SOUND I.F. AND LIMITER-DISCRIMINATOR SECTIONS

The sound I.F. and Limiter-Discriminator sections of this unit utilize a true F.M. circuit.

Two 6BA6 tubes are employed as I.F. Amplifiers, a 6A6U is utilized as a noise limiter which in turn feeds a 5A5 Dual-Diode as the discriminator or F.M. Detector. From the top of the discriminator DIODE lead you will find a 27K resistor feeding a .022uf capacitor and from there to a shielded lead carrying the Audio signal to the top of the volume control. This combination of the 27K resistor and the capacity in the shielded lead form a high frequency (audio) de-emphasis circuit, which helps restore the normal proportion of high to low in the audio frequency spectrum, which was greatly over or under emphasized at the transmitter. This De-emphasis circuit is a form of tone control.

The sound I.F. signal is picked off the tap lug “B” on the secondary of the converter transformer and fed to the grid of the first 6BA6 amplifier, which amplifies the F.M. Sound I.F. Signal and feeds it to the first sound I.F. transformer and from there into the grid of the second 6BA6 amplifier. Notice the 470K resistor and .01uf Capacitor from the bottom of the first sound I.F. Secondary to ground. This combination forms an overload control circuit. If the signal is very strong at the second 6BA6 and the grid draws current this combination provides an automatic bias which also helps to level off the signal at the weakest point of the signal strength. After the signal is amplified by the second 6BA6, it is fed into the second sound I.F. transformer and then into the grid of the 6A6U sound I.F. Limiter. This 6A6U is a sharp cut-off Pentode operating with very low plate and screen voltages and has no Cathode Bias. The only bias is the bias developed across the 22K resistor and 51MMF Condenser combination which is in the lower end of the 2nd Sound I.F. Transformer secondary to ground.

The strong signal on the grid causes it to draw current on the positive half of the signal cycle and charge the 51MMF Condenser providing a bias on the tube. The rate of discharge is governed by the 22K resistor. The time constant of the grid circuit is chosen to effectively limit ignition and other noise pulses by driving the tube grid to cutoff on strong negative variations in amplitude. The 6A6U reaches plate saturation also on a strong signal and with constant signal into the discriminator primary and prevents any noise pulses from being passed, or any amplitude variations in signal strength from affecting the detector circuit. Thus, looking into the Discriminator circuit, it sees a signal whose Frequency is Continuously Varying but whose strength or Amplitude (Voltage) is kept relatively constant throughout.

The discriminator circuit is a standard type of circuit and responds to variations in F.M. Frequency by converting them into Variations of Voltage across the discriminator DIODE load resistors. These voltage variations correspond to the original sound or AUDIO which was used to modulate the sound carrier at the transmitter. The AUDIO voltage appearing at the Discriminator load is sent through the De-emphasis circuit, and from there to the volume control and into the 1st Audio Amplifier.

For further detailed description of F.M. circuits we ask you to refer to any recent standard textbooks on the subject.

When working on the I.F. Strip keep a Schematic in front of your at all times and use the information provided here in this treatise as a guide.
VIDEO AMPLIFIERS AND D.C. RESTORER

The function of the video amplifier section of the I.F. strip is to amplify the composite video and sync pulse output of the second detector. The D.C. operating potentials on the grids and plates of these two tubes, 6A16 and 6K6, are set as values which make these amplifiers, also act as noise limiters or clippers. The gain from the first video amplifier grid to the output plate is 30X and the frequency response extends to approximately 4.25 Mc.

NOISE SATURATION CIRCUIT (Clippers)

Since the synchronizing pulse is "Blacker than Black" and "Black" information must drive the cathode ray tube grid toward cut-off, this means that the video signal polarity must be such that the sync is negative when applied to the C.B.T. grid. It is obvious that for the two-stage video amplifier as is used, the sync pulse from the second detector must be negative at the first video amplifier grid. The first stage is designed so that with a normal signal input level to its grid, the tube will be working over most of its operating range. Any large noise signals will drive the grid to cut-off and the noise will be limited. In effect, the signal to noise ratio is thus improved.

The second video amplifier stage (6K6) starts clipping before the signal noise at the grid of the first video stage (6A16) is large enough to make the first stage also go into saturation or clipping point. In effect, we have a dual or cascaded limiter, as well as having two stages of video amplification, thus stabilizing our sync pulses, so that noise signals do not readily tend to throw our sweep oscillators out of synchronization.

D.C. RESTORER AND SYNC TAKE-OFF CIRCUIT

Since the video amplifier is an A.C. amplifier, the D.C. component of the video signal that represents the average illumination of the original scene will not be passed. Unless this D.C. 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 D.C. restorer accomplishes this setting automatically thus assuring proper picture illumination at all times. For a detailed explanation of the operation of the D.C. restorer, see any recent standard text book or publication on television.

**Diagram**

- **Voltage Analysis Chart A**
- **Video Strip Data**
- **Notes:**
  - All readings taken with respect to chassis unless otherwise noted on charts.
  - V = Voltage, too small to be measured accurately due to instrument loading of circuit, etc.,
  - Tolerance on voltage measurements ± 5%.
  - Refer to voltage chart "A" for test conditions, settings of controls in set.

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RESISTANCE ANALYSIS CHART "A"

(1) Set not connected to power lines (line plug out of socket).
(2) Volume control turned to full clockwise rotation position.
(3) Contrast control turned to full clockwise rotation position.
(4) Brightness control turned to full clockwise rotation position.
(i) All readings taken with respect to chassis ground unless otherwise noted on charts.
(ii) All readings taken with Precision Model #858 20,000 ohms per Volt Meter or equivalent instrument.
(*) NOTATION: $\infty$ = Infinity, too high in resistance to be measured accurately or open circuit reading.
(4) NOTE:—Tolerance on resistance measurements is ± 10%.

<table>
<thead>
<tr>
<th>TUBE SOCKET</th>
<th>LUG #1</th>
<th>LUG #2</th>
<th>LUG #3</th>
<th>LUG #4</th>
<th>LUG #5</th>
<th>LUG #6</th>
<th>LUG #7</th>
<th>LUG #8</th>
</tr>
</thead>
<tbody>
<tr>
<td>6BA6 1st Sound I.F. Amp.</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>21K</td>
<td>21K</td>
<td>100Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6BA6 2nd Sound I.F. Amp.</td>
<td>170K</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>21K</td>
<td>23K</td>
<td>100Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6AL6 Sound I.F. Limiter</td>
<td>12K</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>10K</td>
<td>10K</td>
<td>&quot;0&quot; Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6AL5 Sound I.F. Discriminator</td>
<td>300K</td>
<td>100K</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>100Ω</td>
<td></td>
<td></td>
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<tr>
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<td>10K</td>
<td>20K</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>11K</td>
<td>50Ω</td>
<td></td>
<td></td>
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<td>20K</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>12K</td>
<td>50Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6J6 3rd Video I.F. Amp.</td>
<td>20K</td>
<td>20K</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>13K</td>
<td>50Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6J6 4th Video I.F. Amp.</td>
<td>20K</td>
<td>20K</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>13K</td>
<td>50Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6J6 5th Video I.F. Amp.</td>
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<td>20K</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>3.9K</td>
<td>50Ω</td>
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<td></td>
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<tr>
<td>6J6 1/2 Video Detector</td>
<td>20K</td>
<td>33K</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>3.3K</td>
<td>50Ω</td>
<td></td>
<td></td>
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<tr>
<td>6J6 1/2 Video Detector</td>
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<td>20K</td>
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<td>&quot;0&quot; Ω</td>
<td>30Ω</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6K6 2nd Video Amp. &amp; Clipper</td>
<td>21K</td>
<td>20K</td>
<td>55K</td>
<td>55K</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>300Ω</td>
<td></td>
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<tr>
<td>6AL5 1/2 D.C. Restorer</td>
<td>50K</td>
<td>50K</td>
<td>&quot;0&quot; Ω</td>
<td>1.3Meg.</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
<td>&quot;0&quot; Ω</td>
</tr>
</tbody>
</table>

RESISTANCE ANALYSIS CHART "B"

NOTES:
1. $\infty$ = Infinity, open circuit or resistance too high for accurate measurements.
2. 0Ω = Lower than 1Ω in resistance and meter cannot be accurately read.
3. You should get readings of 10Ω or each decoupling resistor between dummy.
4. Refer to resistance chart A notes for test conditions & settings of controls in the set.
5. All readings taken with respect to ground on chassis, except where noted on chart, is a coil reading taken between two lug points.

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**BILL OF MATERIAL**

**MODELS Standard, Champion**

**VOLTAGE ANALYSIS CHART "A"**

1. Set connected to 117 Volts 60 cycle power line.
2. Deflection yoke and focus coil assembly plugged into rear of set. Leave C.R.T. 5 prong plug disconnected from set, and make sure high voltage lead is not anywhere near your body or instruments so as not to get a shock. (Leave speaker plugged in during test operations as a monitor.)
3. To check voltages, turn controls #10 thru #18 to maximum clockwise position.
4. Remove converter (mixer) tube from front end so that you prevent any signal from coming into I.F. Strip when measurements are taken.
5. All D.C. voltages are measured with a meter sensitivity of 20,000 ohm per volt, and all A.C. voltages are measured with a meter sensitivity of 1000 ohm per volt.
6. All readings taken with respect to chassis ground unless otherwise noted on charts.
7. * = Voltage too small to be measured accurately due to instrument loading of circuits, etc.
8. Tolerance on voltage measurements is ± 20%.

<table>
<thead>
<tr>
<th>TUBE SOCKET</th>
<th>LUG #1</th>
<th>LUG #2</th>
<th>LUG #3</th>
<th>LUG #4</th>
<th>LUG #5</th>
<th>LUG #6</th>
<th>LUG #7</th>
<th>LUG #8</th>
</tr>
</thead>
<tbody>
<tr>
<td>6BA6 1st Sound I.F. Amp.</td>
<td>0 Volts</td>
<td>0 Volts</td>
<td>0 Volts</td>
<td>6.4 Volts</td>
<td>120 Volts</td>
<td>120 Volts</td>
<td>1.8 Volts</td>
<td></td>
</tr>
<tr>
<td>6BA6 2nd Sound I.F. Amp.</td>
<td>*</td>
<td>0 Volts</td>
<td>6.4 Volts</td>
<td>0 Volts</td>
<td>125 Volts</td>
<td>121 Volts</td>
<td>1.8 Volts</td>
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<tr>
<td>6A6 Sound I.F. Limiter</td>
<td>−.5 Volts</td>
<td>0 Volts</td>
<td>6.4 Volts</td>
<td>0 Volts</td>
<td>62 Volts</td>
<td>55 Volts</td>
<td>0 Volts</td>
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<tr>
<td>6AL5 Sound I.F. Discriminator</td>
<td>*</td>
<td>−.4 Volts</td>
<td>6.4 Volts</td>
<td>0 Volts</td>
<td>0 Volts</td>
<td>0 Volts</td>
<td>−.4 Volts</td>
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<tr>
<td>6J6 1st Video I.F. Amp.</td>
<td>117 Volts</td>
<td>137 Volts</td>
<td>6.3 Volts</td>
<td>A.C.</td>
<td>0 Volts</td>
<td>0 Volts</td>
<td>−1.2 Volts</td>
<td>.6 Volts</td>
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<tr>
<td>6J6 2nd Video I.F. Amp.</td>
<td>120 Volts</td>
<td>130 Volts</td>
<td>0 Volts</td>
<td>6.3 Volts</td>
<td>A.C.</td>
<td>0 Volts</td>
<td>−1.2 Volts</td>
<td>.95 Volts</td>
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<td>6J6 3rd Video I.F. Amp.</td>
<td>125 Volts</td>
<td>125 Volts</td>
<td>0 Volts</td>
<td>6.3 Volts</td>
<td>A.C.</td>
<td>0 Volts</td>
<td>−1.2 Volts</td>
<td>.55 Volts</td>
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<tr>
<td>6J6 4th Video I.F. Amp.</td>
<td>120 Volts</td>
<td>120 Volts</td>
<td>0 Volts</td>
<td>6.4 Volts</td>
<td>A.C.</td>
<td>0 Volts</td>
<td>−1.2 Volts</td>
<td>.75 Volts</td>
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<tr>
<td>6J6 5th Video I.F. Amp.</td>
<td>117 Volts</td>
<td>117 Volts</td>
<td>0 Volts</td>
<td>6.4 Volts</td>
<td>A.C.</td>
<td>0 Volts</td>
<td>*</td>
<td>.65 Volts</td>
</tr>
<tr>
<td>6J6 1/2 Video Detector</td>
<td>117 Volts</td>
<td>*</td>
<td>0 Volts</td>
<td>6.4 Volts</td>
<td>A.C.</td>
<td>*</td>
<td>−.2 Volts</td>
<td>.75 Volts</td>
</tr>
<tr>
<td>6A6 1st Video Amp. &amp; Clipper</td>
<td>−.75 Volts</td>
<td>0 Volts</td>
<td>6.4 Volts</td>
<td>255 Volts</td>
<td>137 Volts</td>
<td>0 Volts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6K6 2nd Video Amp. &amp; Clipper</td>
<td>0 Volts</td>
<td>0 Volts</td>
<td>103 Volts</td>
<td>137 Volts</td>
<td>5.5 Volts</td>
<td>0 Volts</td>
<td>6.4 Volts</td>
<td>A.C.</td>
</tr>
<tr>
<td>6AL5 1/2 D.C. Restorer</td>
<td>0 Volts</td>
<td>*</td>
<td>6.4 Volts</td>
<td>0 Volts</td>
<td>.5 Volts</td>
<td>0 Volts</td>
<td>0 Volts</td>
<td></td>
</tr>
</tbody>
</table>
An indication of whether or not the receiver is operating properly can be obtained by taking response curves at indicated points and comparing them with representative curves from a normal receiver. Depending upon the type of oscilloscope used, the response curves may appear inverted from those shown here. A sweep generator, an oscilloscope, and a marker generator will be required in obtaining the curves. CAUTION: When making tests in the signal circuits care must be taken not to disturb any wiring or location of circuit components in order not to affect the original alignment. This is important as these circuits are fixed-tuned. To obtain these response curves, proceed as follows: Connect the oscilloscope from the junction point of C46 and L17 to ground. This capacitor and coil are located between the video detector and the first video amplifier. Set the sweep generator for a sweep of 20 to 30 megacycles, approximately. Beginning at the 5th video i-f stage, connect the sweep generator to the input grid (pin 6) of the 5th video i-f amplifier. A normal response curve will be similar to that shown for the 5th video i-f stage. Markers are used to establish the frequency points indicated. The diminished size is due to insufficient amplification of the signal by the single i-f stage.

For an over-all video response curve, select any convenient channel not in use. Set the sweep generator to the middle frequency of this channel with a 10-megacycle sweep and connect it to the antenna input terminals. The response curve obtained should be similar to the over-all response curve shown. To check the sound i-f response, set the sweep generator to 3.5 Mc with at least a 1-Mc sweep on either side, and connect it to the grid (pin 1) of the 6BA6 first sound i-f amplifier. Connect the oscilloscope across resistor R7 in the grid circuit of the 6A5 discriminator tube. The curve should be as shown for the sound i-f response. Leaving the sweep generator connected to the input of the sound i-f section, connect the oscilloscope from the cathode (pin 1) of the 6A5 discriminator tube to ground. The curve obtained should resemble the discriminator response curve shown with a bandwidth of approximately 300 kc between peaks.
HELPFUL FIELD SERVICE DATA FOR THE SERVICE TECHNICIAN

Complaint: 3.9K Grid resistors burning; 100 ohms B+ decoupling resistors overheated and no contrast control of picture.
Causes: Leaky or shorted 51MMF condensers going to Lug #6 on 6J6 Tubes
Leaky or shorted 250MMF condensers from Lug #A on converter transformer to Lug #6
on first 6J6 video I.F. Socket.
Internally Shorted 6J6 tubes or gassy 6J6 tubes causing positive voltage to appear on grid Lug #6 of 6J6 Tubes. Grids should never be positive, but should show negative voltage of approximately -2 to -6 volts ± 20% tolerance, on the first four 6J6 stages
which are controlled by contrast control biasing. The remaining two 6J6 tubes are biased only by their cathode resistors and these grids should also never read positive.

Complaint: No control of brightness: brightness control burns; 10K resistor and 3.3K resistor burn in D.C. Restorer circuit.
Causes: Shorted .05MF condenser on lug #5 of 6AL5 D.C. Restorer socket.
Shorted .05MF condenser coupling 4st Sync amplifier tube to sync take-off point on lug #2 of 6AL5.
Defective 50K brightness control pot.
Defective 6AL5 Tube (D.C. Restorer shorted internally).

Complaint: Horizontal black bar in picture; washed out picture; 300 ohm resistor and 3.3K resistor burning on 6K6 socket.

Complaint: No Picture and resistors burning on 6K6 socket as well as on terminal board of I.F. Strip.
Causes: Shorted .05MF Condenser going to Lug #5 on 6K6 2nd Video Amplifier socket; Parts damaged are as follows: 330 ohm resistor on Lug #8 of 6K6 socket, 3.3K resistor on Lug #4 of 6K6 socket, 3.6K and 6.8K resistors on terminal board of I.F. Strip located near 6K6 Tube socket.
NOTE: Replace .05MF Condensers that are defective with ones having a 600 working Volts D.C.
rating.

Complaint: No picture and resistors burning on I.F. strip terminal board near 6AU6 1st Video Amplifier.
Causes: Shorted 6AU6 Tube
Shorted 10MF Electrolytic Capacitor bypassing Junction of 3.6K and 6.8K resistors on terminal board.

Complaint: Picture weak, erratic, sections of it rip out due to Video I.F. Oscillation.
Causes: Open 1500MMF ceramic capacitors used for filament or B+ decoupling and bypassing. Traps tampered with by customer and set incorrectly to wrong frequencies.

Complaint: Audio weak and distorted.
Causes: Dead or defective 6AL5 discriminator tube
Defective 6AU6 sound limiter tube
Sound I.F. or discriminator adjustments thrown out of alignment.
Shorted audio shielded lead from volume control into I.F. strip.
250MMF capacitor on Lug #1 of 6AL5 socket is open or shorted.

Complaint: Audio oscillation in sound I.F. section.
Causes: Open 1500MMF capacitors in plate, screen or cathode circuits of sound I.F. amplifier stages.
Poor dressing of wires and leads near converter transformer.
Open 600MMF mica condenser bypass on screen of 6AU6 limiter stage.

Complaint: Hum in Picture
Causes: Open or leaky filter capacitor in low-voltage power supply.
Defective tubes (shorted heater to cathode, etc.)
Defective decoupling filters in Video amplifier stages.
Pickup due to misplaced leads.

Complaint: Narrow vertical or diagonal lines in picture.
Causes: Interference from nearby radio transmitters for other services such as amateur, communications, F.M., etc.

Complaint: Ghosts
Causes: Poor Antenna orientation
Reflector element required
Mismatched Antenna line to front end, etc.

Complaint: Weak or Distorted Audio
Causes: Tuning control improperly adjusted
Defective tubes
Open filter capacitor
Open or shorted coupling capacitor
Open bypass capacitor
Sound I.F. or discriminator stages misaligned
Defective speaker
Faulty connections

Complaint: Noise in Audio Output
Causes: Noisy tube
Overheated resistors
Faulty capacitors
Defective speaker
Airing in High-Voltage circuits
Dirty or worn volume control
 Loose Tube-Socket contacts
Faulty connections

Complaint: Hum in Audio Output
Causes: Open filter capacitor
Defective tube
Poor ground connections
Pickup due to misplaced leads

Complaint: No Sound and No Picture; Raster O.K.
Causes: Defective Tubes
Open Antenna Input circuit
Open Coupling capacitors
Short-Circuited bypass capacitors
Open load resistors
Faulty connections
Defective Antenna, R.F. or oscillator stage
Oscillator for all channels incorrectly aligned

Complaint: No Sound; Picture Satisfactory
Causes: Sound I.F. circuits mis-aligned
Defective tubes
Check voltages referring to Voltage and resistance charts

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MODELS Standard, Champion

TELEVISION ASSEMBLY
TROUBLE-SHOOTING CHART AND PROCEDURE

In order to facilitate the location of faulty components in defective receivers a systematic troubleshooting procedure should be used by the Service Technician. Before making any tests involving the use of test equipment, it is advisable to first make a visual observation of the receiver. This inspection will often give a speedy indication which section of the receiver is not operating correctly so that location of the faulty component can be accomplished with minimum time expenditure.

Following the visual inspection, checks should be made at specific points in the receiver to isolate the defect to a particular section of the receiver, after which a stage by stage analysis of the section is made to determine the 2 or 3 faulty stages.

TEST EQUIPMENT

It is assumed that the Technician has the following Basic Test Equipment in his shop laboratory:
1) A good A.M. Signal Generator capable of producing 30 megacycles on fundamental frequencies; 400 cycle or 1000 cycle AUDIO output available for testing AUDIO stages and VIDEO Amplifier stages.
2a) Vacuum tube Voltmeter of Junior Voltmohym type or equivalent.
b) 20,000 ohms per Voltmeter.
3) A good tube tester.
4) Pliers, alignment tools (insulated type), soldering irons, etc.
5) Check all connections to C.R.T. socket and cable assembly to make sure that no poor contacts are present to give you trouble.
6) By injecting a strong 25 MC. signal from your A.M. generator, modulated at 30% with 400 cycles modulation into the grid lead of the 5th 6L6 VD500 I.F. Amplifier you should see a series of horizontal light and dark bars on screen of C.R.T. By connecting generator to each previous stage, you can roughly check gain per stage if readings are taken with a V.T.V.M. connected to Video detector load resistor 3.3K.
7) To check sound I.F. system, connect output meter across voice coil of speaker and turn volume control up for audible tests. With generator set on A.M. and feeding in correct center frequency (219 MC. on Champion Models and 2.6 MC. on Standard Models) into grid lug #1 of 1st 6B6 Sound I.F. Now, is you vary generator 75 KC. higher or lower than enter frequency AUDIO output should rise.

This is only to be used as a rapid check and not for alignment.
The alignment procedure is on the preceding alignment instruction page.

TROUBLE-SHOOTING CHART

<table>
<thead>
<tr>
<th>Video Section</th>
</tr>
</thead>
</table>
| **Complaint:** Smearred Picture
| **Causes:** Defective loud resistors or peaking coils in Video amplifier stages. Open bypass capacitors. Video I.F. stages misaligned. Excessive signal input to receiver. Open coupling capacitors. |
| **Complaint:** Blurred Picture
| **Causes:** Improper adjustment of focus control or defective focus control on receiver. |
| **Complaint:** Poor picture definition
| **Causes:** Improper adjustment of focus, contrast, or brightness control. Weak input signal. Incorrect tuning adjustment. Weak tubes. Defective peaking coils (may be open or shorted). |
| **Complaint:** Noise in Picture
| **Causes:** Interference due to external causes, such as diathermy, ignition, electronic equipment, etc. Dirty or worn contacts on switches, sockets, etc. Noisy tubes. Noisy resistors or capacitors. Arcing in high voltage circuits. (comma, etc.) |
| **Complaint:** Sound in Picture
| **Causes:** Incorrect trap alignment. Oscillator improperly adjusted (front end tuning). Oscillations in Video I.F. stage. Sound and Video I.F. leads too close together. Microphonic tubes in front end or I.F. Strip. |

STANDARD MODELS ALIGNMENT PROCEDURE

With Sarkes-Tarzian Front Ends

Before attempting realignment of I.F. Strip, make sure you have carefully checked all tubes in strip to see if they are operating or whether they are shorted, gassy, microphonie, etc. Also check resistances, condensers and voltages to see if they are all OK.

Make sure that no other point in the set is the cause of your trouble, before you arrive at the decision that the I.F. Strip needs adjustment. Many times nothing in the strip is wrong but someone may have tampered with the set. The factory scale all adjustments after unit is aligned to prevent shifting or changing of settings. This unit is noted for its stability and rarely does it have to be realigned except where rough shipping or handling of set is encountered.

**A) EQUIPMENT NEEDED:**

1) Signal Generator A.M. Type Modulated 30% at 400 Cycles. It must be accurately calibrated and warmed up for at least 1/2 hour before using. It must cover frequencies to at least 300 MC. on fundamentals and have a good attenuator system.

2) A voltvohymn V.T.V.M., preferably, with a zero center, D.C. volts scale on it also available for discriminator work. D.C. Probe should have 1 meg. isolating Resistor contained in it.

3) Use a .05MF 600 Volt D.C. Blocking Condenser in series with “HOT” lead of signal generator at all times. Make sure grid. Clip Lead of generator is grounded very close to point where signal is being injected in order to prevent spurious or unwanted Regeneration.

**ALIGNMENT OF SOUND I.F. SYSTEM IN I.F. STRIP (216 MC.):**

1) Turn Generator to 216 MC, making sure that set has been warmed up for at least 15 minutes previously. Turn up Attenuator for maximum output to give at least 3 Volt output.

2) Detune Secondary of Disc, Transformer T4 Bottom Slug and Clip Signal Generator “HOT” Lead to Grid of 6AL5 Limiter. Pin #1 connect V.T.V.M. (which is set to lowest range D.C. Volts and having 1 Meg. isolating Resistor connected to probe) onto lug “C” of Disc Transformer ( Junction R10 & B11). Adjust Primary SLUG as top of T4 for maximum output on V.T.V.M. Then shift V.T.V.M. probe to Pin #1 on 6AIS disc. tube socket and adjust Secondary SLUG (bottom of T4) for “0” Volts output.

New turn Signal Generator slowly from 216 MC. to points on the dial which are 75 KC. higher and lower than the Center or Mean Frequency of 216 MC. and observe carefully if V.T.V.M. shows Linear Deflection or Voltage Scale on either + or – deviation of Generator. If Voltages are not equal on either side of Deviation in Frequency you must touch up Primary SLUG in order to compensate for Non-Linearity. New recheck Discriminator Action again to make sure that Discriminator Action is Linear on either side of Mean or Center Frequency.

3) CLIP GENERATOR ONTO GRID LUG #1 OF 2ND 6B6 AND REDUCE OUTPUT SO AS NOT TO OVERLOAD FOLLOWING STAGES. GENERATOR IS SET AT 216 MC. AND V.T.V.M. IS CLAMPED ON LUG 6A5A TO LIMIT GRID RETURN. Now peak T3 Primary & Secondary to maximum output on V.T.V.M.

4) CLIP GENERATOR ONTO GRID LUG #1 OF 1ST 6B6 AND PEAK T2 PRIMARY AND SECONDARY TO MAXIMUM OUTPUT ON V.T.V.M.

5) CLIP GENERATOR ONTO PRIMARY OF T1 WHERE LF. LEAD FROM FRONT END CONNECTS TO New Peak Secondary SLUG on converter coil T1 (Top SLUG) for maximum output on V.T.V.M.

C) ALIGNMENT OF TRAPS IN VIDEO I.F. SYSTEM.

**NOTE:** Do not touch unless Sound Bars appear is picture. These are set at factory very carefully.

1) Accompanying sound trap trimmers C29 is between 2nd & 3rd 6L6 I.F. stages and adjacent Sound Trap Trimmer C28 is between 4th & 5th 6J6 I.F. stages.

2) Set Generator to 17.6 MC. and feed strong signal into grid of 1st 6L6 I.F. and connect V.T.V.M. to junction of R32 and L17. (Load of Video Detector) and using insulated (Fiber) Alignment tool adjust C28 trap for maximum output.

3) GENERATOR IS NOW SET FOR 21.6 MC. AND C29 TRAP ADJUSTED FOR MINIMUM OUTPUT. Put a drop of Duco Cement on Srew Threads of Traps and SLUGS adjusted up to present point in order to seal settings.

**NOTE:** Bottom SLUG Primary of T1 Converter Coil is to be adjusted for maximum resolution on a test pattern only.
## VOLTAGE CHART

<table>
<thead>
<tr>
<th>TRAY</th>
<th>TYPE</th>
<th>FUNCTION</th>
<th>TRIM</th>
<th>TRIM</th>
<th>TRIM</th>
<th>TRIM</th>
<th>TRIM</th>
<th>TRIM</th>
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<td>944</td>
<td>1st Stage 1-L amp.</td>
<td>195 V</td>
<td>195 V</td>
<td>6.3 VAC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-6 to -4 V</td>
<td>-5 V</td>
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## RESISTANCE CHART

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<th>Remarks</th>
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<tr>
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<td>250k Ohm</td>
<td>Approx. 0</td>
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<tr>
<td>V120</td>
<td>944</td>
<td>1st Stage 1-L amp.</td>
<td>100 Ohm</td>
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<td>250k Ohm</td>
<td>Approx. 0</td>
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</tbody>
</table>

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CHAMPION MODELS ALIGNMENT PROCEDURE
With Dumont Inputuner Front Ends

1. Before attempting re-alignment of L.F. Strip, make sure you have carefully checked all tubes in strip to see if they are operating or whether they are shorted, gasly, microphonic, etc. Also check resistances, condensers and voltages to see if they are all O.K.

2. Make sure that no other point in the set is the cause of your trouble, before you arrive at the decision that the L.F. Strip needs adjustment. Many times nothing in the strip is wrong but someone may have tampered with the set. The factory seals all adjustments after unit is aligned to prevent shifting or changing of settings. This unit is noted for its stability and rarely does it have to be re-aligned except where rough shipping or handling of set is encountered.

A) EQUIPMENT NEEDED:

1) Signal Generator A.M. Type Modulated 30% at 400 Cycles. It must be accurately calibrated and warmed up for at least ½ hr. before using. It must cover frequencies to at least 30 M C. on fundamentals and have a good attenuator system.

2) A Voltomhyst V.T.V.M., preferably, with a zero center, D.C. Volts scale on it also available for discriminator work, D.C. Probe should have 1 Meg. isolating Resistor contained in it.

3) Use a .05 MF 600 Volt D.C. Blocking Condenser in series with "HOT" lead of signal generator at all times. Make sure Grid, Clip Lead of generator is grounded very close to point where signal is being injected in order to prevent spurious or unwanted regeneration.

B) ALIGNMENT OF SOUND I.F. SYSTEM IN L.F. STRIP (21.9 MC.):

1) Turn Generator to 21.9 MC, making sure that set has been warmed up for at least 15 minutes previously. Turn up Attenuator for maximum output to give at least .1 volt output.

2) Detune Secondary of Disc. Transformer T4 Bottom Slug and clip Signal Generator "HOT" Lead to Grid of 6AU6 Limiter (Pin #1) connect V.T.V.M. (which is set to lowest range D.C. Volts and having 1 Meg. isolating Resistor connected to probe) onto IUC "C" of Disc. Transformer (Junction R10 & R11). Adjust Primary SLUG on top of T4 for maximum output on V.T.V.M. Then shift V.T.V.M. probe to Pin #1 on 6A55 disc. tube socket and adjust Secondary SLUG (bottom of T4) for "0" Volts output.

Now turn Signal Generator slowly from 21.9 MC. to points on the dial which are 75 KC. higher and lower than the Center or Mean Frequency of 21.9 MC. and observe carefully if V.T.V.M. shows Linear Deflection on Voltage Scale on either + or - Deviation of Generator. If Voltages are not equal on either side of Deviation in Frequency you must touch up Primary SLUG in order to compensate for Non-Linearity. Now recheck Discriminator Action again to make sure that Discriminator Action is Linear on either side of Mean or Center Frequency.

3) CLIP GENERATOR ONTO GRID LUG #1 OF 2ND 6BA6 AND REDUCE OUTPUT SO AS NOT TO OVERLOAD FOLLOWING STAGES. -- GENERATOR IS SET AT 21.9 MC. AND V.T.V.M. IS CLIPPED ONTO LUG #A OF T3 (Limiter Grid Return). Now peak T3 Primary & Secondary to maximum output on V.T.V.M.

4) CLIP GENERATOR ONTO GRID LUG #1 OF 1ST 6BA6 AND PEAK T2 PRIMARY AND SECONDARY TO MAXIMUM OUTPUT ON V.T.V.M.

5) CLIP GENERATOR ONTO PRIMARY OF T1 WHERE I.F. LEAD FROM FRONT END CONNECTS TO. Now Peak Secondary SLUG on converter coil T1 (Top SLUG) for maximum output on V.T.V.M.

C) ALIGNMENT OF TRAPS IN VIDEO I.F. SYSTEM

NOTE: Do not touch unless Sound Bars appear in picture. These are set at factory very carefully.

1) Accompanying sound trap trimmer C-29 is between 2nd & 3rd 6J6 I.F. stages and adjacent Sound Trap Trimmer C-38 is between 4th & 5th 6J6 I.F. stages.

2) Set Generator to 27.9 MC. and feed strong signal into grid of 1st 6J6 I.F. and connect V.T.V.M. to junction of R-32 and L17 (Load of Video Detector) and using insulated (Fiber) Alignment tool adjust C-38 trap for minimum output.

3) GENERATOR IS NOW SET FOR 21.9 MC. AND C-29 TRAP ADJUSTED FOR MINIMUM OUTPUT. Put a drop of Duco Cement on Screw Threads of Traps and SLUGS adjusted up to present point to seal settings.

NOTE: Bottom SLUG Primary of T1 Converter Coil is to be adjusted for maximum resolution on a test pattern only.

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