ELECTRICAL SPECIFICATIONS

POWER SUPPLY RATING

105 - 120 volts, 60 cycles, 215 watts

AUDIO POWER OUTPUT RATING

3.5 watts

LOUDSPEAKER

Type - 6½-inch permanent magnet dynamic
Voice Coil impedance - 3.2 ohms at 400 cycles

RECEIVER ANTENNA INPUT IMPEDANCE

300 ohms balanced

TUBE COMPLEMENT

See Figure 1.

TUNING RANGE

FM - 88-108 mc.

TV - Channels 2 - 6 (54-88 mc.)
Channels 7 - 13(174-216 mc.)

ALIGNMENT DATA

Picture Carrier Frequency	-	25.75 mc.
Accompanying Sound Trap	-	21.25 mc.
Sound I.F. Frequency	-	4.5 mc.
FM first I.F. Frequency	-	10.7 mc.
FM second I.F. Frequency	-	4.5 mc.
FM second Oscillator Frequency	-	15.2 mc.
Sound Ratio Detector Band Width	-	225 kc. (between peaks)
Video Response	-	to 4.0 mc.
Focus	-	Permanent Magnet
Sweep Deflection	-	Electromagnetic

OPERATING CONTROLS

See Figure 1.

NON-OPERATING CONTROLS

See Figure 1.

PHONO INPUT

High Impedance
Plug - Type PL55 or equivalent

RECEIVER OPERATING INSTRUCTIONS

Refer to the OPERATING INSTRUCTIONS booklet for Model TV-120 Series.

DISCUSSION OF TV RECEIVER CIRCUITS

Consult the block diagram Figure 2 to understand the basic layout of the circuits.

TV FRONT END

The TV front end is a separate sub-chassis of the receiver. Mounted on this chassis are the RF amplifier, converter and oscillator, bandswitch, all RF and oscillator coils and the converter plate coil. Referring to the schematic diagram, it will be noticed that there are three double triodes available in the front end. One section of each triode is used for high band tuning, and the other section of each triode is used for low band tuning. The switching comprises a changeover in the B plus and antenna coils. The two bands are otherwise completely independent.

With the chassis inverted and the tuning dials facing the operator, all components on the left side of the front end are associated with the low band and all components associated with the high band are located on the right side WITH THE EXCEPTION OF THE LOW AND HIGH BAND ANTENNA COILS WHICH ARE INVERTED IN THEIR LOCATION. The antenna terminates in a band-pass transformer for the low or high band respectively and is switched to the proper transformer when the bandswitch is set to the desired band. The trimmer T3 adjusts the high band circuit. Tuning in the plate circuit of the RF amplifier and grid circuit of the converter is accomplished through a band-pass transformer which is continuously tuned by means of the 3-gang variable condensers located on the top of the chassis directly above their respective coils. The low

band interstage transformer is aligned by iron slug S2. The high band interstage transformer is aligned by iron slug S4 and trimmers T4 and T5. The RF oscillators are of the tickler feedback type, tuned over the bands by means of the rear sections of the variable condensers. The low band oscillator is adjusted by brass slug S1 and trimmer T2 and the high band oscillator by brass slug S3 and trimmer T6. The converter plate circuit, common to the low and high band, consists of an RF choke in parallel with the converter coil S5 which is mounted at the rear of the front end sub-chassis.

PICTURE I.F. AMPLIFIER AND DETECTOR

The picture I.F. amplifier is of the conventional stagger tuned type. Its unusual feature for a set in this price range is the use of four stages of I.F. amplification. In order to obtain proper band-pass characteristics, the picture I.F. coils are tuned as follows:

1. Converter coil - 23.5 Mc (iron slug S5)
2. First picture I.F. coil - 25.6 Mc (iron slug S6)
3. Second picture I.F. coil - 22. Mc (iron slug S7)
4. Third picture I.F. coil - 21.6 Mc (iron slug S8)
5. Fourth picture I.F. coil - 24.8 Mc (iron slug S9)

To align the I.F. system, the coils are peaked to the specified frequency with an unmodulated signal generator. The over-all I.F. response is then observed by use of the sweep generator and oscilloscope.

TRAP CIRCUIT

In order to avoid sound carrier interference in the picture, a sound trap is incorporated. It is aligned by iron slug S10 to a frequency of 21.25 Mc to absorb excessive sound energy.

PICTURE SECOND DETECTOR

The detector is a germanium crystal rectifier (1N34) and is contained in Video Detector Can Assembly 279-54.

INTERCARRIER SOUND SYSTEM

This receiver is designed on the basis of conventional intercarrier sound. The frequency modulated 4.5 mc. carrier appearing at the output of the video detector is amplified by the two stages of video and by means of a tuned circuit (279-46) in the plate of the second video amplifier is separated from the video signal. The sound carrier is then amplified by the 6AU6 ratio detector driver and demodulated by the 6AL5 ratio detector. Two stages of audio amplification are employed. An additional 4.5 mc. trap circuit (79-75) is placed in the plate circuit of the second video amplifier to prevent FM interference in the picture. Provision is made for the connection of a record player for phonograph reproduction.

VIDEO AMPLIFIER, CONTRAST CONTROL AND A.G.C.

The video amplifier consists of a 12AU7 tube which provides two stages of video amplification having a flat frequency response up to 4.0 mc., and a gain of approximately 20 times. A 4.5 mc. trap circuit is incorporated in the plate circuit of the second stage to eliminate the effect of the 4.5 mc. FM component in the picture.

The contrast control which is part of the video amplifier circuit, performs two functions simultaneously. When rotated in a clockwise direction, the cathode bias on the second video amplifier is decreased, thereby increasing the video gain of the receiver. At the same time, the positive voltage at the junction of the 82K ohm resistor and the contrast control is increased. This positive voltage is fed back to the A.G.C. bus through a 1 megohm resistor. The negative A.G.C. voltage being developed by the 6AL5 A.G.C. rectifier is partially cancelled by this positive voltage and therefore the RF-IF gain of the receiver is increased. This action allows the video gain and the RF-IF gain to be controlled simultaneously to realize maximum sensitivity on weak signals.

DC RESTORER

Since the video amplifier is an AC amplifier, the DC component of the video signal that represents the average illumination of the original scene will not be passed. Unless this DC component is restored, difficulty will be experienced in maintaining proper scene illumination. For any given scene, this average illumination could be set properly by the brightness control. However, a change of scene would probably necessitate resetting this control. The DC restorer accomplishes this setting automatically, thus assuring proper picture illumination at all times.

SYNC. AMPLIFIER AND CLIPPER

The function of this system is to amplify the sync. signal and effect separation of sync. from the video signal. The signal from the DC restorer is fed into one half of a 12AU7 (amplifier) with the sync. in the negative direction. The signal is amplified and then fed to the other half of the 12AU7 (clipper) with the sync. in the positive direction. The operating voltages applied to this stage are such that the negative portion of the applied signal is cut off. Thus, the video and blanking pulses are removed and only the sync. pulses appear at the sync. clipper plate.

VERTICAL SYNC. AMPLIFIER

The sync. pulses appearing at the sync. clipper plate are negative in polarity and must be inverted before injection into the vertical sweep oscillator. One half of a 12AU7 performs this function and in conjunction with an integrating network in its plate circuit (27K ohm resistor and .01 mfd. condenser), effectively separates the vertical from the horizontal sync. pulses. Due to the isolating action of this tube, the vertical sync. pulses of proper polarity are fed to the vertical sweep oscillator free of all horizontal pulses.

VERTICAL OSCILLATOR AND OUTPUT

The function of these circuits is to provide a sawtooth of current of the proper frequency and phase to perform the vertical scanning for the picture tube. One half of a 6SN7 tube with its associated components form a blocking oscillator and discharge circuit. The voltage present at the plate of this tube is of the shape required to produce a sawtooth of current in the vertical deflection coil. This voltage is coupled to the other half of the 6SN7 which amplifies it and supplies a sufficient amount of power to the vertical deflection coil.

PHASE INVERTER AND HORIZONTAL PHASE DETECTOR

The horizontal phase detector (6AL5) is a dual diode in a circuit which produces a DC output voltage which is proportional to the phase displacement between two input voltages.

The composite sync. signal is split in phase by the 12AU7 phase inverter and the resultant signals (equal and 180° out of phase) comprise one of the input voltages to the phase detector. The other input voltage is taken from a tap on the horizontal output transformer. This peaked sawtooth voltage is shifted in phase and properly shaped by an RC network before being applied as the other input voltage to the phase detector.

The DC output voltage which is proportional to the phase displacement between the two input voltages, namely, the sync. pulses and the output sawtooth voltage, appears at the junction of the two 100K ohm resistors. A 4.7 megohm resistor is connected from this point to ground to provide a DC return for the horizontal sweep oscillator grid circuit. A conventional AFC filter consisting of the 470K ohm resistor in parallel with an 0.005 mfd. condenser in series with an 0.05 mfd. condenser is used. The voltage appearing across the 0.05 mfd. condenser is then the filtered control voltage which is applied to the horizontal sweep oscillator.

HORIZONTAL SWEEP OSCILLATOR

The horizontal sweep oscillator has been developed to realize the characteristics which are most desirable for this purpose. The circuit shown is a stabilized cathode coupled multivibrator, which combines the sensitivity of the multivibrator with the stability of the sine wave oscillator. The circuit is essentially a sine wave oscillator with good stability, but the resistor in series with the tuned circuit adds an impulse component which provides the desired rapid return time, and in conjunction with the other circuit constants, provides the proper control sensitivity both for the DC applied to the first grid for AFC, and with change in resistance in the second grid circuit for the manual control. Figure 4 shows the wave shape appearing at the plate of the first section of the oscillator.

Figure 4 - Wave Shape at Plate of Horizontal Oscillator.

To place the circuit in operation, the 50K ohm horizontal hold control should be set in the center of its range and the variable inductor (part #72-66) adjusted until the picture is properly synchronized.

HORIZONTAL OUTPUT AND HIGH VOLTAGE SUPPLY

The horizontal output amplifier (6BG6G) and "flyback" type power supply uses standard components and is conventional except that no electrical centering means is provided. Centering of the raster is accomplished by manipulating the mechanical adjustments of the focus coil and ion trap. The correct centering procedure is outlined in the OPERATING INSTRUCTIONS booklet.

LOW VOLTAGE POWER SUPPLY

Although the low voltage power supply is a conventional circuit delivering about 400 volts at 210 ma., the voltage distribution circuit through the receiver is unique. In this receiver, circuits which operate at lower voltages are connected in series with each other and placed across the higher voltage required for other circuits. The RF-IF cathodes return to chassis and the plates and screens are at + 140 volts. The cathode of the audio power amplifier is returned to + 140 volts. This tube then operates on the difference between + 140 and + 400 volts or + 260 volts. Resistance is added in series with the 6AQ5 audio output tube plate circuit which, together with the 20 mfd. condenser returned to the cathode, acts as a filter to keep its current variations from modulating the B supply voltage.

The 6AQ5 tube also operates as a series regulator tube to maintain the + 140 volts relatively constant. Because its grid is connected to a divider running from + 400 volts to ground, any change in the + 140 volts, due to current variations in the RF-IF circuits, changes the effective grid - cathode voltage of the 6AQ5 thereby providing a substantial amount of automatic voltage regulation.

FM TUNER

The FM tuner section of this receiver consists of a 6BA6 RF amplifier, a 6BE6 first converter and a 6BA7 second converter. The RF and first converter stages are conventional and produce an intermediate frequency of 10.7 mc. at the output of the first converter. The 10.7 mc. voltage is heterodyned with a fixed oscillator operating at 15.2 mc. in the second converter and produce at its output a second intermediate frequency at 4.5 mc. This final output voltage at 4.5 mc. is coupled into the video detector load circuit. From this point the signal is handled in the same manner as the sound component of the TV signal.

ALIGNMENT PROCEDURE

TEST EQUIPMENT

To properly service this receiver, it is necessary that the following test equipment be available:

1. RF Sweep Generator. - Frequency ranges:
   a) 20 to 27 Mc. b) 50 to 90 Mc. (at least 10 Mc. sweep width)
   c) 170 to 225 Mc. (at least 10 Mc. sweep width)
   Output must be adjustable to a maximum of 1 volt.
2. Cathode Ray Oscilloscope
   Preferably one with a wide band vertical deflection, an input calibrating source and a low capacity probe.
3. Signal Generator to provide frequencies in the following ranges:
   a) 4.4 to 4.6 Mc. b) 10.7 Mc. c) 20 to 27 Mc.
   d) 52 to 90 Mc. e) 88 to 108 Mc.
   f) 172 to 219 Mc.
4. Vacuum Tube Voltmeter and High Voltage Multiplier Probe for use with this meter to permit measurements up to 12,000 volts.

ORDER OF ALIGNMENT

When a complete receiver alignment is necessary, it should be performed in the following order:

A.) Align ratio detector as indicated in alignment table at 4.5 Mc.

B.) Set 4.5 Mc. trap with slug 11.

C.) Align all I.F. transformers following procedure and table.

D.) Set sound trap to 21.25 Mc. with slug S10.

E.) Retouch picture I.F. transformers for full band width as per alignment procedure in table.

F.) Align FM section as per alignment procedure in table.

G.) Connect receiver to an antenna and tune for a test pattern if possible.

H.) Set horizontal hold control at approximately center of rotation. Adjust slug S19 until picture is properly synchronized.

I.) Adjust other size and hold controls as outlined in OPERATING INSTRUCTIONS booklet.

J.) Adjust FM trap slug S11 for minimum FM interference in picture.

PICTURE I.F. OSCILLATION

If the receiver is badly misaligned and two or more of the I.F. coils are tuned to the same frequency, or if the sound trap is not set at 21.25 Mc., the receiver may fall into I.F. oscillation. I.F. oscillation shows up as a voltage in excess of a few tenths of a volt at the picture detector load resistor. This voltage is unaffected by RF signal input and sometimes is independent of picture control setting. If such a condition is encountered, it is sometimes possible to stop oscillation by adjusting the coils approximately by setting the adjustment screws to be nearly equal to those of another receiver known to be in proper alignment.

There is little likelihood of any oscillation occurring if the 21.25 Mc. trap (adjusted by slug S10) is at its proper frequency, and the third picture I.F. (slug S8) is set at 21.6 Mc. or lower. If oscillation persists, check for open by-pass condenser in I.F. strip.

RATIO DETECTOR ALIGNMENT

Set the signal generator for approximately 1 volt output at 4.5 Mc. and connect it to the grid of the ratio detector driver. To align the primary of the Ratio Detector, connect the vacuum tube voltmeter to pin No. 2 of the 6AL5 and tune S13 for maximum negative voltage. To balance the secondary of the ratio detector, connect the vacuum tube voltmeter from the phono input jack to ground. Adjust S14. It will be found that it is possible to produce a positive or negative voltage depending on this adjustment. Obviously, to pass from a positive to a negative voltage, the voltage must go through zero. S14 should be adjusted for zero output.

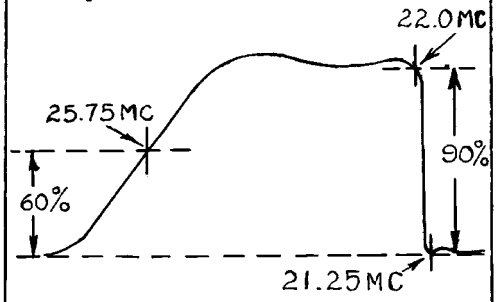
SOUND I.F. ALIGNMENT

Connect the signal generator to terminal #4 of the video detector assembly and maintain it at 4.5 Mc. Connect the vacuum tube voltmeter to pin No. 2 of the 6AL5 and adjust slug S12 for maximum DC reading. Reduce output of signal generator to a very low level and readjust S12.

ALIGNMENT CHART

FUNCTION	NOTES	CONNECT R.F. SIGNAL GENERATOR TO:	CONNECT OUTPUT INDICATOR (V.T.V.M.) TO:	SET R.F. SIGNAL GENERATOR TO: (MC.)	ADJUST	OUTPUT INDICATION
1) Video I.F. Spot Frequancy Alignment	Switch To TV Channels 2-6 Contrast Control To Maximum Remove 12AT7 Oscillator Tube	Low Band Mixer Grid (Pin #7)	Terminal #4 of Video Detector Coil Assembly	23.5	S5	Maximum on V.T.V.M.
				25.6	S6	" " "
				22.0	S7	" " "
				21.6	S8	" " "
				24.8	S9	" " "
				21.25	S10	Minimum on V.T.V.M.
2) FM & TV SOUND I.F. and Ratio Detector Alignment	Switch to FM (Close Gang) - - - - Contrast Control to Maximum - - - -	Terminal #4 Of Video Detector Coil Assembly	Pin #2 of 6AL5 Ratio Detector	4.5 Mc. (Use Weak Signal)	S13 and S12	Maximum on V.T.V.M.
		Pin #7 of 6BA7 FM 2nd Converter	Same	4.5 Mc. (Use Weak Signal)	S18	Maximum on V.T.V.M.
		Same	Phono Input Jack	4.5 Mc. (Use Weak Signal)	S14	Accurately for Zero Balance
		Same	Same	10.7 Mc. (Use Weak Signal)	S17	Readjust for Accurate Zero Balance
		Pin #1 of 6BE6 FM 1st Converter	Pin #2 of 6AL5 Ratio Detector	10.7 Mc. (Use Weak Signal)	S16 and S15	Maximum on V.T.V.M.
		Repeak Slugs S13, S12, S18, S16 and S15 For Maximum Output Indication				
3) FM RF ALIGNMENT	Switch to FM - - - - Contrast Control to Maximum - - - - Before Aligning Check Zero Set of FM Dial Pointer - - - -	Antenna Terminals Through 2 250 ohm Resistors (Dummy)	Pin #2 of 6AL5 Ratio Detector	90 MC.	Oscillator Disc (P1) and R.F. Padder (P2)	Maximum on V.T.V.M.
				Set Generator to 106 MC. and Locate Signal on FM Dial. Note amount of error.	Set Tuner Pointer to the Other Side of 106 MC. by 1/2 the Error Found. Then Adjust T8.	Maximum on V.T.V.M.
				106 MC.	Oscillator Disc (P1) and Antenna Trimmer (T7)	Maximum on V.T.V.M.
				Recheck Calibration at 90 MC. If Necessary, Repeat.		

ALIGNMENT CHART (continued)

FUNCTION	CONNECT SWEEP GENERATOR TO:	CONNECT R.F. SIGNAL GENERATOR TO:	SET R.F. SIGNAL GENERATOR TO:	CONNECT SCOPE TO:	ADJUSTMENTS
4) VIDEO I.F. SWEEP ALIGNMENT	Loosely coupled to 12AT7 mixer tube by means of a metal sleeve 1" wide. A miniature tube shield may be used. NOTE: Switch to TV Channels 2-6	Loosely coupled to Sweep Generator Output Cable.	Signal Generator is used as marker. Set from 20-27 Mc. as needed for markers.	Terminal #4 of Video Detector Coil Assembly. (Scope is synchronized to Sweep Generator.)	Adjust S5, S6, S7, S8 and S9 (as needed) to give following response curve:  NOTE: Keep input signal at low level to avoid overloading. Keep contrast control at maximum.

TV-120 SERIES VOLTAGE CHART

Measurements made with receiver operating on 110 volts AC at 60 cycles with no signal input.

Volume control, brightness control and contrast control set at minimum, except where noted.

Band Switch set to TV Ch. 2-6 except where noted.

All voltages are measured with a Vacuum Tube Voltmeter, except where otherwise specified.

Voltages are read between indicated pin and chassis, except where otherwise noted.

NOTE: GRID VOLTAGES ARE MEASURED BETWEEN GRID AND CATHODE.

TUBE TYPE	FUNCTION	PLATE		SCREEN		CATHODE		*GRID		NOTES on MEASUREMENTS
		PIN	VOLTS	PIN	VOLTS	PIN	VOLTS	PIN	VOLTS	
12AT7 (a)	Low Band RF	6	135	-	-	8	0	7	-2.4	Band Switch
12AT7 (b)	Low Band Mixer	6	135	-	-	8	0	7	-1.2	Set on
12AT7 (c)	Low Band Osc.	6	120	-	-	8	0	7	-1.0	TV Ch. 2 - 6
12AT7 (a)	High Band RF	1	135	-	-	3	0	2	-2.7	Band Switch
12AT7 (b)	High Band Mixer	1	135	-	-	3	2.7	2	-2.7	Set on
12AT7 (c)	High Band Osc.	1	120	-	-	3	0	2	-2.0	TV Ch. 7-13
6AU6	1st I.F.	5	135	6	135	7	0.1	1	-2.8	Band Switch to Ch. 2-6.
6AU6	2nd I.F.	5	135	6	135	7	0.1	1	-2.8	
6AU6	3rd I.F.	5	135	6	135	7	0.1	1	-2.8	
6AH6	4th I.F.	5	280	6	135	7	1.3	1	-1.3	
6AU6	Ratio Det. Driver	5	105	6	105	7	0.6	1	-0.6	
6AL5	Ratio Detector	7	1.6	-	-	1	10.0	-	-	These voltages will vary with different signal or noise conditions.
		2	-10.0			5	1.6			
6AT6	1st Audio Amplifier	7	75	-	-	2	0	1	-0.6	
6AQ5	Audio Power Amplifier	5	365	6	375	2	135	7	-14.0	Control Grid to Ground = 121 V. (Varies with signal)

TV-120 SERIES VOLTAGE CHART
(continued)

TUBE TYPE	FUNCTION	PLATE PIN	PLATE VOLTS	SCREEN PIN	SCREEN VOLTS	CATHODE PIN	CATHODE VOLTS	*GRID PIN	*GRID VOLTS	NOTES on MEASUREMENTS
1/2 12AU7	1st Video Amplifier	1	295	-	-	3	12.0	2	-12.0	
1/2 12AU7	2nd Video Amplifier	6	115	-	-	8	1.5	7	-1.5	Contrast Minimum
		6	115	-	-	8	1.4	7	**-2.0	Contrast Maximum **Noise
1/2 6AL5	DC Rest	7	-0.4	-	-	1	10.0	-	-	
1/2 6AL5	A.G.C.	2	-0.5	-	-	5	0	-	-	Contrast Minimum
		2	-0.8	-	-	5	0	-	-	Contrast Maximum
1/2 12AU7	Sync.Amp.	1	23.0	-	-	3	0	2	-0.4	
1/2 12AU7	Sync. Clipper	6	57.0	-	-	8	0	7	-15.0	
1/2 12AU7	Vertical Sync.Amp.	1	90.0	-	-	3	56.0	2	-0.7	
1/2 12AU7	Phase Inverter	6	85.0	-	-	8	56.0	7	-1.7	
6AL5	Horizontal Phase Det.	2	-19.0	-	-	5	0	-	-	
		7	0			1	26.0			
1/2 6SN7GT	Vertical Sweep Osc.	5	100	-	-	6	0	4	-38.0	All vertical controls set at normal picture setting.
1/2 6SN7GT	Vertical Output	2	375	-	-	3	14.0	1	-14.0	
1/2 6SN7GT	Horizontal Oscillator	2	335	-	-	3	16.0	1	-11.0	All horizontal controls set at normal picture setting.
1/2 6SN7GT	Horizontal Oscillator	5	240	-	-	6	16.0	4	-32.0	
6BG6G	Horizontal Output	cap	460	8	260	3	8.4	5	-18.0	
1B3GT	H.V.Rectifier	-	-	-	-	2	10K.V.	-	-	
6W4GT	Damper	5	370	-	-	3	460	-	-	
12LP4	Cathode Ray Tube	Cap	10K.V.	10	390	11	110	2	-105	Brightness Minimum.
		Cap	9.5K.V.	10	390	11	40	2	-35	Brightness Maximum.

TV-120 SERIES VOLTAGE CHART
(continued)

TUBE TYPE	FUNCTION	PLATE PIN	PLATE VOLTS	SCREEN PIN	SCREEN VOLTS	CATHODE PIN	CATHODE VOLTS	*GRID PIN	*GRID VOLTS	NOTES on MEASUREMENTS
6BA6	FM - RF Amplifier	5	135	6	92	7	1.0	1	-1.0	BAND SWITCH To FM - PHONO POSITION (Gang Closed)
6BE6	FM 1st Converter	5	140	6	95	2	0	1	-2.5	
								7	0	
6BA7	FM 2nd Converter	9	140	1	95	3	0	2	-4.5	
								7	-0.4	
5U4G	Rectifier	4	380 AC	-	-	2	405	-	-	Band Switch to FM-Phono Position
		6	380 AC							
		4	375 AC	-	-	2	395	-	-	Band Switch to TV Ch. 2-6 Position
		6	375 AC							

*GRID VOLTAGES ARE MEASURED BETWEEN GRID AND CATHODE.
NOTE: High voltage measurements taken with an electrostatic type Voltmeter.

SERVICE SUGGESTIONS

NOTE 1:

PLACEMENT OF FOCUS MAGNET

12LP4 cathode ray tubes will vary in length by as much as 3/4 of an inch. In the event of tube replacement, the possibility would be that, due to the different length of the new tube, the focus magnet would no longer be placed properly with respect to the deflection yoke. Readjust placement as follows:-

1. Loosen yoke mounting wing screws.
2. Loosen 4 screws holding yoke mounting assembly to wood base.
3. Move yoke forward so that rubber cushion fits snugly against tube.
4. Check distance between rear face of deflection yoke and brass plate of focus magnet.
5. Move mounting assembly forward until above distance is less than 1/8 inch.
6. Tighten all screws.

NOTE 2:

All of the ≠ 140 voltages depend upon proper operation of the 6AQ5 audio power amplifier which acts as a voltage regulator (see text). In the event of discrepancy or failure of the ≠ 140 volts, check 6AQ5 and associated circuit components.

NO RASTER ON C.R.T.

1. Incorrect setting of ion trap - reversed.
2. Check 6BG6G or 1B3GT and associated circuit components - 1/4 Amp. fuse.
3. Check 6SN7GT horizontal oscillator and associated circuit components.
4. Defective C.R.T.
5. Defective power supply - no B ≠ voltage.

NO VERTICAL DEFLECTION

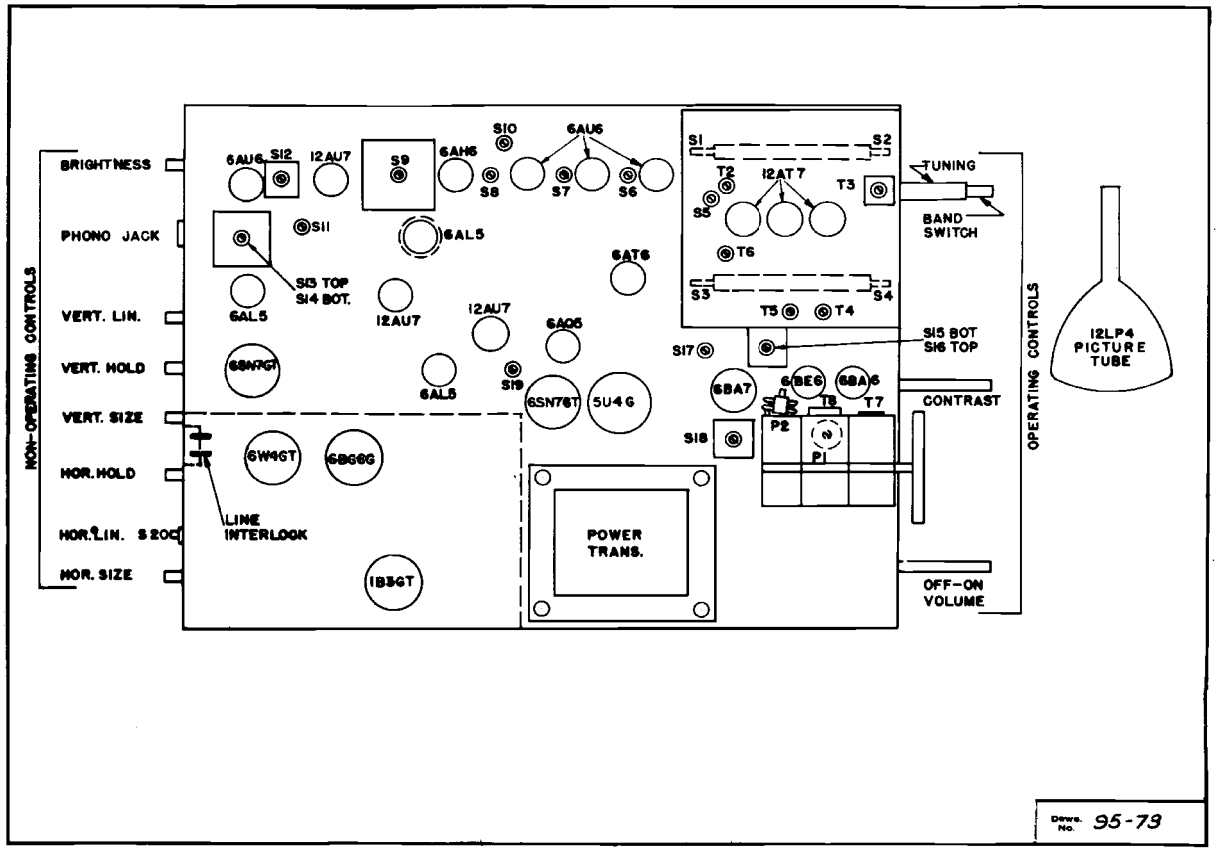
1. Check 6SN7GT vertical oscillator and output and associated circuit components.
2. Vertical deflection coils open.
3. Vertical output transformer open.

POOR VERTICAL LINEARITY

1. If adjustments do not correct, change 6SN7GT vertical oscillator tube.
2. Low B ≠ voltage.
3. Vertical output transformer defective.
4. Leaky 10 mfd. filter in vertical B ≠ feed.

POOR HORIZONTAL LINEARITY

1. If adjustments do not correct, change 6SN7GT, 6BG6G or 6W4GT in horizontal sweep circuit.
2. Horizontal output transformer defective.
3. Horizontal linearity control or its by-pass condensers defective.



RASTER AND SIGNAL ON C.R.T. BUT NO SOUND

1. Check 6AU6 (ratio detector driver), 6AL5 ratio detector and audio amplifier circuit.
2. Defective speaker.

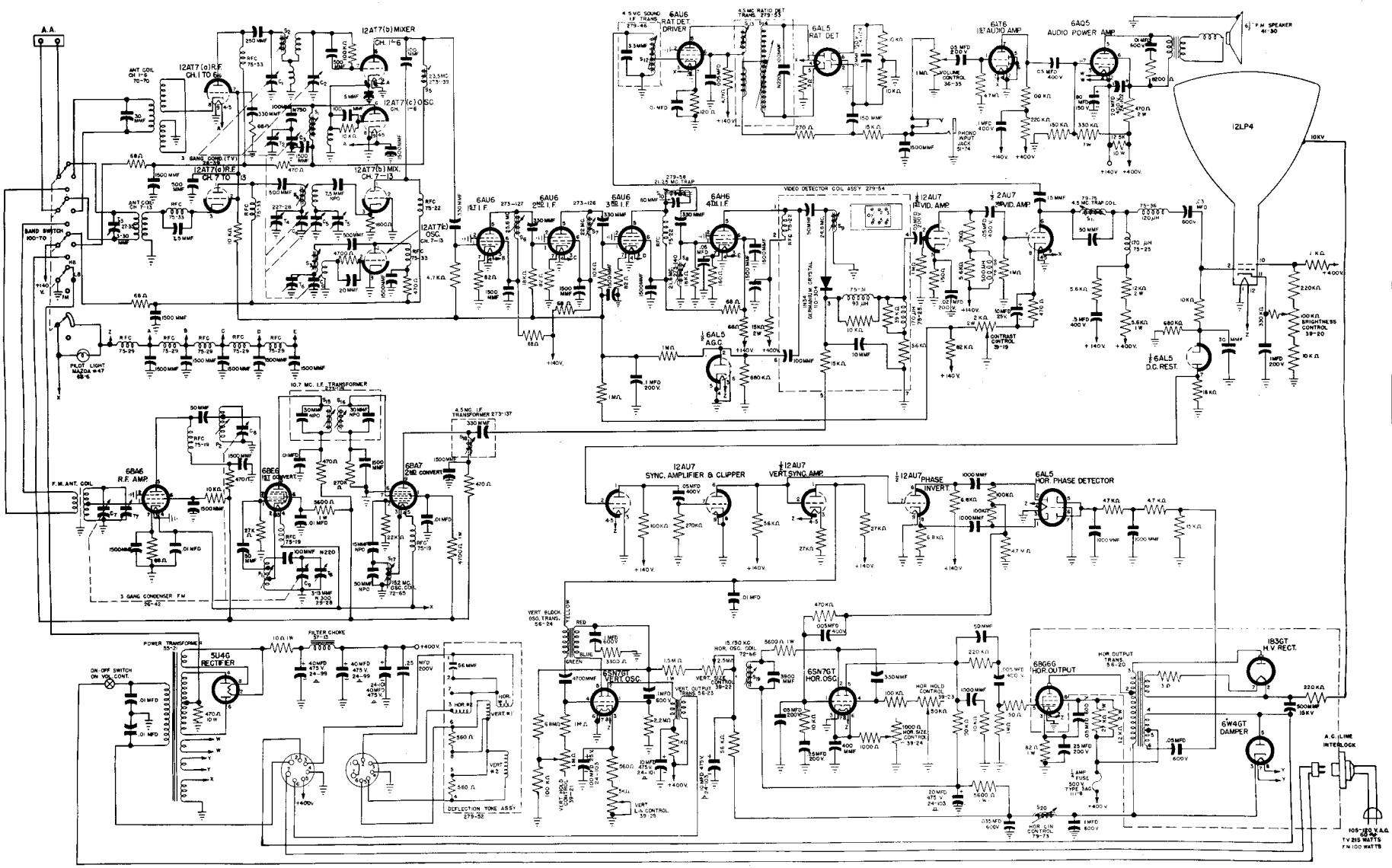
SIGNAL AT C.R.T. GRID BUT NO SYNC.

1. Check 12AU7 Sync. Amplifier and Clipper and associated circuit components.
2. Check 6AL5 D.C. Restorer.

NO VERTICAL SYNC.

1. Check 1/2 12AU7 Vertical Sync. Amplifier and associated circuit components.

TV-120 Series, MODEL TV-121



ALL RESISTANCE RATED AT .5 WATTS UNLESS OTHERWISE STATED.

K Ω EQUALS 1000 Ω.

MΩ EQUALS MEGOHMS.

DRWG. NO. 90-69

NO HORIZONTAL SYNC.

1. S19 misadjusted - readjust as instructed in text.
2. 1/2 12AU7 Phase Inverter or 6AL5 phase detector inoperative. Check circuit components.
3. Horizontal output transformer defective.

PICTURE STABLE BUT POOR RESOLUTION

1. Check video detector coil assembly (defective 1N34).
2. Check 12AU7 video amplifier tubes.
3. Check peaking coils in video amplifier.
4. Check setting of focus magnet.
5. RF-IF circuits misaligned.

PICTURE SMEAR

1. Video amplifier overloaded by excessive input. Reduce contrast control setting.
2. Check for incorrect bias on video amplifiers.
3. Check coupling condensers and grid resistors.

TRAPEZOIDAL OR NON-SYMMETRICAL RASTER

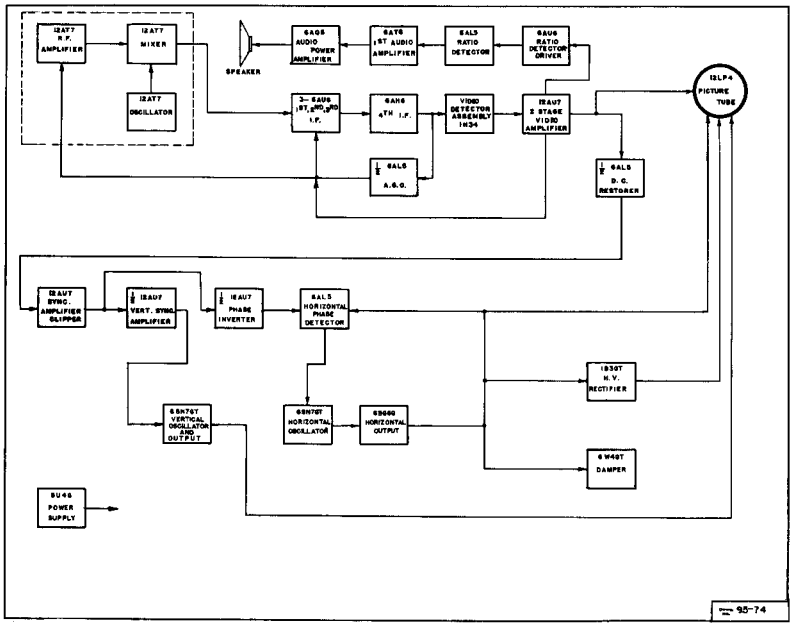
1. Improper setting of focus magnet or ion trap magnet.
2. Defective yoke.

PICTURE JITTER

1. Contrast control operated at excessive level.
2. Vertical instability may be due to loose connections or noisy tubes, etc.

RASTER BUT NO SOUND, PICTURE OR SYNC.

1. Defective antenna or transmission line.
2. R.F. oscillator off frequency.
3. R.F. unit completely inoperative. Check tubes and voltages.
4. I.F. section inoperative. Check tubes and voltages.
5. Video amplifier inoperative. Check tubes and voltages.



SOUND DISTORTED

1. Check alignment and balance of Ratio Detector Transformer.
2. Check operating bias on 6AQ5 tube (10 to 17 volts).
3. Defective speaker
4. Weak 6AQ5 tube.

TELEVISION OPERATES PROPERLY BUT NO F.M.

1. Check 6BA6, 6BE6, 6BA7 tubes and associated circuit components.
2. Defective video detector coil assembly (open 15K ohm)
3. Check alignment of FM - R.F., I.F., and oscillator circuits.