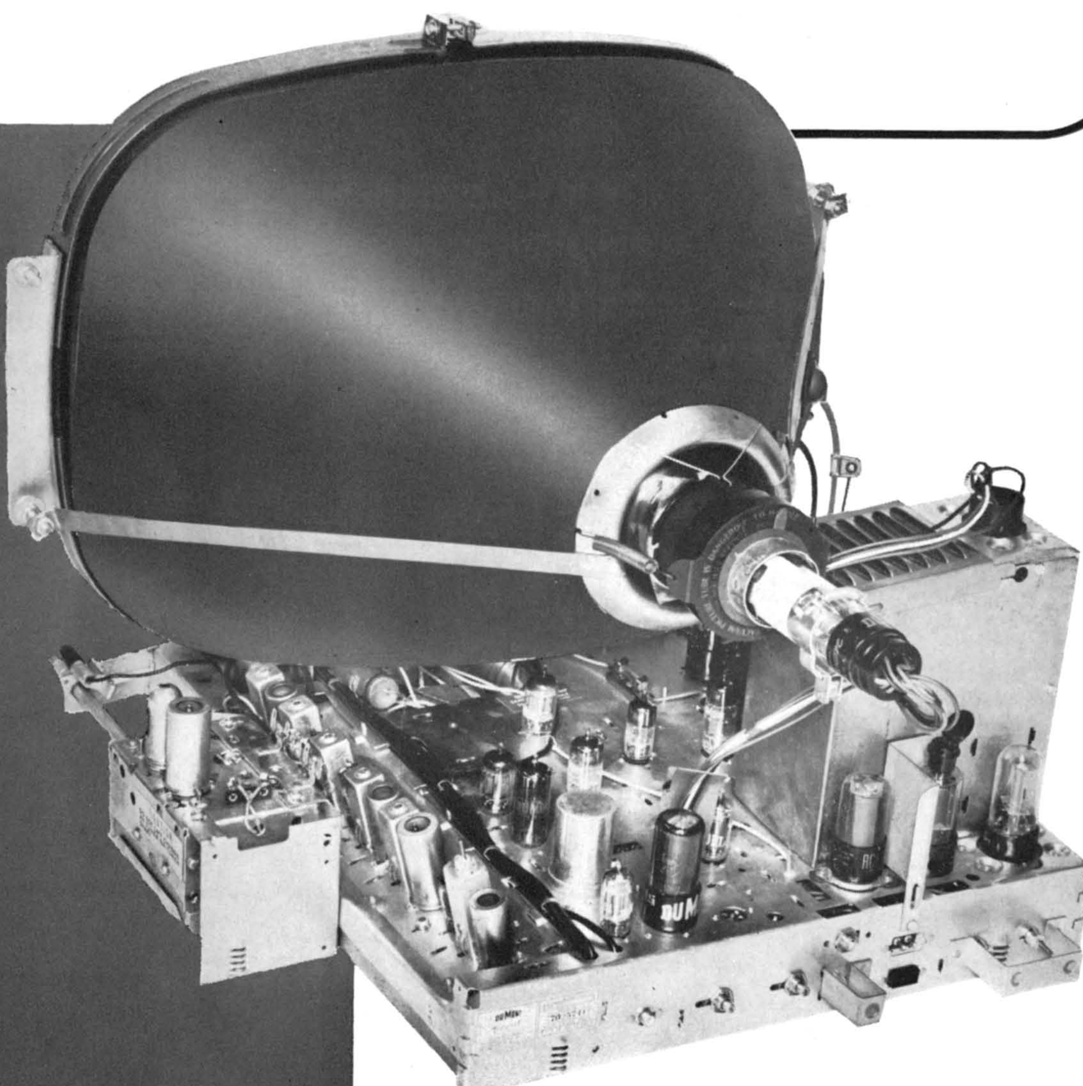
Service Manual

for

RA-166/RA-171 TELESETS



ALLEN B. DU MONT LABORATORIES INC.

TELESET SERVICE DEPARTMENT

DUMONT

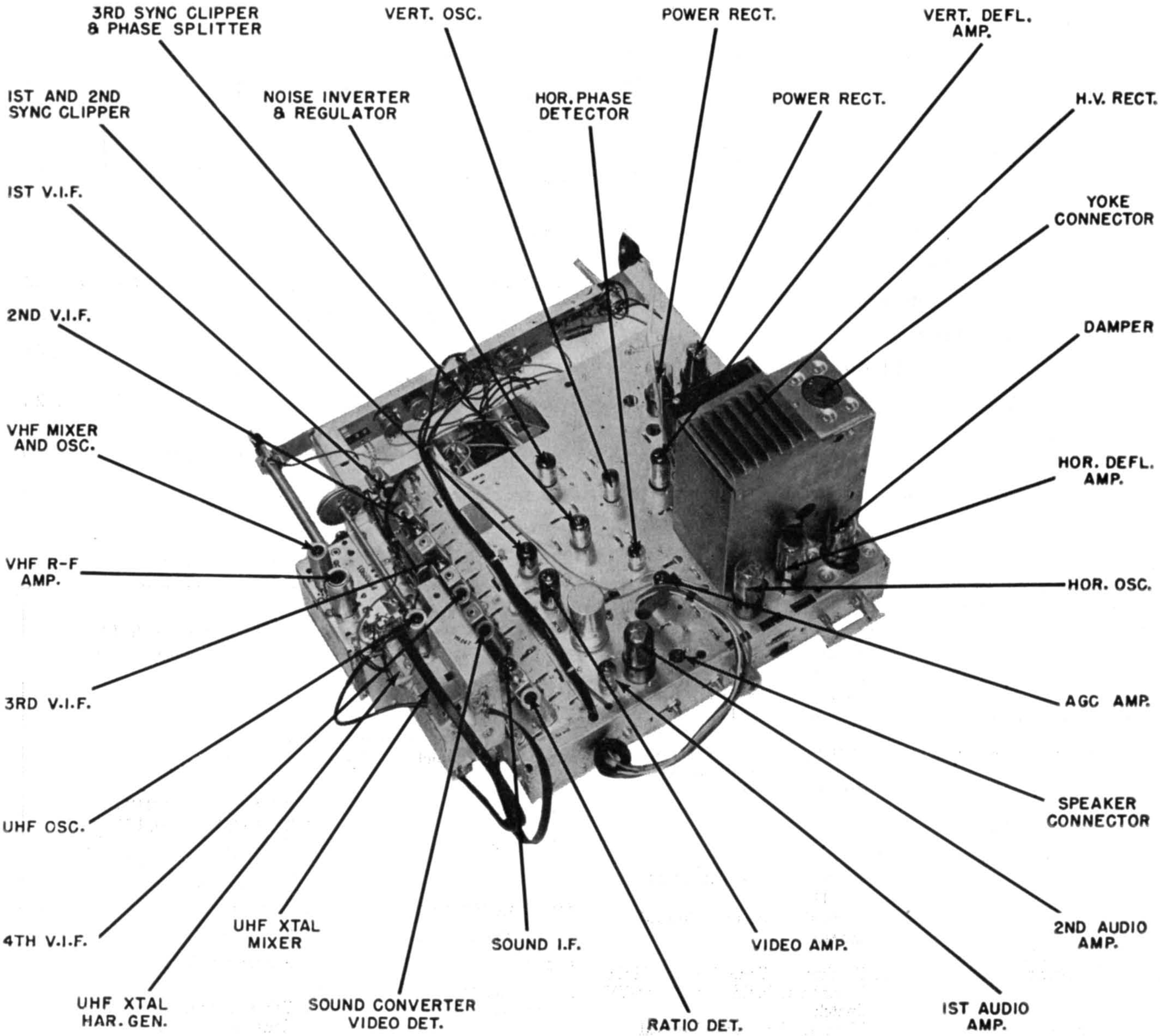
CONTENTS

ELECTRICAL AND MECHANICAL SPECIFICATIONS

POWER RATING	
Source	105-129 volts, 60 cycle a-c
Consumption	
RA-166, 167, 170	225 watts
RA-168, 169, 171	240 watts
NUMBER OF TUBES	
RA-166, 167, 170	22 plus 3 Rectifiers and 1 CRT
RA-168, 169, 171	23 plus 3 Rectifiers, 2 Crystals and 1 CRT
OPERATING CONTROLS	Station Selector, Fine Tuning and UHF Tuning, Contrast, Volume and On-Off.
HIDDEN FRONT PANEL CONTROLS	
RA-166, 167, 168, 169	
Operating	Brightness, Vertical Hold and Horizontal Hold
Service	Vertical Size and Vertical Linearity
RA-170, 171	
Operating	Brightness, Tone, Vertical Hold, Horizontal Hold and Phono-TV Switch
Service	Vertical Size and Vertical Linearity
ANTENNA INPUT IMPEDANCE	
VHF	Balanced 300 ohm
UHF	Balanced 300 ohm
FREQUENCY RANGE	
RA-166, 167, 170	Channels 2 through 13
RA-168, 169, 171	Channels 2 through 83
INTERMEDIATE FREQUENCIES	
Video I-F Carrier	45.75 mc
Sound I-F Carrier	41.25 mc
Sound Intercarrier Frequency	4.5 mc
Adjacent Channel Sound Trap	47.25 mc
PICTURE TUBE	
Type	RA-166, 168: 17HP4 RA-167, 169, 170, 171: 21FP4A
Dimensions	RA-166, 168: 11 x 14¼ RA-167, 169, 170, 171: 13⅞ x 19⅛
CRT HIGH VOLTAGE	14.5 kv
SWEEP DEFLECTION	Magnetic
FOCUS	Automatic Electrostatic
LOUDSPEAKER	
Size	Table Model: 5 inch Console: 10 inch
Impedance	3.2 ohm at 400 cycles

TUBE COMPLEMENT

Symbol	Type	Function
V101	6BK7	R-F Amplifier
V102	6J6	R-F Oscillator and Mixer
V151	6J6	UHF Oscillator
V201	6CB6	1st Video I-F
V202	6CB6	2nd Video I-F
V203	6CB6	3rd Video I-F
V204	6CB6	4th Video I-F
V205	6AL5/ 12AU7	Sound Converter and Video Detector
V206	6AU6	Sound I-F
V207	6AL5	Ratio Detector
V208	12AU7	1st and 2nd Sync Clipper
V209	12AT7	3rd Sync Clipper and Phase Splitter
V210	6AL5	Horiz. Phase Detector
V211	12BY7	Video Amplifier
V212	6AU6	AGC Amplifier
V213	6AB4	Vertical Oscillator
V214	6AT6	1st Audio Amplifier
V215	6W6-GT	2nd Audio Amplifier
V216	6S4	Vertical Deflection Amplifier
V217	5Y3-GT	Power Rectifier
V218	5Y3-GT	Power Rectifier
V219	6SN7-GT	Horizontal Oscillator
V220	6BQ6-GT	Horizontal Deflection Amplifier
V221	6AX4-GT	Damper
V222	1B3-GT	H.V. Rectifier
V223	12AU7	Sync Noise Inverter and Voltage Regulator
V401	17HP4; 21FP4A	CRT



The RA-171 Chassis

SECTION I
GENERAL DESCRIPTION

The new Du Mont RA-166/171 chassis are high-performance units designed to provide high-definition pictures and outstanding fringe area reception. RA-166, 167 and 170 chassis are designed to receive all VHF channels and are easily adapted for UHF. The RA-168, 169 and 171 chassis are designed to receive all 82 VHF and UHF channels. The circuitry of all chassis is of similar design.

Among the many outstanding features found in these new chassis are:

1. Low-noise cascode 12-channel switch-turret VHF tuner for superior fringe area performance.
2. One dial tuning of all 82 VHF and UHF channels on VHF-UHF models.
3. Non-UHF models easily adapted for UHF by substitution of tuner strips.
4. Du Mont's Selfocus* Teletron*—provides fully automatic focus—eliminates focus control.
5. Four-stage, 41-mc, stagger-tuned, intercarrier video i-f strip for maximum sensitivity and high-definition pictures.
6. Fast acting keyed and delayed AGC, provides instantaneous control of receiver gain and automatically adjusts for both strong and weak signals.
7. Vertical retrace blanking circuit—eliminates retrace lines at all control settings.
8. Conveniently located controls—the most used controls are on the front panel, rear controls are easily accessible.
9. Shipped completely adjusted ready for installation.

*Trade Mark

SECTION II
CIRCUIT DESCRIPTION

A block diagram of the RA-166/171 chassis is shown in figure 1. The RA-168, 169 and 171 are UHF-VHF receivers equipped with separate UHF and VHF tuners coupled to a single control shaft. In the RA-166, 167 and 170, only the VHF tuner is provided. The VHF tuners in all models are of similar design.

The VHF tuner is of the switch-turret type. 13 switch positions are provided. When the tuner is switched to the thirteenth position, in receivers equipped with UHF tuners, the input of the VHF tuner is switched to the output of the UHF tuner, and the necessary circuits are switched to enable the VHF tuner to operate as a 41 mc i-f amplifier.

The video i-f strip consists of four stagger-tuned 6CB6 amplifier stages. The video i-f is 45.75 mc and the sound i-f is 41.25 mc. Separate video detector and sound

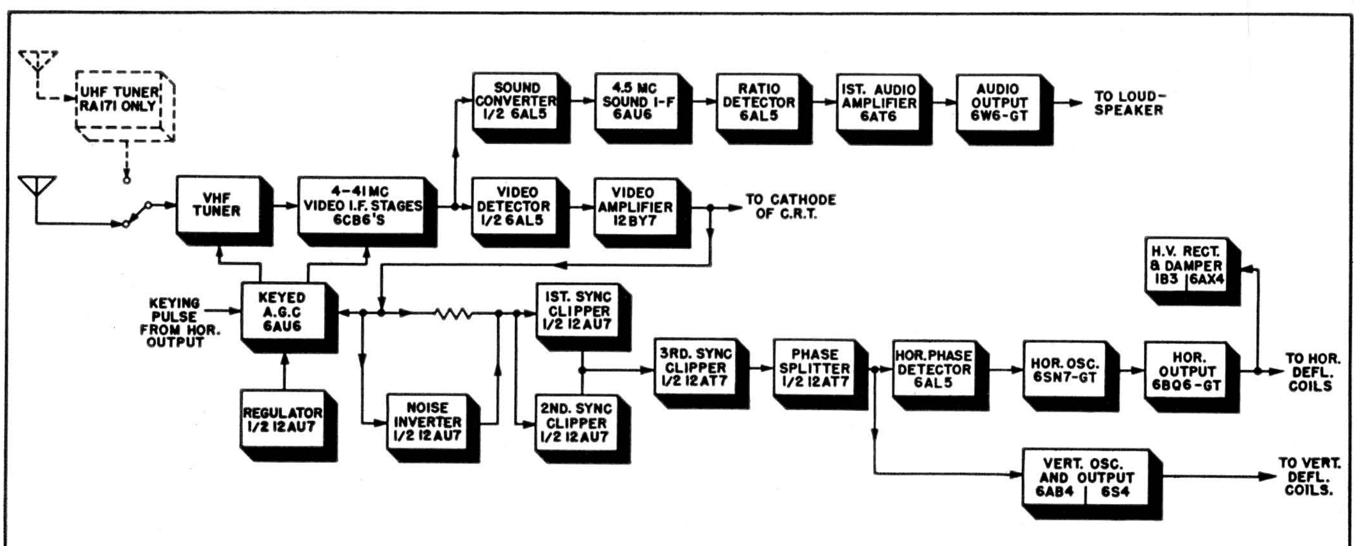


Figure 1. Block diagram of RA-166/171 chassis.

converter diodes are provided. This provision increases the amount of signal available at the input of the sound i-f amplifier, as compared to that obtained when a single diode is used. A single high-gain video-amplifier stage is employed.

The sync takeoff is in the plate circuit of the video amplifier. Three sync-clipper stages are used. The output of the third sync clipper is fed to a phase-splitter stage which provides out-of-phase sync signals required for operation of the horizontal phase detector. A multivibrator type horizontal-oscillator circuit is employed. A ringing circuit is provided in the oscillator circuit for improved stability.

A single 6BQ6-GT is used in the horizontal-output stage. A high-efficiency flyback-type high-voltage supply provides 14.5 kv for application to the CRT.

A keyed a-g-c circuit similar to that employed in RA-164-165 chassis is used. The a-g-c system also includes a tuner a-g-c delay circuit to provide a wide range of control for maximum performance in fringe - and strong - signal areas. A voltage regulator tube is provided in the a-g-c amplifier circuit to improve a-g-c stability.

The vertical-sync signal is taken off at the cathode of the phase-splitter stage and applied to a printed-circuit integrator network. A multivibrator circuit performs the combined functions of vertical oscillator and output stage.

As previously mentioned a separate sound-converter diode is provided. The output of the sound converter is applied to the input of a 4.5 mc intercarrier sound i-f stage. A ratio sound detector is employed. To secure optimum sound quality two stages of audio amplification are used.

In the following paragraphs a more detailed description is given of those circuits which are not familiar to the technician.

UHF - VHF TUNERS. — RA-168, RA-169 and RA-171 chassis are designed to receive all 82 UHF and VHF channels and are equipped with both UHF and VHF tuners. RA-166, RA-167 and RA-170 chassis are designed to receive the 12 VHF channels and are easily converted for UHF reception. The VHF tuners used in all models are of similar design. They are of the conventional switch-turret type, similar to those used in RA-160-162 and RA-164-165 Telesets. Since most technicians are familiar with this type of tuner it will not be described in detail here.

A block diagram of the VHF and UHF tuners, showing the circuit arrangement when receiving the UHF channels, is shown in figure 2. The UHF tuner is of the continuous-tuning type and provides coverage of the complete UHF television band (470-890 mc). 300-ohm balanced input is used. The incoming UHF signal is coupled to a tuned preselector. The preselector consists of two tuned circuits which pass the desired channel and attenuate all other signals. The output of the preselector is applied to a crystal mixer.

The UHF tuner oscillator operates at one half the required frequency and its second harmonic is injected into the mixer circuit. The second-harmonic signal is obtained by applying the oscillator fundamental to a crystal harmonic generator. A tuned circuit is provided to select the proper harmonic.

The oscillator frequency is chosen to provide a second harmonic 41.25 mc higher than the incoming sound carrier, in order to produce a sound i-f of 41.25 mc and a video i-f of 45.75 mc in the output of the mixer. A link-coupling network is provided in the mixer output circuit. The UHF tuner output signals are fed from this coupling circuit to the input of the VHF tuner by means of a short length of 73-ohm coax.

The VHF tuner is provided with 13 switch-turret positions. To receive the UHF channels the tuner is switched to the thirteenth, or UHF position. In this position the tuner oscillator is disabled and the r-f and mixer stages operate as 41-mc i-f amplifiers. Note that the incoming signal is converted only once and that the UHF tuner is a true tuner, not a converter.

When receiving VHF signals the B+ is removed from the UHF tuner and the input of the VHF tuner is connected to the VHF antenna. This is accomplished by a slide switch which is actuated by the Station Selector.

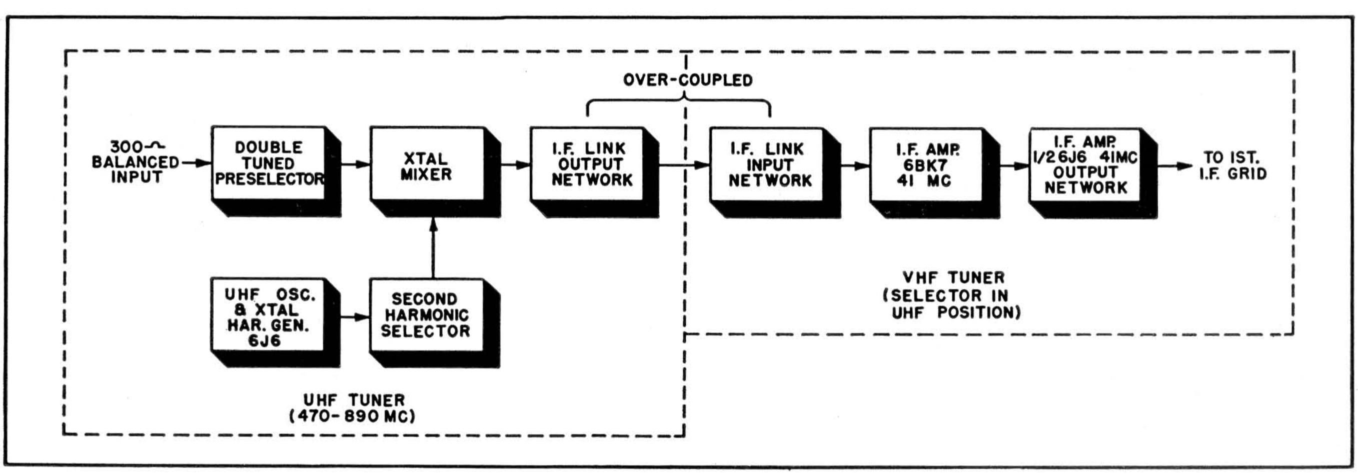


Figure 2. Block diagram of UHF-VHF Tuners.

PRESELECTOR CIRCUITS. — As previously mentioned the preselector consists of two inductively-coupled tuned circuits. Conventional tuned-circuit construction cannot be used in the UHF tuned circuits, consequently a special type high-Q low-loss circuit referred to as a capacitively-tuned, shorted coaxial line is used as shown in figure 3.

To aid in explanation of the preselector a low-frequency equivalent circuit is shown in figure 4A. The circuit configuration of the preselector is shown at B. The preselector tuned circuits are labeled 1 and 2.

The construction of these circuits is based upon the fact that transmission lines exhibit the same properties as do tuned circuits. For this reason the preselector circuits are referred to as transmission-line tuned circuits. For the benefit of the technician who is not familiar with this property of transmission lines a brief discussion follows.

An ordinary parallel-resonant circuit consists of an inductance and a capacitance as shown in figure 5A. At its resonant frequency this circuit presents a very high impedance. At frequencies above its resonant frequency the inductive reactance, X_L, is greater than the capacitive reactance, X_C. Since the greatest current flows through the smallest reactance, the capacitor current is greater than the inductor current, and the circuit is predominantly capacitive.

At frequencies below the resonant frequency of the circuit the capacitive reactance, X_C, is greater than the inductive reactance, X_L, the current through the inductor is greater than that through the capacitor, and the circuit is predominantly inductive.

A section of transmission line an exact electrical quarter-wave length long, shorted at one end, acts just the same as a parallel-resonant circuit. This property of transmission lines is due to the fact that it has both capacitance and inductance, as shown in figure 5B. The line shown is of the coaxial type. When current passes through the inner lead a field is set up around the lead, conseqently the lead has inductance. The capacitance necessary to complete the tuned circuit exists between the inner and outer conductors and is represented by the dotted capacitors in figure 5B. This capacitance is referred to as distributed capacitance and while it is not a "lumped constant" capacitor, as we ordinarily expect to find in a tuned circuit, it performs the same function.

As in the parallel-resonant circuit in figure 5A, the quarter-wave line is a high impedance at its resonant frequency. Above its resonant frequency it is predominantly capacitive, while *below its resonant frequency it is predominantly inductive.* Stating it another way, a transmission line shorter than a quarter wavelength at a given frequency is inductive at that frequency. The fact that a shorted section of transmission line is inductive under certain conditions is important because this characteristic is taken advantage of in the design of the UHF tuner.

A transmission line less than a quarter-wavelength long can therefore be used as the inductor in a parallel-resonant circuit. By adding sufficient capacitance between the inner and outer conductors, as shown in figure 5C, it can be resonated at the desired frequency. If the capacitor is made variable the circuit will be tunable over a band of frequencies.

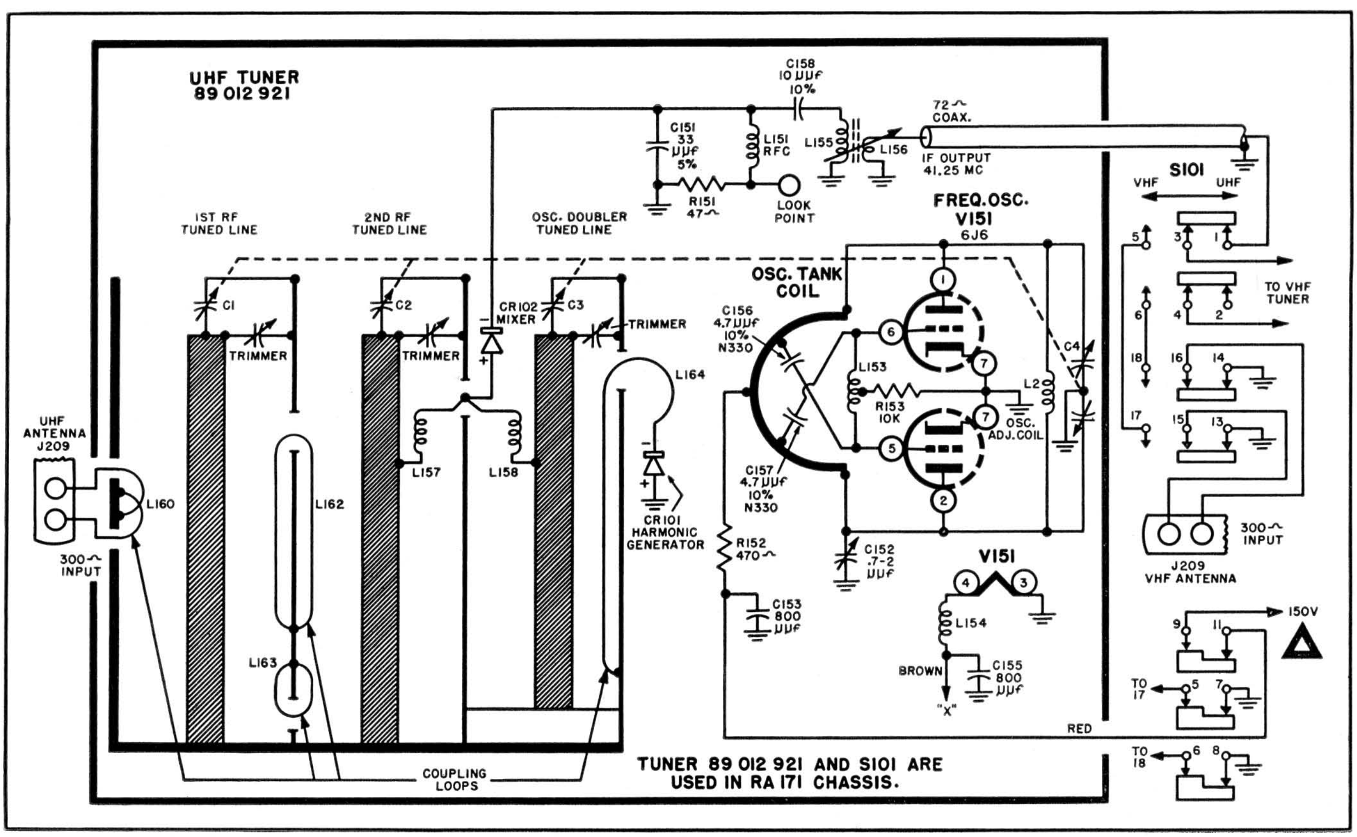


Figure 3. Schematic diagram of the UHF tuner.

Comparing figure 5C with the preselector tuned circuits in figure 4B we can see that they are the same. A form of link coupling is used between the preselector tuned circuits. Since the inductance for the circuits is supplied primarily by the inner conductor of the transmission line, the link must be located inside of the line. Partial turns of wire serve as the two links required (3 and 4 in figure 4B). They are brought out through holes in the outer conductors.

The same type of inductive coupling is also used between the input tuned circuit and the antenna. Two coupling loops are used to provide a 300-ohm balanced input (5 in figure 4B).

The output of the second preselector circuit is coupled to the mixer by means of a tap on the inner conductor (6 in figure 4B). This method of coupling is the same as the tapped coil of figure 4A.

The physical construction of the preselector tuned circuits is shown in figure 6. The box in which the tuner is mounted forms parts of the outer conductors of the tuned lines. The inner conductors are hollow U's, as shown in the figure. The inner conductors also serve as the stator plates of the tuning capacitors.

A shield located between the first and second preselector circuits forms one side of the outer conductors of the tuned lines.

The tuning-capacitor rotor plates are of the straight-line frequency type. Four rotor plates are used in each capacitor. The end plates are slotted so that they may be bent in sections to correct tracking and passband characteristics over the tuning range.

Each line section is provided with a metal tab attached to the inner surface of the outer conductor. These tabs are used as trimmer capacitors to correct for normal production variations. They are adjusted by bending them closer to or farther from the inner conductors of the tuned lines, and are adjusted with the tuning-capacitor rotors completely unmeshed, to establish the high end of the tuning range.

As shown in figure 3, two coupling loops are used between the preselector tuned circuits. The upper loop, L162, is effective primarily at the low-frequency end of the band, while the lower loop, L163, is effective primarily at the high-frequency end of the band.

THE UHF OSCILLATOR. — The UHF oscillator uses a push-pull, tuned-plate, tuned-grid circuit. To avoid the need for a special tube type, and permit the use of an existing type of known reliability, the oscillator is operated at one half the required frequency. Operation in this manner also results in greater stability and uniformity in manufacture.

A 6J6 dual triode is used in the oscillator. The plate tank coil is a flat piece of sheet metal shaped as shown in figure 6. This type of construction results in greater uniformity of inductance and lead dress.

Plate-circuit tuning is accomplished by means of split-stator capacitor C4. The rotor of this capacitor is ganged with those of the preselector and harmonic selector circuits. The grid circuit is tuned by L153 which is self resonant at the lower end of the tuning range and maintains the proper oscillator signal amplitude at these frequencies.

C156 and C157 provide the feedback necessary to maintain oscillation. Coil L2 is provided to permit adjustment of the plate circuit inductance. C152 is used to adjust the oscillator tracking at the high end of the tuning range.

In order to produce a 41.25-mc sound i-f and a 45.75-mc video i-f the local-oscillator signal must be tunable from 517 mc to 931 mc. Since the oscillator operates at half the required frequency it tunes from 258.5 mc to 465.5 mc.

The oscillator output is applied to a crystal harmonic

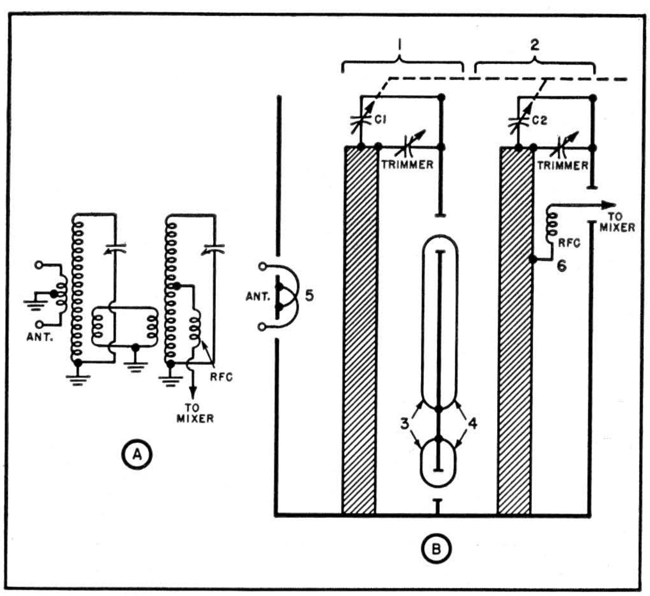


Figure 4. A—Low frequency equivalent of the preselector circuits. B—The actual preselector using tuned coaxial lines.

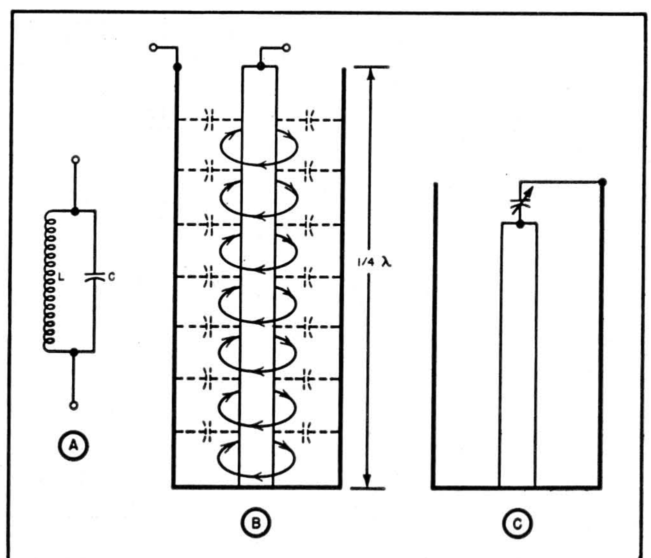


Figure 5. A—Parallel tuned resonant circuit. B—Resonant quarter-wave coaxial line. C—Shorted coax line less than quarter-wave long used as resonant circuit by the addition of capacitance.

generator, CR101, by means of coupling link L164. The crystal distorts the oscillator signal making it rich in harmonics. From the harmonic generator the signal is fed to a harmonic-selector circuit. The harmonic selector is a tuned circuit identical to the preselector circuits, except for frequency range. It is tuned to the second harmonic of the oscillator, the frequency required for mixer injection.

The oscillator second harmonic is applied to the crystal mixer, CR102, by means of a tap on the inner conductor of the harmonic-selector tuned line. L158 is an r-f choke.

The mixer output appears across i-f coil L155. This coil is slug tuned to permit adjustment for proper bandpass. From this point the signal is link coupled (L156) to a short length of 72-ohm coax, through which the signal is fed to the VHF tuner input.

The look point in the mixer-output circuit is used in production to observe the tuner bandpass and check the mixer injection current.

As pointed out previously the VHF tuner is provided with 13 switch-turret positions. To receive the UHF channels the Station Selector is placed in the thirteenth position. When this is done the VHF oscillator is disabled, and the necessary tuned circuits are switched in the VHF tuner so that the r-f amplifier and the mixer operate as 41 mc i-f stages.

In addition to the above, placing the Station Selector in the thirteenth position actuates a slide switch, S101 in figure 3, which applies B+ to the UHF tuner and connects the VHF tuner input to the UHF tuner output.

VIDEO I-F STRIP. — Four 41-mc stagger-tuned video i-f stages, employing 6CB6 tubes, are used. The grid circuit of the first video i-f stage is double tuned. All other coupling circuits are single tuned. A 47.25 mc adjacent-channel sound trap is provided. This trap is of the absorption type and is located in the plate circuit of the second video i-f stage. A-g-c voltage is applied to the first three stages.

VIDEO DETECTOR AND AMPLIFIER. — One-half of a 6AL5 twin diode serves as the video detector. D-c coupling is used between the detector and the video amplifier, as well as between the video amplifier and the CRT. A single high-gain video-amplifier stage employing a 12BY7 tube, is used.

The contrast control is located in the video-amplifier stage and consists of a potentiometer, connected between the cathode of the tube and ground. This potentiometer varies the bias and hence the gain of the video-amplifier stage.

A-G-C CIRCUITS. — A keyed a-g-c system with provisions to delay application of a-g-c voltage to the tuner r-f amplifier is used. The system posseses the excellent noise immunity and rapidity of action characteristic of keyed systems. In addition the delay provision greatly improves performance in both weak and strong-signal areas.

The tuner a-g-c voltage remains at the minimum permissible value (−.5 volts) on weak signals. This permits the tuner r-f amplifier to operate at full gain, maintaining maximum signal-to-noise ratio and minimizing picture snow. Adequate a-g-c is maintained on weak signals by the voltage applied to the i-f stages.

The tuner a-g-c delay also makes it possible to select component values in the a-g-c circuit which permit the tuner a-g-c voltage to rise rapidly at higher signal levels. As a result maximum performance is obtained over a wider range of input signal levels, with a given a-g-c control setting.

The a-g-c circuit is shown in figure 7. A 6AU6 sharp cut-off pentode is used as a keyed a-g-c amplifier (V212). The composite video signal, at the plate of the video amplifier, is applied to the grid of V212, through R256. Since d-c coupling is used, a portion of the plate voltage of the video amplifier appears at V212's grid, making it positive with respect to ground.

A positive d-c potential is applied to the cathode of

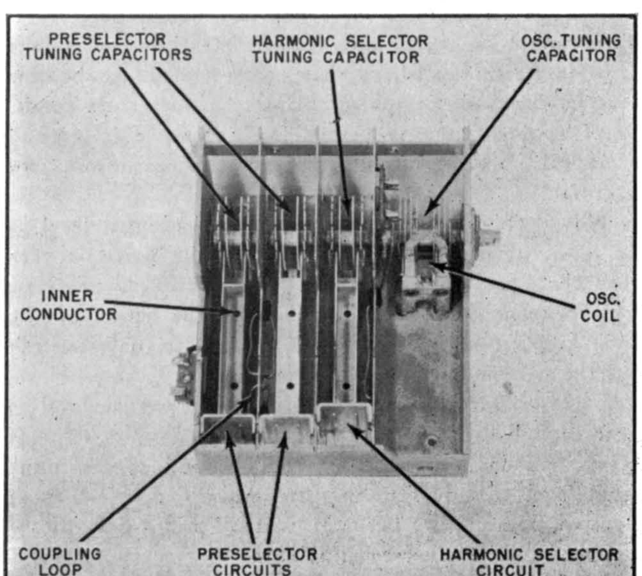


Figure 6. The UHF tuned circuits.

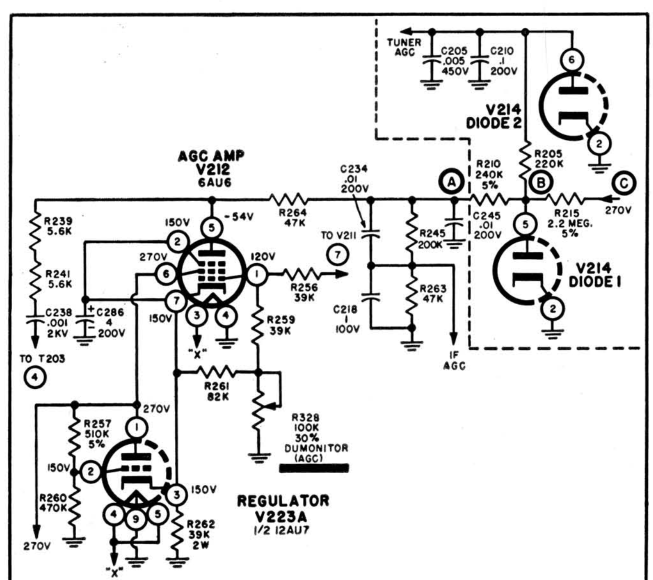


Figure 7. The a-g-c circuit.

V212. This positive voltage is obtained from the cathode of the regulator tube, V223. The positive voltage applied to V212's cathode is greater than the voltage at its grid, consequently the tube is negatively biased.

The composite video signal on the grid of V212 is positive. The grid is biased sufficiently beyond cut off so that only the sync pulses drive the grid out of cut off.

A positive pulse, obtained from terminal 4 of the horizontal output transformer, is applied to the plate of V212 through C238, R239 and R241. This positive horizontal pulse occurs at the same time as the sync pulse at the grid, causing the tube to conduct. As a result a negative voltage is developed at the plate of V212. The a-g-c amplifier is similar to the one used in the RA-164-165 chassis, and the reader is referred to the October, 1952 issue of the Service News for a more detailed description of its operation.

R264 and C245, at the plate of V212, function as a filter which removes most of the horizontal pulse component. The total a-g-c voltage is developed across R245 and R263. This voltage is appplied to the tuner a-g-c delay network, shown in figure 7 within the dotted lines.

To simplify the explanation of the delay network it has been shown in figure 8 with the diodes and capacitors removed. The negative a-g-c voltage produced by V212 appears at point A, causing a current to flow through R245 and R263 in the direction indicated by the dotted arrows. If we assume that this current is 225μa (.000225 amps), point A will be approximately −55 volts with respect to ground. As shown in the figure a bucking voltage of +270 volts is applied to R215, producing a current through the circuit as indicated by the solid arrows.

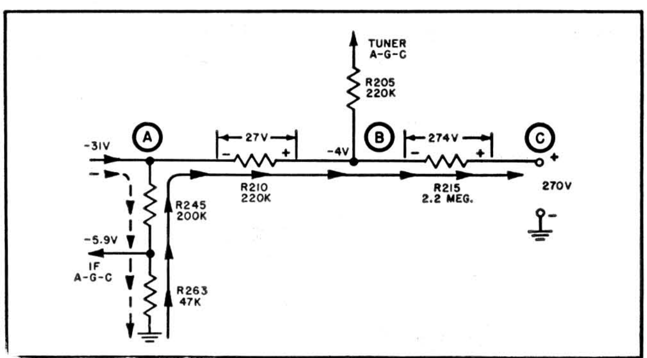


Figure 8. Simplified schematic of a-g-c delay net work showing currents produced by the a-g-c amplifier and the bucking voltage.

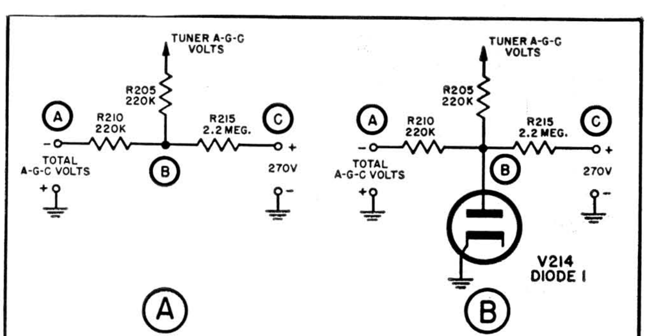


Figure 9. Operation of the delay circuit.

The total resistance of R263, R245, R210 and R215 is 2,667,000 ohms, therefore the current due to the +270 volts is approximately 100 μa. (.0001 amps).

Since the direction of the current due to the bucking voltage is opposite that due to V212, the currents subtract and the resultant current through R263 and R245 is 125 μa (225 μa minus 100 μa), flowing from point A to ground. As a result point A becomes approximately 31 volts negative with respect to ground. The a-g-c voltage for the i-f stages is taken off at the junction of R245 and R263. The voltage at point A divides across these resistors producing approximately −5.9 volts at the i-f a-g-c take off.

Since point A is 31 volts negative and point C is 270 volts positive, the total drop across R210 and R215 is 301 volts. This voltage divides across the resistors producing a drop across R210 of approximately 27 volts. Thus point B is 27 volts positive with respect to point A, making it 4 volts negative with respect to ground. The tuner a-g-c voltage is taken off at point B and is applied to the tuner r-f amplifier through R205.

So far we have explained how the bucking voltage reduces the a-g-c voltage. The delay action of the circuit will be described with reference to figure 9. Referring to figure 9A assume that the same conditions exist as in figure 8. Point A is −31 volts and point B is −4 volts. Now assume that the voltage at point A is gradually made less negative. This will cause the voltage at point B to also gradually become less negative.

When the a-g-c voltage at point A is reduced to approximately −27 volts, the voltage at point B will be zero. A further reduction in the voltage at point A will cause the voltage at point B to become positive. Provisions have been made in the a-g-c circuit to prevent point B from becoming positive. This is accomplished by the addition of diode V214, as shown in figure 9B.

When the voltage at point A is sufficiently negative to produce a negative voltage at point B the plate of the diode is negative and it does not conduct. Therefore it has no effect on the circuit. However, when the voltage at point A is reduced, so that point B tends to become positive, the diode begins to conduct. Under these conditions the diode acts as a very low resistance to ground (practically a short circuit) and point B remains at zero potential.

Now let's examine what occurs as the signal level at the input of the receiver changes. If the signal is very weak the a-g-c voltage at point A is not very negative. Point B tends to become positive but the action of the diode keeps it at zero potential. As the signal strength rises the voltage at point A becomes more negative. However, point B remains at zero until the signal level is great enough to produce approximately −27 volts at point A. The diode now ceases to conduct and as the input signal level continues to increase, making point A more negative, point B also becomes negative and a-g-c voltage is applied to the tuner r-f amplifier.

In this way application of a-g-c voltage to the tuner is delayed until the input signal reaches a pre-determined level. It should be noted that negative a-g-c voltage is being applied to the i-f stages at all times because point A is always negative.

To prevent the plate current of the r-f amplifier from exceeding the maximum tube ratings, a minimum grid bias of −.5 volts must be maintained on the tube. This bias is obtained from the plate of diode number 2 in figure 7. When the voltage at point B, in figure 7, is zero the plate of diode 2 assumes a potential of −.5 volts, due to contact potential. This contact potential is produced by random electrons which strike the plate of the diode and create a current flow in R205.

C205 and C210 at the plate of diode 2 are bypass capacitors. C205 prevents r-f signals from the tuner from entering the a-g-c circuits. C210 eliminates the remaining horizontal pulse component from the a-g-c voltage.

As shown in figure 7 a voltage regulator tube (V223A) is provided to stabilize the cathode voltage on the a-g-c amplifier. The addition of this tube prevents line voltage, or power supply load fluctuations from affecting the a-g-c voltage.

When the current through the a-g-c amplifier (V212) increases, the drop across R262 and the bias on V223A also increases. This results in a drop in current through V223A and R262 which tends to compensate for the original change. As a result the bias on V212 is held at a comparatively constant value.

SYNC CIRCUITS. — The sync circuits consist of a noise inverter, three sync-clipper stages and a phase splitter, as shown in the block diagram of figure 10.

The composite-video signal is applied to the grids of the noise inverter and the first and second sync clippers. The noise inverter is biased so that it is normally cut off. When a noise pulse occurs, whose amplitude exceeds that of the sync signal, the noise inverter is driven out of cut off and the noise pulse appears at its plate. The output of the noise inverter is coupled to the grids of the first and second sync clippers. Since a phase reversal occurs in the noise inverter, the noise pulse arrives at the first and second sync clipper grids 180° out-of-phase with the composite-video signal and the noise pulse is cancelled at the grids.

The first sync clipper passes only horizontal sync information and the second sync clipper only vertical sync information. The separated horizontal and vertical sync signals are recombined in the output of the sync clippers and fed to the input of the third sync clipper. The third sync clipper is biased so that it clips near sync tip, to remove noise present on the sync pulse.

The output of the third sync clipper is fed to the grid of the phase splitter. This stage provides additional clipping action and in addition provides out-of-phase sync signals for application to the horizontal phase detector. The vertical sync is taken off at the cathode of the phase splitter.

NOISE INVERTER. — The composite-video signal at the plate of the video amplifier is applied to the upper end of R238 in figure 11. R238, R302 and R303 form a voltage divider. That portion of the signal which appears across R303 is applied to the grid of the noise inverter, V223B. Since d-c coupling is used between the video-amplifier plate and the grid of V223B, part of the video-amplifier plate voltage is applied to the grid, making it positive. A positive potential, obtained from the cathode of V208A, is applied to the cathode of V223B through R305. The positive cathode voltage is sufficiently greater than the positive grid voltage to bias the tube beyond cut

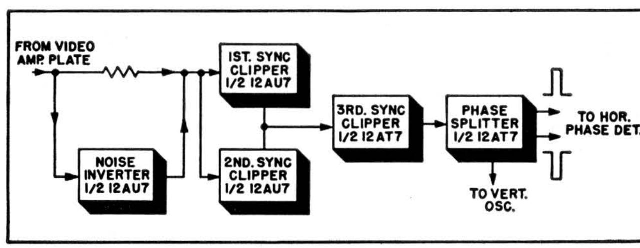


Figure 10. Block diagram of sync circuits.

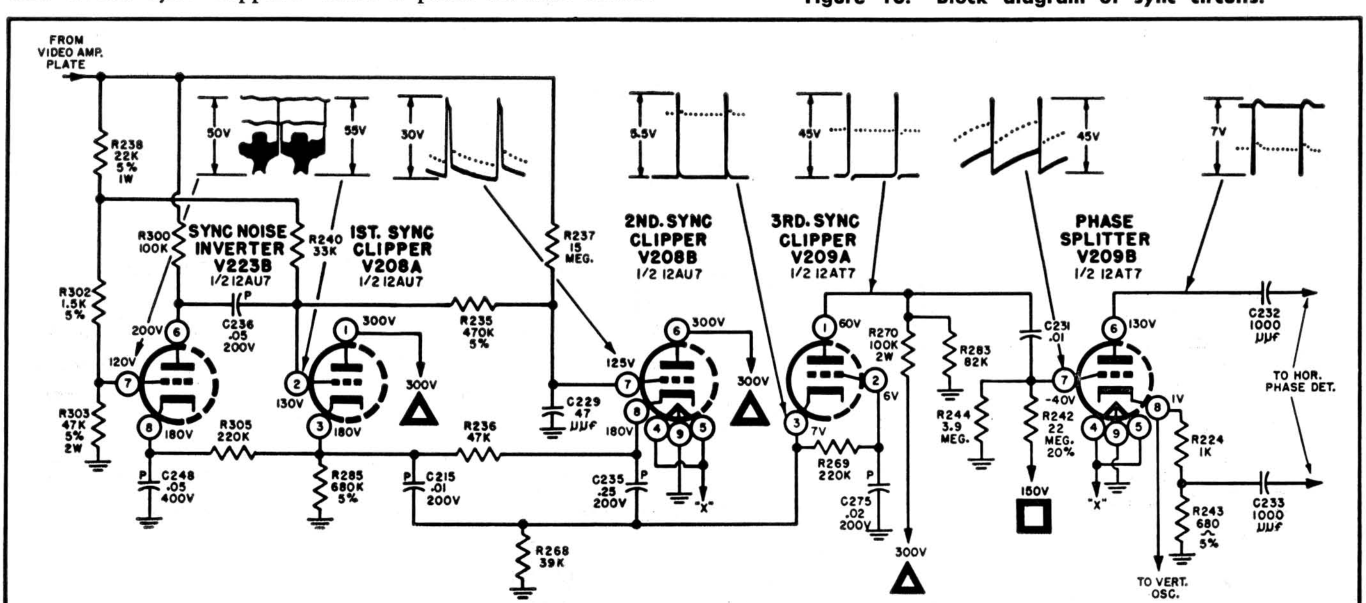


Figure 11. Schematic of sync circuits.

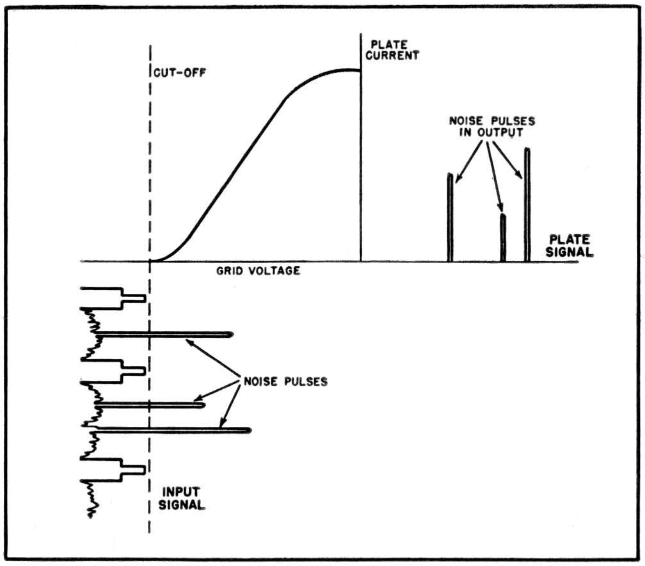


Figure 12. V223B grid-voltage, plate-current waveforms.

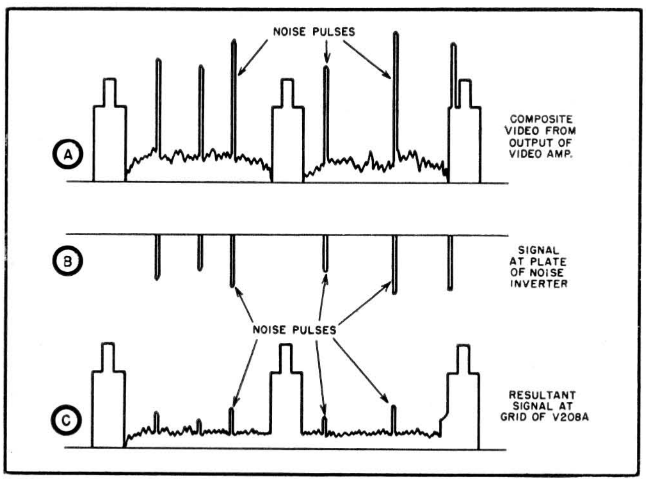


Figure 13. Signal at grid of V208A.

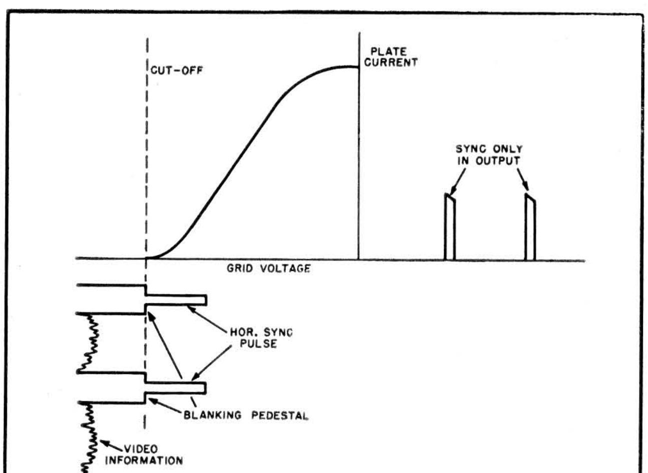


Figure 14. V208A grid-voltage, plate-current waveforms.

off and prevent it from conducting on any part of the composite-video signal, as shown in figure 12. Therefore under normal operating conditions there is no signal at the plate of this stage.

When a noise pulse occurs whose amplitude exceeds that of the sync, it drives the tube into conduction and appears in its output, as shown in figure 12. The output of the noise inverter is coupled to the grid of the first sync clipper. The signal at this point is shown in figure 13. A shows the composite-video signal obtained from the junction of R238-R302 and applied to the grid of the first sync clipper (V208A) through R240. B shows the noise pulses which are coupled from the plate of V223B to the grid of V208A, through C236. Note that the polarity of the noise pulses from the plate of V223B is opposite that of those in the composite-video signal. As a result the noise pulses cancel and the resultant signal appears as shown at C. Only a small portion of the noise still remains. In this way a large portion of the noise in the composite video signal is eliminated before application to the sync clippers.

FIRST SYNC CLIPPER. — That portion of the composite-video signal which appears across R302 and R303 is applied to the grid of the first sync clipper in conjunction with the output of the noise inverter. The noise cancellation action previously described takes place at this grid. Since the video-amplifier plate is d-c coupled to V208A, the grid is positive. A positive cathode voltage, exceeding this positive grid voltage, is developed across R285-C215, negatively biasing the tube. The operating conditions of the tube are shown in figure 14. The grid bias point of V208A is well beyond cut off, so that the tube conducts only on the horizontal-sync pulse, and the video and blanking information do not appear in its output.

In addition to eliminating the video and blanking information V208A removes most of the vertical-sync signal. This occurs as a result of the cathode-bias network, R285, C215 and R268. The signal at the grid of V208A is shown in figure 15A. Since the tube does not conduct on the video and blanking portions of the signal they have not been shown.

The horizontal sync pulses have a duration of 5 microseconds. During each horizontal sync pulse the tube conducts, as shown in figure 15C, charging C215 as shown at B. Since the interval between horizontal pulses is 58 microseconds (approximately 12 times the duration of each horizontal pulse), the charge due to each pulse is dissipated before the next pulse occurs, and the bias on V208A is substantially equal to that produced by the static current through the tube. V208A continues to conduct on each horizontal pulse producing current through R268, as shown in figure 15C.

Since the equalizing pulses are only 2.5 microseconds in duration and the interval between them is long (32 microseconds), the charges on C215 due to each pulse is dissipated before the next pulse occurs. Consequently, the equalizing pulses also produce a signal across R268.

As shown in figure 15A the vertical sync pulses are of much longer duration (27 microseconds) and are not as widely separated (4 microseconds) as are the horizontal and equalizing pulses.

As a result the vertical-sync pulses develop a large charge across C215, as shown in figure 15B. This charge is added to the static cathode bias on V208A, causing the tube to remain near cut off for the duration of the vertical-sync interval. Therefore, after the first vertical pulse occurs there is very little current through V208A, and the cathode resistor, R268.

V208A operates as a cathode follower with output taken off across R268. As a result of the operating conditions just described, only the horizontal sync, the equalizing and the leading vertical sync pulses appear in its output.

The advantage of this type of sync-clipper circuit lies in the fact that noise pulses do not affect the bias on the stage. Noise pulses are normally of short duration. As noted in the previous discussion short duration pulses do not develop a significant charge on the cathode capacitor, C215, and therefore do not change the bias on V208A.

In the usual grid-leak biased sync clipper the bias is determined by the peak amplitude of the signal. As a result high-amplitude noise pulses increase the grid bias, changing the clipping level and compressing, or completely eliminating, the sync information.

SECOND SYNC CLIPPER. — As noted in the preceding discussion the first sync clipper, V208A, does not pass the vertical sync signal. As a result other provisions have been made to separate the vertical sync from the composite-video signal. This is accomplished in the second sync clipper, V208B in figure 11.

The composite-video signal at the grid of the first sync clipper is applied to the grid of the second sync clipper through R235. Since noise cancellation takes place at the grid of V208A a large portion of the noise present in the composite-video signal is cancelled before it reaches the grid of V208B.

Bias for V208B is obtained from the cathode of V208A, through resistor R236. R236 and C235 function as a filter to prevent the horizontal and equalizing pulse components, present at the cathode of V208A, from reaching the cathode of V208B. The filter produces a slightly higher positive voltage at the cathode of V208B. Since the grids of V208A and V208B are at approximately the same potential, this causes the negative bias on V208B. to exceed the bias on V208A. To equalize the bias on both tubes R237 has been connected between the video take-off line and the grid of V208B. The addition of the resistor produces a slightly higher voltage at the grid, to compensate for the slightly higher cathode voltage. In this manner

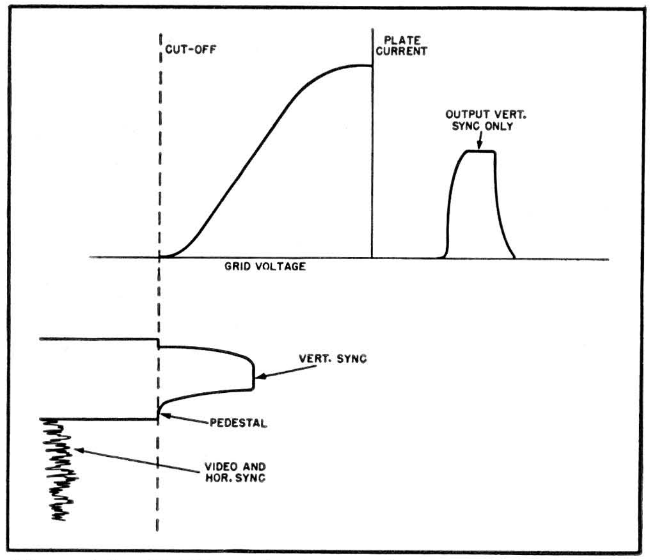


Figure 16. V208B grid-voltage, plate-current waveforms.

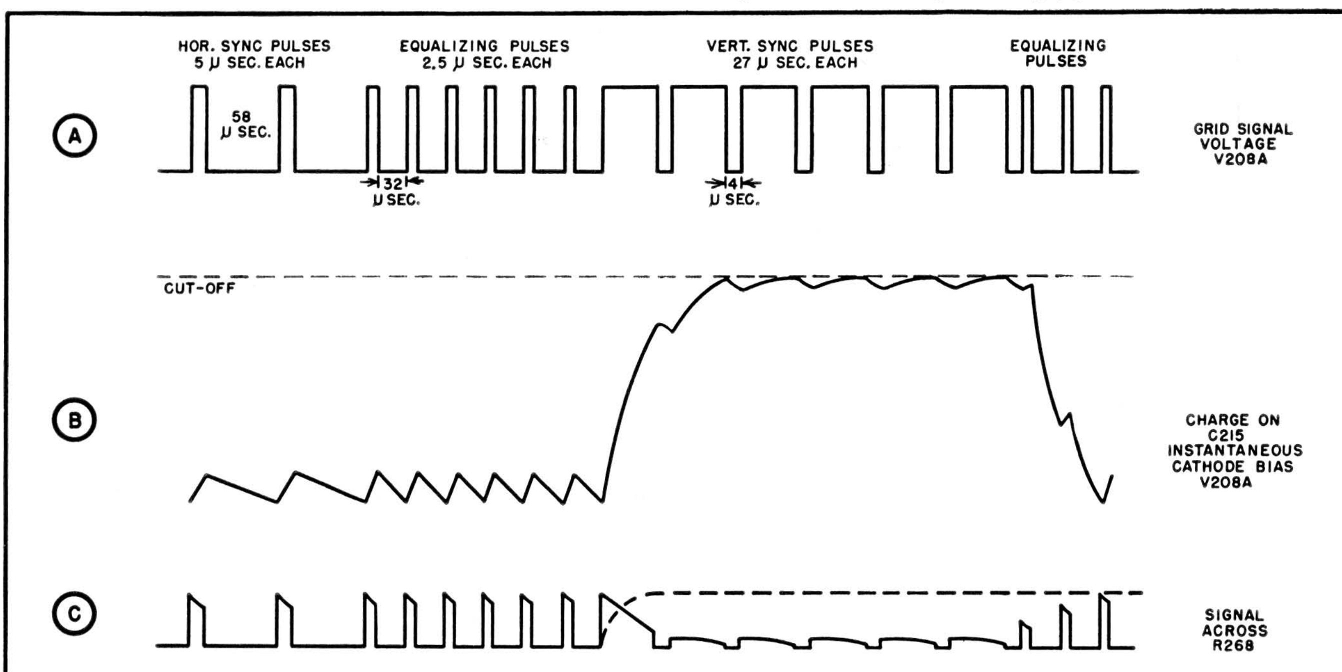


Figure 15. Operation of the first sync clipper, V208A. A—Sync portion of the composite video signal at grid. B—Instantaneous cathode voltage. C—Signal voltage across R-268. The dash line is due to V208B.

V208B is negatively biased beyond cut off. The operating conditions of the tube are shown in figure 16. Cut off corresponds to the blanking-pedestal level.

As previously mentioned the input signal is applied to the grid of V208B through R235. The time constant of R235-C229 in the grid circuit is approximately 25 microseconds. As a result the 5 microsecond horizontal and the 2.5 microsecond equalizing pulses produce very little voltage at the grid and do not drive the tube into conduction. The 27 microsecond vertical sync pulses, being of much longer duration, are integrated and drive the tube into conduction as shown in figure 16, producing a vertical-sync pulse across cathode resistor R268. This resistor is common to V208A and V208B and both the horizontal and vertical sync signals appear across it.

THIRD SYNC CLIPPER. — The composite-sync signal (horizontal, equalizing and vertical pulses) appearing across R268 is applied to the cathode of the third sync clipper, V209A in figure 11. R269 maintains the grid and cathode at approximately the same d-c potential, while the addition of C275 prevents the input signal from appearing at the grid. The operating conditions of the stage are shown in figure 17. Since the positive input signal is applied to the cathode it has the same effect as a negative signal applied to the grid, therefore the sync pulses drive the tube into cut off. As a result the upper 40% of the sync signal is clipped and does not appear at the plate. This clipping action removes noise superimposed on the sync signal.

PHASE SPLITTER. — The phase splitter, V209B in figure 11, provides additional clipping and out-of-phase sync signals for application to the horizontal a-f-c phase detector.

The sync signal at the plate of V209A is applied to the grid of V209B through coupling capacitor C231. C231 in combination with R244 form a grid-leak bias network which biases the grid negatively. The comparatively long vertical-sync pulse tends to charge C231 and increase the bias on the tube, so that the sync information immediately following the vertical-sync pulse is reduced in amplitude at the output of the stage. To overcome this condition a small positive voltage, obtained from the +150 volt line, is applied to the grid through R242. This permits the charge on C231 to leak off more rapidly so that the amplitude of the horizontal sync information is not reduced.

V209B operates as a conventional triode phase splitter. Output is obtained from both the plate and cathode circuits. The plate and cathode signals are of opposite polarity as required for operation of the horizontal a-f-c phase detector.

The vertical-sync signal is taken off at the cathode of V209B and applied to an integrator network before application to the vertical oscillator.

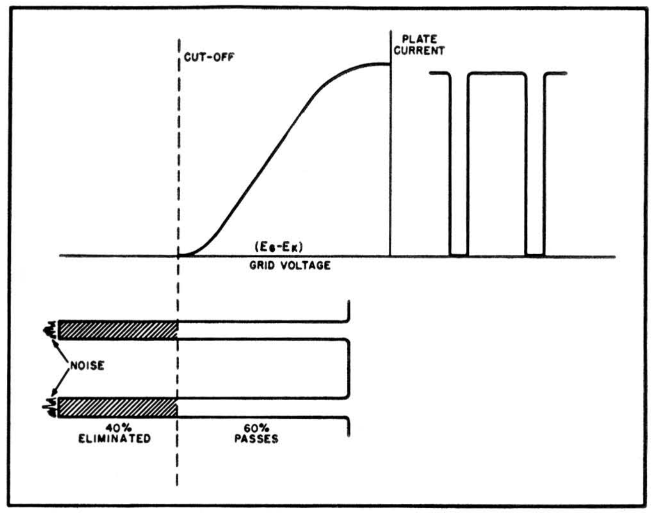


Figure 17. V209A grid-voltage, plate-current waveforms.

SECTION III
SERVICING PROCEDURES

ION-TRAP MAGNET ADJUSTMENT. —

1. Place the ion-trap approximately as shown in figure 18.

NOTE: A magnetic shunt may have been clipped on the ion-trap magnet at the factory. Do not disturb this shunt.

2. Turn the set on and allow 30 seconds for warm-up. Set the Contrast control at the middle of its range and set the brightness so that a raster is just visible on the screen.

NOTE: Do not operate the Teleset with the ion-trap magnet improperly positioned for any longer than necessary.

3. Slide the magnet slowly back and forth along the neck of the tube, while at the same time rotating it slightly to the left and right. As the raster becomes brighter, turn down the Brightness control until there is just enough brightness to permit the adjustment to be made. When the position giving maximum *brightness* and optimum *focus* has been located, turn up the Brightness control until the raster begins to increase in size. Adjust the ion-trap magnet again, for maximum brightness and optimum focus.

DEFLECTION YOKE ADJUSTMENT. — If the picture is tilted, squeeze the ends of the yoke spring clip (A in Figure 18) together and lift them off the CRT support ring. Rotate the yoke until the picture is horizontal. The deflection yoke retainer (B in Figure 18) may rotate with the yoke. If this occurs the retainer should be held in position while the yoke is rotated, making sure that the yoke end cover rotates with the yoke. When the deflection yoke has been properly adjusted, reset the spring clip to hold the yoke in position.

POSITIONING ADJUSTMENT. — If the picture is not properly positioned, readjust the positioning magnet using the following procedure:

1. Push the positioning magnet assembly forward until it touches the rear of the yoke retainer.

2. Bring the protruding adjustment tabs (C in Figure 18) together.
3. Rotate the entire positioning magnet assembly around the neck of the tube until the picture is properly positioned.
4. If the picture cannot be properly positioned in this manner, separate the tabs slightly and rotate the entire assembly around the tube again. Continue to repeat this step, increasing the separation of the tabs each time, until the picture is properly positioned. When this adjustment has been made, a slight readjustment of the ion-trap magnet may be necessary.

VHF TUNER OSCILLATOR ADJUSTMENT. — Individual oscillator adjustment slugs are provided in the VHF tuner to permit precise adjustments to suit the receiving condition for each channel in your area. These slugs are set at the factory for average conditions and do not require adjustment when the receiver is installed. However, it is often possible to obtain better reception by readjusting the oscillator slugs to suit the particular conditions at the location where the receiver is installed.
The following procedure should be used:
1. Turn the Station Selector to the channel on which the oscillator is to be adjusted.
2. Remove the Fine Tuning and Station Selector knobs (and the UHF channel dial).
3. Set the Fine Tuning control so that the flat on the shaft faces downward. The oscillator slug is accessible through the hole just to the right of the tuning shaft.
4. Using an insulated alignment tool, adjust the slug for best picture and sound.

DUMONITOR ADJUSTMENT. — The Dumonitor control is adjusted at the factory and normally does not require readjustment in the field. However, in some cases better reception can be obtained by adjusting the control to suit the conditions in your area.

In weak signal areas the Dumonitor control should be adjusted for best contrast and picture stability.

In strong signal areas the control should be set to prevent overloading on the strongest signal received, using the following procedure:
1. Set the front panel Horizontal Hold control for minimum whip (straight vertical wedge on test pattern) at the top of the picture.
2. Adjust the Dumonitor control until no overload is observed.
3. Switch the Station Selector on and off channel. If this causes overload to occur reset the Dumonitor until the overload does not reappear when switching on and off channel.

In areas where both very strong and very weak signals are received the Dumonitor control should always be adjusted to prevent overloading on the strongest signal.

SUPER DUMONITOR ADJUSTMENT — A Super Dumonitor control is provided to improve reception in noisy fringe areas or to minimize audio buzz in strong signal areas.

If sound buzz occurs in strong signal areas, place the Super Dumonitor in the Strong position. In weak signal areas place the Super Dumonitor in the Medium position to reduce picture noise.

If both strong and weak signals are received use the Super Dumonitor in its Normal position.

HORIZONTAL DRIVE CONTROL. — The presence of a bright vertical line near the center of the picture is an indication that the Horizontal Drive control requires adjustment. To adjust the control, rotate it until the bright line disappears. The proper setting is just beyond the point at which the line is no longer visible.

HORIZONTAL STABILIZER. — If the Horizontal Hold control does not lock the picture in horizontally, or if lock-in does not occur near the center of the control range, readjust the Horizontal Stabilizer control using the following procedure:
1. Allow the receiver to warm up for a few minutes.
2. Set the front panel Horizontal Hold control at the center of its range.
3. Short the a-f-c test point to ground. The a-f-c test point is located adjacent to the horizontal-oscillator tube, V219.
4. Adjust the Horizontal Stabilizer control until the picture holds sync momentarily.

NOTE: With the a-f-c test point shorted the a-f-c circuits are not functioning and the picture will not continue to hold sync.

5. Remove the short from the a-f-c test point.

HORIZONTAL SIZE AND LINEARITY CONTROLS. — Tune the receiver to a station (preferably one transmitting a test pattern) and observe the width of the picture.
1. If the picture is too narrow, turn the Horizontal Size control screw clockwise until the correct width is obtained.
2. If the picture is too wide, turn the Horizontal Size control slug screw counter-clockwise to reduce the picture width.

If the picture is not properly proportioned horizontally, when the Horizontal Size control is set for correct picture width, readjust the Horizontal Drive and Horizontal Linearity controls. Readjust the Horizontal Drive control first, using the procedure previously described.

The Horizontal Linearity control's main effect is on the center and left side of the picture. It should be adjusted

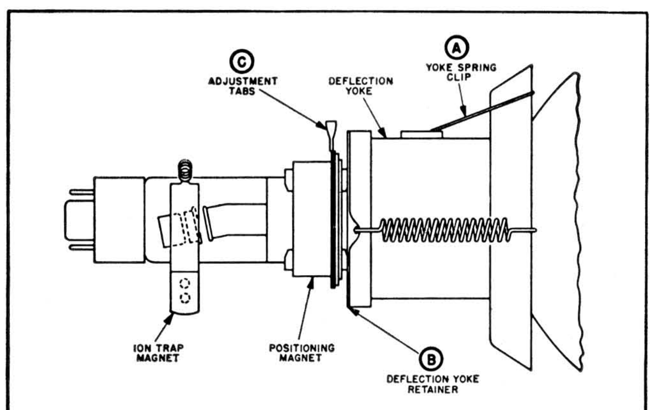


Figure 18.

until the left side of the picture equals the right side, using the following procedure:

1. Turn the control screw counter-clockwise until it is fully out.
2. Turn the control screw in (clockwise) until proper horizontal linearity is obtained.

When the linearity is correct it may be necessary to readjust the Horizontal Size control slightly. In some cases it may be necessary to adjust first the Horizontal Size control, then the Horizontal Linearity control, several times to obtain proper width and linearity.

VERTICAL SIZE AND LINEARITY CONTROLS. — Tune the receiver to a station (preferably one transmitting a test pattern) and observe the vertical size of the picture.

1. If the picture is too short, turn the Vertical Size control clockwise.
2. If the picture is too tall, turn the control counter-clockwise.

If the picture is not properly proportioned vertically, after the Vertical Size control has been set, readjust the Vertical Linearity control.

The Vertical Linearity control affects the size at the top of the picture, and should be adjusted so that the top and bottom halves of the picture are equal.

When the Vertical Linearity control has been properly set, a slight readjustment of the Vertical Size control may be required. In some cases it may be necessary to adjust first the Vertical Linearity control, then the Vertical Size control, several times to obtain proper vertical size and linearity.

REPLACING THE VHF TUNER COIL STRIPS

1. Remove the four screws holding the tuner bottom cover and remove the cover.
2. Using a screw driver, push the spring finger holding the strip toward rear of tuner and lift out strip.
3. To install new strip, insert end having smaller projection into the hole in the detent plate.
4. Pry the spring finger away from rear of drum and push the strip into place. Let spring finger snap back into place making sure that projection on end of strip seats correctly in hole in spring finger.

CLEANING THE TUNER CONTACTS. — Remove the tuner bottom cover and several of the coil strips as described in the previous paragraph. Rotate the turret so that the wiping contacts are accessible through the opening made by removing the strips. Clean the coil strip and wiping contacts with a soft cloth moistened with "No Noise."

ADJUSTING THE TENSION OF THE WIPING CONTACTS. — Remove the tuner bottom cover and several of the coil strips. Rotate the turret to permit access to the contacts through the opening thus provided. Using a small screw driver bend each contact spring until it extends approximately 1/8 inch inward from the surface of the plastic contact-mounting plate.

REMOVING VHF TUNER

1. Unplug the coax lead connection near 1st VIF transformer.
2. Remove the dial cord.
3. Unsolder the four VHF tuner leads from the terminal strip on top of VHF tuner bracket.
4. Unsolder lead from terminal strip at slide switch.
5. Unsolder lead from UHF tuner at slide switch.
6. Unsolder center coax lead from slide switch.
7. Remove the bracket supporting the front end of the tuning shafts.
8. Remove the three screws mounting the VHF tuner to the support bracket.

REMOVING UHF TUNER

1. Unsolder the center lead of coax from slide switch, and remove ground lug fastening outside lead of coax to bracket.
2. Unsolder red lead from UHF tuner at slide switch.
3. Unsolder brown lead from UHF tuner at terminal strip.
4. Loosen UHF tuner-shaft coupling screw.
5. Remove three screws fastening tuner to mounting bracket.

DIAL STRINGING PROCEDURE

1. Rotate the UHF pulley shaft fully clockwise.
2. Rotate the UHF tuning control so that the opening of the tuner shaft drum is positioned to the left.
3. Hook end of the dial cord on the pulley drum, marked START in figure 19, and string dial cord as shown.

UHF DIAL CALIBRATION

If a UHF channel is available tune to channel and adjust the UHF dial for proper calibration.

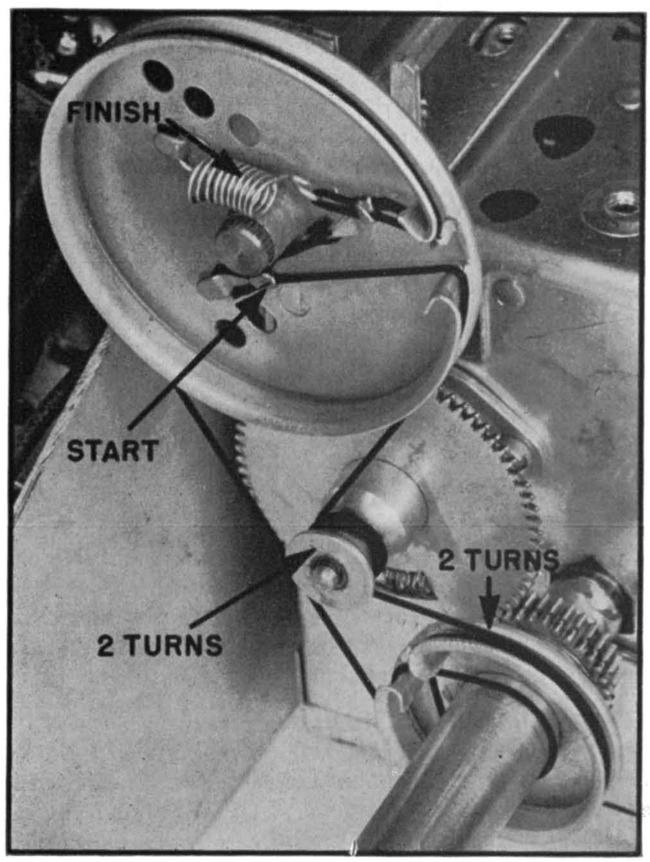


Figure 19.

If no UHF channel is available, calibrate the dial so that it tunes below the channel 20 marker and above the channel 80 marker.

CLEANING THE CRT AND SAFETY GLASS — The safety glass mountings of the RA-166/171 Telesets have been designed to permit easy removal of the safety glass for cleaning.

To remove the safety glass of an RA-166, 168 Chatham simply remove the four Phillips-head screws which fasten the safety glass bezel to the front of the cabinet. The bezel and glass may then be removed.

To remove the safety glass of an RA-167 to 171 cabinet the following procedure should be used:

1. Grasp the moulding across the top of the safety glass and pull it away from the cabinet. The moulding is held by two spring clips.
2. Remove the four bracket screws and the safety glass support bracket.
3. Grasp the safety glass at each upper corner and swing it out and upward. The mask, safety glass and side supports may then be removed from the cabinet.
4. To install the safety glass follow the above procedure in reverse.

CHASSIS, CRT REMOVAL AND REPLACEMENT

1. Remove all front-panel knobs.
2. Remove the back-panel woodscrews, and swing the bottom of the panel out and up.
3. Remove CRT socket, HV Anode connector, deflection-yoke cable plug and grounding clip, speaker connector, and antenna terminal board.
4. Remove the five hex-head tap screws holding the chassis in place.
5. Pull chassis straight back out of the cabinet.
6. Remove the ion trap and centering magnet from neck of CRT.
7. Remove the deflection-yoke-retainer springs. Grasp each spring in turn with a pair of long-nose pliers and push forward on the pliers until the spring is unhooked.
   CAUTION: One hand should be placed between the CRT and the pliers, to prevent the pliers from striking the tube if they slip.
8. Remove the yoke spring clip from the CRT rear support.
9. Slip the yoke and yoke retainer off the CRT neck.
10. Remove the two hex-nuts fastening the CRT support straps to the CRT rear support. Hold the bell of the CRT as the straps are loosened.
11. Remove the four hex-nuts fastening the CRT support plates to front of cabinet.
12. Remove CRT assembly.
13. Place CRT face down on a soft cloth and remove straps and support plates by loosening the two 10-24 x 1½ screws.
14. To install the CRT and chassis follow the above procedure in reverse.
15. When the CRT has been installed, the ion trap and centering magnets should be adjusted.

SECTION IV
TROUBLESHOOTING PROCEDURES

The information presented in the chart which follows will aid the technician in locating the causes of most common television receiver troubles. No attempt has been made to point out the specific components at fault because most troubles can be caused by more than one component. What has been presented in the chart is a systematic method of approach for each of the symptoms listed.

The more obvious causes of a particular symptom which require little or no test equipment are listed first. These are followed by the more complex causes. The symptoms are given on the basis that the receiver is normal in all other respects, e.g., "Bright Horizontal line" assumes that the sound is OK.

PICTURE

Symptom	Procedure
Bright Horizontal Line **Loss of Vertical Size**	1. Substitute V213 and V216 2. Check voltages, waveforms and associated components of V213 and V216 3. Check yoke and vertical output transformer, T201
Critical Vertical Hold	1. Check waveforms in integrator network
Drive Line in Center	1. Check setting of drive control
Insufficient Horizontal Size	1. Check settings of horizontal size and linearity controls 2. Substitute V220, V221 and V219 3. Check boosted B+ and associated components 4. Check C279 and C278

PICTURE (con't)

Symptom	Procedure
Insufficient Vertical Size	1. Check setting of vertical-size control **Control Has No Effect** 2. Check vertical size pot. R324 **Control Does Not Give Normal Size** 2. Substitute V213 and V216 3. Check voltages, waveforms and associated components of V213 and V216
Loss of Horizontal and Vertical Hold Probable Cause: Faulty sync clipper stage	1. Check settings of front panel hold controls 2. Substitute V208 and V209 3. Check voltages, waveforms and associated components of V208 and V209
Loss of Vertical Hold Only	1. Substitute V208 2. Check associated components of V208B
Microphonics - Visual Probable Cause: Mechanical modulation of tube in picture circuits.	1. Check control shafts and knobs for binding against cabinet 2. Substitute V101 and V102 3. Substitute V201, V202, V203, V204 and V211
No Brightness	1. Check for presence of high voltage at CRT connector **High Voltage OK** 2. Check CRT for open filament (look for glow) 3. Check adjustment of ion trap 4. Check voltages and associated components of CRT **No High Voltage** 2. Check the ¼ amp. fuse (F201) in high voltage cage 3. Substitute V222, V221, V220 and V219 4. If a picture of reduced size with heavy horizontal fold-over appears when V221 is removed, replace C278 5. Check voltages, waveforms and associated components of V222, V221, V220 and V219
No Horizontal Hold - or Critical Horizontal Hold Probable Cause: Defective a-f-c circuit	1. Check setting of front panel horizontal hold control 2. Substitute V210 and V219 3. Check setting of L210 horizontal-stabilizer control located on rear of chassis 4. Check voltages, waveforms and associated components of V210 and V219
Picture Oversize - Low Brightness Probable Cause: Insufficient high voltage	1. Substitute V222 2. Check h-v rectifier components
Picture Too Small (Horizontal and Vertical) Probable Cause: B+ low	1. Substitute V217 and V218 2. Check B+ line and associated components
Poor Focus	1. Check setting of ion trap
Poor Horizontal Linearity	1. Check setting of horizontal-linearity control 2. Substitute V220 and V221 3. Check voltages, waveforms and components associated with V220 and V221

PICTURE (con't)

Symptom	Procedure
Poor Vertical Linearity	1. Check setting of vertical-linearity control 2. Substitute V216 3. Check voltages, waveforms and associated components of V216 and 213
Sound Bars In Picture Probable Cause: Misalignment	1. Check fine tuning adjustment 2. Check video i-f alignment
Vertical Instability Probable Cause: Faulty vertical oscillator	1. Check setting of front panel vertical hold control 2. Substitute V213 and V216 3. Check voltages, waveforms and associated components of V213 and V216
Weak Picture	1. Substitute V211 2. Check voltages and components associated with V211

PICTURE AND SOUND

Symptom	Procedure
No Picture, No Sound, Brightness OK	1. Substitute V101, V102, V201, V202, V203, V204, V205, V215 (see note) and V223 2. Check voltages on V101, V102, V201, V202, V203, V204 and V205 and speaker plug connection. NOTE: The 150V source is the cathode of V215, the 2nd audio amp., therefore, a defective tube, speaker plug connection, or output transformer will result in loss of the 150V
No Picture, No Sound, Low Brightness (brightness control set at maximum)	1. Substitute V211 2. Check voltages and components associated with V211
Overload in Picture - Buzz in Sound Probable Cause: Loss of a-g-c voltage	1. Check setting of the a-g-c potentiometer 2. Substitute V212, V201, V202 and V203 3. Check voltages, waveforms and components associated with V212
UHF OK, VHF Inoperative	1. Substitute V102. 2. Check operation of cam and slide switch, S101. 3. Check voltages and components associated with V102.
VHF OK, UHF Inoperative	1. Substitute V151, CR101 and CR102. 2. Check operation of cam and slide switch, S101. 3. Check VHF tuner 40 mc i-f strip.

SOUND

Symptom	Procedure
Buzz Probable Cause: Vertical sync in sound	1. Check fine tuning adjustment 2. Substitute V206 and V207 3. Check sound i-f alignment
Cannot Be Tuned In Properly Probable Cause: H-f oscillator frequency misadjusted	1. Check oscillator slug adjustment 2. Substitute V102
Microphonics - Audible Probable Cause: Mechanical modulation of h-f oscillator (V102) or audio amplifier tubes.	1. Check for binding knobs or control shafts 2. Substitute V102 3. Substitute V214 and V215

SOUND (con't)

Symptom	Procedure
Dead or Weak Probable Cause: Loss of gain in audio or sound i-f stage	1. Substitute, V205, V206, V207, V214 and V215 2. Check speaker plug and speaker audio transformer 3. Check voltages on V205, V206, V207, V214 and V215 4. Check components associated with V205, V206, V207, V214 and V215 5. Check sound i-f alignment
Distorted	1. Check fine tuning adjustment 2. Substitute V206, V207, V214 and V215 3. Check alignment of Z206 4. Check voltages on V214 and V215 5. Check components in 1st and 2nd audio amp.
Poor Quieting Probable Cause: Improper operation of ratio detector or sound i-f stage	1. Check fine tuning adjustment 2. Substitute V207 3. Check alignment of Z206 4. Substitute V206 5. Check components of ratio detector, V207

SECTION V
ALIGNMENT

TEST EQUIPMENT. — To properly align the RA-166/171 i-f strip and/or switch turret tuner the following test equipment is required:

Oscillograph

Vertical amplifier must have good 60 cycle response and a vertical deflection sensitivity of at least 0.1 rms volts per inch.

Sweep Signal Generator

Frequency range—54 to 216 mc.
Sweep—At least 10 mc.

Marker Signal Generator

Frequency range—54 to 216 mc.
Should have built-in calibrator crystal.

BENCH SET-UP. — The following precautions should be observed when setting up equipment for tuner alignment purposes:

1. Connect all equipment to a common ground. A metal topped bench is preferred, however heavy bonding straps may be used.

2. The sweep generator output *must* be properly matched to the tuner input. A suitable matching device is shown in figure 20. It consists of a connector plug, which fits the generator output and three half-watt resistors.

3. Before attempting to perform an actual alignment check the bench set-up by connecting the test equipment to a chassis which is operating properly and observe the tuner curves. If the curves are correct it can be assumed that the bench set-up is functioning properly.

FREQUENCY TABLE

Channel Number	Channel Freq., MC	Video Carrier, MC	Sound Carrier, MC	41.25 MC HF Osc., MC
2	54-60	55.25	59.75	101
3	60-66	61.25	65.75	107
4	66-72	67.25	71.75	113
5	76-82	77.25	81.75	123
6	82-88	83.25	87.75	129
7	174-180	175.25	179.75	221
8	180-186	181.25	185.75	227
9	186-192	187.25	191.75	233
10	192-198	193.25	197.75	239
11	198-204	199.25	203.75	245
12	204-210	205.25	209.75	251
13	210-216	211.25	215.75	257

The oscillator frequencies shown in the above table are for reference only. Final oscillator frequency adjustments should always be made with the available TV station signals.

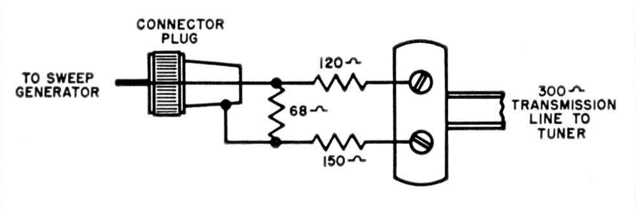
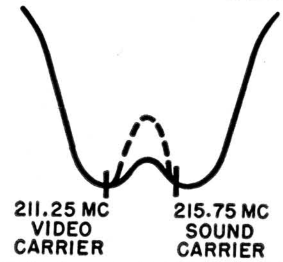


Figure 20. Matching device suitable for tuner alignment work. Keep the lead lengths between the connector plug and the resistor network as short as possible.

TURRET TUNER ALIGNMENT PROCEDURE

Disable the horizontal sweep circuits by removing the horizontal oscillator and deflection amplifier tubes. Apply -3 volts to the tuner green a-g-c lead.

Step	Signal Generator		Output Indicator	Connect to	Adjust
	Frequency	Connect to			
1	213 mc 10 mc deviation	Ant. Term. through matching device (see figure 20)	Oscillograph	Look point through 10K resistor (1)	Check for curve. If necessary adjust slugs A and B for band-pass and C in figure 21 for maximum amplitude with equal peaks. See notes. Set video carrier just inside peak. Sound carrier position may vary slightly. 
2	Sweep each channel in turn.	As above.	Oscillograph	As above.	Above adjustment sufficient for all channels. Individual channel may be favored if desired. The video and sound markers are given in the frequency table.
3	Tune to each channel on which a TV signal is available				Turn fine tuning control shaft so that the flat on the shaft faces downward. Adjust each oscillator slug for best picture and sound, using a non-metallic adjustment tool.

NOTES

Slug A adjusts low frequency side of curve, slug B the high frequency side and slug C adjusts the r-f stage band-pass.

Some tuners have slug D which adjusts the oscillator frequency. It should be reset only if a channel strip oscillator slug cannot be properly set for its channel.

Failure to obtain the proper curves can be caused by a misadjusted oscillator slug or mixer output coil. The adjustment of the mixer output coil is included in the i-f alignment procedure.

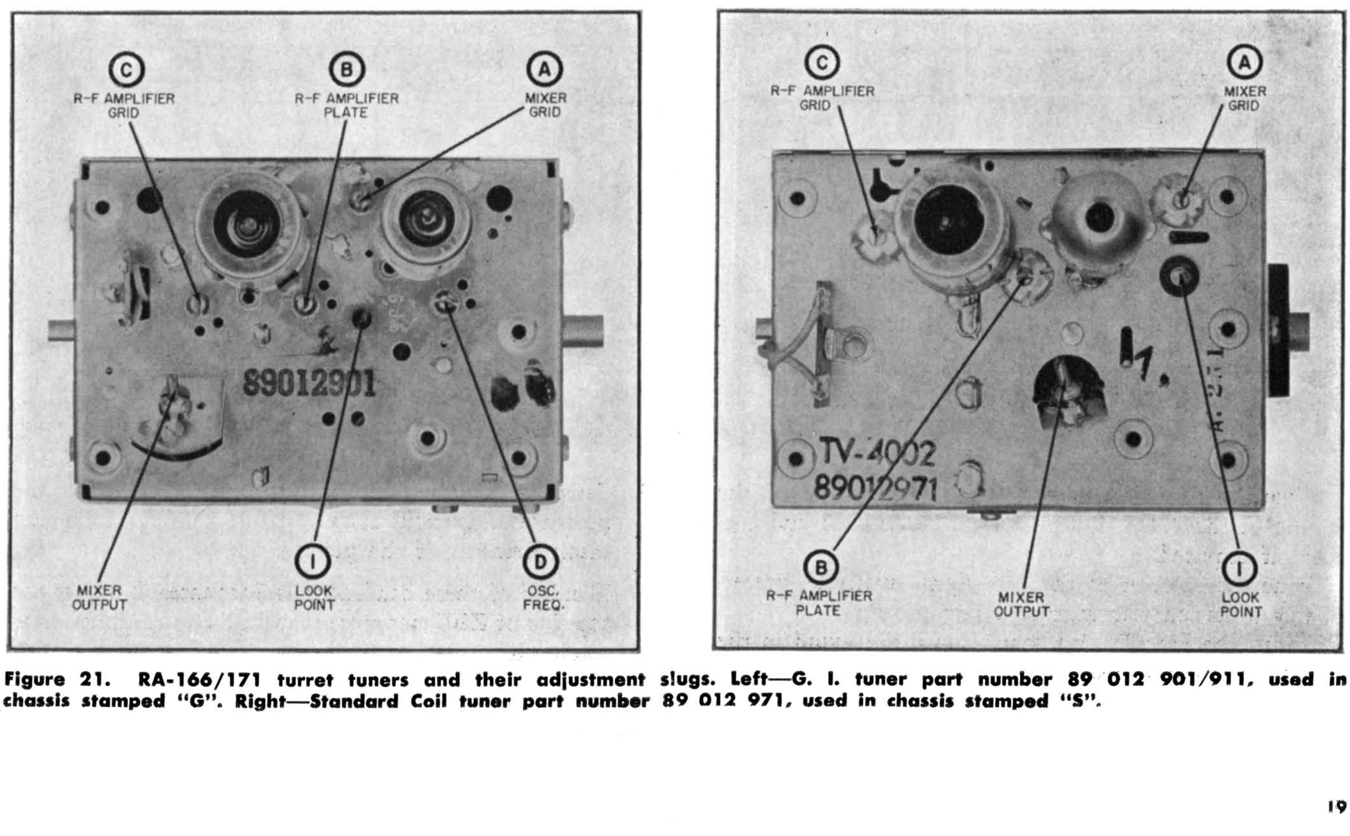


Figure 21. RA-166/171 turret tuners and their adjustment slugs. Left—G. I. tuner part number 89 012 901/911, used in chassis stamped "G". Right—Standard Coil tuner part number 89 012 971, used in chassis stamped "S".

ALIGNMENT TEST POINTS

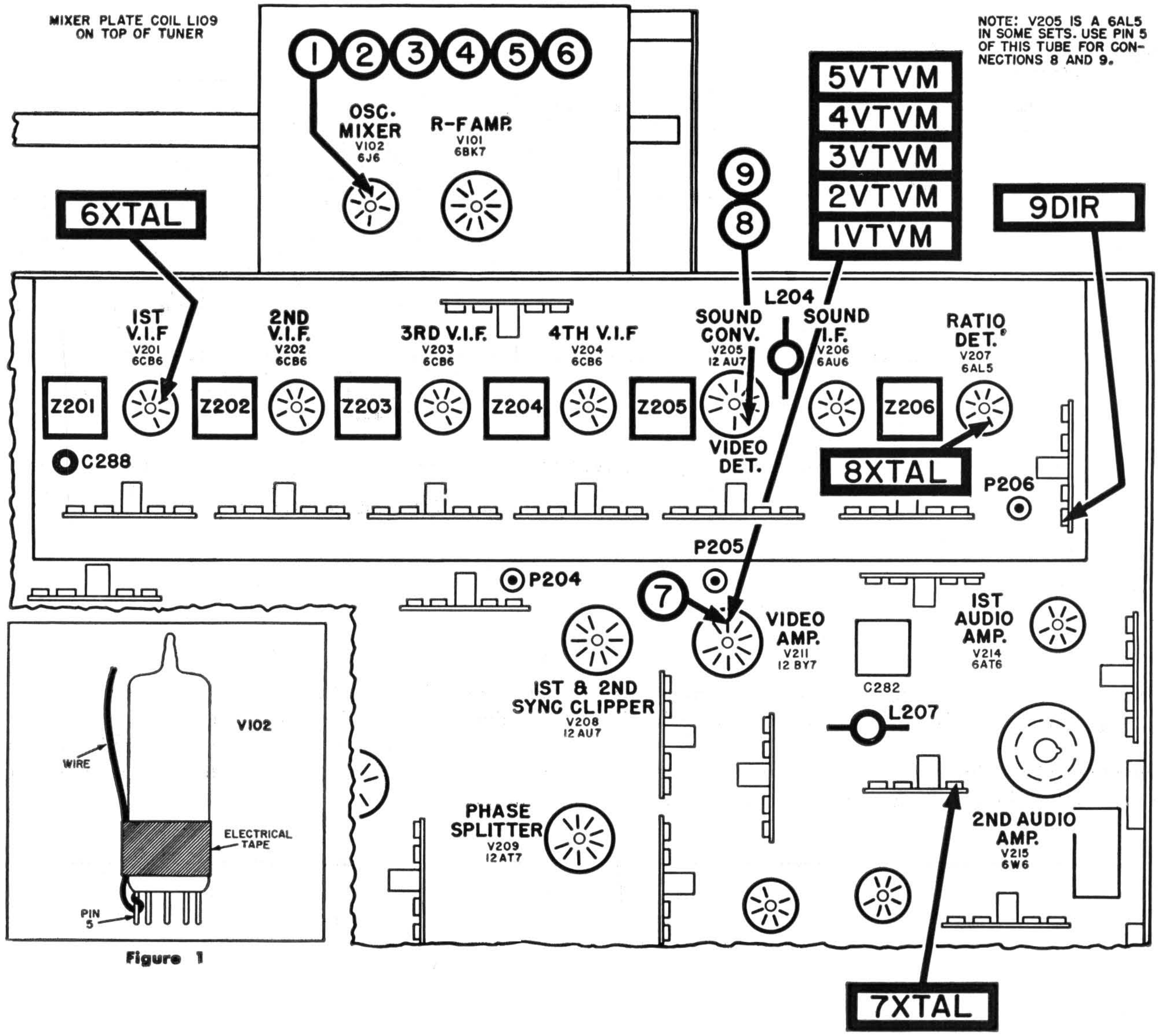


Figure 1

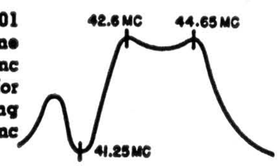
PHASING

When the alignment procedure has been completed, the phasing of the video IF strip should be checked and corrected if required.

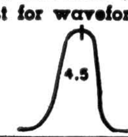
1. Tune the receiver to the best signal available, preferably a station transmitting a test pattern.
2. Adjust the Fine Tuning control until the sound in the picture is eliminated.
3. Carefully examine the picture for trailing whites, or the presence of spurious black response (smear) following black elements of the picture.
4. If either of these conditions is encountered, adjust the top slug of Z201 not more than ½ turn to eliminate the condition.

VIDEO IF ALIGNMENT RA-166/171

Place STATION SELECTOR between channels to disable oscillator. Remove fuse, F201. Connect short length of wire to pin 5 of V102, Fig. 1. Use lowest VTVM range.

Step	Signal Generator		Output Indicator	Connect to	Adjust
	Frequency	Connect to			
1	44.25 mc No Sweep	Pin 5 V102 ①	VTVM	Pin 2, V211 1VTVM	Z205 for maximum reading. Set signal generator output to maintain reading on lowest range of VTVM.
2	42 mc No Sweep	As Above ②	VTVM	As Above 2VTVM	Z204 for maximum reading
3	46.1 mc No Sweep	As Above ③	VTVM	As Above 3VTVM	Z203 (bottom) for maximum reading
4	44.25 mc No Sweep	As Above ④	VTVM	As Above 4VTVM	Z202 for maximum reading
5	47.25 mc	As Above ⑤	VTVM	As Above 5VTVM	Z203 (top) for minimum reading. Increase signal generator output to obtain reading on VTVM
6	43.5 mc 10 mc deviation	As Above ⑥	Oscillograph through XTAL	Pin 5 V201 6XTAL	Mixer Plate Coil (L109) and Z201 (top) for 44.65 mc marker on one peak Z201 (bottom) for 42.6 mc marker on other peak. C288 for 41.25 mc dip. (Sets not having C288 do not need the 41.25 mc adjustment.) 
7	4.5 mc 400 CPS AM	Pin 2 V211 ⑦	Oscillograph through XTAL	Junction R266, R267, & C239 7XTAL	L207 for minimum reading

SOUND IF ALIGNMENT

Step	Frequency	Connect to	Output Indicator	Connect to	Adjust
8	4.5 mc 1 mc Sweep	Pin 8 V205 See Note ⑧	Oscillograph through XTAL	Pin 7 V207 8XTAL	L204 and Z206 (bottom) Adjust for waveform below 
9	As Above	As Above ⑨	Oscillograph Direct	Junction R232, C228 9DIR	Z206 top Adjust for waveform below 

ALTERNATE SOUND IF ALIGNMENT — USING TV SIGNAL

Step	Signal	Output Indicator	Connect to	Adjust
8	TV Signal Teleset must be tuned for best picture.	VTVM	Pin 7, V207 8XTAL	L204 Z206 (bot.) for maximum reading
9	As Above	VTVM	Ratio Det. Test Point P206	Z206 (top) for zero reading

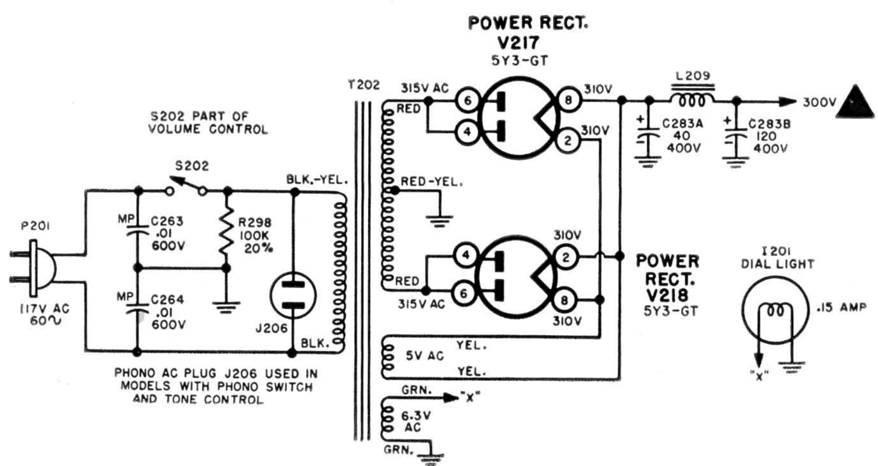
SECTION VI
SCHEMATIC DIAGRAMS - PART LIST

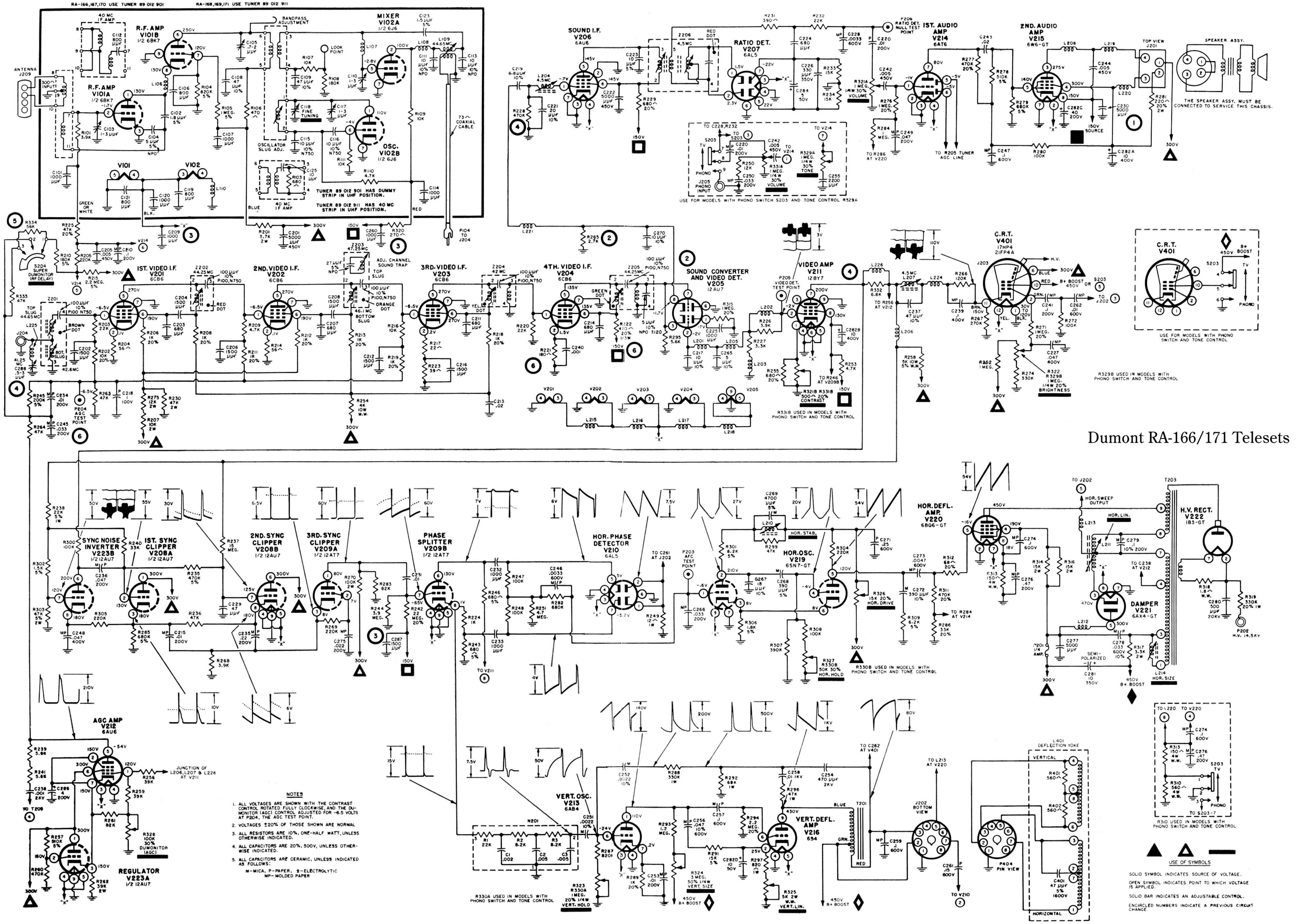
RESISTANCE MEASUREMENTS
All Readings to Ground

		1	2	3	4	5	6	7	8	9
V201	**6BC6**	80K	56	.1	0	30K	30K	0		
V202	**6CB6**	50K	56	.1	0	30K	30K	0		
V203	**6CB6**	50K	61	.1	0	30K	30K	0		
V204	**6CB6**	.3	100	.1	0	25M	25M	0		
V205	**12AU7**	1M	3.3K	.8	.1	.1	0	.8	2.7K	0
V206	**6AU6**	100K	0	0	.1	25M	25M	0		
V207	**6AL5**	INF	INF	.1	0	15K	0	15K		
V208	**12AU7**	25K	60K	680K	.1	.1	25K	520K	720K	0
V209	**12AT7**	50K	220K	3.9K	.1	.1	25M	3.9M	1.6K	
V210	**6AL5**	12	12	.1	0	4.8M	0	4.8M		
V211	**12BY7**	0-350	3.3K	0	0	0	.1	25K	25M	0
V212	**6AU6**	30K-40K	27K-30K	.1	0	280K	25K	27K-30K		
V213	**6AB4**	INF		.1	0		820K-1.8M	1K		
V214	**6AT6**	2M	0	0	.1	400K	600K	500K		
V215	**6W6GT**		.1	25K	25K	350K		0	25M	
V216	**6S4**		820-5.8K		0	.1	2.2M			INF
V217	**5Y3GT**		25K		18		18		25K	
V218	**5Y3GT**		25K		18		18		25K	
V219	**6SN7GT**	5.3M	30K-50K	1.8K	80K-110K	250K-265K	1.8K	0	.1	
V220	**6BQ6GT**		0	500K	32K	500K		.1	150	Cap INF
V221	**6AX4GT**			INF		25K		0	.1	
V222	**1B3GT**		INF		INF		INF	INF		Cap INF
V223	**12AU7**	25K	300K	30K	.1	.1	150K	30K	1M	0
V401*	**CRT**	0	1M-1.5M				25K			
		***10**	**11**	**12**						
		INF	100K	.1						

The above resistance readings were taken with an RCA Model WV97A VTVM. All readings are in ohms, K = 1000, M = million. When the reading is affected by a control two readings are given. These readings indicate the variation produced by the control

POWER SUPPLY





Dumont RA-166/171 Telesets

PARTS LIST

Symbol	Part No.
C201	03 015 610
C202	03 017 850
C203	03 121 520
C204	03 017 850
C205	03 015 610
C206	03 017 850
C207	03 121 520
C208	03 017 850
C209	03 100 490
C210	03 126 860
C211	03 121 520
C212	03 017 850
C213	03 122 430
C214	03 121 520
C215	03 126 800
C216	03 017 850
C217	03 115 000
C218	03 122 800
C219	03 120 900
C220	03 126 800
C221	03 015 790
C222	03 015 610
C223	03 015 270
C224	03 121 520
C225	03 100 490
C226	03 014 390
C227	03 127 600
C228	03 128 130
C229	03 115 330
C231	03 015 920
C232	03 015 810
C233	03 015 810
C234	03 126 800
C235	03 126 880
C236	03 126 840
C237	03 015 760
C238	03 122 420
C239	03 127 620
C240	03 100 490
C241	03 126 860
C242	03 015 610
C243	03 122 430
C244	03 015 610
C245	03 140 330
C246	03 128 130
C247	03 128 220
C248	03 127 600
C249	03 126 840
C250	03 126 830
C251	03 029 480
C252	03 029 480
C253	03 126 800
C254	03 122 440
C255	03 124 190
C256	03 127 900
C257	03 128 220
C258	03 119 630
C259	03 128 220
C260	03 100 490
C261	03 120 730
C262	03 128 160
C263	03 125 780
C264	03 125 780
C265	03 014 610
C266	03 126 830
C267	03 121 530
C268	03 021 510
C269	03 030 140

Symbol	Part No.
C270	03 115 000
C271	03 120 120
C272	03 021 950
C273	03 128 140
C274	03 128 220
C275	03 126 820
C276	03 126 900
C277	03 015 610
C278	03 127 880
C279	03 126 620
C280	03 121 501
C281	03 250 411
C282	03 124 180
C283	03 121 080
C284	03 120 960
C286	03 122 480
C287	03 017 850
C288	03 019 871
C330	03 051 610
C401	03 122 461
F201	11 000 720
I201	12 001 310
J201	09 022 690
J202	34 003 192
J203	34 003 462
J204	09 031 070
J205	09 031 070
J206	09 015 560
J209	40 015 240
L201	21 011 301
L202	21 006 624
L203	21 006 628
L204	21 011 021
L205	21 011 082
L206	21 006 627
L207	21 010 961
L208	21 006 230
L209	21 010 952
L210	21 010 991
L211	21 011 001
L212	21 006 520
L213	21 006 280
L214	21 011 011
L215	21 008 972
L216	21 008 972
L217	21 008 972
L218	21 008 972
L219	21 006 230
L220	21 006 230
L221	21 011 082
L224	21 011 082
L225	21 012 011
L226	21 006 623
L401	21 011 062
N201	88 000 631
P201	09 036 920
P202	50 093 801
P203	63 018 210
P204	63 018 210
P205	63 018 210
P206	63 018 210
P404	09 015 590
R201	02 037 820
R202	02 032 480
R203	02 041 930
R204	02 031 620
R205	02 032 050

Symbol	Part No.
R206	02 032 420
R207	02 037 890
R208	02 032 420
R209	02 031 850
R210	02 031 020
R211	02 032 420
R212	02 032 420
R213	02 032 420
R214	02 031 620
R215	02 031 280
R216	02 031 890
R217	02 031 570
R218	02 032 420
R219	02 032 420
R220	02 031 930
R221	02 041 680
R222	02 052 420
R223	02 031 600
R224	02 031 770
R225	02 032 520
R226	02 031 840
R227	02 031 830
R228	02 032 090
R229	02 032 410
R230	02 037 970
R231	02 031 720
R232	02 031 930
R233	02 031 910
R234	02 031 910
R235	02 031 120
R236	02 031 970
R237	02 032 270
R238	02 033 800
R239	02 031 860
R240	02 031 950
R241	02 031 860
R242	02 032 680
R243	02 030 440
R244	02 032 200
R245	02 031 030
R246	02 030 440
R247	02 032 010
R248	02 032 010
R249	02 034 540
R250	02 031 900
R251	02 032 210
R252	02 032 130
R253	02 031 850
R254	02 113 050
R255	02 032 410
R256	02 031 960
R257	02 031 130
R258	02 107 960
R259	02 031 960
R260	02 032 090
R261	02 032 000
R262	02 037 960
R263	02 031 970
R264	02 031 970
R265	02 031 820
R266	02 032 020
R267	02 032 060
R268	02 031 840
R269	02 032 050
R270	02 038 010
R271	02 032 600
R272	02 032 010
R273	02 032 130

Symbol	Part No.
R274	02 032 070
R275	02 037 900
R276	02 032 600
R277	02 032 580
R278	02 031 130
R279	02 031 160
R280	02 032 010
R281	02 038 380
R282	02 032 110
R283	02 032 000
R284	02 032 130
R285	02 031 160
R286	02 032 510
R287	02 032 120
R288	02 035 070
R289	02 032 420
R291	02 030 760
R292	02 034 990
R293	02 032 140
R294	02 032 620
R295	02 031 860
R296	02 034 970
R297	02 034 760
R298	02 035 540
R299	02 031 970
R300	02 032 010
R301	02 030 700
R302	02 030 520
R303	02 036 880
R304	02 032 050
R305	02 032 050
R306	02 030 540
R307	02 032 080
R308	02 032 010
R309	02 030 670
R310	02 121 630
R311	02 032 580
R312	02 032 350
R313	02 121 620
R314	02 037 910
R315	02 032 600
R316	02 037 910
R317	02 037 830
R318	02 100 710
R319	02 035 570
R320	02 031 700
R321	01 053 200
R322	01 051 100
R323	01 051 100
R324	01 051 010
R325	01 024 740
R326	01 044 441
R327	01 052 900
R328	01 053 800
R329	01 038 346
R330	01 038 344
R331	01 053 131
R332	02 031 870
R333	02 031 970
R334	02 031 980
R401	02 041 740
R402	02 041 740
S202	01 053 200
S202	01 053 131
S203	05 005 120
S204	05 008 731
T201	20 008 021

Symbol	Part No.
T202	20 008 182
T203	20 008 061
V201	25 002 670
V202	25 002 670
V203	25 002 670
V204	25 002 670
V205	25 000 130
V206	25 000 050
V207	25 000 020
V208	25 000 130
V209	25 001 530
V210	25 000 020
V211	25 007 380
V212	25 000 050
V213	25 001 760
V214	25 000 040
V215	25 002 680
V216	25 003 010
V217	25 000 220
V218	25 000 220
V219	25 000 110
V220	25 001 830
V221	25 007 780
V222	25 000 150
V223	25 000 130
V401 (17")	25 007 710
V401 (21")	25 007 720
Z201	20 008 231
Z202	20 008 241
Z203	20 008 251
Z204	20 008 261
Z205	20 008 303
Z206	20 006 141

TUNER
89 012 901 - 89 012 911

Symbol	Part No.
C101	03 125 500
C102	03 125 010
C103	03 019 840
C104	03 124 780
C105	03 124 770
C106	03 124 790
C107	03 125 500
C108	03 119 170
C109	03 119 170
C110	03 019 840
C111	03 125 110
C113	03 125 110
C114	03 125 500
C115	03 126 010
C116	03 126 010
C117	03 019 840
C118	03 126 191
C119	03 124 790
C120	03 125 500
C121	03 124 790
C123	03 125 000
L106	21 011 811
L107	21 011 571
L108	21 011 581
L109	21 011 801
L110	21 011 561
P104	09 018 810
R101	02 031 840
R104	02 041 180
R105	02 041 200
R106	02 041 730
R107	02 031 890
R108	02 032 040
R109	02 031 890
R110	02 031 850
R111	02 031 890
V101	25 007 341
V102	25 000 190

89 012 911 Only

Symbol	Part No.
C112	03 124 790
C125	03 115 000
R103	02 031 750
S101	05 007 371

TUNER STRIPS
89 012 901-89 012 911

Channel	Part No.
2	40 014 881
3	40 014 882
4	40 014 883
5	40 014 884
6	40 014 885
7	40 014 886
8	40 014 887
9	40 014 888
10	40 014 889
11	40 014 891
12	40 014 892
13	40 014 893
40 mc IF	40 014 896

89 012 921

Symbol	Part No.
C151	03 126 130
C152	03 125 180
C153	03 125 500
C154	03 124 790
C155	03 125 500
C156	03 126 140
C157	03 126 140
C158	03 125 460
C159	03 125 110
C160	03 014 560
CR101	26 001 082
CR102	26 001 082
L151	21 011 821
L154	21 011 831
L155	21 011 841
R151	02 031 610
R152	02 031 730
R153	02 031 890
R154	02 031 700
V151	25 000 190

TUNER
89 012 971

Symbol	Part No.
C101	03 124 790
C102	03 100 490
C103	03 119 150
C104	03 119 190
C105	03 119 170
C106	03 119 150
C107	03 138 130
C108	03 123 010
C109	03 123 020
C110	03 119 210
C111	03 123 030
C114	03 124 790
C115	03 124 790
C116	03 124 790
C117	03 124 790
C118	03 100 490
C119	30 039 231
C120	03 119 160
C121	03 100 490
C122	03 100 490
L106	21 010 460
L107	21 012 041
L108	21 010 470
L109	21 010 440
L110	21 012 051
R101	02 032 070
R102	02 032 050
R104	02 031 910
R105	02 032 400
R106	02 032 560
R107	02 032 480
R108	02 031 910
R109	02 032 520
R110	02 032 460
R111	02 031 910
T101	20 008 541
V101	25 007 000
V102	25 000 190

TUNER STRIPS ANTENNA
89 012 971

Channel	Part No.
2	40 015 401
3	40 015 402
4	40 015 403
5	40 015 404
6	40 015 405
7	40 015 406
8	40 015 407
9	40 015 408
10	40 015 409
11	40 015 411
12	40 015 412
13	40 015 413

MIXER
89 012 971

Channel	Part No.
2	40 015 381
3	40 015 382
4	40 015 383
5	40 015 384
6	40 015 385
7	40 015 386
8	40 015 387
9	40 015 388
10	40 015 389
11	40 015 391
12	40 015 392
13	40 015 393

MECHANICAL PARTS
Chassis

Part No.	Description
11 000 600	Holder Fuse
12 006 230	Lampholder
12 006 700	Jewel Light
34 001 100	Socket Octal Wafer
34 001 220	Socket 7 Pr. Min. Molded
34 001 300	Socket 7 Pr. Min. Wafer
34 001 670	Socket 9 Pr. Min. Molded
34 001 770	Socket 9 Pr. Min. Wafer
34 002 380	Socket Octal Molded
34 003 193	Socket Octal Wafer V221
34 003 570	Socket Octal, Shock Mtg.
34 003 590	Socket 9 Prong (V205)
34 003 671	Socket, Octal for V222
36 003 720	Plate Contact V220
38 001 310	Grommet Rubber
42 002 860	Shield Tube Min.
42 006 611	Shield Corona V222
42 006 710	Base Tube Shield Min.
42 009 040	Shield for 12AU7 (V205)

TUNER
89 012 901 - 89 012 911

Part No.	Description
30 035 020	Detent Roller and Spring
30 035 030	Spring Shaft Support
30 035 040	Snap Ring
35 025 600	Bearing Plate
42 002 900	Tube Shield V101
42 004 580	Tube Shield V102
42 007 930	Bottom Shield
42 007 940	Side Shield
60 408 200	Screw Bottom, Side Shield
60 409 600	Screw Bearing Plate

89 012 911

Part No.	Description
30 008 310	Dial Cord
30 033 611	UHF Dial Sleeve
30 033 621	Backlash Gear and Pulley
30 033 641	Shaft, Backlash Gear
30 033 651	Ring Bearing
30 033 661	Bearing Bracket
30 035 011	Extension Shaft
30 035 100	Pulley Dial Cord
30 035 262	Coupling
30 035 461	Spring Dial Cord
30 036 621	Cam
30 036 631	Gear Tuning Shaft
43 005 011	Spacer, Shaft
60 057 501	Screw Bearing Plate
60 408 420	Screw, Coupling
60 806 101	Set Screw
61 025 200	Lock Nut Flat
62 403 221	"C" Washer, Shaft

89 012 921

Part No.	Description
42 002 900	Tube Shield V151
45 004 461	Dial UHF

89 012 971

Part No.	Description
30 029 440	Spring Retainer
30 029 460	Spring Fine Tuning
30 029 470	Spring Detent
30 029 480	Roller Detent
42 003 400	Shield, Tube V102
42 006 210	Shield, Tube V101
60 052 800	Padder Screw
62 005 880	Washer Fiber
62 103 100	Padder Spring Nut

CABINET PARTS
RA-166

Part No.	Description
18 003 521	Speaker Asy 5"
22 001 941	Antenna Loop
28 001 391	L Shunt Ion Trap
29 000 651	Magnet Centering
29 000 661	Magnet Ion Trap
30 014 011	Cup Back Panel
30 027 963	Spring Defl. Coil
30 027 971	Retainer Defl. Coil
32 003 461	Panel Back
35 019 593	Bracket CRT Mtg.
35 022 141	Strap CRT (Sq. Hole)
35 022 142	Strap CRT (Rd. Hole)
35 022 151	Plate CRT Mounting
36 003 761	Clip Bracket Ground
36 003 791	Spring Clip Defl. Coil
38 011 901	Cushion CRT
38 011 921	Door Stop
42 006 662	Cover Control Mah.
42 006 663	Cover Control Bl.
45 004 061	Safety Glass
45 004 431	Knob Selector Mah.
45 004 432	Knob Selector Bl.
45 004 441	Knob Fine Tuning
45 004 442	Knob Contrast
45 004 451	Knob Volume Mah
45 004 452	Knob Volume Bl.
50 002 900	Power Cable
60 405 070	Screw Chassis Mtg.
62 200 240	Washer Chassis Mtg.
64 006 608	Mask Asy. Brown
64 006 609	Mask Asy. Green
64 007 022	Bezel Front Panel
64 008 691	Support Rear CRT

RA-167-170-171

Part No.	Description
22 001 941	Antenna Loop
28 001 391	L Shunt Ion Trap
29 000 651	Magnet Centering
29 000 661	Magnet Ion Trap
30 027 963	Spring Defl. Coil
30 027 971	Retainer Defl. Coil
30 031 282	Cup Back Panel
32 003 471	Panel Back
35 019 592	Bracket CRT Mounting
35 022 121	Strap CRT (Rd. Hole)
35 022 122	Strap CRT (Sq. Hole)
35 022 131	Plate CRT Mounting
35 025 821	Bracket Safety Glass Mtg.
36 003 761	Clip Bracket Ground
36 003 791	Spring Clip Defl. Coil
38 009 841	Side Support Mask Mah.
38 009 842	Side Support Mask Bl.
38 010 141	Cushion Safety Glass
38 011 902	Cushion CRT
38 011 921	Door Stop
38 012 541	Btm. Support Mask Mah.
38 012 542	Btm. Support Mask Bl.
42 006 662	Cover Control Mah.
42 006 663	Cover Control Bl.
45 004 001	Safety Glass
45 004 431	Knob Selector Mah.
45 004 432	Knob Selector Bl.
45 004 441	Knob Fine Tuning
45 004 442	Knob Contrast
45 004 451	Knob Volume Mah.
45 004 452	Knob Volume Bl.
50 002 900	Power Cable
60 405 070	Screw Chassis Mtg.
62 200 240	Washer Chassis Mtg.
64 006 763	Mask Asy. Gold
64 006 764	Mask Asy. Brown
64 008 691	Support Rear CRT

RA-167 Only

Part No.	Description
18 003 521	Speaker Asy 5"
18 003 511	Speaker Asy 10"

RA-170-171 Only

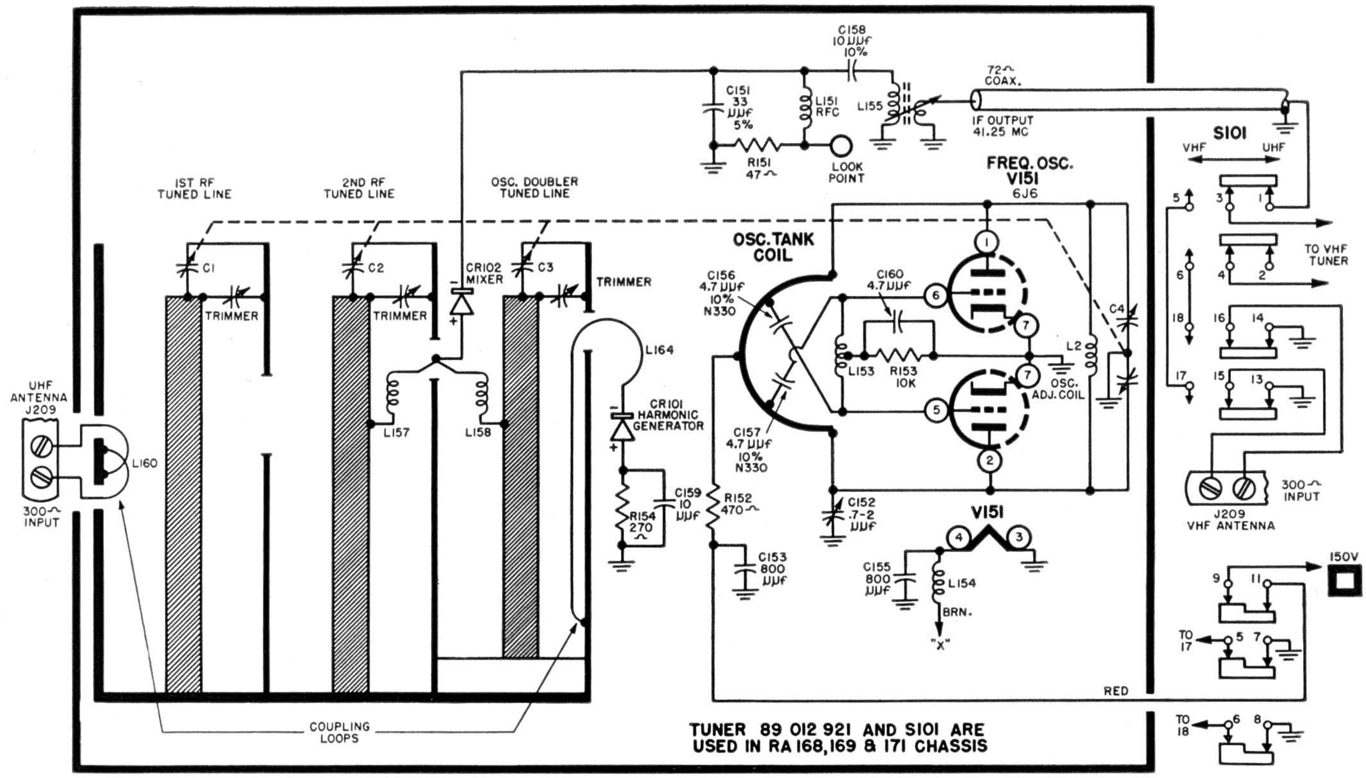
Part No.	Description
18 003 501	Speaker Asy. 10"
32 003 481	Panel Back
45 004 711	Knob Hidden Control Mah.
45 004 712	Knob Hidden Control Bl.

NOTE:

Use RA-166 cabinet parts list for model RA-168.

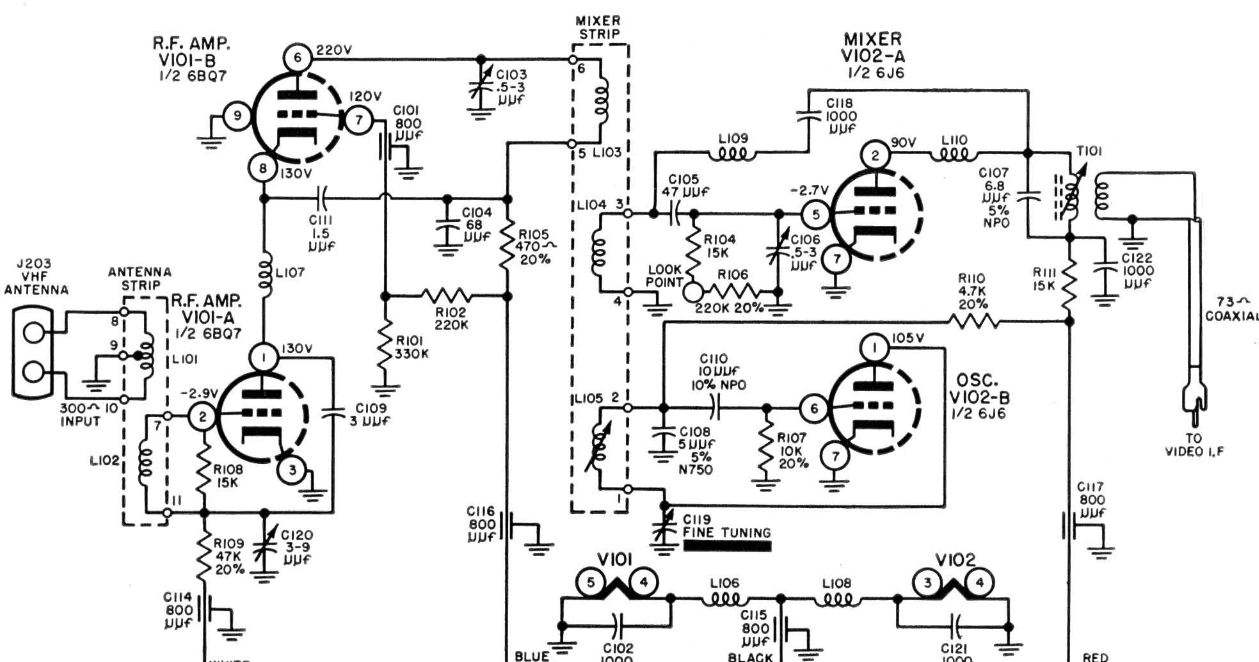
Use RA-167 cabinet parts list for model RA-169.

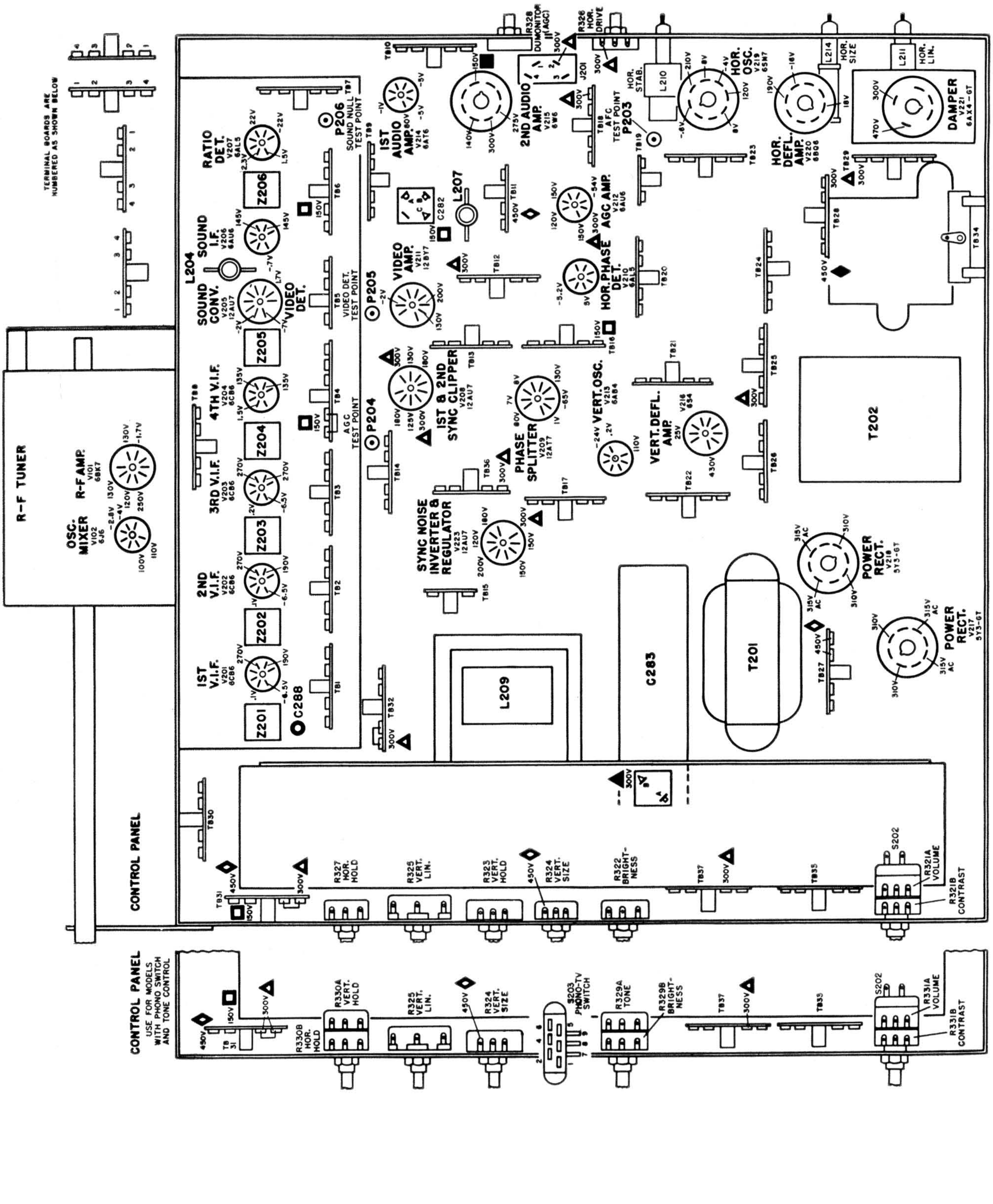
UHF TUNER 89 012 921



TUNER 89 012 971

USED ALTERNATELY WITH TUNER 89 012 901.




TERMINAL BOARDS ARE NUMBERED AS SHOWN BELOW
R-F TUNER
OSC. MIXER V102 6J6
R-F AMP. V101 6BK7
CONTROL PANEL
CONTROL PANEL USE FOR MODELS WITH PHONO SWITCH AND TONE CONTROL
1ST V.I.F. V201 6CB6
2ND V.I.F. V202 6CB6
3RD V.I.F. V203 6CB6
4TH V.I.F. V204 6CB6
SOUND CONV. V205 12AU7
VIDEO DET.
SOUND I.F. V206 6AU6
RATIO DET. V207 6AL5
1ST AUDIO AMP. V214 6AT6
2ND AUDIO AMP. V215 6W6
VIDEO AMP. V211 12BY7
1ST & 2ND SYNC CLIPPER V208 12AU7
SYNC NOISE INVERTER & REGULATOR V223 12AU7
PHASE SPLITTER V209 12AT7
VERT. OSC. V213 6AB4
VERT. DEFL. AMP. V216 6S4
HOR. PHASE DET. V210 6AL5
AGC AMP. V212 6AU6
HOR. OSC. V219 6SN7
HOR. DEFL. AMP. V220 6BQ6
DAMPER V221 6AX4-GT
POWER RECT. V218 5Y3-GT
POWER RECT. V217 5Y3-GT
AGC TEST POINT
VIDEO DET. TEST POINT
SOUND NULL TEST POINT
AFC TEST POINT
P203
P204
P205
P206
C288
C282
C283
L204
L207
L209
L210
L211
L214
T201
T202
Z201
Z202
Z203
Z204
Z205
Z206
J201
R328 DUMONITOR II (AGC)
R326 HOR. DRIVE
HOR. STAB.
HOR. SIZE
HOR. LIN.
R327 HOR. HOLD
R325 VERT. LIN.
R323 VERT. HOLD
R324 VERT. SIZE
R322 BRIGHT-NESS
S202
R321A VOLUME
R321B CONTRAST
R330A VERT. HOLD
R330B HOR. HOLD
S203 PHONO-TV SWITCH
R329A TONE
R329B BRIGHT-NESS
R331A VOLUME
R331B CONTRAST

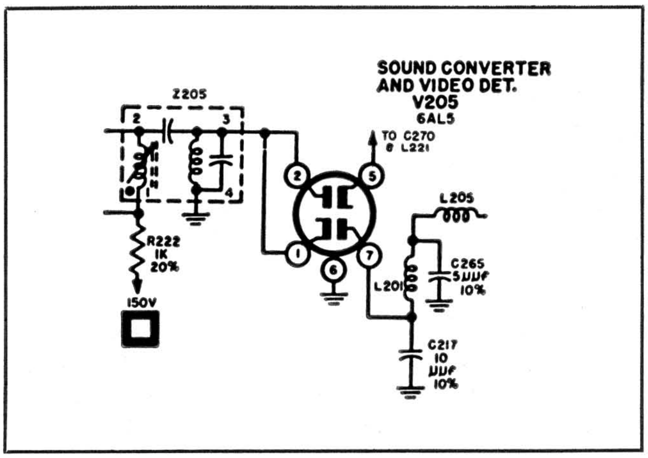
PRODUCTION CHANGES

RA-166/171

(1)

C230 is not used in RA-166/171 chassis prior to serial number 666426.

(2)

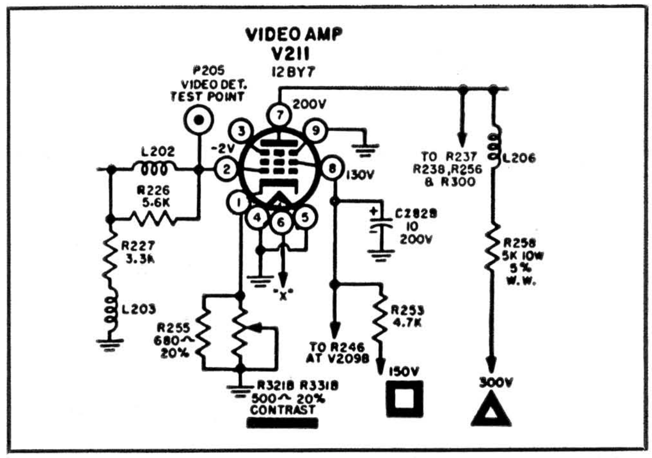


V205 is a 6AL5 in chassis prior to those coded Run 1. The early circuit is shown above. R265 is 1K and is connected between the junction of C219, L221 and ground.

(3)

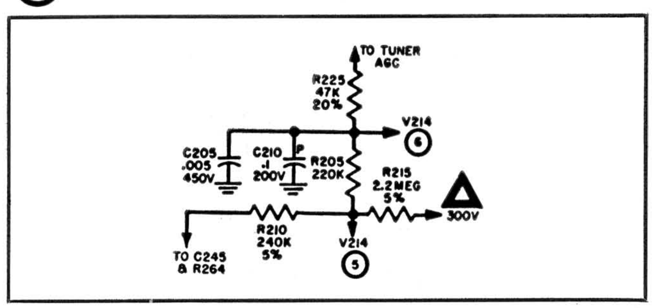
C209, C260, C287 and R320 are not used in RA-166 and RA-167 chassis prior to serial number 668401 or RA-170 chassis prior to serial number 704201.

(4)



In chassis prior to those coded Run 4 the video amplifier circuit shown above is used. In these chassis L225, C288 are not used and R228 is 100K.

(5)



S204 is not used in chassis prior to those coded Run 5. The early circuit is shown above.

(6)

C245 is a .01 mmf paper capacitor. R221 is 100 ohms and R222 is 1K in chassis prior to those listed below.

RA-166/167	6619866
RA-168/169	681901
RA-170	7027381
RA-171	719501

NOTE: Numbers encircled above correspond to those on the schematic.

SECTION VII
INSTALLATION

CHOOSING A LOCATION.—When installing a Teleset, the technician should guide the customer in choosing a location, keeping the following points in mind:

1. The receiver should not be placed near radiators or other sources of heat.
2. It should not be placed near a window which may be left open or through which bright sunlight may fall on the television screen or cabinet.
3. To permit ventilation of the cabinet, it should not be located closer than two inches from the nearest wall or other surface.
4. The ventilating openings in the rear and bottom of the cabinet should not be covered.
5. The receiver should be located convenient to an electrical outlet and the antenna transmission line.
6. The location chosen should provide convenient viewing from the majority of the seats in the room.

ANTENNA AND TRANSMISSION LINE. —

RA-166, 167 and 170

This Teleset is equipped with a built-in antenna. If an outdoor antenna is used, the lead from the built-in antenna should be disconnected, and the transmission line from the outdoor antenna connected to the VHF antenna terminals on the back of the cabinet.

This receiver is designed for use with a 300 ohm transmission line. If a 72 ohm transmission line is used a matching transformer (Du Mont Part No. 20 007 581) should be connected between the transmission line and the antenna-input terminals of the receiver.

RA-168, 169 and 171

This Teleset is equipped with built-in UHF and VHF antennas. If outdoor antennas are used, the leads from the built-in antennas should be disconnected and the transmission lines from the outdoor antennas connected to the antenna terminals on the back of the set.

This receiver is designed for use with 300 ohm UHF and VHF transmission lines. Tubular 300 ohm lead in is recommended for UHF use.

A 72 ohm VHF transmission line may be used if desired. If a 72 ohm VHF transmission line is used a matching transformer (Du Mont Part No. 20 007 081) should be connected between the transmission line and the VHF antenna input terminals of the receiver.

PLACING THE RECEIVER IN OPERATION.—To place the Teleset in operation, connect the antenna transmission line to the antenna terminals on the back of the cabinet and connect the a-c power cord to a 115-volt, 60-cycle electrical outlet.

CAUTION

> This Teleset is designed to operate from a 115-volt, 60-cycle a-c power source. Connection to any other power source may damage the receiver.

PERFORMANCE CHECKS.—Each Teleset is properly adjusted before leaving the factory and is ready for operation when received.

When a Teleset is installed, the following performance checks should be made to insure that none of the adjustments have been disturbed during transit:

1. Check the setting of the ion-trap magnet by observing the picture. Ample brightness should be available and the horizontal scanning lines should be sharply focused and clearly distinguishable. If the above check indicates need for readjustment of the ion-trap, refer to the Servicing Procedures given on page 12.

   NOTE: An improperly positioned ion-trap magnet can greatly reduce the life of the CRT. If you are not sure that the ion-trap is properly positioned, readjust it.

2. In strong signal areas check for the presence of overload. Overloading usually causes poor sync stability and excessive contrast. When overload is encountered readjust the Dumonitor (a-g-c control) as described in the Servicing Procedures.
3. With the Teleset tuned to a station (preferably one transmitting a test pattern) check the picture positioning. If the picture is not properly positioned, readjust the positioning control assembly as outlined in the Servicing Procedures. If the picture is tilted, reduce the vertical size so that the extreme top of the picture is visible, and rotate the yoke until the picture is horizontal. When rotating the yoke, hold the yoke retainer in place to prevent it from turning with the yoke.

CUSTOMER INSTRUCTION.—A few moments spent with the customer at the time of the installation will often save costly service calls in the future.

An instruction booklet is shipped with each Teleset. Use it as an aid in instructing the customer in the operation of his Teleset. Demonstrate the correct method of adjusting the front panel controls and allow the customer to demonstrate his ability to adjust them.

NOTES

A PUBLICATION OF THE
TELESET SERVICE DEPARTMENT
ALLEN B. DU MONT LABORATORIES, INC.
PATERSON NEW JERSEY

PART NUMBER 67 010 073