GENERAL DESCRIPTION

MODEL A-2000 ---------- 10" Table model television receiver

MODEL A-2001 ---------- 12½" Table model television receiver

MODEL A-1001 A ---------- 10" Console model television receiver

MODEL A-2002 ---------- 12½" Console model television receiver

The above Television receivers are of the Intercarrier Sound type of Television receiver using 20 tubes including rectifiers and kinescope tube. This receiver has complete coverage of the television bands, channel 2 thru channel 13. Features of this receiver are clear, bright pictures, good picture stability, and noise free F.M. sound. The receiver is operated by means of seven controls located on the front of the cabinet. One additional control is provided on the Console Models to switch from built-in antenna to the outdoor antenna.

SPECIFICATIONS

R.F. FREQUENCY RANGE

CHANNEL NUMBER	CHANNEL FREQ.	PICTURE CARRIER	SOUND CARRIER
2	54 - 60MC.	55.25MC.	59.75MC.
3	60 - 66	61.25	65.75
4	66 - 72	67.25	71.75
5	76 - 82	77.25	81.75
6	82 - 88	83.25	87.75
7	174 - 180	175.25	179.75
8	180 - 186	181.25	185.75
9	186 - 192	187.25	191.75
10	192 - 198	193.25	197.75
11	198 - 204	199.25	203.75
12	204 - 210	205.25	209.75
13	210 - 216	211.25	215.75

TUBE COMPLEMENT (EXCLUSIVE OF R.F. TUNER. SEE SECTION ON TUNERS)

TUBE NO.	TUBE TYPE	FUNCTION
V4	6AU6	1st I.F. Amplifier
V5	6AU6	2nd I.F. Amplifier
V6	6AU6	3rd I.F. Amplifier
V7	6AL5	Video Detector and Automatic Gain Control
V8	6AC7	Video Amplifier
V9	6AU6	Ratio Detector Driver
V10	6T8	Ratio Detector and First Audio
V11	6V6GT	Audio Output
V12	10BP4	Kinescope 10"
	12LP4	Kinescope 12½"
V13	12AU7	D.C. Restorer, Sync Clipper, Sync Amplifier and Phase Splitter
V14	6SN7	Vertical Sweep Oscillator and Vertical Sweep Amplifier
V15	6AL5	Horizontal Phase Detector
V16	12AU7	Horizontal Sweep Oscillator
V17	6BG6G	Horizontal Sweep Output
V18	1B3-8016	High Voltage Rectifier
V19	6W4	Horizontal Damper
V20	5U4G	Medium Voltage Rectifier
V21	6X5GT	Low Voltage Rectifier

POWER SUPPLY RATING

117 volts 60 cycles ---------- 180 watts.

AUDIO POWER OUTPUT

5.5 watts.

CIRCUIT DESCRIPTION

In the mixer stage, of an intercarrier sound system of a television receiver, both the picture and sound carriers are heterodyned by the local oscillator. Both I.F. carriers thus created and their respective side bands are then amplified by the I.F. amplifiers and are demodulated by the video detector. The output of the video detector is then further amplified by the video amplifier.

In the plate circuit of the video amplifier the frequency modulated intercarrier sound signal is separated from the video signal. The video signal is fed directly to the Kinescope grid. The sound signal is further amplified and fed to the ratio detector. The output of the ratio detector is then amplified and fed to the loud speaker.

The sound output is nearly independent of the setting of the contrast control because in most settings of the contrast control the 4.5 MC. sound I.F. amplifier is operating in an overload condition.

For ease in understanding the basic operation of this receiver a 16 unit block diagram of its operation is shown in FIGURE 1. The circuit description will follow the numerical order of these blocks in order to logically follow a signal through the receiver.

R.F. TUNER (Block #1)

A description of the R.F. tuner and its operation will be found in a separate section of this manual.

VIDEO AND SOUND I.F. AMPLIFIERS (Block #2)

The video and sound I.F. amplifier consist of three stages using 6AU6 tubes. It is very simple to align because it uses only four tuned circuits and they are resonated at only two frequencies. The bandpass characteristic of this amplifier is shown in FIGURE 23. It is important to note that the two peaks of this bandpass curve do not correspond to the alignment frequency. It is also recommended that no attempt should be made to observe this bandpass by means of a sweep generator. The I.F.'s should be adjusted to their alignment frequencies and left alone. The bandpass of these I.F.'s at about fifty per cent voltage response is approximately 3 MC.

PICTURE DETECTOR (Block #3)

The picture detector is one half of a 6AL5 tube connected as a conventional half wave rectifier. It produces video signal of the proper polarity with a frequency modulated sound beat.

VIDEO AMPLIFIER (Block #4)

The video amplifier uses a 6AC7 tube that is direct coupled to the video detector and capacitive coupled to the Kinescope grid. The circuit is so designed so as to give good noise clipping due to the fact the peaks of the synchronizing signal are at the knee of the plate voltage to plate current characteristics of the tube.

In the plate circuit of the video amplifier we find the sound take-off that is tuned to 4.5 MC. In addition to this there are two peaking coils and two plate load resistors. These resistors are effectively in parallel but are connected to different voltage sources so as to provide an effective voltage of around 215 volts on the video amplifier plate.

The contrast control in addition to varying the automatic gain control delay voltage also varies the video amplifier bias and the amount of A.C. degeneration. This results in the clipping level and maximum output remaining relatively constant from the weakest to the strongest signal.

It has been found that a crisper picture results when the response of the video amplifier is peaked towards the high frequency end of the curve. However, it must be noted that increasing the high frequencies will increase the apparent noise in the picture. This receiver is therefore so designed that the amount of A.C. degeneration will vary with the setting of the contrast control resulting in little or no peaking of the high frequencies when the contrast control is advanced as used for the reception of weak signals.

SOUND I.F. RATIO DETECTOR AND FIRST AUDIO (Block #5)

The frequency modulated sound beat is taken from the video amplifier plate by means of a sound take-off coil. The signal is then amplified by a 6AU6 tube functioning as a ratio detector driver and demodulated by two diodes in a 6T8 tube operating as a ratio detector. The triode section of the 6T8 tube is functioning as the first audio amplifier. The audio volume is adjusted by means of a volume control connected to the grid coupling condenser of this tube.

AUDIO OUTPUT AMPLIFIER (Block #6)

The audio output tube is a 6V6 capable of about five watts of audio power. This is fed to a 5 inch permanent magnet speaker on the table models and to a 10 inch permanent speaker on the console models.

D.C. RESTORER AND SYNC CLIPPER (Block #7)

The D.C. restorer and sync clipper is one half of a 12AU7 tube. The grid and cathode form a diode that clips the sync signal from the composite signal. The voltage developed across the resistor connected between cathode and grid is a function of the average applied signal and thus provides the required D.C. restoration. A small positive voltage is applied to the plate of this tube. During the tube conduction electrons are first drawn to the plate because it is positive with respect to the grid until its voltage drops to approximately that of the grid. At this point the excess electrons go to the grid thus holding the plate to approximately zero potential. This clips the sync on the other side and prevents noise pulses from exceeding the peak amplitude of the sync signal.

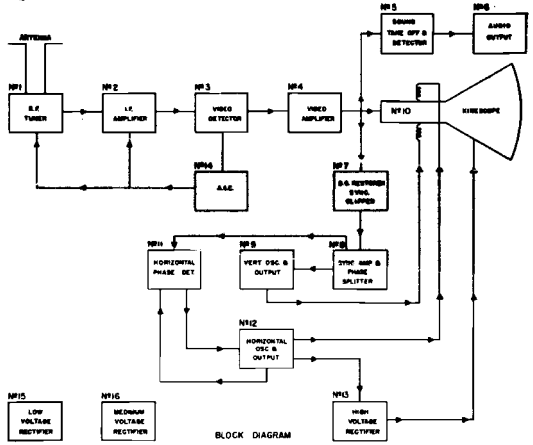


FIGURE 1. BLOCK DIAGRAM

SYNC AMPLIFIER AND HORIZONTAL PHASE SPLITTER (Block #8)

The second half of the 12AU7 tube is used to amplify and reverse the phase of the vertical sync pulses that are taken from the plate in positive form and fed thru an intergrating network to the vertical sweep oscillator.

The horizontal pulses are also taken from the plate and cathode in both positve and negative form of equal amplitude and fed to the horizontal phase detector.

VERTICAL SWEEP OSCILLATOR AND OUTPUT (Block #9)

One triode of a 6SN7 tube is used as a conventional vertical sweep blocking oscillator while the other triode is used as the vertical output tube. The blocking oscillator is tripped by the incoming sync signal. The oscillator is brought into sync by adjusting the grid resistor. The height is controlled by adjusting the charge rate of C47. The vertical linearity is controlled by adjusting the bias on the vertical sweep output tube.

The plate of the output tube is connected to a transformer which in turn is connected to the vertical coils in the yoke and provides them with a saw tooth current.

KINESCOPE (Block #10)

The Kinescope is a 10 or 12 1/2" tube employing a screen material which provides considerable picture brilliance. The tube employs magnetic deflection and magnetic focus. An ion trap is employed to prevent the ion beam from producing a brown spot on the picture screen. The inside and outside of the flaring portion of the bulb are given a metallic coating. The inner coating, which is the second anode, is connected to the high voltage supply. The outer coating is grounded by means of two small springs on the deflection yoke support. The capacity between the two coatings is approximately 500 mmfd. and is used as a high voltage filter condenser.

HORIZONTAL PHASE DETECTOR (Block #11)

A 6AL5 tube is used as a phase detector to compare the phase of the horizontal sync pulses with the phase of the saw tooth voltage derived from the pulses across the secondary of the horizontal output transformer. The D.C. voltage developed by the difference in phase of the above two pulses is used to control the frequency of the horizontal oscillator.

HORIZONTAL OSCILLATOR AND OUTPUT (Block #12)

A type 12AU7 tube is used as a Horizontal oscillator and discharge tube. The output of the oscillator which is a saw tooth with a peaking component is fed into the grid of a 6BG6G Horizontal output tube. The output of this tube is fed into the Horizontal yoke and it is also used to develop the high voltage for the kinescope tube.

HIGH VOLTAGE RECTIFIER AND DAMPER TUBE (Block #13)

The high voltage supply is a conventional type of Horizontal fly-back supply with its associated damper tube. The high voltage rectifier is a 1B3 - 8016 type of tube while the damper tube is a 6W4.

AUTOMATIC GAIN CONTROL (Block #14)

One half of the 6AL5 video detector is used to supply automatic gain control voltage to control the bias on the R.F. and I.F. stages of this receiver. 2.5 volts of delay is supplied to this circuit which is controlled by the contrast control. The delay is at maximum with maximum contrast and at zero with minimum contrast. This increases the range of the contrast control and also increases the sensitivity of the receiver.

LOW AND MEDIUM VOLTAGE RECTIFIERS (Block #15 & 16)

A 5U4G is used as a 360 volt full wave rectifier while a 6X5GT is used as a 150 volt full wave rectifier.

FRONT PANEL CONTROLS

(1) CONTRAST CONTROL (PICTURE)

The contrast control operates by varying the delay voltage on the AGC diode and the bias on the video amplifier. Due to the use of AGC in this receiver the picture control should not require re-adjustment when channels are switched except where the signal received from different stations varies greatly.

(2) BRIGHTNESS CONTROL

The Brightness control operates by varying the D.C. voltage on the cathode of the Cathode Ray tube, thereby controlling the light on the face of the tube.

(3) HORIZONTAL CONTROL

The Horizontal control on the front panel is a fine frequency regulator for the horizontal sweep oscillator. Its setting is not critical and is used to restore sync when necessary.

(4) VERTICAL CONTROL

The vertical control regulates the frequency of the vertical oscillator. Misadjustment of this control will cause the picture to "roll" up or down. The setting is not normally critical.

(5) OFF - ON SOUND CONTROL

The OFF - ON switch is located on the rear of this control and is operated by rotating the control until a click is heard. This switch turns the television receiver on or off. This control is also used to control the volume of the sound from the receiver.

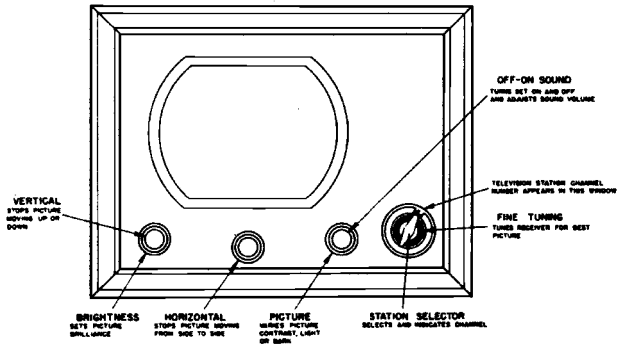


FIGURE 2. FRONT PANEL CONTROLS - TABLE MODEL

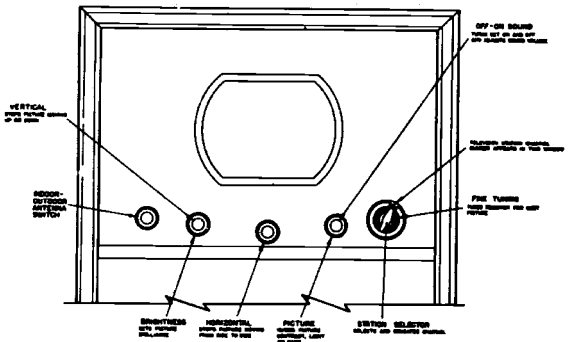


FIGURE 3. FRONT PANEL CONTROLS - CONSOLE MODELS

(6) STATION SELECTOR

This control selects the channel desired for viewing.

(7) FINE TUNING CONTROL

This control varies the local R.F. Oscillator Frequency. Correct adjustment will result in a picture with maximum definition. This is not a control for tuning the sound.

(8) ANTENNA CONTROL

This control is found on console models only. It is used to switch from the built-in antenna to the outside antenna. The built-in antenna will operate satisfactorily in most locations and sometimes it will be found to operate better than an outdoor antenna.

CHASSIS CONTROLS

These controls have been properly adjusted at the factory. If it becomes necessary to readjust these controls, the correct method of adjustment will be found under "PICTURE ADJUSTMENTS"

(1) HEIGHT CONTROL

The Height control varies the input to the vertical sweep amplifier. Since changes in height will affect picture linearity this control should be used in conjunction with the Vertical Linearity Control.

(2) VERTICAL LINEARITY CONTROL

The Vertical Linearity control adjusts the vertical sweep wave-form and should be used with the height control.

(3) FOCUS CONTROL

The Focus control varies the current flowing through the focus coil.

(4) HORIZONTAL LOCKING CONTROL

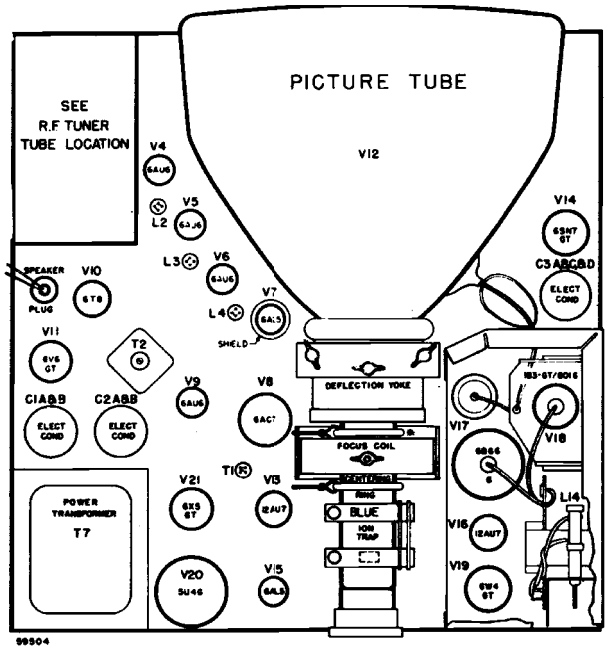
The Horizontal Locking control adjusts the sensitivity of the front panel Horizontal Hold control.

(5) HORIZONTAL DRIVE CONTROL

The Horizontal Drive control varies the input to the horizontal sweep amplifier.

*(6) WIDTH CONTROL

The Width control permits variation of the picture width without affecting the high voltage.



NOTE:
* USED WITH SOME SETS ONLY.

TUBE & TRIMMER LOCATION

FIGURE 5. TOP OF CHASSIS

ALIGNMENT PROCEDURE

TEST EQUIPMENT REQUIRED

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

(1) Signal Generator with an output variable between 100 and 100,000 micro-volts and crystal controlled or crystal calibrated at the following frequencies.

(a) 4.5 megacycles
(b) 22.8 megacycles
(c) 25.2 megacycles

(2) R.F. Sweep Generator with a frequency range from 40 to 220 megacycles with a sweep width of 10 megacycles and an adjustable output of at least 0.1 volt.
(3) Crystal controlled or crystal calibrated markers for the sound carrier of each Television channel. Picture carrier markers are desirable but not necessary.
(4) Cathode Ray Oscilloscope
(5) Vacuum Tube Voltmeter (V.T.V.M.)

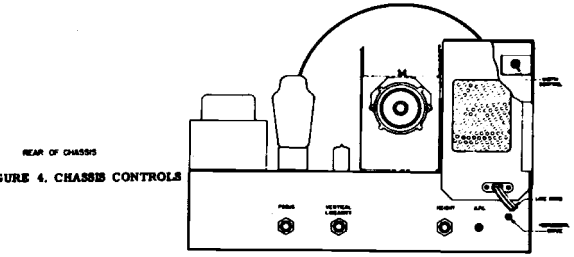


FIGURE 4. CHASSIS CONTROLS

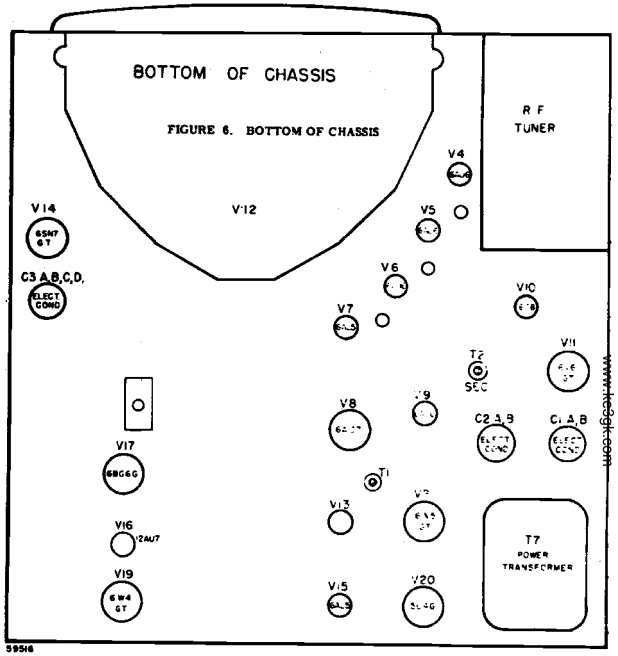


FIGURE 6. BOTTOM OF CHASSIS

CAUTION

THE SECOND ANODE LEAD TO THE PICTURE TUBE HAS A POTENTIAL OF APPROXIMATELY 10,000 VOLTS. DURING ALIGNMENT IT IS ADVISABLE TO REMOVE THE 6BG6G TUBE FROM ITS SOCKET THUS ELIMINATING THIS 10,000 VOLT HAZARD.

I.F. ALIGNMENT

(1) Adjust the PICTURE control for 1 volt measured from pin "5" to chassis. (V8-6AC7)
(2) Connect the V.T.V.M. across the 8200 ohm resistor R17 in the cathode of the 6AL5 video detector, V7A.
(3) Connect the signal Generator to the test loop located on top of the tuner #1 or to the antenna terminals of tuner #2.
(4) Adjust the signal generator to 22.8 megacycles with sufficient output to develop approximately 2.5 volts on the meter.
(5) Adjust L1 and L4 for maximum reading. NOTE - On tuner number two the adjustment for L1 is under the chassis inside the tuner, directly under the wave trap T1.
(6) Adjust the signal generator for 25.2 Megacycles.
(7) Adjust L2 and L5 for maximum reading.
(8) Re-check operations 3, 4, 5, and 6. This completes the alignment of the I.F. Amplifier.

ALIGNMENT OF RATIO DETECTOR DRIVER AND RATIO DETECTOR

(1) Connect the V.T.V.M. across the 47,000 ohm resistor R31 in the diode of the ratio detector tube 6T8 V10. The negative side of the meter goes to the diode plate.
(2) Connect the signal generator in series with a .001 mica condenser to the grid (pin #4)

of the Video amplifier 6AC7, V8. The ground side of the signal generator is connected to chassis.

(3) Set the signal generator to 4.5 Megacycles with sufficient output to give a reading of about 10 volts on the meter.
(4) Adjust the primary and secondary of T1 and the primary of the ratio detector transformer T2 for maximum reading.
(5) Connect two 100,000 ohm resistors in series across the 47,000 ohm resistor R31 in the diode of the ratio detector tube 6T8, V10.
(6) Connect one side of the V.T.V.M. to the center tap of these two resistors. The return lead of the meter is connected to the tertiary winding lug "E" of the ratio detector transformer.
(7) The secondary of the ratio detector transformer T2 is adjusted for zero voltage in such a manner that slight movement of the core in either direction will cause a positive or negative voltage on the meter depending upon which direction the core was moved.
(8) Re-check adjustments 4 and 7 above. This completes the alignment of the ratio detector.

R.F. TUNER ALIGNMENT

See the separate section on R.F. tuners.

PARTS REMOVAL

TO REMOVE THE CHASSIS FROM THE CABINET

(1) Remove the screws holding the back to the cabinet.
(2) On the table model receivers, remove the screws holding the antenna terminal strip to the cabinet. On the console model receivers, remove the antenna connector plugs connecting the antenna terminal strip and the built-in antenna to the chassis.
(3) Reach into the cabinet from the rear and remove the plug from the speaker socket.
(4) Remove all the knobs from the front of the cabinet by pulling them straight out.
(5) Remove the four mounting screws from the base of the chassis. These screws will be found under the cabinet in the table models and under the chassis mounting board in the console models.
(6) Slide the chassis straight out of the back of the cabinet.
(7) To replace the chassis into the cabinet reverse the operations listed above.

TO REMOVE THE KINESCOPE FROM THE CHASSIS

CAUTION

THE KINESCOPE BULB ENCLOSES A HIGH VACUUM, AND, DUE TO ITS LARGE AREA, IS SUBJECTED TO CONSIDERABLE AIR PRESSURE. FOR THESE REASONS, KINESCOPE TUBES MUST BE HANDLED WITH EXTREME CARE.

DO NOT OPEN THE KINESCOPE SHIPPING CARTON, INSTALL, REMOVE OR HANDLE THE KINESCOPE IN ANY MANNER UNLESS SHATTERPROOF GOGGLES AND HEAVY GLOVES ARE WORN. PEOPLE NOT SO EQUIPPED SHOULD BE KEPT AWAY WHILE HANDLING KINESCOPES.

THE LARGE END OF THE KINESCOPE BULB, PARTICULARLY THAT PART AT THE RIM OF THE VIEWING SURFACE, MUST NOT BE STRUCK, SCRATCHED OR SUBJECTED TO MORE THAN MODERATE PRESSURE AT ANY TIME. IN INSTALLATION OR REMOVING, IF THE TUBE STICKS OR FAILS TO SLIP SMOOTHLY INTO ITS SOCKET OR DEFLECTING YOKE, INVESTIGATE AND REMOVE THE CAUSE OF THE TROUBLE. DO NOT FORCE THE TUBE.

To remove the kinescope from the chassis proceed as follows:

(1) Remove the socket from the base of the tube by sliding the socket straight back.
(2) Loosen the screws holding the ion trap magnet in place and slide the magnet straight back off the tube. On some sets the ion trap magnets are held in place by springs instead of screws.
(3) Remove the centering rings by sliding straight back. (There may be either one or two centering rings).
(4) If there is a centering ring located between the yoke and the focus coil the screws mounting the focus coil to its brackets must be removed and the focus coil slid back and off the neck of the tube. This will allow you to slide the centering ring off the neck of the tube. If there is no centering ring at this point it will not be necessary to remove the focus coil.
(5) Remove the thumb-screws holding the strap around the face of the kinescope tube.
(6) Lift the kinescope slightly so as to clear the front brackets and slide the tube straight forward.
(7) To replace the kinescope tube reverse the above operations. Be sure that the face of the tube is in contact with the two front support brackets and that the yoke support is slid forward so that the cone of the tube is supported in the rubber collar.

ADJUSTMENTS

ADJUSTMENTS OF KINESCOPE CONTROLS

If it should become necessary to readjust the Kinescope controls proceed as follows:

ION TRAP MAGNET ADJUSTMENT

(1) Turn the Off-On switch to the ON or clockwise position.
(2) Turn the PICTURE control fully counterclockwise.
(3) Turn the BRIGHTNESS control fully clockwise.
(4) The rear ion trap magnet should be approximately over the ion trap flags as shown in Figure 7. Starting from this position adjust the ion trap magnet by moving it forward and backward, at the same time rotating it slightly around the neck of the tube for the brightest raster on the screen.
(5) Tighten the ion trap magnet adjustment thumb screws sufficiently to hold it in this position but still be free to permit further adjustment.
(6) Reduce the Brightness control until the raster is slightly above average brilliance.
(7) Adjust the focus control R38 FIGURE 4, until the line structure is clearly visible.
(8) 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. THIS ADJUSTMENT SHOULD BE MADE ONLY AFTER THE PICTURE IS PROPERLY CENTERED, FOCUSED, AND FRAMED AS DESCRIBED IN THE FOLLOWING PARAGRAPHS. ADJUSTMENT OF THE CENTERING RINGS AND THE FOCUS COIL WILL CAUSE A CHANGE IN THE ADJUSTMENT OF THE ION TRAP MAGNET.
(9) Tighten the ion trap magnet adjustment thumb screws. (Some ion trap magnets are held by springs and have no adjustment screws).

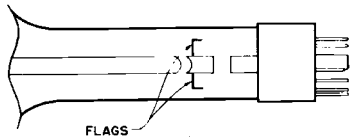


FIGURE 7 - ION TRAP FLAGS

FOCUS COIL AND CENTERING RINGS

(1) Turn the centering rings around the neck of the tube keeping the rear centering ring as close to the focus coil as possible with the focus coil as far forward as possible, until the picture is centered and there are no shadows appearing on the screen.
(2) Adjust the focus control R38 Figure 4 on the rear of chassis until the lines are in sharp focus. It may be necessary to readjust the ion trap magnet as indicated in step #8 above.

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

In order to proceed with the adjustments it will be necessary to obtain a test pattern. To accomplish this follow the operating instructions in the operating instructions manual.

HORIZONTAL AFC ADJUSTMENT

(1) Set the HORIZONTAL hold control (Front Panel) to the center of its range.
(2) Adjust the AFC control in either direction until the picture locks into Horizontal sync.
(3) Slowly rotate the Horizontal hold control and readjust the AFC control until the picture will hold thru at least 3/4 of the horizontal hold control range.

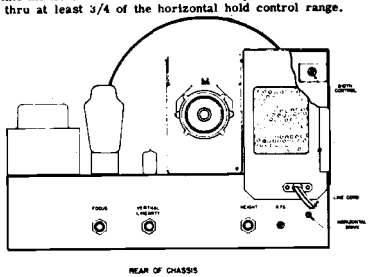


FIGURE 8. CHASSIS CONTROLS

HEIGHT AND VERTICAL LINEARITY

(1) Adjust the height control R60 (on rear of chassis) (See Figure 4) until the picture fills the mask vertically.
(2) Adjust the Vertical Linearity control R63 (on rear of chassis) until the test pattern is symmetrical from top to bottom.

NOTE:- Adjustment of either control will require readjustment of the other control.

WIDTH AND HORIZONTAL DRIVE

(1) Turn the horizontal drive condenser C56 (on rear of chassis) (See Figure 4) as far counterclockwise (loosen) as possible without crowding one side of the picture or causing the picture to tear. This will provide the maximum high voltage.
(2) Adjust the width control L14 (on rear of high voltage shield) (See Figure 4) until the picture fills the mask horizontally.

NOTE:- AN ADJUSTMENT OF THE HORIZONTAL DRIVE WILL AFFECT THE ADJUSTMENT OF THE HORIZONTAL AFC CONTROL.

TUBE VOLTAGES

(EXCLUSIVE OF R.F. TUNER. SEE SECTION ON TUNERS)

All voltages are measured with a D.C. Vacuum Tube Voltmeter and with the PICTURE Control and BRIGHTNESS Control in the minimum position, unless otherwise specified. No incoming signals are being received at the time the measurements are being made. The following voltages were taken on a production receiver with 117 volts 60 cycle AC input. A variation of 10% in the voltages should be considered normal.

TUBE NO.	TUBE TYPE	FUNCTION	ELEMENT	PIN NO.	VOLTAGE	NOTES
V4	6AU6	1st I.F. Amplifier	Plate	5	130	
			Screen	6	130	
			Grid	1	-0.5	
			Cathode	7	0.6	
			Suppressor	2	0	
V5	6AU6	2nd I.F. Amplifier	Plate	5	132	
			Screen	6	132	
			Grid	1	-0.5	
			Cathode	7	0.6	
			Suppressor	2	0	
V6	6AU6	3rd I.F. Amplifier	Plate	5	135	
			Screen	6	135	
			Grid	1	0	
			Cathode	7	0.9	
			Suppressor	2	0	
V7 (A)	1/2 6AL5	Detector	Plate	2	-2.5	
			Cathode	5	-2.25	
V7 (B)	1/2 6AL5	Automatic Gain Control	Plate	7	-0.5	
			Cathode	1	0	
V8	6AC7	Video Amplifier	Plate	8	210	* Will vary from 0 to 1.8 with the contrast control setting.
			Screen	6	155	
			Grid	4	-1.8	
			Cathode	5	* 1.8	
			Suppressor	3	1.8	Tied to Cathode
V9	6AU6	Ratio Detector Driver	Plate	5	240	
			Screen	6	25	
			Grid	1	-0.7	
			Cathode	7	0	
			Suppressor	2	0	
V10	6T8	Ratio Detector & 1st Audio	Diode #1	6	-0.6	
			Cathode	3	-0.6	
			Diode #2	2	-1.1	
			Diode #3	1	0	
			Plate	9	78	
			Grid	8	-0.8	
			Cathode	7	0	
V11	6V6GT	Audio Output	Plate	3	230	
			Screen	4	240	
			Grid	5	0	
			Cathode	8	10	
V12	10BP4	Kinescope	Plate	Cap	9000	*Will vary from 130 to 30 with the Brightness control setting
			Screen	10	350	
			Grid	2	1.4	
			Cathode	11	* 130	
V13 (A)	1/2 12AU7	D.C. Restorer Sync clipper	Plate	6	8.5	
			Grid	7	0	
			Cathode	8	1.0	
V13 (B)	1/2 12AU7	Sync Amplifier Phase Splitter	Plate	1	125	
			Grid	2	0	
			Cathode	3	6.2	
V14 (A)	1/2 6SN7GT	Vertical sweep Oscillator	Plate	2	98	Will vary from 72 to 110 with height control
			Grid	1	-32	Will vary with height and vertical hold control.
			Cathode	3	0	
V14 (B)	1/2 6SN7GT	Vertical sweep	Plate	5	350	Will vary from 310 to 350 with vertical linearity control
			Grid	4	0	Will vary from 6 to 20 volts with vertical linearity control
			Cathode	6	14	
V15	6AL5	Horizontal Phase detector	Plate *1	7	0	
			Cathode *1	1	3.2	
			Plate *2	2	-1.6	
			Cathode *2	5	0	

V16	12AU7	Horizontal Sweep Osc.	Plate	1	240	
			Grid	2	0.3	
			Cathode	3	10	Tied to cathode pin 8
			Plate	6	96	
			Grid	7	-6	Will vary with Horizontal hold control settings
			Cathode	8	10	Tied to cathode pin 3
V17	6BG6G	Horizontal Sweep output	Plate	Cap	Pulse present do not measure	
			Screen	8	250	
			Grid	5	-6.8	
			Cathode	3	8.5	
V18	1B3-8016	High voltage Rectifier	Plate	Cap	Pulse present do not measure	
			Cathode	2&7	9000	
V19	6W4	Horizontal	Plate	5	Pulse present do not measure	
			Cathode	3	420	
V20	5U4G	Medium voltage Rectifier	Plate	4	360 AC	
			Plate	6	360 AC	
			Cathode	2&8	360	
V21	6X5GT	Low voltage Rectifier	Plate	5	175 AC	
			Plate	3	175 AC	
			Cathode	8	185	

SERVICE HINTS

NO RASTER ON KINESCOPE

(1) Incorrect adjustment of ion trap magnet.
(2) V16 or V17 inoperative - Check voltages and wave form.
(3) No high voltage - If horizontal deflection is operating as evidenced by the correct wave-form on terminal 5 of the horizontal damper tube V19, the trouble can be isolated to the 8016 circuit. Either the T6 high voltage winding is open, (points 2 to 3), the 8016 tube is defective, its filament circuit is open, C63 is shorted, R82 or R84 is open.
(4) V16 circuits inoperative - Check wave form pin 1 and 6.
(5) Horizontal damper V19 inoperative.
(6) Defective Kinescope.
(7) L13 open.
(8) No receiver plate voltage - filter capacitor or B+ shorted.

NO VERTICAL DEFLECTION

(1) V14 inoperative.
(2) T4 or T5 open.
(3) Vertical deflection coils open.

NO HORIZONTAL DEFLECTION

(1) Horizontal deflection coil open.

SMALL RASTER

(1) Low plus B or low line voltage.

POOR VERTICAL LINEARITY

(1) H adjustments are correct change V14.
(2) Vertical output transformer defective.

WRINKLES ON LEFT SIDE OF RASTER

(1) R65, R66 or C64 defective.
(2) Defective yoke.

TRAPEZOIDAL OR NON-SYMMETRICAL RASTER

(1) Improper adjustment of focus coil, centering rings or ion trap magnet.
(2) Defective yoke.

RASTER & SIGNAL ON KINESCOPE BUT NO SOUND

(1) Sound I.F. or Audio amplifier inoperative - check V9, V10, and V11.
(2) T1 or T2 defective.
(3) Speaker defective.

SIGNAL AT KINESCOPE GRID BUT NO SYNC

(1) V13 inoperative - check voltages and wave-forms.

SIGNAL ON KINESCOPE GRID BUT NO VERTICAL SYNC

(1) Intergrating network inoperative - check C42, C43, C44, R51, R52, and R53.

SIGNAL ON KINESCOPE GRID BUT NO HORIZONTAL SYNC

(1) L13 misadjusted.
(2) V15 inoperative - check voltages and wave-forms.
(3) C40, C41, C48, or C49 defective.

SOUND & RASTER BUT NO PICTURE OR SYNC

(1) R21 shorted.
(2) Bad contact to Kinescope grid.

PICTURE STABLE BUT POOR RESOLUTION

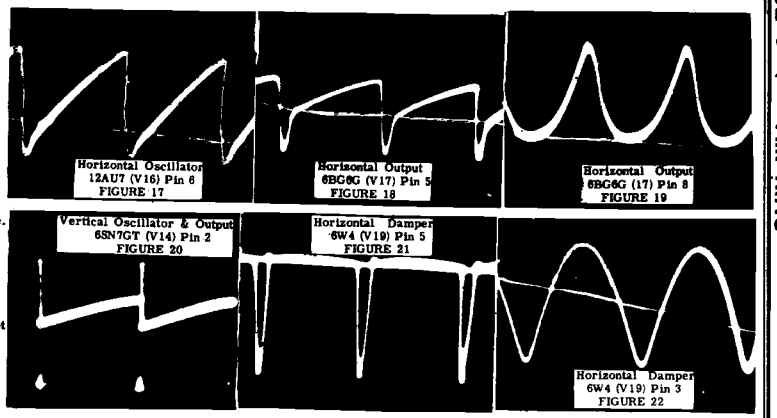
(1) Peaking coils defective.
(2) Make sure that the focus control operates on both sides of proper focus. Check V11.
(3) Make sure that the yoke, focus coil and centering ring are as far forward as possible.
(4) Be sure that the centering ring is as close to the focus coil as possible.
(5) R.F. and I.F. circuits misaligned.

RASTER BUT NO SOUND PICTURE OR SYNC

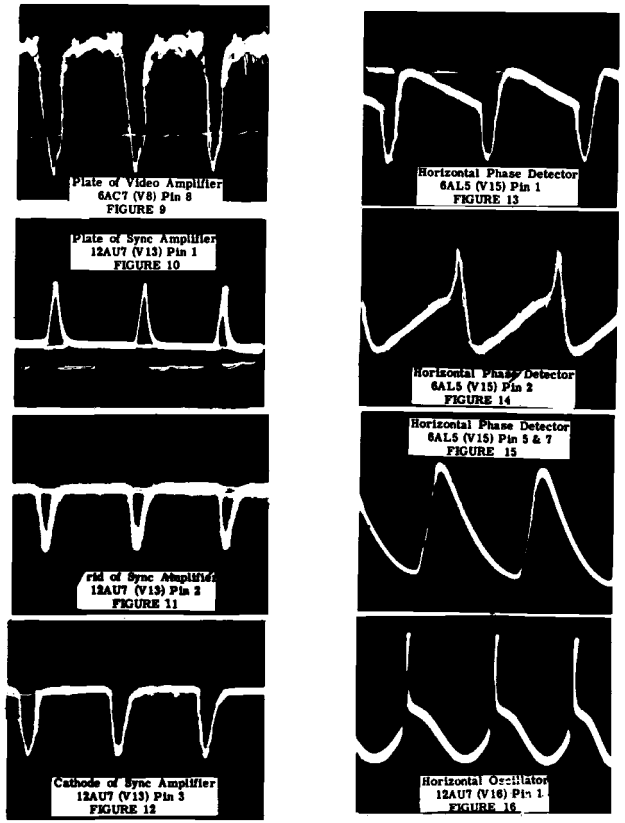
(1) Defective antenna or transmission line.
(2) R.F. unit inoperative - Check V1, V2 and their socket voltages.
(3) I.F. or Video amplifier inoperative - check V4,V5,V6,V7, and V8 and their socket voltages.

DARK VERTICAL LINE ON LEFT OF PICTURE

(1) Reduce horizontal drive and readjust width.
(2) Replace V17.



WAVEFORM DIAGRAMS



SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
	PA18158-1	Antenna Disconnect
	PA4683	Bearing Assembly #1
	PA4682	Bearing Assembly #2
	PE6060	Cabinet Model A1001-A
	PD6055	Cabinet Model A2000
	PE6059-B	Cabinet Model A2001
	PE6059-A	Cabinet Model A2002
C1	PA20126	Capacitor, Electrolytic 40 x 40 Mfd. @ 450 V.
C2	PA20127	Capacitor, Electrolytic 20 x 40 Mfd. @ 250 V.- 10 Mfd. @ 150 V.
C3	PA20125	Capacitor, Electrolytic 40 x 20 x 10 x 10 @ 450 V.
C4	PP20129	Capacitor, Electrolytic 1 Mfd. 25 V. +20 -10% 85°.
C5	PP20130	Capacitor, Electrolytic 100 Mfd. 25 V. 85° C.
C6,C7	PP191106	Capacitor, Moulded Bakelite .01 Mfd. 600 V. 85°.
C8,C9,C10,C13, C11,C17,C18,C29	PP19109	Capacitor, Ceramic, Disc Type 5000 Mmfd. +30% -10%.
C14,C15,C16, C21	PP19110	Capacitor, Ceramic 100 Mmfd. 500 V. ±20 %.
C20,C51	PP19111	Capacitor, Paper .1 Mfd. 200 V. +30% -10% 85°.
C22	PP19113	Capacitor, Disc Type .01 Mfd. +30% -10%.
C23	PP19114	Capacitor, Ceramic 5 Mmfd. 300 V. ±10%.
C24	PP19104	Capacitor, Mica 680 Mmfd. 500 V. ±10%.
C25	PP19105	Capacitor, Mica 470 Mmfd. 500 V. ±10%.
C26	PP19116	Capacitor, Paper .01 Mfd. 600 V. +30% -10% 85°.
C27,C47	PP19121	Capacitor, Paper .1 Mfd. 600 V. ±10% 85°.
C28	PP19117	Capacitor, Mica 39 Mmfd. 300 V. ±20%
C30	PP19115	Capacitor, Paper .02 Mfd. 600 V. +30% -10% 85°.
C31	PP19118	Capacitor, Ceramic 3300 Mmfd. 300 V. ±20%.
C32	PP19119	Capacitor, Paper .05 Mfd. 200 V. +30% -10% 85°.
C33	PP19103	Capacitor, Paper .001 Mfd. 200 V. +30% -10% 85°.
C34,C36,C50, C67	PP1987	Capacitor, Paper .005 Mfd. 600 V. +30% -10% 85°.
C35,C39,C48, C49	PP1988	Capacitor, Paper .01 Mfd. 600 V. +30% -10% 85°.
C37	PP1989	Capacitor, Paper .1 Mfd. 600 V. +30% -10% 85°.
C38	PP1990	Capacitor, Mica 22 Mmfd. 500 V.
C40,C41	PP1991	Capacitor, Paper .001 600 V. +30% -10% 85°.
C42	PP19101	Capacitor, Paper .002 Mfd. 600 V. ±10% 85°.
C43,C44	PP19120	Capacitor, Paper .005 Mfd. 600 V. ±10% 85°.
C45	PP1992	Capacitor, Mica 4700 Mmfd. 300 V. ±10%.
C46,C62,C61	PP19106	Capacitor, Paper .25 Mfd. +30% -10% 85°.
C52	PP19122	Capacitor, Mica 390 Mmfd. 500 V. ±10%.
C53	PP19107	Capacitor, Silver Mica 3900 Mmfd. ±5% 500 V.
C54	PP1993	Capacitor, Mica 390 Mmfd. 500 V. ±20%.
C55	PP1994	Capacitor, Mica 270 Mmfd. 500 V. ±20%.
C57,C68	PP19102	Capacitor, Mica 36 Mmfd. 2500 A.C. 400 V. D.C. ±10%.
C58	PP1995	Capacitor, Paper .25 Mfd. 400 V. +30% -10% 85°.
C59	PP1996	Capacitor, Paper .05 Mfd. 600 V. +30% -10% 85°.
C63	PP1998	Capacitor, Mica 500 Mmfd. 10,000 V. ±100 Mmfd.
C64	PP1999	Capacitor, Mica 56 Mmfd. 500 V. ±20%.
C65	PP19100	Capacitor, Paper .1 Mfd. 600 V. +30% -10% 85°.
C66	PP20128	Capacitor, Electrolytic 500 Mfd. 6 V. 85°.
C69	PP19136	Capacitor, Mica 220 Mmfd. 2500 V. ±10% 85°.
L3	PA28253	Coil, I.F. Choke
L19,L20	PP28264	Coil, Filament Choke
L11	PP28260	Coil, Focus P.M.
L8	PA28262	Coil, Peaking
L9	PA28255-3	Coil, Peaking, Blue

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
L10	PA29255-4	Coil, Peaking, Green
L7	PA28255-1	Coil, Peaking, Red
L14	PP28258	Coil, Width Control
L13	PA28263	Coil, Horizontal Frequency Control
L17	PB1404	Choke, Filter
	PB55111	Connector, Anode
R30A,R30B	PA2499	Control, Contrast, Volume Control, Switch
R38	PP2525	Control, Focus 1500 ohm
R41A,R41B	PA24100	Control, Vertical Speed, Brightness
R60	PP2524	Control Height 2.5 megohm
R63	PP2523	Control, Vertical Linearity 500 ohm
R77	PA24101	Control, Horizontal Speed 50,000 ohm
	PP55110	Cord, Line
	PP54586	Corona Ring
	PC62240	Cover, Back, Model A2000
	PC62252	Cover, Back, Model A2001
	PC62253	Cover, Back, Model A2002 & A1001-A
	PA54610	Cushion, Tube
	PA54611-1	Cushion, Tube Strap, Model A1001-A & A2000
	PA54611-2	Cushion, Tube Strap, Model A2001 & A2002
	PP59458	Escutcheon, Tuner #1
	PP54621	Escutcheon, Tuner #2
F1,F2,F3	PP54682	Fuse, 1/4 Amp., 250 V. 3AG Littlefuse #310116
	PC62256	Glass, Safety, Model A2000
	PC62260	Glass, Safety, Model A2001, A2002, & A1001-A
	PP54623	Ion Trap (P.M.)
	PA39192-1	Knob, Antenna, Model A2002 & A1001-A
	PP39188	Knob, Brilliance
	PP39188	Knob, Contrast
	PP39190	Knob, Fine Tuning
	PP39189	Knob, Horizontal hold
	PP39187	Knob, Off-On Sound
	PP39191	Knob, Selector
	PP39187	Knob, Vertical Hold
	PC62257	Mask, Kinescope, Model A2000 & A1001-A
	PC62259	Mask, Kinescope, Model A2001 & A2002
	PA18163	Plug
	PP54661	Plug, Male, Line Cord
	18100	Plug, Speaker
R1	PP21102	Resistor, 1,000 Ohm 4 W. ±10% W.W.
R2	PP23104	Resistor, 10 Ohm 1 W. ±10% Carbon
R3	PP23108	Resistor, 10,000 Ohm ½ W. ±10%
R4,R7	PP23148	Resistor, 82 Ohm ½ W. ±10% Carbon
R5	PP23110	Resistor, 330 Ohm ½ W. ±10% Carbon
R6,R11,R17, R52,R53	PP23111	Resistor, 8,200 Ohm ½ W. 10% Carbon
R8,R9,R10,R12, R37	PP23109	Resistor, 100 Ohm ½ W. ±10% Carbon
R13,R47,R54,R78	PP23112	Resistor, 1 megohm ½ W. ±10% Carbon
R14	PP23113	Resistor, 680,000 Ohm ½ W. ±10% Carbon
R15	PP23107	Resistor, 39,000 Ohm 1 W. ±10%
R16,R28	PP23114	Resistor, 1,000 Ohm ½ W. ±10% Carbon
R18	PP23115	Resistor, 120 Ohm ½ W. ±10% Carbon
R19	PP23100	Resistor, 22,000 Ohm 2 W. ±10% Carbon
R20,R85	PP23116	Resistor, 47,000 Ohm 2 W. ±10% Carbon
R21	PP23101	Resistor, 10,000 Ohm 7 W. ±10%
R22,R64	PP23117	Resistor, 6800 Ohm 1 W. ±10% Carbon
R24,R35,R73	PP23118	Resistor, 470,000 Ohm ½ W. ±10% Carbon
R26	PP23119	Resistor, 12,000 Ohm ½ W. ±10% Carbon
R27,R57,R70, R71,R76	PP23120	Resistor, 100,000 Ohm ½ W. ±10% Carbon
R29	PP23121	Resistor, 15,000 Ohm ½ W. ±10% Carbon
R31	PP23147	Resistor, 47,000 Ohm ½ W. ±10% Carbon
R33	PP23123	Resistor, 10 megohm ½ W. ±10% Carbon
R34	PP23124	Resistor, 330,000 Ohm 1 W. ±10% Carbon
R36	PP23125	Resistor, 220 Ohm 1 W. ±10% Carbon
R39	PP21101	Resistor, 1500 Ohm 7 W. ±10% W.W.
R40	PP23126	Resistor, 27,000 Ohm ½ W. ±10% Carbon
R42	PP23127	Resistor, 220,000 Ohm ½ W. ±10% Carbon
R43,R69	PP23128	Resistor, 2200 Ohm ½ W. ±10% Carbon
R44,R32	PP23129	Resistor, 270,000 Ohm ½ W. ±10% Carbon
R45	PP23130	Resistor, 820,000 Ohm ½ W. ±10% Carbon
R46	PP23131	Resistor, 47,000 Ohm ½ W. ±10% Carbon
R48,R49,R50	PP23132	Resistor, 3900 Ohm ½ W. ±10% Carbon
R51	PP23122	Resistor, 22,000 Ohm ½ W. ±10% Carbon
R55	PP23146	Resistor, 56,000 Ohm ½ W. ±10% Carbon
R56	PP23150	Resistor, 6.8 megohm ½ W. ±10% Carbon
R58	PP23134	Resistor, 2.2 megohm ½ W. ±10% Carbon
R59	PP23135	Resistor, 1.5 megohm ½ W. ±10% Carbon
R61	PP23136	Resistor, 3300 Ohm ½ W. ±10% Carbon
R62,R65,R66	PP23137	Resistor, 560 Ohm ½ W. ±10% Carbon
R67	PP23138	Resistor, 33,000 Ohm ½ W. ±10% Carbon
R68	PP23139	Resistor, 4700 Ohm ½ W. ±10% Carbon
R72	PP23140	Resistor, 4.7 megohm ½ W. ±10% Carbon
R74	PP23103	Resistor, 5600 Ohm 1 W. ±10% Carbon
R75	PP23141	Resistor, 1500 Ohm ½ W. ±10% Carbon
R79	PP23142	Resistor, 68 Ohm ½ W. ±10% Carbon
R80	PP23143	Resistor, 82 Ohm 1 W. ±10% Carbon
R81	PP23106	Resistor, 82,000 Ohm 2 W. ±10% Carbon
R82	PP23144	Resistor, 3.3 Ohm 1 W. ±10% Carbon
R83	PA21100	Resistor, 10,000 Ohm Tapped @ 7,500 Ohms 20 W. ±10% W.W.
R84	PP23145	Resistor, 1 megohm 2 W. ±10% Carbon
R87	PP23149	Resistor, 22,000 Ohm 1 W. ±10% Carbon
R88	PE233-2228	Resistor, 100 Ohm 2 W. ±20% Carbon
R89	PE230-2321	Resistor 1 megohm 1/4 W. ±20% Carbon
	PP54587	Socket, High Voltage
	PP18156	Socket, Kinescope .
	PA18147	Socket, Miniature 7 Pin, Wafer 7/8" mounting centers
	PA18157	Socket, Miniature 9 pin, Wafer 1 1/8" mounting centers
	PA18155	Socket, Octal Moulded 1 5/16" mounting centers
	18101	Socket, Speaker Plug
	PP54618	Shield, Tube
	PC5866	Speaker with output transformer, Model A2000 & A2001 (5")
	PC58121	Speaker, with output transformer, Model A2002 & A1001-A (10")
	PP54614	Spring, for Escutcheon
	PC54541	Strap, Picture Tube, Model A2000 & A1001-A
	PC54509	Strap, Picture Tube, Model A2001 & A2002
	PB54558-1	Support, Deflection Yoke, Model A2000 & A101-A
	PB54558-2	Support, Deflection Yoke, Model A2001 & A2002
	PC54535	Support, Picture Tube, Model A2000 & A1001-A
	PC54507	Support, Picture Tube, Model A2001 & A2002
	PA54625	Terminal Strip, Antenna
L2,L4,L6	PP3392	Transformer, Pix I.F.
T1	PA28254	Transformer, Audio Take-off
T2	PP3393	Transformer, Ratio Detector
T4	PB1099	Transformer, Vertical Oscillator
T5	PB1352	Transformer, Vertical Output
T6	PP1095	Transformer, Horizontal Output
T7	PC1098	Transformer, Power
C96	PA1772	Trimmer 25 - 280 Mmfd.
	PB54617	Tuner #1
	PP54615	Tuner #2
	PP54604	Wafer, Electrolytic Cond. mounting bracket
L12 & L16	PP28261	Yoke, Deflection

R.F. TUNER NUMBER ONE

DESCRIPTION

The R.F. tuner number one is a separate sub-chassis of the receiver. On this sub-chassis is located the R.F. amplifier, R.F. converter, R.F. oscillator, fine tuning control, channel drum, converter transformer, and all R.F., converter, and oscillator adjustments. This tuner operates on all the television channels number two thru number thirteen. Its function is to select the desired picture and sound carriers, amplify and convert to the proper I.F. frequency.

R.F. tuner number one is easily recognized from the other type of R.F. tuners that are used in this receiver by the fact that it has a rotating drum to change from one channel to another and it uses the following tubes.

TUBE COMPLEMENT

NO.	TUBE	FUNCTION
V1	6AG5	R.F. Amplifier
V2	6J6	Converter and Oscillator

R.F. AMPLIFIER - CONVERTER

Referring to the Schematic diagram FIGURE 26, L101 is the center tapped primary coil inductively coupled, (by being wound on the same form) to L102. L102 is the grid coil of V1. It is series tuned to the desired channel by C101 fixed condenser and C102 variable condenser. It is also shunt tuned by the input capacitance of V1. The band-pass response of L102 is increased by shunting it with a 3900 ohm resistor R108.

In the plate circuit of the R.F. amplifier there is a coil L103 that is shunt tuned by the output capacitance of the tube and the variable capacitor C103. This coil is tuned to the same frequency as L102 and its band-pass is broadened by the 10,000 ohm shunt resistor R106.

The coil L103 is inductively coupled (by being wound on the same form) to coil L104 in the grid of the converter tube. Coil L104 is shunt tuned to the same frequency as L103 by the input capacitance of V2 and by the variable capacitor C104.

OSCILLATOR

The oscillator coil L105 is inductively coupled to L104 (by being wound on the same form). This provides the proper injection voltage. The coil is series tuned to its proper frequency by means of the variable capacitor C105 shunted by the fine tuning capacitor C112. The coil is also shunt tuned by the fixed capacitor C11 and its inductance is varied by means of an adjustable brass core.

BAND SWITCHING

This tuner is switched from channel to channel by means of a rotating drum. This provides a different set of coils L101, L102, L103, L104, and L105 for each channel. With the exception of the brass core in coil L105 the tuning adjustments are common for all coils. This necessitates that each coil be very accurately adjusted at the factory so that they will require the same amount of capacity to adjust as all other coils in the tuner, of the same type.

ALIGNMENT PROCEDURE

Before attempting to align the R.F. tuner it is necessary that the I.F. amplifier be correctly aligned. It is desirable that all adjustments of the trimmers be made at channel #12. To align the tuner proceed as follows:-

(1) Connect an R.F. sweep generator to the antenna terminals.
(2) If the generator is not provided with internal crystal controlled or crystal calibrated markers connect a marker generator to the antenna terminals.
(3) Connect a Cathode Ray Oscilloscope across the picture detector diode load resistor R17. (8200 ohms)
(4) Adjust the R.F. generator for a 10MC. sweep width with a center frequency at approximately 207 MC.
(5) Adjust the marker generator for the sound carrier of channel 12 (209.75 MC.).
(6) Set the range switch to channel 12 with the fine tuning in the middle of its range.
(7) Set the PICTURE control for one volt measured from pin "5" to chassis. (V8-6AC7).
(8) Turn the receiver on and allow it about 15 minutes for the receiver to warm up and stabilize.
(9) Align C102, C103, and C104 for a curve similar to that shown in FIGURE 23.
(10) Adjust C105 until the sound carrier marker is at the base of the curve.
(11) Change the Station selector to the various channels and using the correct setting of the R.F. generator to center it in the channel and the correct marker frequency for the sound carrier, adjust the brass core in L105 so that the sound marker will be in the correct position on the curve. FIGURE 23.
NOTE: Each core is independent of the one in another channel. This enables you to adjust any channel without changing the adjustment of all other channels.
(12) This completes the alignment of the R.F. tuner with the exception of the converter transformer which you have aligned when you aligned the I.F.

CHANNEL NO.	CHANNEL FREQUENCY	SOUND CARRIER
2	54 - 60	59.75
3	60 - 66	65.75
4	66 - 72	71.75
5	76 - 82	81.75
6	82 - 88	87.75
7	174 - 180	179.75
8	180 - 186	185.75
9	186 - 192	191.75
10	192 - 198	197.75
11	198 - 204	203.75
12	204 - 210	209.75
13	210 - 216	215.75

OVERALL RESPONSE - ANTENNA TO PICTURE DETECTOR

FIGURE 23. OVERALL CURVE

SERVICE NOTES

READJUSTMENT OF R.F. OSCILLATOR WITHOUT EQUIPMENT

(1) Remove the band switch escutcheon by sliding the spring slide to the left.
(2) Tune the receiver to the channel you wish to align.
(3) Turn the fine tuning control to the center position.
(4) Adjust the oscillator brass core, located in the hole on the upper right side of the front of the tuner chassis, for the best picture.
(5) Proceed to the next channel you wish to adjust and repeat the operation above, etc. Each adjustment is independent so that you may adjust any one or all channels as desired.

CHANGING TUBES

Due to the high frequencies at which the receiver operates the adjustments are critical and may be affected by a tube change. In replacement, if an old tube can be matched for frequency by trying several new ones, this practice is recommended. At best, however, it will probably be necessary to completely realign the oscillator when changing the oscillator tube.

REMOVING CHANNEL COIL UNITS

To remove a channel coil unit insert a screwdriver blade between the coil retainer spring (on the outside end of each unit) and the turret plate. Twist the blade away from the turret and lift the end of the coil upward and remove. Do not lift the spring any more than is necessary.

OSCILLATOR SLUG IN TOO FAR

If the oscillator slug is tuned in too far it will become disengaged with its retaining spring and fall into the coil. To correct this condition proceed as follows:-

(1) Remove the channel coil unit as described above.
(2) Move the slug retaining spring to one side.
(3) Tap the coil assembly until the slug slips forward.
(4) Set the slug retaining spring into position. It should rest firmly against the slug.
(5) Replace the channel coil unit.

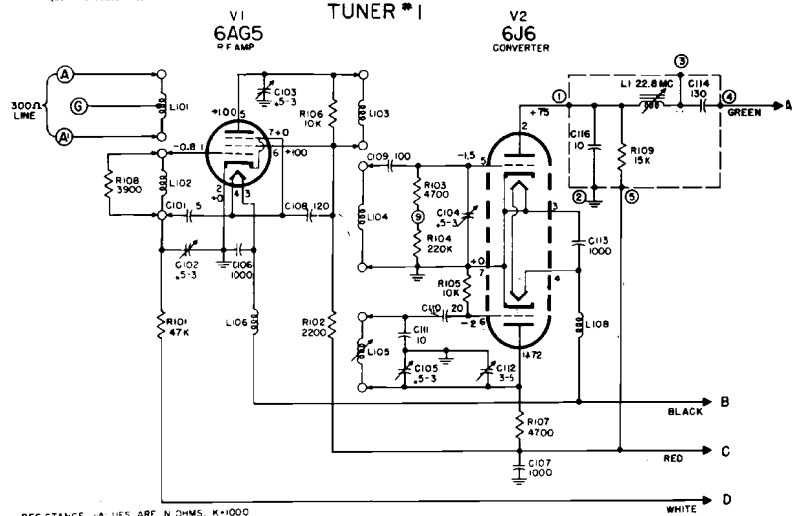
REMOVING THE TURRET ASSEMBLY

To remove the turret assembly proceed as follows:-

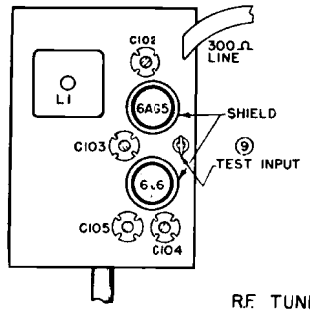
(1) Remove the screw holding the fine tuning control grounded stator plate.
(2) Slide the fine tuning rotor, spring, and bushing from the turret shaft.
(3) Remove the shaft retainer spring from the front and rear of the tuner.
(4) Grasp the turret shaft and slip the turret from the tuner chassis being careful not to loosen the detent roller.
(5) Reassemble by reversing the above operations.

RESETTING THE DETENT SPRING

(1) Loosen the detent mounting screw.
(2) Grasp the turret and the roller end of the detent spring while observing the contacts on the contact plate. Rotate the drum slightly in both directions until a point is reached where the contacts appear to have the greatest rise.
(3) Check to see that the detent roller is setting in the center of the depression in the turret detent plate.
(4) Tighten the detent spring mounting screw.
(5) Rotate the turret and check the contacts on all channels.



RESISTANCE VALUES ARE IN OHMS, K=1000
CAPACITANCE VALUES IN MMFD UNLESS OTHERWISE NOTED.
FIGURE 26 - R.F. TUNER NUMBER ONE - SCHEMATIC



RF TUNER #1
TUBE & TRIMMER
LOCATION

FIGURE 24 - TUNER - TOP VIEW

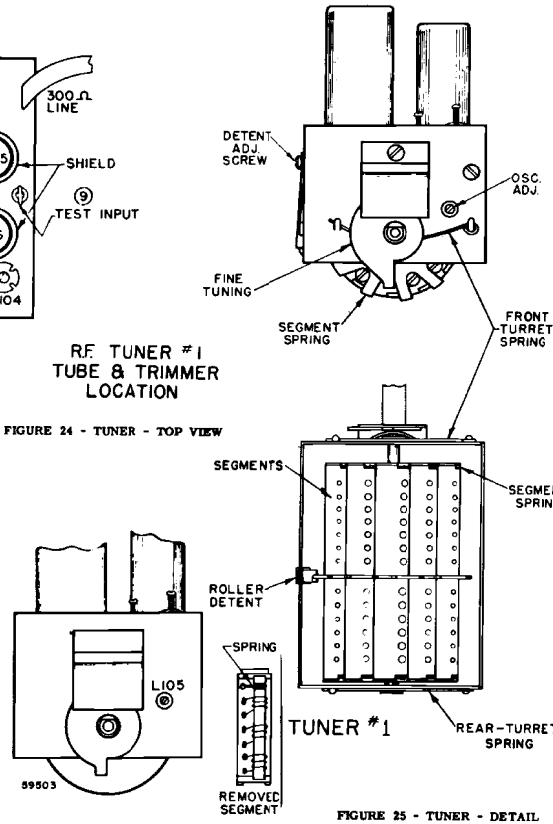


FIGURE 25 - TUNER - DETAIL

REPAIR PARTS LIST - TUNER NUMBER ONE

SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
C101	PP19137	Capacitor, Ceramic 5 Mmfd. ±10%
C106,C107,C113	PP19139	Capacitor, Ceramic 1000 Mmfd. ±10%
C108	PP19140	Capacitor, Ceramic 120 Mmfd. ±10%
C109	PP19141	Capacitor, Ceramic 100 Mmfd. ±10%
C110	PP19142	Capacitor, Ceramic 20 Mmfd. ±10%
C111	PP19143	Capacitor, Ceramic 10 Mmfd. ±10%
C112	PP19144	Capacitor, Fine Tuning 3 to 5 Mmfd.
L106,L107	PP28270	Choke, Filament
R101	PE230-89	Resistor, 47,000 Ohm 1/4 W. ±10% Carbon
R102	PE230-2257	Resistor, 2200 Ohm 1/4 W. ±20% Carbon
R103	PE230-2265	Resistor, 4700 Ohm 1/4 W. ±20% Carbon
R104	PE230-2305	Resistor, 220,000 Ohm 1/4 W. ±20% Carbon
R105,R106	PE230-1173	Resistor, 10,000 Ohm 1/4 W. ±10% Carbon
R107	PE230-1165	Resistor, 4700 Ohm 1/4 W. ±10% Carbon
R108	PE230-1163	Resistor, 3900 Ohm 1/4 W. ±10% Carbon
L101-2,L102-2	PP28268-2	Transformer Assy., Antenna Channel #2
L101-3,L102-3	PP28268-3	Transformer Assy., Antenna Channel #3
L101-4,L102-4	PP28268-4	Transformer Assy., Antenna Channel #4
L101-5,L102-5	PP28268-5	Transformer Assy., Antenna Channel #5
L101-6,L102-6	PP28268-6	Transformer Assy., Antenna Channel #6
L101-7,L102-7	PP28268-7	Transformer Assy., Antenna Channel #7
L101-8,L102-8	PP28268-8	Transformer Assy., Antenna Channel #8
L101-9,L102-9	PP28268-9	Transformer Assy., Antenna Channel #9
L105-10		
L103-11,L104-11, L105-11	PP28269-11	Transformer Assy., Oscillator Channel #11
L103-12,L104-12, L105-12	PP28269-12	Transformer Assy., Oscillator Channel #12
L103-13,L104-13, L105-13	PP28269-13	Transformer Assy., Oscillator Channel #13
L1	PP28271	Transformer Assy., Converter
C102,C103,C104, C105	PP19138	Trimmer condensers, .5 to 3 Mmfd.
L101-10,L102-10	PP28268-10	Transformer Assy., Antenna Channel #10
L101-11,L102-11	PP28268-11	Transformer Assy., Antenna Channel #11
L101-12,L102-12	PP28268-12	Transformer Assy., Antenna Channel #12
L101-13,L102-13	PP28268-13	Transformer Assy., Antenna Channel #13
L103-2,L104-2, L105-2	PP28269-2	Transformer Assy., Oscillator Channel #2
L103-3,L104-3, L105-3	PP28269-3	Transformer Assy., Oscillator Channel #3
L103-4,L104-4, L105-4	PP28269-4	Transformer Assy., Oscillator Channel #4
L103-5,L104-5, L105-5	PP28269-5	Transformer Assy., Oscillator Channel #5
L103-6,L104-6, L105-6	PP28269-6	Transformer Assy., Oscillator Channel #6
L103-7,L104-7, L105-7	PP28269-7	Transformer Assy., Oscillator Channel #7
L103-8,L104-8, L105-8	PP28269-8	Transformer Assy., Oscillator Channel #8
L103-9,L104-9, L105-9	PP28269-9	Transformer Assy., Oscillator Channel #9
L103-10,L104-10,	PP28269-10	Transformer Assy., Oscillator Channel #10

TUBE VOLTAGES

R.F. TUNER NUMBER ONE

All voltages are measured with a D.C. Vacuum Tube Voltmeter and with the PICTURE Control and BRIGHTNESS Control in the minimum position, unless otherwise specified. No incoming signals are being received at the time the measurements are being made. The following voltages were taken on a production receiver with 117 volts 60 cycle AC input. A variation of 10% in the voltages should be considered normal.

TUBE NO.	TUBE TYPE	FUNCTION	ELEMENT	PIN NO.	VOLTAGE	NOTES
V1	6AG5	R.F. Amplifier	Plate	5	100	
			Screen	6	100	
			Grid	1	-.8	
			Cathode	2	0	
V2 (A)	1/2 6J6	Converter	Plate	2	75	The cathode is common to both the converter and oscillator
			Grid	5	-1.5	
			Cathode	7	0	
V2 (B)	1/2 6J6	Oscillator	Plate	1	72	
			Grid	6	-2	

R. F. TUNER NUMBER TWO

DESCRIPTION

The R.F. tuner number two is a separate subchassis of the receiver. On this subchassis are the R.F. amplifier, converter, oscillator, fine tuning control, channel switch, converter transformer, R.F. converter and oscillator coils and all their tuning adjustments. This tuner operates on all channels, number one (no longer a part of the television band) thru channel number thirteen. Its function is to select the desired picture and sound carriers, amplify and convert them to the proper I.F. frequency.

R.F. tuner number two is easily recognized from the other types of R.F. tuners that are used in this receiver by the fact that it has a wafer type of band switch and that it tunes to channel number one.

TUBE COMPLEMENT

NO	TUBE	FUNCTION
V1	6J6	R.F. Amplifier
V2	6J6	Converter
V3	6J6	R.F. Oscillator

R.F. AMPLIFIER

Referring to the schematic diagram T1 is a center tapped coil used for the short circuiting of low frequency signals picked up by the antenna which would otherwise be directly applied to the control grids of the 6J6 R.F. amplifier V1. C201 and C201 are antenna isolating capacitors. The D.C. return for the grids of V1 is through R203 and R213 which also properly terminates the 300 ohm antenna transmission line. C203 and C204 are neutralizing capacitors necessary to counteract the grid to plate capacitance of the triode R.F. amplifier.

In the plate circuit of the R.F. amplifier are a series of inductances L201 to L225 and L202 to L226 inclusive. These inductances may be considered as a quarter wave section of a balanced transmission line which can be tuned over a band of frequencies by moving a shorting bar along the parallel conductors.

Adjustable coils L225 and L226 provide the correct length of line for the thirteenth channel, 210 - 216 MC. L213 to L223 and L214 to L224 are fixed sections of line which are added to L225 and L226 as the shorting bar is moved progressively down the line. The physical construction of each one of these inductances is a small non-adjustable silver strap between the switch contacts. Each strap is cut to represent a six megacycle change in frequency. In order to make the jump between the lowest high frequency channel (174 - 180 MC.) and the highest low frequency channel (82 - 88 MC.) adjustable coils L211 and L212 are inserted. To provide for the remaining five low frequency channels, L201 to L209 and L202 to L210 are progressively switched in to add the necessary additional inductance.

Coils L201 to L209 and L202 to L210 are unusual in that they are wound in figures "8" fashion protruding from the switch wafer. This winding form produces a relatively non-critical coil since the coupling between turns is minimized. A maximum amount of wire is used for the small inductance which is required, thus permitting greater accuracy in manufacturing.

The converter grid operates in a similar manner and is so arranged on the switch to provide coupling between it and the R.F. line. C210, C212, C213 and a link provide additional coupling which is arranged to produce at least 4.5 megacycle band pass on each of the channels.

L280 and C214 form a series resonated circuit used to prevent I.F. feedback in the converter by grounding the grids for I.F. frequency. They also act as a trap to reject short-wave signals of I.F. frequency which arrive at the converter grids in push push manner.

A 6J6 triode is used as a converter. Since the grids are fed in push pull by both the signal and the oscillator, the hetrodyne products (I.F. signals) are in phase on the converter plates so the two plates are connected in parallel. Unwanted signals of the I.F. frequency that arrive at the converter grid in a push pull manner are out of phase on the converter plates. Since the plates are tied together, these signals tend to cancel thus reducing the possibility of interference from this source.

R.F. OSCILLATOR

The oscillator is similar except that trimmer adjustments are provided for each channel and

the low frequency coils are not figure "8" windings. For tuning each channel brass screws are used in close proximity to the high frequency tuning straps L266 to L276 and brass cores are adjusted through coils L254 to L262. It is obvious that the high frequency adjustments should be made before each lower frequency one.

C215 is a fine tuning adjustment which provides approximately plus or minus 300 kc. variation of the oscillator frequency on channel #1 and approximately plus or minus 750 kc. on channel #13.

The physical location of the oscillator line with respect to the converter grid line such as to provide some coupling to the converter grids. The coupling is augmented by the link shown on the schematic and provides reasonably uniform oscillator voltage at the converter grids over the entire tuning range of the unit.

ALIGNMENT PROCEDURE

Before attempting to align the R.F. tuner it is necessary that the I.F. amplifier is correctly aligned. It is important that all adjustments be made in the order given below. To align proceed as follows:

(1) Connect an R.F. sweep generator to the antenna terminals.
(2) If the generator is not provided with internal crystal controlled or crystal calibrated markers connect a marker generator to the antenna terminals.
(3) Connect a cathode ray oscilloscope across the picture detector diode load resistor R17 (8200 ohm).
(4) Adjust the R.F. generator for a 10 MC. sweep width with a center frequency at approximately 213 MC.
(5) Adjust the marker generator for the sound carrier of Channel 13 (215.75 MC.)
(6) Set the range switch to channel 13 with the fine tuning in the middle of its range.
(7) Set the PICTURE control for one volt across pin "5" to chassis. (V8 - 6AC7)
(8) Turn the receiver on and allow it about 15 minutes for the receiver to warm up and stabilize.
(9) Align L225, L226, L251 and L252 for a curve similar to that shown in FIGURE 27.
(11) Using trimmers L276, L274, L272, L270, L268, L266, adjust the sound carrier for channel #12 thru Channel #7 same as in step #10 above. It is important to do this in the order given. Use the frequency settings shown in the chart.
(10) Adjust L277 and L288 until the sound carrier marker is at the base of the curve. See Figure 27.
(12) Proceed as in step #9 using channel #6 and coil adjustments L211, L212, L237 and L238. Be sure to use the correct frequency for channel #6.
(13) Adjust L263 and L264 until the sound carrier marker is at the base of the curve.
(14) Adjust L252, L260, L258, L256, and L254 so that the sound carrier for channel #5 thru channel #1 is at the base of the curve. It is important to do this in the order given. Use the frequency settings shown in the chart.
(15) Adjust the sound trap of T1 (top core) so that it puts a pip on any one of the sound markers at the base of the curve. Before doing this it is necessary to remove the shot from this coil. See step #8.
(16) This completes the alignment of the R.F. tuner number two except for the converter I.F. which you aligned when you aligned the I.F.

CHANNEL NO.	CHANNEL FREQUENCY	SOUND CARRIER
2	54 - 60	59.75
3	60 - 66	65.75
4	66 - 72	71.75
5	76 - 82	81.75
6	82 - 88	87.75
7	174 - 180	179.75
8	180 - 186	185.75
9	186 - 192	191.75
10	192 - 198	197.75
11	198 - 204	203.75
12	204 - 210	209.75
13	210 - 216	215.75

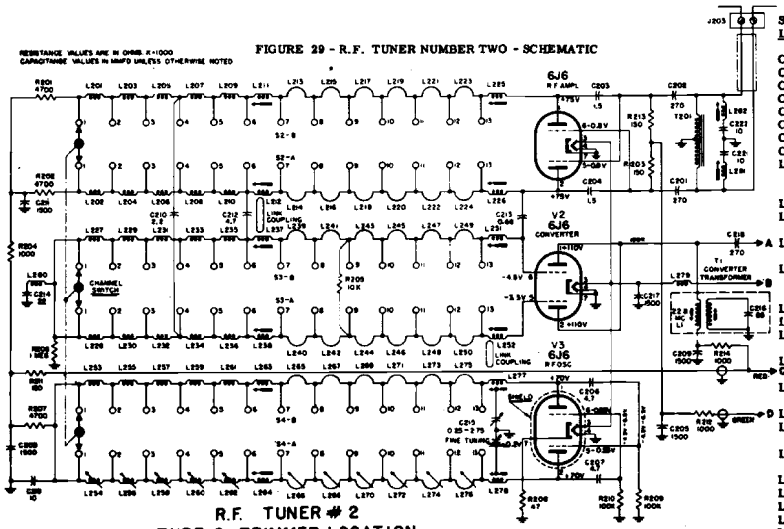
TUBE VOLTAGES

R.F. TUNER NUMBER TWO

All voltages are measured with a D.C. Vacuum Tube Voltmeter and with the PICTURE control and BRIGHTNESS Control in the minimum position, unless otherwise specified. No incoming signals are being received at the time the measurements are being made. The following voltages were taken on a production receiver with 117 volts 60 cycle AC input. A variation of 10% in the voltages should be considered normal.

TUBE NO.	TUBE TYPE	FUNCTION	ELEMENT	PIN NO.	VOLTAGE
V1	6J6	R.F. Amplifier	Plate	1	75
			Plate	2	75
			Grid	6	-0.8
			Grid	5	-0.8
			Cathode	7	0
V2	6J6	Converter	Plate	1	110
			Plate	2	110
			Grid	6	-4.5
			Grid	5	-3.5
			Cathode	7	0
V3	6J6	Oscillator	Plate	1	70
			Plate	2	70
			Grid	6	-0.25
			Grid	5	-0.25
			Cathode	7	0.2

FIGURE 29 - R.F. TUNER NUMBER TWO - SCHEMATIC



R.F. TUNER # 2
TUBE & TRIMMER LOCATION

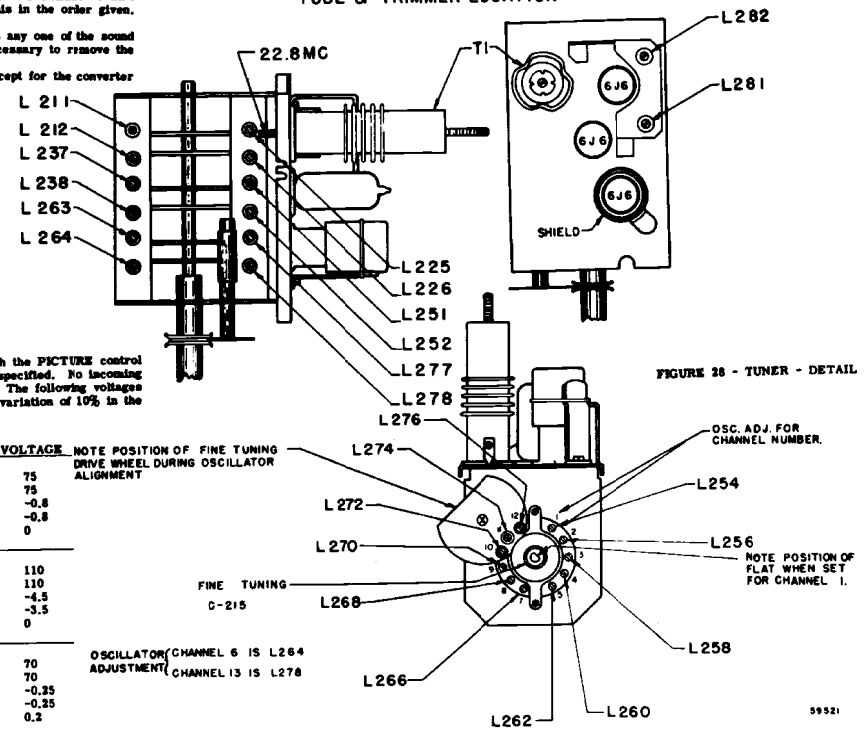
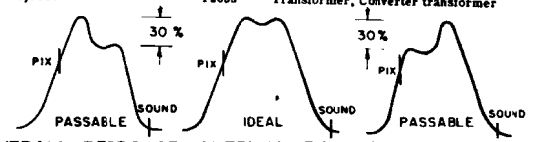


FIGURE 28 - TUNER - DETAIL

REPAIR PARTS LIST-TUNER NUMBER TWO

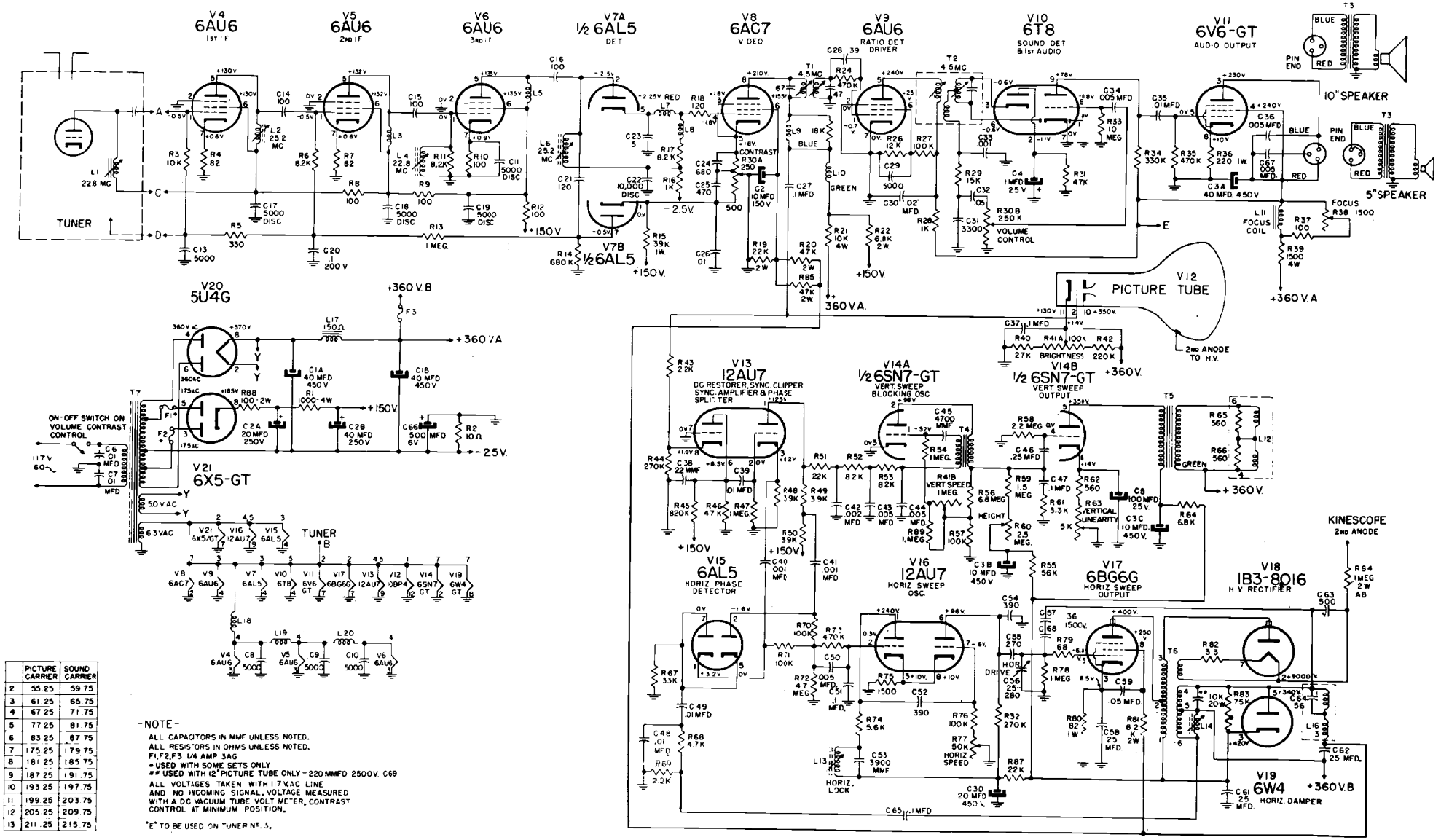
SCHEMATIC LOCATION	PART NUMBER	DESCRIPTION
C213	T2001	Capacitor, Ceramic, 0.68 Mmfd.
C203,C204	T2002	Capacitor, Ceramic, 1.5 Mmfd.
C210	T2003	Capacitor, Ceramic, 2.2 Mmfd.
C206,C207,C212	T2004	Capacitor, Ceramic, 4.7 Mmfd.
C214	T2005	Capacitor, Ceramic, 22 Mmfd.
C201,C202	T2006	Capacitor, Ceramic, 270 Mmfd.
C218	T2007	Capacitor, Mica, 270 Mmfd.
C205,C208,C209,C211,C217	T2008	Capacitor, Ceramic, 1500 Mmfd.
L201,L202,L227,L228	T2009	Coil, Channel #1 R.F. amplifier plate coil, front or rear section or channel #1 converter grid coil, front or rear section
L203,L204,L205,L206,L229, L230,L233,L234	T2010	Coil, Channels #2 and #3 R.F. amplifier plate coil, front or rear section or channels #2 and #4 converter grid coil, front or rear section
L207,L208	T2011	Coil, Channel #4 R.F. amplifier plate coil, front or rear section
L209,L210,L235,L236	T2012	Coil, Channel #5 R.F. amplifier plate coil, front or rear section or channel #5 converter grid coil, front or rear section
L211,L212,L237,L238,L263, L264	T2013	Coil, Channel #6 oscillator, converter grid or R.F. amplifier plate coil, front or rear sections
L225,L251	T2014	Coil, Channel #13 converter grid or R.F. amplifier plate coil, rear section
L226,L252	T2015	Coil, Channel #13 converter grid or R.F. amplifier plate coil, front section
L231,L232	T2016	Coil, Channel #3 converter grid coil, front or rear section
L253,L254	T2017	Coil, Channel #1 oscillator coil, front or rear section
L255,L232	T2018	Coil, Channel #5 oscillator coil, front section or channel #2 oscillator coil, rear section
L256,L258,L260	T2019	Coil, Channels #2,#3, and #4 oscillator coil, front sections
L257	T2020	Coil, Channel #3 oscillator coil, rear section
L259	T2021	Coil, Channel #4 oscillator coil, rear section
L261	T2022	Coil, Channel #5 oscillator coil, rear section
L277	T2023	Coil, Channel #13 oscillator coil, rear section
L278	T2024	Coil, Channel #13 oscillator coil, front section
L279	T2025	Coil, Heater Choke Coil
L280	T2026	Coil, Converter grid I.F. choke coil
	T2027	Connector, Segment connector
	T2028	Core, Channel #13 front and rear oscillator coils adjustable core and stud
	T2029	Core, Channels #6 and #13 front and rear converter grid coils or front and rear R.F. amplifier plate coils' adjustable core and stud
	T2030	Core, Channel #6 front and rear oscillator coils' adjustable core and stud
	T2031	Detent, R.F. unit detent mechanism and fiber shaft
Part of C215	T2032	Disc, Rotor disc for fine tuning control
	T2033	Drive, Fine tuning pinch washer drive
	T2034	Form, Coil form only for channels #6 and #13 coils, less winding
	T2035	Loop, Oscillator to converter grid coupling loop
R208	T2036	Resistor, 47 Ohms ½ W.
R203,R211,R213	T2037	Resistor, 150 Ohms, ½ W.
R204,R212,R214	T2038	Resistor, 1000 Ohms ½ W.
R201,R202,R207	T2039	Resistor, 4700 Ohms ½ W.
R205	T2040	Resistor, 10,000 Ohms ½ W.
R209,R210	T2041	Resistor, 100,000 Ohms ½ W.
R206	T2042	Resistor, 1 Megohm ½ W.
	T2043	Ring, Retaining ring for drive
L254,L256,L258,L260,L262	T2044	Screw, #4-40 x 15/32" adjusting screw for coils
L266,L268,L270,L272,L274,L276	T2045	Screw, #4-40 x 1/4" binder head screw for adjusting coils
Part of S202,S203	T2046	Segment, converter grid section front segment, less coils or R.F. amplifier plate section front segment, less coils
Part of S202,S203	T2047	Segment, converter grid section rear segment, less coils or R.F. amplifier plate section rear segment, less coils
Part of S204	T2048	Segment, Oscillator section front segment, less coils
Part of S204	T2049	Segment, Oscillator section rear segment, less coils
	T2050	Shield, Lead tube shield for V3
	T2051	Socket, Miniature tube socket
	T2052	Spring, Snap spring to hold fine tuning shaft
Part of C215	T2053	Stator, Oscillator fine tuning stator and bushing
T201	T2054	Transformer, Antenna transformer
T202,C216	T2055	Transformer, Converter transformer



OVERALL RESPONSE - ANTENNA TO PICTURE DETECTOR

FIGURE 27. OVERALL CURVE

MODELS A-1000 A,
A-2000, A-2001, A-2002



	PICTURE CARRIER	SOUND CARRIER
2	55.25	59.75
3	61.25	65.75
4	67.25	71.75
5	77.25	81.75
6	83.25	87.75
7	175.25	179.75
8	181.25	185.75
9	187.25	191.75
10	193.25	197.75
11	199.25	203.75
12	205.25	209.75
13	211.25	215.75

-NOTE-

ALL CAPACITORS IN MMF UNLESS NOTED.
ALL RESISTORS IN OHMS UNLESS NOTED.
F1,F2,F3 1/4 AMP 3AG
* USED WITH SOME SETS ONLY
** USED WITH 12" PICTURE TUBE ONLY - 220 MMFD. 2500V. C69
ALL VOLTAGES TAKEN WITH 117 V.AC LINE AND NO INCOMING SIGNAL. VOLTAGE MEASURED WITH A DC VACUUM TUBE VOLT METER, CONTRAST CONTROL AT MINIMUM POSITION.

"E" TO BE USED ON TUNER NO. 3.