CHARACTERISTICS

Speakers
4 by 6 inch PM
8 inch PM
10 inch PM
Voice-coil impedance
3.2 ohms - 400 cycles
Antenna type
Folded dipole with reflector
Antenna impedance
300 ohms input impedance to receiver
I-F frequencies
Video, 26.1 mc
Sound, 21.6 mc
Audio strip, 4.5 mc
Power supply
117 volts, 60 cycles, a.c.
Power consumption
180 Watts
Tube complement
See parts list

CIRCUIT ANALYSIS

The R-F Tuner

One of two r-f tuners is used with any of these receivers. Schematics of each tuner are included. Each tuner is a complete assembly in itself. Both tuners employ a 5BH6 tube as an r-f amplifier and a 6AG5 tube as a mixer. However, tuner TT-1 (see Fig. 7) uses a 6C4 tube as the local oscillator, whereas tuner TT-3 (see Fig. 8) employs a 6J6 tube. A fine tuning control is incorporated in each tuner. Component parts of the tuners are omitted from the parts list. It is suggested that if any trouble is suspected in the tuner, it be returned to the factory for repair.

The Video System

Three video i-f amplifiers, V-4, V-5, and V-6, each a 6AU6 tube, are employed. (The schematic, Fig. 9, should be consulted while reading the rest of the circuit analysis.) Four staggered-tuned i-f transformers, L4, L6, L9, and L12, are employed to produce the necessary bandwidth. Both the video and sound i-f signals are passed through this complete amplifier section which functions as a combined i-f system. There is no separation of the sound i-f signal from the video i-f signal, and they are both fed directly into V-7, the video detector. This is the basis upon which the intercarrier system operates. The over-all response of the i-f section is such that the amplitude of the sound i-f carrier is a very small percentage of the video i-f carrier when they are both fed to the video detector, which is one half of a 6AL5 tube. No sound traps are employed. Response shaping is discussed in the alignment section.

The video detector considers the sound i-f signal as a high-frequency sideband of the video i-f signal and detection occurs in the normal manner. The sound and video i-f carriers can be considered as beating together inside the video detector. The carriers of these two i-f signals are always separated by 4.5 mc, so that after detection their difference frequency of 4.5 mc appears in the output of the video detector. This 4.5-mc beat note contains all of the f-m characteristics of the input f-m sound i-f signal and very little a.m. effects. It is the amplitude relationship between the two input i-f signals that determines the character of the 4.5-mc output signal.

The 4.5-mc f-m signal as well as the video signal output from the detector is directly coupled to the grid of V-8, a 6AC7 video amplifier, through an L-R high-frequency compensating network. In this manner, the 4.5-mc signal receives additional amplification. In the plate of the video amplifier is the primary parallel-tuned circuit of a double-tuned 4.5-mc transformer, L2, which selects the f-m 4.5-mc signal to be fed to the sound section of the receiver. The video signal output is fed directly to the grid of the picture tube V-10, through peaking coil L3 and capacitor C223.

AGC and Contrast

The video i-f signal output from the third video i-f stage, V-6, is fed to the plate, pin 7, of the other half of the 6AL5 tube, V-7, which serves as a delayed AGC rectifier. The AGC voltage is supplied to the r-f and first and second video i-f amplifiers. A small positive voltage on the cathode of this diode prevents rectification of the video i-f signal until the i-f signal voltage on the diode plate exceeds whatever voltage is on the cathode. The contrast control, PD4, which is in the cathode circuit of the video amplifier, V-8, besides controlling the bias and hence the gain of this stage, also controls the amount of delay voltage on the cathode of the AGC tube. The influence of the contrast control is such that the delay voltage will be greatest at the time the gain of the video amplifier is greatest. This makes for a better over-all control of the picture contrast.

The Sweep and Sync Circuits

One half of V-9, a 12AU7 tube, serves as the d-c restorer and sync clipper. The sync voltage output from this section is fed to the grid of the other half of V-9, which functions as a sync amplifier to the vertical sync pulses and as a phase splitter to the horizontal sync pulses. The positive sync output signal is taken directly from the plate, pin 6 of V-9, and applied to an integrating network which consists of C301, R301, C302, R302, and C303. This integrating network separates the vertical sync pulses from the horizontal and applies the former to the grid circuit, pin 1, of the vertical sweep oscillator, V-13. This latter circuit utilizes one half of a 6SN7-GT tube as a blocking oscillator. The other half of V-13 functions as the vertical sweep output amplifier. The output from this amplifier feeds into the vertical output transformer, T4, and then to the vertical deflection yoke.

The 1-megohm potentiometer (of dual-control unit PD5) in the grid circuit, pin 1, of the vertical sweep oscillator, controls the frequency of operations and is termed the VERT. HOLD control. The VERT. LINEARITY control is the 5000-ohm potentiometer, P2, in the cathode circuit, pin 6, of the vertical sweep output amplifier. The VERT. SIZE control is a 2.5-megohm potentiometer, P5, located in the B-supply lead to the plate of the vertical sweep oscillator.

The type 6SN7-GT tube, V-14, which is the horizontal sweep oscillator, is employed as a combined cathode-coupled sine wave oscillator and multivibrator. The output from the plate, pin 5, of this oscillator is coupled to the grid of V-15, a 6EG6-G tube serving as the horizontal sweep output amplifier. The output from the plate of this latter tube is fed to tap 2 on the primary of the horizontal output transformer, T5. From the high side of the primary of this transformer, tap 3, the horizontal sweep signal is fed to the plate of V-16, a 1B3-GT tube, serving as the high-voltage rectifier. This rectifier is employed in a kick-back type of high-voltage power supply, which supplies voltage for the second anode of the kinescope.

The secondary of T5 consists of taps 4, 5, and 6, and feeds the horizontal deflection yoke. A 6W4-GT tube, V-17, serves as the horizontal damper. From tap 6 of T5, some of the horizontal sweep signal is applied to the cathode and plate (pins 1 and 2 which are tied together) of the horizontal phase detector, V-11, through an integrating network essentially consisting of R327 and C322. The horizontal sync pulses from the V9 phase splitter is applied to the other cathode and plate sections of the horizontal phase detector and these sync pulses are compared with the phase of the horizontal sweep input. If their phases are different, an afc voltage is developed across R323 and then applied to the grid circuit, pin 1, of the horizontal sweep oscillator.

The 50,000-ohm potentiometer, PD5, in the grid circuit, pin 4, of V-14, regulates the horizontal sweep frequency and is called the HOR. HOLD control, and trimmer capacitor C325 between V-14 and V-15 is the HOR. DRIVE control. Coil L21 in the cathode circuit of the horizontal damper tube V-17 is the HOR. LINEARITY control and coil L20 across taps 5 and 6 of the horizontal output transformer functions as the horizontal WIDTH control.

The Sound Section

The 4.5-mc f-m signal from the secondary of the takeoff transformer L2 is fed to the grid circuit of the ratio detector driver and limiter, V-3, a 6AU6 tube. The output from this driver tube feeds the primary of the ratio detector transformer L1, which is tuned to 4.5 mc. The double diode section of a 6T8 tube, V-2, is used as the ratio detector, and the triode section of this same tube is used as the first audio amplifier. The 500,000-ohm potentiometer P7 in the output circuit of the ratio detector is the VOLUME control. The output from the first audio amplifier is R-C coupled to the grid of V-1, a 6AQ5 tube which is the audio output amplifier. The audio signal output from this latter stage is fed to the audio output transformer, T1, and then to the speaker.

Power Supply and Voltage Regulation

The low-voltage supply incorporates a 5U4-G tube, V-12, as the rectifier. Coil L17 in the output filter system is the focus coil and connected across this coil is the FOCUS control, P6, a 1500-ohm potentiometer. This low-voltage power supply provides a positive 360-volt B-plus source and a negative 2-1/2 volt bias supply. For the r-f and i-f section of the receiver the 360-volt output is decreased to 140

volts for the screens and plates of these tubes while the cathodes are returned to chassis ground. The 360-volt supply is used directly for the deflection circuits and also for the plates and screens of the tubes in the sound section. However, the cathodes of these audio tubes are connected in series with the B supply for the r-f and i-f tubes, which means that the cathodes of the audio section are 140 volts positive with respect to ground. Thus, the effective B supply between the plate and cathode of the tubes in the sound section is 360 less 140, or 220 volts.

The interesting thing about the 6AQ5 tube circuit, V-1, is that it functions as a series automatic voltage regulator for the 140-volt supply and prevents any current variations in the r-f and i-f circuit from changing this voltage. The grid of the 6AQ5 tube is connected to the 360-volt supply through a voltage divider. A positive voltage of 123 volts is applied to the grid, but since the cathode is 140 volts positive, the grid has an effective bias of -17 volts. Any change in the 140 volts will tend to change the bias of the 6AQ5 tube. This, in turn, will cause the tube current to change, which means that the voltage drop across the cathode load will likewise vary. This voltage drop will be such that it will bring the cathode back to the 140 volts.

For instance, if the voltage increases beyond 140 volts, the bias on the 6AQ5 tube will become more negative. Less current will flow in the tube and a smaller voltage drop will occur across the complete cathode load. This decrease in voltage drop will be just enough to offset the previous increase in the cathode voltage.

FUNCTIONING OF CONTROLS

The controls of the receiver are divided into two groups, the front panel operating controls and the rear panel pre-set controls.

FRONT PANEL OPERATING CONTROLS

There are seven front panel operating controls as indicated in Fig. 1, each operating independently of the other. Reading from left to right, the controls and their functions are as follows:

On-Off and Volume

This is a single control. The knob should be turned clockwise, until a click is heard. This supplies a.c. to the receiver. Further clockwise rotation of the control varies the input to the audio amplifier, and, consequently, controls the volume of sound output.

Vertical Hold

This control functions to keep the picture stationary in the vertical direction. Electrically it is a variable resistor which controls the frequency of the vertical sweep oscillator.

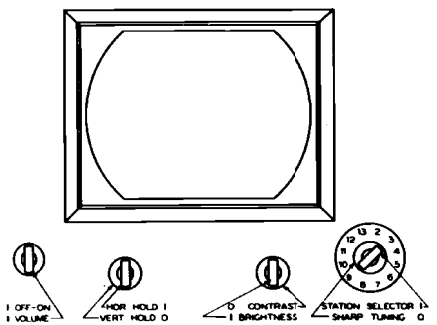


FIG. 1— OPERATING CONTROLS

Horizontal Hold

The function of this control is to keep the picture stationary in the horizontal direction. It is a variable resistor which affects the frequency of the horizontal sweep oscillator.

Brightness

This control, which is also a variable resistor, affects the cathode voltage on the kinescope, thereby regulating the brightness of the picture.

Contrast

The contrast control provides a means for varying the relative intensities of black and white in the picture. Advancing this control toward excessive contrast will introduce a loud buzz.

Station Selector

This control permits selection of the channel desired.

Fine Tuning

This control varies the frequency of the r-f heterodyne oscillator. It is adjusted for best picture quality and is not used to tune in the sound.

REAR PANEL PRE-SET CONTROLS

There are six so-called pre-set controls at the rear of the chassis as indicated in Fig. 2. They are all screw driver adjustments. The SOUND DISC. is the alignment screw for the secondary of the ratio detector transformer L1, and is not considered a pre-set control.

Vertical Linearity

This control is a variable resistor in the cathode circuit of the vertical sweep output tube. Manipulation of this control affects the upper portion of the picture.

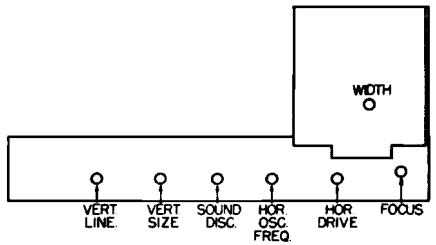


FIG. 2— PRE-SET CONTROLS

Vertical Size

The vertical size control varies the plate voltage of the vertical sweep oscillator. It primarily causes a change in height of the picture but it also interacts with the vertical linearity so that these controls must be used in conjunction with each other.

Horizontal Oscillator Frequency

This control is a slug adjustment for L18 which controls the frequency of the horizontal oscillator. To set this control properly, connect an antenna to the receiver and tune in a station, preferably one with a test pattern on the air. Center the horizontal hold control. Adjust the L18 slug until the picture locks in. Set the horizontal hold control in the full clockwise position and slowly rotate it in the opposite direction. Just before the picture falls into sync, 3 or 4 black and white bars should appear sloping downward to the right. Repeat the process, but with the horizontal hold control in the full counterclockwise position. The same conditions should be observed except that the bars will slope downward to the left.

If the sloping bar effect is as stated, then the picture should remain in sync over 1/4 rotation of the horizontal hold range and drop out of sync on either end of this range.

Horizontal Drive

This trimmer capacitor affects the height of the horizontal pulse, varying the horizontal linearity principally on the left side of the picture.

Focus

A variable resistor which controls the current flow through the focus coil on the neck of the tube.

Width

This slug adjustment inside the high-voltage cage affects the right side of the horizontal axis.

NOTE: There are no horizontal or vertical positioning controls. Centering of the picture is accomplished by positioning of the focus coil. The deflection yoke should be placed on the neck of the tube as far forward as possible.

ALIGNMENT PROCEDURE

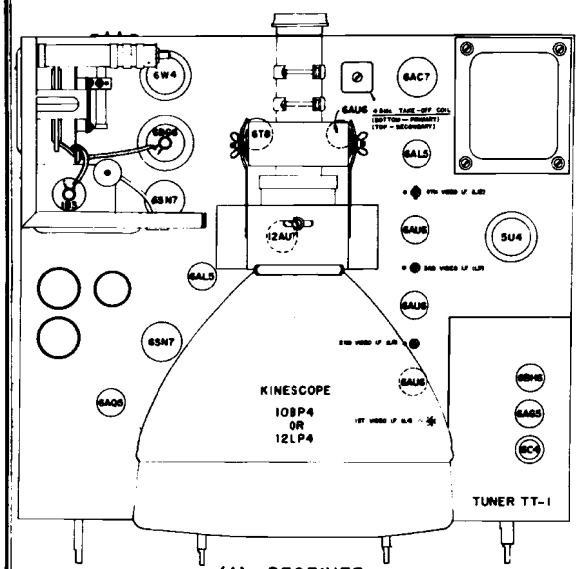
The sweep generator has its output continually variable in frequency. In this alignment, only one output sweep signal is needed, that sweeping between 20 to 30 mc.

The oscilloscope used is a high-gain, general purpose type employed for test purposes. The size of the screen is unimportant.

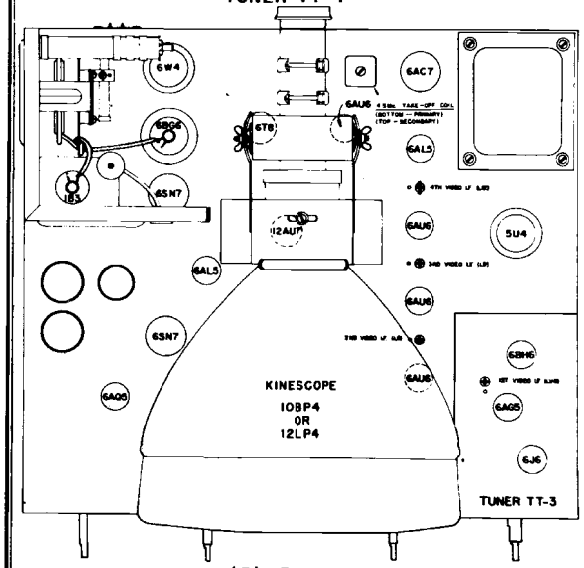
The VTVM is of the standard type with a high input impedance. It should have provision for a-c and d-c measurements. A 20,000 ohm-per-volt meter should be used for d-c indications if the VTVM can only measure a.c.

Alignment

For the alignment points refer to the figure indicated in the discussion. Most of the adjustments are located on top of the chassis. The r-f marker generator is used in making most of the alignment adjustments. It is recommended that the order of alignment in the following procedure be adhered to if alignment is found necessary. The ground leads of the test instruments should be connected to the receiver chassis.



(A)- RECEIVER INCORPORATING TUNER TT-1.



(B)- RECEIVER INCORPORATING TUNER TT-3.

FIG. 3 - TOP VIEW OF CHASSIS

Test Equipment

The test equipment required for the alignment of this receiver is as follows:

Marker Generator (RCA WR-39A, or equivalent)
Sweep Generator (RCA WR-59A, or equivalent)
Oscilloscope (RCA WO-55A, or equivalent)
VTVM (RCA Junior VoltOhmyst, or equivalent)
Volt-Ohmmeter (Simpson 260, or any 20,000 ohm-per-volt meter)

The marker generator is an r-f signal generator used for peaking the i-f coils and also to supply marker pips on the response pattern. The required frequency range of this generator is approximately from 20 to 30 mc and must also have provision for a 4.5 mc output. The accuracy of the frequency calibration of this generator is very important. It must also have provision for an amplitude modulated, as well as an unmodulated, r-f output.

Picture I-F Alignment (Fig. 3)

Connect the VTVM (a-c scale), or oscilloscope to the grid of the kinescope at the junction of C223 and R222. (Do not attempt to take readings with the VTVM at the video detector.) Adjust the contrast control about 1/8 turn below its maximum setting. Connect the output of the signal generator (marker) to the nipple on top of the 6AG5 mixer tube of either tuner.

Set the generator at 25.6 mc, amplitude-modulated at approximately 400 cycles, and adjust the first and third video i-f coils for maximum response. For those receivers employing tuner TT-1, the first video i-f coil is L4 as indicated in Fig. 3(A). When tuner TT-3 is used, the first video i-f coil is LV-6 and is incorporated in the tuner and not the receiver proper, as shown in Fig. 3(B). Reset the generator to 23.4 mc, still amplitude-modulated, and tune the second and fourth video i-f coils, L6 and L12 respectively, for maximum response. Repeat the above process for fine adjustments of settings.

Over-all Picture Response

With the sweep generator adjusted for a 10-mc sweep, using a center frequency of about 25 mc, connect the generator to nipple of the 6AG5 mixer tube of either tuner. Loosely couple the marker generator to the same mixer tube. The oscilloscope should remain at the grid of the kinescope. Inject individual markers of 26.1 mc, 25.6 mc, 22.6 mc, and 21.6 mc in the order indicated and note positions of marker pips on response curve. Turning the adjustments very slowly, retune the four video i-f coils again for an over-all picture i-f response as indicated in Fig. 4.

NOTE: A 30% variation in amplitude between peaks and from peak to valley, of the response curve is permissible. The most important considerations here are that the video i-f carrier of 26.1 mc is approximately halfway down the right hand slope, and that the sound i-f carrier of 21.6 mc is 20 times down at the other end of the curve.

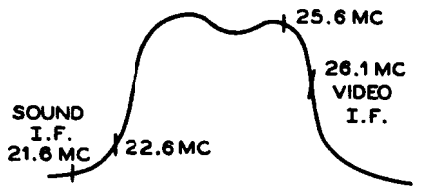


FIG. 4 - OVER-ALL I-F RESPONSE CURVE

Sound Takeoff and Detector Transformer Alignment

Move the signal generator (marker) output lead to the junction of L13 and R217, between the video detector, V-7, and video amplifier V-8. Set the generator to a 4.5-mc unmodulated signal output. Connect the VTVM (d-c scale) or the 20,000 ohm-per-volt meter across C107 in the output circuit of the ratio detector, V-2. (Remember that the negative lead at this point is actually above -140 volts with respect to ground.)

Adjust the following for maximum reading on the meter in the order indicated. The primary of L1 (the ratio detector transformer), the adjustment of which is shown in Fig. 5. Next tune the secondary of L1; this adjustment, shown in Fig. 5, is also shown in Fig. 2 and indicated as SOUND DISC. Then adjust the primary L2, the 4.5-mc takeoff transformer; see Fig. 5. Next adjust the secondary of L2, shown in Fig. 3. Decrease the signal output from the generator to the minimum required to give a readable deflection on the meter and then repeat the sound alignment process.

After the alignment is complete, remove the generators and meters. Tune in a station. Turn up the contrast control until a buzz is heard. Adjust the secondary of the detector transformer (see Figs. 2 and 5) for minimum buzz.

NOTE: Alignment of the r-f and oscillator sections are not recommended and are therefore not included. If any misalignment of these sections is suspected, consult the manufacturer.

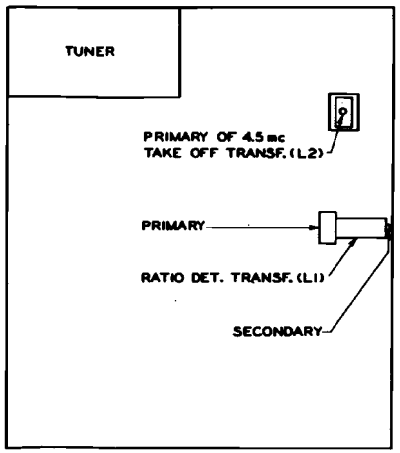


FIG. 5 - BOTTOM VIEW SHOWING ALIGNMENT POINTS FOR L1 AND PRIMARY OF L2

SERVICE NOTES

No Raster

Defective picture tube or misadjusted ion trap magnet.
No high voltage. Check tubes V-14, V-15, V-16, and V-17.
Check horizontal output transformer, T211T3; and also check C335, R326, and R336.
Check all voltages and waveforms in sweep section. Do not check voltage directly on plate of V-16.

Raster Present -- No Sound or Picture

Open transmission line.
Defective tube in r-f unit, or defective r-f unit.
Check B+ supply for sound and picture sections.
Check tubes V-1, V-2, V-3, V-4, V-5, V-6, V-7, and V-8.

Raster and Sound -- No Picture

Open green lead from picture tube socket.
Check tube V-8 and associated circuit.
Open C223.

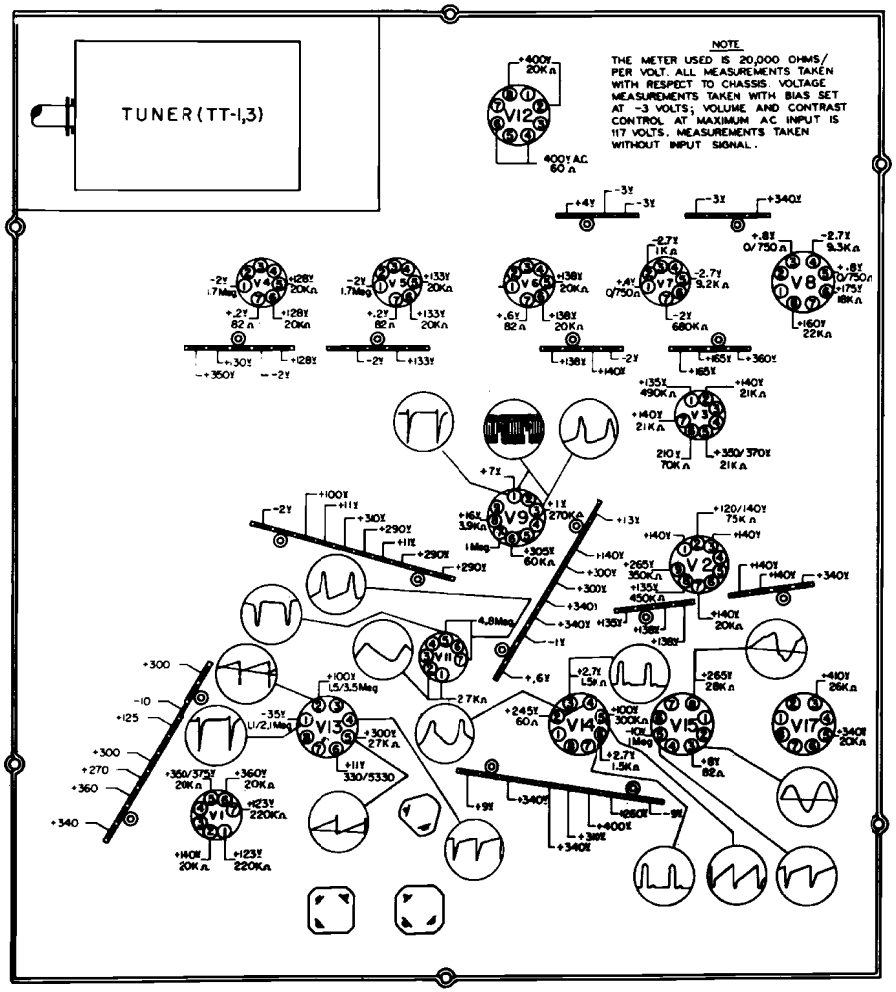


FIG. 6- BOTTOM VIEW INDICATING VOLTAGE AND RESISTANCE VALUES AND ALSO WAVE FORMS.

Raster and Picture -- No Sound

Defective sound takeoff transformer, T2, or ratio detector transformer, T1.
Check tubes V-1, V-2, and V-3.
Defective audio output transformer, T1, or speaker.

Unable to Synchronize Vertically or Horizontally

Check tube V-9 and associated circuit.

Unable to Synchronize Vertically

Check tube V-13.
Defective vertical oscillator transformer, T3, or vertical output transformer, T4.

Unable to Synchronize Horizontally

Horizontal sweep oscillator coil L18 misadjusted.
Coil L18 or capacitor C315 defective.
Defective tubes V-11 or V-14, or feedback capacitor C330.
Check voltages, resistances, and waveforms in horizontal sync section.

Insufficient Height

Defective vertical oscillator transformer, T3.
C313 increasing in capacity.
R304 and R310 changing in value.

Inability to Center Picture

Blanking on left side may be due to leaky C313.
Carefully try turning CR Tube.

NOTE: Entire audio circuit is at a potential of 140 volts above ground and the grids are hot. Also, V-1, 6AQ5, functions as a series voltage regulator to this 140 volts, as well as an audio output tube. Proper operation of this tube affects B+, and is, therefore, vital to normal operation of other circuits. A primary check of this circuit should be instituted when starting to service receiver.

For voltage and resistance analysis and waveforms, see Fig. 6.

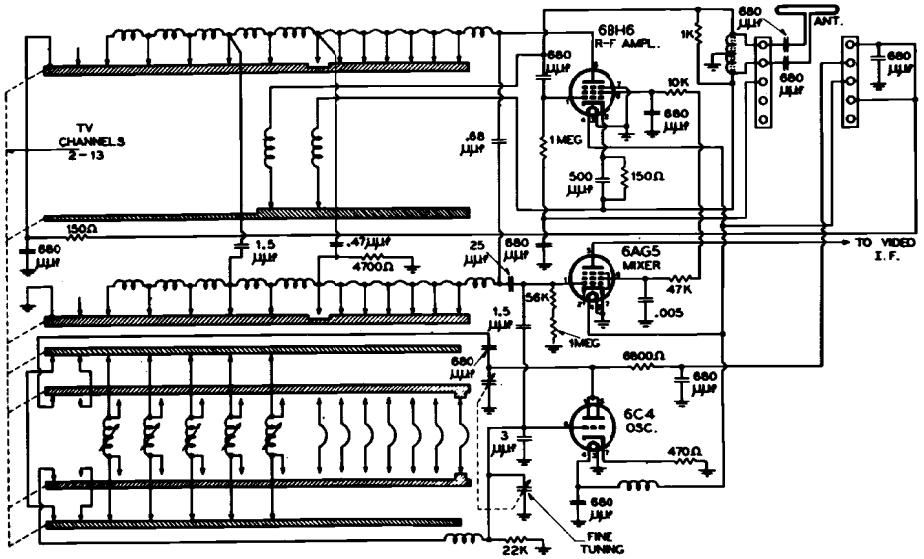


FIG. 7- SCHEMATIC OF TT-1 TUNER

DISASSEMBLY

To remove chassis from the cabinet, first pull off all knobs from controls in front of cabinet. Remove the six mounting bolts to be found underneath the cabinet and lift the chassis from the cabinet. Use care to prevent damage to the kinescope.

The kinescope is mounted on the chassis itself. It is held in place by a strap that is fastened over the outer rim of the bell of the kinescope.

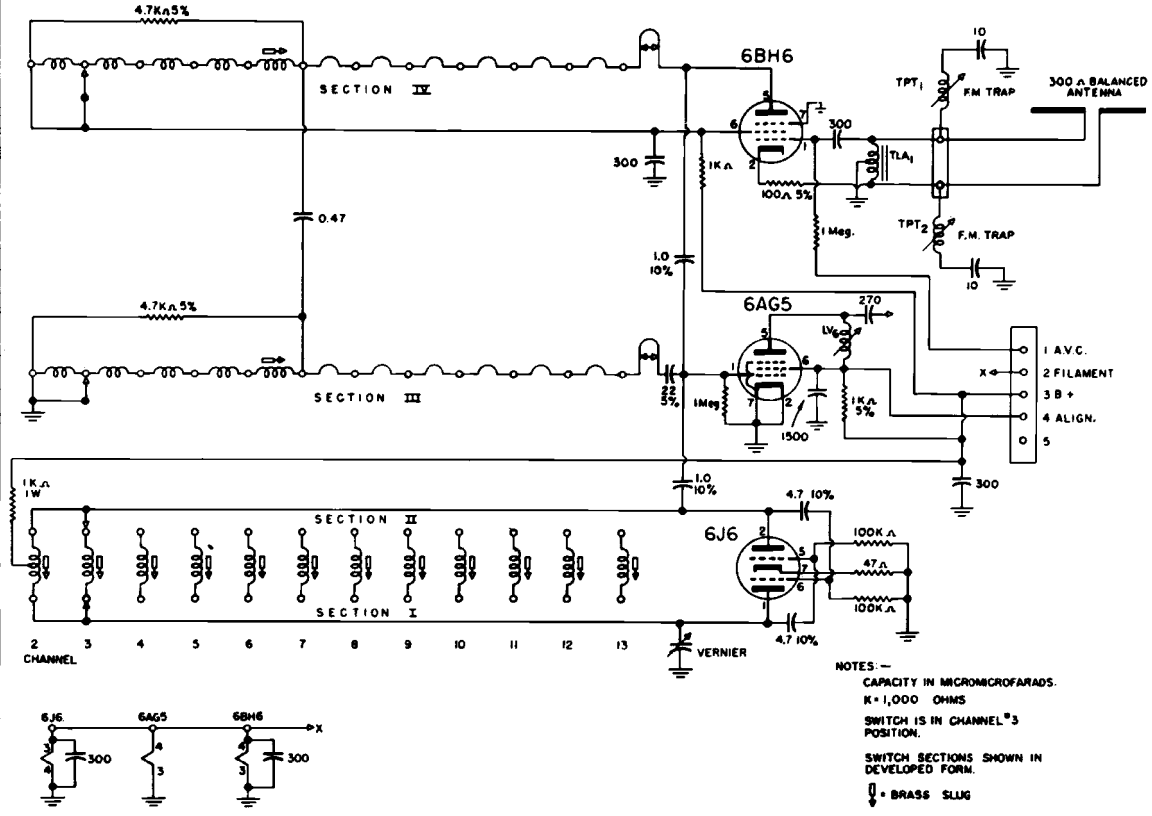


FIG. 8 – SCHEMATIC OF TT-3 TUNER

PARTS LIST

Ref Symbol	Description	Part No.
	CAPACITORS	
C101	Paper: 0.005 µf, 400 V	CP-4-25
C102	Tubular elect: 40 µf, strap mounting, 450 V	CET-4
C103	Can elect: 2-sect; 50 µf, 150 V; 500 µf, 5 V; size 1"	CEM-7
C104	Paper: 0.02 µf, 400 V	CP-4-12
C105	Paper: 0.05 µf, 400 V	CP-4-15
C106	Paper: 0.005 µf, 400 V	CP-4-25
C107	Tubular elect: 1 µf, 25 V	CET-6
C108	Paper: 0.005 µf, 400 V	CP-4-25
C109	Paper: 0.001 µf, 400 V	CP-4-21
C110	Paper: 0.02 µf, 400 V	CP-4-12
C111	Paper: 0.005 µf, 400 V	CP-4-25
C112	Paper: 0.02 µf, 400 V	CP-4-12
C113	Ceramic: 39 µµf, 20%	CC-439
C114	Paper: 0.1 µf, 400 V	CP-4-01
C115	Paper: 0.002 µf, 400 V	CP-4-22
C201	Ceramic: 100 µµf, GMV	CC-31
C202	Ceramic: Herlec GMV, 2-sect; each 0.002 µf	CCD-22
C203		
C204		
C205		
C206	Ceramic: GMV, 100 µµf	CC-31
C207		
C208	Ceramic: Herlec GMV, 2-sect; each 0.002 µf	CCD-22
C209		
C210	Paper: 0.1 µf, 400 V	CP-4-01
C211	Ceramic: Herlec GMV, 2-sect; each 0.002 µf	CCD-22
C212	Ceramic: Herlec GMV, 0.002 µf	CC-22
C213	Ceramic: Herlec GMV, 2-sect; each 0.002 µf	CCD-22
C214	Ceramic: GMV, 120 µµf	CC-312
C215	Ceramic: GMV, 100 µµf	CC-31
C216	Ceramic: Herlec GMV, 0.002 µf	CC-22
C217	Ceramic: 5 µµf, 20%	CC-55
C218	Paper: 0.1 µf, 400 V	CP-4-01
C219	Paper: 0.01 µf, 400 V	CP-4-11
C220	Ceramic: 680 µµf, 20%	CC-368
C221	Ceramic: 470 µµf, 20%	CC-347
C222	Can elect: 4-sect; 10 µf, 150 V; 10, 20, 10 µf, 450 V; size 1-3/8"	CEM-6
C223	Paper: 0.1 µf, 400 V	CP-4-01
C224	Ceramic: Herlec GMV, 0.002 µf	CC-22
C225		
C301	Paper: 0.002 µf, 400 V	CP-4-22
C302	Paper: 0.005 µf, 400 V	CP-4-25
C303		
C304	Paper: 0.01 µf, 400 V	CP-4-11
C305		
C306	Can elect: 3-sect; 40, 40, 40 µf, 450 V; size 1-3/8"	CEM-5
C307		
C308		
C309	Can elect: 2-sect; 50 µf, 150 V; 500 µf, 5 V; size 1"	CEM-7
C310	Paper: 0.005 µf, 400 V	CP-4-25
C311	Tubular elect: 100 µf, 150 V	CET-5
C312	Paper: 25 µf, 400 V	CP-4-025
C313	Paper: 0.1 µf, 400 V	CP-4-01
C314	Can elect: 4-sect; 10 µf, 150 V; 10, 20, 10 µf, 450 V; size 1-3/8"	CEM-6

Ref Symbol	Description	Part No.
R116	1K 10%, 1/2 W	RC-102-2
R117	470K 10%, 1/2 W	RC-474-2
R118	10K 10%, 1/2 W	RC-103-2
R119	220K 10%, 1/2 W	RC-224-2
R201	10K 10%, 1/2 W	RC-103-2
R202	330 Ω 10%, 1/2 W	RC-331-2
R203	82 Ω 10%, 1/2 W	RC-820-2
R204	100 Ω 10%, 1/2 W	RC-101-2
R205	330 Ω 10%, 1/2 W	RC-331-2
R206	8.2K 10%, 1/2 W	RC-822-2
R207	82 Ω 10%, 1/2 W	RC-820-2
R208	100 Ω 10%, 1/2 W	RC-101-2
R209	8.2K 10%, 1/2 W	RC-822-2
R210	82 Ω 10%, 1/2 W	RC-820-2
R211	100 Ω 10%, 1/2 W	RC-101-2
R212	1 Meg 10%, 1/2 W	RC-105-2
R213	680K 10%, 1/2 W	RC-684-2
R214	100 Ω 10%, 1/2 W	RC-101-2
R215	39K 10%, 1 W	RC-393-5
R216	1K 10%, 1/2 W	RC-102-2
R217	120K 10%, 1/2 W	RC-121-2
R218	44K 10%, 2 W	RC-443-8
R218A	44K 10%, 2 W	RC-443-8
R219	22K 10%, 2 W	RC-223-5
R220	54K 10%, 2 W	RC-543-8
R220A	54K 10%, 2 W	RC-543-8
R221	5.6K 10%, 1 W	RC-562-5
R222	2.2K 10%, 1/2 W	RC-222-2
R223	270K 10%, 1/2 W	RC-274-2
R224	8.2K 10%, 1/2 W	RC-822-2
R301	8.2K 10%, 1/2 W	RC-822-2
R302	8.2K 10%, 1/2 W	RC-822-2
R303	15 Ω 10%, 1 W	RC-150-5
R304	6.8 Meg 10%, 1/2 W	RC-685-2
R305	1 Meg 10%, 1/2 W	RC-105-2
R306	2.2 Meg 10%, 1/2 W	RC-225-2
R307	330 Ω 10%, 1/2 W	RC-331-2
R308	100K 10%, 1/2 W	RC-104-2
R309	6.8K 10%, 1/2 W	RC-682-2
R310	1.5 Meg 10%, 1/2 W	RC-155-2
R311	5.6K 10%, 1/2 W	RC-562-2
R312	1.5K 10%, 1/2 W	RC-152-2
R313	68K 10%, 1/2 W	RC-683-2
R314	270K 10%, 1/2 W	RC-274-2
R315	22K 10%, 1 W	RC-223-5
R316	1 Meg 10%, 1/2 W	RC-105-2
R317	22K 10%, 1 W	RC-223-5
R318	27K 10%, 1/2 W	RC-273-2
R319	470K 10%, 1/2 W	RC-474-2
R320	68 Ω 10%, 1/2 W	RC-680-2
R321	82 Ω 10%, 1 W	RC-820-5
R322	8.2K 10%, 2 W	RC-822-8
R323	4.7 Meg 10%, 1/2 W	RC-475-2
R324	100K 10%, 1/2 W	RC-104-2
R325	100K 10%, 1/2 W	RC-104-2
R326	3.3 Ω 10%, 1/2 W	RC-336-2
R327	4.7K 10%, 1/2 W	RC-472-2
R328	6300 Ω tapped 10% 500-500 50 W Std	RC-632-17
R329	22K 10%, 1/2 W	RC-223-2
R330	3.9K 10%, 1/2 W	RC-392-2
R331	3.9K 10%, 1/2 W	RC-392-2
R332	820K 10%, 1/2 W	RC-824-2
R333	47K 10%, 1/2 W	RC-473-2
R334	1 Meg 10%, 1/2 W	RC-105-2
R335	3.9K 10%, 1/2 W	RC-392-2
R336	1 Meg 10%, 1 W	RC-105-5
R337	6.8K 10%, 1 W	RC-682-5

TRANSFORMERS

T1	Audio output trans	T-102
T2	Power trans	T-106
T3	Vert blocking osc. trans	T-104
T4	Vert output trans	T-107
T5	Hor output trans	T-211T3
IT-1	Ion trap	IT-1

TUBES

V-1	Audio ampl	6AQ5
V-2	Ratio det	6T8
V-3	Ratio det driver	6AU6
V-4	1st video i-f ampl	6AU6
V-5	2nd video i-f ampl	6AU6
V-6	3rd video i-f ampl	6AU6
V-7	Video det & AGC	6AL5
V-8	Video ampl	6AC7
V-9	D-c restorer, sync clipper & sync ampl	12AU7
V-10	Kinescope tube	10BP4 or 12LP4
V-11	Hor phase det	6AL5
V-12	Power rectifier	5U4G
V-13	Vert sweep osc. & vert sweep output	6SN7
V-14	Hor sweep osc.	6SN7
V-15	Hor sweep output	6BG6G
V-16	H-V rect	1B3/8016
V-17	Hor damper	5V4

Tubes in R-F Tuner not included

Ref Symbol	Description	Part No.
C315	Mica, silver: 3900 μμf, 5%	CM-239
C316	Paper: 0.05 μf, 400 V	CP-4-15
C317	Mica, silver: 330 μμf, 10%	CM-333
C318	Mica: 390 μμf, 20%	CM-339
C319	Can elect: 4-sect; 10 μf, 150 V; 10, 20, 10 μf, 450 V; size 1-3/8"	CEM-6
C320	Mica: 270 μμf, 20%	CM-327
C321	Paper: 0.05 μf, 400 V	CP-4-15
C322	Paper: 0.01 μf, 400 V	CP-4-11
C323	Paper: 0.005 μf, 400 V	CP-4-25
C324	Can elect: 4-sect; 10 μf, 150 V; 10, 20, 10 μf, 450 V; size 1-3/8"	CEM-6
C325	Mica: 25-280 μμf, padder, Hor. Drive	CT-1
C326	Paper: 0.25 μf, 400 V	CP-4-025
C327	Paper: 0.05 μf, 600 V	CP-6-15
C328	Paper oil-filled: 0.035 μf, 600 V	CO-6-135
C329	Paper oil-filled: 0.1 μf, 600 V	CO-6-01
C330	Mica: 12 μμf, 5%, 1500 V	CM-412
C331	Paper: 0.001 μf,	CP-4-21
C332	400 V	
C333	Paper: 0.01 μf, 400 V	CP-4-11
C334	Mica: 22 μμf, 20%	CM-422
C335	Ceramic: 500 μμf, 10KV Std.	CHV-35
C336	Paper: 0.25 μf, 400 V	CP-4-025

COILS & CHOKES

L1	4.5 mc discrim.trans	LRD-1
L2	4.5 mc take-off trans	LTO-2
L3	Peaking coil	LP-7
L4	1st video i-f trans	LV-6
L5	Filament choke	LC-1
L6	2nd video i-f trans	LTO-2
L7	Filament choke	LC-1
L8	R-f choke	LC-4
L9	3rd video i-f trans	LV-6
L10	Filament choke	LC-1
L11	R-f choke	LC-4
L12	4th video i-f trans	LV-6
L13	Peaking coil	LP-5
L14	Peaking coil	LP-6
L15	Peaking Coil	LP-8
L16	Filter choke	LC-3
L17	Focus coil	LP-3
L18	Afc coil	LHO-2
L19	Deflect yoke	DY-2
L20	Width control	L-201R1
L21	Hor linearity ol control	L-201R3

CONTROLS--POTENTIOMETERS

P-2	Vert Linearity, 5K, 1/2 W	P-2
P-5	Vert Size, 2.5 Meg, 1/2 W	P-5
P-6	Focus, 1500 Ω, 3 W	P-6
P-7	Volume, 500K, audio taper with switch	P-7
PD-4	Dual-control: Brightness, 100K, 1/2 W; Contrast, 750 Ω, 1 W, wire wound, tap at 250 Ω	PD-4
PD-5	Dual-control: Vert Hold, 1 Meg; Hor Hold, 50K	PD-5

RESISTORS

R101	390 Ω 10%, 1 W	RC-391-5
R102	4.7K 10%, 1/2 W	RC-472-2
R103	470K 10%, 1/2 W	RC-474-2
R104	100K 10%, 1/2 W	RC-104-2
R105	330K 5%, 1/2 W	RC-334-3
R106	180K 5%, 1/2 W	RC-184-3
R107	330K 10%, 1/2 W	RC-334-2
R108	470K 10%, 1/2 W	RC-474-2
R109	18K 10%, 2 W	RC-183-8
R110	15K 10%, 1/2 W	RC-153-2
R111	44K 10%, 1/2 W	RC-443-2
R113	1K 10%, 1/2 W	RC-102-2
R114	100K 10%, 1/2 W	RC-104-2
R115	82K 10%, 1/2 W	RC-823-2

MODELS AR-TV-10C, AR-TV-10X, AR-TV-12X

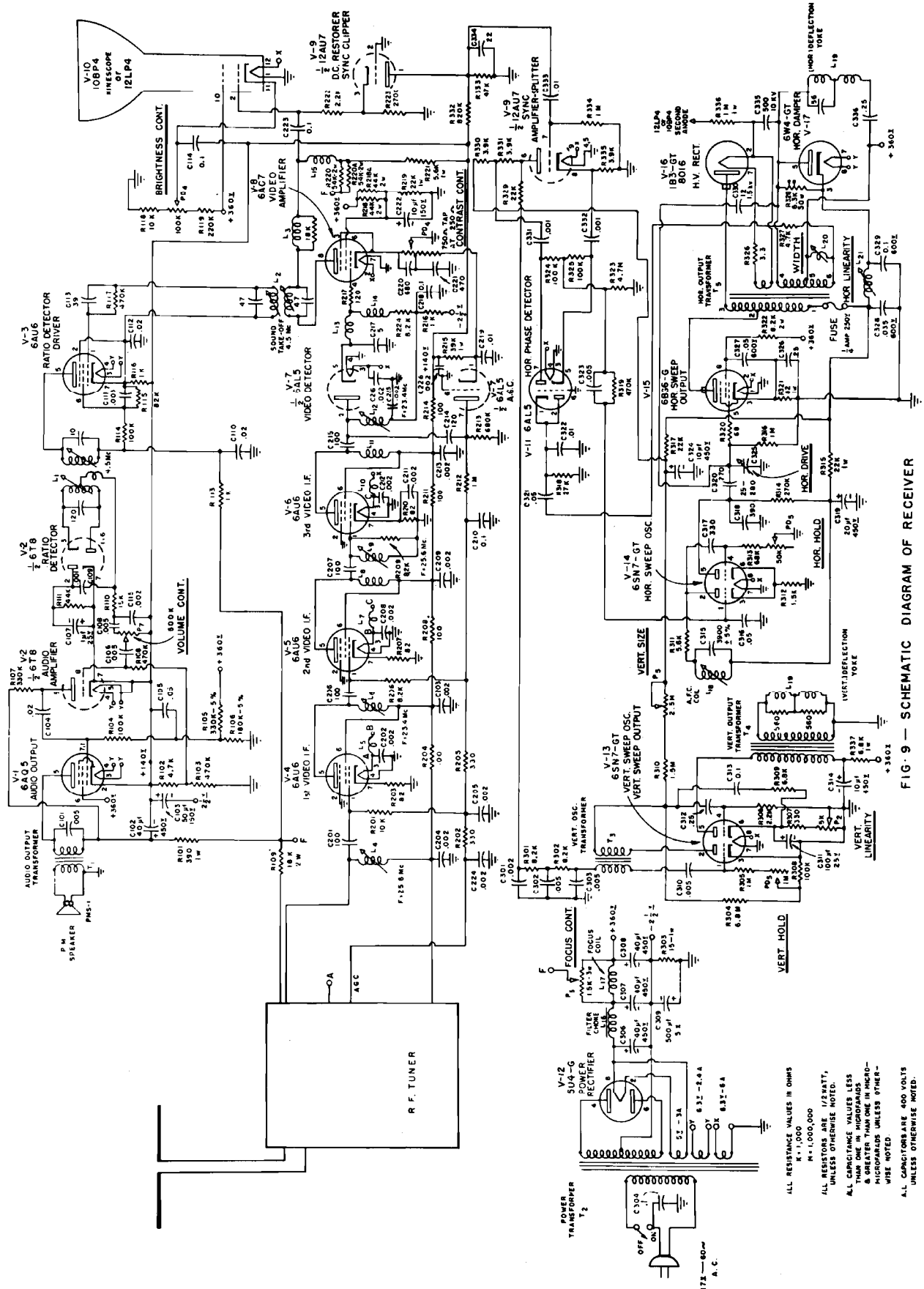


FIG. 9 — SCHEMATIC DIAGRAM OF RECEIVER

GENERAL

Picture Area	54 square inches
Tubes	Twenty-one plus two rectifiers
Speaker	6-1/2 inch E.M.
Speaker V.C. Impedance	3.2 ohms
Antenna	Provision for external antenna using 300-ohm transmission line.
Tuning	Rotary selector plus fine tuning adjustment
Tuning Range	Twelve pre-set channels.

Channel No.	Frequency (mc)	Channel No.	Frequency (mc)
2	54-60	8	180-186
3	60-66	9	186-192
4	66-72	10	192-198
5	72-82	11	198-204
6	82-88	12	204-210
7	174-180	13	210-216

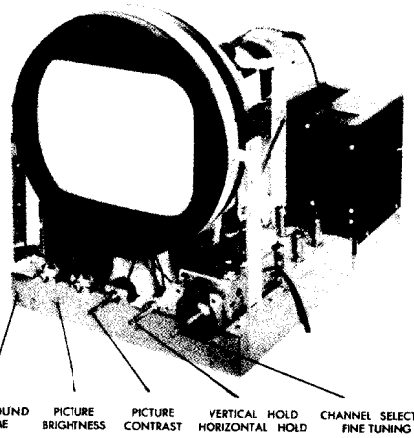
*Intermediate Frequency
- Picture carrier . . . . . 26.25 mc
- Sound carrier . . . . . 21.75 mc
- Intercarrier sound system . 4.5 mc

Power Supply . . . . . 105-125 V. 60 cycles AC

Power Consumption . . . . . 230 Watts

CARE OF THE KINESCOPE WINDOW

The window in front of the picture tube is made of safety glass, hence may be cleaned by any of the conventional window cleaning processes. Abrasive or strong solvent type cleaning solutions that may scratch the glass or damage the cabinet finish, however, should be avoided.



HIGH VOLTAGE WARNING

Operation of the receiver chassis outside of the cabinet involves a shock hazard. An interlock in the line cord disconnects the power when the back cover is removed. The HIGH VOLTAGE supply, while of low current capacity, operates at a 9,000 volt potential. Exercise all normal HIGH VOLTAGE precautions while working with this equipment.

KINESCOPE HANDLING PRECAUTIONS

The kinesccpe housing provides adequate protection against possible tube implosure while in the cabinet. Do not expose the kinescope or handle it in any way without providing personal protection in the form of shatterproof goggles and heavy gloves. The kinescope should be handled by qualified personnel only.

The kinescope envelope encloses a high vacuum and with the large surface area of glass involved, the stresses set up, particularly at the front rim of the tube, are considerable. An abnormal handling stress, accidental blow at a highly stressed surface, or even a scratch on the surface of the tube could cause it to implode or collapse with destructive violence.

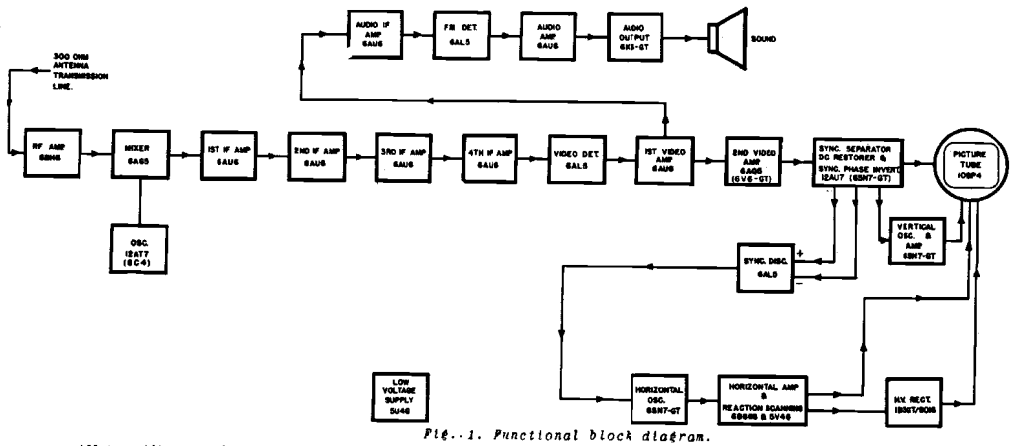


Fig. 1. Functional block diagram.

*Note - Alignment frequencies. For complete list of intermediate frequencies, see I-F FREQUENCY CHART.

NON-OPERATING CONTROL ADJUSTMENTS

The "non-operating" or screw-driver adjustments normally will require an occasional minor adjustment if any circuit work or tube changing is required. A test pattern, generated either locally in the shop or obtained from a television station is recommended for best results. Normal picture contrast and brightness should be maintained during the following adjustments for best results.

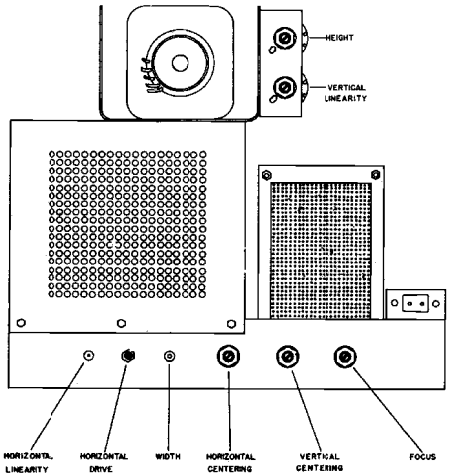


Fig. 2. Rear chassis view, location of non-operating controls.

HORIZONTAL-OSC.,-DRIVE,-LINEARITY, CENTERING AND WIDTH ADJUSTMENTS

1. Advance the HORIZONTAL DRIVE control (clockwise) as far as possible without causing crowding of the right hand side of the test pattern or producing picture instability. Insufficient horizontal drive will cause the raster to fall short of filling the mask horizontally. Should the HORIZONTAL HOLD control fail to hold the test pattern in the normal manner, set the HORIZONTAL HOLD control in the middle of its range and adjust the HORIZONTAL OSC. ADJ. screw for horizontal sync. (See Fig. 11 for location).

HORIZONTAL DRIVE CONTROL MISADJUSTMENT

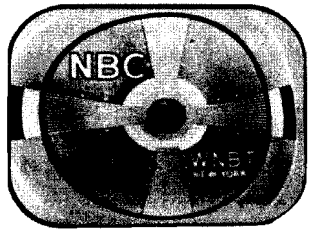


Figure 3.

WIDTH CONTROL MISADJUSTMENT

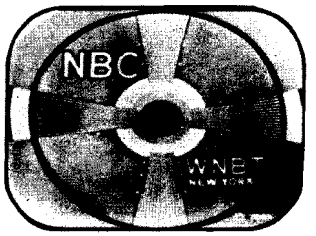


Figure 4.

2. Set the WIDTH and HORIZONTAL CENTERING controls so that the test pattern fits and centers in the horizontal dimension of the kinescope mask.

HORIZONTAL CENTERING CONTROL MISADJUSTMENT

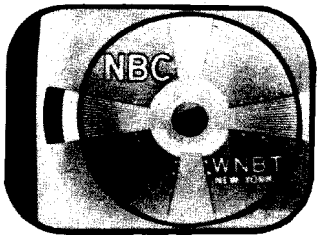


Figure 5.

3. Set the HORIZONTAL LINEARITY control so that the test pattern is symmetrical from left to right. A slight readjustment of the HORIZONTAL DRIVE control may be necessary when making this adjustment.

HORIZONTAL LINEARITY CONTROL MISADJUSTMENT

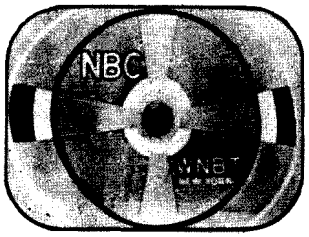


Figure 6.

VERTICAL-CENTERING,-LINEARITY, AND HEIGHT ADJUSTMENTS

HEIGHT CONTROL MISADJUSTMENT

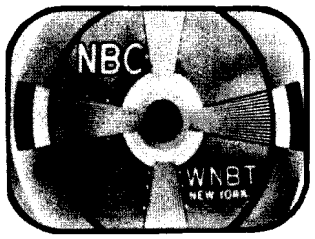


Figure 7.

1. Set the HEIGHT and VERTICAL CENTERING controls so that the test pattern fits and centers in the vertical dimension of the kinescope mask.

VERTICAL CENTERING CONTROL MISADJUSTMENT

Figure 8.

VERTICAL LINEARITY CONTROL MISADJUSTMENT

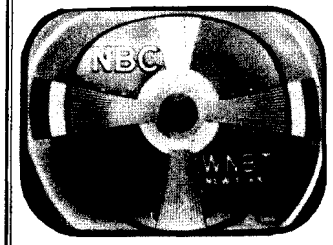


Figure 9.

2. Set the VERTICAL LINEARITY control for a symmetrical test pattern in the vertical dimension. A slight readjustment of the HEIGHT and VERTICAL CENTERING controls may be required when making this adjustment.

Note - The sequence of "non-operating" control adjustments outlined above is suggested as a convenient method of approach and not an arbitrary procedure. Variations of the procedure is permitted to obtain the final result.

DISMANTLING FOR KINESCOPE REPLACEMENT OR ALIGNMENT ADJUSTMENTS

1. Remove the five front panel control knobs by pulling them straight from their shafts. The two dual control knobs must be removed in two pieces, removing the center unit first.

2. Remove the back cover. Note that the line cord and half of the interlock connector will come along with the back cover.

REMOVING THE KINESCOPE

Refer to the warning KINESCOPE HANDLING PRECAUTIONS. Follow the dismantling instructions above to expose the tube and proceed as follows:

1. Disconnect the tube socket connector at the base of the tube and the high voltage anode lead. (Snap on connector).

2. Remove the ION TRAP slipping it from the neck of the tube passed the tube socket.

3. Loosen the steel band at the front rim of the tube and slip the tube with the rubber boot out through the steel band.

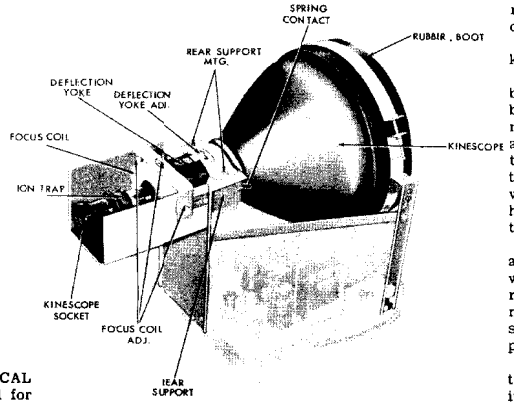


Fig. 10. Kinescope mounting detail.

INSTALLING THE KINESCOPE

1. Slip the rubber boot over the front rim of the kinescope tube so that when the raster area is properly positioned the anode contact is at the top and slightly to the right of the center as viewed from the screen of the tube.

2. Slip the tube through the front rim (socket first) and on through the REAR SUPPORT, DEFLECTION YOKE and FOCUS COIL. Orient the raster area and seat the tube firmly against the REAR SUPPORT. If the tube fails to slip into place smoothly, investigate and remove the cause of the trouble. Do not force the tube. Check the distance from the front face of the RUBBER BOOT to the front edge of the metal clamp. The distance is approx. 1-1/16 inches to properly seat the boot against the cabinet. If this dimension is off; loosen the two REAR SUPPORT MTG. screws, position the tube correctly and fasten the front rim firmly about the RUBBER BOOT.

3. Disconnect and remove the speaker to provide clearance for the kinescope tube mounting.

4. Release the two chassis units by removing the eight mounting screws at the base of the cabinet and pull the chassis clear of the cabinet. The kinescope tube is now accessible for replacement or adjustment.

5. Reconnect the interlock connector for power while making the non-operating control adjustments or alignment adjustments on the bench.

3. The REAR SUPPORT must seat firmly against the flare of the tube and be securely anchored in place by the two REAR SUPPORT MTG. screws. Check the two SPRING CONTACTS grounding the outer coating of the kinescope tube. A high potential is developed on the outer coating of the tube if these contacts are faulty.

4. The DEFLECTION YOKE must seat firmly against the flare of the tube. Check by loosening the single DEFLECTION YOKE ADJ. screw and pushing the DEFLECTION YOKE housing forward as far as it will go. Take up on the mounting screw temporarily to hold the coil in place.

5. Slip the ION TRAP over the neck of the tube. If it is the ring type, the arrow points toward the front of the tube· if it is of the clamp type, the blue coded clamp is toward the front.

6. Connect the tube socket and anode connector to the kinescope and turn on the receiver.

7. After allowing a few minutes for warm up, turn up the brightness control and set the ION TRAP for maximum raster brilliance, backing off the brightness control adjustment as the maximum point is approached. The ION TRAP must be rotated about the axis of the tube as well as shifted along the neck of the tube to obtain the proper setting. The arrow on the ring type ion trap will generally point at the HV anode connector when properly positioned as far as rotation is concerned, hence a rough setting may be obtained immediately with this type of trap.

With the BRIGHTNESS control set for slightly above average brilliance and the CONTRAST control full counterclockwise, adjust the FOCUS control until the line structure of the raster is clearly visible and readjust the ION TRAP 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.

8. Set the HORIZONTAL and VERTICAL CENTERING controls at mid-position. 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 ADJ. screws and rotate the coil about its vertical and horizontal axis until the entire raster is visible, approximately centered and with no shadowed corners. Tighten the adjustments with the coil in this position.

9. If the lines of the raster are not horizontal or square with the picture mask loosen the DEFLECTION YOKE ADJ. screw and rotate the DEFLECTION YOKE until this condition is obtained. Tighten the adjustment.

10. Follow the procedure under NON-OPERATING CONTROL ADJUSTMENTS and make any minor adjustments of the FOCUS COIL or DEFLECTION YOKE necessary to obtain the desired results. A slightly better average focus may be obtained by sliding the FOCUS COIL back and forth along the kinescope neck while adjusting the FOCUS control and watching the test pattern. The final adjustment of the focus coil should leave the raster approximately centered.

MEASUREMENT OF H.V.POTENTIAL ON KINESCOPE ANODE

The second anode potential will be approx. 9,000 V. on a receiver that is functioning properly. Since the high potential for the kinescope anode is obtained from the horizontal output transformer, the "non-operating" control adjustments outlined above must be made or be known to be in proper adjustment before the H.V. measurement will have any meaning. Improper operation of the horizontal sweep circuit or circuit faults in the high voltage filter will generally account for an abnormal anode potential. If the anode potential is low, check the HORIZONTAL DRIVE adjustment outlined above.

CAUTION HIGH VOLTAGE

Do not use hand held flexible test leads when making the following measurement. Keep the hands clear of the circuit during measurement. A 9,000 V. potential exists in this circuit. Exercise all normal high voltage precautions.

1. Connect a 50-megohm resistor string in series with a 200 microampere meter. Connect the free meter terminal to the chassis and the high side of the resistor string to the anode cap of the kinescope. The connection to the anode cap may be made with a fine wire slipped under the connector. Make up the resistor string with 10-megohm one or two watt resistors to provide a safety factor for voltage breakdown. If 10-megohm resistors are used, a total of five will be required to obtain the 50 megohms. Make the setup self-supporting and allow adequate clearance between the resistor string and chassis parts to prevent high voltage breakdown.

2. Turn on the receiver and set the BRIGHTNESS and CONTRAST controls at minimum. The microammeter will read approx. 180 microamperes or 9,000 V. at the kinescope anode. The anode potential is measured in this manner (CONTRAST and BRIGHTNESS controls at minimum; meter current approx. 200 microamperes) to simulate the kinescope load on the high voltage power supply.

ALIGNMENT PROCEDURE

Note.- The following alignment adjustments do not require the use of the kinescope tube. It is recommended that the tube be removed if extensive alignment adjustments are to be made.

CAUTION - Removal of the kinescope tube exposes the HIGH VOLTAGE anode connector contact. Keep this lead and contact clear of personnel servicing equipment and grounded objects on the service bench. Exercise all normal high voltage precautions while working with the exposed units. See Figures 14 and 16 for high voltage points on the power supply chassis.

EQUIPMENT REQUIRED

Signal generator covering 4 mc to 30 mc
Signal generator covering 40 mc to 215 mc
Electronic voltmeter
Two 150-ohm carbon resistors
One .01 mfc. 600 V. tubular paper condenser

F-M SOUND CHANNEL ALIGNMENT

1. Connect the low frequency signal generator output between the control grid (pin 1) of the 6AU6 1st VIDEO AMP. tube (V-9) and chassis ground.

2. Connect the electronic voltmeter between pin 7 of the 6AL5 FM DET. tube (V-16) and chassis ground.

3. With the signal generator (unmodulated) set at 4.5 mc, set the 4.5 MC LIMITER GRID ADJ. and FM DET. PRI. ADJ. for maximum d-c voltage as measured by the electronic voltmeter. Adjust the limiter grid coil (L-14) before adjusting the f-m detector transformer (T-1) primary. Use just enough signal generator output to obtain approximately one volt at the electronic voltmeter.

4. Connect the electronic voltmeter across the 1,000 mmf condenser (C-17) at the output of the f-m detector stage and adjust the FM DET. SEC. ADJ. of the f-m detector transformer (T-1) for the null.

5. Shift the frequency of the signal generator either side of 4.5 mc and touch up the FM DET. PRI. ADJ. for approximately equal peaks. Use just enough signal generator output to obtain one volt peaks for best results.

I-F AMPLIFIER ALIGNMENT CHART

1. Connect the electronic voltmeter across the 5600 - ohm resistor (R-57) in the plate circuit of the 6AL5 VIDEO DET. tube (V-8). This resistor is located on the terminal strip between the 6AL5 VIDEO DET. tube (V-8) and the 6AU6 1st VIDEO AMP tube (V-9).

2. Connect the high side of the low frequency signal generator directly to the grid of the OSC tube (V-3) (Pin 7 of the 12AT7 or pin 6 of the 6C4). Connect the generator ground to the frame of the tuning unit.

(a) Set the FINE TUNING control in the center of its range.

(b) Set the channel selector for the channel number to be aligned.

(c) Clip on an .01 mfd condenser between pin 2 of 10BP4 kinescope (V-19) and pin 1 of the 6AU6 AUDIO AMP tube (V-17). The connection at pin 2 of the kinescope can be made at the terminal strip under the chassis provided for the socket leads of this tube.

(d) Set the "BFO" generator at 24.5 mc(No modulation)

(e) Set the high frequency signal generator per the alignment chart. (No modulation)

(f) Adjust the OSC ADJ. screw, or shift turns on the oscillator coil corresponding to the channel being aligned for a rough audio beat note, using the speaker as a detector. This ordinarily completes the alignment of any one channel, all others are to be treated in the same manner.

NOTE: Although the resonant circuits in the r-f amplifier and mixer stages of the tuning unit are not provided with adjustments and should not ordinarily require adjustment, they may be touched up by compressing or expanding the coils as required to bring up the overall gain. Adjust the coils for maximum d-c voltage as measured by the electronic voltmeter. (Voltmeter connected as for i-f alignment.)

CHANNEL ALIGNMENT CHART

Channel No.	Channel Freq. (mc)	H.F. Signal Generator Freq. (No modulation)	Channel No.	Channel Freq. (mc)	H.F. Signal Generator Freq. (No modulation)
2	54-60	57 mc	8	180-186	183 mc
3	60-66	63 mc	9	186-192	189 mc
4	66-72	69 mc	10	192-198	195 mc
5	76-82	79 mc	11	198-204	201 mc
6	82-88	85 mc	12	204-210	207 mc
7	174-180	177 mc	13	210-216	213 mc

The overall sensitivity for the receiver will run approximately 100 to 200 microvolts for one volt DC at resistor R-57 when measured in the above manner.

CARRIER vs I-F FREQUENCY CHART

Channel No.	Channel Freq. (mc)	Picture Carrier Freq. (mc)	Sound Carrier Freq. (mc)	Receiver Osc. Freq. (mc)		Picture IF Freq. (mc)		Sound IF Freq. (mc)		Picture IF less Sound IF (mc
2	54-60	55.25	59.75	*81.5	+81.5	*26.25	+26.25	*21.75	+21.75	4.5
3	60-66	61.25	65.75	87.5	87.5	26.25	26.25	21.75	21.75	4.5
4	66-72	67.25	71.25	93.5	93.5	26.25	26.25	21.75	21.75	4.5
5	76-82	77.25	81.75	103.5	103.5	26.25	26.25	21.75	21.75	4.5
6	82-88	83.25	87.75	109.5	109.5	26.25	26.25	21.75	21.75	4.5
7	174-180	175.25	179.75	152.5	201.5	22.75	26.25	27.25	21.75	4.5
8	180-186	181.25	185.75	158.5	207.5	22.75	26.25	27.25	21.75	4.5
9	186-192	187.25	191.75	164.5	213.5	22.75	26.25	27.25	21.75	4.5
10	192-198	193.25	197.75	170.5	219.5	22.75	26.25	27.25	21.75	4.5
11	198-204	199.25	203.75	176.5	225.5	22.75	26.25	27.25	21.75	4.5
12	204-210	205.25	209.75	182.5	231.5	22.75	26.25	27.25	21.75	4.5
13	210-216	211.25	215.75	188.5	237.5	22.75	26.25	27.25	21.75	4.5

* Frequency for tuners using type 12AT7 oscillator tube.
\+ Frequency for tuners using type 6C4 oscillator tube.

3. Set the channel selector at channel 2.

4. Set the signal generator output (unmodulated) to develope two volts at the electronic voltmeter and adjust the five i-f amplifier coils, according to the following chart, for maximum d-c voltage as measured by the electronic voltmeter. Readjust the signal generator output as required to maintain the two-volt potential at the electronic voltmeter.

I-F AMPLIFIER ALIGNMENT CHART

Signal Generator Frequency (No Modulation)	Adjustment (Refer to Fig. 11)	Stage Adjusted
25.8 mc	25.8 MC IF ADJ.	Mixer
22.3 mc	22.3 MC IF ADJ.	1st IF amp.
25.5 mc	25.5 MC IF ADJ.	2nd IF amp.
23.7 mc	23.7 MC IF ADJ.	3rd IF amp.
26.3 mc	26.3 MC IF ADJ.	Video detector

5. Check the i-f amplifier frequency response by tuning the signal generator from 21 mc through 26.25 mc and observing the change in d-c voltage at the electronic voltmeter. If the signal generator output is set for an electronic voltmeter reading of 1.5 volts at the peak i-f amplifier response, the d-c voltage should not drop below one volt between the two peaks normally obtained with this i-f amplifier. If the response is unsatisfactory, repeat the procedure or try slight modifications of the recommended settings to obtain the desired response. Avoid resonating the coils with the iron core at the bottom end of the coil form. (Adjustment screw near limit of its travel). Check the two carrier i-f responses, 21.75 mc and 26.25 mc. The 21.75 mc response will be approximately 20 db below the peak response (Approximately 0.15 volt) and the 26.25 mc response will fall approximately 6 db below the peak. (Approximately 0.4 volt). Refer to Fig. 12.

The average i-f amplifier sensitivity when feeding the signal generator output through the receiver in the above manner, will run approximately 800 to 5000 microvolts for the one volt d-c peak measured at the 5600 - ohm resistor (R-57). (Receiver's oscillator operating on channel 2).

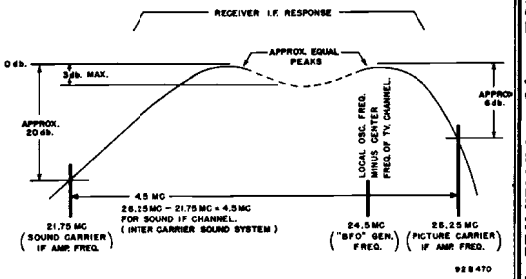


Fig. 12. I-F amplifier response.

STATION CHANNEL ALIGNMENT

1. Due to the broad frequency response of the i-f amplifier, it is necessary to use a 24.5 mc signal generator or oscillator (unmodulated) as a beat frequency oscillator (BFO) in order to locate the center frequency of the i-f amplifier response for the correct local oscillator adjustment. The "BFO" generator should be loosely coupled by means of a wire from the generator output placed in close proximity to the 6AL5 VIDEO DET. tube (V-8).

2. Connect the high frequency signal generator output to the receiver's antenna transmission line through the two 150 - ohm carbon resistors, one connected in each conductor of the transmission line.

3. Each channel may be aligned independently without affecting the alignment of the others. Alignment of the individual channels is carried out as follows:

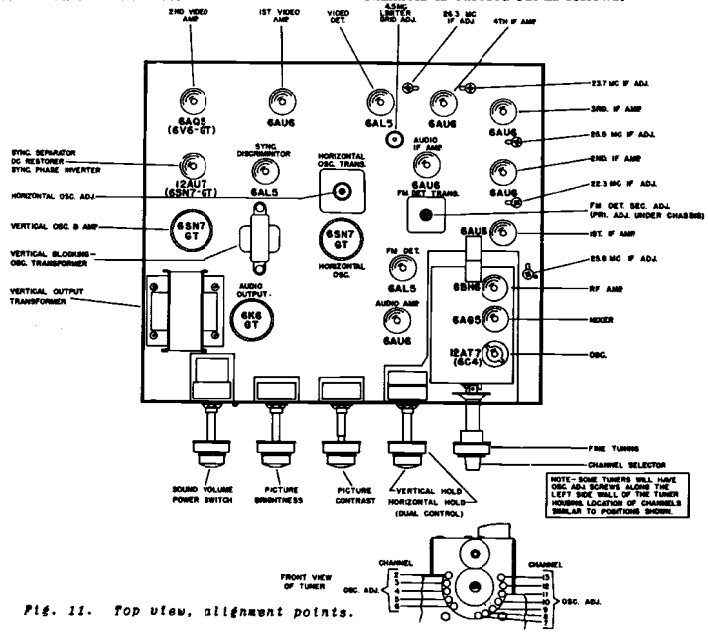


Fig. 11. Top view, alignment points.

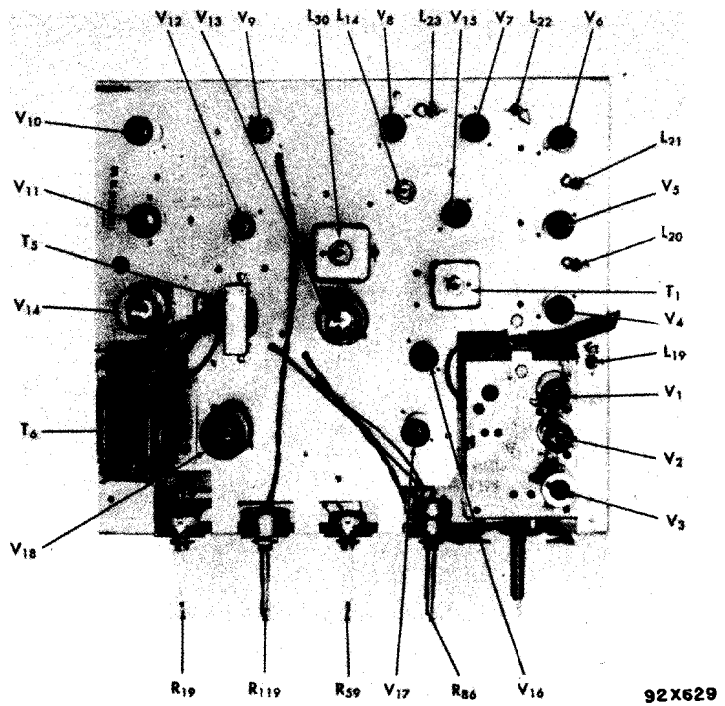


Fig. 13. Top view, receiver chassis, component location.

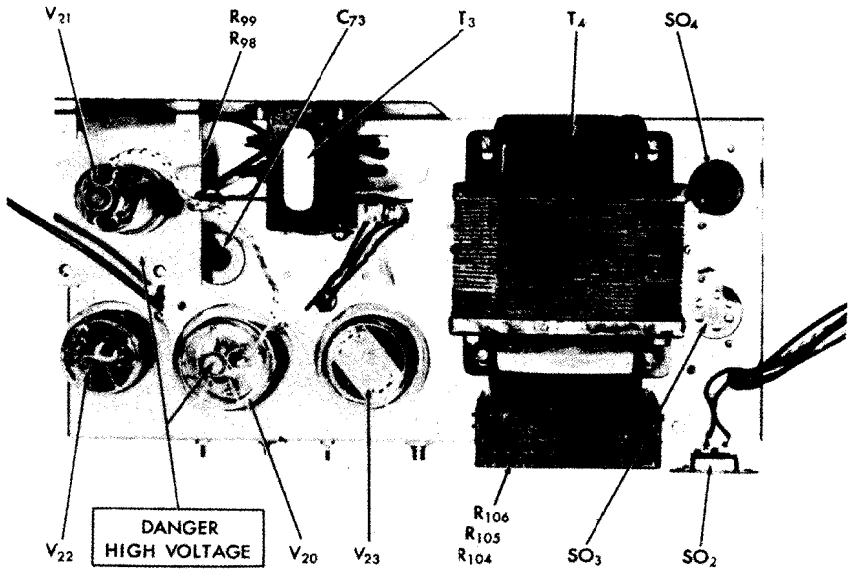


Fig. 14. Top view, power supply chassis, component location

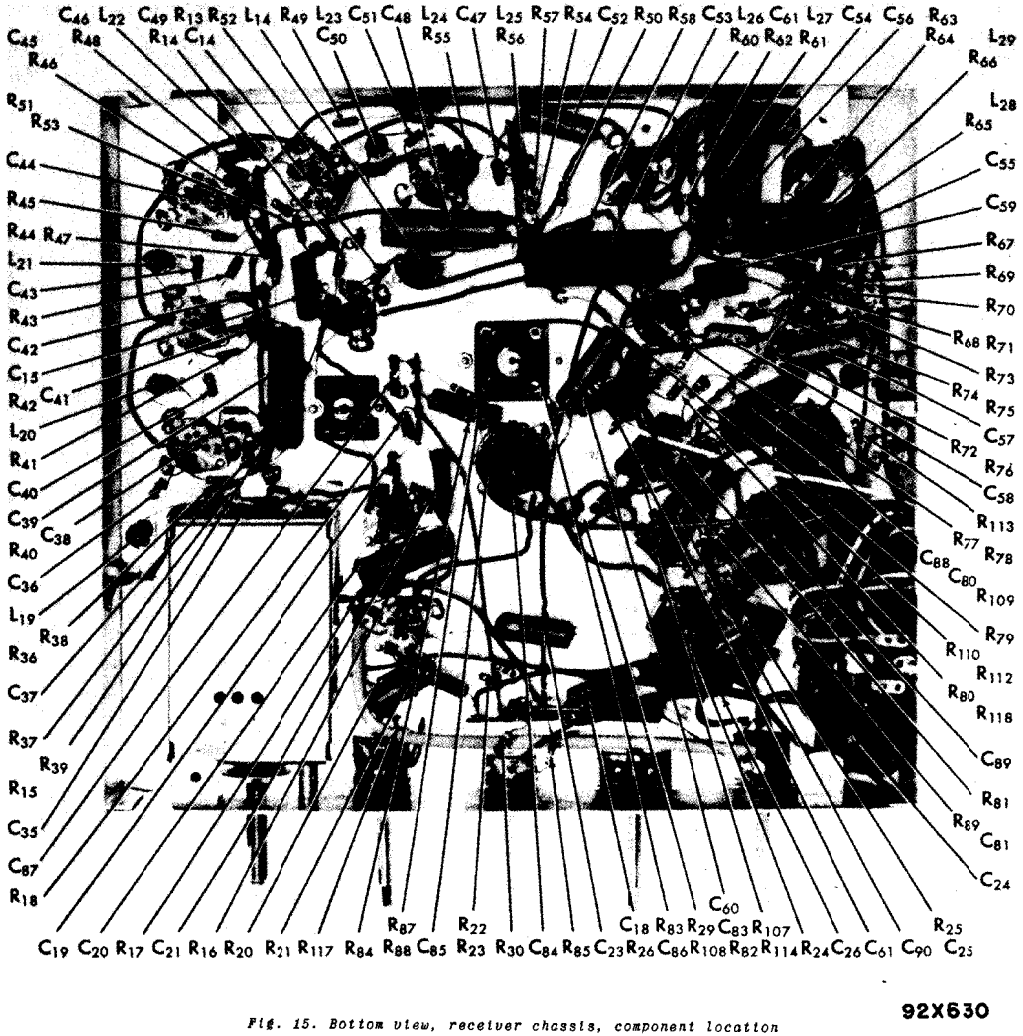
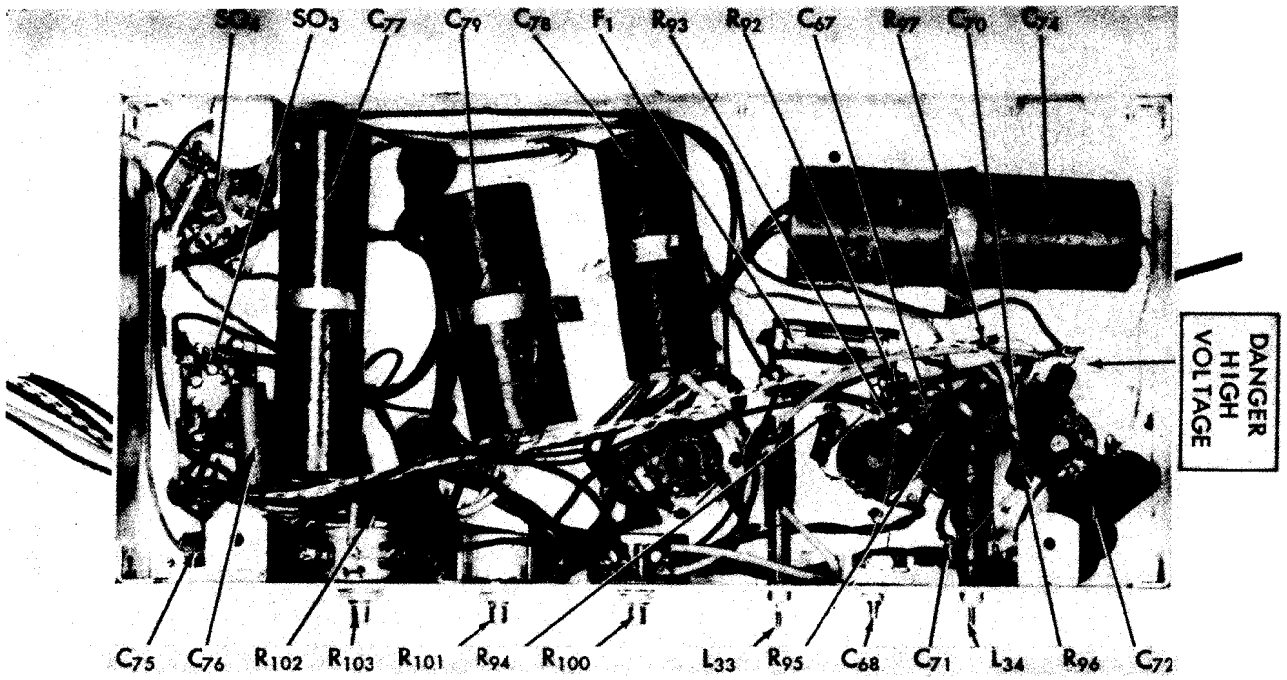


Fig. 15. Bottom view, receiver chassis, component location

SERVICE PARTS LIST

Ref. No.	Description	Manufacturer's Part Number
	CONDENSERS	
C-1,2,3,4, 10,11,62	680 mmf 500 V., ceramic	47B20A681M5
C-5	47 mmf 500 V., ceramic	47B20A470K5
C-6,12	.68 mmf 500 V., bakelite	47A160-1
C-7	25 mmf 500 V., ceramic	47B30A250K5
C-8,13,16	1.5 mmf 500 V., bakelite	47A160-3
C-9,35,49	5000 mmf 450 V., ceramic	47A168
C-14,36,40, 43,46,50	100 mmf. 500 V., ceramic	47B20101K5
C-15	.01 mfd. 200 V., tubular	46AU103J
C-17,37,38, 41,42,44, 45,47,93,94	1000 mmf. 500 V., ceramic	47B20A102N5
C-18,22,23, 70	.01 mfd. 600 V., tubular	46AZ103J
C-19,21	330 mmf. 500 V., ceramic	47B20331K5
C-20	5 mfd. 50 V., electrolytic	45A109
C-24	10-10-10 mfd. 450 V., 150 mfd. 50 V., electrolytic	45B135
C-25	10 mfd. 25 V., electrolytic	45A121
C-26,92	470 mmf. 500 V., mica	CM20A471M
C-27	.1 mfd. 200 V., tubular	46AU104J
C-28	56 mmf. 500 V., mica	CM20A560K
C-39,48	.25 mfd. 200 V., tubular	46AT254J
C-51	10 mmf. 500 V., bakelite	47A160-11
C-52	.05 mfd. 200 V., tubular	46AU503J
C-53	8-8 mfd. 300 V., electrolytic	45B139
C-54,57	.05 mfd. 600 V., tubular	46AY503J
C-55,72,90	.1 mfd. 600 V., tubular	46AY104J
C-56,89	.25 mfd. 600 V., tubular	46AX254J
C-58,59	1500 mmf. 500 V., mica	CM30A152K
C-60	.02 mfd. 600 V., tubular	46AY203J
C-61,81,83, 85	.005 mfd. 600 V., tubular	46AZ502J
C-63	20 mmf 500 V., ceramic	47B20200K5
C-64	Trimmer, FINE TUNING, part of tuner ass'y	
C-65	3.3 mmf 500 V., ceramic	47A160-5
C-67	390 mmf. 500 V., ceramic	47B20391K5
C-68	Trimmer, HORIZONTAL DRIVE adjustment	44A361
C-71	.035 mfd. 600 V., tubular	46AY353J
C-73	500 mmf. 10,000 V., ceramic	47A178
C-74	40-40 mfd. 450 V., electrolytic	45B137
C-75,76	.01 mfd. 600 V., moulded paper	46BR103L6
C-77	80 mfd. 450 V., electrolytic	45B136
C-78	250 mfd. 10 V., 1000 mfd. 6 V., electrolytic	45B134
C-79	40 mfd. 150 V., 40 mfd. 350 V., 30 mfd. 250 V., electrolytic	45B138
C-80	.002 mfd. 600 V., tubular	46AZ202J
C-84	330 mmf. 500 V., mica	CM20A331K
C-86	6200 mmf. 500 V., mica	CM35C622J
C-87	390 mmf. 500 V., mica	CM20A391M
C-88	4700 mmf. 500 V., mica	CM35A472K
	RESISTORS	
R-1	1000 ohms 1/2 watt, carbon (Part of coil L1)	
R-2	100 ohms 1/2 watt, carbon	RC20AE101M
R-3	22,000 ohms 1/2 watt, carbon	RC20AE223M
R-4	10,000 ohms 1 watt, carbon	RC30AE103M
R-5	68,000 ohms 1/2 watt, carbon	RC20AE683M
R-6,37,45,88	4700 ohms 1/2 watt, carbon	RC20AE472K
R-7,35,58,63, 70,75,92	1 megohm 1/2 watt, carbon	RC20AE105M
R-8	82,000 ohms 1/2 watt, carbon	RC20AE823M
R-9	10,000 ohms 1/2 watt, carbon	RC20AE103M
R-10	6800 ohms 1 watt, carbon	RC30AE682M
R-13	150,000 ohms 1/2 watt, carbon	RC20AE154K
R-14,38	12,000 ohms 1/2 watt, carbon	RC20AE123K
R-15,18	33,000 ohms 1/2 watt, carbon	RC20AE333K
R-16,17	10,000 ohms 1/2 watt, carbon	RC20AE103J
R-19	1 megohm, VOLUME control	25B785
R-20	330 ohms 1/2 watt, carbon	RC20AE331K
R-21	68,000 ohms 1 watt, carbon	RC30AE683K
R-22,113	2.2 megohms 1/2 watt, carbon	RC20AE225M
R-23,24,54, 82	470,000 ohms 1/2 watt, carbon	RC20AE474K
R-25	680 ohms 1 watt, carbon	RC30AE681K
R-26	1000 ohms 1 watt, carbon	RC30AE102K
R-27,28,110	560 ohms 1/2 watt, carbon	RC20AE561K
R-29	180,000 ohms 1/2 watt, carbon	RC20AE184K
R-30,76	15,000 ohms 1/2 watt, carbon	RC20AE153K
R-36,39,44, 77,78,108	100,000 ohms 1/2 watt, carbon	RC20AE104K

Fig. 16. Bottom view, power supply chassis, component location.



Ref. No.	Description	Manufacturer's Part Number
	RESISTORS (Cont.)	
R-40,43,48, 53	2200 ohms 1/2 watt, carbon	RC20AE222K
R-41,49,57, 79	5600 ohms 1/2 watt, carbon	RC20AE562K
R-42,46,51	68 ohms 1/2 watt, carbon	RC20AE680K
R-50	220,000 ohms 1/2 watt, carbon	RC20AE224K
R-52	6800 ohms 1/2 watt, carbon	RC20AE682K
R-55	39,000 ohms 1 watt, carbon (Part of coil L24)	
R-56,61, 65,66	1 megohm 1 watt, carbon (Part of coils L25, 27, 28, and 29)	
R-59	2500 ohms, CONTRAST control	25B783
R-60	47,000 ohms 1 watt, carbon (Part of coil L26)	
R-62	3300 ohms 1 watt, carbon	RC30AE332K
R-64	680 ohms 1/2 watt, carbon	RC20AE681K
R-67,95	4700 ohms 2 watts, carbon	RC40AE472K
R-68,121	47,000 ohms 1/2 watt, carbon	RC20AE473K
R-69	27,000 ohms 1/2 watt, carbon	RC20AE273K
R-71,72,74	3900 ohms 1/2 watt, carbon	RC20AE392K
R-73,87	270,000 ohms 1/2 watt, carbon	RC20AE274K
R-80,81,97	8200 ohms 1/2 watt, carbon	RC20AE822K
R-83	68,000 ohms 1 watt, carbon	RC30AE683K
R-84	1000 ohms 1/2 watt, carbon	RC20AE102K
R-85	68,000 ohms 1/2 watt, carbon	RC20AE683K
R-86	50,000/1 megohms, HORIZONTAL/VERTICAL control (dual)	25B786
R-93	47 ohms 1/2 watt, carbon	RC20AE470K
R-94	82 ohms 1 watt, carbon	RC30AE820K
R-96	1800 ohms 2 watts, carbon	RC40AE182K
R-98	3.3 ohms 1/2 watt, carbon	RC20AE033M
R-99	1 megohm 1 watt, carbon	RC30AE105K
R-100	20 ohms 2 watts, HORIZONTAL CENTERING control	25B707
R-101	20 ohms 2 watts, VERTICAL CENTERING control	25B706
R-102	470 ohms 2 watts, carbon	RC40AE471K
R-103	2500 ohms 4 watts, FOCUS control	25B708
R-104	1000 ohms 20 watts, WW	24BH102D
R-105	1100 ohms 20 watts, WW	24BH112D
R-106	8200 ohms 10 watts, WW	24BG822E
R-107	6.8 megohms 1/2 watt, carbon	RC20AE685M
R-109,117	1.2 megohms 1/2 watt, carbon	RC20AE125K
R-111	5000 ohms, VERTICAL LINEARITY control	25B769
R-112	3300 ohms 1/2 watt, carbon	RC20AE332K
R-114	1.5 megohms 1/2 watt carbon	RC20AE155K
R-115	2.5 megohms, HEIGHT control	25B768
R-116	2200 ohms, 1 watt, carbon	RC30AE222K
R-118	4.7 megohms 1/2 watt, carbon	RC20AE475M
R-119	50,000 ohms, BRIGHTNESS control	25B784
R-120	33 ohms 1/2 watt, carbon	RC20AE330K

Tol. on carbon resistors -- M - 20%, K - 10%, J - 5%

SERVICE PARTS LIST (Cont.)

Ref. No.	Description	Manufacturer's Part Number
	TRANSFORMERS AND COILS	
T-1	Transformer, ratio detector	50B406
T-2	Transformer, audio output (Part of speaker ass'y)	
T-3	Transformer, horizontal output	55C113-1
T-4	Transformer, power	52C170
T-5	Transformer, vertical oscillator	55B115
T-6	Transformer, vertical output	55B114
L-1	Coil, antenna (Part of tuner ass'y)	
L-2	Coil, heater choke (Part of tuner ass'y)	
L-3	Coil, r-f stage (Part of tuner ass'y)	
L-4	Coil, mixer stage (Part of tuner ass'y)	
L-5	Coil, osc. stage (Part of tuner ass'y)	
L-6	Coil, osc. cathode (Part of tuner ass'y)	
L-14	Coil, 4.5 mc. sound trap	51A1037
L-15	Coil, focus	51A1065
L-16	Deflection yoke	53B140
L-19,20,21, 22,23	Coil, i-f amplifier	50A372-1
L-24	Coil, video peaking	51A1079
L-25	Coil, video peaking	51A1080
L-26	Coil, video peaking	51A1087
L-27,29	Coil, video peaking	51A1082
L-28	Coil, video peaking	51A1086
L-30	Coil, horizontal sweep osc.	50B411
L-33	Coil, WIDTH control	51B1072
L-34	Coil, HORIZONTAL LINEARITY control	51B1071
	TUBES, RECTIFIERS AND FUSES	
V-1	Type 6BH6: RF amp.	90X6BH6
V-2	Type 6AG5: mixer	90X6AG5
*V-3	Type 12AT7: oscillator	90X12AT7
V-4,5,6,7, 9,15,17	Type 6AU6: 1st, 2nd, 3rd, 4th IF amp.; 1st video amp.; audio IF amp.; and audio amp.	90X6AU6
V-8,12,16	Type 6AL5: video det.; sync. disc. and FM det.	90X6AL5
+V-10	Type 6AQ5: 2nd video amp.	90X6AQ5
#V-11	Type 12AU7: sync. separator; DC restorer; and synd. phase inverter	90X12AU7
V-13,14	Type 6SN7GT: horizontal osc. and vertical osc. & amp.	90X6SN7GT
V-18	Type 6K6GT: audio output	90X6K6GT
V-19	Type 10BP4: kinescope	90X10BP4
V-20	Type 6BG6G: horizontal amp.	90X6BG6G
V-21	Type 1B3GT: high voltage rectifier.	90X1B3GT
V-22	Type 5V4G: reaction scanning	90X5V4G
V-23	Type 5U4G: low voltage rectifier.	90X5U4G
F-1	Fuse, 1/4 ampere, type 3AG	39A334

* Some tuners use a 6C4 (90X6C4)
\+ Some sets will use a type 6V6GT (90X6V6GT)
\# Some sets will use a type 6SN7GT (90X6SN7GT)

Ref. No.	Description	Manufacturer's Part Number
	PLUGS AND SOCKETS	
PL-1	Plug, speaker (Part of speaker ass'y)	
PL-2	Plug, 10BP4 anode	10A300
PL-3	Line cord and plug PL-4	87A1668
PL-5	Plug, 6 prong (Power)	10A298
PL-6	Plug, 9 prong (Power)	10A299
	Shell, plug (Used on PL-5 and PL-6)	10A324
PL-7	Plug, 2 prong (Focus coil)	10A301
PL-8	Plug, 4 prong (Deflection yoke)	10A302
	Shell, plug (Used on PL-7 and PL-8)	10A305
SO-1	Socket, 5 pin (Speaker)	10A319
SO-2	Socket, a-c power	10A286
SO-3	Socket, 6 pin (Power)	6A312
SO-4	Socket, 9 pin (Power)	6A313
SO-5	Socket, 2 pin (Focus coil)	10A295
SO-6	Socket, 4 pin (Deflection yoke)	10A296
	Shell, socket (Used on SO-1, SO-5 and SO-6)	10A294
	Socket, octal (Tube)	6A296
	Socket, miniature (Tube)	6A308
	Socket, miniature, 9 pin (Tube V-11)	6A311
	Socket, octal (Tube V-21)	6A177
	Socket, kinescope	6B309
	Receptacle, fuse	6A287
	MISCELLANEOUS	
	Tuning unit assembly complete	1C727
LS-1	Speaker assembly (Includes connector PL-1)	85C079
	Rubber boot, kinescope mounting	16E130
	Clamp, kinescope mounting	76D406
	Bracket, kinescope clamp support	67C860
	Bracket, rear kinescope support	67C870
	Bracket, VERT. LINEARITY and HEIGHT control mtg.	67A863
	Rear support (Deflection yoke housing)	67B845
	Bracket, focus coil	67B858
	Bracket, brace	67C869
	Insert, rubber (Focus coil)	16A134
	Ion trap	21B083
	Plate, bakelite (Mtg. for tube V-21)	8B823
	Escutcheon, kinescope tube	7E079-2
	Glass, safety (clear)	22C220
	Clip, safety glass	76A331
	Knob, VOLUME, BRIGHTNESS, and CONTRAST	15B148-2
	Knob, VERTICAL (Front section)	15B147-2
	Knob, HORIZONTAL (Rear section)	15B146
	Knob, channel selector (Front section)	15B150-2
	Knob, FINE TUNING (Rear section)	15B151-1

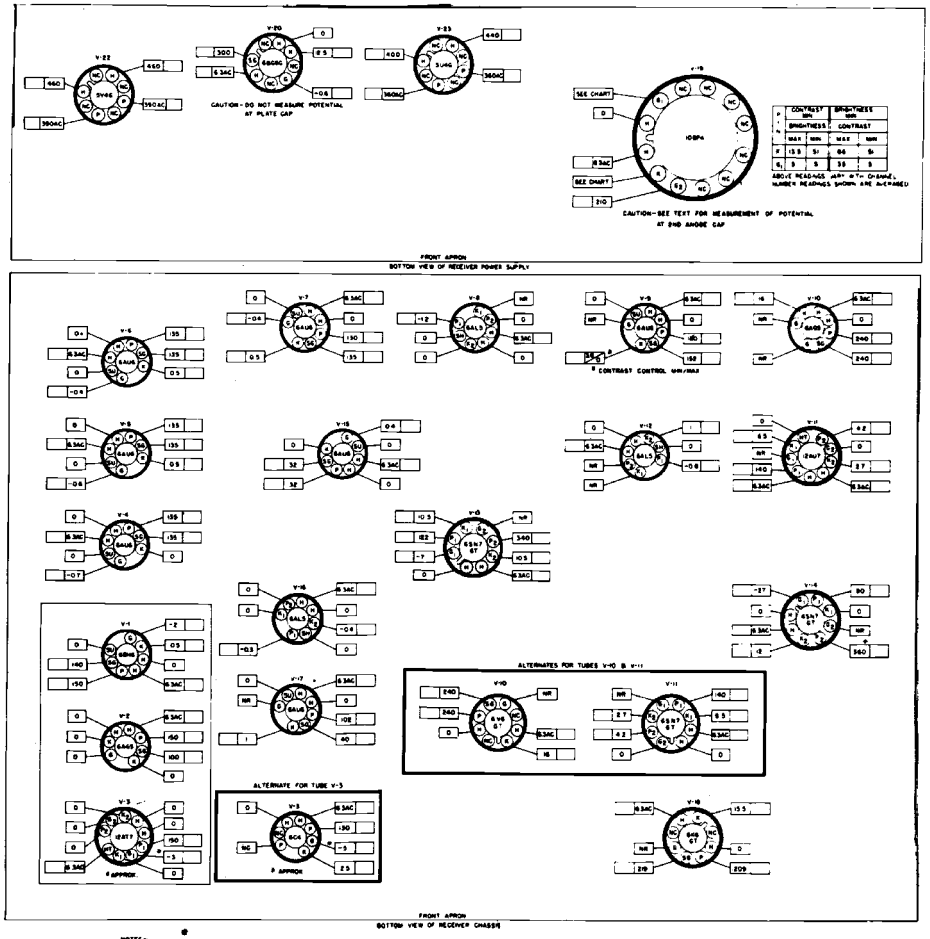


Fig. 17. Tube socket voltage chart

MODEL AR-23-TV-1

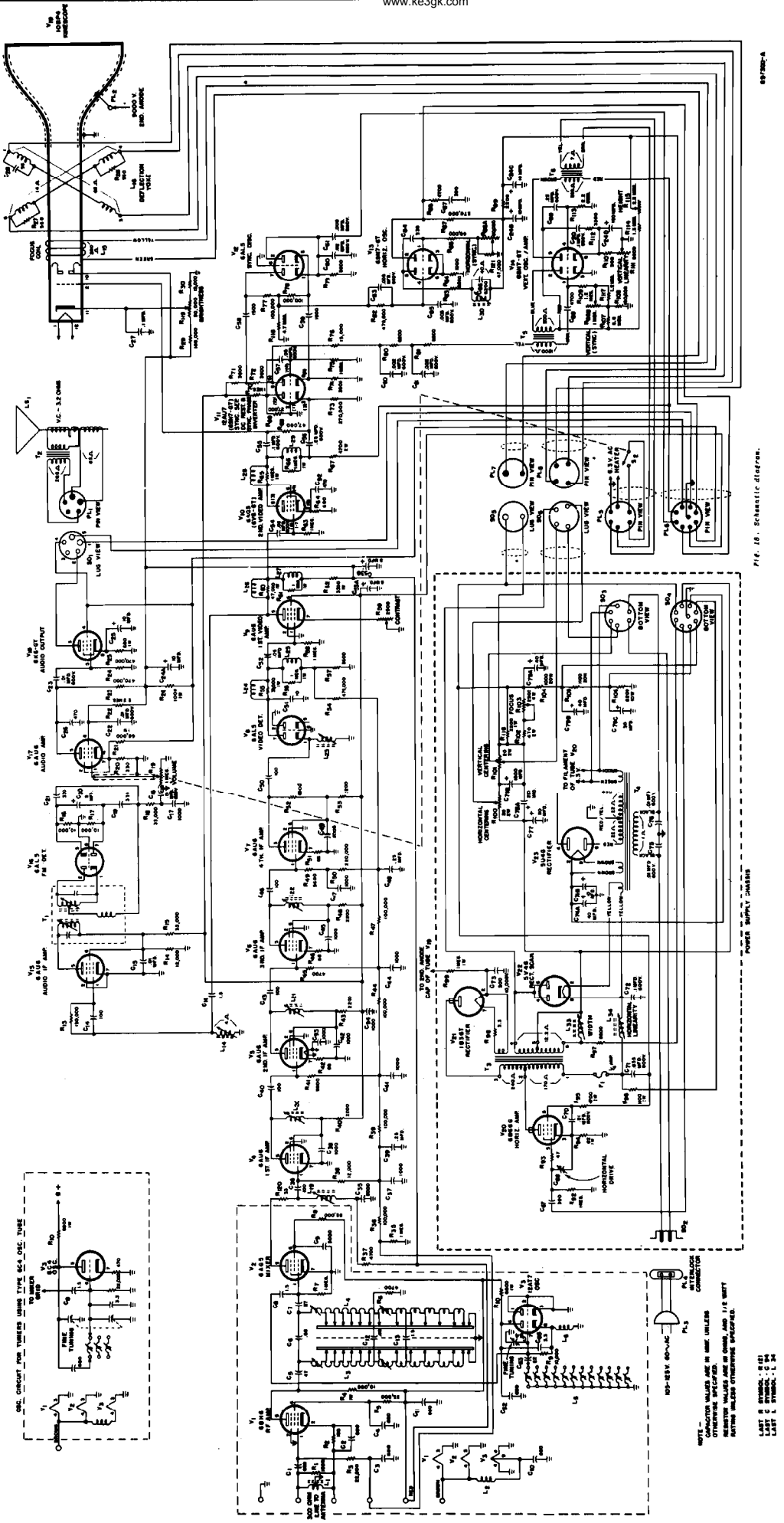


Fig. 18. Schematic diagram.