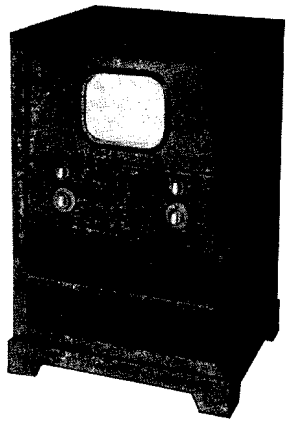
MODELS 94TV2-43-8970A, 94TV2-43-8971A,
94TV2-43-8985A, 94TV2-43-8986A

ELECTRICAL SPECIFICATIONS

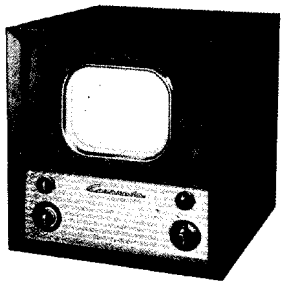
Power Supply	105-125 Volts AC 60 Cycles Only
Power Consumption	220 Watts
Power Output	2.4 Watts Maximum 1.8 Watts Undistorted
Antenna Input Impedance	300 Ohms Balanced
Picture Area	52 Square Inch
Tuning Range	12 Channel
Intermediate Frequencies	Picture—25.75 Mc Sound—21.25 Mc
Loud Speaker (Console)	12" PM Dynamic
Loud Speaker (Mantel)	4"x6" PM Dynamic
Voice Coil Impedance	3.2 Ohms 400 Cycles
Video Response	to 3.5MC
Focus	Magnetic
Sweep Deflection	Magnetic
Scanning	Interlaced, 525 Line
Horizontal Scanning Frequency	15,750 CPS
Vertical Scanning Frequency	60 CPS
Frame Frequency	30 CPS

TUBE COMPLEMENT

Symbol	Type	Function
V1	1—6AG5	R-F Amplifier
V2	1—6AG5	Converter
V3	1—6C4	R-F Oscillator
V4	1—6BA6	1st Sound I-F Amp.
V5	1—6AU6	2nd Sound I-F Amp.
V6	1—6AL5	Sound Discriminator
V7	1—6K6GT	Audio Output
V8	1—6AT6	1st Audio and Bias Clamp
V9	1—6AG5	1st Picture I-F Amp.
V10	1—6AG5	2nd Picture I-F Amp.
V11	1—6AG5	3rd Picture I-F Amp.
V12A-12B	1—6AL5	Picture 2nd Det. and Sync Limiter
V13	1—12AU7	1st and 2nd Video Amp.
V14	1—6SN7-GT	Sync Amplifier and Separator
V15	1—6SN7-GT	Vertical Sweep Oscillator, Discharge and Output
V16	1—6SN7-GT	Horizontal Sweep Oscillator and Sync Guide
V17	1—6BG6-G	Horizontal Sweep Output
V18	1—1B3-GT/8016	High Voltage Rectifier
V19	1—5V4-G	Horizontal Damper
V20	1—5U4-G	Power Supply Rectifier
V21	1—10BP4	Kinescope (Picture Tube)



94TV2-43-8970A (MAH.)
94TV2-43-8971A (OAK)



94TV2-43-8985A (MAH.)
94TV2-43-8986A (OAK)

RADIO FREQUENCY RANGES

Channel Number	Channel Frequency Mc	Picture Carrier Frequency Mc	Sound Carrier Frequency Mc	Receiver R-F Osc. Frequency Mc
2	54-60	55.25	59.75	81
3	60-66	61.25	65.75	87
4	66-72	67.25	71.75	93
5	76-82	77.25	81.75	103
6	82-88	83.25	87.75	109
7	174-180	175.25	179.75	201
8	180-186	181.25	185.75	207
9	186-192	187.25	191.75	213
10	192-198	193.25	197.75	219
11	198-204	199.25	203.75	225
12	204-210	205.25	209.75	231
13	210-216	211.25	215.75	237

RECEIVER LOCATION—Advise the owner as to the proper location for the television receiver. The following may be used as a guide:

1. Choose an area in the home where sunlight or light from lamps do not strike the face of the picture tube and cause glare.
2. Remember the necessity of an electrical outlet and the location of the point at which the antenna leads enter the room.
3. The receiver should be placed a short distance from the wall to allow adequate ventilation.
4. The receiver should be placed to permit easy access for operation and comfortable viewing from all angles.

ANTENNA —This receiver has been designed to use an antenna with a 300 ohm balanced transmission line. This line must be as short as possible because the longer the line the greater the chances are for picking up electrical disturbances. Stand-off insulation should be used to keep the line away from the mast, metal or walls. Twist the line about one turn per foot throughout the line to cancel out direct signal and/or noise pickup by the transmission line. It should also be securely anchored in place so that a change in weather will not affect its position.

HIGH VOLTAGE WARNING

This television receiver contains high voltages which are dangerous to life. Never operate or service the receiver outside of the cabinet or with the covers removed until all the safety precautions necessary for working with high voltage equipment have been observed.

KINESCOPE (Picture Tube)
HANDLING PRECAUTION

Shatterproof goggles and heavy gloves must be worn by individuals while handling the kinescope or installing the kinescope into the receiver.

The kinescope encloses a high vacuum and due to the large surface area, is subjected to excessive air pressure. Therefore, care should be taken not to bump or scratch the picture tube accidentally as it may cause the tube to implode resulting in damage to property or injury to an individual.

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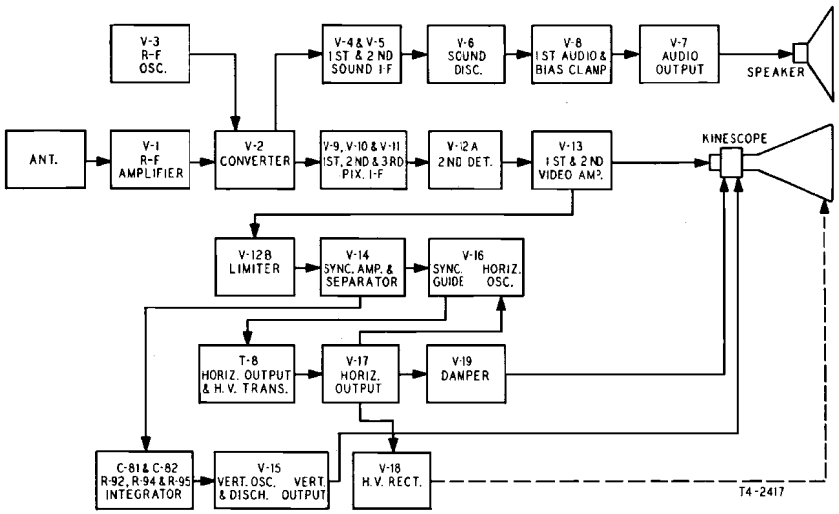

Fig. 2—Block Diagram

TUNING PROCEDURE

1. To turn the television receiver on, turn the OFF-ON SOUND CONTROL clockwise until a click is heard. Allow approximately 30 seconds for the tubes to warm up.
2. Turn the STATION SELECTOR CONTROL to the desired channel. This control may be turned in either direction.
3. Turn the CONTRAST CONTROL fully counterclockwise.
4. Turn the BRIGHTNESS CONTROL fully counterclockwise and then very slowly clockwise until light is readily visible on the screen.
5. Turn the CONTRAST CONTROL clockwise until activity or definite form is noted on the screen.
6. Adjust the FINE TUNING CONTROL for best tonal quality and the SOUND CONTROL for desired volume.
7. Turn the VERTICAL CONTROL until the picture stops moving up or down.
8. Adjust the HORIZONTAL CONTROL until the picture is obtained and centered.
9. Adjust the CONTRAST CONTROL until the best picture is obtained and if necessary make a slight readjustment of the BRIGHTNESS CONTROL.
10. After the receiver has been on for a while it may be necessary to readjust the FINE TUNING CONTROL for best sound quality.
11. When switching from one channel to another, it may be necessary to repeat steps number 6 and 9.
12. To turn off the receiver, turn only the OFF-ON SOUND CONTROL counterclockwise until a click is heard.

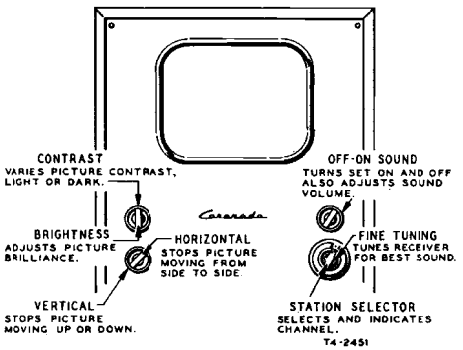

Fig. 3—Front Panel Controls

13. When the receiver is turned on again and the positions of the controls have not been changed, no further adjustments will be necessary except for the FINE TUNING CONTROL and SOUND CONTROL for the desired volume.
14. If the positions have been disturbed since the last time the receiver has been used it may be necessary to follow steps 1 to 10.

KINESCOPE — The receiver is shipped with the kinescope in place. However, some of the kinescope adjustments may have been jarred loose in shipment. Adjustments are necessary. The following should be used as a guide:

1. After the receiver has been unpacked and the cradle removed, take off the cabinet back and make sure all the tubes are properly mounted in their respective sockets.
2. Remove the tape from the kinescope socket base and the corrugated cardboard lock holding the focus coil in place.
3. Connect an antenna to the antenna terminals at the rear of the cabinet and insert the line cord plug into a convenient outlet.
4. Turn on the receiver and wait about 60 seconds for the receiver to warm up. Turn the channel selector to a station that is transmitting and check the picture. If the picture is not centered on the screen, or visible at all, make the adjustments on the deflection yoke, focus coil and ion trap magnet assemblies

KINESCOPE REPLACEMENT—Should the kinescope have to be replaced, remove the defective kinescope in the following manner:

1. Remove the front panel control knobs by pulling them straight from their shafts.
2. Remove two ornamental screws holding the front panel to the cabinet (see figure 5) and lift out panel.
3. Remove the cabinet back.
4. Disconnect the kinescope socket connector at the base of the tube and the high voltage anode lead from the front of the kinescope.
   WARNING—REMOVE STATIC CHARGE FROM THE ANODE LEAD BY GROUNDING IT AGAINST THE CHASSIS.
5. Remove the ion trap magnet, slipping it from the neck of the kinescope past the socket.
6. Loosen the wing nuts and wing screws on the deflection yoke and focus coil.
7. Loosen the strap holding the front of kinescope in place and withdraw the kinescope toward the front of the chassis.
8. To install a new kinescope, reverse the above procedure making sure that the kinescope is fitted closely against the kinescope cushion and that the high voltage well connector is at the top of the kinescope. If the kinescope sticks or fails to slip into place smoothly, investigate and remove the source of the trouble. Never force the tube.

KINESCOPE WINDOW — Clean the kinescope window with a dampened cloth or a soft lint-free cloth if dust or finger marks are present.

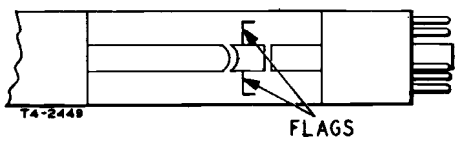

Fig. 4—Ion Trap Flags

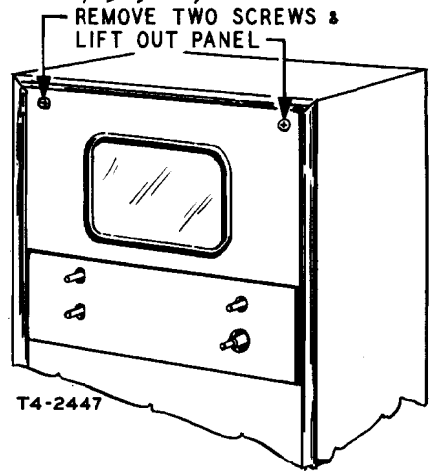

Fig. 5—Front Panel Removal

NON-OPERATING CONTROLS
(Rear Of Chassis)

Horizontal Centering	R-106
Vertical Centering	R-105
Width	L-1
Height	R-86
Horizontal Linearity	L-16
Vertical Linearity	R-93
Horizontal Drive	C-55C
Horizontal Frequency (Fine)	C-55B
Horizontal Oscillator Frequency (Bottom Chassis)	L-14
Horizontal Locking Range	C-55A
Focus	R-104
Focus Coil	Wing Screw Adjustment
Ion Trap Magnet	Top Chassis Adjustment
Deflection Coil	Wing Nut Adjustment

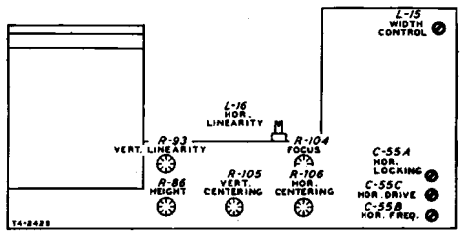

Fig. 6—Rear Chassis Adjustments

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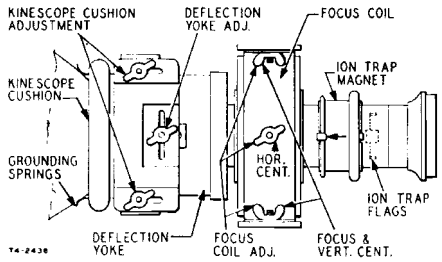

Fig. 7—Yoke, Focus and Ion Trap Magnet Adjustments

DEFLECTION YOKE ADJUSTMENT — If the lines of the raster are not horizontal or squared with the picture mask, rotate the deflection yoke until this condition is obtained. Tighten the yoke adjustment wing screw.

FOCUS COIL ADJUSTMENT — Turn the HORIZONTAL CENTERING (R-106) and VERTICAL CENTERING (R-105) CONTROLS to the halfway position. (See Figure 6). If a corner of the raster is shadowed, it indicates that the electron beam is striking the neck of the tube. Loosen the focus coil adjustment wing nuts and rotate the coil about its vertical and horizontal axes until the entire raster is visible, approximately centered and with no shadowed corners. Tighten the focus coil adjustment wing nuts with the coil in this position.

ION TRAP MAGNET ADJUSTMENT —The ion trap magnet should be positioned exactly as shown in Figure 7. Adjust the magnet by moving it back and forth and at the same time rotating it slightly around the neck of the kinescope until the brightest raster is obtained on the picture screen. Reduce the brightness control setting until the raster is slightly above average brilliance. Adjust the Focus Control R-104 (see Figure 6) until the line structure of the raster is clearly visible. Readjust the ion trap magnet for maximum raster brilliance. The final touches on this adjustment should be made with the brightness control at the maximum position with which good line focus can be maintained.

PICTURE ADJUSTMENT—For further adjustments, obtain a test pattern on the receiver. Turn on receiver and follow tuning procedure

CHECK OF HORIZONTAL OSCILLATOR ALIGNMENT—Turn the horizontal hold control to the extreme counter-clockwise position. The picture should remain in horizontal sync. Momentarily remove the signal by switching off channel and then back. Normally the picture will be out of sync. Turn the control clockwise slowly. The number of diagonal bars will be gradually reduced and when only 3-1/2 to 4-1/2 bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional clockwise rotation of the control. The pull-in should occur when the control is approximately 90 degrees from the extreme counter-clockwise position. The picture should remain in sync for approximately 90 degrees of additional clockwise rotation of the control. At the extreme clockwise position, the picture should be out of sync and should show from 3-1/2 to 4-1/2 bars sloping downward to the right.

If the receiver passes the above checks and the picture is normal and stable, the horizontal oscillator is properly aligned. Skip "Alignment of Horizontal Oscillator" and proceed with "Focus" adjustment.

ALIGNMENT OF HORIZONTAL OSCILLATOR—If in the above check the receiver failed to hold sync with the hold control at the extreme counter-clock-wise position or failed to hold sync for at least 60 degrees of clockwise rotation of the control from the pull in point, it will be necessary to make the following adjustments.

HORIZONTAL FREQUENCY ADJUSTMENT—Turn the horizontal hold control to the extreme clockwise position. Tune in a television station and adjust the rear apron horizontal frequency trimmer C-55B (see Figure 6) until the picture is out of sync and shows 3-1/2 to 4-1/2 bars sloping downward to the right. If the trimmer has insufficient range, set the trimmer to mid-position (1 turn out from maximum capacity) and adjust the L-14 horizontal frequency adjustment until this condition is obtained. See Figure 9 for the location of L-14.

HORIZONTAL LOCKING RANGE ADJUSTMENT—Set the horizontal hold control to the extreme counter-clockwise position. Momentarily remove the signal by switching off channel and then back. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync. If more than 4-1/2 bars are present just before the picture pulls into sync, adjust the horizontal locking range trimmer C-55A (See Figure 6) slightly clockwise. If less than 3-1/2 bars are present, adjust trimmer C-55A slightly counter-clockwise. Turn the horizontal hold control counter-clockwise, momentarily remove the signal and recheck the number of bars present at the pull-in point. Repeat this procedure until 3-1/2 to 4-1/2 bars are present. Repeat the adjustments under "Horizontal Frequency Adjustment" and "Horizontal Locking Range Adjustment" until the condition specified under each are fulfilled. When the horizontal hold operates as outlined under "Check of Horizontal Oscillator Alignment" the oscillator is properly adjusted.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENTS — Adjust the height control R-86 (See Figure 6) until the picture fills the mask vertically. Adjust the vertical linearity control R-93 (See Figure 6) until the picture is symmetrical from top to bottom. Adjustment of either control will require a readjustment of the other. Adjust vertical centering control R-105 (See Figure 6) to align the picture with the mask.

WIDTH, DRIVE AND HORIZONTAL LINEARITY ADJUSTMENTS —Turn the width control L-15 (at top of power supply cover) to the maximum clockwise position. Vary the horizontal drive trimmer C-55C (See Figure 6) to yield the best compromise between brightness and linearity. Adjust the horizontal linearity control L-16 (See Figure 6) for best linearity of the right half of the picture. Readjust the width control L-15, until the picture just fills the mask. Adjust horizontal centering control R-106 (See Figure 6) to align the picture with the mask.

FOCUS —Adjust the focus control R-104 (see Fig. 6) for maximum definition of the vertical wedge of the picture. Check to see that all cushion, yoke and focus coil thumb screws are tight. Replace the cabinet back making sure that the back is on tight,. otherwise it may rattle at high volume.

CHECK OF R-F OSCILLATOR ADJUSTMENTS —With a crystal calibrated test oscillator or heterodyne frequency meter, check to see if the receiver R-F oscillator is adjusted to the proper frequency on all channels. The adjustments for all channels are available from the front of the cabinet by removing the front panel as shown in Figure 5. Tune in all available television stations.

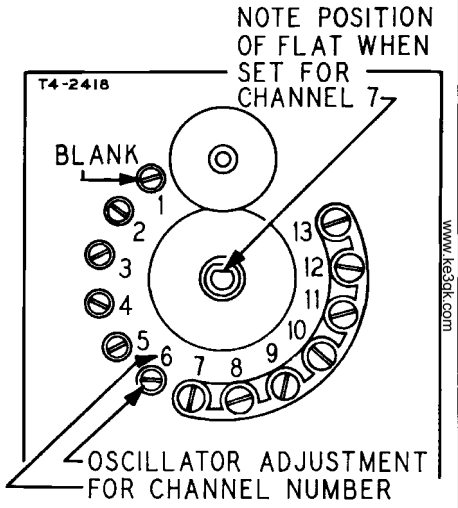

Fig. 8—R-F Oscillator Adjustments

VIDEO PEAKING LINK—A video peaking link is provided to permit changing the video response. This link is connected at the factory with the peaking in. However, if transients are produced on high contrast pictures, or picture is smeared or fuzzy, or if the receiver is operated in areas where the signal strength is weak, open the video peaking link connecting L-13 and R-52.

VENTILATION CAUTION—The receiver is provided with adequate ventilation holes in the bottom and back of the cabinet. Care should be taken not to allow these holes to be covered or ventilation to be impeded in any way.

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SERVICE SUGGESTIONS

NO RASTER ON KINESCOPE —If raster cannot be obtained check below for the possible causes.

1. Ion trap magnet adjustment is incorrect.
2. No high voltage, check V-17 (6BG6-G) and V-18 (1B3-GT 8016) tubes and circuits. If the horizontal deflection circuits are operating, as evidenced by the correct wave form measured on terminal 4 of horizontal output transformer (T-8), the trouble can be isolated to the high voltage rectifier (V-18) circuit. Either the high voltage winding (points 2 to 3 on T-8) is open, tube V-18 is defective, its filament circuit is open, or the high voltage filter capacitor (C-76) is shorted.
3. Damper tube V-19 (5V4-G) defective. Plate voltage supply for V-17 (6BG6-G) horizontal output tube is obtained through the damper tube. Check tube and heater winding on power transformer (T-9). If the tube is alright, check the horizontal linearity coil (L-16) for continuity and check capacitors C-69 and C-75 for short circuit.
4. Defective kinescope. Heater open, cathode return circuit open.
5. No plate voltage. Electrolytic capacitor shorted. All +B measurements are accessible for measurement by removing cover from bleeder box.
6. Horizontal oscillator and control tube V-16 (6SN7-GT) defective. Check for sawtooth on grid of horizontal output tube V-17 (6BG6-G). If not present, check voltages and components in the V-16 (6SN7-GT) circuits.

HORIZONTAL DEFLECTION ONLY —If only horizontal deflection is obtained as evidenced by a straight line across the face of the kinescope, it can be caused by the following:

1. Vertical oscillator and output tube V-15 (6SN7-GT) inoperative. Check voltages on grid and plate.
2. Vertical output transformer (T-7) open.
3. Yoke vertical coils open.

POOR VERTICAL LINEARITY —If adjustment of the vertical height and linearity controls will not correct this condition any of the following may be the cause:

1. Vertical output transformer (T-7) defective.
2. Capacitors C-80A or C-78A defective.
3. V-15 (6SN7-GT) defective, check voltages.
4. Excess leakage or incorrect value in capacitor C-82.
5. Low plate and bias voltages. Check rectifier tube and capacitors in +B supply circuits.
6. Capacitor C-81 defective.

POOR HORIZONTAL LINEARITY —If adjustment of controls does not correct this condition, check the following:

1. Check or replace horizontal output tube V-17 (6BG6-G).
2. Check or replace damper tube V-19 (5V4-G).
3. Check linearity coil L-16 for short circuit.
4. Check capacitors C-69 and C-75 for defects.

TRAPEZOIDAL OR NONSYMMETRICAL RASTER—

1. Improper adjustment of focus coil or ion trap magnet.
2. Defective yoke.

WRINKLES ON LEFT SIDE OF RASTER —This condition can be caused by:

Defective yoke due to R-97, R-98 or C-86 (internal in yoke assembly) being wrong value or open. These components are mounted in rear of yoke assembly.

SMALL RASTER —This condition can be caused by:

1. Low +B or line voltage.
2. Insufficient output from horizontal output tube V-17 (6BG6-G). Replace tube.
3. Insufficient output from vertical output tube V-15 (6SN7-GT). Replace tube.

RASTER; NO IMAGE, BUT ACCOMPANYING SOUND —This condition can be caused by:

1. No signal on kinescope grid. Check picture I-F amplifier tubes V-9, 10 and 11 (6AG5's), second detector V-12 (6AL5) and video amplifier V-13 (12AU7).
2. Bad contact to kinescope grid (lead to socket broken).

SIGNAL APPEARS ON KINESCOPE GRID BUT IMPOSSIBLE TO SYNCHRONIZE THE PICTURE VERTICALLY AND HORIZONTALLY —A condition of this nature can be caused by:

1. Defective sync amplifier and separator V-14 (6SN7-GT).
2. If tube is O.K. check voltages, and associated circuits.

SIGNAL ON KINESCOPE GRID AND HORIZONTAL SYNC ONLY —If this condition is encountered check:

1. Vertical integrating network capacitors C-71, C-72, C-73 and C-74; and resistors R-79, R-80 and R-81.

PICTURE STABLE BUT WITH POOR RESOLUTION —If the picture resolution is not up to standard, it may be caused by any of the following:

1. Defective picture detector V-12 (6AL5) or video amplifier V-13 (12AU7).
2. Open video peaking coil. Check all peaking coils L-8, L-9, L-10, L-11 for continuity. Note that L-9 and L-11 have shunting resistors.
3. Leakage in V-13 (12AU7) grid capacitor C-42. If the above components are not found to be defective, check the following:
1. Check all potentials in video circuits.
2. Check kinescope grid circuit for poor or dirty contact.
3. Check adjustment of focus control R-104. It should be effective on either side of proper focus.
4. Check and realign, if necessary, the picture I-F and R-F circuits.

PICTURE SMEAR:

1. Normally, smear can be attributed to phase shift at the low frequency end of the video characteristic. This can be caused by improper values of resistors and capacitors in the video circuits. Check for grid current on video amplifier tube V-13 (12AU7).
2. This trouble can also originate at the transmitter. Check reception from another station.

PICTURE JITTER:

1. If regular sections at left of the picture are displaced, replace the horizontal output tube V-17 (6BG6-G).
2. Vertical instability may be due to loose connections or noise received with the signal.
3. Horizontal instability may be due to unstable transmitted sync or to noise.

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ALIGNMENT PROCEDURE

TEST EQUIPMENT —To service this receiver properly, it is recommended that the following test equipment be available:

R-F SWEEP GENERATOR meeting the following requirements:

(a) Frequency ranges:

18 to 30 mc, 1 mc sweep width
40 to 90 mc, 10 mc sweep width
170 to 225 mc, 10 mc sweep width

(b) Output adjustable with at least .1 volt maximum.
(c) Output constant on all ranges.
(d) Flat output in all attenuator positions.

CATHODE-RAY OSCILLOSCOPE preferably one with a wide band vertical deflection and an input calibrating source.

SIGNAL GENERATOR to provide the following frequencies: (Output on these ranges should be adjustable and at least .1 volt maximum.)

(a) Intermediate frequencies:

21.25 mc sound i-f and sound traps
22.8 mc converter transformer
23.9 mc first picture i-f coil
24.5 mc third picture i-f coil
26.0 mc second picture i-f coil
27.25 mc adjacent channel trap

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(b) Radio frequencies:

Channel Number	Picture Carrier Freq. Mc	Sound Carrier Freq. Mc
2	55.25	59.75
3	61.25	65.75
4	67.25	71.75
5	77.25	81.75
6	83.25	87.75
7	175.25	179.75
8	181.25	185.75
9	187.25	191.75
10	193.25	197.75
11	199.25	203.75
12	205.25	209.75
13	211.25	215.75

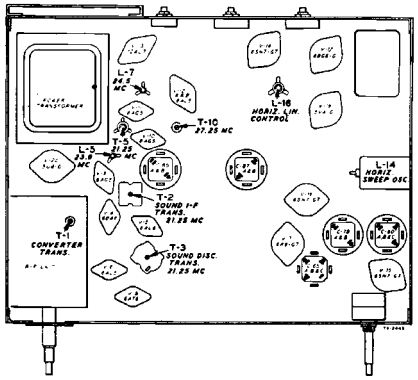

Fig. 9—Bottom Chassis Components

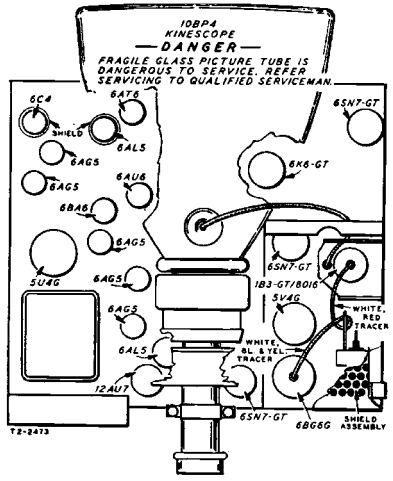

Fig. 10—Tube Layout Diagram

ALIGNMENT PROCEDURE (continued)

HETERODYNE FREQUENCY METER with crystal calibrator if the signal generator is not crystal controlled.

ELECTRONIC VOLMETER and a high voltage probe for use with this meter to permit measurements up to 10 kilovolts.

SERVICE PRECAUTIONS —To service the receiver remove the chassis from the cabinet. To do so, remove the knobs, the front panel, the cabinet back and then the 5 chassis mounting bolts. The chassis normally should be serviced without the kinescope. However, if it is necessary to view the raster during servicing, the kinescope should be inserted only after the chassis is turned on end. The kinescope should never be allowed to support its weight by resting in the deflection yoke. A bracket should be used to support the tube at its viewing screen. By turning the chassis on end with the power transformer up, all adjustments will be conveniently available. Since this is the only safe position in which the chassis will rest and still leave adjustments accessible, the trimmer location drawings are oriented similarly for ease of use.

CAUTION: Do not permit the kinescope second-anode lead to become shorted to the chassis. To do so will cause a considerable overload on the high-voltage filter resistor R-82.

ALIGNMENT TABLE
DISCRIMINATOR AND SOUND I-F ALIGNMENT

Step No.	Connect Signal Generator to	Signal Gen. Freq. Mc.	Connect Sweep Generator to	Sweep Gen. Freq. Mc.	Connect Oscilloscope to	Connect Voltmeter to	Miscellaneous Connections and Instructions	Adjust	Refer to
1	2nd sound i-f grid (pin 1, V-5)	21.25 .1 volt output	Not used		Not used	In series with 1 meg. to junction of R-14 and R-13	Meter on 10 volt scale	Detune T-3 (bottom) Adjust T-3 (top) for max. on meter.	Fig. 11 Fig. 12
2	2nd sound i-f grid (pin 1, V-5)	21.25 .1 volt output	Not used		Not used	Discriminator output (pin 1 of V-6)	Meter on 3 volt scale	T-3 (bottom) for zero on meter	Fig. 12
3	2nd sound i-f grid (pin 1, V-5)	21.25 .1 volt output	2nd sound i-f grid (pin 1, V-5)	21.25 center 1 mc .1 volt output	Discriminator output (pin 1 of V-6)	Not used	Check for symmetrical response waveform (positive and negative). If not equal adjust T-3 (top) until they are equal. See Note 1.		Fig. 11 Fig. 12 A
4	Trap winding on T-1 (top of chassis)	21.25 reduced output	Trap winding on T-1	21.25 reduced output	Terminal A, T-2 in series with 33,000 ohms. See Note 2.	Not used	Sweep output reduced to provide .3 volt p-to-p on scope. See Note 3.	T-2 (top and bottom) for max. gain and symmetry at 21.25 mc.	Fig. 11 Fig. 12 B

NOTE: 1: The peak to peak bandwidth of the discriminator should be approximately 350 kc. and should be linear from 21.175 mc. to 21.325 mc.

NOTE 2: If a 60 cycle sweep rate is used, it will be necessary to reduce the time constant in the 2nd sound i-f grid circuit in order to reproduce the desired response curve. To do this, shunt R-10 (Terminal "A" of T-2 to chassis) with 5600 ohms.

NOTE 3: The sweep generator output should be set to produce approximately 0.3 volt peak-to-peak at the second sound i-f grid return (Terminal "A" of T-2) for final touch-up on this adjustment. Signal voltage in excess of 0.3 volt will tend to broaden the response curve—permitting misadjustment to pass unnoticed.

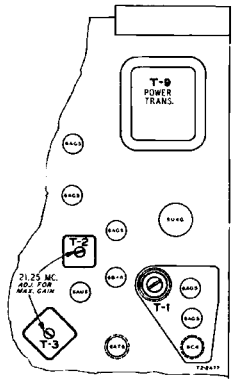

Fig. 11—Top Chassis Audio I-F Adjustments

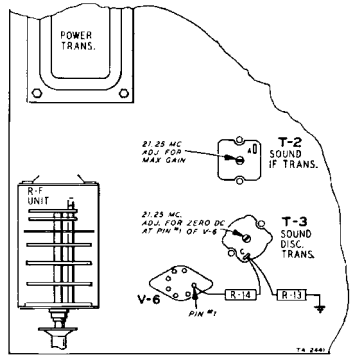

Fig. 12—Bottom Chassis Audio I-F and Discriminator Adjustments

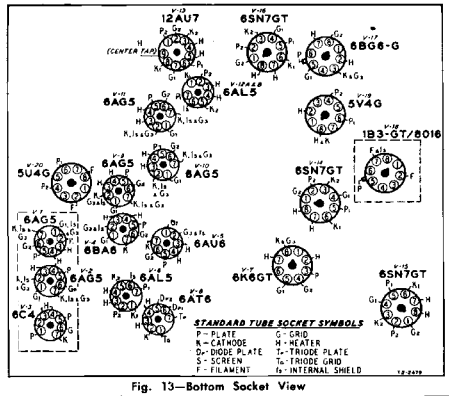

Fig. 13—Bottom Socket View

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ALIGNMENT TABLE (continued)

PICTURE I-F AND TRAP ADJUSTMENT

Step No.	Connect Signal Generator to	Signal Gen. Freq. Mc.	Connect Sweep Generator to	Sweep Gen. Freq. Mc.	Connect Oscilloscope to	Connect Voltmeter to	Miscellaneous Connections and Instructions	Adjust	Refer to
5	Not used		Not used		Not used	Junction R-41 and R-43	Set "Station Selector" switch to channel 13	Adjust "Picture" control for —3 volts reading on Voltmeter	Fig. 15
6	Junction R-6 and R-7	21.25	Not used		Not used	Junction of L-8 and R-51	Meter on 3 volt scale	T-1 (top) for min. on meter	Fig. 14 Fig. 15
7	Junction R-6 and R-7	21.25	Not used		Not used	Junction of L-8 and R-51	Meter on 3 volt scale	T-5 for min.	Fig. 14
8	Junction R-6 and R-7	27.25	Not used		Not used	Junction of L-8 and R-51	Meter on 3 volt scale	T-10 (bottom) for min.	Fig. 9
9	Junction R-6 and R-7	22.8	Not used		Not used	Junction of L-8 and R-51		T-1 (bottom) for max.	Fig. 15
10	Junction R-6 and R-7	23.9	Not used		Not used	Junction of L-8 and R-51		L-5 (top chassis) for max.	Fig. 14
11	Junction R-6 and R-7	26.0	Not used		Not used	Junction of L-8 and R-51		T-10 (top chassis) for max.	Fig. 14
12	Junction R-6 and R-7	24.5	Not used		Not used	Junction of L-8 and R-51		L-7 (top chassis) for max.	Fig. 14

NOTE: Oscillation may occur if the i-f section is badly out of alignment. This will be evidenced by a meter reading in excess of 3 volts and is caused by the "staggered" i-f stages being tuned to approximately the same frequency. If this condition is encountered, adjust the core studs of T-1 (bottom) L-5, T-10 and L-7 until oscillation ceases. Oscillation may not be encountered until proceeding with steps 9, 10, or 11.

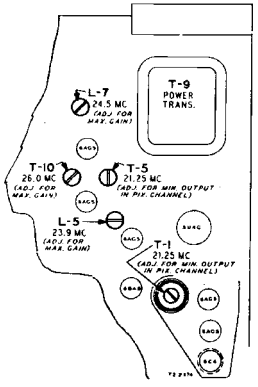

Fig. 14—Top Chassis Video I-F Adjustments

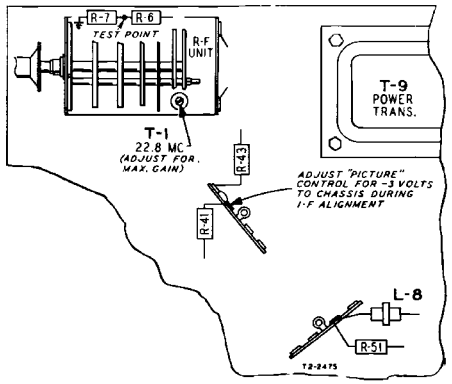

Fig. 15—Bottom Chassis Video I-F Adjustments

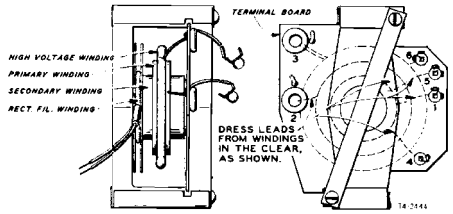

Fig. 16—Transformer Winding Leads

RETOUCHING OF PICTURE I-F ADJUSTMENTS—The picture i-f response curve varies somewhat with change of bias and for this reason it should be aligned with approximately the same signal input as it will receive in operation.

If the receiver is located at the edge of the service area, it should be aligned with approximately —1 volt i-f grid bias. However, for normal conditions, (signals of 1000 microvolts or greater), it is recommended that the picture i-f be aligned with a grid bias of —3 volts. Set the picture control for —3 volts at the junction of R-41 and R-43.

Connect the r-f sweep generator to the receiver antenna terminals.

Connect the signal generator to the antenna terminals and feed in the 25.75 megacycles i-f picture carrier marker and a 23 megacycles marker.

Connect the oscillascope across the picture detector load resistor R-51.

Set the channel switch to channel (between 1 and 6) found to have the best response.

Set the sweep output to produce approximately .3 volt peak to peak across the picture detector load resistor.

Observe and analyze the response curve obtained. The response will not be ideal and the i-f adjustments must be retouched in order to obtain the desired curve. In making these adjustments, care should be taken that no two transformers are tuned to the same frequency as i-f oscillation may result.

On final adjustment the picture carrier marker must be at approximately 45% response. The curve must be approximately flat topped and with 23 mc marker at 90% response.

The most important consideration in making the i-f adjustments is to get the picture carrier at the 45% response point. If the picture carrier operates too low on the response curve, loss of low frequency video response, of picture brilliance, of blanking, and of sync may occur. If the picture carrier operates too high on the response curve, the picture definition is impaired by loss of high frequency video response.

SENSITIVITY CHECK -- A comparative sensitivity check can be made by operating the receiver on a weak signal from a television station and comparing the picture and sound obtained to that obtained on other receivers under the same conditions.

This weak signal can be obtained by connecting the shop antenna to the receiver through an attenuator pad of the type shown in Figure 17. The number of stages in the pad depends upon the signal strength available at the antenna. A sufficient number of stages should be inserted so that a somewhat less than normal contrast picture is obtained when the picture control is at the maximum clockwise position.

Only carbon type resistors should be used to construct the attenuator pad. Since many of the low value moulded resistors generally available are of wire wound construction, it is advisable to break and examine one of each type of resistor used in order to determine its construction.

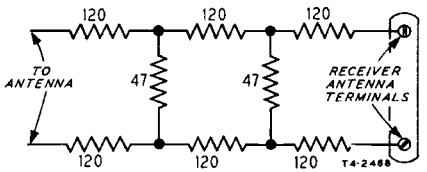

Fig. 17—Attenuator Pad

RESPONSE CURVES — The response curves shown in Figure 18 were taken from a production set. Although these curves are typical, some variation can be expected.

The response curves are shown in the classical manner of presentation, that is with response up and low frequency to the left. The manner in which they will be seen in a given test set-up will depend upon the characteristic of the oscilloscope and the sweep generator. The curves may be seen inverted and/or switched from left to right depending on the deflection polarity of the oscilloscope and the phasing of the sweep generator.

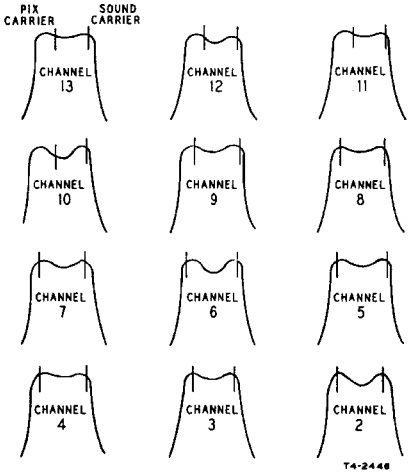

Fig. 18—Response Curves

CRITICAL LEAD DRESS—

1. Do not permit any strains to be placed on the leads R-68, R-59, R-63, R-62, R-58, R-61, R-67 and R-64. Do not permit these resistors to be exposed to the heat of a soldering iron any more than is absolutely necessary.
2. Dress the temperature compensating resistor R-64 approximately one quarter inch from the power transformer and the chassis.
3. Dress all video coupling capacitors and peaking coils up and away from the chassis.
4. Contact between the R-F oscillator frequency adjustments screws and the oscillator coils on channel switch outlets must be avoided.
5. Dress T-8 winding leads as shown in figure 16.

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Ref. No.	DESCRIPTION	Part No.

S-25A3 R-F TUNER ASSEMBLY

C-1, C-2, C-4, C-9, C-11, C-31, C-35, C-36, C-88	Capacitor, Ceramic, 680 mmf	47X554
C-3, C-5	Capacitor, Ceramic 25 mmf	47X487
*C-6	Capacitor, Ceramic, 0.25 mmf	
C-7	Capacitor, Ceramic, 15 mmf	47X552
*C-8	Capacitor, Ceramic, 3 mmf	
C-10, C-89, C-90	Capacitor, Ceramic, 5000 mmf	47X597
*C-12	Capacitor, Ceramic, 62 mmf	
*C-32	Capacitor, Ceramic, 0.5 mmf	
*C-33	Capacitor, Ceramic, 1.5 mmf	
*C-34	Capacitor, Ceramic, 0.68 mmf	
C-44	Capacitor, Ceramic, 270 mmf	47X534
C-91	Capacitor, Ceramic, 1500 mmf	47X545
*C-92	Capacitor, Fine Tuning	
R-1, R-2, R-3, R-38	Resistor, Carbon 1000 Ohm 0.5 W.	B85102
R-4	Resistor, Carbon 33 K Ohm 0.5 W.	B85333
R-5	Resistor, Carbon 10 K Ohm 0.5 W.	B85103
R-6	Resistor, Carbon 82 K Ohm 0.5 W.	B85823
R-7	Resistor, Carbon 1 Megohm 0.5 W.	B85105
R-21	Resistor, Carbon 470 Ohm 0.5 W.	B85470
R-22	Resistor, Carbon 22 K Ohm 0.5 W.	B85223
R-23	Resistor, Carbon 82 K Ohm 0.5 W.	B85823
R-24	Resistor, Carbon 18 K Ohm 0.5 W.	B85183
R-25	Resistor, Carbon 4.7 K Ohm 0.5 W.	B85472
R-107	Resistor, Carbon 6800 Ohm 1.0 W.	C85682
L-1	Choke, Filament	9A2023
T-1	Converter Transformer	9A2035
*T-11	Part of R-F Tuner	

PARTS ARE NOT INTERCHANGEABLE — COMPLETE TUNER ASSEMBLY MUST BE ORDERED.

CAPACITORS

C-13, C-16, C-18, C-22, C-47, C-48, C-49, C-50, C-52	Capacitor, Ceramic; 1500 mmf ± 20%	47X545
C-14, C-15	Part of T-2 (Sound I-F Trans.)	
C-17, C-25, C-26	Capacitor, Tubular; .01 mf 400 V.	D67103
C-19, C-20, C-21	Part of T-3 (Sound Disc. Trans.)	
C-23, C-37, C-38, C-40	Capacitor, Molded Mica; 270 mmf 1000 V.	47X534
C-24, C-27	Capacitor, Tubular; .0025 mf 400 V.	D54252
C-28	Capacitor, Tubular; .005 mf 600 V.	F65502
C-29	Capacitor, Dry Electrolytic; 24 mf 300 V.	45X372
C-39	Part of T-5 (Cathode Trap)	
C-41, C-42, C-60, C-70	Capacitor, Tubular; .05 mf 400 V.	D67503
C-43, C-46, C-58, C-66, C-81	Capacitor, Tubular; .25 mf 400 V.	D65254
C-51	Capacitor, Ceramic; 100 mmf ± 5%	47X546
C-53	Capacitor, Molded Mica; 10 mmf 500 V.	47X542
C-54, C-56	Capacitor, Molded Mica; 120 mmf 1000 V.	47X532
C-55A, C-55B, C-55C	Capacitor, Trimmer; 10-160 mmf, 40-370 mmf, 40-370 mmf	17A259
C-57, C-72	Capacitor, Tubular; .002 mf 600 V.	F66202
C-59	Capacitor, Tubular; .02 mf 400 V.	D65203
C-61	Capacitor, Molded Mica; 180 mmf 1000 V.	47X536
C-62	Capacitor, Molded Mica; 2200 mmf 1000 V.	47X531
C-63, C-71	Capacitor, Molded Mica; 390 mmf 1000 V.	47X535
C-64	Capacitor, Molded Mica; 47 mmf 500 V.	47X541
C-65A, C-65B, C-65C	Capacitor, Dry Electrolytic; 10 mf 450 V., 30 mf 300 V., 30 mf 400 V.	45X371
C-67	Capacitor, Molded Mica; 100 mmf 1000 V.	47X544
C-68	Capacitor; Tubular; .05 mf 600 V.	F67503
C-69	Capacitor, Tubular; .035 mf 1000 V.	46X408
C-73, C-74	Capacitor, Tubular; .005 mf 400 V.	D65502
C-75, C-82	Capacitor, Tubular; .1 mf 1000 V.	46X409
C-76	Capacitor, High Voltage Ceramic; 500 mmf	47X530
C-77	Capacitor, Molded Mica; 5 mmf 1500 V.	47X533
C-78A, C-78B	Capacitor, Dry Electrolytic; 10 mf 450 V., 80 mf 450 V.	45X369
C-79	Capacitor, Molded Mica; 4700 mmf 500 V.	47X543
C-80A, C-80B, C-80C	Capacitor, Dry Electrolytic; 130 mf 50 V., 40 mf 450 V., 40 mf 150 V.	45X370
C-83, C-84	Capacitor, Molded Paper; .01 mf 400 V.	46X410
C-85A, C-85B	Capacitor, Dry Electrolytic; 10 mf 350 V., 40 mf 450 V.	45X367
C-86	Part of Deflection Yoke Assembly	
C-87A, C-87B	Capacitor, Dry Electrolytic; 1000 mf 6 V., 250 mf 10 V.	45X368
C-93	Part of T-10	

RESISTORS

R-8	Resistor, Carbon; 82 ohms 0.5 W.	32B4820
R-9	Resistor, Carbon; 1200 ohms 0.5 W.	32B4122
R-10, R-19	Resistor, Carbon; 470K ohms 0.5 W.	32B5474
P-11, R-79	Resistor, Carbon; 22K ohms 0.5 W.	32B5223
R-12, R-44, R-45, R-48, R-50, R-96	Resistor, Carbon; 1000 ohms 0.5 W.	32B5102
R-13, R-14	Resistor, Carbon; 100K ohms 0.5 W.	32B3104
R-15	Resistor, Wirewound; 5.1 ohms 0.5 W.	43X239
R-16	Resistor, Carbon; 10 megohms 0.5 W.	32B5106
R-17	Volume Control & Switch; 1 megohm	36X378
R-18	Resistor, Carbon; 330K ohms 0.5 W.	32B4334
R-20	Resistor, Carbon; 1000 ohms 1.0 W.	32C5102
R-26, R-28	Resistor, Carbon; 39 ohms 0.5 W.	32B4390
R-27, R-29	Resistor, Carbon; 5600 ohms 0.5 W.	32B3562
R-30, R-78	Resistor, Carbon; 6800 ohms 0.5 W.	32B3682
R-31	Part of L-9	
R-32, R-54, R-71, R-74	Resistor, Carbon; 1 megohm 0.5 W.	32B5105
R-33	Resistor, Carbon; 3300 ohms 1.0 W.	32C4332
R-34, R-46	Resistor, Carbon; 1000 ohms 0.5 W.	32B4102
R-35	Part of L-11	
R-36, R-47	Resistor, Variable; 500K ohms 10K ohms — Brightness & contrast control	78X1
R-37	Resistor, Carbon; 100K ohms 0.5 W.	32B5104
R-39	Resistor, Carbon; 6.8 megohms 0.5 W.	32B4685
R-40	Resistor, Carbon; 82K ohms 0.5 W.	32B4823
R-41, R-67, R-83	Resistor, Carbon; 10K ohms 0.5 W.	32B4103
R-42	Resistor, Carbon; 15K ohms 0.5 W.	32B3153
R-43	Resistor, Carbon; 12K ohms 0.5 W.	32B4123
R-49	Resistor, Carbon; 150 ohms 0.5 W.	32B4151
R-51	Resistor, Carbon; 4700 ohms 0.5 W.	32B4472
R-52	Part of L-13	
R-53, R-55	Resistor, Carbon; 3300 ohms 0.5 W.	32B4332
R-56, R-72	Resistor, Carbon; 47 ohms 0.5 W.	32B5470
R-57	Resistor, Carbon; 150K ohms 0.5 W.	32B4154
R-58	Resistor, Carbon; 3.3 megohms 1.0 W.	32C3335
R-59	Resistor, Carbon; 560K ohms 0.5 W.	32B3564
R-60, R-80, R-81	Resistor, Carbon; 8200 ohms 0.5 W.	32B4822
R-61	Resistor, Carbon; 100K ohms 0.5 W.	31B1104
R-62	Resistor, Carbon; 100K ohms 1.0 W.	32C3104
R-63	Resistor, Carbon; 180K ohms 0.5 W.	32B4184
R-64	Resistor, Temp. Comp. 30K ohms 0.25 W.	34A1
R-65	Resistor, Carbon; 120K ohms 0.5 W.	32B4124
R-66, R-90	Resistor, 50K ohms Variable; 1 megohm — (Horizontal & Vertical Hold Control)	78X2
R-68	Resistor, Carbon; 270K ohms 1.0 W.	32C4274
R-69	Resistor, Carbon; 120K ohms 1.0 W.	32C4124
R-70	Resistor, Carbon; 82 ohms 1.0 W.	32C4820
R-73	Resistor, Carbon; 15K ohms 1.0 W.	32C5153
R-75	Resistor, Carbon; 4700 ohms 1.0 W.	32C4472
R-76	Resistor, Wirewound; 3.3 ohms 0.5 W.	43X238
R-77	Resistor, Carbon; 3.9 megohms 0.5 W.	32B4395
R-82	Resistor, Carbon; 1 megohm 1.0 W.	32C5105
R-84	Resistor, Carbon; 560K ohms 0.5 W.	32B4564
R-85	Resistor, Carbon; 56K ohms 0.5 W.	32B4563
R-86	Resistor, Variable; Height Control	77X3
R-87	Resistor, Carbon; 1.5 megohms 0.5 W.	32B4155
R-88	Resistor, Carbon; 6.8 megohms 0.5 W.	32B5685
R-89	Resistor, Carbon; 1 megohm 0.5 W.	32B3105
R-91	Resistor, Carbon; 100K ohms 0.5 W.	32B4104
R-92	Resistor, Carbon; 560 ohms 0.5 W.	32B4561
R-93	Resistor, Variable; Vert. Lin. Control	77X4
R-94	Resistor, Carbon; 2.2 megohms 0.5 W.	32B5225
R-95	Resistor, Carbon; 3900 ohms 0.5 W.	32B4392
R-97, R-98	Part of Vertical Yoke	
R-99A, R-99B	Resistor, Wirewound; 1125 ohms 20.0 W., 610 ohms 20.0 W.	43X234
R-100A, R-100B, R-100C	Resistor, Wirewound; 8200 ohms 5.0 W., 35 ohms 0.8 W., 100 ohms 2.0 W.	43X235
R-101	Resistor, Carbon; 39 ohms 1.0 W.	32C4390
R-102, R-103	Resistor, Carbon; 680 ohms 1.0 W.	32C5681
R-104	Resistor, Variable; 2250 ohms (Focus Control)	77X1
R-105	Resistor, Variable; 20 ohms (Vert. Centering)	77X2
R-106	Resistor, Variable; 20 ohms (Horiz. Centering)	77X5

TRANSFORMERS AND COILS

L-5, L-7	1st and 3rd Pix I.F. Coil	9A1980
L-8, L-10	Peaking Coil	9A1979
L-9, L-11	Peaking Coil	9A1978
L-13	Peaking Coil	9A1977
L-14	Transformer (Sync. Guide)	9A1984
L-15	Width Control Coil	9A1976
L-16	Coil (Horiz. Linearity)	9A1981
L-17, L-18, L-19, L-20	Part of 9A1987 Deflection Yoke Assembly (See Miscellaneous)	
L-21	Focus Coil	9A1974
L-22	Filter Choke	52X87
T-2	Sound I.F. Transformer	9A1986
T-3	Sound Disc. Transformer	9A1983
T-4	Audio Output Transformer	51X139
T-5	Cathode Trap Transformer	9A1985
T-6	Vertical Oscillator Transformer	54X4
T-7	Vertical Output Transformer	51X140
T-8	Horizontal Output & H.V. Transformer	53X296
T-9	Power Transformer	53X297
T-10	2nd Pix I.F. Transformer	9A1982

MISCELLANEOUS

Ion Trap Magnet	2A382
Tube Socket (Miniature)	3A428
Tube Socket (9 Pin)	3A443
Tube Socket (Ceramic)	3A444
Tube Socket (Octal)	3A445
Socket (Hi-Voltage Capacitor)	3A448

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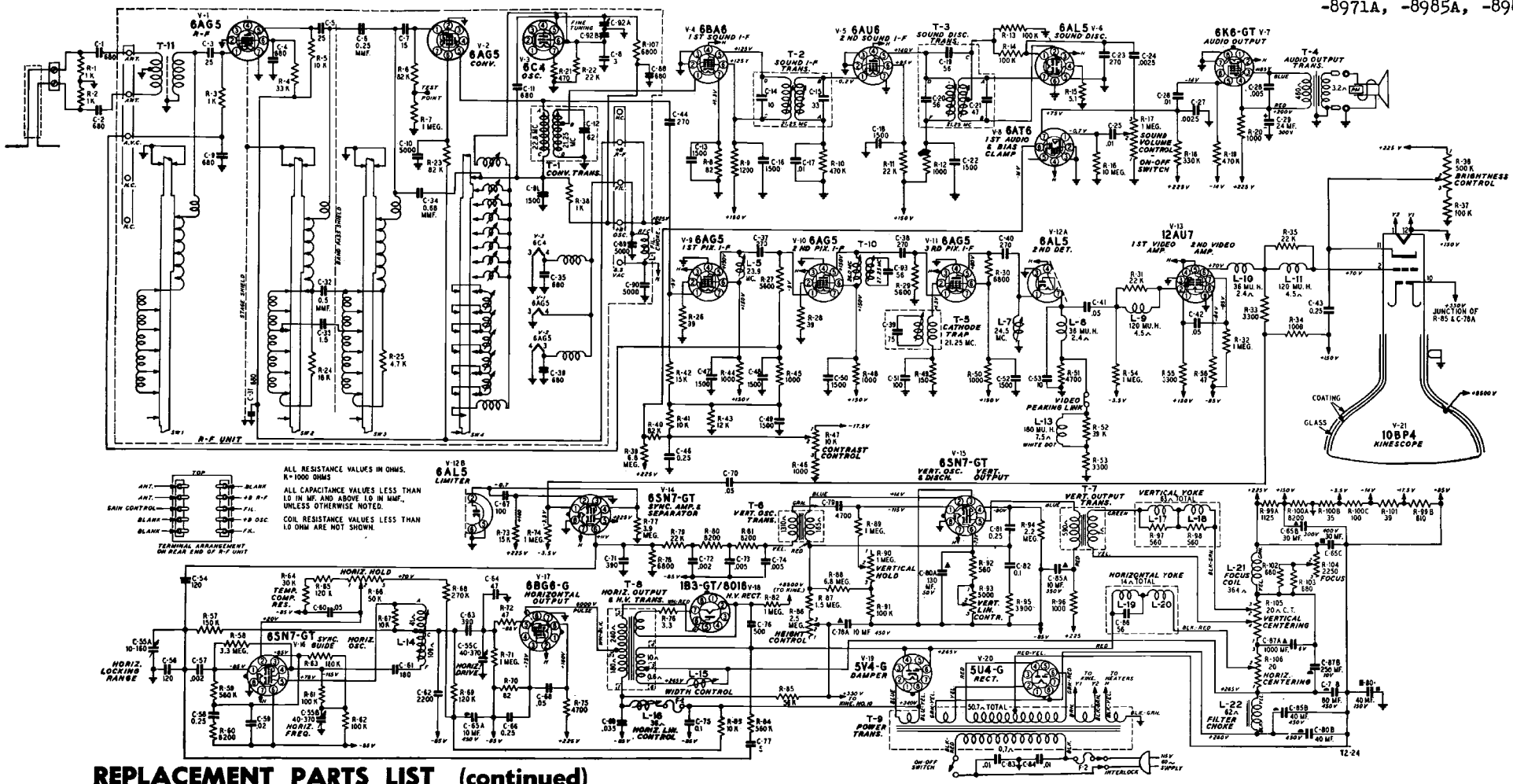

REPLACEMENT PARTS LIST (continued)

Ref. No.	DESCRIPTION		Part No.
	Anode Connector		6A306
	Deflection Yoke Assembly		9A1987
	Knob (Brightness and Horizontal)	Mahogany Cabinets	10A714
	Knob (On-Off Sound)		10A715
	Knob (Contrast, Vertical and On-Off Sound)		10A716
	Knob (Fine Tuning)		10A717
	Knob (Channel Tuning)		10A718
	Knob (Fine Tuning)	Blond Cabinets	10A723
	Knob (Brightness and Horizontal)		10A724
	Knob (Contrast, Vertical and On-Off Sound)		10A725
	Knob (On-Off Sound)		10A726
	Knob (Channel Tuning)		10A727
	Speaker 12" P.M. (Console)		12A490

Ref. No.	DESCRIPTION		Part No.
	Speaker 4" X 6" P.M. (Mantel)		12A491
	Support Assembly		25A1047
	Stud Assembly		25A1049
	Screen Escutcheon		4X1026
	Escutcheon (Channel)	Mahogany Cabinets	4X1028
	Escutcheon (Vertical & Horizontal)		4X1029
	Escutcheon (Channel)	Blond Cabinets	4X1038
	Esutcheon (Vertical & Horizontal)		4X1039
	Coronado Emblem (Blond Cabinets)		4X1046
	Coronado Emblem (Mahogany Cabinets)		4X1045
	Mask		8X191

Ref. No.	DESCRIPTION	Part No.
	Tube Socket (Kinescope)	13X614
	Ventilator Grille (Metal)	14X449
	Ventilator Grille (Back of Cab. Console)	14X460
	Ventilator Grille (Back of Cab. Mantel)	14X461
	Grille (Front of Cab. Mantel)	14X462
	Fuse Holder	16X131
	Fuse (3 Amperes 250 Volts)	16X132
	Fuse (1/4 Ampere 250 Volts)	16X133
	Pix Crystal	17X101
	Wing Nut (Mtg. Focus Coil)	20X1557
	Wing Screw (Mtg. Def. Yoke)	20X1558

Ref. No.	DESCRIPTION	Part No.
	Top Bracket } Middle Bracket } Focus Coil	25X1595 25X1598
	Support Bracket (Mtg. Def. Yoke)	25X1597
	Tube Shield (6AL5 Sound Disc.)	32X221
	Tube Shield (6C4 R.F. Osc.)	32X396
	Socket Assembly (H.V. Rectifier)	S-3A1
	R-F Tuner Assembly	S-25A3
	Hood Assembly	S-8X1
	R-F Cable and Terminal Assembly	S-13X644
	Rubber Strip and Bracket Assembly	S-25X36
	Line Cord and Shield Assembly	S-32X4

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MODELS 10TZ1, 10TZ3, 10TZ4, 12TZ1, 12TZ3, 12TZ4, 12TZ6, 15TZ6

HIGH VOLTAGE WARNING

OPERATION OF THIS RECEIVER WITH INTERLOCKED BACK COVER REMOVED INVOLVES A SHOCK HAZARD FROM THE RECEIVER POWER SUPPLIED. WORK ON THIS RECEIVER SHOULD NOT BE ATTEMPTED BY ANYONE WHO IS NOT THOROUGHLY FAMILIAR WITH THE PRECAUTIONS NECESSARY WHEN WORKING ON HIGH VOLTAGE EQUIPMENT.

(A) SETTING UP THE RECEIVER

1. Remove the two decorative screws, holding the top cabinet strip in place retaining the glass front assembly.
2. Remove the glass front assembly.
3. Remove the three slotted head P.K. screws retaining the back in place and release with interlocked line cord.
4. Remove the two hex head P.K. screws, retaining the line cord at the top center of the back. Remove line cord for use in service operations.
5. Remove the carton containing the Tele-Zoom remote control unit and beam bender if used.
6. Remove the four copper plated shipping screws from the bottom of the cabinet
7. Remove the six "Service Adjustment" plug buttons located at the front of the cabinet.
8. Install the push-on knobs to the respective controls.
9. Remove the Picture tube retaining band held in place by the two wing screws.
10. Check all the other tubes to be sure they are in place and firmly seated in their sockets.
11. Loosen the two Picture tube cushion hood adjustment wing nuts and slide the cushion hood toward the rear of the chassis. Loosen the deflection yoke adjustment, slide the yoke toward the rear of the chassis and tighten.
12. From the front of the cabinet, look through the deflection yoke and check the alignment of the focus coil with the yoke. If the focus coil is not in line, loosen the three focus coil adjustment wing nuts and raise, lower or rotate the focus coil until the correct alignment is obtained. Tighten the wing nuts with the coil in position.

(B) PICTURE TUBE INSTALLATION

PICTURE TUBE HANDLING PRECAUTION - Extreme care should be used in handling the picture tube. The Picture tube bulb encloses a high vacuum and, due to its large surface area is subjected to considerable air pressure.

The front of the Picture tube, particularly that part of the r m of the viewing surface, must not be struck, scratched, or subjected to more than moderate pressure at any time. In installation, if the tube sticks or fails to slip smoothly into the deflecting yoke or its socket, check and remove the cause of the trouble. Do not under any circumstances force the tube. Keep the carton for possible future shipping use.

1. Insert the neck of the tube through the deflection yoke and focus coil until the base protrudes about two inches beyond the focus coil. Keep the second anode recessed metal well contact toward the top. The front of the tube should now rest on the three rubber support cushions at the front of the chassis.
2. Orient the Beam Bender Flags located in the neck about 1-1/2 inches from the end of the socket horizontal with the chassis. (Does not apply to 12" direct view tube).
3. Replace the Picture tube retaining band and secure with the two wing screws provided.
4. Slide the Beam Bender over the neck of the tube with the arrow pointing toward the front of the tube in line with the H.V. connector.
5. Connect the Picture tube socket to the tube base.
6. Wipe the Picture tube screen surface and glass front assembly safety glass of all dust and finger marks with a soft cloth moistened with "Windex" or other cleaning agent.
7. From the rear of the cabinet slip the Picture tube cushion hood firmly up against the flare of the tube and tighten the adjustment wing screws.
8. Slide the deflection yoke as far forward as possible.
9. Connect the high voltage lead to the recessed tube contact.
10. Connect the Tele-Zoom remote control leads to terminals "A" and "G" on the antenna terminal strip.
11. Insert the line cord plug into the socket at the top of the cabinet and connect to a suitable outlet of the proper voltage and frequency.
12. Connect the antenna to the antenna terminals.
13. Turn the ON-OFF volume knob clockwise to the ON position. Turn SELECTOR SWITCH TO "TELEV" position.
14. Press the Tele-Zoom button so that the normal rectangular picture appears on the face of the tube.
15. Advance the BRIGHTNESS control fully clockwise and contrast control counter-clockwise (minimum contrast).

(C) BEAM BENDER ADJUSTMENT. (For 10" 10BP4 or 12QP4 Direct View Tube)

1. The Beam Bender should be positioned approximately over the picture tube flags (about 1-1/2 inches from the socket).
2. Starting from this position adjust the Beam Bender by moving it forward or backward at the same time rotating it slightly around the neck of the tube until the brightest raster appears on the screen.
3. Reduce the BRIGHTNESS control setting until the raster is slightly above average brilliance.
4. Adjust the FOCUS control with a thin blade screwdriver, located at the front of the cabinet as shown on the "SERVICE ADJUSTMENT" diagram) until the line structure of the raster is clearly visible.
5. Readjust the Beam Bender for maximum raster brilliance. The final adjustment should be made with the BRIGHTNESS control at the maximum position with which good line focus can be maintained and left in that position.

(D) FOCUS COIL ADJUSTMENTS

1. Turn the VERTICAL and HORIZONTAL centering controls to mid position. Refer to the "SERVICE ADJUSTMENT" diagram at the rear of the masonite back for location of these controls.
2. If a corner of the raster is shadowed, it indicates that the electron beam is striking the neck of the tube. Loosen the Focus coil wing nuts and rotate the coil about its HORIZONTAL and VERTICAL axis until the entire raster is visible, approximately centered and with no shadowed corners. The Focus coil should be kept as close to the rear of the deflection coil for optimum range of the focus control.
3. Tighten the focus coil adjustment wing nuts with the coil in this position.
4. Readjust the FOCUS control for clearest line structure on the raster.

(E) DEFLECTION YOKE ADJUSTMENT

1. If the lines of the raster are not horizontal or squared with the picture mast, rotate the deflection yoke until this condition is obtained.
2. Tighten the yoke adjustment wing screw.

BEFORE PROCEEDING WITH THE PICTURE "SERVICE ADJUSTMENTS" FOR A NORMAL RECTANGULAR OR TELE-ZOOM PICTURE A BRIEF DESCRIPTION OF TELE-ZOOM OPERATION IS DESCRIBED BELOW.

The Garod "Tele-Zoom" is so arranged that at the will of the viewer, a normal picture is obtained, which is essentially a rectangle with an aspect ratio of 4 to 3, on the circular face of the picture tube; or the picture may be expanded uniformly to cover the entire screen area of the picture tube.

When increasing the picture size both horizontally and vertically while maintaining the proper aspect ratio 4 to 3 it is obvious that parts of the picture will necessarily fall past the edge of the tube and will be lost.

The picture is expanded or reduced to normal size by depressing a push buttor in a small plastic housing, connected to the television receiver rear terminal strip, by a 20 foot length of flexible cord. This push button switch is of the push-push type, that is the first push will close the circuit, and the next will open it. No indication is required since the picture size is its own indication.

Control is obtained thru this switch, which actuates a relay excited from the 6 volt filament supply. Thus, should the cord break or become detached, no shock or fire hazard is encountered; the relay will simply open, leaving the picture in the expanded position.

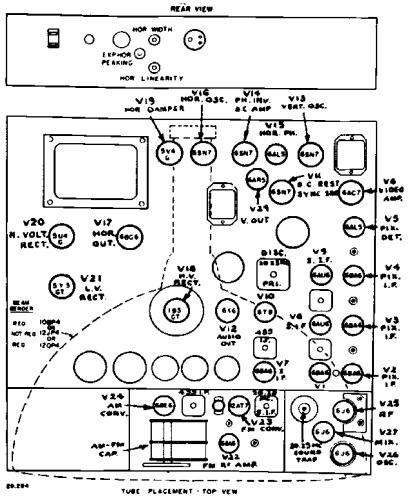
(F) PICTURE "SERVICE ADJUSTMENTS"

(a) NORMAL RECTANGULAR PICTURE (Refer to the diagram at rear of masonite back cover for location of controls).

1. In order to make further adjustments it wi l be necessary to obtain a test pattern picture.
2. Tune in a station as described under paragraph (A) pages two and three of the condensed operating instructions.
3. Adjust the normal VERTICAL size and normal VERTICAL LINEARITY controls until the test pattern is vertically symmetrical from top to bottom. Adjustment of either control will require readjustment of the other.
4. Adjust VERTICAL CENTERING control to cente the picture in the circular mask opening.
5. Adjust normal HORIZONTAL PEAKING control for a symetrical pattern so that the outer circle of the test pattern appears round.
6. Adjust the normal HORIZONTAL LINEARITY slotted screw located at the rear of the chassis for centrel alignment of the inner circles of the test pattern.
7. Adjust the normal WIDTH control at rear of the chassis until the four corners of the picture reach the circular mask opening.
8. Readjust the normal HORIZONTAL peaking control for best symmetry.
9. Adjust the HORIZONTAL CENTERING control to center the picture horizontally.
0. Repeat adjustment 3 above to obtain 4:3 aspect ratio of test pattern.

(b) TELE - ZOOM ADJUSTMENTS (Expanded Picture)

1. Remove the glass front assembly to allow access to the two expanded Vertical Service Adjustment controls.
2. Press the button on the remote control box so that the test pattern is expanded on the face of the picture tube.
3. Adjust the EXP. VERTICAL SIZE and EXP. VERTICAL LINEARITY controls until the outer circle of the test pattern fills the entire tube face vertically. Adjustment of either control will require readjustment of the other.
4. Readjust the VERTICAL CENTERING control to center the test pattern or the face of the tube vertically.
5. Adjust the EXP. HORIZONTAL PEAKING control at the rear of the chassis so that the outer circle of the test pattern appears round and fills the face of the tube horizontally.
6. Readjust the focus control if necessary.
7. Replace the glass front assembly, cabinet strip and decorative screws.



CIRCUIT ALIGNED	STEP	SELECTOR SWITCH	CHANNEL	SIGNAL GENERATOR CONNECTIONS	SIGNAL GENERATOR FREQ.	CONNECT VTVM	ADJUST	METER INDICATION	REMARKS
TV SOUND	1	FOLLOW PROCEDURE FOR FM-IF & DISCRIMINATOR ADJUSTMENT, STEPS 2,3, & 4 AS SHOWN ON AM-FM ALIGNMENT CHART.							USE IDENTICAL SIGNAL GEN. FREQ AS IN STEPS 2,3,&4 OF FM IF ALIGNMENT. VISUAL CHECK DESIRABLE FOR "TOUCH-UP" OF BAND-PASS CIRCUIT. (SEE FIG. 1)
TV IF	2	TV	8	ACROSS CENTER TAP OF MIX. GRID COILS & GND. (R150)	22.8 MC	ACROSS 4.7K LOAD RES. (R39)	T5	MAX. DEFL.	
	3	"	"	"	22.1 MC	"	T4	"	
	4	"	"	"	24.2 MC	"	T3	"	
	5	"	"	"	24.9 MC	"	T2	"	
	6	"	"	"	21.75 MC	"	T1 (BOT)	"	
	7	"	"	"	20.25 MC	"	T1 (TOP)	MIN. DEFL.	

TV RF ALIGNMENT

DUMMY ANTENNA	STEP	SIGNAL GENERATOR CONNECTIONS	SIGNAL GENERATOR FREQUENCY (10 MC SWEEP)	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
ONE 150 Ω CARBON RESISTOR IN SERIES WITH EACH LEAD.	8	ANTENNA TERMINALS	213 MC	211.25 MC & 215.75 MC	13	VERT. AMPLIFIER ACROSS CENTER TAP OF MIX GRID COILS & GND. (ACROSS R150 & C152).	C15, C16 C20, C21 (SEE FIG. 2)	ADJUST FOR RESPONSE APPROX. AS SHOWN BELOW, WITH MARKERS MORE THAN 70% OF PEAK AMPLITUDE. KEEP THE RF AND MIXER TRIMMER PAIRS IN APPROX. THE SAME RELATIVE POSITION.
"	9	"	177 MC	175.25 MC & 179.75 MC	7	"	L103, L104	ADJUST RINGS FOR WAVE-FORM AS SHOWN BELOW.
"	10	"	183 MC	181.25 MC & 185.75 MC	8	"		CHECK RESPONSE ON ALL CHANNELS. SLIGHT ADJUSTMENT OF C15, C16, C20 OR C21 MAY BE REQUIRED TO OBTAIN OPTIMUM RESPONSE ON ALL CHANNELS.
"	11	"	189 MC	187.25 MC & 191.75 MC	9	"		
"	12	"	195 MC	193.25 MC & 197.75 MC	10	"		
"	13	"	201 MC	199.25 MC & 203.75 MC	11	"		
"	14	"	207 MC	205.25 MC & 209.75 MC	12	"		
"	15	"	85 MC	83.25 MC & 87.75 MC	6	"	C13, C14 C18, C19	ADJUST FOR RESPONSE APPROX. AS SHOWN BELOW.
"	16	"	79 MC	77.25 MC & 81.75 MC	5	"		CHECK RESPONSE ON ALL CHANNELS. SLIGHT ADJUSTMENT OF C13, C14, C18, OR C19 MAY BE REQUIRED TO OBTAIN OPTIMUM RESPONSE ON ALL CHANNELS.
"	17	"	69 MC	67.25 MC & 71.75 MC	4	"		
"	18	"	63 MC	61.25 MC & 65.75 MC	3	"		
"	19	"	57 MC	55.25 MC & 59.75 MC	2	"		

TV OSC. ALIGNMENT

DUMMY ANTENNA	STEP	SIGNAL GENERATOR CONNECTIONS	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM DC PROBE	ADJUST	REMARKS
SAME AS ABOVE	20	ANTENNA TERMINALS	215.75 MC	13	ACROSS 6AU8 LIM. GRID (PIN 1) & GND.	L102	ADJUST FOR MAXIMUM DEFLECTION
"	21	"	87.75 MC	6	"	L101	"
"	22	CHECK TO SEE THAT ALL OTHER CHANNELS ARE RECEIVED WELL WITHIN THE LIMITS OF THE FINE TUNING CONTROL. IF NOT, SOME COMPROMISE MAY BE MADE BY ADJUSTING L102 FOR HIGH CHANNELS AND L101 FOR LOW CHANNELS.					

RECOMMENDED RESPONSE CURVES

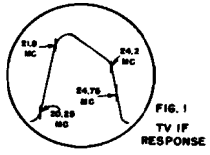


FIG. 1 TV IF RESPONSE

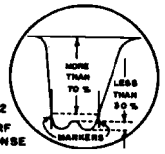


FIG. 2 TV RF RESPONSE

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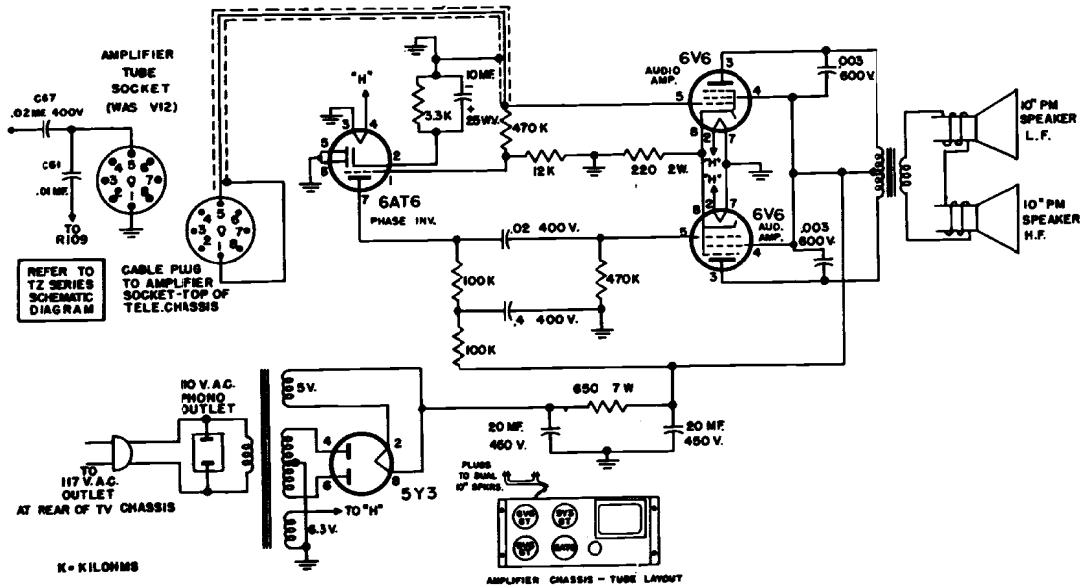
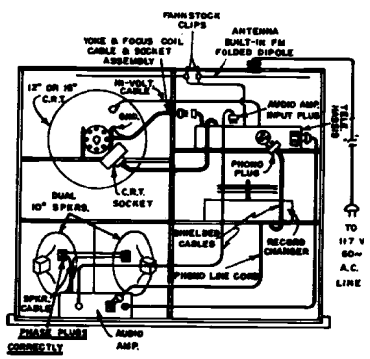
AM-FM RECEIVER ALIGNMENT CHART SERIES 10TZ, 12TZ, & 15TZ TELEVISION RECEIVERS

CIRCUIT ALIGNED	STEP	SELECTOR SWITCH POS.	R'C'V'R DIAL SET TO	SIGNAL GENERATOR FREQUENCY	SIGNAL GENERATOR CONNECTIONS	METER TYPE	METER CONNECTIONS	COMPONENT ADJUSTED	METER INDICATION	REMARKS
BC I.F.	1	BC	1650 KC	455 KC 30% MOD.	THRU .1 MFD TO 6BE6 GRID PIN #1	A C OUTPUT	ACROSS VOICE COIL	TOP AND BOTTOM OF T-10, T11	MAXIMUM DEFLECTION	
FM I.F.	2	FM	108.5 MC	20.25 MC. UN MOD.	THRU .01 MFD. TO GRID OF 12AT7 (PIN #7)	D C VTVM	FROM LIMITER GRID, PIN 1 OF 6AU6 AND GROUND.	TOP AND BOTTOM OF T6, T7, T8	"	
FM DISC.	3	"	"	"	"	"	FROM DISC. CATHODE, PIN 3 OF 6T8 AND GROUND.	TOP OF T9	MAX. DEFLECTION OF EITHER POLARITY	
	4	"	"	"	"	"	"	BOTTOM OF T9	0. VOLTS	ADJUST FOR ZERO BETWEEN PLUS AND MINUS PEAKS
BC OSC	5	BC	1650 KC	1650 KC 30% MOD.	COUPLED TO R'C'VR LOOP BY 2 OR 3 TURNS	AC OUTPUT	ACROSS VOICE COIL	C-126	MAXIMUM DEFLECTION	
BC RF	6	"	1500KC	1500 KC 30% MOD.	"	"	"	C-125	"	
FM OSC	7	FM	108.5 MC	108.5 MC UN MOD.	THRU BALANCED 300 Ω DUMMY ANT. TO F.M. ANT & GND.	DC VTVM	FROM LIMITER GRID PIN 1 OF 6AU6 AND GROUND.	C-123 2-6 MMF. TRIMMER ADJ. ACENT TO TUNING GANG	MAXIMUM DEFLECTION	
	8	"	87.5 MC.	87.5 MC. UNMOD.	"	"	"	OSC. COIL CORE L90	"	REPEAT STEPS 7 & 8 AS NECESSARY
FM R.F.	9	"	95 MC.	95 MC UNMOD.	"	"	"	RF COIL CORE L 86	"	
	10	"	"	"	"	"	"	ANT. TRANS. CORE T-18	"	



CIRCUIT SCHEMATIC DIAGRAM - AMPLIFIER UNIT



CONSOLE REAR VIEW SHOWING CONNECTION OF UNITS

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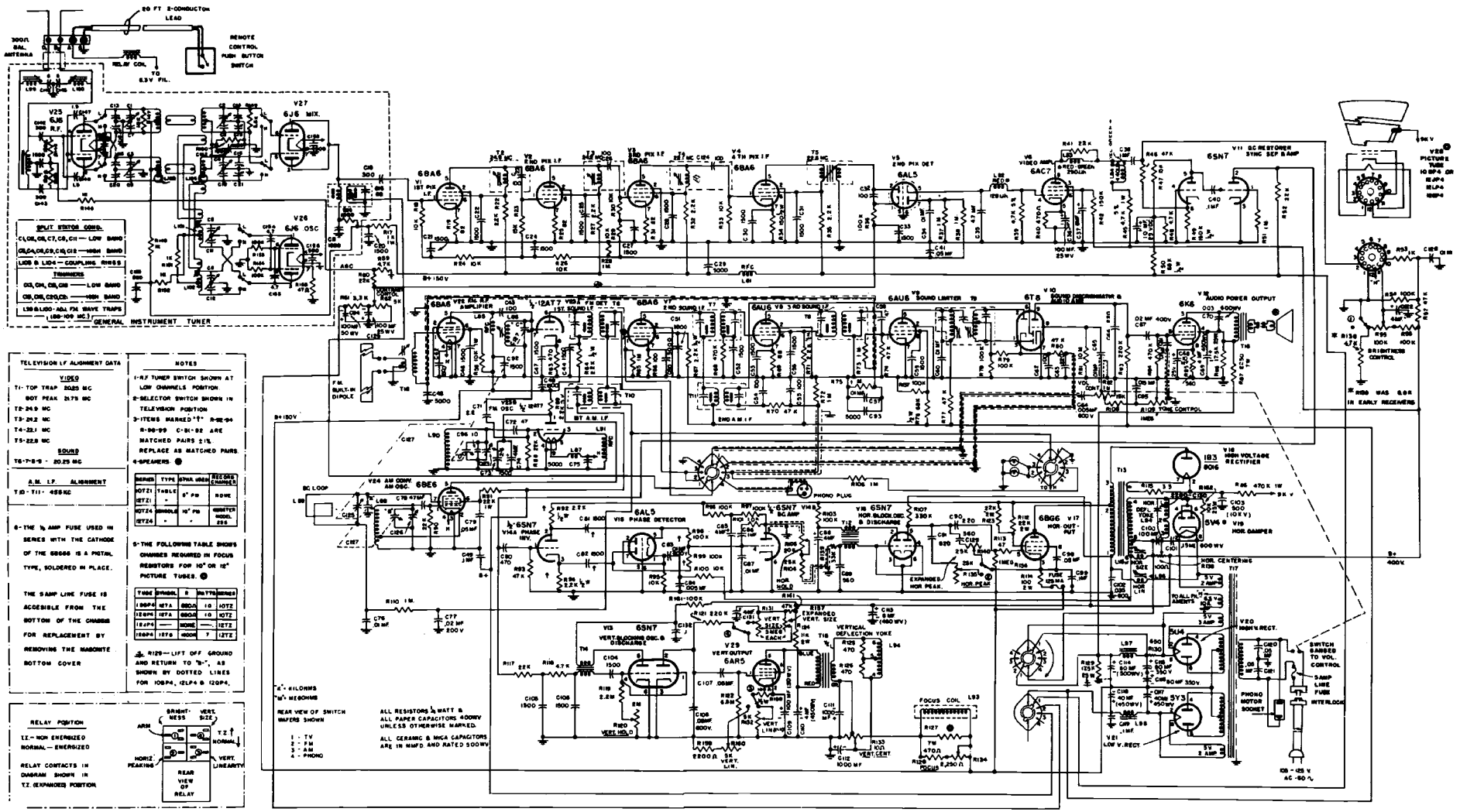

SERIES

10TZ1 10" TABLE
10TZ3 10" CONSOLETTE
12TZ1 12" TABLE
12TZ3 12" CONSOLETTE
10TZ4 10" CONSOLE
12TZ4 12" CONSOLE
12TZ6 12" DELUXE CONSOLE } WITH AUDIO
15TZ6 15" DELUXE CONSOLE } AMPLIFIER

CIRCUIT SCHEMATIC DIAGRAM

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HIGH VOLTAGE WARNING

OPERATION OF THIS RECEIVER WITH INTERLOCKED BACK COVER REMOVED INVOLVES A SHOCK HAZARD FROM THE RECEIVER POWER SUPPLIED. WORK ON THIS RECEIVER SHOULD NOT BE ATTEMPTED BY ANYONE WHO IS NOT THOROUGHLY FAMILIAR WITH THE PRECAUTIONS NECESSARY WHEN WORKING ON HIGH VOLTAGE EQUIPMENT.

(A) SETTING UP THE RECEIVER

1. Remove the two decorative screws, holding the top cabinet strip in place retaining the glass front assembly.
2. Remove the glass front assembly.
3. Remove the three slotted head P.K. screws retaining the back in place and release with interlocked line cord.
4. Remove the two hex head P.K. screws, retaining the line cord at the top center of the back. Remove line cord for use in service operations.
5. Remove the carton containing the Tele-Zoom remote control unit.
6. Remove the four copper plated shipping screws from the bottom of the cabinet.
7. Remove the two "Service Adjustment" plug buttons located at the front of the cabinet.
8. Install the push-on knobs to the respective controls.
9. Loosen the Picture tube retaining band held in place by the two wing screws.
10. Check all the other tubes to be sure they are in place and firmly seated in their sockets.
11. Loosen the two Picture tube cushion hood adjustment wing nuts and slide the cushion hood toward the rear of the chassis. Loosen the deflection yoke adjustment, slide the yoke toward the rear of the chassis and tighten.
12. From the front of the cabinet, look through the deflection yoke and check the alignment of the focus coil with the yoke. If the focus coil is not in line, loosen the three focus coil adjustment wing nuts and raise, lower or rotate the focus coil until the correct alignment is obtained. Tighten the wing nuts with the coil in position.

(B) PICTURE TUBE INSTALLATION

PICTURE TUBE HANDLING PRECAUTION - Extreme care should be used in handling the picture tube. The Picture tube bulb encloses a high vacuum and, due to its large surface area is subjected to considerable air pressure.

The front of the Picture tube, particularly that part of the rim of the viewing surface, must not be struck, scratched, or subjected to more than moderate pressure at any time. In installation, if the tube sticks or fails to slip smoothly into the deflecting yoke or its socket, check and remove the cause of the trouble. Do not under any circumstances force the tube. Keep the carton for possible future shipping use.

1. Insert the neck of the tube through the deflection yoke and focus coil until the base protrudes about two inches beyond the focus coil. Keep the second anode recessed metal well contact toward the top. The front of the tube should now rest on the two rubber support cushions at the front of the chassis.
2. Replace the Picture tube retaining band and secure with the two wing screws provided.
3. Connect the Picture tube socket to the tube base.
4. Wipe the Picture tube screen surface and glass front assembly safety glass of all dust and finger marks with a soft cloth moistened with "Windex" or other cleaning agent.
5. From the rear of the cabinet slip the Picture tube cushion hood firmly up against the flare of the tube and tighten the adjustment wing screws.
6. Slide the deflection yoke as far forward as possible.
7. Connect the high voltage lead to the recessed tube contact.
8. Connect the Tele-Zoom remote control leads to terminals "A" and "G" on the antenna terminal strip.
9. Insert the line cord plug into the socket at the top of the cabinet and connect to a suitble outlet of the proper voltage and frequency.
10. Connect the antenna to the antenna terminals.
11. Turn the ON-OFF Volume knob clockwise to the ON position. Turn SELECTOR SWITCH TO "TELEV" position.
12. Press the Tele-Zoom button so that the normal rectangular picture appears on the face of the tube.
13. Advance the BRIGHTNESS control fully clockwise and contrast control counter-clockwise (minimum contrast).

(C) FOCUS COIL ADJUSTMENTS

1. Turn the VERTICAL and HORIZONTAL centering controls to mid position. Refer to the "SERVICE ADJUSTMENT" diagram at the rear of the masonite back for location of these controls.
2. If a corner of the raster is shadowed, it indicates that the electron beam is striking the neck of the tube. Loosen the focus coil wing nuts and rotate the coil about its HORIZONTAL and VERTICAL axis until the entire raster is visible, approximately centered and with no shadowed corners. The Focus coil should be kept as close to the rear of the deflection coil for optimum range of the focus control.
3. Tighten the focus coil adjustment wing nuts with the coil in this position.
4. Readjust the FOCUS control for clearest line structure on the raster.

(D) DEFLECTION YOKE ADJUSTMENT

1. If the lines of the raster are not horizontal or squared with the picture mask, rotate the deflection yoke until this condition is obtained.
2. Tighten the yoke adjustment wing screw.

BEFORE PROCEEDING WITH THE PICTURE "SERVICE ADJUSTMENTS" FOR A NORMAL RECTANGULAR OR TELE-ZOOM PICTURE A BRIEF DESCRIPTION OF TELE-ZOOM OPERATION IS DESCRIBED BELOW.

The Garod "Tele-Zoom" is so arranged that at the will of the viewer, a normal picture is obtained, which is essentially a rectangle with an aspect ratio of 4 to 3, on the circular face of the picture tube; or the picture may be expanded uniformly to cover the entire screen area of the picture tube.

When increasing the picture size both horizontally and vertically while maintaining the proper aspect ratio 4 to 3 it is obvious that parts of the picture will necessarily fall past the edge of the tube and will be lost.

The picture is expanded or reduced to normal size by depressing a push button in a small plastic housing, connected to the television receiver rear terminal strip, by a 20 foot length of flexible cord. This push button switch is of the push-push type, that is the first push will close the circuit, and the next will open it. No indication is required since the picture size is its own indication.

Control is obtained thru this switch, which actuates a relay excited from the 6 volt filament supply. Thus, should the cord break or become detached, no shock or fire hazard is encountered; the relay will simply open, leaving the picture in the expanded position.

(E) PICTURE "SERVICE ADJUSTMENTS"

(a) NORMAL RECTANGULAR PICTURE (Refer to the diagram at rear of masonite back cover for location of controls).

1. In order to make further adjustments it will be necessary to obtain a test pattern picture.
2. Tune in a station as described under paragraph (A) pages two and three of the condensed operating instructions.
3. Adjust the normal VERTICAL size and normal VERTICAL LINEARITY controls until the test pattern is vertically symmetrical from top to bottom. Adjustment of either control will require readjustment of the other.
4. Adjust VERTICAL CENTERING control to center the picture in the circular mask opening.
5. Adjust normal HORIZONTAL PEAKING control for a symmetrical pattern so that the outer circle of the test pattern appears round.
6. Adjust the normal HORIZONTAL LINEARITY brass slotted screw located at the rear of the chassis for central alignment of the inner circles of the test pattern.
7. Adjust the normal WIDTH control at rear of the chassis until the four corners of the picture reach the circular mask opening.
8. Readjust the normal HORIZONTAL peaking control for best symmetry.
9. Adjust the HORIZONTAL CENTERING control to center the picture horizontally.
10. Repeat adjustment 3 above to obtain 4:3 aspect ratio of test pattern.

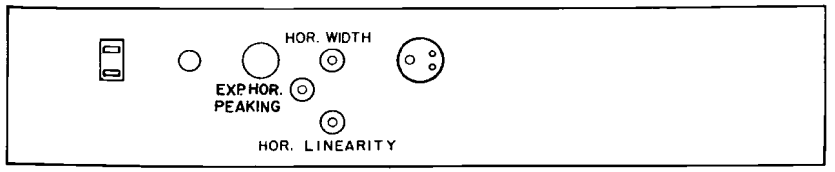
(b) TELE - ZOOM ADJUSTMENTS (Expanded Picture)

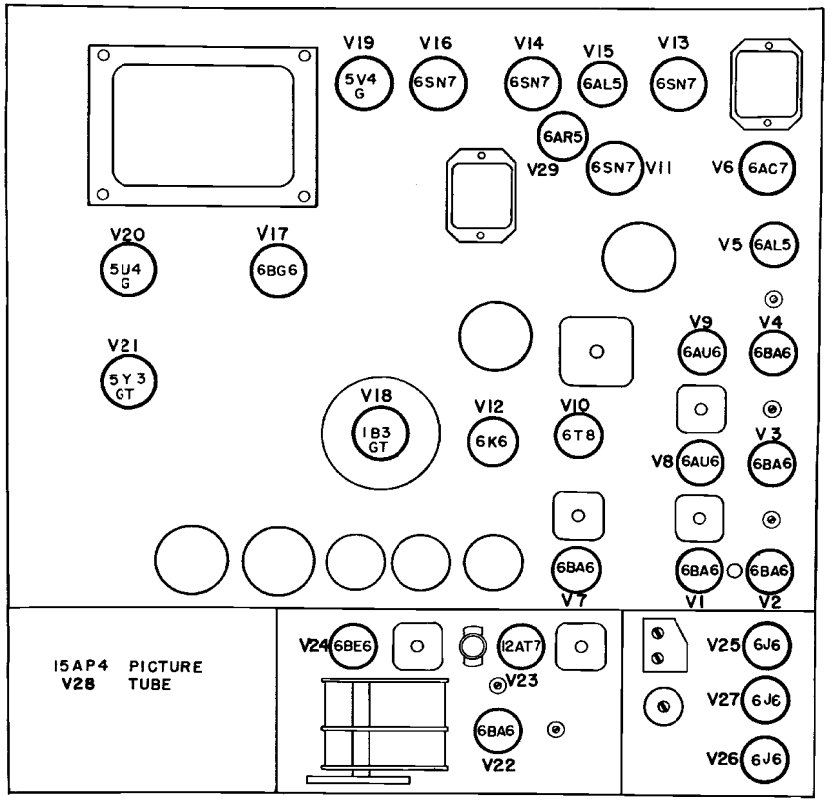
1. Press the button on the remote control box so that the test pattern is expanded on the face of the picture tube.
2. Adjust the EXP. VERTICAL SIZE and EXP. VERTICAL LINEARITY controls until the outer circle of the test pattern fills the entire tube face vertically. Adjustment of either control will require readjustment of the other.
3. Readjust the VERTICAL CENTERING control to center the test pattern on the face of the tube vertically.
4. Adjust the EXP. HORIZONTAL PEAKING control at the rear of the chassis so that the outer circle of the test pattern appears round and fills the face of the tube horizontally.
5. Adjust the AUTO. BRIGHTNESS control if necessary so that the brightness appears the same intensity for normal or expanded picture.
6. Readjust the focus control if necessary.
7. Replace the glass front assembly, cabinet strip and decorative screws.
8. Replace the back cover and line cord assembly.

F-M ANTENNA

The built-in 300 ohm dipole antenna for F-M reception should be suitable for most locations. However in remote areas an external dipole antenna may necessary. The external dipole 300 ohm lead-in should be connected to the two "fahnstock clips" at the top of the cabinet.

REAR VIEW





TUBE PLACEMENT - TOP VIEW

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CIRCUIT ALIGNED	STEP	SELECTOR SWITCH	CHANNEL	SIGNAL GENERATOR CONNECTIONS	SIGNAL GENERATOR FREQ.	CONNECT VTVM	ADJUST	METER INDICATION	REMARKS
TV SOUND	1	FOLLOW PROCEDURE FOR FM-IF & DISCRIMINATOR ADJUSTMENT, STEPS 2,3, & 4 AS SHOWN ON AM-FM ALIGNMENT CHART.							USE IDENTICAL SIGNAL GEN. FREQ AS IN STEPS 2,3,&4 OF FM IF ALIGNMENT. VISUAL CHECK DESIRABLE FOR "TOUCH-UP" OF BAND-PASS CIRCUIT. (SEE FIG. 1)
TV IF	2	TV	8	ACROSS CENTER TAP OF MIX. GRID COILS & GND. (R150)	22.8 MC	ACROSS 4.7K LOAD RES. (R39)	T5	MAX. DEFL.	
	3	"	"	"	22.1 MC	"	T4	"	
	4	"	"	"	24.2 MC	"	T3	"	
	5	"	"	"	24.9 MC	"	T2	"	
	6	"	"	"	21.75 MC	"	T1 (BOT.)	"	
	7	"	"	"	20.25 MC	"	T1 (TOP)	MIN. DEFL.	

TV RF ALIGNMENT

DUMMY ANTENNA	STEP	SIGNAL GENERATOR CONNECTIONS	SIGNAL GENERATOR FREQUENCY (10 MC SWEEP)	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
ONE 150 Ω CARBON RESISTOR IN SERIES WITH EACH LEAD.	8	ANTENNA TERMINALS	213 MC	211.25 MC & 215.75 MC	13	VERT. AMPLIFIER ACROSS CENTER TAP OF MIX. GRID COILS & GND. (ACROSS R150 & C152).	C15, C16 C20, C21 (SEE FIG.2)	ADJUST FOR RESPONSE APPROX. AS SHOWN BELOW, WITH MARKERS MORE THAN 70% OF PEAK AMPLITUDE. KEEP THE RF AND MIXER TRIMMER PAIRS IN APPROX. THE SAME RELATIVE POSITION.
"	9	"	177 MC	175.25 MC & 179.75 MC	7	"	L103, L104	ADJUST RINGS FOR WAVE-FORM AS SHOWN BELOW.
"	10	"	183 MC	181.25 MC & 185.75 MC	8	"		CHECK RESPONSE ON ALL CHANNELS. SLIGHT ADJUSTMENT OF C15, C16, C20 OR C21 MAY BE REQUIRED TO OBTAIN OPTIMUM RESPONSE ON ALL CHANNELS.
"	11	"	189 MC	187.25 MC & 191.75 MC	9	"		
"	12	"	195 MC	193.25 MC & 197.75 MC	10	"		
"	13	"	201 MC	199.25 MC & 203.75 MC	11	"		
"	14	"	207 MC	205.25 MC & 209.75 MC	12	"		
"	15	"	85 MC	83.25 MC & 87.75 MC	6	"	C13, C14 C18, C19	ADJUST FOR RESPONSE APPROX. AS SHOWN BELOW.
"	16	"	79 MC	77.25 MC & 81.75 MC	5	"		CHECK RESPONSE ON ALL CHANNELS. SLIGHT ADJUSTMENT OF C13, C14, C18, OR C19 MAY BE REQUIRED TO OBTAIN OPTIMUM RESPONSE ON ALL CHANNELS.
"	17	"	69 MC	67.25 MC & 71.75 MC	4	"		
"	18	"	63 MC	61.25 MC & 65.75 MC	3	"		
"	19	"	57 MC	55.25 MC & 59.75 MC	2	"		

TV OSC. ALIGNMENT

DUMMY ANTENNA	STEP	SIGNAL GENERATOR CONNECTIONS	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM DC PROBE	ADJUST	REMARKS
SAME AS ABOVE	20	ANTENNA TERMINALS	215.75 MC	13	ACROSS 6AU6 LIM. GRID (PIN 1) & GND.	L102	ADJUST FOR MAXIMUM DEFLECTION.
"	21	"	67.75 MC	6	"	L101	"
"	22	CHECK TO SEE THAT ALL OTHER CHANNELS ARE RECEIVED WELL WITHIN THE LIMITS OF THE FINE TUNING CONTROL. IF NOT, SOME COMPRIMISE MAY BE MADE BY ADJUSTING L102 FOR HIGH CHANNELS AND L101 FOR LOW CHANNELS.					

AM-FM RECEIVER ALIGNMENT CHART

CIRCUIT ALIGNED	STEP	SELECTOR SWITCH POS.	R'C'V'R DIAL SET TO	SIGNAL GENERATOR FREQUENCY	SIGNAL GENERATOR CONNECTIONS	METER TYPE	METER CONNECTIONS	COMPONENT ADJUSTED	METER INDICATION	REMARKS
BC I.F.	1	BC	1650 KC	455 KC 30% MOD.	THRU .1MFD TO 6BE6 GRID PIN #1	A C OUTPUT	ACROSS VOICE COIL	TOP AND BOTTOM OF T10, T11	MAXIMUM DEFLECTION	
FM I.F.	2	FM	108.5 MC	20.25 MC. UN MOD.	THRU .01MFD TO GRID OF 12AT7 (PIN #7)	D C VTVM	FROM LIMITER GRID, PIN 1 OF 6AU6 AND GROUND	TOP AND BOTTOM OF T6, T7, T8	"	
FM DISC.	3	"	"	"	"	"	FROM DISC. CATHODE, PIN 3 OF 6T8 AND GROUND.	TOP OF T9	MAX. DEFLECTION OF EITHER POLARITY	
	4	"	"	"	"	"	"	BOTTOM OF T9	0 VOLTS	ADJUST FOR ZERO BETWEEN PLUS AND MINUS PEAKS
BC OSC	5	BC	1650 KC	1650 KC 30% MOD.	COUPLED TO R'C'V'R LOOP BY 2 OR 3 TURNS	AC OUTPUT	ACROSS VOICE COIL	C-126	MAXIMUM DEFLECTION	
BC RF	6	"	1500 KC	1500 KC 30% MOD.	"	"	"	C-125	"	
FM OSC	7	FM	108.5 MC	108.5 MC UN MOD.	THRU BALANCED 300 Ω DUMMY ANT. TO FM ANT & GND.	D C VTVM	FROM LIMITER GRID PIN 1 OF 6AU6 AND GROUND.	C-123 2-6 MMF TRIMMER ADJ. ACENT TO TUNING GANG	MAXIMUM DEFLECTION	
	8	"	87.5 MC	87.5 MC. UNMOD.	"	"	"	OSC. COIL CORE L90	"	REPEAT STEPS 7 & 8 AS NECESSARY
FM R.F.	9	"	95 MC.	95 MC UNMOD.	"	"	"	RF COIL CORE L86	"	
	10	"	"	"	"	"	"	ANT. TRANS. CORE T-18	"	

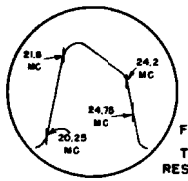

FIG. 1 TV IF RESPONSE

RECOMMENDED RESPONSE CURVES

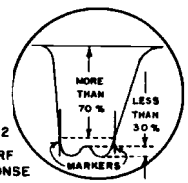

FIG. 2 TV RF RESPONSE

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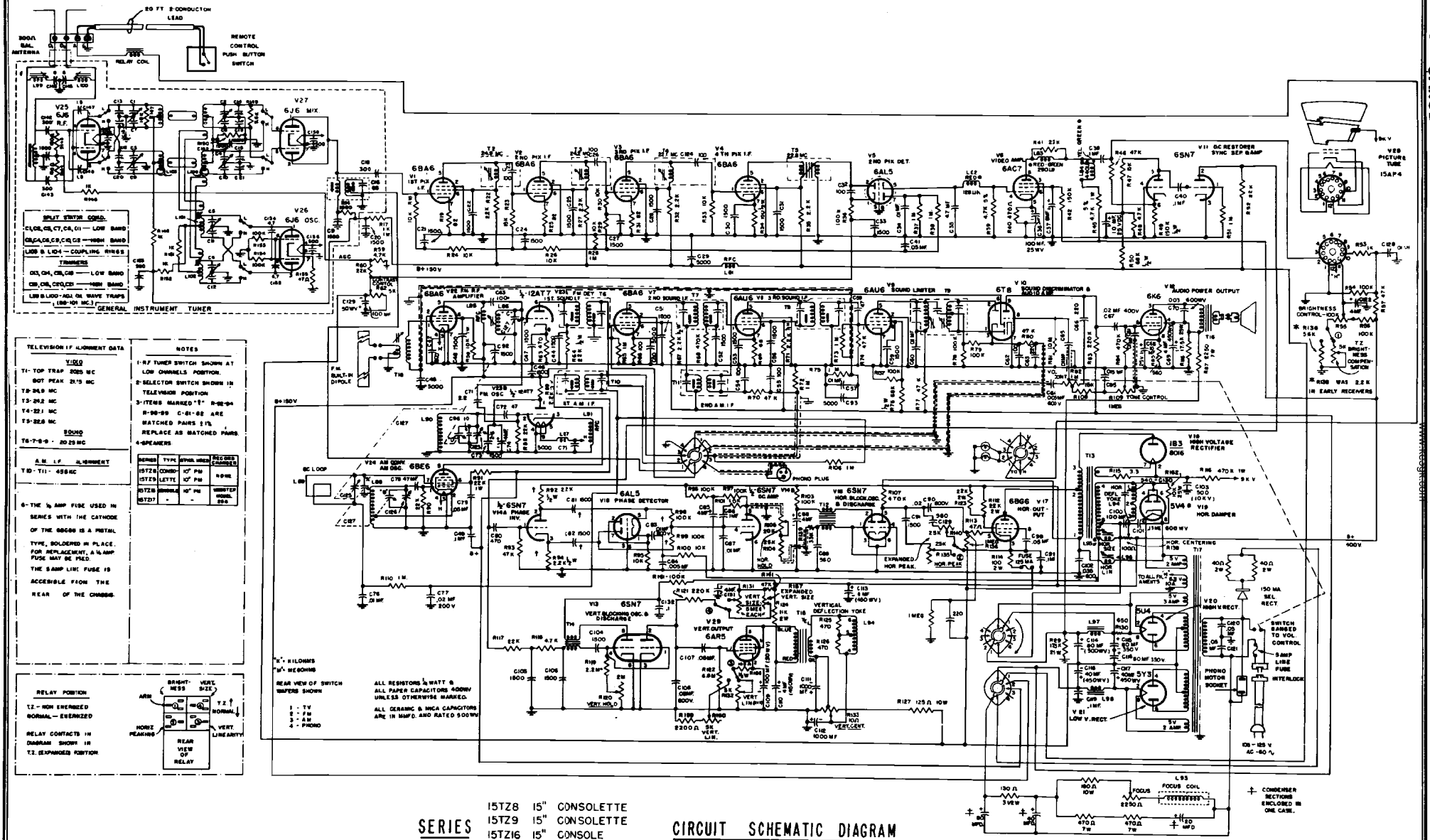

SERIES

15TZ8	15"	CONSOLETTE
15TZ9	15"	CONSOLETTE
15TZ16	15"	CONSOLE
15TZ17	15"	CONSOLE

CIRCUIT SCHEMATIC DIAGRAM

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CIRCUIT ALIGNED	STEP	SIGNAL GENERATOR CONNECTIONS	SIGNAL GENERATOR FREQ.	CONNECT D.C. V.T.V.M	ADJUST	REMARKS
	1	TUNE RECEIVER TO QUIET PORTION OF TV HIGH BAND (CHANNEL 8)				
T V I.F.	2	THRU 1500 MF. COND. TO CENTER TAP OF MIXER GRID COILS & GROUND (ACROSS R5 & C27)	24.55 MC.	ACROSS VIDEO DIODE LOAD - HIGH SIDE TO JUNCTION OF L5, L6 & R104, - LOW SIDE TO GROUND.	T4	ADJUST FOR MAXIMUM DEFLECTION ON V.T.V.M.
	3	"	21.6 MC.	" " "	T3	" " "
	4	"	24.55 MC.	" " "	T2	" " "
	5	"	21.6 MC	" " "	T1 BOTTOM	" " " VISUAL CHECK-UP DESIRABLE FOR TOUCH-UP OF BANDPASS CIRCUIT. SEE FIG. 1 FOR RESPONSE.
SOUND TAKE-OFF	6	THRU 1500 MMFD. COND. ACROSS DIODE LOAD - HIGH SIDE TO JUNCTION OF L5, L6 & R104 - LOW SIDE TO GROUND	4.5 MC.	NEGATIVE LEAD TO JUNCTION OF R22 & R23 (LOCATED AT 6T8 RATIO DET.) POSITIVE LEAD TO EITHER SIDE OF C41 4 MF. CONDENSER.	T5 TOP T5 BOT. T6 BOT.	ADJUST FOR MAXIMUM DEFLECTION ON V.T.V.M.
RATIO DETECTOR	7	"	4.5 MC.	NEGATIVE LEAD TO JUNCTION OF R22 & R23 (LOCATED AT 6T8 RATIO DET.) POSITIVE LEAD TO JUNCTION OF C43, C45 & R24 (OUTPUT OF DEEMPHASIS NETWORK)	T6 TOP	ADJUST FOR ZERO OUTPUT ON V.T.V.M. BETWEEN A PLUS AND A MINUS PEAK.

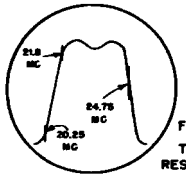


FIG. 1 TV IF RESPONSE

RECOMMENDED RESPONSE CURVES

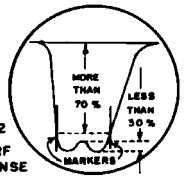
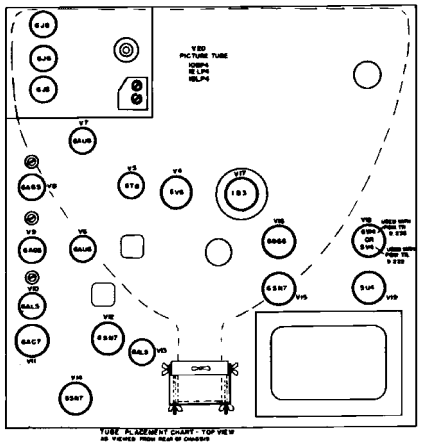
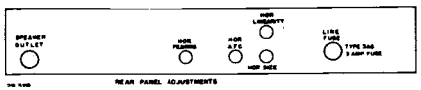


FIG. 2 TV RF RESPONSE



TUBE PLACEMENT CHART - TOP VIEW



REAR PANEL ADJUSTMENTS

TV RF ALIGNMENT

DUMMY ANTENNA	STEP	SIGNAL GENERATOR CONNECTIONS	SIGNAL GENERATOR FREQUENCY (10 MC SWEEP)	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
ONE 150 Ω CARBON RESISTOR IN SERIES WITH EACH LEAD.	8	ANTENNA TERMINALS	213 MC	211.25 MC & 215.75 MC	13	VERT. AMPLIFIER ACROSS CENTER TAP OF MIX. GRID COILS & GND. (ACROSS R5 & C27).	C11, C20 C13, C22 (SEE FIG. 2)	ADJUST FOR RESPONSE APPROX. AS SHOWN BELOW, WITH MARKERS MORE THAN 70% OF PEAK AMPLITUDE. KEEP THE RF AND MIXER TRIMMER PAIRS IN APPROX. THE SAME RELATIVE POSITION.
"	9	"	177 MC	175.25 MC & 179.75 MC	7	"	L1 & L2	ADJUST RINGS FOR WAVE-FORM AS SHOWN BELOW.
"	10	"	183 MC	181.25 MC & 185.75 MC	8	"		CHECK RESPONSE ON ALL CHANNELS. SLIGHT ADJUSTMENT OF C11, C20, C13, OR C22 MAY BE REQUIRED TO OBTAIN OPTIMUM RESPONSE ON ALL CHANNELS.
"	11	"	189 MC	187.25 MC & 191.75 MC	9	"		
"	12	"	195 MC	193.25 MC & 197.75 MC	10	"		
"	13	"	201 MC	199.25 MC & 203.75 MC	11	"		
"	14	"	207 MC	205.25 MC & 209.75 MC	12	"		
"	15	"	85 MC	83.25 MC & 87.75 MC	6	"	C7, C16 C9, C18	ADJUST FOR RESPONSE APPROX. AS SHOWN BELOW.
"	16	"	79 MC	77.25 MC & 81.75 MC	5	"		CHECK RESPONSE ON ALL CHANNELS. SLIGHT ADJUSTMENT OF C7, C16, C9, OR C18 MAY BE REQUIRED TO OBTAIN OPTIMUM RESPONSE ON ALL CHANNELS.
"	17	"	69 MC	67.25 MC & 71.75 MC	4	"		
"	18	"	63 MC	61.25 MC & 65.75 MC	3	"		
"	19	"	57 MC	55.25 MC & 59.75 MC	2	"		

TV OSC. ALIGNMENT

DUMMY ANTENNA	STEP	SIGNAL GENERATOR CONNECTIONS	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM DC PROBE	ADJUST	REMARKS
SAME AS ABOVE	20	ANTENNA TERMINALS	215.75 MC	13	ACROSS 6AU6 LIM. GRID (PIN 1) & GND.	L4	ADJUST FOR MAXIMUM DEFLECTION.
"	21	"	87.75 MC	6	"	L3	" " "
"	22	CHECK TO SEE THAT ALL OTHER CHANNELS ARE RECEIVED WELL WITHIN THE LIMITS OF THE FINE TUNING CONTROL. IF NOT, SOME COMPRIMISE MAY BE MADE BY ADJUSTING L4 FOR HIGH CHANNELS AND L3 FOR LOW CHANNELS.					

ELECTRICAL SPECIFICATIONS
Line Voltage ..... 105-125V.A.C.
Frequency ..... 60 cycles
Wattage ..... 175 watts

ANTENNA REQUIREMENTS
Type ..... Folded Dipole or Equiv.
Impedance ..... 300 ohms

TUBE COMPLEMENT (Total: 19 plus Picture Tube)
(V1) R.F. Amplifier 6J6
(V2) Converter 6J6
(V3) Oscillator 6J6
(V4) Audio Output 6V6
(V5) Ratio Detector & Audio Amp 6T8
(V6) Ratio Detector Driver 6AU6
(V7) 1st Video I.F. 6AU6
(V8) 2nd Video I.F. 6AG5
(V9) 3rd Video I.F. 6AG5
(V10) Video Det. - A.G.C. 6AL5
(V11) Video Amplifier 6AC7
(V12) D.C. Rest., Clip., Sync. Sep. 6SN7
(V13) Hor. Phase Detector 6AL5
(V14) Vert. Sweep Osc. & Output 6SN7
(V15) Hor. Sweep Osc. 6SN7
(V16) Hor. Sweep Output 6BG6G
(V17) High Voltage Rectifier 1B3GT
(V18) Hor. Damper ..... 6W4 or 5V4
(V19) Power Rectifier 5U4G
(V20) Picture Tube ..... See Diagram

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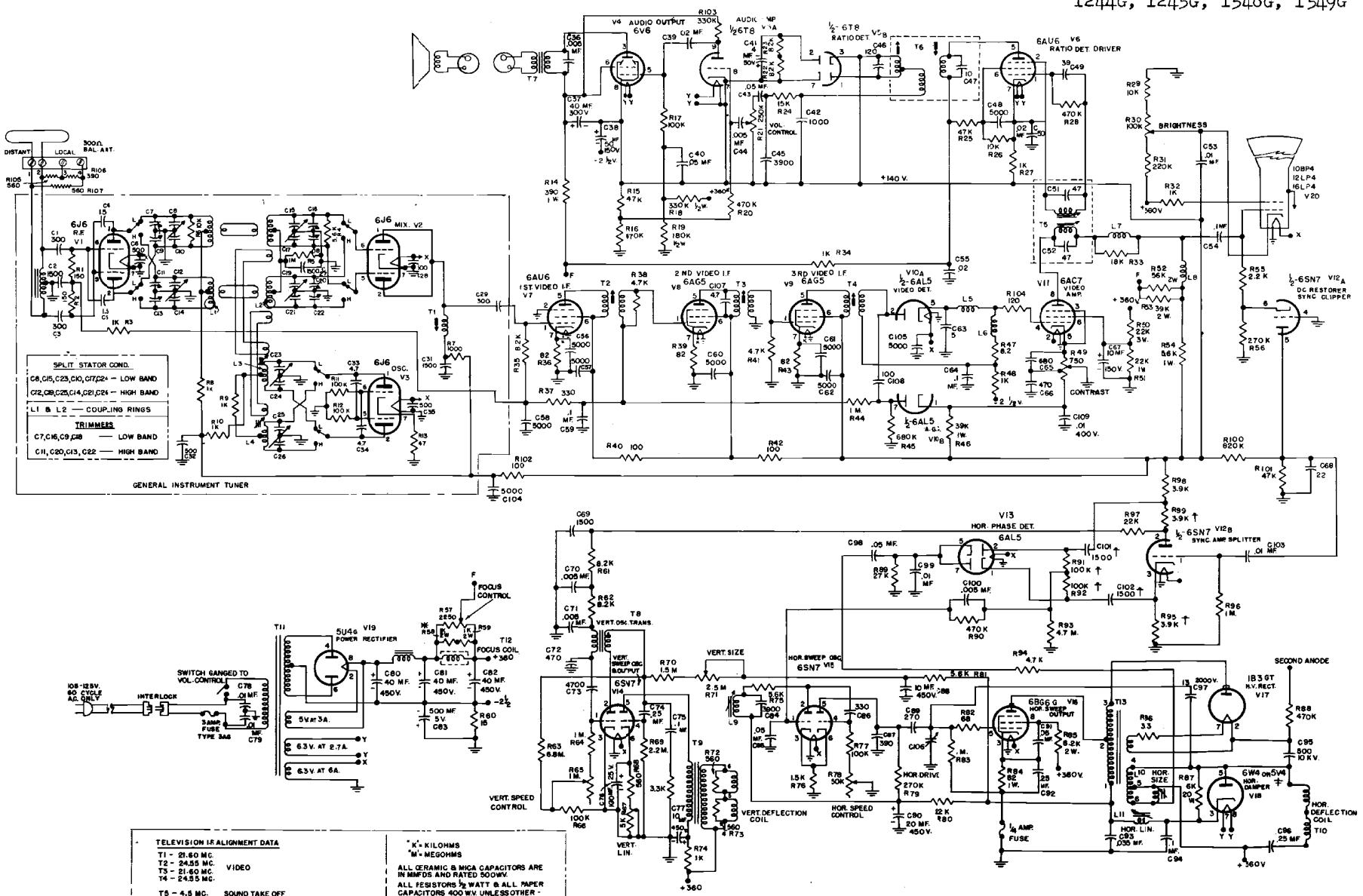
MODELS 1042G, 1043G, 1546G, 1547G, 1244G, 1245G, 1548G, 1549G



TELEVISION I.F. ALIGNMENT DATA

T1 - 21.60 MC.
T2 - 24.55 MC.
T3 - 21.60 MC. VIDEO
T4 - 24.55 MC.

T5 - 4.5 MC. SOUND TAKE OFF

T6 - 4.5 MC. RATIO DETECTOR

THE ¼ AMP FUSE USED IN SERIES WITH THE CATHODE OF THE 6BG6 G IS ACCESSIBLE FROM THE BOTTOM OF THE CHASSIS.

THE 3 AMP LINE FUSE IS ACCESSIBLE FROM THE REAR OF THE CHASSIS.

"K" = KILOHMS
"M" = MEGOHMS

ALL CERAMIC & MICA CAPACITORS ARE IN MMFDS AND RATED 500WV.

ALL RESISTORS ½ WATT & ALL PAPER CAPACITORS 400 W.V. UNLESS OTHERWISE MARKED.

† = ITEMS MARKED †; R91, R92, R95, R99, C101, C102 - ARE MATCHED PAIRS ± 1% REPLACE AS MATCHED PAIRS.

‡ V18 - 6W4 USED WITH POWER TRANS. PART NO. 9.235
5V4 USED WITH POWER TRANS. PART NO. 9.222

*R58 IS SHORTED OUT IN SETS EMPLOYING 10BP4 & 12LP4 PICTURE TUBES

SERIES

1042 G 10" TABLE MODEL MAHOGANY
1043 G 10" TABLE MODEL BLEACHED
1244 G 12" TABLE MODEL MAHOGANY
1245 G 12" TABLE MODEL BLEACHED
1546 G 16" TABLE MODEL MAHOGANY
1547 G 16" TABLE MODEL BLEACHED
1548 G 16" CONSOLETTE MAHOGANY
1549 G 16" CONSOLETTE BLEACHED

CIRCUIT SCHEMATIC DIAGRAM

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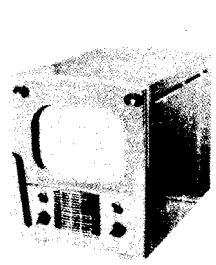
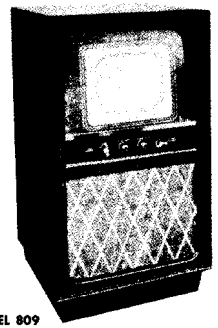
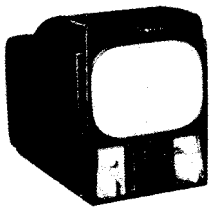
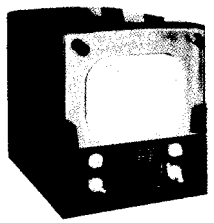

MODEL 807


MODEL 809


MODEL 805


MODEL 806

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 servicing a chassis which has been removed from the cabinet. Always use an isolation transformer in the power line when servicing or aligning these receivers.

GENERAL INFORMATION

The General Electric Models 805, 806 and 807 are table model type television receivers providing reception on all twelve commercial television channels. The Model 809 is a consolette type receiver, providing reception on all twelve commercial channels. The picture is reproduced on a 10-inch picture tube electromagnetically deflected.

Features of this television receiver include a two stage r-f amplifier, balanced input impedance, selenium type rectifiers, inter-carrier sound system, ratio detector, improved focus control, safe high voltage for the picture tube, automatic frequency control for horizontal sweep synchronization. Models 806, 807 and 809 employ a picture tube with aluminized screen for brighter pictures.

INSTALLATION AND OPERATING INSTRUCTIONS:

Models 805, 806, 807 . . . . . Installation Instructions ER-A-805
Models 805, 806, 807 . . . . . Operating Instructions ER-I-805B
Model 809 . . . . . Installation Instructions ER-A-809
Model 809 . . . . . Operating Instructions ER-I-809

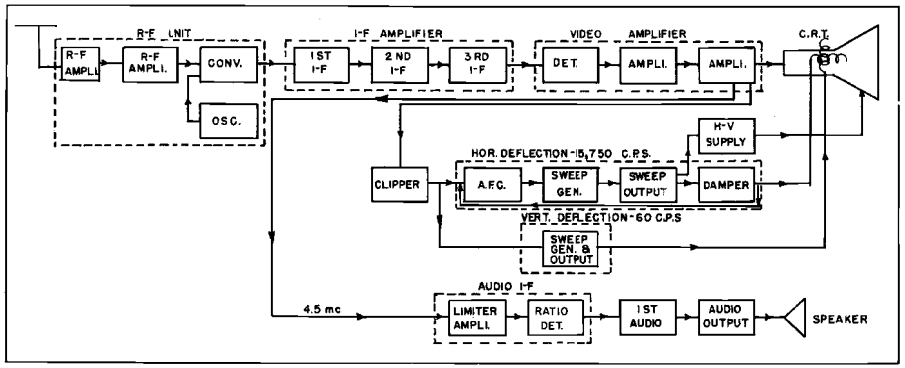


Fig. 1. Block Diagram Models 805, 806, 807, and 809

SPECIFICATIONS

		805	806	807	809
OVER-ALL DIMENSIONS:	Height	14 1/16 in.	17 1/16 in.	17 1/16 in.	35 1/2 in.
	Width	11 3/4 in.	13 1/2 in.	13 1/2 in.	20 in.
	Depth	20 1/4 in.	19 7/8 in.	19 7/8 in.	21 1/8 in.

ELECTRICAL RATING:	Frequency	60 cycles
	Voltage	115 v. ac
	Watts	150 w.
INTERMEDIATE FREQUENCIES:	Video	26.3 mc
	Audio	4.5 mc
AUDIO POWER OUTPUT:	Undistorted	1.0 watt
	Maximum	2.0 watts
LOUDSPEAKER:	Type	Electrodynamic or PM (see production changes)
	Cone Diameter (805, 806, 807)	4 inches
	(809)	10 inches
	Voice Coil Impedance @ 400 Cycles	3.2 ohms

R-F FREQUENCY:	Selector Switch Position	Frequency Range MC	Picture Carrier Frequency MC	Sound Carrier Frequency MC
	No. 2	54–60	55.25	59.75
	No. 3	60–66	61.25	65.75
	No. 4	66–72	67.25	71.75
	No. 5	76–82	77.25	81.75
	No. 6	82–88	83.25	87.75
	No. 7	174–180	175.25	179.75
	No. 8	180–186	181.25	185.75
	No. 9	186–192	187.25	191.75
	No. 10	192–198	193.25	197.75
	No. 11	198–204	199.25	203.75
	No. 12	204–210	205.25	209.75
	No. 13	210–216	211.25	215.75

ANTENNA:	Type	Folded dipole, or equivalent
	Impedance	300 ohms

PICTURE SIZE:	
Model 805, 806, 807, 809 Early	8 1/2 in. x 6 3/8 in.
Model 806, 807, 809 Late	9 1/2 in. x 7 1/2 in.

TUBES:	SYMBOL	PURPOSE	TYPE
	V1	R-F Amplifier	6AU6
	V2	R-F Amplifier (W version)	6AU6 6AG5
	V3	Converter-Oscillator	12AT7
	V4	1st I-F Amplifier	6AU6
	V5	2nd I-F Amplifier	6AU6
	V6	3rd I-F Amplifier	6AU6
	V7	Video Detector, D-C Restorer and Clipper	6AL5
	V8	Video Amplifier	12AU7
	V9	Picture Tube (Model 805)	10BP4
	V9	Picture Tube (Models 806, 807, and 809)	10FP4
	V10	Vertical Multivibrator and Sweep Output	12SN7GT
	V11	Phase Inverter and Clipper (early and "T" versions)	12SN7GT
	V12	AFC and Hor. Sweep Generator (early and "T" versions)	12SN7GT
	V13	Hor. Sweep Output	19BG6-G
	V14	Hi-voltage Rectifier	1B3GT/ 8016
	V15	Damper ("Early" version); Damper ("T" "U" and "W" version)	25Z6GT 25W4
	V16	Audio I-F Limiter and Amplifier	6AU6
	V17	Ratio Detector	6AL5
	V18	1st Audio Amplifier	6SQ7
	V19	Audio Output	25L6GT
	V20	Sync Inverter and Clipper ("U" and "W" version)	6SL7GT
	V21	Hor. Control & Oscillator ("U" and "W" version)	12SN7GT
	V22	AFC Disc ("U" and "W" version)	6AL5

CAUTION NOTICE

The regular B + voltages are dangerous and precaution should be observed when this chassis is removed from its cabinet for service purposes. The high-voltage supply (9000 v.) at the picture tube anode will give an unpleasant shock but will 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 + supply, certain portions of the high-voltage generating circuit are dangerous and extreme precautions should be observed.

DESCRIPTION—TELEVISION RECEIVER CIRCUITS

The television receiver circuits are divided into the following sections:

1. R-F Amplifier, Oscillator, and Converter (Head-End).
2. Video and Audio I-F Amplifier.
3. Video Detector and Video Amplifier.
4. Horizontal and Vertical Sync. Pulse Separator.
5. Vertical Sweep Generator and Output.
6. Horizontal Sawtooth Generator & AFC.
7. Horizontal Sweep Output.
8. High Voltage Power Supply for Picture Tube.
9. B + Power Supply.

A brief description of the operation of each circuit is given 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 diagrams

A block diagram of the receiver is shown in Figure 1 to assist in signal tracing and to better visualize the operation of the receiver.

1. R-F AMPLIFIER, CONVERTER AND OSCILLATOR (SEE FIGURE 2).

The r-f head-end unit which includes two r-f amplifier stages, a converter and local oscillator is constructed as a self-contained subassembly which can be demounted readily from the main chassis. The tube complement consists of two Type 6AU6 tubes used as r-f amplifiers (V1, V2) and a twin triode Type 12AT7, one section of which is the converter (V3A) and the other section is the local oscillator (V3B). The 1st r-f amplifier, V1, is connected as a triode amplifier.

The antenna input circuit provides a 300 ohm balanced input. To obtain this, the antenna input is coupled between the grid and cathode sections of the tube so that both of these tube elements perform as signal input elements. The Gm of a 6AU6 tube connected as a triode is adjusted so the input impedance to the cathode is approximately 300 ohms, the grid input is made the equivalent by shunting its input impedance by a resistor, R201, to give a balance. The addition of the center-tapped choke L201 from grid to cathode provides a balance to ground and, at the same time, transfers the cathode and grid impedances so as to give a total of 300 ohms across the choke terminals, which is the point of signal input. The inductance of L201 is chosen to resonate broadly with the capacity in the grid and cathode circuits so as to provide a uniform impedance for all of the lower channels. Chokes L203 and L207 are shunted across the choke L201 on the high frequency channels for the same reason.

The resistors R216 and R217 are used to drain static charges from the antenna to ground. C201 and C203 are employed to keep line voltage off from the antenna and to form a high-pass filter with L201, L203, and L207 to remove any low frequency interference.

Tuning of the r-f amplifier is provided by a shunt tuned circuit in the plate circuit of each of the r-f amplifier tubes, V1 and V2.

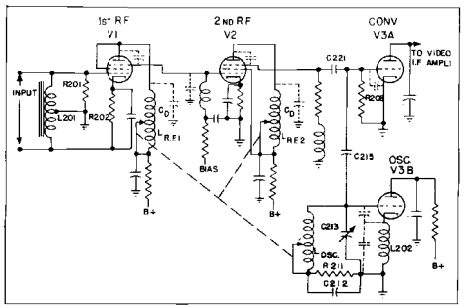


Fig. 2. R-F Amplifier, Converter, and Oscillator

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The bandwidth is acquired on the low frequency channels by stagger tuning these two tuned circuits so that the 1st r-f amplifier tunes to a lower frequency than that of the 2nd r-f amplifier plate circuit. On the upper channels, the tube loading provides a rounded top of sufficient bandwidth. The plate circuit coils are selected by a wafer-type rotary switch and are pretuned at the factory so that the inductance of the coil resonates with the distributed and tube capacity to give the desired frequency.

It will be noted that the V1 suppressor grid is connected directly to the control grid of V2. Since the suppressor grid is in the tube plate electron stream and has interelectrode capacity with the plate, it provides an efficient coupling device. The r-f choke coils in the output of V1 and the output of V2 are used as a high-pass filter to shunt out any r-f interference of a low frequency which may be passed from the 1st r-f amplifier. A bias derived from the contrast control circuit is applied to the 2nd r-f amplifier grid circuit.

The output of the 2nd r-f amplifier is coupled by the suppressor grid, to the converter V3A, through the coupling capacitor C221. Converter grid rectification of the local oscillator voltage charges C221 which in conjunction with R208 provides the necessary bias for the converter grid.

The triode tube section, V3B, is connected in a modified Colpitts oscillator circuit which operates on the high frequency side of the r-f channel frequencies for all channels. Oscillation is provided by the split capacity across the inductance, L202, consisting of the cathode-to-grid and cathode-to-plate interelectrode and distributed capacities. The choke L202 provides a d-c ground path to the cathode of the tube and maintains the cathode off-ground at the r-f frequencies. C213 is variable and is the tuning control, permitting a limited variation in frequency for each channel selected. C212 and R211 is the grid leak and capacitor used for self bias on the oscillator. Coupling of the oscillator voltage into the converter grid is provided through the capacitor C215.

2. VIDEO AND AUDIO I-F AMPLIFIERS (SEE FIGURE 3).

The video i-f amplifier makes use of three Type 6AU6 pentode tubes in a stagger tuned band-pass amplifier. A single-tuned choke is included in each stage, each tuned to a different frequency and then loaded with suitable resistance to give an adequate over-all band-pass frequency characteristic. The choke inductance in conjunction with the tube and distributed circuit capacity represented by C_D in the diagram are tuned to the approximate frequencies shown in Figure 3 by the variable core adjustments in the chokes.

Since intercarrier sound is used in these receivers, the sound i-f of 21.8 mc formed at the converter is passed through the entire video i-f amplifier to the detector. It is attenuated in passage through the video i-f to give the proper ratio of sound i-f to video i-f signal at the detector. At the detector, the video modulation components are detected from the 26.3 mc video i-f and, also, a 4.5 mc frequency-modulated sound i-f results from the beat between the 21.8 MC sound i-f and the 26.3 mc video i-f. This 4.5 mc is amplified by the video amplifier tube sections V8A and V8B and then applied to a limiter-amplifier tube V16. Detection of the 4.5 mc signal is accomplished by a ratio detector, V17.

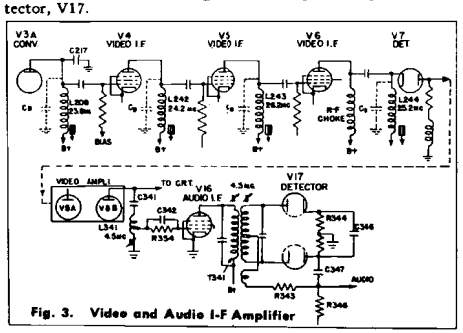

Fig. 3. Video and Audio I-F Amplifier

No trap circuits are required in the video i-f amplifier. The shaping of the skirts of the i-f response is accomplished by the choise of frequencies to which each tuned i-f choke resonates and by the loading across this tune circuit. At the output of the video amplifier, a 4.5 mc series tuned circuit, consisting of C341 and L341, is used to attenuate the 4.5 mc FM i-f prior to application of the video signal to the picture tube. By taking voltage across the inductive reactive element of this trap, it will provide a means of obtaining a slug tuned input to the limiter stage at the sound i-f of 4.5 mc.

The contrast control bias is applied to the 1st video i-f amplifier as well as the 2nd r-f amplifier. On early production receivers, the contrast control obtained its bias from a fixed negative voltage source, while on "U" and "W" version receivers this bias was obtained from the video detector and clipper tube circuits which furnished a variable source of bias for AGC purposes.

3. VIDEO DETECTOR AND VIDEO AMPLIFIER (SEE FIGURE 4).

The video i-f amplifier output is applied to one section of a 6AL5 dual diode, V7A, which is connected as a series diode so as to develop a negative-going signal across the diode load resistance, R265. The signal is then amplified by two triode amplifier stages using a Type 12AU7 dual triode tube, V8. L255 and L258 are series compensating chokes, while L256, L260, and L257 are shunt compensating chokes. These are used to obtain good high frequency response and provide sharp cut-off at frequencies above the useable pass-band. The combination of C266, C281, L249, and L255 serve as an i-f filter to prevent any of the i-f or harmonic frequencies thereof from being amplified by the video amplifier.

In addition to amplification, the first video amplifier tube V8A operates as a noise limiter. The B+ voltage applied to this tube is relatively low and the video signal applied to the grid is negative-going. Any large excursions of voltage above sync level, such as introduced by transient noise, will drive the grid voltage sufficiently negative to cause plate current cut-off. Thus, the interference will be limited close to the level of the sync signal. This improves the signal to transient noise interference ratio without affecting the video signal.

Since capacity coupling of the video amplifier stage is used, the d-c component of the video signal must be restored to maintain the proper background illumination. This is accomplished by the diode V7B. The negative-going output signal of V8B, which is coupled to the picture tube, is also applied to the cathode of V7B through the resistor capacitor coupling (R266 and C274) components. The rectification of this signal causes the capacitor C274 to charge to the peak value of the sync pulse. Since this charge will vary with the amplitude of the pulse above the a-c axis, the resulting d-c voltage will provide the required restoration of the d-c component. This d-c is supplied to the a-c video component through the resistor R269, so that the grid of the picture tube will have a composite video signal with a d-c component.

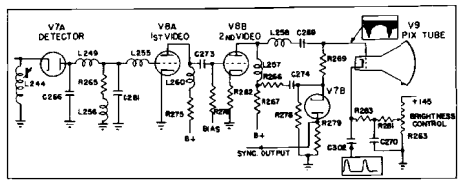

Fig. 4. Video Detector and Amplifier

On early production receivers, the diode V7B also performs the function of the 1st clipper, developing the sync pulse voltage across R279 to be passed on to an additional clipper and the sync circuits which follow. On "U" and "W" version receivers, this tube is not used as a clipper, its only function being to restore the d-c component at the picture tube grid.

By connecting the cathode of the picture tube to a variable positive voltage source, the picture tube may be biased so as to change the brilliance. The potentiometer control, R263, which changes this bias voltage, is brought out to the front panel as the Brightness Control. In addition to the bias supplied the cathode, a voltage waveshape (shown in Figure 4) derived from the vertical sweep output, is supplied through the capacitor C302. The positive peak voltage corresponds to retrace time so that by application to the cathode circuit, it causes the picture tube to be biased to cut-off during its duration. This results in the removal of most of the retrace lines.

4. SYNC SEPARATION (SEE FIGURE 5).

Figure 5 shows the circuit used in the early production and "T" version receivers for amplification and shaping of the sync pulses and their separation (clipping) from the composite video signal. This circuit incorporates two clippers. Partial clipping of the sync pulse from the video signal is performed by the diode, V7B. This tube also performs the function of the d-c restorer for the video amplifier output to the picture tube as described in the previous section. With the polarity of the sync pulses of

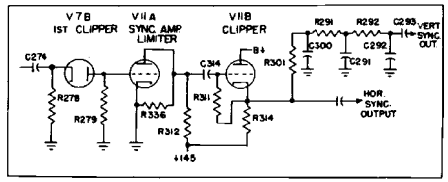

Fig. 5. Sync Separator Circuit

the composite video signal being negative-going as applied through capacitor C274, the diode V7B will conduct on negative peaks of the composite video signal, resulting in negative polarity sync pulses developed across R279. The application of this signal to tube V11A performs the following. The signal is (1) amplified, (2) limited in amplitude so as to reduce any noise riding above the sync pulse amplitude and, (3) invert the phase of the signal so that a positive-going signal can be applied to the following tube V11B, which functions as a second clipper.

The clipper tube V11B is operated at a low plate voltage with its bias derived by grid rectification of the positive polarity signal applied to the grid. Thus, conduction in V11B will occur only during the sync pulse intervals which are the most positive component of the signal applied, resulting in clipping action. The horizontal and vertical synchronizing pulses are developed across R314 in the cathode of V11B and are positive-going.

An integrating network, consisting of R301, R291, R292, C300, C291 and C292, is used to separate the horizontal sync from the vertical sync pulses before passage of the sync signal to the vertical sweep generator.

In the "U" and "W" version receivers which use a different type of horizontal AFC circuit, the clipper circuit is used. The diode V7B is used only as a d-c restorer, R279 being omitted in the "U" and "W" version. The only clipper is the second section of V20. This particular type of AFC circuit requires negative-going sync pulses taken from the clipper plate instead of from the cathode. The negative-going sync pulse output of V20 is applied to the cathode of the AFC diodes as indicated in Figure 9 and also to the vertical integrating circuit. The negative-going vertical sync pulses are applied to the grid of V10B of the vertical sweep generator rather than V10A.

5. VERTICAL SWEEP GENERATOR AND OUTPUT (SEE FIGURE 6).

The vertical sawtooth waveshape is generated by a Type 12SN7GT, V10, connected as a multivibrator. The tube section, V10B, also serves the function of an output tube supplying a sawtooth current wave to the vertical sweep yoke, D291, through the impedance matching transformer T291. Vertical frequency is controlled by changing the bias on V10A by the (Hold) potentiometer, R298. This bias change results in the free running conduction level for tube V10A being made variable which controls the frequency of the discharge rate of C295, across which the sawtooth voltage waveshape is formed. Vertical size (Height) of the picture is changed by the potentiometer R302, which changes the B+ voltage applied to the sawtooth waveshape forming capacitor, C295, in the plate of V10A. By changing the operating bias on tube, V10B, by the potentiometer R300, the conduction characteristics of this tube may be changed to compensate for non-linearity in the current output waveshape of V10B.

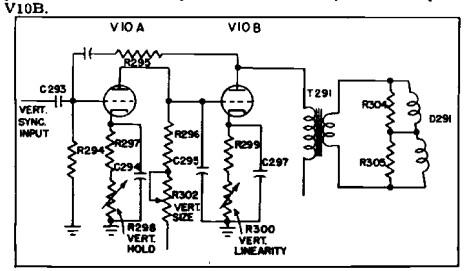

Fig. 6. Vertical Sweep and Output

6. HORIZONTAL SAWTOOTH GENERATOR AND AFC SYNC (SEE FIGURE 7 AND FIGURE 9).

The horizontal sawtooth generator makes use of one section of a Type 12SN7GT tube, V12B, connected in a blocking oscillator circuit. Instead of its frequency being controlled directly by

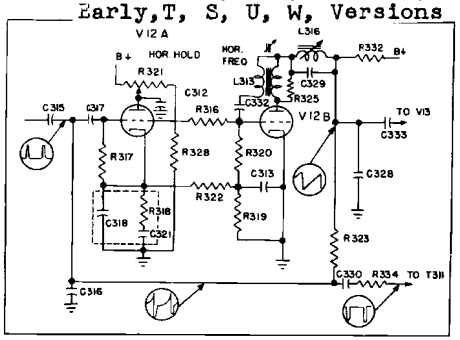

Fig. 7. Horizontal Sweep and AFC Sync (Early and "T" Version)

the horizontal sync pulse, it is controlled by the adjustment of the operating bias in the grid of this tube. A control tube consisting of the other triode tube section, V12A, is incorporated which compares the phase between the incoming horizontal sync and the blocking oscillator frequencies, the result of which produces a voltage proportional to the phase displacement. This voltage, which is called an automatic frequency control (AFC) voltage, is applied as bias to the grid of the blocking oscillator tube V12B and results in the oscillator frequency being maintained at the proper phase relation with the incoming sync signals.

The tube V12A obtains its operating bias through its connection to the grid circuit of the blocking oscillator tube, V12B, through resistor, R316. This bias is sufficiently great to keep the tube V12A cut off except when the sync pulse rides up on the fed-back waveform, as shown in Figure 8(B). If the sweep generator frequency changes phase in relation to the sync pulse such as when the generator is operating at too low a frequency, the pulse will slide up the slope of the waveshape as shown in Figure 8(A), resulting in longer plate conduction. If the blocking oscillator frequency is operating at too high a frequency, the sync pulse will slide down the slope of the waveshape as shown in Figure 8(C), resulting in a shorter plate conduction than in Figures 8(A) or 8(B). During the conduction of tube V12A, the cathode filter capacitors consisting of C318 and C321 charge to a d-c potential proportional to the plate conduction time. With this potential applied to the grid circuit of tube V12B, through resistor R322, the resulting change in bias voltage in this tube changes the oscillator frequency so as to pull it in phase with the incoming horizontal sync pulses.

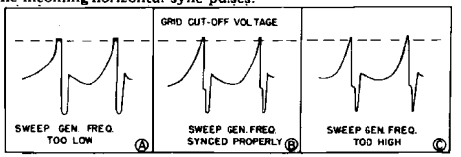

Fig. 8. AFC Waveshapes (Early and "T" Version)

A tuned circuit consisting of L316 and C329, adjusted for the horizontal frequency, is used in series with the plate return lead to the blocking oscillator of later production "T" version receivers to stabilize the sync, especially in the presence of noise. It is shock excited into oscillation by the pulses of plate current and adds to the sawtooth wave developed across C328 in proper phase to increase the slope of the wave just prior to discharge (retrace portion of sawtooth). This increase in slope gives greater sensitivity of control. This voltage applied through resistor R323, to the integrated pulse from transformer, T312, is the waveshape fed-back from the sweep generator and applied to the input of the control tube grid.

The Horizontal Hold Control R321 is used to vary the frequency about the mean horizontal sweep frequency by varying the AFC tube V12A plate voltage. By varying the iron core slug in the blocking oscillator transformer, the frequency of the sweep generator is also changed. The choke L316 is made variable so that it may be used to change the slope of the oscillator waveform.

During production of these receivers, another form of horizontal oscillator and AFC control circuit was incorporated, as shown in Figure 9. Chassis with this circuit were marked "U" or "W."

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One section of a Type 12SN7GT tube, V21B, functions as a 15,750 cycle/sec. sine wave oscillator and sawtooth generator, while the other section, V21A, is the reactance control tube. A Hartley oscillator circuit, consisting of coil L316 and capacitors C403 and C401, is connected to oscillate at a mean frequency of 15,750 cycles/sec. in the grid of V21B. This sine wave voltage generated in the grid circuit, biases tube V21B by the grid leak bias developed across R394 and C402, so as to give a class C operation to tube V21B. In the plate circuit of V21B is a capacitor C404 which charges and discharges as plate current is turned off-and-on by the tube, thus forming a sawtooth type of waveshape across this capacitor.

Across the tank circuit of the sine wave oscillator is connected an AFC reactance tube V21A. It derives its name because it appears like a variable resistance in series with C400, and shunts the Hor. Osc. tank circuit. When the bias on tube V21A changes, the frequency of the sine wave oscillator changes; as for example, when the bias becomes more negative, the tube plate resistance rises and makes C400 have less capacity effect on the tank circuit with the result that the frequency of the sine wave oscillator will rise. The opposite effect is true if the bias changes in the positive direction. The bias change for V21A is obtained by a sync discriminator circuit.

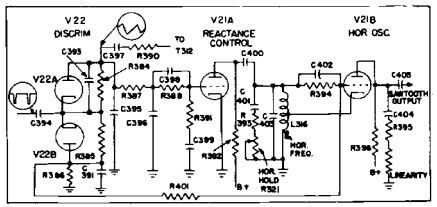

Fig. 9. Hor. Sweep and AFC Sync (U and W Version)

The discriminator circuit makes use of a Type 6AL5 dual diode V22, which produces a d-c voltage (AFC) proportional to the phase displacement of the incoming sync pulse as compared to the output sawtooth voltage. The output sawtooth voltage is developed across C395. When in phase as shown in Figure 10(A), the d-c voltages across resistors R384 and R385 are of equal and opposite polarity resulting in zero voltage developed across C395. When the sawtooth voltage lags the sync pulse, as shown in Figure 10(B), a minus control voltage exists because the d-c voltage E_{D2} across R384 exceeds the voltage E_{D1} across R385. This minus voltage applied to V21A caused C400 to become less effective across the sine wave oscillator tank and the frequency is raised. In (C), the reverse condition exists and the correction takes place in the opposite direction. Thus the output of the discriminator swings from positive through zero to negative, depending upon the phase relation of the sync pulse and the sawtooth output.

The control shown in Figure 9 is the Horizontal Hold Control which establishes the correct operating frequency for the sine wave oscillator.

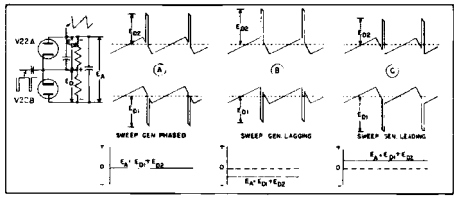

Fig 10. AFC Waveshape (U and W Version)

7. HORIZONTAL SWEEP OUTPUT (SEE FIGURE 11).

The horizontal sawtooth waveshape formed across capacitor C328 (C404 in "U" and "W" version) is amplified by a power pentode Type 19BG6G tube, V13. The output of this tube which is essentially a sawtooth current wave is applied to the horizontal deflection coils through an impedance matching transformer T312. The damping tube diode V15 is connected across a part of the secondary and functions principally to remove a transient oscillation created during rapid retrace of the current in the high inductance of the plate circuit and still retain the positive overshoot in the primary of T312 for use in the high voltage supply. The damping tube circuit provides control of linearity and is used to recover some of the energy from the inductive kick-back to help supply the B+ requirements of the tube V13. During conduction of V15, capacitors C322 and C335 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 L315 and capacitor C322 constitute a phase shift network which alters the phase of the ripple voltage developed across C335 and permits control of linearity.

The Horizontal Size Control is a variable inductance shunted across the secondary of T312. When the inductance is at a minimum, more of the output is shunted through L314 resulting in less sweep width. The opposite is true for greater sweep width.

A Horizontal Drive Control C319 forms a capacity voltage divider in conjunction with capacitor C333 to control the amount of sawtooth voltage applied to the grid of V13. This permits adjustment of grid voltage to compensate for variations in output tubes. Its adjustment supplements the Horizontal Linearity Control in the control of linearity.

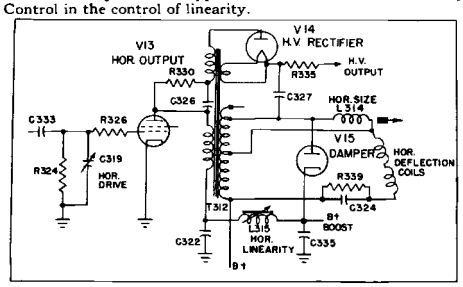

Fig. 11. Horizontal Sweep Output

8. HIGH VOLTAGE SUPPLY (SEE FIGURE 11).

The high voltage required by 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 T311 or T312. 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 is insufficient to produce the required anode voltage, an additional winding connected electrically and magnetically with the primary is added to provide further step-up of this voltage. The output of this tertiary winding connects to the plate of a rectifier tube, V14. This tube is a Type 1B3GT/8016 which derives its filament voltage from the sweep transformer T311 or T312 by a single turn around the core. Since the frequency supplied the rectifier tube is higher (15,750 cps), a 500 mmf filter capacitor, C327, is adequate to give a smooth d-c voltage output. Due to the low capacitance in the filter, this supply is relatively safe to work with.

R330 and C326 are connected in parallel between the primary and tertiary winding for safety purposes. The resistance thus introduced in this circuit prevents harmful currents in case accidental contact is made with the circuit when power is turned on.

9. B+ POWER SUPPLIES (SEE FIGURES 12 AND 13).

Two types of voltage doublers were used in production of these receivers. Early production used a full-wave voltage doubler, as shown in Figure 12. "T," "U," and "W" productions used a half-wave voltage doubler circuit, as shown in Figure 13.

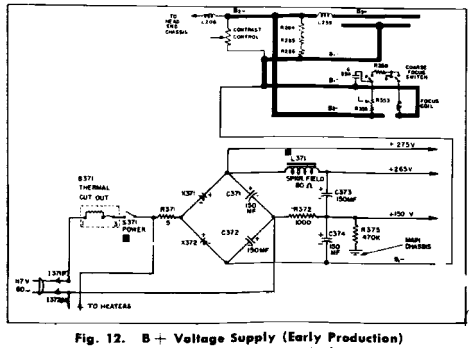

Fig. 12. B+ Voltage Supply (Early Production)

The rectifiers in Figure 12 are connected to conduct on alternate half cycles of the line voltage. When the line voltage at R371 is positive, X371 selenium rectifier will conduct and charge C371 to approximately 150 v., the peak voltage of one half the sine wave. On the other half cycle when the power line at the junction of R372, C371 and C372 is positive, X372 will conduct and charge C372 to approximately 150 volts. The B+ voltage may be tapped off across either C371 or C372, or across these two capacitors in series giving a B+ voltage which is the sum of the two capacitor potentials. L371, C373, C374, and R372 give additional filtering. C373 and C374 are capacity dividers which give voltage division.

B − bus is connected to the junction of X372 and C372. B_2- bus is connected to B_1- bus through R284, R285, and R286. The current drain from the video i-f, the video amplifier, and the audio sections through R284, R285, and R286 develops a bias voltage to operate the contrast control which is also connected between B_2- and B_1- buses.

"T," "U," and "W" version receivers used a half-wave voltage doubler circuit shown in Figure 13 to obtain a B+ voltage supply. Selenium rectifier X372 will conduct when the power line at S372 is negative, charging C371 and C372 (as shown in Figure 13) to approximately 150 volts. On the next half cycle when the power line at S372 is positive, the charge across C371 and C372 is in series with the power line voltage and will add to the power line voltage to charge C383 and C384 through X371 to approximately 300 volts, the sum of the half cycle peak voltage and the charge across C371 and C372. L376, C373, and C374 give additional filtering. Capacitors C373 and C374 in series act as a voltage divider to obtain a low and a high B+ source.

Contrast bias in "T" version receivers is obtained in the same manner as explained for early production receivers. "U" and "W" version receivers obtained their contrast bias from other sources and, therefore, there is only one B− return bus on "U" and "W" version receivers.

On late production "T" versions, choke L259 was removed and B_2- bus was connected directly to B_2- bus.

B371 is a thermal cutout to protect the receiver in cases of excessive current drain from the power line or from excessive

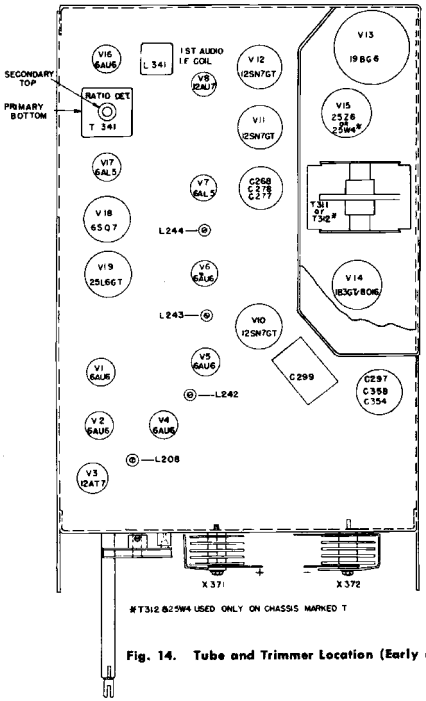

Fig. 14. Tube and Trimmer Location (Early and "T")

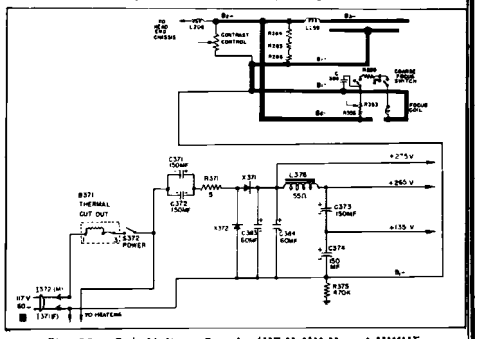

Fig. 13. B+ Voltage Supply ("T," "U," and "W")

If the cutout continues to trip, the receiver circuits should be checked for defects.

R373 and R374 are resistors with a negative temperature coefficient and are placed in series with each heater series string. These resistors have a high resistance when voltage is first applied to the filament string. As the filaments heat up, the resistance of these resistors R373 and R374 gradually decreases to a final operating value of approximately 75 ohms. Therefore, the initial surge of current through the heaters is limited to a low value, extending the life of the tube heaters.

CAUTION: One side of the power line is connected to B_1- through a capacitor on early production and directly to B_1- on "T," "U," and "W" production receivers. Always use an isolation transformer in the power line when servicing or aligning this receiver to protect test equipment.

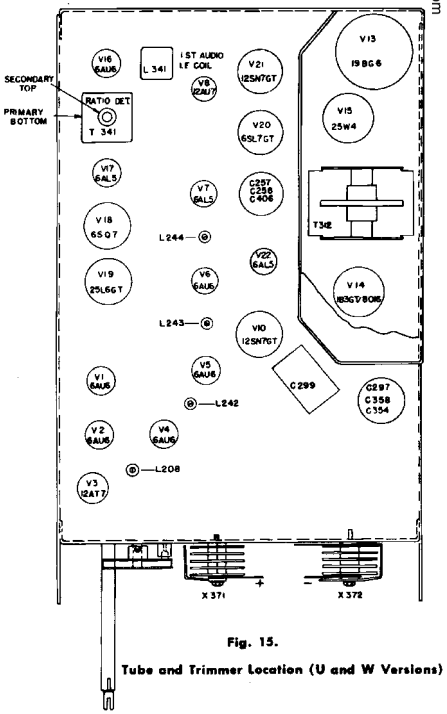

Fig. 15. Tube and Trimmer Location (U and W Versions)

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CIRCUIT ALIGNMENT

(CAUTION: TO PROTECT TEST EQUIPMENT ALWAYS USE AN ISOLATION TRANSFORMER)

GENERAL—A complete alignment of the receiver tuned circuits is given in the following charts.

NOTE: Care should be taken when making connections to the correct B— bus with low side of the signal generator, the scope, and the vacuum tube voltmeters. On "early" and "T" productions of these receivers the contrast bias was obtained between the B_2- bus and the B_1- bus. The B_3- bus was isolated from the B_2- bus by a choke. The head-end chassis ground was isolated from the B_3- bus by another choke. The B_1- bus was isolated from main chassis by a 470,000 ohm resistor. On "U" and "W" versions of this receiver all of the busses are common for both d-c and r-f. The head-end chassis on "U" and "W" versions is also common to B_1-. The B_1- bus is isolated from main chassis by 470,000 resistance ohms and a capacitor, C331.

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

1. R-F Sweep Generator.

a. Frequency Requirements:
   20 - 30 MC with 10 MC sweep width.
   40 - 90 MC with 15 MC sweep width.
   170-220 MC with 15 MC sweep width.
b. Constant output in the sweep width range.
c. At least 0.1 volt output.

2. Signal Generator (Marker Generator).

Must have good frequency stability and must be accurately calibrated. It should be capable of tone modulation and should cover the following frequencies. 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.

21.8 MC for Video I-F
23.3 MC for Video I-F
25.55 MC for Video I-F
26.3 MC for Video I-F
4.5 MC for Sound I-F
54 MC to 110 MC and 174 MC to 238 MC for R-F and Oscillator Adjustments

3. Oscilloscope.

This oscilloscope should have good sensitivity and preferably have a 5-inch screen and a good wide-band frequency response on the vertical deflection circuits. Although the high frequency response is unnecessary for alignment, it is necessary when making the waveform measurements.

4. Crystal Calibrator.

This unit is necessary to establish calibration check points for the marker generator to provide accurate marker frequencies.

5. Wave Traps.

Accurately calibrated wave trap may be used to supply markers in place of the marker generator for video alignment and r-f alignment.

6. Isolation Transformer.

Always use an isolation transformer in the power line to protect test equipment.

7. Vacuum Tube Voltmeter.

Vacuum tube voltmeter should have a d-c voltage scale.

VIDEO I. F. ALIGNMENT

1. In most receivers it may be only necessary to make an over-all video alignment check, as in Step 4, and make only minor adjustments of L208, L242, L243 and L244 to obtain video i-f response curve of Figure 16-D. In cases where a simple over-all check of video i-f alignment is not possible, complete video i-f alignment as in Steps 1 thru 4 is necessary.

2. Sweep generator cable should be properly terminated in its characteristic impedance. See Figure 18.

3. The signal should be coupled to the point of input through a 100 mmf. capacitor using short leads and short B_1- connections. Use a K27 ohm resistor when coupling to the converter grid to prevent loading.

4. Set contrast control to obtain −4 volts bias between junction of R243, R241, and head-end chassis B− as measured on a vacuum tube voltmeter. Disconnect vacuum tube voltmeter leads during alignment. On "U" and "W" version receivers where bias voltage is obtained from the grid of V20, it is necessary to connect a bias battery between junction of contrast control C385, R382, and B_1- to obtain −4 volts bias at same point as above. Connect positive of battery to B_1-.

5. Adjust the signal input to give a video output curve of approximately 3 volts peak-to-peak value, as measured on a calibrated oscilloscope.

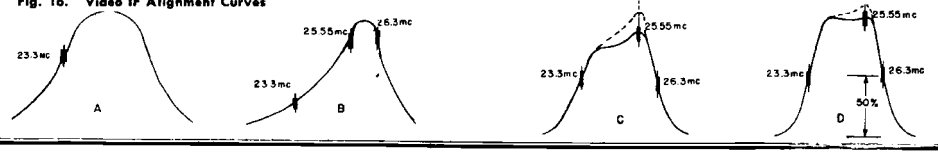
6. The 23.3 mc and the 26.3 mc marker should fall at the 50 per cent mark, as shown in Figure 16-D.

7. When checking the over-all video i-f alignment curve (Step 4), check for oscillator influence, by turning the tuning control, if this changes the shape of the curve switch to another channel where there is no oscillator interference noted.

VIDEO I-F ALIGNMENT CHART (See Fig. 27 or 29,

STEP	SIGNAL GENERATOR FREQUENCY	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT POINTS	CONNECT OSCILLOSCOPE BETWEEN	CHANNEL SWITCH SETTING	ADJUST	REMARKS
1	23.3 MC Marker	20-30 MC	V6 grid (Pin 1) and B_2- (or B_1- on "U" and "W" version)	Plate V8A (Pin 1) and B_1- on V8A socket (or B_1- on "U" or "W" version thru 10K Resistor)	5 or 6. See note for osc. interference.	Core of L244 for curve of Fig. 16(A)	Readjust L243 to place 26.3 mc marker at the 50% mark on the curve and 25.55 mc, as shown in Figure 16-D. Readjust L242 to place 23.3 mc marker at the 50% point on the curve as in Figure 16-D. L208 and L244 should be adjusted for maximum over-all gain while getting an approximate flat top curve. Reduction of L208 inductance with a corresponding increase in L244 will tend to reduce excessive saddleback in the top of the curve.
2			V5 grid (Pin 1) and B_2- (or B_1- on "U" and "W" version)			Core of L243 for curve of Fig. 16(B)	
3	23.3 MC 25.55 MC 26.3 MC Markers		V4 grid (Pin 1) and B_2- (or B_1- on "U" and "W" version)			Core of L242 for curve of Fig. 16(C)	
4			V3A grid (Pin 7) thru 27K resistor and B− at head-end			Core of L208 and L244 for curve of Fig. 16(D). Retrim L243 and L242. See remarks	See Figs. 14, 15

Fig. 16. Video IF Alignment Curves



AUDIO I-F ALIGNMENT

Two alignment methods are given below for sound i-f alignment. The first uses a vacuum tube voltmeter to measure the d-c voltage output of the ratio detector with an unmodulated 4.5 mc input. The second method uses a scope to show the output wave of the ratio detector with a ±1 mc sweep, about a 4.5 mc center frequency input.

In steps 5-a through 7-a, the secondary of T341, ratio detector transformer, is first detuned to produce approximately ¼ volt d-c volts output measured with VTVM at 4.5 mc unmodulated input, and then the primary of T341 and coil L341 are aligned for maximum output. In step 8-a, the secondary of T341 is readjusted for zero d-c output.

Steps 5-b through 8-b give visual alignment of T341 and L341. In step 5-b the secondary is aligned for minimum output with 4.5 mc modulated input. In step 6-b, the primary is adjusted for maximum peak-to-peak amplitude and symmetry about the base line. The trace between the peaks should be linear.

When making sound i-f alignment, it is important that the secondary of T341 be aligned to exactly the difference frequency of the video and sound carrier of the station on which the receiver will operate. If the secondary is not aligned to this difference frequency, buzz modulation may be evident in the sound output when receiving the station program. A final check on sound i-f alignment is to tune in a television station, reduce the input to the sound i-f to a relative weak input by reducing the antenna input to the receiver. While listening to the speaker output, adjust L341 for maximum audio output. Adjust the secondary of T341 for best quality audio output, minimum buzz modulation, and minimum noise in the speaker.

AUDIO IF ALIGNMENT CHART (METER) (See Fig. 27 or 29,

STEP	SIGNAL GENERATOR FREQUENCY	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT POINTS	CONNECT OSCILLOSCOPE BETWEEN	ADJUST	REMARKS
5-a	4.5 MC at approx. 1/10 volt unmod. or below limiting level of receiver	—	Grid V8B (Pin 7) and B_3- bus on V8 socket (or B_1- bus on V8 socket on "U" or "W" versions)	—	Secondary of T341 for approx. ¼ volt as measured on a vacuum tube voltmeter.	Connect a vacuum tube voltmeter (D-C) between junction of R343, R346, C347, and B_2- bus (or B_1- bus on "U" and "W" versions)
6-a		—		—	Primary of T341 for max reading on VTVM	
7-a		—		—	Adjust core of L341 for max. readings on VTVM.	
8-a		—		—	Adjust secondary of T341 for zero reading on VTVM.	

AUDIO I-F ALIGNMENT CHART (VISUAL) (See Fig. 27 or 29,

STEP	MARKER GENERATOR FREQUENCY	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT POINTS	CONNECT OSCILLOSCOPE BETWEEN	ADJUST	REMARKS
5-b	4.5 MC with tone mod.	—	Grid of V16 (Pin 1) and B_2- (or B_1- on "U" and "W" version)	Junction R346, R343, C347 and B_2- (or B_1- on "U" and "W" version chassis)	Secondary of T341 for min. sine wave amplitude or for min. tone from loudspeaker.	
6-b	—	4.5 MC with ±1 MC sweep			Primary of T341 for max peak-to-peak amplitude and symmetry about base line.	See Fig. 17 for curve. Curve should be linear.
7-b	Repeat Step 5b.					
8-b	—	4.5 MC with ±1 MC sweep	Grid of V8B (Pin 7) and B_2- (or B_1- on "U" and "W" version)	Junction R346, R343, C347 and B_1- (or B_1- on "U" and "W" version chassis)	Adjust core of L341 for max. amplitude of peaks.	See Fig. 17

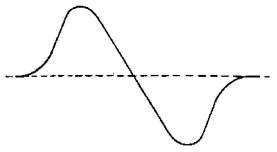


Fig. 17. Sound Alignment Curves

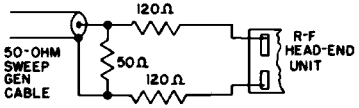


Fig. 18. Generator Termination

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R-F ALIGNMENT

1. Disconnect 300 ohm line from head-end terminals. Sweep generator cable should be properly terminated and coupled to the antenna terminals at the head end through a capacitor, Figure 18.
2. Adjust the contrast control for r-f alignment to give a −4 volts bias measured from P in 1 of V2 to head-end chassis.
3. Shunt L208 with a 220-ohm resistor during r-f alignment to prevent oscillator from affecting the response curve.
4. When aligning the high frequency coils (Steps 9 thru 15), the video carrier marker and the sound carrier marker should fall one on each side of the peak of the curve. See Figure 20.
5. Since the coils for Channels 12 through 7 are fixed inductances, it is only necessary to check the alignment on these channels. It might be necessary to slightly readjust Channel 13 alignment (Step 9) to give best over-all tracking on Channels #13 thru #7.
6. Check tracking on Channels #6, #5 and #4. Slight readjustment of Channel #6 (Step 16) may be necessary for best tracking on Channels #5 and #4.
7. Check tracking on Channels #3 and #2. Slight readjustment of Channel #3 may be necessary for best tracking on Channels #2 and #3.
8. The video carrier marker on Channels #6 through #2 (Steps 16 through 20) should always fall at the top of the response curve. The sound carrier marker should fall at least ½ the distance up the right side of the response curve. See Figure 22.

R.F. ALIGNMENT CHART (See Fig. 27 or 29,

STEP	SIGNAL GENERATOR FREQUENCY	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT POINTS	CONNECT OSCILLOSCOPE BETWEEN	CHANNEL SWITCH SETTING	ADJUST	REMARKS
9	211.25 MC and 215.75 MC markers	Channel No. 13 with 15 MC sweep	Ant. terminals at head-end unit	Junction L208, R209, C216, and B− of head-end (On "U" and "W" to L208, R219, C214, and B− of head-end)	No. 13	Screws of L228 to place 211.25 MC marker and L238 to place 215.75 MC marker approx. as shown in Fig. 20.	See RF alignment Notes 4 and 5. See Figs. 19 and 21 for location of components.
10	205.25 MC and 209.75 MC markers	Channel No. 12 with 15 MC sweep			No. 12		
11	199.25 MC and 203.25 MC markers	Channel No. 11 with 15 MC sweep			No. 11		
12	193.25 MC and 197.75 MC markers	Channel No. 10 with 15 MC sweep			No. 10		
13	187.25 MC and 191.75 MC markers	Channel No. 9 with 15 MC sweep			No. 9		
14	181.25 MC and 185.75 MC markers	Channel No. 8 with 15 MC sweep			No. 8		
15	175.25 MC and 179.75 MC markers	Channel No. 7 with 15 MC sweep			No. 7		

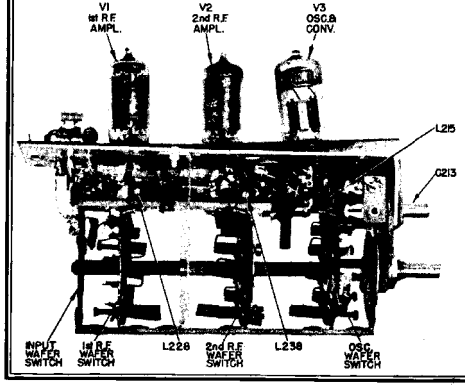


Fig. 19.
R.F. Head End

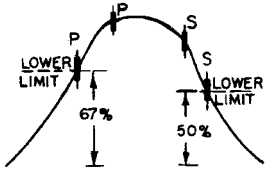


Fig. 20. Channels 13–7 Alignment Curve
P = Picture carrier marker
S = Sound carrier marker

RF ALIGNMENT (Cont'd)

STEP	SIGNAL GENERATOR FREQUENCY UNMOD.	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT POINTS	CONNECT OSCILLOSCOPE BETWEEN	CHANNEL SWITCH SETTING	ADJUST	REMARKS
16	83.25 MC and 87.75 MC markers	Channel No. 6 with 15 MC sweep	Ant. terminals and head-end chassis	Junction L208, R209, C216. and B− of head-end. (On "U" and "W' versions junction L208, R219 and C214)	No. 6	Screws of L226 to place 83.25 MC marker and L236 to place 87.75 MC marker, as shown in Fig. 22.	See RF alignment Notes 6 and 8
17	77.25 MC and 81.75 MC markers	Channel No. 5 with 15 MC sweep			No. 5	See Fig. 21.	
18	67.25 MC and 71.75 MC markers	Channel No. 4 with 15 MC sweep			No. 4		
19	61.25 MC and 65.75 MC markers	Channel No. 3 with 15 MC sweep			No. 3	Screws of L223 to place 61.25 MC marker and L233 to place 65.75 MC marker, as shown in Fig. 22.	See RF alignment Notes 7 and 8
20	55.25 MC and 59.75 MC markers	Channel No. 2 with 15 MC sweep			No. 2	See Fig. 21.	

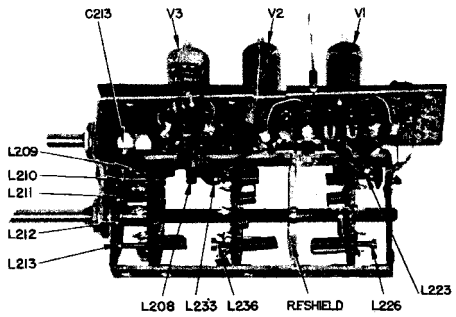
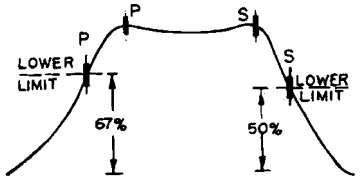


Fig. 21.
RF Head End



P = PICTURE CARRIER MARKER
S = SOUND CARRIER MARKER LIMITS

Fig. 22. Channels 6-2 Alignment Curve

OSCILLATOR ALIGNMENT

1. Adjust indicated adjustment for zero beat between the signal generator frequency, which is equal to the correct oscillator frequency, and the local oscillator frequency on the scope.
2. Signal input should be at antenna terminals or at the grid (Pin 1) of V2 signal, whichever will give sufficient signal to obtain a zero beat with the oscillator signal as indicated at the scope.
3. Set tuning control at center of rotation for Step 21. Check Channels #12 thru #7 (Steps 22 thru 27) to see that zero beat may be obtained at least ⅓ of a rotation from either end of the tuning knob rotation.
4. On Channels #6 thru #2 (Steps 28 thru 32), the tuning control should be set at mid-position of its rotation.

OSCILLATOR ALIGNMENT CHART (Fig. 27 or 29,

STEP	SIGNAL GENERATOR FREQUENCY UNMODULATED	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT POINTS	CONNECT OSCILLOSCOPE BETWEEN	CHANNEL SWITCH SETTING	ADJUST	REMARKS
21	237.55 MC	—	Ant. terminals at head-end	Junction R209, L203, and C216 and B− of head-end chassis ground. (On "U" and "W" versions, junction L208, R219, C214, and B− of head-end chassis	No. 13	L215 by squeezing or spreading turns for zero beat. See Fig. 19.	See oscillator alignment note 3.
22	231.55 MC	—			No. 12	See note 3.	
23	225.55 MC	—			No. 11	See note 3.	
24	219.55 MC	—			No. 10	See note 3.	
25	213.55 MC	—			No. 9	See note 3.	

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OSCILLATOR ALIGNMENT CHART (Cont'd)

STEP	SIGNAL GENERATOR FREQUENCY UNMODULATED	SWEEP GENERATOR FREQUENCY	SIGNAL INPUT POINTS	CONNECT OSCILLOSCOPE BETWEEN	CHANNEL SWITCH SETTING	ADJUST	REMARKS
26	207.55 MC	—	Ant. terminals at head-end	Junction R209, L208, and C216 and B— at head-end (On "U" and "W" versions, junction L208, R219, C214, and B— at head-end chassis)	No. 8	See note 3.	
27	201.55 MC	—			No. 7	See note 3.	
28	109.55 MC	—			No. 6	Adjust screw in L213 for zero beat. See Fig. 21.	See note 4.
29	103.55 MC	—			No. 5	Adjust screw in L212 for zero beat. See Fig. 21.	See note 4.
30	93.55 MC	—			No. 4	Adjust screw of L211 for zero beat. See Fig. 21.	See note 4.
31	87.55 MC	—			No. 3	Adjust screw of L210 for zero beat. See Fig. 21.	See note 4.
32	81.55 MC	—			No. 2	Adjust screw of L209 for zero beat. See Fig. 21.	See note 4.

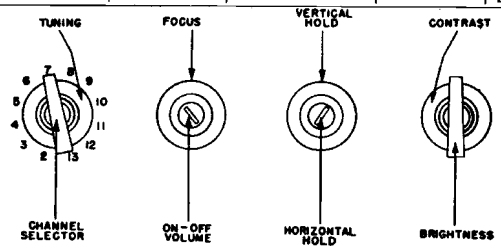

Fig. 24. Control Location, Model 809

OPERATING CONTROLS

OFF-VOLUME—This control turns on power to the receiver by rotation clockwise from the extreme counterclockwise position, and increases the volume of the sound portion of the program as it is turned clockwise.

NOTE: It takes approximately one minute for the receiver to warm up after the switch is first turned "on"; therefore a picture will not appear or the sound be heard instantly.

FOCUS—This control focuses the received picture or raster on the screen. It is necessary to adjust this control until the picture looks the sharpest in detail.

SELECTOR—The twelve positions of this switch permit selection of the twelve commercial television program channels. The switch is numbered from 2 through 13, and these numbers correspond to the channel numbers assigned to the television stations as they appear in the program section of your newspaper.

TUNING—This control tunes the frequency of your receiver to the television channel to be received. Correct adjustment is essential for optimum picture detail.

HORIZONTAL HOLD—This control synchronizes the horizontal sweep circuit and should be adjusted so that the picture is steady and does not move sideways or tilt.

VERTICAL HOLD—This control synchronizes the vertical sweep circuit and should be adjusted to a position where the picture does not move up or down in the picture frame.

CONTRAST—The correct setting of this control is dependent upon the location of the receiver with respect to the station. For a weak television signal, this control may have to be operated almost fully clockwise, while for a strong signal, it may be necessary to operate this control almost fully counterclockwise. This control adjusts the black and white contrast of the picture elements. Too much contrast is apparent when the picture is lacking in gradations between black and white, or when the picture loses form. Too little contrast causes the picture to appear faded so that it seems composed entirely of grey picture elements. When the contrast control is operated too far clockwise, the video amplifier may overload, causing poor picture reproduction and a buzz in the sound reproduction may be heard.

BRIGHTNESS—This control has to be adjusted simultaneously with the contrast control to regulate 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 and the brightness control settings.

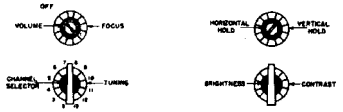

Fig. 23. Control Location, Models 805, 806, 807

INSTALLATION AND SERVICE ADJUSTMENTS

Note unpacking and installation instructions for Models 805, 806, and 807 are contained in ER-A-805. Unpacking and installation instructions for Model 809 are contained in ER-A-809. Some of this data is repeated here.

To remove or replace the picture tube, it is necessary to remove the chassis from the cabinet. Loosen the picture tube strap and the deflection yoke. Disconnect the picture tube socket and the high voltage anode lead. The tube may be removed from the front of the chassis.

Install the new picture tube from the front of the chassis by inserting the neck of the tube through the deflection yoke and the focus coil. Connect the picture tube socket.

Connect the high voltage anode and tighten the picture tube strap. Place the chassis in the cabinet and replace the mounting screws. Push the tube forward against the mask. Push the deflection yoke forward against the bell of the picture tube and clamp in position.

On early production receivers a centering ring was used between the focus coil and the deflection yoke. On "T," "U," and "W" versions, the focus coil adjustment is used to effect centering. Fig. 26.

On Model 805, which uses a 10BP4 picture tube, an ion trap was used which should be placed between the focus coil and the base of the tube about the neck of the tube with the arrow on the ion trap pointing towards the focus coil.

Centering, tilt and ion trap adjustments must be made before the cabinet back, or on the 805 the cabinet body, is replaced. Wipe the safety glass and the screen surface of the picture tube to remove dirt before installation. *Do not handle, remove or install a picture tube unless safety glasses and gloves are worn.*

VENTILATION OF RECEIVER.

Air circulation about the chassis is provided through ventilation slots in 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. Antenna installation is covered in booklets ER-A-805 or ER-A-809 and, also, in the booklet accompanying each G-E antenna. Antenna Cat. No. UKA-005 is a 300-ohm, folded dipole easy to install and provides good reception on all of the twelve commercial channels in medium and high signal strength areas.

Antenna Cat. No. UKR-005 is a 300-ohm, folded dipole with a reflector to increase the front-to-back ratio of the dipole. This will increase pick-up from stations when used in low signal area. Also, the use of a reflector tends to discriminate against reflected signals.

Antenna Cat. No. UKR-007 is a stacked array 300-ohm antenna. This antenna gives considerable signal gain over a single dipole. It also will discriminate against reflected waves.

Adapter UKT-002 is a high-band adapter to be used in conjunction with one of the above antennas. It is connected in parallel with the low-band antenna but may be oriented separately to give maximum signal pick-up from a high frequency station. This adapter may also be used alone for reception from a high frequency station.

UKT-003 is a high-band stacked array adapter designed to resonate on the high frequency channels. It is mounted on and connected in parallel with a low-band antenna. This adapter may be oriented separately to give better reception from high frequency channels.

A lightning arrester, Cat. No. REM-001, should be installed with each outdoor antenna installation. When a metal mast is used, it should be connected to a good ground with No. 6 copper wire or copper strap.

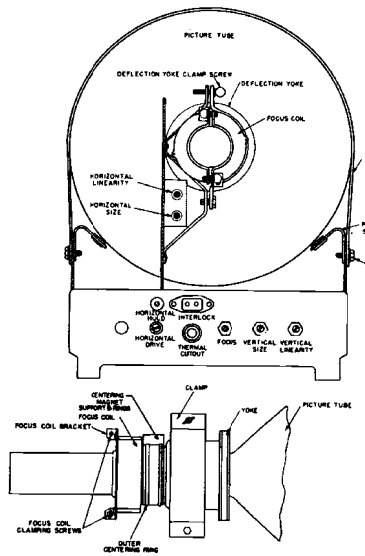

Fig. 25. Preset Adjustments (Early Production)

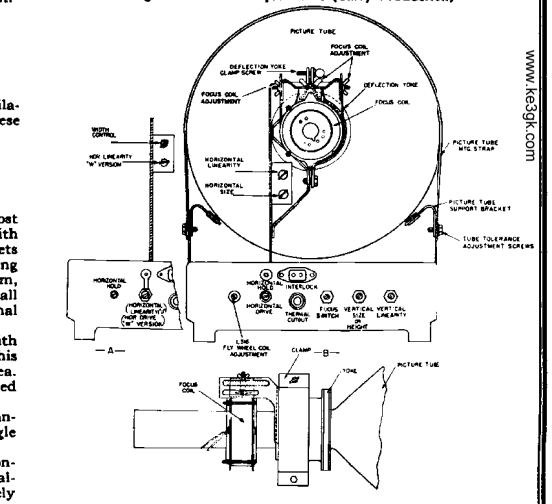

Fig. 26. (A) Special U and W Controls
(B) T Version Controls

ION TRAP (Used only on Model 805).

The ion trap should be adjusted to give maximum brightness on the screen. With the trap placed around the neck of the tube with the arrow pointing towards the focus coil, the ion trap should then be rotated and moved forward or backwards to give maximum brightness. If the illuminated area gets too bright, reduce the brightness control and readjust the ion trap for maximum brightness. Always adjust the ion trap for maximum brightness. Do not leave the ion trap adjusted for less than maximum brightness as this may shorten the life of the picture tube.

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The following is a listing of possible troubles and their cures. This is not intended as a comprehensive coverage of all troubles possible, but only serves as a guide in locating some of the more difficult problems. From time to time this information will be supplemented by service bulletins.

TROUBLE SHOOTING CHART

SYMPTOM	CHECK	REMARKS
(1.) No Raster on Picture Tube.	(a.) Waveform at output of T311 or T312. (b.) V14, 1B3GT/8016. (c.) Filter circuit of V14. (d.) V9 picture tube. (e.) Check high voltage anode cap for good connection to picture tube. (f.) For defective brightness control. (g.) Anode voltage low. (h.) Check (V13) (V12 or V21) for waveforms. (i.) Defective damper tube (V15).	(a.) Check waveforms, using waveform diagrams. (b.) If filament of V14 glows orange, high voltage is being generated. (g.) Check deflection yoke for shorted turns.
(2.) Raster Normal. No Picture or Sound.	(a). Oscillator V3-B defective. (b.) Defective antenna or lead-in. (c.) R-f amplifiers, converter, i-f amplifier or video amplifier stages.	(b.) With contrast full clockwise, a noise pattern should be seen on screen, and noise heard in speaker.
(3.) Picture Normal. No Sound.	(a.) V16, V17, V18, V19. (b.) Defective speaker. (c.) Alignment of T341 or L341. (d.) Audio amplifier stage.	
(4.) No Raster. Sound Normal.	(a.) Picture tube. (b.) D-c restorer, V7-B.	
(5.) Normal Picture. No Vertical Sync.	(a.) V11 (clipper and inverter) waveforms. (V20 on U and W versions). (b.) Input to V10-A waveform.	
(6.) Picture Normal. No Horizontal Sync.	(a.) Clipper waveform. (V11 early versions or V20 late versions). (b.) V12-A and V12-B, on U and W versions. Check V21-A and V21-B. (c.) Check for free-running speed of 15,750 cps.	
(7.) Raster Edge Not Straight—Keystoning.	Deflection yoke.	
(8.) Picture Jumpy.	(a.) Operating at incorrect contrast setting. (b.) Gassy or noisy 19BG6 (V13) tube. (c.) Noisy sweep or sync circuit tubes. (d.) Excess noise picked up on antenna or lead-in. (e.) Adjustment of hold controls.	
(9.) Poor Picture Detail.	(a.) Mismatch between transmission line and antenna or receiver. (b.) Misalignment of i-f and r-f circuits. (c.) Defective video chokes. (d.) Focus control to make sure to be of sufficient range. (e.) Overload of video amplifier; check contrast control operation.	(a.) Transmission line too close to metal objects. (b.) Alignment chart. (d.) Check position of focus coil.
(10.) Neck Shadow.	(a.) Centering of focus coil about neck of picture tube. (b.) Ion trap assembled too close to the base of the picture tube. (c.) Yoke not against bell of picture tube.	(b.) Ion trap is used only on receivers using a 10BP4 picture tube.
(11.) Fold-over of Picture at the Left Side of Picture When Horizontal Hold is Set for Best Sync.		See Production Change No. 2.
(12.) Audio Instability. Early "T" Versions.		See Production Change No. 3.
(13.) Poor Vertical Linearity.		See Production Change No. 4.
(14.) Horizontal Linearity. "T" Versions.		See Production Change No. 5.
(15.) Poor Focus.	(a.) Adjustment of coarse focus switch and setting of focus coil.	(a.) In some cases it may be necessary to move the focus coil back slightly along the neck of the picture tube.
(16.) Barkhausen oscillation (one or several vertical dark lines), when program is being received.	(a.) Readjust drive control (or linearity control U versions). (b.) 19BG6 sweep output tube.	
(17.) Picture Flutter on strong signals.		See Production Change No. 17.

PICTURE CENTERING ADJUSTMENTS.

Centering (Early Production Using Centering Rings).

The centering ring and support assembly is shown in Fig. 25 between the focus coil and the deflection yoke. The centering assembly consists of a large cunifee ring which can be moved forwards or backwards along the ring support assembly. Therefore, to center the electron beam move the large cunifee ring towards the focus coil. Rotate the whole centering assembly until the beam moves in the proper direction, then move the large cunifee ring forward until the beam is centered.

Centering ("T" "U" and "W" versions Using Focus Coil Adjustment). Fig. 26.

Five adjustments are used to center the electron beam and secure uniformity of focus over the greatest picture area.

A. By loosening the two side wing nuts, the focus coil may be adjusted in three dimensions:

1. It may be moved forwards or backwards along the neck of the tube.
2. It may be tilted with respect to the picture tube neck.
3. It may be moved slightly up or down across the neck of the tube.

B. By loosening the top wing nut on the focus coil mounting bracket, two adjustments of the focus coil are possible.

4. The focus coil may be moved slightly to the right or left across the tube neck.
5. The focus coil may be rotated about a vertical axis.

The focus coil should be operated as near as possible to the base of the picture tube to secure uniformity of focus over the greatest area of the picture or raster.

The tilting, as in steps 2 and 5, and the offset of the focus coil about the neck of the tube, as in steps 3 and 4, govern the centering of the beam.

If the focus coil air gap is too near the base of the picture tube, a dimming of the picture will be noted as the coil is tilted further from normal.

Adjust the focus coil first for uniformity of focus by moving the focus coil along the neck of the picture tube. The front and the rear focus controls should be adjusted simultaneously with the focus coil to give maximum uniformity of focus over the greatest picture area. Second, adjust the focus coil for centering of the picture. Tighten all wing nuts after a satisfactory setting is secured.

FOCUS.

With the front panel control set approximately to its mid-position, the rear panel coarse focus control should be switched to the position which allows the front panel control to obtain best focus within its range.

In some cases it may be necessary to move the focus coil backwards slightly to achieve uniform focus, over the greatest picture area, with the coarse focus switch and the front panel focus control.

TILT.

If the raster is slightly tilted and does not square with the picture tube mask, rotate the deflection yoke in its clamp bracket by loosening the wing screw.

THERMAL CUT-OUT.

This is a protection device to protect the receiver against excessive current drain or excessive heat within the chassis. A five minute period should elapse after this control has tripped before resetting. If the control continues to trip out upon resetting, the receiver circuits should be checked.

VERTICAL SIZE OR HEIGHT.

The control adjusts the picture height. When adjusted to the correct size, 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.

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 a 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 so as to necessitate the readjustment of the vertical size control.

HORIZONTAL HOLD ADJUSTMENT (EARLY AND "T" VERSIONS).

Rotate the front panel horizontal hold control to the maximum clockwise end. Turn the horizontal frequency control core all the way into the coil.

Turn the horizontal hold control on the rear of the chassis until the picture is synced.

Adjust the rear Horizontal Hold Control counterclockwise until the picture loses sync. Rotate this control ½ turn further counterclockwise. This is the best setting for the rear Horizontal Hold

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Control to give a steady picture. The front panel Horizontal Hold control will now have to be readjusted to sync the picture.

FLYWHEEL COIL ADJUSTMENT ("T" VERSION).

In order to improve the horizontal sync in the presence of noise, a "flywheel circuit" was added to the late production "T" version receivers. This circuit consists of L316 and C329, tuned to 15,750 cycles. For the adjustment of the horizontal hold control, proceed as follows:

1. Run adjustment screw all the way in or out for minimum inductance on flywheel coil L316, and short circuit it with jumper.
2. Tune in TV signal and lock picture in usual manner with normal setting of contrast control.
3. Turn front panel Horizontal Hold control fully clockwise, whereby picture may tear out.
4. Run core of blocking oscillator transformer L313 all the way out and slowly run it back in, until picture just locks in. Then gradually bring core out until the blanking bar appears on left edge of screen just before picture tears out completely.
5. With the blanking bar still visible, move front panel control in a counterclockwise direction until picture *just* locks in.
6. Remove short across flywheel coil L316 and bring its core out until picture *just* locks in.
7. Switch off receiver and allow to cool off; switch on again with hold control fully clockwise. If sweep breaks into half frequency, readjust flywheel coil L316 for approximately 6 horizontal bars across screen. Repeat this operation and check for half frequency condition. If it still persists, turn core half a turn into coil L316 and recheck for normal frequency.

HORIZONTAL DRIVE CONTROL (EARLY, "T" AND "W" VERSIONS).

This control should be turned full counterclockwise. In some receivers a white vertical line will appear on the screen. The control should be rotated clockwise until this line just disappears. In other receivers this control can be operated fully counterclockwise without encountering the white vertical line.

HORIZONTAL LINEARITY CONTROL (EARLY, "T" AND "W" VERSIONS).

This control L315 adjusts the picture for correct horizontal proportions. A maladjustment shows an elongation or crowding of either side of the picture. This is best adjusted on a test pattern by adjusting the Horizontal Linearity Control until the distance from the center to the left and right edges of the test pattern measures the same. The adjustment of this control should be made simultaneously with the adjustment of the Horizontal Size Control to get proper width and good linearity. The Horizontal Drive Control can be slightly readjusted to give a good compromise between linearity and hi-voltage.

HORIZONTAL SIZE OR WIDTH (EARLY, "T" AND "W" VERSIONS).

This control changes the horizontal size or width of the picture. When adjusted to the proper position, the picture should extend 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 adjustments of the width control, it will be noted that this condition makes inner circle of the test pattern egg-shape instead of a circle.

HORIZONTAL HOLD ADJUSTMENT ("U" AND "W" VERSION CHASSIS).

Set the contrast control to minimum setting (counterclockwise). Adjust the front panel horizontal hold control to the approximate center of its rotation.

Adjust the rear panel horizontal hold control to sync the picture or test pattern and place it at the center of the raster. Rotation of the front panel horizontal hold control slowly in either direction should shift the picture slightly left or right. The picture should not lose sync when the front panel Horizontal Hold control is rotated slowly.

HORIZONTAL SIZE AND LINEARITY ADJUSTMENTS ("U" VERSION).

Adjust the Horizontal Linearity control R402 to give maximum high voltage on the picture tube. As the high voltage is increased, vertical size will decrease. Therefore, maximum high voltage can be determined by noting the point of minimum vertical size. On some receivers a vertical white line (fold-over) will appear as the Horizontal Linearity is turned counterclockwise. The Horizontal Linearity control should be turned clockwise until this white line just disappears.

Adjust the Horizontal Size control to fill the picture tube mask. Check for linearity. The distance from the center to left and to the right-hand edge of the picture should be approximately equal. If the horizontal linearity is not correct, it will be necessary to compromise between high voltage and linearity by readjusting the Horizontal Linearity control. Readjust the Horizontal Size control so that the picture extends approximately ⅛ inch beyond the edge of the picture tube mask so that the left- and right-hand edges of the picture are not visible.

PRODUCTION CHANGES

(1) CHASSIS MARKINGS.

As production of these models proceeded, major production changes were identified by stamping a large letter on the chassis front apron. These letters are "T", "S", "U", or "W".

"T" Version (See production change #9)	—Change from a molded type horizontal output transformer T311 to a ceramic iron core type transformer T312.
"S" Version (See production change #16)	—In addition to the "T" change a larger picture opening was incorporated into the cabinets. Chassis are marked "S".
"U" Version (See production change #11)	—This change changed to a new Horizontal Automatic Frequency control and Automatic Gain control circuits. "U" also incorporates the "T" version changes.
"W" Version (See production change #15)	—This letter "W" is used to identify the change from a 6AU6 second r-f amplifier (V2) to a 6AG5 second r-f amplifier (V2). "T", "U", and "S" versions changes are also included in "W" version.

Note chassis marked BCF in addition to "U" or "W" have the broadcast filter added in the antenna circuit as described in Production Change No. 10.

(2) FOLD-OVER ON "T" VERSION RECEIVERS.

On "T" versions of these receivers, fold-over at the left edge of the picture when the horizontal hold control is set for best synchronization has been corrected in late production "T" versions by the following:

(a) Change R334 from 220K, to 560K, ½ watt resistor, Cat. No. URD-115.
(b) Connect a 12 mmf., 880 v., mica capacitor, C336, from the junction of R334 and C330 to B_1-, Cat. No. RCU-286.
(c) Disconnect R315 from 277 volt, B+, and reconnect to the B+ boost voltage at the junction of C322 and L315.
(d) Change C315 from 68 mmf. to 220 mmf., mica, Cat. No. UCU-1036.

(3) AUDIO INSTABILITY (IN EARLY "T" VERSION RECEIVERS).

This appeared as tweets when operating the focus control at maximum clockwise rotation and has been cured in late production by reconnection of the 25L6GT (V19) screen by-pass capacitor, C367. On "T" version receivers, C367, ground connection was removed from the B_3- bus and connected to the junction of R352, R353, and S341.

(4) TO IMPROVE THE VERTICAL LINEARITY.

R299 has been changed from 3K to 2.2K, 1 w. resistor. This change also centers the operation of the vertical linearity control.

(5) HORIZONTAL LINEARITY "T" VERSION MODELS.

A transient oscillation which appears as wiggles on vertical running lines at the top one-half inch of the picture may be removed by shunting C324 (0.47 mfd.) with a 1200 ohm, ½ w., carbon resistor (R339). C324 is the capacitor in series with the horizontal deflection coils.

(6) IMPROVEMENT IN VERTICAL SYNC—EARLY AND "T" VERSIONS CHASSIS.

To improve vertical synchronization under noisy conditions such as encountered in "fringe" areas, the following changes have been made in production:

(a) Short C265 with a bus wire.
(b) Remove V8-A grid resistor, R274 (2.2 meg.).
(c) Change value of R280 in plate circuit of V8-A from 8200 ohms to 39,000 ohms, ½ w., carbon resistor, Cat. No. URD-087.
(d) Change value of C314 (couples V11-A to V11-B) from 5000 mmf. to 1000 mmf., mica, Cat. No. UCU-052.
(e) Change the value of R311 (in grid of V11-B) from its 2.2 meg. to 470,000 ohms, ½ w., carbon URD-113. R311 should be reconnected between pin 1 and pin 3 of V11-B.
(f) Change value of C293 (grid of V10-A) from .001 mfd. to a 150 mmf., mica capacitor, Cat. No. UCU-1532.

(7) TO IMPROVE THE R-F STABILITY WHEN OPERATING ON CHANNEL NO. 2 IN WEAK SIGNAL AREAS.

The following changes have been made in late production. When operating on Channel No. 2 with the contrast control near maximum clockwise, the picture may become streaked or blacked out entirely, due to regeneration. This may be corrected as follows:

(a) Replace or short out L206 with a piece of bus wire No. 20 or larger.

(b) At the rear of C213, the tuning capacitor is a terminal board mounted on the head-end unit. From the ground lug of this terminal board, connect a 5000 mmf. capacitor, C208, Cat. No. RCW-3014, to the main chassis. This main chassis ground may be made by adding a ground lug under the self-tapping screw which holds the vertical sweep output transformer.

(8) IMPROVED STABILITY OF HORIZONTAL SWEEP GENERATOR IN EARLY AND "T" VERSION RECEIVERS.

A tuned circuit, L316, Cat. No. RLD-014, and capacitor C329, Cat. No. UCU-2568, is tuned to 15,750 cycles and will stabilize the blocking oscillator to reduce the effects of noise on sync.

For adjustment, see installation control adjustments, flywheel circuit.

L316 and C321 are added in the B+ supply of V21B as shown in Figure 30, L316 is mounted at the rear of the chassis at the left-hand side, as shown in Figure 26.

(9) NEW TYPE TRANSFORMER ("T" VERSION).

In late production Model 805, 806, 807, and 809's, a new type horizontal sweep output transformer was employed. The new transformer uses a ceramic iron core. All receivers using this core will be identified by a large "T" ink-stamped on the chassis front apron. Receivers ink-stamped "U" "S" or "W" on the chassis front apron have this new transformer and other new developments incorporated, as explained below. The schematic diagram for receivers stamped "T" is shown on Fig. 30.

On early production receivers, a 25Z6GT damper tube was used. Because of the higher peak inverse voltage of this new transformer, it is necessary to use a 25W4GT damper tube which has a higher peak inverse voltage rating.

(10) BROADCAST INTERFERENCE.

To eliminate interference from strong broadcast signals, which appear as r-f interference in the picture, choke L259 was removed and B_2- bus was connected to B_3- bus directly with a short piece of bus wire. A broadcast filter has been added in the antenna input circuit, and is connected as shown on the schematic diagram, Fig. 31,

(11) NEW HORIZONTAL AUTOMATIC FREQUENCY CONTROL CIRCUIT AND AUTOMATIC GAIN CONTROL CIRCUIT ("U" AND "W" VERSIONS).

A schematic diagram showing these two circuits is shown on Fig. 31. Chassis incorporating this change can be identified by the large "U" or "W" ink-stamped on the chassis front apron.

(12) VOLTAGE DOUBLER CHANGE.

Early production receivers used a full-wave voltage doubler type of transformerless power supply. This is shown in schematic diagram Fig. 28,

"T" versions and "U" and "W" versions were changed to a half wave voltage doubler type of circuit shown in schematic diagrams, Figs. 30 and 31, respectively.

(13) SHIPMENT WITH PICTURE TUBE INSTALLED.

Late production receivers were shipped from the factory with the picture tube installed. Another picture tube mounting strap was added on these models to secure the picture tube. Though this extra strap does not have to be removed when the receiver is installed, it is not necessary to replace it when the picture tube has been removed or replaced, unless the receiver is to be reshipped.

(14) LOW SENSITIVITY, EARLY PRODUCTION.

A few early production models were built with the plate of V6 (3rd video i-f) amplifier connected to B+ supply through a 10K resistor, R278, or to B+ supply through R278 and choke L248 in parallel.

To improve the sensitivity of these models, R278 should be removed and pin 5 of V6 should be connected to the junction of R253, C253, and R252 through choke L248. Catalog number for L248 is RLF-027.

(15) SECOND R-F AMPLIFIER ("W" VERSION).

Early production chassis used a 6AU6 second r-f amplifier V2. This tube was replaced by a 6AG5 tube in later production. Connections for V2, 6AU6, "U" versions are the same as connections for V2, 6AU6 of "T" version, as shown on schematic for "T" version, Fig. 30,

Chassis with (V2) second r-f amplifier 6AG5 are stamped "W".

(16) CHANGE TO LARGER PICTURE ("S" VERSION).

Models 806 and 809 stamped with a large S on the chassis front apron indicate a cabinet change from a picture size 8½" wide, by 6⅜", to a picture size of 9½" by 7½". Model 807 changed to 9½" x 7½" picture opening at the same time the "W" changes were incorporated. The left and right sides of the new large picture are now arcs of a circle 9½" in diameter. See replacement parts list for cabinets and cabinet parts.

(17) FLUTTER ON STRONG SIGNALS "U" AND "W" VERSIONS.

Intermittent flutter (similar to low frequency airplane flutter) of picture brilliance on "U" and "W" versions, in very strong signal areas, which requires the contrast control be set at minimum, has been corrected in production as follows.

Change C255 from a .05 mfd. capacitor to a .5 mfd. capacitor, 200 v., Cat. No. RCC-016. This capacitor is in the automatic gain control circuit.

Change R280 plate dropping resistor of V8A from 39,000 ohms to 18,000 ohms, ½ watt, Cat. No. URD-079.

(18) LINEARITY CONTROL ("U" VERSION)

"U" version chassis were built with the potentiometer R402 acting as both linearity and drive control. L315 linearity control shown in Figure 31, was removed and the junction of T312 terminal one and R303 was connected directly to the junction of C412, R303 and pin 3 of V15. Capacitor C335 was removed.

On "W" versions, L315 and C325 were added to give better linearity control and are connected as shown in Figure 31,

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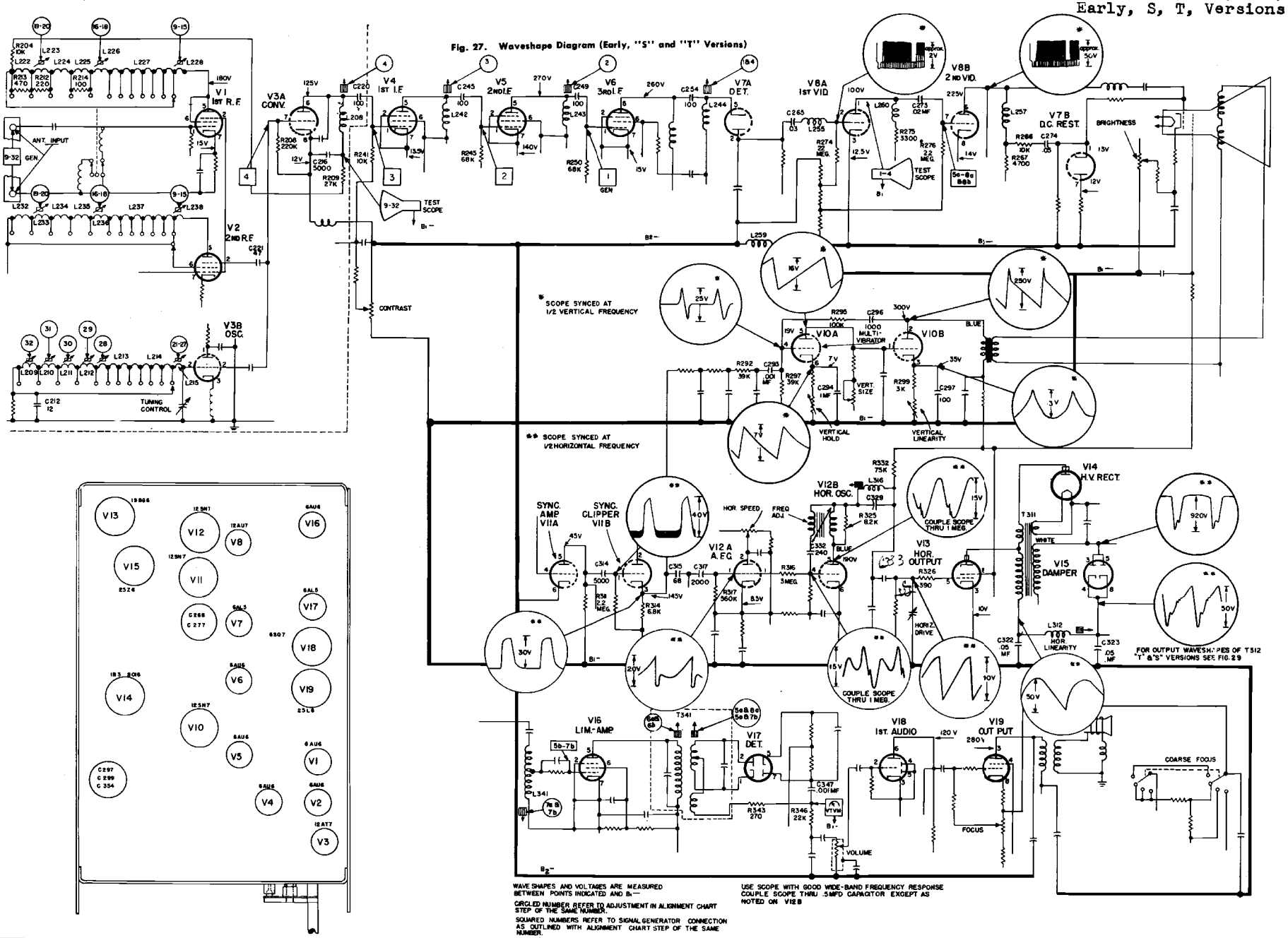
Fig. 27. Waveshape Diagram (Early, "S" and "T" Versions)



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MODELS 805, 806, 807, 809;
Early Version

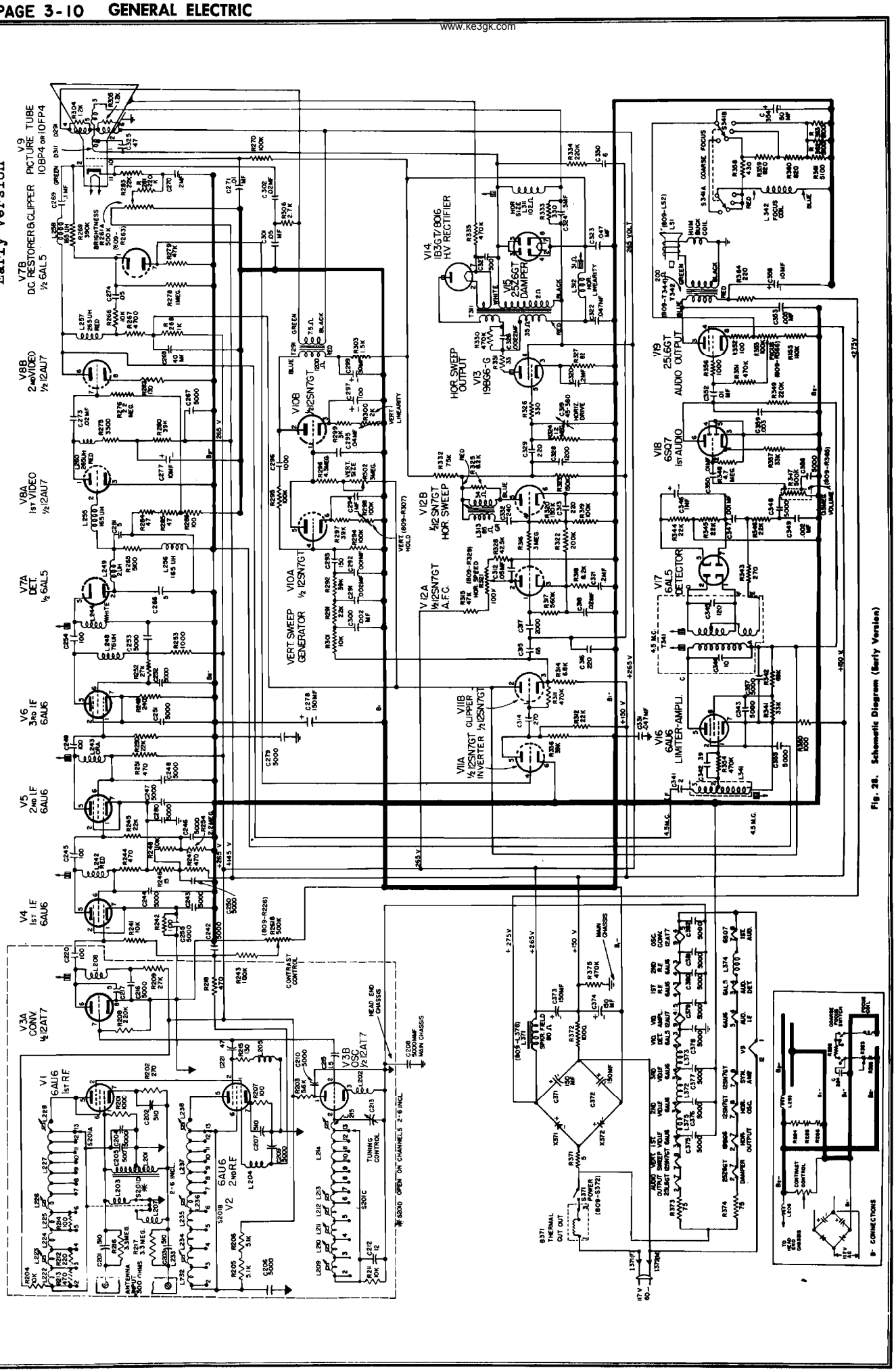

Fig. 28. Schematic Diagram (Early Version)

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