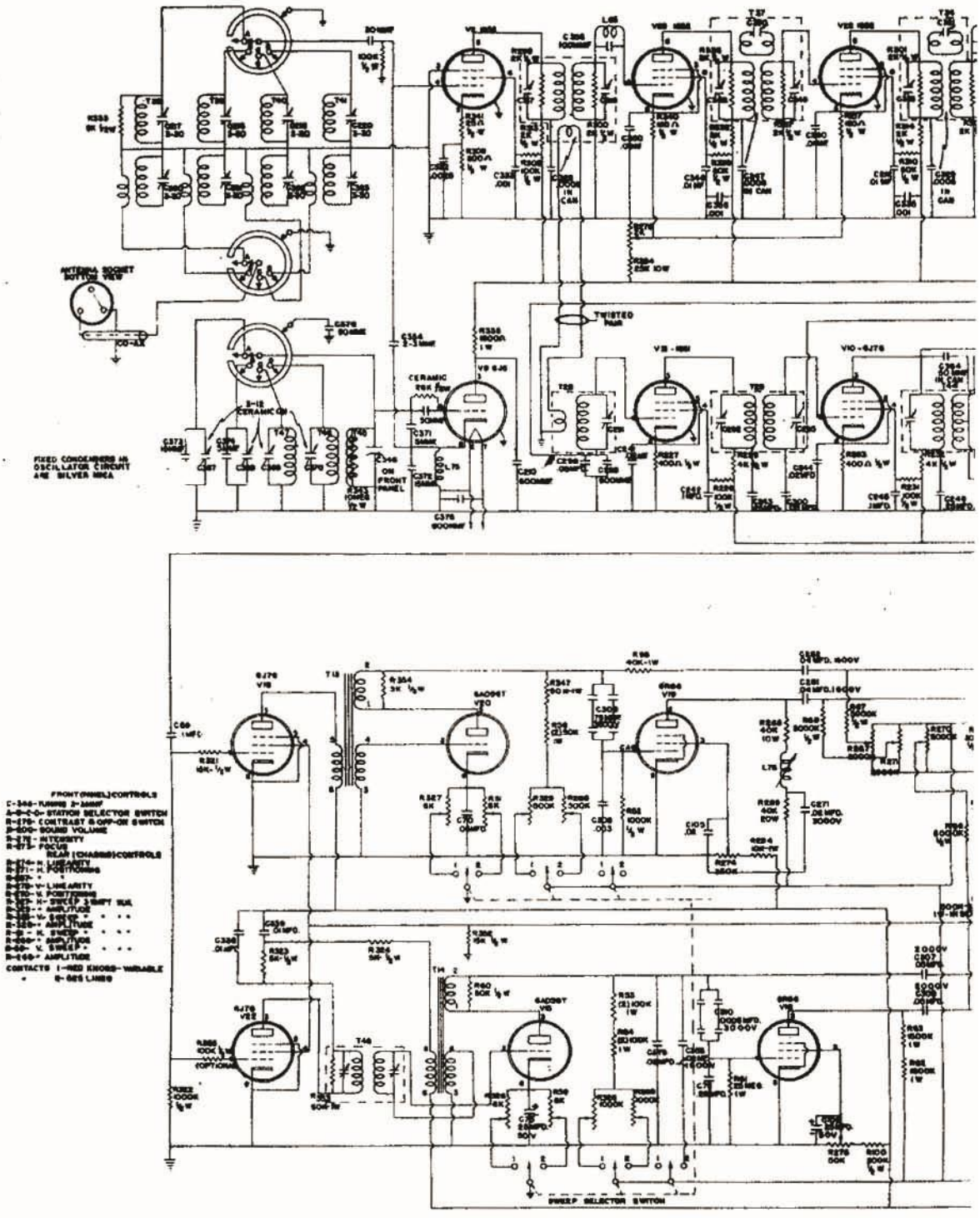
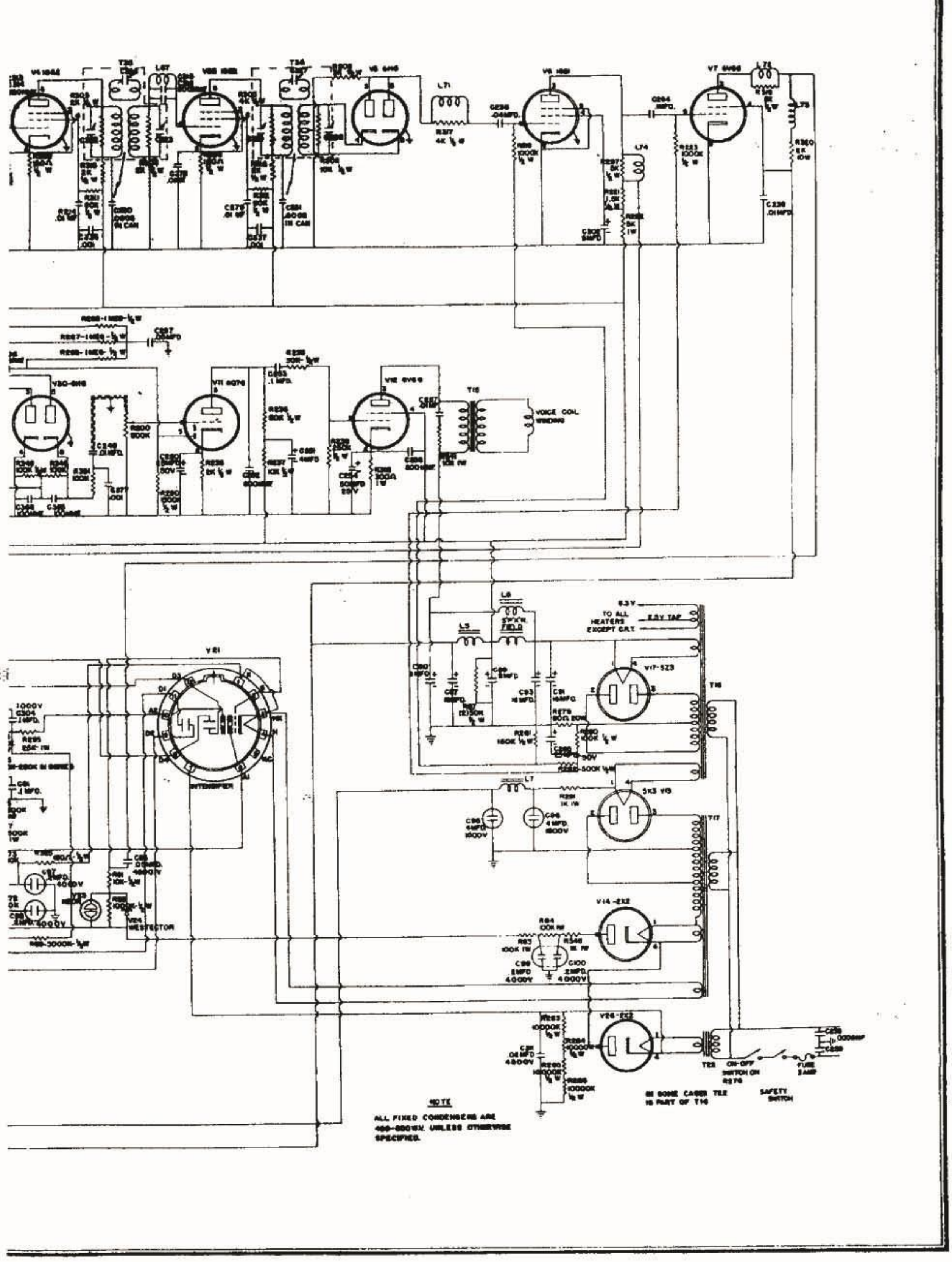


MODELS 180X, 181X, 182X, 183X

T LABS., INC.



ALIGNMENT AND PRODUCTION TESTING OF TELEVISION RECEIVERS.

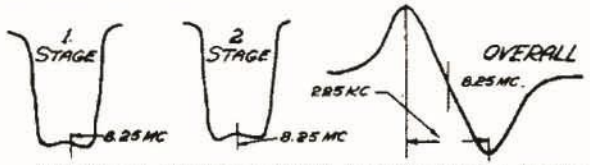
1. AUDIO CIRCUITS

Operation of the audio frequency amplifier may be checked by touching the grid of the 6Q7 and noting hum pickup in the speaker. The first video IFT should be adjusted roughly as it affects the sound I.F. characteristic.

Next, the I.F. amplifier should be aligned, using an oscillograph connected to the screen of the 2nd I.F. tube (screen by pass removed) and a wobbulator connected to the proper points to indicate the desired characteristic. The 2nd I.F.T. should be adjusted first with the wobbulator connected to the grid of the first I.F. tube (1851), and then the first I.F.T. adjusted with the wobbulator connected to the converter grid. Next the 6J7 screen by pass should be put back, the oscillograph shifted to the diode output at the first audio coupling condenser, the .001 de-emphasis condenser opened, and the discriminator transformer adjusted.

The output of the wobbulator should be of the order of 5000 microvolts which may be obtained from the RCA wobbulator using the low tap with a 10 ohm resistor shunting it to ground. A Ferris signal generator may be used as a marker connecting it to the wobbulator output (low tap) through a 100 ohm resistor.

The appearance of the characteristics are indicated by the sketches below. The exact shape of these curves will vary somewhat with individual receivers.

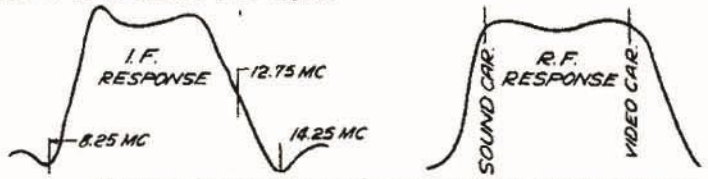


A check on alignment should be made using a Ferris signal generator with about 5000 microvolts output. Tuning the signal generator through the band two equal peaks (± 10%) and a null point should be observed. The null point should be at 8.25 mc (± 15 Kc).

Sensitivity should then be checked using the Ferris signal generator connected to the converter grid, and the oscillograph connected to the plate of the 6V6G audio output tube. The input for an average output for the two peaks of 50 V. p. to p. (1" direct on 168) should be from 30 to 100 microvolts. (At this low input the two peakr may not be exactly equal due to the fact that signal level affects the I.F. tuning to some extent.)

2. VIDEO I.F. CIRCUITS

An oscillograph is attached to the 6H6 video detector load. An I.F. wobulator is connected successively to the last I.F. stage, next to the last, and so on, back to the mixer grid with adjustment of the corresponding I.F. transformer at each step. In this alignment the overall curve is approximately that shown below. This sketch is illustrative of several receivers but the exact amount of dip is somewhat variable and the final adjustment generally involves use of an actual test pattern received by R.F. It is desirable that the video I.F. alignment shall have the 6db attenuation at the carrier to provide successful reception of the single side band transmission. 4 of the 5 picture I.F. transformers are triple tuned while the first I.F. transformer is a double tuned unit. When tuning the video I.F. transformer in the plate of the mixer tube, the R.F. circuits should be disconnected from the grid of the mixer before attaching the I.F. signal wobbulator to this grid so as to insure flat input.



The trap to reject the adjacent channel picture carrier and the traps to reject the associated sound carrier are all pretuned and need no further adjustment. These traps are tuned in manufacture using a Q-meter.

3. R.F. CIRCUITS

The R.F. circuits are aligned by using an input wobbulator having relatively high voltage of the order of 1 volt covering the channels as follows:

1	50-56 Mc
2	60-66 Mc
4	78-84 Mc
6	96-102 Mc

To determine the characteristic of these R.F. circuits independent of I.F. response, an oscillograph is connected with its grounded terminal to the B plus supply (using care not to touch the oscillograph) and with its vertical input amplifier connected to the mixer screen. In this way the mixer screen response represents quite adequately the band pass characteristics of the R.F. circuits. This high level wobbulator is applied to the antenna terminals, following which the R.F. antenna coil and the mixer grid coil are tuned with the corresponding condensers for each band. The response curve for each band is represented by the sketch above, showing the response for one of the bands which is typical of all of them. The higher channels are somewhat broader than this. During this alignment the oscillator tube has been removed.

Alignment of the oscillator itself is made by using a signal generator tuned to the carrier frequency for the sound channel. Then the oscillator trimmers are adjusted for each of the 4 channels mentioned above so that the sound carrier is received as indicated by the loud speaker. To insure that the oscillator is tuned above the desired carrier the signal generator is then tuned to the picture carrier and a check of received signal is made through the video channel. Another check is to see that the minimum capacity of the oscillator trimmer is used where it is possible to get 2 oscillator frequencies which pass a sound signal. This adjustment of the oscillator is made with the front knob trimmer set at ½ capacitance. A final sensitivity measurement is now made using the signal generator on the carrier frequencies for sight and sound for all 4 channels.

The picture sensitivity should be approximately 200 microvolts input signal on all channels to yield 15 volts peak to peak at the final video 6V6 amplifier plate, using an oscillograph for measurement and using a signal generator with 30% modulation. 4

Sound Rejection

While an attenuation ratio of 100 at the sound carrier was sufficient with A.M. sound, it is not adequate with F.M. sound. The signal generator should be tuned through the sound band which is 150 Kc (± 75 Kc) and the attenuation ratio should be at least 100 throughout this band at R.F.

Adjacent Channel Sound Rejection

Previously rejection ratios of 1000 to 1 at R.F. was attained, measurements should be made by tuning through the band as above and the ratio should be over 500 throughout the band.

The sound sensitivity at R.F. should be approximately the same as at I.F.

4. VIDEO AND SWEEP CIRCUITS

This alignment of the video amplifier and the sweep circuits can be made either with an over-the-air test pattern or with a test pattern from a coaxial line. When an over-the-air transmission is used the signal is applied to the antenna terminals.

However, when a coaxial line signal is used, it is necessary to observe the precaution of a suitable input network for applying the signal to the grid of the 1851 first video amplifier tube. This tube has a fixed bias within the set to which its grid lead is returned and its cathode is grounded. It is therefore desirable to insert a coupling condenser of at least 0.1 ufd from the coaxial line and supply a grid leak from the 1851 grid lead of at least ½ megohm between the 1851 grid cap and the lead wire from beneath the chassis which would otherwise normally be connected to the 1851. In this way the proper fixed bias is still applied to this tube.

After alignment has been made as outlined above there are certain tests and precautions that should be followed closely in order to eliminate the possibility of shipping either defective receivers or those that are not up to standard in efficiency and quality. A co-ax line carrying a composite video signal to be used for checking video amplifier and sync circuits should be monitored to make sure that Horizontal Blanking is no more than 16% and front porch comprises 2% of total. Vertical Blanking should be from 7 to 8%.

The 1851 tube and 6V6 tube of the 2 stage video frequency amplifier have their frequency constants such that the overall response to the cathode-ray tube grid is essentially flat from 30 cps to 3½ megacycles with a gradual drop to approximately 4½ megacycles at which time the response is down to about 30%. This original design was checked with the video frequency wobbulator and it has been found unnecessary to check each receiver individually except for general observation of a test pattern which is adequate to show up any actual mistake in the circuit wiring of the peaking coils, etc.

The sweep circuits are tested to determine the adequacy of amplitude and frequency range. Linearity adjustment is made with the two linearity controls on the sweep deck. In case these adjustments do not cover a sufficient range additional small capacitances are placed in parallel with the bottom condenser of the potential divider which feeds the grid of the sweep amplifier tube. This added condenser is actually placed from grid to ground of the sweep amplifier tube. In this way the ratio of signal from the oscillator to the signal from the amplifier will be controlled, thus correcting the linearity so that an overall linear sawtooth is produced by combination of a sweep oscillator output which is exponential and a sweep amplifier output which by its grid characteristic produces a reverse curvature.

After linearity has been adjusted the horizontal amplitude control should have at least one inch additional amplitude available. The vertical amplitude control should have several inches of additional amplitude available.

The black sweep control knobs, which are connected by turning the sweep selector switch on the front panel counterclockwise (to position 2), should be checked to insure that the vertical frequency range includes 30 and 60 fields per second with adequate overlap, and that the horizontal frequency range includes 8000 and 16,750 lines per second with adequate overlap.

The black knobs should be set up at the standard 525 lines 30 frames.

The red sweep control knobs, which are connected by turning the sweep selector switch clockwise (to position 1) should be capable of being adjusted to the following color combinations:

(a) CBS color pictures use 375 lines per frame at 60 frames per second which requires a horizontal scanning rate of 22,500 lines per second, and a vertical scanning rate of 120 field scans per second.

(b) NBC has transmitted color with 441 lines per frame and 60 frames per second, requiring 26,460 scanning lines per second, and 120 vertical fields per second.

The Du Mont sync transformer should be adjusted as follows:

A Du Mont picture signal should be applied to the 1851 first video grid in accordance with the previous instructions, or received over the air. A diode rectifier with its output connected to an oscillograph should be very loosely coupled to the grid of the horizontal oscillator (green lead on Du Mont sync transformer). This may be done by clipping a battery clip around an insulated portion of the green lead. The oscillograph sweep should be synchronized to the 60 cycle power line, the beam of the CRT should be cut off, and the sweep oscillator tubes of the television receiver removed. The Du Mont sync transformer should then be adjusted for maximum amplitude of the envelope of the H.F. burst pulse as indicated on the oscillograph.

The test pattern should be clean and crisp with no signs of any breakdown visible. Breakdown will cause intermittent black lines which jump back and forth vertically or horizontally tear out similar to that produced by noise, which is particularly noticeable at the black circle of the test pattern.

Very often faulty coupling condensers in the deflection circuits will cause this trouble and tapping them with an insulated rod will help locate the faulty part.

7. No control of focus or intensity
8. Breakdown in raster or test pattern
9. Microphonics
10. Sound in picture
11. Single vertical line or horizontal line on screen of CRT
12. Intermittent sound or picture
13. Poor linearity

1. Receiver dead
   (a) If receiver is dead check a.c. plug and check back of cabinet to make sure safety switch is closed.
   (b) If 3 amp. fuse is blown, look for a shorted or arcing 2X2, 4000 volt, high voltage rectifier tube.
   (c) Check for shorted or arcing 5X3, 1500 volt. high voltage rectifier tube.
   (d) Check for shorted or arcing 2x2. 4500 volt intensifier-rectifier tube mounted in a horizontal position.
   (e) Check for a shorted high voltage filter condenser in the 1500 or 4000 volt supply.
   (f) Check for a shorted .05-4500 volt coupling condenser mounted in a horizontal position under sweep deck.

2. Sound but no picture
   (a) Check video amplifier by touching grid of 1851 first video amplifier tube. You should see broad white bars on CRT indicating that that circuit is OK. If no response is noted, check that portion of the circuit the 1851, or 6V6G video amplifier tubes may be defective.
   (b) Drift in oscillator realign oscillator trimmer.
   (c) Check 1852 video I.F. amplifier tubes for open filament or shorts.

3. Picture but no sound
   (a) Check oscillator for drift realign oscillator trimmer.
   (b) Check 6V6G audio amplifier tube. Check 6Q7G, 6J7G, also 1851 first audio I.F amplifier tube. These tubes will also cause the sound to be distorted, weak and intermittent.

4. Poor sound
   (a) Defective 6V6G audio amplifier tube.
   (b) Shorted or gassy 1st audio 1851 tube.
   (c) 6Q7G audio amplifier tubes not all the way in sockets - press tubes all the way in socket.

5. Poor synch. Picture tears out
   (a) A weak signal due to a broken or shorted antenna lead-in or a defective synch. separator tube, will cause the picture to lose synch. Also check frequency controls for correct adjustment.

6. Bright spot on screen of CRT Sound OK
   (a) If this condition exists. turn intensity off at once as this will burn a spot on the screen of the CRT. Look for a defective 5X3, 1500 volt rectifier tube. If tube is OK look for a shorted 4 mfd. 1500 volt filter condenser.

7. No control of focus or intensity
   (a) Fibre tongue is usually broken on controls. The fibre tongue insulates the intensity and focus control pots from ground as they are 4000 volts above ground. If no fibre tongues are available, turn controls with an insulated screwdriver to the proper intensity and focus.
   (b) The 750K and 2 meg.bleeder resistors mounted on the front panel between the focus and intensity pots may be open.

8. Breakdown in raster or test pattern
   (a) Check for leakage at CRT socket and base.
   (b) If breakdown is due to leakage at CRT socket, you will hear a sizzling noise at base of CRT socket. If socket hasn't arced across causing complete breakdown, you can put a 25 watt lamp in tube socket to dry out moisture. If that doesn't do it, replace CRT socket and if CRT base is badly burned from arcing send CRT to plant to be rebased.
   (c) Breakdown is noticed on the raster by the separation of the line structure.

9. Microphonics
   (a) Check the 6J5 oscillator, 1852 mixer and the 1851 first audio tubes for microphonic conditions.

10. Sound in picture
   (a) Check 1851 first video amplifier tube.
   (b) Check 6V6G video amplifier tube.
   (c) R.F. and detector circuits being off, frequency due to drift or misalignment. Realignment will be necessary.

11. Vertical or horizontal lines on screen
   (a) Caused by no plate voltage on 6AD5 horizontal or vertical sweep oscillator, due to open plate supply resistors. On the vertical side there are four 100K 1 watt resistors. Always turn down the intensity control if there is a bright horizontal or vertical line on screen or it will become burned.

12. Intermittent sound or picture
   (a) Due to shorted antenna line.

13. Poor linearity
   (a) Due to defective 6R6G horizontal or vertical amplifier tube. On the right side of the sweep deck. you will find the horizontal linearity control. On the left side you will find the vertical linearity control. By adjusting controls, poor linearity can be corrected.

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