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1954

VOLUME TV-8

Television

Servicing Information

Compiled by
M. N. BEITMAN

SUPREME PUBLICATIONS

VOLUME TV-8
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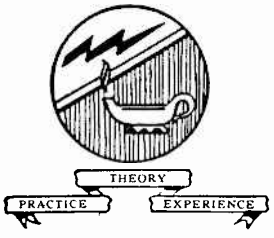

Supreme Publications

FOREWORD

This new 1954 Television Servicing Information manual is the eighth volume of the Supreme Publications TV series. As in previous volumes, we have tried to include in this new manual circuit diagrams and all essential service facts on every popular TV set made during the past year. Factory prepared and checked material was used in every case where it was available. We believe that each manufacturer knows its sets best and can prepare the most accurate and easiest to apply service material on the very sets they engineered, built, and distributed. The kind reception given by servicemen to previous volumes of this series encourages us to believe that our selection and editing of factory material incorporated in these manuals meets with your needs and approval.

The data on 1954 TV models included in this new SUPREME manual brings exciting news of recent technical developments that will prove of great interest to you and will be the help you need when these sets are in your shop for service.

The list of Contents is given on pages 3 and 4, while a complete Index by manufacturers and model (or chassis) numbers begins on page 191. Refer to this list and index to find the TV material you need.

Our sincere thanks and appreciation is extended to all manufacturers through whose cooperation it was possible to present technical information on the sets of their make.

M. N. Beitman

February 1954
Highland Park, Illinois

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Admiral

22F2, 22G2, 22M2, 22N2, 22P2 and 22R2 CHASSIS

MODEL IDENTIFICATION CHART

MODEL NUMBERS Model numbers may have suffix letter "N"	TV Chassis	Picture Tube	VHF Tuner	UHF Tuner	Record Changer	Radio	Tone Control
122DX12	22F2	21ZP4A	94D61-1	.....	.....	.....	Yes
122UDX12	22G2	21ZP4A	94D61-1	A3969 or A4000	.....	.....	Yes
222DX15B, 222DX16B, 222DX17B	22M2	21EP4A	94D61-1	.....	.....	.....	Yes
222UDX15, 222UDX16, 222UDX17	22N2	21EP4A	94D61-1	A3969 or A4000	.....	.....	Yes
222DX27B	22M2	21EP4A	94D61-1	.....	.....	.....	Yes
322DX16A	22P2	21EP4A	94D61-1	.....	RC600	Built-In AM	Yes
322UDX16	22R2	21EP4A	94D61-1	A3969 or A4000	RC600	Built-In AM	Yes

All these chassis have the same basic television circuitry and are similar to earlier Chassis 22C2, 22E2, covered in 1953 manual. For alignment information on all of these sets please refer to Supreme Publications Volume TV-7, Most-Often-Needed 1953 Television Servicing Information manual, pages 13 to 15, inclusive.

The circuit for 22G2 and 22N2 chassis is printed on pages 10-11. These are all channel VHF and UHF sets. Chassis 22R2 is used in a combination set and is similar to 22G2, 22N2, except for a built-in AM radio, record changer, and the necessary switching network. On pages 12-13 is the circuit for 22P2 combination which uses a similar radio and switching arrangement. Chassis 22F2 and 22M2 are straight television sets that correspond to the TV circuitry of 22P2 chassis.

BUILT-IN VHF AND UHF TELEVISION ANTENNAS

VHF-UHF receivers using the All-Channel UHF tuner are equipped with separate VHF and UHF built-in antennas which may eliminate the need for either indoor or outdoor antennas if the receiver is in a "normal signal" area. The VHF built-in antenna is connected to the two lower terminals; the UHF built-in antenna is connected to the two upper terminals.

CONNECTING EXTERNAL ANTENNAS

A combination VHF-UHF antenna or a separate VHF and UHF antenna system can be used with these receivers. For best results in weak signal areas, we recommend the use of separate VHF and UHF antennas and transmission lines.

If separate VHF and UHF external antennas are used, connect the VHF antenna lead-in to the lower antenna terminals and the UHF antenna lead-in to the upper antenna terminals.

If a combination VHF-UHF antenna is used, the following connections should be made:

1. Connect a 3¼ inch stub of 300 ohm transmission line (shorted on one end) to the upper left terminal and the lower left terminal, as shown in the figure below.

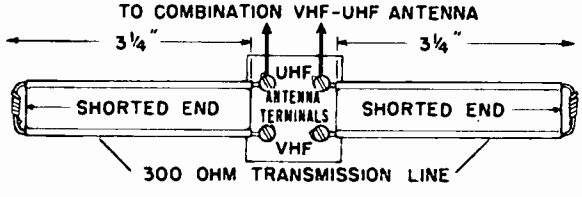


Figure 21. Antenna Connections when Combination VHF-UHF Antenna is Used.

2. Connect a similar stub to the other two terminals, upper right and lower right.
3. Connect the combination antenna lead-in wire to the upper two terminals.

ADMIRAL Chassis 22F2, 22G2, 22M2, 22N2, 22P2, and 22R2, continued.

SERVICE ADJUSTMENTS

For best results, all checks or adjustments should be made using a transmitted television test pattern. A mirror placed in front of the picture tube screen will be of help in observing the picture while making adjustments at the rear of the chassis. Removing the TV back disconnects the line cord; use a separate line cord (part number 89A22-1) when servicing.

1. ADJUSTING CHANNEL SLUGS

Individual channel slug adjustment of every receiver should be checked upon installation or servicing. If this adjustment is properly made, it is possible to tune from one station to another by merely turning the CHANNEL control. With correct slug channel adjustment, best picture and satisfactory sound will be located at the approximate center (half rotation) of the range of the Tuning control.

Channel slug adjustment can be made without removing the chassis from the cabinet. Adjust as follows:

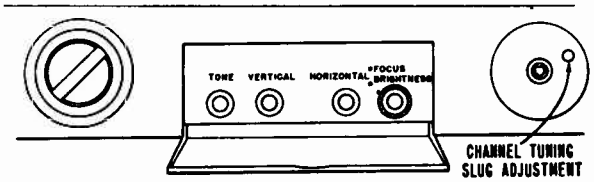
a. Turn the set on and allow 15 minutes to warm up.

b. Set the CHANNEL knob for a station; set other controls for normal picture and sound.

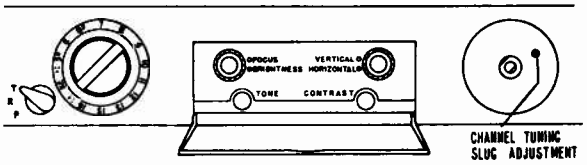
c. Set TUNING control at center of its range by rotating it approximately half-way.

d. Remove the CHANNEL and TUNING knobs.

e. Insert a 1/8" blade, NON-METALLIC tool in the hole adjacent to the channel tuning shaft (see illustration). Since some channel slugs may be "hollowed out" for hex drive, the screwdriver slot will exist on only the outer edge of the slug. A narrow, worn or excessively sharp blade will cause the adjustment tool to slip out of the drive slot in the slug. For each channel in operation, carefully adjust the channel slug for best picture with clear detail. (Note that this may not be the point at which the sound is loudest.) Be sure that the Tuning control is set at the center of its range before adjusting each channel slug. Generally, only slight rotation of the slug will be required; turning the slug in too far will cause it to fall into the coil. (If the slug falls into the coil, remove the chassis from the cabinet and remove the coil. Move the retaining spring aside, lightly tap the open end of the coil until the slug slips out. Replace slug and reset retaining spring.)



Control Panel in 22F2 and 22M2 Sets. Channel Knob Removed.



Control Panel in 22P2 Sets. Channel Knob Removed.

2. ADJUSTING THE ION TRAP

To prolong the life of the picture tube, it is important that this adjustment be made upon installation, after adjusting the picture positioning lever, or after repositioning the focus coil.

Set the BRIGHTNESS control (at front of set) for normal brightness.

Position the ion trap on the picture tube close to the base. Starting from this point, very carefully move the ion trap forward or backward and at the same time, rotate it slightly in either direction until maximum brightness is produced.

Reset the BRIGHTNESS control for normal brightness. Adjust the FOCUS control (at front of set) for good focus. Readjust the ion trap for maximum brightness.

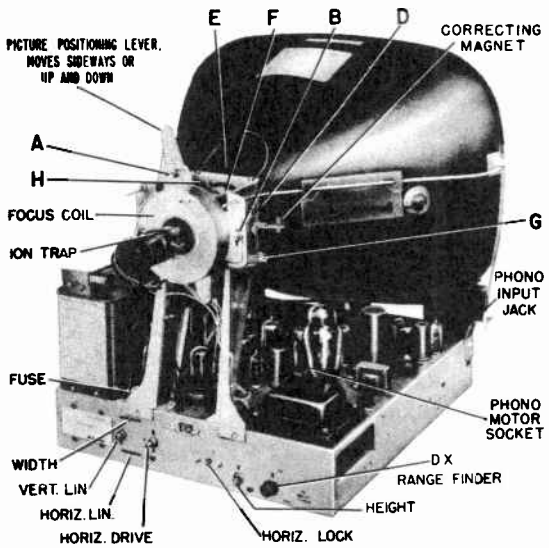
Note that there may be two locations where the brightest picture can be produced. The second ion trap location, which is further away from the tube base, should not be used or tube damage will result.

Important: If the corners of the picture are shaded, be sure the ion trap has been properly adjusted. Do not sacrifice picture brightness when adjusting the ion trap to remove shaded corners. To eliminate shaded corners, see paragraph 5 "Picture Centering".

3. ADJUSTING DX RANGE FINDER

This control is at the rear of the set, near the right side.

This control is used to improve TV reception in fringe areas and in areas where there is interference.



Chassis View Showing Adjustment Locations.

ADMIRAL Chassis 22F2, 22G2, 22M2, 22N2, 22P2, and 22R2, continued.

The DX RANGE FINDER should be at the "0" position, if satisfactory pictures can be obtained by using the operating controls on the front of the set.

Where the TV signal strength is weak, the picture can often be improved by turning the DX RANGE FINDER part way to the right or, if necessary, all the way to "300".

White flashes across the picture can sometimes be minimized by careful adjustment of the DX RANGE FINDER.

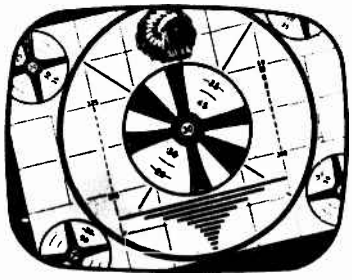
Caution: If the DX RANGE FINDER is turned too far to the right for a strong signal, the picture may disappear completely.

If the signal strength changes, it may be desirable to change the setting of the DX RANGE FINDER; however, it is generally possible to set it at a single compromise position which gives reasonable reception for the different signal strengths.

It is important to keep the DX RANGE FINDER setting as low as possible consistent with satisfactory pictures.

4. ADJUSTING PICTURE TILT

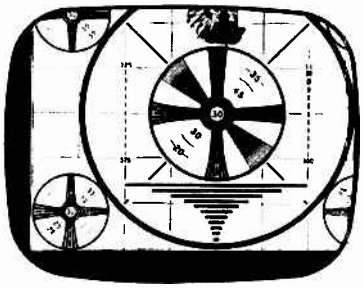
If the picture is tilted, loosen the wing screw "H" on the deflection yoke coil "F" and slightly rotate the yoke until the picture is straight. Before tightening the wing screw, be sure that the yoke is moved as far forward as possible, otherwise corners of the picture may become shaded.



Picture Tilted; Adjust Deflection Yoke Coil.

5. PICTURE CENTERING

If the picture is off center, it can be centered by using the picture positioning lever, and when necessary, repositioning the focus coil around the picture tube neck. Follow the instructions given below. ***Note that the picture positioning lever can be moved sideways, or up and down.***



Picture Not Centered; Adjust Picture Positioning Lever.

a. Adjust ion trap as instructed on preceding page.

b. Slightly loosen the screw "A" which locks the picture positioning lever to the focus coil, and adjust the lever (sideways, or up and down) for correct picture centering.

c. Readjust the ion trap.

Difficulty in Centering the Picture

a. Adjust ion trap as instructed on preceding page.

b. Slightly loosen the two screws "B" which hold the focus coil to the yoke bracket. Center focus coil around the tube neck; tighten screws.

c. Loosen the screw "A" and center the picture with the picture positioning lever. If the picture cannot be centered with the lever, it may be necessary to locate the focus coil slightly off center and then center the picture with the picture positioning lever.

d. Readjust the ion trap.

Difficulty in Eliminating Shaded Corners

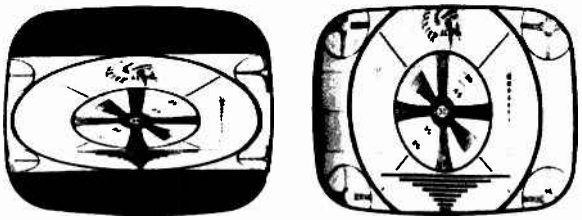
a. Loosen screws "G", then move the yoke support bracket forward until rubber grommet "E" is firmly against the flare of the picture tube.

b. Move the deflection yoke coil "F" as far forward as possible. In some cases, it may be necessary to loosen the two screws "D", move the bracket up or down, and then move the deflection yoke coil as far forward as possible.

c. Adjust ion trap as instructed on preceding page.

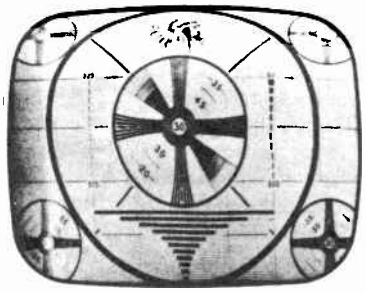
6. HEIGHT AND VERTICAL LINEARITY ADJUSTMENT

If the picture is of incorrect height (vertical size), adjust the HEIGHT control. This adjustment may affect the vertical linearity of the picture. If necessary, alternately adjust the VERT. LIN. control and HEIGHT control. Note that the upper portion of the picture is affected mostly by the Vertical Linearity control; the lower portion by the Height control.



Incorrect Height; Alternately Adjust HEIGHT and VERT. LIN. Controls.

If the large circle in the test pattern appears cramped or flattened at top or bottom (non-linear vertically), correct by alternately adjusting the VERT. LIN. control and the HEIGHT control.



Top or Bottom of Picture Cramped or Flattened; Adjust VERT. LIN. and HEIGHT.

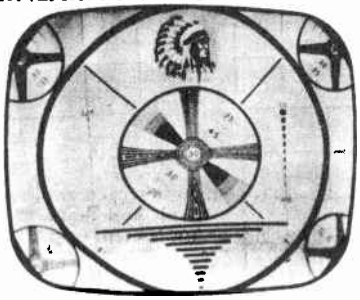
ADMIRAL Chassis 22F2, 22G2, 22M2, 22N2, 22P2, and 22R2, continued.

7. WIDTH ADJUSTMENT

If the picture is too wide or too narrow, slide the WIDTH adjustment to the left or to the right until the picture just fills the picture tube screen.

8. HORIZONTAL LINEARITY ADJUSTMENT

If the large circle in the center of the test pattern has a cramped appearance at either side (non-linear horizontally), slide the HORIZ. LIN. adjustment to the left or right as required. Note that the Horizontal Drive and the Width adjustments also affect linearity. Be sure that these adjustments are set correctly when making the horizontal linearity adjustment.



Side of Picture Cramped or Flattened; Adjust HORIZ. LIN.

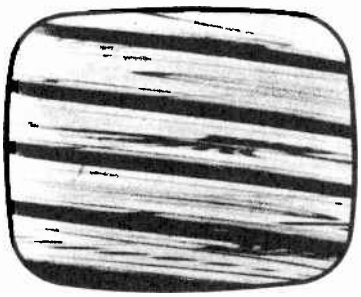
9. HORIZONTAL OSCILLATOR AND HORIZONTAL DRIVE ADJUSTMENT

A receiver which requires horizontal oscillator or horizontal drive adjustment can be corrected only by following in exact detail the step-by-step procedure given here.

NOTE: ***If HORIZ. DRIVE adjustment is not properly made, it may be difficult to obtain sufficient picture width and brightness.***

Check to see if the HORIZONTAL control (on front panel) keeps the picture in "horizontal sync" through half of its range so that the picture does not "break up" when switching channels. Note: Since there is some interaction between the HORIZ. LOCK adjustment and the HORIZ. DRIVE control, adjustment of these controls are combined in one procedure.

If the picture will not stay in "horizontal sync" through half of the range of the HORIZONTAL control (on front panel), it will be necessary to make HORIZ. LOCK and HORIZ. DRIVE adjustments. However, before making these adjustments, be sure that the picture can be made to remain stationary up and down (sync vertically) as lack of both vertical and horizontal sync is an indication of trouble in the sync circuits such as a defective tube or other component.



Picture Out of Horizontal Sync.

Make the HORIZ. LOCK and HORIZ. DRIVE adjustments exactly as follows:

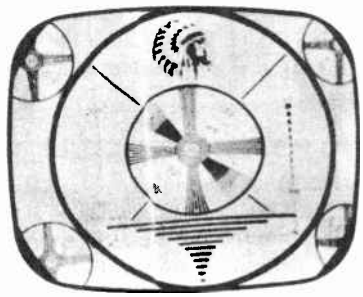
a. Allow the receiver to warm up for a few minutes. Tune in the station, set the BRIGHTNESS control at a lower than average setting. Turn PICTURE control fully to the left. Important: Before proceeding, be sure that the DX Range Finder control (AGC) is adjusted according to the instructions given in this manual.

b. Turn the HORIZONTAL control (front panel) completely to the left. Turn the HORIZ. DRIVE control fully to the right.

c. Turn the HORIZ. LOCK adjustment to the right until the picture falls out of sync. If the picture cannot be made to fall out of sync, momentarily interrupt the signal by switching the CHANNEL control off channel and then back on.

d. With the picture out of sync, turn the HORIZ. LOCK adjustment slowly to the left until the picture just falls in sync.

e. Turn the CHANNEL control to an unused channel. If a white vertical line(s) appears near the center of the screen, slowly turn the HORIZ. DRIVE control to the left until the line(s) just disappears.



Vertical Line; Adjust HORIZ. DRIVE.

f. If, in step "e", the HORIZ. DRIVE control required readjustment, tune in a station and repeat steps "c" and "d" to be sure of proper Horizontal Oscillator adjustment.

g. Adjustment should now be satisfactory. However, check adjustment by slowly rotating the HORIZONTAL control in either direction while interrupting the television signal by switching the CHANNEL control off channel and then back on. The picture should automatically fall in sync through at least half of the range of the HORIZONTAL control. If necessary, repeat the above step.

h. Do not use the HORIZ. DRIVE control to obtain correct width or linearity. If necessary, make Width and Horizontal Linearity adjustments.

ADJUSTING CURVATURE CORRECTING MAGNETS IN SETS USING 21EP4A (21") PICTURE TUBE

If either side of the picture has excessive curvature (pin cushion effect) or if corners of the picture are bent inwardly, this can be minimized by adjustment of the correcting magnets shown in the chassis illustration. Either side of the picture can be adjusted individually by using the magnet on that side of the picture tube. A picture or test pattern having straight vertical lines near the sides can be used for making adjustment.

ADMIRAL Chassis 22F2, 22G2, 22M2, 22N2, 22P2, and 22R2, continued.

TROUBLE CHART

Picture	Raster	Sound	Checks and Suggested Tube Changes
None.	None.	None.	Is set plugged in? Line cord loose. Change tube V501.
None, weak, or intermittent.	None, insufficient brightness, or intermittent.	OK.	Fuse (if it is necessary to replace fuse, also replace tube V408). Change tubes V406, V405, V407, V408, V305. Adjust ion trap per paragraph 2. Replace picture tube.
None, weak, or intermittent.	OK.	None, distorted, weak, or intermittent.	Check antenna connections. Changes tubes V101, V102, V301, V302, V303, V304, V305, V307. See paragraphs 1 and 3.
None, weak, or intermittent.	OK.	OK.	Change tubes V305, V304, V303, V101, V102, V301, V302, and V307. See paragraph 3. Replace picture tube.
OK.	OK.	None, weak, distorted, or intermittent.	See paragraph 1 Changes tubes V202, V201, V203, V204 and V304. Check speaker connections.
Insufficient brightness.	Insufficient brightness.	OK.	See paragraph 2. Changes tubes V305 and V407. Replace picture tube.
Picture expands when picture control is advanced.	May have insufficient brightness.	OK.	Change tube V407.
Insufficient width.	Insufficient width.	OK.	See paragraphs 7, 8, and 9. Change tubes V406, V405, V501 and V408.
Insufficient height.	Insufficient height.	OK.	See paragraph 6. Change tubes V402, V401, and V501.
Bright, horizontal line across center of screen.	Bright, horizontal line across center of screen.	OK.	Change tubes V402 and V401.
Horizontal lines move upward when volume control is advanced.	OK.	OK.	See paragraph 1. Change tubes V102, V101, V301, V302, V303, and V304.
Will not hold sync vertically, or horizontally.	OK.	OK.	Change tubes V403, V401, and V101. After changing each tube, adjust the vertical-hold control, and make the adjustments in paragraph 9.
Holds sync vertically, but not horizontally.	OK.	OK.	Change tubes V404, V405, V406, V305, V101, V301, V302, and V403. After changing each tube, make the adjustments in paragraph 9.
Holds sync horizontally, but rolls vertically.	OK.	OK.	Change tubes V401 and V403.
Picture curves (bends).	OK.	OK.	See paragraph 9. Change tubes V404, V405, V406, V305, V101, V301, V302, and V403.
Poor horizontal linearity.	OK.	OK.	See paragraphs 7, 8, and 9. Change tubes V406, V405, and V408.
Poor vertical linearity.	OK.	OK.	See paragraph 6. Change tubes V402 and V401.
Tilted.	Tilted.	OK.	See paragraph 4.
Off center or shaded corners.	Off center or shaded corners.	OK.	See paragraph 5.
Vertical lines or jagged edges, poor horizontal linearity.	Jagged edges.	OK.	See paragraph 9. Change tubes V408, V406, and V405.
Wide, black horizontal bar across picture.	Wide, black horizontal bar across raster.	OK.	Change tube V305.

Admiral Corporation

Schematic for 22G2 and 22N2 Television Chassis.

Block Diagram of UHF Tuner Circuit: The block diagram of the circuit functions (figure 29) will aid in understanding the operation of the UHF tuner. The principle employed is that of a single conversion stage and can be compared to a simple superheterodyne radio receiver. The incoming signal is applied to a tuned preselector stage and then coupled to the input of a mixer stage. In the mixer, the signal is beat with signal from the local oscillator, thus producing a beat of the desired frequency. In this case, the oscillator operates below the frequency of the incoming UHF signal and produces a beat which is the difference between the two frequencies. The preselector bandwidth is such that the usable beat frequency extends from 76 to 88 MC, which is within the frequency range of Channel 5 or 6.

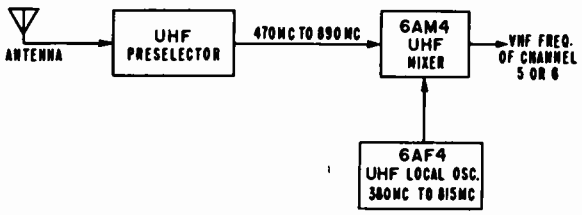
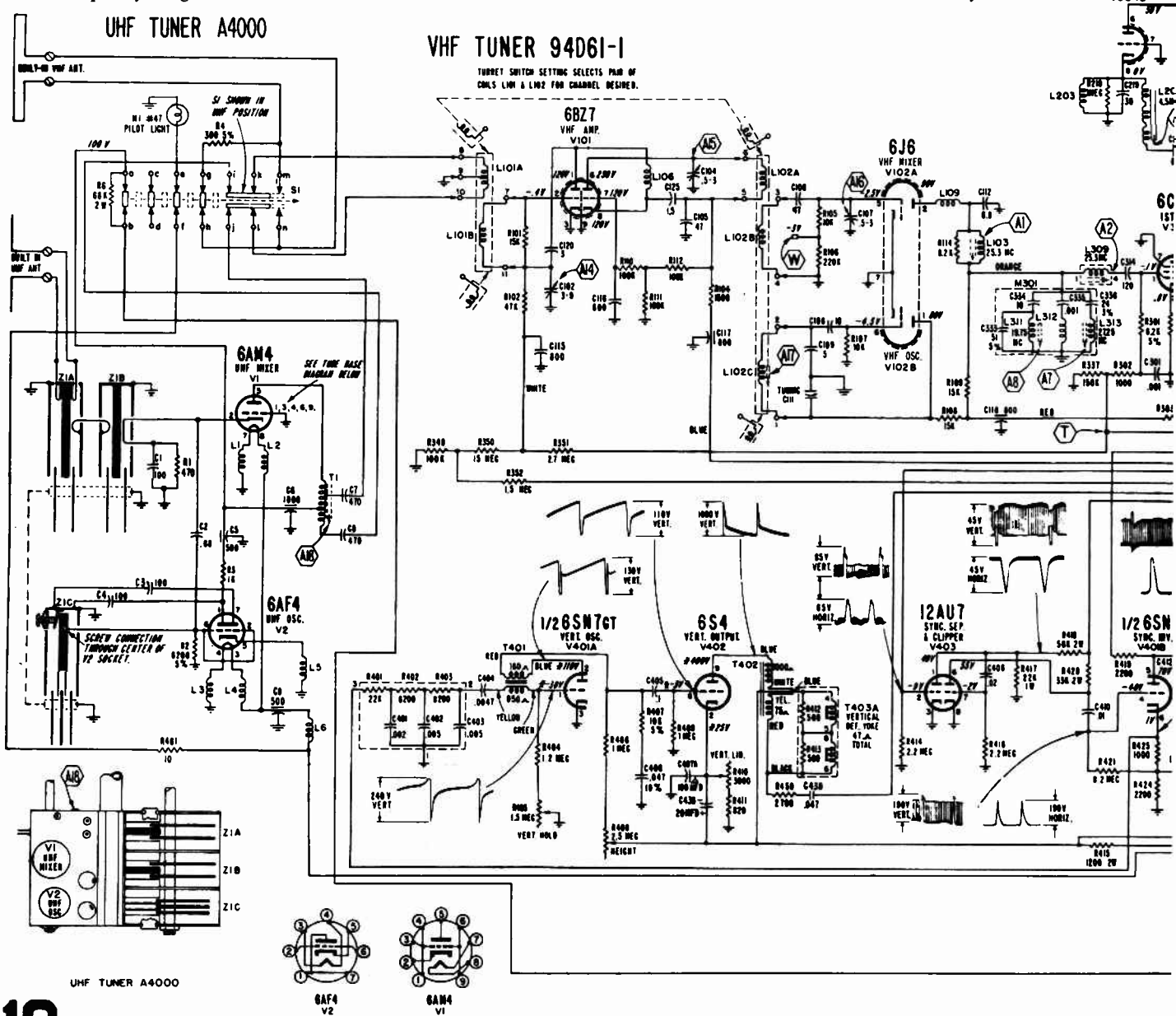


Figure 29. Block Diagram of UHF Tuner Circuit.

UHF Preselector Circuit: The UHF signal is coupled to the first tuned line of the preselector circuit by a coupling loop CL1. The loop is center-tapped in order to provide a balanced 300 ohm input. The signal from Z1A is transferred to the second tuned line Z1B by means of



coupling loop CL2. Since maximum coupling is at the point of current maximum, a loop of constant size at this point will have a degree of coupling which will vary with frequency. To provide the most uniform coupling over the entire tunable range, the loop is placed as close as possible to the point of current maximum.

Coupling from the second tuned line Z1B to the cathode of the 6AM4 mixer tube, V1 is provided by coupling loop CL3. Tuning capacitors TC2 and TC3 are connected to the end of the line and add capacity to it. This effectively lengthens the line. The two lines are tracked from Channel 14 to Channel 83.

An equivalent circuit of the tuned line preselector is shown in figure 31. Note that parallel resonant circuits have been substituted for the tuned lines. Z1A can be considered as a tuned primary and Z1B a tuned secondary. CLI is the UHF antenna coupling and CL2 is the link coupling between the two tuned circuits.

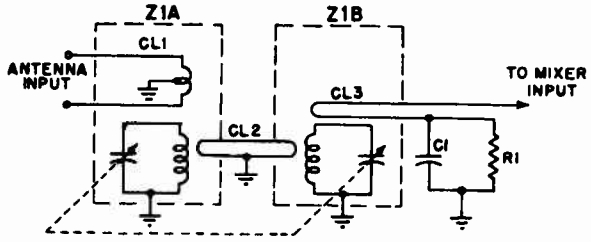
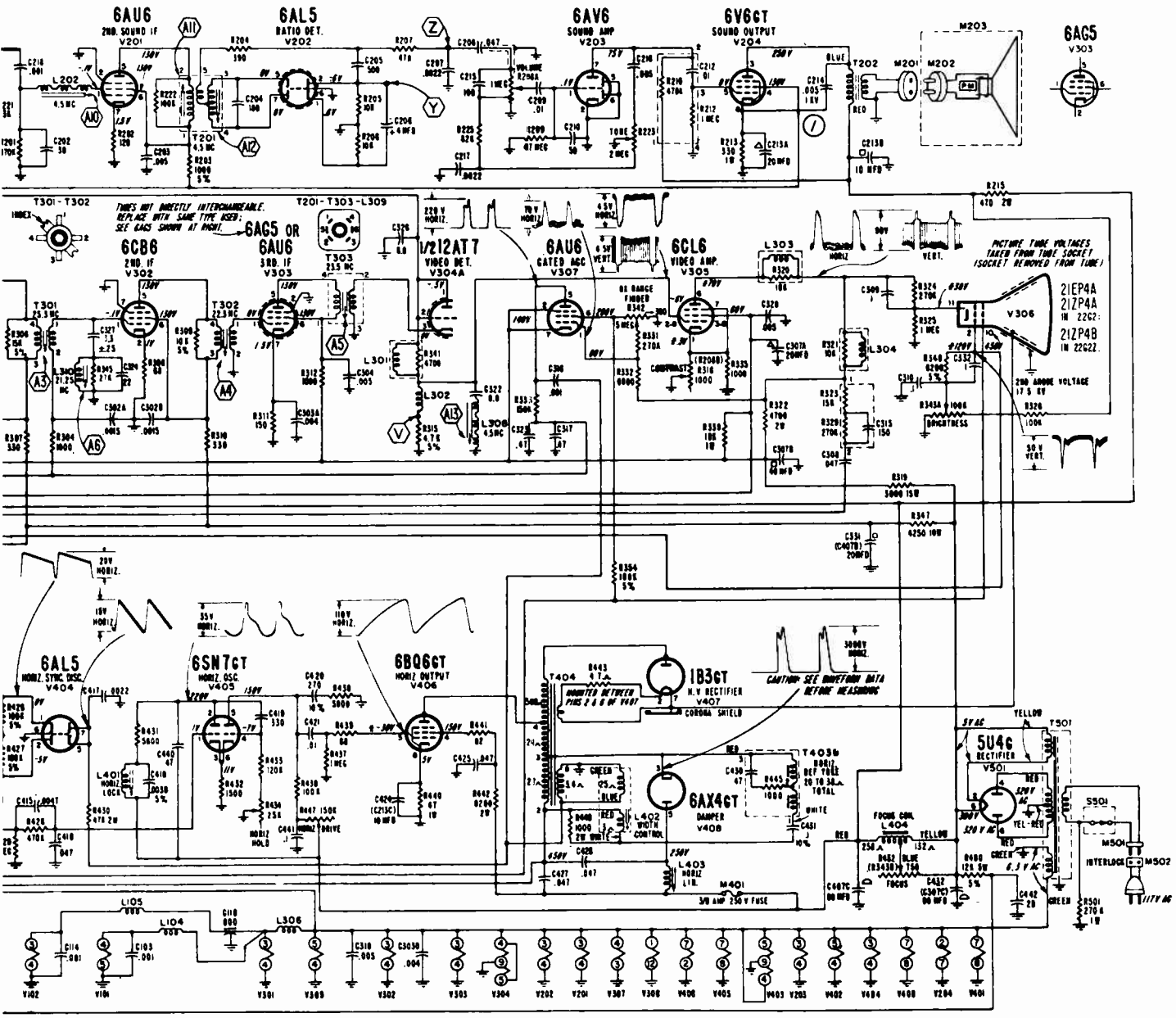


Figure 31. Equivalent Circuit of Preselector.



Refer to notes on page 14.

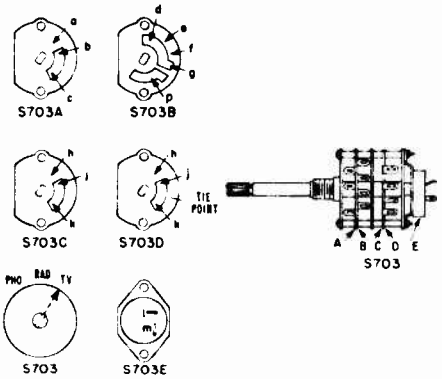
Admiral Corporation — Schematic for 22P2 Television and Radio Chassis.

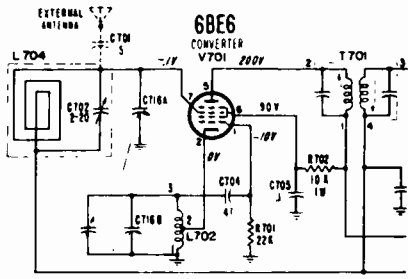
SCHEMATIC NOTES

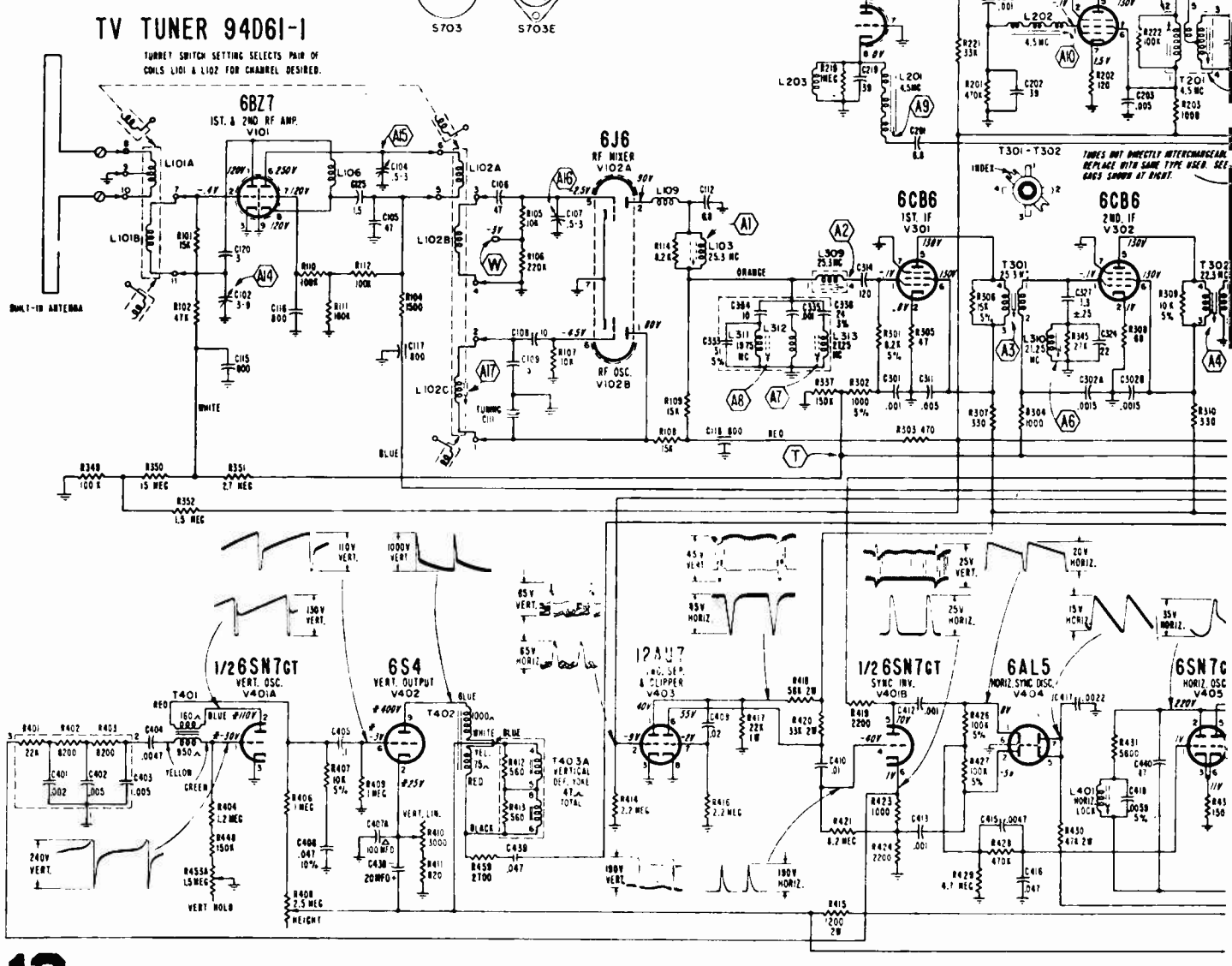
Run numbers are rubber stamped at the rear of the chassis.

Numerical symbols ①, ②, ③, etc. indicate run numbers for all 22 series chassis.

Ⓐ1, Ⓐ2,.....Ⓨ, Ⓩ, etc. indicate alignment points and alignment connections.





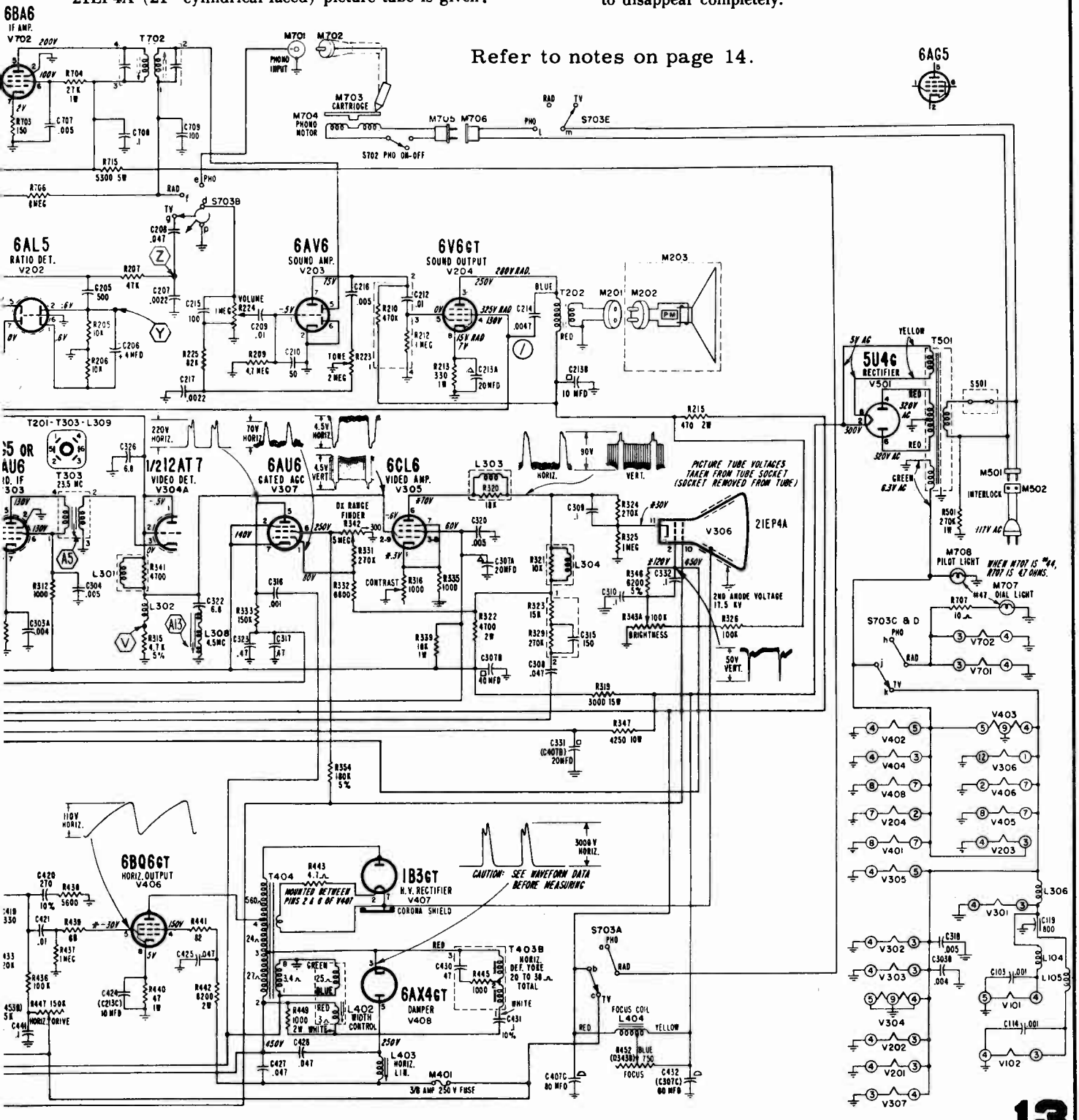


PICTURE TUBE REPLACEMENT

Picture tube replacement for the 22 series receivers is similar to that of other chassis using a rectangular glass picture tube. The 21ZP4A is not interchangeable with the 21EP4A because of cabinet differences. Instructions for adjusting curvature correcting magnets used with 21EP4A (21" cylindrical faced) picture tube is given.

White Flashes Across Picture (22F2, 22M2 and 22P2 chassis): In weak signal, high noise level areas, white flashes across the picture can sometimes be minimized by careful adjustment of the DX Range Finder control. Caution: turning the DX Range Finder control too far to the right for a strong signal may cause the picture to disappear completely.

Refer to notes on page 14.



Admiral Chassis 22F2, 22M2, 22P2, continued.

WAVEFORM DATA
(Waveforms given on schematic)

Waveforms taken with CONTRAST control set fully to the right, all other controls set for normal picture (in sync). Warning: Incorrect adjustment of the DX Range Finder control will cause waveform distortion.

Waveforms at video and sync stages obtained with transmitted signal input to receiver.

The oscilloscope sweep is adjusted for 30 cycles (which is one-half of the vertical frequency), or for 7875 cycles (which is one-half of the horizontal frequency) so that two pulses appear on the screen.

The peak-to-peak voltage readings shown are subject to some variations due to response of the oscilloscope and parts tolerances.

CAUTION

Pulsed high voltage is present on the caps of V406, V407 and pin 3 of V408. Do not make direct connection to these points with ordinary test equipment. Waveform and peak-to-peak voltage at pin 3 of V408 taken, using an oscilloscope with a capacitive voltage divider probe. Waveform at pin 3 of V408 can be taken by clipping or twisting the lead from the oscilloscope high side over the insulation on the cap lead. When taking the waveform this way, the shape of the waveform will be the same but the peak-to-peak voltage will be much lower, depending upon the degree of coupling.

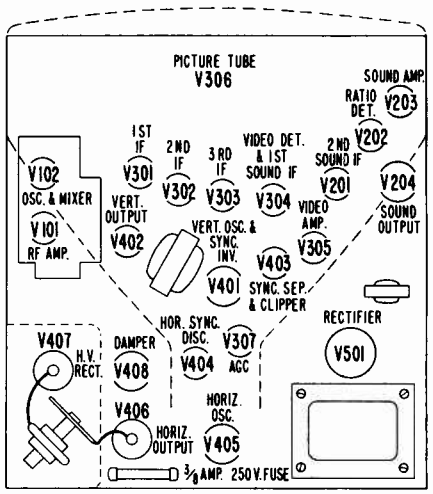
VOLTAGE DATA
(Voltages given on schematic)

- TV voltage taken with function switch on "TV" position. CONTRAST control turned fully clockwise. CHANNEL control set on an unused channel. Other front controls set at approximately half rotation. Vert. Lin. and Height set at approximately half rotation. DX Range Finder control set fully to the left (at "0" position). TV antenna disconnected from set with terminals shorted.
- Radio voltages V701 and V702 taken with function switch on "Rad" position; voltages measured from underside of tube sockets. When measured from top of tube sockets (with tube removed), B plus voltage at pins 5 and 6 of V701 and V702 will be approximately 275 volts.
- B plus voltages at V203 and V204, will be slightly higher when set is switched to "Rad" position. Voltages marked with an asterisk * will vary widely with control setting.
- Line voltage 117 volts AC.
- Voltages measured with a vacuum tube voltmeter between tube socket terminals and chassis, unless otherwise indicated.
- Voltages at V306 measured from top of socket with tube removed.
- Voltages at V101 and V102 (TV Tuner) are measured with tube in socket. Use an adapter or lift tube out of socket just high enough to allow a needle point probe to contact tube pins.

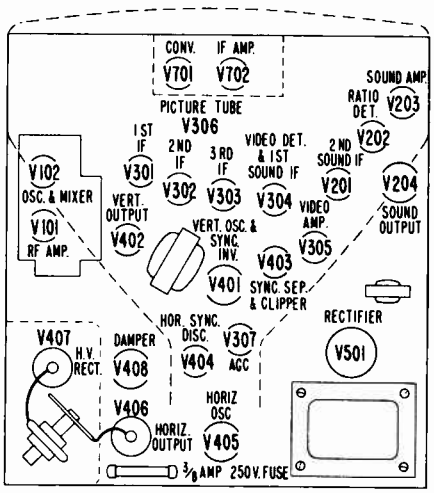
CAUTION

Pulsed high voltages are present on the cap of V406, pin 3 of V408 and on the filament terminals and cap of the 1B3GT tube. NO ATTEMPT SHOULD BE MADE TO TAKE MEASUREMENTS FROM THESE POINTS WITHOUT SUITABLE TEST EQUIPMENT.

Picture tube 2nd anode voltage can be measured from the 2nd anode connector and should be taken only with a high voltage instrument such as a kilovoltmeter or VTVM with a high voltage probe. 2nd anode voltage is approximately 17.5 KV. Proper filament voltage check of the 1B3GT tube may be made by observing filament brilliancy as compared with that obtained with a 1.5 volt dry cell battery.



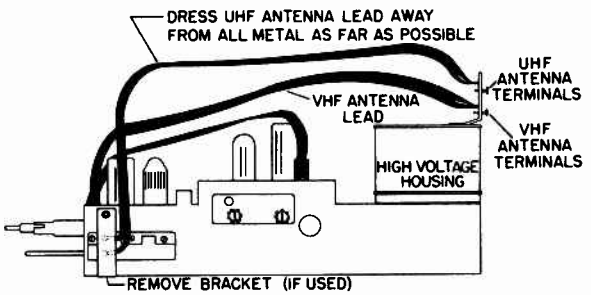
Top View of 22F2 and 22M2 Chassis.



Top View of 22P2 Chassis. (V701 and V702 are accessible from underside of chassis.)

POOR UHF RECEPTION DUE TO IMPROPER ANTENNA LEAD DRESS

Poor UHF reception in All-Channel VHF-UHF receivers, may be caused by the UHF antenna lead from the UHF antenna terminals to the UHF tuner being close to or touching the metal brackets of the rear picture tube mount. This lead is purposely long and acts to present a high shunt impedance at the mean frequencies of the lower and higher VHF channels.



Side View of VHF-UHF Chassis Showing VHF and UHF Antenna Leads.

Remove the back cover of the cabinet and check this lead to be sure it is not close to any metal and straighten it out if it is looped or doubled up. While the back is off the cabinet and after the antenna lead has been checked, check the lead from UHF antenna terminals at the point where it is soldered to the side of the UHF tuner; see illustration above. Remove the metal bracket (if used) that covers the UHF antenna connections. This bracket was used on the production line and is not required after the set is installed in the cabinet.

REPLACING FUSE M401

The horizontal output circuit of these receivers is protected by fuse M401 (3/8 amp., 250 volts). This fuse is located at the side of the high voltage compartment.

Admiral

19J1, 19L1, 19P1, 19S1, 19A2, 19B2, 19D2 and 19E2 CHASSIS

Used in Models 121UDX12, 221UDX16L, 221UDX17L, 321UDX15L, 321UDX16L, TU1811, TU1812, TU1822, TU2212, C2215, CU2215, T2215, TU2215, C2216, CU2216, H2216, HU2216, K2216, KU2216, T2216, TU2216, C2217, CU2217, H2217, HU2217, K2217, KU2217, T2217, TU2217, T2218, TU2218, TU2222, TU2226, C2236, CU2236, C2237, CU2237.

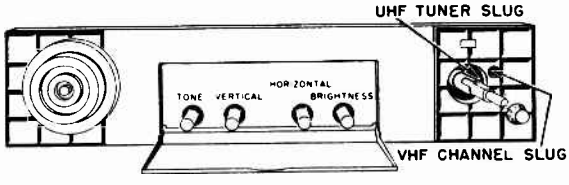
For alignment of these sets please refer to pages 6 to 9 in Supreme Publications Volume TV-7, 1953 Television Servicing Information manual. The circuit printed on pages 16-17 of this manual is exact for Chassis 19J1, 19L1. The other chassis are very similar and this material may be used for servicing these additional sets.

INDIVIDUAL VHF CHANNEL SLUG ADJUSTMENT

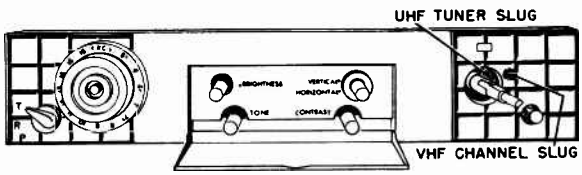
Individual VHF channel slug adjustment of every receiver should be checked upon installation or servicing. If this adjustment is properly made, it is possible to tune from one VHF station to an other by merely turning the LOW-CHANNEL selector. With correct channel slug adjustment, best picture and satisfactory sound will be located at the approximate center (half rotation) of the range of the Fine Tuning tab.

VHF channel slug adjustment can be made without removing the chassis from the cabinet. Adjust as follows:

a. Turn the set on and allow 15 minutes to warm up.
b. Turn HIGH-CHANNEL selector completely to the right until the pilot light goes out and the letters "VHF" are at the top of the knob.
c. Set the LOW-CHANNEL selector for a station; set other controls for normal picture and sound.
d. Set the FINE TUNING tab (low-channel) at center of its range by rotating it approximately half-way.



Control Panel in 19J1 and 19L1 Sets; Knobs Removed.



Control Panel in 19P1 Sets; Knobs Removed.

e. Remove the CHANNEL knobs and FINE TUNING tab.
f. Insert a 1/8" blade, ***non-metallic*** tool in the hole adjacent to the channel tuning shaft (see illustrations below). For each VHF channel in operation, carefully adjust the channel slug for best picture with clear detail. (Note that this may not be the point at which the sound is loudest.) Be sure that the Fine Tuning tab is set at the center of its range before adjusting each channel slug. Caution: Only slight rotation of the slug will be required.

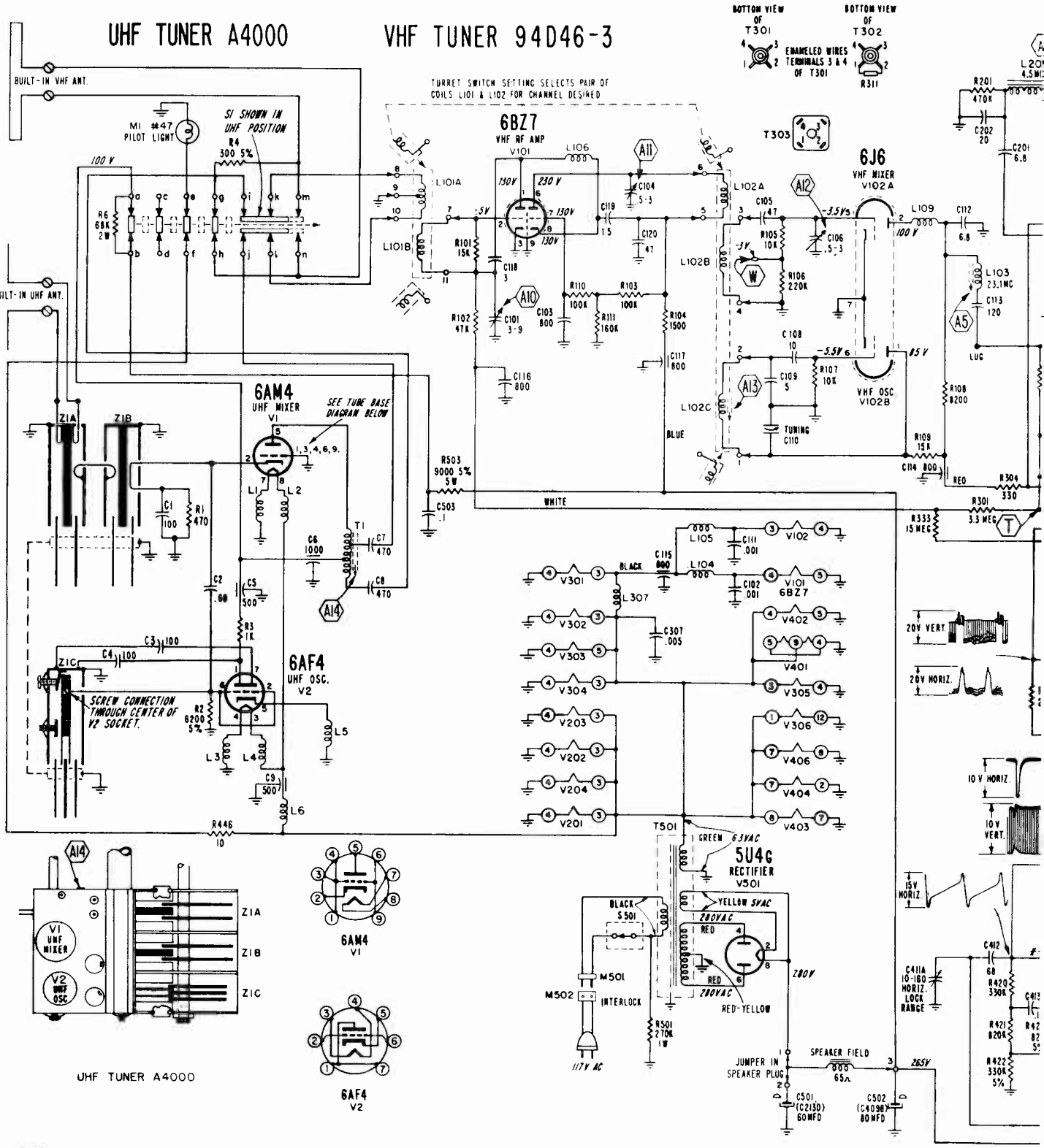
UHF TUNER SLUG ADJUSTMENT

The UHF tuner slug (mixer output network) is set at the factory and should generally never require readjustment in the field. However, if UHF reception is weak (picture has excessive snow), reception can be improved by readjusting the UHF tuner slug. This adjustment is located below the VHF channel slug adjustment. It can be reached after removing the CHANNEL knobs and FINE TUNING tab (low-channel).

UHF tuner slug adjustment can be made without removing the chassis from the cabinet. Adjust as follows:

a. Set the LOW-CHANNEL selector knob to either Channel 5 or 6 (whichever does not have a TV station).
b. Set the FINE TUNING tab at the center of its range by rotating it approximately half-way.
c. Tune in UHF station for best picture.
d. Remove the CHANNEL knobs and FINE TUNING tab.
e. Insert a 1/8 inch blade, ***non-metallic*** tool through the tuner shaft hole in the knob panel until the alignment tool engages the adjustment screw just below the VHF channel slug adjustment hole. Carefully adjust the slug for best picture with clear detail. Only slight adjustment in either direction will be required.

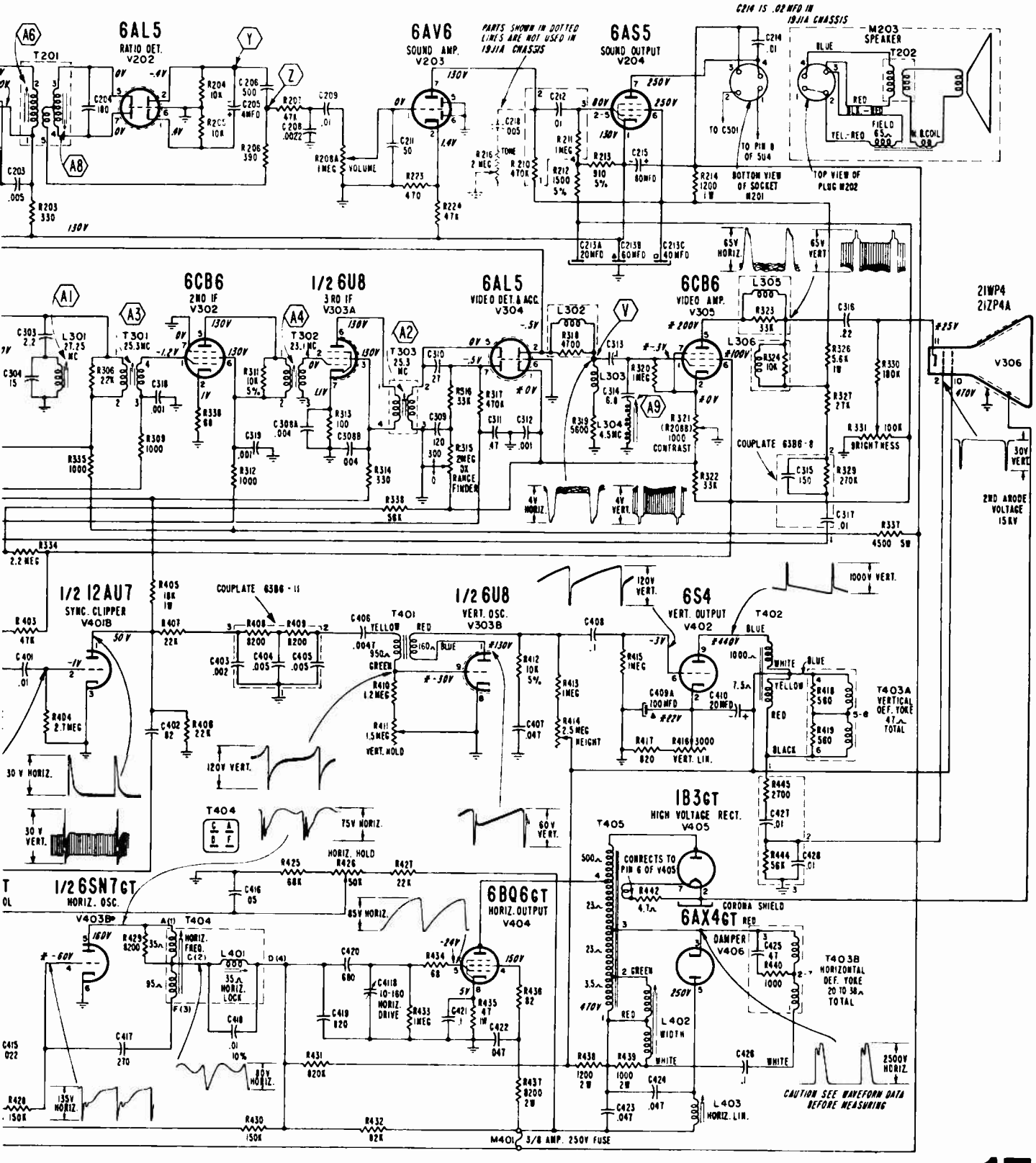
ADMIRAL 19J1, 19L1, 19P1, etc., continued



Schematic for 19J1 and 19L1 VHF-UHF Television Chassis.

See page 18 for notes applicable to this schematic diagram.

Admiral



ADMIRAL 19J1, 19L1, 19P1, 19S1, 19A2, 19B2, 19D2, and 19E2, continued.

SCHEMATIC NOTES

Run numbers are rubber stamped at the rear of the chassis.

Numerical symbols ①, ②, ③, etc. on schematic indicate a production change covered by a run number.

Ⓐ1, Ⓐ2,.....Ⓨ, Ⓩ, etc. indicate alignment points and alignment connections.

IMPORTANT: Before making waveform and voltage measurements, see instructions below.

WAVEFORM DATA

(Waveforms and Voltages given on schematic)

Waveforms taken with CONTRAST control set fully to the right, all other controls set for normal picture (in sync). DX Range Finder control set fully to the left (at "0" position). Warning: Incorrect adjustment of the DX Range Finder control will cause waveform distortion.

Waveforms at video and sync stages obtained with transmitted signal input to receiver.

Waveform at pins 1 and 4 of V403 and terminal "C" (2) of T404 taken with a 10 mmfd. condenser connected in series with the oscilloscope high side.

The oscilloscope sweep is adjusted for 30 cycles (which is one-half of the vertical frequency), or for 7875 cycles (which is one-half of the horizontal frequency) so that two pulses appear on the screen.

The peak-to-peak voltage readings shown are subject to some variations due to response of the oscilloscope and parts tolerances.

Caution: Pulsed high voltages are present on the caps of V404 and V405 and at pin 3 of V406. Do not make direct connection to these points with ordinary test equipment. Waveform and peak-to-peak voltage taken at pin 3 of V406, using an oscilloscope with a capacitive voltage divider probe. Waveform at V406 can also be taken by clipping or twisting the lead from the oscilloscope high side over the insulation on the lead connecting to pin 3. When taking the waveform this way, the shape of waveform will be the same but the peak-to-peak voltage will be much lower, depending upon the degree of coupling.

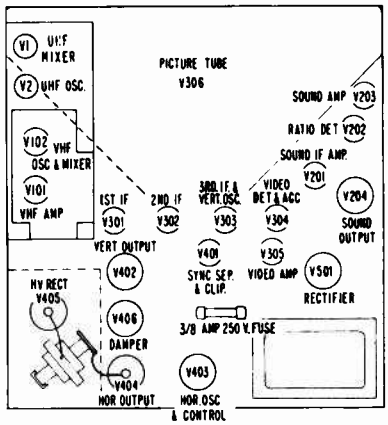
TV VOLTAGE DATA

- CONTRAST control turned fully clockwise. LOW-CHANNEL SELECTOR set on an unused VHF channel. HIGH-CHANNEL SELECTOR in the "VHF" position. Other front controls set at approximately half rotation. Vert. Lin. and Height set at approximately half rotation. DX Range Finder control set fully to the left (at "0" position).
- VHF antenna disconnected from set with terminals shorted.
- Voltages marked with an asterisk (*) will vary widely with control setting.
- Line voltage 117 volts AC.
- Voltages measured with a vacuum-tube voltmeter between tube socket terminals and chassis, unless otherwise indicated.
- Voltages at V101 and V102 (VHF Tuner) are measured with tube in socket. Use an adapter or lift tube out of socket just high enough to allow a needle point probe to contact tube pins.
  Voltages at pins 1 and 8 of V101 (6BZ7) must be taken as described above or no voltage reading will be obtained.
- Voltages at V306 measured from top of socket with tube removed.
- B+ voltage at terminal "a" of VHF-UHF switch S1 of UHF tuner A4000 taken with switch in UHF position.

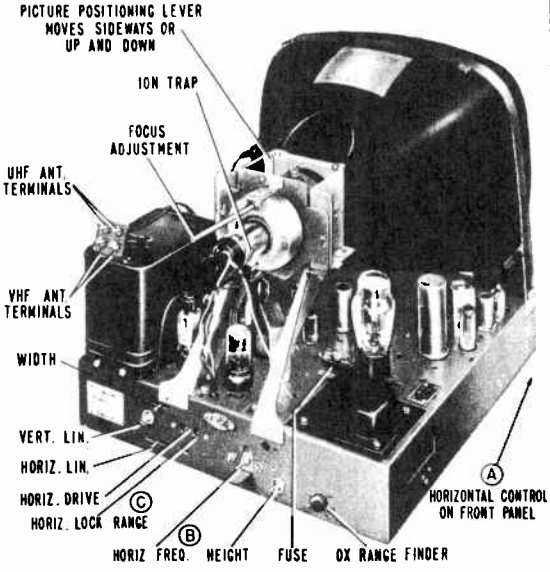
CAUTION

Pulsed high voltages are present on the cap of V404, pin 3 of V406 and on the filament terminals and cap of the 1B3GT tube. NO ATTEMPT SHOULD BE MADE TO TAKE MEASUREMENTS FROM THESE POINTS WITHOUT SUITABLE TEST EQUIPMENT.

Picture tube 2nd anode voltage can be measured from the 2nd anode connector and should be taken only with a high voltage instrument such as a kilovoltmeter or a vacuum-tube voltmeter with a high voltage probe. 2nd anode voltage is approximately 15 KV. Proper filament voltage check of the 1B3GT tube may be made by observing filament brilliancy as compared with that obtained with a 1.5 volt dry cell battery.



Top View of Chassis.



Rear View of VHF-UHF Chassis Showing Antenna Terminals and Adjustment Locations.

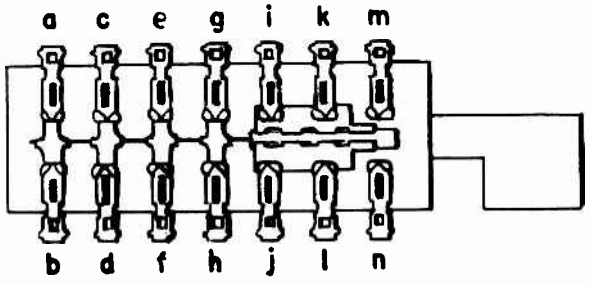
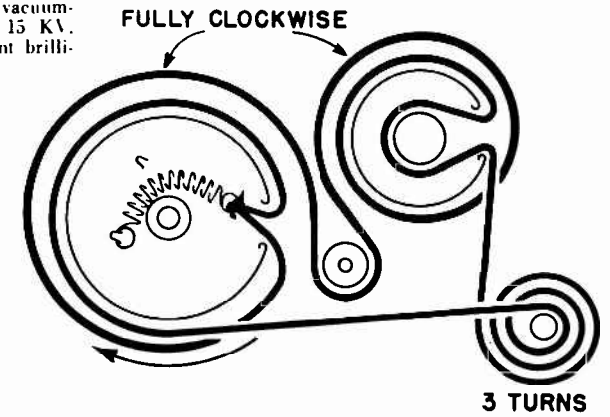


Illustration of VHF-UHF Switch S1.



Drive Cord Stringing for UHF Tuner A4000.

Arvin TE 358-1, TE 359, TE 363-1, TE 364

The chassis listed above are almost identical except for type of tuner and size of picture tube. The circuit diagram on the next two pages, over, is exact for TE 363-1. To the time of publication these chassis were used in television models listed below.

Models 9210, 9212, 9216, 9218, 9219, 9240 (with various suffix letters)

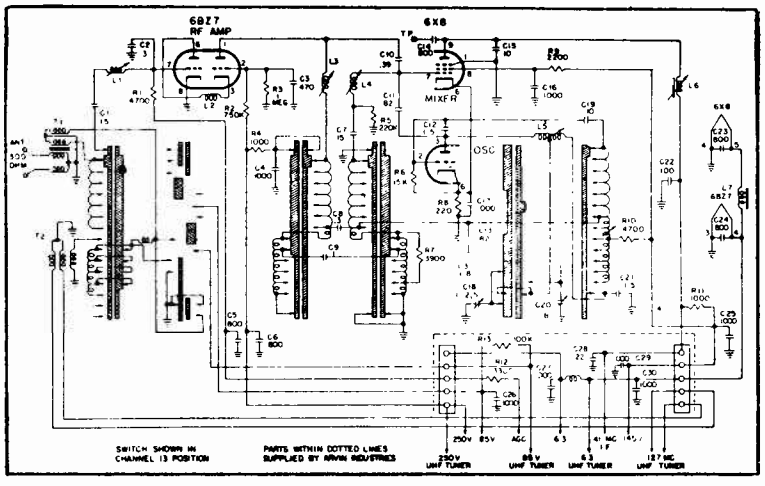
PARTS LIST

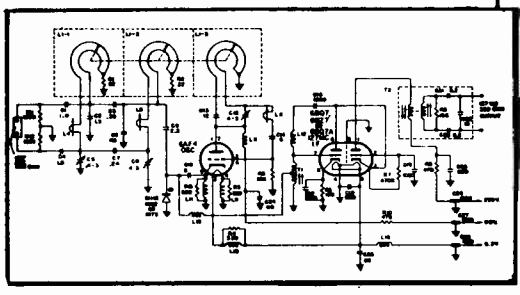
Schematic Location	Part No.	Description
		CAPACITORS
C202	40355-1	Disc. 2.2 uuf, 5%, 500V. P-100
C204	41077-1	Disc. 2.7 uuf 0.5 uuf, P-100
C217	20290-390	Mica. 39 uuf, 10%
C407	20290-101	Mica. 100 uuf, 10%
C414	40538	Disc. 130 uuf, 5 KV.
C410	20290-271	Mica. 270 uuf, 10%
C408	20331-331	Mica. 330 uuf, 5%, 500V.
C409	20290-331	Mica. 330 uuf, 10%
C416	24994	Hi Volt 500 uuf, 20 KV.
C205, 208 215, 211	41052-1	Disc. 560 uuf
C201, 203, 206, 207, 209, 210, 212, 213, 214, 216, 317	23078	Disc. .001 uf, G.M.V.
C111, 308 307, 105	40054-102	Disc. .001 uf, 20%
C405	40108-102	Disc. Heavy Duty. .001 uuf, 1000V.
C110	40054-332	Disc. .0033 uf, 20%
C406	20433-392	Mica. 3900 uuf, 5%, Class B.
C301	40053-472	Disc. .0047 uf, G.M.V.
C302, 401, 109	40054-472	Disc. .0047 uf, 20%
C112	40108-472	Disc. Heavy Duty .0047 uf, 1000V.
C3 1	20324-472	.0047 uf, 5%, 600V. Min. Oil Imp. Molded Paper
C101, 102, 103, 104, 106, 108,	40053-103	Disc. .01 uf, G.M.V.
C417, 418	41135-103	Disc. Heavy Duty, .01 uf, 1500V.
C404, 304	25455-103	.01 uf, 20%, 200V. P.T.
C319	25455-223	.022 uf, 20%, 200V. P.T.
C412, 419, 51	25462-104	1 uf, 20%, 400V.
C413, 415	20457-473	.047 uf, 10%, 600V. P.T.
C311	25461-473	.047 uf, 20%, 600V. P.T.
C402, 219	25455-473	.047 uf, 20%, 200V. P.T.
C312,	25461-104	.1 uf, 20%, 600V. P.T.
C50	25455-104	.1 uf, 20%, 200V, P.T.
C107, 313	25462-224	.22 uf, 20%, 400V.
C306	25455-474	.47 uf, 20%, 200V. P.T.
C314	25461-474	.47 uf, 20%, 600V. P.T.
C6	41534	Elect. 2 uf, 150V.
C7	25453	Elect. 4 uf, 150V.
C5	40002	Elect. 5 uf, 250V.
C4	41429	Elect. 10 uf, 350V.
C1	22422-20	Elect. 30-400V, 60-20 350V, 100-50V.
C3	22422-22	Elect. 30 uf, 400V.
C2	22422-21	Elect. 60-40-350V, 50-400V, 20-25V.
CP-1	24166	Couplate
C411	24528	Trimmer 40-370 uuf
		RESISTORS
R420	20209-39	3.9 ohm, 10%, 1/2W, W-W
R419	20308-100	10 ohm, 10%, 1/2 W, W-W
R50	22381-220	22 ohm, 10%, 1/2W
R415	20061-470	47 ohm20%, 1/2W
R208, 204, 212	22382-470	47 ohm, 5%, 1/2W
R101	22381-680	68 ohm, 10%, 1/2W
R113	20070-181	180 ohm, 10%, 1W
R215	22381-181	180 ohm, 10%, 1/2W
R332	20103-471	470 ohm, 20%, 1W
R416	23970-16	220 ohm, 10%, 5W
R428	23970-27	400 ohm, 10%, 5W
R105	22382-681	680 ohm, 5%, 1/2W
R322	22382-821	820 ohm, 5%, 1/2W
R205, 206, 207, 210, 213, 216	22381-102	1000 ohm, 10%, 1/2W
R434	20070-102	1000 ohm, 10%, 1W
R51	20061-102	1000 ohm, 20%, 1/2W
R320	22382-112	1100 ohm, 5%, 1/2W

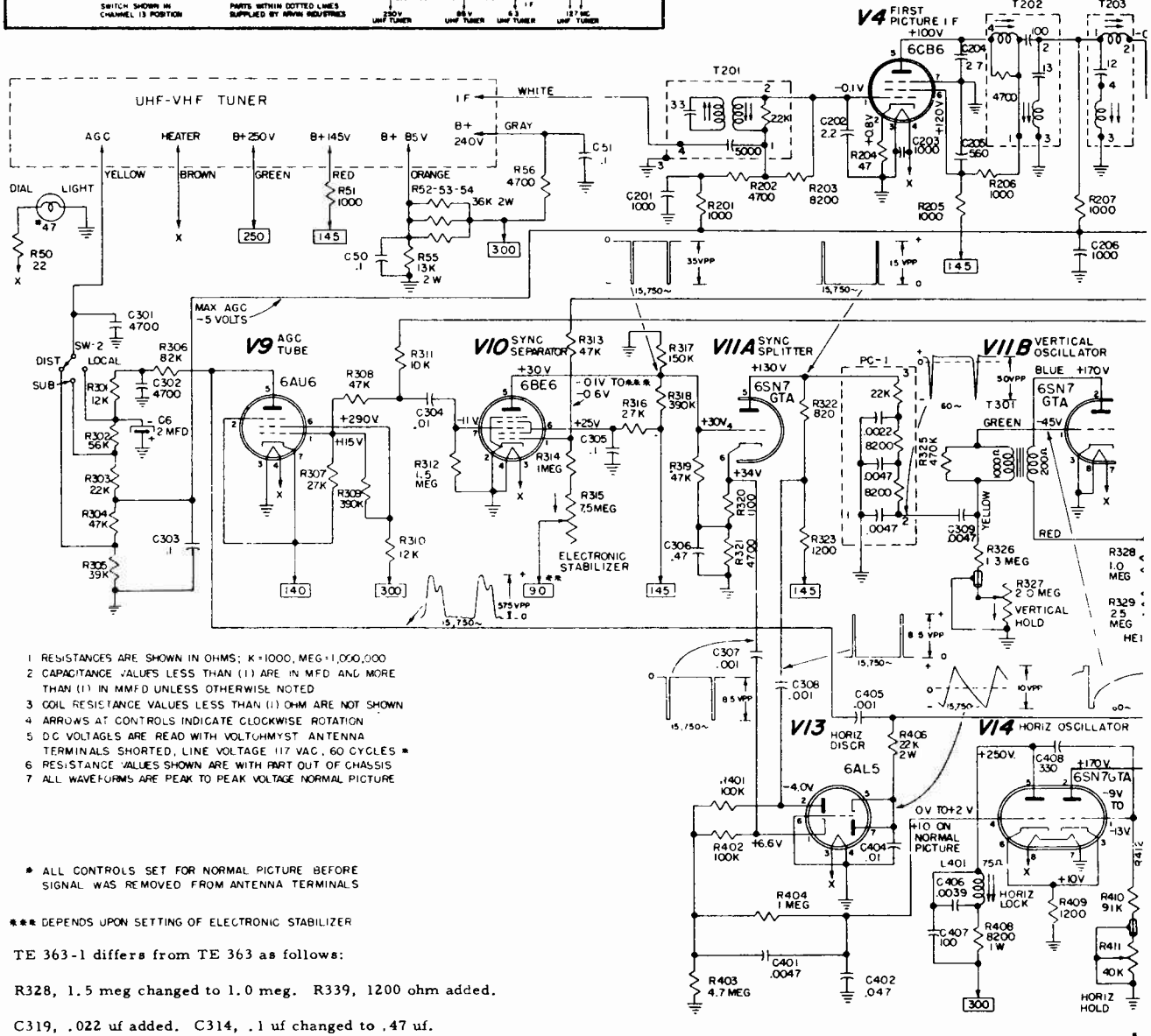
Schematic Location	Part No.	Description
		RESISTORS
R426	41050	1100 ohm, 5%, 22W
R409	22381-122	1200 ohm, 10%, 1/2W
R217, 323, 339	22382-122	1200ohm, 5%, 1/2W
R429	25467-152	1500 ohm, 5%, 2W
R427	23970-18	2000 ohm, 10%, 5W
R221	22381-222	2200 ohm, 10%, 1/2W
R218	22382-272	2700 ohm, 5%, 1/2W
R430	20070-332	3300 ohm, 10%, 1W
R202, 321	22381-472	4700 ohm, 10%, 1/2W
R219	41075-602	6000 ohm, 5%, 4W
R56	20070-472	4700 ohm, 10%, 1W
R104	20070-682	6800 ohm, 10%, 1W
R211	22382-682	6800 ohm, 5%, 1/2W
R203	22382-822	8200 ohm, 5%, 1/2W
R413	22381-822	8200 ohm, 10%, 1/2W
R408	20070-822	8200 ohm, 10%, 1W
R330	22382-822	8200 ohm, 5%, 1/2W
R431, 432	25467-103	10K, 5%, 2W
R311	22381-103	10K, 10%, 1/2W
R310	22381-123	12K, 10%, 1/2W
R301	22382-123	12K, 5%, 1/2W
R55	25467-133	13K, 5%, 2W
R224	22381-153	15K, 10%, 1/2W
R214	22381-183	18K, 10%, 1/2W
R417, 418	20302-183	18K, 10%, 2W
R303	22382-223	22K, 5%, 1/2W
R406	20302-223	22K, 10%, 2W
R307, 316	22382-273	27K, 5%, 1/2W
R433	22383-303	30K, 5%, 1W
R52, 53, 54	25467-363	36K, 5%, 2W
R106	22381-393	39K, 10%, 1/2W
R305	22382-393	39K, 5%, 1/2W
R308, 313, 319	22381-473	47K, 10%, 1/2W
R304	22382-473	47K, 5%, 1/2W
R109	20061-473	47K, 20%, 1/2W
R302	22382-563	56K, 5%, 1/2W
R306	22382-823	82K, 5%, 1/2W
R110	22381-823	82K, 10%, 1/2W
R410	22382-913	91K, 5%, 1/2W
R225	22381-104	100K, 10%, 1/2W
R401, 402	22382-104	100K, 5%, 1/2W
R412	22381-124	120K, 10%, 1/2W
R317, 222	22381-154	150K, 10%, 1/2W
R423	20061-224	220K, 20%, 1/2W
R108	22381-334	330K, 10%, 1/2W
R309	22382-394	390K, 5%, 1/2W
R318	22381-394	390K, 10%, 1/2W
R334, 325, 414	22381-474	470K, 10%, 1/2W
R404, 314, 328	22382-135	1 meg 10%, 1/2W
R326	22382-135	1.3 meg, 5%, 1/2W
R312	22381-155	1.5 meg, 10%, 1/2W
R331	22381-225	2.2 meg, 10%, 1/2W
R403	22381-475	4.7 meg. 10%, 1/2W
R107	20061-106	10 meg, 20%, 1/2W
		COILS, CHOKES & TRANSFORMERS
L403	41020	Coil, Width Control
L101	40937	Coil, Quadrature
L202	25468-18	Coil, Peaking 93 UH on 6800 ohm
L206	25468-16	Coil, Peaking 500 UH on 10K
L203	25468-15	Coil, Peaking 500 UH on Dummy
L204	25468-19	Coil, Peaking 185 UH on 8200 ohm
L207	25468-20	Coil, Peaking 215 UH on 8.2K
L402	25468-10	Coil, Peaking 93 UH
L401	23449	Coil, Horizontal Osc.
L205	25609	Coil, Video Trap
L404	40533	Coil, Horizontal Linearity
L406	40925-1	Choke, Filter
L405	23095	Choke, Filament
	24807	Coil, Deflection Yoke

Schematic Location	Part No.	Description
	22381-561	R335, 336, Resistor 560 ohm 10%
	22381-102	R337, Resistor 1000 ohm, 10%,
	24123-560	C315, Capacitor Disc. 56 uuf, 10%
T202	41171	Transformer, 1st Pix I.F. Assy (M1)
T203	41172	Transformer, 1st Pix I.F. Assy (M2)
T204, 205	41173	Transformer, 2nd & 3rd I.F. Assy
T206	41174	Transformer, 4th Pix I.F. Assy.
T301	22446-1	Transformer, Vert. Osc. Assy
T402	40926	Transformer, Power
T401	41024	Transformer, Horiz. Output Assy.
T102	24776-5	Transformer, Audio Output
L201	41176	Transformer, Sound Take Off
T101	41177	Transformer, 1st Sound I.F.
T302	41023-1	Choke, Vertical Output Assy.
T201	41175	Transformer, Converter
		MISCELLANEOUS
	41129-1	Door, Control & Escutcheon Assy (9210, 18, 19CM UHF)
	41129-3	Door, Control & Escutcheon Assy (9210, 16, 18CB UHF)
	41129-2	Door, Control & Escutcheon Assy (9212CFP UHF)
	41129-4	Door, Control & Escutcheon Assy (9212MEA UHF)
	40935-3	Knob, Channel Indicator (9210, 16, 18, 19CM CB UHF)
	40935-2	Knob, Channel Indicator (9212CFP UHF)
	40935-4	Knob, Channel Indicator (9212MEA UHF)
	40934-3	Knob, Volume (9210, 16, 18, 19-CM CB UHF)
	40934-2	Knob, Volume (9212CFP UHF)
	40934-4	Knob, Volume (9212MEA UHF)
	40933	Knob, Fine Tuning
	40932	Knob, Brightness
	24699-7	Knob, Behind Control Door
	24973	Rail, Top Retainer
	24944-4	Rail, Bottom Retainer
	24947	Glass, Safety
	40670-1	Mask, Plastic
	25519	Speaker
	23538	Plug, Speaker
	19579	Socket, Speaker
	25267-12	Tuner Assy. (Dual)
	40663	Fuse, High Voltage
	25471	Cap, Tube Top (6CD6G)
	40959	Plug, Interlock Assy.
	40512	Socket & Corona Ring Assy. (1B3GT)
	25095	UHF Indicator
	25265-1	Panel Light Socket Assy
	19351	Dial Light Bulb.
	24911-8	Socket, Kinescope Assy.
	25662-3	Trap, Ion
	41123-2	Connector, Anode Assy.
	25511-1	Cover, Hi Volt Top & Rear Assy.
	41464	41 Mc,
R111, 223 SW-3	22464-50	Control, Volume, Brightness
R220	22464-52	Control, Contrast
R333	22464-41	Control, Vertical Linearity
R327	22464-58	Control, Vertical Hold
R411	22464-53	Control, Horizontal Hold
R112, SW-1	22464-56	Control, Tone-Phono-TV Switch
R329	22464-43	Control, Height
R315	22464-57	Control, Elect. Stabilizer
R103	41038	Control, Buzz
	41072	Shaft, Control Contrast
	41073	Coupling, Contrast Control
SW-2	41039	Switch, Local Distance
	40991-2	Control, Magnetic Focus
	24458-3	Antenna Loop Assy.

Arvin television CHASSIS TE 363-1







1 RESISTANCES ARE SHOWN IN OHMS; K=1000, MEG=1,000,000
2 CAPACITANCE VALUES LESS THAN (1) ARE IN MFD AND MORE THAN (1) IN MMFD UNLESS OTHERWISE NOTED
3 COIL RESISTANCE VALUES LESS THAN (1) OHM ARE NOT SHOWN
4 ARROWS AT CONTROLS INDICATE CLOCKWISE ROTATION
5 DC VOLTAGES ARE READ WITH VOLTOHMYST ANTENNA TERMINALS SHORTED, LINE VOLTAGE 117 VAC, 60 CYCLES *
6 RESISTANCE VALUES SHOWN ARE WITH PART OUT OF CHASSIS
7 ALL WAVEFORMS ARE PEAK TO PEAK VOLTAGE NORMAL PICTURE

* ALL CONTROLS SET FOR NORMAL PICTURE BEFORE SIGNAL WAS REMOVED FROM ANTENNA TERMINALS

*** DEPENDS UPON SETTING OF ELECTRONIC STABILIZER

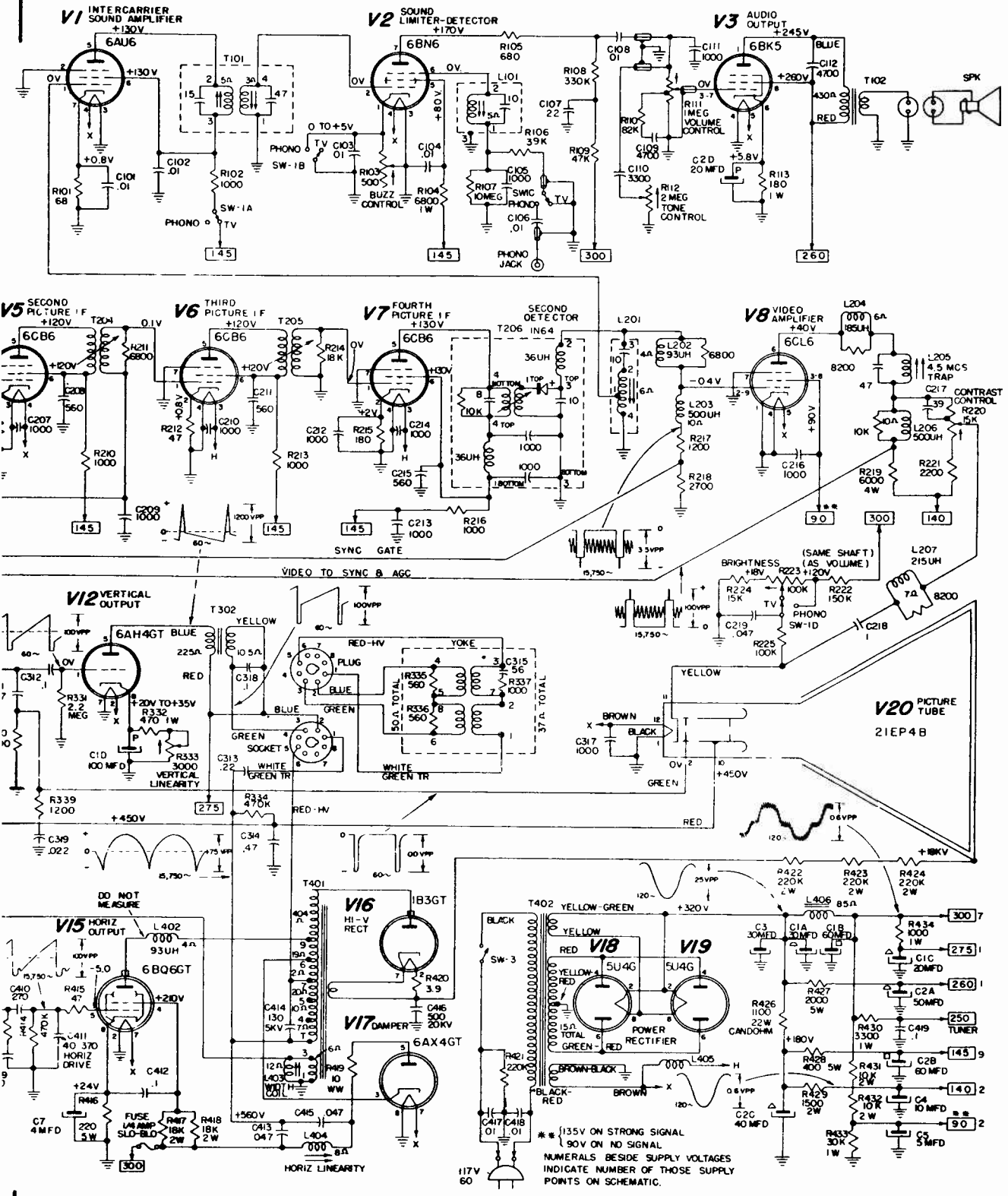
TE 363-1 differs from TE 363 as follows:

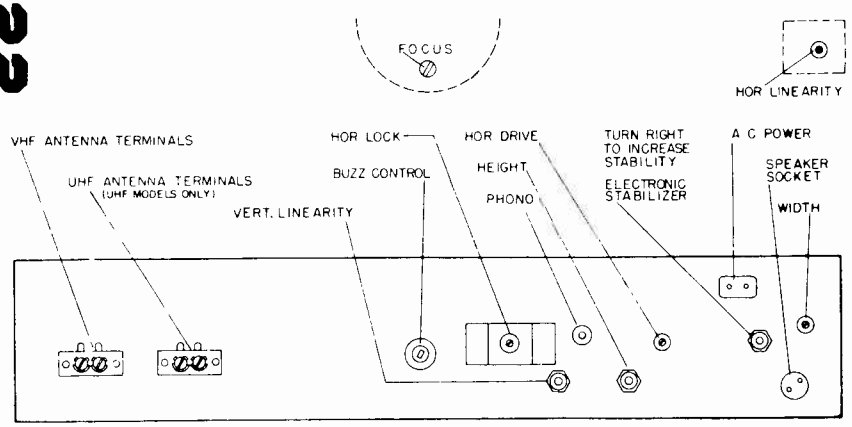
R328, 1.5 meg changed to 1.0 meg. R339, 1200 ohm added.

C319, .022 uf added. C314, .1 uf changed to .47 uf.

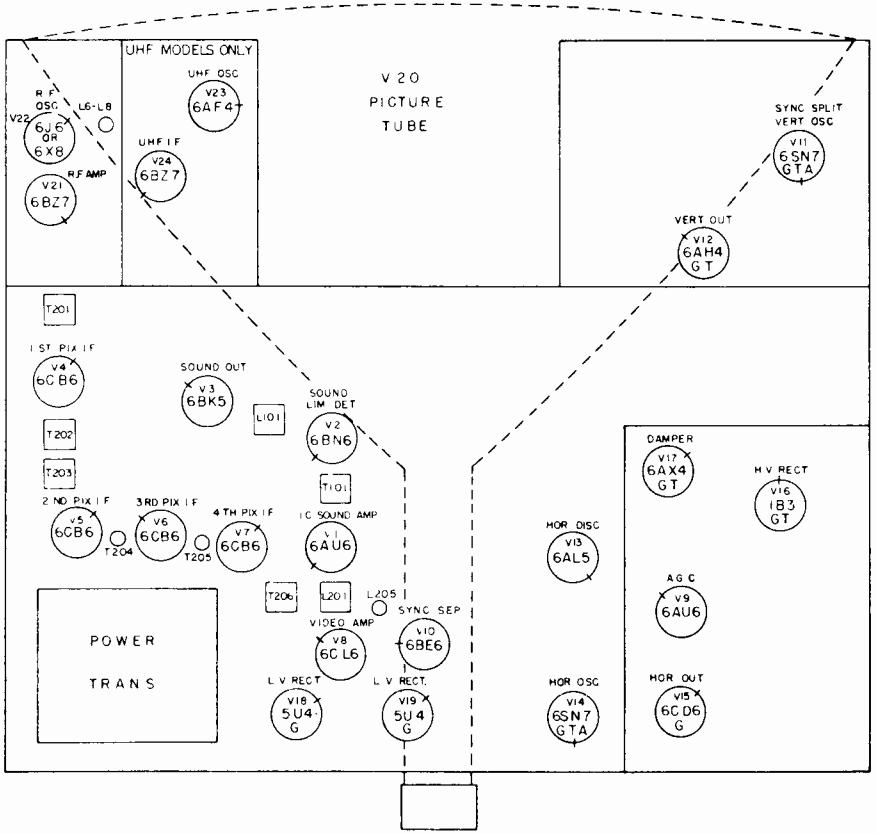
Service data on Arvin Chassis TE 358-1, TE 359, TE 363-1, TE 364, continued.

Alignment information on the next page.





REAR PANEL CONTROLS



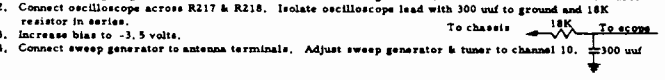
STAGGER-TUNED I.F. ALIGNMENT PROCEDURE

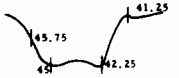
1. Set tuner to channel 9-10 or 11.
2. Pull AGC tube V9 out.
3. Connect -2.5 volts bias from junction R304 and R303 to ground with triple power switch in Suburban position.
4. Connect VTVM across R217 & R218. Isolate VTVM with 18K resistor. Use -5V scale.
5. Connect RF signal generator to ungrounded mixer tube shield i.e. lift mixer tube shield until it is just ungrounded.
6. Good R.F. grounding between TV receiver on test and test equipment is necessary. A metal surface bench top should be used to insure proper RF grounding.

STEP	FREQUENCY	ADJUSTMENT	INSTRUCTIONS
1.	39.75 mc	Top T201 for min.	
2.	41.25 mc	Bottom T202 for min.	Outer peak
3.	47.25 mc	Bottom T203 for min.	Outer peak
4.	43.2 mc UHF-VHF 42.8 mc VHF	Tuner coil for max.	Note: Turn bottom T201 completely out before making this adjustment.
5.	45.2 mc UHF-VHF 45.0 mc VHF	Bottom T201 for max.	
6.	44 mc	Top T202 for max.	Outer peak
7.	42.2 mc	Top T203 for max.	Outer peak-recheck steps 6 and 7
8.	40.3 mc	Bottom T204 for max.	
9.	45.2 mc	Bottom T205 for max.	
10.	43 mc	Bottom T206 for max.	Recheck steps 8-9 and 10

OVERALL SWEEP CHECK

1. Connect RF signal generator to chassis near V4 for marker generator. Push shield down on mixer tube.
2. Connect oscilloscope across R217 & R218. Isolate oscilloscope lead with 300 uuf to ground and 18K resistor in series.
3. Increase bias to -3.5 volts.
4. Connect sweep generator to antenna terminals. Adjust sweep generator & tuner to channel 10.



CURVE	ADJUSTMENT	INSTRUCTIONS
	T205	T205 positions 45.75 marker
	T206	T206 adjusts tilt of curve
	Note: If desired curve cannot be obtained, slight adjustment of tuner coil and bottom T201 may be necessary.	

SOUND AND 4.5 MC TRAP ALIGNMENT

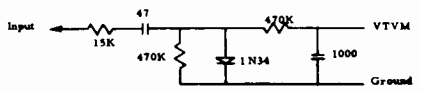
1. Tune in available TV station and reduce signal into set until hiss is heard with sound. This can be done by inserting an attenuator in the antenna lead-in or by removing antenna lead-in from the set and stray feeding in signal by placing lead-in in close proximity of the set.

2. Set buss control in the middle of its range. Adjust tabs off coil L201, top and bottom T101, Quadrature coil (L101) and buss control for cleanest sound and minimum buss. If any adjustment causes hiss to disappear reduce signal into set until hiss reappears and continue with adjustments.

   Note: If difficulty is encountered either in reducing signal sufficiently or adjustments being very broad. The following procedure may be used.

STEP	EQUIPMENT	CONNECTION	FREQUENCY	ADJUSTMENT	INSTRUCTIONS
1.	Det. Jig *	Input of jig to pin 2 of V2			Keep lead between 15K resistor and pin 2 as short as possible
2.	VTVM	out put of jig	Tune in available channel	L201-T101 (top and bottom) for max.	Adjust L201 on inner peak
3.		remove jig	Same	Quadrature coil (L101) for max. sound	Set buss control in middle of its range before adjusting L101
4.			Same	Buss control for minimum buss	Correct adjustment of buss control is approx. middle of its range
5.	Det. Jig *	Junction L205 and L206			Connect VTVM to output of jig
6.	RF signal generator	Pin 9 (V8)	4.5 mc	Tune 4.5 mc trap (L205) for minimum	

*Detector Jig



CROSLEY

CHASSIS 405
Models:

F-21TOMH	F-21COMH	F-21CDMH
F-21TOBH	F-21COBH	F-21CDBH

CHASSIS 405-1
Models:

F-21TOMU	F-21COMU	F-21CDMU
F-21TOBU	F-21COBU	F-21CDBU

CHASSIS 410
Models:

F-17TOMH	F-17COMH
F-17TOBH	F-17COBH

CHASSIS 410-1
Models:

F-17TOMU	F-17COMU
F-17TOBU	F-17COBU

A UHF Converter with a continuous tuner that covers the seventy (70) UHF television channels (14 to 83) is included in the 405-1 and 410-1 chassis.

The material on the next eight pages is exact for models listed above. The sets listed below use chassis which are very similar to the ones covered and, therefore, this material can be used as an aid in servicing these additional sets. The main differences are in AGC circuit, tubes used in sync clipper and amplifier, and type of VHF tuner.

CHASSIS 402
Models:
F-17TOLH
F-17TOLBH

CHASSIS 402-1
Models:
F-17TOLU
F-17TOLBU

CHASSIS 403
Models:
F-21TOLH
F-21TOLBH

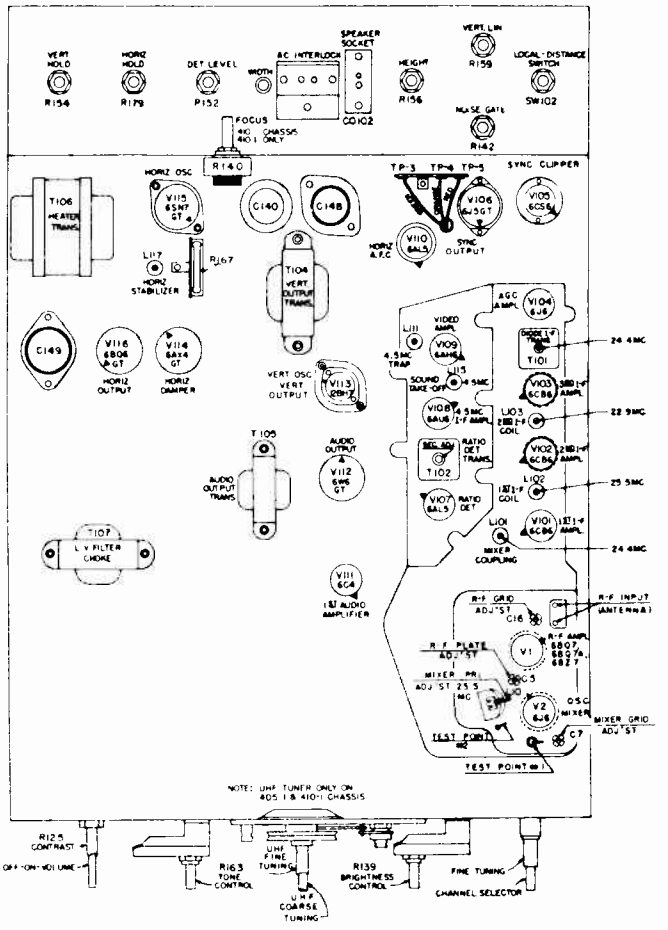
CHASSIS 404
Models:

F-21COLH	F-21CDLH
F-21COLBH	F-21CDLBH

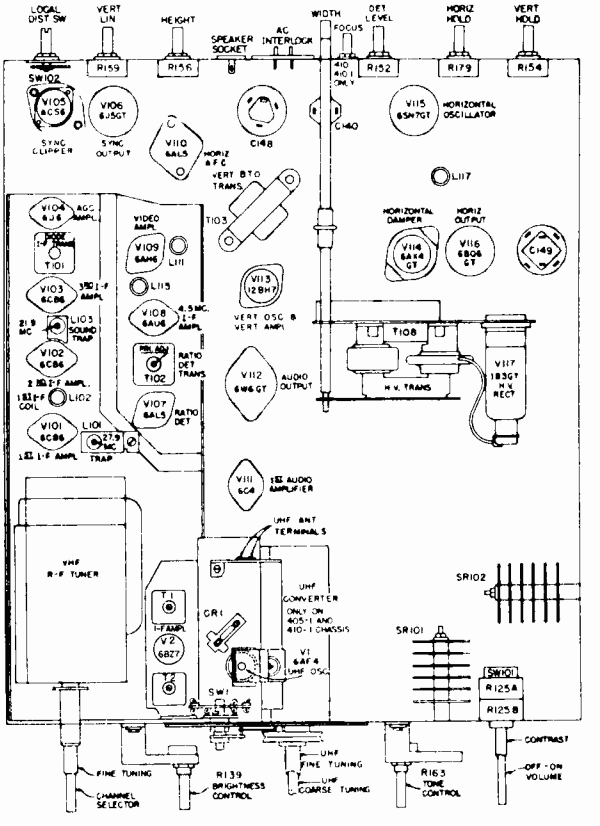
CHASSIS 403-1
Models:
F-21TOLU
F-21TOLBU

CHASSIS 404-1
Models:

F-21COLU	F-21CDLU
F-21COLBU	F-21CDLBU



TOP VIEW 405-1, 410-1 CHASSIS
(Tube and Alignment Locations)



BOTTOM VIEW 405-1, 410-1 CHASSIS
(Tube Socket and Alignment Locations)

CROSLEY (Continued)

I. F. ALIGNMENT

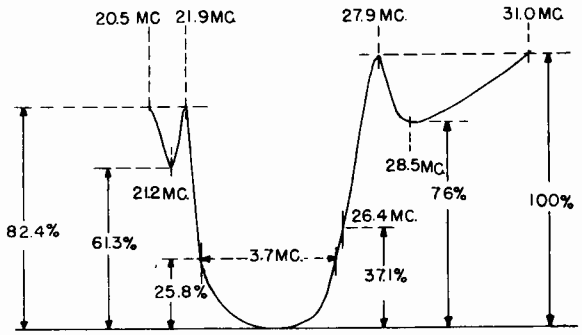
All lead connections from the signal generator and wobbulator must be shielded. Keep the exposed ends and ground leads as short as possible (about one inch). Always locate the ground lead connections as close as possible to their respective "hot" leads in the television receiver chassis. The wobbulator, signal generator output, and contrast control must be kept low enough to prevent overloading the television receiver circuits.

1. TO CHECK I. F. ALIGNMENT ON OSCILLOSCOPE.

a. Lift the shield of the Oscillator-Mixer tube V2 sufficiently to clear the socket ground clips. Connect sweep signal generator "hot" lead to the ungrounded tube shield and generator ground lead to the tuner chassis.

b. Connect high side of oscilloscope to high side of contrast control, and the low side to chassis.

c. Apply -3.0 volts D. C. bias to I. F. Bias line(see sketch "Variable Bias Control"). Contrast control should be set in the maximum counter-clockwise position.



NOMINAL OVERALL I. F. RESPONSE CURVE
NOTE: Response as Seen by Means of Sweep Generator.

d. With the generator sweep set at zero, connect an electronic voltmeter between top of detector load and chassis. Adjust the output of the generator to obtain a reading of 2 volts D. C. on the meter.

e. Set generator to sweep from 20 mc. to 32 mc.

f. Connect marker generator to sweep generator output leads and adjust to provide markers that appear in the curve. See nominal response curve.

g. Observe curve and position of markers (see nominal response curve). Slight deviation in shape from the nominal response curve is permissible, but if any great deviation is noted, it will be necessary to realign the I. F. Amplifier.

2. ALIGNMENT, I. F. & TUNER ASSEMBLY (with electronic voltmeter):

a. Connect -3.5 volts D. C. bias supply to I. F. Bias line.

b. Connect signal generator "hot" lead through a 1000 mmf. capacitor to TP-1 (wire protruding from tuner closest to the oscillator mixer tube V2) and the ground lead to the R. F. tuner case.

c. Connect high side of Electronic Voltmeter to top of detector load resistor, R116, and low side to chassis; zero the meter.

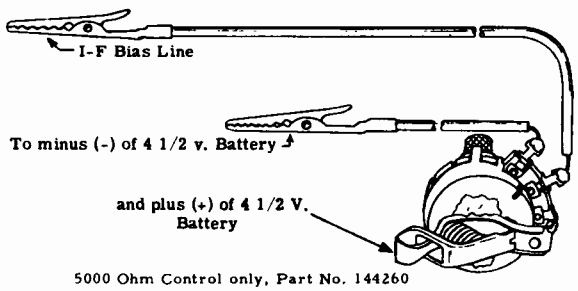
d. Set signal generator to 24.4 mc. and adjust top of T101 for maximum D. C. meter indication on voltmeter. Adjust the signal generator amplitude to make this peak indication 2 volts D. C., approximately.

e. Set signal generator to 22.9 mc. and adjust top of L103 for maximum D. C. meter indication, limiting meter deflection to 2 volts D. C. by adjusting input of attenuator.

f. Set the signal generator to 21.9 mc. and adjust bottom of L103 for minimum D. C. meter deflection. Input should be high enough to permit a definite null to be observed on meter.

g. Repeat steps "e" and "f".

h. Set signal generator to 25.5 mc. and adjust top of L102 for maximum meter deflection, limiting meter deflection to 2 volts D. C. by adjusting input attenuator.



VARIABLE BIAS CONTROL ASSEMBLY

i. Connect a 100 ohm resistor in series with a 1000 mmf capacitor across L101. With signal generator at 25.5 mc., adjust converter output, L10 of R.F. Tuner, for maximum meter deflection, but limit output of generator so this reading does not exceed 2 volts D.C. Remove the 100 ohm resistor and the 1000 mmf., capacitor.

j. Reset signal generator to 27.9 mc. and adjust the bottom of L101 for minimum D. C. meter deflection. Signal generator amplitude must be sufficiently high to produce a definite null.

k. Set signal generator to 24.4 mc. Connect the 100 ohm resistor and the 1000 mmf. series capacitor from TP-2 (wire protruding from the tuner through the insulated eyelet closest to L10) on the R. F. Tuner to the tuner case and adjust L101 for maximum D. C. meter indication, adjusting amplitude of signal generator to make this maximum indication approximately 2 volts D.C. Remove the 100 ohm resistor and the 1000 mmf capacitor.

l. Repeat steps "j" and "k".

m. Check sensitivity. The input, to obtain 2 volts D. C. output with zero bias, should not exceed 650 microvolts at 24.4 mc. with generator properly terminated and generator fed into grid of first I. F. Amplifier.

n. Remove the signal generator and electronic voltmeter.

o. Note: When aligning bottom of L103 and bottom of L101 the first null obtained when running the core into the trap winding from the Tinnerman Clip end of the trap winding is the proper alignment null.

CROSLEY Chassis 405, 410, etc. Alignment Continued

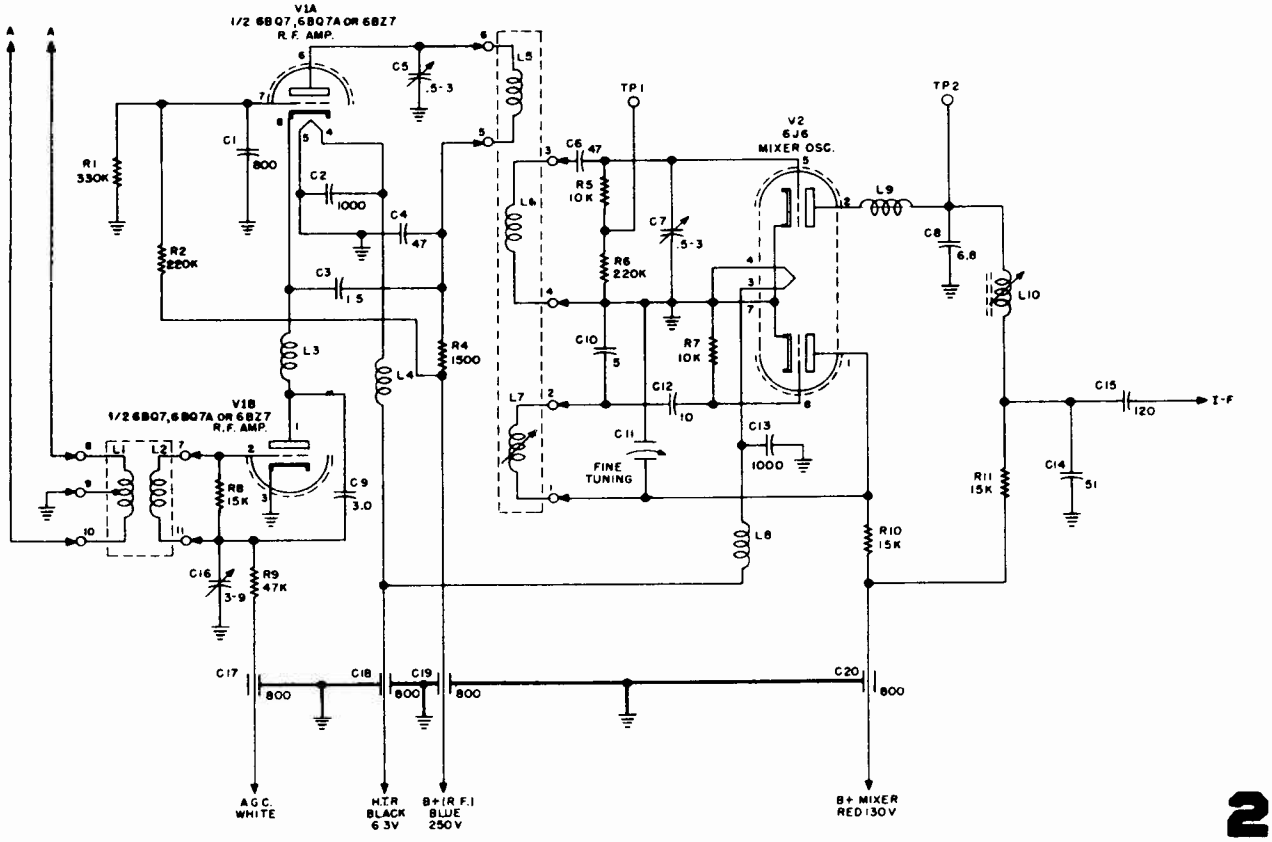
SOUND ALIGNMENT

1. Connect crystal controlled 4.5 mc. 400 cycle amplitude modulated signal, modulated 30% or greater, between grid of video amplifier and chassis.
2. Connect high side of scope through detector probe to the junction of R132 & C121 (picture tube cathode). Connect low side of scope to chassis. Adjust 4.5 mc. trap, L111, for minimum 400 cycle deflection on scope.
3. Connect electronic voltmeter to lug 2 of ratio detector, V107, and adjust 4.5 mc. sound take-off (L115) and bottom of ratio transformer (T102) for peak reading on voltmeter. Adjust input to make this peak reading 4 volts.
4. Adjust input to obtain 12 volts output. Transfer electronic voltmeter to junction of R135 and R136 (refer to Schematic Wiring Diagram). Adjust top of T102 for zero balance on electronic voltmeter.
5. Recheck steps 2, 3 and 4 above.
6. Remove input signal, scope and electronic voltmeter.

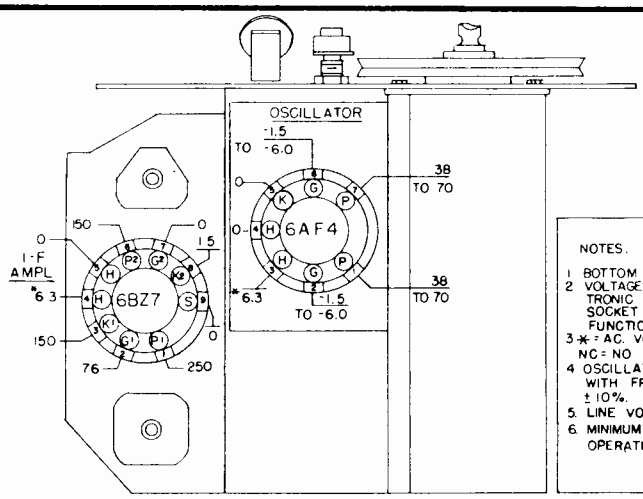
HORIZONTAL HOLD ADJUSTMENT

1. Tune in a local television signal and adjust contrast control for normal picture.
2. Connect electronic voltmeter between TP-3 (green lead) and chassis.
3. Short TP-5 (red lead) to chassis and adjust electronic voltmeter to zero.
4. Remove short from TP-5. Do not change zero on electronic voltmeter.
5. Connect a 0.1 mfd. 600 volt capacitor between TP-4 (orange lead) and chassis.
6. Adjust Horizontal Hold control for zero reading on the meter.
7. Remove the 0.1 mfd. capacitor from TP-4 and chassis. Do not disturb setting of horizontal hold control.
8. Adjust Horizontal Stabilizer coil (L117) for zero reading on the meter.
9. Remove electronic voltmeter from TP-3.
10. Check horizontal pull-in range. The pull-in range should be approximately 50° of the control's rotation.

VHF TUNER SCHEMATIC

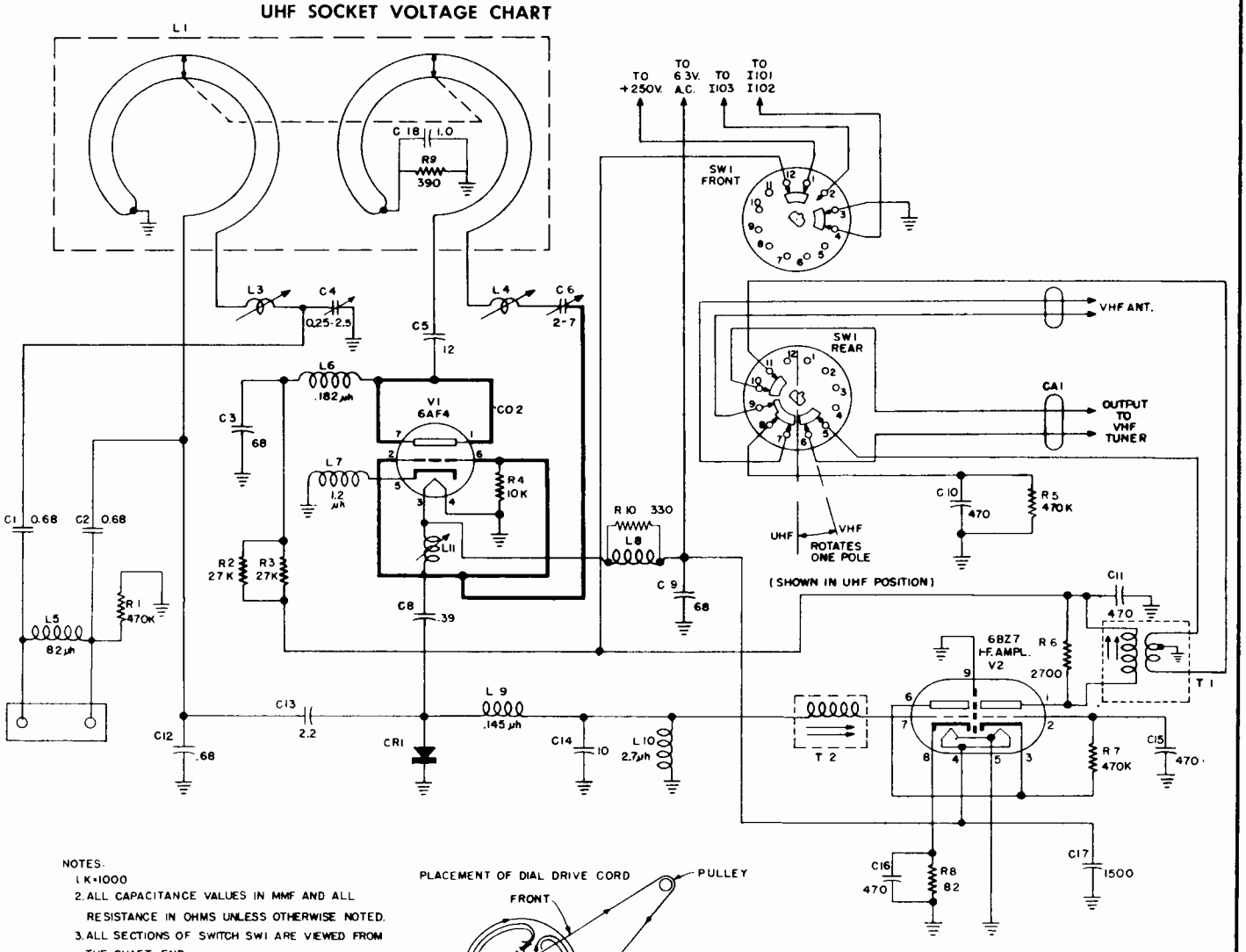


CROSLEY Chassis 405, 410, etc.
(Continued)

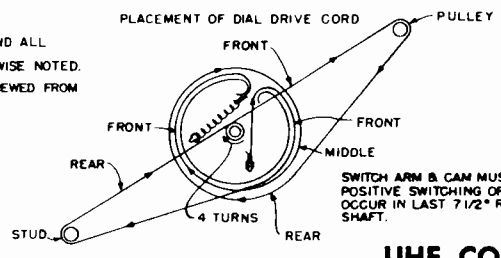


NOTES.
1. BOTTOM VIEW OF TUBE SOCKETS.
2. VOLTAGES MEASURED WITH AN ELECTRONIC VOLTMETER CONNECTED FROM SOCKET LUG TO CHASSIS WITH THE FUNCTION SWITCH IN "UHF" POSITION.
3. * = A.C. VOLTAGES.
   NC = NO CONNECTION.
4. OSCILLATOR SOCKET VOLTAGE VARIES WITH FREQUENCY, OTHER VOLTAGES ± 10%.
5. LINE VOLTAGES, 117V, 60 ~ AC.
6. MINIMUM CRYSTAL CURRENT FOR PROPER OPERATION OF THE OSCILLATOR, 300 μa.

UHF SOCKET VOLTAGE CHART



NOTES.
1. K = 1000
2. ALL CAPACITANCE VALUES IN MMF AND ALL RESISTANCE IN OHMS UNLESS OTHERWISE NOTED.
3. ALL SECTIONS OF SWITCH SW1 ARE VIEWED FROM THE SHAFT END.



SWITCH ARM & CAM MUST BE SET SO THAT POSITIVE SWITCHING OF ALL POLES WILL OCCUR IN LAST 7 1/2° ROTATION OF TUNER SHAFT.

UHF CONVERTER SCHEMATIC

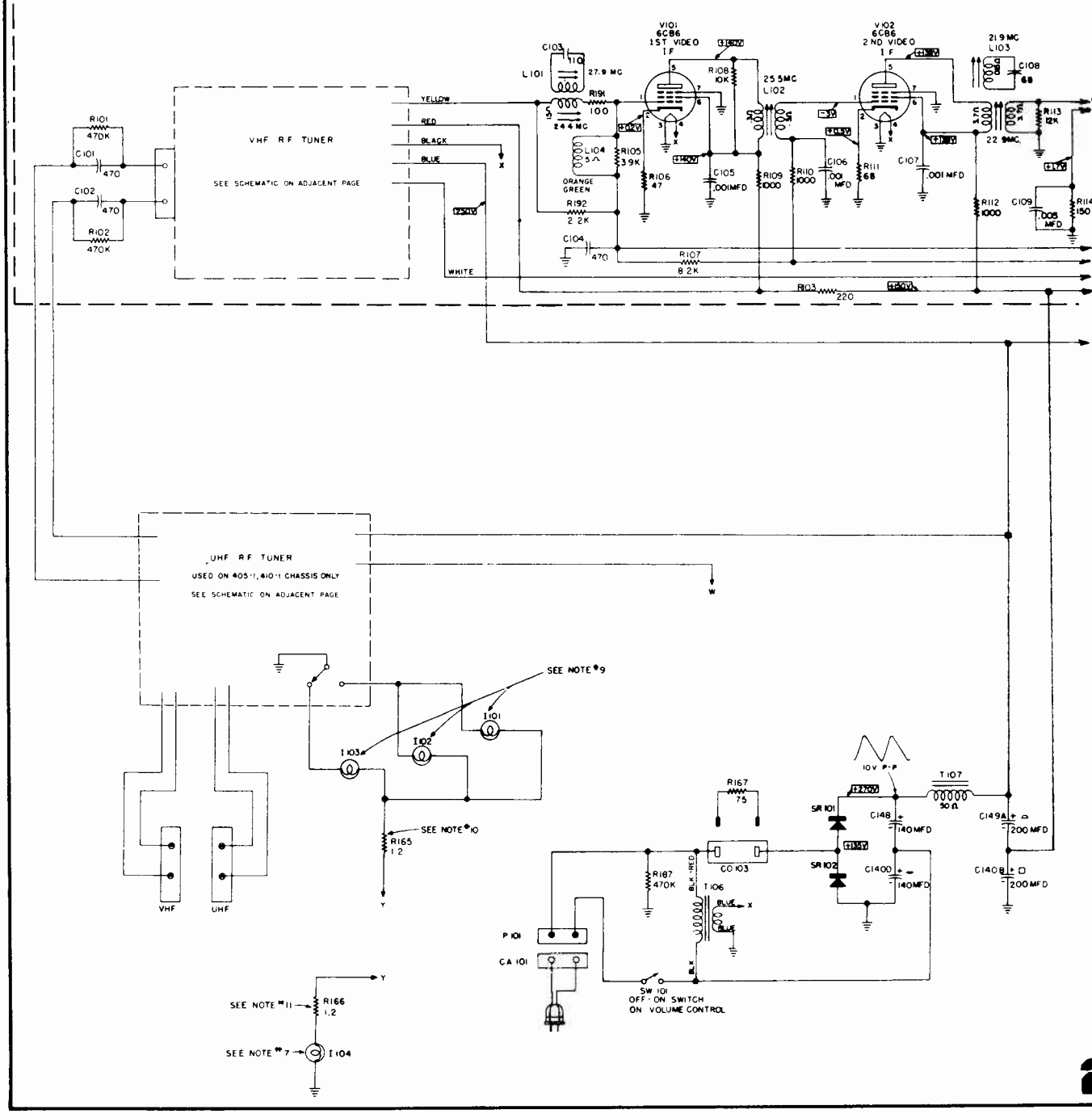
CROSLEY Chassis 405, 410, etc.
(Material continued)

NOISE GATE CONTROL:

This control makes it possible to obtain improved picture stability in the presence of electrical interference (noise). When the control is turned completely counter-clockwise, its effect is minimized. Adjust the control by turning it clockwise until the picture is stable. If the control is adjusted on a signal of one strength, it may require readjusting when a signal of a different strength is received.

VHF OSCILLATOR ADJUSTMENT:

A turret type VHF tuner is used on this receiver, and there is an oscillator adjustment for each channel. When the receiver is installed, the oscillator should be adjusted for each channel on which a station is operating in the area. Set the Channel Switch to the channel that is to be adjusted. Turn the Fine Tuning control to the center of its range. The oscillator trimmer screw is directly to the right of the tuner shaft, and is accessible through a hole in the front of the chassis after the two VHF tuning knobs have been removed. Use a non-metalic screw driver and adjust the oscillator trimmer screw until the proper tuning point is in the center of the fine tuning range.



Part of main circuit diagram. Points numbered 1 to 7, connect to correspondingly numbered points of diagram shown on the next two pages.

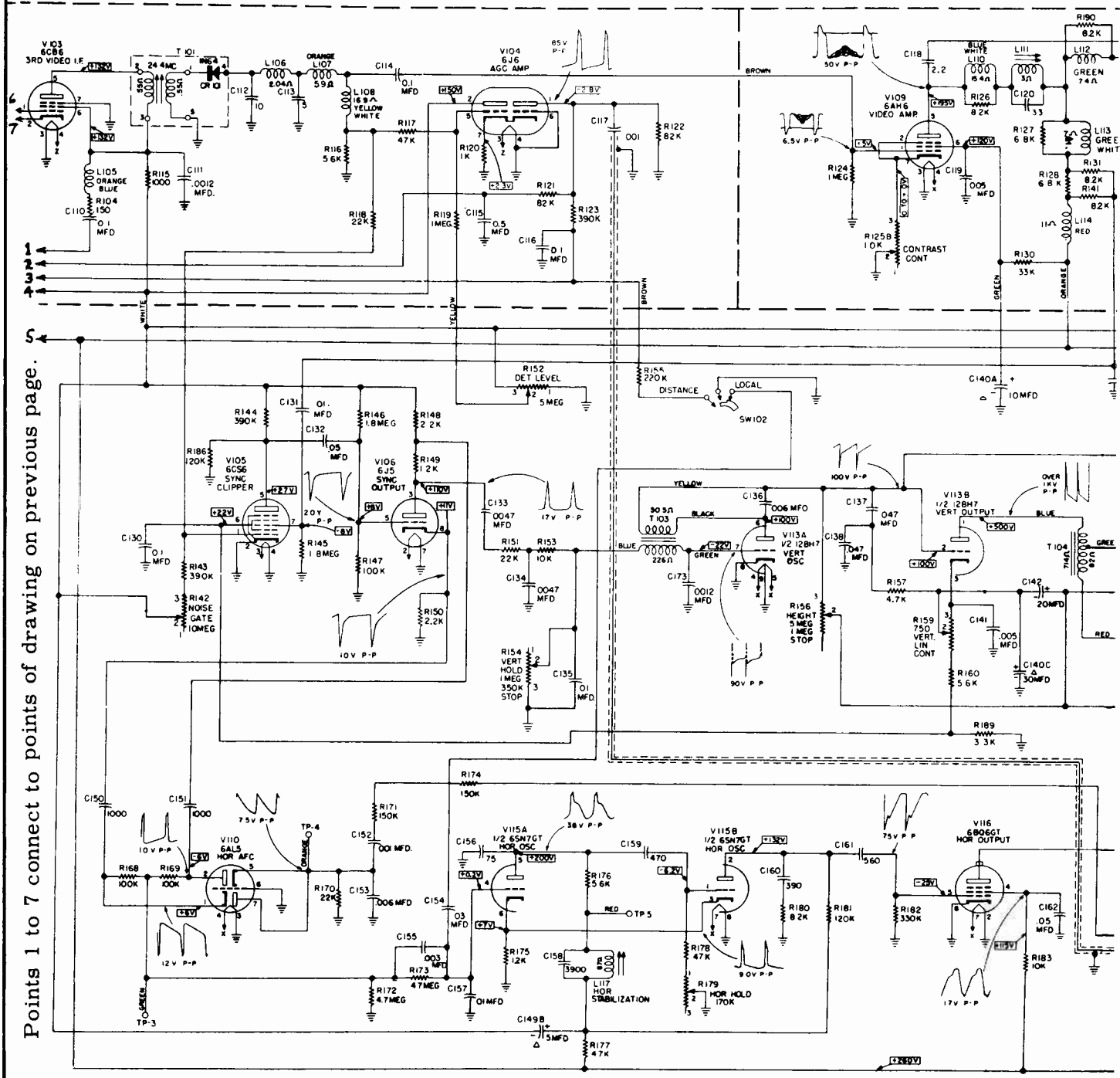
CROSLEY Chassis 405, 405-1, 410, 410-1

Part of this circuit diagram is shown on the preceding page. This division is made for printing convenience only and is not present physically.

DEFLECTION YOKE AND BRACKET:

The DEFLECTION YOKE BRACKET should be positioned as far forward as possible so that the rubber cushion on the front of the bracket rests on the flare of the tube.

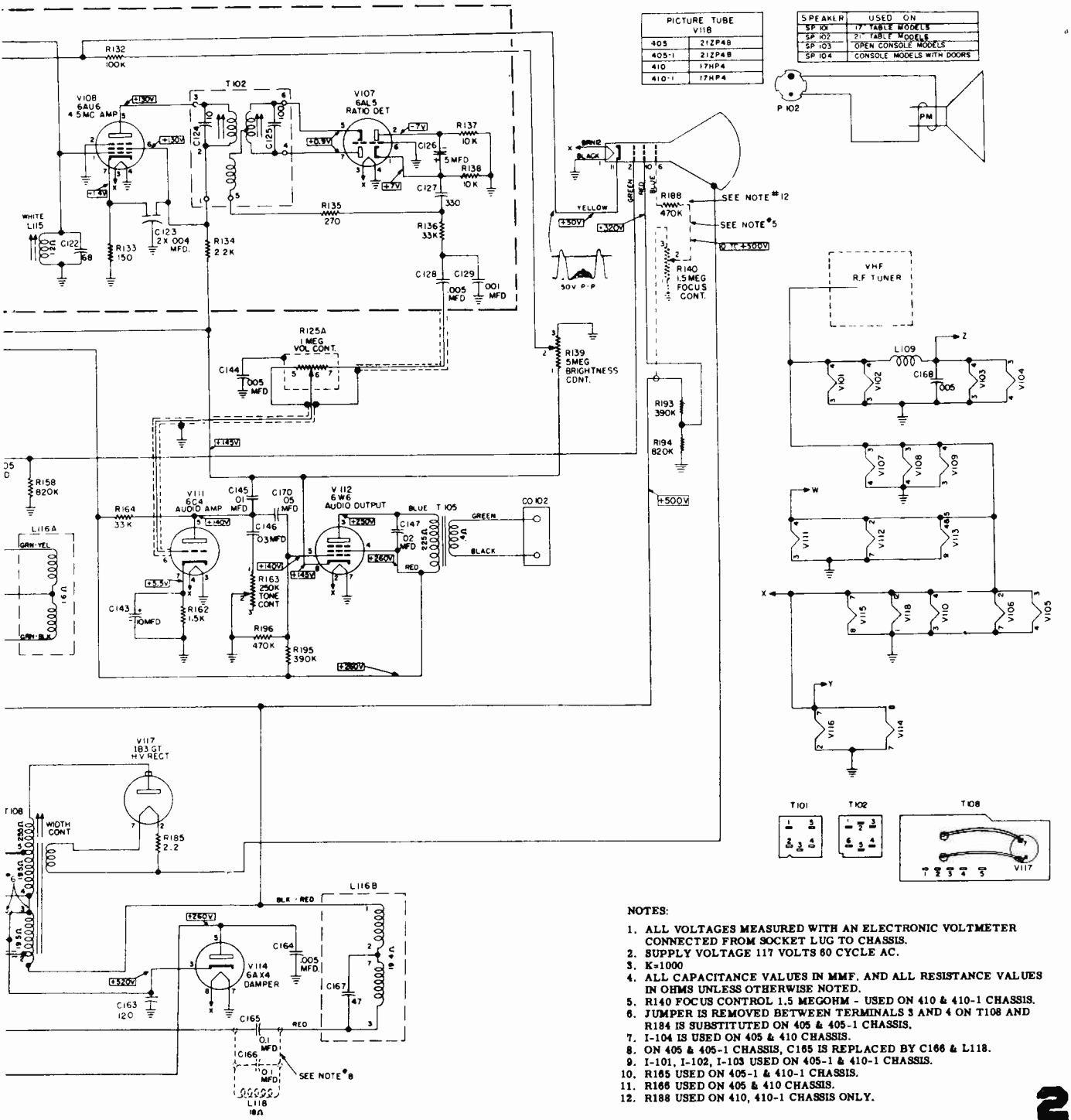
The DEFLECTION YOKE should be positioned as far forward as possible on the picture tube neck and rotated to the left or right as required to make the picture parallel with respect to the top and bottom of window frame.



Note: for minor circuit changes see page 30.

SCHEMATIC WIRING DIAGRAM - CHASSIS 405, 405-1, 410 & 410-1

CAUTION: One side of the chassis is connected to the power line. Therefore, test equipment should not be connected to the receiver unless an isolation transformer is used between the power line and the receiver. DO NOT GROUND THE RECEIVER CHASSIS UNLESS AN ISOLATION TRANSFORMER IS USED.



NOTES:

1. ALL VOLTAGES MEASURED WITH AN ELECTRONIC VOLTMETER CONNECTED FROM SOCKET LUG TO CHASSIS.
2. SUPPLY VOLTAGE 117 VOLTS 60 CYCLE AC.
3. K=1000
4. ALL CAPACITANCE VALUES IN MMF. AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE NOTED.
5. R140 FOCUS CONTROL 1.5 MEGOHM - USED ON 410 & 410-1 CHASSIS.
6. JUMPER IS REMOVED BETWEEN TERMINALS 3 AND 4 ON T108 AND R184 IS SUBSTITUTED ON 405 & 405-1 CHASSIS.
7. I-104 IS USED ON 405 & 410 CHASSIS.
8. ON 405 & 405-1 CHASSIS, C165 IS REPLACED BY C166 & L118.
9. I-101, I-102, I-103 USED ON 405-1 & 410-1 CHASSIS.
10. R165 USED ON 405-1 & 410-1 CHASSIS.
11. R166 USED ON 405 & 410 CHASSIS.
12. R188 USED ON 410, 410-1 CHASSIS ONLY.

CROSLEY, Continued.

CIRCUIT CHANGES

ON CHASSIS 405, 405-1, 410, & 410-1*

The circuit shown in Fig. 1 appears only on those chassis bearing code letter "A". The circuit change, as shown in the complete schematic, was made in later production sets (Code B, etc.) to improve the contrast ratio.

Fig. 2 shows two capacitors (.005 mfd) that appear in chassis coded with the letter "A". These capacitors were found unnecessary and are not used in with later code letters.

The circuits in Fig. 3 & 4 are found only in the chassis coded A and B. The changes to the circuits shown on the complete schematic were production changes only, not design improvements.

Chassis 405, 405-1, 410, & 410-1 (Code B or later) have a provision for greater heat dissipation in the screen circuit of the 6BQ6. This is accomplished in two ways: (1) Part No. 156911-1 resistor is used for R183, for under test, this resistor shows more than its rated 2 watt heat dissipation ability. (2) Two resistors are used in place of one and are wired in parallel; one is a 33,000 ohm, 10%, 1 w. resistor (Part No. 39374-131), and the other is a 15,000 ohm, 10%, 2 w. resistor (Part No. 39374-215).

NOTE: In early production sets, R125B (Contrast Control) had a resistance of 1500 ohms. To reduce the total resistance, a shunt was added by wiring a 3300 ohm, 10%, 1/2 w. resistor (Part Number 39374-31) from terminal 1 to terminal 3 of the control. In later sets, R125B has a resistance of 1000 ohms.

Code A

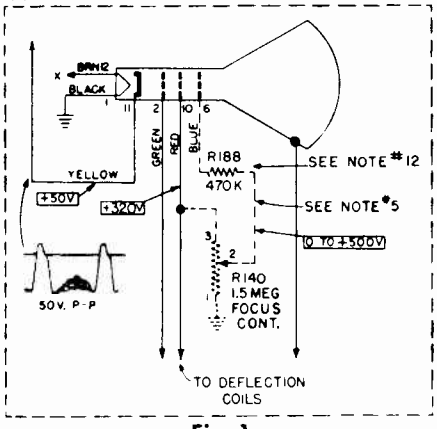


Fig. 1

Codes A & B

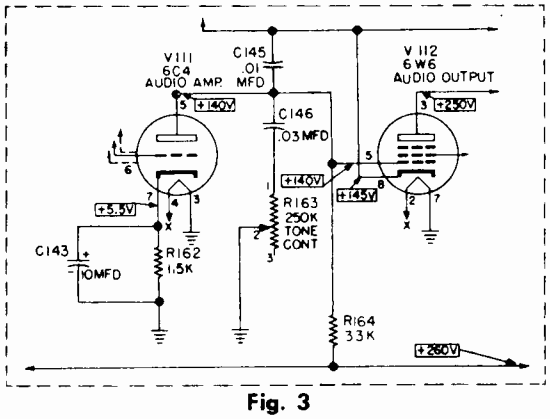


Fig. 3

Code A

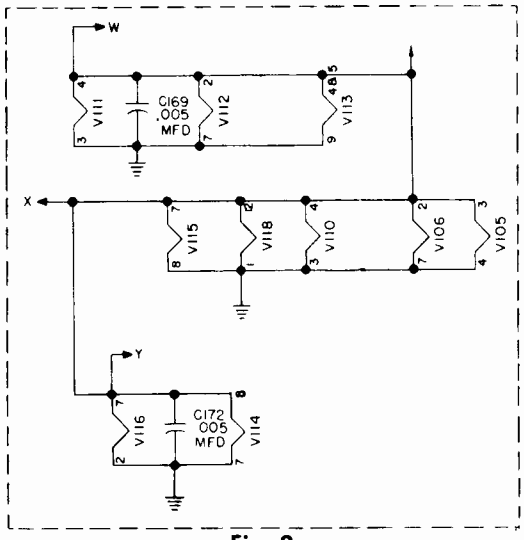


Fig. 2

Codes A & B

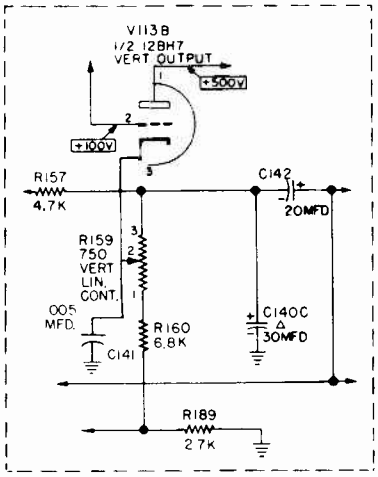


Fig. 4

* In early production, when a change was made to one of the above chassis, it was made to all of them; similarly, the same code letter was assigned to all chassis incorporating the same changes.

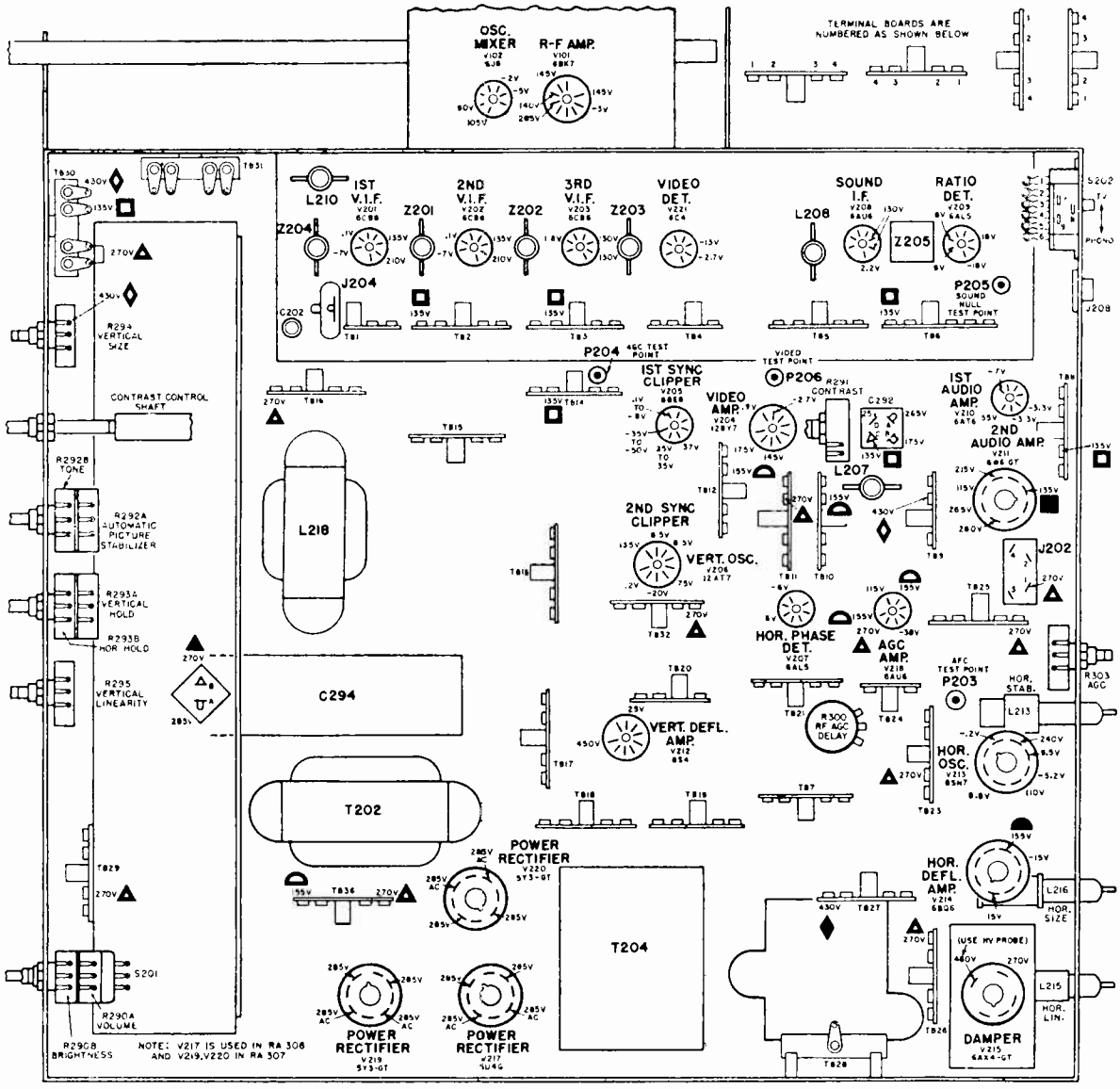
DUMONT

ALLEN B. DU MONT LABORATORIES, INC

RA-306, 307 CHASSIS

Service material on these chassis is printed below and through page 36. For convenience in printing, the circuit diagram is divided and printed on page 33 and across pages 34-35. This separation is not present in the physical sense in the actual chassis.

UNDERCHASSIS VOLTAGE POINTS

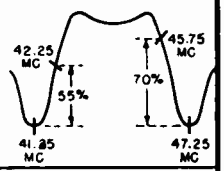


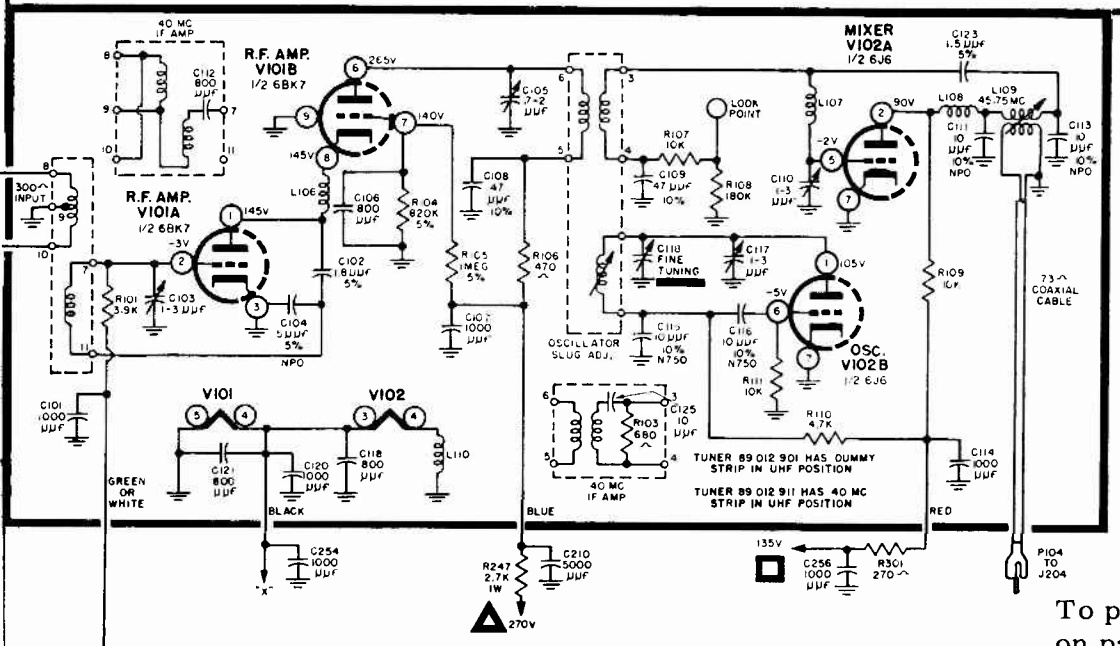
Du Mont Chassis RA-306/307, continued

(See page 36 for Alignment Test Points location drawing)

VIDEO IF ALIGNMENT RA-306/307

Place STATION SELECTOR between channels to disable oscillator. Remove the Horizontal Deflection Amplifier, V214, and Damper, V215. Connect a short length of wire to pin 5 of V102 (see figure 1). Use the lowest VTVM range for all steps.

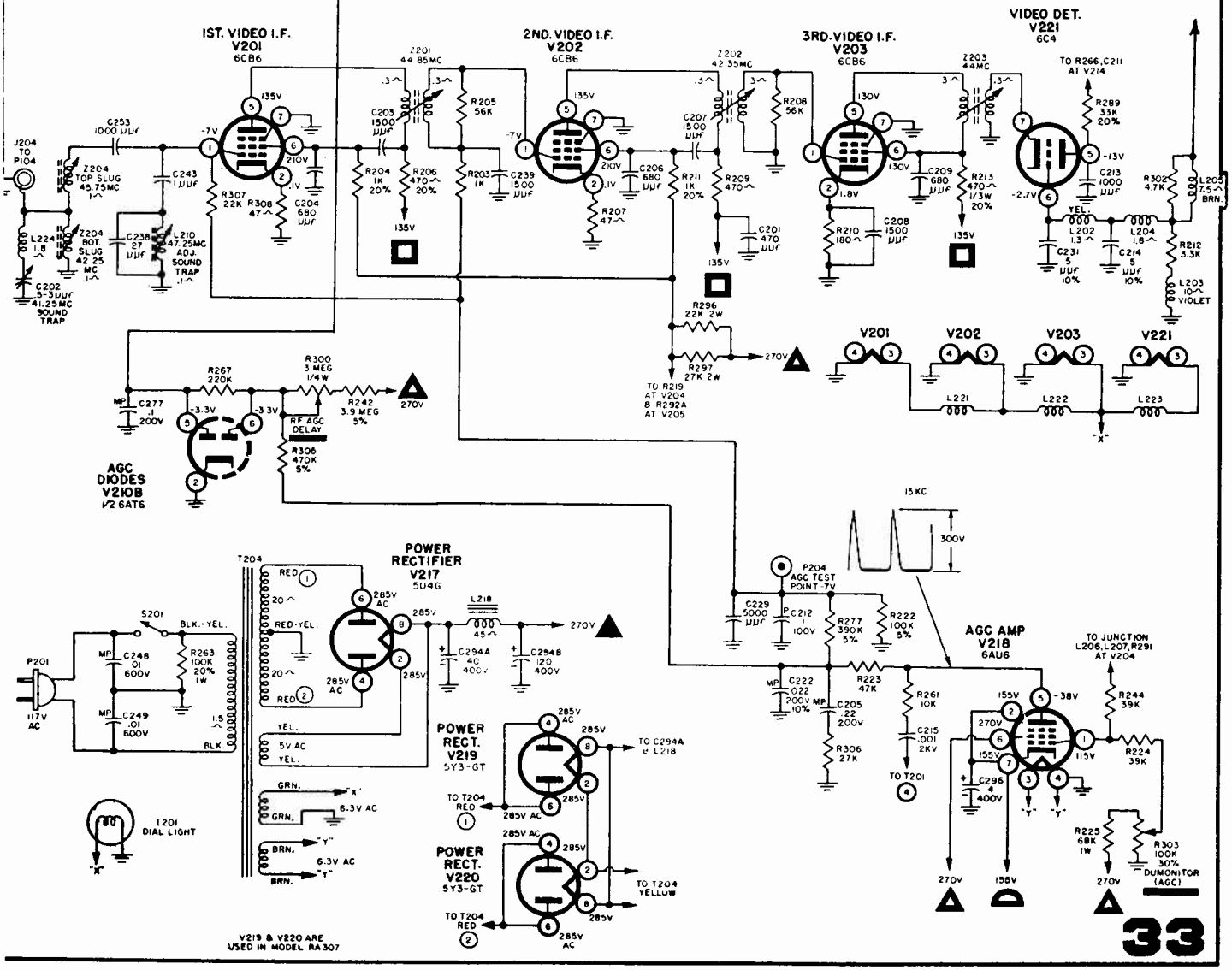
Step	Signal Generator Frequency	Signal Generator Connect to	Output Indicator	Connect to	Adjust
1	44.0 MC No Sweep	Pin 5, V102 ①	VTVM	P206 (Pin 2, V204) 1VTVM	Z203 for maximum reading. Set signal generator output to maintain reading on lowest range of VTVM.
2	42.35 MC No Sweep	As Above ②	VTVM	As Above 2VTVM	Z202 for maximum reading.
3	44.85 MC No Sweep	As Above ③	VTVM	As Above 3VTVM	Z201 for maximum reading.
4	43.5 MC Center Freq. 10 MC deviation	As Above ④	Oscillograph through XTAL	Pin 5, V201 4XTAL	C202 for 41.25 MC trap. Mixer plate coil (L109) and Z204 (top) for 45.75 MC marker. Z204 (bottom) for 42.25 MC marker. L210 for 47.25 MC trap. 
5	4.5 MC 400 CPS AM	P206 (Pin 2, V204) ⑤	Oscillograph through XTAL	Junction of R217, R220, and C216. 5XTAL	L207 for minimum reading.
SOUND IF ALIGNMENT					
6	4.5 MC 1 MC Sweep	P206 (Pin 2, V204) ⑥	Oscillograph through XTAL	Pin 5, V209 6XTAL	L208 and Z205 (bottom) for waveform. 
7	As Above	As Above ⑦	Oscillograph DIRECT	P205 (Junction of C241 & C242) 7DIR	Z205 (top) for waveform. 
ALTERNATE SOUND IF ALIGNMENT — USING TV SIGNAL					
6	TV Signal. Teleset must be tuned for best picture.		VTVM	Pin 5, V209 6VTVM	L208 and Z205 (bottom) for maximum reading.
7	As Above		VTVM	P205 (Junction of C241 & C242) 7VTVM	Z205 (top) for null point.



DU MONT

Part of circuit diagram shown on pages 34-35. Corresponding points connect together as is explained.

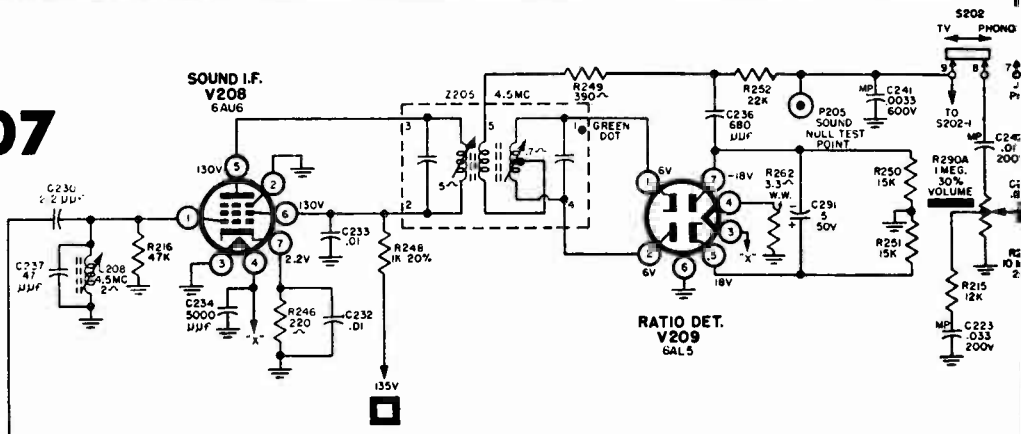
To point "A" of circuit on pages 34-35.

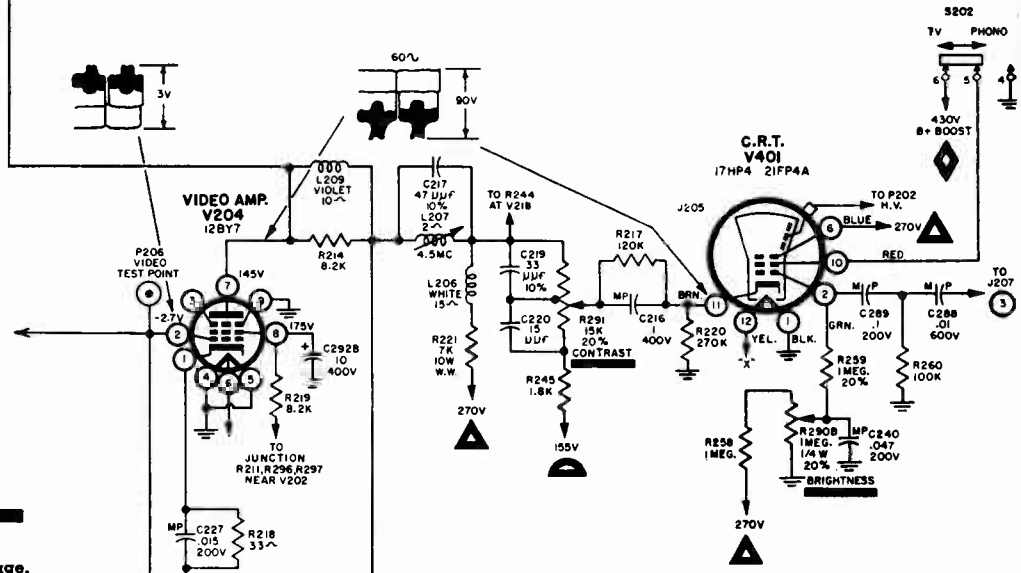


Allen B. Du Mont
(Continued)

RA-306, 307

Part of this circuit diagram is shown on page 33. This division is made for printing convenience and is not present physically in the actual chassis.





To point "A" of circuit on page 33.

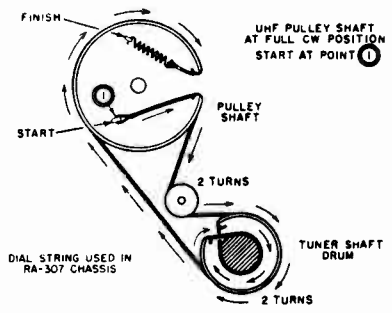
USE OF SYMBOLS

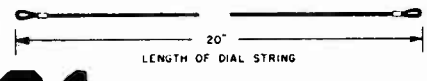
Solid symbol indicates source of voltage.

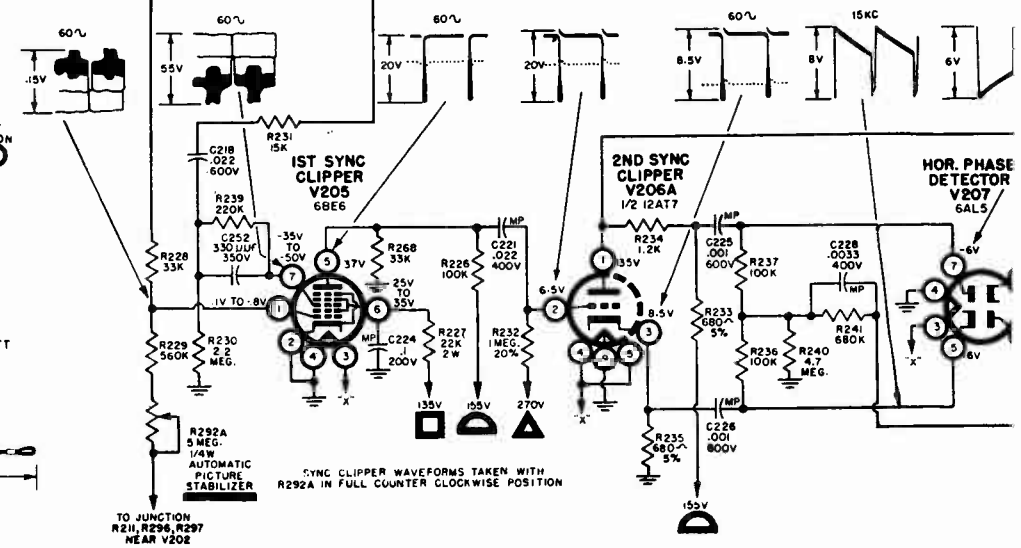
Open symbol indicates point to which voltage is applied.

Solid bar indicates an adjustable control.

DIAL STRINGING

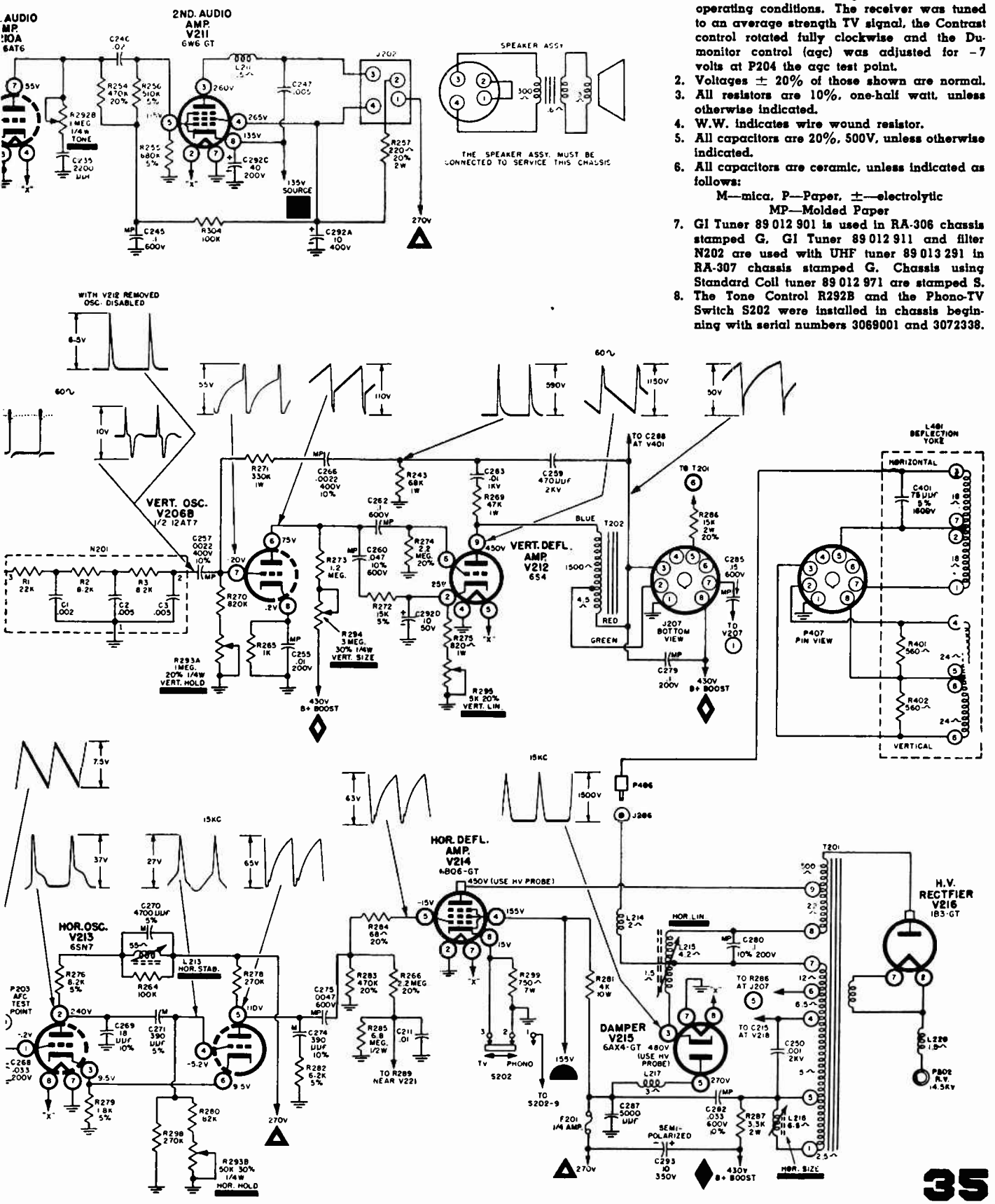






NOTES

1. All waveforms and voltages were taken under operating conditions. The receiver was tuned to an average strength TV signal, the Contrast control rotated fully clockwise and the Du-monitor control (agc) was adjusted for −7 volts at P204 the agc test point.
2. Voltages ± 20% of those shown are normal.
3. All resistors are 10%, one-half watt, unless otherwise indicated.
4. W.W. indicates wire wound resistor.
5. All capacitors are 20%, 500V, unless otherwise indicated.
6. All capacitors are ceramic, unless indicated as follows:
   M—mica, P—Paper, ±—electrolytic
   MP—Molded Paper
7. GI Tuner 89 012 901 is used in RA-306 chassis stamped G. GI Tuner 89 012 911 and filter N202 are used with UHF tuner 89 013 291 in RA-307 chassis stamped G. Chassis using Standard Coil tuner 89 012 971 are stamped S.
8. The Tone Control R292B and the Phono-TV Switch S202 were installed in chassis beginning with serial numbers 3069001 and 3072338.



DU MONT
(Continued)

ALIGNMENT TEST POINTS

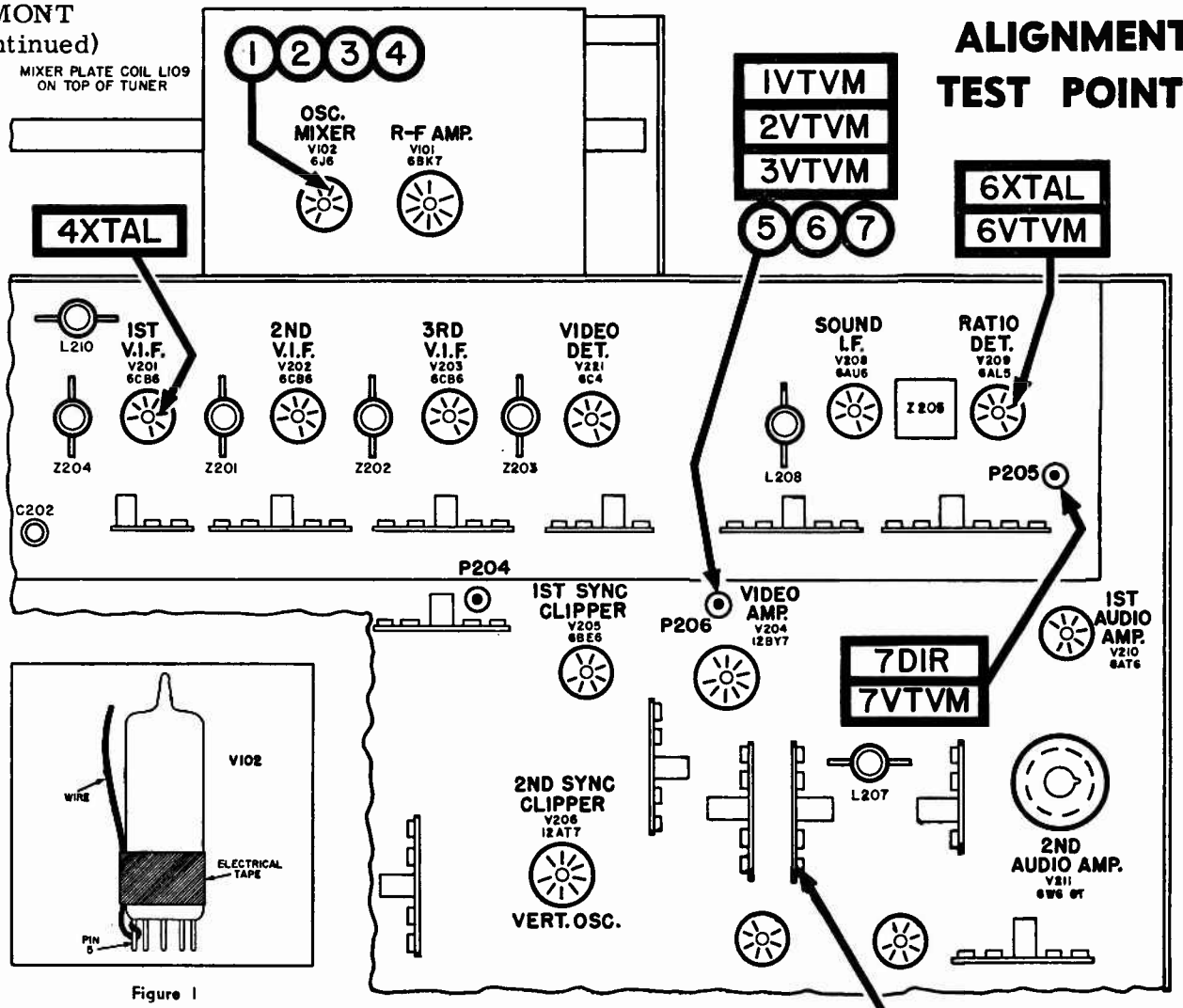
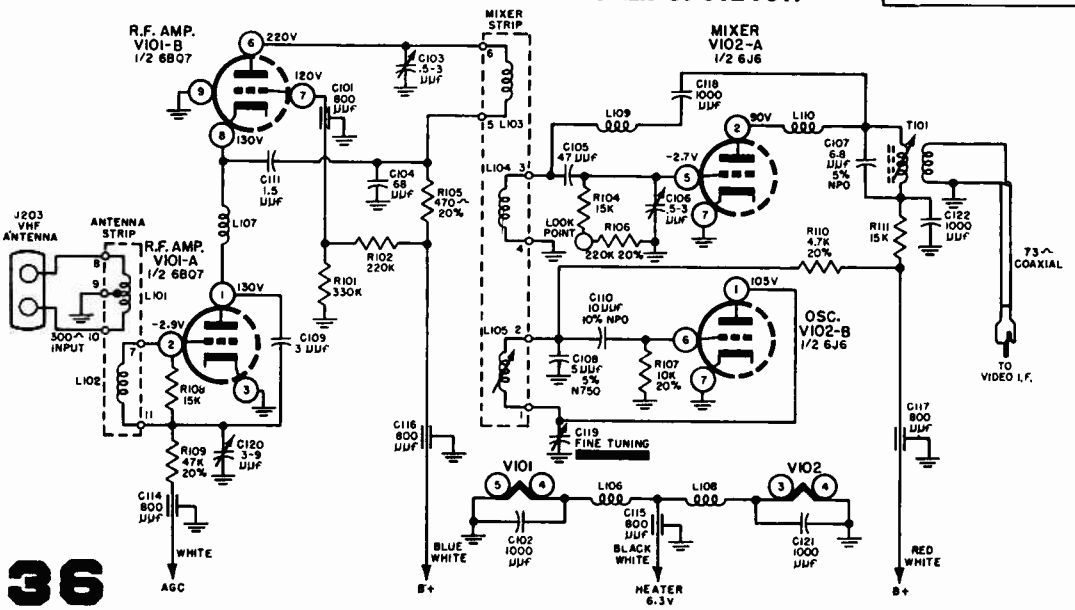


Figure 1

TUNER 89 012 971

USED ALTERNATELY WITH TUNER 89 012 901.



NOTES

When the alignment procedure has been completed the setting of the tuner oscillator slugs should be checked on each available channel and corrected if necessary.

1. Tune the receiver to each available channel.
2. Place the flat of the Fine Tuning control face downward and adjust the oscillator slug for best picture and sound.

Emerson Television

Model Numbers	TV Chassis	Tube Size	TV Tuner
760D, 762D	120191-D	17LP4 (GLASS-RECT.)	470696
760H	120190-D		
732G, 742E	120185-B	21MP4 (METAL-RECT.)	470696
767A, 771A, 773A	120192-B		
771D	120192-D	21YP4 (GLASS-RECT.)	470696

The service material on the next eight pages is exact for models using chassis as listed above. This material is also applicable to the following additional models:

Models 752A, 755A, 784A, use Chassis 120174B, and Models 768A, 772A, 774A, use Chassis 120193B, which are almost identical to Chassis 120185B, with the main differences in the use of individual VHF and UHF tuners, and placement of 5U4G rectifier tubes.

Models 753D, 761C, use Chassis 120180D, and Models 753F, 785C, 785E, use Chassis 120198D, which are almost identical to Chassis 120191D described in this manual; the main difference is in type of tuners used.

TUBE TROUBLE ANALYSIS CHART FOR CHASSIS 120185-B, 120190-D, 120191-D and 120192-B, D

SYMPTOM	CHECK
Weak or no sound nor video (picture), raster normal	V-22, V-23, V-1, V-2, V-3, V-4, *
Weak or no sound video and raster normal	
(a) Volume control setting effects strength of sound or hum	V-6, V-7, V-8, V-9
(b) Volume control setting does not effect strength of sound or hum	V-9, V-10
Weak or no video - Sound and raster normal	V-5, V-24
Sound and raster normal. Picture takes more than a couple of minutes to come to full contrast, starts out silvery. In time picture may always be negative in appearance	V-24
Poor or no horizontal nor vertical sync - sound and video normal (contrast control makes video darker or lighter)	V-11, V-17
Poor or no horizontal nor vertical sync - Video weak or distorted, raster normal - sound may or may not be normal	V-22, V-23, V-1, V-2, V-3, V-4
Poor or no horizontal sync - raster normal and sound normal (picture locks in vertically)	V-11, V-12, V-13, V-17
Poor or no vertical sync - raster normal and sound normal (picture locks in horizontally)	V-11, V-17, V-18
Horizontal line (no vertical sweep) - sound normal	V-18, V-19
Insufficient horizontal size, sound and video normal	V-14, V-16, V-20, V-21
Insufficient vertical size, or white horizontal bar in picture, horizontal size OK	V-19
No sound, no raster - tubes lit	Fuse, V-20, V-21
No sound, no raster - tubes not lit	Plug connection in wall socket, ON-OFF switch, line cord.

By raster we mean the illuminated scanning lines.

*Another very common fault is a shorted or open circuit antenna connection to set.

EMERSON Chassis 120185B, 120190D, 120191D, 120192B, -D, continued

ALIGNMENT

ALIGNMENT

a. Equipment Required - A sweep generator, (10 MC. sweep with center frequency of 44 MC. plus all necessary R.F. sweep frequencies as listed in R.F. Table), accurate marker generator, oscilloscope and V.T.V.M. are required for alignment. The marker generator must supply frequencies of 4.5 MC., 40 to 48 MC. and 50 to 216 MC.

b. Alignment Points - The location of all I.F. transformers, Tuned Circuits, and trimmers shown in Figure 14.

TV R.F. & MIXER ALIGNMENT

Connect 3 volt bias battery to both I.F. and R.F. AGC. circuits, positive terminal to chassis, negative terminal to junction of R-19, C-19, C-18. Add a jumper wire from this junction to junction of R-10, R-16, C-8 so that the bias battery is also applied to I.F. AGC.

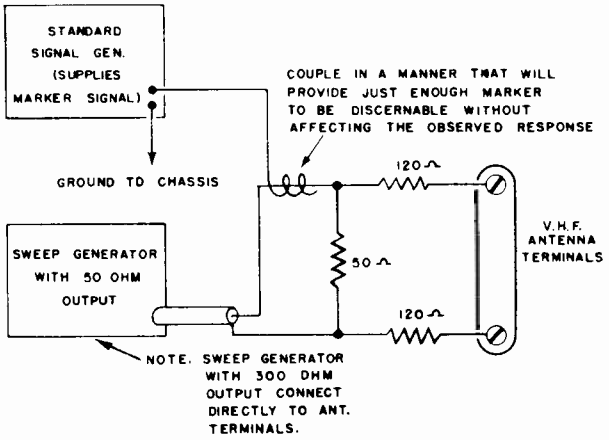


Figure 10. GENERATOR CONNECTIONS FOR TELEVISION R.F. CHANNEL ALIGNMENT.

SWEEP & MARKER GENERATOR		MARKER GEN.	OSCILLOSCOPE CONNECTIONS	MISCELLANEOUS INSTRUCTIONS	TRIMMER OR SLUG	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
CONNECTIONS	FREQ. RANGE	FREQ.				
Connect as shown in Fig. 10 and adjust sweep controls for width so that complete channel response may be observed as shown in Fig. 11	Channel #12 207 MC. Center Freq.	209.75 MC. Sound Carrier 205.25 MC. Pix Carrier	Vert. input of scope through 10K resistor to test point on tuner Fig. 14 Low side to chassis	Set Channel Selector to #12 NOTE Keep output of R.F. Marker Generator at a level that provides a readable marker but does not distort the curve that is being observed on the scope.	C-2 R.F. Amp. Input Trimmer C-1 I.F. Trap C-5 R.F. Plate Trimmer C-6 Mixer Grid Trimmer	Adjust Trimmers C-2, C-5 and C-6 to obtain response shown in Fig. 11 IMPORTANT: When adjusting trimmers C-2, C-5 and C-6 it will be noted that the band pass characteristic can be broadened by sacrificing amplitude. It is undesirable to overly broaden the curve as that would result in a loss of sensitivity. C-1 should normally be set at maximum capacity (screw all the way in) unless interference is encountered. (See note below)
Same as Above	#13 213 MC.	*215.75 MC. **211.25 MC.	Same as Above	Set Channel Selector to #13 (See Note Above)		The r-f band pass characteristic of the other television channels should now be checked without disturbing the settings of trimmers C-2, C-5 and C-6. Adjust the r-f sweep generator and marker generator for operation on the other television channels, observing position of both the sound carrier and picture carrier markers.
	#11 201 MC.	*203.75 MC. **199.25 MC.		Set Channel Selector to #11 (See Note Above)		
	#10 195 MC.	*197.75 MC. **193.25 MC.		Set Channel Selector to #10 (See Note Above)		
	#9 189 MC.	*191.75 MC. **187.25 MC.		Set Channel Selector to #9 (See Note Above)		
	#8 183 MC.	*185.75 MC. **181.25 MC.		Set Channel Selector to #8 (See Note Above)		
	#7 177 MC.	*179.75 MC. **175.25 MC.		Set Channel Selector to #7 (See Note Above)		
	#6 85 MC.	* 87.75 MC. ** 83.25 MC.		Set Channel Selector to #6 (See Note Above)		
	#5 79 MC.	* 81.75 MC. ** 77.25 MC.		Set Channel Selector to #5 (See Note Above)		
	#4 69 MC.	* 71.75 MC. ** 67.25 MC.		Set Channel Selector to #4 (See Note Above)		
	#3 63 MC.	* 65.75 MC. ** 61.25 MC.		Set Channel Selector to #3 (See Note Above)		
	#2 57 MC.	* 59.75 MC. ** 55.25 MC.		Set Channel Selector to #2 (See Note Above)		

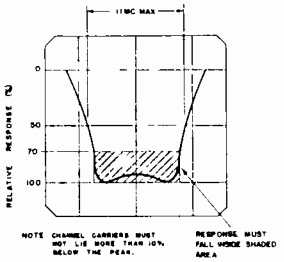


Figure 11-- TUNER RESPONSE CURVE SHOWING BAND-PASS LIMITS.

The response for all channels should meet with the requirements of Fig. 11. To do so it may be necessary to compromise by slightly changing the initial channel #12 adjustments of C-2, C-5 and C-6 while switched to channel which does not conform.

*Sound Carrier Marker
**Picture Carrier Marker

NOTE: C-1 IS AN I.F. TRAP AND CAN BE ADJUSTED IN THE FIELD TO REDUCE ANY INTERFERENCE WHICH MAY AFFECT CHANNEL #2 FROM A NEARBY TRANSMITTER OPERATING IN THE 40 MC. BAND.

EMERSON Chassis 120185B, 120190D, 120191D, 120192B, -D, continued

I.F. ALIGNMENT

1) Tune receiver to unused Channel 10 or 12.

2) Connect 3 volt bias battery with negative terminal to I.F. AGC. (Junction R-10, C-8, R-16) positive terminal to chassis.

3) Connect D.C. V.T.V.M. to video test point (see location in Fig. 13 and 14).

4) Connect terminated marker generator to floating shield of converter tube V-23 6J6. (Shield raised slightly so that it does not make contact with chassis). Use unmodulated marker. See Fig. 13.

MARKER GENERATOR	ADJUST	PROCEDURE
45.75 MC. Unmodulated	T-4	Peak for maximum response. Adjust output of signal generator so that maximum response does not produce more than -2V. D.C. on V.T.V.M.
43.2 MC. Unmodulated	T-3	
42.0 MC. Unmodulated	T-2	
45.0 MC. Unmodulated	L-3 T-1	
41.25 MC. Unmodulated	L-2	Adjust trap for minimum response. Increase output from signal generator so that a true minimum position can be found.

5) Connect vertical input of an oscilloscope instead of V.T.V.M. to video test point with vertical scope gain set at, or near, maximum. (Horizontal scope sweep set at 400 cycles).

MARKER GENERATOR	ADJUST	PROCEDURE
47.25 MC. 400 Cycles Amp. Mod.	L-1	With signal generator set at maximum output, adjust L-1 for minimum vertical response on scope.

6) Now that all the I.F. coils and transformers have been set, the overall response can be observed and adjusted if necessary.

SIGNAL GENERATOR INPUT			MEASURING INSTRUMENT	ADJUST	PROCEDURE
CONNECTION	FREQUENCY				
	SWEEP	MARKER			
Connect terminated sweep and marker as shown in Fig. 13.	Center frequency 44 MC. 10 MC. Sweep	45.75 MC.	Scope connected to Video Test Point	T-4	If 45.75 MC. doesn't lie from 60 to 70% down adjust T-4 (see fig 12) for tolerances. *

Providing overall curve is within tolerances as shown below, no further adjustments are needed. If band width or tilt is not as specified, repeat entire alignment procedure. If still out then a slight retouching is permissible. TRAPS L-1 and L-2 MUST BE ADJUSTED AS INDICATED ABOVE. DO NOT RE-ADJUST WHILE OBSERVING OVERALL I.F. RESPONSE CURVE.

*KEEP OUTPUT SIGNAL GENERATOR AS LOW AS POSSIBLE WHEN OBSERVING THE OVERALL I.F. SHAPE SINCE TUBE OVERLOAD MIGHT RESULT AND THE RESPONSE WILL APPEAR INCORRECTLY FLAT AND WIDE.

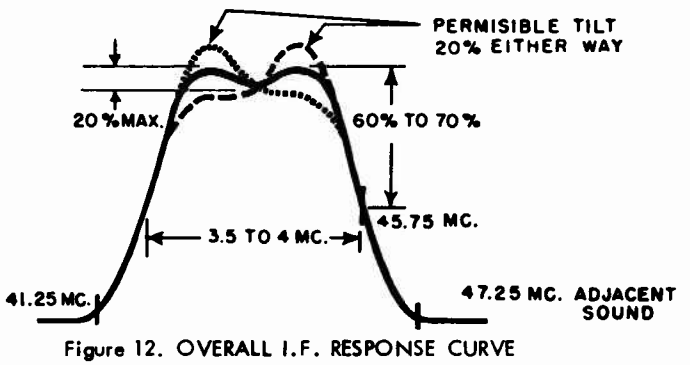


Figure 12. OVERALL I.F. RESPONSE CURVE

NOTE: It may be impossible to observe the 47.25 MC. marker with the average service equipment due to the high attenuation of trap L-1 (adjacent sound).

EMERSON Chassis 120185B, 120190D, 120191D, 120192B, -D, continued

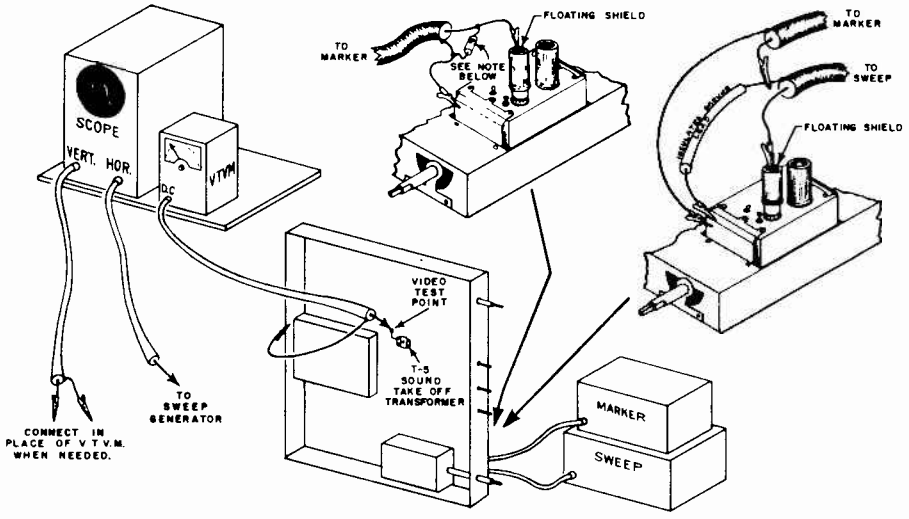


Figure 13. CONNECTIONS FOR I.F. ALIGNMENT.

All instrument leads should be dressed as directed and as short as possible to prevent interaction between input and output leads. Failure to do this may result in an unstable response indication.

NOTE: It is important that the output cable of the sweep and marker generator be properly terminated in their characteristic impedance which is usually from 50 to 75 ohms. If this termination has not been built into the end of the cable by the instrument manufacturer then a resistor of the proper value (characteristic impedance) should be connected across the output of each generator cable as shown above.

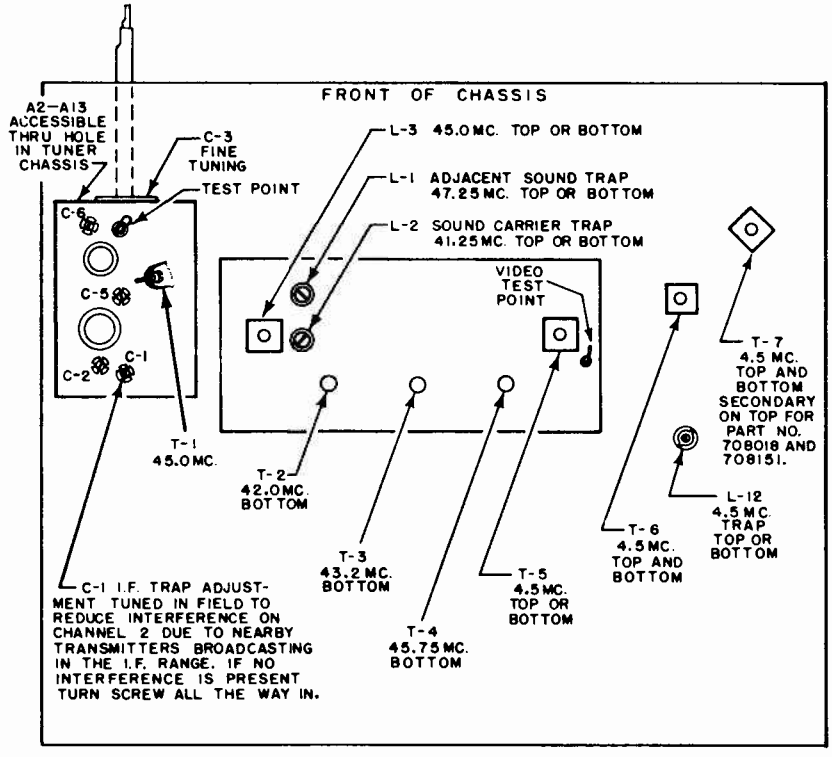
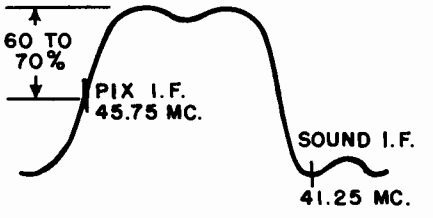


Figure 14 - LOCATION OF ALIGNMENT POINTS (TOP VIEW)

EMERSON Chassis 120185B, 120190D, 120191D, 120192B, -D, continued

R.F. OSCILLATOR ALIGNMENT (V.H.F.)

1. Connect marker and sweep generator as shown in Figure 10, low side to chassis.
2. Connect scope to video test point (see location Fig. 13 and 14).
3. Connect 3 volt bias battery as described under R.F. Alignment
4. Before undertaking oscillator alignment be sure I.F. circuits are correctly aligned for band pass characteristic and trap settings.
5. During oscillator alignment, it is necessary to set the fine tuning control so that the tooth on the fine turning cam points downward.

MARKER SIGNAL GENERATOR FREQUENCY	SWEEP GENERATOR FREQUENCY	MISCELLANEOUS INSTRUCTIONS	TRIMMER OR SLUG	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
*209.75 MC. **205.25 MC.	Channel #12 Center Frequency 207 MC. 10 MC. Sweep	Be sure that fine tuning control has been properly positioned (tooth on the cam pointing down) NOTE During this step and thru-out all succeeding steps it is necessary to: 1. Keep output of sweep generator at a level that does not allow the reading on a VTVM to exceed minus 1 volt when connected across video detector load at minimum sweep width. 2. Keep output of standard signal generator at a level that provides a readable marker but does not distort the curve that is being observed on the scope.	Adjust Slug A-12	NOTE: Before making the following adjustment, advance the vertical gain control on the scope in order to magnify the sound trap portion of the response curve. Then, use a non-metallic screwdriver to adjust channel #12 oscillator slug (accessible thru hole on front of r-f tuner unit) and shift response curve so that sound carrier marker is located at the position indicated below. Now reduce gain control setting of scope to restore pattern to normal amplitude and observe position of picture carrier marker. This marker should appear on the high frequency side of the characteristic curve. The amplitude of the picture carrier should be between 60 and 70% down from peak response.
*215.75 MC. **211.25 MC.	Channel #13 213 MC.	Set Channel Selector to #13 (See note above)	Adjust the r-f sweep generator and marker generator for operation on other television channels; set marker generator to sound carrier frequency. After setting Channel Selector to corresponding channel, adjust oscillator slug thru hole on front of r-f tuner unit. (A-2 to A-13) This permits response curve to be shifted so that sound carrier marker will appear at the position indicated below.  TYPICAL OVERALL RESPONSE CURVE NOTE: Make sure that cam on fine tuning control shaft remains properly positioned during this step (tooth on the cam pointing downward).
*203.75 MC. **199.25 MC.	Channel #11 201 MC.	Set Channel Selector to #11 (See note above)		
*197.75 MC. **193.25 MC.	Channel #10 195 MC.	Set Channel Selector to #10 (See note above)		
*191.75 MC. **187.25 MC.	Channel #9 189 MC.	Set Channel Selector to #9 (See note above)		
*185.75 MC. **181.25 MC.	Channel #8 183 MC.	Set Channel Selector to #8 (See note above)		
*179.75 MC. **175.25 MC.	Channel #7 177 MC.	Set Channel Selector to #7 (See note above)		
* 87.75 MC. ** 83.25 MC.	Channel #6 85 MC.	Set Channel Selector to #6 (See note above)		
* 81.75 MC. ** 77.25 MC.	Channel #5 79 MC.	Set Channel Selector to #5 (See note above)		
* 71.75 MC. ** 67.25 MC.	Channel #4 69 MC.	Set Channel Selector to #4 (See note above)		
* 65.75 MC. ** 61.25 MC.	Channel #3 63 MC.	Set Channel Selector to #3 (See note above)		
* 59.75 MC. ** 55.25 MC.	Channel #2 57 MC.	Set Channel Selector to #2 (See note above)		

NOTE: If an unsatisfactory overall response is obtained for a particular channel, observe R-F amp. and Mixer response curve for that channel (as described in R-F Amp. and Mixer Alignment Table). If characteristic curve does not conform reasonably well within the typical curve shown in Figure 11, then do the following things:

1. Check method of connecting scope, voltmeter and generator leads to eliminate possible distortion of observed response, or:
2. Attempt to obtain a better compromise for R.F. response on all channels by realigning R-F Amp. and Mixer circuits, or:
3. Try replacing Antenna, R-F and Oscillator coils for the particular channel.

*Sound Carrier Marker
**Picture Carrier Marker

EMERSON Chassis 120185B, 120190D, 120191D, 120192B, -D, continued

SOUND ALIGNMENT

(A) USING 4.5 mc UNMODULATED SIGNAL GENERATOR

1) Short pin #1 of V-3 to Chassis with short jumper wire.
2) Keep output of signal generator low so as to provide a sharp meter indication with adjustment of transformers.

(B) USING TRANSMITTED TV AIR SIGNAL

1) Connect antenna and tune to a good on the air TV station.
2) Adjust fine tuning control for best picture.
3) Adjust antenna coupling for moderate signal so as to provide a sharp meter indication with adjustment of transformers.
4) Meter reading may pulsate due to changes in signal strength; do not confuse with a peak adjustment.

STEP	SIGNAL GENERATOR INPUT		MEASURING INSTRUMENT	ADJUST	PROCEDURE
	CONNECTION	FREQUENCY			
1	Marker Gen. through .01 MF to Pin 7 of V-4 low side to chassis. - or - Connect antenna and tune in a good transmitted TV. signal (any channel)	4.5 MC (Unmodulated) - or - A good on the air TV. channel	Connect D.C. V.T.V.M. (negative scale) through 10K Resistor to Junction of C-30, R-35, R-36 - low side to chassis.	T-5 Top or Bottom T-6 Top and Bottom	Peak for maximum voltage. Adjust output of signal generator to produce about a one volt D.C. rise on meter (1 volt above noise* voltage) If T.V. signal is used adjust ant. coupling to receiver to produce about the same voltage rise.
2	Same as above.	Same as above.	Connect V.T.V.M. through 10K Resistor to Junction of R-44, C-34 - low side to chassis.	T-7 Top and Bottom (Discriminator)	A) Detune Discriminator secondary T-7 (Top Pt. #708018, 708151; Bottom Pt. #708017) for maximum negative meter reading. B) Adjust primary T-7 for maximum negative meter reading. C) Readjust Discriminator secondary (towards original setting) for zero D.C. reading on V.T.V.M. D) Check Audio, if distorted repeat steps A - C.

* The noise voltage is measured under no signal conditions (antenna terminals shorted directly at tuner by means of a short jumper wire; or disconnect 4.5 MC. generator if procedure (A) above is followed.)

4.5 MC VIDEO TRAP ALIGNMENT (L-12)

1. Connect crystal controlled 4.5 mc. signal generator through a .01 mf. condenser to the grid of the video amplifier tube (Pin 1 of V-5, 6CB6) low side to chassis.
2. Set contrast control for maximum contrast (fully clockwise).
3. Connect a V.T.V.M. (D.C. scale) through an R.F. probe to the cathode of the picture tube (Pin 11, yellow lead) low side to chassis.
4. Adjust the 4.5 mc. trap L-12 for minimum reading on the V.T.V.M.

If a crystal controlled generator is not available the video trap can be adjusted in the field by setting the fine tuning control for maximum 4.5 mc. in picture and adjusting the 4.5 mc. trap (L-12) until this 4.5 mc. beat note is reduced. Be sure that video ringing is not introduced from this adjustment since this indicates the trap was aligned at too low a frequency.

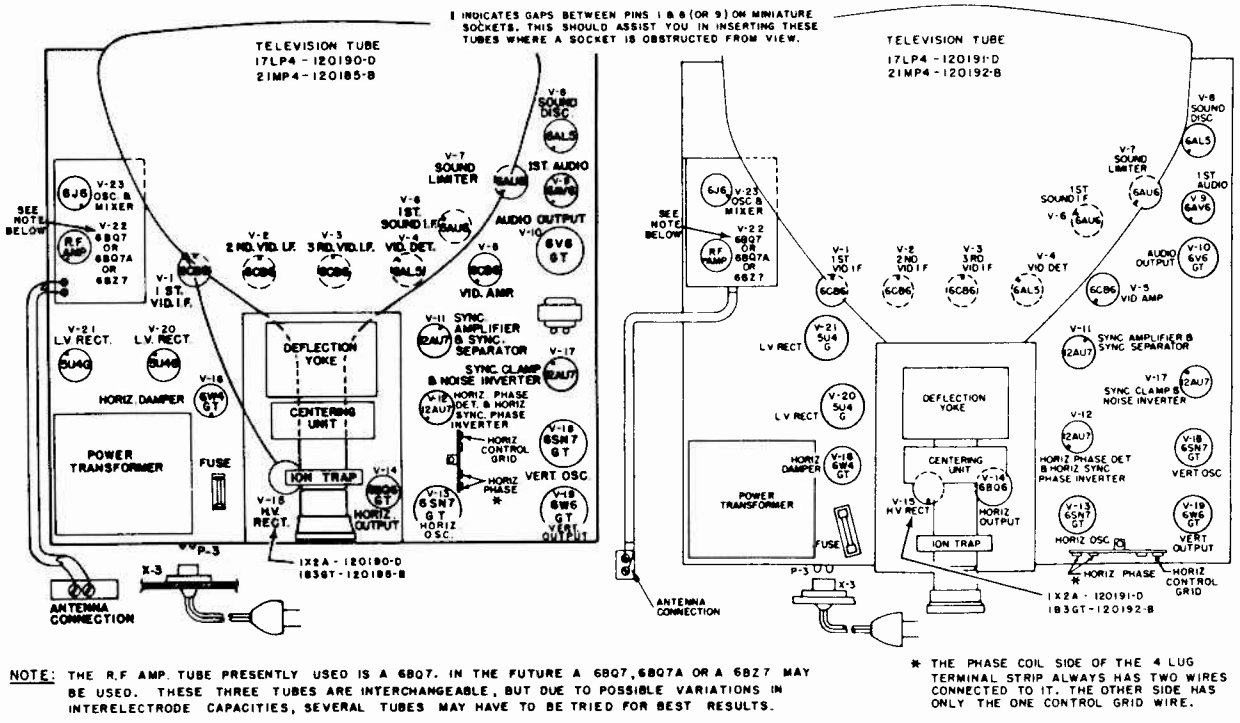
REPAIR OF TUNER

The majority of tuner troubles which are not due to defective tubes can usually be detected by a physicol examination of the tuner (turret removed), such as burnt resistors, broken parts, bent or dirty contact fingers, cold solder joints, broken socket pins, etc.

It should always be borne in mind that a burnt resistor is usually the result of a shorted condenser or tube.

The part numbers of items which are not generally commercially available are given on the tuner schematic. When replacing parts, leads should be kept as short as possible and components replaced in the same position as the original parts.

EMERSON Chassis 120185B, 120190D, 120191D, 120192B, -D, continued

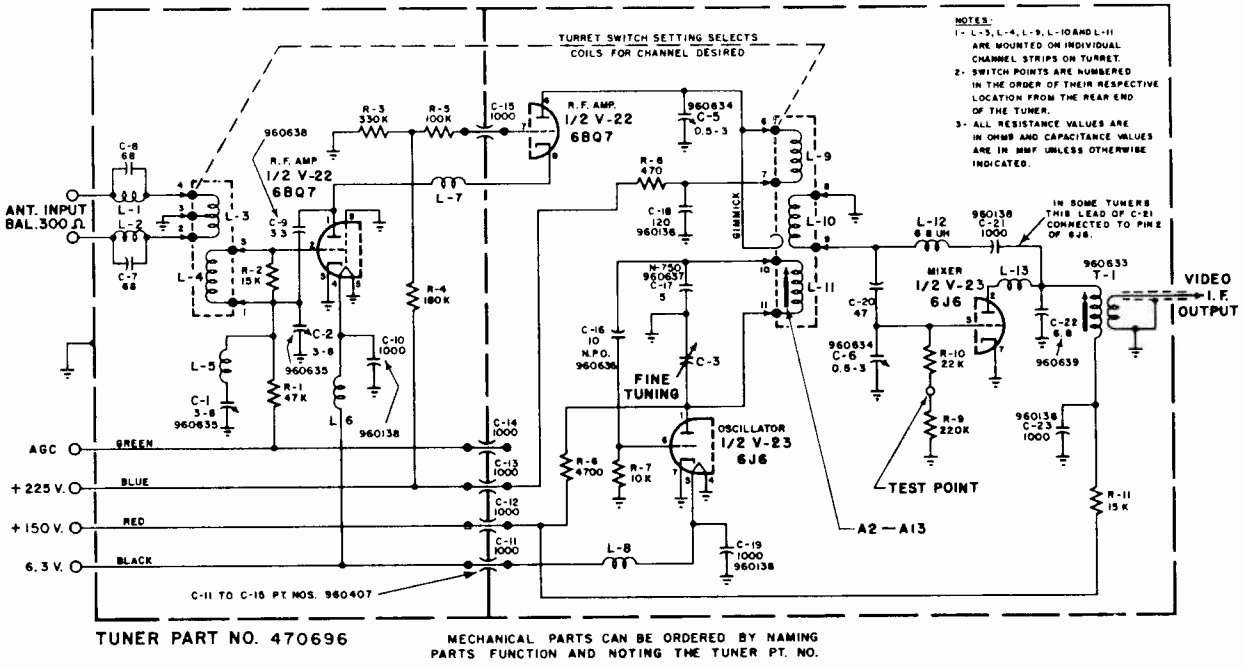


NOTE: THE R.F. AMP. TUBE PRESENTLY USED IS A 6BQ7. IN THE FUTURE A 6BQ7, 6BQ7A OR A 6BZ7 MAY BE USED. THESE THREE TUBES ARE INTERCHANGEABLE, BUT DUE TO POSSIBLE VARIATIONS IN INTERELECTRODE CAPACITIES, SEVERAL TUBES MAY HAVE TO BE TRIED FOR BEST RESULTS.

* THE PHASE COIL SIDE OF THE 4 LUG TERMINAL STRIP ALWAYS HAS TWO WIRES CONNECTED TO IT. THE OTHER SIDE HAS ONLY THE ONE CONTROL GRID WIRE.

Figure 15 - TUBE LOCATION DIAGRAM CHASSIS 120185-B, 120190-D

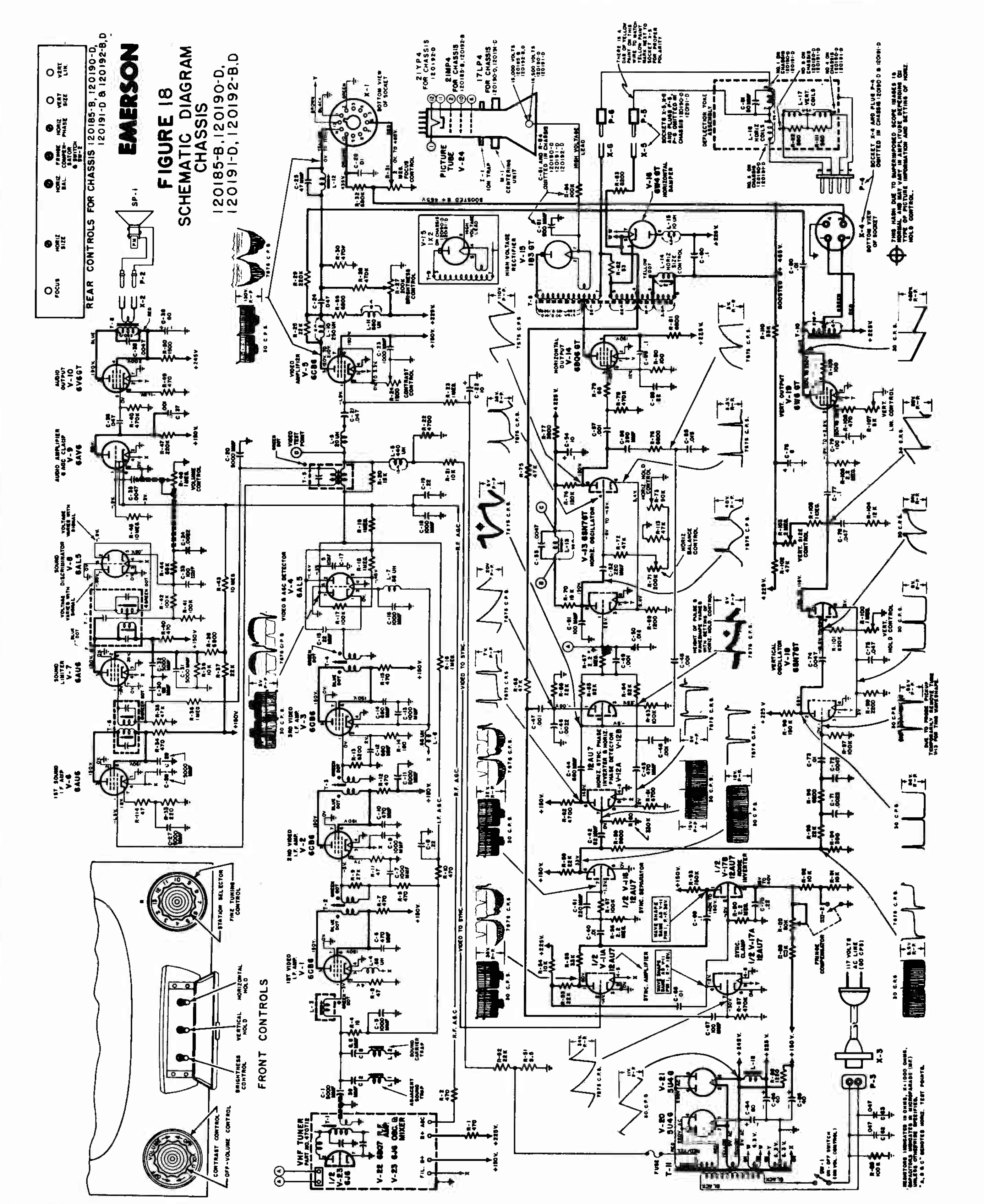
Figure 16 - TUBE LOCATION DIAGRAM CHASSIS 120191-D, 120192-B, D



TUNER PART NO. 470696

MECHANICAL PARTS CAN BE ORDERED BY NAMING PARTS FUNCTION AND NOTING THE TUNER PT. NO.

Figure 17 – SCHEMATIC DIAGRAM OF TURRET TYPE TUNER USED ON CHASSIS 120185-B, 120190-D, 120191-D AND 120192-B, D


EMERSON
FIGURE 18
SCHEMATIC DIAGRAM
CHASSIS
120185-B, 120190-D,
120191-D, 120192-B,D
REAR CONTROLS FOR CHASSIS 120185-B, 120190-D, 120191-D & 120192-B,D
FRONT CONTROLS

Emerson Television

Model Numbers	TV Chassis	Tube Size	TV Tuner
741F, 757D	120182-D	17LP4 (GLASS - RECT.)	VHF - 470696
781A, 781B	120196-B	21MP4 (METAL - RECT.)	
784E	120197-B	21MP4 (METAL - RECT.)	VHF - 470712 UHF - 470729
784G	120197-D	21YP4 (GLASS - RECT.)	
785K	120195-D	17LP4 (GLASS - RECT.)	

For circuit diagram see the next page, over. Alignment procedure for these sets is the same as for earlier sets covered in the 1953 Television Manual, and you are referred to pages 50 to 54 of this volume (TV-7) for alignment information.

BRIEF CIRCUIT DESCRIPTION

The above chassis incorporate a 40 mc I.F. intercarrier system. The 4.5 mc intercarrier sound signal which is developed in the video detector is fed back to the grid of V-2 where it is amplified along with the regular video and audio I.F. signals are then fed to the sound limiter (V-6). This system is known as "sound reflex" and is accomplished by incorporating two resonant circuits in the plate and two resonant circuits in the grid of V-2. One set of plate and grid circuits resonates at the 40 mc video I.F. frequencies and the other set at the intercarrier sound frequency (4.5 mc). C-7 resonates with the secondary of T-5 to form the 4.5 mc grid resonant circuit of V-2.

To operate the R.F. amplifier at maximum gain at low signal levels delayed A.G.C. is applied to the tuner.

The output of the video amplifier (V-5, 6CB6) not only drives the cathode of the picture tube but also feeds the composite video signal to the grid circuit of the sync separator tube (1/2 V-8, 12AX7). Since the polarity of the video signal is such that the sync tips drive the grid of V-5 in a negative direction strong noise pulses of greater amplitude than the sync will drive the grid to cutoff and will, therefore, be clipped in the plate circuit of this tube. This effect greatly improves sync stability in electrically noisy weak signal areas.

ALIGNMENT OF MIRACLE PICTURE LOCK
(Horizontal Oscillator and A.F.C.)

This can be accomplished without removing chassis from cabinet.

1- Tune set to a channel known to be good.
2- Short phasing coil by using a clip lead across phasing coil terminal strip located on top of chassis next to horizontal oscillator tube.
3- Rotate horizontal hold control fully clockwise.
4- Starting with horizontal frequency slug all the way out, rotate in until picture just locks into sync. (Turn slug in 1/2 turn more).
5- Adjust horizontal size if necessary; if picture falls out of sync. repeat Step 4.
6- Adjust centering so that right hand edge of picture is visible while facing front of set (see Figure #1).
7- Decrease contrast and turn up brightness while viewing a good picture so that the horizontal blanking porch is visible (see Figure #1) on right hand side of picture.
8- Remove the short across the phasing coil. If the picture falls out of horizontal sync. adjust the phasing coil to re-sync. the picture and then carefully continue to adjust the phasing coil so that the start of the horizontal sync. pulse is just visible at the end of the front blanking porch. (see Figure #2). It should be noticed that the sync. pulse is darker than the front blanking porch but not quite as dark as the unlit portion of the picture tube.

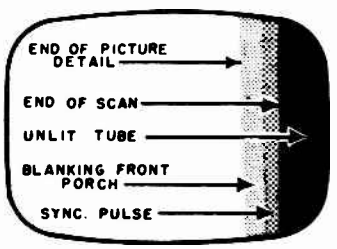


FIGURE 1

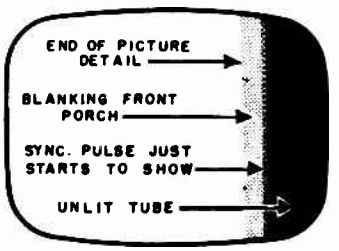
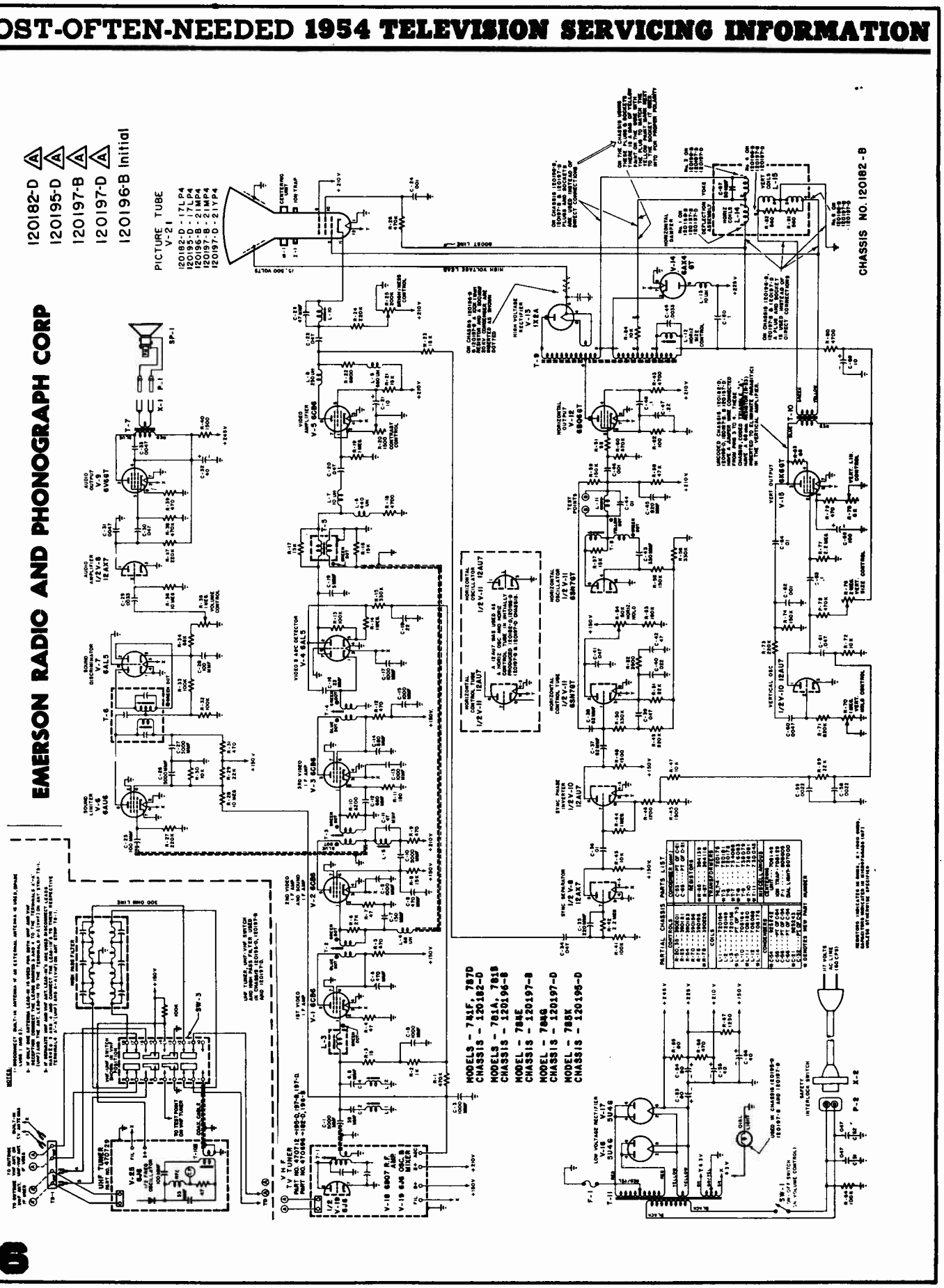


FIGURE 2


EMERSON RADIO AND PHONOGRAPH CORP
120182-D
120195-D
120197-B
120197-D
120196-B Initial
PICTURE TUBE
V-21
120182-D - 17LP4
120195-D - 17LP4
120196-B - 21MP4
120197-B - 21MP4
120197-D - 21YP4
CHASSIS NO. 120182-B
MODELS - 741F, 787D
CHASSIS - 120182-D
MODELS - 781A, 781B
CHASSIS - 120196-B
MODEL - 784E
CHASSIS - 120197-B
MODEL - 784G
CHASSIS - 120197-D
MODEL - 785K
CHASSIS - 120195-D
PARTIAL CHASSIS PARTS LIST
UNF TUNER
V.H.F. TUNER

GENERAL ELECTRIC

TELEVISION RECEIVERS
MODELS 21T7 & 21T8

This material is exact for Models 21T7 and 21T8. Models 21C225 to 21C333, 21T20, and 21T21, are similar, but waveform voltages may differ somewhat.

TROUBLE SHOOTING

In many cases a circuit difficulty may be localized by observing the picture or test pattern and by noting the presence or absence of sound. In general, the tubes in defective circuits should be checked first since this check does not take much time and the probability of failure is higher in tubes than in components. When substituting tubes in r-f or video i-f circuits, the original tube should be replaced in the socket if it is found to be satisfactory.

General Service Information

1. CRITICAL LEAD DRESS

To prevent the effects of undesired 4.5 mc harmonic radiation, it is essential that all audio and video i-f components be replaced in exactly the same position they occupied when they were wired in at the factory. All r-f, video and sync carrying leads should be made as short as possible. Check lead dress of picture tube anode lead to prevent high-voltage arc-over.

2. NOISE INVERTER CHECK

A simple oscillographic check may be performed which will display the operation of the noise inverter. The procedure is based upon noise pulse inversion in the absence of signal.

1. Turn on receiver. Set channel selector switch to an unoccupied channel.
2. Connect oscilloscope to Junction of C303 and C304.
3. Bias off the noise inverter (V115B) by connecting a 100,000-ohm resistor between its pin No. 3 and +250 volts.
4. Supply a moderate-amplitude noise signal to the antenna input terminals. A suitable noise source would be an electric shaver or similar "spark" type noise generator.
5. Observe positive polarity of noise pulses on oscilloscope. Removal of the temporarily added 100,000-ohm resistor should cause the noise signal to reverse itself and hence become negative in polarity.

3. KEYER TUBE CHECK

The proper operation of the AGC Keyer tube V108B may be checked by shorting pins 2 and 7 and observing the AGC voltage. This voltage should reach a value of 40 volts as measured at the AGC terminal of the R-F Tuner (see Fig. 19).

SYMPTOM	CHECK FOR
DEFECTS OF THE SYNC SECTION	
A. Weak or no horizontal sync; vertical sync, picture and sound satisfactory	1. Sync amplitude at input to discriminator tube, V119A 2. Bias and plate voltage on control tube, V119B 3. Sine-wave oscillator components, L351, C361, C357, R358 and R359 4. Leaky or shorted capacitors, C354 and C355 5. Waveform feedback components, C364, R365, R366 and C365
B. Weak or no composite sync, otherwise picture and sound normal	1. Defective coupling capacitor C303 or C304 to clipper tube 2. Incorrect value of plate resistor, R312 of clipper tube, V116A 3. Insufficient amplitude of composite signal applied to sync amplifier from video detector; check video detector circuit
C. No vertical sync, horizontal sync satisfactory	1. Sync pulse at input of vert. oscillator, check integrator plate P301 2. Vert. oscillator frequency, if far off from 60 cps, check vert. oscillator components such as C311 and R317 3. Leakage in feedback capacitor, C315
D. Picture displaced to left, right edge wavy	1. Open or low value of capacitor, C304
E. Horizontal sync out, bright bar or bars in picture	1. Shorted, open or leaky capacitor, C360 2. Improper value resistor, R361
F. "Gear Tooth" effect	1. Open or low value capacity of C356 2. Open or high resistance of R357
DEFECTS OF THE VERTICAL DEFLECTION CIRCUIT	
A. Poor vertical linearity, inadequate height	1. Low emission of sweep output tube, V118 2. Improper grid input "drive" voltage at V118 3. Defective sweep output transformer T301 4. Low B+ voltage to sweep output tube V118 5. Low value of cathode capacitor, C402C
B. Inadequate picture height	1. Rise in resistance value of vert. oscillator plate resistor, R319 or R374 2. Leakage in capacitor C312 3. Incorrect value of plate, or grid voltages on output tube, V118 4. Low value capacitor in cathode of vert. output tube, C402C (This usually results in poor linearity) 5. Weak vertical deflection tube, V117 or V118
C. No vertical deflection	1. Open vertical deflection coils, D301 2. Defective sweep output transformer, T301 3. Shorted capacitor C312, C314 4. Poor contacts in yoke plug

Continued on pages 48 to 52.

GENERAL ELECTRIC Models 21T7 & 21T8

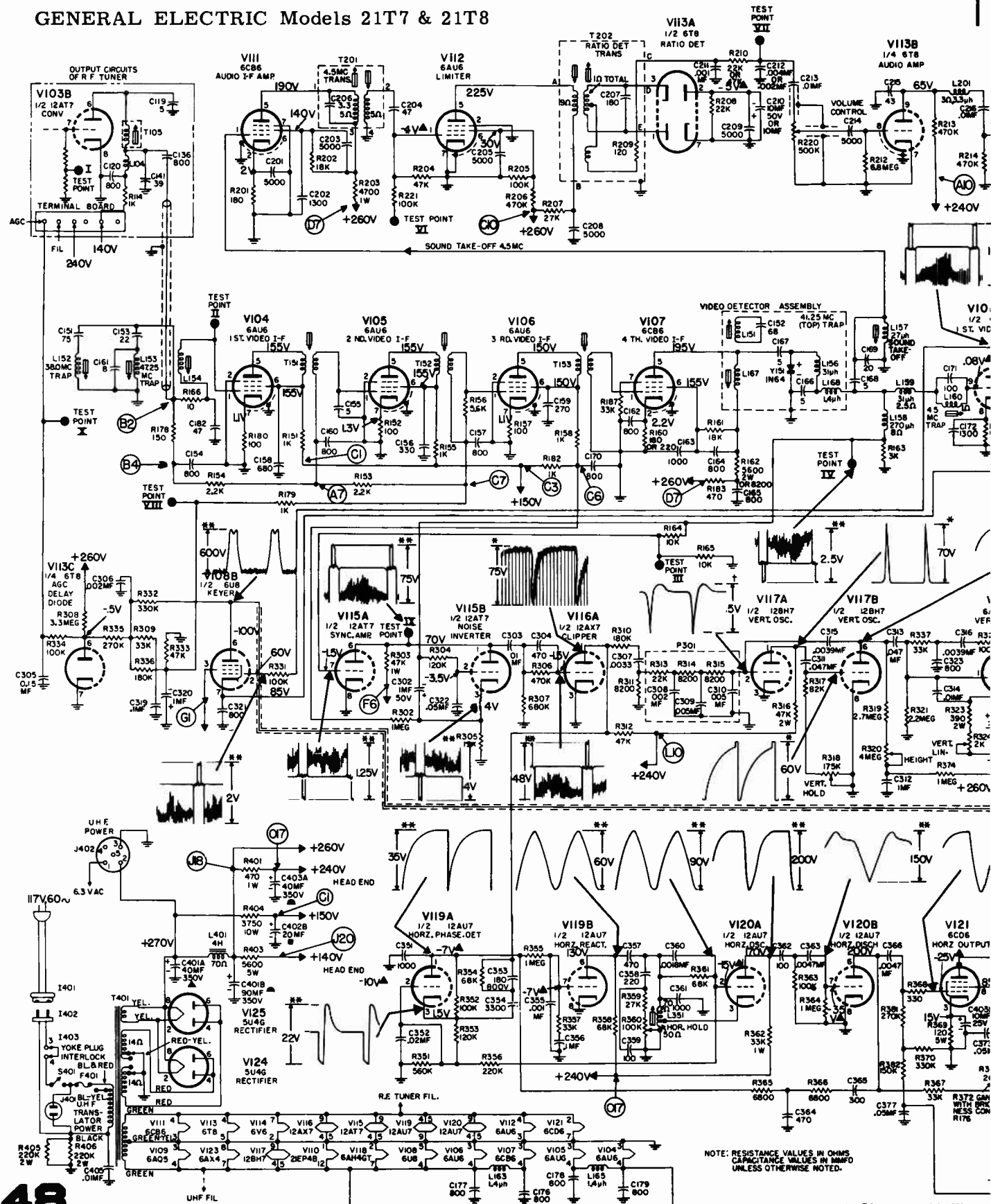
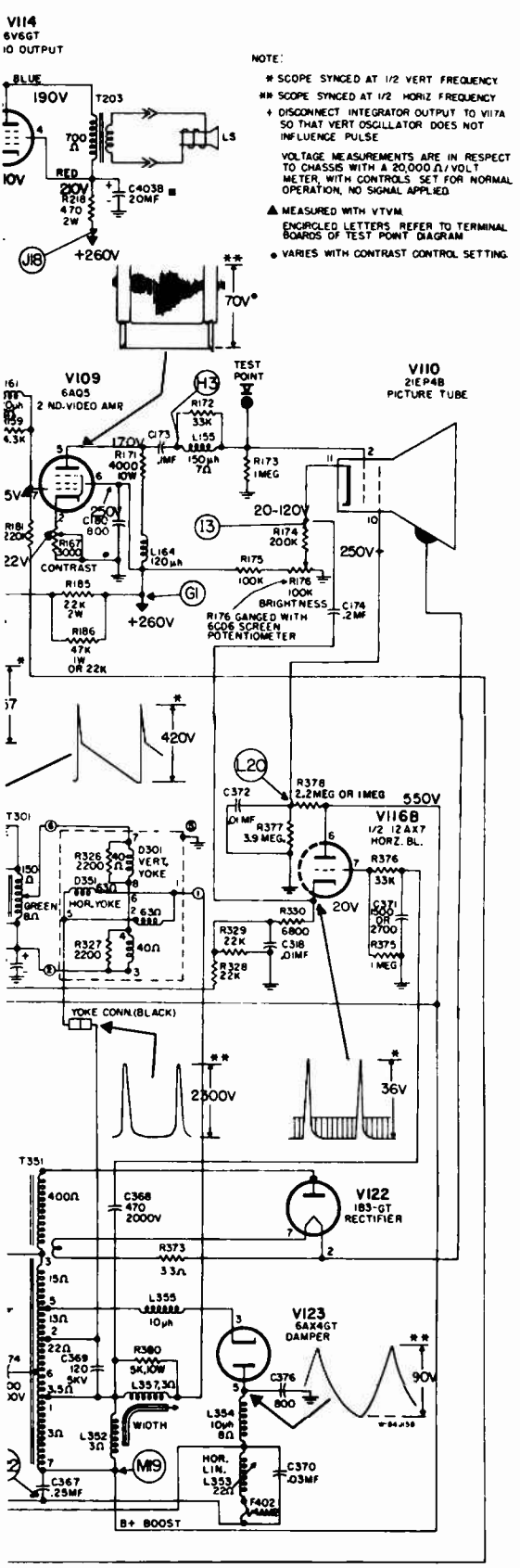
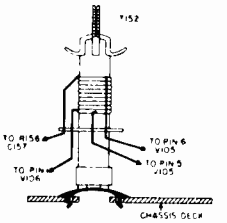


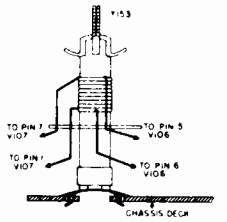
Fig. 31. Schematic Diagram with Waves

GENERAL ELECTRIC

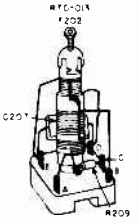




Wiring Diagram for T152



Wiring Diagram for T153



Ratio Detector Wiring

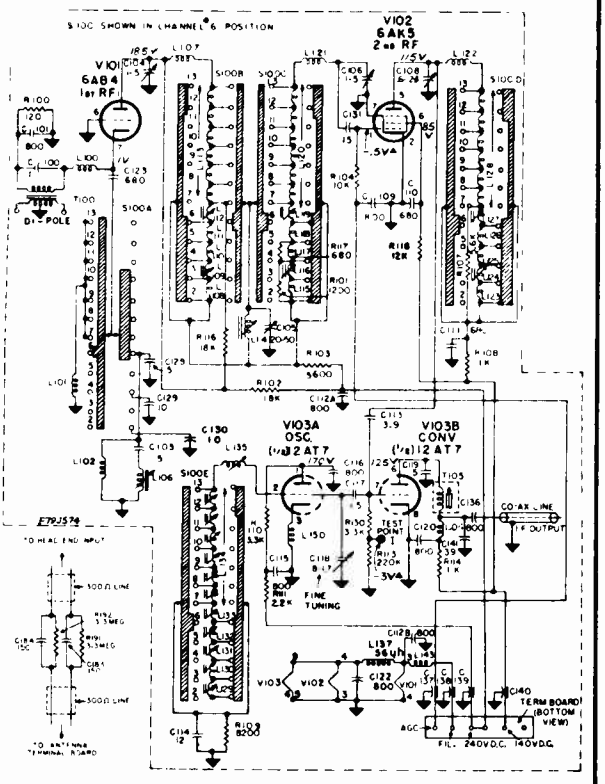
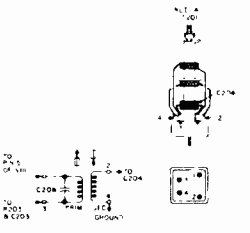
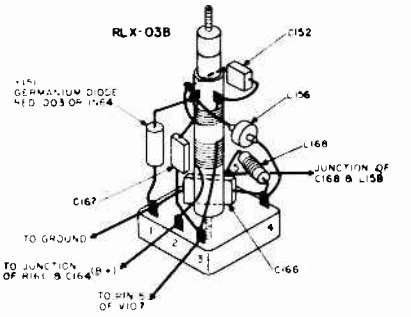


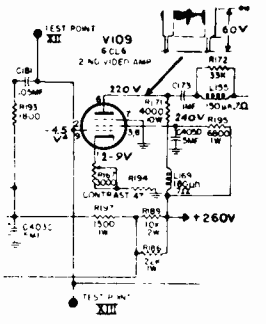
Fig. 29. R-F Tuner, Schematic Diagram

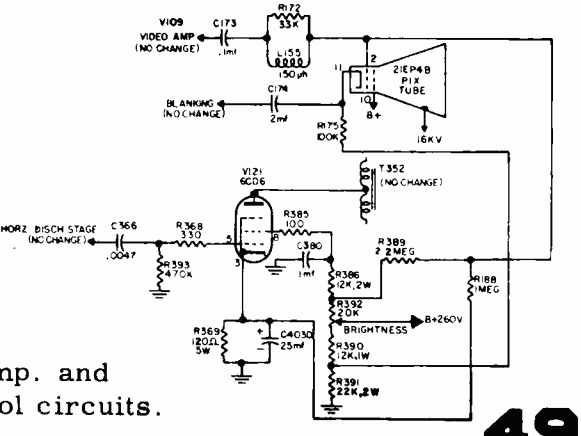


4.5 mc Interstage Transformer Wiring



Video Detector Wiring Diagram





Revised Video Amp. and Brightness Control circuits.

GENERAL ELECTRIC

RECEIVER ALIGNMENT (Cont'd)

AUDIO I-F ALIGNMENT

NOTES:

1. Tune in a television signal. This will provide a 4.5 mc signal source for audio alignment. Keep the Volume control turned down unless the speaker is connected.

2. Figure 21 shows a simple resistor network needed for the alignment of T202 secondary. These two 100K resistors should be chosen as accurately as possible, for equal resistance. Be sure to remove these resistors after completing the alignment. Align as follows:

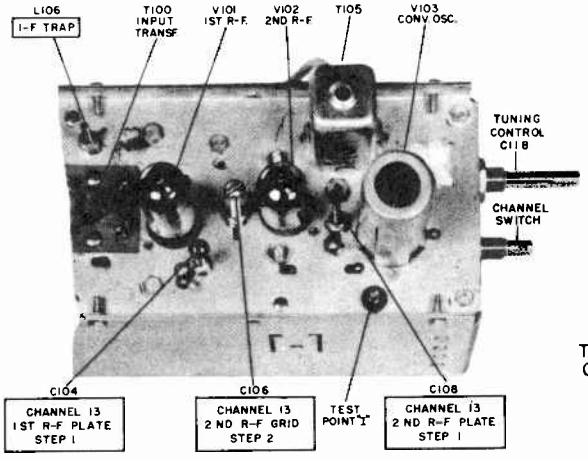


Fig. 18. R-F Tuner Adjustment, Top View

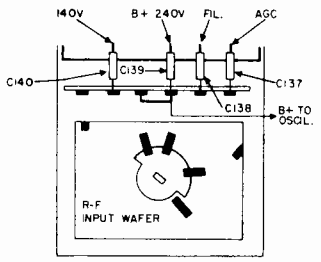


Fig. 19. R-F Tuner Terminal Board

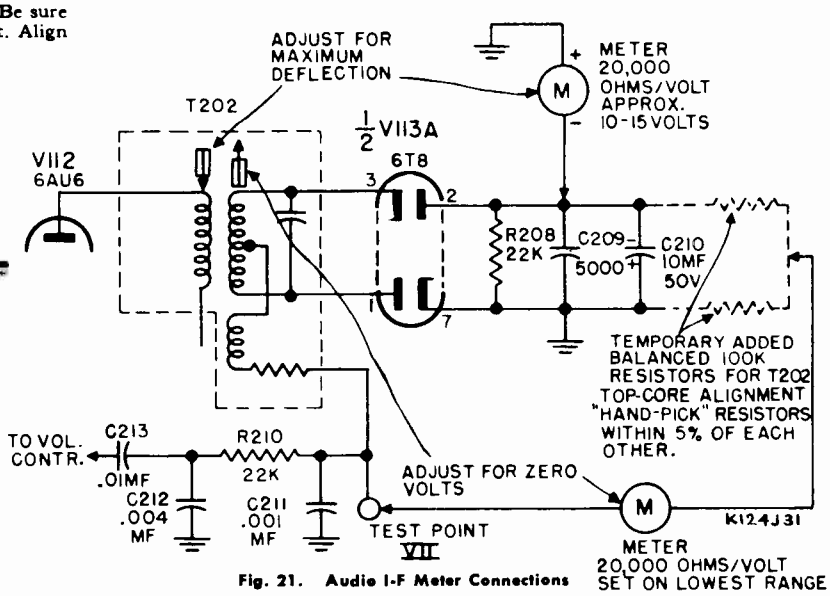


Fig. 21. Audio I-F Meter Connections

AUDIO I-F ALIGNMENT CHART

STEP	CONNECT VTVM OR 20,000 OHMS/VOLTMETER	ADJUST	METER INDICATION	REMARKS
1	To test point VI and chassis.	L157 and T201 (top and bottom cores).	Adjust for maximum deflection.	Voltage to be read is negative with respect to chassis.
2	V113A, pin 2 and chassis.	T202 primary (bottom core).		
3	Test Point VII and center of two 100K resistors. See Fig. 21.	T202 secondary (top core).	Adjust for zero volts d-c output.	Repeat steps 1, 2 and 3 to assure proper final adjustment.

L106 TRAP ADJUSTMENT

ALIGNMENT OF L106 I-F TRAP

The trap, L106 (Fig. 18) is incorporated in the r-f tuner to remove or attenuate any interfering frequency in the i-f range. The trap should be aligned by tuning for minimum i-f channel interference pattern on the screen. If the interference is intermittent and the interfering frequency is known, L106 may also be aligned by the use of a calibrated signal generator.

NOTES:

1. Connect 3 volts bias from the AGC line on the r-f tuner (see Fig. 19) to chassis with the positive terminal of the battery connected to chassis.

2. Use an accurate marker generator to furnish a signal of the same frequency as the interfering frequency and a sweep generator with its center frequency set approximately at the interference frequency. Connect the scope to view the response curve at the output of the video detector.

3. Use the GE-ST-8A balanced adapter and a 3-foot piece of 300-ohm transmission line to couple the r-f sweep to the antenna terminals of the receiver.

4. Be sure not to tune the trap so that it will attenuate channel No. 2.

L106 ALIGNMENT CHART

Marker Frequency	Sweep Frequencies and Input Point	Observe Response Curve at	Channel Switch Setting	Adjust
Interference frequency	40 to 50 mc to antenna terminals	Test Point IV	2	Core of L106 for minimum amplitude of curve at marker

RECEIVER ALIGNMENT (Cont'd)

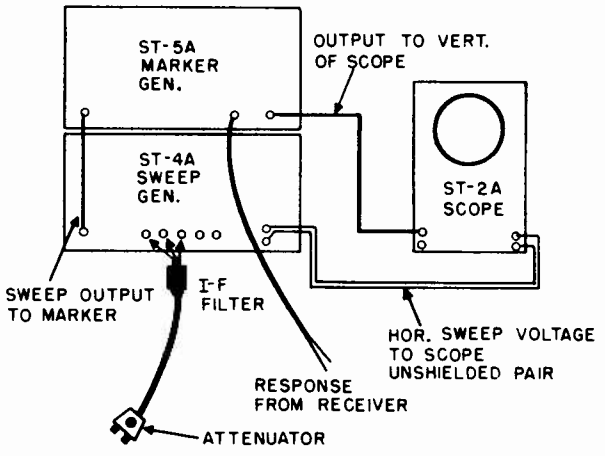


Fig. 15. I-F Sweep Equipment Connection Diagram

VIDEO I-F ALIGNMENT

Introduction:

The following alignment data is divided into two separate procedures. Because of the extremely high adjacent channel trap attenuation, the conventional method of sweep observation of these traps becomes difficult.

The second portion of this procedure involves the shaping of the i-f response curve in the conventional manner by the application of a sweep generator signal. During this procedure, observe the usual precautions regarding warm-up time, equipment cable lead dress and generator output cable termination, see Fig. 15.

TRAP ALIGNMENT

In many cases, the technician will have a suitable AM signal generator available. It should cover the range of 37 to 48 megacycles at fundamental frequency, with available internal 400-cycle modulation. When this type of signal is used, the traps should be adjusted for minimum 400-cycle signal as observed on the oscilloscope.

Owners of General Electric sweep alignment equipment may obtain the required amplitude-modulated carrier frequencies by a simple manipulation of the equipment controls as noted below.

Those technicians who do not have either of the above equipment available are advised to omit the trap alignment procedure. With the exception of the video amplifier 4.5 mc trap L160, the traps will not become seriously mis-aligned due to tube changes. The above-mentioned 4.5 mc trap may be sweep-aligned, if desired, in which case a 4.5 mc sweep signal should be used in step 2, of trap alignment chart.

Obtaining AM Output from G-E Sweep Equipment

The General Electric ST-4A Sweep Generator will provide 60-cycle square-wave amplitude-modulated signal. To obtain this signal proceed as follows:

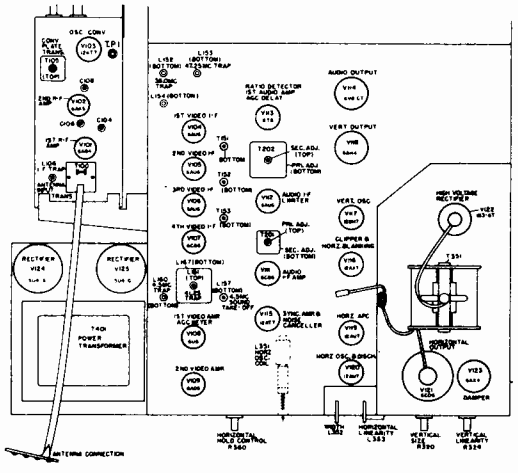


Fig. 22. Tube and Trimmer Locations

1. Turn the sweep generator sweep width control fully counterclockwise. This will provide a steady (zero sweep) carrier.
2. Turn the sweep generator blanking switch "on." This will square-wave-modulate the carrier at a 60-cycle rate.
3. The next step is to calibrate the frequency of this AM carrier.

a. Turn the marker generator "on" and set the dial to the desired frequency (4.5 mc, 38.0 mc, 41.25 mc or 47.25 mc).

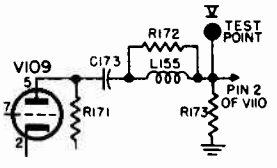
b. Slowly tune the sweep generator through the desired frequency. As the desired frequency is approached, a strong beat signal will be observed on the oscilloscope. At *exact* resonance, a zero beat condition will be noticed, on each side of which will appear a beat pattern. Minor sweep generator back-and-forth frequency drift may be noted. However, this drift is insignificant and may be disregarded.

c. Turn off the marker output.

4. Apply this AM signal according to the instructions in the chart on page 52.
5. The signal observed on the oscilloscope appears as two parallel lines. When the traps are properly tuned the distance between these lines will be at a minimum. NOTE: It may be necessary to use full output of the sweep generator and near maximum oscilloscope gain to observe proper trap tuning.

ALIGNMENT NOTES:

1. Remove V121 plate cap. Temporarily connect a 2500-ohm, 25-watt resistor from B+ 260 V to Chassis.
2. Remove tube V115 from its socket.
3. Turn the Volume control to minimum and the Picture Contrast control to maximum. Turn the Brightness control fully counterclockwise.
4. Set Channel Selector to channel 11 position. Set the Fine Tuning control to its maximum counterclockwise position.
5. Connect oscilloscope to test point V (picture tube grid).
6. Allow receiver and test equipment to warm up for 15 minutes. Refer to Fig. 22 for alignment adjustments location.



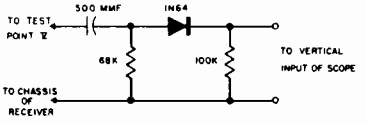


Fig. 23. Detector Network

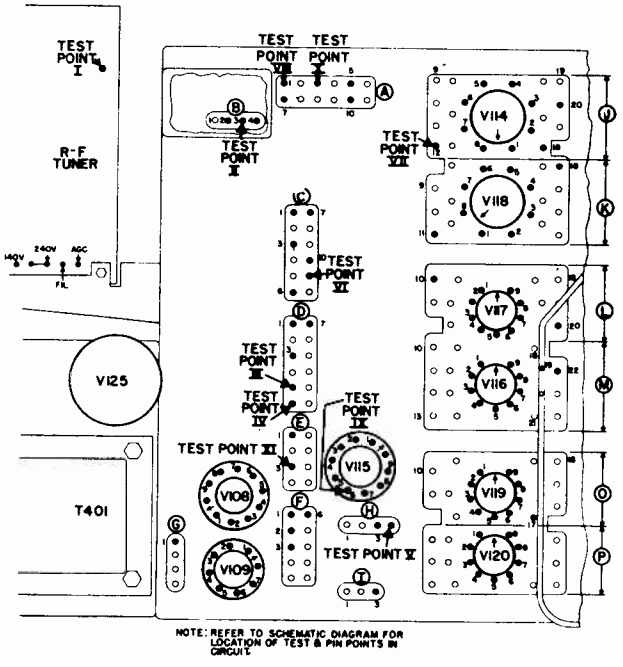


Fig. 27. Test Point Diagram

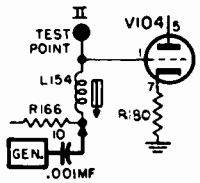
GENERAL ELECTRIC

RECEIVER ALIGNMENT (Cont'd)

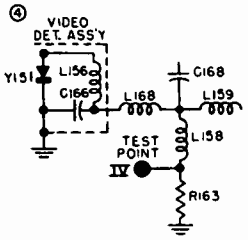
TRAP ALIGNMENT CHART

STEP	AM—GENERATOR INPUT POINT	AM—GENERATOR FREQUENCY	ADJUST FOR MINIMUM OUTPUT	REMARKS
1	Through .001 mf capacitor to junction of R166 and L154; connect generator cable shield to receiver chassis (see figure below)	41.25 mc	L151	May require maximum oscilloscope vertical gain.
		47.25 mc	L153	
		38.0 mc	L152	
2	Test Point IV (Diode Load) (see figure below)	4.5 mc	L160	Connect detector network between oscilloscope input and receiver test point V as shown in Fig. 23. Remove V107 during this step.

Trap Alignment Step 1



Trap Alignment Step 2

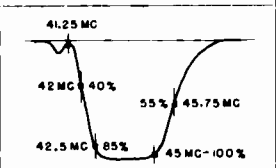
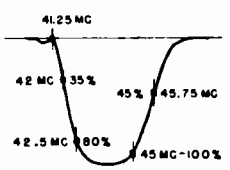


I-F SYSTEM SWEEP ALIGNMENT

GENERAL:—
Now that the traps have been set at their proper frequencies the i-f curve may be shaped.

NOTES:—
1. Turn Picture Contrast control to minimum.
2. Connect oscilloscope to test point III (junction of R164 and R165).
3. Apply a negative 4½-volt battery bias voltage to test point VIII. Connect positive lead of battery to chassis.
4. Calibrate the vertical gain of the oscilloscope to provide a 2-inch deflection with applied signal, 1¾ volts peak-to-peak.
5. Note that the following procedure uses 45.0 mc as the 100% reference point. Maintain the sweep generator output so that the baseline-to-45.0 mc marker amplitude equals 2 inches. Align as indicated in the alignment chart below.

I-F ALIGNMENT CHART

STEP	CONNECT SWEEP GENERATOR	ADJUST	DESIRED RESPONSE	REMARKS
1	Into Test Point II and chassis through .001 mf capacitor. Center sweep frequency approx. 44.0 mc. Sweep width approx. 10 mc.	T151 for proper 42.0 mc response. T153 for proper 45.75 mc response. T152 & L167 for zero "tilt" and maximum gain without "saddle-back."		Make indicated adjustments to obtain maximum gain consistent with proper curve. Corners of curve peak must show slight rounding. Peak of curve may extend 10% (max.) beyond 45.0 mc marker.
2	Into Test Point I and chassis through .001 mf capacitor. Center sweep frequency approx. 44.0 mc. Sweep width approx. 10 mc.	L154 and T105 (R-F Tuner) for maximum gain and proper marker position.		Obtain maximum gain and proper marker positions. Peak of curve should extend 15% beyond 45.0 mc marker, with slight rounding.
3	Into R-F Tuner input through balanced adapter and 300-ohm pad and line. Sweep channels 2–13. Sweep width approx. 10 mc.	C108 (R-F Tuner)	Align for zero "tilt" on ch. 10. Check chs. 7–13 and make further compromise adjustment so that each channel will have no more than ±20% "tilt" with the Fine Tuning adjusted to provide the proper sound and picture i-f markers.	
4		L124 & L127 (R-F Tuner)	Align for zero "tilt" on channels 3 and 5. Check chs. 2–6 and make further compromise adjustment, so that each channel will have no more than ±20% "tilt" with the Fine Tuning adjusted to provide the proper sound and picture i-f markers.	

hallicrafters

A1400D	B1400D	C1400D	D1400D
21" UHF/VHF	21" VHF	24" or 27" UHF/VHF	24" or 27" VHF

CHASSIS IDENTIFICATION

The first two digits of the model number indicates the picture tube size while the last letter indicates the cabinet finish. A mahogany cabinet has an M suffix while a blonde cabinet has a B suffix.

CHASSIS NO.	MODELS CHASSIS MAY BE USED IN
A1400D	21K201B, 21K211M, 21K221B, 21K231M
B1400D	21K200B, 21K210M, 21K220B, 21K230M
C1400D	24K241M, 24K241B, 27K251M, 27K251B
D1400D	24K240M, 24K240B, 27K250M, 27K250B

The circuit of B1400D chassis is printed on pages 54-55. Chassis A1400D also uses a 21" picture tube and is practically the same as the B1400D except that provisions are included for UHF reception. Chassis C1400D and D1400D use either 24" or 27" picture tubes and are very similar to 21" chassis. The I.F. chassis are practically identical and the circuit differences will be found in the deflection circuits where circuit changes were required in order to obtain higher deflection voltages for the 24 and 27-inch picture tubes and also a higher second anode voltage. The alignment information applies to all 1400D chassis. This service material is continued through page 58.

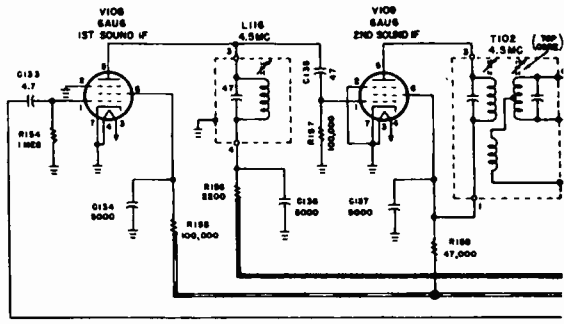
POWER SUPPLY & I. F. CHASSIS - The Hallicrafters 1400D series television chassis are composed of two basic chassis which are bolted together by means of a single bracket in the rear and the dial support bracket in the front. One chassis contains the VHF tuner, the UHF tuner and cascode i-f amplifier if the chassis has UHF provisions, all four i-f stages and the video detector, sound i-f amplifiers, ratio detector and two audio stages, AGC tube, video amplifier, and sync clipper stage. This chassis will be referred to in this service manual as the I.F. CHASSIS.

The other chassis contains two rectifiers in a transformer type power supply for both chassis. Two 5U4G tubes are used in a full wave rectifier circuit. This chassis also contains an additional stage of sync clipping, the vertical oscillator and output stages, horizontal AFC tube, horizontal oscillator and output stages, damper tube, and high voltage rectifier. This chassis will be referred to in this service manual as the POWER SUPPLY CHASSIS.

The two chassis are connected together electrically by a nine pin plug and socket, a three pin plug and socket, and a single shielded plug and socket. The nine pin plug and socket is used primarily for supplying the I.F. CHASSIS with 150, 270, heater and bootstrap voltages. One pin is used for feeding the brightness and the retrace blanking voltages to the grid of the picture tube and one is used for feeding the sync signal from the sync clipper stage in the i-f chassis to the sync clipper stage in the power supply chassis. The three pin plug and socket is used for feeding the output from the ratio detector to the volume control, which is mounted in the power supply chassis, and then back to the audio amplifier stages in the i-f chassis. The single shielded plug is used to feed the pulse from the horizontal output transformer to the plate circuit of the AGC tube.

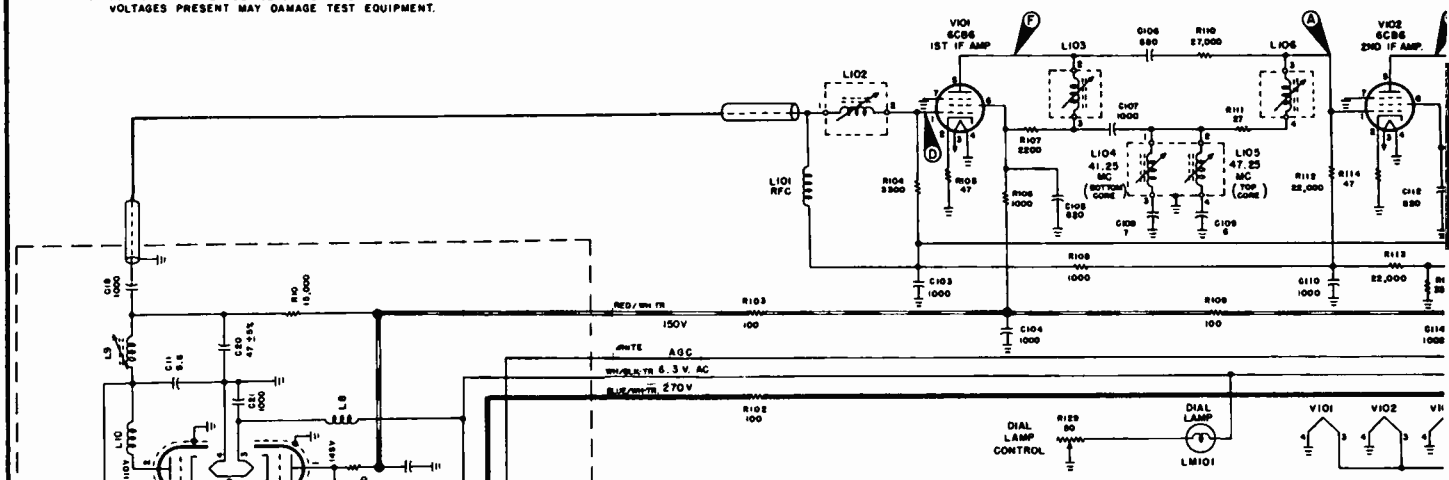
HALLICRAFTERS 1400 Series

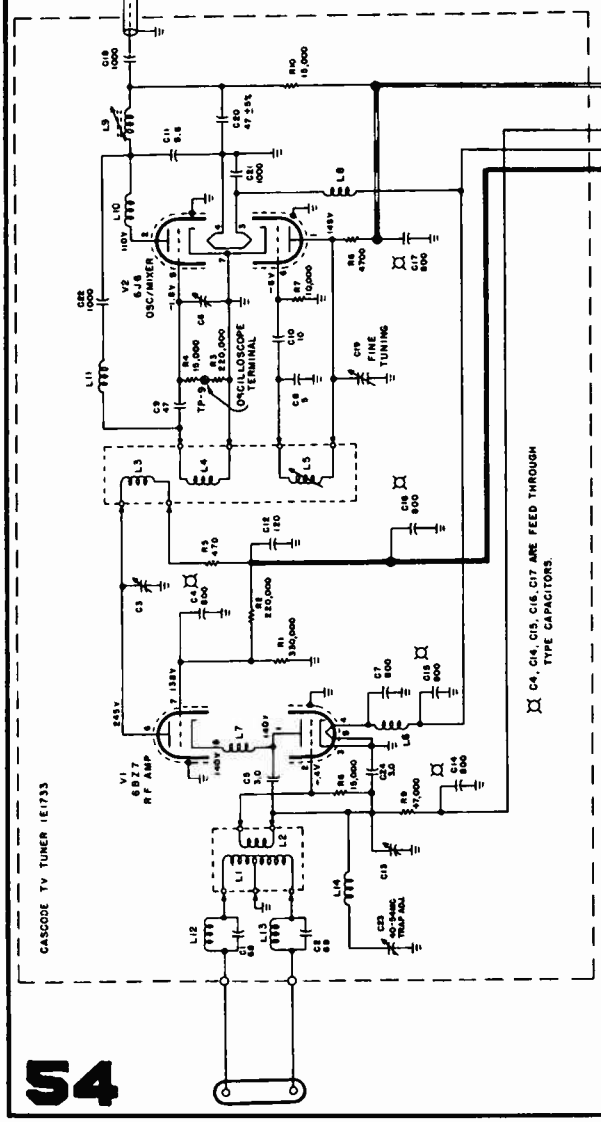
VHF
21" CHASSIS
B1400D
RUN 1

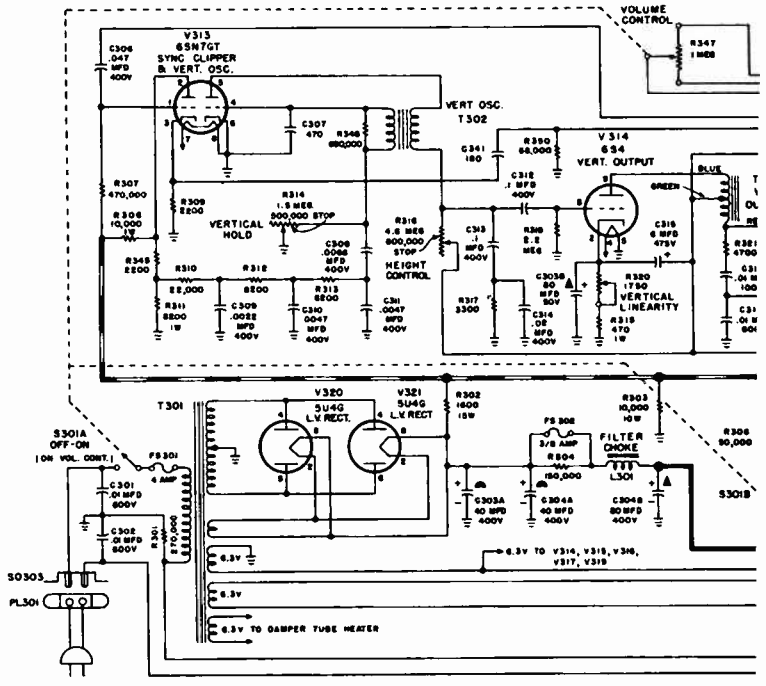


NOTES

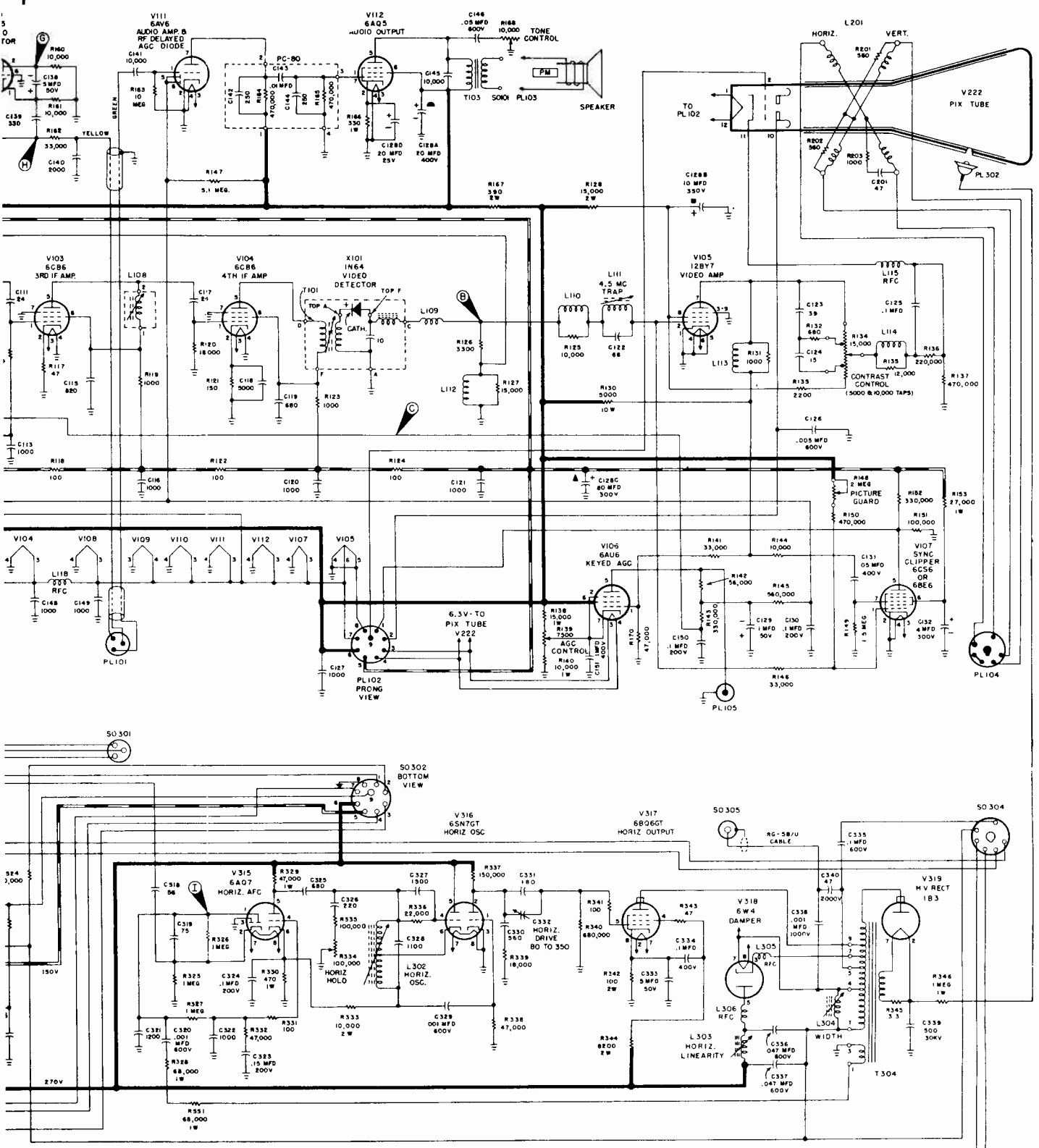
1. CAPACITOR VALUES ARE IN MMF AND HAVE 500V RATING UNLESS OTHERWISE SPECIFIED.
2. RESISTOR VALUES ARE IN OHMS AND HAVE 1/2 WATT RATING UNLESS OTHERWISE SPECIFIED.
3. 275 VOLT B+ LEADS SHOWN IN HEAVY SOLID LINES.
4. 150 VOLT B+ LEADS SHOWN IN HEAVY BROKEN LINES.
5. DO NOT MEASURE VOLTAGE ON PLATE OF V317. PEAK VOLTAGES PRESENT MAY DAMAGE TEST EQUIPMENT.







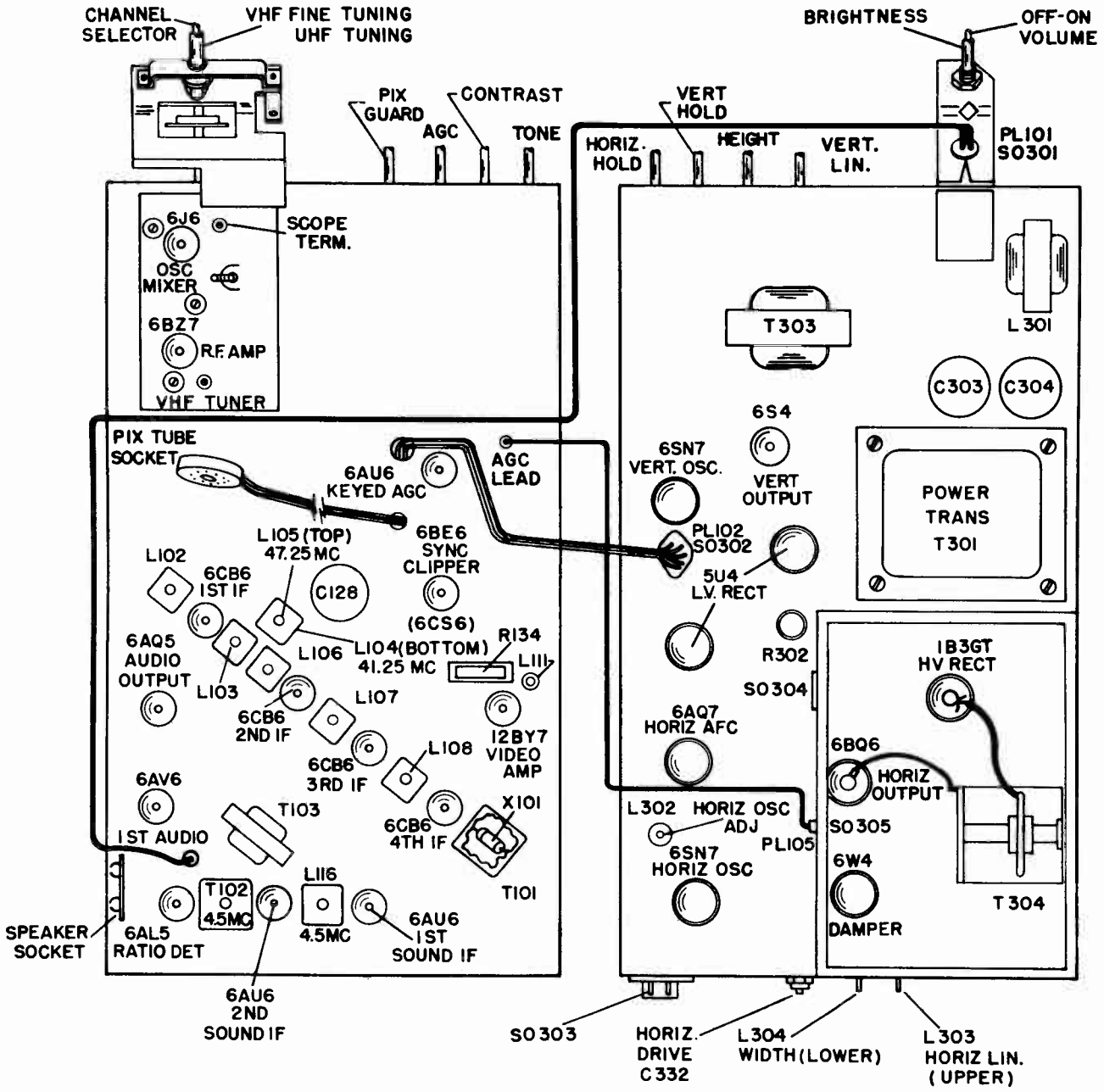
HALLICRAFTERS 1400 Series, continued



HALLICRAFTERS 1400 Series, continued

HORIZONTAL OSCILLATOR ADJUSTMENT

1. Turn the channel selector to the strongest station that can be received and tune it for the best possible picture.
2. Connect the d.c. test probe of a zero center scale vacuum tube voltmeter to test point (I) (V-315 pin 1).
3. Set the horizontal hold control (R-334) in the center of the range over which it may be rotated.
4. Adjust the horizontal oscillator coil (L-302) adjustment screw until the picture is in sync and a zero d.c. voltage is indicated by the vacuum tube voltmeter.



The UHF tuner and cascode amplifier will be found only in combination VHF/UHF chassis.

Fig. 617A. Alignment Adjustment Points for all 1400D Chassis

HALLICRAFTERS 1400 Series, continued

4.5 MC TRAP ADJUSTMENT & FM SOUND CHANNEL ALIGNMENT

EQUIPMENT REQUIRED

1. Signal generator capable of delivering approximately a 1 volt unmodulated signal between 4 and 5 megacycles.
2. Vacuum tube voltmeter (VTVM).
3. Test circuit shown in Fig. 616A.

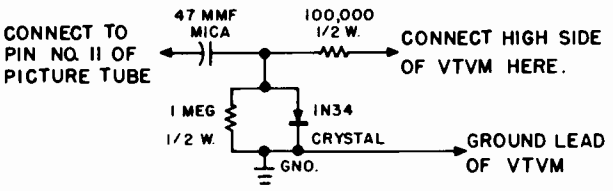


Fig. 616A. Test Circuit for Trap Adjustment

PROCEDURE

1. Disconnect the 1N64 video detector diode from terminal (F) in the top of T-101. CAUTION - Crystal diodes are very easily damaged by excessive heat. Hold the lead between the diode and the terminal with a pair of pliers to help dissipate heat when removing the solder connection to terminal (F).
2. Connect the hot lead from the signal generator to terminal (F) from which the diode was disconnected. A 3300 ohm resistor should be connected in series with the generator lead and terminal (F). Set the generator to 4.5 MC.
3. Connect the detector circuit shown in Fig. 616A. to pin 11 (yellow wire) of the picture tube.
4. Adjust the generator output (unmodulated) to give a 1 volt reading on the VTVM.
5. Adjust the 4.5 MC trap (L-111) in the video amplifier grid circuit for a minimum VTVM reading. Use the setting nearest the outer limit of the adjusting screw. Increase the output of the generator as required to maintain a usable VTVM reading.
6. Remove the detector circuit and connect the VTVM to terminal (G) (V-110 plate pin 2).
7. Adjust L-116 and the bottom core of T-102 at 4.5 MC for a maximum VTVM reading.
8. Connect the VTVM to test terminal (H) shown in the schematic diagram. Adjust the secondary of T-102 (top core) at 4.5 MC for the zero reading which occurs between the positive and negative peaks. If the zero reading occurs at more than one setting, use the position nearest the top limit of the core.
9. Shift the signal generator an equal amount on either side of 4.5 MC and touch up the primary of T-102 (bottom core) for approximately equal peaks. Use just enough signal output to obtain one volt peaks for best results.

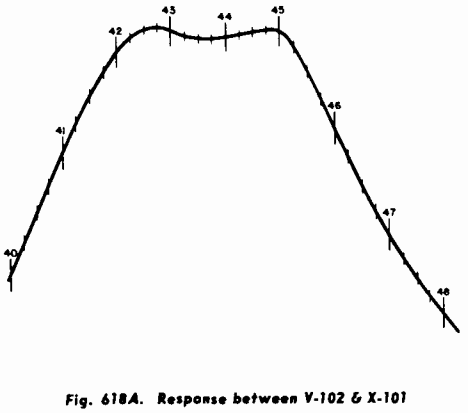


Fig. 618A. Response between V-102 & X-101

Fig. 618D. Response Between VHF Tuner & V-101

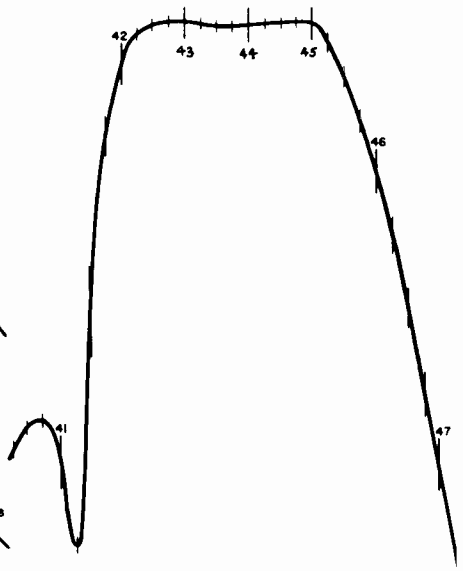


Fig. 618B. Overall I-F Response Curve

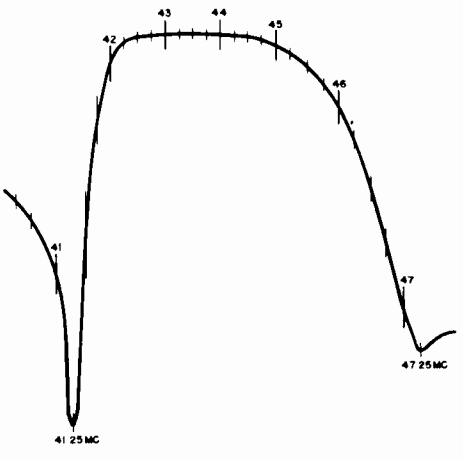


Fig. 618C. Response Between V-101 & V-102

HALLICRAFTERS 1400 Series, continued

I-F AMPLIFIER ALIGNMENT FOR 1400D CHASSIS

EQUIPMENT REQUIRED

Sweep Generator _____ RCA type WR-59B or equiv.

Marker Generator_____ RCA type WR-39C Television Calibrator or equivalent.

Oscilloscope _____ RCA type WO-56A or equiv.

VTVM _____ RCA type WV-97A vacuum tube voltmeter or equiv.

Detector Circuit _____ Shown in Fig. 619A.

Bias Source _____ 3 volt battery or equiv.

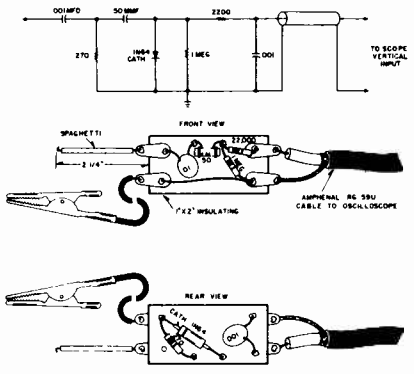


Fig. 619A. Detector Circuit

PROCEDURE

1. Connect the hot lead from the sweep generator to point (A) (grid of the second i-f amplifier, V-102) through a .005 mfd. capacitor. Connect the ground lead from the generator to the receiver chassis.

2. Connect the vertical input terminal on the oscilloscope through a 47,000 ohm 1/2 watt resistor to point (B) in the video detector circuit.

3. Connect the oscilloscope terminals on the sweep generator to the horizontal input of the oscilloscope and adjust the gain for the desired test pattern width.

4. Connect the negative side of the 3 volt bias supply to the AGC bus at point (C) through a 1000 ohm isolating resistor. Connect the positive side of the bias supply to the receiver chassis.

5. Adjust T-101, L-108, and L-107 (See Fig. 617A) until the pattern shown in Fig. 618A is obtained. A marker generator loosely coupled to the hot lead from the sweep generator may be used to locate the 50% points which should fall at 41 MC and 46 MC as shown. Adjust for maximum gain and a flat topped response with the 41 and 46 MC points down 50% on the skirt of the response curve. Keep the output of the generators low so as to prevent overloading of the i-f system of the receiver.

6. Disconnect the sweep and marker generators from point (A) and reconnect to point (D) (V-101 grid pin 1).

7. Connect the hot lead for the vertical amplifier in the oscilloscope to point (E) (V-102 grid pin 1) through the detector circuit shown in Fig. 619A.

8. Adjust L-103, L-104, L-105, and L-306 for the response curve shown in Fig. 618C. The 41.25 MC and 47.25 MC sound traps, L-104 and L-105, must be carefully adjusted for a minimum response on the exact frequencies specified.

9. Disconnect the detector circuit and oscilloscope lead from test point (E) and reconnect to test point (F)

10. Raise the shield for the oscillator mixer tube in the VHF tuner above the ground clips that hold it in place and connect the hot lead from the signal generator to it. Loosely couple the hot lead from the marker generator to the sweep generator lead.

11. Adjust L-9 (in the VHF tuner) and L-102 for the response curve shown in Fig. 618D.

12. Repeat steps 6 and 2 which will give an overall response curve.

13. Touch-up the adjustments for L-107, L-108, and T-101 for a flat topped response curve with maximum gain and the band width shown in Fig. 618B. L-107 will have more effect on the high frequency side of the response curve and L-108 will have more effect on the low side. Transformer T-101 should be adjusted to control the tilt of the top portion of the curve. DO NOT change the settings of L-103, L-104, L-105, and L-106. Their adjustment was completed in step 8.

Hoffman
SERVICE DATA
TELEVISION CHASSIS
300-17 & 300-21

CHASSIS 300-17
MODELS 7M140, 7B141

CHASSIS 300-21
MODELS 21M143, 21B144, 21P145, 21M317, 21B318, 21M718, 21B719, 21P720

Chassis incorporating the "All-Wave Tuner" can be identified by a "U" following the model number. (Example 7M140U)

The 300 chassis and its complete model assembly is designed to facilitate receiver servicing. The chassis is mounted in a horizontal position within the cabinet. It is held in position within the cabinet by four bolts which thread into four mounting brackets located at the corners of the chassis. The four bolts are inserted from below the mounting shelf in the cabinet. Removal of the backboard exposes the top of the chassis. The removal of two screws from the bottom rear of the high voltage cage allows the back and top of the cage to be rotated away for servicing inside of the cage. The bottom of the chassis is made accessible by removing the bottom cover board which is held in place by several wood screws.

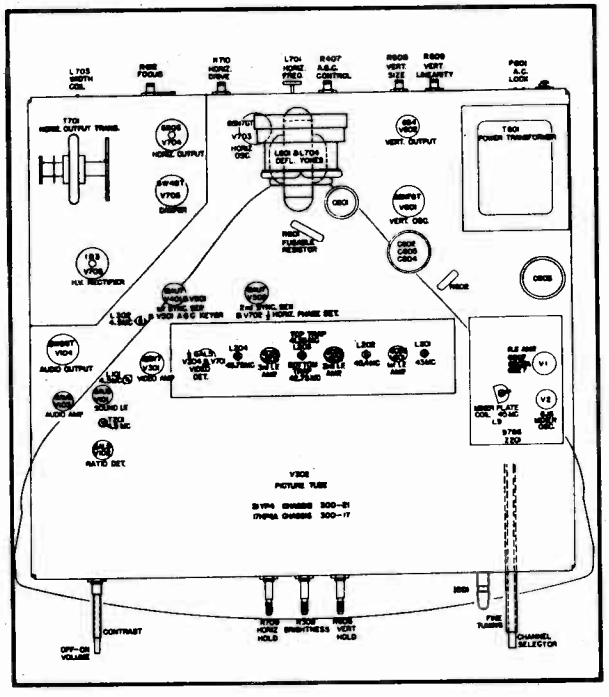


Figure 3. Top View Parts Layout

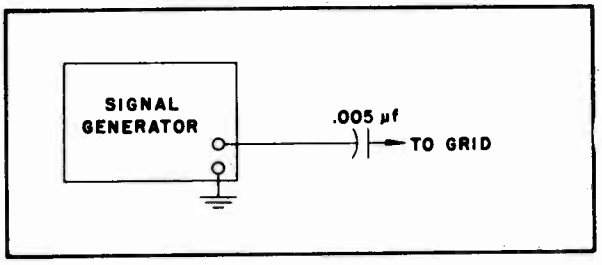


Figure 4. Signal Generator Isolation

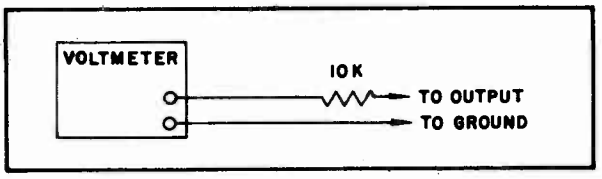


Figure 5. Voltmeter Isolation

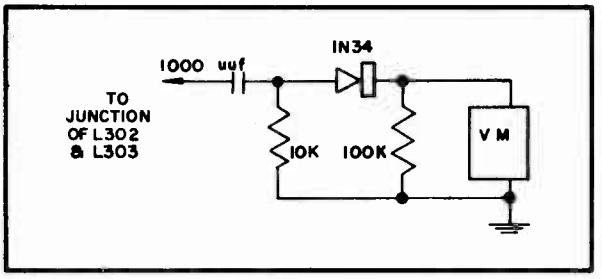


Figure 6. Detector Network

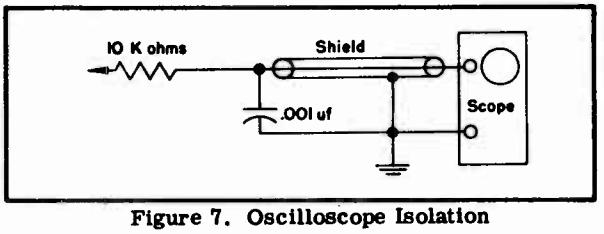


Figure 7. Oscilloscope Isolation

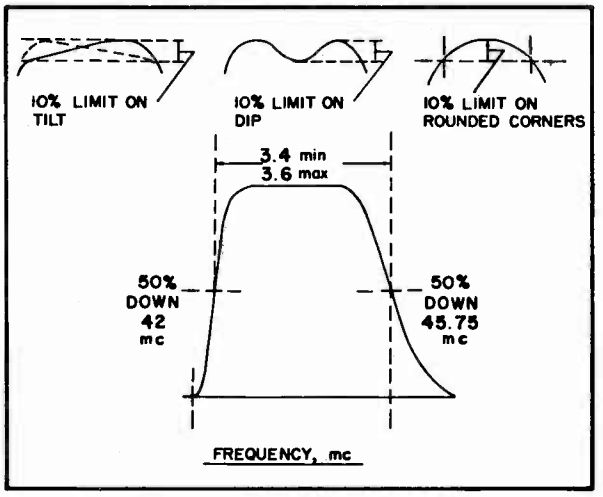


Figure 8. Picture I-F Response Curve

Circuit diagram is on the next two pages.
Alignment continued on the page following.

HOFFMAN Chassis 300-17 & 300-21

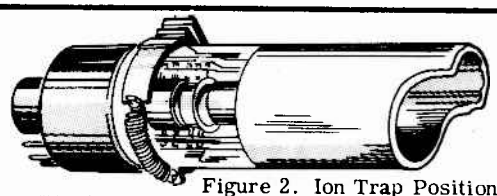


Figure 2. Ion Trap Position

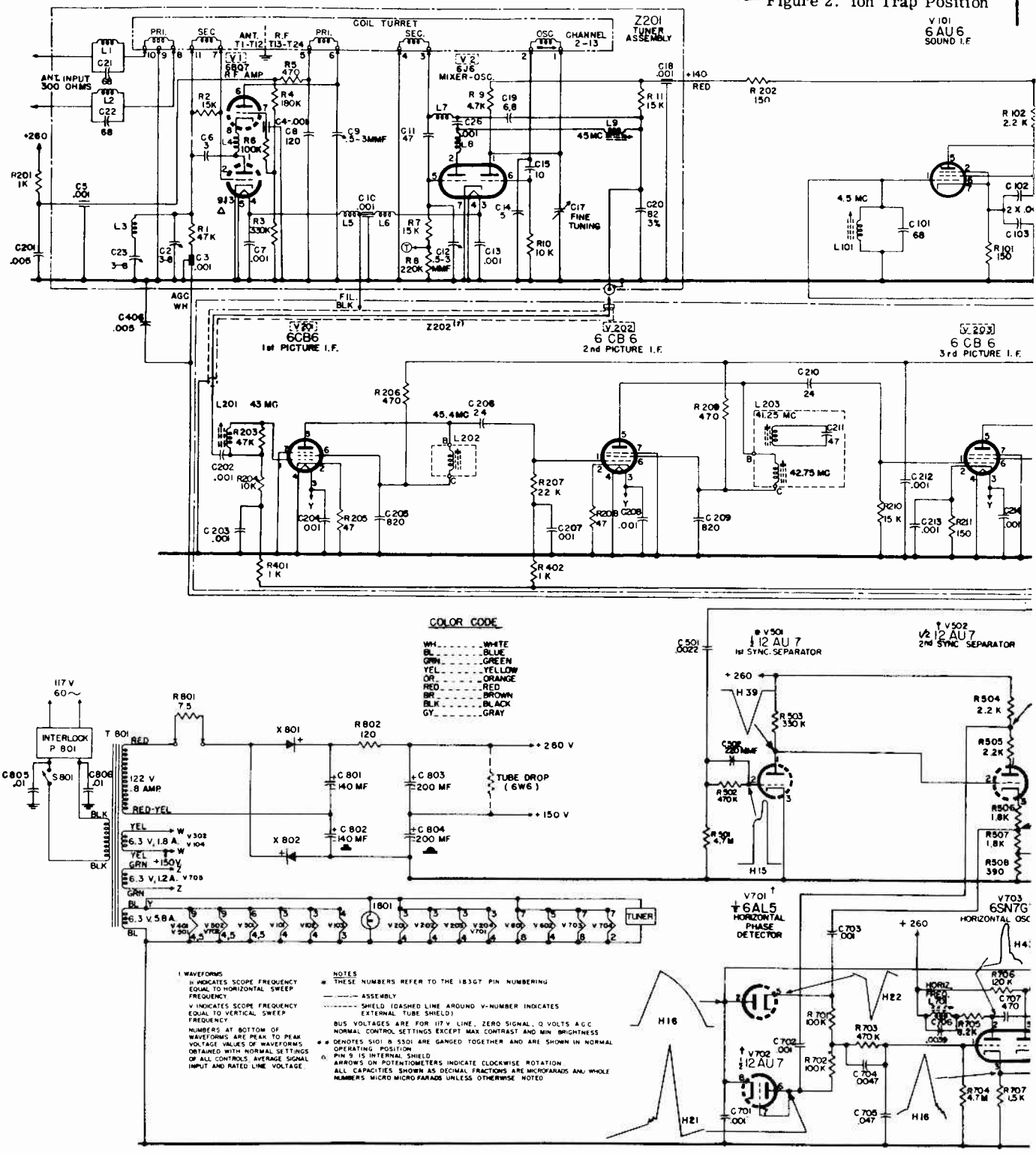
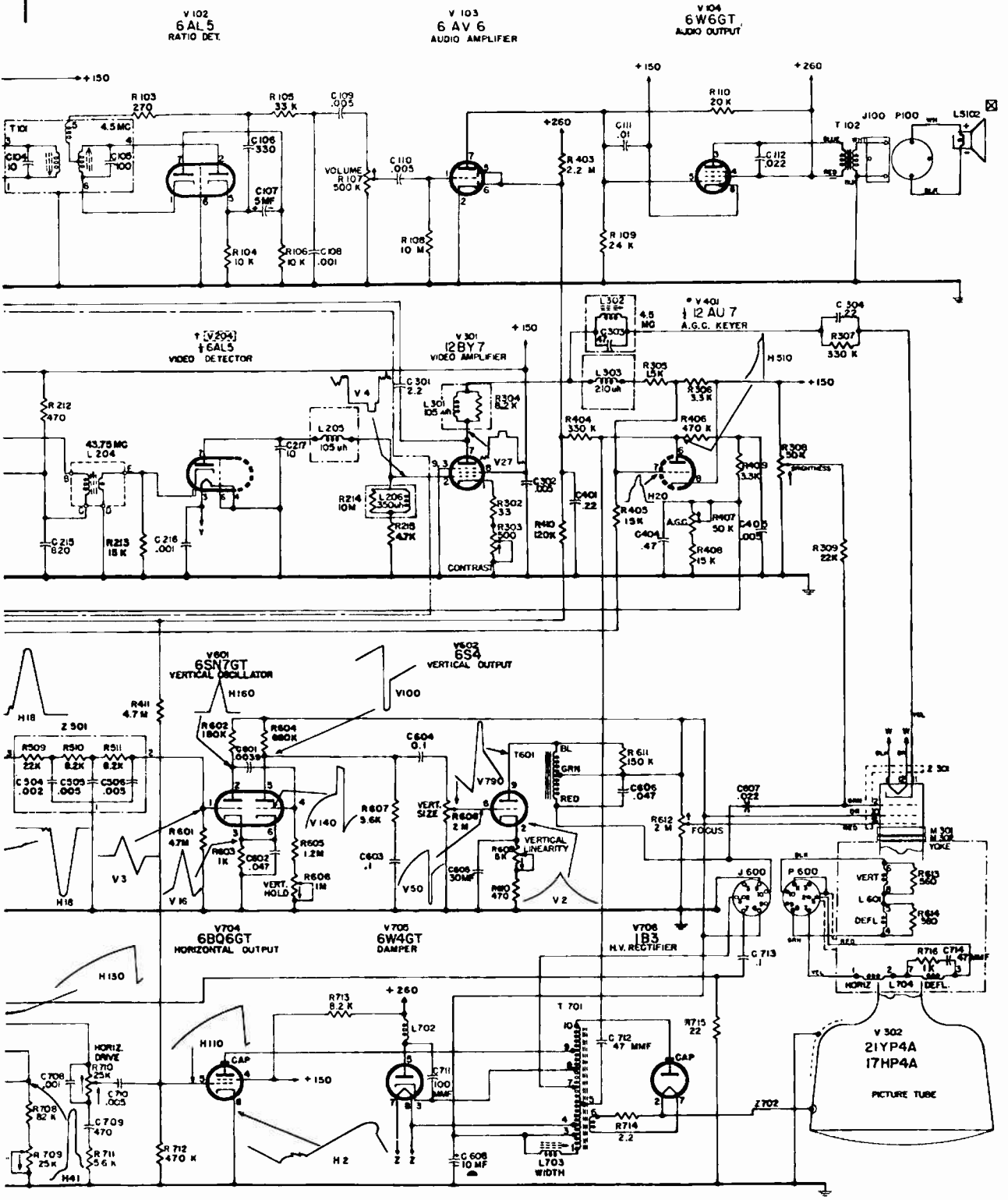


Figure 13. Schematic Diagram for Chassis 300

The source of protection which is provided in the chassis is the fusable resistor, R801. The entire receiver is protected against overloading due to short circuiting that results in excessive input current being drawn by the selenium rectifiers. R801 will open circuits on several times normal load.

HOFFMAN Chassis 300-17 & 300-21



HOFFMAN Chassis 300-17 & 300-21, continued

ALIGNMENT

Before alignment is begun, tune the tuner off-channel by turning the tuner CHANNEL SELECTOR shaft so that the detent roller rests on one of the high points of the drum disc. Bias pin 1 of V704 with -60 volts, in order to eliminate spurious signals and possibility of high voltage shock hazard, or remove high voltage tube.

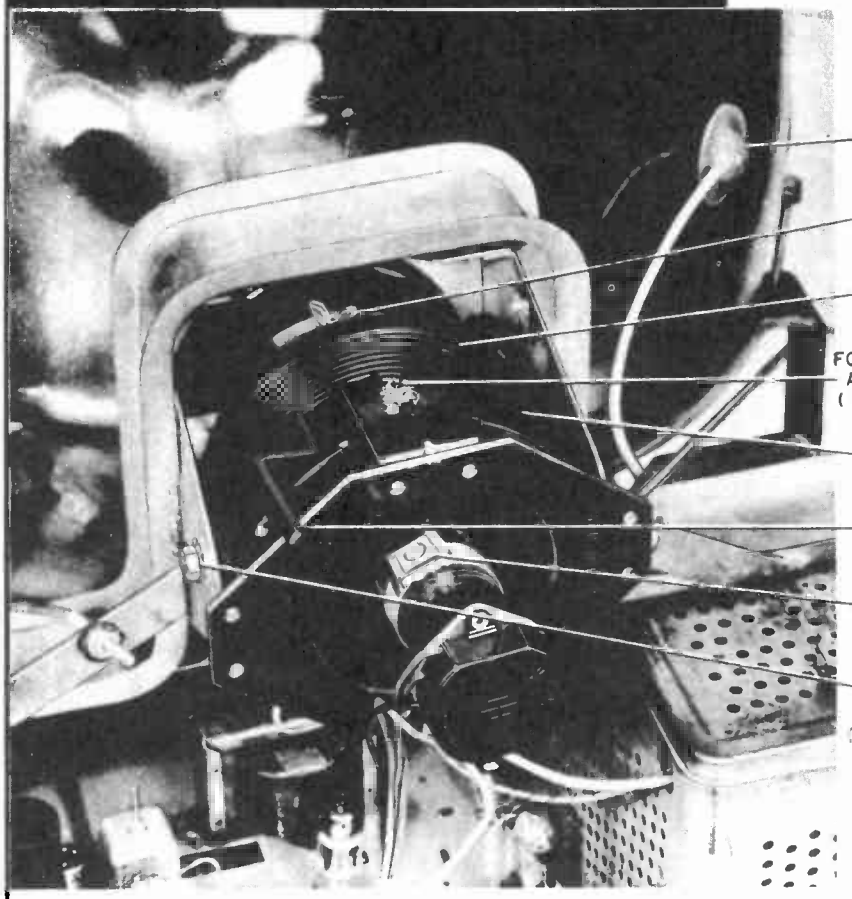
TV ALIGNMENT PROCEDURE

STEP NO.	SIGNAL GENERATOR FREQUENCY, MC	CONNECT SIGNAL TO	OUTPUT INDICATOR	ADJUST	INSTRUCTIONS	SPECIAL CONNECTIONS AND SETTINGS
			SOUND I-F AND RATIO DETECTOR			
1	4.5 CW	Pin 2 of V301	Meter across pin 7 of V102 and ground.	T101 Pri. (bottom) L101	Tune for maximum reading on meter	Signal level should be low enough to obtain approximately 4 to 7 volts on meter. Use isolation networks shown in Figures 4 and 5.
2	4.5 CW	"	Meter across ground and junction of R105 and C108.	T101 Sec. (top)	Tune for zero meter reading; use same signal level as in step 1.	Repeat tuning of T101 primary and secondary until adjustments do not change.
			TRAPS AND PICTURE I-F			
3	4.5 CW	Pin 2 of V301	Meter connected through detector network to picture tube cathode lead.	L302	Tune for minimum reading on meter.	Detector and isolating networks shown in Figures 4 and 6.
4	41.25 CW	Mixer grid	Voltmeter across R215.	Top of L203	Tune for minimum reading on meter.	Apply -3V bias to AGC bus. See text for connection to mixer grid. Use isolating resistor between negative voltmeter lead and R213. Keep generator output low. Either bias V704 with A-60 volts or remove tube. Set CONTRAST control for maximum contrast. Adjust signal level throughout I-F alignment so that a 1 volt DC output is maintained across R215.
5	43.75 CW	"	"	L204	Tune for maximum.	
6	42.75 CW	"	"	L203	"	
7	45.4 CW	Mixer grid	"	L202	Tune for maximum reading on meter.	
8	43 CW	"	"	L9	Tune for minimum reading on meter.	
9	43 CW	"	"	L201	Tune for maximum.	
10	45 CW	"	"	L9	Tune for maximum.	
11	Repeat steps 4 through 10 until adjustments do not change.					
12	Approximately 43.5 with 10-mc sweep. Marker required.	Mixer grid	High gain scope across R215	Adjust L202, L203 and L204 if necessary.	Set 45.75 mc marker at 50% point with L202. Eliminate tilt with L204.	See Figure 7 for isolation network. Use markers to determine bandpass between picture carrier and 50% point on opposite skirt. Bandpass should be between 3.4 mc and 3.6 mc. Adjust L9 and L201 only when absolutely necessary.

Motorola TV

CHASSIS
TS-602
TS-602 Y

MODELS
24K1
Y24K1
24K1B
Y24K1B
24K2
Y24K2
24K2B
Y24K2B
24K3
Y24K3
24K3W
Y24K3W
27K2
Y27K2
27K2B
Y27K2B
27K3
Y27K3



Service material below and on the next five pages.

GENERAL INFORMATION

TV CHASSIS DIFFERENCES

Chassis	VHF Tuner	UHF Tuner
TS-602	VTT-42	
TS-602Y	VTT-42Y	TT-37

FUSES - B+ and initial surge; 5 ohm special resistor
Filament - fusing wire; 1" of #26 copper wire

POWER SUPPLY - 117 volts, 60 cycles, AC only

POWER CONSUMPTION - 220 watts

OPERATING CONTROLS

There is a dual control on the right and a triple control on the left of the receiver's front panel. Supplementary controls are located behind a door in the center of the front panel. See Figure 1 for control functions.

ADJUSTMENT OF ION TRAP

NOTE: The ion trap is accessible without removing the cabinet back. The picture tube rear cover is hinged at the top and can be opened by pulling on bottom edge to expose ion trap.

1. Place the magnet on the neck of the tube so that it is positioned over the slash in the gun structure. The slash is the separation between grids #1 and #2.

2. Set the brightness control at low intensity.

3. Move the magnet a short distance forward and backward, at the same time rotating it to obtain the brightest raster.

4. Keep brightness at low intensity until the ion trap is properly set. NOTE: A few precautions to keep in mind while adjusting the ion trap are:

a. If the magnet has to be moved more than 1/2" forward from the slash, the ion trap is probably weak and should be replaced.

b. Never correct for a shadowed raster with the ion trap if such correction results in decreased brightness. The ion trap is always adjusted for maximum brightness and, if shadows occur at this setting, they should be eliminated by adjusting the focus coil or adjusting the yoke.

MOTOROLA, INC.

TELEVISION CHASSIS TS-602

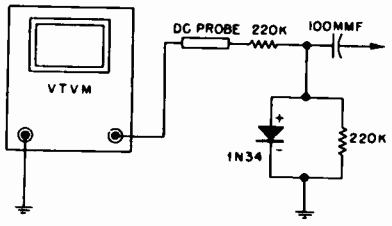
24K1 SERIES

24K2 SERIES

24K3 SERIES

27K2 SERIES

27K3 SERIES



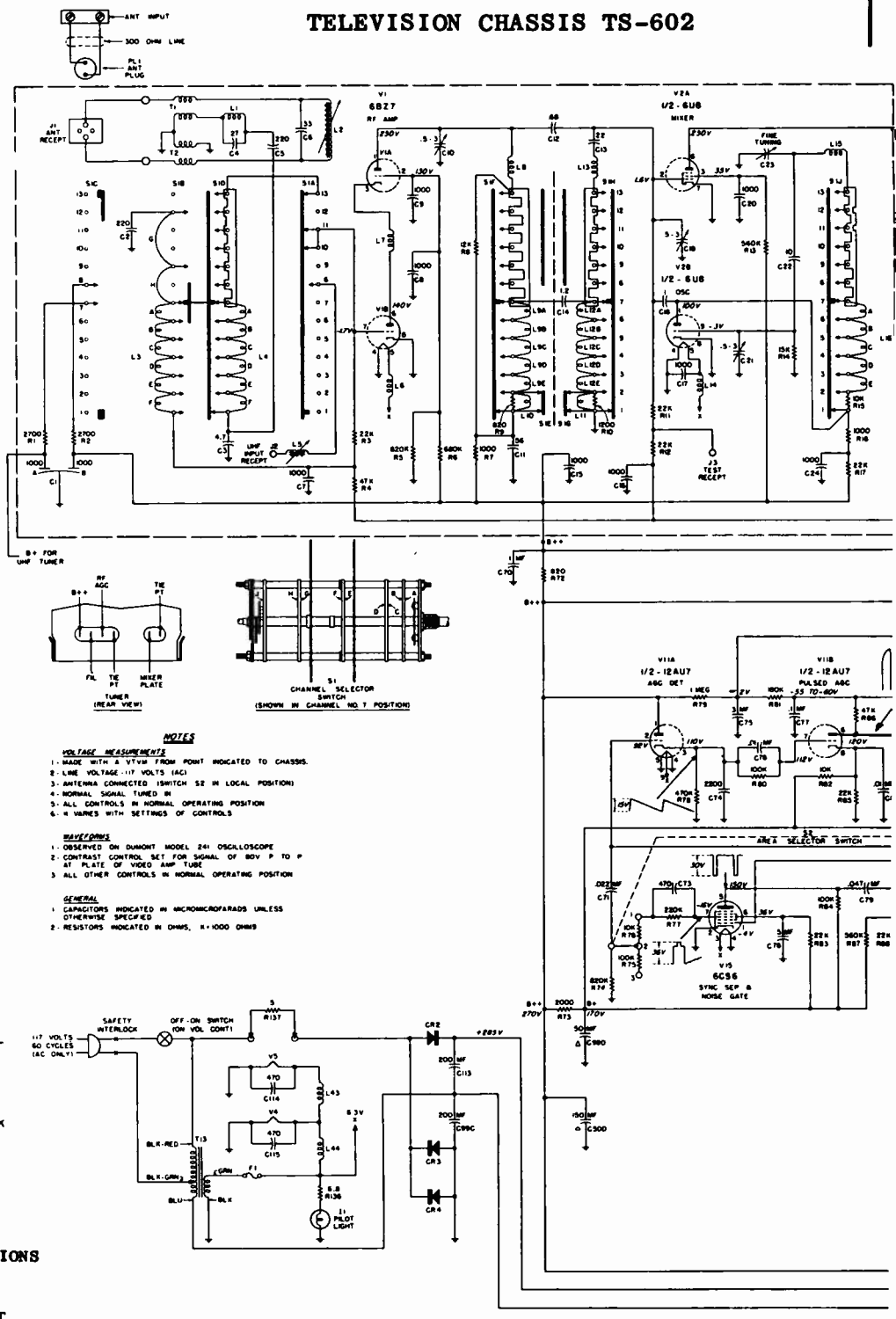


FIGURE 19. CRYSTAL DETECTOR CONNECTIONS

4.5 MC TRAP ALIGNMENT

Equipment Required:

AM Signal Generator: Accurately calibrated at 4.5 mc
DC Meter: Low range electronic voltmeter

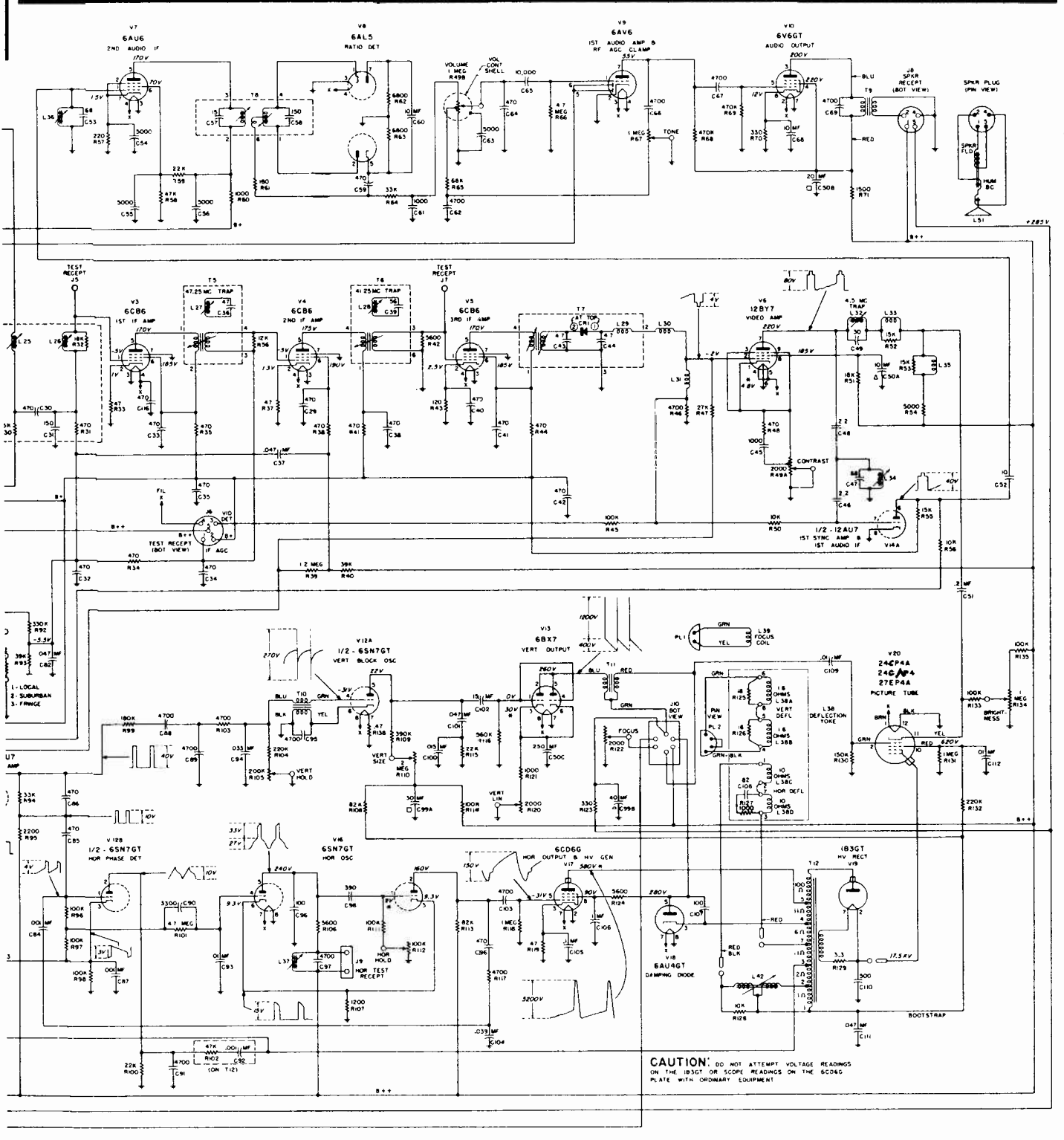
Procedure:

1. Connect the signal generator to top of the 4700 ohm detector load resistor R-46.

2. Set the contrast control for maximum gain (fully clockwise).

3. Connect the voltmeter and a crystal detector, as shown in Figure 19, between the cathode of the picture tube (yellow lead) and chassis.

4. With the signal generator accurately set at 4.5 mc and maximum output, adjust the trap L-32 for a null or minimum reading on the voltmeter.



PICTURE TUBE REMOVAL

1. Remove the mounting board containing the chassis and picture tube from the cabinet by removing the screws holding the board to the cabinet.

2. Remove the picture tube socket, ion trap, and high voltage lead.

3. Loosen the tie rod nuts.

4. Remove the strap retaining screws which hold the picture tube to the front picture tube support bracket.

5. Remove the picture tube with band, and place face up in unused tube carton.

6. Loosen the band clamping nuts and remove band from old tube. DO NOT BEND OR KINK BAND.

Motorola Chassis TS-602

ALIGNMENT

(Continued)

GENERAL

The chassis should be mounted on angle iron brackets so that all connections and adjustments are readily accessible.

Since the power cord circuit is broken by the interlock when the cabinet back is removed, it is necessary to obtain an extra power cord with the female interlock receptacle in order to make a power connection to the receiver. Order Motorola Part No. 30B470756.

It is important that an isolation transformer be used between the receiver and line when any test equipment is attached to the chassis. Due to the full-wave rectifier, there is always a potential difference between the chassis and earth. This precaution is especially important if grounded test equipment is used. NEVER GROUND THE RECEIVER CHASSIS DURING TESTING OPERATIONS OR INSTALLATION UNLESS AN ISOLATION TRANSFORMER IS USED.

For all of the following procedures, the line voltage must be set at 117 volts. If necessary, a variac should be used to obtain the proper line voltage.

ORDER OF ALIGNMENT

A complete receiver alignment can be most conveniently performed in the following order:

1. IF & Mixer Transformers
2. Oscillator & RF Sections
3. IF Trap
4. 4.5 Megacycle Trap
5. Audio Take-Off Interstage Coil and Ratio Detector

IF AMPLIFIER ALIGNMENT

Equipment Required:

IF Sweep Generator meeting the following requirements:

1. 38 to 50 mc approximately 12 mc sweep width.
2. Output constant and adjustable to at least 0.1 volt maximum.
3. Accurately calibrated, adjustable markers

Cathode Ray Oscilloscope - Preferably one with a calibrated attenuator.

AM Signal Generator - Adjustable Output

NOTE: If there are no built-in markers in the sweep generator, loosely couple the output of an accurately calibrated AM signal generator to the IF strip. At all times, keep the marker output low enough to prevent the markers from distorting the response curve.

If a wide band scope is used, the markers will be more distinct if a capacitor of 100 to 1000 mmf is placed across the scope input. Use the smallest size possible, since too large a capacitor will affect the shape of the curve.

NOTE: Caution should be observed that all coils are tuned with slugs tuned away from the center of the coil.

Keep the signal input low, to prevent flattening the top of the curve, due to limiting in the video or scope amplifiers.

The dressing of plate and grid components in the IF circuit affects tuning. Do not move indiscriminately.

Procedure:

1. Remove the horizontal output tube V-17 to eliminate RF interference in the oscilloscope. Place a 2500 ohm 25W resistor from B++ to chassis to normalize the bus voltages.

2. By means of an external battery, apply a voltage to the IF AGC line, so that a negative 3V bias appears at pin 1 of the test receptacle.

3. Attach a scope to pin 3 (video detector output) of the test

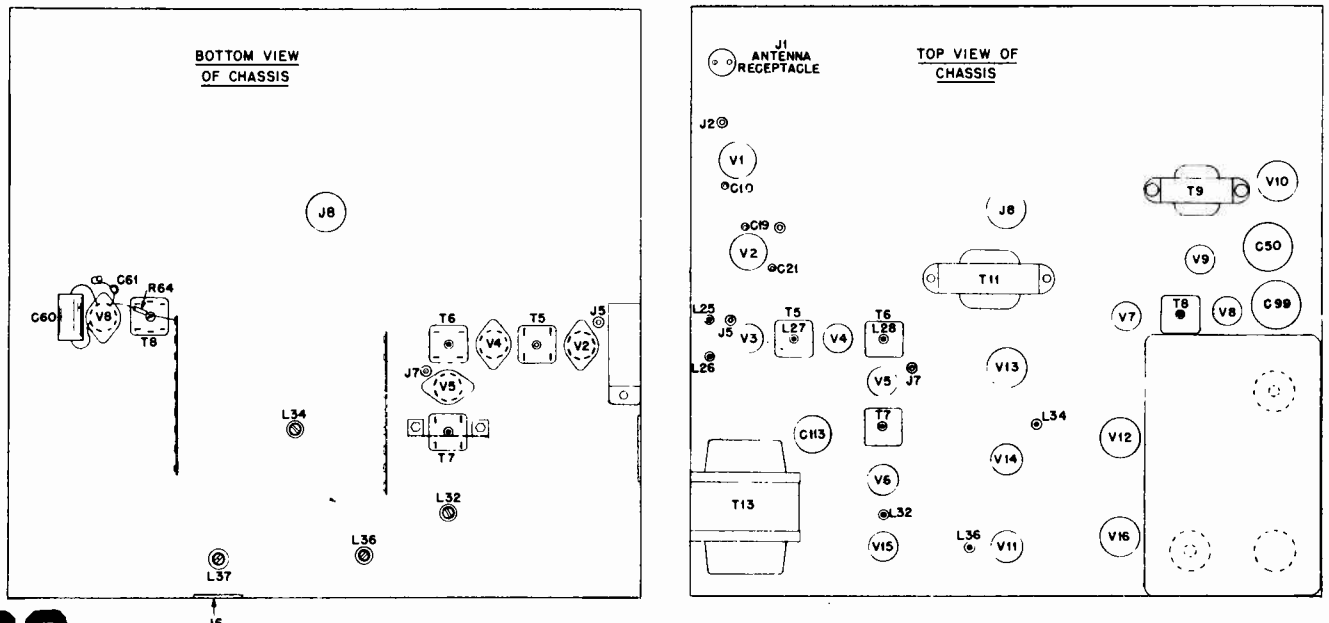


FIGURE 7. ALIGNMENT ADJUSTMENT LOCATIONS

Motorola Chassis TS-602, Alignment Information, continued.

receptacle (J-6) and chassis. If a stronger output is required, connect the oscilloscope between the picture tube cathode (yellow lead) and chassis. The curve seen at this point will be opposite in polarity to that seen at the detector load.

4. Turn AREA SELECTOR SWITCH (S-2, Figure 2) to LOCAL position. Set channel selector switch to channel 13. Set contrast control to minimum.

5. Detune the oscillator by placing a 470 mmf capacitor from the channel 13 coil to chassis.

6. Using leads as short as possible, connect the sweep generator through a 1000 mmf capacitor to test receptacle (J-7), feeding into the grid of the third IF tube (V-5, see Figure 7). (Do not use the loose or "spraying" method of coupling.) Set the generator center frequency to 44 megacycles with a sweep deviation of 12 megacycles.

7. Connect an AC voltmeter to the high side of detector load resistor (R-46) and chassis. Adjust sweep output to give 3 volts AC at the detector load.

8. Tune the primary and secondary of the 3rd IF transformer (T-7) to place a 45.75 mc marker on the high side of the response curve approximately 5 to 10% down from maximum response and a 42.25 mc marker on the low side of the response curve approximately 5 to 10% down from maximum response. See Figure 8.

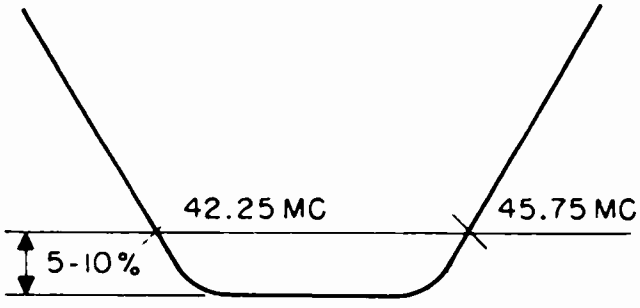


FIGURE 8. 3RD IF RESPONSE CURVE

9. Move the sweep generator and capacitor to test receptacle (J-5, see Figure 7) feeding into the grid of the 1st IF stage. Set the sweep generator to 45.75 mc and adjust the 1st IF transformer T-5 to place the 45.75 mc marker 30% down from maximum response on the high side of the curve. See Figure 9. The resonance point of the IF coils and the traps will be found at two settings of the core. The correct setting is the one with the cores at the outer end of the winding (toward the top).

10. Set the sweep generator to 42.25 mc and adjust the 2nd IF transformer T-6 to place the 42.25 mc marker 30% down from maximum response on the low side of the curve. See Figure 9. The resonance point of the IF coils and the traps will be found at two settings of the core. The correct setting is the one with the cores at the outer end of the winding (toward the top).

11. Set the sweep generator to 47.25 mc. Adjust the trap L-27, which is located at the top of the 1st IF transformer, until the marker is at maximum attenuation on the curve. See Figure 9. Make sure the core is toward the outside of the trap winding (toward the top).

12. Set the sweep generator to 41.25 mc. Adjust the trap L-28, which is located at the top of the 2nd IF transformer, until the marker is at maximum attenuation on the curve. See Figure 9. Make sure the core is toward the outside of the trap winding (toward the top).

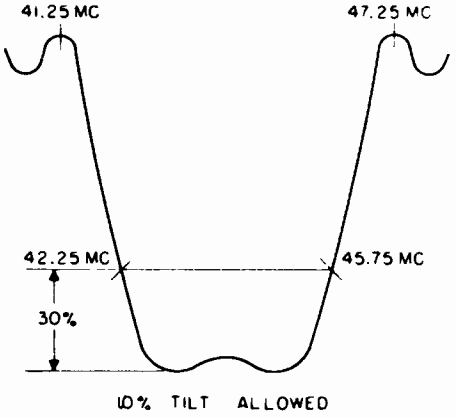


FIGURE 9. OVERALL IF RESPONSE CURVE

13. Apply the sweep generator and capacitor to the test receptacle J-3, which feeds into the grid of the mixer. See Figure 7.

14. Adjust the mixer coils L-25 & L-26 to the response and markers shown in Figure 10. The mixer coils should be tuned so the slugs are toward the outside of the coils (toward the chassis). L-25 affects the high side of the curve, while L-26 affects the tilt.

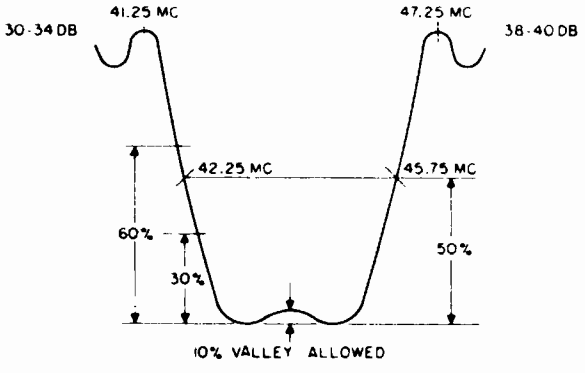


FIGURE 10. MIXER RESPONSE CURVE

NOTE: It is important that the 41.25 mc and the 47.25 mc carriers be attenuated as much as shown in Figure 10. To calculate, connect an AM generator directly to the mixer grid (pin 2 of V-2) and a VTVM across the detector load resistor R-46. Take voltage readings at 41.25 mc, 44 mc, and 47.25 mc and divide per following formula:

$$\frac{\text{voltage reading at 41.25 mc}}{\text{voltage reading at 44 mc}} = \text{between 40 and 70}$$

$$\frac{\text{voltage reading at 47.25 mc}}{\text{voltage reading at 44 mc}} = \text{75 or better}$$

Motorola Chassis TS-602, continued

BANDWIDTH

The IF bandwidth may be checked with an AM signal generator, if desired. Connect the generator, through a 1000 mmf capacitor, directly into the grid of the mixer tube (pin 2 of V-2) and an electronic voltmeter across the video detector load resistor R-46. Set the generator to 44 mc and adjust its output for a 1 volt reading on the meter. Double the output of the generator. Tune to both sides of 44 mc and note the frequencies at which the meter again reads 1 volt. These frequencies indicate the 6 db bandwidth. By watching the meter while tuning slowly through the band, any serious peaks or holes in the response curve can be detected.

REGENERATION

After the mixer and IF stages have been aligned, a check for regeneration in the IF strip should be made as follows:

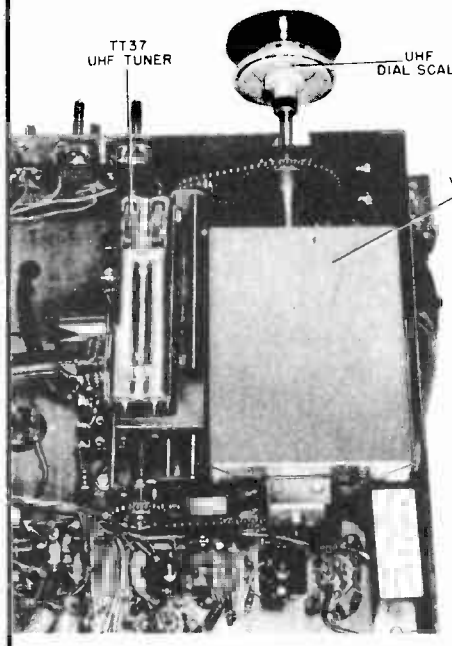
1. Detune the oscillator by placing a 470 mmf capacitor from channel 13 coil to ground.
2. Remove the bias and observe the response curve on the scope as taken between the picture tube cathode (yellow lead) and chassis. The bandwidth may change with the bias removed, but should not change more than 0.3 mc. If the bandwidth does change more than 0.3 mc, check the cathode resistors or change tubes.
3. Set the contrast control at maximum gain.
4. Decrease the generator input until the output signal shows a marked decrease.
5. Any regeneration present will be indicated by sharp peaks on the overall response curve.

MIXER SENSITIVITY MEASUREMENTS

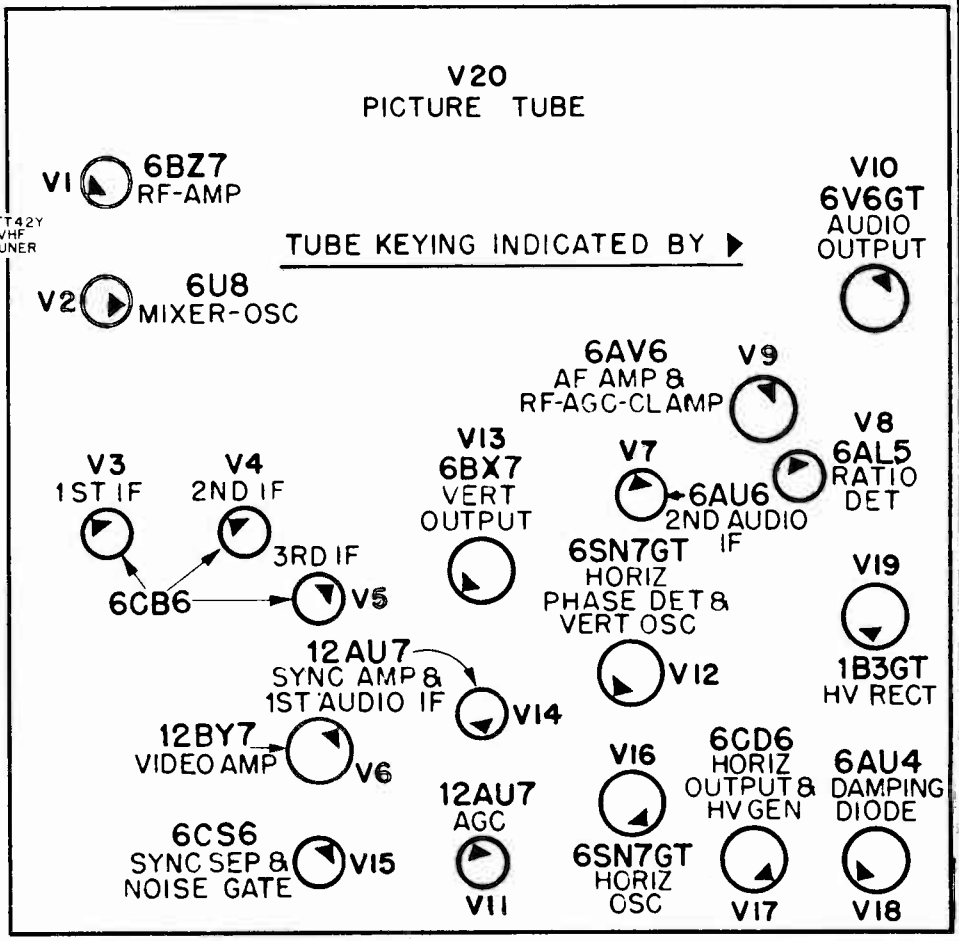
1. Connect an AM signal generator set at 44 mc directly into the grid of the mixer tube (pin 2 of V-2) through a capacitor of 1000 mmf.
2. Remove battery bias from the AGC line.
3. The 470 mf capacitor should be left on from the channel 13 coil to ground to detune the oscillator.
4. Connect the electronic voltmeter across the video detector load resistor R-46. Turn contrast control to maximum.
5. Turn area selector switch to fringe position (fully clockwise).
6. The signal required to produce 1 volt DC above noise voltage at the detector should be less than 90 microvolts.

IF SENSITIVITY MEASUREMENT

1. Move the generator to test receptacle J-5, feeding into the grid of the 1st IF tube V-3.
2. Connect the electronic voltmeter across the video detector load resistor R-46 (4700 ohms).
3. The sensitivity at 44 mc for 1 volt DC at the detector should be at least 600 microvolts.



VIEW OF UHF TUNER INSTALLED IN "Y" SERIES CHASSIS



TUBE LOCATION

Motorola TV

MODELS

21C1BD	21K4WDY
21C1BDY	21K4WY
21C1BY	21K4Y
21C1D	21K5BD
21C1DY	21K5BDY
21C1Y	21K5BY
21F2F	21K5D
21F2FB	21K5DY
21F2FBY	21K5Y
21F2FY	21K6D
21F2Y	21K6DY
21F3BD	21K6Y
21F3BDY	21K7D
21F3BY	21K7DY
21F3D	21K7Y
21F3DY	21K9
21F3Y	21K9Y
21K4AY	21K10
21K4BD	21K10B
21K4BDY	21K10BY
21K4BY	21K10Y
21K4C	21K11
21K4CB	21K11B
21K4CBY	21K11BY
21K4CW	21K11Y
21K4CWY	21T4ACY
21K4CY	21T7
21K4D	21T7B
21K4DY	21T7BY
21K4WD	21T7Y

See the next two pages for complete circuit diagram of basic chassis.

Complete service material on Chassis TS-292A is in Volume TV-7, 1953 TV manual, pages 91 to 98. The production changes after TS-292B-04 are printed below and the differences of other chassis are also explained.

CHASSIS

TS-292B-04
WTS-292B-04
VTS-292B-05

THRU

TS-292C-03
WTS-292C-03
VTS-292C-03

TS-292AY SER
WTS-292BY SER
VTS-292BY SER

THRU

TS-292CY-03
WTS-292CY-03
VTS-292CY-03

CHASSIS DESCRIPTION

The basic chassis is TS-292. Suffixes (B-04, C-01, etc.) to this basic number indicate production changes. Prefixes (WTS and VTS) indicate only mechanical differences between chassis. A "Y" suffix designates a chassis containing a factory-installed UHF tuner.

CHASSIS WTS-292 SERIES

Same as chassis TS-292 with corresponding suffix, except for different picture tube front support brackets, made necessary by a thicker safety glass window in some cabinets (e.g., chassis WTS-292B-04 is electrically the same as TS-292B-04). Chassis WTS-292 uses the TT-44 Cascode VHF tuning unit.

CHASSIS TS-292Y, WTS-292Y, VTS-292Y SERIES

Chassis model numbers with a "Y" suffix (TS-292BY-04, WTS-292CY-02, etc.) indicate that the chassis contain factory-installed UHF tuners. Chassis TS-292Y and WTS-292Y use the TT-52M UHF tuning unit, and chassis VTS-292Y uses the TT-60M UHF tuning unit.

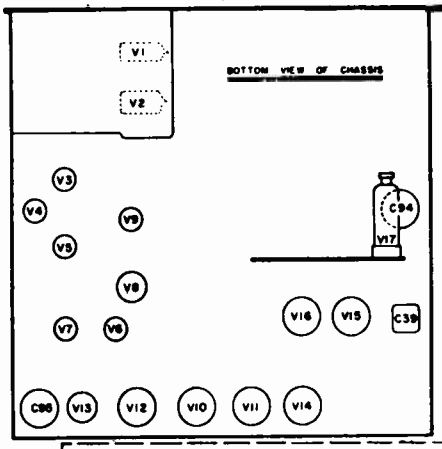
CHASSIS VTS-292 SERIES

Electrically, the same as chassis TS-292 with corresponding suffix (e.g., chassis VTS-292B-05 is the same as TS-292B-05). Mechanically, the picture tube rear tilt bracket has been removed, and the VTS-292 picture tube front support brackets are different from the TS-292 brackets because of a different type window and mask in some cabinets. Chassis VTS-292 uses the TT-45 Cascode VHF tuning unit and a new volume control, both with longer shafts than the tuner and volume control on the TS-292 chassis.

PRODUCTION CHANGES

Chassis Coding	Changes
TS-292B-04 WTS-292B-04	Fusing wire (F-1) added to filament circuit. R-84 (470) added to screen circuit of 6BQ6GT, to reduce barkhausen oscillation.
TS-292B-05 WTS-292B-05 VTS-292B-05	R-82 (4700) changed to 6800 ohms to reduce horizontal over-drive and fold-over.
TS-292B-06 WTS-292B-06 VTS-292B-06	R-62 (3300) changed to 1800 ohms and R-63 (1800) changed to 3300 ohms, to increase blanking pulse at the grid of the picture tube. (This change did not occur in some chassis until "C-01".)
TS-292C-00 WTS-292C-00 VTS-292C-00	NOTE: Chassis marked "C-00" do not incorporate the change above in "B-06". Compensating coil L-16 and 4.5 mc trap L-17 interchanged, to improve video response. "Framelock" circuit added, as listed below, to improve vertical sync under noise conditions: C-103 (33), C-104 (22), R-96 (1000), and L-27 added to 3rd IF stage. C-28 (1500) changed to 1000 mmf C-105 (470) and R-97 (15K) added to video amplifier stage. C-63 (22) removed from 1st clipper.
TS-292C-01 WTS-292C-01 VTS-292C-01	These chassis incorporate all changes listed under "B-06" and "C-00".
TS-292C-02 WTS-292C-02 VTS-292C-02	R-53 (680K) changed to 1 meg, to improve interlace.
TS-292C-03 WTS-292C-03 VTS-292C-03	C-75 (5000 mmf, 2000V) added from picture tube focusing anode (blue lead) to chassis, and C-73 (5000 mmf) changed to capacitor with 2000V rating, to prevent high voltage flash-over within the picture tube and the vertical output tube, respectively.

MOTOROLA, INC. CHASSIS TS-292C-00



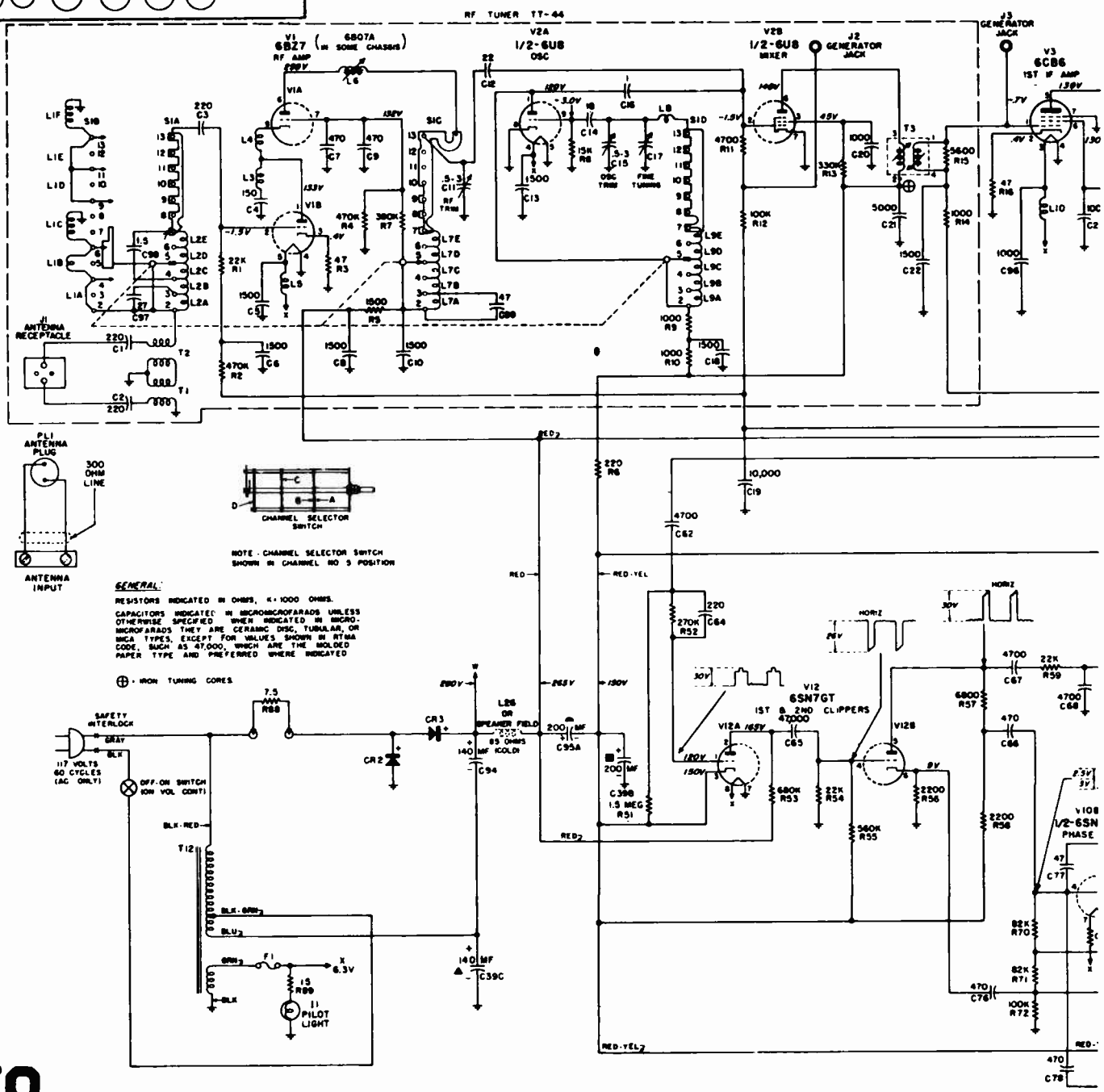
NOTES

VOLTAGE MEASUREMENTS

1. MADE WITH A VTVM FROM POINT INDICATED TO CHASSIS
2. LINE VOLTAGE - 117 VOLTS
3. ANTENNA DISCONNECTED. (SET IN LOCAL POSITION.)
4. CHANNEL SELECTOR SWITCH ON CHANNEL WHICH DEVELOPS LESS THAN 1 VOLT NOISE AT PIN NO. 3 OF TEST RECEPT.
5. CONTRAST CONTROL MAXIMUM CLOCKWISE POSITION.
6. ALL OTHER CONTROLS IN NORMAL OPERATING POSITION.
7. ⊕ VARIES WITH SETTINGS OF CONTROLS

WAVEFORMS

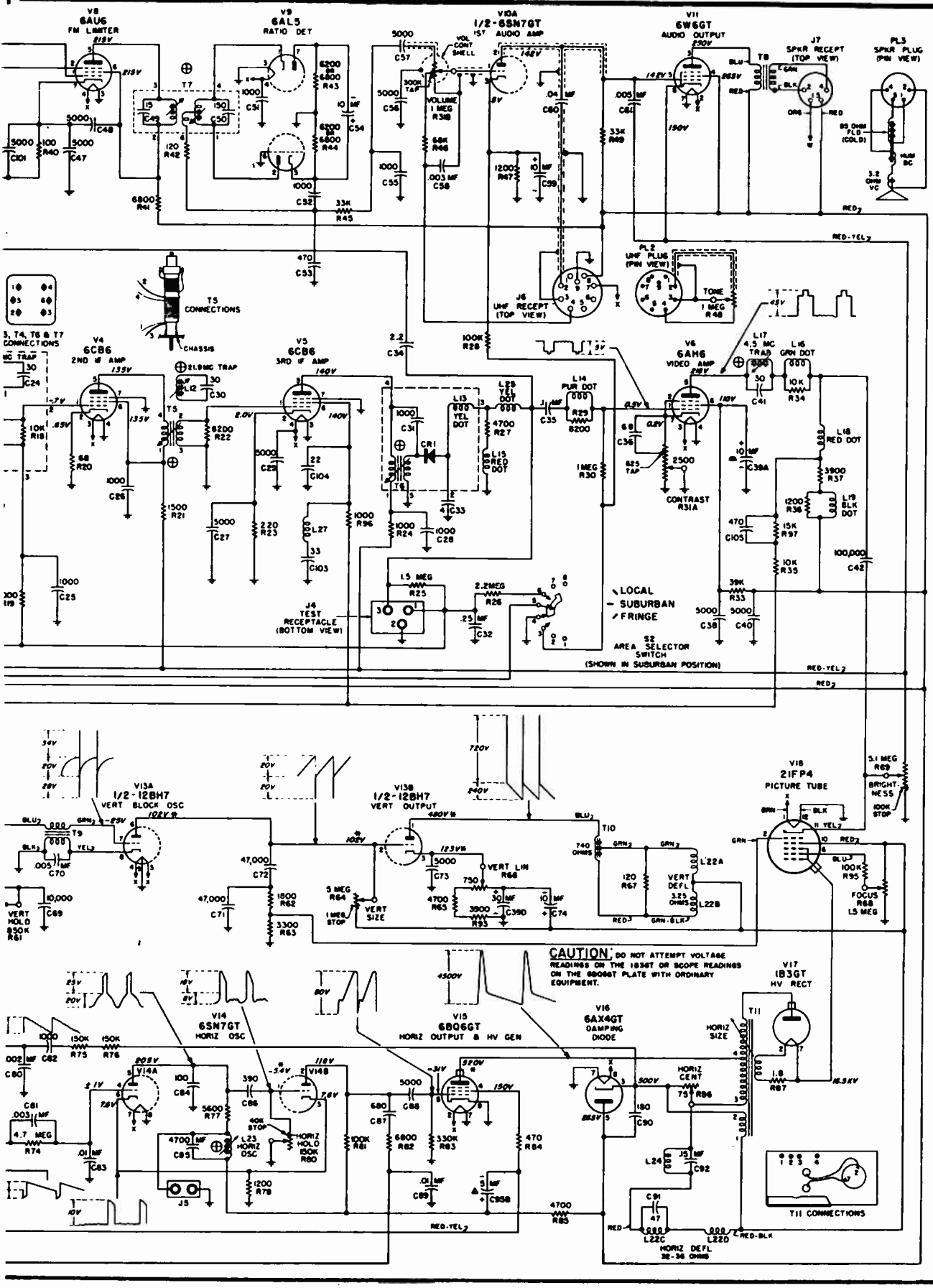
1. OBSERVED ON DUMONT MODEL 241 OSCILLOSCOPE.
2. CONTRAST CONTROL SET FOR SIGNAL OF 45V P TO P AT PLATE OF VIDEO AMP TUBE.
3. ALL OTHER CONTROLS IN NORMAL OPERATING POSITION.
4. 6BG6GT HV SER TUBE REMOVED TO ELIMINATE HV PULSE INTERFERENCE FROM SCOPE WHEN OBSERVING ALL WAVEFORMS, EXCEPT THOSE FROM PHASE DET THROUGH HORIZ CIRCUIT



GENERAL

RESISTORS INDICATED IN OHMS, K = 1000 OHMS.

CAPACITORS INDICATED IN MICROMICROFARADS UNLESS OTHERWISE SPECIFIED. WHEN INDICATED IN MICROFARADS THEY ARE CERAMIC DISC, TUBULAR, OR MICA TYPES, EXCEPT FOR VALUES SHOWN IN RTMA CODE, SUCH AS 47,000, WHICH ARE THE MOLDED PAPER TYPE AND PREFERRED WHERE INDICATED


V8 6AU6 FM LIMITER
V9 6AL5 RATIO DET
V10A 1/2-6SN7GT 1ST AUDIO AMP
V11 6W6GT AUDIO OUTPUT
T8
J7 SPKR RECEPT (TOP VIEW)
PL3 SPKR PLUG (PIN VIEW)
T7
T5 CONNECTIONS
CHASSIS
T3, T4, T6 & T7 CONNECTIONS
J6 UHF RECEPT (TOP VIEW)
PL2 UHF PLUG (PIN VIEW)
TONE 1 MEG R48
V4 6CB6 2ND IF AMP
V5 6CB6 3RD IF AMP
V6 6AH6 VIDEO AMP
L17 4.5 MC TRAP
L16 GRN DOT
L18 RED DOT
L19 BLK DOT
L13 YEL DOT
L14 PUR DOT
L15 RED DOT
CR1
CONTRAST R31A
J4 TEST RECEPTACLE (BOTTOM VIEW)
S2 AREA SELECTOR SWITCH (SHOWN IN SUBURBAN POSITION)
LOCAL
SUBURBAN
FRINGE
V13A 1/2-12BH7 VERT BLOCK OSC
V13B 1/2-12BH7 VERT OUTPUT
VERT HOLD 850K R61
VERT SIZE
VERT LIN R66
VERT DEFL
L22A
L22B
T10
V18 21FP4 PICTURE TUBE
BRIGHTNESS
FOCUS R68
CAUTION: DO NOT ATTEMPT VOLTAGE READINGS ON THE 1B3GT OR SCOPE READINGS ON THE 6BQ6GT PLATE WITH ORDINARY EQUIPMENT.
V14 6SN7GT HORIZ OSC
V15 6BQ6GT HORIZ OUTPUT & HV GEN
V16 6AX4GT DAMPING DIODE
V17 1B3GT HV RECT
HORIZ HOLD 150K R80
HORIZ SIZE
HORIZ CENT R86
L23 HORIZ OSC
L24
L22C
L22D
HORIZ DEFL 32-36 OHMS
T11
T11 CONNECTIONS

Motorola

CHASSIS
TS-402 SER
TS-502 SER

RECEIVER MODEL BREAKDOWN CHART

Model	Cabinet Description	TV Chassis Used
17K17	Console, red-brn mahogany	TS-402
Y17K17	Console, red-brn mahogany	TS-402Y
17K17B	Console, limed oak	TS-402
Y17K17B	Console, limed oak	TS-402Y
17T15A	Table, red-brn mahogany; plastic	VTS-402
Y17T15A	Table, red-brn mahogany; plastic	VTS-402Y
17T15AE	Table, ebony plastic	VTS-402
Y17T15AE	Table, ebony plastic	VTS-402Y
17T16	Table, red-brn mahogany	TS-402
Y17T16	Table, red-brn mahogany	TS-402Y
17T16B	Table, limed oak	TS-402
Y17T16B	Table, limed oak	TS-402Y
21C2	Table, red-brn mahogany: with detachable, console-height legs	TS-502
Y21C2	Table, red-brn mahogany: with detachable, console-height legs	TS-502Y
21C2B	Table, limed oak: with detachable, console-height legs	TS-502
Y21C2B	Table, limed oak: with detachable, console-height legs	TS-502Y
21F5	Combination, red-brn mahogany	TS-502
Y21F5	Combination, red-brn mahogany	TS-502Y
21F5B	Combination, limed oak	TS-502
Y21F5B	Combination, limed oak	TS-502Y
21K12A	Console, red-brn mahogany	WTS-502
Y21K12A	Console, red-brn mahogany	WTS-502Y
21K12AB	Console, limed oak	WTS-502
Y21K12AB	Console, limed oak	WTS-502Y
21K12WA	Console, walnut	WTS-502
Y21K12WA	Console, walnut	WTS-502Y
21K13	Console, red-brn mahogany	TS-502
Y21K13	Console, red-brn mahogany	TS-502Y
21K13B	Console, limed oak	TS-502
Y21K13B	Console, limed oak	TS-502Y
21K14	Console, red-brn mahogany	TS-502
Y21K14	Console, red-brn mahogany	TS-502Y
21K14B	Console, limed oak	TS-502
Y21K14B	Console, limed oak	TS-502Y
21K15	Console, walnut	TS-502
Y21K15	Console, walnut	TS-502Y
21K16	Console, birch	TS-502
Y21K16	Console, birch	TS-502Y
21K16W	Console, walnut	TS-502
Y21K16W	Console, walnut	TS-502Y
21K17	Console, birch: with iron stand	TS-502
Y21K17	Console, birch: with iron stand	TS-502Y
21T8A	Table, red-brn mahogany; plastic	TTS-502
Y21T8A	Table, red-brn mahogany; plastic	TTS-502Y
21T8AE	Table, ebony plastic	TTS-502
Y21T8AE	Table, ebony plastic	TTS-502Y
21T11	Table, red-brn mahogany; metal	VTS-502
Y21T11	Table, red-brn mahogany; metal	VTS-502Y
21T11B	Table, blonde; metal	VTS-502
Y21T11B	Table, blonde; metal	VTS-502Y
21T11W	Table, walnut: metal	VTS-502
Y21T11W	Table, walnut: metal	VTS-502Y

ALIGNMENT

IF AMPLIFIER ALIGNMENT

Equipment Required:

IF Sweep Generator meeting the following requirements:

1. 38 to 50 mc, approximately 10 mc sweep width

2. Output constant and adjustable to at least 0.1 volt maximum.

3. Accurately calibrated, adjustable markers

Cathode Ray Oscilloscope - Preferably one with a calibrated attenuator.

AM Signal Generator - Adjustable Output

NOTE: If there are no built-in markers in the sweep generator, loosely couple the output of an accurately calibrated AM signal generator to the IF strip. At all times, keep the marker output low enough to prevent the marker from distorting the response curve.

If a wide band scope is used, the marker will be more distinct if a capacitor of 100 to 1000 mmf is placed across the scope input. Use the smallest size possible, since too large a value will affect the shape of the curve.

If necessary, use a variac to obtain input of 117 volts.

NOTE: Keep the signal input between 3 and 5 volts peak-to peak, at the detector, to prevent overloading of the IF or scope amplifiers.

To check for crystal overloading an AM signal generator, set at 44 mc and fed into the first IF grid, should be used. With the AGC shorted to ground, the output at the detector load R-46 should be at least 13V DC before limiting occurs or increasing the input gives no corresponding increase in output.

The dressing of plate and grid components in the IF circuit affects tuning. Do not move indiscriminately.

The resonance point of the IF coils and the trap can be found at two settings of the core. Be sure that the coils are tuned with the cores away from the center of the coil form so as not to affect the coupling between the coil and the trap windings.

Procedure:

1. Turn the AREA SELECTOR switch to LOCAL position.

2. By means of an external battery, apply a negative 3 volt bias, through a decoupling resistor of 47K ohms, to the AGC line, which is connected to pin 1 of the test receptacle J-7. See Figure 5 for receptacle location. Check to make sure that bias is still 3 volts after sweep is applied.

3. Turn tuner to channel 13.

4. Stop oscillator by shorting grid (pin 9) of V-2 to ground with a short lead.

Circuit diagram on pages 74-75, alignment continued on page 73.

MOTOROLA Chassis TS-402, TS-502, continued.

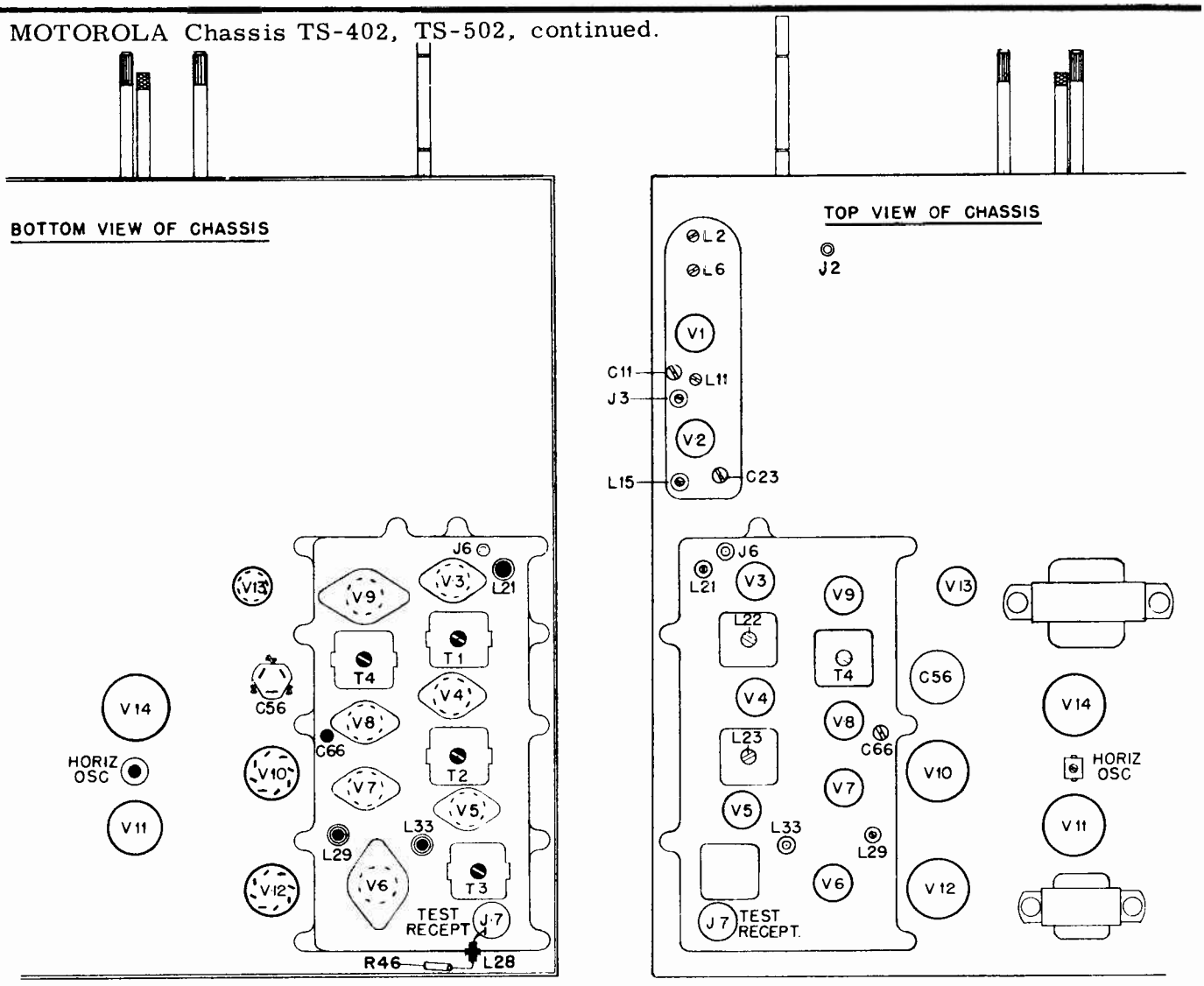


FIGURE 5. ALIGNMENT ADJUSTMENT LOCATIONS

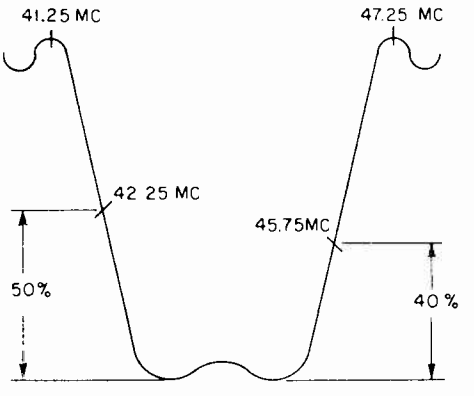
5. Using leads as short as possible, connect the sweep generator, through a 1000 mmf capacitor, to test receptacle J-6 feeding into the grid of 1st IF tube V-3. See Figure 5. (Do not use the loose or "spraying" method of coupling.) Set the generator center frequency to 44 mc, with a sweep deviation of 10 mc.

6. Through a 47K ohm decoupling resistor, connect the oscilloscope across the video detector load resistor R-46 (4700) which may be reached from pin 3 of test receptacle J-7.

7. Adjust trap L-23 (top slug of the 2nd IF transformer T-2) so the trap suck-out falls on the 41.25 mc marker. The sweep generator input should be adjusted to a level sufficient to clearly define the trap.

8. Adjust trap L-22 (top slug of the 1st IF transformer T-1) so the trap suck-out falls on the 47.25 mc marker. Temporarily removing the AGC -3 volt bias may define the trap suck-out to a greater degree).

9. Tune the 1st IF transformer, T-1, to place a 45.75 mc marker on the high side of the response curve 40% down from maximum response. At the same time, adjust T-3 to provide a flat top or symmetrical response curve. Tuning the two transformers together will make for proper marker placement and "jacking" action of T-3. See Figure 6.



IF RESPONSE CURVE

FIGURE 6. OVERALL IF RESPONSE CURVE

Alignment continued on page 76.

MOTOROLA, INC.

TELEVISION CHASSIS TS-402, 502

NOTES

VOLTAGE MEASUREMENTS

1. MADE WITH A VTVM FROM POINT INDICATED TO CHASSIS
2. LINE VOLTAGE 117V AC
3. ANTENNA DISCONNECTED (52 IN LOCAL POSITION)
4. CHANNEL SELECTOR SWITCH ON CHANNEL WHICH DEVELOPS LESS THAN 1 VOLT NOISE AT PIN NO 5 OF TEST RECEPT
5. CONTRAST CONTROL MAXIMUM CLOCKWISE POSITION
6. ALL OTHER CONTROLS IN NORMAL OPERATING POSITION
7. * VARIES WITH SETTING OF CONTROLS

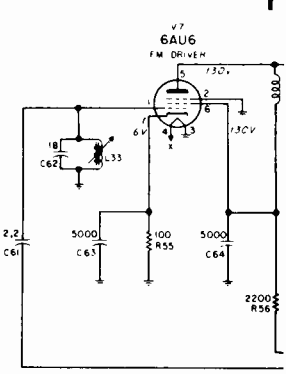
WAVEFORMS

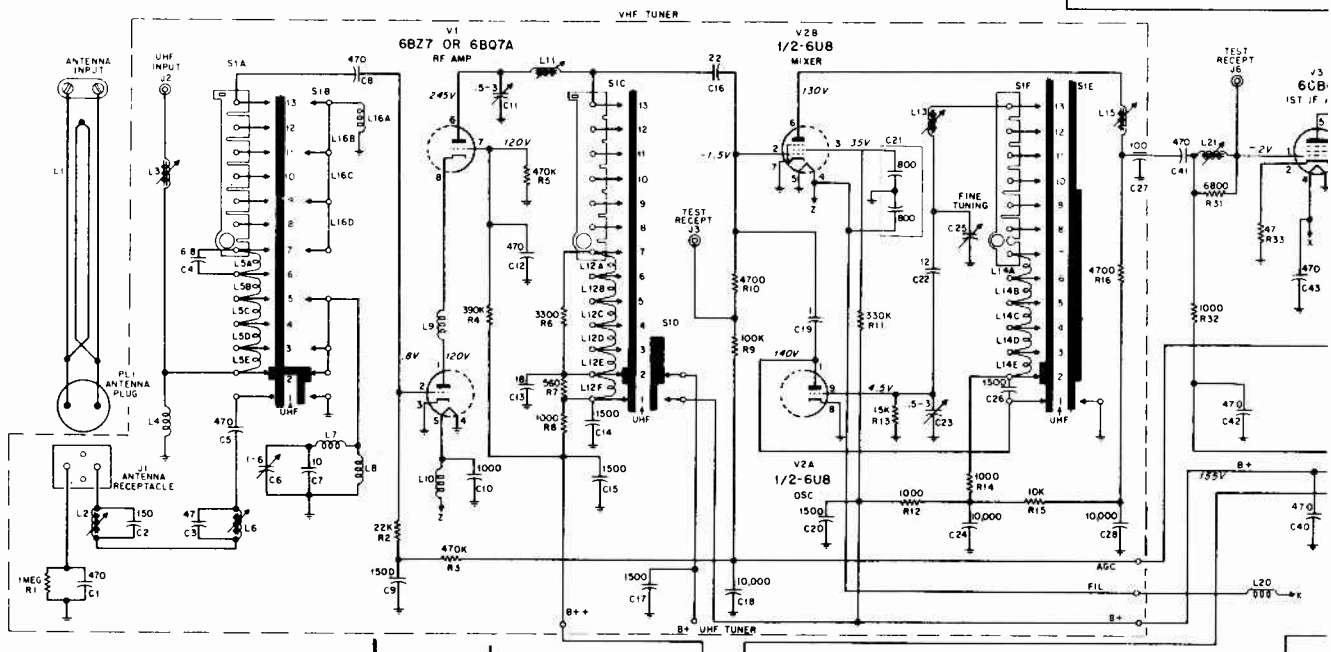
1. OBSERVED ON DUMONT MODEL 241 OSCILLOSCOPE
2. CONTRAST CONTROL SET FOR SIGNAL OF 45V P TO P AT PLATE OF VIDEO AMP TUBE
3. ALL OTHER CONTROL IN NORMAL OPERATING POSITION
4. 6BQ6GT HV GEN TUBE REMOVED TO ELIMINATE HV PULSE INTERFERENCE FROM SCOPE WHEN OBSERVING ALL WAVEFORMS, EXCEPT THOSE FROM PHASE DET THROUGH HORIZ CIRCUIT

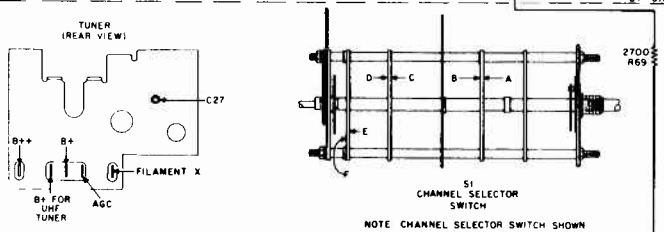
GENERAL

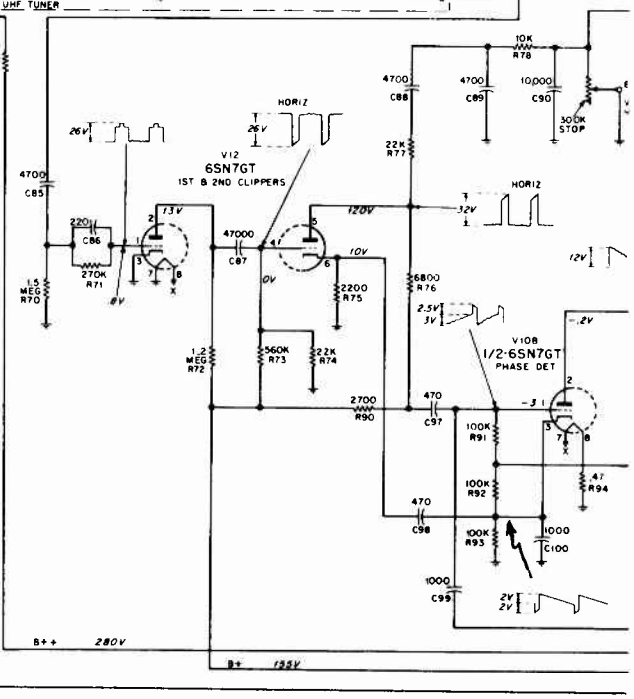
RESISTORS INDICATED IN OHMS, K=1000 OHMS

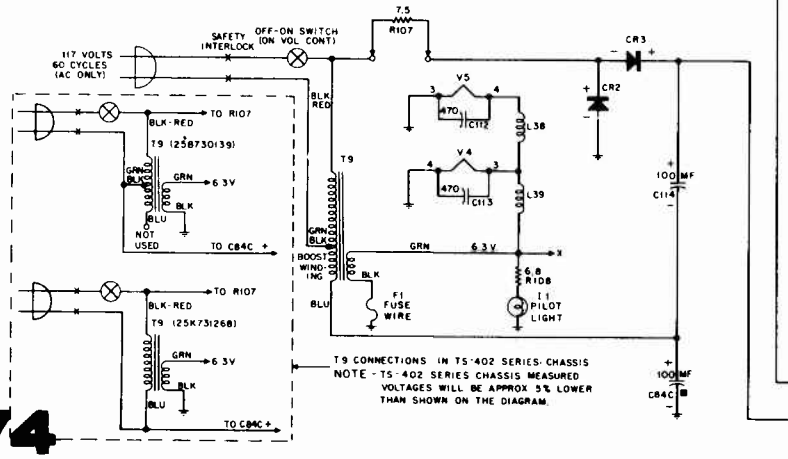
CAPACITORS INDICATED IN MICROMICROFARADS UNLESS OTHERWISE SPECIFIED WHEN INDICATED IN MICROMICROFARADS THEY ARE CERAMIC DISC, TUBULAR, OR MICA TYPES, EXCEPT FOR VALUES SHOWN IN RTMA CODE, SUCH AS 47,000, WHICH ARE THE MOLDED PAPER TYPE AND PREFERRED WHERE INDICATED



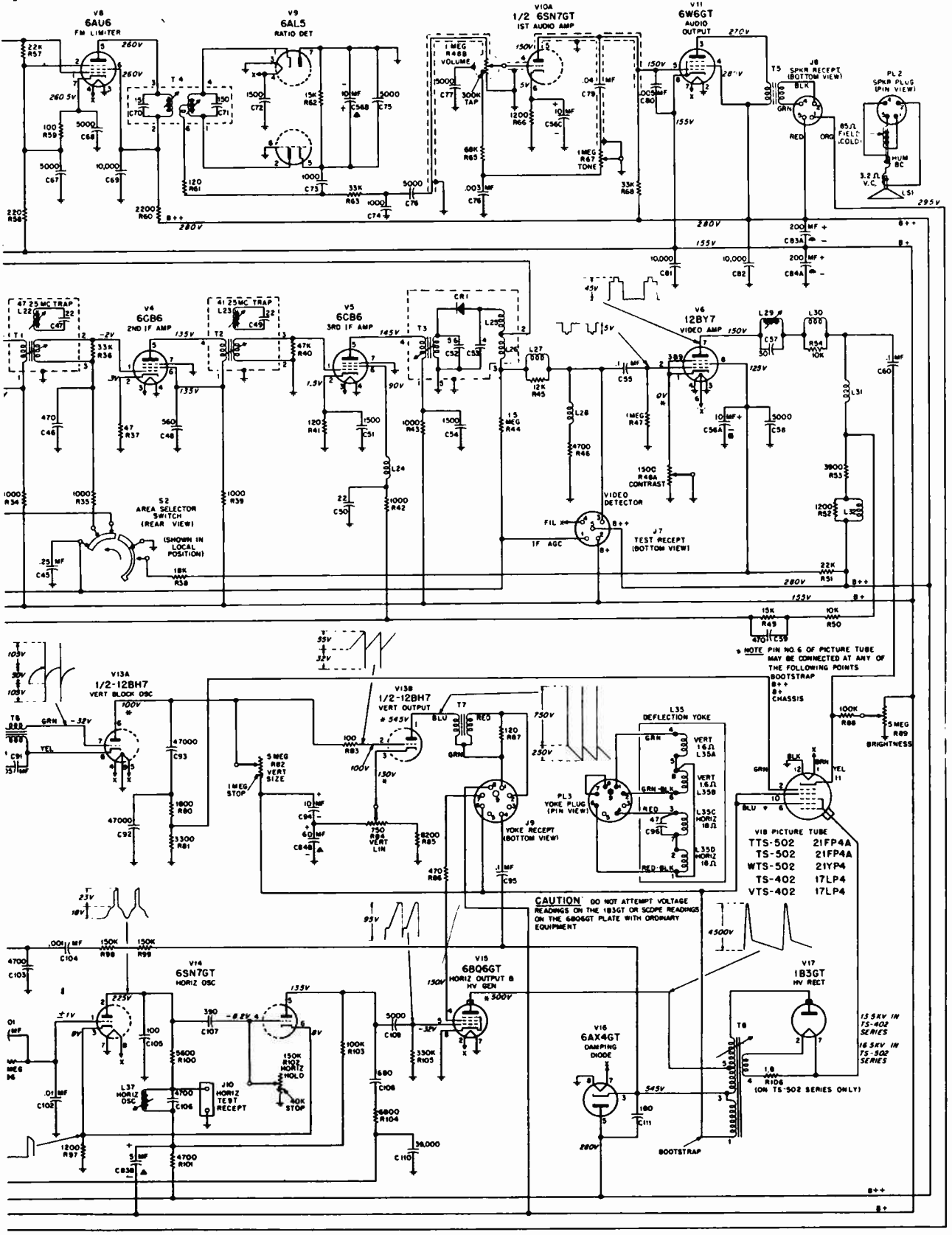








MOTOROLA Chassis TS-402, TS-502



MOTOROLA, continued.

10. Tune the 2nd IF transformer, T-2, to place a 42.25 mc marker on the low side of the response curve 50% down from maximum response. At the same time, adjust T-3 to provide a flat top or symmetrical response curve as in step 9. See Figure 6.

11. Move the generator and capacitor to test receptacle J-3. See Figure 5.

12. Tune the convertor coils L-15 and L-21 together so that the bandpass appears as in Figure 7. L-15 positions the curve and L-21 levels it.

This is a double-tuned bottom coupled circuit. L-15 and L-21 should be tuned simultaneously so that the convertor response is centered over the IF response.

BANDWIDTH

The IF bandwidth may be checked with an AM signal generator if desired. Connect the generator, through a 1000 mmf capacitor, to test receptacle J-3 in the grid circuit of the mixer tube, V-2, and an electronic voltmeter across the video detector load resistor R-46 (4700). Apply 3 volt bias as in 2nd step of IF procedure. Short out R-10 (4700), set the generator frequency to 44.00 mc, and adjust its output for a 1 volt reading on the meter. Double the output of the generator. Tune to both sides of 44 mc and note the frequencies at which the meter again reads 1 volt. These frequencies indicate the 6 db bandwidth points and should be even with the low marker between 42.1 and 42.25 and the high marker between 45.3 and 45.75. By watching the meter while tuning slowly through the band, any serious peaks or holes in the response curve can be detected.

REGENERATION

After the mixer and IF stages have been aligned, a check for regeneration in the IF strip should be made as follows:

1. Remove the battery bias and observe the response curve. The bandwidth may change with the bias removed, but should not change more than 0.2 mc. If the bandwidth does change more than 0.2 mc, check the cathode resistors, bypass capacitors, and tubes.

2. Any regeneration present will be indicated by sharp peaks on the overall response curve.

NOTE: The oscillator should be stopped, as described, during this procedure.

CAUTION: Do not inject too much marker signal.

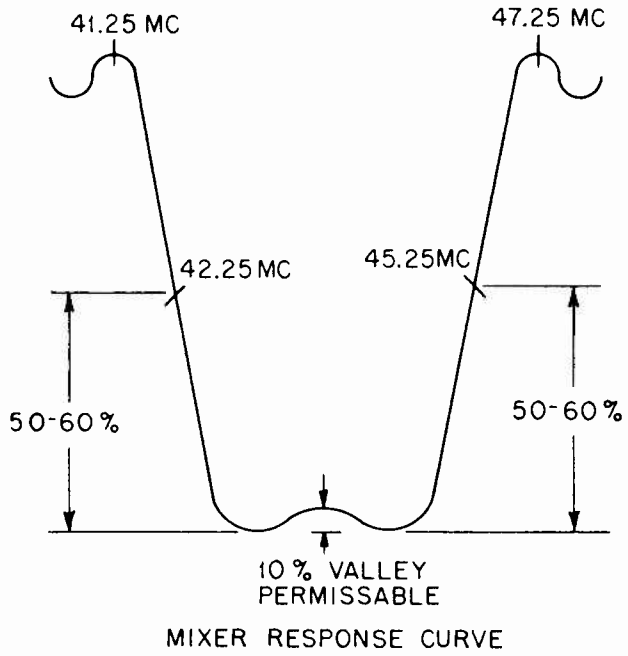


FIGURE 7. MIXER RESPONSE CURVE

AUDIO TAKE-OFF, INTERSTAGE COIL, & RADIO DETECTOR ALIGNMENT

Refer to Figure 5 for location of adjustments.

1. If possible, it is desirable to align the audio section from an actual station signal, since the 4.5 mc alignment will be exact. To permit operation below the limiting level of the audio drive tube, for sharp alignment, the fine tuning should be turned off the station slightly so that there is between 6 and 8V as measured from plus side of C-56B and chassis.

2. If a signal generator is used, tune it accurately to 4.5 mc, and adjust the output to approximately 5,000 microvolts. Connect the high side of the signal generator to pin 3 of test receptacle J-7 and the low side to chassis. The following steps apply whether the station signal or signal generator is used.

3. From positive side of electrolytic capacitor C-56B (10 mf) through a 10K ohm decoupling resistor, connect an electronic voltmeter to chassis.

4. Tune audio take-off coil L-33 for maximum reading on meter.

5. Tune interstage trimmer C-66 for maximum reading on meter.

NOTE: As adjustments are brought to resonance, it is advisable to reduce the signal generator output to prevent overloading.

6. Tune ratio detector T-4 primary (top core) for maximum reading on meter.

NOTE: Both the primary and secondary of the ratio detector transformer have two tuning points. Only one, with the cores at the outer end of the windings, is the proper point.

7. Connect a matched pair of 100K resistors across the ratio detector load R-62.

8. Connect the ground side of meter to the mid-point of the 100K resistors and the high side to the output of the de-emphasis network (junction of R-63 (33K) and C-74 (1000 mmf).

9. Adjust T-4 secondary (bottom core) for zero response on the lowest scale of the meter. Be sure the slug is tuned to the outside of the transformer winding. This corresponds to the cross-over point of the FM detector curve. If desired, the symmetry of the curve may be checked by tuning the signal generator 25 Kc above and below 4.5 mc and noting the plus and minus voltage produced, reversing the meter connections, as necessary. For proper balance of the ratio detector system, the voltages in each direction should be approximately equal. If not, check the tuning of L-33, C-66, and both the primary and secondary of T-4, the ratio detector transformer. If necessary, replace the ratio detector tube V-9.

10. Repeat steps 4 through 9 for maximum accuracy.

Muntz TV INC.

Material on models listed at left presented on the next six pages.

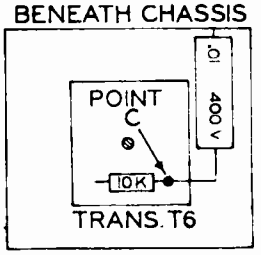


Figure No. 6

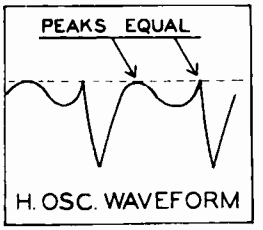


Figure No. 6A

MODELS

MODEL NO.	CHASSIS NO.	PICTURE TUBE	CABINET STYLE
2053-A	17B1 or 17B2	20" Rect.	Consolette
2054-A	17B1 or 17B2	20" Rect.	Console Comb.
2055-A	17B1 or 17B2	20" Rect.	Table Model Leatherette
2055-B	17B2	20" Rect.	Table Model Leatherette
2056-A	17B1 or 17B2	20" Rect.	Consolette W/Doors
2457-A	17B3 or 17B4	24" Round	Consolette With Doors
2158-A	17B5 or 17B6	21" Rect.	Consolette With Doors
2159-A	17B5 or 17B6	21" Rect.	Consolette
2162-A	17B5 or 17B6	21" Rect.	Table Model
2461-A	17B3 or 17B4	24" Round	Consolette
317T2	37A2	17BP4A	Table Leatherette
321T1	17B2	21WP4	Table Masonite
321T2	17B2	21WP4	Table Leatherette

CHECKING NEED FOR HORIZONTAL OSC. ADJUSTMENT

Rotate the horizontal hold control (found beneath the Muntz nameplate) fully counter-clockwise. The picture should remain in horizontal sync. Rotate the control fully clockwise and the picture should fall out of sync showing one vertical black blanking bar near the center of the picture. If the horizontal oscillator does not fill the above requirements, the circuit needs readjusting and can usually be done in the customer's home by readjustment of the Horz. Range Trimmer, the top Horz. Slug, the Horz. Drive and the Horz. Hold control until settings are found that fulfill the above procedure. If these conditions cannot be obtained, the bottom slug of T-6 under the chassis probably requires adjustment. Then follow the procedure listed under "Complete Alignment of Horizontal Oscillator." For a stable setting of the Horz. Hold Control, turn the control fully clockwise. The picture should slip out of sync by one vertical black blanking bar. Now move the control counter-clockwise until picture locks into sync. Final setting of this control should be 20 degrees counter-clockwise from where the picture pulls into sync.

COMPLETE ALIGNMENT OF HORIZONTAL OSCILLATOR (A. F. C.)

(a) Tune in a known good signal (test pattern where possible) and adjust the contrast control well below an over-contrast condition.

(b) Turn both Horz. Osc. slugs out of coil can No. LO-0039 (T-6) as far as possible.
Caution: For manufacturing convenience both of the oscillator adjustments are within the can No. LO-0039. If the Horz. Osc. slugs are turned too far in, a coupled condition is reached which is undesirable.

(c) Place jumper wire between terminals C and D of T-6.

(d) Preset Horz. Range Trimmer ¼ turn out from full "in" position. Turn Horz. Hold control fully clockwise. Through adjustment of top slug of T-6 cause the picture to sync. Readjust Horz. Range Trimmer slightly in order to sync picture.

(e) With picture in sync., check picture width and linearity adjusting Horz. Drive and Linearity controls if necessary until a normal picture is obtained.

(f) Remove jumper between terminals C and D of T-6. Picture should remain in sync. If it does not, re-adjust Horz. Range Trimmer or top slug of T-6. *IMPORTANT:* The Oscilloscope used in the following adjustment must have a flat vertical amplifier response up to 500 K. C. or better or a false waveform will result. A scope with poor vertical response will show a perfect waveform as shown in Figure 6A but when checked against a good wide band oscilloscope, the waveform will be found to have considerable tilt. This is highly undesirable because the bottom core is not adjusted properly, although we are led to believe it is.

(g) Connect scope having a 10 mmf. condenser in series with the vertical lead to point C Fig. 6.

Adjust bottom slug of T-6 until the broad and sharp peaks are of equal height (Fig. 6A) keeping picture in sync at all times. If picture goes out of sync at any time repeat procedure under step No. f. If the picture still goes out of sync., there is a defect in the Horz. control and A.F.C. circuit. Try a new 6SN7 tube before checking further.

The above adjustment is very important to correct circuit operation. If the broad peak is lower than the sharp peak the noise immunity becomes poor, hence the osc. is not stabilized as well resulting in greater drift. If the broad peak is higher than the sharp peak, the oscillator becomes over-stabilized and double triggering can occur when the hold control approaches full clockwise position. REMOVE SCOPE.

(h) Set the Horz. Hold control to extreme clockwise position and adjust top slug of T-6 for one vertical blanking bar. Rotate Horz. Hold control fully counter-clockwise. Picture should remain in sync.

ALIGNMENT INSTRUCTIONS

MUNTZ TV, continued

Avoid excessive signal input when using V.T.V.M. as alignment indicator. Use lowest scale on V.T.V.M. and just enough signal from the generator to override the noise level at all times. Run coil slugs at points A, B, C, and D in Figure 7 down all the way before proceeding. A 22,000 ohm isolation resistor, for scope or V.T.V.M., is provided beneath the chassis terminating at Point "E" Figure 7.

VIDEO I. F. ALIGNMENT CHART

STEP NO.	SIGNAL GENERATOR FREQUENCY	SIGNAL GENERATOR FREQUENCY	CHANNEL	CORRECT V.T.V.M.	FIGURE NO. 7 ADJUST	REMARKS
#1	High side thru .001 to ungrounded tube shield floating over converter tube (V-2). Low side to chassis	24.25	2 or 13	D.C. Probe To Test Point "E"	C (Z-5)	Short Antenna Connections. To avoid distortion which may be caused by AGC action keep the attenuator of the signal generator to a minimum just enough to override noise level voltages. Adjust for maximum.
#2		22.5	2 or 13		A (L-5)	
#3		22.5	2 or 13		D (Z-6)	
#4		25.	2 or 13		B (Z-4)	
#5	Repeat above operations in sequence until no further improvement can be made. Be very particular about the last adjustment made at 25 M.C.					

OVERALL VIDEO I. F. RESPONSE EMPLOYING I. F. CURVE

Precautions to be observed before making the following adjustments:
When observing the television receiver band pass characteristics on the scope, it is extremely important to avoid distortion of the response curve which would occur when using a large signal input from the sweep and marker generators.
Always set the generator attenuator below the point where its output voltage starts to alter the shape of the response curve shown on the scope. This applies to both sweep and marker generators.

STEP NO.	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	FIGURE NO. 7 TOUCH UP	REMARKS
#6	High side thru .005 to ungrounded tube shield floating over converter tube (V-2). Low side to chassis.	23 M.C. (10 M.C. Sweep)	20.6 M.C. 22.6 M.C. 24.3 M.C. 25.1 M.C.	2 or 13	Point E	A B C D	Short Antenna Connections. Check response curve to Fig. 8 and touch up where necessary.

DISCRIMINATOR AND SOUND I. F. ALIGNMENT

EQUIPMENT: A.M. Generator and V.T.V.M. indicator.
Connect two matched 100K ohm resistors in series from Pin #2 of the 6T8 to chassis ground. Fig. 9.

STEP NO.	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT V.T.V.M.	FIGURE NO. 7 ADJUST	REMARKS
#7	High side thru .1 blocking condenser to side of Xtal (Y-1). Low side to chassis	4.5 M.C. (unmod) Max. Signal output of generator	2 or 13	Pin #2 of 6T8 and chassis ground	F, H	Turn picture control (contrast) all the way counter-clockwise. Adjust for maximum reading. Use non-metallic screw driver.
#8	Same as Step #7	4.5 M.C. (unmod)	2 or 13	Move neg. lead of V.T.V.M. to point T, pos. lead to Point 5. Be sure V. T. V. M. case is not grounded during this adjustment.	G	The correct setting is when V.T.V.M. Pointer is at zero "cross over point." Use non-metallic screw driver.

DISCRIMINATOR AND SOUND I. F. SWEEP ALIGNMENT

STEP NO.	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	FIGURE NO. 7 ADJUST	REMARKS
#7 Alternate	High side thru .1 to side of Xtal. Low side to chassis	4.5 M.C. (100 K.C. Sweep)	4.5 M.C.	2 or 13	Pin #2 of 6T8 and Chassis Ground	F, H Refer to Fig. 10	Same as Step #7. Remove C-22 gnd. lead. Adjust for maximum symmetrical output wave form. Solder C-22 gnd. lead when finished.
#8 Alternate	Same as Step #7 (alternate)	4.5 M.C. (100 K.C. Sweep)	4.5 M.C.	2 or 13	Move Vert. Scope input lead to point T in Fig. 7. Neg. scope lead to gnd.	G Refer to Fig. 11	When finished the correct setting is when the "S" curve as shown on scope is symmetrical each side of base line and 4.5 M.C. marker in center of "S" curve.

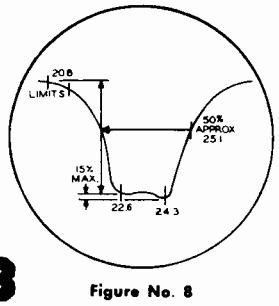


Figure No. 8

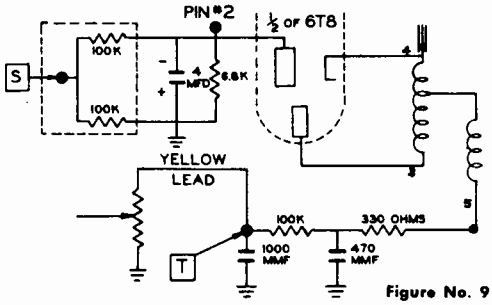


Figure No. 9

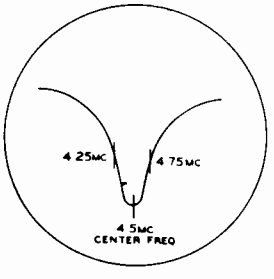


Figure No. 10

MUNTZ TV, continued

R. F. ALIGNMENT

Remove 1st I.F. Amplifier tube V7 before making adjustments L, J, M.

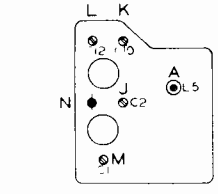
STEP No.	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	MASTER OSC. (MC)	MARKER GEN. FREQ. (MC)	CHANNEL	CONNECT SCOPE	FIGURE No. 7 ADJUST	REMARKS
#9	Two 120 ohm carbon res.	Across ant. term. with 120 ohms in each lead.	207.50 (10 MC sweep)	205.25 209.75	12	R.F. Test Point N, Figure No. 7	Points L, J, M	Adjust to response curve Figure No. 12 with markers as shown.
#10	Two 120 ohm carbon res.	Across ant. term. with 120 ohms in each lead.	213.50	211.25 215.75	13	R.F. Test Point N, Figure No. 7		Check all channels to see that they have not been seriously affected.
			201.50	199.25 203.75	11			
			195.50	193.25 197.75	10			
			189.50	187.25 191.75	9			
			183.50	181.25 185.75	8			
			177.50	175.25 179.75	7			
			85.50	83.25 87.75	6			
			79.50	77.25 81.75	5			
			69.50	67.25 71.75	4			
			63.50	61.25 65.75	3			
			57.50	55.25 59.75	2			

OSCILLATOR ALIGNMENT

Restore 1st I.F. tube V7 to its socket. If the oscillator seems to be off frequency approximately the same amount for a majority of the channels, it is possible to correct them in one step, using adjustment K Figure No. 7. Before adjusting K move each individual channel oscillator slug (they are reached through a hole at the right of the channel switch shaft), and observe the curve. It should be noted that adjustment K is an all-channel oscillator circuit adjustment and should not be adjusted for any individual channel.

Connect the output of Model 7008 (Philco) to the antenna terminals of the receiver through a matching network; see Figure No. 14. Connect the oscilloscope input through the scope input leads to point E Figure No. 7. Set the FUNCTION switch to AM RF.

STEP No.	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	MASTER OSC. (MC)	MARKER GEN. FREQ. (MC)	CHANNEL	CONNECT SCOPE	ADJUST OSC. SLUG	REMARKS
#11	See Figure No. 12	Across ant. terminals with matching network. See Figure No. 12.	(Use Table in above R.F. Alignment Chart)			Point E, Figure No. 7	13 to 2 incl.	Adjust to place the sound marker as per Figure No. 13. The Video marker should fall about 50%.



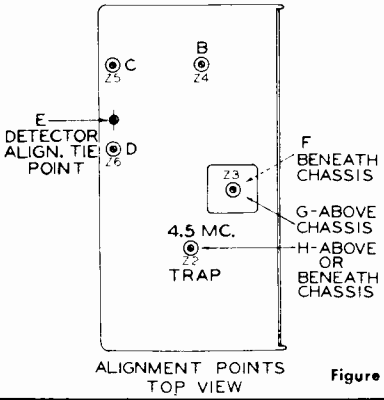


Figure No. 7

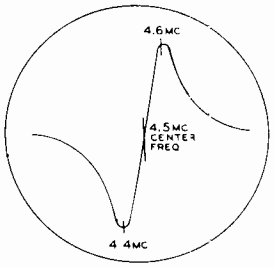


Figure No. 11

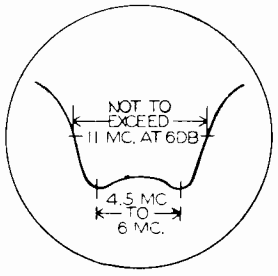


Figure No. 12

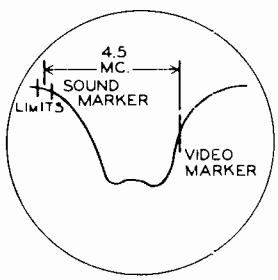


Figure No. 13

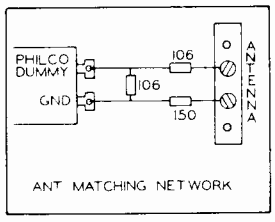
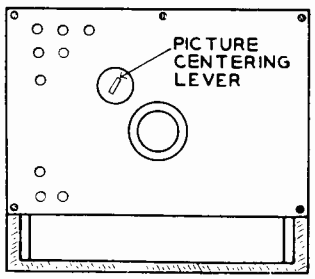


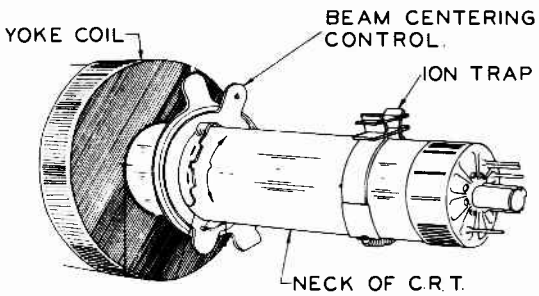
Figure No. 14

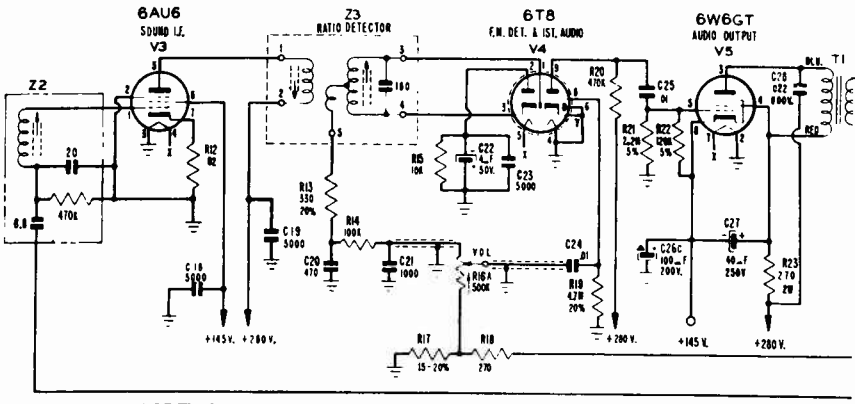
Muntz TV INC.

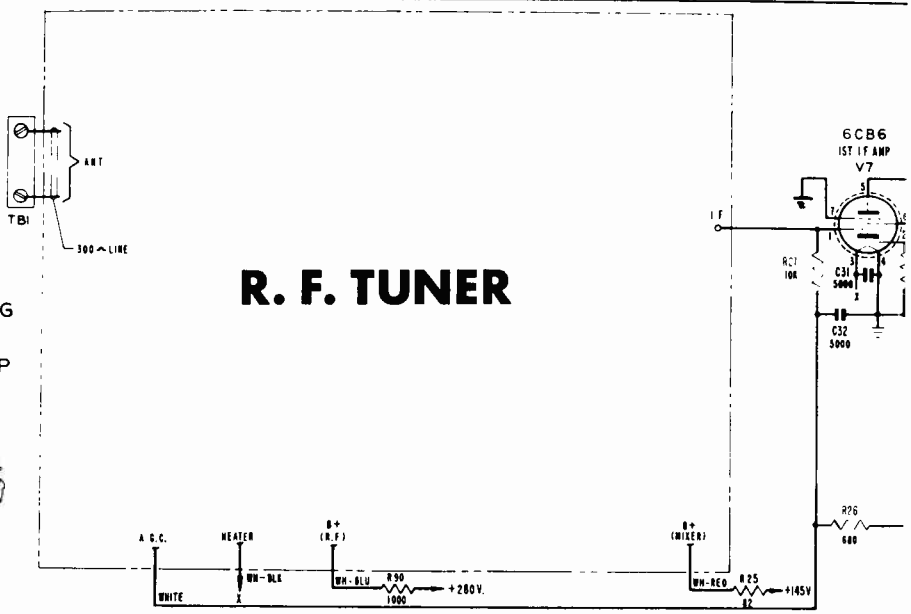
This circuit is exact for Chassis 17B2 above Serial No. 369500, 17B6 above Serial No. 361950, other chassis are very similar.

BACK OF CABINET

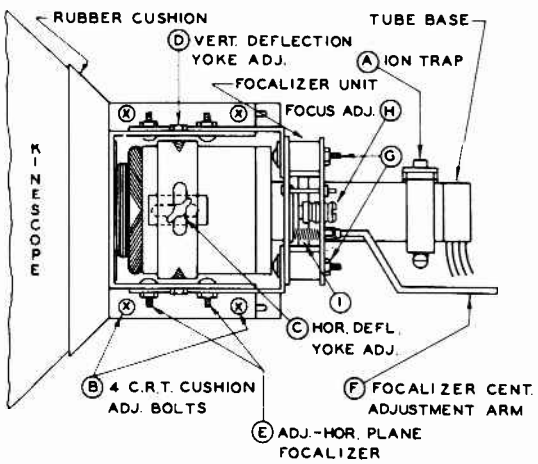


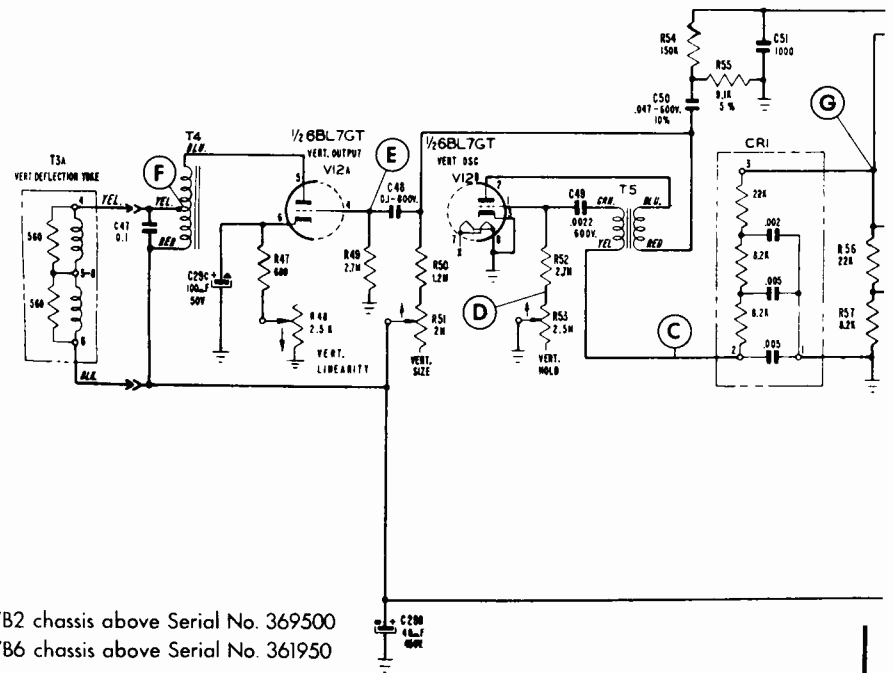






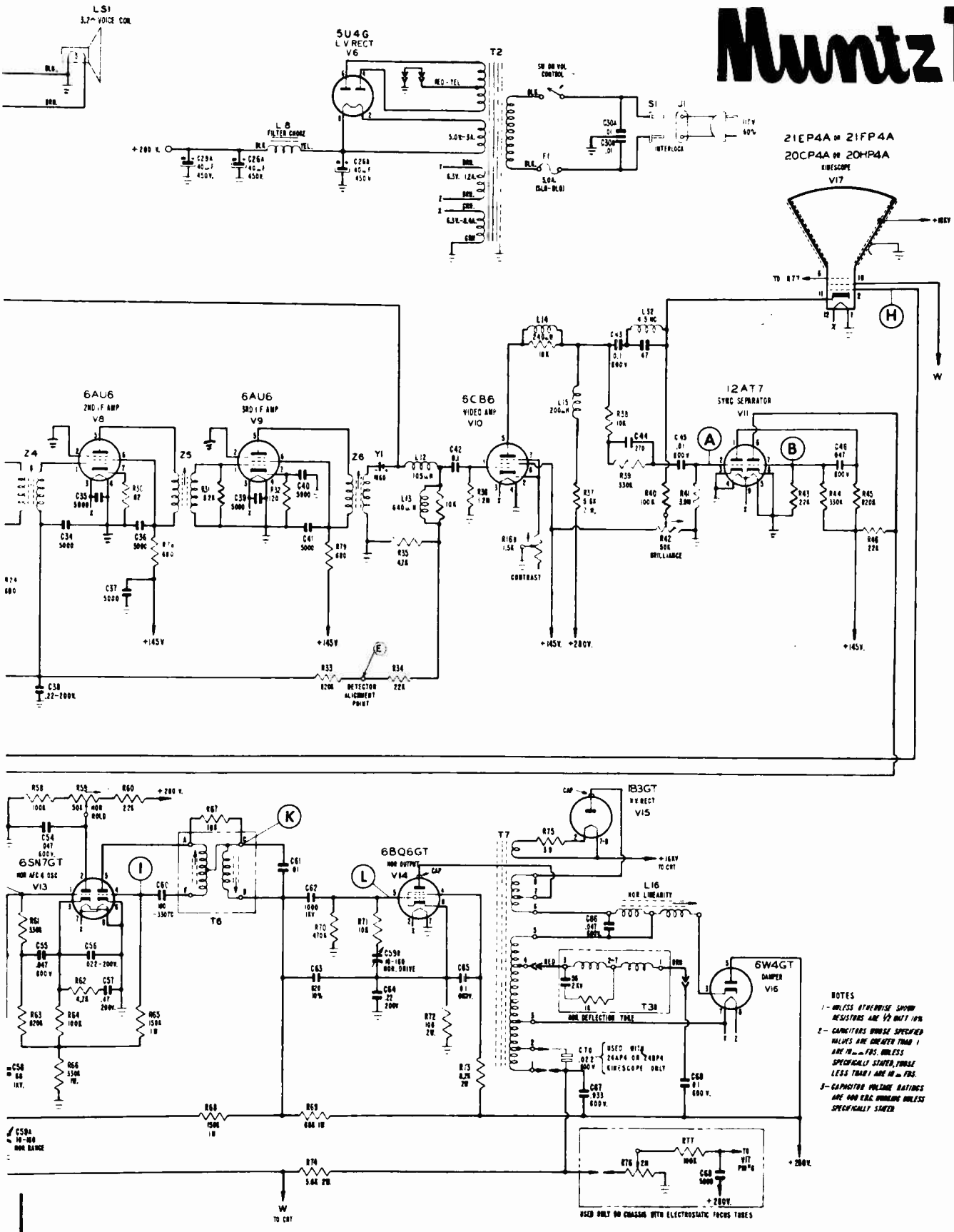
TOP VIEW – C.R.T. ADJUSTMENTS





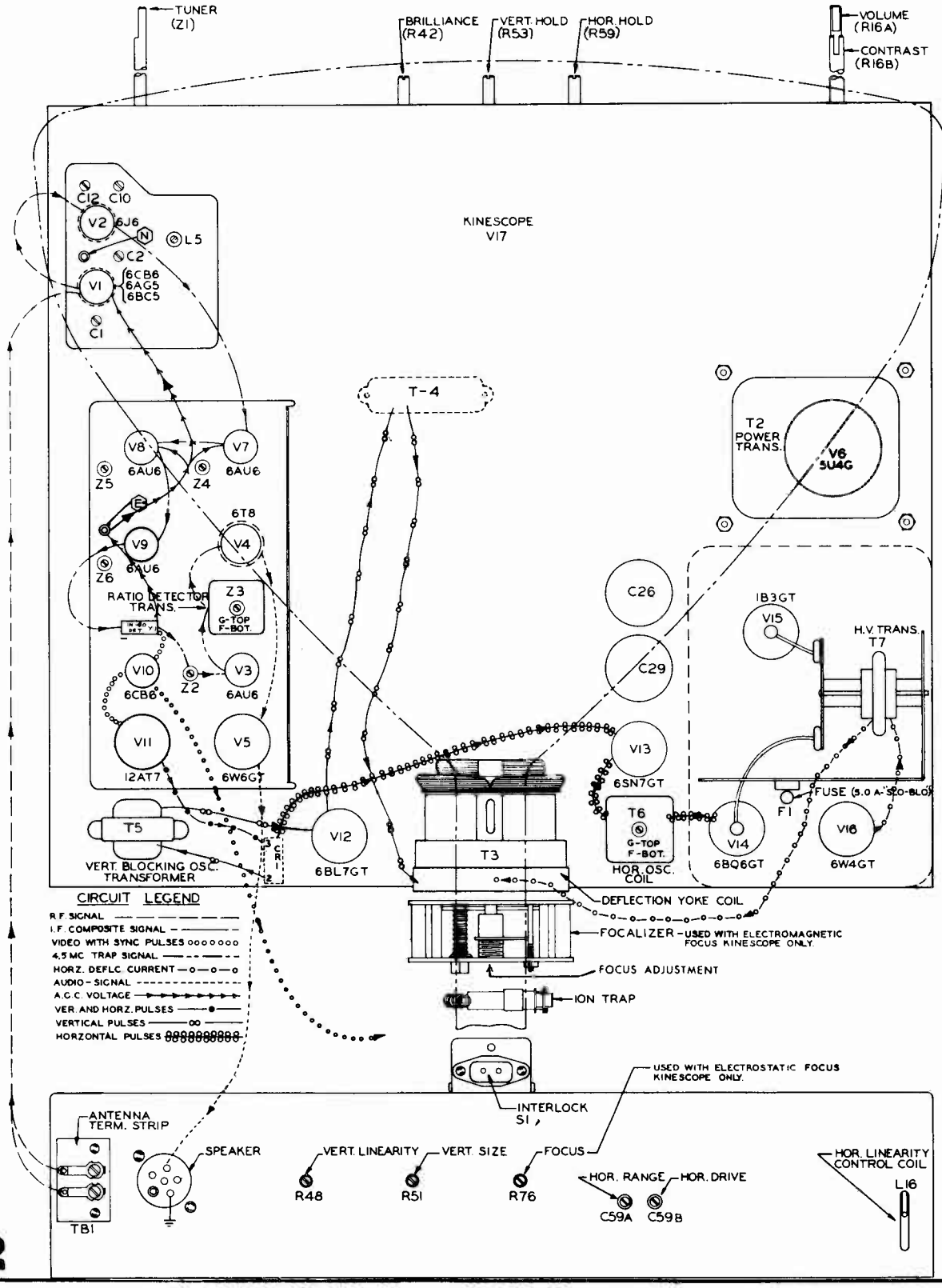
17B2 chassis above Serial No. 369500
17B6 chassis above Serial No. 361950

Muntz TV


LS1
3.2Ω VOICE COIL
5U4G
RECT
V6
T2
L8
FILTER CHOKE
S1
21EP4A OR 21FP4A
20CP4A OR 20HP4A
KINESCOPE
V17
6AU6
2ND I.F. AMP
V8
6AU6
3RD I.F. AMP
V9
6CB6
VIDEO AMP
V10
12AT7
SYNC SEPARATOR
V11
CONTRAST
BRILLIANCE
DETECTOR ALIGNMENT POINT
6SN7GT
HOR. AFC & OSC
V13
6BQ6GT
HOR. OUTPUT
V14
1B3GT
H.V. RECT
V15
6W4GT
DAMPER
V16
L16
HOR. LINEARITY
T38
HOR. DEFLECTION TUBE
T6
T7
NOTES
1 - UNLESS OTHERWISE SHOWN RESISTORS ARE 1/2 WATT 10%
2 - CAPACITORS UNDER SPECIFIED VALUES ARE GREATER THAN 1 ARE IN μμ FDS. UNLESS SPECIFICALLY STATED, THOSE LESS THAN 1 ARE IN μ FDS.
3 - CAPACITOR VOLTAGE RATINGS ARE 600 D.C. WORKING UNLESS SPECIFICALLY STATED
USED ONLY ON CHASSIS WITH ELECTROSTATIC FOCUS TUBES

MUNTZ TV Chassis 17B1, 17B2, 17B3, 17B4, 17B5, 17B6, 37A2, continued

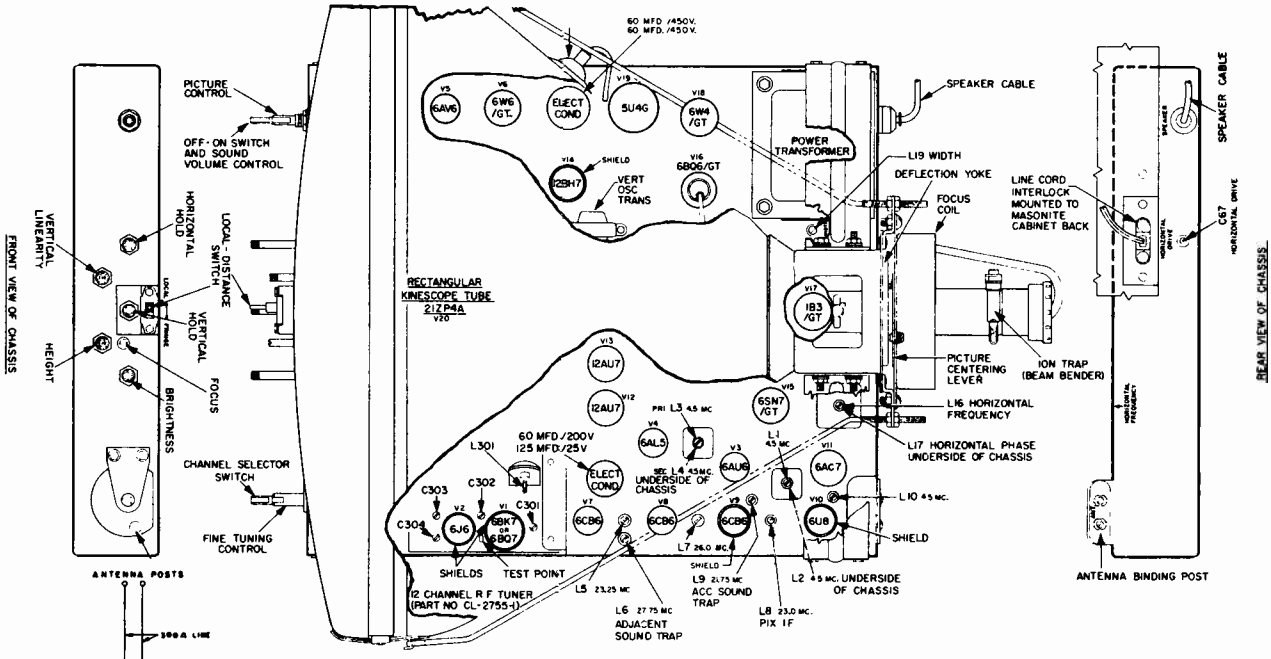
TUBE LAYOUT AND SIGNAL PATH CHART

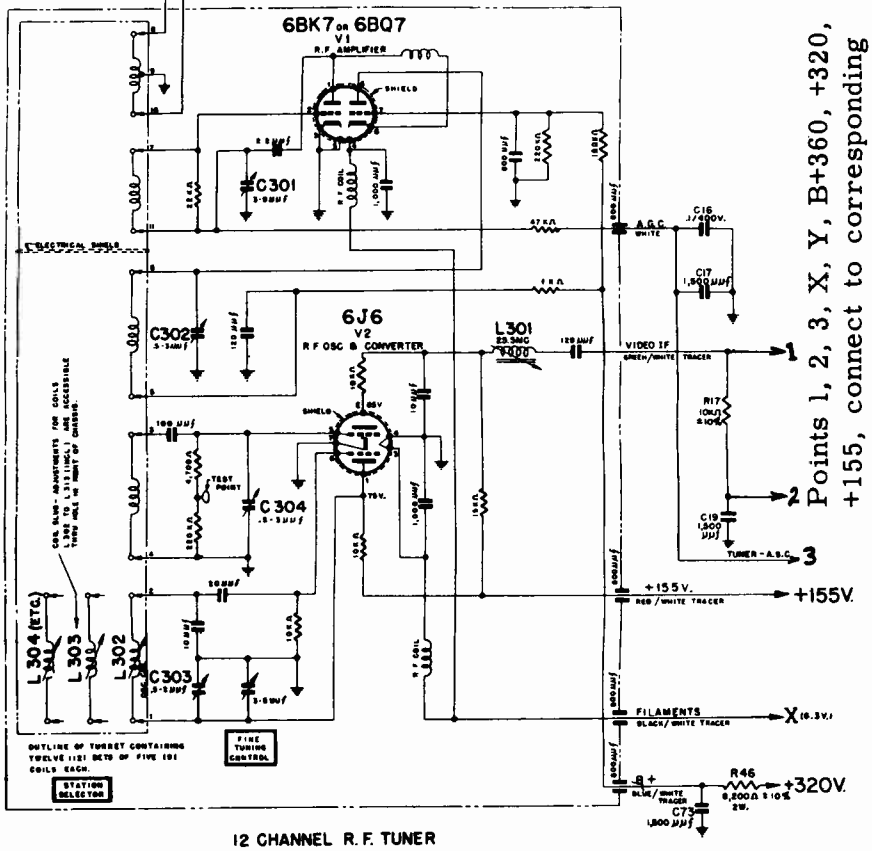


The signal path chart provided is to assist the Serviceman in isolating a particular trouble in the easiest and fastest way possible. As an example; the receiver under test has picture and no audio. A quick look at the audio signal will tell you immediately that the trouble lies somewhere between V-4 and the speaker.

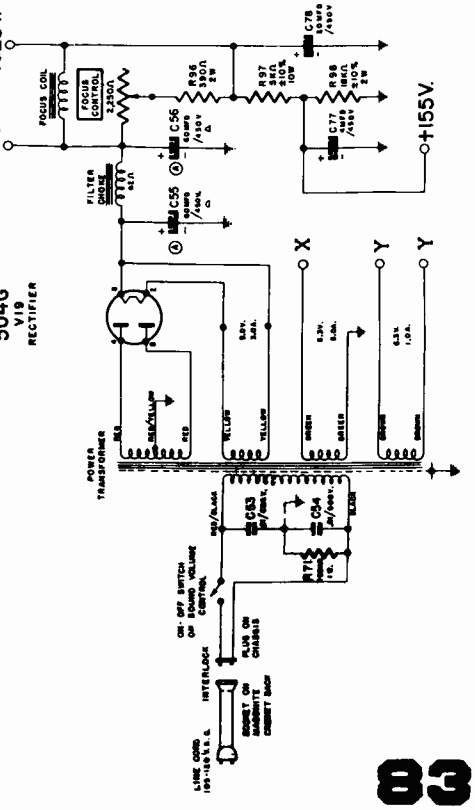
OLYMPIC RADIO & TELEVISION INC.

Chassis TN-21, used in Models 21C65, 21C68, 21C72, 21C73, 21D60, 21D64, 21K61, 21K62, 21K63B, 21T58, 21T69, 21T70, and 21T74, is covered by diagrams below and on page 84. Chassis TM-17, used in Models 17C57, 17K55, 17T56, uses 17HP4 picture tube, but is very similar to TN chassis. TV section of the combination set TNA-21, Model 21K101, is also similar.



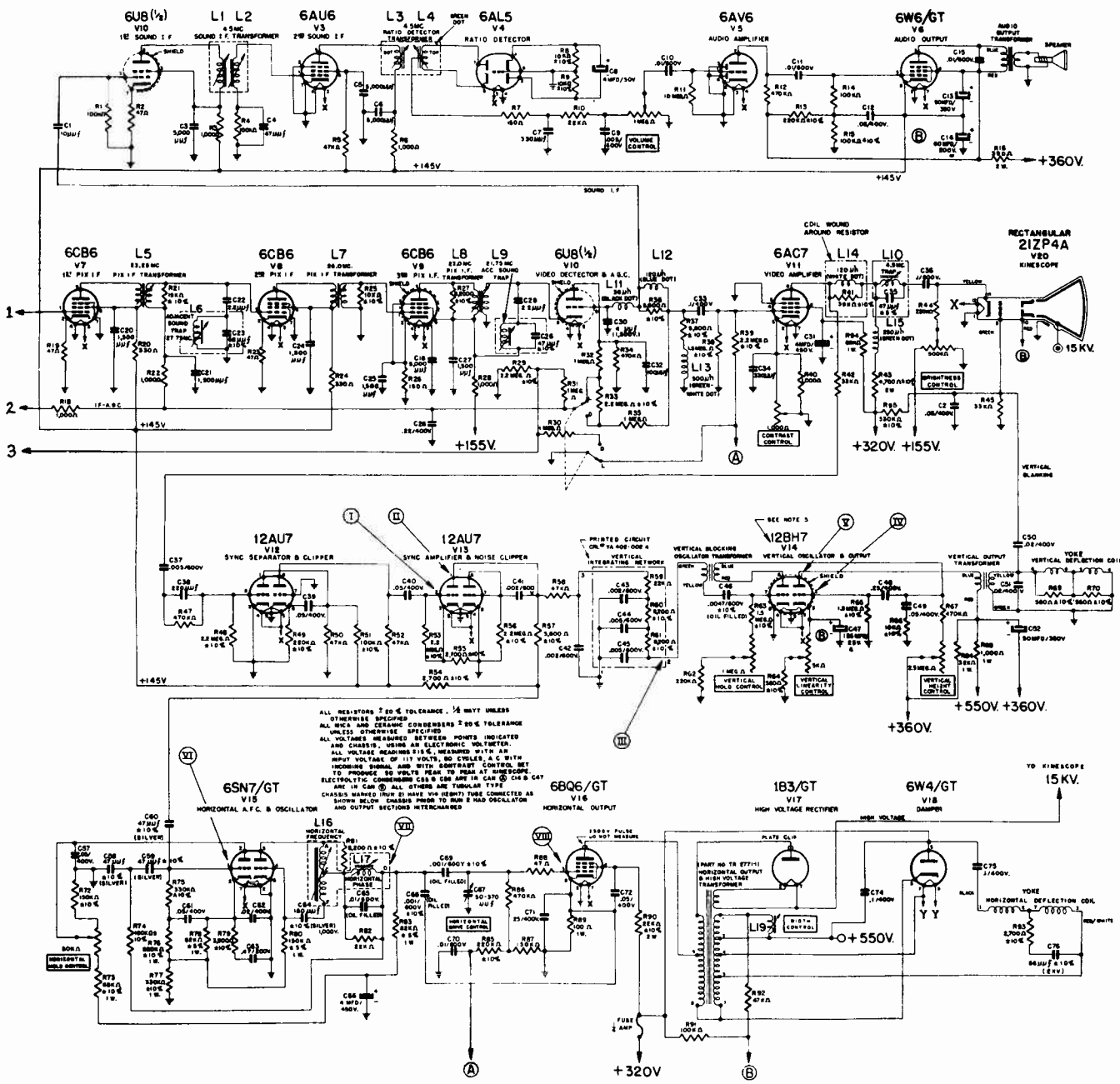


Points 1, 2, 3, X, Y, B+360, +320, +155, connect to corresponding points of main diagram, page 84.



OLYMPIC TN-21 CHASSIS

21" TN MODELS: 21T58, 21D60, 21K61, 21K62, 21K63B, 21D64, 21C65, 21C68, 21T69, 21T70, 21C72, 21C73 & 21T74



Part of circuit diagram is printed on page 83, and points 1, 2, 3, X, Y, and B+ voltages 360, 320, 155, connect to correspondingly marked points.

I	II	III	IV	V	VI	VII	VIII
V13 - PIN 2 7875CPS 20V	V13 - PIN 1 7878 CPS 30V	OUTPUT - VERT INT NET (2) 30 CPS 15V	V16 - PIN 2 30 CPS 90V.	V16 - PIN 1 30 CPS 1200V	V15 - PIN 5 7878 CPS 18V	TERM "D" HOR OSC TRANS 7875 CPS 125 V	V16 - PIN 5 7875 CPS 125V

Packard-Bell

CHASSIS TYPE 2040 is a 20 tube TV chassis which mounts a 21 inch electrostatic focus picture tube on all models except the 17 inch table model. It features a Local-Distance switch located on the rear chassis apron to insure optimum performance in either fringe or metropolitan areas. This chassis is used on the following models:

(VHF Tuner)	*(VHF-UHF Tuner)*	
2041	2141	Table Model, 21 inch
2042	2142	Standard Console, 21 inch
2043	2143	De Luxe Console, 21 inch
2044	2144	Table Model, 17 inch

Complete circuit diagram is printed on the next page, over.

ALIGNMENT PROCEDURE CHASSIS 2040

PICTURE I-F ALIGNMENT:

1. Connect a vacuum tube voltmeter between point "A" and ground.
2. Loosely couple signal generator to mixer tube in tuner.

Step	Sig. Gen. Freqncy.	Adjust	For
3.	45.50 Mc.	S-15 (mixer I-F in tuner)	MAXIMUM
4.	45.50 Mc.	S-6	MAXIMUM
5.	41.80 Mc.	S-5	MAXIMUM
6.	43.30 Mc.	S-8	MAXIMUM
7.	44.50 Mc.	S-10	MAXIMUM
8.	39.75 Mc.	S-4 and S-9	Minimum
9.	47.25 Mc.	S-3 and S-7	Minimum

REPEAT STEPS 3 THROUGH 9

10. Connect oscilloscope to point "B", using a 22,000 ohm isolating resistor in series with the scope probe. Connect an electrolytic capacitor, 5 mfd., 50 volt, between point "A" and ground, the negative lead to point "A".
11. Connect sweep generator to antenna terminals through an impedance matching network. (Antenna terminals 300 ohms balanced.)
12. Rotate tuner to channel 3, and set sweep generator to center frequency of channel, (63 Mc.). With a sweep width of 10 Mc., adjust generator output to develop approximately 2 volts of A. G. C.
13. With signal generator loosely coupled to converter tube, adjust output to provide the markers shown on the response curve, Fig. 1. Check the position of the markers one at a time.
14. Observe the waveform obtained on the oscilloscope and compare it with the waveform shown in Fig. 1. If the spot frequency alignment has been carefully done, the comparison will be favorable. However, slight retouching of the I-F adjustments may be required. It should not be necessary to change any adjustment appreciably. The markers should be located as follows:

    The 47.25 Mc. and the 39.75 Mc. at minimum response. (These markers will be at too low a level to show on scope.)

    The 45.75 Mc. marker at 50% response.

    The 43.30 Mc. marker at 95% response.

    The 45.00 Mc. marker at 97% response.

    The 41.25 Mc. marker at 8% response.

    IMPORTANT: The 45.00 Mc. marker must not exceed 97% response on channel 3 or picture may smear on higher channels.

ALIGNMENT OF 4.5 Mc. TRAP:

1. Connect signal generator between point "B" and ground through a .001 mfd isolating capacitor.
2. Turn contrast control to maximum.
3. Connect a R-F vacuum tube voltmeter to point "C". If an R-F VTVM is not available, connect a germanium diode crystal in series with the positive probe of a conventional VTVM.
4. Set signal generator to 4.50 Mc., exactly, with the output at one volt or more.
5. Adjust trap, S-11, for minimum VTVM reading

NOTE: If signal generator is not capable of one volt output, it will be necessary to adjust the trap by visual means. To do this, observe the picture and adjust the trap to eliminate the 4.5 Mc. beat.

SOUND I-F AND RATIO DETECTOR ALIGNMENT:

1. Connect signal generator between point "B" and ground.
2. Connect VTVM between point "D" and ground.
3. With generator frequency at 4.50 Mc., adjust S-12 and S-1 for MAXIMUM output.
4. Connect VTVM between points "E" and "F".
5. Adjust Ratio Detector secondary, S-2, for zero between positive and negative peaks.

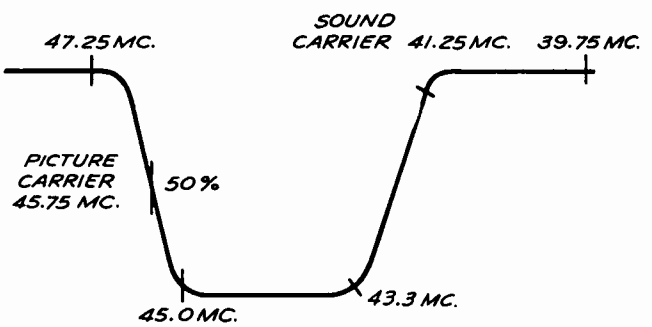
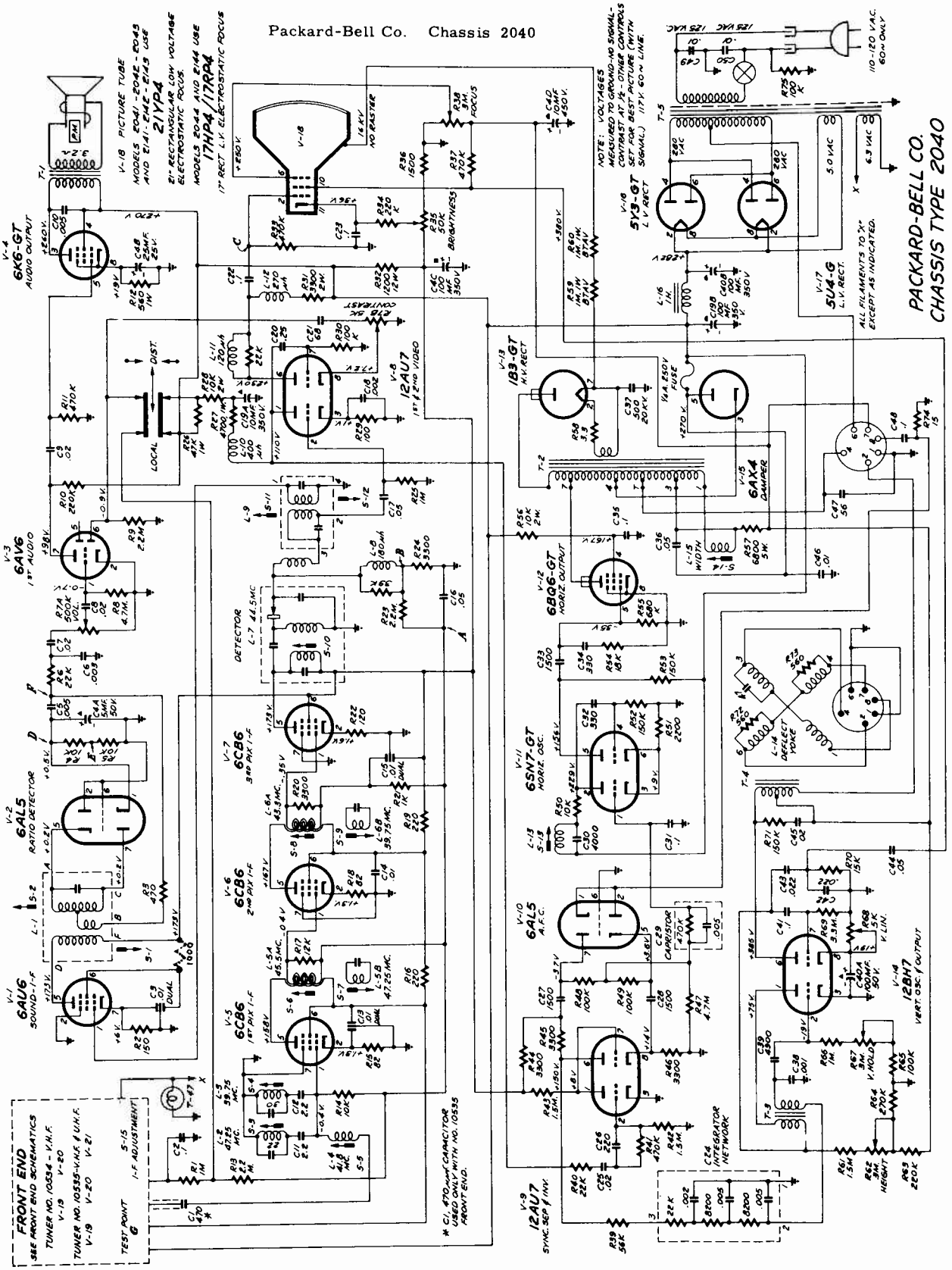
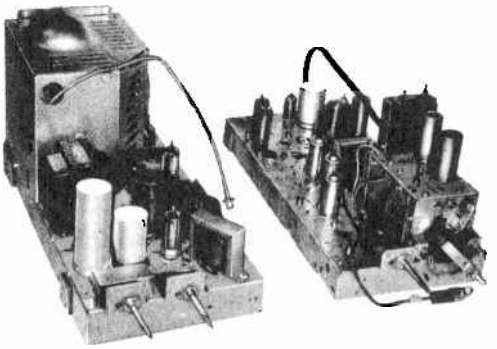


Fig. 1. I-F Response Curve, Chassis 2040


Packard-Bell Co. Chassis 2040
PACKARD-BELL CO.
CHASSIS TYPE 2040
V-1 6AU6 SOUND 1-F
V-2 6AL5 RATIO DETECTOR
V-3 6AV6 1ST AUDIO
V-4 6K6-GT AUDIO OUTPUT
V-5 6CB6 1ST PIX 1-F
V-6 6CB6 2ND PIX 1-F
V-7 6CB6 3RD PIX 1-F
V-8 12AU7 1ST & 2ND VIDEO
V-9 12AU7 SYNC SEP & INV
V-10 6AL5 A.F.C.
V-11 6SN7-GT HORIZ. OSC.
V-12 6BQ6-GT HORIZ. OUTPUT
V-13 1B3-GT H.V. RECT
V-14 12BH7 VERT. OSC. & OUTPUT
V-15 6AX4 GAMPER
V-16 5Y3-GT L.V. RECT
V-17 5U4-G L.V. RECT.
V-18 PICTURE TUBE
MODELS 2041-2042-2043 AND 2141-2142-2143 USE 21YP4
21" RECTANGULAR LOW VOLTAGE ELECTROSTATIC FOCUS.
MODELS 2044 AND 2144 USE 17HP4/17RP4
17" RECT. L.V. ELECTROSTATIC FOCUS
FRONT END
SEE FRONT END SCHEMATICS
TUNER NO. 10534 - V.H.F.
V-19 V-20
TUNER NO. 10535 - V.H.F. & U.H.F.
V-19 V-20 V-21
TEST POINT G
I.F. ADJUSTMENT
* C1, 470 μμf CAPACITOR USED ONLY WITH NO. 10535 FRONT END.
ALL FILAMENTS TO "X" EXCEPT AS INDICATED.
NOTE: VOLTAGES MEASURED TO GROUND WITH SIGNAL-MEASURED AT 1 MC. OTHER CONTROLS SET FOR BEST PICTURE (WITH SIGNAL) 117 V. 60 ~ LINE.
110-120 V.A.C. 60 ~ ONLY
125 VAC
6.3 VAC
5.0 VAC
280 VAC
DETECTOR L-7 44.5 MC
HORIZ. CENTERING
HORIZ. HOLD
V. LIN.
V. HOLD
HEIGHT
BRIGHTNESS
FOCUS
CONTRAST
VOL.
DIST.
LOCAL
DEFLECT YOKE
OSCILLATOR NETWORK
CAMCITOR

PHILCO

R-F CHASSIS R-181 AND DEFLECTION CHASSIS D-181



R-F Chassis R-181U incorporates a UHF tuner for UHF reception, and is used in UHF models.

For a complete list of models using these chassis, see listing on page 96.

(This material is printed through the courtesy of the Philco Corp.)

CIRCUIT DESCRIPTION

Philco "B line", Code 130 Television Receivers use two chassis—r-f chassis R-181, containing the r-f, video, audio, and sync circuits, and deflection chassis D-181, containing the power and deflection circuits. Since these chassis are not isolated from the 60-cycle power line, all protruding shafts and mounting feet are insulated from the chassis.

CAUTION: See A-C LINE ISOLATION.

A separate subchassis contains the r-f amplifier, the oscillator, and the mixer. The r-f amplifier uses a 6BZ7 tube, V1. The oscillator and mixer each use one half of a 12AZ7 tube, V2. The output of the mixer is fed to a three-stage, stagger-tuned, i-f amplifier system employing three 6CB6 tubes. A type 1N64 crystal diode is used for the video detector, the output of which is amplified by a single-stage video amplifier utilizing a type 12BY7 tube, V6. The connections at the detector are such as to produce a composite video signal with negative-going sync pulses. The signal, which is subjected to a 180-degree phase shift through the video amplifier, is applied to the cathode of the picture tube; therefore, the sync pulses at this point are positive-going. The grid of the picture tube is returned to ground through a resistor (R309). A blanking pulse, taken from the vertical output stage, is applied across R309, for suppression of the vertical retrace.

Sound i.f. (intercarrier) is obtained by utilizing the beat frequency produced when the 26.6-mc. video carrier and the 22.1-mc. sound carrier are mixed in the video detector. The 4.5-mc. beat frequency is the difference between 26.6 mc. and 22.1 mc., and contains the FM sound signal. This 4.5-mc. signal contains only a negligible amount of video amplitude modulation, provided that the amplitude of the 22.1-mc. signal is considerably lower than that of the 26.6-mc. signal. The proper relationship between the two carriers is established during the alignment of the receiver.

The oscillator is tuned primarily to obtain the best picture, since the 4.5-mc. relationship always exists between the two carriers. The 4.5-mc. sound i.f. (intercarrier), which is taken from the plate circuit of the video amplifier, is passed through a 4.5-mc. sound i-f stage using a 6AU6 tube, V7, and is then applied to the FM detector, which utilizes two diode sections of a 6T8 tube, V8A. The triode section of the 6T8, V8B, is used as the first audio amplifier. The power amplifier uses a 6K6GT tube, V9.

A portion of the video signal appearing at the grid of the video amplifier is applied to the pentode section of a 6U8 tube which operates as a sync amplifier, V10A. The output of this stage is composite video with positive-going sync, and is applied to grid 3 (pin 7) of the 6BE6 sync separator, V11. Since grid-leak bias is used on grid 3, the tips of the sync pulses are clamped to zero, and the video components swing in a negative direction from zero. Because of the cut-off characteristics of grid 3, the video components are eliminated, and only negative-going sync pulses appear in the plate circuit of the sync separator. At the same time, however, a signal is taken from the video detector and applied to grid 1 (pin 1) of the 6BE6 tube. This grid is returned to B plus, and the bias is maintained close to zero, because of a small grid-current flow. Since the signal applied to grid 1 is composite video with negative-going sync, any noise modulation present in the signal appears in the form of sharp spikes, driving in a negative direction. The circuit constants are chosen to allow grid 1 to cut off plate current whenever the signal goes more negative than the sync pulses. A series grid-limiting resistor (R614) is also incorporated, to prevent the video components from appearing in the plate circuit of the sync separator. A-G-C voltage is also developed in the sync separator circuit in the following manner: On tips of the sync pulses, grid 3 (pin 7) of the 6BE6 tube draws current, which flows downward

(Continued on the next 10 pages)

through the network composed of R609, R610, R611, L214, and R211, causing capacitors C604, C602, and C603 to assume negative charges that are proportional to the amount of peak signal applied to grid 3. The tuner a-g-c voltage is delayed by means of a resistor divider network, which applies a small positive voltage to the tuner a-g-c circuit. This positive voltage prevents a-g-c action from lowering the tuner gain on weak signals. To prevent the delay voltage from driving the tuner a-g-c voltage positive on weak signals, a diode clamp (part of V8B) is connected across C602.

The negative-going sync pulses appearing in the plate circuit of the sync separator are fed to the sync inverter stage, V10B (triode section of the 6U8 tube). This stage acts as a phase-splitter circuit; positive sync pulses appear in the plate circuit, and negative sync pulses are taken from the cathode. Both positive and negative sync pulses are fed through the interchassis cable into the deflection chassis.

Proper triggering of the vertical oscillator requires negative synchronizing pulses. The vertical sync signal is separated from the horizontal sync signal by the integrator circuit, and is fed to the grid of the vertical oscilator (V12), a cathode-coupled multivibrator. The output of the vertical oscillator is amplified by a type 12B4 tube, V13, which is employed as the vertical output amplifier. The output of the amplifier is applied to the vertical-deflection coils through the vertical-output transformer.

The horizontal sweep circuits require both positive and negative sync pulses. The phase-comparer circuit uses a 6AL5 tube, V14. Positive sync pulses are applied to the plate of V14A, and negative sync pulses are applied to the cathode of V14B. A saw-tooth voltage is fed to the plate of V14B and to the cathode of V14A, for comparison of the sync and horizontal sweep voltages. When the saw-tooth and sync signals are exactly in phase, no voltage is developed across R800, but when the two signals are out of phase, either a positive or a negative voltage is developed, depending upon whether the horizontal-oscillator frequency is lower or higher than the sync-pulse frequency. The grid circuit of the horizontal oscillator, a 12AU7 (V15) cathode-coupled multivibrator, is connected to R800 through a filter network; when the voltage at this point goes in a positive direction, the frequency of the horizontal oscillator is increased, and when the voltage swings negative, the frequency of the oscillator is decreased. In this manner the frequency of the horizontal oscillator is controlled over the lock-in range of the circuit. The horizontal-oscillator hold control (R812) adjusts the horizontal-oscillator frequency so that it is within the control range of the phase comparer. The output of the horizontal oscillator is fed to the horizontal output amplifier, which makes use of a 6BQ6GT tube, V16. The screen voltage for the horizontal amplifier is supplied from a voltage-divider network. R816, R817, (the WIDTH control), R818, R307 (the BRIGHTNESS control), and R311 are parts of this divider. R817 varies the voltage applied to the screen, thus adjusting for proper picture width. Adjusting R307 for brightness varies the bias on the picture tube. The change in bias causes a change in beam current, and would tend to result in a change in picture width and variation in the second-anode voltage. However, when the control arm of the BRIGHTNESS control, R307, is moved toward ground, less of the control is shunted by the 22K resistor, R311, and the total resistance of the voltage divider is increased. This increase in resistance results in a decrease in the current through the divider, and the screen voltage on the horizontal amplifier is increased proportionally, thus compensating automatically for the increase in beam current in the picture tube. The horizontal amplifier feeds the deflection coils through the horizontal output transformer. A 6AX4GT tube, V17, is used as the horizontal damper.

The second-anode voltage for the picture tube is supplied by one 1B3GT high-voltage rectifier tube, V18. The B plus voltage for the receiver is supplied by two selenium rectifiers, CR100 and CR101, in a full-wave, voltage-doubler circuit, operating directly from the power line. Bias voltage is obtained from across a filter choke, L405, which is in series with the negative side of the B plus supply. The B plus boost voltage, derived from the horizontal damper circuit, supplies higher B plus voltage to the vertical oscillator and the first anode of the picture tube. Filament voltage for all the tubes except the high-voltage rectifier is supplied by a step-down transformer. Filament voltage for the high-voltage rectifier is supplied by a winding on the horizontal output transformer.

IMPORTANT
A-C LINE ISOLATION

CAUTION: One side of the a-c line is connected to the chassis through C101 and L405. The other side of the a-c line is connected to the chassis through R100, F100, CR100, and C103, in series. Grounding the chassis will result in a short circuit across one or the other of these two branches in the voltage-doubler circuit. During servicing and alignment it is desirable that an a-c line isolation transformer capable of handling at least 225 watts (Philco Part No. 45-9600) be used. Failure to use an isolation transformer will greatly increase the shock hazard, and may result in damage to the test equipment or receiver, or both.

PHILCO **CHASSIS TYPES R-181, D-181**

HORIZONTAL-OSCILLATOR ADJUSTMENT

To adjust the horizontal-oscillator circuit, tune in a station and proceed as follows:

1. Reduce the width of the picture until approximately 1 inch of blank screen appears at the right-hand and left-hand sides of the picture.
2. Increase the BRIGHTNESS control setting until the blanking becomes visible. This will appear as a dark vertical bar on each side of the picture.
3. Connect a .1-μf. condenser from the test point, adjacent to TC800, to ground. (The plate side of the horizontal ringing coil, L800, is connected to the test point.)
4. Set the HORIZONTAL HOLD control to the approximate center of its mechanical rotation.
5. Adjust the HORIZ. HOLD CENTERING control until equal portions of the blanking bar appear on both sides of the picture.
6. Remove the .1-μf. condenser from the test point.
7. Adjust the horizontal ringing coil, L800, until equal portions of the blanking bar again appear on both sides of the picture.
8. Rotate the HORIZONTAL HOLD control through its range. The picture should fall out of sync on both sides of the center of its rotation. If the picture does not fall out of sync on both sides, readjust the HORIZ. HOLD CENTERING control.
9. Rotate the HORIZONTAL HOLD control through its range, and observe the number of diagonal blanking bars that appear just before the picture pulls into sync. The pull-in should occur with from 1 to 2 diagonal bars when the sync position is approached from either direction. If proper pull-in is not obtained, repeat the above procedure.

VIDEO-DETECTOR PEAKING-COIL ADJUSTMENT

The video-detector peaking coil, L214, is adjusted at the factory for proper transient response of the video circuit. Ordinarily, this coil will require no further adjustment by the serviceman. On any station where excessive overshoot or excessive smear is present, a slight adjustment of L214 may improve the picture quality on that station; however, this adjustment may sacrifice the quality on other channels. If L214 is replaced in servicing, adjustment will be required.

Before adjusting L214, check the tuner alignment and i-f alignment. (Never adjust L214 until the alignment of the receiver is correct.) Then tune in a station and adjust L214 until there are no trailing whites or smear in the picture. Turning TC206 clockwise reduces trailing whites and overshoot; turning TC206 counterclockwise reduces picture smear and increases trailing whites. The proper position is the point where no smear or trailing whites appear in the picture.

TELEVISION ALIGNMENT

GENERAL

The alignment consists of tuning each i-f coil to a given frequency, using an AM signal, and then feeding in a sweep signal at the antenna terminals and touching up the adjustments to obtain the desired pass band.

The over-all response curve (r-f, i-f) of the circuits from the antenna terminals to the video detector, after the i-f stages have been aligned, should appear essentially the same, regardless of the channel under test. If not, the tuner should be aligned.

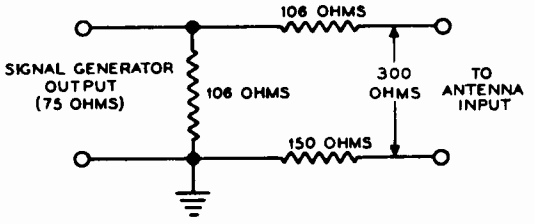
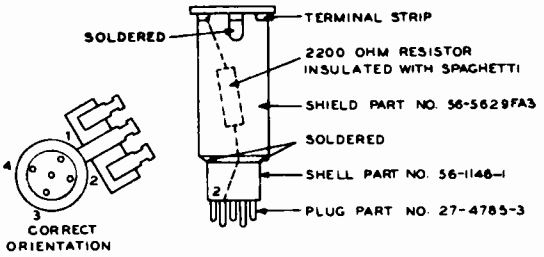


Figure 1. Antenna-Input Matching Network



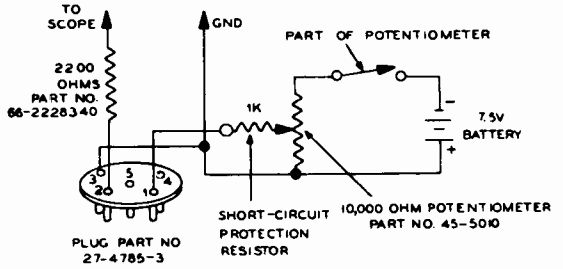


Figure 2. Video I-F Alignment Jig

TELEVISION TUNER ALIGNMENT

After the tuner is serviced, or if an i-f alignment is required, the tuner alignment should be checked by observing the tuner response curve, as given under Bandpass Alignment. If the response curve does not fall within the limits shown in figure 5, the tuner should be realigned. If realignment is necessary, use the procedure given below.

Since the frequency of the local oscillator affects the tuner response, the local-oscillator alignment should be made first.

PHILCO

CHASSIS TYPES R-181, D-181

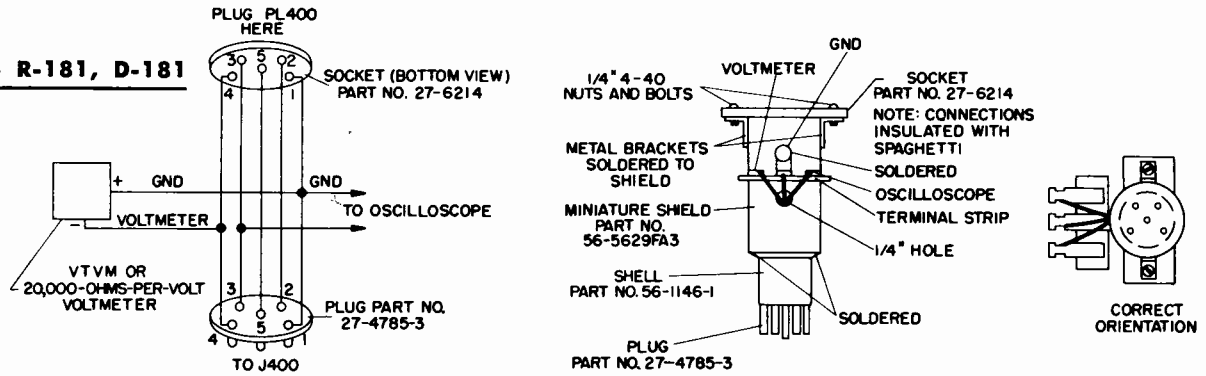


Figure 3. Sound I-F Alignment Jig

Oscillator Alignment

General

Tuning cores are provided in the oscillator coils at channels 13, 11, 9, 7, 6, and 4. By adjusting these tuning cores, all channels may be placed on frequency. This procedure should be carried out with the highest-frequency channel first, since the alignment of each channel affects the alignment of all the channels below it in frequency. The channel adjustments are so arranged that, with one exception, each adjustment corrects the tuning of more than one channel. The coverage of the various adjustments is as follows:

Channel Adjustment	Channels Corrected By Adjustment
13	13 and 12
11	11 and 10
9	9 and 8
7	7 only
6	6 and 5
4	4, 3, and 2

The FINE TUNING cam should be preset for all adjustments by placing the stop on the FINE TUNING cam between the Channel 7 and 8 holes on the front plate of the tuner. See figure 4.

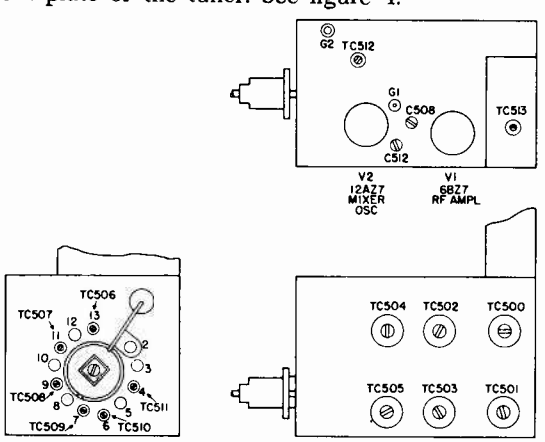


Figure 4. Television Tuner, Showing Locations of Adjustments

Procedure Using Signal Generator

An r-f signal (unmodulated), at the oscillator frequency, is fed into the antenna input from an AM signal generator, and the oscillator tuning cores are adjusted for zero beat. The r-f signal frequency should be accurately determined. It is preferable that the signal be taken from a crystal-controlled source; if this is not available, the signal generator may be calibrated against the television station.

1. Connect the hot lead of the oscilloscope to the mixer plate test point, G2, through a 1000-ohm resistor, and connect the ground lead of the oscilloscope to the chassis, near the test point. (High oscilloscope gain may be necessary to obtain a visual beat. In this instance, base-line hum may be ignored.)

2. Connect the AM (marker) generator to the 300-ohm antenna-input terminals. For this purpose the antenna-input matching network is not required.

3. Disconnect the white (a-g-c) lead from the tuner, and connect it to the negative terminal of a 1½-volt battery. Ground the positive terminal. If regeneration is observed, the bias may be increased to 4 or 5 volts, to reduce the regeneration.

4. Mechanically preset the fine-tuning cam as shown in figure 4.

5. Feed in an r-f signal (unmodulated), at the oscillator frequency for Channel 13, with the CHANNEL SELECTOR set for Channel 13.

6. Adjust the Channel 13 tuning core (see figure 4).

7. Reset the signal-generator frequency and the CHANNEL SELECTOR, and adjust the tuning cores for Channels 11 and 9, respectively.

8. Repeat steps 5, 6 and 7 until Channels 13, 11, and 9 are within plus or minus 500 kc. of the correct frequency.

9. Feed in r-f (unmodulated) signals, at the oscillator frequencies for Channels 7, 6, and 4, consecutively (see NOTE below), and adjust the respective tuning cores (see figure 4).

NOTE: The exact position of the FINE TUNING cam should be marked when Channel 4 is correctly aligned. This position is to be used in step 4 of the i-f alignment procedure.

PHILCO CHASSIS TYPES R-181, D-181

Procedure Using Station Signal

The following simplified procedure may be used to align the oscillator when the television i-f alignment is satisfactory and a station signal is available:

1. Mechanically preset the FINE TUNING cam to the center of its range (see figure 4).

2. Tune in the highest-frequency channel to be received.

3. Adjust the tuning core for that channel, or the next highest channel, for the best picture; that is, starting with sound in the picture, turn the tuning core until the sound disappears. Repeat for each channel received in the area.

Bandpass Alignment

General

The bandpass alignment consists of aligning the tuner at Channels 13 and 6, and then making it track down to Channels 7 and 2, respectively.

During the alignment, a fixed bias of 1½ volts is applied to the r-f amplifier tube.

An FM (sweep) signal is applied to the antenna-input circuit, and an oscilloscope is connected to the mixer plate circuit. The oscilloscope gain should be as high as possible, consistent with hum level and "bounce" conditions. Hum conditions will cause distortion of the time base and response. Bounce conditions, which are caused by poor line regulation, will cause the response and time base to jump up and down. The use of too high an oscilloscope gain aggravates these conditions, whereas the use of too low a gain necessitates increasing the generator output to a point where the tuner may be overloaded. Overload may be checked by changing the generator output while observing the shape of the response curve; any change in the shape of the curve indicates overload, in which case a lower generator output and higher oscilloscope gain must be used. The tuner coupling link should be disconnected from the i-f section and a 40- to 70-ohm resistor connected across the open end of the link, to eliminate the absorption effect of this coil on the response curve.

1. Disconnect the white (a-g-c) lead from the tuner, and connect it to the negative terminal of a 1½-volt battery. Ground the positive terminal.

2. Disconnect the tuner link at terminal board B11-5 and B11-7 (see figure 36), and connect a 40- to 70-ohm carbon resistor to the two leads of the link.

3. Connect a 1000-ohm resistor in series with the hot lead of the oscilloscope. Connect the other end of the resistor to the mixer plate test point, G2, and connect the ground lead of the oscilloscope to the chassis, near the test point.

4. Connect the FM (sweep) generator to the 300-ohm antenna-input terminals through an antenna-input matching network. See figure 1.

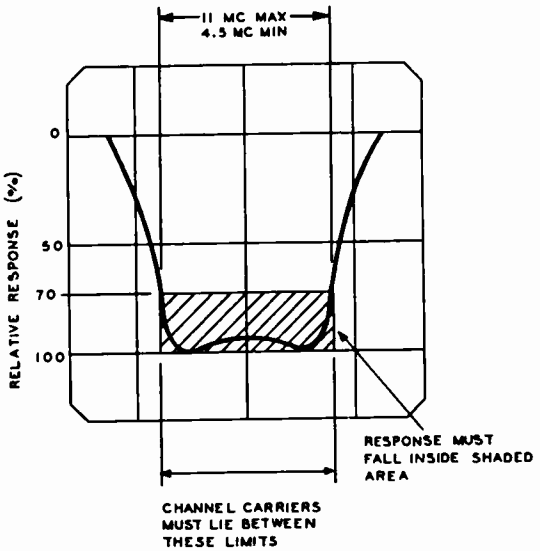


Figure 5. Television Tuner Response Curve, Showing Bandpass Limits

Procedure

1. Set the CHANNEL SELECTOR and FM (sweep) generator to Channel 13 (213 mc.): Adjust the generator for sufficient sweep to show the complete response curve.

2. Establish the channel limits (see figure 5) by using the marker (AM r-f) signal generator to produce marker pips on the response curve. (Set the marker generator first to 210 mc., then to 216 mc.) The curve should be reasonably flat between the limits shown in figure 5.

3. Adjust TC502 and TC504 (figure 4) for a symmetrical, approximately centered pass band. Set the marker generator to 213 mc. Detune TC504 counterclockwise until a single peak appears. Adjust TC502 until the peak falls on the 213-mc. marker. It may be necessary to increase the output of the generator during this adjustment. Then adjust TC500 for maximum curve height and symmetry of the single peak. The antenna circuit is now tuned for the high-frequency channels.

4. Readjust TC502 and TC504 for a symmetrical response, centered about 213 mc., and falling within the limits shown in figure 5.

5. Set the CHANNEL SELECTOR and FM generator to Channel 7 (177 mc.).

6. Establish the channel limits by using the marker generator to produce marker pips on the response curve. (Set the generator first to 174 mc., then to 180 mc.). The curve should be reasonably flat between the limits.

7. On Channel 7, note the response curve, with respect to tilt and center frequency. The curve should be centered in the pass band, and should be symmetrical.

PHILCO

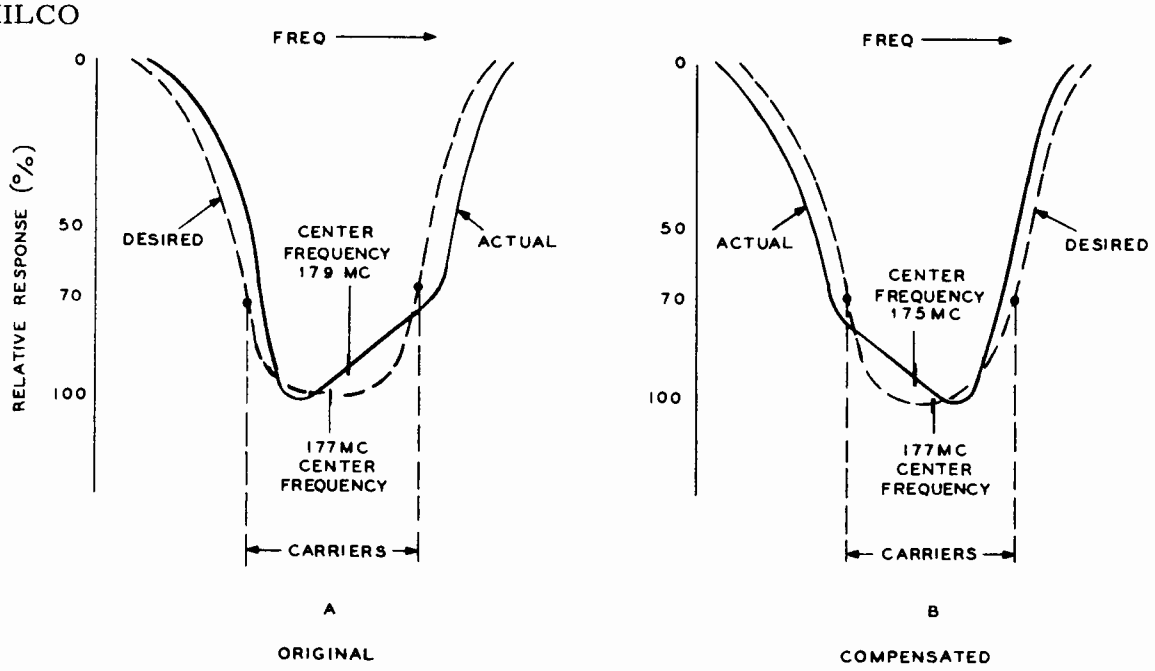


Figure 6. Television Tuner Response Curve, Showing Tracking Compensation

8. If the curve is not symmetrical, and appears unbalanced, as shown in figure 6, leave the generator and tuner set to Channel 7, and adjust C508 and C512 (see figure 4) to obtain a response curve which is the mirror image (tilt in the opposite direction) of the original. This is a form of overcompensation, to allow for the effect of Channel 13 adjustment on Channel 7. For example, if the Channel 7 response appears as in figure 6A, then the trimmer should be adjusted to obtain the response shown in figure 6B.

9. Reset the CHANNEL SELECTOR and generators to Channel 13. Readjust TC502 and TC504 for a symmetrical and centered pass band. See step 4.

10. Set the CHANNEL SELECTOR and generators to Channel 7, and check the response for center frequency and symmetry. Repeat steps 8 and 9 as many times as necessary to obtain the most symmetrical and centered response curves on Channels 13 and 7. Channels 7 through 13 are now correctly aligned.

11. Set the CHANNEL SELECTOR and sweep generator to Channel 6 (85 mc.).

12. Establish the channel limits, using the marker generator to produce marker pips on the response curve. (Set the generator first to 82 mc., then to 88 mc.)

13. Adjust TC503 and TC505 for a symmetrical, approximately centered pass band. Set the marker generator to 85 mc. Detune TC505 counterclockwise until a single peak appears.

CAUTION: Do not turn TC505 excessively, or it will fall out of the coil.

Adjust TC503 until the peak falls on the 85-mc. marker. It may be necessary to increase the output of the generator during this adjustment. Then adjust TC501 for maximum curve height and symmetry of the single peak. The antenna circuit is now tuned for Channels 2 through 6. To prevent overloading, the output of the generator should be reduced after this adjustment is completed.

14. Readjust TC503 and TC505 for a symmetrical response, centered about 85 mc.

VIDEO I-F ALIGNMENT

Preliminary

Before proceeding with the alignment or making an alignment check, observe the following preliminary instructions:

1. Preset the CONTRAST and BRIGHTNESS controls to the maximum counterclockwise position.
2. Preset the CHANNEL SELECTOR to Channel 4.
3. Insert the video i-f alignment jig into J200.
4. Connect the oscilloscope to the 2200-ohm resistor from the video i-f alignment jig. Connect the ground lead of the oscilloscope to the ground lead of the jig.
5. Connect a 3-volt bias battery to the video i-f alignment jig, with the negative terminal of the battery to the bias lead of the jig, and the positive terminal to the ground lead.
6. Connect the AM generator to the mixer test point, G-1, through a mixer jig, and adjust the generator for approximately 30 percent modulation at 400 cycles. Adjust the output of the generator during alignment, to keep the output at the second detector below .6 volt, peak to peak.

PHILCO **CHASSIS TYPES R-181, D-181**

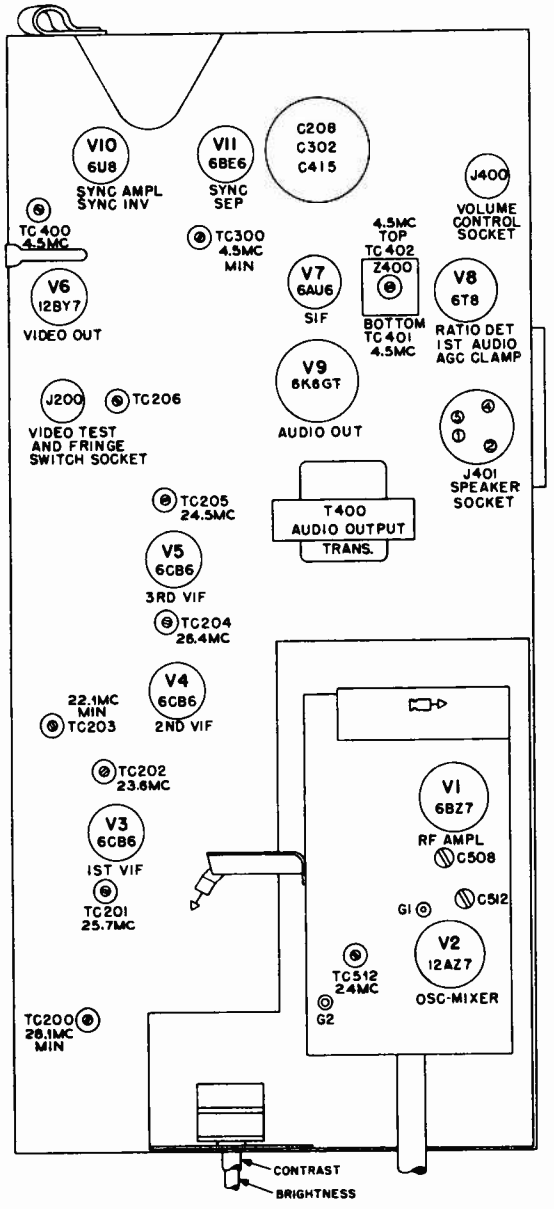


Figure 7. R-F Chassis R-181, Top View, Showing Locations of Adjustments

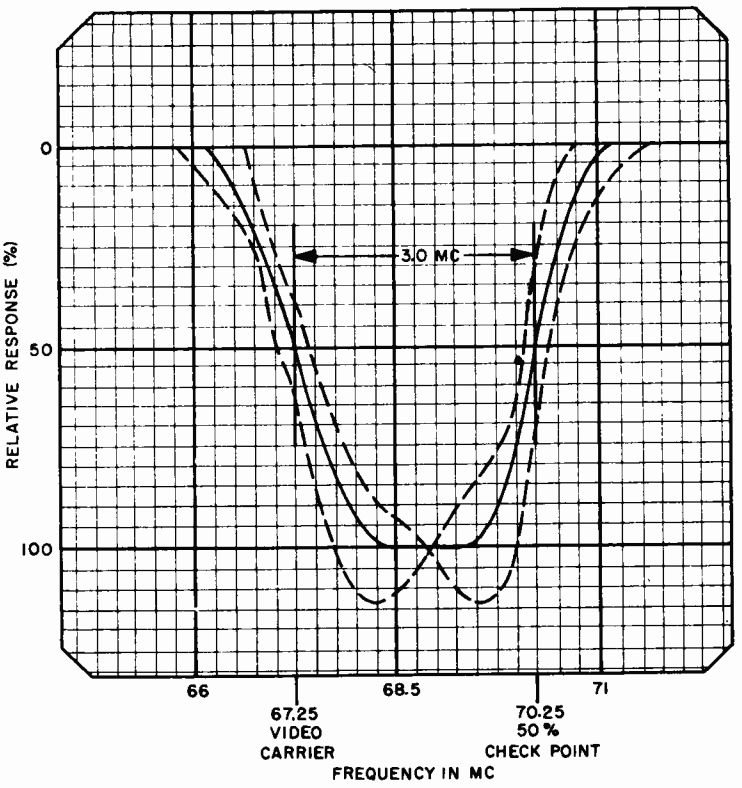


Figure 8. Over-all R-F, I-F Response Curve, Showing Tolerance Limits

Procedure

1. Tune the AM generator to 28.1 mc., and adjust TC200 (see figure 7) for minimum output, as observed on the oscilloscope.

2. Tune the AM generator to 22.1 mc., and adjust TC203 for minimum output, as observed on the oscilloscope.

NOTE: In steps 1 and 2 it is necessary to keep the generator output sufficiently high that a null indication may be observed on the oscilloscope; however, avoid overloading of the receiver by excessive signal.

3. Tune the AM generator to the frequencies indicated below, and adjust the tuning cores for maximum output.

a. 24.0 mc., adjust TC512.
b. 25.7 mc., adjust TC201.
c. 23.6 mc., adjust TC202.
d. 26.4 mc., adjust TC204.
e. 24.5 mc., adjust TC205.

4. Connect the sweep generator and r-f marker generator to the antenna terminals through a matching jig. (If a separate oscilloscope is used, connect the sweep output of the generator to the horizontal input of the oscilloscope.) Set the CHANNEL SELECTOR to Channel 4, and tune the sweep generator for output on Channel 4. After the equipment is properly connected, adjust the FINE TUNING control to the mark previously made (see NOTE under Oscillator Alignment).

5. If the response curve does not fall within the limits shown in figure 8, the adjustment of the tuning cores may be touched up slightly while observing the response curve with the sweep generator. Do not touch the setting of TC200 and TC203. To adjust the curve, adjust TC201 and TC204 for proper video carrier level. The top of the curve may be leveled by adjusting TC205, and the low-frequency

PHILCO **CHASSIS TYPES R-181, D-181**

Circuit diagrams on the next three pages.

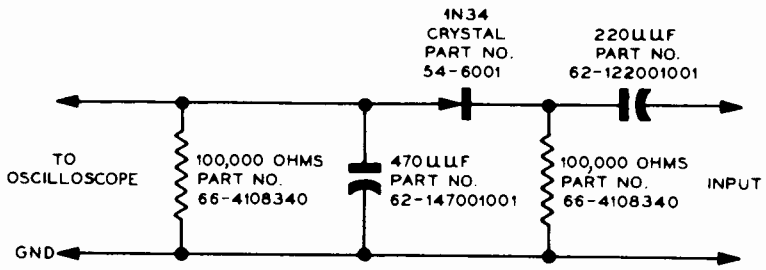


Figure 9. Wiring Diagram of Crystal Detector

side of the curve may be adjusted by adjusting TC202. By means of these adjustments the response curve should be brought within the limits shown in figure 8.

CAUTION: Do not turn any of the tuning cores excessively. To retouch, only turn the tuning cores slightly. This caution applies particularly to TC202.

SOUND I-F ALIGNMENT

1. Remove the 1st v-i-f tube, and connect a v.t.v.m. or a 20,000-ohms-per-volt voltmeter to the sound i-f alignment jig. Adjust the VOLUME control for moderate speaker output.

2. Feed in an accurately calibrated 4.5-mc. AM signal through the 2200-ohm resistor in the video i-f alignment jig, to pin 2 of J200.

3. Tune TC400, TC401, and TC402 for maximum indications on the meter. The point of maximum meter indication for TC402 should also be the point of minimum speaker output.

4. Tune TC402 for minimum speaker output.

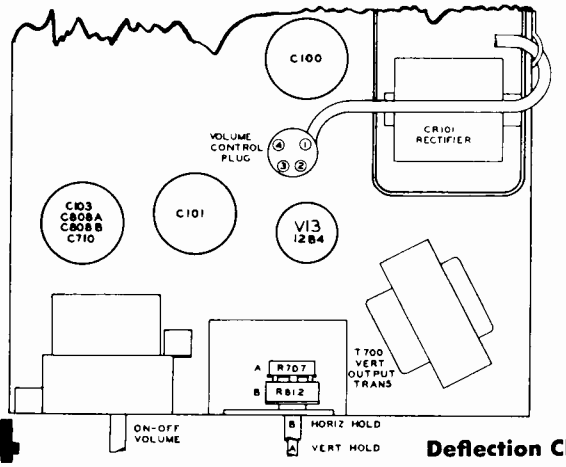
5. Connect an r-f probe or crystal detector to the cathode (pin 11) of the picture tube. See NOTE below.

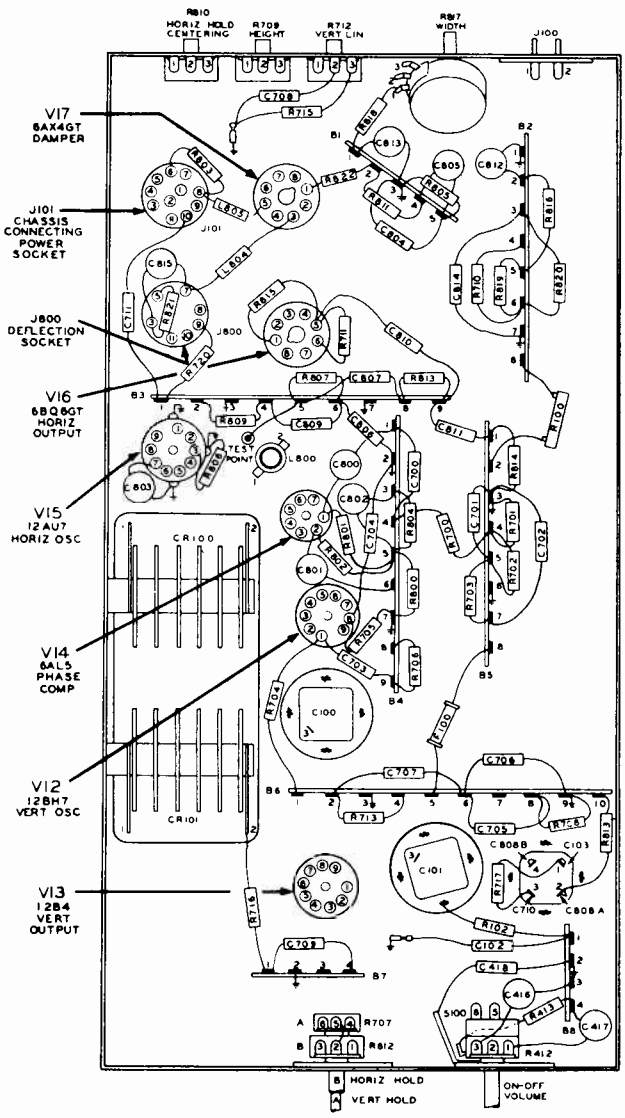
6. Tune TC300 for minimum indication on oscilloscope. (If a crystal detector is not available, TC300 may be adjusted for minimum beat pattern, as observed on the picture tube, with a station picture present.)

7. Replace the 1st v-i-f tube. Tune in a station and use the speaker output as an indication.

8. Turn the FINE TUNING control clockwise to obtain a slightly fuzzy picture.

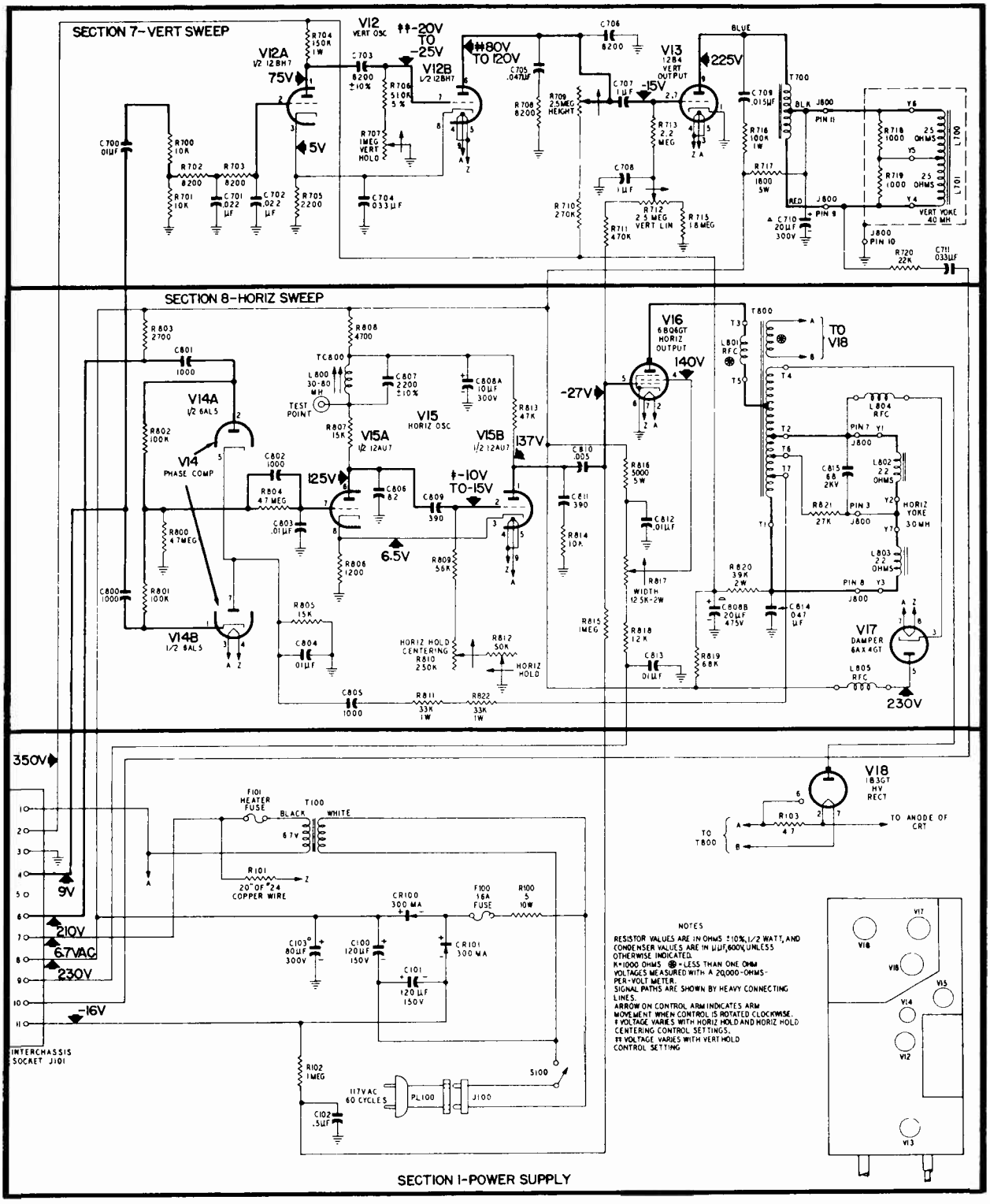
9. Tune TC402 for minimum AM (noise) output. NOTE: The R-F Probe, Part No. 76-3595, is used as a detector of the 4.5-mc. signal, and the oscilloscope is used as an indicating device. An alternate crystal detector may be made up as shown in figure 9.





Deflection Chassis D-181, Run 4 (First Production), Base Layout

PHILCO **CHASSIS TYPES R-181, D-181**



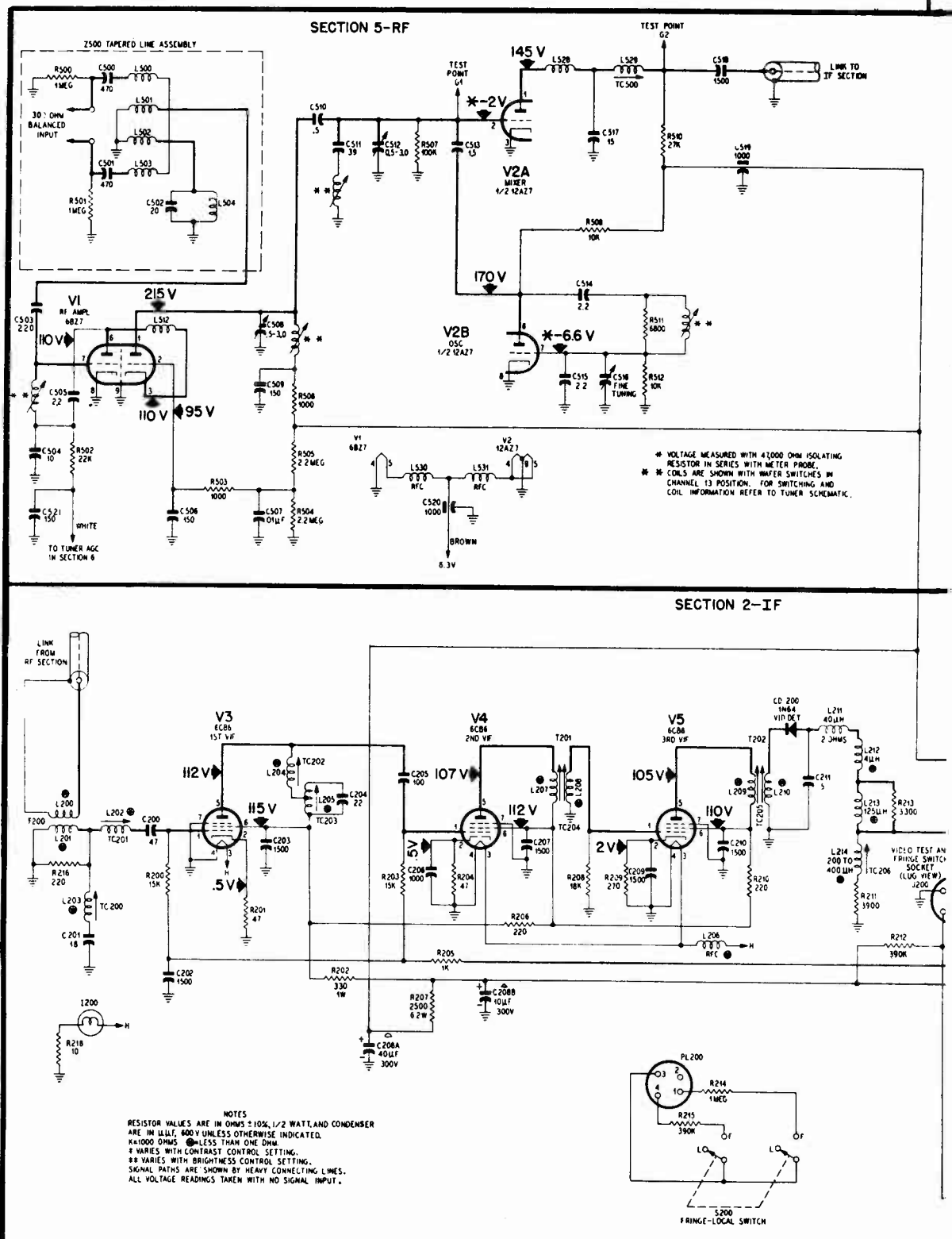
Deflection Chassis D-181, Run 4 (First Production), Schematic Diagram

PHILCO **CHASSIS TYPES R-181, D-181**

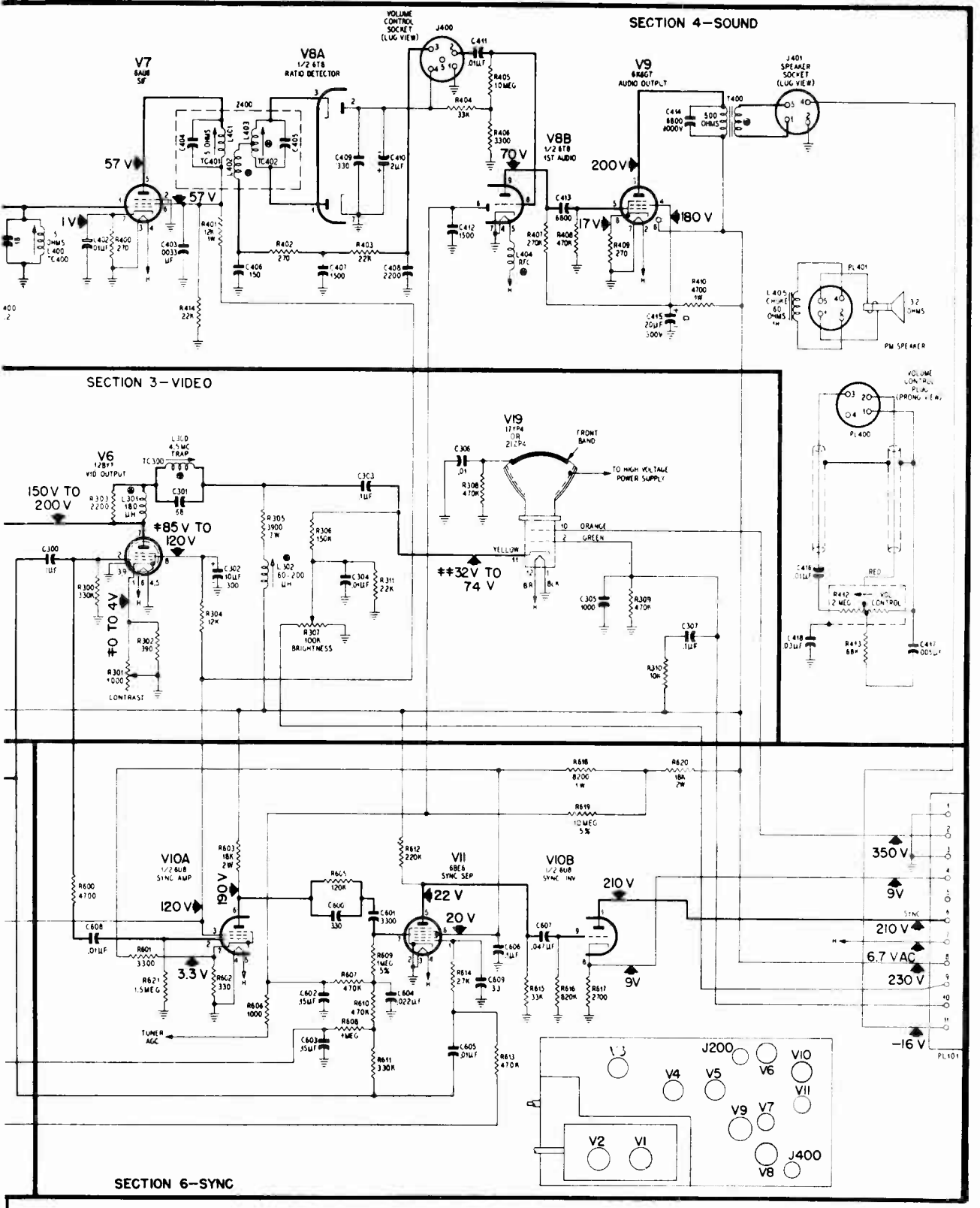
List of Models

18B3000
18BU3000
18B3001
18BU3001
18B3100
18B3100HM
18B3100L
18BU3100
18BU3100HM
18BU3100L
22B4000
22BU4000
22B4100
22B4100L
22BU4100
22BU4100L
22B4301
22B4303
22BU4303

Models with the letters "BU" use Chassis R-181U for UHF reception.

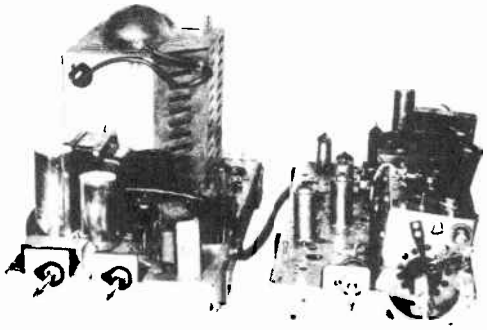


R-F Chassis R-181, Run 15 (First Production), Schematic Diagram


SECTION 4—SOUND
V7
V8A
1/2 6T8
RATIO DETECTOR
V8B
1/2 6T8
1ST AUDIO
V9
6K6GT
AUDIO OUTPUT
J400
J401
SPEAKER SOCKET
(LUG VIEW)
VOLUME CONTROL SOCKET (LUG VIEW)
57 V
1 V
70 V
200 V
180 V
17 V
PM SPEAKER
SECTION 3—VIDEO
V6
VID OUTPUT
150 V TO 200 V
+85 V TO 120 V
0 TO 4 V
V19
FRONT BAND
TO HIGH VOLTAGE POWER SUPPLY
ORANGE
GREEN
YELLOW
RED
++32 V TO 74 V
BRIGHTNESS
CONTRAST
V10A
1/2 6U8
SYNC AMP
V11
6BE6
SYNC SEP
V10B
1/2 6U8
SYNC INV
120 V
190 V
22 V
20 V
210 V
9 V
3.3 V
TUNER AGC
350 V
SYNC
6.7 VAC
230 V
-16 V
J200
V1
V2
V3
V4
V5
V6
V7
V8
V9
V10
V11
J400
SECTION 6—SYNC

PHILCO

R-F CHASSIS R-191 AND DEFLECTION CHASSIS D-191



R-F Chassis R-194 and Deflection Chassis D-194 used in combination sets, are similar to units R-191 and D-191, described on pages 98 to 104, inclusive. Chassis R-191U incorporates a UHF tuner to provide UHF reception. Chassis R-192U uses a different VHF tuner and a UHF tuner unit. A complete list of models using these chassis is given on page 102.

Philco "B" line, Code 140, Television Receivers use two chassis—the r-f chassis R-191, containing the r-f, video, audio, and sync circuits, and deflection chassis D-191, containing the power and deflection circuits. Since these chassis are not isolated from the 60-cycle power line, all protruding shafts and mounting feet are insulated from the chassis.

HORIZONTAL-OSCILLATOR ADJUSTMENT

To adjust the horizontal-oscillator circuit, tune in a station and proceed as follows:

1. Reduce the width of the picture until approximately 1 inch of blank screen appears at the right-hand and left-hand sides of the picture.
2. Increase the BRIGHTNESS control setting until the blanking becomes visible. This will appear as a dark vertical bar on each side of the picture.
3. Connect a .1 μf. condenser from the test point, adjacent to TC800, to ground. (The plate side of the horizontal ringing coil, L800, is connected to the test point.)
4. Set the HORIZONTAL HOLD control to the approximate center of its mechanical rotation.
5. Adjust the HORIZ HOLD CENTERING control until equal portions of the blanking bar appear on both sides of the picture.
6. Remove the .1-μf. condenser from the test point.
7. Adjust the horizontal ringing coil, L800, until equal portions of the blanking bar again appear on both sides of the picture.
8. Rotate the HORIZONTAL HOLD control through its range. The picture should fall out of sync on both sides of the center of its rotation. If the picture does not fall out of sync on both sides, readjust the HORIZ HOLD CENTERING control.
9. Rotate the HORIZONTAL HOLD control through its range, and observe the number of diagonal blanking bars that appear just before the picture pulls into sync. The pull-in should occur with from 1 to 2 diagonal bars when the sync position is approached from either direction. If proper pull-in is not obtained, repeat the above procedure.

VIDEO PEAKING-COIL ADJUSTMENT

The video peaking coil, L303, is adjusted at the factory for proper transient response of the video circuits. Ordinarily, this coil will require no further adjustment by the serviceman. On any station where excessive overshoot or excessive smear is present, a slight adjustment of L303 may improve the picture quality on that station; however, this adjustment may sacrifice the quality on other channels. If L303 is replaced in servicing, adjustment will be required.

Before adjusting L303, check the tuner alignment and i-f alignment. (Never adjust L303 until the alignment of the receiver is correct.) Then tune in a station and adjust L303 until there are no trailing whites or smear in the picture. Turning TC301 clockwise reduces trailing whites and overshoot; turning TC301 counterclockwise reduces picture smear and increases trailing whites. The proper position is the point where no smear or trailing whites appear in the picture.

The above procedure for adjustment of TC301 applies to a particular station exhibiting smear or overshoot. After TC301 is adjusted, reception on all the other stations should be checked, to make certain that the adjustment has not impaired the picture quality.

PHILCO R-191 and D-191, continued

VIDEO I-F ALIGNMENT

Preliminary

Before proceeding with the i-f alignment or making an alignment check, observe the following preliminary instructions:

1. Preset the CONTRAST and BRIGHTNESS controls to the maximum counterclockwise position.
2. Preset the CHANNEL SELECTOR to Channel 4.
3. Insert the video i-f alignment jig (figure 2) into J200.
4. Connect the oscilloscope to the 15,000-ohm resistor from the video i-f alignment jig. Connect the ground lead of the oscilloscope to the ground lead from the adapter.
5. With a voltmeter connected across the points shown in figure 2, set the potentiometer to furnish –6 volts of bias.
6. Connect the AM generator to the mixer test point, G1, through a mixer jig (described in step 4 of procedure given below), and adjust the generator for approximately 30 percent modulation with 400 cycles. Adjust the output of the generator during the alignment to keep the output at the second detector below .6 volt, peak to peak.

Procedure

1. Preset condenser C526 for minimum capacitance (turn screw counterclockwise).
2. Tune the AM generator to 47.25 mc., and adjust C200 for minimum output, as observed on the oscilloscope. See figure 7.

NOTE: It is necessary to keep the generator output sufficiently high that a null indication may be observed on the oscilloscope; however, avoid overloading of the receiver by excessive signal.

3. Tune the AM generator to the frequencies indicated below, and adjust the trimmers for maximum output, as observed on the oscilloscope.
   a. 45.7 mc.—adjust C526
   b. 42.6 mc.—adjust C202
   c. 45.0 mc.—adjust C206
   d. 43.2 mc.—adjust C210
   e. 44.3 mc.—adjust C212
4. Connect the sweep generator and r-f marker generator to the antenna terminals through a matching jig. (If a separate oscilloscope is used, connect the sweep output of the generator to the horizontal input of the oscilloscope.) Set the CHANNEL SELECTOR

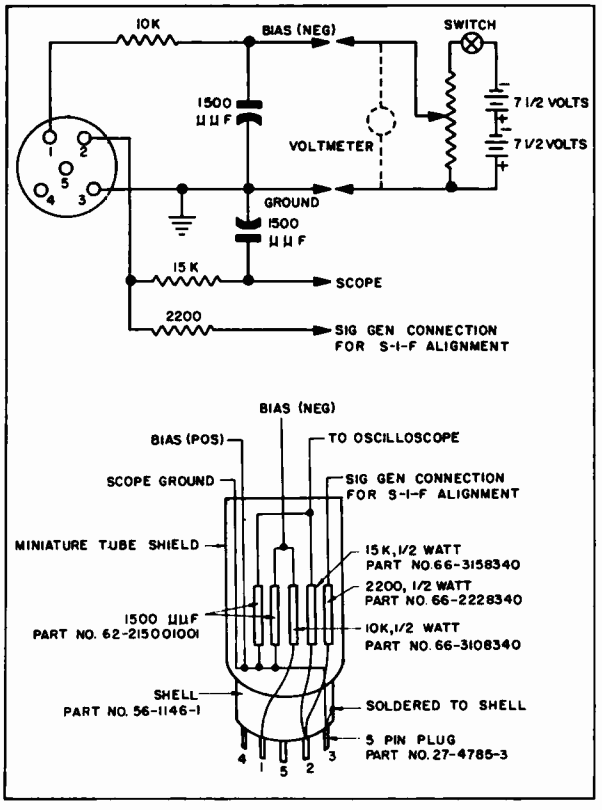


Figure 2. Video I-F Alignment Jig

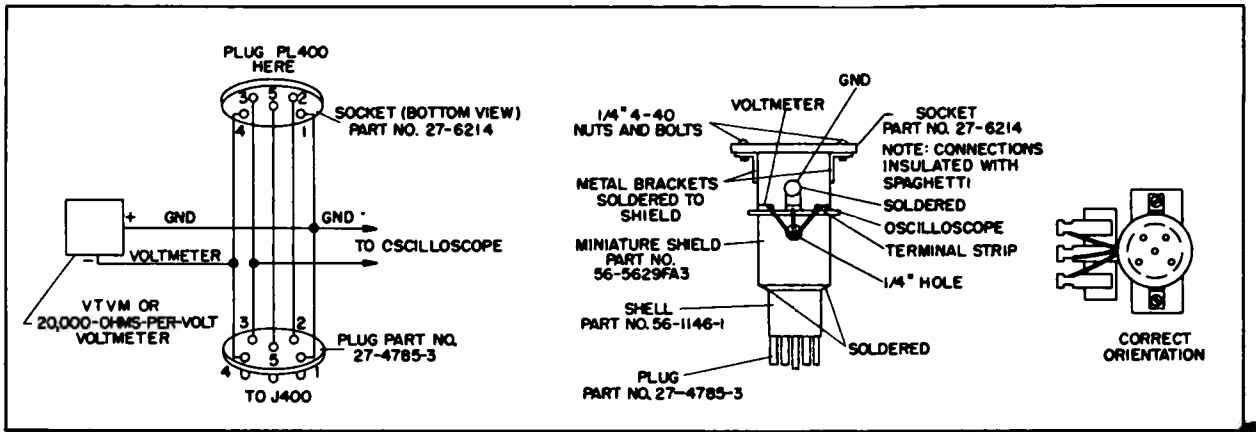


Figure 3. Sound I-F Alignment Jig

PHILCO R-191 and D-191, continued

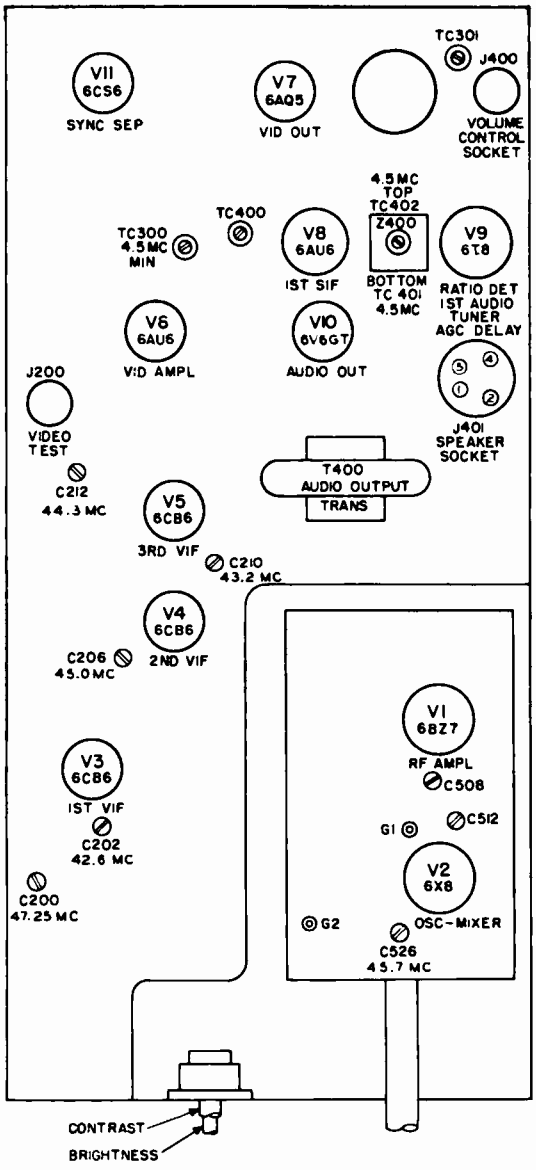


Figure 7. R-F Chassis R-191, Top View, Showing Locations of Adjustments

to Channel 4, and tune the sweep generator for output on Channel 4. Tune the r-f marker generator to the video carrier frequency of Channel 4 (67.25 mc.), and tune the i-f marker generator (capacitively coupled to the mixer grid) to 45.75 mc. Note two marker generators are used for this procedure. The r-f marker generator is connected to the antenna terminals, while the i-f marker generator is coupled capacitively to the mixer grid test point, G1. A jig constructed from a piece of fiber tubing, with $^{3}/_{16}$-inch inside diameter, and a brass machine screw which fits tightly into the tubing, is used to couple the generator capacitively to the test point. The screw is adjusted so that its tip clears the test point by approximately $^{1}/_{64}$ inch. The output cable of the marker generator is connected to the head of the brass screw in the jig and to the chassis near the mixer tube. Both marker generators should be adjusted for the minimum output required to make the markers barely visible. Failure to observe this precaution, or the use of excessive output from the sweep generator, will cause misleading results. After the equipment is properly connected, adjust the FINE TUNING control for zero beat of the two markers, as observed on the oscilloscope. When zero beat is obtained, remove the i-f marker.

5. If the response curve does not fall within the limits shown in figure 8, the adjustment of the trimmers may be touched up slightly, while observing the response curve. Do not retouch the setting of C202 at this point. To adjust the curve, first adjust C206 and C212, alternately, until maximum improvement has been obtained. C212 affects the tilt of the curve, and C206 affects the dip of the curve. After C212 and C206 have been adjusted, adjust C210 for proper slope at the 42.5-mc. side of the curve, then adjust C526 for proper level at the video carrier frequency (45.75 mc.). After these adjustments have been made, if the response curve still does not fall within the limits shown in figure 8, a slight readjustment of C202 is permissible.

CAUTION: Do not turn any of the trimmers excessively. To retouch, turn the trimmers only slightly.

SOUND I-F ALIGNMENT

1. Remove the 1st v-i-f tube, and connect a v.t.v.m. or a 20,000-ohms-per-volt voltmeter to the sound i-f alignment jig (figure 3). Adjust the VOLUME control for moderate speaker output.

2. Feed in an accurately calibrated 4.5-mc. AM signal, through the 2200-ohm resistor in the video i-f alignment jig, to pin 2 of J200.

3. Tune TC400, TC401, and TC402 for maximum indications on the meter. The point of maximum meter indication for TC402 should also be the point of minimum speaker output.

4. Tune TC402 for minimum speaker output.

5. Connect an r-f probe or crystal detector to the grid (pin 2) of the picture tube. See NOTE below.

6. Tune TC300 for minimum indication on oscilloscope. (If a crystal detector is not available, TC300 may be adjusted for minimum beat pattern, as observed on the picture tube, with a station picture present.)

7. Replace the 1st v-i-f tube. Tune in a station, using the speaker output as an indication of correct tuning.

PHILCO R-191 and D-191, continued

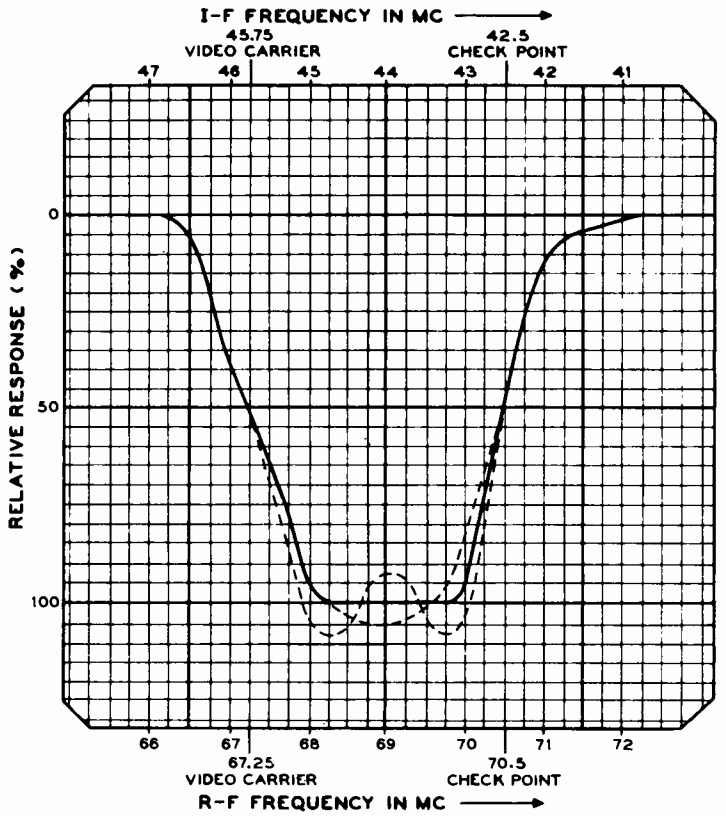
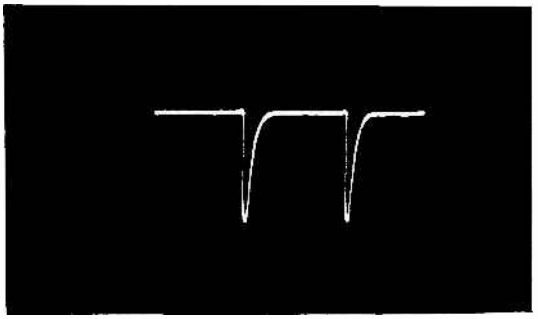
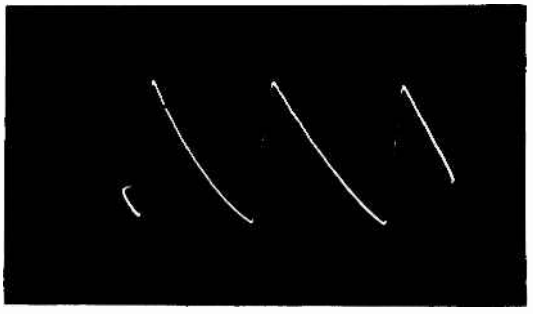


Figure 8. Over-All, R-F, I-F Response Curve, Showing Tolerance Limits



Sync Separator Plate, Pin 5 26 volts, 15,750 c.p.s.



Phase Comparer, Pins 5 and 7 8 volts, 15,750 c.p.s.

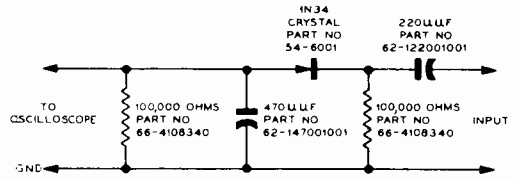


Figure 9. Wiring Diagram of Crystal Detector

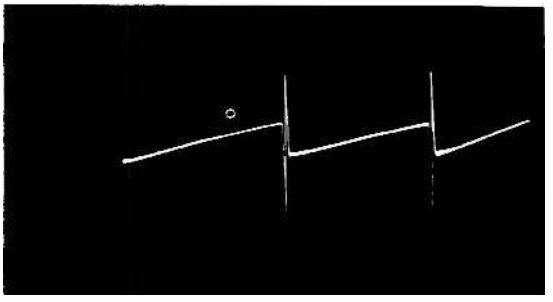
8. Turn the FINE TUNING control clockwise to obtain a slightly fuzzy picture.

9. Tune TC402 for minimum AM (noise) output.

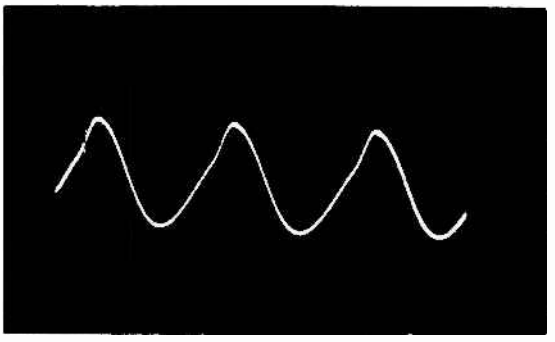
NOTE: The R-F Probe, Part No. 76-3595, is used as a detector of the 4.5-mc. signal, and the oscilloscope is used as an indicating device. An alternate crystal detector may be made up as shown in figure 9.

OSCILLOSCOPE WAVEFORM PATTERNS

These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 2 volts at the video detector. The voltages given with the waveforms are approximate peak-to-peak values. The frequencies shown are those of the waveforms—not the sweep rate of the oscilloscope.



Vertical-Oscillator Plate, Pin 6 260 volts, 60 c.p.s.



Horizontal Oscillator, Junction of L800 and R806 34 volts, 15,750 c.p.s.

PHILCO Circuit Diagram of R-F Chassis R-191

Models using R-191, R-191U, R-192U, R-194, R-194U, D-191, and D-194.

18B3002
18BU3002
18B3102
18B3102L
18BU3102
18BU3102L
18B3408
18BU3408
22B4002
22B4002L
22BU4002
22B4004
22BU4004
22B4102
22B4102L
22BU4102
22BU4102L
22B4106
22BU4106
22B4109HM
22BU4109HM
22B4150
22B4302
22BU4302
22B4304
22BU4304
22B4306
22B4306L
22BU4306
22BU4306L
22B4307HM
22BU4307HM
22B4400W
22BU4400W
22B4402
22BU4402
24B6002
24B6104
24B6104L

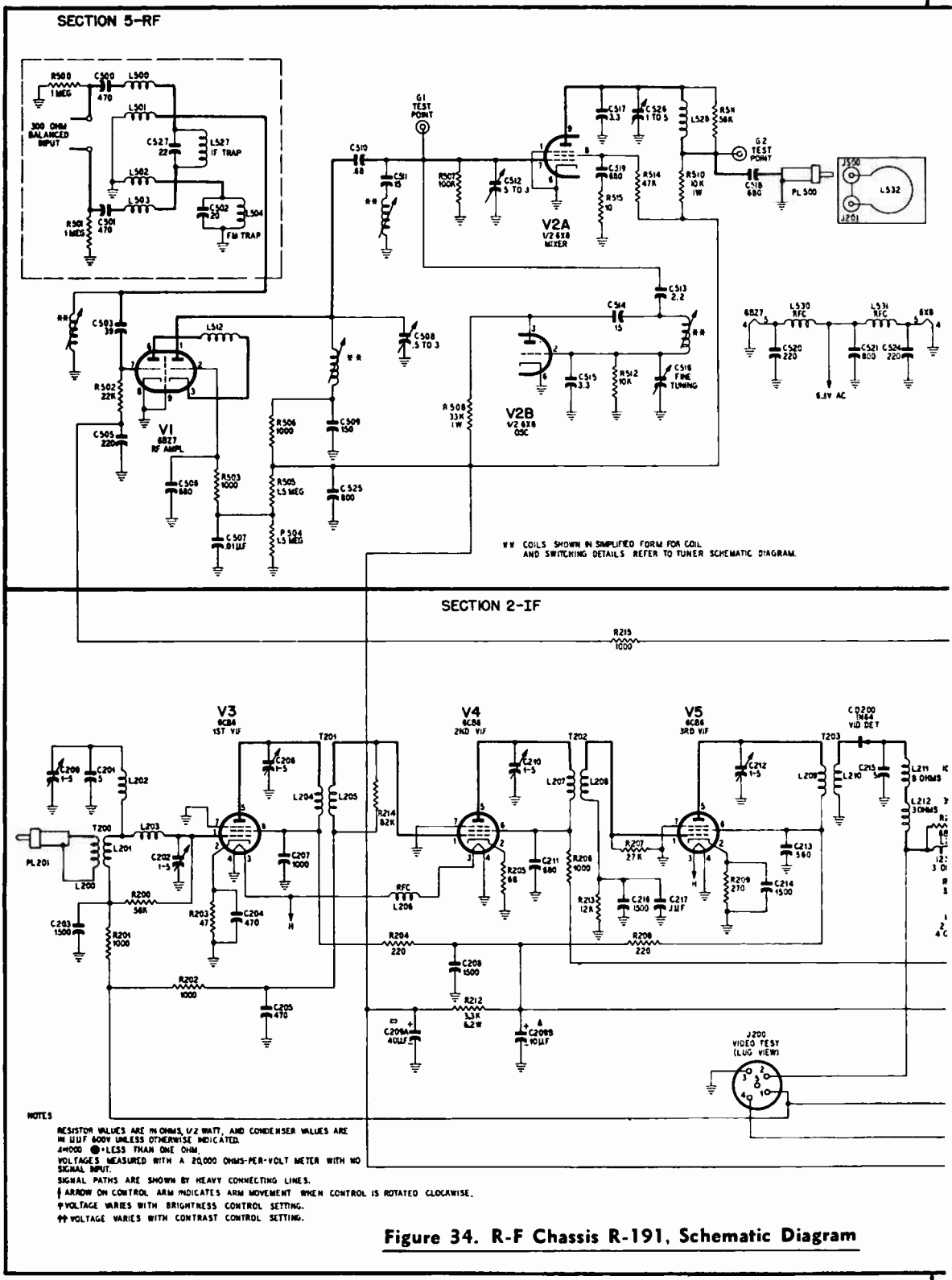
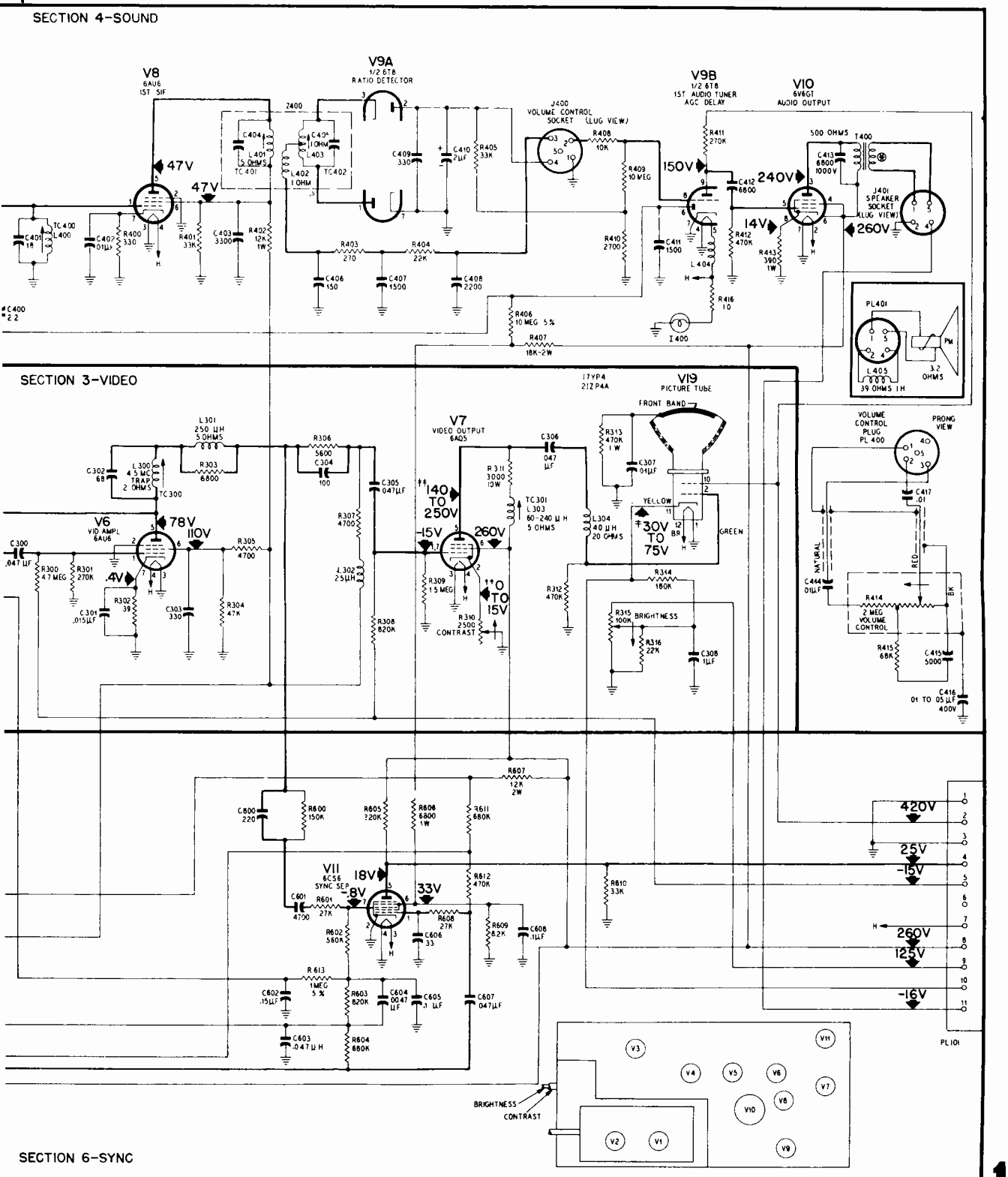


Figure 34. R-F Chassis R-191, Schematic Diagram

PHILCO Circuit Diagram of R-F Chassis R-191



PHILCO Deflection Chassis D-191

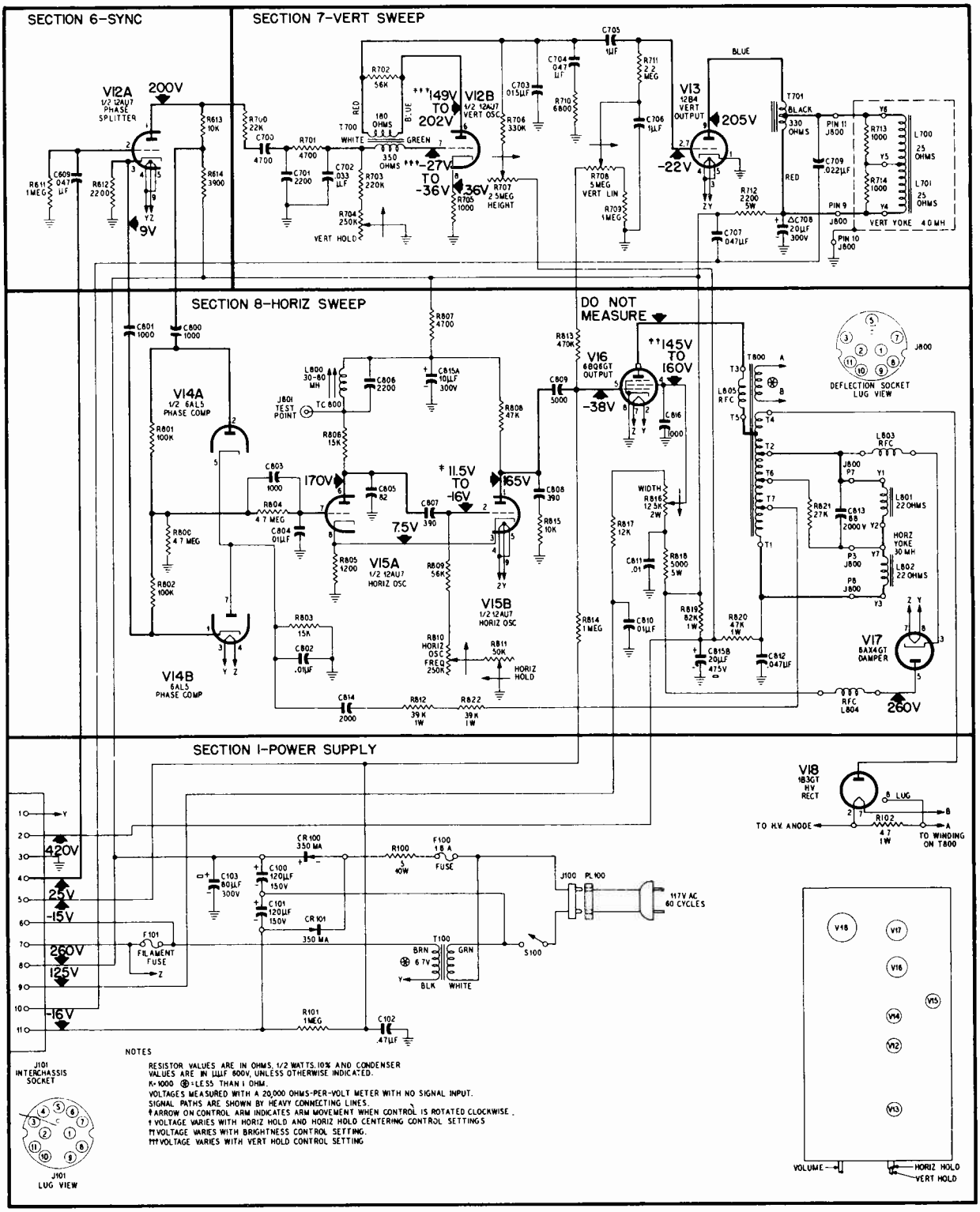


Figure 35. Deflection Chassis D-191, Schematic Diagram

PHILCO
R-F CHASSIS R-201
DEFLECTION CHASSIS D-201

R-F Chassis R-202 and R-204, and Deflection Chassis D-202 and D-204, are used in combination sets, and are similar to R-F Chassis R-201 and Deflection Chassis D-201 described on pages 105 to 110, inclusive.

List of models using these chassis is printed on page109.

VIDEO I-F ALIGNMENT Preliminary

1. Preset the CONTRAST and BRIGHTNESS controls to the maximum counterclockwise position.

2. Preset the CHANNEL SELECTOR to Channel 4.

3. Insert the video i-f alignment jig into J200.

4. Connect the oscilloscope to the 15,000-ohm resistor from the video i-f alignment jig. Connect the ground lead of the oscilloscope to the ground lead from the adapter.

5. With a voltmeter connected across the points shown in figure 2, set the potentiometer to furnish –14 volts of bias.

6. Connect the AM generator to the mixer test point, G1, through a mixer jig, and adjust the generator for approximately 30 percent modulation at 400 cycles. Adjust the output of the generator during the alignment to keep the output at the second detector below .6 volt, peak to peak.

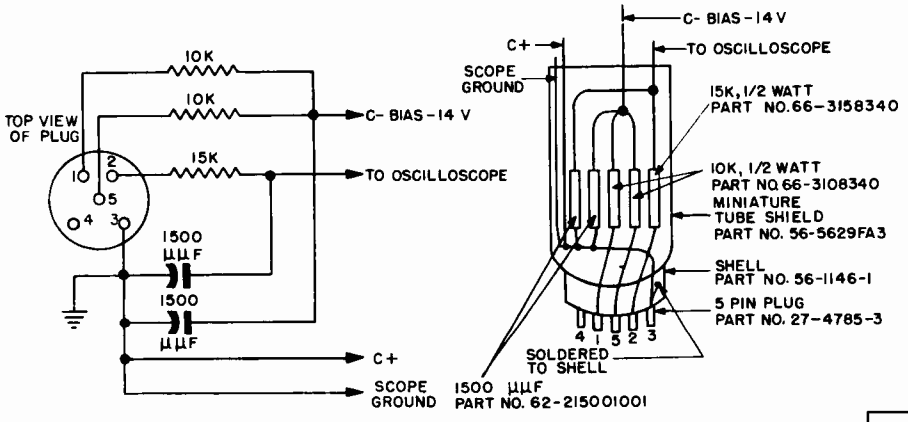


Figure 2. Video I-F Alignment Jig

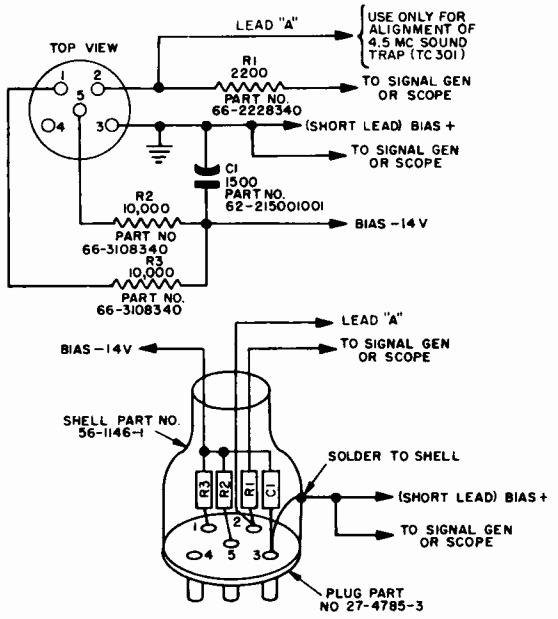


Figure 3. Sound I-F Input Alignment Jig

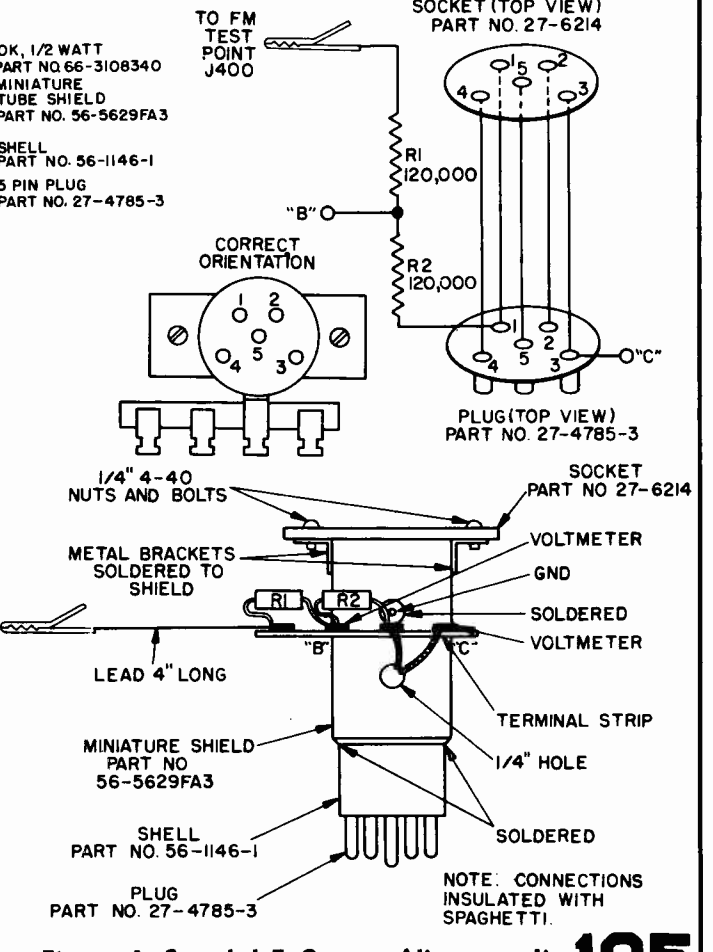


Figure 4. Sound I-F Output Alignment Jig

PHILCO R-201 and D-201, continued

NOTE: If the i-f shield has been removed for repairs, it must be replaced before proceeding with the alignment.

Procedure

1. Tune the AM generator to 47.25 mc., and adjust C201 for minimum output, as observed on the oscilloscope.

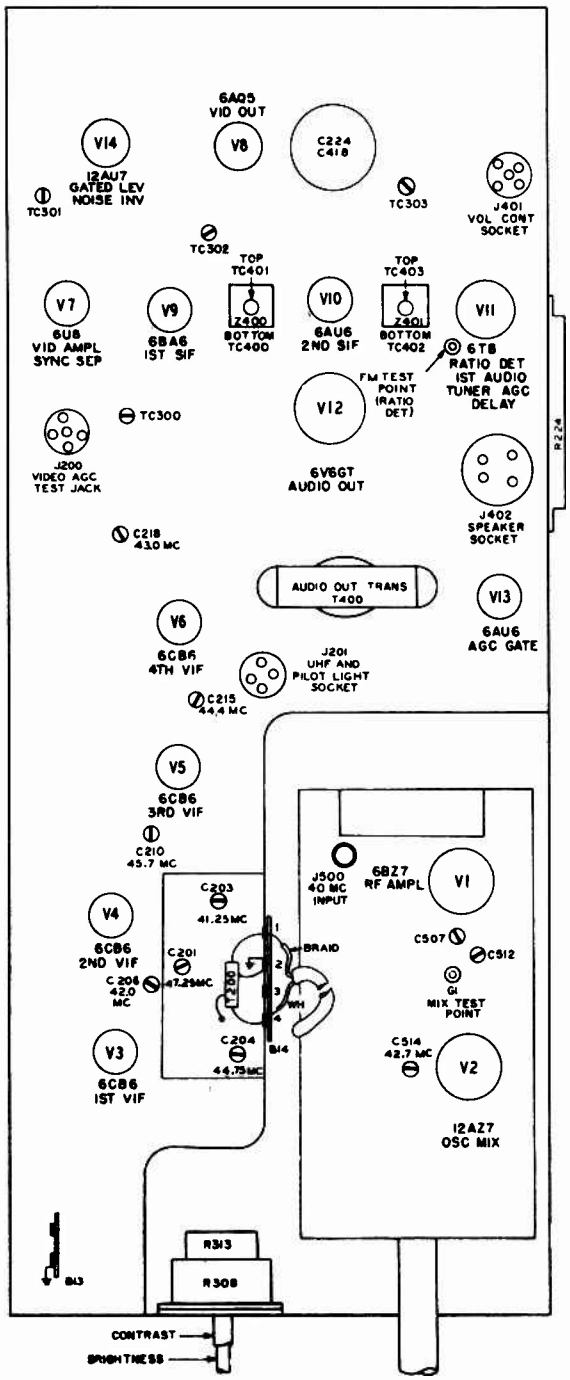


Figure 8. R-F Chassis R-201, Top View, Locations of Adjustments

2. Tune the AM generator to 41.25 mc., and adjust C203 for minimum output, as observed on the oscilloscope.

3. Tune the AM generator to the frequencies indicated below, and adjust the trimmers (see figure 8) for maximum output.

a. 42.7 mc.—adjust C514
b. 44.75 mc.—adjust C204
c. 45.7 mc.—adjust C210
d. 44.4 mc.—adjust C215
e. 43.0 mc.—adjust C218
f. 42.0 mc.—adjust C206

4. Increase the bias (by means of the potentiometer) until the scope presentation of step f, above, is reduced to 50 percent of its previous amplitude, and retouch C206 for maximum indication on the oscilloscope.

5. Connect the sweep generator and r-f marker generator to the antenna terminals through a matching jig. (If a separate oscilloscope is used, connect the sweep output of the generator to the horizontal input of the oscilloscope.) Set the CHANNEL SELECTOR to Channel 4, and tune the sweep generator for output on Channel 4. Tune the r-f marker generator for the video carrier frequency of Channel 4 (67.25 mc.), and tune the i-f marker generator (connected through jig to mixer grid) to 45.75 mc. Note that two marker generators are used for this procedure. The r-f marker generator is connected to the antenna terminals, while the i-f marker generator is connected capacitively to the mixer grid test point, G1. A jig constructed from a piece of fiber tubing, with $\frac{3}{16}$ inch inside diameter, and a brass machine screw which fits tightly into the tubing, is used to connect the generator capacitively to the test point. The screw is adjusted so that it clears the test point by approximately $\frac{1}{64}$ inch. The output cable of the marker generator is connected to the head of the brass screw in the jig and to chassis near the mixer tube. Both marker generators should be adjusted for the minimum output required to make the markers barely visible. Failure to observe this precaution, or the use of excessive output from the sweep generator, will cause misleading results. After the equipment is properly connected, adjust the FINE TUNING control for zero-beat of the two markers, as observed on the oscilloscope. When zero beat is obtained, remove the i-f marker.

6. If the response curve does not fall within the limits, as shown in figure 9, the adjustment of the trimmers may be touched up slightly, while observing the response curve. Do not retouch the setting of C201, C203, or C206. To adjust the curve, first adjust C215 and C218 alternately until maximum improvement has been obtained. C215 affects the tilt

PHILCO Chassis R-201 and D-201, continued

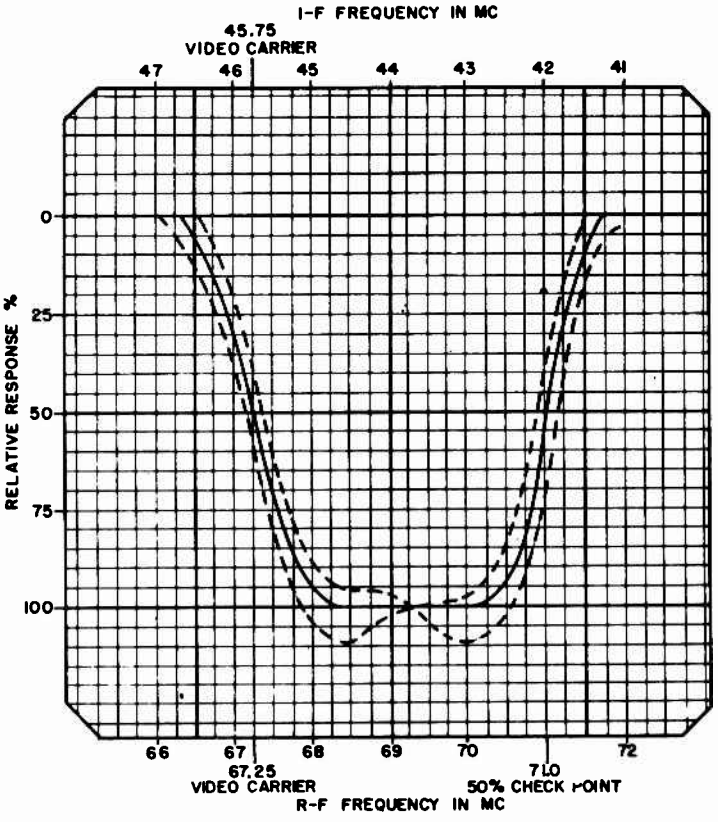


Figure 9. Over-all R-F, I-F Response Curve

of the curve, and C218 affects the dip of the curve. After C215 and C218 have been adjusted, adjust C514 for proper slope at the 42.25-mc. side of the curve, and then adjust C204 and C210 for proper level at the video carrier frequency (45.75 mc.).

CAUTION: Do not turn any of the trimmers excessively. To retouch, only turn the trimmers slightly.

SOUND I-F ALIGNMENT

The sound i-f system may be aligned by the use of a station signal or an accurately calibrated signal generator, for the signal source. If the station signal is used, tune the FINE TUNING control for the best picture, regardless of sound. It will be necessary to reduce the signal input to the receiver, so that the d-c output at the sound detector, as measured with the aid of the sound i-f output alignment jig (between point "B" and ground), is kept below 5 volts, maximum, and preferably below 3 volts. To establish this level in strong signal areas, it may be necessary to short the antenna terminals and to apply bias to the a-g-c circuit. The signal input to the receiver may be adjusted by varying the length of the shorting lead. The bias may be applied to the a-g-c circuit by means of the jig shown in figure 3. The sound i-f output alignment jig shown in figure 4 should be used for convenient connection of the meter to the sound-detector output.

When a signal generator is used, bias should be applied to the a-g-c circuit, to avoid any possibility of regeneration, using the sound i-f input alignment jig (figure 3). In addition, the first video i-f tube should be removed, to aid in the reduction of circuit noises from the i-f system.

1. Connect the generator through the 2200-ohm resistor, in the sound i-f input alignment jig, to pin 2 of J200. The generator should be adjusted for unmodulated output at 4.5 mc.

2. Insert the sound i-f output alignment jig into the volume-control socket (J401), and insert the volume-control plug (PL401) into the top of the jig. Connect the clip lead to the FM test point (J400); connect a 20,000-ohms-per-volt voltmeter between point "B" and the ground lug of the jig, with the negative lead of the meter going to point "B."

3. Adjust TC300, TC400, TC401, and TC402 for maximum output, as indicated on the meter. If the output exceeds 5 volts, reduce the signal input to the receiver.

4. Shift the positive lead of the meter to point "C" on the sound i-f output alignment jig, and adjust TC403 for zero crossover. Zero crossover is indicated by a zero indication on the meter. When TC403 is turned in one direction from this zero point, the meter will swing positive; turning TC403 in the opposite direction will cause a negative swing. (To aid in reading a positive and negative swing on the meter, set the pointer, by means of its zero-adjustment screw, to a convenient calibration mark on the scale, before connecting the meter to the circuit.)

5. Replace the first video i-f tube, and tune in a station on the receiver. Turn the FINE TUNING control to obtain a slightly fuzzy picture, and retouch TC403 for minimum AM (noise), using the speaker output as an indication.

ADJUSTMENT OF 4.5-MC. TRAP

1. Tune in a strong station signal.

2. Turn the FINE TUNING control in the clockwise direction until a fine beat pattern appears in the picture.

3. Adjust TC301 until the beat disappears or is at a minimum. When correctly adjusted, the screw will be out from the chassis approximately $\frac{5}{8}$ inch.

4. If more than one station is available, check the setting of TC301 on all stations.

PHILCO Circuit Diagram of R-F Chassis R-201

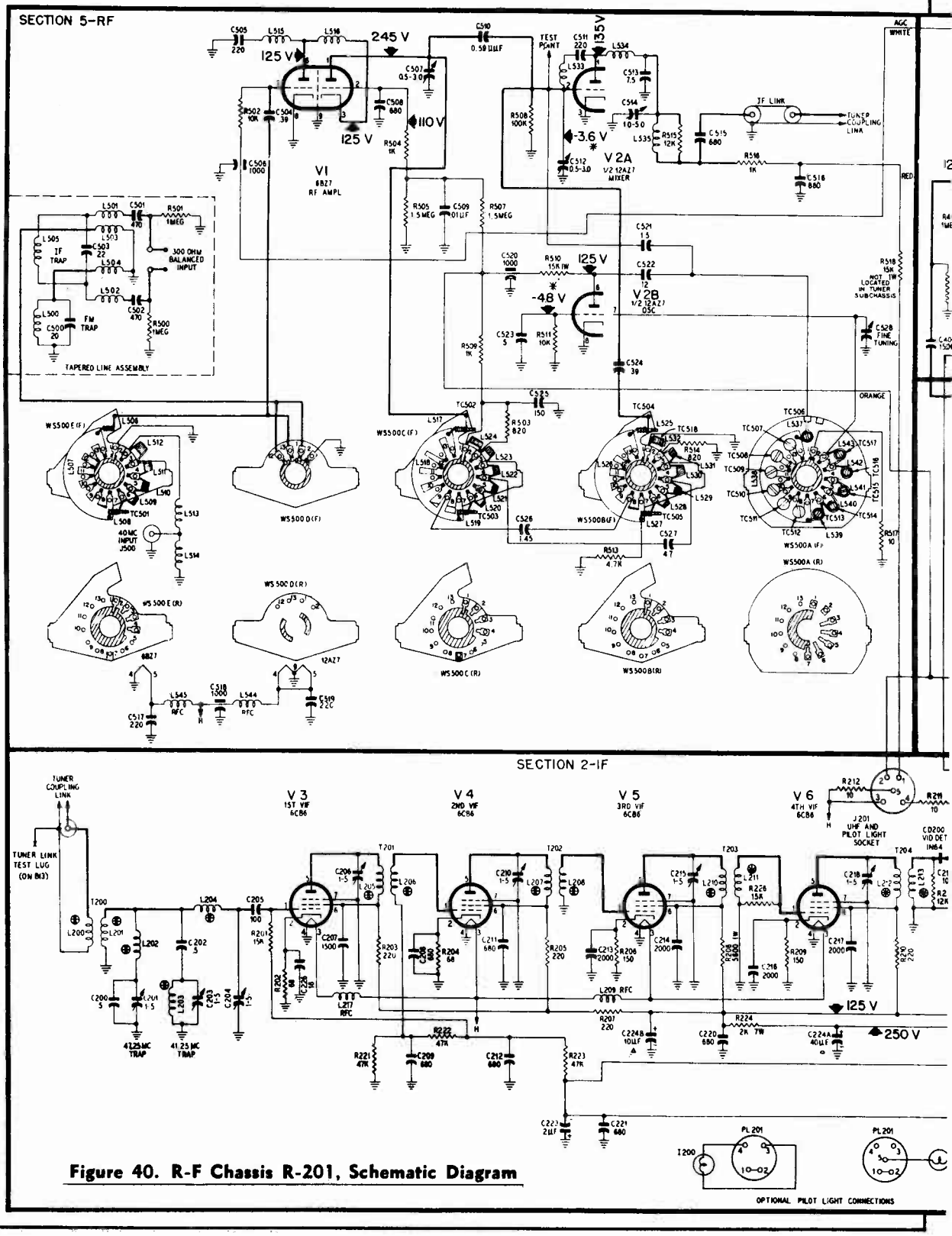
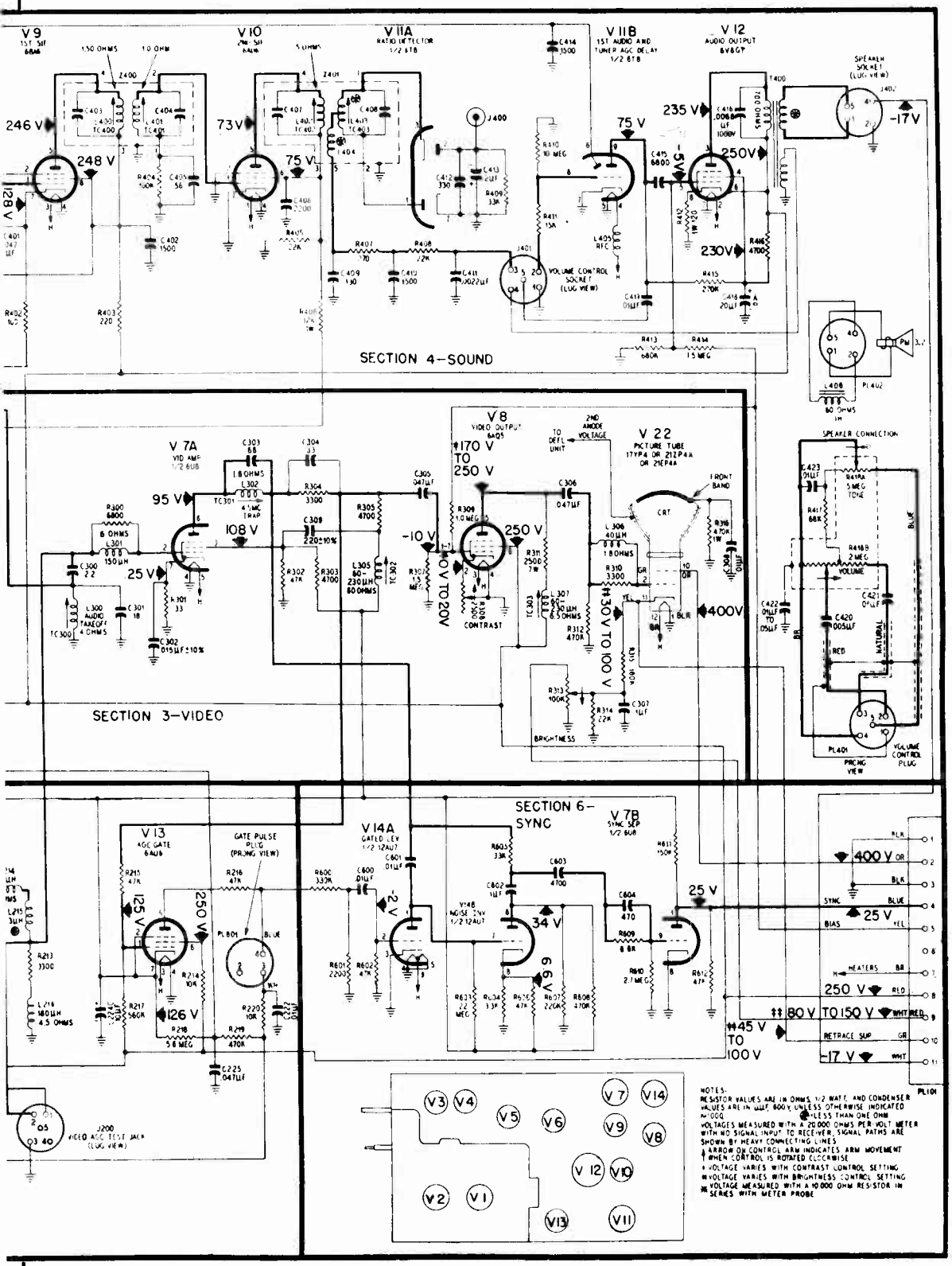


Figure 40. R-F Chassis R-201, Schematic Diagram

PHILCO Circuit Diagram of R-F Chassis R-201



List of Models using Chassis R-201, D-201, R-202, D-202, R-204, D-204.

18B3104
18BU3104
22B4008
22BU4008
22B4108
22BU4108
22B4110
22B4110L
22BU4110
22BU4110L
22B4308
22BU4308
22B4404
22B4405
22B4406
22B4406L

PHILCO Circuit Diagram of Deflection Chassis D-201

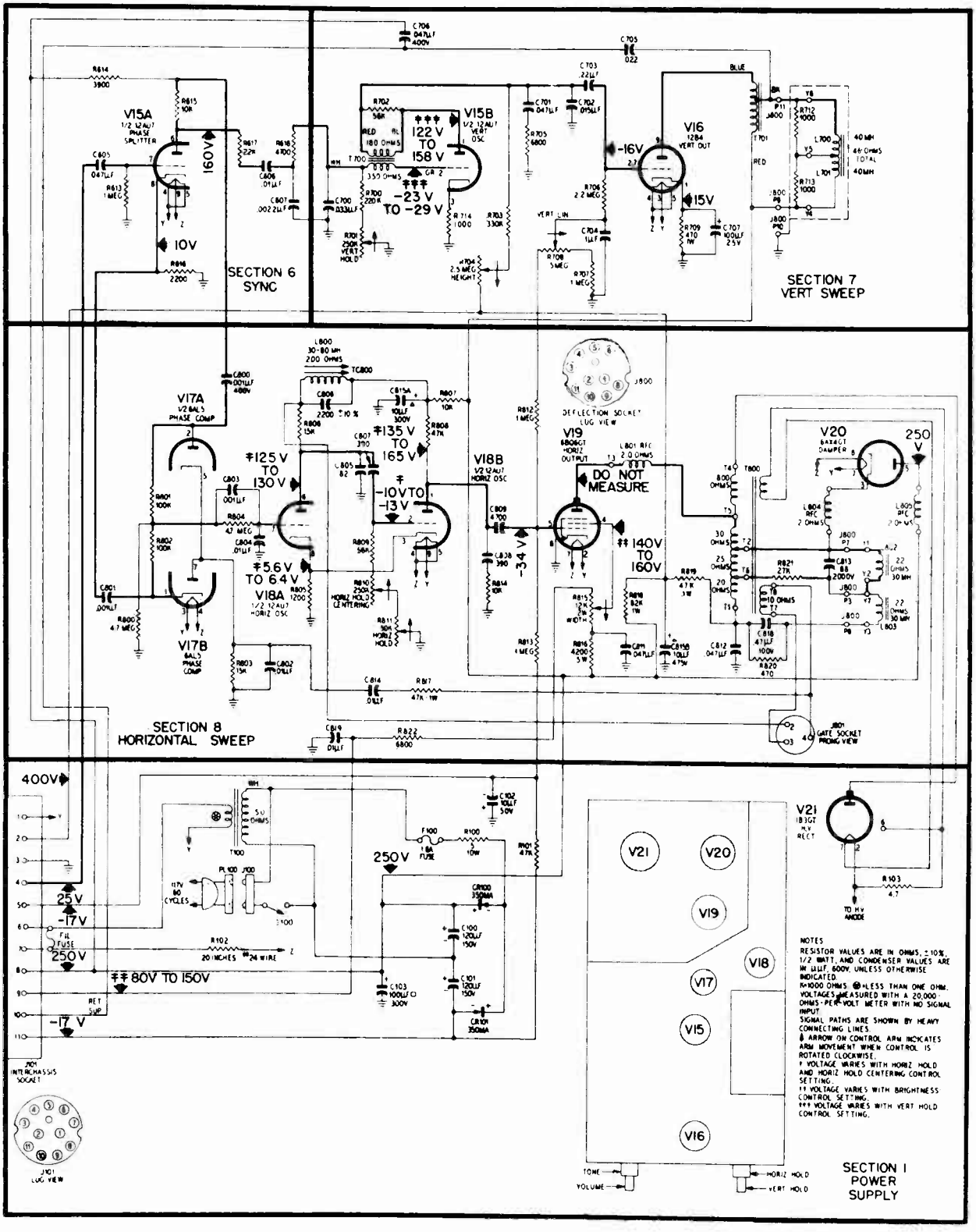


Figure 41. Deflection Chassis D-201, Schematic Diagram

RCA VICTOR

TELEVISION RECEIVERS — MODELS 21-T-356 U, 21-T-363, 21-T-363 U, 21-T-364, 21-T-364 U, 21-T-365, 21-T-365 U, 21-T-372, 21-T-372 U, 21-T-373, 21-T-373 U, 21-T-374, 21-T-374 U, 21-T-375, 21-T-375 U

Chassis Nos. KCS83, KCS83B or KCS83E

The circuit on the next two pages, over, is exact for Chassis KCS-83B used in "U" models. KCS-83E used in 21T356U is identical but employs 21EP4A picture tube. Other models use Chassis KCS-83 which is practically identical to KCS-83B but has KRK-29 tuner unit for VHF only.

Chassis KCS-83C used in Models 21S354 and 21S362 with tuner KRK-29, and Chassis KCS-83D used in Models 21S354U and 21S362U with tuners KRK-29A and KRK-27 (UHF), are very similar to chassis listed above.

ION TRAP MAGNET ADJUSTMENT.—Set the ion trap magnet approximately in the position shown in Figure 2. Starting from this position immediately adjust the magnet by moving it forward or backward at the same time rotating it slightly around the neck of the kinescope for the brightest raster on the screen. Reduce the brightness control setting until the raster is slightly above average brilliance. Turn the focus control (shown in Figure 2) until the line structure of the raster is clearly visible. Readjust the ion trap magnet for maximum raster brilliance. The final touches of this adjustment should be made with the brightness control at the maximum clockwise position with which good line focus can be maintained.

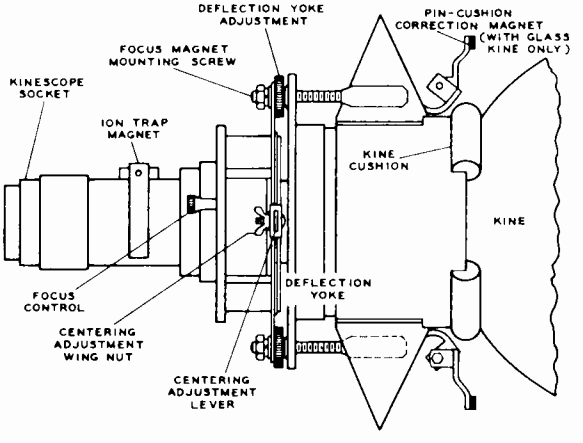


Figure 2—Yoke and Focus Magnet Adjustments

DEFLECTION YOKE ADJUSTMENT.—If the lines of the raster are not horizontal or squared with the picture mask, rotate the deflection yoke until this condition is obtained. Tighten the knurled yoke adjustment nuts.

PICTURE ADJUSTMENTS.—It will now be necessary to obtain a test pattern picture in order to make further adjustments.

If the receiver is overloading, turn R154 on the rear apron (see Figure 3) counter-clockwise until the set operates normally and the picture can be synced.

If the Horizontal Oscillator and AGC System are operating properly, it should be possible to sync the picture at this point. However, if the AGC control is misadjusted, and the receiver is overloading, it may be impossible to sync the picture.

CHECK OF HORIZONTAL OSCILLATOR ALIGNMENT.—Turn the horizontal hold control to the extreme counter-clockwise position. The picture should remain in horizontal sync. Momentarily remove the signal by switching off channel then back. Normally the picture will be out of sync. Turn the control clockwise slowly. The number of diagonal black bars will be gradually reduced and when only 2 or 3 bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional clockwise rotation of the control. Pull-in should occur before the control has been turned 120 degrees from the extreme counter-clockwise position. The picture should remain in sync for approximately 90 degrees of additional clockwise rotation of the control. At the extreme clockwise position, the picture should remain in sync and should not show a black bar in the picture.

ALIGNMENT OF HORIZONTAL OSCILLATOR.—If in the above check the receiver failed to hold sync with the hold control at the extreme counter-clockwise position or failed to hold sync over 90 degrees of clockwise rotation of the control from the pull-in point, it will be necessary to make the following adjustments.

Horizontal Frequency Adjustment.—Turn the horizontal hold control to the extreme clockwise position. Tune in a television station and adjust the T114 horizontal frequency adjustment at the rear of the chassis until the picture is just out of snync and the horizontal blanking appears as a vertical or diagonal black bar in the raster. Then turn the T114 core until the bar moves out of the picture leaving it in sync.

Horizontal Locking Range Adjustment.—Set the horizontal hold control to the full counter-clockwise position. Momentarily remove the signal by switching off channel then back. The picture may remain in sync. If so turn the T114 rear core slightly and momentarily switch off channel. Repeat until the picture falls out of sync with the diagonal lines sloping down to the left. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.

If more than 3 bars are present just before the picture pulls into sync, adjust the horizontal locking range trimmer C174A slightly clockwise. If less than 2 bars are present, adjust C174A slightly counter-clockwise. Turn the horizontal hold control counter-clockwise, momentarily remove the signal and recheck the number of bars present at the pull-in point. Repeat this procedure until 2 or 3 bars are present.

Repeat the adjustments under "Horizontal Frequency Adjustment" and "Horizontal Locking Range Adjustment" until the conditions specified under each are fulfilled. When the horizontal hold operates as outlined under "Check of Horizontal Oscillator Alignment" the oscillator is properly adjusted.

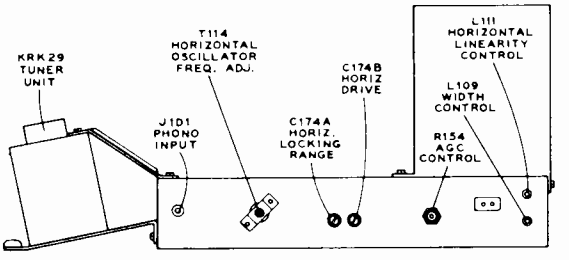


Figure 3—Rear Chassis Adjustments

RCA-Victor

CIRCUIT SCHEMATIC DIAGRAM, KCS83B (KCS83E with 21EP4A Kinescope)

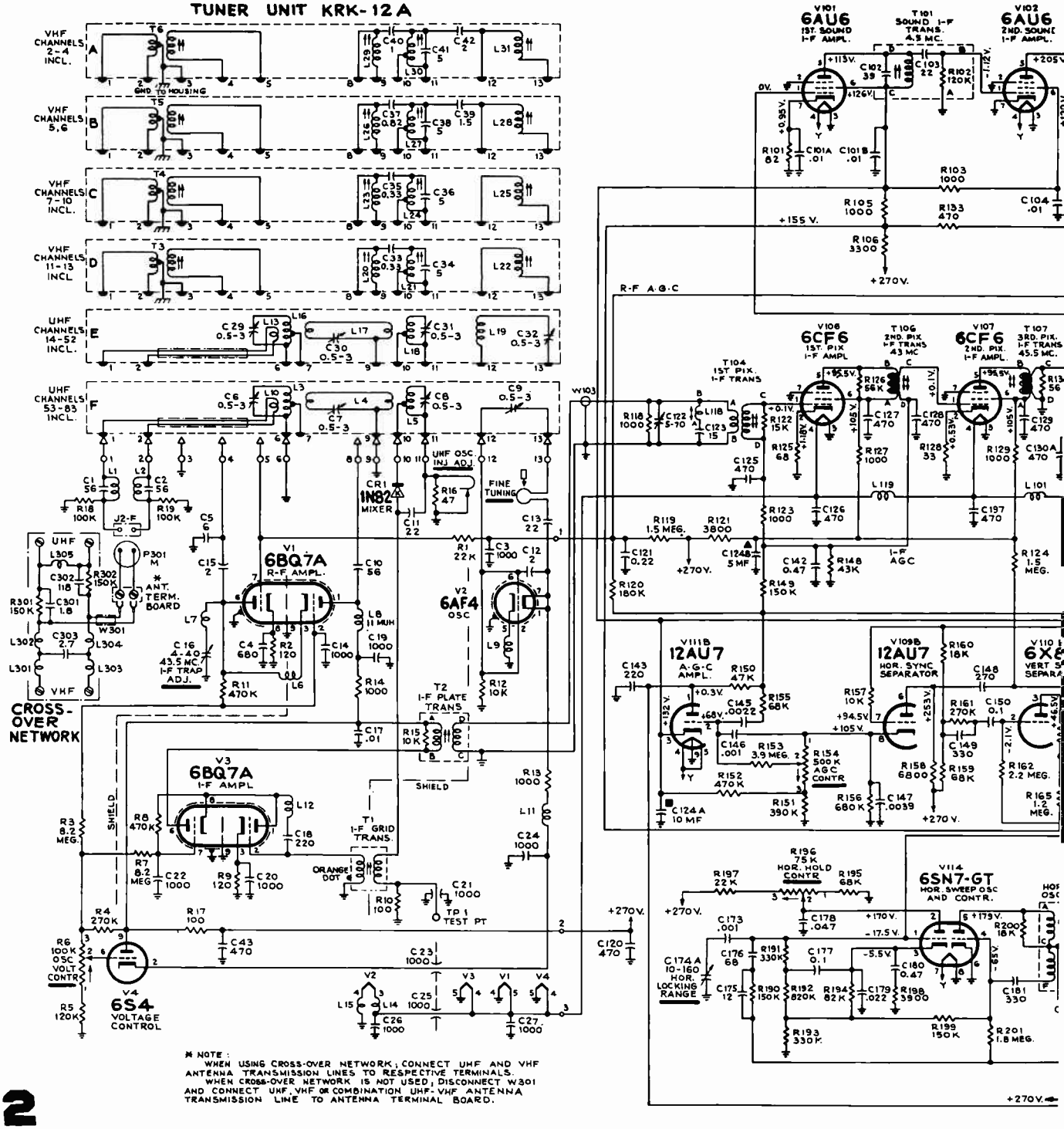
21-T-356 U, 21-T-363, 21-T-363 U, 21-T-364, 21-T-364 U, 21-T-365, 21-T-365 U, 21-T-372, 21-T-372 U, 21-T-373, 21-T-373 U, 21-T-374, 21-T-374 U, 21-T-375, 21-T-375 U

The schematic is shown in the latest condition at the time of printing.
All resistance values in ohms. K = 1000.

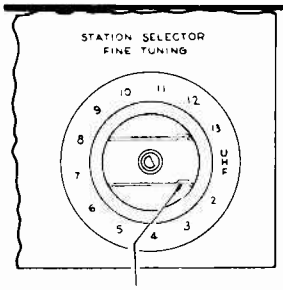
Direction of arrows at controls indicates clockwise rotation.

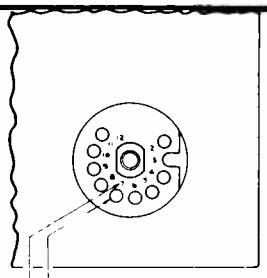
All capacitance values less than 1 in FM and above 1 in MMF unless otherwise noted.

All voltages measured with "VoltOhmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.



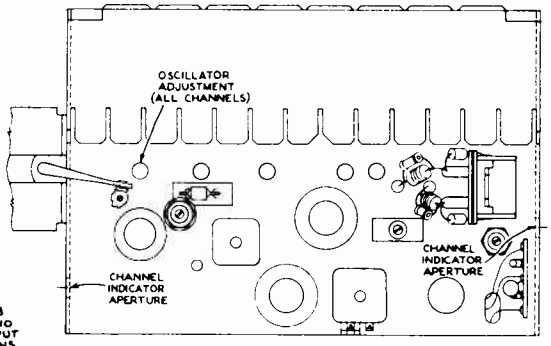
* NOTE:
WHEN USING CROSS-OVER NETWORK, CONNECT UHF AND VHF ANTENNA TRANSMISSION LINES TO RESPECTIVE TERMINALS. WHEN CROSS-OVER NETWORK IS NOT USED, DISCONNECT W301 AND CONNECT UHF, VHF OR COMBINATION UHF-VHF ANTENNA TRANSMISSION LINE TO ANTENNA TERMINAL BOARD.



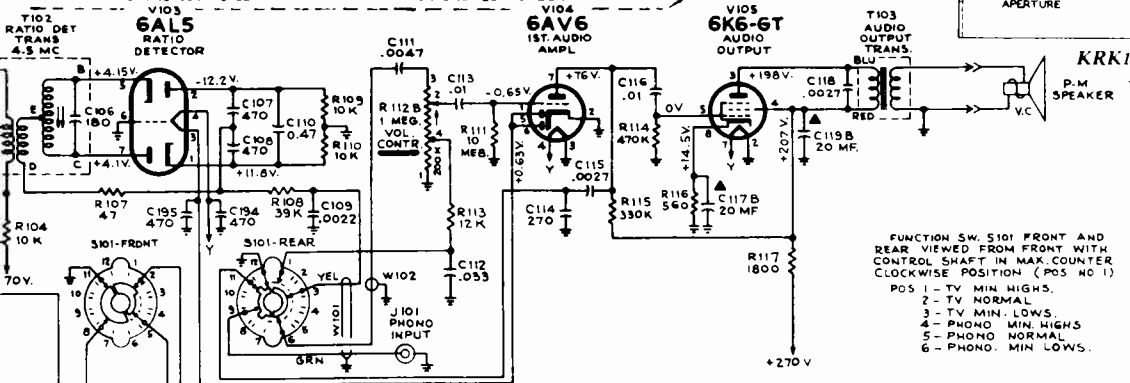


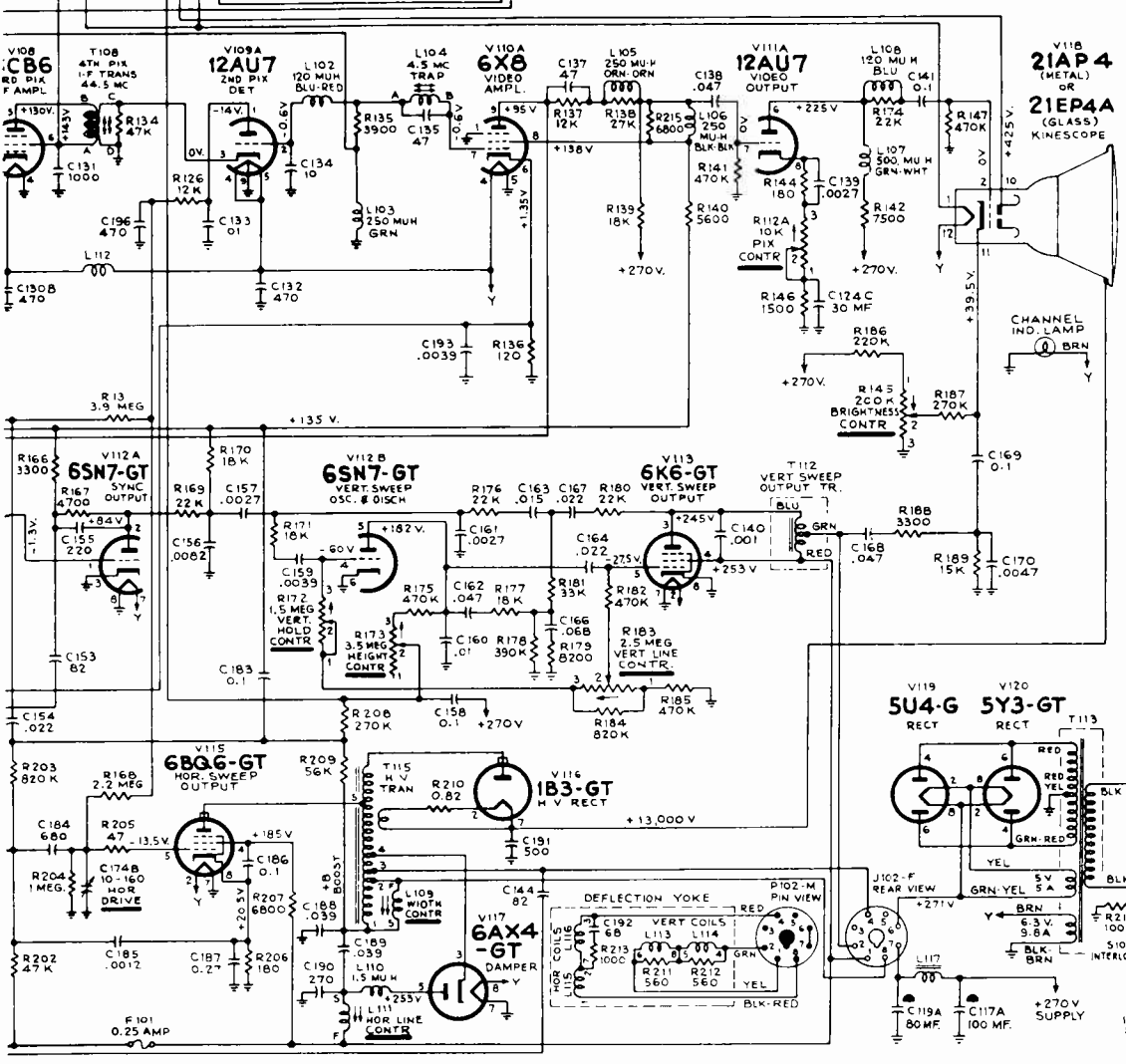
RCA

KRK29 R-F Oscillator Adjustments



KRK12A Oscillator Adjustment





Circuit Schematic Diagram, KCS83B, KCS83E

See over for alignment facts.

RCA-Victor (Continued) ALIGNMENT PROCEDURE 21-T-363 to 21-T-375 incl. 21-T-356U to 21-T-375U incl.

PICTURE I-F TRANSFORMER ADJUSTMENTS.—

Models 21-T-363 to 21-T-375 incl.

Connect the i-f signal generator across the link circuit on terminals A and B of T104.

Connect the "VoltOhmyst" to the junction of R123 and C142. Turn the AGC control fully clockwise.

Obtain two 7.5 volt batteries capable of withstanding appreciable current drain and connect the ends of a 1,000 ohm potentiometer across each. Connect the battery positive terminal of one to the chassis and the potentiometer arm to the junction of R123 and C142. The second battery will be used later.

Set the bias to produce approximately —5.0 volt of bias at the junction of R123 and C142.

Connect the "VoltOhmyst" to junction of R135 and L102 and to ground.

Set the VHF signal generator to each of the following frequencies and peak the specified adjustment for maximum indication on the "VoltOhmyst". During alignment, reduce the input signal if necessary in order to produce 3.0 volts of d-c at R123 and L102 with —5.0 volts of i-f bias at the junction of R123 and C142.

44.5 mc.	T108
45.5 mc.	T107
43.0 mc.	T106

Set the VHF signal generator to the following frequency and adjust the picture i-f trap for minimum d-c output at R135, L102. Use sufficient signal input to produce 3.0 volts of d-c on the meter when the adjustment is made.

47.25 mc.	L118

Models 21-T-356U to 21-T-375U incl.

Connect the "VoltOhmyst" to the junction of R123 and C142.

Turn the AGC control fully clockwise.

Obtain a 7.5 volt battery capable of withstanding appreciable current drain and connect the ends of a 1,000 ohm potentiometer across it. Connect the battery positive terminal to chassis and the potentiometer arm to the junction R123 and C142. Adjust the potentiometer for —5.0 volts indication on the "VoltOhmyst".

Connect the "VoltOhmyst" to the junction of R135 and L102 and to ground.

Connect the output of the signal generator to the front terminal of the crystal mixer in series with a 1500 mmf. ceramic capacitor.

Set the VHF generator to each of the following frequencies and with a thin fiber screwdriver tune the specified adjustment for maximum indication on the "VoltOhmyst". In each instance the generator should be checked against a crystal calibrator to insure that the generator is on frequency.

During alignment, reduce the input signal if necessary in order to produce 3.0 volts of d-c at R135 and L102 with —5.0 volts of i-f bias at the junction of R123 and C142.

44.5 mc.	T108
45.5 mc.	T107
43.0 mc.	T106

Set the signal generator to the following frequency and adjust the picture i-f trap for minimum d-c output at junction of R135 and L102. Use sufficient signal input to produce 3.0 volts of d-c on the meter when adjustment is made.

47.25 mc.	L118

RATIO DETECTOR ALIGNMENT.—Set the signal generator at 4.5 mc. and connect it to the first sound i-f grid, pin 1 of V101.

As an alternate source of signal, the RCA WR39B or WR39C calibrator may be employed. In such a case, connect the calibrator to the grid of the third pix i-f amplifier, pin 1 of V108.

Set the frequency of the calibrator to 45.75 mc. (pix carrier) and modulate with 4.5 mc. crystal. The 4.5 mc. signal will be picked off at L103 and amplified through the sound i-f amplifier.

Connect the "VoltOhmyst" to pin 2 of V103.

Tune the ratio detector primary, T102 top core for maximum d-c output on the "VoltOhmyst". Adjust the signal level from the signal generator for 6 volts on the "VoltOhmyst" when finally peaked. This is approximately the operating level of the ratio detector for average signals.

Connect the "VoltOhmyst" to the junction of R108 and C109.

Tune the ratio detector secondary T102 bottom core for zero d-c on the "VoltOhmyst".

Repeat adjustments of T102 top for maximum d-c at pin 2 of V103 and T102 bottom for zero d-c at the junction of R108 and C109. Make the final adjustments with the signal input level adjusted to produce 6 volts d-c on the "VoltOhmyst" at pin 2 of V103.

SOUND I-F ALIGNMENT.—Connect the signal generator to the first sound i-f amplifier grid, pin 1 of V101.

As an alternate source of signal, the RCA WR39B or WR39C calibrator may be employed as above.

Connect the "VoltOhmyst" to pin 2 of V103.

Tune the T101 top core for maximum d-c on the "VoltOhmyst".

The output from the signal generator should be set to produce approximately 6.0 volts on the "VoltOhmyst" when the final touches on the above adjustment are made.

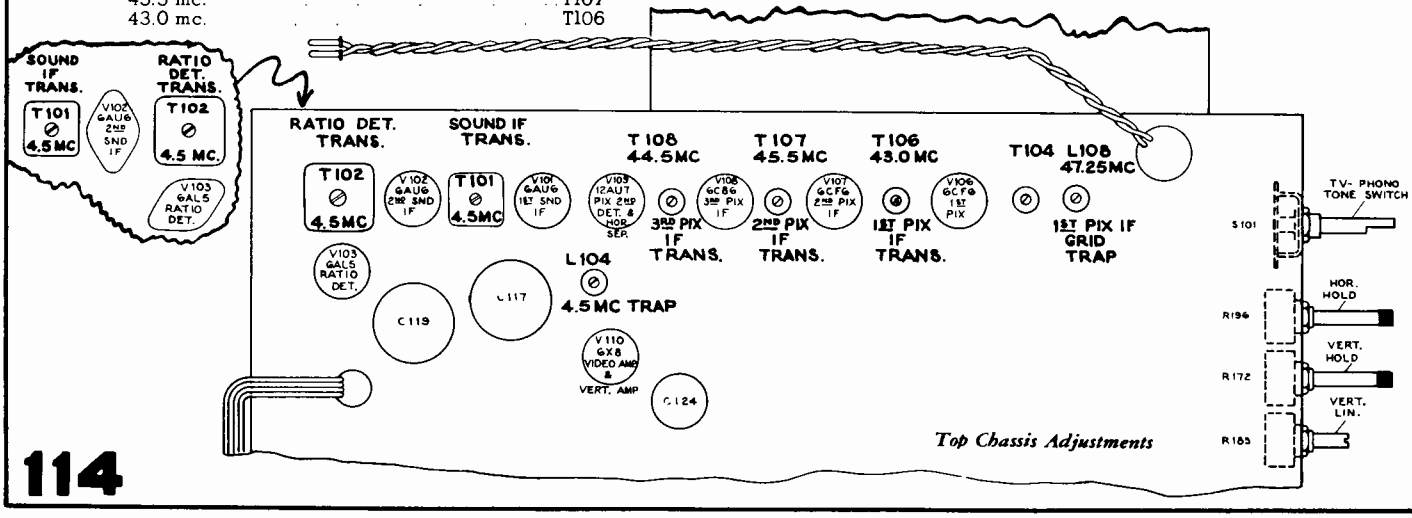
4.5 MC. TRAP ADJUSTMENT.—Connect the signal generator in series with a 100 ohm resistor to pin 2 of V109. Set the generator to 4.5 mc. and modulate it 30% with 400 cycles. Set the output to approximately 0.5 volt.

Short the third pix i-f grid to ground, pin 1, V108, to prevent noise from masking the output indication.

Connect the crystal diode probe of an oscilloscope to the plate of the viedo amplifier, pin 9 of V110.

Adjust the core of L104 for minimum output on the oscilloscope.

Remove the short from pin 1, V108 to ground.



Top Chassis Adjustments

RCA VICTOR

Models 17S349, 17S350, 17S351, 17S360, 17T361, use Chassis KCS-78F that has its exact circuit printed on the next two pages, over. Models 17S350U, 17S351U, 17S360U, use Chassis KCS-78H which is practically identical to the KCS-78F, but employs VHF tuner unit KRK-29A and UHF tuner KRK-27, to permit reception of any UHF channels. Models 17T352U and 17T361U use Chassis KCS-78J which is also almost identical to KCS-78F, but uses a combination VHF and UHF tuner unit KRK-12B.

Models 17T301, 17T302, 17T310, use Chassis KCS-78 with tuner KRK-11B for VHF reception, and Models 17T301U, 17T302U, 17T310U, use Chassis KCS-78B with tuner KRK-12 to provide both VHF and UHF reception. These chassis KCS-78 and KCS-78B use a circuit similar to KCS-78F shown on the next two pages, but differ in tuner type and in that some other (but technically similar) types of tubes are employed in some of the sections. The use of these different tubes will change some of the voltage values shown in the diagram.

Models 21T303, 21T313, 21T314, 21T315, 21T316, 21T322, 21T323, 21T324, use Chassis KCS-82 employing tuner KRK-11B and 21AP4 picture tube, but otherwise practically identical to the circuit of KCS-78F shown on the next two pages. Models 21T303U, 21T313U, 21T314U, 21T315U, 21T316U, 21T322U, 21T323U, 21T324U, use Chassis KCS-82B which uses tuner KRK-12 to provide VHF and UHF reception, but otherwise is the same as KCS-82, and therefore is practically identical to KCS-78F.

The alignment information and service notes below and on the next five pages are applicable to all these chassis. Notice that parts of the alignment procedure differ for VHF and VHF-UHF models and are so marked.

ION TRAP MAGNET ADJUSTMENT.—Set the ion trap magnet approximately in the position shown in figure 2. Starting from this position immediately adjust the magnet by moving it forward or backward at the same time rotating it slightly around the neck of the kinescope for the brightest raster on the screen. Reduce the brightness control setting until the raster is slightly above average brilliance. Turn the focus control (shown in figure 2) until the line structure of the raster is clearly visible. Readjust the ion trap magnet for maximum raster brilliance.

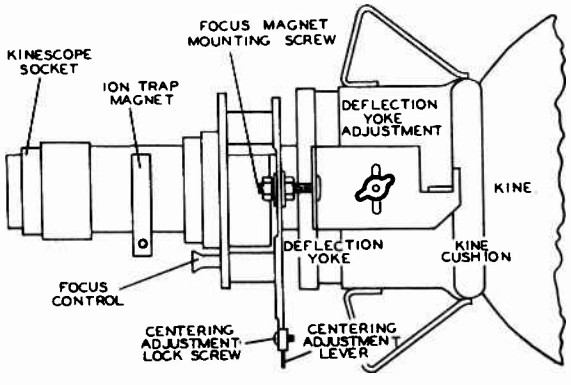


Figure 2—Yoke and Focus Magnet Adjustments

CHECK OF HORIZONTAL OSCILLATOR ALIGNMENT.—Turn the horizontal hold control to the extreme counter-clockwise position. The picture should remain in horizontal sync. Momentarily remove the signal by switching off channel then back. Normally the picture will be out of sync. Turn the control clockwise slowly. The number of diagonal black bars will be gradually reduced and when only 2 or 3 bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional clockwise rotation of the control. Pull-in should occur before the control has been turned 120 degrees from the extreme counter-clockwise position. The picture should remain in sync for approximately 90 degrees of additional clockwise rotation of the control. At the extreme clockwise position, the picture should remain in sync and should not show a black bar in the picture.

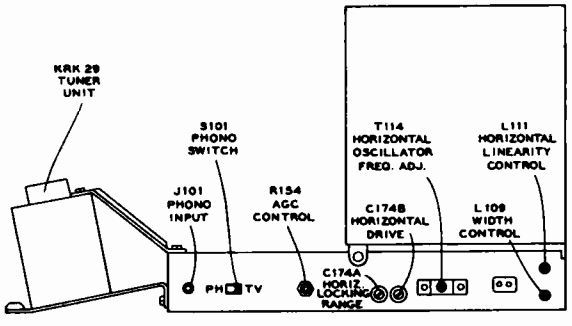
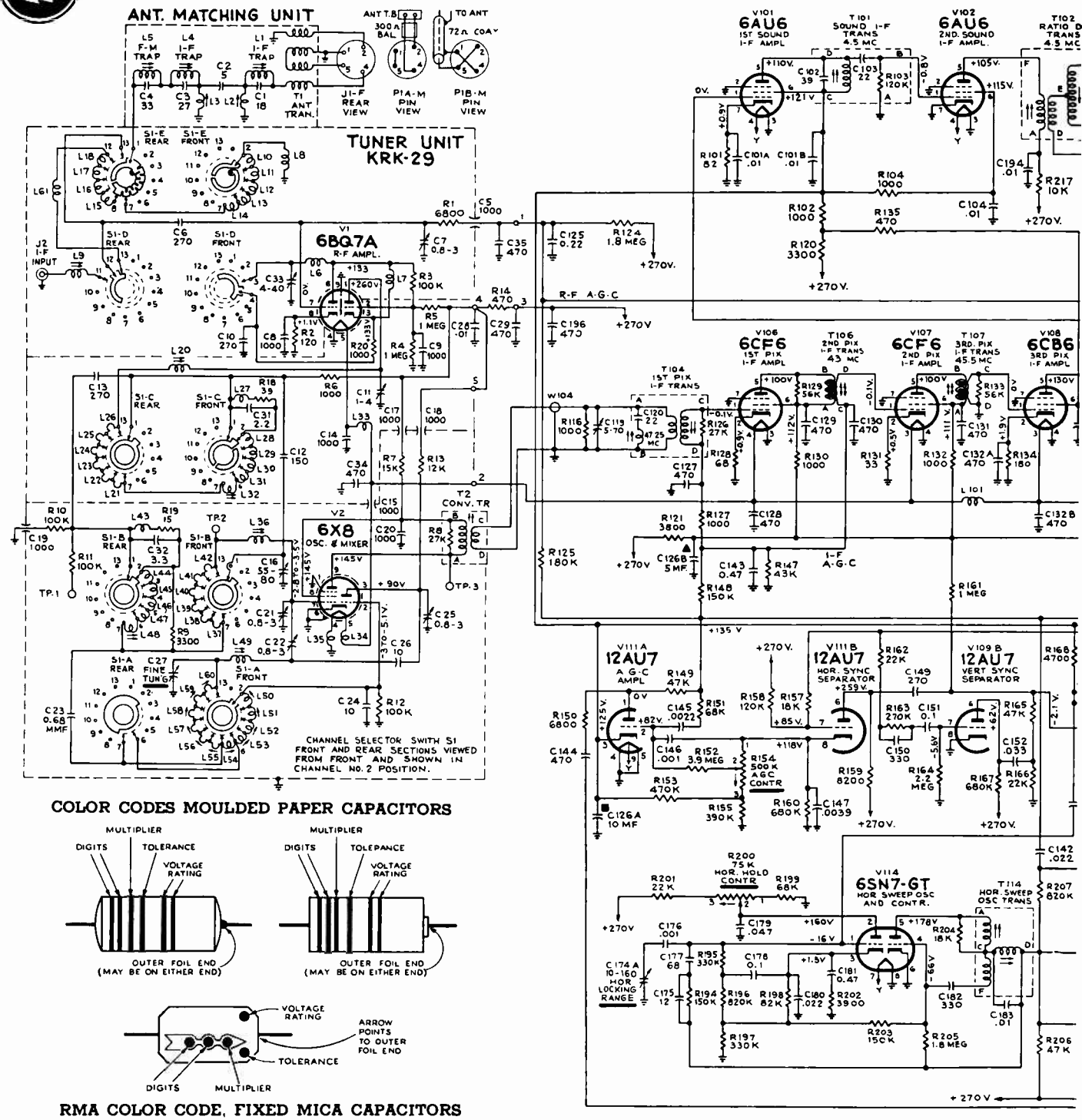


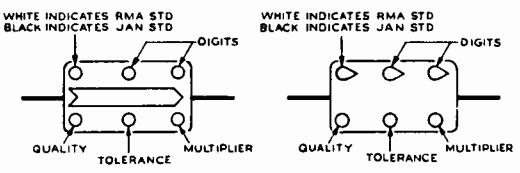
Figure 3—Rear Chassis Adjustments

Schematic Diagram Chassis KCS-78F



COLOR CODES MOULDED PAPER CAPACITORS

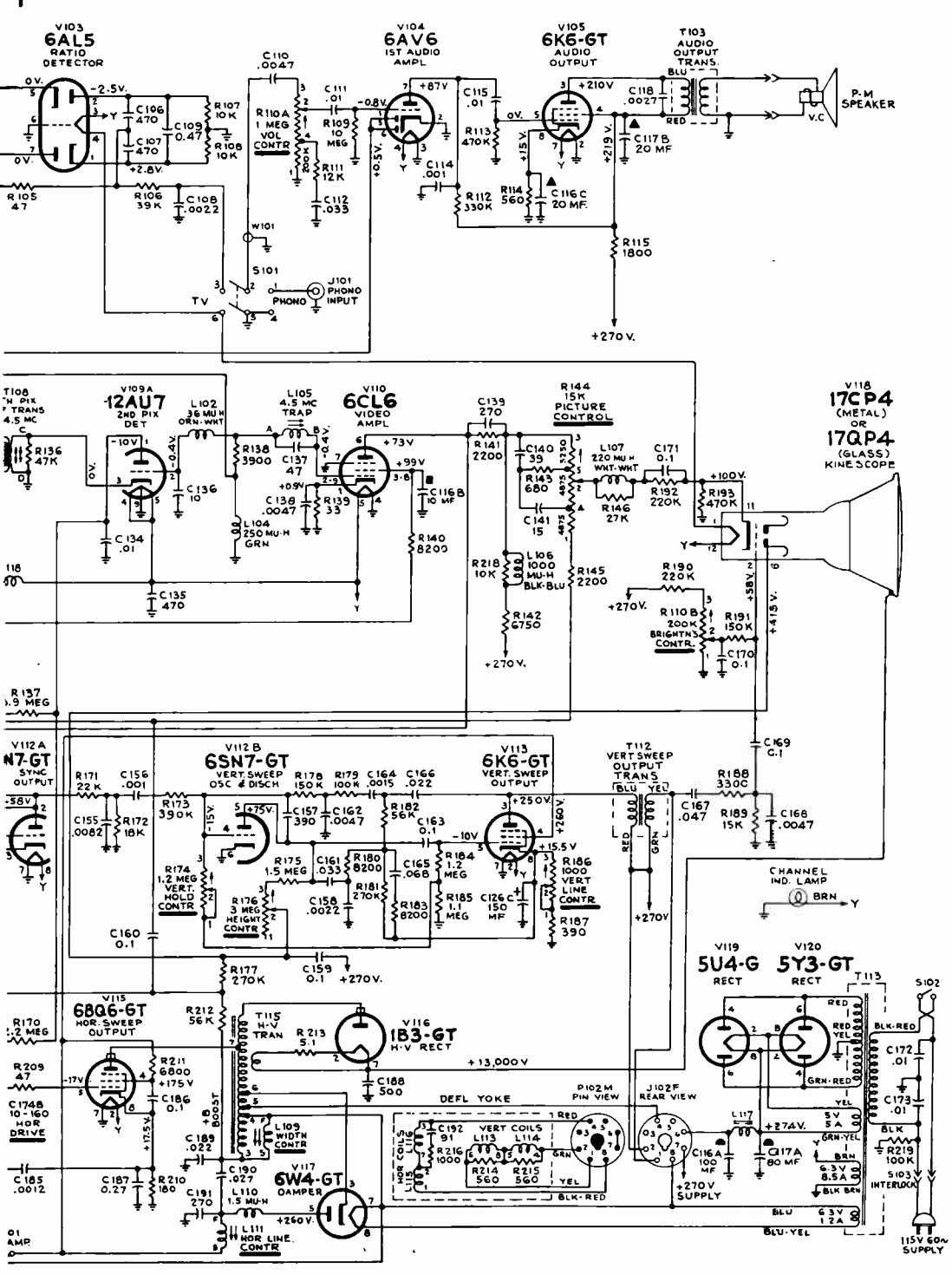
RMA COLOR CODE, FIXED MICA CAPACITORS



All resistance values in ohms. K = 1000.

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

CIRCUIT SCHEMATIC DIAGRAM KCS78F



Additional service material on the next three pages.

All voltages measured with "VoltOhmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

Direction of arrows at controls indicates clockwise rotation.

Schematic Diagram KCS78F

RCA-Victor Chassis KCS-78, KCS-78B, KCS-78F, KCS-78H, and KCS-78J

ALIGNMENT PROCEDURE

PICTURE I-F TRANSFORMER ADJUSTMENTS.—

VHF Models

Connect the i-f signal generator across the link circuit on terminals A and B of T104.

Connect the "VoltOhmyst" to the junction of R147 and R148 and to ground.

Obtain a 7.5 volt battery capable of withstanding appreciable current drain and connect the ends of a 1,000 ohm potentiometer across it. Connect the battery positive terminal to chassis and the potentiometer arm to the junction of R147 and R148.

Set the bias to produce approximately —5.0 volt of bias at the junction of R147 and R148.

Connect the "VoltOhmyst" to the juncture of R138 and L105 and to ground.

Set the VHF signal generator to each of the following frequencies and peak the specified adjustment for maximum indication on the "VoltOhmyst". During alignment, reduce the input signal if necessary in order to produce 3.0 volts of d-c at R138, L105 with minus 5.0 volts of i-f bias at the junction of R147 and R148.

44.5 mc.	**T108**
45.5 mc.	**T107**
43.0 mc.	**T106**

Set the VHF signal generator to the following frequency and adjust the picture i-f trap for minimum d-c output at R138, L105. Use sufficient signal input to produce 3.0 volts of d-c on the meter when the adjustment is made.

47.25 mc.	**T104 top core**

VHF-UHF Models

Connect the "VoltOhmyst" to the junction of R147 and R148 and to ground.

Turn the AGC control fully clockwise.

Obtain a 7.5 volt battery capable of withstanding appreciable current drain and connect the ends of a 1,000 ohm potentiometer across it. Connect the battery positive terminal to chassis and the potentiometer arm to the junction R147 and R148. Adjust the potentiometer for —5.0 volts indication on the "VoltOhmyst".

Connect the "VoltOhmyst" to the junction of R138 and L105 and to ground.

Connect the output of the signal generator to the front terminal of the crystal mixer in series with a 1500 mmf ceramic capacitor.

Set the VHF generator to each of the following frequencies and with a thin fiber screwdriver tune the specified adjustment for maximum indication on the "VoltOhmyst". In each instance the generator should be checked against a crystal calibrator to insure that the generator is on frequency.

During alignment, reduce the input signal if necessary in order to produce 3.0 volts of d-c at R138, L105 with —5.0 volts of i-f bias at the junction of R147 and R148.

44.5 mc.	**T108**
45.5 mc.	**T107**
43.0 mc.	**T106**

Set the signal generator to the following frequency and adjust the picture i-f trap for minimum d-c output at R138, L105. Use sufficient signal input to produce 3.0 volts of d-c on the meter when the adjustment is made.

47.25 mc.	**T104 top core**

SWEEP ALIGNMENT OF PIX I-F.—

VHF Models

To align T2 and T104, connect the sweep generator to the mixer grid test point TP2, in series with a 1500 mmf ceramic capacitor. Use the shortest leads possible, with not more than one inch of unshielded lead at the end of the sweep cable. Connect the sweep ground lead to the r-f unit outer shield.

Set the channel selector switch to channel 4.

Clip 330 ohm resistors across terminals A and B of T107 and T108.

Preset C119 to minimum capacity.

Adjust the bias box potentiometer to obtain —5.0 volts of bias as measured by a "VoltOhmyst" at the junction of R147 and R148. Set the AGC control fully clockwise.

Connect a 180 ohm composition resistor from pin 5 of V106 to terminal A of T106. Connect the oscilloscope diode probe to pin 5 of V106 and to ground.

Couple the signal generator loosely to the diode probe in order to obtain markers.

Adjust T2 (top) and T104 (bottom) for maximum gain and with 45.75 mc. at 70% of maximum response.

Set the sweep output to give 0.3 volt peak-to-peak on the oscilloscope when making the final touch on the above adjustment.

Adjust C119 until 42.5 mc. is at 70% response with respect to the low frequency shoulder of the curve as shown in Figure 22.

Disconnect the diode probe, the 180 ohm and two 330 ohm resistors.

Connect the oscilloscope to the junction of R138 and L105.

Leave the sweep generator connected to the mixer grid test point TP2 with the shortest leads possible.

Adjust the output of the sweep generator to obtain 3.0 volts peak-to-peak on the oscilloscope.

Couple the signal generator loosely to the grid of the first pix i-f amplifier. Adjust the output of the signal generator to produce small markers on the response curve.

Retouch T106, T107 and T108 to obtain the response shown in figure 23.

VHF-UHF Models

To align the crystal mixer plate circuit, T2 and T104 connect the VHF sweep generator to the front terminal of the 1N82 crystal holder in series with a 1500 mmf ceramic capacitor. Use the shortest leads possible, grounding the sweep generator to the tuner case.

Clip 330 ohm resistors across terminals A and B of T107 and T108.

Set the channel selector to channel 5.

Connect a 180 ohm composition resistor from pin 5 of V106 to terminal A of T106. Connect the oscilloscope diode probe to pin 5 of V106 and to ground.

Couple the signal generator loosely to the diode probe in order to obtain markers.

The shunt trimmer C119 across terminals A and B of T104 is variable and is provided as a bandwidth adjustment. Preset the shunt trimmer to minimum capacity. Adjust T2 (top) and T104 (bottom) for maximum gain at 43.5 mc. and with 45.75 mc. at 70% of maximum response.

Adjust T1 for maximum gain. Readjust T2 and T104 if necessary to obtain proper wave shape, see Fig. 13.

Disconnect the diode probe, the 180 ohm and the two 330 ohm resistors.

Connect the oscilloscope to the junction of R138 and L105.

Adjust the bias potentiometer to obtain —5.0 volts of bias as measured by a "VoltOhmyst" at the junction of R147 and R148.

Leave the sweep generator connected to the front terminal of the 1N82 crystal holder with the shortest leads possible and with not more than one inch of unshielded lead at the end of the sweep cable. If these precautions are not observed, the receiver may be unstable and the response curves obtained may be unreliable.

Adjust the output of the sweep generator to obtain 3.0 to 5.0 volts peak-to-peak on the oscilloscope.

Couple the signal generator loosely to the grid of the first pix i-f amplifier. Adjust the output of the signal generator to produce small markers on the response curve.

Retouch T106, T107 and T108 to obtain the response shown in Figure 14.

Remove the oscilloscope, sweep and signal generator connections.

RCA-Victor Chassis KCS-78, -78B, -78F, -78H, -78J, continued

ALIGNMENT PROCEDURE

RATIO DETECTOR ALIGNMENT.—Set the signal generator at 4.5 mc. and connect it to the first sound i-f grid, pin 1 of V101.

As an alternate source of signal, the RCA WR39B or WR39C calibrator may be employed. In such a case, connect the calibrator to the grid of the third pix i-f amplifier, pin 1 of V108.

Set the frequency of the calibrator to 45.75 mc. (pix carrier) and modulate with 4.5 mc. crystal. The 4.5 mc. signal will be picked off at L104 and amplified through the sound i-f amplifier.

Connect the "VoltOhmyst" to pin 2 of V103.

Tune the ratio detector primary, T102 top core for maximum d-c output on the "VoltOhmyst." Adjust the signal level from the signal generator for 6 volts on the "VoltOhmyst" when finally peaked. This is approximately the operating level of the ratio detector for average signals.

Connect the "VoltOhmyst" to the junction of R106 and C108.

Tune the ratio detector secondary T102 bottom core for zero d-c on the "VoltOhmyst."

Repeat adjustments of T102 top for maximum d-c at pin 2 of V103 and T102 bottom for zero d-c at the junction of R106 and C108. Make the final adjustments with the signal input level adjusted to produce 6 volts d-c on the "VoltOhmyst" at pin 2 of V103.

SOUND I-F ALIGNMENT.—Connect the signal generator to the first sound i-f amplifier grid, pin 1 of V101.

As an alternate source of signal, the RCA WR39B or WR39C calibrator may be employed as above.

Connect the "VoltOhmyst" to pin 2 of V103.

Tune the T101 top core for maximum d-c on the "VoltOhmyst."

The output from the signal generator should be set to produce approximately 6.0 volts on the "VoltOhmyst" when the final touches on the above adjustment are made.

4.5 MC. TRAP ADJUSTMENT.—Connect the signal generator in series with a 1,000 ohm resistor to pin 2 of V109. Set the generator to 4.5 mc. and modulate it 30% with 400 cycles. Set the output to approximately 0.5 volts.

Short the third pix i-f grid to ground, pin 1, V108, to prevent noise from masking the output indication.

Connect the crystal diode probe of an oscilloscope to the plate of the video amplifier, pin 6 of V110.

Adjust the core of L105 for minimum output on the oscilloscope.

Remove the short from pin 1, V108 to ground.

As an alternate method, this step may be omitted at this point in the alignment procedure and the adjustment made "on the air" after the alignment is completed.

If this is done, tune in a station and observe the picture on the kinescope. If no 4.5 mc. beat is present in the picture, when the fine tuning control is set for proper oscillator-frequency, then L105 requires no adjustment. If a 4.5 mc. beat is present, turn the fine tuning control slightly clockwise so as to exaggerate the beat and then adjust L105 for minimum beat.

AGC CONTROL ADJUSTMENT.—Disconnect all test equipment except the oscilloscope which should be connected to pin 6 of V110.

Connect an antenna to the receiver antenna terminals.

Turn the AGC control fully counter-clockwise.

Tune in a strong signal and adjust the oscilloscope to see the video waveform.

Turn the AGC control clockwise until the tips of sync begin to be compressed, then counter-clockwise until no compression is obtained.

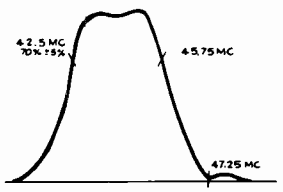


Figure 13 KRK12B T2 and T104 Response

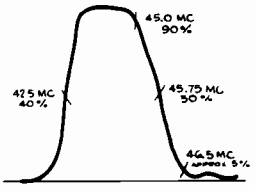


Figure 14 Over-all I-F Response with KRK12B

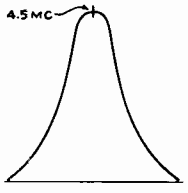


Figure 20 Sound I-F Response

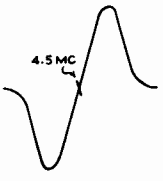


Figure 21 Ratio Det. Response

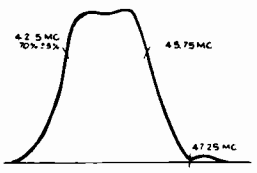


Figure 22 KRK29 T2 and T104 Response

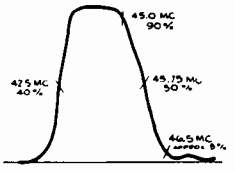


Figure 23 Over-all I-F Response with KRK29

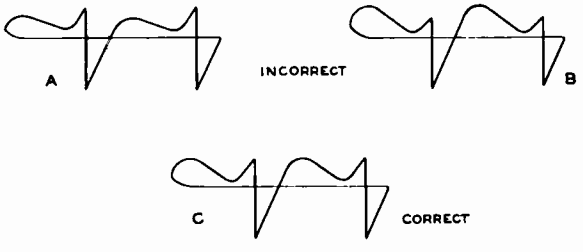


Figure 24—Horizontal Oscillator Wave Forms

RCA-Victor Chassis KCS-78, -78B, -78F, -78H, -78J, continued

ALIGNMENT PROCEDURE

HORIZONTAL OSCILLATOR ADJUSTMENT. — Normally the adjustment of the horizontal oscillator is not considered to be a part of the alignment procedure, but since the oscillator waveform adjustment may require the use of an oscilloscope, it cannot be done conveniently in the field. The waveform adjustment is made at the factory and normally should not require readjustment in the field. However, the waveform adjustment should be checked whenever the receiver is aligned or whenever the horizontal oscillator operation is improper.

Horizontal Frequency Adjustment.—Tune in a station and sync the picture. If the picture cannot be synchronized with the horizontal hold control R200, then adjust the T114 frequency core on the rear apron until the picture will synchronize. If the picture still will not sync, turn the T114 waveform adjustment core (under the chassis) out of the coil several turns from its original position and readjust the T114 frequency core until the picture is synchronized.

Examine the width and linearity of the picture. If picture width or linearity is incorrect, adjust the horizontal drive control C174B, the width control L109 and the linearity control L111 until the picture is correct.

Horizontal Oscillator Waveform Adjustment.—The horizontal oscillator waveform may be adjusted by either of two methods. The method outlined in paragraph A below may be employed in the field when an oscilloscope is not available. The service shop method outlined in paragraph B below requires the use of an oscilloscope.

A.—Turn the horizontal hold control completely clockwise. Place adjustment tools on both cores of T114 and be prepared to make simultaneous adjustments while watching the picture on the screen. First, turn the T114 frequency core (on the rear apron) until the picture falls out of sync and three or four diagonal black bars sloping down to the right appear on the screen. Then, turn the waveform adjustment core (under the chassis) into the coil while at the same time adjusting the frequency core so as to maintain three or four diagonal black bars on the screen. Continue this procedure until the oscillator begins to motorboat, then turn the waveform adjustment core out until the motorboating just stops. As a check, turn the T114 frequency core until the picture is synchronized then reverse the direction of rotation of the core until the picture falls out of sync with the diagonal bars sloping down to the right. Continue to turn the frequency core in the same direction. No more than three or four bars should appear on the screen. Instead, the horizontal oscillator should begin to motorboat. Retouch the adjustment of the T114 waveform adjustment core if necessary until this condition is obtained.

B.—Connect the low capacity probe of an oscilloscope to terminal C of T114. Turn the horizontal hold control one-quarter turn from the clockwise position so that the picture is in sync. The pattern on the oscilloscope should be as shown in Figure 24. Adjust the waveform adjustment core of T114 until the two peaks are at the same height. During this adjustment, the picture must be kept in sync by readjusting the hold control if necessary.

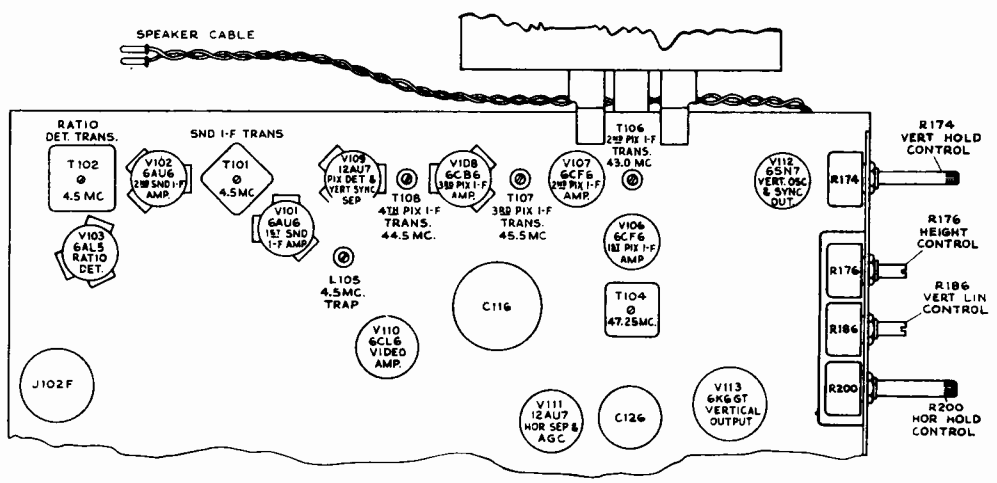
This adjustment is very important for correct operation of the circuit. If the broad peak of the wave on the oscilloscope is lower than the sharp peak, the noise immunity becomes poorer, the stabilizing effect of the tuned circuit is reduced and drift of the oscillator becomes more serious. On the other hand, if the broad peak is higher than the sharp peak, the oscillator is overstabilized, the pull-in range becomes inadequate and the broad peak can cause double triggering of the oscillator when the hold control approaches the clockwise position.

Remove the oscilloscope upon completion of this adjustment.

Horizontal Locking Range Adjustment.—Set the horizontal hold control to the full counterclockwise position. Momentarily remove the signal by switching off channel then back. The picture may remain in sync. If so turn the T114 frequency core slightly and momentarily switch off channel. Repeat until the picture falls out of sync with the diagonal lines sloping down to the left. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.

If more than 3 bars are present just before the picture pulls into sync, adjust the horizontal locking range trimmer C174A slightly clockwise. If less than 2 bars are present, adjust C174A slightly counter-clockwise. Turn the horizontal hold control counter-clockwise, momentarily remove the signal and recheck the number of bars present at the pull-in point. Repeat this procedure until 2 or 3 bars are present.

Turn the horizontal hold control to the maximum clockwise position. Adjust the T114 frequency core so that the diagonal bar sloping down to the right appears on the screen and then reverse the direction of adjustment so that bar just moves to the left side of the screen leaving the picture in synchronization.



Top Chassis Adjustments

RCA VICTOR

Models 21D358U, 21D368U, 21D376U, 21D377U, 21D378U, 21D379U, 21D380U, use Chassis KCS-81J that has its exact circuit printed on the next two pages, over. Models 21D358, 21D368, 21D376, 21D377, 21D378, 21D379, 21D380, use Chassis KCS-81F which is practically identical to the KCS-81J, but is intended for VHF reception only and uses tuner unit KRK-29.

Models 21D305, 21D317, 21D326, 21D327, 21D328, 21D329, 21D330, use Chassis KCS-81 with tuner unit KRK-11B for VHF reception only, while Models 21D305U, 21D317U, 21D326U, 21D327U, 21D328U, 21D329U, 21D330U, employ Chassis KCS-81B which has tuner unit KRK-12 for both VHF and UHF reception. Outside of different tuners, these chassis are practically the same as KCS-81J and the circuit of this chassis on the next two pages should be used for these additional models.

Model 21D346 uses Chassis KCS-81D with tuner unit KRK-22A for VHF reception only, and Model 21D346U uses Chassis KCS-81E with tuner unit KRK-12 for reception of both VHF and UHF. Both of these chassis are used in combination sets with separate radio chassis, audio amplifier, and record changer. Outside of tuner differences and provisions for switching and connecting the radio chassis which has the audio output tube and speaker, these chassis are very similar to other chassis covered by service material on this and the next five pages.

WIDTH, DRIVE AND HORIZONTAL LINEARITY ADJUSTMENTS. — Adjustment of the horizontal drive control affects the high voltage applied to the kinescope. In order to obtain the highest possible voltage hence the brightest and best focused picture, adjust horizontal drive trimmer C186B for maximum drive (minimum capacity) consistent with a linear raster. Compression of the raster due to excessive drive can be seen as a white vertical bar or bars in the right half of the picture. Besides compression caused by excessive drive, another item to watch for is the change in linearity at the extreme left with changes of brightness control setting. By proper adjustment of the linearity coil, the changes in linearity with changes in brightness can be made negligible. In general, to achieve this condition, the linearity coil should be set slightly on the high inductance side (core slightly clockwise) of the optimum position.

Preset the following adjustments as directed:

A.—Place the width plug P103 in the minimum width position (top).

B.—Set the width control coil L109 in approximately mid-position.

C.—Set the linearity control coil L111 near minimum inductance (counter-clockwise).

D.—Set the drive capacitor C186B in the maximum drive position (counter-clockwise).

If the raster is cramped or shows compression bars on the right half of the picture turn C186B clockwise until this condition is just eliminated.

Adjust the linearity control coil L111 clockwise until best linearity and maximum deflection or best compromise are obtained, then turn one quarter turn clockwise from this position.

Retouch the drive trimmer C186B if necessary to obtain best linearity and maximum width.

Check the horizontal linearity at various settings of the brightness control R114A. There should be no compression of the right half and no appreciable change of linearity especially at the extreme left of the picture. If objectionable change does occur, turn linearity coil L111 slightly clockwise and repeat the test.

Adjust the width control L109 to fill the mask.

If the line voltage is low and it becomes impossible to fill the mask, remove the width plug P103 to the bottom position.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENTS. — Adjust the height control (R190 behind front control panel) until the picture fills the mask vertically. Adjust vertical linearity (R197 behind front control panel), until the test pattern is symmetrical from top to bottom. Adjustment of either control will require a readjustment of the other.

ION TRAP MAGNET ADJUSTMENT. — Set the ion trap magnet approximately in the position shown in Figure 2. Starting from this position immediately adjust the magnet by moving it forward or backward at the same time rotating it slightly around the neck of the kinescope for the brightest raster on the screen. Reduce the brightness control setting until the raster is slightly above average brilliance. Turn the focus control (shown in Figure 2) until the line structure of the raster is clearly visible. Readjust the ion trap magnet for maximum raster brilliance. The final touches of this adjustment should be made with the brightness control at the maximum clockwise position with which good line focus can be maintained.

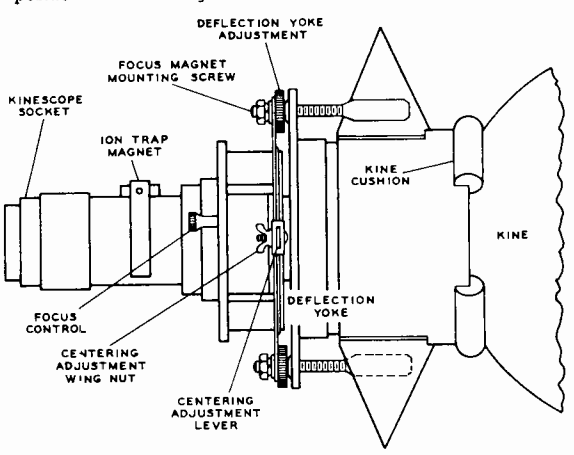


Figure 2—Yoke and Focus Magnet Adjustments

KCS81J CIRCUIT SCHEMATIC DIAGRAM

The schematic is shown in the latest condition at the time of printing.
All resistance values in ohms. K = 1000.

All capacitance values less than 1 in MF and above 1 in MMF unless otherwise noted.

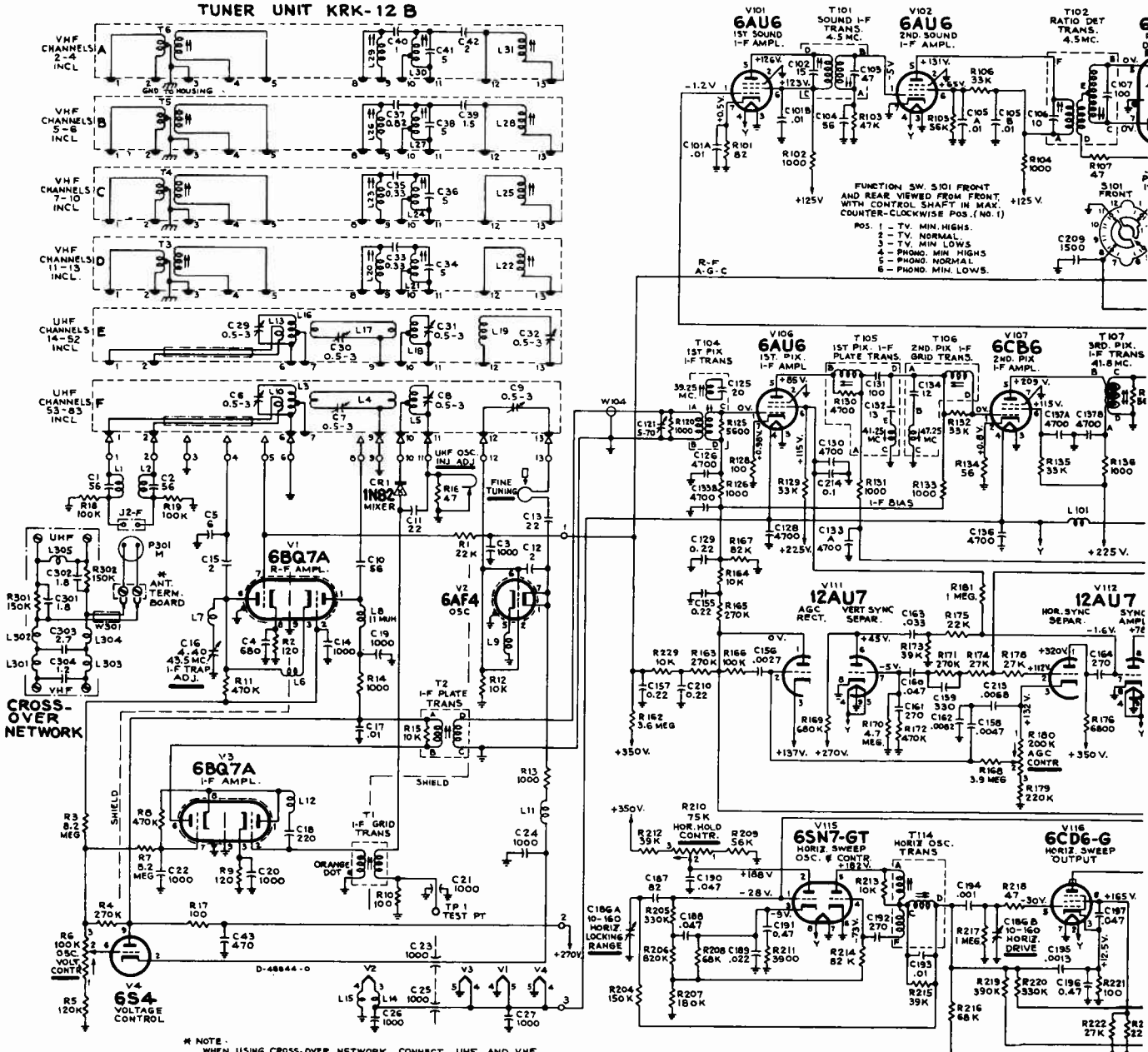
Direction of arrows at controls indicates clockwise rotation.

AGC THRESHOLD CONTROL.

To check the adjustment of the AGC Threshold Control, tune in a strong signal and sync the picture. Momentarily remove the signal by switching off channel and then back. If the picture reappears immediately, the receiver is not over-loading due to improper setting of R180. If the picture requires an appreciable portion of a second to reappear, or bends excessively, R180 should be readjusted.

Turn R180 fully counter-clockwise. The raster may be bent slightly. This should be disregarded. Turn R180 clockwise until there is a very, very slight bend or change of bend in the picture. Then turn R180 counter-clockwise just sufficiently to remove this bend or change of bend.

If the signal is weak, the above method may not work as it may be impossible to get the picture to bend. In this case, turn R180 clockwise until the snow in the picture becomes more pronounced, then counter-clockwise until the best signal to noise ratio is obtained.



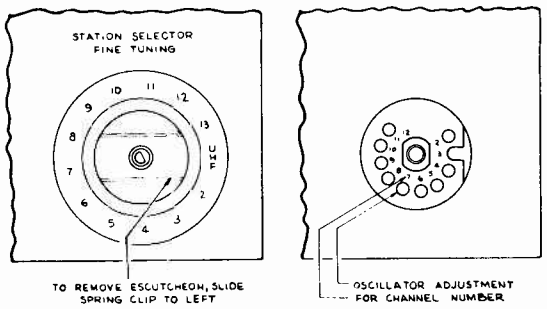


Figure 4—KRK29 R-F Oscillator Adjustments

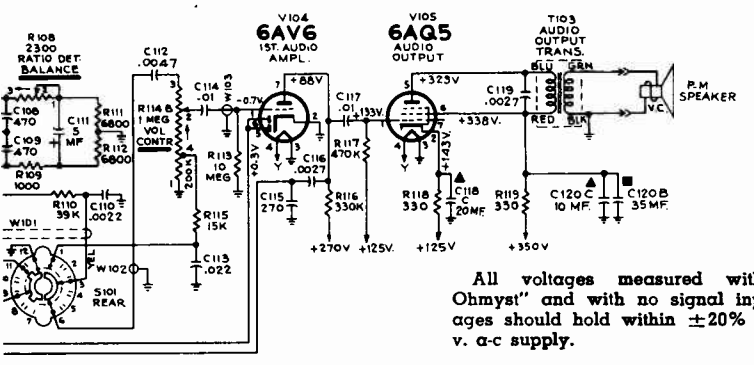
CHECK OF R-F OSCILLATOR ADJUSTMENTS

Models 21-D-358 to 21-D-380 incl. with KRK29 Tuner

Tune in all available stations to see if the receiver r-f oscillator is adjusted to the proper frequency on all channels. If adjustments are required, these should be made by the method outlined in the alignment procedure on page 11. The adjustments for channels 2 through 12 are available from the front of the cabinet by removing the station selector escutcheon as shown in Figure 4. Adjustment for channel 13 is on top of the chassis.

Models 21-D-358U to 21-D-380U incl. with KRK12B Tuner

Tune in all available UHF and VHF stations to see if the receiver r-f oscillator is adjusted to the proper frequency on all channels. Set the fine tuning control to the center of its range. Adjust the oscillator core for each channel to obtain maximum audio output without distortion. The location of the adjustment is the same for all channels (see Figure 5).



All voltages measured with "Volt-Ohmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.

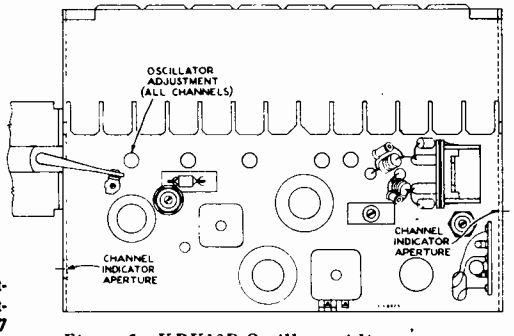
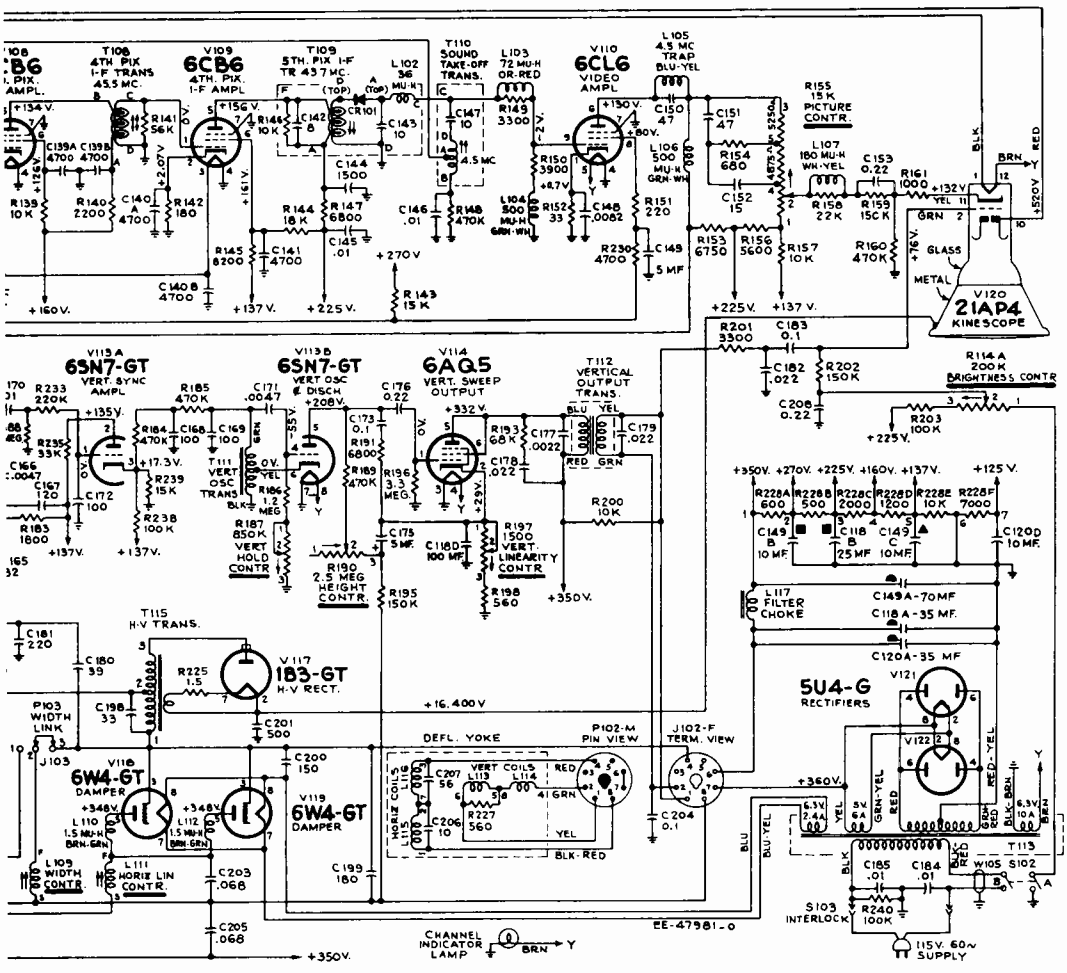


Figure 5—KRK12B Oscillator Adjustment



Continued on the next three pages.

Circuit Schematic Diagram, KCS81J

RCA-Victor Chassis KCS-81, -81B, -81D, -81E,-81F, -81J, continued

ALIGNMENT PROCEDURE

PICTURE I-F TRAP ADJUSTMENT. — Connect the i-f signal generator across the link circuit on terminals A and B of T104.

Connect the "VoltOhmyst" to the junction of R133 and C133B.

Obtain two 7.5 volt batteries capable of withstanding appreciable current drain and connect the ends of a 1,000 ohm potentiometer across each. Connect the positive terminal of one battery to chassis and the potentiometer arm to the junction of R133 and C133B.

Set the bias to produce approximately −1.0 volt of bias at the junction of R133 and C133B.

Connect the "VoltOhmyst" to pin 9 of V110, the 6CL6 video amplifier.

Set the signal generator to each of the following frequencies and adjust the corresponding circuit for minimum d-c output at pin 9 of V110. Use sufficient signal input to produce 1.0 volt of d-c on the meter when the final adjustment is made.

39.25 mc. ..... T104 top core
41.25 mc. ..... T105 bottom core
47.25 mc. ..... T106 bottom core

PICTURE I-F TRANSFORMER ADJUSTMENTS.—

VHF Models

Set the signal generator to each of the following frequencies and peak the specified adjustment for maximum indication on the "VoltOhmyst." During alignment, reduce the input signal if necessary in order to produce 1.0 volt of d-c at pin 9 of V110 with −1.0 volt of i-f bias at the junction of R133 and C133B.

43.7 mc. T109
45.5 mc. T108
41.8 mc. T107

To align T105 and T106, connect the sweep generator to the first picture i-f grid, pin 1 of V106 through a 1,000 mmf. ceramic capacitor. Shunt R137, R141 and terminals "A" and "F" of T109 with 330 ohm composition resistors. Set the i-f bias to −1.0 volt at the junction of R133 and C133B.

Connect the oscilloscope to pin 9 of V110.

Adjust T105 and T106 top cores for maximum gain and curve shape as shown in Figure 22. For final adjustment set the output of the sweep generator to produce 0.5 volt peak-to-peak at the oscilloscope terminals.

To align T2 and T104, connect the sweep generator to the mixer grid test point TP2. Use the shortest leads possible, with not more than one inch of unshielded lead at the end of the sweep cable.

Adjust C121 until 41.25 mc. is at 85% response with respect to the low frequency shoulder at approximately 41.9 mc. as shown in Figure 23.

Disconnect the diode probe, the 180 ohm and three 330 ohm resistors.

VHF-UHF Models

Set the signal generator to each of the following frequencies and peak the specified adjustment for maximum indication on the "VoltOhmyst." During alignment, reduce the input signal if necessary in order to produce 1.0 volt of d-c at pin 9 of V110 with −1.0 volt of i-f bias at the junction of R133 and C133B.

43.7 mc. T109
45.5 mc. T108
41.8 mc. T107

To align T105 and T106, connect the sweep generator to the first picture i-f grid, pin 1 of V106 through a 1,000 mmf. ceramic capacitor. Shunt R137, R141 and terminals "A" and "F" of T109 with 330 ohm composition resistors. Set the i-f bias to −1.0 volt at the junction of R133 and C133B.

Connect the oscilloscope to pin 9 of V110, the 6CL6 video amplifier.

Adjust T105 and T106 top cores for maximum gain and curve shape as shown in Figure 22. For final adjustment set the output of the VHF sweep generator to produce 0.5 volt peak-to-peak at the oscilloscope terminals.

To align the crystal mixer and T2 and T104, connect the VHF sweep generator to the front terminal of the 1N82 crystal holder in series with a 1,500 mmf. ceramic capacitor. Use the shortest leads possible, grounding the sweep generator to the tuner case.

Set the channel selector to channel 5.

Connect a 180 ohm composition resistor between terminal "B" of T105 and the junction of R131 and C133A.

Connect the oscilloscope diode probe to terminal "B" of T105 and ground. Couple the signal generator loosely to the diode probe in order to obtain markers.

The shunt trimmer C121 across terminals "A" and "B" of T104 is variable and is provided as a bandwidth adjustment. Preset the shunt trimmer to minimum capacity. Adjust T2 (top) and T104 (bottom) for maximum gain at 43.5 mc. and with 45.75 mc. at 70% of maximum response.

Adjust the shunt trimmer C121 until 41.25 mc. is at 85% response with respect to the low frequency shoulder at approximately 41.9 mc. as shown in Figure 13. Adjust T1 for

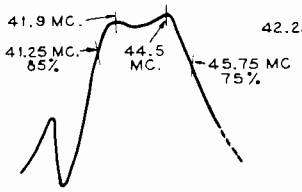


Figure 13—T2 and T104 Response with KRK12B

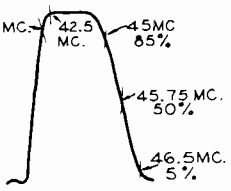


Figure 14—Over-all I-F Response with KRK12B

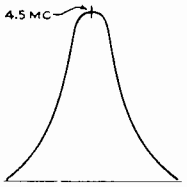


Figure 20—Sound I-F Response

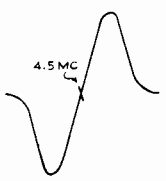


Figure 21—Ratio Det. Response

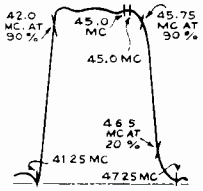


Figure 22—T105 and T106 Response

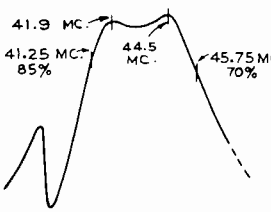


Figure 23—T2 and T104 Response with KRK29

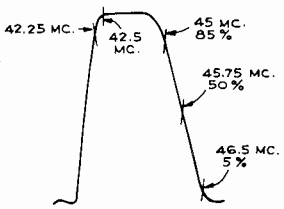


Figure 24—Over-all I-F Response with KRK29

ALIGNMENT PROCEDURE

maximum gain. Readjust T2 and T104 if necessary to obtain proper wave shape, see Figure 13.

Disconnect the diode probe, the 180 ohm and the three 330 ohm resistors.

SWEEP ALIGNMENT OF PICTURE I-F.—

Connect the oscilloscope to pin 9 of V110.

Adjust the bias potentiometer to obtain −6.0 volts of bias as measured by a "VoltOhmyst" at the junction of R133 and C133B.

Leave the sweep generator connected to the mixer grid test point TP2 on KRK29 Tuner or to the front terminal of the 1N82 crystal holder on KRK12B Tuner. Use the shortest leads possible with not more than one inch of unshielded lead at the end of the sweep cable. If these precautions are not observed, the receiver may be unstable and the response curves obtained may be unreliable.

Adjust the output of the sweep generator to obtain 3.0 volts peak-to-peak on the oscilloscope.

Couple the signal generator loosely to the grid of the first pix i-f amplifier. Adjust the output of the signal generator to produce small markers on the response curve.

Retouch T108 and T109 to obtain the response shown in Figure 14. Do not adjust T107 unless absolutely necessary. If T107 is adjusted too low in frequency it will raise the level of the 41.25 mc. sound i-f carrier and may create interference in the picture. It will also cause poor adjacent channel picture rejection. If T107 is tuned too high in frequency, the level of the 41.25 mc. sound i-f carrier will be too low and may produce noisy sound in weak signal areas.

Remove the oscilloscope, sweep and signal generator connections.

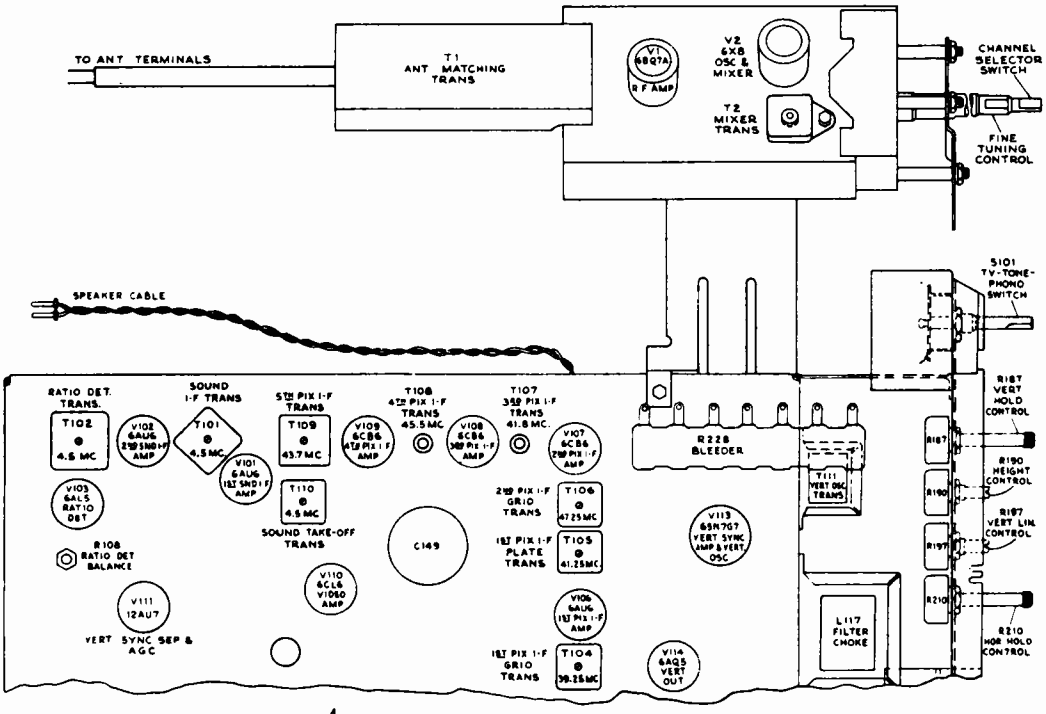


Figure 26—Top Chassis Adjustments (KRK29 Tuner Shown)

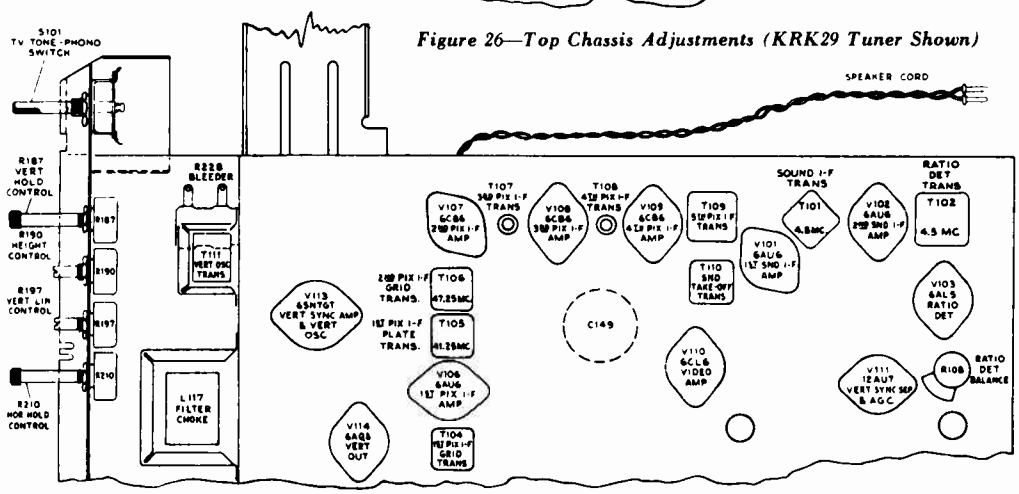


Figure 27—Bottom Chassis Adjustments

RCA-Victor Chassis KCS-81, -81B, -81D, -81E, -81F, -81J, continued

ALIGNMENT PROCEDURE

RATIO DETECTOR ALIGNMENT. — In order to obtain good ratio detector alignment an AM modulated signal generator that is exceptionally free from FM modulation must be employed. Set the signal generator at 4.5 mc. and connect it to the second sound i-f grid, pin 1 of V102. Set the generator for 30% 400 cycle modulation.

As an alternate source of signal, the RCA WR39B or WR39C calibrator may be employed. If used, connect it to the grid of the 4th pix i-f amplifier, pin 1, V109. Set the frequency of the calibrator to 45.75 (pix carrier) and modulate with 4.5 mc. crystal. Also turn on the internal AM audio modulation. The 4.5 mc. signal will be picked off at T110A and amplified through the sound i-f amplifier.

Connect the "VoltOhmyst" to the junction of R111 and C111.

Connect the oscilloscope across the speaker voice coil and turn the volume control for maximum output.

Tune the ratio detector primary, T102 top core for maximum DC output on the "VoltOhmyst." Adjust the signal level from the signal generator for −10 volts on the "VoltOhmyst" when finally peaked. This is approximately the operating level of the ratio detector for average signals.

Connect the "VoltOhmyst" to the junction of R110 and C110.

Adjust the T102 bottom core for zero d-c on the meter. Then, turn the core to the nearest minimum AM output on the oscilloscope.

Repeat adjustments of T102 top for maximum DC and T102 bottom for minimum output on the oscilloscope making final adjustment with the 4.5 mc. input level adjusted to produce 10 volts d-c on the "VoltOhmyst" at the junction of R111 and C111.

Connect the "VoltOhmyst" to the junction of R110 and C110 and note the amount of d-c present. If this voltage exceeds ±1.5 volts, adjust R108 by turning it in until zero d-c is obtained. Readjust the T102 bottom core for minimum output on the oscilloscope. Repeat adjustments of R108 and T102 bottom core until the voltage at R110 and C110 is less than ±1.5 volts when T102 bottom core is set for minimum output on the oscilloscope.

Connect the "VoltOhmyst" to the junction of R111 and C111 and repeak T102 top core for maximum d-c on the meter and again reset the generator so as to have −10 volts on the meter.

Repeat the adjustments in the above two paragraphs until the voltage at R110 and C110 is less than ±1.5 volts when the T102 top core is set for maximum d-c at the junction of R111 and C111 and the T102 bottom core is set for minimum indication on the oscilloscope.

SOUND I-F ALIGNMENT. — Connect the sweep generator to the first sound i-f amplifier grid, pin 1 of V101. Adjust the generator for a sweep width of 1 mc. at a center frequency of 4.5 mc.

Insert a 4.5 mc. marker signal from the signal generator into the first sound i-f grid. With the WR39B or WR39C calibrators the 4.5 mc. crystal signal may be obtained at the R-F out terminal by turning the variable osc. switch off, the calibrate switch to 4.5 mc. and the volume control with mod. off.

Connect the oscilloscope in series with a 10,000 ohm resistor to terminal A of T101.

Adjust T101 top and bottom cores for maximum gain and symmetry about the 4.5 mc. marker on the i-f response. The pattern obtained should be similar to that shown in Figure 20.

The output level from the sweep should be set to produce approximately 2.0 volt peak-to-peak at terminal A of T101 when the final touches on the above adjustment are made. It is necessary that the sweep output voltage should not exceed the specified values otherwise the response curve will be broadened, permitting slight misadjustment to pass unnoticed and possibly causing distortion on weak signals.

Connect the oscilloscope to the junction of R110 and C110 and check the linearity of the response. The pattern obtained should be similar to that shown in Figure 21.

SOUND TAKE-OFF ALIGNMENT. — Connect the 4.5 mc. generator in series with a 1,000 ohm resistor to terminal "C" of T110. The input signal should be approximately 0.5 volt.

Short the fourth pix i-f grid to ground, pin 1, V109, to prevent noise from masking the output indication.

As an alternate source of signal the RCA WR39B or WR39C calibrator may be used. In such a case, disregard the above two paragraphs. Connect calibrator across link circuit, T104 A, B, and modulate 45.75 with 4.5 mc. crystal.

Connect the crystal diode probe of a "VoltOhmyst" to the plate of the video amplifier, pin 6 of V110.

Adjust the core of T110 for minimum output on the meter.

Remove the short from pin 1 V109 to ground, if used.

HORIZONTAL OSCILLATOR ADJUSTMENT. — Normally the adjustment of the horizontal oscillator is not considered to be a part of the alignment procedure, but since the oscillator waveform adjustment may require the use of an oscilloscope, it can not be done conveniently in the field. The waveform adjustment is made at the factory and normally should not require readjustment in the field. However, the waveform adjustment should be checked whenever the receiver is aligned or whenever the horizontal oscillator operation is improper.

Horizontal Frequency Adjustment. — Tune in a station and sync the picture. If the picture cannot be synchronized with the horizontal hold control R210, then adjust the T114 frequency core on the rear apron until the picture will synchronize. If the picture still will not sync, turn the T114 waveform adjustment core (under the chassis) out of the coil several turns from its original position and readjust the T114 frequency core until the picture is synchronized.

Examine the width and linearity of the picture. If picture width or linearity is incorrect, adjust the horizontal drive control C186B, the width control L109 and the linearity control L111 until the picture is correct.

Horizontal Locking Range Adjustment. — Set the horizontal hold control to the full counter-clockwise position. Momentarily remove the signal by switching off channel then back. The picture may remain in sync. If so turn the T114 frequency core slightly and momentarily switch off channel. Repeat until the picture falls out of sync with the diagonal lines sloping down to the left. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.

If more than 3 bars are present just before the picture pulls into sync, adjust the horizontal locking range trimmer C186A slightly clockwise. If less than 2 bars are present, adjust C186A slightly counter-clockwise. Turn the horizontal hold control counter-clockwise, momentarily remove the signal and recheck the number of bars present at the pull-in point. Repeat this procedure until 2 or 3 bars are present.

Turn the horizontal hold control to the maximum clockwise position. Adjust the T114 frequency core so that the diagonal bar sloping down to the right appears on the screen and then reverse the direction of adjustment so that bar just moves off the screen leaving the picture in synchronization.

SENSITIVITY CHECK. — A comparative sensitivity check can be made by operating the receiver on a weak signal from a television station and comparing the picture and sound obtained to that obtained on other receivers under the same conditions.

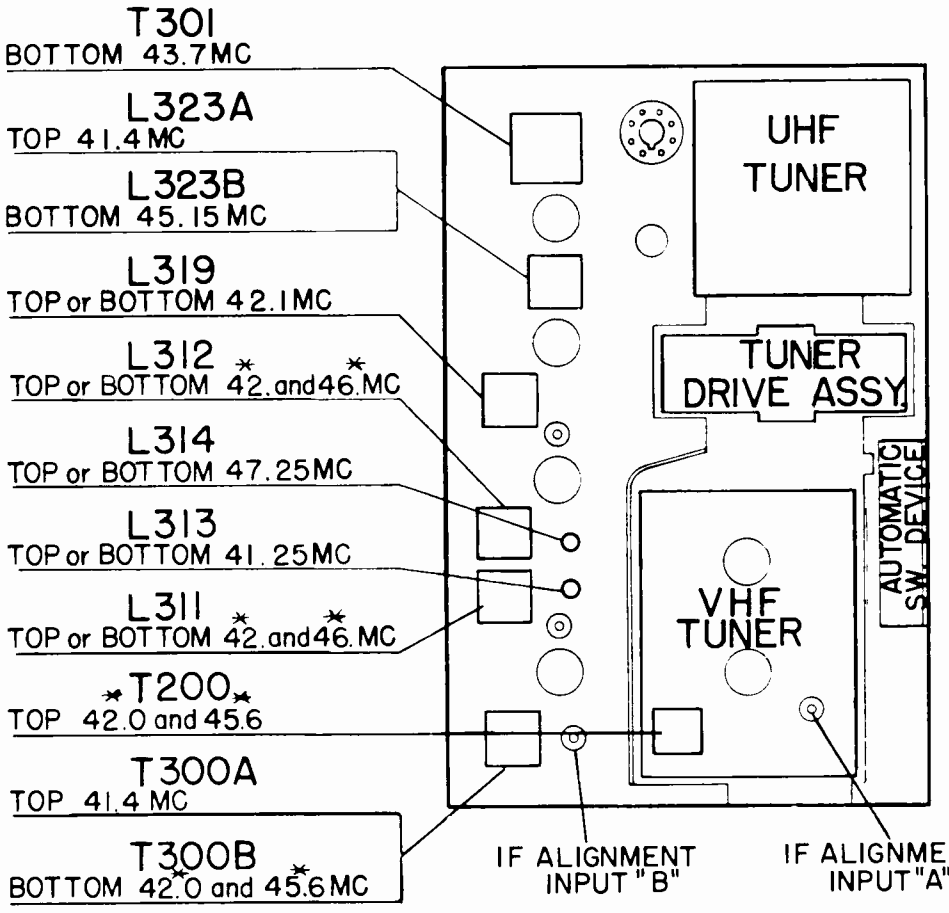
RAYTHEON MANUFACTURING COMPANY
TELEVISION AND RADIO DIVISION

21T8 CHASSIS

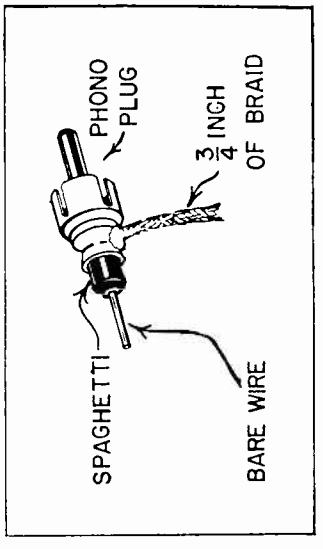
MODELS UM-2133A, UM-2134A, UM-2135A, UM-2136A, UC-2139A, UC-2141A, UC-2142A, UC-2144A and UC-2145A

24T2 CHASSIS

MODELS UC-2403A, UC-2404A, UC-2405A, and UC-2406A



Circuit diagram for Chassis 21T8 is on pages 130-131, and the circuit diagram for Chassis 24T2 is on pages 132-133. Alignment facts for all models are printed on pages 127 to 129, and page 134.



ALIGNMENT PLUG

* MARKER FREQUENCIES

VIDEO TRAP COIL (L403) ADJUSTMENT

(a) Tune in station.
(b) Adjust tuner until sound bars just appear.
(c) Turn L-403 Slug all the way out (counter-clockwise).
(d) Turn the slug in (clockwise) until the horizontal scanning lines are smooth and continuous.

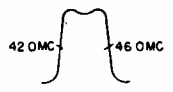
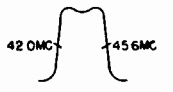
ALIGNMENT PLUG

For ease of alignment and to reduce the possibility of regeneration, it is suggested that a simple generator alignment plug be made and used during the alignment.

Raytheon Manufacturing Company, Chassis 21T8 and 24T2, continued

VIDEO IF ALIGNMENT

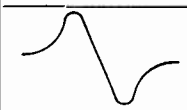
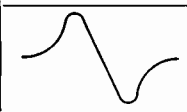
NOTE: (a) Preheat the unit for at least five minutes.
(b) Set VHF tuner to approximately Channel 7.
(c) Use 10K ohm resistor (isolation) in series with VTVM and scope for the following steps.

Step No.	Signal Generator Freq. (mc.)	Sweep Generator Freq (mc.)	Signal Input Point	Output Point	Remarks	Adjust	Response
1	43.7	———	IF Alignment Input "A"	VTVM at IF Detector Output	Adjust generator for output of approx. 2 volts DC on VTVM	T-301	Maximum Reading
2	41.4	———	IF Alignment Input "A"	VTVM at IF Detector Output	Adjust generator for output of approx. 2 volts DC on VTVM	L-323A (Top)*	Minimum Reading
3	45.15	———	IF Alignment Input "A"	VTVM at IF Detector Output	Adjust generator for output of approx. 2 volts DC on VTVM	L-323B (Bottom)*	Maximum Reading
4	42.1	———	IF Alignment Input "A"	VTVM at IF Detector Output	Adjust generator for output of approx. 2 volts DC on VTVM	L-319	Maximum Reading
5	41.25	———	IF Alignment Input "A"	VTVM at IF Detector Output	Adjust generator for output of approx. 2 volts DC on VTVM	L-313 (Bottom)	Minimum Reading
6	47.25	———	IF Alignment Input "A"	VTVM at IF Detector Output	Adjust generator for output of approx. 2 volts DC on VTVM	L-314 (Bottom)	Minimum Reading
7	41.4	———	IF Alignment Input "A"	VTVM at IF Detector Output	Adjust generator for output of approx. 2 volts DC on VTVM	T-300A (Top)*	Minimum Reading
8	Remove VTVM from IF Detector output and substitute an oscilloscope in its place. Calibrate scope for sensitivity of one volt per inch.						
9	42.0 46.0	40	IF Alignment Input "B"	Scope at IF Detector Output	Adjust wave form for approx. 20 divisions on scope with sweep gen.	L-311 (Bottom) L-312 (Bottom) Adjust for maximum amplitude with proper bandwidth	
10	42.0 45.6	40	IF Alignment Input "A"	Scope at IF Detector Output	Adjust wave form for approx. 20 divisions on scope with sweep gen.	T-200 T-300B (Bottom)* C-305 Adjust for maximum amplitude with proper bandwidth	

* NOTE: Two Peaks can be obtained. Use Peak with core furthest out of coil form.

SOUND IF ALIGNMENT

NOTE: Short antenna to ground.

Step No.	Signal Generator Freq. (mc.)	Sweep Generator Freq (mc.)	Signal Input Point	Output Point	Remarks	Adjust	Response
1	4.5	——	IF Detector Output	VTVM across C-416	———	T400 Primary (Bottom of can)	Maximum Reading on V.T.V.M.
2	——	4.5	IF Detector Output	Scope across C-416	Sweep approx. ± 100 KC. Adjust for maximum Linearity	T400 Secondary (Top of can)	
3	——	4.5	IF Detector Output	Scope across C-416	Sweep approx. ± 100 KC. Adjust for symmetry of peaks	T400 Primary (Bottom of can)	

Raytheon Manufacturing Company, Chassis 21T8 and 24T2, continued

VHF TUNER ALIGNMENT

NOTE: IF amplifier must be aligned before tuner adjustments are made. Also Low Band of Tuner must be aligned before High Band.

1. Preset trimmer screws as shown in Figure 5.
2. Preset coil cores as following:
   (A) With Band Sw. in Low Band pos., set treadle bar to top of stroke (Cores furthest out of coil)
   (B) Adjust Cores: L200, L201, L205, L206, L209, L210 to 1-1/2" from cores to end of coil form.
   (C) Adjust Core: L213, L214 to 1-5/8" from cores to end of coil form. (See Figure 6.)

Note 1: From bottom of treadle bar 1 3/4" to top of tuner chassis.
Note 2: From bottom of treadle bar 1 1/8" to top of tuner chassis.
Note 3: From bottom of treadle bar 5/8" to top of tuner chassis.
Note 4: From bottom of treadle bar 7/8" to top of tuner chassis.

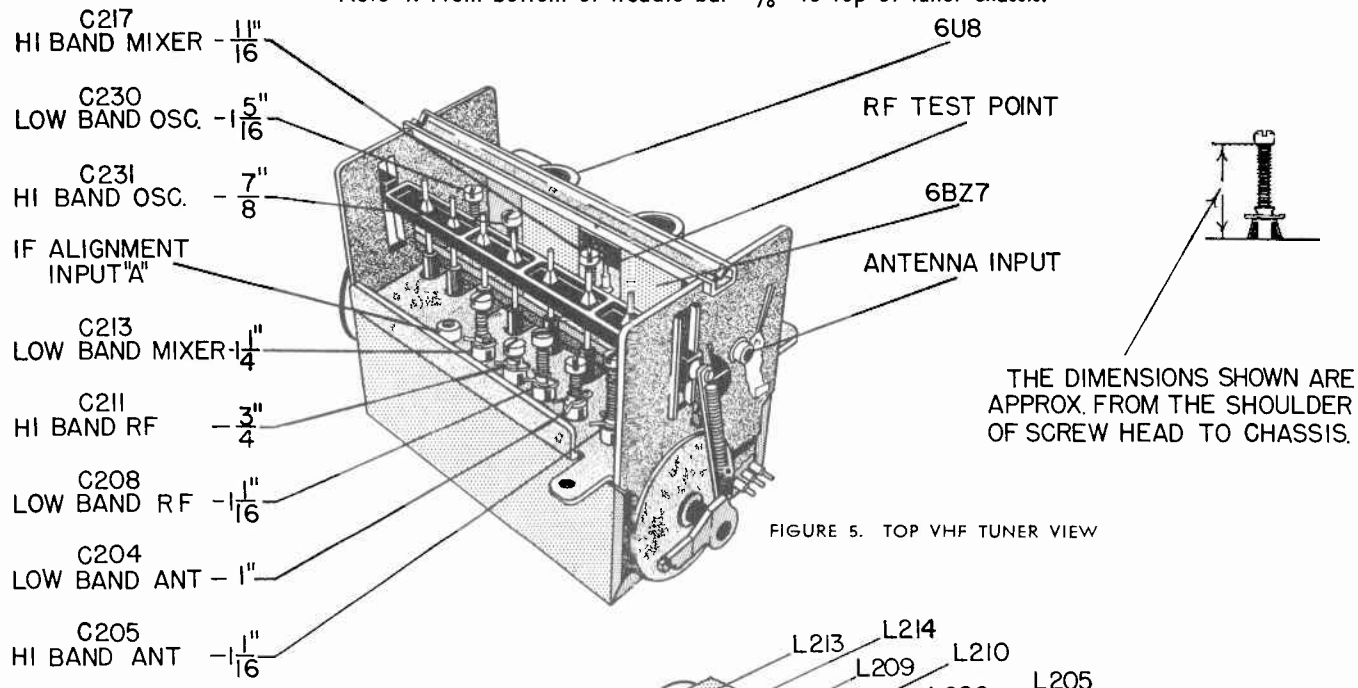


FIGURE 5. TOP VHF TUNER VIEW

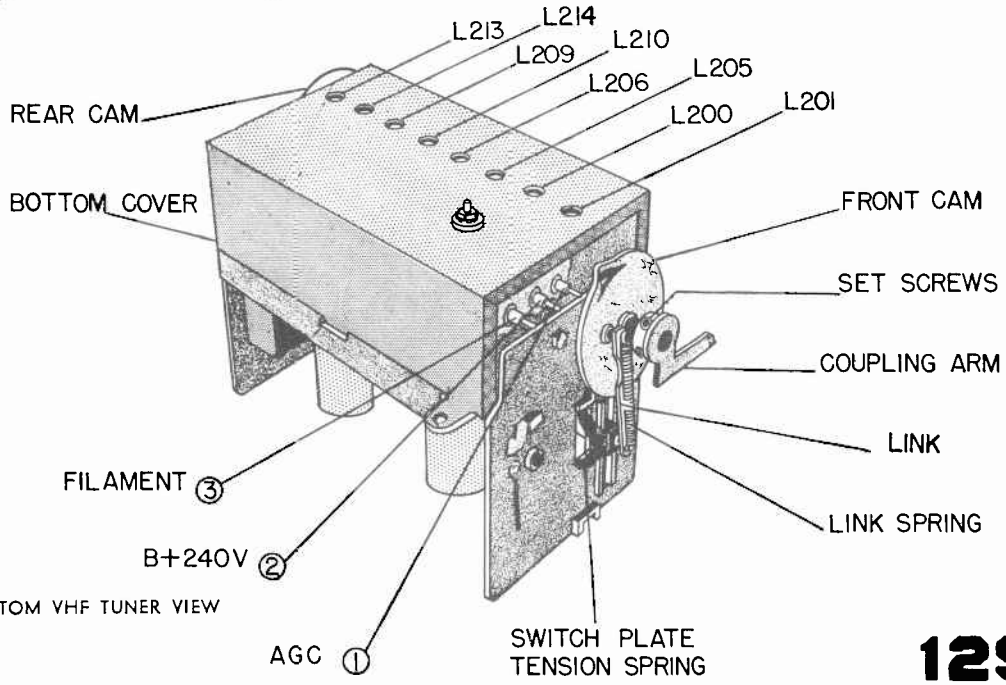
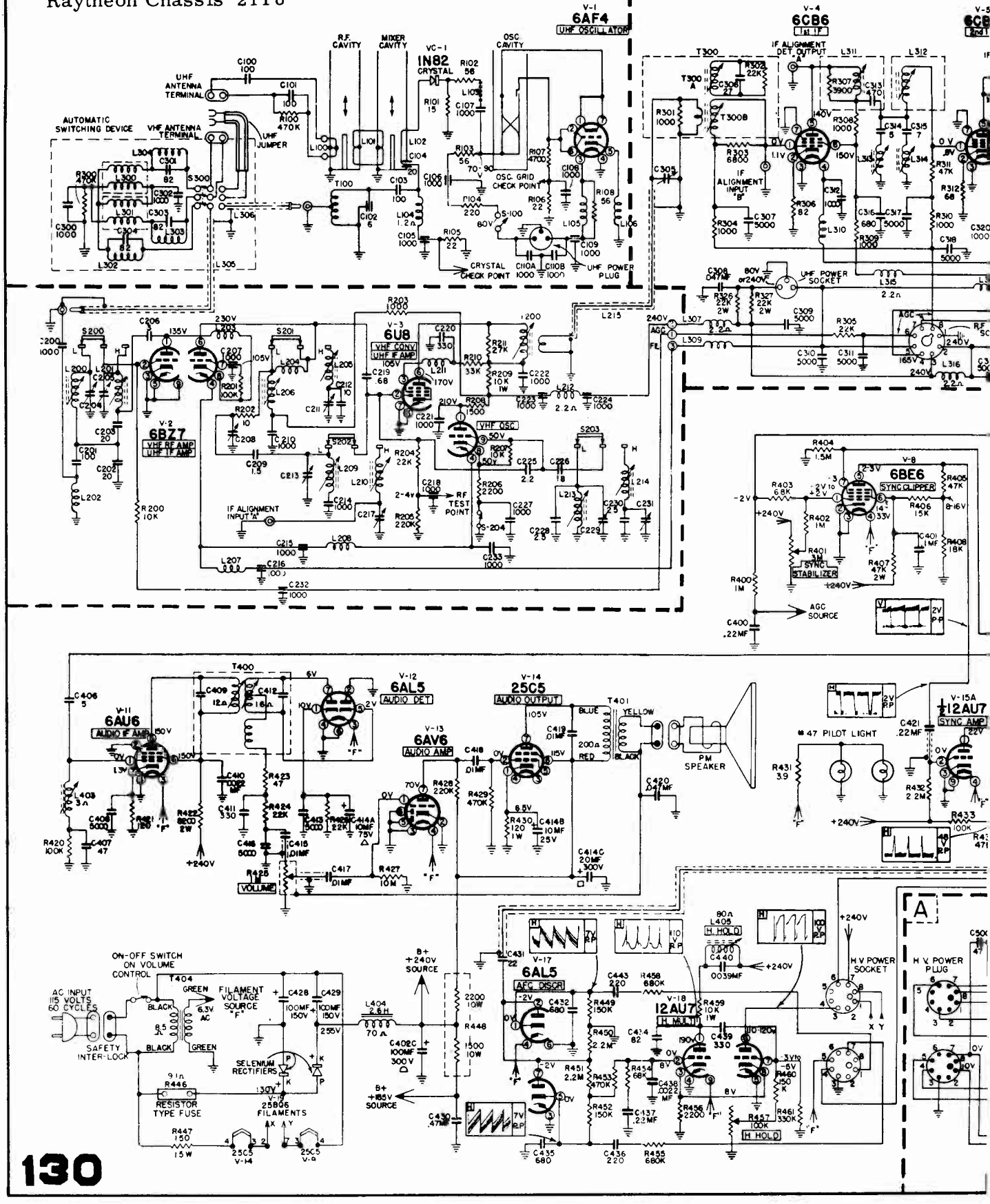


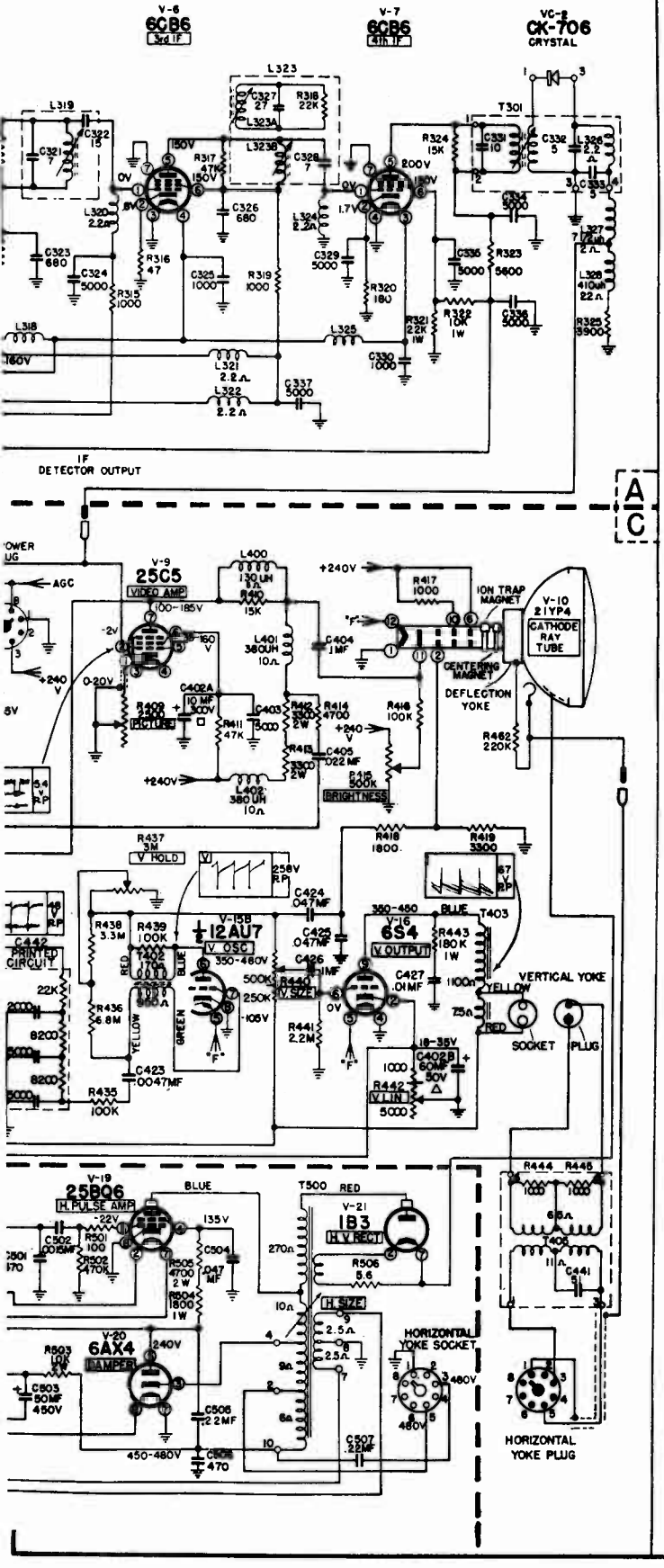
FIGURE 6. BOTTOM VHF TUNER VIEW

Alignment table is on page 134.

Raytheon Chassis 21T8



Raytheon Manufacturing Co.
Circuit Diagram Chassis 21T8



CAPACITORS CAPACITOR VALUES ARE REPRESENTED IN MICRO-MICROFARAD (MMF) UNLESS OTHERWISE INDICATED. "MF" DENOTES MICRO-FARAD.

RESISTORS RESISTOR WATTAGE IS REPRESENTED IN 1/2 WATT UNLESS OTHERWISE INDICATED. "K" DENOTES X 1,000 & "M" DENOTES X 1,000,000.

SWITCHES ALL SWITCHES ARE SHOWN IN THE POSITION FOR VHF OPERATION.

VOLTAGE READINGS THE VOLTAGE READINGS INDICATED AT THE VARIOUS TUBE SOCKET PINS WERE MEASURED WITH A 20,000 OHM PER VOLT VOLTMETER, NORMAL OPERATION, NO SIGNAL INPUT AND LINE VOLTAGE AT 115V AC WHERE CONTROL SETTINGS AFFECT VOLTAGE READINGS THE MINIMUM AND MAXIMUM ARE INDICATED. (SEE WARNING BELOW)

HIGH VOLTAGE HIGH VOLTAGE ON PLATE CAPS OF THE 1B3 HIGH VOLTAGE RECTIFIER AND 25BQ6 HORIZONTAL PULSE AMPLIFIER. DO NOT MEASURE THIS VOLTAGE. MEASURE CRT 2nd ANODE VOLTAGE WITH H. V. PROBE.

D.C. RESISTANCE THE DC RESISTANCE READING INDICATED NEAR THE TRANSFORMERS AND COILS HAVE BEEN TAKEN WITH AN OHMMETER DIRECTLY ACROSS THE COIL BEING MEASURED. COILS SHOWN WITHOUT A RESISTANCE READING HAVE A DC RESISTANCE OF LESS THAN ONE OHM. A TOLERANCE OF ± 10% IS PERMISSIBLE. DO NOT MEASURE WITH SET TURNED ON.

WAVE FORMS THE WAVE FORMS ILLUSTRATED ARE EXACT COPIES OF THAT SHOWN ON A LABORATORY OSCILLOSCOPE. THE WAVE FORMS WERE TAKEN UNDER NORMAL OPERATING CONDITIONS, WITH A TRANSMITTED SIGNAL AND THE PICTURE IN SYNC AT ALL TIMES. WITH EACH WAVE FORM IS THE PEAK-TO-PEAK VOLTAGE AND A HORIZONTAL OR A VERTICAL NOTATION REPRESENTING VERTICAL (60 CYCLES) OR HORIZONTAL (15,750 CYCLES) SCOPE FREQ. THE WAVE FORM AND PEAK-TO-PEAK VOLTAGE READINGS MAY VARY SOMEWHAT DEPENDING ON THE STRENGTH OF THE SIGNAL, THE PICTURE INFORMATION BEING TRANSMITTED AND THE ADJUSTMENT OF THE VARIOUS CONTROLS. WHEN CHECKING WAVE FORMS, CONNECT THE GROUND LEAD FROM THE OSCILLOSCOPE TO THE CHASSIS AND THE HOT LEAD TO THE POSITION INDICATED BY THE ARROW. (SEE WARNING BELOW)

REPLACING TUBES BEFORE REPLACING TUBES THE CABINET BACK MUST FIRST BE REMOVED. REMOVING THE CABINET BACK DISENGAGES THE SAFETY INTERLOCK AND REMOVES THE POWER TO THE RECEIVER. DO NOT TAMPER WITH OR ATTEMPT TO DEFEAT THE PURPOSE OF THE SAFETY INTERLOCK, AS SEVERE SHOCK MAY RESULT. DO NOT REMOVE TUBES WHILE THE RECEIVER IS IN OPERATION AS OVERLOADING OR COMPONET FAILURE MAY RESULT.

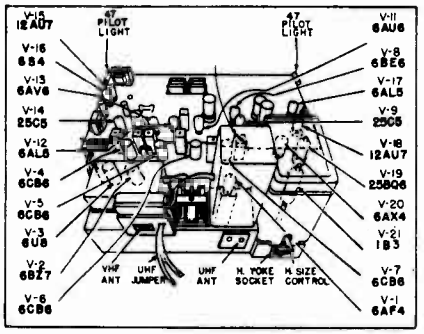
PICTURE TUBE HANDLING DUE TO LARGE SURFACE AND EXTREME HIGH VACUUM OF THE PICTURE TUBE, CARE SHOULD BE USED WHEN HANDLING THE CHASSIS OUTSIDE THE CABINET. DO NOT SUBJECT THE TUBE TO EXCESSIVE PRESSURE OR ROUGH HANDLING AS AN IMPLOSION MAY RESULT CAUSING SERIOUS PERSONAL INJURY.

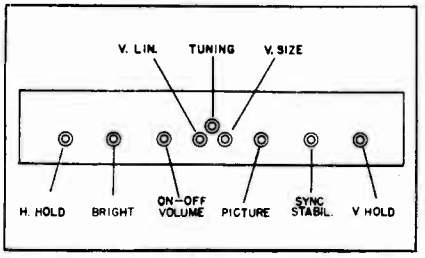
WARNING

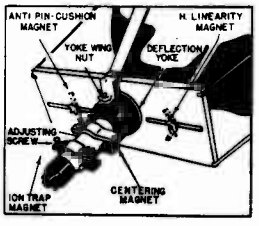
AT ALL TIMES DURING OPERATION THE CHASSIS IS AT 125 VOLTS DC POTENTIAL ABOVE GROUND AND IT ALSO MAY BE AT THE LINE VOLTAGE POTENTIAL DEPENDING ON HOW THE LINE CORD PLUG IS INSERTED IN THE POWER RECEPTACLE.

EXTREME CAUTION MUST BE OBSERVED WHEN WORKING WITH THE CHASSIS OUTSIDE THE CABINET AND WHEN POWER IS APPLIED TO THE RECEIVER WITH THE CABINET BACK REMOVED. *SEVERE SHOCK* MAY RESULT FROM CONTACT WITH CHASSIS.

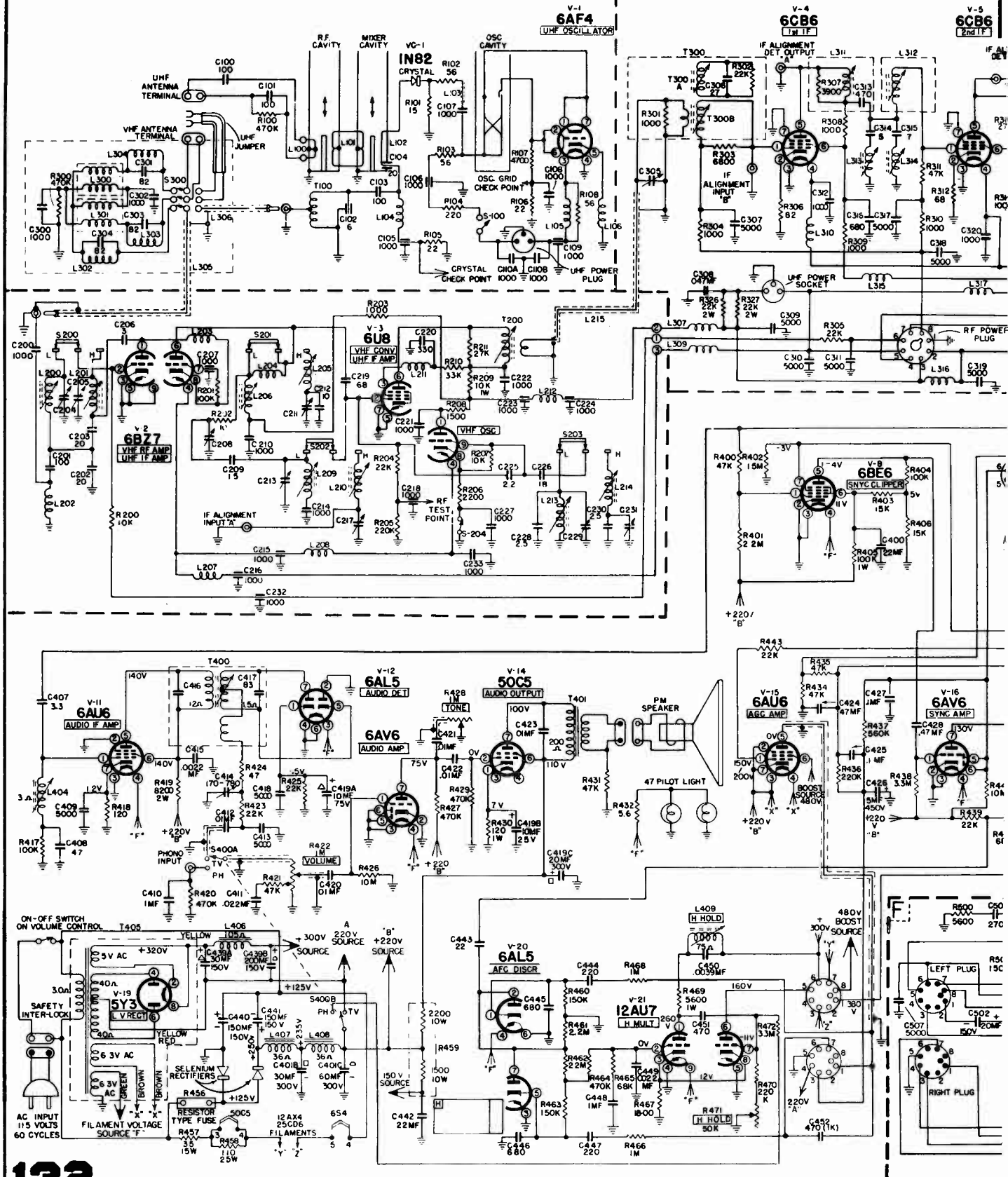
AN ISOLATION TRANSFORMER BETWEEN THE LINE CORD PLUG AND POWER RECEPTACLE MUST BE USED WHEN SERVICE IS REQUIRED. THIS REMOVES AC LINE SHOCK HAZARDS. DAMAGE TO THE RECEIVER AND TEST EQUIPEMENT MAY RESULT WITHOUT THE USE OF AN ISOLATION TRANSFORMER.



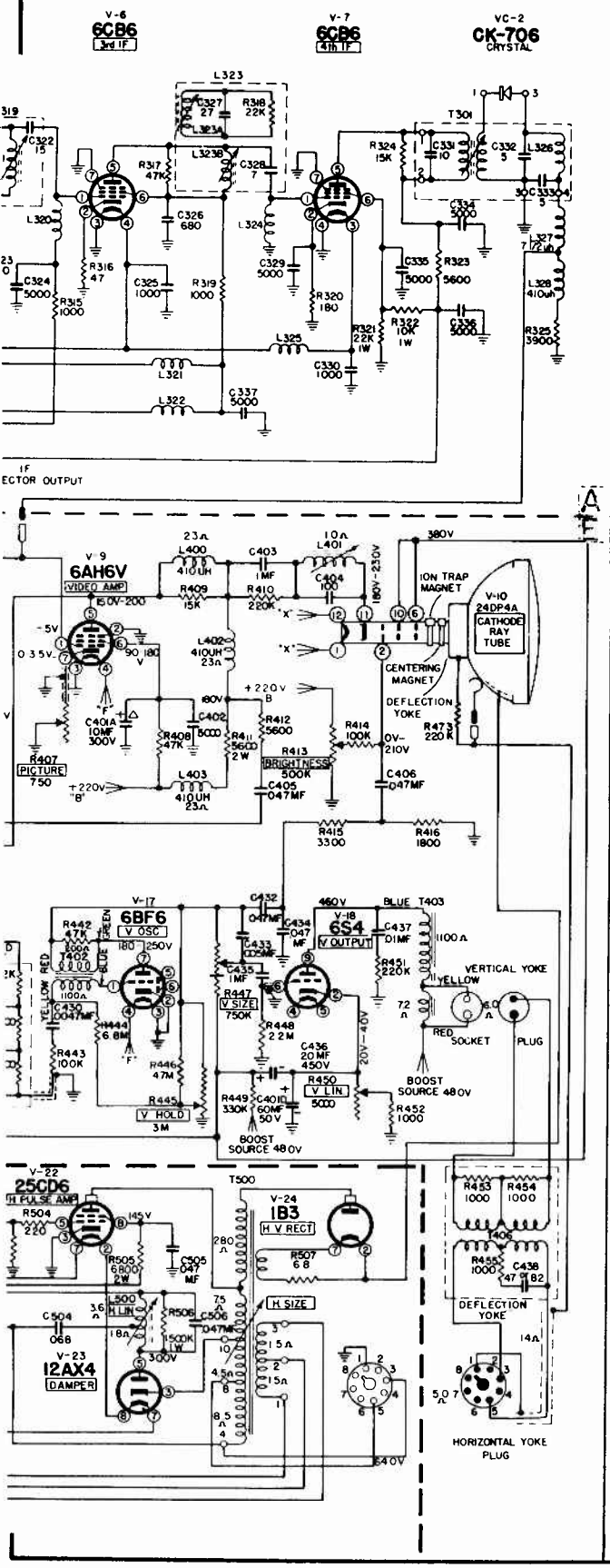




Raytheon Chassis 24T2



Raytheon Manufacturing Co.
Circuit Diagram Chassis 24T2



CAPACITORS CAPACITOR VALUES ARE REPRESENTED IN MICRO-MICROFARAD (MMF) UNLESS OTHERWISE INDICATED "MF" DENOTES MICRO-FARAD

RESISTORS RESISTORS WATTAGE IS REPRESENTED IN 1/2 WATT UNLESS OTHERWISE INDICATED "K" DENOTES X 1,000 Ω "M" DENOTES X 1,000,000

SWITCHES ALL SWITCHES ARE SHOWN IN THE POSITION FOR VHF OPERATION

VOLTAGE READINGS THE VOLTAGE READINGS INDICATED AT THE VARIOUS TUBE SOCKET PINS WERE MEASURED WITH A 20,000 OHM PER VOLT VOLTMETER, NORMAL OPERATION, NO SIGNAL INPUT AND LINE VOLTAGE AT 115V AC WHERE CONTROL SETTINGS AFFECT VOLTAGE READINGS THE MINIMUM AND MAXIMUM ARE INDICATED

WARNING HIGH VOLTAGE ON PLATE CAPS OF THE 1B3 HIGH VOLTAGE RECTIFIER AND 25CD6 HORIZONTAL PULSE AMPLIFIER DO NOT MEASURE THIS VOLTAGE

COIL DC RESISTANCE THE DC RESISTANCE READING INDICATED NEAR THE TRANSFORMERS AND COILS HAVE BEEN TAKEN WITH AN OHMMETER DIRECTLY ACROSS THE COIL BEING MEASURED COILS SHOWN WITHOUT A RESISTANCE READING HAVE A DC RESISTANCE OF LESS THAN ONE OHM A TOLERANCE OF + OR-5 % IS PERMISSIBLE

REPLACING TUBES BEFORE REPLACING TUBES THE CABINET BACK MUST FIRST BE REMOVED REMOVING THE CABINET BACK DISENGAGES THE SAFETY INTERLOCK AND REMOVES THE POWER TO THE RECEIVER DO NOT TAMPER WITH OR ATTEMPT TO DEFEAT THE PURPOSE OF THE SAFETY INTERLOCK, AS SEVERE SHOCK MAY RESULT DO NOT REMOVE TUBES WHILE THE RECEIVER IS IN OPERATION AS OVERLOADING OR COMPONET FAILURE MAY RESULT

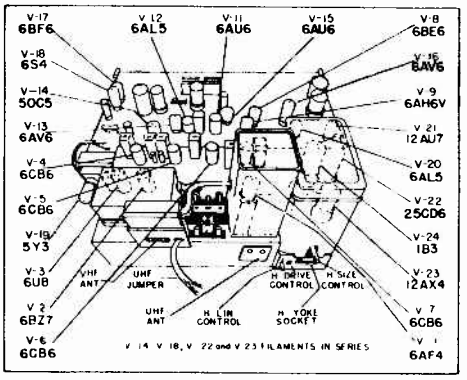
PICTURE TUBE HANDLING DUE TO LARGE SURFACE AND EXTREME HIGH VACUUM OF THE PICTURE TUBE, CARE SHOULD BE USED WHEN HANDLING THE CHASSIS OUTSIDE THE CABINET DO NOT SUBJECT THE TUBE TO EXCESSIVE PRESSURE OR ROUGH HANDLING AS AN IMPLUSION MAY RESULT CAUSING SERIOUS PERSONAL INJURY

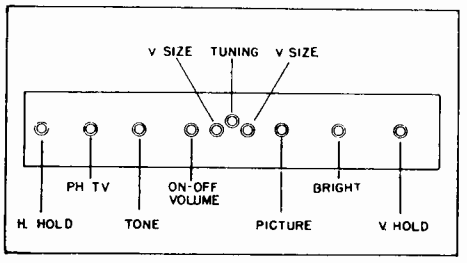
WARNING

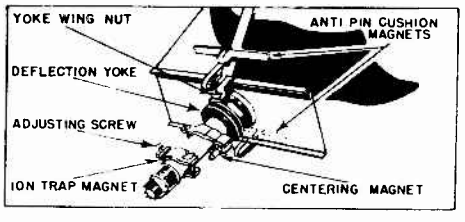
AT ALL TIMES DURING OPERATION THE CHASSIS IS AT 125 VOLTS DC POTENTIAL ABOVE GROUND AND IT ALSO MAY BE AT THE LINE VOLTAGE POTENTIAL DEPENDING ON HOW THE LINE CORD PLUG IS INSERTED IN THE POWER RECEPTACLE

EXTREME CAUTION MUST BE OBSERVED WHEN WORKING WITH THE CHASSIS OUTSIDE THE CABINET AND WHEN POWER IS APPLIED TO THE RECEIVER WITH THE CABINET BACK REMOVED *SEVERE SHOCK* MAY RESULT FROM CONTACT WITH CHASSIS

AN ISOLATION TRANSFORMER BETWEEN THE LINE CORD PLUG AND POWER RECEPTACLE MUST BE USED WHEN SERVICE IS REQUIRED THIS REMOVES ALL SHOCK HAZARDS AND IS THE *ONLY* SAFEGUARD DAMAGE TO THE RECEIVER AND TEST EQUIPEMENT MAY RESULT WITHOUT THE USE OF AN ISOLATION TRANSFORMER



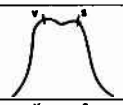
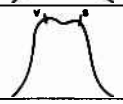
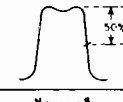
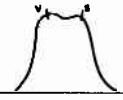
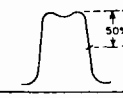
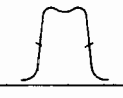




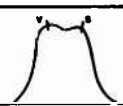
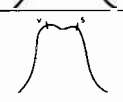
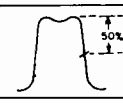
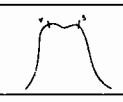
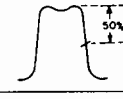
Raytheon Manufacturing Company, Chassis 21T8 and 24T2, continued

V—Video
S—Sound

LOW BAND RF ALIGNMENT (Turn Tuner to Channel 6)

Step No.	Signal Generator Freq. (mc.)	Sweep Generator Freq (mc.)	Signal Input Point	Output Point	Remarks	Adjust	Response
1	V - 83.25 S - 87.75	Channel 6	VHF Antenna Terminals	RF Test Point	Adjust for max. gain and Flat Response	C208 & C213	
2	V - 83.25 S - 87.75	Channel 6	VHF Antenna Terminals	RF Test Point	Adjust for max. gain between markers	C204	
3	V - 83.25	Channel 6 Note: 1	VHF Antenna Terminals	IF Detector Output	Adjust osc. trimmer until marker is 50% down on video side of curve.	C230	
4	V - 83.25 S - 87.75	Channel 6	VHF Antenna Terminals	RF Test Point	Re-adjust for max. gain and flat response	C208 & C213	
5	V - 55.25	Channel 2 Note: 2	VHF Antenna Terminals	IF Detector Output	Adjust osc. core until marker is 50% down on video side of curve.	L-213 (Repeat step 3)	
6	42.0 45.5	40 Note: 3	Antenna Input	IF Detector Output	Check over all IF response	C-204	
7	V - 77.25 S - 81.75 V - 67.25 S - 71.75 V - 61.25 S - 65.75 V - 55.25 S - 59.75	Channel 5 Channel 4 Channel 3 Channel 2	VHF Antenna Terminals	IF Detector Output	Adjust tuner until response curve appears.	Check Point Only	

HIGH BAND RF ALIGNMENT (Turn to Channel 13)

1	V - 211.25 S - 215.75	Channel 13	VHF Antenna Terminals	RF Test Point	Adjust for maximum gain and flat response	C-211 & C-217	
2	V - 211.25 S - 215.75	Channel 13	VHF Antenna Terminals	RF Test Point	Adjust for maximum gain between markers	C-205	
3	V - 211.25	Channel 13 Note 1	VHF Antenna Terminals	IF Detector Output	Adjust osc. trimmer until marker is 50% down on video side of curve	C-231	
4	V - 211.25 S - 215.75	Channel 13	VHF Antenna Terminals	RF Test Point	Re-adjust for maximum gain and flat response	C-211 & C-217	
5	V - 175.25	Channel 7 Note 4	VHF Antenna Terminals	IF Detector Output	Adjust osc. core until marker is 50% down on video side of curve	L-214 (Repeat Step 3)	
6	V - 205.25 S - 209.75 V - 199.25 S - 203.75 V - 193.25 S - 197.75 V - 187.25 S - 191.75 V - 181.25 S - 185.75 V - 175.25 S - 179.75	Channel 12 Channel 11 Channel 10 Channel 9 Channel 8 Channel 7	VHF Antenna Terminals	IF Detector Output	Adjust tuner until response curve appears on scope	Check point only	

(See page 129 for reference figures)

SENTINEL RADIO CORPORATION

MODELS 500, 510, 511, 512, 513, and 515.

Models 532, 542. 552, 554, 562, 564, are similar to these sets in most respects.

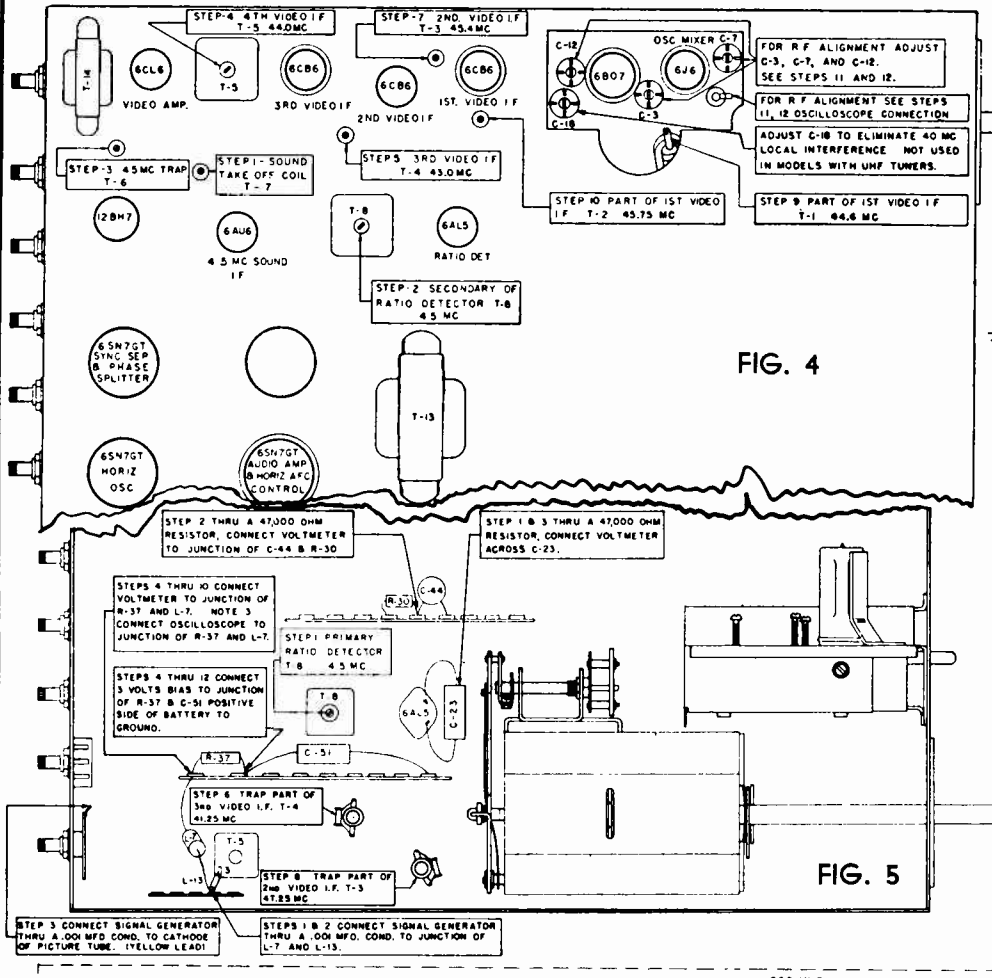
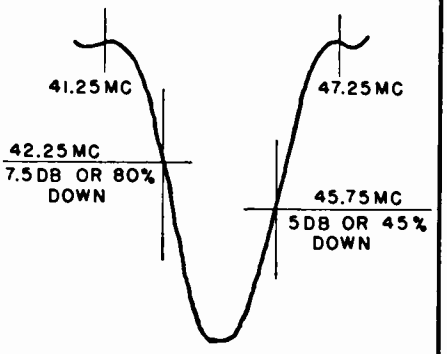


FIG. 4



OVERALL RESPONSE CURVE

FIG. 2

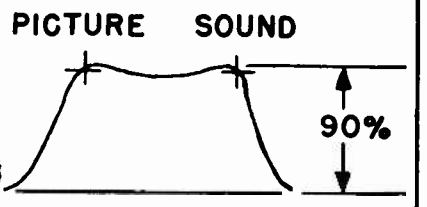
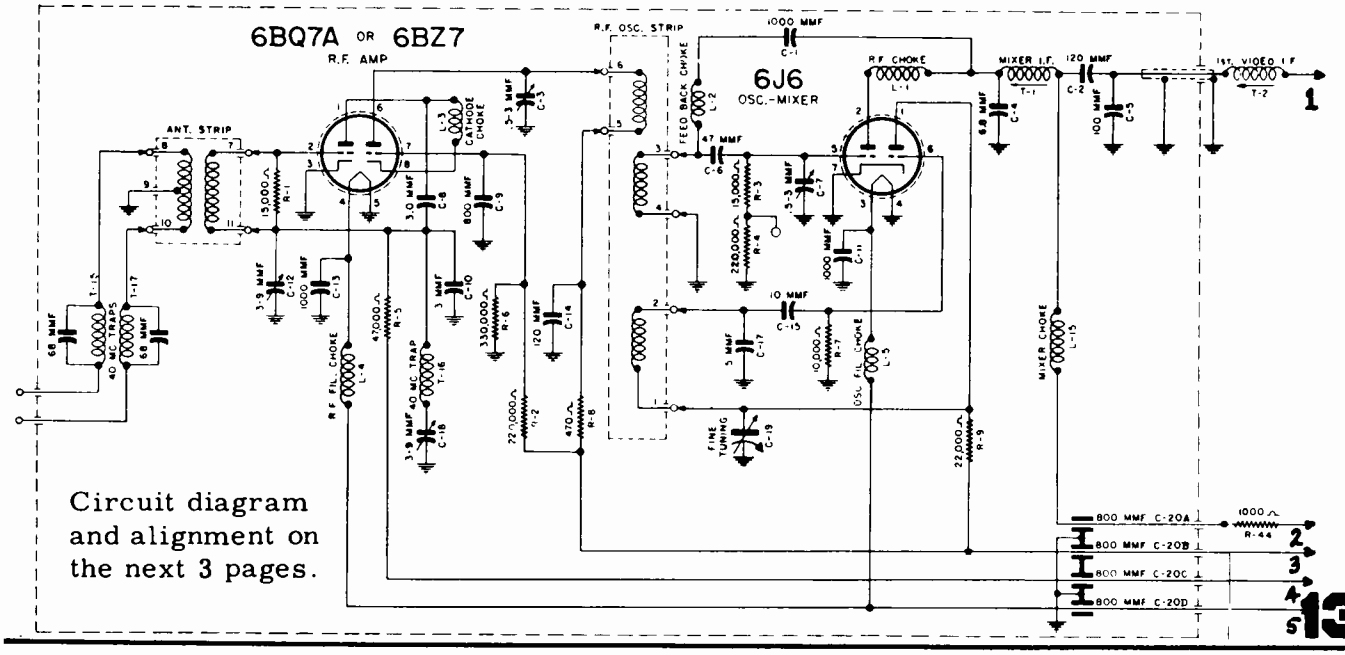


FIG. 3

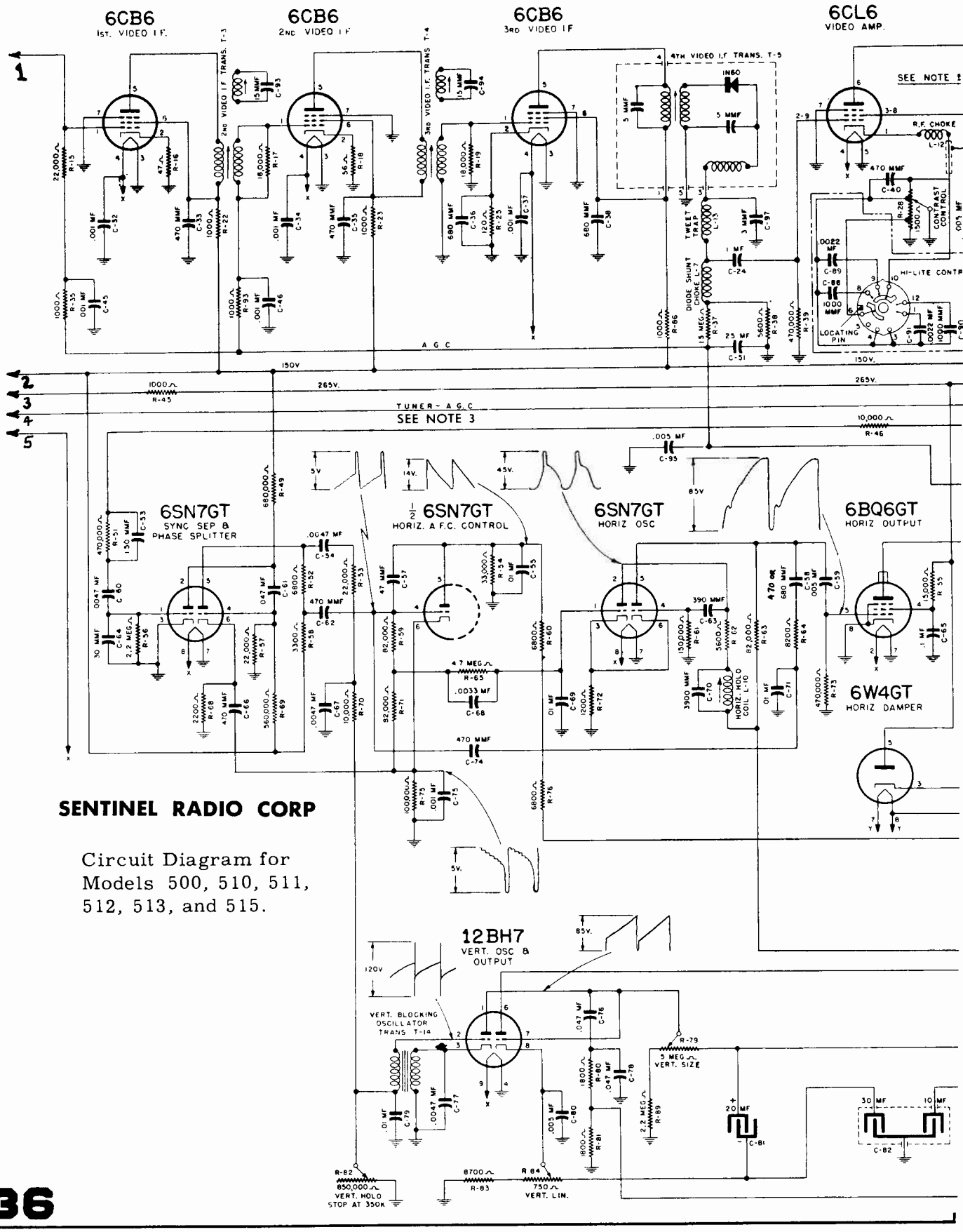
FIG. 5



Circuit diagram and alignment on the next 3 pages.

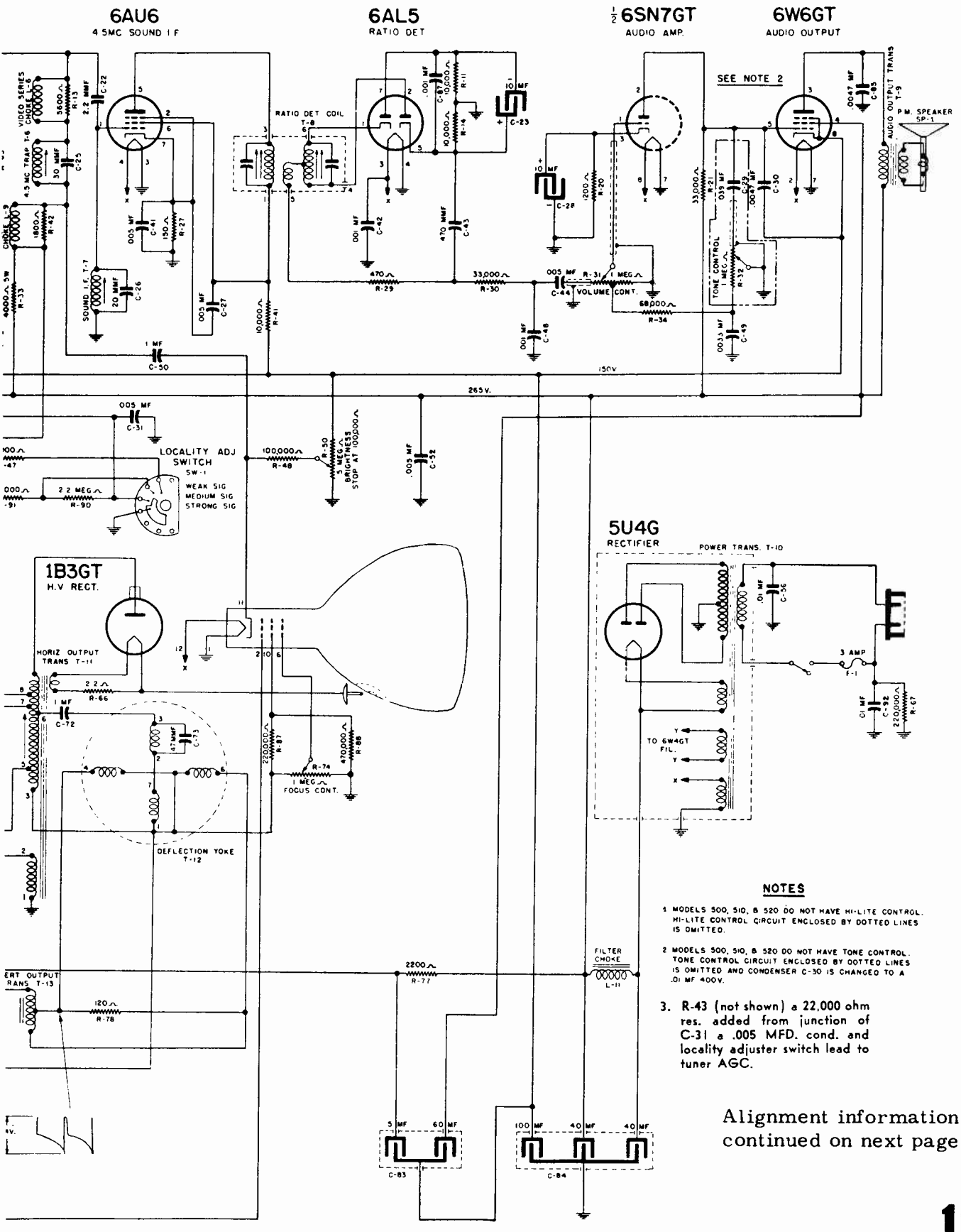
Connects to similar points of main circuit on the next 2 pages.

Points 1 to 5 connect to corresponding points of circuit on previous page.



SENTINEL RADIO CORP

Circuit Diagram for Models 500, 510, 511, 512, 513, and 515.



NOTES

1 MODELS 500, 510, & 520 DO NOT HAVE HI-LITE CONTROL. HI-LITE CONTROL CIRCUIT ENCLOSED BY DOTTED LINES IS OMITTED.

2 MODELS 500, 510, & 520 DO NOT HAVE TONE CONTROL. TONE CONTROL CIRCUIT ENCLOSED BY DOTTED LINES IS OMITTED AND CONDENSER C-30 IS CHANGED TO A .01 MF 400V.

3. R-43 (not shown) a 22,000 ohm res. added from junction of C-31 a .005 MFD. cond. and locality adjuster switch lead to tuner AGC.

Alignment information continued on next page.

SENTINEL

RATIO DETECTOR AND SOUND ALIGNMENT

Step No.	Connect Signal Generator to	Sig. Gen. Freq.	Connect Voltmeter to	Miscellaneous Instructions	Adjust
1	In series with .001 Mfd. Cond. to junction of C-97 and L-13 terminal 3 of 4th I.F. See fig. 5	4.5 MC.	In series with 47,000 ohm res. across C-23 a 10 Mfd. cond. See fig. 5	Maintain reading on 10 volt scale contrast at maximum. Remove 3rd video IF tube 6CB6.	T-7 (top) and T-8 (bottom) for max. reading. See fig. 4 & 5
2	In series with .001 Mfd. Cond. to junction of C-97 and L-13 terminal 3 of 4th I.F. See fig. 5	4.5 MC.	In series with 47,000 ohm res. to junction of R-30 and C-44. See fig. 5	Maintain reading on 10 volt scale contrast at maximum. Remove 3rd video IF tube 6CB6.	T-8 (top) for zero reading. See fig. 4
3	In series with .001 Mfd. Cond. to cathode of picture tube yellow lead. See fig. 5	4.5 MC.	In series with 47,00 ohm res. across C-23 a 10 Mfd. cond. See fig. 5	Maintain reading on low volt scale. Remove 3rd video IF tube 6CB6.	T-6 (top) for minimum reading. See fig. 4

PICTURE I-F ALIGNMENT

4	Ungrounded converter tube (6J6) shield	44.0 MC.	In series with 47,000 ohm res. to junction of R-37 and L-7. See fig. 5	Tuner on channel 3, 3 volts bias across C-51 positive side to ground. Locality switch in strong position. See fig. 5	T-5 (top) for maximum reading. See fig. 4
5	Ungrounded converter tube (6J6) shield	43.0 MC.	In series with 47,000 ohm res. to junction of R-37 and L-7. See fig. 5	Tuner on channel 3, 3 volts bias across C-51 positive side to ground. Locality switch in strong position. See fig. 5	T-4 (top) for maximum reading. See fig. 4
6	Ungrounded converter tube (6J6) shield	41.25 MC.	In series with 47,000 ohm res. to junction of R-37 and L-7. See fig. 5	Tuner on channel 3, 3 volts bias across C-51 positive side to ground. Locality switch in strong position. See fig. 5 Repeat Steps 5 & 6	T-4 (bottom) for minimum reading. See fig. 5
7	Ungrounded converter tube (6J6) shield	45.4 MC.	In series with 47,000 ohm res. to junction of R-37 and L-7. See fig. 5	Tuner on channel 3, 3 volts bias across C-51 positive side to ground. Locality switch in strong position. See fig. 5	T-3 (top) for maximum reading. See fig. 4
8	Ungrounded converter tube (6J6) shield	47.25 MC.	In series with 47,000 ohm res. to junction of R-37 and L-7. See fig. 5	Tuner on channel 3, 3 volts bias across C-51 positive side to ground. Locality switch in strong position. See fig. 5 Repeat Steps 7 & 8	T-3 (bottom) for minimum reading. See fig. 5
9	Ungrounded converter tube (6J6) shield	44.6 MC.	In series with 47,000 ohm res. to junction of R-37 and L-7. See fig. 5 **NOTE:** Detune T-2 by turning slug out as far as possible.	Tuner on channel 3, 3 volts bias across C-51 positive side to ground. Locality switch in strong position. See fig. 5	T-1 (top) for maximum reading. See fig. 4
10	Ungrounded converter tube (6J6) shield	45.75MC.	In series with 47,000 ohm res. to junction of R-37 and L-7. See fig. 5	Tuner on channel 3, 3 volts bias across C-51 positive side to ground. Locality switch in strong position. See fig. 5	T-2 (top) for maximum reading. See fig. 4

NOTE 1: For **minimum buzz** always adjust T-8 (top) with the sound carrier of a TV station.

NOTE 2: Alternate 4.5 MC. trap alignment: Adjust T-6 (top) for minimum 4.5 MC. beat on picture with a strong station signal.

NOTE 3: For visual check of IF response curve (see fig. 2) connect signal and sweep generator to ungrounded converter tube shield (6J6). Connect oscilloscope in series with 47,000 ohm resistor to junction of R-37 and L-7.

TUNER R.F. ALIGNMENT

Step No.	Connect Marker Generator to	Marker Gen. Freq.	Connect Sweep Gen. to	Sweep Gen. Chan.	Connect Oscilloscope to	Miscellaneous Connections	Adjust
11	Loosely couple to sweep gen. leads.	205.25 MC. and 209.75 MC.	300 ohm antenna terminals.	12	Lead extending from top of tuner. See fig. 4	Tuner on channel 12 3 volt bias to junction of C-51 locality switch in strong position.	C-3, C7 and C-12 for max. response having linear peaks with picture and sound markers at 90% maximum response. See fig. 3
12	OBSERVE RESPONSE CURVE FOR ALL CHANNELS USING CORRECT FREQUENCIES AND CHANNELS. A SLIGHT COMPROMISE SHOULD BE MADE WITH C-3, C-7 and C-12 IF MARKERS ARE BELOW 70%.						

NOTE 5: FOR RF OSCILLATOR ALIGNMENT, SET FINE TUNING CONTROL IN CENTER POSITION. ADJUST INDIVIDUAL CHANNEL TRIMMERS FOR BEST PICTURE DETAIL WITH THE PATTERNS OF A TV STATION.

NOTE 6: C-18 (See fig. 4) part of a 40 MC. tuned trap need only be adjusted when local interferences from 40 thru 45 MC. affect the picture. Adjust C-18 for minimum 40 MC. beat on picture with a station signal. Not used in Models with UHF Tuner.

SPARTON TELEVISION

DIVISION OF
THE SPARKS-WITHINGTON COMPANY - JACKSON, MICHIGAN

Chassis 21S173A, used in Models 58112 and 58114
21S214, used in Models 31322, 32324, 35342, 35343, 11322A, 11324A, 15312A, and 15314A
24U174, used in Models 58112 and 58114
24U213, used in Models 20312, 20313, 21322, 21324
24U214, used in Models 21322A, 33322, 34324, 36342, 36343, 50312, and 50314.

The chassis listed above are practically identical except for minor circuit differences, different size and type of picture tubes, and the incorporation of the Kingston UHF converter. The circuit diagram on the next two pages (over) is exact for Chassis 24U214.

MISCELLANEOUS SERVICE HINTS

Horizontal Drive Adjustments:

With 125V.A.C. line adjust vertical deflection for 10% over-scan with best linearity then adjust horizontal linearity control for best linearity and follow with adjustment of horizontal width control for maximum width. Adjust horizontal hold control to its maximum counter-clockwise position. Decrease horizontal drive control resistance until the compression near the center of the picture disappears. Reset horizontal hold control to its mid-position.

With 117 A.C. line volts, the cathode current of the 6BQ6 must not exceed 110 Ma. with zero beam current.

Horizontal Oscillator Adjustment:

With 117 A.C. line volts and the horizontal hold control set at the mid-point of its range, adjust L-36 for synchronization with approx. zero volts from Pin #1 of V-17 to ground as measured with a vacuum tube or other high impedance voltmeter.

Adjustment of Anti-Pin Cushion Corrector Magnets:

These magnets are mounted on the deflection coil mounting bracket and can be moved in and out by first loosening the mounting screws. Under certain conditions it may be necessary to form, or bend the flexible arms which support the magnets. The above adjustment is made at the factory and should not require re-adjustment unless the original position of the magnets is accidently disturbed. Adjustment can be made in the following manner:

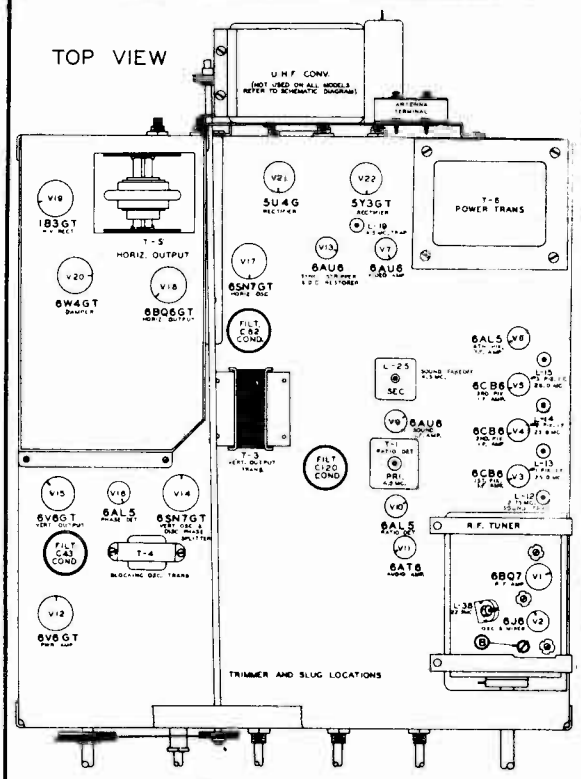
1. With the size controls reduce the size of the raster until the sides are visible.

2. Adjust the corrector magnets for straightest possible raster edges. Restore the picture to normal size.

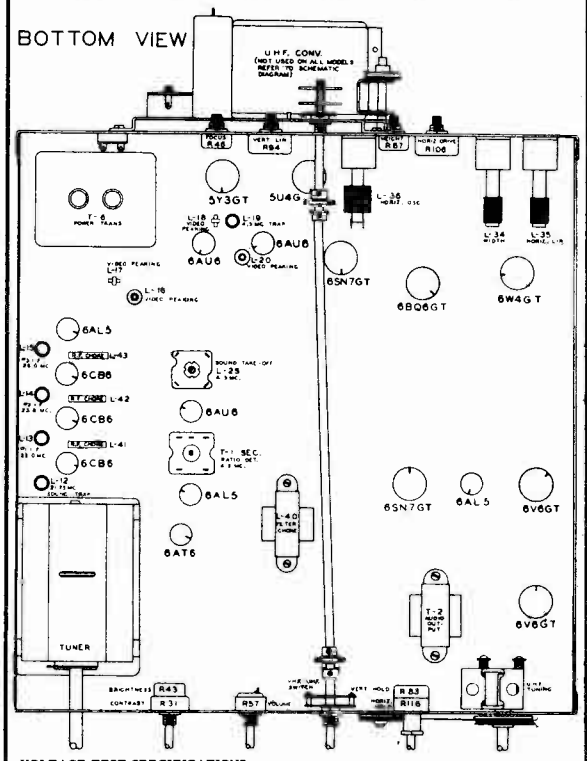
Misadjustment of the corrector magnets may cause barreling, keystoning and/or poor linearity.

MOST-OFTEN-NEEDED 1954 TELEVISION SERVICING INFORMATION

TOP VIEW

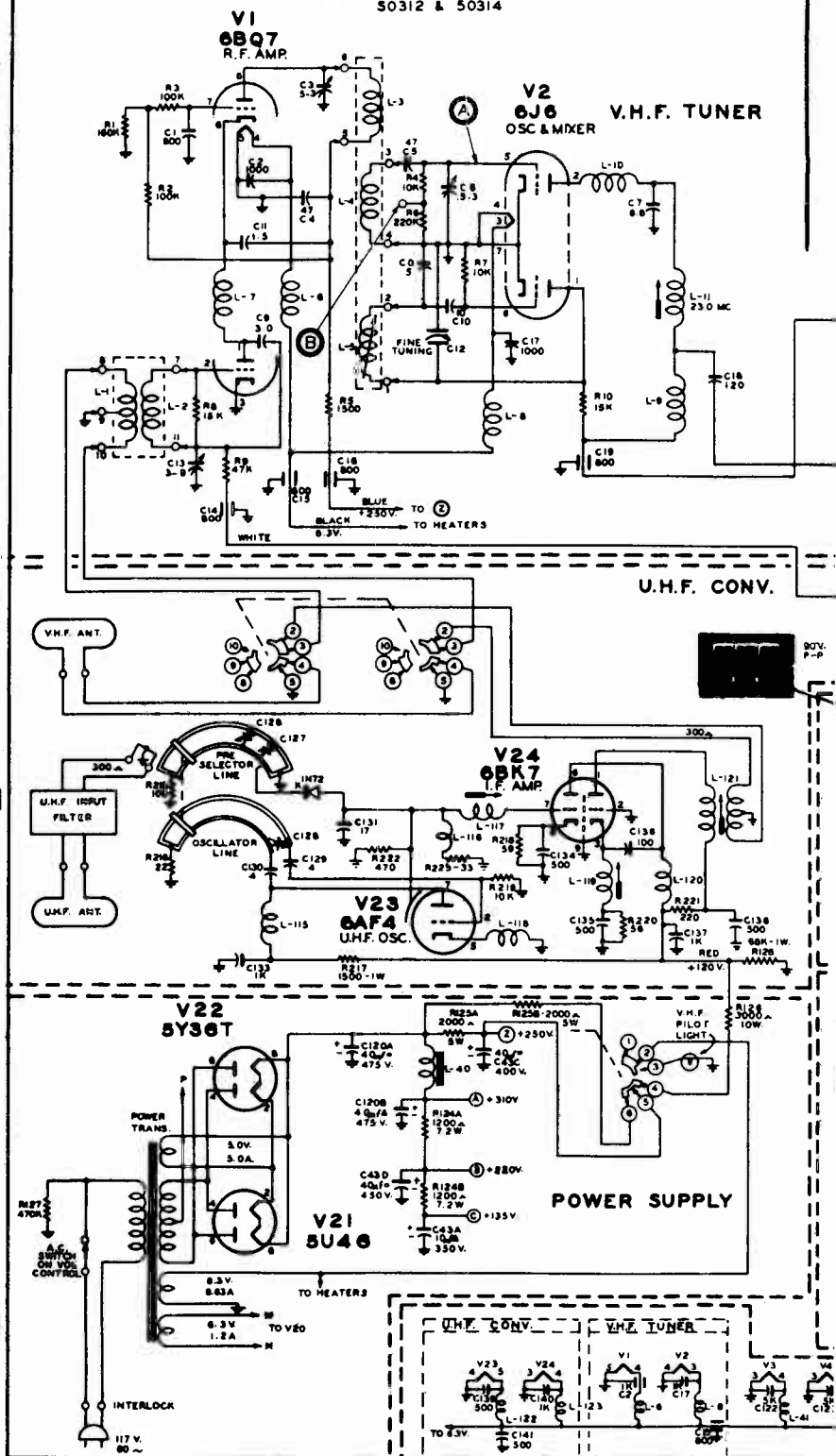


BOTTOM VIEW



SPARTON TELEVISION SCHEMATIC DIAGRAM

CHASSIS TYPE 24U214 - MODELS 21322A, 33322, 34324, 36342, 36343, 50312 & 50314



VOLTAGE TEST SPECIFICATIONS:

1. All Voltages & Current measured with VHF - UHF Switch in VHF position.
2. Channel Switch Position - Channel 2-
3. Line Voltage - 117 Volts A.C. No signal input applied to set.
4. Brightness & Contrast Control Position - Maximum Clockwise.
5. Horizontal & Vertical Hold Control Positions - Set correct position to lock in
6. Width Control Position - Set for normal size.
7. Vertical Size & Linearity Control Position - Set for normal size best linearity.
8. Focus Control Position - Properly focused.
9. Volume Control & Tone Control Position - Maximum Counter-Clockwise.
10. Instrument (Meter) Used - (VTVM) Vacuum Tube Volt Meter.
11. Unless otherwise designated all voltages measured in respect to Chassis Ground.

NOTE:
The points indicated by the letters A,B,C,D,E,F, & G are the alignment test points referred to in the alignment procedure.

(A) Pin 5 of V2 (6J6) Osc. & Mixer Tube.
Apply signals here for spot I.F. Alignment or I.F. Sweep

(B) Apply minus 3 volts through 220K Ohms to test terminal, located between the tubes on top of R.F. Tuner. (See Suggested Input adapter.)

(C) Diode Load Resistor
Read D.C. output here for spot I.F. Alignment
Connect scope here for visual I.F. Alignment.

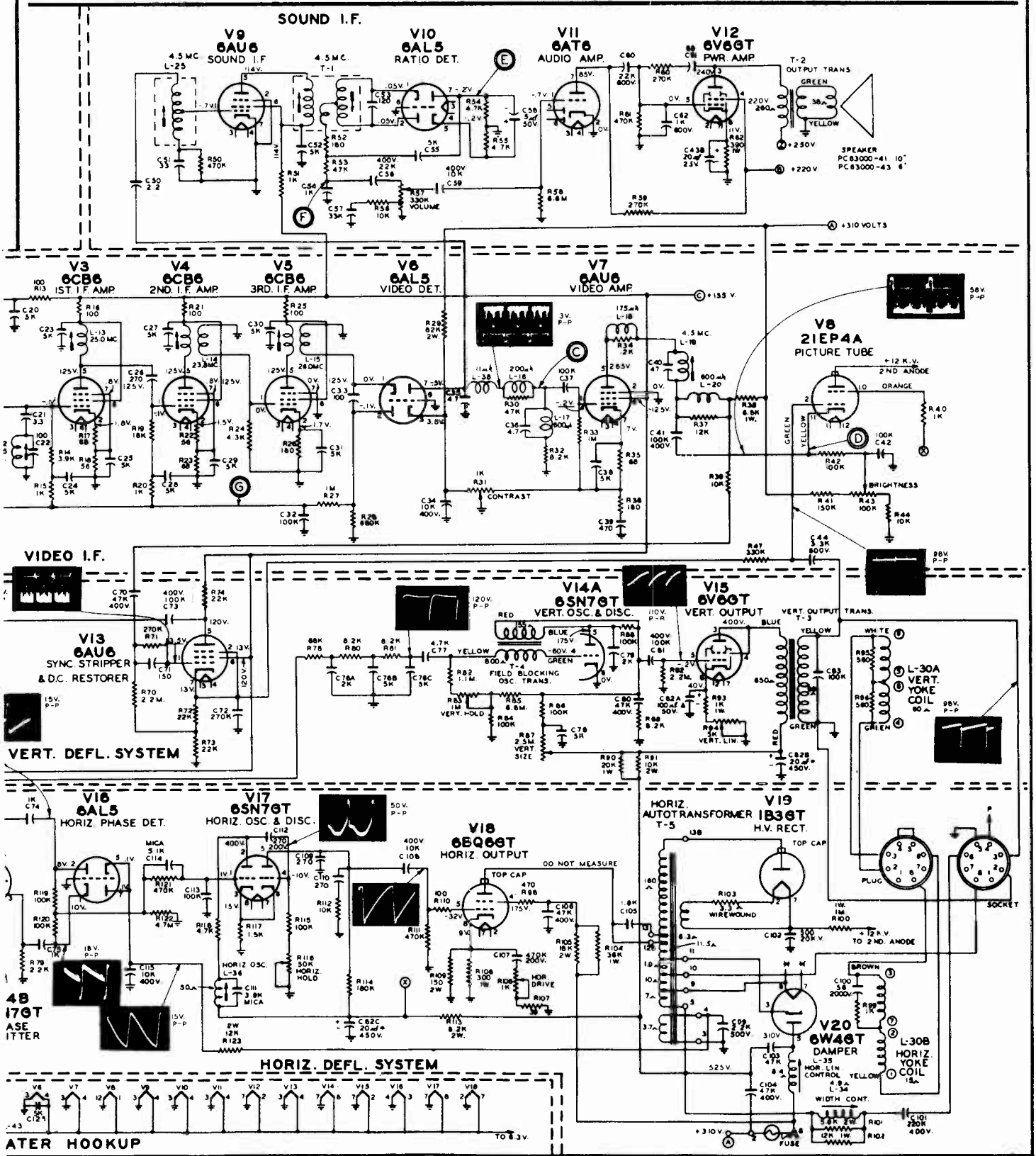
(D) Cathode of Picture tube
Read A.C. output here for overall sensitivity
Read 4.5 Mc output here for overall sensitivity.

(E) Ratio Detector Output
Read D.C. here for alignment of sound take-off trap, inter-stage sound.

(F) Ratio Detector Balanced output
Read D.C. here for alignement of secondary of ratio det. trans.

(G) A.G.C. line
Apply 4.5 volts bias here for visual check of I.F. or overall with oscilloscope.

MOST-OFTEN-NEEDED 1954 TELEVISION SERVICING INFORMATION



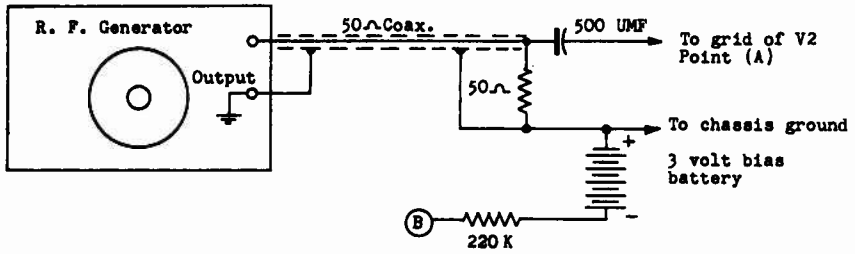
VHF R.F. AND MIXER ALIGNMENT

1. Set station selector to Channel 12.
2. Connect oscilloscope through 10,000 ohms to test point T (Wire loop on top of tuner.)
3. For negative bias connect -3 volts DC to A.G.C. lead (white covered wire) from tuner.
4. Feed sweep generator into antenna terminals, sweeping Channel 12.
5. Adjust C3, C6 and C13 (upright screws on top of tuner) for flat top response curve and maximum gain. Check markers on all channels.

ALIGNMENT PROCEDURE UNMODULATED (CW) GENERATOR METHOD

Step One: SOUND TRAP ALIGNMENT

A. Adjust all controls to normal operating position. Connect the R.F. Signal Generator to the grid of V-2 (Point A.) I.F. input adapter, as shown below.



B. Connect VTVM across R32 (Point C.) Use low volts D. C. Scale.
C. Connect a 4.5 volt bias battery between Point G and ground. (Positive terminal of battery to chassis ground.)
D. Set R.F. Tuner to channel which gives minimum indication on voltmeter.
E. Adjust L12 for minimum indication on voltmeter at the specified frequency:

L12 = 21.75 mc

Step Two: PIX IF ALIGNMENT

A. Adjust L11, L13, L14, L15, for maximum indication on voltmeter at the specified frequency:

L11	22.5 mc
L13	25.0 mc
L14	23.8 mc
L15	26.0 mc

Step Three: SOUND IF ALIGNMENT

A. Connect the R.F. Signal Generator to Point C.
B. Inject the 4.5 mc signal. (Frequency accuracy important.)
C. Connect VTVM from Point E to ground. Use — 10 volt DC Scale.
D. Adjust L25 and T1 primary for maximum indication on voltmeter.
E. Connect VTVM from Point F to ground. Use lowest D. C. Scale. Adjust secondary of T1 for zero output, as indicated by voltmeter. Note: It is possible to produce a positive or negative voltage indicated by varying this adjustment. The point where the voltage swings from positive to negative is zero output and indicates correct alignment.(If Ratio Detector is seriously misaligned repeat alignment of primary and secondary until no improvement can be made.)
F. Connect VTVM with detector probe from Point D to ground. Use lowest DC Scale.
G. Adjust L19 for minimum indication on voltmeter.

SPARTON Alignment Information, continued.

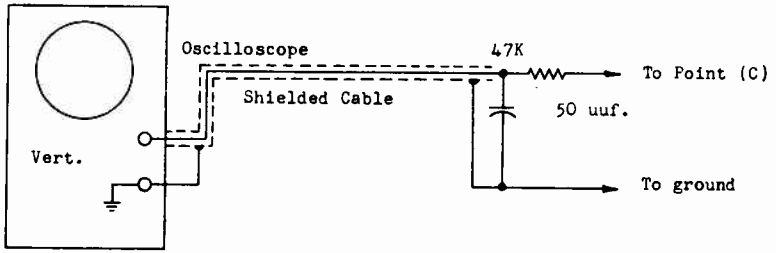
VHF OSCILLATOR ALIGNMENT

1. Turn on set and select channel to be viewed.
2. Center fine tuning control.
3. Place a non inductive screwdriver through opening, and adjust oscillator coil for best picture and sound.
4. Repeat this adjustment for each channel that can be viewed in the area.

VISUAL ALIGNMENT CHECK USING SWEEP GENERATOR, MARKER GENERATOR, AND OSCILLOSCOPE.

A. Adjust all controls to normal operating position. Connect the sweep generator to the grid of V2 (point A.) Connect a 4.5 volt bias battery between point G and ground. (Positive terminal of battery to chassis ground.)

B. Connect the oscilloscope across R32 (point C) by means of the shielded cable and filter system shown below.

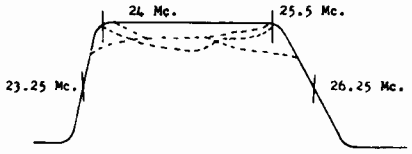


C. Adjust the R. F. sweep generator so that it sweeps from approximately 20 to 30 mc.

D. Adjust the oscilloscope so that the I.F. response is visible. (Set tuner to channel where rotation of Fine Tuning does not change observed response.)

E. Inject proper marker signals as recommended by manufacturer of R.F. sweep generator used.

F. Observe the band width, relative position of the picture carrier, and flatness of the overall I.F. response curve. If necessary, slightly vary the tuning of the picture I.F. coils L11, L13, L14, L15, until the picture I.F. response shown is obtained. The solid curve depicts the ideal I.F. response while the dotted curves show permissable variations.

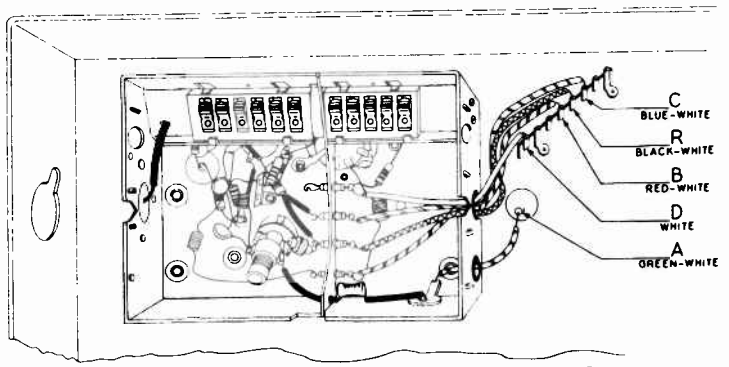


STEWART-WARNER

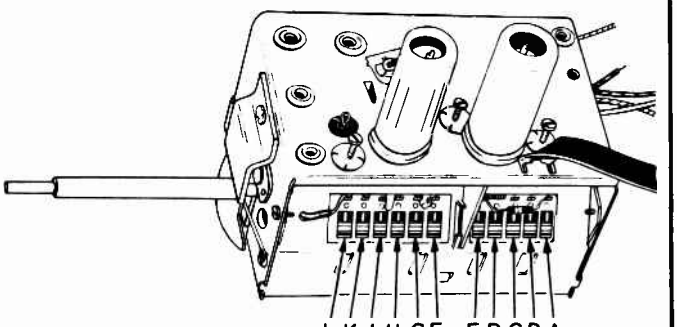
TELEVISION RECEIVER MODELS

21T-9300A, 21T-9300AA, 21T-9300B, 21T-9300D, 21C-9300E, 21C-9300F, 21C-9300G, 21T-9300H, 21T-9300HA, 21C-9300K, 21C-9300KB, 21C-9300L, 21C-9300LB, 21C-9300M, 21C-9300MB, 21C-9300P, 21T-9300R, 21T-9300RB, 21T-9300S & 21T-9300T.

Series 9300 service material applicable to the above listed models is presented on pages 143 to 152 inclusive. The main circuit diagram is on pages 144-145. Models 24C-9360, 24C-9370, 27C-9310, 27C-9350, use very similar circuits.



BOTTOM VIEW OF CHASSIS SHOWING CONNECTIONS TO RF TUNER UNIT



521068 R.F. TUNER UNIT
(SHOWN WITH SIDE SHIELD REMOVED)

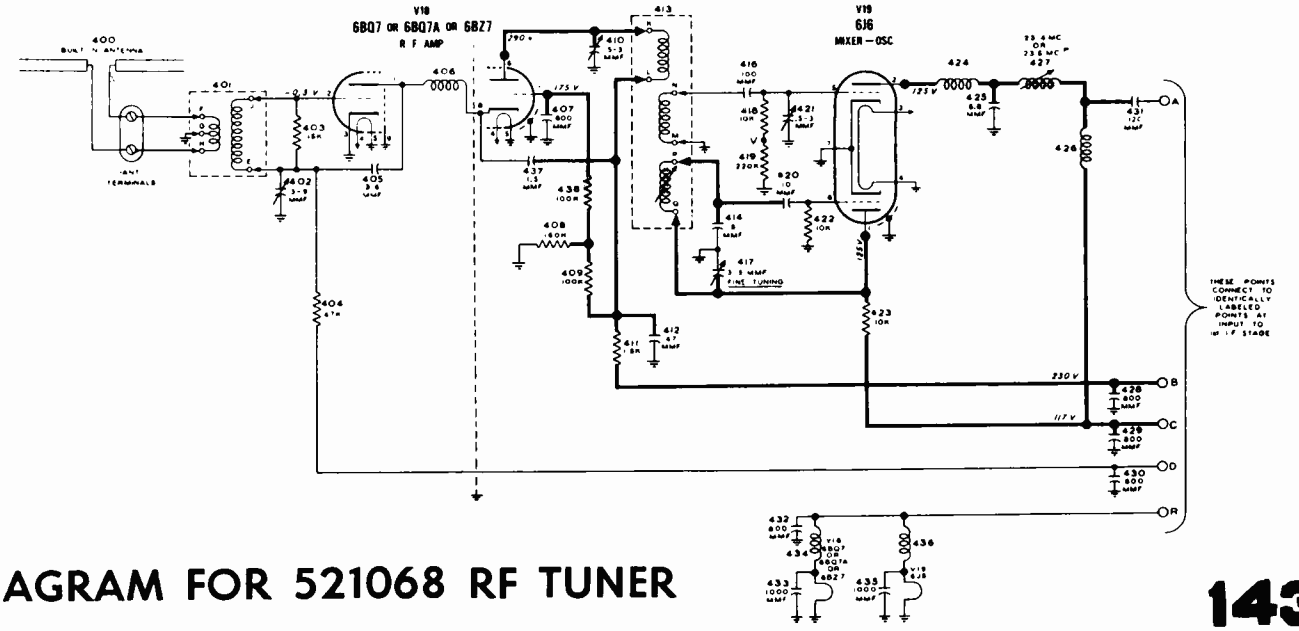
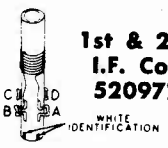
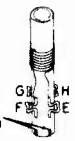


DIAGRAM FOR 521068 RF TUNER

STEWART-WARNER MODELS 21C-9300 E, F, G, K, KB, L, LB, M, MB & P 21T-9300 A, AA, B, D, H, HA, R, RB, S & T



1st & 2nd I.F. Coil 520977

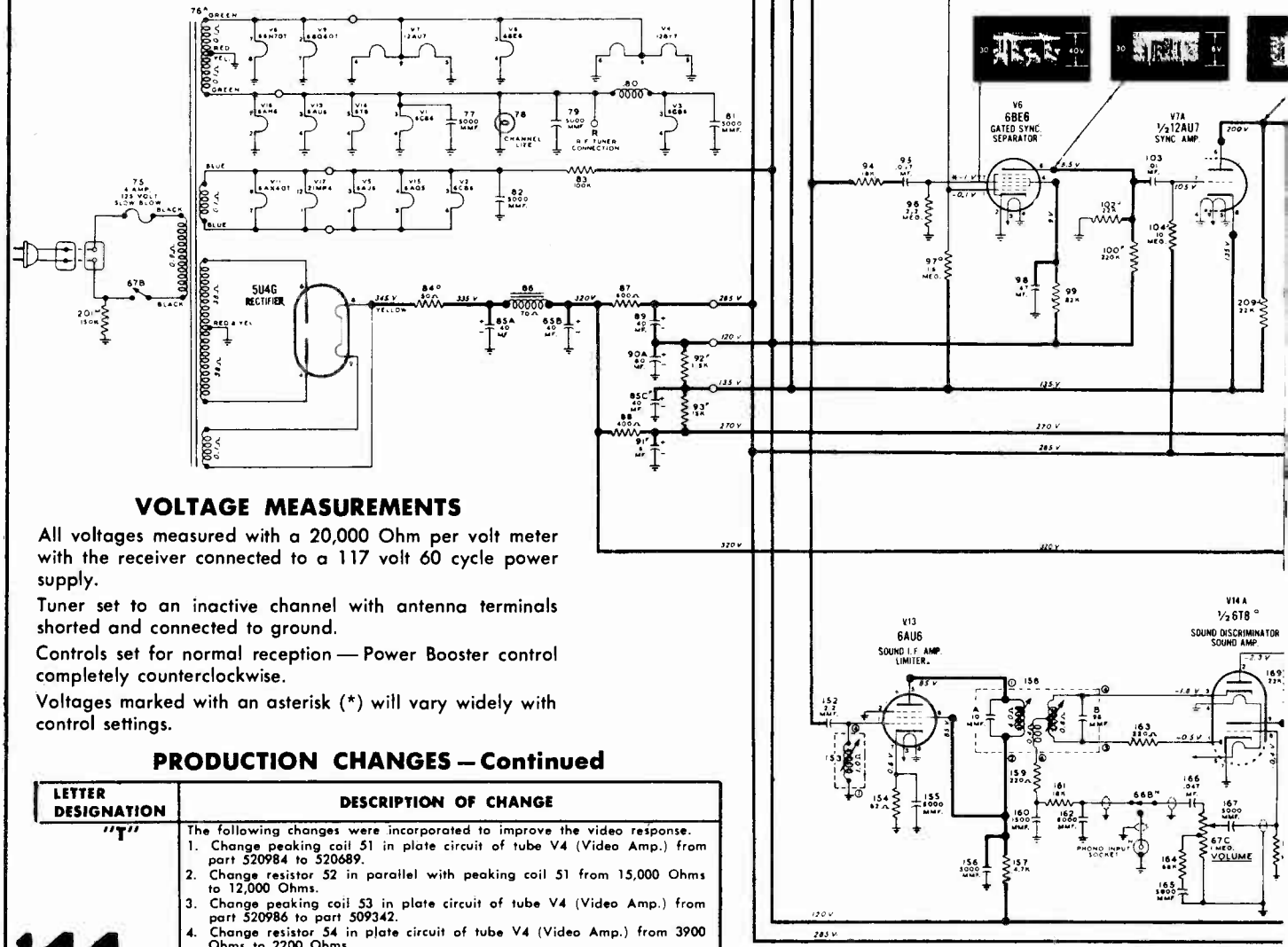


3rd I.F. Coil 520979

OSCILLOGRAMS

All oscillograms taken with ground lead of 'Scope connected to receiver chassis and controls set for normal reception. Power Booster control adjusted to give 50 volts peak to peak at cathode of picture tube. Oscilloscope vertical amplifier response was flat to within 20% at 2 MC.

Number appearing to the left of oscillogram specifies setting of horizontal sweep frequency control on 'Scope.



VOLTAGE MEASUREMENTS

All voltages measured with a 20,000 Ohm per volt meter with the receiver connected to a 117 volt 60 cycle power supply.

Tuner set to an inactive channel with antenna terminals shorted and connected to ground.

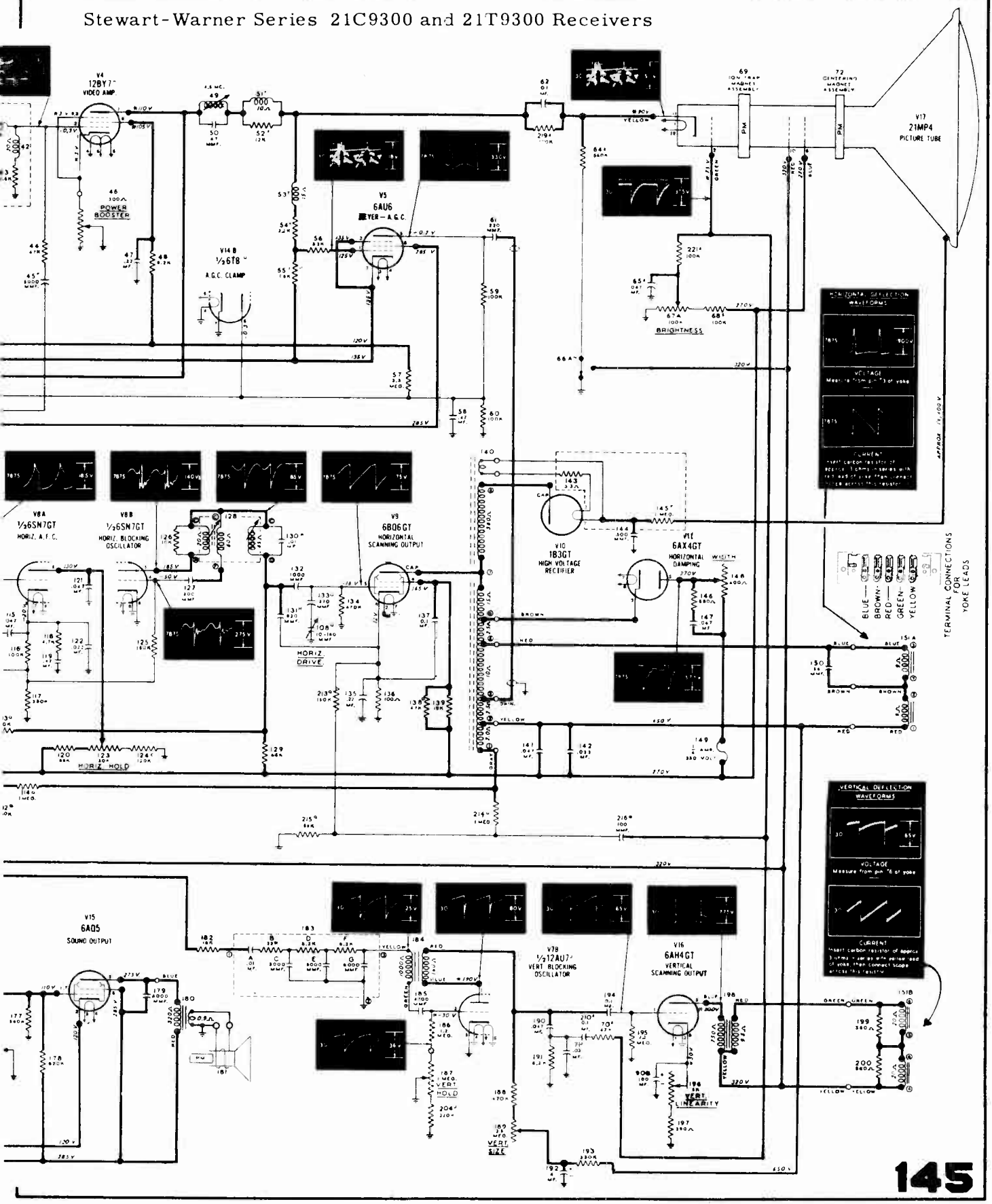
Controls set for normal reception — Power Booster control completely counterclockwise.

Voltages marked with an asterisk (*) will vary widely with control settings.

PRODUCTION CHANGES — Continued

LETTER DESIGNATION	DESCRIPTION OF CHANGE
"T"	The following changes were incorporated to improve the video response. 1. Change peaking coil 51 in plate circuit of tube V4 (Video Amp.) from part 520984 to 520689. 2. Change resistor 52 in parallel with peaking coil 51 from 15,000 Ohms to 12,000 Ohms. 3. Change peaking coil 53 in plate circuit of tube V4 (Video Amp.) from part 520986 to part 509342. 4. Change resistor 54 in plate circuit of tube V4 (Video Amp.) from 3900 Ohms to 2200 Ohms. 5. Change resistor 55 in plate circuit of tube V4 (Video Amp.) from 1500 Ohms to 1800 Ohms.

Stewart-Warner Series 21C9300 and 21T9300 Receivers



Stewart-Warner Television Receivers Series 21C9300 and 21T9300, continued

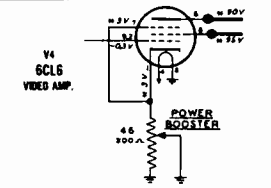
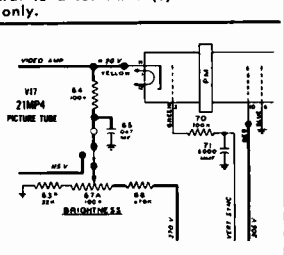
PRODUCTION CHANGES

The following tabulation furnishes complete details on changes which occurred during receiver production. The receivers incorporating these changes are identified by coding stamped on rear surface of chassis. The coding consists of one or more letters following the word SERIES, as SERIES B, SERIES AC, etc., and corresponds to similarly lettered changes shown below. Chassis incorporate only that change indicated by letter designation; i.e., chassis stamped "SERIES BE" does not include changes "A" or "C" or "D".

The circuit shown on this page applies to "SERIES ABCDEFGHJKLMPQRST" chassis.

A letter following the component circuit diagram number thus—201^, indicates that this particular item was affected by a circuit change. The letter corresponds to the series code letter listed in the production change column, from which complete change information can be obtained.

LETTER DESIGNATION	DESCRIPTION OF CHANGE
UNCODED	**INITIAL PRODUCTION**
"A"	The following change was incorporated to maintain a better balance of filament voltage on the tubes connected across the 12.6 volt transformer filament winding in the event of tube failure or removal from the socket. 1. The center tap of the 12.6 filament winding on power transformer 76 is connected to ground through the common red and yellow lead. Transformers not having this modification have a red identification dot on the bottom side.
"B"	The following changes were incorporated to improve focus at high brightness levels. 1. Change resistor 63, connected from one end of the Brightness control from 15,000 Ohms to 22,000 Ohms. 2. Disconnect pin 6 of picture tube, V17, from the 270 volt supply and connect to chassis ground. 3. Disconnect phono terminal of switch 66A from the 320 volt supply and connect to the 120 volt supply.
"C"	The following changes were incorporated to increase horizontal sync. stability on strong signal levels. 1. Change connection of condenser 107 (100 Mmfd.) in grid circuit of V8A (Horiz. A.F.C.) from junction of resistors 105 and 106 to the plate (pin 6) of V7A (12AT7—Sync. Amplifier). 2. Change resistor 124 in plate circuit of V8A (Horiz. A.F.C.) from 100,000 Ohms to 120,000 Ohms. 3. Change resistor 97 in grid circuit of V6 (Gated Sync. Separator) from 1.2 Meg. to 820,000 Ohms.
"D"	The following changes were incorporated to extend range of width control. 1. Change resistor 84 at output of V12 (Rectifier) from 100 Ohms to 50 Ohms. 2. Add resistor 138 (47,000 Ohms) in parallel with resistor 139 (12,000 Ohms) located in screen circuit of V9 (Horiz. Scanning Output).
"E"	The following change was incorporated to facilitate production techniques. 1. Two interconnecting sockets and plugs were added in the chassis.
"F"	The following change was incorporated to minimize the possibility of critical horizontal holding action when changing channels. 1. Add condenser 45 (5000 Mmfd.) between resistor 44 (47,000 Ohms) and pin 1 of tube V6 (Gated Sync. Separator). NOTE: When undertaking this modification be sure that the SERIES "C" is also incorporated. The following changes were incorporated to minimize hum and buzz in audio system. 1. Add resistar 92 (1500 Ohms) and resistor 93 (15,000 Ohms) in series between the 120 volt supply and the 270 volt supply. The junction of these two resistors, 92 and 93, provides the 135 volt supply. 2. Relocate condenser 85C (40 Mfd.) from the 270 volt supply to the 135 volt supply and add condenser 91 (4 Mfd.) to the 270 volt supply in the position formerly occupied by condenser 85C. 3. Disconnect pins 2 and 7 of tube V5 (Keyer—A.G.C.) from the 120 volt supply and connect to the 135 volt supply. 4. Disconnect resistor 97 (820,000 Ohms) in grid circuit of V6 (Gated Sync. Separator) from the 120 volt supply and connect to the 135 volt supply. 5. Disconnect resistor 104 (1 Meg.) in grid circuit of V7A (12AT7—Sync. Amplifier) from the 120 volt supply and connect to the 135 volt supply. 6. Disconnect pin 8, cathode of V7A (12AT7—Sync. Amplifier) from the 120 volt supply and connect to the 135 volt supply. 7. Disconnect pin 6, screen, of tube V5 (Keyer—A.G.C.) from the 270 volt supply and connect to the 285 volt supply. 8. Remove resistor 105 (3300 Ohms) in plate circuit of tube V7A (12AT7—Sync. Amplifier) and change resistor 106 from 3300 Ohms to 6800 Ohms. The following changes were incorporated to meet an U.L. requirement. 1. Add resistor 145 (1 Meg.) in high voltage supply to the picture tube. This resistor is located in the shield of the 1B3GT socket. The following changes were incorporated to reduce the amount of undesired video signal present in the sync. pulse. 1. Change resistor 100 in plate circuit of V6 (Gated Sync. Separator) from 330,000 Ohms to 220,000 Ohms. 2. Change resistor 102 in plate circuit of V6 (Gated Sync. Separator) from 12,000 Ohms to 6800 Ohms.
"G"	The following change was incorporated to improve the shape of the sync. pulse. 1. Change resistor 102, in plate circuit of V6 (Gated Sync. Separator), to 18,000 Ohms. Chassis that have the letter "F" in the series designation were produced with a 6800 Ohm resistor. Chassis that do not have the letter "F" in the series designation were produced with a 12,000 Ohm resistor.
"H"	The following change was incorporated to minimize horizontal oscillator drift thus improving Horizontal Hold action: 1. Change condenser 131 in plate circuit of V8B (Horz. Blocking Osc.) from a ceramic type, 820 Mmfd. ±10%, 400 volt to a mica type, 820 Mmfd. ±5%, 500 volt.
"J"	The following changes were incorporated to provide for the use of an alternate type tube. 1. Change V7A (Sync. Amp.) and V7B (Vert. Blocking Oscillator) from a type 12AT7 to a type 12AU7 tube. Change condenser 71 in grid circuit of tube V17 from 5000 Mmfd. to .03 Mfd.

LETTER DESIGNATION	DESCRIPTION OF CHANGE
"K"	The following changes were incorporated to provide for the use of an alternate type tube. 1. Change V4 (Video Amp.) from a type 6CL6 to a type 12BY7 tube. 2. The circuit for tube V4-6CL6 (Video Amp.) is shown at the right: 
"L"	The following change was incorporated to improve focus. 1. Disconnect pin 6, focusing grid of V17 (Picture tube), from ground and connect to 270 volt supply.
"M"	The following changes were incorporated to meet an U.L. requirement. 1. Remove condensers 73 and 74 (.01 Mfd.) from each leg of the A.C. input. 2. Add resistor 201 (150,000 Ohms) to the switch leg of the A.C. input.
"N"	Chassis having this change do not incorporate a Phono Switch (66-A, B) nor a Phono Input Socket.
"P"	The following changes were incorporated to improve the picture quality. 1. Change resistor 30 in plate circuit of tube V2 (2nd I.F.) from 15,000 Ohms to 5600 Ohms. 2. Alignment frequencies of the I.F. system are as follows: Converter Plate coil: 23.5 Mc. 2nd I.F. coil: 25.9 Mc. 1st I.F. coil: 23.5 Mc. 3rd I.F. coil: 25.9 Mc.
"Q"	The following changes were incorporated to extend the useful range of the Horizontal Hold control. 1. Change Horizontal Range 108-A control in the grid circuit of V8A (Horizontal A.F.C.) from a variable condenser (10-160 Mmfd.) to a fixed condenser 218 (47 Mmfd.). 2. Change resistor 113 in grid circuit of tube V8A (Horizontal A.F.C.) from 150,000 Ohms to 220,000 Ohms. 3. Change resistor 114 in grid circuit of tube V8A (Horizontal A.F.C.) from 330,000 Ohms to 1 Meg. 4. Add resistor 212 (150,000 Ohms) from the junction of condenser 109 (47 Mmfd.) and resistor 114 (1 Meg.) to chassis ground. 5. Remove resistor 133 (10,000 Ohms) in grid circuit of tube V9 (Horizontal Scanning Output) and replace with condenser 133 (270 Mmfd.). 6. Change resistor 97 in grid circuit of tube V6 (Gated Sync. Separator) from 820,000 Ohms to 1.5 Meg. 7. The plate load resistor of tube V7A (Sync. Amp.) differs with various series type chassis. Before undertaking the change listed below, check the series type chassis and incorporate only the applicable portion. a. On chassis that incorporate a letter "J" in the series designation, change resistor 106 from 10,000 Ohms to 4700 Ohms and add resistor 105 (4700 Ohms) in series with resistor 106 and plate of tube V7A. Resistor 182 (18,000 Ohms) remains connected to the plate of tube V7A—12AU7 while condenser 107 (100 Mmfd.) is reconnected to the junction of resistors 105 and 106. b. On chassis that incorporate a letter "F" but does not include the letter "J" in the series designation, change resistor 106 from 6800 Ohms to 3300 Ohms and add resistor 105 (3300 Ohms) in series with resistor 106 and plate of tube V7A. Resistor 182 (18,000 Ohms) remains connected to the plate of tube V7A—12AT7 while condenser 107 (100 Mmfd.) is still connected to the junction of resistor 105 and 106. c. On chassis that do not incorporate letters "F" and "J" this step (#7) need not be undertaken when incorporating the "Q" change. In addition to the above changes the Syncroguide transformer must be re-adjusted in accordance with the procedure (for a Series "Q" chassis) given in the service data section of the manual. The following changes were incorporated to improve the blanking during horizontal retrace interval. 1. Add resistar 213 (150,000 Ohms) between cathode of tube V9 (Horizontal Scanning Output) and the grid circuit of tube V17 (Picture Tube). 2. Add resistor 214 (1 Meg.) between pin 1 of the horizontal output transformer and grid circuit of tube V17 (Picture Tube). 3. Add resistor 215 (56,000 Ohms) from the junction of resistors 213 and 214 to chassis ground. 4. Add condenser 216 (100 Mmfd.) from the junction of resistors 213 and 214 to the grid of tube V17 (Picture Tube). The following change was incorporated to reduce illumination of picture tube with minimum setting of the Brightness Control. 1. Change resistor 68 in the brightness circuit from 470,000 Ohms to 330,000 Ohms. The following change was incorporated to prevent the A.G.C. voltage from going positive. 1. Add V14B (6T8—A.G.C. Clamp) by connecting diode plate pin 6 of tube V14—6T8 to A.G.C. system.
"R"	The following change was incorporated to minimize frequency drift in the syncroguide circuit. 1. Change condenser 130 from a .01 Mfd. to a .01 Mfd. (Special characteristic) Stewart-Warner part 512311 only.
"S"	The following changes were incorporated to improve the useful ronge of the Power Booster control. 1. Change connection of Brightness control 67A associated circuit from cathode of tube V17 (Picture tube) to grid of the same tube. The Brightness circuit for chassis that do not incorporate the letter "S" is shown at the right: 2. Add resistor 219 (470,000 Ohms) in parallel with condenser 62 (.1 Mfd.) located in cathode circuit of tube V17 (Picture tube). 3. Change resistor 70 in plate circuit of tube V7B (Vert. Blocking Osc.) from 100,000 Ohms to 47,000 Ohms and add condenser 210 (.1 Mfd.) in series with resistor 70. Connect other end of condenser 210 to the junction of condenser 190 (.047 Mfd.) and resistor 191 (8200 Ohms). 

Stewart-Warner Series 21C9300 and 21T9300 Receivers, continued

ALIGNMENT PROCEDURE

The receiver chassis must be removed from the cabinet in order to accomplish alignment of all tuned circuits.

Alignment of all RF and IF tuned circuits in this receiver may be accomplished by utilizing the procedures described in the following charts.

These procedures should preferably be applied in the order in which they are presented. Alignment of Sound Channel of IF Channel may be accomplished individually if desired.

The RF Amplifier and Mixer alignment may also be accomplished independent of Sound or IF Channel alignment, but oscillator calibration can only be done after IF Channel has been correctly aligned.

CAUTION

The picture tube is highly evacuated and if broken fragments will be violently expelled. Handle with care. Avoid contact with metal shell of picture tube as this is part of the high voltage circuit.

INSTRUMENTS: The following instruments will be required as signal sources and output indicators during the alignment process. Since accurate alignment of a television receiver is heavily dependent upon the performance of your instruments, it is imperative that they meet the essential specifications described here.

1. **STANDARD SIGNAL GENERATOR** to provide unmodulated (pure RF) signals at the following frequencies. Maximum output on all ranges should be at least .1 volt with provision for attenuation as desired. This instrument must have good frequency stability and be accurately calibrated.

   a. IF Frequencies:
   4.5 Mc. Sound Channel
   21.5 Mc. to 26.6 Mc. IF Channel

   b. RF Frequencies:
   54 to 88 Mc.
   174 to 216 Mc.

2. **VACUUM TUBE VOLTMETER.** The lowest voltage range of this instrument should preferably permit a 1.0 volt reading to be indicated at not less than one third of full scale deflection.

3. **RF SWEEP GENERATOR** to provide frequency modulated signal for observing the over-all bandpass characteristic and RF Channel alignment at the following frequencies:
   20 to 30 Mc. with 10 Mc. sweep width.
   54 to 88 Mc. with 10 Mc. sweep width.
   174 to 216 Mc. with 10 Mc. sweep width.

4. **CATHODE RAY OSCILLOSCOPE,** preferably a unit with vertical amplifier having wide range frequency response and low capacity pick-up probe. This instrument is used for observing the over-all bandpass characteristic and for RF Channel alignment.

SOUND CHANNEL ALIGNMENT PROCEDURE

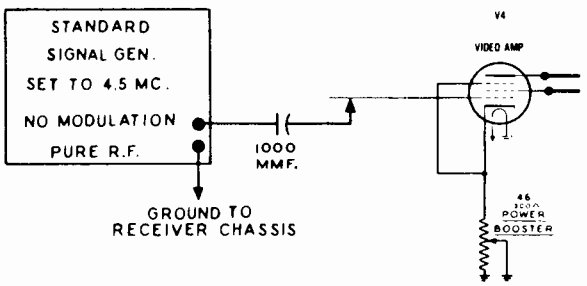
1. Short antenna terminals together with a jumper wire.
2. Set receiver Channel Selector to any inactive television channel and Power Booster control to its maximum counter-clockwise position; other controls may be left at any desired setting.
3. A small screwdriver (preferably non-metallic) can be used for alignment of Sound IF. The blade of this tool will fit the slot in the core of the transformer.

STANDARD SIGNAL GENERATOR		VTVM CONNECTIONS	MISCELLANEOUS INSTRUCTIONS	TRIMMER OR SLUG	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
CONNECTIONS	FREQUENCY				
Connect as shown in Fig. 1.	**4.5 MC.** unmodulated IMPORTANT This signal must be accurate within ¼ of 1% of 4.5 Mc. Check generator calibration against a crystal controlled signal source by "zero beating" (heterodyning) with harmonics of the crystal frequency.	Connect as shown in Fig. 2.	1. Set Power Booster control to its maximum clockwise position. 2. A special detector must be utilized when aligning the 4.5 Mc. Sound Trap Coil. This unit can be constructed in accordance with the information contained in Fig. 3. If a VTVM containing a high frequency A.C. probe is available, this probe can be utilized in place of the crystal detector shown in Fig. 2 3. During this adjustment only, remove one of the three 6CB6 IF amplifier tubes (V1, V2 or V3). This will prevent noise in the RF stages from effecting the voltage reading while adjusting the sound trap.	**#1** 4.5 MC Sound Trap (See Fig. 10)	Adjust for minimum reading on VTVM.
Same as above	Same as above.	Connect as shown in Fig. 4.	A "swishing" sound may be heard in the speaker during Sound Channel Alignment. This spurious oscillation is caused by horizontal sweep voltage being picked up in the audio system thru stray coupling of instrument leads; it should be disregarded as it will have no effect on alignment of the sound channel.	**#2** Discriminator Secondary (See Fig. 10)	Adjust for maximum reading on VTVM.
				#3 Discriminator Primary (See Fig. 11)	Adjust for maximum reading on VTVM.
				#4 Sound IF Transformer (See Fig. 10)	Adjust for maximum reading on VTVM.
Same as above.	Same as above.	Connect as shown in Fig. 5.	To obtain zero balance of the discriminator circuit, two 68,000 ohm resistors will be required. These resistors must be matched so that their respective resistances do not differ by more than 1%—the accuracy of the total resistance is not critical. Connect the two resistors in series from pin 2 of the 6T8 tube to chassis ground as shown in Fig. 5.	**#2** Discriminator Secondary (See Fig. 10)	Note that as slug #2 is rotated, a point will be found where the voltmeter will swing rather sharply from a positive to a negative reading or vice versa. The correct setting of slug #2 is obtained when the meter reads zero as the slug is moved thru this point.

Replace the type 6CB6 tube previously removed in the above procedure and turn set on. Tune in to a local channel and should there be an unusual amount of "Intercarrier Buzz" refer to procedure on adjoining page to remove this aforementioned fault.

Stewart-Warner Series 21C9300 and 21T9300 Receivers, continued

INSTRUMENT CONNECTIONS FOR SOUND CHANNEL ALIGNMENT



(Refer to circuit diagram page for tube type and pin connections.)

FIG. 1
Generator Connections for Sound Channel and 4.5 Mc. Sound Trap Alignment

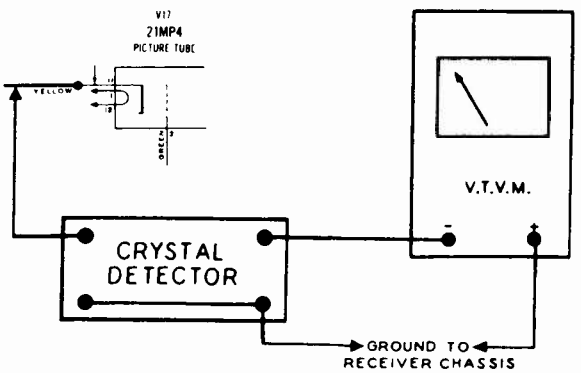


FIG. 2
Crystal Detector and VTVM Connections for 4.5 Mc. Sound Trap Alignment

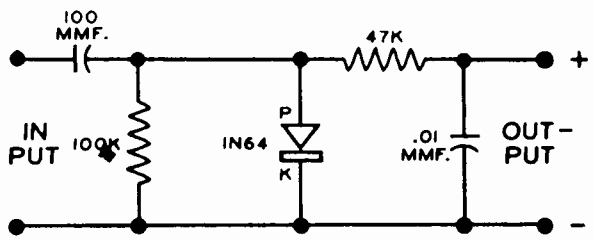


FIG. 3
Circuit Diagram for Crystal Detector shown in Fig. 2

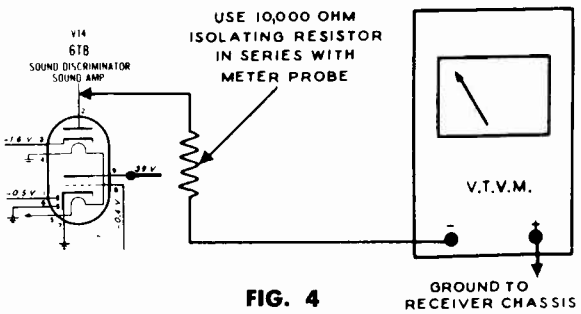


FIG. 4
VTVM Connections for Sound IF Alignment

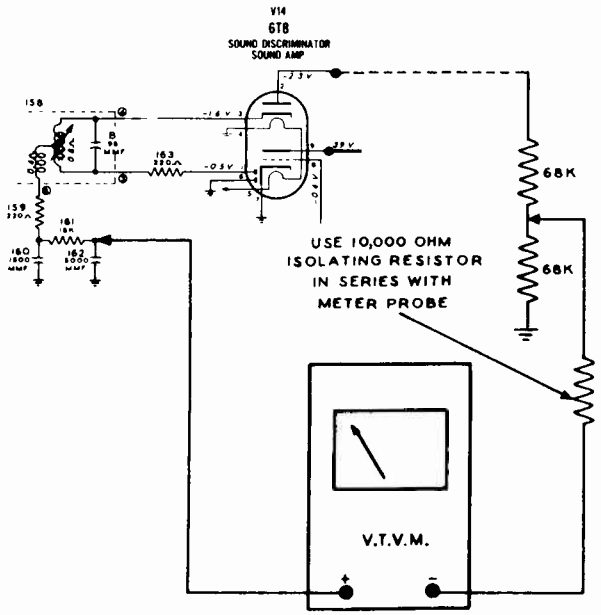


FIG. 5
VTVM Connections for Sound Discriminator Alignment

REDUCTION OF INTERCARRIER BUZZ

Under actual reception conditions slight "dynamic" unbalance of the discriminator secondary can emphasize intercarrier buzz due to incomplete amplitude modulation rejection. Therefore it is vitally important to obtain an accurate setting of the discriminator secondary slug under these conditions.

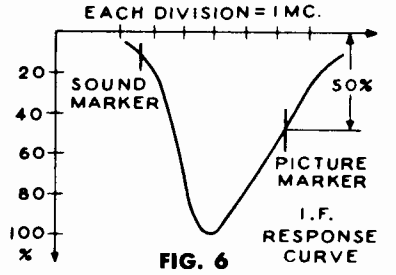
Disconnect all instruments (be sure that I.F. tube removed for the adjustment of Sound Trap has been replaced) and then connect an antenna to the receiver to obtain program reception from a local station. If intercarrier buzz is prominent, a slight readjustment of the discriminator secondary slug (#2) should be made to obtain the "dip" point for the buzzing sound. Note that program sound will be clear and free from distortion at this point. Buzz should now be at an acceptable minimum if station transmission is not at fault.

Stewart-Warner

IF CHANNEL ALIGNMENT PROCEDURE (Continued)

1. A special aligning tool designed to fit the stems on adjustable cores of the IF coils (see points 5, 6, 7 and 8 in Fig. 10) is available and may be obtained from Stewart-Warner by requesting IF Alignment Tool #507479.
2. Turn receiver Channel Selector to television channel #12 and short antenna terminals together with a jumper wire.
3. Connect a 3 volt battery to the receiver AGC system so that negative terminal of battery connects to the AGC line and positive terminal of battery connects to receiver chassis. See Fig. 11 for convenient point of connection.
4. If the IF channel is badly misaligned and two or more immediately adjoining IF stages are tuned to the same frequency, oscillation may occur. Such oscillation shows up as an excessive voltage across the video detector load, circuit reference number 42 and 43, and is indicated by the VTVM that is connected to this point during alignment. It should be noted that voltage due to IF oscillation is unaffected by strength of signal from the generator.

   Where IF oscillation is encountered, it is generally possible to correct the condition by detuning the IF coils in different directions. If that does not have the desired effect, increase fixed bias on AGC line by using a 4½ volt battery instead of the 3 volt battery referred to in instruction #3. After stopping the oscillation in this manner it will then be possible to align all IF stages using the following procedure, however, the AGC bias battery must be changed back to 3 volts when using the oscilloscope to observe band pass characteristics. Once all stages have been aligned using the 4½ volt bias, the IF channel should be stable with reduced bias.
5. In order to eliminate the possibility of spurious oscillations, it is desirable to render the RF oscillator inoperative. This may be readily accomplished by insulating oscillator terminals of tuner. Remove tuner bottom shield and place a piece of transparent cellulose tape on the first two contacts (from front) of drum assembly. Use any inoperative channel and rotate drum to this insulated position.

STANDARD SIGNAL GENERATOR		SWEEP GENERATOR		VTVM CONNECTIONS	'SCOPE CONNECTIONS	MISCELLANEOUS INSTRUCTIONS	TRIMMER OR SLUG	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
CONNECTIONS	FREQUENCY	CONNECTIONS	FREQ.					
Connect as shown in Fig. 7.	**23.4 MC. OR 23.5 MC.** See Note "P" Below	Not used.	———	Connect as shown in Fig. 9.	Not used.	Be sure that RF oscillator has been rendered inoperative as outlined in instruction #5 at the head of this chart.	**#5** Converter plate coil (See Fig. 10)	Adjust for maximum reading on VTVM.
Same as above.	**24.2 MC. OR 23.5 MC.** See Note "P" Below	Not used.	———	Same as above.	Not used.	Same as above.	**#6** 1st I.F. (See Fig. 10)	Adjust for maximum reading on VTVM.
Same as above.	**26.2 MC. OR 25.9 MC.** See Note "P"	Not used.	———	Same as above.	Not used.	Same as above.	**#7** 2nd I.F. (See Fig. 10)	Adjust for maximum reading on VTVM.
Same as above.	**25.4 MC. OR 25.9 MC.** See Note "P"	Not used.	———	Same as above.	Not used.	Same as above.	**#8** 3rd I.F. (See Fig. 10)	Adjust for maximum reading on VTVM.
Connect as shown in Fig. 8.	**26.6 OR 26 MC.** See Note "P" Below	Connect as shown in Fig. 8.	**25 MC.** Sweeping ± 5 Mc.	Same as above.	Connect as shown in Fig. 9	IMPORTANT: 1. Adjust output attenuator on sweep generator so that reading on VTVM is approximately one-half volt. 2. Set attenuator on standard signal generator so that marker signal does not distort the pattern on the oscilloscope. 3. Be sure that a 3 volt battery is connected to AGC line as specified in instruction #3 at the head of this chart. Do not use a battery of any other voltage.		The I.F. bandpass characteristic can now be observed by the use of a 'scope. Its general shape and contour should compare with the curve shown in Fig. 6. The picture carrier marker (26.6 Mc. or 26 Mc. on Chassis that incorporate a letter "P" in the series designation at rear of chassis) should appear at the 50% (±10%) amplitude position of the curve as shown in Fig. 6.  FIG. 6 Should this observation fail to meet the above requirements, the complete I.F. alignment procedure must be repeated, exercising greater care in frequency setting of the marker generator and adjusting the I.F. transformer slugs for maximum output at the prescribed frequencies.
Same as above.	**22.1 OR 21.5 MC.** See Note "P" Below	Same as above.	Same as above.	Same as above.	Same as above.	Same as above.		The sound carrier marker (22.1 Mc. or 21.5 Mc. on chassis that incorporate a letter "P" in the series designation at rear of chassis) can be observed by the use of a 'scope and should be compared with that shown in Fig. 6. Increase the vertical gain control on 'scope in order to magnify the sound portion of the response curve. This marker should appear at the position indicated in Fig. 6. Should the sound marker not be properly positioned, check the setting of the picture carrier marker as indicated in the previous step.

NOTE "P": On chassis which have a letter "P" in the SERIES designation on rear of chassis, the converter Plate and 1st I.F. coils must be aligned to 23.5 Mc. and the 2nd I.F. and 3rd I.F. coils must be aligned to 25.9 Mc. The carrier markers on this series type chassis are: picture carrier 26 Mc., sound carrier 21.5 Mc.

Stewart-Warner Series 21C9300 and 21T9300 Receivers, continued

INSTRUMENT CONNECTIONS FOR IF CHANNEL ALIGNMENT

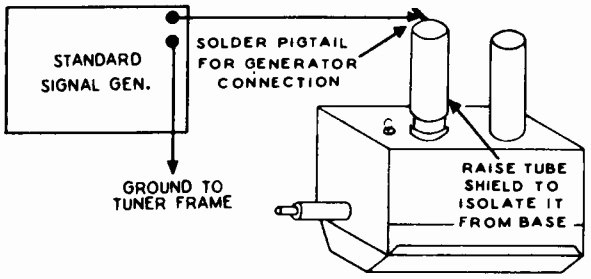


FIG. 7
Generator Connections for IF Channel Alignment

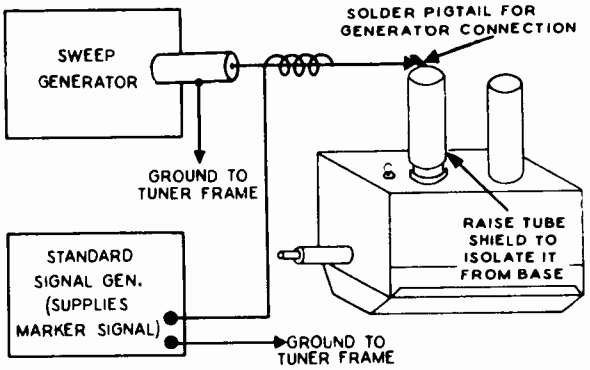


FIG. 8
Generator Connections for IF Channel Alignment

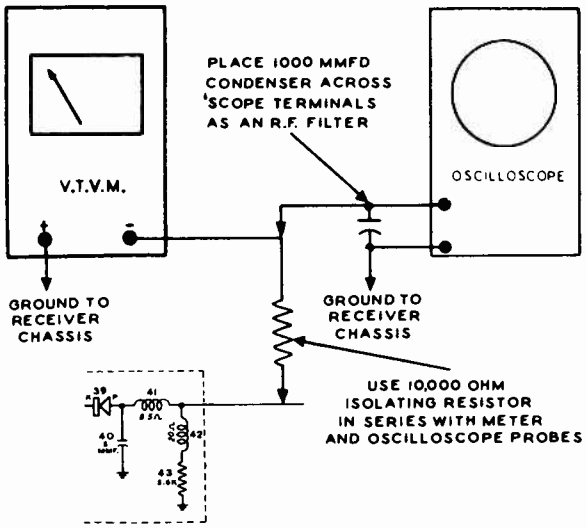


FIG. 9
VTVM and Oscilloscope Connections for IF Channel Alignment

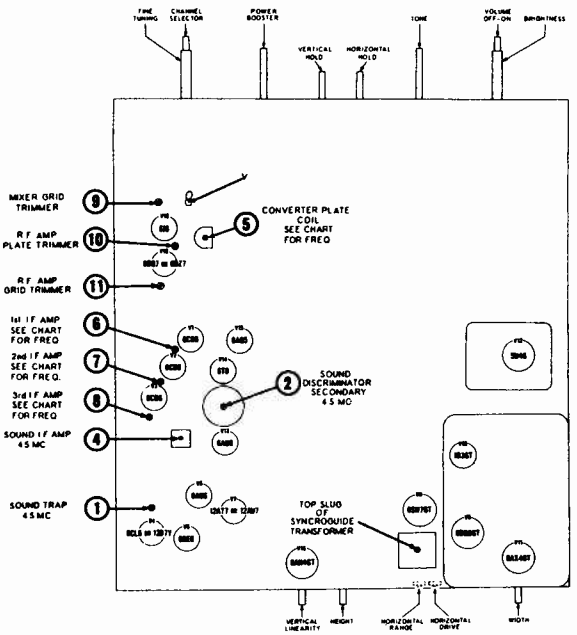


FIG. 10
Top View of Chassis

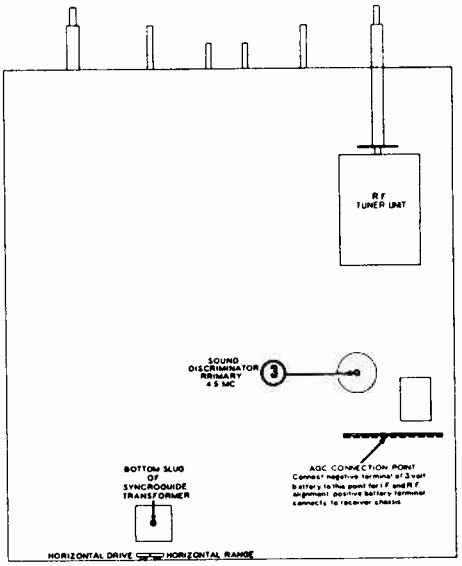


FIG. 11
Bottom View of Chassis

Stewart-Warner Series 21C9300 and 21T9300 Receivers, continued

RF CHANNEL ALIGNMENT PROCEDURE

1. **CAUTION:** The shell of the picture tube has a high voltage potential, approximately 14,000 volts, and contact should be avoided. As the adjustment screws are in relatively close proximity to this shell, some means of insulation from accidental contact should be provided.
2. Connect a 3 volt battery to the receiver AGC system so that negative terminal of battery connects to AGC line and positive terminal of battery connects to receiver chassis. (See Fig. 11 for convenient point of connection.)

STANDARD SIGNAL GENERATOR		SWEEP GENERATOR		VTVM CONNECTIONS	SCOPE CONNECTIONS	MISCELLANEOUS INSTRUCTIONS	TRIMMER OR SLUG	TYPE OF ADJUSTMENT AND OUTPUT INDICATION
CONNECTIONS	FREQUENCY	CONNECTIONS	FREQ.					
RF AMPLIFIER AND MIXER ALIGNMENT								
Connect as shown in Fig. 12.	**209.75 MC.** Sound Carrier **205.25 MC.** Picture Carrier Marker.	Connect as shown in Fig. 12 and set controls for sweep width of 10 Mc. on television channel specified in the next column.	**CHANNEL #12**	Not used.	Connect as shown in Fig. 13.	Set Channel Selector to #12. IMPORTANT: Keep output of standard signal generator at a level that provides a readable marker but does not distort the curve that is being observed on the scope.	**#9** Mixer Grid. (See Fig. 19) **#10** RF Amp. Plate. (See Fig. 19) **#11** RF Amp. Grid. (See Fig. 19)	Adjust these trimmers to obtain properly shaped RF band pass characteristic as shown in Fig. 16. Use Mixer Grid trimmer #9; and RF Amplifier Plate trimmer #10 to obtain correct amplitude of characteristic in vicinity of picture and sound carrier markers. Then adjust RF Amp. Grid trimmer #11 to equalize overall amplitude. Repeat adjustment of trimmers to be sure correct response has been obtained. **IMPORTANT:** When adjusting trimmers #9, 10 and 11 it will be noted that the band pass characteristic can be broadened by sacrificing amplitude. It is undesirable to overly broaden the curve as that would result in a loss of sensitivity.
Same as above.	The bandpass characteristic for each of the successive channels should now be observed individually. For frequency setting of marker signals see table in Fig. 15.	Same as above.	Set sweep generator to channel frequencies being observed.	Not used.	Same as above.	Set channel selector to channel being observed.	The RF band pass characteristic of the other television channels should now be checked without disturbing the settings of trimmers #9, 10 and 11. Adjust the RF sweep generator and marker generator for operation on the other television channels, observing position of both the sound carrier and picture carrier markers. Band pass characteristic of these channels should conform close to the RF response curve in Fig. 16. If necessary, a compromise may be obtained to compensate for large variations in channel response by returning to channel #12 and making slight changes in the settings of trimmers #9, 10 and 11.	

OSCILLATOR ALIGNMENT

1. **IMPORTANT:** Before undertaking oscillator alignment be sure IF circuits are correctly aligned for band pass characteristic illustrated in Fig. 6.
2. During oscillator alignment, it is necessary to set the Fine Tuning control so that the tooth on the fiber fine tuning cam points downward (correct position for this control is shown in Fig. 18).
3. During this step and thru-out all succeeding steps it is necessary to: keep output of sweep generator at a level that does not allow reading on VTVM to exceed one-half volt.
4. Keep output of standard signal generator at a level that provides a readable marker but does not distort the curve that is being observed on the 'scope.

Connect as shown in Fig. 12.	**209.75 MC.** Sound Carrier Marker. **205.25 MC.** Picture Carrier Marker.	Connect as shown in Fig. 12 and set controls for sweep width of 10 Mc. on television channel specified in the next column.	**CHANNEL #12**	Connect as shown in Fig. 14.	Connect as shown in Fig. 13.	Set Channel Selector to #12 Be sure that generator's output does not exceed voltage specified in instructions #3 and 4 above.	Using a non-metallic screwdriver to adjust channel #12 oscillator slug (accessible thru hole on front of RF Tuner Unit—see Fig. 18) shift response curve so that picture carrier marker is located at the position indicated in Fig. 17. **NOTE:** Before making the following adjustment, advance the vertical gain control on the 'scope in order to magnify the sound portion of the response curve. Observe position of sound carrier marker (see Fig. 17).
Same as above.	The bandpass characteristic for each of the successive channels should now be observed individually. For frequency setting of marker signals see table in Fig. 15.	Same as above.	Set sweep generator to channel frequencies being observed.	Same as above.	Same as above.	Set channel selector to channel being observed.	Adjust the RF sweep generator and marker generator for operation on the other television channels; set marker generator to sound carrier frequency. After setting Channel Selector to corresponding channel, adjust oscillator slug thru hole on front of RF Tuner Unit (see Fig. 18). This permits response curve to be shifted so that picture and sound carrier markers will appear at the position indicated in Fig. 17. The picture carrier marker for the corresponding channel should then appear at the 50% amplitude position on the opposite side of the band pass characteristic curve. **NOTE:** Make sure that cam on fine tuning control shaft remains properly positioned during this step (tooth on the cam pointing downward—see Fig. 18).

If an oscillator slug "falls into" its coil form during adjustment, remove the Channel Coil from the turret assembly and lift the Slug Retaining Spring aside. By tapping the coil form it should be possible to make the slug move toward the end so that its threads will be engaged by the Slug Retaining Spring when that spring is returned to its normal position. (See Fig. 20.)

If an unsatisfactory overall response is obtained for a particular channel, observe RF Amp. and Mixer response curve for that channel. If characteristic does not conform reasonably well within the typical curve shown in Fig. 16, then, (1) attempt to obtain a better compromise for RF response on all channels by realigning RF Amp. and Mixer circuits, or (2) try replacing Antenna, RF and Oscillator coils for the particular channels.

Stewart-Warner Series 21C9300 and 21T9300 Receivers, continued

INSTRUMENT CONNECTIONS FOR R.F. CHANNEL ALIGNMENT

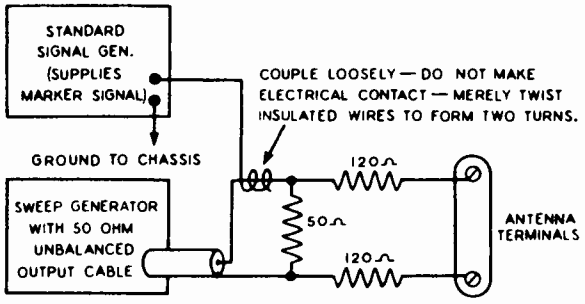


FIG. 12
Generator Connections for RF Channel Alignment

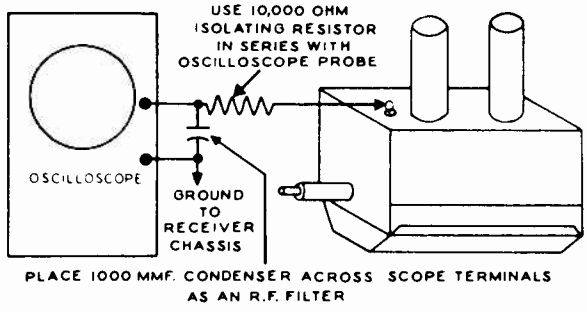


FIG. 13
Oscilloscope Connections for RF Amp. and Mixer Alignment

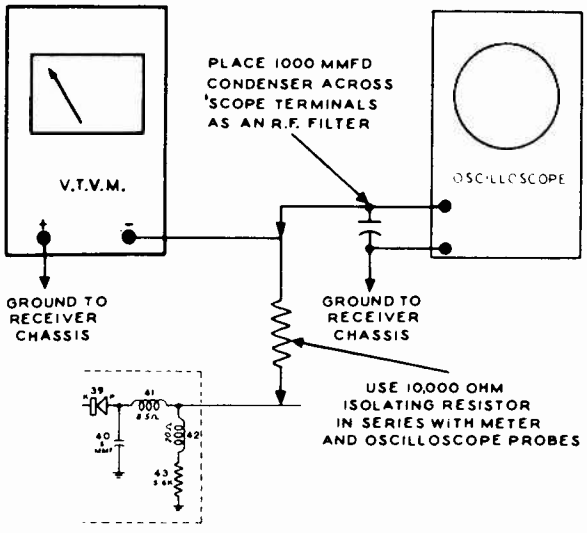


FIG. 14
VTVM and Oscilloscope Connections for Oscillator Alignment

CHANNEL NUMBER	PICTURE CARRIER MARKER FREQ.	SOUND CARRIER MARKER FREQ.
13	211.25 MC.	215.75 MC.
12	205.25 MC.	209.75 MC.
11	199.25 MC.	203.75 MC.
10	193.25 MC.	197.75 MC.
9	187.25 MC.	191.75 MC.
8	181.25 MC.	185.75 MC.
7	175.25 MC.	179.75 MC.
6	83.25 MC.	87.75 MC.
5	77.25 MC.	81.75 MC.
4	67.25 MC.	71.75 MC.
3	61.25 MC.	65.75 MC.
2	55.25 MC.	59.75 MC.

Fig. 15

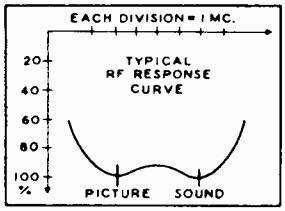


FIG. 16

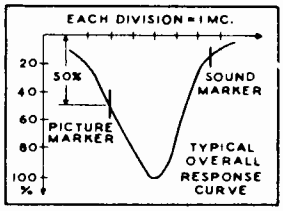


FIG. 17

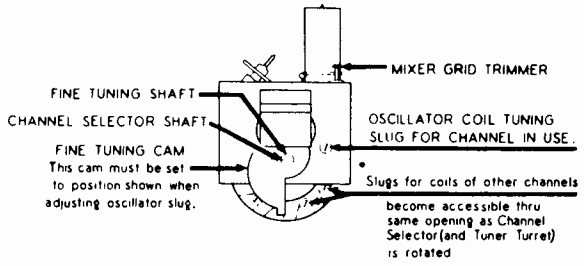


FIG. 18
Front View of RF Tuner Unit

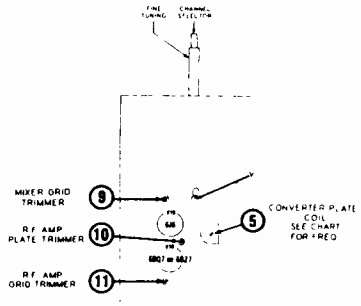
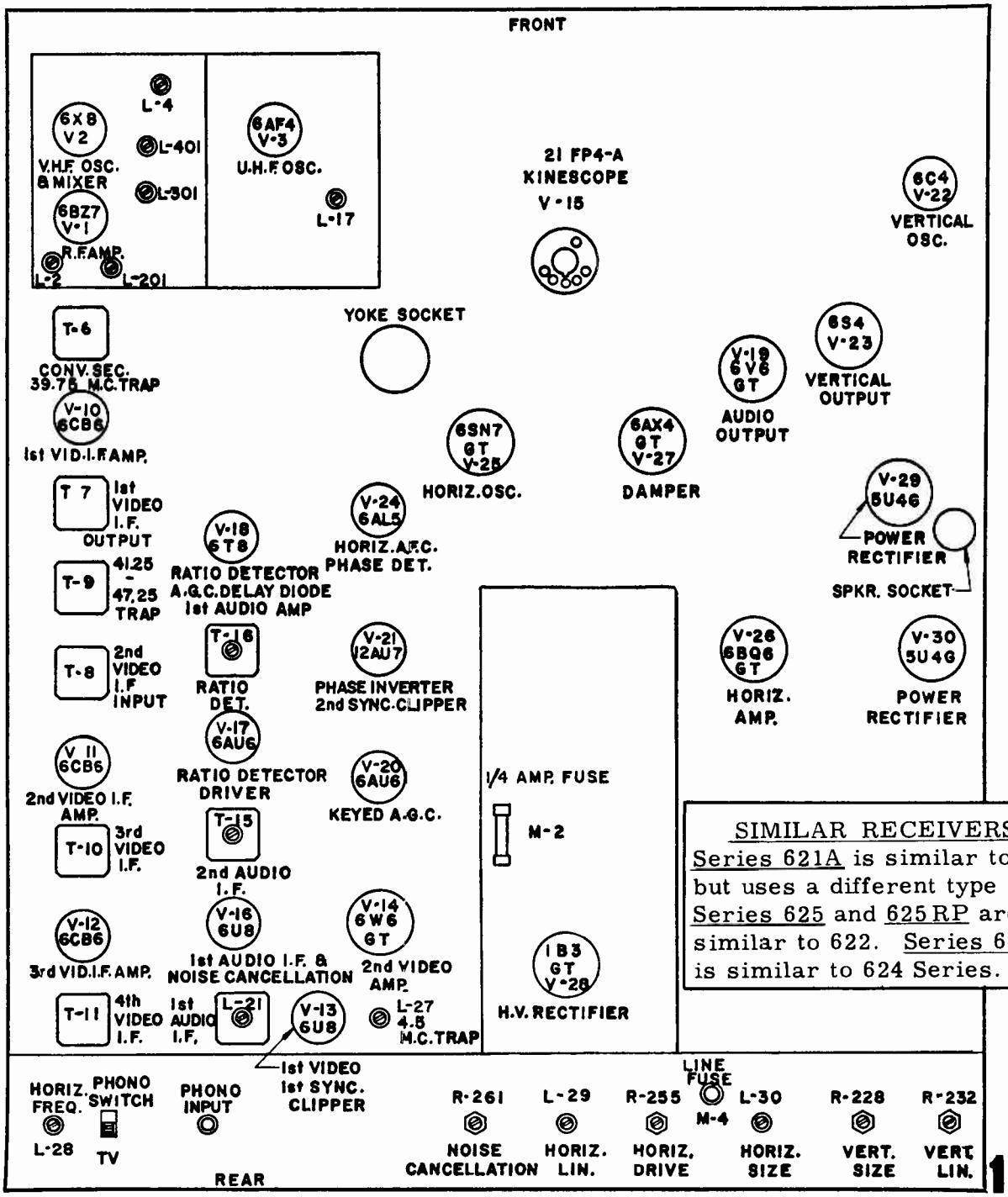


FIG. 19
Trimmer Location of R.F. Tuner

STROMBERG-CARLSON 622 SERIES 624 SERIES TELEVISION

The illustration on this page of chassis top and rear panel is exact for 622 Series and is similar in appearance to 624 Series. In following alignment information on page 158, which is applicable to both 622 and 624, reference may be made to this view. Tube voltage chart for 622 Series is on page 154, and the circuit diagram for 622 Series on page 155. The circuit diagram for 624 Series is printed separately on pages 156-157, since it is different in some important respects from the 622.



SIMILAR RECEIVERS

Series 621A is similar to 622, but uses a different type tuner. Series 625 and 625RP are also similar to 622. Series 624RP is similar to 624 Series.

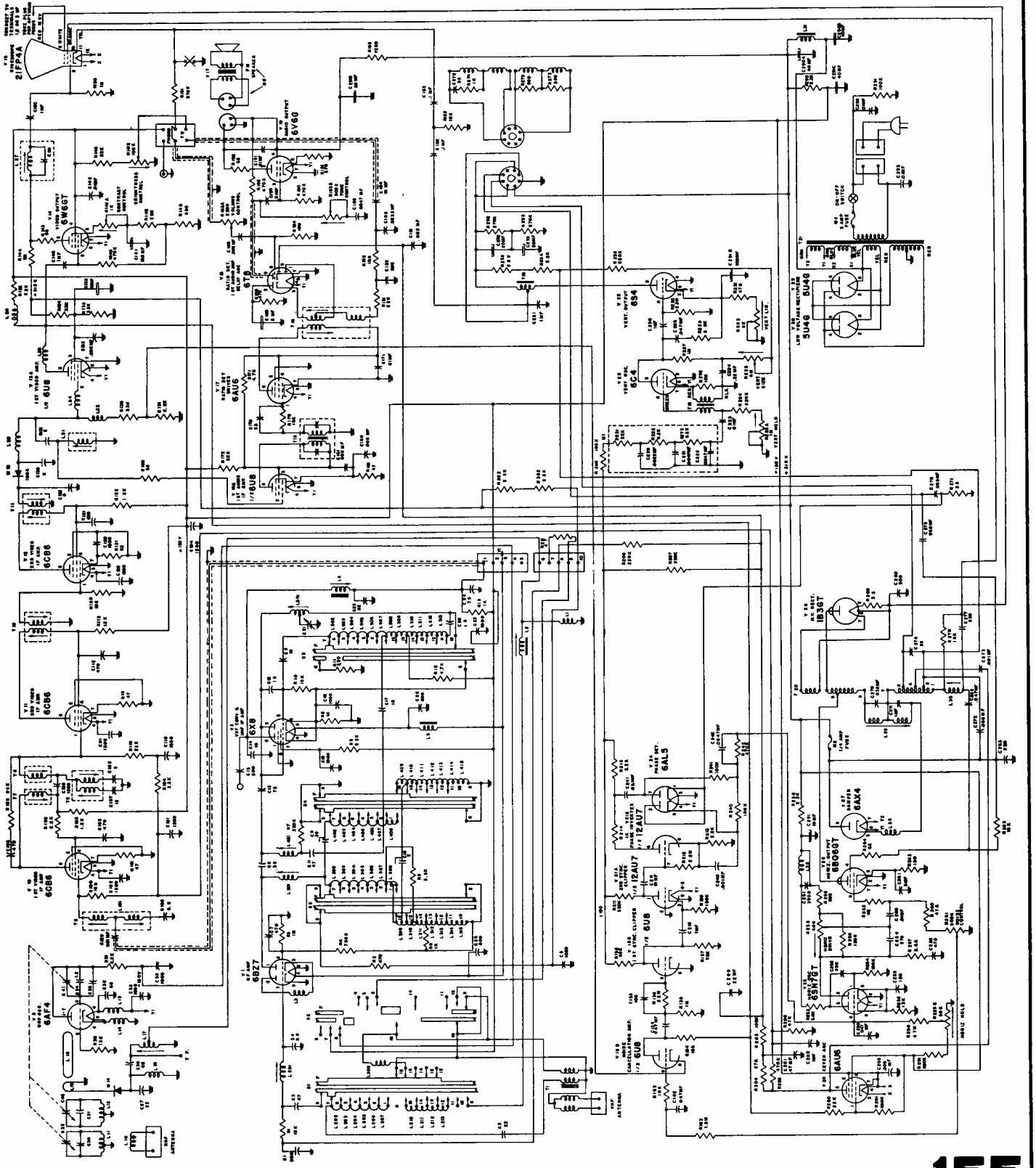
Stromberg-Carlson 622 Series Tube Voltage Chart

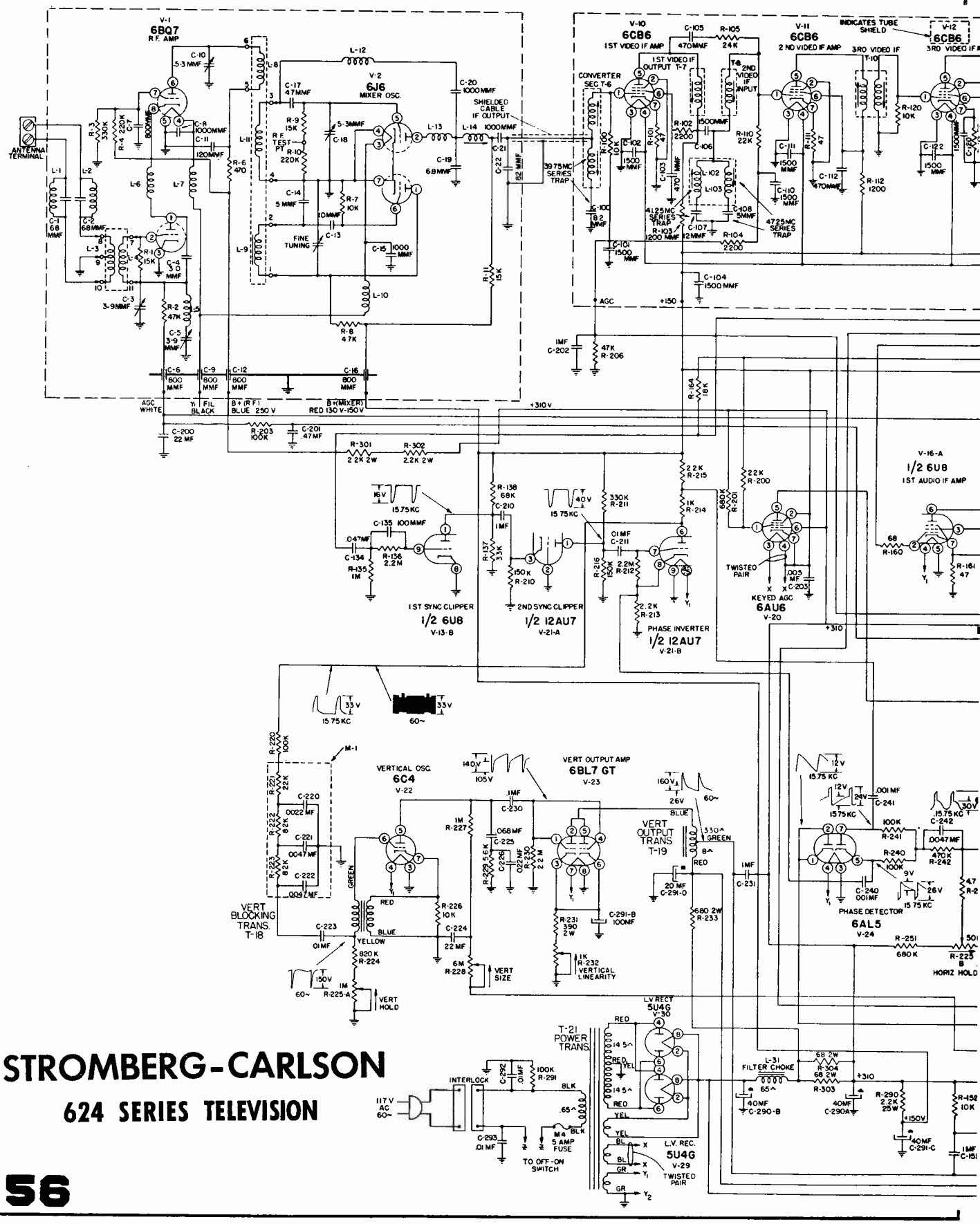
TUBE VOLTAGE CHART

1. Measurements are made at 117 Volts line using vacuum tube voltmeter. All voltages are D.C. and are positive with respect to chassis ground except where noted.
2. Contrast and brightness controls set for normal picture. (Strong signal area).

			PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V-10	6CB6	1st VIDEO	—3.66	.09	Fil.	AC 6.3	134	144	Gnd.		
V-11	6CB6	2nd VIDEO	—3.46	.08	AC 6.3	AC 6.3	125	144	Gnd.		
V-12	6CB6	3rd VIDEO	0	1.28	AC 6.3	AC 6.3	110	128	Gnd.		
V-13	6U8	1st SYNC. CLIPP. 1st VIDEO AMP.	43.2	—1.32	104	AC 6.3	AC 6.3	129	Gnd.	Gnd.	
V-14	6W6	2nd VIDEO AMP.	9.8	AC 6.3	274	146	9.26	528	Gnd.	25	
V-15		KINESCOPE SOCKET.	Gnd.	313	474	RF	522	Gnd.	468	465	
V-16	6U8	1st AUDIO	128	0	141	AC 6.3	AC 6.3	140	.78	—.56	—21.2
V-17	6AU6	DRIVER	—11.3	Gnd.	AC 6.3	AC 6.3	107	113	Gnd.		
V-18	6T8	RATIO DET.	—15.8	—37.4	—2.46	AC 6.3	AC 6.3	—3.7	Gnd.	—.76	64.4
V-19	6V6	AUDIO OUTPUT	NC	Gnd.	234	257	.05	NC	AC 6.3	12	
V-20	6AU6	A.G.C.	134	144	144	144	—37	316	144		
V-21	12AU7	PHASE INV. 2nd SYNC. CLIPPER.	41.8	Gnd.	15.6	AC 6.3	AC 6.3	116	13.4	20.6	Gnd.
V-22	6C4	VER. OSC.	NC	NC	Gnd.	AC 6.3	128	—28.5	0		
V-23	6S4	VER. OUTPUT	NC	23.2	NC	/ 0	AC 6.3	.11	NC	NC	458
V-24	6AL5	PHASE DET.	0	0	Gnd.	AC 6.3	14.8	NC	—13.6		
V-25	6SN7	HOR. OSC.	—14.6	156	11.6	1.64	264	11.6	AC 6.3	Gnd.	
V-26	6BQ6	HOR. AMP.	161	Gnd.	NC	159	—25.4	—25.4	AC 6.3	10	
V-27	6AX4	DAMPER	NC	NC	565	NC	316	563	AC 6.3	Gnd.	
V-29	5U4	L.V. RECTIFIER	NC	335	NC	Plate	NC	Plate	NC	335	
V-30	5U4	L.V. RECTIFIER	NC	335	NC	Plate	NC	Plate	NC	335	
227	Terminal	V.H.F. TUNER	137	152	AC 6.3	—.98	NC	0	0	0	T.B.17 0

STROMBERG-CARLSON 622 SERIES TELEVISION RECEIVER

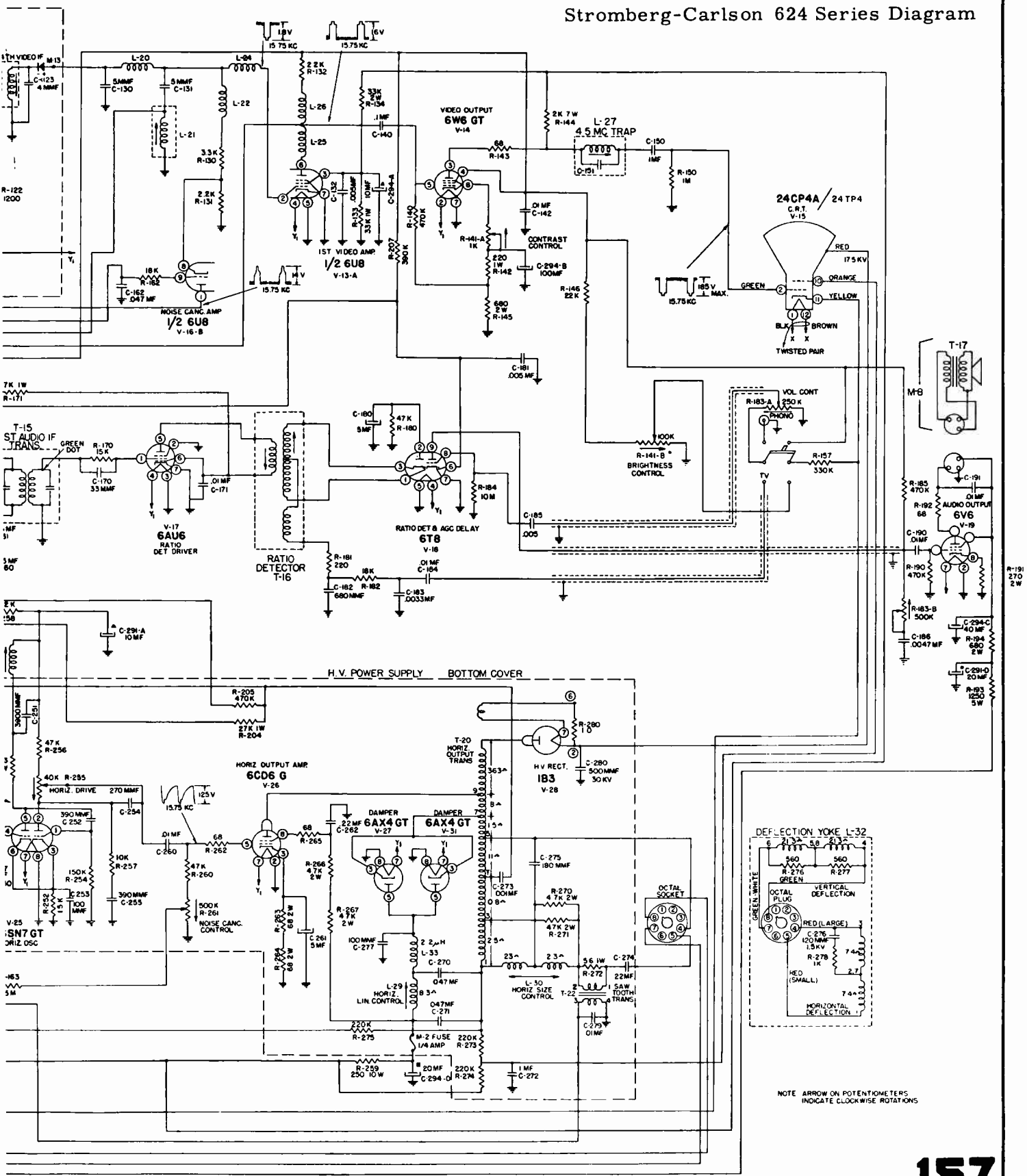




STROMBERG-CARLSON

624 SERIES TELEVISION

Stromberg-Carlson 624 Series Diagram



Stromberg-Carlson 622 and 624 Series Alignment Procedure

Apply A.G.C. bias of approximately—2 V to A.G.C. Line (across C-202). Maintain the output level of the sweep generator such that the second detector output is 2 volts peak to peak. Scope Cal. 1-V per inch.

NOTE—USE A NON-METALLIC ALIGNING TOOL AND LIGHT PRESSURE ON ALL SLUGS.

Signal Generator Connection	Oscilloscope or VTVM Connection	Adjustments
1. Output of 40mc. Sweep Generator to grid of 3rd I.F. Tube, pin 1 of 6CB6 V-12 thru 100 MMF isolating capacitor.	Input of scope to grid of Video Amplifier, pin 2 of 6U8 V-13 thru 47K ohm isolating resistor.	1. Adjust top ond bottom of T-11 for marker positions as shown on curve Figure 1.
2. Output of 40mc. Sweep Generator to grid of 2nd I.F. Tube, pin 1 of 6CB6 V-11 thru 100 MMF isolating capacitor.	Same as Step #1.	1. Adjust top and bottom of T-10 for marker positians as shown on curve Figure 2.
3. Output of 40mc. Sweep Generator to grid of 1st I.F. Tube, pin 1 of 6CB6 V-10 thru 100 MMF isolating capacitor.	Same as Step #1.	1. Adjust top of T-9 for marker position of 47.25mc. 2. Adjust bottom of T-9 for marker positions at 41.25mc. 3. Adjust bottom of T-6 for marker position at 39.75mc. 4. Adjust bottom of T-7 and T-8 to produce curve as shown on Figure 3.
4. Raise converter tube shield from ground and connect output of 40mc. sweep generator to the shield.	Same as Step #1.	1. Adjust top of T-6 ond L-4 on tuner (L-14 on standard coil tuner) assembly to produce a curve as shown on Figure 4.
5. Connect a 400 cycle modulated 4.5mc. signal to the junction of Video detector M-13 and C-130. Adjust generator output to a level to indicate 1.5 Volts on VTVM.	Connect 2-100 resistors in series from plate of ratio detector pin 2 of V-18, 6T8 to ground. Connect VTVM from junction of the 2-100K resistors to ground.	1. Adjust L-21, T-15 and bottom slug of T-16 for maximum indication.
6. Same as Step #5.	Connect — VTVM ground lead to the junction of the 2-100K resistors (see 5 above). Connect VTVM D.C. lead to the junction of C-183 and R-182.	1. Adjust the secondary (Top slug) of T-16 for zero volts between the positive ond negative excursions. (Increase Generator output for good deflection).

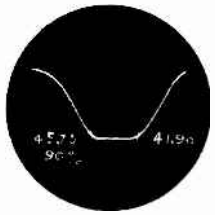


FIG. 1

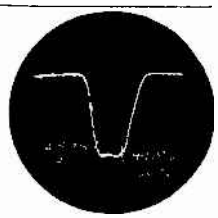


FIG. 2

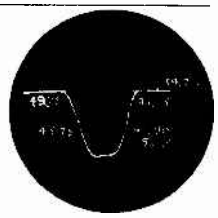


FIG. 3

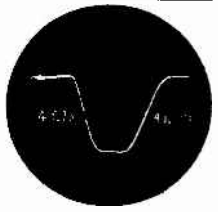


FIG. 4

Alternate Trap Alignment

IF THIS METHOD IS USED, IT SHOULD BE PERFORMED BEFORE THE I.F. CURVE ALIGNMENT

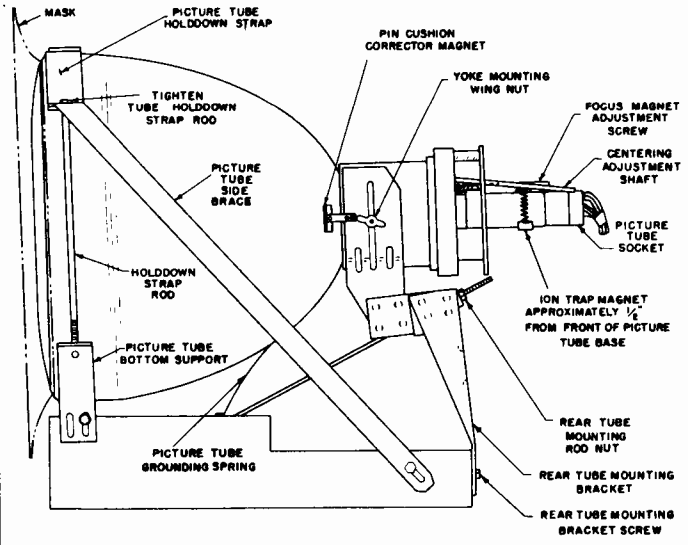
Signal Generator Connection	Oscilloscope or VTVM Connection	Adjustments
1. Connect a modulated (400 cycle) 39.75mc. signal to grid, pin 1 of the 1st video I.F. Tube—V-10.	Same as Step #1.	1. Adjust bottom of T-6 for minimum response on scope.
2. Connect a modulated (400 cycle) 41.25mc. signal to the grid, pin 1 of 1st video I.F. Tube 6CB6—V-10.	Same as Step #1.	1. Adjust bottom of T-9 for minimum response on scope.
3. Connect a modulated (400 cycle) 47.25mc. signal to grid, pin 1 of 1st video I.F. Tube 6CB6—V-10.	Same as Step #1.	1. Adjust top of T-9 for minimum response on scope.

SYLVANIA TELEVISION

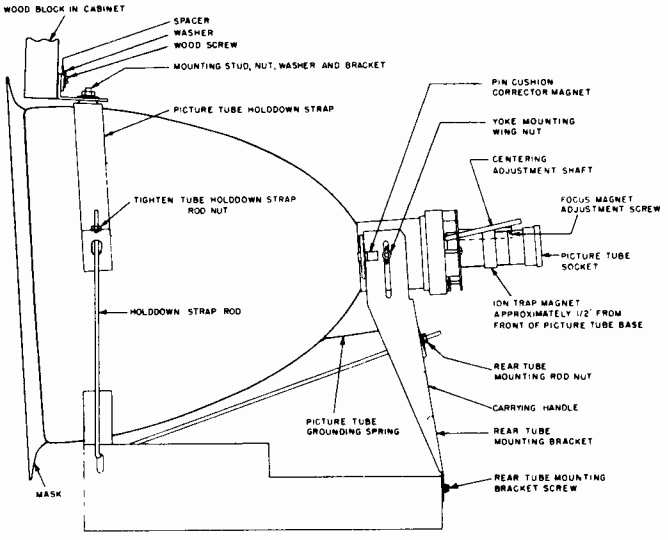
SYLVANIA ELECTRIC PRODUCTS INC.

CHASSIS 1-514-1, -3, -4
1-520-1, -3, -4, -7, -8

MODELS ALL 105-14, 300 SERIES
ALL 120-20, 320, 325, 326 SERIES



1-514 CHASSIS



1-520 CHASSIS

PICTURE TUBE INSTALLATION

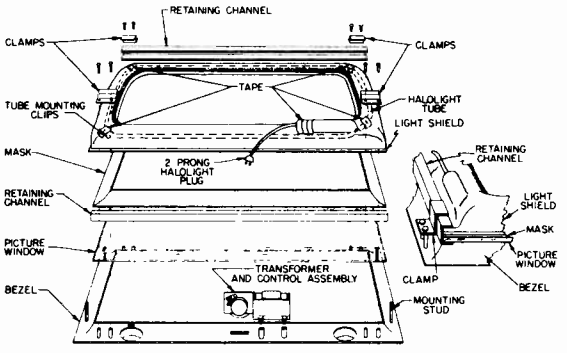
Picture Tube Replacement

Alignment of the mask and picture tube should not be necessary after normal servicing of the chassis. However, if tube support members have been disturbed during picture tube replacement, observe the following procedure. See Picture Tube Installation illustrations.

1. Position tube with face tilted forward about 3 degrees with brackets in approximately normal position. Tighten the following just enough to permit further adjustment in cabinet.
   (a) Tube holddown strap mounting nuts (21" chassis only).
   (b) Holddown strap rod or rod nuts.
   (c) Rear tube mounting rod nut.
   (d) Yoke mounting wing nuts.
   (e) Rear tube mounting bracket screws if previously loosened.

HaloLight Tube Replacement

1. Remove chassis from cabinet.
2. Unfasten the nuts that hold the bezel assembly to the cabinet and remove assembly.
3. Lay bezel assembly face down on a surface that will not scratch bezel.
4. Remove clamps holding light shield and mask to bezel.
5. Remove HaloLight plug, and transformer and control assembly.
6. Remove retaining channels and lift HaloLight shield from assembly.
7. Remove tape holding HaloLight tube mounting clips and leads to shield.
8. Remove vinyl tubing from ends of tube and carefully lift tube from shield.
9. Unsolder leads from tube.
10. To replace tube, follow the foregoing steps in reverse order. It is important that all tape removed from assembly be replaced to minimize dust collection on picture tube face.



HALOLIGHT TUBE REMOVAL

SYLVANIA Chassis 1-514 and 1-520, continued

VIDEO IF, 4.5MC TRAP AND SOUND ALIGNMENT

PREALIGNMENT INSTRUCTIONS READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT.

Lay chassis on side with H. V. supply down for under-chassis adjustments.

Ground all test equipment unless otherwise stated.

Keep detector leads short.

Use proper non-metallic alignment tools for powdered iron cores with hex holes or slots. Metallic screw drivers may be used for cores adjusted by brass screws.

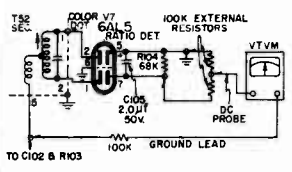
Receiver should warm up for approximately 15 minutes before alignment.

During Video IF Alignment, when indicated, raise shield on Oscillator/Mixer tube so ground contact is broken.

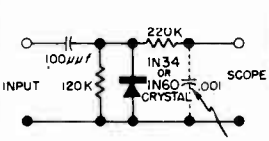
Set Fringe (AGC) switch to maximum counterclockwise position on 1-514-3, 1-514-4, 1-520-3, 1-520-4 and 1-520-8 chassis.

VIDEO IF ALIGNMENT

STEP	SIGNAL GENERATOR Connection	Freq.	SWEEP GENERATOR Connection	Freq.	VTVM CONNECTION	OSCILLOSCOPE CONNECTION	ADJUST	OUTPUT READING	COMMENTS
1.	To raised tube shield on Osc./Mix. tube.	39.75 MC			Across diode load resistor R147-4.7K.		L54 (Top Core)	Min.	Set VHF tuner to free channel. Apply -3V. between C130 - .22 Mfd. and chassis. Use sufficient output for satisfactory reading.
2.	CHASSIS 1-514-1, 1-520-1 AND 1-520-7 ONLY: Loosely couple marker to Looker Point "B" on VHF tuner.	42.1 & 45.75 MC	Looker Point "B" on VHF tuner.	43.25 MC 10 MC Sweep		Pin 5 of 1st Video IF Amp. thru detector circuit.	L54 (Bot. Core); T2 (VHF tuner)	Response curve shown in Fig. A.	Remove AGC voltage. Disconnect T55 primary lead from pin 5 of V1 - 6CB6; connect 330 Ohm resistor in its place (from R128 - 1K to pin 5 of V1). Lower Osc./Mix. tube shield to normal position. On chassis 1-514-1 and 1-520-1 and -7, set VHF tuner to any free high channel; on chassis 1-514-3, 1-514-4, 1-520-3, 1-520-4 and 1-520-8, set VHF tuner between any two channels. L53 controls width of curve on 1-514-3, 1-514-4, 1-520-3, 1-520-4 and 1-520-8 chassis.
	CHASSIS 1-514-3, 1-514-4, 1-520-3, 1-520-4, 1-520-8 ONLY: Loosely couple marker to pin 5, 6J6 thru hole in VHF tuner.	42.1 & 45.75 MC	Pin 5, 6J6 thru hole in VHF tuner.	43.25 MC 10 MC Sweep		Pin 5 of 1st Video IF Amp. thru detector circuit.	L54 (Bot. Core); L8 (VHF tuner); L53	Response curve shown in Fig. C.	
3.	Repeat step 2 until curve is flat with 42.1 MC and 45.75 MC markers on corners. REMOVE 330 OHM RESISTOR AND RECONNECT T55 before proceeding with step 4								
4.	To raised tube shield on Osc./Mix. tube.	41.25 MC			Across diode load resistor R147-4.7K.		L55 4th Video IF trap.	Min.	Set VHF tuner to free channel. Apply -3V. between C130 - .22 Mfd. and chassis. Use sufficient output for satisfactory reading.
5.	Same as 4	47.25 MC	———	———	Same as 4	———	T56 (Top Core)	Min.	Same as 4
6.	Same as 4	41.25 MC	———	———	Same as 4	———	T55 (Top Core)	Min.	Same as 4
7.	Same as 4	44.0 MC	———	———	Same as 4	———	T58	Max.	Same as 4. Reduce signal generator output to keep VTVM reading between 1 and 2 volts.
8.	Same as 4	42.0 MC	———	———	Same as 4	———	T57	Max.	Same as 7
9.	Same as 4	45.2 MC	———	———	Same as 4	———	T56 (Bot. Core)	Max.	Same as 7
10.	Same as 4	43.2 MC	———	———	Same as 4	———	T55 (Bot. Core)	Max.	Same as 7
11.	Repeat steps 4 to 6 inclusive.								
12.	Loosely couple marker to raised tube shield on Osc./Mixer.	41.25 MC 42.1 MC 45.75 MC 47.25 MC	To raised tube shield on Osc./Mixer tube.	43.25 MC 10 MC Sweep	———	Across diode load resistor R147 - 4.7K with 33K resistor in series with hot scope lead.	T58 T57 T56 (Bot. Core) T55 (Bot. Core)	Response Curve shown in Fig. B	Same as 4. Use low signal input and high scope gain. Retouch T58, T57, T56 and T55 adjustments slightly to obtain response curve shown.

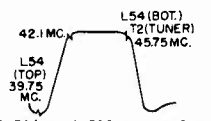


SOUND DISCRIMINATOR ALIGNMENT SETUP



(NOT NECESSARY IF SHIELDED LEAD IS USED ON SCOPE)

VIDEO IF DETECTOR CIRCUIT



1-514-1, 1-520-1, 1-520-7
FIGURE A

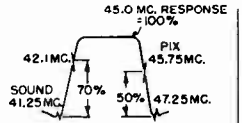
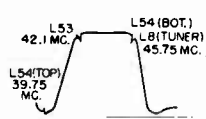


FIGURE B

VIDEO IF RESPONSE CURVES



1-514-3, 1-514-4, 1-520-3, 1-520-4, 1-520-8
FIGURE C

4.5MC TRAP ALIGNMENT

STEP	SIGNAL GENERATOR Connection	Freq.	VTVM CONNECTIONS RF Probe	Ground Lead	ADJUST	OUTPUT READING	COMMENTS
1.	To Pin 2 of 12BY7 Video Amplifier.	4.5 MC	RF Probe connected to Cathode (Pin 11) of Picture Tube.	To chassis.	L61	Min.	Short Pin 1 of V4-6CB6 4th Video IF Amplifier to Chassis.

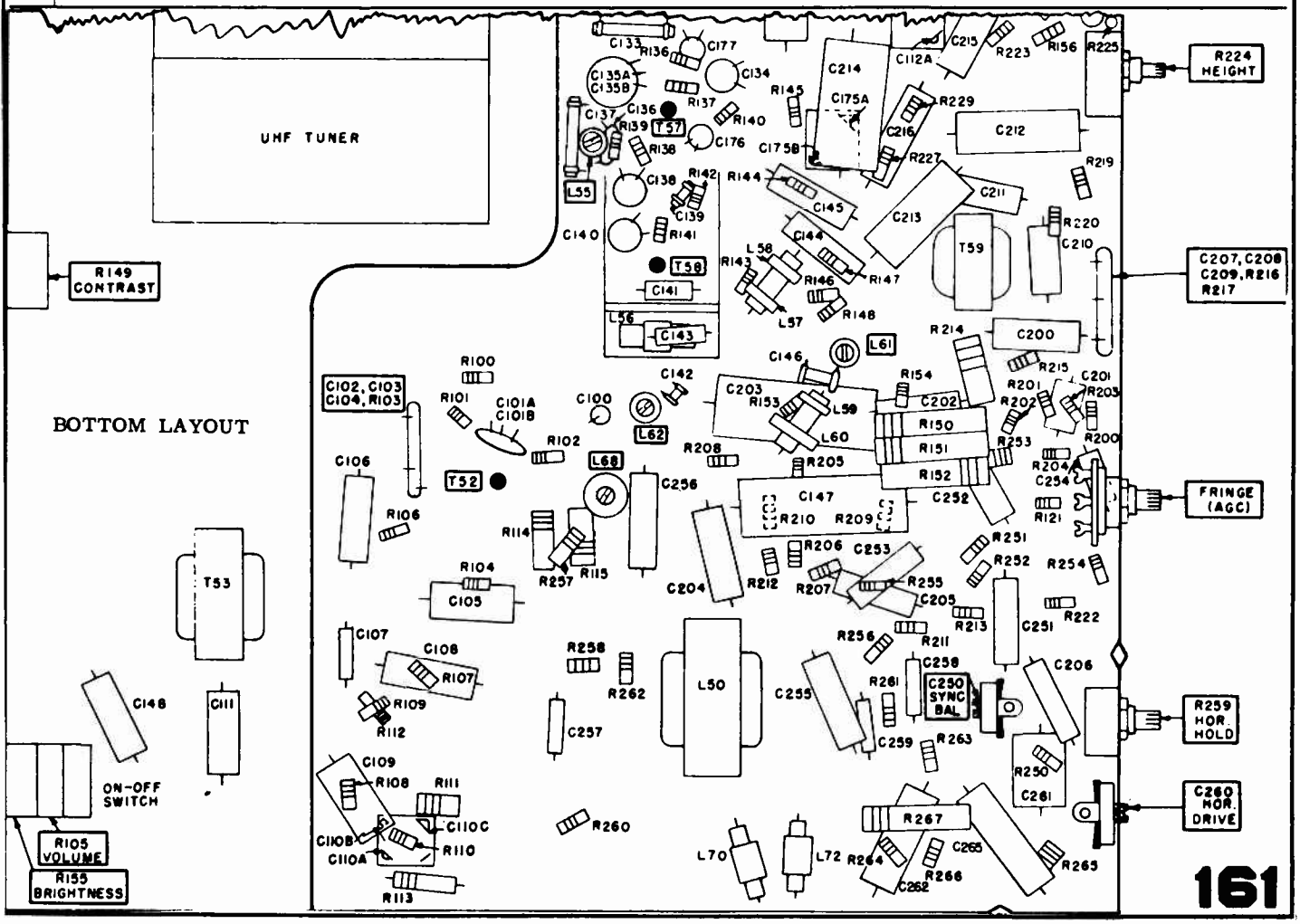
SYLVANIA Chassis 1-514 and 1-520, continued

SOUND ALIGNMENT

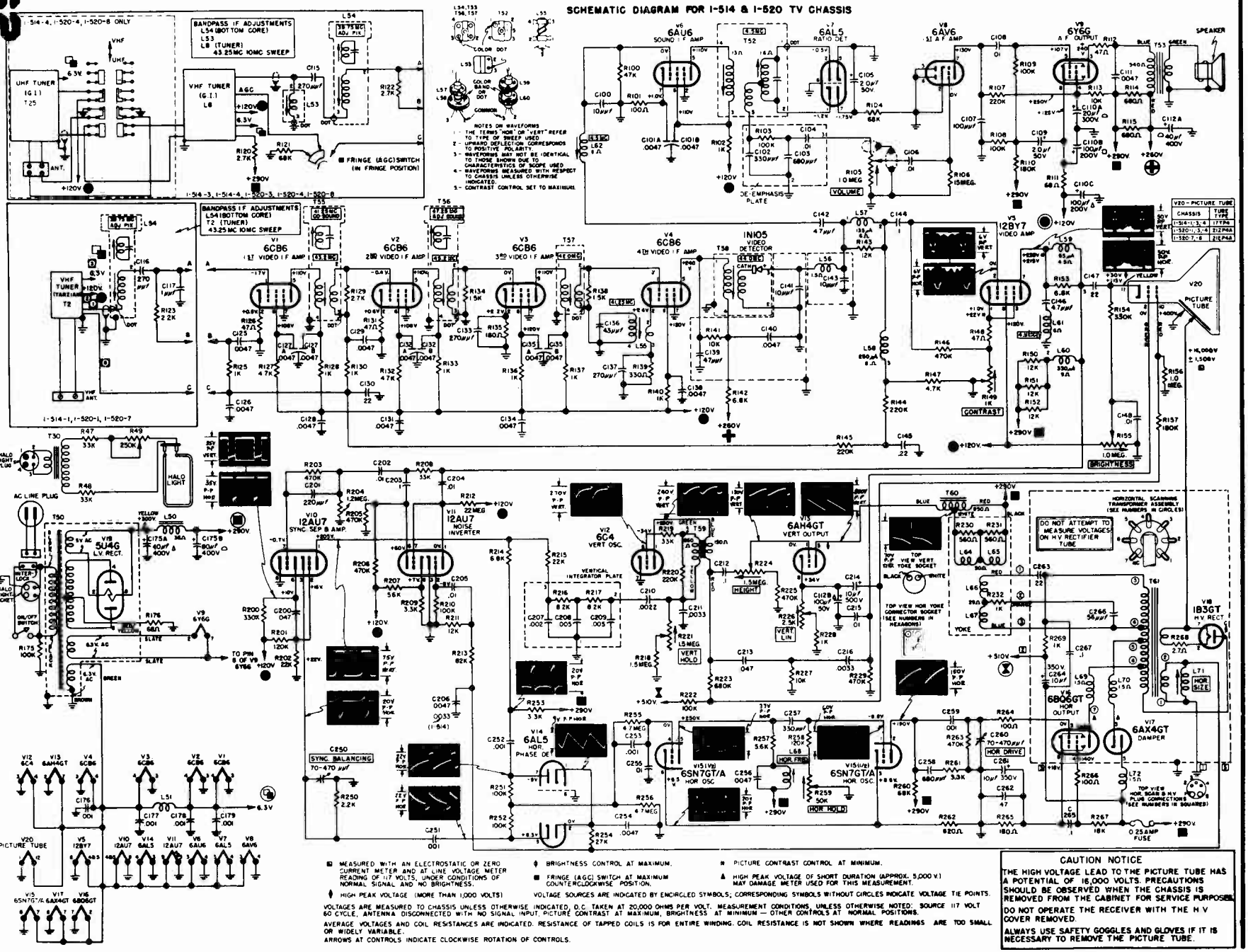
STEP	SIGNAL GENERATOR CONNECTION	VTVM CONNECTIONS DC Probe	VTVM CONNECTIONS Ground Lead	ADJUST	OUTPUT READING	COMMENTS
1.	45 MC and 4.5 MC generators each connected through a 1000 ohm resistor to pin 1 of V1-6CB6 1st video IF Amplifier or 45 MC generator with 4.5 MC marker (preferably crystal controlled) through 1000 ohm resistor to pin 1 of V1.	To pin 5 of V7-6AL5.	To pin 7 of V7.	T52 Sec. (Top Core) T52 Prl. (Bot. Core) L62	Max.	Set tuner to free channel with minimum interference.
2.	Same as 1	To junction of two matched 100K resistors connected in series across R104.	Thru 100K resistor to terminal 5 of T52.	T52 Sec. (Top Core)	Zero	Use lowest meter scale set to zero center. At correct setting, a slight turn of core will give either a positive or negative reading.
3.	Remove test equipment and resistors.					

ALTERNATE SOUND ALIGNMENT

STEP	SIGNAL SOURCE	VTVM CONNECTIONS DC Probe	VTVM CONNECTIONS Ground Lead	ADJUST	OUTPUT READING	COMMENTS
1.	Connect a good antenna installation to the receiver.					
2.	Strong station	To pin 5 of V7-6AL5.	To pin 7 of V7-6AL5.	T52 Prl. (Bot. Core) L62	Max.	Repeat all adjustments until maximum is reached.
3.	Strong station	Thru 100K resistor to terminal 5 of T52.	To junction of two matched 100K resistors connected in series across R104.	T52 Sec. (Top Core)	Zero	Use lowest meter scale set to zero center. At correct setting, a slight turn of core will give either a positive or negative reading.
4.	Remove test equipment and resistors.					



SYLVANIA ELECTRIC PRODUCTS Chassis 1-514 and 1-520 Circuit Diagram



CAUTION NOTICE

THE HIGH VOLTAGE LEAD TO THE PICTURE TUBE HAS A POTENTIAL OF 16,000 VOLTS. PRECAUTIONS SHOULD BE OBSERVED WHEN THE CHASSIS IS REMOVED FROM THE CABINET FOR SERVICE PURPOSES.

DO NOT OPERATE THE RECEIVER WITH THE H.V. COVER REMOVED.

ALWAYS USE SAFETY GOGGLES AND GLOVES IF IT IS NECESSARY TO REMOVE THE PICTURE TUBE.

MOST-OFTEN-NEEDED 1954 TELEVISION SERVICING INFORMATION

CODE CHANGES

DESCRIPTION OF CHANGE	CHASSIS → 1-514-1	1-514-3	1-514-4	1-520-1	1-520-3	1-520-4	1-520-7	1-520-8	
Hor. Osc. socket and Audio Output transformer relocated.	C01	I. P.	C01	I. P.	I. P.	I. P.	I. P.	I. P.	
R269 - 1 K and C267 - .1 Mfd. added to H. V. assembly (Initial change).	C02	I. P.	C02	C01	I. P.	C01	I. P.	I. P.	
R269 - 1 K and C267 - .1 Mfd. added to H. V. assembly (Revised production).	C03	I. P.	C03	C02	I. P.	C02	C01	C01	
C206 - .0033 Mfd. changed to 0047 Mfd. (1-514 only)	C04	—	C04	—	—	—	—	—	
C261 - 10 Mfd. removed.	C04	I. P.	C04	C03	I. P.	C03	C02	C02	

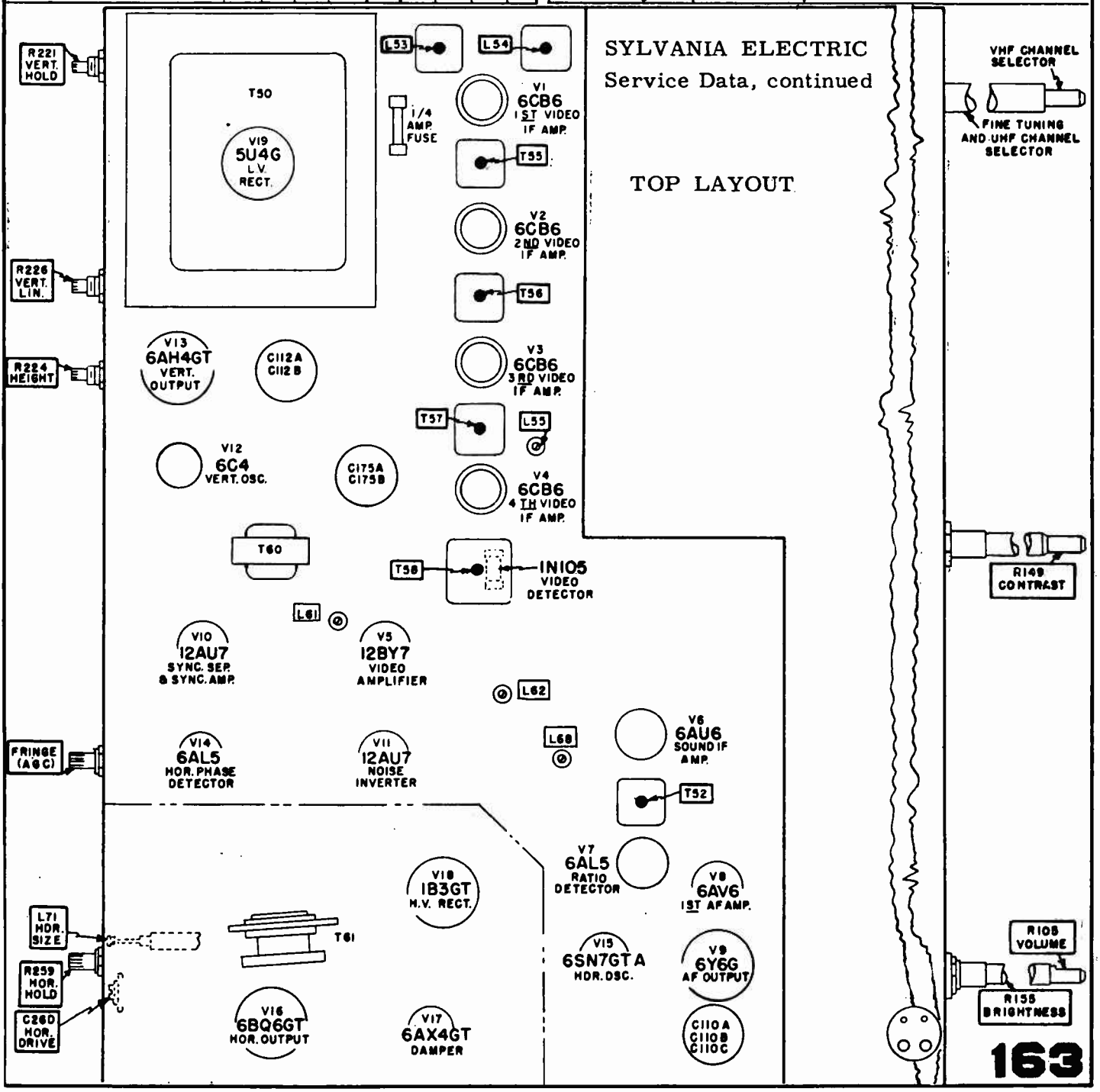
CHASSIS VARIATIONS

CHASSIS	PICTURE TUBE	TUNERS VHF	TUNERS UHF	HALOLIGHT	MODELS
1-514-1	17YP4(Cyl.)	S.T.	—	No	105-14; 300
1-514-3	17YP4(Cyl.)	G.I.	—	No	Same as 1-514-1.
1-514-4	17YP4(Cyl.)	G.I.	G.I.	No	105-14; 300 ("U" Models)
1-520-1	21ZP4A(Spher.)	S.T.	—	No	120-20; 320; 325
1-520-3	21ZP4A(Spher.)	G.I.	—	No	Same as 1-520-1.
1-520-4	21ZP4A(Spher.)	G.I.	G.I.	No	120-20; 325 ("U" Models)
1-520-7	21EP4A(Cyl.)	S.T.	—	Yes	326
1-520-8	21EP4A(Cyl.)	G.I.	G.I.	Yes	326 ("U" Models)

S.T. - Sarkes - Tarzian tuner.
G.I. - General Instrument tuner.
"U" Models - All-channel models designated BU, MU, etc.
Cyl. - Cylindrical faced; Spher. - Spherical faced.
I. P. - Change incorporated in initial production.

SYLVANIA ELECTRIC
Service Data, continued

TOP LAYOUT



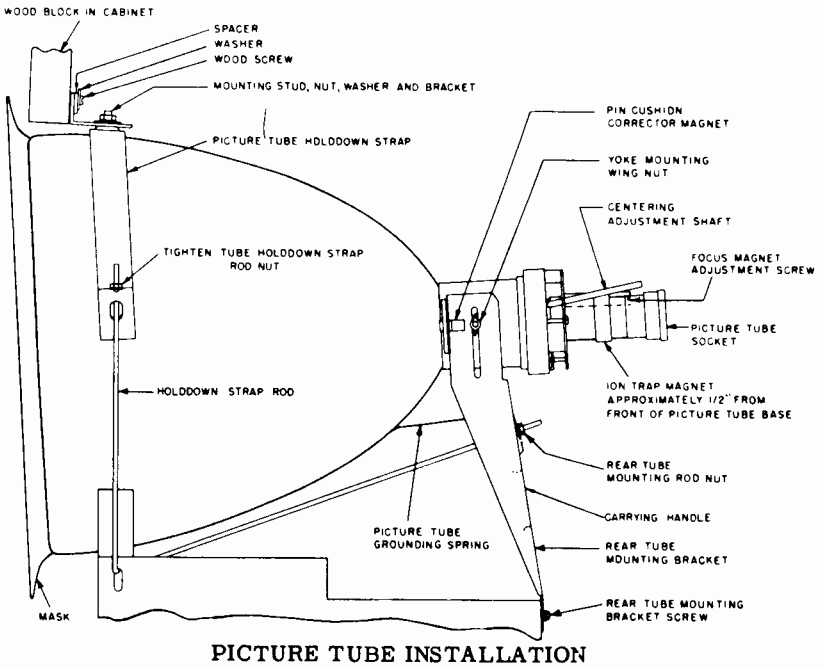
SYLVANIA TELEVISION

CHASSIS 1-518-1, -2, -3

MODELS ALL 175-18, 372, 373, 375, 376, 377 SERIES

(Pages 164 to 168)

SYLVANIA ELECTRIC PRODUCTS INC.



PICTURE TUBE INSTALLATION

Note 1: The terms "Horizontal," or "Vertical," refer to the oscilloscope sweep employed.

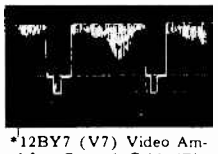
Note 2: All waveforms are taken with the oscilloscope horizontal sweep direction from left to right and with upward deflection corresponding to positive polarity.

Note 3: In some instances the waveforms obtained will not be identical with those shown, due to the electrical characteristics of the oscilloscope used.

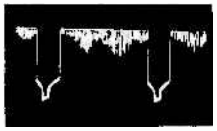
Note 4: All waveforms are measured with respect to chassis unless otherwise indicated.

Note 5: Have Picture (Contrast) control at maximum.

*The peak to peak (PP) voltages of these waveforms are dependent on the depth of modulation of the transmitted signal; voltages shown are obtained when modulation is approximately 90 percent.

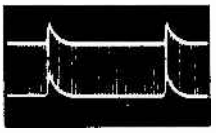


*12BY7 (V7) Video Amplifier Control Grid (Pin 2) 3.5 Volts (PP) Vertical



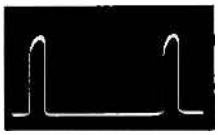
*12BY7 (V7) Video Amplifier Control Grid (Pin 2) 3.5 Volts (PP) Horizontal

12AX7 (V14) Hor. Sync Separator and AGC Rectifier Cathode (Pin 3) 6 Volts (PP) Vertical

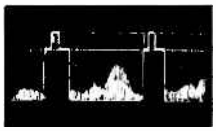


12AX7 (V14) Hor Sync Separator and AGC Rectifier Plate (Pin 1) 45 Volts (PP) Vertical

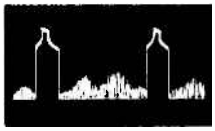
12AX7 (V14) Sync Separator Plate (Pin 6) 40 Volts (PP) Vertical



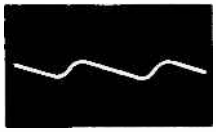
12AU7 (V15) Sync Amplifier and Clipper Plate (Pin 1) 80 Volts (PP) Horizontal



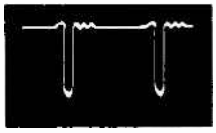
*12BY7 (V7) Video Amplifier Plate (Pin 7) 75 Volts (PP) Vertical



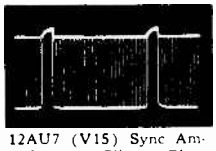
*12BY7 (V7) Video Amplifier Plate (Pin 7) 75 Volts (PP) Horizontal



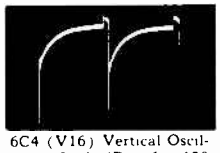
12AX7 (V14) Hor. Sync Separator and AGC Rectifier Cathode (Pin 3) 4.0 Volts (PP) Horizontal



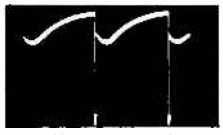
12AX7 (V14) Hor. Sync Separator and AGC Rectifier Plate (Pin 1) 45 Volts (PP) Horizontal



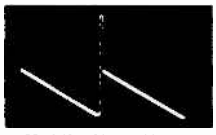
12AU7 (V15) Sync Amplifier and Clipper Plate (Pin 1) 90 Volts (PP) Vertical



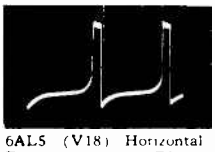
6C4 (V16) Vertical Oscillator Grid (Pin 6) 180 Volts (PP) Vertical



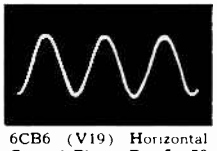
6C4 (V16) Vertical Oscillator Plate (Pin 1) 180 Volts (PP) Vertical



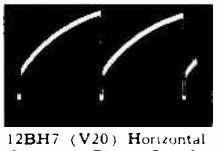
6AH4GT (V17) Vertical Output Plate (Pin 5) 700 Volts (PP) Vertical



6AL5 (V18) Horizontal Discriminator Plate (Pin 2) 55 Volts (PP) Horizontal

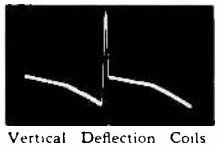


6CB6 (V19) Horizontal Control Plate (Pin 5) 70 Volts (PP) Horizontal

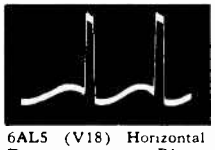


12BH7 (V20) Horizontal Discharge Plate (Pin 6) 85 Volts (PP) Horizontal

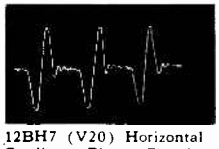
6AH4GT (V17) Vertical Output Grid (Pin 1) 85 Volts (PP) Vertical



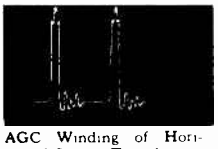
Vertical Deflection Coils (Test Point 1) 70 Volts (PP) Vertical



6AL5 (V18) Horizontal Discriminator Plate (Pin 7) 55 Volts (PP) Horizontal



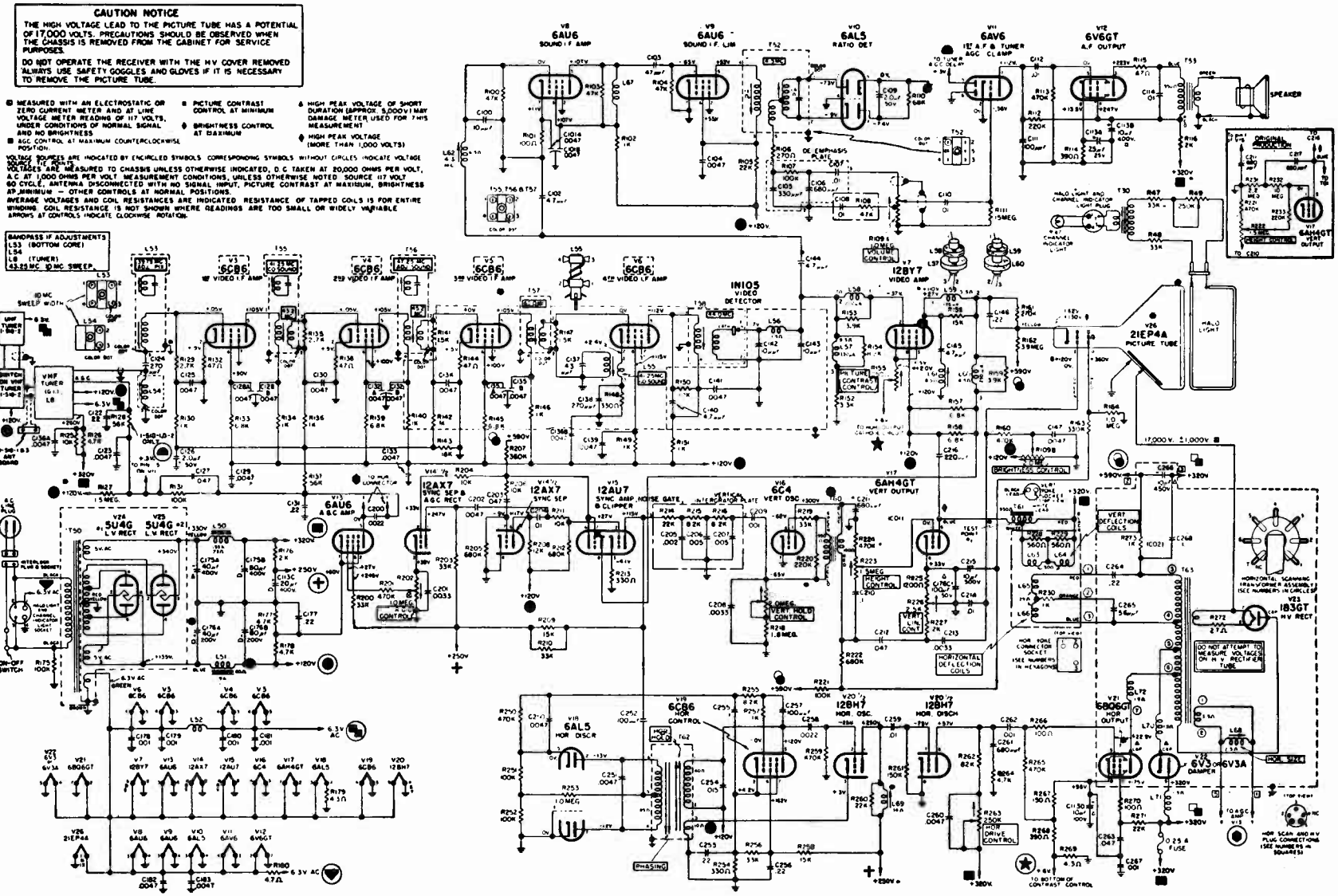
12BH7 (V20) Horizontal Oscillator Plate (Pin 1) 80 Volts (PP) Horizontal



AGC Winding of Horizontal Output Transformer (Point X to Ground) 300 Volts (PP) Horizontal

SYLVANIA ELECTRIC PRODUCTS Circuit Diagram

Chassis 1-518-1, -2, -3, Models All 175-18, 372, 373, 375, 376, 377



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VIDEO IF, 4.5MC TRAP AND SOUND ALIGNMENT PROCEDURES

PREALIGNMENT INSTRUCTIONS - READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT.

1. Lay chassis on side for under chassis adjustments.
2. Ground all test equipment unless otherwise stated.
3. When constructing detector circuit keep leads short.
4. Use proper insulated alignment tools for powdered iron cores with hex holes or slots and metallic screw drivers for those cores adjusted by brass screws.
5. Allow receiver to warm up for approximately 15 minutes before proceeding with alignment.

NOTE: During Video IF Alignment, when indicated, raise shield on Oscillator-Mixer tube so that ground contact is broken.

VIDEO IF ALIGNMENT

STEP	SIGNAL GENERATOR Connection	Freq.	SWEEP GENERATOR Connection	Freq.	VTVM CONNECTION	OSCILLOSCOPE CONNECTION	ADJUST	OUTPUT READING	COMMENTS
1.	To raised tube shield on Osc. - Mixer	39.75 MC	———	—	Across Diode Load Res. R152 3.3K	———	L53 (Top Core)	Min.	Set Tuner to free channel. Apply -12 V. between junction of R137 and C131 and chassis. Use sufficient output for satisfactory readings.
2.	Loosely couple marker to control grid (pin 5) of 6J6 Osc. - Mixer through hole in Tuner Cover.	45.75 MC 42.1 MC	Through Hole in tuner cover to Pin 5 of 6J6	43.25 MC 10 MC Sweep	———	Plate Pin 5 of V3 6CB6 through Detector Circuit. See "Comments"	L53 (Bot. Core), L8 (Tuner), L54	Response Curve shown in Fig. A	Remove AGC voltage. Disconnect T55 primary from pin 5 of V3 6CB6; connect a 330 ohm resistor in its place. Lower Osc.-Mixer tube shield. Set VHF tuner between any two channels. L54 controls width of curve.
3.	Repeat step 2 adjustments until curve is flat with 42.1 MC and 45.75 MC markers on corners. REMOVE 330 OHM RESISTOR AND RECONNECT T55 before proceeding with step 4.								
4.	To raised tube shield on Osc. - Mixer	41.25 MC	———		Across Diode Load Res. R152 3.3K	———	L55 4th Video IF trap.	Min.	Set Tuner to free channel. Apply -12 V. between junction of R137 and C131 and chassis. Use sufficient output for satisfactory readings.
5.	Same as 4	47.25 MC	———		Same as 4	———	T56 (Top Core)	Min.	Same as 4
6.	Same as 4	41.25 MC	———		Same as 4	———	T55 (Top Core)	Min.	Same as 4
7.	Same as 4	44.0 MC	———		Same as 4	———	T58	Max.	Same as 4. Reduce Sig. Gen. output to keep VTVM reading between 1 and 2 Volts.
8.	Same as 4	42.0 MC	———		Same as 4	———	T57	Max.	Same as 7
9.	Same as 4	45.2 MC	———		Same as 4	———	T56 (Bot. Core)	Max.	Same as 7
10.	Same as 4	43.2 MC	———		Same as 4	———	T55 (Bot. Core)	Max.	Same as 7
11.	Repeat steps 4 to 6 inclusive.								
12.	Loosely couple marker to raised tube shield on Osc.-Mixer	41.25 MC 42.1 MC 45.75 MC 47.25 MC	To raised tube shield on Osc.-Mixer	43.25 MC 10 MC Sweep	———	Across Diode Load Res. R152 3.3K with 33K resistor in series with hot scope lead.	T58 T57 T56 (Bot. Core) T55 (Bot. Core)	Response Curve shown in Fig. B	Same as 4. Use low signal input and high scope gain.

4.5MC TRAP ALIGNMENT

STEP	SIGNAL GENERATOR Connection	Freq.	VTVM CONNECTIONS RF Probe	Ground Lead	ADJUST	OUTPUT READING	COMMENTS
1.	To Pin 2 of 12BY7 Video Amplifier	4.5 MC	RF Probe connected to Cathode (Pin 11) of Picture Tube	To chassis	L61	Min.	Short Pin 1 of V6 6CB6 4th Video IF Amplifier to Chassis

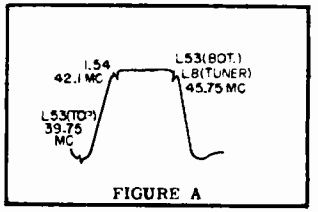
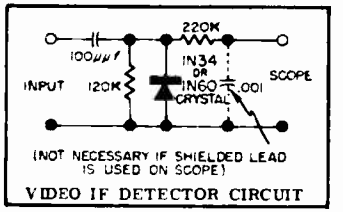


FIGURE A



VIDEO IF DETECTOR CIRCUIT

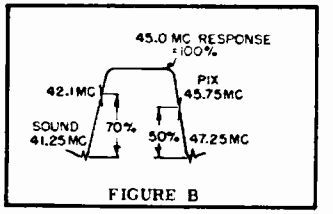


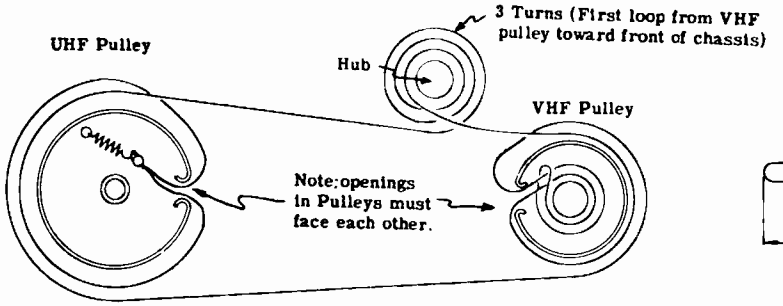
FIGURE B

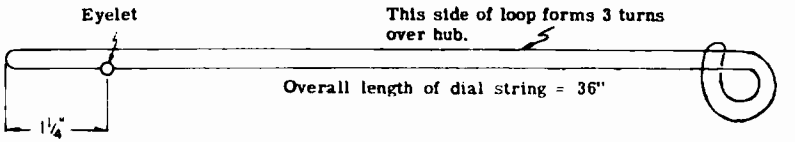
SOUND ALIGNMENT

STEP	SIGNAL GENERATOR CONNECTION	VTVM CONNECTIONS DC Probe	VTVM CONNECTIONS Ground Lead	ADJUST	OUTPUT READING	COMMENTS
1.	45 MC and 4.5 MC generators each connected through a 1000 ohm resistor to pin 1 of V3 6CB6 1st Video IF Amplifier or 45 MC generator with 4.5 MC marker (preferably crystal controlled) through 1000 ohm resistor to pin 1 of V3.	To pin 7 of V10 6AL5	To pin 5 of V10 6AL5.	T52 Sec. (Top Core) T52 Pri. (Bot. Core) L62	Max.	Set tuner to free channel with minimum interference.
2.	Same as 1	To junction of two matched 100K resistors connected in series across R110.	To pin 1 of de-emphasis plate through 100K resistor	T52 Sec. (Top Core)	Zero	Use lowest meter scale set to zero center. At correct setting, a slight turn of core will give either a positive or negative reading.
3.	Remove test equipment and resistors.					

ALTERNATE SOUND ALIGNMENT

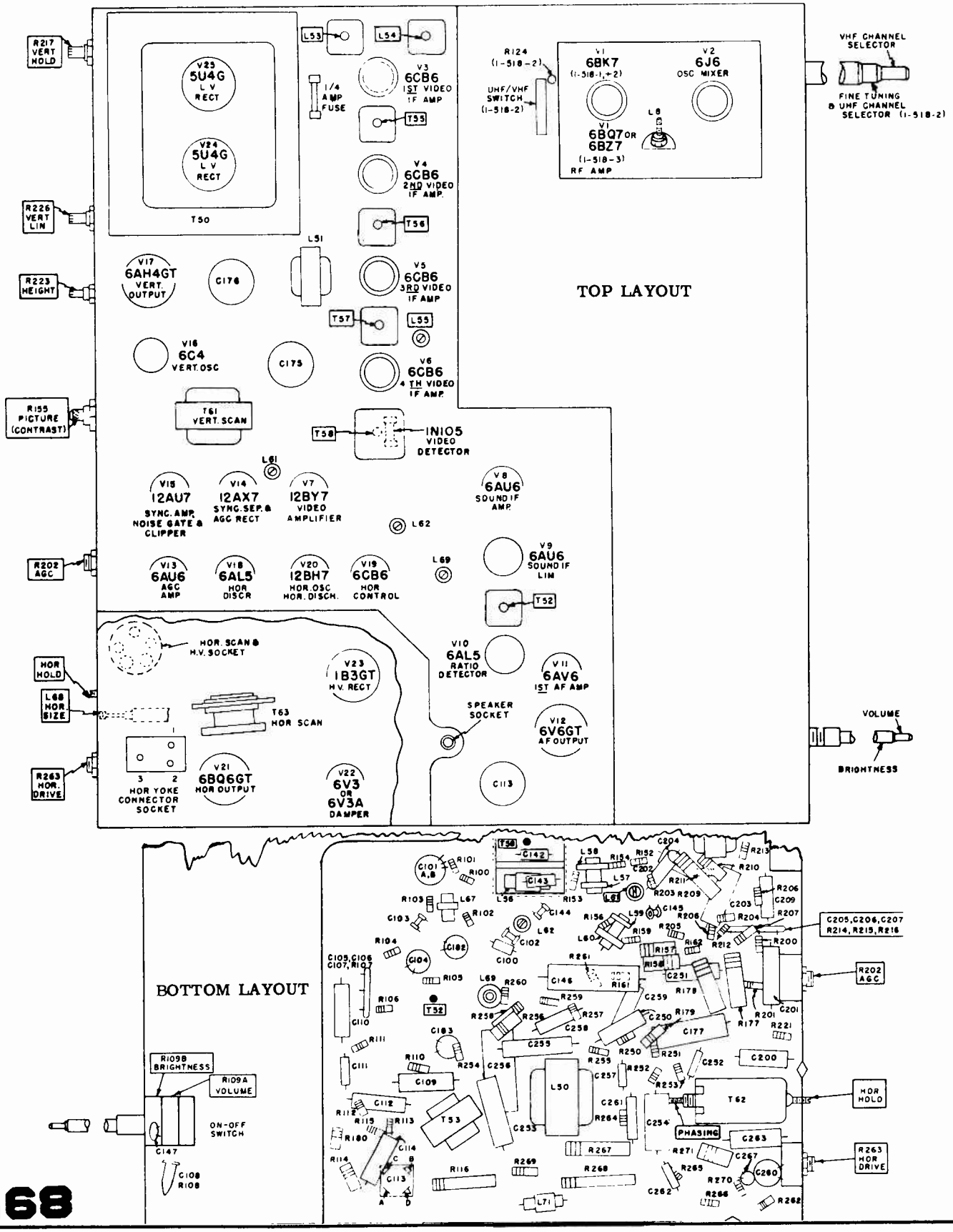
STEP	SIGNAL SOURCE	VTVM CONNECTIONS DC Probe	VTVM CONNECTIONS Ground Lead	ADJUST	OUTPUT READING	COMMENTS
1.	Connect a good antenna installation to the receiver.					
2.	Strong station	To pin 7 of V10 6AL5	To pin 5 of V10 6AL5	T52 Pri. (Bot. Core) L62	Max.	Repeat all adjustments until maximum is reached.
3.	Strong station	To terminal 5 of T52	To junction of two 100K resistors in series from pin 5 to pin 7 of V10 6AL5.	T52 Sec. (Top Core)	Zero	Use lowest meter scale set to zero center. At correct setting, a slight turn of core will give either a positive or negative reading.
4.	Remove test equipment and resistors.					





UHF/VHF DIAL CORD STRINGINGING

SYLVANIA Chassis 1-518-1, -2, -3, Service Information, Continued.



Westinghouse
TELEVISION

Models H-765T17, H-766T17, H-810T17, Chassis V-2240-1, V-2240-2, and

Models H-770T21, H-771T21, H-772K21, H-773K21, H-774K21, H-775K21, H-776T21, H-786K21, H-787K21, using Chassis V-2243-1.

MODELS CONTAINING ALL-CHANNEL UHF TUNERS

When the letter "U" appears in the model number, it indicates that the receiver contains an all-channel UHF tuner in addition to its VHF facilities. For example, Model H-770TU21 is the same as Model H-770T21 except that an all-channel UHF tuner has been added to it.

The service material and alignment information presented on pages 169 to 171, applies to all models listed above. Separate circuit diagrams for Chassis V-2240-1 and -2 (pages 172-173), and for Chassis V-2243-1 (on pages 174-175), are printed since these diagrams differ in some respects. Refer to correct material.

The following additional Models H-782K21, H-783K21, H-784K21, H-785K21, H-791K21, H-792K21, using Chassis V-2247-1, and Models H-788C21, H-789C21, H-790C21, H-794C21, using Chassis V-2249-1, are similar to Chassis V-2243-1, and differ mainly in the Sound I.F. and Audio sections. Models H-795T27, H-815T24, and H-817K24, using Chassis V-2250-1, are also similar to V-2243-1, with the main differences in the Power and Sweep sections.

This drawing is exact for Chassis V-2243-1

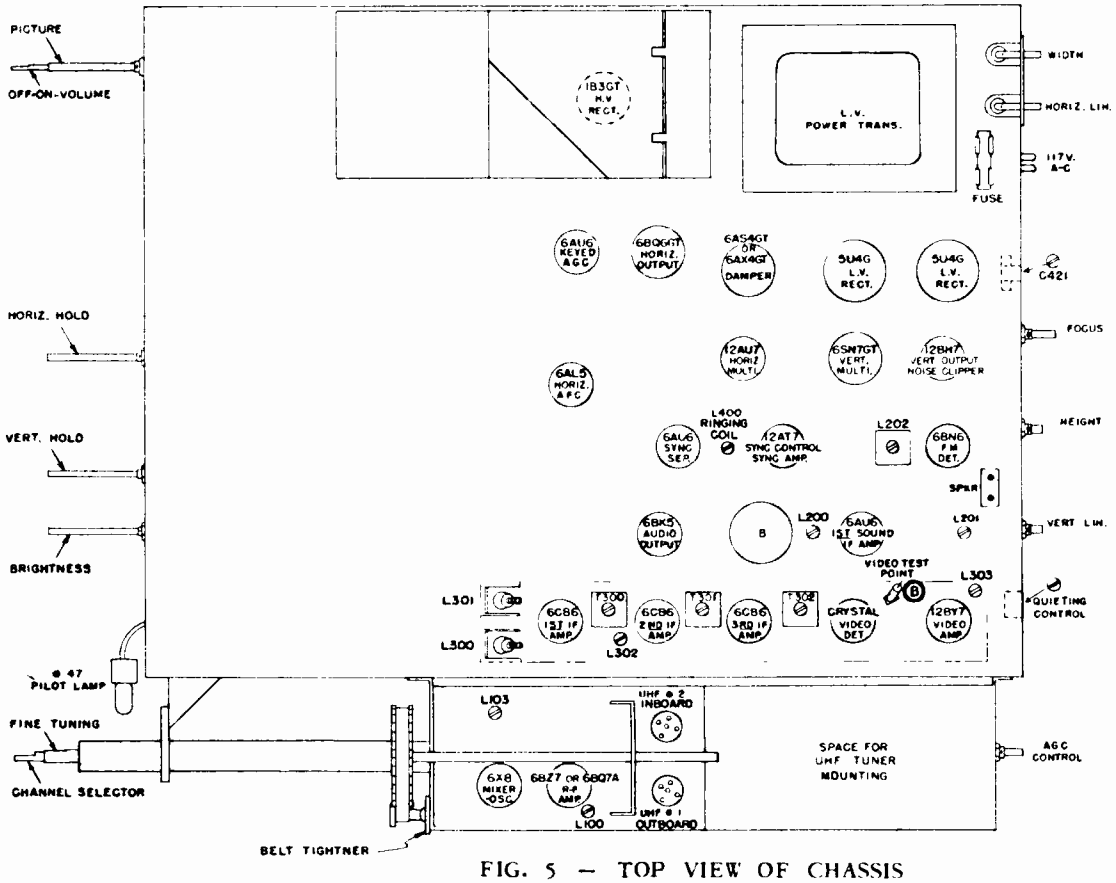


FIG. 5 — TOP VIEW OF CHASSIS

Westinghouse Electric, Television Chassis V-2240-1, V-2240-2, V-2243-1

ALIGNMENT CHARTS

COMMON I-F SECTION

Rotate the channel selector to channel 13.

Connect the oscilloscope to the video test terminal, point "B" through the decoupling network shown in Fig. 2.

Connect a 9 volt bias battery to the AGC line, point "A".

Couple the marker generator output to the sweep generator output. In the steps that follow, use the marker to check the response curve at the frequencies indicated on Fig. 6.

Step	*Alignment Signal*	*Remarks*	*Adjust —*
1.	Remove the 6BZ7 R-F amplifier tube		
2.	44 mc. sweep to 3rd I-F grid	Connect detuning clips to 1st & 2nd I-F plates	Pri. of T302 for max. response and sec. of T302 for symmetrical curve shown in Fig. 6A
3.	47.25 mc. amplitude modulated to 1st I-F grid	Use sufficient signal to produce sine wave response on oscilloscope	L302 for min. response
4.	44 mc. sweep to 2nd I-F grid	Connect detuning clip to 1st I-F plate	Pri. of T301 for max. response and sec. of T301 for symmetrical curve shown in Fig. 6B
5.	44 mc. sweep to 1st I-F grid	Detune L103 before adjusting T300	Pri. of T300 for max. response and sec. of T300 for symmetrical curve
6.	44 mc. sweep to 1st I-F grid		L103 for "suck-out" at 44 mc. (center of curve). See Fig. 6C
7.	Replace the 6BZ7 R-F amplifier tube		
8.	213 mc. sweep to antenna terminals through network	Fine tuning set to mid-range	L300 for symmetrical curve and L301 for min. 41.25 mc. marker amplitude. See Fig. 6D

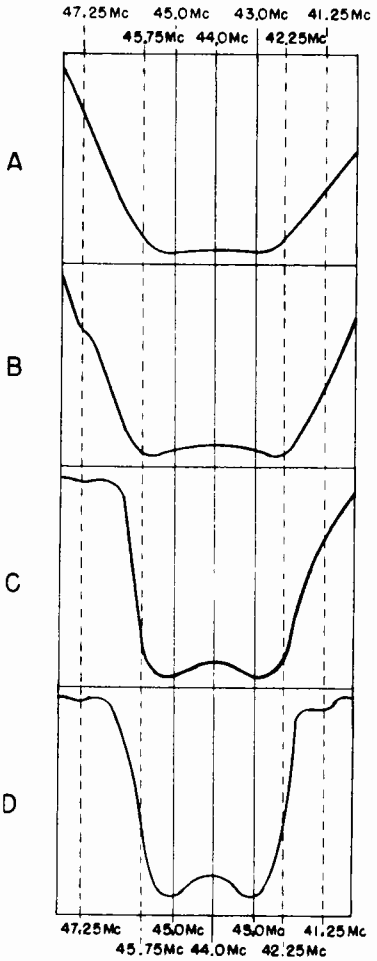


FIG. 6 — RESPONSE CURVES AT VARIOUS STAGES OF ALIGNMENT

4.5 MC. TRAP

Connect the signal generator to pin #3 or #7 of the 6BK5 video amplifier (point "B") through a .001 mfd capacitor.

Step	*Signal Gen. Frequency*	*VTVM Connections*	*Remarks*	*Adjust —*
1.	4.5 mc. unmodulated	R-F probe to point "C", and common lead to chassis	Use strong signal from generator	L303 for minimum voltage

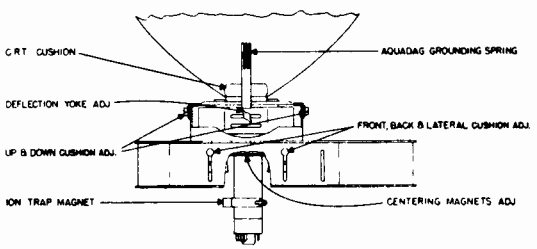


FIG. 1 — CRT ADJUSTMENTS

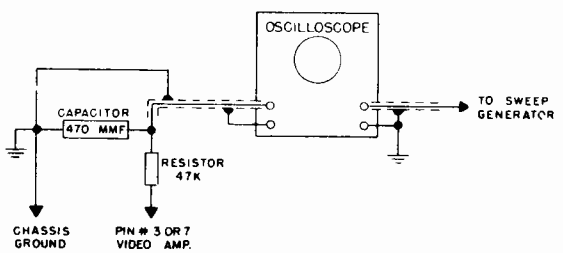


FIG. 2 — OSCILLOSCOPE CONNECTIONS

Westinghouse Electric, Television Chassis V-2240-1, V-2240-2, and V-2243-1
Alignment Information, continued. Sound Section.

The sound system can be aligned using either locally generated signals or a received TV signal. Since the latter method does not require signal generating equipment, it will be described first and will be followed by the procedure using locally generated signals.

To use an "air" TV signal for alignment:

1. Tune the receiver to a TV station and connect an attenuator between the receiver and the antenna so that the strength of the signal can be varied from weak to strong.

2. Set the quieting control (R202) located on the back of the chassis approximately to its mid-position.

3. Adjust the 4.5 mc. IF slug (L200) for maximum program sound. If peaks occur at two different positions of the slug, use the peak that occurs when the slug is farthest counterclockwise. Reduce the signal to its lowest usable level and recheck the adjustments.

4. Apply a *strong* signal to the receiver, and adjust the quadrature coil (L202) for maximum program sound. If peaks occur at two different positions that are widely separated, use the one that occurs with the slug farthest counterclockwise. If two peaks occur within a *narrow* range of adjustment, sufficient signal is not being applied to the receiver or the quieting control is not set at the desired position.

5. Apply a very weak signal that allows noise to be heard and adjust the quieting control (R202) for minimum noise. The position at which the noise is minimized depends on the strength of the signal; therefore, the weakest usable station in the area should be used for this adjustment. This control determines the AM rejection characteristics of the sound system, and its correct setting is normally about mid-position. ***Do not leave the quieting control set at its maximum counterclockwise position.***

To use locally generated signals for alignment:

1. Connect an oscilloscope or an AC voltmeter across the volume control for use as an indicator.

2. Apply a 4.5 mc. FM signal (deviation approximately 7.5 kc.) to pin #3 or #7 of the 6BK5 video amplifier.

3. Using the lowest signal level that will produce an indication, adjust L200 for maximum output.

4. Using a *strong* signal, adjust L202 for maximum output.

5. Apply a 4.5 mc. AM signal (modulated approximately 30 percent) to pin #3 or #7 of the 6BK5 video amplifier.

6. Beginning with a very low signal level, increase the generator output, while rotating the quieting control back and forth, until the signal level is such that the AM output across the volume control dips to *zero* with a rise on each side as the quieting control is rotated. Set the quieting control for zero output at this signal level.

CHASSIS REMOVAL

To avoid scratching or chipping the cathode ray tube, the speaker and baffle should be removed before attempting to remove the chassis from the cabinet. To release the speaker and baffle from the cabinet, remove the four No. 6 Phillips-head screws from the top of the cabinet.

CRITICAL LEAD DRESS

All leads located near the horizontal multivibrator trimmer capacitor, C430, must be dressed away from the capacitor and close to the chassis.

All resistors rated above one watt must be dressed away from each other and clear of other components and wires.

Video peaking coils should be dressed away from the chassis and clear of adjacent parts.

All leads in the high voltage unit must be dressed away from the high voltage transformer to prevent arcing.

Keep all leads in the I-F and video circuits as short as possible.

REFLECTION ELIMINATION

Light reflection from the pilot lamp can appear on the lower right hand corner of the CRT unless preventive measures are taken. To eliminate the reflection, a piece of electrical tape (1" x 6") is applied to the edge of the lower right corner of the CRT face.

When replacing a CRT, the electrical tape must be applied to the new tube in the same manner as it was applied to the old tube.

Westinghouse
TELEVISION

CHASSIS ASSEMBLY
V-2240-1 OR V-2240-2

In production, any or all of the following changes may be incorporated in V-2240-1 chassis.

R450 is changed from 6.8K to 12K to prevent horizontal overdrive.

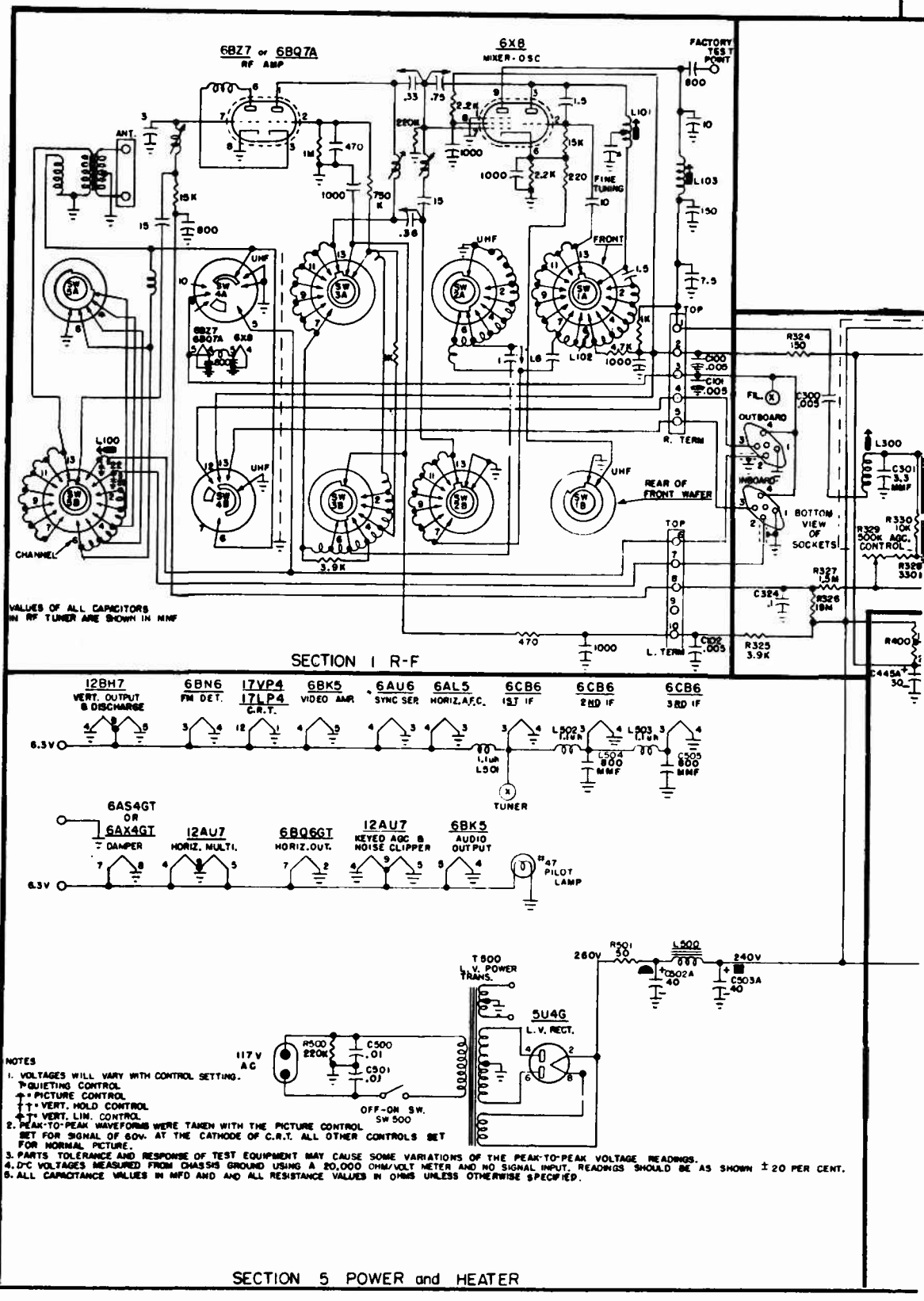
A condenser C447, 47mmf. is added between the plate (pin 5) of the 6AU6 sync separator and ground.

R316 is increased to 270K and R332 to 120K to prevent picture streaking.

Filament choke L505 part #V-4886-2 has been added in series with the filament (pin 3) of the 6BN6. A 12K resistor has been inserted between R203, 470 ohms and C211, .02 mfd.

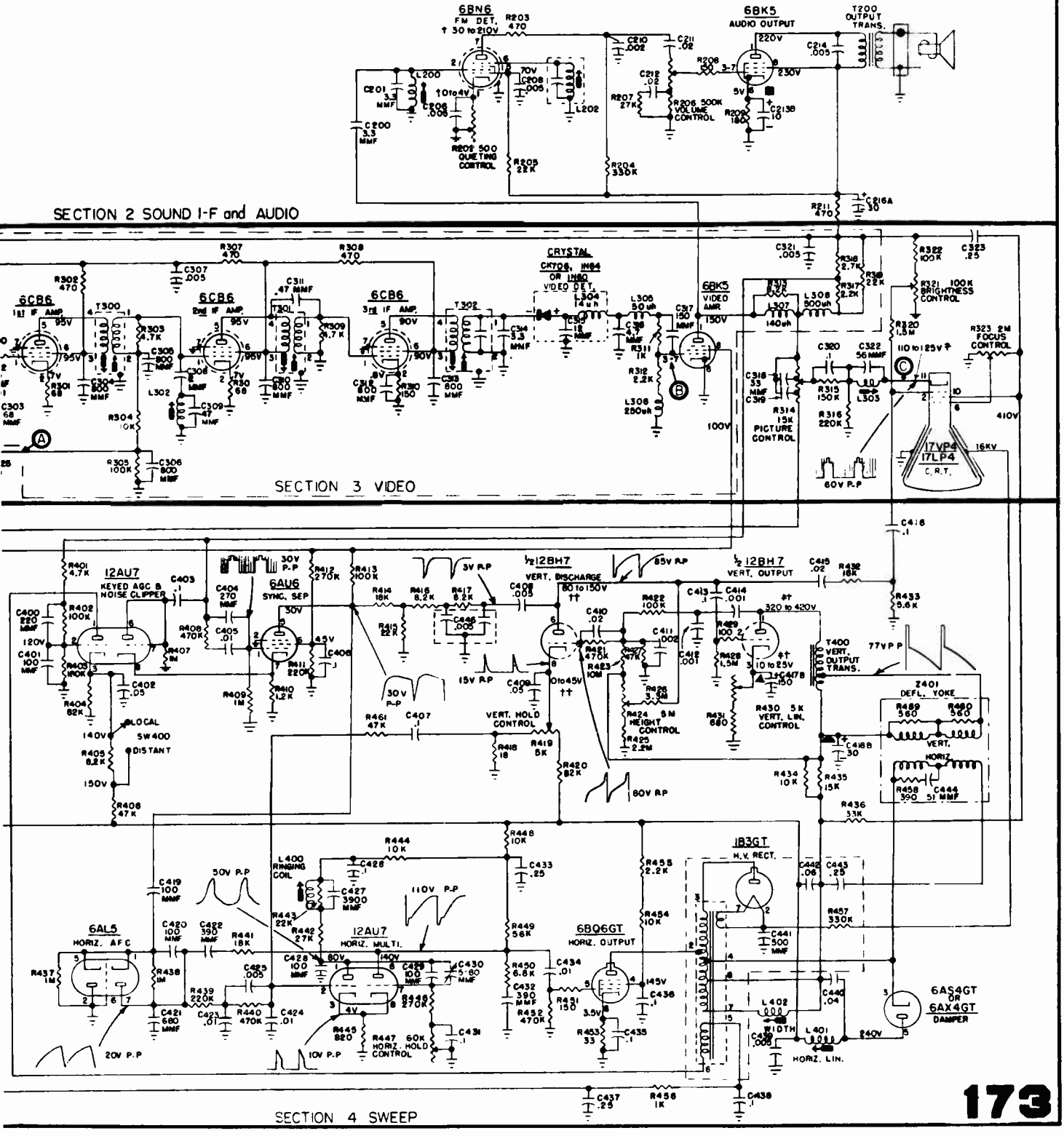
C419 is changed from 100 mmf. to 150 mmf.

8. C302, 1.5 mmf. has been changed to 2.2 mmf. to increase sound attenuation. With this change C301, 3.3 mmf., is unnecessary and has been removed.



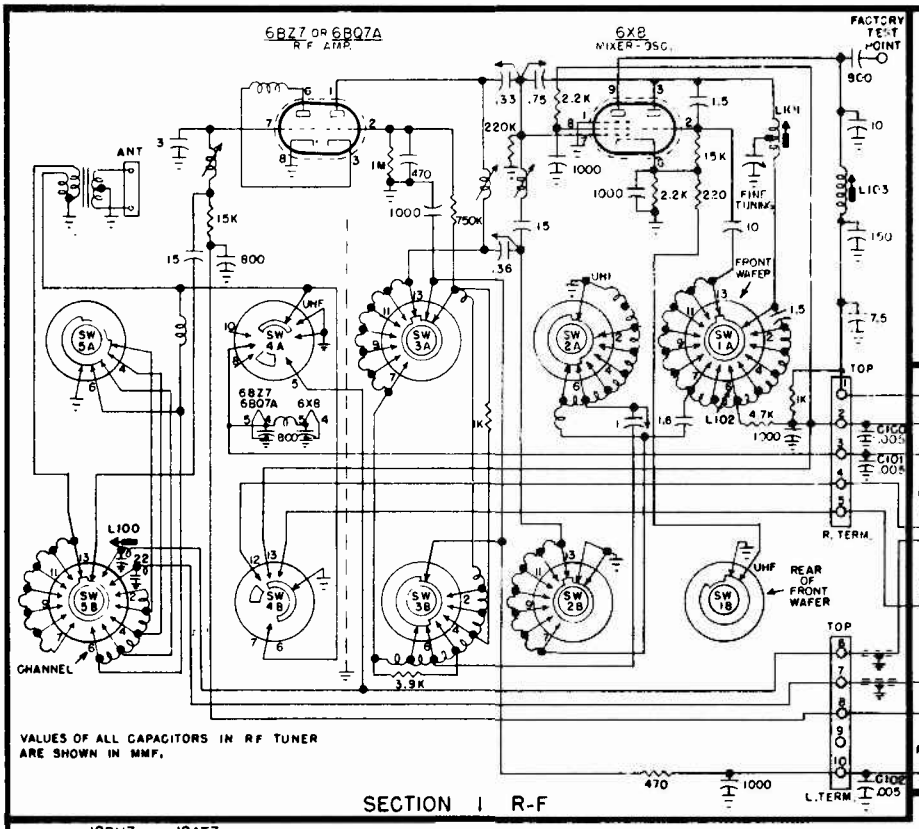
NOTES
1. VOLTAGES WILL VARY WITH CONTROL SETTING.
*QUIETING CONTROL
+ PICTURE CONTROL
†† VERT. HOLD CONTROL
‡‡ VERT. LIN. CONTROL
2. PEAK-TO-PEAK WAVEFORMS WERE TAKEN WITH THE PICTURE CONTROL SET FOR SIGNAL OF 60v. AT THE CATHODE OF C.R.T. ALL OTHER CONTROLS SET FOR NORMAL PICTURE.
3. PARTS TOLERANCE AND RESPONSE OF TEST EQUIPMENT MAY CAUSE SOME VARIATIONS OF THE PEAK-TO-PEAK VOLTAGE READINGS.
4. D-C VOLTAGES MEASURED FROM CHASSIS GROUND USING A 20,000 OHM/VOLT METER AND NO SIGNAL INPUT. READINGS SHOULD BE AS SHOWN ± 20 PER CENT.
5. ALL CAPACITANCE VALUES IN MFD AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.

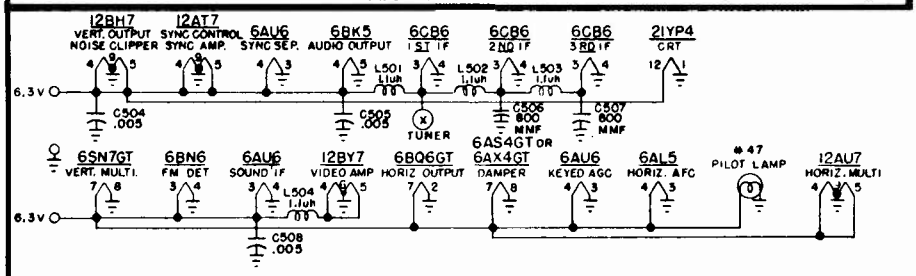
MODEL H-765T17 H-766T17 H-810T17



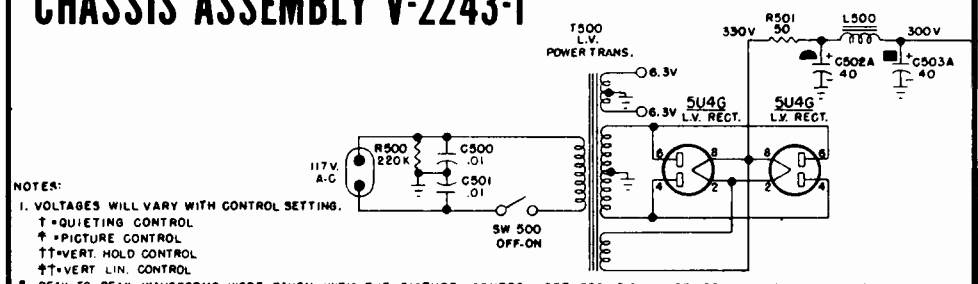
Westinghouse TELEVISION MODELS H-786K21 (MAHOGANY) H-787K21 (BLOND)

CHASSIS ASSEMBLY V-2243-1





CHASSIS ASSEMBLY V-2243-1



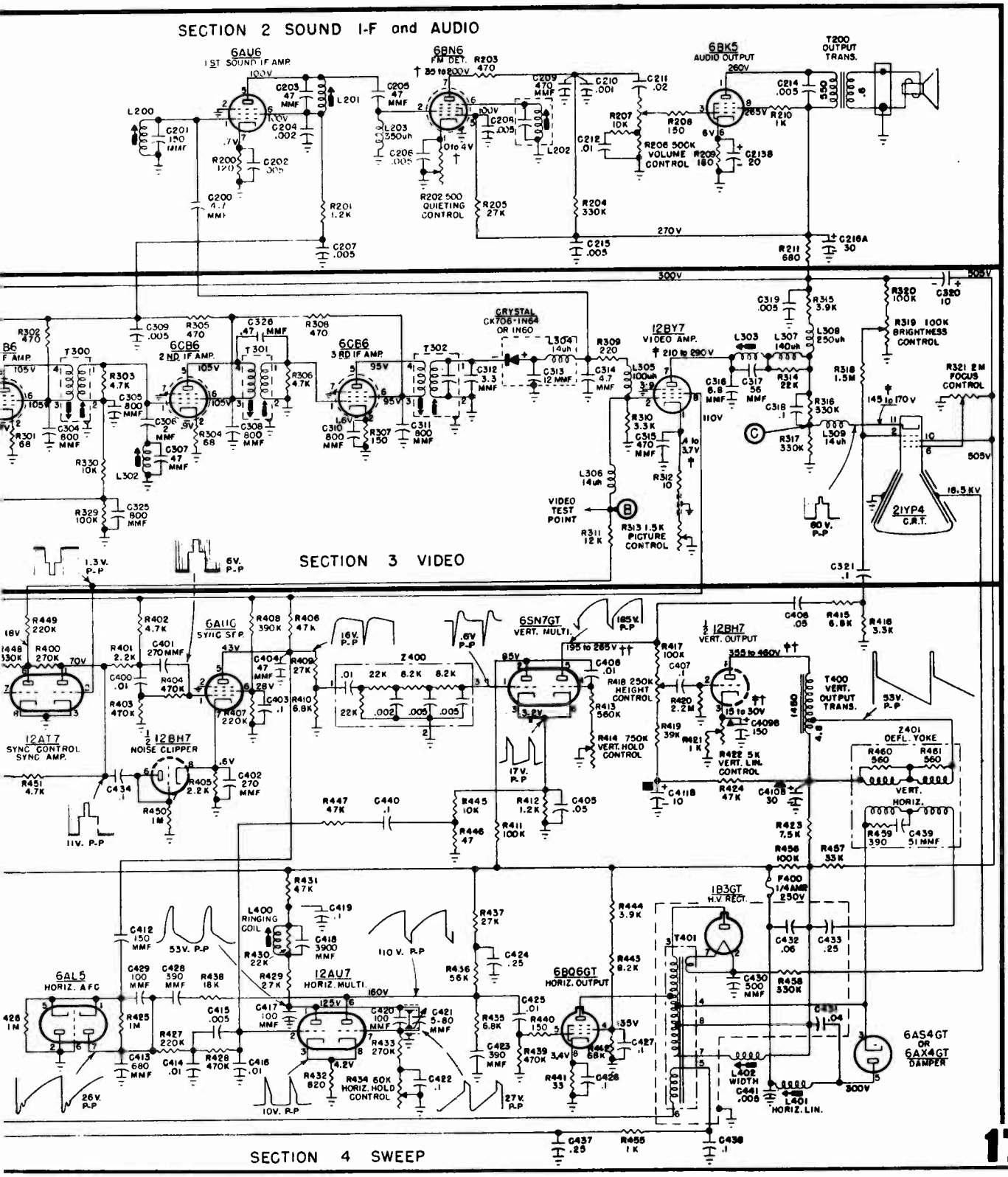
NOTES:

1. VOLTAGES WILL VARY WITH CONTROL SETTING.
   † = QUIETING CONTROL
   ‡ = PICTURE CONTROL
   †† = VERT. HOLD CONTROL
   ‡† = VERT LIN. CONTROL
2. PEAK-TO-PEAK WAVEFORMS WERE TAKEN WITH THE PICTURE CONTROL SET FOR SIGNAL OF 60V. AT THE CATHODE OF C.R.T. ALL OTHER CONTROLS SET FOR NORMAL PICTURE.
3. PARTS TOLERANCE AND RESPONSE OF TEST EQUIPMENT MAY CAUSE SOME VARIATIONS OF THE PEAK-TO-PEAK VOLTAGE READINGS.
4. D-C VOLTAGES MEASURED FROM CHASSIS GROUND USING A 20,000 OHM/VOLT METER AND NO SIGNAL INPUT. READINGS SHOULD BE AS SHOWN ± 20 PER CENT.
5. ALL CAPACITANCE VALUES IN MFD AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.

SECTION 5 POWER and FILAMENTS

H-770T21 (MAHOGANY) H-772K21 (MAHOGANY) H-774K21 (MAHOGANY) Westinghouse TELEVISION

H-771T21 (BLOND) H-773K21 (BLOND) H-775K21 (BLOND) H-776T21 (MAHOGANY)



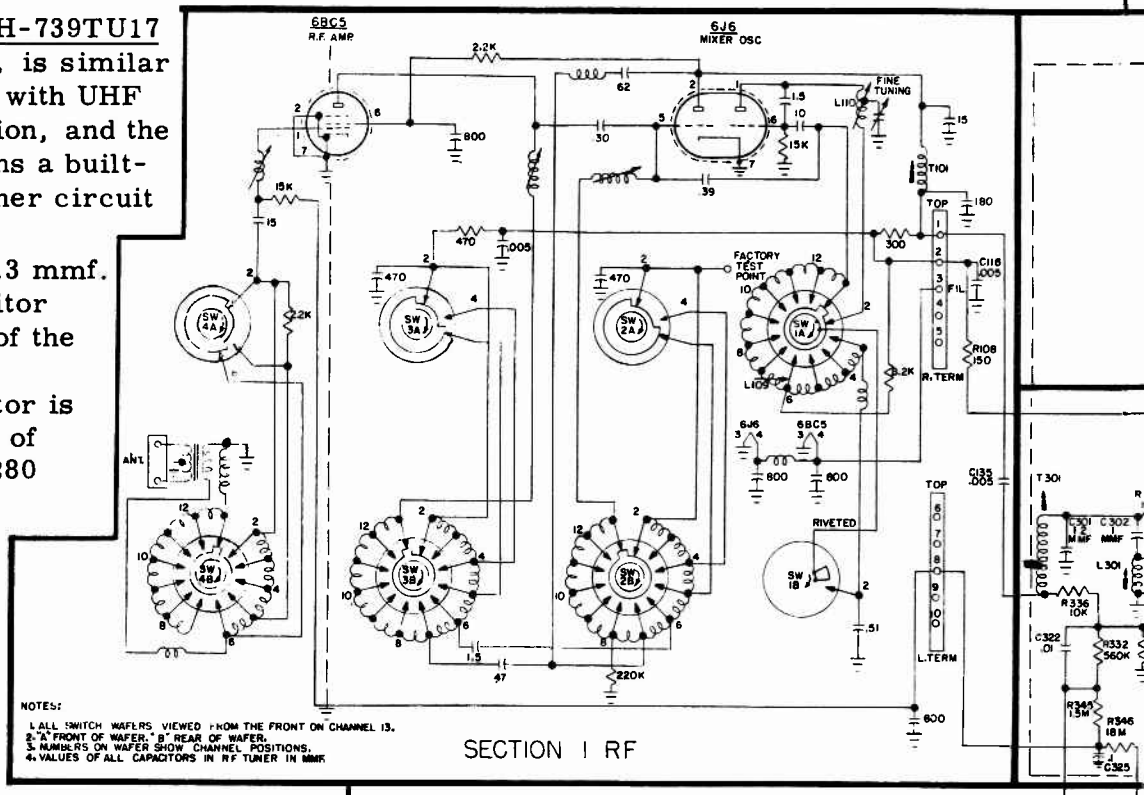
Westinghouse Electric Corporation

Models H-736T17 and H-738T17
Chassis Assembly V-2227-1

Although this circuit differs in important respects from the sets covered in last year's volume, the alignment information given on page 184, Volume TV-7, 1953 Television Manual, applies exactly to this additional chassis, V-2227-1.

Model H-739T17, H-739TU17 Chassis V-2227-2, is similar but uses RF tuner with UHF attachment provision, and the H-739TU17 contains a built-in UHF tuner. Other circuit differences are:

C301 changed to 3.3 mmf.
A .005 mfd. capacitor added between #3 of the tuner and ground.
A 2200-ohm resistor is added between #10 of the tuner and the 280 volt B+ line.



In the later production of Models H-736T17 and H-738T17, the following production changes were incorporated.

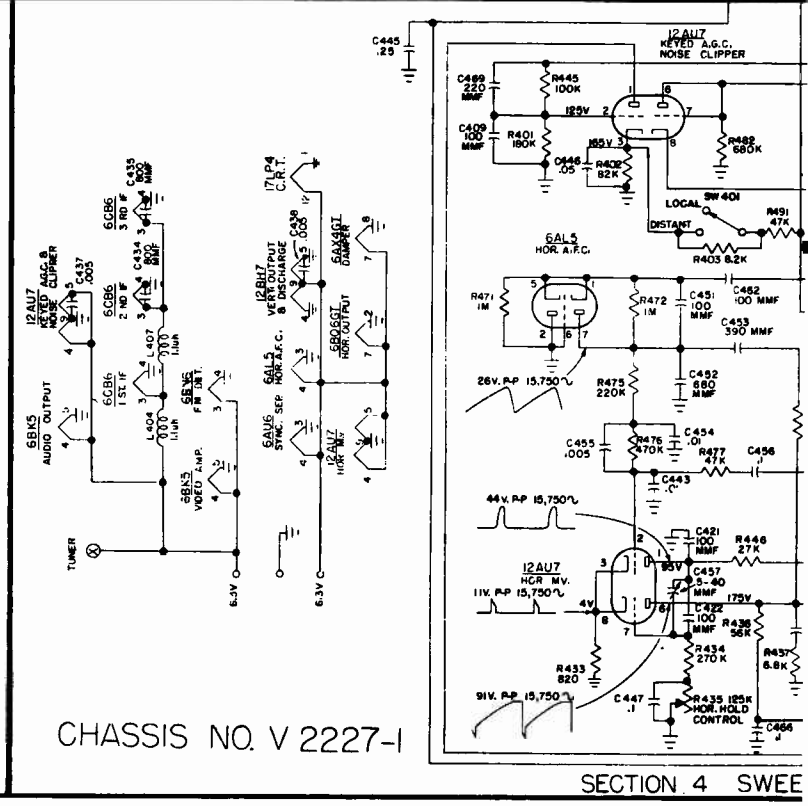
IMPROVED HORIZONTAL AFC. To increase the lock-in range of the horizontal oscillator, the horizontal multivibrator trimmer, C457, was changed from 5-40 mmf to 5-80 mmf and R435 was changed from 125,000 ohms to 60,000 ohms.

VERTICAL MULTIVIBRATOR CIRCUIT. C407, .002 mfd and C408, .002 mfd (series connected) were removed and replaced with a single .001 mfd., 1000 volt capacitor designated C407.

IMPROVED TONE COMPENSATION. C208 has been changed from .01 mfd to .02 mfd. R207 has been changed from 10,000 ohms to 27,000 ohms.

PICTURE DISTORTION. Picture distortion which appears as a vertical wiggle from the top to the bottom of the picture can be caused by AC ripple in the B+ applied to the plates of the horizontal multivibrator tube. This condition is corrected by changing C466 to .25 mfd and R441 to 10,000 ohms.

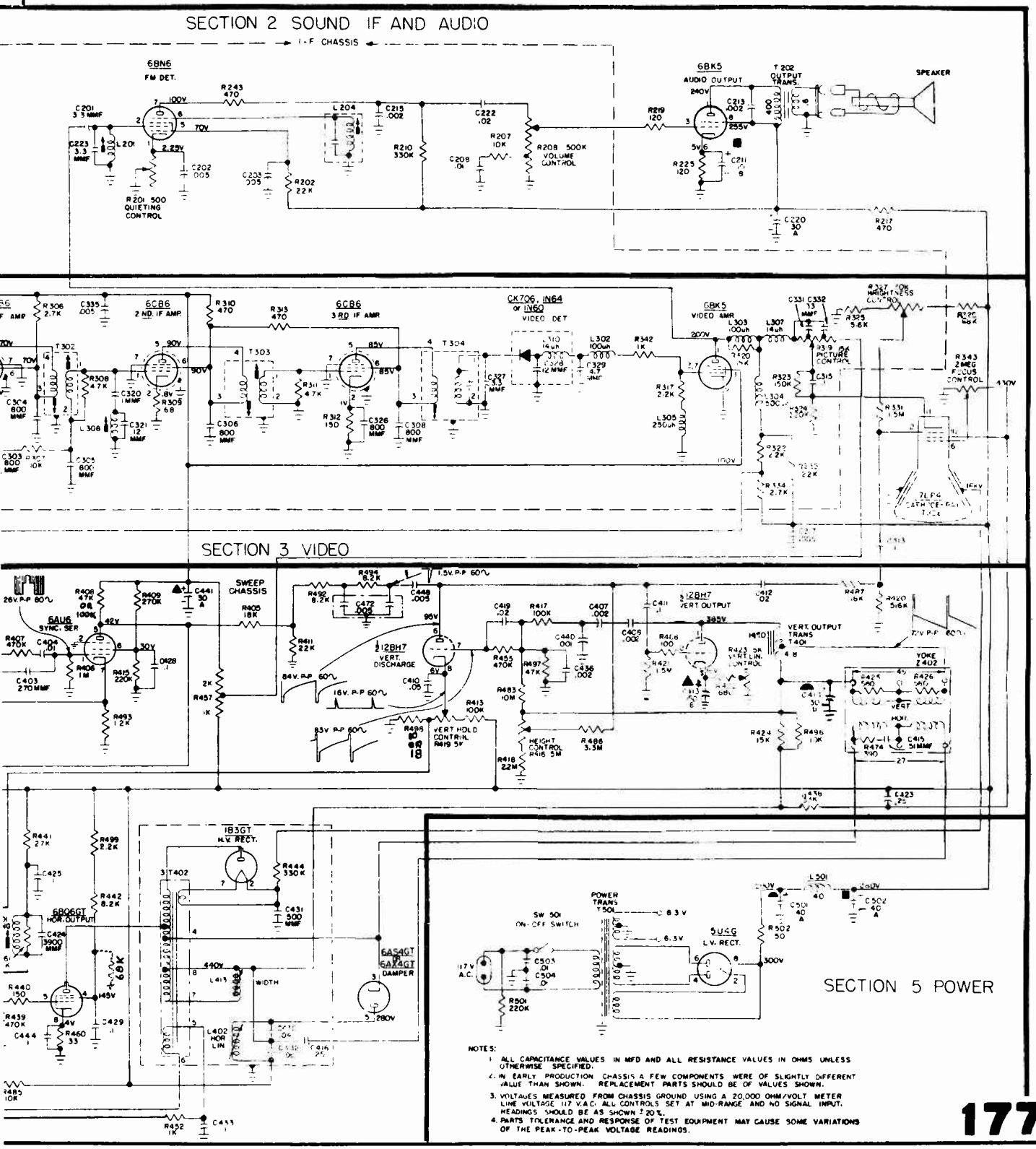
6BQ6GT PLATE CURRENT REDUCTION. To reduce the plate current of the 6BQ6GT horizontal output tube and thus prolong its life, R499 was increased to 39,000 ohms.



Westinghouse TELEVISION

H-736T17 H-738T17

CHASSIS ASSEMBLY V-2227-1

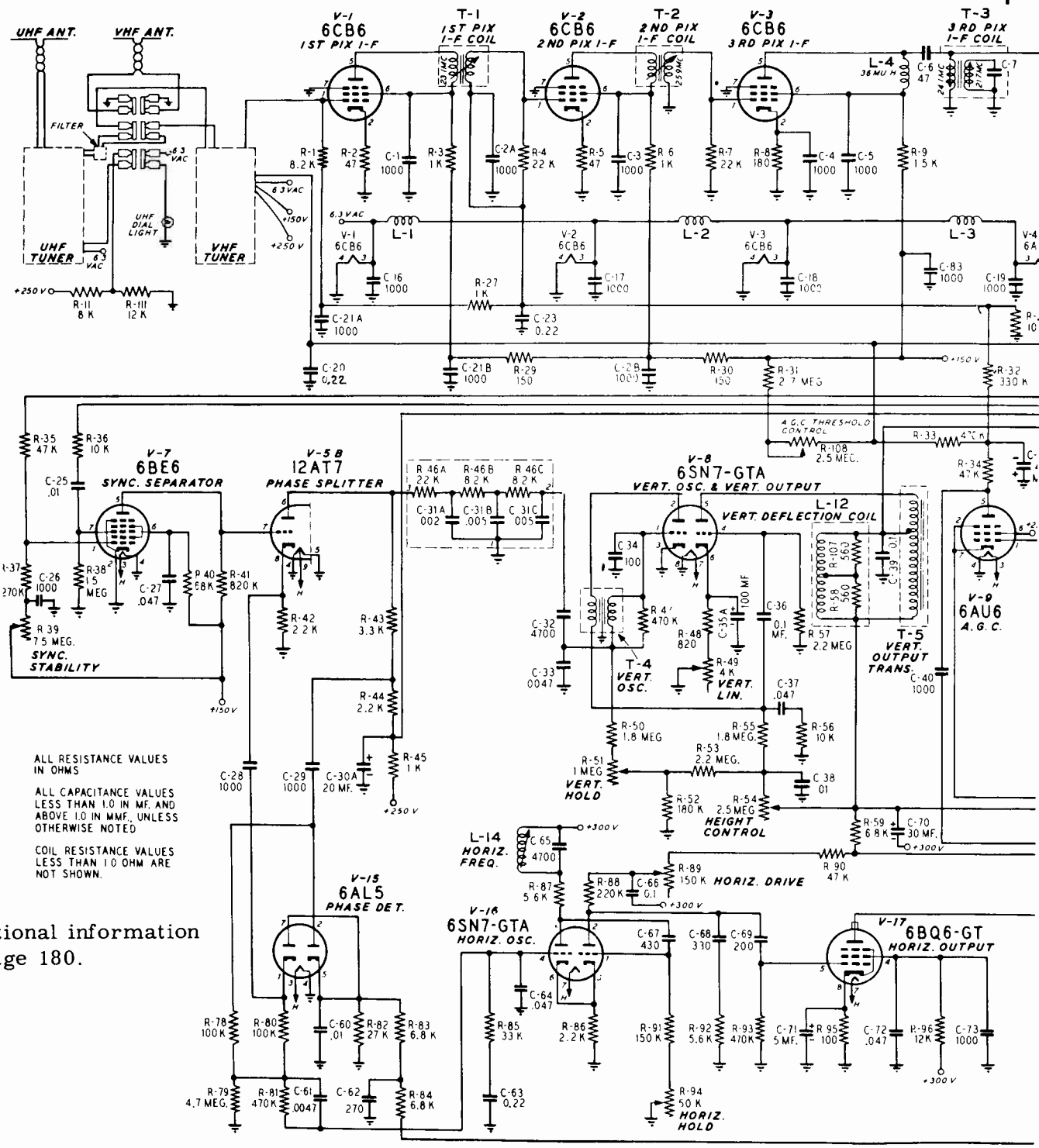


WESTERN AUTO SUPPLY COMPANY

truetone

MODEL 2D1331A 2D1345A 2D2334A

Models No. 2D1330A and 2D1336A use almost the identical circuit.

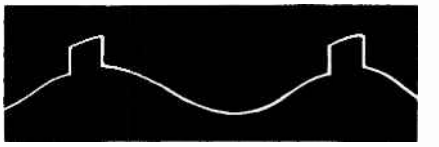


Additional information on page 180.

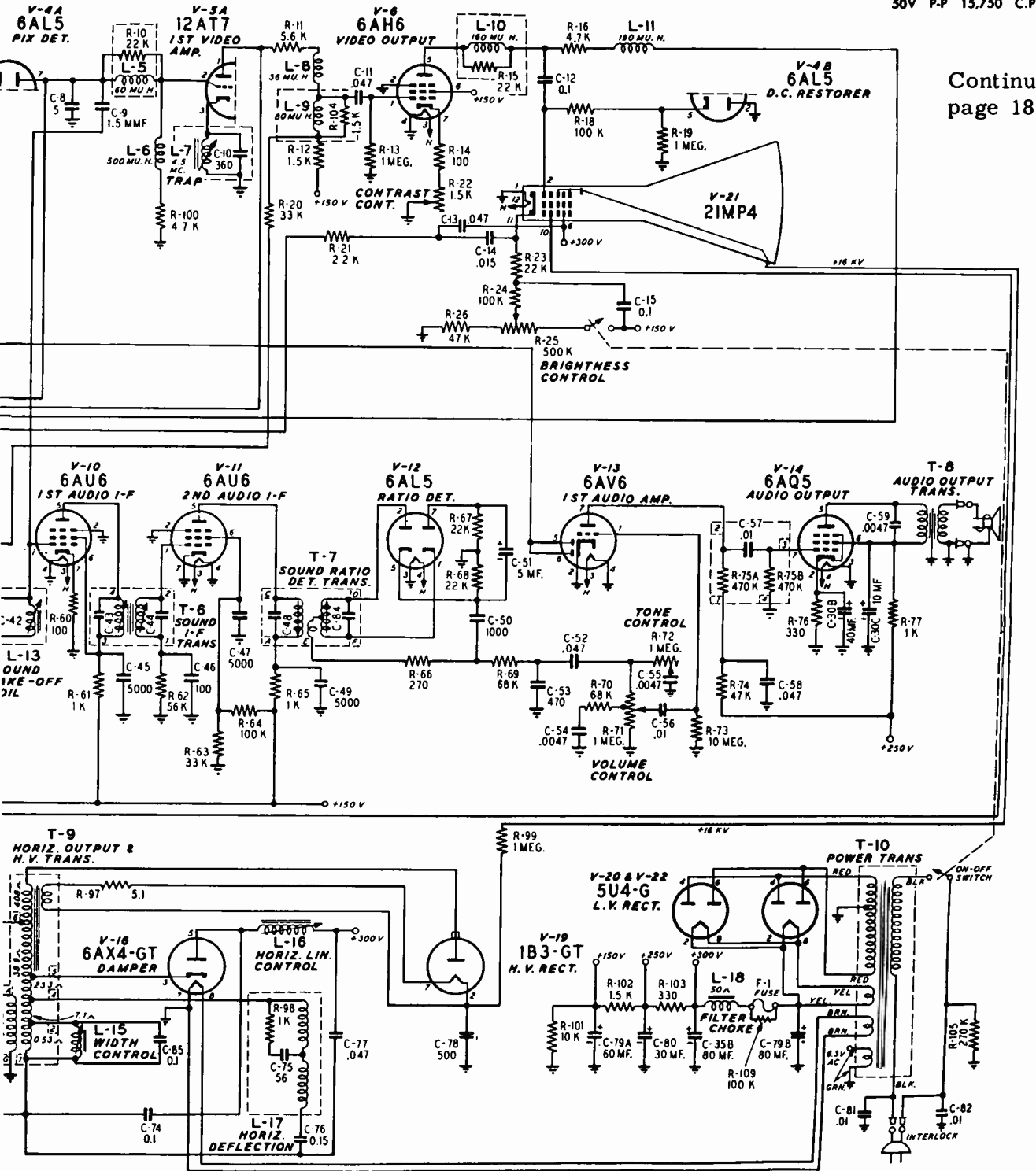
WESTERN AUTO (Truetone) Models 2D1331A and 2D2334A (2D1336A is similar)

6SN7-GTA—Vert. Osc. Plate
125V P-P 60 C.P.S.

6AU6 A.G.C.
450V P-P 15,750 C.P.S.



6SN7—Hor. Osc. Plate
50V P-P 15,750 C.P.S.

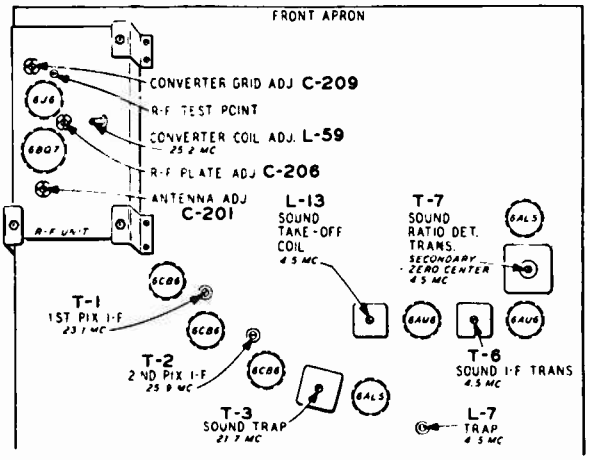


Continued on page 180.

WESTERN AUTO SUPPLY COMPANY

Models 2D1331A, 2D1345A, 2D2334A (2D1336A is similar) continued from pp 178-179

ALIGNMENT PROCEDURE



A. Unmodulated R-F signal into Converter Grid by means of tube shield insulated from base. VTVM with filter in lead of 22 K ohms and 5000 mmf connected to pic. det. load resistor, (R-100) 4700 ohms, in series with peaking coil (L-6) from Pin 7 of 6AL5. Input signal level should be such that output is less than 2 volts DC. Apply –4.5V battery bias on AGC line.

	FREQUENCY	ADJUST
1.	25.2 MC	Converter plate coil on top of tuner for maximum dc at picture detector.
2.	23.1 MC	1st picture I-F coil (T-1) for maximum dc at picture detector.
3.	25.9 MC	2nd picture I-F coil (T-2) for maximum dc at picture detector.
4.	24.1 MC	3rd picture I-F coil (T-3 below chassis) for maximum dc at picture detector.
5.	21.7 MC	3rd picture I-F trap (T-3 in con above chassis) for minimum dc at picture detector.

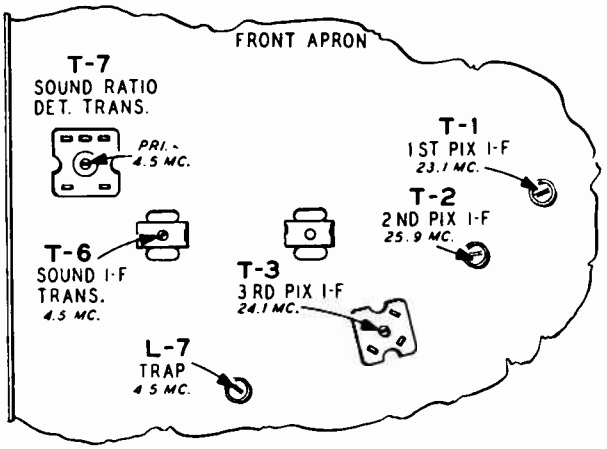
B. I-F Sweep Generator into converter grid by means of tube shield insulated from base.

Connect oscilloscope across R-100 (in place of VTVM). Apply –4.5V bias (DC) to AGC line (battery).

Tuner should be switched to dead channel so as not to cause interference.

Observe overall I-F response, which should be as shown above: A slight touch-up may be required. At no time should the trap coil be re-adjusted, nor should it be necessary to turn any of the picture I-F coils more than 1/2 turn of the slug. The following comments are suggestions only:

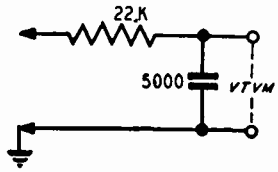
1. The height of the 26.2 MC marker is controlled by the 25.2 MC (Converter Plate Coil on tuner) and the 25.9 MC (2nd P.I.F.) coils.
2. The uniformity of response (flatness across top and position of 23.5 MC) marker is controlled for the most part by the 24.1 MC third picture I-F coil.
3. The 23.0 MC marker position is controlled by the first picture I-F (23.1 MC coil). However, it is not advisable to change the setting of the coil, due to its effect on sound rejection.



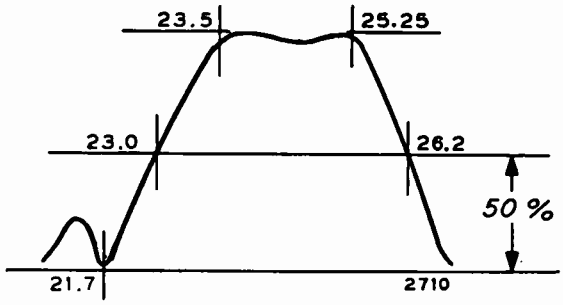
Bottom Chassis Video and Audio I-F Adjustments

VIDEO

With 4.5 MC unmodulated signal from a high impedance source, (10,000 ohms in series with the generator) into plate of the picture detector tube (Pin 7-6AL5) and VTVM on picture tube grid, tune 4.5 MC trap (L-7 Top) for minimum response. VTVM on 0-10 V AC scale. This adjustment can also be made while observing a picture from a station. Tune trap for least 4.5 MC beat in picture.



VTVM Connections



Overall Response Curve

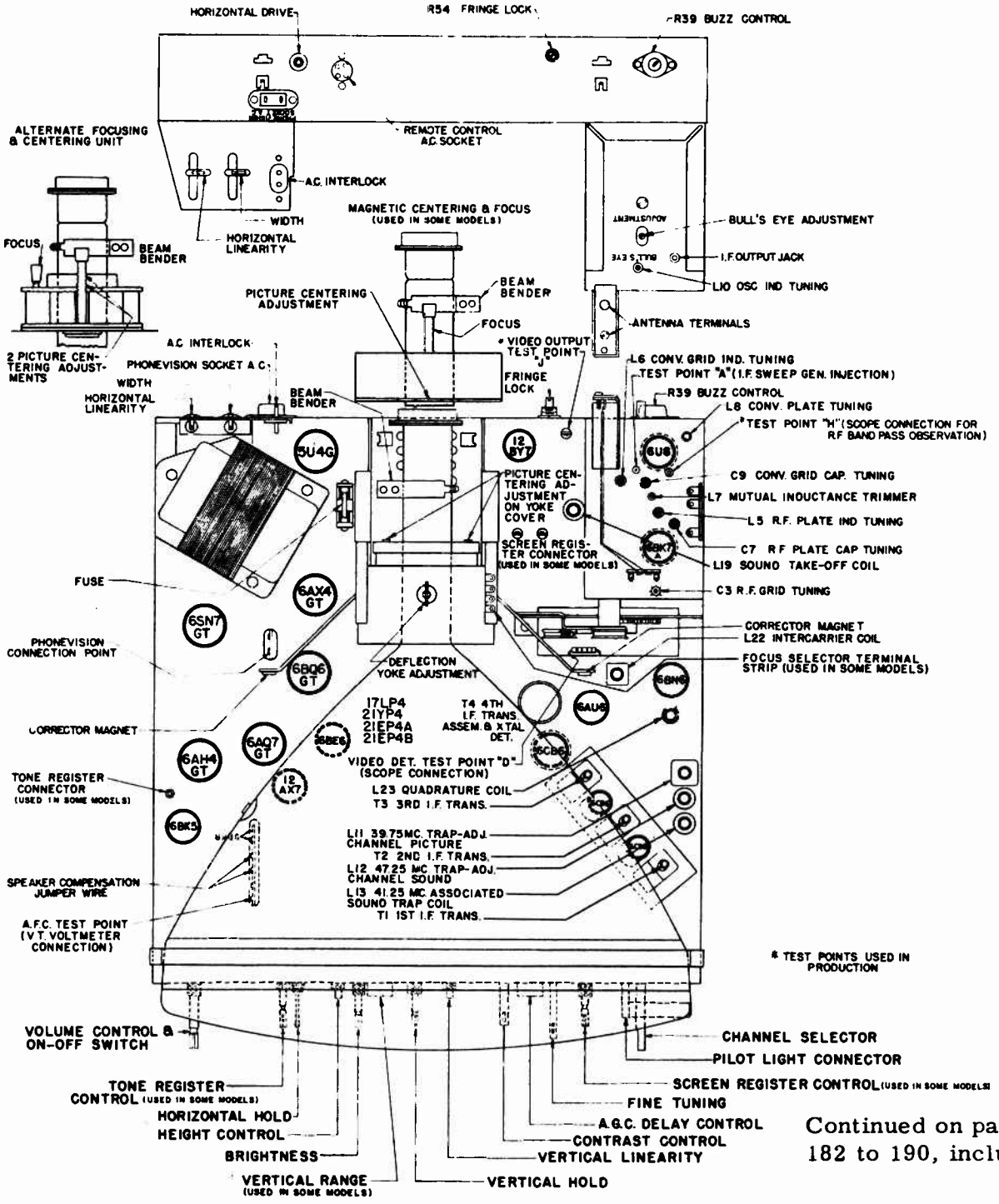
AUDIO I-F

1. With signal generator set to 4.5 MC and dc VTVM connected to junction of R-62 and C-46, adjust sound take-off coil (L-13 Top) and sound I-F transformer slugs (T-6 Top & Bottom) for maximum.
2. With VTVM connected to pin 7 of V-12 (6AL5) adjust the ratio detector primary (T-7 Bottom) for maximum.
3. With VTVM connected to junction of R-66, R-69 and C-50, adjust ratio detector secondary (T-7 Top) for cross over (zero voltage) on lowest scale.

NOTE-- If no signal generator is available, the procedure above may be followed by tuning in a station and using the 4.5 MC beat between picture and sound carrier.

ZENITH 1954 "L" SERIES

CHASSIS 19L25—19L26—19L27—19L28—21L21—22L20



Continued on pages 182 to 190, inclusive.

Fig. 1 Representative Chassis Layout "L" Models.

Zenith "L" Series, continued

INTRODUCTION

The 19L25, 19L26, 19L27, 19L28, 21L21 and 22L20 chassis described in this manual are basically alike. Alignment and adjustment procedures are identical. The slight differences which exist are as follows:

19L25: This chassis utilizes a 17 inch rectangular picture tube and is the basic chassis.

19L26: This chassis is the same as the 19L25 without the screen and tone register controls.

19L27: This is the 19L25 chassis with a 21 inch picture tube.

19L28: This is the 19L26 chassis with a 21" picture tube.

21L21: This chassis is the same as the basic 19L25 chassis except for the 21 inch picture tube and the addition of a 5U4G low voltage rectifier and a 1X2A tube in the high voltage circuit. The 1X2A is used in conjunction with the 1B3GT rectifier to boost the picture tube second anode voltage to 18.5 Kv. This chassis uses a 6CD6 in the horizontal output circuit. PM focusing and centering is utilized.

22L20: This chassis is similar to the 21L21 chassis but has a separate power supply and utilizes either the 24 or 27 inch picture tube. The 12AX7 used as the vertical oscillator in all other "L" chassis is used in the interlace circuit of this chassis. This circuit is designed to utilize the actual vertical pulse for triggering, rather than depending on the voltage build-up across an intergrating network. In this circuit the first of the six serration of the vertical pulse is differentiated, clipped by the 12AX7 (used as a diode) and applied to the 6SN7GT vertical oscillator. By using the actual pulse for triggering, the time relationship between alternate fields remains constant and positive interlacing results. This chassis utilizes the 6AV5GT vertical output and the 6AS4GT damper.

All models have provisions for reception of the new Ultra High Frequency stations by the simple addition of UHF strips as required.

THE FRINGE LOCK CIRCUIT

The fringe lock is a newly developed circuit, utilizing a 6BE6 heptode, which can be adjusted to assure sync stability over the wide range of noise and signal levels encountered in different areas. In this circuit the output of the crystal detector, approximately -3 volts peak to peak, is fed to grid #1 of the 6BE6. The same signal, after it has been inverted and amplified to approximately 40 volts peak to peak by the first video amplifier, is applied to grid #3 which in this circuit is the signal grid. The fringe lock control is used to pre-set the bias on grid #1 so that the normal 3 volt signal allows proper sync clipping action, i.e. the sync pulses, which have been stripped from the composite video signal appearing at grid #3, will appear at the plate. If a noise pulse drives grid #1 beyond the 2 volt level, plate current cutoff occurs and the noise pulse cannot get through to falsely trigger the sweep oscillators. On rare occasions, a strong noise pulse may occur at the time of the sync pulse and the tube likewise will cut off, however, the flywheel action of the sweep oscillators will maintain sync during this brief period. The entire fringe lock system is based on the fact that the loss of an occasional sync pulse is to be preferred over having a noise pulse get through to falsely trigger the sweep oscillator.

FRINGE LOCK ADJUSTMENT

1. Turn the fringe lock control fully clockwise and then back it off approximately 1/4 turn. Adjust the vertical and horizontal hold controls and check operation of the receiver to see that it syncs normally when the turret is switched from channel to channel.

2. If the picture jitters or shows evidence of delay, tearing, split phase, etc., back down the fringe lock control further, a few degrees at a time, each time readjusting the hold controls and switching from channel to channel until normal sync action is obtained. It will be found that under normal signal conditions, the correct adjustment will be near the counterclockwise position of the control.

3. In fringe and noisy areas, the best adjustment will be found at or near the maximum clockwise position of the control, however, do not automatically turn the fringe lock fully clockwise in fringe areas as has been done on previous models. Always follow the procedure outlined.

CENTERING ADJUSTMENT

In the 19L series, the centering assembly is built into the yoke housing. This assembly is made up of two magnetic rings which can be rotated by means of tabs. Centering is accomplished by gradually rotating the tabs with respect to each other then rotating both tabs simultaneously until the picture is centered.

In the 21L and 22L series, PM focusing and centering is utilized. The top screwdriver adjustment on the centering assembly is used to move the picture up or down and the bottom adjustment for side to side movement. The center adjustment is for focusing.

In some 21L and 22L receivers, a single centering lever is used for both vertical and horizontal centering. The up down movement of this lever moves the picture horizontally while a left-right movement moves the picture vertically. A screwdriver adjustment is provided for focusing.

AFC ADJUSTMENT

The AFC adjustment can effectively be made by setting the horizontal hold control L26 to a position where it is virtually impossible to "throw" the receiver out of horizontal sync when switching from channel to channel.

BULLS EYE TUNER ADJUSTMENTS

To adjust the receiver for bulls-eye tuning, set the fine tuning control to its approximate center position as shown in Fig 2. Without further adjustment of the fine tuning control insert a 68-21 alignment wrench into the tuner (See Fig.11) and adjust each operating channel to resonance. It will be noted that tuning to one side of resonance results in a faded, washed-out picture with the spacing between the wedge lines fogged and tuning in the opposite direction causes the spaces between the lines to clear up. However, going beyond this point causes the picture to take on a "wormy" appearance from sound getting into the picture. Correct adjustment is obtained by tuning to the "wormy" picture and then backing the control off slightly until the picture clears up.

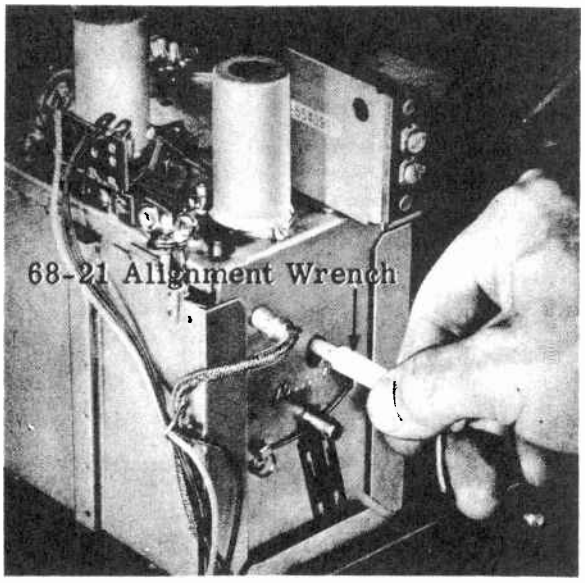


Fig. 11 Bulls-eye Tuning Adjustment.

REMOVING TURRET TUNER

1. Pull out the power and IF connector cables and disconnect the antenna transmission line.

2. Look through the U shaped opening in the top of the tuner and rotate the fine tuning control until the allen head set screw (or paint mark on some tuners) is straight up.

3. Loosen (do not remove) the hex head set screw in the turret dial cord pulley assembly.

4. Slide the pulley towards the front of the chassis until it clears the fine tuning shaft.

5. Remove the four hex nuts and gently pull the tuner assembly straight out of its case.

REMOVING CHANNEL STRIPS

1. To insure proper indexing, carefully note the channel to which the receiver is tuned so that the tuner drum can be rotated back to this channel before the unit is reassembled.

2. Rotate the turret drum until the strip to be removed is readily accessible.

3. Insert a small screwdriver in the slot (See Fig.13). Push in the direction of arrow until the channel strip clears the drum slot then lift straight out in direction of screwdriver shaft. Some strips have a round hole instead of a slot and a pointed tool is used in place of the screwdriver.

CAUTION: TO AVOID DAMAGE TO CHANNEL STRIPS, DO NOT USE PRYING ACTION IN REMOVING STRIPS.

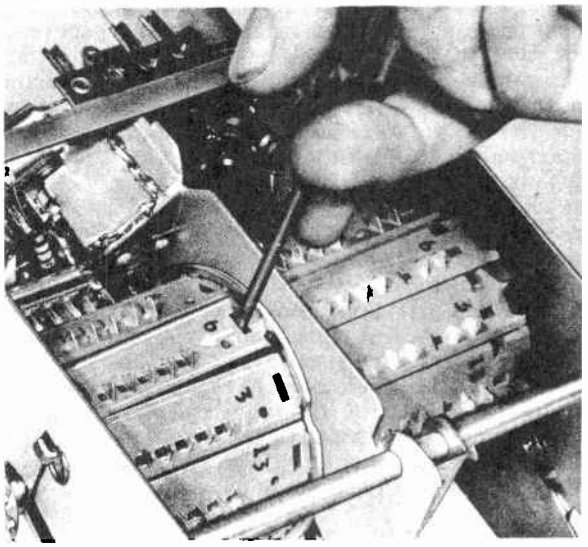


Fig. 13 Removing Channel Strips.

REMOVING TURRET DRUM ASSEMBLY

1. Use long nose pliers and remove the two turret shaft tension springs from the front and rear of the tuner assembly. Unsolder and slide the bronze turret shaft grounding springs out of their slots at the front and rear of the tuner.

2. With a pair of long nose pliers, grasp the first turn of the spiral index spring and lift spring off its hook. This takes pressure off the detent arm and may cause the roller to fall out and become lost.

3. Slide the drum out of its slot. Reverse this procedure to re-assemble the tuner.

Some of the component parts in the tuner cannot be replaced without removing the fine tuning control and bracket assembly. This bracket can be removed as follows:

1. Unsolder the fine tuning capacitor lead.

2. Loosen the Allen head set screw on the fine tuning shaft collar and remove fine tuning shaft.

3. Remove the self tapping screw from the center top of the tuning capacitor mounting bracket, loosen the three remaining screws and remove the bracket.

Zenith "L" Series, continued

DOUBLE DELAYED GATED AGC

In order to obtain the best possible performance in fringe and weak signal areas, it is important that the application of AGC voltage to the 6BK7A RF tube be withheld until the signal level reaches approximately 500 microvolts at the antenna input. The noise figure of the tuner will be optimized only under this condition of no AGC voltage. To accomplish this, the cathode of the 6CB6 1st IF tube is approximately 8 volts positive by virtue of the drop through the cathode resistor of the 6CB6 3rd IF. This voltage plus the voltage which results from current flow through the tube makes the grid of the 6CB6 1st IF approximately 9.3 volts negative with respect to its cathode. It should be noted here that the bias voltage for the 3rd IF is obtained across the 100 ohm portion of the cathode resistor only. The voltage at the junction of the two resistors varies from 8 volts with no signal to 4 volts with strong signals. The 2nd IF tube is in series with the 1st IF tube and any changes in the plate current of the 1st IF tube will also change the 2nd IF tube thus the 2nd IF tube is also controlled indirectly by the AGC.

Under weak signal conditions, the output of the AGC tube at point "E" is approximately 8 volts positive. This positive voltage however, does not reach the grid of the 6BK7A because of the 2.2 megohm resistor. Actually the grid of this tube is slightly negative because of contact potential developed as a result of the high resistance in its grid circuit (2.2 megohms). The 8 volts positive voltage however, is applied to the grid of the 6CB6 1st IF but because the cathode is 9.3 volts positive the grid is actually 1.3 volts negative with respect to its cathode and AGC control of the IF results under weak signal conditions.

When the receiver is used with normal signals, the signal voltage applied to the grid of the AGC tube will increase and as a result the output of the AGC tube will become 4 to 5 volts negative. This negative voltage will be applied to the 6BK7A through the 2.2 megohm resistor thus both the RF and IF stages will then be controlled by the AGC.

With the application of a negative AGC voltage to the 6BK7A tube under normal signal conditions, the noise figure of the tuner will not be optimized as under weak signal conditions, however, this is not a consideration with normal signal levels.

AGC ADJUSTMENTS

IMPORTANT: THE AGC CONTROL CANNOT BE USED IN ANY WAY TO IMPROVE THE RECEIVER SENSITIVITY. The sole function of this control is to set the level applied to the video amplifier (12BY7) tube so that the output of this tube is approximately 100 volts peak (100% modulated video signal) for application to the picture tube cathode.

The adjustment can also be made by connecting a calibrated oscilloscope through a 10K isolation resistor, to test point "D" (See Fig.16) and, while receiving the strongest TV signal adjust the AGC delay control for 2.5 volts (2.75V on 19L26 and 28 models) peak output.

Satisfactory adjustment can also be made by observing the picture and slowly turning the AGC delay control from its maximum clockwise position, counterclockwise until a point is reached where the picture distorts and buzz is heard in the sound. The control should then be turned slowly clockwise and set at a point comfortably below this level of intercarrier buzz, picture distortion and improper sync.

CAUTION: Misadjustment of the AGC delay control can result in a washed-out picture, distorted picture, buzz in sound OR COMPLETE LOSS OF PICTURE AND SOUND.

ALIGNMENT

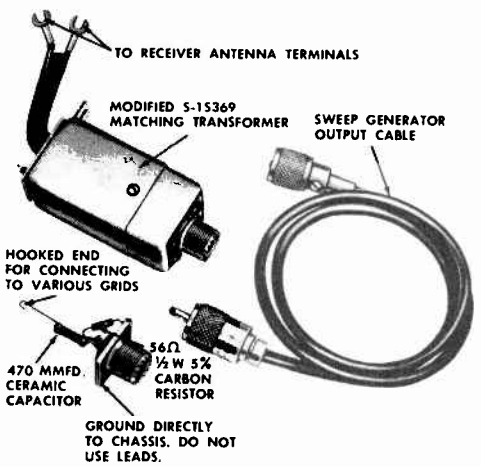


Fig. 15 IF-RF Alignment Fixtures

A suitable sweep generator in conjunction with an accurate marker must be used for alignment work. It is very important to have the sweep generator output cable properly terminated and to check whether or not its attenuator is reactive. If the attenuator is reactive or if the output cable is improperly terminated, correct alignment cannot be made since the degree of attenuation then may change the shape as well as the amplitude of the response curve. The position of the attenuator should only vary the amplitude and not the shape of the response curve.

VIDEO IF ALIGNMENT

1. Connect the negative lead of a 2 volt battery supply to terminal "E" (Fig.36) and the positive lead to chassis. The bias supply should be made variable so that it can be varied from negative 3 volts to positive 3 volts. Keep the supply leads short.

2. Connect the calibrated oscilloscope through a 10,000 ohm isolation resistor between terminal "D" and chassis. The sweep generator input to the receiver should be adjusted for 3 volts peak to peak detector output. Do not exceed this output level during any of the adjustments.

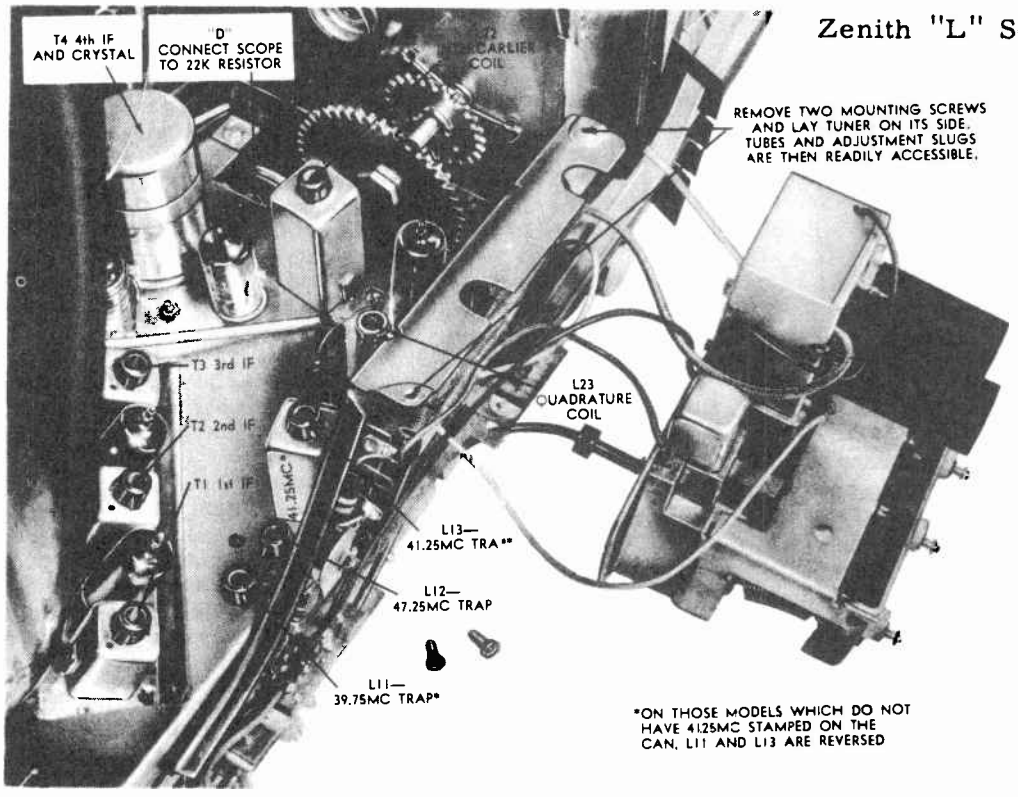


Fig. 16 IF Alignment Guide.

3. Feed the output from the sweep generator through the special termination unit shown in Fig. 15 to point "C" (Pin 1 of 6CB6, 3rd IF). Adjust the generator until a pattern similar to Fig. 17 is obtained.

4. Set the Marker Generator to 45.75 Mc and alternately adjust the top and bottom slugs of the 4th IF transformer for maximum gain with the 41.25 Mc and 45.75 Mc markers positioned as shown in fig. 17

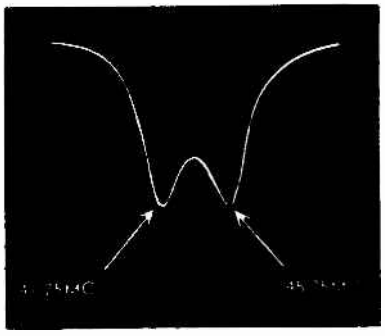


Fig. 17 4th IF Response.

If the correct response curve cannot be obtained in this step, check the position of the two slugs to see that they are entering their respective coils from the opposite ends of the coil form. The position of the slugs near the center of the coils may change the coefficient of coupling, making correct alignment difficult if not impossible.

5. Connect the sweep generator cable to terminal "A" (Mixer Grid). In this step it may be necessary to temporarily reduce the bias to zero or even to go to a slightly positive voltage in order to see the highly attenuated trap slots with the oscilloscope vertical gain near maximum.

6. Adjust the 47.25 Mc, 41.25 Mc and 39.75 Mc traps for minimum marker amplitude (See Fig. 18 . It can be seen that maximum oscilloscope gain has been used and as a result the top of the response curve has been "run off" the oscilloscope screen in order to see a "blow-up" of the trap slots.

7. Readjust the bias to -2 volts and set the oscilloscope vertical gain to the calibrated position. Adjust the sweep generator for a 3 volt peak to peak output from the video detector.

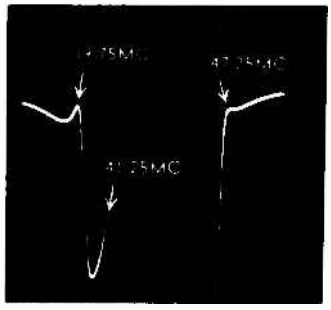


Fig. 18 Exploded View of Trap.

Zenith "L" Series, continued

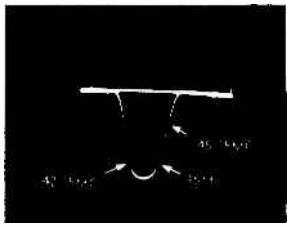


Fig. 19 Overall IF Response.

8. With the test equipment set up as in Step 7, alternately adjust the 2nd IF, 3rd IF, 1st IF and the converter plate coil until an overall response curve similar to Fig19is obtained. It will be found that the 2nd IF affects the low side (42.75 Mc) and the 3rd IF the high side of the response curve. If the proper response curve cannot be obtained by an alternate adjustment of the above trimmers, it may be necessary to retouch the 4th IF transformer.

SOUND ALIGNMENT

Proper alignment of the 4.5 Mc intercarrier sound channel can only be obtained if the signal to the receiver antenna terminals is reduced to a level below the limiting point of the 6BN6 Gated Beam Detector. This level can be easily identified by the "hiss" which then accompanies the sound.

Various methods may be used to reduce the signal level, however, it is recommended that a step attenuator similar to the S-17203 unit be used for most satisfactory results. To prevent leakage, certain precautions must be taken when connections are made. Use as short a lead as possible between the attenuator and receiver antenna terminals and approximately 6 feet of 300 ohm shielded line between the antenna transmission line and the attenuator. The shield from the transmission line should be connected to the attenuator and the attenuator itself grounded to the TV chassis under test.

After the connections have been made, proceed as follows:

1. Tune in a tone modulated TV signal and adjust the step attenuator until the signal is reduced to a level where "hiss" is heard with the sound.

2. Adjust the sound take-off coil L19 (top and bottom slugs), intercarrier coil L22, quadrature coil L23 and buzz control R39 for the cleanest sound and minimum buzz. It must be remembered that any of these adjustments may cause the "hiss" to disappear and further reduction of the signal will be necessary so that the "hiss" does not disappear during alignment.

If intercarrier buzz is in evidence, after all normal sound adjustments have been made, the cause may be attributed to one or more of the following:

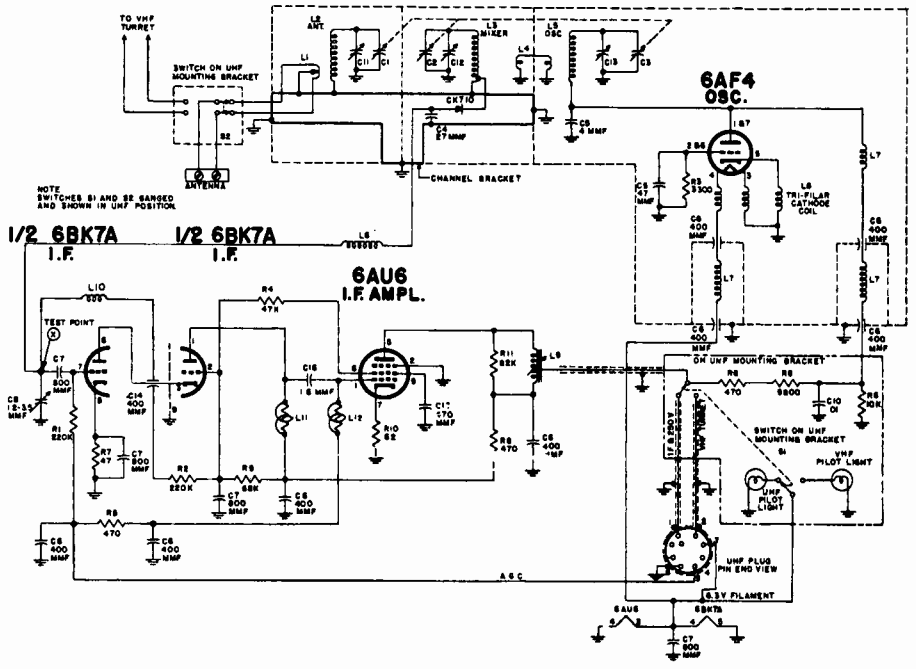
1. Improper adjustment of the AGC delay control.

2. Defective 6AU6 sound limiter.

3. Extremely high signal levels which require attenuation in the antenna circuit.

4. Transmitter over modulation.

ITEM NO.	PART NO.	DESCRIPTION
C1	149-128	ANTENNA BLDG
C2	149-125	MIXER BLDG
C3	149-127	OSCILLATOR BLDG
C4	22-2509	27 MMF ± MMF CER DISC CAP 500V
C5	22-2454	4MMF ± ± 500V
C6	22-2404	4700 MMF 5MV FT CAP 500V
C7	22-2331	800MMF 5MV CER DISC CAP 500V
C8	22-2405	2.3-3.9 MMF CER TRIM CAP 500V
C9	22-1807	47 MMF CER DISC CAP 500V
C10	22-3	.01 MFD -20+100% 500V
C11	112-886	ANTENNA TRIMMER
C12	112-885	MIXER TRIMMER
C13	112-884	OSCILLATOR TRIMMER
C14	22-2503	3400 MMF 5MV FT CAP 500V
C15	22-2302	470 MMF CER 500V
C16	22-2428	1.6 MMF MOLDED GIMMIC 500V
R1	63-1884	220K OHM 20% 1/2 W
R2	63-1883	220K OHM 10% 1/2 W
R3	63-1806	3300 OHM 10% 1/2 W
R4	63-1835	47K OHM 10% 1/2 W
R5	63-3136	5500 OHM 10% WW 10 W
R6	63-1198	10K OHM 10% 2 W
R7	63-1729	47 OHM 10% 1/2 W
R8	63-1779	470 OHM 20% 1/2 W
R9	63-1862	68K OHM 10% 1/2 W
R10	63-1740	82 OHM 10% 1/2 W
R11	63-1868	82K OHM 10% 1/2 W
L1	5-19683	FINAL ANT. LEAD ASSEM.
L2	20-426	ANT. TUNING COIL
L3	20-425	MIXER TUNING COIL
L4	20-466	COUPLING COIL
L5	20-435	OSC. TUNING COIL
L6	5-20535	GRID COIL ASSEM.
L7	20-425	R.F. CHOKE
L8	20-423	TRI-FILAR CATHODE COIL
L9	5-20808	PENTODE PLATE COIL ASSEM.
L10	5-19641	NEUTRALIZING COIL ASSEM.
L11	5-20607	CASCODE PLATE COIL ASSEM.
L12	5-20610	PENTODE GRID COIL ASSEM.

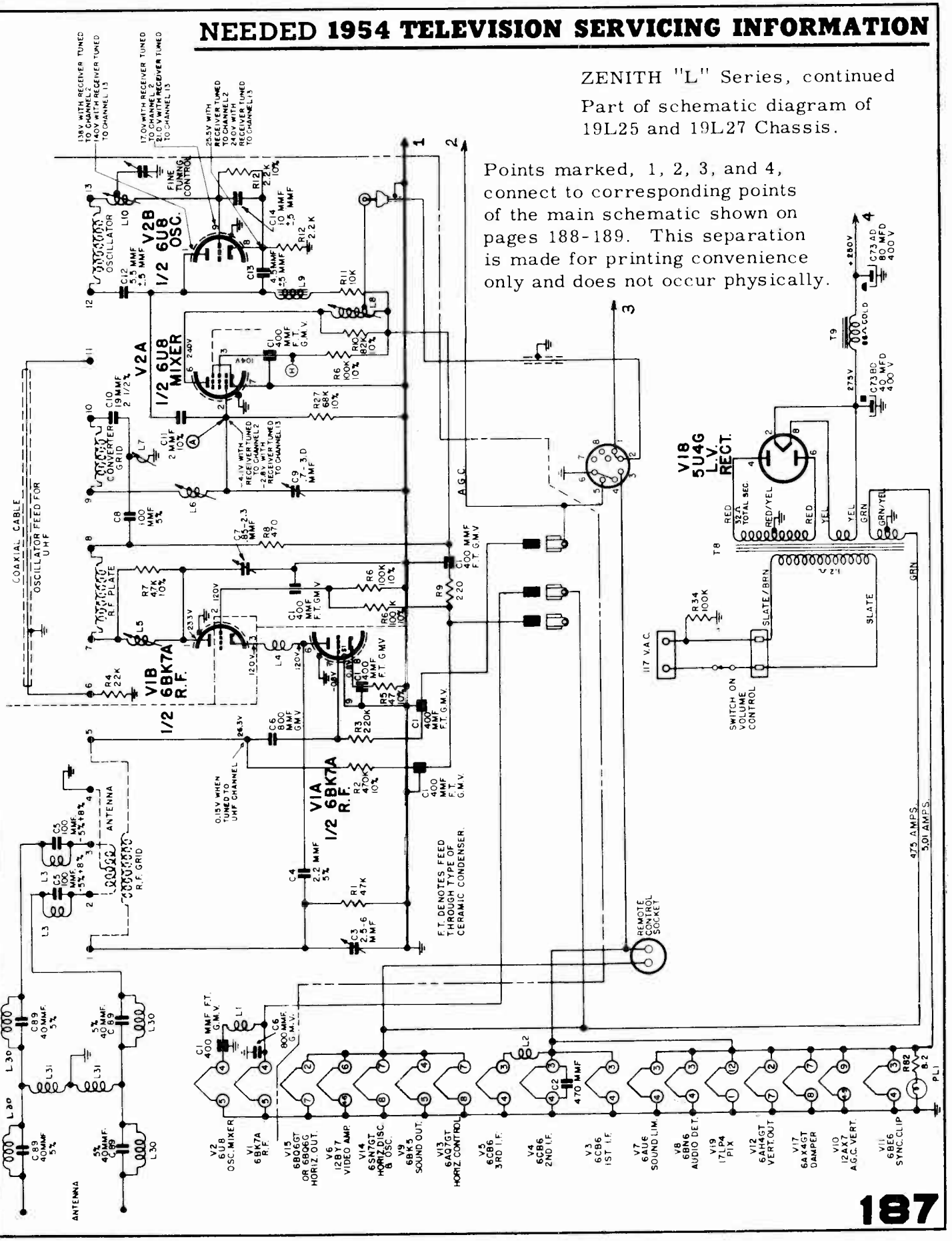


Schematic Diagram S-19670 Continuous Tuner.

ZENITH "L" Series, continued

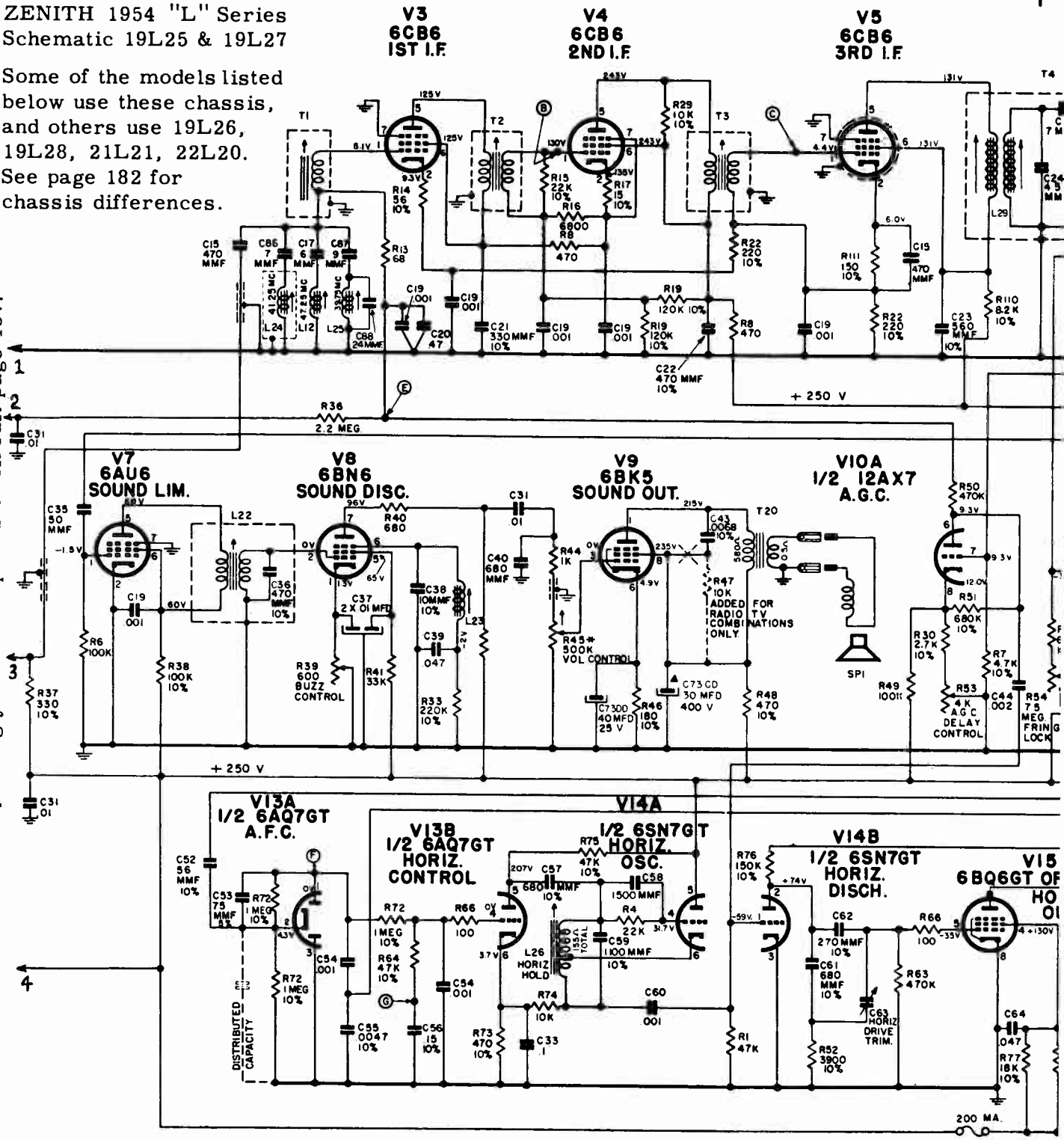
Part of schematic diagram of 19L25 and 19L27 Chassis.

Points marked, 1, 2, 3, and 4, connect to corresponding points of the main schematic shown on pages 188-189. This separation is made for printing convenience only and does not occur physically.



ZENITH 1954 "L" Series
Schematic 19L25 & 19L27

Some of the models listed below use these chassis, and others use 19L26, 19L28, 21L21, 22L20.
See page 182 for chassis differences.

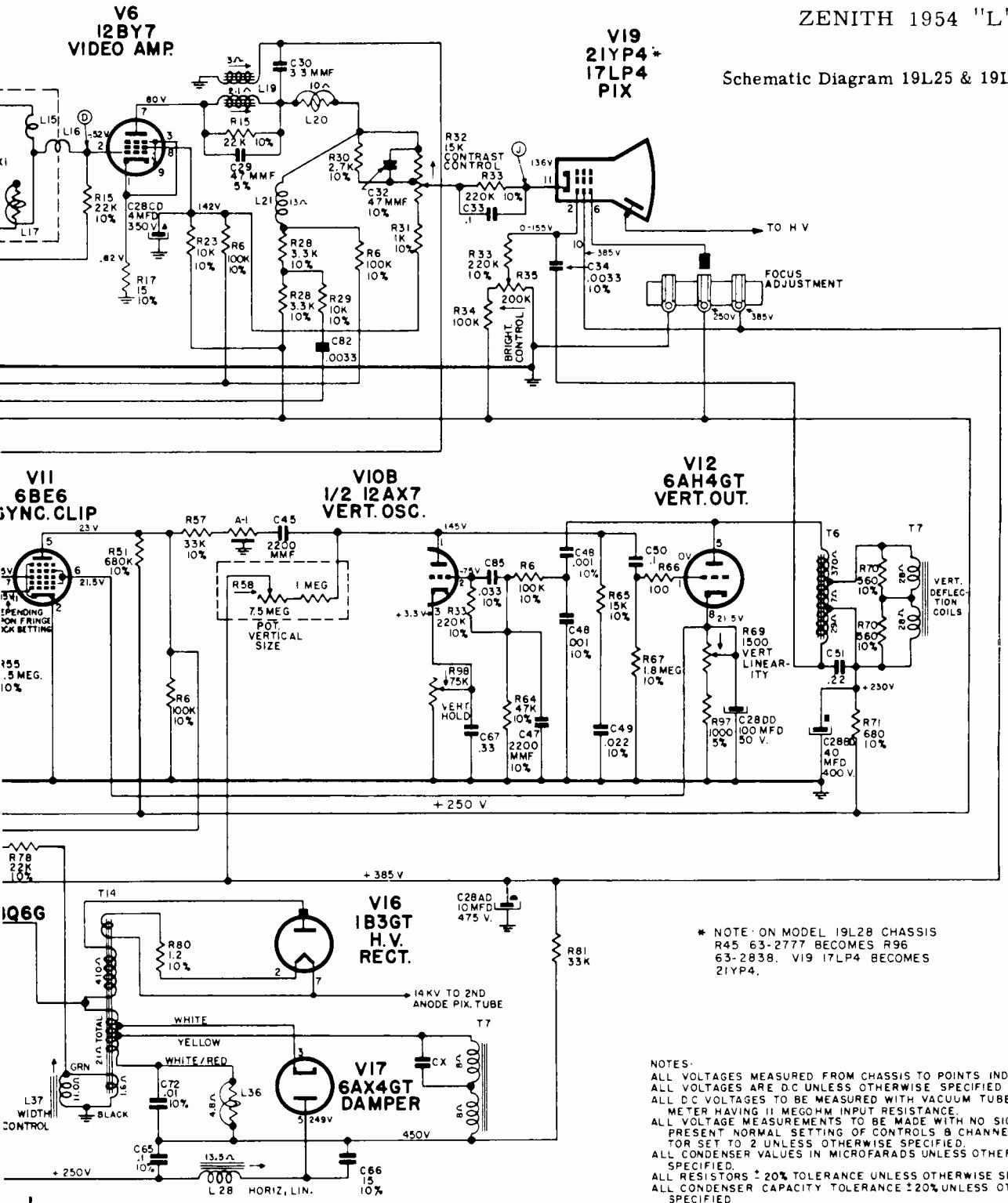


MODEL

L1812E or R	L1846E or R	L2260R	L2270	L2571R	L2593H
L1820E or R	L2229E or R	L2261E or H	L2281 or E	L2572R	L2876E
	L2235E or R	L2262C	L2281R	L2573E	L2876R
	L2236E or R	L2262R	L2285R	L2574R	L2878R
	L2258E or R	L2266R	L2287R	L2575E	L2879E
	L2259E or R	L2267E or H	L2291E	L2592R	L2894HU

ZENITH 1954 "L" Series

Schematic Diagram 19L25 & 19L27 Chassis.



* NOTE: ON MODEL 19L28 CHASSIS R45 63-2777 BECOMES R96 63-2838. V19 17LP4 BECOMES 21YP4.

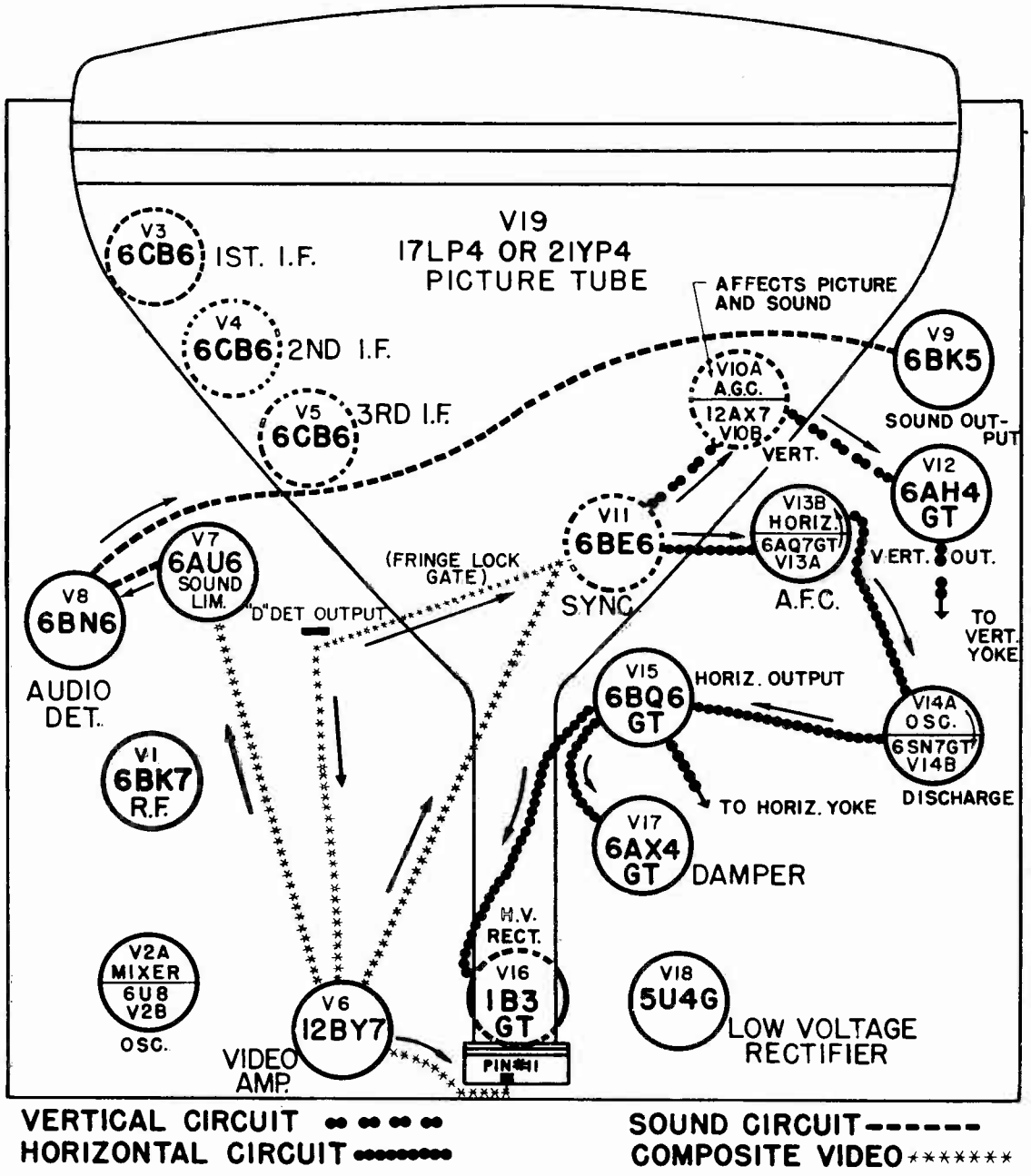
NOTES:
- ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.
- ALL VOLTAGES ARE D.C UNLESS OTHERWISE SPECIFIED
- ALL D.C VOLTAGES TO BE MEASURED WITH VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.
- ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT NORMAL SETTING OF CONTROLS & CHANNEL SELECTOR SET TO 2 UNLESS OTHERWISE SPECIFIED.
- ALL CONDENSER VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
- ALL RESISTORS ± 20% TOLERANCE UNLESS OTHERWISE SPECIFIED.
- ALL CONDENSER CAPACITY TOLERANCE ±20% UNLESS OTHERWISE SPECIFIED
- RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT
- COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM.
- CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 20K MIN OHM PER VOLT HIGH VOLTAGE METER.
- ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION
- (A) ALIGNMENT POINTS → CIRCLED ALPHABETS INDICATE ALIGNMENT AND TEST POINTS.

POWER SUPPLY
110 Volts - 60 Cycles AC
19L Series 185 Watts
21L Series 225 Watts
22L Series 255 Watts

FINISH
E - Blonde
R - Mahogany
H - Cherry
C - Copper Tone Mahog.

ZENITH 1954 "L" Series, continued

Signal Path Chart



Signal Path Chart 19L Series Receivers.

This signal path chart can be used for quickly isolating the particular section of the receiver where trouble is suspected. As an example, if the set under test has video but no sound, the chart will indicate that the sound signal alone is handled by V8 and V9, and so the trouble must lie in one of these sections. The AGC tube (V10A) affacts both picture and sound. In using this chart reference should be made to the main circuit shown on pages 187 and 188-189.

Index

Under each manufacturer's name are listed that make chassis and models in numerical order, at left. The corresponding page number at right of each listing refers to the first page of each section dealing with such material.

Another

Supreme Publications

Service Manual