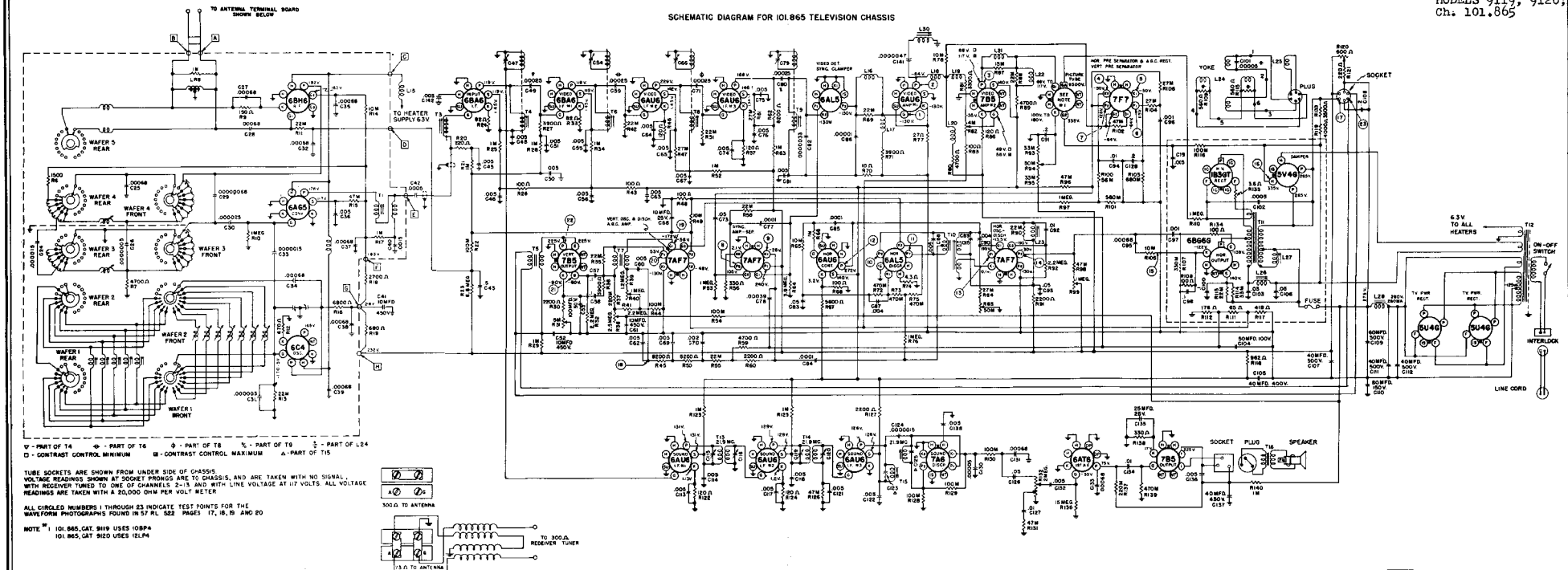
MODELS 9119, 9120;
Ch. 101.865

SCHEMATIC DIAGRAM FOR 101.865 TELEVISION CHASSIS



▽ - PART OF T4 ◈ - PART OF T6 ◊ - PART OF T8 ⅋ - PART OF T9 ½ - PART OF L24
□ - CONTRAST CONTROL MINIMUM ▣ - CONTRAST CONTROL MAXIMUM △ - PART OF T15

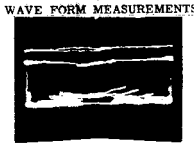
TUBE SOCKETS ARE SHOWN FROM UNDER SIDE OF CHASSIS.
VOLTAGE READINGS SHOWN AT SOCKET PRONGS ARE TO CHASSIS, AND ARE TAKEN WITH NO SIGNAL, WITH RECEIVER TUNED TO ONE OF CHANNELS 2-13 AND WITH LINE VOLTAGE AT 117 VOLTS. ALL VOLTAGE READINGS ARE TAKEN WITH A 20,000 OHM PER VOLT METER.

ALL CIRCLED NUMBERS 1 THROUGH 23 INDICATE TEST POINTS FOR THE WAVEFORM PHOTOGRAPHS FOUND IN 57 RC 522 PAGES 17, 18, 19 AND 20

NOTE *: 101.865, CAT. 9119 USES 10BP4
101.865, CAT. 9120 USES 12LP4

WAVE FORM MEASUREMENTS

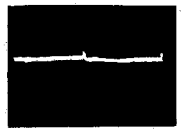
6AU6 1st Video Amplifier. Control Grid (Test Point 1) 3 Volts P to P (Horizontal)



6AU6 1st Video Amplifier. Plate (Test Point 2) 20 Volts P to P. (60 Cycle Sine Wave Sweep)

7B5 2nd Video Amplifier. 65 Volts P to P. (Horizontal) Contrast Control Maximum Brightness Control Minimum

7B5 2nd Video Amplifier. Plate (Test Point 3) 65 Volts P to P. (Vertical) Contrast Control Maximum Brightness Control Minimum



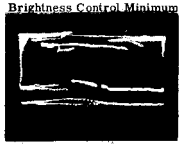
7F7 Hor. Preseparator, AGC Rect. & Vert. Preseparator. Cathode of AGC Rect. & Hor. Presep. (Test Point 4) 1.5 Volts P to P. (Vertical)

7F7 Hor. Preseparator, AGC Rect. & Vert. Preseparator. Cathode of AGC Rect. & Hor. Presep. (Test Point 4) 0.5 Volts P to P. (Horizontal)

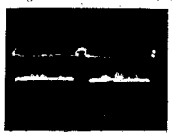
7F7 Hor. Preseparator, AGC Rect. & Vert. Preseparator. Cathode of Vert. Separator (Test Point 5) 0.5 Volts P to P. (Vertical)

6AU6 1st Video Amplifier. Control Grid (Test Point 1) 3 Volts P to P. (60 Cycle Sine Wave Sweep)

6AU6 1st Video Amplifier. Plate (Test Point 2) 20 Volts P to P. (Vertical)

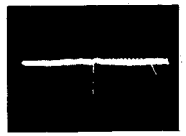


7B5 2nd Video Amplifier. Plate (Test Point 3) 65 Volts P to P. (60 Cycle Sine Wave Sweep) Contrast Control Maximum Brightness Control Minimum



6AU6 1st Video Amplifier. Plate (Test Point 2) 20 Volts P to P. (Horizontal)

7F7 Hor. Preseparator, AGC Rect. & Vert. Preseparator. Plate of Vert. Preseparator (Test Point 6) 45 Volts P to P. (Horizontal)



7F7 Hor. Preseparator, AGC Rect. & Vert. Preseparator (Test Point 6) 70 Volts P to P. (Vertical)

7F7 Hor. Preseparator, AGC Rect. & Vert. Preseparator. Plate of AGC Rect. & Hor. Preseparator (combined output from both sections of 7F7) Test Point 7, 25 Volts P to P. (Horizontal)

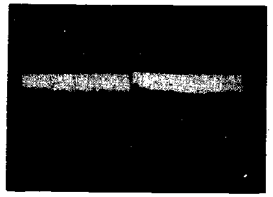
NOTE 1: The Peak to Peak (P to P) voltages of the above Wave Forms are dependent on the depth of modulation of the transmitter signal; voltages shown above are obtained when modulation is approximately 90 per cent.

NOTE 2: The bend in the vertical sync. and blanking period is due to the operation of the AGC system and has no effect on the received picture.

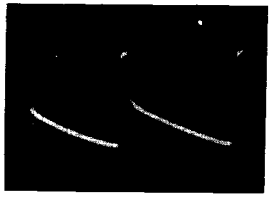
Note 3: The term "60 Cycle Sine Wave" refers to the type of oscilloscope horizontal sweep employed.

Note 4: The above waveforms are taken with the oscilloscope horizontal sweep direction from left to right and with upward deflection corresponding to positive polarity.

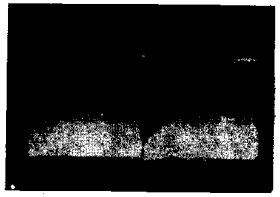
Note 5: In some instances the waveforms obtained will not be identical with those shown, due to the electrical characteristics of the oscilloscope used.



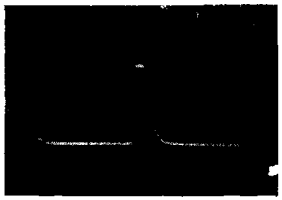
7F7 Hor. Preseparator, AGC Rect. & Vert. Preseparator. Plate of AGC Rect. & Hor. Preseparator (combined output from both sections of 7F7) Test Point 7, 30 Volts P to P. (Vertical)



7AF7 Sync. Amplifier & Sync. Separator. Plate of Sync Amplifier (Test Point 8) 160 Volts P to P. (Horizontal)



7AF7 Sync. Amplifier & Sync. Separator. Plate of Sync. Amplifier (Test Point 8) 160 Volts P to P. (Vertical)



7AF7 Sync. Amplifier & Sync. Separator. Cathode of Sync. Separator (Test Point 9) 35 Volts P to P. (Horizontal)

7AF7 Sync. Amplifier & Sync. Separator. Cathode of Sync. Separator (Test Point 9) 45 Volts P to P. (Vertical)

7AF7 Sync. Amplifier & Sync. Separator. Cathode of Sync. Separator (Test Point 9). 45 Volts P to P. (60 Cycle Sine Wave Sweep)

6AL5 AFC Disc. Diode Plate (Test Point 10) 30 Volts total P to P 10 Volts Sine Wave P to P. (Horizontal)

6AL5 AFC Disc. Diode Plate to Diode Plate (Test Point 10 to Test Point 11). Ground Lead of Oscilloscope to Pin 7 8 Volts P to P. (Horizontal)

6AU6 Hor. Control. Plate (Test Point 12) 60 Volts P to P. (Horizontal)

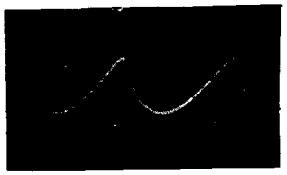
7B5 Vert. Output. Control Grid (Test Point 21) 125 Volts P to P. (Vertical)

7B5 Vert. Output. Plate (Test Point 22) 700 Volts P to P. (Vertical)

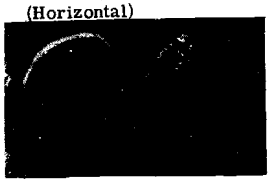
Input to Vert. Deflection Coils (Test Point 23). 70 Volts P to P. (Vertical)

7AF7 Hor. Osc. & Disch. Plate of Osc. Section (Test Point 13) 120 Volts P to P (Horizontal)

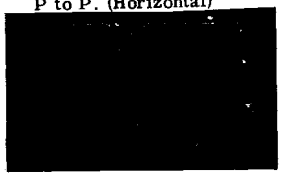
7AF7 Hor. Osc. & Disch. Plate of Disch. Section. (Test Point 14) 110 Volts P to P. (Horizontal)



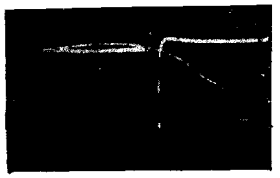
6BG6G Hor. Output. Cathode (Test Point 15) 15 Volts P to P. (Horizontal



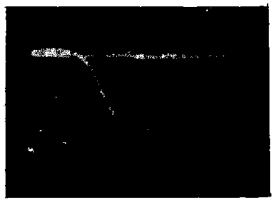
5V4G Hor. Damper. Cathode (Test Point 16) 35 Volts P to P. (Horizontal)



Input to Hor. Deflection Coils. (Test Point 17) 1100 Volts P to P. (Horizontal)

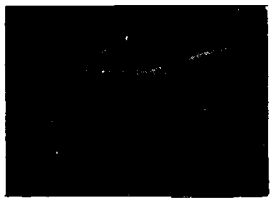


Vert. Sync. Integrating Network. (Test Point 18) 65 Volts P to P. (Vertical)



Vert. Sync. Integrating Network. (Test Point 18) 65 Volts P to P. (60 Cycle Sine Wave Sweep)

7AF7 Vert. Osc. & AGC Amplifier. Control Grid of Vert. Osc. (Test Point 19) 350 Volts P to P. (Vertical)

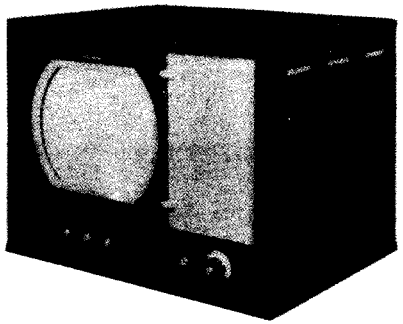


7AF7 Vert. Osc. & AGC Amplifier Plate of Vert. Osc. Section (Test Point 20) 160 Volts P to P. (Vertical)

GENERAL DESCRIPTION

The 101.865 television receiver is a direct viewing table model designed to reproduce a television picture on either a 10 inch or 12 1/2 inch picture tube. Features of this chassis include full 12 channel coverage, automatic gain control, stabilized horizontal hold, four stages of stagger-tuned video IF amplification, direct coupled video amplifier, a preselector circuit and a noise limiting circuit.

Catalog 9119 uses the type 10BP4 picture tube. Catalog 9120 uses the type 12LP4 picture tube. Except for picture tube differences, the two catalogs are the same.



SPECIFICATIONS

POWER SUPPLY

All models 117 volts AC 60 cycle operated unless otherwise specified. Power consumption 290 watts.

FREQUENCY RANGE

Channels 2 through 13. For channel frequencies see table

ANTENNA EQUIPMENT

The antenna input is designed to operate with maximum efficiency on a dual channel dipole antenna using 73 ohm concentric co-axial lead-in. Silvertone Television Kit, Catalog No. 6720 or equivalent is recommended. Instructions for proper erection and installation of the antenna are included with the antenna kit. A separate installation manual is available covering the technical procedure and problems in antenna installation. The shield of the lead-in should be connected to terminal screw or clamp "G." The center conductor of the lead-in, connect to terminal screw "A."

INTERMEDIATE FREQUENCIES

Sound IF Carrier -- 21.9 MC.
Video IF Carrier -- 26.4 MC.

PICTURE TUBE VIEWING AREA

Catalog 9119 - 61 sq. inches
Catalog 9120 - 90 sq. inches

TUBES (29; including rectifiers)

Function	Type	Function	Type
RF Amplifier	6BH6	First Audio Amplifier	6AT6
RF Converter	6AG5	Audio Output	7B5
RF Oscillator	6C4	Vertical Oscillator, AGC Amplifier	7AF7
Input IF Amplifier	6BA6	Vertical Output	7B5
First Video IF Amplifier	6BA6	Sync Amplifier-Separator	7AF7
Second Video IF Amplifier	6AU6	Horizontal Control	6AU6
Third Video IF Amplifier	6AU6	Horizontal Discriminator	6AL5
Video Det.-Sync clamper	6AL5	Horizontal Oscillator, Discharge	7AF7
First Video Amplifier	6AU6	Horizontal Output	6BG6G
Second Video Amplifier	7B5	Damper	5V4G
Pre-Separator, AGC Rectifier	7F7	High Voltage Rectifier	1B3GT
First Sound IF Amplifier	6AU6	Low Voltage Rectifiers(2)	5U4G
Second Sound IF Amplifier	6AU6	Picture Tube (Catalog 9119)	10BP4
Third Sound IF Amplifier	6AU6	Picture Tube (Catalog 9120)	12LP4
Sound Discriminator	7A6		

TELEVISION CHANNELS & FREQUENCIES

CHANNEL NO.	FREQ. MC.	PICTURE CARRIER MC.	SOUND CARRIER MC.	HETERODYNE OSC. FREQ. MC.
2	54 - 60	55.25	59.75	81.65
3	60 - 66	61.25	65.75	87.65
4	66 - 72	67.25	71.75	93.65
5	76 - 82	77.25	81.75	103.65
6	82 - 88	83.25	87.75	109.65
7	174 -180	175.25	179.75	201.65
8	180 -186	181.25	185.75	207.65
9	186 -192	187.25	191.75	213.65
10	192 -198	193.25	197.75	219.65
11	198 -204	199.25	203.75	225.65
12	204 -210	205.25	209.75	231.65
13	210 -216	211.25	215.75	237.65

CIRCUIT DESCRIPTION

The 101.865 television receiver chassis operates with twenty-five tubes plus two low voltage rectifiers, one high voltage rectifier, and one 10BP4 or 12LP4 picture tube, depending on catalog number. The operating controls as viewed from the front, left to right are Vertical Sync., Brightness, Contrast, On-Off & Volume and Channel Selector and Fine Tuning.

The special features of this receiver are as follows:

1. Rotary Channel Selector

A compact size, low drift, 12 channel rotary tuner is provided in this chassis for simplicity of operation. Channel selector and fine tuning control are on concentric shafts.

2. Shielded Co-axial Antenna Lead-in

Although the input to the tuner is 300 ohms impedance, an impedance coupler is provided to match a shielded co-axial antenna lead-in of 73 ohms. This simplifies the antenna installation and prevents noise pick-up on the antenna lead-in.

3. Automatic Gain Control

Simplified customer operation is provided by a very flat AGC System which has a high degree of noise immunity. Very little, if any, readjustment of controls is required in going from one station to another.

4. Direct Coupled Video System

A direct coupled Video System eliminates all video coupling capacitors and also eliminates the need for a DC Restorer. This reduces the visible effects of noise.

5. New Contrast Control

A new method of controlling contrast practically eliminates the necessity for readjustment of the brightness control when making adjustments of the contrast control.

6. Horizontal Automatic Frequency Control

A sine-wave type of Horizontal AFC is employed which provides excellent picture stability, even in the presence of noise and weak signals.

For convenience of tracing circuits, a block diagram of the television chassis is shown in Figure 1. The shielded antenna lead-in is connected to the impedance coupler, which connects to the input of the RF tuner. This tuner functions to select the desired TV channel by rotary switching. The entire tuner tube complement functions on all channels. The output of the tuner unit is at intermediate frequency and the band width up to this point is wide enough to pass both picture carrier and sound carrier of the desired channel signal.

The output of the Tuner Unit is then applied to the Input IF Amplifier which also passes both the picture and sound carriers. The output of the Input IF Amplifier is split; the picture carrier and the sound carrier being amplified by individual signal channels.

The sound carrier with its accompanying side-bands is passed through three additional stages of IF amplification and "detected" by a discriminator to produce audio output.

The video carrier, together with its side-bands, is passed through three additional IF amplifier stages and detected to produce a video signal. Suitable traps are provided in the video amplifier channel to reject the sound carrier, since this sound carrier must not be permitted to reach the Video Detector.

The video signal out of the video detector is passed through two amplifier stages and the out-put of the 2nd video amplifier is impressed

upon the grid of the picture tube.

Automatic gain control voltage is obtained from the output of the 1st video amplifier by means of the AGC rectifier. The output of the AGC rectifier is amplified by the AGC amplifier and the negative DC voltage developed by the AGC amplifier is applied to the RF amplifier and two IF amplifiers to control their gain.

The AGC rectifier performs a dual function; that is, it also separates horizontal synchronizing information. A separate tube is used to separate the vertical synchronizing information. After separation, the horizontal and vertical synchronizing information is combined and passed through a sync amplifier. Final separation of the combined horizontal and vertical synchronizing information is accomplished in the sync separator. The output of the sync separator is split; that is, the horizontal synchronizing information passes to the horizontal sweep circuits and the vertical synchronizing information passes to the vertical sweep circuits.

Vertical synchronizing pulses from the sync separator are applied to the vertical sweep oscillator and hold this oscillator in synchronism with the incoming sync pulses. The vertical sweep oscillator produces a saw-tooth voltage which is applied to the vertical sweep output stages and there in turn energize the vertical deflection coils of the picture tube.

Horizontal synchronizing information from the sync separator is supplied to the Horizontal Discriminator. A signal from the horizontal oscillator is also supplied to the horizontal discriminator. The output of the horizontal discriminator is applied to the horizontal control tube which then functions to hold the horizontal oscillator in synchronism with the incoming horizontal sync pulses.

The output of the horizontal oscillator actuates the horizontal discharge tube which produces a saw-tooth of voltage suitable for application to the horizontal output stage and the output of the horizontal output stage energizes the horizontal deflection coils on the picture tube. Associated with the horizontal output stage is the damper tube which is necessary to obtain horizontal deflection.

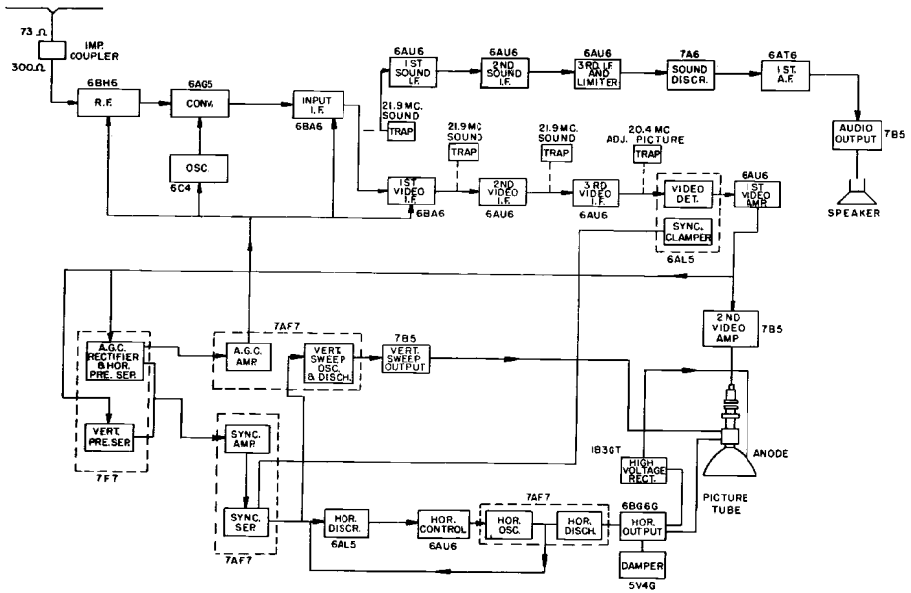


FIG. 1 - CHASSIS BLOCK DIAGRAM

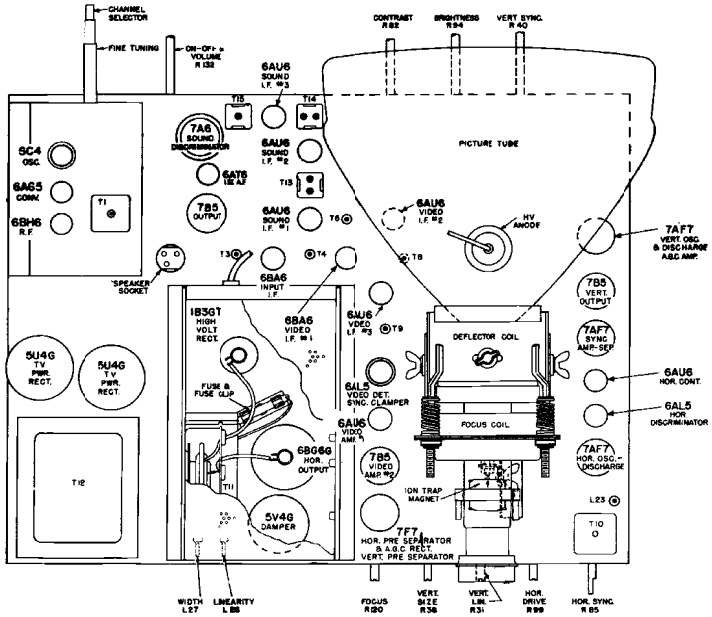


FIG. 2 - CHASSIS LAYOUT - TOP VIEW

TELEVISION ALIGNMENT PROCEDURE

PRELIMINARY

This alignment is an exacting procedure and should be undertaken only when necessary. Before fully deciding that alignment is necessary and before removing the chassis from the customer's home:

1. Be sure of the antenna installation.
2. Check all operating controls and adjustments including the fine-tuning control.
3. Check reception on all channels possible.
4. Check tubes by substitution of known good tubes.

In the repair shop:

5. Measure all important voltages including the AFC.
6. Substitute a known good picture tube.
7. If picture definition is still inadequate, observe the overall IF response curve of the receiver as outlined under RF alignment (paragraphs 1, 2 and 3). If none of the above checks indicate the trouble, proceed as follows.

TEST EQUIPMENT

To service this receiver according to the alignment procedure below, the following test equipment is required:

1. RF Sweep Generator with frequency range from 10-220 MC. with sweep width adjustable from 1 to 10 MC. flat to ± 1 D.B. and having adjustable output of at least 0.1 volt.
2. Signal generator with frequency range from 20-220 MC. crystal calibrated with adjustable output of at least 0.1 volt. If available, the use of two signal generators as markers will facilitate the alignment.
3. Cathode Ray Oscilloscope capable of passing a 60 cycle square wave and having a vertical sensitivity of .025 volts per inch.
4. Vacuum tube volt meter (VTVM).

ATTENTION: It is preferred that the picture tube be removed; refer to installation and removing instructions. However, if necessary to view the image on the picture

tube during servicing, the picture tube must remain installed on the chassis. In this case extreme care must be exercised in preparing the chassis for alignment. It is advisable that the chassis be adequately supported on end with the power transformer toward the bench. So as not to place strain on the 5U4G rectifier, insert a wooden supporting block under the power transformer only high enough to raise the 5U4G rectifier off the bench.

CAUTION: The 2nd anode lead to the picture tube has a potential of approximately 10,000 volts. To eliminate this high voltage hazard, remove the filament voltage to the 6BG6G horizontal output tube. Although the 6BG6G tube is in the H.V. scanning box, the filament supply can be removed by unsoldering the brown filament wire coming out of the H.V. scanning box, at the connecting point on the filament terminal board. In all cases be sure the shell of the picture tube is grounded when the 2nd anode lead is connected. The 7AF7 horizontal oscillator and discharge tube must be pulled from its socket to remove the modulation on the oscilloscope.

VIDEO IF ALIGNMENT

1. Connect the negative lead of a 3 volt battery to pin 6 of the 7AF7 AGC amplifier tube, the positive lead to ground.
2. Connect the VTVM across the 6AU6 1st video amplifier grid return resistor R71, using shielded leads. NOTE: This resistor is 125 volts below ground.
3. Connect signal generator through 500 MMFD capacitor to pin 1 of 6BA6 input IF tube.
4. Align the following adjustments in sequence:

SET SIGNAL GENERATOR AT:	ADJUST
20.4 MC.	Trimmer C79 on transformer T9 for min. output
27.9 MC.	Trimmer C66 on transformer T8 for min. output
21.9 MC.	Trimmer C54 on transformer T6 for min. output
21.9 MC.	Trimmer C47 on transformer T4 for min. output
23.5 MC.	Tuning slug on transformer T8 for max. output
26.1 MC.	Tuning slug on transformer T8 for max. output
23.2 MC.	Tuning slug on transformer T6 for max. output
25.2 MC.	Tuning slug on transformer T4 for max. output

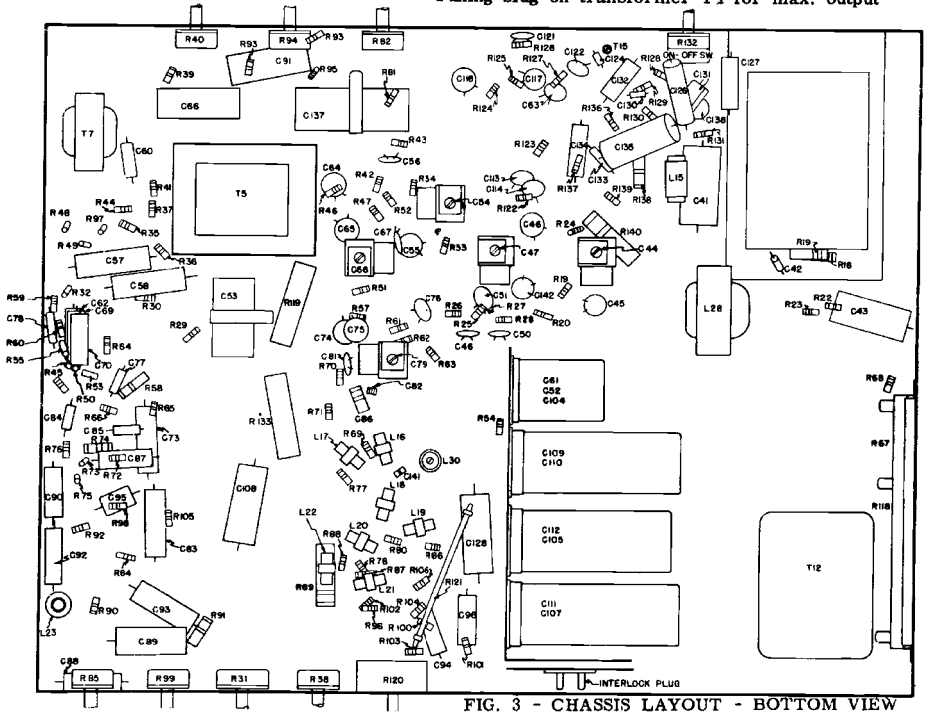


FIG. 3 - CHASSIS LAYOUT - BOTTOM VIEW

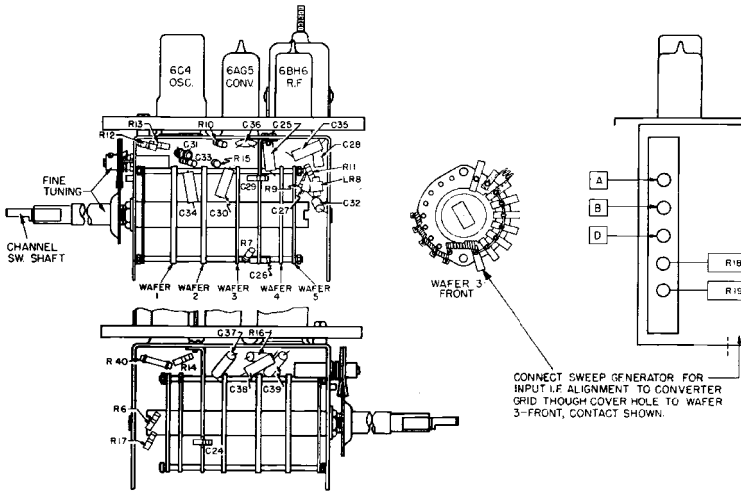


FIG. 4 - TUNER UNIT LAYOUT

TELEVISION ALIGNMENT PROCEDURE - cont'd

All trimmer adjustments are under chassis, slug adjustments on top. For trimmer alignment the generator output should be increased as required to get a satisfactory indication on the meter. For slug alignment the generator output should be decreased as required to keep the meter reading less than 3 volts, and select the first peak that occurs when the slugs are turning in from the fully out position. Repeat the above procedure until adjustments do not change.

5. Disconnect the voltmeter from across 3900 ohm resistor R71 and connect scope to the same points using shielded leads; keeping the high side of the scope on the high side of resistor R71. The scope should be calibrated for 2.8 volts peak to peak.

To calibrate scope for 2.8 volts P/P, feed 1 volts RMS into the vertical input of the scope Adjust vertical gain on scope so as to obtain a sine wave large enough for viewing (approx. 2''). At the desired size, draw two horizontal lines on the face of the tube, each designating the extremes of the sine curve. When parallel lines are drawn, make no further adjustment of the vertical gain while measuring output at video detector. Note where gain control is set for future reference to eliminate unnecessary setups for obtaining this scope calibration.

At these points also connect a .005 mfd. capacitor across the input of scope. If no capacitor is in input of scope, connect a .1 mfd in series.

6. Disconnect the signal generator and connect the sweep generator to the same point; loosely coupling the signal generator at 26.4 MC. for use as a marker

7. Tune sweep generator to 24 MC. with 10 MC. sweep and view response curve of the video IF transformers. See Figure 5 for desired overall response curve. If necessary, readjust slug on T6 slightly to obtain this result. Note, also, that the curve should be symmetrical and band width should be approximately 3.3 MC. The band width may be checked by varying the frequency of the marker signal until it indicates 70% response on the opposite side of the curve. The difference between this frequency and 26.4 MC. should be approximately 3.3 MC. If necessary, make slight readjustment of slugs on T4,T8,T9 to obtain the required curve result.

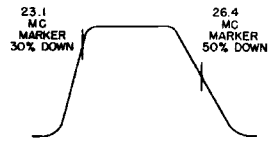


FIG. 5

SOUND DISCRIMINATOR AND IF ALIGNMENT

1. Connect the signal generator to pin 1 of 6BA6 input IF tube.
2. Connect the VTVM across the 6AU6 1st video amp. grid return resistor R71 and tune signal generator for dip in response at 21.9 MC.
3. Connect VTVM across 6AU6 3rd sound IF grid return resistor R126. Adjust trimmers C120,C119,C116 and C115 of transformer T14 and T13 respectively for max. negative indication on the meter; adjusting the signal generator to produce a neter reading of approximately 10 volts.
4. Short out 100,000 ohm resistor R128 and connect meter between pins 2 and 6 of the 7A6 sound discriminator tube. Tune the primary slug (under chassis) of discriminator transformer T15 for maximum output on the meter.
5. Remove the short from resistor R128 and connect meter between pin 2 of the same tube and ground. Adjust secondary slug (top of T15) for "zero output" on the meter. Note that a positive or negative reading is possible when making this adjustment. This is why the discriminator must be adjusted for "zero output."
6. Repeat 3, 4 and 5.
7. Connect the sweep generator to pin 1 of 6BA6 input IF tube and loosely couple the signal generator set at 21.0 MC. for use as a marker.
8. Connect the oscilloscope to pin 2 of 7A6 sound discriminator tube with a .01 MFD. capacitor in parallel.
9. Tune the sweep generator to 21.9 MC. with a 1 MC. sweep and view the pattern on the oscilloscope. The pattern should be similar to that shown in Figure 6.

FIG. 6

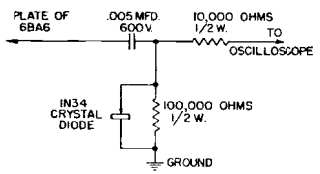


FIG. 7

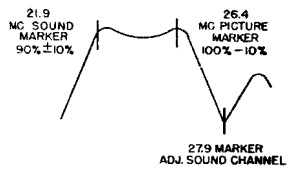


FIG. 8

INPUT IF ALIGNMENT

TELEVISION ALIGNMENT PROCEDURE - cont'd

1. Connect a detector probe as shown in Figure 7 to plate (pin 5) of 6BA6 input IF amplifier.
2. Connect a 330 ohm resistor between pins 5 and 6 of 6BA6 input IF tube and remove the 6BA6 1st video IF tube from its socket.
3. Connect sweep generator tuned to 24 MC. with a 10 MC. sweep to 6AG5 converter grid, point on RF tuner shown in Figure 4. Loosely couple the signal generator tuned to 27.9 MC. to this point for use as a marker.
4. Connect scope with vertical gain at maximum to output of detector probe shown in Figure 7 and short the trap (21.9 MC.) on T4 by soldering wire across trimmer C47.
5. Set channel selector on tuner to channel 2. Adjust slug on tuner output transformer T1 and input IF transformer T5 to obtain an approximate symmetrical curve as shown in Figure 8.
6. Remove short across trimmer C47.

OSCILLATOR ALIGNMENT

Oscillator coils in the 5 lower channels (2 thru 6) are tuned by means of slug adjustments which are wax-sealed. The remaining 7 high channels (7 thru 13) are tuned by adjusting the wire loops, spreading apart to increase the oscillator frequency, or making them smaller to lower the frequency.

This tuner is rigidly built and free from frequency drift. Only in case of unusual handling, should it be necessary to adjust this tuner. If trouble is suspected, it is advisable that the sound and video IF frequency be checked thoroughly before attempting to make any adjustment on the front end.

Due to capacity effect, the shield cover will have influence on the oscillator alignment, particularly on the high band. Whenever possible, this cover should remain intact when making coil adjustments. The shield cover is provided with two slotted openings, both on one side so high and low band coils may be adjusted by placing the cover on the tuner in a position to make coils accessible.

NOTE: The slotted openings side of the tuner cover will have a different capacity effect than its opposite side. Therefore, the cover must be on in its original position when making final frequency checks.

If satisfactory alignment can not be obtained with the shield cover on, then coil adjustments must be made to compensate for the loss of capacity.

TELEVISION ALIGNMENT PROCEDURE - cont'd

To tune in the center frequency of each channel in approximately the center position of the fine tuning control, it is suggested that the fine tuning control be advanced (clockwise) three-quarters of its travel. Use insulated pick to make all coil adjustments.

1. Connect signal generator to antenna terminals and tune to 215.75 MC.
2. Connect volt meter across 47,000 ohm resistor R126.
3. Set channel selector on tuner to channel 13 and turn the fine tuning control to the center position.
4. Align the oscillator coil in the manner described above for max. output on the meter; reducing the generator output to keep the meter reading below 10 volts.
5. Switch tuner to each channel, 12 through 2 and adjust the respective channel coils to get maximum reading on the meter for sound carrier frequencies. Be sure all final frequency checks are made with the tuner cover on in its original position.

RF ALIGNMENT

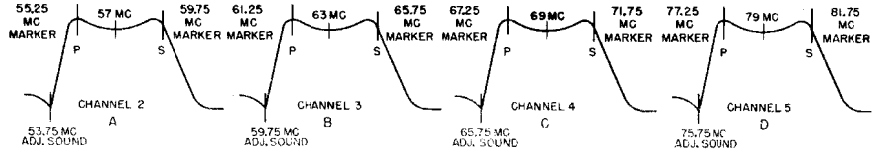
1. Connect the negative lead of a 6 volt battery to pin 6 of the 7AF7 AGC amplifier tube, the positive lead to ground.
2. Connect sweep generator to antenna terminals through a resistive network to match the chassis input impedence of 300 ohms.
3. With the scope set up for 2.8 volts P/P, connect to 3900 ohm resistor R71. View the overall video response, tuning through channels 2 through 13. Should the scope show a tilt of the overall response curve in the same direction on all channels, it may be possible to compensate for this response by a slight readjustment of slug on T8 or T6, depending on which side of the band the response is down.

NOTE: ONLY A SLIGHT ADJUSTMENT OF EITHER THE ABOVE COILS IS ADVISABLE. EXTREME TUNING MAY REQUIRE COMPLETE VIDEO IF ALIGNMENT.

4. If the above adjustments do not prove satisfactory, proceed with the RF alignment below.
   (A) Connect the scope to detector probe as shown in Figure 7 to plate (pin 5) of 6BA6 input IF amplifier and short out trimmer C47.
   (B) Tune sweep generator to 213 MC. with a 10 MC. sweep and adjust the RF coils of channel 13 for a symmetrical over-coupled response curve, similar to that shown in Figure 9 L.
   (C) Switch tuner to each channel, 12 through 2 and adjust the respective channel coils. Refer to Figure for center frequencies and desired over-coupled response curves. Be sure all final frequency checks are made with the tuner cover on in its original position. With the use of marker signals, check their position with those shown for each channel in Figure
   (D) After all channels have been aligned, check back through channels 13-2.
   (E) Remove short across trimmer C47.

ADJUSTMENT OF THE 4.5 MC. TRAP

1. With the chassis completely adjusted, and connected for operation, tune in a test pattern from a television station.
2. Turn the contrast control to its full on position and the brightness control to a low level (so that contrast is still noticeable.)
3. De-tune the fine tuning control so that sound bars just become visible. A 4.5 MC. beat is now readily visible on the screen.
4. Rotate (counterclockwise) the 4.5 MC. trap (L30) adjustment screw to its full out position (about 1 inch of screw showing).
5. Turn the adjustment screw in (clockwise) until the 4.5 MC. beat on the screen just disappears. DO NOT GO BEYOND THIS POINT.



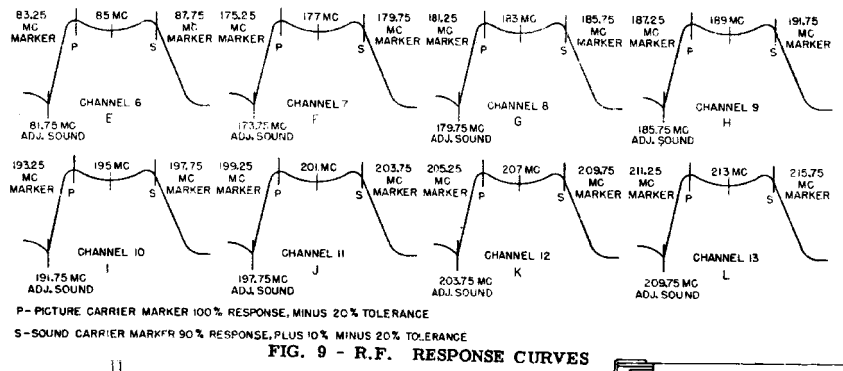


FIG. 9 - R.F. RESPONSE CURVES

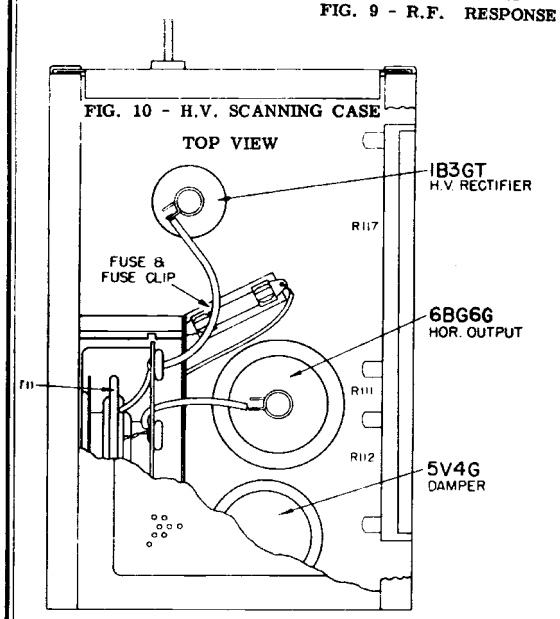


FIG. 10 - H.V. SCANNING CASE

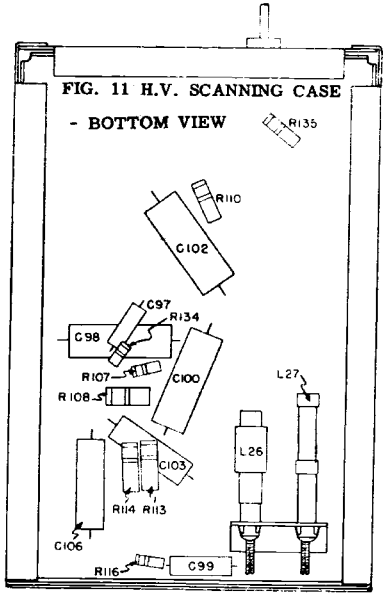


FIG. 11 H.V. SCANNING CASE

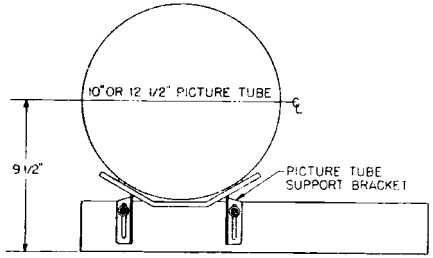
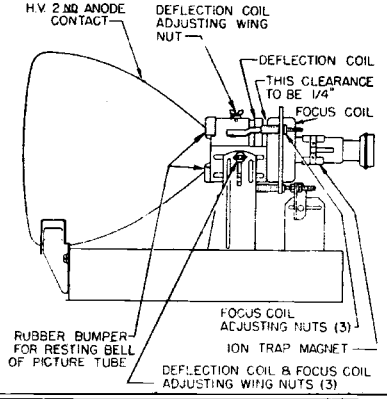


FIG. 12 - TUBE INSTALLATION



PICTURE TUBE INSTALLATION

The picture tube must be centered within the front panel mask. For this purpose, the tube brackets at the front of the chassis are slotted and may be raised or lowered by releasing the nuts which secure them to the chassis. These nuts are adjustable with an open end wrench.

Three wing nut adjustments allow the deflection coil and focus coil supports to be raised or lowered, and a thumb screw atop the deflection assembly permits rotation of the deflection coil.

Three knurled nut adjustments move the focus coil forward and backward in relation to the deflection coil assembly.

Insert the picture tube with the 2nd anode connection in an upward position and seat bell of tube on rubber pads attached to the adjustable brackets on front of chassis. Be sure that the picture tube rests against rubber cushion of deflection coil and that the deflection coil is moved forward as far as possible. It will be impossible to adjust the focus coil so that the corners of the raster are not shadowed if this is not done. Raise or lower the picture tube supports brackets until the horizontal centerline of the picture tube is 9 1/2'' above the bottom of the chassis. Tighten the nuts securely.

Apply strap across top of picture tube and install the picture tube socket and second anode contact. Position the ion trap so that the arrow points toward the second anode contact. See Figure 12.

NOTE: Before inserting chassis into the cabinet, clean the tube face and glass panel with glass cleaner to remove dirt and smudges. If tube face or glass panel needs cleaning at a later date, the glass may be removed from the cabinet by removing the two gold painted plastic clips, sliding glass panel to the right, and then pulling lower edge of glass out and down.

Place the chassis almost all the way into the cabinet, replace the speaker plug, and slide chassis all the way into the cabinet.

TELEVISION SERVICE ADJUSTMENTS

ION TRAP MAGNET ADJUSTMENT

Position the ion trap so that arrow points toward the second anode contact.

The ion trap rear magnet poles should be approximately over the ion trap flags in the picture tube. The ion trap flags are small, rectangular plates in the neck of the picture tube about 1 inch from the black base of the tube. Starting from this position, adjust the magnet by moving it forward or backward until the raster (illuminated area of picture tube within the mask) is observed. Rotate it slightly around the neck of the picture tube for the brightest raster on the screen, and at the same time reduce the brightness control setting until the raster is slightly above average brilliance. Adjust the focus control (on the rear apron) 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.

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.

PICTURE ADJUSTMENTS

It will now be necessary to obtain a test pattern picture in order to obtain further adjustments.

TELEVISION SERVICE ADJUSTMENTS - cont'd

FOCUS COIL ADJUSTMENT

If a corner of the raster is shadowed, it indicates that the electron beam is striking the neck of the tube. Adjust the knurled brass nuts on the focus coil assembly backward or forward until the entire raster is visible, properly centered and with no shadowed corners. Corner-cutting or shadows at the corner may be caused by mis-adjustment of either the ion trap magnet or the focus coil, and both may require adjustment to secure the brightest raster upon the screen, evenly distributed. CAUTION: While adjusting the focus coil, make sure that there is no strain caused by the focus coil binding on the neck of the picture tube.

CHECK OF HORIZONTAL OSCILLATOR ALIGNMENT

Turn the horizontal sync control (on the rear panel) to the extreme counterclockwise position. The picture should remain in horizontal sync. Momentarily remove the signal by turning the channel selector switch to another channel and then back to the original channel. Normally the picture will pull into sync.

Turn the horizontal sync control to the extreme clockwise position. The picture should remain in sync. Momentarily remove the signal as noted above. Again the picture should normally pull into sync.

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 "Vertical Size and Vertical Linearity Adjustments."

ALIGNMENT OF HORIZONTAL OSCILLATOR

If in the above check the receiver failed to hold sync with the horizontal sync control at either extreme or failed to pull into sync after momentary removals of the signal, make the adjustments under "Slight Retouching Adjustments," as noted below. If, after making these retouching adjustments, the receiver fails to pass the above checks or if the horizontal oscillator is completely out of adjustment, then make the adjustmerts under "Complete Realignment."

SLIGHT RETOUCHING ADJUSTMENTS

Tune in a television station and adjust the fine tuning control for best sound quality. Sync the picture and adjust the contrast control for normal contrast. Turn the horizontal sync control to the extreme position in which the oscillator fails to hold or to pull in. Turn the frequency adjustment on the top of the horizontal discriminator transformer (T10) until the oscillator pulls into sync. Check hold and pull-in for both extreme positions of the sync control.

COMPLETE REALIGNMENT

A. Check that there is 11/16" of threaded rod visible on the horizontal "ringing" coil L23 (the rod is located on top the chassis near the horizontal discriminator transformer T10).

B. Tune in a television station and adjust the fine tuning control for best sound quality.

C. If necessary, turn the frequency adjustment screw (top of transformer T10) until the picture is synchronized horizontally. (If the picture is not synchronized vertically, adjust the vertical hold on the front panel of receiver).

D. Set the horizontal sync control (on rear panel of receiver) approximately one-third of the rotation back from the fully clockwise position and remove the horizontal discriminator tube--type 6AL5 (located between tube 7AF7 and tube 6AU6).

TELEVISION SERVICE ADJUSTMENTS - cont'd

E. Carefully turn the frequency adjustment screw (top of transformer T10) until the picture moves back and forth across the screen of the picture tube with the blanking bar vertical.

F. Insert the 6AL5 tube. The picture should "lock" in position horizontally. With the horizontal sync control still set approximately 1/3 of the rotation back from the fully clockwise position, check that there is approximately 1/4" of "blanking" visible on the right hand edge of the picture. In order to see the "blanking," it will be necessary to turn the contrast control almost to minimum and to readjust the brightness control.

G. If the check described in F does not give correct result, it will be necessary to turn the phase adjustment screw (underside of discriminator transformer T10) until the picture is correctly "phased" and the "blanking" width on the right-hand edge of the picture is as described in F.

H. If a phase adjustment has to be made, the procedure described in D and E should be repeated and then a final check of the "phasing," as described in F, must be made. It is important that both the "free-running" (D and E) and "phasing" (F) are correct.

I. The pull-in range of the circuit should now be checked. Turn the frequency adjustment screw (top of transformer T10) in a counterclockwise direction until the picture falls out of synchronization in the horizontal direction. Now slowly turn the frequency adjustment screw (top of transformer T10) in a clockwise direction until approximately four diagonal "blanking bars" are seen (three across the center of the screen and two "half-bars" top and bottom). When the adjustment screw is now again turned very slowly, the picture should suddenly fall into synchronization. The test should now be repeated to check the "pull-in" range in the opposite direction by turning the frequency adjustment screw (top of transformer T10) in a clockwise direction until the picture falls out of synchronization and then turning it slowly counterclockwise. These checks insure that the "pull-in" range is correct (approximately three "blanking bars" in each direction or approximately plus or minus 180 cycles).

J. After checking the "pull-in" range, it is necessary to repeat the procedure described in D and E. This is important.

K. Set the horizontal sync control to the fully clockwise position and then select a "free" channel; i.e., a channel in which no signal is received. Now return to the channel already tuned in and used for the previous checks. The picture should immediately appear, correctly synchronized.

L. Turn the horizontal sync control to the fully counterclockwise position and repeat the check described in K.

M. Set the horizontal sync control approximately one-third of the rotation back from the fully clockwise position.

VERTICAL SIZE AND VERTICAL LINEARITY ADJUSTMENTS

Adjust the vertical size control (on rear apron) until the picture fills the screen vertically. Adjust vertical linearity (on rear apron) until the test pattern is symmetrical from top to bottom. Adjustment of either control will require a readjustment of the other. If necessary, adjust vertical centering by means of the focus coil to align the picture with the mask.

WIDTH AND HORIZONTAL LINEARITY ADJUSTMENTS

Turn the horizontal drive (on rear apron) clockwise as far as possible without causing crowding of the right of the picture. This position provides maximum high voltage to the picture tube second anode. Adjust the horizontal linearity control until the test pattern is symmetrical left to right. A slight readjustment of the horizontal drive control may be necessary when the linearity control is used. Adjust the width control until the picture just fills the screen horizontally. If necessary, adjust horizontal centering by means of the focus coil to align the picture with the mask.

FOCUS

Adjust the focus control for maximum definition in the test pattern vertical "wedge." Check to see that all adjustment screws of the deflection yoke and focus coil are tight.

REPAIR PARTS LIST

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION	MU CODE
	R70636	Anode Connector & Lead Assy.	
	R70344	Antenna Board Assy.	AAO
LR8	R61652	Antenna Choke & Resistor Assy.	
	R70132	Base - Tube Shield - for 6AL5 Video Det. & Sync Clamper	
C62,C69,C88,C99,C132, C136		Capacitor-.005 Mfd.-600 V.	
C87,C90		Capacitor-.004 Mfd.-600 V.	
C70		Capacitor-.002 Mfd.-600 V.	
C96		Capacitor-.001 Mfd.-600 V.	
C73,C83,C93,C106,C126		Capacitor-.05 Mfd.-600 V.	
C103		Capacitor-.03 Mfd.-600 V.	
C92,C94,C127,C134		Capacitor-.01 Mfd.-600 V.	
C91,C108,C128		Capacitor-0.2 Mfd.-600 V.	
C57,C58,C98,C100		Capacitor-0.1 Mfd.-600 V.	
C43		Capacitor-0.5 Mfd.-100 V.	
C26		Capacitor-0.5 Mmfd.-Ceramic	
C29		Capacitor-0.68 Mmfd.-Ceramic	
C24,C124		Capacitor-1.5 Mmfd.-Ceramic	
C31		Capacitor-3.0 Mmfd.-Ceramic	
C82		Capacitor-3.3 Mmfd.-Ceramic	
C141		Capacitor-4.7 Mmfd.-Ceramic	
C86		Capacitor-10 Mmfd.-Ceramic	
C101,C130		Capacitor-50 Mmfd.-Ceramic	
C77,C84,C85		Capacitor-100 Mmfd.-Ceramic	
C42		Capacitor-500 Mmfd.-Ceramic	
C25,C27,C28,C32,C33,C34, C35,C37,C38,C39		Capacitor-680 Mmfd.-Ceramic	
C97		Capacitor-1,000 Mmfd.-Ceramic	
C40		Capacitor-1,500 Mmfd.-Ceramic	
C36,C45,C46,C48,C50,C51, C55,C56,C63,C64,C65,C67, C74,C75,C76,C81,C113,C114, C117,C118,C121,C122,C138, C142		Capacitor-5,000 Mmfd.-Ceramic	
C89	R67119	Capacitor-.015 Mfd.-400 V. Polystyrene	
C102	R70154	Capacitor-500 Mmfd.-Paper-10,000V.	
C41	R70581	Capacitor-10 Mfd.-450 V.	
C78		Capacitor-390 Mmfd.-Mica	
C95,C131,C133		Capacitor-680 Mmfd.-Mica	
C60		Capacitor-5,000 Mmfd.-Mica	
	R70577	Capacitor-Electrolytic	
C68		10 Mfd.-25 V.	
	R70580	Capacitor-Electrolytic	AAD
C107		40 Mfd.-500 V.	
C112		40 Mfd.-500 V.	
	R70578	Capacitor-Electrolytic	AAO
C111		40 Mfd.-500 V.	
C105		40 Mfd.-400 V.	
	R70575	Capacitor-Electrolytic	
C104		50 Mfd.-100 V.	
C52		10 Mfd.-450 V.	
C61		10 Mfd.-450 V.	
	R70579	Capacitor-Electrolytic	AAO
C109		60 Mfd.-500 V.	
C110		80 Mfd.-150 V.	
	R70576	Capacitor-Electrolytic	
C53		100 Mfd.-50 V.	
	R70582	Capacitor-Electrolytic	
C135		25 Mfd.-25 V.	
	R70583	Capacitor-Electrolytic	
C137		40 Mfd.-450 V.	
L28	R67133	Choke-Filter	
	R70065	Clip-Fuse	
	R67868	Clip-Glass Retaining	
L25	R70519	Coil-Focus	
L15	R65734	Coil-Heater Choke	
L26	R65453	Coil-Linearity Control	
L23	R65453	Coil-Ringing	
L16,L21	R65474	Coil-Video Peaking #1	
L17	R65497	Coil-Video Peaking #2	
L22	R67122	Coil-Video Peaking #4	
L18,L19	R67123	Coil-Video Peaking #5	
L20	R67143	Coil-Video Peaking #6	
L27	R65452	Coil-Width Control	
L24	R65641	Coil-Yoke-Deflection	B5
L30	R70077	Coil-4.5 MC. Trap	
R94	R70538	Control-Brightness	
R82	R70536	Control-Contrast	
R120	R65450	Control-Focus	
R99	R65448	Control-Horizontal Drive	
R85	R70539	Control-Horizontal Sync	
R132	R70540	Control-Off-On & Volume	
R31	R67085	Control-Vertical Linearity	
R38	R63869	Control-Vertical Size	
R40	R70537	Control-Vertical Sync	
	R67325	Cord-Interlock Cover	
	R70068	Fuse	
	R67849	Glass-Picture Bezel	AO
	R61830	Insulator-Electrolytic Capacitor Mtg.	
	R65424	Insulator-Tube Mounting	
	R67738	Knob-Brightness	
	R67861	Knob-Channel Selector	
	R67737	Knob-Contrast	
	R67862	Knob-Fine Tuning	
	R67736	Knob-Horizontal	
	R67735	Knob-Off-On & Volume	
	R67739	Knob-Vertical	
	R69867	Leaflet-Instruction	
	R65489	Magnet-Ion Trap	
	R70610	Pin-Channel Indicator Attaching	
	R65476	Plug-2 Prong	
R135	R67236	Resistor-3.6 Ohm-1/2 W.	
R74	R67223	Resistor-4.3 Ohm-1/2 W.	
R70		Resistor-10 Ohm-1/2 W.	
R77		Resistor-27 Ohm-1/2 W.	
R24,R33		Resistor-82 Ohm-1/2 W.	
R26,R43,R48,R68,R83,R134		Resistor-100 Ohm-1/2 W.	
R46,R57,R86,R122,R124		Resistor-120 Ohm01/2 W.	
R9		Resistor-150 Ohm-1/2 W.	
R20		Resistor-220 Ohm-1/2 W.	
R56		Resistor-330 Ohm-1/2 W.	
R12		Resistor-470 Ohm-1/2 W.	
R109,R115		Resistor-560 Ohm-1/2 W.	
R6,R17,R21,R25,R28,R29, R34,R52,R63,R66,R123,R125		Resistor-1,000 Ohm-1/2 W.	
R30,R60		Resistor-2,200 Ohm-1/2 W.	
R81		Resistor-3,300 Ohm-1/2 W.	
R27,R36,R71		Resistor-3,900 Ohm-1/2 W.	
R7,R59,R80		Resistor-4,700 Ohm-1/2 W.	
R45,R50,R62		Resistor-8,200 Ohm-1/2 W.	
R48,R65,R78,R105		Resistor-10,000 Ohm-1/2 W.	
R87		Resistor-15,000 Ohm-1/2 W.	
R11,R13,R35,R42,R51,R55, R69,R88,R90		Resistor-22,000 Ohm-1/2 W.	
R47,R61,R84,R104,R106		Resistor-27,000 Ohm-1/2 W.	
R93,R95		Resistor-33,000 Ohm-1/2 W.	
R15,R96,R98,R102,R126,R131		Resistor-47,000 Ohm-1/2 W.	
R100		Resistor-56,000 Ohm-1/2 W.	
R22,R44,R54,R116,R128,R129, R130		Resistor-100,000 Ohm-1/2 W.	
R37,R137		Resistor-220,000 Ohm-1/2 W.	
R107		Resistor-330,000 Ohm-1/2 W.	
R72,R73,R75,R139		Resistor-470,000 Ohm-1/2 W.	
R101		Resistor-560,000 Ohm-1/2 W.	
R103		Resistor-680,000 Ohm-1/2 W.	
R10,R53,R76,R97		Resistor-1 Megohm-1/2 W.	
R39		Resistor-1.2 Megohm-1/2 W.	
R32,R41,R92		Resistor-2.2 Megohm-1/2 W.	
R64		Resistor-3.9 Megohm-1/2 W.	
R23		Resistor-6.8 Megohm-1/2 W.	
R136		Resistor-15 Megohm-1/2 W.	
R138		Resistor-330 Ohm-1 W.	
R19		Resistor-680 Ohm-1 W.	
R91,R127		Resistor-2,200 Ohm-1 W.	
R18		Resistor-2,700 Ohm-1 W.	
R16		Resistor-6,800 Ohm-1 W.	
R58,R113		Resistor-22,000 Ohm-1 W.	
R114		Resistor-33,000 Ohm-1 W.	
R110		Resistor-1 Megohm-1 W.	
R108		Resistor-100 Ohm-2 W.	
R140		Resistor-1,000 Ohm-2 W.	
R89		Resistor-4,700 Ohm-2W.	
R121	R67024	Resistor-220 Ohm-3 W.-Glasohm	
R133	R67190	Resistor-3,500 Ohm-10 W.	
R119	R70523	Resistor-4,000 Ohm-10 W.-Wirewound	
R111,R112,R117	R67318	Resistor-Metal Clad	
R67,R118	R67104	Resistor-Metal Clad	
	R62128	Retainer-Tube	
	R55639	Ring-Socket Retainer	
	R57193	Shield-Tube-for 7A6 Sound Discrim.	
	R67091	Shield-Tube-for 6AL5 Video Det. & Sync Clamper	
	R70503	Socket-3 Prong	
	R17307	Socket-6 Prong	
	R65323	Socket-Tube-Miniature	
	R57049	Socket-Tube-8 Prong Lock-in-Wafer	
	R41217	Socket-Tube-8 Prong Octal	

WHEN ORDERING SPEAKER PARTS ALWAYS GIVE THE PART NUMBER APPEARING ON THE SPEAKER.

	R67881	Speaker-5" x 7" P.M.	AO
	R67884	Cone & Voice Coil	
	R67886	Plug-3 Prong	
T16	R67885	Transformer-Output	
	R67869	Spring-Knob Retaining	
	R70307	Spring-Picture Tube Grounding	
	R70549	Spring-Picture Tube Mounting	
	R70311	Strap-Picture Tube Mounting-10"	
	R70584	Strap-Picture Tube Mounting-12 1/2"	
T15	R65479	Transformer-Sound Discriminator	
T10	R67083	Transformer-Horizontal Discriminator	
T11	R70155	Transformer-Horizontal Scanning	B5
T3	R65427	Transformer-Input IF	
T12	R67304	Transformer-Power-60 C.	B5
T13,T14	R65480	Transformer-Sound IF	
T1	R61651	Transformer-Tuner Output	
T7	R65428	Transformer-Vertical Oscillator	
T5	R65451	Transformer-Vertical Scanning	
T4,T6,T8,T9	R65426	Transformer-Video IF #1, #2, #3, #4	