertical Sweep Speed)

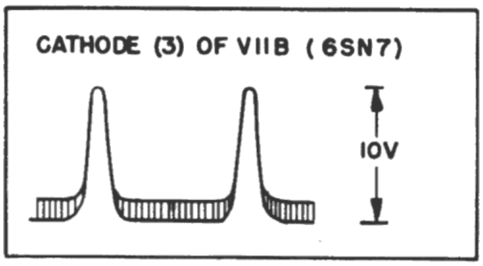


Fig. 46. Clipper Cathode Horizontal Sync. Pulse
(Osc. Synced at Half of Horizontal Sweep Speed)

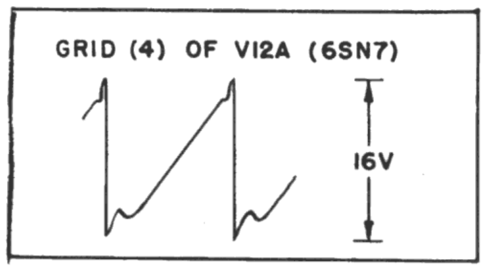


Fig. 47. Horizontal A.F.C. Grid
(Osc. Synced at Half of Horizontal Sweep Speed)

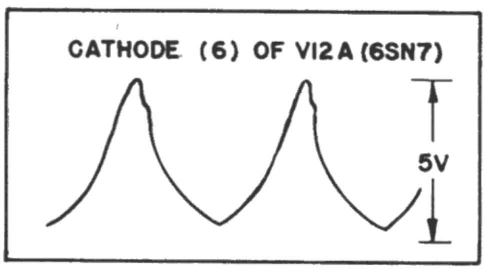


Fig. 48. Horizontal A.F.C. Cathode
(Osc. Synced at Half of Horizontal Sweep Speed)

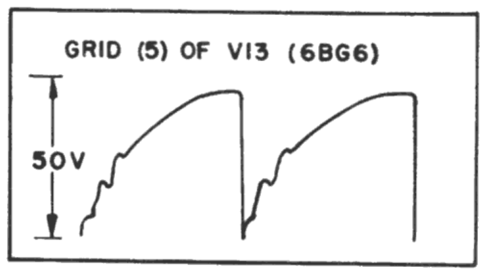


Fig. 49. Grid of Horizontal Sweep Generator
(Osc. Synced at Half of Horizontal Sweep Speed)

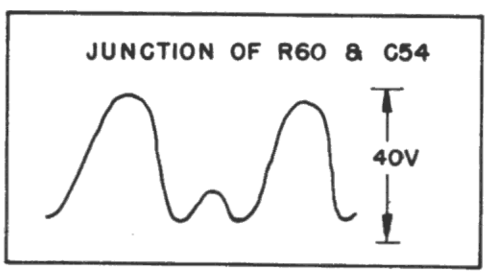


Fig. 50. Start of Primary of Sweep Transformer
(Osc. Synced at half of Horizontal Sweep Speed)

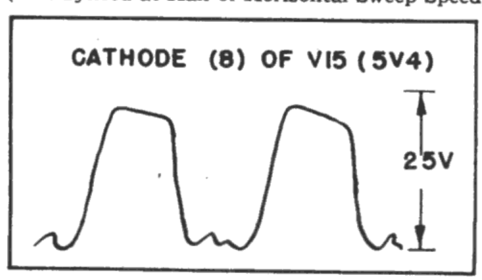


Fig. 51. Cathode of Damping Tube
(Osc. Synced at Half of Horizontal Sweep Speed)

SOCKET VOLTAGE CHART

D-C measurements taken by a 20,000 ohm/volt meter. Selector switch at Channel No. 4.
Normal synced picture, normal brilliance and normal contrast. Line voltage—117 volts.

SYMBOL	TUBE TYPE	PLATE		SCREEN		CATHODE		GRID		PLATE M.A.	SCREEN M.A.	NOTES
		Pin	Volts	Pin	Volts	Pin	Volts	Pin	Volts			
V1	6AU6	5	150	6	150	7	1.6	1	0	8.5	—	Triode connected.
V2A	12AT7	1	230	—	—	3	0.3	2	0	6.0	—	†Grid voltage at V3 and V4 indicates range of Contrast Control.
V2B	12AT7	6	150	—	—	8	0	7	−3.3*	3.3	—	
V3	6AU6	5	275	6	195	7	0.6	1	−1.7V† to	8.0	12.0	
V4	6AU6	5	275	6	195	7	0	1	−13V†	—	—	
V5	6AU6	5	240	6	160	7	0	1	−1.8*	7.2	2.8	
V6A	6AL5	7	−7	—	—	1	0	—	—	—	—	
V6B	6AL5	2	−25	—	—	5	0	—	—	—	—	
V7A	12AU7	1	45	—	—	3	0	2	−1.5*	2.2	—	
V7B	12AU7	6	185	—	—	8	2.0	7	−0.7*	18.0	—	
V8	10FP4	CAP	9200	10	425	11	240	2	185	—	—	Measure H.V. by 20,000 ohm/volt meter with suitable multiplier. Fil-gnd = 315 v.
V9A	6SN7	2	30	—	—	3	0	1	−0.8	—	—	
V9B	6SN7	5	6.0	—	—	6	0	4	−12	—	—	
V10	6V6GT	3	260	—	—	8	20	5	6.0	23	—	
V11A	6SN7	5	155	—	—	6	0	4	−2.0	5.3	—	
V11B	6SN7	2	235	—	—	3	1.6	1	−25	0.2	—	
V12A	6SN7	5	60	—	—	6	2.0	4	−12*	0.2	—	
V12B	6SN7	2	230	—	—	3	0	1	−57*	2.5	—	
V13	6BG6-G	CAP	440†	8	295	3	9	5	6	102	10	†Measure at start of primary winding.
V14	1B3G	—	—	—	—	2	9200	—	—	—	—	Check visually for filament glow. Measure high voltage by 20,000 ohm/volt meter with suitable multiplier.
V15	5V4G	4	355	—	—	8	440	—	—	112	—	
V16	5U4G	4/6	345AC	—	—	8	380	—	—	145	—	
V17	6AU6	5	105	6	85	7	1.0	1	0	5.8	2.3	
V18	6SH7	8	240	6	35	3	0	4	0	2.6	1.0	
V19A	6AQ7GT	3	4.3	—	—	2	0.7	—	—	—	—	Volume at minimum.
V19B	6AQ7GT	5	8.5	—	—	6	0	—	—	0.7	—	
V20	6K6	3	315	4	250	8	19	5	0	22	3.5	
V21	5Y3GT	4/6	310AC	—	—	2	310	—	—	—	—	
V22	6AU6	5	100	6	110	7	1.0	1	0	6.0	2.5	

*VTVM through 0.5 megohm resistor.

WAVEFORM MEASUREMENTS (Continued)

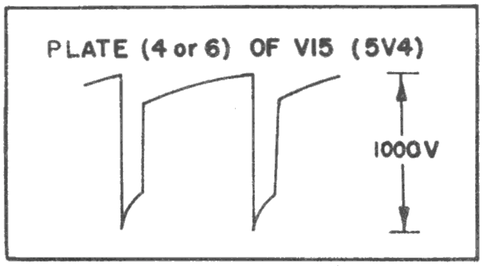


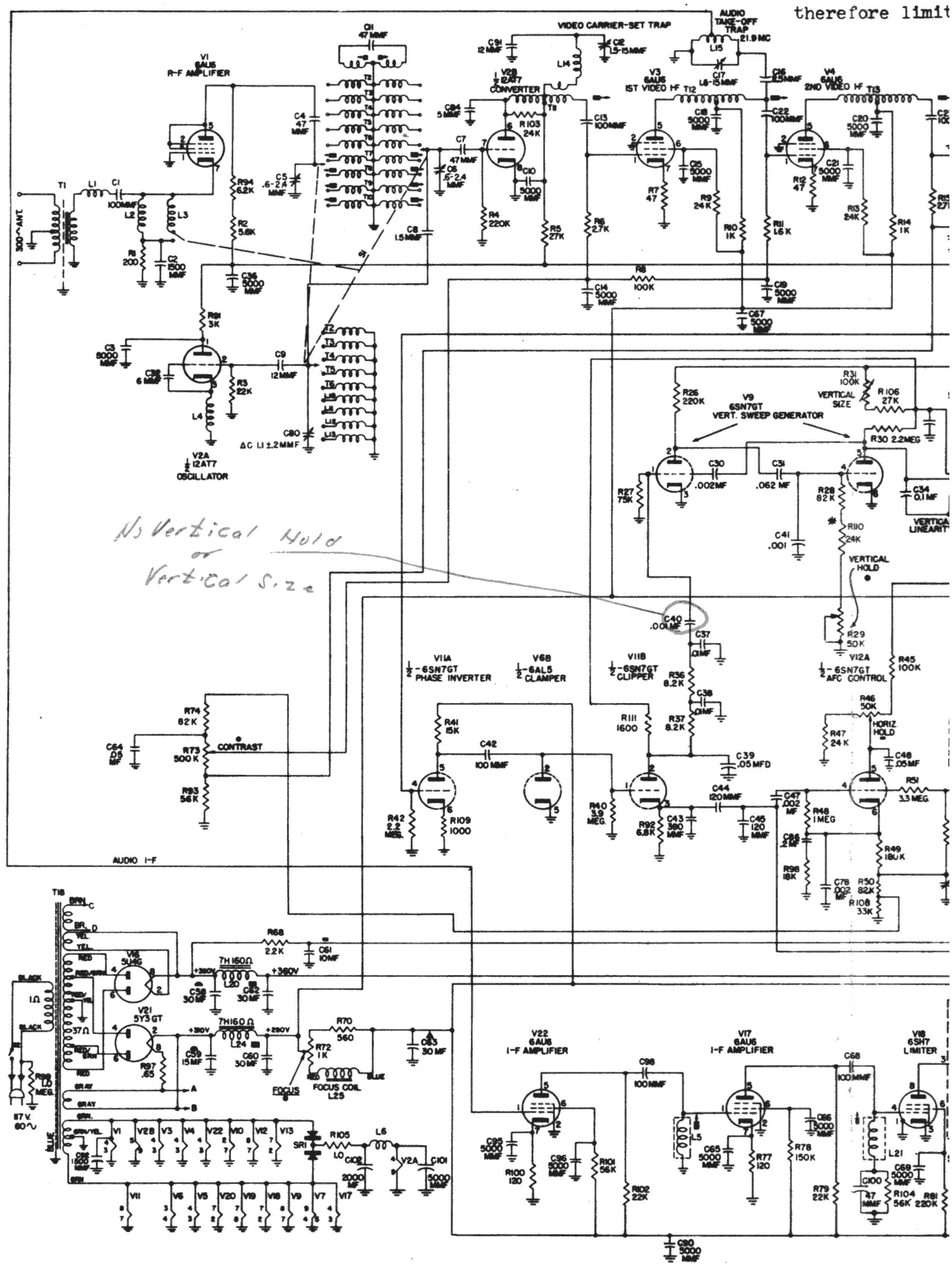
Fig. 52. Plate of Damping Tube
(Osc. Synced at Half of Horizontal Sweep Speed)

MODEL 810 REPLACEMENT PARTS LIST

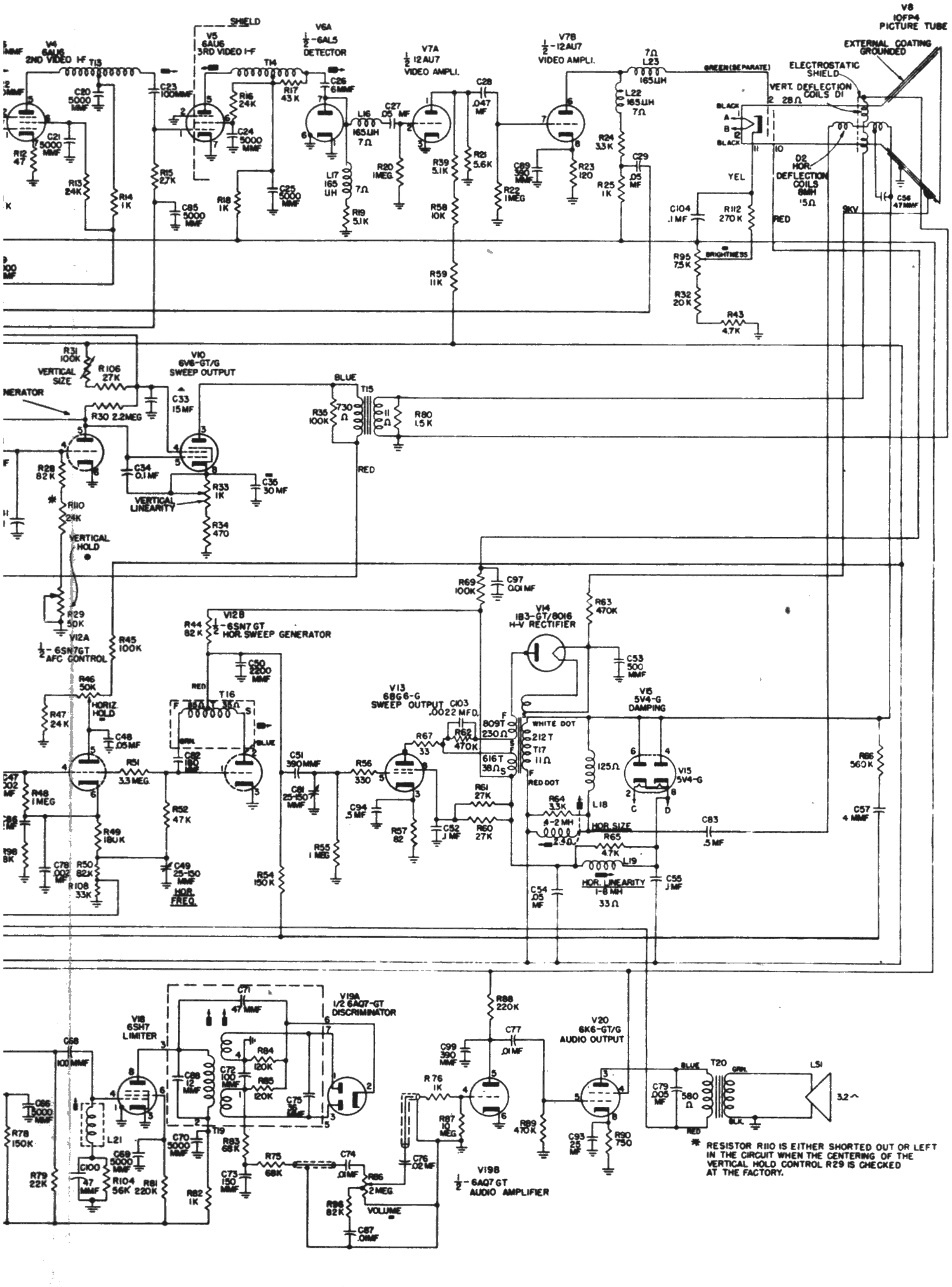
UNIVERSAL REPLACEMENT PARTS

Cat. No.	Symbol	Description
UCC-014	C86	CAPACITOR—.2 mfd., 600 v., paper
UCC-620	C40, 41	CAPACITOR—.001 mf., 600 v., paper paper
UCC-621	C47, 78, 30	CAPACITOR—.002 mfd., 600 v., paper
UCC-625	C79	CAPACITOR—.005 mfd., 600 v., paper
UCC-630	C38, 74, 77, 87, 97	CAPACITOR—.01 mfd., 600 v., paper
UCC-631	C76	CAPACITOR—.02 mfd., 600 v., paper
UCC-635	C27, 29, 48, 54, 64, 39	CAPACITOR—.05 mfd., 600 v., paper
UCC-640	C34, 52, 55, 104	CAPACITOR—.1 mfd., 600 v., paper
UCE-065	C93	CAPACITOR—25 mfd., 25 v., electrolytic
UCU-1506	C91	CAPACITOR—12 mmf., mica
UCU-1528	C42, 68, 98	CAPACITOR—100 mmf., mica
UCU-1530	C44, 45, 46	CAPACITOR—120 mmf., mica
UCU-1532	C73	CAPACITOR—150 mmf., mica
UCU-1542	C43, 51, 89, 99	CAPACITOR—390 mmf., mica
UCU-2534	C82	CAPACITOR—180 mmf., mica
UCU-2560	C50	CAPACITOR—2200 mmf., mica
UJB-004		BOARD—Antenna terminal board
UOP-577	LS1	LOUDSPEAKER—5¼ inch PM speaker
URD-037	R56	RESISTOR—330 ohms, ½ w., carbon
URD-049	R10, 14, 18, 76, 82, 109	RESISTOR—1000 ohms, ½ w., carbon
URD-053	R80	RESISTOR—1500 ohms, ½ w., carbon
URD-065	R65	RESISTOR—4700 ohms, ½ w., carbon
URD-069	R92	RESISTOR—6800 ohms, ½ w., carbon
URD-071	R36, 37	RESISTOR—8200 ohms, ½ w., carbon
URD-085	R108	RESISTOR—33,000 ohms, ½ w., carbon
URD-089	R52	RESISTOR—47,000 ohms, ½ w., carbon
URD-091	R93, 101, 104	RESISTOR—56,000 ohms, ½ w., carbon
URD-093	R75, 83	RESISTOR—68,000 ohms, ½ w., carbon
URD-095	R96	RESISTOR—82,000 ohms, ½ w., carbon
URD-097	R8, 35, 69	RESISTOR—100,000 ohms, ½ w., carbon
URD-099	R84, 85	RESISTOR—120,000 ohms ½ w., carbon
URD-101	R54, 78	RESISTOR—150,000 ohms, ½ w., carbon
URD-105	R81, 88	RESISTOR—220,000 ohms, ½ w., carbon
URD-107	R112	RESISTOR—270,000 ohms, ½ w., carbon
URD-113	R62, 63, 89	RESISTOR—470,000 ohms, ½ w., carbon
URD-115	R66	RESISTOR—560,000 ohms, ½ w., carbon
URD-121	R20, 22, 55, 99	RESISTOR—1 meg., ½ w., carbon
URD-129	R42	RESISTOR—2.2 meg., ½ w., carbon
URD-135	R40	RESISTOR—3.9 meg., ½ w., carbon
URD-145	R87	RESISTOR—10 meg., ½ w., carbon
URD-1017	R7, 12	RESISTOR—47 ohms, ½ w., carbon
URD-1027	R23, 77, 100	RESISTOR—120 ohms, ½ w., carbon
URD-1032	R1	RESISTOR—200 ohms, ½ w., cabon
URD-1041	R34	RESISTOR—470 ohms, ½ w., carbon
URD-1049	R25	RESISTOR—1000 ohms, ½ w., carbon
URD-1054	R11, 111	RESISTOR—1600 ohms, ½ w., carbon

Resistor R24
tion receivers,
therefore limit



Resistor R24 has been changed from a 1 watt, 3.3 K, to a 2 watt, 3.3 K, on production receivers. It was found that this resistor increased in resistance slightly, therefore limiting the brightness obtainable on the picture tube.



UNIVERSAL REPLACEMENT PARTS (Continued)

Cat. No.	Symbol	Description
URD-1059	R6, 15	RESISTOR—2700 ohms, ½ w., carbon
URD-1065	R43	RESISTOR—4700 ohms ½ w., carbon
URD-1066	R19	RESISTOR—5100 ohms ½ w., carbon
URD-1067	R21	RESISTOR—5600 ohms, ½ w., carbon
URD-1081	R3	RESISTOR—22,000 ohms, ½ w., carbon
URD-1082	R9, 13, 16, 103, 47, 110	RESISTOR—24,000 ohms, ½ w., carbon
URD-1088	R17	RESISTOR—43,000 ohms, ½ w., carbon
URD-1094	R27	RESISTOR—75,000 ohms, ½ w., carbon
URD-1095	R50, 74, 28	RESISTOR—82,000 ohms, ½ w., carbon
URD-1103	R49	RESISTOR—180,000 ohms, ½ w., carbon
URD-1105	R4, 26	RESISTOR—220,000 ohms, ½ w., carbon
URD-1121	R48	RESISTOR—1.0 meg. ½ w., carbon
URD-1129	R30	RESISTOR—2.2 meg., ½ w., carbon
URE-013	R67	RESISTOR—33 ohms, 1 w., carbon
URE-077	R41	RESISTOR—15,000 ohms, 1 w., carbon
URE-083	R5, 106	RESISTOR—27,000 ohms, 1 w., carbon
URE-097	R45	RESISTOR—100,000 ohms, 1 w., carbon
URE-133	R51	RESISTOR—3.3 meg., 1 w., carbon
URE-1046	R90	RESISTOR—750 ohms, 1 w., carbon
URE-1060	R91	RESISTOR—3000 ohms, 1 w., carbon
URE-1066	R39	RESISTOR—5100 ohms, 1 w., carbon
URE-1067	R2	RESISTOR—5600 ohms, 1 w., carbon
URE-1068	R94	RESISTOR—6200 ohms, 1 w., carbon
URE-1081	R79, 102	RESISTOR—22,000 ohms, 1 w., carbon
URF-1061	R24	RESISTOR—3300 ohms, 2 w., carbon
URF-061	R64	RESISTOR—3300 ohms, 2 w., carbon
URF-083	R60, 61	RESISTOR—27,000 ohms, 2 w., carbon
URF-1023	R57	RESISTOR—82 ohms, 2 w., carbon
URF-1057	R68	RESISTOR—2200 ohms, 2 w., carbon
URF-1073	R58	RESISTOR—10,000 ohms, 2 w., carbon
URF-1074	R59	RESISTOR—11,000 ohms, 2 w., carbon
URF-1080	R32	RESISTOR—20,000 ohms, 2 w., carbon
URF-1095	R44	RESISTOR—82,000 ohms, 2 w., carbon

SPECIALIZED REPLACEMENT PARTS

Cat. No.	Symbol	Description
RAB-077		BACK—Cabinet back cover
RAV-059		CABINET—Television receiver cabinet
RAX-024		CENTERING ASSEMBLY—Centering ring assembly, includes magnet rings, and split fiber tube
RCC-016	C83, 94	CAPACITOR—.5 mfd., 200 v., paper
RCC-095	C31	CAPACITOR—.062 mf., 600 v., molded paper
RCE-070	C33, 35, 58, 62	CAPACITOR—15 mfd., 450 v.; 30 mfd., 50 v.; 30 mfd., 450 v.; 30 mfd., 450 v.; electrolytic
RCE-071	C59, 60, 61, 63	CAPACITOR—15 mfd., 450 v.; 30 mfd., 450 v.; 10 mfd., 450 v.; 30 mfd., 450 v.; electrolytic
RCE-083	C102	CAPACITOR—2000 mfd., electrolytic
RCN-011	C53	CAPACITOR—500 mmf., 20,000 v., molded.
RCN-014	C28	CAPACITOR—.047 mfd., 600 v., paper (molded)
RCN-019	C103	CAPACITOR—.0022 mfd., 1000 v., paper (molded)
RCN-020	C57	CAPACITOR—4 mmf., 800 v., mica
RCN-021	C56	CAPACITOR—47 mmf., 800 v., mica
RCW-006	C88	CAPACITOR—12 mmf., ceramic
RCW-026	C2, 92	CAPACITOR—1500 mmf., ceramic
RCW-1002	C26	CAPACITOR—6 mmf., ceramic
RCW-1045	C8	CAPACITOR—1.5 mmf., ceramic
RCW-1047	C1, 13, 22, 23, 72	CAPACITOR—100 mmf., ceramic
RCW-1052	C4, 7, 100	CAPACITOR—47 mmf., ceramic
RCW-2006	C9	CAPACITOR—12 mmf., ceramic
RCW-2010	C11, 71	CAPACITOR—47 mmf., ceramic
RCW-2019	C75	CAPACITOR—36 mmf., ceramic
RCW-2030	C32	CAPACITOR—6 mmf., ceramic
RCW-2035	C84	CAPACITOR—5 mmf., ceramic
RCW-3014	C3, 10, 14, 15, 18, 19, 20, 21, 24, 25, 36, 65, 66, 67, 69, 70, 85, 90, 95, 96, 101	CAPACITOR—5000 mmf., ceramic
RCW-3017	C16	CAPACITOR—2.5 mmf., ceramic
RCY-045	C49, 81	CAPACITOR—25-150 mmf., mica trimmer
RCY-046	C80	CAPACITOR—1.25 mmf., variable tuning condenser
RCY-047	C12, 17	CAPACITOR—1.5-15 mmf., mica trimmer
RCY-048	C5, 6	CAPACITOR—0.4-2.4 mmf., trimmer
RDC-032		CORD—For focus control drive, 25 yds. bulk
RDK-152		KNOB—Vertical speed, contrast control knobs
RDK-153		KNOB—Horizontal speed, brightness control knobs
RDK-154		KNOB—Focus, tuning control knobs
RDK-155		KNOB—On-Off switch and volume, channel selector control knobs
RDW-010		SAFETY GLASS—Cabinet glass protects picture tube
REI-014		SLUG—R-F and converter coil tuning slugs for T7, T8, T9, and T10
REI-015		CORE—Adjustment core for blocking oscillator coil T16

GENERAL ELECTRIC CO.

SPECIALIZED REPLACEMENT PARTS (Continued)

Cat. No.	Symbol	Description
REI-016		CORE—Tuning core for T11, T12, T13, T14 video i-f and L5, L21 sound i-f
REI-017		CORE—Adjustment core for horizontal linearity L19
REI-018		CORE—Adjustment core for horizontal size control L18
REI-019		CORE—Tuning core for sound discriminator T19
REI-026		CORE—Plate winding core for T14
RER-003	SR1	RECTIFIER—Selenium rectifier
RHM-025		WASHER—"C" washer, retains tuning shaft or focus control shaft
RHM-047		CLIP—Speed clip for mounting capacitor C53
RHM-054		SLEEVE—Fiber sleeve centers focus coil assembly with tube neck
RII-016		POST—Textolite support for V14 tube socket
RJC-008		CONNECTOR—Picture tube anode connector assembly
RJF-003		CONNECTOR—Connector cap for V14
RJJ-007		RECEPTACLE—A-C power receptacle
RJS-003		SOCKET—Tube socket for V9, V10, V11, V18, V19, and V20
RJS-015		SOCKET—Tube socket for V12
RJS-017		SOCKET—Tube socket for V13, V15, V16, and V21
RJS-030		SOCKET—Tube socket for V14
RJS-092		SOCKET—Tube socket for V3, V4, V5, V6, V17, and V22
RJS-107		SOCKET—Tube socket for V1
RJS-119		SOCKET—Picture tube socket
RJS-120		SOCKET—Tube socket for V7
RJS-127		SOCKET—Tube socket for V2
RJX-023		HEAD-END UNIT—R-f head-end unit (includes tubes) completely aligned
RLA-031	T1	TRANSFORMER—Antenna input
RLA-032	T7, 8, 9, 10	COIL—R-F and converter (Channel 7, 8–9, 10–11, 12–13)
RLC-069	T2	COIL—R-F, converter, and oscillator (Channel 2)
RLC-070	T3	COIL—R-F, converter, and oscillator (Channel 3)
RLC-071	T4	COIL—R-F, converter, and oscillator (Channel 4)
RLC-072	T5	COIL—R-F, converter, and oscillator (Channel 5)
RLC-073	T6	COIL—R-F, converter, and oscillator (Channel 6)
RLC-074	L10	COIL—Oscillator (Channel 7) (no code dot)
RLC-075	L11	COIL—Oscillator (Channel 8–9) (red code dot)
RLC-076	L12	COIL—Oscillator (Channel 10–11) (orange code dot)
RLC-077	L13	COIL—Oscillator (Channel 12–13) (yellow code dot)
RLD-004	L18	COIL—Horizontal size control
RLD-005	L19	COIL—Horizontal linearity control
RLD-006	D1, 2	SWEEP YOKE—Vertical and horizontal deflecting coils
RLF-013	L25	FOCUS COIL—Coil and PM magnet
RLI-003	L2	CHOKE—R-F choke (V2 cathode)
RLI-005	L14, 6	CHOKE—Video carrier-set trap
RLI-006	L1, 3	CHOKE—R-F input, V2 cathode
RLI-019	L4	CHOKE—V2A oscillator cathode
RLI-038	L16, 17, 22, 23	CHOKE—Video choke, 165 henry
RLI-059	L20	CHOKE—7 henry, high voltage supply filter choke
RLI-060	L24	CHOKE—7 henry, low voltage supply filter choke
RLI-061	L15	CHOKE—Television audio take-off trap
RMF-003		CLAMP—Tube clamp for V13 and V16
RMM-081		CUSHION—Rubber cushion for picture tube mounting
RMU-043		SHAFT—Tubular shaft for focus or tuning control
RMU-046		DRIVE SHAFT—Focus control drive drum and shaft
RMW-044		DRIVE WHEEL—Rubber friction drive for focus control
RMW-045		PULLEY—Pulley and hub assembly for tuning control
RMW-054		DRIVE WHEEL—Rubber friction drive for tuning control
RRC-086	R33	POTENTIOMETER—1000 ohms, 2 w., w.w. (vertical linearity)
RRC-087	R31	POTENTIOMETER—100,000 ohms, composition (vertical size)
RRC-088	R72	POTENTIOMETER—1000 ohms, 4 w., w.w. (focus)
RRC-089	R73, 95	POTENTIOMETER—500,000 ohms —7500 ohms, composition (Dual, Contrast—Brightness)
RRC-090	R29, 46	POTENTIOMETER—50,000 ohms—50,000 ohms, composition (Dual, Vertical Hold—Horizontal Hold)
RRC-091	R86, S2	POTENTIOMETER—2 meg., composition (Volume and ON-OFF Switch)
RRW-028	R70	RESISTOR—560 ohms, 7 w., w.w.
RRW-029	R97	RESISTOR—.65 ohm, 4 w., w.w.
RRW-034	R105	RESISTOR—1.0 ohm, ½ w., w.w.
RTD-007	T19	TRANSFORMER—Audio discriminator
RTL-081	T11	TRANSFORMER—1st video i-f
RTL-082	T12	TRANSFORMER—2nd video i-f
RTL-083	T13	TRANSFORMER—3rd video i-f
RTL-085	L5, 21	COIL—Television audio 1st i-f, 2nd i-f
RTL-089	T14	TRANSFORMER—4th video i-f
RTM-003	T16	TRANSFORMER—Horizontal sweep blocking oscillator
RTO-052	T20	TRANSFORMER—Audio output
RTO-053	T15	TRANSFORMER—Vertical sweep output
RTO-054	T17	TRANSFORMER—Horizontal sweep and high voltage
RTP-062	T18	TRANSFORMER—Power transformer, 60 cycle
RWL-019		POWER CORD AND PLUG

GENERAL ELECTRIC CO. MODEL 810

PRODUCTION CHANGES

The following production changes have taken place up to the time that this service data was compiled.

1. TUNING DRIVE—The early production rubber bushing on the tuning shaft used to drive the tuning condenser caused some slipping and backlash. This has been replaced by a new rubber bushing, Stock No. RMW-054, to correct the trouble. The early production bushing had Stock No. RMW-046.

2. HI-VOLTAGE FAILURE—Failure of insulator posts used for mounting the 8016/1B3GT tube socket was caused by corona leakage and eventually caused falling off of the high anode voltage. These early production posts were textolite Stock No. RII-014. These should be replaced by ceramic posts, Stock No. RII-017.

3. CONTRAST CONTROL TOO CRITICAL—In strong signal strength areas, it required adjustment at a critical point of the contrast control taper. This was corrected by changing the voltage applied across the contrast control as follows: Change R74 to a 82,000-ohm resistor, R50 was one resistor of 120,000 ohms, this now becomes two resistors of R50 82,000 ohms and R108 33,000 ohms with the bias for the contrast control taken off at the junction of these two resistors. See schematic diagram, Figure 21, for circuit.

4. ADDITION OF RECTIFIER TO OSC. FILAMENT.—When the filament of the Type 12AT7 oscillator tube section was operated on 6.3 volts a-c, hum modulation was introduced which became objectionable in some cases on the high channels. This was eliminated by operating the filament of V2A on d-c, which was provided by rectifying the filament voltage by a full-wave selenium rectifier, SR1 (GE Cat. No. RER-003) and filtering the output by a 2000 mfd. capacitor, C102 (GE Cat. No. RCE-083). The choke L6 (GE Cat. No. RLI-005) and capacitor C101 (GE Cat. No. RCW-3014) were added to eliminate the possibility of any regeneration at the r-f frequencies being introduced by this filament lead.

5. DRIFT OF HOR. HOLD ADJUSTMENT—The very early production receivers showed a tendency to warm-up drift in reference to the Horizontal Hold Control. This condition was corrected by the following component changes: (1) Removed R53 (10,000 ohms) resistor from across plate winding of T16. This requires removal of shield can on T16; (2) Remove C46 (120 uuf.) which is in parallel with C49; (3) Replace R50 (270,000 ohms) with two resistors in series. One resistor is R50 82,000 ohms from trimmer C49 to junction. Another resistor is R108 33,000 ohms and will go from junction to ground. R74 (see 7) will come off junction; (4) Change R52 (100,000 ohms) to 47,000 ohms; (5) Change R51 from 3.3 megohm, ½ watt rating, to same value 1 watt rating and mount resistor on full length leads so as to have resistor body hang vertically as far down away from chassis as possible. Mounting of this resistor is very important; (6) Change R48 (560,000 ohms) to 1 megohm; All of the above mentioned resistors are critical as to temperature coefficient and should be ordered from General Electric replacement stock. (7) Change R74 (470,000 ohms) to 82,000 ohms; (8) Change R44 from 82,000 ohms, ½ w., to 2 watt rating. (9) Change R45 to 100,000 ohms, 1 watt (Cat. No. URE-097), and reconnect R45 to high B+ (360 v.) as shown on schematic. (10) Change R47 to 24,000 ohms, ½ watt (Cat. No. URD-1082). After these changes are incorporated, it will be necessary to reset the horizontal blocking oscillator frequency. Following is the procedure. (a) Connect a VTVM to measure the voltage from the junction of R74 and potentiometer R73 to ground. (b) Tune the receiver to any suitable television signal. (c) Set the front panel Horizontal Hold Control R46 to the approximate mid-point of its resistance range. Then adjust the iron core of the blocking oscillator coil T16 and the setting of the horizontal frequency control trimmer C49 to bring the picture into horizontal sync and to develop approx. −12 volts across the contrast control as measured on the VTVM. The iron core adjustment and the trimmer setting are interlocking and, therefore, it is necessary to adjust each of these controls in turn to bring the picture in sync and also obtain −12 volts. (d) At the completion of the above adjustments the range of the front panel horizontal hold control should be checked. The sync range should fall in the approximate center of the control and it should be possible to throw the circuit out of sync by turning the control to either end of its range. Receivers having the above changes made can be identified by noting that red glyptal cement has been applied to one of the nuts holding the shield can of T16.

6. VIDEO "TWEET" RESPONSE ON CHANNEL #7—A cross-hatch pattern on Channel #7 set up by local radiation from the 8th harmonic of the 21.9 mc (early production) sound, is cured as follows: (1) Change ground connection of C41 (.01 mfd.) from pin #1 of V6 socket to the ground terminal on the adjacent terminal board; (2) Add copper ground strap to pin #5 of V18 socket with chassis ground as close to socket pin as possible; (3) Change ground connection of C69 (5000 mmf.) from pin #1 of V18 socket to pin #5 of same socket; (4) Change value of R78 (56,000 ohms) to 150,000 ohms.

7. CHANGE IN 2ND AND 3RD VIDEO I-F TRANSFORMERS.—The plate winding of the video i-f transformers, T12 and T13, has been increased in inductance to compensate for a recent lowering in the plate capacity of the Type 6AU6 tube. In early production receivers where the plate winding inductance is low, if a low capacity 6AU6 tube is substituted, the 26.3 mc marker will ride up too far on the selectivity curve. This condition can usually be corrected without changing the i-f transformer by pushing the plate lead in this winding close to the coil form so as to increase the distributed capacity and thus compensate for the tube capacity. In the late production receivers with the higher inductance i-f transformers, if a high capacity Type 6AU6 tube is used, it may be necessary to spread turns on the plate side of the transformer to affect proper tuning.

8. V2A OSCILLATOR DRIFT—The tube socket for tube V2 originally specified tube socket Stock No. RJS-120. This should be changed to read Stock No. RJS-127. This change in socket composition reduces warm-up drift considerably.

9. VIDEO AND SYNC AMPLIFIER LIMITING.—On some receivers it was not possible to drive the picture tube to full contrast before the sync pulse would be limited with a resultant loss in vertical and horizontal sync. This was corrected in production by the following changes. (1) Change R21 to 5600 ohms, ½ watt. (2) Add Resistor R109, 1000 ohms, ½ watt, between Pins 6 and 7 of V11 after removing the bus wire connecting these pins.

10. VERTICAL HOLD CONTROL RANGE.—To give better vertical hold control range and sync, the following changes were made in production. (1) Remove R38 and connect R37 to Pin 2 of V11 as shown in the schematic. (2) Change C39 to a .05 mf. 400 volt capacitor. (3) Change C40 to a .001 mf., 400 volt capacitor, and connect between junction of C37 and R36, and Pin 1 of V9. (4) Change C37 and C38 to .01 mf., 400 volt capacitors. These were originally .01 mf., 200 volt capacitors. (5) Disconnect the B+ from Pin 2 of V11. Connect a resistor R111, 1600 ohms ±5%, ½ watt, from Pin 2 of V11 to Pin 4 of V10, as shown in schematic. (6) Remove Capacitor C41, .01 mf., 200 volt, from junction of R28 and R29. Connect a capacitor C41, .001 mf., 400 volts, from Pin 4 of V9 to ground. (7) Change Resistor R28 to 82,000 ohms ±5%, ½ watt. (8) Change C30 to a .002 mf., 600 volt capacitor. (9) Change C31 to a .062 mf., 600 volt capacitor. When these changes are made, it is necessary to check the vertical hold control to see whether it is possible to go through the 60 cycle speed. This 60 cycle speed setting should be at least 70° from either end of the control. If the 60 cycle point is closer than 70° from the CCW end of the control, or if the 60 cycle point cannot be reached at the CCW end of the control, a resistor, R110, 24,000 ohms ±5%, ½ watt, should be inserted between R28 and R29 and the control rechecked. It should always be possible to pull the multivibrator out of sync at the maximum CW end of the control, but it may not always be possible to pull it out of sync at the CCW end of the control.

11. BLOOM.—This is caused by a difference in modulation level of the television signal, such as is encountered when switching from one television camera to another. This has been corrected in the Model 810 receiver by the following changes. (1) Connect a 270,000 ohm ±10%, ½ watt, resistor, R112, between the yellow lead connected to Pin 11 of the picture tube and the center tap of the brightness control, R95. (2) Connect a .1 mf. capacitor, 600 volts (C102) between yellow lead connected to Pin 11 of picture tube and the junction of R95 and the red B+ line.

12. AUDIO I-F FREQUENCY CHANGE TO 21.8 MC.—All Model 810 receivers marked with 11 in a circle in green ink on the chassis and on the carton, and subsequent Model 810 receivers will be aligned to 21.8 mc. This measure was taken to eliminate the video interference of a strong Washington, D. C. FM station operating at 93.9 mc beating with the Channel #4 video carrier (67.25 mc), and forming an i-f frequency which showed on the screen as a herringbone pattern.