ALLEN B. DUMONT LABORATORIES, INC. MODEL RA-105

1.0 INTRODUCTION

1.1 DESCRIPTION OF SET

The Model RA-105 Teleset is produced in the following styles:

CABINET	SERVICES	PICTURE TUBE	SPEAKER
Stratford (Table top)	FM & TV	15 inch	6 inch
Westbury (Console)	FM & TV	15 inch	12 inch
Whitehall (Console)	FM & TV	15 inch	12 inch
Colony (Console)	AM, FM, TV & Phono	15 inch	12 inch

Two chassis incorporating the necessary circuits for F.M. and T.V. reception are used in all models of the RA-105. These are referred to in this manual as the Receiver Main Chassis (Fig. 1) and the Flyback Power Supply (Fig. 2). In the Colony Model a separate chassis (Fig. 3) for reception of A.M. is used. An automatic record changer is included in this model.

An external record player may be used with the Stratford, Westbury and Whitehall if so desired. A jack at the rear of the main receiver chassis, and the Phono position of the Service Selector Switch makes this possible.

TUBES USED IN RA-105

Receiver Main Chassis (27 Tubes)

Tube Symbol	*Tube Type*	*Tube Function*
V101	6J6	RF amplifier
V102	6AK5	Mixer
V103	6J6	VHF oscillator
V201	6AG5	1st Video IF
V202	6AG5	2nd Video IF
V203	6AG5	3rd Video IF
V204	6AL5	Video Detector and A.G.C. Diode
V205	6AG5	1st Video amplifier
V206A	½12AU7	2nd Video amplifier
V206B	½12AU7	DC Restorer
V207	6K6GT/G	3rd Video amplifier
V208	15AP4	Picture Tube
V209	6AT6	Automatic Gain Control
V210	6AU6	1st Sound IF
V211	6AU6	2nd Sound IF
V212	6AU6	3rd Sound IF and limiter
V213	6AL5	Sound discriminator
V214	6AL7 GT	Tuning indicator
V215	6AT6	1st Sound amplifier
V216	6V6GT/G	2nd Sound amplifier
V217	6AG5	Sync clipper
V218	6AL5	Sync Discriminator
V219	6K6GT/G	Horizontal oscillator
V220A	½6SN7	Vertical buffer
V220B	½6SN7	Vertical saw generator
V221	6SN7 GT	Vertical deflection amplifier
V222	5U4G	Low voltage rectifier
V223	5U4G	Low voltage rectifier
V224	6AC7	Reactance Tube

FLYBACK POWER SUPPLY CHASSIS (7 *Tubes*)

Tube Symbol	*Tube Type*	*Tube Function*
V401A	½12AU7	Horizontal saw maker
V401B	½12AU7	Relay control
V402	6BG6G	Horizontal Sweep amplifier
V403	1B3-GT/8016	High voltage rectifier
V404	1B3-GT/8016	High voltage rectifier
V405	5V4G	Damper
V406	6X4	Negative voltage rectifier
V407	6X4	Negative voltage rectifier

A M TUNER CHASSIS (Colony only) (4 *Tubes*)

Tube Symbol	*Tube Type*	*Tube Function*
V501	6BA6	AM RF amplifier
V502	6BE6	AM Converter
V503	6BA6	AM IF
V504	6SO7	AM Detector and AVC

1.2 ELECTRICAL CHARACTERISTICS

Stratford, Westbury, Whitehall

Average Power Ratings
(Line Voltage . . . 117 Volts A.C.)
Tele: 300 Watts
FM: 195 Watts
Phono: 195 Watts

Colony

Average Power Ratings
(Line Voltage . . . 117 Volts A.C.)
Tele: 300 Watts
FM: 195 Watts
Phono: 215 Watts
AM: 230 Watts

All Models

Audio Power Output: 2.5 Watts
Picture Size: 9½ x 12¾ inches

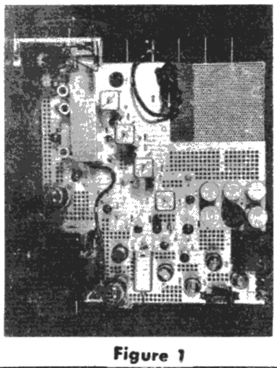

Figure 1

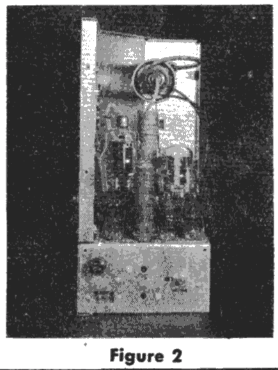

Figure 2

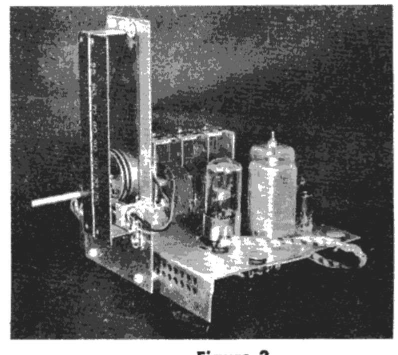

Figure 3

2.0 DESCRIPTION OF CIRCUITS

(Reference Fig. 4 Block Diagram also Schematic Diagrams

2.1 RF TUNING ASSEMBLY

The RF Tuner used in all post-war Du Mont Telesets constitutes an assembly identified as the Inputuner. The circuits are developed around a three gang variable inductor called the "Mallory-Ware Inductuner". This inductor consists of L102A, L102B and L102C on the Schematic diagram.

This Inputuner is a continuous type tuner covering the range of frequencies from 44 MC to 216MC. This range covers the twelve television channels, the standard FM band plus other short wave facilities in this range.

The input impedance of this tuner is approximately 73 ohms, therefore, coaxial transmission line such as RG-59/U should be used with Du Mont Telesets.

The transmission line is capacitively coupled to the input circuit through C101. Inductance L106 in parallel with the antenna input provides a high pass, radio frequency filter to suppress broadcast band or other low frequency cross modulation interference which may arise when the Teleset is located in an extremely intense field of a local AM broadcast station or other radiator.

The plates of the 6J6 RF Amplifier (V101) are coupled to the grid of the 6AK5 mixer tube (V102) by means of a six megacycle wide broad-band coupling network. The variable series coil combinations consisting of L101-L102A and L105-L102B tune to the desired signal frequency in conjunction with the associated tube capacities and the coupling network consisting of C105, C106 and C107. Resistors R110 and R104 reduce the "Q" of the respective coils considerably in order for the coupling network to maintain the very wide pass band.

The VHF oscillator utilizes one section of the twin triode 6J6 (V103) in a modified Colpitts Oscillator circuit. The feedback voltage from the plate to the grid of the oscillator tube is accomplished by means of the interelectrode capacity of the vacuum tube. The oscillator frequency is adjusted by movement of the tap on the coil L102C which short circuits a portion of the coil.

The oscillator output is coupled to the grid of the mixer tube V102 by means of capacitor C112. Both the incoming signal and the oscillator voltages are fed into the grid of the mixer tube V102. The plate of V102 feeds into the first video IF transformer.

When properly tuned to a channel, the heterodyning action between the incoming signal and the locally generated oscillation in the mixer, will produce the sound and the video IF signals. These signals will be present in the plate circuit of the 6AK5 mixer. The local oscillator frequency plus other important frequencies are presented in table No. 1.

The gain of the mixer stage is controlled by the A.G.C. voltage applied to the grid circuit. This control voltage is fed back from the AGC circuit located on the Main Chassis.

CHANNEL	FREQ. LIMITS	VIDEO CARRIER FREQ.	SOUND CARRIER FREQ.	LOCAL OSC. FREQ.
2	54- 60	55.25	59.75	81.65
3	60- 66	61.25	65.75	87.65
4	66- 72	67.25	71.75	93.65
5	76- 82	77.25	81.75	103.65
6	82- 88	83.25	87.75	109.65
7	174-180	175.25	179.75	201.65
8	180-186	181.25	185.75	207.65
9	186-192	187.25	191.75	213.65
10	192-198	193.25	197.75	219.65
11	198-204	199.25	203.75	225.65
12	204-210	205.25	209.75	231.65
13	210-216	211.25	215.75	237.65

All Frequencies Shown Above in Mc.

TABLE 1.

This chart shows the video and sound carrier frequencies for the TV channels. The local oscillator frequency refers to the operating frequency of the RF oscillator in the Du Mont Telesets. The IF frequencies thus produced are:

Video 26.4 Mc
Accompanying sound 21.9 Mc
Lower adjacent channel sound 27.9 Mc

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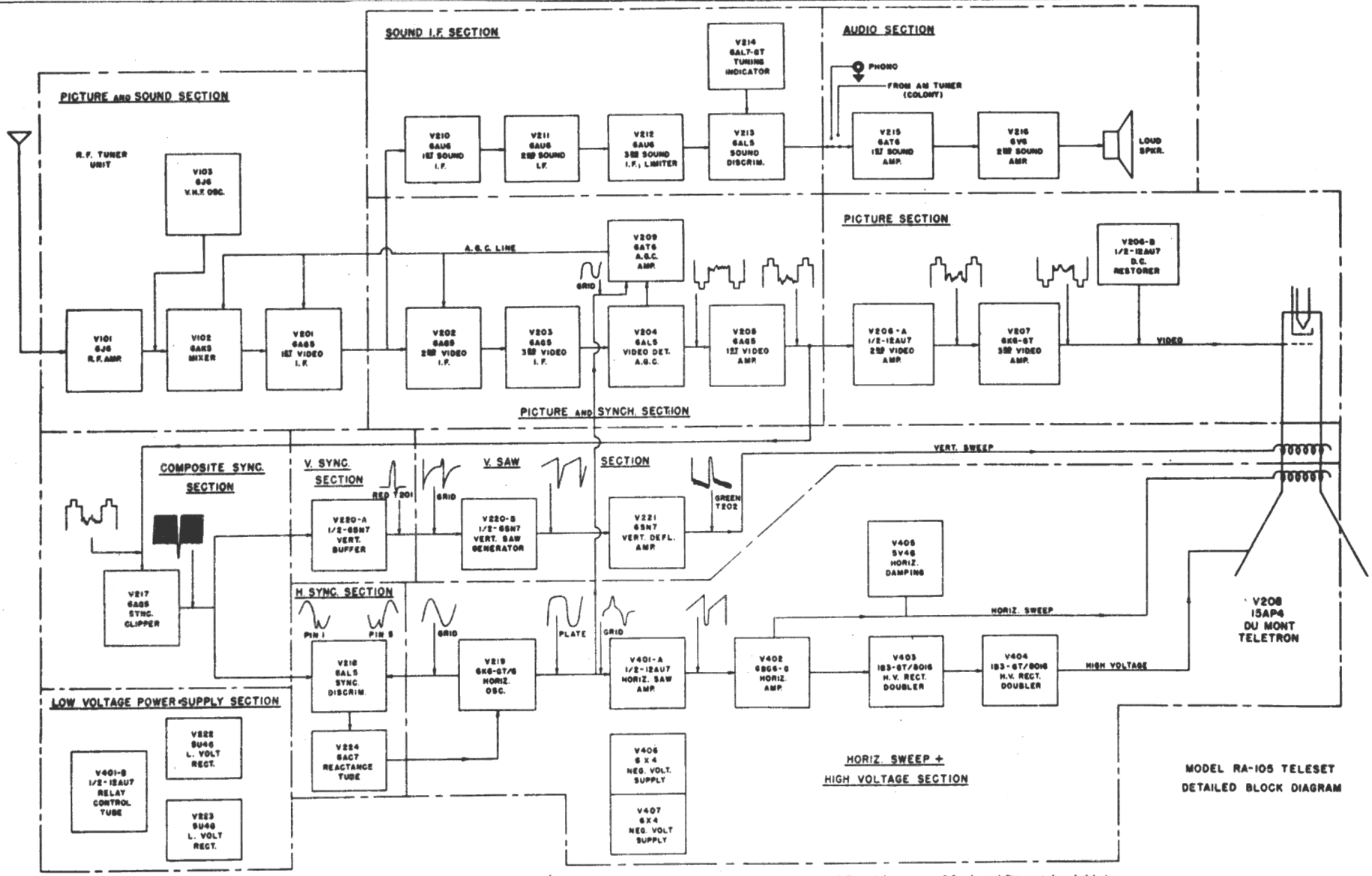

USE OF DETAILED BLOCK DIAGRAM

The purpose of this block diagram is to assist the serviceman, especially the inexperienced man, in rapidly localizing troubles.

The large, or section blocks, have been designated according to the function of the Teleset that will be affected if a defect occurs in that section. For example: One section has been referred to as the Picture and Sync section. The reason it was so identified is that certain defects in the circuits could affect both picture and sync.

Following is a list of troubles with the section in which they normally would occur. Only one trouble at one time is anticipated.

1. No picture and no sound or weak picture and weak sound. *Location*: Picture and Sound Section.

2. Picture normal but no sound. Tuning indicator does not function as channel is tuned. *Location*: Sound IF Section.

3. Picture normal but no sound. Tuning indicator functions normally with tuning. *Location*: Audio Amplifier Section. Note: In the case of the Colony, the AM or Phono would not work either.

4. Sound normal. No picture, but raster is synchronized (See Fig. 87). Picture Section.

5. Sound normal. No picture, raster is not synchronized. *Location*: Picture and Sync Section.

6. Sound normal. Picture rolls vertically. *Location*: Vertical Sync Section.

7. Sound normal. Picture out of sync both horizontally and vertically. *Location*: Composite Sync Section.

8. Sound normal. Picture out of Sync horizontally. *Location*: Horizontal Sync Section.

9. No Raster. Sound normal. *Location*: Horizontal Sweep and Hi Voltage section.

10. No Sound. No Raster. Tuning Indicator does not glow. *Location*: Low Voltage Section.

11. Sound normal. Horizontal bright line on face of CRT. *Location*: Vertical Saw Section.

Figure 4

2.2 VIDEO IF AMPLIFIERS

The video IF strip used in the RA-105 Telesets consists of three stages of amplification incorporating 6AG5 tubes. The serviceman who has worked on the Du Mont RA-103 Telesets will notice a very definite similarity between this IF amplifier strip and that used in the RA-103.

One item that should be noted by the serviceman is the means used for controlling the gain of the IF strip. The contrast control is no longer located in the grid circuits of the first two video IF stages. Instead of the manually operated contrast control, a control voltage is developed in an automatic gain control circuit (to be discussed later) and fed back to the grid circuits of the first two IF stages and the mixer.

The 21.9 Mc sound IF signal is taken off at the grid of the 2nd video IF and fed to the primary of the first sound IF transformer Z201.

Located between the 2nd video IF and the 3rd video IF are two parallel resonant circuits that merit some discussion. The combination of L210 and C208 form a parallel resonant circuit at a frequency of 21.9 Mc. This circuit offers high attenuation to 21.9 Mc which is the frequency of the sound accompanying the picture being received. Thus, signals of this frequency are prevented from getting to the picture tube and causing interference.

The parallel combination of L209 and C209 is resonant at a frequency of 27.9 Mc. The purpose of this "trap" is to prevent the sound of the lower adjacent channel from getting through to the picture tube and causing interference.

Occasionally the television serviceman may find it difficult to determine how the figure of 27.9 Mc is arrived at.

To determine the origin of the 27.9 Mc, we can investigate a specific case. In certain parts of Long Island, N. Y., it is possible to obtain good reception from channel 6 in New Haven, Connecticut and from channel 5 (WABD) in New York City.

Suppose then, that a Teleset at this location is tuned to channel 6. The channel limits are 82-88 Mc. The picture carrier frequency is 83.25 Mc, and the sound carrier frequency is 87.75 Mc. Since the video IF frequency used is 26.4 Mc, the local oscillator will be tuned to 83.25 Mc plus 26.4 Mc or 109.65 Mc. Since this oscillator signal of 109.65 Mc beats with the sound carrier frequency of 87.75 Mc, the difference frequency is 21.9 Mc which is the sound IF frequency.

The frequency limits of channel 5 is 76-82 Mc. The sound carrier frequency is 81.75 Mc. Since both stations are receivable at this location, some of the 81.75 Mc sound carrier signal will appear in the 6AK5 mixer. The local oscillator at 109.65 Mc heterodyning with 81.75 Mc will produce a frequency equal to the difference obtained by subtracting 81.75 Mc from 109.65 Mc which is 27.9 Mc.

It should be noted then, that the interfering signal will come from the adjacent channel below the channel being received.

Another point that the serviceman should realize pertains to the location in the frequency spectrum of the adjacent channel. For example, although channel 4 and channel 5, are adjacent to each other as far as channel designation is concerned, they are not adjacent insofar as the frequency spectrum is concerned. Channel 4 is from 66-72 Mc, while 4 Mc above or 76-82 Mc are the limits of channel 5.

All the adjustments in the video IF strip are variable inductances except for C213. This variable capacitor is used to control the bandwidth of the coupling network with which it is used.

The procedure for making the necessary adjustments will be covered under ALIGNMENT in the Service Section of this Manual.

2.3 AUTOMATIC GAIN CONTROL

One of the features of the Du Mont Model RA-105 Teleset is the use of an Automatic Gain Control circuit. This AGC circuit automatically controls the gain of the first two video IF stages plus the gain of the mixer stage.

One half of a 6AL5, (V204) and a 6AT6, (V209) are the tubes used in this circuit.

The video IF signal is applied to the plate (pin #2) of the 6AL5 (V204).

During the positive half cycle of the video IF signal this tube will conduct on the sync pulses. The voltage developed at the cathode is coupled to the grid of V209 through an RC filter. This filter will tend to smooth out the pulsating signal so that the voltage applied to the control grid is essentially a DC voltage. The amplitude of this voltage will change with any change in amplitude of the incoming signal. The polarity of this signal is positive. This DC voltage is used to control the gain of the triode section of V209.

The signal from the plate of the horizontal oscillator V219 is also fed to the grid circuit of V209.

This signal from the plate of the 6K6 is essentially a square wave at a frequency of 15,750 cps.

This horizontal signal is amplified by the triode section of the 6AT6. The gain of this triode depends on the bias voltage which is supplied from the half of the 6AL5.

The horizontal signal in the plate circuit of V209 is coupled from the plate of the triode to the diode plate in the same tube. This signal is then rectified by the diode section, and a negative voltage is available across R246 and R247 to ground. A filter consisting of R244 and C226 remove any variations so that the signal fed back to the 1st and 2nd video IF stages is essentially a smooth DC.

When the signal presented to the antenna tends to increase, the DC developed in the AGC diode becomes more positive. This increases the gain of the triode section of V209. Thus, the signal in the plate circuit of this stage is increased and the negative AGC voltage is also increased, thereby reducing the gain of the mixer and video IF amplifiers.

This AGC voltage is fed to the grid of the mixer through the filter consisting of R245 and C227.

2.4 VIDEO DETECTOR AND VIDEO AMPLIFIERS

The output from the 3rd video IF is fed to one half of V204, the video detector. The other half of this tube is used in the AGC circuit.

The waveform of the voltage observed at pin #7 is essentially as shown in Fig. 5 (exact waveforms can be seen in the Service Section of this manual). Since the sync pulses are extending in a negative direction, the polarity of this signal is said to be "black negative". This means that the portion of the signal corresponding to the "blacks" in the picture is in the negative direction.

Coils L213 and L214 are used to improve the high frequency response of this circuit.

Coil L220 and C215 are used to prevent any video IF from appearing at the grid of the first video amp.

The video signal is now amplified by the first video amplifier V205 using a 6AG5. As shown in Figure 6, the polarity has been reversed by the action of the amplifier. Since the "blacks" are extending in a positive direction, the signal is said to be "black" positive.

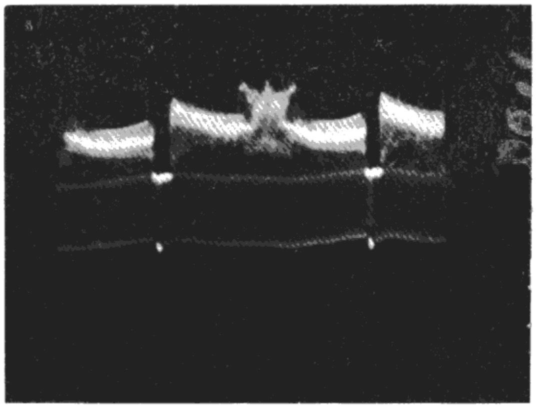

Figure 5. Video Signal at Pin #7 (plate) of V204

Since direct coupling was used between the video detector and 1st video amplifier, no provisions were needed to take care of the low frequency response. In this stage, a 10 mfd. capacitor is used as the screen bypass capacitor to provide good low frequency response. Plate compensation for low frequency response is provided by the use of R224 and C214-B.

L215 is used to improve the high frequency response of this circuit.

The parallel combination of L216, R280 and C216 forms a resonant circuit at 4.5 Mc. This circuit is called a "grain trap". The purpose of this trap is to prevent the 4.5 Mc "beat" frequency between the picture IF frequency and sound IF frequency from getting through to the picture tube.

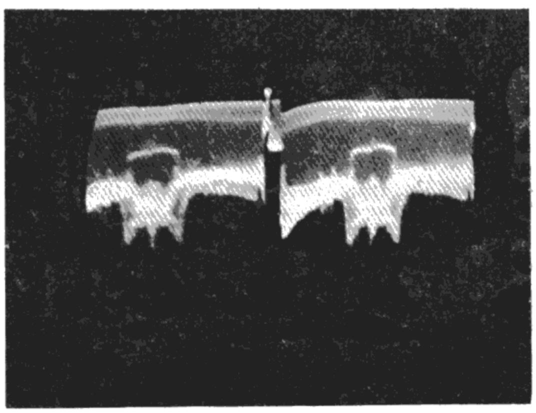

Figure 6. Video Signal at pin #5 (plate) V205 1st video amplifier

Although V206-A is identified as the 2nd video amplifier, no gain is realized by this stage. The circuit used here is called a Cathode Follower. The signal is applied to the control grid as usual, but it is taken out at the cathode. The plate is at AC ground potential. This is accomplished by connecting a 10 mfd. capacitor, C220-B to ground from the plate.

The contrast control is located in the Cathode circuit of this stage. The action of this control is to adjust the amplitude of the signal being applied to the control grid of V207 and subsequently to the grid of the Cathode Ray Tube.

Observation of waveforms in this stage indicate there is no reversal of polarity between the signal applied to the grid and that taken out at the Cathode. (Fig. 7.) This is characteristic of Cathode Followers. The amplitude of the signal observed at the cathode is lower than that at the grid.

The third video amplifier V207 uses a 6K6. The screen grid of this stage is also heavily by-passed using a 10 mfd. 450V capacitor to provide good low frequency response.

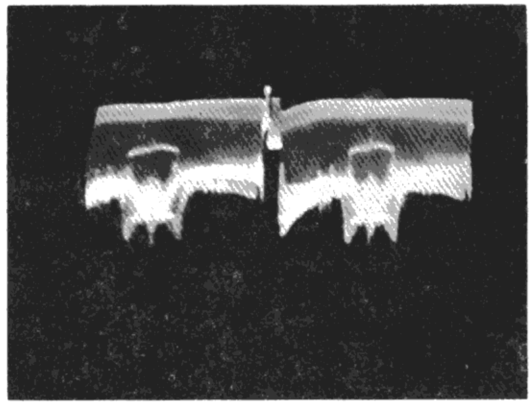

Figure 7. Signal observed at cathode of V206-A. 2nd Video amp.

*L217 is a series peaking coil and L218 is a shunt peaking coil, both of which are used to improve the high frequency response of this circuit.

The video signal is amplified and inverted by this stage and applied to the grid of the Cathode Ray tube as shown in Fig. 8. Note the polarity is "black negative". This indicates that the dark or black portions of the signal cause the grid to be driven negative, reducing the current in the beam of the CRT and thus reducing the intensity on the screen. The white portions of the signal drive the grid less negative increasing the beam current and thus brightening the picture.

A DC restorer circuit incorporating the second half of V206-B the 12AU7 is used in the grid circuit of the 15AP4 Teletron. This circuit rectifies the video signal and reinserts its DC component at this point.

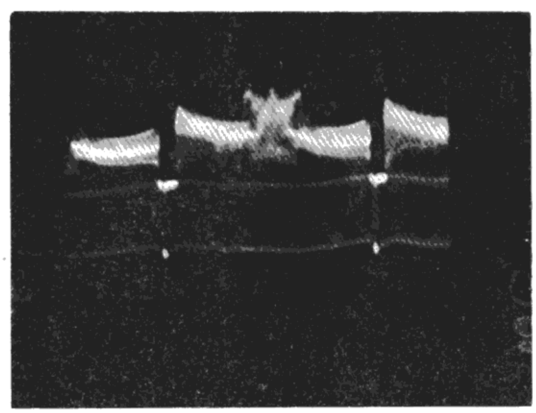

Figure 8. Signal Observed at Grid of CRT

2.5 SYNC CLIPPER

The video signal is fed from the plate circuit of the first video amplifier to the grid of the Sync Clipper V217. The purpose of this stage is to remove the composite sync signal from the video signal by means of a clipping action. This

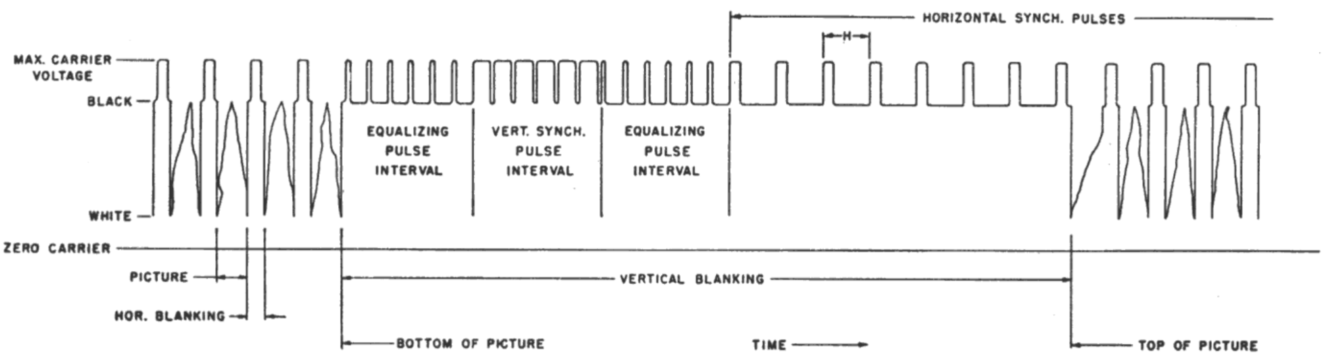

Figure 9. Composite Video Signal at Grid of Sync Clipper.

Figure 9A. Composite Synchronizing Signals at Plate of Sync Clipper.

clipping action is acomplished by using low screen voltage and low plate voltage.

Figures 9 and 9A shows the effect of passing the video signal through the Sync Clipper.

Figure 9 is essentially the waveform that is applied to the grid of the sync clipper. The sync signals that are necessary for synchronization of the sweep circuits are those signals shown above the black level.

Figure 9A is called the composite sync signal because it is composed of horizontal sync pulses plus the sequence of pulses that occur at the end of a field (bottom of the picture). This sequence consists of 6 equalizing pulses, followed by the vertical sync pulse interval which is comparable to 6 equalizing pulses turned upside down, then followed by 6 more equalizing pulses, after which the horizontal sync pulses again appear.

There is actually no 60 cycle signal present in this waveform as shown, since the frequency of the equalizing pulses and the pulses used in the vertical sync pulse interval is 31,500 cps.

However, this sequence occurs every 1/60 of a second. The integrator, located in the plate circuit of the vertical buffer, will derive a 60 cycle positive pulse from this composite sync. This positive pulse will be used to synchronize the Vertical Saw Generator.

2.6 VERTICAL BUFFER

The purpose of the vertical buffer stage V220A is to amplify the composite sync signal fed to it from the Sync Clipper V217. In the plate circuit of the vertical buffer is a circuit consisting of R304, C271, R305, and C272. This circuit is called an integrator and its purpose is to derive a single 60 cycle pulse from the sequence of pulses that occurs at the end of a field. The action of this circuit is readily seen by the waveforms observed and presented in the Service Section of this manual.

2.7 VERTICAL SAW GENERATOR

The Vertical Saw Generator utilizes one half of a 6SN7 identified as V220-B. This blocking tube oscillator circuit is non-conducting during the time corresponding to the vertical trace and conducting heavily during the vertical retrace time.

The free running frequency of this circuit is controlled by C273, R307 and the vertical hold control R308. Normally, the free running frequency is adjusted lower than 60 cycles. This permits proper synchronization when the vertical sync pulse from the integrator circuit is inserted.

During the period corresponding to the vertical trace time when V220-B is non-conducting, capacitor C275 located in the plate circuit is charged through resistors R309, R310 and R311 to form the vertical sawtooth voltage. When V220-B conducts heavily, capacitor C275 discharges through the plate cathode circuit of V220-B and R311. The heavy discharge current flowing through R311 develops a negative spike across this resistor.

The waveform produced by this action in the plate circuit of V220-B is ideal for use in the vertical deflection circuit. As will be seen in the Service Section of this manual, it consists of a sawtooth voltage during the trace time and a negative pulse during the retrace time.

2.8 VERTICAL DEFLECTION AMPLIFIER

This voltage is applied to the grid circuit of the vertical deflection amplifier V221, a 6SN7 with both halves in parallel. In this stage the sweep signal is amplified and inverted in polarity.

Transformer T202 matches the impedance of the deflection yoke coils to the tube to obtain maximum transfer of energy. Since this is essentially an output transformer, high current and low voltage are desirable in the secondary. For this reason the voltage on the secondary is much lower than that on the primary.

2.9 HORIZONTAL SAW FORMING CIRCUITS

The horizontal saw voltage is developed by the joint operation of the horizontal oscillator V219 and the horizontal saw maker stage V401-A (located on the power supply chassis.)

The horizontal oscillator is a continuous wave oscillator operating at a frequency of 15,750 cycles per second. The circuit used is an electron coupled oscillator, wherein the cathode, control grid and screen grid (acting as the plate) form the triode oscillator. The circuit is essentially a Hartley Oscillator, with the free running (not synchronized) frequency determined primarily by the constants of the transformer Z205. (Synchronization will be discussed later.)

The Oscillator voltage developed in the grid circuit is of sufficient amplitude to overdrive this tube. The waveform of the signal that appears at the plate of the 6K6 approaches that of a square wave.

This signal is fed through a cable to the Flyback Power Supply Chassis. The waveform of this voltage undergoes a complete change as it is passed through a differentiator circuit consisting of capacitor C401 and resistor R401. (See WAVEFORM OBSERVATIONS in Service Section).

The differentiator circuit output consists of positive and negative pulses. A bias voltage at the grid of the horizontal saw maker is developed by grid rectification of these pulses.

This bias is sufficient to keep the tube operating beyond cut-off during the time corresponding to the horizontal trace.

This allows capacitor C413 located in the plate circuit of V401A to charge through resistors R403, R404 and R405.

The positive pulses from the differentiator overcome the cut-off bias and cause the tube to conduct heavily during the retrace time. This allows C413 to discharge rapidly through R404, R405 and the plate cathode circuit of V401A.

Since R404 and R405 are connected between C413 and AC ground the voltage waveform will not only have a sawtooth form, but during the retrace time will consist of a negative pulse. The amplitude of this pulse if determined by the setting of the horizontal drive control.

2.10 HORIZONTAL SYNC CIRCUITS

The method used to synchronize the horizontal oscillator is a form of Automatic Frequency Control.

The Sync circuits utilize a 6AC7 reactance tube and a 6AL5 Sync Discriminator circuit.

The purpose of the sync discriminator is to compare the locally generated 15,750 cps sine wave with the incoming horizontal sync pulses. If the locally generated signal is out of phase with the sync signal from the transmitter, then a DC voltage will be fed to the 6AC7 reactance tube. Upon receipt of this signal, the 6AC7 will act to correct the frequency of the horizontal oscillator.

The 6AC7 reactance tube is connected across the oscillator transformer and will cause the frequency of the horizontal oscillator to change if the DC voltage at its (6AC7) control grid is varied. This is possible because the coupling between the green lead of Z205 and the cathode of V224 consists of a phase shifting network (C286 and R326) that causes an approximate 90° phase difference to exist between the plate voltage and plate current of the 6AC7, thus causing the tube to act like a reactance.

The 15,750 cps sine wave is coupled from the oscillator circuit through transformer Z205 to the two cathodes of the 6AL5 discriminator circuit. With no station being received, the sine wave at each cathode with respect to ground is of equal amplitude but 180° out of phase with each other.

Resistors R296 and R297 are connected between the plates of this tube, and the center point of these resistors is returned to the center tap on transformer Z205. Thus, as each section of the 6AL5 conducts the voltage developed across the above resistors will be of equal amplitude but opposite polarity with respect to ground. Therefore, the DC output voltage of this circuit will be zero. This output is coupled from Pin #7 of V218 through a filter to the grid of the reactance tube V224. As long as no change in the DC is fed to the reactance tube, the frequency of the oscillator will not be affected.

The Sync circuits utilize a 6AC7 reactance tube and a 6AL5 per V217 to the center tap (white lead) of Z205. Applying the signal to the center tap means that the polarity of the pulse at either end of the winding will be the same (in this case it will be negative.)

With the frequency control (top of can) and phase adjustment (bottom of can) properly set (see section on Adjustments) the waveform on pin #1 (V218) will be approximately that seen in Fig. 10 and the voltage on pin #5 (V218) will be approximately that seen in Fig. 11.

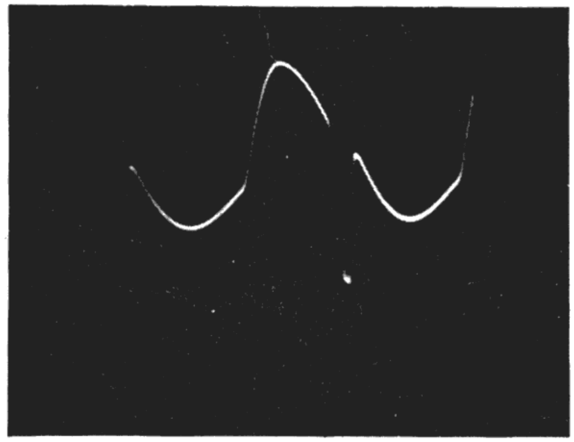

Figure 10

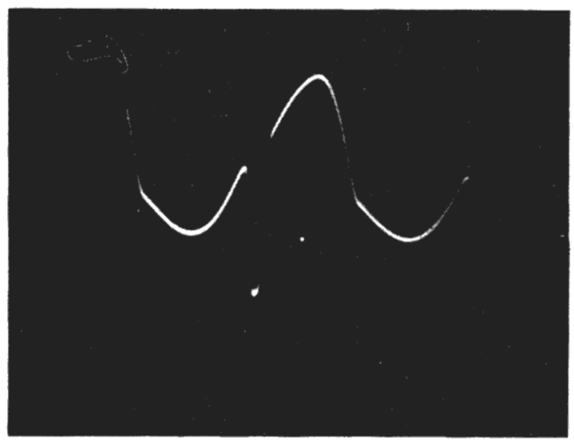

Figure 11

With the signals at the two cathodes as shown, both tubes will still conduct the same amount and the DC voltage variation at pin #7 of V218 will be approximately zero.

However, if the locally generated signal tends to drift out of phase with the sync pulses, then the pulse will change position on the sine wave so that one half of the diode will conduct more than the other. This will develop a DC voltage at Pin #7, the plate of the 6AL5 with respect to ground. This voltage fed to the grid of the 6AC7 will cause the reactance tube to correct the frequency of the horizontal oscillator.

The polarity of the discriminator output voltage depends upon which half of the 6AL5 conducts greatest. This, in turn, is a function of the direction (high or low) that the frequency of the local oscillator drifts.

SIMPLIFIED SCHEMATIC NEGATIVE VOLTAGE SUPPLY
DU MONT MODEL RA-105 TELESET

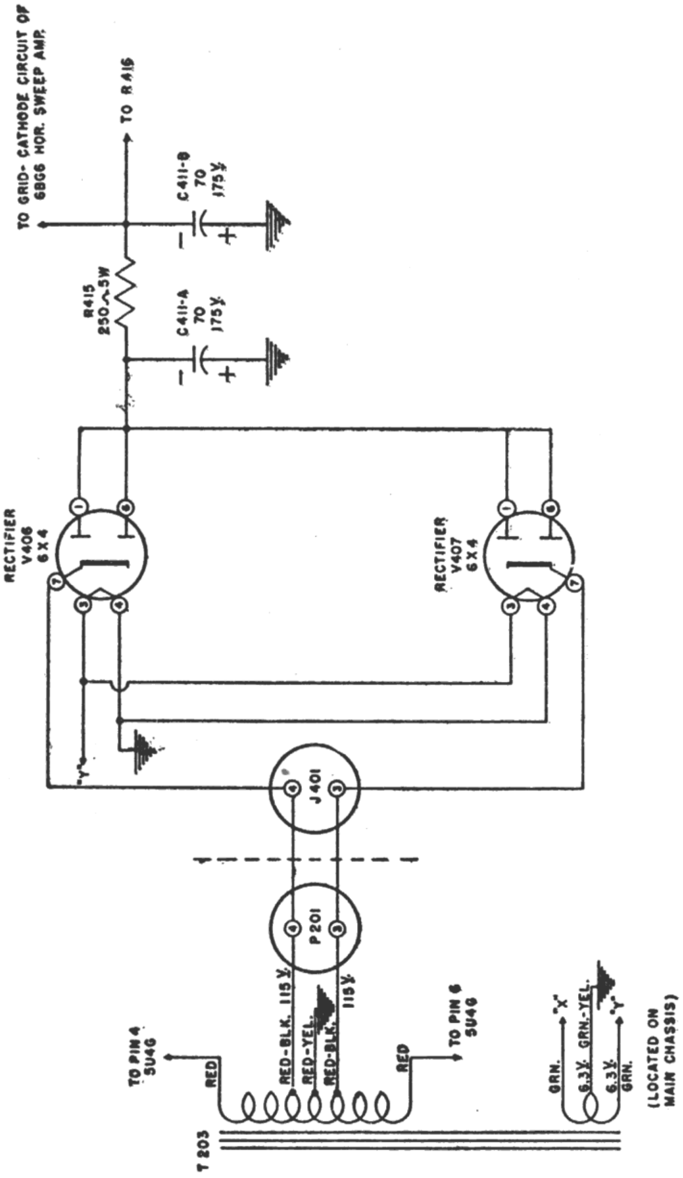

Figure 12.

2.11 HORIZONTAL SWEEP AMPLIFIER

The saw voltage developed in the plate circuit of the horizontal saw maker is coupled to the grid of the horizontal sweep amplifier V402.

The purpose of this stage, utilizing a 6BG6, is to provide sufficient current of the proper waveform to the horizontal deflection coils. This is necessary to scan the CRT horizontally.

The output of this stage is transformer coupled to the horizontal deflection coils. This transformer (T-401) matches the impedance of the deflection coils to the 6BG6, but it is also used in producing the high positive voltage used on the CRT.

A 5V4G rectifier tube is connected across the secondary of T-401 and is used as a damper tube. It is used to dampen any oscillation that may occur during the flyback time. When the tube conducts, it will charge capacitor C409 directly and C408 through L402.

This voltage thus developed and filtered by C408, C409 and L402 is in series with the B+ voltage that is applied to the horizontal saw maker and the horizontal sweep amplifier. This voltage derived from the energy in the output circuit provides additional voltage for the horizontal saw maker and the horizontal sweep amplifier.

Resistor R413 connected across V405 is used to provide good horizontal linearity.

The effect of the width and linearity controls will be covered in the Section on ADJUSTMENTS.

2.12 HIGH VOLTAGE SUPPLY

The means of obtaining the necessary high accelerating voltage for the Teletron is similar to that used in the Du Mont RA-103 Teleset. The circuit is known as the "Flyback" or "Kickback" Power Supply.

The essential difference between this supply and that used in the RA-103 is the fact that this is a voltage doubler supply.

This circuit uses two 1B3-GT/8016 in what may be called a pulsed cascade doubler. The high voltage output is developed across C407 and C410 to ground.

Two separate filament windings are used for these tubes.

The voltage is developed when the magnetic field surrounding the horizontal deflection coil collapses at the end of a scanning line. This causes a positive pulse to appear at the 6BG6 plate which is stepped up by the autotransformer action of the transformer primary. This voltage is rectified by the two 1B3's filtered and then applied to the Teletron. In this doubler circuit the output voltage is approximately 12,000 V. DC.

2.13 NEGATIVE VOLTAGE SUPPLY

A pair of 6X4 miniature rectifier tubes are used in a full wave rectifier circuit. A simplified schematic for this circuit is shown in Fig. 12. The tubes are located on the power supply chassis and the 115V AC is obtained from two taps, off center on the low voltage power transformer located on the main chassis.

The purpose of this circuit is to make available additional voltage to provide a greater horizontal sweep amplitude. This is accomplished by returning the grid-cathode circuit of the horizontal sweep amplifier and horizontal saw maker to this circuit. Since the effective plate voltage is that measured between plate and cathode, this will provide a greater difference in potential between these elements. (On some of the early models, the grid-cathode circuit of the horizontal saw maker is returned to ground instead of to the negative voltage supply.)

2.14 LOW VOLTAGE POWER SUPPLY

The low voltage power supply located on the main chassis utilizes two 5U4G rectifiers in a conventional full wave circuit.

A condenser input filter is used with a single series choke L219.

The 117 volt AC is applied to the primary of the power transformer T203 from the Flyback Power Supply Chassis. The 4 amp. fuse is located on the power supply chassis.

2.15 RELAY CONTROL CIRCUIT

A time delay circuit is used to prevent the application of high surge voltages to the input capacitors C281 and C282 in the low voltage power supply filter.

This circuit consists of relay K201, and the Relay Control tube V401-B, one half of a 12AU7. The relay is located on the Main Chassis whereas the tube is located on Power Supply Chassis.

The 12AU7 section is connected up as a diode. The cathode is returned to the negative voltage supply through resistor R416. A 10 ohm resistor is connected in series with the filament to ground.

The plate of the 12AU7 is wired through the connectors J402 and P202 and the cable between the power supply and Main Chassis to one side of the coil on K201. The other side of this coil goes to ground through the cable between J204 and P604.

The contacts on the relay are located between the filaments of the 5U4G rectifiers and the junction of R318 and C281. Thus, if the contacts are open no voltage is applied to the filter input.

When the set is turned on, these contacts are open as the relay is not energized. The 10 ohm resistor in series with the 12AU7 filament delays the heating of this filament. This allows sufficient time for the filaments of the other tubes in the Teleset to come up to operating temperature. At the end of approximately 15 seconds, the 12AU7 cathode will emit. Since the cathode of the 12AU7 is connected to the negative supply and the plate goes to ground, the tube will conduct.

The current flowing through the relay will energize it, close the contacts and apply the positive voltage to the filter. Since all the tubes in the receiver are warmed up they will draw current, thus reducing the surge voltage applied to the input condensers.

2.16 SOUND IF AMPLIFIERS

The 21.9 Mc Sound IF Signal is fed from the grid circuit of the 2nd video IF stage to Z201 the input transformer to the sound IF strip.

Three stages, using 6AU6's comprise the sound IF strip. The first two stages are straight amplifiers while the third stage functions not only as an amplifier but also as a limiter. Inasmuch as the discriminator circuit used here will detect amplitude variations as well as frequency variations the signal presented to the discriminator should be of constant amplitude. The purpose of the limiter is to clip the signal of any amplitude variation so the signal presented to the discriminator will be of constant amplitude varying only in frequency.

When using the Teleset on FM an AVC voltage is fed back to the grid of the mixer from the grid of V212.

To assist in tuning the receiver a tuning indicator V214 is connected across the output of the discriminator. The audio signal out of the discriminator is applied to the service selector switch.

2.17 AUDIO AMPLIFIER SECTION

The audio amplifier section consists of a 6AT6 (triode section) driving a 6V6. This amplifier section is used for all services. A compensated volume control is located between the service selector switch and the grid of the 1st sound amp. A tone control in the plate circuit of V215 is used.

The output transformer is physically mounted on the frame of the speaker. Do not disconnect the speaker with the set in operation unless the 6V6 output tube is removed.

2.18 AM TUNER

The AM Tuner used in the Colony Teleset is designed for reception of the Standard Broadcast Band only. This is a four stage tuner consisting of a 6BA6 used as an RF amplifier, a 6BE6 converter, a single stage of IF using a 6BA6 and a 6SQ7 used as the second detector and AVC.

A loop antenna is provided with the set but a long wire antenna may be used if so desired, by connecting to the terminal marked A.

All external connections with the exception of the antenna terminate in the plug P501. P501 is plugged into J205 on the Main Chassis. Both filament and B+ Voltages are obtained from the Main Chassis.

The audio output from the second detector, is fed through the interconnecting cable to the service selector switch.

Thus with the selector switch on the AM position, the output of the AM tuner feeds into the audio amplifier located on the Main Chassis.

3.0 INSTALLATION

The serviceman who has been installing and servicing Telesets for the past few years, fully realizes the necessity for good installations.

Many service calls can be attributed to faulty installation. Many of these calls fall into the "nuisance" class, in that the customer was inadequately instructed on how to properly use his Teleset. In these cases, nothing was wrong with the Teleset. The customer just did not understand how to properly use it.

The serviceman should go into such details as to how the record player should be operated (in the case of the Colony). Many servicemen have received the complaint that the record player would not work. Investigation of the complaint disclosed that the Service Selector was not switched to phono.

When instructing the customer, the serviceman should leave nothing to chance.

Before installing a Teleset, in locations where the signal is questionable or known to be weak, a survey should be made to determine if the operation of the Teleset will be satisfactory. Details of making such a survey has been covered in previous Du Mont Service Manuals and reference should be made to these.

One piece of equipment that is essential in making a survey is illustrated in Fig. 13. This Test Set as it is called, is a Du Mont RA-103 chassis mounted in a portable metal cabinet. A front cover (not shown in the photograph) hinges back on the top. When carrying, the cover hinges down in place to prevent damage to the tube and components.

A 0-150 volt AC meter is used to measure the line voltage where the set is installed.

An indication of relative field strength can be observed on the microammeter which is connected in the grid circuit of the video amplifier. Antenna adjustments can be made and their results observed on this meter.

To properly cover the many problems and their solutions encountered in installations would require a manual perhaps larger than this entire Service Manual. However, the serviceman should become familiar with the many types of antennae on the market. He should also become familiar with their capabilities and limitations.

Figure 13

He should read the many articles being published in the trade magazines in an effort to improve his knowledge of installations.

The Radio Amateurs' Handbook is an excellent source of information on antennas. It is practical and the serviceman should have no difficulty in understanding the theories set forth therein.

In addition to the technical requirements for an installation to provide a good picture, the serviceman should also be familiar with the requirements of the National Electrical Code pertaining to installations. It is suggested that the serviceman obtain a copy of the National Electrical Code and become familiar with these requirements.

Before making an installation, the customer should be informed that the installation price he is paying is for a normal installation. In the event that any unusual conditions exist, requiring additional antennae or other devices, the price will of necessity have to be increased. This is important, as in many cases the customer was not informed of this possibility, with the result that considerable ill-feeling was created.

Should you run into any unusual installation problems you cannot handle, get in touch with DuMont for information or assistance.

4.0 SERVICE SECTION

4.1 INTER-CHASSIS CABLING

The inter-chassis cabling of the RA-105 Telesets should present no particular problem to the Serviceman as long as he is careful in handling the plugs during removal from their respective sockets.

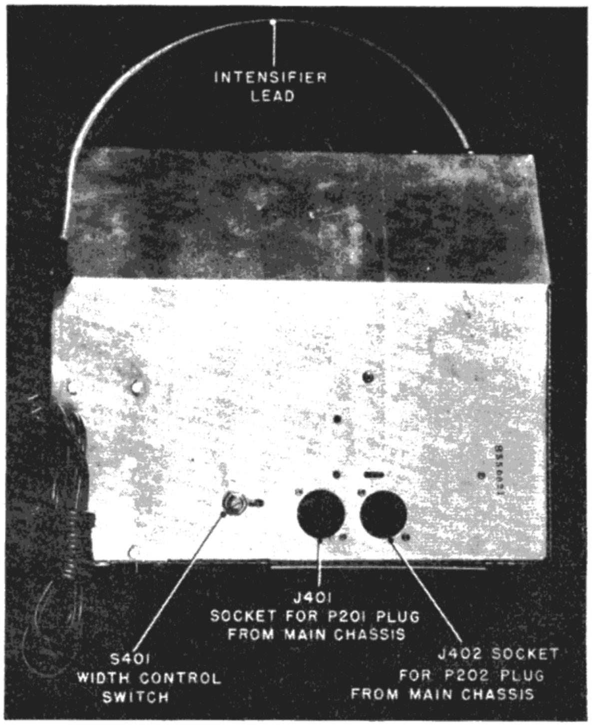

Figure 14. Flyback Power Supply, socket identification.

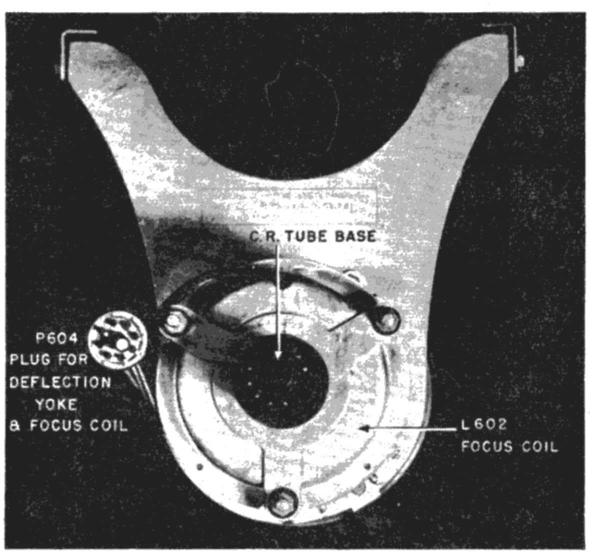

Figure 15. Teletron Assembly Plug and Socket Identification.

To assist in the identification of the plugs and connectors used in this cabling, the following figures are presented. The circuits brought to the pins of these connectors and sockets are designated on the various schematics.

The AM Tuner connectors are not shown here because the AM Tuner socket is specifically identified on the Main Chassis schematic.

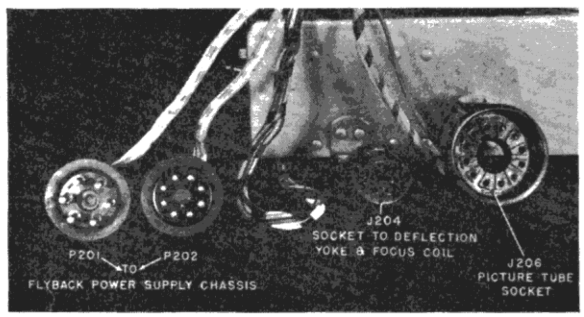

Figure 16. Main Chassis. Plug and socket identification.

4.2 COMPONENT LOCATION

The following illustrations are presented to assist the serviceman in the location of specific components. All the small parts are not identified on these illustrations. In seeking unidentified parts, the serviceman should look for those parts associated wtih the desired components.

Improvements in future production runs may obsolete certain parts. In some cases these improvements may cause the addition of other components. The serviceman should take this into consideration when looking for components.

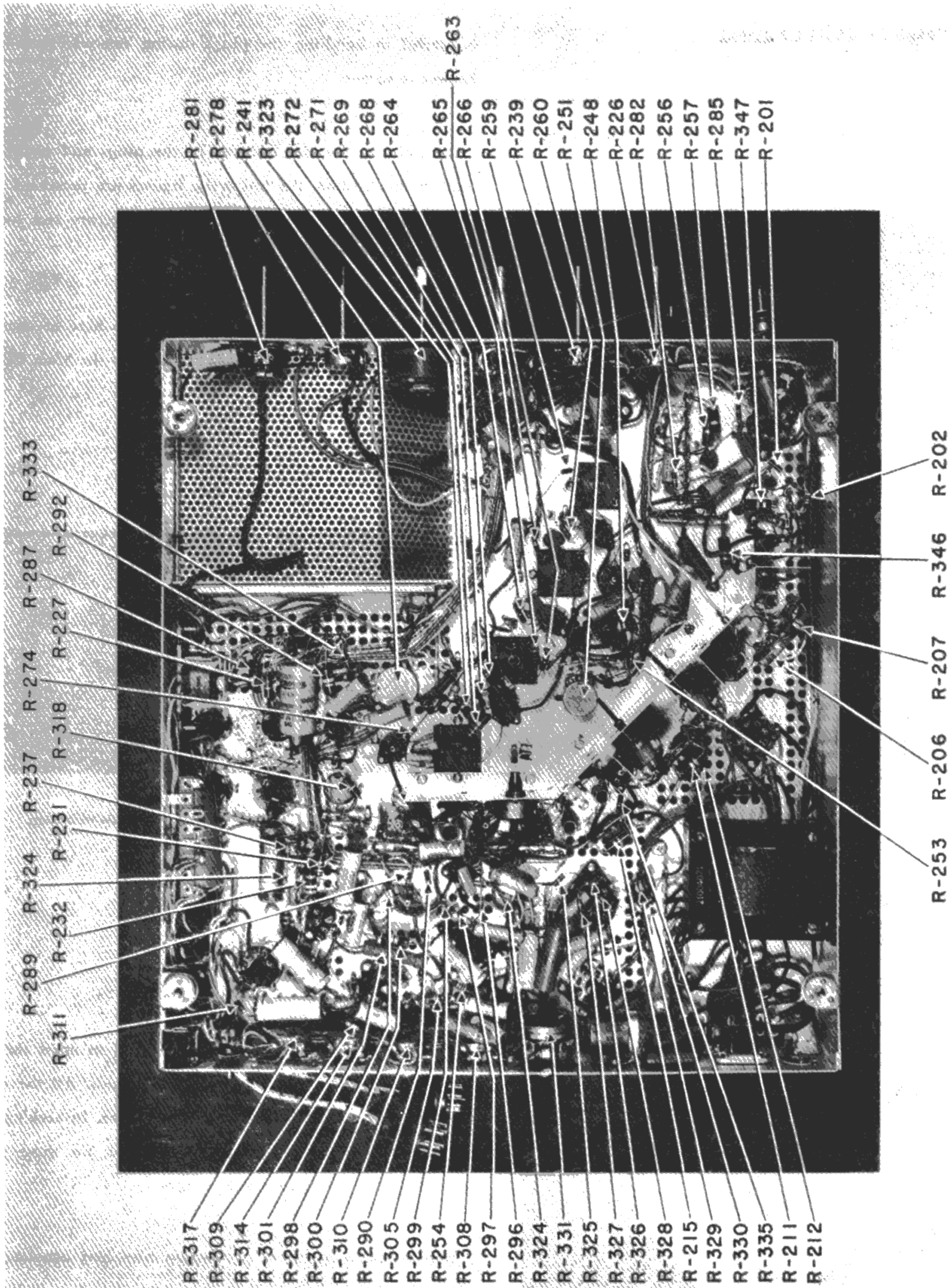

Figure 17. Main Chassis Resistor Location.

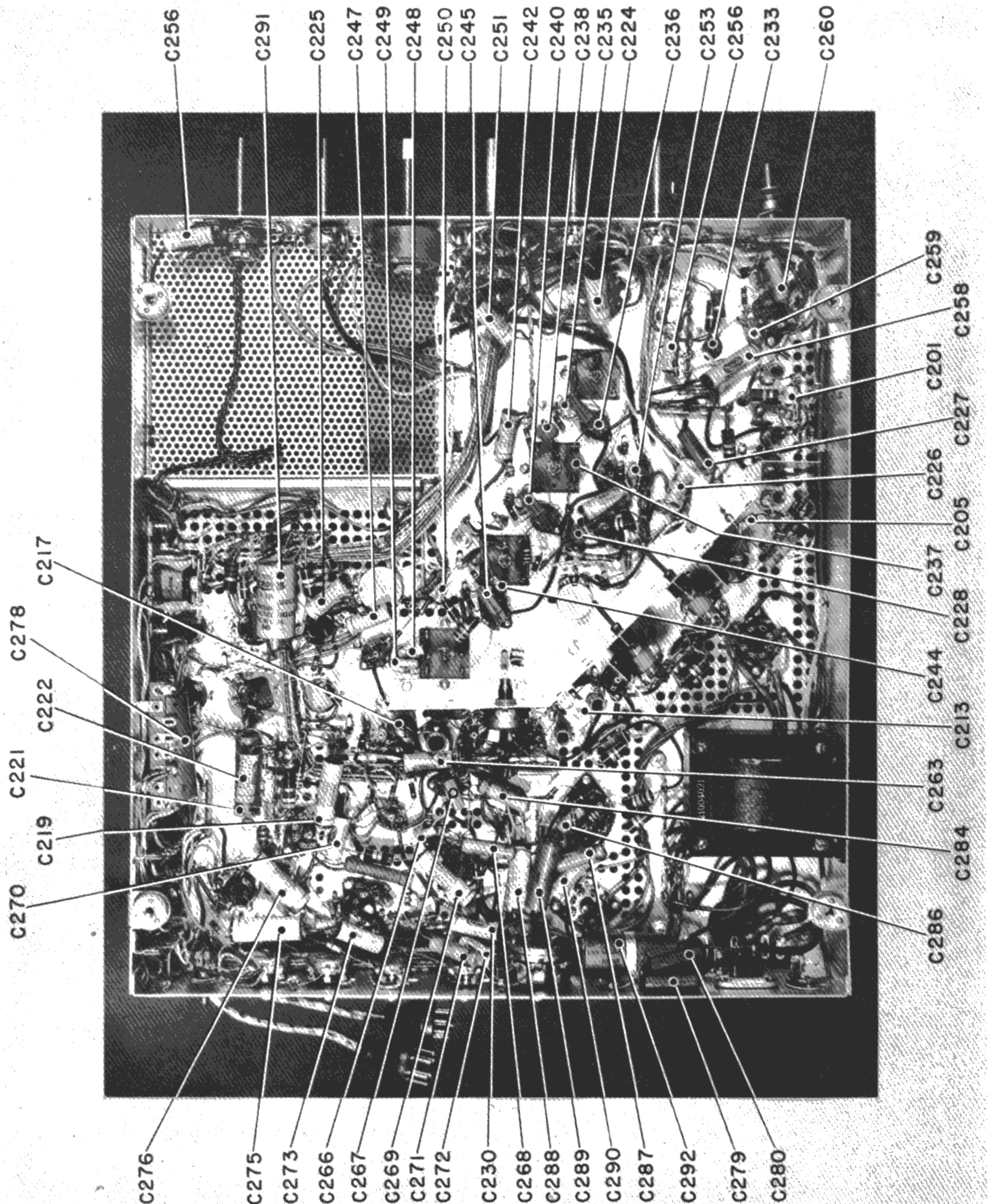

Figure 18. Main Chassis Capacitor Location

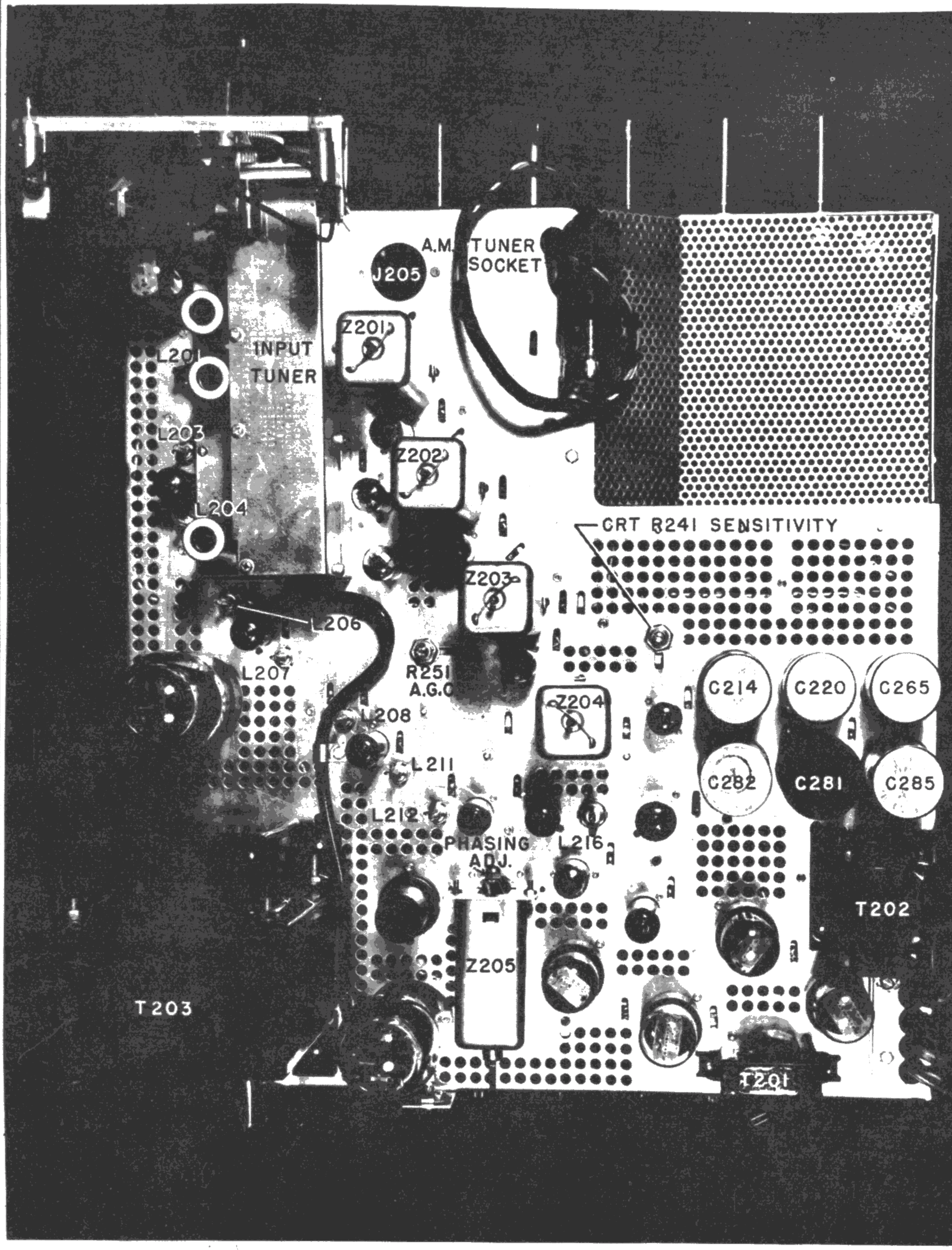

Figure 19. Main Chassis, top view.

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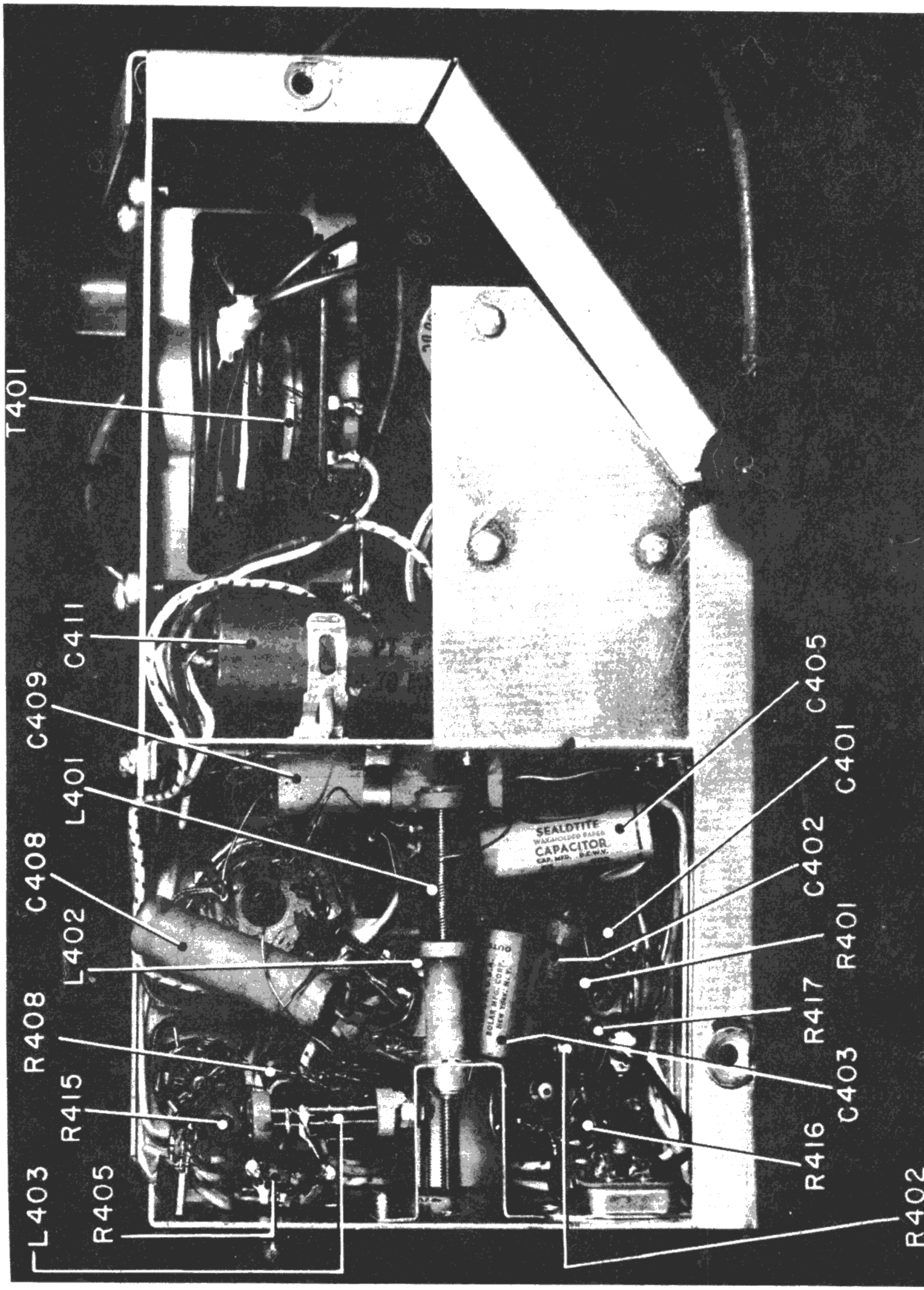


Figure 20. Flyback Power Supply, bottom view.

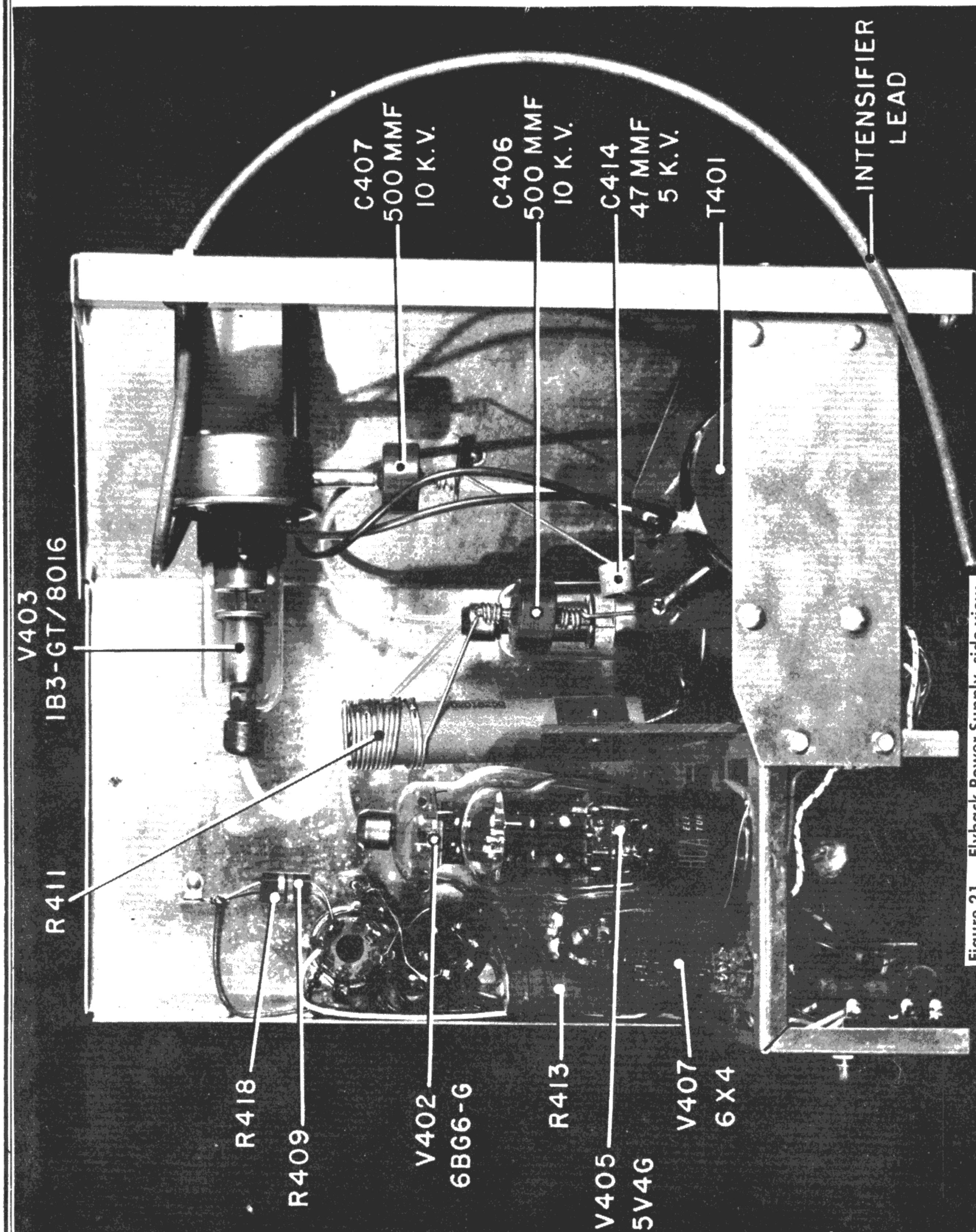


Figure 21. Flyback Power Supply, side view.

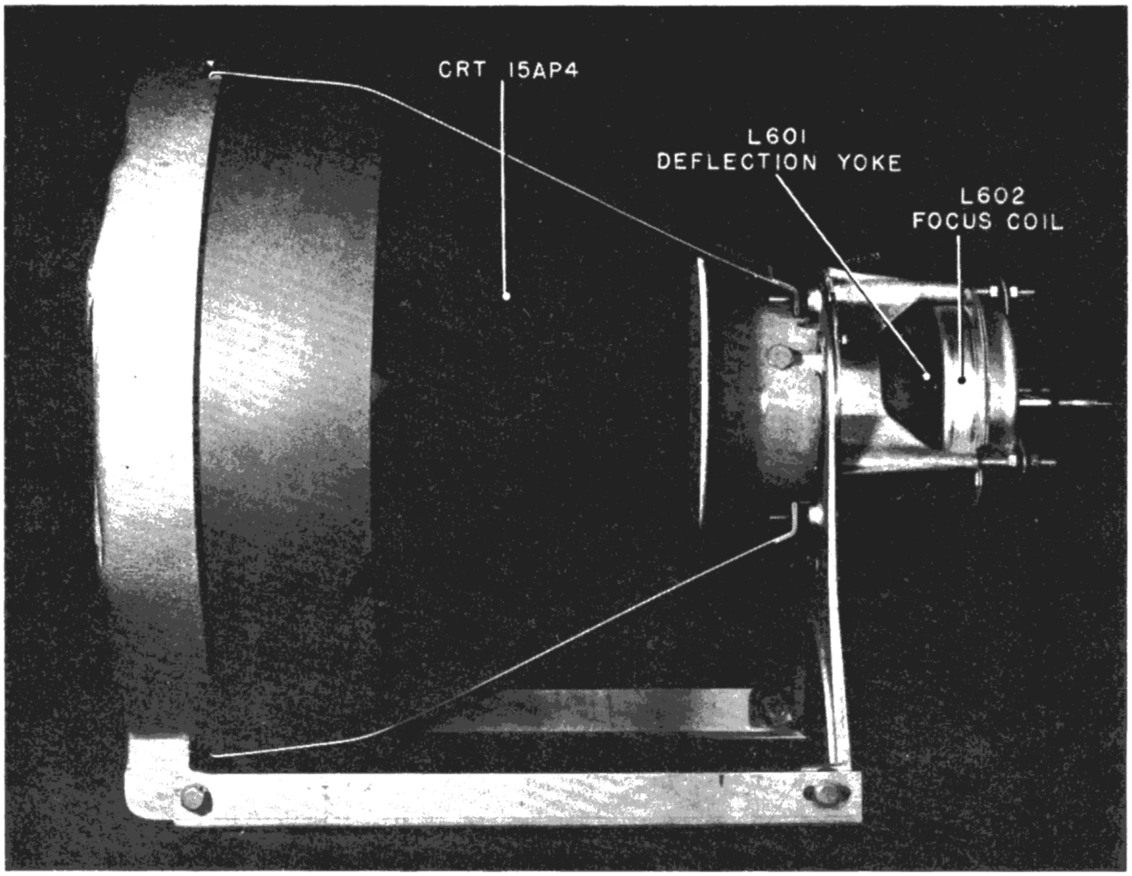


Figure 22. CRT Assembly, side view.

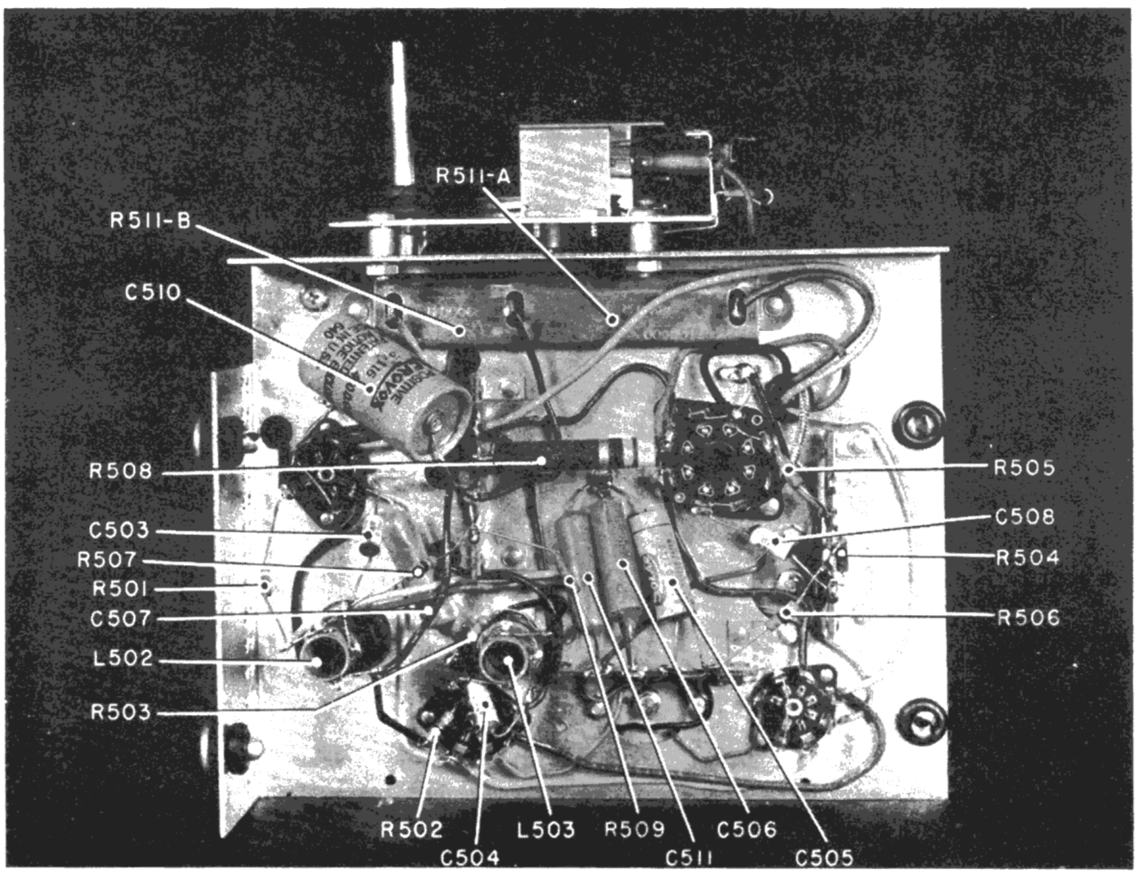


Figure 23. AM Tuner Chassis, bottom view.

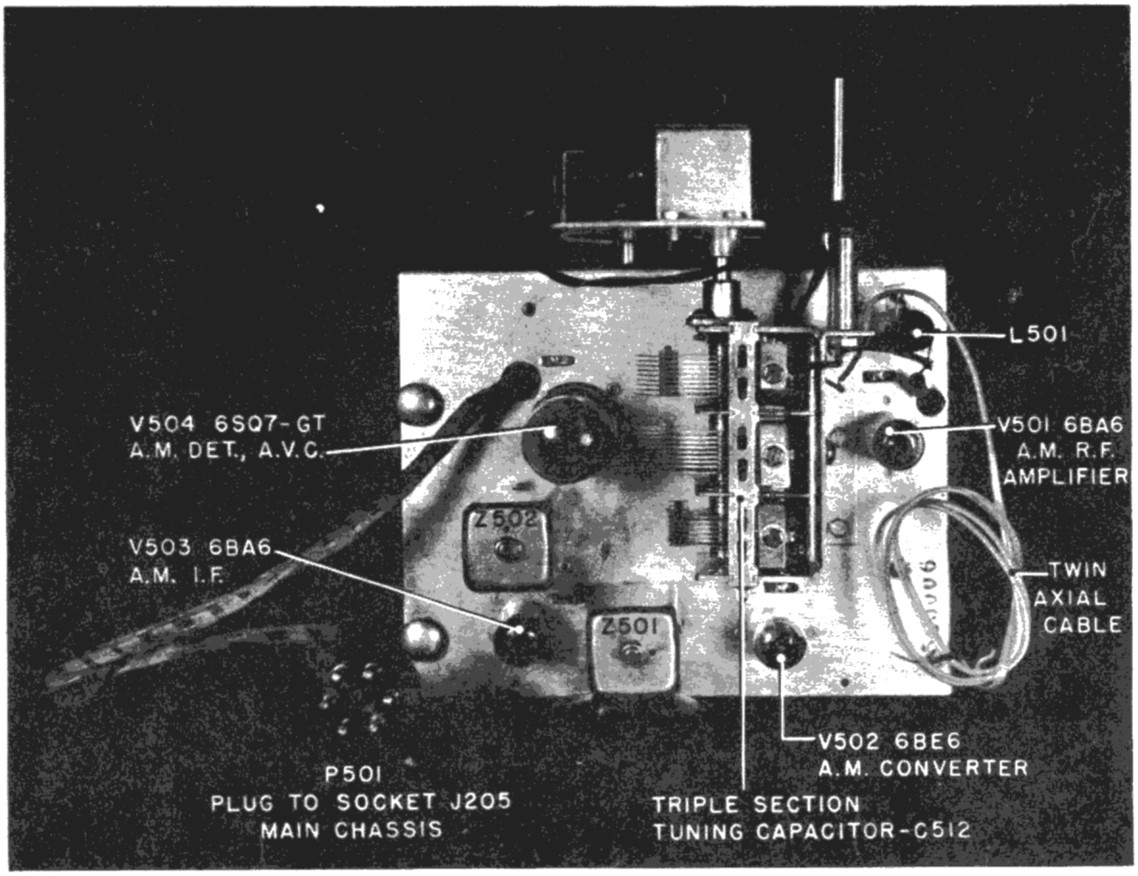


Figure 24. AM Tuner, Top View.

4.3 ADJUSTMENT OF CONTROLS

LOCATION OF CONTROLS

To facilitate locating the various controls on the RA-105 Telesets, these illustrations are presented.

For location of non-operational adjustments on top of Main Chassis, refer to Fig. 19.

For location of the width control switch, refer to Fig. 14.

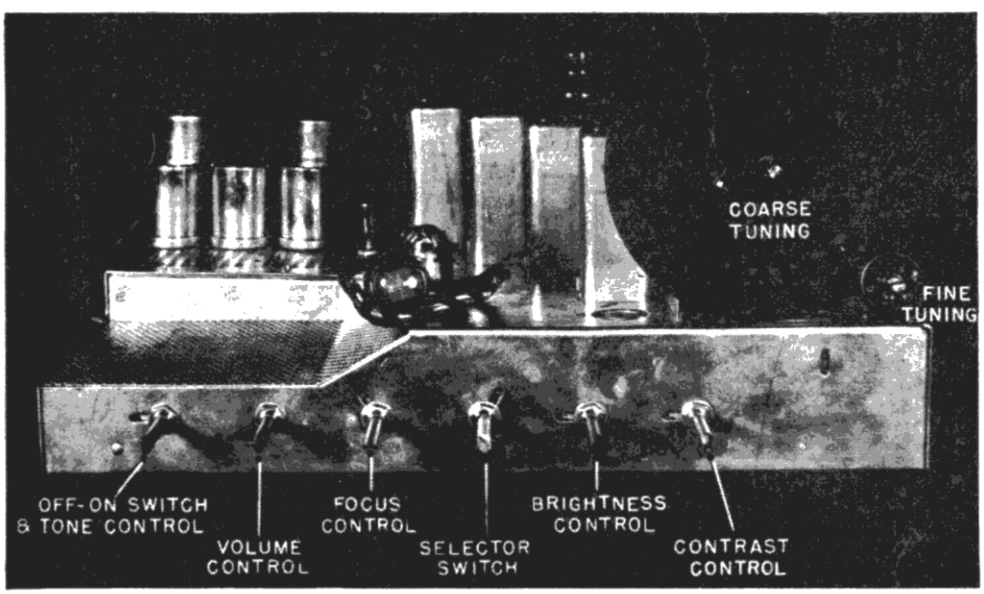


Figure 25. Main Chassis.
Front Panel Operational Controls

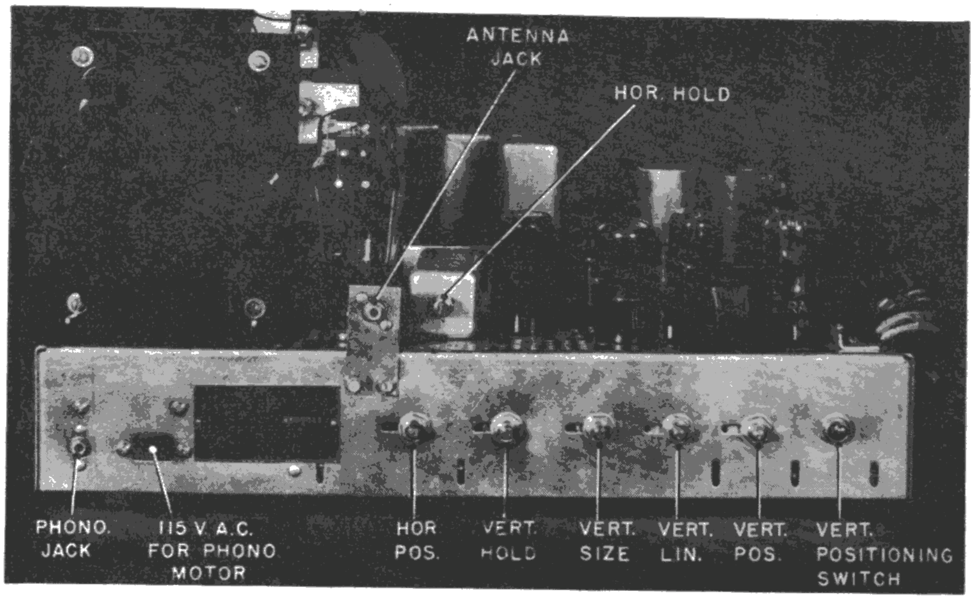


Figure 26. Main Chassis.

Non-operational Controls at rear.

HORIZONTAL CONTROLS

Correct picture width 12¾ *inches.*

Control	*Part*	*Effect*
Horizontal positioning	R331	Positions picture in the horizontal direction.
Horizontal phase	Z205	Adjusts phasing to obtain equal blanking on each side of the picture.
Horizontal frequency	Z205	Adjusts frequency of horizontal Oscillator for proper synchronization.
Horizontal size	L401	Controls the horizontal size of the picture and linearity of the right hand side.
Horizontal size switch	S401	Controls the overall size of the picture (three positions).
Horizontal linearity	L402	Controls the linearity of the center of the picture.
Horizontal drive	R405	Controls the size and linearity of the left side of the picture.

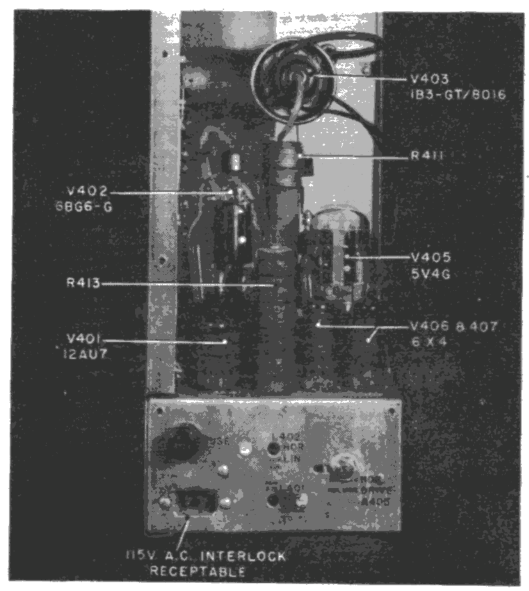


Figure 27. Power Supply Chassis.

PROCEDURES FOR MAKING HORIZONTAL ADJUSTMENTS

Horizontal frequency adjustment

Rotate the horizontal frequency control until the picture falls out of sync. Adjust the control to bring the picture back into sync and note the point at which this occurs. Repeat the above but in direction opposite to that just described. The correct setting is halfway between the two points where the picture falls into sync.

Horizontal phasing adjustment

Reduce the horizontal size until both edges of the picture are in view. Turn up the brightness control and reduce the contrast so that the normally blanked borders of the raster are visible. Adjust the phasing control so that the normally blanked border on one side is equal in width to that on the other side.

Size and Linearity Adjustments

The horizontal size of the picture is controlled by the horizontal size switch S401 plus the horizontal size control. For large changes in size use the horizontal size switch. For small changes in horizontal size use the horizontal size control.

If any non-linearity in the horizontal direction is observed, the horizontal drive and horizontal linearity controls should be readjusted.

VERTICAL CONTROLS

Correct picture height 9½ inches

Control	*Schematic Designation*	*Effect*
Vertical positioning	R317	Positions picture in the vertical direction
Vertical positioning switch	S203	Permits greater vertical positioning of raster.
Vertical hold	R308	Adjusts frequency of Vertical Saw Generator for proper synchronization.
Vertical size	R310	Controls vertical size of picture. Varies the time constant of the saw forming circuit.
Vertical linearity	R314	Spreads out or contracts the top half of the raster. Electrically varies the operating point of the Vertical deflection amplifier by adjusting its bias voltage.

PROCEDURES FOR MAKING VERTICAL ADJUSTMENTS

Proper adjustment of Vertical hold control

Rotate hold control until picture falls out of sync. Adjust control to bring picture back into sync and note point where this occurs. Rotate hold control until picture goes out of sync in direction opposite to that just described. Adjust control and note point where picture falls into sync. Correct setting is between the two points where picture falls into sync.

If any non-linearity in the vertical direction is observed, readjustment of the vertical linearity and vertical size controls will have to be made.

MISCELLANEOUS ADJUSTMENTS

The following control should be adjusted only when Teletron is changed.

Control	*Designation*	*Effect*
CRT Cutoff	R241	Adjusts the correct cut off point of the CRT.

AGC Threshold Adjustment

Control	*Designation*	*Effect*
AGC	R251	Adjusts the bias on the 6AT6 to cut-off.

This control should be readjusted if it becomes necessary to replace the 6AT6 AGC tube.

Procedure for Adjusting

Rotate contrast control completely CCW. Connect DC voltmeter between arm of brightness control and ground. Adjust brightness control until meter reads 45 volts. Adjust R241 the CRT cutoff control until the illumination on screen just disappears.

Procedure for adjustment in the Shop

Disconnect antenna from the Teleset. Connect VTVM across C226 to ground. Rotate R251 completely counter-clockwise. At this setting the meter will read approximately 1 Volt. Rotate control slowly clockwise. It will be noticed that this AGC Voltage will be constant over part of the range of this pot and will, near mid range, begin to increase fairly abruptly. The AGC voltage should be set at the point at which the abrupt increase begins.

Procedure for Adjustment in the Field

Disconnect antenna. Turn up the contrast control fully and adjust the brightness control so that a raster can be seen. Rotate R251 completely counter-clockwise. At this position a considerable amount of "noise" will be visible on the face of the CRT. Rotate the control clockwise slowly. It will be noticed that over a portion of the range, the amount of noise is not affected. This is comparable to the condition in the shop, where over the same range of the control, the meter reading is not affected. As the control is further adjusted, it will be noticed that a point is found when the noise starts to decrease and beyond this point decreases very rapidly. The correct setting for the control is immediately before the point where the affect upon the noise is observed.

4.4 REMOVAL AND REPLACEMENT OF CATHODE RAY TUBE

In the event the Teletron becomes defective, a recommended procedure for the removal and replacement of same is depicted in the following series of illustrations.

Step No. 1. Fig. 28. Remove the back panel by removing the 9 screws. Be careful that the base of the tube is not hit during this step.

Figure 28.

Step No. 2. Fig. 29. Removing the Flyback Power Supply Chassis. Remove the two plugs from the sockets on the Flyback Power Supply. Remove the high voltage lead from the cathode ray tube by grasping the connector between the fingers and gently remove. Do not pull on the high voltage lead. Remove the two cap screws that fasten the Flyback Power Supply to the cabinet. This will free the chassis and it may be removed as shown below by withdrawing to the rear.

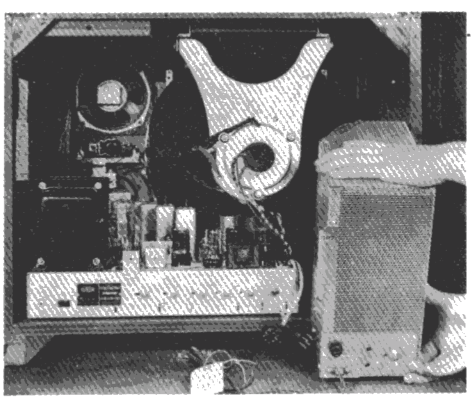


Figure 29.

Step No. 3. Fig. 30. Removing the Main Chassis. Remove all knobs from the front of the cabinet. Disconnect the speaker. Remove the socket from the base of the cathode ray tube. Remove the socket from the deflection yoke plug. Remove the tuning indicator from its clip. Remove the 4 cap screws that fasten the Main Chassis to the cabinet. The chassis may now be removed by raising slightly and withdrawing to the rear.

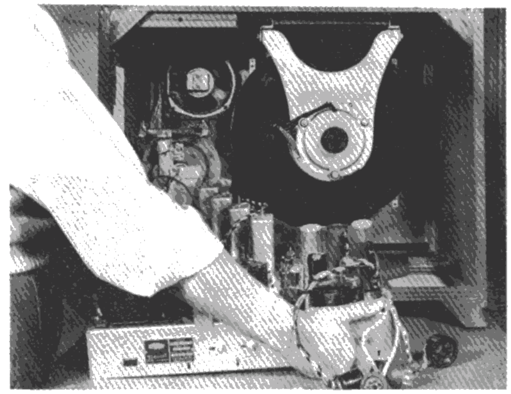


Figure 30.

Step No. 4. Fig. 31. Disengaging the Cathode Ray Tube Assembly from its track. The removal of two phillips-head machine screws will free the assembly from the track and permit the removal of same.

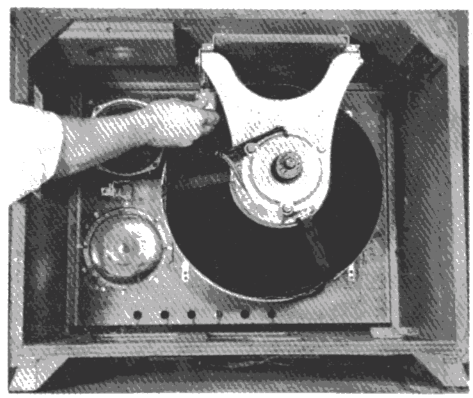


Figure 31.

Step No. 5. Fig. 32. Removal of Cathode Ray Tube Assembly from cabinet. This step should be undertaken by two men. The assembly should be grasped as shown below and carefully removed by sliding to the rear.

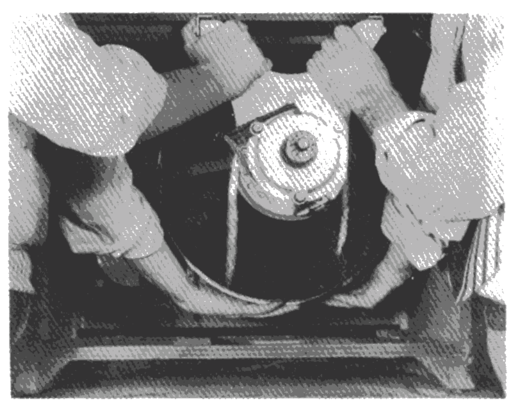


Figure 32.

Step No. 6. Fig. 33. The tube should be placed face down on the work bench. Obviously there should be no tools or other objects under the face of the tube. In this position the face of the tube will not touch the bench as it is supported by the assembly frame.

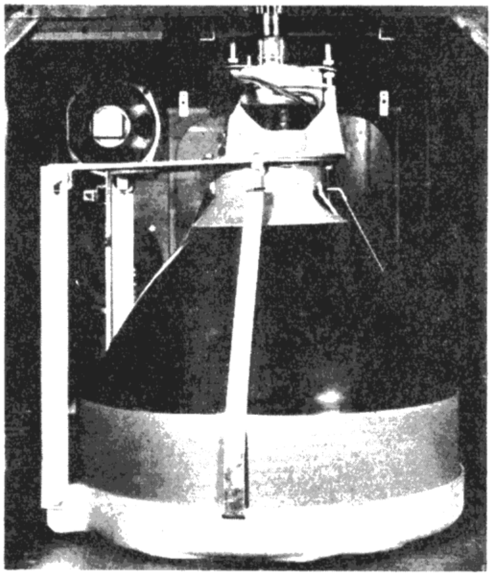


Figure 33

Step No. 7. Fig. 34. Removal of Deflection Yoke and Focus Coil Assembly. This assembly may be removed by removing the three nuts that hold the assembly in place. Care should be taken when removing this assembly that no force is exerted on the neck of the tube.

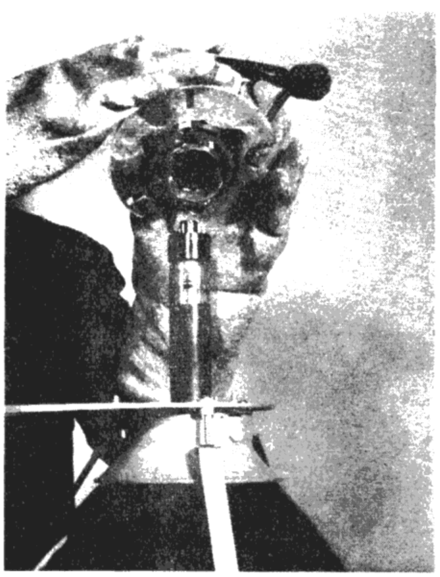


Figure 34

Step No. 8. Remove the assembly to which the Deflection Yoke and Focus Coil Assembly was fastened. This is accomplished by removing the two bolts that fasten this piece to the upright angle irons and disengaging the three side bands by unscrewing the machine screws.

Step No. 9. Fig. 35. Removing the tube. With the help of an assistant, tilt the assembly towards you. The tube should then be tilted in its assembly by pressure from underneath. The tilt should be enough to allow the gloved hands to reach underneath, grasp the face and gently remove the tube.

Figure 35

REPLACING THE C.R.T.

Step No. 1. With the face of the frame on a flat table as in Fig. 35, place the new tube into the assembly. The tube should be so oriented that the high voltage cap is located between the two angle iron rails.

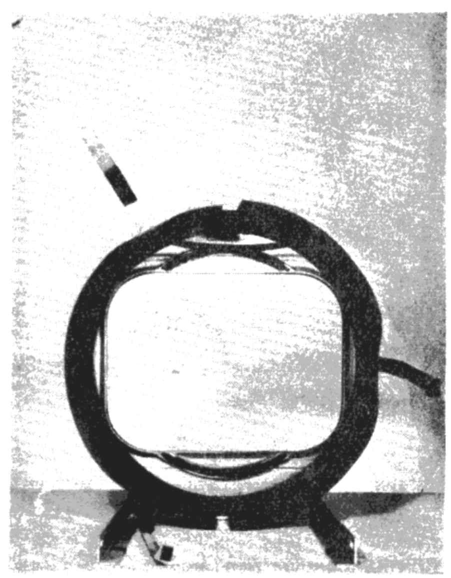


Figure 36. Inside of assembly showing front C.R.T. cushion.

Step No. 2. Fig. 37. Replace the assembly to which the rails and the side clamps were fastened.

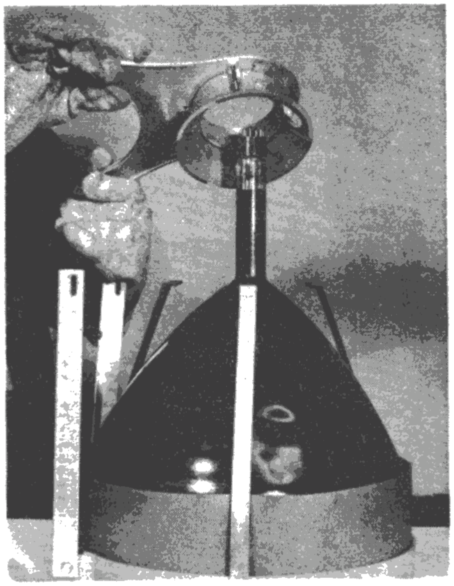


Figure 37.

Step No. 3. Fig. 38. (Note the protective covering around neck of tube.) Using a square as shown in this figure, the angle between the face of the tube and the rails should be 90°. This is important.

The clamps should now be fastened to the piece mentioned in step No. 2 and should be tightened by tightening the machine screws. While tightening these screws, the rails should be maintained at the 90 degree angle with the face. Care should be taken when tightening these clamps that the face of the tube is not forced against the metal front of the assembly.

After the clamps have been tightened evenly and the tube is properly centered in the rear collar, the four rail bolts should be tightened.

Step No. 4. Replacing the Yoke and Focus Assembly. (Orient assembly so the plug is at left when viewed from the rear of the cabinet.)

This step is the reverse of step No. 7 on removal. Care should be taken that the neck is not damaged when this step is made.

The remaining steps are the reverse of those starting with Fig. 5 of the removal procedure.

Figure 38.

CAUTION

When removing or replacing picture tube in owner's home, be sure that only authorized service personnel are present in the room. Serious injury may result from flying glass if CRT should shatter.

Do not leave CRT in any spot where it may fall or be struck.

4.5 WAVEFORM OBSERVATIONS

The trained television serviceman, with the aid of an oscilloscope, can reduce the time necessary to locate trouble in a television receiver by the investigation of questionable circuits and interpreting the wave shapes observed.

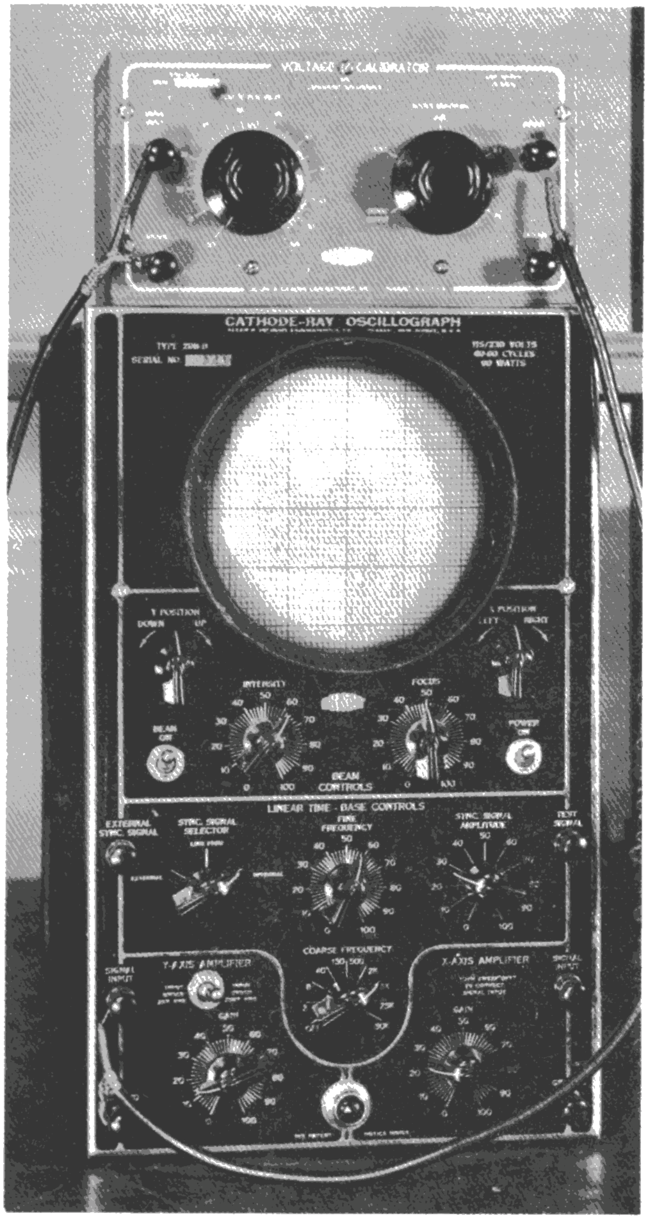


Figure 39. DuMont 208-B Oscillograph and 264-A Voltage Calibrator adjusted for observation of horizontal frequency voltages.

The waveforms presented on these pages were observed at the points indicated and under the conditions described herein.

In observing these waveforms, the receiver was broken down into a number of sections. As will be seen later in the section on Trouble Shooting, this practice is a definite aid in localization of troubles.

The equipment used was a Du Mont 208-B Oscillograph and a Du Mont Type 264-A Voltage Calibrator. The calibrator was used to measure the amplitude of the observed signal. RG-59/U co-axial cable was used for the necessary test leads. This equipment is shown in Fig. 39.

NOTE: *In all cases, the line voltage was adjusted to 117 volts, A.C. All observations were made from the "Point of Observation" to ground.*

Fig. 39, illustrates the correct settings of the sweep frequency controls on the Oscillograph when observing signals whose frequency is 15,750 cps (Horizontal frequency).

Fig. 39A, illustrates the correct settings of the sweep frequency controls on the Oscillograph when observing signals whose frequency is 60 cps (Vertical frequency).

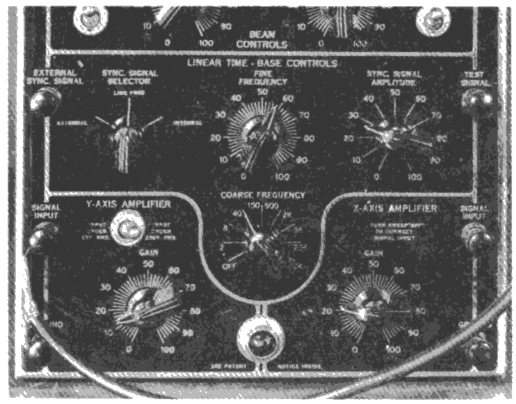


Figure 39A. DuMont 208-B Oscillograph adjusted for vertical or field frequency.

DESCRIPTION OF VIDEO DETECTOR AND AMPLIFIER WAVEFORMS

At each of the figures representing the waveforms observed in the video detector and video amplifier circuits the word "line" or "field" appears.

The word "line" indicates that the waveform shown represents the signal necessary to reproduce the information in a horizontal scanning line as transmitted by the television station. The scanning line constitutes an excursion of the electron beam in the CRT. This excursion starts at the left side of the CRT, progresses at a constant rate until it reaches the right side of the CRT and then rapidly returns to the left side. 525 of these lines are used in completely scanning a scene.

The frequency of occurrence of these "lines" is 15,750 cps. Obviously, for the "line" waveforms, the horizontal settings of the oscilloscope should be used.

The word "field" indicates that the waveform presented represents approximately 262½ scanning lines. The term "field" is sometimes defined as the scanning of half the picture area. To further clarify this definition, consider the picture area to be separated into 525 horizontal lines or strips. The electron beam, starting at the top of the picture, progresses towards the bottom at a 60 cycle rate, but at the same time the horizontal scanning lines at 15,750 cycles per second are being formed. The field represents every other line from top to bottom of the picture.

When observing the waveforms where the word "field" appears, use the vertical settings on the oscilloscope.

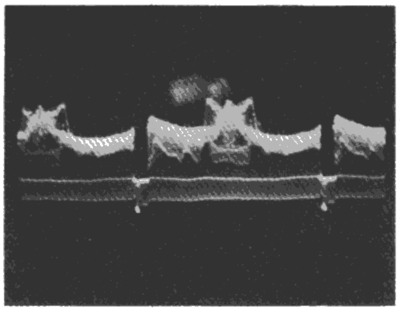


Figure 40
Pin No. 7 V204
(Video detector plate)
(Field) 1.4V p-p.

Fig. 40. The amplitude of this signal is determined by the operation of the AGC Circuit. The amplitude is, therefore, essentially constant for all channels. Since the sync pulses are in a negative direction, the polarity of the signal is black negative.

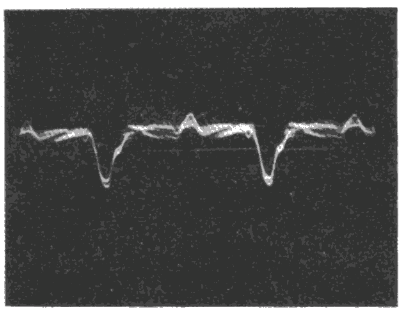


Figure 41
Same point as Fig. 40. (Line)
1.4V p-p.

Fig. 41. The waveform shown here represents a single horizontal line of video information. This oscilloscope does not present a true picture of this waveform. The reason is that the response of the 208-B is quite low compared to what it should be to reproduce the horizontal blanking and sync pulses. A type 241 Du Mont Oscillograph will give a truer reproduction of this signal.

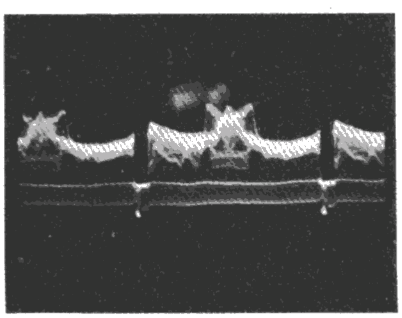


Figure 42
Pin No. 1. V205 (Grid 6AG5
1st video amp.) (Field) IV p-p.

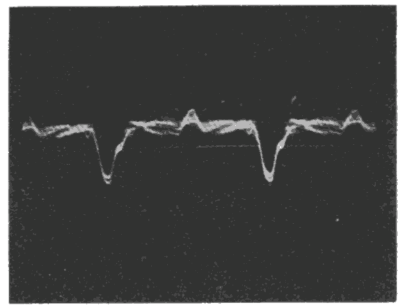


Figure 43
Same point as Fig. 42 (Line)
1V p-p.

Fig. 42 and 43. Note that the waveform has been reduced somewhat in amplitude after passing through the coupling circuit.

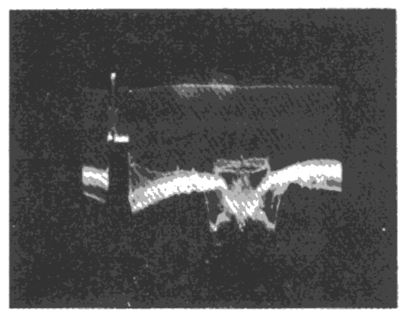


Figure 44
Pin No. 5 V205 (Plate 6AG5
1st video amp.) (Field) 16V p-p.

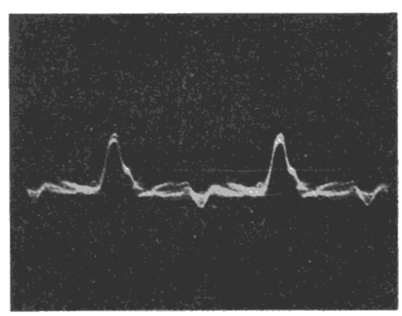


Figure 45
Same point as Fig. 44
(Line) 16V p-p.

Fig. 44 and 45. Notice that the polarity of the signal has been reversed. Since the sync pulses extend in a positive direction, the signal may be referred to as "black positive". The gain of this stage, obtained by dividing the amplitude of this waveform by the amplitude of the signal on the grid, is approximately 16.

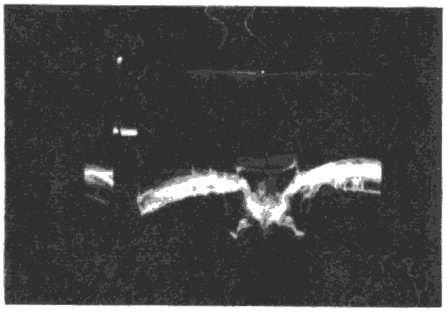


Figure 46
Pin No. 3 V206A (Cathode 2nd video amp. ½12AU7) 10v p-p.

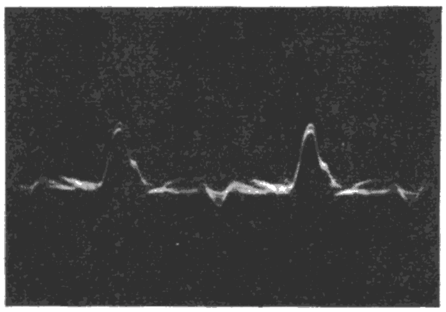


Figure 47
Same point as Fig. 46 (Line)
10V p-p.

Fig. 46 and 47. Note here that the polarity of the signal is still black positive indicating no reversal of polarity through the tube. This condition is true of all Cathode Followers. Note also that a decrease in amplitude occurs. The gain of this stage is, therefore, less than 1. It is approximately .6 in this case.

Figure 48
Pin No. 5 V207
(Grid 3rd video amplifier)
10V p-p.

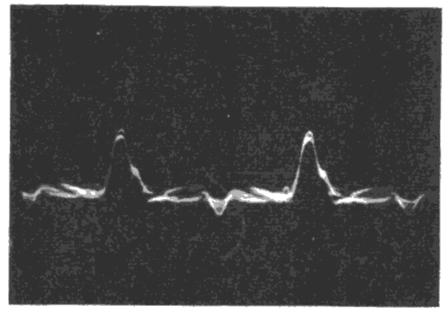


Figure 49
Same point as Fig. 48 (Line)
10V p-p.

Fig. 48 and 49. The amplitude of this signal depends upon the setting of the contrast control. At maximum contrast, the amplitude will be the same as that observed at the cathode of the 2nd video amplifier.

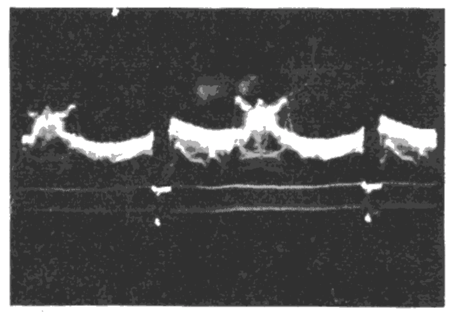


Figure 50
Pin No. 3 V207 (Plate 3rd video amp. 6K6) 47V p-p.

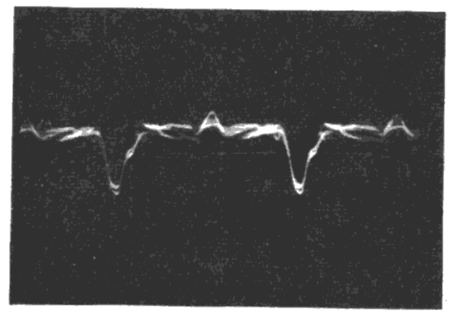


Figure 51
Same point as Fig. 50 (Line)
47V p-p.

Fig. 50 and 51. Again the amplitude depends on the setting of the contrast control. The contrast control is set at maximum for these measurements. Note also the signal is amplified and inverted. The gain of this stage is approximately 5.

NOTE: *At the grid of the CRT the signal is essentially the same as that measured at the plate of the third video amplifier.*

DESCRIPTION OF COMPOSITE SYNC WAVEFORMS

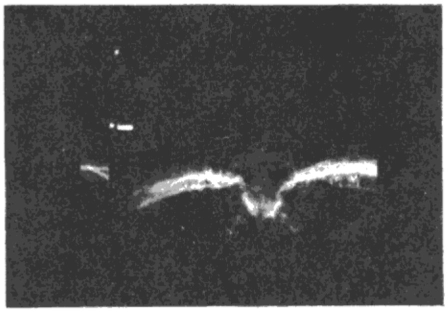


Figure 52
Junction of L215-R223 plate circuit
of V205, 1st video amplifier
(Vertical) 16V p-p.

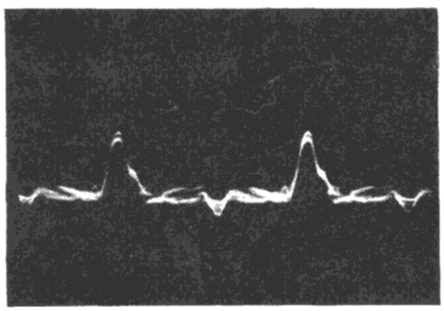


Figure 53
Same point as Fig. 52
(Horizontal) 16V p-p.

Fig. 52 and 53. This signal observed in the plate circuit of the first video amplifier is fed the sync clipper.

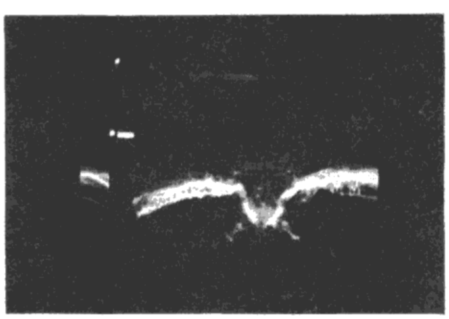


Figure 54
Pin No. 1 217 (Grid sync clipper
6AG5) (Vertical) 12V p-p.

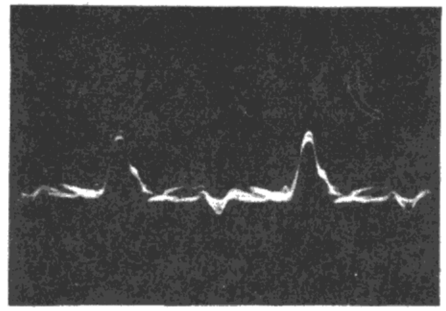


Figure 55
Same point as Fig. 54 (Horizontal)
12V p-p.

Fig. 54 and 55. Note that at this point the amplitude of the signal is slightly decreased because of the drop across R289.

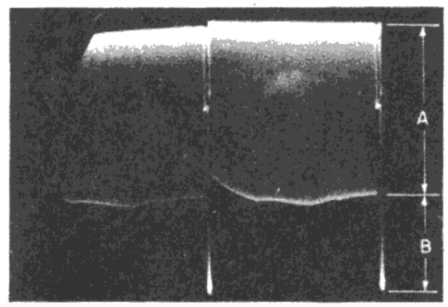


Figure 56
Pin No. 5 V217 (Plate 6AG5
sync clipper) (Vertical)
A—23V B—15V

Fig. 56. The purpose of the Sync Clipper stage is to remove or clip the composite sync from the Video signal. The waveform shown here is the composite sync. This spike that shoots below the horizontal sync portion is composed of pulses that occur during the vertical sync pulse interval.

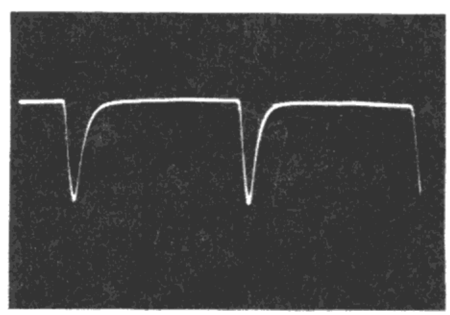


Figure 57
Same point as Fig. 56
(Horizontal) 23V p-p.

Fig. 57. This waveform is that of the horizontal sync pulse. This is part of the composite sync as seen in Fig. 56.

DESCRIPTION OF VERTICAL SYNCHRONIZING WAVEFORMS

The following waveforms were observed in the vertical synchronizing circuits. All observations made in this section using 60 cycle sweep on the oscilloscope.

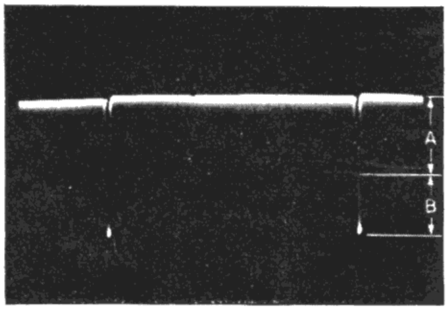


Figure 58
Pin No. 4 V220A.
(Grid 6SN7 vertical buffer)
A—19V B—19V

Fig. 58. This waveform is that of the composite sync again and is essentially the same as was observed at the plate of the sync clipper.

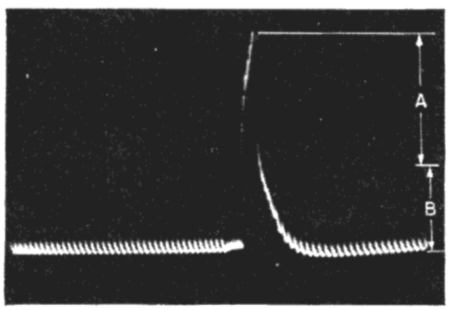


Figure 59
Pin No. 5 V220A. (Plate 6SN7 vertical buffer)
A—55V B—40V

Fig. 59. In order to observe the same amount of detail as seen in the illustration, the horizontal gain control on the scope should be so adjusted as to spread out the waveform. Note how the waveform rises in amplitude during the vertical sync pulse interval.

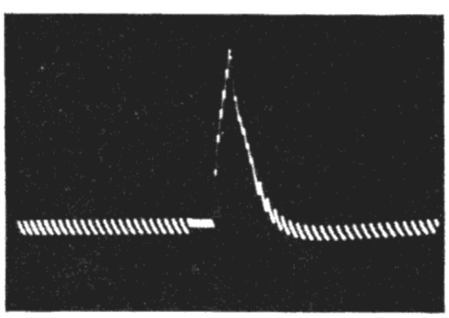


Figure 60
Junction R304-R305 plate circuit of V220A. 55V p-p.

Fig. 60. The circuit consisting of R304, C271, R305, and C272 in the plate circuit of V220A is called an integrator circuit. The purpose of this circuit is to develop a single pulse at 60 cps, for synchronizing the vertical saw generator. This pulse is developed when the sequence of pulses that occur at the end of a field is applied to this circuit. The left-hand side of the pulse (as seen in the diagram) is produced by the charging of C271 through R304. This voltage builds up across C271 only during the Vertical Sync pulse interval. This occurs because the width of the positive portion of the cycle is wider than the negative portion. In the illustration, the stepping up of the voltage across C271 can be readily seen at the left side of the pulse. The waveform of the horizontal signals is such that a small charge is taken on C271 during the positive pulse and then completely discharged during the negative portion. Thus no accumulation of charge takes place during the horizontal or equalizing pulses.

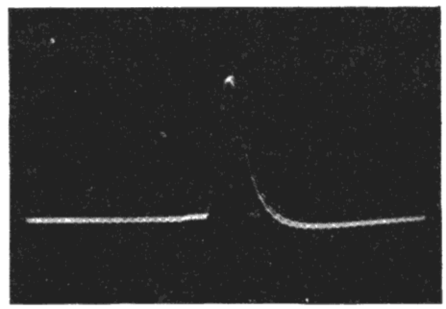


Figure 61
Junction R305-R306 plate circuit of V220A. 35V p-p.

Fig. 61. After passing through the second section of the integrator, the waveform is smoothed out. Notice also that the amplitude has decreased considerably.

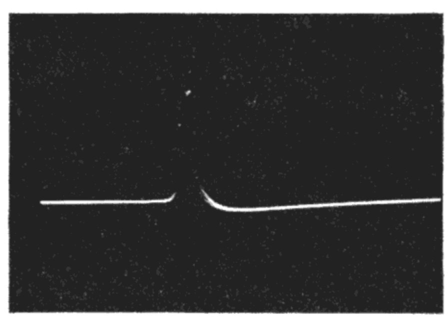


Figure 62
Junction R306 and red lead of T201. 32V p-p.

Fig. 62. The "pip" seen in the leading edge (left side of the pulse) is from the vertical saw generator. Adjusting the vertical hold control will affect its position.

DESCRIPTION OF VERTICAL SWEEP SECTION WAVEFORMS

All observations were made in this section using 60 cycle sweep on the oscilloscope. Controls adjusted for normal size picture 9½ inches high.

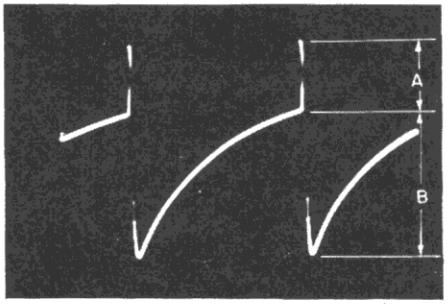


Figure 63
Pin No. 1 V220B (Grid 6SN7 vertical saw generator)
A—24V B—50V

Fig. 63. This waveform is typical of the type that is present in the grid circuit of a blocking oscillator. The curved portion of this waveform is formed by capacitor C273 discharging through R307, and R308 the vertical hold control. The free running frequency of the oscillator is determined by the rate of this discharge. The curve actually represents the instantaneous value of grid voltage. Throughout the time indicated by the slope, the tube is beyond cutoff. When this grid voltage either reduces to a value below cutoff or is driven below cutoff by the sync pulse, the tube goes into oscillation and conducts heavily as indicated by the positive pulse at the end of the slope.

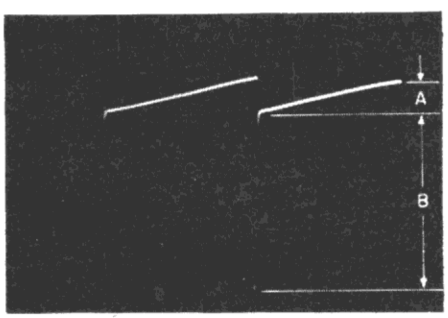


Figure 64
Pin No. 2 V220B (Plate vertical saw generator)
A—10V B—110V

Fig. 64. This waveform represents the signal that is developed in the plate circuit of the vertical saw generator. The saw tooth portion is developed when capacitor C275 is charged through R309, R310 and R311. The capacitor charges when the tube is beyond cutoff. The negative spike occurs when C275 discharges through R311. This discharge occurs when the tube conducts heavily.

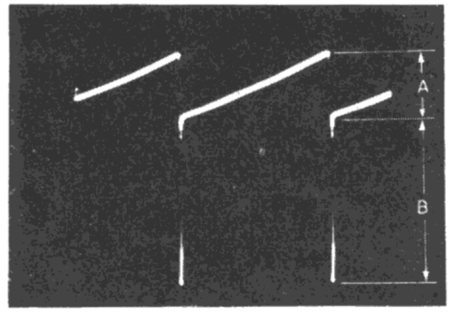


Figure 65
Junction C275, C276, R309.
A—16V B—50V

Fig. 65. Note that the amplitude is apparently reduced to approximately half of the original. The spike is reduced to approximately half the amplitude measured in Fig. 64. The saw portion apparently gains a few volts.

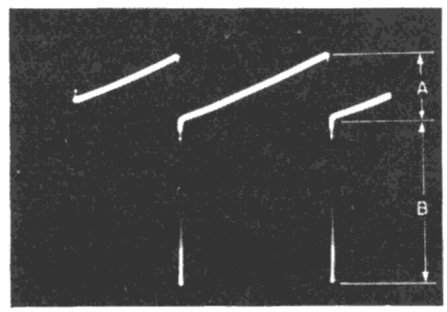


Figure 66
Pin No. 1 V221 (Grid 6SN7 vertical deflection amplifier)
A—16V B—50V

Fig. 66. This waveform is essentially the same as that measured at the junction of C275, C276 and R309. (Fig. 65.)

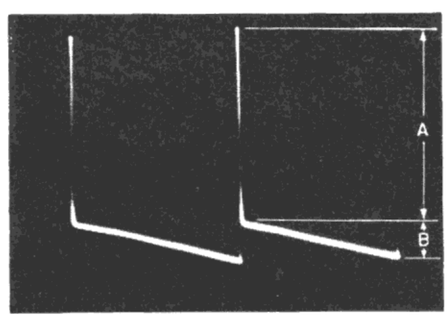


Figure 67
Pin No. 2 (Plate vertical deflection amplifier)
A—830V B—120V

Fig. 67. Note that the amplitude is increased considerably and the signal is inverted in polarity. The gain of this stage is approximately 15.

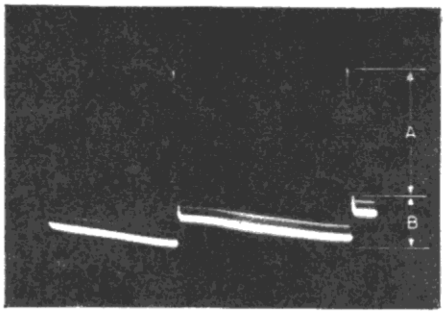


Figure 68
Green lead, secondary of vertical output transformer, T202.
A—60V B—35V

Fig. 68. Note that there is no reversal of polarity through the transformer. The signal has been reduced to approximately 1/10 of the voltage across the primary. The high frequency signals superimposed on the saw portion are from the horizontal circuits.

DESCRIPTION OF HORIZONTAL SWEEP WAVEFORMS

All observations were made in this section using the oscilloscope settings for horizontal frequency. Adjustments set for normal size picture unless otherwise noted. Width of picture is 12¾ inches.

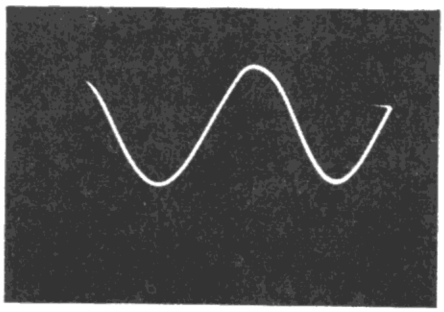


Figure 69
Pin No. 5 V219
(Grid 6K6 horizontal oscillator)
126V p-p.

Fig. 69. This sine wave at a frequency of 15,750 cps is produced by the oscillator.

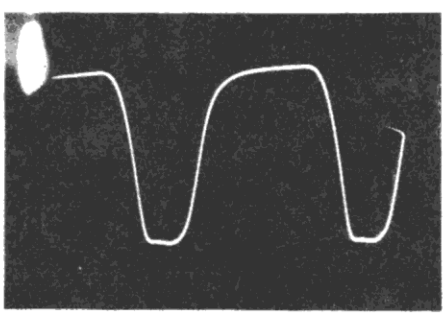


Figure 70
Pin No. 3 V219 (Plate horizontal oscillator) 200V p-p.

Fig. 70. The sine wave developed at the grid overdrives this tube. Therefore, this signal at the plate approaches a square waveform.

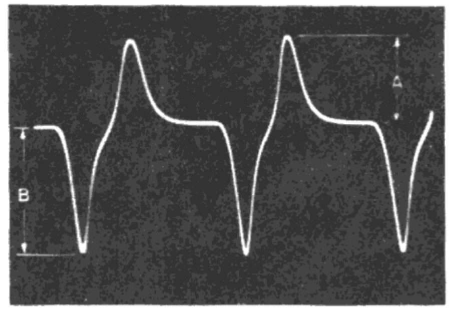


Figure 71
Junction C401, C402, R401.
A—34V B—43V

Fig. 71. R401 and C401 constitute a circuit known as a differentiator. This circuit will produce a signal in its output when a change in the applied voltage occurs. Thus, during the sharp rise and fall of the applied signal, a positive and negative pulse, as shown by this figure, will appear.

HORIZONTAL SWEEP WAVEFORMS

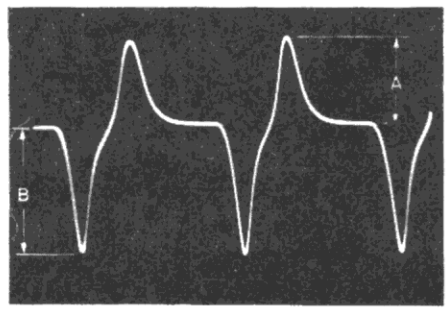


Figure 72
Pin No. 2 V401A (Grid 12AU7 horizontal saw maker)
A—34V B—43V

Fig. 72. This waveform is practically identical to that observed at Fig. 71.

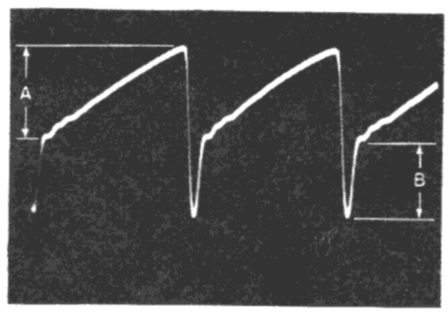


Figure 73
Pin No. 1 V401A (Plate horizontal saw maker)
A—39V B—30V

Fig. 73. This waveform is that of the sawtooth voltage developed by charging capacitor C413 through resistors R403, R404 and R405. The saw is produced when V401A is held beyond cut off and the negative pulse is produced when C413 is discharged through V401A, R404 and R405. This waveform was observed with the drive control adjusted to give a normal size picture.

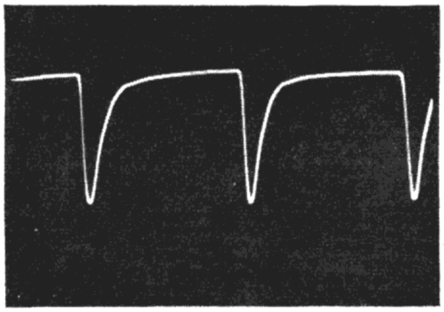


Figure 74
Same point as Fig. 73. Drive control set at maximum counter-clockwise position. 186V p-p.

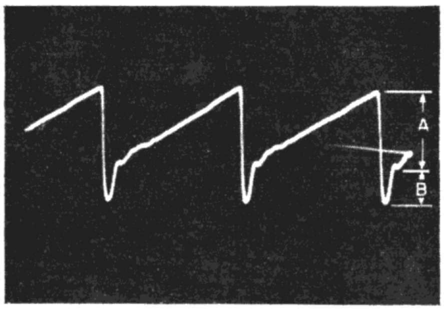


Figure 75
Same point as Fig. 73. Drive control set at maximum clockwise position.
A—35V B—25V

Figs. 74 and 75. These waveforms are shown, to assist the serviceman to determine whether or not the drive control is working properly.

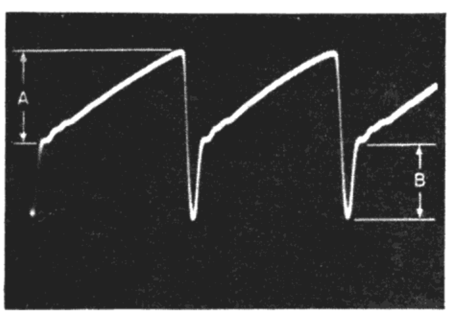


Figure 76
Pin No. 5 V402 (Grid 6BG6 horizontal sweep amplifier)
A—38V B—27

Fig. 76. This waveform is essentially the same as that observed at Fig. 73. The amplitude, however, is slightly lower.

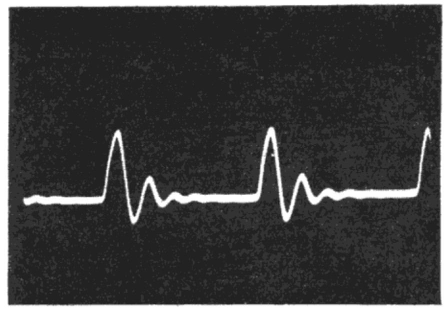


Figure 77
Radiation adjacent to flyback transformer.

Fig. 77. This waveform was observed by holding the oscilloscope lead adjacent to the underside of the flyback transformer. This signal is radiated by the transformer.

DESCRIPTION OF HORIZONTAL SYNC SECTION WAVEFORMS

All observations were made in this section using the oscilloscope settings for horizontal. The circuits will be upset when the measurements are taken. It will be necessary to readjust the frequency and phase controls with the leads attached to obtain these waveforms.

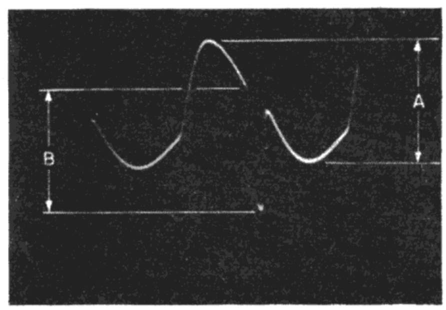


Figure 78
Pin No. 1 V218 (Cathode 6AL5 sync discriminator)
A—5V B—5V

Fig. 78. This signal was observed with the Teleset tuned to a channel. The sync pulse is inserted at the correct point on the sine wave.

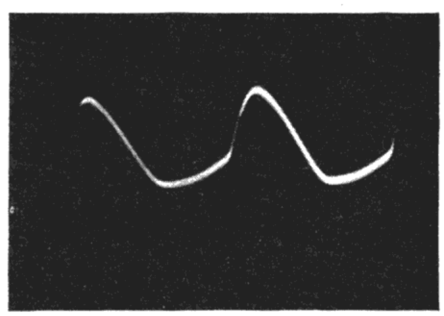


Figure 79
Same point as Fig. 78. Signal observed when not tuned to a channel. 5V—p-p.

Fig. 79. With the Teleset not tuned to a channel only the sine wave from the oscillator will be seen.

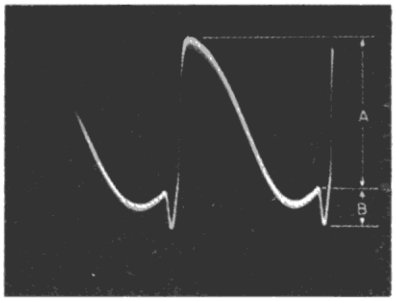


Figure 80
Pin No. 5 V218 (Cathode 6AL5 sync discriminator).
A—5.8V B—2V

Fig. 80. This waveform is similar to that of Fig. 78. However, with the oscilloscope leads attached, it is difficult to adjust the controls to obtain the desired pattern. Note also that the pulse is located on the slope of the sine wave opposite that of Fig. 78.

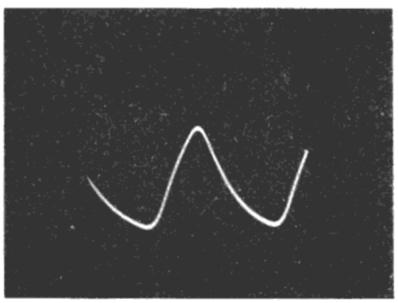


Figure 81
Same point as Fig. 80. Signal observed when not tuned to a channel. 5V—p-p.

Fig. 81. This waveform is similar to that of Fig. 79. However, the sine wave at this point is 180 degrees out of phase with the sine wave seen at Fig. 79 with respect to ground.

4.6 TROUBLE SHOOTING

INTRODUCTION

The serviceman should encounter no particular difficulty in servicing the RA-105 Teleset. Accurate design, in conjunction with the use of high grade components, operated well within their ratings, insures minimum trouble from this Teleset.

To properly service this Teleset, the serviceman should have certain essentials with which to work. These essentials include:

1. A knowledge of television receiver circuits and television fundamentals in general.
2. Adequate test equipment and tools.
3. The Service Manual for the RA-105.
4. Adequate spare tubes and spare parts.

It is assumed that the serviceman already has the necessary knowledge. It is to be expected, at the present state of the art, that he is improving in skills and techniques as time goes on.

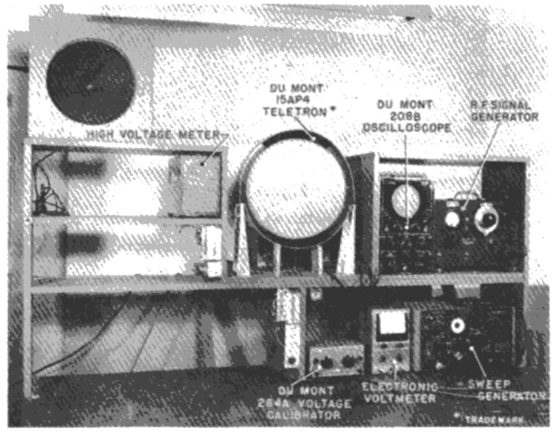


Figure 82.

TEST EQUIPMENT

As to test equipment, Fig. 82 illustrates a test bench with a set of test equipment that is being used to service the RA-101 and the RA-105 Telesets.

The 15-inch tube is permanently mounted, making it unnecessary to remove the tube from the cabinet of the defective Teleset. Special extension cables are used so the various interchassis connections can be made.

The test equipment shown represents an optimum selection that is needed for servicing.

The equipment and their uses follow:

DU MONT 208 B OSCILLOGRAPH

Very helpful in localizing troubles to a definite stage once the section in which the trouble exists has been determined. It is also necessary for visual alignment of the IF stages.

Although not designed for the observation of high frequency signals, it is very good as an all round oscillograph. Most of the type troubles that could occur can be located by the use of this instrument. If, however, an oscillograph that can reproduce a more accurate version of the high frequency pulses is desired, the Du Mont type 224 (3" tube) or 241 (5" tube) are excellent.

DU MONT 264A VOLTAGE CALIBRATOR

Since the amplitude of the waveform under observation is very important, this calibrator is needed with the oscillograph for such measurements.

RF SIGNAL GENERATOR

This generator serves two purposes. It can be used to determine stage gains of the video or sound IF strips or the front end of the receiver. It is also used as a marker generator with the sweep generator when aligning the teleset.

SWEEP GENERATOR

This generator is used in the alignment of the Teleset.

ELECTRONIC VOLTMETER

A very important item in making voltage and resistance measurements. Especially valuable in making voltage measurements in high impedance circuits.

HIGH VOLTAGE METER

Used for measuring the high voltage that is applied to the accelerating anode of the CRT.

SERVICING PROCEDURE

To establish a procedure for servicing the RA-105 Teleset, the receiver has been broken down into a number of sections. This breakdown has been performed on the detailed block diagram located in the pocket on the inside back cover of this manual. The sections are as follows:

1. Picture and sound section.
2. Sound IF section.
3. Audio section.
4. Picture and sync section.
5. Picture section.
6. Composite sync section.
7. Vertical sync section.
8. Horizontal sync section.
9. Vertical saw section.
10. Horizontal sweep and high voltage section.
11. Low voltage power supply section.

The method of using this block diagram for localizing troubles is described on the diagram proper.

A logical procedure that may be followed in servicing this Teleset follows:

1. Observe all indications of faulty operation.
2. Based on the observations made in step No. 1, the trouble should be localized to one of the sections previously noted.
3. The trouble should be further localized to the defective stage by means of signal tracing with an oscilloscope. (See Waveform Observation Section.)
4. Once the trouble has been localized to a definite stage, replace the tube with a tube that has been working in the same type circuit.
5. If the trouble is not remedied by step No. 4, then voltage and resistance measurements should be made in order to locate the defective part.
6. If step No. 5 does not reveal any discrepancy, a defective component, whose type of defect will not noticeably affect the voltage and resistance readings should be looked for. For example, an open by-pass condenser or a coil with shorted turns.

In following step No. 3 as noted above, considerable care should be taken when observing waveforms. Not only should the waveshape be noted, but the peak to peak amplitude should be measured. This is where a calibrator is needed.

The importance of waveform measurements in a TV receiver cannot be overemphasized. The serviceman should study the use of his oscilloscope in order that he can obtain the maximum possible results from its application.

Occasionally a receiver may come into the shop with the complaint that the picture quality is poor. It may be that the high frequency response is poor, as indicated by poor reproduction of the wedges on the test pattern.

One of the first things that most servicemen would try is to align the receiver. Before attempting alignment, the serviceman should carefully check the receiver to be certain that misalignment is the cause of the defect.

One quick way to check the alignment is to examine the overall response of the video IF strip. This can be accomplished by feeding a sweep generator signal into the mixer and observing the response with an oscilloscope at the output of the detector. The observed response should be compared to that recommended by the manufacturer. (See alignment section).

Obviously any great deviation from the observed response will indicate the need for alignment.

If the response is satisfactory, then the peaking coils in the video amplifier section should be investigated.

If the above mentioned items check OK, then the response of the front end of the receiver should be investigated.

RECORDS

One practice that is followed by some shops, and which is recommended for general use, is the recording of various troubles encountered in specific receivers.

This practice could be readily applied to the RA-105 Teleset. For example, a chart could be made up to cover all troubles found in the RA-105. This chart could include several headings as follows:

Indications	*Defective Section*	*Defective Part*	*Frequency of Occurrence*

Following is an example of the recording of information for a certain trouble.

Indications	*Defective Section*	*Defective Part*	*Frequency of Occurrence*
Picture rolls Vertically	Vertical Synch	Open Cathode Resistor R303	1 (7/11)

Information of this type is a definite help to a new man as he can refer to the chart and in many cases will locate the trouble in a much faster time than if he completely checked the receiver.

This information compiled over a period of time will also be of help to the manufacturer. Inasmuch as many receivers use the same type circuits, a defect in one receiver can give the same indications if it occurs in another receiver.

REPLACEMENT OF PARTS

The serviceman should understand that lead placement is very important in high frequency circuits. Thus, during the replacement of defective parts, the wiring should always be returned to its original layout. Any replaced parts should also be placed in the same physical location and orientation as the original.

TROUBLE SHOOTING PROCEDURES

Following is a list of procedures that can be followed in locating trouble in the Teleset.

It should be understood that only one trouble is assumed to be happening at a time. Thus, under the heading "Indications", only the indication presented describes the fault. For example, if the statement reads "Picture but no Sound", it is to be assumed that everything else is working OK.

At a later date, a chart listing specific troubles and their cause and remedy will be prepared. This will be accomplished as soon as sufficient information is gathered from the field. These charts will be available to all authorized Du Mont Dealers and Service Organizations. Any contributions of information of this type will be definitely appreciated.

1. PICTURE AND SOUND SECTION

INDICATIONS	PROCEDURE
1. No picture and no sound, or weak picture and low sound output.	1. Check installation. 2. Replace tubes. 3. Use R. F. generator and signal trace these circuits. 4. Take voltage and resistance readings.
2. Picture and sound fades out, retuning receiver brings them back in.	Replace C114 in the Inputuner. Be sure to replace with a type N-030 as specified on the schematic diagram.
3. Picture jumps as the Teleset is tuned. Sound is noisy at the same time.	The inductuner (adjustable coils) requires cleaning. Procedure for cleaning follows: 1. Remove the Inductuner cover in a clean, dust free location. 2. Using a small soft brush, clean the wire, end rings and bottom track of all three coils. 3. Lubricate the wire, end rings and bottom track of all three coils with Lubriplate type 105. Use the Lubriplate sparingly. 4. Rotate the Inductuner completely through its range several times to insure a smooth film of lubricant over all the contact surfaces. 5. Replace cover and tighten screws. CAUTION: *No lubrication other than Lubriplate type 105 should be used.*

Note

If you should run into trouble with the Inputuner section that you cannot locate, it is recommended that the Inputuner be returned to us for repair.

REMOVAL AND REPLACEMENT OF THE INPUTUNER

1. Unsolder the four leads coming out of the Inputuner to the receiver chassis. *Do not cut the leads; keep them full length.* Denote the color coding of the wires and terminals from which the wires were removed.
2. Unsolder the Inputuner cable leads at the antenna terminals. Remove the clamp that holds this transmission line to the chassis.
3. Remove the three screws which fasten the Inputuner to the chassis.
4. Lift the Inputuner from the chassis.
5. To put in the new Inputuner, reverse the steps above.

2. SOUND IF SECTION

INDICATIONS	PROCEDURE
Picture normal. No sound or weak sound. Trouble isolated to this stage because the tuning indicator does not function normally as the Teleset is tuned.	1. Test or replace tubes in this section. 2. Signal trace the stages in this section using an RF generator, a crystal probe and an oscilloscope. The crystal probe will have to be used in making measurements within this section. 3. Check voltage and resistance measurements at defective stage. 4. If No. 3 reveals no difficulty, check for an open capacitor or partially shorted transformer. 5. Check the alignment.

3. AUDIO SECTION

INDICATIONS

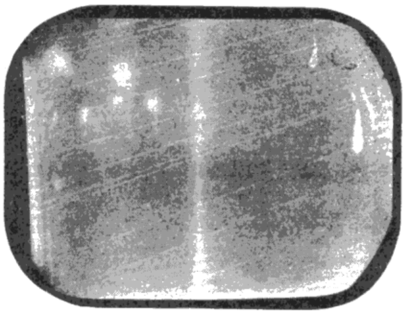
Picture normal. No sound or weak sound. Trouble isolated to this section because the tuning indicator functions normally as the Teleset is tuned. Also, on the Colony, there is no sound or weak sound output when using the record player or AM radio.

PROCEDURE

1. Replace tubes.
2. Tune to a station. With oscilloscope, signal trace these circuits.
3. At defective stage check voltage and resistance measurements.

4. PICTURE AND SYNC SECTION

INDICATIONS



1. Fig. 83. Unsynchronized raster. Sound normal, but no picture or sync.

PROCEDURE

1. Check setting of A.G.C. threshold control. It is possible that gas current in the 6AT6 will make re-adjustment necessary.

2. Replace tubes.

3. Using an oscilloscope and probe detector, signal trace these circuits. The Teleset should be tuned to the strongest station and the A.G.C. control turned completely counter-clockwise during this procedure.

4. Take voltage and resistance measurements at defective stage as located in item No. 3.

2. Picture completely blanked out on strong stations. On the weakest stations, picture is present and synchronized but there is excessive "snow" or "noise". On the other stations of intermediate strength, the picture will not synchronize. These indications resemble what can occur in some locations using an RA-103 Teleset with the contrast on full.

1. Replace 6AT6 AGC tube and readjust the AGC control. If this does not correct the fault, proceed as follows with the antenna removed.

2. Using a voltmeter, run through AGC adjustment to determine if action is normal (See Section on adjustments)

3. If reading remains constant as control is varied check C226 for a short.

4. If reading varies normally, check grid circuits of the AGC controlled stages.

5. If at step No. 3 C226 is okay, observe waveform at pin No. 1 of V209. This waveform should be approximately the same as Fig. 84.

6. Observe the waveform at pins No. 7 and 5 of V209. With the A.G.C. control properly adjusted no waveform should be present at pin No. 7 or pin No. 5.

7. Rotate A.G.C. control completely clockwise. Observe waveforms at pin No. 7 and pin No. 5. These should be approximately the same as Fig. 85 and Fig. 86.

8. Take voltage and resistance readings at portion of circuit where the waveforms are incorrect. If waveforms appear normal, check all voltage and resistance measurements of this circuit.

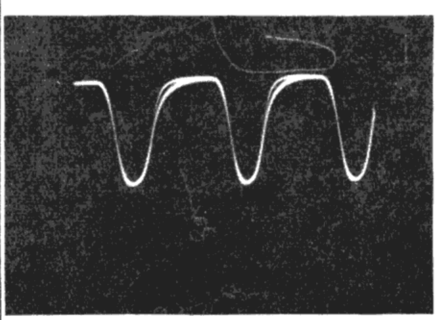


Fig. 84. Pin No. 1 V209 (Horizontal) P-P—2V.

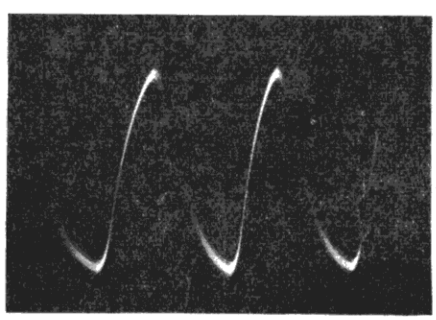


Fig. 85. Pin No. 7 V209 (Horizontal) P-P—6V.

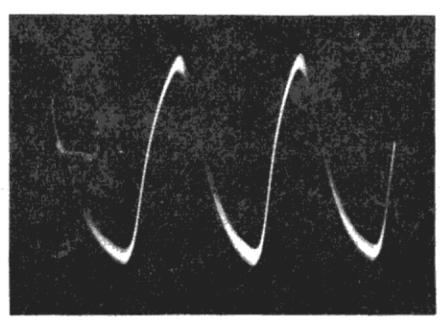
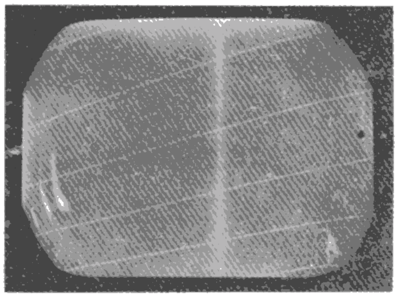


Fig. 86. Pin No. 5 V209 (Horizontal) P-P—6V.

5. PICTURE SECTION

INDICATIONS



1. Fig. 87. Synchronized raster but no picture.

PROCEDURE

1. Replace tubes.
2. Tune to a TV station. Signal trace section with an oscilloscope. (See Waveform Observation Section).
3. Check E and R measurements.
4. If No. 3 does not reveal discrepancy, look for open coupling capacitor.

2. Picture quality poor. Brightness control works backward.

Check C221, (coupling capacitor between plate of V207 and grid of CRT) for short.

3. Picture too bright. Cannot properly decrease brightness.

POSSIBLE DEFECT

Defective CRT. (Grid-cathode shorted).

Shorted C224. (Cathode of CRT to ground).

6. COMPOSITE SYNC SECTION

INDICATIONS

Fig. 88. Picture out of sync both horizontally and vertically.

PROCEDURE

1. Replace V217.
2. Observe waveforms.
3. Make necessary voltage and resistance measurements.
4. Check C263.

7. VERTICAL SYNC SECTION

INDICATIONS | **PROCEDURE**

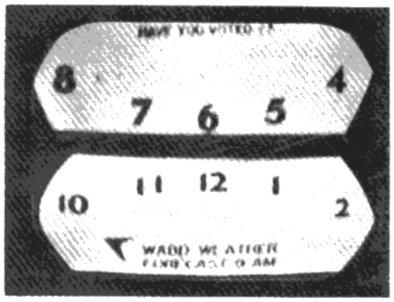


Fig. 89.
Picture Rolls Vertically

1. Adjust vertical hold control.
2. Replace the tube in this section.
3. Check waveforms. (See Waveform Observation Section).

If the above procedure does not disclose the trouble, the defect may be in the Vertical Saw Generator. (See below).

The trouble may be the free running frequency of the Vertical blocking oscillator cannot be adjusted close enough to 60 cycles.

Fig. 90.
Vertical free running frequency too high.

1. Note Fig. 90. If by adjustment of the vertical hold control, the indications on the CRT approach this figure, and it is not possible to get one complete picture manually, the free running frequency is too high.

2. Note Fig. 91. If by adjustment of the vertical hold control, the indications on the CRT are similar to this figure, and it is not possible to get one complete picture manually, the free running frequency is too low. This figure indicates there are approximately one and one half frames in view at one time. A more extreme condition of this would be when two complete pictures one above the other are visible.

Fig. 91.
Vertical free running frequency too low.

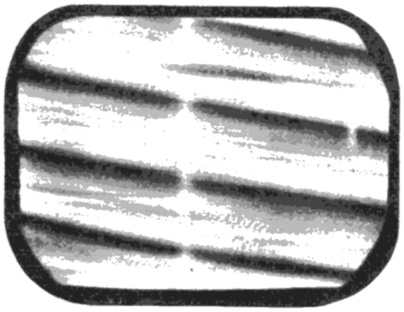
In either of the above two cases, investigate the grid circuit of the vertical blocking oscillator. Check C273, R307 and R308.

If the free running frequency is too high and cannot be adjusted low enough, the value of one of the above must be much lower than normal.

If the frequency is too low, the defective component will have increased in value.

8. HORIZONTAL SYNC SECTION

INDICATIONS



1. Fig. 92. No Horizontal Sync

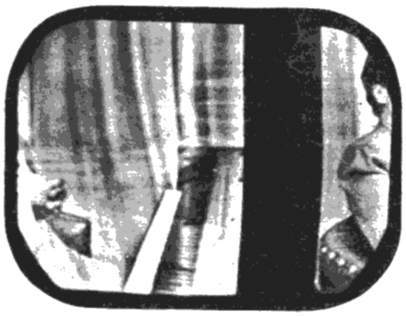


Fig. 93. After frequency control has been adjusted.

PROCEDURE

1. Adjust the horizontal frequency control, until a complete picture is seen on the screen. The entire picture will move sideways as shown at Fig. 93.

2. Replace 6AC7 and then the 6AL5.

3. Observe waveforms. (See Waveform Observation Section).

4. Check Voltage and resistance measurements.

If the above check reveal no discrepancy proceed as follows:

1. Connect a high impedance voltmeter from grid to ground at the 6AC7 reactance tube. Try to manually synchronize the horizontal oscillator by carefully adjusting the horizontal frequency control. If the correction voltage is being applied to the grid of the reactance tube, the meter pointer will swing one way as the frequency shifts in one direction and the opposite way as the frequency shifts in the other direction. The magnitude of this variation in voltage will be at least three volts in each direction.

If this variation is present, then the reactance tube circuit is defective.

If not, then the same check should be made at pin No. 7, of the sync discriminator. The results of the test at this point will reveal whether or not the defective circuit is the sync discriminator, or the filter circuit between the discriminator and the reactance tube.

2. Top of picture tries to tear out. Ignition noise causes tearing out of the picture.

Replace C288. (The .1 ufd capacitor at junction of R324 and R325. Capacitor is open.)

3. Several pictures appear side by side. Not possible to obtain a single picture regardless of horizontal frequency adjustment.

Check transformer Z205 for broken slug. Check C268 and R299.

9. VERTICAL SAW SECTION

INDICATIONS

1. Fig. 94. No Vertical Sweep.

PROCEDURE

Check the following items in the order given:

1. Tubes.
2. Waveforms.
3. Voltage and resistance measurements.

If the fault is not located after the regular procedure, check the deflection yoke.

2. Insufficient Vertical Size.

Use procedure as above.
In addition to procedure check C285C and C265A for open.

3. Poor Vertical linearity. Adjustment of linearity control has no effect.

Check C285C for possible short or leakage.

10. HORIZONTAL SWEEP AND HIGH VOLTAGE SECTION

INDICATIONS / **PROCEDURE**

1. No Raster, sound is normal.

1. Replace 1B3's.
2. Replace 6BG6, 12AU7, 6K6, 5V4.
3. Observe waveforms.
4. Take voltage and resistance measurements.
5. Observe if the filament of the CRT is lit.

2. Fig. 95. Fold over in the horizontal sweep. Note the horizontal size is reduced considerably.

If adjustments are correct, then check R413 for an open.

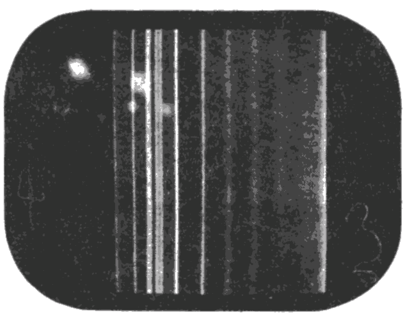


Fig. 96. Same trouble as Fig. 95 showing effect on raster alone.

Same as above.

3. Very poor horizontal linearity. Picture stretched out on left side.

Check capacitors C408 and C409 for open.

4. Insufficient horizontal size.

Adjust size control switch, and size control.
Replace V401 and V402.
Check R403, C413, R404 and R405 for correct value.
Observe waveforms in the circuits of V401-A and V402.
Take voltage and resistance measurements in questionable portion of the circuit.

CAUTION: *When replacing any components in the high voltage section of the power supply, the dressing of leads is very important. To prevent corona (arcing) there should be no sharp bends in the high voltage circuit leads. These leads should be kept away from the metal chassis as well as possible. Also if it is necessary to do any soldering in this section be careful to "ball" the solder joint. Any sharp metal points that are at a high voltage will cause corona to issue from them. This corona causes a hissing noise and if the circuit is closely examined, sharp needles of purple flame will be seen to issue forth from these points.*

11. LOW VOLTAGE POWER SUPPLY SECTION

INDICATIONS

No Raster, no picture and no sound. Tuning indicator fails to glow.

PROCEDURE

1. Check to see if the filaments of the tubes are lit. If not, check the fuse and the A.C. connections.
2. If the tubes are lit then replace the 12AU7 relay control tube in the Flyback Power supply chassis.
3. Check relay K201.
4. Check resistors R415, R416 and R417.

4.7 ALIGNMENT PROCEDURE

The alignment of a Television receiver is a procedure that must be followed very carefully in order that the end result is comparable to that obtained when aligned at the factory.

Before attempting to align, the serviceman must be sure that alignment is required.

If there is any doubt in the serviceman's mind regarding the need for alignment, a quick check can be made by viewing the overall response of the video IF strip. This is accomplished by performing step No. 9 in the alignment procedure.

EQUIPMENT NEEDED

SWEEP GENERATOR

This generator should be capable of putting out a band of frequencies from about 20 to 30 megacycles. Some means for identifying the frequency of various parts of the response curve must be available. To effect this, the sweep generator must either have an internal marker circuit or an external RF generator to perform the same function, will have to be used.

In the alignment table under the heading "Type of Input Signal Required", the description "Wobb and unmodulated RF signal" means that both the sweep generator output (wobbulator) and the unmodulated RF generator are to be fed into the point designated. It should be understood that both these units will have to be used if the sweep generator does not have an internal marker generator. (Fig. 97.)

If, however, the sweep generator has an internal marker generator, (Fig. 98) only the output from this one unit need be fed into the designated point.

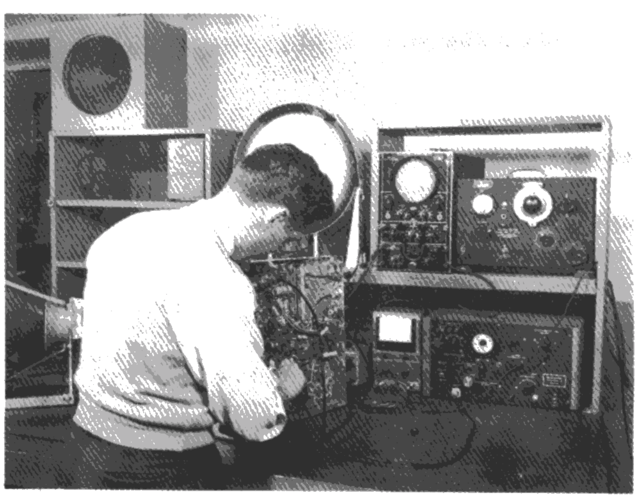


Fig. 97. Alignment using sweep generator with external marker generator.

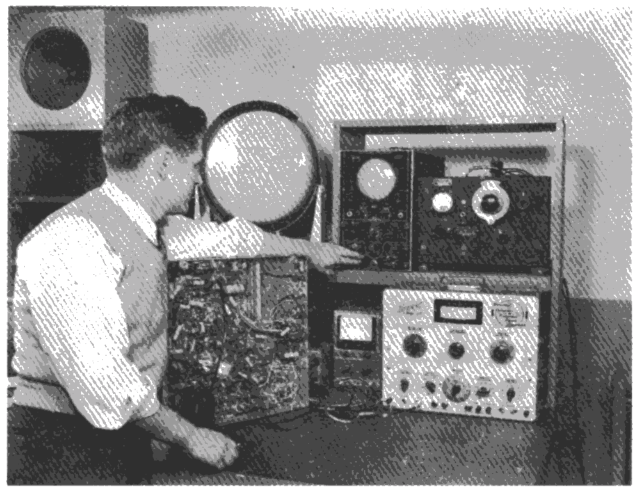


Fig. 98. Alignment using sweep generator with self-contained marker generator.

OSCILLOSCOPE

An oscilloscope is used as a means of visually indicating the response of the stage or stages under observation.

All of this equipment must be securely grounded to the receiver being aligned. This grounding can be accomplished by using a metal top bench, preferably copper. If such a bench is not available, these units should be bonded together by the use of heavy metal braid between the chassis. Ordinary wire is not enough to effectively place all units at the same potential.

Once the equipment is set in place, the generators and receiver should be allowed to run at least 15 minutes before starting to align.

Additional equipment necessary for alignment is what is referred to as a 6AK5 adapter tube. This is simply a 6AK5 with a fine wire soldered to pin No. 1. It may be necessary to fasten this wire to the side of the tube with scotch tape to prevent it shortening against the bottom of the shield. This tube is used to permit feeding the generator output into the grid of the mixer stage without disturbing the inputuner.

In the procedure, reference is made to the use of a "Probe Detector". This device is merely a crystal rectifier with the necessary filter. (Fig. 99). Its purpose is to permit the observation of the response of a single stage when viewed ahead of the video detector.

VIDEO IF ALIGNMENT TABLE

Step No.	To Adjust	Type of Input Signal Required	Connect Generator Leads Across	Connect Output Leads Across	Feed Output leads directly into Oscillograph or into Oscillograph via Probe Detector	Adjust to Conform to response. Curve Shown in	Remarks
1.	C213 L211 L212	Wobb and unmodulated R.F. signal.	Pin 1 (grid) V203 and chassis	Pin 1 (grid) V205 and chassis	Direct	Fig. 100	C213 adjusts curve for double peak. L211 and L212 adjusts markers. L209 should be shorted to ground.
2.	R251 AGC						Set for 3.2V. At junction of R246 and C226.
3.	L210 Z201 (top)	Mod. signal at 21.9 mc.	Pin 1 (grid) V201 and chassis	Pin 1 (grid) V205 and chassis	Direct	None	Adjust both for minimum output.
4.	L209	Mod. signal at 27.9 mc.	Pin 1 (grid) V201 and chassis	Pin 1 (grid) V205 and chassis	Direct	None	Adjust for minimum output.
5.	L207 L208	Wobb and unmodulated R.F. signal.	Pin 1 (grid) V202 and chassis	Pin 1 (grid) V205 and chassis	Direct	Fig. 101	
6.	L204 L206	Wobb and unmodulated R.F. signal.	Pin 1 (grid) V201 and chassis	Pin 5 (plate) V202 and chassis	Probe Detector	Fig. 102	
7.	To check 1st, 2nd and 3rd Video IF stages	Wobb and unmodulated R.F. signal.	Pin 1 (grid) V201 and chassis	Pin 1 (grid) V205 and chassis	Direct	Fig. 103	If necessary readjust L204 and L206
8.	L201 L203	Wobb and unmodulated R.F. signal.	Pin 1 (grid)* V102 and chassis	Pin 5 (plate) V201 and chassis	Probe Detector	Fig. 104	Grid of V202 should be grounded.
9.	Check overall Video IF stages	Wobb and unmodulated R.F. signal.	Pin 1 (grid) V102 and chassis	Pin 1 (grid) V205 and chassis	Direct	Fig. 105	If necessary readjust L206, L204.

SOUND IF ALIGNMENT TABLE

Step No.	To Adjust	Type of Input Signal Required	Connect Generator Leads Across	Connect Output Leads Across	Feed Output leads	Curve Shown in	Remarks
1.	Z203	Wobb and unmodulated R.F. signal at 21.9 mc.	Pin 1 (grid) V211 and chassis	Pin 5 (plate) V212 and chassis	Probe Detector	Fig. 106	Adjust for a symmetrical response.
2.	Z202	Wobb and unmodulated R.F. signal at 21.9 mc.	Pin 1 (grid) V210 and chassis	Pin 5 (plate) V212 and chassis	Probe Detector	Fig. 107	Adjust for a symmetrical response.
3.	Z201 bottom coil	Wobb and unmodulated R.F. signal at 21.9 mc.	Pin 1 (grid)* V201 and chassis	Pin 5 (plate) V212 and chassis	Probe Detector	Fig. 108	Adjust for a symmetrical response. (If AGC is set too high the 1st video IF tube will cut off, resulting in no signal.
4.	Z204 top coil (sec.) bottom coil (pr.)	Wobb and unmodulated R.F. signal at 21.9 mc.	Pin 1 (grid) V201 and chassis	Junction of R274 and and C250	Direct	Fig. 109	Center the 21.9 mc marker on S response curve with secondary control. Then adjust for maximum response with primary control.

GRAIN TRAP ADJUSTMENT

Step No.	To Adjust	Type of Input Signal Required	Connect Generator Leads Across	Connect Output Leads Across	Feed Output leads	Curve Shown in	Remarks
1.	L216	Modulated R.F. at 4.5 mc.	Pin 1 (grid) V205 and chassis	At grid, pin 2 CRT	Probe Detector		Adjust for minimum output. (Contrast control at maximum setting.)

*Use 6AK5 adaptor. Connect hot lead of generator to the wire on Pin No. 1.
After completing the alignment, be sure to properly adjust the AGC control.

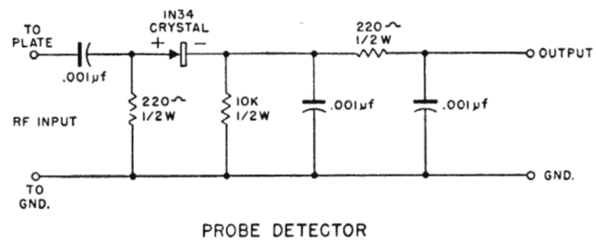


Figure 99

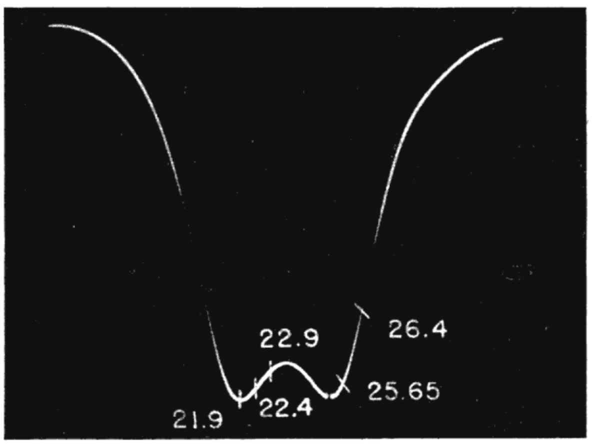


Figure 100

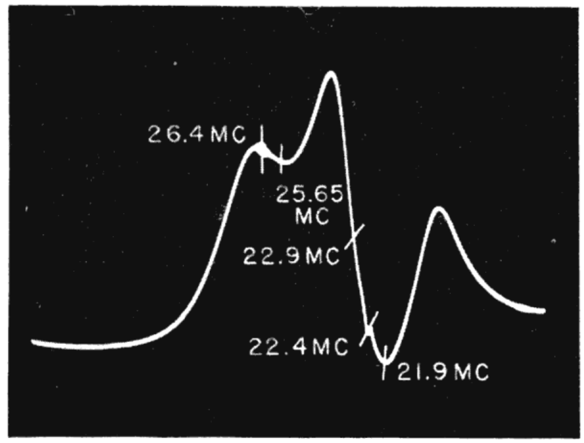


Figure 102. Frequencies shown above are in reverse order, which merely indicates that the response was observed when sweep generator was sweeping from high to low end.

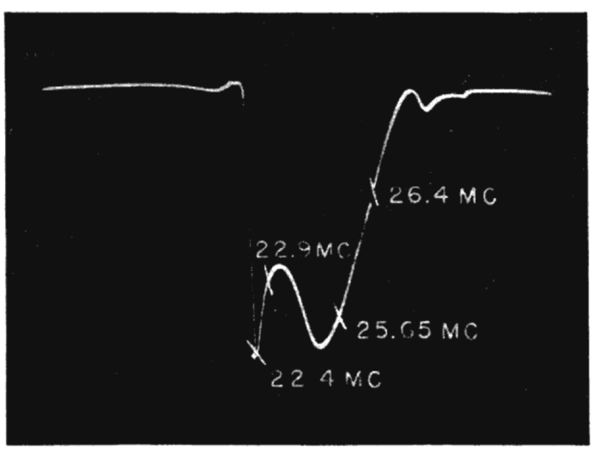


Figure 101

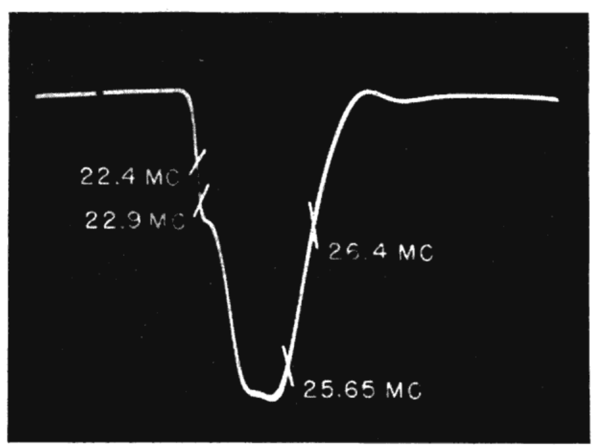


Figure 103

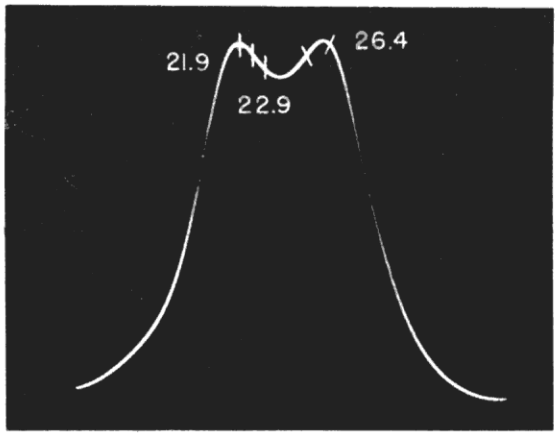


Figure 104. The two unidentified markers are at 22.4 MC and 25.65 MC.

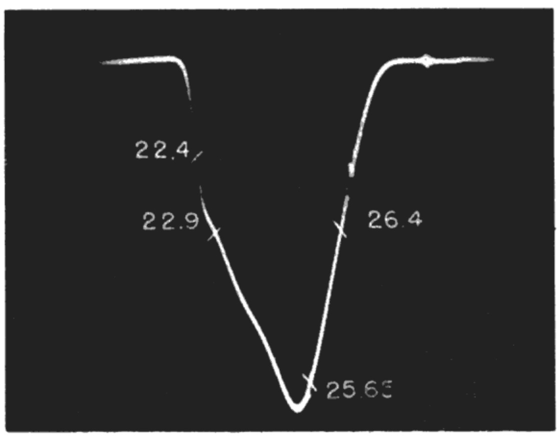


Figure 105.

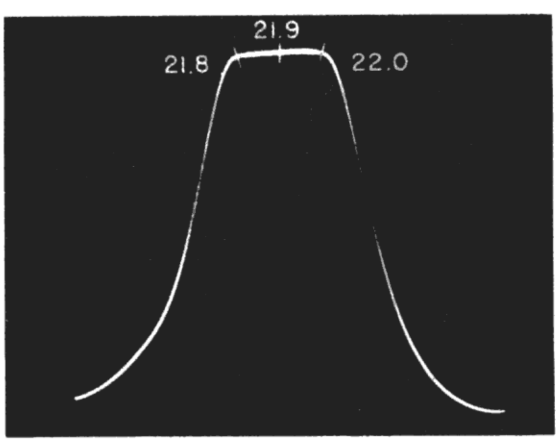


Figure 106.

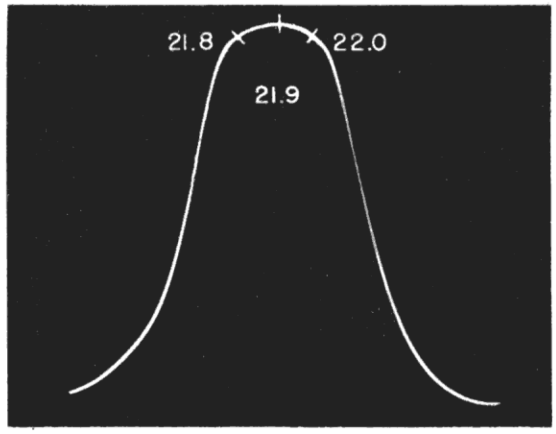


Figure 107.

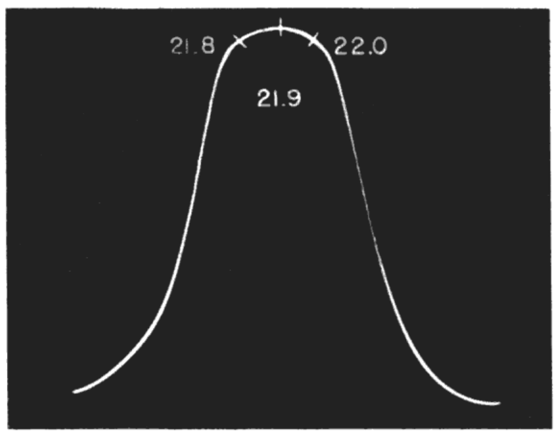


Figure 108.

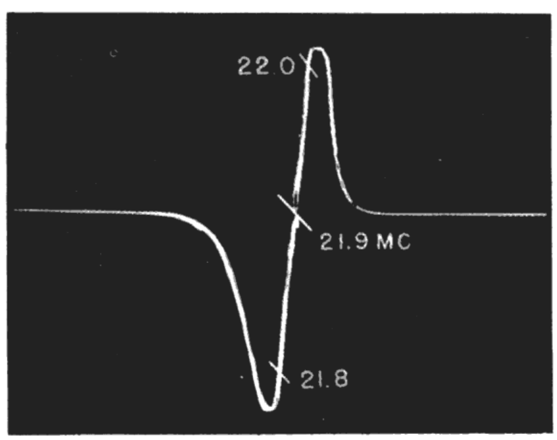


Figure 109.

MODEL RA-105 TELESET

5.0 PARTS LIST

Abbreviations used:

Res	Resistor	V	Variable	W	Wire Wound	M	Mica
Cap	Capacitor	F	Fixed	Pa	Paper	E	Electrolytic
		C	Composition	Ce	Ceramic	Elec	Electronic

Unless otherwise stated, the tolerance shown is plus and minus of the indicated value.
Where two or more part numbers are shown, the second and third numbers, if any, are alternate parts.

RF TUNING ASSEMBLY ELECTRICAL PARTS LIST

(Oct. 6, 1948)

Symbol No.	*Part No.*	*Description*
C101	03014590	Cap F Ce 470 mmfd 20% 350 V
C102	Same as C101	
C103	03014600	Cap F Ce 470 mmfd 20% 600 V
C104	03014580	Cap F Ce 15 mmfd 5% 500 V
C105	03014490	Cap V Ce 3-12 mmfd 10% NPO
C106	Same as C105	
C107	Same as C105	
C108	Same as C104	
C109	Same as C101	
C110	Same as C103	
C111	03014890	Cap V Ce 2-12 mmfd 10% 500 V
C112	03012150	Cap F C 1 mfd 20% 500 V
C113	Same as C103	
C114	03014610	Cap F Ce 5 mmfd 10% 500 V
C115	Same as C101	
C116	Same as C101	
L101	21004031	Inductor end plate assembly
L102 (A, B & C)	21004291	Inductuner
L103	21004041	Coil shunt
L104	21004051	Inductor V end oscillator
L105	21004061	Inductor end Grid assembly
L106	21004071	Coil antenna
L107	21004081	Coil bandpass coupling
R101	02030310	Res F C 200 ohms 5% ½ W
R102	02037890	Res F C 10,000 ohms 10% 2 W
R104	02031900	Res F C 12000 ohms 10% ½ W
R105	02032130	Res F C 1 megohms 10% ½ W
R106	02032010	Res F C 100,000 ohms 10% ½ W
R107	02032070	Res F C 330,000 ohms 10% ½ W
R108	Same as R102	
R109	Same as R104	
R110	Same as R104	
V101	25000190	Tube Elec type 6J6
V102	25000180	Tube Elec type 6AK5
V103	25000190	Tube Elec type 6J6

RECEIVER PARTS LIST RA-105

MAIN CHASSIS

(Dec. 21, 1948)

Symbol No.	*Part No.*	*Description*
C201	03014380	Cap Ce 100 mmfd 20% 500 V
C202	03015610	Cap Ce .005 mfd Min 450 V
C203	Same as C202	
C204	Same as C202	
C205	Same as C201	
C206	Same as C202	
C207	Same as C202	
C208	03013800 03015220	Cap Ce 20 mmfd ±5% Zero Temp Coef 500 V
C209	03015270 03015260	Cap Ce 10 mmfd 5% 500 V Zero Temp Coeff
C210	Same as C202	
C211	Same as C202	
C212	Same as C202	
C213	03015420	Cap V Ce 1—3.5 mmfd 500 V
C214 (A.B.C. D)	03015580	Cap E 10/10/10/10 mfd +50% —10% 450 V
C215	03013080 03015250	Cap Ce 10 mmfd ±10% Zero Temp Coef 500 V
C216	03012730 03015300	Cap Ce 47 mmfd Zero Temp. Coef 10% 500 V
C217	03014040	Cap Pa .1 mfd 25% 400 V
C219	03013910	Cap Pa .1 mfd 25% 200 V
C220	Same as C214	
C221	03011380	Cap Pa .1 mfd 25% 600 V
C222	03000950	Cap Pa .05 mfd 25% 200 V
C224	Same as C219	
C225	03012560	Cap Pa .01 mfd 25% 600 V
C226	Same as C222	
C227	03001450	Cap Pa .01 mfd 25% 400 V
C228	Same as C202	
C229	03013940	Cap Ce .001mfd Min 350 V
C230	Same as C227	
C231	Same as C222	
C232	03014570 03015240	Cap Ce 2.5 mmfd Zero Temp Coef 10% 500 V
On later models C 232 is described as follows:		
	03014610	Cap Ce 5 mmfd 10%
C233	Same as C202	
C234	Same as C202	
C235	03002720 03014280	Cap Ce 2.5 mmfd ±.5mmfd Zero Temp Coef 20% 500 V
C236	03033060	Cap M 4700 mmfd 20% 500 V
C237	Same as C202	
C238	Same as C202	
C239	Same as C235	
C240	Same as C236	
C241	Same as C202	
C242	Same as C222	
C243	Same as C202	
C244	Same as C215	
C245	Same as C236	
C246	Same as C202	
C247	Same as C222	
C248	Same as C216	
C249	Same as C216	
C250	03014420 03012920	Cap Ce 470 mmfd 10% 350 V
C251	03001460	Cap Pa .02 mfd 25% 400 V
C252	Same as C227	
C253	03015920	Cap Ce .01 mfd min 450 V
C255	Same as C202	
C256	Same as C227	
C258	03014020	Cap Pa .05 mfd 25% 400 V
C259	03020180	Cap M 330 mmfd 10% 500 V
C260	03001570	Cap Pa .005 mfd 25% 600 V
C263	Same as C227	
C265 (A,B,C)	03015590	Cap E 30/100/25 mfd
C266	Same as C216	
C267	03033420	Cap M .01 mfd 5% 300 V
C268	Same as C260	
C269	Same as C258	
C270	Same as C227	
C271	Same as C260	
C272	Same as C227	
C273	03015940	Cap Pa .02 mfd 10% 400 V
C275	03003400	Cap Pa .1 mfd 10% 400 V
C276	Same as C217	
C278	03012250	Cap E 2000 mfd +150%—10% 6 V
C279	03015330 03014180	Cap Pa .05 mfd 25% 600 V
On later models C279 is described as follows:		
	03016500	Cap Pa .05 mfd 20% 600 V
C280	Same as C279	
C281	03014080	Cap E 80 mfd+50%—10% 350 V
C282	03015320	Cap E 80 mfd+50%—10% 350 V
C284	Same as C260	
C285	03016170	Cap E 40/40/25 mfd
C286	Same as C267	
C287	Same as C260	
C288	Same as C219	
C289	03015310	Cap E 25 mfd+250%—10% 25 V
C290	Same as C222	
C291	03001160	Cap E 8 mfd 450 V
C292	03015740	Cap E 1000 mfd+150%—10% 6 V
C293	Same as C202	
C294	03013670	Cap E 4 mfd 150 V
C295	Same as C215	
1201	12001310	Lamp incandescent .15 amp 6.3 V
1202	Same as 1201	
1203	Same as 1201	
J201	09002760	Connector female 1 contact
J202	09005481	Connector assembly female 2 contacts
J203	Same as J201	
J204	50014151	Assembly cable yoke
J205	34001130	Socket tube 6 prong
J206	34001071	Socket assembly CRT
J207	34001081	Socket assembly eye
J208	09005490	Connector female 2 contacts
K201	05002410 05003260	Relay armature SPST
L201	21004137	Coil V video IF
L202	21004141	Coil V video IF
L203	21004136	Coil V video IF
L204	21004138	Coil V video IF
L205	Same as L202	
L206	21004135	Coil V video IF
L207	Same as L204	
L208	Same as L206	
L209	21003971	Coil V 21.9 MC
L210	Same as L209	
L211	Same as L201	
L212	Same as L203	
L213	21004462	Coil video peaking
L214	21004464	Coil video peaking
L215	21004463	Coil video peaking
L216	21004121	Coil V 4.5 MC trap
L217	Same as L213	
L218	Same as L214	
L219	21004021	Coil filter choke

ALLEN B. DUMONT LABORATORIES, INC. MODEL RA-105

Symbol No.	Part No.	Description
L220	21004465	Coil video peaking
P201	50002471	Assembly cable 6 pin
P202	50002451	Assembly cable 8 pin
R201	02030700	Res F C 8.2 K ohms 5% ½ W
	02040700	
R202	02031970	Res F C 47 K ohms 10% ½ W
	02041970	
R203	02030660	Res F C 5.6 K ohms 5% ½ W
	02040660	
R204	02031630	Res F C 68 ohms 10% ½ W
R205	02030920	Res F C 68 K ohms 5% ½ W
	02040920	
R206	02037930	Res F C 22 K ohms 10% 2 W
R207	Same as R206	
R208	02031890	Res. F C 10 K ohms 10% ½ W
	02041890	
R209	02030590	Res F C 3 K ohms 5% ½ W
	02040590	
R210	Same as R204	
R211	Same as R206	
R212	Same as R206	
R213	02030760	Res F C 15 K ohms 5% ½ W
	02040760	
R214	02031650	Res F C 100 ohms 10% ½ W
R215	Same as R206	
R216	Same as R206	
R218	02032140	Res F C 1.2 megohms 10% ½ W
	02042140	
R219	02030650	Res F C 5.1 K ohms 5% ½ W
	02040650	
R220	02031590	Res F C 33 ohms 10% ½ W
R221	02037940	Res F C 27 K ohms 10% 2 W
R222	02037940	Res F C 27 K ohms 10% 2 W
R223	02030630	Res F C 4.3 K ohms 5% ½ W
	02040630	
R224	02031770	Res F C 1 K ohms 10% ½ W
	02041770	
R225	02032090	Res F C 470 K ohms 10% ½ W
	02042090	
R226	01007260	Res V C 1 K ohms 20% ½ W
	01008220	
R227	02034860	Res F C 5.6 K ohms 10% ½ W
	02044860	
R228	Same as R225	
R229	02034740	Res F. C. 560 ohms 10% 1 W
	02044740	
R230	02030790	Res F C 20 K ohms 5% ½ W
	02040790	
R231	02034940	Res F C 27 K ohms 10% 1 W
	02044940	
R232	02037850	Res F C 4.7 K ohms 10% 2 W
R233	Same as R230	
R234	Same as R208	
R235	02037840	Res F C 3.9 K ohms 10% 2 W
R236	02031850	Res F C 4.7 K ohms 10% ½ W
	02041850	
R237	02032060	Res F C 270 K ohms 10% ½ W
	02042060	
R238	02032130	Res F C 1 Megohms 10% ½ W
	02042130	
R239	01007350	Res V C 100 K ohms 20% ½ W
	01008230	
R240	02032050	Res F C 220 K ohms 10% ½ W
	02042050	
R241	01007400	Res V C 500 K ohms 20% ½ W
R242	02032080	Res F C 3390 K ohms 10% ½ W
	02042080	
R243	Same as R208	
R244	Same as R240	
R245	Same as R218	
R246	Same as R218	
R247	Same as R218	
R248	Same as R237	
R249	02038010	Res F C 100 K ohms 10% 2 W
R250	Same as R224	
R251	01007500	Res V C 1 K ohms 20% ¼ W
R252	Same as R218	
R253	02031730	Res F C 470 ohms 10% ½ W
	02041730	
R254	Same as R202	
R255	02032210	Res F C 4.7 Megohms 10% ½ W
	02042210	
R256	02037680	Res F C 8.2 K ohms 10% 2 W
R257	Same as R256	
R258	02031930	Res F C 22 K ohms 10% ½ W
	02041930	
R259	02032010	Res F C 100 K ohms 10% ½ W
	02042010	
R260	02031640	Res F C 82 ohms 10% ½ W
R261	02034950	Res F C 33 K ohms 10% 1 W
	02044950	
R262	Same as R224	
R263	Same as R259	
R264	Same as R260	
R265	Same as R261	
R266	Same as R224	
R267	Same as R218	
R268	Same as R237	
R269	Same as R260	
R270	Same as R208	
R271	02037950	Res F C 33 K ohms 10% 2 W
R272	02034880	Res F C 8.2 K ohms 10% 1 W
	02044880	
R273	Same as R218	

Symbol No.	Part No.	Description
R274	Same as R259	
R275	Same as R259	
R276	Same as R259	
R277	Same as R258	
R278	01007300	Res V C 1 Megohm 25%; ¼ W
	01011920	
R279	Same as R218	
R280	Same as R208	
R281 & S201	01007310	Res V C 200 Kohms 25%; ½W SPST
	01008300	
R282	Same as R259	
R283	02102560	Res F W 2.2 ohms 10% 1W
R284	Same as R240	
R285	Same as R240	
R286	02037700	Res F C 270 ohms 10% 2 W
R287	02037780	Res F C 1.2 K ohms 10% 2 W
R288	Same as R287	
R289	Same as R258	
R290	02032150	Res F C 1.5 Megohms 10% ½ W
	02042150	
R291	Same as R 213	
R292	Same as R249	
R293	Same as R258	
R294	Same as R249	
R295	02031940	Res F C 27 Kohms 10% ½ W
	02041940	
R296	Same as R225	
R297	Same as R225	
R298	Same as R208	
R299	Same as R202	
R300	02037890	Res F C 10 Kohms 10% 2 W
R301	02107960	Res F W 5 Kohms 5% 10 W
	02106160	
R302	Same as R218	
R303	02031810	Res F C 2.2 K ohms 10% ½ W
	02041810	
R304	Same as R208	
R305	Same as R208	
R306	Same as R208	
R307	02032070	Res F C 330 K ohms 10% ½ W
	02042070	
R308	01007930	Res V C 500 K ohms ±20% ¼ W
	01011740	
R309	02032120	Res F C 820 K ohms 10% ½ W
	02042120	
R310	01008570	Res V C 4 Megohms 40% ¼ W
	01011760	
R311	Same as R223	
R312	02032170	Res F C 2.2 Megohms 10% ½ W
	02042170	
R313	02034690	Res F C 220 ohms 10% 1 W
R314	01007640	Res V C 2 K ohms 20% 2 W
	01008130	
	01007750	
R315	Same as R300	
R316	Same as R300	
R317	01007710	Res V W 25 ohms ±10% 2 W
	01016910	
R318	02035540	Res F C 100 K ohms 20% 1 W
	02045540	
R319	Same as R318	
R320	02017610	Res F W 1280 ohms 10% 25 W
R321 A & B	02017660	Res F W 200/250 ohms 10% 15/10 W
R322	02030690	Res F C 7.5 K ohms 5% ½ W
	02040690	
R323	01007330	Res V W 1 K ohms 10% 25 W
	01008730	
	01011700	
R324	Same as R225	
R325	Same as R253	
R326	02031530	Res F C 10 ohms 10% ½ W
R327	02031670	Res F C 150 ohms 10% ½ W
R328	Same as R231	
R329	02037970	Res F C 47 K ohms 10% 2 W
R330	Same as R206	
R331	01007800	Res V W 25 ohms 10% 4 W
R333	Same as R259	
R335	02030720	Res F C 10 K ohms 5% ½ W
	02040720	
R336	02032110	Res F C 680 K ohms 10% ½ W
	02042110	
R337	Same as R202	
R338	02030310	Res F C 200 ohms 5% ½ W
R339	02037980	Res F C 56 K ohms 10% 2 W
	02047980	
R340	02031900	Res F C 12 K ohms 10% ½ W
	02041900	
R341	Same as R202	
R342	Same as R339	
R344	02030840	Res F C 33 K ohms 10% ½ W
R345	02031760	Res F C 820 ohms 10% ½ W
	02041760	
On later models R345 is described as follows:		
	02031720	Res F C 390 ohms 10% ½ W
	02041720	
R346	Same as R206	
R347	Same as R206	
S201	01007310	Switch SPST with R281
	01008300	
S202	05003041	Switch rotary
S203	05000120	Switch toggle DPDT
	05003050	

MODEL RA-105 ALLEN B. DUMONT LABORATORIES, INC.

Symbol No.	Part No.	Description
T201	20003931	Transformer BT oscillator
T202	20003941	Transformer sweep vertical
T203	20003891	Transformer power
V201	25000010	Tube Elec type 6AG5
V202	Same as V201	
V203	Same as V201	
V204	25000020	Tube Elec type 6AL5
V205	Same as V201	
V206	25000130	Tube Elec type 12AU7
V207	25000100	Tube Elec type 6K6GT/G
V208	25000030	Tube CRT type 15AP4
V209	25000040	Tube Elec type 6AT6
V210	25000050	Tube Elec type 6AU6
V211	Same as V210	
V212	Same as V210	
V213	Same as V204	
V214	25000200	Tube Elec type 6AL7GT
V215	Same as V209	
V216	25000090	Tube Elec type 6V6 GT/G
V217	Same as V201	
V218	Same as V204	
V219	Same as V207	
V220	25000110	Tube Elec type 6SN7—GT
V221	Same as V220	
V222	25000060	Tube Elec type 5U4G
V223	Same as V222	
V224	25000120	Tube Elec type 6AC7
Z201	20003911	Transformer sound IF
Z202	Same as Z201	
Z203	Same as Z201	
Z204	20003901	Transformer discriminator
Z205	20003921	Transformer oscillator

FLYBACK POWER SUPPLY ELECTRICAL PARTS LIST

(Dec. 21, 1948)

Symbol No.	Part No.	Description
C401	03020180	Cap M 330 mmfd 10% 500V
C402	03001450	Cap Pa .01 mfd 25% 400 V
C403	03012560	Cap Pa .01 mfd 25% 600 V
C404	03000040	Cap E 25 mfd + 150%—25% 50 V
C405	03015370	Cap Pa .05 mfd 25% 600 V
C406	03014410	Cap Ce 500 mmfd +50%—20% 10 KV
C407	Same as C406	
C408	03014060	Cap Pa .035 mfd 10% 1000 V
C409	03015650	Cap Pa .05 mfd 10% 1000 V
C410	Same as C406	
C411 (A+B)	03016040	Cap E 2 sections 70/70 mfd +100%—10% 175 V
C413	03029080	Cap M 2200 mmfd 10% 500 V
C414	03015930	Cap Ce 47 mmfd 20% 5KV
F401	11000800	Fuse Cart 4 amp 250 V
F402	11001100	Fuse ¼ A 250 V
J403	09005000	Connector male interlocking
L401	21004171	Coil V Hor size
L402	21004350	Coil V 5.5 to 20 MH
L403	21004181	Coil F Hor size
R401	02031870 02041870	Res F C 6800 ohms 10% ½ W
R402	02032050 02042050	Res F C 220,000 ohms 10% ½ W
R403	02038050 02048050	Res F C 220,000 ohms 10% 2 W
On most models R403 is described as follows:		
R403	02037020	Res F C 150,000 ohms 5% 2 W
R404	02031810 02041810	Res F C 2200 ohms 10% ½ W
R405	01007920 01011730	Res V C 25,000 ohms 20% ¼ W
R406	02031730 02041730	Res F C 470 ohms 10% ½ W
R407	02032130 02042130	Res F C 1 megohm 10% ½ W
R408	02037610	Res F C 47 ohms 10% 2 W
R409	02037920	Res F C 16000 ohms 10% 2 W
R410	02100810	Res F W 4.7 ohms 10% ½ W
R411	02019500	Res F W 2 megohms 20% 5 W
R412	Same as R410	
R413	02018861	Res F W 8.5 K ohms Tap 5% 25 W
R414	02035010 02045010	Res F C 100 K ohms 10% 1 W
R415	02107140 02107630	Res F W 250 ohms 5% 5 W
R416	02034870 02044870	Res F C 6800 ohms 10% 1 W
R417	02031530	Res F C 10 ohms 10% ½ W
R418	02037930	Res F C 22000 ohms 10% 2 W
On later models R418 is described as follows:		
	02111030	Res F W 12 K ohms 5% 5 W
R419	02031610 02101056	Res F C 47 ohms 10% ½ W
S401	05002981	Switch 3 position
T401	20003951	Transformer flyback
V401	25000130	Tube Elec type 12AU7
V402	25000140	Tube Elec 6BG6—G
V403	25000150	Tube Elec 1B3—GT/8016
V404	Same as V403	
V405	25000160	Tube Elec 5V4—G
V406	25000170	Tube Elec 6X4
V407	Same as V406	
11000550		Fuse Holder
34001100		Socket Tube Octal
34001180		Socket Tube 7 Prong
34001140		Socket Tube 9 Prong
34001150		Socket Tube Octal

Symbol No.	Part No.	Description
34001160		Socket Tube 6 Prong
35000260		Mounting, Capacitor
36000500		Clip, Tube Contact
36000761		Clip Spring
42001301		Shield, Cover Assembly
42001311		Shield, Corona
43000101		Bushing, Standoff
43000131		Sleeve, Capacitor Mtg.
50002900		Cable Assembly, Power

AM TUNER ELECTRICAL PARTS LIST

(Dec. 21, 1948)

Symbol No.	Part No.	Description
C502	03014390	Cap Ce 330 mmfd 20% 350 V
C503	03014380	Cap Ce 100 mmfd 20% 500 V
C504	03012730	Cap Ce 47 mmfd Zero Temp Coeff 10% 500 V
C505	03000950	Cap Pa .05 mfd 25% 200 V
C506	03001570	Cap Pa .005 mfd 25% 600 V
C507	Same as C506	
C508	Same as C502	
C510	03001160	Cap E 8 mfd +50%—10% 450 V
C511	Same as C506	
C512	03016111 03016122	Cap V 3 section tuning
I501	12001310	Lamp Incandescent .15 amp 6.3V
L501	21004321	Assembly antenna coil
L502	21004331	Assembly RF coil
L503	21004311	Assembly oscillator coil
P501	50014121	Assembly cable
R501	02032580	Res F C 470 K ohms 20% ½ W
R502	02032660	Res F C 10 megohms 20% ½ W
R503	02032500	Res F C 22 K ohms 20% ½ W
R504	02032560	Res F C 220 K ohms 20% ½ W
R505	Same as R504	
R506	02032600	Res F C 1 megohm 20% ½ W
R507	02032420	Res F C 1000 ohms 20% ½ W
R508	02105400	Res F W 47 ohms 10% 2 W
R509	02032430	Res F C 1500 ohms 20% ½ W
R511 (A, B)	02108600	Res F W 4500/9000 ohms 8/3.5 W
V501	25000240	Tube Elec type 6BA6
V502	25000250	Tube Elec type 6BE6
V503	Same as V501	
V504	25000210	Tube Elect type 6SQ7 GT/G
	45000281	Dial A.M.
	34001100	Socket Tube Octal
	34001360	Socket Tube 7 Prong
Z501	20004043	Transformer IF
Z502	Same as Z501	

MISCELLANEOUS PARTS LIST RA-105

(Dec. 21, 1948)

Table Model — Stratford (99005101)
Console Model — Westbury (99005102)
Console Model With Phono (99005103)
Console Model — Whitehall (99005104)
Console Model with phono and AM Tuner (99005105)
Table Model — Stratford Blonde (99005106)

Part No.	Description
45000043	Window safety glass all models
25000030	Tube CRT 15AP4 all models
21004241	Assembly yoke deflection all models
21004251	Assembly coil focus all models
18002761	Assembly Loud Speaker Stratford
18002771 18002781	Assembly Loud Speaker 12 in. Console models
64000213	Assembly Bezel eye
19034351	Reproducer sound 156 colony Phono and AM Tuner
64000061	Bezel Dial all models
45000211	Assembly Vernier Dial
45000221	Assembly Main Dial
45000221	Pointer Dial
09000600	Connctor male 8 contacts all models
38000671	Cushion CRT all models
38000351	Cushion CRT front all models
43000111	Cushion rubber all models
38000831	Cushion safety glass all models
35000151	Sleeve CRT rear all models
35000401	Strap CRT all models
38000851	Strap cushion all models
38000871	Gasket CRT all models
35000131	Plate front CRT MTG
03014670	Cap Pa .002 mfd 25% 600 V
45000032	Knob tuner Stratford, Westbury and Colony
45000023	Knob control Stratford, Westbury and Colony
45000022	Knob control Stratford, Westbury and Colony
45000093	Knob control Whitehall and Blonde Stratford
45000092	Knob control Whitehall and Blonde Stratford
45000102	Knob AM tuner Whitehall
35000221	MTG coil and yoke
35000331	Angle CRT MTG right hand all models
35000332	Angle CRT MTG left hand all models
09003730	Connector Male 1 contact Colony
09002760	Connector Female 1 contact Colony
02032010	Res F C 100 K ohms 10% ½ W Colony (For Phono)
02042010	See below
35000391	Strap MTG all models
45000581	Window AM dial
64000571	Bezel AM dial
45000021	Knob control Colony
On late models this should read:	
02031990	Res F C 68 K ohms 10% ½ W Colony (For Phono) Alternate 02041990

ALLEN B. DUMONT LABORATORIES, INC. MODEL RA-105

Typical Resistance Measurements

All readings in ohms unless otherwise stated.

(Inf.=Infinite K=Thousand M=Million)

Tube	1	2	3	4	5	6	7	8	9
V201	2.5M	65	0.05	0	22K	14K	65		
V202	2.5M	65	0.05	0	22K	22K	65		
V203	0.2	110	0.05	0	22K	22K	110		
V204	0.2	0.2	0	0.05	5.8M	Inf.	5.5K		
V205	5.5K	26	0.05	0	17K	50K	26		
V206	17K	0.5M	900	0.05	0.05	0	0	1M	0
V207	Inf.	0	13.5K	52K	550K	11K	0.05	570	
V209	6M	2.4K	0	0.05	2.8M	0	330K		
V210	1.5M	0	0.05	0	12K	47K	80		
V211	1.5M	0	0.05	0	12K	47K	90		
V212	300K	0	0.05	0	15K	9.3K	85		
V213	200K	100K	0.05	0	0	0	100K		
V214	3.5K	0.05	11K	1.4M	0	0	0	3.5K	
V215	4.9M	0	0	0.05	Inf.	Inf.	120K		
V216	Inf.	0.05	12K	12K	0.5M	220K	0	300	
V217	1.6M	0	0	0.05	48K	15K	0		
V218	520K	0	0.05	0	520K	Inf.	1M		
V219	0	0	17K	22K	47K	500K	0.05	14	
V220	580K	2M	0	1.3M	43K	2.5K	0	0.05	
V221	2.1M	17K	1.3K	2.1M	17K	1.3K	0.05	0	
V222	Inf.	Inf.	Inf.	12	Inf.	11	Inf.	Inf.	
V223	Inf.	Inf.	Inf.	12	Inf.	11	Inf.	Inf.	
V224	0	0.05	145	1.5M	155	20K	0	34K	

Typical Voltage Measurements

Line 117V. Antenna disconnected. All readings in volts.

Tube	1	2	3	4	5	6	7	8	9
V201	-0.65	0.6	6.3AC	0	260	150	0.6		
V202	-0.65	1.0	6.3AC	0	200	200	1.0		
V203	0	1.4	6.3AC	0	175	175	1.4		
V204	0	0	0	6.3AC	1.65	—	-0.3		
V205	-0.3	0.35	6.3AC	0	265	110	-0.35		
V206	260	0	8.4	6.3AC	6.3AC	0	0	3.0	0
V207	—	0	305	200	0	310	6.3AC	29	
V209	1.6	7.4	0	6.3AC	-0.5	0	275		
V210	0.02	0	6.3AC	0	290	170	1.2		
V211	0.05	0	6.3AC	0	290	200	1.0		
V212	-0.25	0	6.3AC	0	240	19	0.25		
V213	0.65	-0.85	6.3AC	0	0	0	-7.6		
V214	1.1	6.3AC	310	0.6	0	0	0	1.0	
V215	-0.75	0	0	6.3AC	-1.0	-0.9	160		
V216	—	6.3AC	285	290	0	0	0	8.7	
V217	-1.1	0	0	6.3AC	50	40	0		
V218	7.6	0	6.3AC	0	7.4	—	-0.6		
V219	0	0	220	225	-42	7.4	6.3AC	0.55	
V220	-26	120	0	0	210	8.0	0	6.3AC	
V221	0.3	335	13.5	0.3	335	13.5	6.3AC	0	
V222	—	425	—	400AC	—	400AC	—	425	
V223	—	425	—	400AC	—	400AC	—	425	
V224	0	6.3AC	0.65	-0.65	0.7	93	0	225	

For use with serial numbers 8,500,001 - 8,501,000.

MODEL RA-105 ALLEN B. DUMONT LABORATORIES, INC.

MAIN CHASSIS RESISTANCE MEASUREMENTS

All readings to chassis.
Selector switch in TV position.
All readings are in ohms unless otherwise stated.
RCA 195A Voltohmyst used.
(M=Million K=Thousand)

Tube	1	2	3	4	5	6	7	8	9
Tube	1	2	3	4	5	6	7	8	9
V201	2.1M	0	0.2	Gnd	28K	28K	0		
V202	2.5M	68	0.2	Gnd	40K	40K	0		
V203	0.2	100	0.2	Gnd	36K	36K	100		
V204	0.3	0.3	Gnd	0.2	5.9M	NC	5.2K		
V205	5.2K	33	0.2	Gnd	26K	66K	33		
V206	26K	470K	1K	0.2	0.2	Gnd	Gnd	1M	Gnd
V207	NC	Gnd	17K	40K	470K	NC	0.2	560	
V209	5.3M	2.25K	Gnd	0.2	2.7M	Gnd	370K		
V210	1.6M	Gnd	0.2	Gnd	15K	50K	82		
V211	1.2M	Gnd	0.2	Gnd	15K	50K	82		
V212	270K	Gnd	0.2	Gnd	17K	9K	82		
V213	200K	100K	0.2	Gnd	Gnd	Gnd	100K		
V214	3.3K	0.1	14K	14M	Gnd	Gnd	Gnd	3.3K	
V215	1.2M	Gnd	Gnd	0.2	NC	NC	120K		
V216	NC	0.2	15K	14K	440K	220K	Gnd		
V217	1.5M	Gnd	Gnd	0.1	46K	14K	Gnd		
V218	500K	0	0.2	Gnd	500K	NC	4M		
V219	Gnd	Gnd	20K	25K	47K	500K	0.2	Gnd	
V220	600K	2.2M	Gnd	1.2M	46K	2.2K	Gnd	0.2	
V221	2.2M	20K	1.3K	2.2M	20K	1.3K	0.2	Gnd	
V223	NC	Inf	NC	14	NC	14	NC	Inf	
V224	0	.1	150	1.6	170	22K	0	40K	

MAIN CHASSIS VOLTAGE MEASUREMENTS

All readings to chassis.
Selector switch in TV position.
Antenna lead disconnected.
All readings are in volts.
RCA 195A Voltohmyst used.
Line 117V.

Tube	1	2	3	4	5	6	7	8
Tube	1	2	3	4	5	6	7	8
V201	-1.4	NC	6.3AC	0	180	180	0	
V202	-1.4	.5	6.3AC	0	190	190	.5	
V203	0	1.3	6.3AC	0	150	150	1.3	
V204	0	0	0	6.3AC	.9	NC	-.05	
V205	-.05	.2	6.3AC	0	260	150	NC	
V206	240	0	8.5	6.3AC	6.3AC	0	0	1.4
V207	NC	0	290	190	0	NC	6.3AC	13.5
V209	.7	6	0	6.3AC	-.8	0	250	
V210	-.3	0	6.3AC	0	295	180	1.1	
V211	-.3	0	6.3AC	0	285	165	1	
V212	-.4	0	6.3AC	0	240	52	.25	
V213	.5	-5.2	6.3AC	0	0	0	-13	
V214	1.6	6.3AC	290	-2.7	0	0	0	1.6
V215	-.5	0	0	6.3AC	NC	NC	115	
V216	NC	6.3AC	255	270	0	NC	0	13
V217	-.9	NC	0	6.3AC	15	18	0	
V218	6.8	0	6.3AC	0	6.8	NC	-.6	
V219	NC	0	220	225	-46	NC	6.3AC	.5
V220	-33	13.5	0	0	200	7.5	0	6.3AC
V221	0	330	14	0.1	330	14	6.3AC	0
V223	NC	430	NC	400AC	NC	400AC	NC	430
V224	NC	6.3AC	1	0	1	100	0	200

Additional Measurements:

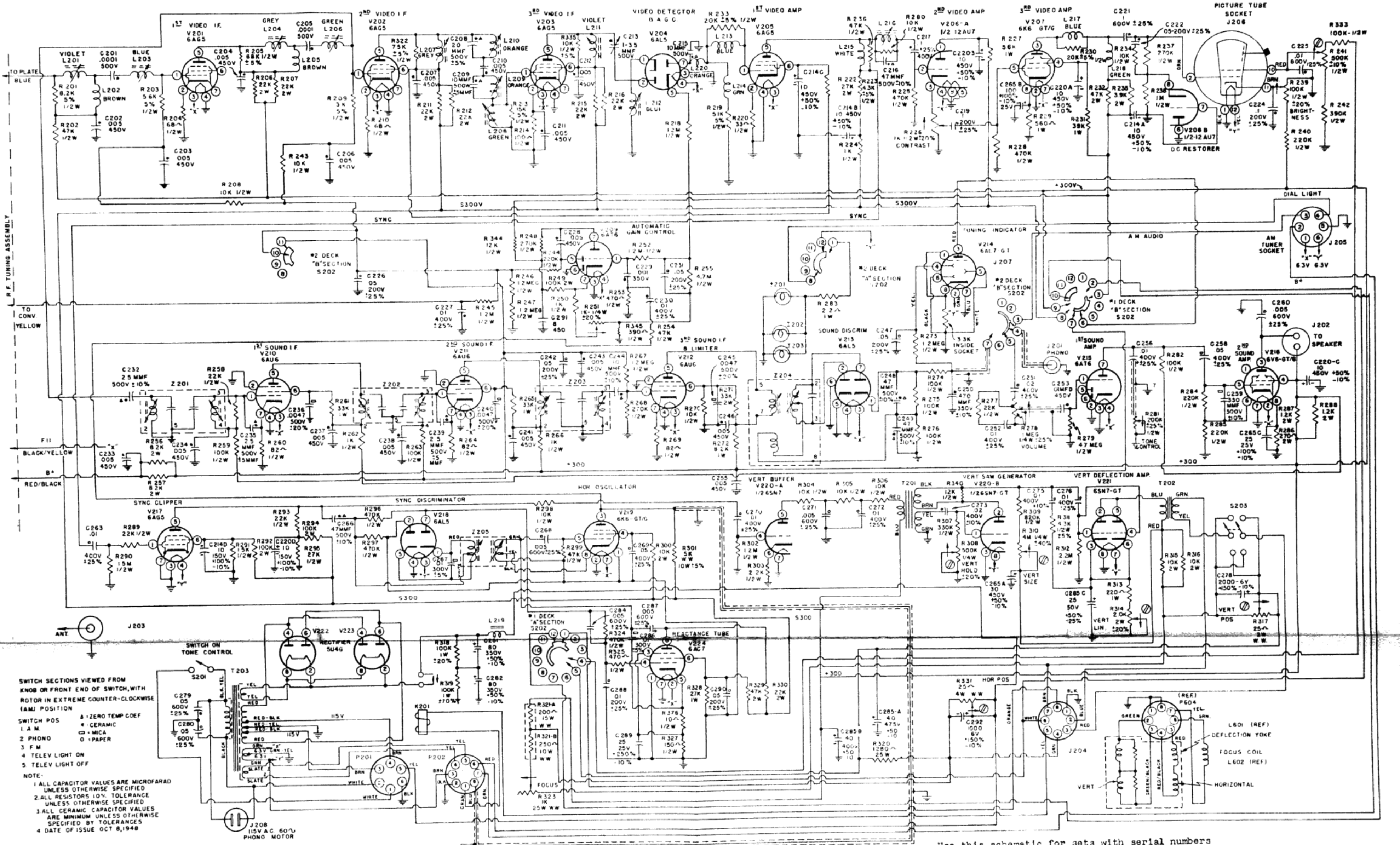
Arm of Brightness control set at cutoff = 45V

Arm of CRT bias control R241 = 370V.

For use with serial numbers starting with 8,501,000.

ALLEN B. DUMONT LABORATORIES, INC

MODEL RA-105, Colony, Stratford, Westburg, Whitehall



SWITCH SECTIONS VIEWED FROM KNOB OR FRONT END OF SWITCH, WITH ROTOR IN EXTREME COUNTER-CLOCKWISE (AM) POSITION

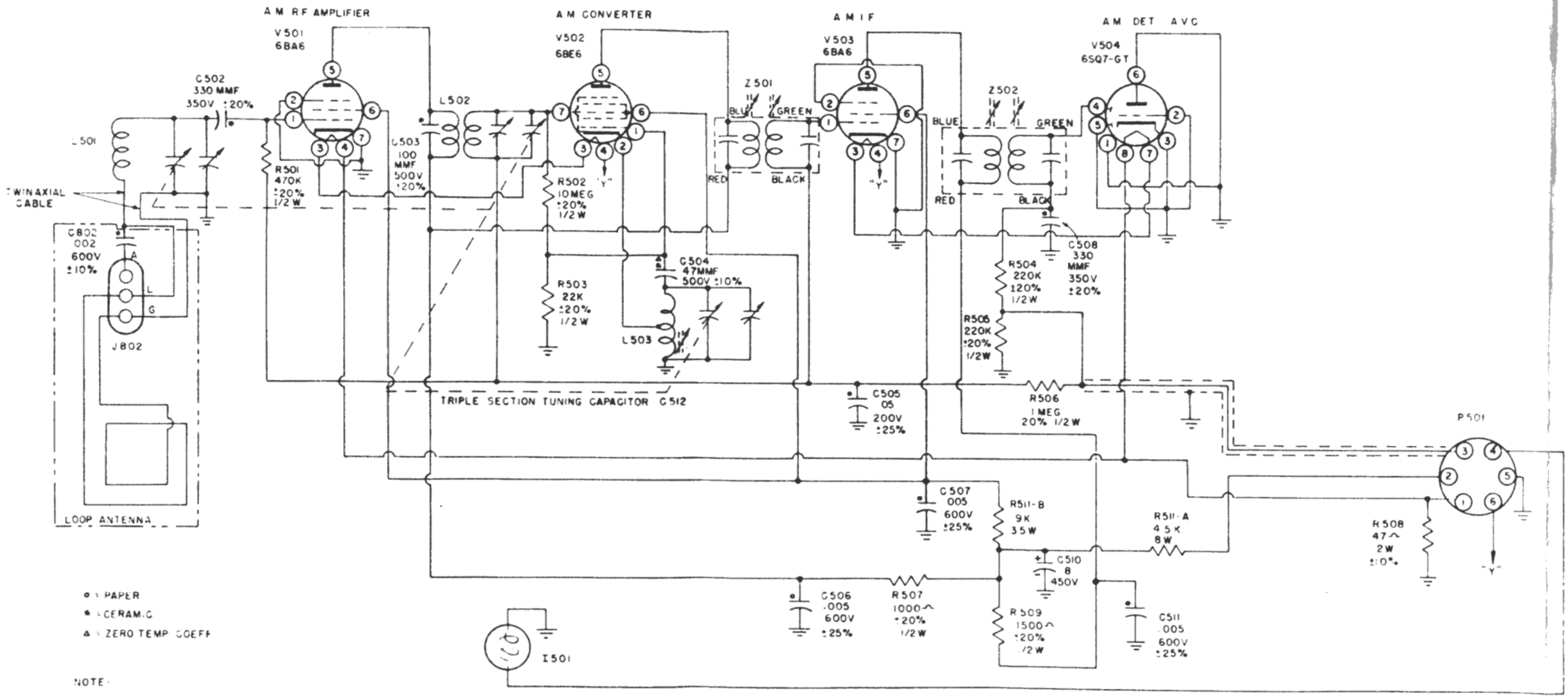
SWITCH POS
1 A.M.
2 PHONO
3 F M
4 TELEV LIGHT ON
5 TELEV LIGHT OFF

& = ZERO TEMP COEF
Φ = CERAMIC
▭ = MICA
O = PAPER

NOTE:
1 ALL CAPACITOR VALUES ARE MICROFARAD UNLESS OTHERWISE SPECIFIED
2 ALL RESISTORS 10% TOLERANCE UNLESS OTHERWISE SPECIFIED
3 ALL CERAMIC CAPACITOR VALUES ARE MINIMUM UNLESS OTHERWISE SPECIFIED BY TOLERANCES
4 DATE OF ISSUE OCT 8, 1948

Use this schematic for sets with serial numbers from 8,500,001 to 8,501,000

MODEL RA-105 TELESET
RECEIVER MAIN CHASSIS



● = PAPER
✱ = CERAMIC
▲ = ZERO TEMP COEFF

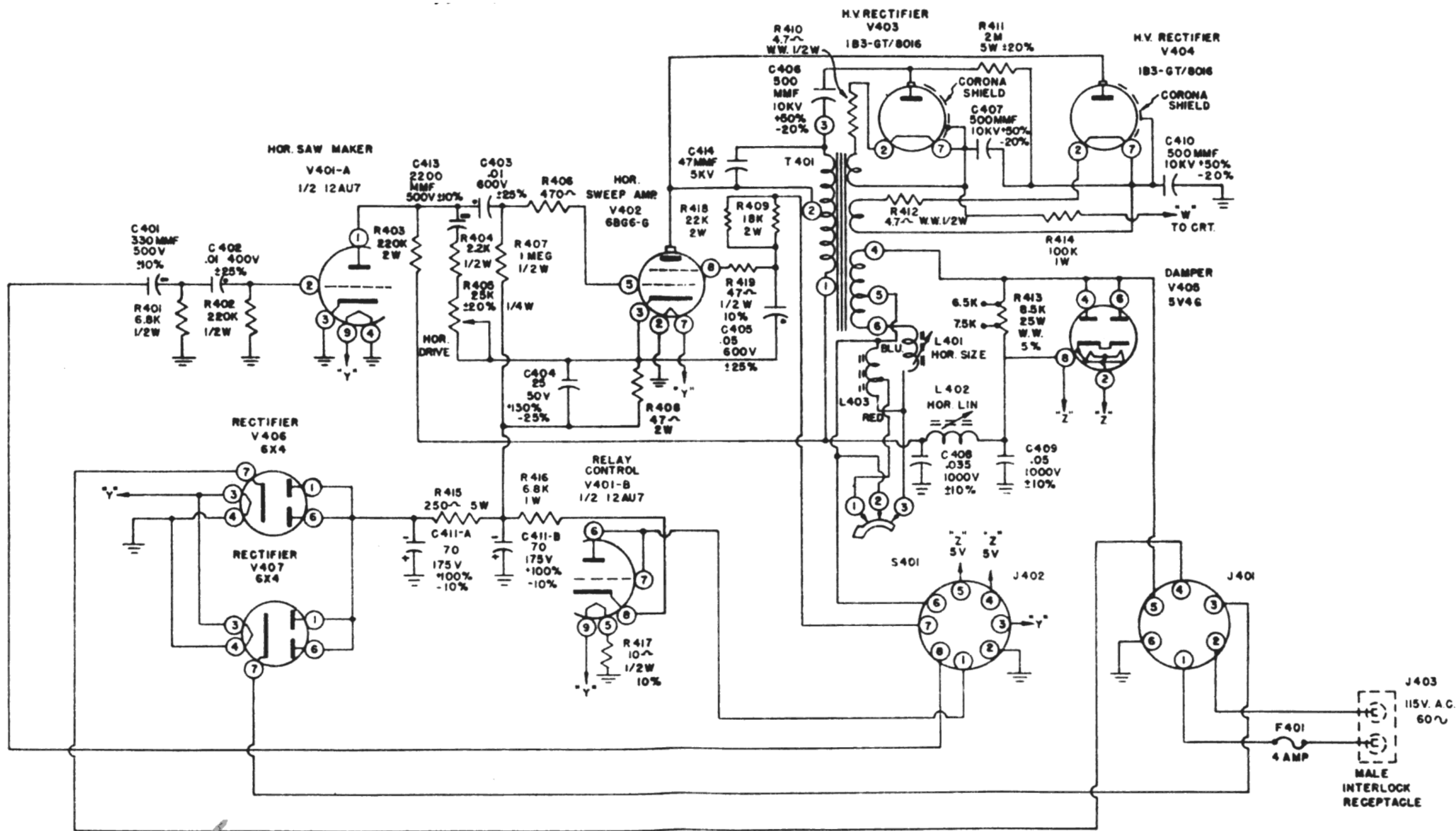
NOTE:

ALL CAPACITOR VALUES ARE MICROFARAD UNLESS OTHERWISE SPECIFIED

2 FOR PERFORMANCE SPEC. SEE 89000301-7

3 DATE OF ISSUE OCT 11, 1948

MODEL RA-105 TELESET*
A.M. TUNER CHASSIS

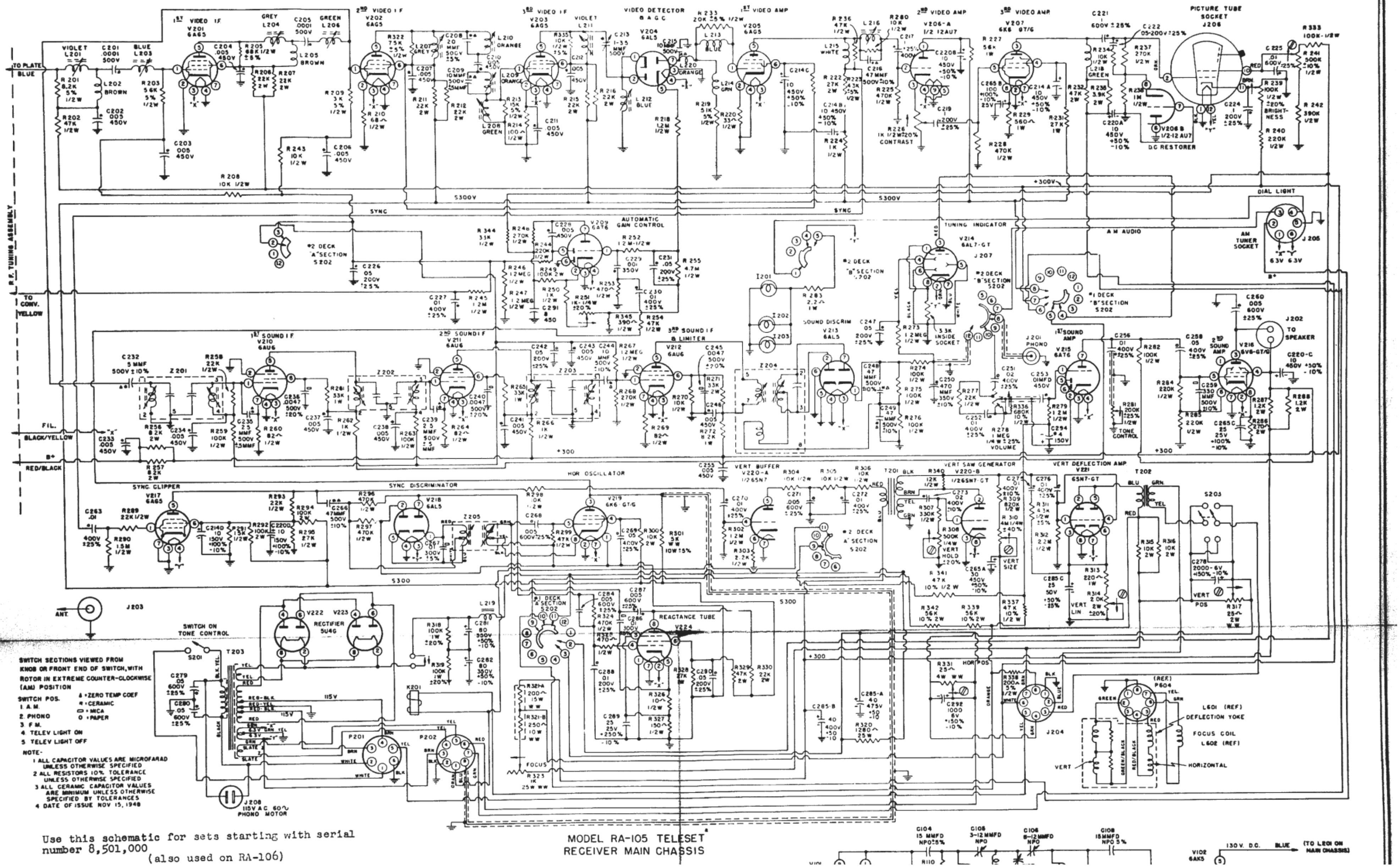


MODEL RA-105 TELESET*
FLYBACK POWER SUPPLY CHASSIS

NOTE:
1. ALL CAPACITOR VALUES ARE MICROFARADS UNLESS OTHERWISE SPECIFIED
2. ALL RESISTORS 10% TOL. UNLESS OTHERWISE SPECIFIED
   - △ = ZERO TEMP. COEFF
   - ■ = CERAMIC
   - ▭ = MICA
   - ● = PAPER
3. SWITCH (S401) SHOWN AS VIEWED FROM KNOB OR FRONT END WITH ROTOR IN EXTREME COUNTER-CLOCKWISE POSITION
4. DATE OF ISSUE AUG. 31, 1948

ALLEN B. DUMONT LABORATORIES, INC

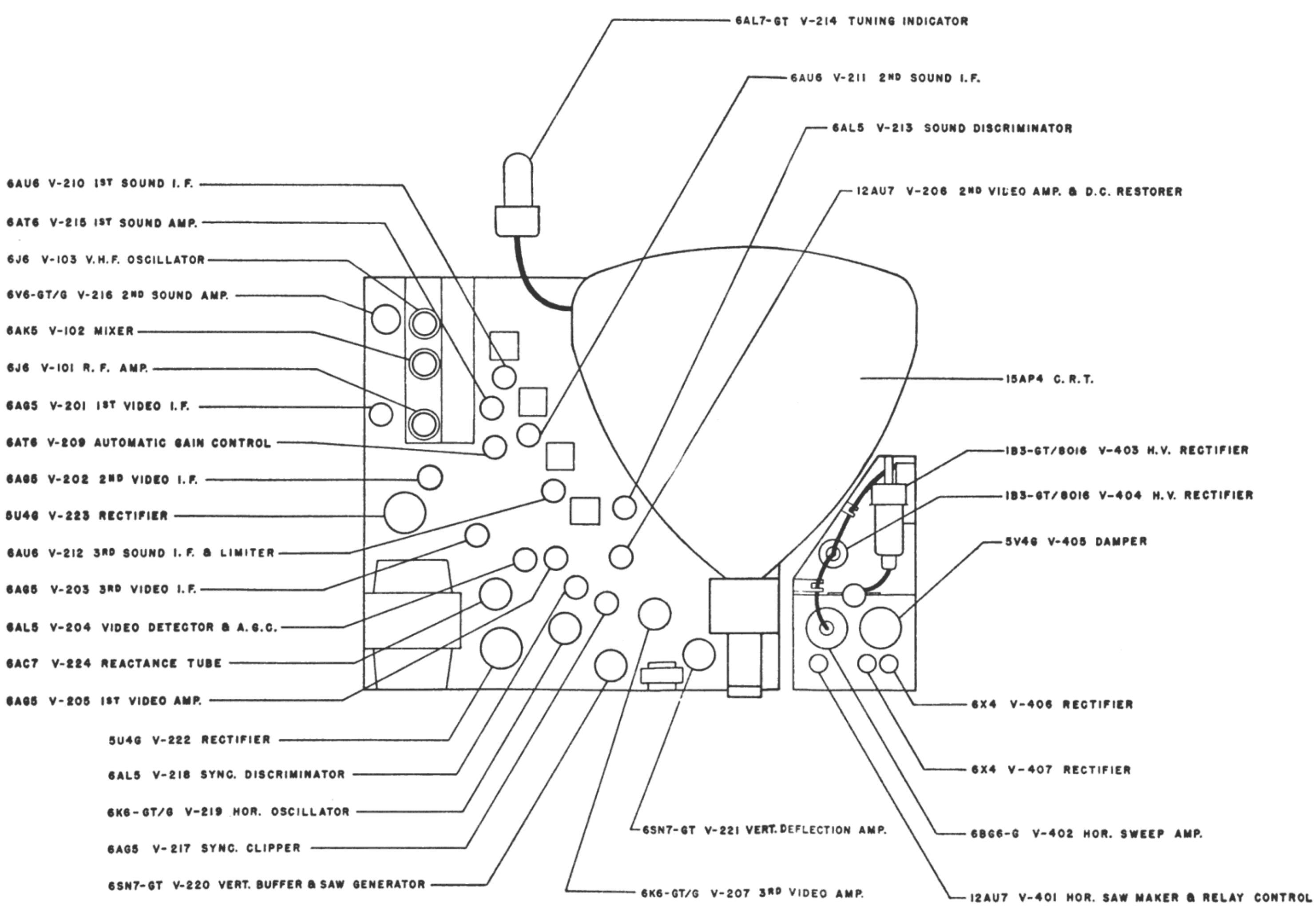
MODEL RA-105, Colony, Stratford, Westburg, Whitehall



Use this schematic for sets starting with serial number 8,501,000
(also used on RA-106)

MODEL RA-105 TELESET
RECEIVER MAIN CHASSIS

TUBE LOCATION



DU MONT MODEL RA-105 TELESET

MODEL
R.F.

TYP

All readings in ohms unless otherwise indica

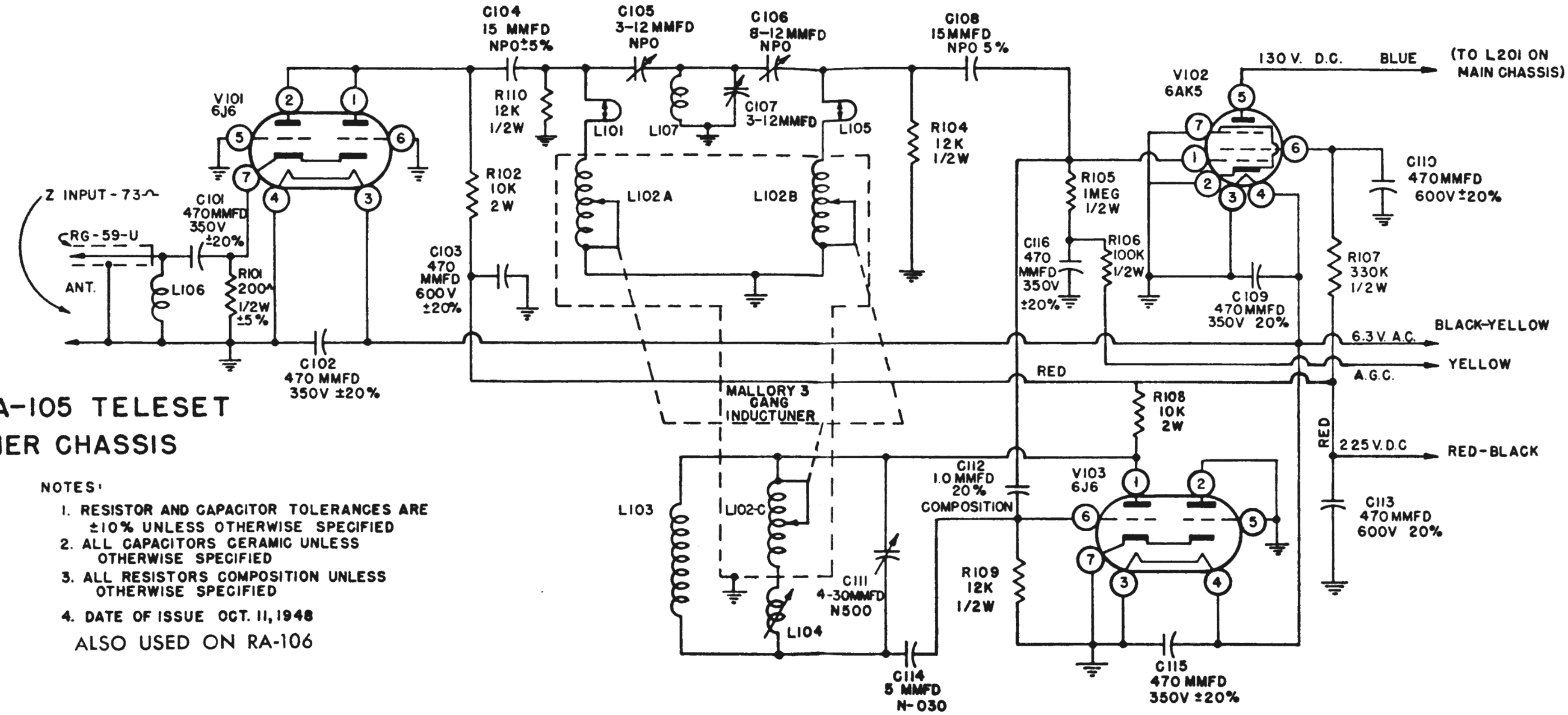
	Tube	1	2	3
†	V401	210K	2.5M*	2M
	V402	21K	0	2M
	V403	Inf.	Inf.	Inf
	V404	Inf.	Inf.	Inf
	V405	Inf.	22K	Inf.
	V406	3.5M*	4.5M	0.0
	V407	3.5M*		0.0

†On the early models, R402 and the cathode
R403 is a 220K 2W resistor. The following re

Tube	1	2	3
V401	220K	220K	0

*Readings were observed after the capacity

TELESET[a]
CHASSIS



MODEL RA-105 TELESET
R.F. TUNER CHASSIS

NOTES:

1. RESISTOR AND CAPACITOR TOLERANCES ARE ±10% UNLESS OTHERWISE SPECIFIED
2. ALL CAPACITORS CERAMIC UNLESS OTHERWISE SPECIFIED
3. ALL RESISTORS COMPOSITION UNLESS OTHERWISE SPECIFIED
4. DATE OF ISSUE OCT. 11, 1948

ALSO USED ON RA-106

TYPICAL RESISTANCE READINGS

otherwise indicated. M=1 million K=1 thousand

2	3	4	5	6	7	8	9
2.5M*	2M*	0	5.5	5K	5K	300K	
0	2M*	6.5	3.8M*	3.8M*	.1	23K	—
Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	
Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	
22K	Inf.	5K	Inf.	5.8K	Inf.	22K	—
4.5M	0.05	0	4.1M	3.5M*	4.5	—	—
	0.05	0	500K*	3.5M*	4.5	—	—

and the cathode of V401-A are returned directly to ground. On these sets,
The following readings will apply only to these sets.

2	3	4	5	6	7	8	9
220K	0	0	5.5	5K	5K	300K*	0.05

er the capacity in the circuit was charged.

TYPICAL VOLTAGE READINGS

Line 117V Picture adjusted for normal size. RCA Voltomyst Model 195A used. All readings to chassis.

Tube	1	2	3	4	5	6	7	8	9	Top Cap
** V401	100V	-140V	-95V	0	0	-37V	-37V	-42V	6	
V402	190V	0	-85V		110V	-110V	6.3 Vac	190V		560V
V403		11KV					11KV			4.6KV
V404		4.6KV					4.6KV			560V
V405		4.60V		390V		390V		470V		
V406	-120V		Vac 6.3	0		-120V	115 Vac			
V407	-120V		Vac 6.3	0		-120V	115 Vac			

**On the early models, R402 and the cathode of V401-A are returned directly to ground. On these sets, R403 is a 220K 2W resistor.
The following readings will apply only to these sets:

Tube	1	2	3	4	5	6	7	8	9	Top Cap
V401	180V	-41V	0	0	1.2 Vac	-37V	-37V	-41V	6.2 Vac	