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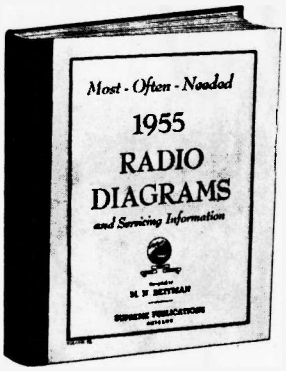

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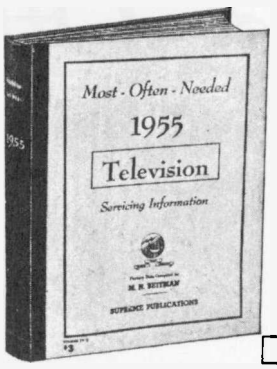

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Admiral

20Y4B, 20Y4BF, 20Y4D, 20Y4E, 20Y4EF, 20Y4F, 20Y4FF, 20Y4H, 20Y4HF, 20Y4L, 20Y4LF, 20Y4LS, 20Y4MS, 20Y4NF Chassis with 21 MC I.F., and 20SY4B, 20SY4BF, 20SY4E, 20SY4EF, 20SY4F, 20SY4FF, 20SY4H, 20SY4L, 20SY4LS Chassis with 41 MC I.F.

Model types	Using Chassis
T23B1, T23B2	20Y4L, 20Y4MS
TS23B1, TS23B2, TS23B6 TS23B7	20SY4L, 20SY4LS
T23B6, T23B7	20Y4L, 20Y4LS
T23B16, T23B17, T23B18	20Y4B, 20Y4BF
TS23B16, TS23B17, TS23B18	20SY4BF
T23B26, T23B27	20Y4L, 20Y4LF
TS23B26, TS23B27	20SY4L, 20SY4LF
T25B26, T25B27	20Y4F, 20Y4FF
TS25B26, TS25B27	20SY4F, 20SY4FF
TS2301DRW to TS2303+	20SY4LS
C23B1, C23B2, C23B3	20Y4E, 20Y4NF
CS23B1, CS23B2, CS23B3	20SY4E, 20SY4EF
CS23A6, CS23A7	20SY4EF

Model types	Using Chassis
C23B16, C23B17, C23B18, C23B26, C23B27	20Y4E, 20Y4EF
CS23B16, CS23B17, CS23B26, CS23B27	20SY4E,20SY4EF
C25B6, C25B7, C25B8, C25B16, C25B17, C25B18	20Y4F, 20Y4FF
CS25B6, CS25B7, CS25B16, CS25B17	20SY4F, 20SY4FF
C28B6, C28B7	20Y4D, 20Y4DF
F23B6, F23B7	20Y4E, 20Y4EF
F25B6, F25B7	20Y4F, 20Y4FF
L23B6, L23B7	20Y4H, 20Y4HF
LS23B6, LS23B7	20SY4H, 20SY4HF

All the chassis listed above employ the same basic circuitry and are covered by the service material on pages 6 through 18. The chassis with a number containing letters SY use 41 MC I.F. and employ VHF-UHF tuners. The alignment for these sets is on pages 10-12, and the schematic diagram on pages 16-17 is applicable for all these straight TV sets using 21" or 24" picture tubes.

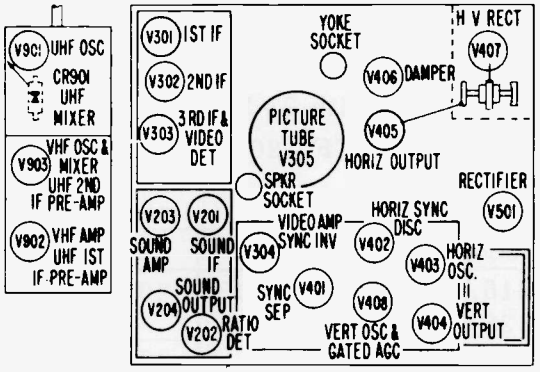
All chassis with prefix 20Y4 followed by various letters use 21 MC I.F. and are for VHF reception. Alignment is on pages 7-9. The circuit on pages 14-15 is exact for chassis listed on page 14. The other 21" and 24" straight TV sets in this series are earlier versions of run 22 sets covered by schematic on pages 14-15. Besides some of the changes listed on page 14, these sets differ in the placement of some of the parts. The tuner may be mounted to the side of the chassis at the top, and to keep all leads short the positions of I.F. Board and Sound Board are interchanged and both boards are inverted end for end.

The 20Y4D chassis is mounted on end because of the 27" picture tube. PM focus assembly is used. Width and horizontal linearity adjustments are also used. A different printed wiring Sync Board is used because a different vertical output tube (V404) type 6AV5GT is required. This tube is mounted on a metal extension located in the lower corner of the chassis.

The combination models (having a chassis numbers that include letter "H") use Dynamagic radio type 3D1 in combination with the television chassis. In these sets only two printed wiring boards are used instead of three. The I.F. and Sync Boards are similar to those used in other sets, but the sound stages are conventionally wired on a metal sub-chassis which is mounted on the main chassis.

ADMIRAL Service Information on the 20Y4 and 20SY4 Series Chassis

Rear View of Chassis.



CR901—IN82A
V901—6AF4
V902—6BC8
V903—6U8
V201—6AU6
V202—6AL5
V203—6AV6
V204—6BF5
V301—6CB6
V302—6CB6
V303—6AM8
V304—6AW8
V305 {**21ALP4A** / **24DP4A**}
V401—6CS6
V402—6AL5
V403—12AU7
V404—6S4
V405—6CU6
V406—6AU4GT
V407—1B3GT
V408—6BH8
V501—5U4GA or 5U4GB

Top view, showing location of tubes of 20SY4 series 21" and 24" sets.

NOISE GATE ADJUSTMENT

The Noise Gate control is used to improve sync stability in fringe and noisy areas.

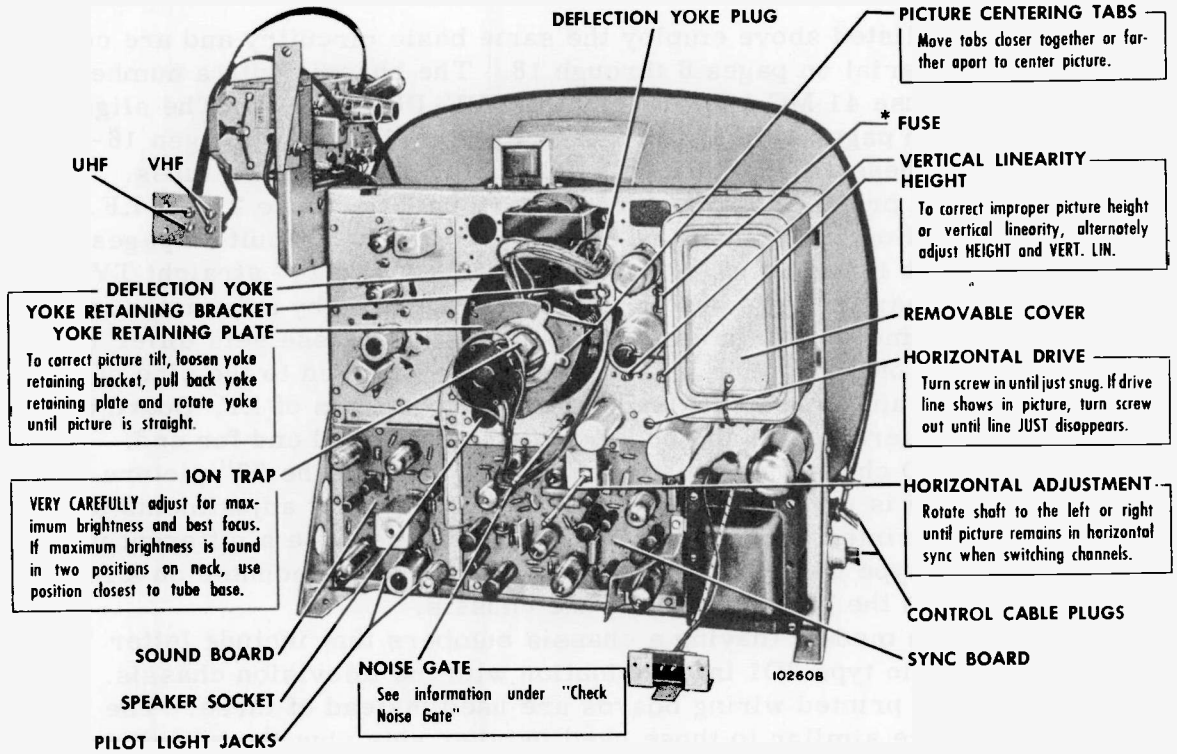
Set the Noise Gate fully to the left (counter-clockwise). Set the Channel Selector for the strongest TV station. (Be sure that the Vertical and Horizontal adjustments are correct.) If the picture is unstable (jitters or rolls), slowly turn the Noise Gate control to the right until the picture just becomes stable. Check adjustment on other TV stations, and if necessary, readjust control.

Caution: If the Noise Gate is turned too far clockwise for a strong signal, the picture may roll vertically, tear horizontally or disappear.

ALIGNMENT OF 4.5 MC TRAP A11, USING A TELEVISION SIGNAL

Beat interference (4.5 MC) appears in picture as very fine vertical or diagonal lines, very close together, having a "gauze-like" appearance, the pattern will vary with speech, forming a very fine herringbone pattern.

The trap can be tuned by watching the picture and adjusting the slug A11 for minimum 4.5 MC interference. If greater accuracy is required, the trap should be adjusted as instructed in step 3 under "4.5 MC Sound IF and Trap Alignment".



*Early sets used a ½ amp. quick-acting (8AG) fuse. A ½ amp. slow-blow (3AG) fuse, Part No. 84A1-33 is used in later sets and is the recommended replacement. Since the 3AG fuse is longer, it may be necessary to replace or modify the fuse holder.

Rear View of Chassis Showing Adjustment Locations. Note: Control Cable Sockets and Plugs Not Used In 20SY4E, 20SY4F and 20SY4L Chassis.

41 MC IF Sub-Chassis used in VHF-UHF Chassis.

*Early sets used a ½ amp. quick-acting (8AG) fuse. A ½ amp. slow-blow (3AG) fuse, Part No. 84A1-33 is used in later sets and is the recommended replacement. Since the 3AG fuse is longer, it may be necessary to replace or modify the fuse holder.

Figure 5. Rear View of 20Y4E, 20SY4E, 20Y4F, 20SY4F, 20Y4L, 20SY4L Chassis Showing Adjustment Locations.

IMPORTANT ALIGNMENT HINTS

The following suggestions should be performed if difficulty is experienced during the alignment procedure.

1. IF CIRCUIT INSTABILITY: When spot frequency aligning the IF amplifiers, the VTVM pointer may swing when the hand is placed too near the IF transformers. When viewing the IF response curve on an oscilloscope, the curve may change shape with hand capacity, especially when aligning 3rd IF transformer T303. To correct either of these conditions, the following alignment hints should be tried:

(a) Check the generator output leads to be certain that the unshielded portion (especially the grounded lead) is as short as practicable.

(b) Be sure that a decoupling network is used at the video detector output and that the leads on the network are kept as short as possible; see figure 11.

(c) The use of a nine inch hexagonal alignment tool will permit adjustment without encountering "hand capacity" effects.

2. RECEIVER OVERLOADING WHEN CHECKING THE OVER-ALL RESPONSE CURVE: Due to the inherent high sensitivity of these receivers, it is very easy to cause overloading of the third IF amplifier stage. In some cases, generator leakage alone is enough to produce a response curve on the oscilloscope. To prevent overloading, the following things should be done:

(a) Be certain that the generator output attenuators are set for a minimum output.

(b) Some generators have a built-in pad in the output cable. Be sure that the pad in the cable is properly connected in the circuit. Refer to the generator instruction manual for details.

(c) If a pad is not built in, the 12 db pad shown below in figure 10 can be constructed and connected between the generator and the antenna terminals.

3. CONNECT SPEAKER AND DEFLECTION YOKE: Speaker and deflection yoke must be connected to chassis during alignment.

Figure 9. Special Tube Shield for IF Alignment and IF Response Curve Check.

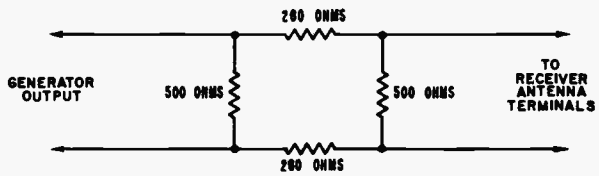


Figure 10. Illustration of 12 db Attenuation Pad for Viewing Over-all RF-IF Response Curve.

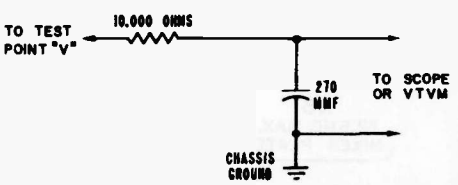


Figure 11. Decoupling Filter.

ADMIRAL Alignment Information for 20Y4 Series, 21 MC I.F. Chassis

Information on this page applies ONLY to chassis with a 21 MC IF system.

SIMPLIFIED ALIGNMENT

After becoming familiar with alignment procedure, some servicemen simplify subsequent alignment of sets by merely using the essential alignment data given in figures 12, 13, 14.

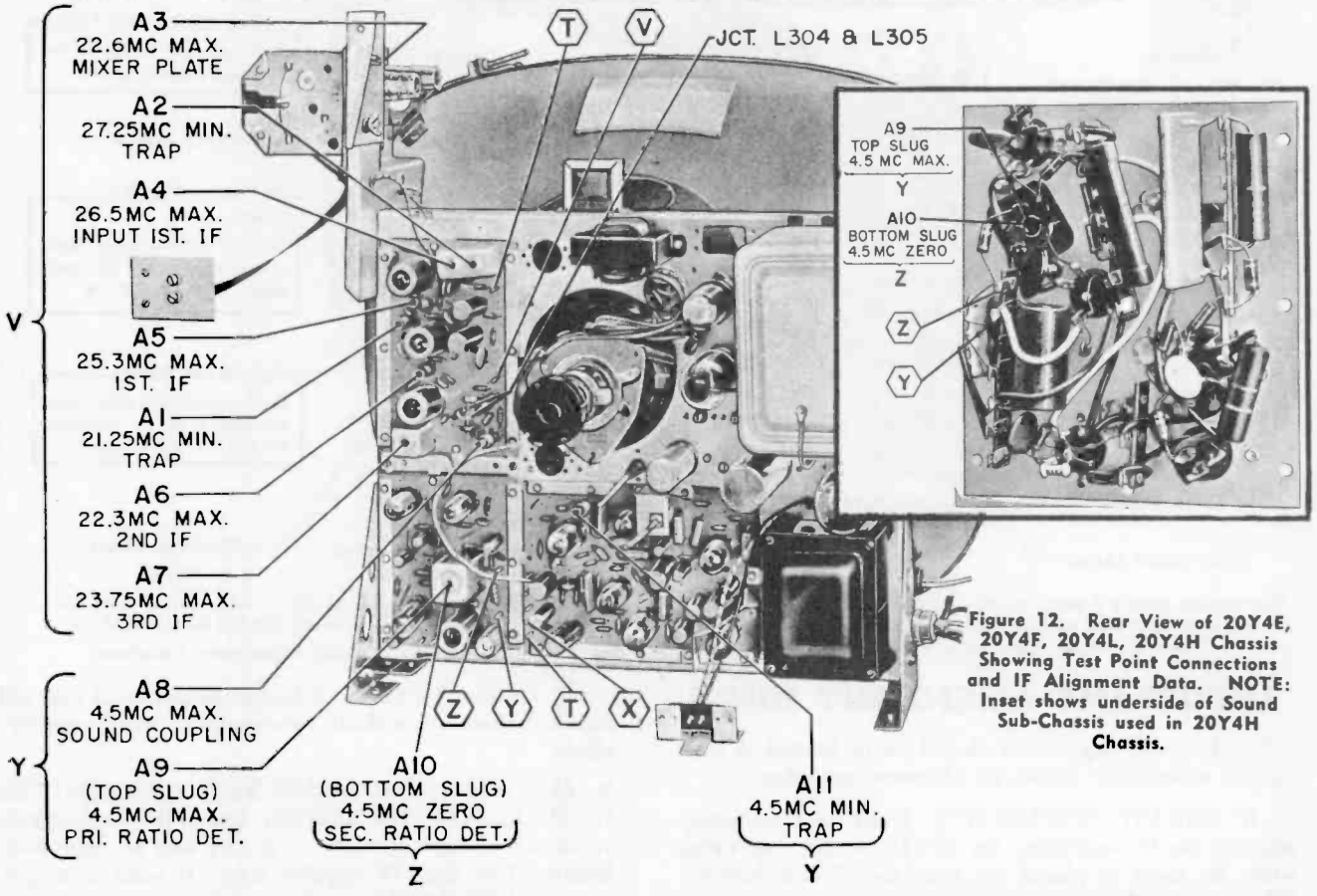


Figure 12. Rear View of 20Y4E, 20Y4F, 20Y4L, 20Y4H Chassis Showing Test Point Connections and IF Alignment Data. NOTE: Inset shows underside of Sound Sub-Chassis used in 20Y4H Chassis.

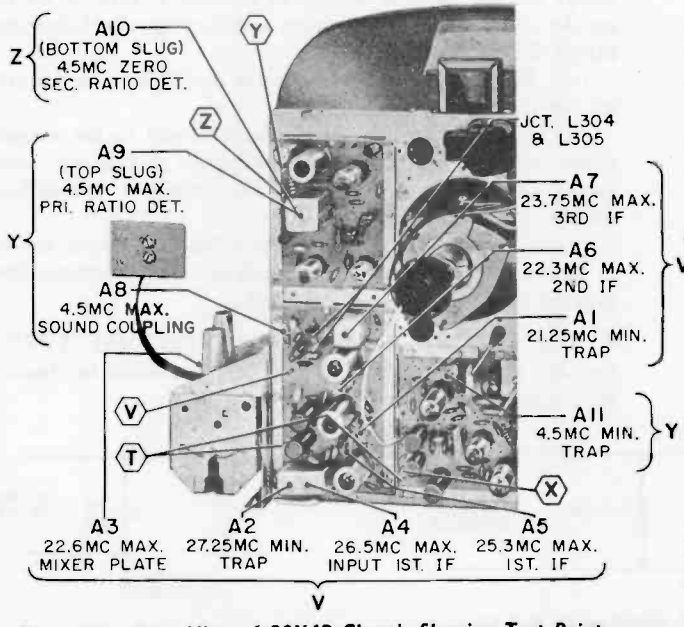


Figure 13. Rear View of 20Y4B Chassis Showing Test Point Connections and IF Alignment Data.

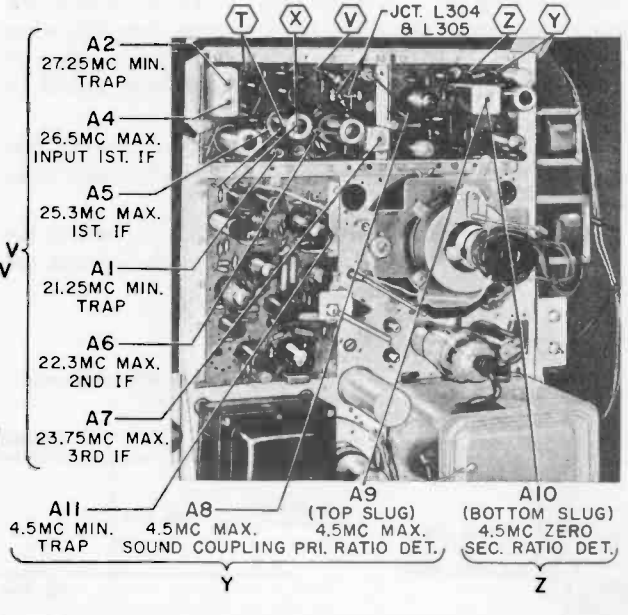


Figure 14. Rear View of 20Y4D Chassis Showing Test Point Connections and IF Alignment Data.

ADMIRAL Alignment Information for 20Y4 Series, 21 MC I.F. Chassis

21 MC IF AMPLIFIER AND TRAP ALIGNMENT

See page 11 for 41 MC IF Amplifier and Trap Alignment.

- Connect negative of bias supply to test point "T", see figures 12 through 14, positive to chassis. -3 volt supply required for steps 3, 4, 5, 6, 7 and 8. -1½ volt supply may be required for steps 1 and 2.
- Disconnect antenna. Connect a jumper wire across antenna terminals.
- Set Channel Selector to Channel 3 or other unassigned low channel to prevent interference during alignment.
- Set Contrast control fully counterclockwise.
- Connect generator high side to insulated tube shield for 6J6 (V102); connect low side to chassis near tube shield. See figure 9.
- Connect VTVM high side to test point "V" through a decoupling filter, common to chassis. See figures 11 through 14. Use lowest DC scale on VTVM.
- Allow about 15 minutes for receiver and test equipment to warm up.

Step	Signal Gen. Freq.	Instructions	Adjust
Before proceeding, be sure to check the signal generator used in alignment against a crystal calibrator or other frequency standard for absolute frequency calibration required for this operation.			
1	21.25 MC	If necessary, increase generator output and/or reduce bias to -1½ volts to obtain a definite indication on VTVM.	A1 for minimum.
2	27.25 MC		A2 for minimum.
3	22.6 MC	Use -3 volts bias. When adjusting, keep reducing generator output to prevent VTVM reading from exceeding 2 volts.	A3 for maximum.
4	26.5 MC		A4 for maximum.
5	25.3 MC		A5 for maximum.
6	22.3 MC		A6 for maximum.
7	23.75 MC		A7 for maximum.
8	To insure correct IF alignment, make "IF Response Curve Check".		

IF RESPONSE CURVE CHECK (Using sweep generator and oscilloscope)

Receiver Controls and Bias Battery	Sweep Generator	Marker Generator	Oscilloscope	Instructions
Set Channel Selector on channel 3 or an unassigned low channel. Contrast control fully to the left. Connect negative of 3 volt bias supply to test point "T"; positive to chassis.	Connect high side to 6J6 mixer-osc. insulated tube shield, see fig. 9. Connect low side to chassis near tube shield. Set sweep frequency to 23MC, and sweep width approximately 7MC.	If an external marker generator is used, loosely couple high side to sweep generator lead on tube shield, low side to chassis. Marker frequencies indicated on IF Response Curve.	Connect high side to test point "V" through a decoupling filter, see figs. 11 through 14.	Check curve obtained against ideal response curve in fig. 15. Note tolerances on curve. Keep marker and sweep outputs at very minimum to prevent overloading. A reduction in sweep output should reduce response curve amplitude without altering the shape of the response curve. If the curve is not within tolerance or the markers are not in the proper location on the curve, touch-up with IF slugs as instructed below. **Important:** If curve changes shape with hand capacity, see section 1 of "Important Alignment Hints."

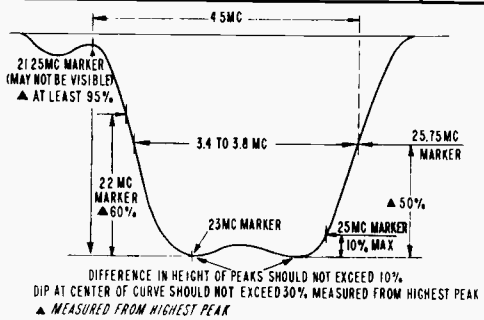


Figure 15. Ideal IF Response Curve.

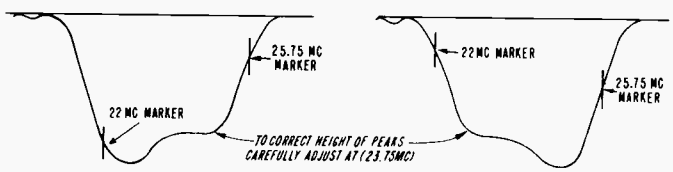


Figure 16. IF Response Curves, Incorrect Shape.

If it is necessary to adjust for approximate equal peaks and marker location, carefully adjust alignment slugs as instructed under the above figures. It should not be necessary to turn the slugs more than one turn in either direction.

If the curve cannot be made to resemble the response curve shown at left, repeat all steps under "IF Amplifier and Trap Alignment" making sure that generator frequencies are accurate and adjustments are carefully made. If a satisfactory curve cannot be obtained after repeating these steps, it may be necessary to change IF amplifier tubes or check for a defective circuit component to be sure that each stage is operating properly.

4.5 MC SOUND IF AND TRAP ALIGNMENT

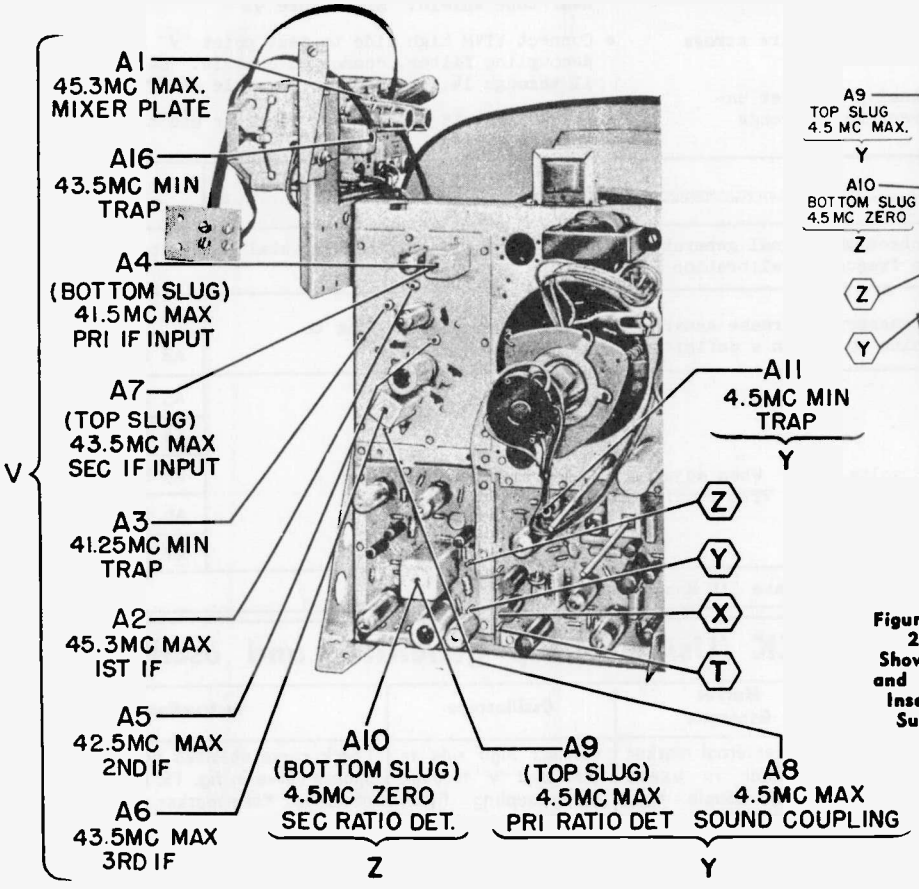
This procedure is identical for 21 MC and 41 MC IF Chassis. ***See page 12.***

ADMIRAL Alignment Information for 20SY4 Series, 41 MC I.F. Chassis

Information on this page applies ONLY to chassis with a 41 MC IF system.

SIMPLIFIED ALIGNMENT

After becoming familiar with alignment procedure, some servicemen simplify subsequent alignment of sets by merely using the essential alignment data given in figures 22, 23,24.



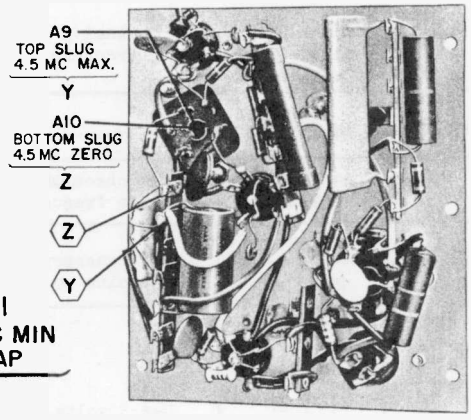


Figure 22. Rear View of 20SY4E, 20SY4F, 20SY4L, 20SY4H Showing Test Point Connections and IF Alignment Data. NOTE: Inset shows underside of Sound Sub-Chassis used in 20SY4H Chassis.

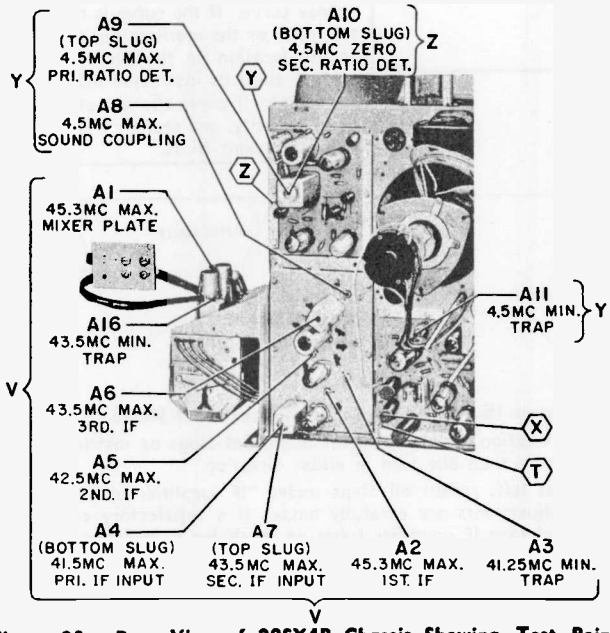


Figure 23. Rear View of 20SY4B Chassis Showing Test Point Connections and IF Alignment Data.

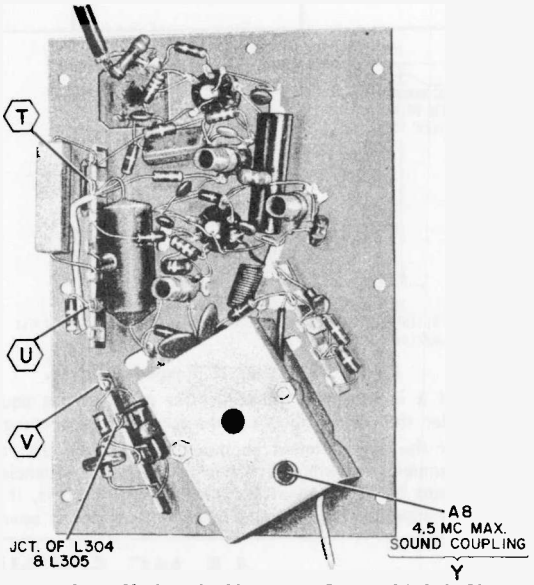


Figure 24. Underside View of 41 MC IF Sub-Chassis Showing Test Point Locations.

ADMIRAL Alignment Information for 20SY4 Series, 41 MC I.F. Chassis

41 MC IF AMPLIFIER AND TRAP ALIGNMENT

See page 9 for 21 MC IF Amplifier and Trap Alignment

- Connect negative of bias supply to test point "T", see figures 22 or 23, positive to chassis. 4 volt supply required for steps 1, 2, 4, 5, 6, 7 and 8. -1½ volt supply may be required for steps 3 and 13.
- Disconnect antenna. Connect a jumper wire across antenna terminals.
- Set Channel Selector to Channel 12 or other unassigned high VHF channel to prevent interference during alignment.
- Set Contrast control fully counterclockwise, and Noise Gate fully clockwise.
- Allow about 15 minutes for receiver and test equipment to warm up.
- Connect generator high side to top of insulated tube shield for 6U8 (V903); connect low side to chassis near tube shield. See figure 9.
- Connect VTVM high side to test point "V" through a decoupling filter, common to chassis. See figures 11 and 24. Use lowest DC scale on VTVM.

Step	Signal Gen. Freq.	Instructions	Adjust
Before proceeding, be sure to check the signal generator used in alignment against a crystal calibrator or other frequency standard for absolute frequency calibration required for this operation.			
1	45.3 MC	Use-4 volts bias. When adjusting, keep reducing generator output to prevent VTVM reading from exceeding 3 volts.	A1 for maximum.
2	45.3 MC		A2 for maximum.
3	41.25 MC	If necessary, increase generator output and/or reduce bias to -1½ volts to obtain a definite indication on VTVM.	A3 for minimum.
4	41.5 MC		A4 for maximum.
5	42.5 MC	Use-4 volts bias. When adjusting, keep reducing generator output to prevent VTVM reading from exceeding 3 volts.	A5 for maximum!
6	43.5 MC		A6 for maximum.
7	43.5 MC		A7 for maximum.
8	45.3 MC	Repeat steps 1 and 2.	Readjust A1 and A2 for maximum.
9	43.5 MC	Repeat steps 6 and 7.	Readjust A6 and A7 for maximum.
10	42.5 MC	Repeat step 5.	Readjust A5 for maximum.
11	41.5 MC	Repeat step 4. NOTE: If more than ¼ turn of rotation is needed to peak A4 in this step, then it will be necessary to repeat steps 2 and 6.	Readjust A4 for maximum.
12	45.3 MC 41.5 MC 43.5 MC	Repeat steps 2, 4 and 6. If A2, A4 and A6 were far off frequency in these steps, repeat steps 2, 4 and 6 once more.	A2 for maximum. A4 for maximum. A6 for maximum.
13	43.5 MC	Disconnect antenna terminals jumper, connect generator high side to antenna terminals. Set Channel Selector to 2 or other low channel. If necessary, increase generator output and/or reduce bias to -1½ volts to obtain a definite indication on VTVM.	A16 for minimum.
14	To insure correct IF alignment, make "IF Response Curve Check".		

TOUCH-UP OF RATIO DETECTOR SECONDARY (A10) USING TELEVISION SIGNAL

Adjustment need be made on one channel only.

Proceed as follows:

a. Turn set on and allow about 15 minutes for warm up.

b. Tune set for normal picture and sound.

c. Carefully adjust the secondary slug (A10) of the Ratio Detector Transformer using a non-metallic alignment tool with a hexagonal end (part number 98A30-12). Both slugs (A9 and A10) have hollow cores. Either slug may be adjusted from the top or bottom of the chassis by passing the alignment tool through the core of the first slug encountered. A10 is the slug closest to the chassis.

Adjust A10 for best sound with minimum buzz level. Do this carefully as only slight rotation in either direction will generally be required. Correct adjustment point is located between the two maximum buzz peaks that will be noticed when turning the slug back and forth about ¼ to ½ turn.

d. If necessary, repeat individual channel slug adjustment and conclude with retouching the ratio detector secondary. Note: If oscillator adjustment is required for other channels, it will ***not*** be necessary to repeat the ratio detector secondary adjustment after ***once*** correctly adjusting it.

ADMIRAL Alignment Information for 20SY4 and 20Y4 Series Chassis

IF RESPONSE CURVE CHECK (Using sweep generator and oscilloscope)

Receiver Controls and Bias Battery	Sweep Generator	Marker Generator	Oscilloscope	Instructions
Set Channel Selector on channel 12 or an unassigned high channel. Contrast control fully to the left. Connect negative of 4½ volt bias supply to test point "T"; positive to chassis.	Connect high side to 6U8 mixer-osc. insulated tube shield, see figure 9. Connect low side to chassis near tube shield. Set sweep frequency to 44.5 MC, and sweep width approximately 7MC.	If an external marker generator is used, loosely couple high side to sweep generator lead on tube shield, low side to chassis. Marker frequencies indicated on IF Response Curve.	Connect high side to test point "V" through a decoupling filter, see figs. 11 and 24.	Check curve obtained against ideal response curve in fig. 25. Note tolerances on curve. Keep marker and sweep outputs at very minimum to prevent overloading. A reduction in sweep output should reduce response curve amplitude without altering the shape of the response curve. If the curve is not within tolerance or the markers are not in the proper location on the curve, touch-up with IF slugs as instructed below. **Important:** If curve changes shape with hand capacity, see section 1 of "Important Alignment Hints."

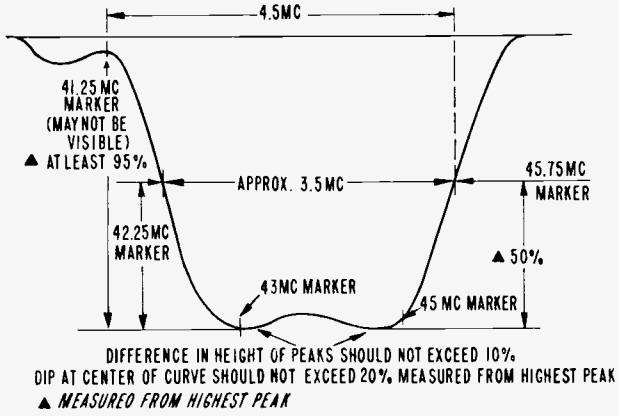


Figure 25. Ideal IF Response Curve.

Figure 26. IF Response Curves, Incorrect Shape.

If it is necessary to adjust for incorrect response curve tilt or for excessive peak to valley ratio, carefully adjust alignment slugs as instructed under the above figures.

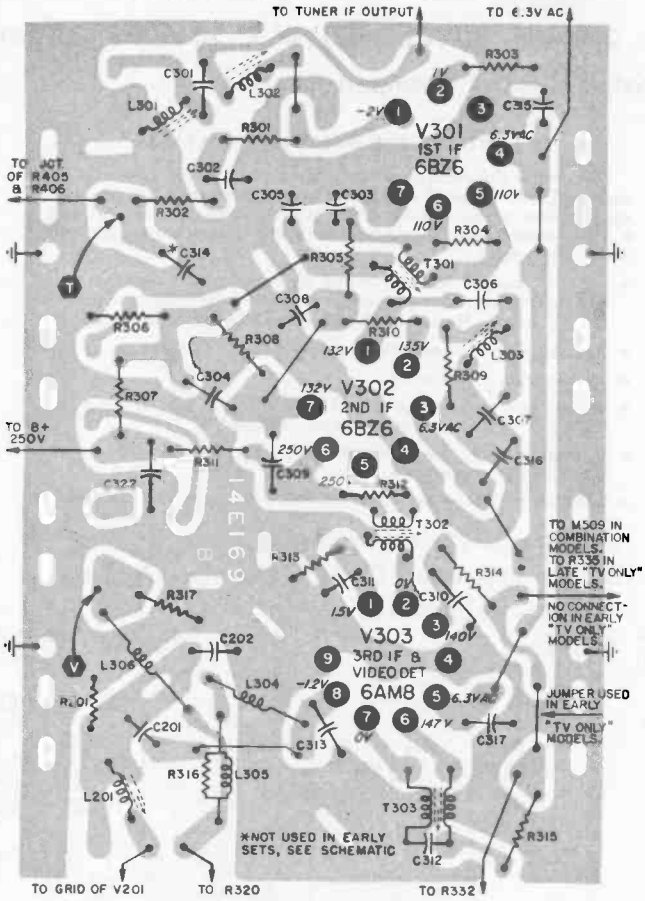
If the curve cannot be made to resemble the response curve shown at left, repeat all steps under "IF Amplifier and Trap Alignment" making sure that generator frequencies are accurate and adjustments are carefully made. Note: When aligning A1, A4 and A7, interaction between these tuned circuits is present. Repeat adjustment of these three tuned circuits several times at the correct frequency until a minimum of touch up is required for each stage.

4.5 MC SOUND IF AND TRAP ALIGNMENT

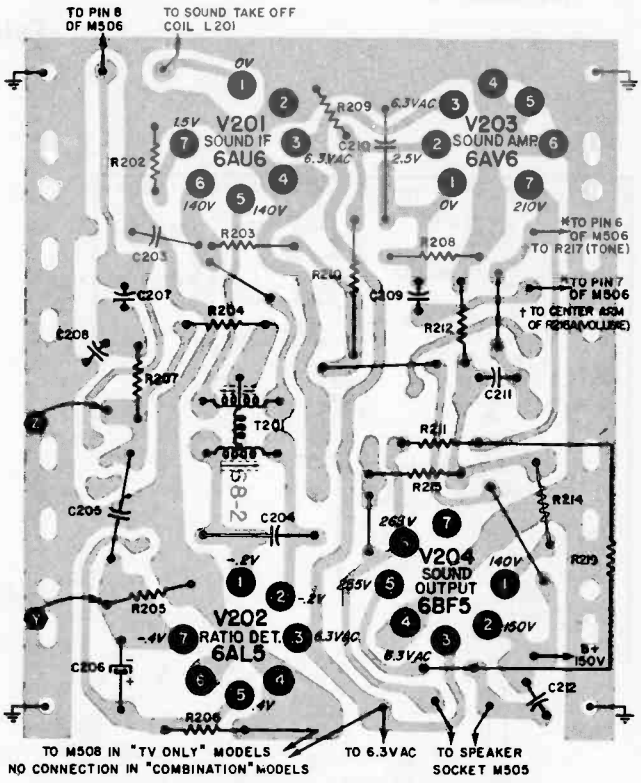
It is preferable to use a TV signal rather than a signal generator for this alignment. However, if a TV signal is not available, a signal generator which has been checked against a crystal calibrator or other frequency standard may be used. Accuracy required is within one kilocycle.

- If a television signal is to be used, connect antenna, set Channel Selector to the strongest TV signal available and tune in a picture.
- If a signal generator is to be used, disconnect antenna and short terminals together. Connect high side of generator to junction of L304 and L305 through a .01 mf, capacitor.
- Allow about 15 minutes for receiver and test equipment to warm up.
- Set Contrast control fully to the left (counterclockwise).
- See figures 12 through 14 (21 MC sets) or figures 22 through 24 (41 MC sets), for alignment and test point locations.
- Use a ***non-metallic*** alignment tool. Ratio Detector Transformer (T201) has hollow core slugs. Adjustments A9 and A10 can be made from the top of transformer if you use alignment tool, part number 98A30-12 obtainable from Admiral distributor.

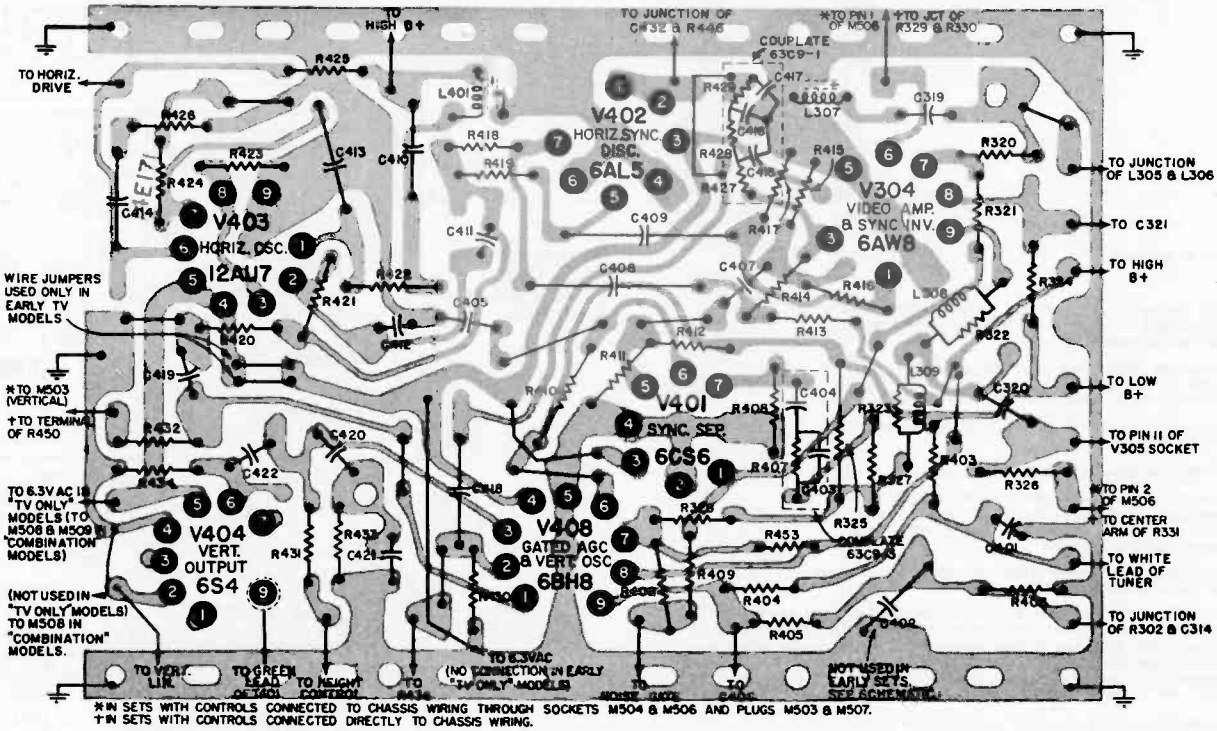
Step	Signal Gen. Freq. (MC)	VTVM Connections	Instructions	Adjust
1	Tune in TV Signal or Set Signal Generator to exactly 4.5 MC	High side to test point "Y"; common to chassis.	Use lowest DC scale on VTVM.	A8 and A9 for maximum (keep reducing generator output to keep VTVM at approx. 1 volt).
2		High side to test point "Z"; common to chassis.	Use zero center scale on VTVM, if available.	A10 for zero on VTVM (the correct zero point is located between a positive and a negative maximum). If A10 was far off, repeat step 1.
3		High side to test point "Y"; common to chassis.	Connect a wire jumper across L305. Use lowest DC scale possible on VTVM.	A11 for minimum.



View of PRINTED WIRING SIDE of IF Board. Gray area represents printed wiring; black symbols and lines represent components and connections on opposite side.



View of PRINTED WIRING SIDE of Sound Board. Gray area represents printed wiring; black symbols and lines represent components and connections on opposite side.



View of PRINTED WIRING SIDE of Sync Board. Gray area represents printed wiring; black symbols and lines represent components and connections on opposite side.

ADMIRAL

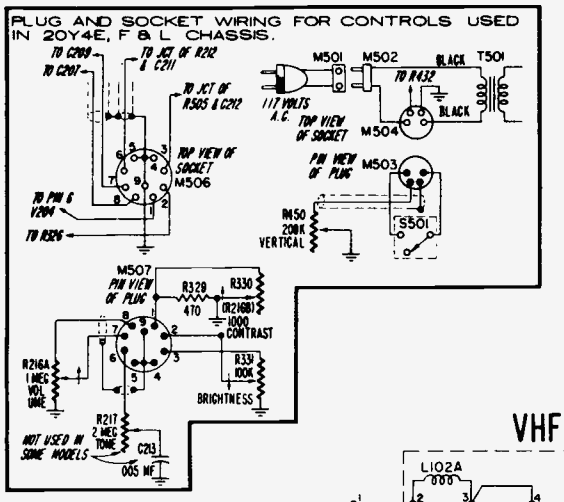
Schematic for 20Y4EF, 20Y4FF, 20Y4LF, 20Y4LS, 20Y4MS, 20Y4NF Television Chassis Stamped Run 22

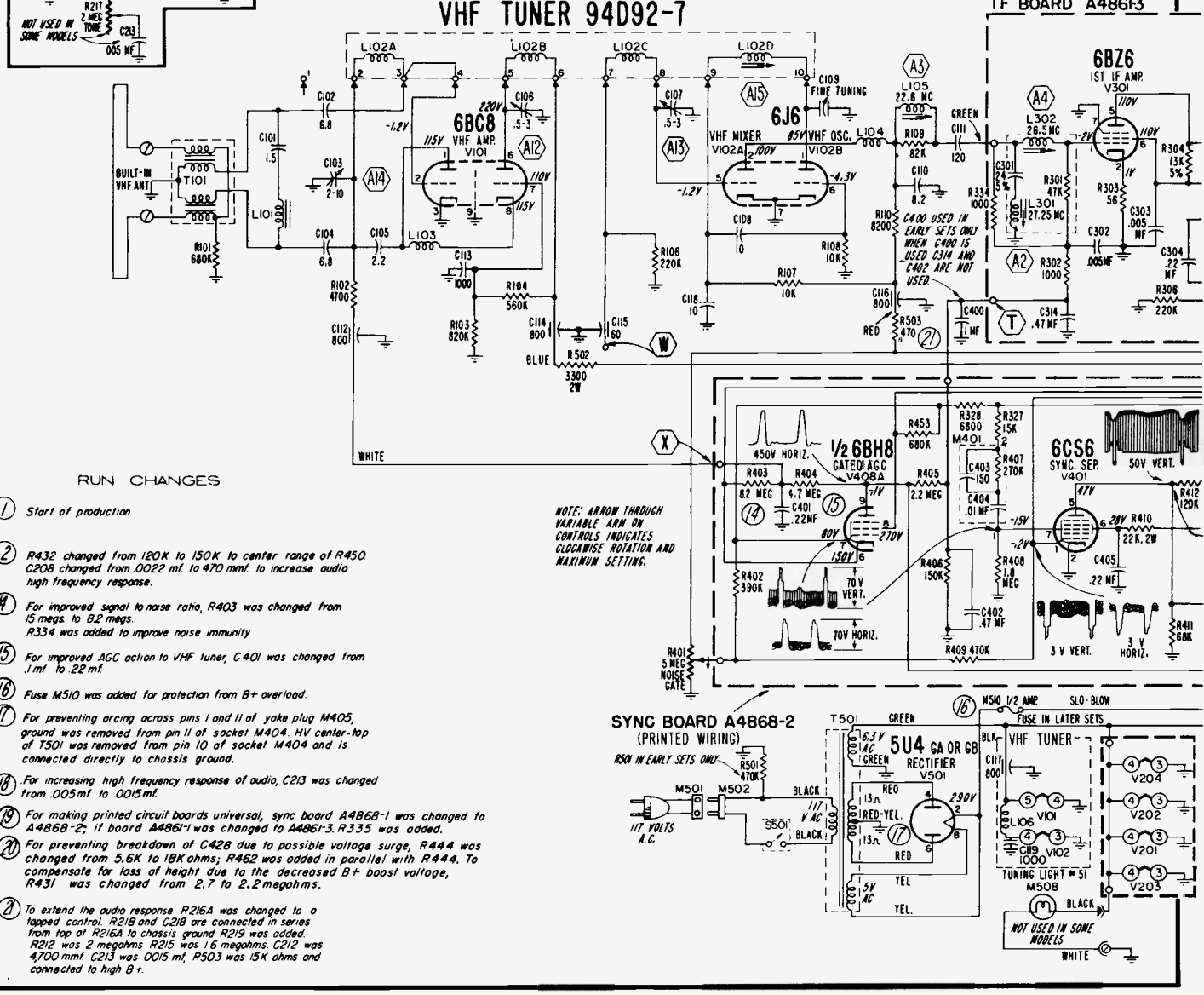
CONDITIONS FOR MEASURING VOLTAGES

Warning: Pulsed high voltages are present at the caps of V405 and V407, and at pin 3 of V406. **Do not** attempt to measure voltages at these points without suitable test equipment. A VTVM with a high voltage probe should be used when measuring picture tube 2nd anode voltage.

- Set the **Channel Selector** on an unused channel. **Contrast** control fully clockwise. All other controls fully counterclockwise. Do not disturb **Horiz. Lock** and **Horiz. Drive** adjustments.
- Antenna disconnected and terminals shorted together.
- Line voltage: 117 volts AC.
- DC voltages measured with a VTVM between tube socket terminals and chassis, unless otherwise indicated.
- Voltages at V101 and V102 measured from the top ot the tuner with tubes in socket. Use of an adapter is recommended.
- Voltages at V305 socket measured with socket removed from tube.

(See page 17 for Schematic Notes and information for Conditions for Observing Waveforms.)





RUN CHANGES

(1) Start of production

(2) R432 changed from 120K to 150K to center range of R450. C208 changed from .0022 mf. to 470 mmf. to increase audio high frequency response.

(14) For improved signal to noise ratio, R403 was changed from 15 megs. to 8.2 megs. R334 was added to improve noise immunity

(15) For improved AGC action to VHF tuner, C401 was changed from .1 mf to .22 mf.

(16) Fuse M510 was added for protection from B+ overload.

(17) For preventing arcing across pins I and II of yoke plug M405, ground was removed from pin II of socket M404. HV center-top of T501 was removed from pin 10 of socket M404 and is connected directly to chassis ground.

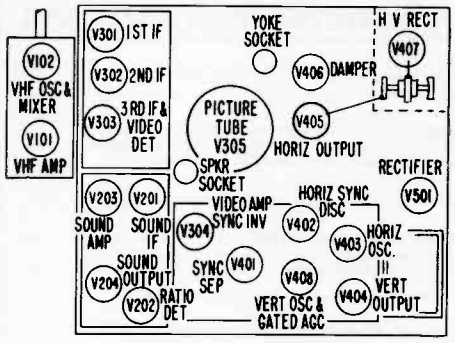
(18) For increasing high frequency response of audio, C213 was changed from .005mf to .0015mf.

(19) For making printed circuit boards universal, sync board A4868-1 was changed to A4868-2; if board A4861-1 was changed to A4861-3. R335 was added.

(20) For preventing breakdown of C428 due to possible voltage surge, R444 was changed from 5.6K to 18K ohms; R462 was added in parallel with R444. To compensate for loss of height due to the decreased B+ boost voltage, R431 was changed from 2.7 to 2.2 megohms.

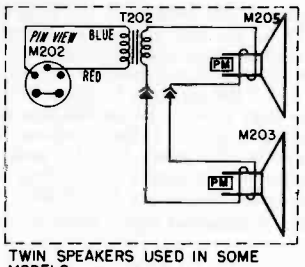
(21) To extend the audio response R216A was changed to a tapped control. R218 and C218 are connected in series from top of R216A to chassis ground R219 was added. R212 was 2 megohms R215 was 16 megohms. C212 was 4700 mmf. C213 was .0015 mf, R503 was 15K ohms and connected to high B+.

ADMIRAL 20Y4EF, etc. Schematic

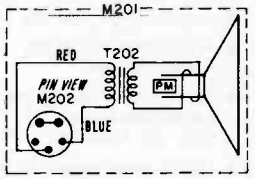


Rear View of Chassis.

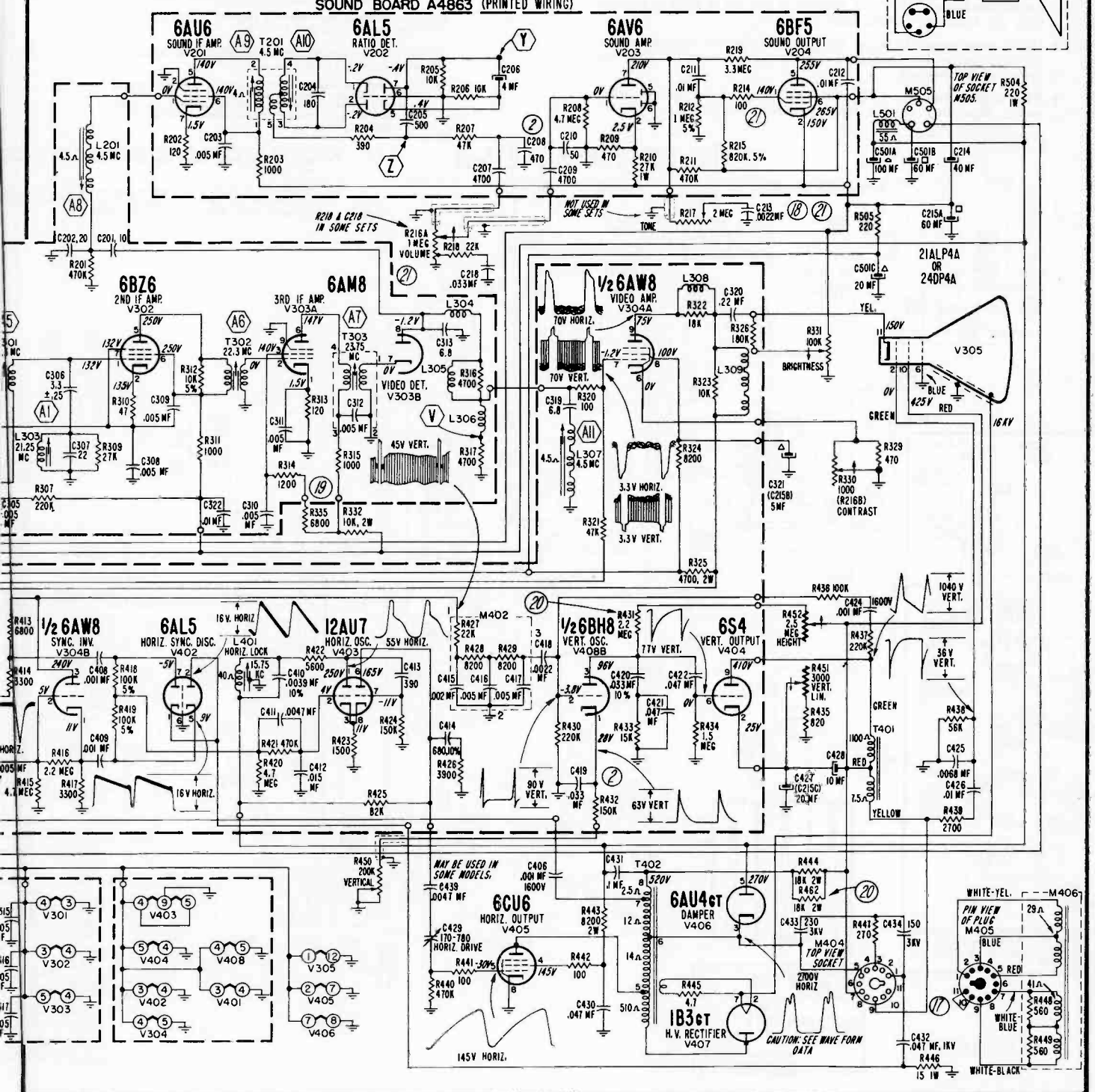
V101—6BC8
V102—6J6
V201—6AU6
V202—6AL5
V203—6AV6
V204—6BF5
V301—6BZ6
V302—6BZ6
V303—6AM8
V304—6AW8
V305 { 21ALP4A, 20Y4EF, LF, LS, MS, NF, 24DP4A, 20Y4FF }
V401—6CS6
V402—6AL5
V403—12AU7
V404—6S4
V405—6CU6
V406—6AU4GT
V407—1B3GT
V408—6BH8
V501—5U4GA or 5U4GB



TWIN SPEAKERS USED IN SOME MODELS



SOUND BOARD A4863 (PRINTED WIRING)



CONDITIONS FOR OBSERVING WAVEFORMS

Warning: Pulsed high voltages are present at the caps of V405 and V407, and at pin 3 of V406. **Do not** attempt to observe waveforms at these points unless suitable test equipment is used. Waveforms at these points may be taken with a capacitive voltage divider probe. The waveform at pin 3 of V406 may also be taken by clipping or twisting the lead from the high side of the oscilloscope over the insulation on the lead connecting to pin 3. If the waveform is taken in this manner, its shape will be the same, but the peak-to-peak voltage will be lower, depending on the degree of coupling between the oscilloscope and the lead connecting to pin 3 of V406.

- Waveforms are taken with a transmitted signal input to the television chassis.
- Set all controls for normal picture. Set **Noise Gate** control fully counterclockwise. After the receiver is set for a normal picture, turn the **Contrast** control fully clockwise.
- Oscilloscope sweep is set at 30 cycles for vertical waveforms and at 7,875 cycles for horizontal waveforms, to permit 2 complete cycles to be observed.
- Peak-to-peak voltages will vary from those shown on the schematic, depending on the test equipment employed.

PRODUCTION CHANGES

(1) Production started.

(2) R432 changed from 120K to 150K to center range of R450. To improve cut-off characteristic, Pin 9 of V902 was removed from ground and connected to junction of R908 and C914.

(15) For improved noise imunity, R403 was changed from 15megs to 8.2megs.

To simplify AGC circuitry, switch S901, R510 and R512 were removed and replaced by R514, R515 and R516. See schematic inset for early circuit.

(16) Fuse M510 was added for protection from B+ overload.

(17) For preventing arcing across Pins 1 and 11 of yoke plug M405, ground was removed from Pin 11 of socket M404. HV center-tap of T501 was removed from Pin 10 of socket M404 and is connected directly to chassis ground.

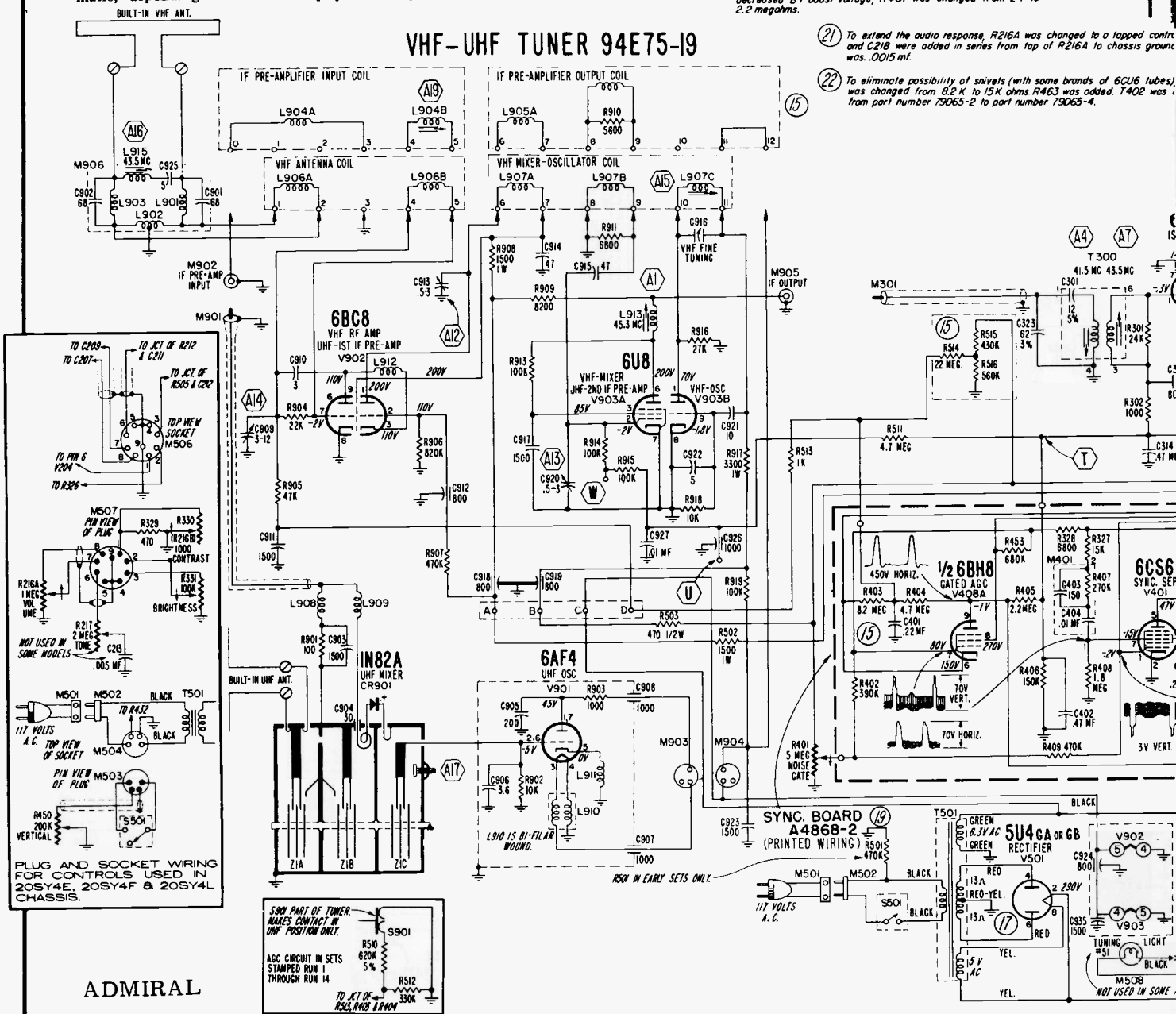
(18) For increasing high frequency response of audio, C213 was changed from .005mf to.0015 mf.

(19) For making printed circuit boards universal sync board A4868-1 was changed to A4868-2

(20) For preventing breakdown of C428 due to possible voltage surge, R444 was changed from 5.6K to 18K ohms, R462 was added in parallel with R444. To compensate for loss of height due to the decreased B+ boost voltage, R431 was changed from 2.7 to 2.2 megohms.

(21) To extend the audio response, R216A was changed to a tapped control and C218 were added in series from tap of R216A to chassis ground. was. .0015 mf.

(22) To eliminate possibility of snivels (with some brands of 6GU6 tubes), was changed from 8.2 K to 15K ohms. R463 was added. T402 was from part number 79065-2 to part number 79065-4.



ADMIRAL

CONDITIONS FOR MEASURING VOLTAGES

Warning: Pulsed high voltages are present at the caps of V405 and V407, and at pin 3 of V406. **Do not** attempt to measure voltages at these points without suitable test equipment. A VTVM with a high voltage probe should be used when measuring picture tube 2nd anode voltage.

- Set the **VHF Channel Selector** on an unused channel. **Contrast** control fully clockwise. All other controls fully counterclockwise. Do not disturb **Horiz. Lock** and **Horiz. Drive** adjustments.
- VHF Antenna disconnected and terminals shorted together.
- Line voltage: 117 volts AC.
- DC voltages measured with a VTVM between tube socket terminals and chassis, unless otherwise indicated.
- Voltages at V901, V902 and V903 measured from the top of the tuner with tubes in socket. Use of an adapter is recommended.
- Voltages at V305 socket measured with socket removed from tube.

Schematic for 20SY4E, 20SY4F, 20SY4L, 20SY4EF, 20SY4FF, 20SY4LS Television Chassis.

SCHEMATIC NOTES

②, ③, . . . indicate production changes covered by a Run number. Run numbers are stamped on the chassis.

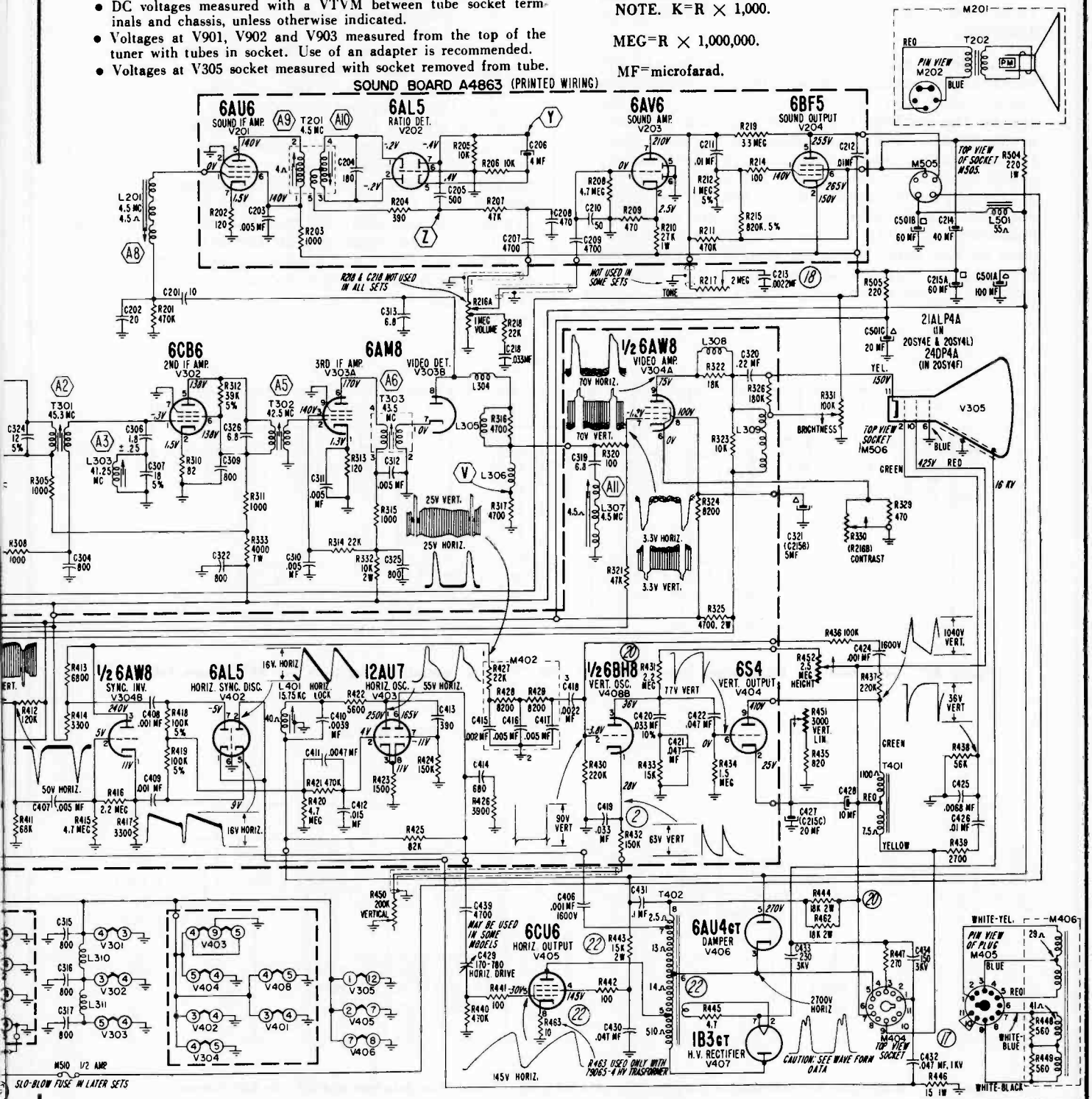
(A1), (A2),.....(Y), (Z), etc. indicate alignment points and alignment connections.

Fixed resistor values shown in ohms ± 10% tolerance, ½ watt; capacitor values shown in micromicrofarads ± 20% tolerance unless otherwise specified.

NOTE. K=R × 1,000.

MEG=R × 1,000,000.

MF=microfarad.



ADMIRAL Service Information on 20Y4+ and 20SY4+ Series Chassis

B+ DISTRIBUTION

To illustrate the basic difference in circuit wiring, B+ distribution diagrams are given

When servicing, it is important to note that in a chassis with a 21 MC IF system, B+ voltage to the 1st and 2nd IF amplifiers V301 and V302 is effectively in series; see B+ distribution diagrams.

The power supply provides approximately 270 volts of DC voltage for application to the receiver circuits. The distribution of this voltage to the various stages is a series-parallel arrangement. The horizontal and vertical deflection circuits, sound amplifier, sync inverter, gated AGC tube screen grid, 1st and 2nd IF amplifiers (in UHF models only) and VHF amplifier requires approximately 270 volts and thus are connected directly across the 270 volt line. Most of the other circuits require approximately one-half of this voltage and obtain it from the cathode of the sound output tube V204 which functions as a series voltage regulator. All the current drawn by these circuits passes through V204, hence the B+ voltage (270 volts) is divided nearly equally between V204 and the stages connected to its cathode. To prevent abnormal current flow through V204, some low voltage stages are connected to 270 volts B+ through a voltage dropping resistor.

The control grid of V204 is connected to a voltage dividing network consisting of R212 and R215, resulting in a fixed potential of approximately 140 volts being applied to the control grid. A change in the cathode voltage of V204 due to AGC fluctuations, tube current variations, etc., will cause a change in the grid to cathode voltage of V204. The resulting change in cathode current tends to maintain the 150 volt supply nearly constant. High value capacitors (C214 and C215A) are necessary in the cathode circuit of V204 to reduce any fluctuations in current due to the audio current components flowing in this stage.

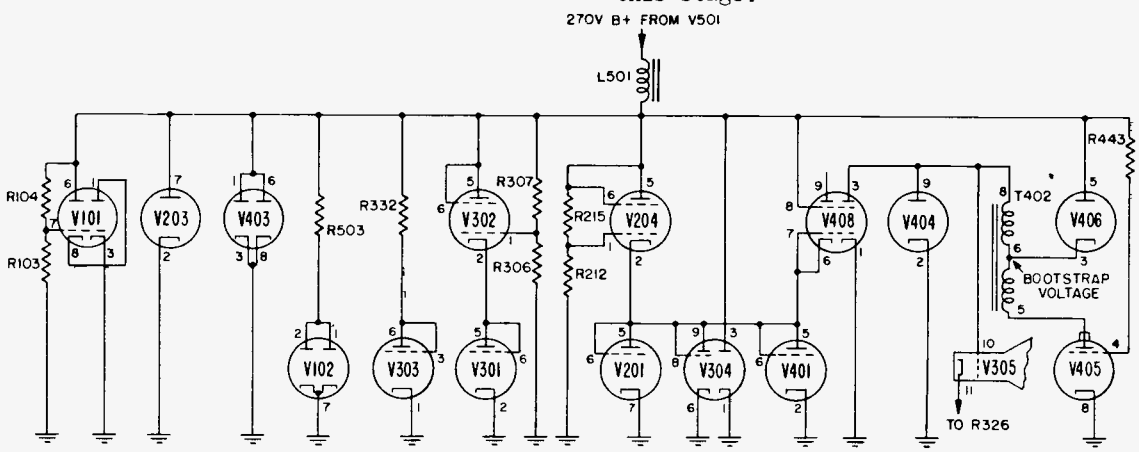


Figure 48. Simplified B+ Distribution Diagram for all VHF "TV-only" models having a 21" or 24" Picture Tube.

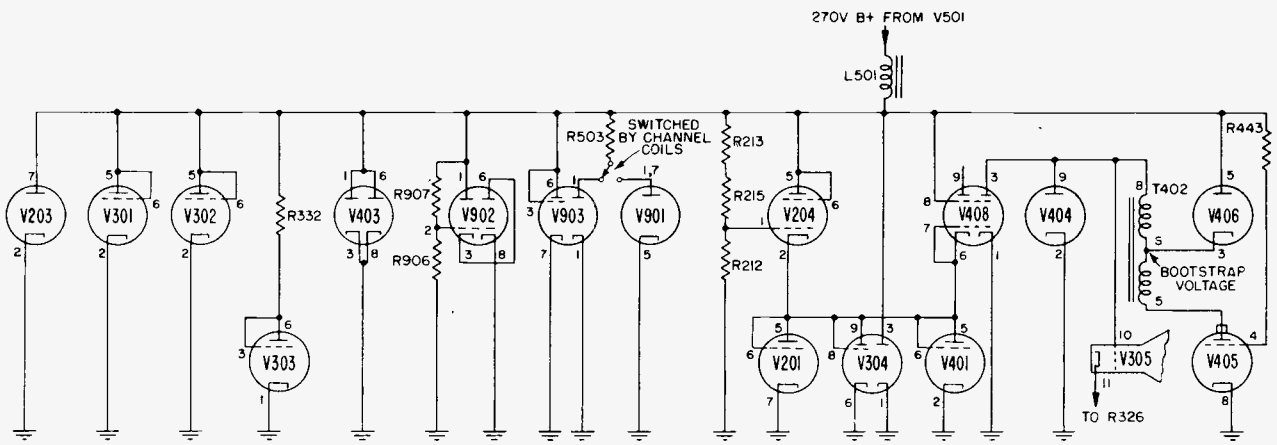
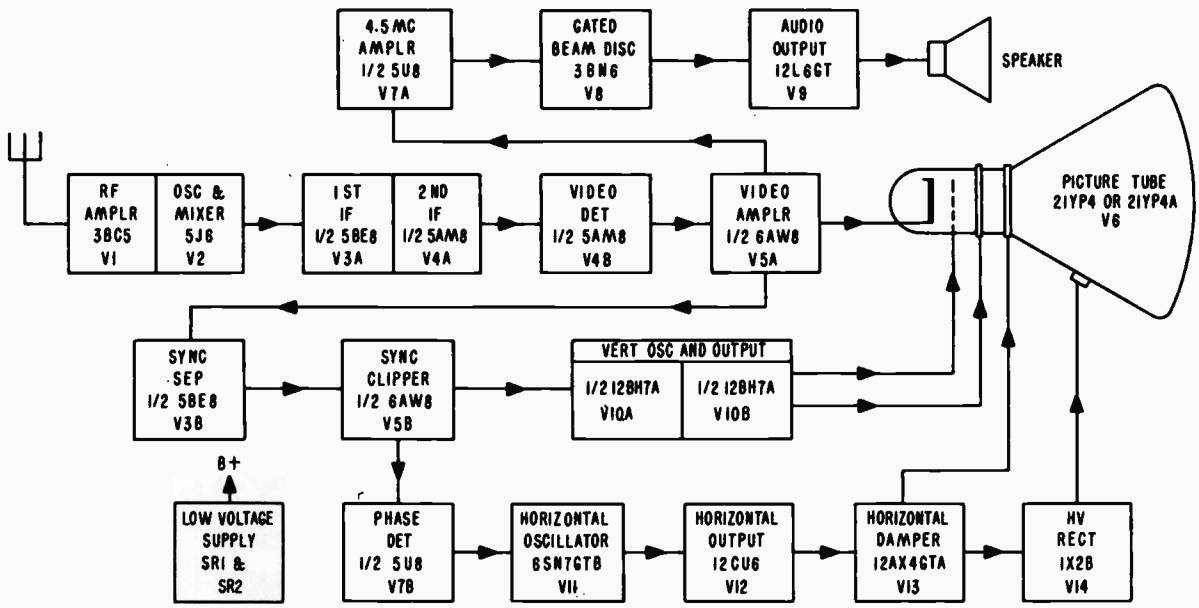


Figure 49. Simplifield B+ Distribution Diagram for all VHF-UHF "TV-only" models having a 21" or 24" Picture Tube.

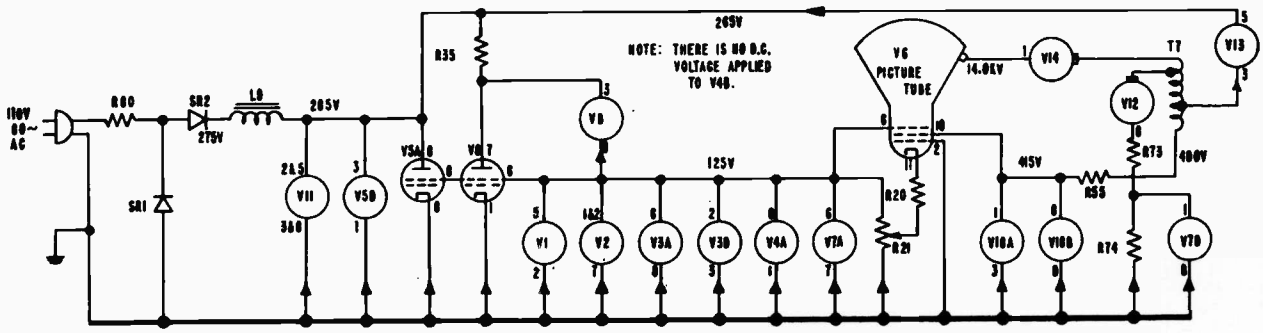
BENDIX TELEVISION
CHASSIS T19

Chassis T 19, used in Models T2100E, T2100M, and T2101M



CURRENT DISTRIBUTION

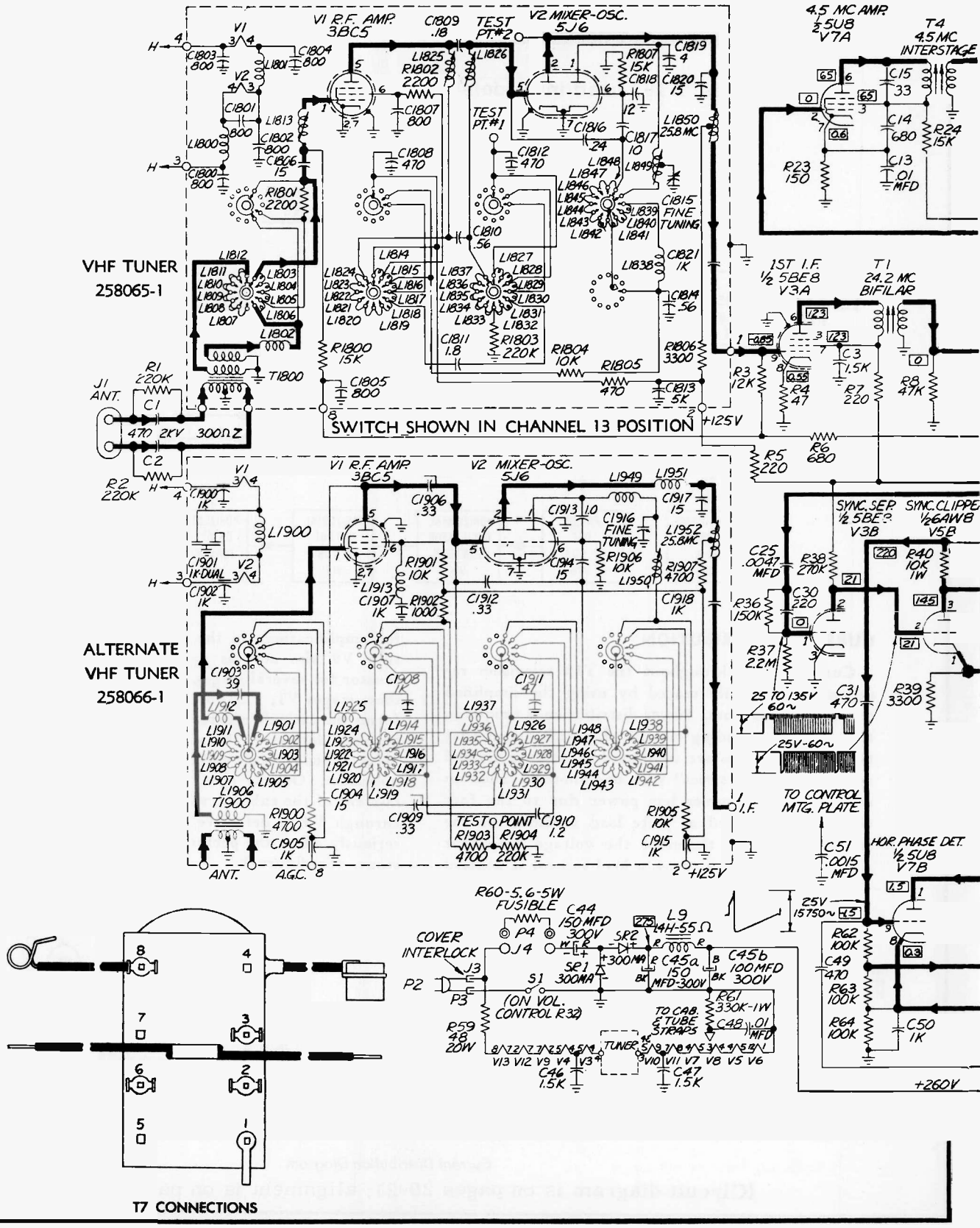
Current flow throughout the T19 television receiver can be easily traced by using the simplified distribution diagram. Power distribution is unique in that voltage cascading is utilized, which means that two or more tubes are connected in what is termed as "plate current series" with one another. Such an arrangement consumes less power due to the fact that tubes are used as plate load resistors for the succeeding stages, therefore the voltage drop that normally takes place across a load resistor is utilized for amplification. In the receiver, the audio output tube V9 also acts as a load- or voltage-dropping resistor for several stages. The parallel impedance of these stages V1, V2, V3A, V3B, V4A, V7A and R21 forms the cathode resistor of V9; consequently, if V9 becomes defective, the supply voltage to the tubes in its cathode circuit will be altered causing inefficient operation. On the other hand, since the combined current of the tubes in the cathode circuit must pass through V9, a defective tube in the cathode could seriously affect the performance of the audio-output stage. (See figure.)



Current Distribution Diagram

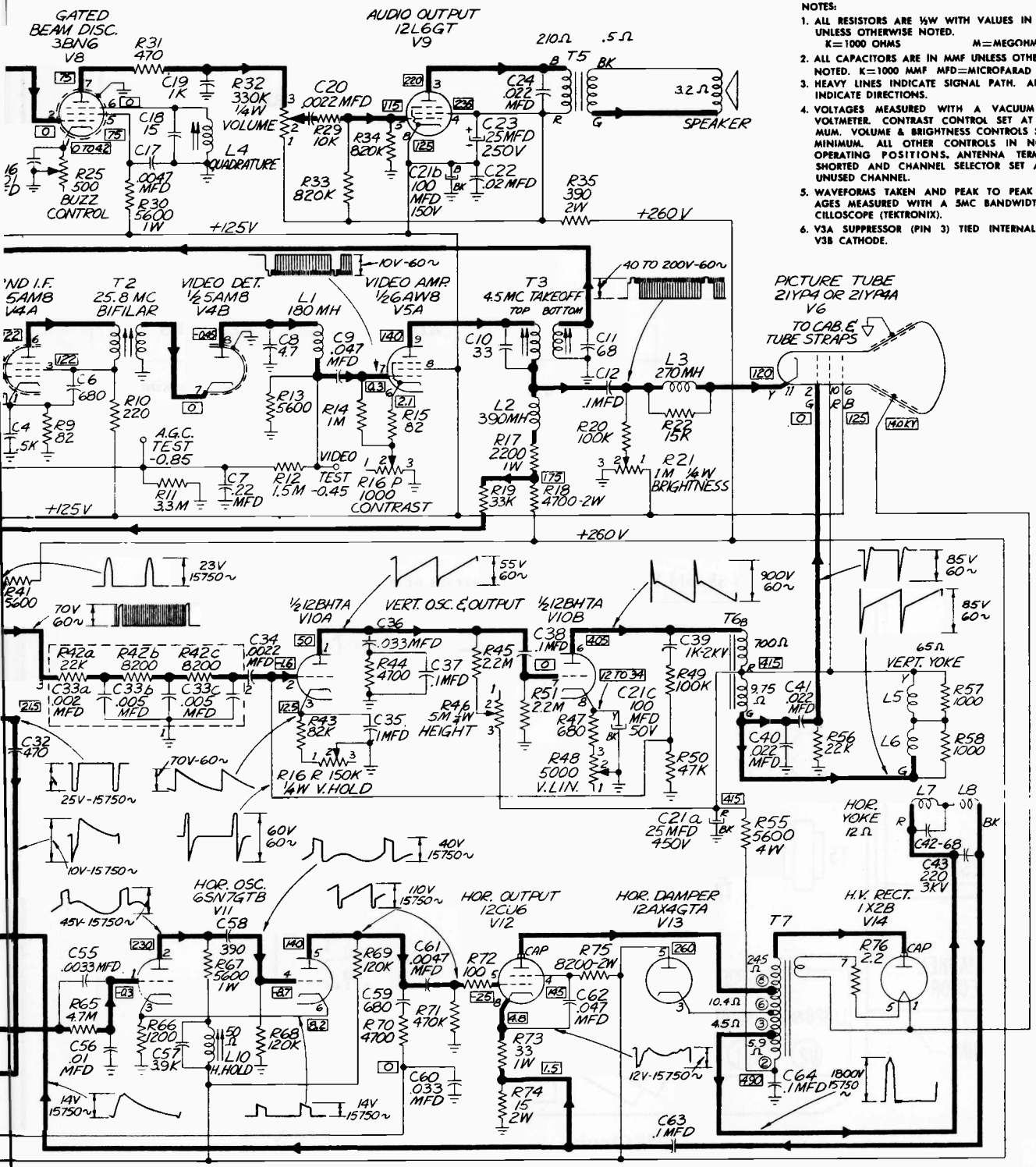
(Circuit diagram is on pages 20-21; alignment is on page 22.)

BENDIX Television Chassis T19 Schematic Diagram



T7 CONNECTIONS

SCHEMATIC DIAGRAM FOR BENDIX TV CHASSIS T19



BUZZ CONTROL ADJUSTMENT

Properly tune in a local television station; and adjust the buzz control (R25) for minimum buzz in the speaker.

BENDIX Chassis T19, Alignment Information

SIMPLIFIED I-F ALIGNMENT

1. Connect the negative terminal of a 3-volt dry cell bias supply to the AGC test point and the positive terminal to chassis ground.

2. Raise the tube shield of V2 until it is not grounded.

3. Connect the output of the signal generator to the ungrounded shield.

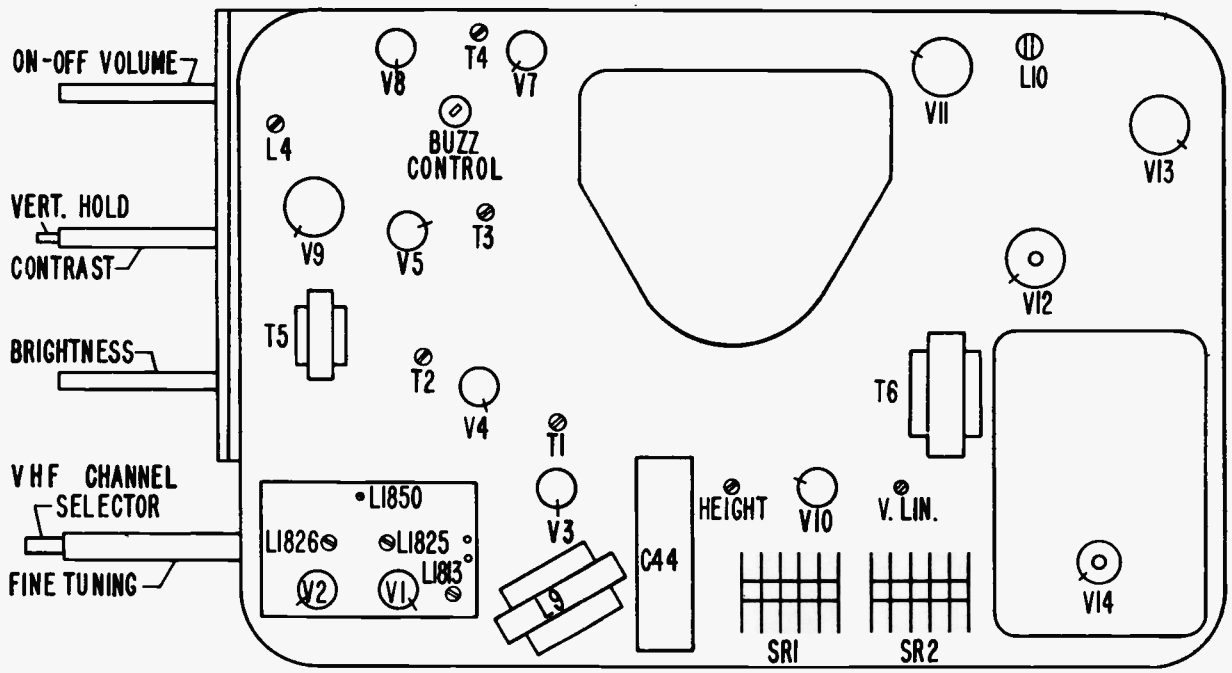
GENERATOR FREQUENCY	VTVM CONNECTIONS	ADJUST	REMARKS
25.8 mc	Video test point	T2 and *L1850	Adjust for maximum
24.2 mc	Video test point	T1	Adjust for maximum

*Located on tuner 258065-1. On tuner 258066-1 the adjustment is L1952.

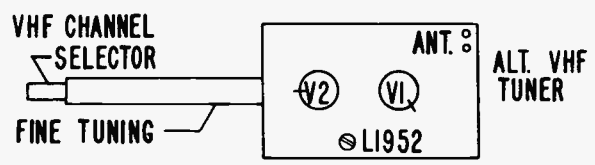
SOUND ALIGNMENT

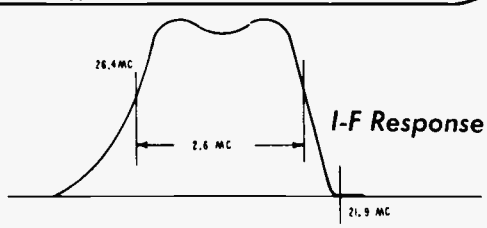
SIGNAL GENERATOR CONNECTIONS	FREQUENCY	CONNECT	ADJUST	REMARKS
Video test point	4.5 mc (FM modulated 12.5 kc deviation)	Audio output meter across voice coil	T3* Top and bottom T4 L4*	Adjust for maximum (with volume and contrast controls set at maximum, the output should not exceed ¾ watt)

*NOTE. The final adjustment of the top slug on T3 should be for minimum 4.5 mc interference in the picture.
The final adjustment of L4 should be for minimum distortion of received audio signal.



Top View, T19 Chassis





I-F Response Curve

CAPEHART-FARNSWORTH COMPANY

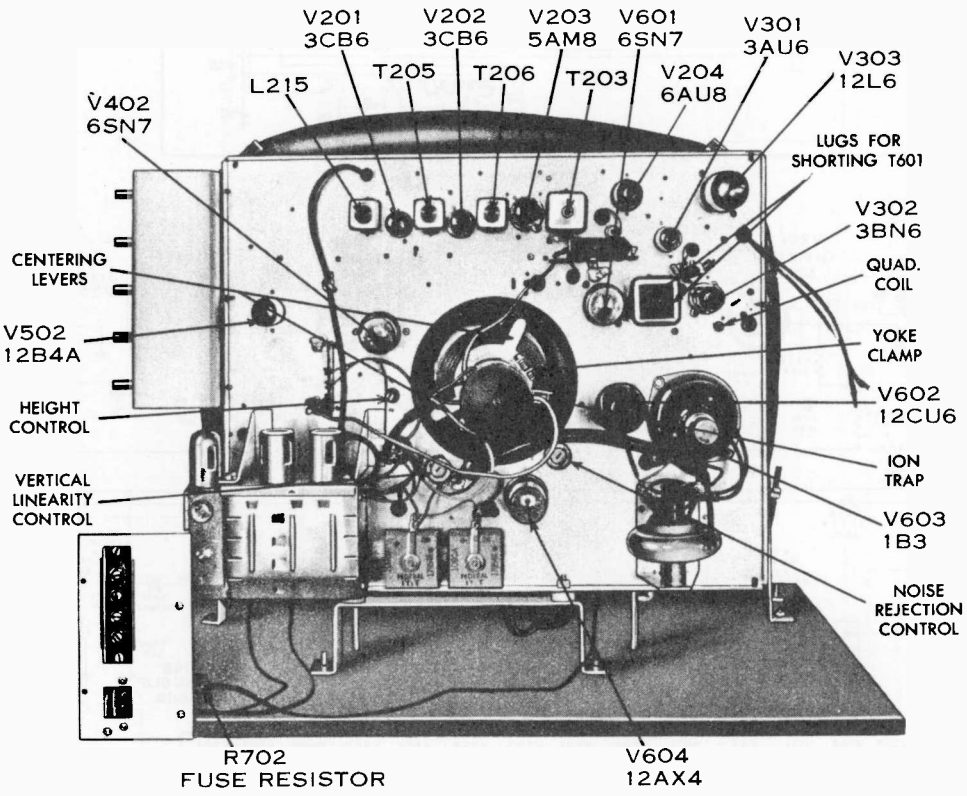
A DIVISION OF
INTERNATIONAL TELEPHONE & TELEGRAPH CORPORATION

Capehart

"CX-43" SERIES

TELEVISION RECEIVER

(Circuit diagram is on pages 24-25; alignment information is on page 26.)



CAPEHART CX-43 CHASSIS TUBE SOCKET RESISTANCE CHART

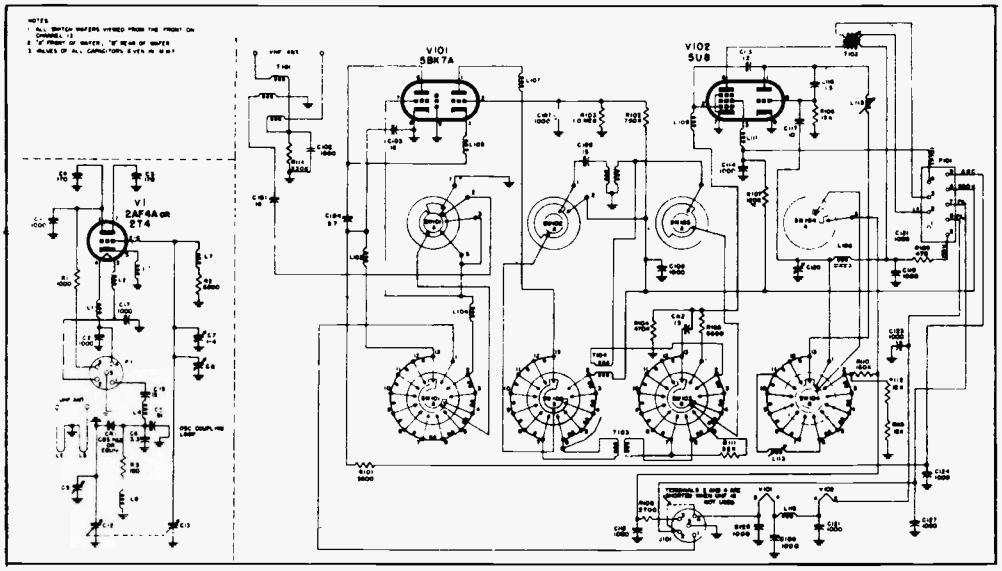
WITH 20,000 OHM PER VOLT METER

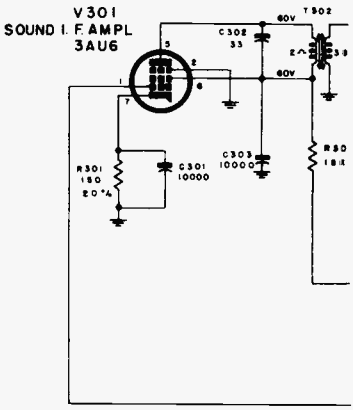
REF. TUBE NO.	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V201 3CB6	850K	47	11	10.5	50K	50K	Short		
V202 3CB6	Inf.	47	10.5	10	50K	50K	Short		
V203 5AM8	100	Short	50K	10	9	50K	3.5	5K	Short
V204 6AU8	Short	2.2 meg.	650K	9	8	*1.6	1 meg.	50K	50K
V205 CRT	Short	100K	Pin 10 100K	*Pin 11 420K	Pin 12 3.5	**Short			
V301 3AU6	Short	Short	8	7	50K	50K	150		
V302 3BN6	*650	3.6	10.5	11	50K	7	300K		
V306 12L6	N/C	19	50K	50K	220K	50K	17	50K	
V402 6SN7	20K	50K	Short	*1.2 meg.	*900K	Short	7 meg.	5	
V503 12B4A	*1.9K	1.5 meg.	6	7	7	N/C	N/C	N/C	50K
V601 6SN7	550K	*240K	280K	*280K	12K	Short	5	3.5	
V602 6CU6	N/C	19	50K	50K	1. meg.	N/C	20	Short	
V603 1B3	N/C	INF.	N/C	N/C	N/C	N/C	INF.	N/C	
V604 12AX4	N/C	N/C	140K	N/C	50K	N/C	20	24	

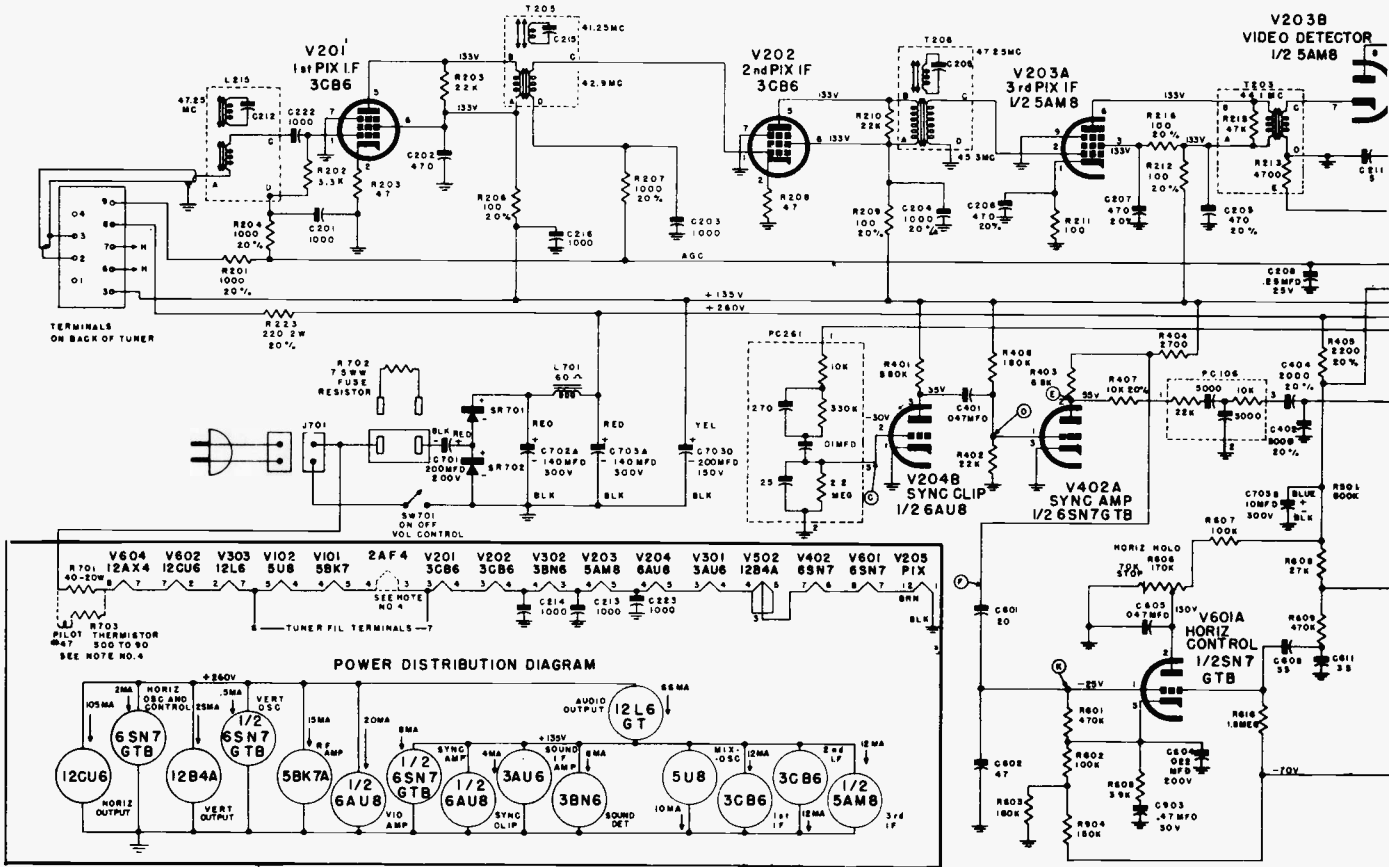
* VARIES WITH A CONTROL SETTING

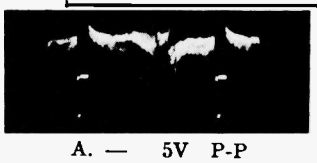
** VARIES WITH FOCUS TAP POSITION

CAPEHART
Chassis CX-43

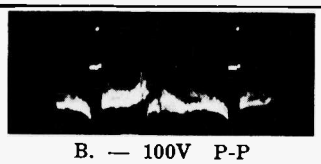




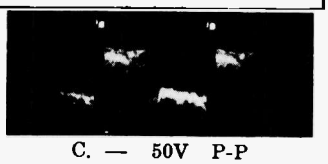




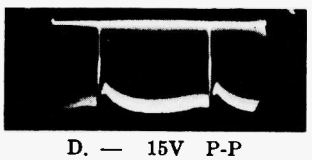
A. — 5V P-P



B. — 100V P-P



C. — 50V P-P



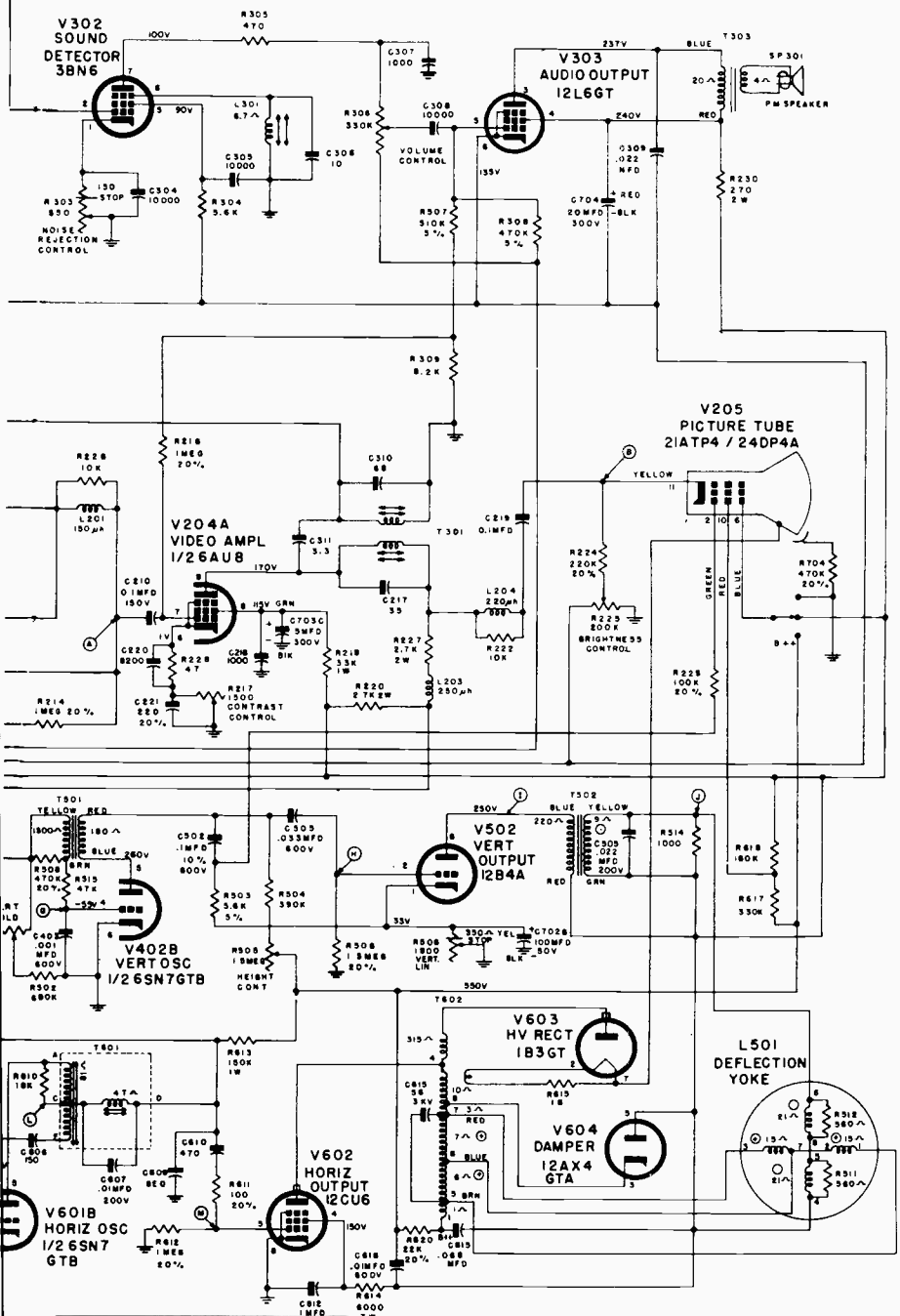
D. — 15V P-P

H. — 170V P-P

I. — 820V P-P

J. — 110V P-P

CAPEHART CX43 CHASSIS



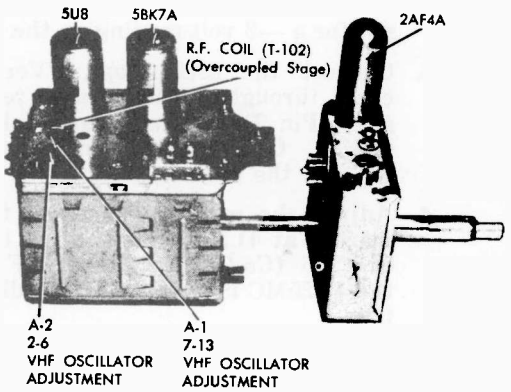
PRODUCTION CHANGES

The schematic shown here is correct for chassis coded R-2. Chassis coded R-1 will differ from those coded R-2 in the following manner.

1. R623 (3.3K-10%-2W) and R624 (8.2K-10%-2W) is replaced by R614 (6K-10%-7W).
2. C617 (.047-400V) is not used.
3. Pin 4 of V602 (12CU6) is connected to ground through a .1-400V capacitor (612).
4. C-405 (3000 mmf-20%-500V) is C404 (2000 mmf-20%-500V).

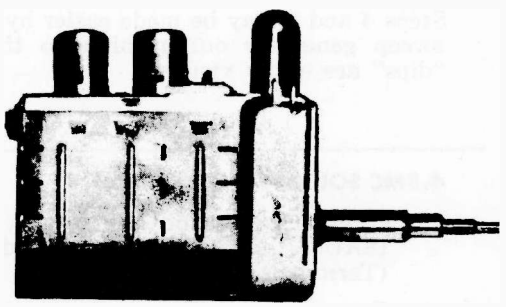
NOTES

1. UNLESS OTHERWISE SPECIFIED MICA & CERAMIC CAPACITORS RATED IN MMF (NOT SPECIFIED) 500V DC WORKING. PAPER CAPACITORS RATED IN MFD 400V DC WORKING. RESISTORS 1/2 WATT 10% (UNLESS SPECIFIED) VALUE IN OHMS (K=1000 OHMS, MEG=1,000,000 OHMS)
2. COLORS REFER TO SOLID COLORS OF WIRE OR TRACER COLOR ON WHITE WIRE.
3. VOLTAGES MEASURED WITH VOLTOHMYST OR EQUIVALENT, FROM CHASSIS GROUND WITH NO SIGNAL INPUT. TOLERANCE OF VOLTAGES ±20%.
4. USED ON UHF ONLY
5. WAVEFORMS FOR 15TV LINE, 1000 MICROVOLTS OR GREATER SIGNAL, & ALL CONTROLS ADJUSTED FOR NORMAL PICTURE
6. WAVEFORMS MEASURED WITH A HIGH DEFINITION WIDE BAND OSCILLOSCOP WAVEFORMS CAN BE EXPECTED TO BE MODIFIED BY A NARROW BAND OSCILLOSCOPE.
7. VOLTAGES WITH + PRECEEDING THEM DESIGNATE BUS LINES IN SET
8. ⊙ DESIGNATES RESISTANCES MEASURED WITH TWO LEADS OF THE HORIZ. YOKE DISCONECTED FROM T602
9. RESISTANCE FOR COILS AND TRANSFORMERS INDICATED ARE APPROX
10. ⊙ DESIGNATES RESISTANCES MEASURED WITH ONE LEAD OF THE VERTICAL YOKE DISCONECTED FROM T502

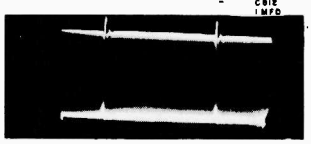


VHF Tuner
850393B-1

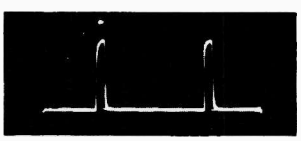
UHF Tuner
750806B-1



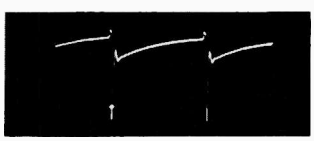
VHF/UHF Tuner
750807A-G1



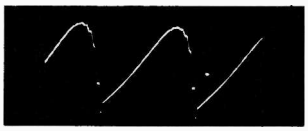
E. — 70V P-P



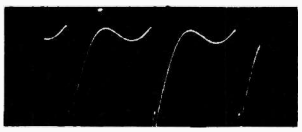
F. — 22V P-P



G. — 330V P-P



K. — 25V P-P



L. — 180V P-P

M. — 160V P-P

Alignment facts on page 26, over.

CAPEHART CX-43 Series, Alignment Information

VIDEO I-F ALIGNMENT

NOTE: The **FRONT** refers to the wiring side of the chassis and the **REAR** refers to the tube side of chassis.

1. Disconnect the tuner lead from terminal "A" of the first I-F transformer (L215) and connect the sweep (40MC) generator to the grid (Pin 1) of the first I-F Amplifier (V201-3CB6), through a .001 mfd. isolating capacitor. If a separate marker generator is used, it should be coupled directly to the vertical input cable of the oscilloscope.
2. Connect a bias source to the junction of R204 & R201 and set the bias for a —3 volts. A bias source may be obtained from a 4.5 volt battery with a 1K pot connected across its terminals. Connect the positive end of the battery to chassis ground and connect the arm of the pot to the junction point above. Connect a VTVM to the arm of the pot and adjust the pot for a —3 volt reading on the VTVM.
3. Connect the oscilloscope, "Vertical Input" cable, through a 10K isolation resistor to the grid (Pin 7) of the video amplifier (V204-6AU8). Connect the ground side of the input cable to the chassis ground.
4. Adjust the marker generator to provide a marker at 41.25MC and adjust the rear slug of T205 (Co-Channel Sound I-F Trap) until the 41.25MC marker is located directly in the trap.
5. Adjust the marker generator to provide a marker at 41.25MC and adjust the rear slug of T206 (Adjacent Channel Sound I-F Trap) until the 47.25MC marker is located directly in the trap.

Steps 4 and 5 may be made easier by running the sweep generator output high so that the trap "dips" are easily visible.

6. Reduce the sweep generator output so that a normal curve is seen. Adjust the marker generator to 44.1MC and adjust T203 for maximum amplitude of the curve, keeping the marker located in the center of the curve, with a minimum tilt.
7. Adjust the marker generator to 42.5MC and adjust the front slug of T205 to position the 42.5MC marker 50% down on the low side of the curve while obtaining maximum amplitude of the curve.
8. Adjust the marker generator to 45.75MC and adjust the front slug of T-206 to position the 45.75MC marker 50% down on the high side of the curve while obtaining maximum amplitude of the curve.
9. After checking the above steps, reconnect the tuner lead to terminal "A" of L215 and connect the Sweep Generator through a dummy tube shield to the 5U8. Set the VHF Tuner to Channel No. 9.
10. Adjust the marker generator to 47.25MC and adjust the rear slug of L215 until the 47.25MC marker is located directly in the trap.
11. Adjust the marker generator to 45.75MC and 42.5MC and adjust T102 (on tuner) and the front slug of L215 (in unison) for maximum amplitude without tilt, maintaining the 45.75-MC marker and 42.5MC marker 50% down on the sides of the response curve.

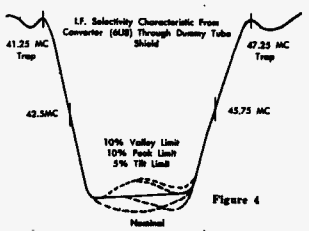


Figure 4

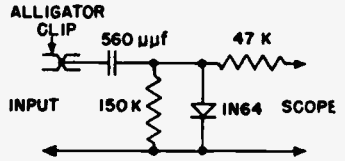


Figure 5

4.5MC SOUND I-F ALIGNMENT

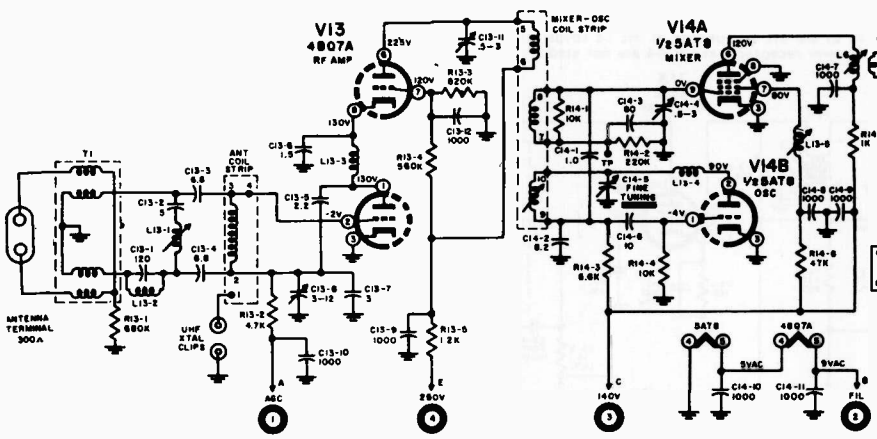
1. Connect generator to pin No. 7 of V204 (6AU8). Short out the secondary of T205 (Terminals "C" to "D").
2. Connect the oscilloscope to the diode detector shown in figure 5 and clip the detector to the junction of C219 and R224.
3. Inject 4.5MC signal with 50% AM modulation and adjust both primary and secondary of T301 for minimum output.
4. Remove the crystal detector and connect the scope directly to the junction of C308, R307 and R308. (Probe of scope must not have a DC path to ground).
5. Turn off AM modulation and inject a 4.5MC signal with 25KC deviation. Using maximum output of the generator to insure limiting in the 3BN6, adjust L301 (quadrature coil) for maximum output. In tuning this coil, two peaks will be noticed; adjust for the peak having the greater amplitude.
6. Keeping the output from the generator low enough to prevent limiting, adjust T302 for maximum output.
7. Remove the short from T205 secondary and connect the receiver to the antenna through a signal attenuator. Adjust the set for reception of a local TV signal. By attenuating the incoming signal so that background noise is just noticeable at all times a more exact setting can be obtained. Adjust the Noise Rejection Control (R303) for minimum background noise and hiss.
8. Remove the attenuator and with full signal adjust L301 for clearest sound.

CBS

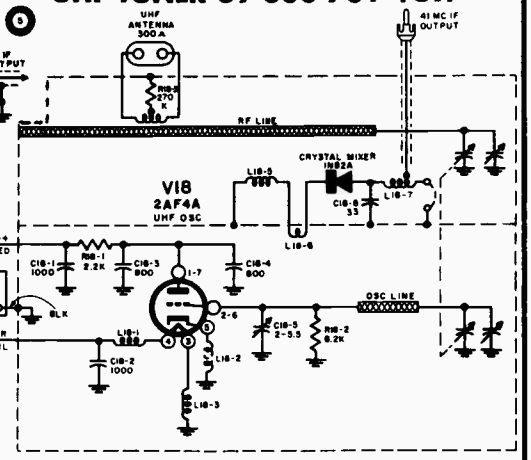
CBS-Columbia

Chassis	Models
1610	U3T602, U3T615, U3T616, U3T621, U3T622, U3T623, U3T624 U3C627, U3C628, U3C631, U3C632, U3C633, U3C634, U3C635, U3C636
1611	3T602, 3T615, 3T616, 3T621, 3T622, 3T623, 3T624 3C627, 3C628, 3C631, 3C632, 3C633, 3C634, 3C635, 3C636

VHF TUNER 69 000 721 (SC)

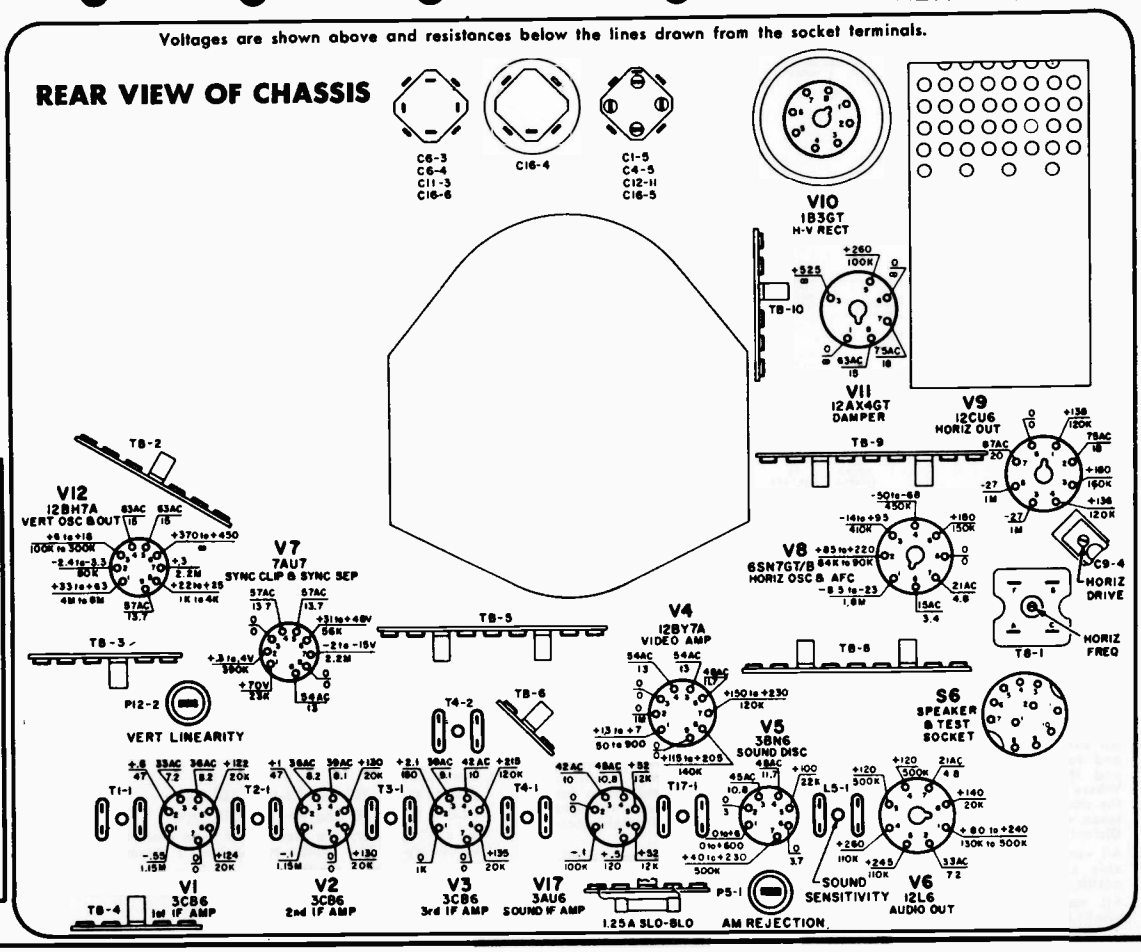


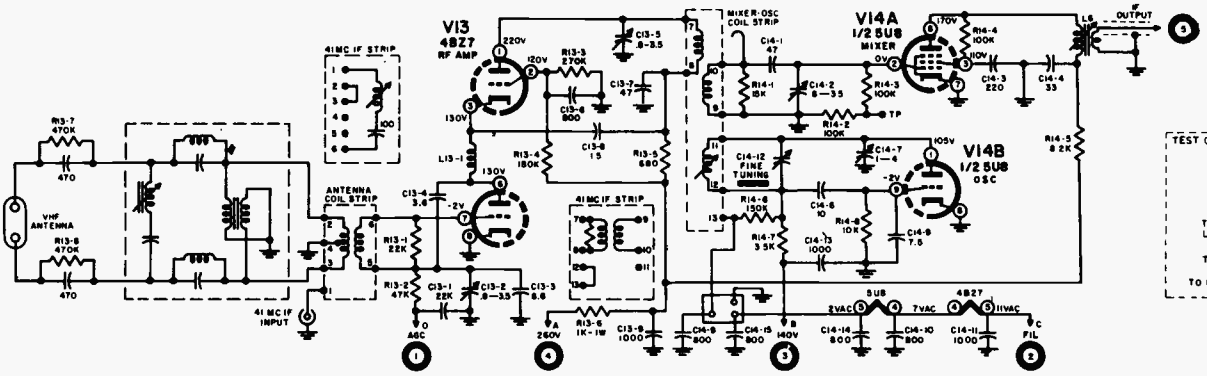
UHF TUNER 69 000 701 (GI)



Voltages are shown above and resistances below the lines drawn from the socket terminals.

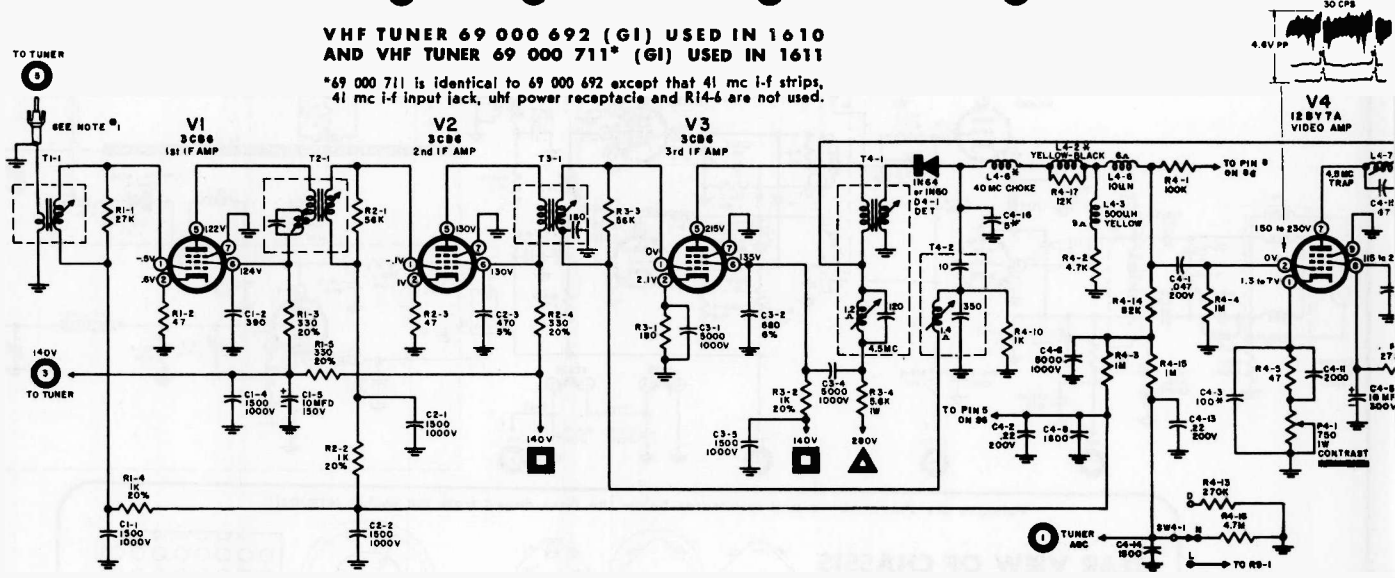
REAR VIEW OF CHASSIS

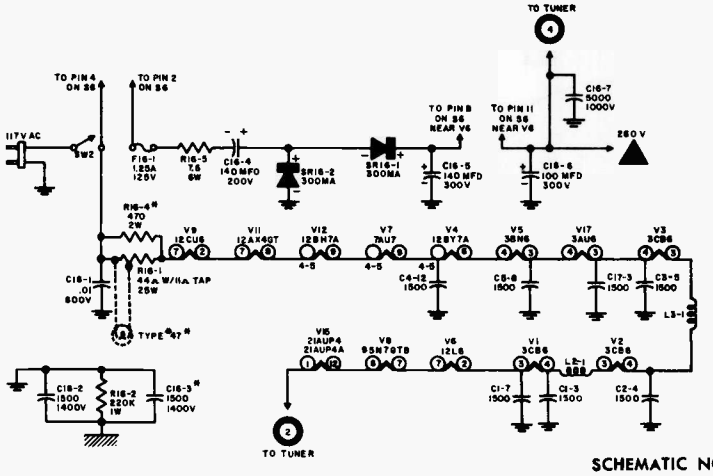


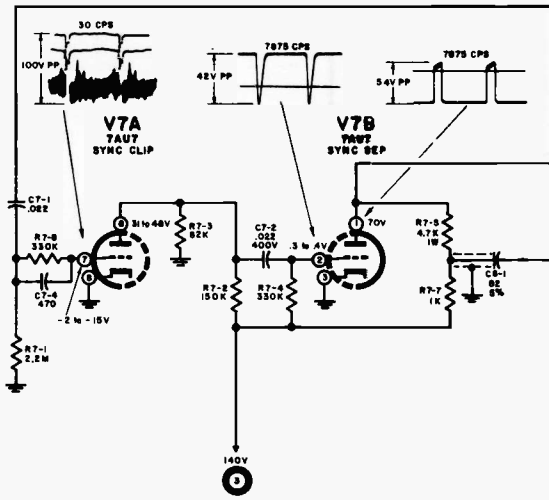


VHF TUNER 69 000 692 (GI) USED IN 1610 AND VHF TUNER 69 000 711* (GI) USED IN 1611

*69 000 711 is identical to 69 000 692 except that 41 mc i-f strips, 41 mc i-f input jack, uhf power receptacle and R14-6 are not used.







SCHEMATIC NOTES

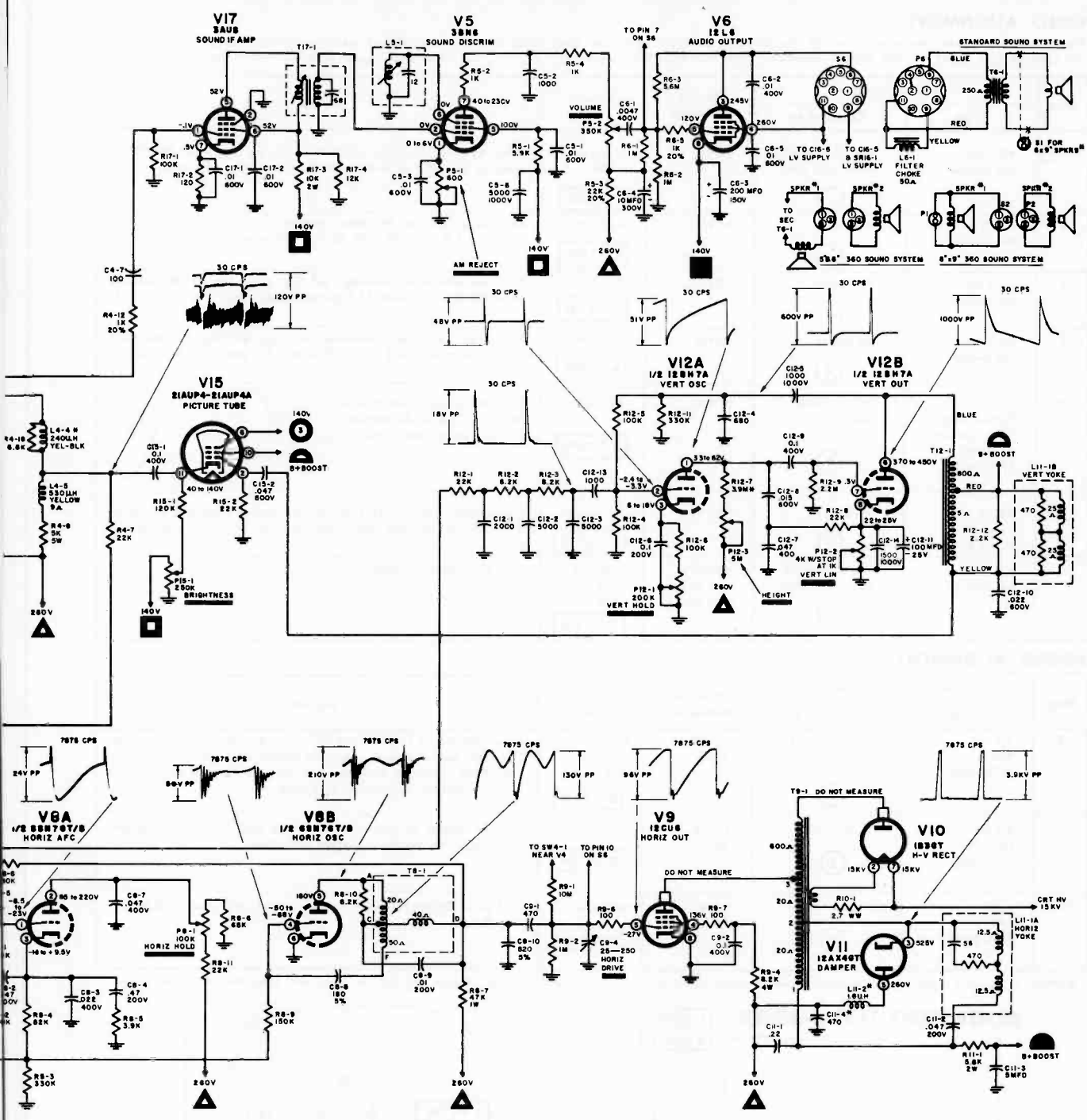
1. In the 1610 chassis, the I.F. input plugs into the tuner. In the 1611 chassis, a shielded lead which is part of the tuner is soldered to T1-1.
2. Solid geometric symbols indicate B+ voltage sources — open symbols indicate points of application.
3. Numbered circles indicate tuner lead connections.
4. Component symbols are coded to indicate tube near which component is located on schematic. Ex. C9-2; capacitor, located near V9.
5. All d-c voltages measured with a VTVM connected between the chassis and tube socket terminals, with channel selector set between channels and the Normal-Local-Distant switch (SW4-1) in the normal position. Where readings are affected by control settings, voltages are shown for the clockwise and counterclockwise positions of the controls. Tuner voltages taken with channel selector set to an unused channel and the Normal-Local-Distant switch in the normal position.
6. All waveforms and peak to peak readings taken with strongest signal available at maximum contrast; horizontal and vertical holds set at normal position.
7. All resistors are ½W, ±10% unless otherwise indicated. K=X1,000; M=X1,000,000.
8. All capacitors are 500 WV unless otherwise indicated. Values less than one are microfarads and values more than one are micro-microfarads, unless otherwise indicated.
9. All coil and winding resistances were taken with the components disconnected from the circuit.

***Indicates change in schematic, as listed below.**

In 1611 chassis
R16-4 and C4-16 are omitted.

In some chassis
L4-2 is 16 001 362 and R4-18 is 18K, ½W.
L4-4 is 16 001 362 and R4-17 is 8.2K, ½W.
6" x 9" speakers are used which have their voice coils connected to the secondary of T6-1 (audio output trans.) through a socket and plug.
The pilot light is omitted.
L4-8 is omitted, C16-3 is added and C4-3 is 220 mmfd. or L4-8 is added, C16-3 is omitted and C4-3 is 100 mmfd.
L11-2 and C11-4 are omitted.

1610 and 1611 Television Receiver Chassis



Horizontal Oscillator Alignment

1—Tune to a TV station, adjust controls for normal picture and sound and set the Horizontal Hold control in the center of its range.

2—Short terminals C & D of the horizontal oscillator coil (T8-1) and adjust rear slug of T8-1 until picture is in sync. Set slug in center of range over which picture remains locked in sync.

3—Remove the short from terminals C & D of T8-1 and connect an oscillograph to terminal C of T8-1, through 10 mmfd.

4—Adjust front slug (on tube side of chassis) of T8-1 for waveform shown in figure 4. The rounded peak and the sharp peak of the waveform must be exactly the same height.

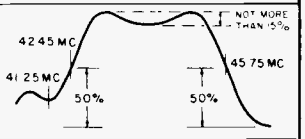
5—Adjust the Horizontal Frequency adjustment (rear slug T8-1) so that picture just begins to fall out of sync with Horizontal Hold control fully clockwise.

Anti-Barkhausen Magnet Adjustment — In UHF models, an anti-barkhausen magnet is mounted on the glass envelope of the 12CU6 horizontal output tube. If a barkhausen oscillation (narrow vertical line in picture) occurs on one or more UHF channels rotate the magnet until the oscillation disappears. Check all channels in use and readjust the magnet if barkhausen appears on another channel.

CBS-COLUMBIA Chassis 1610, 1611, Alignment Procedure

VIDEO ALIGNMENT

Place channel selector between channels (to disable oscillator) and set Local-Distant switch in NORMAL position. Disconnect ground lead from the cathode (pin 8) of V9, the 12CU6 horizontal-deflection amplifier. Apply -3V bias to AGC line. Use lowest possible VTVM range for all steps.

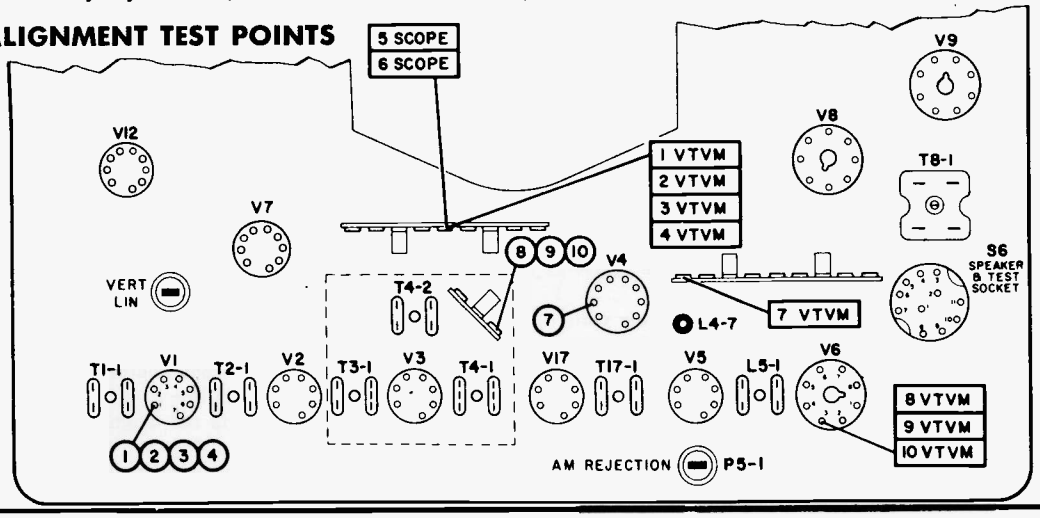
Step	Signal Generator		Output Indicator	Connect to	Adjust
	Freq.	Connect to			
1	42.7 mc No sweep	Pin #1 of V1, thru 1000 mmf. (1)	VTVM	Open end of R4-1 1 VTVM	Front slug T2-1 for maximum reading. Set sig. gen. for VTVM reading of —2.5 to —3V with T2-1 properly adjusted.
2	41.25 mc No sweep	As above (2)	VTVM	As above 2 VTVM	Rear slug T2-1 for minimum reading. Set sig. gen. for reading of —2.5 to —3V with T2-1 properly adjusted.
3	45.5 mc No sweep	As above (3)	VTVM	As above 3 VTVM	T3-1 for maximum reading. Set sig. gen. for VTVM reading of —2.5 to —3V with T3-1 properly adjusted.
4	44.2 mc No sweep	As above (4)	VTVM	As above 4 VTVM	Rear slug T4-1 for maximum reading. Set signal generator for reading of —2.5 to —3V with T4-1 properly adjusted.
5	43 mc Center freq. 10 mc deviation 42.45 mc and 45.75 mc	Mixer shield See Note 1 (5)	SCOPE	As above 5 SCOPE	T1-1 and tuner i-f coil (L-6) to place 45.75 & 42.45 markers at 50% point (see curve). 
6	43 mc Center freq. 10 mc deviation	As above (6)	SCOPE	As above 6 SCOPE	If necessary retouch T2-1 & T3-1 to correct positions of 45.75 & 42.45 mc markers and rear slug of T4-1 for symmetrical curve.
7	4.5 mc No sweep	Pin #2 of V4, thru 1000 mmf. (7)	VTVM thru hi-Z xtal probe	Junction L4-4 & L4-5 7 VTVM	L4-7 for minimum reading.

SOUND ALIGNMENT

Step	Signal Generator		Output Indicator	Connect to	Adjust
	Freq.	Connect to			
8	4.5 mc AM 30% mod.	Junction L4-2 & L4-3 (8)	VTVM (AC)	Pin #3 V6 thru 0.01 mfd 8 VTVM	Front slug of T4-1, T4-2 and T17-1 for maximum output indication. Use lowest signal generator output that gives satisfactory indication. Increase bias to —6V and set Local-Distant switch to Local before performing this step.
9	4.5 mc FM 25 kc dev.	As above (9)	VTVM (AC)	As above 9 VTVM	Volume control to approximate center and adjust L5-1 (quadrature coil) for maximum output indication.
10	4.5 mc AM 30% mod.	As above (10)	VTVM (AC)	As above 10 VTVM	P5-1 (A-M Rejection) for minimum output indication and repeat step 9.

NOTES: 1. Connect signal generator output lead to mixer-oscillator shield. Slip shield partially off tube and hold in place with tape. Do not ground shield.

ALIGNMENT TEST POINTS



CROSLEY

CHASSIS 472

Models: J-21 TKMF J-21 TKBF
J-21 TKLMF J-21 TKLBF
J-21 CKMF J-21 CKBF
J-21 LKBF

CHASSIS 473

Models: J-21 TKMU J-21 TKBU
J-21 TKLMU J-21 TKLBU
J-21 CKMU J-21 CKBU
J-21 LKBU

Service material for the above listed chassis is published on pages 31 through 36. The additional chassis listed below are almost exactly the same, but are used in combination models.

CHASSIS 476

Models: J-21LPKMF
J-21LPKBF

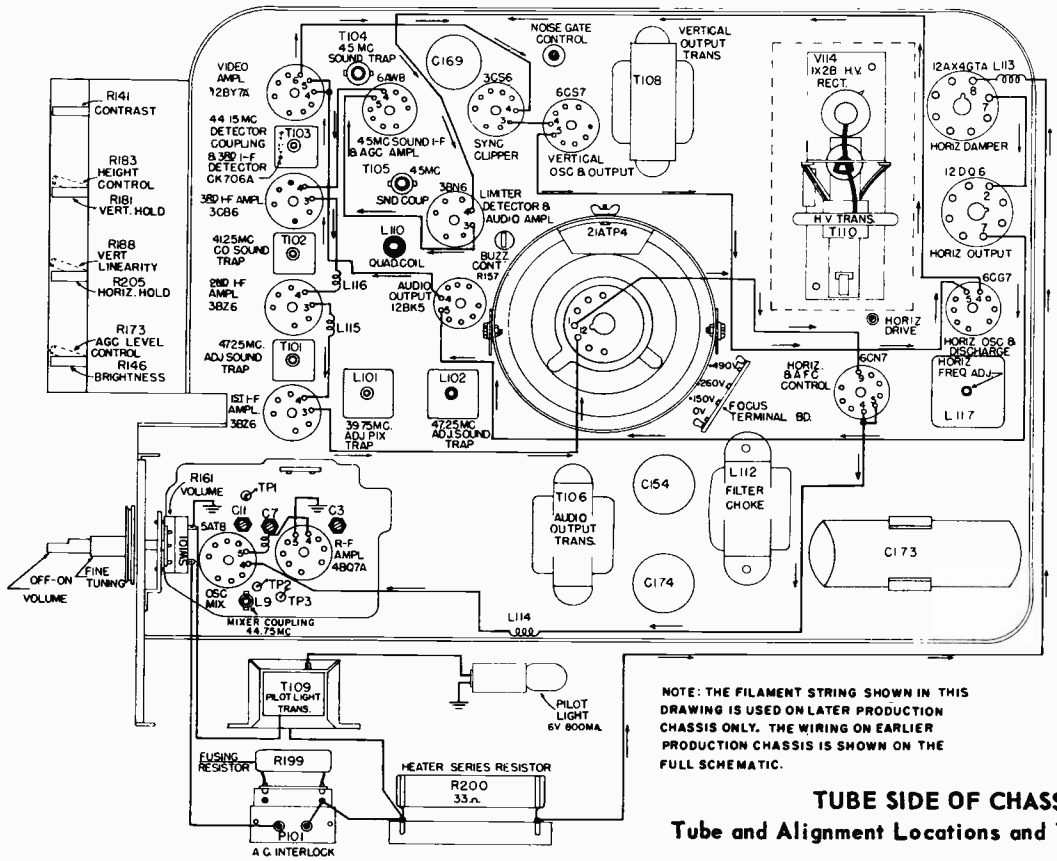
CHASSIS 477

Models: J-21LPKMU
J-21LPKBU

TO ADJUST THE ION TRAP MAGNET: Set the Brightness control completely counter-clockwise, then advance slightly clockwise (less than 1/4 turn). Slide the trap forward or backward on the neck of the tube and at the same time rotate trap clockwise or counter-clockwise until a raster appears, then adjust for maximum brightness. If no raster is obtained with this setting of the Brightness control, advance the control slightly clockwise and repeat adjustment of the trap until a raster appears. The final setting of the trap should be made with the Brightness control set to the maximum position and with which good line focus can be obtained. If neck shadow is encountered, or if the picture is off center, correction should be made with the centering magnet on the back cover of the deflection yoke. Never use the Ion Trap to correct neck shadow. Always set the trap to the position where maximum brightness is obtained. After any adjustment of the deflection yoke or centering magnet the Ion Trap should always be checked and readjusted for maximum brightness.

OSCILLATOR ADJUSTMENT

If the range of the fine tuning control is not sufficient to tune in the UHF channel properly, the oscillator tuning slug will have to be adjusted. This slug is accessible through a hole in the tuner chassis which is directly to the right of the tuner shaft. Set the channel selector knob to the channel to be adjusted. Use a non-metallic screwdriver and adjust the slug until the proper tuning point is in the center of the fine tuning range.



NOTE: THE FILAMENT STRING SHOWN IN THIS DRAWING IS USED ON LATER PRODUCTION CHASSIS ONLY. THE WIRING ON EARLIER PRODUCTION CHASSIS IS SHOWN ON THE FULL SCHEMATIC.

TUBE SIDE OF CHASSIS 472
Tube and Alignment Locations and Tube Filament Wiring

CROSLEY Chassis 472, 473, 476, 477, Alignment Information

I.F. ALIGNMENT

All lead connections from the signal marker generator and sweep generator must be shielded. Keep 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. To prevent overloading the receiver circuits, the sweep generator output and signal generator output must be kept low. Turn AGC level control and contrast control fully clockwise, and Noise Gate control fully counter-clockwise. Set the fine tuning control to the center of its range, set the tuner to an unused channel. and short the antenna input leads to prevent noise feed-thru.

VIDEO I. F. ALIGNMENT (with VTVM)

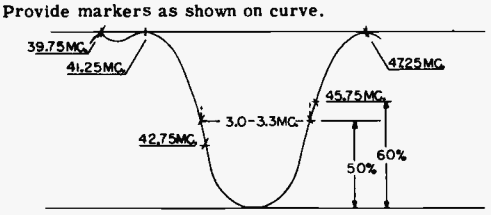
Step No.	Connect Signal Generator Through a .01 Capacitor	Signal Generator Freq. M.C.	Connect VTVM	Miscellaneous Connections and Instructions	Adjust
1.	Test Point No. 2. wire protruding from Tuner closest to 5AT8 (V2).	44.15 mc.	Lug 5 on T103 (junction of R130 and L106)	Connect 3v. negative bias battery to junction of R107 and C106 (RF AGC). Connect 3v. negative bias battery to junction of R108 and C128 (IF AGC).	T103 for maximum indication on meter. limit input to make peak indication - 2 volts D.C. on VTVM. Use first peak from bottom end of coil.
2.	"	43.14 mc.	"	"	Bottom slug of T102 for maximum. Use first peak from bottom end of coil.
3.	"	41.25 mc.	"	"	Top slug of T102 for minimum. First null when running slug into winding from top end is correct tuning point.
4.	Repeat steps 2 and 3.				
5.	Test Point No. 2.	45.1 mc.	"	"	Bottom slug of T101 for maximum. Use first peak from bottom end of coil. Do not use more input than required for -2 volt D.C. indication of VTVM.
6.	"	47.25 mc.	"	"	Top slug of T101 for minimum. First null when running slug into winding from top end is correct tuning point.
7.	Repeat steps 5 and 6.				
8.	Test Point No. 2.	44.15 mc.	"	"	Bottom slug of L101 for maximum. Use first peak from bottom end of coil.
9.	"	39.75 mc.	"	"	Top slug of L101 for minimum. First null when running slug into winding from top end is correct tuning point.
10.	Repeat steps 8 and 9.				
11.	Test Point No. 2.	47.25 mc.	"	"	Top slug of L102 for minimum. First null when running slug into top is correct tuning point.
12.	Repeat steps 9 and 11.				
13.	Test Point No. 1. See Tube and Alignment Diagram.	44.75 mc.	"	Connect dummy load (consisting of 100 ohm resistor and 100 mmf capacitor in series) from grid of V101, pin #1. to chassis.	Mixer output coil on Tuner for maximum. (L9 on 472; L8 on 473).

TO CHECK I. F. ALIGNMENT (with scope)

Excessive sweep input will overload the circuit and cause distortion in the wave form. Check for possible overload by temporarily increasing and decreasing the signal input level and noting any change in the wave form. Excessive signal from the marker generator will also distort the wave form. Be sure to keep the marker at the minimum usable amplitude.

NOTE: Be sure. when checking the I. F. alignment. to set the channel selector switch to a channel where moving the fine tuning control does not affect the shape or position of the I. F. response curve.

Sweep Generator Connected to	Scope Connected	Bias	Set Sweep Generator	Remarks
High side to ungrounded aluminum foil around 5AT8 (V2). Low side to grounded tube shield. See Note 1 and Figures below.	Through 68K ohms to lug 5 of T103.	Connect negative lead of one 3v. bias battery to junction of R107 and C106 (RF AGC) and positive lead to chassis. Connect negative lead of 2nd 3v. bias battery to junction of R108 and C128 (IF AGC) and positive lead to chassis.	To sweep from 39 to 49 mc.	Provide markers as shown on curve.



NOMINAL OVERALL I-F RESPONSE CURVE

A slight deviation in response is tolerable. but if any great deviation is noted. the I. F. stages will have to be realigned.

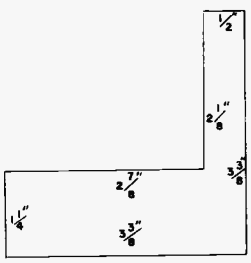


FIG. A

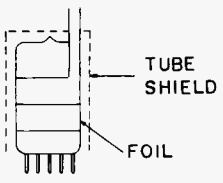


FIG. B

NOTE 1.

Cut aluminum foil to dimensions shown in Fig. A. Wrap foil around the tube and take scotch tape and wrap around the foil to hold it in place and to insulate it from the tube shield as shown in Fig. B. Replace the tube and tube shield. Connect the high side of sweep generator to the (ungrounded) foil extending from the top of the tube shield and the ground lead from sweep generator to tube shield.

CROSLEY Chassis 472, 473, 476, 477, Alignment Information, continued

SOUND ALIGNMENT

Step No.	Channel Set to	Signal Generator Connected to	Scope Connected to	Adjust
1.	Any unused channel	Lug 5 of T103 and chassis. Set generator for 4.5 mc. 400 cycle AM signal (modulated 30% or greater).	High side (thru detector probe) to high side of contrast control. or blue lead on the top lug of terminal board located on tube side of chassis adjacent to T102. Low side of scope to chassis.	Back out each slug of T104. Then adjust slug on clip side of T104 until first null is reached, indicated by minimum height of pattern on scope screen.

Proceed with the remainder of the Sound Alignment, using either a signal from a TV station as a Procedure A, or alignment equipment as in Procedure B.

PROCEDURE A (With signal from station)

Step No.	Channel Set to	Adjust	Remarks
1.	Strong signal	L110 (Quadrature coil) for maximum sound output. 2nd peak from open end of coil is the correct peak.	Set Buzz Control (R157) approximately 90° from clockwise stop.
2.	Weak signal	T104 (slug on wiring side of chassis) and T105 for maximum sound output.	Keep signal below limiting. If the signal in the area is too strong to obtain these peaks, remove the antenna from the receiver.
3.	Weak signal	Buzz Control (R157) for minimum noise hash.	This signal should be weak enough to allow noise (hash) to come thru along with the sound.
4.	Strong signal	L110 (Quadrature coil) for maximum sound output.	Limit the volume control setting so that this peak can be heard.
5.	Weak signal	Repeat step 3.	Same as for step 3.

PROCEDURE B (With alignment equipment)

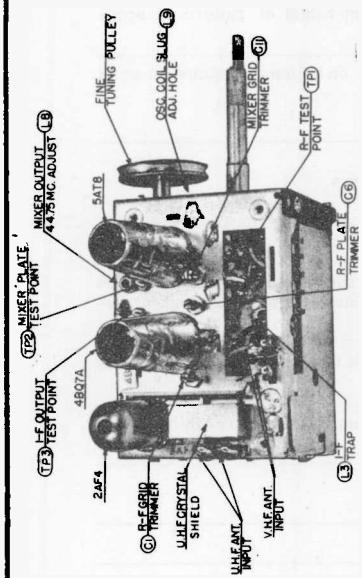
Step No.	Connect Signal Gen.	Signal Gen. Freq. Mc.	Connect Scope	Miscellaneous Instructions	Adjust
1.	Lug 5 of T103	4.5 mc. FM modulated 400 cps. 7.5 kc. deviation.	Across secondary of output transformer T106.	Set Buzz Control (R157) to approximately 90° from clockwise stop. Adjust volume control to keep pattern on scope as amplitude increases.	L110 (Quadrature coil) for maximum amplitude on scope. 2nd peak is the correct one from the open end of the coil. Keep signal level high enough to assure limiting.
2.	"	"	"	Set generator attenuator so that FM signal is below the point of limiting.	T104 (slug on wiring side of chassis) for maximum amplitude on scope. As the height of the pattern increases, decrease the input control on the generator to keep the signal below limiting.
3.	"	"	"	"	T105 for maximum peak, keeping signal below limiting by adjusting the generator output.
4.	"	4.5 mc. AM modulated 400 cps.	"	Use a high input level on signal generator to insure limiting.	Buzz Control (R157) for null (Minimum 400 cps amplitude on scope).
5.	"	4.5 mc. FM modulated 400 cps., 7.5 kc. deviation.	"	Volume control (R161) set at a low level.	Re-peak L110 for maximum 400 cycle indication on Scope
6.	"	Repeat steps 2 and 3, keeping signal below limiting.			

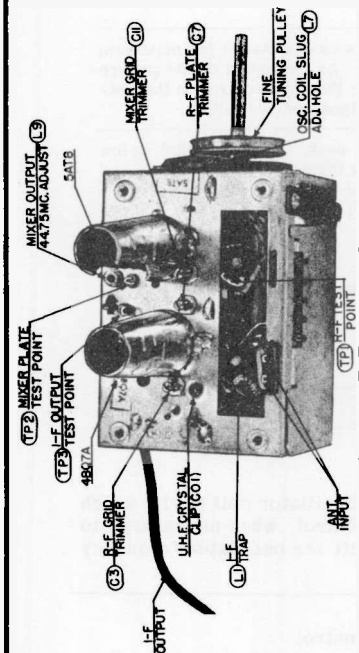
HORIZONTAL FREQUENCY ADJUSTMENT

The Horizontal Frequency Control is the extension on the brass screw in the top of the Horizontal Oscillator coil (L117) which is located below the Horizontal Output tube. The extension shaft permits the adjustment of the control, when necessary, to compensate for any change due to ageing of the tubes or components in the circuit which would shift the oscillator frequency beyond the range of the Horizontal hold Control.

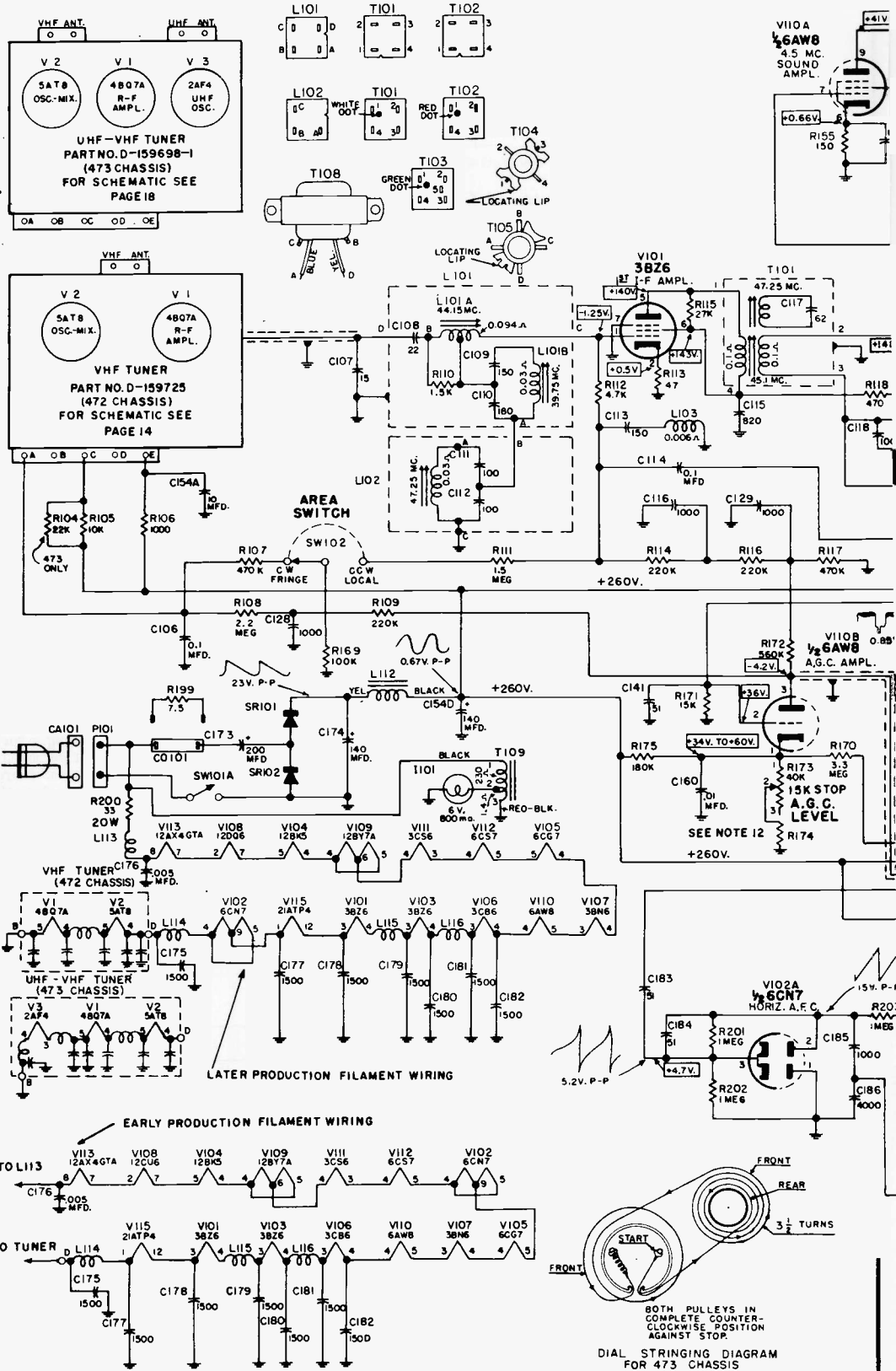
Step No.	Receiver Tuned to	Set Horizontal Hold Control	Adjust Horizontal Frequency Control
1	TV station signal	Fully clockwise.	Adjust clockwise or counter-clockwise until picture locks in. Be sure that Noise Gate Control is not advanced too far.
2	"	"	Adjust counter-clockwise (out of can) until picture goes out of sync.
3	"	"	Adjust slowly clockwise until picture just locks or syncs in.
4	"	Center of range.	When the Frequency Control is properly adjusted, the range of the Horizontal Hold Control is such that when the tuner is switched off and back onto a station, the picture will pull in and lock when the control is set near either end of its range.

CROSLEY Chassis 472 (code B) and 473 (Code B) Schematic Diagram





COMBINATION VHF-UHF 13-Position Turret Tuner, Part No. 159698-1

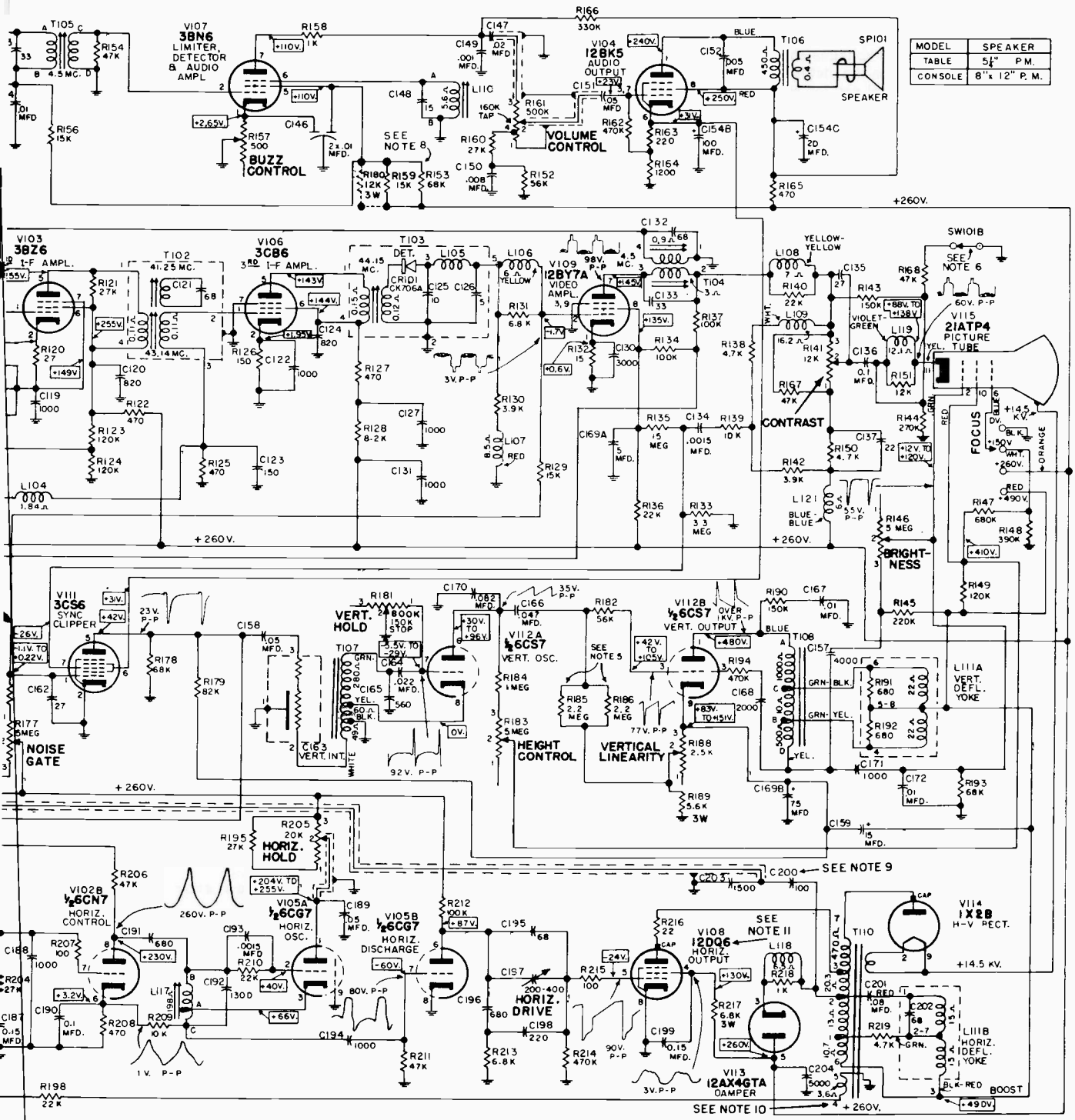


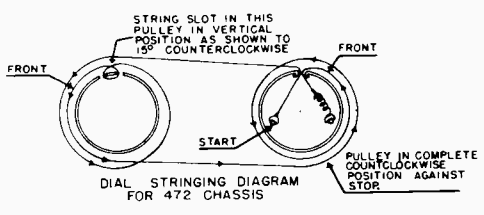
VHF TURRET TUNER Part No. 159725-1

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.

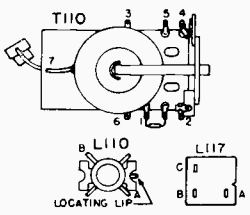
CROSLEY

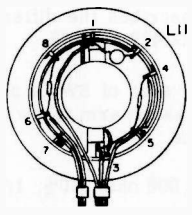
SCHEMATIC CHASSIS 472 (CODE B) and 473 (CODE B)





DIAL STRINGING DIAGRAM FOR 472 CHASSIS





See page 36 for notes.

CROSLEY Chassis 472 and 473, Circuit Diagram Notes and Changes

NOTES

1. All voltages measured with an electronic voltmeter connected from socket lug to chassis. Some voltages are variable and voltages shown were measured with a normal picture on the picture tube and the contrast and brightness control set for 60 volts peak to peak on the cathode (pin #11) of the picture tube. Socket voltages tolerance 10%. Input signal 6000 microvolts, minimum for these readings. Area switch in local position. SW104 in TV position.

2. Supply voltage, 117 volts 60 cycle A. C.

3. K-1000

4. All capacitance values in mmf. and all resistance values in ohms unless otherwise noted.

5. R185 or R186 will be clipped off on some chassis.

6. SW101B is open when SW101A is closed.

7. Terminals of T104, T105 and L119 are viewed from coil side.

8. On some chassis R153 and R159 are replaced by R180, 12K ohm, 3 watt resistor (Part No. B-170773-3).

9. On some chassis C200 (100 mmf) may be replaced with two capacitors connected in parallel:

158215-2	47mmf, 10%, 3 kv, disc
and 158215-32	82mmf, 10%, 3 kv, disc
or	
158215-3	68mmf, 10%, 3 kv, disc
and 158215-56	56mmf, 10%, 3 kv, disc

This change of parts is made on some chassis in order to increase picture width. It is not used on all chassis and is not designated by a code letter change.

10. There were a few pilot run chassis 472 Code A and 473 Code A which were wired as shown in Figure 1. The differences between these and later production chassis are (1) the bottom winding of the transformer, (2) the value of R198, and (3) the use of R197 and C205.

    All service replacement transformers are like those used in the later production. Therefore, when installing replacement transformers, remove C197 and C205, change R198 to a 22K resistor and connect the bottom winding of the transformer as shown in the complete schematic.

11. Tube type 12DQ6 is used in later production chassis instead of 12CU6. It is also recommended to use the 12DQ6 as a replacement horizontal output tube in any Crosley chassis where a 12CU6 was originally used. The new type 12DQ6 tube was created because the standards for the 12CU6 proved to be inadequate. These standards allowed too wide tolerances with the result that some manufacturers were making lower output 12CU6's while other manufacturers were making 12CU6's with higher output. In many instances, a low output 12CU6 can not be used in a circuit that requires a higher output tube. In the 12DQ6 the standards are adequate to specify a tube which is the equivalent of the high output 12CU6, but with narrow tolerances, to avoid another problem of interchangeability.

12. On later production chassis R173 AGC Level Control is Part No. 170501-1; it is the same as 159863-1 but without the 15K stop. For replacement purposes, use whichever control is currently available.

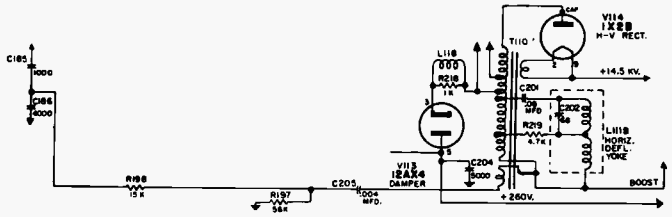


Fig. 1

CHASSIS CODE LETTERS

Code Letters are stamped on the chassis directly following the chassis number, and are used to indicate that certain circuit changes are incorporated in that chassis which are not found in chassis with earlier code letters. Unless otherwise stated, the circuit changes identified by a certain code letter are also carried over into chassis with later letters. The schematic shows the circuits found in Code B chassis.

Code A - Certain components shown in the schematic and schematic parts list are not used in chassis 472 Code A and 473 Code A, but were added in Code B chassis to improve picture quality and to improve IF sensitivity. Other components were changed in value. Certain wiring changes were also made at the same time.

The list below describes the differences between Code A and Code B chassis 472 and 473.

1. R169 between arm of SW102 and ground was not used on Code A chassis; arm of switch was connected directly to ground.

2. R115 was 15,000 ohm, 10%, 1/2 w resistor on Code A chassis.

3. R120 was 47 ohm, 10%, 1/2 w resistor on Code A chassis.

4. L108-R140 was Part No. 170255-1, with coil wound on the 5600 ohm resistor. D.C. Resistance of coil, 6.2 ohms; color dots, blue and gray.

5. L119-R151 was Part No. 170466-1, with coil wound on the 10,000 ohm resistor. D.C. Resistance of coil, 9.5 ohms; color dots, brown and blue.

6. L121 was not used on Code A chassis. Junction of R142 and R150 was directly connected to 260 volts.

7. R170 was not used on Code A chassis. There was nothing connected to Noise Gate Control terminal #3.

8. R174 was 12,000 ohms, 10%, 1/2 w on Code A chassis.

In Code B chassis it was necessary to lower the value of R174 to 10,000 in order to obtain proper adjustment of AGC level control. In some cases where the 12,000 ohm resistor was tried, the range of the control was insufficient to reduce the signal at the Video detector to 3 volts peak-to-peak.

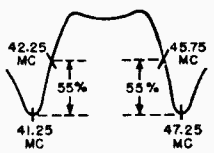
Code B - Chassis 472 (Code B) and 473 (Code B) are as shown in the printed schematic.

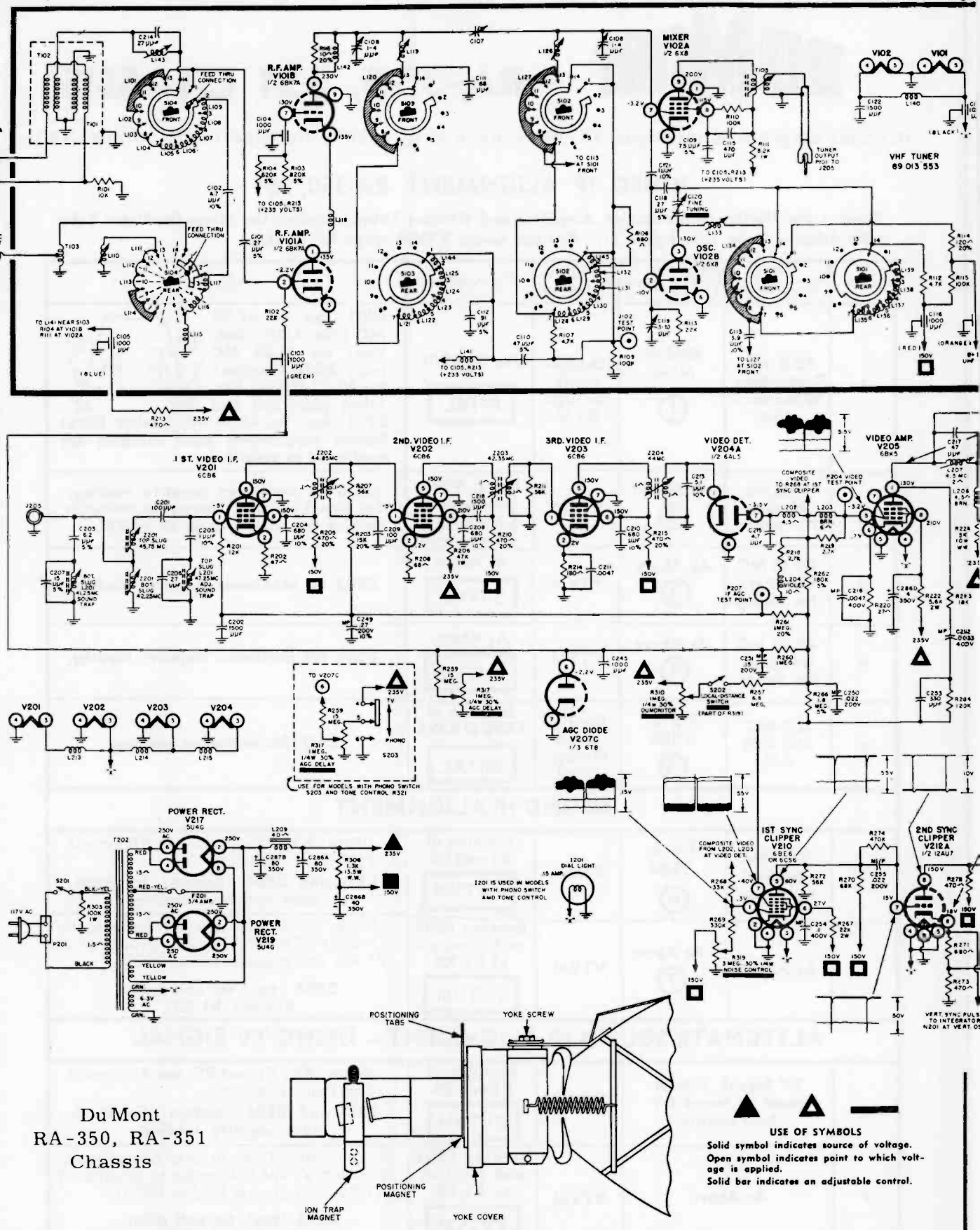
DUMONT RA-350, 351 CHASSIS

(Circuit diagram is on pages 38-39; balance of alignment information is on page 40.)

VIDEO IF ALIGNMENT RA-350, 351

Remove the Horizontal Deflection Amplifier and Damper Tubes. Replace the Mixer-Oscillator Tube with Adapter Tube (see figure 1). Use the lowest VTVM range for all steps.

Step	Signal Generator		Output Indicator	Connect to	Adjust
	Frequency	Connect To			
1	43.5 MC Center Freq. 10 Mc deviation.	Grid of Mixer ①	Oscillograph through XTAL	Pin 5, V201 1XTAL	L201 (top) for 47.25 MC trap. L201 (bottom) for 41.25 MC trap. Z201 (bottom) for 42.25 MC marker. Mixer plate coil and Z201 (top) for 45.75 MC marker. Note: Repeat adjustments until markers are positioned as specified. 
2	44.0 Mc (Marker) No Sweep	As Above ②	VTVM	Pin 3, V205 2VTVM	Z204 for maximum negative reading. Set signal generator output to maintain reading on lowest range of VTVM.
3	42.35 MC (Marker) No Sweep	As Above ③	VTVM	As Above 3VTVM	Z203 for maximum negative reading.
4	44.85 MC (Marker) No Sweep	As Above ④	VTVM	As Above 4VTVM	Z202 for maximum negative reading.
5	4.5 MC 400 CPS AM	Pin 3, V205 ⑤	Oscillograph through XTAL	Junction of C220 & R226 5XTAL	L207 for minimum reading.
SOUND IF ALIGNMENT					
6	4.5 MC (Marker) No Sweep	Pin 3, V205 ⑥	VTVM	Junction of R1 and R2 6VTVM	(Note: Add R1 and R2, see Alignment Test Point Drawing) L211 and Z206 (bottom) for maximum negative reading.
7	As Above	As Above ⑦	VTVM	Between P203 and junction of R1-R2 7VTVM	(Note: Set VTVM to zero center scale. Connect VTVM D-C probe to junction of R1-R2, and ground lead to P203). Z206 (top) for null point. Remove R1-R2.
ALTERNATE SOUND IF ALIGNMENT – USING TV SIGNAL					
6	TV Signal, Teleset must be tuned for best picture		VTVM	Junction of R1 and R2 6VTVM	(Note: Add R1 and R2, see Alignment Test Point Drawing) L211 and Z206 (bottom) for maximum negative reading.
7	As Above		VTVM	Between P203 and junction of R1-R2 7VTVM	(Note: Set VTVM to zero center scale. Connect VTVM D-C probe to junction of R1-R2, and ground lead to P203). Z206 (top) for null point. Remove R1-R2.

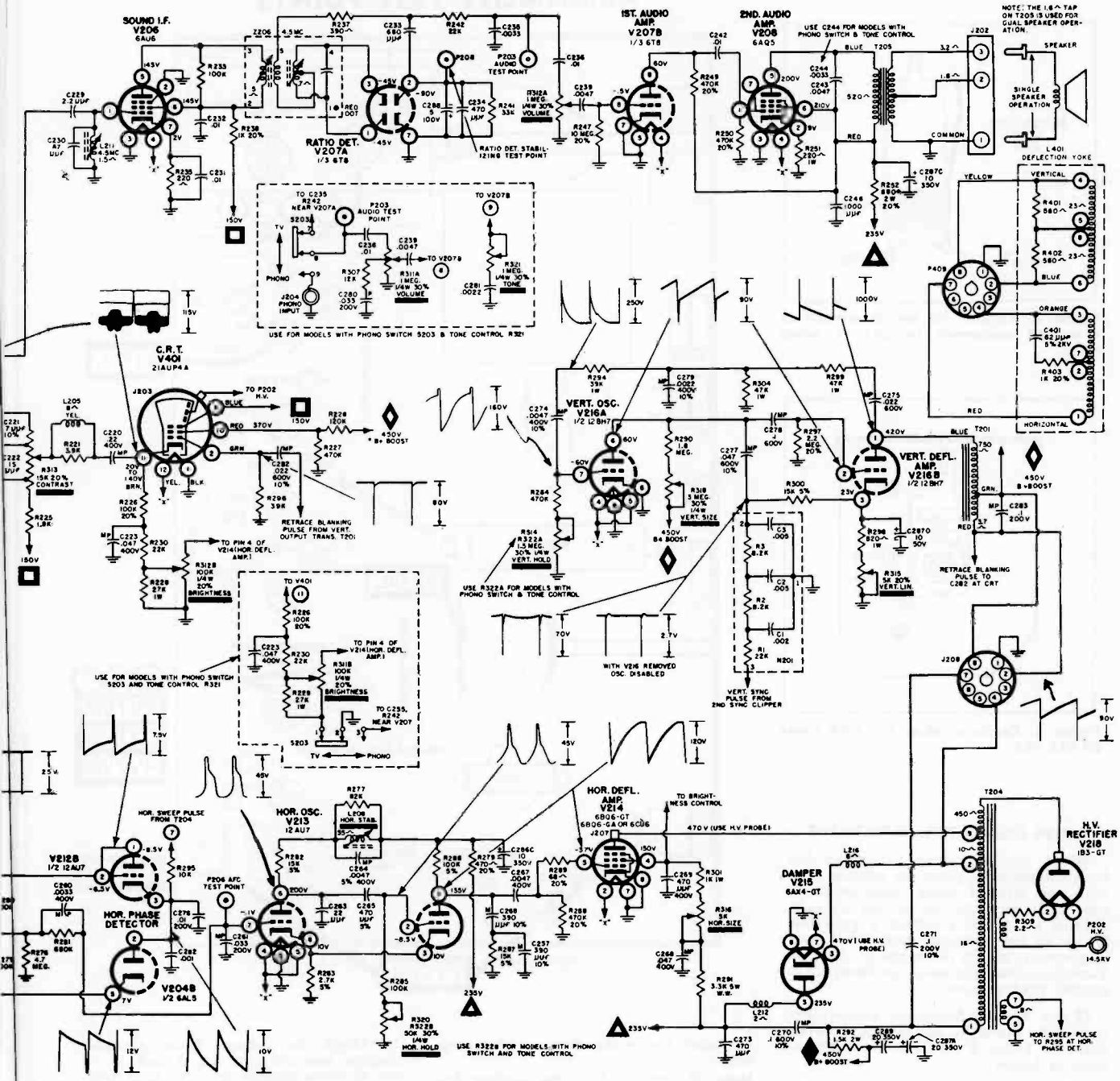


Du Mont
RA-350, RA-351
Chassis

USE OF SYMBOLS

Solid symbol indicates source of voltage.
Open symbol indicates point to which voltage is applied.
Solid bar indicates an adjustable control.

DUMONT RA-350, 351 CHASSIS



CHASSIS 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 Noise control was rotated fully counter-clockwise.
2. The Noise control and Local-Distance switch consists of a potentiometer, R319, and a snap switch, S202. When R319 is rotated fully counter-clockwise S202 apens (Local position as shown in the schematic).
3. Voltages ± 20% of those shown are normal.
4. All resistors are 10%, one-half watt, unless otherwise indicated. W. W. indicates wire wound resistor.
5. All capacitors are 20%, 500V, unless otherwise indicated. All capacitors are ceramic, unless indicated as follows: M-Mica, P-Paper, ± -Electrolytic, MP-Molded Paper.

DUMONT

Chassis RA-350, RA-351, Alignment Information (Continued)

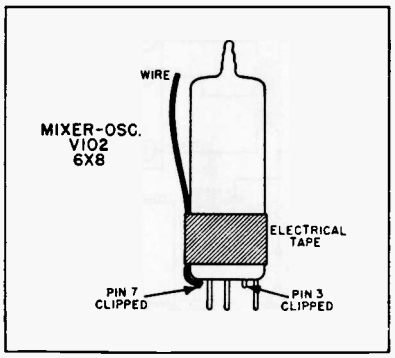


Figure 1. Adapter for use in connecting alignment equipment to grid of mixer stage.

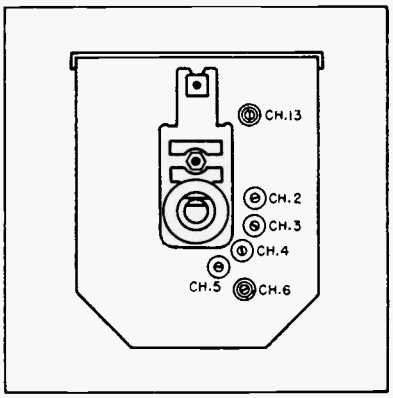
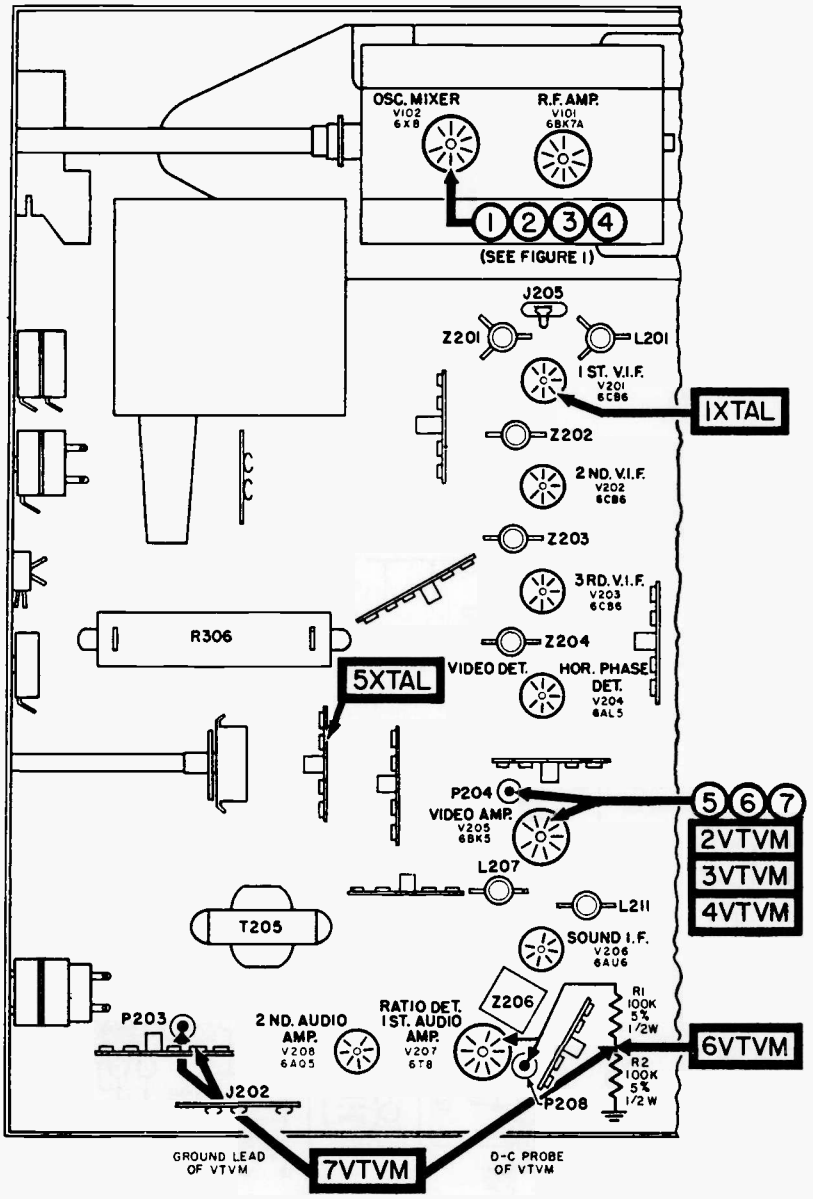


Figure 2. Oscillator slugs for VHF tuner 89 013 553.

ALIGNMENT TEST POINTS



TUNER OSCILLATOR ADJUSTMENT

When the alignment procedure has been completed, replace the adapter tube with the *original* tuner mixer-oscillator tube and check the fine tuning on each channel on which a station is available. If one or more stations cannot be tuned in properly, within the range of the Fine Tuning control, the tuner oscillator slugs require readjustment.

If the highest frequency station that cannot be tuned in properly is between channels 2 and 6 readjust the oscillator slugs as follows:

1. Turn the Station Selector knob to the highest channel that does not tune in properly.

2. Readjust the oscillator slug of that channel (see figure 2) so that proper tuning, within the range of the Fine Tuning control, is obtained.

3. Turn the Station Selector knob to each lower channel and check the fine tuning. Repeat steps 1 and 2 of the above procedure for each available lower frequency station that does not tune properly.

Note: If channel 5 is the highest low channel station available, readjust the channel 6 oscillator slug when the channel 5 slug does not have sufficient range. If a lower channel oscillator slug does not have sufficient range for proper tuning, the next highest channel oscillator slug should also be readjusted.

If the highest frequency station that cannot be tuned in properly, within the range of the Fine Tuning control, is between channels 7 and 13, readjust the oscillator slugs as follows:

1. Check the tuning of the available stations between channels 7 and 13. If one or more stations does not tune properly, adjust the channel 13 oscillator slug so that all available stations between channel 7 and 13 can be properly tuned, within the range of the Fine Tuning control.

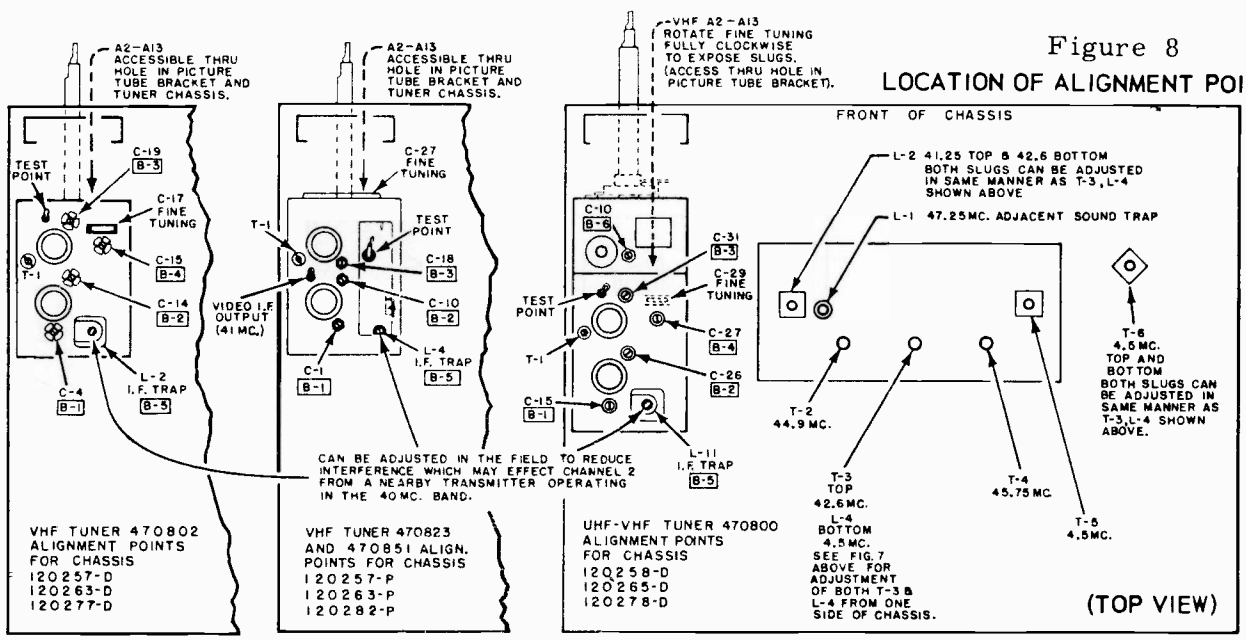
2. Check the tuning of all available stations between channels 2 and 6. If the tuning of one or more stations is not proper, repeat the previous procedure on the adjustment of the oscillator slugs for stations between channels 2 and 6.

Emerson Television

TYPE	MODEL NUMBERS	TV CHASSIS	PICTURE TUBE	TV TUNER	TYPE UHF STRIP
VHF RECEIVERS	1108D, 1110D, 1112D, 1116D, 1120D, 1126D, 1138D, 1140D, 1150D, 1152D, 1154D, 1162F.	120257-D	21ALP4B OR 21ALP4A	470802	"U"
	1108F, 1126F, 1138F, 1140F, 1150F, 1152F, 1154F, 1162D, 1164D.	120257-P		470823	"TD"
	1122D, 1124D, 1156F	120263-D	24DP4A	470802	"U"
	1122F, 1124F, 1156D, 1160D	120263-P		470823	"TD"
	1144D	120277-D-TV 120279-B-RADIO	21ALP4B OR 21ALP4A	470802	"U"
	1158A	120282-P	24DP4A	470851	"TD"
UHF-VHF RECEIVERS	1109D, 1111D, 1113D, 1117D, 1121D, 1127D, 1139D, 1141D, 1151D 1153D, 1155D, 1163D, 1165D	120258-D	21ALP4B OR 21ALP4A	470800	NO U.H.F. STRIPS NEEDED
	1123D, 1125D, 1157D, 1161D	120265-D	24DP4A		
	1145D	120278-D-TV 120279-B-RADIO	21ALP4B OR 21ALP4A		

Service material on the above listed sets is presented in this manual on pages 41 through 46. Some of these sets are also covered in a preliminary fashion in Volume TV-10. All of the chassis listed are basically the same. Different chassis numbers have been assigned since tuners and picture tube sizes may differ. The remote control chassis 120282P is similar to 120263P except for the remote control feature.

Figure 8
LOCATION OF ALIGNMENT POINTS



EMERSON Various 1956 Models, Alignment Information

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-3, C-4) positive terminal to chassis.
3) Connect D.C. V.T.V.M. to junction L-6, R-18, Low side to chassis.
4) Connect terminated marker generator to floating shield of converter tube V-16. (Shield raised slightly to that it does not make contact with chassis). Use unmodulated marker. See Fig. 6.

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.
42.6 MC. Unmodulated	T-3 Top See Fig. 7.	
45.2 MC. Unmodulated	T-2 T-1	
42.6 MC. Unmodulated	L-2 Bottom See Fig. 7.	
41.25 MC. Unmodulated	L-2 Top See Fig. 7.	Adjust trap for minimum response. Increase output from signal generator so that a true minimum position can be found.

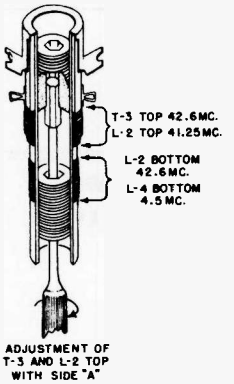


Figure 7

5) Connect vertical input of an oscilloscope instead of V.T.V.M. to video I.F. Align. Point with vertical scope gain set at, or near, maximum. (Horizontal scope sweep set at 400 cycles). See Fig. 6.

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	FREQUENCY MARKER			
Connect terminated sweep and marker as shown in Fig. 6.	Center frequency 44 MC. 10 MC. Sweep	45.75 MC.	Scope connected through 10K Resistor to Junction L-7 & R-18 (Align. Point).	T-4 T-2	If 45.75 MC. marker is too high adjust T-4 if to low adjust T-2 (see fig. 5 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-2 (TOP) and L-1 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.

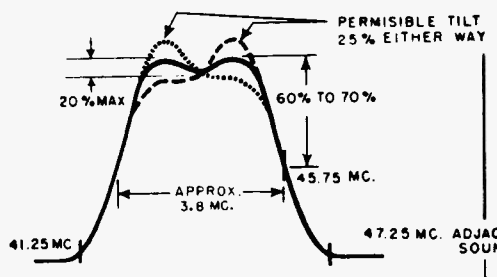


Figure 5. OVERALL I.F. RESPONSE CURVE

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).

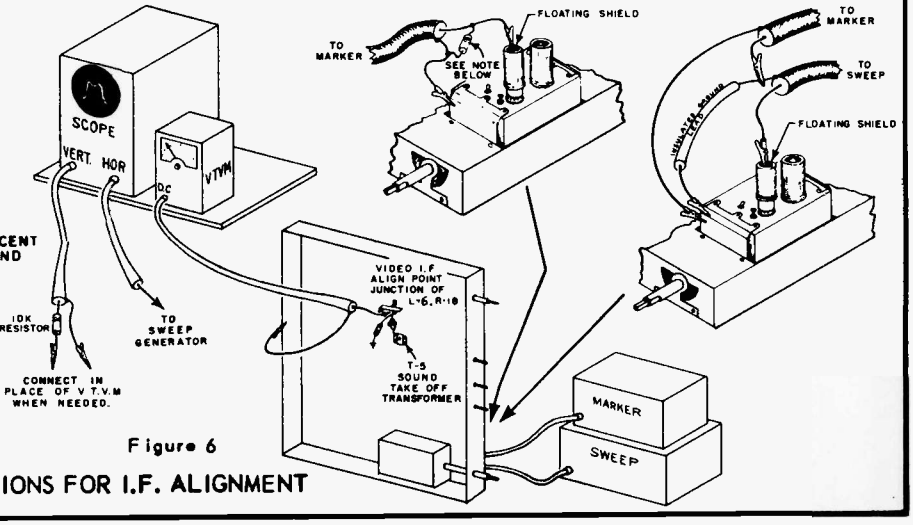


Figure 6

CONNECTIONS FOR I.F. ALIGNMENT

EMERSON Various 1956 Models, Alignment Information and Production Changes

SOUND ALIGNMENT

(A) USING 4.5 mc UNMODULATED SIGNAL GENERATOR

1) Set contrast control (R-20) for min. contrast (counter-clockwise).
2) Keep output of signal generator low so as to provide a sharp meter indication with adjustment of transformers.
3) Short pin No. 1 of V-1 to chassis.

(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 1 of V-5 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 Pin #2 of V6A low side to chassis.	T-5 Top or Bottom ⊕L-4 Bottom See Figs. 7 & 8	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-35, R-36 – low side to chassis.	T-6 Top and Bottom (Discriminator)	A) Detune Discriminator secondary T-6 (Top Pt. #708210) for maximum negative meter reading. B) Adjust primary T-6 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 to 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.)
⊕ L-4 is mounted on same coil form as T-3 and should be adjusted by a hex head fibre align. tool as indicated in fig. 7.

PRODUCTION CHANGES

3- To improve audio response at high volume settings. 120257-D, 120258-D (B) 120263-D, 120265-D (A)

R-37 was changed from 1 meg to 10 meg on chassis coded as shown above. This change increases the grid bias on the tube and allows for additional undistorted audio output.

4- On 21" chassis 120257-D and 120258-D, R-70 (15,000 ohm, 2 watt) horizontal output screen resistor has been changed to 10,000 ohm, 2 watt part #780732. This change was made to increase horizontal picture size and picture tube second anode voltage. 120257-D and 120258-D chassis already incorporating this change are coded Triangle C.

6- 120257-D and 120258-D chassis coded Triangle D_1 use horizontal output transformer part #738111 instead of part #738106. This entails the following changes. Performance is not effected by this change.

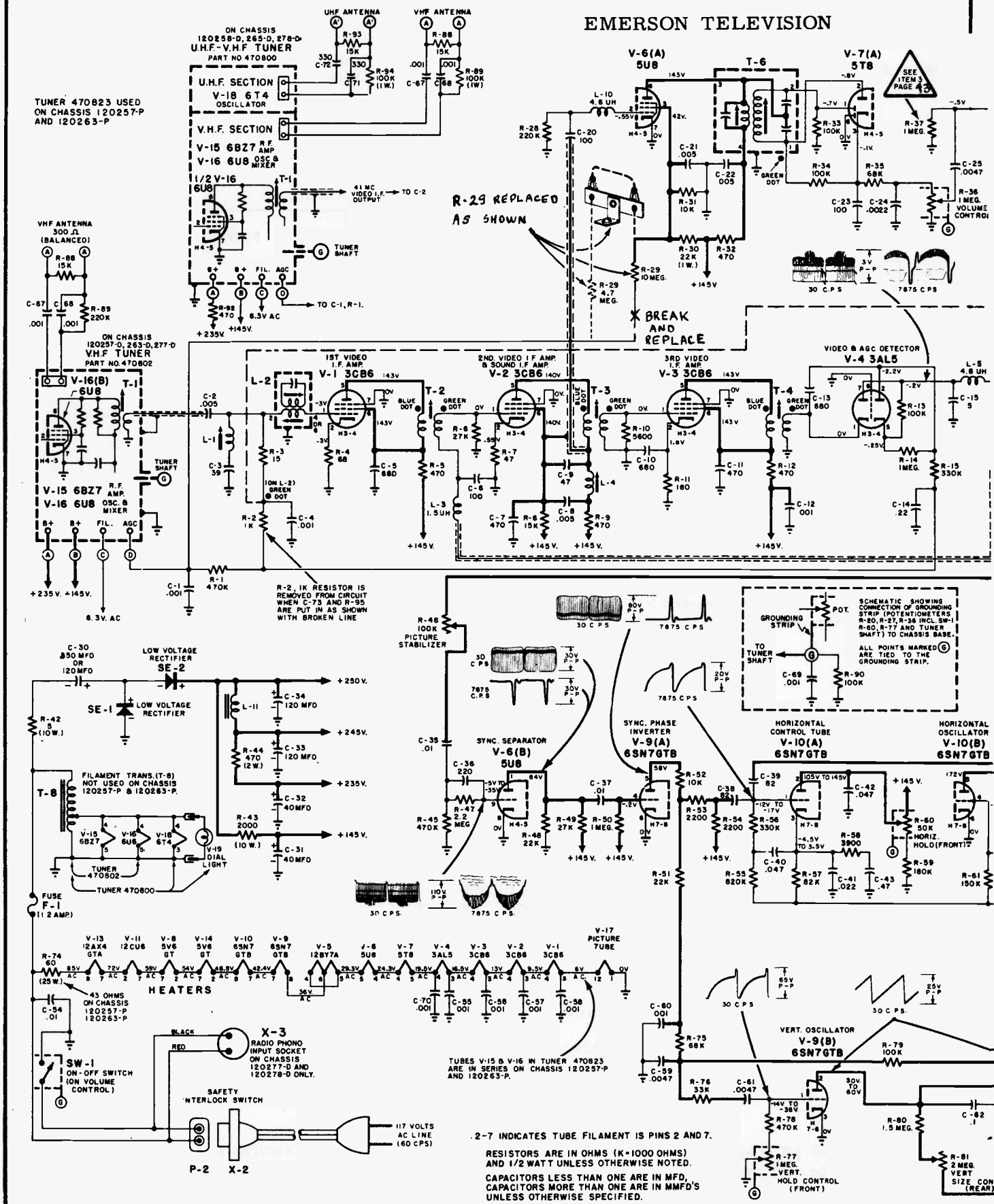
a) R-70 is changed to 8,200 ohms, 2 watts.

b) R-72 and C-52 are removed from the circuit.

c) C-49 is changed to a .22 mfd, 200 volt capacitor part #922325.

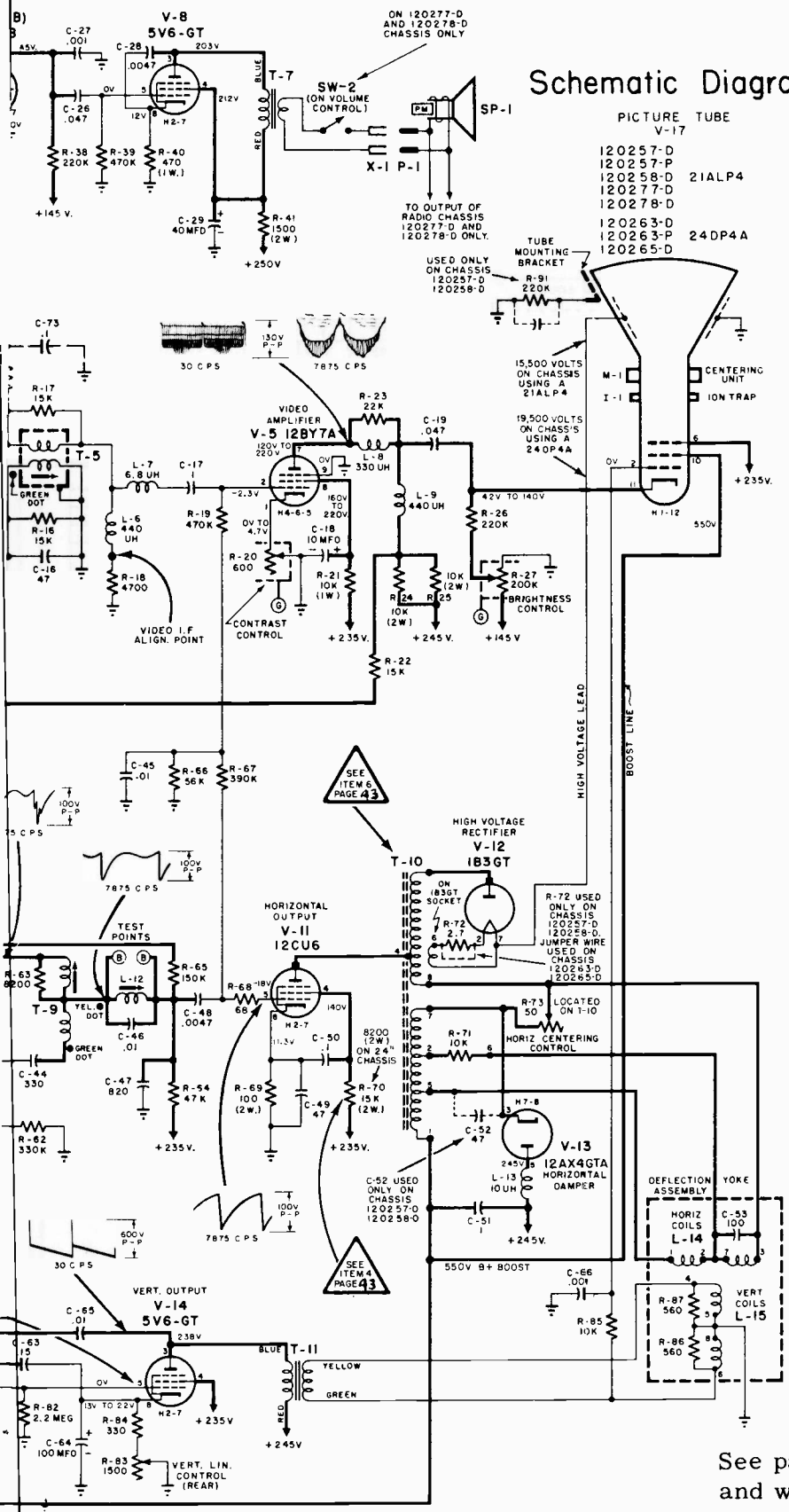
Note: The suffix #1 denotes the use of this horizontal output transformer and not the triangle letter. In other words, if a triangle E change is made at a later date and has suffix #1, it will indicate the use of #738111 horizontal output transformer. If no suffix #1 is used with triangles D, E, F, etc., then #738106 is used.

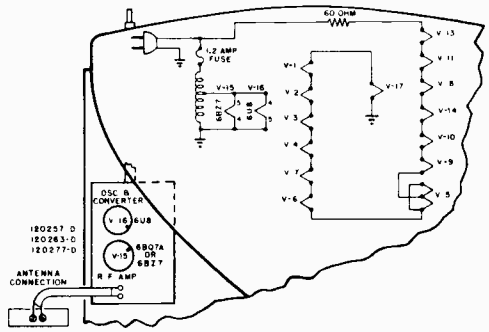
7- 120263-D and 120265-D chassis coded with a suffix No. 1 within the triangle such as triangle B_1, use a picture tube with an R.T.M.A. vendor code no. 188. The screen of these picture tubes are connected directly to B+ boost (Junction C-51, Lug No. 1 on H.O.T.).

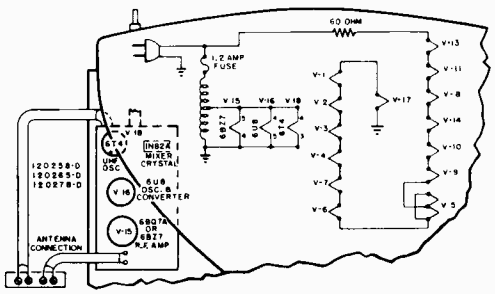

EMERSON TELEVISION
ON CHASSIS 120258-D, 265-D, 278-D
U.H.F.-V.H.F. TUNER
PART NO 470800
U.H.F. SECTION
V-18 6T4 OSCILLATOR
V.H.F. SECTION
V-15 6BZ7 R.F. AMP
V-16 6U8 OSC & MIXER
TUNER 470823 USED ON CHASSIS 120257-P AND 120263-P
UHF ANTENNA
VHF ANTENNA
R-93 15K
R-88 15K
330 C-72
330 C-71
R-94 100K (1W.)
R-89 100K (1W)
.001 C-67
.001 C-68
41 MC VIDEO I.F. OUTPUT
TO C-2
TUNER SHAFT
B+ B+ FIL. AGC
6.3V AC
TO C-1, R-1.
+235V.
+145V.
R-92 470
VHF ANTENNA 300 Ω (BALANCED)
R-88 15K
C-67 .001
C-68 .001
R-89 220K
ON CHASSIS 120257-D, 263-D, 277-D
V.H.F. TUNER
PART NO. 470802
V-16(B) 6U8
T-1
V-15 6BZ7 R.F. AMP
V-16 6U8 OSC. & MIXER
TUNER SHAFT
B+ B+ FIL. AGC
+235V. +145V.
6.3V. AC
C-1 .001
R-1 470K
R-2, 1K RESISTOR IS REMOVED FROM CIRCUIT WHEN C-73 AND R-95 ARE PUT IN AS SHOWN WITH BROKEN LINE
L-2
L-1
C-3 39
C-2 .005
R-3 15
R-4 68
C-5 680
R-5 470
L-3 1.5 UH
C-6 100
R-2 1K
C-4 .001
1ST VIDEO I.F. AMP.
V-1 3CB6 143V
2ND. VIDEO I.F. AMP. & SOUND I.F. AMP.
V-2 3CB6 140V
3RD VIDEO I.F. AMP.
V-3 3CB6 143V
T-2
T-3
T-4
GREEN DOT
BLUE DOT
R-6 27K
R-7 47
C-9 47
L-4
R-10 5600
C-10 680
R-11 180
C-11 470
R-12 470
C-12 001
C-7 470
R-8 15K
C-8 .005
R-9 470
+145V.
VIDEO & AGC DETECTOR
V-4 3AL5
C-13 680
R-13 100K
C-14 .22
R-14 1MEG.
R-15 330K
C-15 5
L-5 4.8 UH
V-6(A) 5U8
V-7(A) 5T8
T-6
L-10 4.8 UH
R-28 220K
C-20 100
C-21 .005
C-22 005
R-31 10K
R-30 22K (1W.)
R-32 470
R-29 10 MEG.
R-29 4.7 MEG.
R-29 REPLACED AS SHOWN
BREAK AND REPLACE
R-33 100K
R-34 100K
R-35 68K
C-23 100
C-24 .0022
C-25 .0047
R-36 1 MEG. VOLUME CONTROL
R-37 1 MEG.
SEE ITEM 3 PAGE 43
30 C.P.S
7875 C.P.S
3V P-P
R-46 100K PICTURE STABILIZER
C-30 850 MFD OR 120 MFD
LOW VOLTAGE RECTIFIER SE-2
SE-1 LOW VOLTAGE RECTIFIER
R-42 5 (10W.)
C-34 120 MFD
C-33 120 MFD
C-32 40 MFD
C-31 40 MFD
L-11
R-44 470 (2W.)
R-43 2000 (10W.)
+250V.
+245V.
+235V.
+145V.
FILAMENT TRANS. (T-8) NOT USED ON CHASSIS 120257-P & 120263-P.
T-8
V-15 6BZ7
V-16 6U6
V-18 6T4
V-19 DIAL LIGHT
TUNER 470802
TUNER 470800
FUSE F-1 (1.2 AMP.)
SYNC. SEPARATOR V-6(B) 5U8
C-35 .01
C-36 220
R-47 2.2 MEG.
R-45 470K
R-48 22K
R-49 27K
R-50 1 MEG.
C-37 .01
SYNC. PHASE INVERTER V-9(A) 6SN7GTB
R-52 10K
R-53 2200
R-54 2200
R-55 820K
R-51 22K
HORIZONTAL CONTROL TUBE V-10(A) 6SN7GTB
HORIZONTAL OSCILLATOR V-10(B) 6SN7GTB
C-39 82
C-38 82
C-42 .047
C-40 .047
C-41 .022
C-43 .47
R-56 330K
R-57 82K
R-58 3900
R-59 180K
R-60 50K HORIZ. HOLD (FRONT)
R-61 150K
+145 V.
105V TO 145V
-12V TO -17V
-4.5V TO 3.5V
172V
GROUNDING STRIP
POT.
TO TUNER SHAFT
C-69 .001
R-90 100K
SCHEMATIC SHOWING CONNECTION OF GROUNDING STRIP (POTENTIOMETERS R-20, R-27, R-36 INCL. SW-1 R-60, R-77 AND TUNER SHAFT) TO CHASSIS BASE.
ALL POINTS MARKED G ARE TIED TO THE GROUNDING STRIP.
80V P-P
20V P-P
30V P-P
110V P-P
HEATERS
V-13 12AX4 GTA
V-11 12CU6
V-8 5V6 GT
V-14 5V6 GT
V-10 6SN7 GTB
V-9 6SN7 GTB
V-5 12BY7A
V-6 5U8
V-7 5T8
V-4 3AL5
V-3 3CB6
V-2 3CB6
V-1 3CB6
V-17 PICTURE TUBE
R-74 60 (25W.)
43 OHMS ON CHASSIS 120257-P 120263-P
C-54 .01
C-70 .001
C-55 001
C-56 001
C-57 001
C-58 001
TUBES V-15 & V-16 IN TUNER 470823 ARE IN SERIES ON CHASSIS 120257-P AND 120263-P.
SW-1 ON-OFF SWITCH (ON VOLUME CONTROL)
X-3 RADIO PHONO INPUT SOCKET ON CHASSIS 120277-D AND 120278-D ONLY.
BLACK
RED
SAFETY INTERLOCK SWITCH
117 VOLTS AC LINE (60 CPS)
P-2 X-2
VERT. OSCILLATOR V-9(B) 6SN7GTB
C-60 001
R-75 68K
C-59 .0047
R-79 100K
R-76 33K
C-61 .0047
R-78 470K
R-77 1 MEG. VERT. HOLD CONTROL (FRONT)
R-80 1.5 MEG.
C-62 .1
R-81 2 MEG. VERT SIZE CON (REAR)
65V P-P
25V P-P
30V TO 60V
-14V TO -38V
2-7 INDICATES TUBE FILAMENT IS PINS 2 AND 7.
RESISTORS ARE IN OHMS (K=1000 OHMS) AND 1/2 WATT UNLESS OTHERWISE NOTED.
CAPACITORS LESS THAN ONE ARE IN MFD, CAPACITORS MORE THAN ONE ARE IN MMFD'S UNLESS OTHERWISE SPECIFIED.

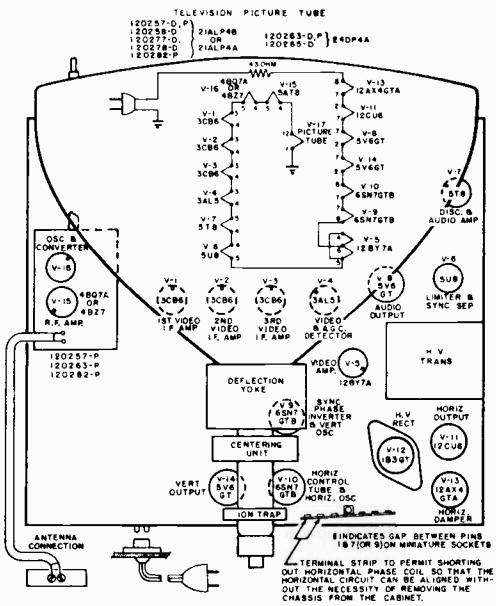
EMERSON RADIO AND PHONO. CORP. Schematic Diagram of Various 1956 Television Sets

Schematic Diagram









TUBE LOCATIONS DIAGRAMS

See page 46 for notes on voltage readings and waveform measurements.

EMERSON TELEVISION

TUBE TROUBLE ANALYSIS CHART FOR CHASSIS

MODELS USING CHASSIS

120257-D 120263-D
120257-P 120263-P
120258-D 120265-D

120277-D - TV
120279-B - RADIO

120278-D - TV
120279-B - RADIO

120282-REMOTE CONTROL

*INDICATES VARYING RESISTANCE - WAIT UNTIL METER SETTLES (ABOUT 30 SECONDS.)

SYMPTOM	CHECK
Weak or no Sound nor video (picture), raster normal -- UHF only	Xtal mixer (UHF tuner) V-18
Weak or no sound nor video (picture), raster normal -- UHF and or VHF	V-15, V-16, V-1, V-2, V-3, V-4
Weak or no sound – Video and raster normal ------- UHF and or VHF	V-6, V-7, V-8
Weak or no video – Sound and raster normal ------- UHF and or VHF	V-5, V-17
Poor or no horizontal nor vertical sync. – Sound and video normal (contrast control makes video darker or lighter) ---------- UHF and or VHF	V-5, V-6, V-9
Poor or no horizontal nor vertical sync. – Video weak or distorted, raster normal – Sound may or may not be normal ---------- UHF and or VHF	V-15, V-16, V-1, V-2, V-3, V-4, V-5
Poor or no horizontal sync. – Raster normal and sound normal (picture locks in vertically). -------- UHF and or VHF	V-9 V-10, V-11
Poor or no vertical sync. – Raster normal and sound normal (picture locks in horizontally) ---------- UHF and or VHF	V-9, V-14
Horizontal line (no vertical sweep) – Sound normal -- UHF and or VHF	V-9, V-14
Insufficient horizontal size, sound & video normal -- UHF and or VHF	V-11, V-13, SE-1, SE-2

RESISTANCE READINGS

SYMBOL	TUBE PIN NUMBERS								
	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V-1	1.3 MEG	68	*2.8	*3.9	*17K	*17K	0		
V-2	2.0	47	*3.9	*4.8	*17K	*30K	0		
V-3	0	180	*4.8	*5.8	*17K	*17K	0		
V-4	0	1.0 MEG	*5.8	*6.5	90K	0	4.7 K		
V-5	CONTRAST CONT. 0 TO 600	470K	0	*8.6	*8.6	*10	*23K	30K	0
V-6	17K	220K	8.5K	*7.5	*8.6	*17K	0	0	2.7 MEG.
V-7	90K	90K	170K	*7.5	*6.5	0	0	1.0 MEG	*250K
V-8	N.C.	*14	*21K	*20K	470K	N.C.	*15	470	
V-9	VERTICAL HOLD 470K TO 1.5 MEG	*INF.	0	1 MEG.	*30K	0	*11.5	*10	
V-10	1.4 MEG.	*HORIZ. HOLD 16K TO 45K	420K	480K	*60K	0	*11.5	*13	
V-11	N.C.	*17.2	N.C.	*35K	400K	N.C.	*15	100	
V-12	DO NOT MEASURE								
V-13	N.C.	N.C.	INF.	N.C.	*18K	N.C.	*17.2	*19.6	
V-14	N.C.	*13	*18K	*18K	2.2 MEG.	N.C.	*14	VERTICAL LIN. 330 TO 1800	

CONDITIONS FOR TAKING VOLTAGE AND RESISTANCE READINGS

The voltage and resistance measurements listed were taken on Chassis 120257-D coded triangle (A)

Due to component variations, voltage and resistance readings may vary slightly from those given here. Slight variations may also be noticed if chassis is not coded as mentioned above.

The picture tube, deflection yoke and high voltage circuits were connected to take the following readings and waveshapes.

1. Antenna disconnected and antenna terminals shorted on tuner and connected to chassis (use short leads).
2. Line voltage 117 volts (Disconnect power for resistance readings).
3. 3 volt bias battery connected to A.G.C. circuit, positive terminal to chassis, negative terminal to junction of R-1, C-1, BIAS BATTERY USED FOR VOLTAGE READINGS ONLY.
4. All controls in position for normal picture. (Varied when it directly effects reading).
5. All measurements taken with a vacuum tube voltmeter and ohmmeter.
6. All readings listed in tables were taken between points shown and chassis.
7. Resistance readings are given in ohms unless otherwise noted.
8. N.C. denotes no connection.

WAVE SHAPE ANALYSIS CHART

The waveshapes shown were taken on chassis 120257-D coded triangle (A)

Slight peak to peak voltage differences may be noticed on chassis of later triangle codes.

The peak to peak voltage given may also vary slightly depending on signal strength and component variations.

To accurately observe the wave shapes, the relatively high input capacity of an oscilloscope must be reduced so as not to change the operating characteristics of the television set. Failure to do this will result in wrong wave shape readings.

1. Connect antenna and tune receiver to channel where best reception has been obtained in the past.
2. Low end of the probe is connected to CHASSIS and the contrast control is set for MAXIMUM UNDISTORTED CONTRAST.
3. The 30 and 7875 C.P.S. oscilloscope sweep settings are used so as to permit the servicemon to observe two cycles of the wave shape.

NOTE: A wave shape seen in your oscilloscope may be upside down from some wave shape shown here. This will depend on the number of stages of amplification in the oscilloscope used.

GENERAL ELECTRIC COMPANY

"S" Line, Models 21C110, 21C111, 21C112, 21C113, 21C123, 21C124, 21C125, 21C126, 21T038, 21T039, 21T041, 21T042, 21T043, 21T045, 24C180, 24C181, 24T070, 24T071. (Service data on pages 47 through 52)

The new General Electric "S" line of receivers are available for straight VHF reception, (channels 2-13), as well as for VHF-UHF reception (channels 2-83). All models are listed by Underwriters Laboratories. Model 21C113 incorporates a clock timer.

REMOVAL AND REPLACEMENT OF PICTURE TUBE (LOBOY MODELS)

If it becomes necessary to remove the picture tube, adhere to the following procedure. Refer to Figure 1.

1. Disconnect and remove speakers.
2. Disconnect chassis speaker leads, picture tube socket, yoke connector and high voltage anode connector.
3. Remove front control knobs and four chassis mounting screws.
4. Slide out chassis, together with both mounting braces.
5. Loosen and remove both securing nuts above picture tube assembly.
6. Remove six screws arranged along edge of picture tube mounting board and slide entire tube assembly from cabinet. Remove yoke, centering assembly and ion trap, loosen clamp nut and remove tube.

CIRCUIT CHANGES

The following items represent the major changes occuring within midproduction. Minor resistor or capacitor value changes, other than those listed below, have occurred.

VERTICAL BLANKING: Early receivers incorporated the circuit shown. Later production receivers pick this voltage off from the yoke driving circuit.

AGC DELAY RESISTOR: R167: Originally was 2.2 megohms. This is changed to two parallel connected 3.3 megohm resistors R167 and R169, to improve fringe area performance. In areas containing both strong and moderate strength signals, it may prove advantageous to clip out one 3.3 megohm resistor to eliminate the need for actuating the local-distant switch.

HORIZONTAL PHASE DETECTOR: The Horizontal Phase Detector has been changed from a triode tube type (1/2 of 6U8), to a dual selenium diode type. This change also removes the Horizontal Phase Balance potentiometer, R251. Since the triode portion of the 6U8 is not required, the 4.5 mc sound I-F amplifier is changed to a 6AU6. This also requires a different ratio detector transformer.

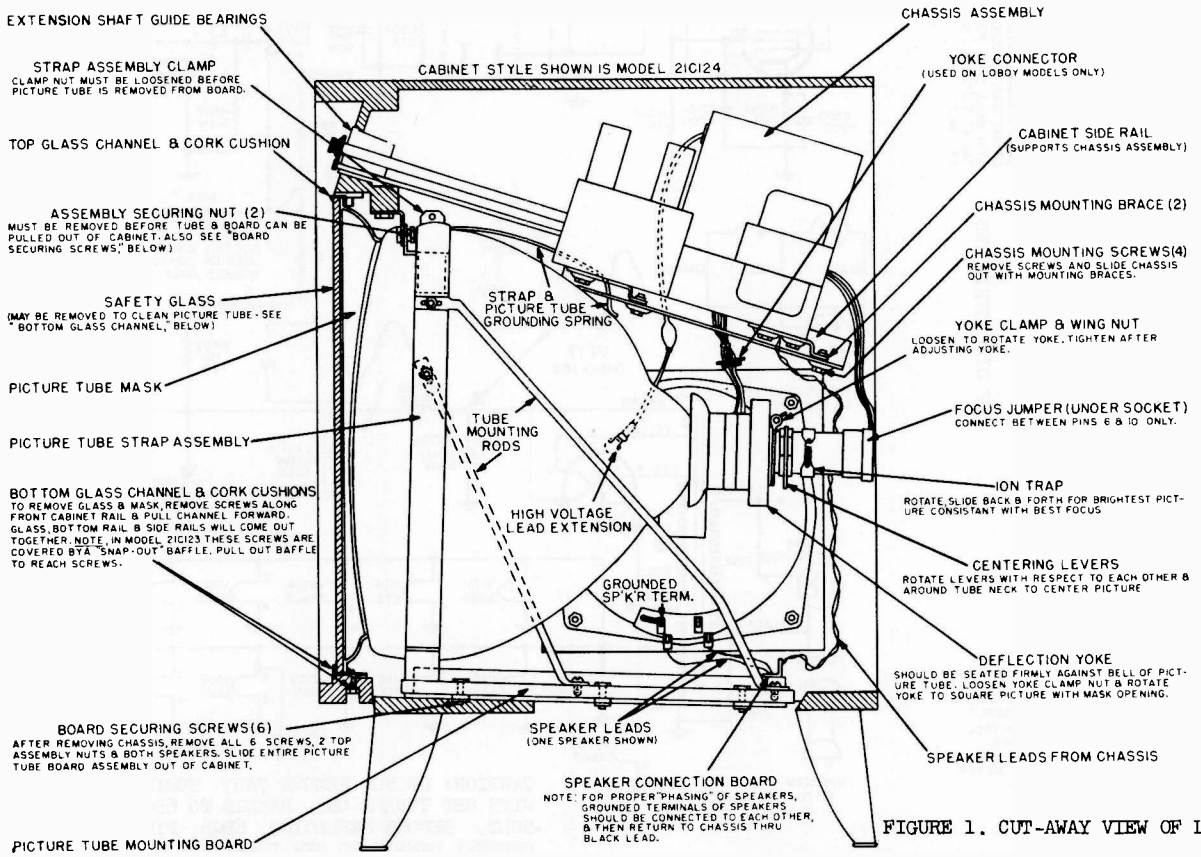
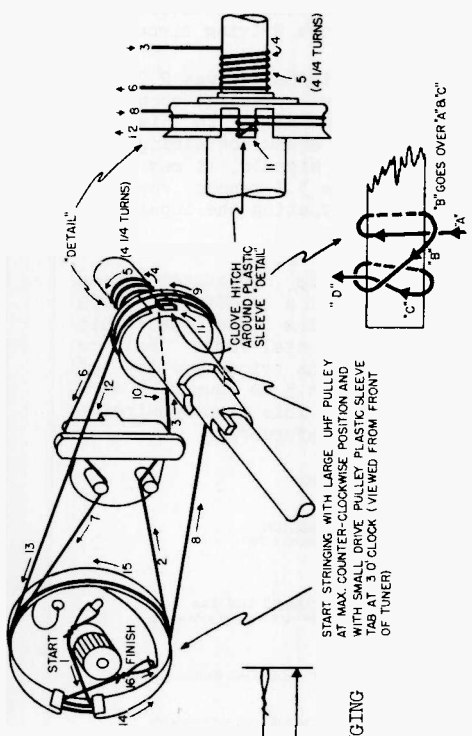
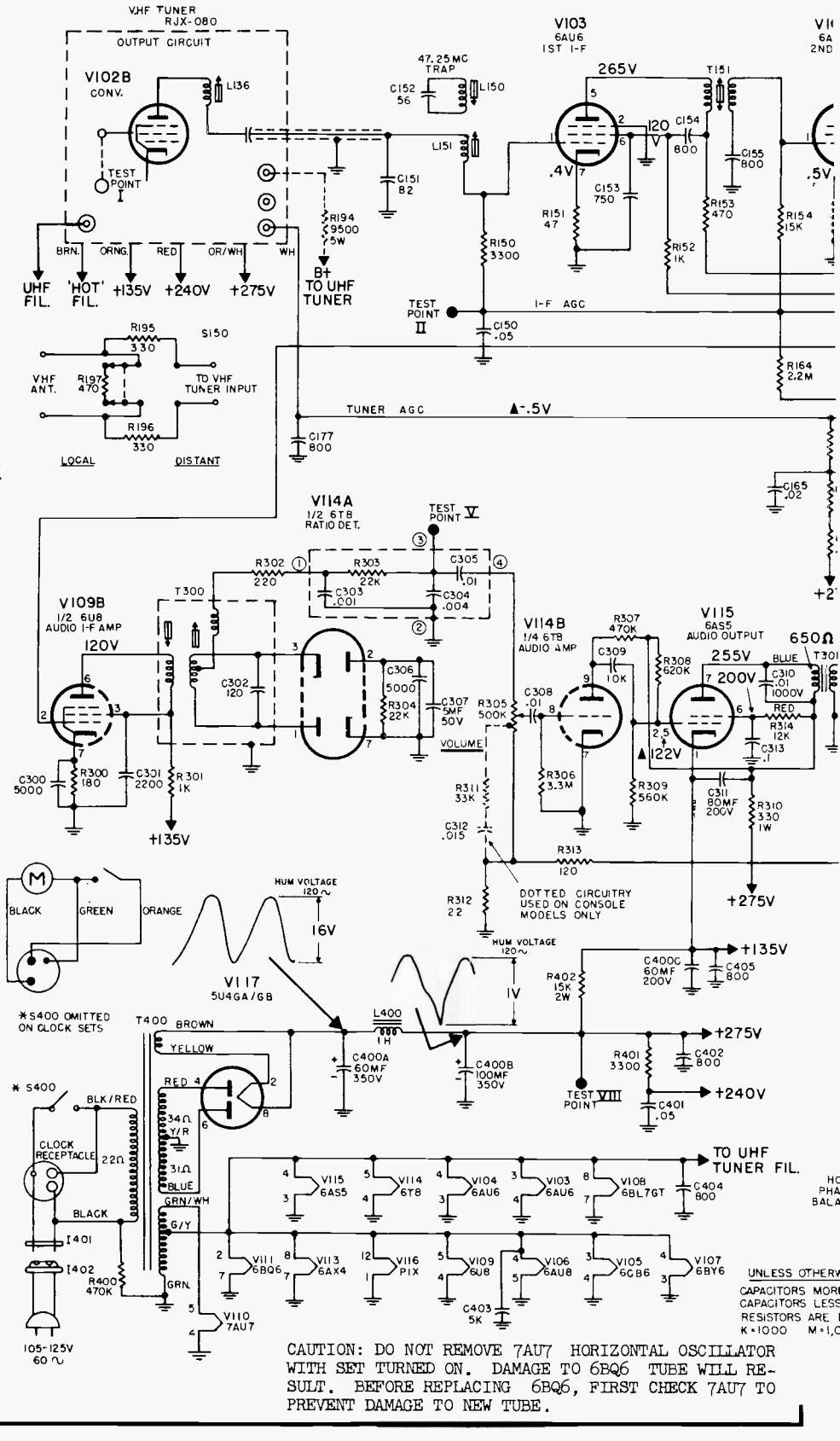


FIGURE 1. CUT-AWAY VIEW OF LOBOY MODELS

GENERAL ELECTRIC "S" Line Models 21C110 through 21C113, 21C123, 21C124, 21C125, 21C126, 21T038, 21T039, 21T041, 21T042, 21T043, 21T045, 24C180, 24C181, 24T070, and 24T071

COVERS "S" LINE MODELS 21T038-T039-T041-T042-T043-T045-21C110-C111-C112-C113-C123-C124-C125-C126-24T070-T071, 24C180-C181

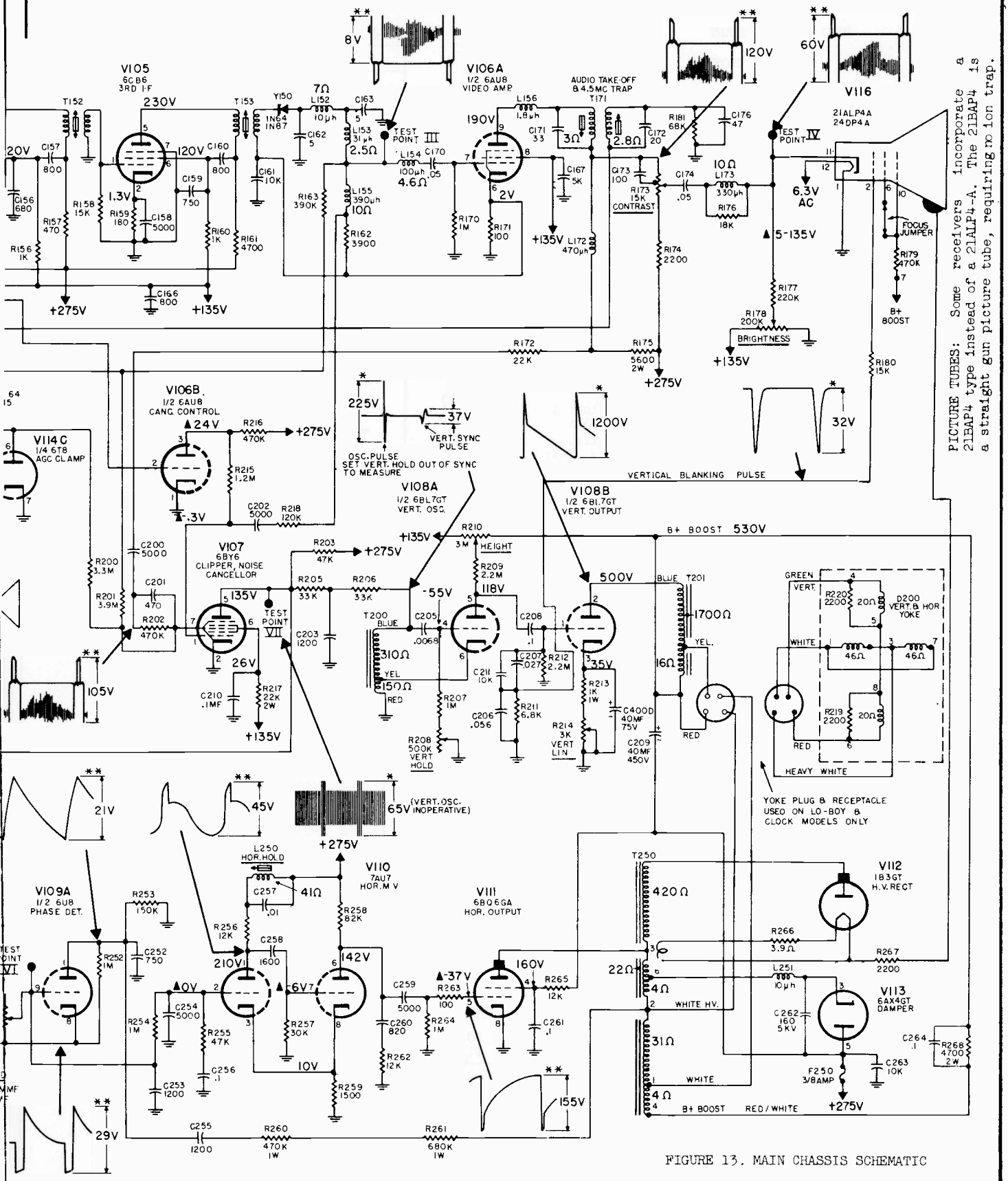




* SCOPE SYNCED AT 1/2 VERT. FREQUENCY.
** SCOPE SYNCED AT 1/2 HORIZ. FREQUENCY.
WAVE SHAPES TAKEN WITH NORMAL CONTROL SETTINGS & NORMAL SIGNAL APPLIED.
VOLTAGE MEASUREMENTS ARE IN RESPECT. TO CHASSIS WITH A 20,000Ω/VOLT METER, WITH CONTROLS SET FOR NORMAL OPERATION, NO SIGNAL APPLIED.
▲ MEASURED WITH VTVM
• VARIES WITH CONTRAST CONTROL.

CAUTION: DO NOT REMOVE 7AU7 HORIZONTAL OSCILLATOR WITH SET TURNED ON. DAMAGE TO 6BQ6 TUBE WILL RESULT. BEFORE REPLACING 6BQ6, FIRST CHECK 7AU7 TO PREVENT DAMAGE TO NEW TUBE.

GENERAL ELECTRIC "S" Line Circuit Diagram



PICTURE TUBES: Some receivers incorporate a 21BAP4 type instead of a 21ALP4-A. The 21BAP4 is a straight gun picture tube, requiring no ion trap.

FIGURE 13. MAIN CHASSIS SCHEMATIC

GENERAL ELECTRIC "S" Alignment and Service Information, Continued

RECEIVER ALIGNMENT

VIDEO I-F SYSTEM

The alignment of the I-F system involves the adjustment of 1 trap and 5 pass-band tank circuits. Allow at least 15 minutes warm-up for the receiver and test equipment before proceeding. Follow the usual precautions regarding equipment termination and cable dress. Some tuning cores will apparently go through two peaks. In all cases, the cores should be tuned to the first peak starting from the "out" position. Adjustment locations are indicated in Figure 11.

NOTES:

1. Set channel selector and volume control to channel 11. Turn fine tuning control fully counter-clockwise. Set contrast control fully clockwise.
2. Connect sweep generator to capacity type jig shown in Figure 9. If General Electric sweep equipment is used, the indicated resistor should be omitted.
3. Connect a 3 volt battery from Test Point II to chassis (positive battery lead to chassis).
4. Remove horizontal sweep output tube, V111.
5. Connect scope through 10,000 ohms to Test Point III. Calibrate vertical gain of scope for 5 volts peak to peak for 2 inch deflection. When aligning, base-line to 45 mc marker should be kept at 2 inches. Refer to pre-peaking chart if alignment difficulty is experienced. Align as follows:

A-M PRE-PEAKING FREQUENCIES

L136	45.0 MC
L150 TRAP	47.25 MC
L151	43.3 MC
T151	45.25 MC
T152	42.9 MC
T153	44.15 MC

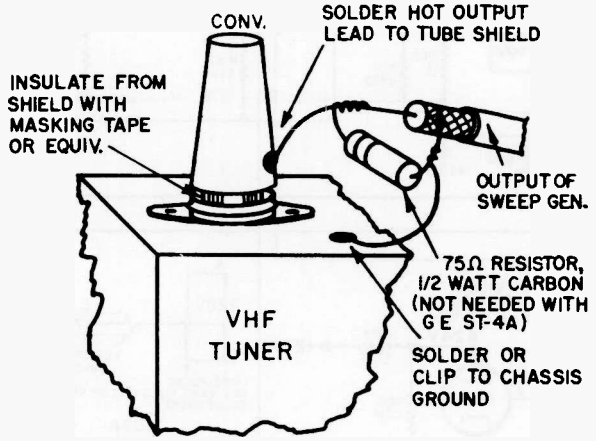
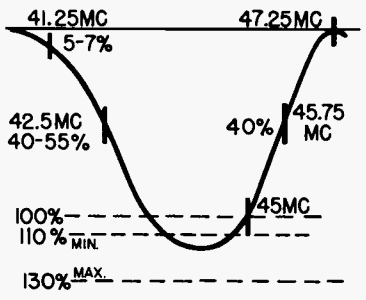


FIGURE 9. I-F SWEEP JIG

VIDEO I-F ALIGNMENT CHART

STEP	ADJUST	DESIRED RESPONSE	REMARKS
1	L150 for minimum at 47.25 mc.		Adjust L136 simultaneously with L151. 41.25 mc marker is very critical and should be kept between limits of 5 to 7%. Peak of curve may fall between limits of 110% and 130% using 45 mc as the 100% reference.
2	T152 to set 42.5 mc marker at 40-55%.		
3	T151 to set 45.75 mc marker at 45%.		
4	L136 to set width of peak region of curve.		
5	L151 & T153 for peak region symmetry.		

AUDIO I-F ALIGNMENT

NOTES:

1. Tune in a television signal. This will provide a 4.5 mc signal source for audio i-f alignment. Keep the volume control turned down unless the speaker is connected.
2. Connect two 100,000 ohm resistors (in series) between pin #2 of V1114 (6T8) and chassis.

AUDIO ALIGNMENT CHART

STEP	CONNECT VTVM OR 20,000 OHMS/VOLT METER	ADJUST	METER INDICATION	REMARKS
1	Between Pin #2 of V114A and chassis	T171 secondary (top)	Adjust for maximum deflection.	Repeat steps 1, 2 and 3 to assure proper bandwidth.
2		T300 primary (bottom)	Adjust for maximum deflection.	
3	Between Test Point V and the center of the two 100,000 ohm resistors.	T300 secondary (top)	Adjust for zero volts d-c output.	

GENERAL ELECTRIC "S" Line Alignment Information

4.5 MC TRAP ALIGNMENT:

1. Turn contrast control fully clockwise.
2. Connect detector network (Figure 10) to Test Point IV and set contrast to maximum. Connect oscilloscope to network.
3. Apply a 4.5 mc AM signal through .001 MF to Test Point III.
4. Tune the bottom core of T171 for minimum signal observed on oscilloscope.

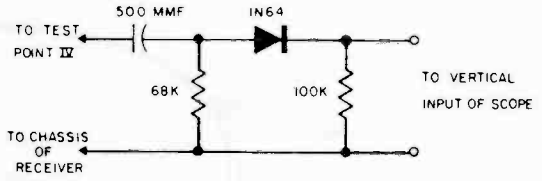


FIGURE 10. DETECTOR NETWORK

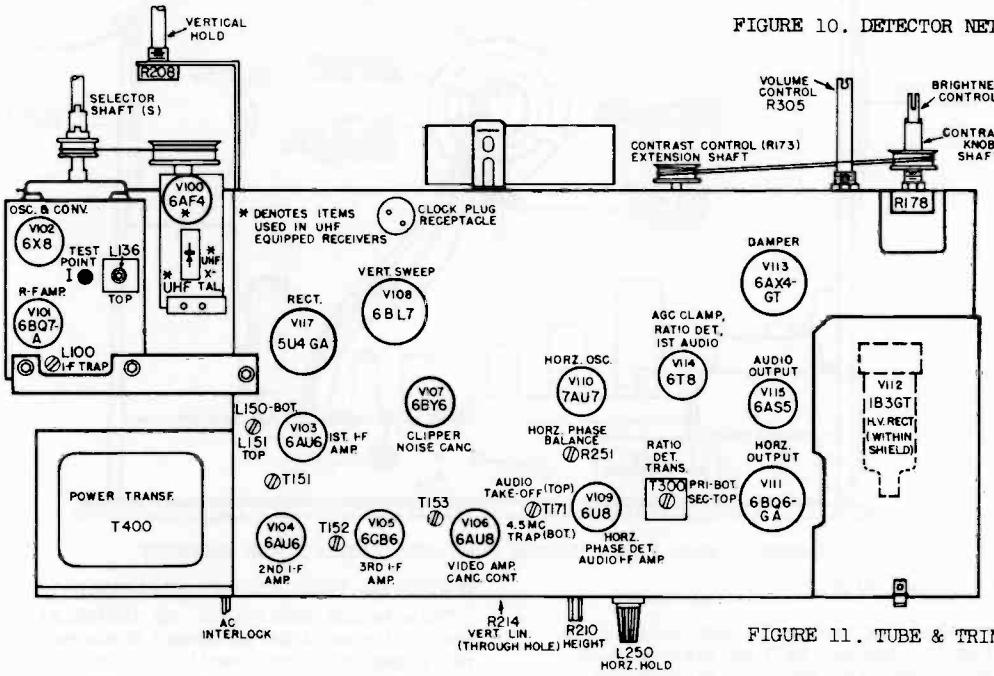


FIGURE 11. TUBE & TRIMMER LOCATION

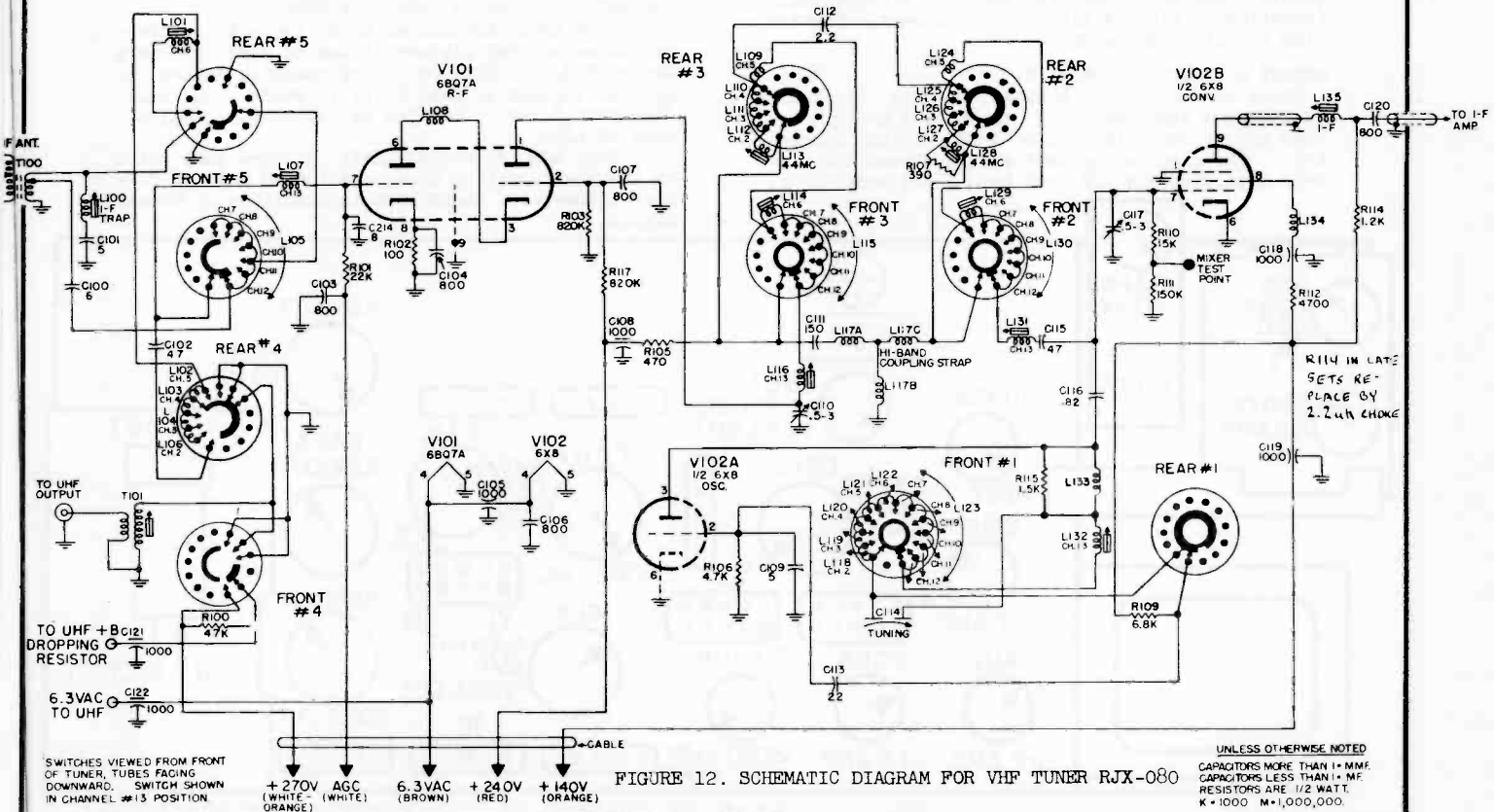


FIGURE 12. SCHEMATIC DIAGRAM FOR VHF TUNER RJX-080

GENERAL ELECTRIC "S" Line Service Information, Continued

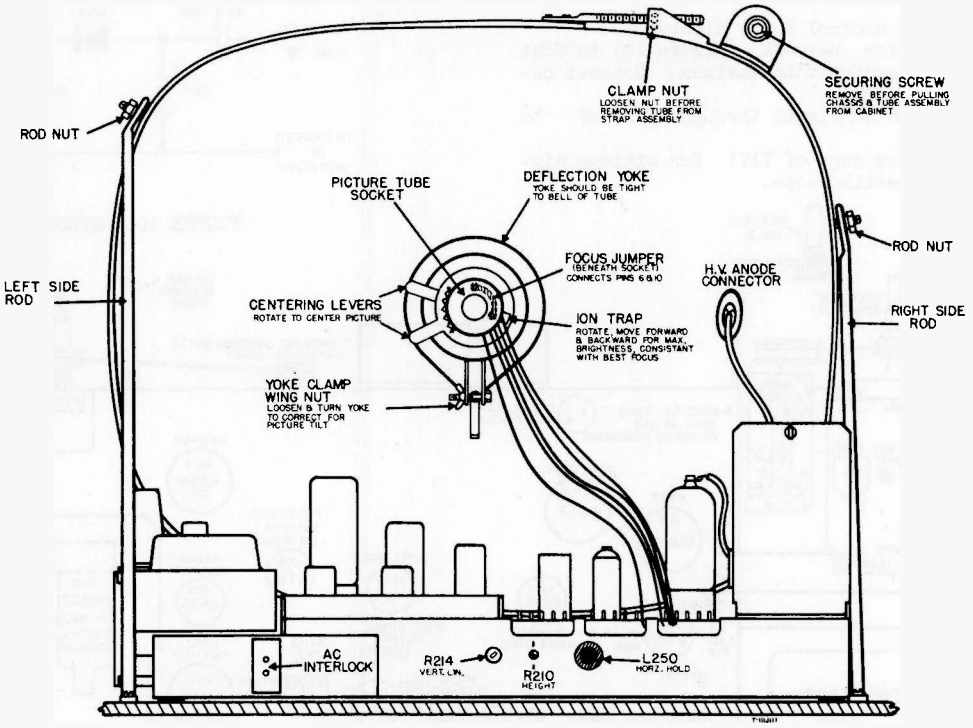


FIGURE 2. REAR VIEW, PICTURE TUBE AND CHASSIS BOARD ASSEMBLY

YOKE POSITION (Picture Tilt):

Loosen yoke clamp wing nut and push deflection yoke to seat firmly against bell of picture tube. Rotate yoke and clamp to correct picture tilt (squaring of picture within picture mask). Tighten wing nut after adjustment.

HEIGHT & VERTICAL LINEARITY:

These controls (R210 & R214), see Fig. 2, should be adjusted simultaneously to provide proper picture height consistent with good vertical linearity. The final adjustment should extend the picture approximately 1/8 inch beyond the mask limits.

HORIZONTAL PHASE BALANCE ADJUSTMENT:

This is not considered an installation adjustment but should be performed whenever the horizontal phase detector, oscillator or output tubes are changed. Use barely visible signal.

1. Turn L250 horizontal hold control counterclockwise so that picture is out of sync by 8 bars Using VTVM, set R251 on top of chassis, Figure 11, so that voltage at Test Point VI reads - .5 volt. (Maintain 8 bar condition by additional adjustment of L250).

2. Turn L250 clockwise until picture just pulls in and then continue knob rotation 45 degrees further clockwise. Check lock-in stability on normal signal.

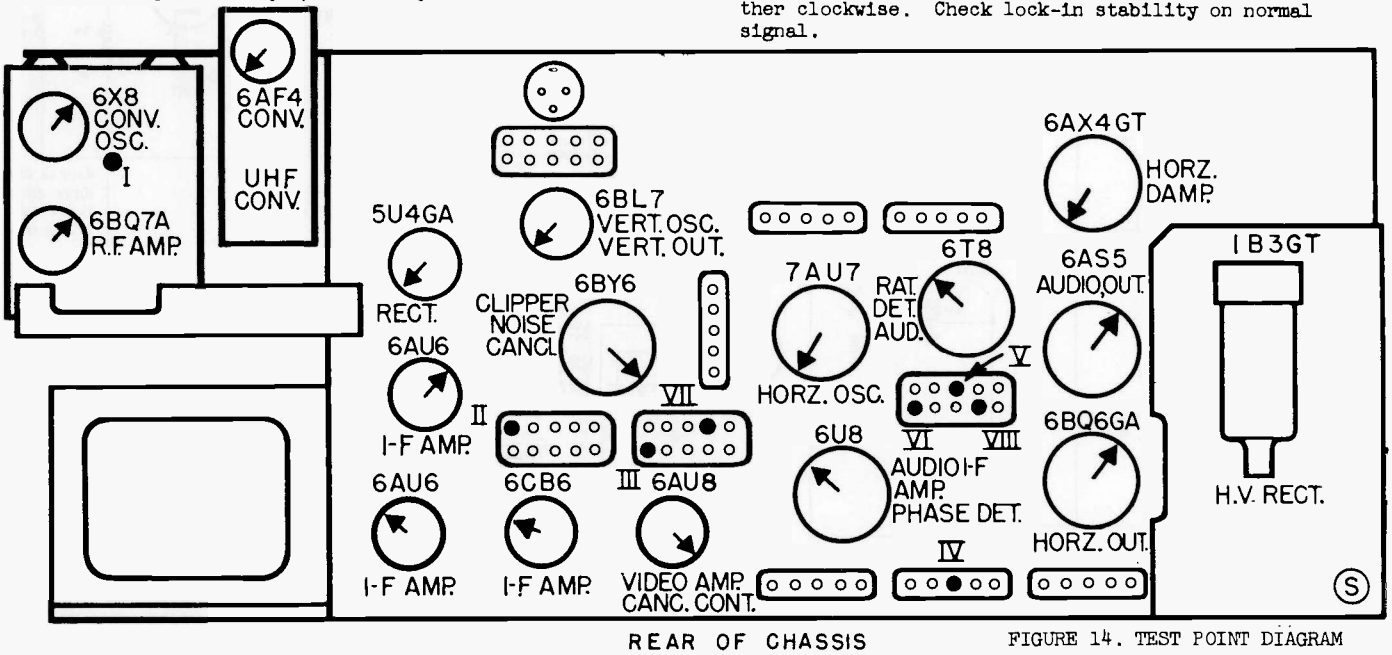


FIGURE 14. TEST POINT DIAGRAM

the hallicrafters co.

Chassis Type Number	Models Chassis May Be Used In
A2000 D	21TT500M, 21TT500B, 21K520M, 21K520B, 21KT540M and 21KT540B
B2000 D	21TT501M, 21TT501B, 21K521M, 21K521B, 21KT540M and 21KT540B
C2000 D	24TT510M, 24TT510B, 24KT550M, 24KT550B
D2000 D	24TT511M, 24TT511B, 24KT551M, 24KT551B

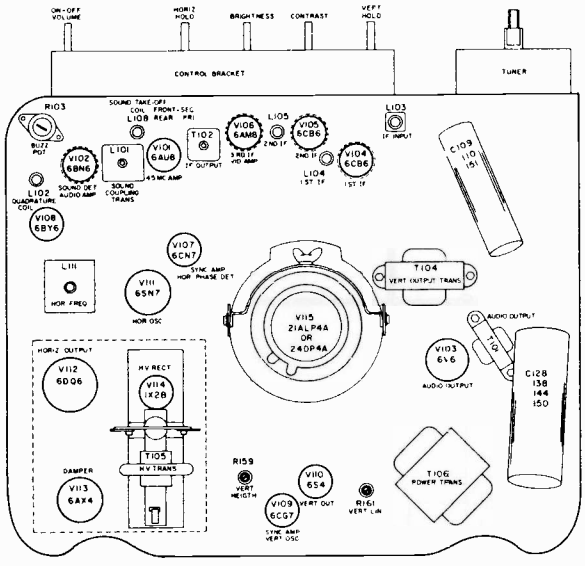


Fig. 1. Tube and Alignment Locations for 2000D

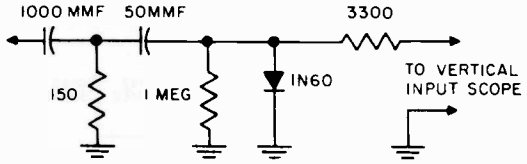


Fig. 2. Detector Circuit

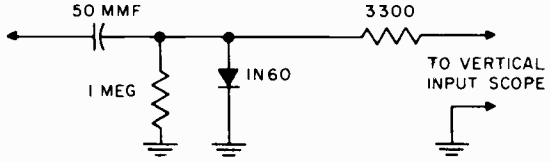
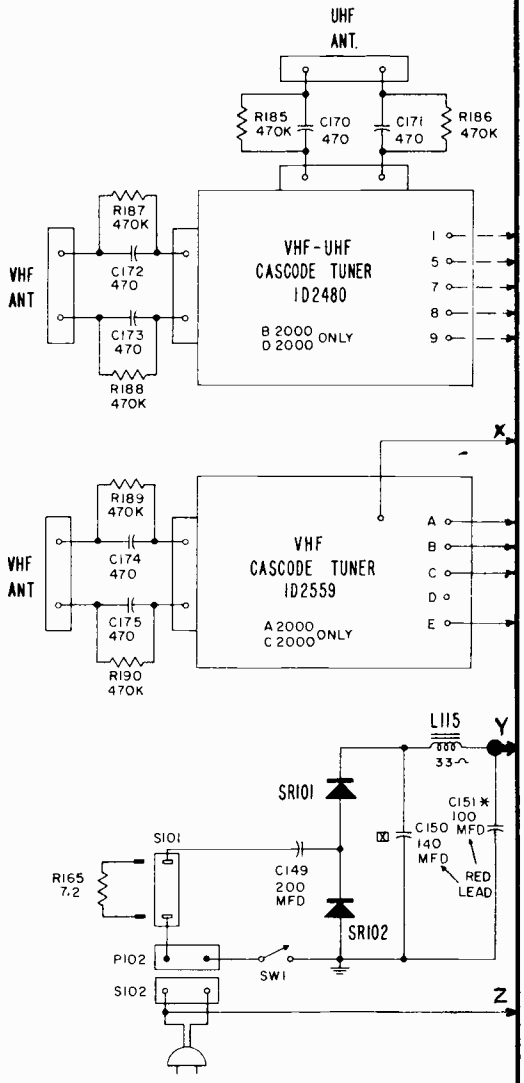


Fig. 3. Detector Circuit

See pages 54-55 for main schematic diagram, and page 56 for alignment.

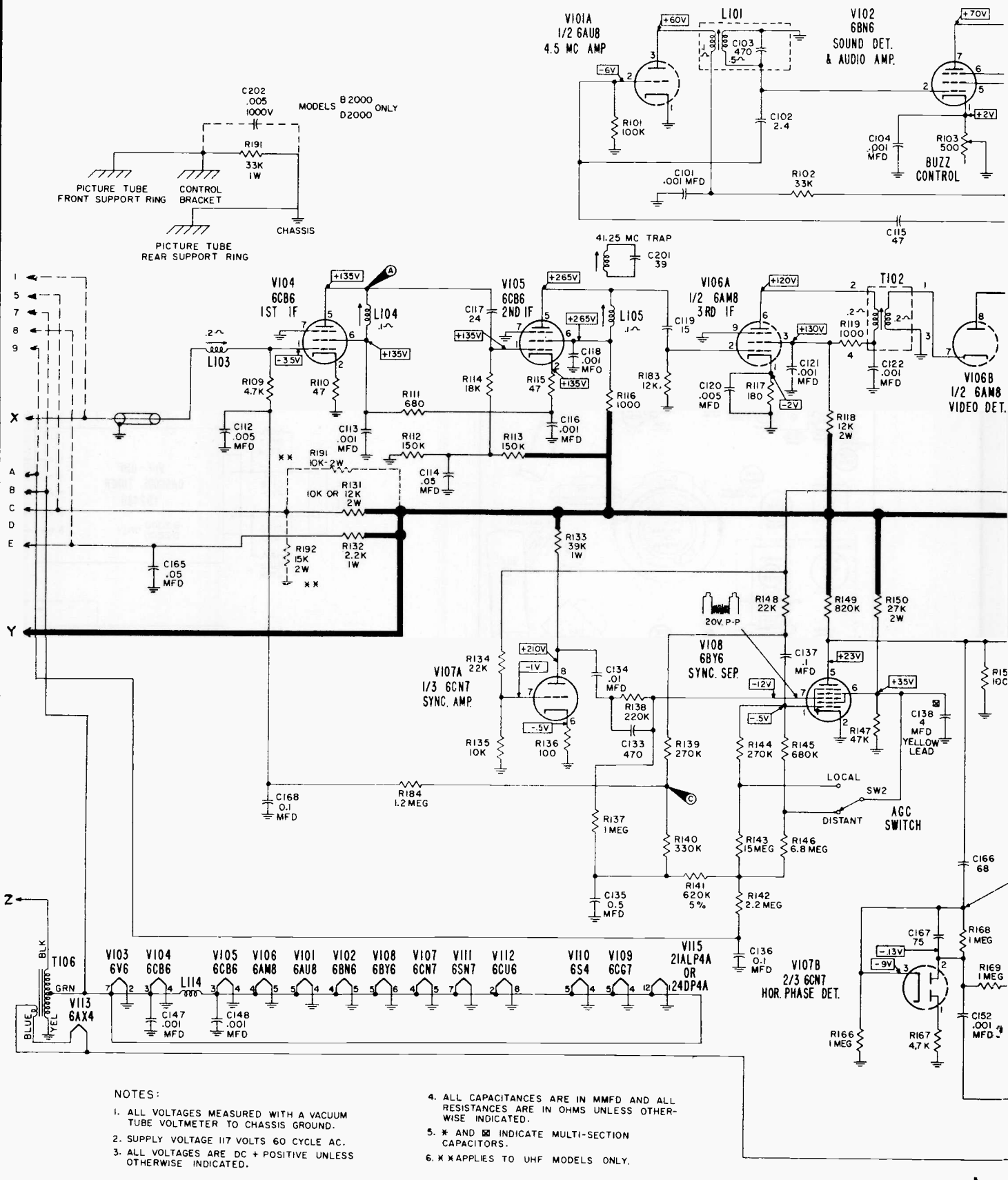


This circuit is a part of the main schematic printed on pages 54-55. Various points connect to corresponding points of main schematic as marked.

These various points connect to corresponding points of main schematic, over.

HALLICRAFTERS Chassis A2000D, B2000D, C2000D, D2000D, Schematic Diagram

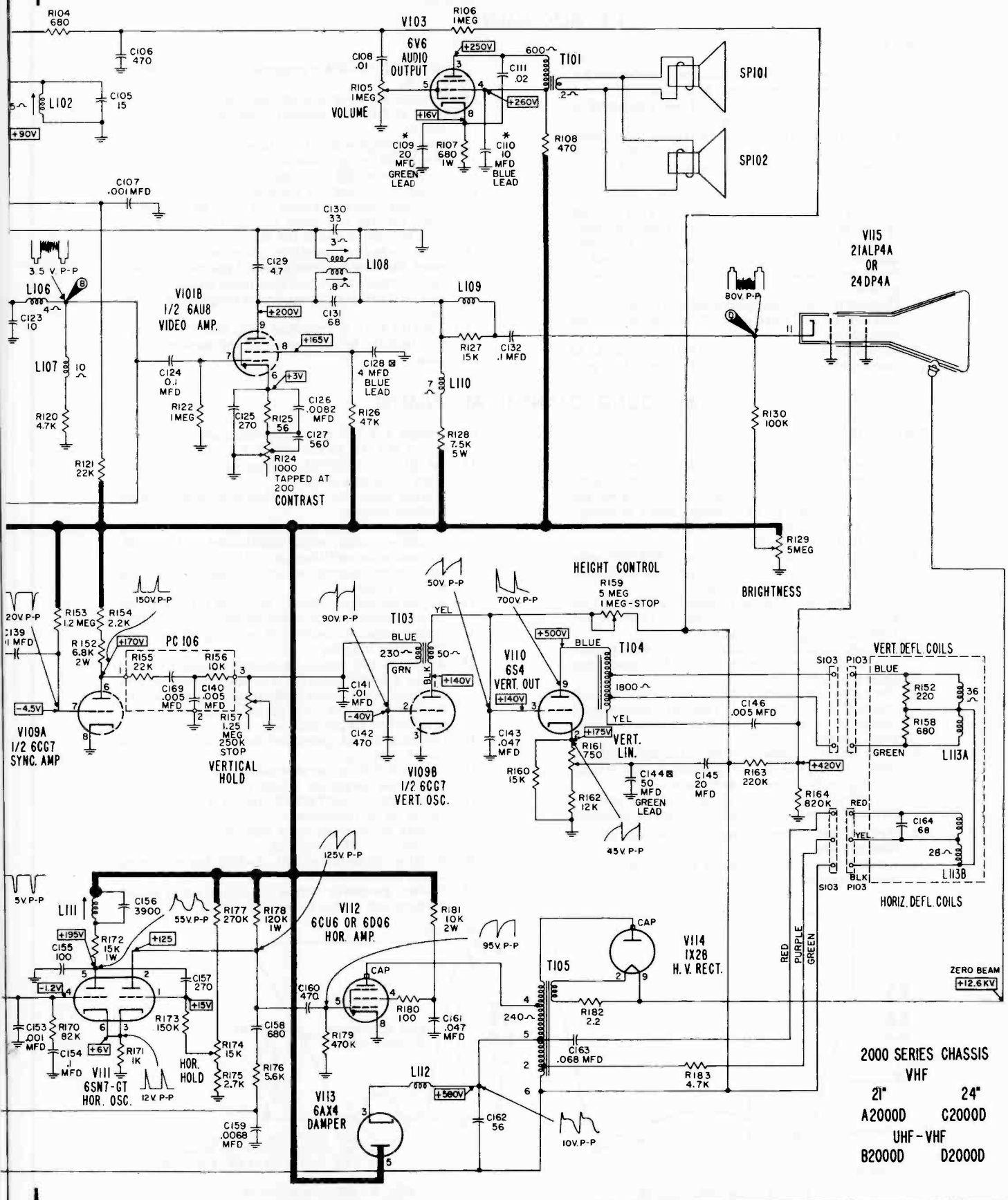
These various points connect to points of diagram shown on page 53.



NOTES:

1. ALL VOLTAGES MEASURED WITH A VACUUM TUBE VOLTMETER TO CHASSIS GROUND.
2. SUPPLY VOLTAGE 117 VOLTS 60 CYCLE AC.
3. ALL VOLTAGES ARE DC + POSITIVE UNLESS OTHERWISE INDICATED.
4. ALL CAPACITANCES ARE IN MMFD AND ALL RESISTANCES ARE IN OHMS UNLESS OTHERWISE INDICATED.
5. * AND ⊠ INDICATE MULTI-SECTION CAPACITORS.
6. ** APPLIES TO UHF MODELS ONLY.

HALLICRAFTERS Chassis A2000D, B2000D, C2000D, D2000D, Schematic Diagram



HALLICRAFTERS Chassis A2000D, B2000D, C2000D, D2000D, Alignment Data

I. F. ALIGNMENT

PROCEDURE

1. Connect the isolation transformer between the television receiver and the A.C. line.
2. Connect the ground leads of all test equipment to the chassis of the receiver.
3. Connect the positive side of the three volt source to the chassis and the negative side to AGC circuit at the junction of (point Ⓒ on schematic).
4. Turn station selector to Channel 13.
5. Connect sweep generator to mixer grid through test point provided on the tuner for this purpose. Use the shortest lead possible to make this connection. If no test point is provided, connect to the mixer tube shield after raising the shield above ground.
6. Connect the oscilloscope through the detector circuit of Fig. 2 to plate pin of V-104 (point Ⓐ on schematic).
7. Adjust mixer plate coil (L-9 on VHF tuner or L-10 on combination tuner) and first I-F amplifier grid coil (L-103) to obtain response curve as shown in Fig. 5.
8. Remove detector circuit and oscilloscope from plate of first I-F amplifier (point Ⓐ on schematic).
9. Connect high side of oscilloscope through 3300 ohm isolation resistor to junction of L-106 and L-107 (point Ⓑ on schematic).
10. Adjust remaining I-F coils as required to obtain response curve as shown in Fig. 6 as follows:

(a) Tune the 1st I-F plate coil (L-104) toward the high frequency end of the desired band pass.

(b) Tune the 2nd I-F amplifier plate coil (L-105) toward the low frequency end of the desired band pass, keeping the sound trap (rear adjustment on this coil) adjusted for minimum response at 41.25 mc.

(c) Tune the 3rd I-F amplifier plate coil (T-102) approximately to the center of the desired band-pass.

FM SOUND CHANNEL ALIGNMENT

PROCEDURE

1. Connect all test equipment to a common ground. Connect the TV chassis to this same ground after installing an isolation transformer between the power line and the TV chassis, which is necessary because one side of the line cord connects directly to the TV chassis.
2. Connect a 4.5 MC generator with 30% 400 cycle amplitude modulation to the junction of L-106, L-107 (point Ⓑ on schematic).
3. Connect the oscilloscope through the Test Circuit shown in Fig. 3 to the cathode pin 11 of picture tube (point Ⓓ on schematic).
4. Set contrast control to maximum clockwise rotation and volume control to one-half maximum clockwise rotation.
5. Turn slug in primary, rear, (video amplifier plate winding) of L-108 (sound take-off transformer) completely out of coil, winding in direction away from chassis.
6. Turn slug in secondary, front, (4.5 MC amplifier plate winding) of L-108 completely out of coil, winding in direction toward chassis.
7. Turn slug in primary, rear, of L-108 into coil until a minimum oscilloscope deflection is obtained.
8. Remove test circuit and oscilloscope from picture tube cathode.
9. Connect oscilloscope directly across the secondary of the audio output transformer.
10. Change 4.5 MC generator modulation from 400 cycles 30% AM to FM with 7.5 KC deviation.
11. Set BUZZ CONTROL approximately 90 degrees from clockwise stop.
12. Reduce generator input below level where output limiting occurs.
13. Starting with slug completely out of coil winding on chassis side, adjust quadrature coil, L-102, for maximum oscilloscope indication. Turn volume control down as required to maintain pattern size on scope.
14. Adjust secondary, front, of L-108 for maximum output indication on oscilloscope. Reduce generator output as required to keep signal level below output limiting.
15. Adjust L-101 (sound coupling transformer) between 4.5 MC amplifier and sound detector grid for maximum output indication on oscilloscope. Reduce generator, as required to keep signal level below output limiting.
16. Increase signal generator output to level above output limiting.
17. Change 4.5 MC generator modulation back to 30%, 400 cycles amplitude modulation.
18. Adjust BUZZ CONTROL R-103 for minimum indication on oscilloscope.
19. Change modulation from 400 cycles 30% AM to FM with 7.5 KC deviation.
20. Readjust quadrature coil, L-102, for maximum output indication.
21. Reduce generator output below level of output limiting and recheck steps 14 and 15.

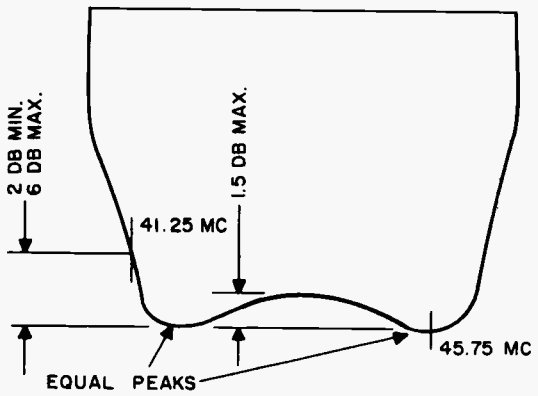


Fig. 5. Alignment Curve

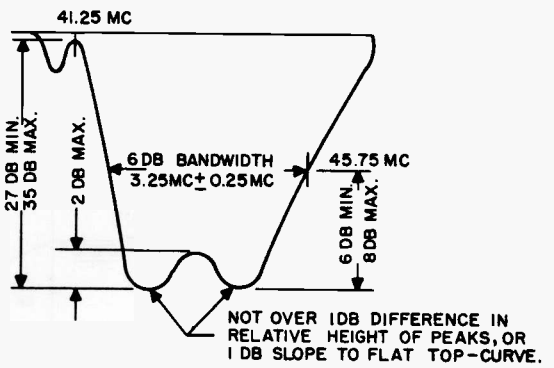


Fig. 6. Alignment Curve

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CHASSIS VHF A 2003 B 2003

Chassis Type Number	Models Chassis May Be Used In
A2003 D	17TS700M, 17TS710T, 17TS720T
B2003 D	17TS700MA, 17TS710A, 17TS720TA, 17TS730TA

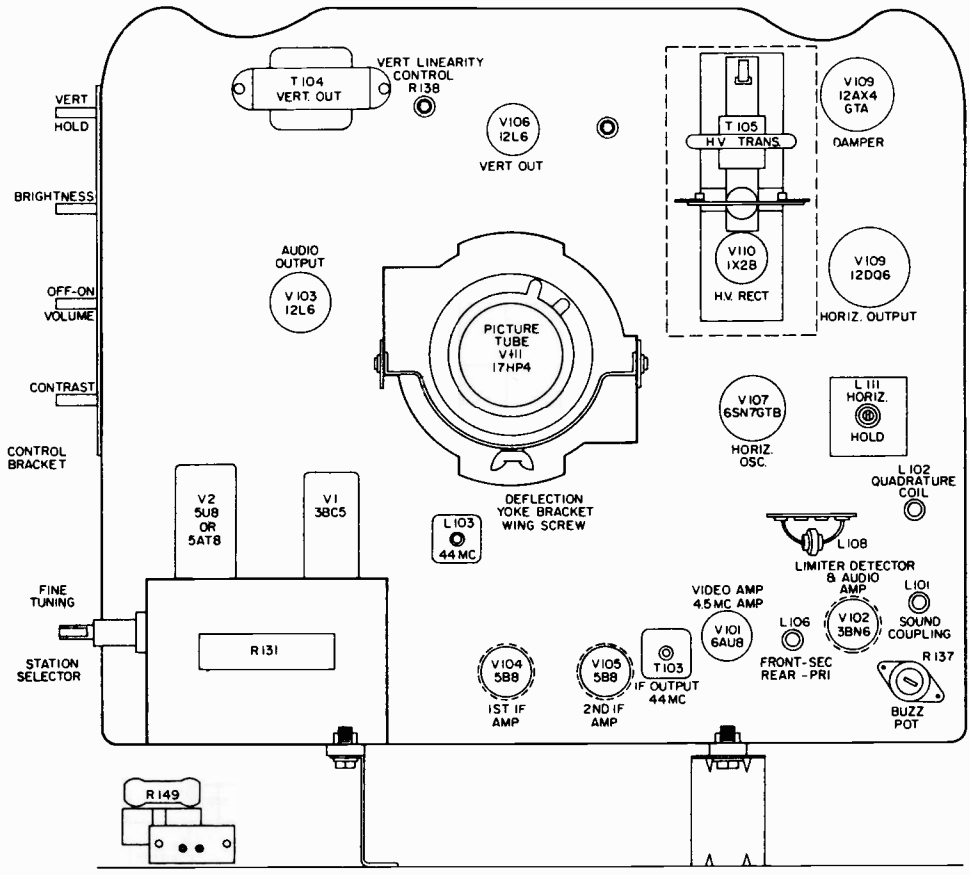


Fig. 1. Tube and Alignment Locations for A2003 and B2003

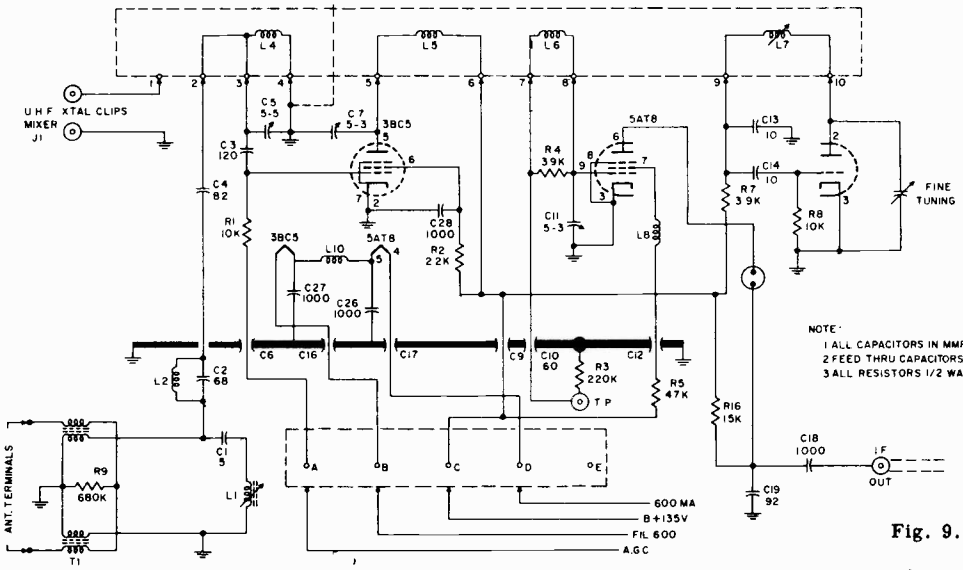
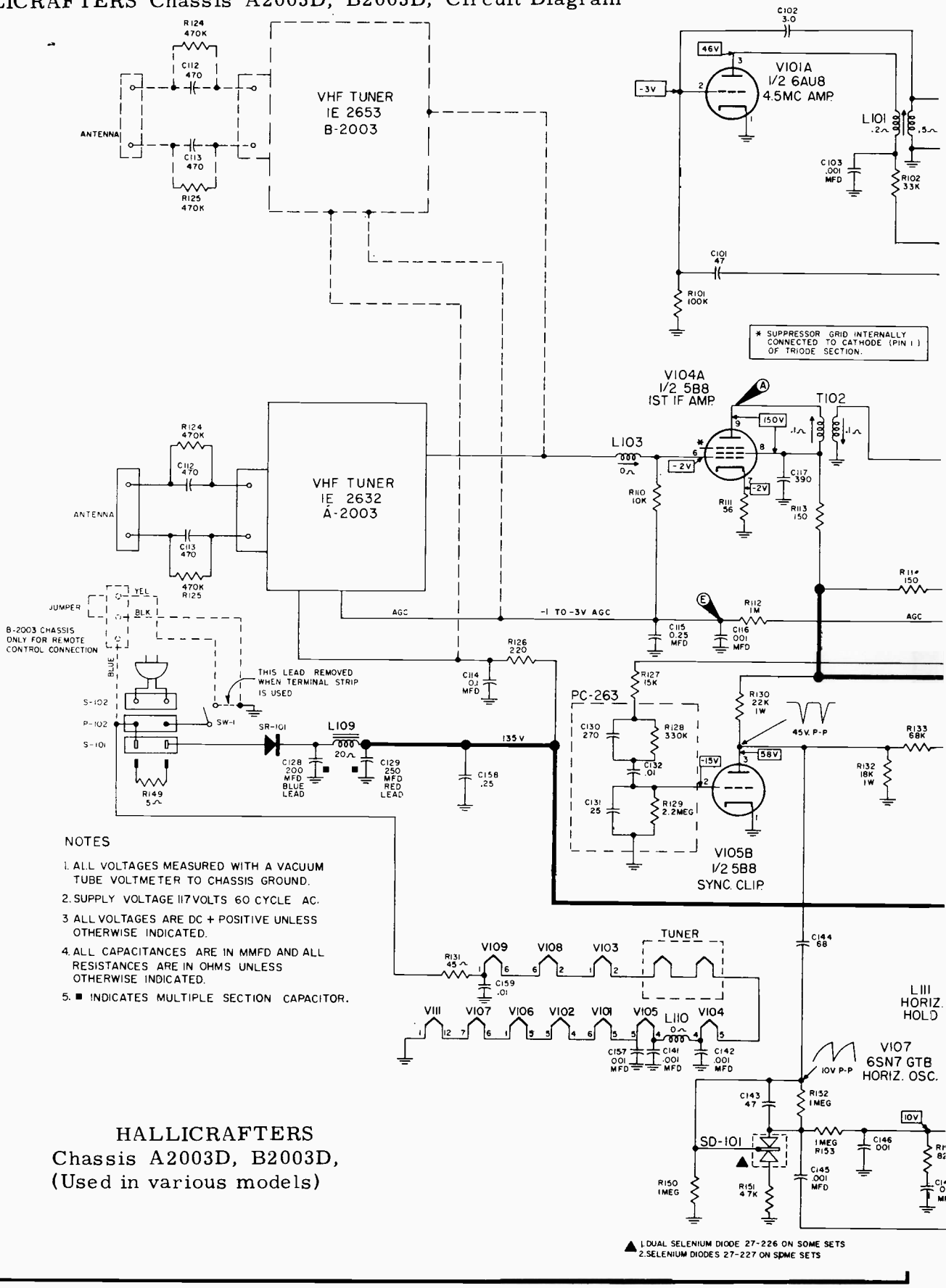


Fig. 9. VHF Tuner Schematic 1D2653

See pages 58-59 for circuit diagram and page 60 for alignment information.

HALLICRAFTERS Chassis A2003D, B2003D, Circuit Diagram



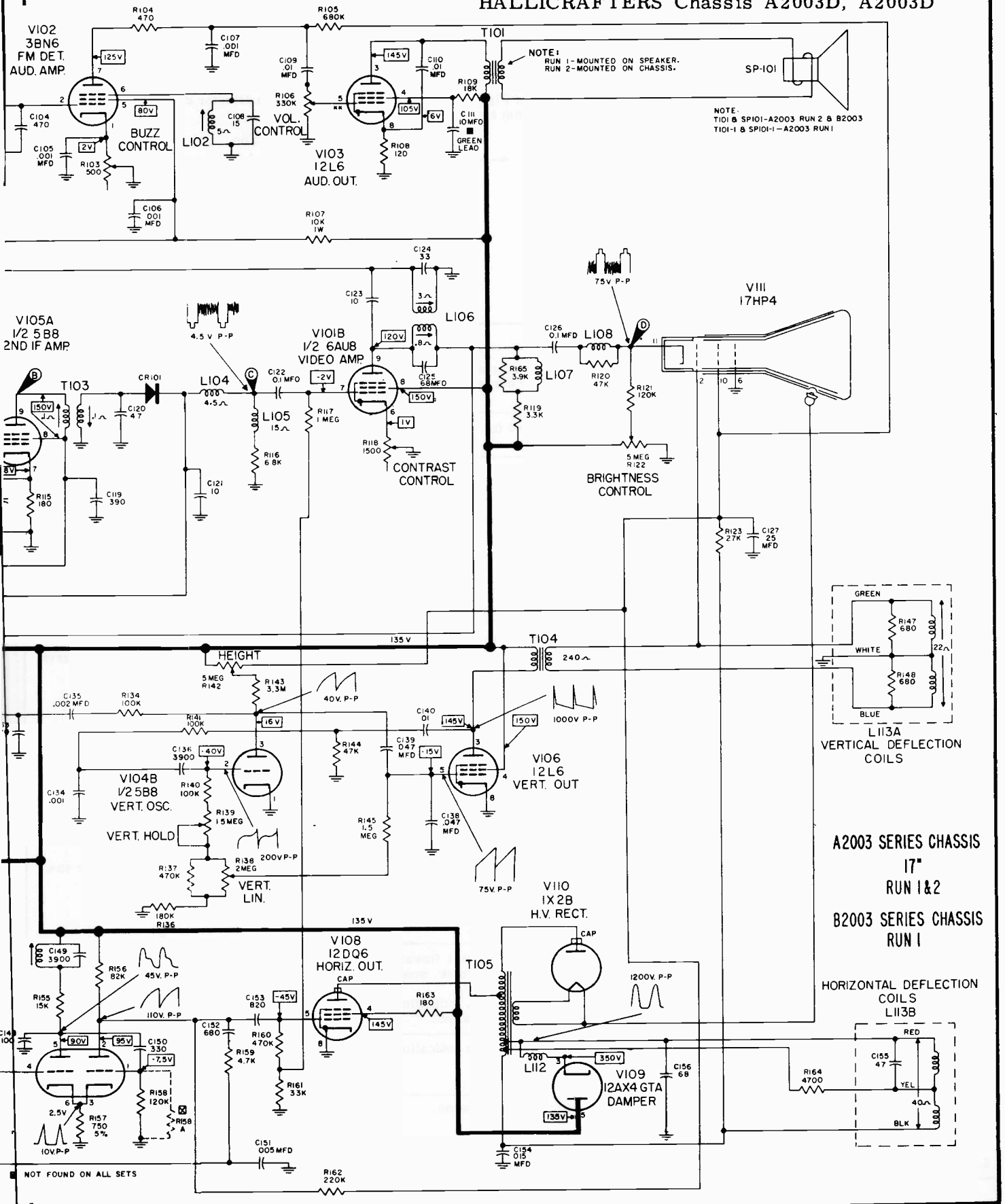
NOTES

1. ALL VOLTAGES MEASURED WITH A VACUUM TUBE VOLTMETER TO CHASSIS GROUND.
2. SUPPLY VOLTAGE 117 VOLTS 60 CYCLE AC.
3. ALL VOLTAGES ARE DC + POSITIVE UNLESS OTHERWISE INDICATED.
4. ALL CAPACITANCES ARE IN MMFD AND ALL RESISTANCES ARE IN OHMS UNLESS OTHERWISE INDICATED.
5. ■ INDICATES MULTIPLE SECTION CAPACITOR.

▲ 1. DUAL SELENIUM DIODE 27-226 ON SOME SETS
2. SELENIUM DIODES 27-227 ON SOME SETS

HALLICRAFTERS
Chassis A2003D, B2003D,
(Used in various models)

HALLICRAFTERS Chassis A2003D, A2003D



HALLICRAFTERS Chassis A2003D, B2003D, Alignment Information

1. Connect negative terminal of 3 volt battery to point E and the positive terminal to the chassis.

2. Generator should be coupled to set through a 1000 mmf. capacitor. (mica or ceramic)

3. Couple scope to set through the detector circuit of Fig. 3 as required in chart. When no detector circuit is required, couple the scope through a 3300 ohm isolation resistor.

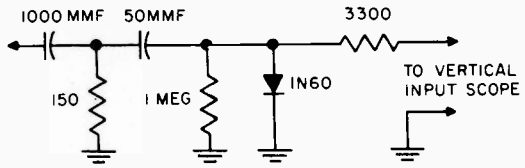


Fig. 3. IF Detector Ckt.

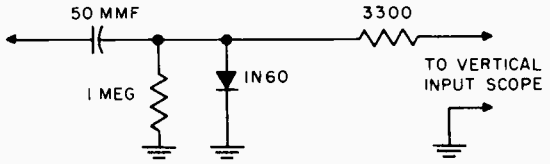


Fig. 4. FM Detector Ckt.

I. F. ALIGNMENT

GENERATOR	MARKER FREQUENCY	SCOPE	ADJUST
1. Mixer Tube Shield (raise shield above ground).	42.75 & 45.75	Det. Ckt. to "A".	Mixer plate coil (L3) and L 103 for curve in Fig. 5.
2. 1st I.F. grid.	" "	Det. Ckt. to "B".	T 102 for curve in Fig. 5.
3. 2nd I.F. grid.	" "	"C"	T 103 for curve in Fig. 5.
4. Mixer grid T.P.	" "	"	Touch up all coils as needed for curve in Fig. 6.

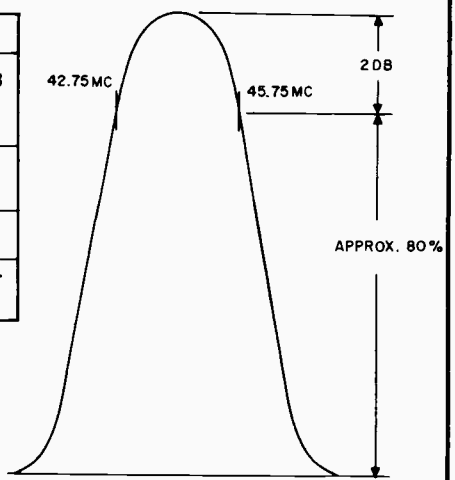


Fig. 5. Individual Response Curve

GENERAL INSTRUCTIONS

1. Couple generator to set in at point "C" through a 1000 mmf. capacitor.

2. Couple scope to set through detector circuit of Fig. 4, as required in chart.

3. Set contrast control to maximum clockwise, volume control to 1/2 maximum clockwise, and buzz control 90 degrees from clockwise stop.

4. Keep generator output below level where limiting occurs except as shown in chart.

SOUND ALIGNMENT

GENERATOR	SCOPE	ADJUST
1. 4.5 mc./30% 400 cps. AM modulation.	Detector ckt. Point "D".	Primary L 106 completely out of coil. Secondary L 106 completely out of coil. Primary L 106 into coil for min. scope indication.
2. 4.5 mc./7.5 kc. deviation FM.	Across sec. audio O.P. x'frmr.	L 102 completely out of coil (toward chassis), and then in for max. scope indication. Sec. L 106 into coil for max. indication. L 101 for max. scope indication.
3. Increase output level above limiting. 4.5 mc./30% 400 cps. AM.	"	Buzz control for min. scope indication.
4. Output level above limiting. 4.5 mc./ 7.5 kc. deviation. FM.	"	L 102 for max. scope indication.
5. Retouch L 101, L 102, and L 106 for maximum scope indication.		

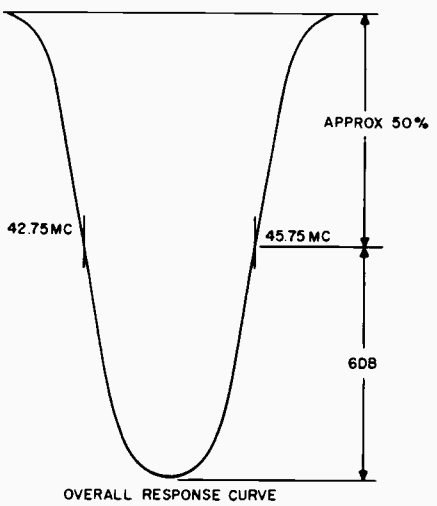


Fig. 6. Overall Response Curve

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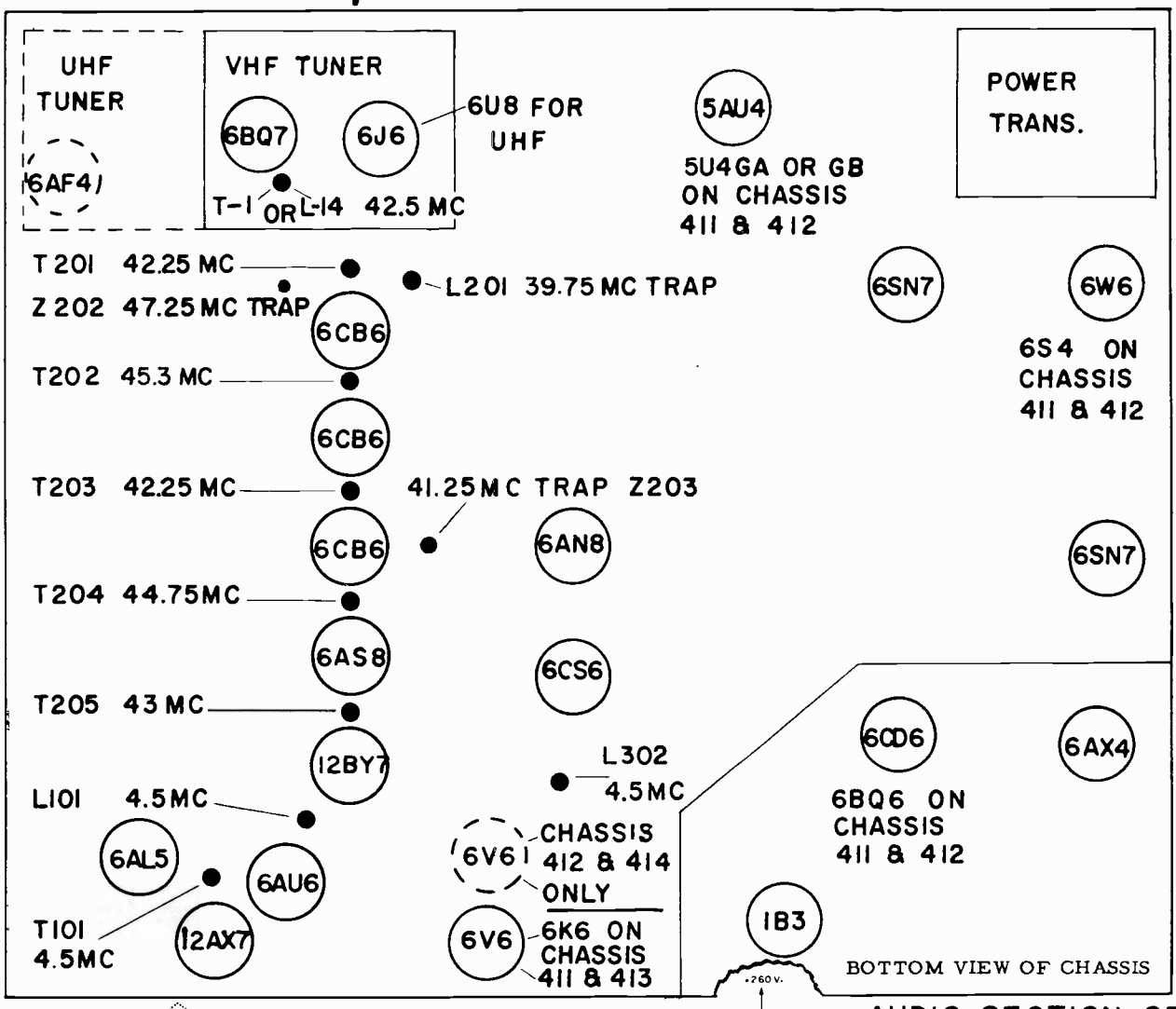
CHASSIS: 411-21, 412-21, 413-24, 414-24

CHASSIS 411-21 is used in Models 21SF179, 21B179S 21P180S, 21M193, 21B194, 21P195.

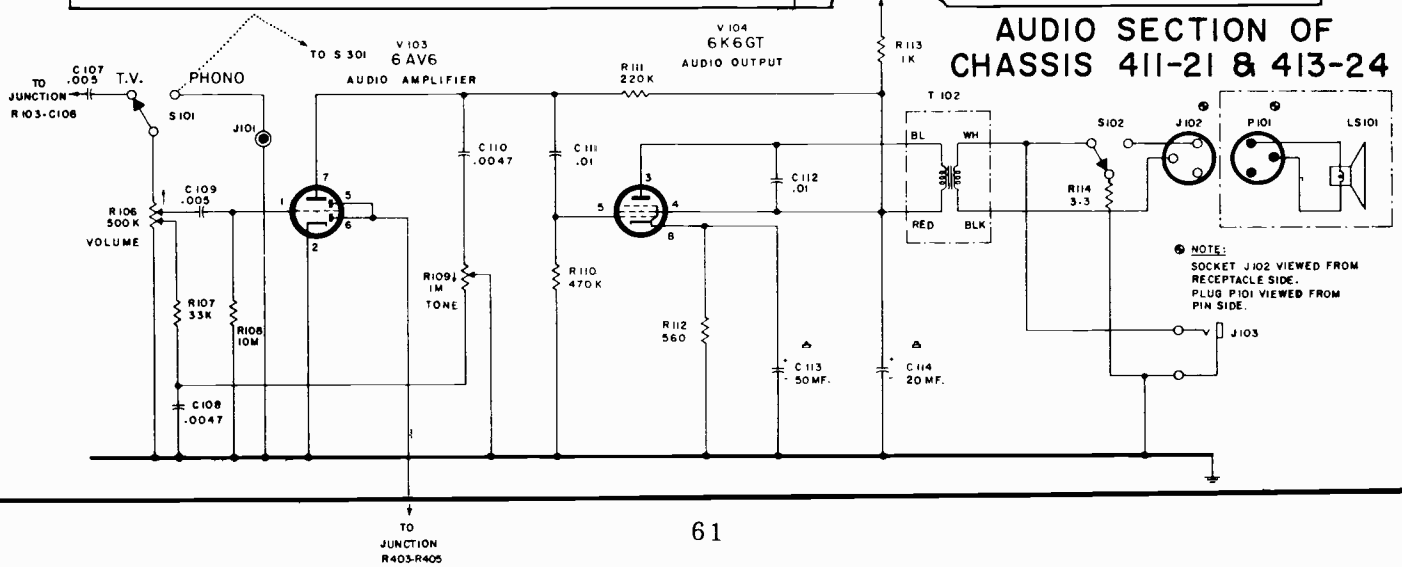
CHASSIS 412-21 is used in Models 21U208-5, 21M351S, 21B352S, 21P353S, 21M363, 21B364, 21P365, 21M728S, 21B729S, 21P731S.

CHASSIS 413-24 is used in Models 24W196, 24M196, 24B197, 24W370, 24M370, 24B371, 24P372.

CHASSIS 414-24 is used in Model 24U211-5.



AUDIO SECTION OF CHASSIS 411-21 & 413-24

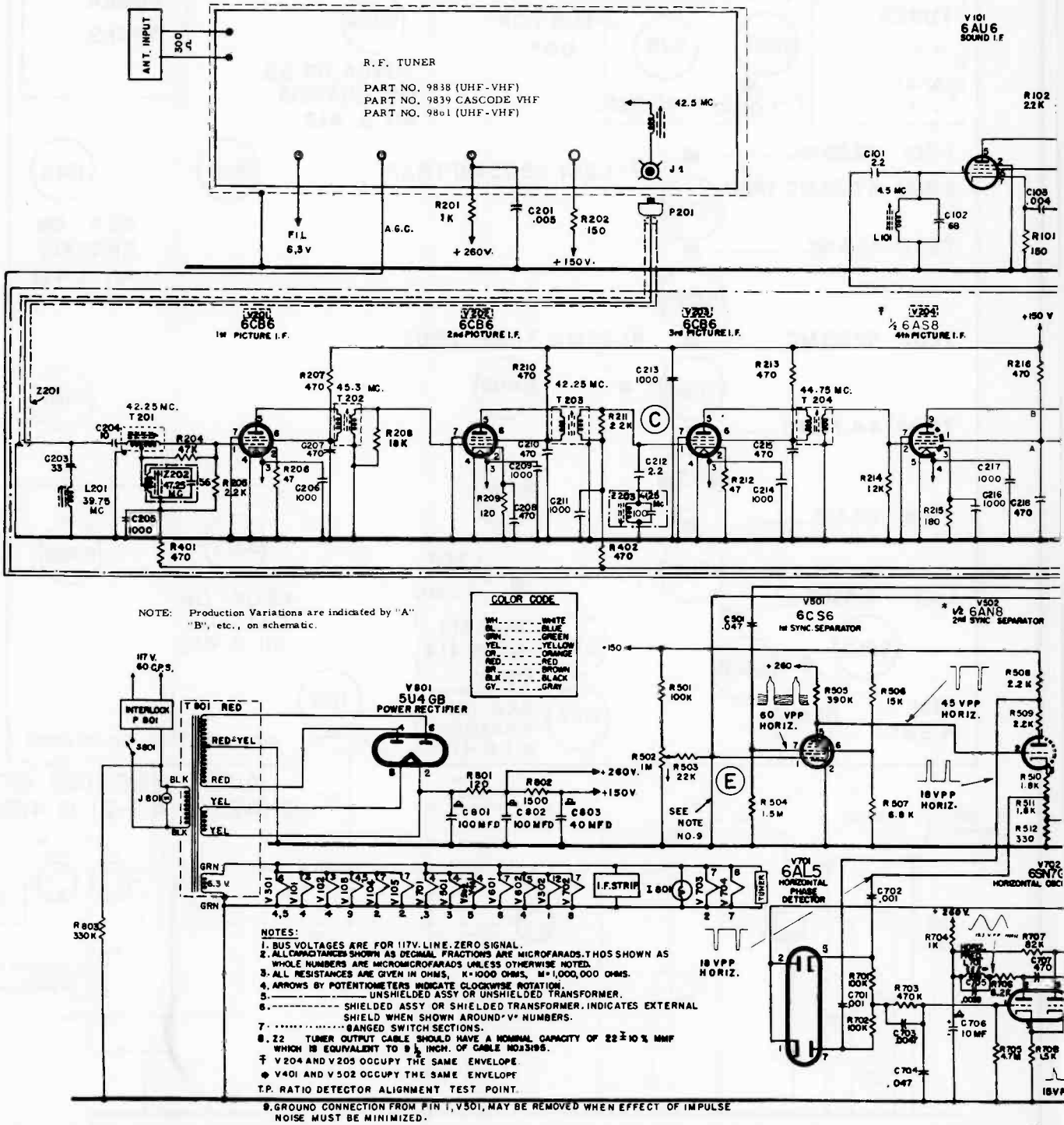


HOFFMAN Chassis 411-21, 412-21, 413-24, 414-24, Schematic Diagram

The major electrical difference in the four chassis aside from tuner usage is in the sweep sections and the audio section. Chassis 411-21 and 412-21 are electrically the same except in the audio section. Chassis 411-21 has single ended audio and a single tone control. Chassis 412-21 has the Hoffman Hi-Fi audio section with separate bass and treble controls. The difference in the tube type used for audio driver eliminates the AGC delay diode from the audio section.

A selenium diode is therefore used on Chassis 412-21 to provide the AGC delay voltage. One schematic diagram plus a small schematic diagram of the Chassis 411-21 audio section can therefore be used for both Chassis 411-21 and Chassis 412-21.

Chassis 413-24 is the 24 inch version of Chassis 411-21 and has single ended audio section. Chassis 414-24 is the 24 inch version of Chassis 412-21 and has the Hoffman Hi-Fi audio system.

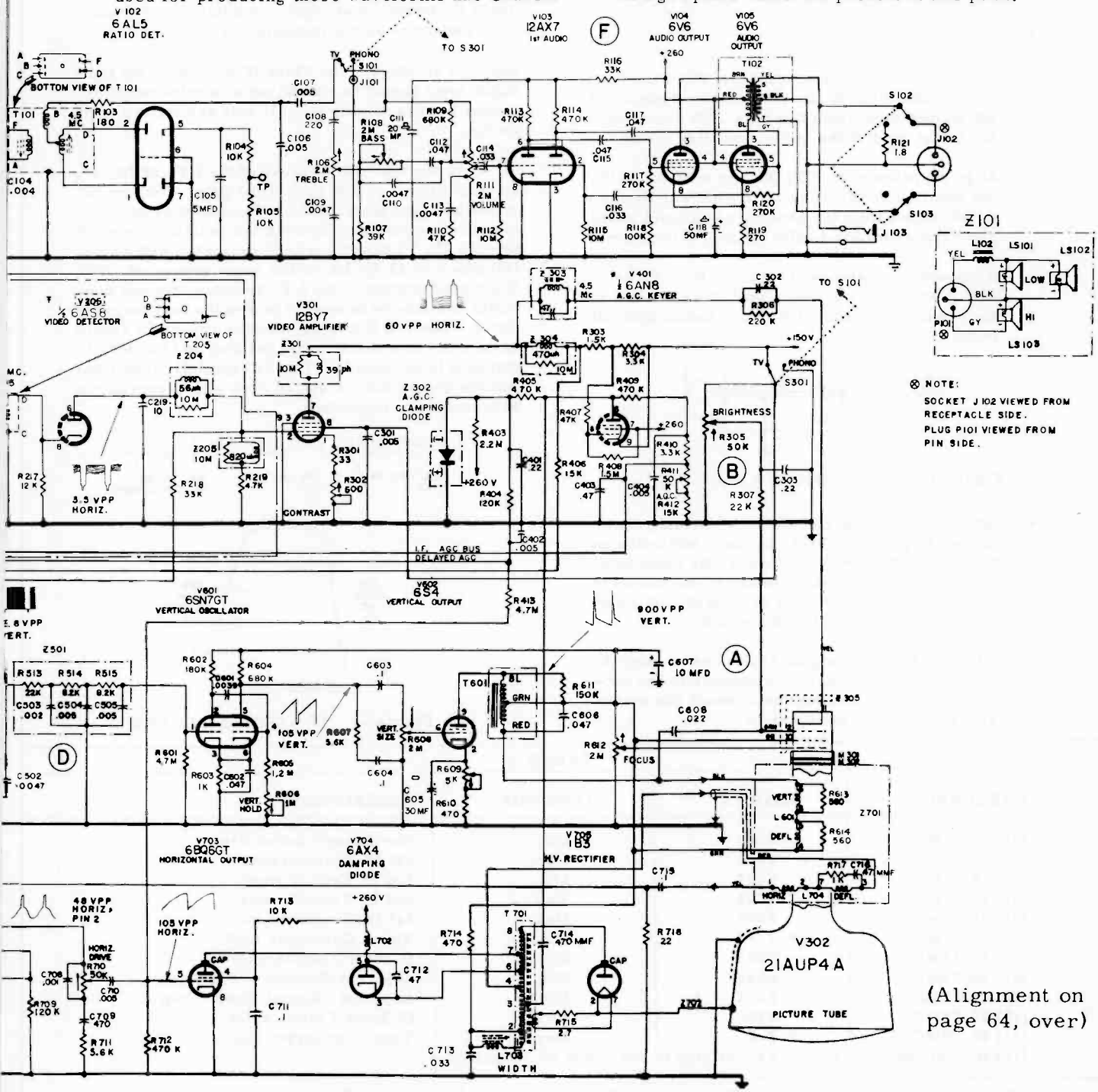


HOFFMAN

SCHEMATIC DIAGRAM FOR MARK V CHASSIS 411-21 & 412-21

WAVEFORM DATA

Waveforms should closely resemble those shown on the schematic. All waveforms shown are sketches of actual oscillographs observed on oscilloscope. Slight variations may occur because of type of scope used, signal received on the television set, adjustment of controls and chassis type variation. Receiver used for producing these waveforms has Chassis 411-21 with tuner No. 9839. All controls were adjusted for a normal picture on a transmitted signal. Operating voltage was 117 volts 60 CPS AC, with B+ values as indicated on the schematic measured with a vacuum tube voltmeter. A negative 3 volts reading was measured across the video detector load, 4.7 volts IF AGC, 4.5 volts RF AGC. Do not take peak to peak reading at plate of V602 unless suitable test equipment is available to handle the high value of voltage spikes which are present at this point.



(Alignment on page 64, over)

HOFFMAN Chassis 411-21, 412-21, 413-24, 414-24, Alignment Information

ALIGNMENT PROCEDURE

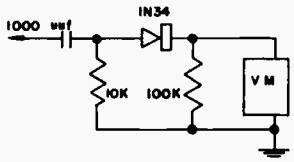


Figure 14. DETECTOR NETWORK

SOUND I. F. ALIGNMENT

1. Connect voltmeter from junction of R104 and R105 (TP on schematic) to chassis ground. Apply a 4.5 MC unmodulated signal through a .005 mfd capacitor to the grid of the video amplifier tube.

2. Align the primary of T101 (bottom slug) and L101 for maximum indication on the meter. Keep the 4.5MC signal from the generator to a level which gives approximately 4 volts reading on the meter.

3. Keep one voltmeter lead attached to T. P. as in step 1 and move the other lead from chassis to the junction of R103, C106, C107 (audio take-off point).

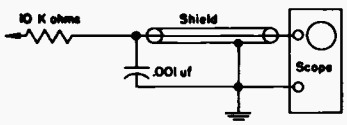


Figure 15. OSCILLOSCOPE ISOLATION

4. Adjust the secondary of the ratio detector transformer (top slug of T101) for zero indication on the meter. Keep 4.5 MC input at the same level as in step 2. Tune in a station on the receiver and readjust Ratio Detector to point of best sound if any buzz is evident in the sound.

5. With 4.5 MC input signal applied as in steps 2, 3 and 4, connect a detector network to the picture tube cathode lead and connect the meter across it. Refer to Figure 14.

6. Adjust L303 (4.5 MC trap in picture tube cathode circuit) for minimum indication on the meter.

VIDEO I. F. ALIGNMENT

Connect a voltmeter from the chassis to Pin #2 of V301 with 10K 1/2W resistor in series with the meter lead. Apply unmodulated R.F. signal to the grid of the tuner converter tube, with frequencies listed in Table C, below, and adjust for minimum or maximum indication on the voltmeter as indicated.

Note: In all steps of the Video IF Alignment the input signal level should be maintained at a value which develops approximately one (1) volt across the voltmeter.

To check the over-all response of the I. F. strip, use an oscilloscope with high vertical gain. Remove the voltmeter from pin #2 of the video amplifier and connect the oscilloscope through the isolation network (Figure 15). Connect a sweep generator with center frequency of 43.50 MC to the tuner converter grid. Slight readjustment of the I. F. transformers and converter coil may be necessary to give the best response curve. The 10% limits specified in Figure 16 should be carefully considered before deciding that further adjustment is necessary. This is especially important outside the normal reception area where sensitivity becomes more important.

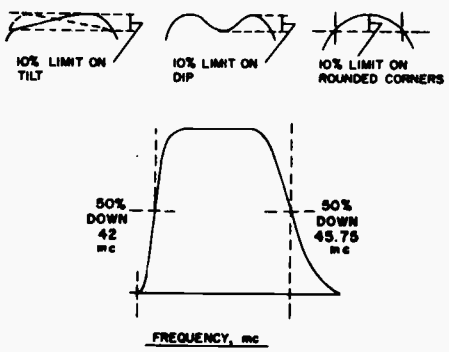


Figure 16. IF RESPONSE CURVE

TABLE C

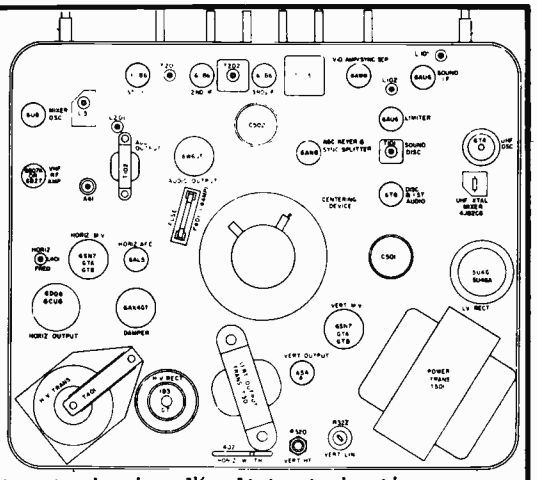
INPUT FREQUENCY	ADJUST	TUNE FOR	DESCRIPTION
(1) 41.25MC	Z203	Min.	Co-Channel Sound Trap
(2) 43.00MC	T205	Max.	4th IF Transformer
(3) 44.75MC	T204	Max.	3rd IF Transformer
(4) 42.25MC	T203	Max.	2nd IF Transformer
(5) 45.30MC	T202	Max.	1st IF Transformer
(6) 42.25MC	* T-1	Min.	Tuner Converter Coil
(7) 42.25MC	T201	Max.	IF Input Transformer
(8) 39.75MC	L201	Min.	Adjacent Channel Video Trap
(9) 47.25MC	Z202	Min.	Adjacent Channel Sound Trap
(10) 42.25MC	T202	Max.	IF Input Transformer
(11) 42.50MC	* T-1	Max.	Tuner Converter Coil
(12) Repeat Steps (8) and (9) as last step of the Video IF Alignment			

*The converter plate coil of All-Wave tuners 9838 and 9861 is L14 instead of T-1 as indicated in the above table.

Magnavox

600 SERIES (see pages 66-67 for circuit diagram and list of models)

650 SERIES (see page 68 for circuit diagram and list of models)



VIDEO IF ALIGNMENT

For 600 Series { Connect positive terminal of a tapped 4½ volt "C" battery to chassis, -1½ volt tap to junction of C213 and R224, and -3 volt tap to junction of C212 and R223. Set "Fringe-Local" switch to local position and Contrast control fully counter-clockwise (min. contrast).

For 650 Series { Note 2: Connect positive terminal of a tapped 4½ volt "C" battery to chassis, -1½ volt tap to junction of R201 and R204, and -3 volt tap to junction of C213 and R227.

SWEEP GEN. COUPLING	SWEEP GEN. FREQUENCY	MARKER GEN. COUPLING	MARKER GEN. FREQUENCY	CONNECT SCOPE	ADJUSTMENTS
1st IF grid (test point TP1 on main chassis)	43mc. Adjust gain so trap suckout is visible.	Converter grid. (Use test point lead wire thru top of VHF Tuner)	47.25mc modulated. Adjust gain so pip is just visible.	Across vid. det. load R211. Place 10K res. in series with probe.	Adjust trap (top of T202) to center pip in suckout. See Fig. 1. Max. attenuation is at two core positions, use one with slug furthest out.
"	43 mc. Set gen. output for approx. 2V P/P output at scope.	"	Unmodulated 42.75 mc. 45.0 mc. 45.75 mc.	"	Check for response curve similar to Fig. 2. Tune T203 for max. gain between 42.75 mc and 45.75 mc. Tune T202 (bottom slug) to place 45.75 mc marker at 60% response. Tune T201 to place 42.75 mc marker at 60% of response. Recheck 47.25 mc trap.
Converter grid (use wire test point lead fed thru top of VHF Tuner)	"	Loosely couple	Same as above	"	Set VHF Tuner to clear channel (6-13). Tune converter plate coil L3 for max. gain with 45.75 mc marker at 50% response. (See Fig. 2.) Tune 1st IF grid coil T201 for max. gain and proper tilt. Interaction might require repeating these two adjustments until Fig. 2 is duplicated.
VHF ant. terms. Use network in Fig. 4 if cable is not balanced.	Channels 2 thru 13 R.F.	"	Same as above	"	Check all channels for bandwidth, slope and position of carrier. Use oscillator trimmer to set osc. at high VHF channel for middle of fine tuner range.
UHF crystal term. nearest UHF osc. tube use 1K isolation resistor.	43 mc. same gain	"	Same as above	"	Set VHF Tuner to UHF position. Adjust R.F. amp. grid coil A41 for min. tilt (slug of A41 is at top rear of VHF Tuner). Response should conform to Fig. 2.

Fig. 1

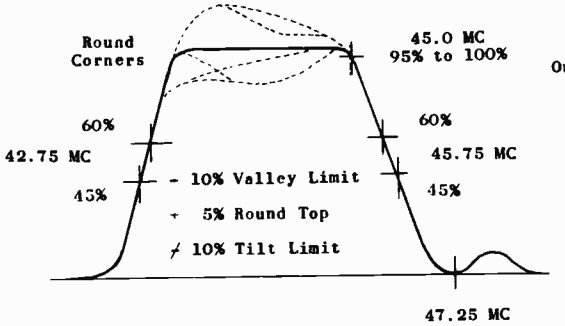
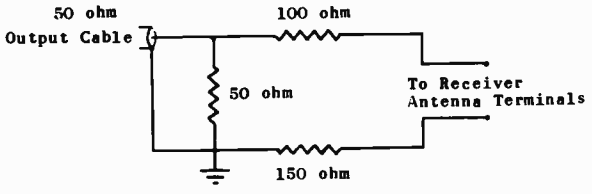


Fig. 2



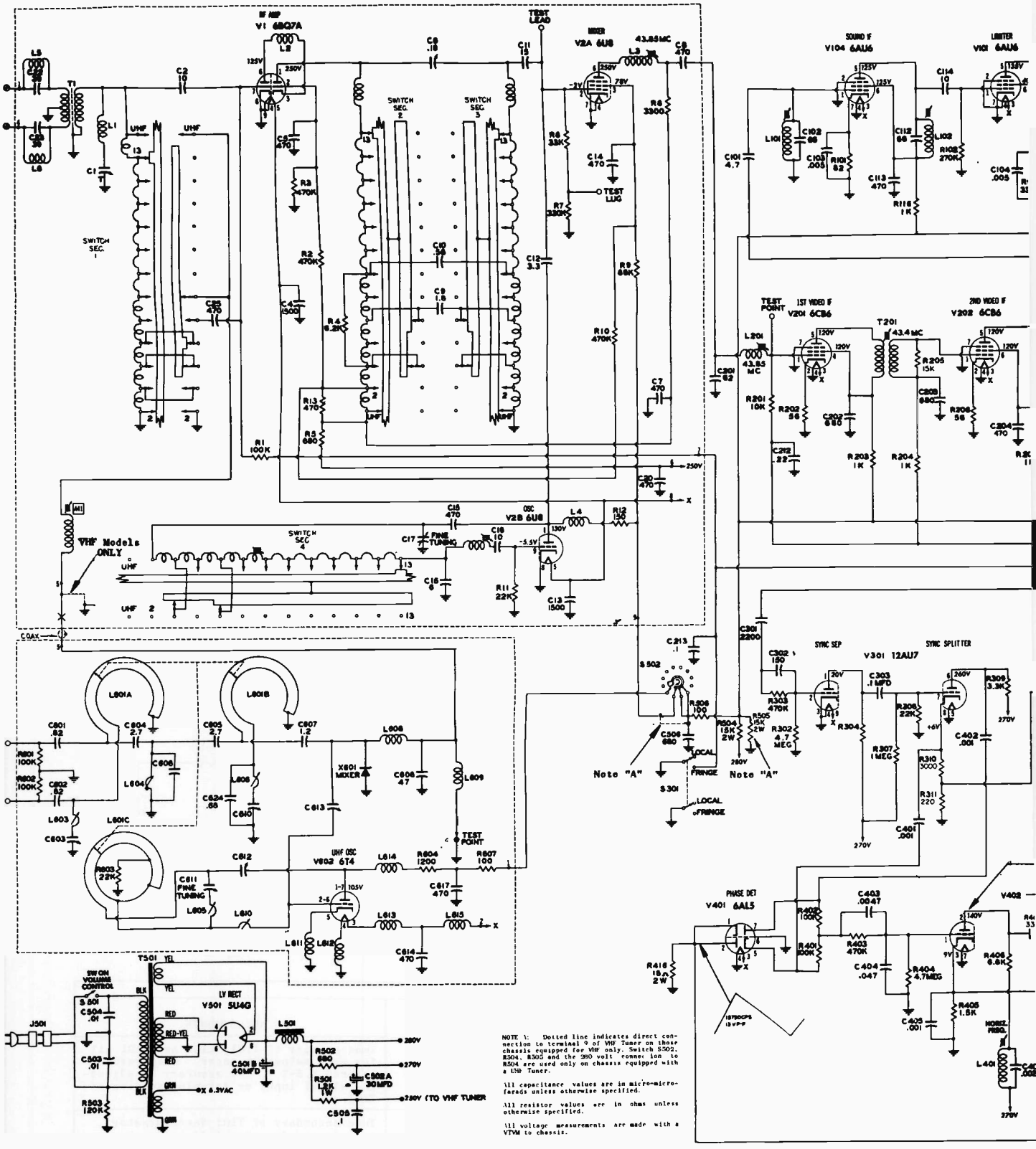
IMPEDANCE MATCHING NETWORK

Fig. 3

SOUND IF ALIGNMENT

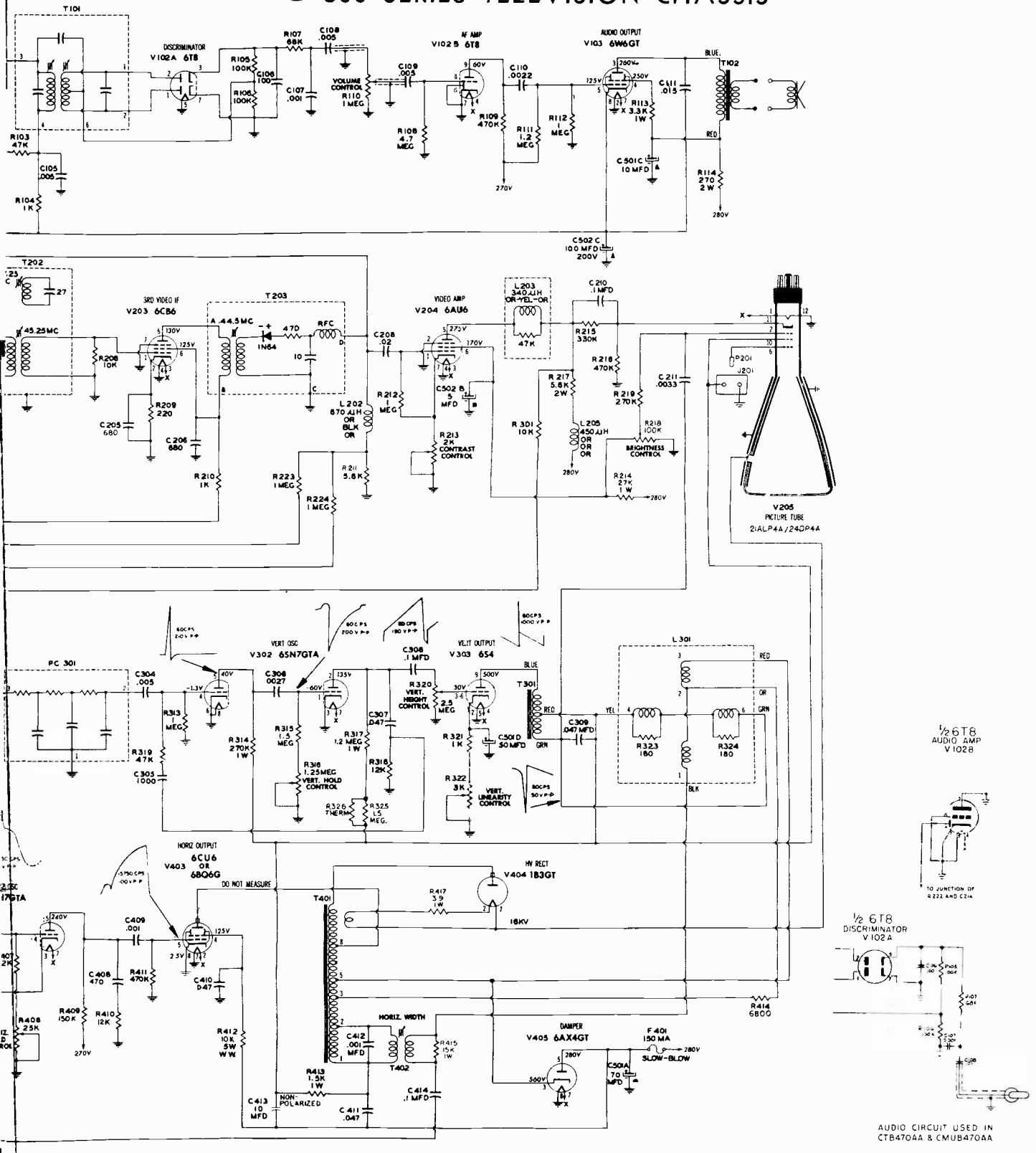
SIG. GEN. COUPLING	SIG. GEN. FREQUENCY	VTVM CONNECTION	ADJUSTMENTS
Couple thru .005 mfd. capacitor to terminal "D" of video detector transformer.	Unmodulated 4.5mc ±.01%	Probe to pin 3 of 6T8 discriminator tube in series with 10K isolation resistor at probe end, low side of meter to chassis.	Tune primary of T101, L102 and L101 all for max. output on meter. Keep reading between 6.5-7 V. for accuracy by adjusting signal input or detuning section of T101.
"	"	"	Tune secondary of T101 descriminator transformer for zero indication on meter. True indication is point where indicating voltage swings positive or negative.

MAGNAVOX List of Models using 600 Series Chassis:
CTA440AA to CTA442AA, CTA475AA, CTA476AA, CTA479AA through CTA481AA, CMUA440AA to CMUA442AA, CMUA475AA, CMUA476AA, CMUA479AA to CMUA481AA.



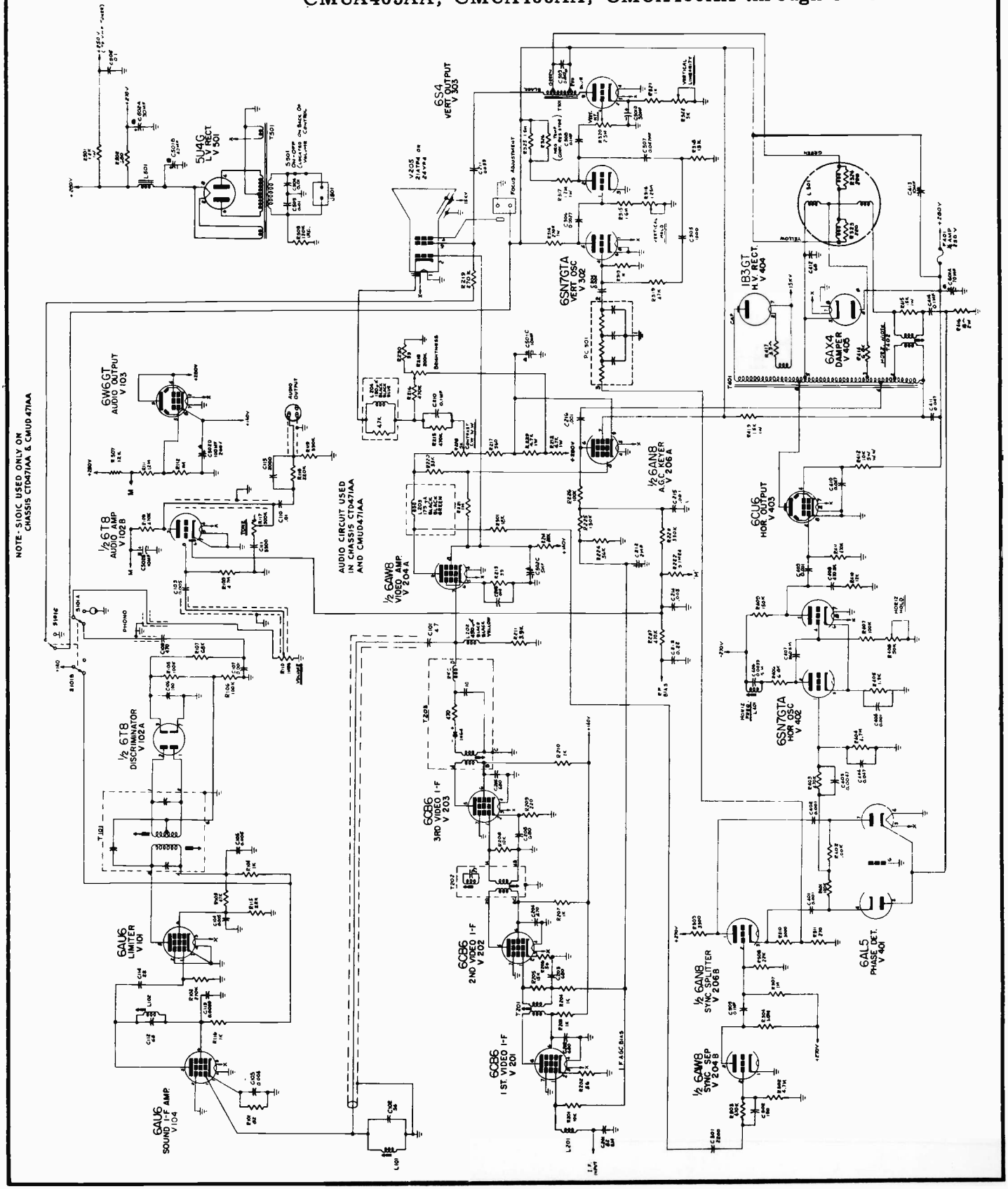
Magnavox (For list of models see page at left.)

600 SERIES TELEVISION CHASSIS



MAGNAVOX CTA465AA, CTA466AA, CTA469AA through CTA474AA,

Models using 650 Series: CMUA465AA, CMUA466AA, CMUA469AA through CMUA474AA.



MOTOROLA

TELEVISION
CHASSIS
TS-530

RECEIVER MODEL BREAKDOWN CHART

Model	Description	TV Chassis
21T25CH	Table, metal: charcoal	TS-530
Y21T25CH	Table, metal: charcoal	TS-530Y
21T25PK	Table, metal: pink	TS-530
Y21T25PK	Table, metal: pink	TS-530Y
21T25TN	Table, metal: tan	TS-530
Y21T25TN	Table, metal: tan	TS-530Y
21K38	Console, masonite: red-brn mahogany	TS-530
Y21K38	Console, masonite: red-brn mahogany	TS-530Y
21K38B	Console, masonite: limed oak	TS-530
Y21K38B	Console, masonite: limed oak	TS-530Y

Circuit diagram of TS-530 is on pages 70-71, alignment information is on pages 72 and 73, service hints are on page 74, and waveshapes references are given in the circuit diagram and illustrated on pages 75 through 78.

REMOVING THE RECEIVER AS A UNIT

The back cover is held in place by means of metal friction clamps arranged around the edges of the cover and one self-tapping screw located between the serial number opening and the power cord connection. Once the screw is removed, the cover may then be carefully pried off with a screwdriver.

Removing the receiver as a unit

1. Remove hex head screw in back cover (located between the serial number and the power cord inlet). Pry back cover off using a screwdriver.

2. Disconnect the speaker plug. (Remove speaker if equivalent field coil is not available in the shop.)

3. Remove the fibre L-shaped tie-down strip in the upper portion of the chassis (the strip bolts to chassis and edge of cabinet).

4. Working at front of cabinet: remove the glass retainer located at the top edge of the safety glass.

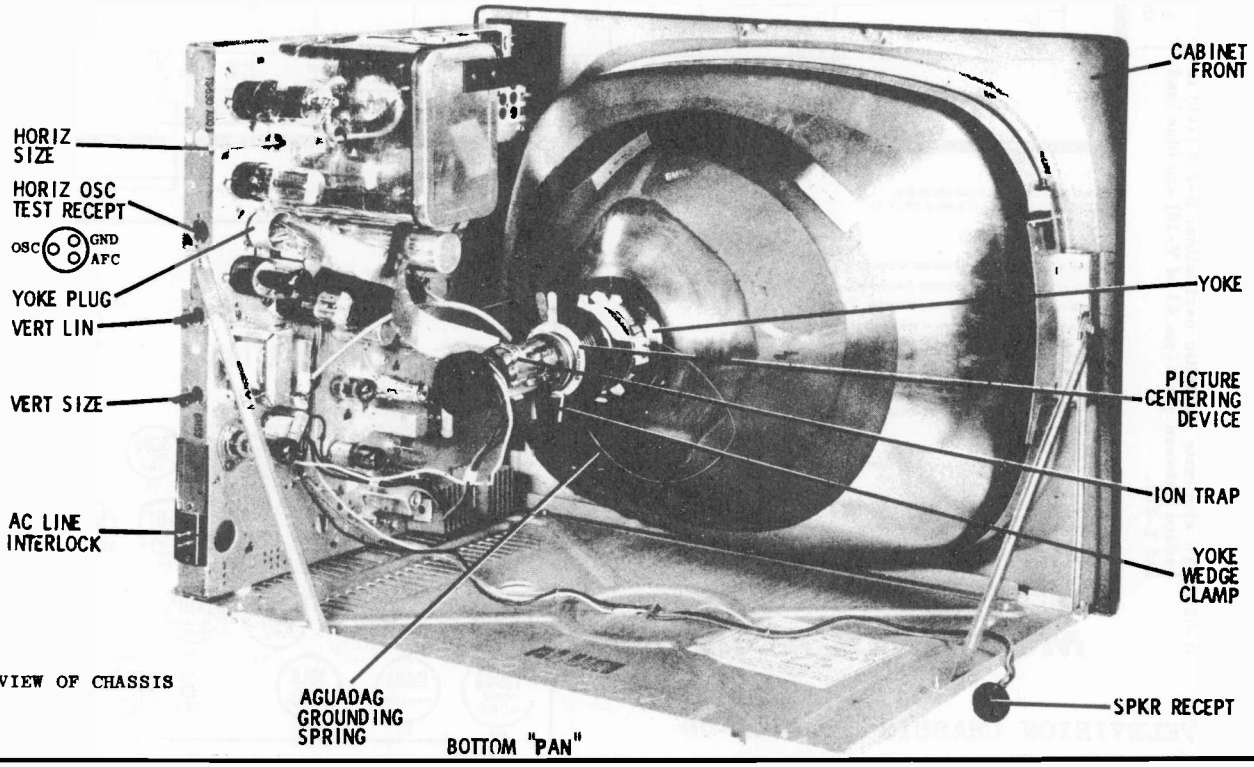
5. Hold safety glass and remove bottom glass retainer and escutcheon plate. Remove safety glass and place in a safe location.

6. Remove the two Phillips head screws exposed by the top safety glass retainer removal.

7. Slide cabinet slightly off edge of working area so that bolts underneath cabinet may be reached. Remove bolts holding bottom pan to the cabinet only. Do not remove the bolts holding the bottom pan to the chassis. (Correct bolts may be seen from rear of receiver.)

8. Remove entire front of cabinet with bottom pan, chassis and picture tube attached.

CAUTION: Bending or warping bottom pan or cabinet front will make replacement of unit difficult.



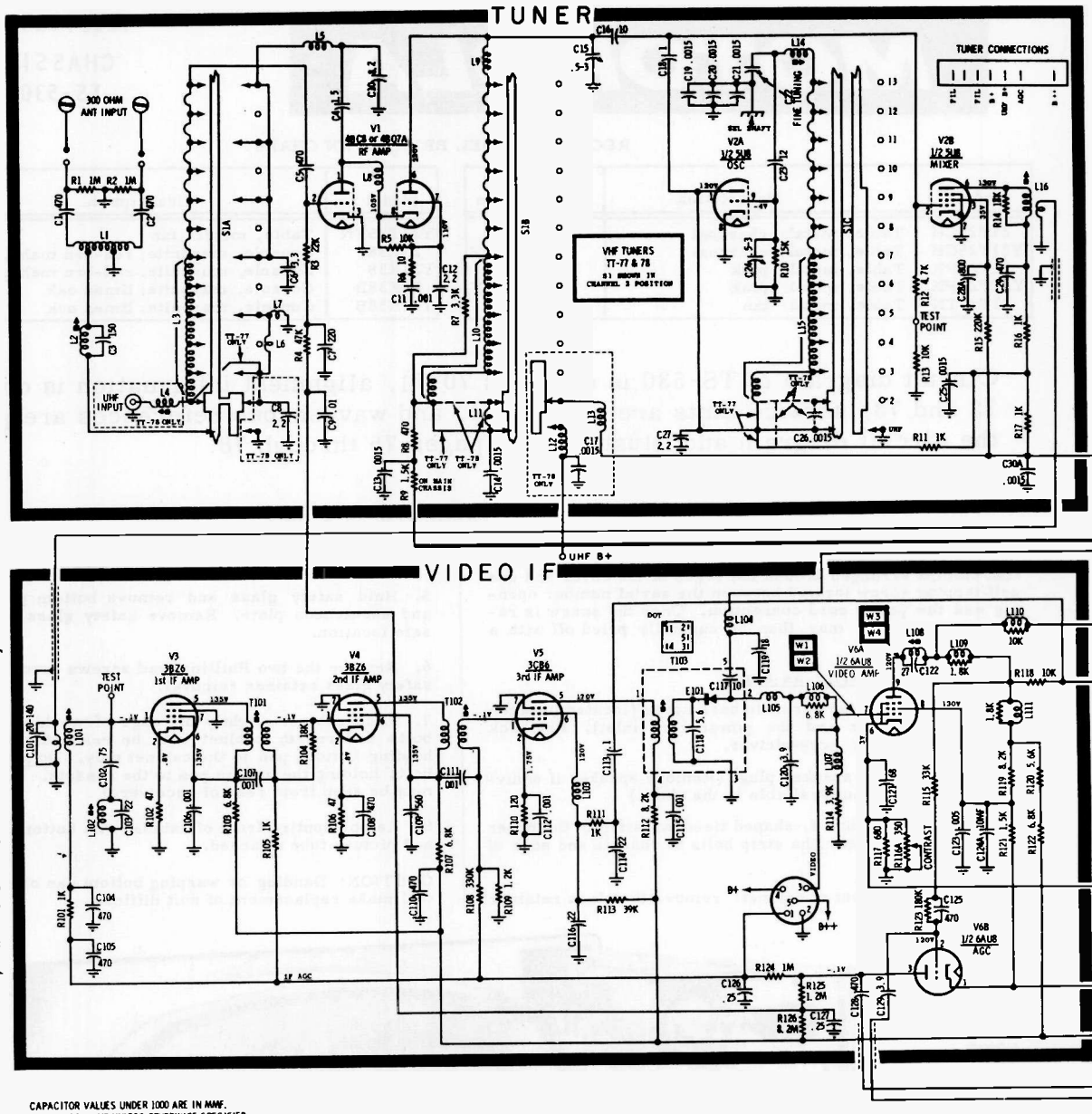
REAR VIEW OF CHASSIS

TV CHASSIS CODING SYSTEM

TS-530A-00.....The original chassis
A-01, 02, etc....Minor electrical revisions of the "A" chassis
A-01-0, A-02-1..Deviations from minor electrical revisions
B-00.....First major revision of the original chassis
B-01, 02, etc....Minor electrical changes of the "B" chassis
Prefixes such as W, R, V, T, etc...Mechanical changes.

A "Y" suffix added to the basic chassis (example, TS-530YA-00) indicates that the chassis contains a factory-installed UHF tuner.

Chassis Coding	Changes
B-01	To improve tone quality, C-211 (.01) changes to .0047; C-212 (.01) changes from paper capacitor to a ceramic disc.
B-02	To eliminate parasitic oscillation, R-210 (100) is added between plate (pin #3 of V-10) and blue lead of T-202.



CAPACITOR VALUES UNDER 1000 ARE IN MMF. ALL OTHERS IN MF UNLESS OTHERWISE SPECIFIED.

NOTES

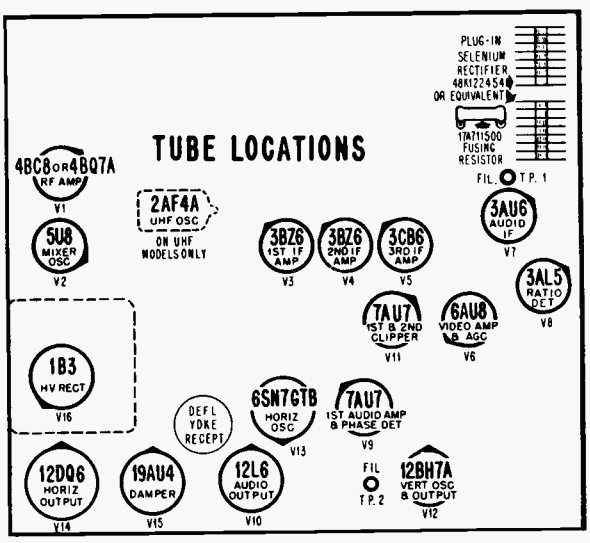
VOLTAGE MEASUREMENTS

1. Made with a VTVM from point indicated to chassis.
2. Line voltage - 117 volts (use Isolation Transformer).
3. Antenna disconnected and input shorted across.
4. Channel selector switch on channel which develops least noise at pin #3 of test receptacle.
5. Contrast control "off", maximum counterclockwise position.
6. All other controls in normal operating position.
7. Voltages associated with variable-control circuitry will vary with control setting.

WAVEFORMS

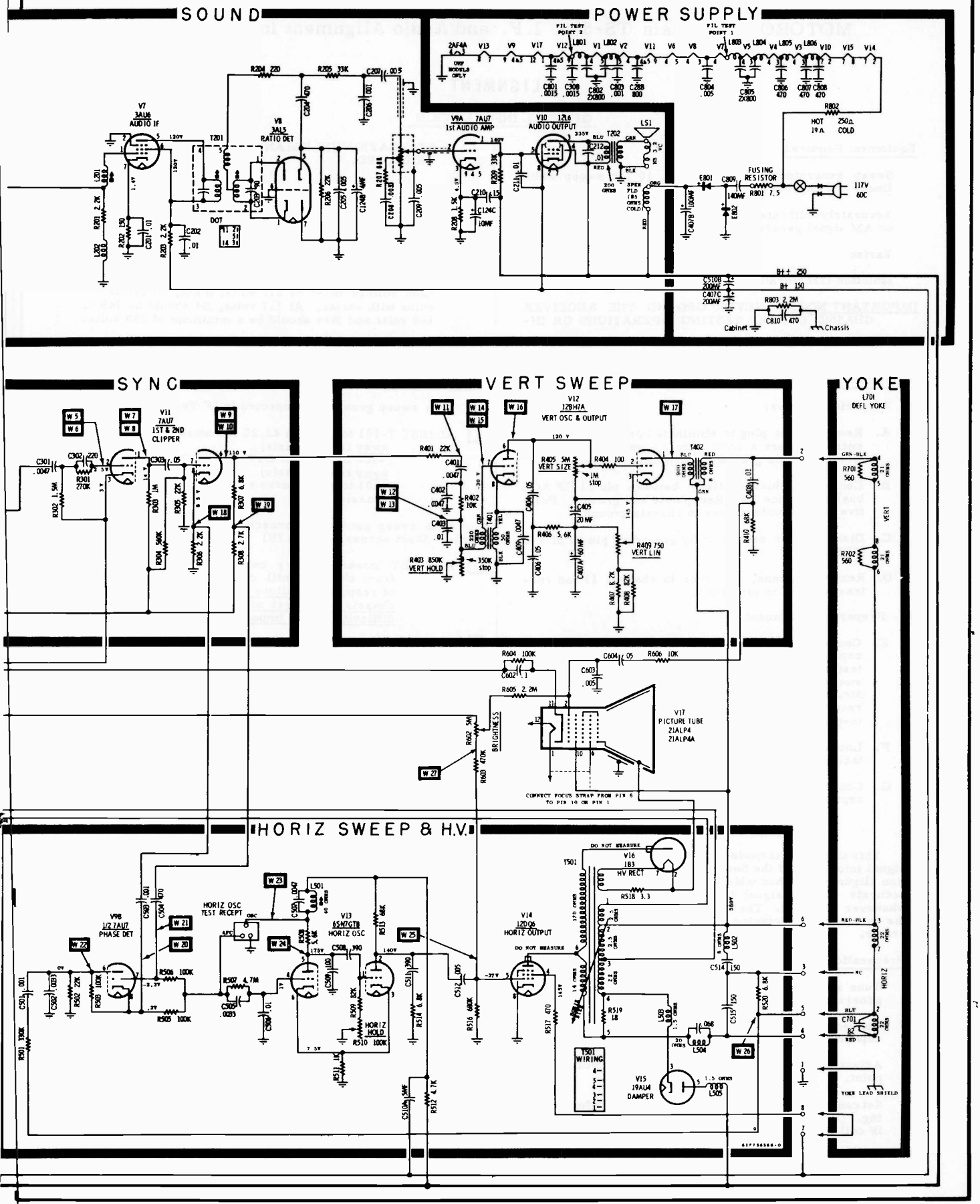
1. Designated by "W" prefix and numerical reference.
2. Photographs of waveforms are on pages
3. Required circuit conditions are given with each waveform.
4. Waveforms observed on wide-band oscilloscope.

Waveforms are illustrated on pages 75 through 78.



MOTOROLA INC.

TELEVISION CHASSIS TS-530B-00


SOUND
POWER SUPPLY
SYNC
VERT SWEEP
YOKE
HORIZ SWEEP & H.V.
V7 3AU6 AUDIO IF
V8 3AL5 RATIO DET
V9A 7AU7 1st AUDIO AMP
V10 12L6 AUDIO OUTPUT
V11 7AU7 1ST & 2ND CLIPPER
V12 12BH7A VERT OSC & OUTPUT
V13 6SN7GTB HORIZ OSC
V14 12DQ6 HORIZ OUTPUT
V15 19AU4 DAMPER
V16 1B3 HV RECT
V17 PICTURE TUBE 21ALP4 21ALP4A
V9B 7AU7 PHASE DET
FUSING RESISTOR
R801 7.5
R802 250Ω HOT 19Ω COLD
117V 60C
B+ 250
B+ 150
R803 2.2M
C810 470
Cabinet
Chassis
T201
T202
T401
T402
T501
L701 DEFL YOKE
VERT
HORIZ
R401 22K
R402 10K
R403 850K VERT HOLD
R405 5M VERT SIZE
R406 5.6K
R407 8.2K
R408 82K
R409 750 VERT LIN
R410 68K
R501 330K
R502 22K
R503 100K
R504 560K
R505 100K
R506 100K
R507 4.7M
R508 5.6K
R509 82K
R510 100K HORIZ HOLD
R511 1K
R512 4.7K
R513 68K
R514 6.8K
R516 680K
R517 470
R518 3.3
R519 18
R520 6.8K
R602 5M BRIGHTNESS
R603 470K
R604 100K
R605 2.2M
R606 10K
HORIZ OSC TEST RECEPT
HORIZ HOLD
PHASE DET
HORIZ OSC
HORIZ OUTPUT
HV RECT
DAMPER
PICTURE TUBE
DO NOT MEASURE
CONNECT FOCUS STRAP FROM PIN 6 TO PIN 10 OR PIN 1
T501 WIRING
YOKE LEAD SHIELD
W1
W2
W3
W4
W5
W6
W7
W8
W9
W10
W11
W12
W13
W14
W15
W16
W17
W18
W19
W20
W21
W22
W23
W24
W25
W26
W27

MOTOROLA Chassis TS-530, I.F. and Audio Alignment Information

ALIGNMENT

GENERAL INFORMATION

Equipment Required:

Sweep generator: 18 to 220 Mc, 10 Mc sweep width linear and capable of .1 volt output.

Accurately calibrated, adjustable marker generator and/or AM signal generator.

Variac

Isolation transformer

IMPORTANT NOTES: NEVER GROUND THE RECEIVER CHASSIS DURING TESTING OPERATIONS OR INSTALLATION UNLESS AN ISOLATION TRANSFORMER IS USED.

Keep marker generator output low at all times, to prevent the marker from distorting the response curve.

Some coils resonate at two settings of the core; set cores as specified in specs.

Line voltage must be 117 volts; if not, adjust to 117 volts with variac. At 117 volts, B+ should be 145 to 160 volts and B++ should be a minimum of 250 volts.

IF AND MIXER ALIGNMENT

Equipment Arrangement

I. Preparing Receiver

A. Remove yoke plug to eliminate horizontal interference. Connect a 2500 ohm 25 watt resistor from B++ to chassis ground to normalize voltages.

B. Connect a bias battery between pin #1 (IF AGC bus) of Service Test Receptacle and ground. Positive side of battery goes to chassis ground.

C. Disable tuner oscillator by grounding pin #9 of V-2 (5U8).

D. Remove antenna, set tuner to channel 13 and contrast control to minimum.

II. Preparing Equipment

E. Connect sweep generator (through 1000 to 5000 mmf capacitor) to: IF test receptacle for step 1 : mixer test receptacle for steps 2 3 and 4 . Center sweep frequency at 44 Mc. Set sweep width to 10 Mc. Adjust generator output level below point of receiver limiting (approximately 3 to 5 volts peak-to-peak at video detector load).

F. Loosely couple marker generator to IF test receptacle.

G. Connect oscilloscope to pin #3 of Service Test Receptacle (through 47K ohm resistor).

IF Alignment

With sweep generator connected to IF Test Receptacle-

[1] ADJUST T-101 to position 42.25 Mc marker (core tuned away from chassis)
T-102 to position 45.75 Mc marker (core tuned away from chassis)
T-103 to shape curve center (core tuned toward chassis)

With sweep generator connected to Mixer Test Receptacle - Short across R-12 (4.7K)

[2] PRE-SET mixer primary coil, L-16, by tuning away from chassis until coil's effect is moved out of response. Failure to adjust core away from chassis will upset mixer coupling and make it difficult, if not impossible, to align properly.

[3] ADJUST capacitor C-101, mixer secondary coil, L-101 and 41.25 Mc trap, L-102, to get response and markers shown in "Mixer" curve.

To see trap clearly, it may be necessary to either increase the input appreciably or remove the IF bias momentarily. The core in L-101 is tuned toward the chassis and the core in L-102 is tuned away from chassis.

[4] ADJUST mixer primary coil, L-16, so that it is tuned into the center of the IF response so as to place the markers as shown in "Overall" curve.

AUDIO ALIGNMENT AND 4.5 MC TRAP ADJUSTMENT

This alignment is made by injecting an accurate 4.5 Mc signal into pin #3 of the Service Test Receptacle. The station alignment method which follows is practical in that an accurate 4.5 Mc signal is available, and should be used whenever possible. The procedure is the same whether the test signal originates from a station or from a generator.

Preparation

Tune in station (or connect 4.5 Mc crystal-controlled generator to pin #3 of Service Test Receptacle).

Connect VTVM from positive terminal of electrolytic capacitor C-124B to ground.

Adjust signal input to maintain 5 to 10 volts at this point.

Set contrast control for maximum contrast before limiting. (It may be necessary to short the plate of the 3rd IF coil to ground through a .01 mf capacitor.)

[1] ADJUST audio take-off coil, L-201 and primary (bottom) of ratio detector transformer, T-201, for maximum reading. (The output of the generator should be reduced so that the meter reading does not exceed 10 volts.) CAREFULLY NOTE VOLTAGE DEVELOPED.

[2] Connect matched pair of 100K resistors across R-206. Connect ground side of VTVM to junction of 100K resistors; high side to junction of R-204 and R-205.

ADJUST secondary (top) of T-201 for zero reading on VTVM.

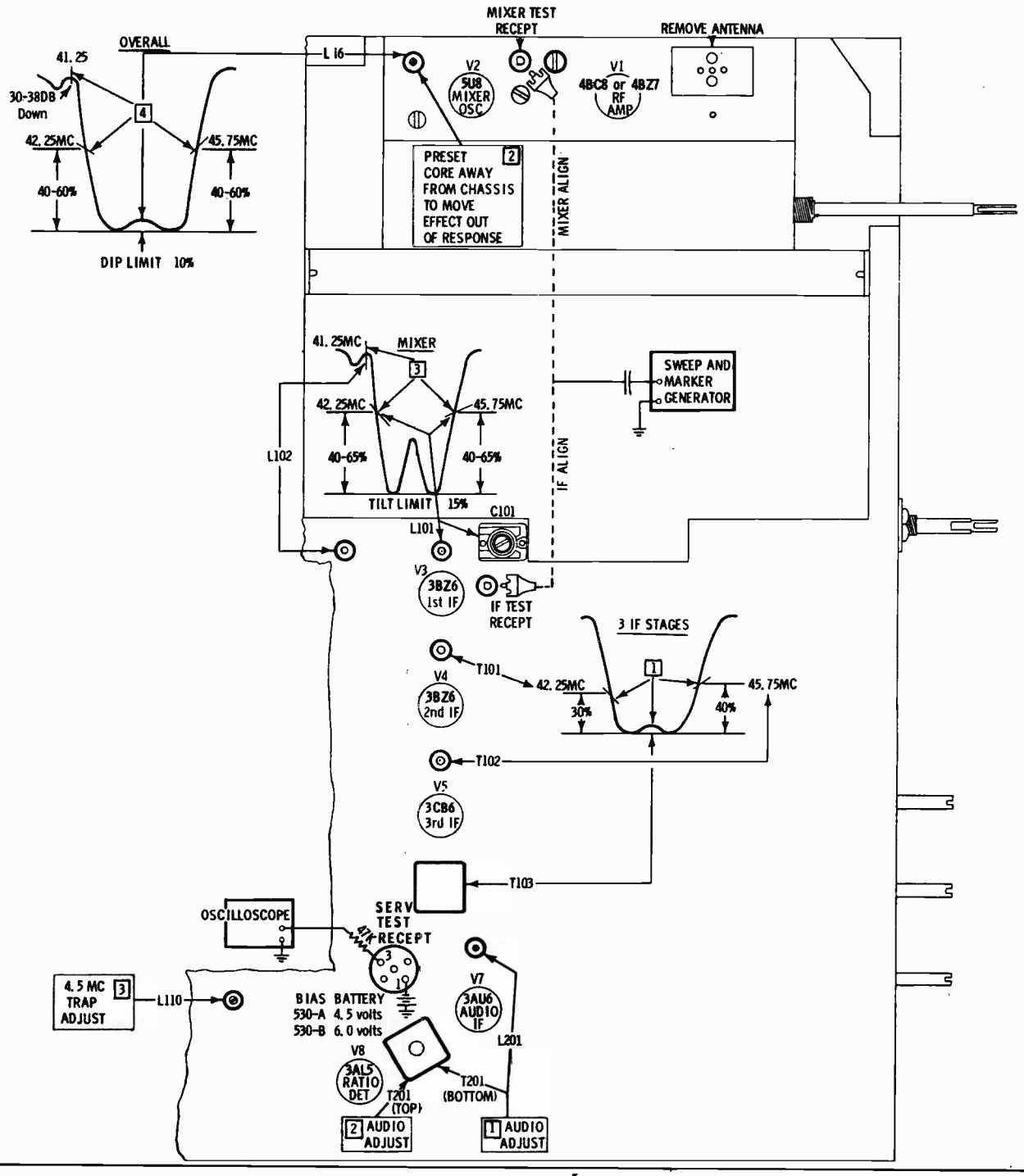
NOTE: The primary and secondary of the ratio detector transformer should be tuned with the core toward the outside of coil.

4.5 Mc Trap Adjustment

[3] Carefully tune receiver to local station and advance contrast control.

ADJUST L-108 to find the two points of adjustment at which beat is just noticeable on the picture tube screen. Rotate the core toward center of two points. Use minimum amount of inductance (core out of coil) that will result in no apparent beat interference.

MOTOROLA Chassis TS-530, I.F. and Audio Alignment Chart



HORIZONTAL OSCILLATOR ADJUSTMENT

The HORIZONTAL HOLD control should have a sync range of approximately 30°. If the control is too critical, adjust as follows:

1. Set all controls for normal picture.

2. Short AFC voltage to ground and shunt HORIZONTAL OSCILLATOR coil, L-501. to ground with a .1 mfd 400 volt capacitor. This may be done with the chassis in the cabinet by using the HORIZONTAL OSCILLATOR TEST RECEPTACLE.

3. Adjust HORIZONTAL HOLD control to the point where the picture almost remains stationary...as far as horizontal sync is concerned.

4. Remove the .1 mfd capacitor shunting the HORIZONTAL OSCILLATOR coil and without turning horizontal hold control, adjust HORIZONTAL OSCILLATOR coil to the center of the range in which the picture almost remains in sync horizontally.

5. Remove short from AFC voltage to ground and adjust HORIZONTAL HOLD control so that no fold-over appears on either side of the raster.

MOTOROLA Chassis TS-530, Service Aid Chart

SYMPTOM	CONTROLS	CHECK OR ADJUST	TUBES	MISCELLANEOUS CHECKS
SET DEAD (tubes not lighting)	Off-on & volume	Is set plugged in? Is back cover on? Is AC line voltage available at outlet? (check with lamp)		All tube filaments
SET DEAD (tubes are lit)		Is speaker plugged in?	V-10 Audio output	Selenium rectifiers Power fuse E-803
NORMAL RASTER (no picture) (no sound)	Channel selector (on station?)	Antenna connections. Is station on air? (See chart on antennas)	V-1, 2, 3, 4, 5. RF, osc-mix, 1st, 2nd & 3rd IF	B+ voltage. RF amp. Osc, Mixer, IF amp. AGC voltage.
WEAK PICTURE (insufficient contrast)	Contrast. Fine tuning. Channel selector on correct channel?	Antenna connections. Booster and/or ant. dist. systems (if used)	V-1, 2, 3, 4, 5, 6, 11 RF, osc-mix, 1st, 2nd & 3rd IF, Sync & video amp	AGC voltage. Contrast control. RF, IF, mixer & AGC stages. Video amp.
LOW BRIGHTNESS OR NO RASTER (sound normal)	Brightness	Ion trap magnet	V-13, 14, 15, 16, 17 Horiz. Osc, horiz amp, damper, high volt rect, picture tube	High voltage at picture tube anode. Drive voltage, pin 5 V-14. Bootstrap voltages. Solder connections at base of CRT. Voltages & waveforms in V-13 & 14 circuits. Horizontal output transformer & deflection yoke. Ion trap adj.
POOR VERTICAL LINEARITY AND/ OR SIZE. HORIZ. WHITE LINE (no vert sweep).	Vertical size. Vert lin. Reduce brightness & return to normal when trouble is cleared.		V-12 Vert osc & output.	Bootstrap voltages. Voltages in V-12 circuit. Electrolytics C-407A & C-405. Vertical output transformer & deflection yoke.
VERTICAL INSTABILITY, PICTURE ROLLS	Vertical hold Vert lin, size & hold		V-11, 12 Sync Sep Sync Amp Vert Osc	AGC voltage. Voltages in V-11 & V-12 circuit. Interference. Sync clipping at video amp. Refer to tests under WEAK PICTURE. Abnormal power supply ripple. Insufficient bootstrap filtering. Video detector.
LOSS OF VERTICAL AND HORIZ HOLD	Horiz hold. Vert hold.	Weak signal. Antenna and lead-in.	V-11 Sync Sep Sync Amp	B+ and B++ voltages. AGC voltage. Refer to test under VERTICAL INSTABILITY & NO HORIZ HOLD
NO HORIZ HOLD OR CRITICAL HORIZ HOLD	Horiz hold.	Horiz osc coil	V-9, 11, 14 Sync sep & amp, Horiz osc, Phase det	Waveforms in V-9, 11, 13 circuits. Refer to tests under WEAK PICTURE.
INSUFFICIENT HORIZ SIZE	Horiz size	Picture centering	V-13, 14, 15 Horiz osc, Horiz amp, Damper	Bootstrap voltage. Drive voltage, pin 5, . Deflection yoke and horiz output transformer
PICTURE NORMAL, NO SOUND OR WEAK SOUND	Fine tuning Volume		V-7 V-8, 9, 10 Audio IF tube Ratio Det. Audio Amp. Audio out-	Speaker & speaker plug. Output transformer. Voltages of V-9 & V-10.
BUZZ IN SOUND	Fine tuning Contrast	Excessive signal	V-7, 8, 9, 10 Audio IF Ratio Det Audio Amp. Audio Output	Ratio det. alignment. Sync clipping in video section. Improper AGC action. Power supply filter & sweep circuit bypass capacitors. Heater-cathode shorts in sound tubes.
VHF-NO UHF	UHF tuning UHF switch	Antenna connections	UHF osc	Tuner contacts. B+ at UHF tuner.
EXCESSIVE CONTRAST, NEGATIVE PICTURE	Contrast		V-1, 2, 3, 4, 5 6, 13 & 17 RF amp. Osc-mix 1st, 2nd & 3rd IF Video amp. AGC tube. Picture tube.	AGC voltage and AGC circuit. Video det. Video det-load resistor. Leakage between prim & sec. in video IF coils. Proper pulse from horiz output to AGC tube. Pulse coupling capacitor to AGC plate. RF AGC delay network.

Waveshapes for MOTOROLA Chassis TS-530, TS-533, TS-534 (See appropriate schematic)

The following photographs were taken at some of the more important points in the receiver. To facilitate photography, a Tektronix oscilloscope was used. The waveshapes will appear much the same, however, on the average wideband oscilloscope. When a limited bandwidth oscilloscope is used, some interpretation may be necessary to compensate for the waveshape differences (rounding of corners, for example).

The input signal used during photography was a comparatively strong television station signal. Receiver contrast was turned to maximum; all other receiver controls were set for normal viewing.

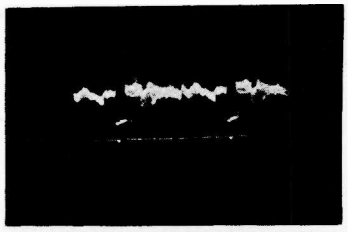
Note that waveshape amplitudes are based on a 4V peak-to-peak composite video voltage at the grid of the video amplifier.

Variations in composite video signal are a result of variations in the type of scene being scanned at the time the photograph was taken. In some waveshapes (I8, for example) the video signal near the baseline is noticeable only because of the high contrast control setting.

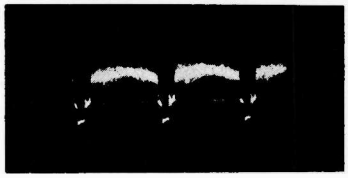
Vertical gain of the oscilloscope was adjusted so that, regardless of the value of peak-to-peak voltage, all traces would be approximately the same height on the photograph.

Note particularly such items as peak-to-peak voltage, the amplitude relationship of vertical to horizontal portions of the video signal and the oscilloscope limitations. This will be important to the proper circuit analysis.

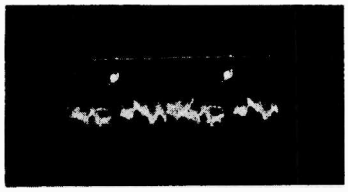
W1 Composite video signal, grid of video amplifier (pin 2, V-6). 4 volts PP (Oscilloscope synced near vertical rate)



W2 Composite video signal, grid of video amplifier (pin 2, V-6). 4 volts PP. (Oscilloscope synced near horizontal rate)



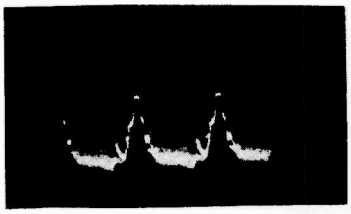
W3 Composite video signal, plate of video amplifier (pin 7, V-6). 110 volts PP. (Oscilloscope synced near vertical rate)



W4 Composite video signal, plate of video amplifier (pin 7, V-6). 110 volts PP. (Oscilloscope synced near horizontal rate)

W5 Composite video signal, grid of sync clipper (pin 1, V-11). 45 volts PP. (Oscilloscope synced near vertical rate)

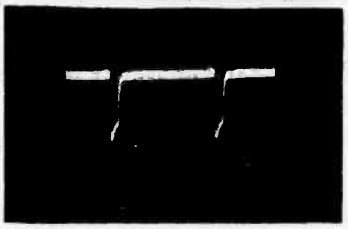
W6 Composite video signal, grid of sync clipper (pin 1, V-11). 45 volts PP. (Oscilloscope synced near horizontal rate)



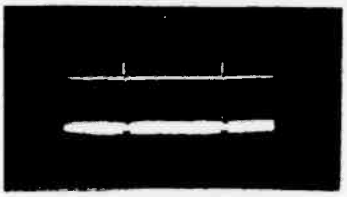
Waveshapes for MOTOROLA Chassis TS-530, TS-533, TS-534 (See appropriate schematic)

W7 Vertical sync pulse, plate of sync clipper (pin 2, V-11). 32 volts PP. (Oscilloscope synced near vertical rate)

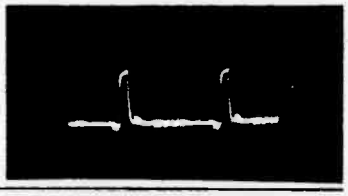
W8 Horizontal sync pulse, plate of sync clipper (pin 2, V-11). 32 volts PP. (Oscilloscope synced near horizontal rate)



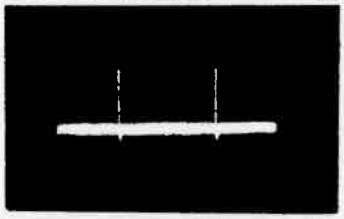
W9 Vertical sync pulse, plate of sync clipper (pin 5, V-11). 40 volts PP. (Oscilloscope synced near vertical rate)



W10 Horizontal sync pulse, plate of sync clipper (pin 5, V-11). 35 volts PP. (Oscilloscope synced near horizontal rate)

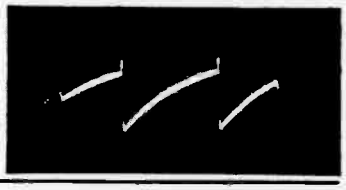


W11 Vertical sync pulse, junction of 22K and .0047 in integrator network. 32 volts PP. (Oscilloscope synced near vertical rate)

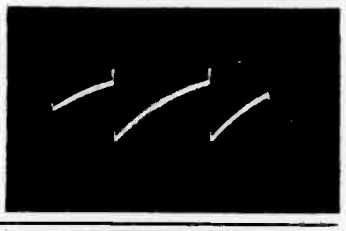


W12 Vertical sync pulse, junction of .01 and 10K in integrator network. 42 volts PP. (Oscilloscope synced near vertical rate) (vertical oscillator tube in circuit)

Note that vertical sync pulse is combined here with the vertical oscillator voltage which is "kicked back" into the network.



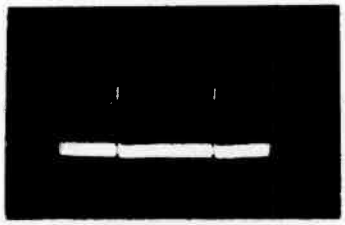
W13 Vertical sync pulse, junction of .01 and 10K in integrator network. 42 volts PP. (Oscilloscope synced near vertical rate) (vertical oscillator tube in circuit)



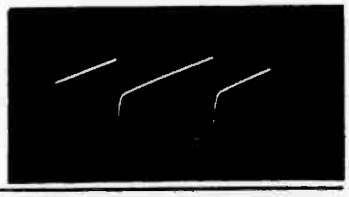
W14 Blocking oscillator voltage, grid of vertical oscillator (pin 4, V-12). 150 volts PP. (Oscilloscope synced near vertical rate)

Waveshapes for MOTOROLA Chassis TS-530, TS-533, TS-534 (See appropriate schematic)

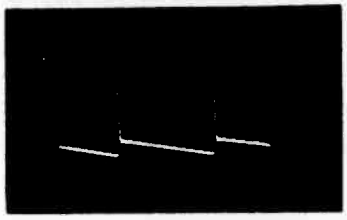
W15 Same as 12 but with vertical oscillator tube removed. 9 volts PP.



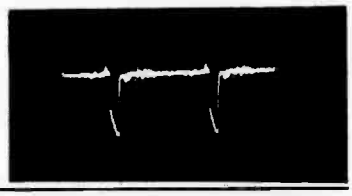
W16 Vertical oscillator voltage, plate of vertical oscillator (pin 5, V-12). 70 volts PP. (Oscilloscope synced near vertical rate)



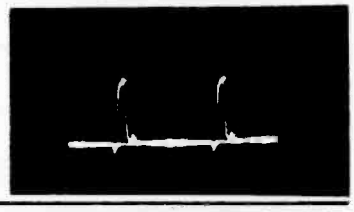
W17 Vertical output voltage, plate of vertical output (pin 2, V-12). 980 volts PP. (Oscilloscope synced near vertical rate)



W18 Horizontal sync pulse, cathode of sync clipper (pin 6, V-11). 11 volts PP. (Oscilloscope synced near horizontal rate)
Note slight amount of video in waveform. This is the result of setting contrast control on maximum with a high input signal.

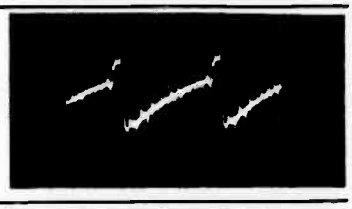


W19 Horizontal sync pulse, junction of 6.8K and 2.7K in sync clipper. 11 volts PP. (Oscilloscope synced near horizontal rate)

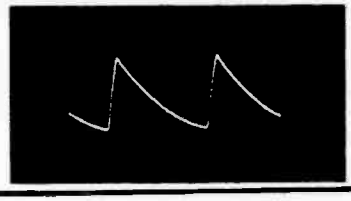


W20 Voltage at cathode of phase detector (pin 6, V-9B). 11 volts PP. (Oscilloscope synced near horizontal rate)

W21 Voltage at grid of phase detector (pin 4, V-9B). 11 volts PP. (Oscilloscope synced near horizontal rate)

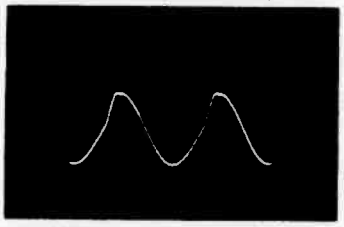


W22 Voltage at plate of phase detector (pin 5, V-9B). 9 volts PP. (Oscilloscope synced near horizontal rate)

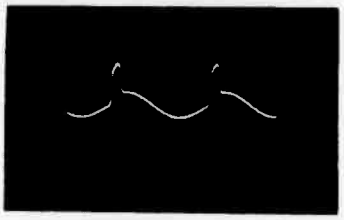


Waveshapes for MOTOROLA Chassis TS-530, TS-533, TS-534 (See appropriate schematic)

W23 Voltage at horizontal oscillator coil connection to service test receptacle. 20 volts PP. (Oscilloscope synced near horizontal rate)



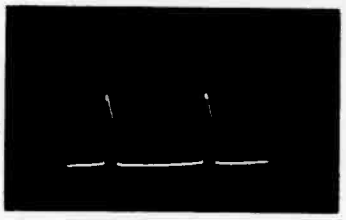
W24 Horizontal oscillator voltage, plate of horizontal oscillator (pin 5, V-14). 38 volts PP. (Oscilloscope synced near horizontal rate)



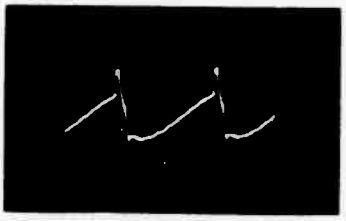
W25 Voltage at junction of R-515 (470) & R-516 (IM) 130 volts PP. (Oscilloscope synced near horizontal rate)

W26 Voltage at pin 5 of yoke socket. 2000 volts PP. (Oscilloscope synced near horizontal rate)

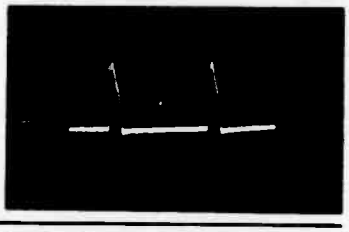
CAUTION: Do not measure with ordinary equipment.



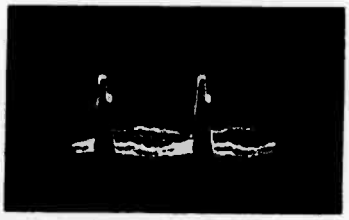
W27 Voltage at junction of 470K and brightness control. 50 volts PP. (Oscilloscope synced near horizontal rate)



W28 Keying pulse on plate of AGC (pin 5, V-13). 520 volts PP. (Oscilloscope synced near horizontal rate)



W29 Composite video signal at grid of AGC (pin 1, V-13). 60 volts PP. (Oscilloscope synced near horizontal rate)



MOTOROLA

TELEVISION
CHASSIS
TS-533

RECEIVER MODEL BREAKDOWN CHART

Model	Description	TV Chassis
21C4	Table, masonite:red-brn mahogany	TS-533
Y21C4	Table, masonite:red-brn mahogany	TS-533Y
21C4B	Table, masonite: limed oak	TS-533
Y21C4B	Table, masonite: limed oak	TS-533Y
21K41	Console, masonite: red-brn mahogany	TS-533
Y21K41	Console, masonite: red-brn mahogany	TS-533Y
21K41B	Console, masonite: limed oak	TS-533
Y21K41B	Console, masonite: limed oak	TS-533Y
21K42	Console, wood: red-brn mahogany	TS-533
Y21K42	Console, wood: red-brn mahogany	TS-533Y
21K42B	Console, wood: limed oak	TS-533
Y21K42B	Console, wood: limed oak	TS-533Y
21K43	Console, wood: red-brn mahogany	TS-533
Y21K43	Console, wood: red-brn mahogany	TS-533Y
21K43B	Console, wood: limed oak	TS-533
Y21K43B	Console, wood: limed oak	TS-533Y
21K44B	Console, wood: birch	TS-533
Y21K44B	Console, wood: birch	TS-533Y
21K44W	Console, wood: walnut	TS-533
Y21K44W	Console, wood: walnut	TS-533Y
21K45	Console, wood: gray mahogany	TS-533
Y21K45	Console, wood: gray mahogany	TS-533Y
24K10	Console, masonite: red-brn mahogany	TS-533
Y24K10	Console, masonite: red-brn mahogany	TS-533Y
24K10B	Console, masonite: limed oak	TS-533
Y24K10B	Console, masonite: limed oak	TS-533Y
24K11	Console, wood: red-brn mahogany	TS-533
Y24K11	Console, wood: red-brn mahogany	TS-533Y
24K11B	Console, wood: limed oak	TS-533
Y24K11B	Console, wood: limed oak	TS-533Y
24T4	Table, masonite: red-brn mahogany	TS-533
Y24T4	Table, masonite: red-brn mahogany	TS-533Y
24T4B	Table, masonite: limed oak	TS-533
Y24T4B	Table, masonite: limed oak	TS-533Y

Circuit diagram of Chassis TS-533 is on pages 80-81, alignment information is on pages 82 and 83, service hints are on page 84, and waveshapes references are given in the schematic diagram and illustrated on pages 75 through 78.

REMOVING THE BACK COVER

The back cover is held in place by means of metal friction clamps arranged around the edges of the cover and one self-tapping screw located between the serial number opening and the power cord connection. Once the screw is removed, the cover may be carefully pried off with a screwdriver.

ION TRAP ADJUSTMENT

To adjust the ion trap, proceed as follows:

1. Turn on the receiver and set brightness control at mid-range.

2. Rotate the ion trap from left to right and position back and forth until the brightest raster is obtained.

3. Adjust for proper screen coverage regarding size, centering, tilt and shadow.

4. Readjust ion trap for maximum brightness with contrast control set for maximum usable contrast and brightness control set for proper black background in picture.

NOTE: The ion trap should be of the proper magnetic strength, so that, at the proper setting, the ion trap magnet is positioned between 1/8 inch and 1 inch from picture tube base. If trap position is outside these limits, full brightness may not be obtained, and the life of the picture tube may be shortened if the ion trap is not replaced with one of correct strength.

PICTURE CENTERING

NOTE: The ion trap should be properly adjusted before centering. To center the picture correctly, follow these steps.

Starting with the magnetic centering device arms together for minimum field strength, and turned horizontally .....

1. Separate the arms of the centering device to center the picture vertically.

2. Adjust horizontal centering by rotating the magnetic centering device as a unit one way or the other. It may then be necessary to readjust vertical centering by slightly rotating the relative position of the arms.

3. Recheck adjustment of ion trap after centering is completed.

FOCUS

A marked difference in the focus can be noticed when the ion trap, magnetic centering device and the shunting strap are properly placed. The adjustments are necessary because of gun structure differences.

To properly focus the picture tube, proceed as follows:

1. Adjust ion trap as described in Ion Trap Instructions.

2. Adjust centering control as described in centering instructions. At times, focus may be improved by rotating the magnetic centering device 180° and repeating the centering procedure.

3. Readjust the ion trap for maximum raster brightness.

4. Adjust shunting strap for best focus. The shunting strap is located on the base of the picture tube between pin #6 (focus anode) and either pin #1 (chassis ground) or pin #10 (bootstrap). Recheck steps #2 and #3.

RASTER CORRECTOR MAGNETS

Raster corrector (pincushion) magnets will be found on either side of the deflection yoke to straighten the sides of the raster. They are correctly set at the factory but if moved in shipping, or if the yoke has been replaced, they may require readjustment. Adjust in the following manner:

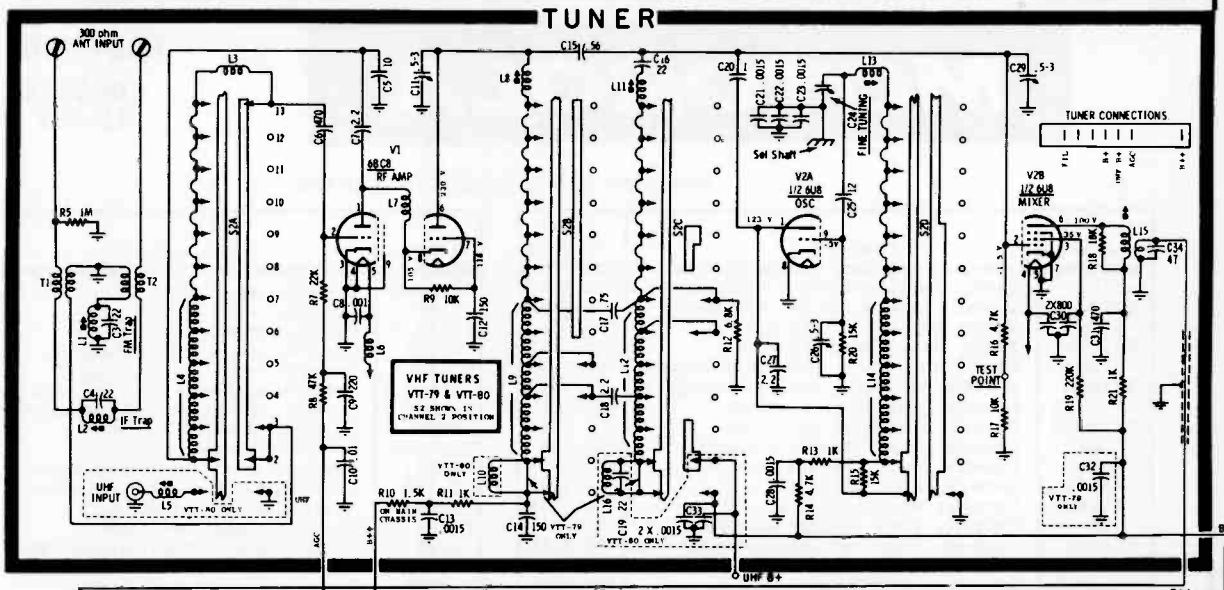
1. Reduce raster size so that its sides are just visible.

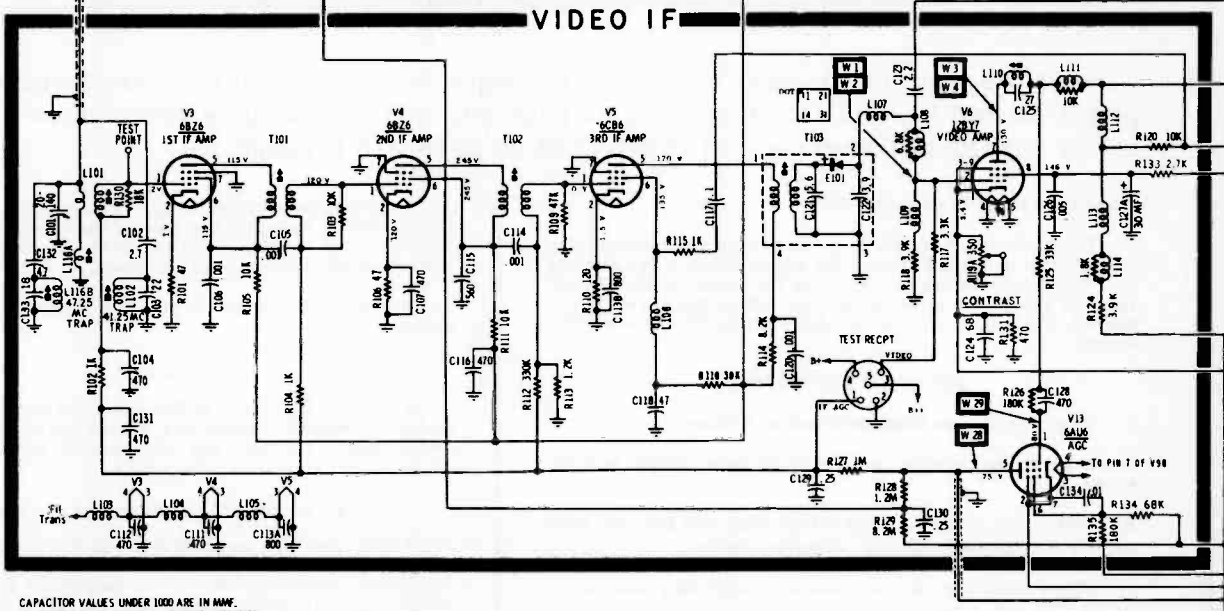
2. Loosen screws holding magnet mountings.

3. Move corrector magnets forward or backward so that raster sides are straight.

4. Tighten screws holding magnet mountings.

5. Magnets without sliding adjustment can be bent forward or backward.





CAPACITOR VALUES UNDER 1000 ARE IN MMF.
ALL OTHERS IN MF UNLESS OTHERWISE SPECIFIED.

NOTES

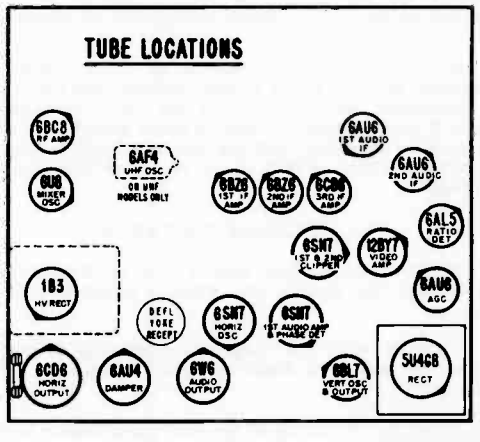
VOLTAGE MEASUREMENTS

1. Made with a VTVM from point indicated to chassis.
2. Line voltage - 117 volts (use Isolation Transformer).
3. Antenna disconnected and input shorted across.
4. Channel selector switch on channel which develops least noise at pin #3 of test receptacle.
5. Contrast control "off", maximum counterclockwise position.
6. All other controls in normal operating position.
7. Voltages associated with variable-control circuitry will vary with control setting.

WAVEFORMS

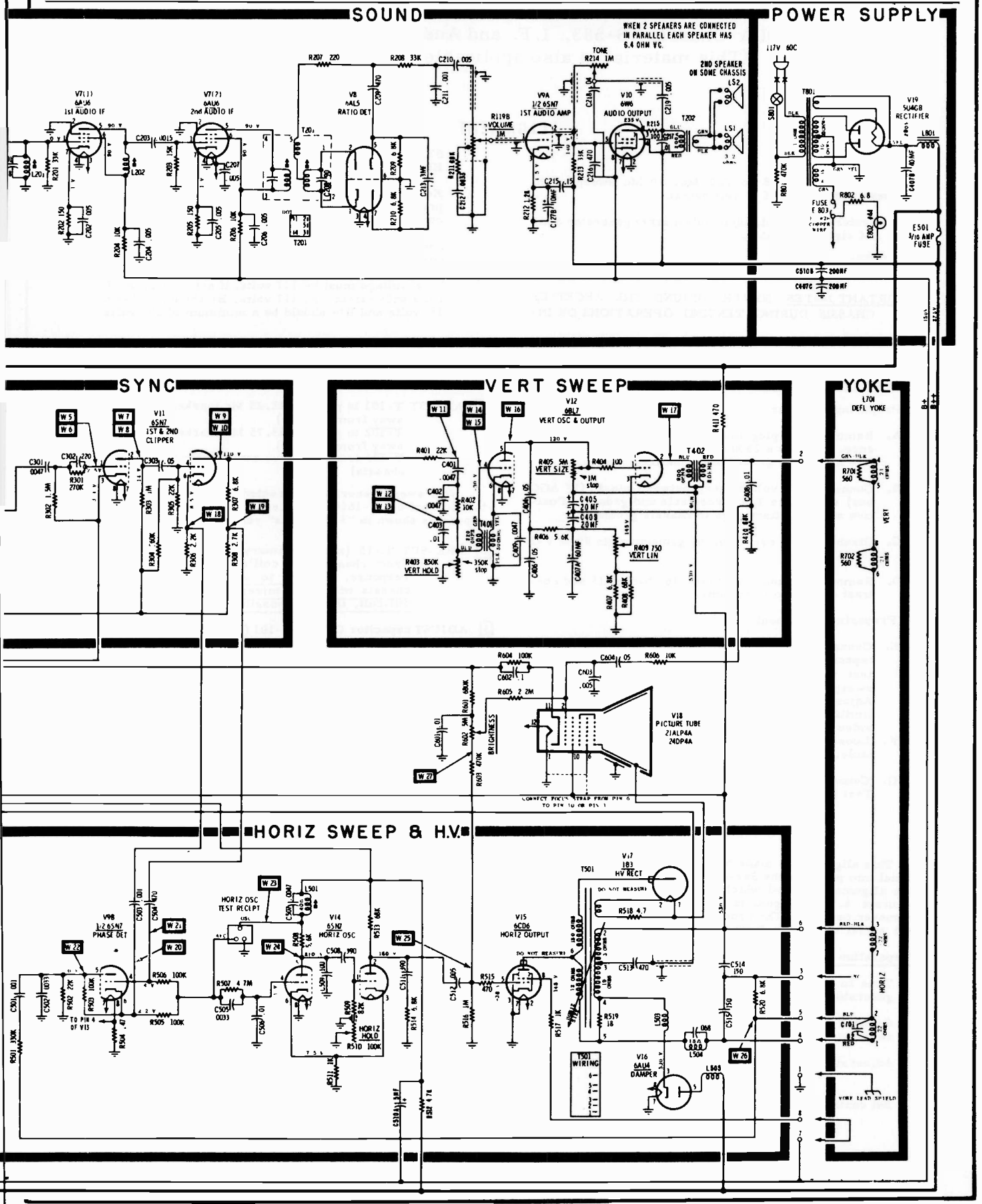
1. Designated by "W" prefix and numerical reference.
2. Photographs of waveforms are on pages
3. Required circuit conditions are given with each waveform.
4. Waveforms observed on wide-band oscilloscope.

Waveforms are illustrated on pages 75 through 78.



MOTOROLA INC.

TELEVISION CHASSIS TS-533C-00


SOUND
POWER SUPPLY
SYNC
VERT SWEEP
YOKE
HORIZ SWEEP & H.V.
WHEN 2 SPEAKERS ARE CONNECTED IN PARALLEL EACH SPEAKER HAS 6.4 OHM VC.
2ND SPEAKER ON SOME CHASSIS
V7(1) 6AU6 1st AUDIO IF
V7(2) 6AU6 2nd AUDIO IF
V8 6AL5 RATIO DET
V9A 1/2 6SN7 1ST AUDIO AMP
V10 6M6 AUDIO OUTPUT
V19 5U4GB RECTIFIER
V11 6SN7 1ST & 2ND CLIPPER
V12 6BL7 VERT OSC & OUTPUT
L70 DEFL YOKE
V18 PICTURE TUBE 21ALP4A 24DP4A
V9B 1/2 6SN7 PHASE DET
V14 6SN7 HORIZ OSC
V15 6CD6 HORIZ OUTPUT
V17 1B3 HV RECT
V16 6AU4 DAMPER
HORIZ OSC TEST RECPT
HORIZ HOLD
VERT HOLD
VERT SIZE
VERT LIN
BRIGHTNESS
FUSE F 803
E501 3/10 AMP FUSE
T501 WIRING

MOTOROLA Chassis TS-533, I. F. and Audio Alignment Information
(This material is also applicable to Chassis TS-534)

ALIGNMENT

Equipment Required:

Sweep generator: 18 to 220 Mc, 10 Mc sweep width, linear and capable of .1 volt output.

Accurately calibrated, adjustable marker generator and/or AM signal generator.

Variac.

Isolation transformer.

IMPORTANT NOTES: NEVER GROUND THE RECEIVER CHASSIS DURING TESTING OPERATIONS OR INSTALLATION UNLESS AN ISOLATION TRANSFORMER IS USED.

Keep marker generator output low at all times, to prevent the marker from distorting the response curve.

Some coils resonate at two settings of the core; set cores as specified in specs.

Line voltage must be 117 volts; if not, adjust to 117 volts with variac. At 117 volts, B+ should be 145 to 160 volts and B++ should be a minimum of 250 volts

IF AND MIXER ALIGNMENT

Equipment Arrangement

I. Preparing Receiver

A. Remove yoke plug to eliminate horizontal interference. Connect a 2500 ohm 10 watt resistor from B++ to chassis ground to normalize voltages.

B. Connect a 6 volt battery between pin #1 (IF AGC bus) of Service Test Receptacle and ground. Positive side of battery goes to chassis ground.

C. Disable tuner oscillator by grounding pin #9 of V-2 (6U8).

D. Remove antenna, set tuner to channel 13 and contrast control to minimum.

II. Preparing Equipment

E. Connect sweep generator (through 1000 to 5000 mmf capacitor) to: IF test receptacle for step 1 : mixer test receptacle for steps 2 3 and 4. Center sweep frequency at 44 Mc. Set sweep width to 10 Mc. Adjust generator output level below point of receiver limiting (approximately 3 to 5 volts peak-to-peak at video detector load).

F. Loosely couple marker generator to IF test receptacle.

G. Connect oscilloscope to R-117 at pin #3 of Service Test Receptacle (through 47K ohm resistor).

IF Alignment With sweep generator connected to IF Test Rec,

[1] ADJUST T-101 to position 42.25 Mc marker (core tuned away from chassis)
T-102 to position 45.75 Mc marker (core tuned away from chassis)
T-103 to shape curve center (core tuned toward chassis)

With sweep generator connected to Mixer Test Receptacle - short out R-16 (4.7K). Response and markers should appear as shown in "3 IF stages" response.

[2] PRE-SET L-15 (mixer primary coil) by tuning away from chassis until coil's effect is moved out of response. Failure to adjust core away from chassis will upset mixer coupling and make it difficult, if not impossible, to align properly.

[3] ADJUST capacitor C-101, L-101 (mixer secondary coil) L-116 bottom (bandwidth coil), L-102 (41.25 Mc trap), and L-116 top (47.25 Mc trap) to get response and markers shown in "Mixer" curve. (15% tilt is allowable). To see trap clearly, it may be necessary to either increase the input appreciably or remove the IF bias momentarily.

[4] ADJUST L-15 (mixer primary coil) so that it is tuned into center of IF response so as to place the markers as shown in "Overall" curve. Note that it may be necessary to retouch bottom of L-116 (away from chassis) and C-101 to achieve proper marker placement.

AUDIO ALIGNMENT AND 4.5 MC TRAP ADJUSTMENT

This alignment is made by injecting an accurate 4.5 Mc signal into pin #3 of the Service Test Receptacle. The station alignment method which follows is practical in that an accurate 4.5 Mc signal is available, and should be used whenever possible. The procedure is the same whether the test signal originates from a station or from a generator.

Preparation

Tune in station (or connect 4.5 Mc crystal-controlled generator to pin #3 of Service Test Receptacle).

Connect VTVM from positive terminal of electrolytic capacitor C-213 to ground.

Adjust signal input to maintain 5 to 10 volts at this point.

Set contrast control for minimum contrast.

Audio Alignment

[1] ADJUST audio take-off coil, L-201, interstage coil, L-202, and primary (bottom) of ratio detector transformer, T-201, for maximum reading.

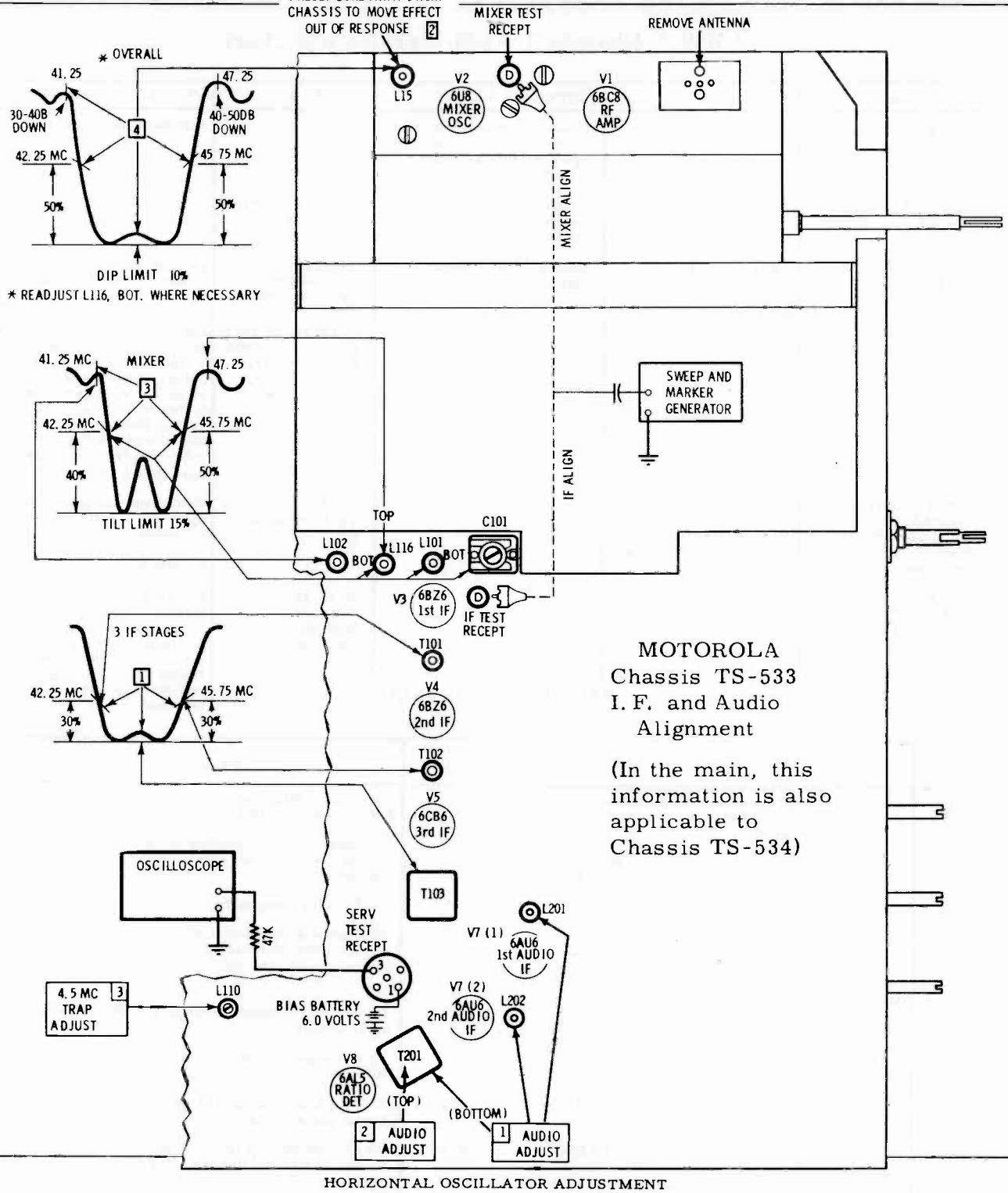
[2] SET VTVM to junction of R-208 (33K) and C-210 (.005) and ground.

ADJUST secondary (TOP) of ratio detector trans, T-201, for zero reading. NOTE: The primary and secondary of the ratio detector transformer, T-201, have two tuning points; one with cores outside the coils and one with the cores towards the inside of the coil. The proper position of cores should be towards the outside of the coil.

4.5 Mc Trap Adjustment

[3] Carefully tune receiver to local station and advance contrast control.

ADJUST L-110 to find the two points of adjustment at which beat is just noticeable on the picture tube screen. Rotate the core toward center of two points. Use minimum amount of inductance (core out of coil) that will result in no apparent beat interference.



MOTOROLA
Chassis TS-533
I. F. and Audio
Alignment

(In the main, this information is also applicable to Chassis TS-534)

HORIZONTAL OSCILLATOR ADJUSTMENT

The HORIZONTAL HOLD control should have a sync range of approximately 30°. If the control is too critical, adjust as follows:

1. Set all controls for normal picture.

2. Short AFC voltage to ground and shunt HORIZONTAL OSCILLATOR coil, L-501, to ground with a .1 mfd 400 volt capacitor. This may be done with the chassis in the cabinet by using the HORIZONTAL OSCILLATOR TEST RECEPTACLE.

3. Adjust HORIZONTAL HOLD control to the point where the picture almost remains stationary...as far as horizontal sync is concerned.

4. Remove the .1 mfd capacitor shunting the HORIZONTAL OSCILLATOR coil and, without turning HORIZONTAL HOLD control, adjust HORIZONTAL OSCILLATOR coil to the center of the range in which the picture almost remains in sync horizontally.

5. Remove short from AFC voltage to ground and adjust HORIZONTAL HOLD control so that no fold-over appears on either side of the raster.

MOTOROLA Chassis TS-533, Service Aid Chart

SYMPTOM	CONTROLS	CHECK OR ADJUST	TUBES	MISCELLANEOUS CHECKS
SET DEAD (tubes not lighting)	Off-on	Is set plugged in? Is back cover on? Is AC line voltage available at outlet? (check with lamp)		Filament fuse E-801
SET DEAD (tubes are lit)		Is speaker plugged in? Replace any tubes that do not light.	LV rect (V-19) Audio out (V-10)	
NORMAL RASTER (no picture) (no sound)	Channel selector (on station?)	Antenna connections. Is station on air?	V-1, 2, 3, 4, 5. RF, osc-mix, 1st, 2nd Crystal Det.	B+ voltage. RF amp. Osc, Mixer, IF amp. AGC voltage.
LOW BRIGHTNESS OR NO RASTER	Brightness		V-13, 14, 15, 16, 17 Horiz. osc, horiz amp, damper, high volt rect, picture tube	High voltage at picture tube anode. Drive voltage, pin 5 V-14. Bootstrap voltages. Solder connections at base of CRT. Voltages & waveforms in V-13 & V-14 circuits. Horizontal output transformer & deflection yoke. Ion trap adj. Power fuse E-501
POOR VERTICAL LINEARITY AND/ OR SIZE. HORIZ. WHITE LINE (no vert. sweep)	Vertical size. Vert lin. Reduce brightness & return to normal when trouble is cleared.		V-12 Vert osc & output	Bootstrap voltage. Voltages in V-12 circuit. Electrolytics C-407A & C-405. Vertical output transformer & deflection yoke.
VERTICAL INSTABILITY, PICTURE ROLLS	Vertical hold Vert lin, size & hold		V-11, 12 Sync Sep. Sync Amp. Vert osc.	Voltages in V-11 & V-12 circuit. Interference. Sync clipping at video amp. Refer to tests under WEAK PICTURE. Abnormal power supply ripple. Insufficient bootstrap filtering. Video detector.

PRODUCTION CHANGES

TS-533A-01 thru C-00

Chassis Coding	Changes
A-01	To reduce white limiting at maximum contrast R-131 (18) added between center post of R-119A (contrast) and ground.
A-02	To correct vertical line structure a shielded lead is added, in place of unshielded wire between R-510 (100K-Horiz Hold) and R-509 (82K), and the lead is dressed away from 1st IF.
A-03	L-502 (RF choke) removed. C-514 (100 mmf, 2 Kv) connected to pin #6 of deflection yoke.
B-00	To reduce adjacent channel interference a 47.25 Mc trap is added. To improve video IF alignment an improved converter circuit is added. See TS-533B-00 schematic (Video IF Section) for above changes. The tuners change to VTT-79C and VTT-80C.
B-01	C-514 (100) and C-515 (100) changed to 150 mmf 2 Kv.
B-02	To increase audio sensitivity R-201 (33K) removed. Shield added over T-201 connections. Components are relocated and dressed close to to chassis.
B-03	To prevent capacitor breakdown negative side of C-405 (20 mf) removed from high side R-409 (750 -vert lin) and connected to B++. New electrolytic C-409 (20 mf) added; negative side connected to high side of R-409 (750-vert lin) and positive connected to B++ side.
B-04	To eliminate parasitic oscillation (snivets) in the audio output stage R-215 (100) added between V-10 (6W6 - Pin 4) and T-202 (red lead).
B-05	This change affects "Y" versions only.
	To reduce slippage, tension is applied to drive belt by added Roller and Spring Assembly.
B-06	To reduce white limiting at maximum contrast setting with a weak signal, video amp circuit is changed.
B 07	R-131 (470) changed to 220.
B-08	To eliminate sync compression and white limiting at maximum contrast setting, also to improve the video circuit, the AGC circuit is changed.
B-09	To reduce filament voltage on IB3 tube R-518 (3.3) changed to 4.7.
B-10	This change affects "Y" versions only. UHF tuner changed to QTT-37B.
B-11	R-105 (8.2K) and R-111 (8.2K) changed to 10K, 4 watt glass resistors.
B-12	To provide an external test point for audio alignment C-211(.001) changed to a Feed-Thru capacitor.
B-13	Same as B-12.
B-14	To improve picture quality C-102 (2.2 mmf) changed to 2.7 mmf; iron core of L-102 changed.
C-00	To increase the protecting capabilities of the fuse the 3/10 amp fuse is rewired. See TS-533C-00 schematic. To reduce hum R-411(470) is added between B++ and junction of C-405 (20 mf) and C-405 (20 mf). To eliminate Horizontal Pull C-503 (.001) and C-504 (470) are changed to 10%.

MOTOROLA

TELEVISION
CHASSIS
TS-534

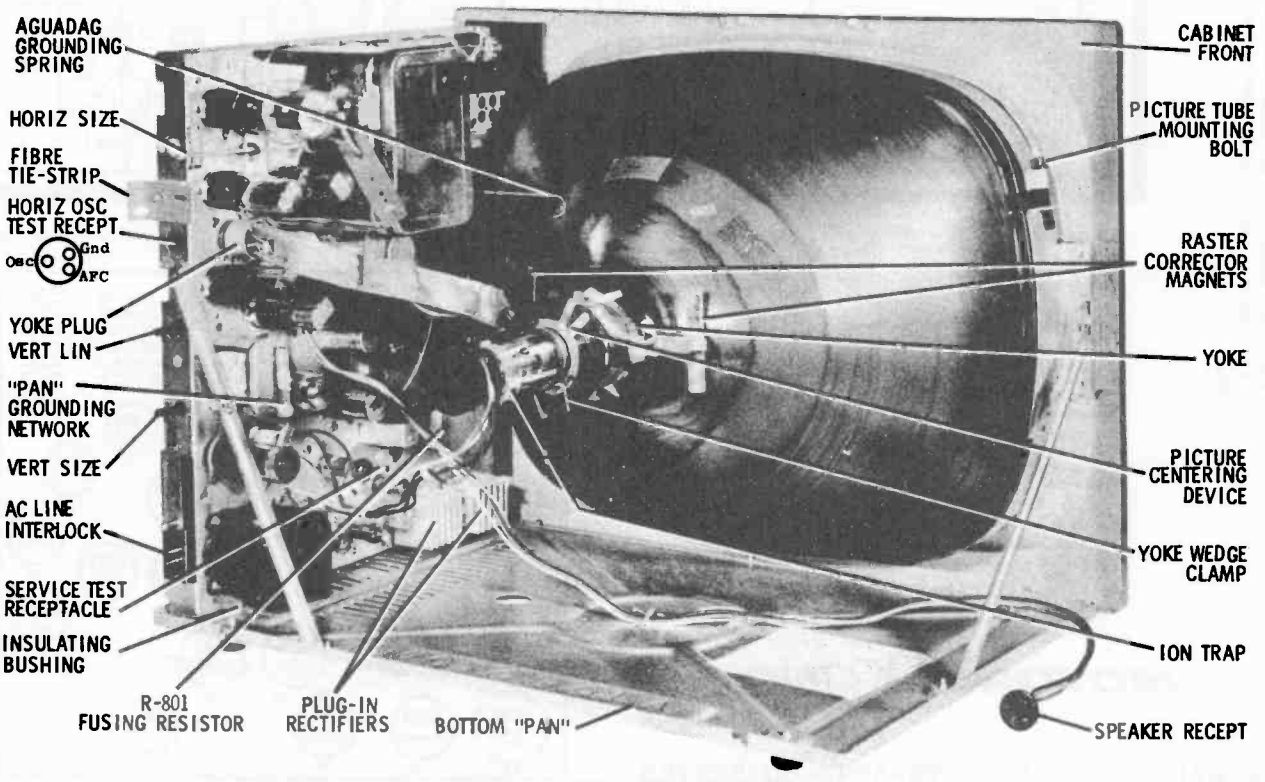
RECEIVER MODEL BREAKDOWN CHART

Model	Description	TV Chassis
21T26B	Table, blonde: metal	TS-534
Y21T26B	Table, blonde: metal	TS-534Y
21T26BA	Table, blonde: metal	TS-534
Y21T26BA	Table, blonde: metal	TS-534Y
21T26BR	Table, bronze: metal	TS-534
Y21T26BR	Table, bronze: metal	TS-534Y
21T26BRA	Table, bronze: metal	TS-534
Y21T26BRA	Table, bronze: metal	TS-534Y
21T26CH	Table, charcoal: metal	TS-534
Y21T26CH	Table, charcoal: metal	TS-534Y
21T26CHA	Table, charcoal: metal	TS-534
Y21T26CHA	Table, charcoal: metal	TS-534Y
21T27B	Table, gossamer blonde: metal	TS-534
Y21T27B	Table, gossamer blonde: metal	TS-534Y
21T27MA	Table, gossamer mahogany: metal	TS-534
Y21T27MA	Table, gossamer mahogany: metal	TS-534Y
21T27PK	Table, gossamer pink: metal	TS-534
Y21T27PK	Table, gossamer pink: metal	TS-534Y
21T28	Table, red-brn mahogany: masonite	TS-534
Y21T28	Table, red-brn mahogany: masonite	TS-534Y
21T28B	Table, blonde: masonite	TS-534
Y21T28B	Table, blonde: masonite	TS-534Y

WTS-534 Same as TS-534 except for addition of a pilot light assembly. NOTE: Some chassis, improperly coded TS-534, a.so have the pilot light assembly.

Model	Description	TV Chassis
21K37B	Console, blonde: metal	TS-534
Y21K37B	Console, blonde: metal	TS-534Y
21K37BA	Console, blonde: metal	TS-534
Y21K37BA	Console, blonde: metal	TS-534Y
21K37BR	Console, bronze: metal	TS-534
Y21K37BR	Console, bronze: metal	TS-534Y
21K37BRA	Console, bronze: metal	TS-534
Y21K37BRA	Console, bronze: metal	TS-534Y
21K39	Console, red-brn mahogany:masonite	TS-534
Y21K39	Console, red-brn mahogany:masonite	TS-534Y
21K39B	Console, blonde: masonite	TS-534
Y21K39B	Console, blonde: masonite	TS-534Y
21K40	Console, red-brn mahogany: masonite	TS-534
Y21K40	Console, red-brn mahogany: masonite	TS-534Y
21K40B	Console, blonde: masonite	TS-534
Y21K40B	Console, blonde: masonite	TS-534Y
21K48M	Console, mahogany: masonite	TS-534
Y21K48M	Console, mahogany: masonite	TS-534Y
21K48B	Console, mahogany: masonite	TS-534
Y21K48B	Console, mahogany: masonite	TS-534Y
24T3BR	Table, gossamer bronze: metal	TS-534
Y24T3BR	Table, gossamer bronze: metal	TS-534Y
24K9	Console, red-brn mahogany: masonite	TS-534
Y24K9	Console, red-brn mahogany: masonite	TS-534Y
24K9B	Console, blonde: masonite	TS-534
Y24K9B	Console, blonde: masonite	TS-534Y

Circuit diagram of Chassis TS-534 is on pages 86-87; for alignment information see pages 82 and 83 (this TS-533 alignment is applicable to TS-534); waveshapes references are given in the schematic diagram and illustrated on pages 75 to 78.



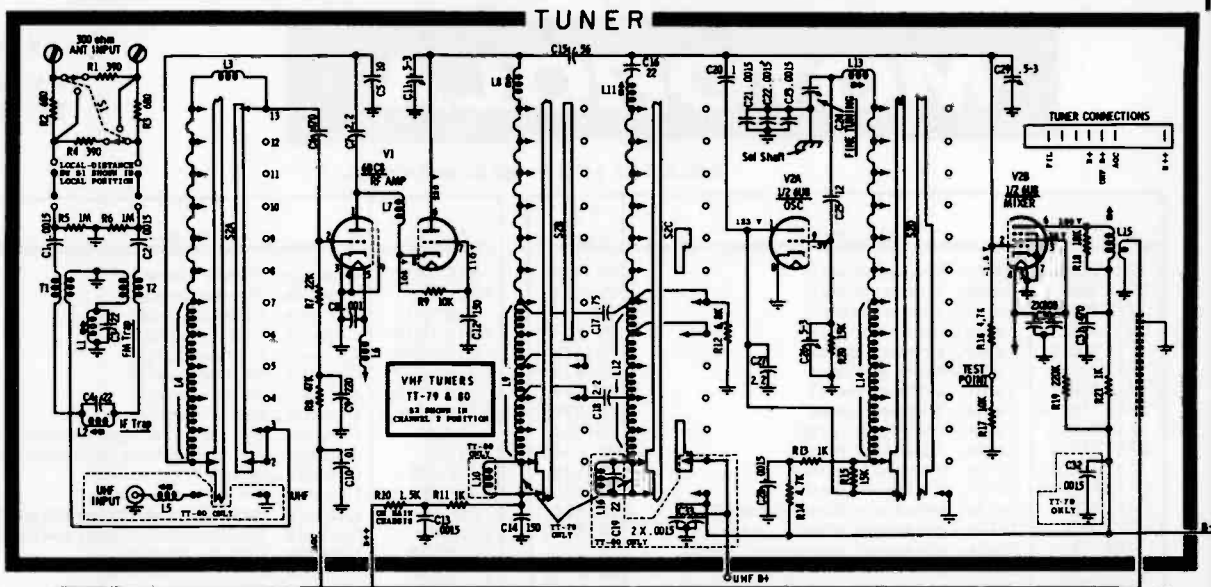
REAR VIEW OF CHASSIS

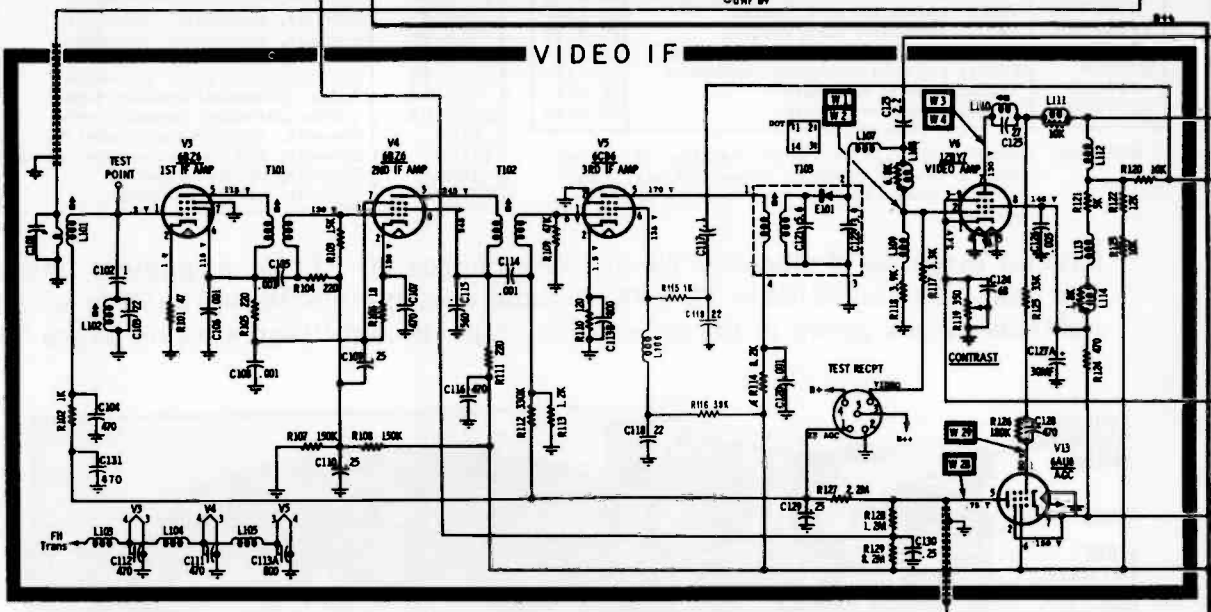
TV CHASSIS CODING SYSTEM

TS-534A-00.....The original chassis.
A-01, 02, etc.....Minor electrical revisions of the "A" chassis.
A-01-0, A-02-1..Deviations from minor electrical revisions.
B-00.....First major revision of the original chassis.
B-01, 02, etc.....Minor electrical changes of the "B" chassis.
Prefixes such as WTS-534, VTS-534, etc.....mechanical changes.

A "Y" suffix added to the basic chassis (for example, TS-534Y-00) indicates that the chassis contains a factory-installed UHF tuner.

TS-534B SERIES — This receiver is electrically similar to the TS-534A except for the addition of a second audio IF amplifier stage and a physical interchange of the ratio detector and original sound IF amplifier tubes.





CAPACITOR VALUES UNDER 1000 ARE IN MMF. ALL OTHERS IN MF UNLESS OTHERWISE SPECIFIED.

NOTES

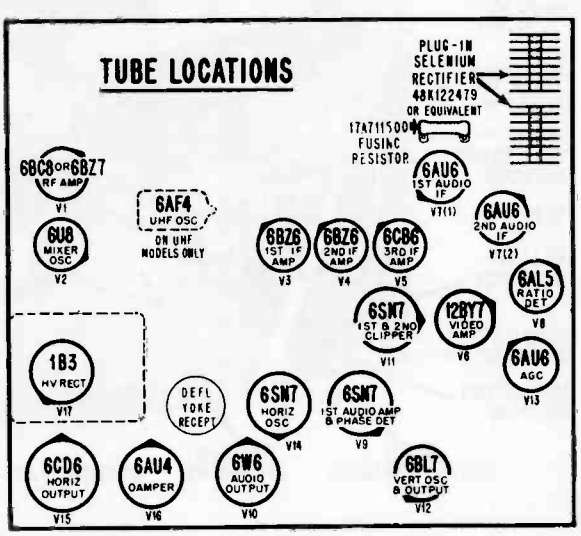
VOLTAGE MEASUREMENTS

1. Made with a VTVM from point indicated to chassis.
2. Line voltage - 117 volts (use Isolation Transformer).
3. Antenna disconnected and input shorted across.
4. Channel selector switch on channel which develops least noise at pin #9 of test receptacle.
5. Contrast control "off", maximum counterclockwise position.
6. All other controls in normal operating position.
7. Voltages associated with variable-control circuitry will vary with control setting.

WAVEFORMS

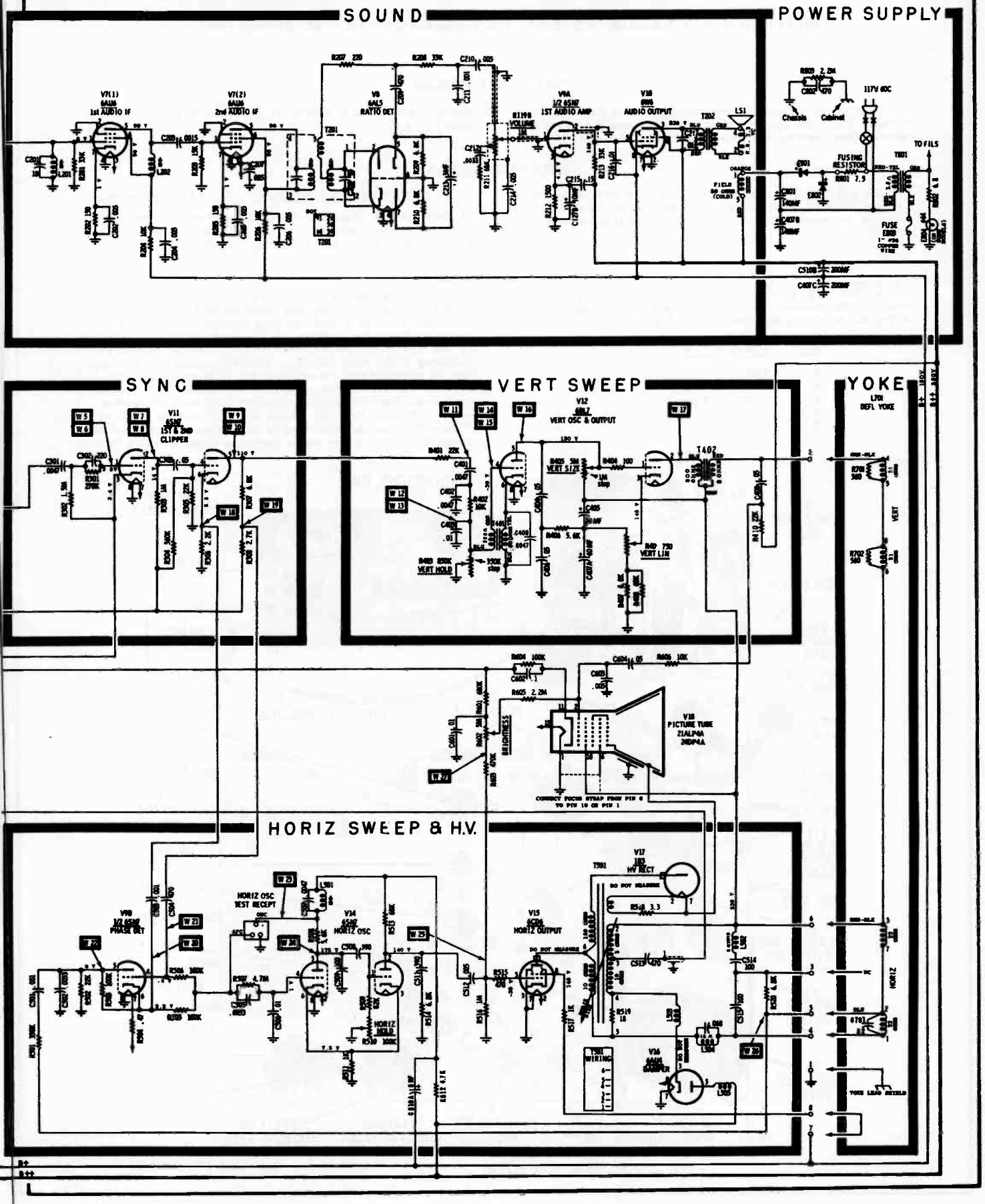
1. Designated by "W" prefix and numerical reference.
2. Photographs of waveforms are on pages
3. Required circuit conditions are given with each waveform.
4. Waveforms observed on wide-band oscilloscope.

Waveforms are illustrated on pages 75 through 78.



MOTOROLA INC.

TELEVISION CHASSIS TS-534B-00 SERIES


SOUND
POWER SUPPLY
SYNC
VERT SWEEP
YOKE
HORIZ SWEEP & H.V.
V7(1) 6AU6 1st AUDIO IF
V7(2) 6AU6 2nd AUDIO IF
V8 6AL5 RATIO DET
V9A 1/2 6SN7 1ST AUDIO AMP
V9B 6W6 AUDIO OUTPUT
V11 6SN7 1ST & 2ND CLIPPER
V12 6BL7 VERT OSC & OUTPUT
V13 PICTURE TUBE 21AUP4A 24DP4A
V14 6SN7 HORIZ OSC
V15 6CD6 HORIZ OUTPUT
V16 6AU6 DAMPER
V17 1B3 HV RECT
V18 1/2 6SN7 PHASE DET
T201
T202
T401
T402
T801
L701 DEFL YOKE
LS1
HORIZ OSC TEST RECEPT
BRIGHTNESS
VERT HOLD
VERT SIZE
VERT LIN
HORIZ HOLD
FUSING RESISTOR
FUSE
TO FILS
117V 60C
Chassis
Cabinet
DO NOT MEASURE
T701 WIRING
CORRECT FOCUS STRAP FROM PIN 6 TO PIN 10 OR PIN 1
B+
B++

MOTOROLA Chassis TS-534, Additional Service Information

TUNER TUBE SHIELDS

It is not necessary to completely remove the tuner tube shields from the chassis. Merely telescope the upper half shield down around the lower half shield for easy tube removal. Make sure shield is returned to full height after tube change.

FUSE REPLACEMENT

B+ and initial surge: Special 7.5 ohm plug-in resistor (R-801) located in the lower front section of chassis. This fuse is accessible by removing the cabinet back (See Figure 5).

Filament fuse (F-803) (one-inch of #26 copper wire)

To replace the filament fuse, the receiver must be removed from the cabinet. Replace with a piece of #26 copper wire, one inch long. Solder between the two lugs.

SERVICE TEST RECEPTACLE

A SERVICE TEST RECEPTACLE, accessible from the rear of the cabinet after the back has been removed, provides the following test points (see Figure 5):

Pin	Connection to
1	AGC
2	ground
3	video detector output
4	B+
5	B++

These test points provide rapid checking of the power supply voltages--giving the approximate condition of the selenium rectifiers and the line voltage. Operation of the receiver from the antenna to the detector may be checked by the use of pin #3 (detector output). Pin #1 allows rapid checking of the AGC voltage. It is suggested that this voltage be checked and recorded at the first opportunity by the service technician using a receiver in normal operating condition. Such AGC voltage information may be invaluable when checking sets in which the AGC action is doubtful. This voltage varies according to the signal strength and may range from a very low value (zero) to about 11 volts minus.

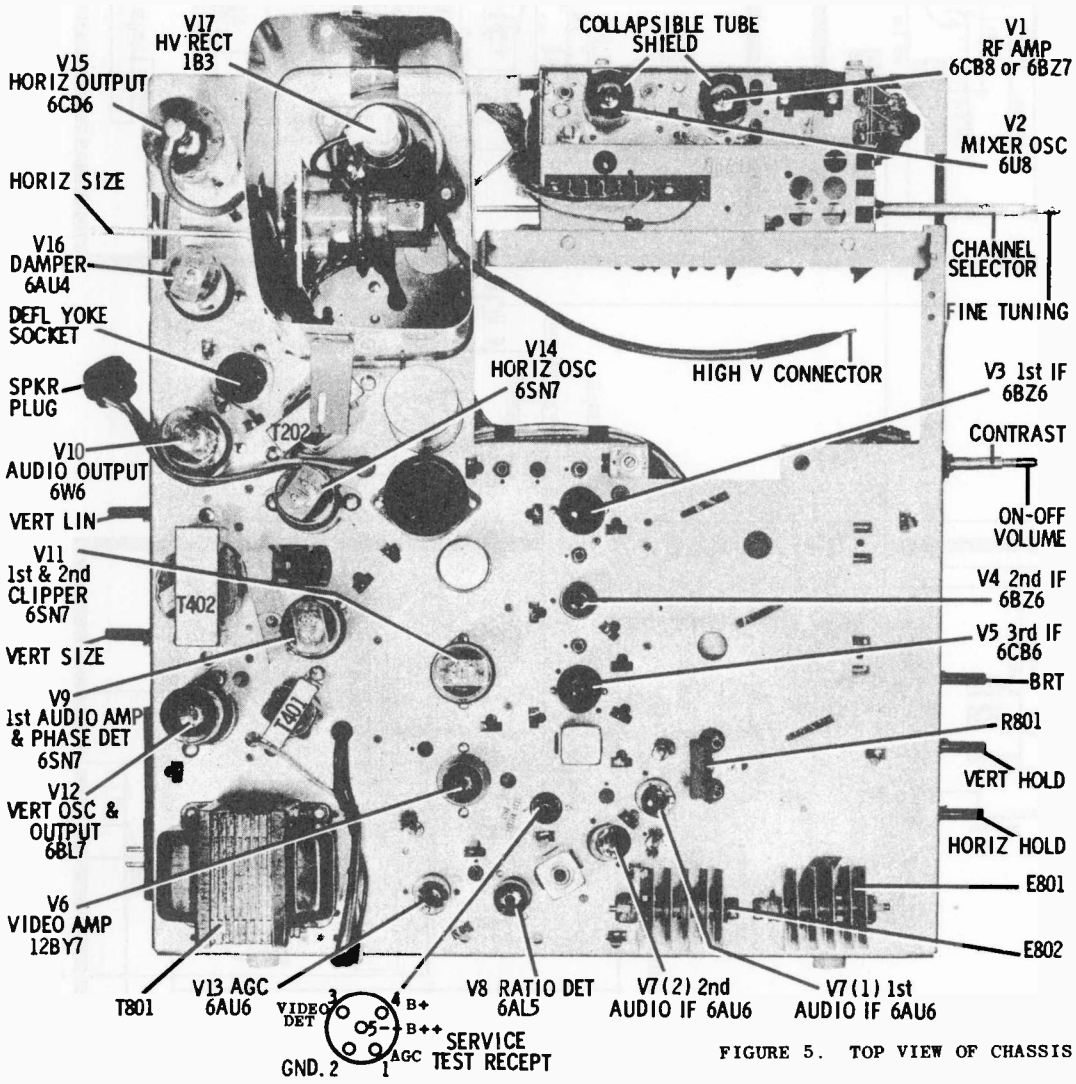


FIGURE 5. TOP VIEW OF CHASSIS

Olympic

MODELS

BD CHASSIS	BF CHASSIS
C21BD35	C21BF21
K21BD34	T21BF20
T21BD19	

DEFLECTION YOKE ADJUSTMENT

If the lines of the raster are not horizontal or squared with the picture mask, loosen the deflection yoke adjustment screw and rotate the deflection yoke until this condition is obtained, and then retighten the yoke adjustment screw. If neck shadow is evident or the corners of the raster are dark, the deflection yoke must be moved forward as far as possible and the wing screw retightened.

ADJUSMENT OF HORIZONTAL OSCILLATOR

(1) Allow set to warm up to operating temperature. Select station operating normally.

(2) Short out horizontal Phasing Coil (L17) terminals C and D.

(3) Set horizontal hold control at maximum clockwise rotation.

(4) Adjust horizontal frequency screw (L16) until picture falls into sync. Turning the horizontal frequency screw (L16) clockwise lowers the frequency, (bars sloping downward to left). Turning the screw counterclockwise increases frequency (bars sloping downward to right).

(5) Connect vertical input lead of oscilloscope with 5 MMF isolating condenser in series to terminal "C" of horizontal oscillator transformer and ground oscilloscope to chassis. Set frequency of scope to approximately 5 KC.

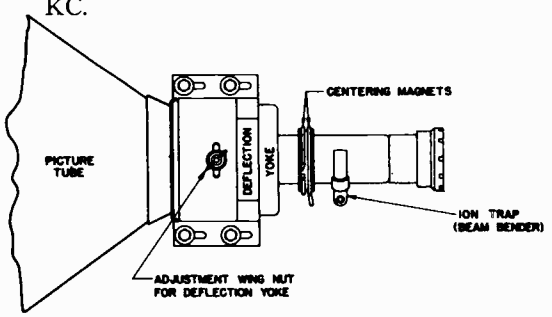


FIG. 2

(6) Remove short from terminals of the horizontal phasing coil (L17) and adjust screw (L17) until wave shape as observed on scope is like that shown in sketch. (See Fig. 3.)

(7) Some further adjustment of horizontal frequency screw (L16) may be necessary to keep picture in sync after adjusting L17 for proper wave shape.

(8) Remove scope from terminal "C" and retouch L16, as per step "9".

(9) Turn horizontal hold control through entire range. Picture should not fall out of sync at either end of rotation. At full clockwise rotation blanking bar or jitter should be evident. At full counterclockwise position picture should not fall out. If this condition cannot be achieved, it will be necessary to retouch L16.

Caution: It is important that the picture be centered in the mask properly with the horizontal hold control in the mid-position, otherwise the set user may attempt to center the picture by means of the hold control. Under this condition the control may be on "edge" and impulse noise or change of camera will cause the picture to fall out of synchronization.

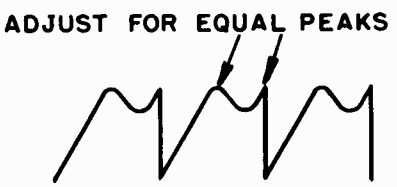


FIG. 3

ALIGNMENT PROCEDURE

ACCOMPANYING SOUND TRAP

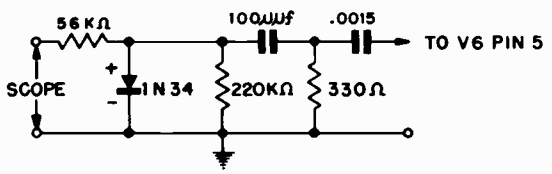
Insert a 100,000 ohm ½ watt resistor in series with the "Hot Lead" of the electronic voltmeter and connect it to the junction of L10 and C25. Meter switch should be set to the lowest negative scale. Ground lead of meter should be connected to chassis.

Remove the shield of the RF Oscillator and Mixer tube (V2) from ground clips leaving shield resting on tube and connect hot lead of the RF Signal Generator to it.. This will couple generator output to mixer plate.

Set the generator frequency accurately to 21.75 MC, and adjust (L4) sound trap (See Fig. 8, Tube and Trimmer Layout) for minimum reading on voltmeter.

PIX IF COIL ADJUSTMENT

Align the overcoupled stage L301 and L5, before adjusting any other I.F. coils, in the following man-



CRYSTAL PROBE FOR OVERCOUPLED STAGE ALIGNMENT

FIG. 4

(Alignment continued on page 92; other information on pages 90 and 91)

OLYMPIC Chassis BD and BF, Models C21BD35, K21BD34, T21BD19, C21BF21, T21BF20

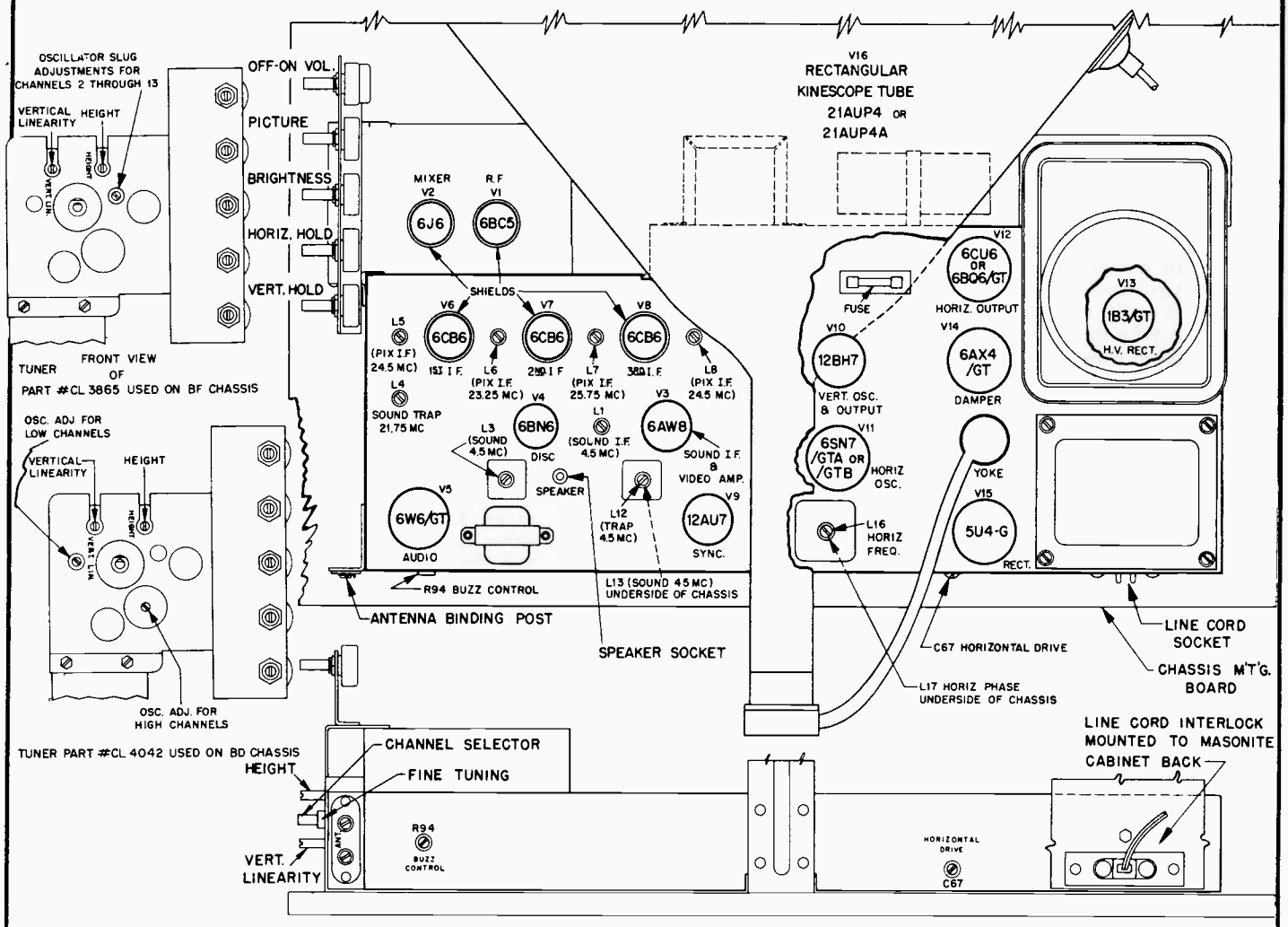
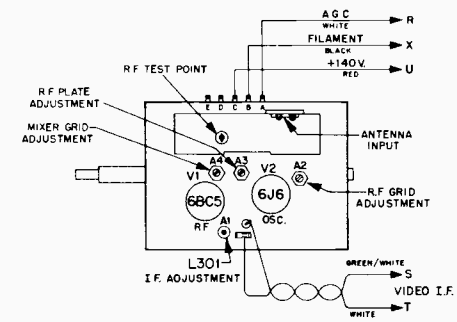


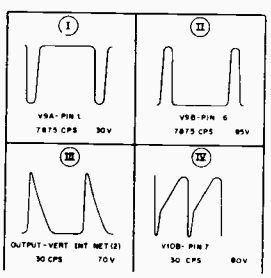
FIG. 8 REAR VIEW OF CHASSIS

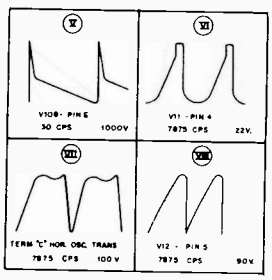
TUBE AND TRIMMER LAYOUT

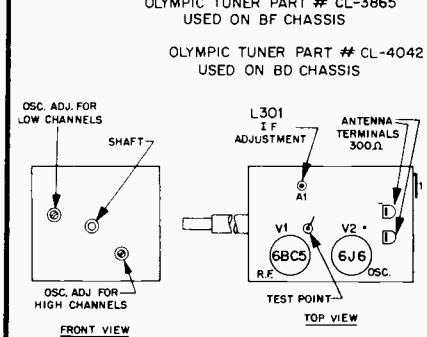


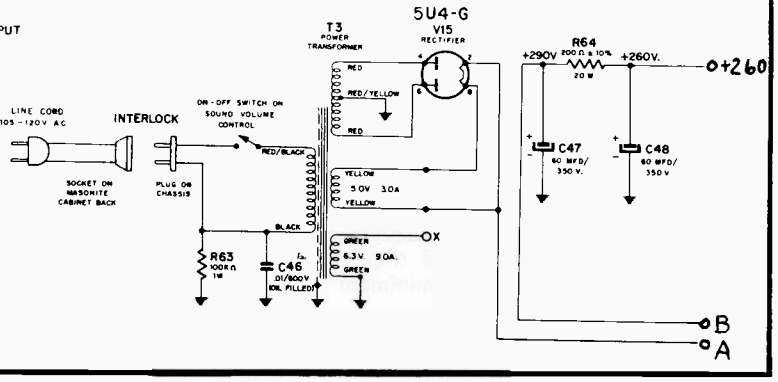
OLYMPIC TUNER PART # CL-3865 USED ON BF CHASSIS

OLYMPIC TUNER PART # CL-4042 USED ON BD CHASSIS

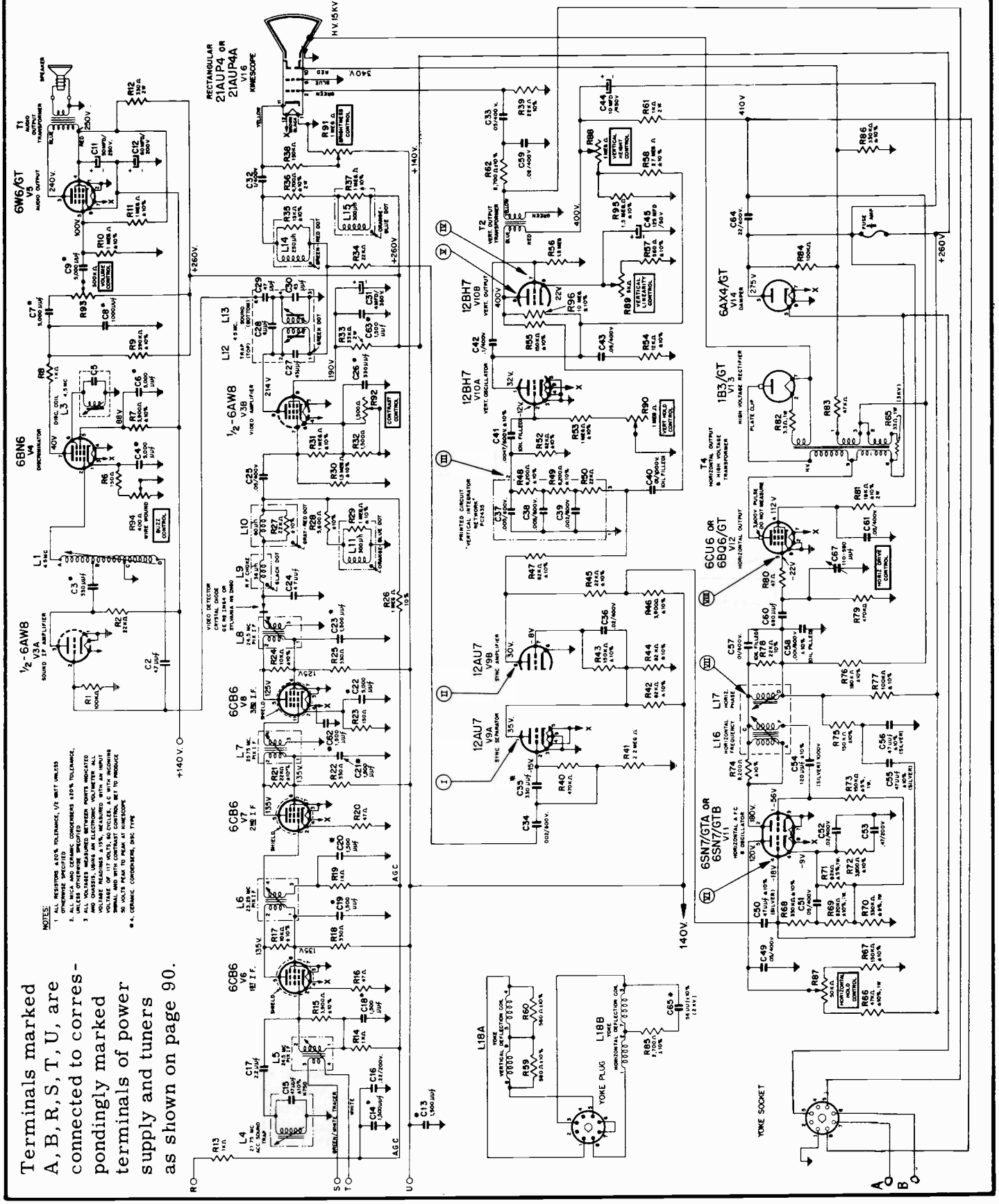








OLYMPIC Chassis BD and BF, Models C21BD35, K21BD34, T21BD19, C21BF21, T21BF20



Terminals marked A, B, R, S, T, U, are connected to correspondingly marked terminals of power supply and tuners as shown on page 90.

OLYMPIC Chassis BD and BF, Alignment Information, Continued

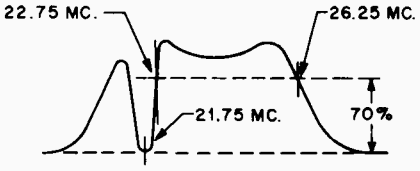
ner: Connect a jumper wire from junction of R13 and C14 (A.G.C.) to chassis and remove last I.F. tube (V8). Connect the I.F. Sweeper to the shield of V2 (as in Trap Adjustment) and the crystal probe (shown in figure 4) between the vertical input terminals of the oscilloscope and the plate (pin 5) of the 1st I.F. tube (V6). Adjust the tuner slug L301 and first I.F. slug L5 so that the 22.75 MC marker falls just on the trap (21.75MC) side of the peak. Both slugs should be adjusted such that both peaks are of equal maximum height as illustrated in figure 5. Remove jumper wire and replace V8.

Note: After setting L301 and L5 DO NOT readjust to improve wave shape.

Adjust the following slugs for maximum output at frequencies and sequence indicated with meter and generator connected as in "ACC. Sound Trap" adjustment.

L6	23.25 MC
L7	25.75 MC
L8	24.5 MC

If oscillation occurs during alignment, temporarily raise frequency of L8 by turning screw counterclockwise until screw projects approximately ¾". Oscillation is evidenced by high reading on voltmeter (— 5V to — 20V) with signal generator OFF and no signal coming in through the antenna terminals. After properly adjusted L301, L5, L6 and L7 reset L8 to proper frequency, if it had been necessary to detune.



NORMAL CURVE FOR OVERCOUPLED STAGE

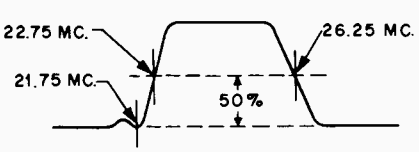
FIG. 5

Connect hot lead of sweep generator through a 330 uuf-condenser to test point on tuner and connect ground lead to chassis.

Connect vertical input terminal of oscilloscope to junction of peaking coil L10 and C25 and connect ground lead of scope to chassis.

Connect 1.5V flashlight battery with positive terminal to chassis and negative terminal to junction of R13 and C14. This point is AGC bias voltage. Set tuner to Channel 9 unless local station is operating on this frequency, in which case an adjacent channel should be used.

Set Sweep Generator frequency to IF sweep on the 20 to 30 MC range.



STANDARD RESPONSE CURVE

FIG. 6

Adjust sweep generator output to produce a curve on the scope which is approximately 3 volts peak to peak.

Loosely couple output of RF signal generator by using shield on V2 and set frequency of RF signal generator to 26.25 MC (marker).

Curve shown on scope should be similar to the response curve shown in Figure 6. For proper setting of the pix carrier the 26.25 MC marker should appear on the curve at a point approximately 50% of the vertical height of the curve.

To obtain this setting retouch L8.

Reset RF signal generator frequency to 22.75 MC and retouch L6 for correct positioning of marker on curve.

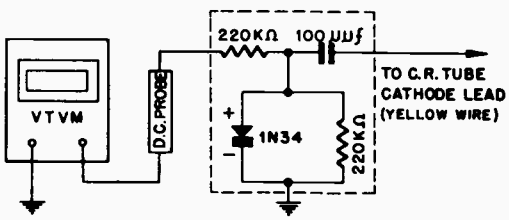
Recheck setting at 26.25 MC marker to make sure that position has not shifted on curve.

Disconnect bias battery.

4.5 MC TRAP ALIGNMENT

Connect voltmeter lead to Diode crystal rectifier as shown in Fig. 7. Connect Diode crystal rectifier between C. R. Tube Cathode lead (yellow wire) and chassis ground. Signal generator is connected at junction of L10 and C25. Set contrast control at maximum and voltmeter to 3 volt scale (negative). Remove 6CB6 (V8) from socket. Use maximum output of generator at 4.5 MC. Adjust L12 for minimum reading on meter.

When it is necessary to retouch this trap in the field, proper adjustment can be made by using the local station signal and turning the Fine Tuning Control to bring fine herringbone sound beat into the picture. The 4.5 MC trap (L12) should then be adjusted to minimize this beat interference.



VOLTMETER AND CRYSTAL DIODE CONNECTIONS

FIG. 7

SOUND DISCRIMINATOR (4.5 MC) ADJUSTMENT

In view of the fact that the transmitted sound signal from a TV station is probably the most accurate available, as far as frequency is concerned, it is recommended that a working signal be used for sound alignment. The set should be turned on, allowed to warm up for 5 to 10 minutes and then tuned to an extremely weak signal. A vacuum tube voltmeter should be connected to Pin 3 of V3A through a crystal detector probe and the meter set to the minus 30 volt scale. The bottom of the 4.5 MC Sound IF Transformer (L13) and L1 should be tuned for maximum deflection of the meter.

The Quadrature coil L3 should be adjusted for maximum audio output using the transmitted signal from a TV station. This is done with the "BUZZ CONTROL" (R94) set to mid-range. An output meter connected to the voice coil terminals may be used for this adjustment, or it may be done by ear since the coil slug must be set carefully for elimination of Buzz. Both the "BUZZ CONTROL" and L3 coil must be adjusted for maximum audio output and elimination of Buzz.

Packard-Bell

Models 21103, 21202, 21401, Chassis T-1

ADJUSTMENT OF NON-OPERATING CONTROLS:

The following adjustments should be made while observing a station test pattern. Allow receiver to warm up for ten minutes.

The HORIZONTAL DRIVE control is adjusted by rotating it clockwise until a bright vertical bar appears, causing picture compression. Then the control is rotated counterclockwise until the compression just disappears. Recheck after adjusting width.

Adjust HEIGHT and WIDTH controls in conjunction with VERTICAL LINEARITY control so that the large circles in the test pattern are as round as possible, and so that the test pattern is slightly larger than the mask opening.

The VERTICAL HOLD is adjusted so that the picture does not move up or down.

The HORIZONTAL HOLD control is set about halfway between the points where the picture tears.

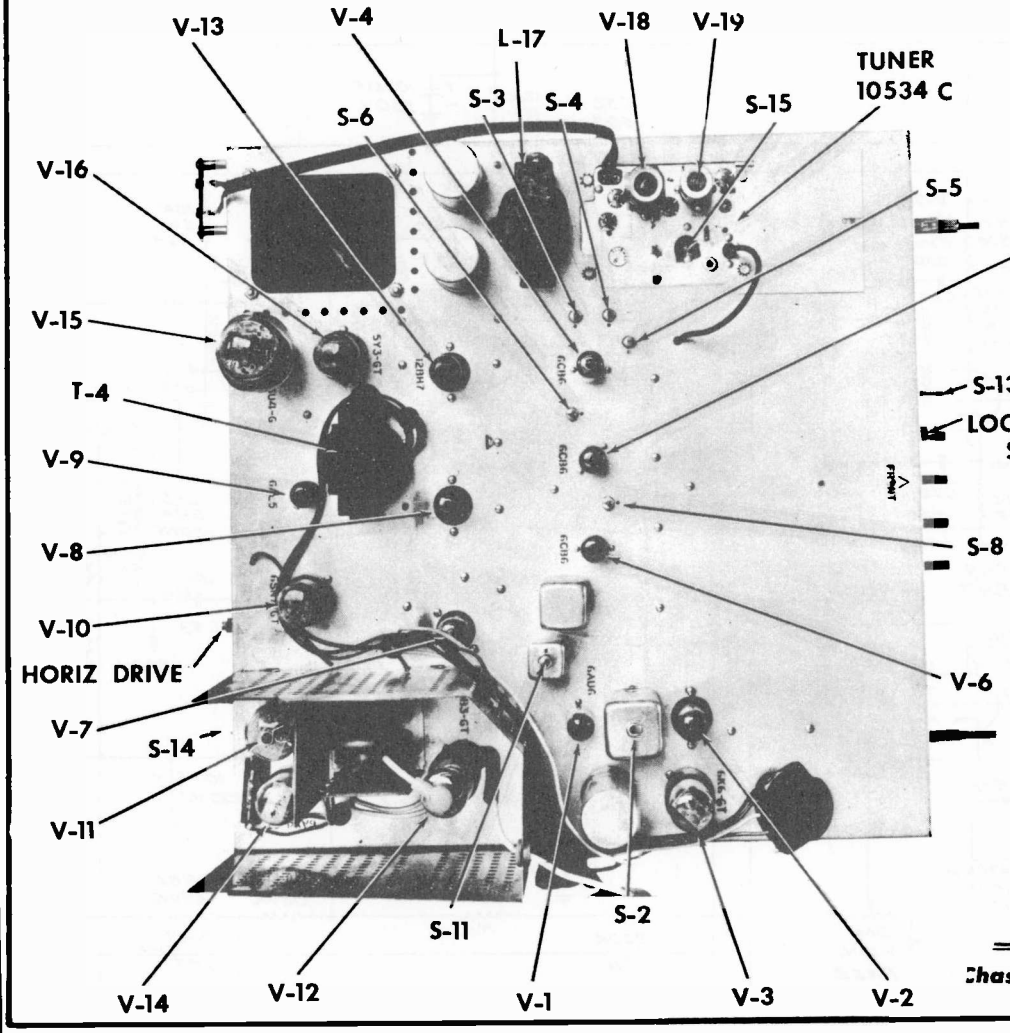
FOCUSING is controlled by the voltage on grid four (terminal 6) of the picture tube. Grid is connected to either the ground, 280 volt, or 400 volt lead, whichever gives the best result. This varies with the picture tube used.

AGC (LOCAL-DISTANCE) SWITCH:

A switch on the front panel is used to add "delayed AGC" to the tuner. In most areas this switch should be left in the normal (local) position. In some weak-signal areas an improvement in signal to noise ratio will be obtained when operating this switch in the delayed (distance) position.

PICTURE LOCK CONTROL:

In all but extremely noisy locations this control should be left as set at the factory, in the counterclockwise position. In fringe areas, if noise affects the sync stability, the control should be set as far clockwise as possible without pulling or tearing the picture. When switching from a local to a distant station, the control may require resetting if strong noise is encountered.



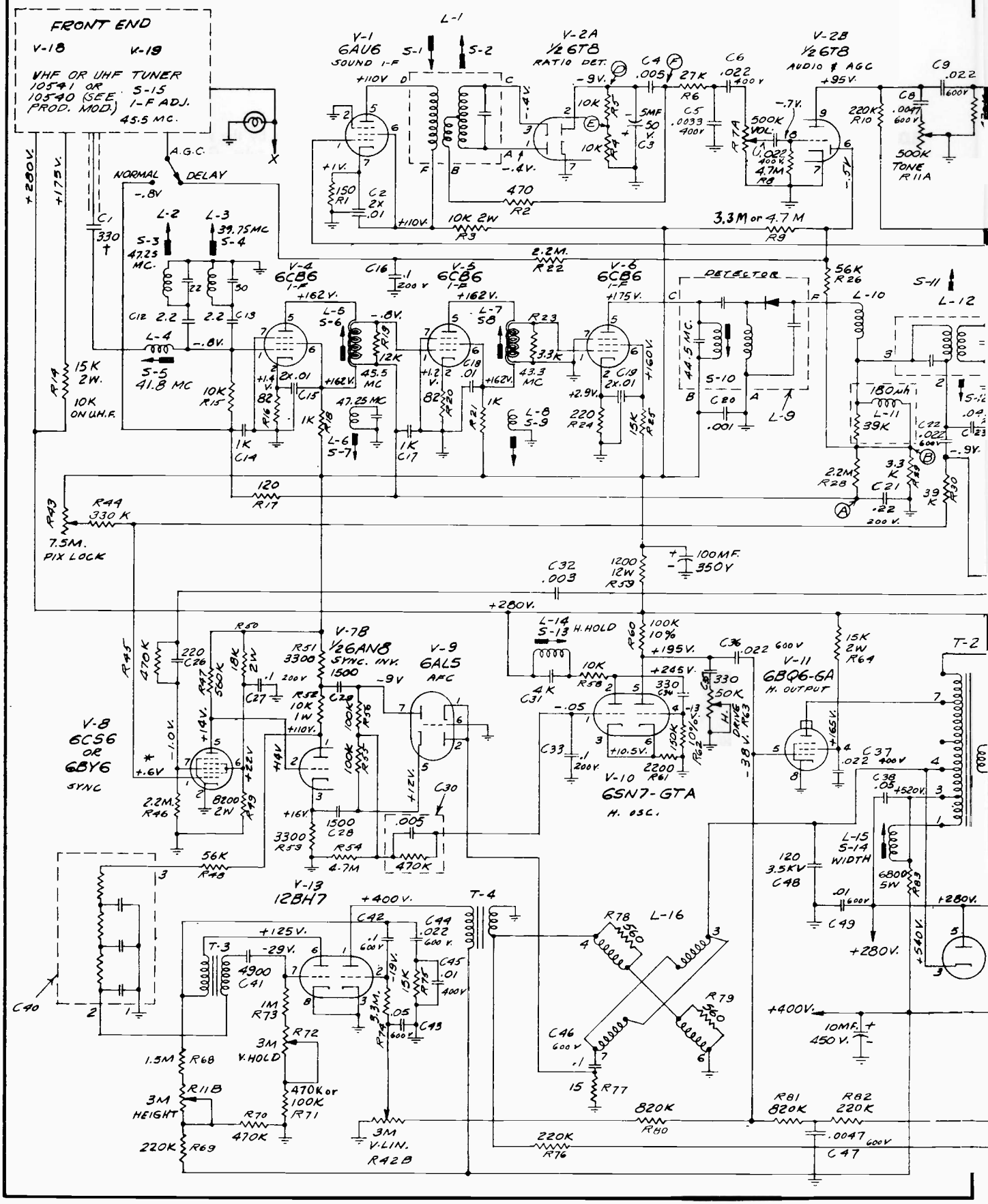
Circuit diagram is on pages 94-95, and alignment is on page 96.

LIST OF ADJUSTMENTS

S-1	Ratio detector primary
S-2	Ratio detector secondary
S-3	Trap, 47.25 Mc.
S-4	Trap, 39.75 Mc.
S-5	1st pix I-F, 41.80 Mc.
S-6	2nd pix I-F, 45.50 Mc.
S-7	Trap, 47.25 Mc.
S-8	3rd pix I-F, 43.30 Mc.
S-9	Trap, not used
S-10	4th I-F, 44.50 Mc.
S-11	Trap, 4.50 Mc.
S-12	Sound I-F, 4.50 Mc.
S-13	Horizontal hold
S-14	Width
S-15	Tuner I-F, 45.50 Mc.

Chassis T-1, Top View

PACKARD-BELL Models 21103, 21202, 21401, Chassis T-1, Circuit Diagram



PACKARD-BELL Models 21103, 21202, 21401, Chassis T-1

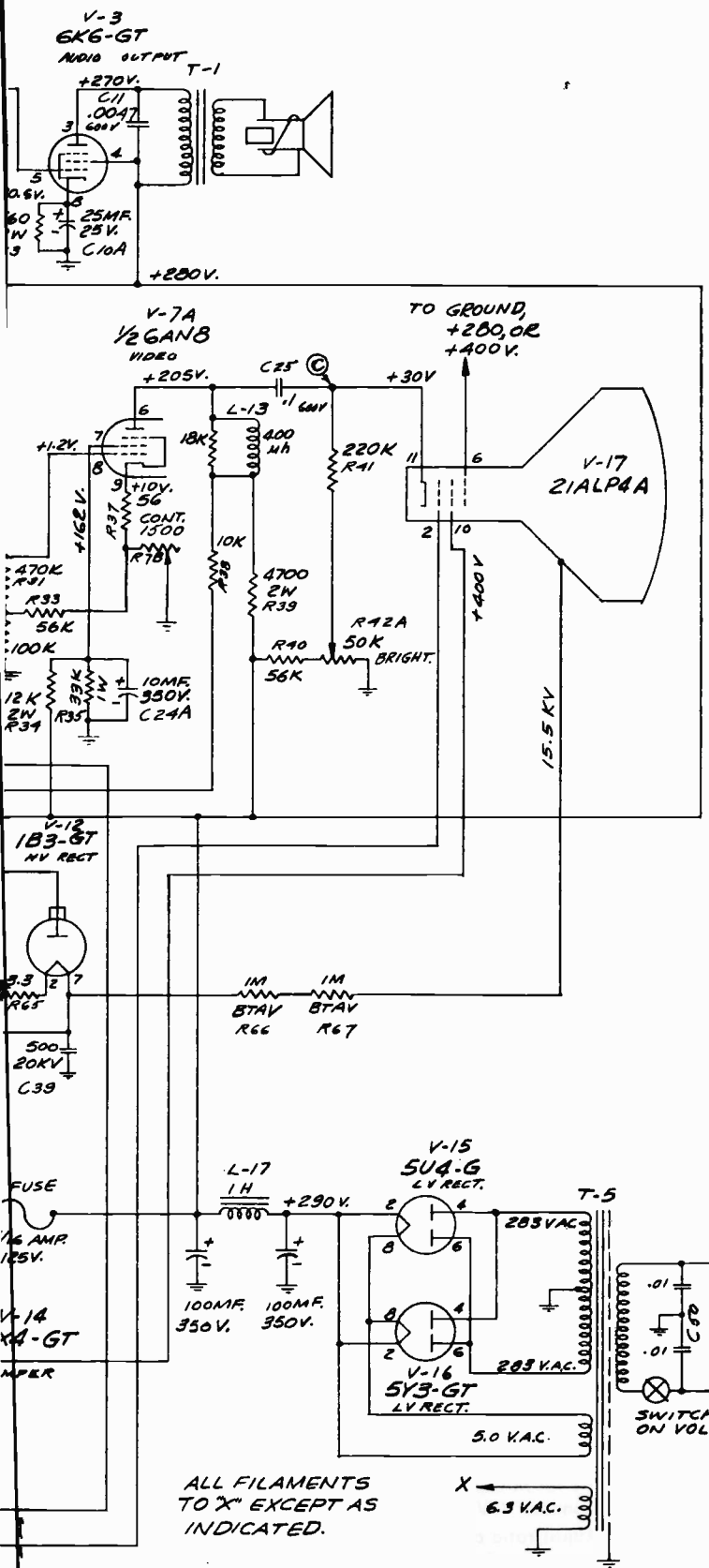


Fig. 9. Schematic Diagram, Chassis T-1

PRODUCTION MODIFICATIONS:

All changes have been incorporated in the schematic diagram in this manual (Fig. 9).

1. Resistor, 3300 ohms, was added across contrast control. (Reduce large contrast change of 5000 ohm control.) See modification 11, below.

2. C-48 changed from 56 to 120 mmf. (Reduce high picture tube anode voltage.)

3. C-21 changed from .05 to .22 mfd.
   C-45 changed from .022 to .01 mfd.
   R-71 changed from 270,000 to 100,000 ohms.
   R-46 changed from 1.5 to 2.2 megohms.
   R-50 changed from 33,000 ohms, 2 watts, to 18,000 ohms, 3 watts. (Improve vertical linearity and sync stability.)

4. R-9, R-22, R-26, and C-16 were added when delayed AGC was incorporated into the circuit. (Improve fringe reception.)

5. V-11 changed from 6BQ6-GT to 6BQ6-GA. (Increase safety factor.)

6. R-24 changed from 120 to 330 ohms, later to 220 ohms. R-25, 15,000 ohm screen dropping resistor added. This resistor was originally 470 ohms and also dropped voltage to R-3. (Remedy sync compression.)

7. R-14 added to circuit. (Eliminate beat interference.)

8. R-76, 220,000 ohms, inserted in picture tube grid lead. (Remove vertical bars in picture.)

9. R-44, 330,000 ohms, was 150,000 ohms in some sets. (The 330,000 value improved stability.)

10. Resistor across contrast control was changed from 3300 to 2200 ohms. Later the control itself was changed from 5000 to 1500 ohms and the shunting resistor deleted altogether. (Improve contrast control.)

NOTE:
VOLTAGES MEASURED TO GROUND WITH NO SIGNAL, 117 VOLTS LINE, AGC SWITCH SET AT "NORMAL".

+ INDICATES USED ON U.H.F. ONLY.

* APPROX. VOLTAGE IN COUNTER-CLOCKWISE POSITION OF PIX LOCK. THIS VOLTAGE WILL VARY WITH PIX LOCK POSITION

PACKARD-BELL Models 21103, 21202, 21401, Chassis T-1, Alignment Procedure

ALIGNMENT PROCEDURE

GENERAL:

It is important that the service technician read and adhere to the alignment instructions in this section, especially in the case of the picture I-F.

Some service technicians may be accustomed to aligning the picture I-F response curve on the oscilloscope alone. This procedure is not recommended because it is actually quite possible to get what appears to be an acceptable curve and still be lacking in horizontal resolution.

Instead, the spot frequency alignment outlined below should be followed.

In this procedure the sweep generator is fed in through the antenna terminals, therefore the output impedance of the generator must match the 300 ohms impedance of the set. A matching network may be devised to accomplish this. Figure 5 shows a network for a sweep generator with 75 ohms output impedance. If the generator impedance is 50 ohms, change the values to 56 ohms for the shunt resistor and 130 ohms for each of the series resistors.

Loose-coupling the signal generator to the mixer tube (done in step 2, below) is accomplished by lifting the tube shield from ground and connecting the generator between the shield and ground. Keep leads less than 1½ inches long.

Allow set to warm up for ten minutes before alignment.

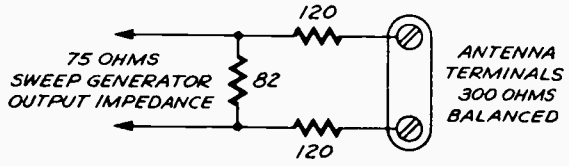


Fig. 5. Matching Network

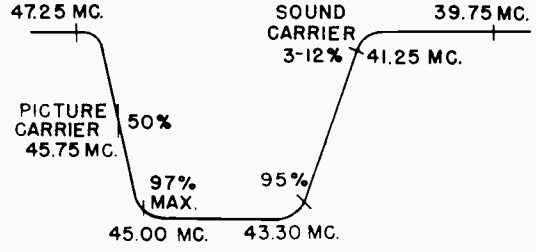
PICTURE I-F ALIGNMENT:

1. Connect a VTVM between point "A" and ground.
2. Loosely couple signal generator to mixer tube in tuner (see par. on R-F tuner). This is accomplished by connecting generator between tube shield and ground (keep leads short). Set generator output at maximum.

Step	Sig Gen. Freqncy	Adjust	For
3.	47.25 Mc.	S-3 & S-7	Minimum
4.	39.75 Mc.	S-4	Minimum
S-3 & S-4 appear similar; S-3 is nearer the power transformer)			
(The trap on the third I-F coil, S-9, is not used)			
5.	45.50 Mc.	S-15 (mixer I-F in tuner)	MAXIMUM
6.	45.50 Mc.	S-6	MAXIMUM
7.	41.80 Mc.	S-5	MAXIMUM
8.	43.30 Mc.	S-8	MAXIMUM
9.	44.50 Mc.	S-10	MAXIMUM
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 volts 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 about 2 volts of AGC.
13. With signal generator still coupled to mixer tube, adjust output to provide the markers shown on the illustrated response curve. Check position of the markers one at a time. Some slight touching-up of the I-F adjustments may be needed to make the curve correspond to the illustration.

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



I-F Response Curve

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 an R-F vacuum tube voltmeter to point "C". If an R-F VTVM is not available, use a germanium crystal diode in series with the probe of a conventional VTVM.
4. Set signal generator to 4.50 Mc., with the output at one volt or more.
5. Adjust trap, S-11, for minimum VTVM reading.

NOTE: If signal generator is incapable of a 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 through a .001 mfd isolating capacitor.
2. Connect VTVM between point "D" and ground.
3. With generator frequency at 4.50 Mc., adjust S-12 and S-1 for MAXIMUM.
4. Connect VTVM between points "E" and "F".
5. Adjust ratio detector secondary, S-2, for zero between positive and negative peaks.
6. Repeat steps 2 and 3.

PHILCO

Chassis TV-330, TV-330U, TV-390, TV-392, TV-394, TV-440, and TV-444

PHILCO "D" LINE TELEVISION RECEIVERS

Philco "D" Line, 1956 television receivers are covered on pages 97 through 106. This factory released material is reproduced through the courtesy of the Philco Corp. The important facts and differences of the three basic chassis series used are explained below. To find what chassis, as well as what tuner and picture tube, any particular model uses, please refer to the chart below.

MODEL	CHASSIS	TUNER PART NO.	PICTURE TUBE
18D3020C		C 76-9192-3	
18D3020UC	330	UC 76-8946-10	17BP4A
18D3020G		G 76-9192-3	
18D3020UG	330	UG 76-8946-10	17BP4A
18D3020L		L 76-9192-3	17BP4A
18D3020UL	330	UL 76-8946-10	
18D3020M		M 76-9192-3	
18D3020UM	330	UM 76-8946-10	17BP4A
18D3122		76-9192-3	
18D3122U	330	U 76-8946-10	17BP4
22D4030E		E 76-9192-3	
22D4030UE	330	UE 76-8946-10	21ZP4A
22D4030L		L 76-9192-3	
22D4030UL	330	UL 76-8946-10	21ZP4A
22D4032	330	76-9192-3	21ZP4B
22D4034	390	76-8946-9	21AMP4A
22D4034L	390	76-8946-9	21AMP4A
22D4136		76-9192-3	
22D4136U	330	U 76-8946-10	21ZP4B
22D4136L		L 76-9192-3	
22D4136UL	330	UL 76-8946-10	21ZP4B
22D4138		76-9192-3	
22D4138U	330	U 76-8946-10	21ZP4B
22D4138L		L 76-9192-3	
22D4138UL	330	UL 76-8946-10	21ZP4B
22D4140	390	76-8946-9	21AMP4A
22D4144	392	76-8946-11	21ZMP4A
22D4140L	390	76-8946-9	21AMP4A
22D4144L	392	76-8946-11	21AMP4A
22D4148	440	76-9531-1	21AMP4A
22D4148L	440	76-9531-1	21AMP4A
22D4150		76-9192-3	
22D4150U	330	U 76-8946-10	21ZP4B
22D4150L		76-9192-3	
22D4150UL	330	U 76-8946-10	21ZP4B
22D4152HM	390	76-8946-9	21AMP4A
22D4152M	390	76-8946-9	21AMP4A
22D4154		76-9192-3	
22D4154U	330	U 76-8946-10	21ZP4B
22D4156	392	76-8946-11	21AMP4A
22D4156L	392	76-8946-11	21AMP4A
22D4158		76-9192-3	
22D4158U	330	76-8946-10	21ZP4B
22D4159	392	76-8946-11	21AMP4A
22D4160	392	76-8946-11	21AMP4A
22D4160L	392	76-8946-11	21AMP4A
22D4162	440	76-9531-1	21AMP4A
22D4162L	440	76-9531-1	21AMP4A
22D4164	440	76-9531-1	21AMP4A
22D4320L	330	76-9192-3	21ZP4B
22D4320M	330	76-9192-3	21ZP4B
22D4320T	330	76-9192-3	21ZP4B
22D4320W	330	76-9192-3	21ZP4B
22D4324HM	392	76-8946-11	21AMP4A
22D4324L	392	76-8946-11	21AMP4A
22D4326	392	76-8946-11	21AMP4A
24D6018	396	76-8946-9	24VP4A
24D6120L	394	76-8946-11	24VP4A
24D6120M	394	76-8946-11	24VP4A
24D6122L	394	76-8946-11	24VP4A
24D6122M	394	76-8946-11	24VP4A
24D6126L	444	79-9531-1	24VP4A
24D6126M	444	79-9531-1	24VP4A
24D6320C	444	79-9531-1	24VP4A
24D6320M	444	79-5931-1	24VP4A

Chassis TV-330 and TV-330U are practically identical. The chassis with the letter "U" contains facilities for the installation of a UHF tuner adapter. The circuit diagram of these chassis is on pages 100-101, and important alignment information is given on pages 98 and 99. The various waveforms presented in this section also apply to this series.

Another series is formed by the group of chassis TV-390, TV-392, and TV-394. These chassis differ in that the TV-392 and TV-394 are designed for the installation of Philco Automatic Tuning System, while the TV-394 also differs in the output deflection circuits since it uses a larger picture tube. The circuit diagram applicable to TV-390 and TV-392 is on pages 104-105, while a partial schematic of TV-394 is on page 106, and should be used with the balance of the circuit on page 104.

The custom series includes chassis TV-440 and TV-444. These differ only in that the TV-444 has output deflection circuits for a 24-inch picture tube. The early circuit for this series is on pages 102 and 103, and there are also some brief service instructions.

OSCILLOSCOPE WAVEFORM PATTERNS — TV-330 and TV-330U

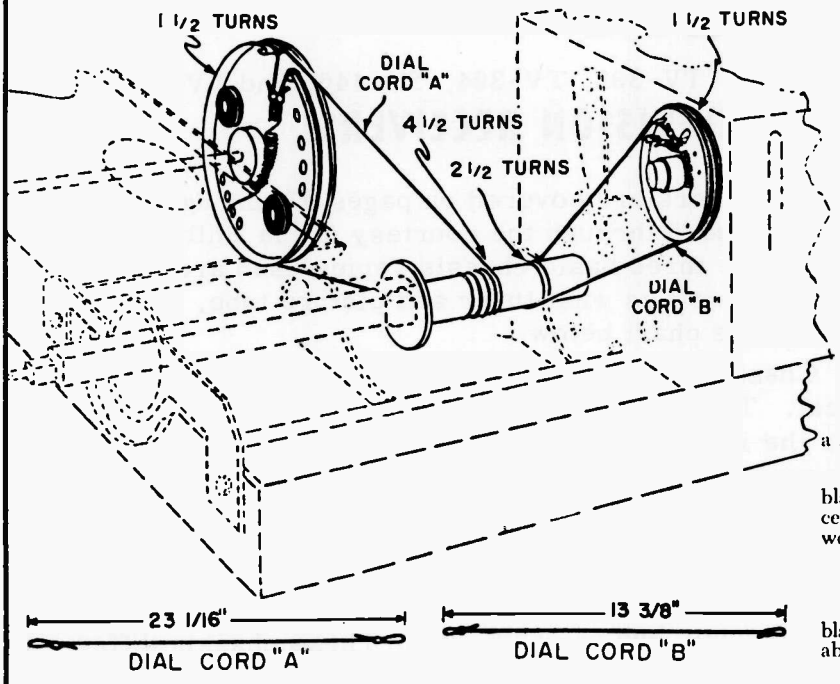
These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 4 volts at the video detector. The voltages given with the waveforms are approximate peak-to-peak values. The frequencies shown are those of the waveforms – not the sweep rate of the oscilloscope. The waveforms were taken with an oscilloscope having good high-frequency response. With oscilloscopes having poor high-frequency response, the sharp peaks of the horizontal waveforms will be more rounded than those shown, and the peak-to-peak voltages will differ from those shown.

12BR7 Sync Separator Plate, Pin 1, 53 volts, 15,750 c.p.s.

12BH7 Vertical-Oscillator Grid, Pin 7, 150 volts, 60 c.p.s.

(Additional waveforms are on page 102)

PHILCO



Dial Cord Stringing Arrangement, T-36D.

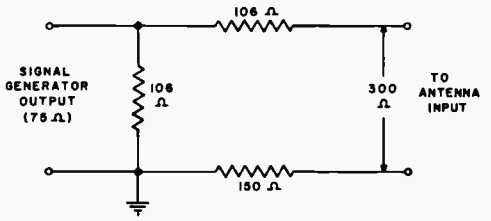
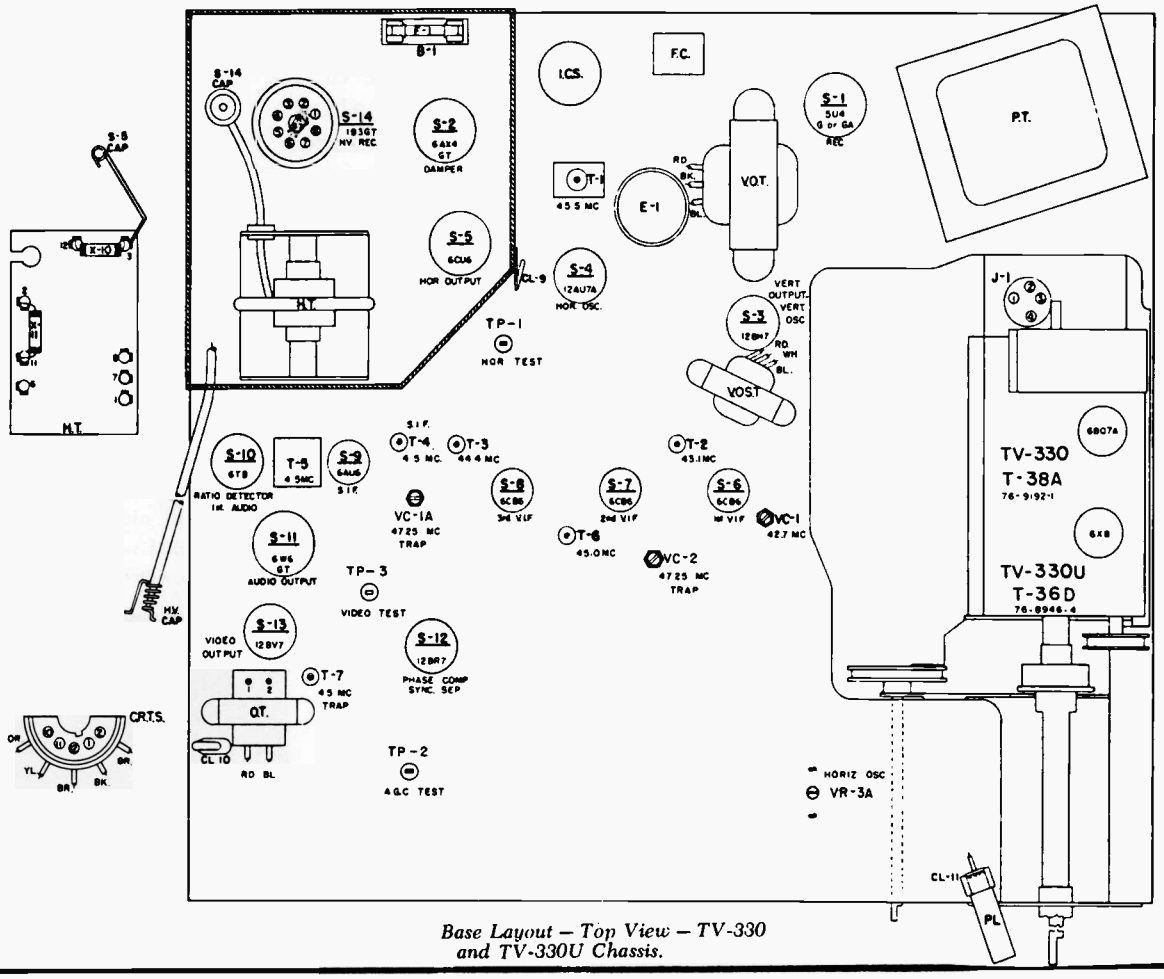


Fig. 1. Antenna-Input Matching Network.

HORIZONTAL OSCILLATOR ADJUSTMENT

1. Turn contrast down until blanking is visible.
2. Set Horizontal Hold Control (VR-4) to center of its range.
3. Short out the stabilizing coil, T1 (TP-1 to ground), with a .1 mfd condenser.
4. Adjust auxiliary oscillator control (VR-3A) until equal blanking exists on each side of raster. The picture must be de-centered, first to one side—then to the other, by moving the wobble plate.
5. Remove the shorting condenser.
6. Adjust T1 until picture is brought into sync with equal blanking on each side. The wobble plate is used as in #4 above.
7. Check the pull-in by tuning the Horizontal Hold Control until the picture goes out of sync and then slowly bring the picture back into sync. This pull-in should occur between 2½ to 3 bars. If pull-in is incorrect repeat the above steps.



Base Layout – Top View – TV-330 and TV-330U Chassis.

PHILCO

VIDEO I-F ALIGNMENT

TV-330 and TV330U CHASSIS

A.M. GENERATOR: Connect to mixer test point, TP-2, through a mixer jig, and adjust the generator for approximately 30% modulation at 400 cycles. Adjust the output of the generator during alignment to keep the signal at TP-3 below 2.0 volts peak to peak.

SWEEP (FM) GENERATOR: After step 5 connect to antenna-input circuit through antenna-input matching network (see figure 1).

OSCILLOSCOPE: Connect vertical-input lead to TP-3, the video test point.

PRESET: Contrast control full on. Channel selector to channel position No. 1 for TV-330U and to channel 4 for TV-330.

BIAS: Apply 5.0 volts of negative bias into TP-2 (AGC system).

NOTE: *I-F Shield must be in place.*

STEP	AM GENERATOR DIAL SETTING	SWEEP (FM) GENERATOR		ADJUST	REMARKS
		SWEEP DIAL SETTING	MARKET DIAL SETTING		
1	47.25 mc.			VC-2 and VC-1A for minimum output.	It is necessary to keep generator output sufficiently high that a null indication may be observed on scope; however, avoid overloading receiver by excessive signal.
2	44.4 mc.			T3-IF for maximum indication on scope.	Adjust the output of the AM generator to keep the output at the second detector below 4 volts, peak to peak. (For convenience, the scope may be calibrated for this purpose beforehand.
3	43.1 mc.			T2-IF for maximum indication on scope.	
4	45.0 mc.			T6-IF for maximum indication on scope.	
5	45.5 mc.			T1 (tuner) for maximum indication on scope.	
6	42.7 mc.			VC-1 for maximum indication on scope.	
7		Channel 4 (69 mc. with 6 mc. sweep width).	Run marker along curve checking against curve limits given in figure 6.	If necessary retouch T1 (tuner), VC1, T2-IF, T6-IF, T3-IF.	Adjust carrier level with T1 (tuner) and T6, level curve with T-3. Position 42.5 mc. slope with VC-1 and T-2. CAUTION: Retouch only slightly.

SOUND ALIGNMENT

BIAS: For steps 2, 3 and 4 inject a –8 volt bias at TP-3.

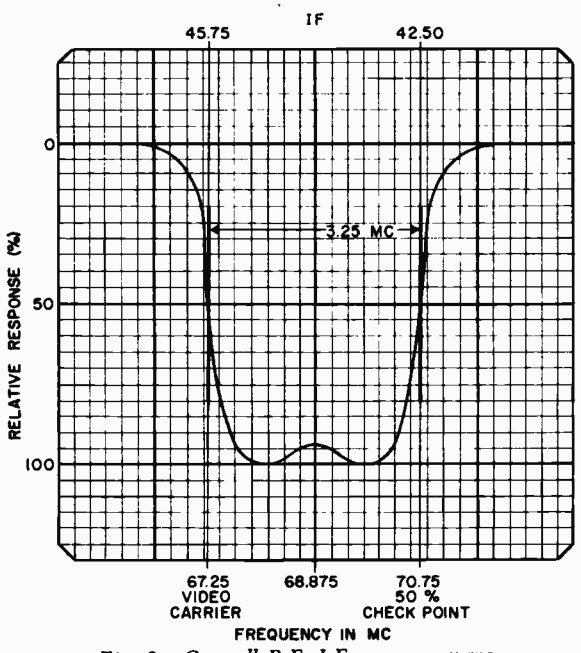


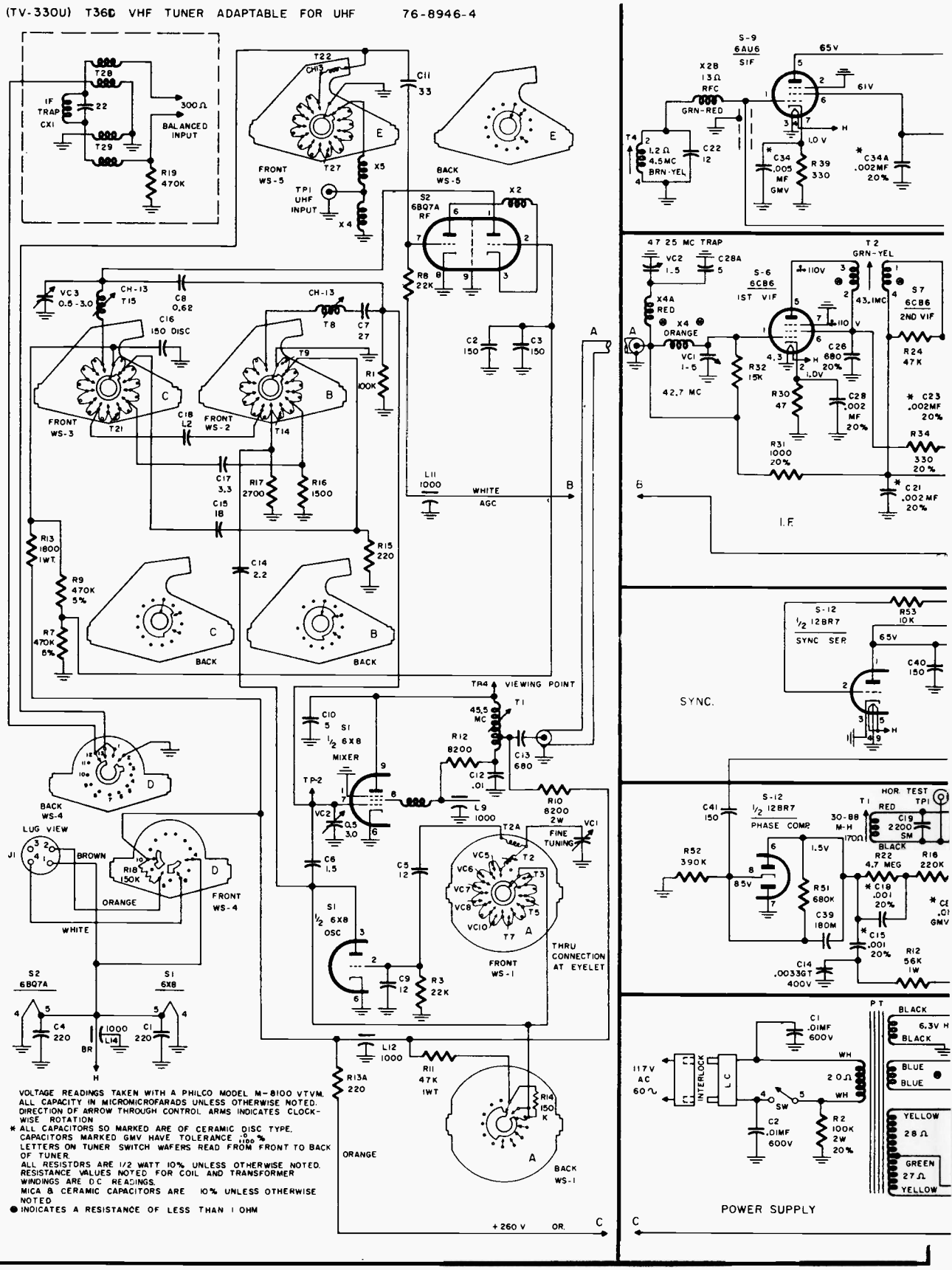
Fig. 6. Over-all R-F, I-F response curve, showing tolerance limits.

A.M. GENERATOR: Connect the "hot" lead to TP-3. Adjust generator for 30% modulation at 400 cycles.

VOLTMETER: Use V.T.V.M. on 20,000-ohms-per-volt voltmeter. Connect through a crystal probe to pin No. 11 of the picture tube in step 1 and to pin No. 3 of the 6W6GT audio output tube in the remainder of the steps.

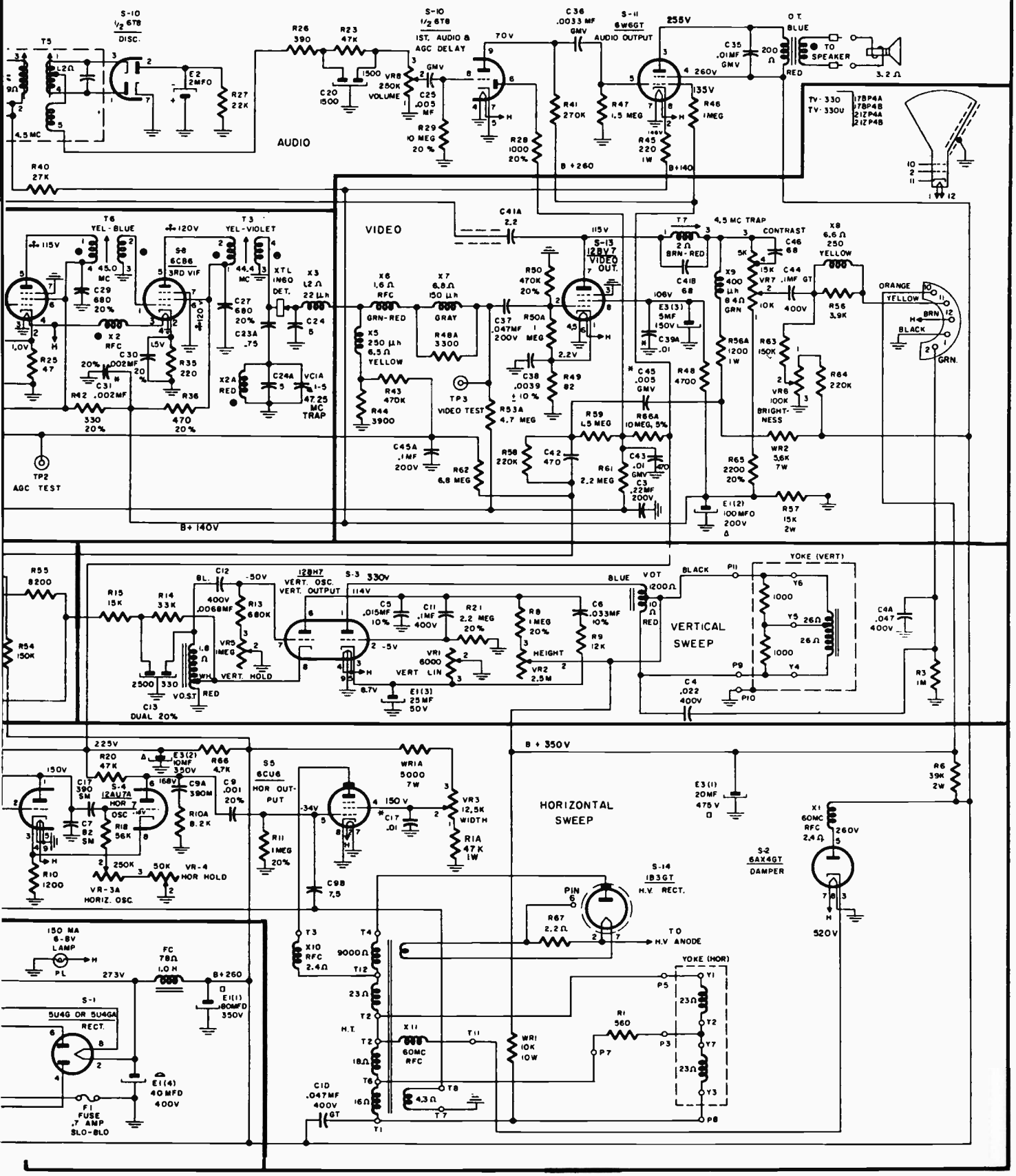
STEP	AM GENERATOR DIAL SETTING	ADJUST	REMARKS
1	4.5 mc. modulated	T7-Sound Trap for minimum indication.	Voltmeter through xtal probe. Plate of video amplifier.
2	4.5 mc. modulated	T5 top for maximum indication.	a. Volume control full on. b. Voltmeter thru xtal probe to 6W6 pin No. 3. c. Keep generator level low to prevent overload.
3	4.5 mc. modulated	T5 bottom for maximum indication.	
4	4.5 mc. modulated	T4-IF for maximum indication.	

PHILCO Schematic Diagram TV-330 and TV-330U Chassis



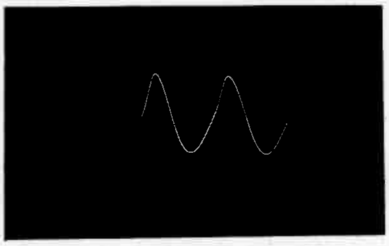
PHILCO

Schematic Diagram – TV-330 and TV-330U Chassis.



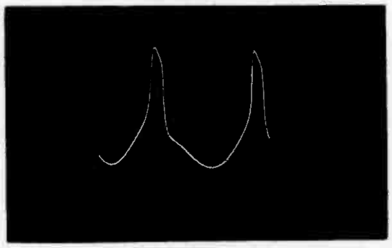
12BH7 Vertical-Output Plate, Pin 1, 1000 volts, 60 c.p.s.

12BR7 Phase Comparer, Pin 6, 9 volts, 15,750 c.p.s.

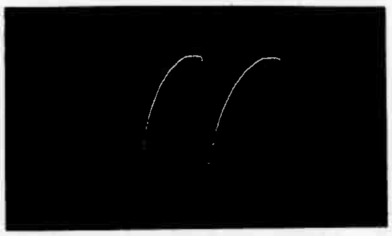


12AU7A Horizontal Oscillator, TP-2, junction of T1 and R17, 30 volts, 15,750 c.p.s.

12AU7A Horizontal-Oscillator Cathode, Pins 3 and 8, 12 volts, 15,750 c.p.s.



12AU7A Horizontal-Oscillator Grid, Pin 7, 45 volts, 15,750 c.p.s.



6CU6 Horizontal-Output Grid, Pin 5, 100 volts, 15,750 c.p.s.

INSTRUCTIONS FOR REMOVING THE 440 AND 444 CHASSIS FROM CONSOLE CABINET

1. Remove channel selector, fine tuning, tone and volume control knobs.
2. Remove the 2 Phillip-head screws and the bar assembly over hidden knobs.
3. Remove the five small knobs.
4. Remove the two hex-head screws holding the panel in position.
5. Press the panel towards the back of the set until you have sufficient clearance from the trim at the front.
   Hold the panel at the volume control and channel selector positions and pull the panel forward and up so that you clear the trim.
   Panel is now free and can be laid on its back on top of set. Be sure to place a cloth on top of cabinet so that panel will not mar or scratch finish.
6. To remove off-on switch and stepper switch from brackets on panel, press dovetail end of switch unit down firmly and slide free of mounting bracket.
7. Remove back from set complete with antenna mounting board.
8. Disconnect speaker leads. Remove AC interlock bracket and "Remote Touch Tuning" socket.
9. Remove the two side brackets from chassis and the three chassis bolts from the bottom of cabinet and chassis can be removed from the cabinet by sliding straight to the rear and then tipping forward so that tbe top controls clear the built-in aerial switch and top cabinet rail.

SETTING UP "TOP TOUCH TUNING"

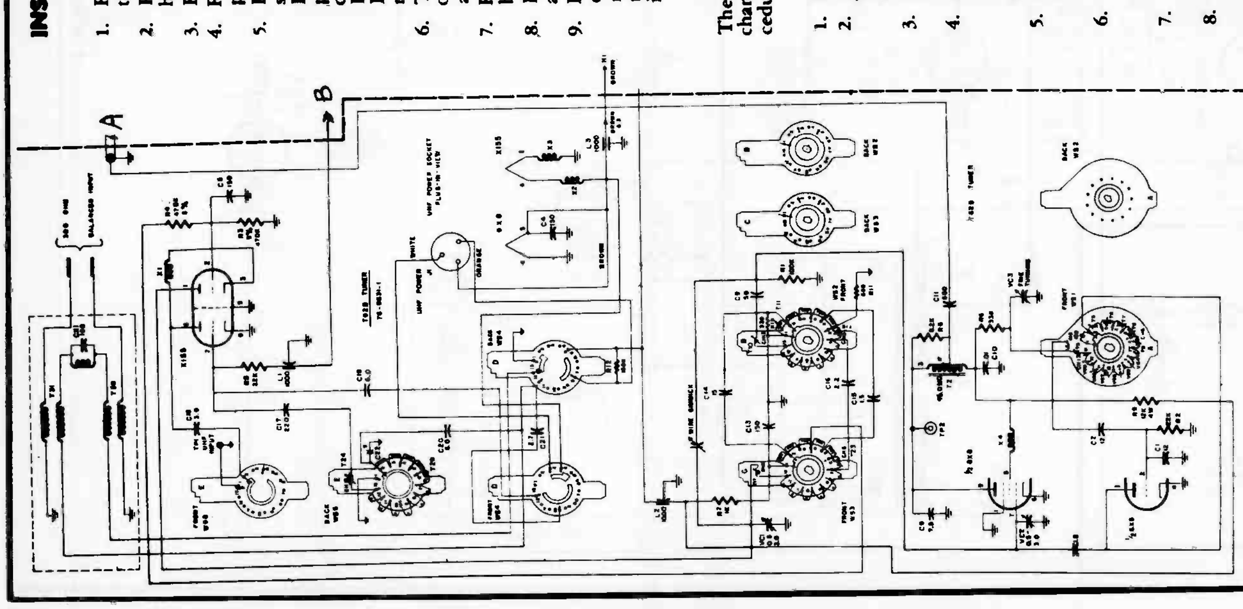
The Tuner can be set up to touch select any or all of the VHF channels plus one UHF channel by using the following procedure.

FOR VHF ONLY

1. Remove cabinet back and aerial terminal panel.
2. With long nosed pliers, remove all nylon buttons at rear of VHF Tuner EXCEPT those buttons numbered with the channels to be received.
3. Manually select highest channel to be received (incremental tuner must be adjusted hi to lo channels).
4. Set fine tuning adjustment at the center of its travel. (Approximately one full turn of knob is full travel and stops can be felt at each end of travel before friction occurs at de-clutching of the drive cord).
5. Remove channel selector knob and fine tuning knob carefully so that center position of fine tuning shaft is maintained.
6. With insulator tipped screw driver inserted through cabinet front and corresponding channel hole in VHF tuner carefully adjust trimmer for best picture and sound.
7. Change channel selector to next lowest channel to be received and repeat above adjustment.
8. Continue as in step 7 until all VHF cbannels to be received have been adjusted without changing fine tuning setting.
9. Check all channels by touching tuning button. If instructions have been carefully followed, each station should deliver good picture and sound.

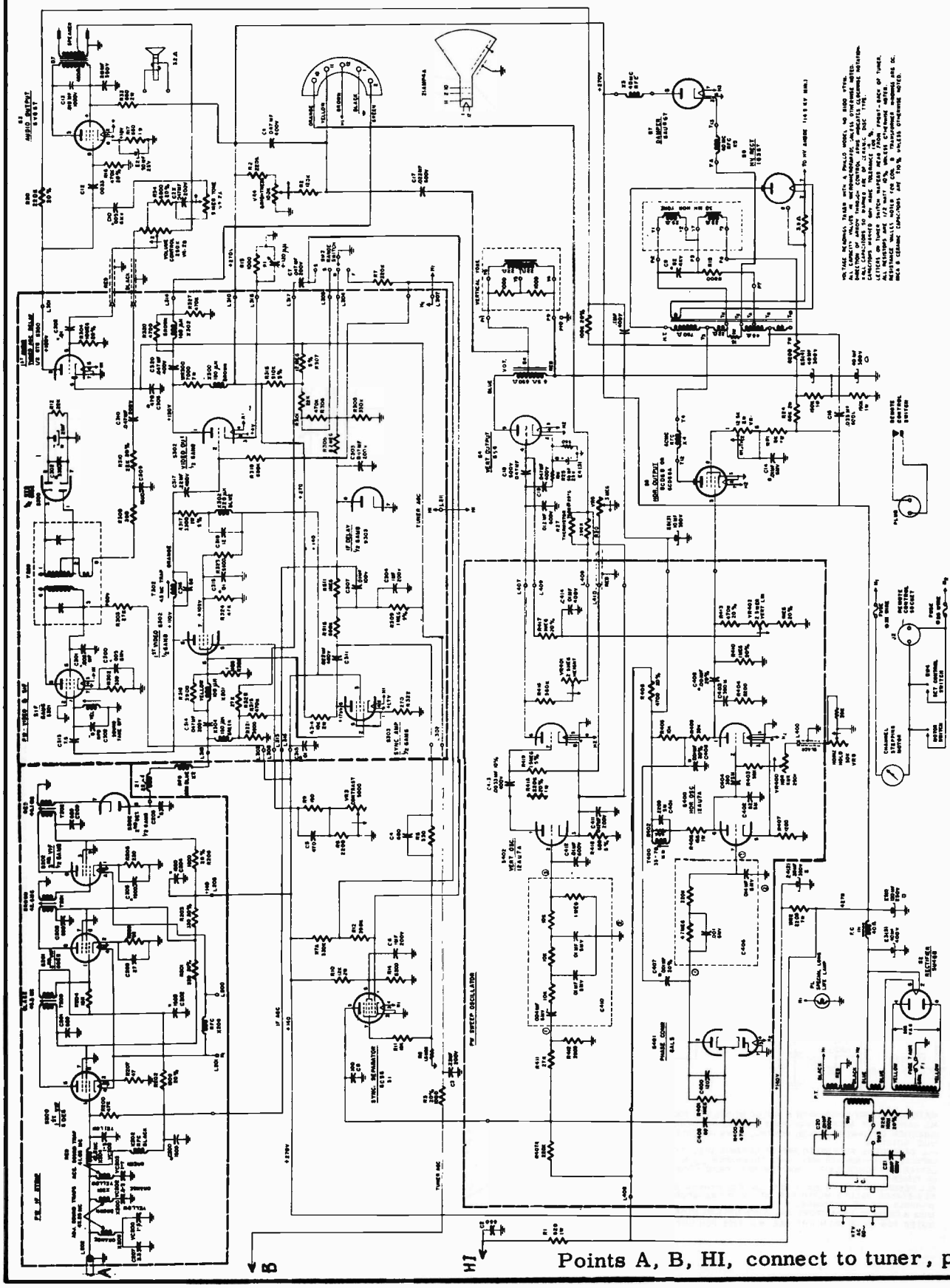
Caution — voltage across aerial input lead-in

During servicing of the 440-444 chassis, a caution should be observed by ***not allowing*** the aerial input lead-in to contact the stepper voltage.



Schematic Diagram
Tuner of Philco TV-440, TV-444
(Points A, B, HI, connect to main schematic, page 103)

PHILCO Schematic Diagram TV-440 and TV-444 Chassis

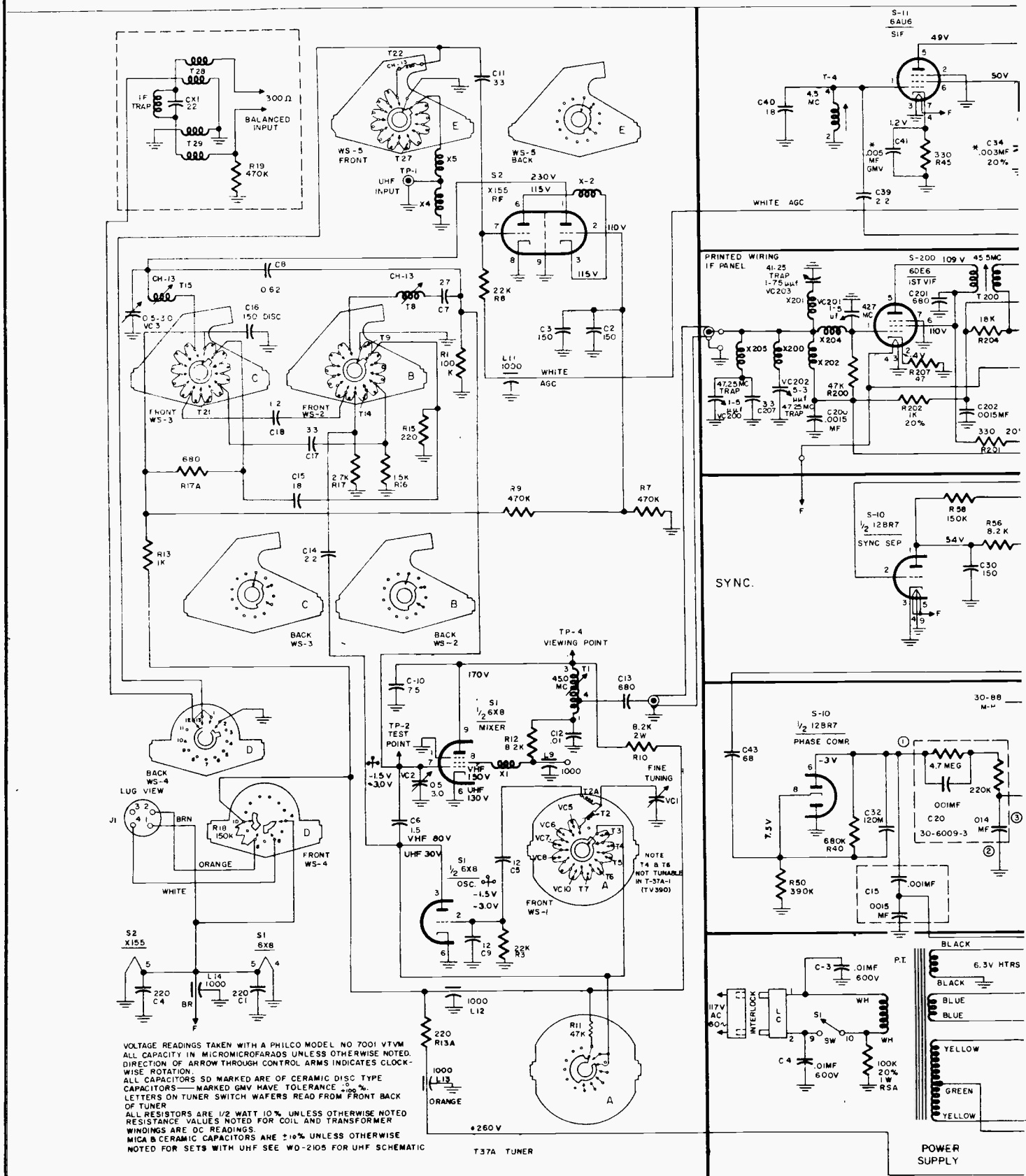


(See page 102 for circuit of tuner and important service instructions)

Philco Chassis TV-440 and TV-444 Schematic Diagram

Points A, B, HI, connect to tuner, page 102.

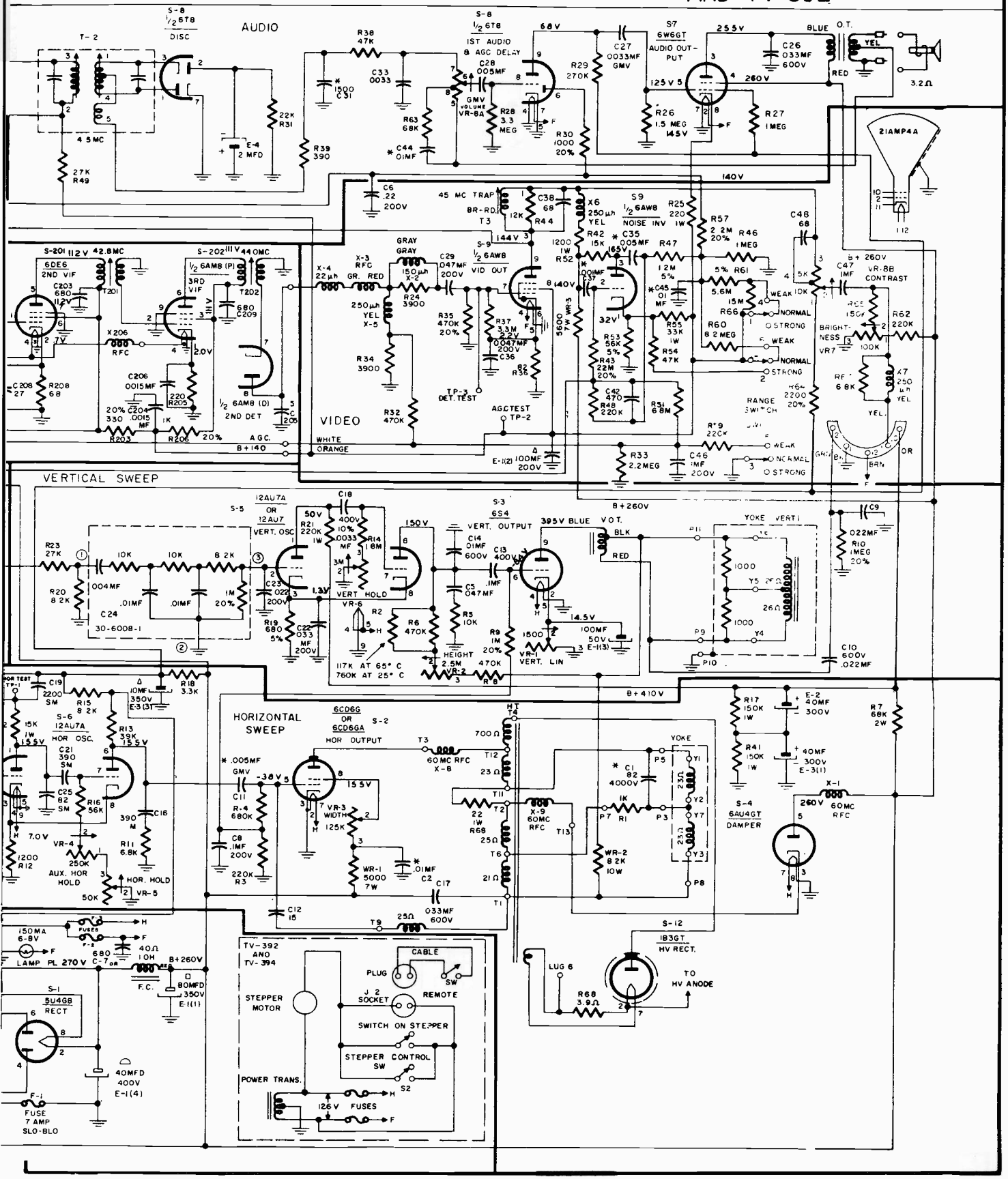
PHILCO Schematic Diagram TV-390 and TV-392 Chassis



VOLTAGE READINGS TAKEN WITH A PHILCO MODEL NO 7001 VTVM
ALL CAPACITY IN MICROMICROFARADS UNLESS OTHERWISE NOTED.
DIRECTION OF ARROW THROUGH CONTROL ARMS INDICATES CLOCKWISE ROTATION.
ALL CAPACITORS SD MARKED ARE OF CERAMIC DISC TYPE
CAPACITORS—— MARKED GMV HAVE TOLERANCE +100 %.
LETTERS ON TUNER SWITCH WAFERS READ FROM FRONT BACK OF TUNER
ALL RESISTORS ARE 1/2 WATT 10% UNLESS OTHERWISE NOTED
RESISTANCE VALUES NOTED FOR COIL AND TRANSFORMER WINDINGS ARE DC READINGS.
MICA & CERAMIC CAPACITORS ARE ±10% UNLESS OTHERWISE NOTED FOR SETS WITH UHF SEE WO-2105 FOR UHF SCHEMATIC

PHILCO

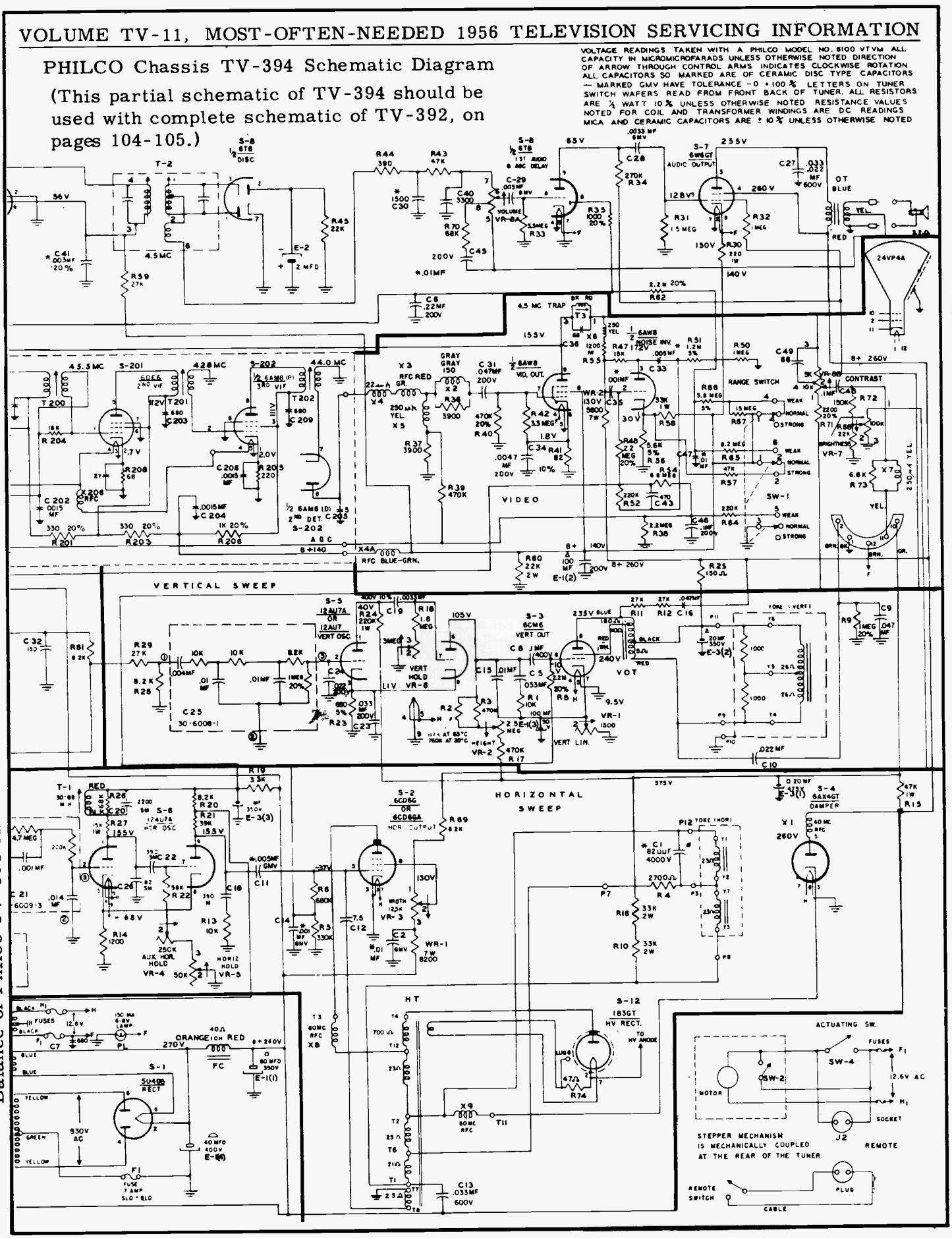
SCHEMATIC DIAGRAM-PHILCO-TV-390 AND-TV-392



PHILCO Chassis TV-394 Schematic Diagram

(This partial schematic of TV-394 should be used with complete schematic of TV-392, on pages 104-105.)

Balance of Philco TV-394 circuit is similar to TV-392 shown on page 104.



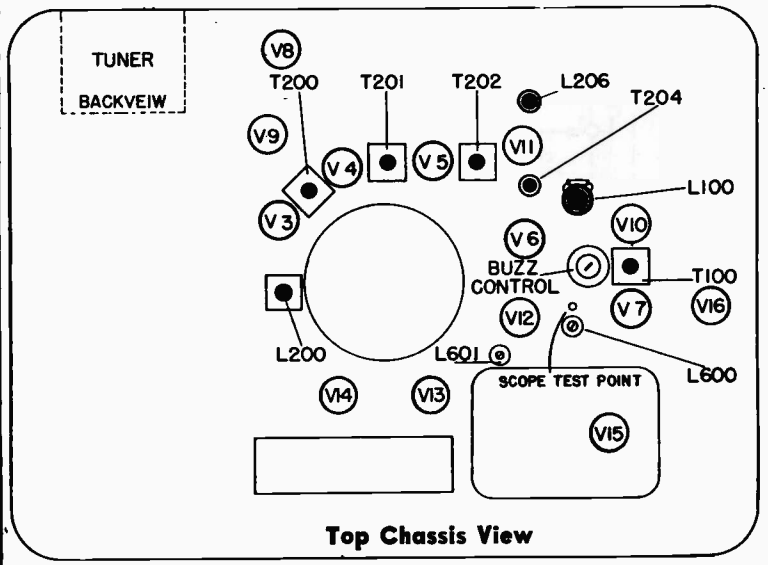
RAYTHEON

21T40-21T41-21T43-21T44-21T45-21T46 CHASSIS

MODEL IDENTIFICATION CHART

Model	Chassis	Speakers	Tuner
M-210-B	21T40	One	VHF
M-210-M	21T40	One	VHF
UM-211-B	21T41	One	UHF-VHF
UM-211-M	21T41	One	UHF-VHF
UC-213-B	21T41	One	UHF-VHF
UC-213- M	21T41	One	UHF-VHF
C-214-B	21T40	One	VHF
C-214-M	21T40	One	VHF
UC-215-B	21T41	One	UHF-VHF
UC-215-M	21T41	One	UHF-VHF
C-216-B	21T45	Two	VHF
C-216-M	21T45	Two	VHF
UC-217-B	21T46	Two	UHF-VHF
UC-217-M	21T46	Two	UHF-VHF
C-218	21T43	Three	VHF
UC-219	21T44	Three	UHF-VHF

(Circuit diagram is on pages 108-109; alignment facts are on page 110.)



Top Chassis View

HORIZONTAL HOLD CONTROLS

The top control (R606), must be capable of producing an out-of-sync condition (equal number of sloping bars) at either stop position. If not, follow alignment procedure below.

1. Set top H. Hold control (R606) to center of mechanical range.
2. Short out H. Stabilizer coil (L600) with a clip lead.
3. Adjust H. Blocking transformer (L601) until picture is in sync.
4. Remove clip lead from L600 and connect a scope with a low capacity probe at the scope test point* (junction of L600, L601, C606 and R609). Wave form illustrated on schematic must be obtained.
5. Adjust H. Stabilizer coil (L600) until peaks of wave form are equal in amplitude.

* Pig-tail connection provided on rear of chassis.

ION TRAP MAGNET

The position of the Ion Trap Magnet MUST be over the screen grid of the picture tube (second cylinder from the base identified by a flared forward lip). If the adjustment is necessary, rotate and slide along the neck of the picture tube until the position which gives maximum illumination is found.

REPLACING SELENIUM RECTIFIERS

Replacement of selenium rectifiers may be accomplished without removing chassis from cabinet. Loosen one hex nut (each rectifier) and move rectifiers to one side. The terminals may then be unsoldered.

CIRCUIT BREAKER

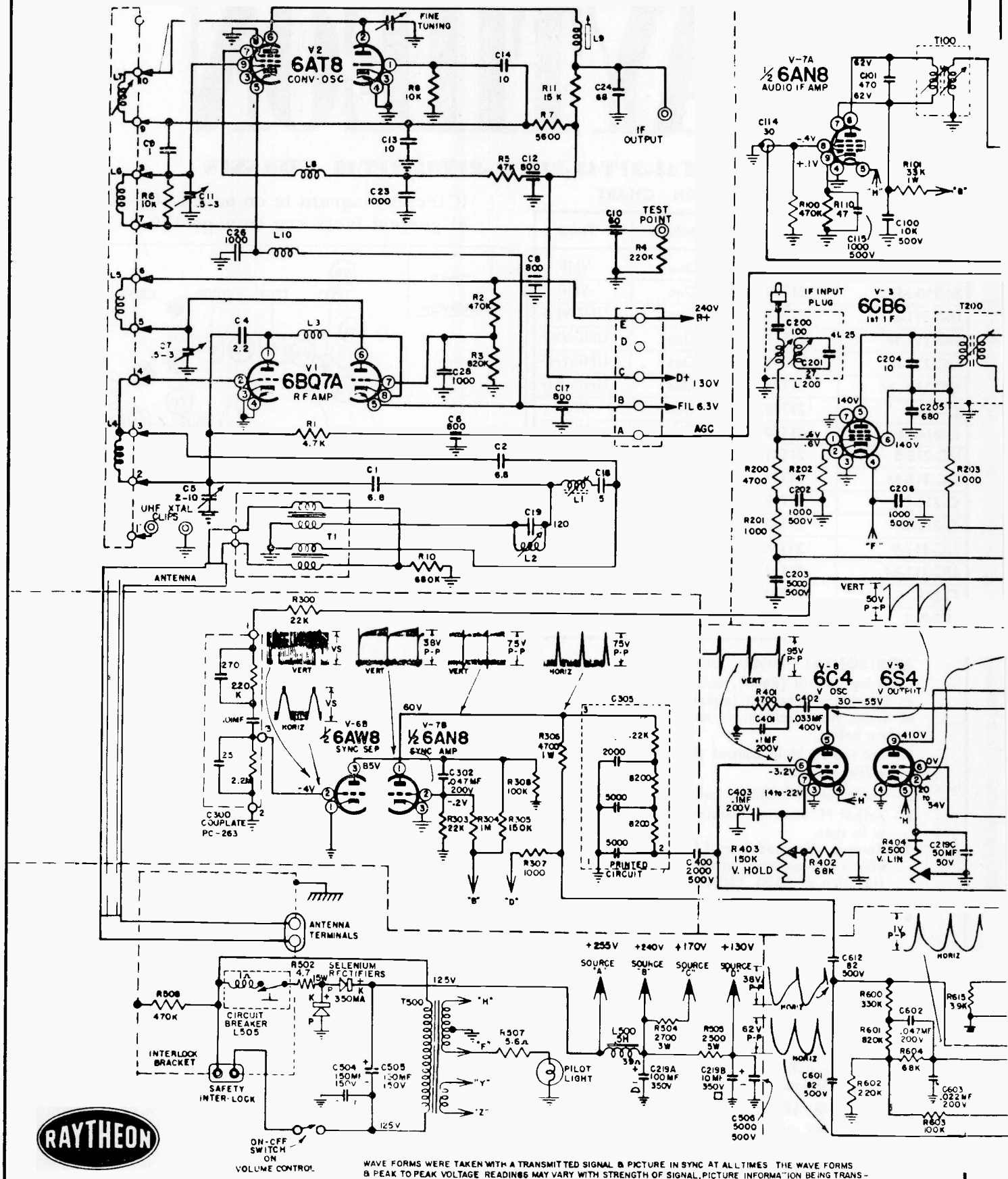
The receiver is equipped with one of the latest electronic devices, a circuit breaker. The circuit breaker is located in the low voltage power supply circuitry and protects the receiver in case of an overload or circuit defect. In the event that the receiver appears to be totally inoperative, as if no power is applied, turn the on-off switch to the off position. Wait approximately one minute, then if the button on the circuit breaker, located on the cabinet back, is in the out position, press in as far as it will go, release button and turn the on-off switch to the on position. If a click is heard after a moment and if the receiver is inoperative or if the circuit breaker button is out again, check for a circuit defect in the receiver.

A G C CONTROLS

Two AGC controls are provided at the rear of the cabinet to adjust the operating characteristics of the receiver for optimum performance. The two controls should be adjusted as follows:

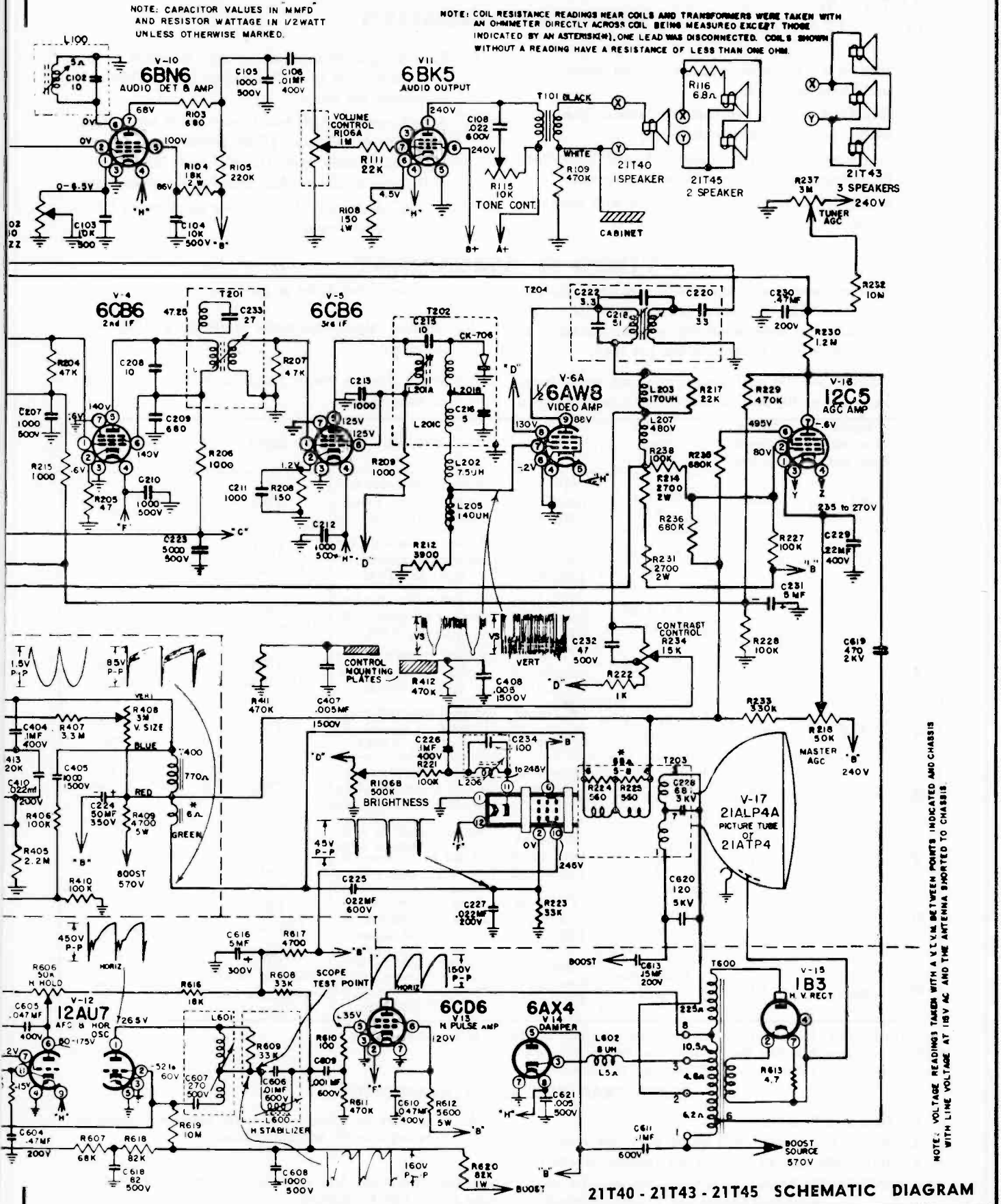
Rotate the tuner AGC control completely counterclockwise until a click is heard. Next, adjust the Master AGC control for the most satisfactory picture and best stability. If, in strong signal areas, picture instability or interference is noticed, rotate the Tuner AGC control clockwise until the best picture is obtained.

NOTE: For best results, adjust the Master AGC control while receiving the strongest available channel. Readjustment of the Tuner AGC control may be necessary each time a different channel is tuned in if variable channel signal levels are being received.



RAYTHEON

WAVE FORMS WERE TAKEN WITH A TRANSMITTED SIGNAL & PICTURE IN SYNC AT ALL TIMES. THE WAVE FORMS & PEAK TO PEAK VOLTAGE READINGS MAY VARY WITH STRENGTH OF SIGNAL, PICTURE INFORMATION BEING TRANSMITTED, & ADJUSTMENT OF VARIOUS CONTROLS. VS DENOTES PEAK TO PEAK VOLTAGE READINGS WILL VARY WITH SIGNAL.



21T40 - 21T43 - 21T45 SCHEMATIC DIAGRAM

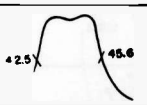
RAYTHEON
21T40, 21T41, etc.

SOUND IF ALIGNMENT

1. Tune in a TV station and adjust fine tuning until sound bars just appear.
2. Turn T204 primary (furthest from chassis pan) slug all the way out (counter-clockwise).
3. Turn same T204 slug in (clockwise) until the horizontal scanning lines are smooth and continuous.
4. Readjust fine tuning for best picture with adequate sound.
5. Reduce signal strength at antenna terminals by use of an attenuator or similar device until a "hiss" accompanies the sound.
6. Adjust sound pick-off transformer (T204 secondary), interstage transformer (T100 primary and secondary), quadrature coil (L-100) and buzz control (R102) for maximum clear sound and minimum buzz.
7. If "hiss" disappears during above adjustments futher reduce signal strength.

VIDEO IF ALIGNMENT

1. If sweep generator does not have a balanced output, connect a 150 ohm resistor in series with the ground lead and 150 ohms minus the internal resistance of the generator in series with the hot lead.
2. Connect a 1000 mmf capacitor across scope terminals and a 10K ohm resistor in series with hot lead as close to test point as possible.
3. Connect signal generator through a 1000 mmf capacitor.
4. When aligning the IF Amplifier be sure tuner is set to channel 10.

Step No.	Signal Generator Freq. (mc.)	Sweep Generator Freq. (mc.)	Signal Input Point	Output Point	Remarks	Adjust	Response
1	44.3	———	Pin 1 of V3	VTVM at junction of L205-R212	Adjust generator for output of not to exceed 2 volts on VTVM	T202	Maximum Reading
2	47.25	———	Pin 1 of V3	VTVM at junction of L205-R212	Adjust generator for output of approx. 2 volts on VTVM	T201 (top core)	Minimum Reading
3	45.4	———	Pin 1 of V3	VTVM at junction of L205-R212	Adjust generator for output of approx. 2 volts on VTVM	T201 (bottom core)	Maximum Reading
4	47.25	———	Pin 1 of V3	VTVM at junction of L205-R212	Adjust generator for output of approx. 2 volts on VTVM	T201 (top core)	Minimum Reading
5	43.0	———	Pin 1 of V3	VTVM at junction of L205-R212	Adjust generator for output of approx. 2 volts on VTVM	T200	Maximum Reading
6		43	Pin 1 of V3	Scope at junction of L205-R212	Keep generator output as low as possible Adjust for flat response	T202	
7	42.5 45.6	43	Pin 1 of V3	Scope at junction of L205-R212	Markers should be 60% down and response curve should be as shown. If not, repeat steps 1 thru 4	Check point only	
8	41.25	———	Converter grid	VTVM at junction of L205-R212	Keep generator output as low as possible to obtain required response.	L200 (top core)	Minimum Reading
9	42.5 45.6	43	Converter grid	Scope at junction of L205-R212	Markers should be 50% down and response curve should be as shown. If not repeat alignment.	L200 (bottom core) Tuner Conv. Coil (L8 or L9)	

L200 (bottom core) has a band width control effect and should be adjusted for marker positioning.
NOTE: A very short lead from the generator must be used to prevent regenration.
Picture IF frequency 46.75 MC—Sound IF frequency 42.25 MC.

VIDEO TRAP COIL (L206) ADJUSTMENT

1. Tune in a TV station.
2. Adjust fine tuning until sound bars just appear.
3. Turn L-206 slug all the way out (counter-clockwise).
4. Turn slug in (clockwise) until horizontal scanning lines are smooth and continuous.

WARNING: The chassis of this receiver may be at the line voltage potential. Use an Isolation Transformer to eliminate shock hazard and to prevent possible damage to the test equipment.

RCA VICTOR

The service material on pages 111 through 116 is applicable to a group of similar chassis used in a great many models. Models 21T6082(U), 21T6083(U), 21T6114(U), 21T6115(U), 21T6117(U), 21T6225(U), 21T6227(U), 21T6255(U), 21T6256(U), 21T6257(U), use Chassis KCS-96, KCS-96B, and KCS-96D if intended for VHF reception only. The tuner is KRK-22F, and the models are marked less (U). The models marked with (U) are for UHF-VHF reception and use Chassis KCS-96A, KCS-96C, KCS-96E, with tuner KRK-30F.

Models 21T6125, 21T6127, 21T635, use Chassis KCS-97 with tuner KRK38. Models 21T6125U, 21T6127U, 21T635U, use Chassis KCS-97A, with tuners KRK-38A/KRK-36., for combination UHF-VHF reception.

Models 21D641(U), 21D645(U), 21D647(U), 21D648(U), 21D652(U), 21D667(U), 21D670(U), use Chassis KCS-97D, KCS-97F, KCS-97J, with tuner KRK-38 or KRK-39, if marked less (U), and use Chassis KCS-97E, KCS-97H, or KCS-97K, with tuners KRK-38A, or -39A, and KRK-36, if marked with (U).

Models 24T6142(U), 24T6285(U), and 24T6287(U), use Chassis KCS-97N, or KCS-97R, with tuner KRK-38F, if marked less (U), and use Chassis KCS-97P, or KCS-97T, with tuners KRK-38E/KRK-36, if marked with (U).

Models 24D655(U), 24D658(U), 24D673(U), 24D676(U), 24D679(U), use Chassis KCS-97U, KCS-97AA, or KCS-97AC, with tuner KRK-38, or -39, if marked less (U), and use Chassis KCS-97W, KCS-97AB, KCS-97AD, with tuners KRK-38A, KRK-39A, and KRK-36, if marked with (U).

RATIO DETECTOR ALIGNMENT.—Set the signal generator at 4.5 mc. and connect it to the first video amplifier grid, pin 7 of V108A (terminal "M" of PC103) in series with a .01 mfd. capacitor.

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 2 of V106A.

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 pin 9 of V108A and amplified through the sound i-f amplifier.

Connect the "VoltOhmyst" to pin 7 of V102 (terminal "F" of PC101).

Tune the ratio detector primary, T102 top core for maximum d-c output on the "VoltOhmyst." (Peak with core at end of coil away from chassis.) Adjust the signal level from the signal generator for 5 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 C105 (terminal "D" of PC101).

Tune the ratio detector secondary T102 bottom core for zero d-c on the "VoltOhmyst." (Adjust with core at chassis end of coil.)

Repeat adjustments of T102 top for maximum d-c at pin 7 of V102 and T102 bottom for zero d-c at the junction of R106 and C105. Make the final adjustments with the signal input level adjusted to produce 5 volts d-c on the "VoltOhmyst" at pin 7 of V102.

SOUND TAKE-OFF ALIGNMENT.—Connect the signal generator to the first video amplifier grid, pin 7 of V108A (terminal "M" of PC103).

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

Connect the "VoltOhmyst" to pin 7 of V102 (terminal "F" of PC102).

Tune the T101 top core for maximum d-c on the "VoltOhmyst." (Peak with core at chassis end of coil.)

The output from the signal generator should be set to produce approximately 5 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 .01 mf. capacitor to pin 7 of V108A. 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 2, V106A, to prevent noise from masking the output indication.

Set the picture control R107A to its maximum clockwise position.

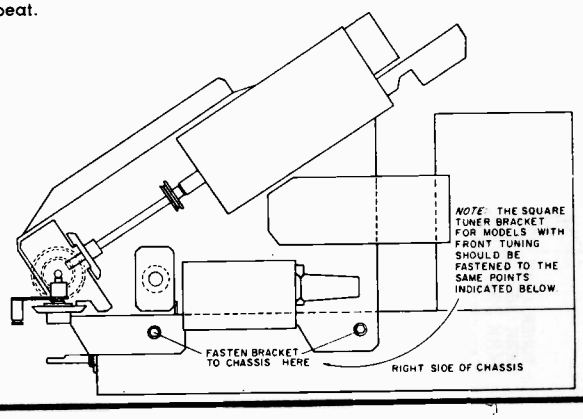
Connect the crystal diode probe of an oscilloscope to terminal "A" of PC103.

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

Remove the short from pin 2, V106A 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 L104 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 L104 for minimum beat.



RCA Victor Chassis KCS-96, -A to -E, KCS-97 with various suffix letters, continued

INSTALLATION CHECK LIST

1. Check position of ion trap magnet and readjust for maximum raster brightness if necessary.
2. Check raster for proper framing (tilt) in mask. Adjust yoke position by rotating.
3. Check AGC and Noise Limiter control settings. (See information at head of next column on adjustments.)
*4. Check width and horizontal linearity, readjust width and drive controls as outlined below, if adjustment is necessary.
*5. Check for normal operation of horizontal (freq.) control. Should hold sync for two full turns or more of the control.
6. Check centering of picture. Adjustment is made with the centering lever on the focus magnet.
7. Check height and vertical linearity, reset controls where required for 1¼" overscan.
8. Adjust focus control for maximum overall definition in fine detail areas of the picture.
9. Check RF oscillator adjustment on all channels. Readjust if necessary, starting at the highest frequency channel, proceeding to the lowest. Do not adjust the UHF rf oscillator in the field.
10. Adjust the FM trap—where FM interference is encountered—for minimum interference in the picture.

*Width, Horizontal Drive and Sinewave Adjustments

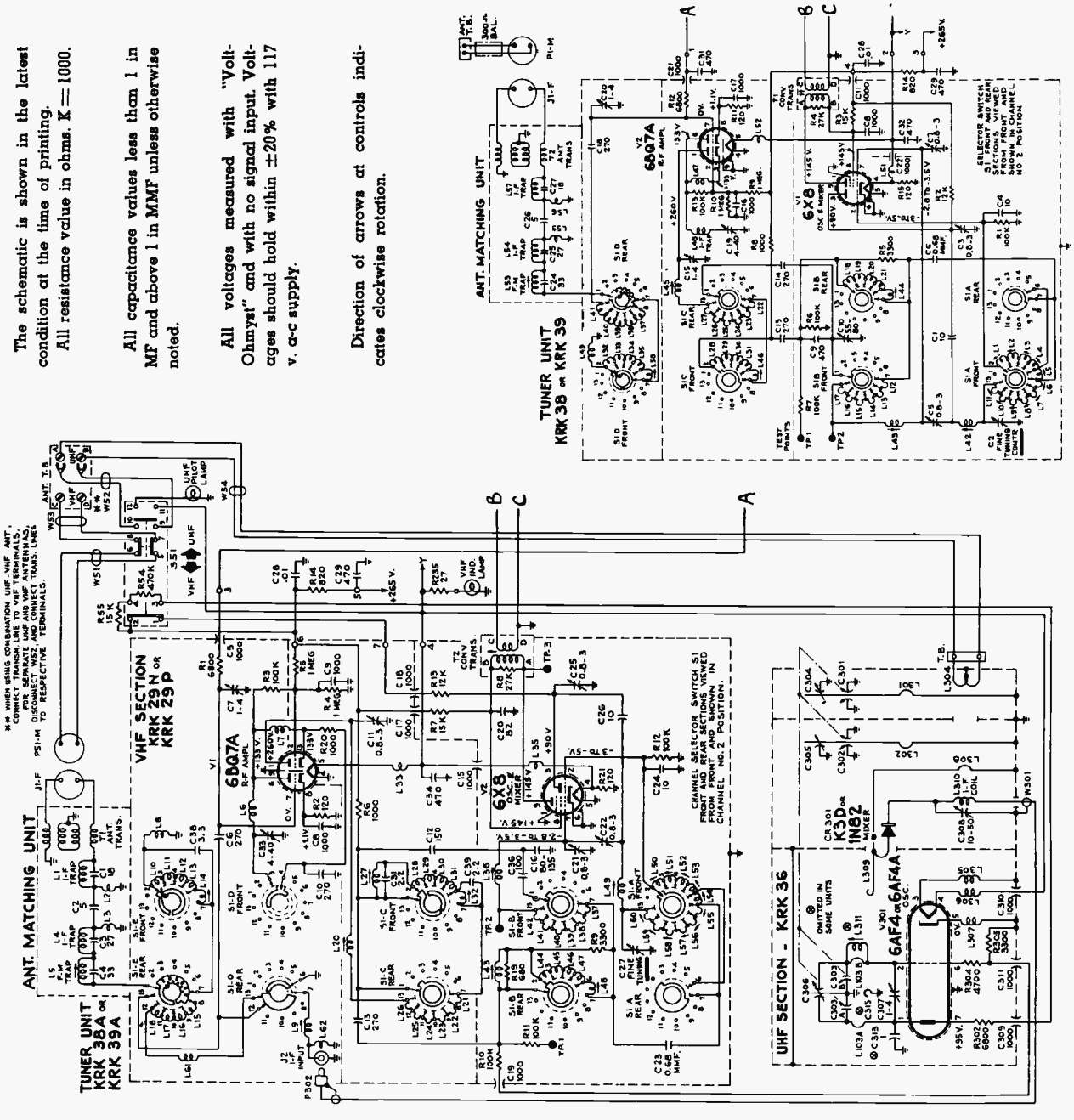
A. Set width coil fully counter-clockwise.
B. Adjust drive for overdrive line, then clockwise until line just disappears. If no line appears set fully counter-clockwise.
C. Adjust width for ¾" overscan at each side, with normal line voltage and normal brightness. Repeat Step B.
D. Turn horizontal hold control to the left, out of sync., to the point where interrupted oscillation occurs.
E. Adjust sinewave core, as the horizontal hold control is rotated to the left beyond the locked-in position, until 3 to 4 bars occur between the fall out point and interrupted oscillation.

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

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

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

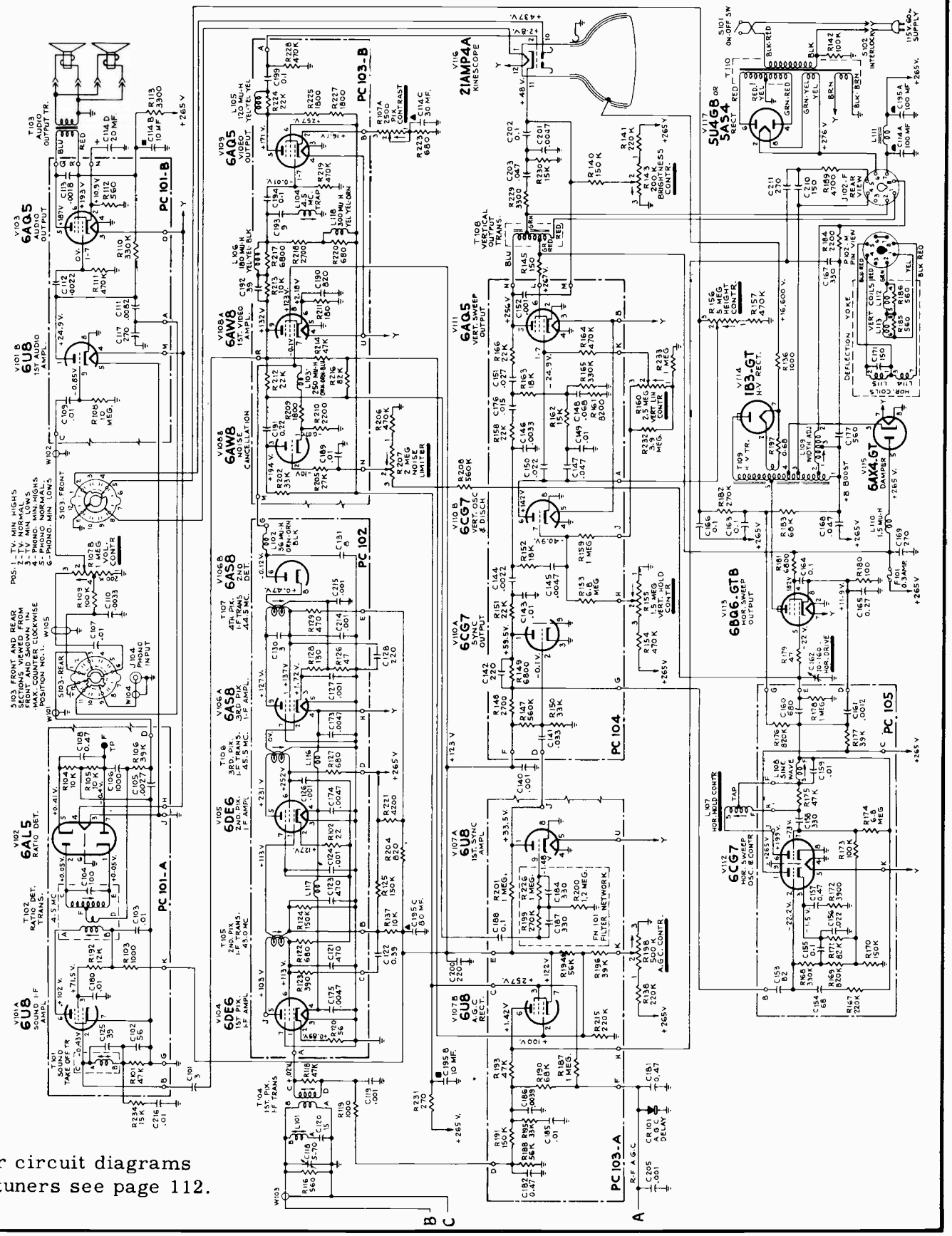
Direction of arrows at controls indicates clockwise rotation.



Circuit diagrams of two groups of tuners used. The terminals connect to correspondingly marked wires of the main schematic shown on page 113.

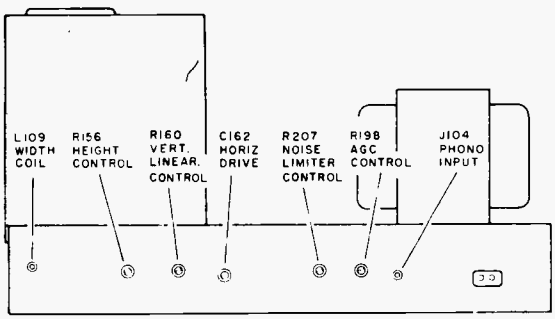
RCA Victor Chassis KCS-96, -A to -E, KCS-97 with various suffix letters, continued

RCA Victor Main Chassis Diagram of KCS-97D, -E, -F, -H, -J, -K

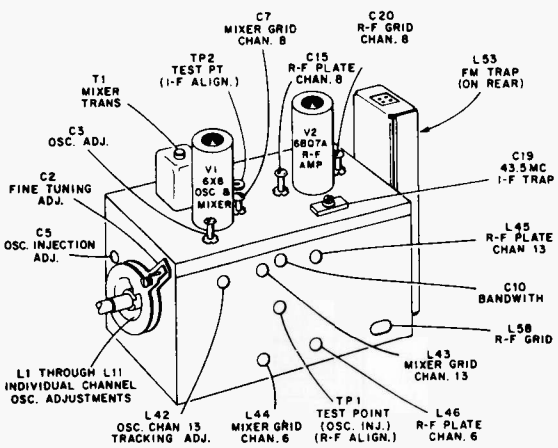


For circuit diagrams of tuners see page 112.

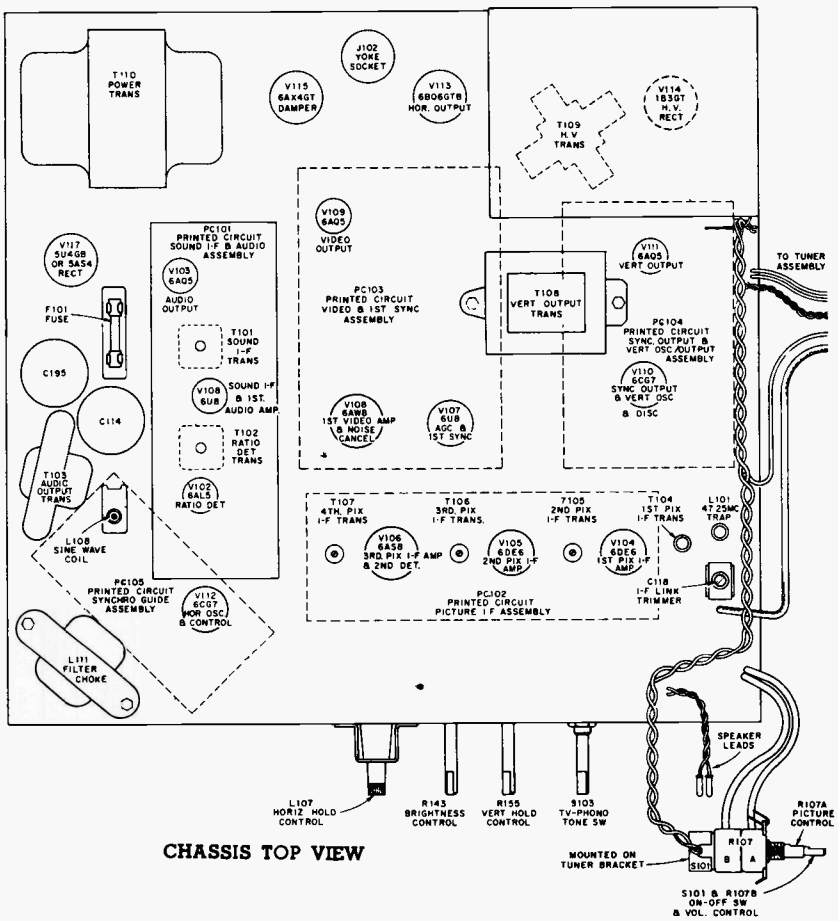
RCA Victor KCS-96, KCS-97, etc.



REAR CHASSIS ADJUSTMENTS



KRK38 or KRK39 TUNER ADJUSTMENTS



CHASSIS TOP VIEW

ALIGNMENT PROCEDURE

PICTURE I-F TRANSFORMER ADJUSTMENTS.—

Applicable to VHF models only.

Connect the i-f signal generator, in series with a 1500 mmf. ceramic capacitor, to the mixer grid test point TP2.

Connect the "VoltOhmyst" to the junction of R119 and R188 and to ground.

Turn the Noise Limiter control fully counter-clockwise. Turn the AGC control fully clockwise.

Note: Improper alignment will result if the above controls are not set as indicated. If the horizontal circuit is disabled during alignment, a bias of —20V. must be applied to the grid, pin 2 of V108 and the AGC control must be fully clockwise to avoid damage to V107 and V108.

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 R119 and R188. The second battery will be used later

Set the bias to produce approximately —5.0 volt of bias at the junction of R119 and R188.

Connect the "VoltOhmyst" to terminal "G" of PC102 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 terminal "G" of PC102 with —5.0 volts of i-f bias at the junction of R119 and R188.

44.5 mc.	T107
45.5 mc.	T106
43.0 mc.	T105

Set the VHF signal generator to the following frequency and adjust the picture i-f trap for minimum d-c output at terminal "G" of PC102. Use sufficient signal input to produce 3.0 volts of d-c on the meter when the adjustment is made.

47.25 mc.	L101

For combination UHF-VHF models.

Connect the i-f signal generator in series with a 1500 mmf. ceramic capacitor, to the mixer grid test point TP2.

Connect the "VoltOhmyst" to the junction of R119 and R188.

Turn the Noise Limiter control fully counter-clockwise. Turn the AGC control fully clockwise.

Note: Improper alignment will result if the above controls are not set as indicated. If the horizontal circuit is disabled during alignment, a bias of —20V. must be applied to the grid, pin 2 of V108 and the AGC control must be fully clockwise to avoid damage to V107 and V108.

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 R119 and R188. Adjust the potentiometer for —5.0 volts indication on the "VoltOhmyst."

Connect the "VoltOhmyst" to terminal "G" of PC102 and to ground.

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 terminal "G" of PC102 with —5.0 volts of i-f bias at the junction of R119 and R188.

44.5 mc.	T107
45.5 mc.	T106
43.0 mc.	T105

Set the signal generator to the following frequency and adjust the picture i-f trap for minimum d-c output at terminal "G" of PC102. Use sufficient signal input to produce 3.0 volts of d-c on the meter when adjustment is made.

47.25 mc.	L101

(Continued on page 115)

RCA Victor Chassis KCS-96, -A to -E, KCS-97 with various suffix letters, continued

SWEEP ALIGNMENT OF PICTURE I-F.—

Applicable to VHF models only.

To align the mixer plate circuit, 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 top of the tuner.

Set the channel selector switch to channel 4.

Clip a 330 ohm resistor between pin 2 of V106A and ground.

Preset C118 to minimum capacity.

Adjust the bias box potentiometer to obtain —5.0 volts of bias as measured by a "VoltOhmyst" at the junction of R119 and R188.

Connect a 180 ohm composition resistor from terminal "J" of PC102 to pin 6 of V104. Connect the oscilloscope diode probe to terminal "J" of PC102 and to ground.

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

Adjust T1 (top) and T104 (top) for maximum gain and with 45.75 mc. at 75% of maximum response.

Set the sweep output to give 0.3 to 0.5 volt peak-to-peak when making the final touch on the above adjustment.

Adjust C118 until 42.5 mc. is at 70% response with respect to the low frequency shoulder of the curve as shown in Figure 11. Maximum allowable tilt is 20%.

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

Connect the oscilloscope to terminal "G" of PC102.

Figure 11— KRK38 or KRK39 T1 and T104 Response

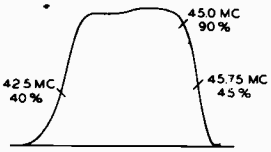


Figure 12— Overall I-F Response with KRK38

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 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 T105, T106 and T107 to obtain the response shown in Figure 12.

Increase sweep output ten times and check attenuation at 41.25 mc. Adjust T105 and T107 to set 41.25 mc. between 25 and 35 times down with curve as shown in Figure 12.

Move the sweep generator to the antenna terminals. Connect —3.0 volts bias to terminal "F" of PC103. Adjust T106 and T107 slightly to correct for any overall tilt while switching from channel to channel.

For combination UHF-VHF models.

To align the mixer plate circuit, 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 top of the tuner.

Set the channel selector switch to channel 4.

Clip a 330 ohm resistor between pin 2 of V106A and ground.

Preset C118 to minimum capacity.

Adjust the bias box potentiometer to obtain —5.0 volts of bias as measured by a "VoltOhmyst" at the junction of R119 and R188.

Connect a 180 ohm composition resistor from terminal "J" of PC102 to pin 6 of V104. Connect the oscilloscope diode probe to pin terminal "J" of PC102 and to ground.

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

Adjust T2 (top) and T104 (top) for maximum gain and with 45.75 mc. at 75% of maximum response.

Set the sweep output to give 0.3 to 0.5 volt peak-to-peak when making the final touch on the above adjustment.

Adjust C118 until 42.5 mc. is at 70% response with respect to the low frequency shoulder of the curve as shown in Figure 13. Maximum allowable tilt is 20%.

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

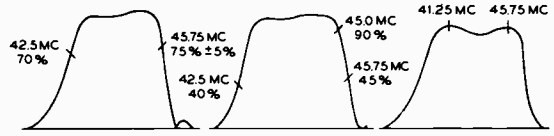


Figure 13— KRK38A or KRK39A T2 and T104 Response

Figure 14— Overall I-F Response with KRK38A or KRK39A

Figure 15— KRK38A or KRK39A L9 and C308 I-F Response

Connect the oscilloscope to terminal "G" of PC102.

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 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 T105, T106 and T107 to obtain the response shown in Figure 14.

Increase sweep output ten times and check attenuation at 41.25 mc. Adjust T105 and T107 to set 41.25 mc. between 25 and 35 times down with curve as shown in Figure 14.

To align the I-F amplifier circuit of the KRK38A or KRK39A, connect the VHF sweep generator to the front terminal of the 1N82 crystal holder in series with a 1000 ohm resistor and a 1500 mmf. ceramic capacitor. Use the shortest leads possible, grounding the sweep ground lead to the tuner case.

To do this, remove the crystal cover and connect the resistor, after insulating the lead with tubing, to the crystal front terminal.

Set the VHF CHANNEL SELECTOR switch to the UHF position, and the UHF TUNING between channels 68 and 69 at 800 mc.

Connect a 220 ohm composition resistor and a 1500 mmf. capacitor in series between the plate, pin 1, of V1 6BQ7A and ground with the capacitor connected to pin 1 and the resistor to ground. This point is accessible through the hole in the left side of the tuner. Connect the oscilloscope diode probe to the junction between the resistor and capacitor.

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

Connect the potentiometer arm of the second bias supply to terminal "F" of PC103 on the tuner and ground the battery positive terminal to the chassis. Adjust the bias potentiometer to produce —3.0 volts of bias, as measured by the "VoltOhmyst" at terminal "F" of PC103.

Set the sweep generator to produce 0.5 volt or less peak-to-peak on the oscilloscope.

Adjust C308, on the UHF section, and L9, on the VHF section, of the tuner for maximum gain with 45.75 mc. and 41.25 mc. markers as shown in figure 15.

Move the diode detector to test point TP3 and adjust L27 and L43 for curve as shown in figure 15.

Remove the resistor, capacitor and diode probe from TP3 and connect the oscilloscope to terminal "G" of PC102. Use 3.0v peak-to-peak on the oscilloscope.

Connect the VHF sweep generator to the VHF antenna terminals. Keep the AGC bias at —3.0 V and the I-F bias at —5.0 volts.

Couple the signal generator loosely to the grid of the first picture I-F amplifier.

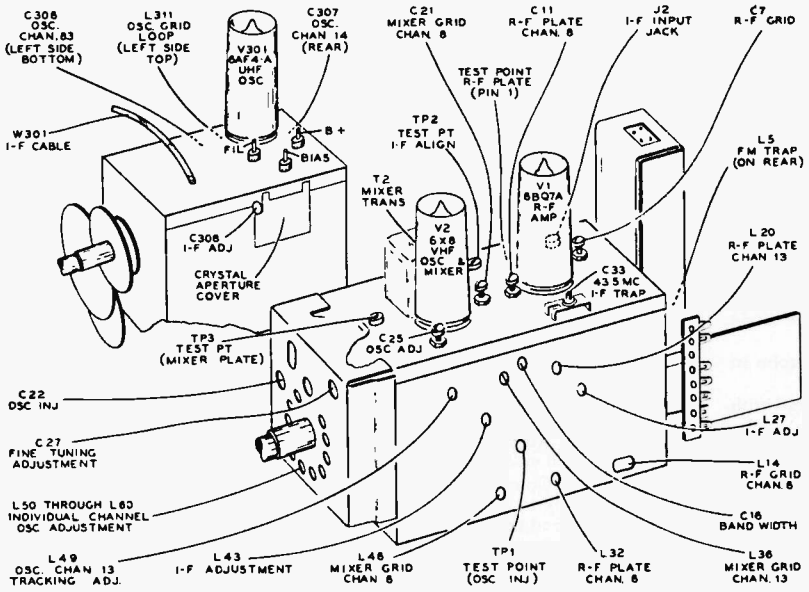
Switch through all VHF channels and check for proper curve shape as in figure 14. Retouch T106 and T107 slightly to correct for any overall tilt that is essentially the same on all channels.

Disconnect the VHF sweep generator and connect the UHF sweep generator to the UHF antenna terminals. Check on all UHF channels for proper wave shape as shown in figure 14, retouching L27 and L43 if necessary to correct any overall tilt.

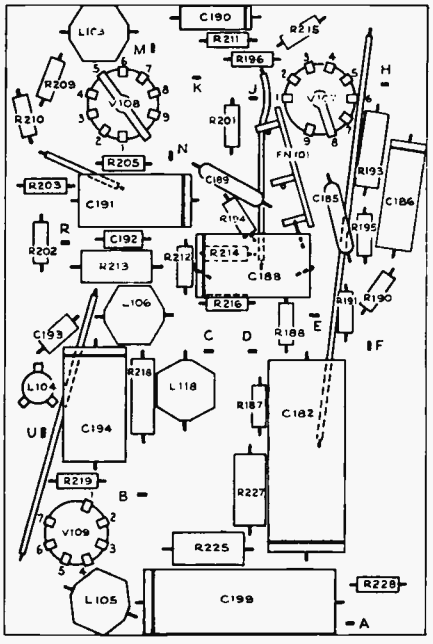
Do not retouch C308, L9, T2, T104, T105, T106 or T107.

Remove the sweep and marker generators and the bias supplies.

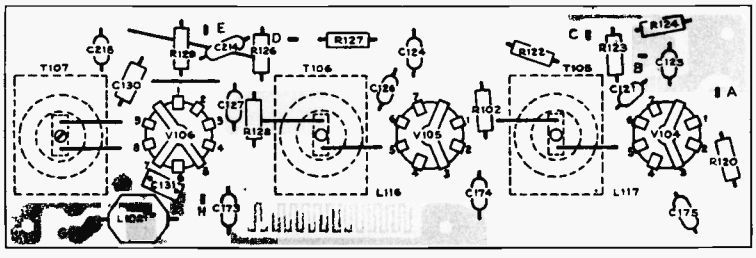
RCA Victor Chassis KCS-96, KCS-97, etc. (Continued)



KRK38A or KRK39A UHF/VHF TUNER



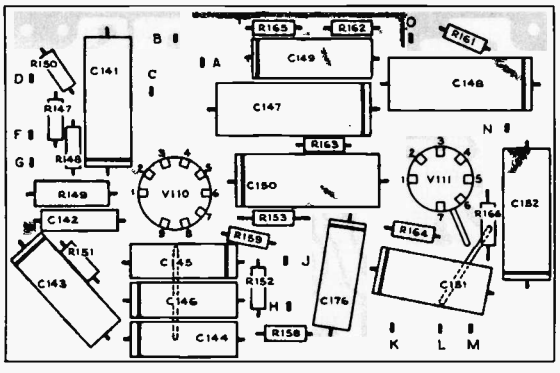
PC103—VIDEO & 1ST SYNC UNIT LAYOUT



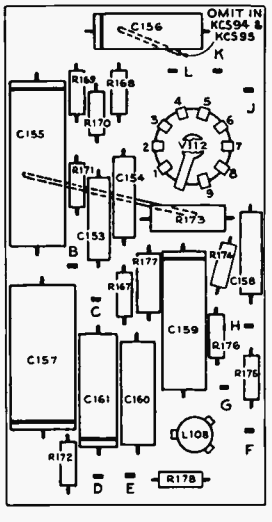
PC102—PICTURE I-F UNIT LAYOUT

IMPORTANT WIRING NOTICE

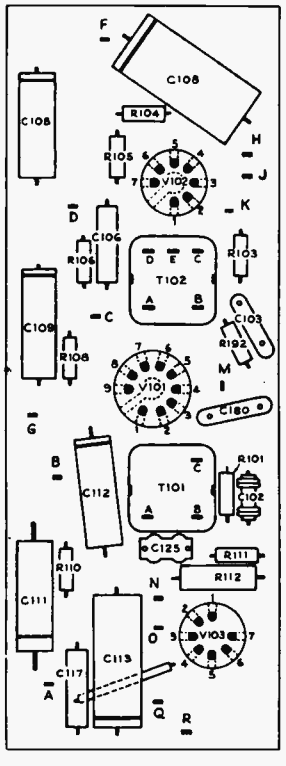
Many of the wiring connections in these receivers employ a new type solderless wire-wrap connection. These connections consist of six or seven turns of tightly machine-wrapped wire around special square studs. They are both electrically and mechanically equal or superior to conventional soldered connections, and should not be considered to require soldering. However, where rewiring is required or the original tightly wrapped connection has once been unwound, conventional soldering methods must be used.



PC104—VERTICAL & SYNC OUTPUT UNIT LAYOUT



PC105—HORIZONTAL OSCILLATOR UNIT LAYOUT



PC101—SOUND I-F UNIT LAYOUT

AGC AND NOISE LIMITER ADJUSTMENTS.—Careful adjustment of the AGC and Noise Limiter controls is very important for the proper functioning of the receiver. Overload or non-functioning of the noise circuits will occur if improper adjustment is made.

Turn the Noise Limiter control fully counter-clockwise.

Adjust the AGC control until a bend just occurs in the picture then counter-clockwise 90° from this point.

Set fine tuning for barely perceptible 4.5 mc. beat. Readjust the AGC control 45° counter-clockwise from picture bend.

Set horizontal hold counter-clockwise as far as possible without making sync unstable.

Advance Noise Limiter control until horizontal shift or bend just occurs then counter-clockwise 30° from this point.

Reset horizontal hold to center of holding range.

RCA VICTOR

The 17" Models 17S6022, 17S6025, 17S6027, 17PT6962, use Chassis KCS-94, with VHF tuner KRK-32B. The 21" Models 21S632, 21S6052, 21S6053, employ Chassis KCS-95 or KCS-95A, both with practically identical circuits to KCS-94. The 17" Models 17S6022U, 17S6025U, 17S6027U, 17PT6962U, use Chassis KCS-94A and are identical to KCS-94 except for the use of a UHF-VHF tuner KRK-29K/36A. The 21" Models 21S632U, 21S6052U, 21S6053U, use Chassis KCS-95C having a UHF-VHF tuner KRK-33B or C.

The service data on these sets are presented on pages 117 through 121. The circuits of the two main tuners used are shown on page 118. The main schematic is on page 119, and is exact for 17" sets, but is applicable to 21" sets as well. On pages 120 and 121 are alignment facts and additional service information.

INSTALLATION CHECK LIST

Connect the antenna transmission line to the receiver antenna terminals.

Plug the power cord into the 117V. AC outlet and turn the receiver "ON". The receiver should operate normally. However, a check of the following adjustments should be made.

1. Check position of ion trap magnet and readjust for maximum raster brightness, if necessary.
2. Check raster for proper framing (tilt) in mask. Adjust yoke position by rotating.
*3. Check width and horizontal linearity, readjust width and drive controls as outlined below, if adjustment is necessary.
*4. Check for normal operation of horizontal hold control. Should hold sync for two full turns or more of the control.
5. Check centering of picture. Adjustment is made with the centering levers on the centering magnet, or by rotation of the entire magnet.
6. Check height and vertical linearity, reset controls where required for 1¼" overscan.
7. Check R-F oscillator adjustment on all channels. Readjust if necessary, starting at the highest frequency channel, proceeding to the lowest. Be sure to replace the guard and disc behind the fine tuning knob.

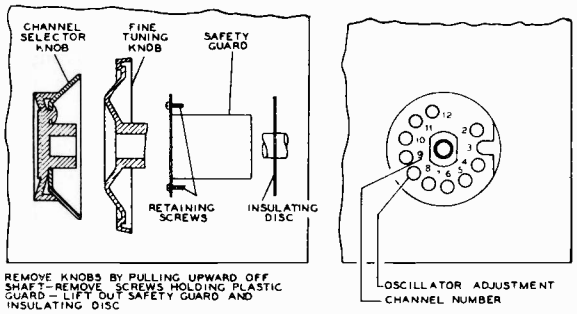
*Width, Horizontal Drive and Sinewave Adjustments

A. Set width coil fully counter-clockwise.
B. Adjust drive for overdrive line then clockwise until line just disappears. If no line appears set fully counter-clockwise.
C. Adjust width for ¾" overscan at each side, with normal line voltage and normal brightness. Repeat Step B.
D. Turn horizontal hold control to the left, out of sync, to the point where interrupted oscillation occurs.
E. Adjust sinewave core, as the horizontal hold control is rotated to the left beyond the locked-in position, until 3 to 4 bars occur between the fall out point and interrupted oscillation.

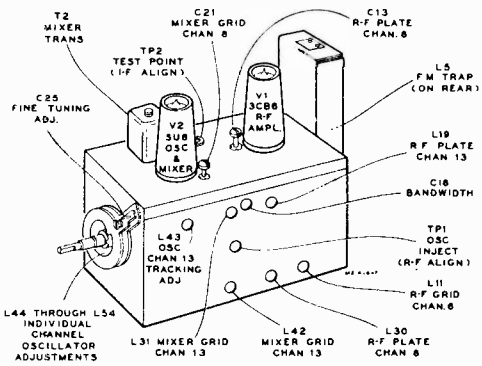
KINESCOPE AND SAFETY GLASS CLEANING.—The front safety glass may be removed to allow for cleaning of the kinescope faceplate and the safety glass if required.

To do this remove the clamp under the bottom edge of the metal front trim and allow the safety glass to slide down.

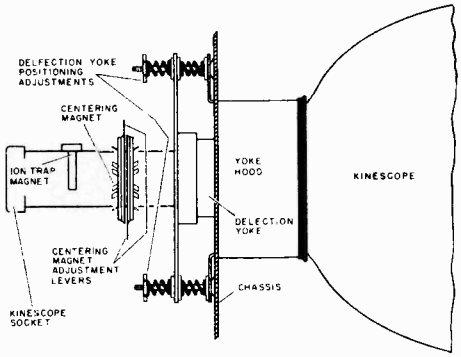
The kinescope faceplate and the safety glass should only be cleaned with a soft cloth and "Windex" or similar cleaning agent.



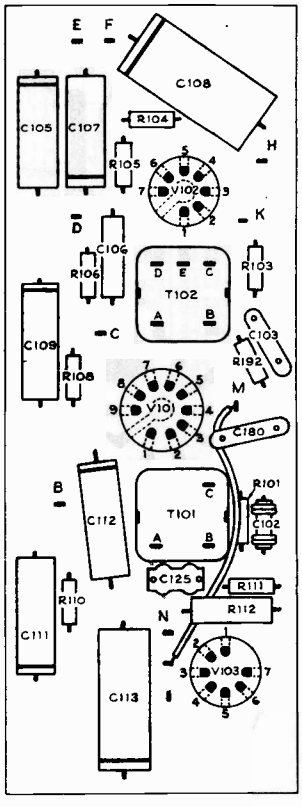
KRK32B R-F OSCILLATOR ADJUSTMENTS



KRK32B VHF TUNER

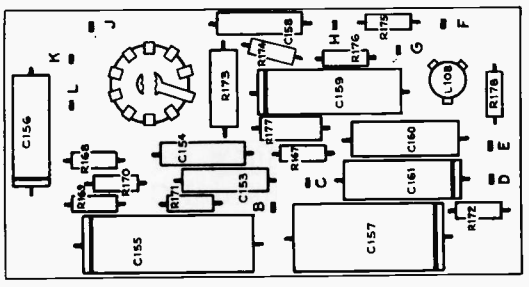


YOKE AND CENTERING MAGNET

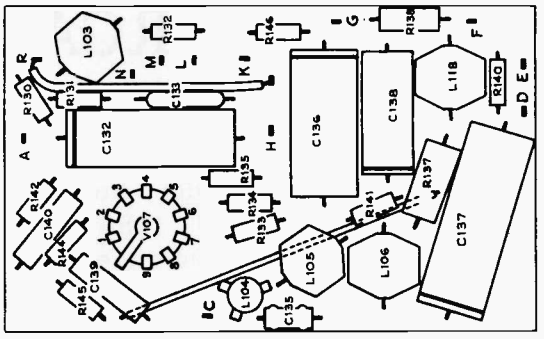


PC101—Sound I-F Unit Layout

RCA Victor Chassis KCS-94, KCS-94A, KCS-95, KCS-95A, KCS-95C, continued



PC105—Horizontal Oscillator Unit Layout



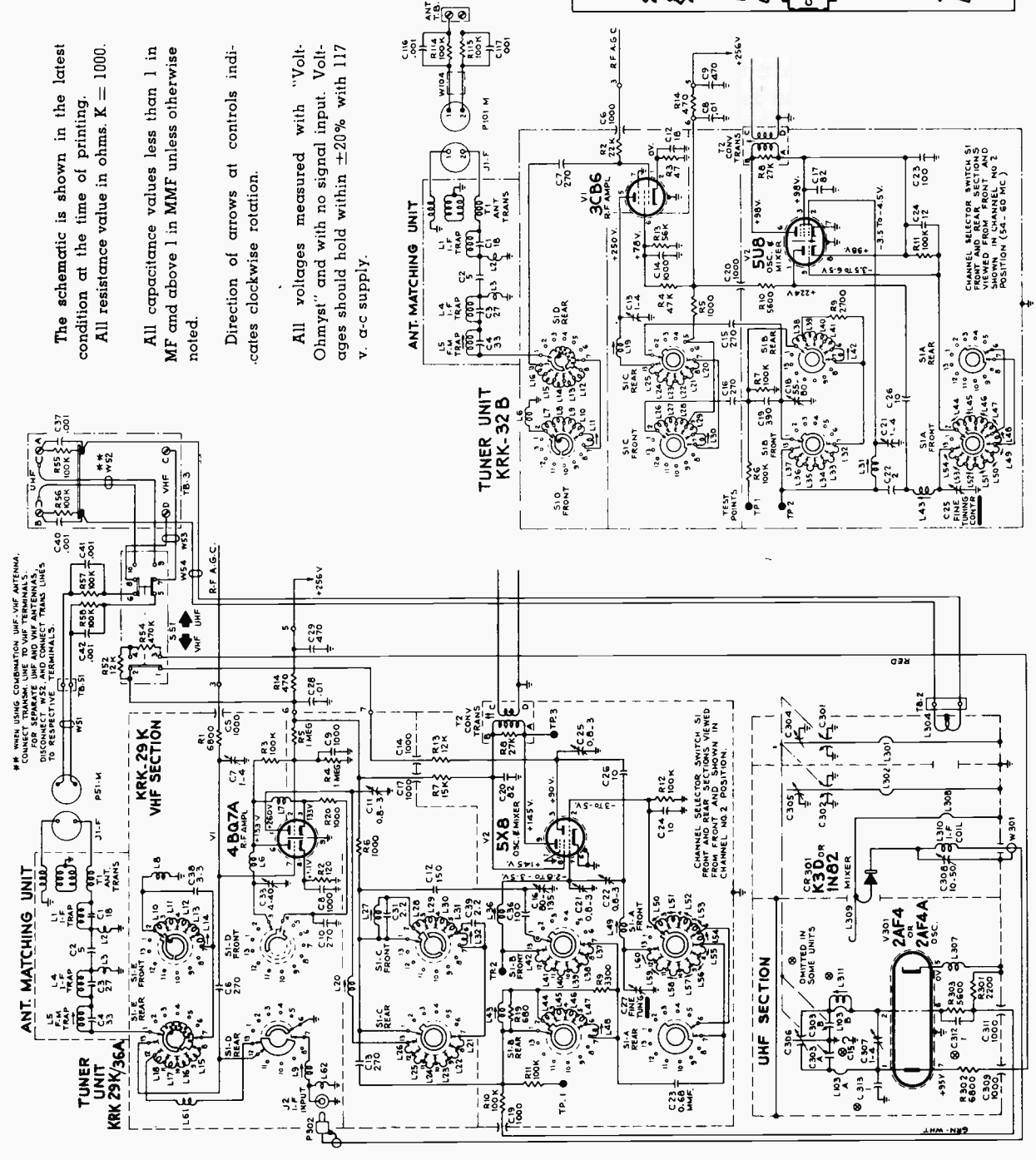
PC103—Video & Sync Unit Layout

The schematic is shown in the latest condition at the time of printing.
All resistance value 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.

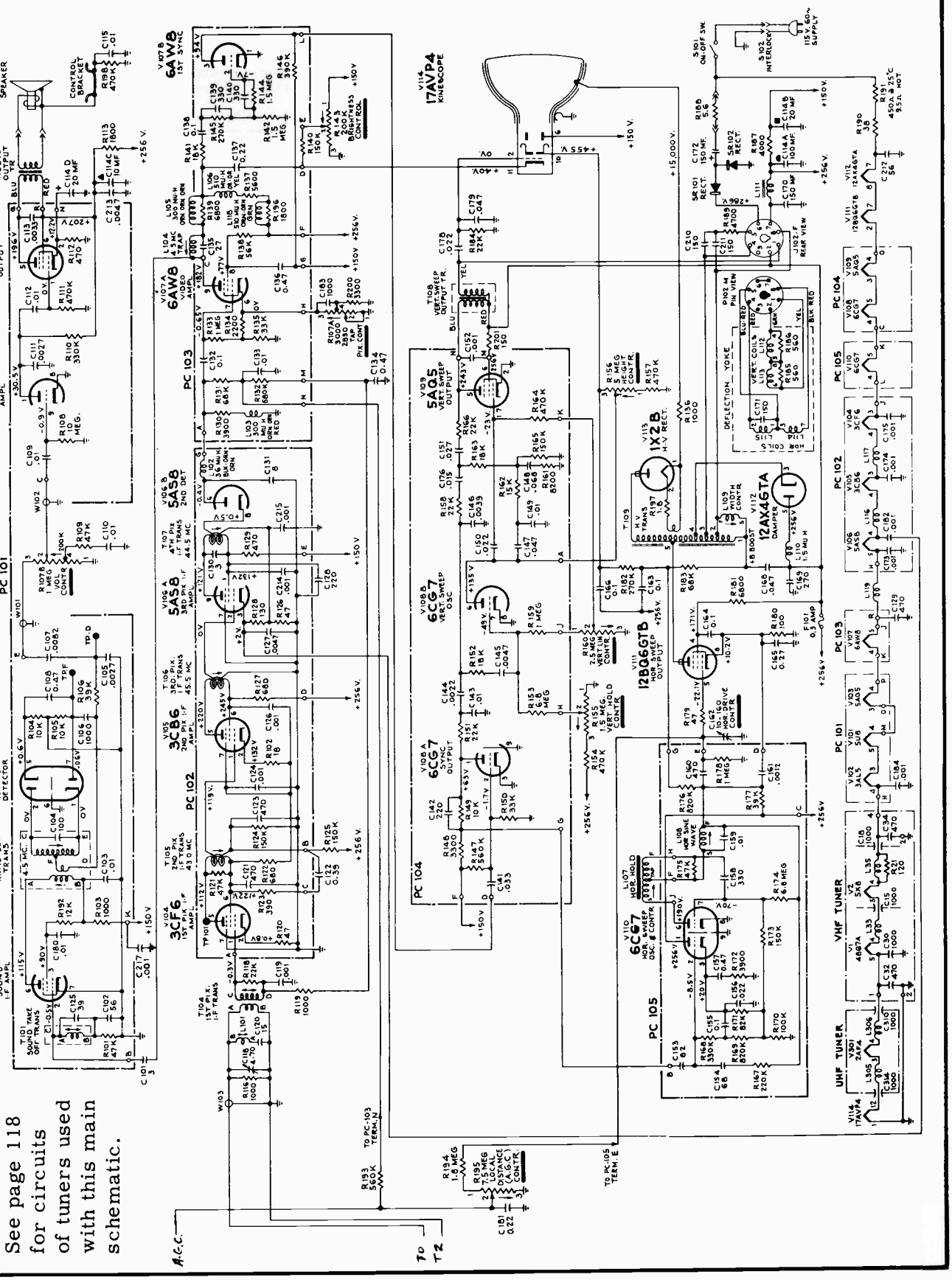
All voltages measured with "Voltohmyst" and with no signal input. Voltages should hold within ±20% with 117 v. a-c supply.



Either of these two tuners is used with main schematic shown on page 119.

RCA Victor Chassis KCS-94, KCS-94A, KCS-95, KCS-95A, KCS-95C, continued

CIRCUIT SCHEMATIC DIAGRAM KCS 94A CHASSIS



See page 118 for circuits of tuners used with this main schematic.

RCA Victor Alignment Procedure for Chassis KCS-94, -A, KCS-95, -A, -C

PICTURE I-F TRANSFORMER ADJUSTMENTS.—

Applicable to VHF sets only.

Connect the i-f signal generator, in series with a 1500 mmf. ceramic capacitor, to the mixer grid test point TP2.

Connect the "VoltOhmyst" to the junction of R117 and R119 and to ground.

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 R117 and R119. The second battery will be used later.

Set the bias to produce approximately —3.5 volt of bias at the junction of R117 and R119.

Connect the "VoltOhmyst" to the junction of R130 and L102 and to ground (terminal "G" of PC102).

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 R130 and L102 with —3.5 volts of i-f bias at the junction of R117 and R119.

44.5 mc. T107
45.5 mc. T106
43.0 mc. T105

Set the VHF signal generator to the following frequency and adjust the picture i-f trap for minimum d-c output at R130 and L102. Use sufficient signal input to produce 3.0 volts of d-c on the meter when the adjustment is made.

47.25 mc. L101

For combination UHF-VHF sets only.

Connect the i-f signal generator in series with a 1500 mmf. ceramic capacitor, to the mixer grid test point TP2.

Connect the "VoltOhmyst" to the junction of R117 and R119.

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 R117 and R119. Adjust the potentiometer for —3.5 volts indication on the "VoltOhmyst."

Connect the "VoltOhmyst" to the junction of R130 and L102 and to ground (terminal "G" of PC102).

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 R130 and L102 with —3.5 volts of i-f bias at the junction of R117 and R119.

44.5 mc. T107
45.5 mc. T106
43.0 mc. T105

Set the signal generator to the following frequency and adjust the picture i-f trap for minimum d-c output at junction of R130 and L102. Use sufficient signal input to produce 3.0 volts of d-c on the meter when adjustment is made.

47.25 mc. L101

SWEEP ALIGNMENT OF PICTURE I-F.—

Applicable to VHF sets only.

To align the mixer plate circuit, 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 top of the tuner.

Set the channel selector switch to channel 4.

Clip a 330 ohm resistor between pin 2 of V106A and ground.

Preset C118 to minimum capacity.

Adjust the bias box potentiometer to obtain —3.5 volts of bias as measured by a "VoltOhmyst" at the junction of R117 and R119.

Connect a 180 ohm composition resistor from pin 5 of V104 to pin 6 of V104. Connect the oscilloscope diode probe to pin 5 of V104 and to ground.

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

Adjust T2 (top) and T104 (top) for maximum gain and with 45.75 mc. at 75% of maximum response.

Set the sweep output to give 0.5 volt peak-to-peak on the oscilloscope when making the final touch on the above adjustment.

Adjust C118 until 42.5 mc. is at 70% response with respect to the low frequency shoulder of the curve as shown in Figure 7. Maximum allowable tilt is 20%.

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

Connect the oscilloscope to the junction of R130 and L102.

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 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 T105, T106 and T107 to obtain the response shown in Figure 8.

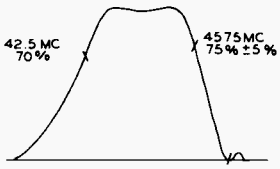


Figure 7— KRK32B T2 and T104 Response

Figure 8— Overall I-F Response with KRK32B

Increase sweep output ten times and check attenuation at 41.25 mc. Adjust T105 and T107 to set 41.25 mc. between 25 and 35 times down with curve as shown in Figure 8.

Move the sweep generator to the antenna terminals. Adjust T106 and T107 slightly to correct for any overall tilt while switching from channel to channel.

For combination UHF-VHF sets only.

To align the mixer plate circuit, 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 top of the tuner.

Set the channel selector switch to channel 4.

Clip a 330 ohm resistor between pin 2 of V106A and ground.

Preset C118 to minimum capacity.

Adjust the bias box potentiometer to obtain —3.5 volts of bias as measured by a "VoltOhmyst" at the junction of R117 and R119.

Connect a 180 ohm composition resistor from pin 5 of V104 to pin 6 of V104. Connect the oscilloscope diode probe to pin 5 of V104 and to ground.

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

Adjust T2 (top) and T104 (top) for maximum gain and with 45.75 mc. at 75% of maximum response.

Set the sweep output to give 0.5 volt peak-to-peak on the oscilloscope when making the final touch on the above adjustment.

Adjust C118 until 42.5 mc. is at 70% response with respect to the low frequency shoulder of the curve as shown in Figure 9. Maximum allowable tilt is 20%.

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

Connect the oscilloscope to the junction of R130 and L102.

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

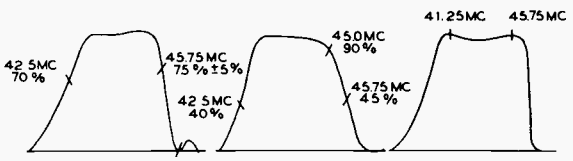


Figure 9— KRK29K T2 and T104 Response

Figure 10— Overall I-F Response with KRK29K

Figure 11— KRK29K L9 and C308 I-F Response

RCA Victor Chassis KCS-94, KCS-94A, KCS-95, KCS-95A, KCS-95C, continued

Adjust the output of the sweep generator to obtain 3.0 to 0.5 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 T105, T106 and T107 to obtain the response shown in Figure 10.

Increase sweep output ten times and check attenuation at 41.25 mc. Adjust T105 and T107 to set 41.25 mc. between 30 and 40 times down with curve as shown in Figure 10.

To align the I-F amplifier circuit of the KRK29K, connect the VHF sweep generator to the front terminal of the 1N82 crystal holder in series with a 1000 ohm resistor and a 1500 mmf. ceramic capacitor. Use the shortest leads possible, grounding the sweep ground lead to the tuner case.

To do this, remove the crystal cover and connect the resistor, after insulating the lead with tubing, to the crystal front terminal.

Set the UHF CHANGEOVER switch to the UHF position, and the UHF TUNING between channels 68 and 69 at 800 mc.

Connect a 220 ohm composition resistor and a 1500 mmf. capacitor in series between the plate, pin 1, of V1 4BQ7A and ground with the capacitor connected to pin 1 and the resistor to ground. This point is accessible through the hole in the left side of the tuner. Connect the oscilloscope diode probe to the junction between the resistor and capacitor.

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

Connect the potentiometer arm of the second bias supply to the AGC terminal on the tuner and ground the battery positive terminal to the tuner case. Adjust the bias potentiometer to produce —3.0 volts of bias, as measured by the "VoltOhmyst" at the AGC terminal on the tuner.

Set the sweep generator to produce 0.5 volt or less peak-to-peak on the oscilloscope.

Adjust C308, on the UHF section, and L9, on the VHF section, of the tuner for maximum gain with 45.75 mc. and 41.25 mc. markers as shown in figure 11.

Move the diode detector to test point TP3 and adjust L27 and L43 for curve as shown in figure 11.

Remove the resistor, capacitor and diode probe from TP3 and connect the oscilloscope to the junction of R130 and L102. Use 3.0v peak-to-peak on the oscilloscope.

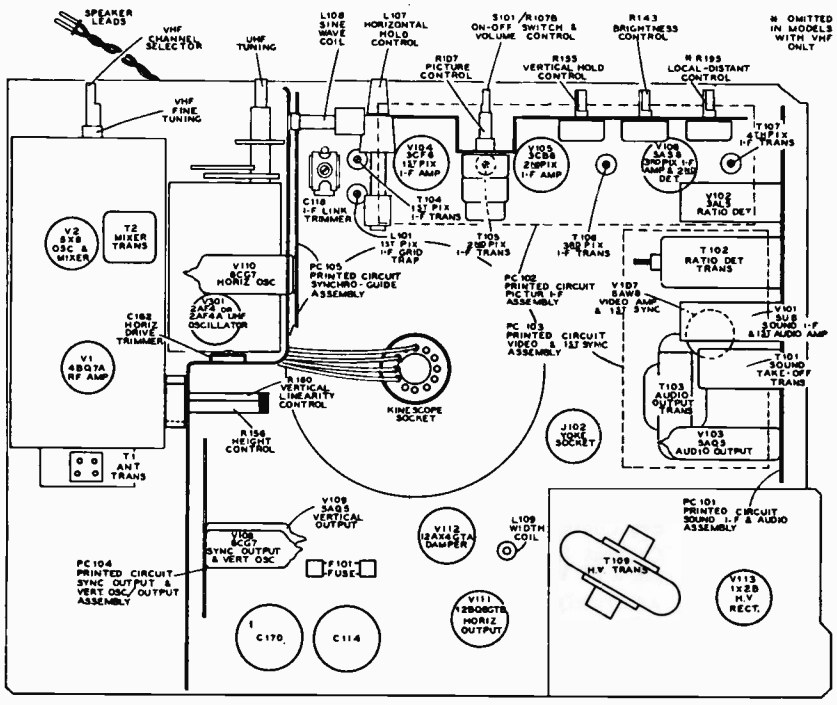
Connect the VHF sweep generator to the antenna terminals. Keep the AGC bias at —3.0 V and the I-F bias at —3.5 volts.

Couple the signal generator loosely to the grid of the first picture I-F amplifier.

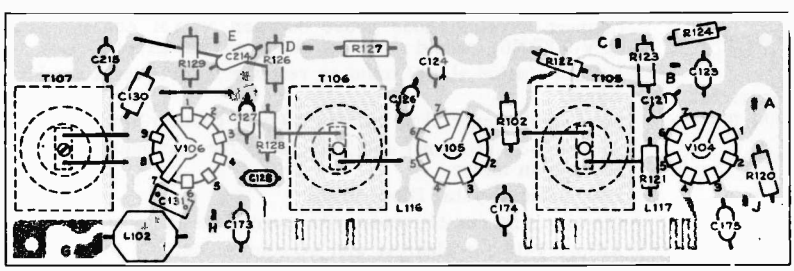
Switch through all VHF channels and check for proper curve shape as in figure 10. Retouch T106 and T107 slightly to correct for any overall tilt that is essentially the same on all channels.

Disconnect the VHF sweep generator and connect the UHF sweep generator to the antenna terminals. Check on all UHF channels for proper wave shape as shown in figure 10, retouching L27 and L43 if necessary to correct any overall tilt. Do not retouch C308, L9, T2, T104, T105, T106 or T107.

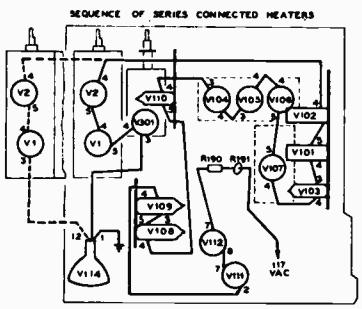
Remove the sweep and marker generators and the bias supplies.

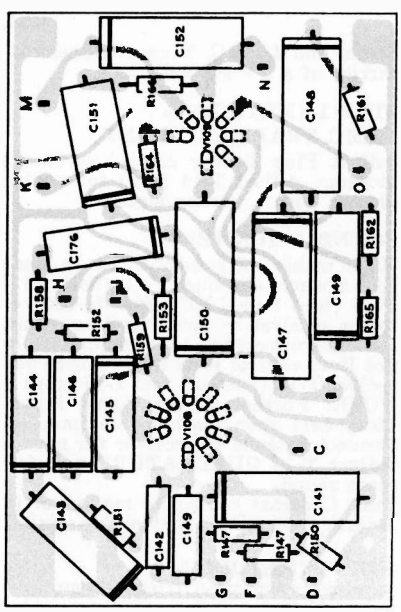


CHASSIS TOP VIEW



PC102—Picture I-F Unit Layout





PC104—Vertical & Sync Unit Layout

Sentinel

SENTINEL RADIO CORPORATION

(Service material on pages 122 through 127)

MODELS

1U-1101	1U-1136
1U-1111	1U-1137
1U-1121	1U-1145
1U-1124	1U-1147
1U-1126	1U-1155
1U-1127	1U-1157
1U-1131	21101
1U-1134	21121
	21145

PICTURE TUBE TILT: Grasp deflection yoke and turn in direction of tilt.

ION TRAP: Maximum brightness and focus will be determined by the positioning of the ION trap. Advance brightness control to its center position. Adjust ION trap for maximum brightness and best focus.

FOCUS: Focus contact spring connected to pin 6 and between either pin 1 or 10 of the picture tube socket compensates for any variations of picture tube. To obtain best focus connect to pin 6 and to either pin 1 or 10 of picture tube socket.

VERTICAL AND HORIZONTAL CENTERING AND CORNER SHADOW: Adjust centering tabs (part of deflection yoke) so that picture is centered both horizontally and vertically without corner shadow. Readjust ION trap after centering adjustment is made.

PICTURE TUBE REMOVAL INSTRUCTIONS:

1. Place cabinet face down on a soft clean cloth.
2. Remove chassis, by disconnecting 4 yoke leads, H.V. connector, picture tube socket, antenna terminals from cabinet and speaker leads.
3. Remove only the four bolts holding the picture tube strap assembly to the cabinet.
4. Remove picture tube and complete strap assembly from cabinet as a unit.

C-93 a .01 mfd. 600 volt capacitor and R-101 a 470,000 ohm ½ watt resistor must always be connected between harness assembly and metal bezel or picture tube strap assembly. Ground clip must always be connected between pin 1 of picture tube socket and harness assembly.

HARNESS ASSEMBLY: Models with metal bezel do not have picture tube strap assembly.

The picture tube mounting assembly has been designed to simplify servicing the receiver.

A few of the many advantages are:

1. Yoke can be removed without unsoldering any leads.
2. More accessible to service tubes on the chassis.
3. Eliminates the handling of heavy and bulky chassis. Much simpler to handle during shop work.
4. Leads from picture tube socket and deflection yoke are long enough to do servicing of underside of chassis.
5. Simplifies checking the picture tube in the home by substituting a 5AXP4 picture tube. (5AXP4 picture tube is a direct substitute for any size picture tube with self focusing, requires no ION trap, small and light weight, especially designed for servicing.)

ALIGNMENT PROCEDURE

All circuits are very stable and will seldom require adjustment. Only when major parts of the tuner or the video I-F strip have been replaced or tampered with will it be necessary to realign the receiver.

Generally under normal conditions only the INDIVIDUAL CHANNEL TRIMMERS in the tuner unit may require adjustment by the service technician.

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.

SOUND AND TRAP ALIGNMENT

Sound and 4.5 MC. Trap alignment is made on the sound carrier of a TV station.

STEP 1 (METHOD 1)

4.5 MC. TRAP ALIGNMENT

Adjust Fine Tuning control so that sound appears with picture. Adjust T-14 (top) for minimum 4.5 MC. beat on picture with a station signal.

SOUND ALIGNMENT

When making alignment by ear, a hiss must accompany the sound when aligning T-14 (bottom) Sound Take-off and T-15 (top) Sound I.F. Simply reduce station signal input to the receiver by spray feeding or attenuation method.
Set Contrast control to minimum (fully counter-clockwise).
Set Buzz control R-58 to its center position.
Adjust T-14 (bottom) and T-15 (top) for maximum signal.
NOTE: Further reduce signal input to receiver if hiss disappears upon reaching maximum signal level.
Connect antenna to receiver for normal receiver operation.
Adjust T-16 QUADRATURE coil for clearest and maximum sound.
Turn Contrast control to maximum (fully clockwise).
Adjust R-58 BUZZ control for minimum buzz.

STEP 1 (METHOD 2)

EQUIPMENT REQUIRED: VTVM, SIGNAL GENERATOR 4.5 MC. (within ¼ of 1% of 4.5 MC.) and 4.5 MC. TRAP ALIGNMENT CRYSTAL DIODE PROBE as shown in fig. 7.

4.5 MC. TRAP ALIGNMENT

Connect Crystal Diode probe between VTVM and junction of pin 11 of V-17, R-86 and C-51; ground side of probe to chassis. (VTVM on low-DC scale).

Set Contrast control to maximum (fully clockwise).

Connect Signal Generator thru a 1000 ohm resistor to pin 2 of V-7 12BY7A.

Accurately set Signal Generator to 4.5 MC. (maximum output).

Ground pin 1 of V-6 3CB6.

Adjust T-14 (top) for minimum reading. Remove equipment.

SOUND ALIGNMENT

Connect Crystal Diode probe between VTVM and pin 2 of V-9 3BN6; ground side of probe to chassis ground.

Reduce station signal input to receiver to produce a weak signal.

Set Contrast control to minimum (fully counter-clockwise).

Adjust T-14 (bottom) and T-15 (top) for maximum signal reading on meter.

Disconnect Crystal Diode probe.

Connect Antenna to receiver for normal receiver operation.

Adjust T-16 for clearest and maximum sound.

Turn Contrast control to maximum (fully clockwise).

Adjust R-58 BUZZ control for minimum buzz.

EQUIPMENT REQUIRED

VACUUM TUBE VOLTMETER
For video I-F alignment maintain readings in middle of low volt scale.

SIGNAL GENERATOR supplying a 4.5 MC. (within .25%) 40 to 216 MC. (within 1%) signal. With output adjustable to at least .1 volt maximum.

CATHODE-RAY OSCILLOSCOPE. Must have good frequency and phase response from 10 cycles to at least 2 MC.

SWEEP GENERATOR. Capable of covering 40 to 270 MC. with a 10 MC. sweep with output adjustable to at least .1 volt maximum.

3 VOLT "A" BATTERY to provide fixed bias during video I-F and R-F alignment.

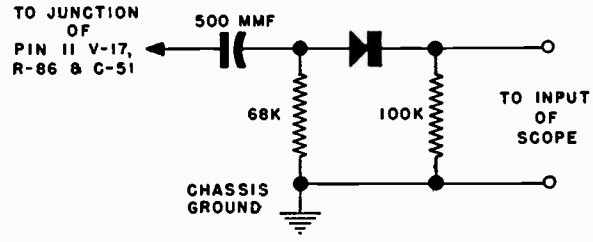


FIG. 7 DIODE DETECTOR

SENTINEL

1U-1101, 1U-1111, 1U-1121, 1U-1124, 1U-1126, 1U-1127, 1U-1131, 1U-1134, 1U-1136, 1U-1137, 1U-1145, 1U-1147, 1U-1155, 1U-1157, 21101, 21121, and 21145.

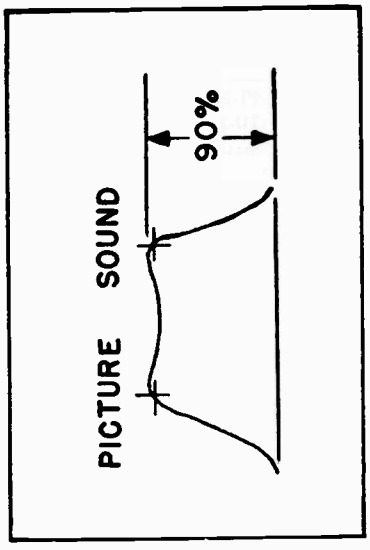
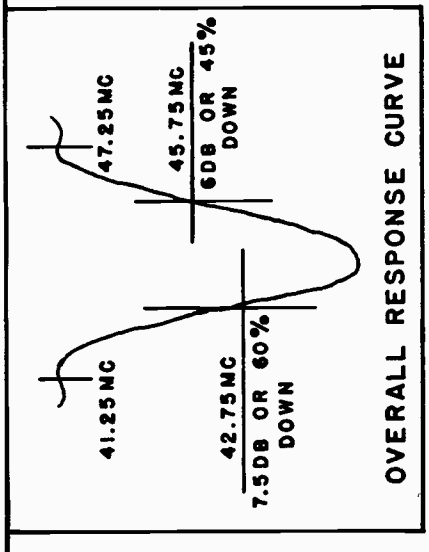


FIG. 6



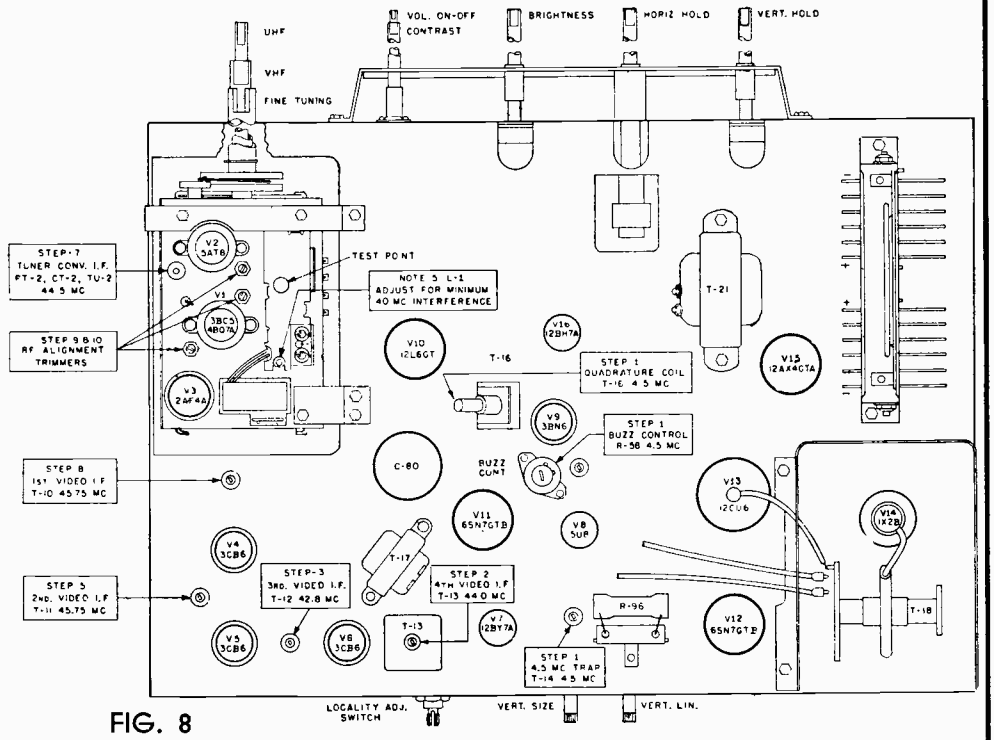


FIG. 8

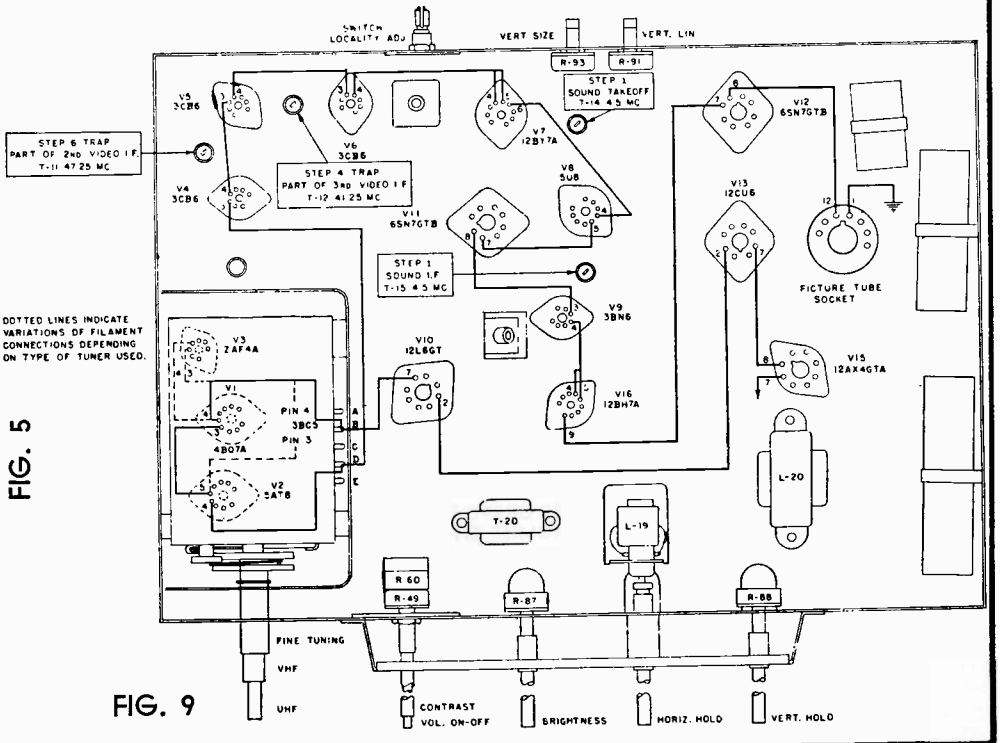


FIG. 9

SENTINEL Models 1U-1101, 1U-1111, 1U-1121, 1U-1124, etc., Continued

VHF ALIGNMENT DATA—(Cont.)

PICTURE I-F ALIGNMENT

Step No.	Connect Signal Generator to	Sig. Gen. Freq.	Connect Voltmeter to	Miscellaneous Instructions	Adjust
2	Ungrounded converter tube (5AT8) shield	44.0 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. See Note 1.	T-13 (top) for maximum reading. See fig. 8.
3	Ungrounded converter tube (5AT8) shield	42.8 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. See Note 1.	T-12 (top) for maximum reading. See fig. 8.
4	Ungrounded converter tube (5AT8) shield	41.25 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. Repeat Steps 3 & 4. See Note 1.	T-12 (bottom) for minimum reading. See fig. 9.
5	Ungrounded converter tube (5AT8) shield	45.75 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. See Note 1.	T-11 (top) for maximum reading. See fig. 8.
6	Ungrounded converter tube (5AT8) shield	47.25 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. Repeat Steps 5 & 6. See Note 1.	T-11 (bottom) for minimum reading. See fig. 9.
7	Ungrounded converter tube (5AT8) shield	44.5 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. See Note 1. **NOTE:** Detune T-10 by turning slug out as far as possible.	PT-2 or CT-2 or TU-2 (top) for maximum reading. See fig. 8.
8	Ungrounded converter tube (5AT8) shield	45.75 MC.	In series with 47,000 ohm res. to junction of R-46 and L-15.	Tuner on channel 3, 3 volts bias across C-47 positive side to ground. See Note 1.	T-10 (top) for maximum reading. See fig. 8.

NOTE 1: FOR MODELS WITH LOCALITY ADJUSTER CONTROL: Locality adjuster control must be in the STRONG position when making the Video and RF alignment adjustments.

NOTE 2: For visual check of IF response curve (see fig. 5) connect signal and sweep generator to ungrounded converter tube shield (5AT8). Connect oscilloscope in series with 47,000 ohm resistor to junction of R-46 and L-15.

TUNER R-F ALIGNMENT

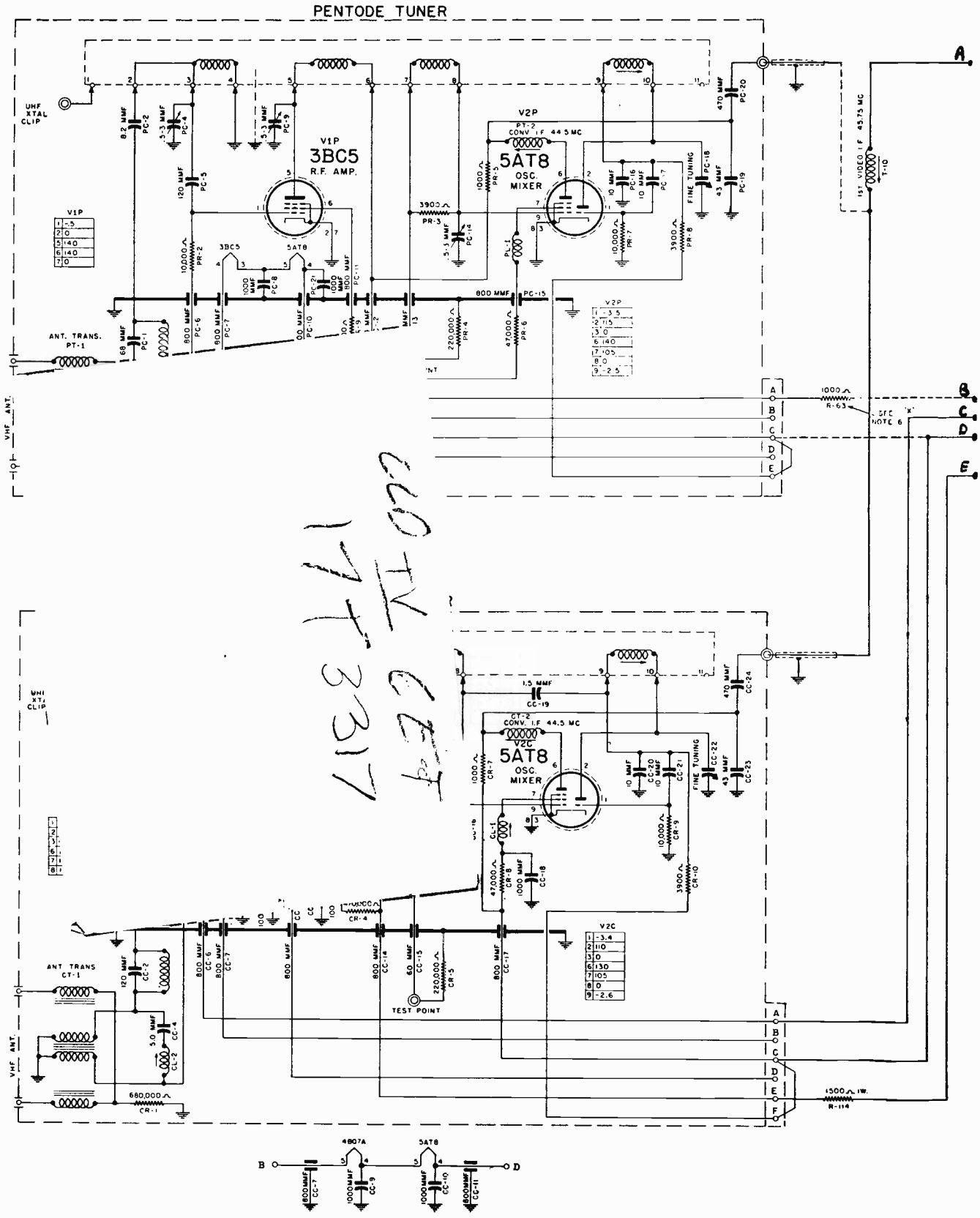
NOTE 3: NEVER ADJUST (PC-4, PC-9, PC-14 PENTODE TUNER), (CC-1, CC-12, CC-16 CASCODE TUNER), (CU-21, CU-27, CU-38 VHF-UHF COMBO TUNER) UNLESS ABSOLUTELY NECESSARY. They are factory preset by special equipment.

Step No.	Connect Marker Generator to	Marker Gen. Freq.	Connect Sweep Gen. to	Sweep Gen. Chan.	Connect Oscilloscope to	Miscellaneous Connections	Adjust
9	Loosely couple to sweep gen. leads.	205.25 MC. and 209.75 MC.	Antenna terminals.	12	Test point on tuner. See fig. 8.	Tuner on channel 12 3 volt bias across C-47 postive side to ground. See Note 1.	Adjust RF trimmers for max. response having linear peaks with picture and sound markers at 90% maximum response. See fig. 6.
10	OBSERVE RESPONSE CURVE FOR ALL CHANNELS USING CORRECT FREQUENCIES AND CHANNELS. A SLIGHT COMPROMISE SHOULD BE MADE WITH RF TRIMMERS IF MARKERS ARE BELOW 70%.						

NOTE 4: RF OSCILLATOR ALIGNMENT: Set the VHF channel selector to the station needing alignment. Set the fine tuning to the center of the fine tuning range. Carefully adjust the individual oscillator slugs for best picture detail. NOTE: USE A NON-METALLIC SCREWDRIVER.

NOTE 5: 40 to 45 MC. TRAP: The 40 MC. trap, located on tuner (see fig. 8) (VHF-UHF tuners have adjustments on side of tuner), need only be adjusted when local interference from 40 thru 45 MC. affects the picture. Adjust for minimum 40 MC. beat in picture with a station signal.

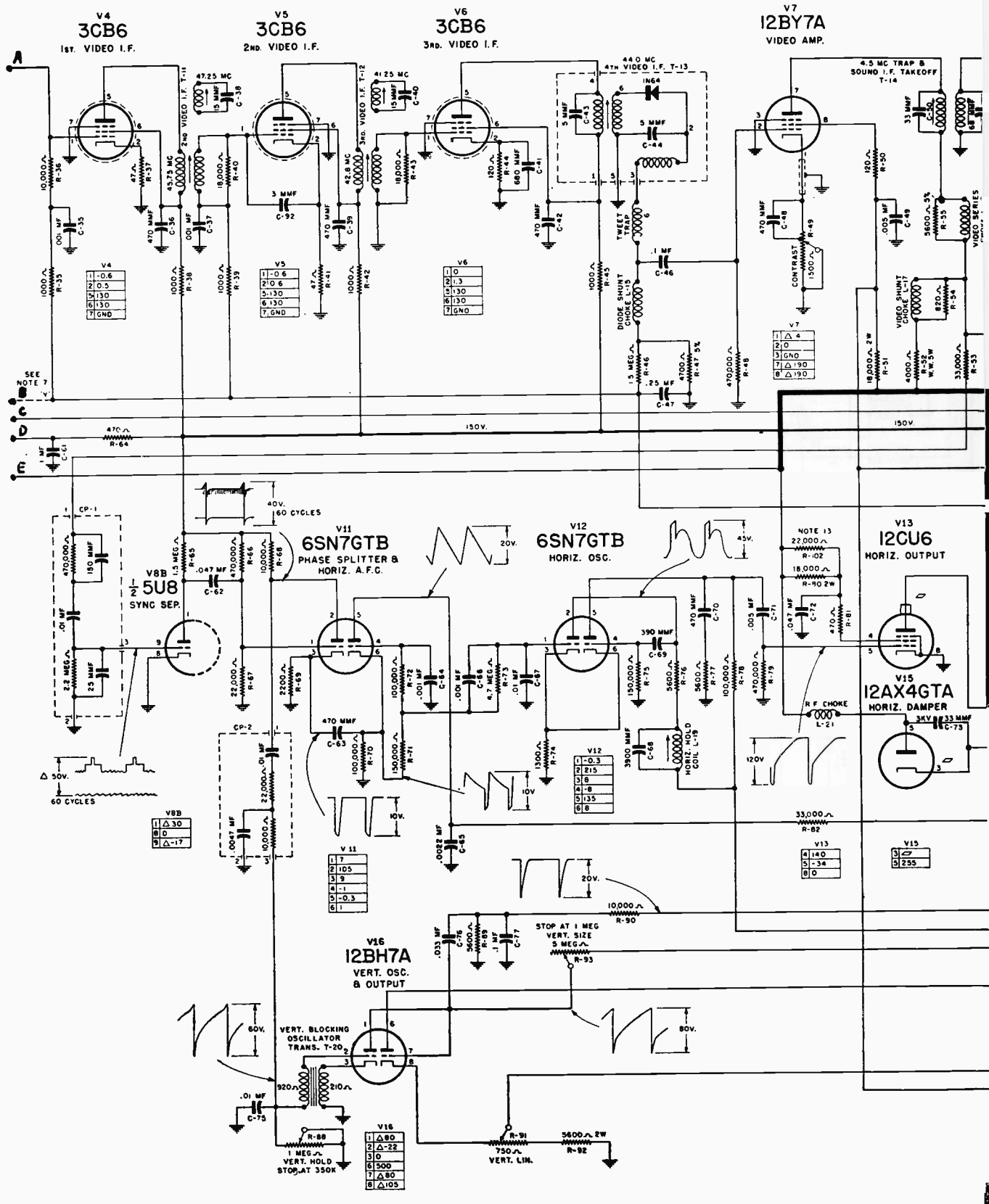
SENTINEL Models 1U-1101, 1U-1111, 1U-1121, 1U-1124, etc., Continued



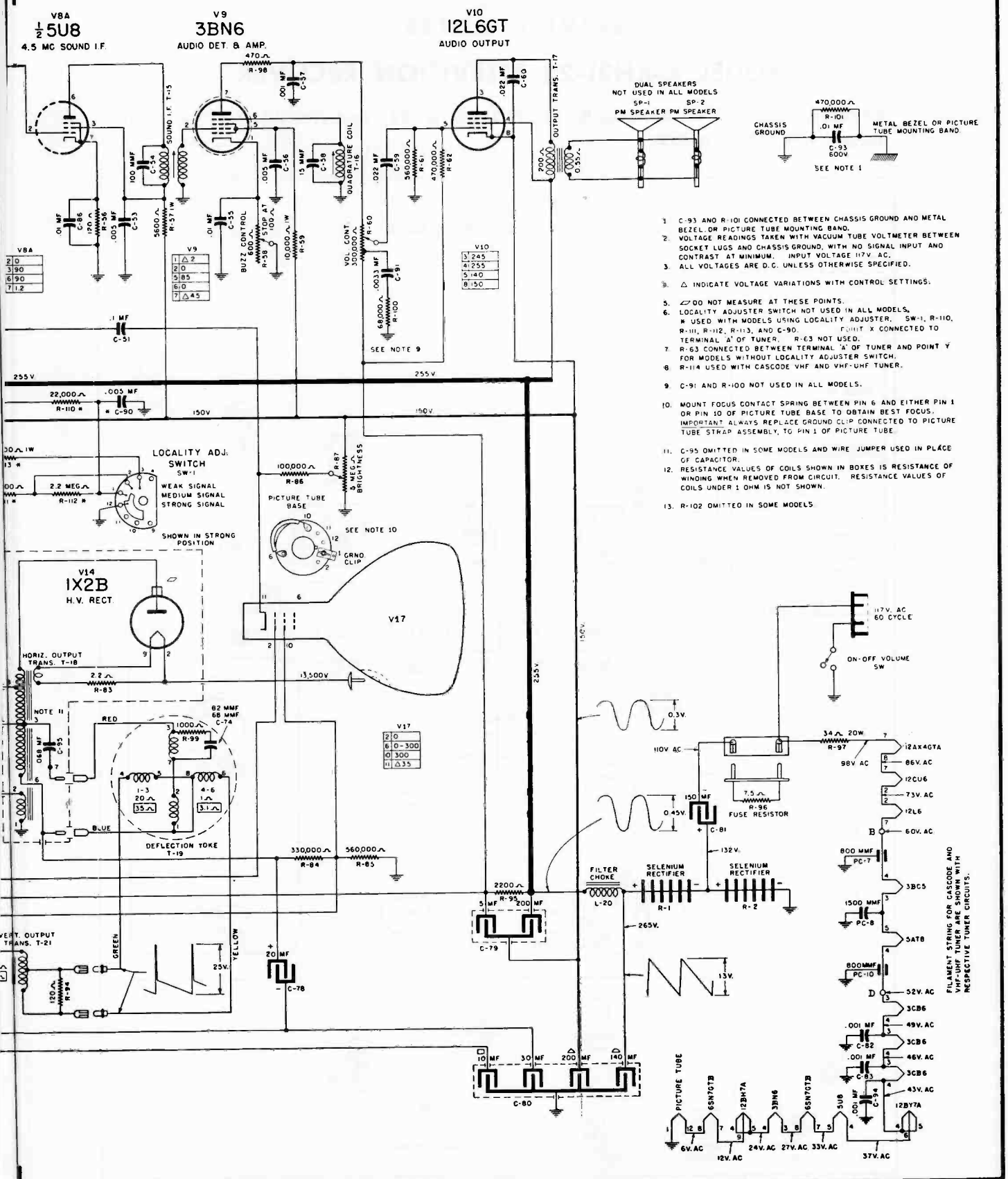
Terminals marked A through E connect to corresponding terminals of main schematic on page 126.

SENTINEL Schematic Diagram of Models 1U-1101, 1U-1111, 1U-1121, etc.

Terminals marked A through E connect to tuner schematic shown on page 125.



SENTINEL Schematic Diagram of Models 1U-1101, 1U-1111, 1U-1121, etc.

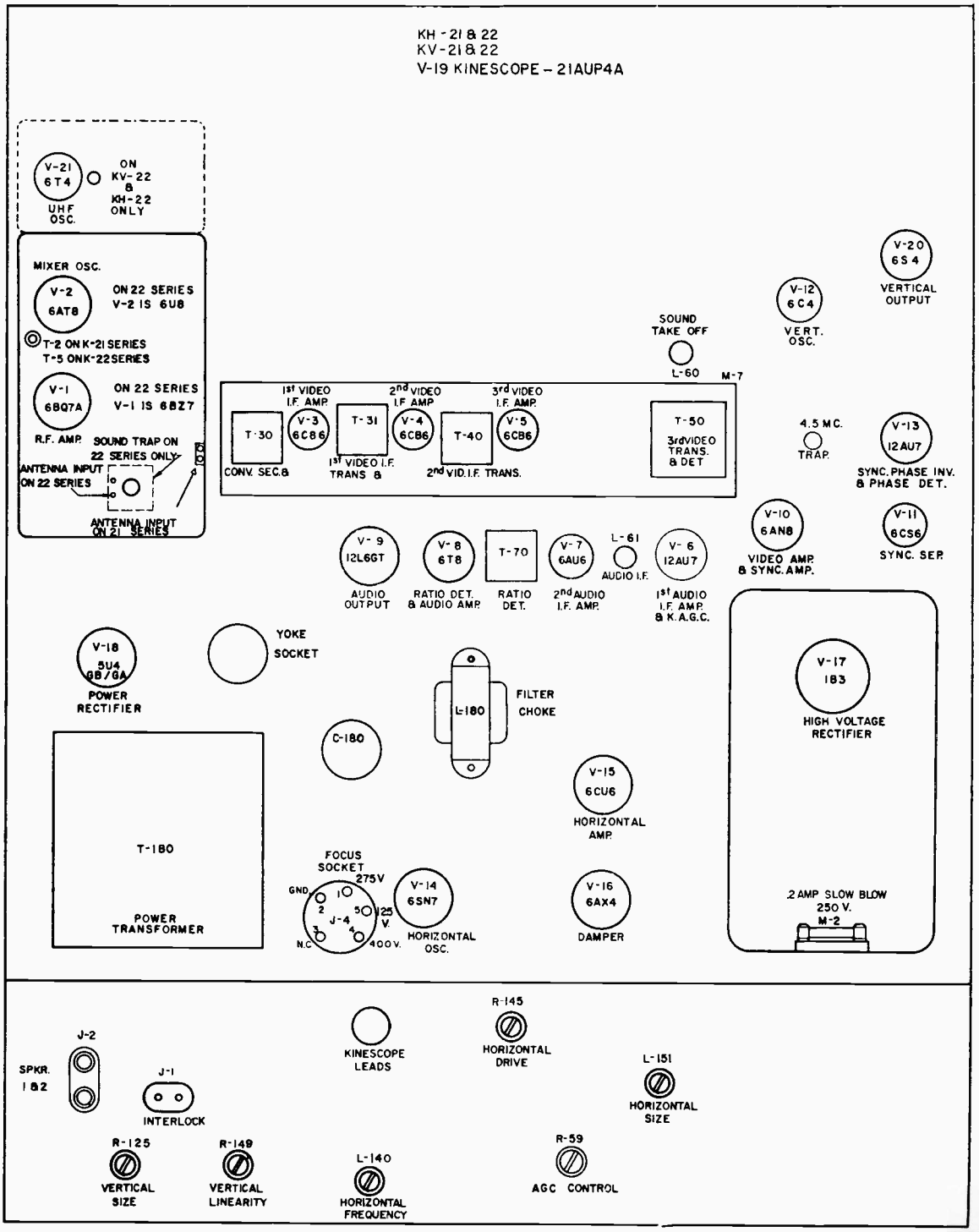


STROMBERG-CARLSON

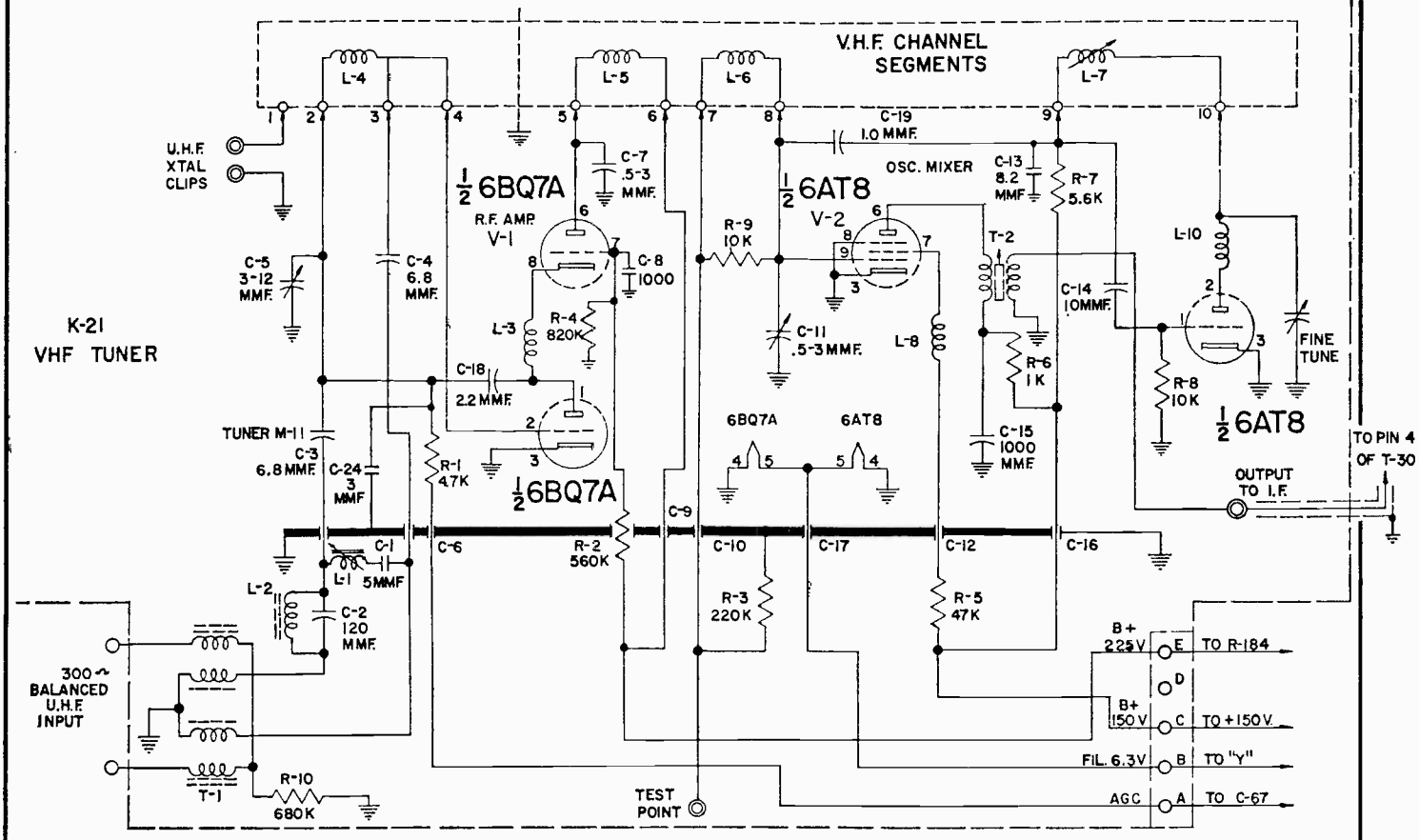
SERVICE NOTES

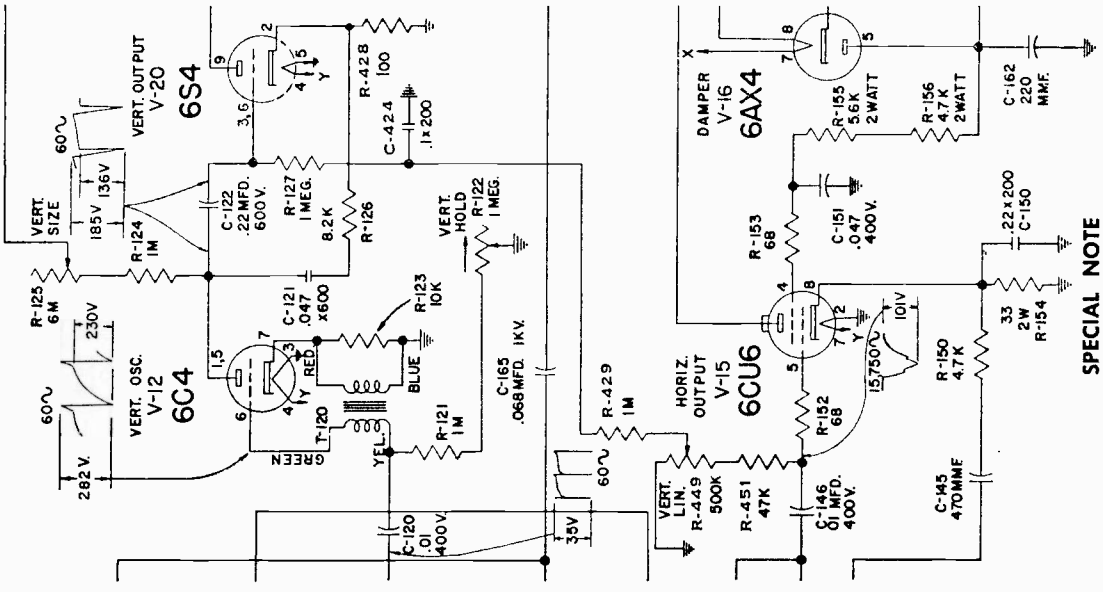
MODEL K-KH21-22 TELEVISION RECEIVER

Service material on Models K-21, KH-21, K-22, and KH-22 is printed on pages 128 through 132.



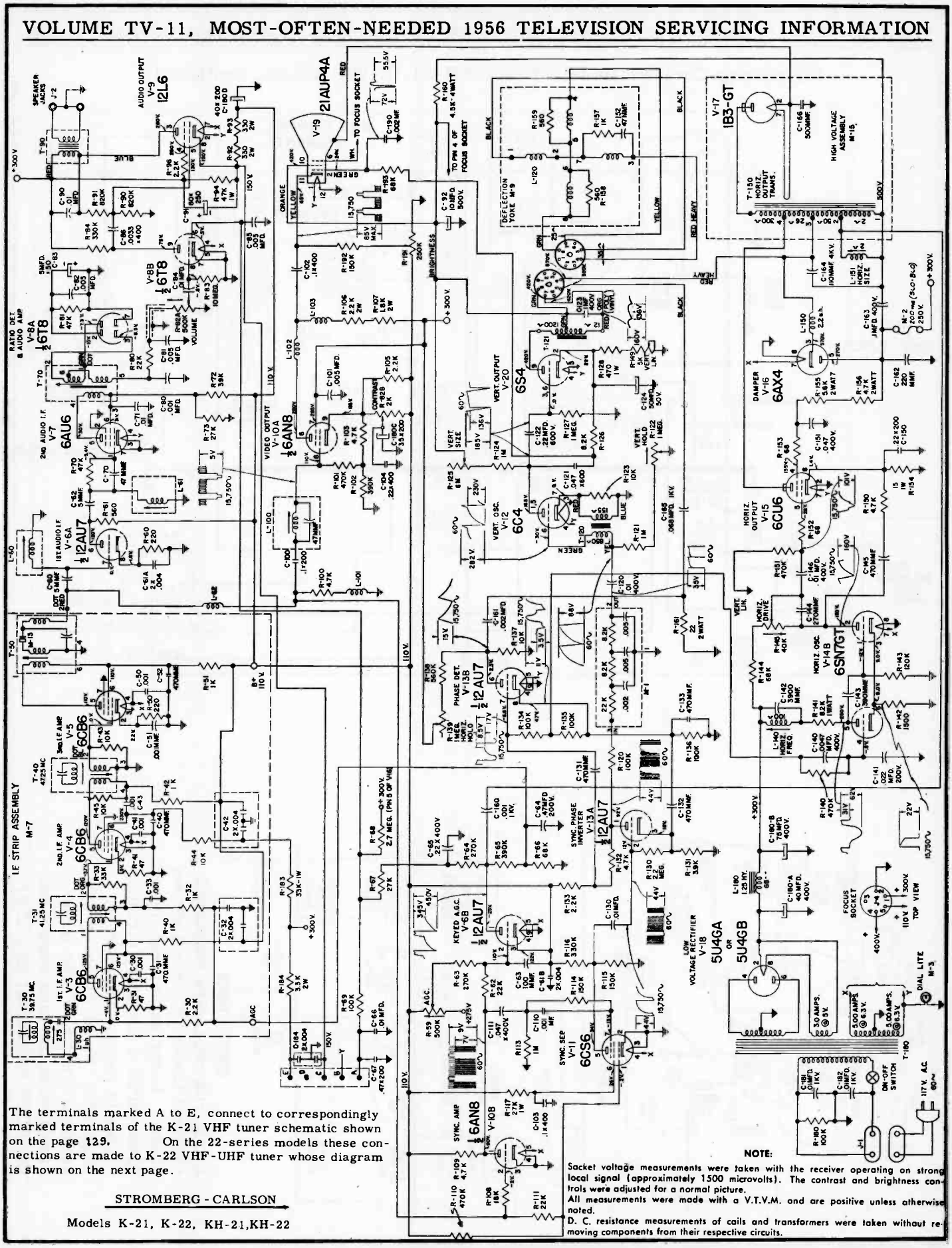
Stromberg-Carlson Models K-21, KH-21, K-22, KH-22, continued





SPECIAL NOTE

Early run receivers employed vertical linearity circuit shown above. Later series receivers used vertical linearity circuit shown in main schematic on page 130. In the circuit above vertical amplifier bias is secured from the bias supply for the 6CU6 horizontal amplifier. Adjust horizontal drive before vertical adjustments.



The terminals marked A to E, connect to correspondingly marked terminals of the K-21 VHF tuner schematic shown on the page 129. On the 22-series models these connections are made to K-22 VHF-UHF tuner whose diagram is shown on the next page.

STROMBERG-CARLSON

Models K-21, K-22, KH-21, KH-22

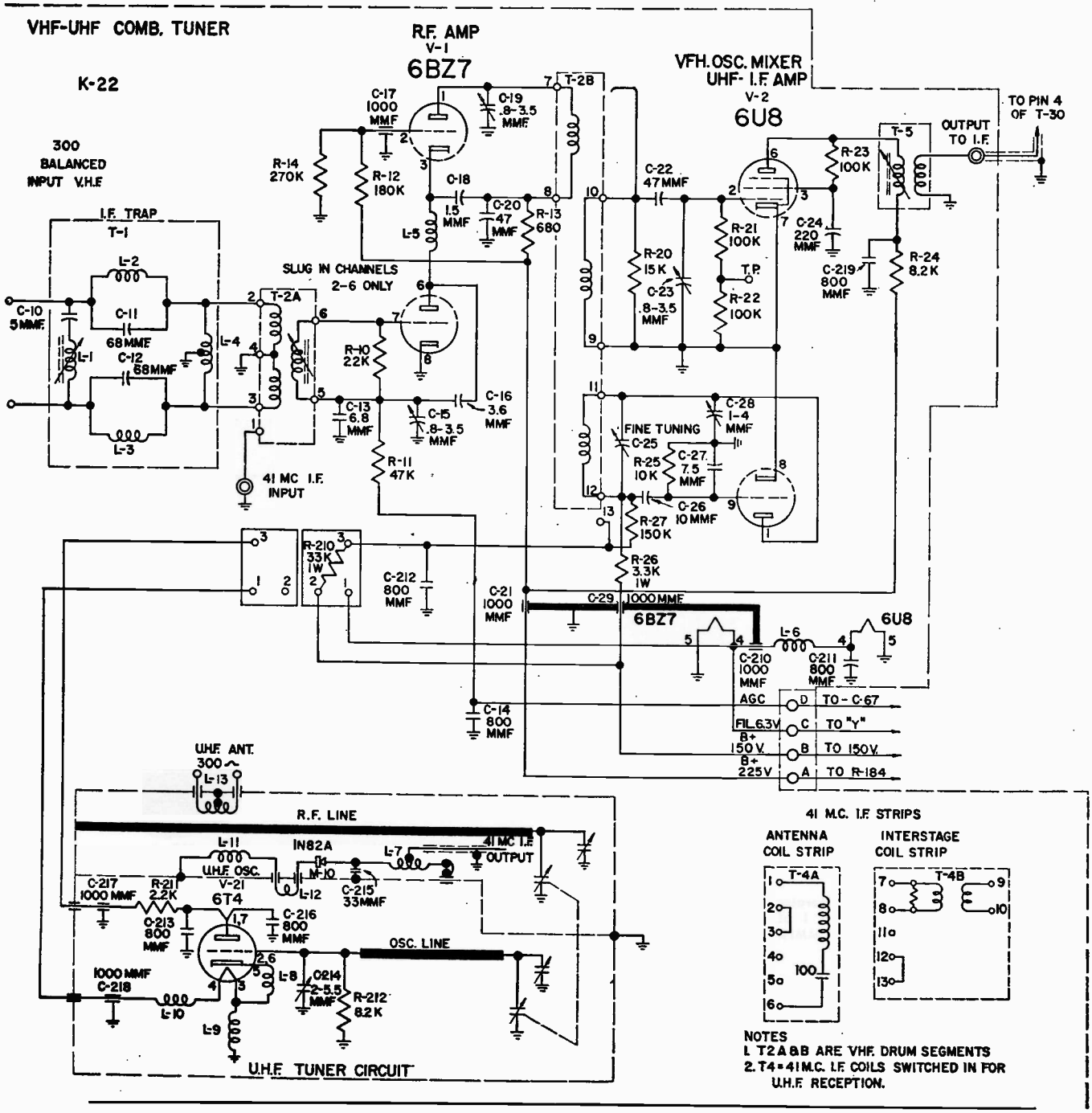
NOTE:

Socket voltage measurements were taken with the receiver operating on strong local signal (approximately 1500 microvolts). The contrast and brightness controls were adjusted for a normal picture.

All measurements were made with a V.T.V.M. and are positive unless otherwise noted.

D. C. resistance measurements of coils and transformers were taken without removing components from their respective circuits.

Stromberg-Carlson Models K-21, KH-21, K-22, KH-22, continued



NOTES
1. T2A & B ARE VHF. DRUM SEGMENTS
2. T4 = 41 M.C. I.F. COILS SWITCHED IN FOR U.H.F. RECEPTION.

ALTERNATE TRAP ALIGNMENT

IF THIS METHOD IS USED, IT SHOULD BE PERFORMED BEFORE THE IF CURVE ALIGNMENT

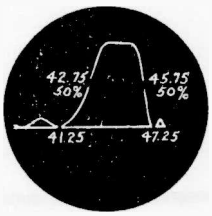
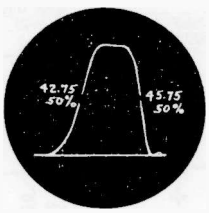
SIGNAL GENERATOR CONNECTION	OSCILLOSCOPE OR VTVM CONNECTION	ADJUSTMENTS
1. Connect modulated 400 cycle 39.75 MC signal to junction of T-6 and L-30.	Same as Step #1. (above)	1. Adjust top slug of T-30 for minimum response.
2. Connect a modulated 400 cycle 47.25 MC signal to grid of 1st IF tube, pin 1 of 6CB6 (V-3).	Same as Step #1.	2. Adjust top slug of T-40 for minimum response.
3. Same as Step #2 except use a modulated signal of 41.25 MC.	Same as Step #1.	3. Adjust top slug of T-31 for minimum response.

Stromberg-Carlson Models K-21, KH-21, K-22, KH-22, continued

ALIGNMENT PROCEDURE

A variable bias supply of approximately 4 volts is applied to the AGC line.
Oscilloscope should be calibrated to read 1-VOLT per inch vertical deflection.
Maintain the output level of the sweep generator to obtain a second detector output of 2 inches peak-to-peak.

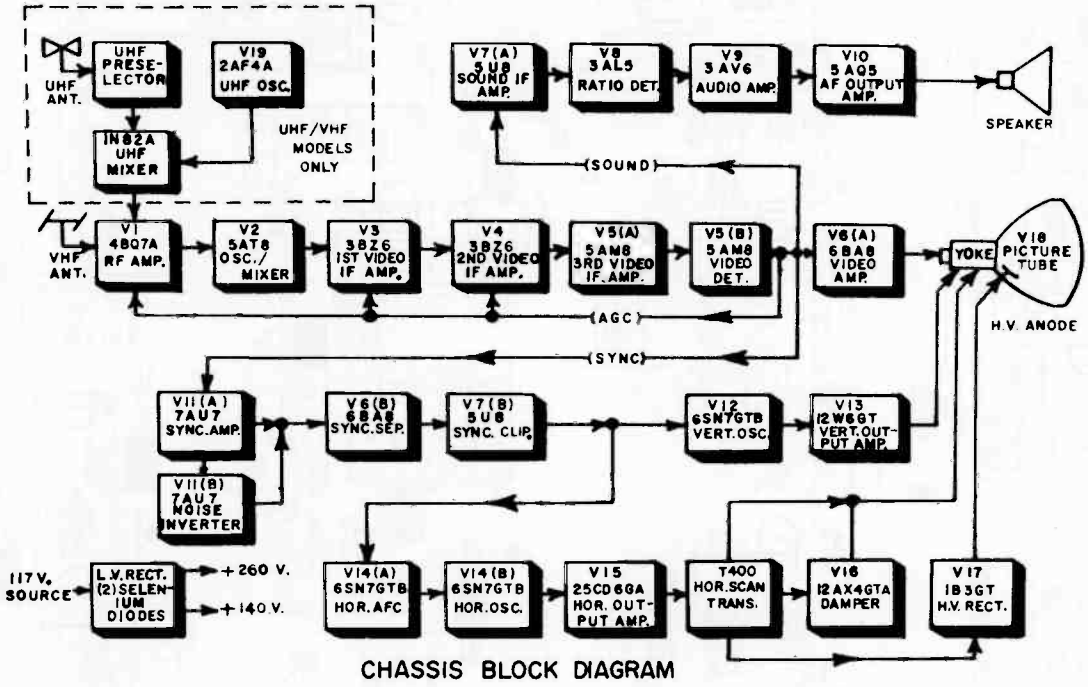
NOTE: To Perform IF Alignment it is not necessary to Remove Picture Tube. Use a non metallic aligning tool such as Walsco No. 2526 or equivalent which permits all slugs to be adjusted from the underside of the chassis.

SIGNAL GENERATOR CONNECTION	OSCILLOSCOPE OR VTVM CONNECTION	ADJUSTMENTS	
1. Output of 40MC sweep generator to junction of T-6 and L-30. Use 39.75MC marker.	Input of scope to grid of video amp., pin 8 of V-10A 6AN8 thru 47K ohm isolating resistor.	1. Adjust top slug of T-30 for response of 39.75 MC as shown on curve of Fig. 1.	 FIG. 1
2. Same os Step #1 using 41.25MC marker.	Same as Step #1.	1. Adjust top slug of T-31 for response of 41.25 MC as shown on curve of Fig. 1.	 FIG. 2
3. Same as Step #1 using 47.25MC marker.	Same as Step #1.	1. Adjust top of slug of T-40 for response of 47.25 MC as shown on curve of Fig. 2.	 FIG. 3
4. Output of 40MC sweep generator to grid of 1st IF tube, pin 1 of 6CB6 (V-3) through 100 MMFD isolating condenser.	Same as Step #1.	1. Adjust bottom slug of T-31 1st IF transformer for low frequency of 43.5 MC (approx.). 2. Adjust bottom slug of T-40, 2nd IF for high response of 45.3 MC (approx.). 3. Adjust bottom slug of T-50, 3rd IF for intermediate response of 44.5 MC (approx.). 4. Maintaining the above relative frequency positions of the individual stages, adjust the slugs to produce a curve shown in Fig. 3 with the 42.75 and 45.75 MC markers at 50% response.	 FIG. 4
5. Raise converter tube shield from ground and connect output of 40 MC sweep generator to shield.	Same as Step #1.	1. Adjust bottom slug of T-30 and T-5 (K-22) or T-2 (K-21) tuner assembly to produce a curve as shown in Fig. 4.	
6. Connect a 400 cycle modulated 4.5 MC signal to term. 3 of vid. det. assembly.	Connect VTVM across C-83.	1. Adjust L-60, L-61 and bottom of T-70 for maximum reading.	
7. Same os Step #6.	Parallel C-83 with pair of 100K resistors. Connect VTVM between center of 2 100K resistors and junction of R-80 and C-81.	1. Adjust top of T-70 for zero voltage. NOTE: Voltage must swing positive or negative as core is varied in or out.	

SYLVANIA ELECTRIC PRODUCTS INC.

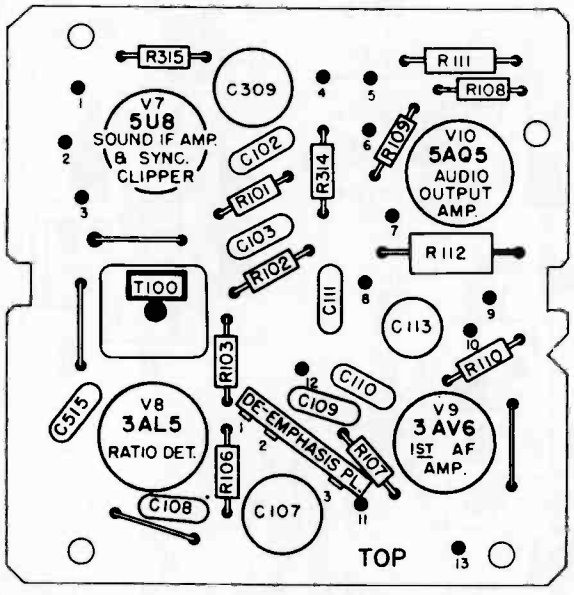
SYLVANIA

CHASSIS 1-532-1,-2
MODELS: 21T101, 21T102, 21T104, 21C401, 21C403, 24T101 SERIES

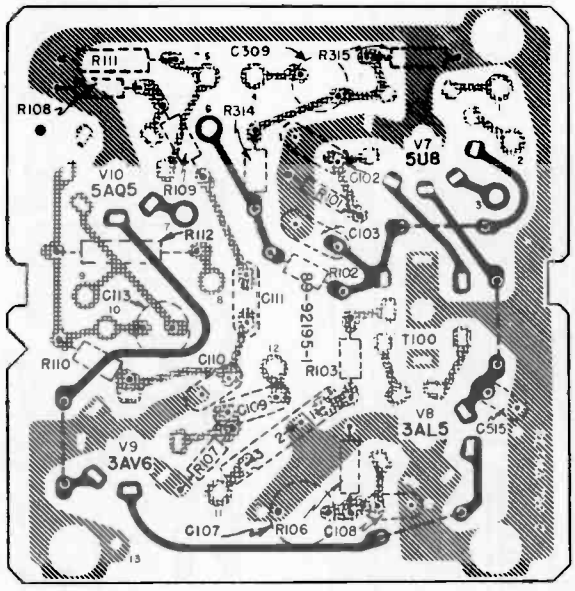


CHASSIS BLOCK DIAGRAM

PRINTED CIRCUIT SUB-CHASSIS LAYOUT



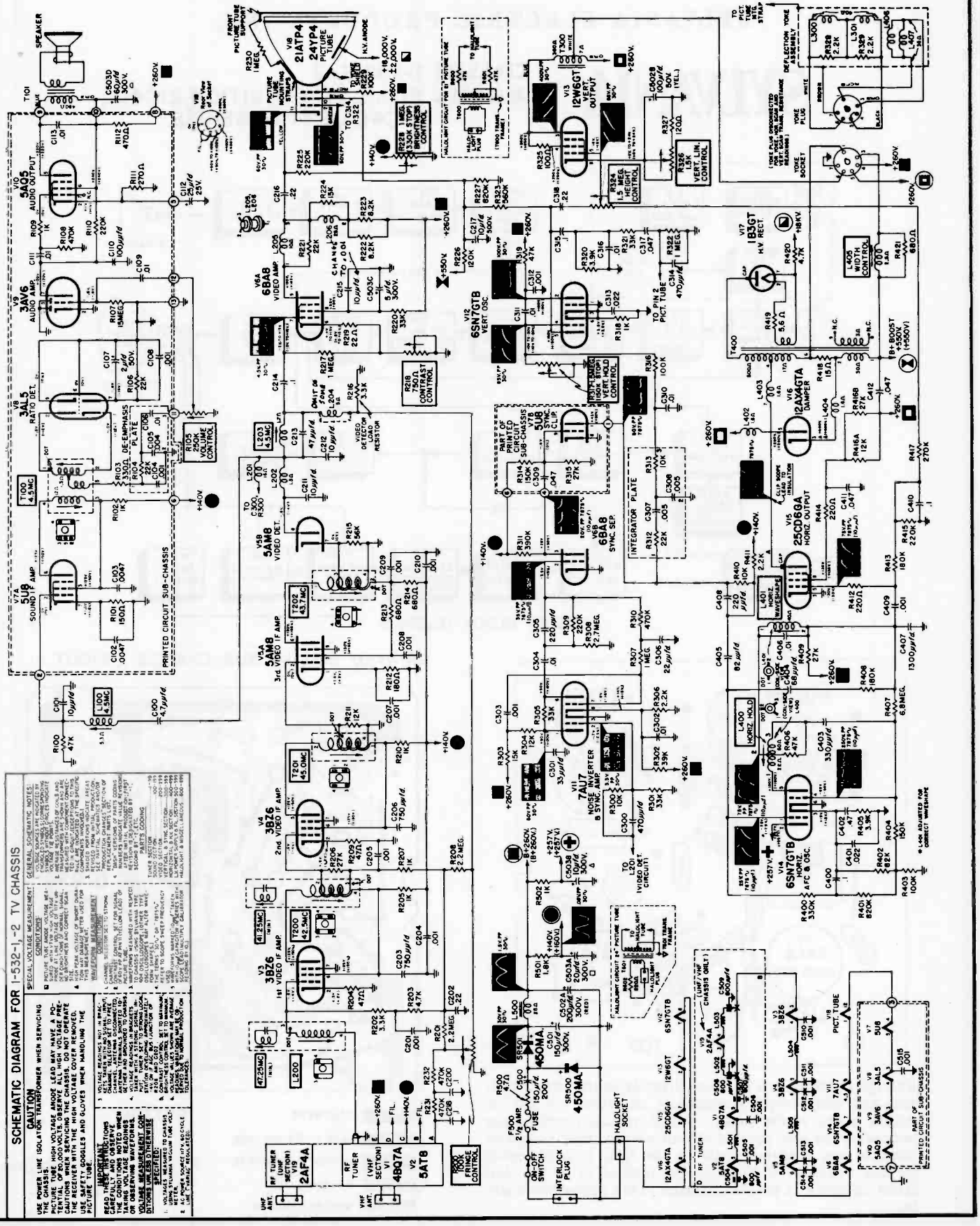
Voltage readings can be taken directly at the tube socket pins and most major components on either the top or bottom sides of the panel. When voltage readings are necessary on any printed circuit wiring, they should be taken at any soldered point on the foil. It is advisable to take readings at these points instead of on the foil itself in order to prevent damage to the protective coating.



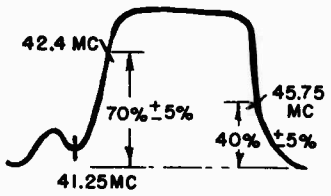
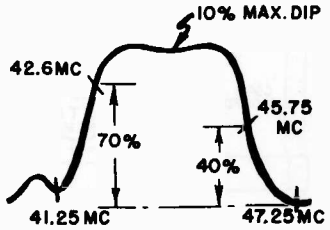
FILAMENT
+260V. B+ VOLTAGE
+140V. B+ VOLTAGE
B— GROUND
MISCELLANEOUS

Continued on pages 134 through 137.

SYLVANIA Chassis 1-532-1, -2, Schematic Diagram

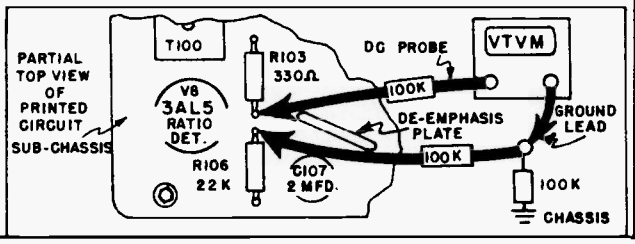


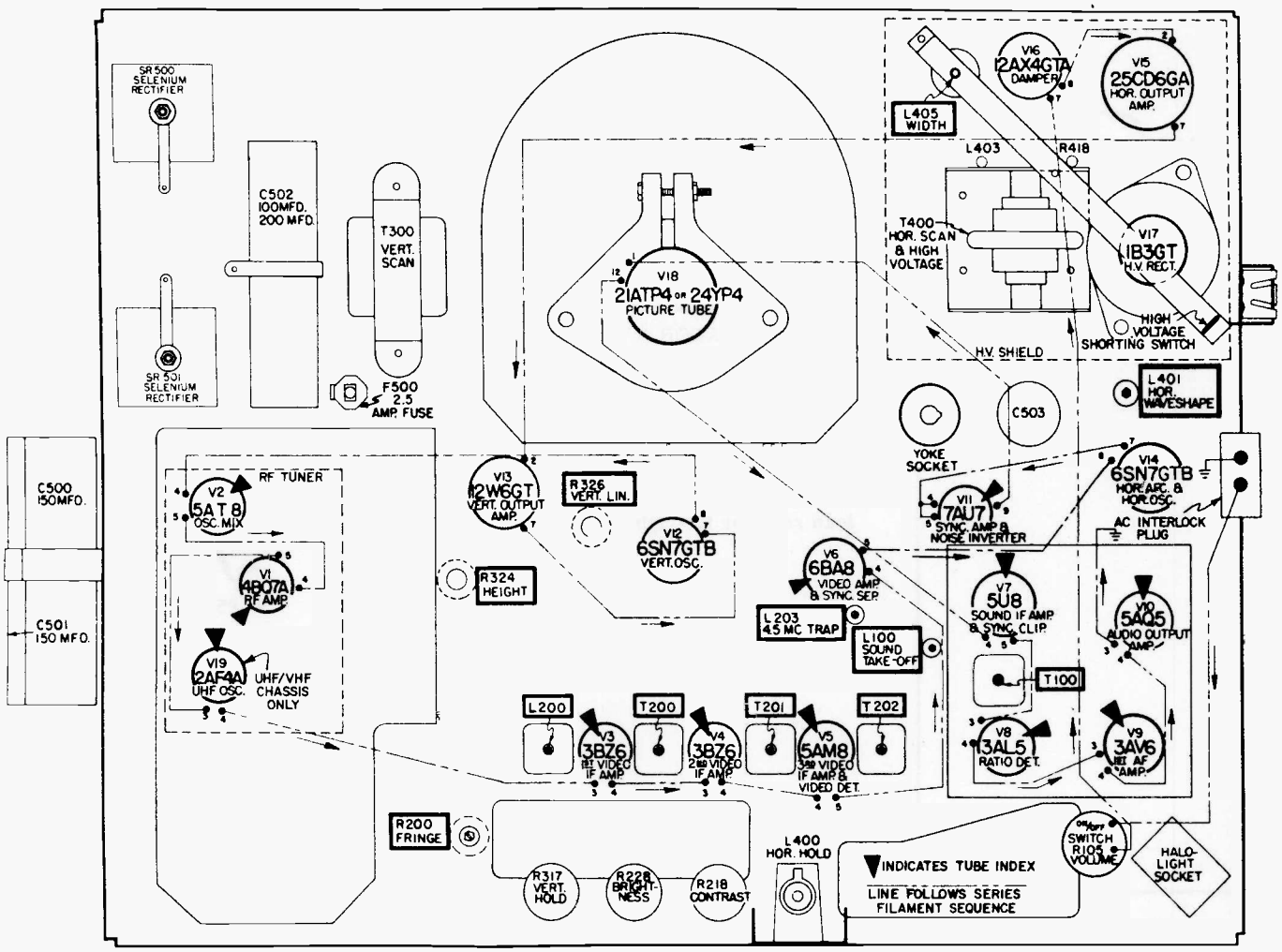
SYLVANIA — VIDEO IF ALIGNMENT — Chassis 1-532-1, -2

STEP	ALIGNMENT SETUP NOTES	TEST EQUIPMENT HOOKUP	ADJUST
1.	Connect 3.5V. DC source (-) terminal to junction of R208 (2.2 meg.) and C202 (.22 mfd.) and connect (+) terminal to chassis. Set VHF tuner to signal-free VHF channel with minimum interference.	SIGNAL GENERATOR - to ungrounded tube shield on VHF Osc./Mixer tube (5AT8). VTVM - across R216 (3.3K) Video Detector load resistor.	For MINIMUM reading: L200 (top core) at 47.25 MC. T200 (top core) at 41.25 MC. Use maximum generator output, initially; reduce generator output as required to keep VTVM reading between 1 and 2 volts.
2.	Same as step 1.	Same as step 1.	For MAXIMUM reading: T202 at 43.7 MC. T201 at 45.0 MC. T200 (bottom core) at 42.5 MC. Reduce generator output as required to keep VTVM reading between 1 and 2 volts.
3.	Same as step 1.  	SWEEP GENERATOR - through .01 mfd. blocking capacitor to pin 1 of V3 (3BZ6). Set generator to 43.5 MC with 10 MC sweep. SIGNAL GENERATOR - loosely couple as a marker to sweep generator lead. OSCILLOSCOPE - across R216 (3.3K) Video Detector load resistor through 33K isolation resistor.	a. Adjust sweep generator output to produce response curve of 3V. peak-to-peak. b. Recheck trap settings by observing markers. c. Adjust T201 to place 45.75 MC marker at 40%. d. Adjust T202 to remove tilt. e. Adjust T200 to place 42.4 marker at 70%. f. Adjust T202 to remove tilt. g. Repeat steps c to f until 45.75 MC marker is at 40% and 42.4 MC marker is at 70%. h. Recheck traps.
4.	Leave 3.5V. AGC voltage connected as in step 1. Set VHF tuner to signal-free high band VHF channel that causes minimum distortion of response curve.	SWEEP GENERATOR - to ungrounded tube shield on Osc./Mixer tube (5AT8). Set generator to 43.5 MC with 10 MC sweep. SIGNAL GENERATOR - loosely couple as a marker to sweep generator lead. OSCILLOSCOPE - across R216 (3.3K) Video Detector load resistor through 33K isolation resistor.	L20 (VHF tuner) and L200 (bottom core) for response curve shown:  Adjust sweep generator output to produce response curve of 3V. peak-to-peak. If impossible to obtain response curve by L20 (VHF tuner) and L200 (bottom core) adjustments, make SLIGHT readjustments of T202, T201 and T200 (bottom core).
5.	Repeat step 1 trap adjustments.		
6.	Repeat step 4 adjustments.		

SYLVANIA Chassis 1-532-1, -2, continued

SOUND ALIGNMENT

STEP	ALIGNMENT SETUP NOTES	TEST EQUIPMENT HOOKUP	ADJUST
1.	Short pin 1 of V4 (3BZ6) 2nd Video IF Amp. tube to chassis. Connect RF signal generator through a 47K isolation resistor to junction of L202, L203 and C100 (4.7 mmfd.). Set signal generator to 4.5 MC (preferably crystal calibrated or controlled). OR Connect a good antenna to receiver and properly tune in a strong station.	VTVM - Ground or "Common" lead to junction of two matched 100K resistors connected in series across R106 (22K). DC Probe through 100K resistor to junction of De-emphasis Plate terminal 1 and R103 (220 ohm). ISOLATE VTVM FROM GROUND. 	For MAXIMUM reading: T100 (both cores) L100 Then, for ZERO reading: T100 (top core) Set VTVM to zero center using lowest meter scale. At the correct setting for the top core of T100, a slight turn of core will give a reading either up or down the scale.
2.	Remove test equipment, resistors and short at pin 1 of V4 (3BZ6); then, tune in a WEAK STATION and adjust top of T100 for optimum signal-to-noise ratio.		



• CHASSIS TOP LAYOUT •

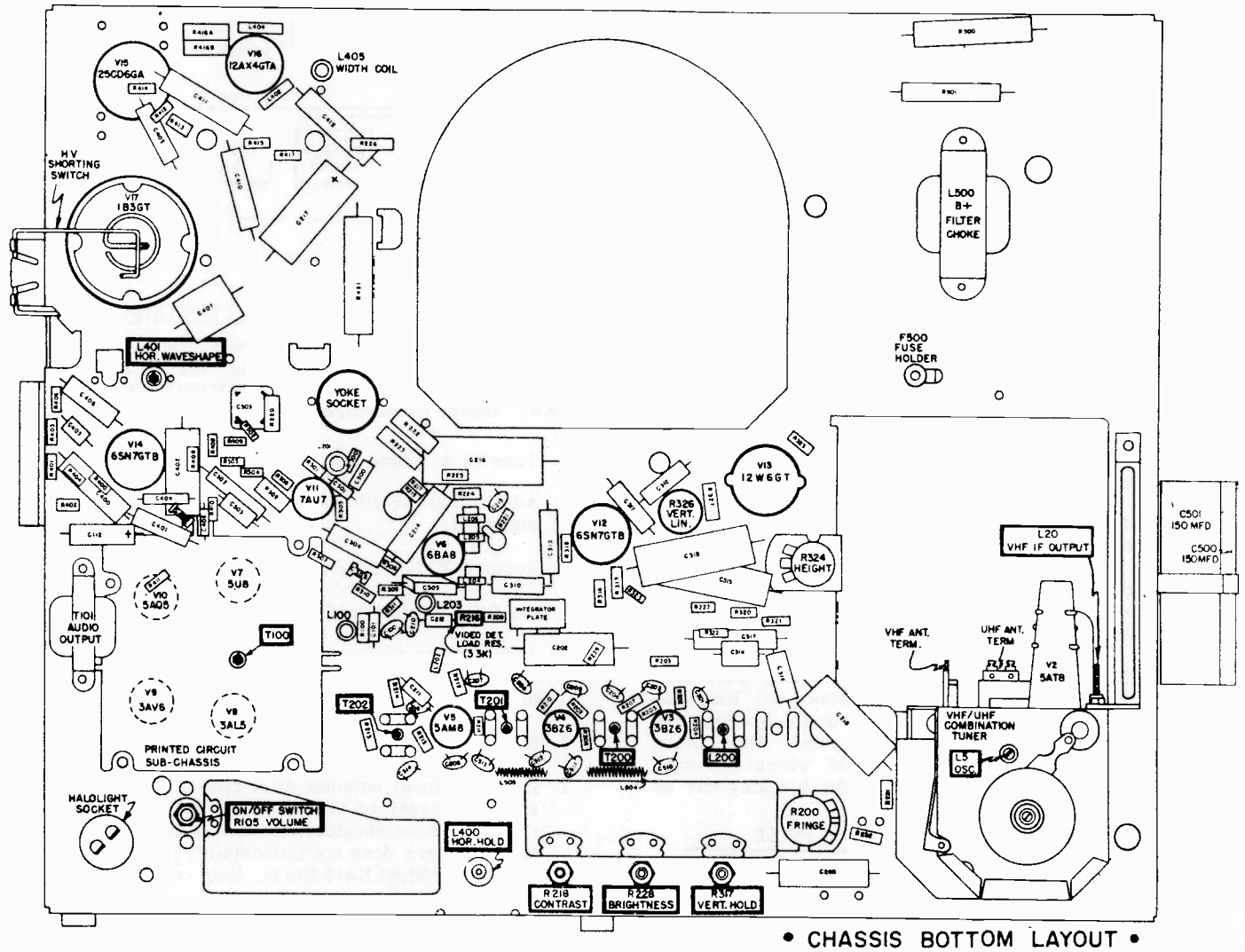
SYLVANIA Chassis 1-532-1, -2, continued

4.5 MC TRAP ALIGNMENT

STEP	ALIGNMENT SETUP NOTES	TEST EQUIPMENT HOOKUP	ADJUST
1.	PERFORM "SOUND ALIGNMENT" PROCEDURE BEFORE PERFORMING THE FOLLOWING PROCEDURE.		
2.	Short pin 1 of V4 (3BZ6) 2nd Video IF Amp. tube to chassis.	SIGNAL GENERATOR - through 2.7K isolation resistor to junction of L202, L203 and C100 (4.7 mmfd.). Set signal generator to 4.5 MC (preferably crystal calibrated or controlled). VTVM - RF Probe to pin 11 (yellow lead) of picture tube.	L203 for MINIMUM reading.
3.	Remove test equipment, resistor and short at pin 1 of V4 (3BZ6).		

ALTERNATE 4.5 MC TRAP ALIGNMENT

Connect a good antenna to the receiver and properly tune in a strong station. Adjust L203 for minimum 4.5 MC interference in the picture. This interference takes the form of a "grainy" appearance or a fine line pattern through the picture.



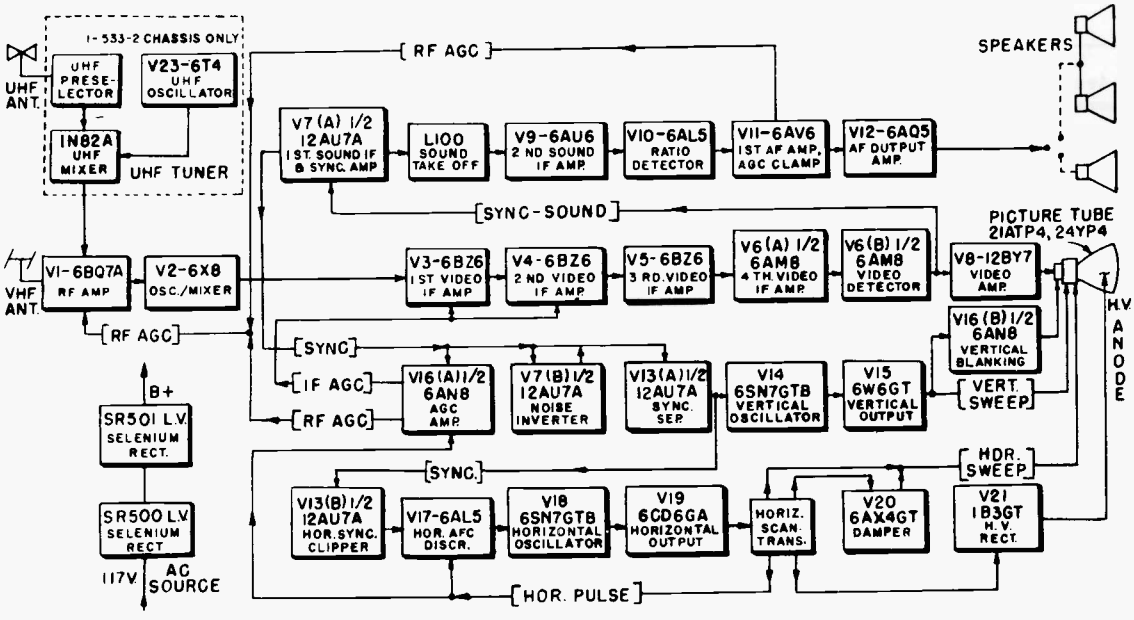
• CHASSIS BOTTOM LAYOUT •

SYLVANIA ELECTRIC PRODUCTS INC.

SYLVANIA

CHASSIS 1-533-1,-2
MODELS 21T201,21T301,21C501, 21C502,21C601,21D802, 24T301,24C601 SERIES

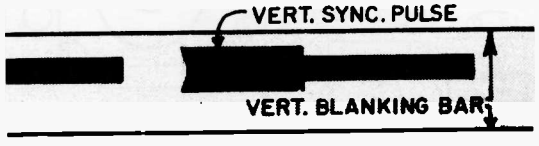
(Service material on these models is printed on pages 138 through 142)



•AGC CONTROL ADJUSTMENT•

The AGC control should be readjusted according to the following instructions whenever the receiver is connected to a different antenna installation.

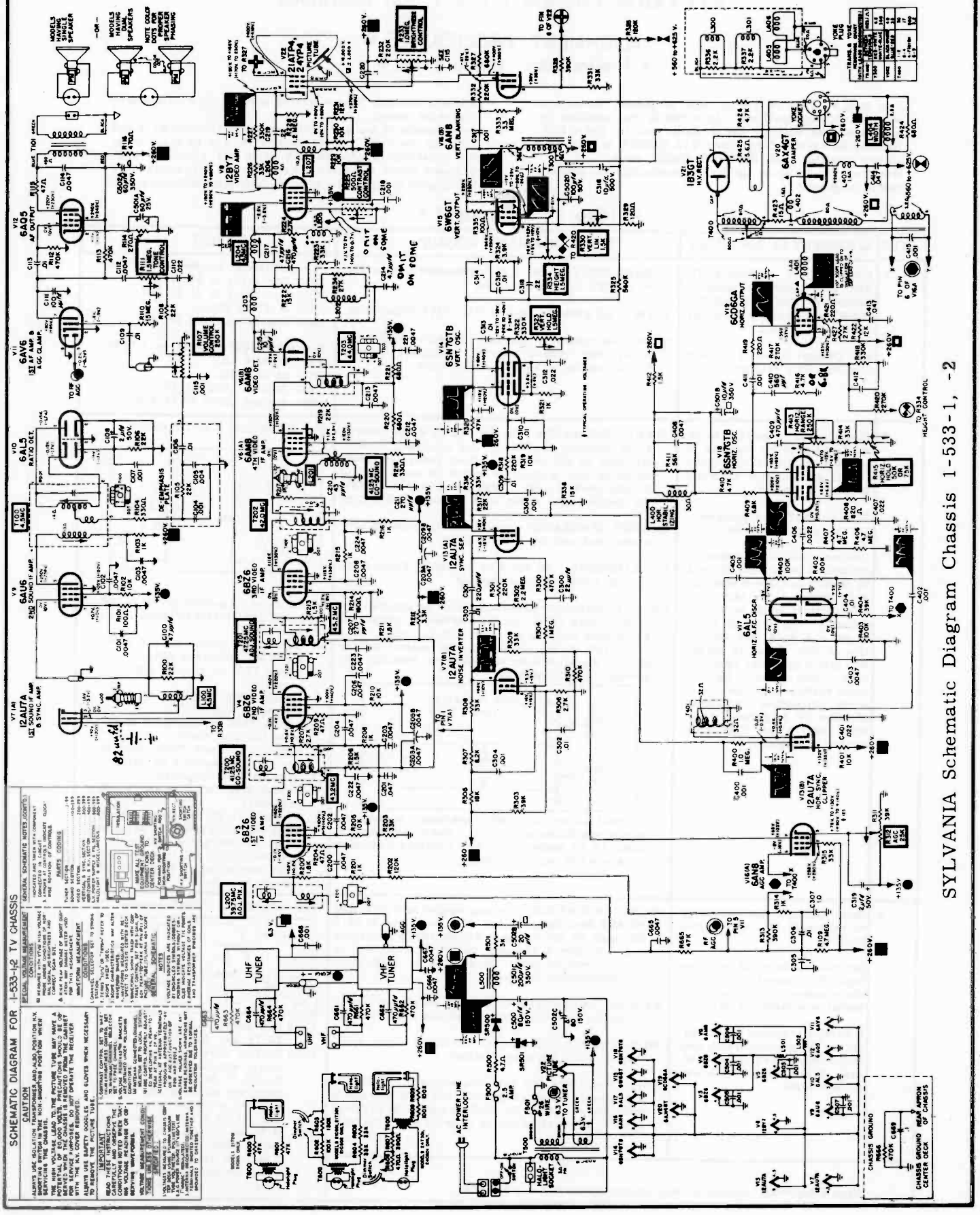
1. Connect antenna to receiver.
2. Tune in a strong channel.
3. Adjust Contrast to minimum, Brightness to maximum.
4. Adjust Vertical Hold control to allow picture to roll downward slowly, or to stop picture with blanking bar in center of screen.
5. While observing the vertical blanking bar, turn the AGC control, R312 clockwise until the sync pulse starts to become lighter or the blanking bar becomes as black as the sync pulse. Then retard the control (CCW) to the point where the sync pulse becomes prominent on the blanking bar as shown in the illustration below.



•HORIZONTAL AFC CIRCUIT ADJUSTMENT•

NOTE: Connect ISOLATION TRANSFORMER between power line and AC input to chassis. Before attempting this adjustment, the AGC CONTROL ADJUSTMENT should be performed.

1. Tune in a strong channel.
2. Adjust L404 Width control for approximately normal scan.
3. Remove V17-6AL5 Horiz. AFC Discr. tube.
4. Set R415 Horiz. Hold control to mid-range.
5. Adjust R413 Horiz. Range control until picture moves back and forth across the screen with the blanking bar vertical.
6. Replace V17-6AL5 Horiz. AFC Discr. tube.
7. Rotate channel selector to a channel on which no signal is received then return to the original station. Picture should immediately fall into sync. If the picture does not immediately fall into sync, slightly readjust R415 Horiz. Hold control and repeat this step.


SCHEMATIC DIAGRAM FOR 1-533-H2 TV CHASSIS
CAUTION
IMPORTANT
SPECIAL VOLTAGE MEASUREMENT CONDITIONS UNLESS OTHERWISE SPECIFIED
GENERAL SCHEMATIC NOTES (CONT'D)
PARTS CONTROLS
NOTES
MODELS HAVING SINGLE SPEAKER
-OR-
MODELS HAVING TWO SPEAKERS
NOTE COLOR DOTS FOR PROPER SPEAKER PHASING
UHF TUNER
VHF TUNER
AC POWER LINE INTERLOCK
CHASSIS GROUND
CHASSIS GROUND REAR APRON CENTER GEAR
SYLVANIA Schematic Diagram Chassis 1-533-1, -2

SYLVANIA Chassis 1-533-1, -2, continued

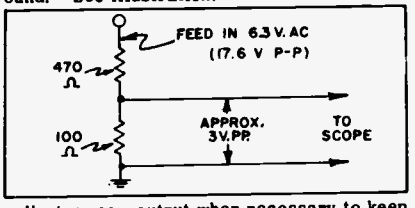
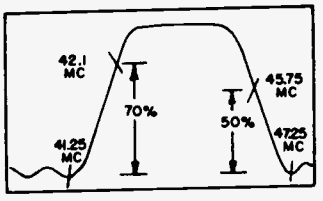
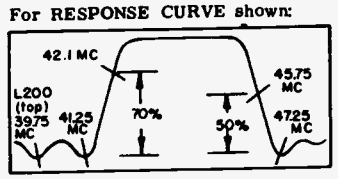
ALIGNMENT PROCEDURES •

• Preliminary Instructions •

Rod of H.V. Shorting Switch must be pushed forward to the non-shorting position. Hold rod in this position by positioning the shorting switch Catch over the end of Rod. Remove Horizontal Output tube V19-6CD6GA to eliminate pickup radiation from Horizontal Output stage.
Receiver should warm up for approximately 15 minutes before alignment

Place a shorting jumper across antenna terminals unless otherwise stated.
Adjustments of top and bottom cores of Transformers and Coils in the Video IF and Sound strip can be made from the underside of chassis with nylon hex alignment tool. In cases where there are two coils in one can, cores must be adjusted to insure the greatest separation between them.

• Video IF Alignment •

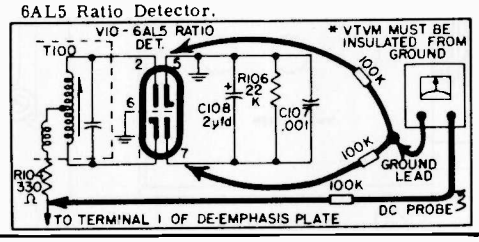
STEP	ALIGNMENT SETUP NOTES	TEST EQUIPMENT HOOKUP	ADJUST
1.	Connect 3.5 V. battery to IF AGC bus-negative terminal to junction of R201 (1K) and R202 (120K) and positive terminal to chassis ground. Set Channel Selector to any free high VHF channel.	MARKER GENERATOR - to ungrounded tube shield of V2-6X8 Osc./Mixer tube. VTVM - DC probe to pin 2 of V8-12BY7 Video Amp. NOTE: Use maximum Marker Generator output initially, then reduce output as necessary to keep VTVM reading between -1 and -2 volts.	For MINIMUM reading on VTVM: L200 (top core) at 39.75 MC. T200 (top core) at 41.25 MC. L201 at 41.25 MC. T201 (top core) at 47.25 MC. For MAXIMUM reading on VTVM: T203 at 44.0 MC. T202 at 42.0 MC. T201 (bottom core) at 45.2 MC. T200 (bottom core) at 43.2 MC.
2.	Connect 3.5 V. battery to IF AGC bus-negative terminal to junction of R201 (1K) and R202 (120K) and positive terminal to chassis ground. Disconnect IF Input Cable during this step from tuner. Calibrate the Oscilloscope to indicate 3 volts peak-to-peak by feeding in a 3 volt peak-to-peak signal from calibrator into vertical input on scope. Adjust vertical gain on scope to get a 3 or 4 inch deflection of this signal (4 inches will give a good size response on a 7 inch scope). Do not touch vertical gain controls of scope throughout remainder of Video IF Alignment. See Note under "Test Equipment Hookup" column.	SWEEP GENERATOR - to pin 1 of V3-6BZ6 through a .01 blocking capacitor. Set generator to 43.0 MC with 10 MC sweep. Adjust sweep generator output to give a response curve on scope that is 3 volts peak-to-peak. (See notes on Calibrating the Oscilloscope in the first column of this step. MARKER GENERATOR - loosely couple to Sweep Generator lead near pin 1 of V3-6BZ6. OSCILLOSCOPE - to pin 2 of V8-12BY7 Video Amp. through a 33K isolation resistor. NOTE: If calibrator is not available, an approximate peak-to-peak signal can be obtained by connecting a 470 ohm and 100 ohm resistor in series, feed a 6.3 volt source to the 470 ohm resistor and tap off the signal across the 100 ohm resistor and ground. See illustration.  Readjust sweep output when necessary to keep response amplitude at 3 volts. Decrease output if either IF or scope amplifiers overload (indicated by severe flat top on response).	For RESPONSE CURVE shown:  If the above response curve is not obtained, readjust the following cores as specified. a. Adjust T201 (bottom core) to place 45.75 MC marker at 50%. b. Adjust T203 to remove tilt from curve. c. Adjust T202 to place 42.1 MC marker at 70%. d. Adjust T200 (bottom core) to remove tilt from curve. e. Adjust T203 and T200 (bottom core) simultaneously to remove hump or dip from curve. f. Repeat step "a" through "e" if necessary. g. Recheck 41.25 MC trap: Adjust T200 (top core) and L201 to place 41.25 MC marker in valley. h. Recheck 47.25 MC trap: Adjust T201 (top core) to place 47.25 marker in valley.
3.	Same as step 2, but remember to reconnect IF Input Cable to tuner. Set channel selector to a free high VHF channel making sure the response curve is not distorted by outside interference. If perfect response curve cannot be obtained from this step due to inadequate range of bandpass, do not readjust IF transformer cores.	SWEEP GENERATOR - to ungrounded tube shield of V2-6X8 Osc./Mixer tube. Set generator to 43.0 MC with 10 MC sweep. Adjust sweep generator output to give a response curve on scope that is 3 volts peak-to-peak. (See notes on calibrating the oscilloscope in step 2.) MARKER GENERATOR - loosely couple to Sweep Generator lead near ungrounded tube shield of V2. OSCILLOSCOPE - to pin 2 of V8-12BY7 Video Amp. through a 33K isolation resistor. NOTE: There are two positions where L16 will give a properly shaped response curve. The one giving optimum results is the position where the greatest amount of brass screw is showing out of the coil.	For RESPONSE CURVE shown:  L200 (top core) - Adjust to place 39.75 MC marker in valley. L200 (bottom core) and L16 (VHF tuner) simultaneously to place the 45.75 MC marker at 50% point and to make top of response curve flat. Check position of 42.1 MC marker. If it is not at 70% position, readjust L200 (bottom core) and L16 (VHF tuner) to give best compromise of proper marker location and minimum tilt.
	Upon completion, remove all test equipment and 3.5 volt battery.		

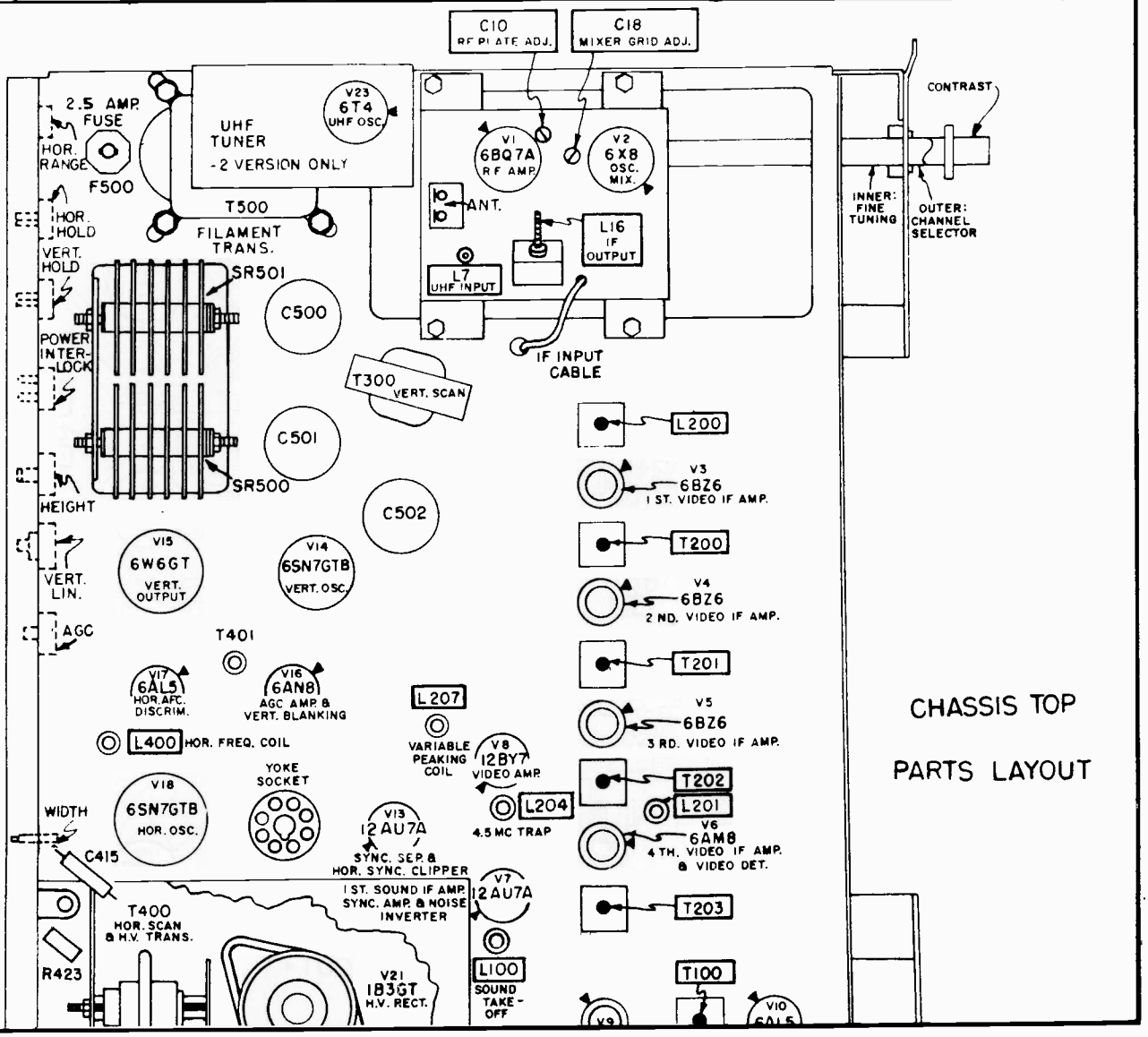
SYLVANIA

• Sound Alignment •

Chassis 1-533-1, -2

STEP	ALIGNMENT SETUP NOTES	TEST EQUIPMENT HOOKUP	ADJUST
1.	Short pin 1 of V4-6BZ6 2nd Video IF Amp. to chassis ground. Connect Marker generator to junction of L203 and L204. Set generator to calibrated or crystal controlled 4.5 MC. OR Connect a good antenna to receiver. Tune in a strong station.	VTVM* - DC Probe to pin 5 of V10-6AL5 Ratio Detector; Ground Lead to pin 7 of V10-6AL5 Ratio Detector. Set VTVM to 3 volt scale. *VTVM must be insulated from ground.	For MAXIMUM reading: T100 (top core) sec. T100 (bottom core) pri. L100 Repeat adjustments until maximum reading is reached.
2.	Same as step 1. Upon completion, remove VTVM and 100K resistors.	VTVM* - DC Probe through 100K to junction of R104 and terminal 1 of de-emphasis plate. Ground Lead to center junction of two matched 100K resistors connected in series across pin 5 and 7 of V10-6AL5 Ratio Detector.	Set VTVM to zero center, use lowest meter scale. Adjust T100 (top core) sec. for ZERO reading on VTVM. At correct zero reading, a slight turn of the core will give a positive reading in one direction and a negative reading in the other direction.

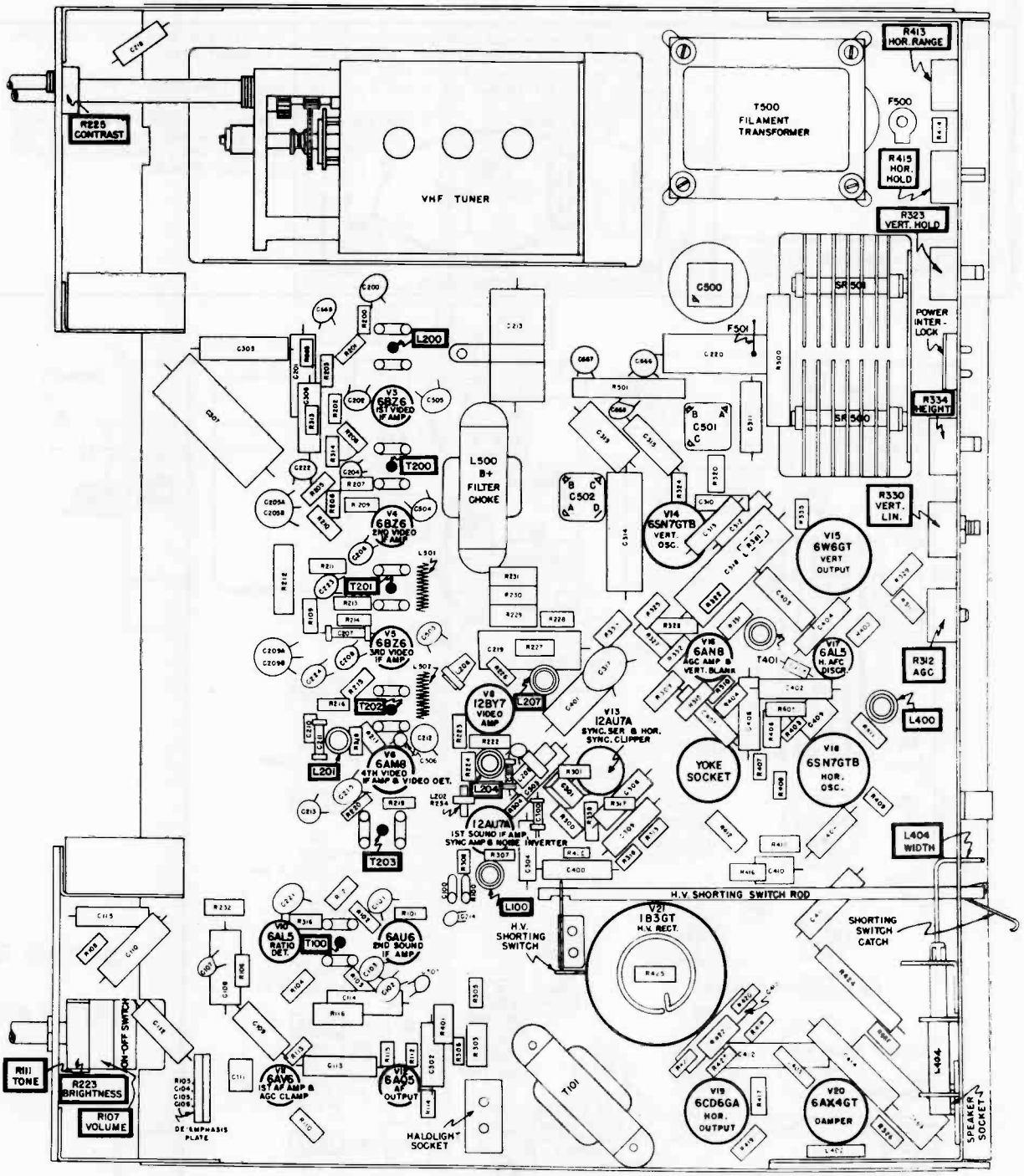




SYLVANIA Chassis 1-533-1, -2, continued

• 4.5 MC Trap Alignment Using Station Signal •

1. Tune in a local station.
2. Misadjust the Fine Tuning Control until sound bars are seen in the picture. Maximum 4.5 MC signal will be fed to the picture at this setting of the fine tuning control. A fine grain-like background will be noticed in the picture.
3. Adjust L204 (4.5 MC Trap) until the 4.5 MC grain-like interference is eliminated or is at a minimum.
4. Readjust the Fine Tuning Control to obtain a normal picture. There should be no grain-like interference present in the picture.



• CHASSIS BOTTOM PARTS LAYOUT •

TRAV-LER RADIO CORPORATION

In general the service material on Trav-ler sets in this manual is applicable to all sets listed in the table below. The two circuit diagrams included are exact for many models and are similar to others, as stated. In some instances, the differences are in type of tuners used, or physical parts placement, or in other minor variations.

Chassis No.	Used in these Models:	Circuit pages:
412E4, 412E5	517-82, 521-79, 521-80, 521-81, 5210-60 5210-61, 517-100, 521-110, 521-115	Exact, 144-145
412F4, 412F5	524-84, 524-85, 524-86	Similar, 144-145
412G5	521-R90, 521-R91	Exact, 144-145
412K5	517-82, 521-79 to -81, 5210-60, 5210-61	Similar, 144-145
412L5	521-R90, 521-R91	Similar, 144-145
417E4, 417E5	517-82U, 521-79U to -81U, 5210-60U, -61U	Similar, 144-145
417F5	524-84U, 524-85U, 524-86U	Similar, 144-145
417G5	521-R90U, 521-R91U	Similar, 144-145
419E5	521-73	Similar, 144-145
510A4	517-56, 517-67	Exact, 146-147
511A4	521-75, 521-76, 521-77, 521-78	Exact, 146-147
513A4, 513A5	Same models as above for 511A4	Similar, 146-147
514A4, 514A5	Same as models under 510A4	Similar, 146-147
518B4, 518B5	524-83	Similar, 146-147

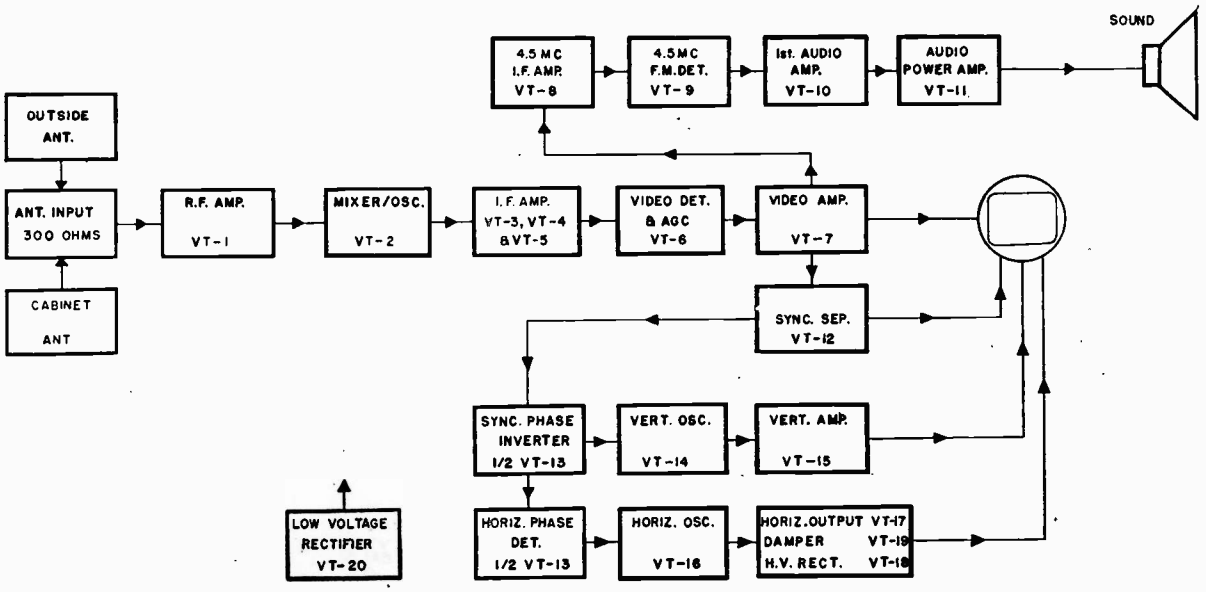
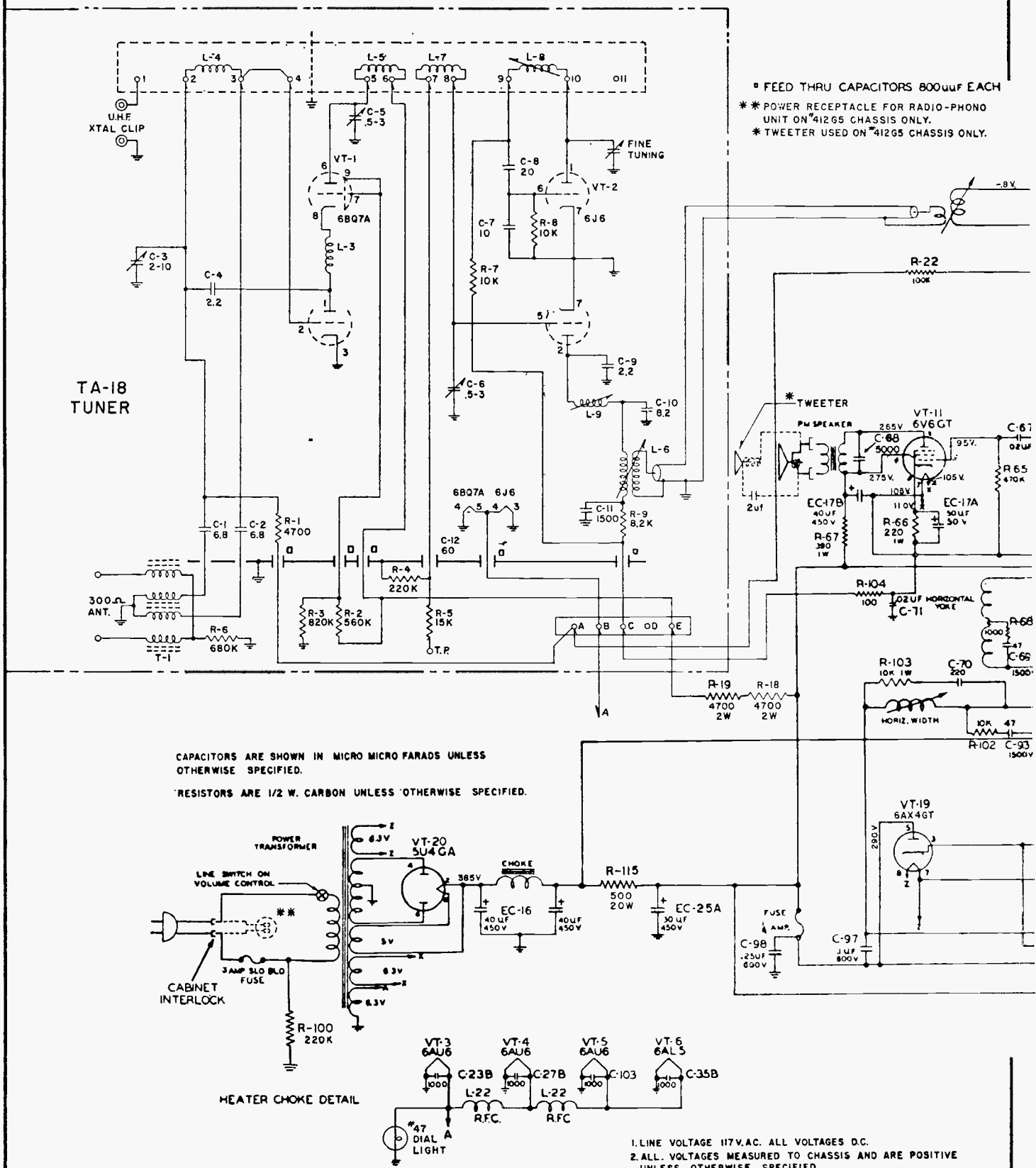


FIG. 1 Circuit Block Diagram

ION TRAP ADJUSTMENT—The brightness and performance of the picture tube depends largely upon the adjustment of the ion trap. To check this adjustment, turn the PICTURE and BRIGHTNESS controls, located on the front panel, to a maximum clockwise position. The face of the picture tube will glow brightly if the ion trap is set properly. If the picture tube does not appear to be bright enough or if the tube dims when the brightness control is turned in a clockwise direction, the ion trap must be adjusted. Remove the cabinet back* and set the PICTURE and BRIGHTNESS controls to a maximum clockwise position. Rotate the ion trap, sliding it back and forth along the neck of the picture tube, until the position is located that causes the picture tube to glow with maximum brilliance.

*NOTE—Removing the cabinet back disconnects the line cord. An alternate test cord must be substituted for this adjustment.

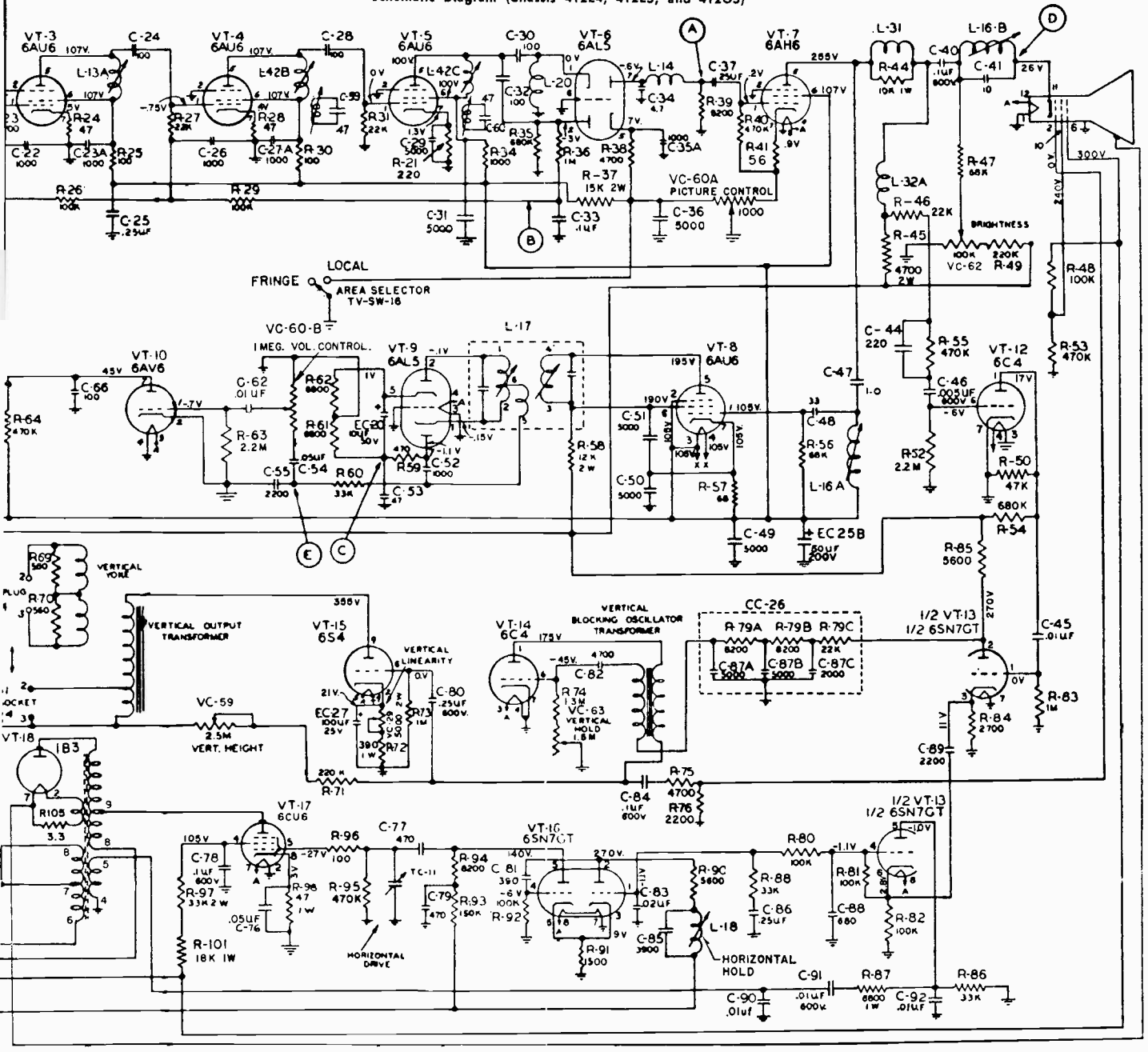


TRAV-LER RADIO CORP.
CHICAGO ILL. ORLEANS IND.
CHASSIS NO. 412E4, 412E5, 412G5

1. LINE VOLTAGE 117 V. AC. ALL VOLTAGES D.C.
2. ALL VOLTAGES MEASURED TO CHASSIS AND ARE POSITIVE UNLESS OTHERWISE SPECIFIED.
3. VOLTAGE READINGS TAKEN WITH ZERO SIGNAL INPUT AND PICTURE CONTROL SET MAX. CLOCKWISE. ALL OTHER CONTROLS SET FOR NORMAL OPERATION.
4. VOLTAGE READINGS TAKEN WITH AN ELECTRONIC VOLTMETER. L-38

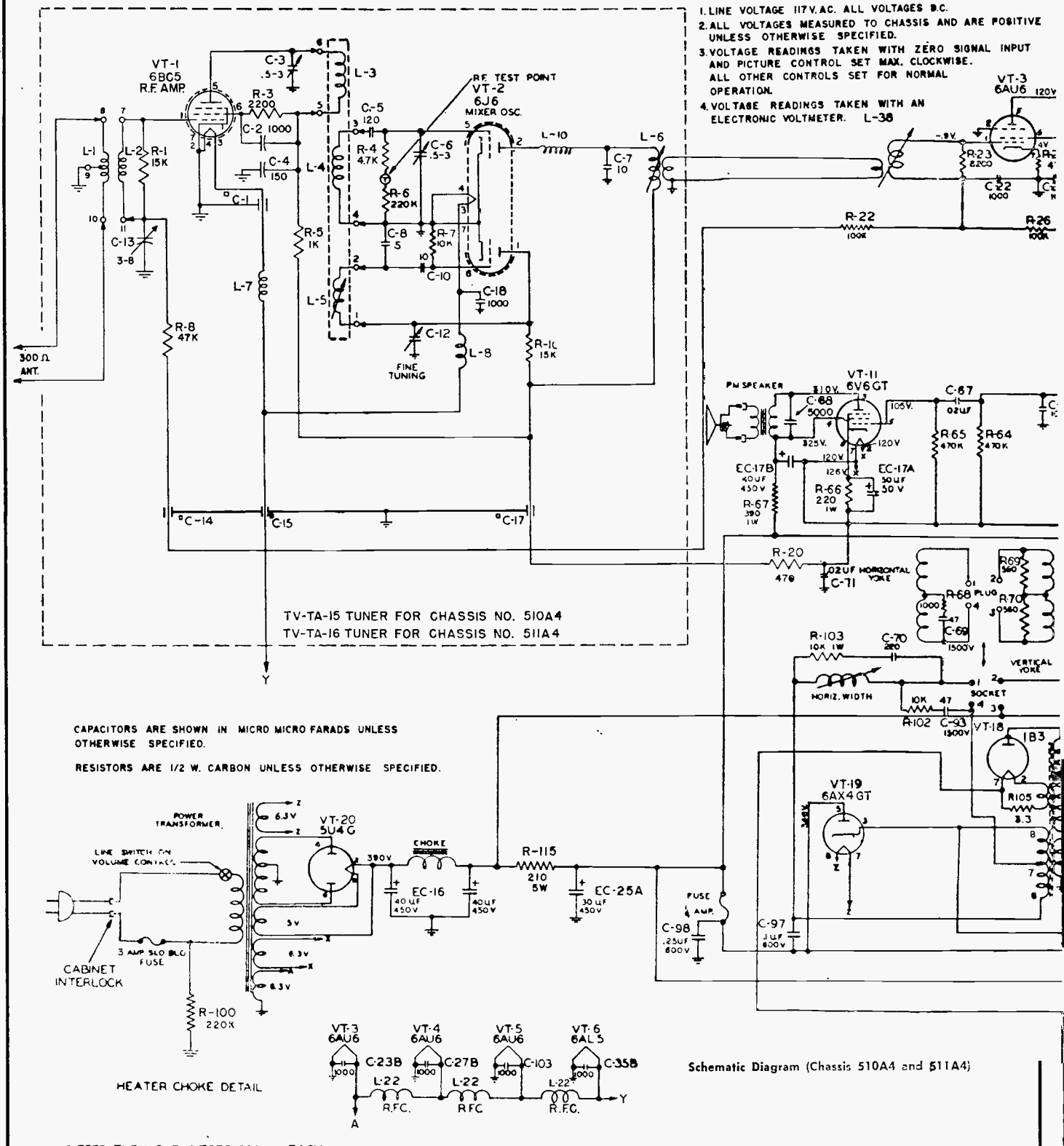
TRAV-LER RADIO CORPORATION (Continued)

Schematic Diagram (Chassis 412E4, 412E5, and 412G5)



CHASSIS PRODUCTION CHANGES

1. Early models using chassis 412E4 and 412E5 contained a TV-TA-18 tuner with Q channel tuning strips. The oscillator adjustment is found to the right of the fine tuning shaft. Later production models contained a TV-TA-18 tuner with C channel tuning strips. Here the oscillator adjustment is found above and slightly to the left of the fine tuning shaft.
2. Early models using chassis 412E4, 412E5 and 412G5 contained either a TV-X-130A or TV-X-130B high voltage assembly. Later production models contain the TV-TR-15 horizontal output transformer.
3. Early models using chassis 412F4 and 412F5 contained either a TV-X-152 or TV-X-152B high voltage assembly. Later production models contain the TV-TR-16 horizontal output transformer.
4. Later production models containing chassis 412F4 and 412F5 have resistor R-115 increased from 210 ohms 5 watt to 500 ohms 20 watt (TV-WR-18) and condenser C-90 decreased from .015 mfd. 600V to .01 mfd. 600V (TV-PC-15).



CAPACITORS ARE SHOWN IN MICRO MICRO FARADS UNLESS OTHERWISE SPECIFIED.

RESISTORS ARE 1/2 W. CARBON UNLESS OTHERWISE SPECIFIED.

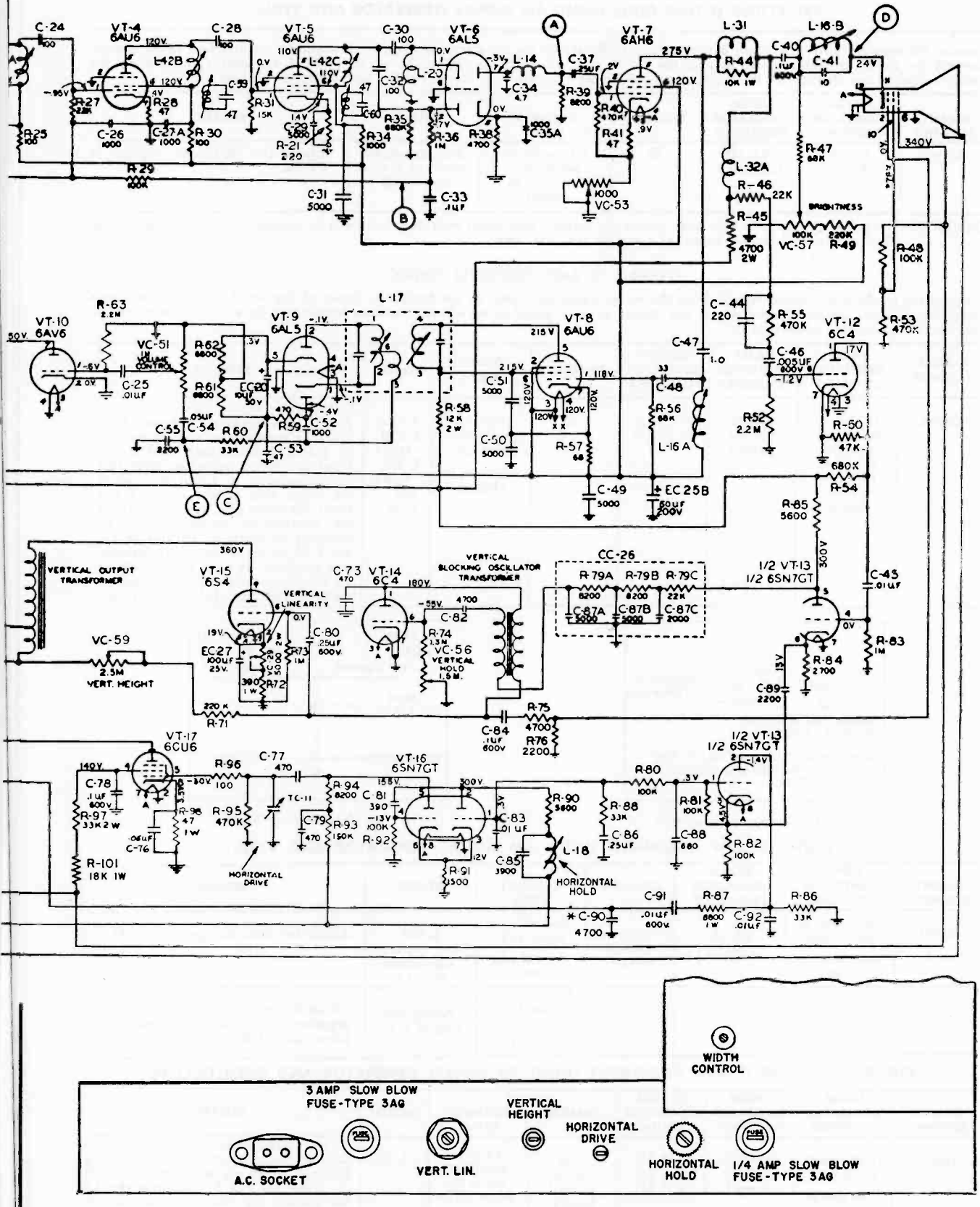
Schematic Diagram (Chassis 510A4 and 511A4)

* FEED THRU CAPACITORS 800 uuf EACH
* 511A4 CHASSIS - C-90 = .01 UF PAPER CONDENSER

TRAV-LER RADIO CORP.
CHICAGO ILL. ORLEANS IND.

CHASSIS NO.'S 510A4 & 511A4

TRAV-LER Chassis 510A4, 511A4, etc.



Side Cabinet and Rear Chassis Apron Controls.

ALIGNMENT INSTRUCTIONS

TRAV-LER

PRESETTING IF TRAP COILS USING AM SIGNAL GENERATOR AND VTVM

Connect the negative lead of a 3-volt battery at point (B) shown on the schematic diagram; connect the positive lead to the chassis. Connect the signal generator to the grid of the 1st IF tube. Connect the DC probe of the VTVM at point (A); connect the negative lead to the chassis. Set the picture and fine tuning controls fully clockwise. Set the receiver to channel 13.

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
Direct	To 1st IF grid	20.6 Mc (Unmod.)	12	DC probe to point (A). Common to chassis.	Bottom adjustments of L-42B and L-42C.	Adjust for maximum voltage at VTVM.

CAUTION—Once the IF trap coils have been preset, no further adjustment with these coils will be necessary. Proceed to the overall IF response as described below to complete the alignment.

OVERALL IF AMP. RESPONSE CHECK

Connect the synchronized sweep voltage from the sweep signal generator to the horizontal input of the oscilloscope for horizontal deflection. Connect the sweep generator to the loosely coupled shield of the 6J6 tube, making certain that the shield is not grounded; connect the ground lead to the chassis.

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
Direct	High side to loosely coupled shield of 6J6; low side to chassis.	24 Mc (10 Mc sweep)	21.75 Mc 26.25 Mc	12	Vertical amplifier to point (A). Common to chassis.	L-13A L-42B (top) L-42C (top) L-6 L-38	Check for response curve similar to Fig. 5 with markers as shown. It is generally necessary to retouch settings of L-13A, L-42B (top), and L-42C (top) for proper response. Note that the adjustment of L-13A will affect the video side of the curve, L-42B (top) the audio side, and L-42C (top) the intermediate range. It may be necessary to touch up settings of L-6 and L-38 for proper symmetry, flatness, and bandpass. A pass band width of 3.5 Mc measured at the 50% response points is recommended at this point.

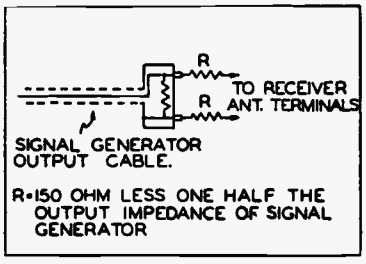


FIG. 3. Dummy Antenna Detail

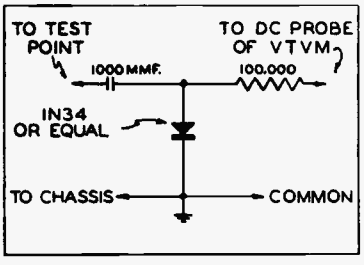


FIG. 4. Diode Detector Detail

SOUND IF AMP ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
Direct	High side to point (A). Low side to chassis.	4.5 Mc (Unmod.)	Any channel unused locally.	Dc probe to point (C). Common to chassis.	L-16A and bottom adjustment of L-17.	Adjust for max. voltage at VTVM.
"	"	"	"	DC probe to point (E). Common to chassis.	Adjust top slug of L-17.	Adjust for zero voltage. A positive and negative reading will be obtained on either side of the correct setting.

CHECK ON SOUND IF AMP ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
Direct	High side to point (A). Low side to chassis.	4.5 Mc (500 Kc sweep)	4.45 Mc 4.5 Mc 4.55 Mc	Any channel unused locally.	Vertical amplifier input to point (C). Common to chassis.	L-17	Touch up the adjustments of L-17 maintaining max. amplitude while adjusting for max. steepness and straightness of the slope. See Fig. 6. Note that the 4.5 Mc marker pip tends to disappear as the correct setting of the top adjustment of L-17 is reached.

TRAV-LER RADIO CORPORATION Service Alignment Data Continued

4.5 MC TRAP ADJUSTMENT

DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
Direct	High side to point (A). Low side to chassis.	4.5 Mc (Unmod.)	Any channel unused locally.	AC probe to cathode of picture tube point (D). Common to chassis.	L-16B	Adjust for minimum voltage. A crystal detector shown in Fig. 4 may be used with the VTVM in place of a commercial AC probe if desired.

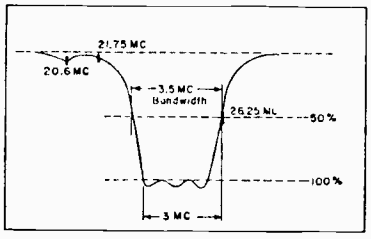


FIG. 5. IF Response Curve

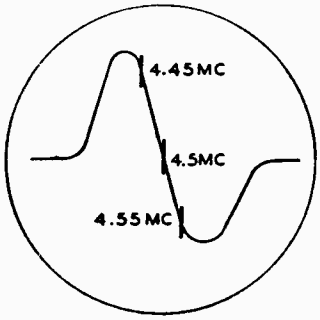


FIG. 6. Audio Response Curve

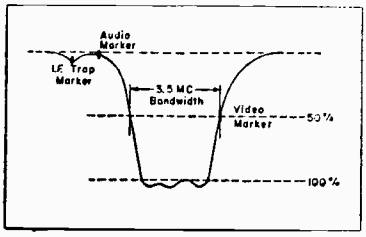


FIG 7. Overall RF Response Curve

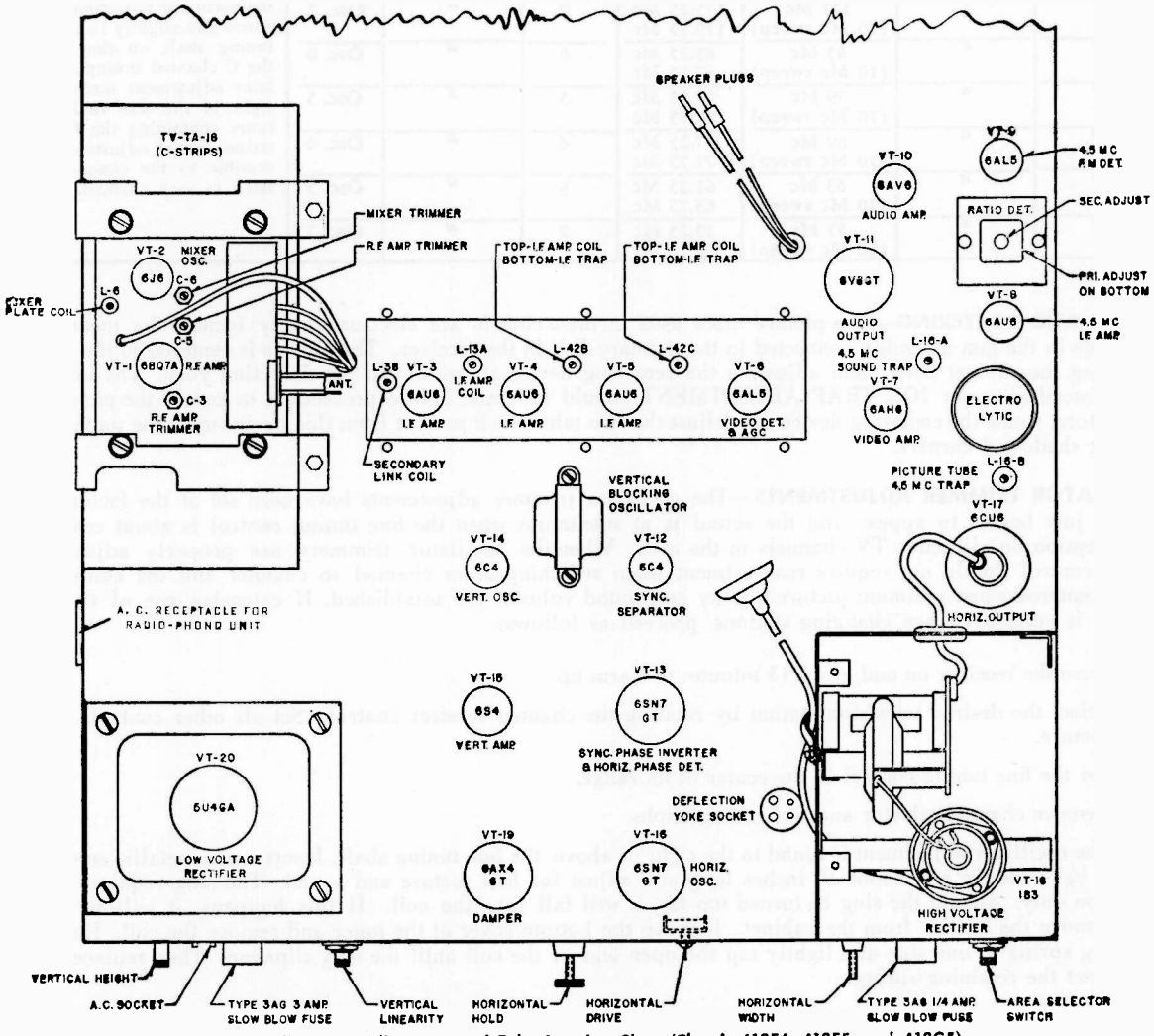


FIG. 8 Alignment Adjustment and Tube Location Chart (Chassis 412E4, 412E5, and 412G5)

TRAV-LER RADIO CORPORATION Service Material Continued

TUNER ALIGNMENT

Connect the synchronized sweep voltage from the sweep signal generator to the horizontal input of the oscilloscope for horizontal deflection.
Connect the negative lead of a 3-volt battery at point (B) shown on the schematic diagram; connect the positive lead to the chassis.

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
Two carbon resistors. See Fig. 3	To receiver antenna terminals.	207 Mc (10 Mc sweep)	205.25 Mc 209.75 Mc	12	Vertical amplifier input to point (A). Common to chassis.	C-3 C-5, 13 C-6 Osc. 12	Adjust C-3 RF amp. trimmer, C-5 RF amp. trimmer, and C-6 mixer trimmer on tuner containing C channel tuning strips for proper passband and symmetry. These adjustments are respectively C-13, C-3 and C-6 on tuner containing Q channel tuning strips. Adjust oscillator coil to place the video marker at the 50% response point. Refer to Fig. 7.
"	"	213 Mc (10 Mc sweep)	211.25 Mc 215.75 Mc	13	"	Osc. 13	
"	"	201 Mc (10 Mc sweep)	199.25 Mc 203.75 Mc	11	"	Osc. 11	
"	"	195 Mc (10 Mc sweep)	193.25 Mc 197.75 Mc	10	"	Osc. 10	Check frequency response for symmetrical peaks as above and if necessary touch up the RF and mixer trimmer adjustments. Adjust oscillator coils so that the video marker will be at the 50% response point of the curve. Note that the oscillator adjustment screw is found above and slightly to the left of the fine tuning shaft on the tuner containing the C channel tuning strips. The oscillator adjustment screw is found to the right of the fine tuning shaft on the tuner containing the Q channel tuning strips. These adjustments are made accessible as the channel selector is rotated to each channel.
"	"	189 Mc (10 Mc sweep)	187.25 Mc 191.75 Mc	9	"	Osc. 9	
"	"	183 Mc (10 Mc sweep)	181.25 Mc 185.75 Mc	8	"	Osc. 8	
"	"	177 Mc (10 Mc sweep)	175.25 Mc 179.75 Mc	7	"	Osc. 7	
"	"	85 Mc (10 Mc sweep)	83.25 Mc 87.75 Mc	6	"	Osc. 6	
"	"	79 Mc (10 Mc sweep)	77.25 Mc 81.75 Mc	5	"	Osc. 5	
"	"	69 Mc (10 Mc sweep)	67.25 Mc 71.75 Mc	4	"	Osc. 4	
"	"	63 Mc (10 Mc sweep)	61.25 Mc 65.75 Mc	3	"	Osc. 3	
"	"	57 Mc (10 Mc sweep)	55.25 Mc 59.75 Mc	2	"	Osc. 2	

FOCUS AND CENTERING—The picture tubes used in these chassis are electrostatically focused by means of a focus electrode in the gun assembly connected to the primary B+ in the receiver. The picture is centered to the escutcheon by removing the cabinet back and adjusting the centering device at the rear of the deflection yoke. The ion trap adjustment described under ION TRAP ADJUSTMENT should be made before proceeding to center the picture. To shift the picture, rotate the centering device and adjust the two tabs which project from this device until the pattern is centered without shadowed corners.

OSCILLATOR TRIMMER ADJUSTMENTS—The oscillator trimmer adjustments have been set at the factory so that the picture just begins to appear and the sound is at maximum when the fine tuning control is about centered. Check the reception on all active TV channels in the area. When the oscillator trimmers are properly adjusted, the fine tuning control should not require readjustment when switching from channel to channel and the control should be about centered when optimum picture quality and sound volume are established. If extensive use of the fine tuning control is necessary when changing stations, proceed as follows:

1. Turn the receiver on and allow 15 minutes to warm up.
2. Select the desired television station by rotating the channel selector control. Set all other controls for a normal picture.
3. Set the fine tuning control in the center of its range.
4. Remove channel selector and fine tuning knobs.
5. The oscillator adjustment is found to the right or above the fine tuning shaft. Insert a non-metallic screwdriver with a 1/8" wide tip and about 10 inches long and adjust for best picture and sound. The slug requires a slight rotation only. Should the slug be turned too far, it will fall into the coil. If this happens, it will be necessary to remove the chassis from the cabinet. Remove the bottom cover of the tuner and remove the coil. Hold the retaining spring to one side and lightly tap the open end of the coil until the slug slips out. Then replace the slug and reset the retaining spring.
6. With the fine tuning control still set as in step 3, repeat the procedure in steps 4 and 5 for each active television channel in the area.

WELLS-GARDNER & Co.

(Material on pages 151 through 154)

21" & 24" TABLE & CONSOLE RECEIVERS

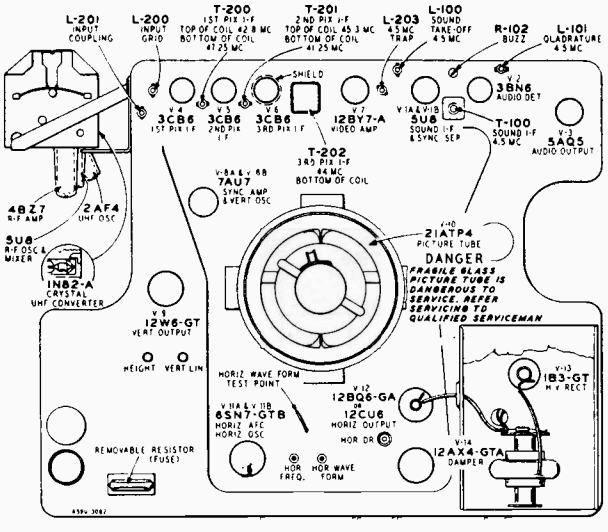


Fig. 1—UHF-VHF Chassis Tube Layout and Trimmers

List of Models:

324A59C-A-576	324A59U-A-576
2324A59C-A-560	2324A59U-A-560
321A59C-A-554	321A59U-A-554
2321A59C-A-556	2321A59U-A-556
321A59C-A-504	321A59U-A-504
2321A59C-A-508	2321A59U-A-508
(VHF's)	(UHF-VHF's)

AREA SELECTOR SWITCH

A three position switch is provided at the rear of the receiver to provide optimum performance in strong, medium and weak signal areas. In strong signal areas turn the switch to the LOCAL position. In medium signal areas turn the switch to the SUBURBAN position and in weak or very weak signal areas the switch must be turned to the FRINGE position. For example, bending or S-ing will occur if switch is in fringe position and the receiver is operating in local area.

SERVICE SUGGESTIONS

HORIZONTAL DEFLECTION ONLY—If only horizontal deflection is obtained as evidenced by a straight line across the face of the picture tube, it can be caused by the following:

1. V-8B or V-9 inoperative. Check socket voltages.
2. Vertical oscillator transformer defective.
3. Vertical output transformer open or shorted.
4. Yoke vertical coils open or shorted.
5. Vertical hold, height or linearity controls may be defective.
6. Capacitor C-422 defective.

WRINKLES ON LEFT SIDE OF RASTER—This condition can be caused by:

1. Defective yoke.
2. V-14 defective.
3. R-420 or C-421 defective.

SMALL RASTER—This condition can be caused by:

1. Low +B or line voltage. Check selenium rectifiers.
2. Insufficient output from V-12. Replace tube.
3. Insufficient output from V-8B and V-9. Replace tubes.
4. Incorrect setting of horizontal drive control.
5. V-14 defective.

RASTER; NO IMAGE, BUT ACCOMPANYING SOUND—This condition can be caused by:

1. No signal on picture tube grid. Check V-7 tube and associated circuits.
2. Bad contact to picture tube grid (lead to socket broken).

BUZZ IN SOUND

1. Check buzz control setting.
2. Check sound I-F alignment.
3. Defective V-1A or V-2 tubes.

BENDING OR S-ING

1. Check capacitors C-402A & C-403A.
2. V-12 or V-11B tubes defective.
3. Check V-1B, V-8A and V-7 tubes.
4. Incorrect setting of area switch.

RASTER ON TUBE BUT NO PICTURE OR SOUND—This condition can be caused by:

1. Defective pix I-F tubes V-4, V-5 or V-6.
2. Defective pix detector crystal or video amplifier tube V-7. Check tube, crystal and their associated circuits.
3. Defective R-F amplifier or oscillator mixer tube in the tuner.

POOR FOCUS

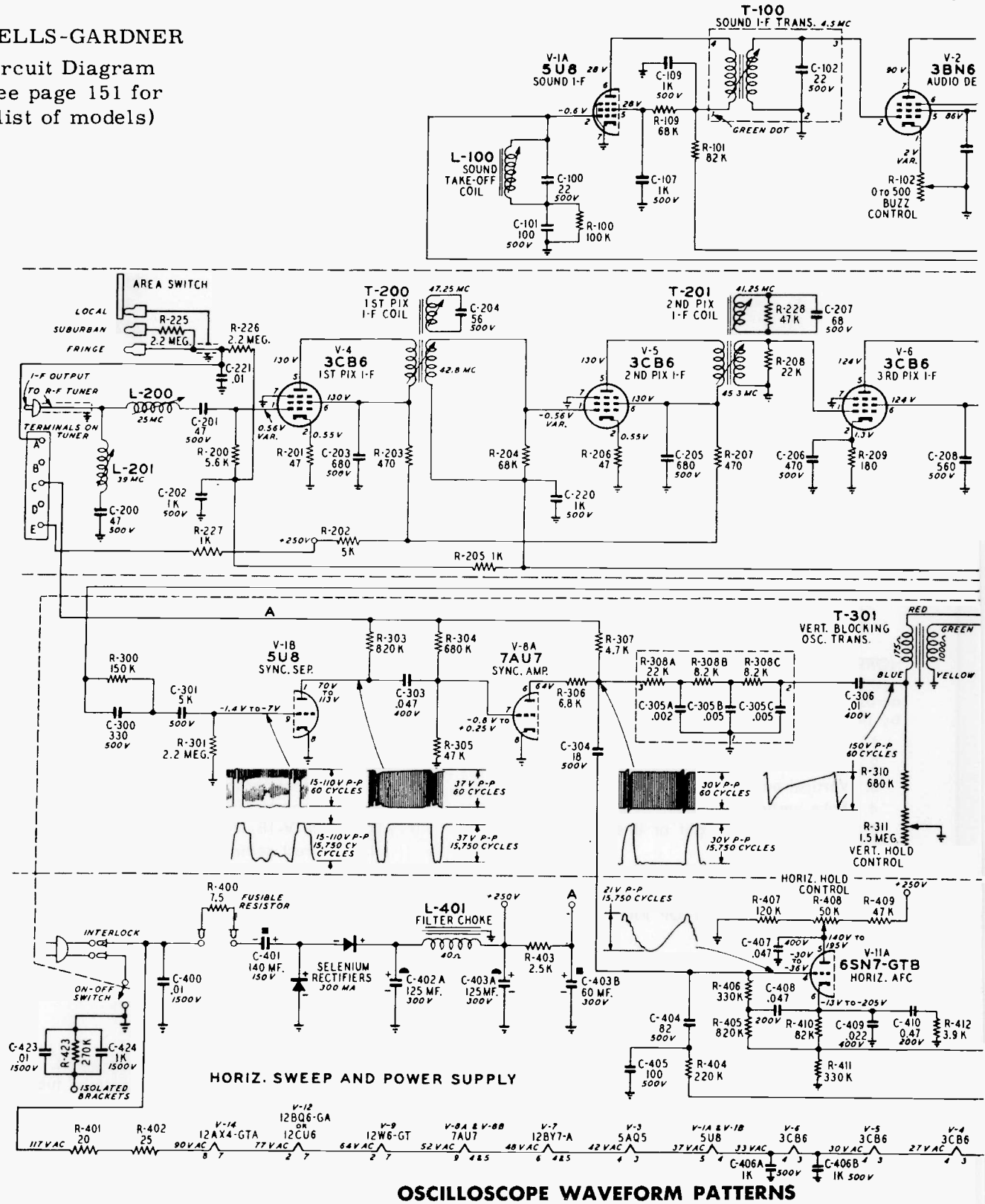
1. Improper setting of ion trap magnet.
2. Defective picture tube or picture tube socket.

PICTURE JITTER

1. If regular sections at left of picture are displaced, replace V-11B.
2. Vertical instability may be due to loose connections or noise received with the signal.
3. Horizontal instability may be due to unstable transmitted sync.
4. Check receiver AGC system for proper operation.
5. Check V-1B tube.
6. Incorrect setting of fine tuning control.
7. Improper adjustment of area switch.

WELLS-GARDNER

Circuit Diagram
(See page 151 for a list of models)



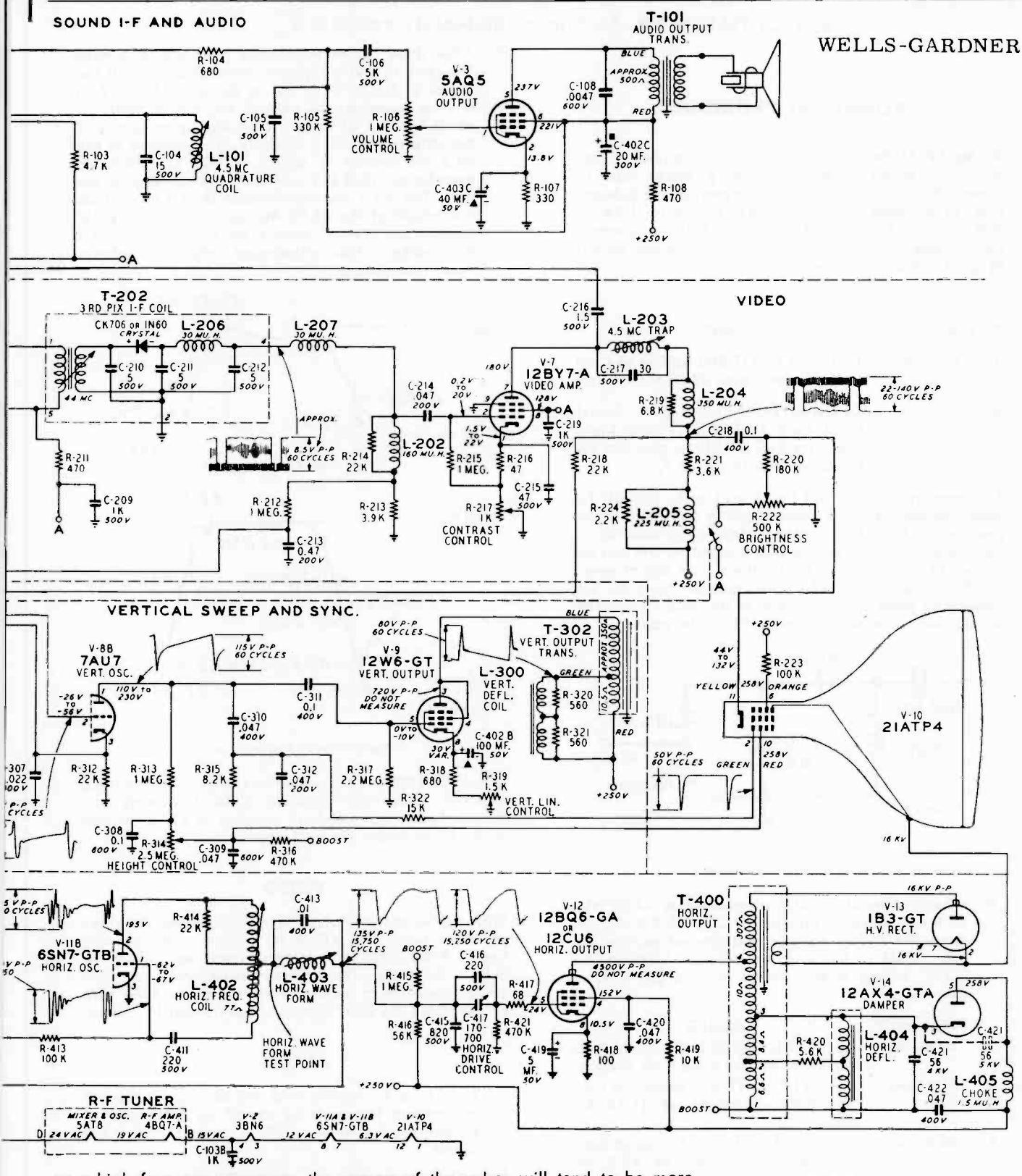
NOTE—Area Switch used only on models stamped 21A59C and 21A59U. 24A59C and 24A59U.

OSCILLOSCOPE WAVEFORM PATTERNS

The waveforms shown on the schematic diagram are as observed on a Tektronix type 524D wide band television oscilloscope with the receiver tuned to a reasonably strong signal and a normal picture. The voltages shown on each waveform are the approximate peak to peak amplitudes. The frequency accompanying each waveform indicates the repetition rate of the waveform not the sweep rate of the oscilloscope. If the waveforms are observed on the oscilloscope with a

NOTE—In UHF receivers the filament voltages in the tuner and above the tuner in the heater string will be slightly greater because of the filament voltages of the tuner tubes. In 24 inch receivers the picture tube is a 24YP4. In later production C-421 was repositioned as indicated with dotted line.

WELLS-GARDNER



poor high frequency response, the corners of the pulses will tend to be more rounded than those shown on the schematic diagram and the amplitude of any high frequency pulse will tend to be less.

DC SOCKET VOLTAGES

All DC socket voltages shown on the schematic are measured with a high impedance VTVM and under zero signal conditions.

ALL RESISTANCE VALUES IN OHMS.

ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF. AND ABOVE 1.0 IN MMF UNLESS OTHERWISE NOTED.

COIL RESISTANCE VALUES LESS THAN 1.0 OHM ARE NOT SHOWN.

K=1000

WELLS-GARDNER Alignment Material, continued

ALIGNMENT PROCEDURE

40 Mc I-F ALIGNMENT—Connect sweep output to ungrounded shield of R-F oscillator & mixer tube in tuner. With short leads connect crystal diode detector (Fig. 6) to plate of 1st I-F tube. Connect —1.5V to A.G.C. line (Junction of C-220 & R-205). Connect oscilloscope to detector output. Adjust sweep output to give adequate deflection.

A.	FREQUENCY	ADJUST
1.	47.25 Mc	1st Pix I-F Coil (T-200 Bottom of Coil) to center notch over 47.25 Mc marker.
2.		Converter Plate Coil (Top of Tuner) Input Grid Coil (L-200) and Input Coupling Coil (L-201) to give the response shown in figure 7.

The converter plate and input grid coils control the shape of the top. The input coupling coil controls the position of the 41.25 marker. This adjustment must be made accurately or the sound rejection will not be correct (41.25 Mc 31 to 36 db down from top of overall P.I.F. response). 45.75 Mc marker must be set exactly on peak or the position of the 44.5 Mc marker in the overall response curve will not be correct.

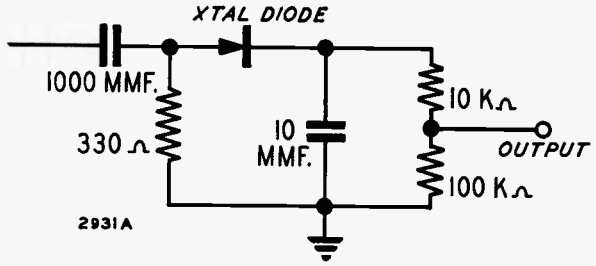


Fig. 6—Crystal Diode Detector

B. When the input circuit is aligned place —4.5V bias on the AGC line. (Junction of C-220 & R-205). Remove the crystal detector and connect oscilloscope and VTVM to the 2nd pix detector load resistor R-213. Adjust sweep output to give 2.0 VDC at detector.

	FREQUENCY	ADJUST
1.	42.8 Mc	1st Pix I-F Coil (T-200, Top of Coil) for maximum height of 42.8 Mc marker.
2.	41.25 Mc	2nd Pix I-F Coil (T-201, Bottom of Coil) for minimum height of 41.25 Mc marker.
3.	45.3 Mc	2nd Pix I-F Coil (T-201, Top of Coil) for maximum height of 45.3 Mc marker.
4.	44.0 Mc	3rd Pix I-F Coil (T-202, Bottom of Coil) for maximum height of the 44.0 Mc marker.

These adjustments may be made with a single frequency generator if it is more convenient to do so.

C. After these adjustments have been made recheck the peak to peak output on the oscilloscope. If the shape of the curve is not as shown in figure 8, it will be necessary to retouch the adjustments. A small fraction of a turn is all that is necessary if the strip is operating correctly. The position of the 44.5 Mc marker is critical (98%). The 44.0 Mc transformer (3rd I-F) controls the symmetry of the top. The 45.3 Mc transformer (2nd I-F) controls the height of the 45.75 Mc marker. The 42.8 Mc transformer (1st I-F) controls the height of the 42.4 Mc marker. This adjustment will very seldom need retouching.

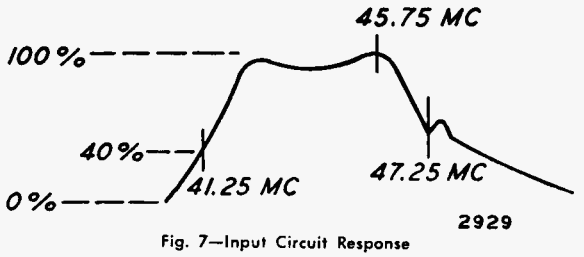


Fig. 7—Input Circuit Response

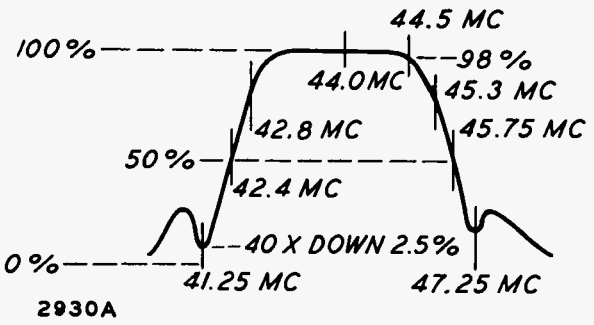


Fig. 8—Overall Response Curve

DO NOT RETOUCH the converter plate coil or the input grid coil. These coils MUST be adjusted correctly with the diode detector. Recheck position of 41.25 Mc and 47.25 Mc markers. Reset if necessary.

VIDEO

With 4.5 Mc unmodulated signal into grid of the video amplifier tube and VTVM on picture tube cathode, tune 4.5 Mc trap 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 (grainy appearance) in picture.

AUDIO

1. Tune in a TV station and reduce signal strength at antenna terminals by use of an attenuator or similar device until a "hiss" accompanies the sound.
2. Adjust sound take-off coil (L-100) sound I-F transformer (T-100) quadrature coil (L-101) and buzz control (R-102) for maximum undistorted sound and minimum buzz.
3. If "hiss" disappears during step 2, further reduce signal strength.

Westinghouse

CHASSIS ASSEMBLY V-2318 and V-2328

Several different variations of the V-2318 and V-2328 chassis are used in current production. The differences wid be found in the type of RF tuner and CRT used. Chassis assemblies V-2318-35, V-2318-45, V-2318-31, V-2318-41, V-2328-301 and V-2328-401 are used in combination TV-Radio-Phono models.

MODEL INFORMATION

The V-2318 chassis will be found in the following models:

H-853K24A(V)	H-869K24A(S)	H-876T24B(S)
H-853K24A(S)	H-870K24A(V)	H-877T24B(V)
H-854K24A(V)	H-870K24A(S)	H-877T24B(S)
H-854K24A(S)	H-875T24B(V)	H-881K24A(V)
H-869K24A(V)	H-875T24B(S)	H-881K24A(S)
	H-876T24B(V)	

The V-2328 chassis will be found in the following models:

H-853KU24A	H-869KU24A	H-876TU24B
H-854KU24A	H-870KU24A	H-877TU24B
	H-875TU24B	H-881KU24A

The following models will contain a V-2318 TV chassis, V-2189-6 Radio chassis and V-9840-5 Record changer:

H-888C24(V)	H-888C24(S)	H-889C24(S)
	H-889C24(V)	

The following models will contain a V-2328 TV chassis, V-2189-6 Radio chassis and V-9840-5 Record changer:

H-888CU24 H-889CU24

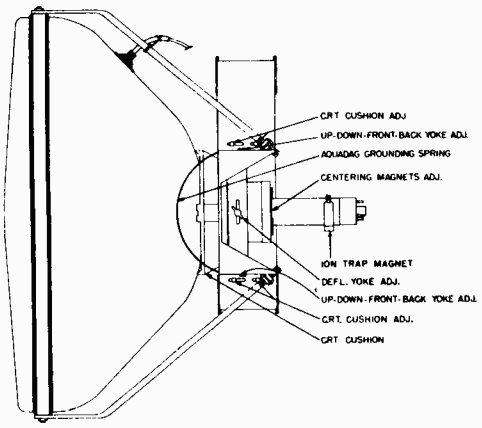


Fig. 1 CRT Adjustments

Circuit diagram is on pages 156-157, alignment data are on page 158.

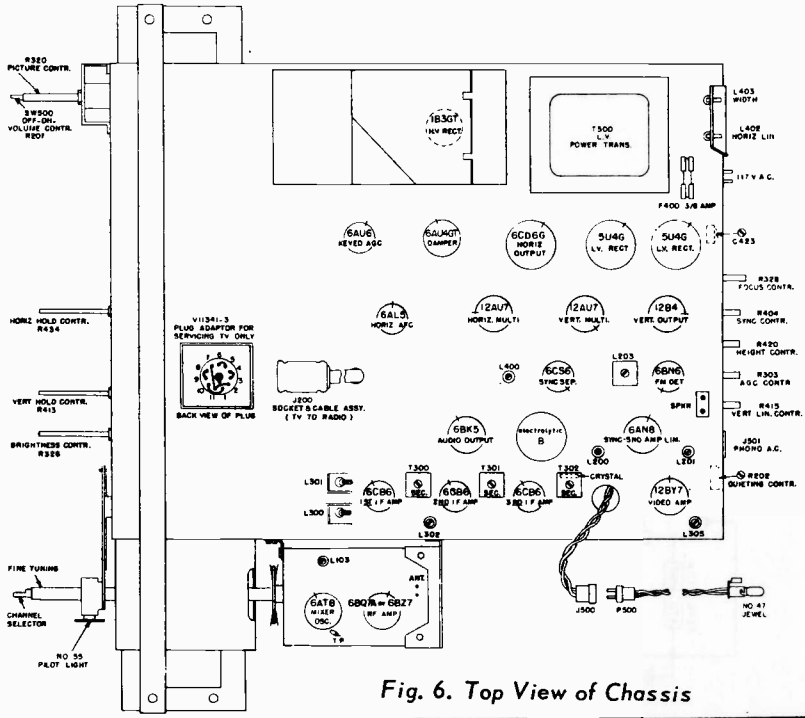
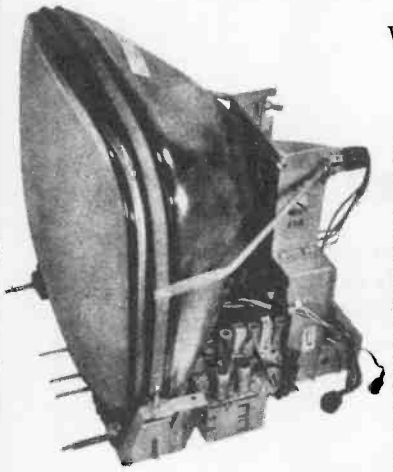


Fig. 6. Top View of Chassis

WESTINGHOUSE Circuit Diagram Chassis V-2318 and V-2328



WIDTH AND HORIZONTAL LINEARITY

The width adjustment on the back of the chassis controls the overall width of the picture, and the horizontal linearity adjustment controls the relationship between the horizontal dimensions of the left and the right sections of the picture. A balance between the two controls is necessary to make the picture symmetrical with correct horizontal dimensions. These controls are sliding type adjustments.

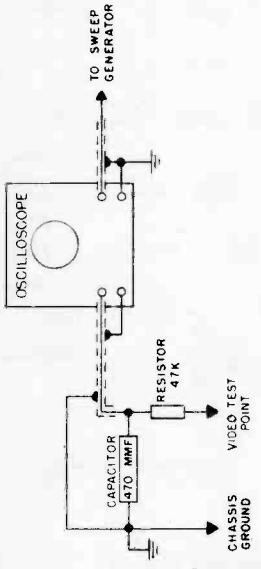
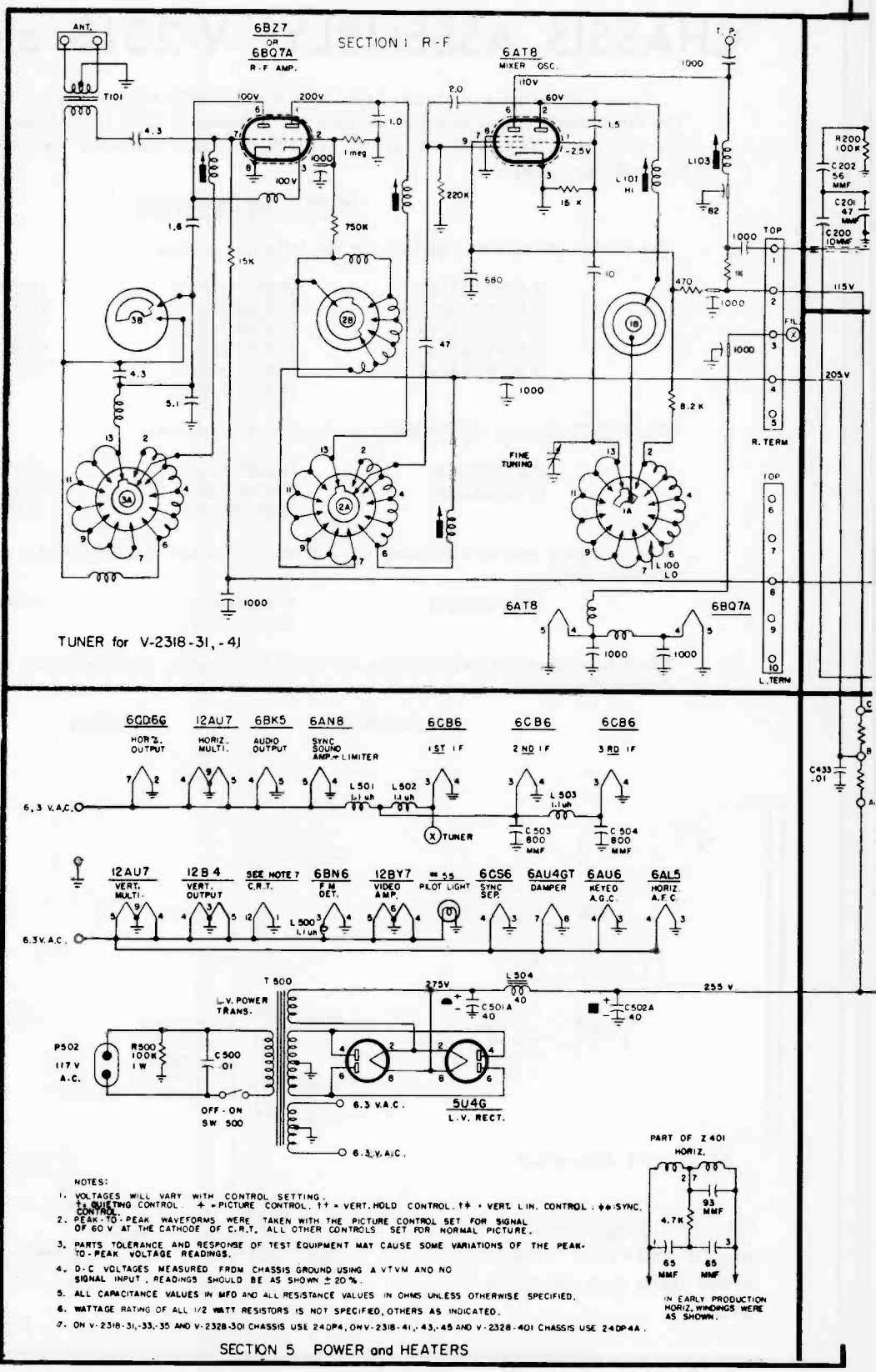


Fig. 2. Oscilloscope Connections



NOTES:

1. VOLTAGES WILL VARY WITH CONTROL SETTING. †† QUIETING CONTROL. + = PICTURE CONTROL. †† = VERT. HOLD CONTROL. †† = VERT. LIN. CONTROL. ◆◆ = SYNC. CONTROL.
2. PEAK-TO-PEAK WAVEFORMS WERE TAKEN WITH THE PICTURE CONTROL SET FOR SIGNAL OF 60 V 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 VTVM AND NO SIGNAL INPUT. READINGS SHOULD BE AS SHOWN ± 20%.
5. ALL CAPACITANCE VALUES IN MFD AND ALL RESISTANCE VALUES IN OHMS UNLESS OTHERWISE SPECIFIED.
6. WATTAGE RATING OF ALL 1/2 WATT RESISTORS IS NOT SPECIFIED, OTHERS AS INDICATED.
7. ON V-2318-31,-33,-35 AND V-2328-301 CHASSIS USE 240P4, ON V-2318-41,-43,-45 AND V-2328-401 CHASSIS USE 240P4A.

SECTION 5 POWER and HEATERS

CHASSIS NO. V-2318-11,-12,-21,-22,-31,-32,-41 & -42
V-2328-101,-201,-301 & -401.

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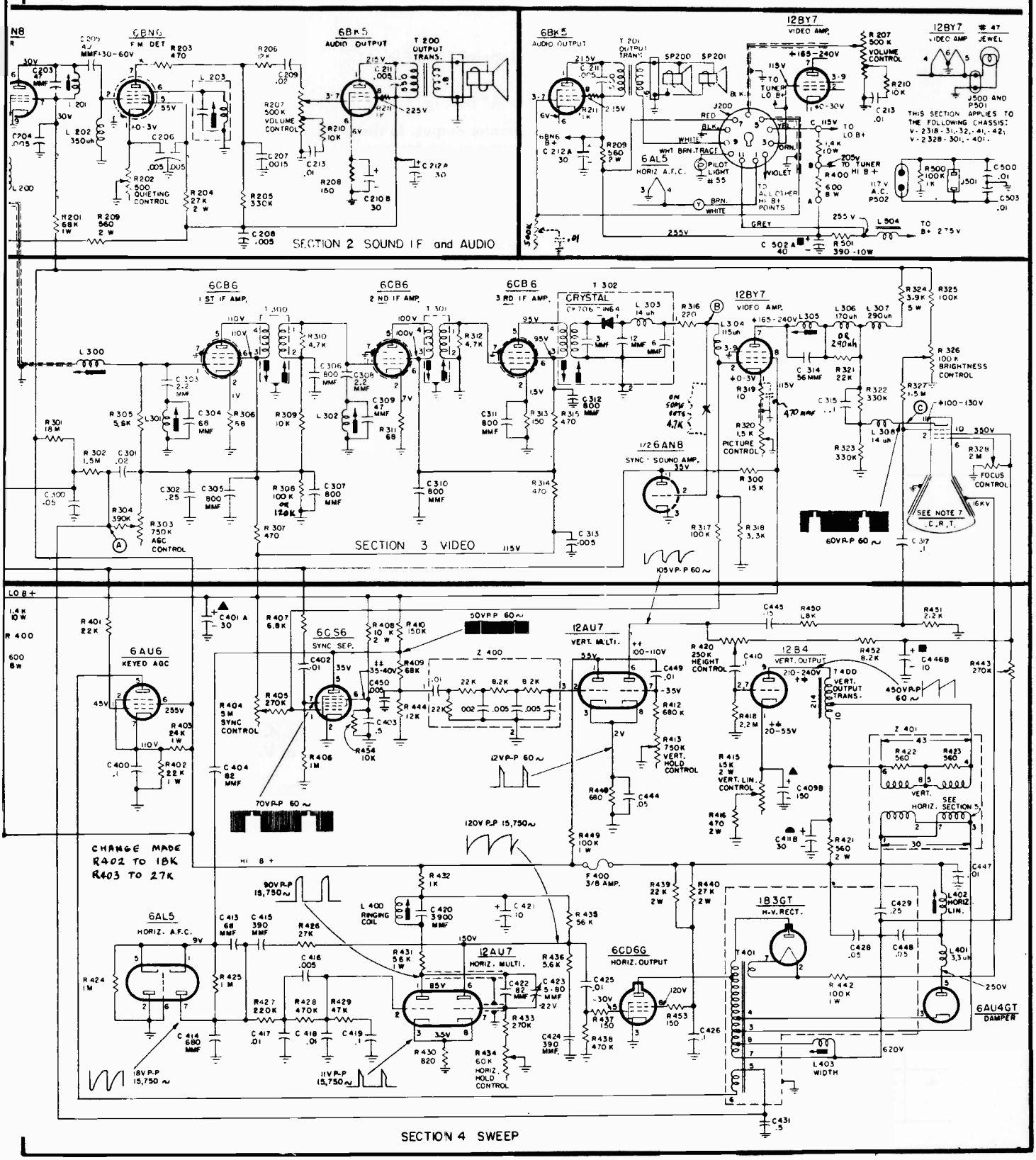
Fig. 5. Schematic Diagram



WESTINGHOUSE Alignment Information for Chassis V-2318 and V-2328

ALIGNMENT CHARTS

COMMON I-F SECTION

Rotate the channel selector to channel 13.

Connect the oscilloscope to the video test terminal, point "B" (Fig. 5) through the decoupling network shown in Fig. 2.

Connect a 9 volt bias battery to the AGC line, point "A" on Fig. 5.

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. 4.

Step	Alignment Signal	Remarks	Adjustments
1.	Remove the RF amplifier tube.		
2.	44 mc. sweep to 3rd IF grid	Connect detuning clips to 1st & 2nd IF plate	Pri. of T302 for max. response and sec. of T302 for symmetrical curve shown in Fig. 4A.
3.	47.25 mc. amplitude modulated to 1st IF grid	Use sufficient signal to produce sine wave response on oscilloscope.	L302 for min. response
4.	44 mc. sweep to 2nd IF grid	Connect detuning clip to 1st IF plate	Pri. of T301 for max. response and sec. of T301 for symmetrical curve shown in Fig. 4B.
5.	44 mc. sweep to 1st IF grid	Detune L103 or T100 when V-14130 tuner is used	Pri. of T300 for max. response and sec. of T300 for symmetrical curve
6.	44 mc. sweep to 1st IF grid		L103 or T100 when V-14130 tuner is used for "suck-out" at 44 mc. (center of curve), See Fig. 4C.
7.	Replace the RF amplifier tube.		
8.	213 mc. sweep to antenna terminals through network.	Feed in 213 mc. marker and adjust the local oscillator (fine tuning so that the marker appears in the center of the response curve (44 mc. on response curve 4D. The fine tuning control is then set at mid-range.	Feed in 215.75 mc. marker and adjust the 41.25 mc. sound trap (L301) for "suck-out" as shown in Fig. 4D.

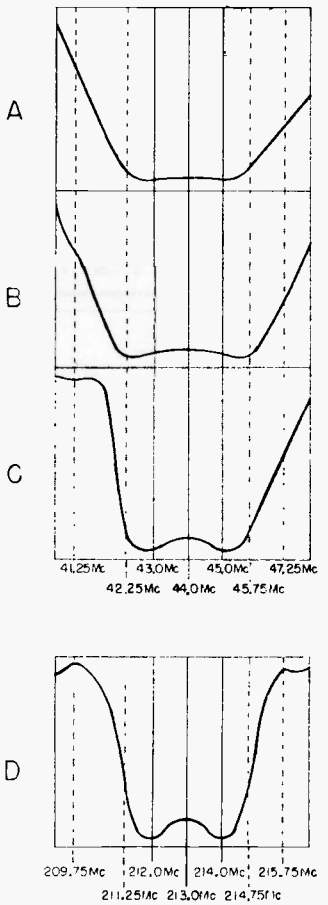


Fig. 4. Response Curves at Various Stages of Alignment

SOUND I-F SECTION AND 4.5 MC. TRAP

Connect the signal generator to the video test terminal (point "B" on Fig.5) through a .001 mfd. capacitor.

Step	Signal Generator Frequency	V VTVM Connections	Remarks	Adjustments
1.	4.5 mc. unmodulated	RF probe to point "C" on Fig. 5 and common lead to chassis.	Use strong signal from generator	L305 for minimum voltage
2.	4.5 mc. FM 7.5 kc. Dev.	Across volume control	Use strong signal from generator	L203 for maximum output
3.	Same as step 2	Same as step 2	Use weakest signal from generator.	L200, L201 and L203 for maximum output
4.	4.5 mc. AM 30% Mod.	Same as step 2	Start with weak signal increase as adjustment is made.	Quieting control for dip to zero.

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CHASSIS ASSEMBLY V-2340, V-2350 AND V-2341, V-2351

Chassis V-2340 uses a 17" picture tube. Chassis V-2341 uses a 21" picture tube. Chassis V-2350 and V-2351 are corresponding chassis using VHF-UHF all-channel tuners. Minor variations are indicated by different —dash numbers. See pages 160-161 for circuit diagram, and page 162 for additional service material. Alignment for these chassis is similar to material printed on pages 164, 165, and 167.

MODEL INFORMATION

The V-2341 Chassis (VHF only) will be found in the following models:

H-924T21A	H-929T21C	H-974T21
H-924T21C	H-965K21C	H-975T21
H-927T21C	H-966K21C	H-976T21
H-928T21C		

The V-2351 Chassis (VHF-UHF) will be found in the following models:

H-924TU21C	H-929TU21C	H-974TU21
H-927TU21C	H-965KU21C	H-975TU21
H-928TU21C	H-966KU21C	H-976TU21

The V-2340 Chassis (VHF only) will be found in the following models:

H-916T17A	H-920T17A	H-978T17
H-919T17A	H-921T17A	H-979T17
		H-980T17

The V-2350 Chassis (VHF-UHF) will be found in the following models:

H-916TU17A	H-920TU17A	H-978TU17
H-919TU17A	H-921TU17A	H-979TU17
		H-980TU17

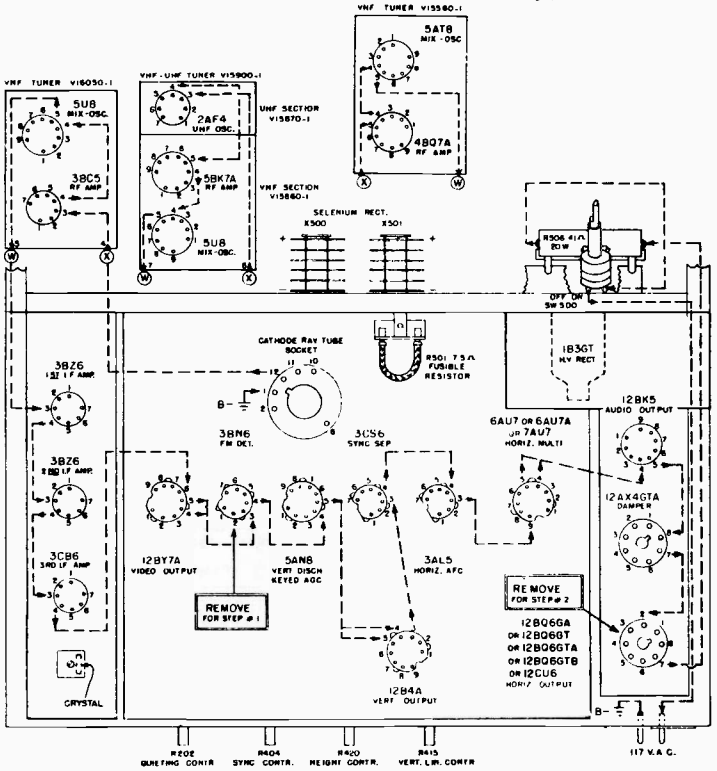


Fig. 12 Top View of Sockets for Heater Check

LOCATING OPEN FILAMENT TUBES

The drawing, Fig. 12, can be used as a guide in making these checks.

Step 1. With the back cover off, remove the 3BN6 as shown as Step No. 1 in Fig. 12 and check the tube from pins 3 to 4 for continuity. If the indicator does not light insert a new 3BN6. If the original 3BN6 filament is good, connect the clip lead of the indicator to any convenient B- point and insert the indicator pin into the No. 4 position of the 3BN6 tube socket. If the indicator does not light, the open filament lies between the 3BN6 tube and B- and can be located by checking at successive tube sockets between the 3BN6 tube and B- in the order shown by the dotted line in Fig. 12. If the indicator lights, continuity exists between the 3BN6 and B- and all the tube filaments be- these points are good.

Step 2. Remove the horizontal output tube (See Fig. 12) from its socket and insert the indicator pin into the No. 2 position of the horizontal output tube socket and the pin of the clip lead into the number 5 position of the 3BN6 tube socket. If the indicator does not light the open filament lies between the horizontal output tube and the 3BN6 and can be located by checking at successive tube sockets between the horizontal output tube and the 3BN6 in the order shown by the dotted line in Fig. 12. If the indicator lights, continuity exists between the horizontal output tube and the 3BN6.

The horizontal output tube should be checked for continuity between pins 2 and 7. If continuity does not exist replace with new tube. If filament string does not function, the resistor R501 should be checked for proper resistance value.

TUBE REPLACEMENT

In cases when tube replacements are necessary, care should be used when extracting or inserting tubes. The printed board is well supported on the chassis and is quite flexible and will withstand some bending, but will crack or break if pressure is excessive.

WESTINGHOUSE Chassis V-2340, V-2341, V-2350, V-2351

SW300 FUNCTION

Switch SW300 operates in conjunction with SW500 the off-on switch. When the off-on switch SW500 is closed, SW300 is open and vice-versa. The purpose of this arrangement is to eliminate and intense bright spot appearing at the center of the CRT after the receiver has been turned off.

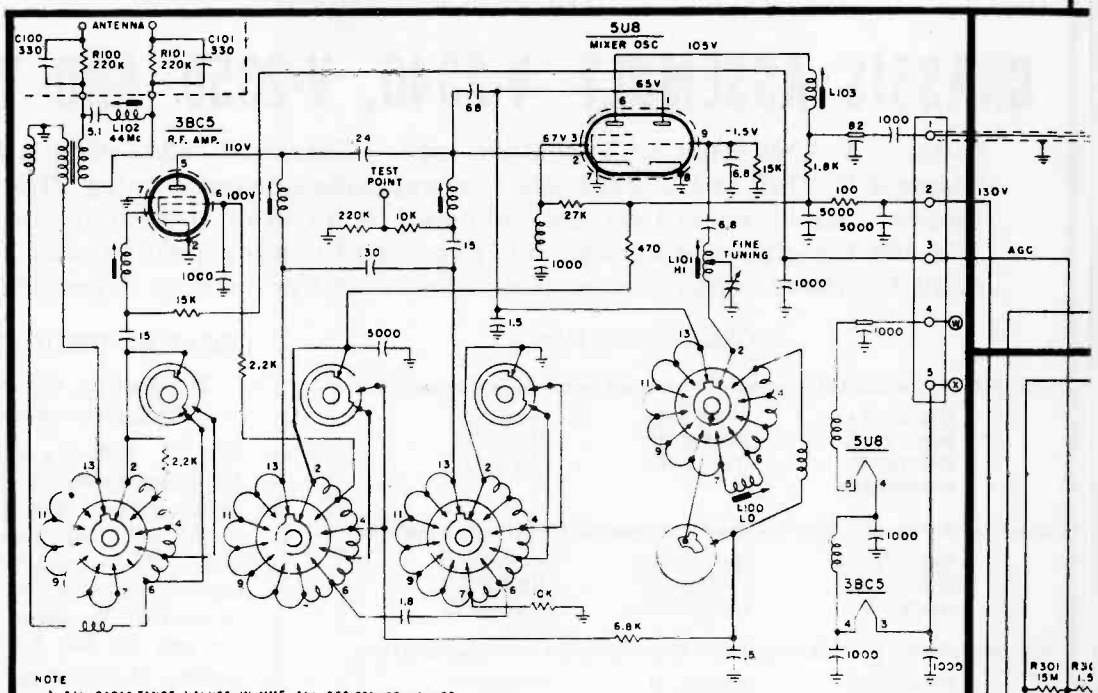
This is accomplished as follows, after the receiver is turned off and the sweep voltage is collapsing, switch SW300 closes and momentarily applies a positive DC potential to grid No. 2 of the CRT, which immediately removes any remaining charge, therefore extinguishing the beam at once.

VIDEO DETECTOR REPLACEMENT

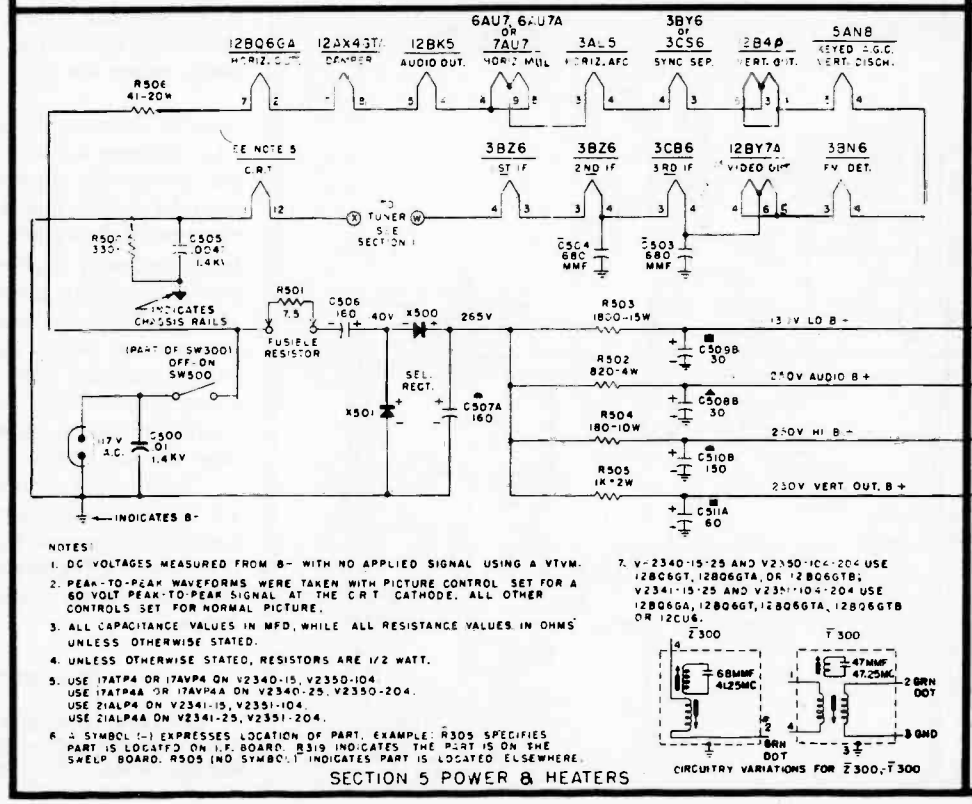
The video detector (CK706A) is easily accessible from the top of the third IF can (T302).

The third IF transformer has a removable top which can be lifted off and a new crystal replaced.

When replacing the crystal care should be used to see that the proper crystal polarity is maintained.



SECTION 1, TUNER



SECTION 5 POWER & HEATERS

WESTINGHOUSE Chassis V-2340, V-2341, V-2350, V-2351

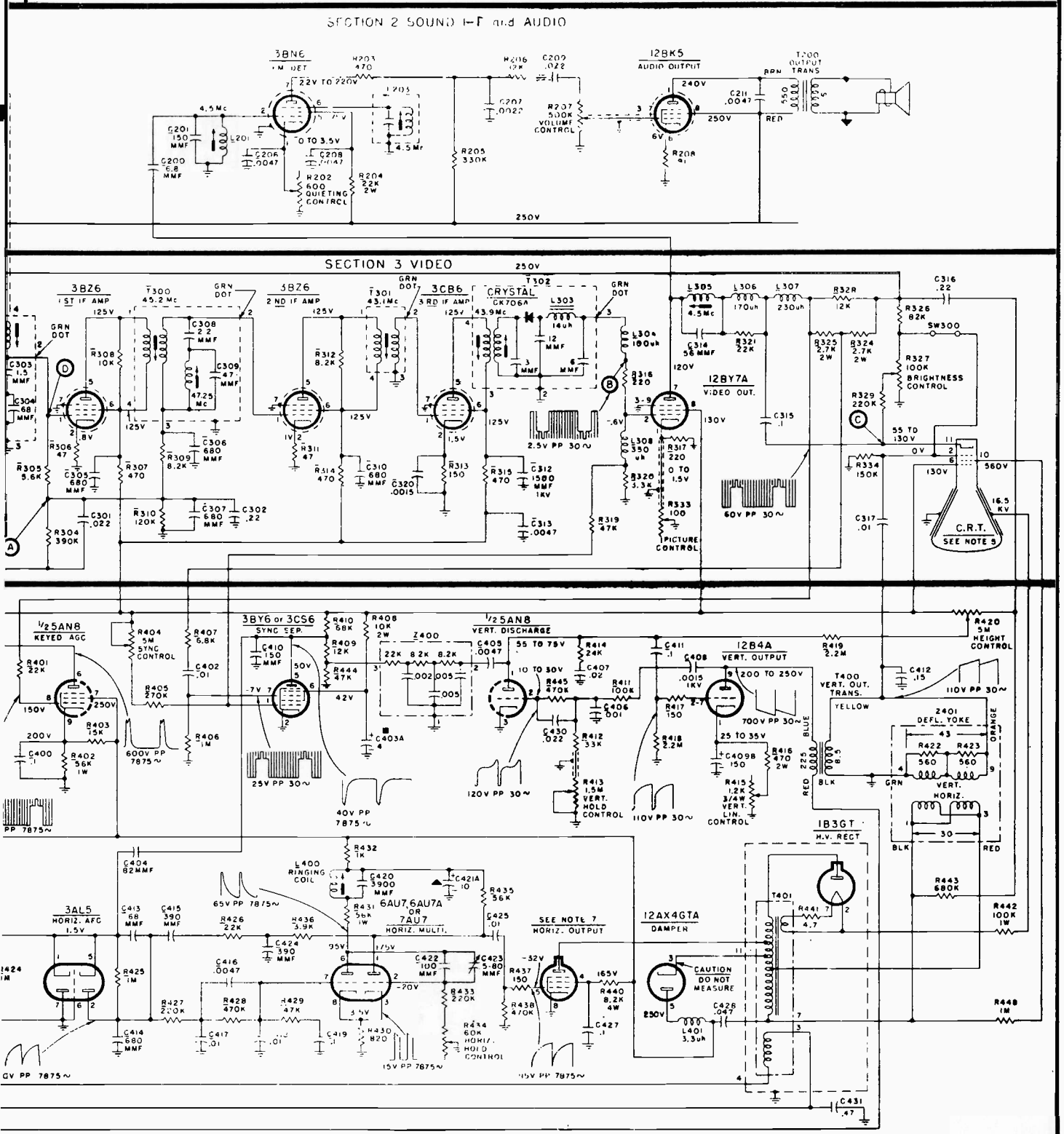


Fig. 20 Schematic Diagram for Chassis Assembly V-2340-15, V-2340-25, V-2350-104, V-2350-204, V-2341-15, V-2341-25, V-2351-104, V-2351-204

WESTINGHOUSE ELECTRIC

(Chassis V-2340-15, V-2340-25, V-2350-104, V-2350-204)
(Chassis V-2341-15, V-2341-25, V-2351-104, V-2351-204)

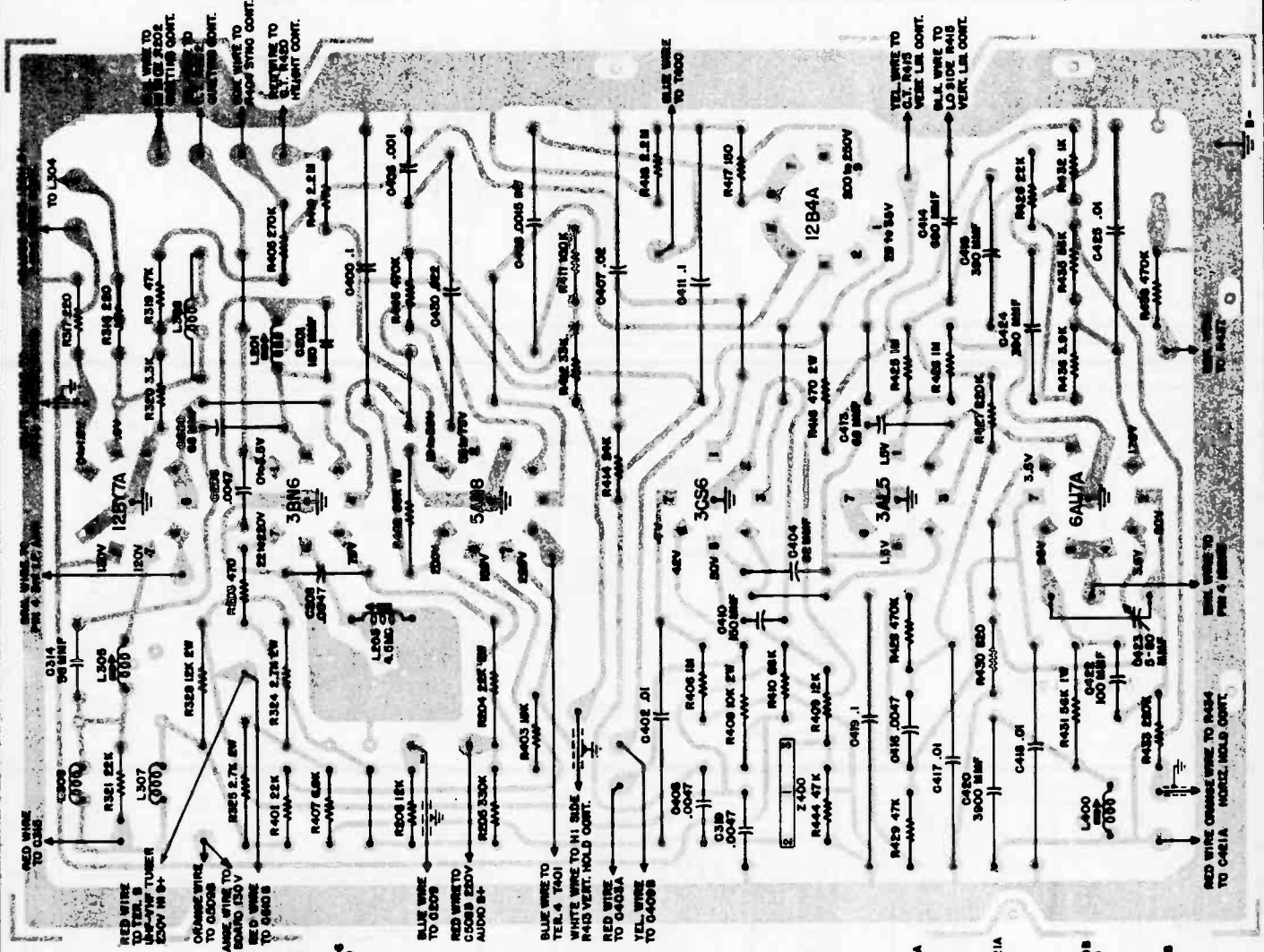


Fig. 18 Bottom View of Sweep Printed Board Showing Top Components Symbolically

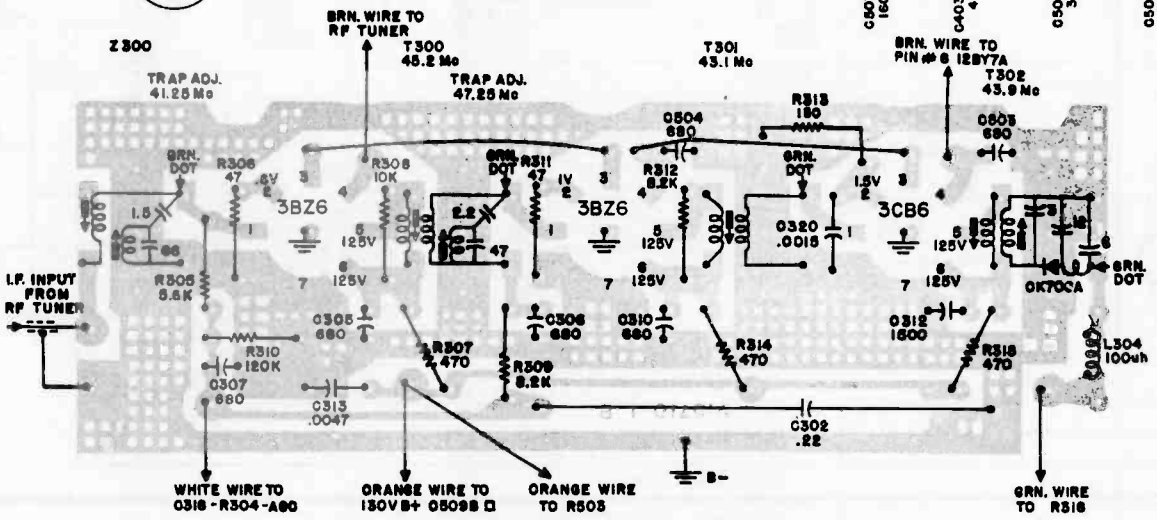


Fig. 19 Bottom View of IF Printed Board Showing Top Components Symbolically

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CHASSIS V-2342, V-2352 and V-2343, V-2353

MODEL INFORMATION

The V-2342 television chassis will be found in the following 21" models:

H-934T21	H-939K21
H-935T21	H-941K21
H-938K21	H-942K21

The V-2352 television chassis will be found in the following 21" factory equipped UHF models:

H-934TU21	H-939KU21
H-935TU21	H-941KU21
H-938KU21	H-942KU21

The V-2343 television chassis will be found in the following 24" models:

H-950T24	H-954K24
H-951T24	H-955K24
	H-956K24

The V-2353 television chassis will be found in the following 24" factory equipped UHF models:

H-950TU24	H-954KU24
H-951TU24	H-955KU24
	H-956KU24

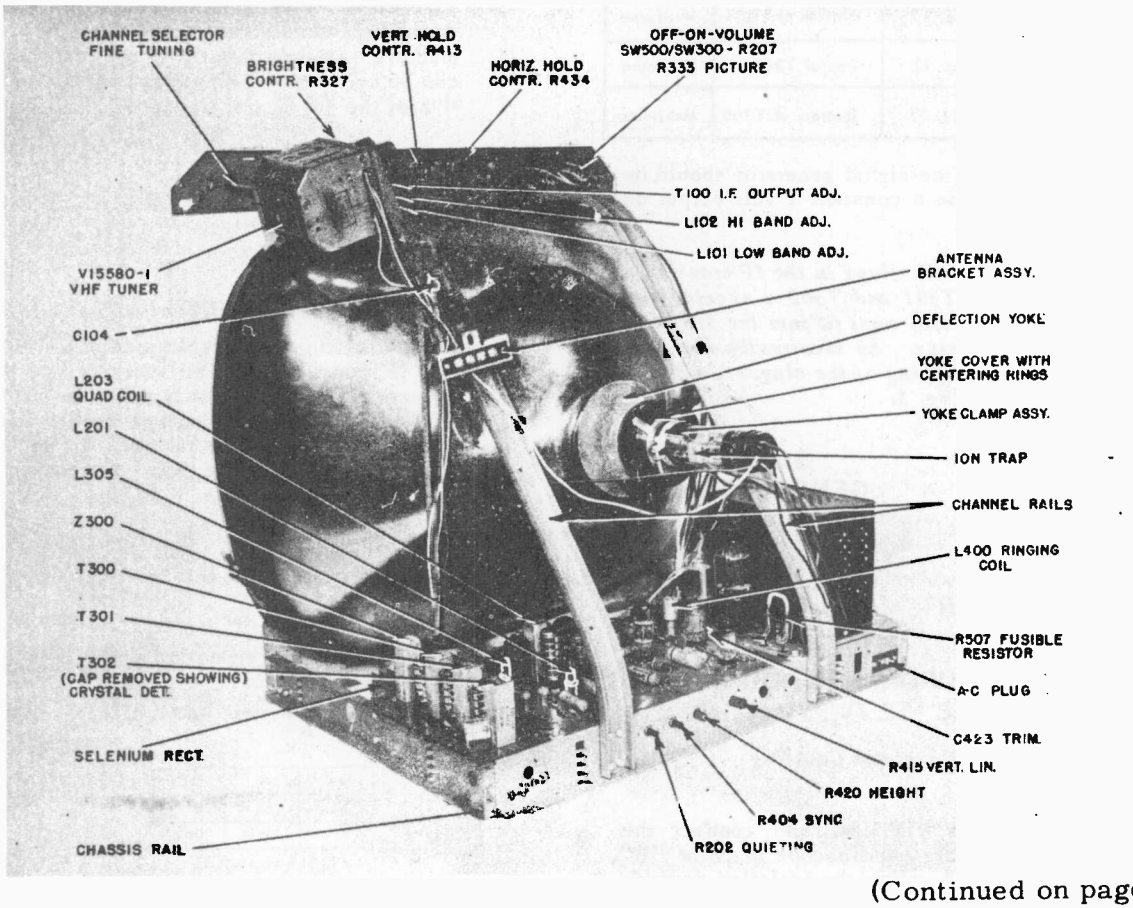


Fig. 1 Rear View of Chassis

(Continued on page 164 through page 170.)

WESTINGHOUSE Alignment for Chassis V-2342, V-2343, V-2352, V-2353

The video IF system uses staggered tuned transformers to obtain the required bandwidth. In this type of system, both the meter and visual methods are used.

A suggested alignment procedure is given in the following steps:

1. Connect a V.T.V.M. (5 volt range) to point "B" as shown on the schematic diagram Fig. 17 or printed board layout Fig. 13.

2. Connect the RF generator, capable of of providing frequencies ranging from 40 to 50 mc. (unmodulated) to point "D" as shown on Fig. 17 and Fig. 14. For suggested RF generator coupling and termination see Fig. 3.

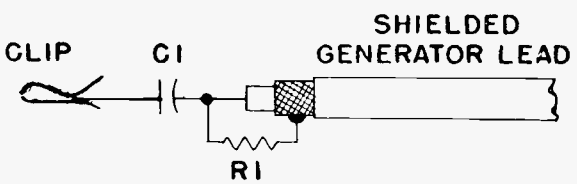
3. Apply -3 volts bias to point "A" as shown in Fig. 17. A simple bias source is shown in Fig. 4.

4. Adjust T302, T301 and T300 as given in the following chart.

Signal Gen. Frequency	Connect Gen. To Point	Adjust	Output
43.9 mc	"D" Fig. 17	Top then bottom of T302	Maximum
43.1 mc	"D" Fig. 17	Bottom of T301	Maximum
47.25 mc	"D" Fig. 17	Top of T300	Minimum
45.2 mc	"D" Fig. 17	Bottom of T300	Maximum

The output of the signal generator should be adjusted to provide a constant 1 volt output on the V.T.V.M.

NOTE: To adjust the slugs in the IF transformers Z300, T300, T301 and T302 a special tool is required. This tool must fit into the 3/32 hex type hole in the slug. An incorrectly designed tool will cause chipping of the slug. A suitable tool is shown in Fig. 5.



C1 = .001 MFD
R1 = DEPENDS UPON GEN. OUTPUT IMPEDANCE 52 Ω . 72 Ω etc.

Fig. 3 RF Generator Coupling

5. Remove the V.T.V.M. and connect the vertical input of the oscilloscope to point "B". See Fig. 17 and 13, using the isolation network as shown in Fig. 7.

6. Remove the RF signal generator from point "D". See Fig. 17 and 14.

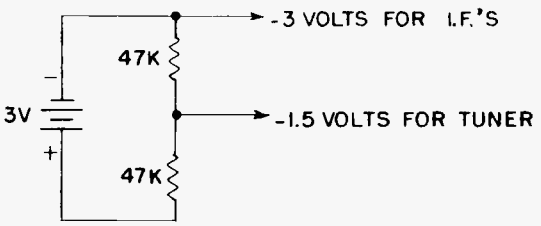


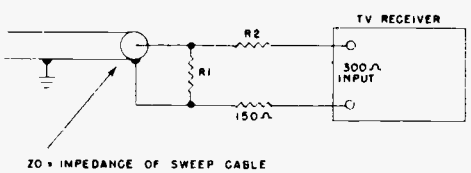
Fig. 4 Bias Supply

7. Couple the marker generator output to the IF sweep generator output so that the two signals are applied together to the points specified in the steps that follow. Some sweep generators have facilities for connecting the marker output directly into the sweep generator. With other sweep generators, the marker can be coupled to the sweep generator by wrapping a few turns of insulated wire around the center conductor of the sweep generator output cable and connecting the marker generator to this wire. The loose coupling obtained in this manner is desirable because excessive marker signal injection will distort the response curve.

8. Connect the IF sweep generator to point "D" as shown on Figs. 17 and 14. The observed wave form should be as shown in Fig. 8 with markers as shown. A tilt in the response curve can be corrected by adjusting the primary (bottom slug) of the 3rd IF transformer (T302). To correct

Fig. 5 Alignment Tool

the bandwidth, or to set the markers, adjust the 2nd IF transformer (T301) to correct the low frequency side and adjust the first IF transformer (T300) to correct the high frequency side. If more than 3 turns are required for any of the touch up adjustments, the preceeding steps should be repeated.



ZO	R1	R2
50 Ω	56 Ω	120 Ω
72 Ω	82 Ω	110 Ω

Fig. 6 Impedance Matching Network

WESTINGHOUSE Alignment for Chassis V-2342, V-2343, V-2352, V-2353

9. Connect the RF sweep generator output cable to the antenna terminals with the proper impedance matching network. (See Fig. 6)

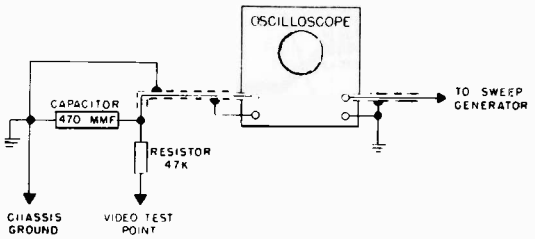


Fig. 7 Oscilloscope Connections

10. Set the channel selector to channel 13 and set the sweep generator to sweep channel 13 frequencies.

11. Adjusting T100 on the tuner for maximum amplitude of the response curve and the bottom adjustment of Z300 to correct the tilt, the curve and marker points should be as shown in Fig. 9. The bottom adjustment of Z300 is made correctly when the response curve rocks about the center frequency of 213 mc.

The top adjustment of Z300 is the accompanying sound trap (41.25 mc) and should be adjusted to to fall as shown in the response curve (Fig. 9) at 215.75 mc. After adjusting the 41.25 mc trap it may be necessary to retouch the bottom adjustment of Z300.

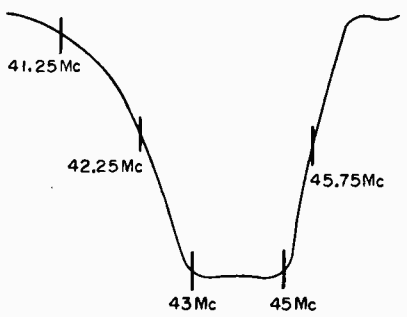


Fig. 8 I.F. Response Curve

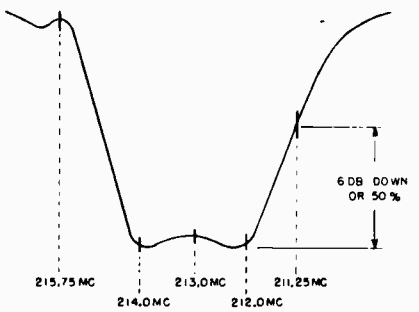


Fig. 9 RF Response Curve

4.5 mc. TRAP ALIGNMENT

Signal Gen. Connect To	Signal Gen. Frequency	Connect RF Probe of V.T.V.M. To	Adjust L305 For
Point "B" (Fig. 17) Lowside to B-	4.5 mc (unmodulated)	Point "C" (Fig. 17) Lowside to B-	Minimum

NOTE: The accuracy of the 4.5 mc frequency is very important, it should be crystal controlled if possible and should be strong enough to produce the proper null.

Depending upon the setting of the brightness control, point "C" potential may be as high as 150V, so the RF probe should contain a blocking capacitor.

HIGH-FREQUENCY OSCILLATOR ALIGNMENT

If the 5U8 oscillator tube is replaced the different inter-electrode capacity of the new tube may change the oscillator frequency enough to necessitate re-alignment.

Alignment of the VHF oscillator for the high and low band channels is accomplished from the top of the tuner.

The adjustments are as follows:

1. Rotate the fine tuning control to the middle of its range. The flat of the shaft will be at the 1 o'clock position.
2. Set the channel selector to the highest channel in the high band (7-13) operating in your locality.
3. Using a non-metallic alignment tool (See Fig. 10) peak the hi-band oscillator slug L101 for best picture detail and sound quality.
4. Set channel selector to the highest channel in the low band (2-6) operating in your locality.
5. Peak the low band adjustment slug (L100) for best picture detail and sound quality.
6. Check the previously made adjustments and if tuning has changed, repeat the above procedure.

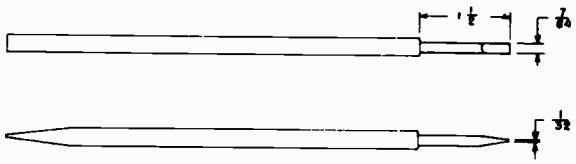


Fig. 10 Alignment Tool

SOUND ALIGNMENT PROCEDURE

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.

(Continued on page 167)

WESTINGHOUSE Chassis V-2342, V-2343, V-2352, V-2353

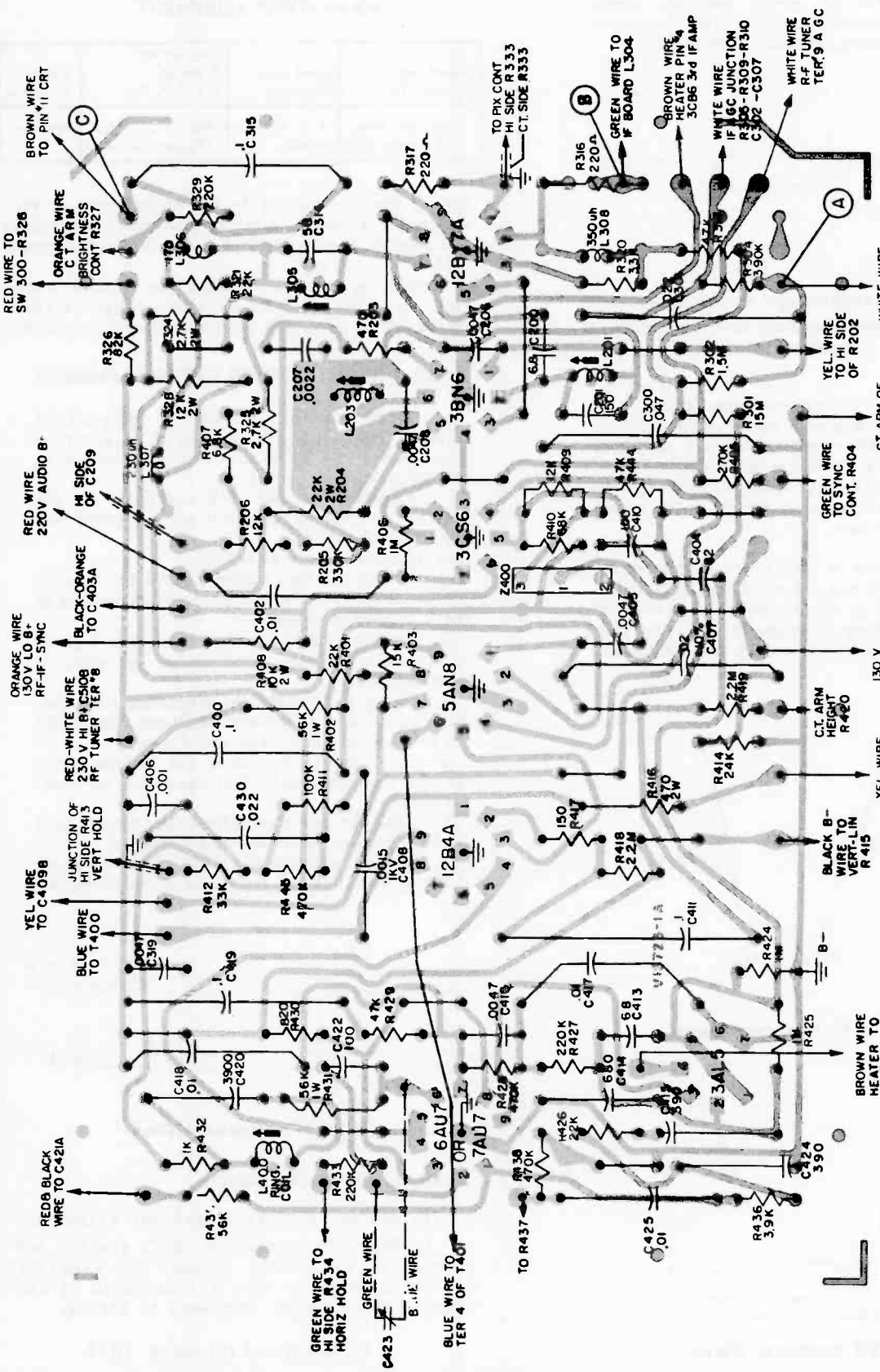


FIG. 13 BOTTOM VIEW OF SWEEP PRINTED BOARD SHOWING TOP COMPONENTS SYMBOLICALLY

WESTINGHOUSE Chassis V-2342, V-2343, V-2352, V-2353

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 (L201) 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 (L203) 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.*

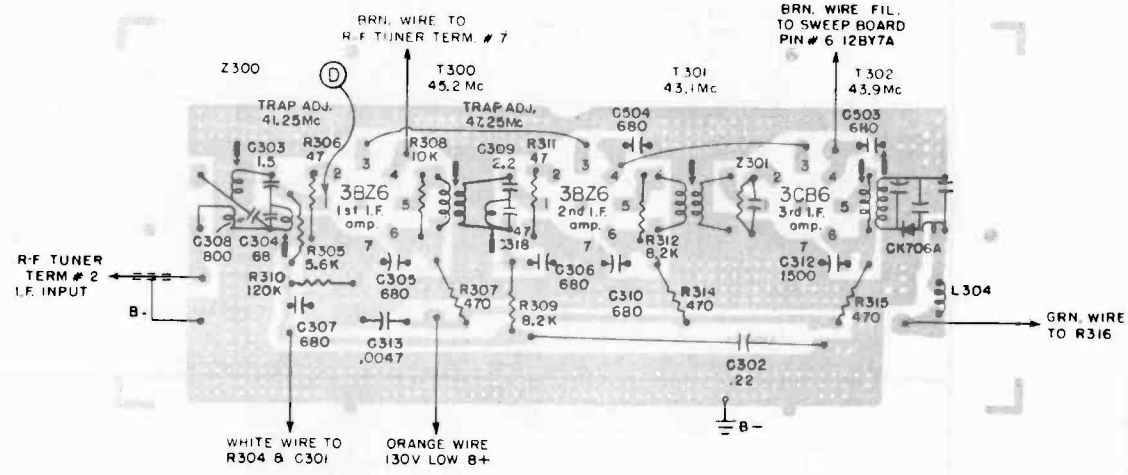


Fig. 14 Bottom View of IF Printed Board Showing Top Components Symbolically

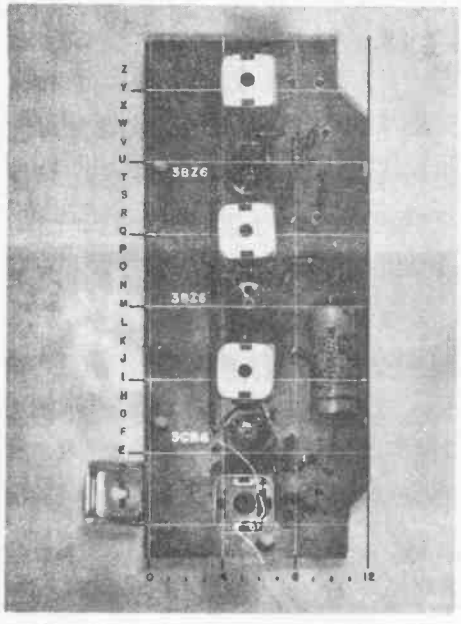


Fig. 15 IF Board Component Location

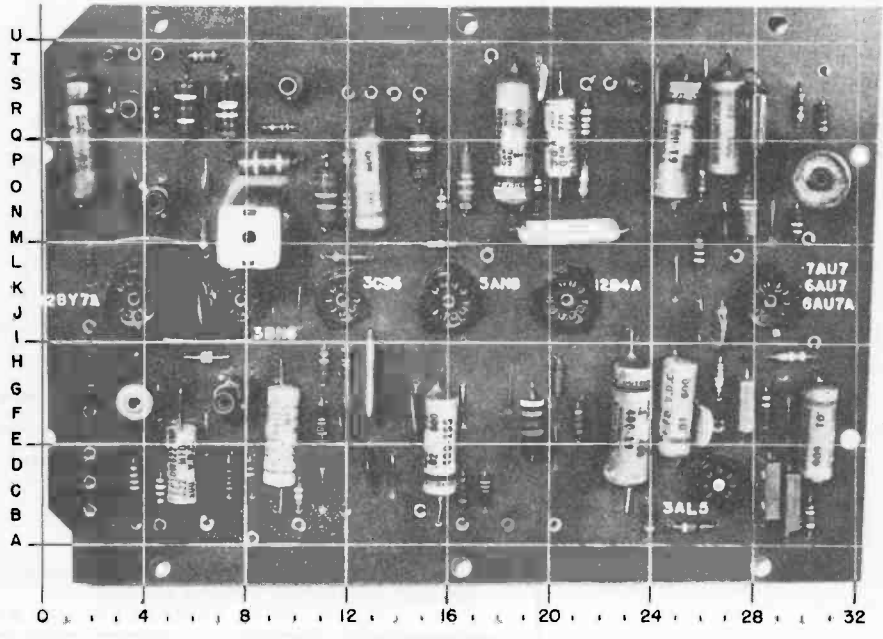


Fig. 16 Sweep Board Component Location

WESTINGHOUSE Schematic Diagram Chassis V-2342, V-2343

PARTS IDENTIFICATION

The schematic diagram of the V-2342 and V-2343 chassis is coded so that the location of parts can be easily determined.

If the part number on the schematic diagram Fig. 17 has a dash (-) above the part number, for example C309, this means that the part will be found on the IF printed board. If the dash is below the number the part will be found on the sweep board, for example, R404. Component numbers not having the dash will be located somewhere on the chassis.

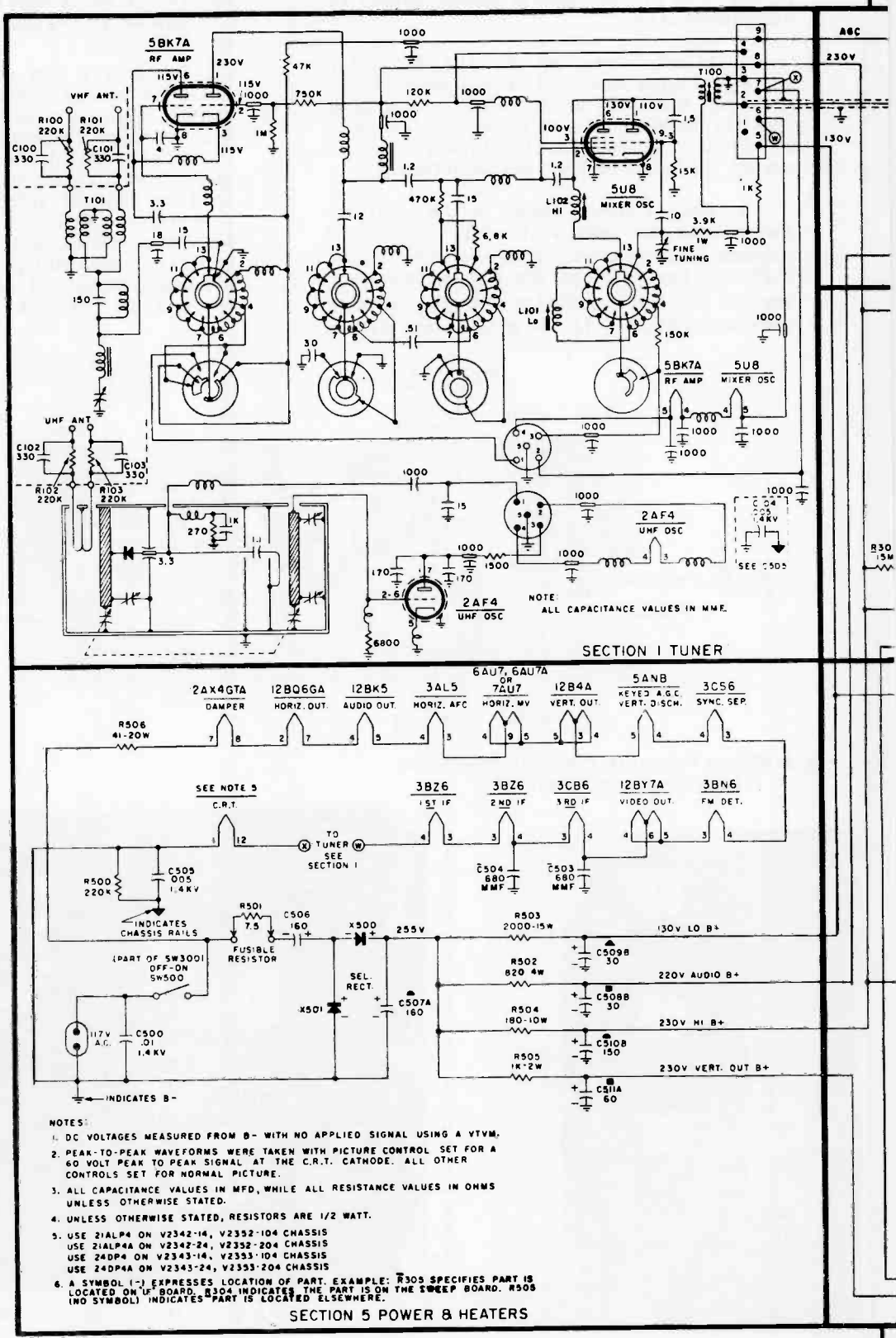
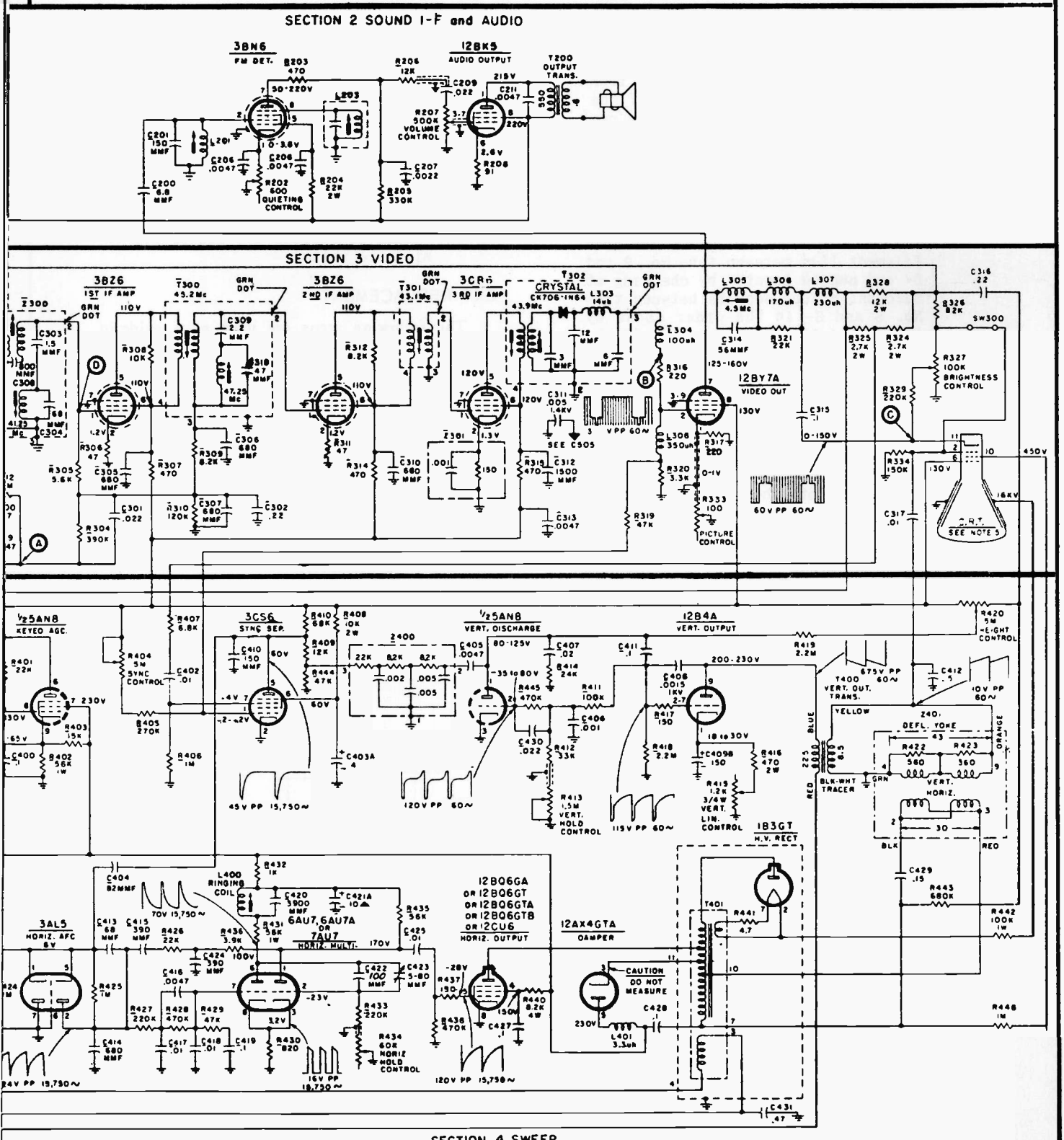


FIG 17

WESTINGHOUSE Schematic Diagram Chassis V-2342, V-2343



V-2342 AND V-2343 SCHEMATIC DIAGRAM

WESTINGHOUSE Service Data for Chassis V-2342, V-2343, V-2352, V-2353

LOCATING OPEN FILAMENT TUBE

Fig. 11 can be used as a guide in making these checks.

STEP 1. With the back cover off, remove tube No. 8 (3BN6) and check the tube from pins 3 to 4 for continuity. If the indicator does not light insert a new 3BN6 If the original 3BN6 filament is good, connect the clip lead of the indicator to any convenient point on the chassis (B –) and insert the indicator pin into the Number 4 position of the tube socket No. 8. If the indicator does not light, the open filament lies between tube No. 8 and B- and can be located by checking at successive tube sockets between tube No. 8 and B- in the order shown by the dotted line in Figure 11. If the indicator lights, continuity exists between tube No. 8 and B- and all the tube filaments between these points are good.

STEP 2. Then remove tube No. 16 (12AX4GTA) from its socket and insert the indicator pin into the No. 8 position of tube socket No. 16 and the pin of the clip lead into the No. 3 position of tube socket No. 8. If the indicator does not light the open filament lies between tube No. 16 and tube No. 8 and can be located by checking at successive tube sockets between tube No. 16 and tube No. 8 in the order shown by the dotted line in Fig. 11. If the indicator lights, continuity exists between tube No. 16 and tube No. 8.

STEP 3. The Damper tube No. 16 (12AX4GTA) should next be checked for continuity between pins No. 7 and 8. If continuity does not exist replace with new tube. If filament string still doesn't function, the resistor R506 should be checked for its proper resistance value.

CRT REPLACEMENT

The following steps are used as a guide in removing the Cathode Ray tube:

1. Remove the television chassis from the cabinet.
2. Remove the CRT socket.
3. Remove the *ion* trap.
4. Loosen and remove the aluminum clamp ring securing the yoke cover.
5. Slip the yoke assembly from the CRT neck.
6. Loosen and remove from each channel stabilizing bar one 3/8" nut and lock washer allow-each stabilizing bar to be free from the CRT mounting strap assembly.
7. Remove the six (three on each side) 1/4" self tapping screws from the chassis side rails securing the CRT cradle.

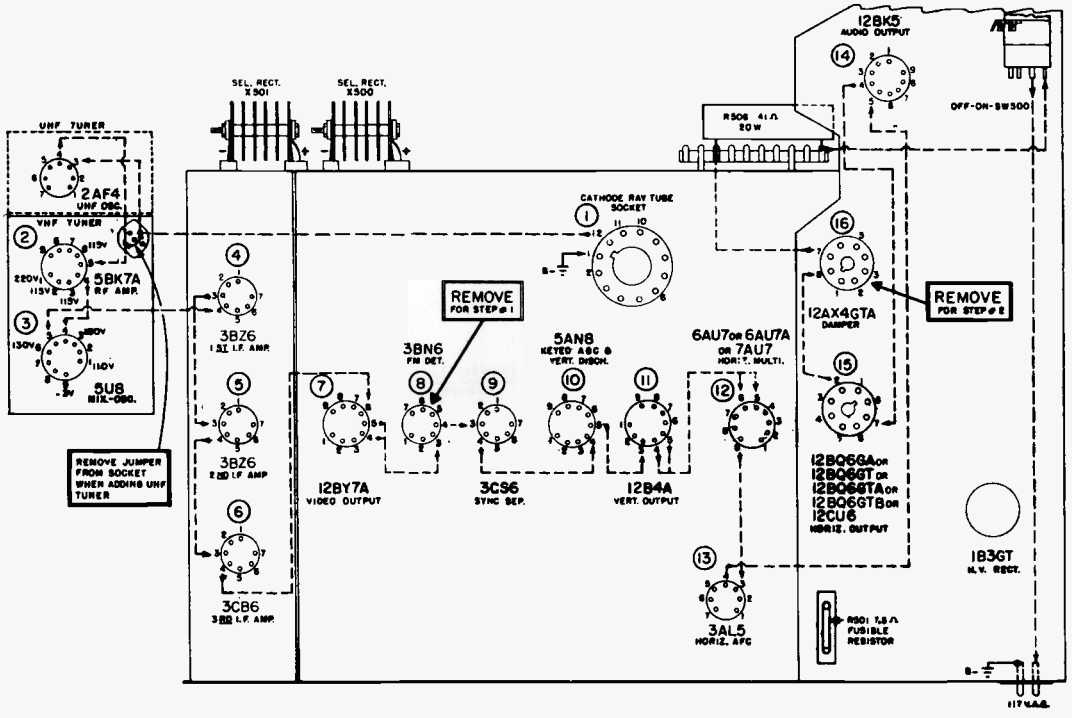


Fig. 11 Top View of Sockets for Heater Check

1956 TELEVISION RECEIVERS

CHASSIS 16X20 - 17X20 - 17X22 - 17X23
19X21 - 19X22 - 19X24 - 22X20
22X21 - 22X22Q

Chassis:	Models using this chassis:
16X20	X1814R, X1816E, G, L, R,
17X20	X2220R, X2222E, G, L, R, Y, X2224E, R, Y,
17X22	X2232E, R, X2247E, R, X2248E, R, X2280E, R,
17X23	X2636E, R, X2670E, R,
19X21	X2229R, X2230E, R, X2256E, R,
19X22	X2258E, R, X2264EQ, RQ, X2254M, X2257, E, R,
19X24	X2640E, R,
22X20	X2359E, X2360R, X2362E, H, R, X2365EQ, RQ, X2383, R, X2391EQ,
22X21	X2671R, X2672E, X2674EQ, RQ,
22X22Q	X2994EU, HU.

SUFFIX "U" FOLLOWING ANY MODEL NUMBER INDICATES A RECEIVER EQUIPPED WITH THE ZENITH CONTINUOUS TUNER

SUFFIX "Q" FOLLOWING ANY MODEL NUMBER INDICATES A RECEIVER EQUIPPED WITH ZENITH FLASH-MATIC REMOTE CONTROL

The vertical type 16X20, 17X20, 17X22, and 17X23 chassis described in this manual are similar in design. Alignment and adjustment procedures are identical. The 17" 16X20 chassis utilizes selenium rectifiers and series connected filaments. One side of the power line is tied to the 16X20 chassis and the use of an isolation transformer is recommended in servicing. The circuit for 16X20 chassis is printed on page 175. The 21" 17X20, 17X22, and the 24" 17X23 chassis are equipped with a power transformer. See pages 178 and 179 for these circuits. With the exception of the IF amplifier and its alignment procedure, these receivers and 16X20 are the same as their "T" counterpart described in Supreme Publications volume TV-10, Additional 1955 Television Servicing Information, pages 181 to 185. The alignment differences are covered on the next page in this manual, page 172.

The alignment and adjustment procedure for the horizontal type 19X21, 19X22, 19X24, 22X20, 22X21, and 22X22 is the same as for the "R" models described in Supreme Publications volume TV-9, Early 1955 Television Servicing Information, pages 173 to 183. See this earlier volume for additional information needed. Circuit diagrams for these new chassis are printed on pages 176-177 and 180 to 189 in this new 1956 TV manual.

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Service information

VIDEO IF AMPLIFIER 16X & 17X CHASSIS

The video IF amplifier is stagger tuned, using three single tuned and one (4th IF) double tuned circuit. The first IF tunes to 43.6mc, the second IF to 42.75mc, the third IF to 45.75mc, and the fourth IF (both cores) to 45.5mc. One trap is used. It is part of the 1st IF assembly and tunes to 47.25mc. Attenuation of the 41.25mc associated sound carrier is controlled by adjusting the band width.

VIDEO IF ALIGNMENT 16X & 17X CHASSIS

A sweep generator must be used for alignment work. A slight deviation from the above mentioned frequencies is permissible to obtain the proper band pass, however, the order must be maintained.

To align the IF, it is necessary to disable the tuner local oscillator. This can be done by removing the 5U8 or 6U8 tube, wrapping a bare wire around the oscillator grid (pin 9) and inserting the tube. Ground this wire. On "U" models it is only necessary to switch the tuner to the UHF positions.

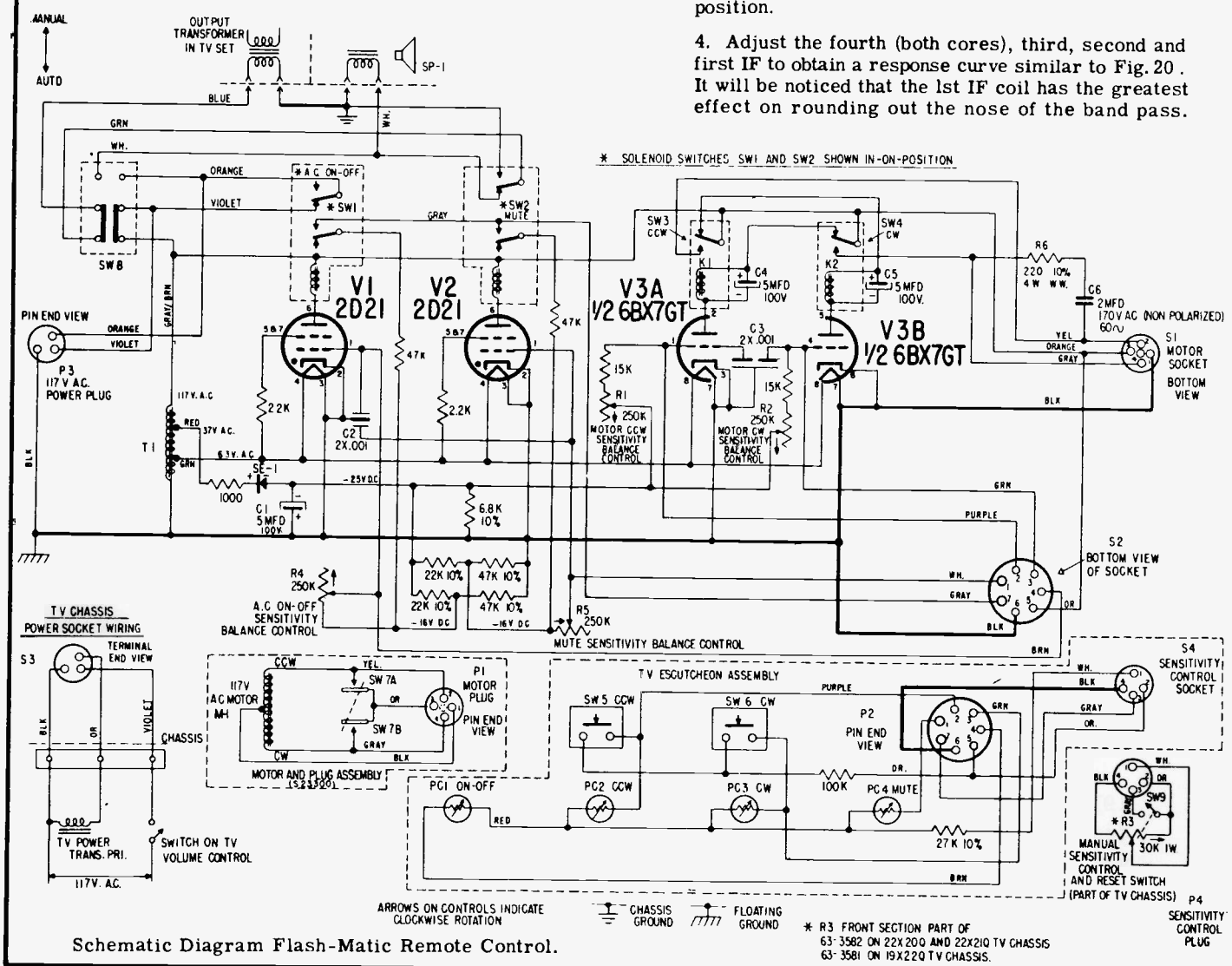
1. Connect the negative lead of a 5 volt battery or a low impedance bias supply to terminal "E" (Fig.7) and the positive lead to chassis. Ground point "F".

2. Connect a calibrated oscilloscope through a 10K ohm isolation resistor between terminal "C" and chassis.

3. Connect the sweep generator through a terminating network to test point "A" (Fig. 7) and adjust attenuator to obtain a 3 volt peak to peak detector output. Do not exceed this output level during any of the adjustments.

Switch the oscilloscope to 10X the gain used in the above steps to "blow up" the trap slots. Adjust the scope centering controls until the base line is visible as in Fig. 21. Adjust the 47.25mc. trap and check the position of the 41.25mc. marker. If the marker is not in the approximate position as shown in Fig. 21, or nearer to the base line a slight readjustment of the 1st and 2nd IF coils may be required to move it into position.

4. Adjust the fourth (both cores), third, second and first IF to obtain a response curve similar to Fig. 20 . It will be noticed that the 1st IF coil has the greatest effect on rounding out the nose of the band pass.



Schematic Diagram Flash-Matic Remote Control.

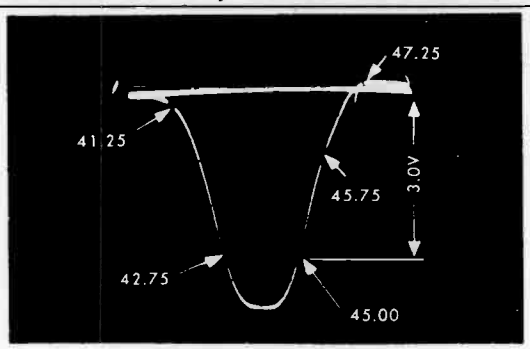


Fig. 20 Overall IF Response.

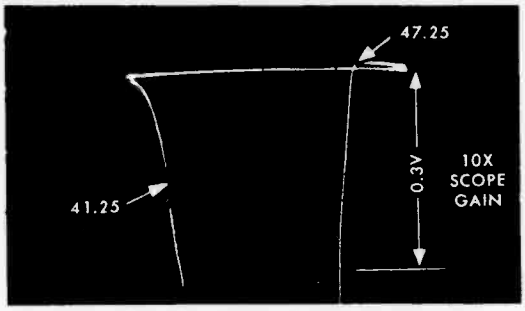


Fig. 21 Exploded View of Sound Carrier and 47.25 Mc Trap.

ZENITH
16X20 Chassis

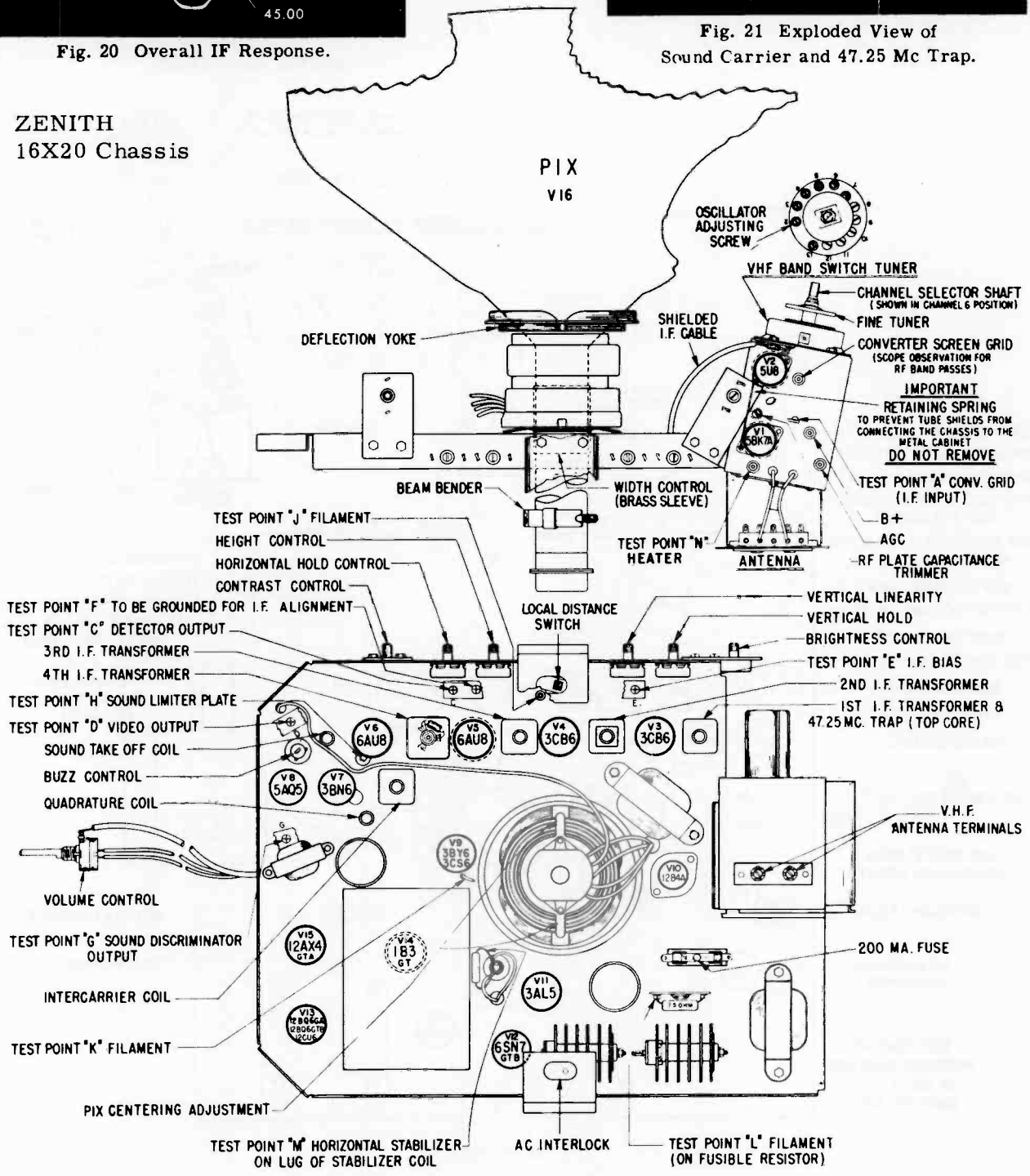


Fig. 7 Tube and Trimmer Layout 16X20 Chassis.

ZENITH 17X20 Chassis

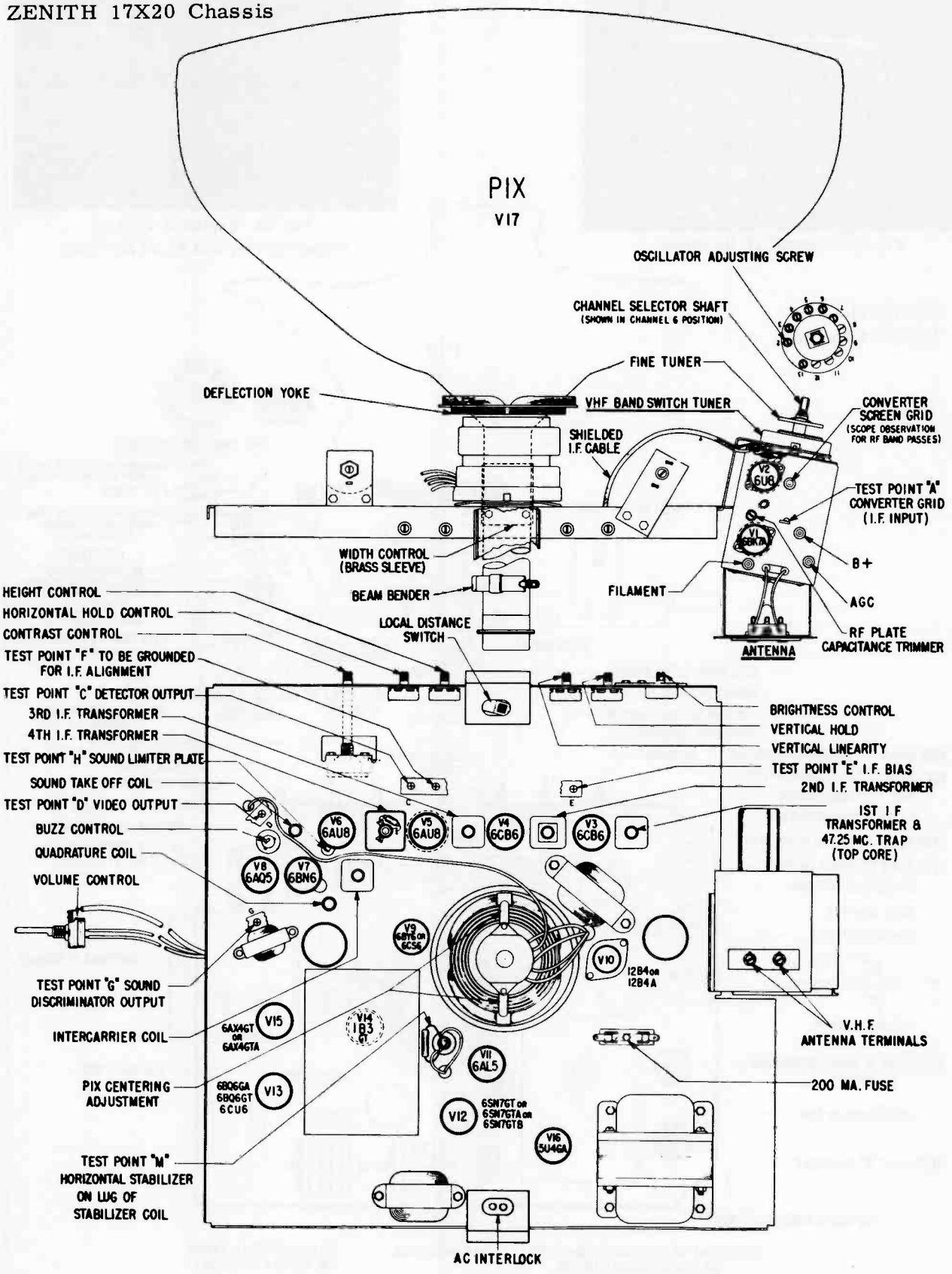
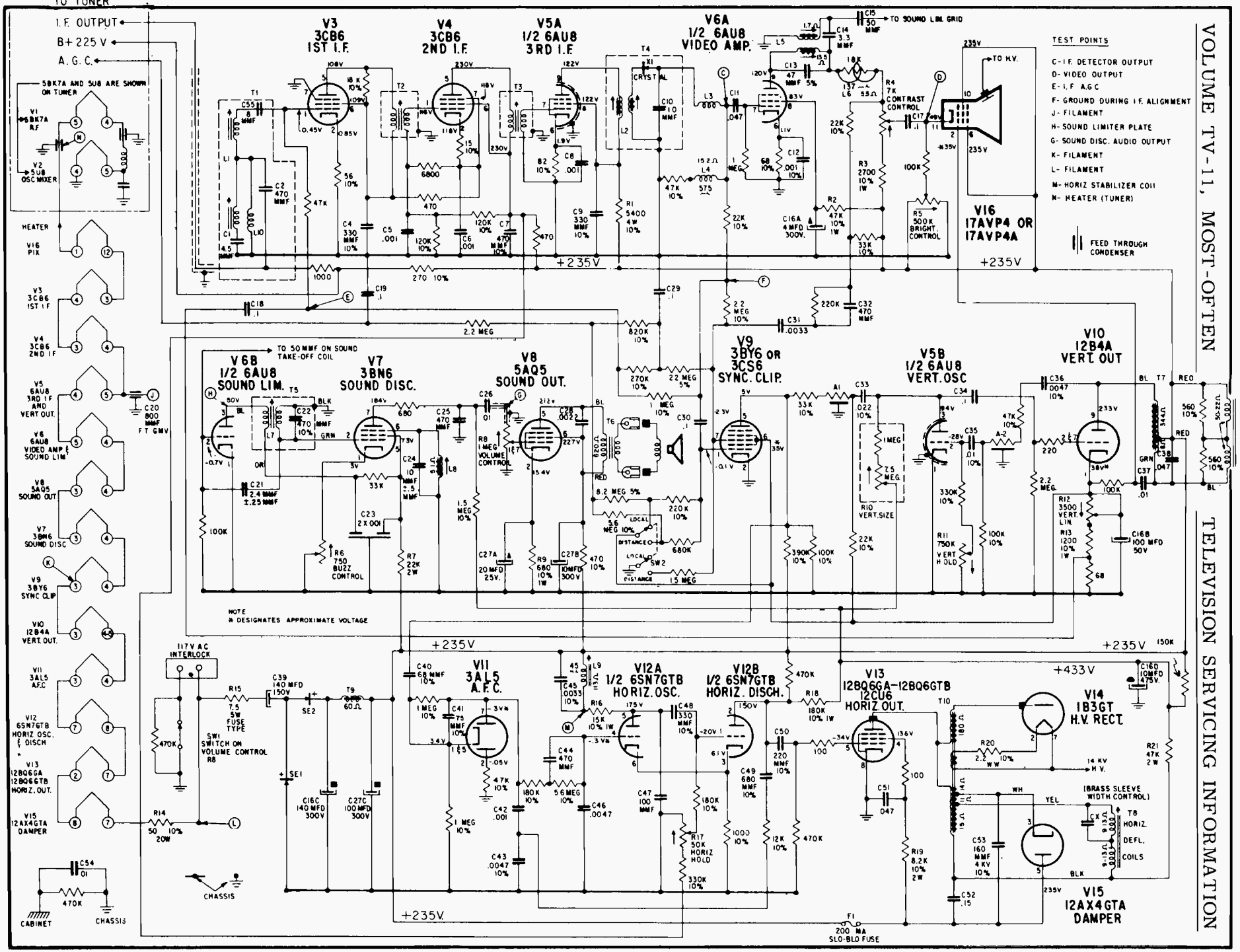
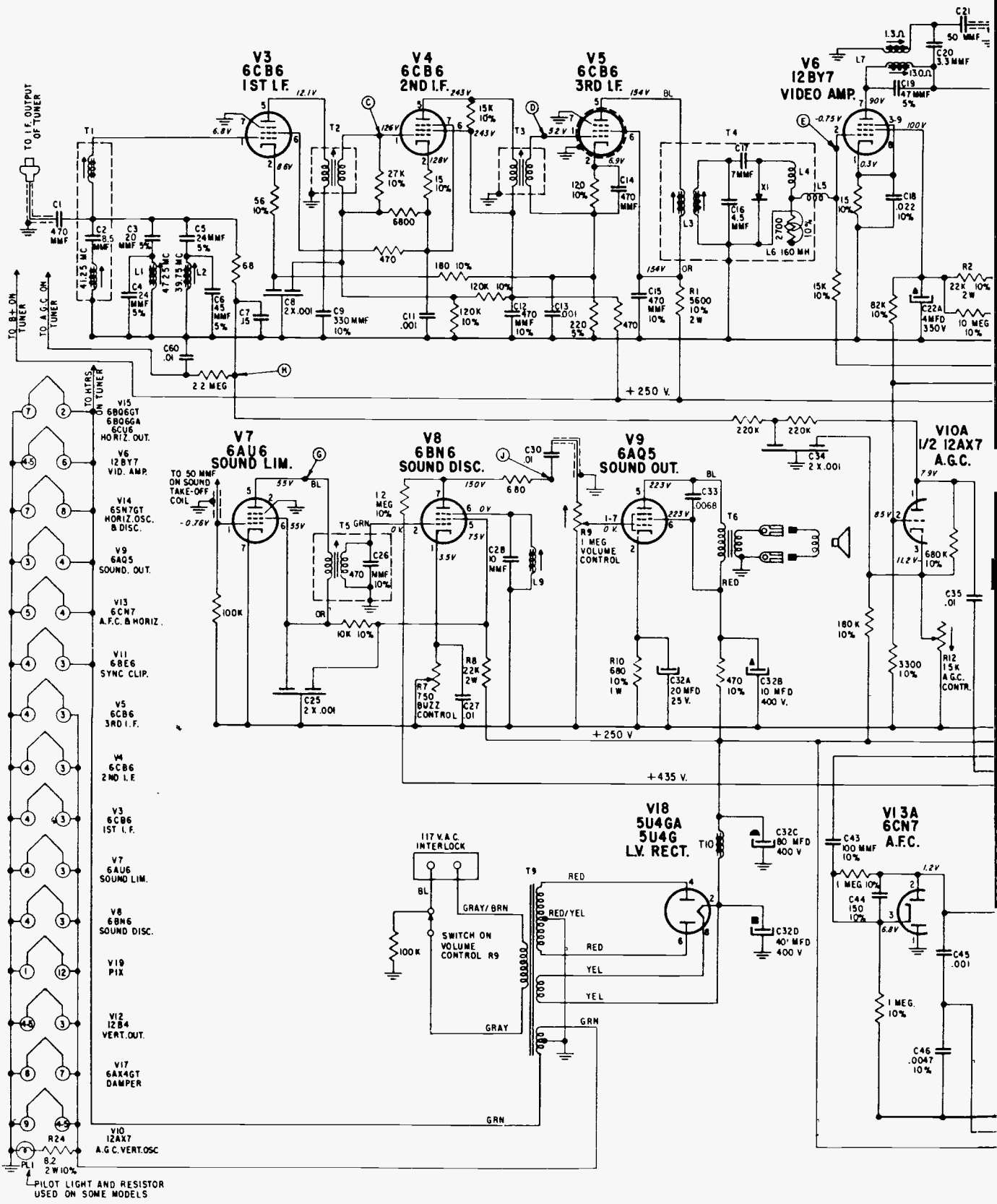


Fig. 8 Tube and Trimmer Layout 17X20 Chassis.

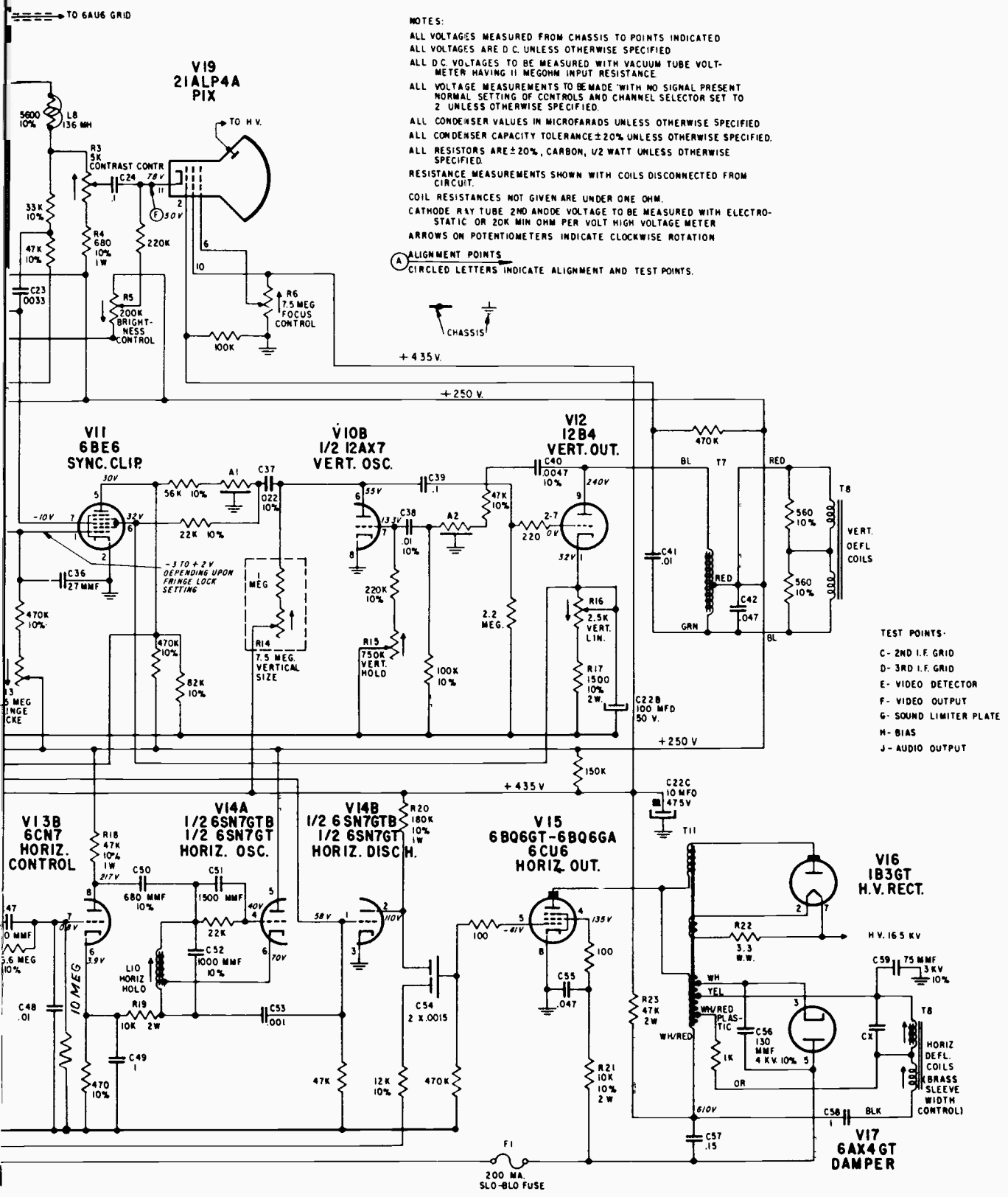
Schematic Diagram of Zenith 16X20 Chassis (See page 174 for explanation of notes.)



ZENITH Schematic Diagram for 19X21 Chassis



ZENITH Schematic Diagram for 19X21 Chassis

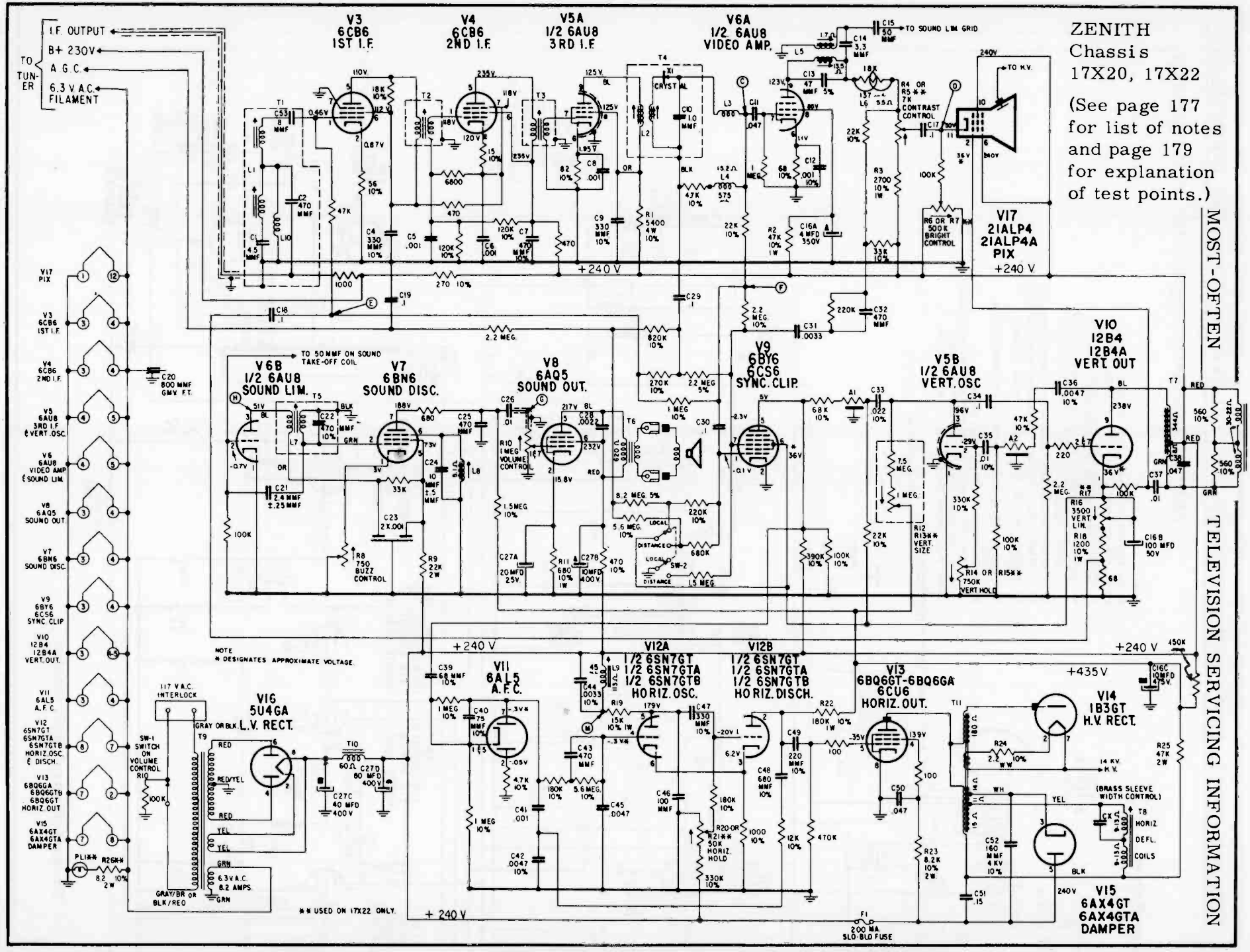


Schematic Diagram 19X21 Chassis.

ZENITH Chassis 17X20, 17X22

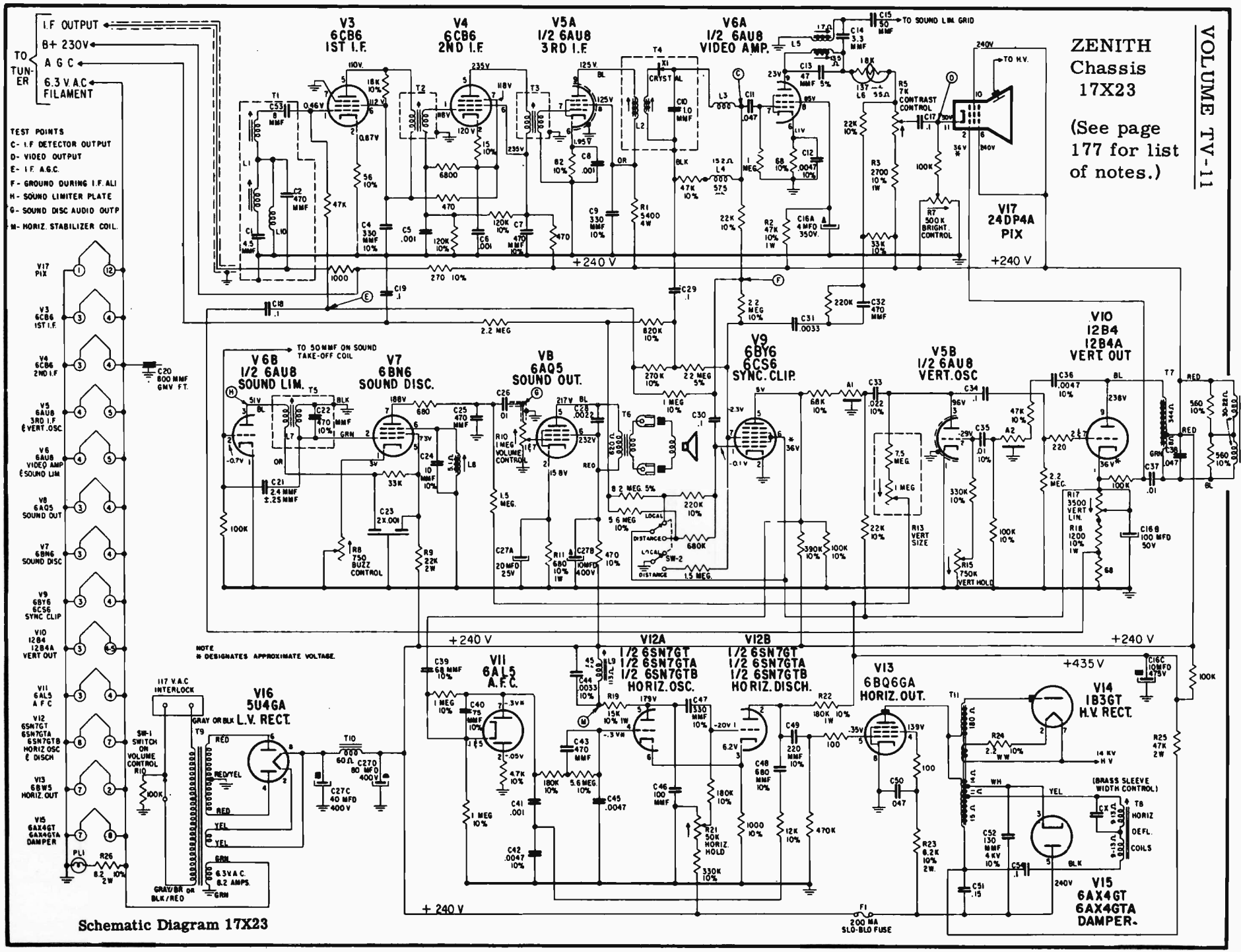
(See page 177 for list of notes and page 179 for explanation of test points.)

MOST-OFTEN TELEVISION SERVICING INFORMATION



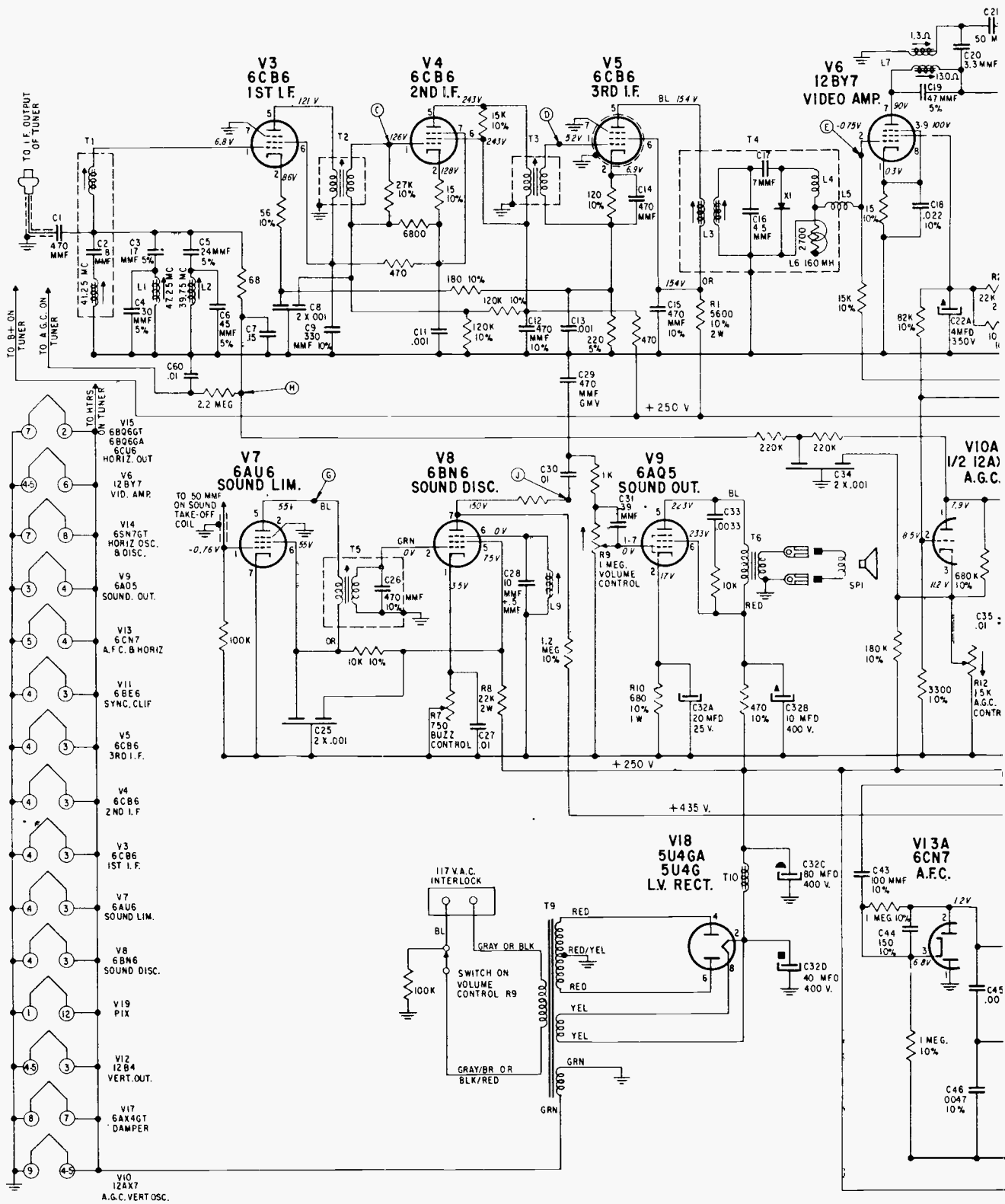
ZENITH Chassis 17X23

(See page 177 for list of notes.)



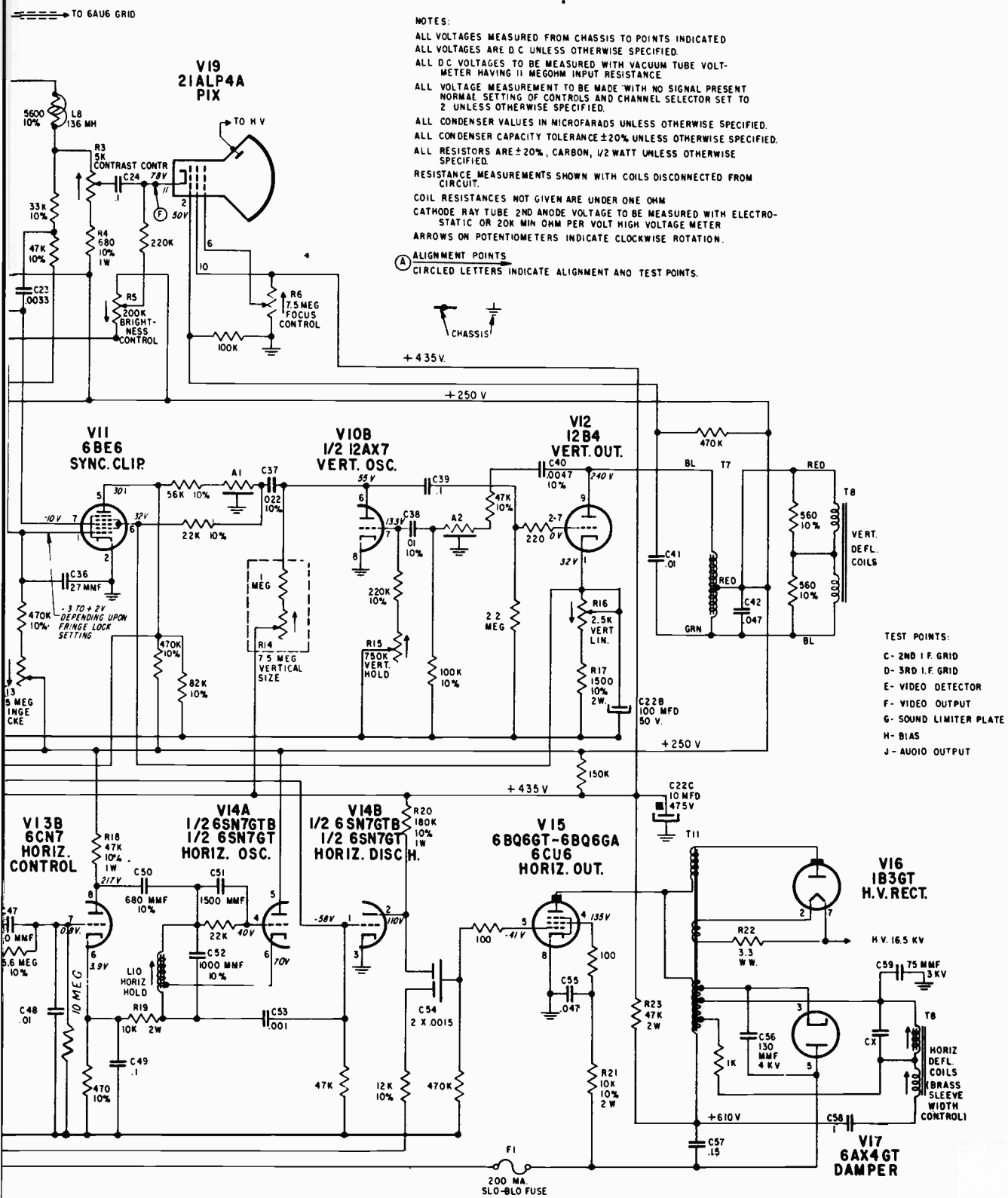
Schematic Diagram 17X23

ZENITH Schematic Diagram for 19X22 Chassis

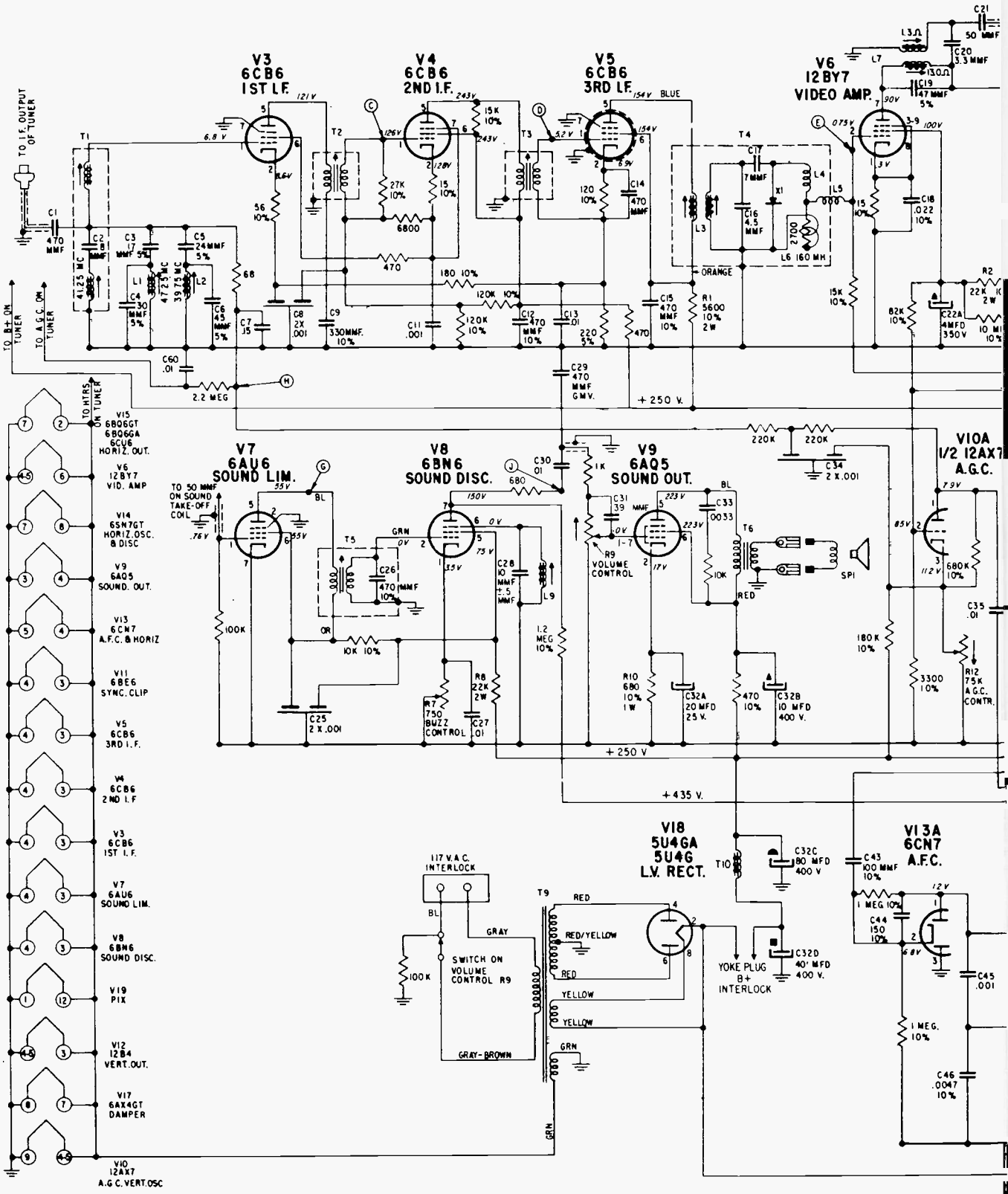


Schematic Diagram 19X22 Chassis.

ZENITH Schematic Diagram for 19X22 Chassis

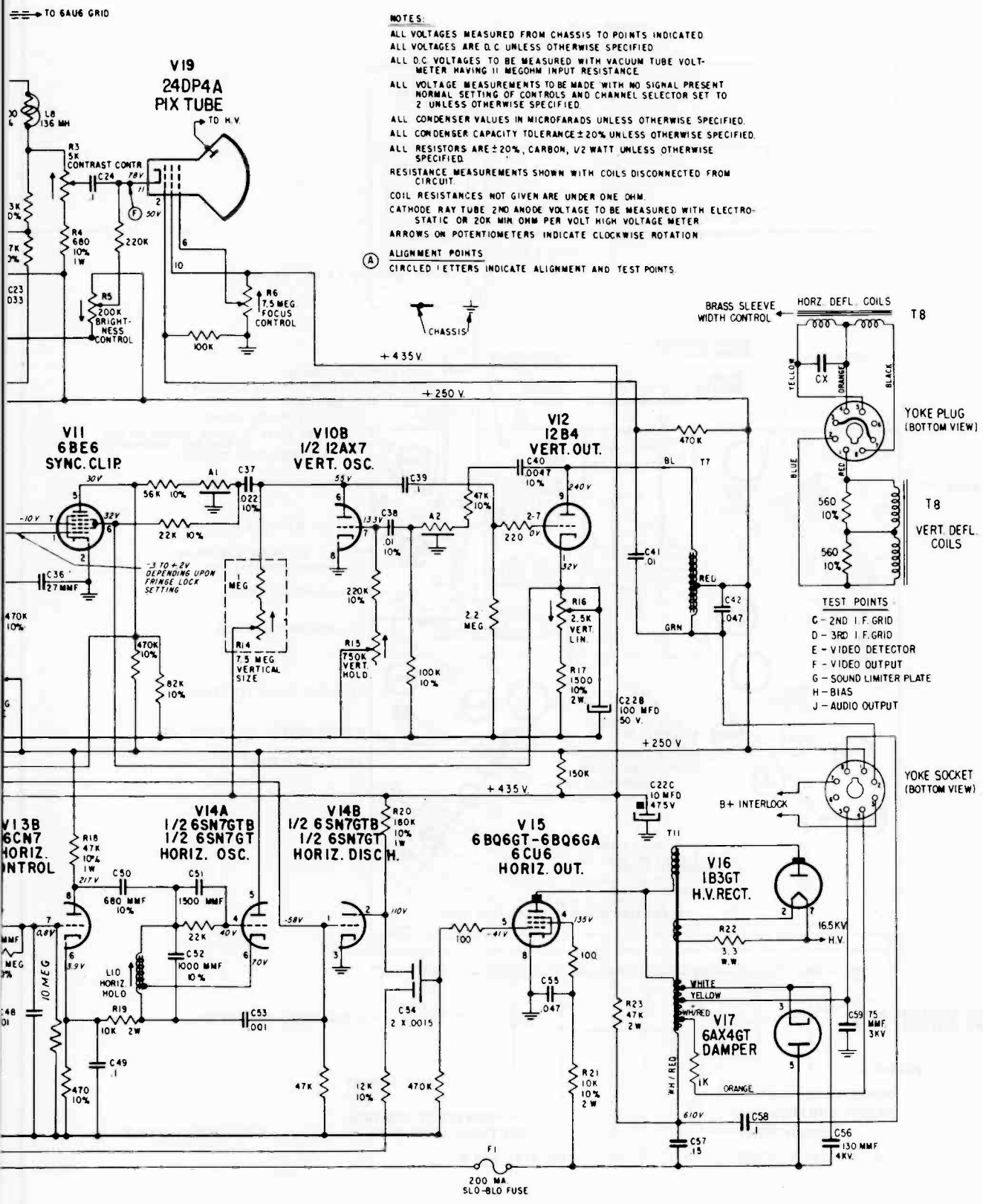


ZENITH Schematic Diagram for 19X24 Chassis

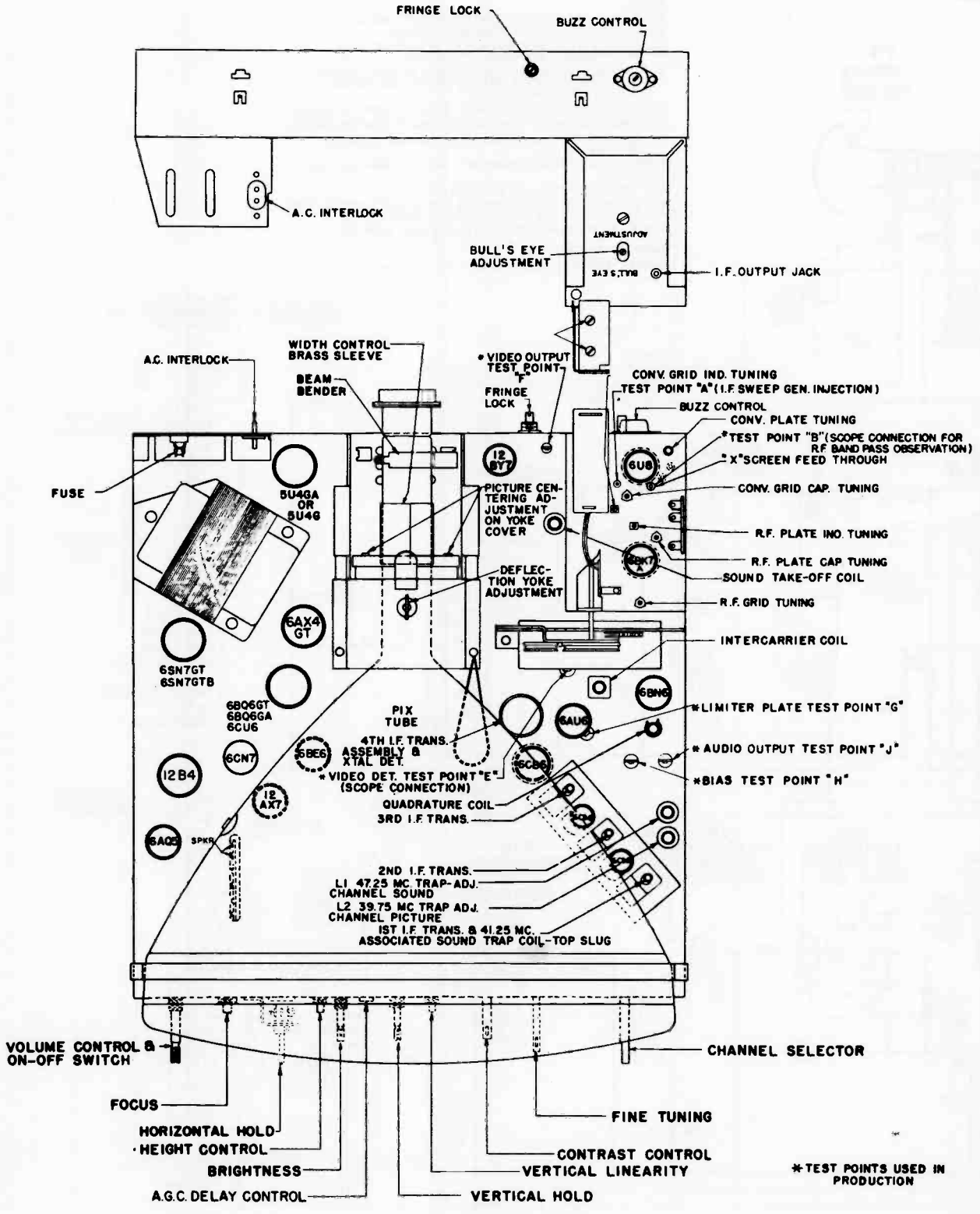


Schematic Diagram 19X24 Chassis.

ZENITH Schematic Diagram for 19X24 Chassis

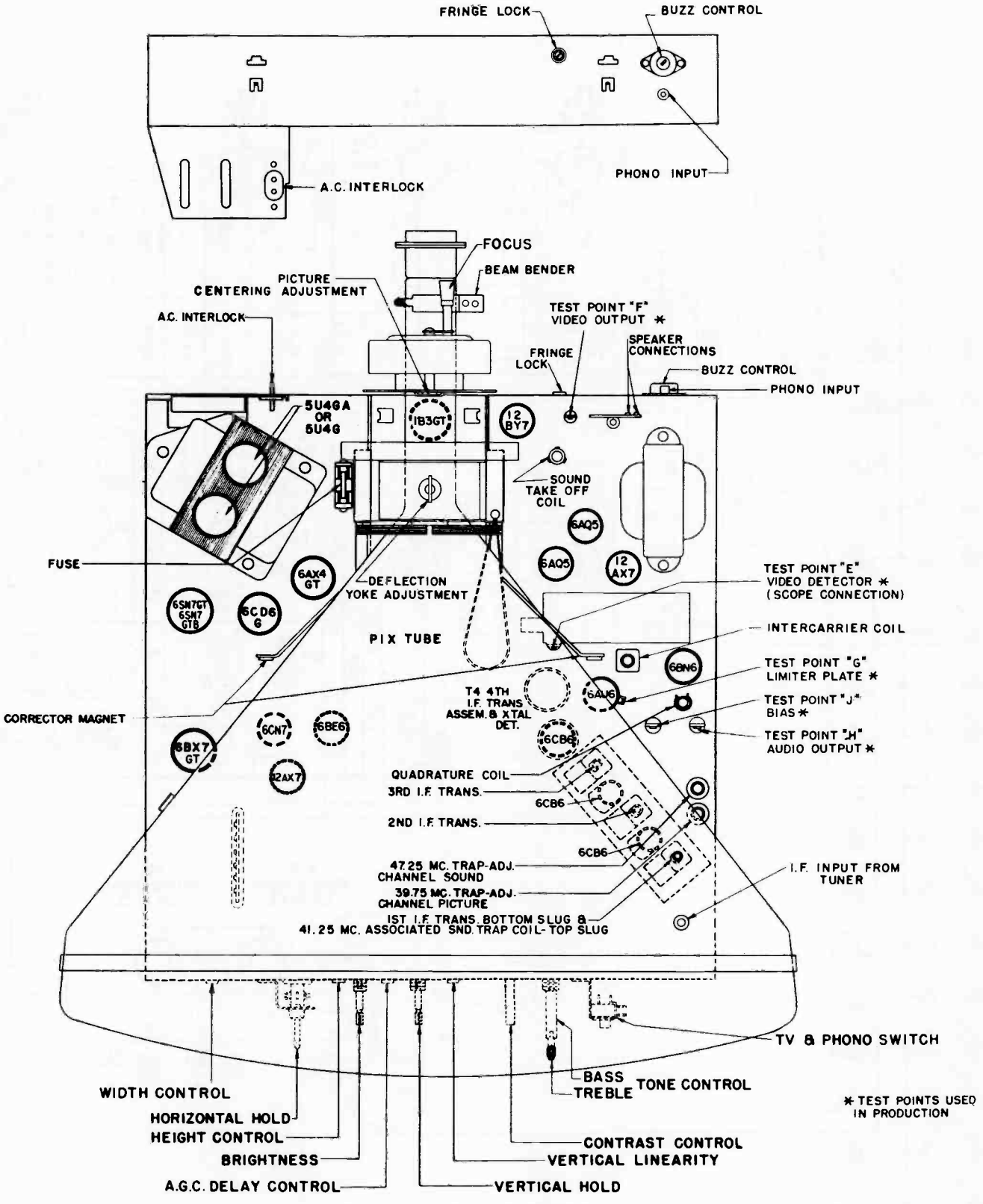


ZENITH Tube and Trimmer Layout for 19X21 Chassis



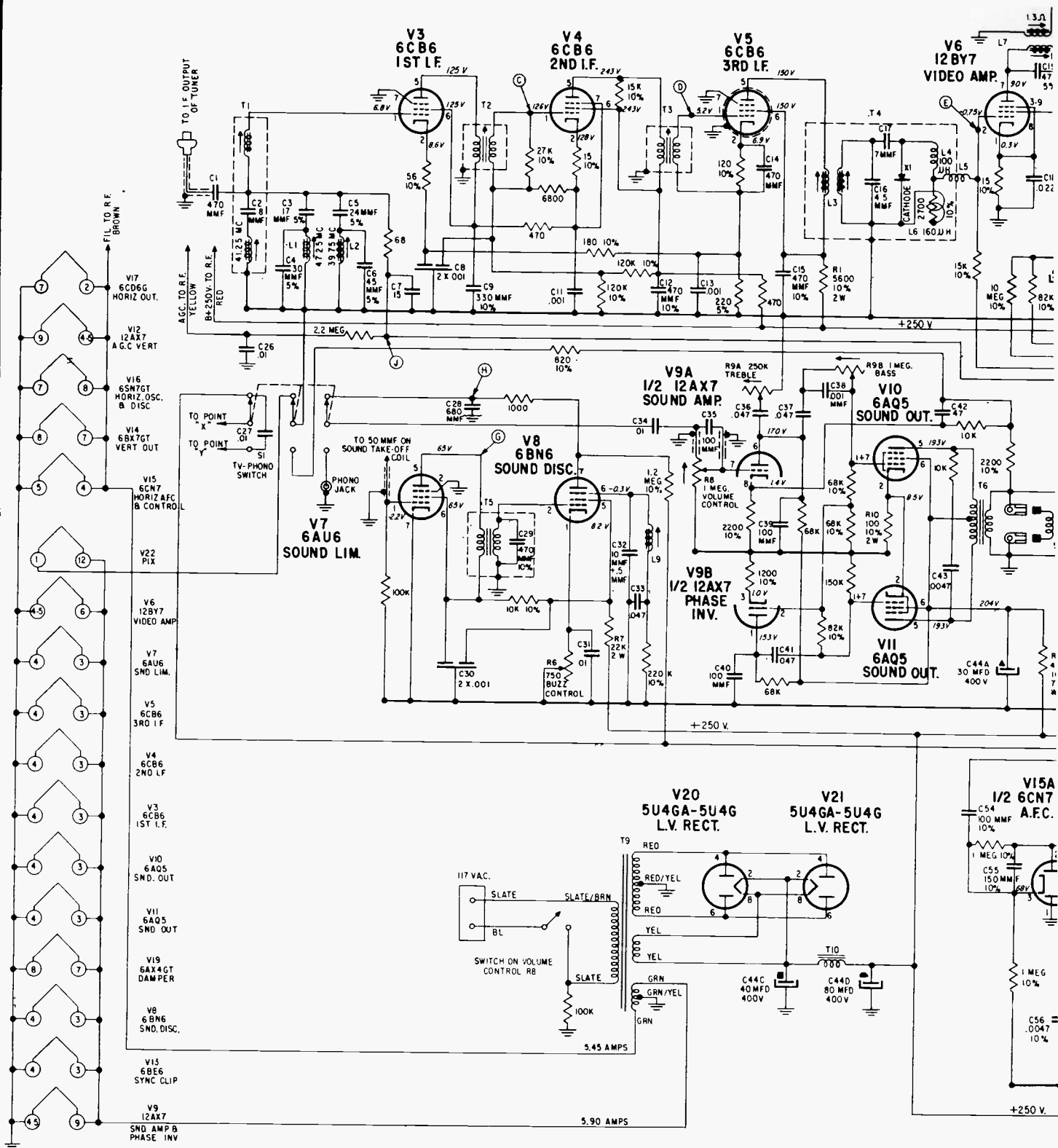
Tube and Trimmer Layout 19X21 Chassis.

ZENITH Tube and Trimmer Layout for 22X20 Chassis

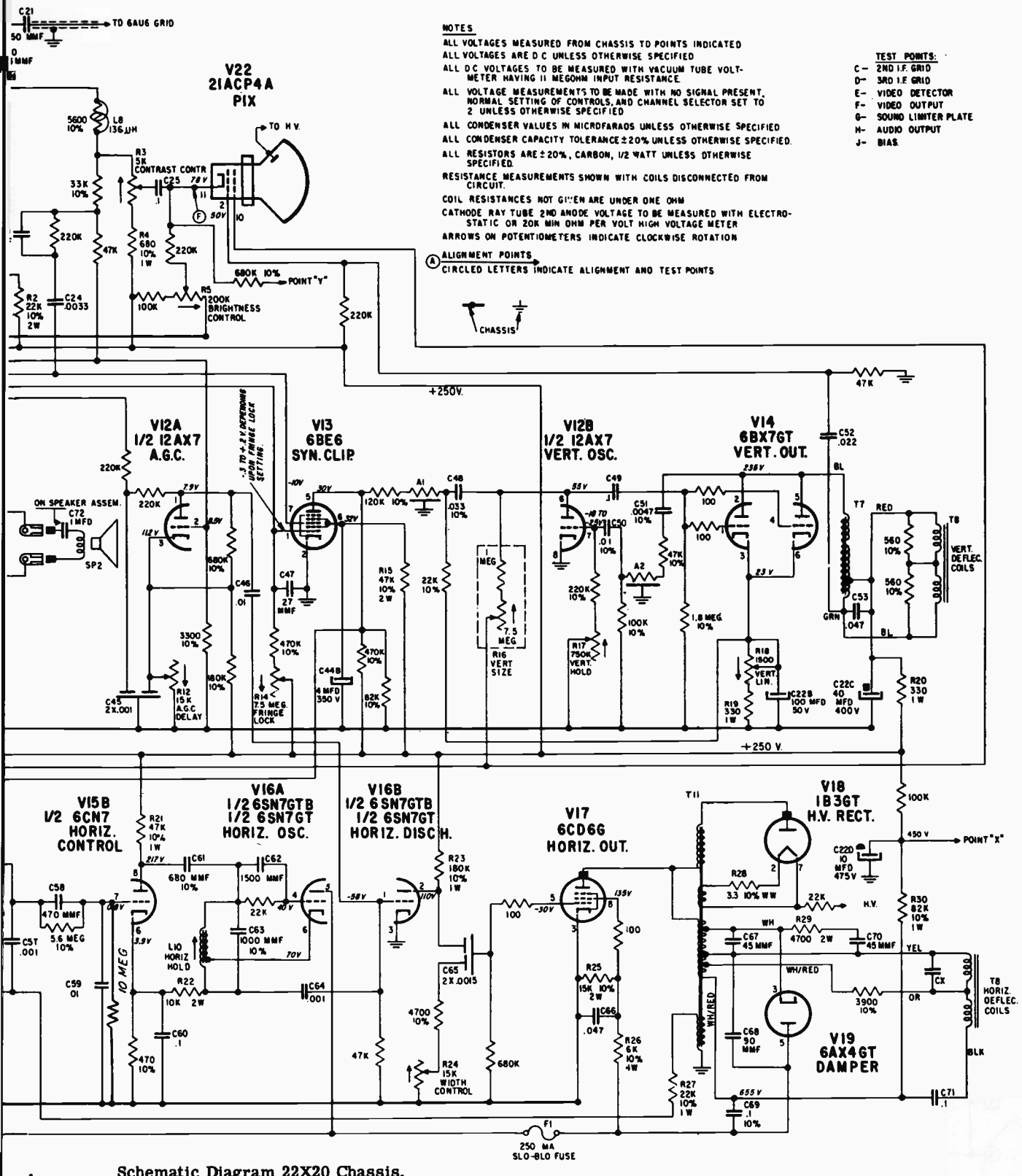


Tube and Trimmer Layout 22X20 Chassis.

ZENITH Schematic Diagram for 22X20 Chassis

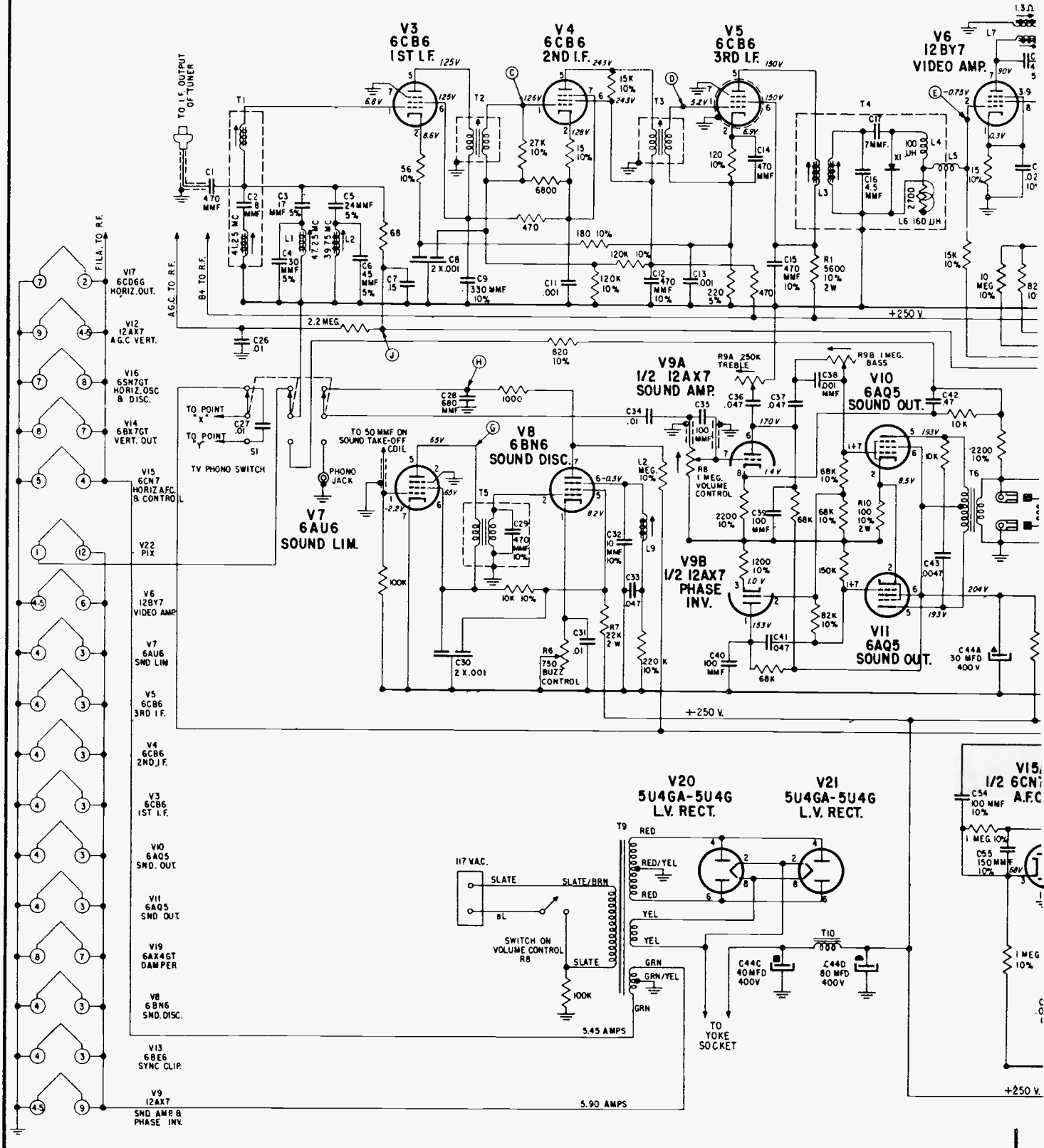


ZENITH Schematic Diagram for 22X20 Chassis

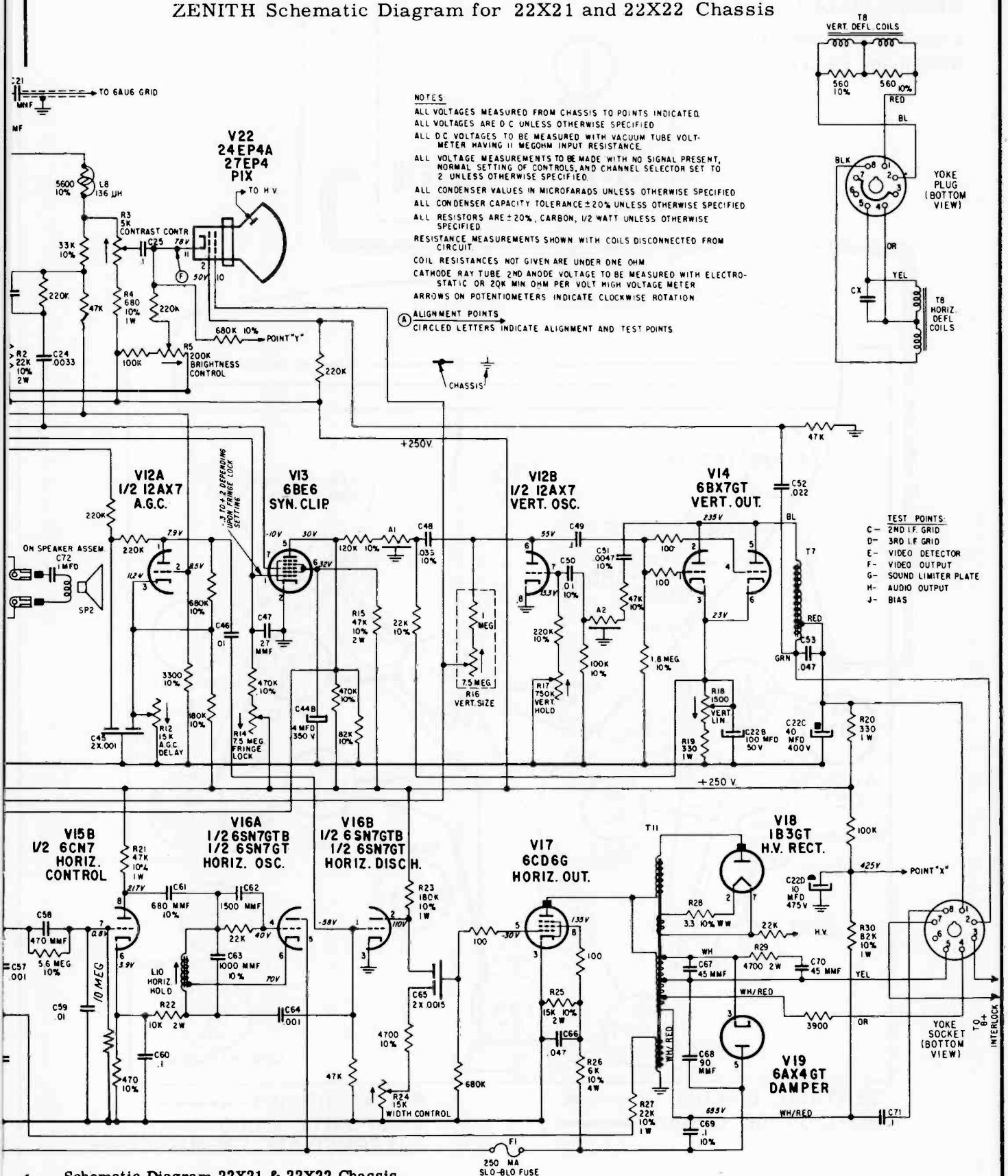


Schematic Diagram 22X20 Chassis.

ZENITH Schematic Diagram for 22X21 and 22X22 Chassis



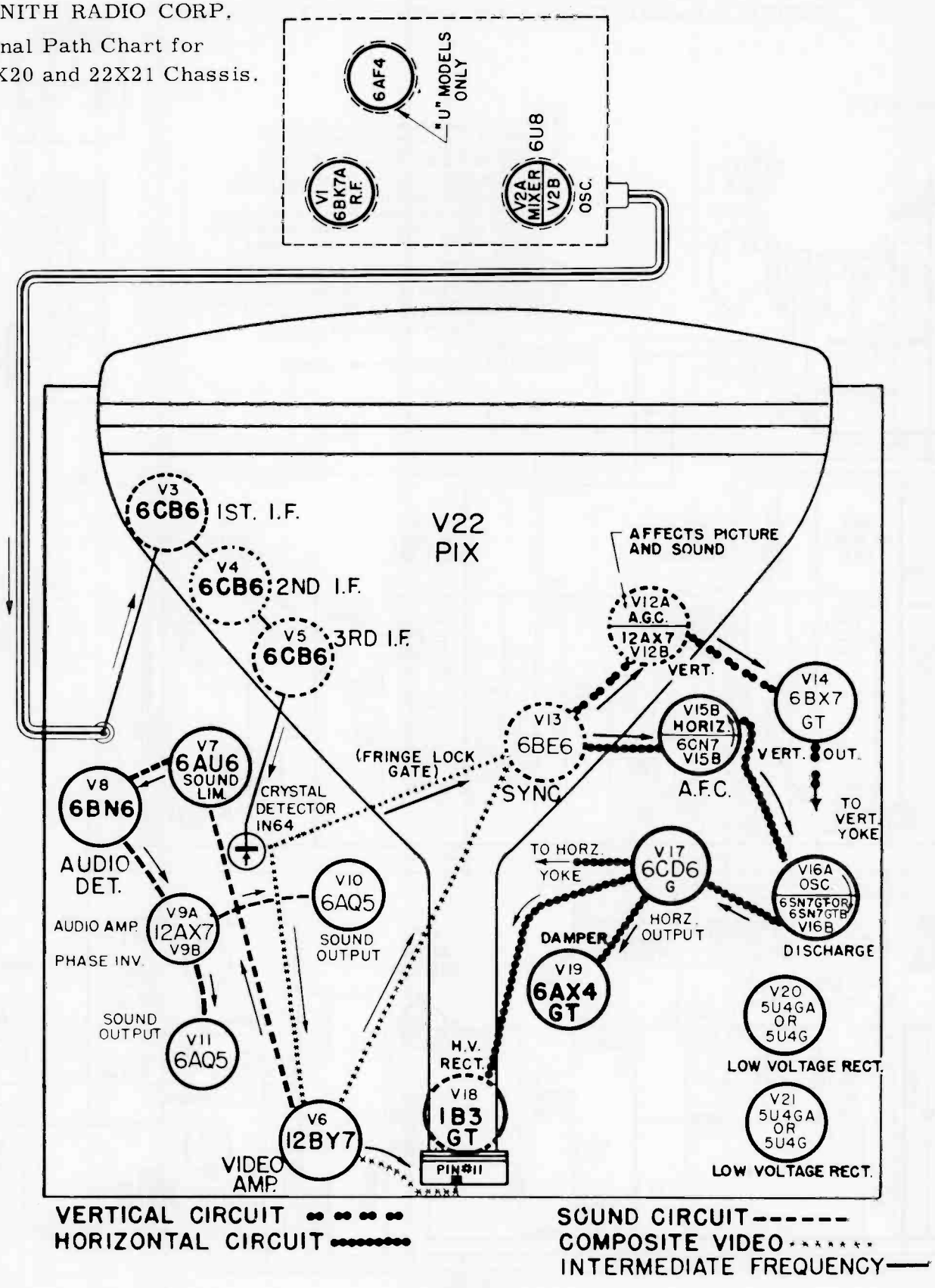
ZENITH Schematic Diagram for 22X21 and 22X22 Chassis



Schematic Diagram 22X21 & 22X22 Chassis.

ZENITH RADIO CORP.

Signal Path Chart for
22X20 and 22X21 Chassis.



Signal Path Chart 22X20 & 22X21 Chassis.

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