ELECTRICAL SPECIFICATIONS

POWER SUPPLY RATING
105 - 120 volts, 60 cycles, 215 watts

AUDIO POWER OUTPUT RATING
3.5 watts

LOUDSPEAKER
Type - 61/2-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 (54-68 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 RL55 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, band-switch, 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 change-over 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 band-switch 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 T4. The convertor
plate circuit, common to the low and high band, consists of an RF choke
in parallel with the convertor 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 - 33.5 Mc (iron slug S5)
2. First picture I.F. coil - 25.0 Mc (iron slug S6)
3. Second picture I.F. coil - 24. 0 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 frequen-
cy 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 S0 to a frequency
26-21.25 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 L50 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 (279-45) in the plate of the second video amplifier is separated
from the video signal. The sound carrier is then amplified by the 6AJ6 ra-
tio detector driver and demodulated by the 6AS7 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 connec-
tion 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 kc., 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 re-
sistor. The negative A.G.C. voltage being developed by the 6AS7 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, diffi-
culty 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 ne-
cessitate 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 6SN7 performs this function and in conjunction with an integrating network is its plate circuit (27K ohm resistor and 0.02 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 10K 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 10K ohm resistor in parallel with a 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 AFC 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 (6BQ6G) 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 600 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 -110 volts. The cathode of the audio power amplifier is returned to -140 volts. This tube then operates on the difference between -110 and -400 volts or -260 volts. Resistance is aided 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 -110 volts relatively constant. Because its grid is connected to a divider running from -400 volts to ground, any change in the -110 volts, due to current variations in the RF-IF circuits, charges 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 S11.
C.) Align all I.F. transformers following procedure and table.
E.) Retouch picture I.F. transformers for full band with 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 phone 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

**TV-12G Series, MODEL TV-121**

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>NOTES</th>
<th>CONNECT R.F. SIGNAL GENERATOR TO</th>
<th>CONNECT OUTPUT INDICATOR (V.T.V.M.)</th>
<th>SET R.F. SIGNAL GENERATOR TO (M.C.)</th>
<th>ADJUST</th>
<th>OUTPUT INDICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Video I.F.’s Spor. Frequency Alignment</td>
<td>Switch To TV Channels 2-6 Contral Control To Maximum Remove 12AT7 Oscillator Tube</td>
<td>Low Band Mixer Grid (Pin #7)</td>
<td>Terminal #4 of Mixer Video Detector Coil Assembly</td>
<td>25.5 Terminal</td>
<td>30 Maximum on V.T.V.M.</td>
<td>4.5 M.</td>
</tr>
<tr>
<td>2) FM &amp; TV SOUND I.F. and Contrast Control Detector Alignment</td>
<td>Switch to FM (Close Gang) Pin #7 of 68A7 FM 2nd Converter Same Pin #1 of 68B6 FM 1st Converter Same</td>
<td>Terminal #4 of Video Detector Coil Assembly Same Pin #2 of 6815 Ratio Detector Same</td>
<td>Pin #2 of 6815 Ratio Same</td>
<td>10.7 M. (Use Weak Signal)</td>
<td>316 Maximum on V.T.V.M.</td>
<td>10.7 M. (Use Weak Signal)</td>
</tr>
<tr>
<td>3) FM RF</td>
<td>Switch to FM RF</td>
<td>Antenna Terminals Through 2</td>
<td>Pin #2 of 6815 Ratio Detector</td>
<td>90 M.</td>
<td>Oscillator Disc (PI) and R.F. Padder (P2)</td>
<td>Maximum on V.T.V.M.</td>
</tr>
</tbody>
</table>

Repeal Slugs S13, S12, S11, S10, S16 and S18

For Maximum Output Indication

Recheck Calibration at 90 M.C. If Necessary, Repeat.
**ALIGNMENT CHART**

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>CONNECT SWEEP GENERATOR TO:</th>
<th>CONNECT R.F. SIGNAL GENERATOR TO:</th>
<th>SET R.F. SIGNAL GENERATOR TO:</th>
<th>CONNECT SCOPE TO:</th>
<th>ADJUSTMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIDEO I.F.</td>
<td>Loosely coupled to 12AT7 mixer tube by means of a metal sleeve 1&quot; wide. A miniature tube shield may be used.</td>
<td>Loosely coupled to Sweep Generator Output Cable.</td>
<td>Signal Generator is used as marker. Set from 20-27 MC as needed for markers.</td>
<td>Terminal #4 of Video Detector Coil Assembly. (Scope is synchronised to Sweep Generator.)</td>
<td>Adjust B5, B6, B7, B8 and B9 (as needed) to give following response curve:</td>
</tr>
</tbody>
</table>

**22.0 MC**

**25.75 MC**

**21.25 MC**

**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.

<table>
<thead>
<tr>
<th>TUBE</th>
<th>FUNCTION</th>
<th>PLATE</th>
<th>SCREEN</th>
<th>CATHODE</th>
<th>GRID</th>
<th>NOTES ON MEASUREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12AT7 (a)</td>
<td>Low Band RF</td>
<td>6</td>
<td>135</td>
<td>-</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>12AT7 (b)</td>
<td>Low Band Mixer</td>
<td>6</td>
<td>135</td>
<td>-</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>12AT7 (c)</td>
<td>Low Band Osc.</td>
<td>6</td>
<td>120</td>
<td>-</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>12AT7 (a)</td>
<td>High Band RF</td>
<td>1</td>
<td>135</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>12AT7 (b)</td>
<td>High Band Mixer</td>
<td>1</td>
<td>135</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>12AT7 (c)</td>
<td>High Band Osc.</td>
<td>1</td>
<td>120</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>6AU6</td>
<td>1st I.F.</td>
<td>5</td>
<td>135</td>
<td>6</td>
<td>135</td>
<td>7</td>
</tr>
<tr>
<td>6AU6</td>
<td>2nd I.F.</td>
<td>5</td>
<td>135</td>
<td>6</td>
<td>135</td>
<td>7</td>
</tr>
<tr>
<td>6AU6</td>
<td>3rd I.F.</td>
<td>5</td>
<td>135</td>
<td>6</td>
<td>135</td>
<td>7</td>
</tr>
<tr>
<td>6AU6</td>
<td>4th I.F.</td>
<td>5</td>
<td>280</td>
<td>6</td>
<td>135</td>
<td>7</td>
</tr>
<tr>
<td>6AU6</td>
<td>Ratio Det. Driver</td>
<td>5</td>
<td>105</td>
<td>6</td>
<td>105</td>
<td>7</td>
</tr>
<tr>
<td>6A15</td>
<td>Ratio Detector</td>
<td>7</td>
<td>1.6</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>6A76</td>
<td>1st Audio Amplifier</td>
<td>7</td>
<td>75</td>
<td>-</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>6AQ5</td>
<td>Audio Power Amplifier</td>
<td>5</td>
<td>365</td>
<td>6</td>
<td>375</td>
<td>2</td>
</tr>
</tbody>
</table>

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### TV-120 Series Voltage Chart (continued)

<table>
<thead>
<tr>
<th>Tube Type</th>
<th>Function</th>
<th>Plate</th>
<th>Screen</th>
<th>Cathode</th>
<th>*Grid</th>
<th>Notes on Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 12AV7</td>
<td>1st Video Amplifier</td>
<td>1</td>
<td>295</td>
<td>-</td>
<td>3</td>
<td>12.0 2 -12.0</td>
</tr>
<tr>
<td>1/2 12AV7</td>
<td>2nd Video Amplifier</td>
<td>6</td>
<td>115</td>
<td>-</td>
<td>8</td>
<td>1.5 7 -1.5</td>
</tr>
<tr>
<td>1/2 6A15</td>
<td>DC Rest</td>
<td>7</td>
<td>-0.4</td>
<td>-</td>
<td>1</td>
<td>10.0 -</td>
</tr>
<tr>
<td>1/2 6A15</td>
<td>A.G.C.</td>
<td>2</td>
<td>-0.5</td>
<td>-</td>
<td>5</td>
<td>0 -</td>
</tr>
<tr>
<td>1/2 12AV7</td>
<td>Sync. Amp.</td>
<td>1</td>
<td>23.0</td>
<td>-</td>
<td>3</td>
<td>0 2 -0.4</td>
</tr>
<tr>
<td>1/2 12AV7</td>
<td>Sync. Clipper</td>
<td>6</td>
<td>57.0</td>
<td>-</td>
<td>8</td>
<td>0 7 -15.0</td>
</tr>
<tr>
<td>1/2 12AV7</td>
<td>Vertical Sync. Amp.</td>
<td>1</td>
<td>90.0</td>
<td>-</td>
<td>3</td>
<td>56.0 2 -0.7</td>
</tr>
<tr>
<td>1/2 12AV7</td>
<td>Phase Inverter</td>
<td>6</td>
<td>85.0</td>
<td>-</td>
<td>8</td>
<td>56.0 7 -1.7</td>
</tr>
<tr>
<td>6A15</td>
<td>Horizontal Phase Det.</td>
<td>2</td>
<td>-15.0</td>
<td>-</td>
<td>5</td>
<td>0 -</td>
</tr>
<tr>
<td>1/2 6SN7T</td>
<td>Vertical Sweep Dec.</td>
<td>5</td>
<td>100</td>
<td>-</td>
<td>6</td>
<td>0 4 -18.0</td>
</tr>
<tr>
<td>1/2 6SN7T</td>
<td>Vertical Output</td>
<td>2</td>
<td>375</td>
<td>-</td>
<td>3</td>
<td>14.0 1 -14.0</td>
</tr>
<tr>
<td>1/2 6SN7T</td>
<td>Horizontal Oscillator</td>
<td>2</td>
<td>335</td>
<td>-</td>
<td>3</td>
<td>16.0 1 -11.0</td>
</tr>
<tr>
<td>1/2 6SN7T</td>
<td>Horizontal Oscillator</td>
<td>5</td>
<td>240</td>
<td>-</td>
<td>6</td>
<td>16.0 4 -12.0</td>
</tr>
<tr>
<td>6SN6G</td>
<td>Horizontal Output</td>
<td>cap</td>
<td>160</td>
<td>8</td>
<td>260</td>
<td>3 8.4 5 -18.0</td>
</tr>
<tr>
<td>1B30T</td>
<td>R.T. Rectifier</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2 10K.V. -</td>
</tr>
<tr>
<td>6SN7T</td>
<td>Dec. Amplifier</td>
<td>5</td>
<td>370</td>
<td>-</td>
<td>-</td>
<td>3 160 -</td>
</tr>
<tr>
<td>12L24</td>
<td>Cathode Ray Tube</td>
<td>Cap</td>
<td>10 K.V.</td>
<td>10</td>
<td>390</td>
<td>11 110 2 -105</td>
</tr>
</tbody>
</table>

*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**

11L24 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 1/4 inch.
6. Tighten all screws.
NOTE 24
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 hi trap - reversed.
2. Check 6H6G or 1B30T 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 μfd. filter in vertical 3 f feed.

POOR HORIZONTAL LINEARITY
1. If adjustments do not correct, change 6SN7GT, 6G6G or 6H6G 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 6A86 (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.