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1965

Volume TV-23

Television

Servicing Information



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Volume TV-23

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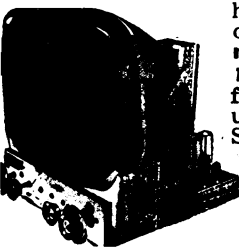
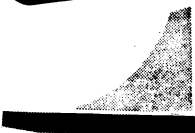
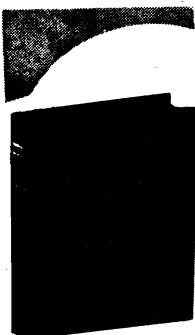
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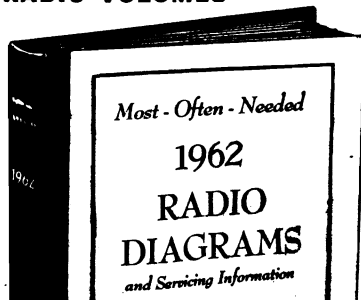
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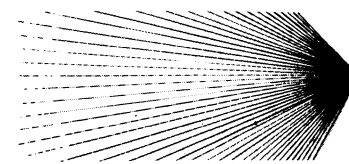
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	TV-15	Early 1959
	TV-14	1958
	TV-13	Late 1957
	TV-12	Early 1957
	TV-11	1956
	TV-10	Late 1955
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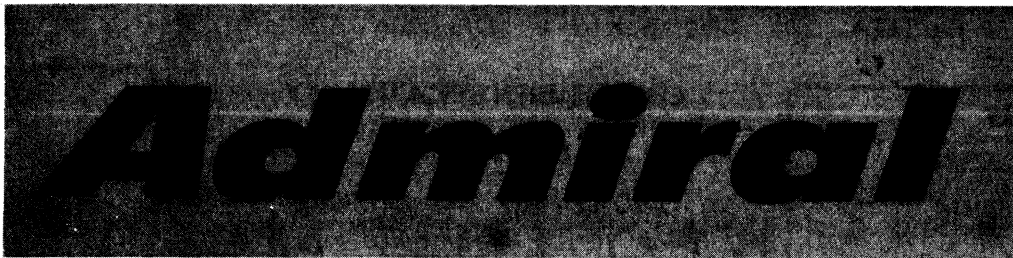
QUANTITY	VOLUME #R	YEAR COVERED
	R-24	1964
	23	1963
	22	1962
	21	1961
	20	1960
	19	1959
	18	1958
	17	1957
	16	1956
	15	1955
	14	1954
	13	1953
	12	1952
	11	1951
	10	1950
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	7	1947
	6	1946
	5	1942
	4	1941
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	1	1926-1938

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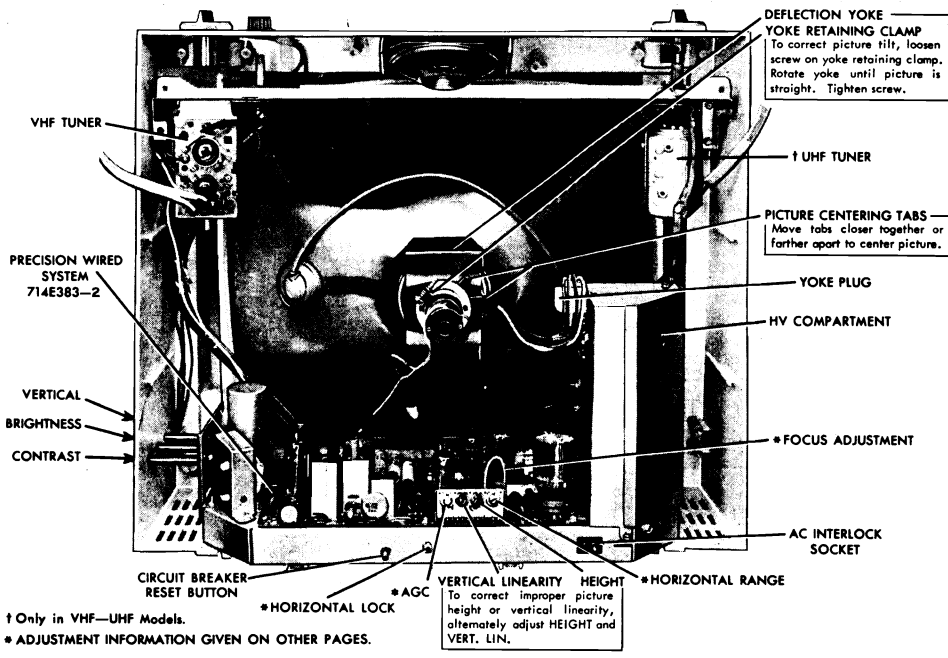


**D4, 1D4, 2D4,
8D4 CHASSIS**

Chassis may be generally referred to by the first letter and number (D4). For parts orders and specific chassis reference always use complete number.

MODEL CHART

MODEL	CHASSIS	SIZE
CD3001		
CDU3001	2D42-1	23"
CD3002	2D413-1	
CDU3002		
LD3011		
LDU3011	2D42-1	23"
LD3012	2D413-1	
LDU3012		
P9414	D42-1	19"
UP9414	D415-1	
P9421		
UP9421	D42-1	19"
P9423	D415-1	
UP9423		
P9428		
UP9428		
P9430	D42-1	19"
UP9430	D415-1	
P9439		
UP9439		
P9621		
UP9621	D44-1	19"
P9623	D416-1	
UP9623		
P9628		
UP9628		
P9630	D44-2	19"
UP9630	D416-2	
P9639		
UP9639		
P9640		
UP9640	D44-4	19"
P9649	D416-4	
UP9649		
UP9808	8D418-1	19"
TD3000		
TDU3000	1D42-2	23"
TD3001	1D413-2	
TDU3001		
TDU3500		
TDU3501	2D413-4	23"



Rear View of Chassis Showing Adjustment Locations (UHF Tuner in D4 Chassis).

COILS AND TRANSFORMER

L201A}	Phase Shift and Sound IF Coil	
L201B}	Includes C202 and C203 ..72C208-2	1.20
L202	Quadrature Coil ..72C132-61	1.20
L301	Trap Coil 47.25 MC ..72C132-65	1.05
R302	IF Input Coil ..72C132-67	1.05
L305	RF Choke Coil ..73B73-19	.70
L307	RF Choke Coil ..73B31-4	.85
L308	Video Peaking Coil ..73B5-44	.95
L309	Video Peaking Coil (wound on R312) ..73B5-54	.95
L310	Video Peaking Coil (wound on R312) ..73B5-40	1.10
L311, 312	Filament Choke ..73B37-2	.20
L401	Horizontal Lock Coil ..94D17-16	.95
L403	RF Choke Coil ..73B37-18	.30
L404	RF Choke Coil ..73B31-10	.85
L502	Filter Choke Coil ..74C18-53	2.75
L503	Line Choke Coil ..73B31-11	1.45
T201	Audio Output Transformer ..79D33-77	1.45
T301	First IF Transformer ..72C222-4	1.20
T302	Second IF Transformer (incl. C311, 312, L305) ..72C261-2	2.80
T303	Sound Take Off and Video Transformer (incl. C314, 315 and 316) ..72C185-2	1.80
T401	Vertical Output Transformer ..79D100-8	4.25
T402	Deflection Yoke Assembly ..750D305-25	15.30
T403	Horizontal Output Transformer 79D109-3	6.10
T701	VHF Tuner Input Assembly ..700B560-507	

(Material on pages 3-8)

GENERAL

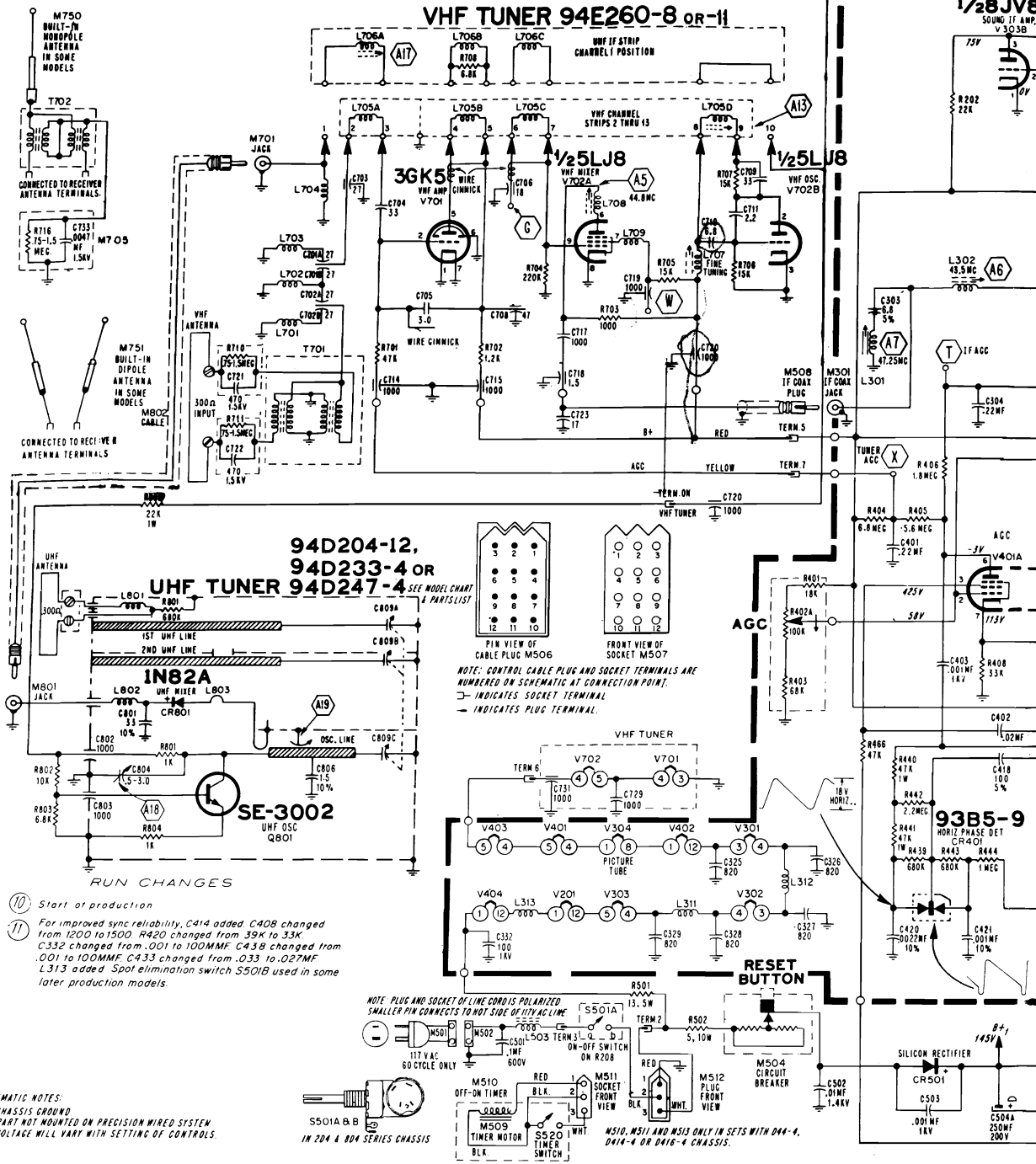
All four chassis covered by this manual are basically the same. Different tuners, tuner drive arrangements, volume, tone brightness controls and picture tubes exist with the various models. Some models are equipped with an automatic on and off timer and private listening earphone. All models have tuner and control plugs for easy chassis removal.

Individual channel strips with adjustable oscillator slugs are provided for each channel. A tuner IF adjustment matches the tuner to the first IF stage. The IF section has five tuned adjustments and an adjacent channel sound trap.

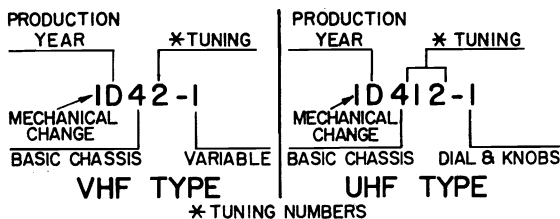
Design of the horizontal output and damper tube into one glass envelope increase the horizontal efficiency and lowers the chassis operating temperature. The 38HE7 tube has special sturdy internal construction design to give long life and stable operation.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

ADMIRAL Chassis D4, 1D4, 2D4, 8D4, Schematic Diagram



CHASSIS IDENTIFICATION SYSTEM



2 STAGE IF CODE

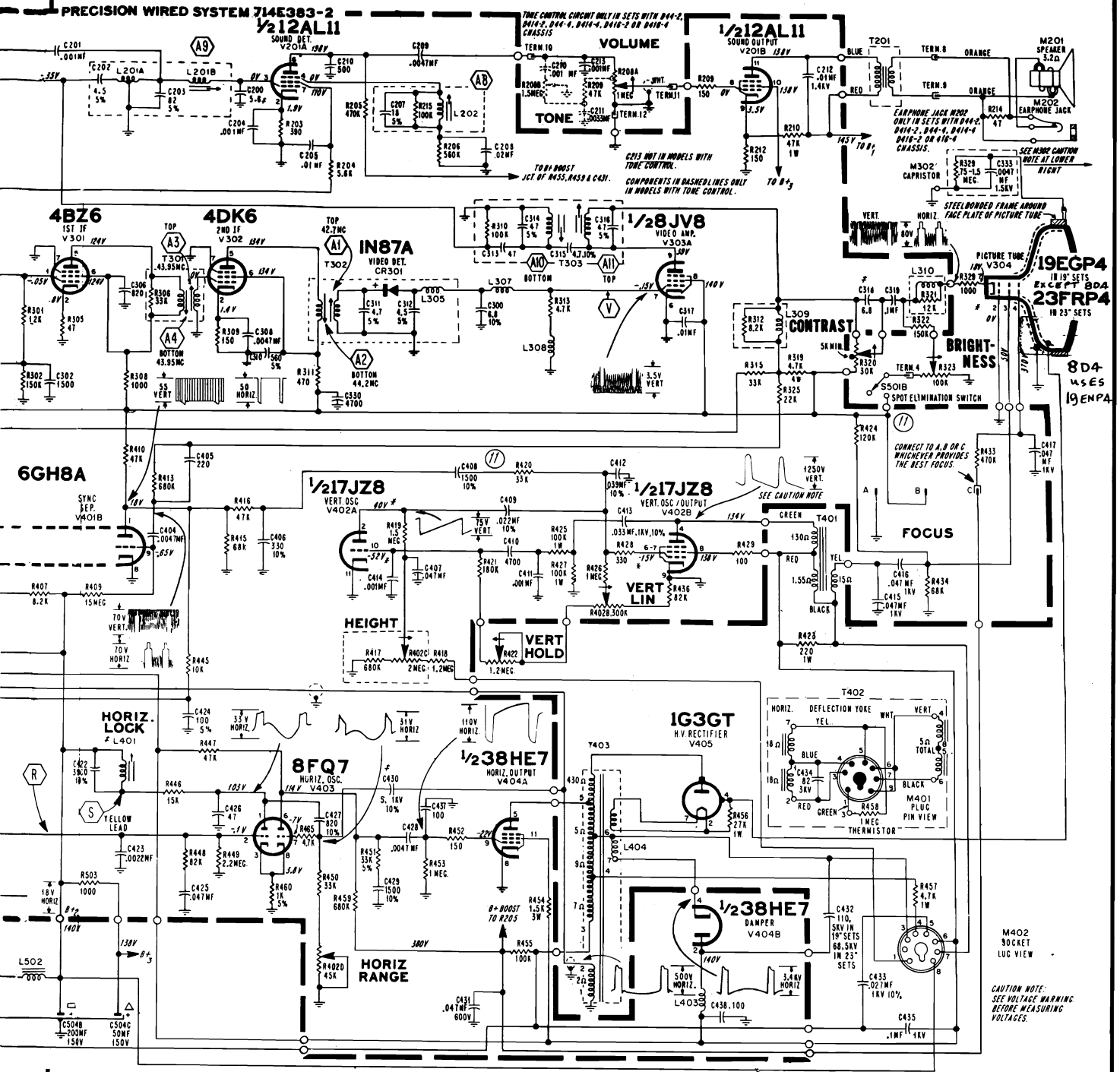
- 1 to 9 VHF Conventional
- 10 to 19 UHF Conventional
- 20 to 29 VHF & UHF Digital
- 30 to 39 Sonar
- 40 to 49

3 STAGE IF CODE

- 50 to 59 VHF Conventional
- 60 to 69 UHF Conventional
- 70 to 79 VHF & UHF Digital
- 80 to 89 Sonar
- 90 to 99

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

ADMIRAL Chassis D4, 1D4, 2D4, 8D4, Schematic Diagram, Continued



SCHEMATIC DIAGRAM OF D4, 1D4, 2D4 and 8D4 CHASSIS

Most all 19 and 23 inch models have steel bonded picture tubes. "Steel Bond" is a steel rim bonded to the outer rim of the picture tube. "Steel Bond" eliminates the need for safety glass. Because a safety glass is not used the viewing efficiency is increased, glare and reflections are greatly reduced.

ADMIRAL Chassis D4, 1D4, 2D4, 8D4, Service Adjustments

VHF CHANNEL ADJUSTMENT

These sets are provided with a channel adjustment slug for each channel, see illustration. Adjust as follows:

1. Turn receiver on and allow 15 minutes warm up.
2. Set Channel Selector at highest channel to be adjusted. Set Fine Tuning control at center of tuning range, by rotating it one third turn counter-clockwise from full clockwise rotation. Set other tuning controls for normal picture and sound.
3. Remove Channel Selector knob.
4. Using a non metallic alignment tool, carefully adjust channel slug for best picture. Note: Sound may not be loudest at this point. Repeat procedure for each channel to be adjusted.

AGC CONTROL ADJUSTMENT

The AGC control is an AGC threshold control which is used solely to adjust the receiver for optimum operation under all signal conditions.

Note: This control is set at the factory and will not normally require field readjustment.

Improper AGC control adjustment can result in picture bending, tearing (overloading) or buzz in the sound. However, these same conditions can also be caused by other troubles in the set. Make adjustment as follows:

1. Turn set on and allow 15 minutes to warm up.
2. Turn Channel Selector to strongest station in the area.
3. Turn Contrast and Brightness controls fully to the right.
4. Very slowly turn AGC control to the left, just to the point where picture is weak (loses contrast).
5. Adjust Horizontal Lock (at rear of set) and Vertical Hold control (at side of set) for steady picture, without bending of vertical lines at top of picture.
6. Very slowly turn AGC control to the right, until picture just begins to bend, tear, shift, or buzz is heard in sound. Then very slowly turn the AGC control to the left, to the point at which picture bending, tearing, shifting and buzz is removed.
7. Make final adjustment by turning AGC control an additional 10 degrees to the left.
8. Recheck at maximum contrast on all channels. Picture should not overload and should reappear immediately after changing channels.

IMPORTANT: AGC adjustment should always be made on the strongest TV station received. If adjustment is made only on a weak station, AGC overload may occur when a strong TV station is tuned in.

HORIZONTAL LOCK ADJUSTMENT

Make adjustment if picture "slips sideways" or "tears" when switching channels. Adjustment is made by rotating flexible shaft extending from rear of set. Adjust as follows:

1. Allow a few minutes for set to warm up. Tune in weakest station, set Brightness and Contrast controls for normal Picture. Important: Before proceeding, be sure that AGC control has been adjusted according to instructions in this manual.
2. Reduce Contrast to minimum. Very slowly turn Horizontal Lock adjustment to the right or left until picture is in sync. Interrupt the television signal by switching Channel Selector off and on channel. Picture should remain in sync. If picture bends or loses sync, adjust Horizontal Lock so that picture remains in sync and bending of vertical lines does not appear at top of picture. Check adjustment on all channels.

IMPORTANT: If adjustment cannot be made using the Horizontal Lock control, it will be necessary to make Horizontal Range adjustment as instructed below.

HORIZONTAL RANGE ADJUSTMENT

The Horizontal Range control is set at the factory and seldom requires readjustment. Adjustment need only be made if 8FQ7 tube (V403) has been replaced and the picture cannot be locked-in with the Horizontal Lock adjustment or if the Horizontal Lock adjustment has insufficient range (adjustment only possible at extreme end rotation). Note: Horizontal Range adjustment is accessible after removing cabinet back.

Caution: Before proceeding with adjustment, be sure that the picture will sync vertically, as lack of both vertical and horizontal sync indicates sync circuit trouble. Lack of only horizontal sync generally indicates trouble in the horizontal sync (phase detector) circuit. Adjust as follows:

1. Remove cabinet back. Connect interlock cord.
2. Allow a few minutes for set to warm up. Tune in weakest station, set Brightness and Contrast controls for a normal picture. Important: Before proceeding, be sure that the AGC control has been adjusted according to instructions in this manual.
3. Using a piece of hook-up wire, short test point "R" (pin 2 of V403, 8FQ7 tube), to chassis ground. See figure B for test point locations.
4. Connect a .22 mf 400 volt capacitor from test point "S" (junction of horizontal lock coil L401 and resistor R446, 15,000 ohms) to chassis ground. Caution: To avoid B+ shock, turn receiver off when making this connection.
5. With picture in vertical sync, set Horizontal Range control at point where picture is in horizontal sync and almost remains stationary with tendency to shift to left or right.
6. Remove the .22 mf capacitor from the horizontal lock coil. Set horizontal lock coil at point where picture is in horizontal sync and almost remains stationary with tendency to shift to left or right.
7. Remove wire short from test point "R". Set Channel Selector to weakest station. Switch Channel Selector on and off channel, picture should remain in horizontal sync. If necessary, adjust horizontal lock coil slightly to bring picture in sync.

IMPROVING FOCUS

The picture tube of these receivers utilizes electrostatic focus in connection with a three position focus adjustment.

For obtaining best overall sharpness of pictures, focus adjustment should be checked at installation and when servicing. Once focus adjustment is properly made, no further need for readjustment is required.

From rear view of chassis on front page, note that there are three focus (pin) connections at top rear of the chassis board, points shown as "A", "B" and "C". To make adjustment, connect plug-in focus lead to either of the three focus pins, whichever provides best focus at central area of picture tube. Important: Focus adjustment should be made with controls set for picture with normal contrast and brightness.

Caution: High B+ potential is present at focus terminals. To prevent electric shock, use care to avoid accidental contact with focus terminals.

OPERATING AUTOMATIC OFF-ON TIMER

Some models are equipped with an automatic OFF-ON timer. The OFF-ON timer (at side of cabinet) can be set to turn television receiver "OFF" after a pre-selected time period, up to ten hours. The timer can also be set to turn receiver "ON" after a pre-selected time period, up to twelve hours.

IMPORTANT: ON-OFF switch (part of Volume Control) must be turned "ON" and timer must be in "ON" detent position for set to operate.

Turning Receiver "OFF" Automatically

With television receiver operating, turn timer knob counter-clockwise until time interval marking on knob, is opposite indicator pointer. Receiver will continue to operate for time period indicated on knob, then automatically turn itself off.

Turning Receiver "ON" Automatically

For turning receiver "ON" automatically, set timer knob to "ON" detent position. Turn television receiver "ON" with ON-OFF switch (part of Volume Control). Tune in wanted channel and set volume control for desired volume level. Then, without disturbing receiver controls, turn timer knob clockwise until interval marking on knob is opposite indicator pointer. Set will turn off. However, when indicated time interval has elapsed, television receiver will automatically turn itself "ON". Sound (from television program), will be heard as indication that interval has elapsed and receiver is operating.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

ADMIRAL Chassis D4, 1D4, 2D4, 8D4, Alignment Information

IF AMPLIFIER ALIGNMENT

Connect isolation transformer between AC line and receiver. Connect negative of 6 volt bias supply to test point "T" (IF AGC), positive to chassis. See figure B.

Using needle nose alligator clip or looped end of hookup wire, connect signal generator high side to test point "G", low side directly to tuner, see figure E.

Connect VTVM high side to test point "V" through a decoupling filter, see figure A. Connect low side to chassis.

Set Channel Selector to channel 12. Connect jumper wire across antenna terminals.

Allow about 15 minutes for receiver and test equipment to warm up: Use a non-metallic alignment tool, part no. 98A30-12.

Important: Before proceeding check signal generator against frequency standard for calibration.

- †1. Set generator at 42.7 MC and adjust A1 for maximum.
- †2. Set generator at 44.2 MC and adjust A2 for maximum.
3. Connect wire jumper across resistor R306 (33K) primary terminals of IF transformer T301.
- †4. Set generator at 43.95 MC and adjust A3 for maximum. Remove wire jumper from across resistor R306.
5. Connect wire jumper from V302, Pin No. 1 to ground.
- †6. Set generator at 43.95 MC and adjust A4 for maximum. Remove wire jumper from Pin No. 1 of V302.
7. Connect wire jumper across IF input coil L302.
- †8. Set generator at 44.8 MC and adjust A5 for maximum.
9. Remove wire jumper from across input coil L302.
- †10. Set generator at 42.7 MC and adjust A6 for maximum.
- *11. Set generator at 47.25 MC and adjust A7 for minimum.
12. To insure correct IF alignment, make "IF Response Curve Check".

* If necessary, increase generator output and/or reduce bias to $-1\frac{1}{2}$ volts to obtain a definite indication on VTVM.

† Use -6 volts bias. When adjusting, keep reducing generator output to prevent VTVM reading from exceeding 2 volts.

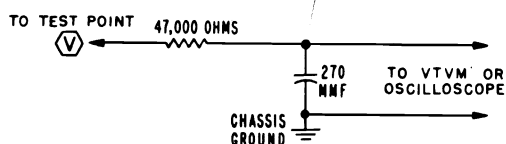


Figure A. Decoupling Filter.

IF RESPONSE CURVE CHECK

1. Connect isolation transformer between AC line and receiver. Allow about 15 minutes for receiver and test equipment to warm up.

2. Set VHF tuner on channel 12. Connect negative of 6 volt bias supply to test point "T" (IF AGC), positive to chassis. See figure B.

3. Using needle nose alligator clip or looped end of hookup wire, connect sweep generator high side to test point "G", low side directly to tuner, see figure E. Set sweep frequency to 43 MC, sweep width approximately 7 MC. If external marker generator is used, loosely couple high side to sweep generator lead, low side directly to tuner. Marker frequencies indicated on IF Response Curve.

4. Connect oscilloscope high side to test point "V" through a decoupling filter (figure A), low side to chassis.

5. Check curve obtained against ideal response curve, figure C. Keep marker and sweep outputs at very minimum to prevent over-loading. A reduction in sweep output should reduce curve amplitude without altering the shape of the response curve.

If curve is not within tolerance or markers not in proper location on curve, adjust A5 to position 45.75 MC Video Marker. Adjust A1 to correct shape of curve.

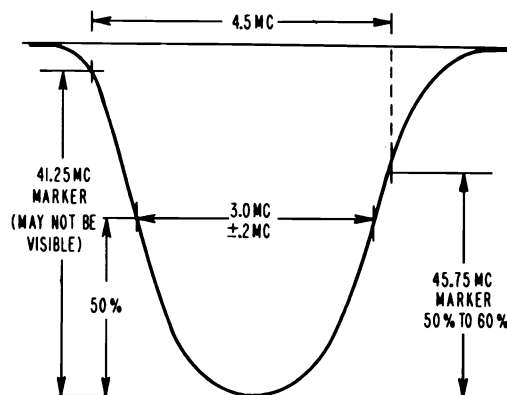


Figure C. Ideal IF Response Curve.

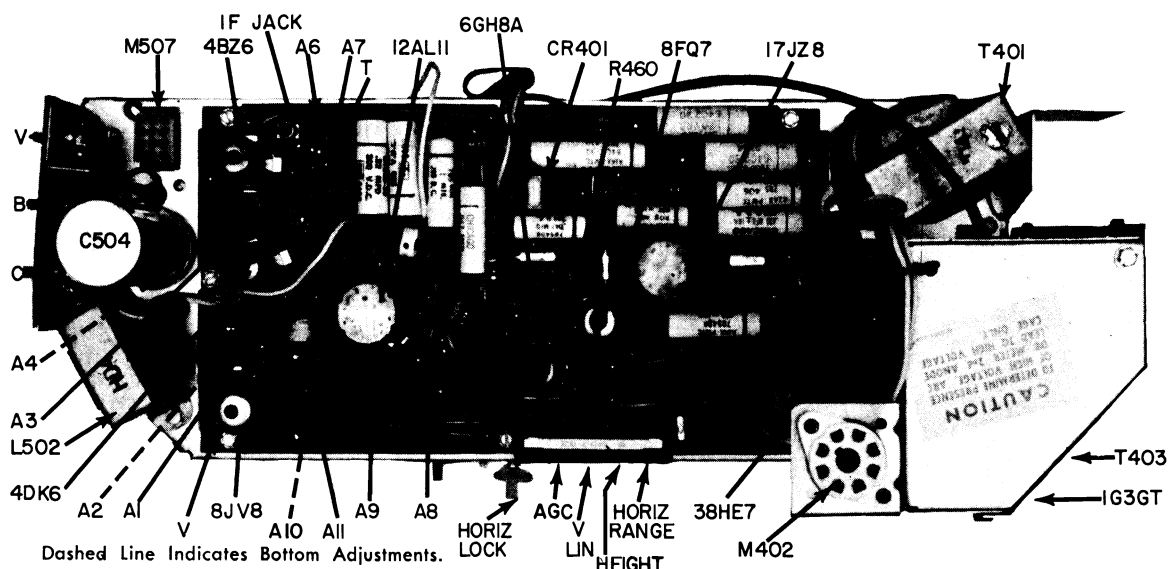


Figure B. View of Precision Wired System Showing Test Point and Alignment Locations.

ADMIRAL Chassis D4, 1D4, 2D4, 8D4, Alignment Information, Continued

VHF AMPLIFIER AND MIXER ALIGNMENT

Tuner 94E260 is a turret type VHF tuner featuring high stability and trouble-free operation. The inductors of this tuner consist of individual channel strips and in general, RF and mixer alignment is permanent. Individual channel oscillator slugs are provided for each channel, should oscillator adjustment be required after replacement of VHF oscillator tube. See figure E for tuner adjustment locations. If it is definitely determined that complete tuner alignment is required, return tuner to Admiral Distributor for repair or replacement. Note: VHF Channel Adjustment can be made from in front of set after removing VHF channel and fine tuning knobs.

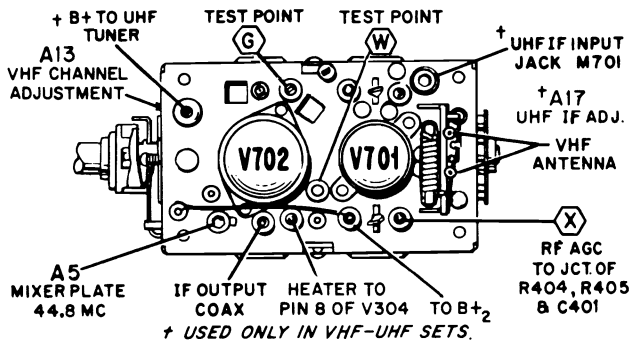


Figure E. Top View of VHF Tuner.

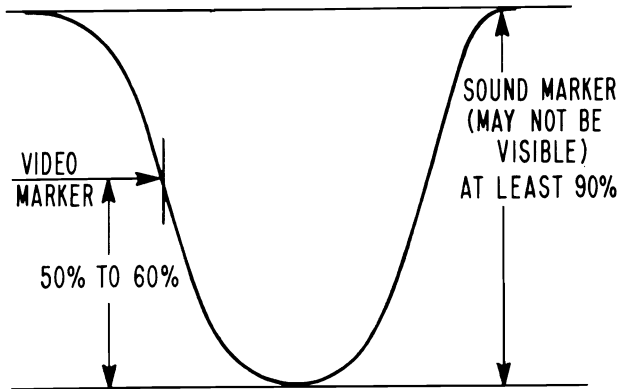


Figure F. Ideal Over-all VHF and IF Response Curve.

OVER-ALL VHF AND IF RESPONSE CURVE CHECK

Set AGC control fully to the left. Channel Selector on channel 12. Connect negative of 3V bias supply to test points "T" (IF AGC) and "X" (RF AGC), positive to chassis. See figure B.

Connect isolation transformer between AC line and receiver. Allow about 15 minutes for receiver and test equipment to warm up.

Connect sweep generator to antenna terminals. Set sweep to channel 12 with sweep output as low as possible. If an external marker generator is used, loosely couple high side to sweep generator lead.

Connect oscilloscope high side to test point "V" through decoupling filter, low side to chassis.

Compare response curve obtained against ideal curve shown in figure "F". If the curve is not within tolerance, adjust A5 to position video marker; adjust A1 to correct shape of curve. It should never be necessary to turn slugs more than one turn in either direction. If curve is satisfactory on channel checked, all other channels should be satisfactory. IMPORTANT: When sweep output is reduced, response curve amplitude on scope should also decrease, but curve shape should remain the same. If curve shape changes, reduce sweep output and/or scope gain until shape does not change.

ALIGNMENT OF UHF IF INPUT USING A TRANSMITTED SIGNAL

Alignment of UHF IF input coil (part of VHF tuner), should be made if UHF reception is poor and after usual causes of poor UHF reception have been checked.

To align UHF IF input coil, tune in UHF channel with normal picture and sound. Using non-metallic alignment tool very carefully adjust slug A17 for best picture, consistent with good sound. For VHF tuner adjustment locations, see figure E.

4.5 MC SOUND IF ALIGNMENT

1. Tune in normal picture on strongest TV station. Allow about 15 minutes for set to warm up. See figure B for adjustment locations.

*2. Using non-metallic alignment tool (part no. 98A30-12), slowly turn slug "A8" several turns to left until a buzz is heard in sound. Then slowly turn slug "A8" to the right for loudest and clearest sound. NOTE: There may be two points (approx. 1/2 turn apart) at which sound is loudest. The slug should be set at center of second point of loudest sound noted as slug is turned in (toward bottom of coil).

3. Reduce signal to antenna terminals until there is considerable hiss in sound. For best results, use a step attenuator, connected between antenna and antenna terminals. Signal can also be reduced by disconnecting antenna and placing it close to antenna terminals or leads.

4. Carefully adjust slug "A9" for loudest and clearest sound with minimum hiss. If hiss disappears during alignment, reduce signal to maintain hiss level. Readjust slug "A9". NOTE: Slug "A9" should be at end nearest bottom of coil.

5. Carefully adjust slug "A10" for loudest and clearest sound with minimum hiss. If hiss disappears during alignment, reduce signal to maintain hiss level. Readjust slug "A10". Caution: Slug "A10" is located nearest bottom of shield can. Use care so as not to disturb slug nearest top of coil.

6. If above alignment is correctly made, no further adjustment is required. However, if sound remains distorted at normal volume level (when receiver is tuned for best sound), repeat entire procedure.

* CAUTION: Do not readjust slug "A8" unless sound is distorted. If "A8" is readjusted, all steps in alignment procedure should be repeated exactly as instructed.

ALIGNMENT OF 4.5 MC TRAP

Alignment of 4.5 MC (beat interference) trap "A11" requires use of a hexagonal non-metallic alignment tool (part number 98A30-12).

To align 4.5 MC trap "A11", tune in television station with beat interference pattern in picture. While closely observing picture, adjust slug "A11" for minimum interference pattern.

Note that adjustment "A11" is top slug (slug farthest from bottom of coil). Use caution so as not to disturb bottom slug (slug nearest bottom of coil) as sound IF alignment will be affected.

MISCELLANEOUS CHASSIS PARTS

M301	IF Input Jack	88B78-1	.55
M302	Capristor, RC Filter	63C10-3	.45
M401	Yoke Plug	88A23-5	.70
M402	Yoke Socket	87B84-2	.35
M501	AC Line Cord	See Cabinet Parts List	
M502	AC Interlock	88A75-1	.20
M504	Circuit Breaker	84B17-4	.95
M506	Plug Less Pins	33D604-3	.35
	Pins for M506, 10 required	9C35-22	.05
M507	Socket Less Pins	33D604-4	.40
	Pins for M507, 10 required	9C35-23	.05
M508	IF Input Cable	700C381-35	
M510	On/Off Timer (in some sets)	91C71-1	7.95
M511	Timer Socket	700D546-6	.70
M512	Timer Plug	700D546-5	.55
M705	Capristor	63C10-3	.45

ADMIRAL

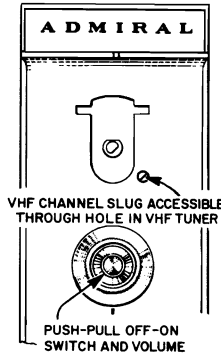
FOR MODELS USING

**D61-1, D610-1,
D61-2, D610-2,
D61-4, D610-4**

MODEL IDENTIFICATION CHART

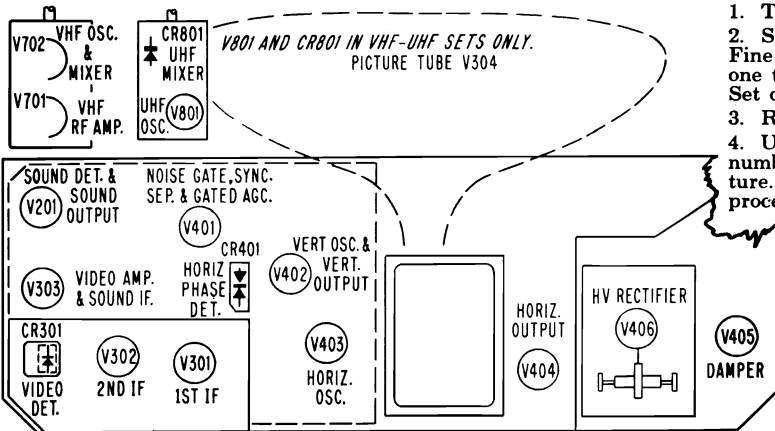
Model	Chassis	Model	Chassis	Model	Chassis
† P9731	D61-2	§ P9741	D61-4	♦ P9751	D61-4
† UP9731	D610-2	§ UP9741	D610-4	♦ UP9751	D610-4
† P9734	D61-2	§ P9749	D61-4	♦ P9752	D61-4
† UP9734	D610-2	§ UP9749	D610-4	♦ UP9752	D610-4
† P9739	D61-2			‡ T9728	D61-1
† UP9739	D610-2			‡ TU928	D610-1

- § Model has dial light, tone control, earphone jack, carrying handle and built-in dipole antenna.
- ♦ Model has dial light, tone control, earphone jack, carrying handle, timer clock and built-in dipole antenna.
- † Model has dial light, carrying handle, and built-in dipole antenna. Does not have tone control or earphone jack.
- ‡ Model has built-in monopole antenna. Does not have dial light, tone control, carrying handle or earphone jack.



Front View of Escutcheon, Channel Selector and Fine Tuning Knobs Removed.

TUBE LOCATIONS



VHF CHANNEL ADJUSTMENT

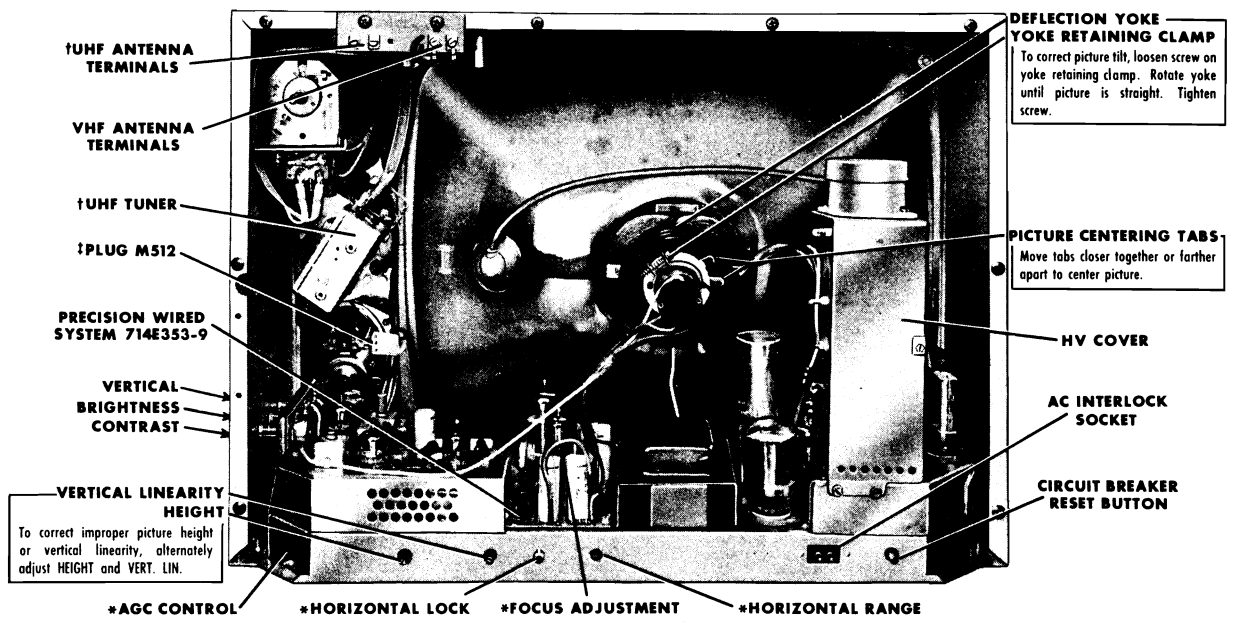
These sets are provided with a channel adjustment slug for each channel, see illustration. Adjust as follows:

1. Turn receiver on and allow 15 minutes warm up.
2. Set Channel Selector at highest channel to be adjusted. Set Fine Tuning control at center of tuning range, by rotating it one third turn counter-clockwise from full clockwise rotation. Set other tuning controls for normal picture and sound.
3. Remove Channel Selector and Fine Tuning knobs.
4. Using a non-metallic alignment tool with $\frac{3}{32}$ " blade (part number 98B30-22), carefully adjust channel slug for best picture. Note: Sound may not be loudest at this point. Repeat procedure for each channel to be adjusted.

TUBE COMPLEMENT

(For VHF and UHF tuners see schematics)

V201—6AL11	V401—6BU8	V406—163GT
V301—6EW7	V402—6EW7	CR301—1N87A
V302—6EJ7	V403—6FQ7	CR401—93B5-6
V303—6JV8	V404—6GE5	CR501—93B12-1
V304—19EBP4	V405—6AX3	CR502—93B12-1



† ONLY IN VHF-UHF CHASSIS.

* ADJUSTMENT INFORMATION GIVEN ON OTHER PAGES.

‡ ONLY IN D61-4 & D610-4 CHASSIS.

Rear View of Chassis Showing Adjustment Locations (UHF Tuner in D610-1, -2 and -4 Chassis).

ADMIRAL Chassis D61-1, -2, -4, D610-1, -2, -4, Service Adjustments

AGC CONTROL ADJUSTMENT

The AGC control is an AGC threshold control which is used solely to adjust the receiver for optimum operation under all signal conditions.

Note: This control is set at the factory and will not normally require field readjustment.

Improper AGC control adjustment can result in picture bending, tearing (overloading) or buzz in the sound. However, these same conditions can also be caused by other troubles in the set. Make adjustment as follows:

1. Turn set on and allow 15 minutes to warm up.
2. Turn Channel Selector to strongest station in the area.
3. Turn Contrast and Brightness controls fully to the right.
4. Very slowly turn AGC control to the left, just to the point where picture is weak (loses contrast).
5. Adjust Horizontal Lock (at rear of set) and Vertical Hold control (at side of set) for steady picture, without bending of vertical lines at top of picture.
6. Very slowly turn AGC control to the right, until picture just begins to bend, tear, shift, or buzz is heard in sound. Then very slowly turn the AGC control to the left, to the point at which picture bending, tearing, shifting and buzz is removed.
7. Make final adjustment by turning AGC control an additional 10 degrees to the left.
8. Recheck at maximum contrast on all channels. Picture should not overload and should reappear immediately after changing channels.

IMPORTANT: AGC adjustment should always be made on the strongest TV station received. If adjustment is made only on a weak station, AGC overload may occur when a strong TV station is tuned in.

HORIZONTAL LOCK ADJUSTMENT

Make adjustment if picture "slips sideways" or "tears" when switching channels. Adjustment is made by rotating flexible shaft extending from rear of set. Adjust as follows:

1. Allow a few minutes for set to warm up. Tune in weakest station, set Brightness and Contrast controls for normal Picture. Important: Before proceeding, be sure that AGC control has been adjusted according to instructions in this manual.
2. Reduce Contrast to minimum. Very slowly turn Horizontal Lock adjustment to the right or left until picture is in sync. Interrupt the television signal by switching Channel Selector off and on channel. Picture should remain in sync. If picture bends or loses sync, adjust Horizontal Lock so that picture remains in sync and bending of vertical lines does not appear at top of picture. Check adjustment on all channels.

IMPORTANT: If adjustment cannot be made using the Horizontal Lock control, it will be necessary to make Horizontal Range adjustment as instructed below.

HORIZONTAL RANGE ADJUSTMENT

The Horizontal Range control is set at the factory and seldom requires readjustment. Adjustment need only be made if 6FQ7 tube (V403) has been replaced and the picture cannot be locked-in with the Horizontal Lock adjustment or if the Horizontal Lock adjustment has insufficient range (adjustment only possible at extreme end rotation).

Caution: Before proceeding with adjustment, be sure that the picture will sync vertically, as lack of both vertical and horizontal sync indicates sync circuit trouble. Lack of only horizontal sync generally indicates trouble in the horizontal sync (phase detector) circuit. Adjust as follows:

1. Remove cabinet back. Connect interlock cord.
2. Allow a few minutes for set to warm up. Tune in weakest station, set Brightness and Contrast controls for a normal picture. Important: Before proceeding, be sure that the AGC control has been adjusted according to instructions in this manual.
3. Using a piece of hook-up wire, short test point "R", junction of resistors R443 (680K) and R444 (1 meg.) to chassis ground. See Figure B for location.
4. Connect a .22 mf, 400 volt capacitor from test point "S" (junction of horizontal lock coil L401 and resistor R446,

12,000 ohms) to chassis ground. Caution: To avoid B+ shock, turn receiver off when making this connection.

5. With picture in vertical sync, set Horizontal Range control at point where picture is in horizontal sync and almost remains stationary with tendency to shift to left or right.
6. Remove the .22 mf capacitor from the horizontal lock coil. Set horizontal lock adjustment at point where picture is in horizontal sync and almost remains stationary with tendency to shift to left or right.
7. Remove wire short from test point "R".
8. Set Channel Selector to weakest station. Switch Channel Selector on and off channel, picture should remain in horizontal sync. If necessary, adjust horizontal lock slightly to bring picture in sync.

IMPROVING FOCUS

The picture tube of these receivers utilizes electrostatic focus in connection with a three position focus adjustment.

For obtaining best overall sharpness of pictures, focus adjustment should be checked at installation and when servicing. Once focus adjustment is properly made, no further need for readjustment is required.

From rear view of chassis on front page, note that there are three focus (pin) connections at top rear of the chassis board, points shown as "A", "B" and "C". To make adjustment, connect plug-in focus lead to either of the three focus pins, whichever provides best focus at central area of picture tube. Important: Focus adjustment should be made with controls set for picture with normal contrast and brightness.

Caution: High B+ potential is present at focus terminals. To prevent electric shock, use care to avoid accidental contact with focus terminals.

OPERATING AUTOMATIC OFF-ON TIMER

Some models are equipped with an automatic OFF-ON timer. The OFF-ON timer (at side of cabinet) can be set to turn television receiver "OFF" after a pre-selected time period, up to ten hours. The timer can also be set to turn receiver "ON" after a pre-selected time period, up to twelve hours. Models having an automatic OFF-ON timer, are listed in Model Identification Chart on front page.

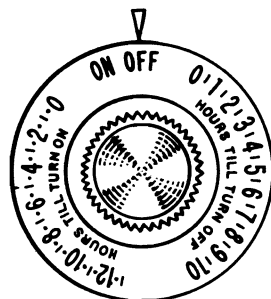
IMPORTANT: Push-pull ON-OFF switch (at front of set) must be "ON" (pulled out) and timer must be in "ON" detent position for set to operate. Dial light is lit, when set is turned on.

Turning Receiver "OFF" Automatically

With television receiver operating, turn timer knob counterclockwise until time interval marking on knob, is opposite indicator pointer. Receiver will continue to operate for time period indicated on knob, then automatically turn itself off.

Turning Receiver "ON" Automatically

For turning receiver "ON" automatically, set timer knob to "ON" detent position. Turn television receiver "ON" with push-pull ON-OFF switch at front of set. Tune in wanted channel and set volume control for desired volume level. Then, without disturbing receiver controls, turn timer knob clockwise until interval marking on knob is opposite indicator pointer. Set will turn off. However, when indicated time interval has elapsed, television receiver will automatically turn itself "ON". Sound (from television program), will be heard as indication that interval has elapsed and receiver is operating.



View of Knob on OFF-ON Timer.

ADMIRAL Chassis D61-1, -2, -4, D610-1, -2, -4, Alignment Information

IF AMPLIFIER ALIGNMENT

Connect negative of 6 volt bias supply to test point "T" (IF AGC), positive to chassis. See figure B.

Using needle nose alligator clip or looped end of hookup wire, connect signal generator high side to test point "G", low side directly to tuner, see figure D.

Connect VTVM high side to test point "V" through a decoupling filter, see figure A. Connect low side to chassis.

Set Channel Selector to channel 12. Connect jumper wire across antenna terminals.

Allow about 15 minutes for receiver and test equipment to warm up. Use a non-metallic alignment tool, part no. 98A30-12.

Important: Before proceeding check signal generator against frequency standard for calibration.

- †1. Set generator at 47.25 MC and adjust A2 for minimum.
2. Connect wire jumper across resistor R304 (4.7K) at terminals of IF input coil L301.
- ‡3. Set generator at 44.3 MC and adjust A3 for maximum. Remove wire jumper from across resistor R304.
- ‡4. Set generator at 42.7 MC and adjust A4 for maximum.
- ‡5. Retouch trap adjustment A2 (step 1).
- ‡6. Set generator at 44.8 MC and adjust A5 for maximum.
- ‡7. Set generator at 42.7 MC and adjust A6 for maximum.
- ‡8. Set generator at 44.3 MC and adjust A7 for maximum.
9. To insure correct IF alignment, make "IF Response Curve Check".

† If necessary, increase generator output and/or reduce bias to $-1\frac{1}{2}$ volts to obtain a definite indication on VTVM.

‡ Use -6 volts bias. When adjusting, keep reducing generator output to prevent VTVM reading from exceeding 2 volts.

IF RESPONSE CURVE CHECK

1. Allow about 15 minutes for receiver and test equipment warm up.
2. Set VHF tuner on channel 12. Connect negative of 6 volt bias supply to test point "T" (IF AGC), positive to chassis. See figure B.
3. Using needle nose alligator clip or looped end of hookup wire, connect sweep generator high side to test point "G", low side directly to tuner, see figure D. Set sweep frequency to 43 MC, sweep width approximately 7 MC. If external marker generator is used, loosely couple high side to sweep generator lead, low side directly to tuner. Marker frequencies indicated on IF Response Curve.
4. Connect oscilloscope high side to test point "V" through a decoupling filter (figure A), low side to chassis.
5. Check curve obtained against ideal response curve, figure C. Keep marker and sweep outputs at very minimum to prevent over-loading. A reduction in sweep output should reduce curve amplitude without altering the shape of the response curve.

If curve is not within tolerance or markers not in proper location on curve, adjust A5 to position 45.75 MC Video Marker. Adjust A6 and A7 to correct shape of curve.

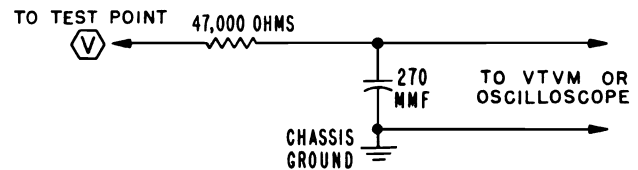


Figure A. Decoupling Filter.

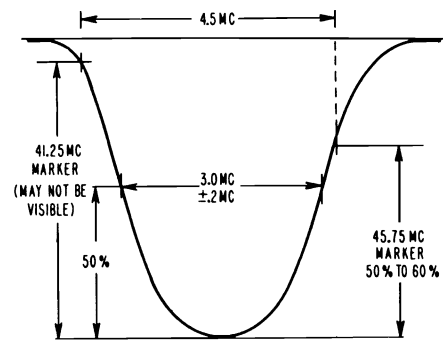


Figure C. Ideal IF Response Curve.

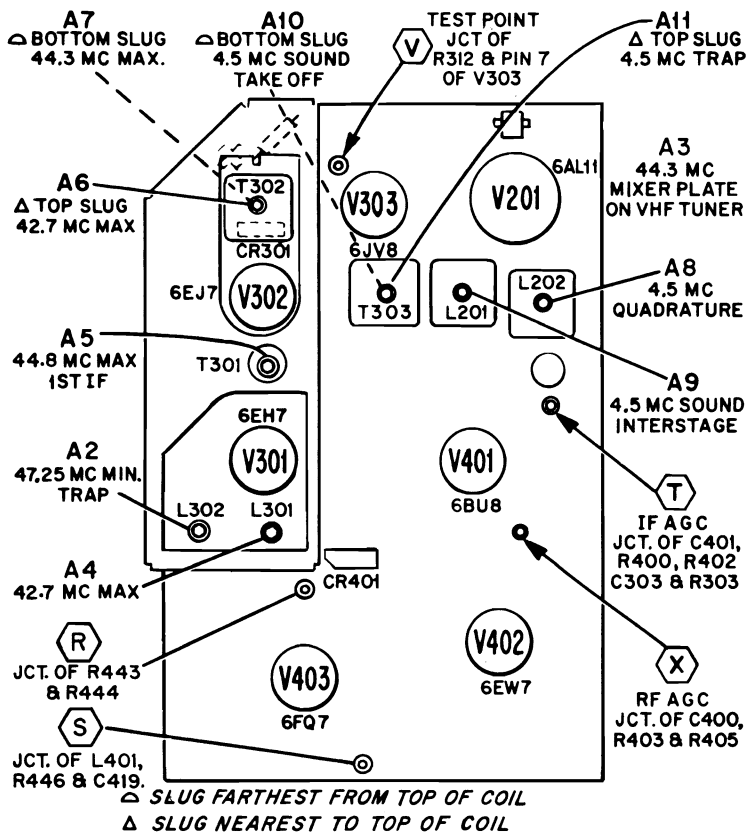


Figure B. View of Precision Wired System Showing Test Point and Alignment Locations.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

ADMIRAL Chassis D61-1, -2, -4, D610-1, -2, -4, Alignment, Continued

VHF AMPLIFIER AND MIXER ALIGNMENT

VHF tuner 94E243-2 features high stability and trouble-free operation. VHF tuners have been carefully aligned and operation checked at the factory. In general, VHF amplifier and mixer alignment is permanent. Channel oscillator adjustment is provided, should oscillator adjustment be required after replacement of VHF oscillator tube. See figure D for tuner adjustment locations. If it is definitely determined that complete tuner alignment is required, return tuner to Admiral Distributor for repair or replacement. Note: VHF Channel adjustment can be made from in front of set after removing VHF channel and fine tuning knobs.

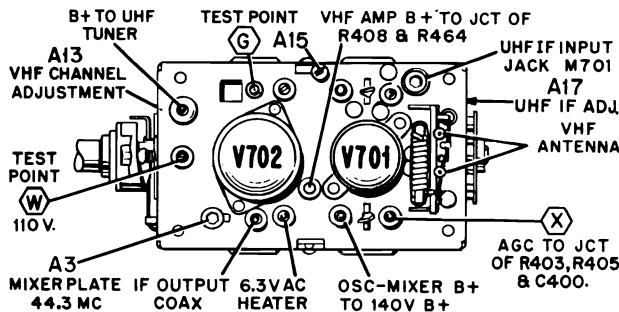


Figure D. Top View of VHF Tuner 94E243-2.

OVER-ALL VHF and IF RESPONSE CURVE CHECK

Set AGC control fully to the left. Channel Selector on channel 12. Connect negative of 3V bias supply to test points "T" (IF AGC) and "X" (RF AGC), positive to chassis. See figure B.

Connect sweep generator to antenna terminals. Set sweep to channel 12 with sweep output as low as possible. If an external marker generator is used, loosely couple high side to sweep generator lead.

Connect oscilloscope high side to test point "V" through decoupling filter, low side to chassis.

Compare response curve obtained against ideal curve shown in figure E. If the curve is not within tolerance, adjust A5 to position video marker; adjust A6 and A7 to correct shape of curve. It should never be necessary to turn slugs more than one turn in either direction. If curve is satisfactory on channel checked, all other channels should be satisfactory. **IMPORTANT:** When sweep output is reduced, response curve amplitude on scope should also decrease, but curve shape should remain the same. If curve shape changes, reduce sweep output and/or scope gain until shape does not change.

ALIGNMENT OF UHF IF INPUT COIL USING A TRANSMITTED SIGNAL

Alignment of UHF IF input coil should be made if UHF reception is poor and after usual causes of poor UHF reception have been checked.

To align UHF IF input coil, tune in UHF channel with normal picture and sound. Using non-metallic alignment tool, very carefully adjust slug A17 for best picture, consistent with good sound. For VHF tuner adjustment locations, see figure D.

4.5 MC SOUND IF ALIGNMENT

1. Tune in normal picture on strongest TV station. Allow about 15 minutes for set to warm up. See figure B for alignment locations.

*2. Using non-metallic alignment tool (part no. 98A30-12), slowly turn slug "A8" several turns to left until a buzz is heard in sound. Then slowly turn slug "A8" to the right for loudest and clearest sound. NOTE: There may be two points (approx. 1/2 turn apart) at which sound is loudest. The slug should be set at center of second point of loudest sound noted as slug is turned in (toward bottom of coil).

3. Reduce signal to antenna terminals until there is considerable hiss in sound. For best results, use a step attenuator, connected between antenna and antenna terminals. Signal can also be reduced by disconnecting antenna and placing it close to antenna terminals or leads.

4. Carefully adjust slug "A9" for loudest and clearest sound with minimum hiss. If hiss disappears during alignment, reduce signal to maintain hiss level. Readjust slug "A9". NOTE: Slug "A9" should be at end nearest bottom of coil.

5. Carefully adjust slug "A10" for loudest and clearest sound with minimum hiss. If hiss disappears during alignment, reduce signal to maintain hiss level. Readjust slug "A10". Caution: Slug "A10" is located nearest bottom of shield can. Use care so as not to disturb slug nearest top of coil.

6. If above alignment is correctly made, no further adjustment is required. However, if sound remains distorted at normal volume level (when receiver is tuned for best sound), repeat entire procedure.

* CAUTION: Do not readjust slug "A8" unless sound is distorted. If "A8" is readjusted, all steps in alignment procedure should be repeated exactly as instructed.

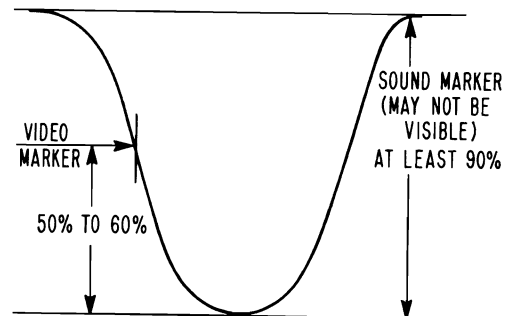


Fig. E. Ideal Over-all VHF and IF Response Curve.

ALIGNMENT OF 4.5 MC TRAP

Alignment of 4.5 MC (beat interference) trap "A11" requires use of a hexagonal non-metallic alignment tool (part number 98A30-12).

To align 4.5 MC trap "A11", tune in television station with beat interference pattern in picture. While closely observing picture, adjust slug "A11" for minimum interference pattern.

Note that adjustment "A11" is top slug (slug farthest from bottom of coil). Use caution so as not to disturb bottom slug (slug nearest bottom of coil) as sound IF alignment will be affected.

SCHEMATIC NOTES

Numbers or letters inside hexagons indicate alignment points.

Fixed resistor values shown in ohms $\pm 10\%$ tolerance, $\frac{1}{2}$ watt; capacitor values shown in microfarads $\pm 20\%$ unless otherwise specified.

VOLTAGES AND WAVEFORMS

Line Voltage: 117.

Channel Selector on unused channel. Contrast control fully clockwise; all other controls counterclockwise. Do not disturb Horizontal Hold control. Antenna disconnected and terminals shorted. DC voltages measured with VTVM between tube

socket and chassis, unless otherwise indicated. Voltages marked (*) will vary widely with control settings.

Waveforms taken with transmitted signal input. For waveforms, controls set for normal picture. Peak-to-peak voltages may vary slightly.

B+ Circuit Breaker: B+ supply of this receiver is equipped with a thermal type circuit breaker having a manual reset button. Allow a few minutes for circuit breaker to cool off before pressing the reset button.

Heater Fuse: A one inch length of number 26 gauge bare annealed copper wire is used. Fuse wire is located at underside of chassis.

VOLTAGE WARNING

High AC voltages are present at terminals of wafer switch S902 and at terminals of diodescent panel.

Exercise normal high voltage precautions when servicing wafer switch or rear of diodescent panel.

Pulsed high voltage is present at cap of V406, and pin 7 of V404 and V405. Use suitable test equipment at these points.

ADMIRAL

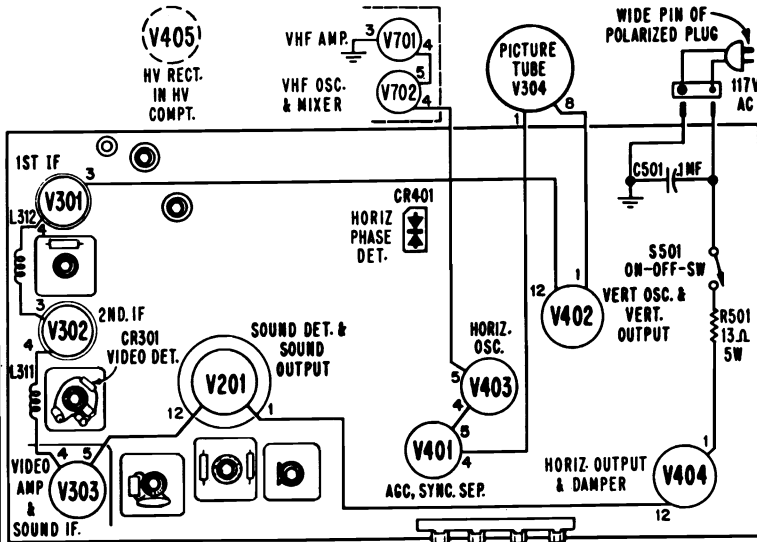
FOR MODELS USING

7D43-1, 7D413-1

MODEL IDENTIFICATION CHART

Model	Chassis	Model	Chassis	Model	Chassis
P6200	7D43-1	UP6201	7D413-1	UP6204	7D413-1
UP6200	7D413-1	P6203	7D43-1	P6209	7D43-1
P6201	7D43-1	UP6203	7D413-1	UP6209	7D413-1
		P6204	7D43-1		

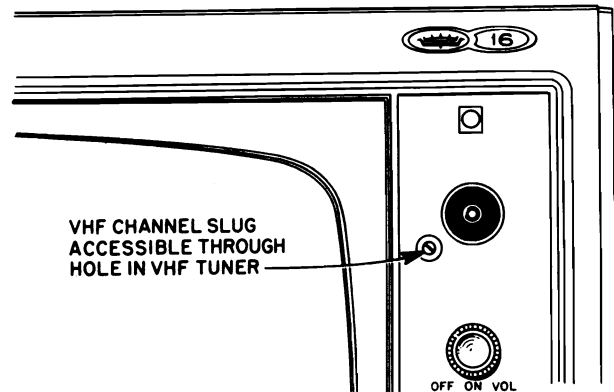
(Material on pages 15 through 20)



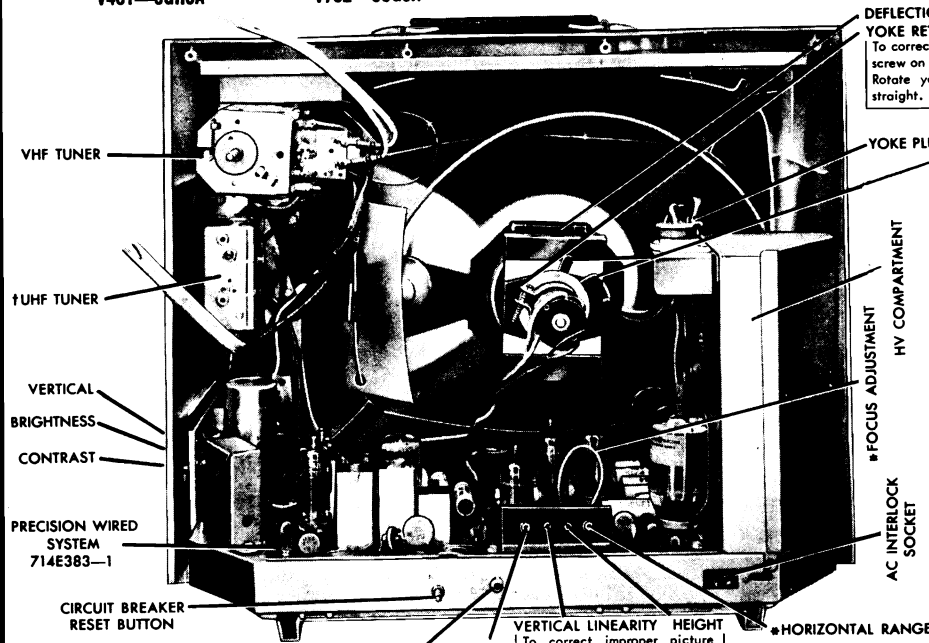
TO SIMPLIFY HEATER STRING DIAGRAM, TUBE SOCKET PIN NUMBERS ARE NOT SHOWN IN ACTUAL LOCATIONS.

TUBE COMPLEMENT

- | | | |
|-------------|------------|---------------|
| V201—12AL11 | V402—17J28 | CR301—1N87A |
| V301—4BZ6 | V403—8FQ7 | CR401—93B5-6 |
| V302—4DK6 | V404—38HE7 | CR501—93B12-1 |
| V303—8JV8 | V405—1636T | CR801—1N82A |
| V304—16BTP4 | V701—3GK5 | Q801—SE-3002 |
| V401—6GH8A | V702—6CG8A | |



Front View of Escutcheon, Channel Selector and Fine Tuning Knobs Removed.



† Only in VHF—UHF Models.
* ADJUSTMENT INFORMATION GIVEN ON OTHER PAGES.

Rear View of Chassis Showing Adjustment Locations (UHF Tuner in 7D413-1 Chassis).

SCHEMATIC NOTES

Numbers or letters inside hexagons indicate alignment points.

Fixed resistor values shown in ohms $\pm 10\%$ tolerance, $\frac{1}{2}$ watt; capacitor values shown in microfarads $\pm 20\%$ unless otherwise specified.

B+ Circuit Breaker: B+ supply of this receiver is equipped with a thermal type circuit breaker having a manual reset button. Allow a few minutes for circuit breaker to cool off before pressing the reset button.

VOLTAGES AND WAVEFORMS

Isolation transformer used. Line Voltage: 117. Channel Selector on unused channel. Contrast control fully clockwise; all other controls counterclockwise. Do not disturb Horizontal Hold control.

Antenna disconnected and terminals shorted. DC voltages measured with VTVM between tube socket and chassis, unless otherwise indicated. Voltages marked (*) will vary widely with control settings.

VOLTAGE WARNING

Pulsed high voltage is present at cap of V405, and pins 4 and 5 of V404. Use suitable test equipment at these points. Servicing receiver out of cabinet involves a shock hazard. Use polarized line (cheater) cord and plug, part number 89C 121-2.

Important: To prevent possibility of static discharge, bronze contact strip M303 (at top of cabinet), should only make contact with steel band around face plate of picture tube. Do not connect steel band to picture tube dag or chassis ground.

ADMIRAL Chassis 7D43-1, 7D413-1, Service Information

AGC CONTROL ADJUSTMENT

The AGC control is an AGC threshold control which is used solely to adjust the receiver for optimum operation under all signal conditions.

Note: This control is set at the factory and will not normally require field readjustment.

Improper AGC control adjustment can result in picture bending, tearing (overloading) or buzz in the sound. However, these same conditions can also be caused by other troubles in the set.

If adjustment is required, it should be made exactly as instructed.

1. Turn set on and allow 15 minutes to warm up.
2. Turn Channel Selector to strongest station in the area.
3. Turn Contrast and Brightness controls fully to the right.
4. Very slowly turn AGC control to the left, just to the point where picture is weak (loses contrast).
5. Adjust Horizontal Lock (at rear of set) and Vertical Hold control (at side of set) for steady picture, without bending of vertical lines at top of picture.
6. Very slowly turn AGC control to the right, until picture just begins to bend, tear, shift, or buzz is heard in sound. Then very slowly turn the AGC control to the left, to the point at which picture bending, tearing, shifting and buzz is removed.
7. Make final adjustment by turning AGC control approximately 10 degrees to the left.
8. Recheck at maximum contrast on all channels. Picture should not overload and should reappear immediately after changing channels.

HORIZONTAL LOCK ADJUSTMENT

Make adjustment if picture "slips sideways" or "tears" when switching channels. Adjustment is made by rotating flexible shaft extending from rear of set. Adjust as follows:

1. Allow a few minutes for set to warm up. Tune in weakest station, set Brightness and Contrast controls for normal Picture. Important: Before proceeding, be sure that AGC control has been adjusted according to instructions in this manual.
2. Reduce Contrast to minimum. Very slowly turn Horizontal Lock adjustment to the right or left until picture is in sync. Interrupt the television signal by switching Channel Selector off and on channel. Picture should remain in sync. If picture bends or loses sync, adjust the Horizontal Lock so that picture remains in sync and bending of vertical lines does not appear at top of picture. Check adjustment on all channels; if necessary, repeat procedure.

IMPORTANT: If adjustment cannot be made using the Horizontal Lock control, it will be necessary to make Horizontal Range adjustment as instructed below.

HORIZONTAL RANGE ADJUSTMENT

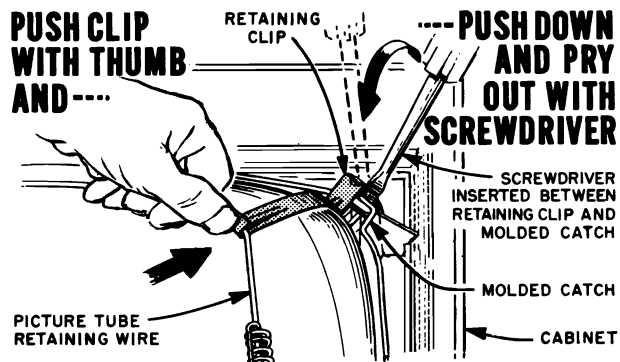
The Horizontal Range control is set at the factory and seldom requires readjustment. Adjustment need only be made if 8FQ7 tube (V403) has been replaced and the picture cannot be locked-in with the Horizontal Lock adjustment or if the Horizontal Lock adjustment has insufficient range (adjustment only possible at extreme end rotation). Note: Horizontal Range adjustment is accessible after removing cabinet back.

Caution: Before proceeding with adjustment, be sure that the picture will sync vertically, as lack of both vertical and horizontal sync indicates sync circuit trouble. Lack of only

horizontal sync generally indicates trouble in the horizontal sync (phase detector) circuit. Adjust as follows:

1. Remove cabinet back. Connect interlock cord.
2. Allow a few minutes for set to warm up. Tune in weakest station, set Brightness and Contrast controls for a normal picture. Important: Before proceeding, be sure that the AGC control has been adjusted according to instructions in this manual.
3. Using a piece of hook-up wire, short test point "R" (pin 2 of V403, 8FQ7 tube), to chassis ground. See figure B for test point locations.
4. Connect a .22 mf 400 volt capacitor from test point "S" (junction of horizontal lock coil L401 and resistor R446, 15,000 ohms) to chassis ground. Caution: To avoid B+ shock, turn receiver off when making this connection.
5. With picture in vertical sync, set Horizontal Range control at point where picture is in horizontal sync and almost remains stationary with tendency to shift to left or right.
6. Remove the .22 mf capacitor from the horizontal lock coil. Set horizontal lock coil at point where picture is in horizontal sync and almost remains stationary with tendency to shift to left or right.
7. Remove wire short from test point "R". Set Channel Selector to weakest station. Switch Channel Selector on and off channel, picture should remain in horizontal sync. If necessary, adjust horizontal lock coil slightly to bring picture in sync.

REMOVING AND INSTALLING PICTURE TUBE



To remove picture tube proceed as follows:

1. Disconnect speaker leads from speaker. Remove chassis, deflection yoke, and tuner assembly from cabinet.
2. Place cabinet, face down, on padded wood blocks supporting the cabinet.
3. At upper right hand corner of picture tube, insert long screwdriver blade between retaining clip and plastic retaining clip catch molded into cabinet.
4. With left thumb, push retaining clip downward toward corner of cabinet, and at the same time, push down and pry out on retaining clip with screwdriver.
5. When installing picture tube, hook retaining clips into molded catches; fasten clip at upper right hand corner last. Push down on retaining clip with thumbs and guide it into catch with finger.

Important: To prevent possibility of static discharge, bronze contact strip M303 (at top of cabinet), should only make contact with steel band around face plate of picture tube. Do not connect steel band to picture tube tag or chassis ground.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

ADMIRAL Chassis 7D43-1, 7D413-1, Alignment Information

IF AMPLIFIER ALIGNMENT

Connect isolation transformer between AC line and receiver. Connect negative of 6 volt bias supply to test point "T" (IF AGC), positive to chassis. See figure B.

Using needle nose alligator clip or looped end of hookup wire, connect signal generator high side to test point "G" low side directly to tuner, see figures E and F.

Connect VTVM high side to test point "V" through a decoupling filter, see figure A. Connect low side to chassis.

Set Channel Selector to channel 12. Connect jumper wire across antenna terminals.

Allow about 15 minutes for receiver and test equipment to warm up. Use a non-metallic alignment tool, part no. 98A30-12.

Important: Before proceeding check signal generator against frequency standard for calibration.

- †1. Set generator at 42.7 MC and adjust A1 for maximum.
- †2. Set generator at 44.2 MC and adjust A2 for maximum.
- †3. Set generator at 44.3 MC and adjust A3 for maximum.
4. Connect wire jumper across IF input coil L302.
- †5. Set generator at 44.8 MC and adjust A4 for maximum.
6. Remove wire jumper from across input coil L302.
- †7. Set generator at 42.7 MC and adjust A5 for maximum.
- *8. Set generator at 47.25 MC and adjust A6 for minimum.
9. To insure correct IF alignment, make "IF Response Curve Check".

*If necessary, increase generator output and/or reduce bias to $-1\frac{1}{2}$ volts to obtain a definite indication on VTVM.

†Use -6 volts bias. When adjusting, keep reducing generator output to prevent VTVM reading from exceeding 2 volts.

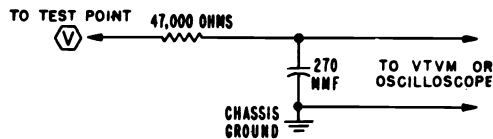


Figure A. Decoupling Filter.

IF RESPONSE CURVE CHECK

1. Connect isolation transformer between AC line and receiver. Allow about 15 minutes for receiver and test equipment to warm up.

2. Set VHF tuner on channel 12. Connect negative of 6 volt bias supply to test point "T" (IF AGC), positive to chassis. See figure B.

3. Using needle nose alligator clip or looped end of hookup wire, connect sweep generator high side to test point "G" low side directly to tuner, see figures E and F. Set sweep frequency to 43 MC, sweep width approximately 7 MC. If external marker generator is used, loosely couple high side to sweep generator lead, low side directly to tuner. Marker frequencies indicated on IF Response Curve.

4. Connect oscilloscope high side to test point "V" through a decoupling filter (figure A), low side to chassis.

5. Check curve obtained against ideal response curve, figure C. Keep marker and sweep outputs at very minimum to prevent over-loading. A reduction in sweep output should reduce curve amplitude without altering the shape of the response curve.

If curve is not within tolerance or markers not in proper location on curve, adjust A4 to position 45.75 MC Video Marker. Adjust A1 to correct shape of curve.

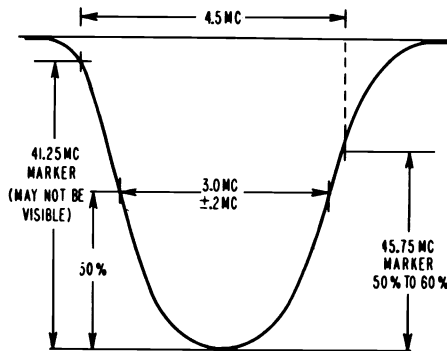


Figure C. Ideal IF Response Curve.

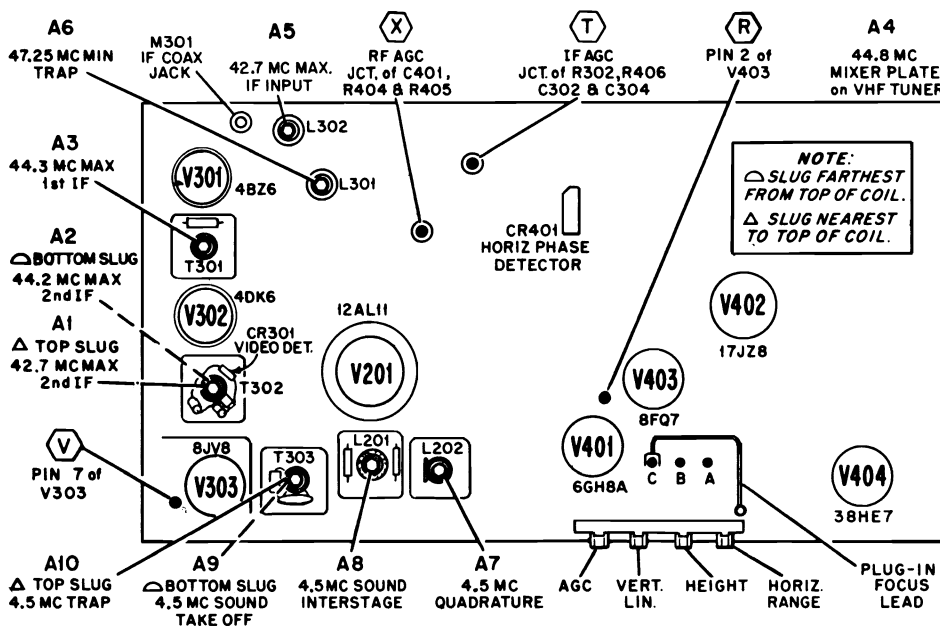


Figure B. View of Precision Wired System Showing Test Point and Alignment Locations.

ADMIRAL Chassis 7D43-1, 7D413-1, Alignment Information, Continued

VHF AMPLIFIER AND MIXER ALIGNMENT

Tuner 94E260-9 is a turret type VHF tuner featuring high stability and trouble-free operation. The inductors of this tuner consist of individual channel strips and in general, RF and mixer alignment is permanent. Individual channel oscillator slugs are provided for each channel, should oscillator adjustment be required after replacement of VHF oscillator tube. See figure E for tuner adjustment locations. If it is definitely determined that complete tuner alignment is required, return tuner to Admiral Distributor for repair or replacement. Note: VHF Channel Adjustment can be made from in front of set after removing VHF channel and fine tuning knobs.

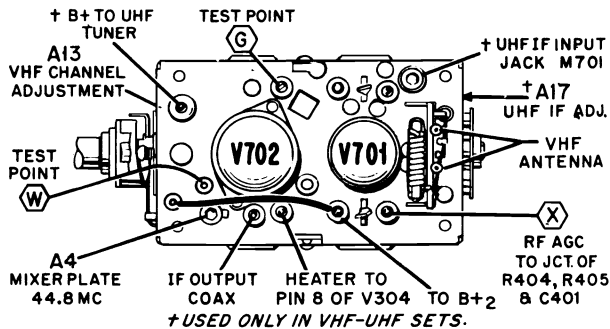


Figure E. Top View of VHF Tuner

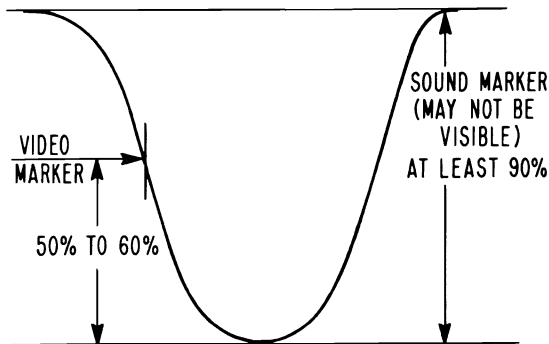


Figure F. Ideal Over-all VHF and IF Response Curve.

OVER-ALL VHF AND IF RESPONSE CURVE CHECK

Set AGC control fully to the left. Channel Selector on channel 12. Connect negative of 3V bias supply to test points "T" (IF AGC) and "X" (RF AGC), positive to chassis. See figure B.

Connect isolation transformer between AC line and receiver. Allow about 15 minutes for receiver and test equipment to warm up.

Connect sweep generator to antenna terminals. Set sweep to channel 12 with sweep output as low as possible. If an external marker generator is used, loosely couple high side to sweep generator lead.

Connect oscilloscope high side to test point "V" through decoupling filter, low side to chassis.

Compare response curve obtained against ideal curve shown in figure "E". If the curve is not within tolerance, adjust A4 to position video marker; adjust A1 to correct shape of curve. It should never be necessary to turn slugs more than one turn in either direction. If curve is satisfactory on channel checked, all other channels should be satisfactory. **IMPORTANT:** When sweep output is reduced, response curve amplitude on scope should also decrease, but curve shape should remain the same. If curve shape changes, reduce sweep output and/or scope gain until shape does not change.

ALIGNMENT OF UHF IF INPUT USING A TRANSMITTED SIGNAL

Alignment of UHF IF input coil (part of VHF tuner), should be made if UHF reception is poor and after usual causes of poor UHF reception have been checked.

To align UHF IF input coil, tune in UHF channel with normal picture and sound. Using non-metallic alignment tool very carefully adjust slug A17 for best picture, consistent with good sound. For VHF tuner adjustment locations, see figure E.

4.5 MC SOUND IF ALIGNMENT

1. Tune in normal picture on strongest TV station. Allow about 15 minutes for set to warm up. See figure B for adjustment locations.

*2. Using non-metallic alignment tool (part no. 98A30-12), slowly turn slug "A7" several turns to left until a buzz is heard in sound. Then slowly turn slug "A7" to the right for loudest and clearest sound. **NOTE:** There may be two points (approx. 1/2 turn apart) at which sound is loudest. The slug should be set at center of second point of loudest sound noted as slug is turned in (toward bottom of coil).

3. Reduce signal to antenna terminals until there is considerable hiss in sound. For best results, use a step attenuator, connected between antenna and antenna terminals. Signal can also be reduced by disconnecting antenna and placing it close to antenna terminals or leads.

4. Carefully adjust slug "A8" for loudest and clearest sound with minimum hiss. If hiss disappears during alignment, reduce signal to maintain hiss level. Readjust slug "A8". **NOTE:** Slug "A8" should be at end nearest bottom of coil.

5. Carefully adjust slug "A9" for loudest and clearest sound with minimum hiss. If hiss disappears during alignment, reduce signal to maintain hiss level. Readjust slug "A9". **Caution:** Slug "A9" is located nearest bottom of coil. Use care so as not to disturb slug nearest top of coil.

6. If above alignment is correctly made, no further adjustment is required. However, if sound remains distorted at normal volume level (when receiver is tuned for best sound), repeat entire procedure.

***CAUTION:** Do not readjust slug "A7" unless sound is distorted. If "A7" is readjusted, all steps in alignment procedure should be repeated exactly as instructed.

ALIGNMENT OF 4.5 MC TRAP

Alignment of 4.5 MC (beat interference) trap "A10" requires use of a hexagonal non-metallic alignment tool (part number 98A30-12).

To align 4.5 MC trap "A10", tune in television station with beat interference pattern in picture. While closely observing picture, adjust slug "A10" for minimum interference pattern.

Note that adjustment "A10" is top slug (slug farthest from bottom of coil). Use caution so as not to disturb bottom slug (slug nearest bottom of coil) as sound IF alignment will be affected.

DELMONICO MODEL 4T-20U

How to remove the Cabinet

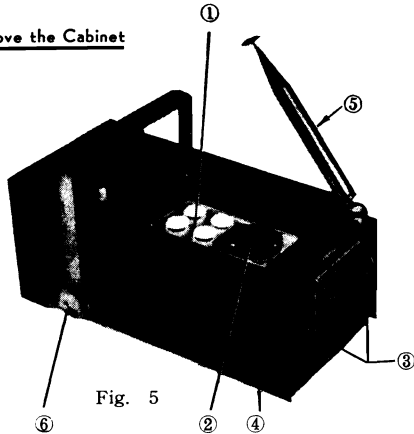
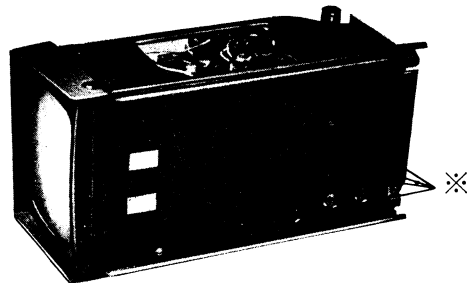
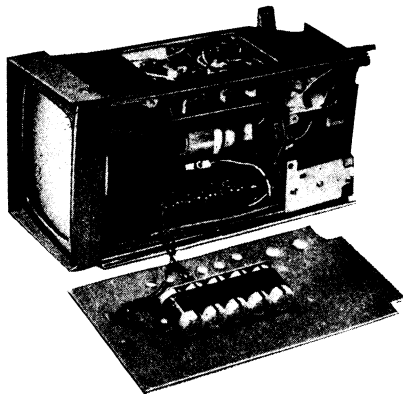


Fig. 5

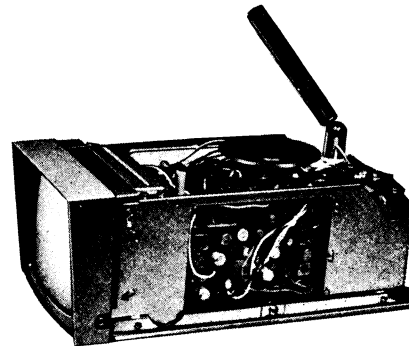
- ① Loosen the screw of knobs and remove them.
- ② Pull out the channel knob and fine tuning knob upward.
- ③ Remove the 2 screws on the back cover.
- ④ Remove the 4 right and left black bolts.
- ⑤ Stand the antenna upright.
- ⑥ The chassis can be removed by lifting the cabinet upward. Handle is fixed to cabinet.



- ※ By removing these 4 bolts, partition plate will be removed.
As this plate can be removed without removing cabinet, in case of adjusting the centering magnet or adjusting inclined yoke, remove the plate only.

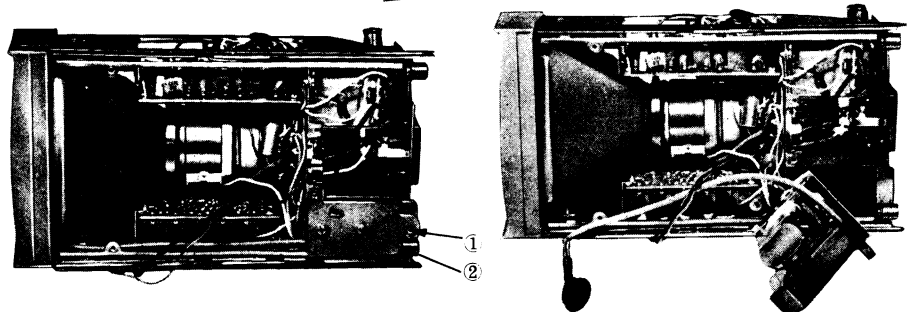
How to remove the Circuit Board

- ① Pull out the receptacles of terminal on the circuit (Then, notice that in signal circuit block, two each of grey and orange colour wires are used, in deflection circuit block, two each of white, grey, red, orange and green wires are also used)
- ② The chassis can be removed by removing 4 screws at the corners.



How to remove H. V. Block

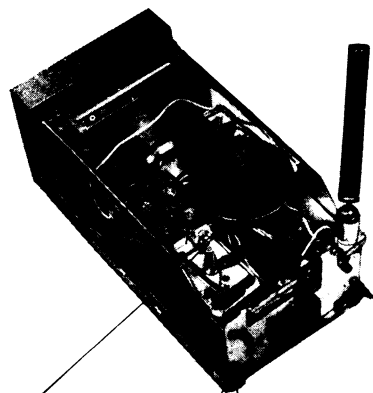
Remove the bolt ①.
By pulling out the plate ② slowly, HV Transformer and H. V. Modul in wired condition will be removed.



DELMONICO Model 4T-20U Servicing Information, Continued

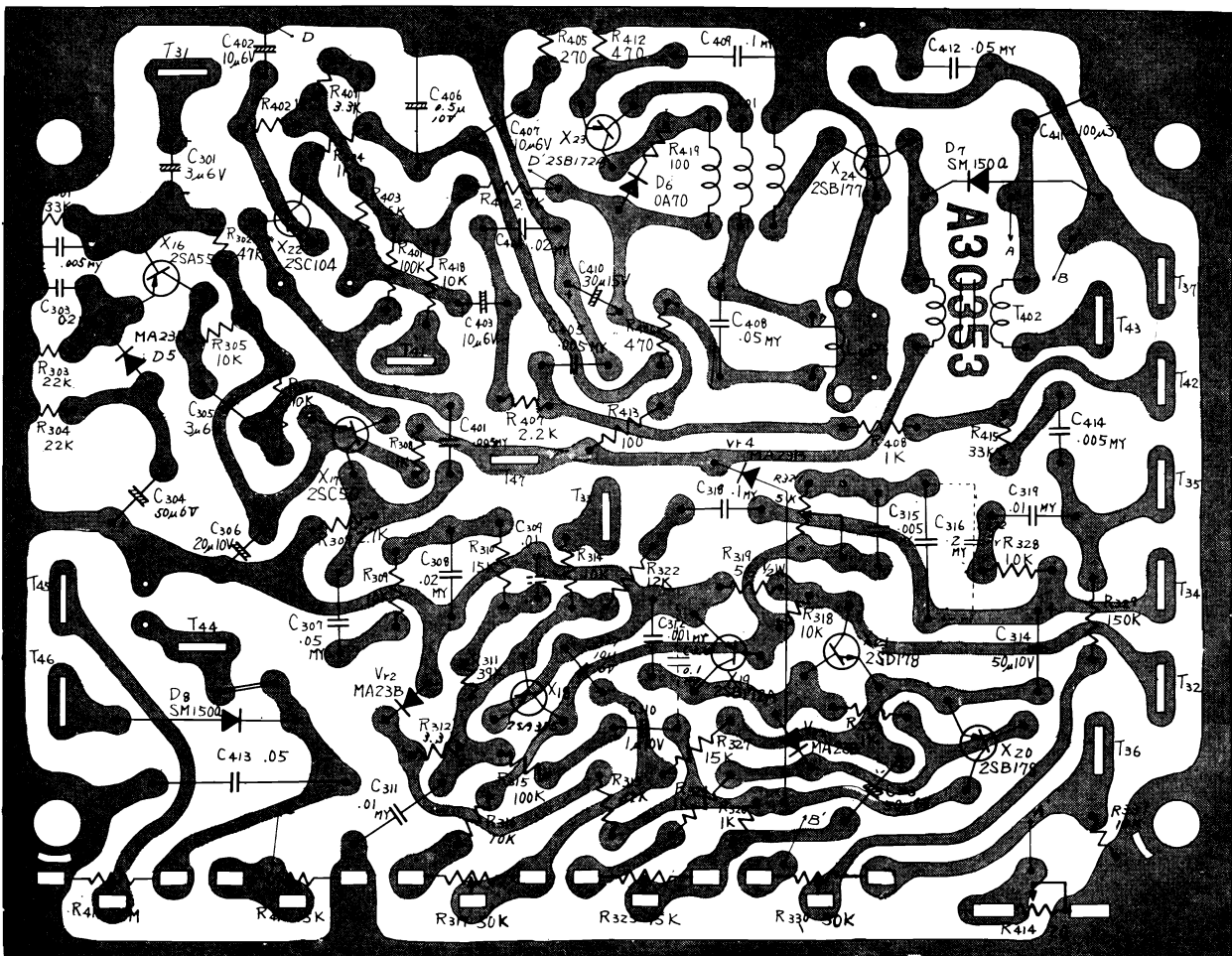
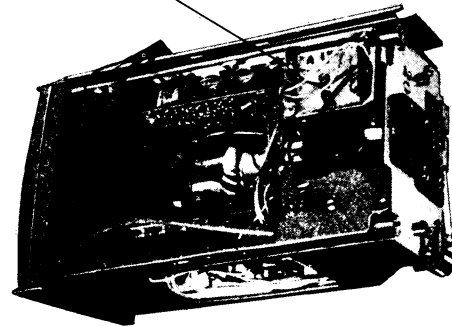
How to remove Tuner

- ① Pull out the output cable of tuner and AGC grey wire from the signal circuit block.
- ② Disconnect the orange wire of power source from lug terminal with a soldering iron.
- ③ Disconnect the cable connected to the antenna from lug terminal beside rod antenna.
- ④ Remove the 2 screws fixing upper and lower part of tuner and push the tuner upward. Then tuner will be removed



Fixing screw for tuner (upper)

Fixing screw for tuner (lower)

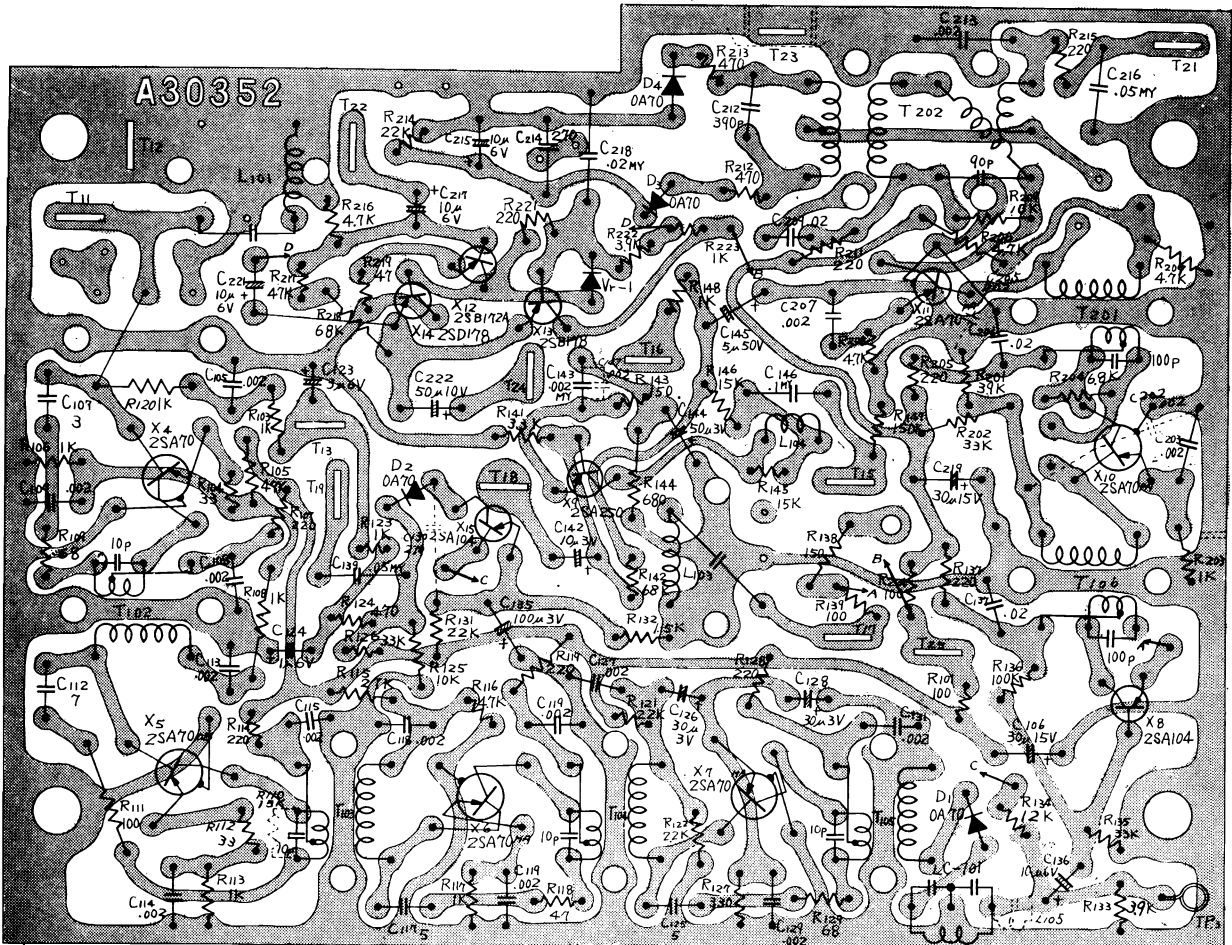
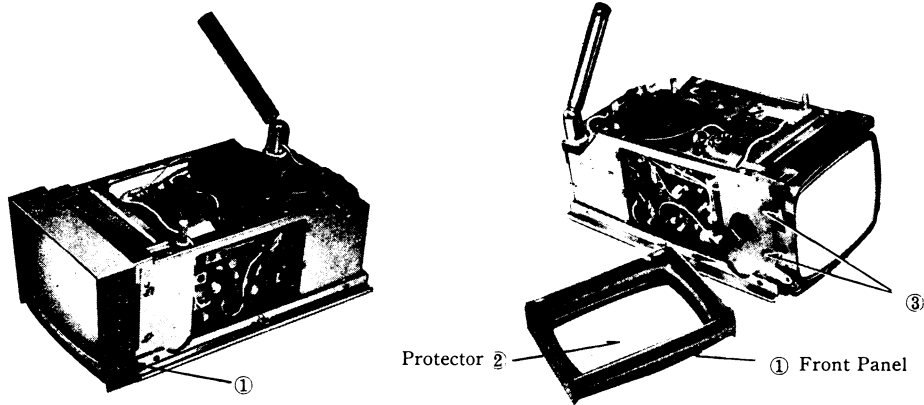


Parts Arrangement of Deflection Circuit Block (TPC-12)

DELMONICO Model 4T-20U Servicing Information, Continued

How to remove the C. R. T

- ① Remove the 2 pieces of left and right screws fixing the escutcheon. Escutcheon can be removed by lifting it up and pulling forward.
- ② Remove the socket of CRT, loosen the fixing screw of deflection yoke and remove the anode cap.
- ③ Remove the 4 saucer bolts on both sides of chassis and pull the C. R. T. forward slowly



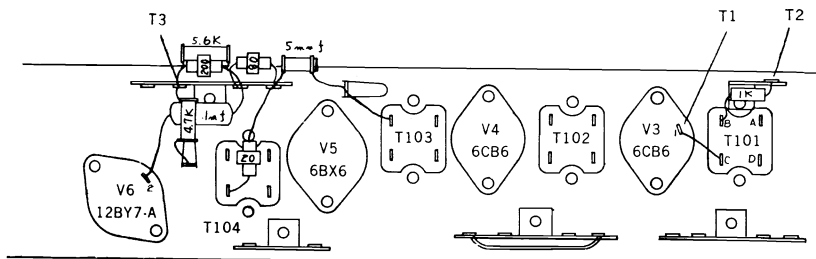
Parts Arrangement of Signal Circuit Block (TPC-11)

DELMONICO

MODEL PTV-19UHF

VIDEO IF ALIGNMENT

1. Test Equipments
Oscilloscope
IF Sweep Generator
Marker Generator



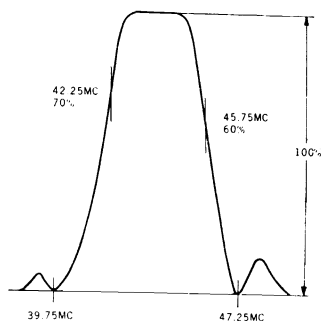
2. Stagger Stage Alignment

Set the channel selector of the VHF tuner to channel 13.

Place the output of the sweep generator to T1 and connect oscilloscope to T3.

Place -3V voltage between T2 and the chassis and lightly couple the marker generator to the output of the sweep generator. Adjust each IF transformer and coil so that the frequency will be maximum respectively and the response will be like Fig. according to chart 3.

VIDEO IF TEST POINT



STAGGER WAVE FORM

IF Transformer and coil to be adjusted	Frequency to be adjusted to maximum or minimum
T102 (inside)	39.75 Mc min.
T103 (inside)	47.25 Mc min.
T102 (outside)	42.5 Mc max.
T103 (outside)	45.5 Mc max.
T104 (outside)	44.0 Mc max.
T102 (outside)	42.25 Mc 70%
T103 (outside)	45.75 Mc 60%

Chart 3

4.5Mc TRAP ALIGNMENT

1. Test Equipments
4.5Mc Oscillator
VTVM with RF probe

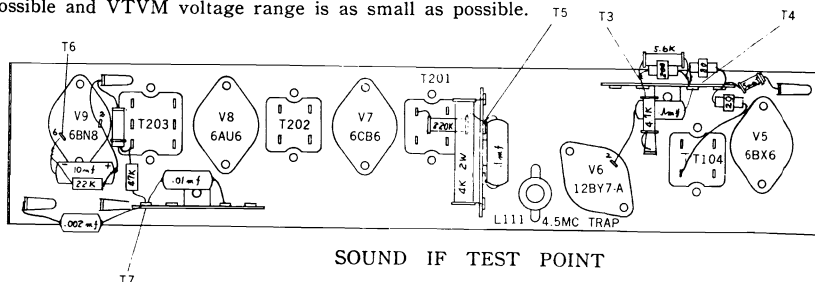
2. Alignment

Place the oscillator to test point T4 on the video circuit and connect the VTVM with RF probe to T5.

Adjust L111 so that the swing of the VTVM indicator will be minimum. In this case, it is better that 4.5 MC signal input is as large as possible and VTVM voltage range is as small as possible.

SOUND IF ALIGNMENT

1. Test Equipments
4.5Mc Oscillator
VTVM



SOUND IF TEST POINT

2. Alignment

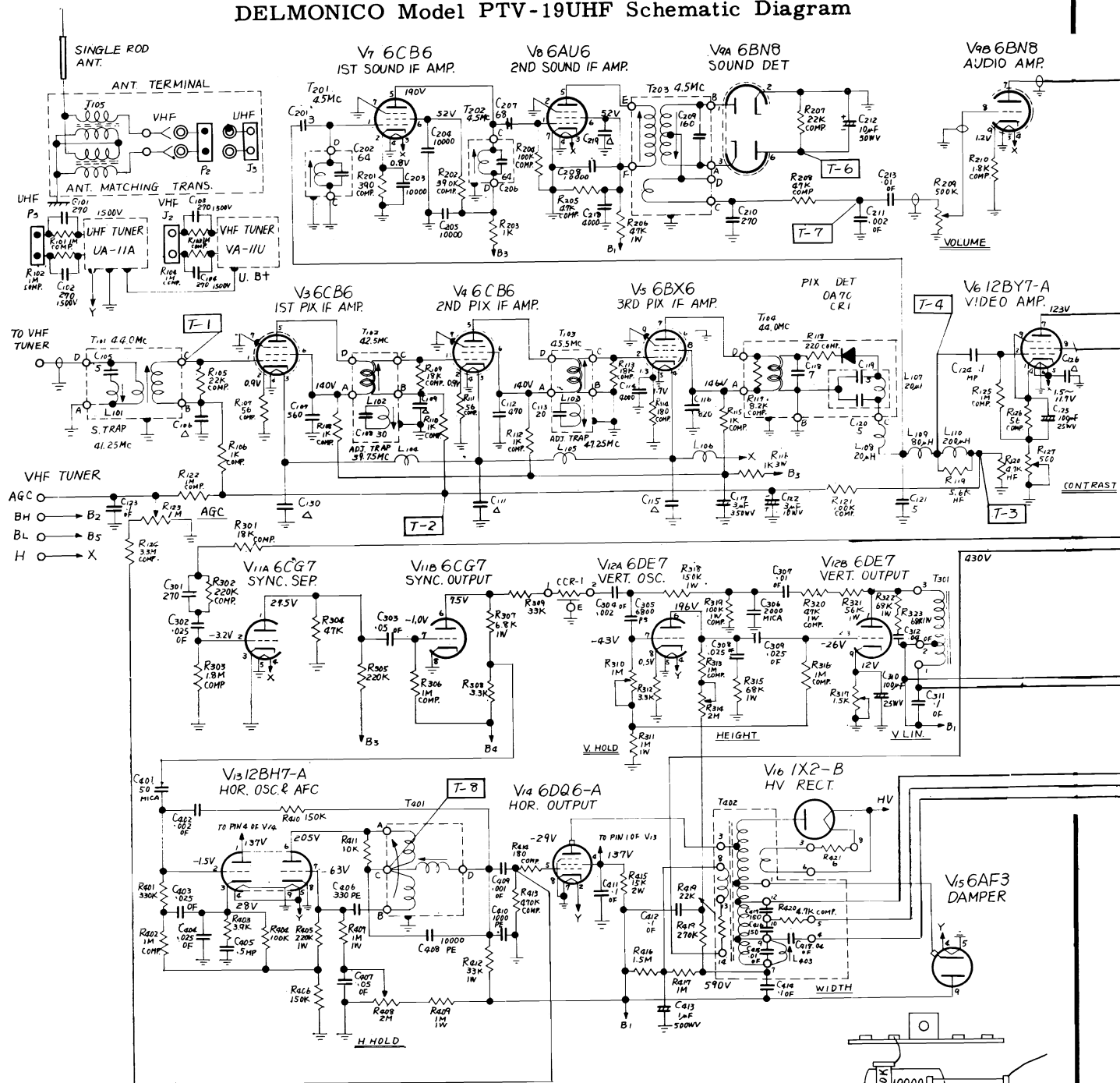
Connect the VTVM to T6 and place the oscillator output to T4 of video circuit. Adjust T201, T202 and T202 (outside) so that the VTVM indicator will be maximum.

Connect two matched resistors 100K ohms in series between the chassis and T6. Connect the ground side of VTVM to the junction of the resistors and the other side of VTVM to T7.

Adjust the inside core of T203 for zero indication. In this case the oscillator output should be adjusted so that max. DC voltage between T6 and the chassis indicates about 4 volts.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

DELMONICO Model PTV-19UHF Schematic Diagram



HORIZONTAL OSCILLATOR ADJUSTMENT

After setting the screw of the Horizontal Osc. Transformer T401 at the outside length of about 3/4" and the inside length of 5/8", adjust the H. HOLD control until picture pulls into sync.

Connect the low capacity probe of the oscilloscope to T8. The sine wave adjustment core (the inside of T401) should be adjusted so that the pattern on the oscilloscope becomes as shown in Fig. 14. During this adjustment, the picture must be kept in sync. by readjusting the H. HOLD control if necessary.

Turn the H. HOLD control to the extreme clockwise position.

The picture should be out of sync, with bars slanting downwards to the right. Adjust the Hor. Freq. adjustment core (the outside of T401) so that about 5 diagonal black bars are obtained. With higher frequencies the circuit may cause double triggering. The H. HOLD control races over the extreme clockwise or counter-clockwise position.

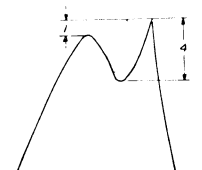
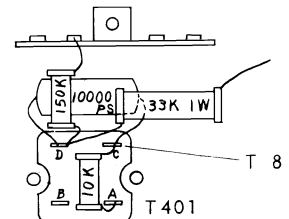


Fig. 14

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

DELMONICO Model PTV-19UHF Servicing Information, Continued

NOTES

All DC voltages measured with VTVM and with no signal input.

All resistance values in ohms.

K, 1,000 M: 1,000,000

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

Unspecified resistors are carbon resistors 1/2 watt.

COMP.: composition resistor

PR: porcelain resistor

GR: G. Resistor

Unspecified capacitors are ceramic capacitor

Δ: 1600 MMF ceramic capacitor

MP: metallized capacitor

OF: oilfilled capacitor

PS: polystyrol capacitor

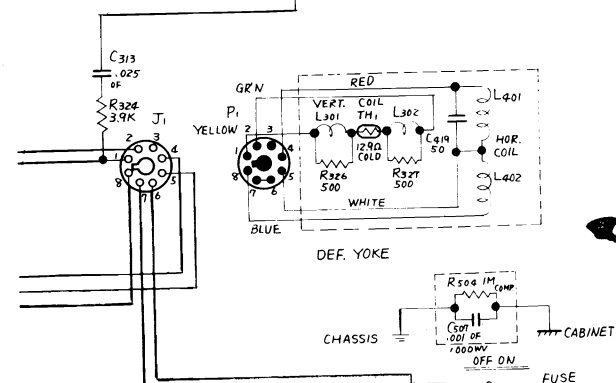
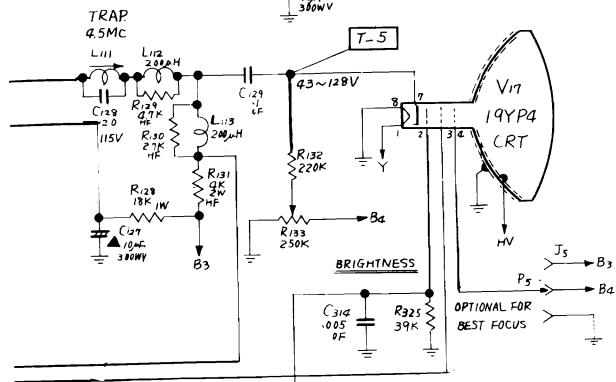
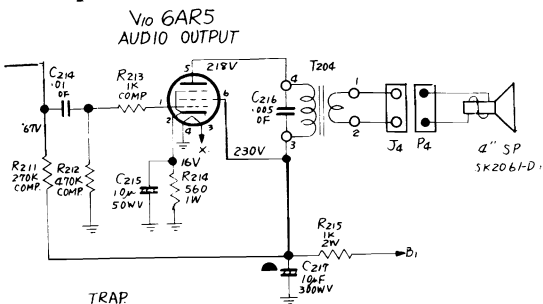
PE: polyethylene capacitor

— UP SIDE or RIGHT SIDE

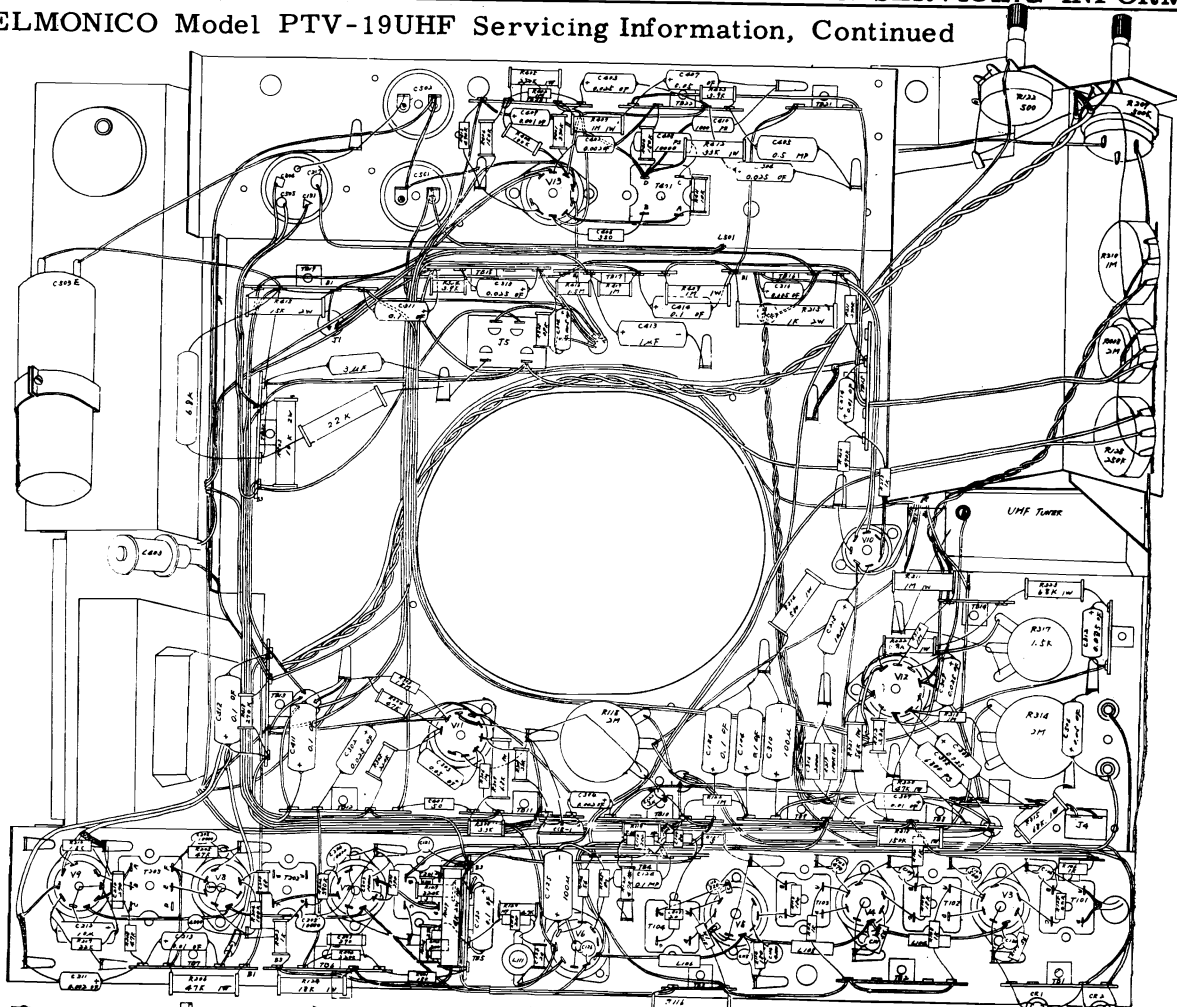
— REAR

→ OUT SIDE

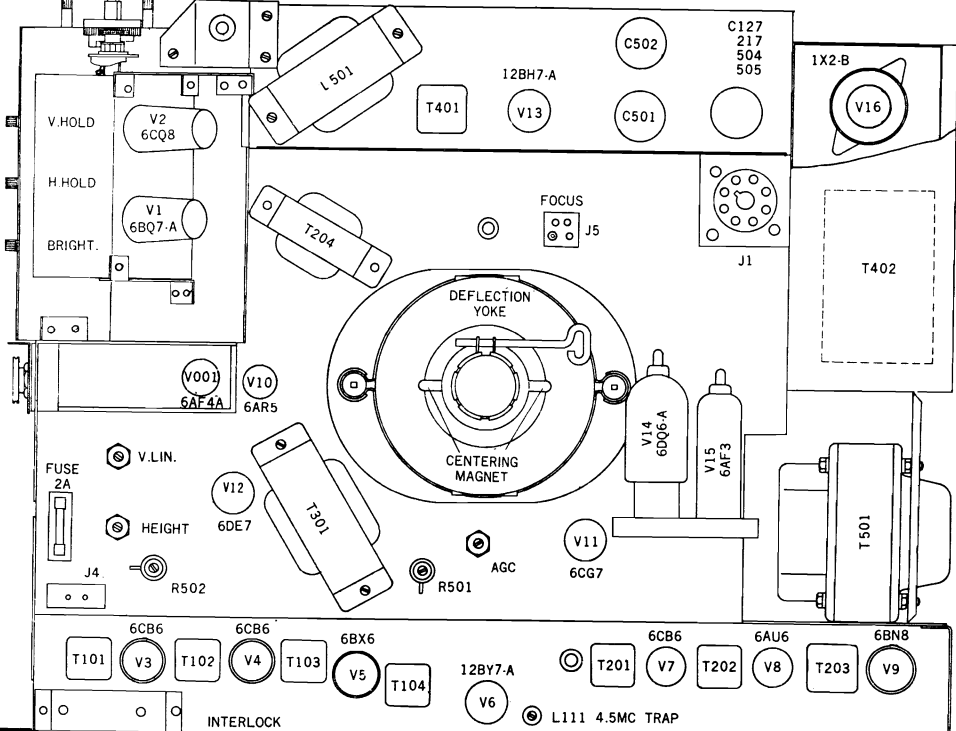
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VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION
DELMONICO Model PTV-19UHF Servicing Information, Continued



OFF - VOLUME CONTRAST CHASSIS BOTTOM VIEW



CHASSIS TOP VIEW

DELMONICO

MODEL CTM-235

(Service material on pages 29 through 34)

TV CHASSIS REMOVAL

1. Remove rear cover.
2. Remove knobs for television controls.
3. Remove 3 nuts fastening control bracket on which tuner and television controls are mounted.
4. Disconnect leads connecting television chassis to radio chassis.
5. Disconnect all of negative lead of picture tube at yoke socket J1, yoke leads and picture tube socket.
6. Disconnect the wire bond connecting television chassis to radio chassis.
7. Remove 4 nuts fastening chassis from top and bottom of cabinet.
8. After pulling out chassis a little, disconnect anode cap of picture tube, then remove the chassis and control bracket together.

RADIO CHASSIS REMOVAL

1. Remove rear cover.
2. Remove 5 knobs for controls of radio chassis.
3. Disconnect leads connecting television chassis to radio chassis, speaker leads and also leads connecting radio chassis to automatic record changer.
4. Disconnect lead connecting chassis to cabinet at interlock plug.
5. Remove 4 screws fastening radio chassis.
6. Pull out chassis, then it will come off.

PICTURE TUBE REMOVAL

Remove the picture tube from the front.

1. Loosen 3 screws and remove upper fitting located at the upper part of the picture tube.
2. Pull out the upper part of glass, then the glass will come off.
3. Pull out the screen escutcheon.
4. Remove rear cover.
5. Disconnect socket, negative lead of picture tube and yoke leads.
6. Remove 4 nuts and 8 washers holding picture tube.
7. Pull out the picture tube a little and remove the anode cap, then picture tube can be taken off.

RECORD CHANGER REMOVAL

1. Remove rear cover.
2. Disconnect signal leads and power cord.
3. Loosen 3 fasteners fastening record changer to cabinet.
4. Take out record changer mechanism upwards.

CHECK WARNING

If in "no raster failure" the filaments are on, check quickly pin 5 of V11 Hor. Sweep Output tube 12DQ6-A

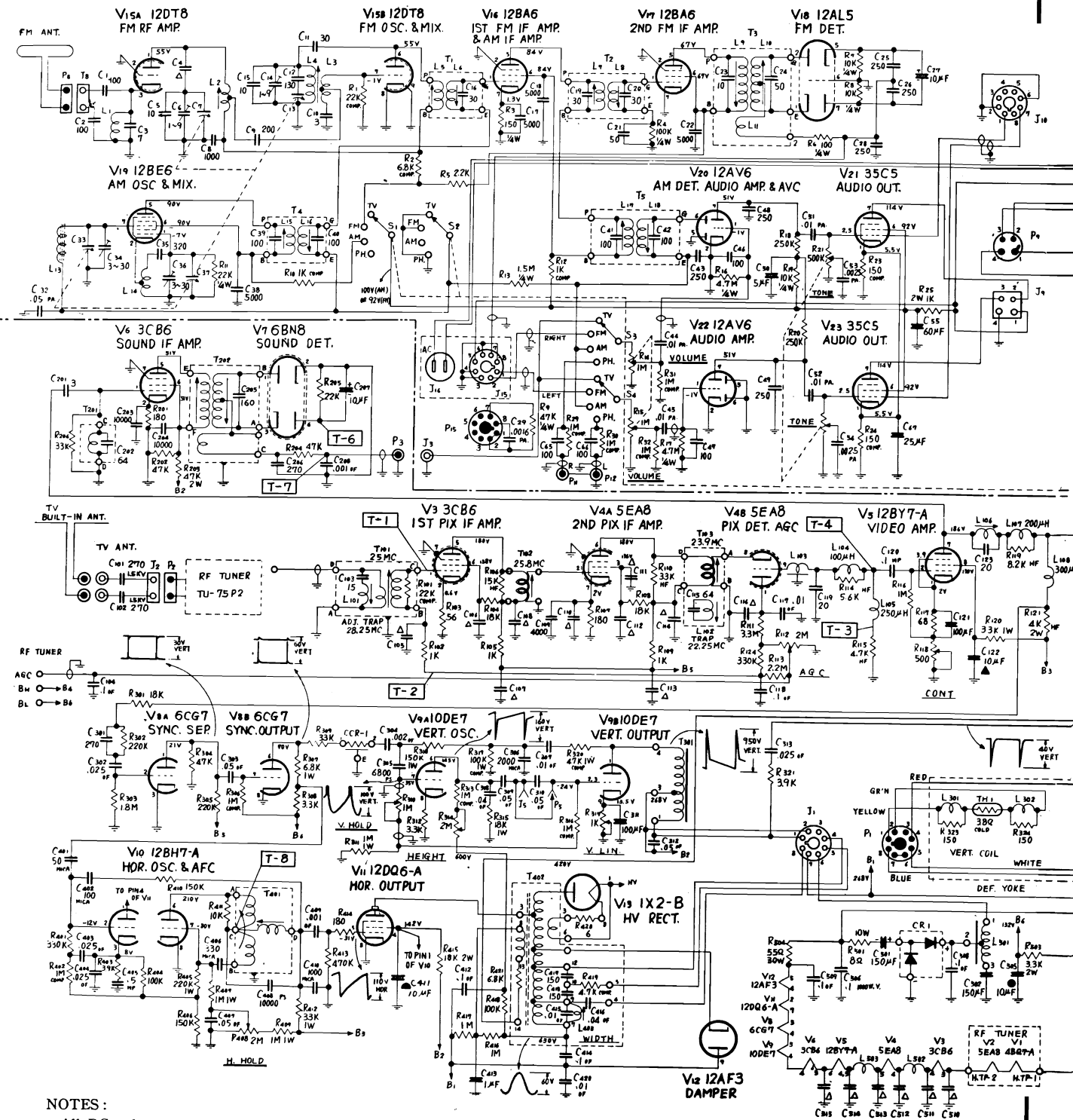
If -31V or any negative voltage cannot be noticed, cut the power off and check the preceding circuit of V11 or B line. Otherwise, serious damage may be effected.

PICTURE TUBE AND PROTECTION GLASS CLEANING

Loosen 3 screws and remove fitting located at the upper part of the picture tube. Then you can take off the glass and screen escutcheon by only pulling them forward.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

DELMONICO Model CTM-235 Schematic Diagram



NOTES:

All DC voltages measured with VTVM

and with no signal input.

All resistance values in ohms.

K: 1,000 M: 1,000,000

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

Unspecified resistors are carbon resistors 1/2 Watt.

COMP.: composition resistor

PR: porcelain resistor

Unspecified capacitors are ceramic capacitor.

△: 1600 MMF ceramic capacitor

MP: metallized capacitor

OF: oiled film capacitor

PA: paper capacitor

PS: polystyrene capacitor

— UP SIDE

— REAR

→ OUT SIDE

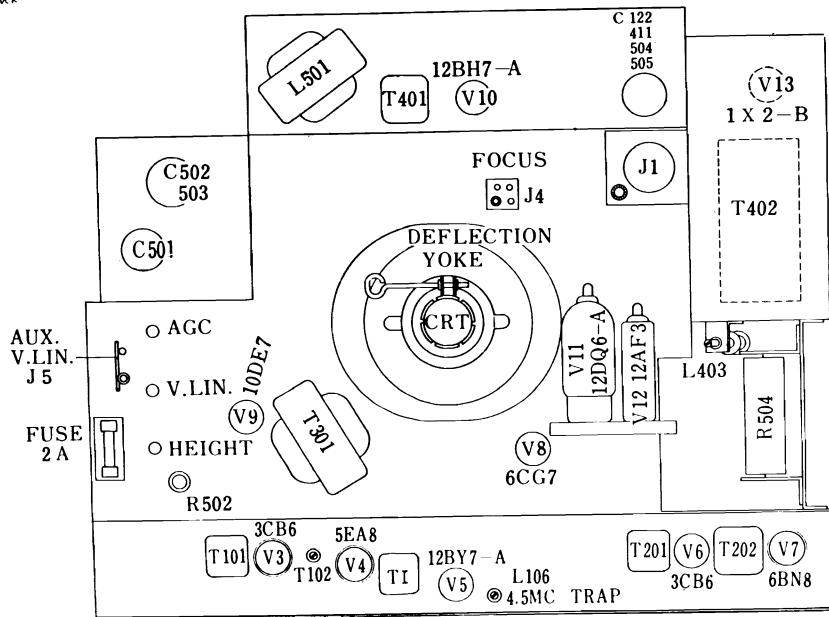
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VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

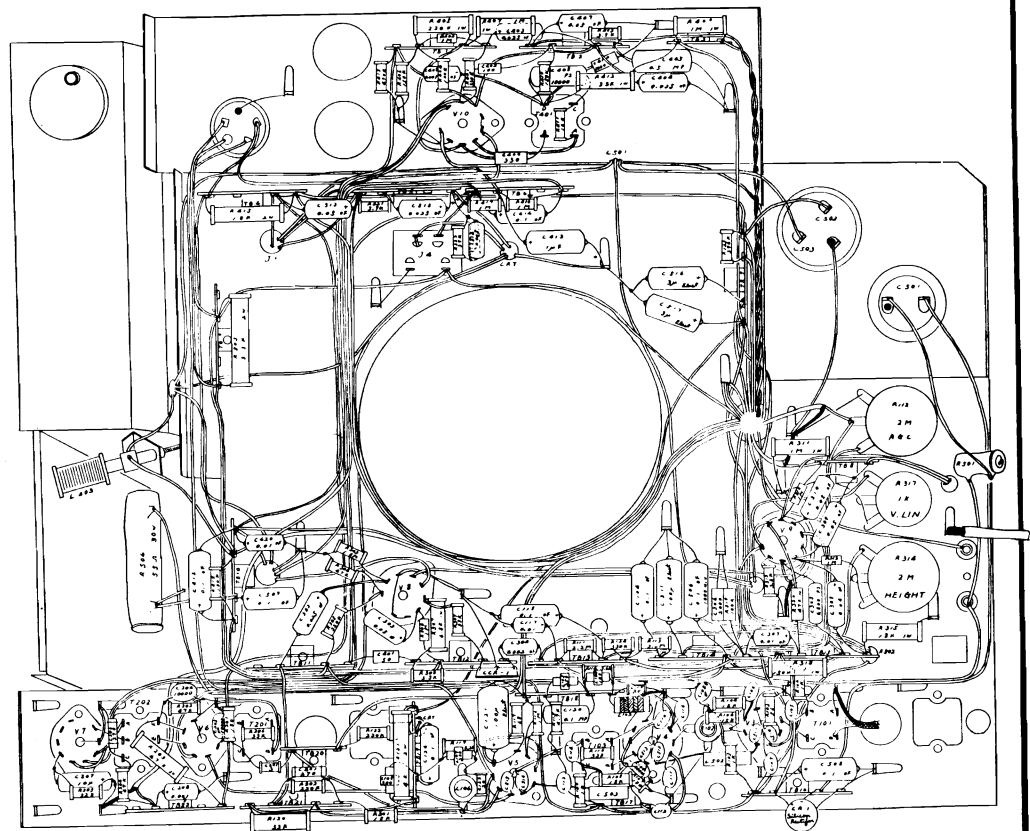
DELMONICO Model CTM-235 Servicing Information, Continued

TUBE LOCATION CHART

Television Chassis Top View



TV CHASSIS BOTTOM VIEW



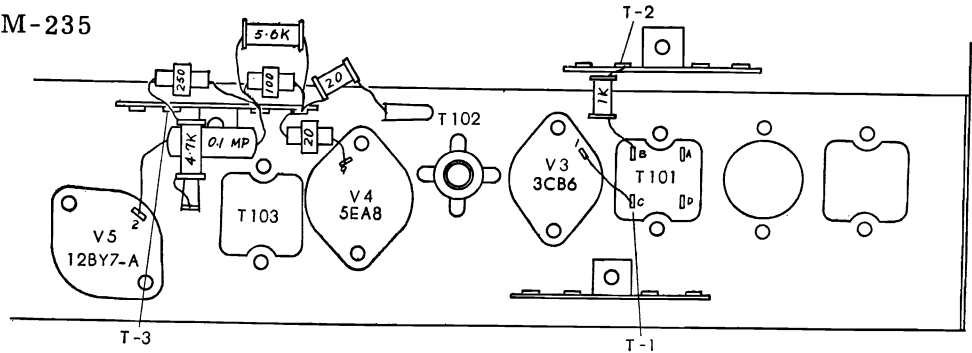
- J1 P1 : DEF. YOKE
- J2 P2 : TUNER
- J3 P3 : AUDIO OUT
- J4 P4 : FOCUS
- J5 P5 : AUX. V. LIN.
- J6 P6 : POWER
- J7 P7 : FM ANT.
- J8 P8 : SP
- J9 P9 : RBC
- J10 P10 : PICK UP
- J11 P11 : AC.
- J12 P12 : INTERLOCK
- J13 P13 : FM MULTI.
- J14 P14 : *
- J15 P15 : *
- J16 P16 : *

DELMONICO Model CTM-235

(Continued)

Video IF Alignment

1. Test Equipments
Oscilloscope
Sweep Generator
Marker Generator
2. Stagger Stage Alignment



Set channel selector of RF tuner to channel 2. Fig. 9 VIDEO IF CIRCUIT

Place output of sweep generator to T-1 and connect oscilloscope to T-3.

Place -3V voltage between T-2 and chassis. Adjust each IF transformer and coil so that the frequency will be maximum or minimum respectively and the response will be like Fig. 10.

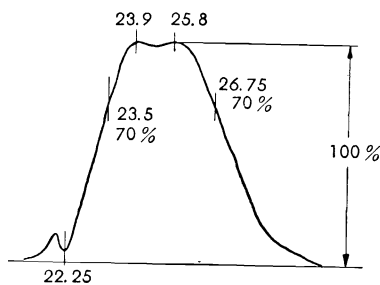


Fig. 10

IF Transformer to be adjusted

IF Transformer to be adjusted	Frequency to be adjusted to maximum or minimum
T103 (inside)	22.25Mc min.
T103 (outside)	23.9 Mc max.
T102	25.8 Mc max.
T102	26.75Mc 70%
T103 (outside)	23.5 Mc 70%

Chart 3

3. IF Overall Alignment

Remove the shield case of RF tuner mixer tube 5EA8 and cover it with adjustable cap as shown in illustration. Add output of sweep generator to A and B of adjustable cap and connect oscilloscope to T-3 on video circuit. Make IF transformer T-2 and T101 be 25Mc and adjust response to be same as Fig. 11.

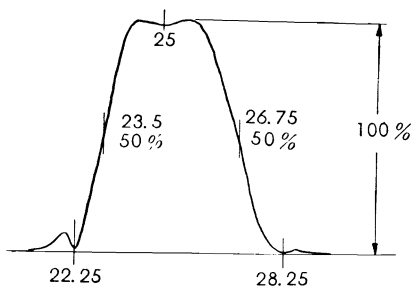
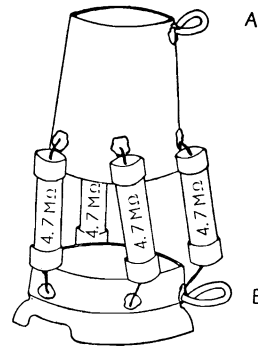


Fig. 11

IF Transformer and coil to be Adjusted

IF Transformer and coil to be Adjusted	Frequency to be adjusted
T101 (inside)	28.25Mc min.
T2 (tuner)	24.75Mc max.
T101 (outside)	24.75Mc max.
T2: T101 (outside)	26.75Mc 50%
T2: T101 (outside)	23.5Mc 50%

Chart 4

4.5Mc TRAP ALIGNMENT

1. Test Equipments
4.5Mc Oscillator
VTVM with RF probe
2. Alignment

Place oscillator to test point T-4 on video circuit and connect VTVM with RF probe to T-5. Adjust L106 so that the swing of VTVM indicator will be minimum. In this case, it is advisable to use large 4.5 Mc signal input and small VTVM voltage range.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

DELMONICO
Model CTM-235
 (Continued)

SOUND IF ALIGNMENT

1. Test Equipments
 4.5 Mc Oscillator
 VTVM with DC probe

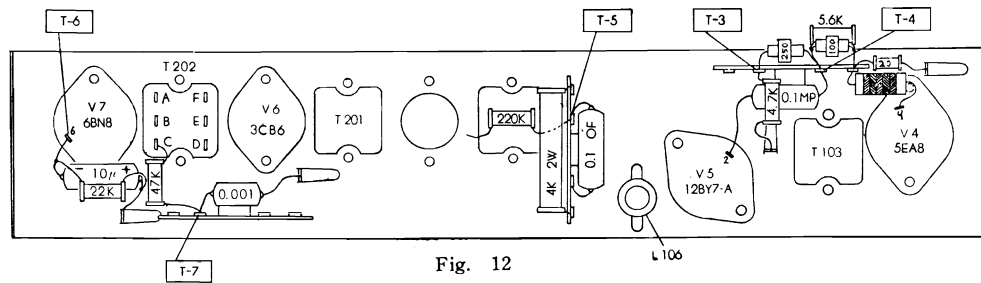


Fig. 12

2. Alignment

Connect VTVM to T-6 and place oscillator output from T-4 of video circuit. Adjust T201 and T202 (outside) so that swing of VTVM indicator will be maximum.

Connect two matched resistors 100K ohms in series between chassis and T-6 (pin 6 of 6BN8). Connect the ground side of VTVM to the junction of the resistors and the other side of VTVM to the junction of R204 (47KΩ) and C208 (.001mfd.), T-7.

Adjust the inside core of T202 for zero indication. (Oscillator output should be adjusted so that max. DC voltage between T-6 and chassis indicates 4 volts.)

HORIZONTAL OSCILLATOR ADJUSTMENT

After setting the screw of Horizontal. Osc. Transformer T401 at outside length of about 3/4" and inside length of 5/8", adjust H. HOLD control until picture pulls into sync.

Connect the low capacity probe of an oscilloscope to terminal "C" of T401 (T-8). The sine wave adjustment core (inside of T401) should be adjusted so that the pattern on the oscilloscope becomes as shown in Fig. 14. During this adjustment, the picture must be kept in sync. by readjusting the H. HOLD control if necessary.

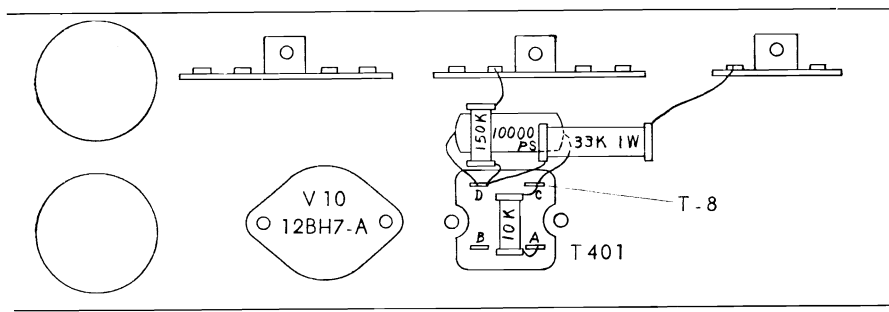
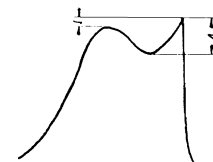


Fig. 13



CORRECT



INCORRECT

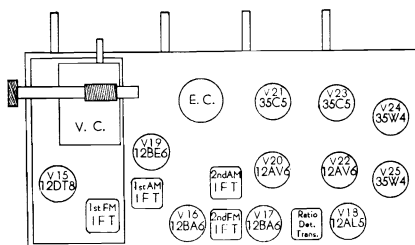


INCORRECT

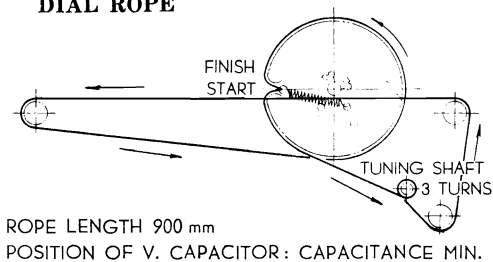
Fig. 14

The waveform adjustment should be checked whenever the receiver is aligned. Particularly if the broad peak of the waveform is higher than the sharp peak, the oscillator is over-stabilized and the broad peak may cause "double triggering" of the oscillator when the picture falls out of sync. Turn the H. HOLD control to the extreme clockwise position. The picture should be out of sync. with bars slanting downwards to the right. Adjust Hor. Freq. adjustment core (outside of T401) so that about 5 diagonal black bars are obtained. With higher frequencies the circuit may cause double triggering. (H. HOLD control races over the extreme clockwise or counter-clockwise position.)

AM/FM Radio Chassis Top View



DIAL ROPE



ROPE LENGTH 900 mm
 POSITION OF V. CAPACITOR: CAPACITANCE MIN.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

DELMONICO Model CTM-235 Alignment Information, Continued

AM/FM Radio and Audio amplifier chassis

SIGNAL GENERATOR

For all alignment operations, connect the low side of the signal generator to the receiver chassis. The output should be adjusted to provide accurate resonance indication at all times.

If the output measurement is used for AM alignment, the output of the signal generator should be kept as low as possible to avoid AVC action.

AM ALIGNMENT

Step	Connect high side of SG to —	Set SG to —	Set radio tuning to —	Adjust for max. output
1	Pin 1 of V16 (12BA6—AM IF Amp.) insides with 0.1 μ F	455 Kc (mod.)	Quiet point near high end	2nd AM IFT top and bottom cores (L _{17, 18})
2	Terminal of AM RF V. Cap. (C ₃₃) insides with 0.1 μ F			1st AM IFT top and bottom cores (L _{15, 16})
3	Ant. terminal of bar ant.	1500 Kc (mod.)	1500 Kc (signal)	C36 osc. trimmer C34 ant. trimmer
4		600 Kc (mod.)	600 Kc (signal)	L14 osc. coil L13 ant. coil
5	Repeat steps	3 and 4		

FM ALIGNMENT

RATIO DETECTOR ALIGNMENT

Set signal generator to 10.7 Mc approx. 0.1 volts.

Connect high side of signal generator to pin 1 of V17 (12BA6—2nd FM IF Amp.)

- Step 1. Connect the DC probe of V T V M to pin 7 of V18 (12AL5—FM ratio detector). Adjust bottom core of ratio detector trans. (L₉) for maximum DC voltage.
- Step 2. Connect the DC probe of V T V M to junction of C25 (250PF) and C26 (250PF). Adjust the top core of ratio detector trans. (L 10) for zero DC voltage.
- Step 3. Repeat steps 1 and 2.

IF ALIGNMENT

Set variable capacitor to minimum capacity and connect the DC probe of V T V M to terminal "E" of 2nd FM IFT. in series with 100K Ω . Adjust signal generator output 10.7Mc unmodulated to maintain approximately 0.5 volt DC indication.

Step	Connect high side of signal generator to —	Adjust for max. DC voltage
1	Pin 1 of V16 (12BA6 1st FM IF Amp.)	2nd FM IFT top and bottom cores (L _{7, 8})
2	Pin 7 of V15 (12DT8 —FM converter) in series 2K Ω	1st FM IFT top and bottom cores (L _{5, 6})

RF ALIGNMENT

Connect output of signal generator to FM ant. terminal through 120 ohms in each side of line.

Step	Set SG to	Set radio tuning to	Adjust—for max. output
1	90 Mc (mod.)	90 Mc (signal)	L3, 4 osc. L2 ant.
2	106 Mc (mod.)	106 Mc (signal)	C14 osc. C6 ant.

Emerson

(Material on pages 35 through 40)

AUTOMATIC TIMER OPERATION:

Models T-1800C, T-1806C and T-1826C are equipped with an automatic timer unit, part no. 471324, which can be set to turn the receiver off after a predetermined period of from one-half to three hours. For details, refer to the schematic diagram on pages 3-4.

WIRELESS REMOTE CONTROL -

Models R-1819C and R-1819D are wireless remote controlled sets equipped with a separate remote receiver chassis and remote transmitter assembly. Model R-1819C employs a vacuum tube-equipped remote receiver chassis, part no. 471345, in conjunction with transmitter assembly 963539. Model R-1819D, utilizes a completely transistorized remote control receiver, part no. 471425, used with transmitter assembly 963539X.

CHASSIS AND TUNER CROSS - REFERENCE CHART

CHASSIS NO.	VHF TUNER	UHF TUNER
120674-A	471332	None
120675-B	471416	471227
120675-E	471416	471424
120677-A	471338	None
120679-A	471338	None
120680-C	471351	None
120681-D	471413	471227
120681-G	471413	471424
120683-C	471351	None
120690-A	471332	None
120691-B	471416	471227
120694-C	471351	None

MODEL AND CHASSIS CROSS - REFERENCE CHART

MODEL NUMBER	CHASSIS NUMBER	CABINET STYLE	C.R.T. NUMBER
T-1800C	120680-C	Portable	19AVP4
T-1805C	120683-C		
T-1806C	120677-A		
T-1808C	120674-A	Console	23CP4
U-1808C	120675-B		
R-1819C,D	120679-A	Portable	19AVP4
T-1822C	120674-A	Console	23CP4
U-1822C	120675-B		
T-1823C	120674-A		
U-1823C	120675-B		
T-1824C	120674-A		
U-1824C	120675-B	Console	
T-1825C	120683-C	Portable	19AVP4
T-1826C	120680-C		
T-1827C	120690-A	Lowboy	27ADP4
U-1827C	120691-B		
T-1828C	120683-C	Portable	19AVP4
U-1828C	120681-D		
T-1832C	120674-A	Lowboy	23CP4
T-1833C	120694-C	Table Model	
T-1835C	120694-C	Console	
T-1837C	120683-C	Table Model	19AVP4
T-1838	120674-A	Console	23CP4
U-1838	120675-B,E		
T-1839	120694-C	Lowboy	
U-1850	120681-D,G	Portable	19AVP4
U-1851	120681-G		
U-1852	120681-G		

UHF RECEPTION - FACTORY EQUIPPED UHF RECEIVERS:

All UHF/VHF receivers described in this Service Note (those having the prefix letter "U") are equipped with a separate UHF tuner assembly, as indicated in the Tuner Cross-Reference Chart on this page.



MODEL AND CHASSIS CROSS - REFERENCE

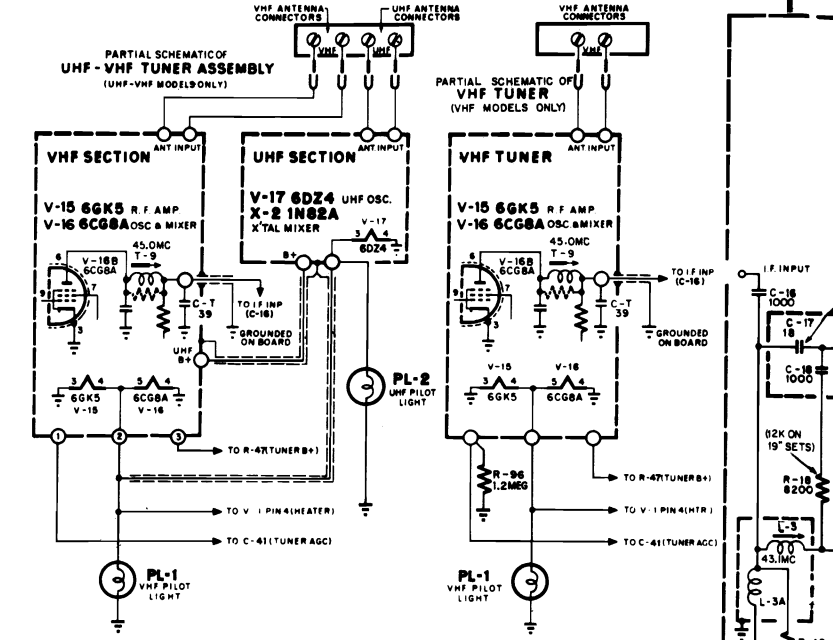
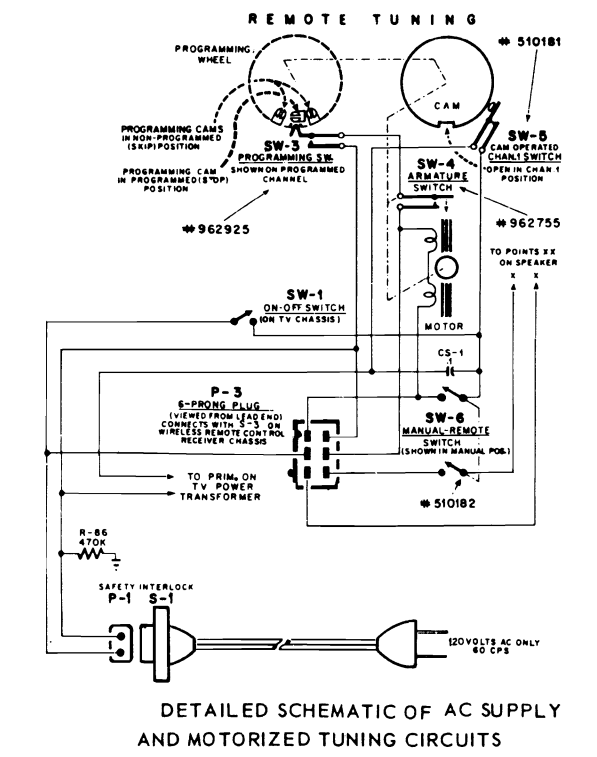
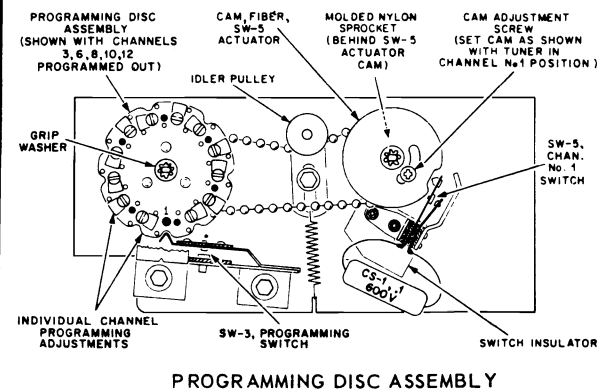
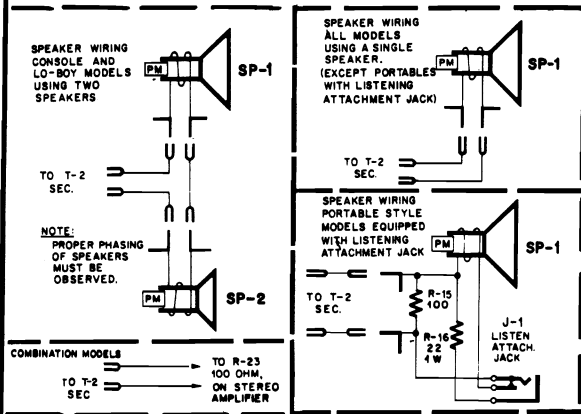
TYPE	MODEL NAME	MODEL NO.	CABINET STYLE	TV CHASSIS	C. R. T.	VHF TUNER
* VHF TV COMBINATIONS	FINLANDIA	B-190	LOWBOY	1	2 3 C P 4	4
	TOULON	B-191		2		7
	FLORENTINE	B-192		0		1
	VALLEY FORGE	B-193		7		4
VHF TV RECEIVERS	RICHMOND	B-195	CONSOLETTA	1	4	6
	BARRETT	B-196	CONSOLE	2		4
	TOURAINA	B-198		-A		4
UHF/VHF RECEIVERS	SPACEMATE 82	B-201	PORTABLE	120708-D	19DKP4	471461
	GALAXY 82	B-202		120725-B		471462

*NOTE : Models B-190 through B-193 are combination models utilizing 20-watt stereo amplifier chassis 120719, AM/FM/MPX tuner 120727-A and stereo record changer 819206 (Garrard model AT-5).

TYPE	MODEL NAME	MODEL NO.	CABINET STYLE	TV CHASSIS	C. R. T.	VHF TUNER
VHF TV RECEIVERS	NASSAU	B-220	TABLE MODEL	120712-A	23CP4	461464
	SPACEMATE	B-221	PORTABLE	120710-F	19DKP4 or 19EDP4	471468
	GALAXY	B-222		120721-F		

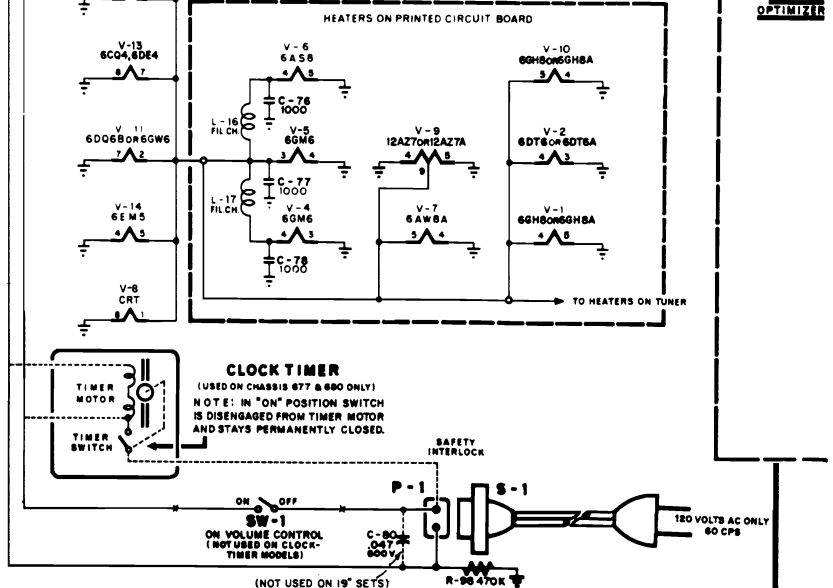
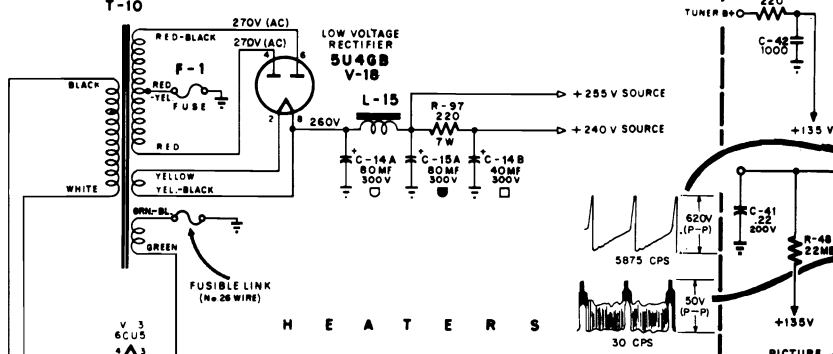
VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

EMERSON - DU MONT (Continued)



⊗ CERAMIC OR MICA CAPACITORS, CAPACITY IN PICOFARADS (pF)
⊗ TUBULAR CAPACITORS, CAPACITY IN MICROFARADS (MF)
⊗ RESISTORS IN OHMS (K = 1000) AND 1/2 WATT UNLESS OTHERWISE SPECIFIED
ALL CERAMICS AND MICAS 500V, ALL TUBULARS 400V UNLESS NOTED
T INDICATES TOP CORE, B INDICATES BOTTOM CORE IN DOUBLE TUNED TRANSFORMERS
ARROWS AT CONTROLS INDICATE CLOCKWISE ROTATION

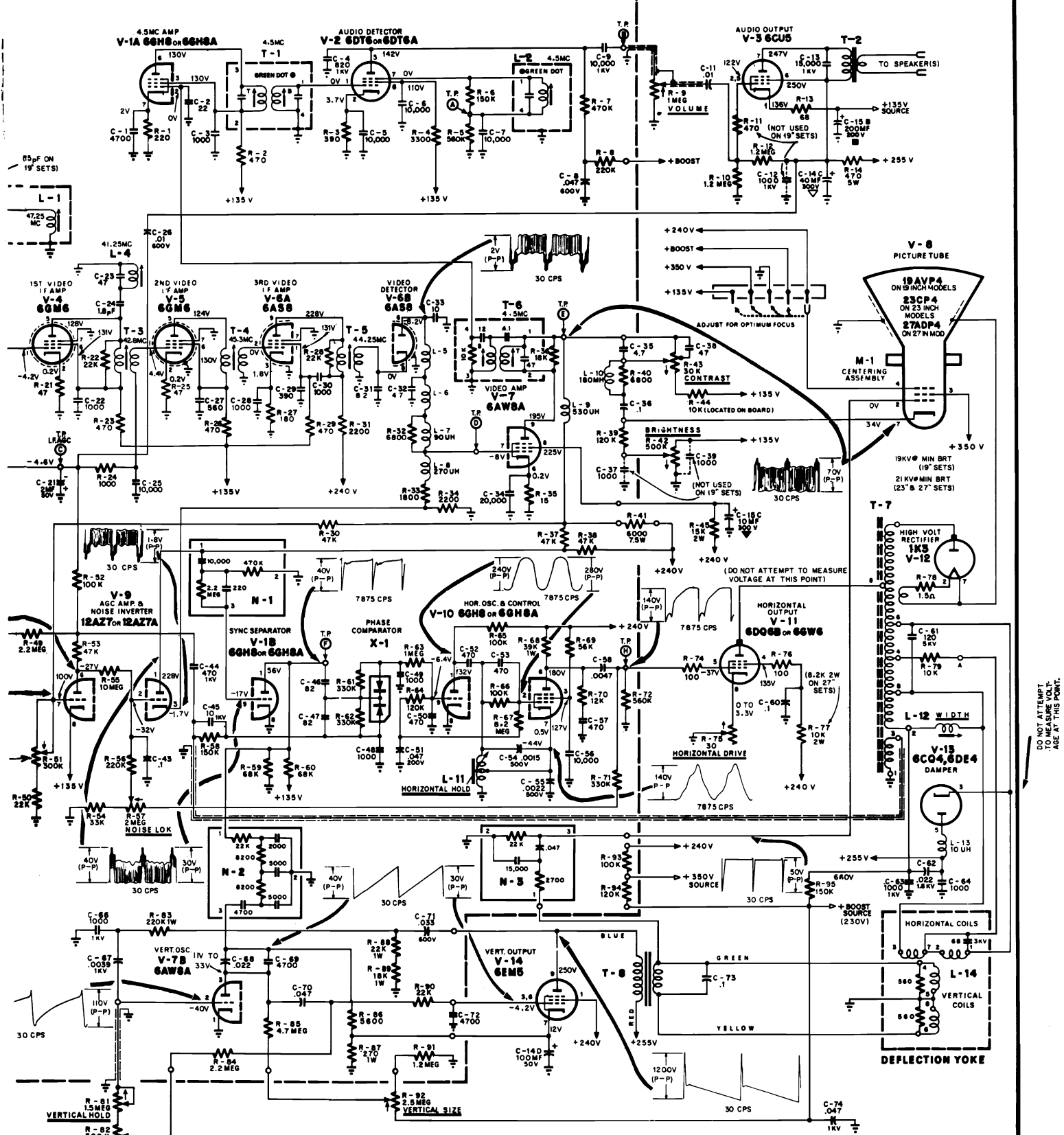
ON PORTABLE MODELS CONTROLS R-42, R-43, R-81, R-82, R-92 ARE LOCATED ON PRINTED CIRCUIT BOARD.



VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

EMERSON - DUMONT (Continued)

PRINTED CIRCUIT BOARD



CHASSIS No. 120674, 675, 677, 679, 680, 681, 683, 690, 691, 694.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

EMERSON - DU MONT Servicing Information, Continued

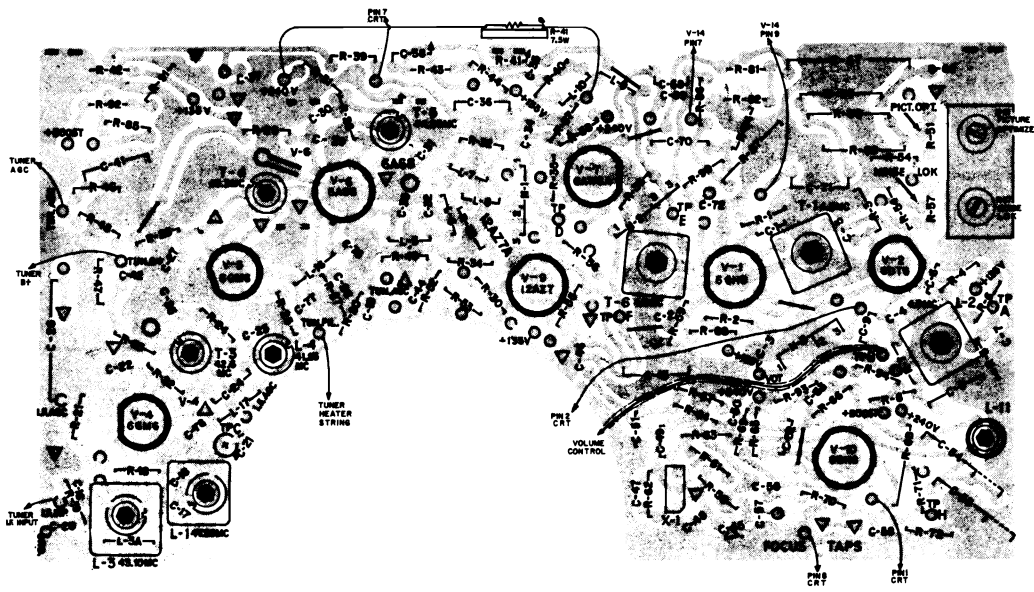


FIG. 1 - ETCHED PRINTED CIRCUIT BOARD, TOP VIEW

CONDITIONS FOR TV CHASSIS READINGS

VOLTAGES and WAVESHAPES were taken under actual operating conditions (normal picture and sound). AGC voltage developed at junction of C-19, C-21 and R-20 was minus 4.6 volts. Voltage and waveshape readings obtained may vary $\pm 10\%$ in value due to component tolerances and strength of input signal to chassis under test. Frequencies indicated for waveshapes shown in schematic diagram are approximate sweep settings for oscilloscope used (one-half actual frequency of signal being measured).

RESISTANCE READINGS were taken with no power applied. Where readings are affected by control settings, both maximum and minimum values are given. All resistance readings may vary $\pm 10\%$ due to normal component tolerances. ALL MEASUREMENTS were taken between points indicated and chassis (unless otherwise indicated), with line voltage maintained at 120 volts AC. A VTVM was used for all voltage and resistance measurements and a low capacity probe was used for all waveshapes shown.

SYM.	TUBE TYPE	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V-1	6GH8	51K	10K	* 540	.1	0	* 540	220	0	2.7M
V-2	6DT6	3.4	390	0	.1	‡920K	*3.3K	560K	—	—
V-3	6CU5	140K	1.2M	.1	0	N.C.	‡ 470	‡ 630	—	—
V-4	6GM6	33K	47	0	.1	* 540	* 540	0	—	—
V-5	6GM6	34K	47	.1	0	* 540	* 540	0	—	—
V-6	6AS8	* 540	0	180	.1	0	4K	0	0	‡2.4K
V-7	6AW8	0	500K TO 2M	5.9M TO 8.4M	0	.1	15	4K	‡15.2K	‡4.6K
V-8	C.R.T.	.1	22K	3.5M	0 TO 3.5M	—	—	120K TO 250K	0	—
V-9	12AZ7	30K	250K TO 1.2M	2.2K	0	0	180K	17K TO 60K	* 68	.1
V-10	6GH8	‡100K	100K	‡ 56K	0	.1	‡39K	120	0	1.8M
V-11	6DQ6/66W6	T.P.	.1	T.P.	‡10.3K	450K	T.P.	0	0 TO 30	—
V-12	1K3	← INFINITE →								—
V-13	6CQ4/6DE4	N.C.	N.C.	‡380K	N.C.	‡ 5	N.C.	.1	0	—
V-14	6EM5	‡220	T.P.	N.C.	.1	0	2.3M TO 2.8M	270	N.C.	‡310
V-18	5U4	N.C.	40K	N.C.	20	N.C.	20	N.C.	40K	—

NOTES: ALL RESISTANCE READINGS ARE IN OHMS, UNLESS OTHERWISE SPECIFIED.
 "K" DENOTES KILOHMS; "M" DENOTES MEGOHMS.
 N.C. - DENOTES NO CONNECTION AT TERMINAL INDICATED.
 T.P. - DENOTES TERMINAL INDICATED USED AS TIE POST.
 * - MEASUREMENTS TAKEN WITH COMMON LEAD OF METER CONNECTED TO PIN 1 OF V-3 (6CU5).
 ‡ - MEASUREMENTS TAKEN WITH COMMON LEAD OF METER CONNECTED TO JUNCTION OF L-15 AND R-97 (B-PLUS 255 V).

EMERSON - DUMONT Servicing Information, Continued

GENERAL ALIGNMENT NOTES:

- A. Set tuner to highest unused channel and allow both chassis and equipment to warm up for ten minutes or more.
- B. Connect -3 volts bias through a 10K resistor to the AGC test point (junction of C-19 C-21 and R-20).
- C. Maintain signal generator output no higher than necessary to produce a reading not to exceed two volts on VTVM and use insulated alignment tools for adjusting.
- D. Video IF alignment requires the use of a shim for signal injection. This can be easily constructed by pasting a thin piece of metal foil, (approx. 1/2 x 2") on a slightly larger piece of heavy paper. Insert this shim between the tuner mixer tube and its shield in such a manner that the foil side faces the tube.

VIDEO IF ALIGNMENT

1. Connect high side of signal generator to metal foil on shim, low side to chassis through a .001 mfd. capacitor.
2. Place a VTVM (-5 volt range) at video detector test point (junction of L-7 and L-8), common lead to chassis.
3. Peak the following for MAXIMUM response at the frequencies specified:
T-5 at 44.25 MC, T-4 at 45.3 MC, T-3 at 42.8 MC
4. Tune the following for MINIMUM response, increasing signal generator output as necessary:
L-4 at 41.25 MC, L-1 at 47.25 MC, L-3 at 45.0 MC
5. Peak T-9 on tuner for MAXIMUM output at 45.0 MC.
6. Set generator at 43.1 MC and re-tune L-3 for MAXIMUM output.

To observe the IF response curve connect an oscilloscope, thru a 10,000 ohm isolation resistor, in place of the VTVM. Inject a sweep signal (40 to 50 MC) along with a loosely coupled marker generator at the mixer tube in the manner described above. Adjust the output of the sweep generator to produce about 2 volts peak to peak curve on the oscilloscope and reduce the marker signal so as not to upset the response curve. The 45.75 MC marker should appear between 55% and 65% down with respect to the peak.

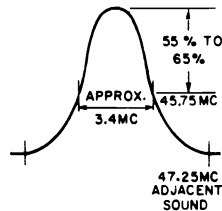


FIG. 5 - OVERALL I.F. RESPONSE CURVE

SOUND IF ALIGNMENT

1. Using a strong T.V. transmitted signal, adjust T-6, sound take-off transformer, bottom, and T-1, sound interstage transformer, top and bottom, for the loudest sound.
2. Adjust L-2, quadrature coil, for clearest and loudest sound. If two peaks are encountered, use the position where the slug is closer to the circuit board.
3. With the antenna loosely coupled to the set, (simulating a weak signal) repeat step No. 1, tuning for maximum volume and minimum distortion.
4. If a VTVM is available, measure the voltage across R-5, 560K resistor. Voltages should be between -3 and -10 volts and not vary by more than 3 volts between a strong and weak signal.
5. Check sound on all channels and repeat entire procedure if necessary.

FOCUS ADJUSTMENT

Any one of four different voltages (available at the quadruple terminal strip mounted directly below the 6CG7 tube) may be utilized as a focus potential. Remove the insulated clip-lead connector (attached to one of the terminals on this strip) and alternately try connecting it to each possible terminal, leaving it connected to the one which gives the best overall focus.

4.5 MC VIDEO TRAP ALIGNMENT

1. Tune in a local station and adjust the fine-tuning control until a 4.5 MC beat is visible in the picture.
2. Adjust T-6 (top) for minimum 4.5 MC beat on screen.

HORIZONTAL SIZE ADJUSTMENT

The chassis described in this Service Note have been designed to provide proper horizontal sweep under the normal variations usually encountered in line voltages. Should unusually low or high line voltages be encountered, it may be necessary to re-adjust the width control (L-12) for proper horizontal sweep. Turning the control clockwise (inward) will result in increased width, while turning the control counter-clockwise (outward) will reduce the width. When adjusting the width, the Horizontal Drive control setting should also be checked, as outlined below.

HORIZONTAL DRIVE ADJUSTMENT

The horizontal drive control, located just below the horizontal output tube, should normally be in its most clockwise position (minimum resistance in circuit). If overdrive bars (indicated by white vertical lines in the raster) appear at this setting, slowly rotate R-75 in a counterclockwise direction until the lines just disappear.

VERTICAL SIZE AND LINEARITY ADJUSTMENTS

Vertical size and linearity may be adjusted by inserting a fiber alignment tool into the hollow shafts of the brightness and vertical hold controls, respectively. Insert alignment tool into the hollow brightness control shaft to adjust vertical size, and into the hollow vertical hold control shaft to adjust vertical linearity.

PICTURE OPTIMIZER AND NOISE-LOK ADJUSTMENTS

1. Rotate the Picture Optimizer and Noise Lok controls fully counterclockwise (as viewed from rear of cabinet).
2. Tune to the strongest channel and rotate the Picture Optimizer slowly clockwise until the receiver begins to overload (sync instability, sound buzz, kinks in picture), then back off slightly counterclockwise to eliminate overload, continuing an additional approximate ten degrees beyond this point to assure a proper safety factor. If the receiver does not overload when the control has been rotated fully, leave it in this position.
3. With the receiver still tuned to strongest channel, rotate the Noise Lok control slowly clockwise until the picture begins to overload (sync instability, sound buzz, kinks in picture), then back off slightly to eliminate this condition. With controls properly set, switch channels to verify setting for strongest signals. This optimizes operation of the Noise Lok for mixed signal conditions (strong and weak). However, in extreme fringe areas it is possible to improve the picture stability by further clockwise adjustment of the control.

FIELD MODIFICATION NOTE

All chassis described in this Service Note are equipped with an I-F input coil which has been designed to allow for the addition of a second adjacent channel sound trap without removing the chassis from the cabinet. This input coil, which is housed in a two-piece shield can with removable top, has been wound around a coil form which extends beyond the windings sufficiently to allow the added adjacent channel sound trap (part no. 720396) to be cemented in place around it. An additional tuning slug (part no. 404052) is then inserted into the open end of the coil form and tuned for minimum adjacent channel sound interference, and the removable metal top section of the coil shield replaced. Parts necessary for this modification may be ordered from Emerson distributors in such areas where the need for these items may exist.

Emerson

MODEL AND CHASSIS CROSS-REFERENCE

MODEL NO.	CHASSIS NUMBER	C.R.T.
T-1840	120671A, B or E	16ANP4
T-1840A	120671E	
U-1840	120673C or D	
U-1840A	120740F or 753J	(or)
T-1841	120702A or E	16BRP4
T-1841A	120702E	
T-1855	120671E	19DNP4 (or)
U-1855	120673D or 753J	
T-1860	120697A or E	
U-1860	120698D	19EHP4
*C-2011	120743E	23FKP4
*D-2011	120744G	

* Models C-2011 and D-2011 are combination models utilizing stereo amplifier chassis 120716, AM-FM tuner chassis 120730 and stereo record changer 819217.

CHASSIS AND TUNER CROSS-REFERENCE

CHASSIS NO.	VHF TUNER	UHF TUNER
120671A	471404	NONE
120671B	471405	
120671E	471507	
120673C	471417	471410
120673D	471411	NONE
120697A	471404	
120697E	471507	
120698D	471411	471421
120702A	471404	NONE
120702E	471507	
120740F	471411	471506
120743E	471507	NONE
120744G	471531	471532
120753J	471537	471541

All UHF/VHF receivers listed in the cross-reference chart (those having the prefix letter "U" or "D") are equipped with a built-in UHF tuner. For details, refer to the chassis and tuner cross-reference chart on this page.

PRODUCTION CHANGES

A Ch. 120671 and 120673 coded with a triangle containing the letter "A" (or any higher letter), as well as all other chassis coded with an empty triangle (indicating initial production), incorporate the following circuit modification:

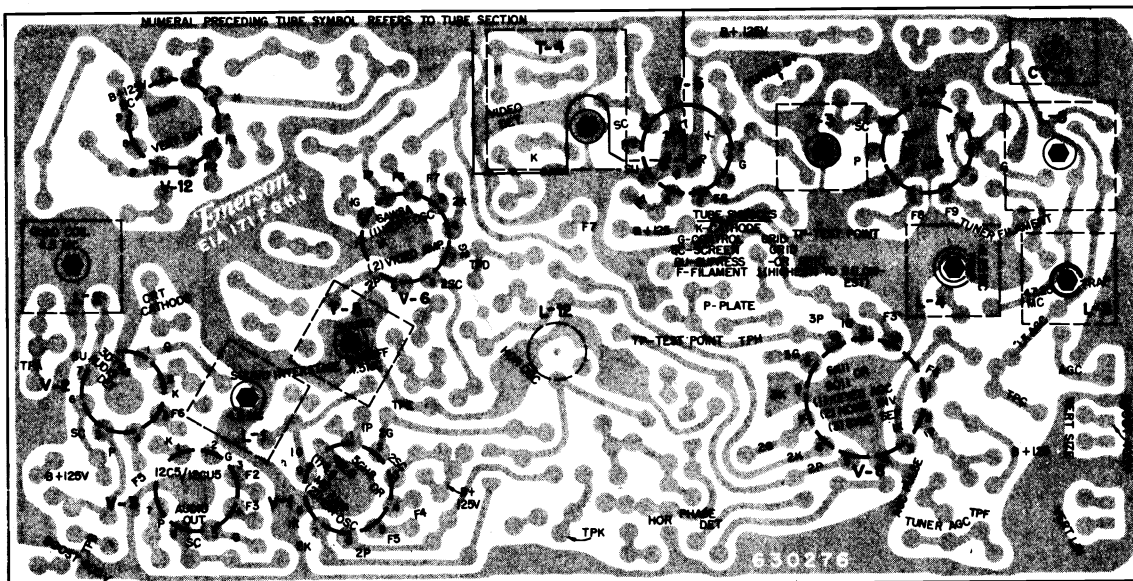
To increase the sensitivity of the sound I-F amplifier, R-1 was changed to 33,000 ohms, ½ watt.

B Ch. 120671 and 120673 coded with a triangle containing the letter "B" (or any higher letter),

To allow a wider range of vertical output tube manufacturing variations, R-71 was changed to 47 ohms, ½ watt.

C Ch. 120673 coded with a triangle containing the letter "C" (or any higher letter), as well as Ch. 120740, 743 and 744 coded with an empty triangle (indicating initial production), incorporate the following circuit modification:

To provide safeguard against the possibility of "snivets" on UHF reception in difficult areas, the horizontal output tube (V-9) was changed to a type 16GY5. This tube is not directly interchangeable with the previously used 13GB5 and requires the use of a different socket (part no. 500144).



ETCHED PRINTED CIRCUIT BOARD (BOTTOM VIEW)

EMERSON Chassis 120671A, etc., Alignment Instructions

ALIGNMENT INFORMATION

ADJUSTMENT PROCEDURE - I-F STAGES, TRAPS AND TUNER OUTPUT COIL

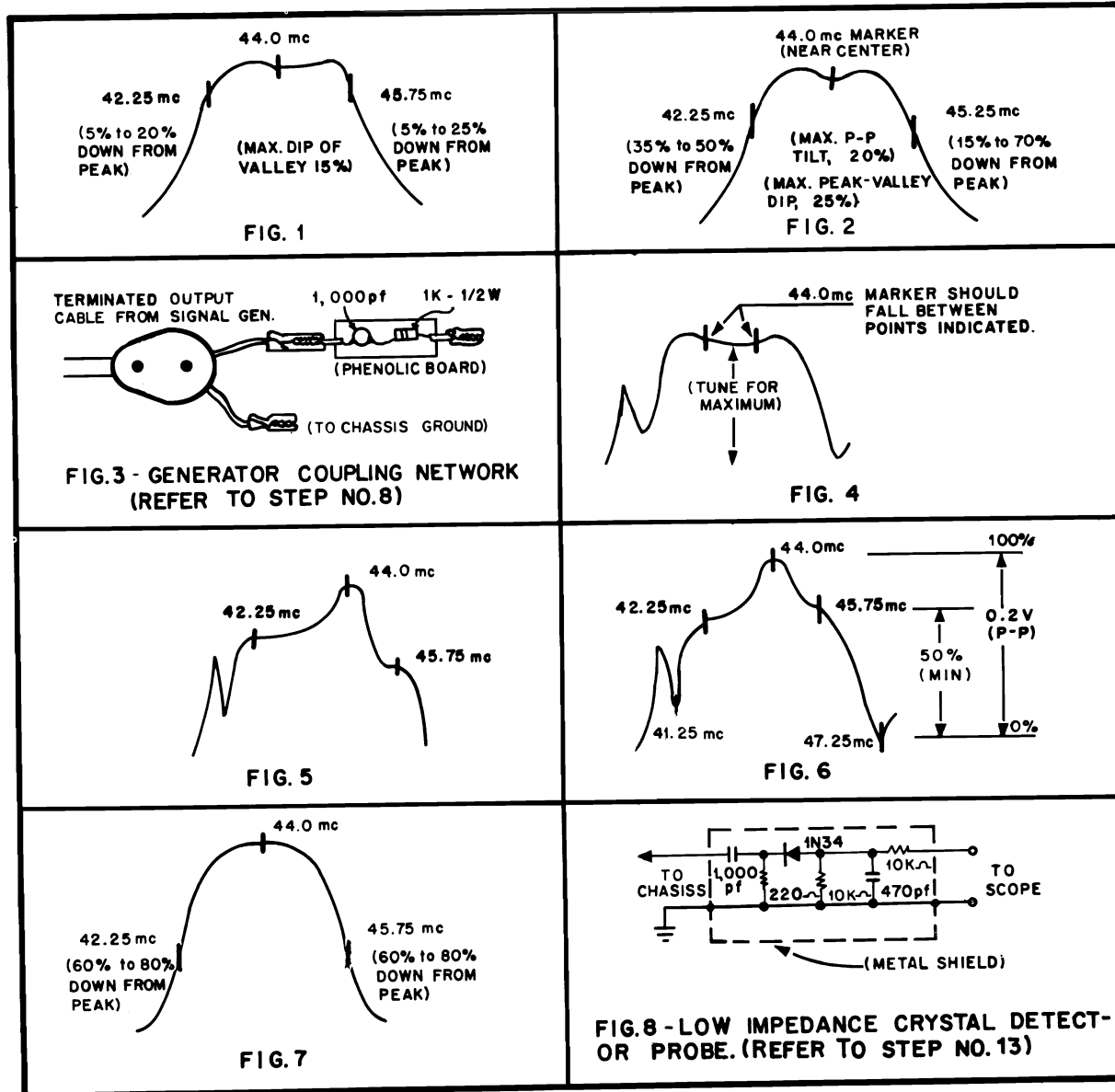
1. Connect an oscilloscope (through a 10k isolation resistor) to pin 7 of V-6B (grid of video amplifier). Scope should be adjusted so that 2 inches of vertical deflection represents approximately 2 volts P-P output.
 2. Connect -4.5 volts bias to the I-F AGC test point (Test point "C"), the junction of C-11 and C-13.
 3. Connect a terminated sweep generator, adjusted to sweep between 40 and 50 mc, to pin 2 of V-5 (grid of second I-F amplifier) through a 1,000 pf isolation capacitor. Note: If sweep generator does not have internal markers, a separate marker should be loosely coupled to the output of the sweep generator.
 4. Adjust T-4 top and bottom simultaneously for maximum gain and symmetry about the 44.0 mc marker as shown in Fig. 1. (Use core positions nearest outside ends of coil.) With input signal maintained to produce 2 volts P-P output during final adjustment, bandwidth markers should fall between the tolerances indicated.
 5. Disconnect generator output leads from grid of second I-F amplifier and connect them to pin 2 of V-4 (grid of first I-F amplifier).
 6. Adjust T-3 top and bottom simultaneously for over-coupled response as shown in Fig. 2. (Use core positions nearest outside ends of coil.) With input signal maintained to produce 2 volts P-P output during final adjustment, bandwidth markers should fall between the tolerances indicated.

Note: The correct overcoupled response is indicated when slight racking of T-3 core settings do not change the amplitude of the 44.0 mc marker, but cause the response to rock or slide about this marker.
 7. Reduce the amount of bias applied to the I-F AGC test point (test point "C") to -1.5 volts.
 8. Disconnect generator output leads from grid of the first I-F amplifier and couple them to the mixer tube (V-14) of the VHF tuner, using the signal injection shim described below. If this is impractical, connect the generator output leads to the I-F mixer point on the tuner, using the coupling network shown in Fig. 3.

Note: A signal injection shim may be easily constructed by pasting a thin piece of metal foil (approx. 1/2" x 2") on a slightly larger piece of heavy paper. Insert this shim between the mixer tube and its shield in such a manner that the foil side faces the tube, and rotate for maximum signal coupling.
 9. Open trimmer CT-1 three turns from its fully closed position and adjust output of generator to produce approximately 2 volts P-P indication on 'scope.
 10. Adjust the tuner output coil (T-8) for maximum gain and symmetry about the 44.0 mc marker.
 11. Adjust the 41.25 mc trap (L-3) and the 47.25 mc trap (L-4) for minimum output at these frequencies (as indicated by their respective markers on the 'scope), increasing generator output as required to insure maximum effectiveness of the trap settings.
 12. Reduce output of generator to produce approximately 2 volts P-P deflection on 'scope and re-adjust the tuner output coil (T-8) for maximum gain and bandwidth about the 44.0 mc marker.
 13. Disconnect oscilloscope from pin 7 of V-6B and connect to pin 7 of V-4 (plate of first I-F amplifier), using a low impedance crystal detector probe as shown in Fig. 8. 'Scope should be calibrated so that 2 inches of vertical deflection now represents approximately 0.2 volts P-P.
 14. Reduce output of generator until a usable display is produced on the oscilloscope and again adjust the tuner output coil (T-8), this time tuning for maximum gain midway between the peaks of the band-pass as indicated in Fig. 4. The 44.0 mc marker should fall between the tolerances indicated.
 15. Maintain generator output to produce approximately 0.2 volts P-P indication on the oscilloscope (as above) and adjust the grid coil (L-5) to center the 44.0 mc marker on the peak of the response as indicated in Fig. 5, disregarding the tilt of the overall waveshape.
 16. Adjust the input trimmer (CT-1) to position the 42.25 and 45.75 mc markers at equal amplitudes and center the 44.0 mc marker with the tuner output coil (T-8), if necessary.
 17. With generator output increased to maximum, check the position of the 41.25 mc and 47.25 mc traps (L-3 and L-4), and re-adjust if necessary.
 18. Re-adjust generator output to produce a 0.2 volt P-P indication on the scope and observe the response. The curve obtained should conform to Fig. 6.
 19. Disconnect the crystal detector probe and connect the oscilloscope to pin 7 of V-6B (grid of the video amplifier) directly through a 10K isolation resistor.
 20. Increase bias voltage to -4.5 volts and adjust the oscilloscope so that 2 inches of vertical deflection is equivalent to approximately 2 volts P-P output. Adjust output of signal generator until a 2 volt P-P indication is obtained on the 'scope. Response curve and marker positions should conform to Fig. 7.
 21. Remove AGC bias from test point "C". Output signal as indicated on the 'scope should increase, and noise signal on baseline should have an amplitude of at least 1/8 inch.
- CAUTION - No attempt should be made to improve a response curve which conforms to that shown in Fig. 7. Minor deviations may be corrected by slight touch-up of specific coils to make response conform to Fig. 7, as indicated below:
- a) To position the 45.75 mc marker adjust T-3, bottom slug.
 - b) To position the 42.25 mc marker adjust T-4, bottom slug.
 - c) To correct tilt, adjust T-8, the tuner output coil.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

EMERSON Chassis 120671A, etc., Alignment Information, Continued



ADJUSTMENT PROCEDURE - SOUND TAKE-OFF, SOUND INTERSTAGE, SOUND DETECTOR & 4.5 MC TRAP

1. With antenna connected directly to VHF terminals of receiver, set the channel selector to a strong local station and adjust the fine-tuning control until a 4.5 mc beat is just visible in the picture being viewed.
2. Adjust the 4.5 mc sound trap (T-5, top slug) until the 4.5 mc beat in the picture is either at minimum or is completely eliminated.
3. Adjust the sound quadrature coil (L-2) for loudest sound consistent with minimum buzz, using the second peak from the top of the coil.
4. Using some form of attenuation between the antenna and the VHF input terminals, gradually reduce the level of the input signal until distortion is noticeable in the audio output.
5. Adjust the sound take-off transformer (T-5, bottom slug) and the sound interstage coil (L-1) for loudest and clearest sound.
6. Keep reducing the level of the input signal until sound distortion again occurs, and re-tune T-5 bottom slug and L-1 for loudest and clearest sound. Repeat this procedure until no further improvement can be noted.
7. Re-connect antenna directly to VHF terminals of receiver (attenuator removed) and touch-up quadrature coil (L-2) for minimum buzz in sound.

EMERSON Servicing Information, Continued

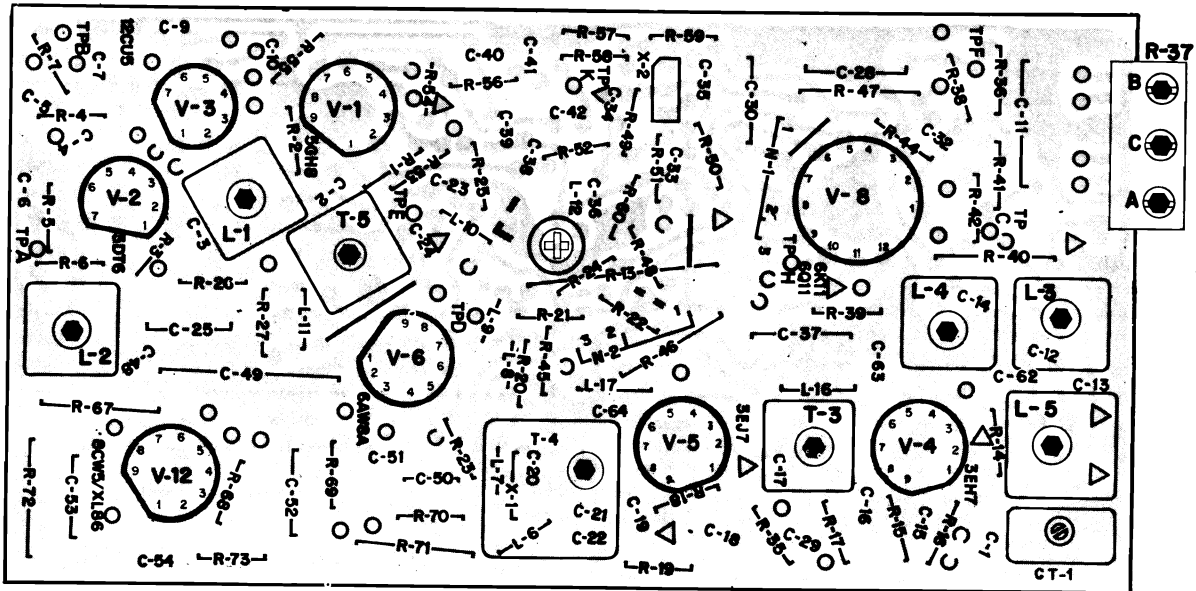


FIG. 12 - ETCHED PRINTED CIRCUIT BOARD (TOP VIEW)

CONDITIONS FOR CHASSIS READINGS

VOLTAGES AND WAVESHAPES were taken under actual operating conditions, with normal picture and sound being received. AGC voltage developed on the I-F AGC line (test point C) was minus nine volts. Input voltage to chassis under test was 120 volts, 60-cycle AC. Frequencies indicated for the waveshapes shown are approximate sweep settings for the oscilloscope being used (one-half actual frequency of signal being measured).

RESISTANCE MEASUREMENTS were taken with no power. Where readings are affected by control

settings, both maximum and minimum values are shown.

ALL MEASUREMENTS were taken between points indicated and chassis ground (unless otherwise noted), using an RCA Voltomyst or equivalent; VTVM. A low-capacity probe was used for all waveshapes shown in the schematic diagram. All readings obtained may vary ±10% due to normal component tolerances and strength of input signal to chassis under test.

SYMBOL NO.	TUBE TYPE	PIN-1	PIN-2	PIN-3	PIN-4	PIN-5	PIN-6	PIN-7	PIN-8	PIN-9	PIN-10	PIN-11	PIN-12
V-1	5GH8 OR 48L8	* 33K	390K	* 0	(FILAMENT)		* 22K	2.2K	0	100K			
V-2	3DT6A	14	390	(FILAMENT)		1.2M	3.3K	560K					
V-3	12CU5 OR 12CS	180	20Ω TO 1M	(FILAMENT)		20Ω TO 1M	* 610	* 760					
V-4	3EH7	142	100K	142	(FILAMENT)		0	* 470	* 470	0			
V-5	3EJ7	100	0	100	(FILAMENT)		0	* 220	* 220	0			
V-6	6AW8A	0	500K TO 2M	5M TO 6.2 M	(FILAMENT)		15	90	* 2.2K	* 4.4K			
V-7	C. R. T.	(FIL.)	3.4K	4.40K	0			90K TO 300 K	(FIL.)				
V-8	6K11 OR 6Q11	(FIL.)	200K	5K TO 32K	0	* 35K	1.3K	850K	0	2.7M	* 30K	24 K	(FIL.)
V-8 (†ALT.)	4HA7 OR 4HC7	(FIL.)	200K	5K TO 32K	0	N.C.	N.C.	N.C.	0	2.7M	* 30K	24 K	(FIL.)
V-9	13GB5/ XL500	220K TO 600K	220K TO 600K	0	(FILAMENT)		* 1.1	* 1.1K	0	(CAP) 800K			
V-9 (†ALT.)	16GY5	(FIL.)		* 1.1K	0	220K TO 600K		* 1.1K	(CAP) 800K	220K TO 600K	10	* 1.1K	(FIL.)
V-10	1K3		INF		INF			INF		(CAP) 800K			
V-11	16AQ3/ XY88				(FILAMENT)				* 120	(CAP) 800K			
V-12	8CW5/ XL86		220K TO 270 K	47 OR 100	(FILAMENT)			* 360		* 0			

NOTES: All resistance readings are in ohms, unless otherwise specified, "K" denotes kilohms; "M" denotes megohms.
 * "N.C." denotes no connection to terminal indicated.
 * Indicates measurements taken with common lead of meter connected to junction of R-80 and C-60B (B + 125V point).
 † Indicates alternate tube types used on some chassis.

GENERAL ELECTRIC

AA CHASSIS

MODELS

M721AEB
M723AMD
M723AWD
M731AMD
M731AWD
M733AMD
M733AMP
M733AWD

MODELS

M735ACL
M735AWD
M735AMP
R735ACL
R735AWD
M737AWL

MODELS

M759AMD
M759AMP
M759AWD
M761AMD
M761AMP
M761AWD

MODELS

M743AMD
M743AMP
M743AWD
M743AWL
M763AMD
M763AMP
M763AWD
R763AMD
R763AWD

DISASSEMBLY PROCEDURE

CABINET BACK: Disconnect any antenna wires. Then remove the screws securing the back to the cabinet and carefully detach the back.

CHASSIS: First remove the back as described. Remove the chassis retaining screws. On table models the screws are removed from the bottom of the cabinet and for consoles the chassis retaining screws are removed from the top back corners of the chassis. The front lip of the chassis is retained by clips on console models. Remove the control knobs and the screws holding the control assembly to the escutcheon. Discharge and remove the picture tube anode; take off the picture tube socket; yoke; antenna board; disconnect the LDR and the loudspeaker. The chassis and control assembly is now removed from the cabinet.

PICTURE TUBE: Remove the cabinet back and chassis as described; then place the cabinet face down on a soft cloth-covered surface. A wood block, two inches thick, is placed under the cloth where the top middle of the cabinet front will rest. Remove one 5/16-inch hex head screw from the tube sling. The picture tube is now removed from the cabinet.

HEIGHT AND VERTICAL LINEARITY: Adjust R208 and R214 simultaneously for proper vertical size and linearity. Picture should extend 1/8-inch beyond top and bottom edges of mask.

WIDTH CONTROL: Adjust this control for largest picture necessary to fill mask.

HORIZONTAL HOLD:

1. Remove the cabinet back.
2. Tune the receiver to a weak signal and adjust the controls for normal operation.
3. Short Test Point VI to the chassis with a jumper wire.
4. Connect a 1000 ohm resistor from Test Point VIII to Test Point IX (in parallel with L251.)
5. Adjust HORIZONTAL HOLD potentiometer, R257, until picture just "floats" back and forth across the screen. Leave R257 set in this position.
6. Remove the 1000 ohm resistor from Test Point VIII and Test Point IX. Adjust L251 (stabilizer coil) so that the picture again just "floats" across the screen, turning the core toward the printed board. Leave L251 set in this position.
7. Remove the chassis jumper from Test Point VI. Repeat adjustments if the picture does not "lock".

AGC CONTROL:

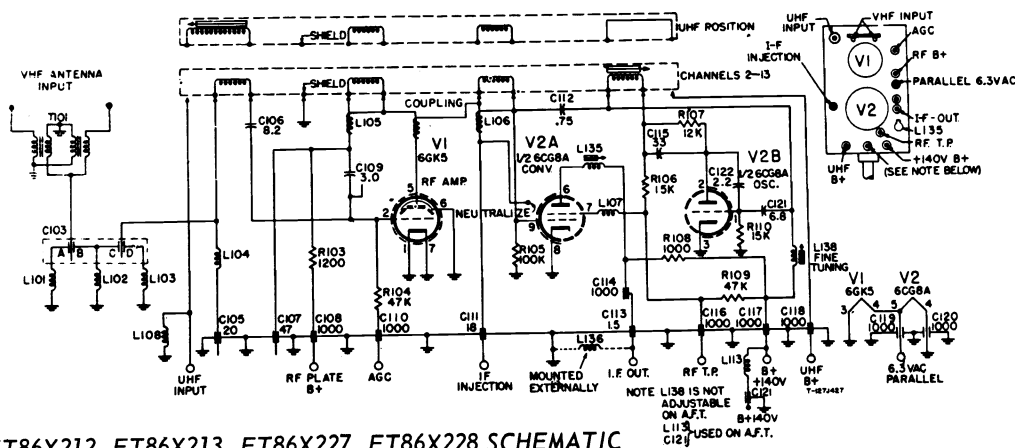
Field Adjustment: Tune in the strongest available signal and adjust R201 to the point where overloading is indicated by "tearing" of the picture. Then back off the AGC control to just beyond the point where the overload condition disappears. Before adjusting the AGC control, set the automatic brightness control defeat switch to the "defeat" position.

Instrument Adjustment:

1. Tune in a broadcast signal, preferably a monoscope signal that is monitored to assure that the percentage of sync does not exceed 25 percent.
2. Connect an oscilloscope to Test Point IV. Synchronize the scope at a vertical rate and observe at least two vertical sync pulses.
3. Adjust the fine tuning for smear and the AGC control for the point where the sync pulses begin to compress. Then back off the AGC control slightly from this point.

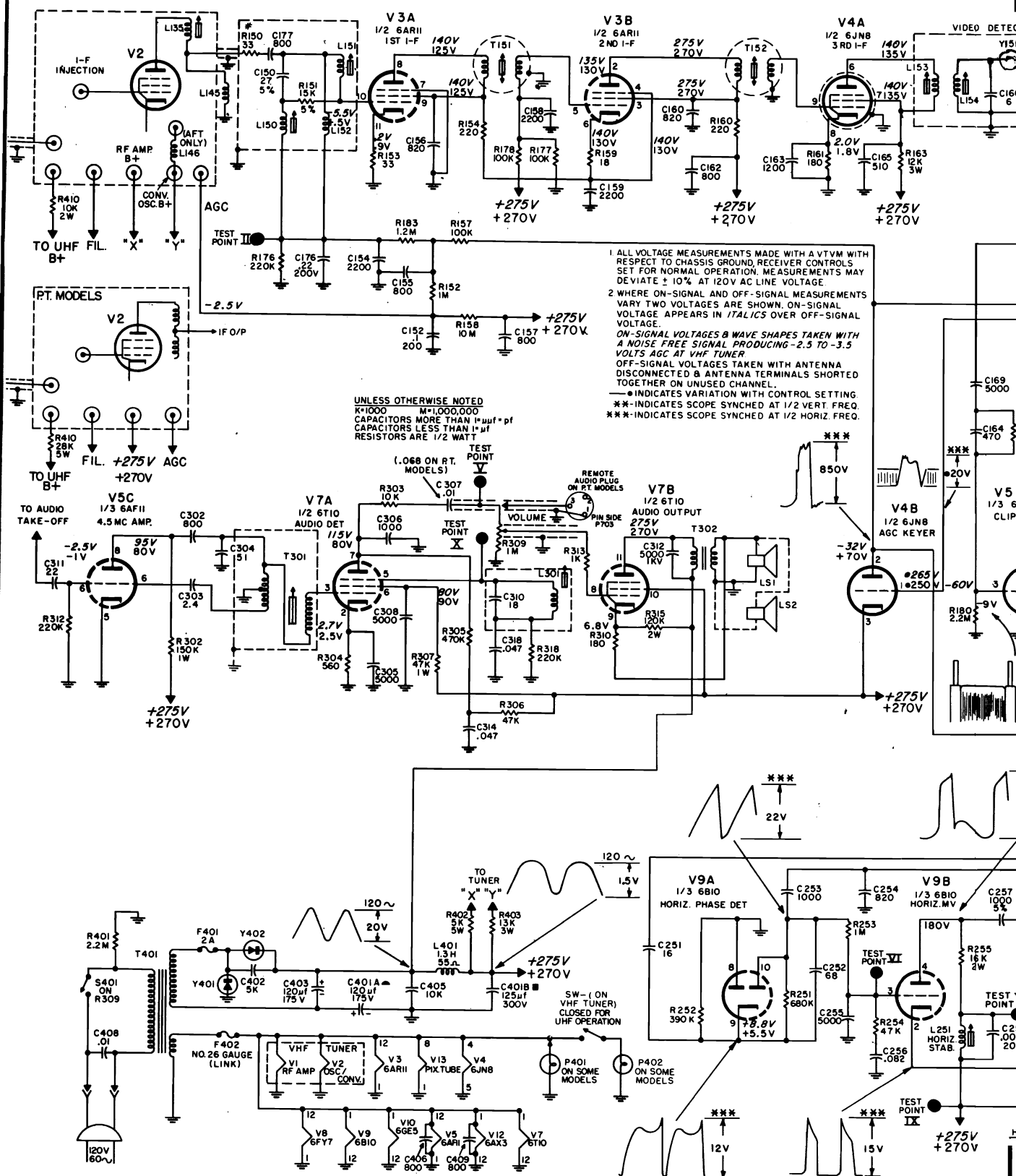
PICTURE TILT: To correct picture tilt, loosen the YOKE CLAMP by squeezing spring over the bend in the clamp. Adjust yoke to correct tilt. Secure yoke with clamp.

PICTURE CENTERING: Rotate the two centering rings located at the rear of the yoke assembly until picture is properly centered.



ET86X212, ET86X213, ET86X227, ET86X228 SCHEMATIC

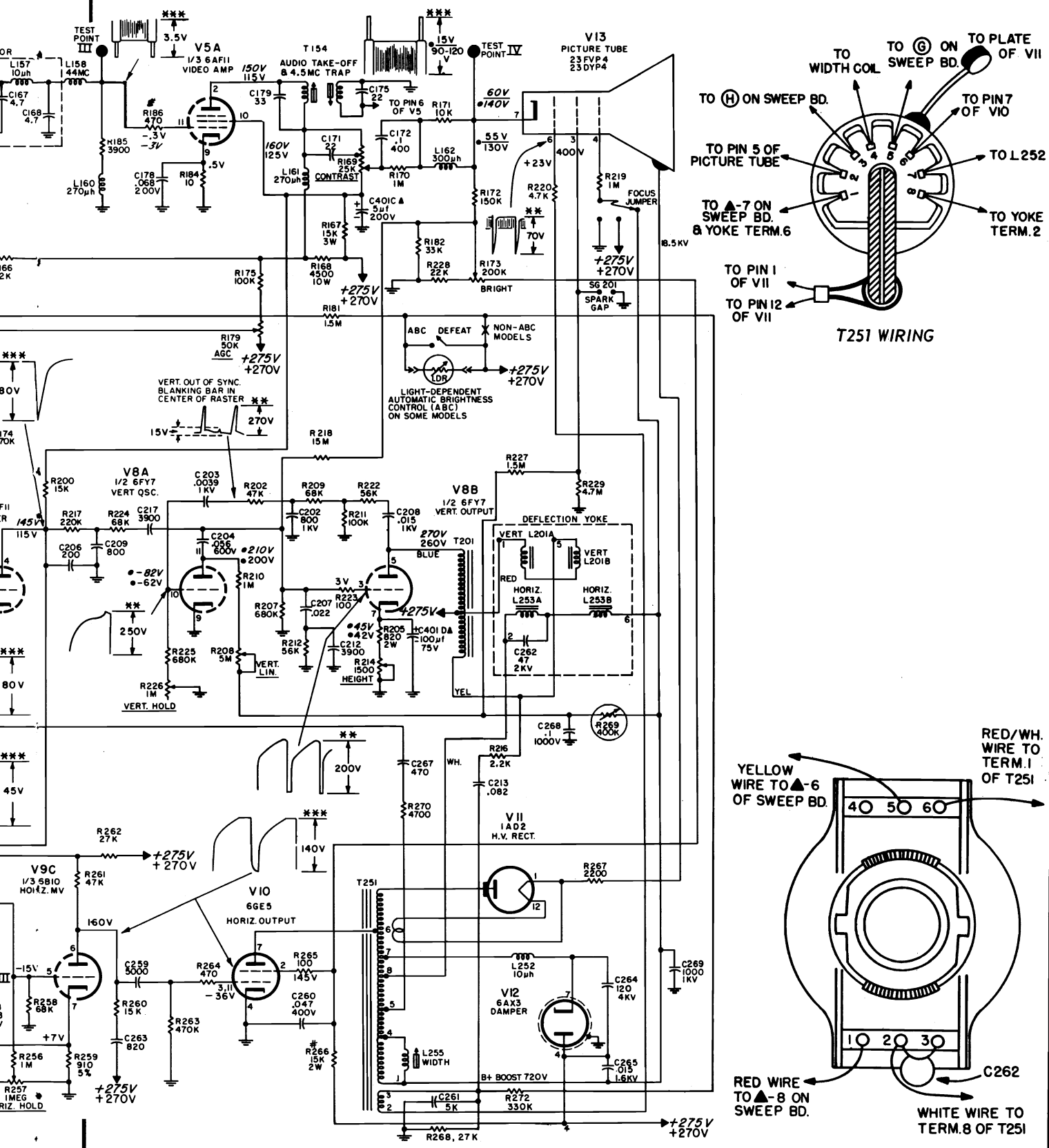
GENERAL ELECTRIC Chassis AA Schematic Diagram



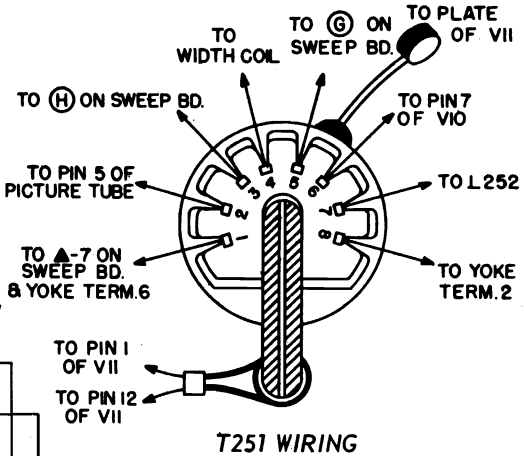
1 ALL VOLTAGE MEASUREMENTS MADE WITH A VTVM WITH RESPECT TO CHASSIS GROUND, RECEIVER CONTROLS SET FOR NORMAL OPERATION. MEASUREMENTS MAY DEVIATE ± 10% AT 120V AC LINE VOLTAGE.
 2 WHERE ON-SIGNAL AND OFF-SIGNAL MEASUREMENTS VARY TWO VOLTAGES ARE SHOWN. ON-SIGNAL VOLTAGE APPEARS IN ITALICS OVER OFF-SIGNAL VOLTAGE.
 ON-SIGNAL VOLTAGES & WAVE SHAPES TAKEN WITH A NOISE FREE SIGNAL PRODUCING -2.5 TO -3.5 VOLTS AGC AT VHF TUNER.
 OFF-SIGNAL VOLTAGES TAKEN WITH ANTENNA DISCONNECTED & ANTENNA TERMINALS SHORTED TOGETHER ON UNUSED CHANNEL.
 * INDICATES VARIATION WITH CONTROL SETTING.
 ** INDICATES SCOPE SYNCH'D AT 1/2 VERT. FREQ.
 *** INDICATES SCOPE SYNCH'D AT 1/2 HORIZ. FREQ.

UNLESS OTHERWISE NOTED
 K=1,000 M=1,000,000
 CAPACITORS MORE THAN 1µf + pf
 CAPACITORS LESS THAN 1µf
 RESISTORS ARE 1/2 WATT

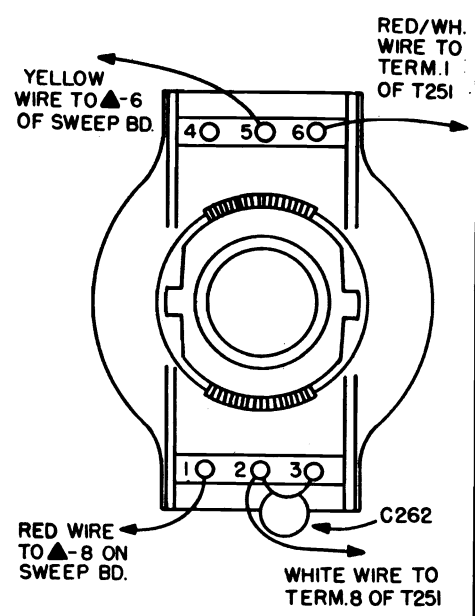
GENERAL ELECTRIC Chassis AA Schematic Diagram, Continued



AA CHASSIS SCHEMATIC DIAGRAM



T251 WIRING

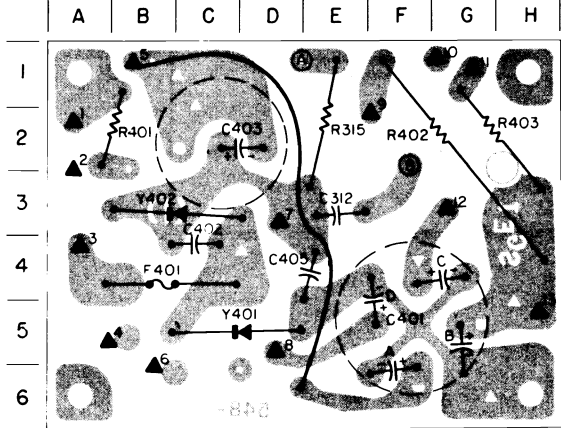


YOKE WIRING

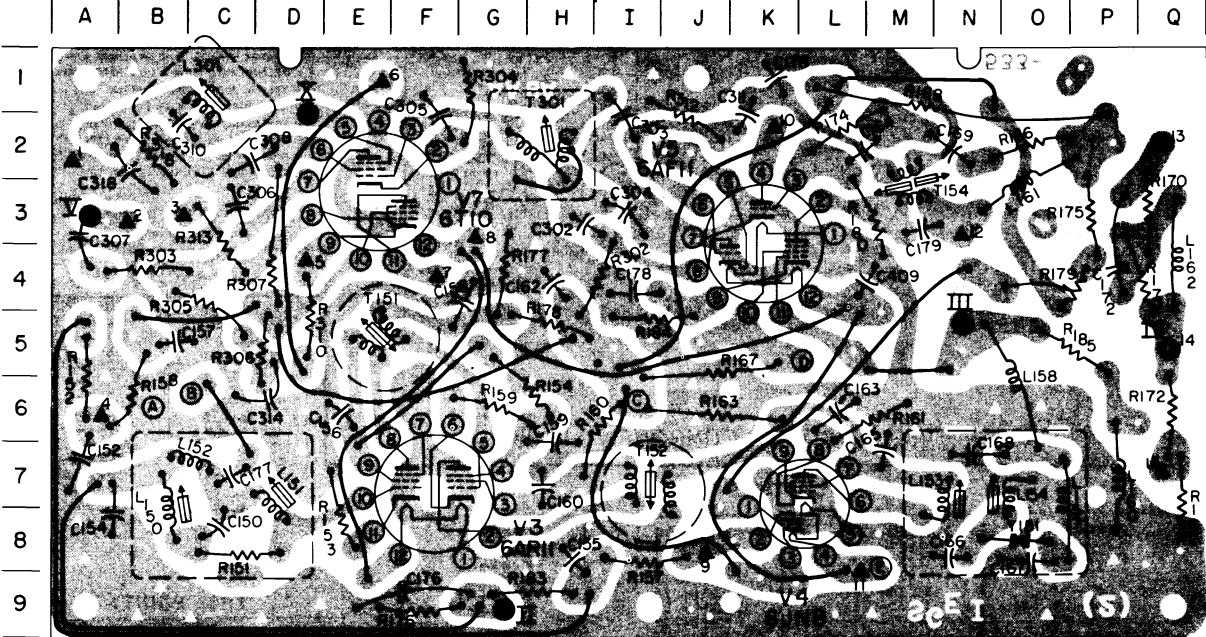
GENERAL ELECTRIC Chassis AA

POWER SUPPLY BOARD
COMPONENT LOCATION

TRIANGLE (▲) NUMBERS	RESISTORS
REPRESENT WIRE WRAP TERMINALS ON COMPONENT BOARD FOR CONNECTION OF WIRES TO POINTS INDICATED:	R315-E2 R401-B2 R402-F2 R403-H2
▲ 1 GREEN & YELLOW WIRE TO T401 ▲ 2 BLACK WIRE TO T401 ▲ 3 RED WIRE TO T401 ▲ 4 BROWN & YELLOW WIRES TO AC INTERLOCK B T401 ▲ 5 BLUE WIRE TO T401 ▲ 6 BROWN WIRE TO AC INTERLOCK B 5401 ▲ 7 GREEN WIRE TO T401 BROWN WIRE TO T302 ▲ 8 YELLOW WIRE TO (C) ON SWEEP BOARD ▲ 9 RED & BLACK WIRE TO TUNER A ▲ 10 GREEN WIRE TO T401 B F402 (1/2 GAUGE WIRE) TO ▲ 6 ON I-F BOARD ▲ 11 RED & YELLOW WIRE TO TUNER Y ▲ 12 ORANGE WIRES (C) ON SWEEP BOARD, R169 (CONTRAST), A (C) ON I-F BOARD ▲ 13 RED WIRES TO L401, (C) ON SWEEP BOARD, (C) ON I-F BOARD	CAPACITORS C312-E3 C401-F5 C402-C4 C403-C2 C405-E4
CIRCLED (A) LETTERS REPRESENT INTERCONNECTING WIRES SOLDERED INTO BOARD	MISCELLANEOUS F401-B4 Y401-C5 Y402-B3
(Q) VISHAY WIRE ▲ 5 ON I-F BOARD	



POWER SUPPLY CIRCUIT BOARD



VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

GENERAL ELECTRIC Chassis AA Servicing Information, Continued

SWEEP BOARD

COMPONENT LOCATION

TRIANGLE (▲-O) NUMBERS

REPRESENT WIRE WRAP TERMINALS ON COMPONENT BOARD FOR CONNECTION OF WIRES TO POINTS INDICATED

- ▲ 1 BROWN WIRE TO ③ ON I-F BOARD
- ▲ 2 BLUE WIRE TO T201
- ▲ 3 RED & GREEN WIRE TO PIN 3 OF PICTURE TUBE
- ▲ 4 GREY WIRE TO ▲10 ON I-F BOARD
- ▲ 5 GREY WIRE TO R225 (VERT HOLD CONTROL)
- ▲ 6 YELLOW WIRES TO TERMINAL 5 OF YOKE, & T201 (WIDTH CONTROL)
- ▲ 7 RED & WHITE WIRES TERMINAL 1 ON T251, & L255
- ▲ 8 RED WIRES TO T201, & TERMINAL 1 OF YOKE
- ▲ 9 BROWN WIRE TO PIN 8 OF PICTURE TUBE
- ▲ 10 ORANGE WIRE TO R173 (BRIGHTNESS)

CIRCLED (A) LETTERS

REPRESENT INTERCONNECTING WIRES SOLDERED INTO BOARD

- (A) BLUE WIRE TO ▲15 ON I-F BOARD
- (B) ORANGE WIRE TO ▲12 ON POWER SUPPLY BOARD
- (C) YELLOW WIRE TO ▲8 ON POWER SUPPLY BOARD
- (D) YELLOW WIRE TO R214 HEIGHT
- (E) BLUE WIRE TO ▲9 ON I-F BOARD
- (F) WHITE WIRE TO TERMINAL 7 OF T251
- (G) BLUE WIRE TO TERMINAL 5 OF T251
- (H) GREEN WIRE TO TERMINAL 3 OF T251
- (I) WHITE WIRE TO TERMINAL 6 OF T251

CAPACITORS

C202—G3	C255—K7
C203—F1	C256—F9
C204—A5	C257—J5
C206—E6	C258—F4
C207—B5	C259—J5
C208—E3	C260—M8
C209—D6	C261—L9
C212—D5	C263—I4
C213—C7	C264—M4
C217—B6	C265—I2
C251—E7	C267—N4
C252—F7	C268—A8
C253—J3	C269—I1
C254—J3	C409—K1

TEST POINTS

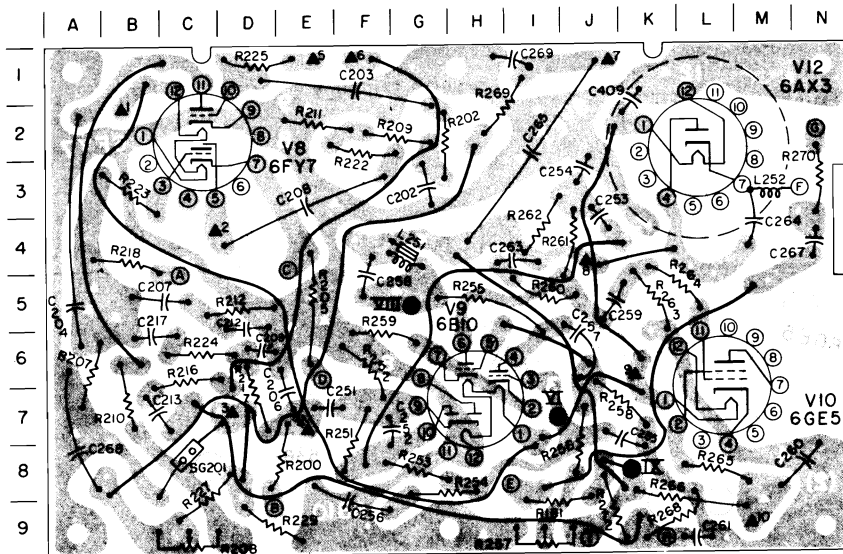
VI —I7
VIII—G5
IX —K8

RESISTORS

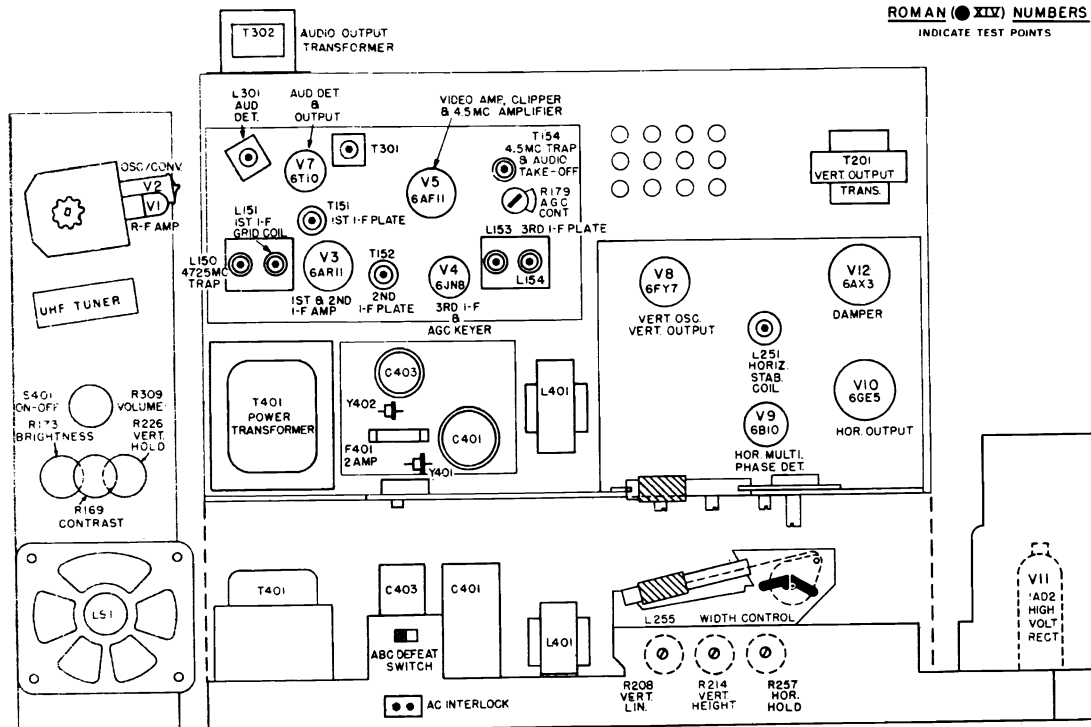
R181—I9	R216—C6	R252—F6	R262—I4
R200—E8	R217—D6	R253—G8	R263—K5
R202—G2	R222—F2	R254—H8	R264—K5
R205—E5	R223—B3	R255—H5	R265—L8
R207—A6	R224—C6	R256—J8	R266—K8
R208—C9	R225—D1	R257—I9	R268—K9
R209—F2	R227—C9	R258—J7	R269—H2
R210—B7	R228—B4	R259—F5	R270—N3
R211—E2	R229—D9	R260—I5	R272—J9
R212—D5	R251—F7	R261—J4	

ROMAN (XIV) NUMBERS

INDICATE TEST POINTS



SWEEP CIRCUIT BOARD COMPONENT VIEW



TUBE AND ADJUSTMENT LOCATIONS

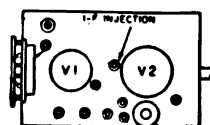
VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

GENERAL ELECTRIC Chassis AA Alignment Information

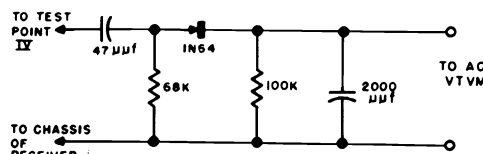
VIDEO I-F SYSTEM

GENERAL: Allow receiver and test equipment at least 20 minutes warm-up.

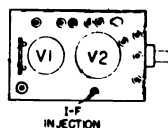
1. Turn volume control to minimum and contrast control fully clockwise. Set channel selector to unused high VHF channel (9-13) and fine tuning fully counterclockwise.
2. Short antenna terminals together.
3. Connect oscilloscope to Test Point III thru 22,000 ohms resistor not more than 1.5 inches away from Test Point III. Connect -4.5V bias between Test Point II and chassis.
4. Inject signals from a properly terminated AM signal generator or sweep generator, through .1000uuf. capacitor to the I F injection point on the VHF Tuner as shown in the illustration.
5. Align the receiver to produce the response curve illustrated.
6. All cores are positioned away from printed board.
7. Either a speaker or 3.2 ohm 5W load resistor must be connected to speaker terminals.



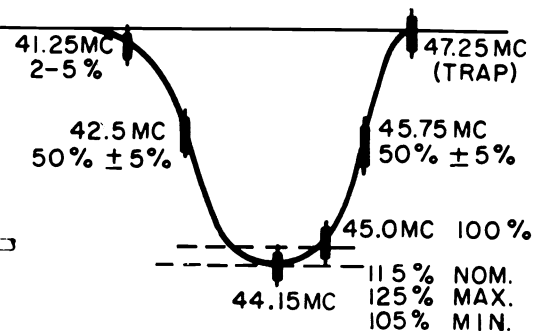
TUNER ET86X217



DETECTOR NETWORK



TUNER ET86X212 & 213



I-F RESPONSE CURVE

VIDEO I-F ALIGNMENT CHART

STEP	SIGNAL FREQUENCY	ADJUST	REMARKS
1	47.25 MC AM	Adjust L150 for minimum scope deflection	Use maximum scope sensitivity and smallest possible signal. Do not retouch this adjustment.
2	38-48 MC sweep generator, with scope calibrated 4 volts peak to peak for 2 inch deflection.	Adjust L154 and L153 in the following sequence: A. Tune L153 core so top of core is flush w/top of coil. B. Tune L154 for max. deflection of 44.15 MC marker. (Do not re-adjust scope) C. Tune L153 for max. deflection of 44.15 MC marker.	Do not retouch these adjustments.
3		L135 (converter plate) for max. deflection of the 45.75 MC marker.	
4		L151 (1st I-F grid) for maximum deflection of the 42.5 MC marker and proper nose shaping.	
5	38-48 MC sweep generator, with scope calibrated 4 volts peak to peak for 2 inch deflection.	T152 (2nd I-F Plate) to place 45.75 MC marker properly on the curve.	Repeat 5, 6, and 7 if necessary.
6		T151 (1st I-F Plate) to place 42.5 MC marker properly on the curve.	
7		L151 if necessary to shape the nose.	

4.5 MC TRAP ALIGNMENT

1. Connect a -7.5V bias to Test Point II, with the positive bias lead grounded to chassis.
2. Turn contrast control to maximum, volume to minimum.
3. Connect the DETECTOR NETWORK shown to Test Point IV and feed its output to an AC VTVM.
4. Apply a 4.5 MC AM signal through a 5µf capacitor at Test Point III.
5. Adjust the top core of T154 for minimum reading on Test Point IV. Two core positions will give an apparent minimum indication, the correct one is the first reached while turning the core from the top end of the coil toward the circuit board.

NOTE: Retouching of the trap adjustment may be necessary after alignment of the audio takeoff.

AUDIO ALIGNMENT WITH ON-THE-AIR SIGNALS

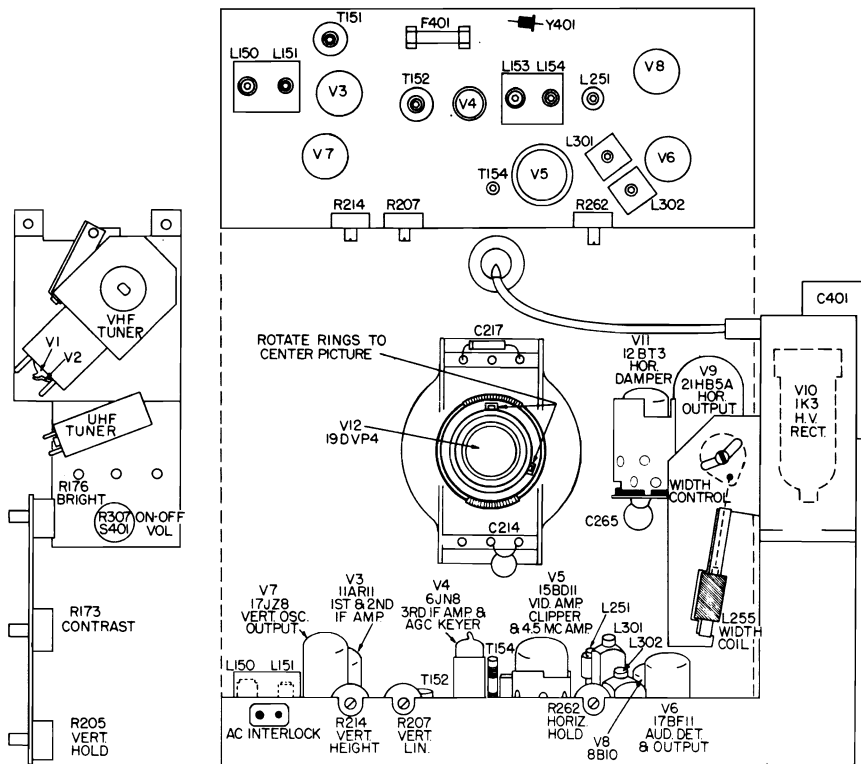
1. Tune in a strong local signal and set receiver volume to a low audible level.
2. Adjust L301 for maximum undistorted, buzz-free audio output. Start with the core at the outermost position away from the printed board and tune for the second "peak" encountered on the way into the coil form.
3. Connect a variable bias supply (3 to 15V) to the AGC test point with the positive lead to the chassis. Adjust bias until audio signal distorts on peaks slightly, then adjust core of T301 to curb distortion. Repeat this procedure several times at increased bias levels until maximum clarity of audio is obtained.
4. Adjust the bottom core of T154, repeating the bias advances in step 3, to achieve the optimum setting for noise-free performance at low signal levels.

GENERAL ELECTRIC

DA CHASSIS

MODELS
 M400ASD
 M401ASD
 M402ABG
 M402AEB
 M402AVY
 M403ABG
 M403AEB
 M403ATS
 M403AVY
 M411AEB
 M411AVY
 M413ABG
 M413AWD
 R413ABG
 R413AWD
 M415AVY
 M415AWD

(Presented on pages
 53 through 58)



TUBE AND ADJUSTMENT LOCATIONS

Disassembly Procedure for Models M400+ through M403+

CABINET BACK: Disconnect any external antenna wires. Remove the 1/4-inch hex head screws securing the cabinet back. Swing the left side of the back away from the receiver just far enough to reach the 300 ohm VHF & UHF tuner antenna input leads which are located inside of the cabinet. Unplug the antenna leads. Then remove the cabinet back.

CHASSIS: Remove the cabinet back as previously described. Remove the control knobs. Unplug the picture tube socket and high voltage anode lead. Then remove and disconnect the following:

1. One hex head screw from the bottom of the cabinet back retaining bracket. (Located directly above the secondary controls)
2. Four hex head screws from the tuner bracket assembly.
3. Two hex head screws from the secondary control bracket.
4. One hex head screw that retains ground strap to left front corner of chassis.
5. Two hex head chassis retaining screws from the rear bottom corners of chassis.
6. Disconnect speaker leads.

The chassis is now slid back from the cabinet front and the yoke is removed. Reassemble in reverse order of disassembly. Notice that the front of the chassis is retained by two plastic bosses, or fingers molded into the cabinet front. These bosses mate with two slots in the front apron of the chassis.

Disassembly Procedure for Models M411+ through M415+

CABINET BACK: Disconnect any external antenna wires. Remove 1/4-inch hex screws securing the cabinet back. Swing the cabinet back away from the receiver just far enough to reach the 300 ohm VHF and UHF tuner antenna input leads located inside cabinet. Unplug these leads from inside cabinet back. Then remove cabinet back.

CHASSIS: Remove cabinet back as previously described. Unplug picture tube socket and high voltage anode lead. Remove control knobs and pull up VHF antenna. Then remove and disconnect the following:

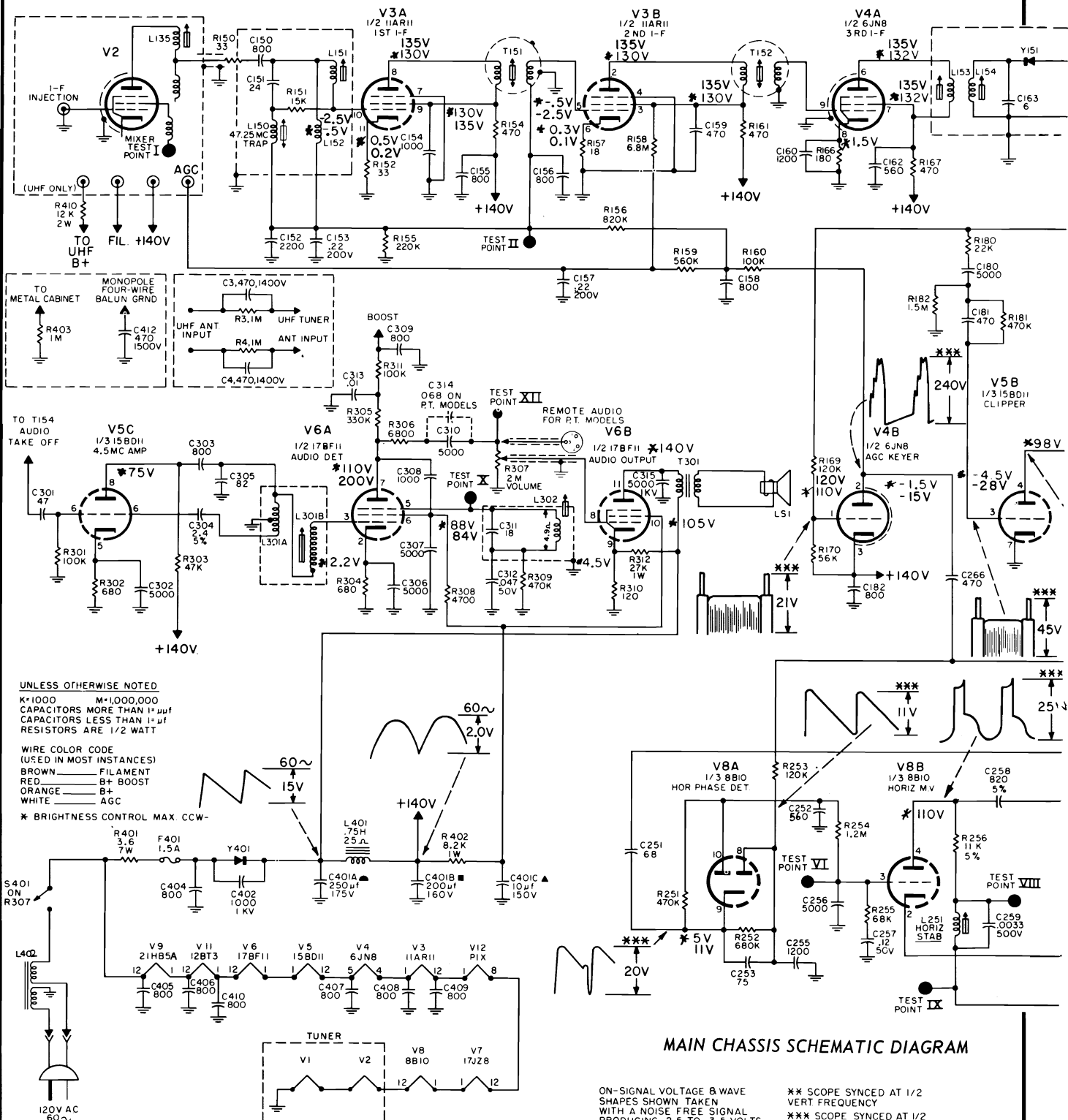
1. Two chassis retaining screws from the underside of the cabinet.
2. For remote equipped sets remove the remote control receiver.
 - a. Three retaining screws from the underside of the cabinet.
 - b. Four screws from power tuning bracket (located at top left corner of cabinet) then swing insulating board to left.
 - c. Unplug remote cables. Then tilt bottom of remote receiver toward TV chassis and slide from cabinet.
3. Remove seven hex head screws from around the periphery of the plastic control mounting back plate.
4. One hex head ground strap retaining screw from left front corner of chassis.

The chassis along with the complete control assembly is now slid back from the cabinet and then the yoke is removed. Reassemble in the reverse order of disassembly observing care to replace isolation networks and insulating material in the same manner in which the receiver was manufactured.

PICTURE TUBE: After chassis removal, place the cabinet face down on a soft cloth covered surface. Remove the tube sling screw from the sling, spread the sling slightly apart and then lift the tube from the cabinet.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

GENERAL ELECTRIC Chassis DA Schematic Diagram



MAIN CHASSIS SCHEMATIC DIAGRAM

UNLESS OTHERWISE NOTED
 K=1000 M=1,000,000
 CAPACITORS MORE THAN 1 μ f
 CAPACITORS LESS THAN 1 μ f
 RESISTORS ARE 1/2 WATT

WIRE COLOR CODE
 (USED IN MOST INSTANCES)
 BROWN FILAMENT
 RED B+ BOOST
 ORANGE B+
 WHITE AGC

* BRIGHTNESS CONTROL MAX. CCW-

1. ALL VOLTAGE MEASUREMENTS MADE WITH A VACUUM TUBE VOLTMETER IN RESPECT TO CHASSIS GROUND, WITH RECEIVER CONTROLS SET FOR NORMAL OPERATION.
2. WITH LINE VOLTAGE MAINTAINED AT 120V AC MEASUREMENTS SHOWN MAY DEVIATE $\pm 10\%$
3. VOLTAGES SHOWN WITH * MADE WITH THE SELECTOR KNOB SWITCHED TO A CHANNEL WITH NO SIGNAL AND THE ANTENNA TERMINALS SHORTED.
4. WHERE VOLTAGE IN RED IS NOT SHOWN, VOLTAGE IN BLACK IS SAME EITHER ON SIGNAL OR OFF SIGNAL.

ON-SIGNAL VOLTAGE & WAVE SHAPES SHOWN TAKEN WITH A NOISE FREE SIGNAL PRODUCING -2.5 TO -3.5 VOLTS AGC AT VHF TUNER FINE TUNING CONTROL ADJUSTED FOR MAXIMUM AGC.

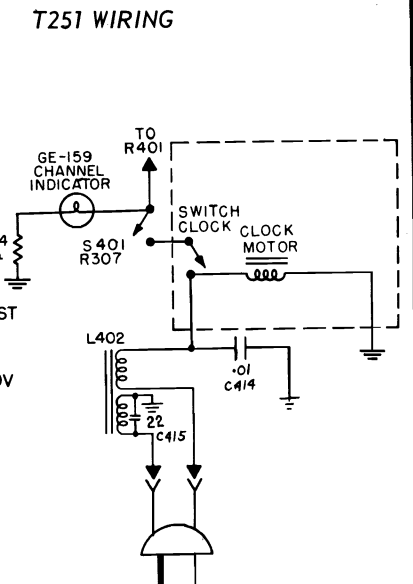
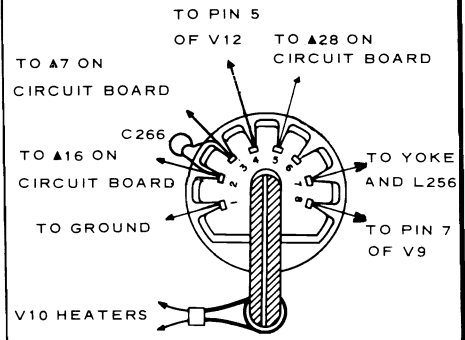
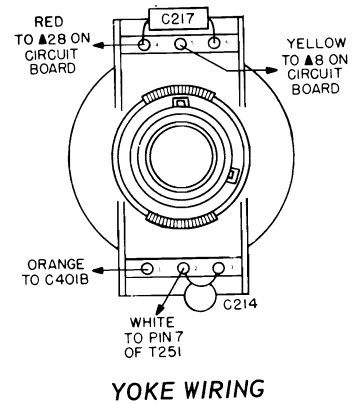
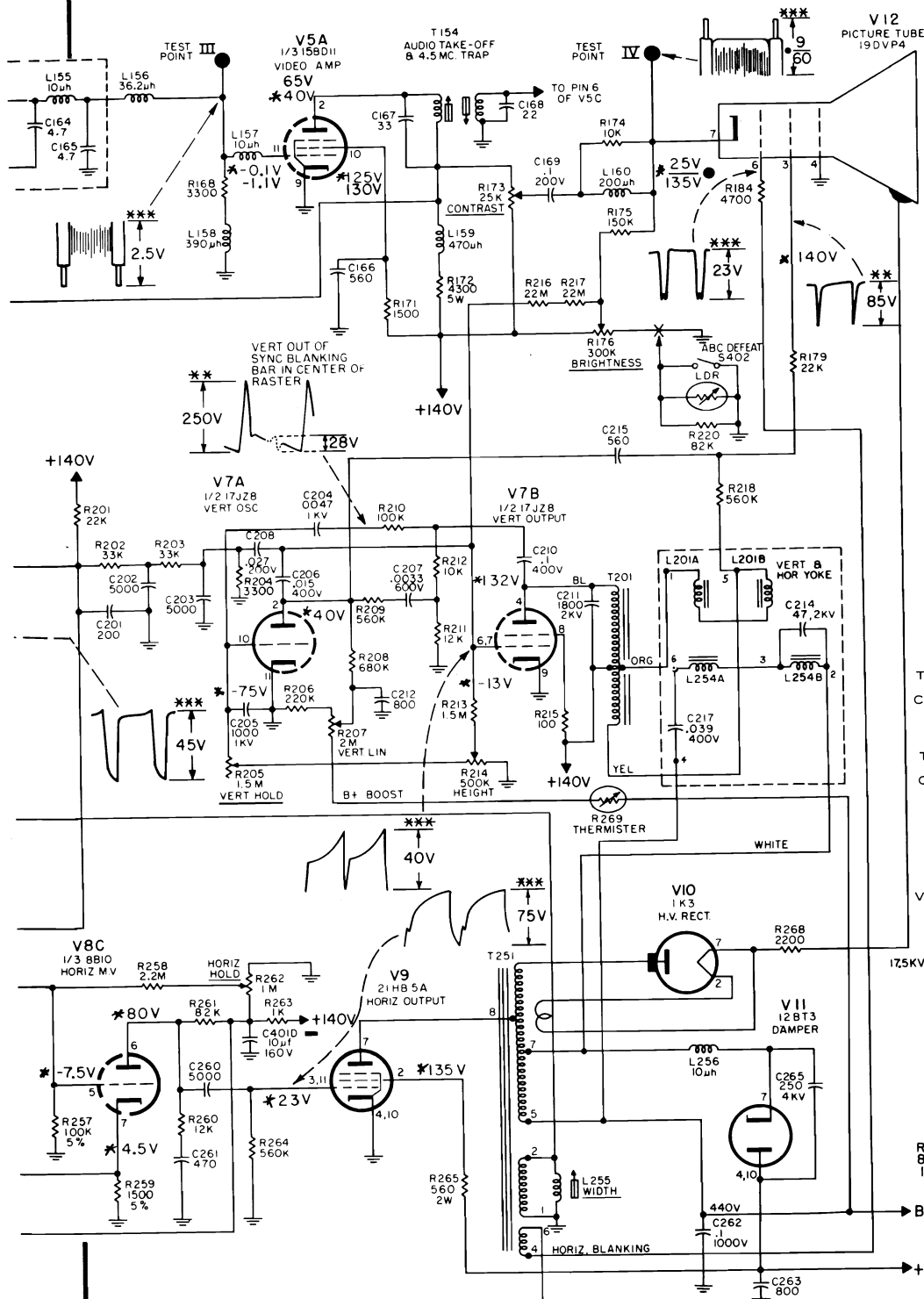
ALL OTHER CONTROLS ARE ADJUSTED FOR NORMAL OPERATION.

• VARIES WITH CONTROL SETTINGS
 * INDICATES PRODUCTION CHANGE

** SCOPE SYNCED AT 1/2 VERT. FREQUENCY
 *** SCOPE SYNCED AT 1/2 HORIZ. FREQUENCY

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

GENERAL ELECTRIC Chassis DA Schematic Diagram (Continued)



PICTURE TUBE ADJUSTMENTS

PICTURE TILT: To correct picture tilt, loosen the YOKE CLAMP by sliding the eye of the spring over the bend in the clamp. Adjust the yoke to correct the tilt. Secure the yoke by sliding the eye of the spring back over the bend in the clamp.

PICTURE CENTERING: Rotate the two centering rings located at the rear of the yoke assembly until picture is properly centered.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

GENERAL ELECTRIC Chassis DA Alignment Information, Continued

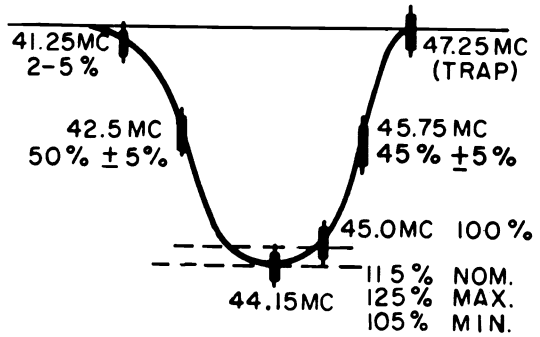
VIDEO I-F SYSTEM

GENERAL: Allow receiver and test equipment at least 20 minutes warm-up. Power the receiver from an isolation transformer.

1. Turn volume control and fine tuning counterclockwise, and contrast control fully clockwise. Set channel selector to Channel 9. Short antenna terminals together.
2. Connect oscilloscope to Test Point III thru 22,000 ohms resistor not more than 2.5 inches away from Test Point III. Connect -3.5 V bias between Test Point II and chassis.
3. Inject signals from a properly terminated AM signal generator or sweep generator, through the I-F INJECTION NETWORK shown, to the I-F injection point. This point is accessible at the base of the Converter (V2) on the top deck of the VHF tuner.
4. Align the receiver to produce the response curve illustrated.
5. Position all cores at ends of coils away from circuit board except as noted below.

AM PRE-PEAKING & TRAP FREQUENCIES

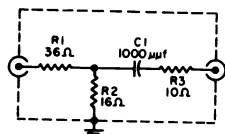
L150Min. 47.25 MC	T151Max. 42.8 MC
L135Max. 45.75 MC	T152Max. 45.2 MC
L151Max. 42.50 MC	L153, L154 .Max. 44.15 MC



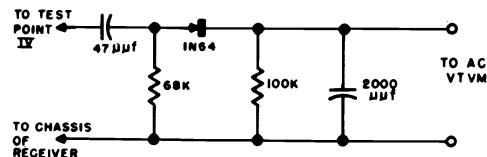
I-F RESPONSE CURVE

VIDEO I-F ALIGNMENT CHART

STEP	SIGNAL FREQUENCY	ADJUST	REMARKS
1	47.25 MC AM	Adjust L150 for minimum scope deflection	Use maximum scope sensitivity and smallest possible signal for the 47.25 MC AM adjustments.
2	44.15 MC AM	Adjust first L154, then L153 for maximum scope deflection	Position L154 core at end of coil nearer circuit board. Do not retouch these adjustments.
3	38-48 MC sweep generator, with scope calibrated 3 volts peak to peak for 2 inch deflection; markers at 41.25, 42.5, 44.15, 45.0 MC & 45.75 MC	L135 (converter plate) for maximum deflection of the 45.75 MC marker	Repeat 5, 6, and 7 if necessary.
4		L151 (1st I-F grid) for maximum deflection of the 42.5 MC marker and proper nose shaping	
5		T152 (2nd I-F Plate) to place 45.75 MC marker properly on the curve.	
6		T151 (1st I-F Plate) to place 42.5 MC marker properly on the curve.	
7		L151 if necessary to shape the nose	



I-F INJECTION NETWORK



DETECTOR NETWORK

4.5 MC TRAP ALIGNMENT

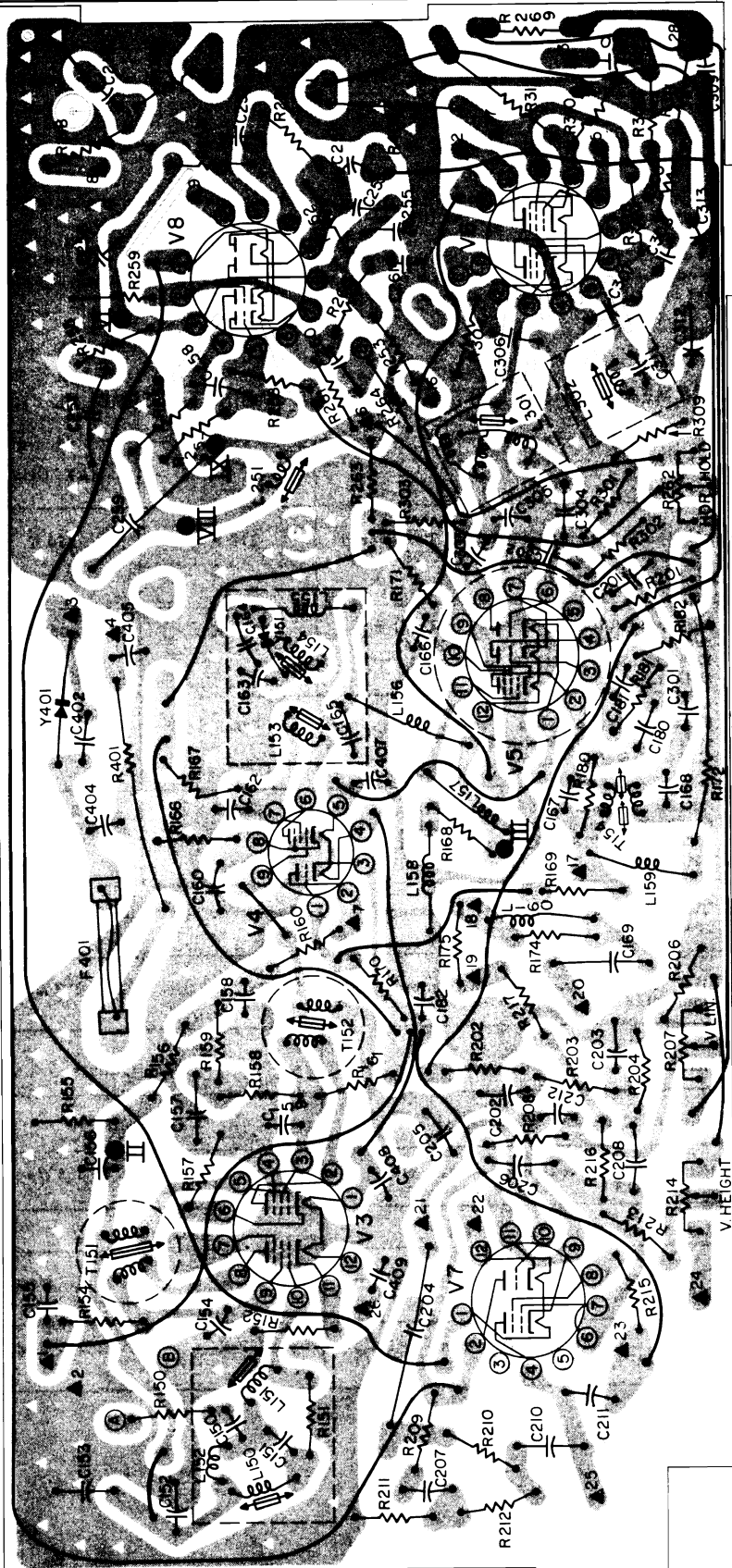
1. Connect a -15V bias to Test Point II, with the positive bias lead grounded to chassis.
2. .05μf capacitor between Test Point X and chassis.
3. Turn contrast control to maximum, volume to minimum.
4. Connect the DETECTOR NETWORK shown to Test Point IV and feed its output to an AC VTVM.
5. Apply a 4.5 MC AM signal through a capacitor at Test Point III.
6. Adjust the top core of T154 for minimum reading on Test Point IV. Two core positions will give an apparent minimum indication, the correct one is nearer the top end of the coil form.

NOTE: Retouching of the trap adjustment may be necessary after alignment of the audio takeoff.

AUDIO ALIGNMENT WITH ON-THE-AIR SIGNALS

1. Tune in a strong local signal and set receiver volume to a low audible level.
2. Adjust L302 for maximum undistorted, buzz-free audio output. Start with the core at the outermost position away from the printed board and tune for the second "peak" encountered on the way into the coil form.
3. Connect a variable bias supply (3 to 15V) to the AGC test point with the positive lead to the chassis. Adjust bias until audio signal distorts on peaks slightly, then adjust core of L301 to curb distortion. Repeat this procedure several times at increased bias levels until maximum clarity of audio is obtained.
4. Adjust the bottom core of T154, repeating the bias advances in step 3, to achieve the optimum setting for noise-free performance at low signal levels.

COMPONENT VIEW OF CIRCUIT BOARD



TRIANGLE (▲) NUMBERS

WIRE WRAP TERMINALS FOR CONNECTION OF OTHER COMPONENTS

- A1. To VHF tuner, contrast control, & yoke Pin 1
- A2. Ground to brightness control
- A3. To C401A
- A4. To S401 on vol. control, & V9 Pin 12
- A5. To C401D
- A6. To Pin 3 of T251 & C266
- A7. To yoke Pin 3 & T201 yellow lead
- A8. Fil. to Hf tuner
- A9. To Pin 2 of pix tube
- A10. To Pin 3 of C256
- A11. To Pin 2 of orange lead, Junction of R265-C263, & blue lead of T301
- A12. To blue lead of T301
- A13. To yellow lead of shielded vol. control cable
- A14. To shield of audio cable
- A15. To green lead of shielded vol. control cable
- A16. To T251 Pin 3 & C256
- A17. To contrast control high side
- A18. To Pin 7 of CRT
- A19. To brightness control-arm
- A20. To contrast control-arm
- A21. To vertical hold control-end
- A22. To CRT Fil. Pin 8
- A23. To contrast control-high side
- A24. To vertical hold control-arm
- A25. To T201 blue lead
- A26. To CRT Fil. Pin 1
- A27. To C401C
- A28. To C217 on yoke, T251 Pin 5

CIRCLED (○) LETTERS

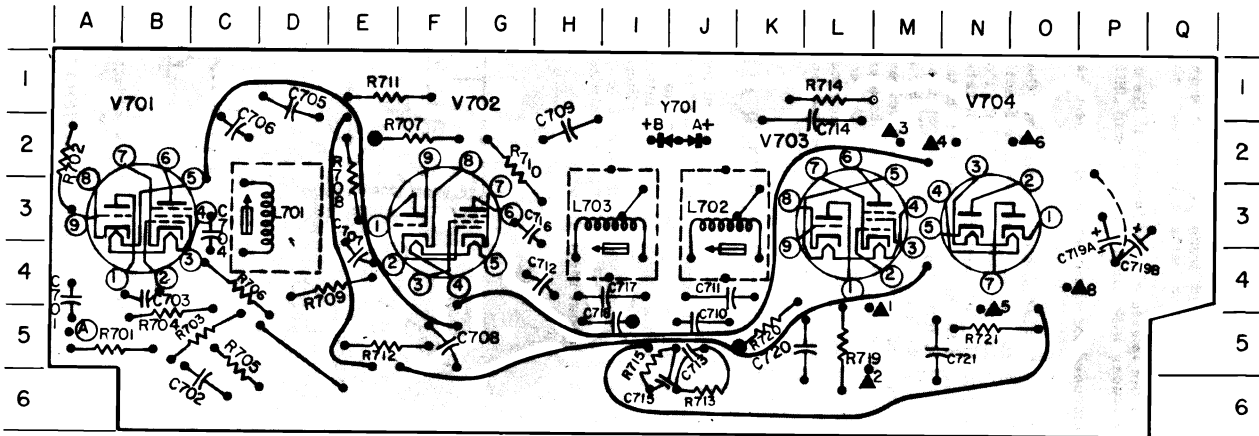
- (A) To VHF tuner link cable-center conductor
- (B) Ground shield IF link cable
- (C) Filament lead to Pin 1 of V11
- (D) To V9 Pin 11

RESISTORS		CAPACITORS		COILS		TEST POINTS		MISC.	
R150-B3	R171-J7	R211-A6	R260-M6	C150-B4	C167-H9	L150-A4	L159-G10	F401-G2	
R151-B5	R172-I11	R212-A8	R261-L5	C151-B5	C168-H10	L151-B5	L160-G8	Y151-J4	
R152-C5	R174-G9	R213-D10	R263-L6	C152-A3	C169-G9	L152-B4	L251-L5	Y401-I1	
R154-C2	R175-G7	R215-C10	R269-P8	C153-A1	C180-I10	L153-I5	L301-L8	V3 -D5	
R155-E1	R179-P3	R216-E9	R301-K9	C154-C4	C181-I10	L154-J5	L302-L10	V4 -H5	
R156-F3	R180-H9	R217-F8	R302-K10	C155-C1	C182-F7	L155-J5	L155-D2	V5 -J8	
R157-D3	R181-I10	R218-O2	R303-K7	C156-E2	C201-J10	L156-I7	L156-H7	V6 -N8	
R158-E4	R182-J10	R251-O5	R304-M7	C157-E3	C202-E8	L157-H7	L157-H7	V7 -C8	
R159-F4	R201-J10	R252-N5	R305-N10	C158-F4	C203-F10	L158-H7	L158-H7	V8 -N4	
R160-G5	R202-F8	R253-M6	R306-O10	C159-E5	C204-C6				
R161-E6	R203-E9	R254-O3	R308-N10	C160-G4	C205-E7				
R166-H3	R204-E10	R255-M2	R309-L10	C162-H4	C206-E8				
R167-H3	R205-E11	R256-L3	R310-O9	C207-A7	C260-M6				
R168-H7	R208-F11	R257-L3	R311-P11	C163-I4	C261-N6				
R169-G9	R209-B7	R258-L5	R312-O8	C164-J4	C262-N6				
R170-F6	R210-B8	R259-M2		C165-I6	C263-N6				
				C166-J7	C264-C6				
					C265-N6				
					C266-M6				
					C267-A7				
					C268-E8				
					C269-E10				
					C270-C6				
					C271-B9				
					C272-H9				
					C273-E9				
					C274-O2				
					C275-O6				
					C276-O4				
					C277-N6				
					C278-N2				
					C279-L2				
					C280-M11				
					C281-N11				
					C282-H2				
					C283-J2				
					C284-H6				
					C285-D6				
					C286-K7				

GENERAL ELECTRIC Chassis DA Circuit Board Information

VOLUME IV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

GENERAL ELECTRIC Remote Transmitter and RW365 Receiver



REMOTE RECEIVER BOARD COMPONENT LOCATIONS VIEWED FROM THE COMPONENT SIDE

COMPONENT LOCATION

CAPACITORS

- C701-Q4
- C702-O5
- C703-P4
- C704-O3
- C705-N1
- C706-O1
- C707-M3
- C708-L5
- C709-J1
- C710-H5
- C711-H4
- C712-J3
- C714-F2
- C716-J4
- C717-I4
- C718-I5
- C719-B4
- C720-G5
- C721-E5

RESISTORS

- R701-Q5
- R702-Q2
- R703-O5
- R704-P5
- R705-O5
- R706-O4
- R707-L2
- R708-M2
- R709-M4
- R710-K2
- R711-M1
- R712-M5
- R714-F1
- R719-F5
- R720-G5
- R721-D5

TEST POINTS

- I-M2
- II-I5
- III-G6

NUMBERED (▲3) TRIANGLES

REPRESENT WIRE WRAP TERMINALS ON COMPONENT BOARD FOR CONNECTION OF WIRES FROM POINTS INDICATED

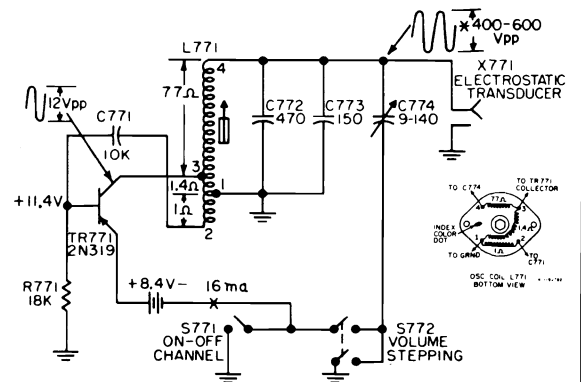
- ▲1 RY 701 COIL
- ▲2 PIN 6 OF P702
- ▲3 RY 702 COIL
- ▲4 GREEN LEAD FROM T701 & PIN 1 OF P702
- ▲5 RY 701 COIL
- ▲6 RED LEAD FROM T701
- ▲8 R717 & RED/YEL OF T701

CIRCLED (A) LETTER

REPRESENTS BOARD MOUNTED WIRE CONNECTED TO POINT INDICATED (A) TO J701

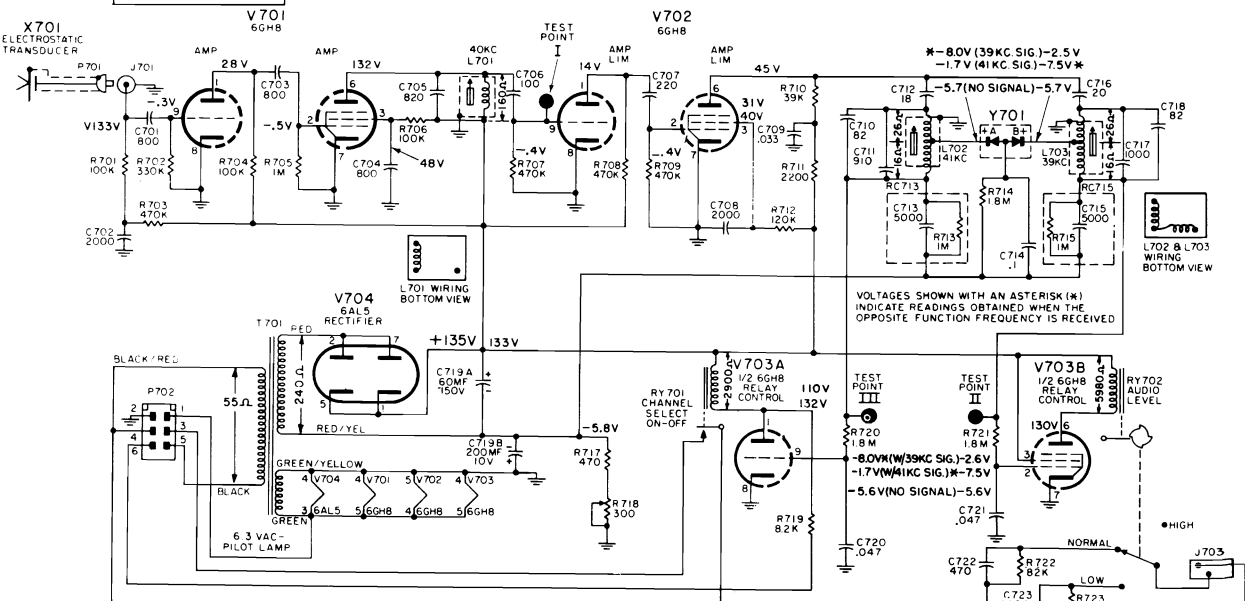
ROMAN (II) NUMERALS

REPRESENT TEST POINTS



*VOLTAGE VARIES WITH INPUT IMPEDANCE OF SCOPE

TRANSMITTER SCHEMATIC DIAGRAM



ALL D.C. VOLTAGE MEASUREMENTS MADE WITH A VACUUM TUBE VOLTMETER WITH LINE VOLTAGE MAINTAINED AT 120 VAC. MEASUREMENTS MAY DEVIATE 10%
ALL MEASUREMENTS TAKEN WITH TUBE SHIELDS AND BOTTOM CHASSIS SHIELD, COVERING L701 & V701 IN PLACE

OFF SIGNAL VOLTAGES SHOWN IN BLACK ARE MEASURED WITH THE TRANSDUCER INPUT SHORTED TO CHASSIS GROUND
RESISTANCE MEASUREMENTS MADE WITH COMPONENTS DISCONNECTED

UNLESS OTHERWISE NOTED
K=1,000 M=1,000,000
CAPACITORS MORE THAN 1 μF
CAPACITORS LESS THAN 1 μF
RESISTORS ARE 1/2 WATT

RW365 SONIC REMOTE RECEIVER

GENERAL ELECTRIC

EA CHASSIS MODELS M501AVY PAM200AVY SAM207ABG SAM211AVY
 M505AEB PAM201AVY SAM207AEB SAM211AWD
 M505AVY PAM203AEB M205AVY

(Service material on pages 59 through 62)

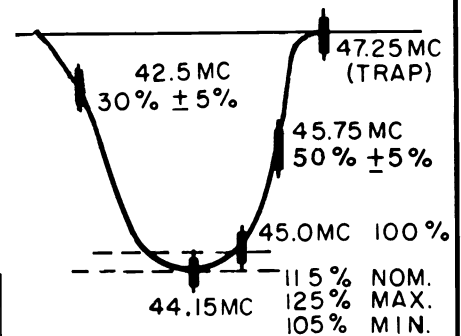
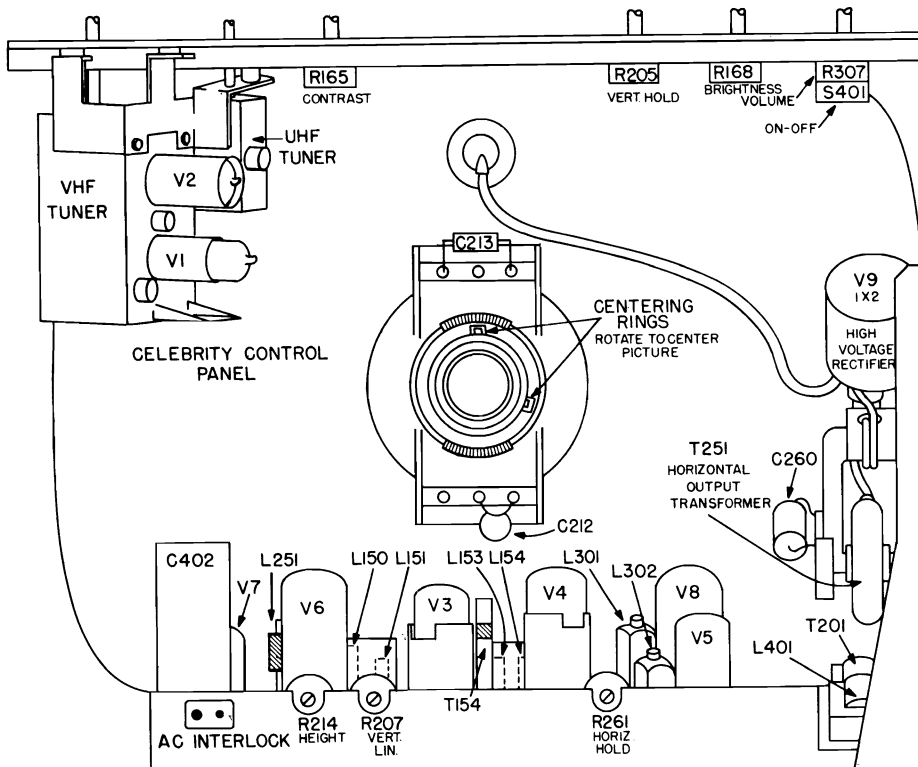
(For notes explaining Video IF Alignment, see such notes on page 68, and follow the alignment instructions given below.)

PICTURE TILT: To correct picture tilt, loosen the YOKE CLAMP by sliding the eye of the spring over the bend in the clamp. Adjust the yoke to correct the tilt. Secure the yoke by sliding the eye of the spring back over the bend in the clamp.

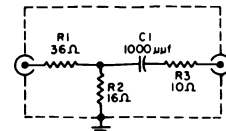
PICTURE CENTERING: Rotate the two centering rings located at the rear of the yoke assembly until picture is properly centered.

VIDEO I-F ALIGNMENT CHART

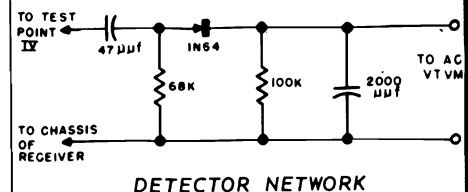
STEP	SIGNAL FREQUENCY	ADJUST	REMARKS
1	47.25 MC AM	Adjust L150 for minimum scope deflection	Use maximum scope sensitivity and smallest possible signal for the 47.25 MC AM adjustments.
2	44.15 MC AM	Adjust first L154, then L153 for maximum scope deflection	Position L154 core at end of coil nearer circuit board. Do not retouch these adjustments.
3	38-48 MC sweep generator, with scope calibrated 3 volts peak to peak for 2 inch deflection; markers at 41.25, 42.5, 44.15, 45.0 MC & 45.75 MC	L135 (converter plate) for maximum deflection of the 45.75 MC marker	Symmetry of the nose is important. No portion of the nose should be out of symmetry by more than 3%. Repeat 5, 6, and 7 if necessary.
4		L151 (1st I-F grid) for proper nose shaping	
5		L135 (converter plate) to place 45.75 MC marker properly on the curve	
6		T151 (1st I-F Plate) to place 42.5 MC marker properly on the curve	
7		L151 if necessary to shape the nose	



I-F RESPONSE CURVE



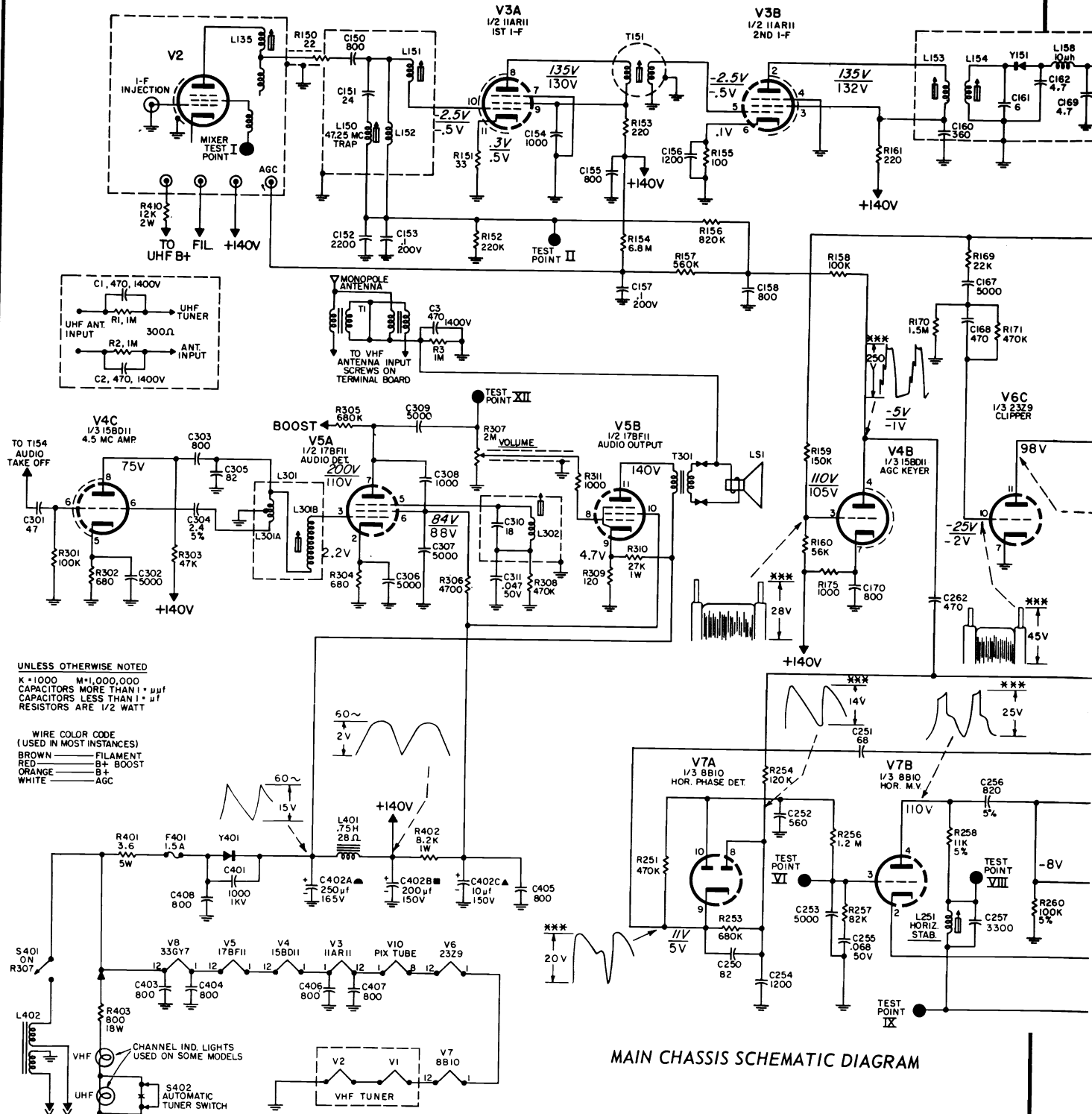
I-F INJECTION NETWORK



DETECTOR NETWORK

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

GENERAL ELECTRIC Chassis EA Schematic Diagram



MAIN CHASSIS SCHEMATIC DIAGRAM

UNLESS OTHERWISE NOTED
 K = 1,000 M = 1,000,000
 CAPACITORS MORE THAN 1 μ f
 CAPACITORS LESS THAN 1 μ f
 RESISTORS ARE 1/2 WATT

WIRE COLOR CODE
 (USED IN MOST INSTANCES)
 BROWN — FILAMENT
 RED — B+ BOOST
 ORANGE — B+
 WHITE — AGC

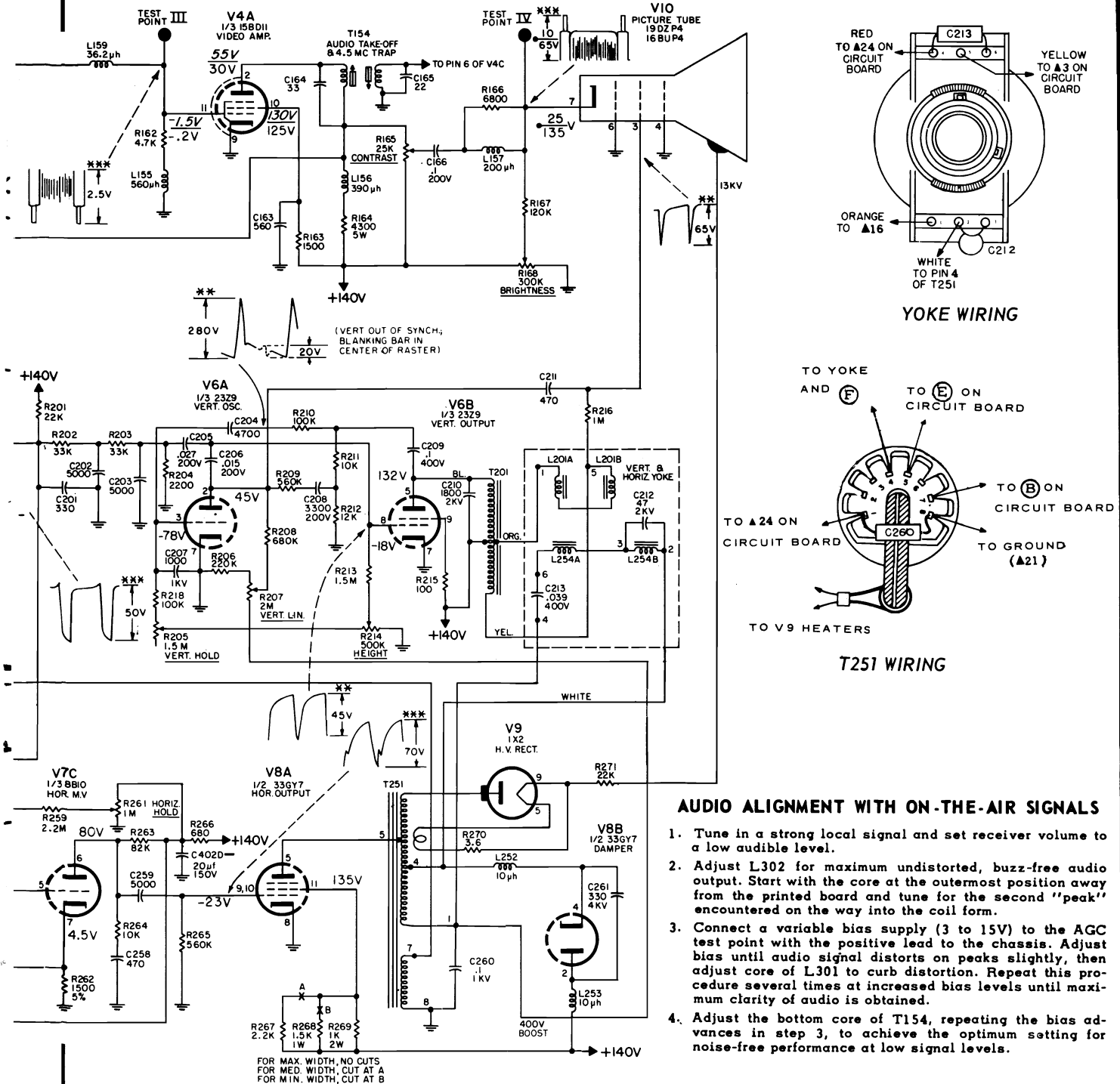
1. ALL VOLTAGE MEASUREMENTS MADE WITH A VTVM WITH RESPECT TO CHASSIS GROUND. RECEIVER CONTROLS SET FOR NORMAL OPERATION. MEASUREMENTS MAY VARY $\pm 10\%$ AT 120V AC LINE VOLTAGE.

2. TWO VOLTAGES ARE SHOWN WHERE ON-SIGNAL AND OFF-SIGNAL MEASUREMENTS VARY ON-SIGNAL VOLTAGE APPEARS IN *ITALICS* OVER OFF-SIGNAL VOLTAGE. NOISE-FREE SIGNAL PRODUCING 2.5 TO 3.5V (MAX) AGC AT VHF TUNER USED FOR ON-SIGNAL AND WAVE SHAPE READINGS OFF-SIGNAL VOLTAGES TAKEN WITH ANTENNA DISCONNECTED & ANTENNA TERMINALS SHORTED

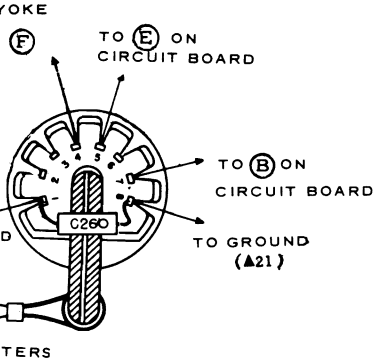
—•— INDICATES VARIATION WITH CONTROL SETTING
 * * — INDICATES SCOPE SYNCH'D AT 1/2 VERT. FREQUENCY
 * * * — INDICATES SCOPE SYNCH'D AT 1/2 HORIZ. FREQUENCY

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

GENERAL ELECTRIC Chassis EA Schematic Diagram, Continued



YOKE WIRING



T251 WIRING

AUDIO ALIGNMENT WITH ON-THE-AIR SIGNALS

1. Tune in a strong local signal and set receiver volume to a low audible level.
2. Adjust L302 for maximum undistorted, buzz-free audio output. Start with the core at the outermost position away from the printed board and tune for the second "peak" encountered on the way into the coil form.
3. Connect a variable bias supply (3 to 15V) to the AGC test point with the positive lead to the chassis. Adjust bias until audio signal distorts on peaks slightly, then adjust core of L301 to curb distortion. Repeat this procedure several times at increased bias levels until maximum clarity of audio is obtained.
4. Adjust the bottom core of T154, repeating the bias advances in step 3, to achieve the optimum setting for noise-free performance at low signal levels.
5. Connect a 1000 ohm resistor from Test Point VIII to Test Point IX (in parallel with L251.)
6. Adjust HORIZONTAL HOLD potentiometer, R261, until picture just "floats" back and forth across the screen. Leave R261 set in this position.
7. Remove the 1000 ohm resistor from Test Point VIII and Test Point IX. Adjust L251 (stabilizer coil) so that the picture again just "floats" across the screen, turning the core toward the printed board. Leave L251 set in this position.
8. Remove the chassis jumper from Test Point VI. Repeat adjustments if the picture does not "lock".

ELECTRICAL ADJUSTMENTS

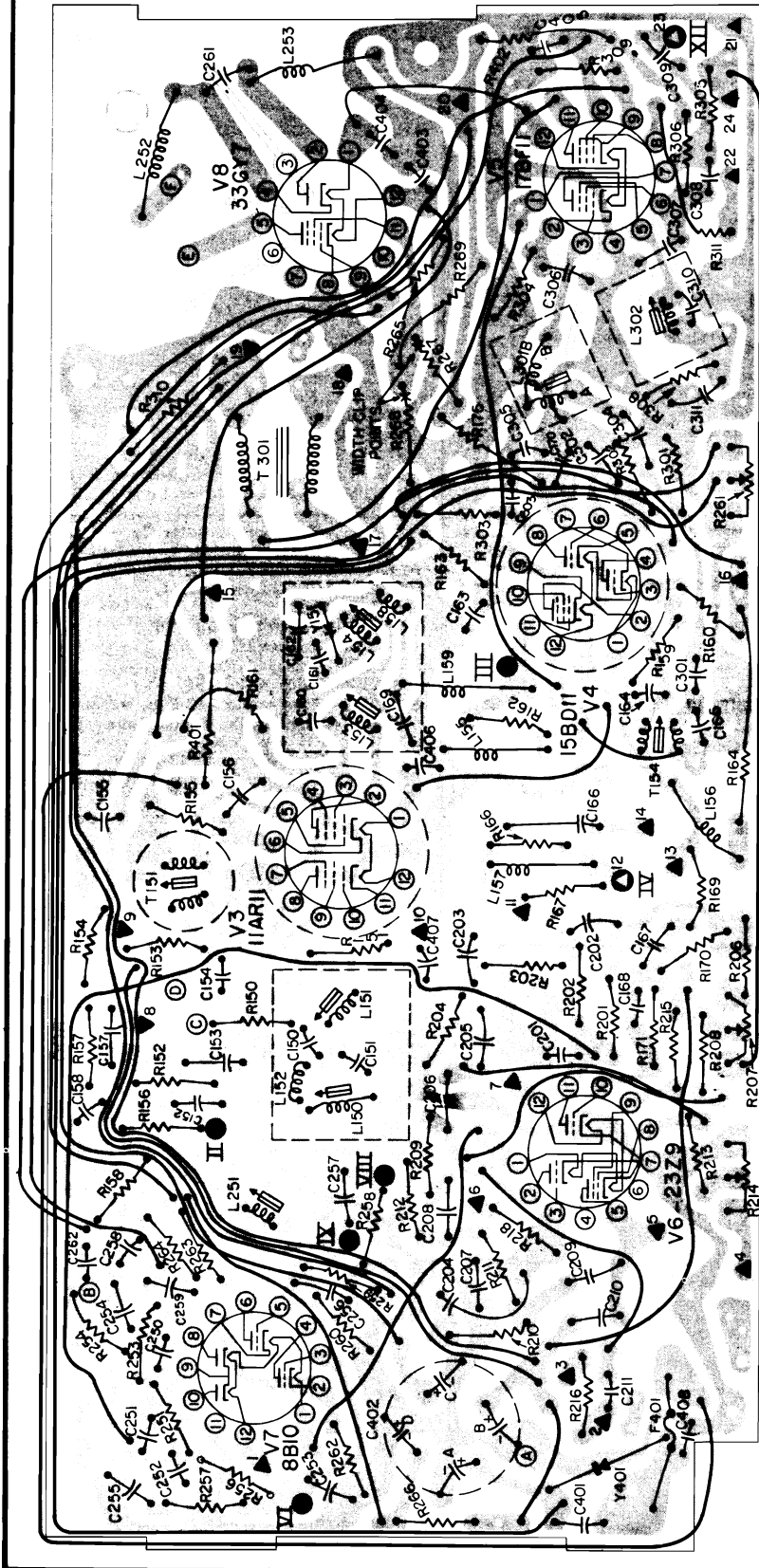
HEIGHT AND VERTICAL LINEARITY: Adjust R214 and R207 simultaneously for proper vertical size and linearity. Picture should extend 1/8-inch beyond top and bottom edges of mask.

HORIZONTAL HOLD:

1. Remove the cabinet back.
2. Tune the receiver to active channel and adjust the controls for normal operation.
3. Short Test Point VI to the chassis with a jumper wire.

FOR MAX. WIDTH, NO CUTS
FOR MED. WIDTH, CUT AT A
FOR MIN. WIDTH, CUT AT B

GENERAL ELECTRIC Chassis EA Circuit Board Information



COMPONENT VIEW OF CIRCUIT BOARD

CIRCLED (C) LETTERS

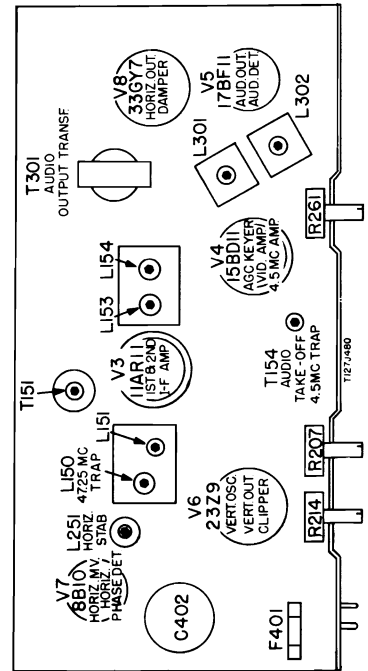
- INDICATE WIRES SOLDERED INTO BOARD
- (A) BLACK WIRE TO CHASSIS GROUND
- (B) GREY WIRE TO TERMINAL 7 OF T251 (HORIZ. OUTPUT TRANSFORMER)
- (C) IF INPUT CABLE (WHITE) FROM TUNER
- (D) I-F INPUT CABLE SHIELD FROM TUNER GROUND
- (E) WHITE LEAD TO TERMINAL 5 OF T251 (HORIZONTAL OUTPUT TRANSFORMER)
- (F) WHITE LEAD TO TERMINAL 4 OF T251 (HORIZONTAL OUTPUT TRANSFORMER)

ROMAN (XIV) NUMBERS

- INDICATE TEST POINTS
- ▲ 11 GREY WIRE TO R168 (BRIGHTNESS CONTROL) CENTER
- ▲ 12 BLUE WIRE TO PIN 7 OF PICTURE TUBE
- ▲ 13 YELLOW WIRE TO R165 (CONTRAST CONTROL)
- ▲ 14 YELLOW WIRE TO R165 (CONTRAST CONTROL) CENTER
- ▲ 15 BROWN WIRE TO S401 ON R307
- ▲ 16 ORANGE WIRE TO TERMINAL 1 ON DEFLECTION YOKE
- ▲ 17 GREEN WIRE TO SPEAKER
- ▲ 18 BLACK WIRE TO L401
- ▲ 19 ORANGE WIRES TO T201 & L401
- ▲ 20 ORANGE WIRES TO T201 & L401
- ▲ 21 AUDIO CABLE SHIELD, BLACK WIRE TO TERMINAL 8 OF T251 (HORIZONTAL OUTPUT TRANS.)
- ▲ 22 AUDIO CABLE GREEN WIRE TO R307 (VOLUME CONTROL) CENTER
- ▲ 23 AUDIO CABLE YELLOW WIRE TO R307 (VOLUME CONTROL) CENTER
- ▲ 24 RED LEADS TO TERMINAL 1 OF T251 (HORIZ. OUTPUT TRANSFORMER) AND TERMINAL 4 OF DEFLECTION YOKE.

TRIANGLE (▲) NUMBERS

- INDICATE WIRE WRAP TERMINALS



GENERAL ELECTRIC

SA CHASSIS

SA CHASSIS

MODELS
PAM109ABG
M111ABG
M111ASD
SAM111ASD
M113ABN
M113AEB
M113ARD
M113AVY

MODELS
M117AWD
PAM119AVY
PAM119AWD
M181AMP
M181AVY
M181AWD

TO REMOVE AND REPLACE THE CABINET BACK

Disconnect all antenna leads from the screw terminals on the antenna strip. Remove the four screws from the cabinet front and carefully pull the cabinet back a few inches to the rear. Disconnect the built-in antenna isolation lead from the terminal mounted on the VHF tuner; then complete removal of the cabinet back. To reassemble the front and back sections, place the receiver face down on a soft clean cloth and reconnect the isolation lead. Slide the back on carefully, making sure the power interlock engages. Then return the receiver to an upright position and replace the four screws which hold the front and back sections together.

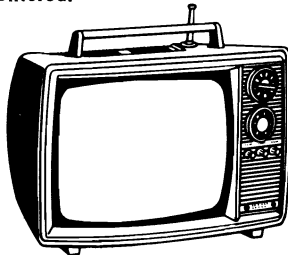
TO DETACH THE CHASSIS FROM THE CABINET FRONT

Remove the cabinet back and the knobs from the VHF and UHF tuners. Take out the three screws which retain the tuner mounting bracket to the cabinet front. Unsolder the grounding strap at the rear of the VHF tuner deck and withdraw the tuner subassembly far enough to provide access to the upper chassis mounting bracket. Remove the screw from this bracket; then tilt the receiver forward and remove the two screws holding the chassis frame to the front assembly. Remove the anode lead, socket and yoke from the picture tube. The chassis may now be separated from the front assembly sufficiently for servicing operations.

PICTURE TUBE ADJUSTMENTS

PICTURE TILT: To correct picture tilt, loosen the YOKE CLAMP with long nose pliers by sliding the eye of the spring over the bend in the clamp. Adjust the yoke to correct picture tilt. Secure the yoke with the pliers by squeezing between the eye of the spring and a point below the bend in the clamp until the spring slips over the bend.

PICTURE CENTERING: Rotate the two centering rings located at the rear of the yoke assembly until picture is properly centered.



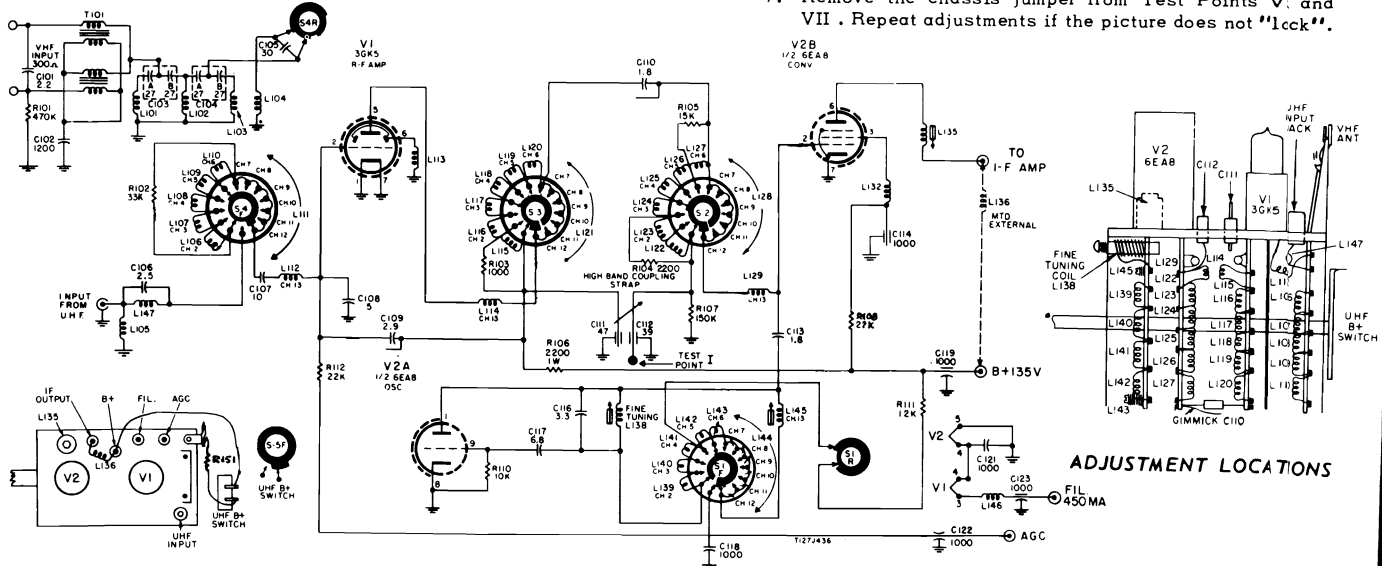
M113A

ELECTRICAL ADJUSTMENTS

HEIGHT AND VERTICAL LINEARITY: Adjust R206 and R209 simultaneously for proper vertical size and linearity. Picture should extend 1/8-inch beyond top and bottom edges of mask.

HORIZONTAL HOLD:

1. Remove the cabinet back.
2. Tune the receiver to a weak signal and adjust the controls for normal operation.
3. Short Test Point VI to Test Point VII with a jumper wire.
4. Connect a 1000 ohm resistor from Test Point VIII to Test Point IX (in parallel with L251).
5. Adjust HORIZONTAL HOLD potentiometer, R260, until picture just "floats" back and forth across the screen. Leave R259 set in this position.
6. Remove the 1000 ohm resistor from Test Point VII and Test Point IX. Adjust L251 (stabilizer coil) so that the picture again just "floats" across the screen, turning the core toward the printed board. Leave L251 set in this position.
7. Remove the chassis jumper from Test Points VI and VII. Repeat adjustments if the picture does not "lock".



VHF Tuner ET86X224 Diagram

GENERAL ELECTRIC Chassis SA Circuit Boards Information, Continued

CIRCLED (A) LETTERS

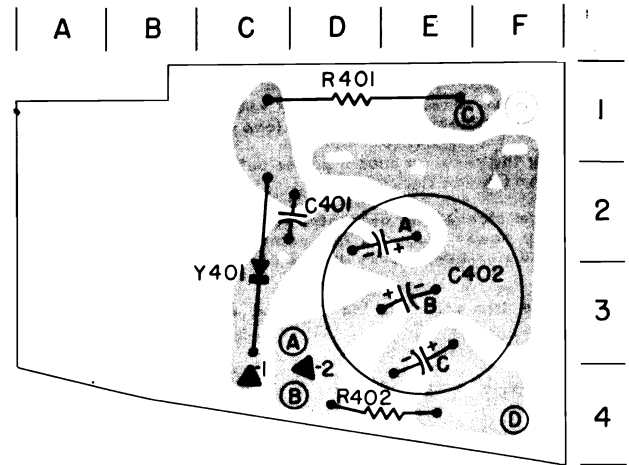
REPRESENT INTERCONNECTING WIRES SOLDERED INTO BOARD

- (A) ORANGE LEAD TO ▲-1 ON MAIN CKT. BD.
- (B) ORANGE LEAD TO (S) ON MAIN CKT. BD.
- (C) BROWN LEAD TO (C) ON MAIN CKT. BD.
- (D) PURPLE LEAD TO (J) ON MAIN CKT. BD.

TRIANGLE (▲-O) NUMBERS

REPRESENT WIRE WRAP TERMINALS ON COMPONENT BOARD FOR CONNECTION OF WIRES TO POINTS INDICATED.

- ▲-1. YELLOW LEAD FROM T301; GREEN LEAD FROM L403
- ▲-2. ORANGE LEAD TO (B) ON CONTROL BD., RED LEADS FROM L403 AND T201

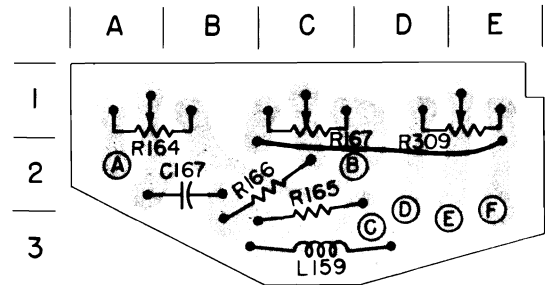


POWER SUPPLY BOARD VIEWED FROM COMPONENT SIDE

CIRCLED (A) LETTERS

REPRESENT INTERCONNECTING WIRES SOLDERED INTO BOARD.

- (A) YELLOW LEAD TO (A) ON MAIN CKT. BD.
- (B) ORANGE LEAD TO ▲-2 ON POWER SUPPLY BD.
- (C) YELLOW LEAD TO PIN 7 OF PICTURE TUBE.
- (D) YELLOW LEAD OF AUDIO CABLE TO ▲-6 OF MAIN CKT. BD.
- (E) GREEN LEAD OF AUDIO CABLE TO ▲-5 OF MAIN CKT. BD.
- (F) SHIELD OF AUDIO CABLE TO ▲-7 OF MAIN CKT. BD.



FRONT CONTROL BOARD VIEWED FROM COMPONENT SIDE

TRIANGLE (▲-O) NUMBERS

REPRESENT WIRE WRAP TERMINALS ON COMPONENT BOARD FOR CONNECTION OF WIRES TO POINTS INDICATED.

- ▲ 1. ORANGE LEAD TO (A) ON POWER SUPPLY BD.
- ▲ 2. BLUE LEAD TO T201
- ▲ 3. YELLOW LEADS TO TERMINAL 5 ON YOKE & T201
- ▲ 4. BLUE LEAD TO T301
- ▲ 5. GREEN LEAD OF AUDIO CABLE TO (E) OF CONTROL BD.
- ▲ 6. YELLOW LEAD OF AUDIO CABLE TO (D) OF CONTROL BD.
- ▲ 7. SHIELD OF AUDIO CABLE TO (F) OF CONTROL BD.

CIRCLED (A) LETTERS

REPRESENT INTERCONNECTING WIRES SOLDERED INTO BOARD

- (A) YELLOW LEAD TO (A) ON CONTROL BD.
- (B) ORANGE LEAD TO TUNER B+
- (C) BROWN LEAD TO (C) ON POWER SUPPLY BD.
- (D) ORANGE LEAD TO TERMINAL 1 ON YOKE.
- (E) BROWN LEAD TO PIN 1 OF PICTURE TUBE
- (F) GREEN LEAD TO R168 ON PICTURE TUBE SOCKET.
- (G) BLACK LEAD TO PIN 2 OF PICTURE TUBE.
- (H) SHIELDED LEAD TO TUNER IF OUTPUT
- (I) SHIELD GND CONNECTION
- (J) PURPLE WIRE TO (D) ON POWER SUPPLY BD.
- (K) RED LEAD TO YOKE TERM. 6
- (L) RED LEAD TO T251 TERMINAL 6
- (M) BROWN LEAD TO PICTURE TUBE PIN 8
- (N) BROWN LEAD TO TUNER
- (O) BLACK LEAD TO TERMINAL 5 OF T251
- (P) BLUE LEAD TO TERMINAL 4 OF T251
- (Q) WHITE LEAD TO TERMINAL 1 OF T251
- (R) WHITE LEAD TO TERMINAL 2 OF T251
- (S) ORANGE LEAD TO (B) ON POWER SUPPLY BD.
- (T) WHITE LEAD TO TUNER AGC

ROMAN (VI) NUMERALS

REPRESENT TEST POINTS

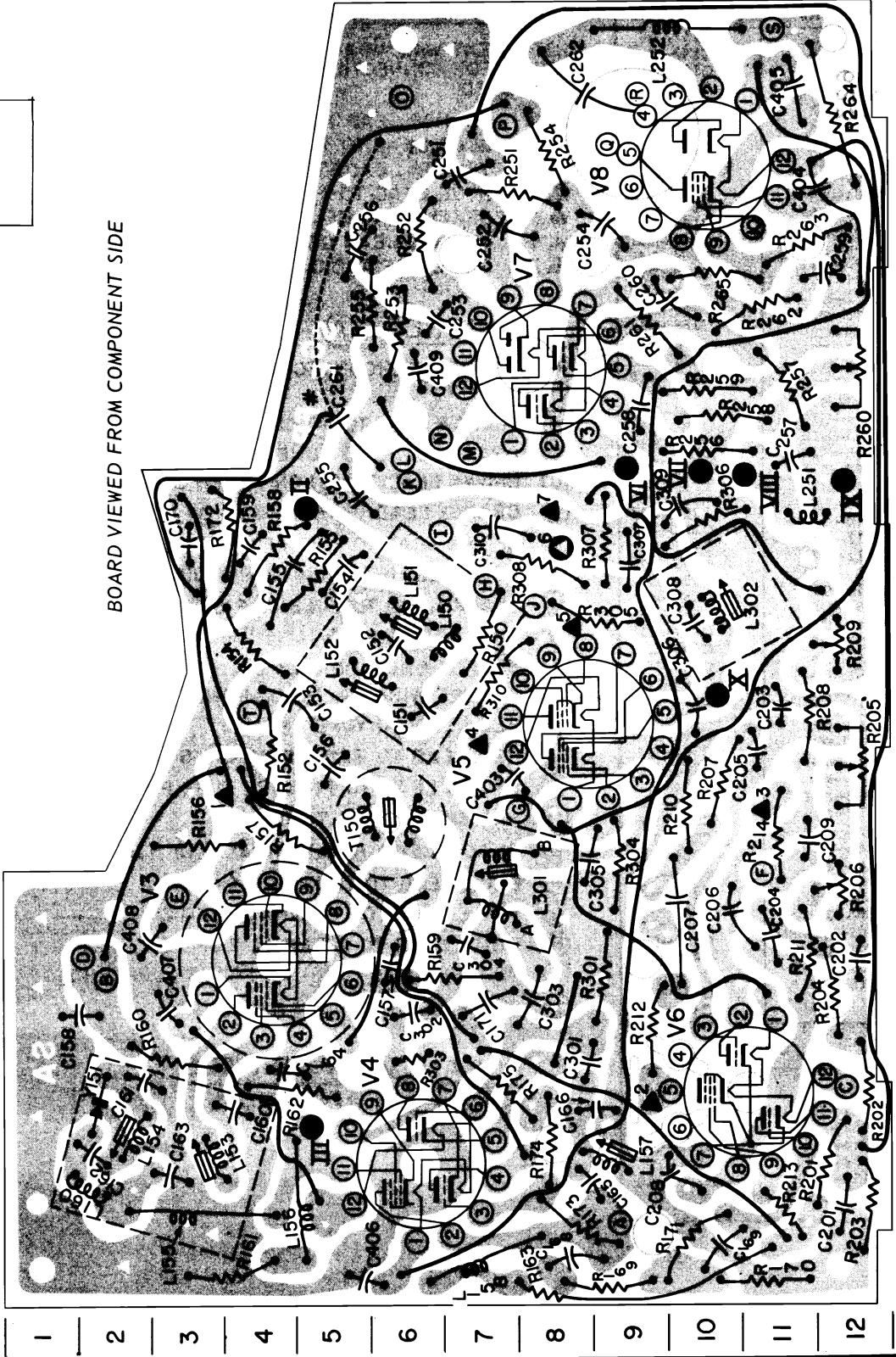
VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

GENERAL ELECTRIC Chassis SA Circuit Board Information, Continued

BOARD COMPONENT LOCATIONS

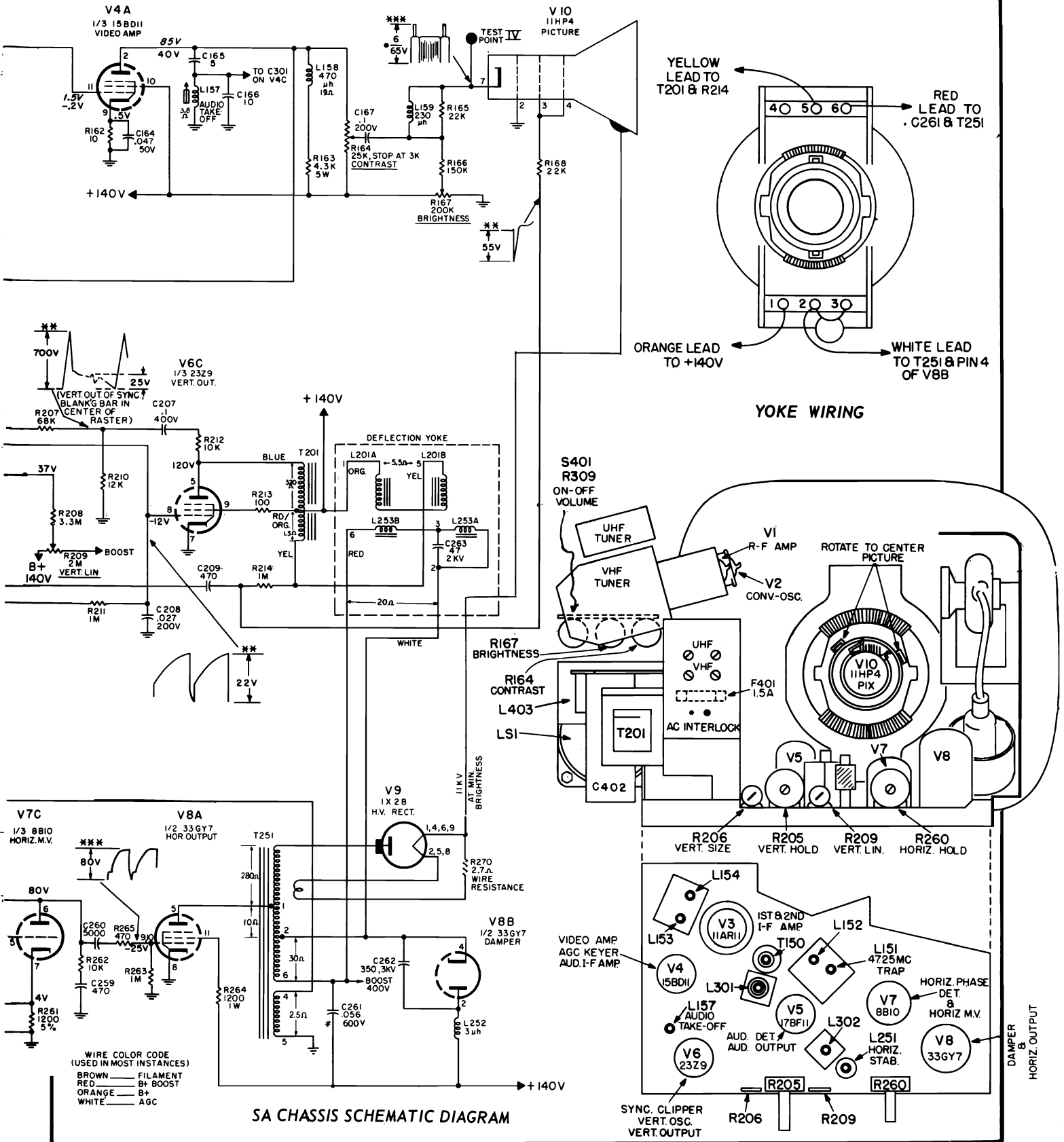
RESISTORS	CAPACITORS	COILS
R171-A10	C164-D4	C303-E8
R172-K4	C165-B9	C304-E7
R173-B8	C166-C8	C305-F9
R174-C8	C168-A8	C306-K10
R175-C7	C169-A11	C307-J9
R201-B12	C170-K3	C308-J10
R202-C12	C171-D7	C309-K10
R203-B12	C201-B12	C310-K7
R204-E12	C202-E12	C403-G7
R205-H12	C203-H10	C404-O12
R206-F12	C204-E11	C405-P11
R162-C5	C205-O12	L157-B9
R163-A8	C206-F10	L158-A7
R169-A9	C207-F10	L251-K11
R170-A11	C208-B10	L252-Q9
R211-E11		L301-F7
R212-D9		L302-J10
R213-B11		
R214-G11		
R251-O8		
R252-O6		
R253-M6		
R254-P8		
R255-N6		
R256-L10		
R257-M11		
R258-L10		
R259-M10		
R260-M12		
R261-M9		
R262-N11		
R263-P12		
R264-P11		
R265-N10		
R301-E9		
R302-D6		
R303-F9		
R305-J9		
R306-H10		
R307-J9		
R308-J8		
R310-I7		
R408-V3		
R407-E		
R409-V3		
R410-V3		
R411-V3		
R412-V3		
R413-V3		
R414-V3		
R415-V3		
R416-V3		
R417-V3		
R418-V3		
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R491-V3		
R492-V3		
R493-V3		
R494-V3		
R495-V3		
R496-V3		
R497-V3		
R498-V3		
R499-V3		
R500-V3		

BOARD VIEWED FROM COMPONENT SIDE



VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

GENERAL ELECTRIC Chassis SA Schematic Diagram, Continued



GENERAL ELECTRIC Chassis SA Alignment Information

VIDEO I-F SYSTEM

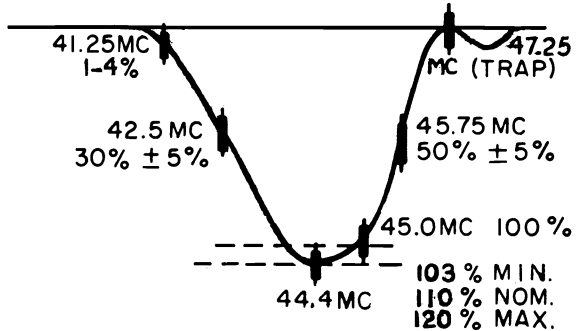
AM PRE-PEAKING & TRAP FREQUENCIES

L151..... Min. 47.25MC	L152 .....Max. 44.4MC
L135..... Max. 44.4MC	L153 .....Max. 45.00MC
T150.....Max. 42.8MC	

GENERAL: Allow receiver and test equipment at least 20 minutes warm-up.

1. Turn volume control to minimum and contrast control fully clockwise. Set channel selector to Channel 9 and fine tuning fully counterclockwise.
2. Short antenna terminals together.
3. Connect oscilloscope to Test Point III through 22,000 ohm resistor not more than 1.5 inches away from Test Point III. Connect -3.5V bias between Test Point II and chassis.
4. Inject signals from a properly terminated AM signal generator or sweep generator, through the I-F INJECTION NETWORK shown, to the I-F injection point.

- This point is accessible through a hole in the tuner top deck at the base of the Oscillator V2.
5. Align the receiver to produce the response curve illustrated.
 6. All cores are positioned away from printed board.



I-F RESPONSE CURVE

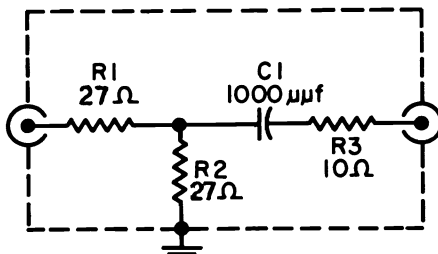
VIDEO I-F ALIGNMENT CHART

STEP	SIGNAL FREQUENCY	ADJUST	REMARKS
1	47.25 MC AM	Adjust L151 for minimum scope deflection	Use maximum scope sensitivity and smallest possible signal. Do not touch this adjustment.
2	38-48 MC sweep generator, with scope calibrated 3 volts peak to peak for 2-inch deflection.	Adjust L154, then L153, then T150 for max. deflection at 44.4MC.	Video doublet alignment.
3		Adjust L135 for max. 45.75 marker deflection, then L152 for nose shaping	Symmetry of the nose is important. No portion of the nose should be out of symmetry or tilted by more than 3%.
4		Adjust L135 to set 45.75 marker at 50%, then L152 for nose shaping.	
5		Readjust T150 to correct 42.5MC marker if below 30% on curve	
6		Knife L150 if 42.5MC marker is above 30% (curve too wide).		Readjust L152 if necessary for proper nose shaping.

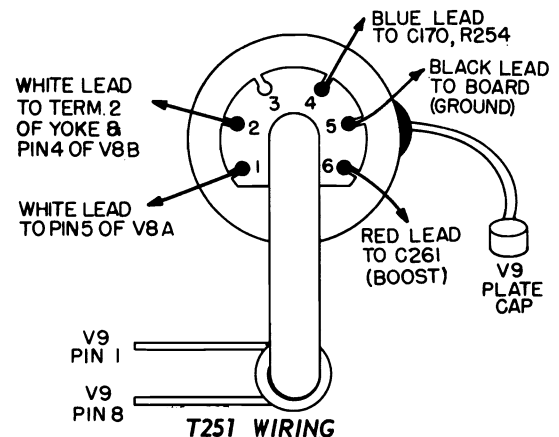
AUDIO ALIGNMENT WITH ON-THE-AIR SIGNALS

1. Tune in a strong local signal and set receiver volume to a low audible level.
2. Adjust L301 for maximum undistorted, buzz-free audio output. Start with the core at the outermost position from the printed board and tune for the second "peak" encountered on the way into the coil form.
3. Connect a variable bias supply (3 to 15V) to the AGC test point with the positive lead to the chassis. Adjust bias until audio signal distorts on peaks slightly, then adjust core of L302 to curb distortion. Repeat this procedure several times at increased bias levels until maximum clarity of audio is obtained.

4. Adjust the core of L157, repeating the bias advances in step 3, to achieve the optimum setting for noise-free performance at low signal levels.



I-F INJECTION NETWORK



T251 WIRING

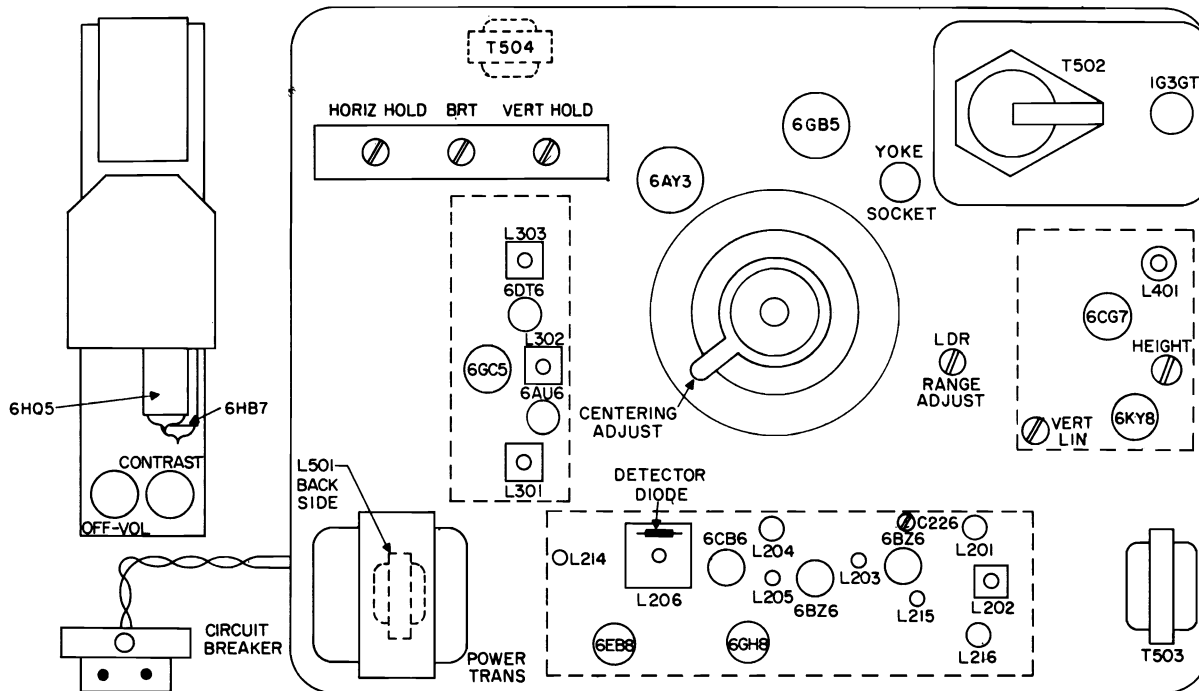
Magnavox

47 SERIES TELEVISION CHASSIS

MODELS 1T121D, 1T122D, 1T123D, 1T124D

CRT 1ST ANODE ADJUSTMENT--On chassis which contain the Magnalux circuitry, a variable control is provided to insure proper tracking of the Light Dependant Resistor. This control should be set to provide a correct ratio between contrast and brightness through out the range of the LDR. Adjustment of this control may necessitate re-adjustment of the contrast and brightness controls.

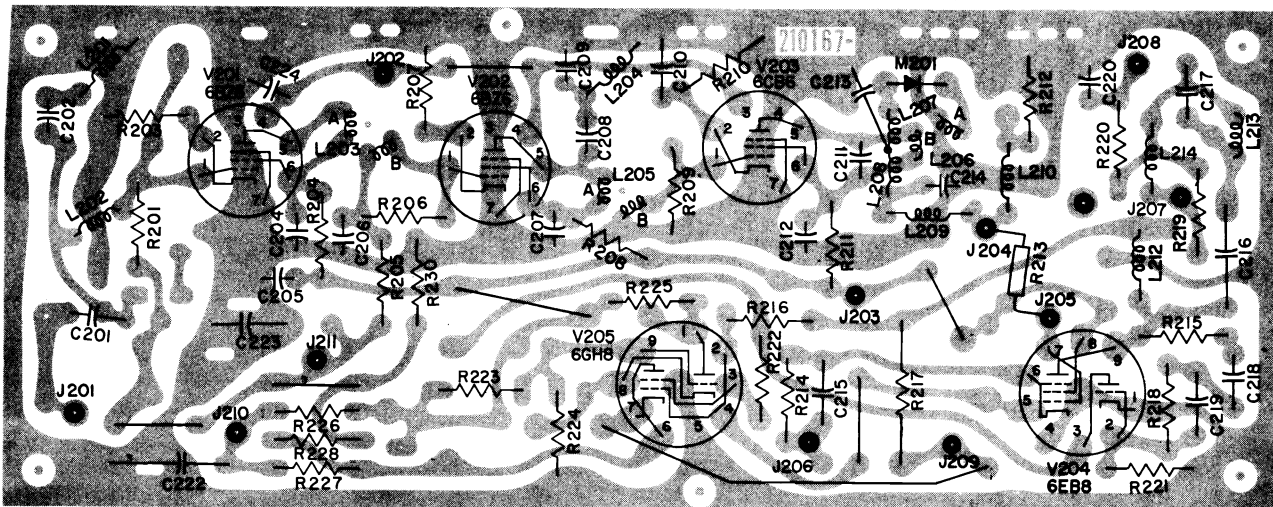
HORIZONTAL OSCILLATOR--Turn the horizontal hold control to its mid-range position. Adjust the horizontal frequency coil "slug" until the picture falls into synchronization. Keep adjusting this slug until the picture falls out of sync. Now reverse the direction of adjustment until the picture just pulls into sync. Rotate the hold control to both extremes of rotation. The picture should either stay in sync at both extremes or fall out of sync by an equal number of bars.



CHASSIS LAYOUT

L215, L216 AND C226 ARE NOT USED ON SOME CHASSIS

**PRINTED WIRING BOARDS
(VIEWED FROM COPPER PATTERN)**

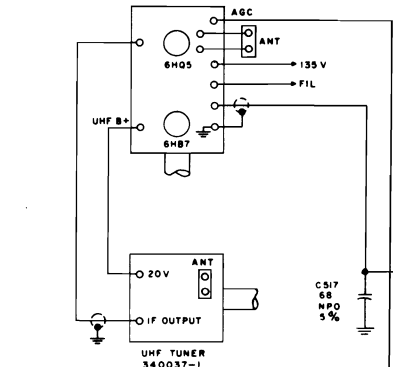


VIDEO AND VIDEO IF BOARD

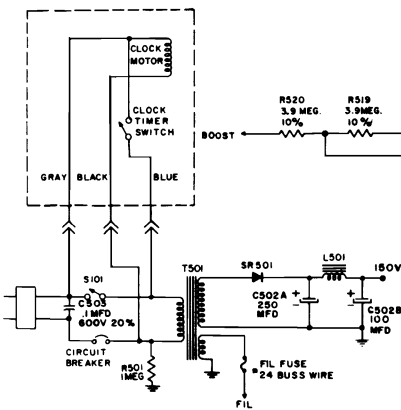
VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

MAGNAVOX Series 47 Schematic Diagram, Continued

4704-VHF TUNER 340047-1 HAS A 300Ω INPUT
 4706-VHF TUNER 340068-1 HAS A 75Ω COAX INPUT

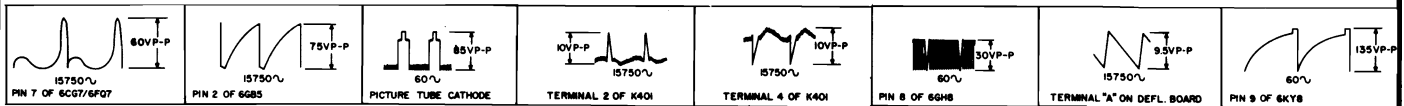
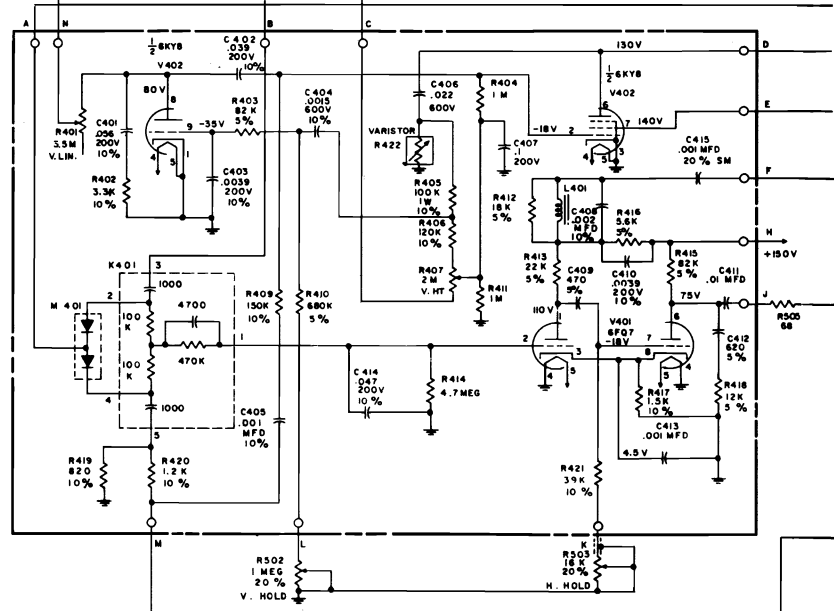
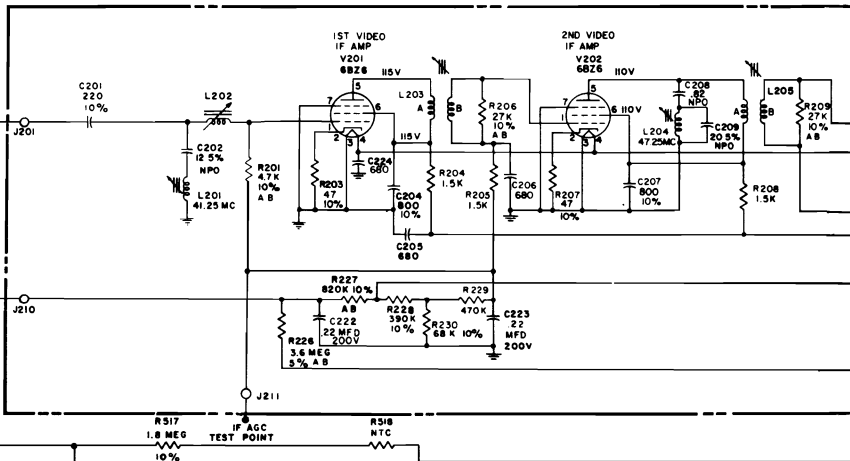
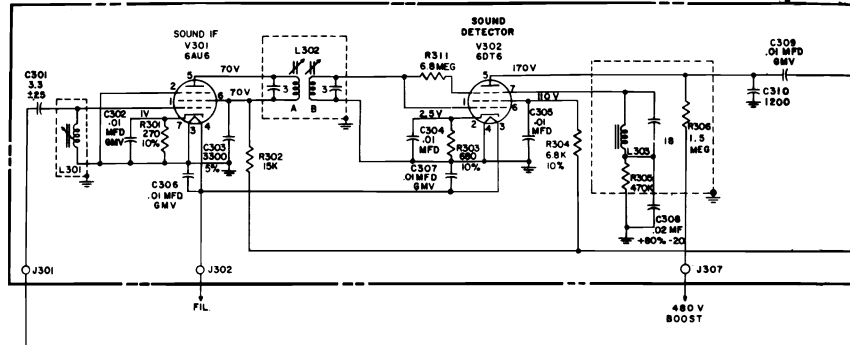


NOTE: PROVISIONS FOR CLOCK CONNECTIONS ARE OMITTED ON 4706.



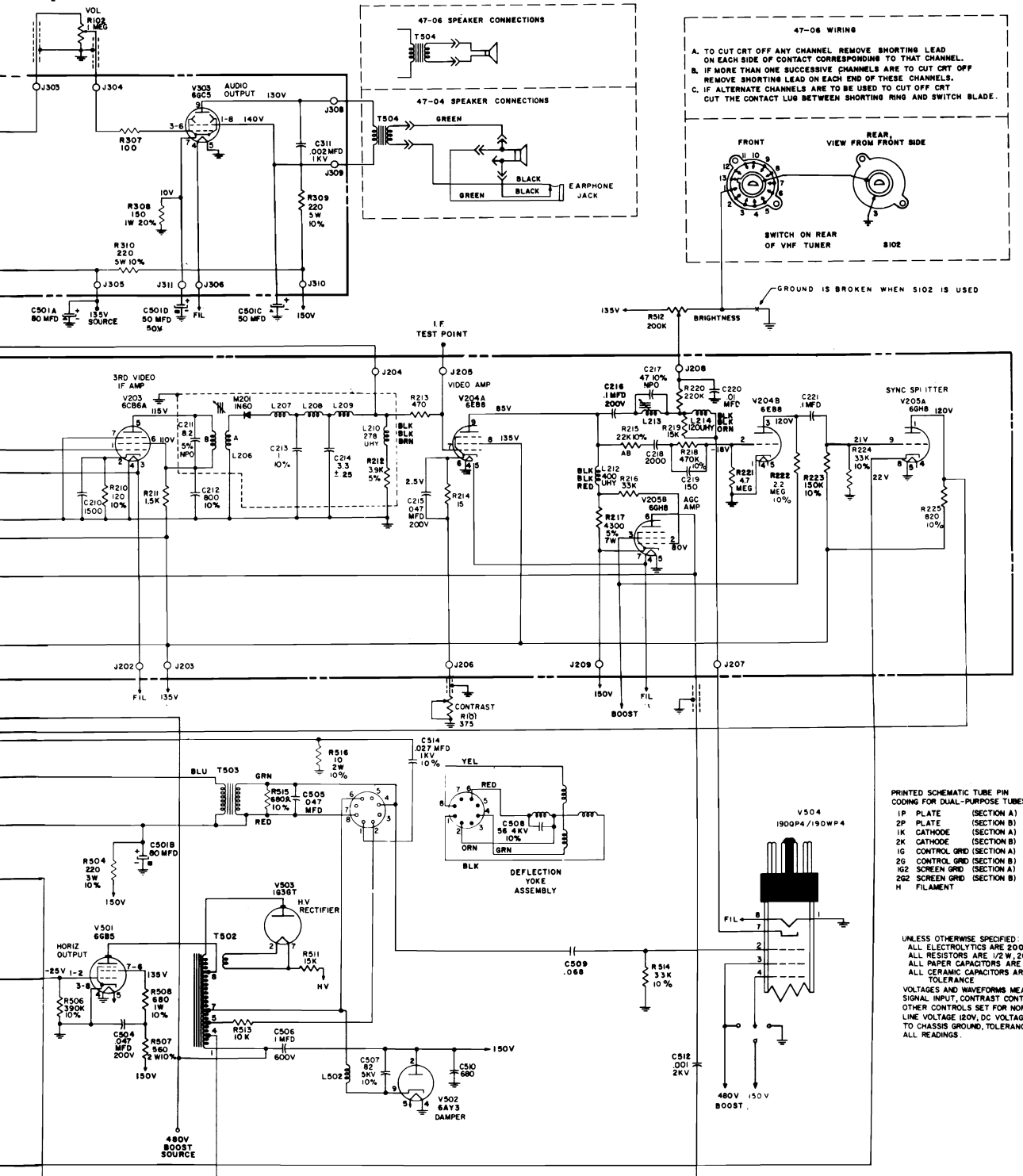
VHF OSCILLATOR--The VHF tuner is equipped with individual oscillator adjustment "slugs" for each channel. On the tuners which have the Automatic Fine Tuning feature, these oscillator "slugs" are adjusted automatically as the Fine Tuning control is rotated. All channels should be checked and the Fine Tuning set so the picture is received when changing channels without any further adjustment of the Fine Tuning Control.

FOCUSING--These chassis employ electrostatic focus picture tubes. The focus is accomplished by varying the voltage applied to the focusing anode of the picture tube. On some versions this is accomplished by plugging the focus anode lead into one of three jacks provided. On others a variable Focus Control is provided.

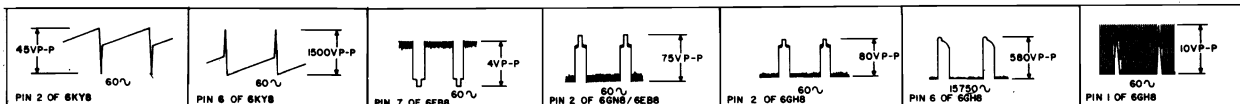


VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

MAGNAVOX Series 47 Schematic Diagram, Continued

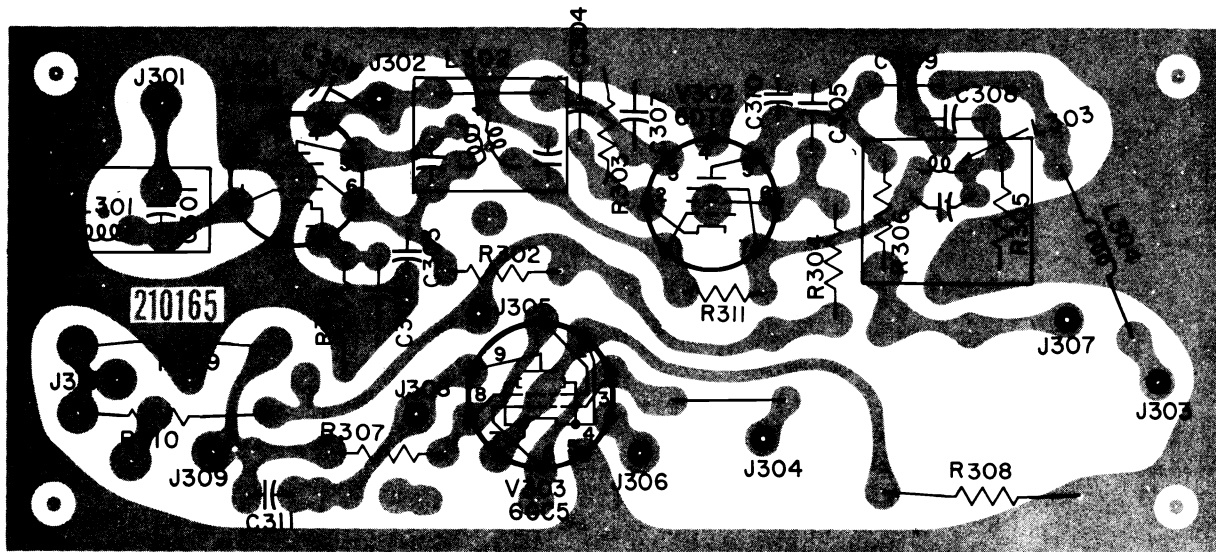


47-04 AND 47-06 SCHEMATIC DIAGRAM

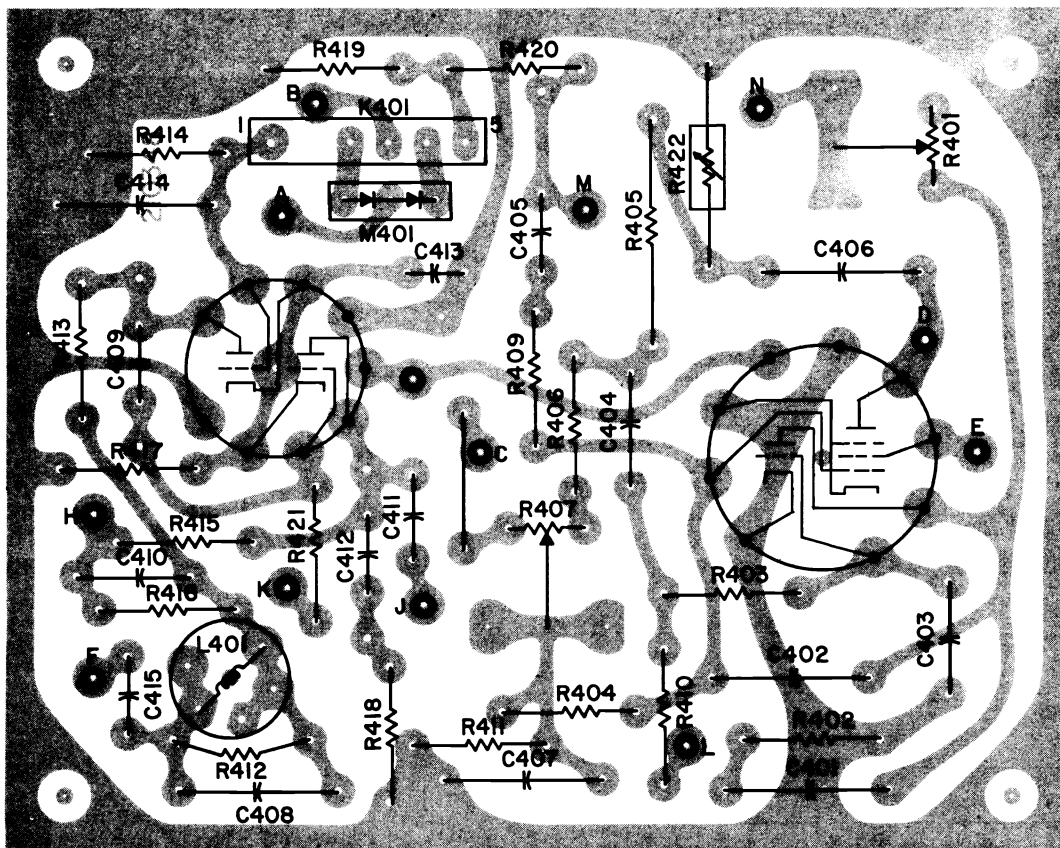


MAGNAVOX Series 47 Servicing Information, Continued

PRINTED BOARDS (CON'T)



AUDIO BOARD



DEFLECTION BOARD

M O N T G O M E R Y W A R D

MODEL WG-1248B

CHASSIS REMOVAL

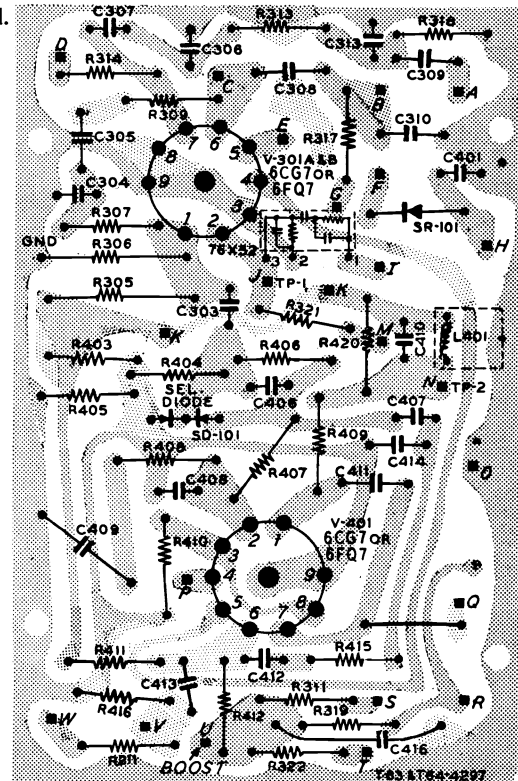
1. Remove all knobs from front of cabinet.
2. Remove horizontal hold knob and the five (5) screws holding the cabinet back in place. Remove the back part way and reach in and disconnect the antenna leads.
3. Disconnect the speaker leads, anode lead, yoke plug, pix tube socket, the ground lead from high voltage to the pix tube mounting ring and grounding strap.
4. Place the cabinet face down on a protective surface and remove the four (4) screws at the bottom of the cabinet and the four (4) screws holding the control bracket to the cabinet. Carefully lift the chassis out of the cabinet.

DEFLECTION YOKE ADJUSTMENT — The deflection yoke should be positioned as far forward on the neck of the tube as the bell will allow. Then, if the lines of the raster are not horizontal or squared with the picture mask, rotate the deflection yoke until this condition is obtained. Upon completion of this adjustment, tighten the clamp at the rear of the deflection yoke.

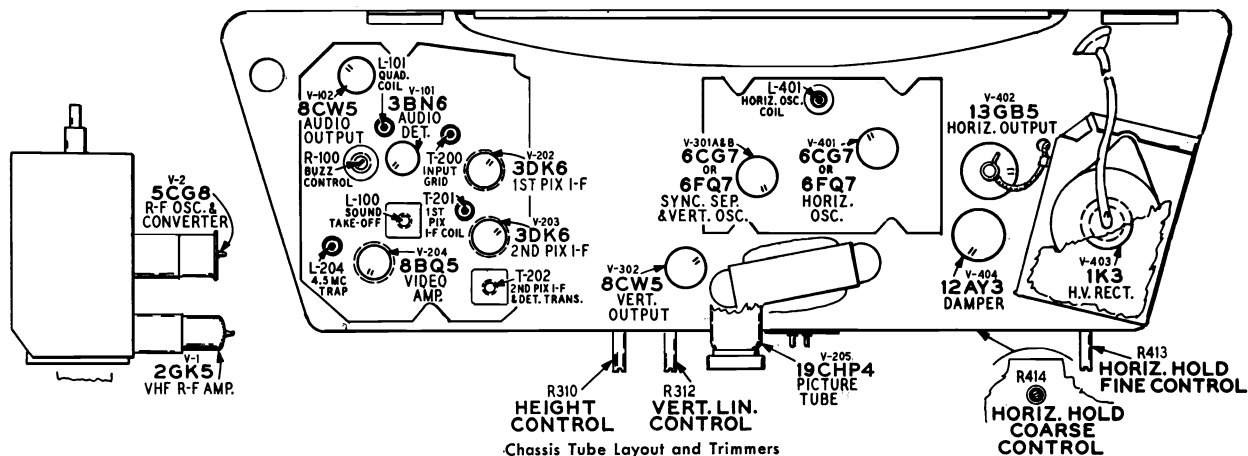
CENTERING ADJUSTMENT — If horizontal or vertical centering is required this should be done at 105V line (if possible) to obtain normal setting. Adjust each ring in the centering device until proper centering is determined. If centering is not adjusted properly, focus may be poor.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENT — Adjust the height control until the picture fills the mask vertically. Adjust the vertical linearity control until the picture is symmetrical from top to bottom. Adjust the picture centering device to align picture with the mask.

PROCEDURE FOR ADJUSTING HORIZONTAL OSCILLATOR COIL Short sync separator plate to ground or B+. Place a short across the terminals of the horizontal oscillator coil. Adjust the horizontal hold control until the horizontal blanking bar drifts slowly across the screen. Remove the short across the horizontal oscillator coil and adjust iron slug in the coil until horizontal blanking bar drifts slowly across the screen. Remove short from the sync separator plate. The picture will lock in — controls need not be touched.

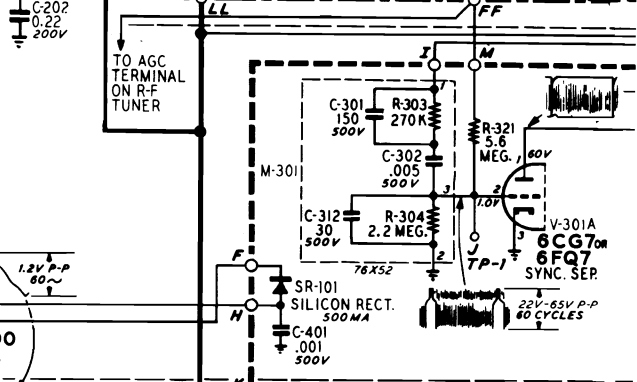
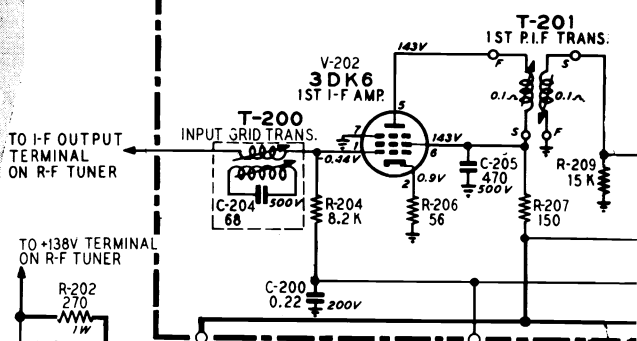
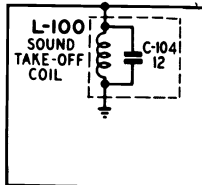
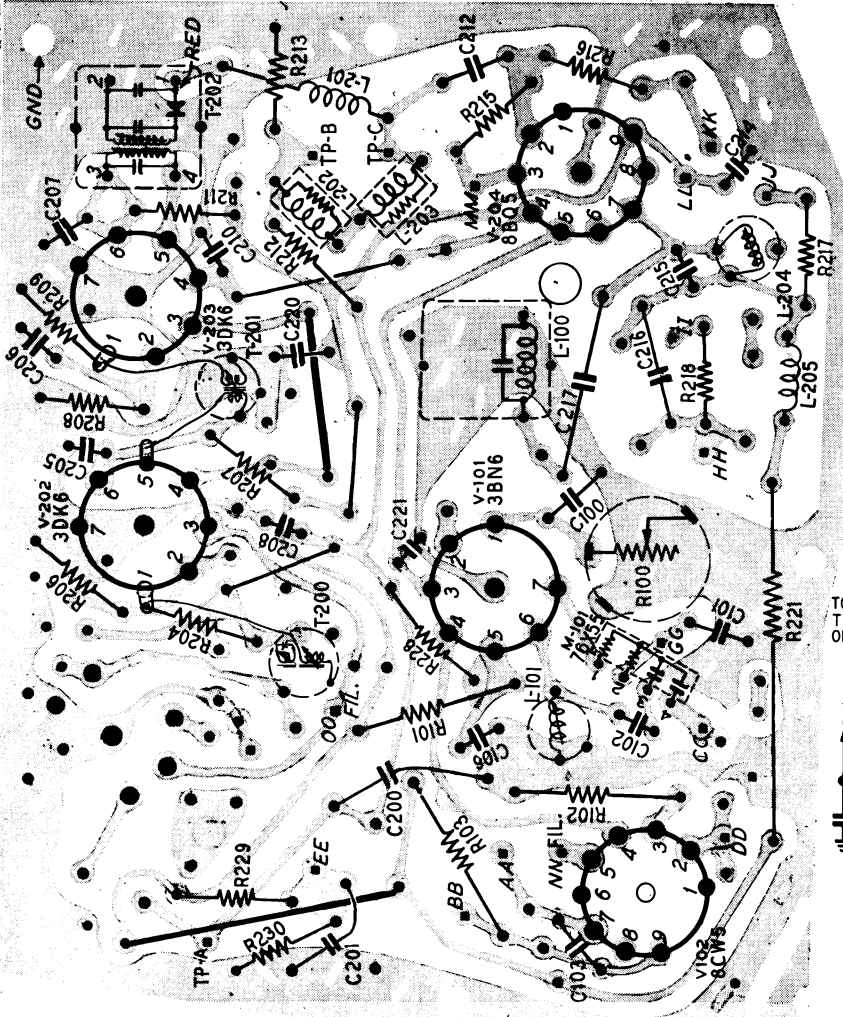


38A2911-000 PRINTED CIRCUIT BOARD ASSEMBLY (SWEEP)



VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

38A2912-000 PRINTED CIRCUIT BOARD ASSEMBLY (I-F)



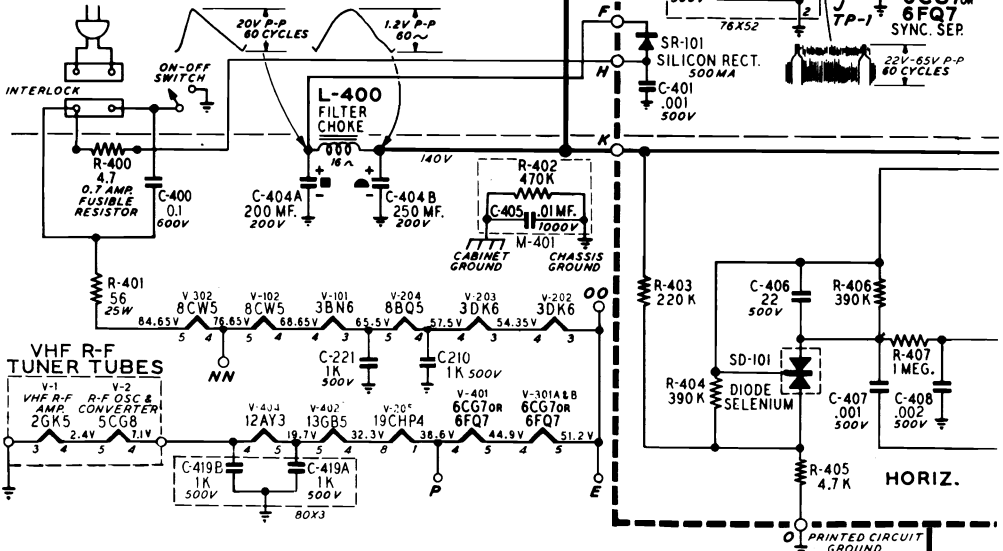
SCHEMATIC IS DIVIDED INTO FOUR SECTIONS WITH EACH SECTION HAVING ITS OWN SERIES OF REFERENCE NUMBERS.

ALL RESISTANCE VALUES IN OHMS AND HALF WATT UNLESS OTHERWISE SPECIFIED.

ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF AND ABOVE 1.0 IN PF. UNLESS OTHERWISE NOTED.

COIL RESISTANCE VALUES LESS THAN 1.0 OHM ARE NOT SHOWN.

K=1000



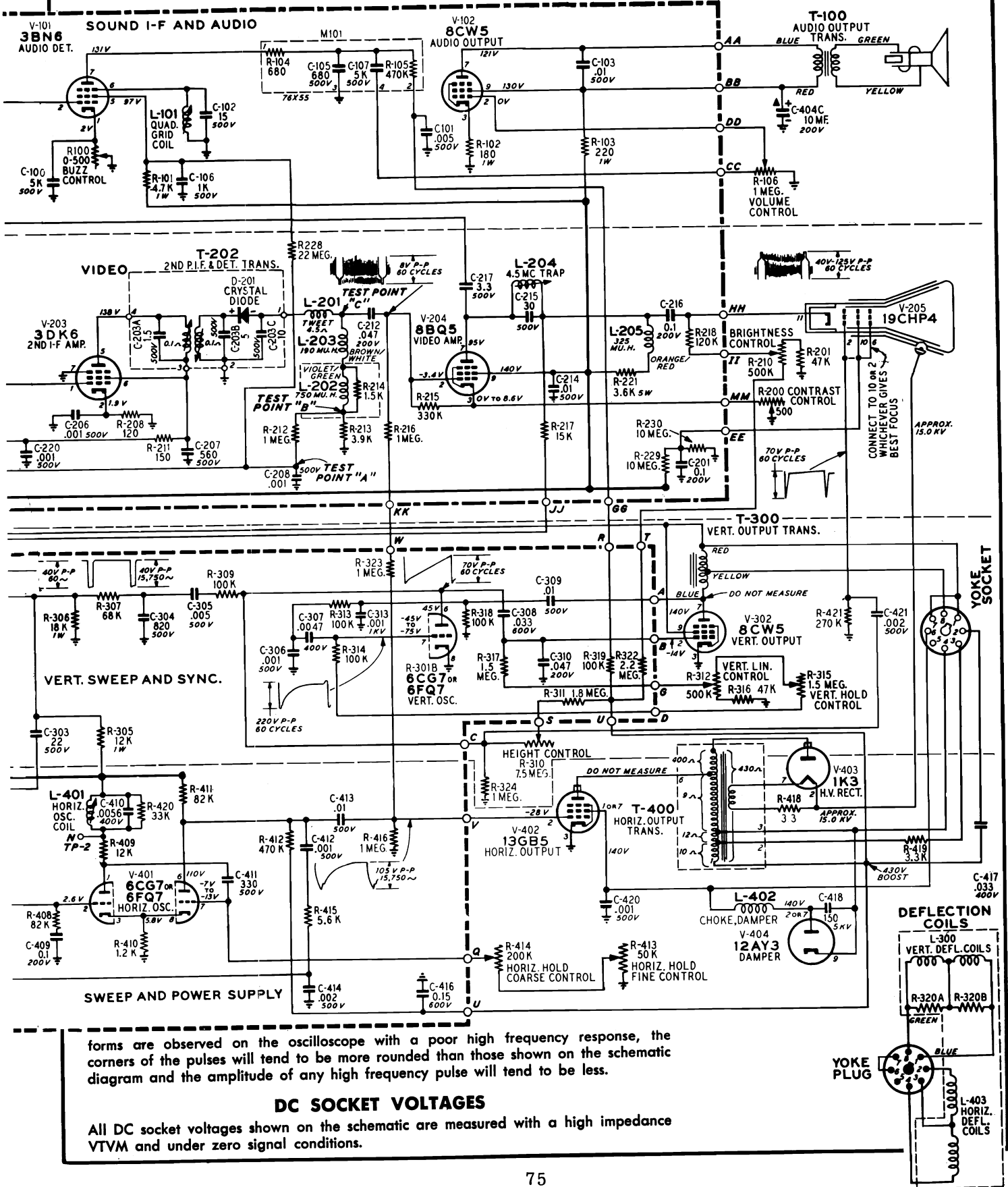
VHF R-F TUNER TUBES

Tube	V-1	V-2	V-4J4	V-402	V-305	V-401	V-301A & B
Type	VHF R-F	R-F OSC & AMP CONVERTER	12AY3	13GB5	19CHP4	6CG7or 6FQ7	6CG7or 6FQ7
Pin 1	2.4V	5C68	19.7V	32.3V	38.6V	44.9V	51.2V
Pin 2	7.1V						
Pin 3							
Pin 4							
Pin 5							

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 wave-

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

MONTGOMERY WARD Model WG-1248B Schematic Diagram, Continued



forms are observed on the oscilloscope with a 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.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

MONTGOMERY WARD & CO.

Models WG-3315A, WG-3345A, WG-3355A,
WG-4315A, WG-4345A, WG-4355A.

INSTRUCTIONS CHASSIS REMOVAL

1. Remove all the knobs from front of cabinet.
2. Remove cabinet back and disconnect the yoke plug, pix tube socket, anode lead, beam aligner (if used) and lead from high voltage can to pix tube mounting ring screw.
3. Disconnect the speaker leads.
4. Disconnect the antenna leads from the tuner.
5. Four screws are used in mounting the chassis to the cabinet. One screw is located at the front (near the tuner), one screw at the rear, holding brace bracket to the cabinet and the other two screws are accessible through the holes in the perforated bottom panel. Remove the four screws and carefully remove the chassis from the cabinet.

DEFLECTION YOKE ADJUSTMENT — The deflection yoke should be positioned as far forward on the neck of the tube as the bell will allow. Then, if the lines of the raster are not horizontal or squared with the picture mask, rotate the deflection yoke until this condition is obtained. Upon completion of this adjustment, tighten the clamp at the rear of the deflection yoke.

CENTERING ADJUSTMENT — If horizontal or vertical centering is required this should be done at 105V line (if possible) to obtain normal setting. Adjust each ring in the centering device until proper centering is determined. If centering is not adjusted properly, focus may be poor.

CONTROLS FRONT OF CHASSIS

VHF Channel Selector & UHF Switch . . .
Fine Tuning
Off-On Volume R-104
Contrast R-213
Brightness R-217
Vertical Hold R-315

CONTROLS REAR OF CHASSIS

Horizontal Centering } Centering
Vertical Centering } Device
Vertical Linearity R-316
Height R-310
Buzz R-101
Horizontal Hold (Coarse) R-414
Horizontal Oscillator L-401
Horizontal Hold (Fine) R-413

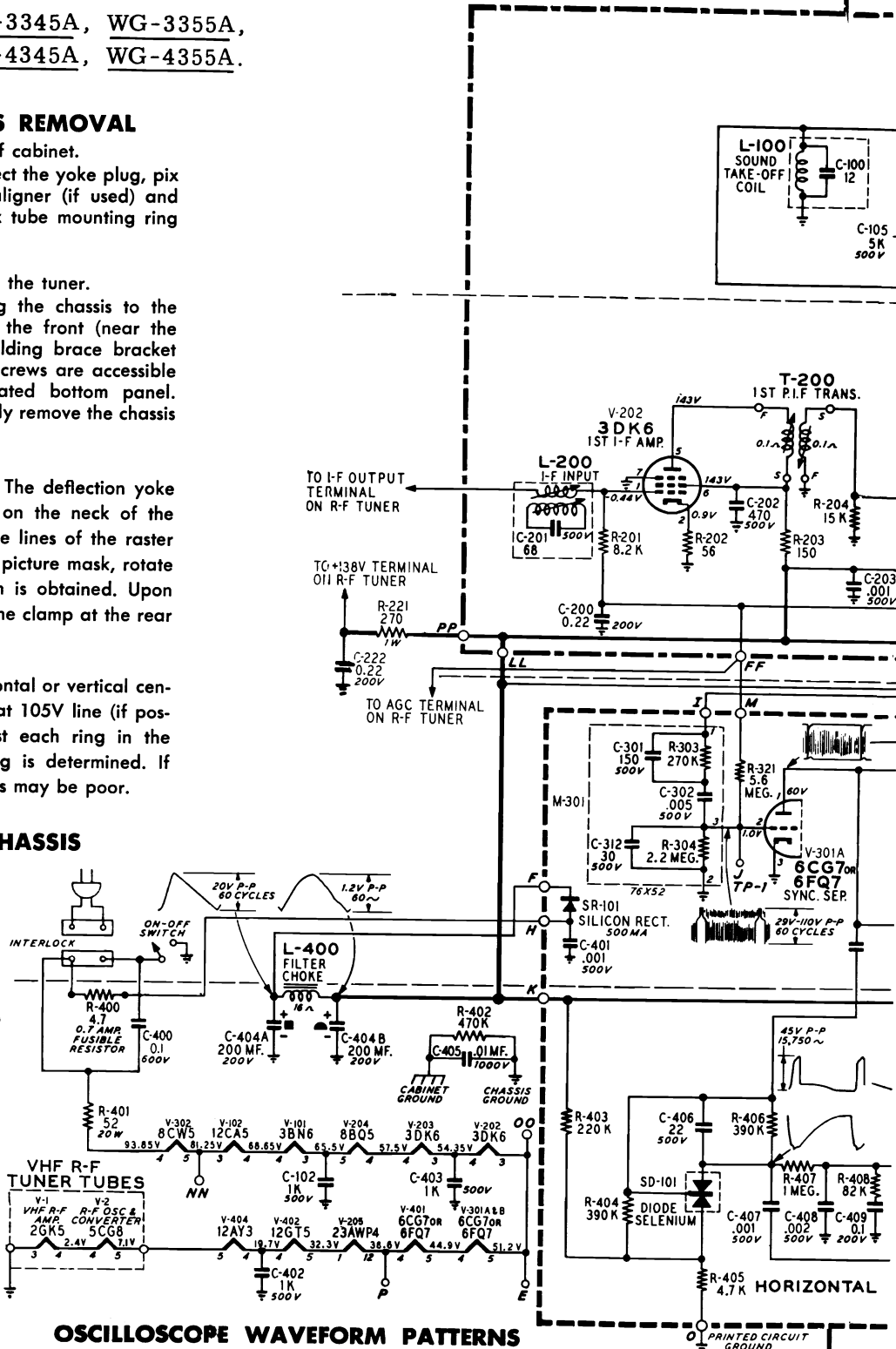
SCHEMATIC IS DIVIDED INTO FOUR SECTIONS WITH EACH SECTION HAVING ITS OWN SERIES OF REFERENCE NUMBERS.

ALL RESISTANCE VALUES IN OHMS AND HALF WATT UNLESS OTHERWISE SPECIFIED.

ALL CAPACITANCE VALUES LESS THAN 1.0 IN MF AND ABOVE 1.0 IN PF, UNLESS OTHERWISE NOTED.

COIL RESISTANCE VALUES LESS THAN 1.0 OHM ARE NOT SHOWN.

K=1000

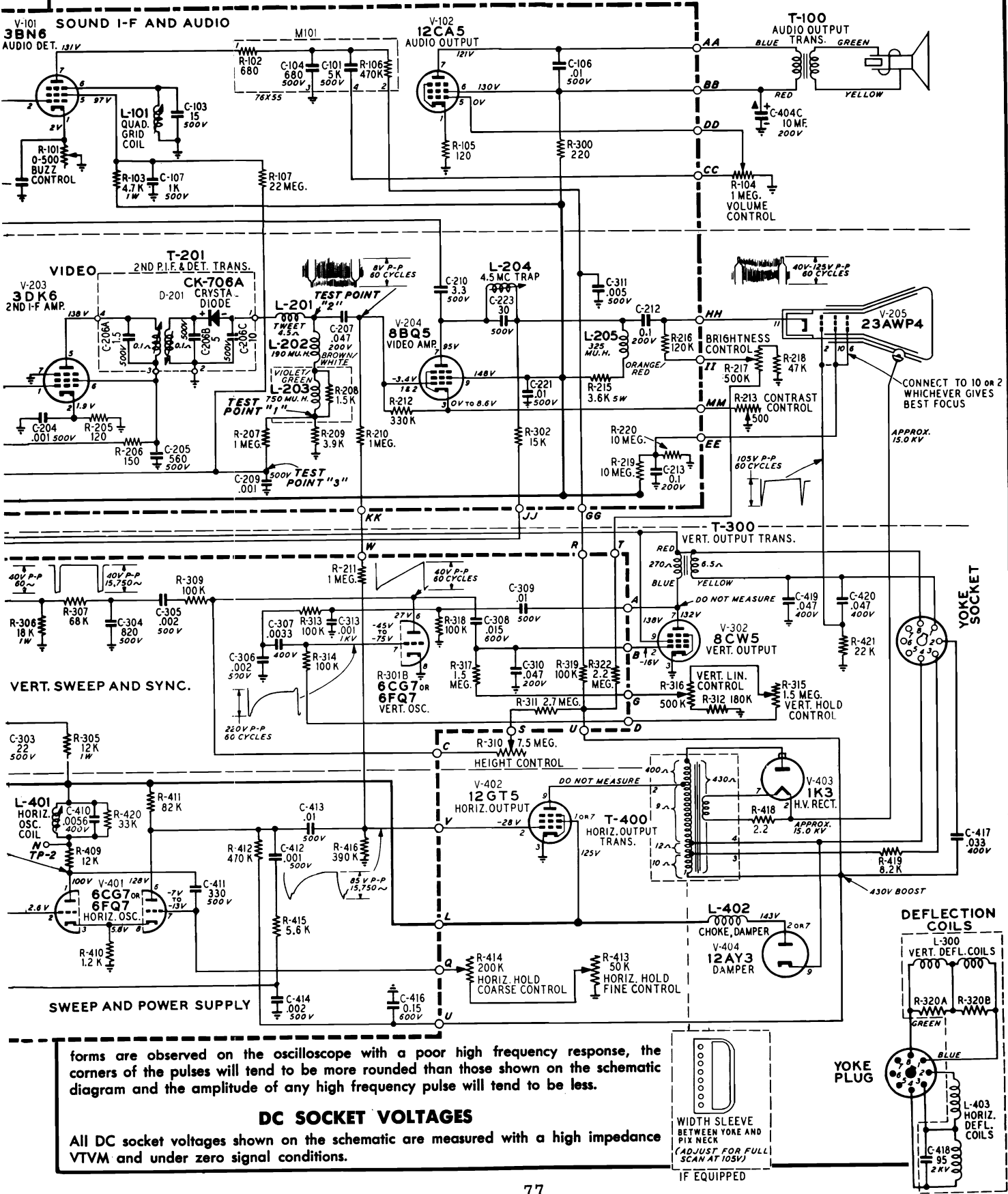


OSCILLOSCOPE WAVEFORM PATTERNS

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 wave-

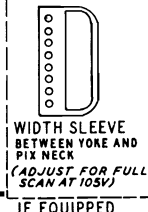
VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

MONTGOMERY WARD Models WG-3315A, WG-4315A, etc., Continued



DC SOCKET VOLTAGES

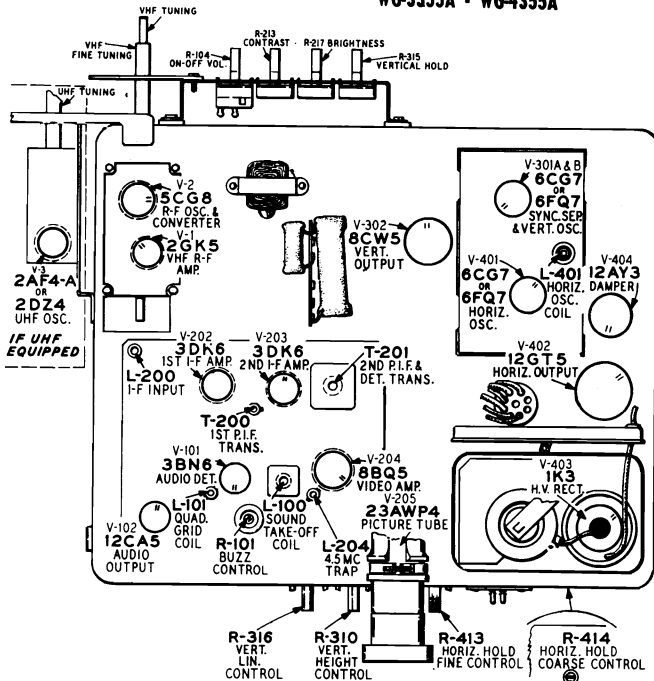
All DC socket voltages shown on the schematic are measured with a high impedance VTVM and under zero signal conditions.



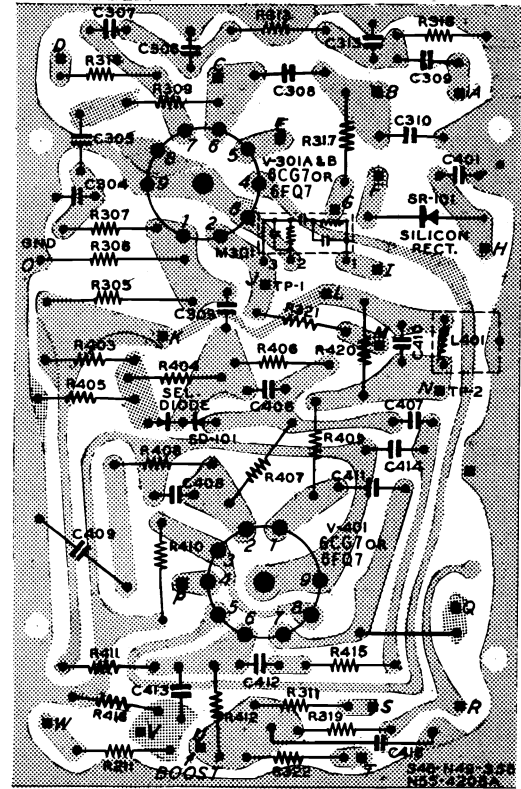
VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

MONTGOMERY WARD & CO.

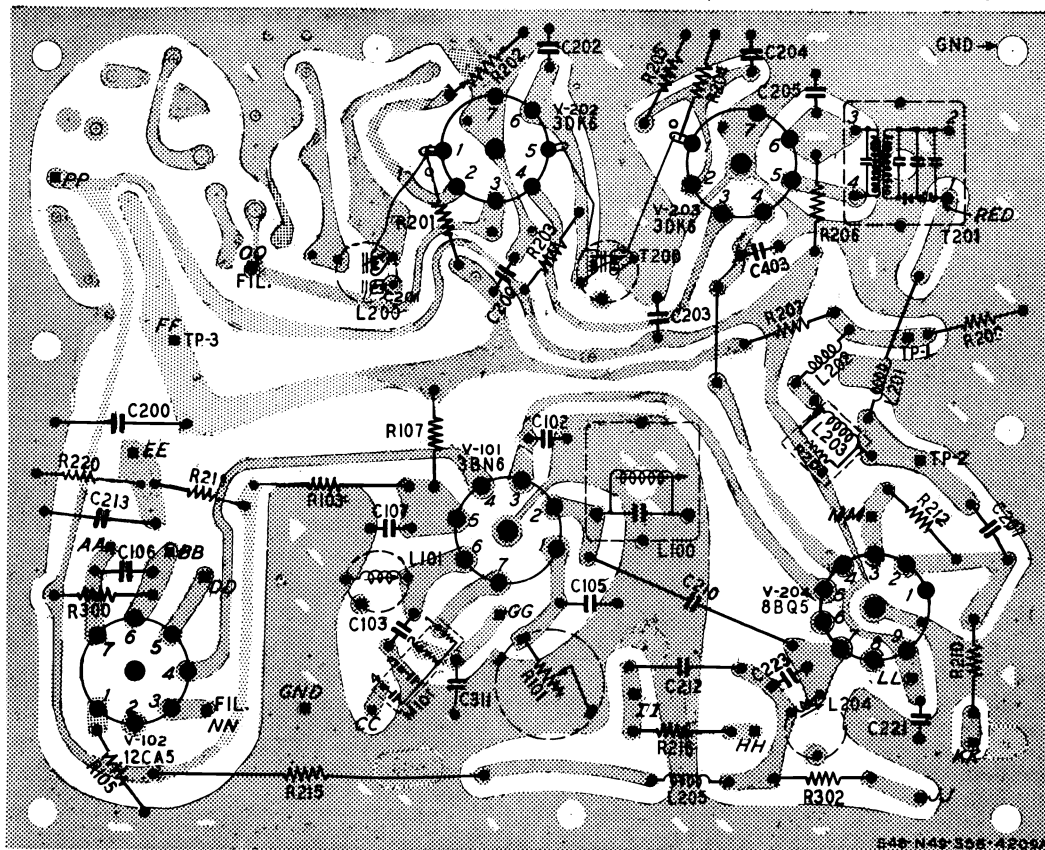
MODELS WG-3315A - WG-4315A
WG-3345A - WG-4345A
WG-3355A - WG-4355A



Chassis Tube Layout and Trimmers



(S-38A2724) PRINTED CIRCUIT BOARD ASSEMBLY (SWEEP)



S-38A2725 PRINTED CIRCUIT BOARD ASSEMBLY (I-F)

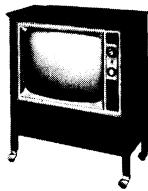
MOTOROLA

CHASSIS TS-588

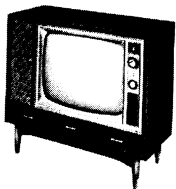
MODEL BREAKDOWN CHART



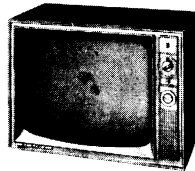
MODEL 23K136



MODEL 23K138



MODEL 23K142



MODEL 23T35

MODEL	CHASSIS	VHF TUNER	UHF TUNER	UHF CONVERSION KIT	CRT
23K136M,W	KTS-588	LCMTT-365Y	--	TK-180	23ARP4
Y23K136M,W	KTS-588	LCMTT-365Y	STT-600	--	23ARP4
23K138M,W	PKTS-588Y	CPTT-361Y	--	TK-180	23ARP4
Y23K138M,W	PKTS-588	CPTT-361Y	STT-600	--	23ARP4
23K140MP	PKTS-588Y	CPTT-361Y	--	TK-180	23ARP4
Y23K140MP	PKTS-588	CPTT-361Y	STT-600	--	23ARP4
23K142M,W	PKTS-588Y	CPTT-361Y	--	TK-180	23ARP4
Y23K142M,W	PKTS-588	CPTT-361Y	STT-600	--	23ARP4
23T35E	KTS-588	LCMTT-365Y	--	TK-180	23ARP4
Y23T35E	KTS-588	LCMTT-365Y	STT-600	--	23ARP4
23T37MG,WG,MPG	PKTS-588	CPTT-361Y	--	TK-180	23ARP4
Y23T37MG,WG,MPG	PKTS-588Y	CPTT-361Y	STT-600	--	23ARP4

FINE TUNING ADJUSTMENT

Continuously Variable Fine Tuning

Center the fine tuning control mechanically. Set tuner to the highest numbered available channel and with an insulated screwdriver, adjust the channel oscillator screw for best picture and sound. Adjust all other available oscillator screws in descending order. Only a slight adjustment should be necessary to bring in each channel.

Tuners With Concentric Pre-Set Fine Tuning

Rotate the fine tuning knob in either direction for best picture and sound on all available channels. Turning the fine tuning shaft to the right or left engages the pre-set gears. The gears, in turn, change the position of the core in the oscillator coil. Individual coils are used for each channel. Therefore, channel pre-set adjustments can be made in any sequence.

FOCUSING ADJUSTMENT

To provide for differences in the picture tube gun structure, a focus adjustment is provided by three (3) lugs located on the chassis. They provide a ground potential point, a B+ voltage point and a bootstrap voltage point. Connect the blue lead from the picture tube socket to the lug which provides the best over-all focus, center to edge of screen.

NOISE GATE CONTROL

The noise gate control is used to adjust the receiver for best hold stability under noise and different signal strength conditions.

To adjust, tune in a channel for best picture and sound. Turn the noise gate control clockwise (when viewed from rear of receiver) until the picture becomes unstable (rolls down or slips, etc.). Then, turn control counter-clockwise until the picture returns to normal. Check all channels; if any are unstable, continue turning control counter-clockwise until the picture is normal on all channels.

CIRCUIT GUARD

The circuit guard is a thermal cut-out type of overload relay. It is in series with the power into the receiver for protection against shorts in the chassis.

The circuit guard will remain in the "closed circuit" state when the current requirements are normal. In the event of a continuous high current overload, the bi-metallic elements of the unit will become heated to the extent of "opening" the contacts and disconnecting the AC power. After the bi-metallic elements have cooled, the circuit guard may be re-set by depressing the plastic re-set button.

The circuit guard is designed to remain "closed" on the higher-than-normal instantaneous surge currents encountered during the initial

warm-up. The circuit guard is unique in the fact that when a short exists in the associated circuitry, power is not re-applied when the re-set button is held depressed.

HORIZONTAL SIZE CONTROL

To provide for differences in line voltages, either of the two end lugs of the terminal strip next to the audio output tube may be selected to provide proper horizontal size. The lead must be connected to one of the lugs. Remove power before making adjustment. See top chassis photo for location.

TO REMOVE IF COILS FROM SHIELDS

The coils located in the shields are locked into position. In order to gain access to the coil and components located within the shield, grip one side of the coil form with long-nose pliers and carefully pull it out of the shield. If leads are too short to permit access to the coil, unsolder leads from chassis components, not from coil form. Heating the coil terminals may result in component damage or loss of wax protection against moisture.

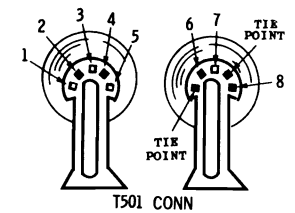
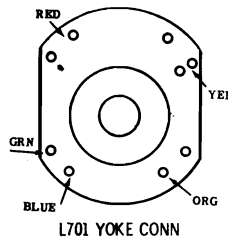
When re-inserting coil assembly in shield, be sure coil form locks into position inside the shield.

Coils which are dipped in wax must be replaced as an assembly to maintain proper moisture protection in high humidity areas.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

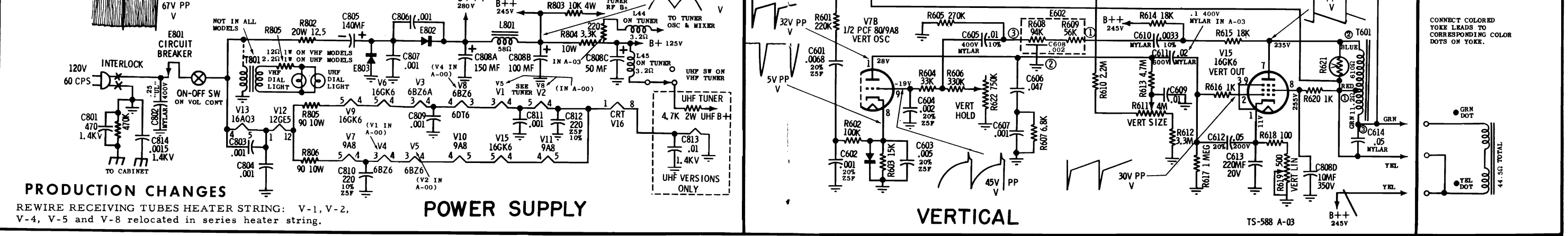
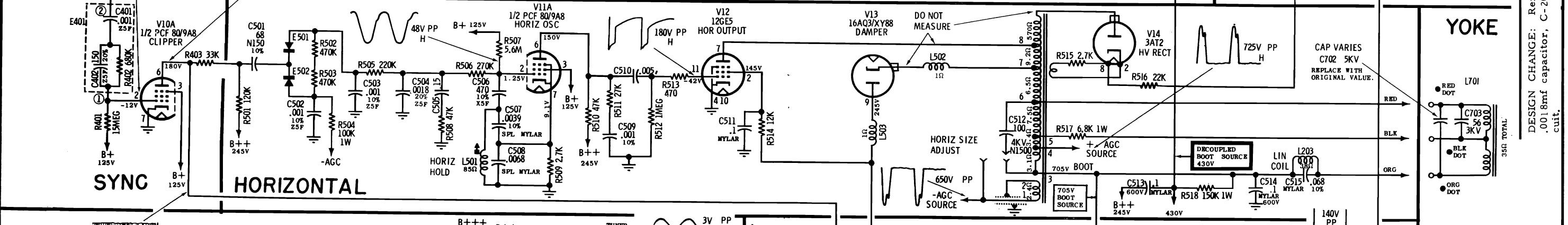
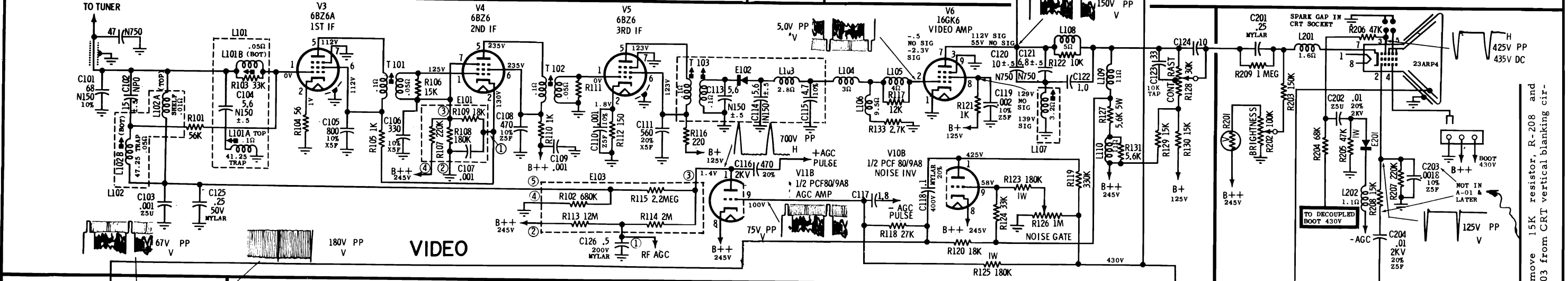
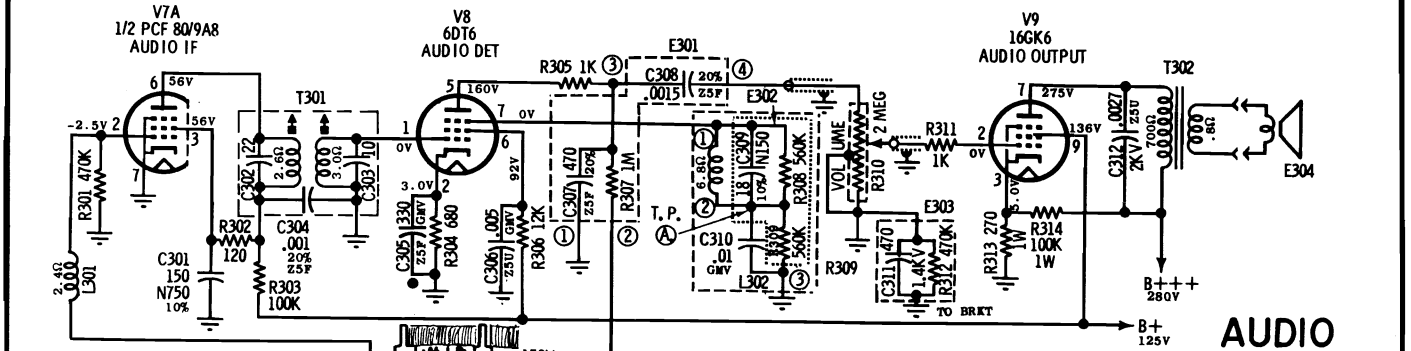
MOTOROLA Chassis TS-588 Schematic Diagram

- NOTES:**
- VOLTAGE MEASUREMENTS**
- TAKEN FROM POINT INDICATED TO CHASSIS WITH A VTVM, $\pm 20\%$
 - LINE VOLTAGE MAINTAINED AT 120V AC.
 - TAKEN WITH CONTRAST CONTROL AT MINIMUM AND ALL OTHER CONTROLS IN NORMAL OPERATING POSITION WITH NO SIGNAL INPUT.
 - TUNER ON CHANNEL 13 OR CHANNEL OF LEAST NOISE WITH ANTENNA TERMINALS SHORTED.
- WAVEFORM MEASUREMENTS**
- TAKEN FROM POINT INDICATED TO CHASSIS WITH A WIDE-BAND OSCILLOSCOPE
 - OSCILLOSCOPE SYNC'D NEAR SWEEP RATE INDICATED.
 - TAKEN WITH STRONG SIGNAL, CONTRAST CONTROL AT MAXIMUM; ALL OTHER CONTROLS IN NORMAL OPERATING POSITION.



UNLESS OTHERWISE SPECIFIED: CAPACITORS ARE DISC CERAMIC 500V DC, TOLERANCE & CHARACTERISTIC AS NOTED; IF TOLERANCE IS NOT GIVEN CAPACITORS ARE GRV (GUARANTEED MIN. VALUE) TYPE. TUBULAR CAPACITORS ARE 20% 400V DC. DECIMAL VALUES IN MF, ALL OTHERS IN MMF. RESISTORS ARE ALL 10% 1/2W.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION



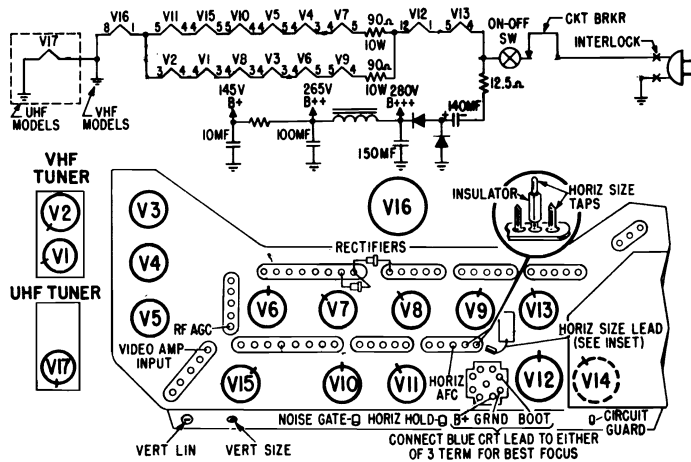
PRODUCTION CHANGES

REWIRE RECEIVING TUBES HEATER STRING: V-1, V-2, V-4, V-5 and V-8 relocated in series heater string.

DESIGN CHANGE: Remove 15K resistor, R-208 and .0018mf capacitor, C-203 from CRT vertical blanking circuit.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

MOTOROLA Chassis TS-588 Servicing Information, Continued



REF NO.	TUBE TYPE	FUNCTION
V1	4GK5	RF AMP
V2	9A8	MIXER OSC
V1	4HA5	RF AMP
V2	9CZ8	MIXER OSC
V3	6BZ6A	1ST IF AMP
V4	6BZ6	2ND IF AMP
V5	6BZ6	3RD IF AMP
V6	16GK6	VIDEO AMP
V7	9A8/PCF80	SOUND IF & VERT OSC
V8	6D7	AUDIO DET
V9	16GK6/PL84	AUDIO OUTPUT
V10	9A8/PCF80	NOISE INV & SYNC CLIPPER
V11	9A8/PCF80	AGC AMP & HORIZ OSC
V12	12CE5	HORIZ OUTPUT
V13	16AQ3/XY-88	DAMPER
V14	3AT2	HV RECT
V15	16GK6	VERT OUTPUT
V16	23ARP4	PICT TUBE
V17	2AF4/20Z4	UHF OSC (UHF ONLY)

TUBE LOCATION

PICTURE TUBE REPLACEMENT

Use extreme care in handling the picture tube as rough handling may cause it to implode due to atmospheric pressure. Do not nick or scratch glass or subject it to any undue pressure in removal or installation. Use goggles and heavy gloves for protection.

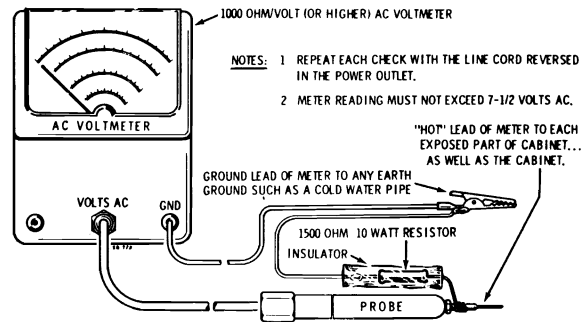
Always place protective tape on the replacement tube in the same position as on the original tube.

Console Models

CRT is removed from front of cabinet. Remove bezel to gain access to CRT mounting screw. Bezel is removed by removing bezel retaining screws from inside of cabinet.

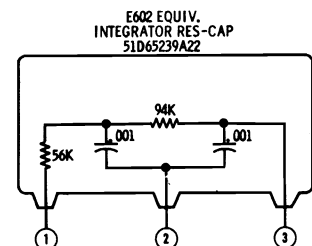
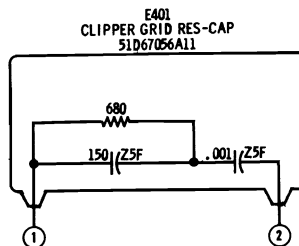
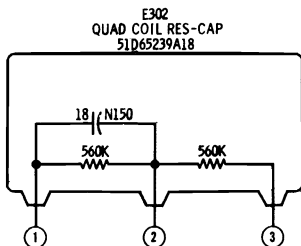
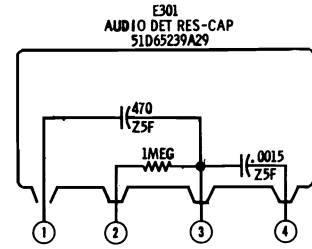
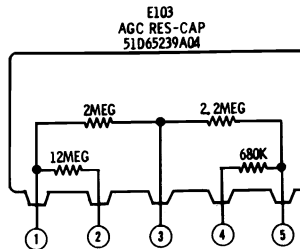
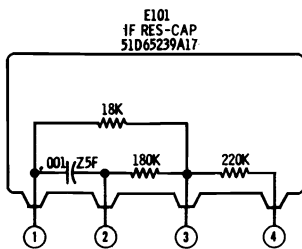
Table Models

CRT is removed from rear of cabinet. Remove chassis and then the CRT mounting screws from inside of cabinet.



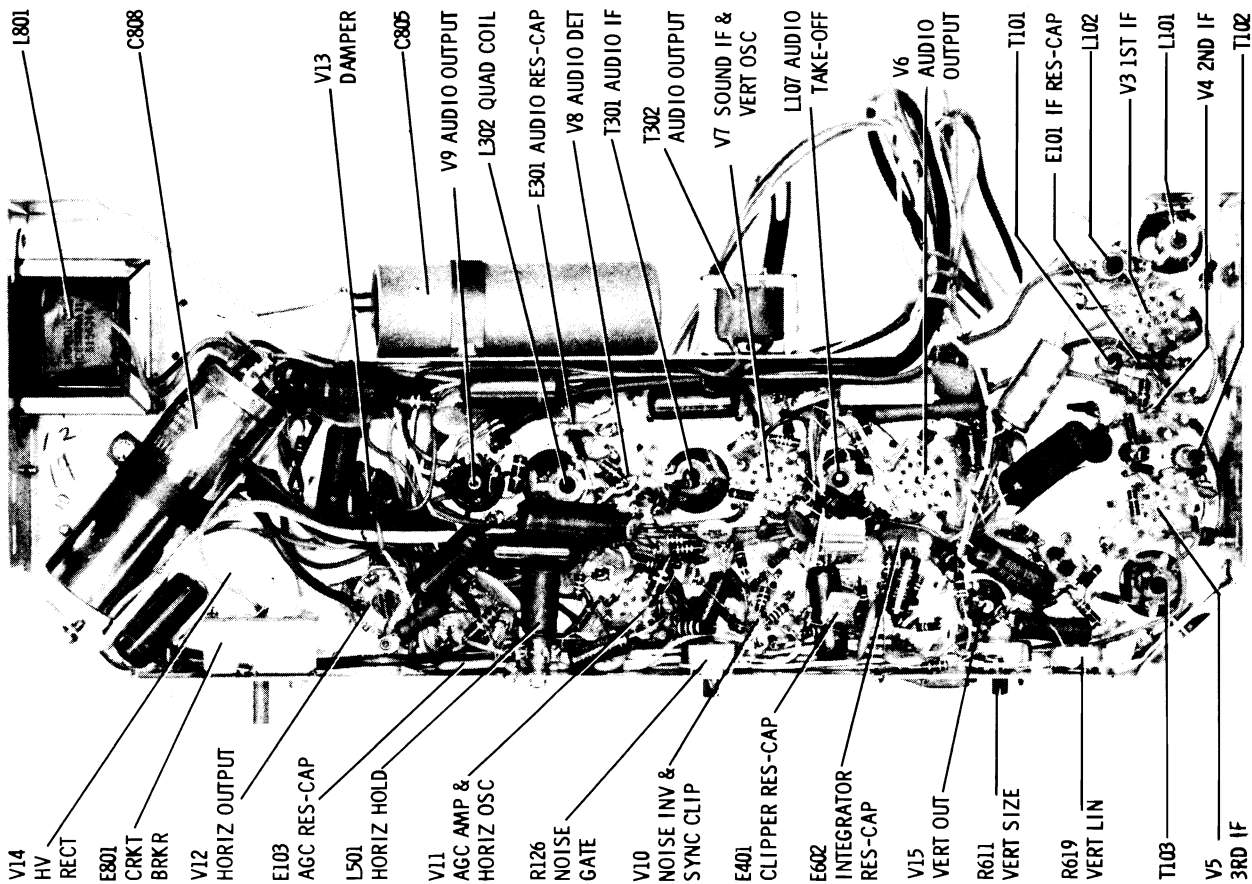
VOLTMETER HOOK-UP FOR SAFETY CHECKS

RES-CAP DIAGRAMS



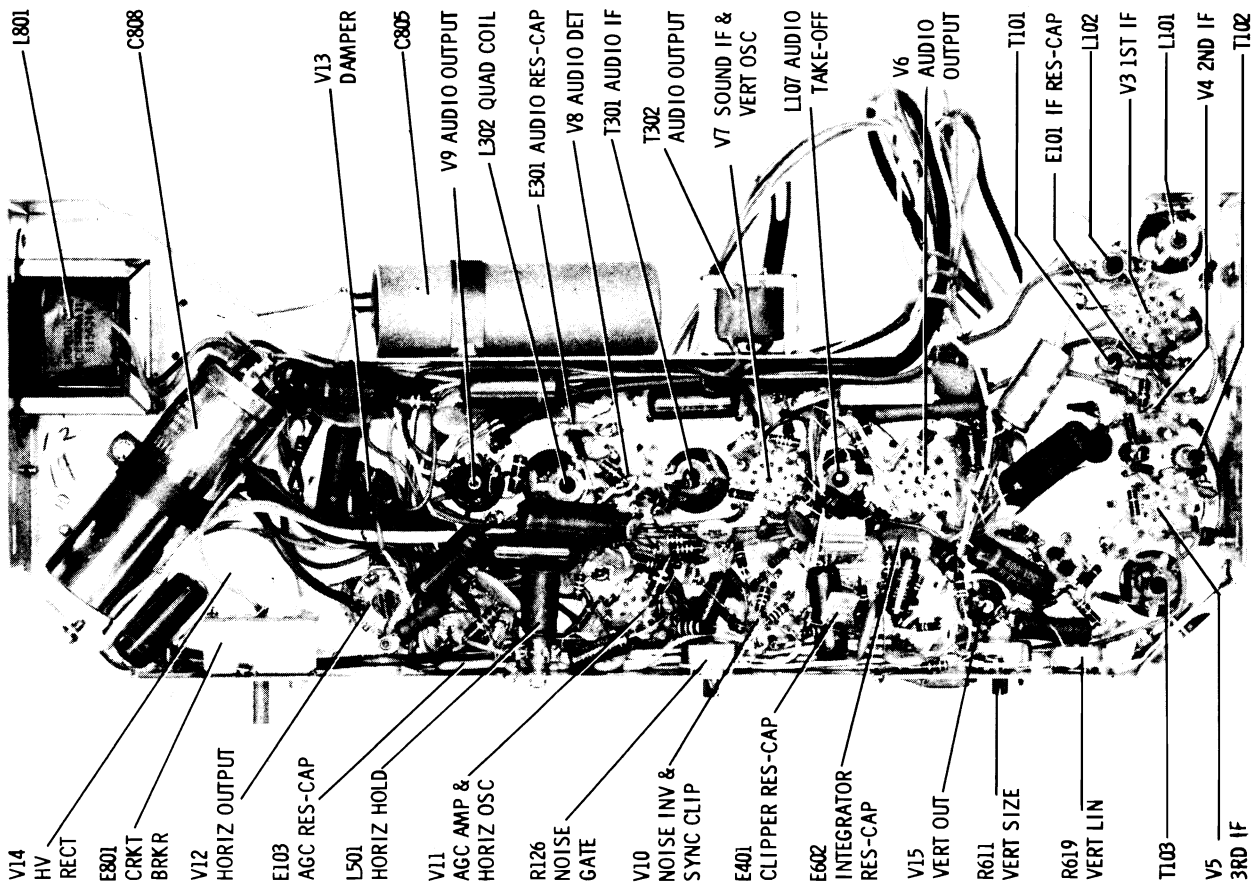
VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

MOTOROLA Chassis TS-588 Parts Location



TOP CHASSIS VIEW - TS-588

PARTS LOCATION



BOTTOM CHASSIS VIEW - TS-588

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

MOTOROLA Chassis TS-588 Alignment Information, Continued

Pre-Alignment Instructions

Before alignment of the video I. F. section is attempted, it is advisable to thoroughly check the system. If alignment is attempted on an I. F. section in which a faulty component exists, successful alignment will probably be impossible and the entire procedure will have to be repeated when the real cause of the trouble is corrected. Preliminary tests of the system should include voltage and resistance measurements, routine checks for bad soldering connections and visual inspection of the circuits for overheated components as well as for obvious wiring defects.

VIDEO IF & MIXER ALIGNMENT

Pre-Alignment Steps

1. Maintain line voltage at 120 with variac.

2. Remove the yellow lead from yoke to eliminate R. F. interference radiation.

3. Disable local oscillator. Ground oscillator grid of mixer-oscillator tube with a piece of bare wire to the tube shield.

4. Apply the negative lead of a 6,0 volt bias supply to I. F. AGC buss and positive lead to chassis ground. See "Alignment" detail.

5. Connect a 1500 ohm, 60 watt voltage normalizing resistor from B++ to chassis.

6. Set the contrast control at minimum (extreme counter-clockwise position).

7. Short across tuner input terminals.

8. Maintain 2 volts peak-to-peak at the grid of video amp except when specific values are given in the procedure chart.

9. Refer to "Video I. F. and Sound Alignment" detail for component and test point locations.

NOTE: To reduce the possibility of inter-action between the two tuning cores in a double tuned transformer or coil, each core should be adjusted for optimum response in the tuning position nearest its respective end of the coil form.

VIDEO IF & MIXER ALIGNMENT PROCEDURE

STEP	SWEEP GENERATOR AND MARKER	INDICATOR	ADJUST	ADJUST FOR AND/OR REMARKS
1.	To grid of 3rd I.F. thru .001mf capacitor. Set sweep to approximately 44Mc, markers as required.	Scope to grid of video amp thru 47K ohm resistor.	Both cores of 3rd I.F. transformer (T-103).	Equal peaks and marker placement as shown in curve #1. NOTE: 45.75 marker must fall on peak of curve.
2.	To grid (pin 1) of 1st I.F. amp thru .001mf capacitor. Wrap a wire around grid pin of tube and connect generator to wire. Set sweep to 44Mc, markers as required.	Same as Step #1.	1st I.F. transformer (T-101), 2nd I. F. transformer (T-102)	Proper 42.25Mc marker placement. See curve #2. Proper 45.75Mc marker placement. See curve #2. NOTE: Mixer plate coil (L-1) may cause suck-out in I. F. response. Detune transformer if desired. Disregard tilt at this time.
3.	To mixer T. P. (M) thru .001mf capacitor. Set sweep to 44Mc, markers as required.	Same as Step #1.	47.25Mc trap, L-101 jumper and 41.25Mc trap, L-102 bottom core	Minimum response at proper trap frequency. See curve #3. NOTE: Temporary removal of bias and an increase of generator output may be required to see traps clearly.
4.	Same as Step #3.	Same as Step #1.	Mixer plate transformer (T-1 on tuner) and 1st I.F. grid coil, L-101, the 1st and 2nd I. F. transformers can be bottom core	To obtain curve #4. The mixer coil affects the center peak and the grid coil affects the two outside peaks. Tune coils simultaneously for proper tuning and band-width consistent with maximum gain. If necessary, the 1st and 2nd I. F. transformers can be touched-up to obtain proper response as shown in curve #4.

SOUND ALIGNMENT (STATION SIGNAL METHOD)

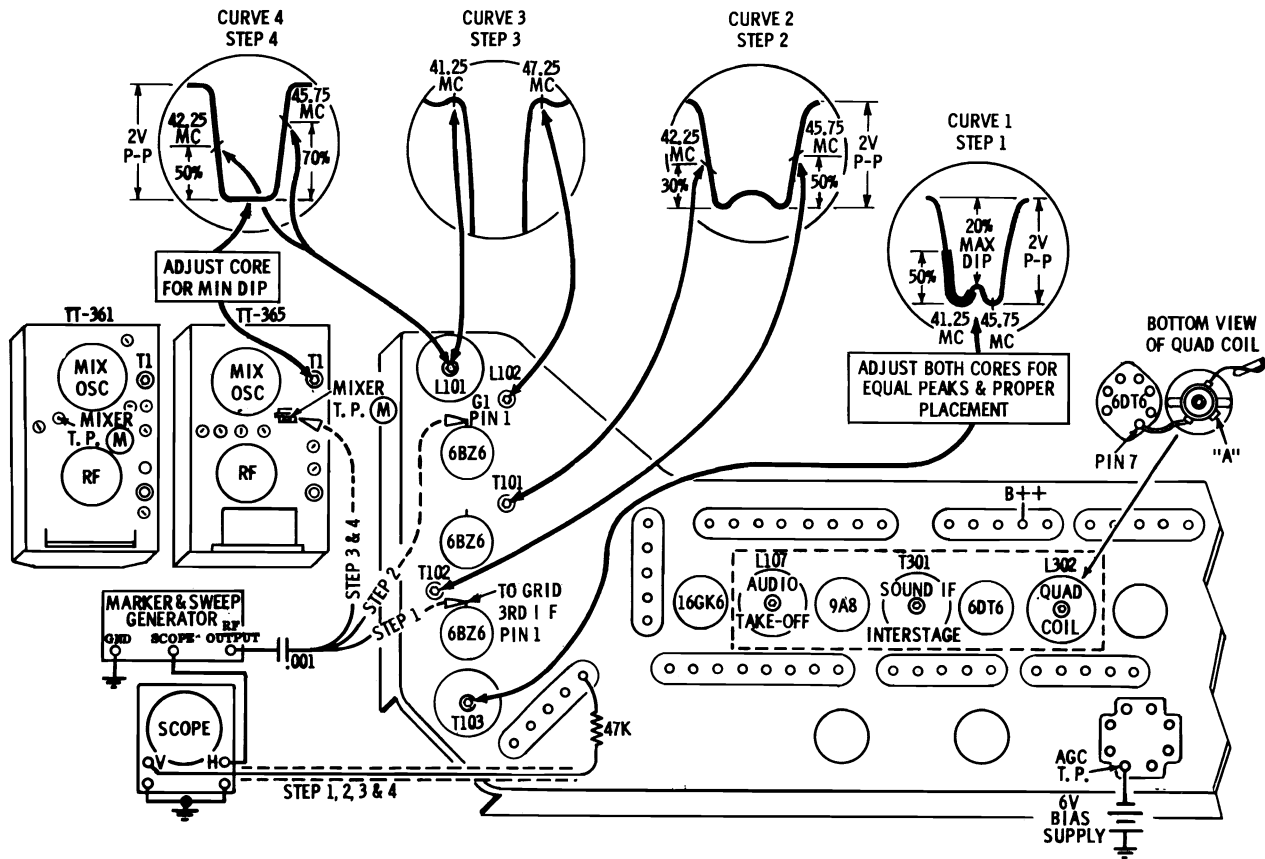
The sound system used in this receiver consists of an audio I. F. amplifier stage, a quadrature grid detector and an output stage. Since this type of sound system is extremely sensitive, relatively small input signal voltage will cause grid current to flow in both the I. F. amplifier and the detector stages. Grid current through the tuned coils will

load them down making the adjustment extremely broad and alignment impossible. For this reason, it is necessary to use a very weak signal when aligning the driver and the detector input coils. Actually, the signal should be well down into the noise level for proper tuning action.

Preliminary Steps

1. Tune in a strong TV station.
2. Adjust all controls for normal picture and sound.
3. Refer to "Video I. F. & Mixer Alignment" detail for coil and test point locations.

MOTOROLA Chassis TS-588 Alignment Information, Continued



VIDEO & SOUND ALIGNMENT DETAIL

SOUND ALIGNMENT PROCEDURE

STEP	STATION	INDICATOR	ADJUST	ADJUST FOR AND/OR REMARKS
1.	Strong signal.	VTVM to point (A) on quad, coil L-302 (see schematic diagram).	L-302 (quad, coil).	Maximum deflection (coarse adjustment) of two possible maximum tuning points, use that giving largest voltage reading.*
2.	Strong signal.	Listening test.	"	Maximum sound with minimum distortion (fine adjustment).
3.	Weak signal.	"	T-301 (inter-stage coil).	Maximum sound with minimum distortion (maintain hiss level).**
4.	Weak signal.	"	L-107 (take-off coil).	Maximum sound with minimum distortion.

If sound is not clear at this point, repeat the above procedure as necessary.

*The purpose of the top pre-set core is to enable the adjustable core to make the tuning range required while reducing the physical length. If the pre-set core should be mis-adjusted by previous service work, merely re-set near top end of coil and tune for maximum.

**The signal must be weakened considerably either by disconnecting one side of the antenna lead or connecting low value resistors across the antenna terminals until a pronounced hiss appears in the sound. The hiss level must be maintained for proper alignment.

MOTOROLA

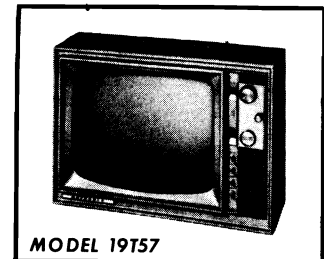
CHASSIS TS-589

MODEL BREAKDOWN CHART

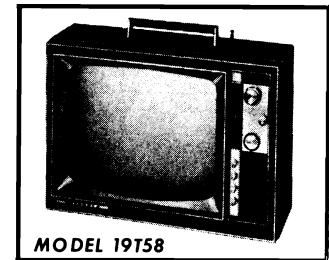
MODEL	CHASSIS*	VHF TUNER*	UHF TUNER	UHF CONVERSION KIT	CRT
19T57AWD	NDTS-589	OPTT-368Y	--	TK-179	19EBP4
Y19T57AWD	NDTS-589Y	OPTT-368Y	HTT-601	--	19EBP4
19T57WGD	NDTS-589	OPTT-368Y	--	TK-179	19EBP4
Y19T57WGD	NDTS-589Y	OPTT-368Y	HTT-601	--	19EBP4
19T58WGD	NDTS-589	OPTT-368Y	--	TK-179	19EBP4
Y19T58WGD	NDTS-589Y	OPTT-368Y	HTT-601	--	19EBP4
19T58AWGD	NDTS-589	OPTT-368Y	--	TK-179	19EBP4
Y19T58AWGD	NDTS-589Y	OPTT-368Y	HTT-601	--	19EBP4
19T58MPGD	NDTS-589	OPTT-368Y	--	TK-179	19EBP4
Y19T58MPGD	NDTS-589	OPTT-368Y	HTT-601	--	19EBP4
19T56BE	NDTS-589	OPTT-368Y	--	TK-179	19XP4
Y19T56BE	DTS-589Y	OPTT-368Y	TT-609	--	19XP4
19T56BR	NDTS-589	OPTT-368Y	--	TK-179	19XP4
Y19T56BR	DTS-589Y	OPTT-368Y	TT-609	--	19XP4
19T57AW	NDTS-589	OPTT-368Y	--	TK-179	19BRP4
Y19T57AW	NDTS-589Y	OPTT-368Y	HTT-601	--	19BRP4
19T57WG	NDTS-589	OPTT-368Y	--	TK-179	19BRP4
Y19T57WG	NDTS-589Y	OPTT-368Y	HTT-601	--	19BRP4
Y19T57AWA	QDTS-589Y	OPTT-368Y	HTT-608	--	19BRP4
Y19T57WGA	QDTS-589Y	OPTT-368Y	HTT-608	--	19BRP4
19T58WG	NDTS-589	OPTT-368Y	--	TK-179	19BRP4
Y19T58WG	NDTS-589Y	OPTT-368Y	HTT-601	--	19BRP4
19T58AWG	NDTS-589	OPTT-368Y	--	TK-179	19BRP4
Y19T58AWG	NDTS-589Y	OPTT-368Y	HTT-601	--	19BRP4
19T58MPG	NDTS-589	OPTT-368Y	--	TK-179	19BRP4
Y19T58MPG	NDTS-589Y	OPTT-368Y	HTT-601	--	19BRP4
23T39WG	KTS-589	CPTT-366Y	--	TK-181	23CMP4
Y23T39WG	KTS-589Y	CPTT-366Y	HTT-601	--	23CMP4
23BK150AM,W	NKTS-589Y	OPTT-366Y	HTT-608	--	23FSP4
23BK152AM,W	NKTS-589Y	OPTT-366Y	HTT-608	--	23FSP4
23BK153AD	NKTS-589Y	OPTT-366Y	HTT-608	--	23FSP4
23BK154AF,H	NKTS-589Y	OPTT-366Y	HTT-608	--	23FSP4
23BK155AS	NKTS-589Y	OPTT-366Y	HTT-608	--	23FSP4
23BK157AS	NKTS-589Y	OPTT-366Y	HTT-608	--	23FSP4
23BK158AM,W	NKTS-589Y	OPTT-366Y	HTT-608	--	23FSP4
23BK160AW	PKTS-589Y	OPTT-366Y	TT-611	--	23FSP4
23BK161AD,M	PKTS-589Y	OPTT-366Y	TT-611	--	23FSP4
23BK162AF,H	PKTS-589Y	OPTT-366Y	TT-611	--	23FSP4
23BK163AS	PKTS-589Y	OPTT-366Y	TT-611	--	23FSP4
19BT108AH,W	QDTS-589Y	OPTT-368Y	HTT-608	--	19EBP4
19BT109AH,W,S	QDTS-589Y	OPTT-368Y	HTT-608	--	19EBP4
19BT107AN,U	DTS-589Y	OPTT-368Y	TT-609	--	19EBP4
Y23T39WGA	KTS-589	CPTT-366Y	HTT-608	--	23CMP4

*OPTT-368Y "C" or CPTT-366Y "D" tuners used with TS-589Y chassis coded B-00 or later.

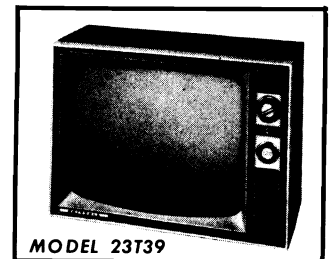
(Material on pages 86 through 92)



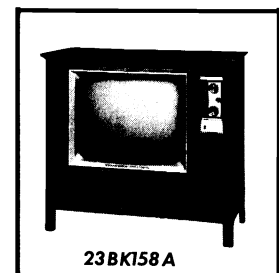
MODEL 19T57



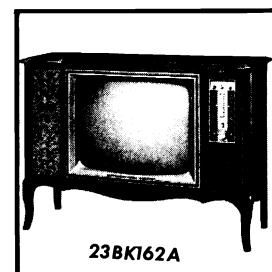
MODEL 19T58



MODEL 23T39



23BK158A



23BK162A

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

MOTOROLA Chassis TS-589 Service Information, Continued

SERVICE ADJUSTMENT AND NOTES

FINE TUNING ADJUSTMENT

Procedure: See "Model Breakdown Chart" for correct reference to the tuner instructions listed below.

Switch Type Tuners With Pre-Set Fine Tuning

Rotate the fine tuning knob in either direction for best picture and sound on all available channels. Turning the fine tuning shaft to the right or left engages the pre-set gears. The gears, in turn, change the position of the core in the oscillator coil. Individual coils are used for each channel. Therefore, channel pre-set adjustments can be made in any sequence.

FOCUSING ADJUSTMENT

To provide for differences in the picture tube gun structure, a focus adjustment is provided by three (3) lugs located on the chassis. They provide a ground potential point, a B+ voltage point and a bootstrap voltage point. Connect the blue lead from the picture tube socket to the lug which provides the best over-all focus, center to edge of screen. See top chassis view for lug location.

NOISE GATE CONTROL

The noise gate control is used to adjust the receiver for best hold stability under noise and different signal strength conditions.

To adjust, tune in a channel for best picture and sound. Turn the noise gate control counter-clockwise (when viewed from rear of receiver) until the picture becomes unstable (rolls down or slips, etc.). Then turn control clockwise until the picture returns to normal. Check all channels; if any are unstable, continue turning control clockwise until the picture is normal on all channels.

CIRCUIT GUARD

The circuit guard is a thermal cut-out type of overload relay. It is in series with the power into the receiver for protection against shorts in the chassis.

The circuit guard will remain in the "closed circuit" state when the current requirements are normal. In the event of a continuous high current overload, the bi-metallic elements of the unit will become heated to the extent of "opening" the contacts and disconnecting the AC power. After the bi-metallic elements have cooled, the circuit guard may be re-set by depressing the plastic re-set button.

The circuit guard is designed to remain "closed" on the higher-than-normal instantaneous surge currents encountered during the initial charge of the filter capacitors. The circuit guard is unique in the fact that when a short exists in the associated circuitry, power is not re-applied when the re-set button is held depressed.

CHASSIS REMOVAL HINTS

The chassis can be completely exposed by removing the back cover. Voltages and waveforms can be taken from the solder well tie points.

PICTURE TUBE REPLACEMENT

Use extreme care in handling the picture tube as rough handling may cause it to implode due to atmospheric pressure. Do not nick or scratch glass or subject it to any undue pressure in removal or installation. Use goggles and heavy gloves for protection.

Always place protective tape on the replacement tube in the same position as on the original tube. Rolls of tape may be purchased from Motorola Distributors (Part Number 11M131475 - black or Part Number 11M10033A12 - white). In most cases, it should only be necessary to loosen, not remove, the picture tube mounting strap in order to remove the tube.

Both the 19" and 23" CRT's are removed from the back of the cabinet. First, remove chassis yoke and anode lead. Next, remove CRT by removing the four (4) mounting bolts. Replace in reverse order.

CHASSIS CODING CHANGES

Chassis Coding	Coding Changes	Chassis Coding	Coding Changes
<u>TS-589A-01-A</u>	TO REDUCE HUM: Add R-315 to V-10 audio output.	<u>TS-589A-03</u>	TO DECREASE RADIATION: Add C-805 and C-806 to power supply. R-207 47K moved from CRT socket to chassis.
<u>TS-589A-01-B</u>	TO REDUCE HIGH VOLTAGE: R-514, 6.8K, 3W changed to 10K, 3W. C-516, 27mmf, N1500 changed to 56mmf, N220. R-515, 5.6 ohm, 1/2 watt wire wound changed to 3.9 ohm, 1/2 watt wire wound.		DESIGN CHANGE: T-103, Part No. 24C65939A06 was changed to 24P65132A38. C-118, L-106 and L-107 deleted.
<u>TS-589A-02-A</u>	DESIGN CHANGE: Add R-316 to V-8A audio I. F. Add C-304 to V-8A audio I. F. Add R-317 to high side of volume control. Change R-105 15K to 10K. Change C-109, 330mmf to 220mmf. Change R-110 33K to 27K. Change C-113 .001mf to 560mmf.	<u>TS-589B-00</u>	DESIGN CHANGE: E-102, Part Number 1V66528A69 changed to 1V66535A64. R-102, 47K, 5% changed to 30K, 5%. C-101, 22mmf changed to 30mmf. Ountuners coded OPTT-368Y "C" and CPTT-366Y "D", mixer transformer T-1 changed to Part Number 24D67228A10.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING

MOTOROLA Chassis TS-589 Schematic Diagram, Continued

NOTES:

VOLTAGE MEASUREMENTS

1. TAKEN FROM POINT INDICATED TO CHASSIS WITH A VTVM. $\pm 20\%$
2. LINE VOLTAGE MAINTAINED AT 120V AC.
3. TAKEN WITH CONTRAST CONTROL AS MINIMUM AND ALL OTHER CONTROLS IN NORMAL OPERATING POSITION WITH NO SIGNAL INPUT
4. TUNER ON CHANNEL 13 OR CHANNEL OF LEAST NOISE WITH ANTENNA TERMINALS SHORTED.

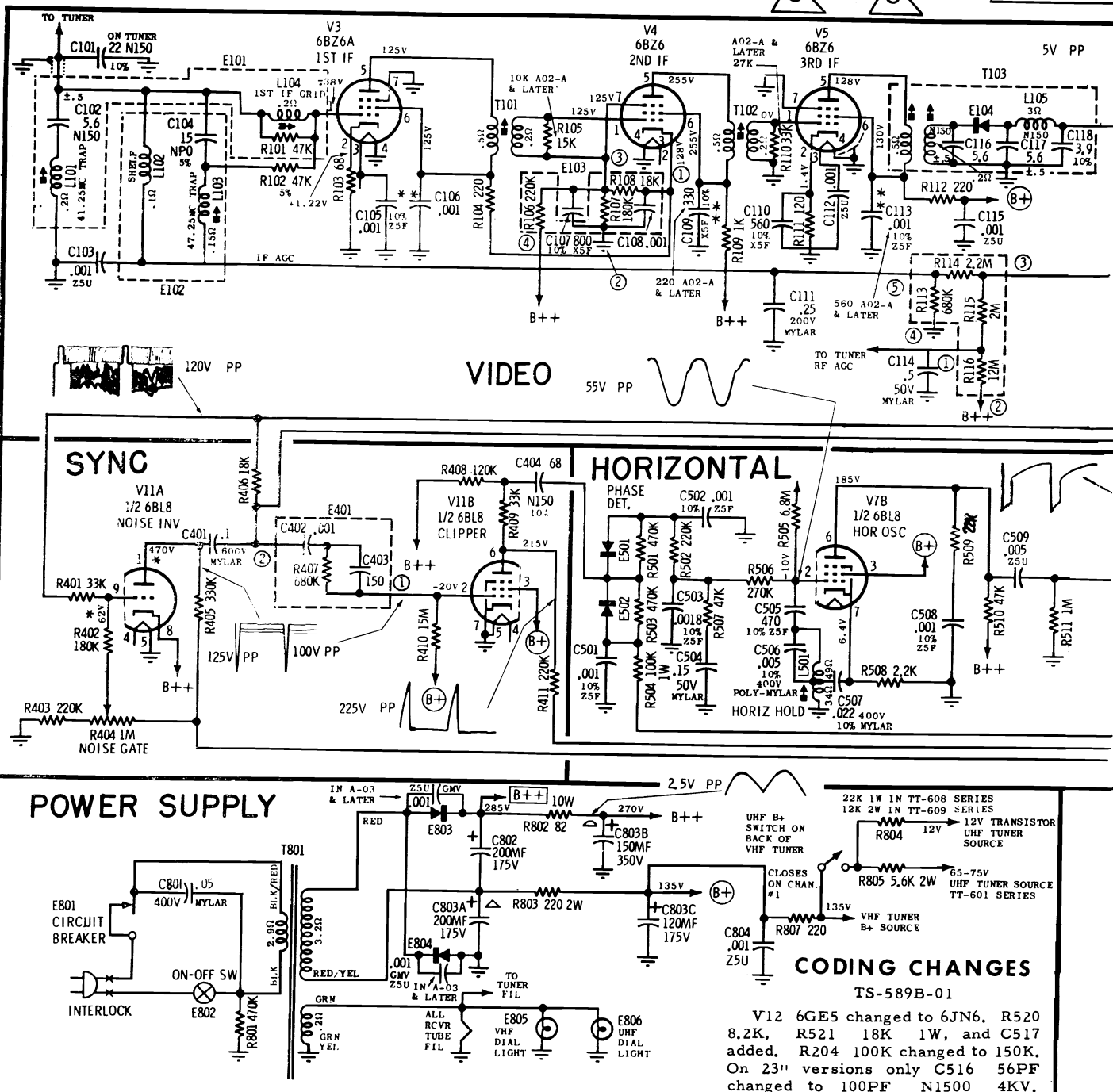
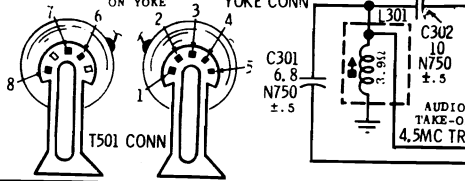
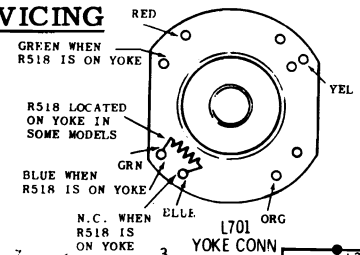
WAVEFORM MEASUREMENTS

1. TAKEN FROM POINT INDICATED TO CHASSIS WITH A WIDE-BAND OSCILLOSCOPE
2. OSCILLOSCOPE SYNCED NEAR SWEEP RATE INDICATED
3. TAKEN WITH STRONG SIGNAL. CONTRAST CONTROL AT MAXIMUM. ALL OTHER CONTROLS IN NORMAL OPERATING POSITION

UNLESS OTHERWISE SPECIFIED: CAPACITORS ARE DISC CERAMIC 500V DC. TOLERANCE & CHARACTERISTIC AS NOTED. IF TOLERANCE IS NOT GIVEN CAPACITORS ARE GMV (GUARANTEED MIN. VALUE) TYPE. TUBULAR CAPACITORS ARE 20% 400V DC. DECIMAL VALUES IN MF ALL OTHERS IN MMF. RESISTORS ARE ALL 10% 1/2 WATT

- * INDICATES VOLTAGE VARIES WITH CONTROL SETTINGS.
- ** INDICATES SPECIAL COMPONENTS. SEE REPLACEMENT PARTS LIST FOR PROPER REPLACEMENT PART NUMBER.

... INDICATES CONTROLS MAY BE GANGED IN SOME CHASSIS

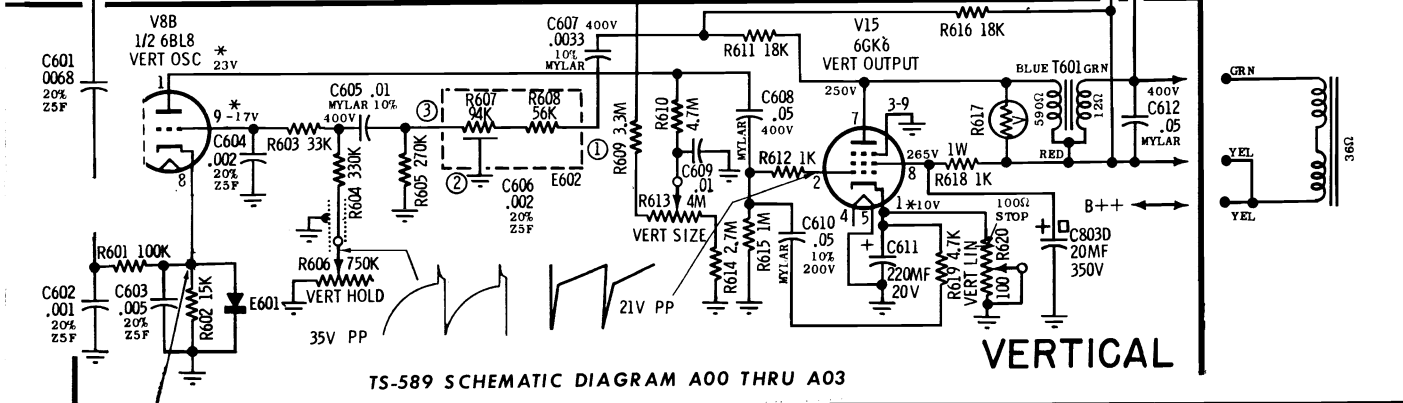
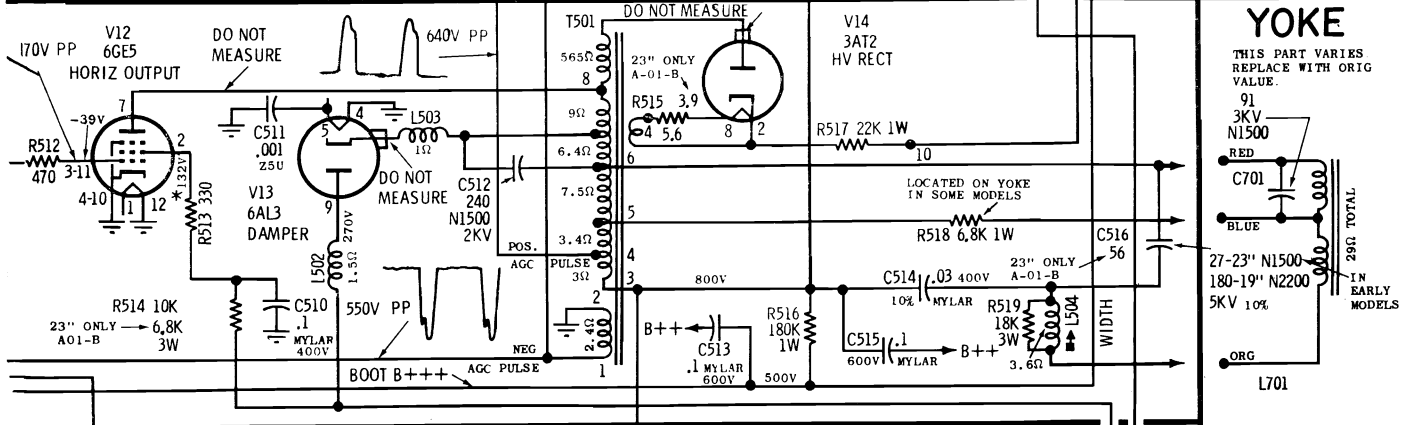
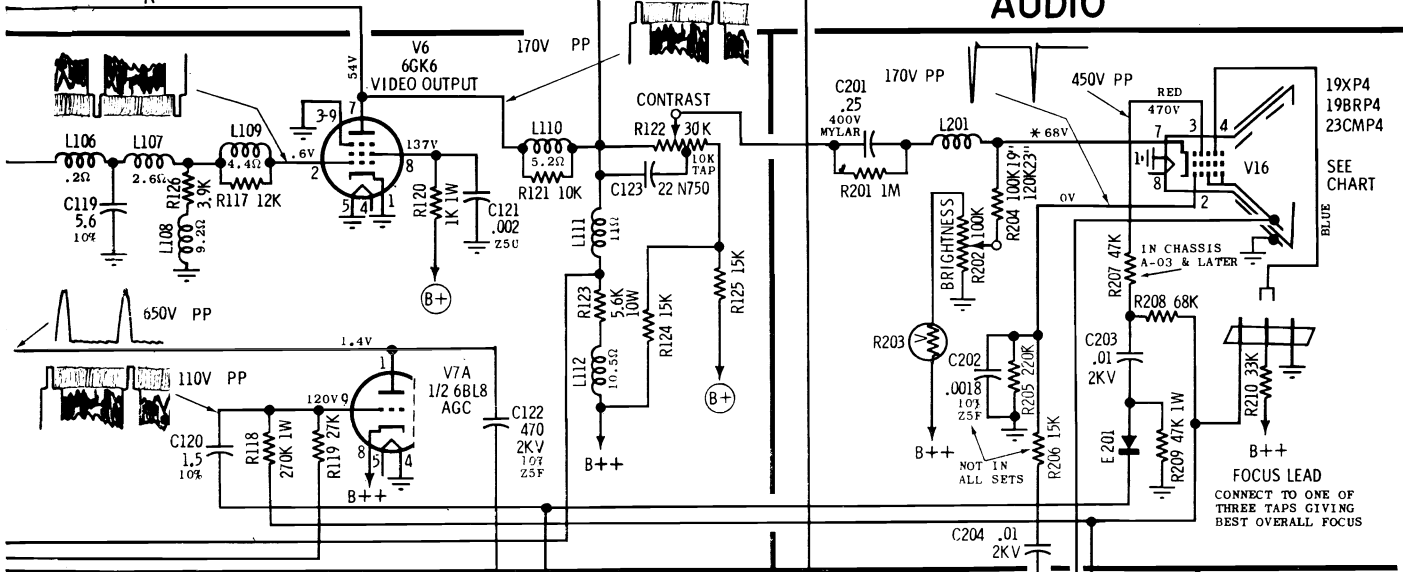
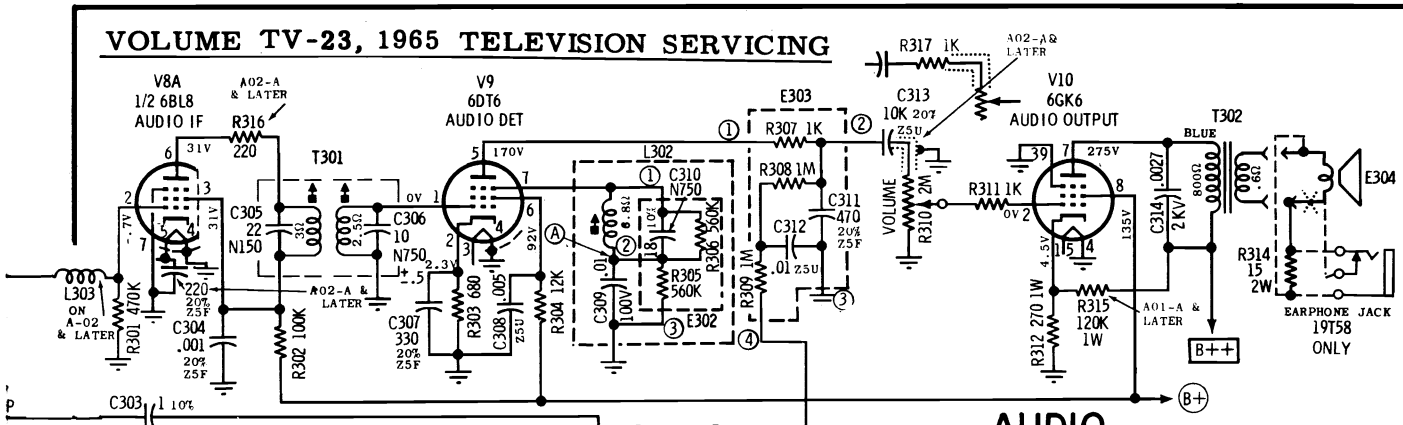


CODING CHANGES

TS-589B-01

V12 6GE5 changed to 6JN6. R520 8.2K, R521 18K 1W, and C517 added. R204 100K changed to 150K. On 23" versions only C516 56PF changed to 100PF N1500 4KV.

VOLUME TV-23, 1965 TELEVISION SERVICING



TS-589 SCHEMATIC DIAGRAM A00 THRU A03

MOTOROLA Chassis TS-589 Alignment Information, Continued

PRE-ALIGNMENT INSTRUCTIONS

Before alignment of the video I.F. section is attempted, it is advisable to thoroughly check the system. If alignment is attempted on an I.F. section in which a faulty component exists, successful alignment will probably be impossible and the entire procedure will have to be repeated when the real cause of the trouble is corrected. Preliminary tests of the system should include voltage and resistance measurements, routine checks for bad soldering connections and visual inspection of the circuits for overheated components as well as for obvious wiring defects.

VIDEO IF & MIXER ALIGNMENT

1. Maintain line voltage at 120 with variac.
2. Disable horizontal oscillator by unplugging yoke lead(s), removing tube or using a dummy tube with cathode pin disconnected. Use whichever is applicable to eliminate horizontal radiation interference.

3. Disable local oscillator. On turret type tuners, set tuner between channels. On switch type tuners, short out grid of mixer oscillator tube with a fine piece of bare wire.
4. Apply the negative lead of a 6.0 volt bias supply to I.F. AGC buss and positive lead to chassis ground.
5. Connect a 1500 ohm, 60 watt voltage normalizing resistor from B+ to chassis.
6. Set the contrast control at minimum (extreme counter-clockwise position).
7. Short across tuner input terminals.
8. Maintain 2 to 5 volts peak-to-peak at the grid of video amp except when specific values are given in the procedure chart.
9. Refer to "Video I.F. and Sound Alignment" detail for component and test point locations.

NOTE: To reduce the possibility of inter-action between the two tuning cores in a double-tuned transformer or coil, each core should be adjusted for optimum response in the tuning position nearest its respective end of the coil form.

4.5 MC TRAP ADJUSTMENT (L-301)

1. Carefully tune receiver to local station and advance contrast control.
2. Adjust local oscillator (with fine tuning control) to bring 4.5Mc interference strongly into the picture.
3. Adjust sound trap (L-301) to find the two points of adjustment at which the sound beat is just noticeable on the picture tube screen. Rotate the core toward the center of the two points. Use minimum amount of inductance (core out of coil) that will result in no apparent beat interference.

VIDEO IF & MIXER ALIGNMENT PROCEDURE

STEP	SWEEP GENERATOR AND MARKER	INDICATOR	ADJUST	ADJUST FOR AND/OR REMARKS
1.	To grid of 3rd I.F. thru .001mf capacitor. Set sweep to approximately 44Mc, markers as required.	Scope to grid of video amp thru 47K ohm resistor.	Both cores of 3rd I.F. transformer (T-103).	Equal peaks and marker placement as shown in curve #1.
2.	To grid (pin 1) of 1st I.F. amp thru .001 mf capacitor. Set sweep to 44Mc, markers as required.	Same as Step #1.	1st I.F. transformer (T-101), 2nd I.F. transformer (T-102)	Proper 42.25Mc marker placement. See curve #2. Proper 45.75Mc marker placement. See curve #3.
3.	To mixer T. P. (M) thru .001mf capacitor. Set sweep to 44Mc, markers as required.	Same as Step #1.	47.25Mc trap, L-103 and 41.25Mc trap, L-101.	Minimum response at proper trap frequency. See curve #3. NOTE: Temporary removal of bias and an increase of generator output may be required to see traps clearly.
4.	Same as Step #3.	Same as Step #1.	Mixer plate transformer (T-1 on tuner) and 1st I.F. grid coil (L-104)	To obtain curve #4. The mixer transformer affects the center peak and the grid coil affects the two outside peaks. Tune coils simultaneously for proper tuning and bandwidth consistent with maximum gain. If necessary, the 1st and 2nd I.F. transformers can be touched-up to obtain proper response as shown in curve #4.

SOUND ALIGNMENT (STATION SIGNAL METHOD)

The sound system used in this receiver consists of an audio I. F. amplifier stage, a quadrature grid detector and an output stage. Since this type of sound system is ex-

tremely sensitive, relatively small input signal voltage will cause grid current to flow in both the I. F. amplifier and the detector stages. Grid current through the tuned coils will

load them down making the adjustment extremely broad and alignment impossible. For this reason, it is necessary to use a very weak signal when aligning the driver and

MOTOROLA Chassis TS-589 Alignment Information, Continued

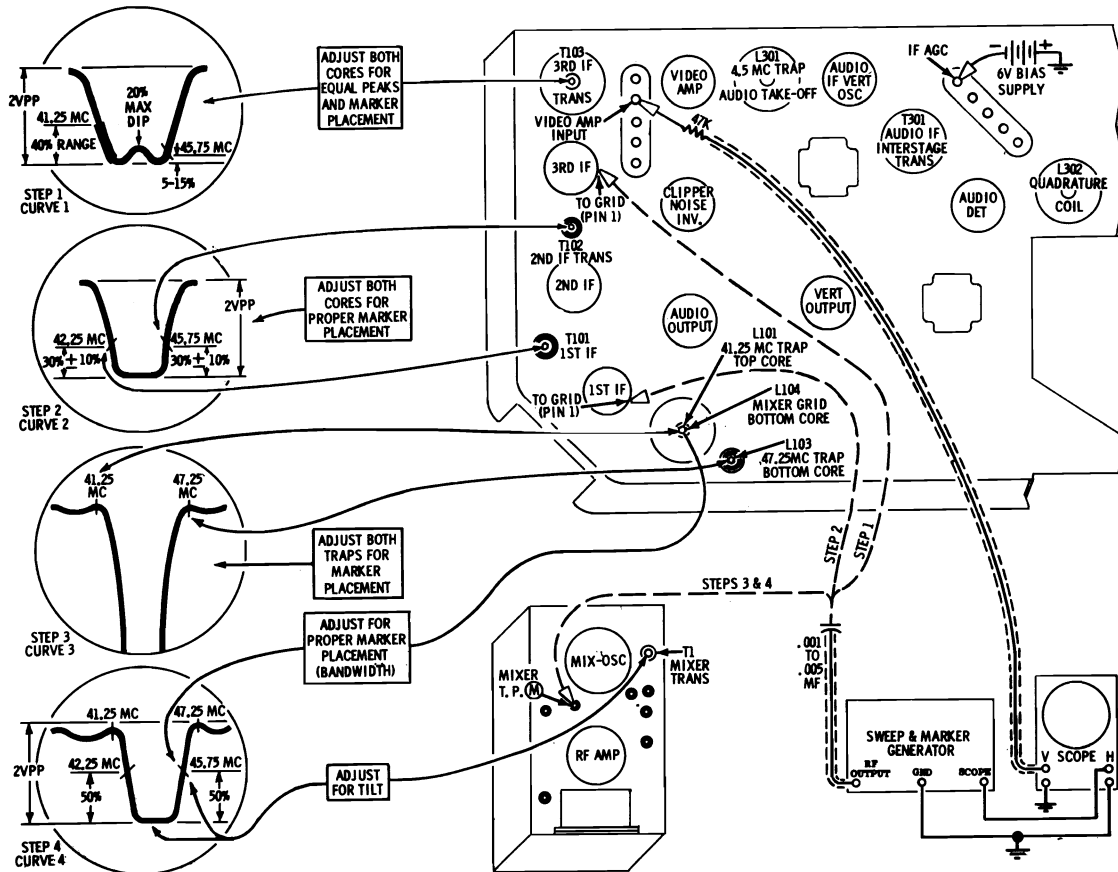
the detector input coils. Actually, the signal should be well down into the noise level for proper tuning action.

Preliminary Steps

1. Tune in a strong TV station.
2. Adjust all controls for normal

picture and sound.

3. Refer to "Video I. F. & Mixer Alignment" detail for coil and test point locations.



VIDEO & SOUND ALIGNMENT DETAIL

SOUND ALIGNMENT PROCEDURE

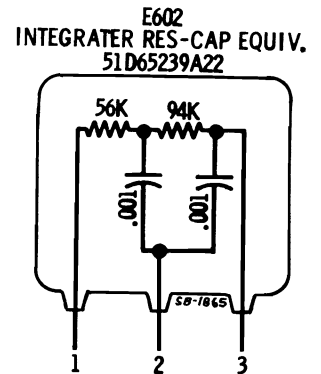
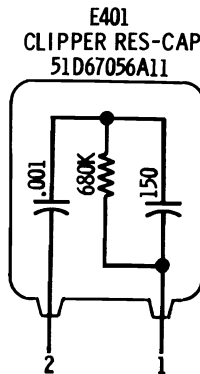
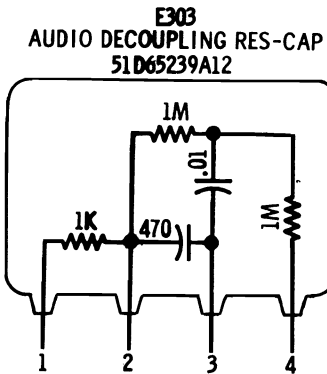
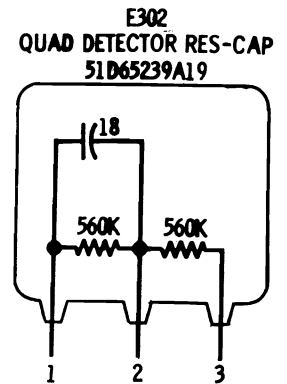
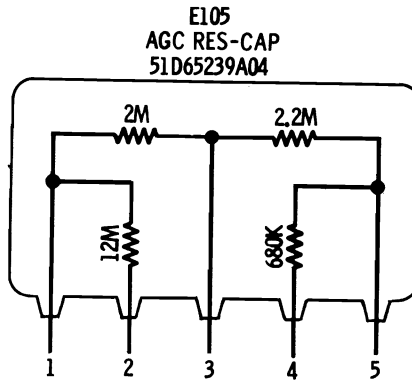
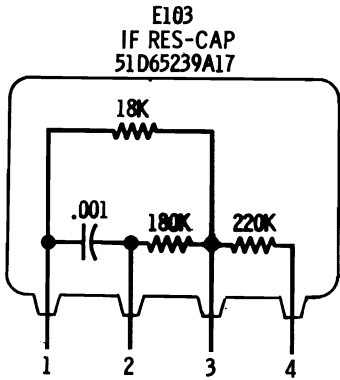
STEP	STATION	INDICATOR	ADJUST	ADJUST FOR AND/OR REMARKS
1.	Strong signal.	VTVM to point (A) on quad. coil L-302 (see schematic diagram).	L-302 (quad. coil).	Maximum deflection (coarse adjustment) of two possible maximum tuning points, use that giving largest voltage reading.*
2.	Strong signal.	Listening test.	"	Maximum sound with minimum distortion (fine adjustment).
3.	Weak signal.	"	T-301 (inter-stage coil).	Maximum sound with minimum distortion (maintain hiss level).**

If sound is not clear at this point, repeat the above procedure as necessary.

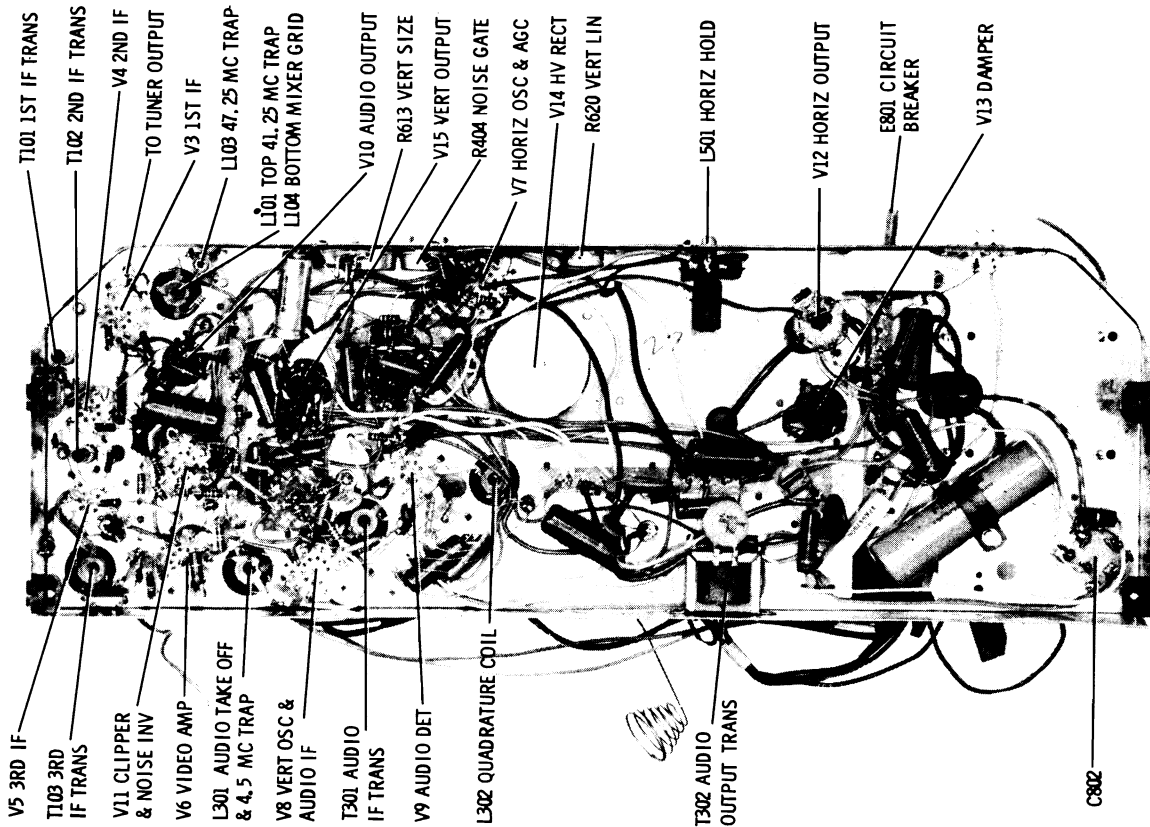
*The purpose of the top pre-set core is to enable the adjustable core to make the tuning range required while reducing the physical length. If the pre-set core should be mis-adjusted by previous service work, merely re-set near top end of coil and tune for maximum.

**The signal must be weakened considerably either by disconnecting one side of the antenna lead or connecting low value resistors across the antenna terminals until a pronounced hiss appears in the sound. The hiss level must be maintained for proper alignment.

MOTOROLA Chassis TS-589 Service Information, Continued



RES-CAP DIAGRAMS



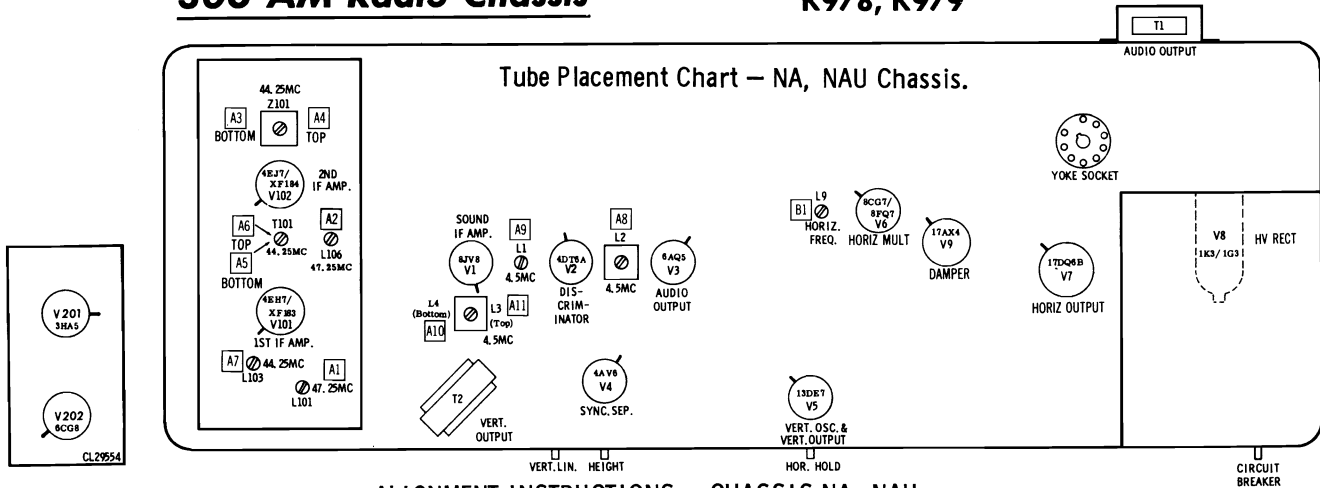
BOTTOM CHASSIS VIEW - TS-589

Olympic

306 AM Radio Chassis

NB and NBU Chassis

C945, C946, C950, C951, C952, C953, C955, K965, K966, K967, K968, K970, K971, K972, K973, K975, K976, K977, K978, K979



ALIGNMENT INSTRUCTIONS – CHASSIS NA, NAU

Video IF Alignment

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection. Use only enough generator output to provide a usable indication. Note: Response may vary slightly from those shown. Connect a variable bias supply to the IF AGC line (point \diamond) and adjust to obtain a response curve which shows no indication of overload. Disable Oscillator section of Mixer-Osc. Set the Channel Selector to any non-interfering channel.

INDICATOR	GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	ADJUST	REMARKS
1.	Connect DC probe of a VTVM thru a 47K resistor to point \diamond . Common to ground.	Not used	47.25 MC	A1, A2	Adjust for MINIMUM.
2.	Connect DC probe of a VTVM thru a 47K resistor to point \diamond . Common to ground.	Not used	44.25 MC 44.25 MC 44.25 MC 44.25 MC	A3, A4, A5, A6, A7, Mixer Plate Coil	Adjust for maximum.
3.	Connect vertical input of a scope to point \diamond . Low side to ground.	44MC (10MC Sweep)	42.75 MC 45.75 MC	A3, A4 A3, A4	Adjust for maximum amplitude and MINIMUM tilt with markers as shown in Figure 1.
4.	Connect vertical input of a scope to point \diamond . Low side to ground.	44MC (10MC Sweep)	42.75 MC 45.75 MC 47.25 MC	A5, A6 A5, A6 A1, A2	Adjust for maximum gain and symmetry of response with markers as shown in Figure 2. In order to obtain a proper response, it may be necessary to slightly retouch A1 thru A6.

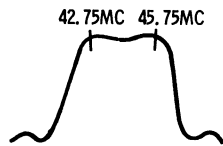


Fig. 1.

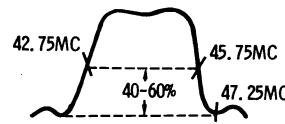


Fig. 2.

Sound IF Alignment

Tune in a station and reduce the signal strength at the antenna terminals until a hiss is heard in the sound. Align for maximum undistorted sound with MINIMUM buzz by adjusting A8. If the hiss disappears during alignment, further reduce the signal strength.

4.5MC Trap Alignment

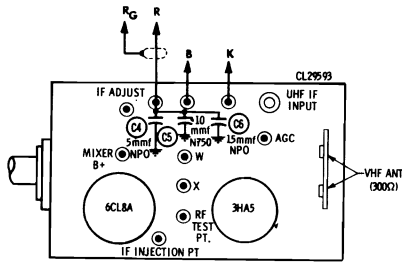
Tune in a strong TV signal and set the Contrast at maximum. Adjust the Fine Tuning until a beat pattern is visible on the screen. Adjust A11 for MINIMUM beat interference.

Sound IF Alignment

Tune in a station and adjust A 8 for maximum sound. Reduce signal strength at the antenna terminals until distortion appears. Continue to reduce signal while aligning for undistorted output by adjusting A9, A10

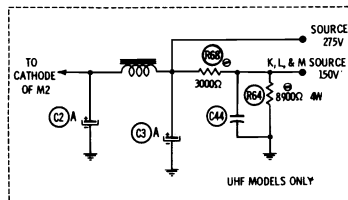
VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

OLYMPIC Chassis NB and NBU Schematic Diagram

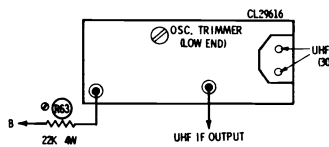


→ K, L, M, P DESIGNATES TIE POINTS ON PRINTED BOARD, PART # 3A31781-1

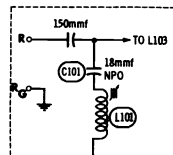
ALL VOLTAGES MEASURED WITH A VTVM BETWEEN INDICATED POINTS AND GROUND, INPUT VOLTAGE MAINTAINED AT 117V, AND CONTROLS SET FOR A NORMAL PICTURE



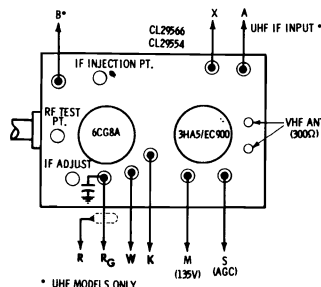
UHF MODELS ONLY



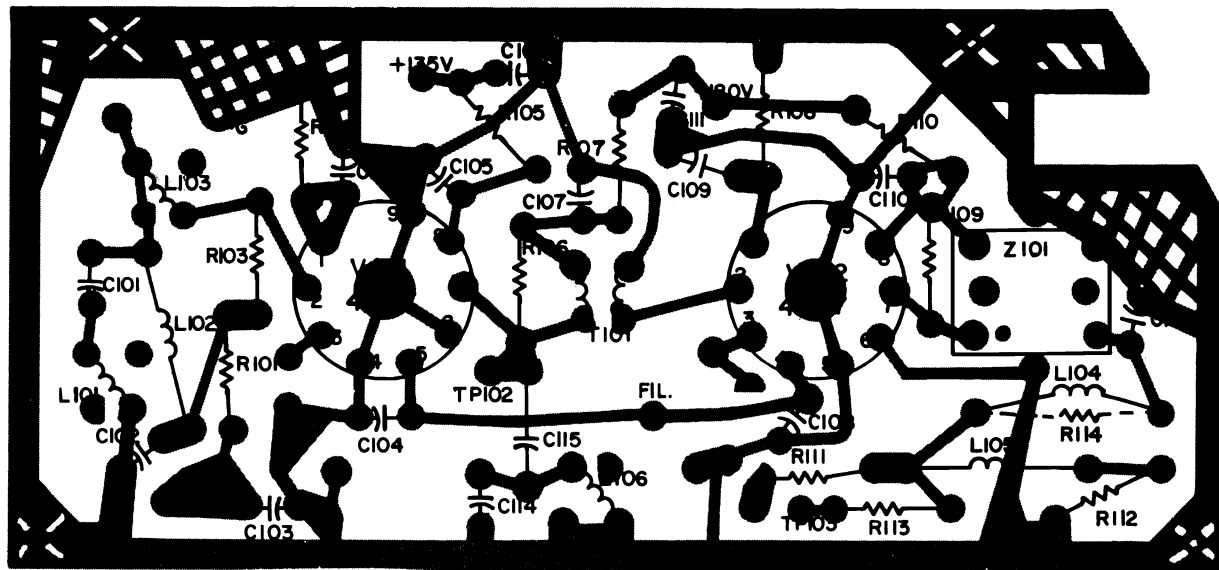
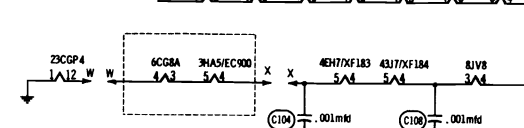
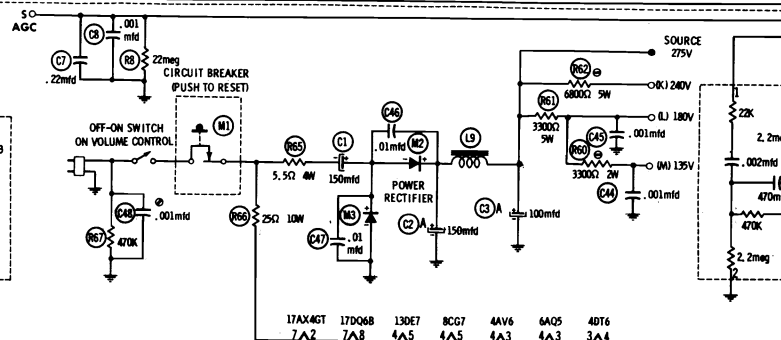
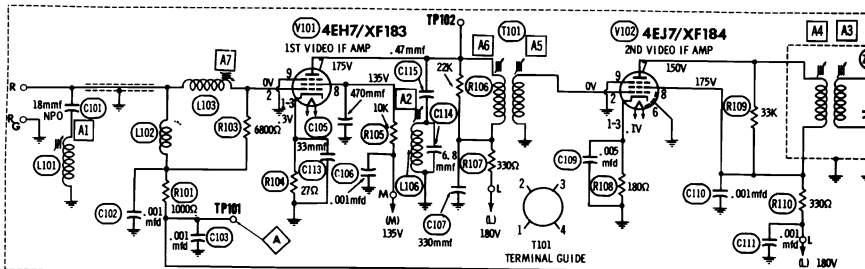
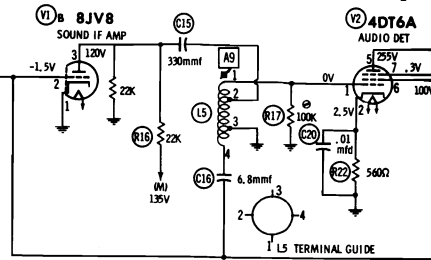
UHF IF OUTPUT



ALTERNATE CIRCUIT USED WITH TUNER PART NO. CL29593



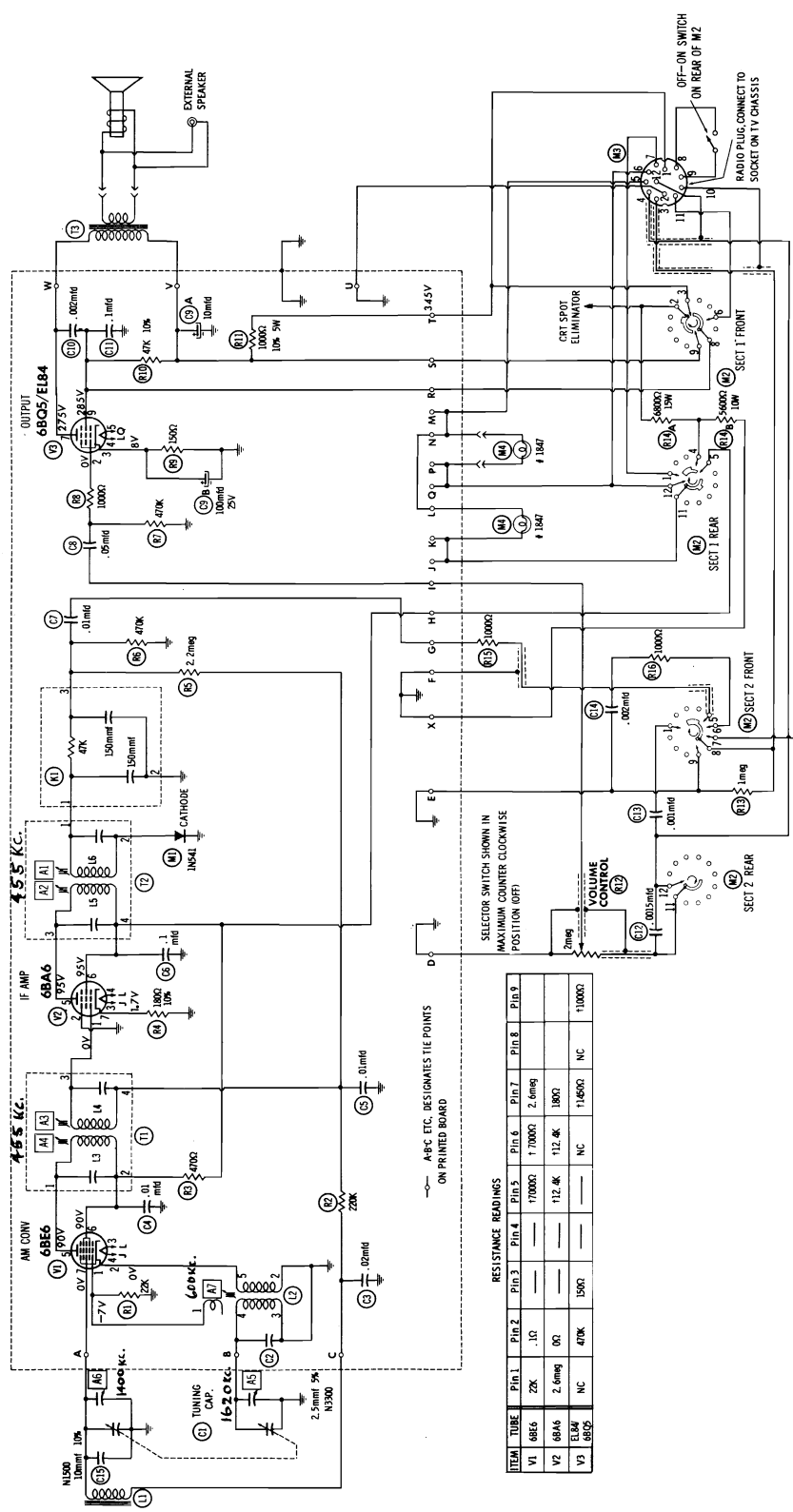
* UHF MODELS ONLY



Video IF Printed Board Wiring Used in NA and NAU Chassis.

OLYMPIC RADIO & TELEVISION

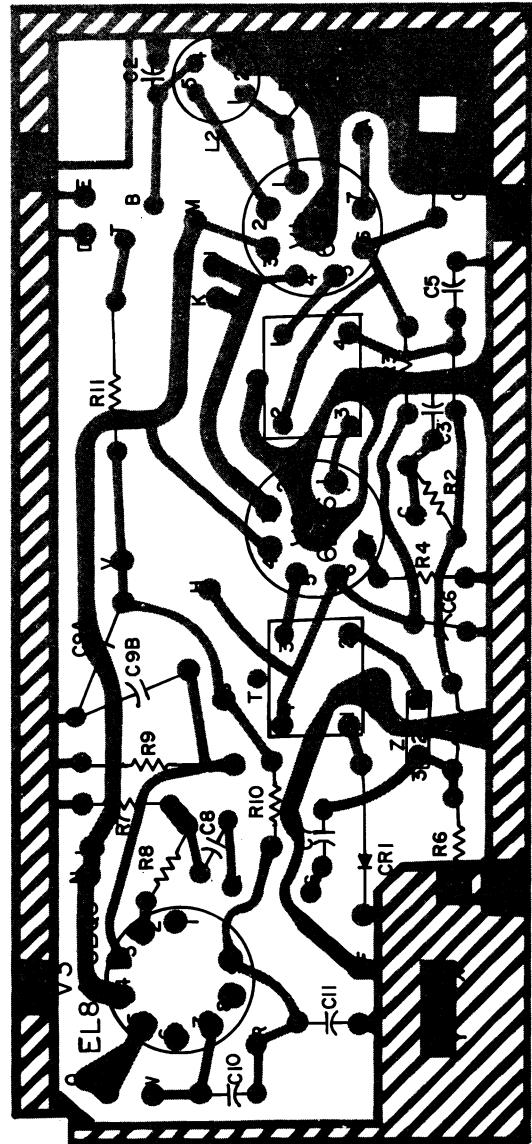
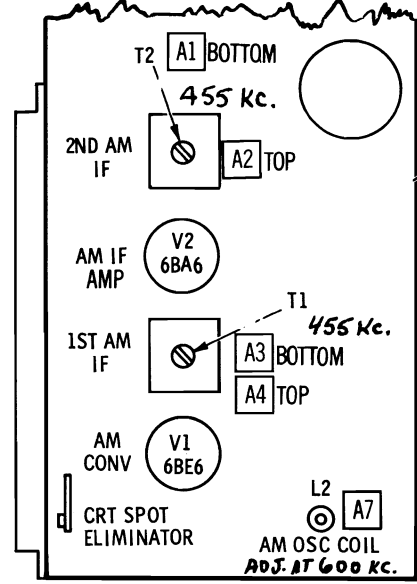
AM Radio Chassis 306



— ABC ETC. DESIGNATES TIE POINTS ON PRINTED BOARD

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BE6	22K	.1K	11000	11000	17000	17000	2.5mg		
V2	6BA6	2.6mg	0	112.4K	112.4K	1800				
V3	6BA6	NC	470K	1500	NC	11450	NC	11000		



Schematic — AM Radio Chassis 306.



The model-chassis cross reference charts below will tell you what chassis material is needed for any particular model. All chassis types and corresponding reference to pages for such material are listed directly below.

Chassis 15G20 diagrams, service material, alignment, see pages 99-103;
 Chassis 15J25 diagrams, service material, alignment, see pages 104-108;
 Chassis 15J27 very similar to 15J25, follow material on pages 104-108;
 Chassis 15N30 alignment, diagram, service material, see pages 109-113;
 Chassis 15N50 diagrams, service material, alignment, on pages 114-119.

1965 "N" LINE TELEVISION MODEL-CHASSIS CROSS REFERENCE

MODEL	CHASSIS	13 POSITION TUNER	ALL CHANNEL UHF TUNER
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MODEL	CHASSIS	13 POSITION TUNER	ALL CHANNEL UHF TUNER
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PORTABLE MODELS

UN2620WH	15G20	TT-164 76-13579-3	TT-155B 76-13588-3
UN2622GY	15G20	TT-164 76-13579-3	TT-155B 76-13588-3
UN3300GY, WH	15J27	TT-162 76-13579-1	TT-150C 76-13439-3
UN3304BK	15J27	TT-162 76-13579-1	TT-150C 76-13439-3

TABLE & CONSOLE MODELS

UN4530WA, MB	15N50	TT-165 76-13587-1	TT-155A 76-13588-2
UN4532WA, MB, PC, MA	15N50	TT-165 76-13587-1	TT-155A 76-13588-2
UN4534WA, CH	15N50	TT-165 76-13587-1	TT-155A 76-13588-2
UN4536MA	15N50	TT-165 76-13587-1	TT-155A 76-13588-2
UN4720MB, UN4722MA, WA	15N30	TT-163 76-13579-2	TT-155X 76-13588-6
UN9306BK	15N30	TT-163 76-13579-2	TT-155X 76-13588-6
UN9310WA, MB	15N30	TT-163 76-13579-2	TT-155X 76-13588-6
UN9312WA, MB, MA	15N30	TT-163 76-13579-2	TT-155X 76-13588-6
UN9516WA	15N30	TT-163 76-13579-2	TT-155X 76-13588-6
UN9518WA, MB, MA	15N30	TT-163 76-13579-2	TT-155X 76-13588-6
UN9520WA, MB, MA	15N30	TT-163 76-13579-2	TT-155X 76-13588-6
UN9522WA, BL, MA, CH	15N30	TT-163 76-13579-2	TT-155X 76-13588-6
UN9524WA, MB	15N30	TT-163 76-13579-2	TT-155X 76-13588-6
UN9526WA	15N30	TT-163 76-13579-2	TT-155X 76-13588-6

COMPACT MODELS

UN3530WH	15J25	TT-163 76-13579-2	TT-155X 76-13588-6
UN3532BE, BU	15J25	TT-163 76-13579-2	TT-155X 76-13588-6
UN3534MB, PC	15J25	TT-163 76-13579-2	TT-155X 76-13588-6
UN3536WA, RW	15J25	TT-163 76-13579-2	TT-155X 76-13588-6
UN3590RW, BR	15J25	TT-163 76-13579-2	TT-155X 76-13588-6
UN3592WA, CH	15J25	TT-163 76-13579-2	TT-155X 76-13588-6
UN3610DCH, MB, LCH, WH	15J25	TT-163 76-13579-2	TT-155X 76-13588-6

CONSOLE TELEVISION-PHONOGRAPH COMBINATIONS

UN4938MB	15N30	TT-163 76-13579-2	TT-155X 76-13588-6
UN4940WA, MA	15N30	TT-163 76-13579-2	TT-155X 76-13588-6
UN4942WA, MA	15N30	TT-163 76-13579-2	TT-155X 76-13588-6
UN4944WA, MB, MA	15N50	TT-165 76-13587-1	TT-155A 76-13588-2
UN4946CH, WA	15N50	TT-165 76-13587-1	TT-155A 76-13588-2

CABINET COLOR SYMBOLS

BE	BEIGE	DCH	DARK CHERRY	PC	PECAN
BK	BLACK	GY	GREY	RW	ROSEWOOD
BL	BLONDE	LCH	LIGHT CHERRY	WA	WALNUT
BU	BLUE	MA	MAPLE	WH	WHITE
CH	CHERRY	MB	MAHOGANY BROWN		

Also the following additional Models M3501V, M3504BK, WH, M3508WA, M3509GD, M3600CH, LCH, MR, WH, use Chassis 15J25; and Models M3300GY and M3304BK use Chassis 15J27.

PHILCO

GENERAL INFORMATION 1965 "N" LINE TV CHASSIS

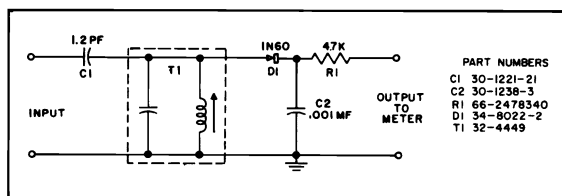
NOISE CONTROL SETUP VR2

The noise control adjusts the bias of the noise inverter stage for optimum performance at all signal levels. The procedure for adjustment is as follows:

1. Adjustment should be made on weak signal.
2. Adjust fine tuning control until slight sound beat appears in picture.
3. Adjust noise control (clockwise) until the picture appears watery or shifts sideways. This condition is due to the noise inverter stage clipping sync.
4. Back off noise control (counterclockwise) until picture appears stable, then rotate approximately 30° in same direction for additional safety.

4.5MC DETECTOR JIG

It is important that the jig be properly aligned to give proper results. Connect detector jig to an accurate source of 4.5MC signal and pad transformer (T1) for maximum D-C voltage output. Signal generator can be calibrated by zero beating with sound I-F developed from station signal.



CHECKING THE HORIZONTAL PHASE COMPARER SELENIUM (DI)

When servicing television receivers where the dual selenium diode is suspected, a fast and efficient method of checking them is this:

A 20,000 ohm/volt meter is employed. On the 10K scale, the forward resistance (meter connected in the same polarity as the diode) should be a maximum of 6000 ohms. The ratio of the forward resistances of the two diodes should be less than 2 to 1. On the 100K scale, the back resistance (meter connected in reverse polarity to the diode) should be a minimum of 2 megohms. The center of the phase comparer is the common negative.

CLEANING PICTURE WINDOW:

CAUTION: When cleaning picture window, always use a soft cloth with soap and warm water. Never use a detergent or abrasive material.

TUNER OSCILLATOR ALIGNMENT FOR PRESET FINE TUNING

The oscillator frequency for the various channels is controlled by the position of the gear-headed tuning screws in coils L2T thru L13T inclusive. The position of these screws is in turn controlled by the fine tuning shaft and its associated preset mechanism. The range is ordinarily ample to cover tube replacement. However, if it should become impossible to tune any of the high channels to the correct frequency, coil L37T may be adjusted as follows:

1. Set the tuner to channel 13 or the highest available channel (air signal).
2. Turn the fine tuning control so as to set the gear-headed screw to the mechanical center of its travel.
3. Adjust L37T with an insulated tool to obtain a correctly tuned picture.
4. The remaining high channels may be set correctly by means of the fine tuning control.
5. L37T will have only a small effect on low channel oscillator frequencies.

HORIZONTAL OSCILLATOR ADJUSTMENT

Allow set to warm up. Tune in a picture.

1. Short out horizontal ringing coil by placing jumper from lug marked HOR. T.P.
2. Adjust horizontal hold control to correct horizontal line frequency (to stop picture); it will not be stable.
3. Remove shorting jumper and adjust ringing coil for stable picture sync.

SPOT DECAY SWITCH S2

When switch S2 is in open position (set turned off) it instantaneously removes external bias from the CRT cathode and prevents spot decay. Switch S2 is part of the volume control.

(Service Hint) - Should the brightness control become ineffective, check switch S2.

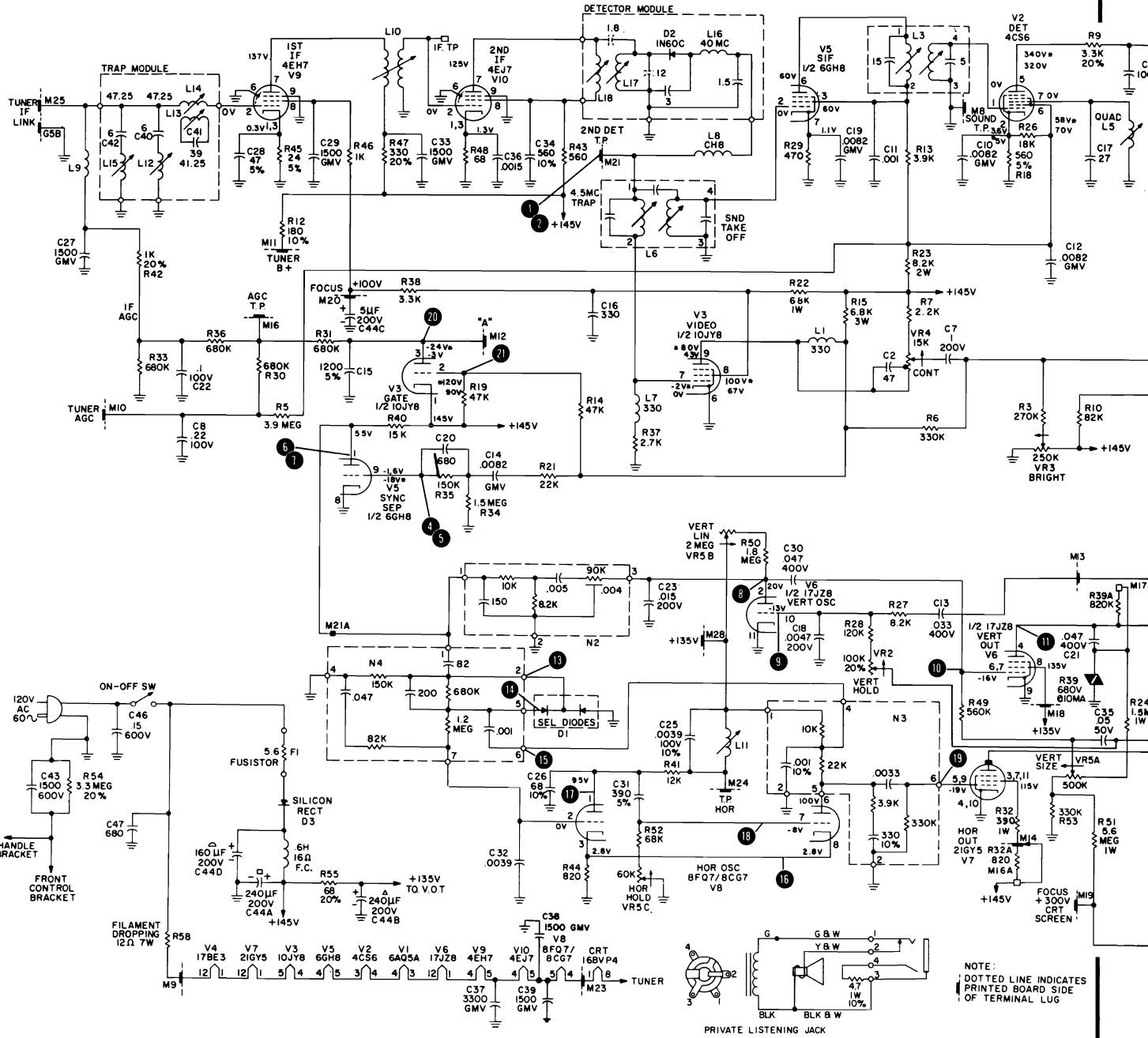
COLD CHECK

1. Remove A-C plug from wall outlet and place a jumper between the two plug prongs. Turn receiver A-C switch "on".

2. Connect one lead from an ohmmeter to the jumpered A-C plug and touch the other ohmmeter lead to the exposed metal parts of the cabinet and trim (including antenna). Limits which the reading should fall are between 1.5 meg and 3.5 meg.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

PHILCO Chassis 15G20 Schematic Diagram (Continued)



RESISTANCE CHART

TUBE	USE	PIN NUMBERS											
		1	2	3	4	5	6	7	8	9	10	11	12
V1	6AP5A Audio Output	60K	220Ω	17Ω	19Ω	16K	16K	60K					
V2	6X4 Sound Det.	6Ω	560Ω	22Ω	19Ω	9 MEG	1.3K	3.5Ω					
V3	6X4 Vid. Out. A.C. Gate	15K	38K	1.7 MEG	24Ω	27Ω	27Ω	0Ω	3K	23K	13K		
V4	6X4 Dumper	33Ω	33Ω	33Ω	16K	1N	1N	8.5 MEG	1N	1N	16K	40Ω	
V5	6BN8 Sound I-F Sync. Sec.	28K	2.5Ω	16K	24Ω	22Ω	16K	470Ω	0Ω	1.6 MEG			
V6	6X4 Vert. Osc. Output	11Ω	2.8 MEG	1N	16K	1N	1.5 MEG	16K	0Ω	130K	0Ω	17Ω	

* VARIES WITH VOLUME CONTROL SETTING.

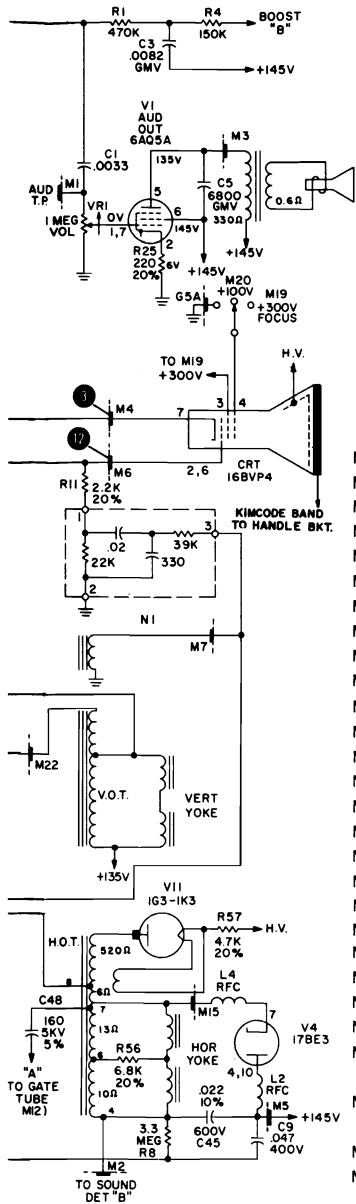
TUBE	USE	PIN NUMBERS											
		1	2	3	4	5	6	7	8	9	10	11	12
V7	6X4 Hor. Out.	27Ω	1N	19K	0Ω	330K	19K	19K	19K	330K	0Ω	19K	33Ω
V8	6X4 Hor. Osc.	24K	1.7 MEG	820Ω	5Ω	8Ω	45K	95K	820Ω	0Ω			
V9	6X4 1st I-F	24Ω	430K	24Ω	11Ω	10Ω	0Ω	16K	22K	0Ω			
V10	6X4 2nd I-F	68Ω	0.1Ω	68Ω	10Ω	8Ω	0Ω	16.5K	16.5K	0Ω			
CRT	168VP4	5Ω	18K	6Ω	0Ω	25K	6 MEG	18K	165K	3Ω			

** DEPENDS ON FOCUS CONNECTION.

PHILCO

OSCILLOSCOPE WAVEFORM PATTERNS - 15G20

These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 3.5 volts at the video detector. Voltage readings taken with the raster just filling screen and all controls set for normal picture viewing, except photos one and two where contrast control was set for maximum. The voltages given are approximate peak-to-peak values. The frequencies shown are those of the waveforms.... not the sweep rate of the oscilloscope. All readings were taken with a Model ES-550B Precision Oscilloscope.

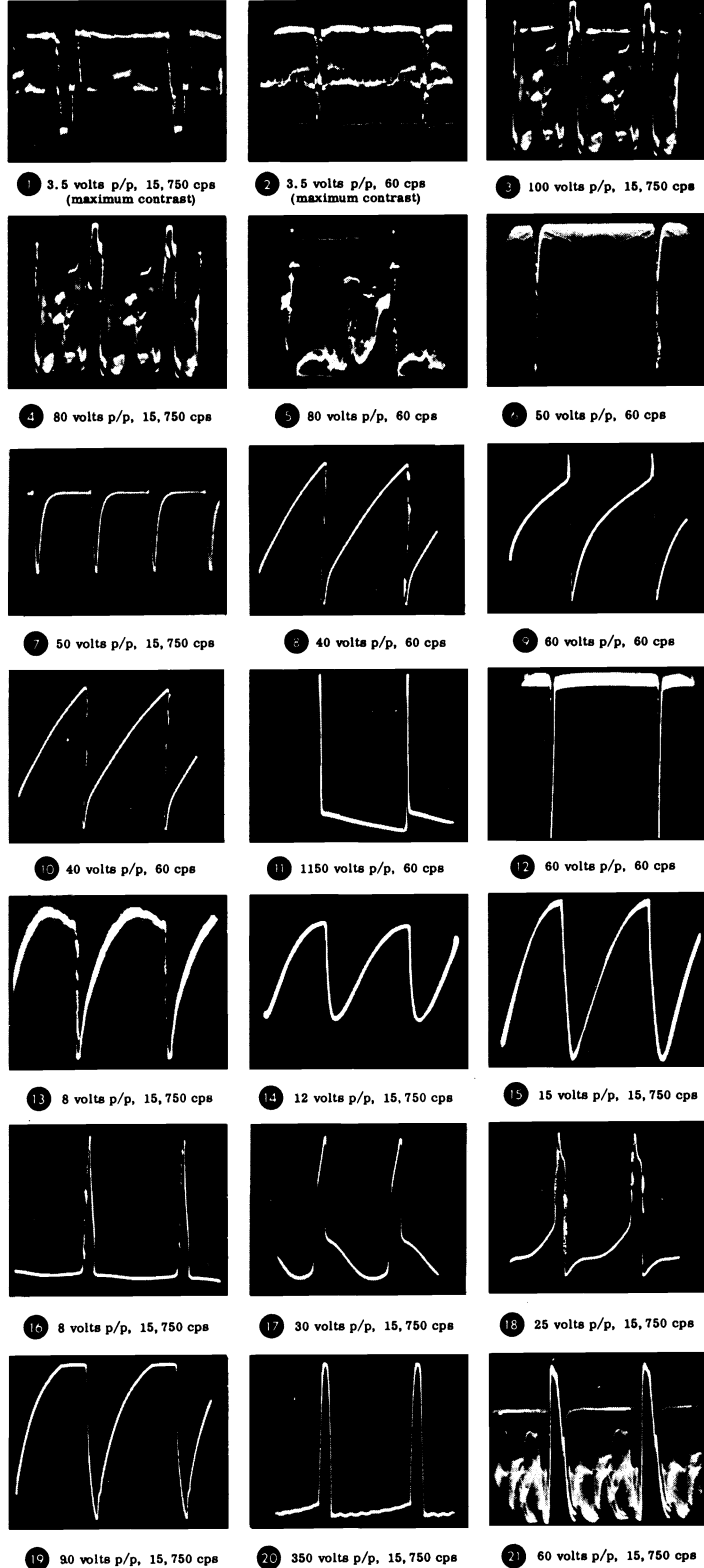


PANEL LUG CONNECTIONS

- M1 AUDIO TEST POINT
- M2 LEAD TO B1-2
- M3 BLUE LEAD TO A.O.T.
- M4 LEAD TO CRT, PIN 7
- M5 LEAD TO B1-5
- M6 LEAD TO CRT, PIN 6
- M7 LEAD TO B1-3
- M8 SOUND T.P. GROUND LINK
- M9 LEAD TO B2-1
- M10 LEAD TO TUNER AGC FEEDTHRU
- M11 LEAD TO TUNER B+ FEEDTHRU
- M12 LEAD TO YOKE
- M13 LEAD TO V.O.T.
- M14 LEAD TO M16A
- M15 LEAD TO H.O.T., PIN 7
- M16 AGC TEST POINT
- M16A LEAD TO M14
- M18 LEAD TO M28 AND TO C44B
- M19 LEAD TO CRT, PIN 4
- M20 LEAD TO C44C
- M21 2ND DETECTOR TEST POINT
- M21A SYNC TEST POINT
- M22 LEAD TO V.O.T.
- M23 LEAD TO CRT, PIN 1
- M24 HORIZONTAL OSCILLATOR TEST POINT
- M25 I-F INPUT CABLE, CENTER CONDUCTOR
- M28 LEAD TO M18
- M29 I-F TEST POINT

NOTES:

1. ALL VOLTAGES TAKEN UNDER NO SIGNAL CONDITIONS. ANTENNA REMOVED AND TUNER OFF CHANNEL.
2. VOLTAGES MEASURED WITH A "PRECISION MODEL 88, V.T.V.M.", FROM POINT INDICATED TO CHASSIS GROUND.
3. VOLTAGES MARKED * WERE TAKEN UNDER AVERAGE SIGNAL CONDITIONS, ANTENNA CONNECTED, TUNER ON AN ACTIVE CHANNEL AND CONTROLS ADJUSTED FOR A NORMAL PICTURE.
4. COIL RESISTANCES READ WITH COIL IN CIRCUIT EXCEPT FOR -
A.O.T. SEC. AND SPEAKER V.C.
WHERE THE COMPONENTS WERE DISCONNECTED AND MEASURED INDIVIDUALLY.
5. BALLOONS 1, 2, ETC. SHOWN ON SCHEMATIC, INDICATE WAVEFORM TEST POINTS.
6. CONTROL SETTINGS:
VOLUME - MINIMUM
CONTRAST - MID-RANGE
BRIGHTNESS - MID-RANGE
ALL OTHER CONTROLS SET FOR NORMAL OPERATION.





CHASSIS ALIGNMENT
15G20

VIDEO I-F AM AND SWEEP ALIGNMENT PROCEDURE

The following video I-F alignment procedure is based upon a tuner, with proper bandpass alignment, connected to the TV chassis.

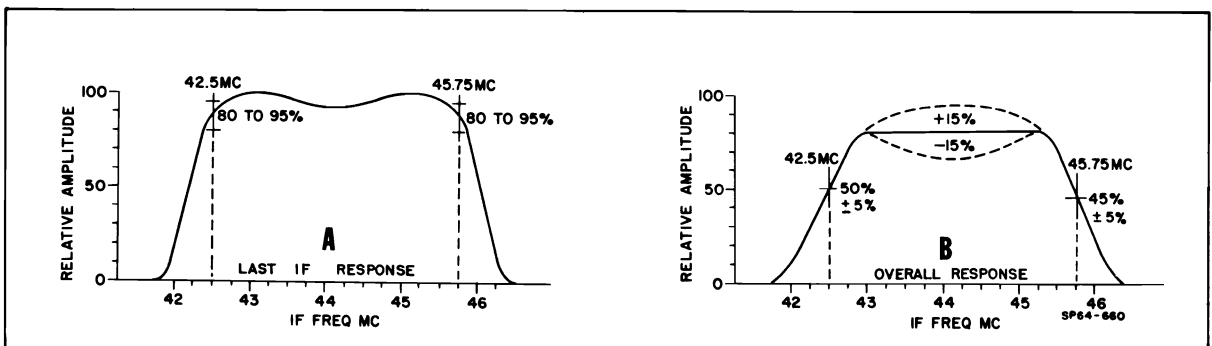
1. Apply -12VDC to AGC test point, Lug M16 on perma-circuit panel.
2. Calibrate oscilloscope for 2.0V p/p for 100% deflection.
3. Connect scope through 10K isolating resistor to 2nd detector T.P., Lug M21. Connect .001 mfd from Lug M21 to ground to sharpen sweep markers. Loose couple marker generator to chassis.
4. Preset L18 so that top of core is 1/4-inch out of coil. Preset L17 so that top of core is even with top of coil.
5. Inject low impedance 40MC sweep to Lug M29. Make sure sweep is not in overload. Marker level should be such that output level is not affected.
NOTE: Steps 4 and 5 above are used for I-F sweep alignment only.
6. Remove 40MC sweep.
CAUTION: Do not attempt to adjust L18 or L17 after they have been 40MC sweep aligned.
7. Connect AM signal generator through test jig to tuner mixer grid (TP1T). Connect sweep generator, through a 72 ohm to 300 ohm matching network, to antenna terminals.
8. Preset L12, L14 and L15 so that tops of cores are 1/4-inch out of coils. Preset L13 so that top of core is even with top of coil.
9. Remove AM signal generator from tuner mixer grid before proceeding with RF sweep alignment.

I-F SWEEP ALIGNMENT CHART

STEP	SWEEP GEN. APPROX. 8MC SWEEP WIDTH	MARKER GEN. UN-MOD. R-F	ADJUST	REMARKS
1	44MC	42.5MC & 45.75MC	L18	ADJUST L18 TO PLACE 42.5MC MARKER AND 45.75MC MARKER BETWEEN INDICATED LIMITS SHOWN IN FIGURE A.
2	44MC	42.5MC & 45.75MC	L17	ADJUST L17 BY ROCKING CURVE TO PLACE 42.5MC MARKER AND 45.75 MC MARKER BETWEEN INDICATED LIMITS SHOWN IN FIGURE A.

AM ALIGNMENT CHART

STEP	AM MOD. 400~ AT 50%	ADJUST	REMARKS
3	43.5MC 42.7MC 45.0MC	L10 - FOR MAX. L15T - (TUNER I-F COIL) FOR MAX. L14 - FOR MAX.	ADJUST INPUT LEVEL TO PREVENT OVERLOADING.
4	41.25MC 47.25MC 47.25MC 47.25MC	L13 - FOR MIN. L15 - FOR MIN. L12 - FOR MIN. L15 - FOR MIN.	BIAS MAY BE LOWERED TO PRODUCE SUFFICIENT SCOPE AMPLITUDE. REPEAT ADJUSTMENTS OF L12 AND L15 UNTIL NO FURTHER IMPROVEMENT IS OBTAINED.





CHASSIS ALIGNMENT
15G20

R-F SWEEP ALIGNMENT CHART

NOTE: Properly position fine tuning for sweep alignment by setting tuner to channel 4 and injecting 65.75MC, modulated 30% at the antenna terminals. Adjust fine tuning control for minimum scope indication. Do not touch fine tuning control or channel selector for balance of alignment.

STEP	SWEEP GEN. APPROX. 8MC SWEEP WIDTH	MARKER GEN. UNMOD. R-F	ADJUST	REMARKS
5	69MC	42.5MC	L15T (TUNER I.F. COIL)	ADJUST L15T TO PLACE 42.5MC MARKER BETWEEN INDICATED LIMITS ON SOUND SIDE OF CURVE (FIG. B). ADJUST SWEEP GENERATOR LEVEL TO LIMIT SCOPE TO 2V P/P DEFLECTION. KEEP RESPONSE LEVEL WITH L10.
6	69MC	45.75MC	L14	ADJUST L14 TO PLACE 45.75MC MARKER BETWEEN INDICATED LIMITS ON VIDEO SIDE OF CURVE (FIG. B). ADJUST SWEEP GENERATOR LEVEL TO LIMIT SCOPE TO 2V P/P DEFLECTION. KEEP RESPONSE LEVEL WITH L10.
7	69MC	42.5MC & 45.75MC	L10	L10 TILTS OR LEVELS CURVE.

4.5MC TRAP, SOUND TAKE-OFF AND INTERSTAGE ALIGNMENT

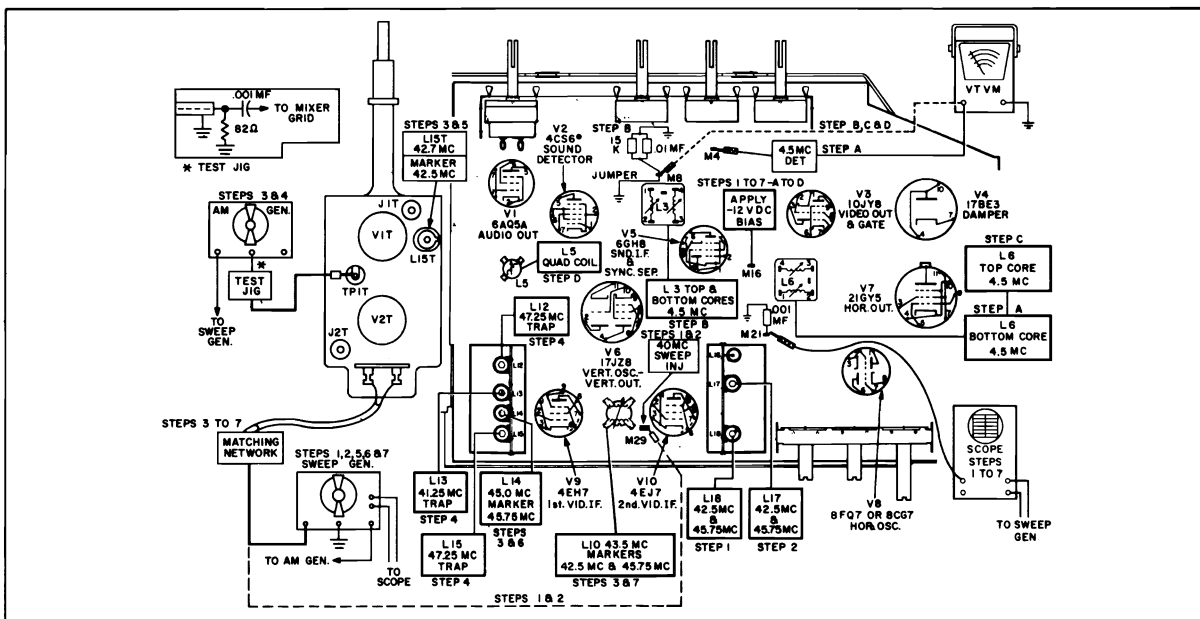
Preliminary:

1. Set contrast control to maximum.
2. Set volume control to minimum.
3. Apply -12V bias to Lug M16.

Equipment:

1. V.T.V.M.
2. AM Generator
3. RC Network (15K resistor and .01 mfd in parallel)
4. 4.5MC Detector probe (See Section 1-2 for circuit diagram)

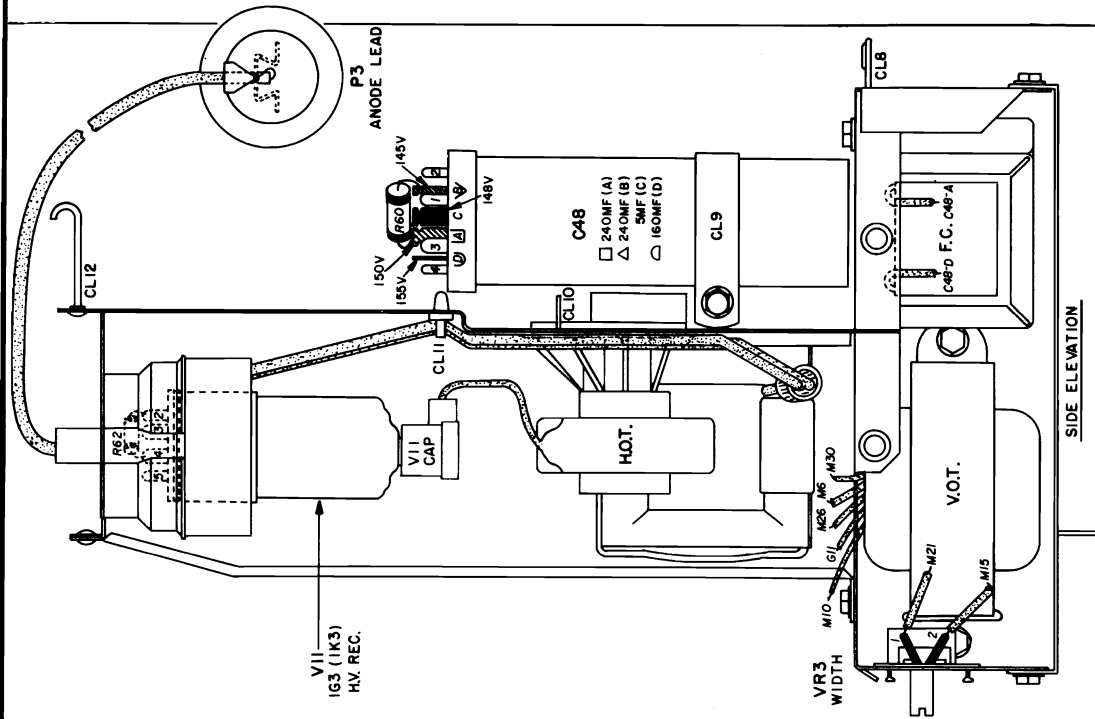
STEP	SIGNAL INPUT THROUGH 1500Ω RESISTOR TO LUG M21	OUTPUT	ADJUST	REMARKS
A	4.5MC AM OR STATION SIGNAL	CONNECT 4.5MC DETECTOR PROBE TO LUG M4. CONNECT VTVM TO 4.5MC PROBE. SET METER TO 2.5V RANGE.	L6 (BOTTOM CORE) FOR MINIMUM OUTPUT INDICATION ON VTVM.	INCREASE SIGNAL INPUT TO GIVE 1/4 SCALE DEFLECTION AT NULL POINT (THIS STEP FOR 4.5MC TRAP ADJ. ONLY).
B	4.5MC AM OR STATION SIGNAL	REMOVE GROUND CONNECTION FROM LUG M8. CONNECT RC NETWORK FROM M8 TO GROUND. PLACE VTVM ACROSS NETWORK. INPUT SHOULD BE ADJUSTED TO KEEP OUTPUT BETWEEN -1V AND -2V.	L3 (TOP & BOTTOM CORES) FOR MAXIMUM INDICATION ON VTVM.	RC NETWORK CONSISTS OF A 15K RESISTOR AND A .01 MFD CAPACITOR IN PARALLEL.
C	4.5MC AM OR STATION SIGNAL	SAME AS STEP B	L6 (TOP CORE) FOR MAXIMUM INDICATION ON VTVM.	
D	USE STATION SIGNAL	REMOVE RC NETWORK AND REPLACE GROUND TO LUG M8.	QUAD COIL L5 FOR MAXIMUM SOUND OUTPUT.	THE CORRECT PEAK WILL BE THE SECOND ONE WHEN TURNING CORE INTO COIL.



PHILCO

Chassis 15J25, exact material,
Chassis 15J27 is very similar.

(Service material on pages 104-106; alignment is on pages 107-108)



1. ALL VOLTAGES TAKEN UNDER NO SIGNAL CONDITIONS. ANTENNA REMOVED AND TUNER OFF CHANNEL.
2. VOLTAGES MEASURED WITH A PRECISION MODEL 88 V.T.V.M. FROM POINT INDICATED TO CHASSIS GROUND.
3. ALL COIL RESISTANCES READ WITH COIL IN CIRCUIT.
4. BALLOONS 8, 9, ETC., SHOWN ON SCHEMATIC, INDICATE WAVEFORM TEST POINTS.

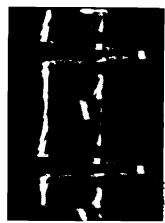
These waveforms were taken with the receiver adjusted for an approximate peak-to-peak output of 2.5 volts at the video detector. Voltages and frequencies are given in the captions. All readings were taken with a Model ES-550B Precision Oscilloscope.



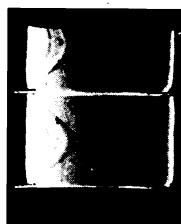
1 2.5 volts p/p, 15,750 cps (max. contrast)



2 2.5 volts p/p, 60 cps (max. contrast)



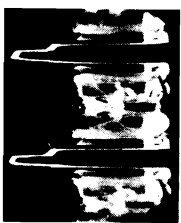
3 2.5 volts p/p, 15,750 cps (max. contrast)



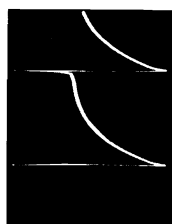
4 75 volts p/p, 15,750 cps (max. contrast)



5 60 volts p/p, 60 cps



6 60 volts p/p, 15,750 cps



7 40 volts p/p, 60 cps



8 36 volts p/p, 60 cps



9 40 volts p/p, 15,750 cps



10 1100 volts p/p, total, ±20 volts p/p sawtooth, 60 cps



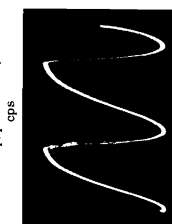
11 38 volts p/p, 60 cps



12 7 volts p/p, 15,750 cps



13 15 volts p/p, 15,750 cps



14 33 volts p/p, 15,750 cps



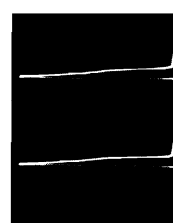
15 25 volts p/p, 15,750 cps



16 75 volts p/p, 15,750 cps (max. contrast)

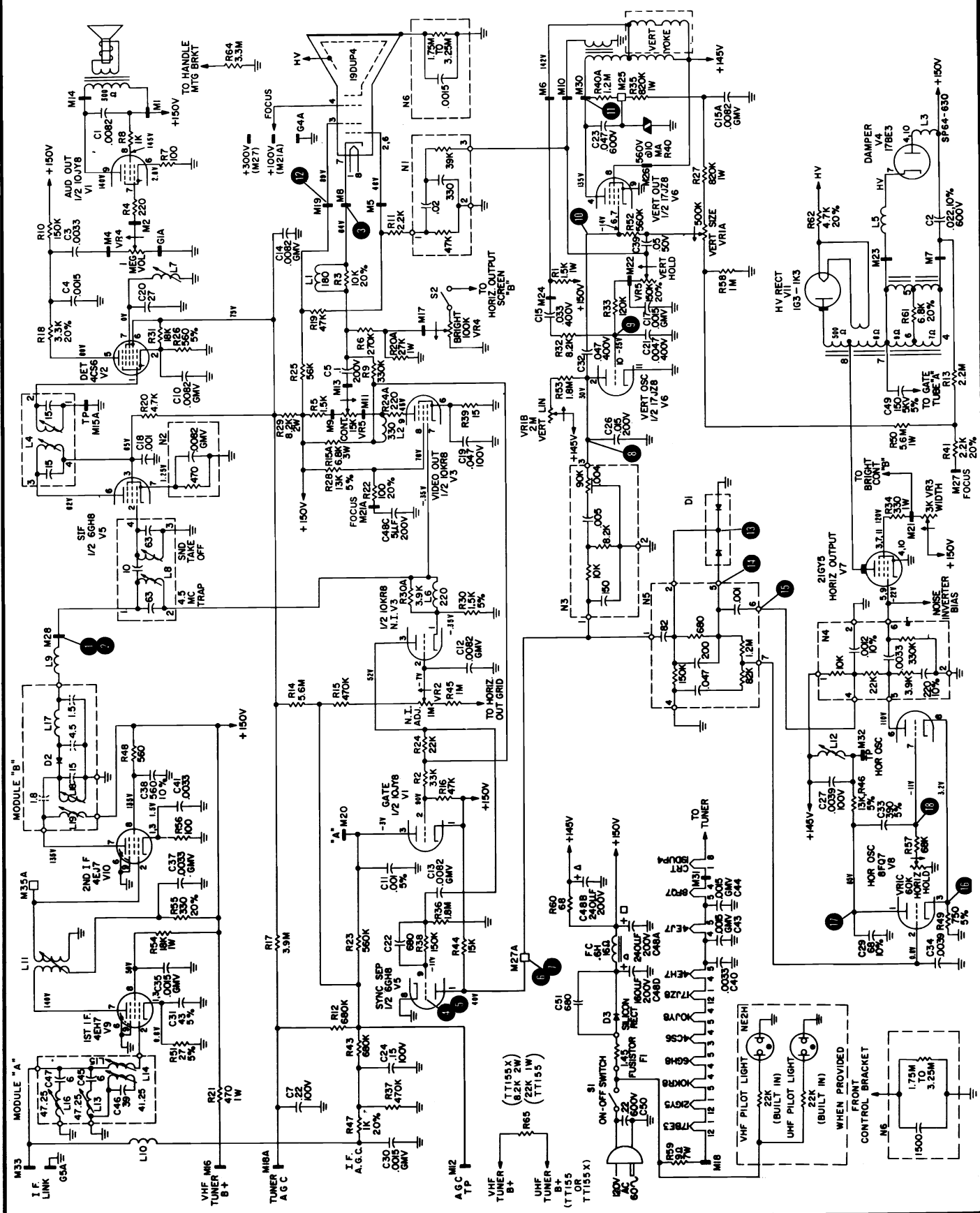


17 60 volts p/p, 60 cps



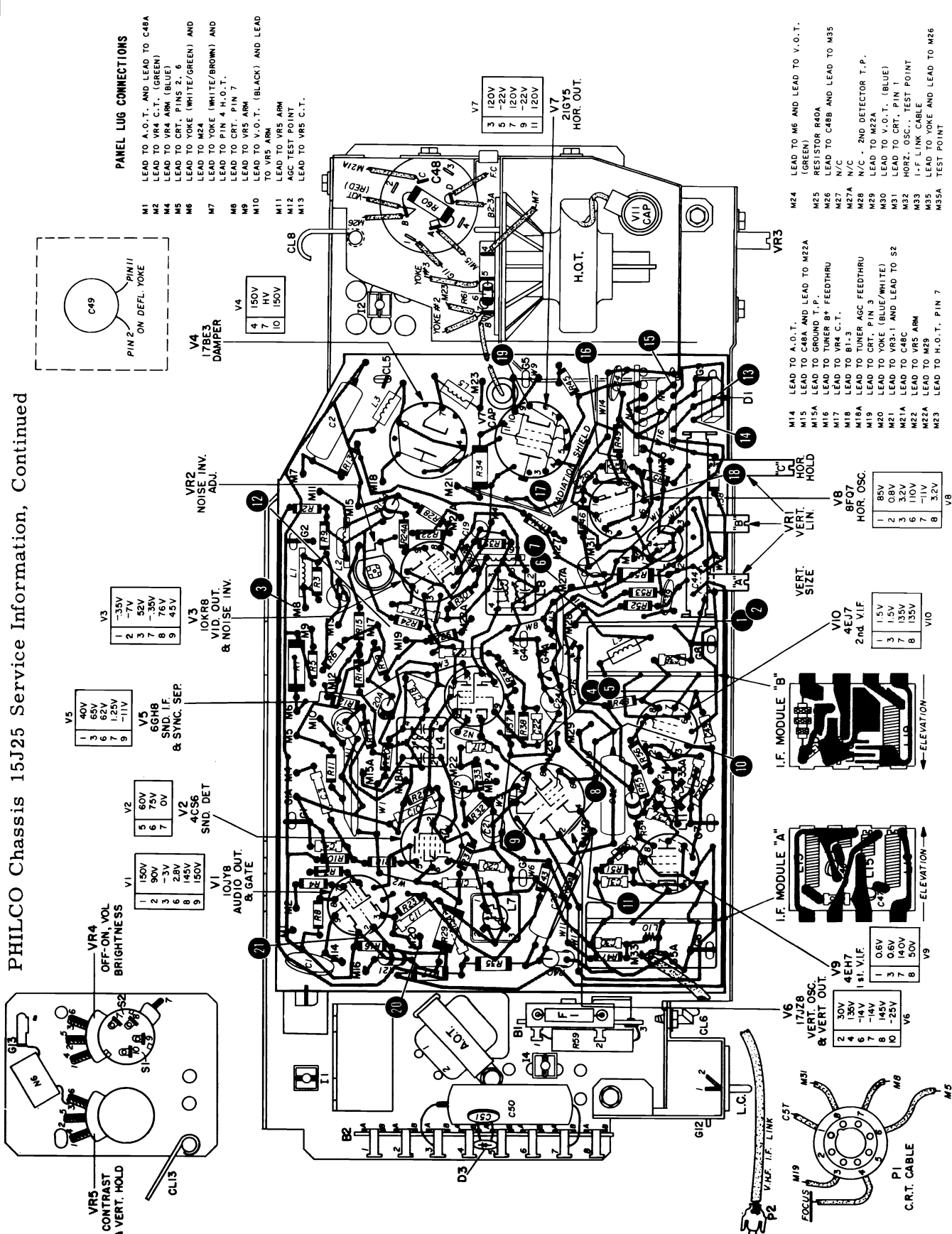
18 40 volts p/p, 15,750 cps

OSCILLOSCOPE WAVEFORM PATTERNS



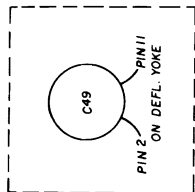
PHILCO Chassis 15J25 Schematic Diagram

PHILCO Chassis 15J25 Service Information, Continued



PANEL LUG CONNECTIONS

- M1 LEAD TO A.O.T. AND LEAD TO C48A
- M2 LEAD TO VR4 C.T. (GREEN)
- M4 LEAD TO VR4 ARM (BLUE)
- M5 LEAD TO CRT. PINS 2, 6
- M6 LEAD TO YOKE (WHITE/GREEN) AND LEAD TO M2A
- M7 LEAD TO YOKE (WHITE/BROWN) AND LEAD TO PIN 4 H.O.T.
- M8 LEAD TO CRT. PIN 7
- M9 LEAD TO VRS ARM
- M10 LEAD TO V.O.T. (BLACK) AND LEAD TO VRS ARM
- M11 LEAD TO VRS ARM
- M12 AGC TEST POINT
- M13 LEAD TO VRS C.T.



- V4 150V HV
- IO 150V DAMPER

- V2 NOISE INV. ADJ.

- V3 1 -35V
- 2 -7V
- 3 52V
- 4 -35V
- 5 76V
- 6 45V

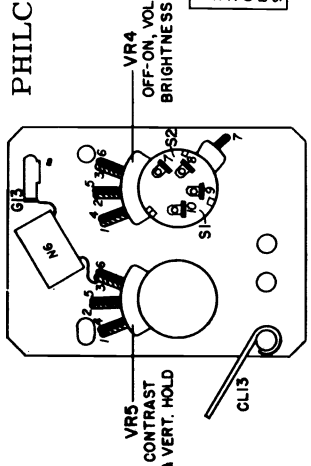
- V3 10KRB VID. OUT. & NOISE INV.

- V5 1 40V
- 2 65V
- 3 62V
- 4 125V
- 5 11V

- V5 1 60V
- 2 75V
- 3 0V

- V2 1 150V
- 2 90V
- 3 3V
- 4 28V
- 5 145V
- 6 150V

- V1 10V8 AUDIO OUT. & GATE



- V2 5 60V
- 6 75V
- 7 0V

- V2 4C56 SND. DET

- V1 1 150V
- 2 90V
- 3 3V
- 4 28V
- 5 145V
- 6 150V

- V1 10V8 AUDIO OUT. & GATE

- V1 1 150V
- 2 90V
- 3 3V
- 4 28V
- 5 145V
- 6 150V

- V1 10V8 AUDIO OUT. & GATE

- V1 1 150V
- 2 90V
- 3 3V
- 4 28V
- 5 145V
- 6 150V

- V1 10V8 AUDIO OUT. & GATE

- V1 1 150V
- 2 90V
- 3 3V
- 4 28V
- 5 145V
- 6 150V

- V1 10V8 AUDIO OUT. & GATE

- V1 1 150V
- 2 90V
- 3 3V
- 4 28V
- 5 145V
- 6 150V

- V1 10V8 AUDIO OUT. & GATE

- V1 1 150V
- 2 90V
- 3 3V
- 4 28V
- 5 145V
- 6 150V

- V1 10V8 AUDIO OUT. & GATE

- V1 1 150V
- 2 90V
- 3 3V
- 4 28V
- 5 145V
- 6 150V

- V1 10V8 AUDIO OUT. & GATE

- M24 LEAD TO M6 AND LEAD TO V.O.T. (GREEN)
- M25 RESISTOR R40A
- M26 LEAD TO C48B AND LEAD TO M35 N/C
- M27 N/C
- M27A N/C - 2ND DETECTOR T.P.
- M28 LEAD TO M22A
- M29 LEAD TO V.O.T. (BLUE)
- M30 LEAD TO CRT. PIN
- M31 LEAD TO VRS.1 AND LEAD TO S2
- M32 HORIZ. OSC. TEST POINT
- M33 I-F LINK CABLE
- M35 LEAD TO YOKE AND LEAD TO M26 TEST POINT
- M35A

- M14 LEAD TO A.O.T.
- M15 LEAD TO C48A AND LEAD TO M22A
- M15A LEAD TO GROUND T.P.
- M16 LEAD TO TUNER R* FEEDTHRU
- M17 LEAD TO VR4 C.T.
- M18 LEAD TO B1-3
- M18A LEAD TO TUNER AGC FEEDTHRU
- M19 LEAD TO CRT. PIN 3
- M20 LEAD TO YOKE (BLUE/WHITE)
- M21 LEAD TO VRS.1 AND LEAD TO S2
- M21A LEAD TO C48C
- M22 LEAD TO VRS ARM
- M22A LEAD TO M29
- M23 LEAD TO H.O.T. PIN 7

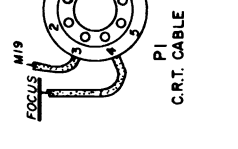
- V8 1 85V
- 2 08V
- 3 32V
- 4 110V
- 5 11V
- 6 3.2V
- 7 3.2V
- 8 3.2V

- V10 1 1.5V
- 2 1.5V
- 3 1.5V
- 4 1.5V
- 5 1.5V
- 6 1.5V
- 7 1.5V
- 8 1.5V



- V9 1 0.6V
- 2 0.6V
- 3 0.6V
- 4 0.6V
- 5 0.6V
- 6 0.6V
- 7 140V
- 8 50V

- V6 1 30V
- 2 15V
- 3 15V
- 4 14V
- 5 145V
- 6 25V
- 7 140V
- 8 25V
- 9 25V
- 10 25V



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CHASSIS ALIGNMENT 15J25 & 15J27

VIDEO I-F AM AND SWEEP ALIGNMENT PROCEDURE

Preliminary Information

The following video I-F alignment procedure is based upon a tuner with proper band-pass alignment connected to the TV chassis.

1. Allow set to warm up 10 minutes minimum.
2. Apply -15VDC bias to AGC TP lug (M12).
3. Connect scope thru a 15K resistor to 2nd detector TP lug (M28). Calibrate scope for 2V p/p for 100% deflection.
4. Connect AM and marker signal generator

thru a .0015 mf capacitor to TP1T (on tuner) I-F test jack.

5. Connect sweep generator through a 72 ohm to 300 ohm matching network to antenna terminals.
6. Preset core adjustments
 - a. L13 and L15, six turns out from flush core position
 - b. L14, L16 and L18 fully engaged
 - c. L19, two turns out from flush core position

AM ALIGNMENT CHART

STEP	AM MOD. 400 AT 30%	ADJUST	REMARKS
1	43.5MC	L11 - FOR MAX.	ADJUST FOR FIRST PEAK DOWN FROM FLUSH CORE POSITION
2	42.75MC	L15T (ON TUNER) - FOR MAX.	
3	45.25MC	L15 - FOR MAX.	
4	41.25MC	L14 - FOR MIN.	BIAS MAY BE LOWERED TO PRODUCE SUFFICIENT SCOPE AMPLITUDE
5	47.25MC 47.25MC	L13 - FOR MIN. L16 - FOR MIN.	BE SURE TO ADJUST L13 FIRST, THEN L16. BIAS MAY BE LOWERED TO PRODUCE SUFFICIENT SCOPE AMPLITUDE
6	REPEAT STEP 5 UNTIL NO FURTHER IMPROVEMENT IS OBTAINED.		

CAUTION: REMOVE AM GENERATOR FROM TP1T BEFORE PROCEEDING WITH SWEEP ALIGNMENT.

NOTE: TO PROPERLY POSITION FINE TUNING FOR SWEEP ALIGNMENT, SET TUNER TO CHANNEL 4 AND INJECT 65.75MC, 30% MODULATED AT ANTENNA TERMINALS. ADJUST FINE TUNING CONTROL FOR MINIMUM SCOPE INDICATION. DO NOT TOUCH FINE TUNING OR CHANNEL SELECTOR FOR BALANCE OF ALIGNMENT.

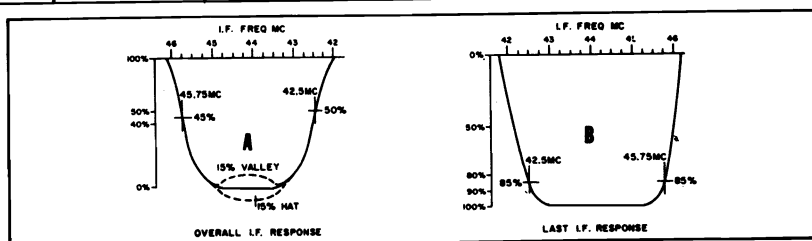
SWEEP ALIGNMENT CHART

1. Repeat Steps 1, 2, 3 and 5 in preliminary information.
2. Inject low impedance 40MC sweep to lug (M35A). Make sure sweep is not in overload. Marker level should be such that output level is not affected.
3. To obtain response curve (Figure B)
 - a. Adjust L19 for marker positions
 - b. Adjust L18 to rock response curve
 - c. Remove RF sweep before proceeding with 40 MC sweep adjustment
4. Remove 40MC sweep.

CAUTION: Do not attempt to adjust L18 or L19 after they have been 40 MC sweep aligned.

5. To obtain response curve (Figure A), proceed with Steps 7 and 8.

STEP	SWEEP GEN. APPROX. 8 MC SWEEP WIDTH	MARKER GEN. UNMOD. R-F	ADJUST	REMARKS
7	44MC	42.5MC	L15T (TUNER I-F COIL)	ADJUST L15T TO PLACE 42.5MC MARKER BETWEEN INDICATED LIMITS ON SOUND SIDE OF CURVE (FIG. A). ADJUST SWEEP GEN. LEVEL TO LIMIT SCOPE TO 2V P/P DEFLECTION. KEEP RESPONSE LEVEL WITH L11.
8	44MC	45.75MC	L15	ADJUST L15 TO PLACE 45.75MC MARKER BETWEEN INDICATED LIMITS ON VIDEO SIDE OF CURVE (FIG. A). KEEP RESPONSE LEVEL WITH L11.



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CHASSIS ALIGNMENT 15J25 & 15J27

4.5MC TRAP, SOUND TAKE-OFF AND INTERSTAGE ALIGNMENT

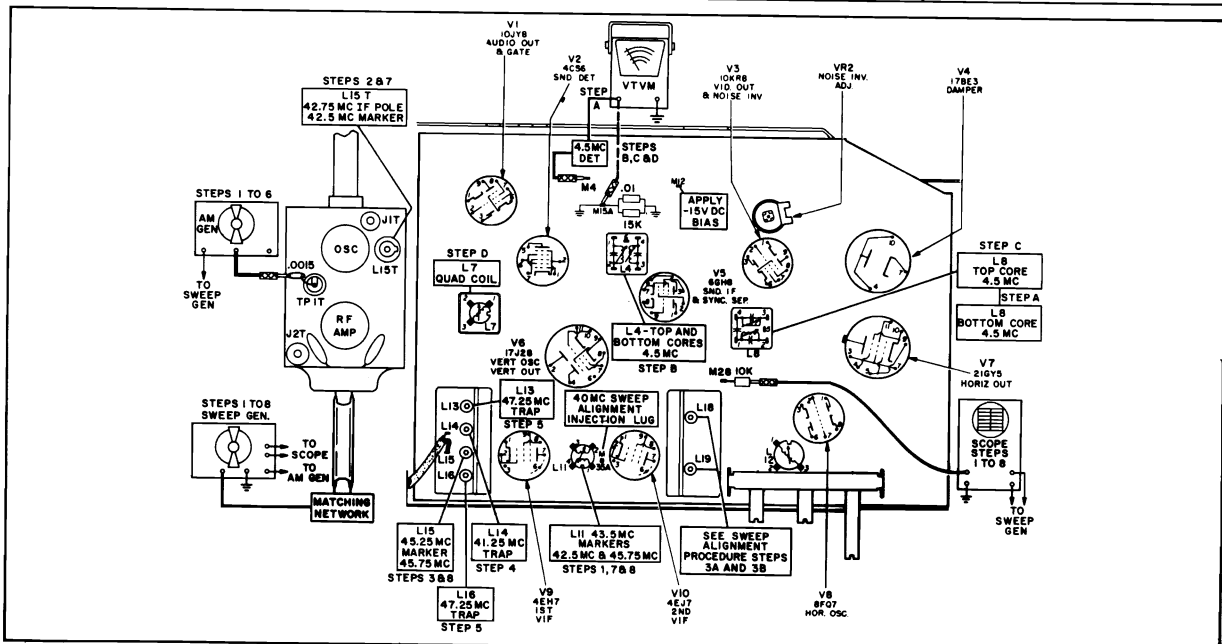
Preliminary:

1. Set contrast control to maximum
2. Set volume control to minimum
3. Apply -15 bias to lug M12

Equipment:

1. V.T.V.M.
2. AM Generator
3. RC Network (15K resistor and .01 mfd in parallel)
4. 4.5MC Detector Probe

STEP	SIGNAL INPUT THROUGH 1500Ω RESISTOR TO LUG M28	OUTPUT	ADJUST	REMARKS
A	4.5MC AM OR STATION SIGNAL	CONNECT 4.5MC DETECTOR PROBE TO LUG M4. CONNECT VTVM TO 4.5MC PROBE. SET METER TO 2.5V RANGE.	L8 (BOTTOM CORE) FOR MINIMUM OUTPUT INDICATION ON VTVM.	INCREASE SIGNAL INPUT TO GIVE 1/4 SCALE DEFLECTION AT NULL POINT (THIS STEP FOR 4.5MC TRAP ADJ. ONLY).
B	4.5MC AM OR STATION SIGNAL	REMOVE GROUND CONNECTION FROM LUG M15A. CONNECT RC NETWORK FROM M15A TO GROUND. PLACE VTVM ACROSS NETWORK. INPUT SHOULD BE ADJUSTED TO KEEP OUTPUT BETWEEN .1V AND .2V.	L4 (TOP & BOTTOM CORES) FOR MAXIMUM INDICATION ON VTVM.	RC NETWORK CONSISTS OF A 15K RESISTOR AND A .01 MFD CAPACITOR IN PARALLEL.
C	4.5MC AM OR STATION SIGNAL	SAME AS STEP B	L8 (TOP CORE) FOR MAXIMUM INDICATION ON VTVM.	
D	USE STATION SIGNAL	REMOVE RC NETWORK AND REPLACE GROUND TO LUG M15A	QUAD COIL L7 FOR MAXIMUM SOUND OUTPUT.	THE CORRECT PEAK WILL BE THE SECOND ONE WHEN TURNING CORE INTO COIL.



15J25 & 15J27 Equipment Setup & Alignment Points



CHASSIS DATA
15N30

(Material on Chassis 15N30 on pages 109 through 113)

VIDEO I-F AM AND SWEEP ALIGNMENT PROCEDURE

PRELIMINARY INFORMATION

The following video I-F alignment procedure is based upon a tuner with proper band-pass alignment connected to the TV chassis.

1. Allow set to warm up ten minutes minimum.
2. Remove 10JY8 gate tube and replace with equivalent filament load.
3. Apply -1.5 VDC to tuner AGC lug (M10)
Apply -9 VDC to I-F AGC lug (M12)
4. Connect scope thru 10K resistor to 2nd det. T.P. lug (M28). Calibrate scope for 2V p/p for 100% deflection.
5. Connect AM and marker signal through .005 mf capacitor to TP1T (on tuner) IF test jack. Connect sweep generator through a 72 ohm to 300 ohm matching network to antenna terminals.
6. Preset core adjustments
 - a. L13, L15 and L16 six turns out from flush core position
 - b. L14 core flush with top
 - c. L18, four turns out from flush core position
 - d. L19 two turns out from flush core position

AM ALIGNMENT CHART

STEP	AM MOD. 400~ AT 30%	ADJUST	REMARKS
1	43.5MC	L11 - FOR MAX.	ADJUST FOR FIRST PEAK DOWN FROM FLUSH CORE POSITION
2	42.75MC	L15T (ON TUNER) FOR MAX.	
3	45.25MC	L15 - FOR MAX.	
4	41.25MC	L14 - FOR MIN.	BIAS MAY BE LOWERED TO PRODUCE SUFFICIENT SCOPE AMPLITUDE
5	47.25MC 47.25MC	L16 - FOR MIN. L13 - FOR MIN.	SAME AS STEP #4
6	REPEAT STEP #5 UNTIL NO FURTHER IMPROVEMENT IS OBTAINED.		

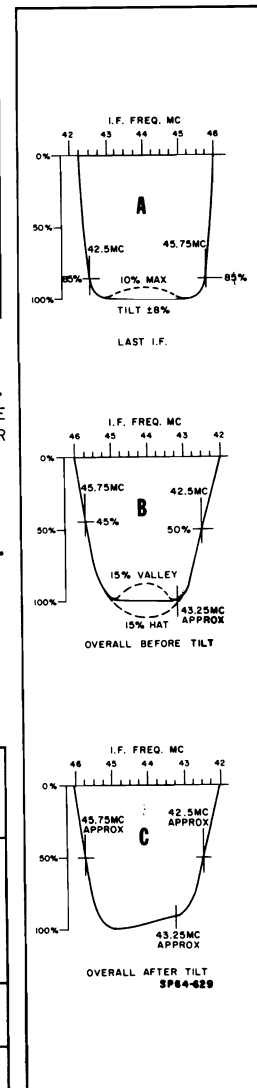
REMOVE GENERATOR FROM TP1T BEFORE PROCEEDING WITH SWEEP ALIGNMENT.

NOTE: TO PROPERLY POSITION FINE TUNING FOR SWEEP ALIGNMENT, SET TUNER TO CHANNEL 4 AND INJECT 65.75MC, 30% MODULATED AT ANTENNA TERMINALS. ADJUST FINE TUNING CONTROL FOR MINIMUM SCOPE INDICATION. DO NOT TOUCH FINE TUNING OR CHANNEL SELECTOR FOR BALANCE OF ALIGNMENT.

SWEEP ALIGNMENT CHART

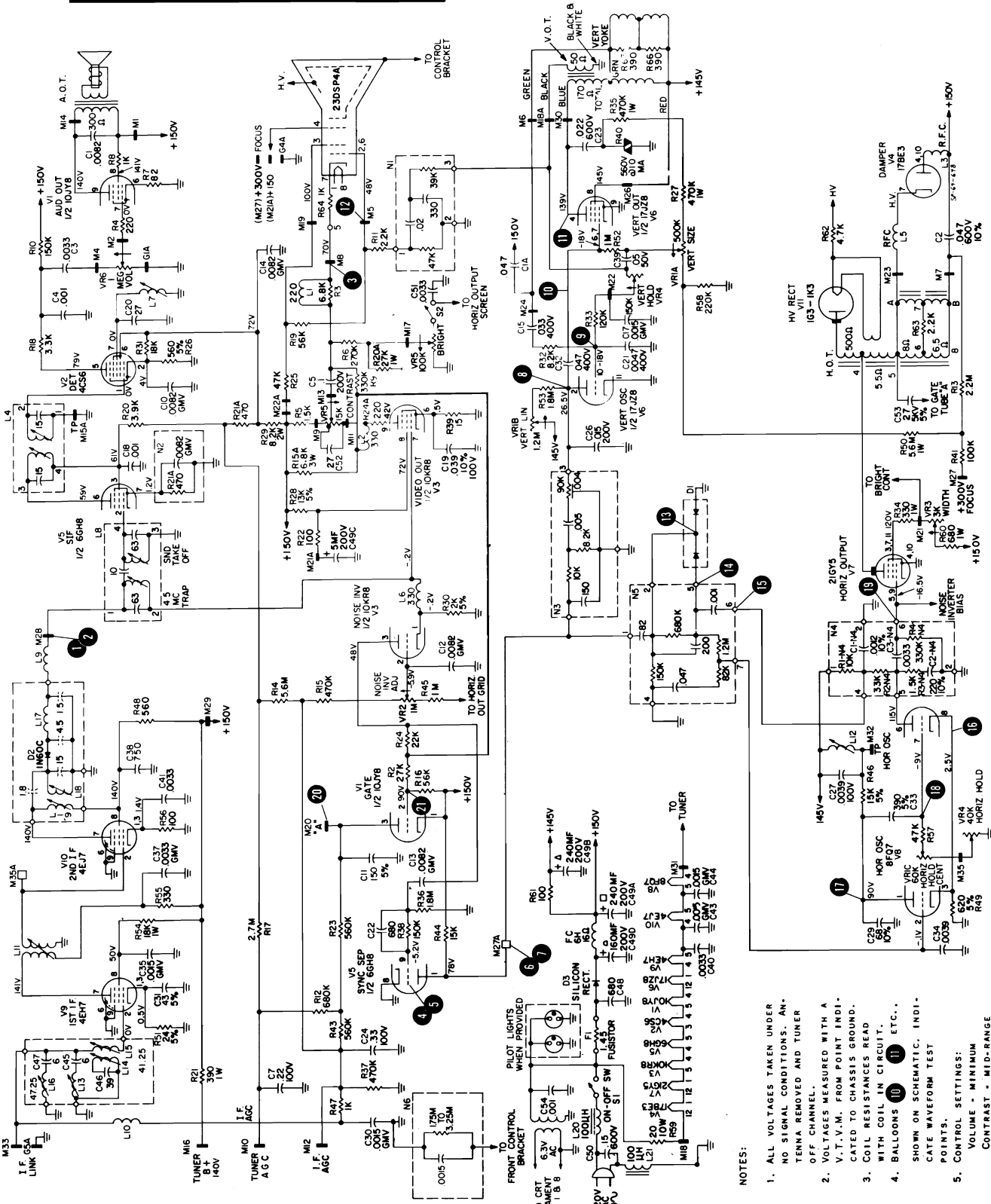
1. Repeat steps 1 thru 4 covered in preliminary information.
2. Inject low impedance 40MC sweep to lug (N35A). Make sure sweep is not in overload. Marker level should be such that output level is not affected.
3. To obtain response curve (Figure A)
 - a. Adjust L19 for marker positions.
 - b. Adjust L18 to rock response curve.
 - c. Remove RF sweep before proceeding with 40MC sweep adjustment.
4. Remove 40MC sweep.
- CAUTION: Do not attempt to adjust L18 or L19 after they have been 40MC sweep aligned.
5. To obtain response curve (Figure B) proceed with Steps 7, 8 and 9.

STEP	SWEEP GEN. APPROX. 8MC SWEEP WIDTH	MARKER GEN. UNMOD. R-F	ADJUST	REMARKS
7	44MC	42.5MC	L15T (TUNER I-F COIL)	ADJUST L15T TO PLACE 42.5MC MARKER BETWEEN INDICATED LIMITS ON SOUND SIDE OF CURVE (FIG. B). ADJUST SWEEP GENERATOR LEVEL TO LIMIT SCOPE TO 2V P/P DEFLECTION. KEEP RESPONSE LEVEL WITH L11.
8	44MC	45.75MC	L15	ADJUST L15 TO PLACE 45.75MC MARKER BETWEEN INDICATED LIMITS ON VIDEO SIDE OF CURVE (FIG. B).
9	44MC	42.5MC & 45.75MC	L11	OBTAIN RESPONSE CURVE (FIGURE C) BY ADJUSTING L11 UPWARD.





CHASSIS ALIGNMENT
15N30



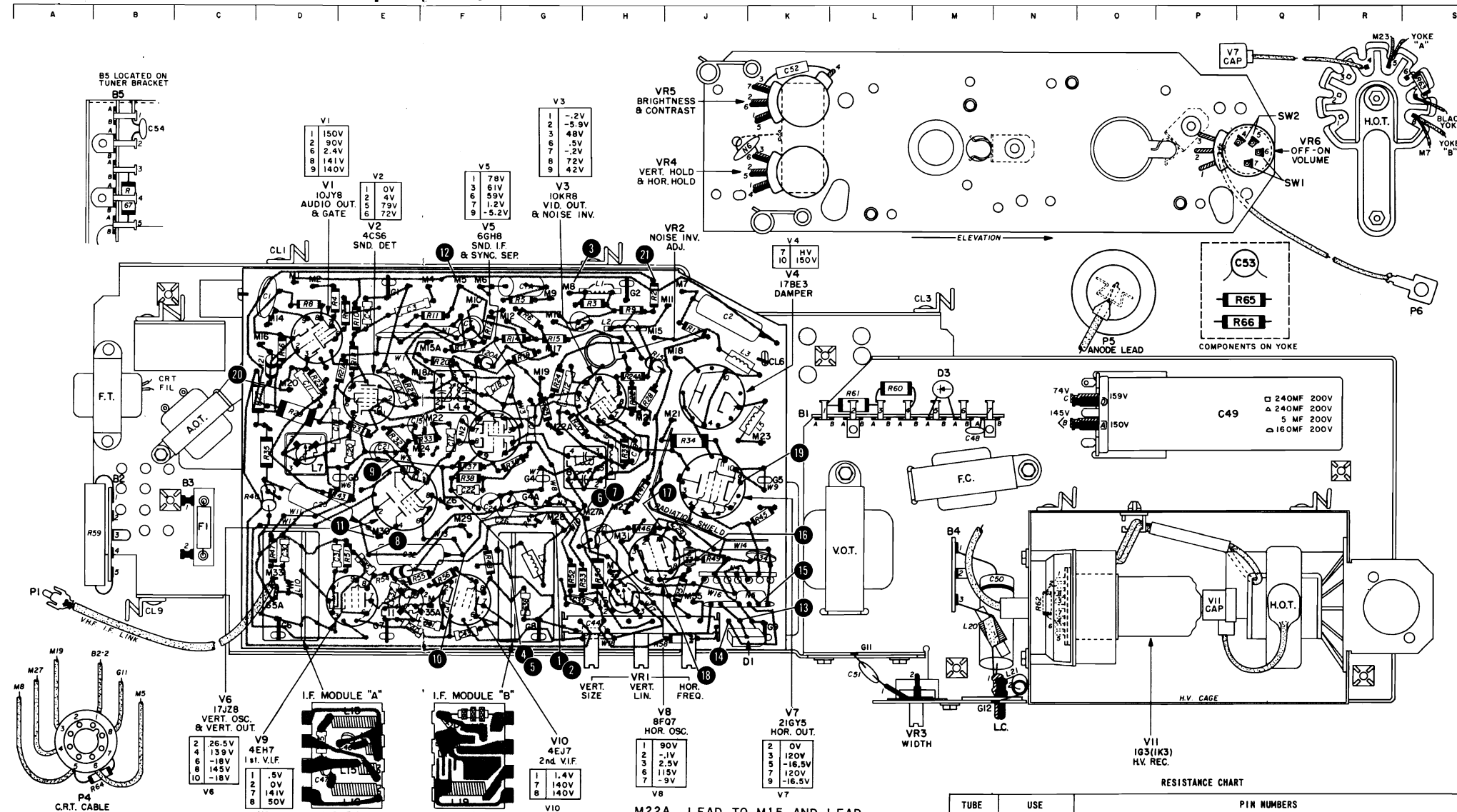
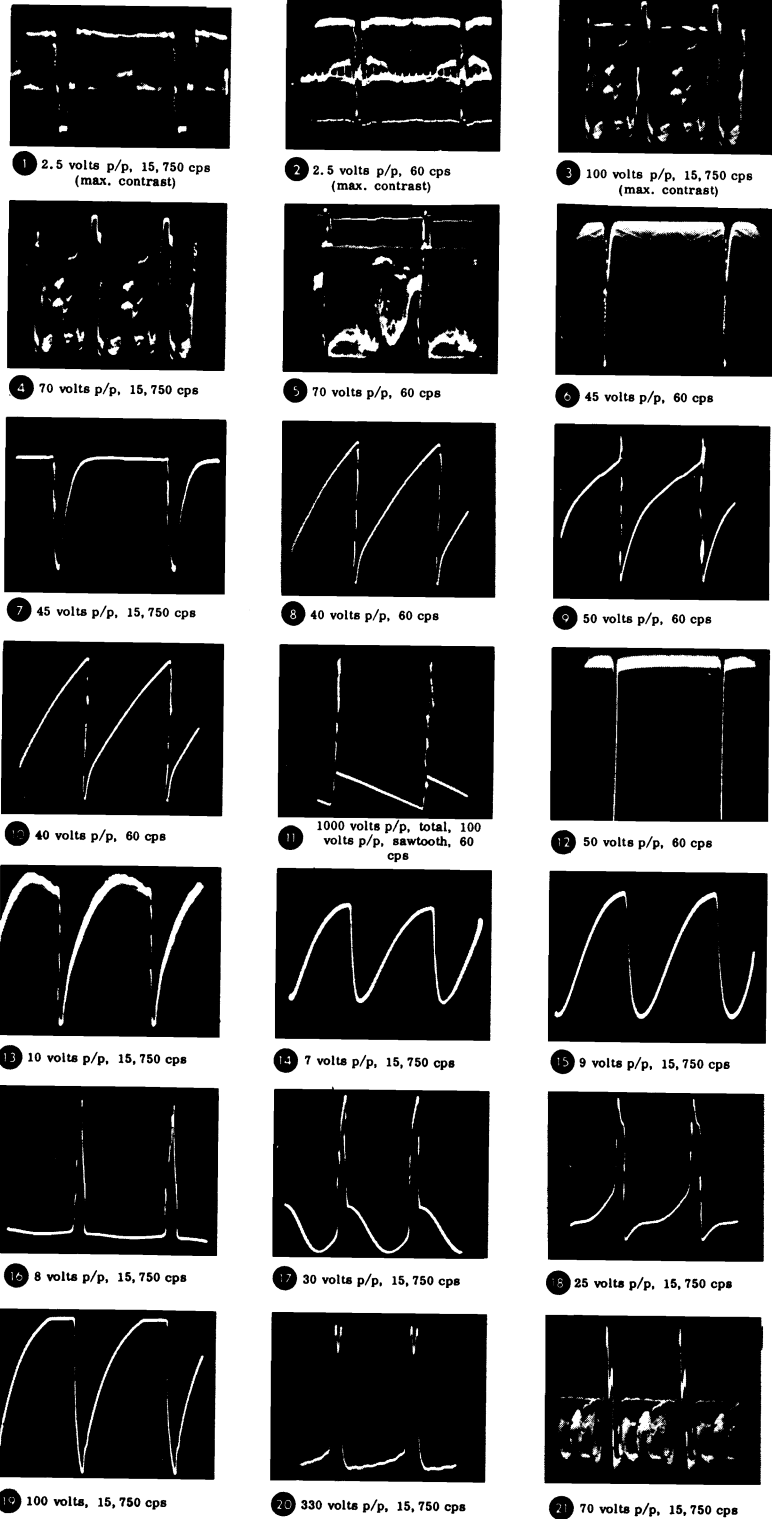
Schematic Diagram of Chassis 15N30

- NOTES:
1. ALL VOLTAGES TAKEN UNDER NO SIGNAL CONDITIONS. ANTENNA REMOVED AND TUNER OFF CHANNEL.
 2. VOLTAGES MEASURED WITH A V.T.V.-M. FROM POINT INDICATED TO CHASSIS GROUND.
 3. COIL RESISTANCES READ WITH COIL IN CIRCUIT.
 4. BALLOONS (10) ETC., SHOWN ON SCHEMATIC. INDICATE WAVEFORM TEST POINTS.
 5. CONTROL SETTINGS:
VOLUME - MINIMUM
CONTRAST - MID-RANGE
BRIGHTNESS - MID-RANGE
ALL OTHER CONTROLS SET FOR NORMAL OPERATION.

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CHASSIS ALIGNMENT 15N30

These waveforms were taken with the receiver adjusted for an approximate output of 2.5V p/p at the video detector. Voltage readings taken with raster just filling screen and all controls set for normal picture viewing except for photos 1, 2 and 3 where contrast was at maximum. The voltages given are approximate peak-to-peak values. The frequencies shown are those of the waveforms...not the sweep rate of the oscilloscope. All readings taken with Model ES-550B Precision Oscilloscope.



PANEL LUG CONNECTIONS

- M1 RED LEAD TO A.O.T.
- M2 GREEN LEAD TO VR6 C.T.
- M4 BLUE LEAD TO VR6 ARM
- M5 LEAD TO CRT GRID PIN 6
- M6 GREEN LEAD TO V.O.T.
- M7 LEAD TO H.O.T. PIN 8
- M8 LEAD TO CRT PIN 5
- M9 LEAD TO VR5 ARM (CONTRAST)
- M10 LEAD TO TUNER AGC FEEDTHRU
- M11 LEAD TO VR5 ARM (CONTRAST)
- M12 I-F AGC TEST POINT
- M13 LEAD TO VR5 C.T.

- M14 BLUE LEAD TO A.O.T.
- M15 LEAD TO B1-3 AND LEAD TO M22A
- M15A LEAD TO GROUND
- M16 LEAD TO TUNER B+ FEEDTHRU
- M17 LEAD TO VR5 C.T. (BRIGHTNESS)
- M18 LEAD TO B2-5
- M18A BLACK LEAD TO V.O.T.
- M19 LEAD TO CRT PIN 3
- M20 LEAD TO YOKE (WHITE/BLUE)
- M21 LEAD TO VR3-1 (WIDTH) AND LEAD TO S2
- M21A LEAD TO C49C.
- M22 LEAD TO VR4 C.T. (VERT. HOLD)

- M22A LEAD TO M15 AND LEAD TO M29
- M23 LEAD TO H.O.T. PIN 5
- M24 LEAD TO YOKE (WHITE/GREEN) AND LEAD TO M6
- M26 LEAD TO B1-1
- M27 FOCUS LEAD TO CRT PIN 4
- M27A N/C
- M28 N/C 2ND DET. TP
- M29 LEAD TO M22A
- M30 BLUE LEAD TO V.O.T.
- M31 LEAD TO TUNER FILAMENT FEEDTHRU
- M32 N/C, HORZ. OSC. TEST POINT
- M33 I-F LINK CABLE
- M35 LEAD TO VR4 C.T. (HORZ. HOLD)
- M35A N/C

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CHASSIS DATA 15N30

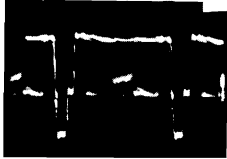
RESISTANCE CHART

TUBE	USE	PIN NUMBERS												
		1	2	3	4	5	6	7	8	9	10	11	12	
V1	Aud. Out. ABC & Gate	10KΩ	40K	2.4M	FIL.	FIL.	82Ω	220Ω	10KΩ	10KΩ				
V2	Sound Det.	5Ω	560Ω	FIL.	FIL.	300KΩ	15KΩ	0Ω						
V3	VID. Out. & R.I.	95Ω	800K	35Ω	FIL.	FIL.	GND.	36K	18K	10KΩ				
V4	Damper	FIL.	50Ω	50Ω	10KΩ	INF.	INF.	8MΩ	INF.	INF.	10KΩ	INF.	FIL.	
V5	Sync Sep. & 2nd. I-F	10KΩ	3.2Ω	13K	FIL.	FIL.	13K	500Ω	GND.	2.5Ω				
V6	Vert. Osc. & Vert. Out.	FIL.	2.5MΩ	INF.	10KΩ	INF.	1.2M	1.2M	10KΩ	GND.	190K	GND.	FIL.	
V7	Horz. Out.	FIL.	INF.	10KΩ	GND.	280KΩ	10KΩ	10KΩ	10KΩ	280KΩ	GND.	10KΩ	FIL.	
V8	Horz. Osc.	20KΩ	1.8MΩ	620Ω	FIL.	FIL.	45KΩ	100K	620Ω	GND.				
V9	1st Vid. I-F	24Ω	350K	24Ω	FIL.	FIL.	GND.	10KΩ	10KΩ	GND.				
V10	2nd Vid. I-F	100Ω	0Ω	100Ω	FIL.	FIL.	GND.	10KΩ	25K	GND.				

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OSCILLOSCOPE WAVEFORM PATTERNS - 15N50

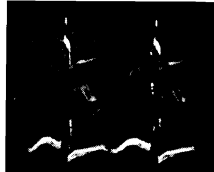
These waveforms were taken with the receiver adjusted for an approximate peak-to-peak of 2.5 volts at the video detector. Voltage readings taken with the raster just filling the screen and all controls set for normal picture viewing except for photos one and two which show maximum contrast. The voltages given are approximate peak-to-peak values. The frequencies shown are those of the waveforms, not the sweep rate of the oscilloscope. All readings were taken with a Model ES-550B Precision Oscilloscope.



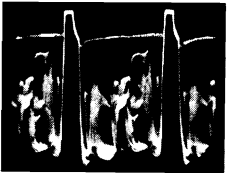
1 2.5 volts p/p, 15,750 cps (max. contrast)



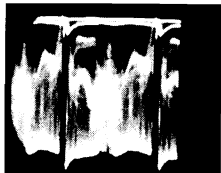
2 2.5 volts p/p, 60 cps (max. contrast)



3 90 volts p/p, 60 cps



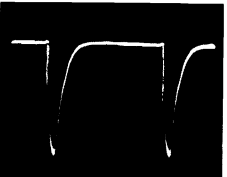
4 60 volts p/p, 15,750 cps



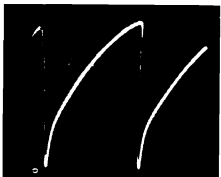
5 60 volts p/p, 60 cps



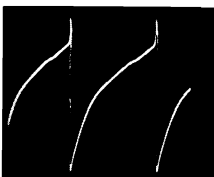
6 50 volts p/p, 60 cps



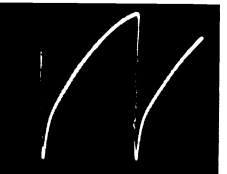
7 50 volts p/p, 15,750 cps



8 45 volts p/p, 60 cps



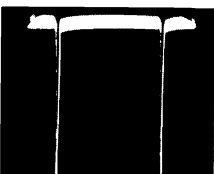
9 75 volts p/p, 60 cps



10 45 volts p/p, 60 cps



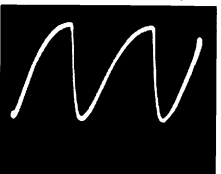
11 80 volts p/p, total, 180 volts p/p sawtooth, 60 cps



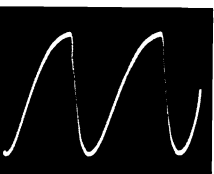
12 62 volts p/p, 60 cps



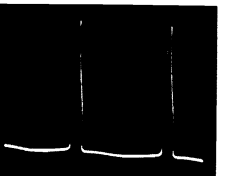
13 15 volts p/p, 15,750 cps



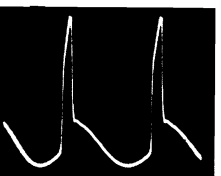
14 18 volts p/p, 15,750 cps



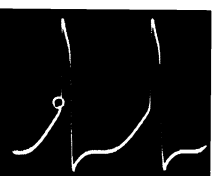
15 20 volts p/p, 15,750 cps



16 4.5 volts p/p, 15,750 cps



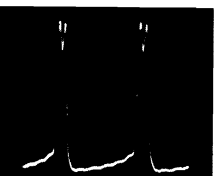
17 50 volts p/p, 15,750 cps



18 50 volts p/p, 15,750 cps



19 91 volts p/p, 15,750 cps



20 560 volts p/p, 15,750 cps

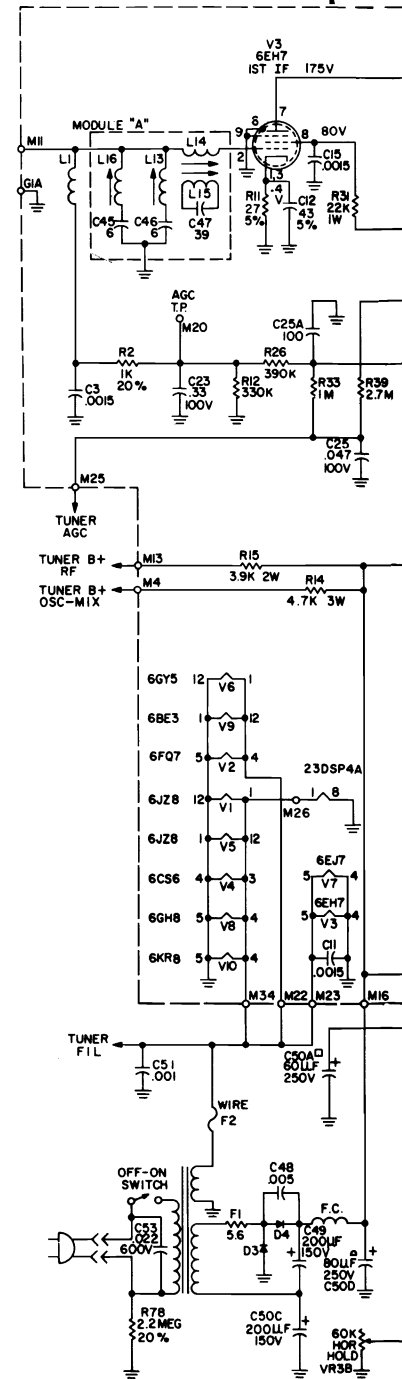


21 38 volts p/p, 15,750 cps

CHASSIS

15N50

Material on pages 114-119.

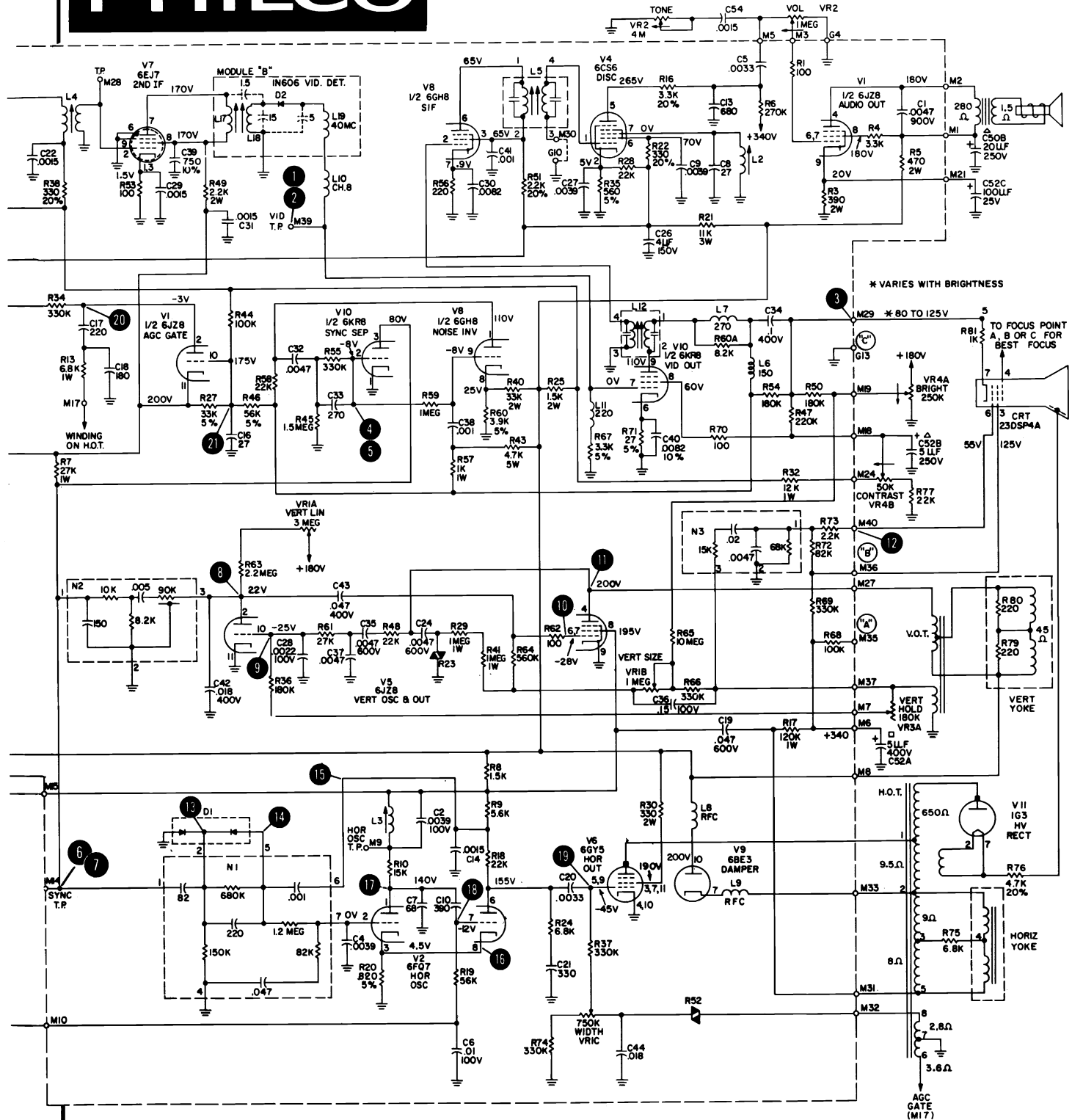


NOTES:

1. ALL VOLTAGES TAKEN UNDER NO SIGNAL CONDITIONS. ANTENNA REMOVED AND TUNER OFF CHANNEL.

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CHASSIS DATA 15N50



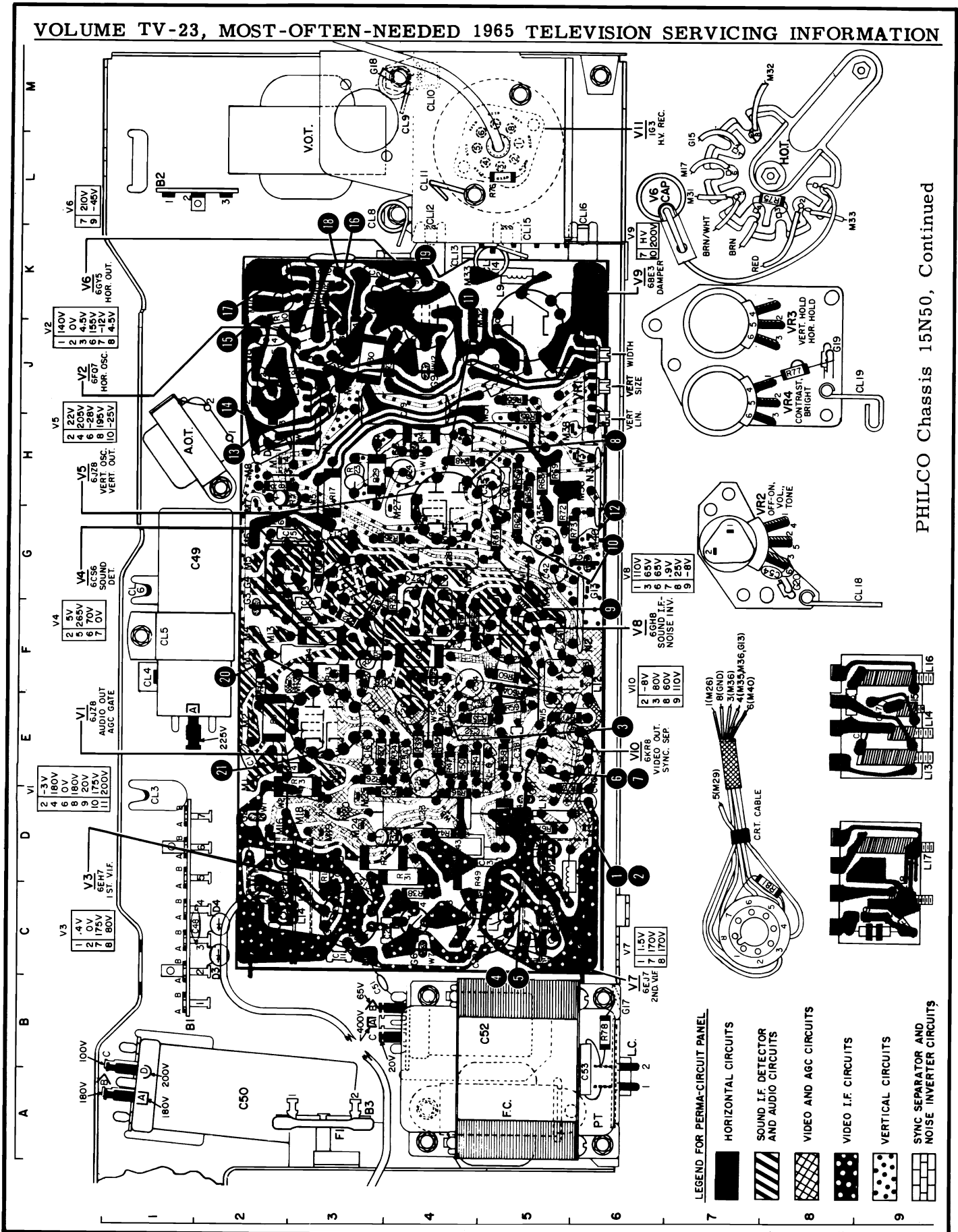
2. VOLTAGES MEASURED WITH A "PRECISION MODEL 88" V.T.V.M. FROM POINT INDICATED TO CHASSIS GROUND.







3. COIL RESISTANCES READ WITH COIL IN CIRCUIT EXCEPT FOR: A.O.T. SECONDARY, HORIZONTAL AND VERTICAL YOKE WHERE THE COMPONENTS WERE DISCONNECTED AND MEASURED INDIVIDUALLY.

4. BALLOONS 1, 2, ETC., SHOWN ON SCHEMATIC, INDICATE WAVEFORM TEST POINTS.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

PHILCO Chassis 15N50, Continued



- LEGEND FOR PERMA-CIRCUIT PANEL**
-  HORIZONTAL CIRCUITS
 -  SOUND I.F. DETECTOR AND AUDIO CIRCUITS
 -  VIDEO AND AGC CIRCUITS
 -  VIDEO I.F. CIRCUITS
 -  VERTICAL CIRCUITS
 -  SYNC SEPARATOR AND NOISE INVERTER CIRCUITS



CHASSIS DATA
15N50

(Continued)

Location and Part Numbers of Some Special Components

SYM-BOL	LOCATION	DESCRIPTION	SERVICE PART NO.
V.O.T.	L3	Transformer, vertical output	32-10012-1
VR1	J6	Control, triple vert. size (1 meg), vert. lin. (3 meg) and width (750K)	33-5600-7
VR2	H7	Control, dual, on-off-volume (1 meg) tone (4 meg)	33-5604-42
VR3	K8	Control, dual, horz. hold (60K) vertical hold (180K)	33-5604-44
VR4	J8	Control, dual, contrast (50K) brightness (250K) Perma-Circuit Panel, V.O.S.	33-5604-43
		Perma-Circuit Panel, det.	27-10708-4
		Perma-Circuit Panel, VIF	27-10561-4
		Yoke and Cable Assy.	27-10561-6
		Yoke Cover	76-13222-2
		Yoke Cover Clamp	76-12555-1
			28-14029-1

SYM-BOL	LOCATION	DESCRIPTION	SERVICE PART NO.
A.O.T.	H1	Transformer, audio out.	32-8747-7
D1	H2	Diode, phase converter	34-8037-1
D2	D5	Diode, video det. IN60C	34-8022-6
D3	C2	Diode, silicon rect.	34-8054-1
D4	C2	Diode, silicon rect.	34-8054-1
F1	A3	Fusible Resistor	33-1366-7
FC	A5	Filter Choke	32-10010-2
H.O.T.	L8	Transformer, horz. output	32-10002-6
L1	C2	Coil, tuner coupling	32-4652-66
L2	G2	Coil, quad.	32-4876-1
L3	J2	Coil, horz. stab.	32-4754-3
L4	C4	Transformer, 1st VIF	32-4686-34
L5	G4	Transformer, inter-stage	32-4745-5
L6	E5	Coil, 150 μ h, video plate shunt	32-4762-6
L7	F5	Coil, 270 μ h, video plate series	32-4769-11
L8	J5	Coil, 60M C RFC damper plate	32-4112-62
L9	K5	Coil, 60M C RFC, damper cathode	32-4112-62
L10	C5	Coil, channel 8 beat	32-4645-44
L11	D5	Coil, 2nd det. 220 μ h	32-4762-8
L12	F5	Transformer, 4.5MC trap and S.T.O.	32-4688-10
L13	C3	Coil, 47.25MC trap	32-4652-78
L14	C3	Coil, 1st VIF pole	32-4652-79
L15	C3	Coil, 41.25MC trap	32-4652-80
L16	D3	Coil, 47.25MC trap	32-4652-78
L17	C5	Coil, 2nd I-F plate	32-4652-78
L18	C5	Coil, video det.	32-4652-79
L19	D5	Choke, 22 μ h, 40MC	32-4837-1
LC	A6	Interlock A-C	27-6240-18
N1	H3	RC Network, horz. phase comp.	30-6035-2
N2	F6	RC Network, vert. integrator	30-6030-12
N3	H6	RC Network, vert. retrace supp.	30-6024-10
P.T.	A6	Transformer, power	32-10011-1

PANEL LUG CONNECTIONS

- M1 RED LEAD TO A.O.T.
 - M2 BLUE LEAD TO A.O.T.
 - M3 GREEN LEAD TO VR2 C.T.
 - M4 LEAD TO TUNER FEEDTHRU (OSC. B+)
 - M5 BLUE LEAD TO VR2 ARM
 - M6 LEAD TO C52A
 - M7 LEAD TO VR3A C.T.
 - M8 RED LEAD FROM V.O.T., LEAD TO YOKE
 - M9 N/C
 - M10 LEAD TO VR3B C.T.
 - M11 I-F INPUT CABLE
 - M13 LEAD TO TUNER FEEDTHRU (RF B+)
 - M14 N/C
 - M15 LEAD TO C50A
 - M16 LEAD TO C50D
 - M17 LEAD TO PIN 6, H.O.T.
 - M18 LEAD TO VR4B C.T., LEAD TO C52B
 - M19 LEAD TO VR4A C.T.
 - M20 N/C
 - M21 LEAD TO C52C
 - M22 LEAD TO M34
 - M23 LEAD TO B1-7
 - M24 LEAD TO VR4 ARM
 - M25 LEAD TO TUNER FEEDTHRU (AGC)
 - M26 LEAD TO CRT FILAMENT, PIN 1
 - M27 BLUE LEAD FROM V.O.T.
 - M28 N/C
 - M29 LEAD TO CRT CATHODE (THRU R81)
 - M30 LEAD TO GROUND, G10
 - M31 LEAD TO PIN 5 H.O.T.
 - M32 LEAD TO PIN 8 H.O.T.
 - M33 LEAD TO PIN 2 H.O.T.
 - M34 LEAD TO M22
 - M35 LEAD TO CRT FOCUS GRID
 - M36 LEAD TO CRT PIN 3
 - M37 LEAD TO VR3A ARM
 - M39 N/C
 - M40 LEAD TO CRT PIN 6
- LEADS PART OF PANEL**
- M19 TO R65
 - R41 TO VR1 (VERT. SIZE)
 - PIN 3 OF V10 TO N2

RESISTANCE CHART - 15N50

TUBE	USE	1	2	3	4	5	6	7	8	9	10	11	12	
V1 6X4	HT, 6.3V	FIL.	3000 Ω	10K Ω	10K Ω	10K Ω	100 Ω	100 Ω	100 Ω	100 Ω	300 Ω	300 Ω	10K Ω	FIL.
V2 6Y7	HT, 6.3V	2A0 Ω	300 Ω	300 Ω	FIL.	FIL.	50K Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	FIL.
V3 6E7	HT, 6.3V	210	310K Ω	310	FIL.	FIL.	50K Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω
V4 6BD6	HT, 6.3V	5.5K	50K Ω	FIL.	FIL.	50K Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω

TUBE	USE	1	2	3	4	5	6	7	8	9	10	11	12	
V5 6BD6	HT, 6.3V	50	300 Ω	10K Ω	10K Ω	10K Ω	10K Ω	10K Ω	10K Ω	10K Ω	10K Ω	10K Ω	10K Ω	FIL.
V6 6BD6	HT, 6.3V	FIL.	10K Ω	10K Ω	10K Ω	10K Ω	10K Ω	10K Ω	10K Ω	10K Ω	10K Ω	10K Ω	10K Ω	FIL.
V7 6E7	HT, 6.3V	100 Ω	0.5 Ω	100 Ω	FIL.	FIL.	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	FIL.
V8 6BD6	HT, 6.3V	300 Ω	50	300 Ω	FIL.	FIL.	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	FIL.
V9 6BD6	HT, 6.3V	FIL.	50	50	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	FIL.
V10 6BD6	HT, 6.3V	500	1.5K	15K Ω	FIL.	FIL.	270	300 Ω	100 Ω	100 Ω	100 Ω	100 Ω	100 Ω	FIL.

* VOLUME CONTROL AT MINIMUM.
* VARIES WITH NON-CRITICAL FOCUS CONTROL.
* VARIES WITH METER POLARITY.



CHASSIS ALIGNMENT
15N50

VIDEO I-F, AM, AND SWEEP ALIGNMENT PROCEDURE

Preliminary Information

The following video I-F alignment procedure is based upon a tuner, with proper band-pass alignment, connected to the TV chassis.

1. Connect yoke or dummy load to receiver so that normal B+ voltage is maintained.
2. Remove AGC gate tube 6JZ8 (V1), and turn contrast control to maximum.
3. Apply -2VDC bias to tuner AGC test point (M25).
Apply -10VDC bias to I-F AGC test point (M20).
4. Connect scope through 10K resistor to 2nd

detector test point (M39). Connect .001 mfd capacitor from lug (M39) to ground to sharpen sweep markers.

5. Connect AM and marker signal generators through test jig to mixer grid (TP2T on tuner). Connect sweep generator, through a 72Ω to 300Ω matching network, to antenna terminals.
6. (a) Preset five turns out from flush core position, L16, L13, L14 and L17.
(b) Preset cores flush, L15 and L18.
(c) Preset seven turns in from flush core position, L4.

AM ALIGNMENT CHART

STEP	AM MOD. 400 CPS AT 30%	ADJUST	REMARKS
1	44.84MC	L17 - FOR MAX.	ADJUST INPUT LEVEL TO PREVENT OVERLOADING.
2	42.75MC	L18 - FOR MAX.	ADJUST INPUT LEVEL TO PREVENT OVERLOADING.
3	43.5MC 42.5MC 45.25MC	L4 - FOR MAX. (CLOCKWISE) L1T - FOR MAX. L14 - FOR MAX.	ADJUST INPUT LEVEL TO PREVENT OVERLOADING.
4	41.25MC 47.25MC 47.25MC	L15 - FOR MIN. L13 - FOR MIN. L16 - FOR MIN.	BIAS MAY BE LOWERED TO PRODUCE SUFFICIENT SCOPE AMPLITUDE. REPEAT ADJUSTMENTS OF L13 AND L16 UNTIL NO FURTHER IMPROVEMENT IS OBTAINED.

SWEEP ALIGNMENT CHART

- NOTE: 1. REMOVE JIG FROM GENERATOR CABLE.
2. REMOVE GENERATOR CABLE FROM MIXER GRID AND CONNECT CABLE TO (G6) ON VOS PANEL.
3. TO PROPERLY POSITION FINE TUNING FOR SWEEP ALIGNMENT, SET TUNER TO CHANNEL 4 AND INJECT 65.75MC MOD. 30% AT THE ANTENNA TERMINALS. ADJUST FINE TUNING CONTROL FOR MINIMUM SCOPE INDICATION. DO NOT TOUCH FINE TUNING CONTROL OR CHANNEL SELECTOR FOR BALANCE OF ALIGNMENT.

STEP	SWEEP GEN. APPROX. 8MC SWEEP WIDTH	MARKER GEN. UNMOD. RF	ADJUST	REMARKS
5	69MC	42.5MC	L1T (TUNER IF COIL)	ADJUST L1T TO PLACE 42.5MC MARKER BETWEEN INDICATED LIMITS ON SOUND SIDE OF CURVE (FIG. A). ADJUST SWEEP GENERATOR LEVEL TO LIMIT SCOPE TO 3V P/P DEFLECTION. KEEP RESPONSE LEVEL WITH L4.
6	69MC	45.75MC	L14	ADJUST L14 TO PLACE 45.75MC MARKER BETWEEN INDICATED LIMITS ON VIDEO SIDE OF CURVE (FIG. A). ADJUST SWEEP GENERATOR LEVEL TO LIMIT SCOPE TO 3V P/P DEFLECTION. KEEP RESPONSE LEVEL WITH L4.
7	69MC	42.5MC AND 45.75MC	L4	L4 TILTS OR LEVELS CURVE. ADJUST CURVE TO FALL WITHIN LIMITS (FIG. B).

Fig. A

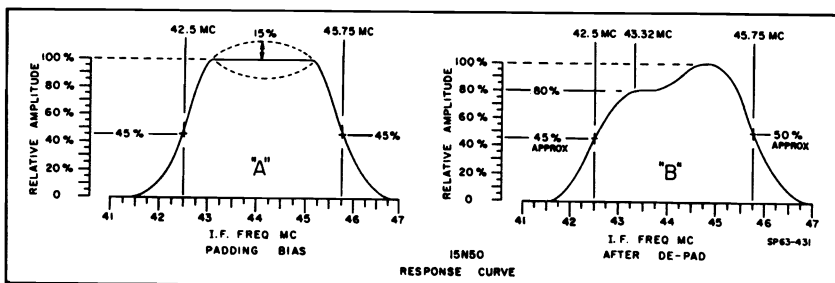


Fig. B

RCA VICTOR

Chassis KCS 136X Series

MODEL AND CHASSIS REFERENCE

MODEL	CABINET TYPE	CHASSIS	TUNER MOUNTING ASSEMBLY	VHF/UHF TUNER	KINESCOPE
BF-211E-M-W-Y	Table	KCS136XC	60A	KRK118C/KRK120JP	23ENP4
CF-265M-W-Y	Consolette	KCS136XC	60A	KRK118C/KRK120JP	23ENP4
CF-315M-W	Console	KCS136XD	60C	KRK118C/KRK120JP	23ENP4
CF-345W	Consolette	KCS136XD	60C	KRK118C/KRK120JP	23ENP4
CF-347L	Consolette	KCS136XE	60C	KRK118C/KRK120JP	23ENP4
CF-349V-W	Consolette	KCS136XD	60C	KRK118C/KRK120JP	23ENP4
CF-351F-V	Consolette	KCS136XD	60C	KRK118C/KRK120JP	23ENP4
CF-355M-W	Lowboy	KCS136XD	60C	KRK118C/KRK120JP	23ENP4
CF-359M-W	Console	KCS136XE	60C	KRK118C/KRK120JP	23ENP4
CF-369-M-W	Lowboy	KCS136XH	70A	KRK118C/KRK120JT	23EFB4
CF-371W	Lowboy	KCS136XH	70A	KRK118C/KRK120JT	23EFB4
CF-373L	Lowboy	KCS136XH	70A	KRK118C/KRK120JT	23EFB4
CF-375F-V	Lowboy	KCS136XH	70A	KRK118C/KRK120JT	23EFB4

Cabinet finishes are identified by the final character in the model number with the exception of the letter "R" which indicates remote control instruments: E—BLACK, F—ANT'D. LIGHT FRUITWOOD, L—COLONIAL MAPLE, M—STRIPED AUT. MAH. GR./AUTUMN MAHOGANY/MAHOGANY GR./ANT'D. BRONZE MAHOGANY, V—ANT'D. BRUSHED PARCH. WHITE/ANT'D. PARCHMENT WHITE, W—HARVEST WAL. GR./DANISH WALNUT/PRESIDENTIAL WAL. GR./ANT'D. FLORENTINE WAL./NAT. WALNUT, Y—RIFT OAK GR./RIFT OAK/OAK GR.

COMBINATION CONSOLES MODEL AND CHASSIS REFERENCES

MODEL NO.	CHASSIS	KINESCOPE	TMA	VHF/UHF TV TUNER	RADIO TUNER	AMPL. CHASSIS	RECORD CHANGER
DF-455M, W, Y,	KCS136XA	23ENP4	60D	KRK118C KRK120JP	RC1215D	RS203C	RP217-B-22
DF457M, W	KCS136XA	23ENP4	60D	KRK120JP	RC1215E	RS203C	RP217-B-22
DF-467W	KCS136XA	23ENP4	60D	KRK118C KRK120JP	RC1215E	RS203C	RP217-B-12
DF-469L	KCS136XA	23ENP4	60D	KRK118C KRK120JP	RC1215E	RS203C	RP217-B-12

CIRCUIT BREAKER

The primary supply for this instrument is protected by a circuit breaker rather than a fuse. The reset button is located on the rear of the chassis and is accessible to the user. The circuit resets when the button is depressed and becomes operative when the button is released.

AGC AND SYNC STABILIZER

Turn the sync stabilizer control completely counterclockwise and adjust a.g.c. while tuned to a strong, local station. Turn the a.g.c. clockwise until picture begins to distort, and then counterclockwise slightly below the point where the distortion is eliminated. Advance the sync stabilizer fully clockwise and rotate the horizontal hold counterclockwise until horizontal sync is lost. Then slowly sync the picture again. If the picture tends to distort or "hang-up" before locking in, retard the sync stabilizer control until this condition is corrected.

HORIZONTAL OSCILLATOR SINE COIL

With sync shorted (Pin 1 of V502 shorted to ground) connect jumper across terminals of L501A and adjust the horizontal hold control so that the sides of the picture are vertical. Remove jumper from L501A only, and adjust L501A slug, if necessary, to again bring the sides of the picture vertical. Remove jumper from Pin 1 of V502 to ground.

CENTERING

If the picture does not fill the screen, it may be necessary to center the picture with the 2 disc magnets mounted behind the yoke cover. Both horizontal and vertical centering are accomplished at once by rotating the discs together or separately. Perform this adjustment along with vertical height, vertical linearity, and width, as they are all interdependent.

TESTING PICTURE PROPORTIONS

Rotate the vertical hold control to roll the picture slowly downward and study the blanking bar. If it is not level, or if the bar varies in thickness as it moves down the screen, make adjustments as prescribed in the next two paragraphs.

DEFLECTION YOKE

If the picture is tilted, loosen the yoke clamp screw and rotate the yoke to level the picture. Retighten the yoke clamp.

HEIGHT AND VERTICAL LINEARITY

If the blanking bar changed size while moving down, alternately adjust the height and vertical linearity controls for best vertical proportions. Final vertical size should allow the raster to overlap the mask about $\frac{3}{8}$ inch at top and bottom with normal (120 volts) line voltage.

RCA Victor Chassis KCS-136X Series Printed Circuits, Continued

KCS136X Series

PW200 SECURITY SEALED CIRCUIT ASSEMBLY

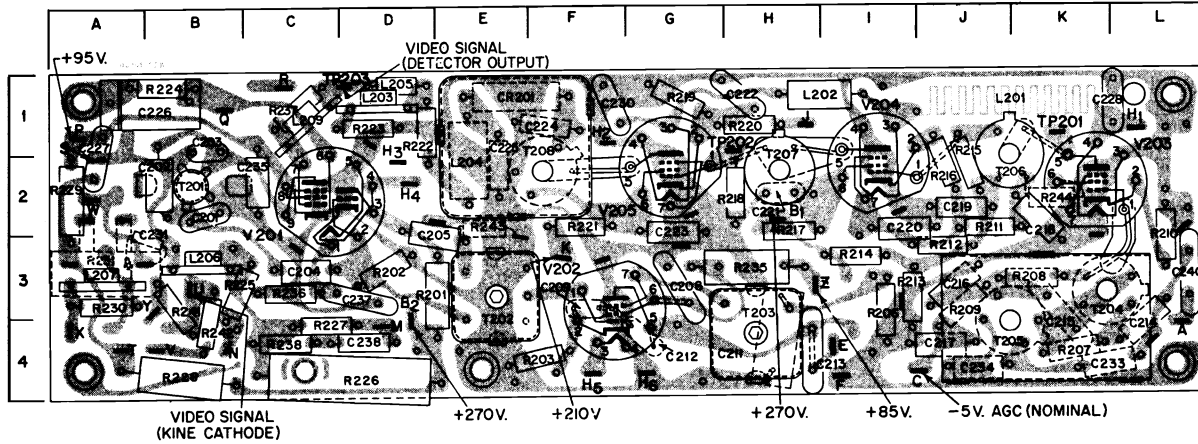


Figure 2—PW200 Sealed Circuit I-F and Video Assembly Composite Diagram

PW200 COMPONENT LOCATION GUIDE

C201 B2	C216 J3	C228 L1	L202 I1	R208 K3	R219 G1	R231 A3	T203 H4
C202 B2	C217 J4	C230 F1	L203 D1	R209 J3	R220 H1	R235 H3	T204 K3
C203 B1	C218 K2	C231 B3	L204 E2	R210 L3	R221 F2	R236 C3	T205 K4
C204 C3	C219 J2	C233 L4	L205 D1	R211 J2	R222 D1	R237 C1	T206 K2
C205 D2	C220 I2	C234 J4	L206 B3	R212 J3	R223 D1	R238 C4	T207 H2
C208 G3	C221 H2	C235 C2	L207 A3	R213 I3	R224 B1	R241 B3	T208 F2
C209 F3	C222 H1	C237 D3	L209 C1		R225 B3	R242 B4	
C211 H4	C223 G2	C238 D4	R201 E3	R214 I3	R226 D4	R243 E2	
C212 G4	C224 F1	C240 L3	R202 D3	R215 J2	R227 C4	R244 K2	
C213 H4	C225 E2		R203 F4	R216 J2	R228 B4		
C214 L4	C226 B1	CR201 E1	R206 I3	R217 H3	R229 A2	T201 B2	
C215 K4	C227 A1	L201 J1	R207 K4	R218 H2	R230 A3	T202 E3	

PW500 SECURITY SEALED CIRCUIT ASSEMBLY

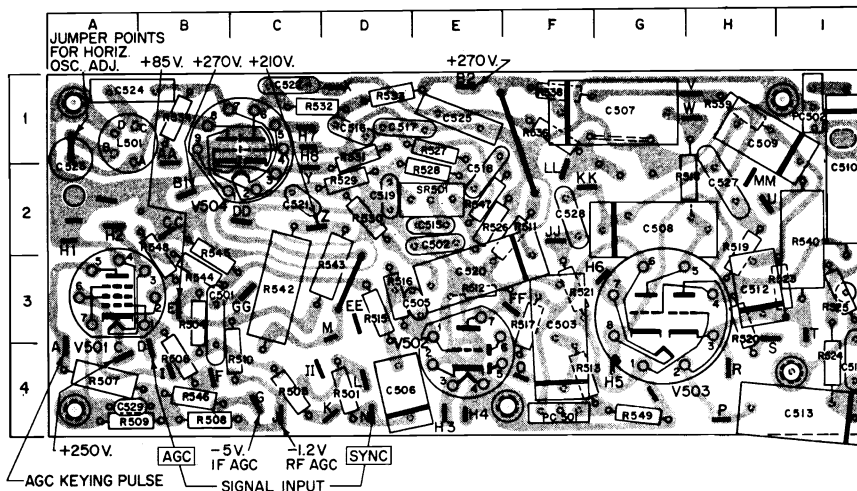


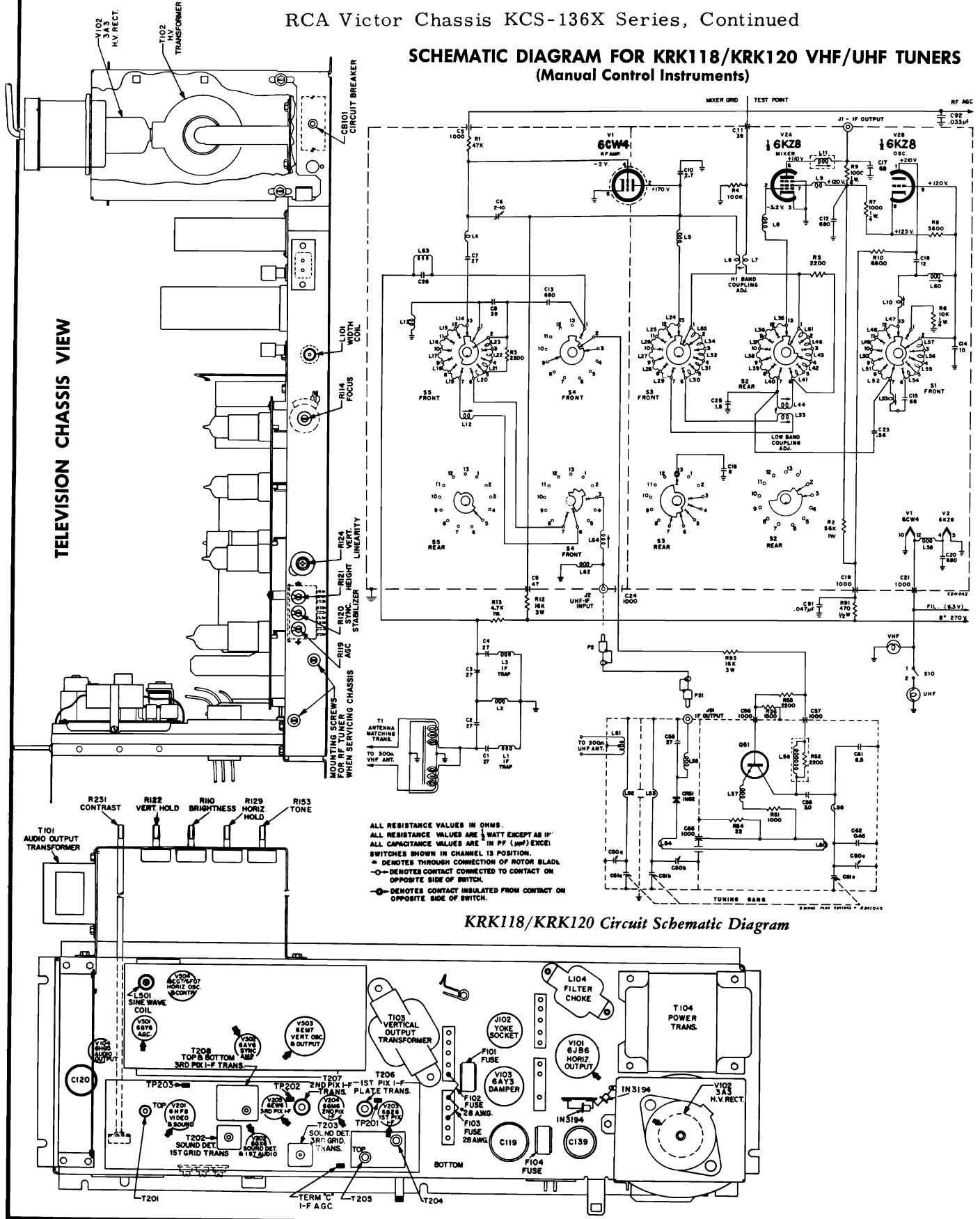
Figure 3—PW500 Sealed Circuit Deflection Assembly Composite Diagram

PW500 COMPONENT LOCATION GUIDE

C501 B3	C513 I4	C523 A1	PC502 I1	R511 F2	R523 I3	R533 D1	R546 B4
C502 E2	C514 I4	C524 A1		R512 E3	R524 I4	R534 B1	R547 E2
C503 F3	C515 E2	C525 E1	R501 D3	R513 F4	R525 I3	R536 F1	R548 B2
C505 D3	C516 D1	C527 H2	R504 B4	R515 D3	R526 E3	R538 F1	R549 G4
C506 D4	C517 D1	C528 F2	R505 C4	R516 D3	R527 E1	R539 H1	
C507 G1	C518 E2	C529 A4	R506 B4	R517 F3	R528 E2	R540 I2	SR501 E2
C508 G2	C519 D2		R507 A4	R518 H2	R529 D2	R542 C3	
C509 H1	C520 E3	L501 A1	R508 B4	R519 H2	R530 D2	R543 D3	
C510 I2	C521 C2		R509 A4	R520 H3	R531 D1	R544 B3	
C512 H3	C522 C1	PC501 F4	R510 C4	R521 F3	R532 C1	R545 B2	

RCA Victor Chassis KCS-136X Series, Continued

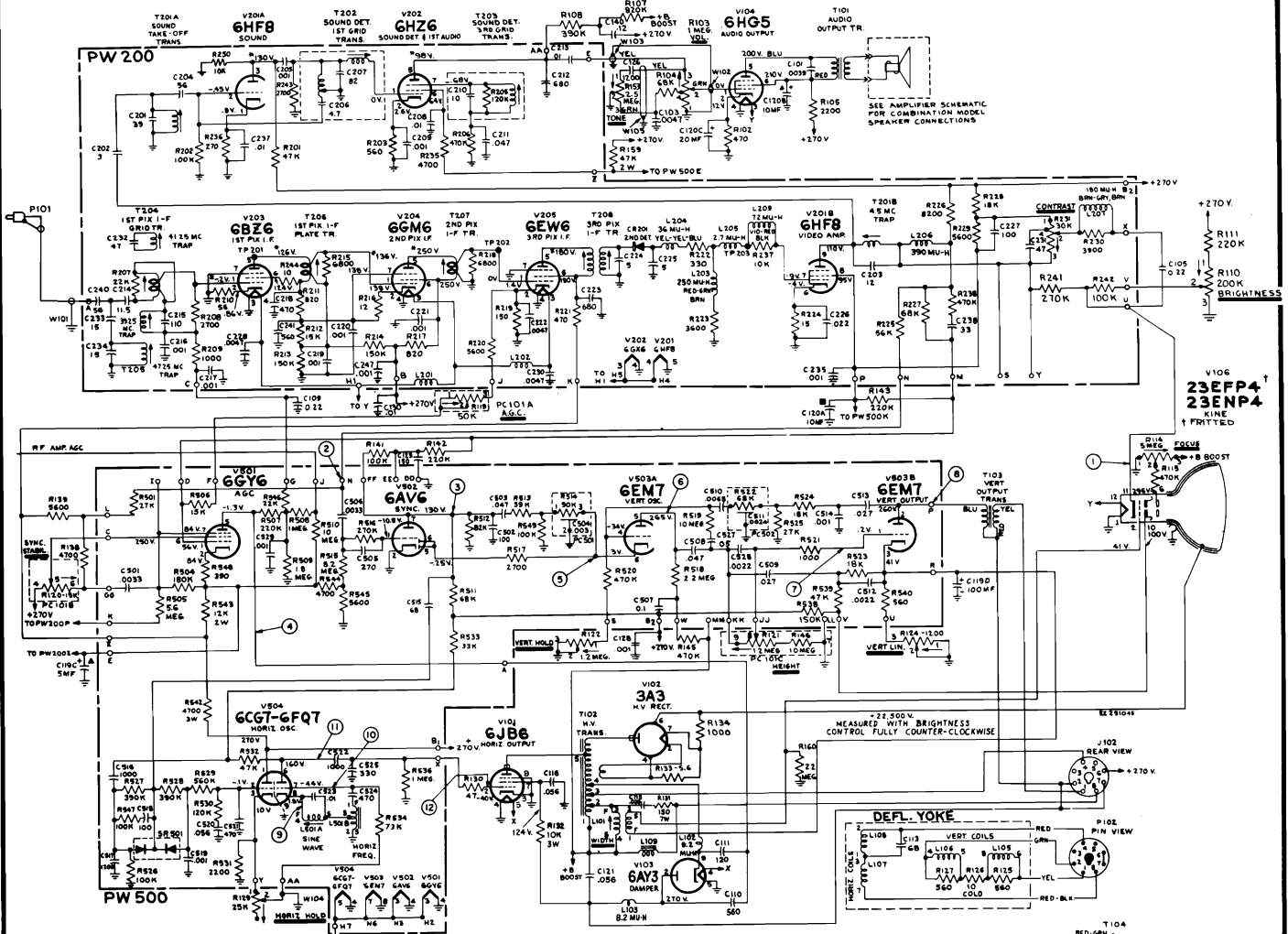
SCHEMATIC DIAGRAM FOR KRK118/KRK120 VHF/UHF TUNERS
(Manual Control Instruments)



Chassis View for the KCS136X

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

RCA Victor Chassis KCS-136X Series Schematic Diagram, Continued



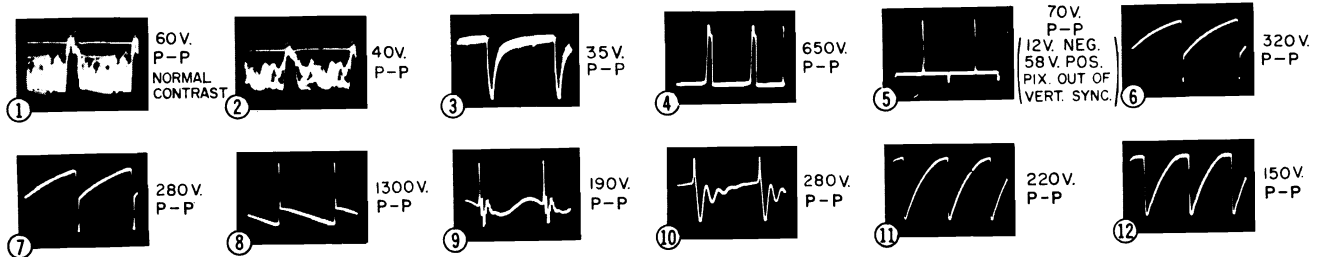
ALL VOLTAGES EXCEPT PEAK-TO-PEAK VOLTAGES MEASURED UNDER NO SIGNAL CONDITIONS WITH TUNER ANTENNA TERMINALS SHORTED AT BALUN. READINGS SHOULD HOLD WITHIN $\pm 20\%$ WITH 120 VOLT A.C. SUPPLY.

Balloons ①, ②, etc., shown on schematic indicate points of observation of the waveforms shown below the schematic. Use low capacity $\times (10)$ probe.

DIAGRAM SCHEMATIC DIAGRAM FOR KCS136X CHASSIS

WIDTH

The width adjustment is made with L101. With normal line voltage, the raster should overscan the mask about $\frac{5}{8}$ inch on each side. The raster should fill the mask at 108 volts.

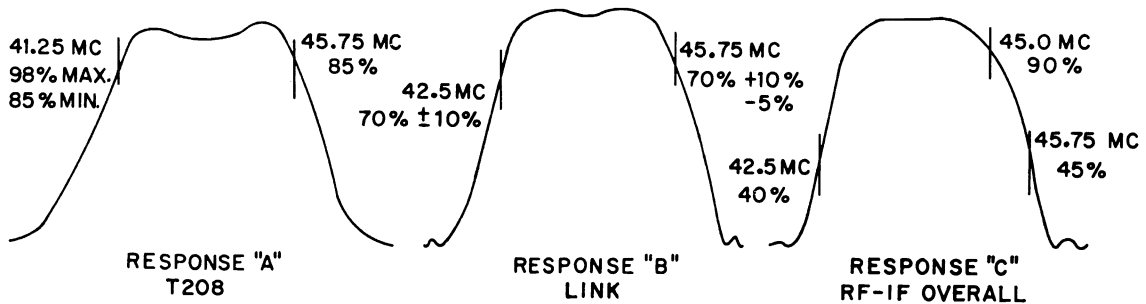
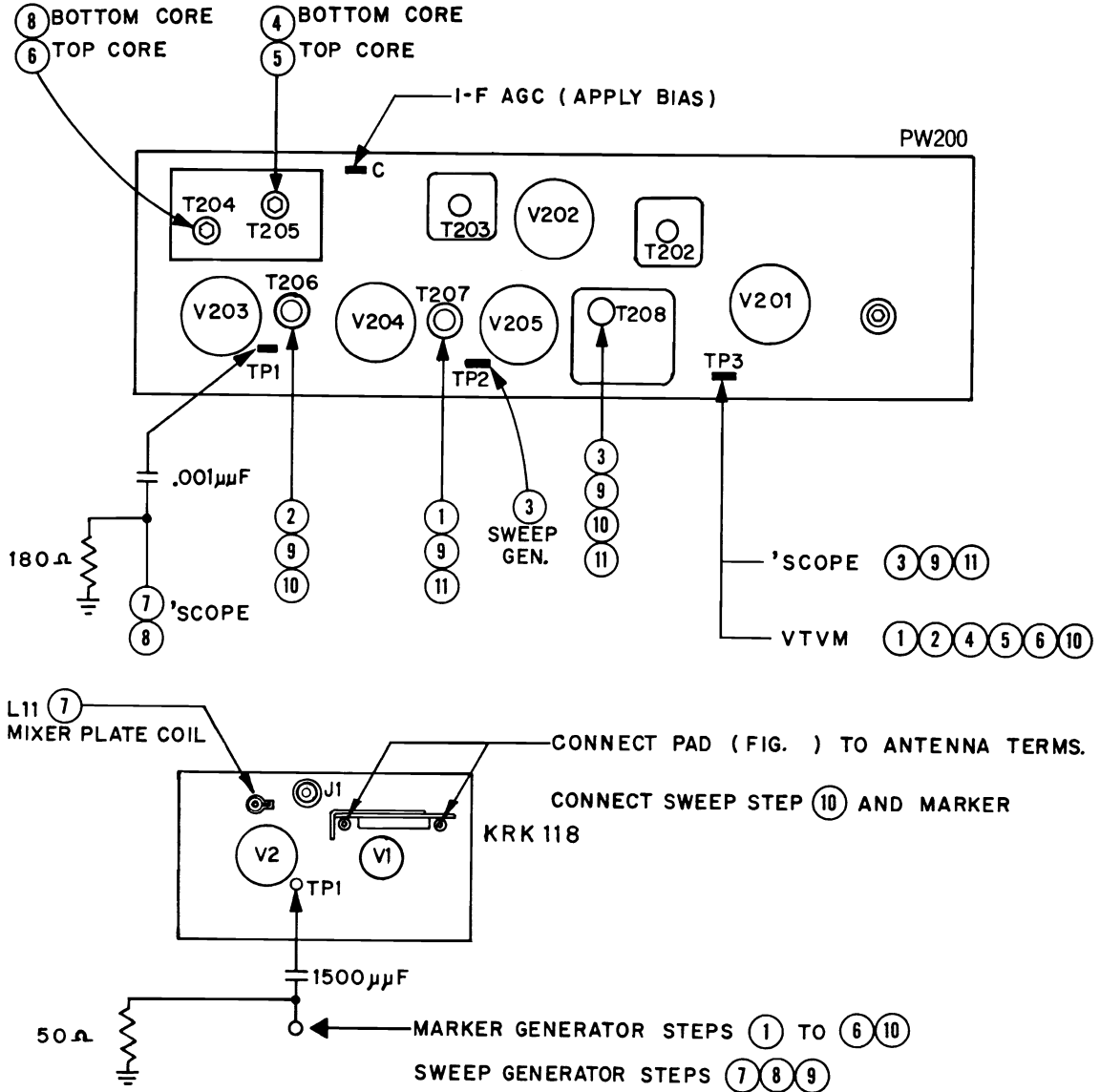


VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

RCA Victor Chassis KCS-136X, KCS-149, Alignment Information

PICTURE I-F ALIGNMENT—KCS136X, KCS149 CHASSIS

PICTURE I-F TRANSFORMER AND TRAP ADJUSTMENTS



Picture I-F Alignment—KCS136X, KCS149 Chassis

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

RCA Victor Chassis KCS-136X, KCS-149, Alignment Information, Continued

PICTURE I-F ALIGNMENT—KCS136X, KCS149 CHASSIS

PICTURE I-F TRANSFORMER AND TRAP ADJUSTMENTS

TEST EQUIPMENT CONNECTIONS:

- BIAS**.....Connect —6 volts from I-F AGC terminal "C" of PW200 to ground.
- OSCILLOSCOPE**.....Connect to 2nd Detector at test point TP3. Set "scope" for 5 volts Peak to Peak.
- MARKER GENERATOR**.....Connect to mixer grid test point through mixer pad shown.
- SWEEP GENERATOR**.....Connect to the grid of 3rd picture I-F, pin 1, V205, test point TP2. Use shortest leads possible.
- VACUUM TUBE VOLTMETER**.....Connect to 2nd Detector output at test point TP3. Use DC probe.
- MISCELLANEOUS**.....Refer to facing page for adjustment locations and responses.

	STEP	SWEEP GENERATOR	MARKER GENERATOR	ADJUST	REMARKS
1	Peak 2nd pix. I-F transformer	————	45.5 mc.	T207	Peak T207 and T206 on frequency for max. output on meter. Adjust generator for 3 volts on meter when finally peaked.
2	Peak 1st pix. I-F Plate transformer	————	43.0 mc.	T206	
3	Adjust 3rd pix. I-F transformer	40-50 mc. (I-F)	41.25 mc. 45.75 mc.	T208 (top & bottom cores)	Adjust for maximum with response shown in "A". Use 5 v. p-p on "scope".
4	Adjust 47.25 mc. trap	————	47.25 mc.	T205B (bottom)	Adjust for minimum output indication on meter.
5	Adjust 39.25 mc. trap	————	39.25 mc.	T205A (top)	Adjust for minimum output indication on meter.
6	Adjust 41.25 mc. trap	————	41.25 mc.	T204A (top)	Adjust for minimum output indication on meter.

PICTURE I-F SWEEP ALIGNMENT

TEST EQUIPMENT CONNECTIONS:

- BIAS SUPPLY**.....Connect —6 volts from I-F AGC terminal "C" on PW200 to ground.
- OSCILLOSCOPE**.....Connect oscilloscope to 180 Ω detector, using diode probe to TP1.
- SWEEP GENERATOR**.....Connect in series with mixer pad into mixer grid test point TP1. Use shortest leads possible.
- MARKER GENERATOR**.....Couple loosely to sweep output cable to provide markers.
- VACUUM TUBE VOLTMETER**.....Connect to 2nd Detector output at test point TP3. Use DC probe.
- MISCELLANEOUS**.....Refer to facing page for adjustment locations and responses.

	STEP	SWEEP GENERATOR	MARKER GENERATOR	ADJUST	REMARKS
Set Channel Selector to Channel 4.					
7	Adjust mixer plate coil	40-50 mc. (I-F)	42.5 mc. 45.75 mc.	L11	Sweep output set for 0.5 v. p-p on "scope". Adjust for max. gain and response "B". Max. allow. tilt 20%.
8	Adjust 1st I-F grid trans.	40-50 mc. (I-F)	42.5 mc. 45.75 mc.	T204B (bottom)	
Repeat step 4 above, if necessary, for minimum output at 47.25 mc. Remove 180 ohm detector and "scope" from TP1. Connect "scope" to test point TP3, using direct probe. Set bias to —10 volts at terminal "C" on PW200.					
9	Retouch I-F transformers	40-50 mc. (I-F)	42.5 mc. 45.0 mc. 45.75 mc.	T208 T207 T206	Adjust for response "C". Use 5 v. p-p on "scope".
Remove sweep from mixer pad and couple marker generator to mixer pad. Set generator to 45.75 mc. and adjust output for exactly one and one-half (1½) volts on "VoltOhmyst." Remove the pad and connect generator directly to mixer grid. Do not change generator output in step 10.					
10	Set 41.25 mc. attenuation	————	41.25 mc.	T206 & T208	Adjust for 1.2 to 1.5 volts on VTVM.
Connect sweep generator to antenna terminals using attenuator pad shown in Figure 8.					
11	Check overall	Channels 13 to 2	42.5 mc. 45.0 mc. 45.75 mc.	T207 & T208B	Retouch slightly to correct overall tilt. Maintain response "C".

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

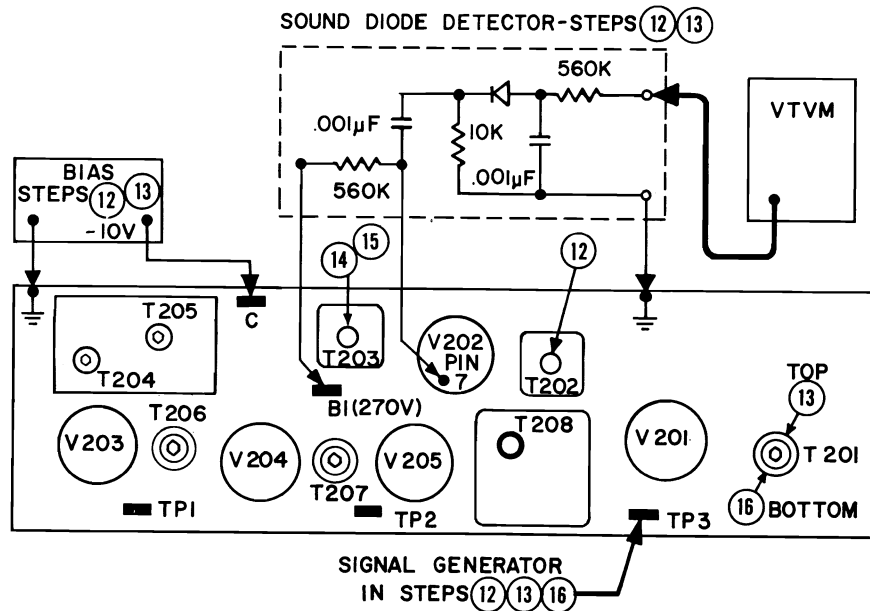
RCA Victor Chassis KCS-136X, KCS-149, Alignment Information, Continued

**SOUND ALIGNMENT OF KCS136X, KCS149 CHASSIS
SOUND I-F, SOUND DETECTOR AND 4.5 MC. TRAP ALIGNMENT**

TEST EQUIPMENT CONNECTIONS:

- BIAS SUPPLY**.....Apply -10 volts to the I-F AGC bus at terminal "C" on PW200.
- OSCILLOSCOPE**.....Connect to kinescope cathode lead through diode probe.
- SIGNAL GENERATOR**.....Connect to test point TP3 on PW200.
- VACUUM TUBE VOLTMETER**.....Connect to output of diode detector shown below. Set meter for negative voltage readings.
- MISCELLANEOUS**.....Connect test diode detector to pin 7 of V202. See below for adjustment locations.

	STEP	SIGNAL GENERATOR	ADJUST	REMARKS
12	Adjust detector grid transformer	4.5 mc.	T202	Adjust for maximum negative d.c. on meter. Set generator for 1.0 to 1.5 volts when peaked. T201A top core and T202 core should penetrate the coil from top of can when finally peaked.
13	Adjust sound take-off transformer	4.5 mc.	T201A (top)	
14	Disconnect the diode test detector. Turn off signal generator and tune in strongest signal in area, adjusting volume control for normal volume. Turn core of T203 flush with top of coil form. Disconnect bias supply.			
15	Adjust sound detector transformer		T201B (bottom)	Turn core clockwise to 2nd peak adjusting for max. volume.
16	Adjust 4.5 mc. trap	4.5 mc., 400 cycle, AM mod.	T201B (bottom)	Adjust for minimum 4.5 mc. indication on oscilloscope. The core should penetrate the coil from the bottom of the can when finally adjusted.



Sound Alignment of KCS136X, KCS149 Chassis

RCA VICTOR

Chassis KCS 149 A

Models AF-125B, E, AF-141L, U, W

Service material on pages 127 through 130; alignment on pages 124-126.

ANTENNA

All models covered in this data are provided with 300 ohm balanced antenna input for both VHF and UHF. If a combined VHF/UHF antenna is to be used with a single transmission line, prepare a matching stub as illustrated in Figure 1 below.

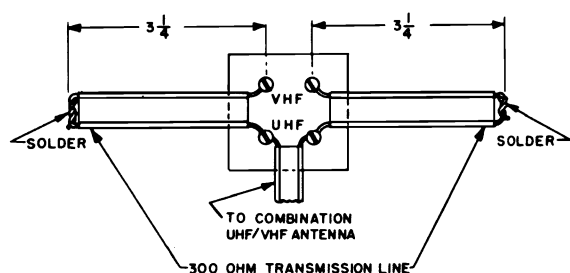


Figure 1—Combination VHF/UHF Antenna Matching

CIRCUIT BREAKER

The primary supply for this instrument is protected by a circuit breaker rather than a fuse. The reset button is located on the rear of the chassis and is accessible to the user. The circuit resets when the button is depressed and becomes operative when the button is released.

NOISE STABILIZER AND AGC CONTROL ADJUSTMENT

Perform the following routine test: Adjust the receiver and antenna to obtain the best picture from a strong, local station. Quickly switch off channel and back, and if the picture distorts and bends, or does not reappear immediately, rotate the AGC control R501, counterclockwise and then clockwise until picture bend occurs. Then slowly retard control until the bend is gone. The noise stabilizer control should be turned counterclockwise to the end of rotation before adjusting AGC.

CENTERING

If the picture does not fill the screen, it may be necessary to center the picture with the 2 disc magnets mounted behind the yoke cover. Both horizontal and vertical centering are accomplished at once by rotating the discs together or separately. Perform this adjustment along with vertical height, vertical linearity, and width, as they are all interdependent.

TESTING PICTURE PROPORTIONS

Rotate the vertical hold control to roll picture slowly downward and study the blanking bar. If it is not level, or if the bar varies in thickness as it moves down the screen, make adjustments as prescribed in the next two paragraphs.

DEFLECTION YOKE

If the picture is tilted, loosen the yoke clamp screw and rotate the yoke to level the picture. Retighten the yoke clamp.

HEIGHT AND VERTICAL LINEARITY

If the blanking bar changed size while moving down, alternately adjust the height and vertical linearity controls until the condition is corrected. Final vertical size should allow the raster to overlap the mask about $\frac{5}{8}$ " at top and bottom.

HORIZONTAL LINEARITY AND WIDTH ADJUSTMENTS

Horizontal linearity and width should be adjusted in conjunction to obtain optimum linearity and proper width. Begin by presetting the width coil two turns in from the extreme counterclockwise position. With the picture properly centered, adjust the horizontal linearity control for best horizontal proportions and then complete the adjustment with the width coil as follows:

The picture may be adjusted to fill the mask with adjusted line voltage of 108 volts, and with normal line voltage, the raster should scan the mask about $\frac{5}{8}$ " on each side. "Normal" line voltage is 120 volts.

The width coil (L101) and the horizontal linearity coil (L109) are identified on the chassis drawing in Figure 3.

HORIZONTAL OSCILLATOR ADJUSTMENT

The horizontal sine wave coil is adjusted by temporarily attaching a short jumper across the coil (L501A) and another jumper from Pin 2 of V501 to ground. Carefully adjust the horizontal hold for least sideways drift of the picture and remove the coil jumper. Again stop the sideways drift (if any) by adjusting the sine wave coil slug with nonmetallic tool. Remove all jumpers. See Zone A-3 of Figure 5 for location of L501.

WARNING: Operation of these receivers outside the cabinet or with the covers removed, involves a shock hazard from the receiver power supplies. Work on the receivers should not be attempted by anyone who is not thoroughly familiar with precautions necessary when working on high voltage equipment.

CAUTION: Do not install, remove, or handle the kinescope in any manner unless shatter-proof goggles are worn. People not so equipped should be kept away while handling kinescopes. Keep kinescope away from the body while handling.

Do not operate the receiver with the high voltage compartment shield open.

RCA Victor Chassis KCS-149A Service Information, Continued

SERVICE ADJUSTMENTS

DISASSEMBLY NOTES

To re-install the UHF knobs, the shaft must be in the extreme clockwise position and the inner (indicator) knob oriented so the line between number 83 and number 14 is adjacent the channel indicator mark on the cabinet. Then replace the outer knob.

A threaded stud is provided at the left edge of the chassis and may be used to mount the tuner assembly attaching it with one of the 1 1/8" nuts used to mount the assembly to the panel. For convenient servicing and for safety in transporting the chassis, it is recommended that this service position for the tuner assembly be utilized.

ADJUST KRK118 TUNER RF OSCILLATOR
(Manual Models)

Refer to the illustration in Figure 2 for the location of adjustments. First, center the fine tuning range on Channel 13 by rotating the fine tuning knob three or more turns clockwise and then one turn counter-clockwise. Then adjust the Channel 13 oscillator slug for best picture. Perform the same sequence of adjustments for Channel 6. Intervening channels are then within the range of the individual fine tuning gears and no additional RF oscillator adjustment is provided.

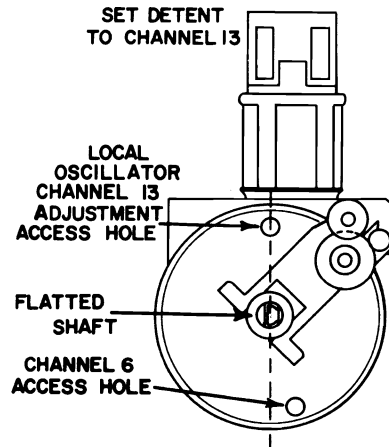


Figure 2—Adjust Tuner RF Oscillator (KRK118)

CHASSIS REAR VIEW

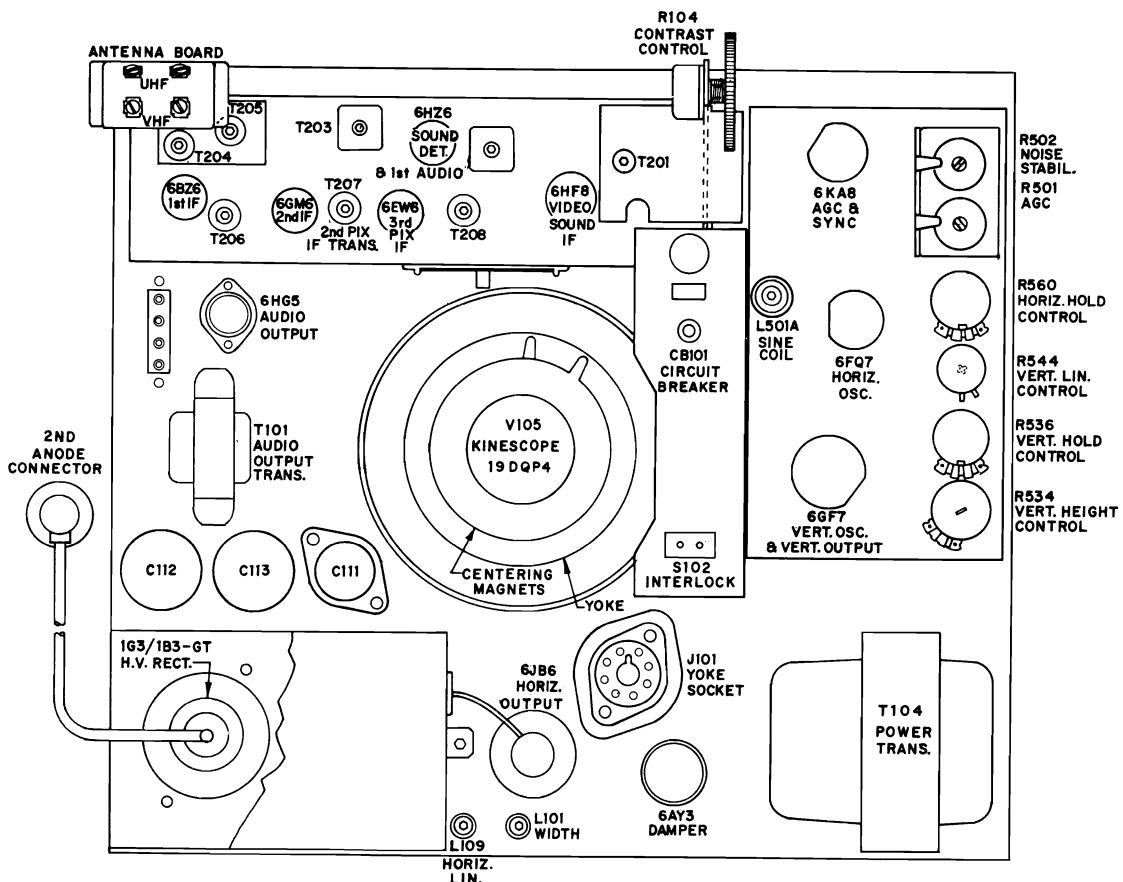


Figure 3—Chassis Rear View

RCA Victor Chassis KCS-149A Printed Boards, Continued

SECURITY SEALED CIRCUIT ASSEMBLIES

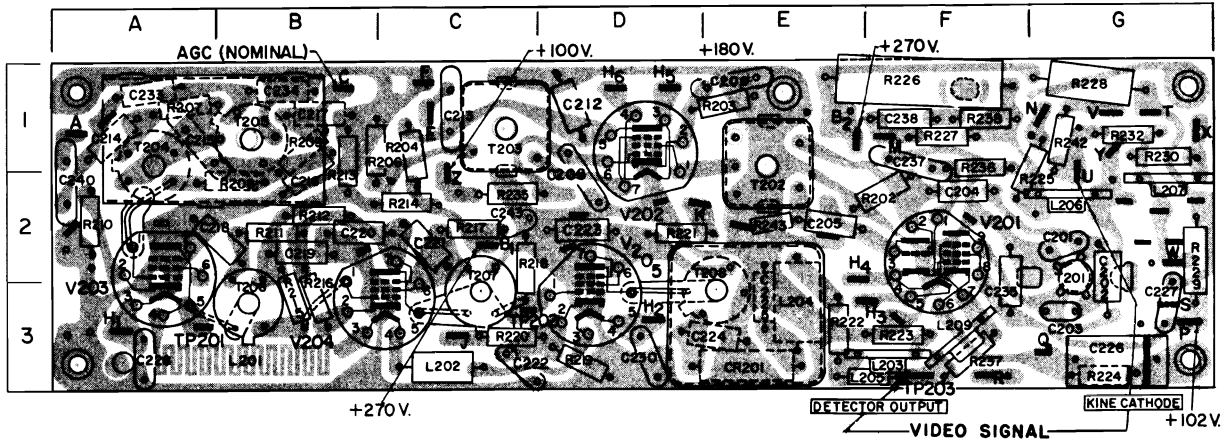


Figure 4—PW200 Sealed Circuit Assembly (Pix-Sound I-F)

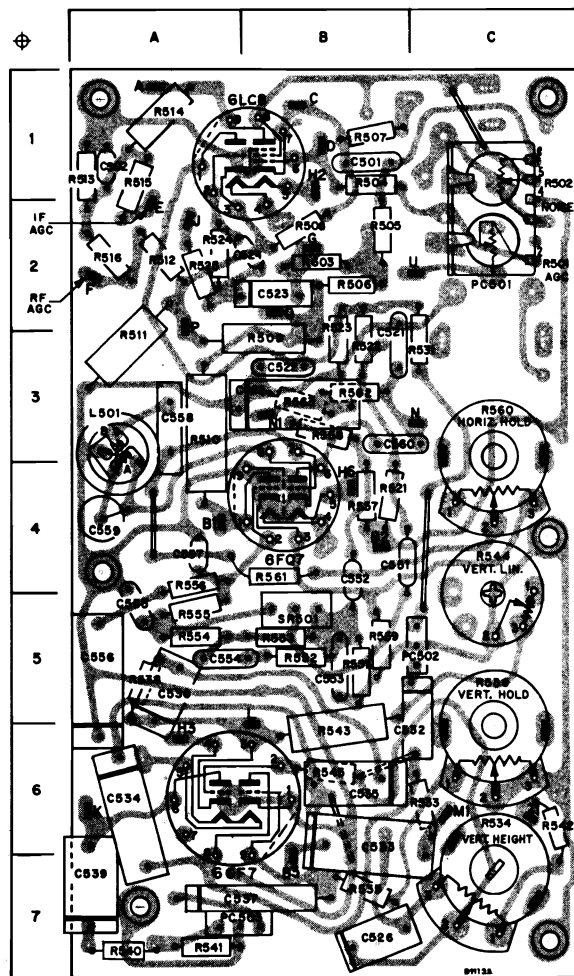


Figure 5—PW500 Sealed Circuit Assembly (Defl.)

C201	...	G2	R206	...	C1
C202	...	G2	R207	...	A1
C203	...	G3	R208	...	B2
C204	...	F2	R209	...	B1
C205	...	E2	R210	...	A2
C213	...	C1	R211	...	B2
C214	...	A1	B212	...	B2
C215	...	A1	R213	...	B2
C216	...	B2	R214	...	C2
C217	...	B1	R215	...	B3
C218	...	B2	R216	...	B3
C219	...	B2	R217	...	C2
C220	...	B2	R218	...	C2
C222	...	E3	R219	...	D3
C225	...	E3	R220	...	C3
C226	...	G3	R221	...	D2
C227	...	G3	R222	...	E3
B228	...	A3	R223	...	F3
*C229	...	B3	R224	...	G3
*C230	...	D3	R225	...	G2
C233	...	A1	R226	...	F1
C234	...	B1	R227	...	F1
C235	...	F3	R228	...	G1
C237	...	F1	R229	...	G2
C238	...	F1	R230	...	G1
C240	...	A2	R232	...	G1
*C243	...	C2	R235	...	C2
			R236	...	F1
CR201	...	E3	R237	...	F3
			R238	...	F1
L202	...	C3	R242	...	G1
L203	...	F3	R243	...	G2
L204	...	E3			
L205	...	E3	T201	...	G2
L206	...	G2	T202	...	E2
L207	...	G2	T203	...	C1
L209	...	F3	T204	...	A1
			T205	...	B1
R201	...	E1	T206	...	B3
R202	...	F2	T207	...	C3
R203	...	E1	T208	...	E3
R204	...	C1			

PW200 LOCATION GUIDE

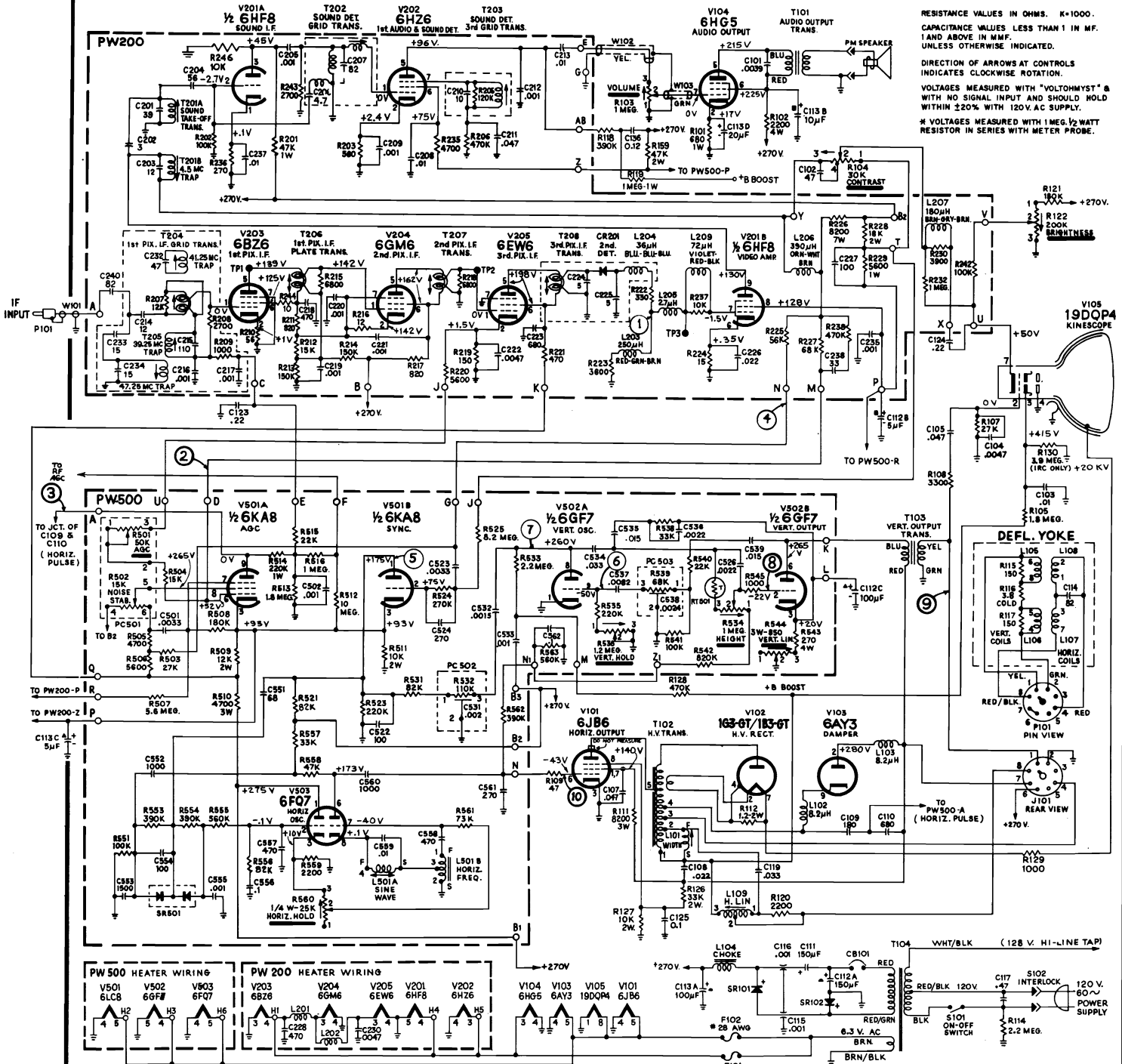
C501	...	B1	R509	...	B3
C502	...	A1	R510	...	A3
C521	...	B3	R511	...	A3
C522	...	B3	R512	...	A2
C523	...	B2	R513	...	A1
C524	...	B2	R514	...	A1
C526	...	B7	R515	...	A1
C532	...	C5	R516	...	A2
C533	...	B6	R521	...	B4
C534	...	A6	R522	...	B3
C535	...	B6	R523	...	B3
C536	...	A5	R524	...	A2
C537	...	B7	R525	...	A2
C539	...	A7	R531	...	C3
C551	...	B4	R533	...	C6
C552	...	B4	R534	...	C6
C553	...	B5	R535	...	B7
C554	...	A5	R536	...	C5
C555	...	A5	R538	...	A5
C556	...	A5	R540	...	A7
C557	...	A4	R541	...	A7
C558	...	A3	R542	...	C6
C559	...	A4	R543	...	B6
C560	...	B3	R544	...	C4
C561	...	B3	R545	...	B6
C562	...	B3	R551	...	B5
			R552	...	B5
L501	...	A3	R553	...	B5
			R554	...	A5
PC501	...	C2	R555	...	A5
PC502	...	C5	R556	...	A4
PC503	...	A7	R557	...	B4
			R558	...	B3
R501	...	C2	R559	...	B5
R502	...	C1	R560	...	C3
R503	...	B2	R561	...	B4
R504	...	B1	R562	...	B3
R505	...	B2	R563	...	B3
R506	...	B2	R564	...	B4
R507	...	B1			
R508	...	B2	SR501	...	B5

PW500 LOCATION GUIDE

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

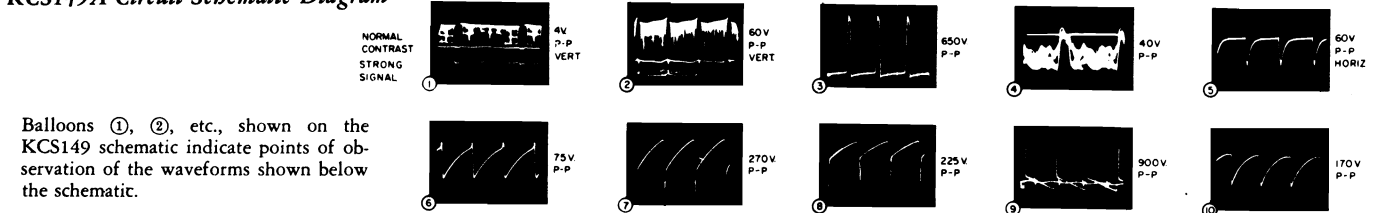
RCA Victor Chassis KCS-149A Schematic Diagram, Continued

CIRCUIT SCHEMATIC DIAGRAM FOR KCS149A CHASSIS



RESISTANCE VALUES IN OHMS. K=1000.
CAPACITANCE VALUES LESS THAN 1 IN MF.
1 AND ABOVE IN MMF.
UNLESS OTHERWISE INDICATED.
DIRECTION OF ARROWS AT CONTROLS
INDICATES CLOCKWISE ROTATION.
VOLTAGES MEASURED WITH "VOLTOHMYST" &
WITH NO SIGNAL INPUT AND SHOULD HOLD
WITHIN 20% WITH 120V AC SUPPLY.
* VOLTAGES MEASURED WITH 1 MEG. 1/2 WATT
RESISTOR IN SERIES WITH METER PROBE.

KCS149A Circuit Schematic Diagram



Balloons ①, ②, etc., shown on the KCS149 schematic indicate points of observation of the waveforms shown below the schematic.

RCA VICTOR

Chassis KCS 148 A & B

Models AF-101A, B, and AF-117E, V, W
(Service material on pages 131 through 136)

AGC CONTROL ADJUSTMENT

Perform the following, routine test: Adjust the receiver and antenna to obtain the best picture from a strong, local station. Quickly switch off channel and back, and if the picture distorts and bends, or does not reappear at once, rotate the agc control (R501) counterclockwise and then clockwise until slight picture bend occurs. Then slowly retard the control until the bend is gone. Check again by switching off and on strong signal.

ADJUST VHF TUNER RF OSCILLATOR (KRK114)

Refer to the illustration in Figure 2 for adjustment locations. First, center the fine tuning range on Channel 13 by rotating the fine tuning knob three or more turns clockwise and then one turn counterclockwise. Then adjust the Channel 13 oscillator slug for best picture. Perform the same sequence of adjustments for Channel 6. Intervening channels are then within the range of the individual fine tuning gears and no additional RF oscillator adjustment is required.

HORIZONTAL OSCILLATOR

The horizontal sine wave coil is adjusted by temporarily attaching a short jumper across the coil (L501A) and another jumper from Pin 2 of the 6LC8 to ground. Carefully adjust the horizontal hold for least sideways drift of the picture and remove the coil jumper. Again stop the sideways drift (if any) by adjusting the sine wave coil slug with nonmetallic tool. Remove all jumpers.

CENTERING

If the picture does not fill the screen, it may be necessary to center the picture with the 2 disc magnets mounted behind the yoke cover. Both horizontal and vertical centering are accomplished at once by rotating the discs together or separately. Perform this adjustment along with vertical height, vertical linearity, and width, as they are all interdependent.

TESTING PICTURE PROPORTIONS

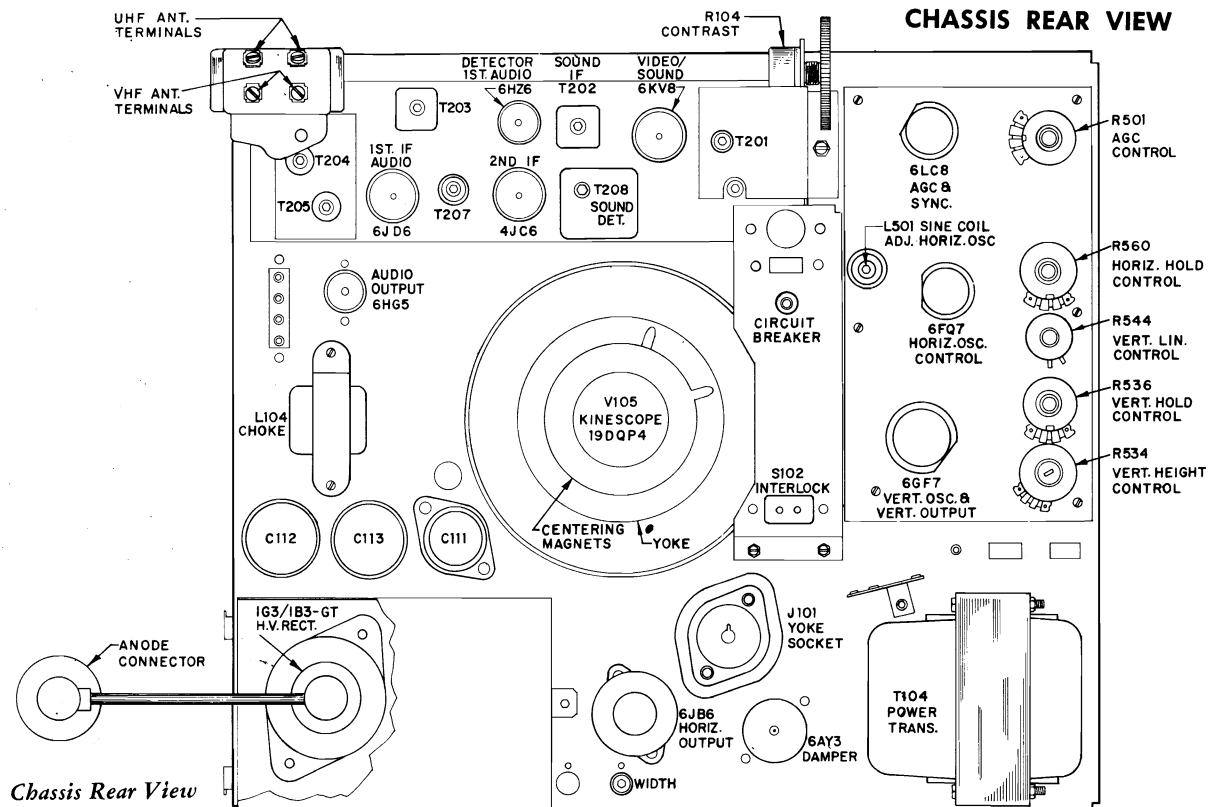
Rotate the vertical hold control to roll picture slowly downward and study the blanking bar. If it is not level, or if the bar varies in thickness as it moves down the screen, make adjustments as prescribed in the next two paragraphs.

DEFLECTION YOKE

If the picture is tilted, loosen the yoke clamp screw and rotate the yoke to level the picture. Retighten the yoke clamp.

HEIGHT AND VERTICAL LINEARITY

If the blanking bar changed size while moving down, alternately adjust the height and vertical linearity controls for best vertical proportions. Final vertical size should allow the raster to overlap the mask about $\frac{3}{8}$ inch at top and bottom with normal (120 volts) line voltage.



VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

RCA Victor Chassis KCS-148A, B, Printed Boards Views, Continued

PW200 SECURITY SEALED CIRCUIT ASSEMBLY

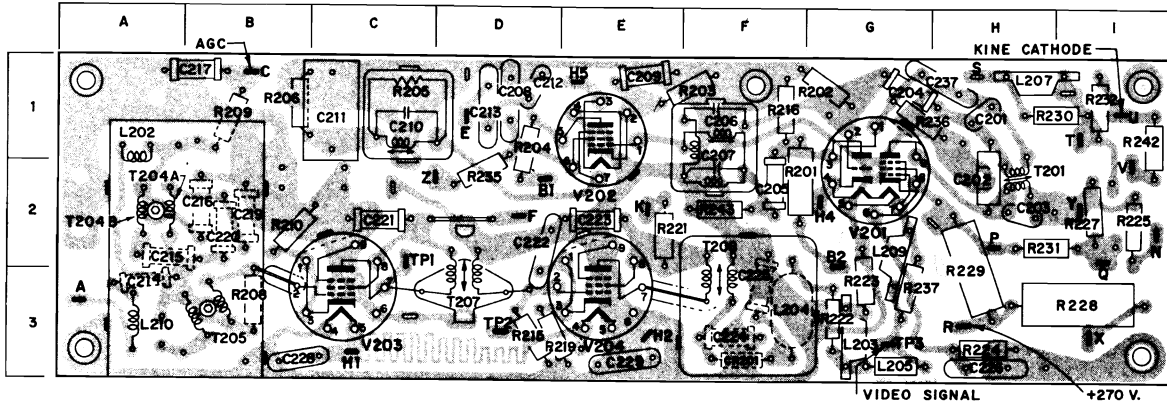


Figure 4—PW200—I-F, Video Board

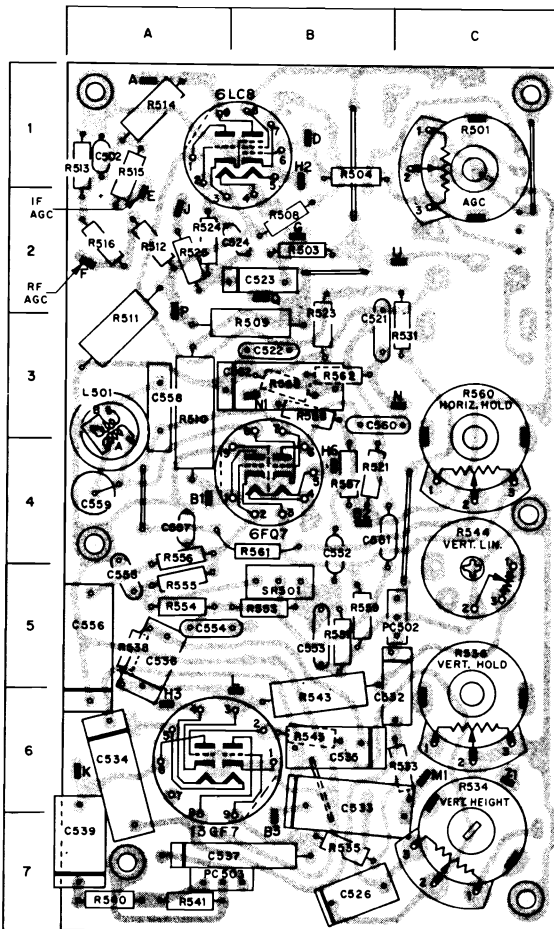
PW200 LOCATION GUIDE

C201	....	F1	L210	....	A3
C202	....	G2	R201	....	E2
C203	....	G2	R202	....	E1
C204	....	F1	R203	....	D1
C205	....	E2	R204	....	C1
C206	....	E1	R205	....	C1
C207	....	E2	R206	....	B1
C208	....	C1	R208	....	B3
C209	....	D1	R209	....	B1
C210	....	C1	R210	....	B2
C211	....	B1	R215	....	C3
C212	....	C1	R219	....	D3
C213	....	C1	R221	....	D2
C214	....	A3	R222	....	E3
C215	....	A2	R223	....	F3
C216	....	A2	R224	....	F3
C217	....	A1	R225	....	G2
*C218	....	B3	R227	....	G2
C219	....	B2	R228	....	G3
C220	....	B2	R229	....	F2
C221	....	B2	R230	....	G1
C222	....	D2	R231	....	G2
C223	....	D2	R232	....	G1
C224	....	E3	R235	....	C2
C225	....	E3	R236	....	F1
C226	....	F3	R237	....	F3
C228	....	B3	R242	....	G1
C229	....	D3	R243	....	E2
C237	....	F1			

CR201	...	E3	T201	....	G2
L202	....	A1	T202	....	D2
L203	....	E3	T203	....	C1
L204	....	E3	T204	....	A2
L205	....	F3	T205	....	A3
L207	....	G1	T207	....	C3
L209	....	F2	T208	....	E3

* Under Board — Not Shown

PW500 SECURITY SEALED CIRCUIT ASSEMBLY



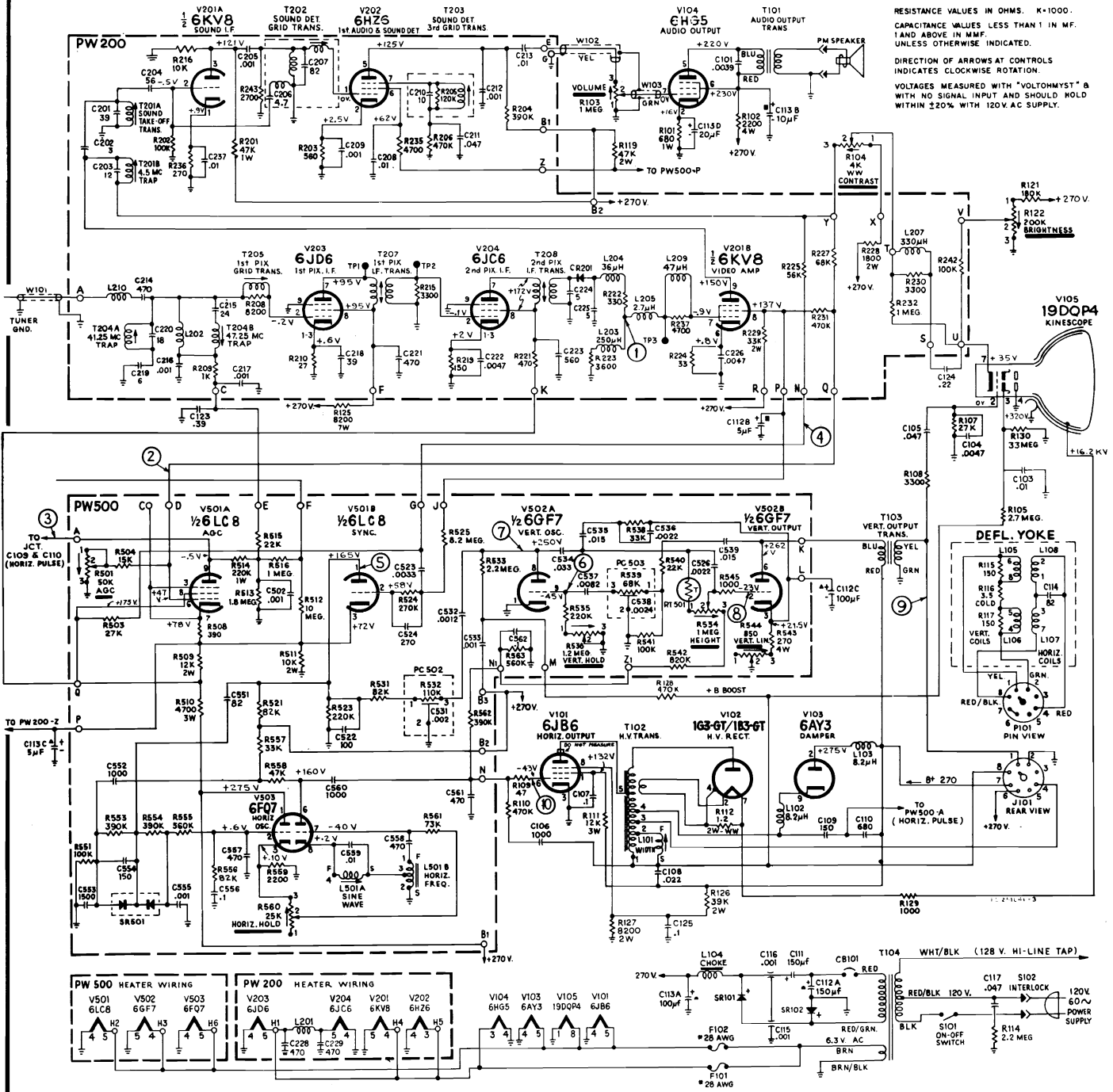
PW500 LOCATION GUIDE

C502	....	A1	R512	....	A2
C522	....	B3	R513	....	A1
C523	....	B3	R514	....	A1
C524	....	B2	R515	....	A1
C526	....	B7	R516	....	A2
C532	....	C6	R521	....	B4
C533	....	B6	R523	....	B2
C534	....	A6	R524	....	A2
C535	....	A6	R525	....	A2
C536	....	A5	R531	....	C3
C537	....	A7	R533	....	C6
C539	....	A7	R534	....	C6
C551	....	B4	R535	....	B7
C552	....	B4	R536	....	C5
C553	....	B5	R538	....	A5
C554	....	A5	R540	....	A7
C555	....	A5	R541	....	A7
C556	....	A5	R543	....	B6
C557	....	A4	R544	....	C4
C558	....	A3	R545	....	B6
C559	....	A4	R551	....	B5
C560	....	B3	R553	....	B5
C561	....	B3	R554	....	A5
C562	....	B3	R555	....	A5
			R556	....	A4
L501	....	A3	R557	....	B4
PC502	....	C5	R558	....	B3
PC503	....	B7	R559	....	B5
R501	....	C1	R560	....	C3
R503	....	B2	R561	....	B4
R504	....	B1	R562	....	B3
R508	....	B2	R563	....	B3
R509	....	B3			
R510	....	A3	SR501	....	B5
R511	....	A3			

Figure 5—PW500 Deflection Board

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

RCA Victor Chassis KCS-148A, B, Schematic Diagram, Continued

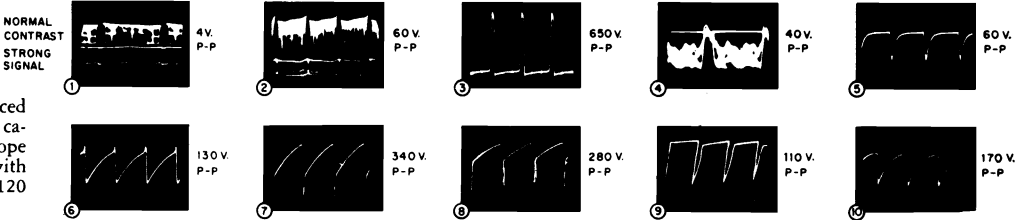


RESISTANCE VALUES IN OHMS. K=1000.
CAPACITANCE VALUES LESS THAN 1 IN MF.
1 AND ABOVE IN MMF.
UNLESS OTHERWISE INDICATED.
DIRECTION OF ARROWS AT CONTROLS
INDICATES CLOCKWISE ROTATION.
VOLTAGES MEASURED WITH "VOLTHMYST"® A
WITH NO SIGNAL INPUT AND SHOULD HOLD
WITHIN 220% WITH 120V AC SUPPLY.

Balloons ①, ②, etc. shown on schematic indicate points of observation of the waveforms shown below the schematic.

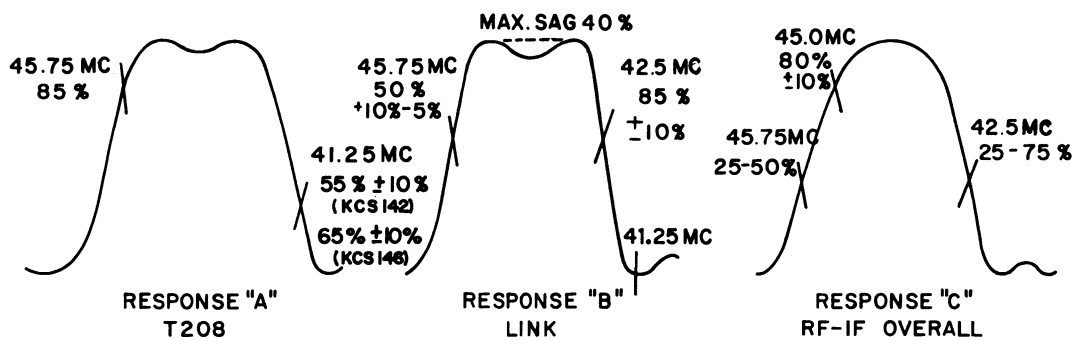
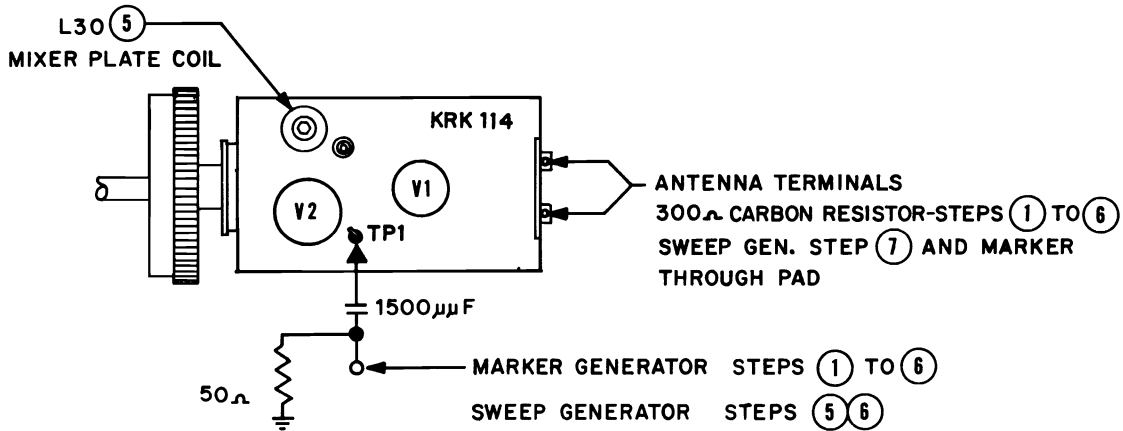
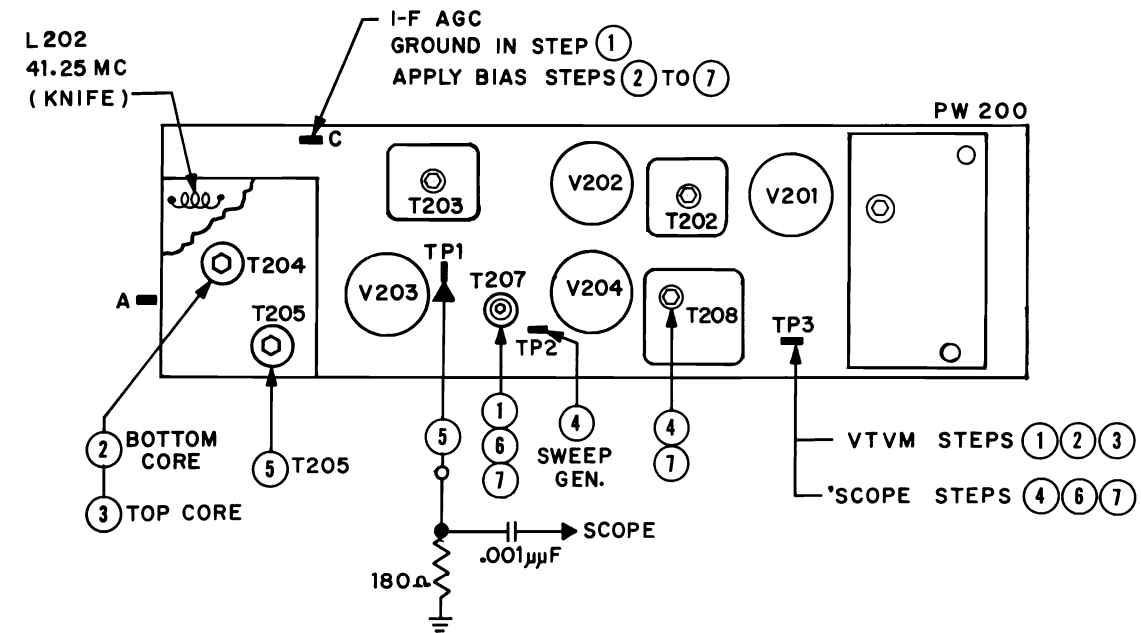
KCS148A & B Circuit Schematic Diagram

The waveforms at right were reproduced from a strong local station. Use a low capacity probe to obtain the oscilloscope traces shown. Voltages will vary with signal level and within ±20% with 120 volt A. C. supply.



RCA Victor Chassis KCS-148A, B, Alignment Information

PICTURE I-F ALIGNMENT—KCS148 CHASSIS
PICTURE I-F TRANSFORMER AND TRAP ADJUSTMENTS



Picture I-F Alignment—KCS148 Chassis

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

RCA Victor Chassis KCS-148A, B, Alignment Information, Continued

PICTURE I-F ALIGNMENT—KCS148 CHASSIS
PICTURE I-F TRANSFORMER AND TRAP ADJUSTMENTS

TEST EQUIPMENT CONNECTIONS:

- BIAS SUPPLY**.....NONE IN STEP 1 (Ground I-F AGC term. "C" of PW200). Bias I-F AGC terminal "C" at —6 to —8 volts when adjusting traps in steps 2 and 3 and during sweep alignment.
- MARKER GENERATOR**.....Connect to Mixer Grid test point (TP1) of KRK114 in series with mixer pad shown.
- VTVM**.....Attach through DC probe at test point TP3 (2nd Dectector).
- MISCELLANEOUS**.....Attach a 300 Ω dummy load across the antenna terminals.
 Refer to facing page for all adjustment locations and responses.

PEAK ALIGNMENT

	STEP	SWEEP GENERATOR	MARKER GENERATOR	ADJUST	REMARKS
1	PEAK 1st Pix IF Plate Trans. (T207)	NOT USED	44.25 mc.	T207	PEAK T207 and adjust generator output to maintain approx. 3 volts on VTVM when finally peaked. Adjust for min. on VTVM. Readjust 47.25 mc. trap, if necessary, after step 5.
2	Adjust 47.25 mc. Trap		47.25 mc.	T204B (Bottom Core)	
3	Adjust 41.25 mc. Trap		41.25 mc.	T204A (Top Core)	

PICTURE I-F SWEEP ALIGNMENT

TEST EQUIPMENT CONNECTIONS:

- BIAS SUPPLY**.....Adjust to —8 volts. Same connection as above.
- OSCILLOSCOPE**.....Attach through direct probe to test point TP3. Calibrate to 5 volts peak to peak.
- MARKER GENERATOR**.....Maintain connected to Mixer Grid test point TP1 of KRK114.
- SWEEP GENERATOR**.....Connect to test point TP2 (pin 2 of 4JC6). Use short leads.
 Use sufficient gain to produce about 3 volts peak to peak at TP3.

	STEP	SWEEP GENERATOR	MARKER GENERATOR	ADJUST	REMARKS
4	Adjust 2nd Pix IF plate trans.	40-50 mc.	41.25 mc. 45.75 mc.	T208 (Top & Bottom Cores)	Adjust for max. gain and response curve "A". Reduce sweep gain to maintain 5 V. P. to P.
Move the OSCILLOSCOPE to the test point TP1 using the diode probe and 180 Ω detector. Calibrate the OSCILLOSCOPE for 0.5 volts Peak to Peak. Sweep Generator to Mixer Grid TPI. Lightly couple Marker to sweep cable. Channel selector to 4.					
5	Adjust tuner IF (L30) and 1st IF grid (T205)	40-50 mc.	42.5 mc. 45.75 mc. 42.5 mc.	L30 T205	Adjust for response "A". Use inner peak of L30 coil slug (bottom of winding). Knife L202 for 42.5 mc. marker, if needed.
Change OSCILLOSCOPE probe to DC probe and attach to test point TP3. Calibrate to 5 Volts Peak to Peak. Remove 180 Ω detector.					
6	Check IF Overall	40-50 mc.	42.5 mc. 45.0 mc. 45.75 mc.	T207	Retouch T207 slightly to maintain response "C".
Remove dummy antenna load and substitute the sweep attenuator pad (Fig. 4). Attach the sweep generator to the attenuator pad. The Marker Generator remains lightly coupled to the sweep generator input cable.					
7	Check RF Overall	40-50 mc.	42.5 mc. 45.0 mc. 45.75 mc.	T207 & T208 Top Core only	Make slight adjustments only. Observe response "A". Do not disturb T208 bottom core.

NOTE the position of the 41.25 mc. marker in response "C". If this marker is difficult to position within limits on the IF overall step 6, it may be necessary to knife the turns of coil L202 slightly. The acceptable position of the 42.5 mc. marker may be 75% ± 10% from the base of the overall response curve. No adjustment of L202 should be attempted before checking the condition of the 4JD6, 1st I-F Amplifier tube.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

RCA Victor Chassis KCS-148A, B, Alignment Information, Continued

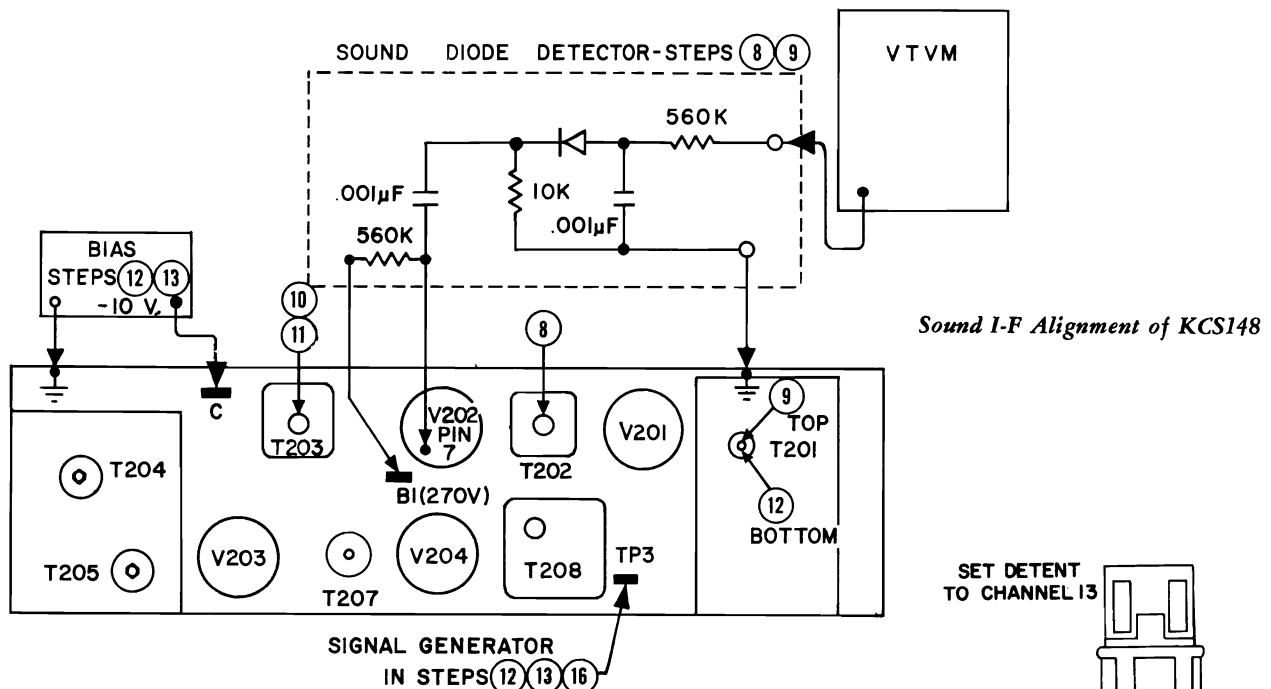
SOUND I-F ALIGNMENT OF KCS148 CHASSIS

SOUND I-F, SOUND DETECTOR AND 4.5 MC. TRAP ALIGNMENT

TEST EQUIPMENT CONNECTIONS:

- BIAS SUPPLY**.....Apply -10 volts to the I-F AGC bus at terminal "C" on PW200.
- OSCILLOSCOPE**.....Connect to kinescope cathode lead through diode detector.
- SIGNAL GENERATOR**.....Connect to test point TP3 on PW200.
- VACUUM TUBE VOLTMETER**.....Connect to output of diode detector shown. Set meter for negative voltage readings.
- MISCELLANEOUS**.....Connect test diode detector to pin 7 of V202. See below for adjustment locations.

STEP	SIGNAL GENERATOR	ADJUST	REMARKS
8	4.5 mc.	T202	Adjust for maximum negative DC on meter. Set generator for 1.0 to 1.5 volts when peaked. T201A top core and T202 core should penetrate the coil from top of can when finally peaked.
9	4.5 mc.	T201A (top)	
10	Disconnect the diode test detector. Turn off signal generator and tune in strongest signal in area, adjusting volume control for normal volume (approx. 1/4 turn from C.C.W.). Turn core of T203 flush with top of coil form. Remove bias.		
11	—	T203	Turn core clockwise to 2nd peak adjusting for maximum volume.
12	4.5 mc., 400 cycle, AM mod.	T201B (bottom)	Adjust for minimum 4.5 mc. indication on oscilloscope. The core should penetrate the coil from the bottom of the can when finally adjusted.



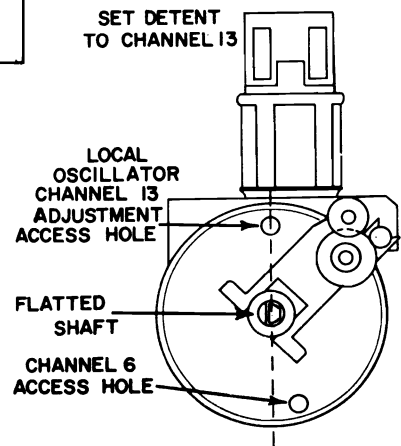
CABINET DISASSEMBLY NOTES

Be certain to attach the back screw for the antenna block through the ground lug. This ground lug is required to properly terminate the monopole antenna.

To re-install the UHF knobs, the shaft must be in the extreme clockwise position and the inner (indicator) knob oriented so the line between number 83 and number 14 is adjacent the channel indicator mark on the cabinet. Then replace the outer knob.

A threaded stud is provided at the left edge of the chassis and may be used to mount the tuner assembly attaching it with one of the 1 1/2" nuts used to mount the assembly to the panel. For convenient servicing and for safety in transporting the chassis, it is recommended that this service position for the tuner assembly be utilized.

The picture tube is dismantled by completely loosening the Phillips head tension bolt located below the kinescope.



RCA VICTOR

Chassis KCS 151 A

Models AF-051J and AF-071E, G, H, T

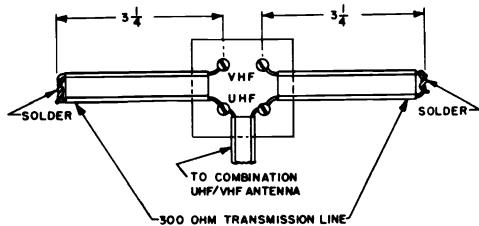


Figure 1—Combination UHF/VHF Antenna Matching

AGC CONTROL ADJUSTMENT

Perform the following, routine test: Adjust the receiver and antenna to obtain the best picture from a strong, local station. Quickly switch off channel and back, and if the picture distorts and bends, or does not reappear at once, rotate the AGC control (R233) counterclockwise and then clockwise until slight picture bend occurs. Then slowly retard the control until the bend is gone. Check again by switching off and on strong signal.

HORIZONTAL OSCILLATOR

The horizontal sine wave coil can be adjusted by temporarily attaching a short jumper across the coil (L207A) and another jumper from Pin 9 of 6GH8 to ground. Carefully adjust the horizontal hold for least sideways drift of the picture and remove the coil jumper. Again stop the sideways drift (if any) by adjusting the sine wave coil slug with nonmetallic tool. Remove all jumpers.

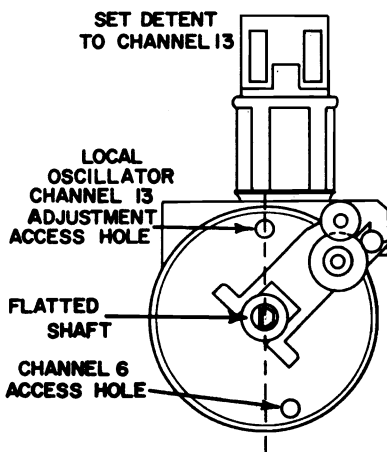


Figure 2—VHF RF Oscillator Adjustment

ADJUST VHF TUNER RF OSCILLATOR (KRK114)

Refer to the illustration in Figure 2 for adjustment locations. First, center the fine tuning range on Channel 13 by rotating the fine tuning knob three or more turns clockwise and then one turn counterclockwise. Then adjust the Channel 13 oscillator slug for best picture. Perform the same sequence of adjustments for Channel 6. Intervening channels are then within the range of the individual fine tuning gears and no additional RF oscillator adjustment is required.

CENTERING

If the picture does not fill the screen, it may be necessary to center the picture with the 2 disc magnets mounted behind the yoke cover. Both horizontal and vertical centering are accomplished at once by rotating the discs together or separately. Perform this adjustment along with vertical height, vertical linearity, and width, as they are all interdependent.

TESTING PICTURE PROPORTIONS

Rotate the vertical hold control to roll picture slowly downward and study the blanking bar. If it is not level, or if the bar varies in thickness as it moves down the screen, make adjustments as prescribed in the next two paragraphs.

DEFLECTION YOKE

If the picture is tilted, loosen the yoke clamp screw and rotate the yoke to level the picture. Retighten the yoke clamp.

HEIGHT AND VERTICAL LINEARITY

If the blanking bar changed size while moving down, alternately adjust the height and vertical linearity controls for best vertical proportions. Final vertical size should allow the raster to overlap the mask about 3/8 inch at top and bottom with normal (120 volts) line voltage.

WIDTH

The width adjustments is made with L101. The picture may be adjusted to fill the mask with a line voltage of 108 volts, and with normal line voltage, the raster should overscan the mask about 5/8 inch on each side. "Normal" line voltage is 120 volts.

CHASSIS REAR VIEW

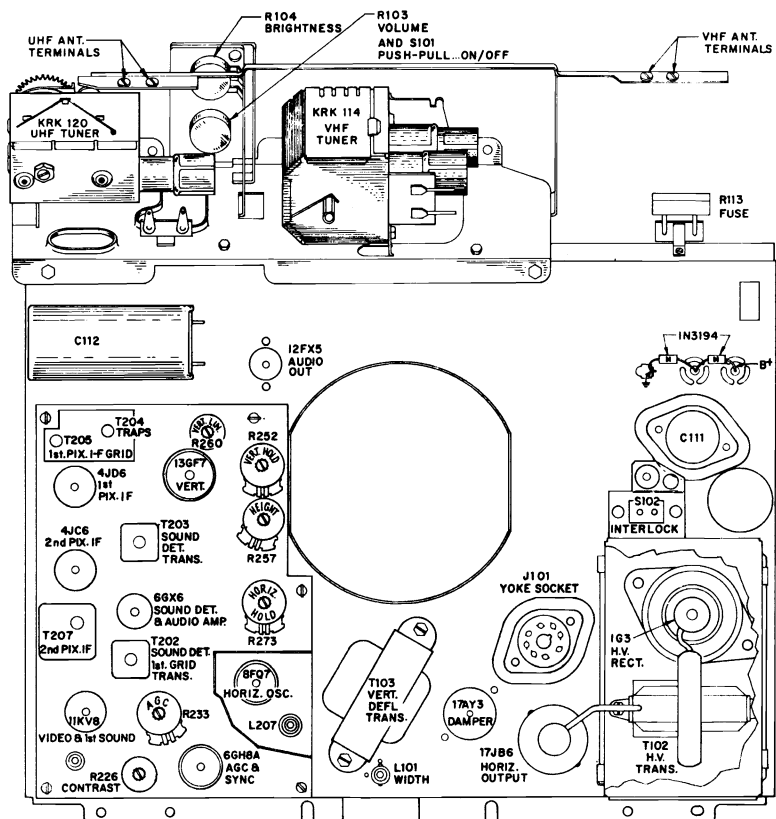
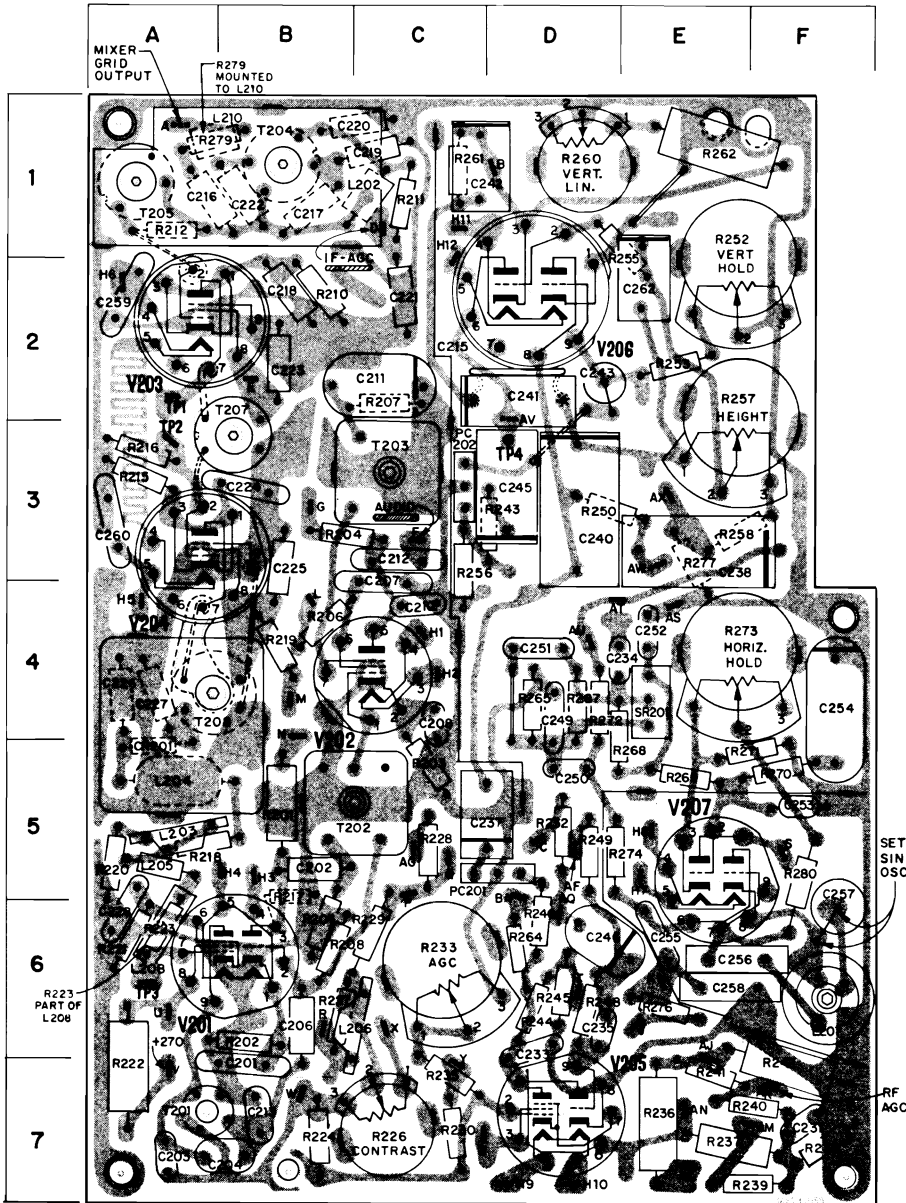


Figure 3—Chassis Rear View

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

RCA Victor KCS-151A Printed Board Data

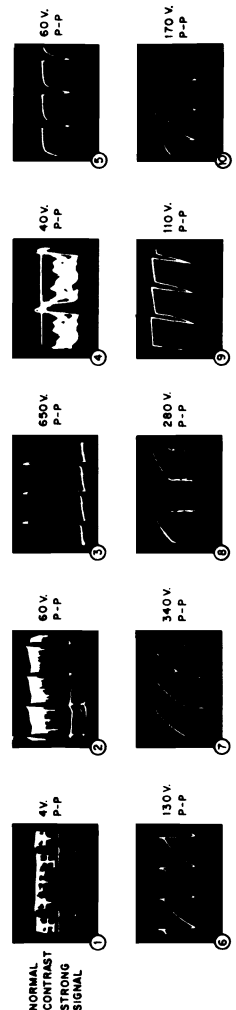
SECURITY SEALED CIRCUIT ASSEMBLY



PW200 COMPONENT LOCATION GUIDE

C201 B7	C224 B3	C251 D4	L206 C6	R215 A3	R237 E7	R260 D1	SR201 E4
C202 B5	C225 B3	C252 E4	L207 F6	R216 A3	R238 F7	R261 C1	T201 A7
C203 A7	C226 A4	C253 F5	L208 A6	R217 B5	R239 E7	R262 E1	T202 C5
C204 B7	C227 A4	C254 F4	L210 A1	R218 A5	R240 F7	R264 D6	T203 C3
C206 B6	C228 A6	C255 E6	PC201 D5	R219 B4	R241 E7	R265 D4	T204 B1
C207 C4	C231 F7	C256 E6	PC202 C3	R220 A5	R242 F7	R267 D4	T205 A1
C208 C4	C233 D6	C257 F5	R201 B5	R221 A6	R243 D3	R268 E5	T207 B2
C210 C4	C234 E4	C258 E6	R202 B6	R222 A7	R244 D6	R269 D6	T208 A4
C211 C2	C235 D6	C259 A2	R203 C5	R223 A6	R245 D6	R270 F5	V201 A6
C212 C3	C237 D5	C260 A3	R204 B3	R224 B7	R246 D6	R271 F5	V202 B4
C213 B7	C238 E3	C262 E2	R205 B6	R225 C7	R248 D6	R272 D4	V203 A2
C216 A1	C240 D3	CR201 A5	R206 B4	R227 B6	R249 D5	R273 E4	V204 A4
C217 B1	C241 D2	L201 C1	R207 C2	R228 C5	R250 D3	R274 D5	V205 D7
C218 B2	C242 C1	L202 C1	R208 B6	R229 C6	R252 E2	R275 F6	V206 D2
C219 C1	C243 D2	L203 A5	R209 C2	R230 C7	R253 E2	R277 E3	
C220 C1	C245 D3	L204 A5	R210 B2	R232 D5	R255 E2	R279 A1	
C221 C2	C246 D6	L205 A5	R211 C1	R233 C6	R256 C3	R280 F5	
C222 B1	C249 D4		R212 A1	R235 C7	R257 E3		
C223 B2	C250 D5			R236 E7	R258 E3		

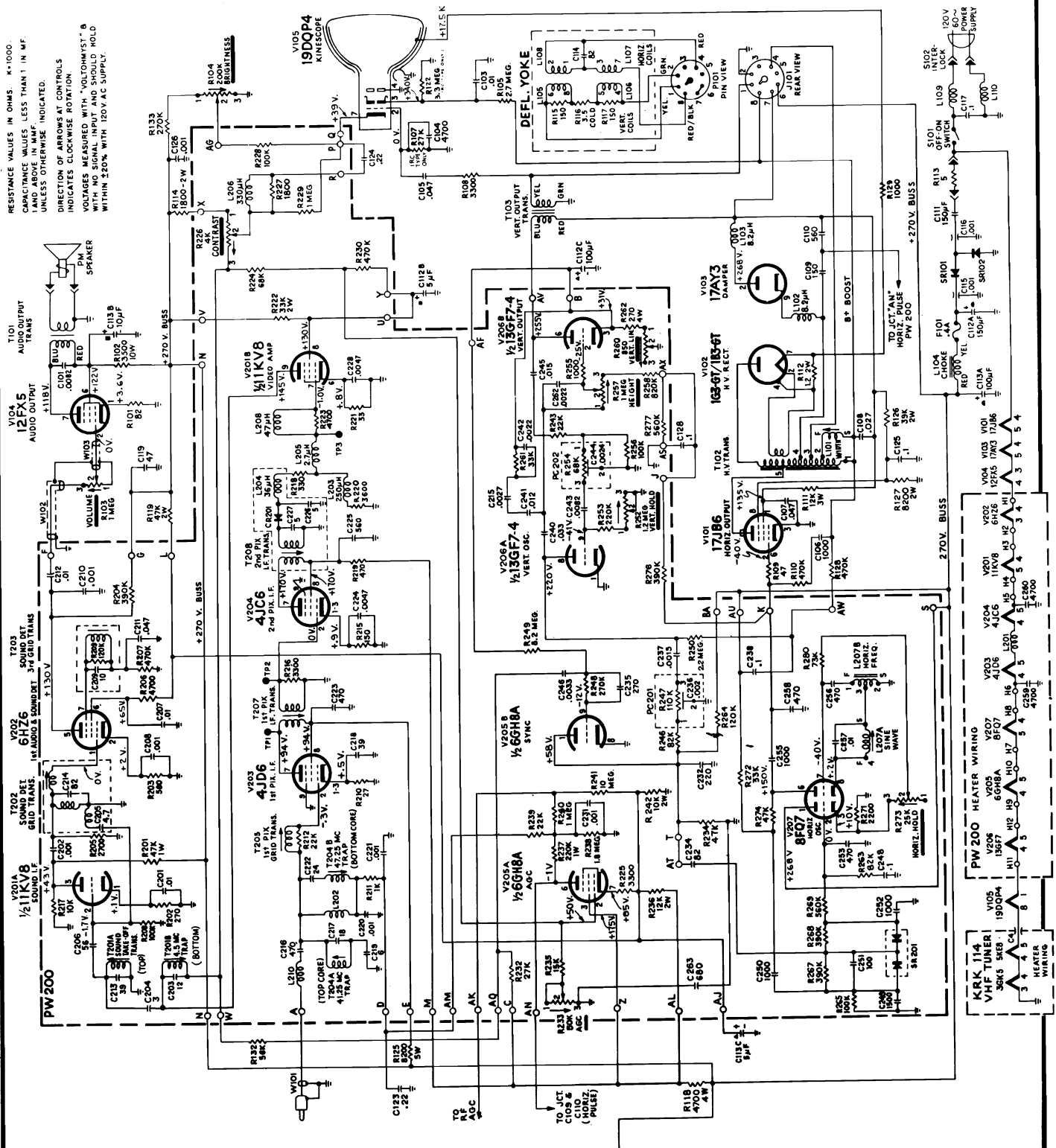
PW200 Board (I-F, Video, and Deflection)



Balloons ①, ②, etc., shown on schematic indicate points of observation of the waveforms shown below the schematic. The waveforms at right were reproduced from a strong local station. Use a low capacity probe to obtain the oscilloscope traces shown. Voltages will vary with signal level and within $\pm 20\%$ with 120 volt A.C. supply.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

RCA Victor Chassis KCS-151A Schematic Diagram, Continued



RESISTANCE VALUES IN OHMS. K=1000.
CAPACITANCE VALUES LESS THAN 1 IN MF.
INDICATE ABG VALUES.
DIRECTION OF ARROWS AT CONTROLS
INDICATES COUNTERCLOCKWISE ROTATION.
VOLTAGES MEASURED WITH "VOLTOHMIST" B
WITH NO SIGNAL INPUT AND SHOULD HOLD
WITHIN 20% WITH 120V AC SUPPLY.

CIRCUIT SCHEMATIC DIAGRAM FOR KCS151A CHASSIS

RCA Victor Chassis KCS-151A Alignment Information

PICTURE I-F ALIGNMENT—KCS151 CHASSIS
 PICTURE I-F TRANSFORMER AND TRAP ADJUSTMENTS

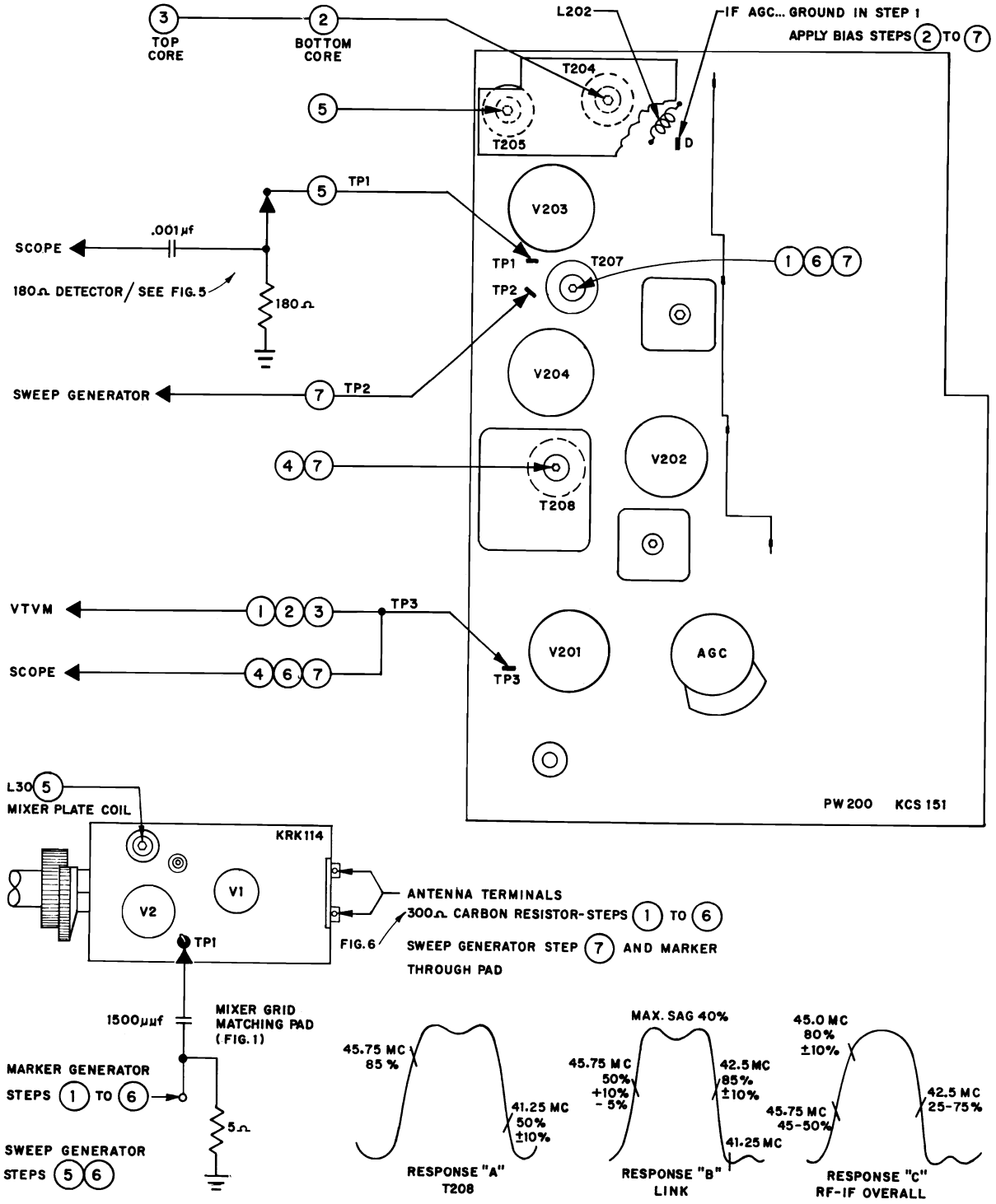


Figure 17—Picture I-F Alignment—KCS151 Chassis

RCA Victor Chassis KCS-151A Alignment Information, Continued

PICTURE I-F ALIGNMENT—KCS151 CHASSIS
PICTURE I-F TRANSFORMER AND TRAP ADJUSTMENTS

TEST EQUIPMENT CONNECTIONS:

- BIAS SUPPLY**.....NONE IN STEP 1 (Ground I-F AGC terminal "D" of PW200). Bias I-F AGC terminal "D" at —6 to —8 volts when adjusting traps in steps 2 and 3.
- MARKER GENERATOR**.....Connect to Mixer Grid test point (TP1) of KRK114 in series with mixer pad shown.
- VTVM**.....Attach through DC probe at test point TP3 (2nd Detector).
- MISCELLANEOUS**.....Attach a 300 Ω dummy load across the antenna terminals.
 Refer to facing page for all adjustment locations and responses.

PEAK ALIGNMENT

	STEP	SWEEP GENERATOR	MARKER GENERATOR	ADJUST	REMARKS
1	PEAK 1st Pix IF Plate Trans. (T207)	NOT USED	44.25 mc.	T207	PEAK T207 and adjust generator output to maintain approx. 3 volts on VTVM when finally peaked.
2	Adjust 47.25 mc. Trap		47.25 mc.	T204B (Bottom core)	Adjust for min. on VTVM. Readjust 47.25 mc. trap, if necessary, after step 5.
3	Adjust 41.25 mc. Trap		41.25 mc.	T204A (Top Core)	

PICTURE I-F SWEEP ALIGNMENT

TEST EQUIPMENT CONNECTIONS:

- BIAS SUPPLY**.....Adjust to —8 volts. Same connection as above.
- OSCILLOSCOPE**.....Attach through direct probe to test point TP3. Calibrate to 5 volts peak to peak.
- MARKER GENERATOR**.....Maintain connected to Mixer Grid test point TP1 of KRK114.
- SWEEP GENERATOR**.....Connect to test point TP2 (pin 2 of 4JC6). Use short leads.

	STEP	SWEEP GENERATOR	MARKER GENERATOR	ADJUST	REMARKS
4	Adjust 2nd Pix IF plate trans.	40-50 mc.	41.25 mc. 45.75 mc.	T208 (Top & Bottom Cores)	Adjust for max. gain and response curve "A". Reduce sweep gain to maintain 5 V. P. to P.
Move the OSCILLOSCOPE to the test point TP1 using the diode probe and 180 Ω detector. Calibrate the OSCILLOSCOPE for 0.5 volts Peak to Peak. Sweep Generator to Mixer Grid TP1. Lightly couple Marker to sweep cable. Channel selector to 4.					
5	Adjust tuner IF (L30) and 1st IF grid (T205)	40-50 mc.	42.5 mc. 45.75 mc.	L30 T205	Adjust for response "A". Use inner peak of L30 coil slug (bottom of winding).
Change OSCILLOSCOPE probe to DC probe and attach to test point TP3. Calibrate to 5 Volts Peak to Peak. Remove 180 Ω detector.					
6	Check IF Overall	40-50 mc.	42.5 mc. 45.0 mc. 45.75 mc.	T207	Retouch T207 slightly to maintain response "C".
Remove dummy antenna load and substitute the sweep attenuator pad. Attach the sweep generator to the attenuator pad. The Marker Generator remains lightly coupled to the sweep generator input cable.					
7	Check RF Overall	40-50 mc.	42.5 mc. 45.0 mc. 45.75 mc.	T207 & T208 Top Core only	Make slight adjustments only. Observe response "A". Do not disturb T208 bottom core.

NOTE the position of the 41.25 mc. marker in response "C". If this marker is difficult to position within limits on the IF overall step 6, it may be necessary to knife the turns of coil L202 slightly. The acceptable position of the 42.5 mc. marker may be 75% ± 10% from the base of the overall response curve. No adjustment of L202 should be attempted before checking the condition of the 4JD6, 1st I-F Amplifier tube.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

RCA Victor Chassis KCS-151A Alignment Information, Continued

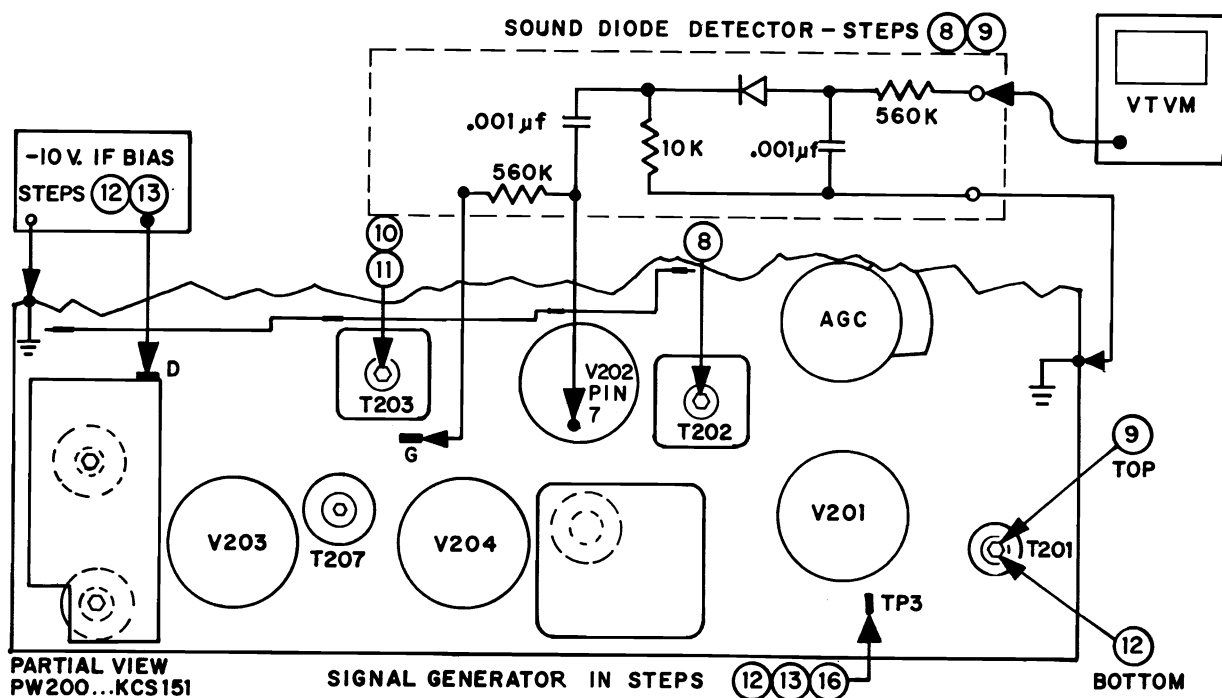
SOUND I-F ALIGNMENT OF KCS151 CHASSIS

SOUND I-F, SOUND DETECTOR AND 4.5 MC. TRAP ALIGNMENT

TEST EQUIPMENT CONNECTIONS:

- BIAS SUPPLY**.....Apply -10 volts to the I-F AGC bus at terminal "D" on PW200.
- OSCILLOSCOPE**.....Connect to kinescope cathode lead through diode detector.
- SIGNAL GENERATOR**.....Connect to test point TP3 on PW200.
- VACUUM TUBE VOLTMETER**.....Connect to output of diode detector shown. Set meter for negative voltage readings.
- MISCELLANEOUS**.....Connect test diode detector to pin 7 of V202. See below for adjustment locations.

STEP	SIGNAL GENERATOR	ADJUST	REMARKS
8	4.5 mc.	T202	Adjust for maximum negative DC on meter. Set generator for 1.0 to 1.5 volts when peaked. T201A top core and T202 core should penetrate the coil from top of can when finally peaked.
9	4.5 mc.	T201A (top)	
10	Disconnect the diode test detector. Turn off signal generator and tune in strongest signal in area, adjusting volume control for normal volume (approx. 1/4 turn from C.C.W.). Turn core of T203 flush with top of coil form. Remove bias.		
11	—	T203	Turn core clockwise to 2nd peak adjusting for maximum volume.
12	4.5 mc., 400 cycle, AM mod.	T201B (bottom)	Adjust for minimum 4.5 mc. indication on oscilloscope. The core should penetrate the coil from the bottom of the can when finally adjusted.



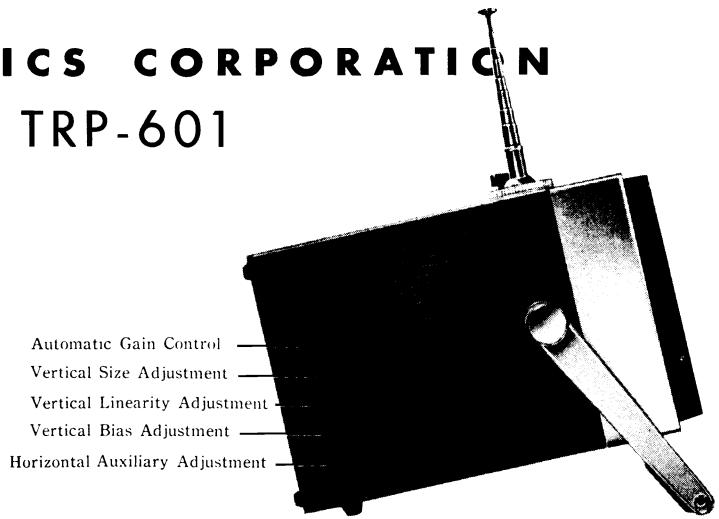
Sound I-F Alignment of KCS151 Chassis

SHARP ELECTRONICS CORPORATION

MODEL TRP-601

TO REMOVE CHASSIS

1. Remove all control knobs marked (A) in Pix. 4.
2. Remove three screws marked (B) in Pix. 4 and 5.
3. Remove screw from rubber foot marked (C) in Pix. 5. (Note: only one screw)
4. Remove two screws marked (D) in Pix. 6.
5. Remove cabinet (B) (you can now inspect the circuit.)
6. Unfasten 4 screws marked (E) in Pix. 7 and 8.
7. Remove the anode clip on the picture tube. (See Pix. 8)
8. Take out the picture tube socket. (See Pix. 8)
9. Take out the centering MG and deflection coil. (See Pix. 8)
10. Remove Cabinet A.



Pix. 2

AC

When operating from AC power source, AC cord should be inserted here.

DC

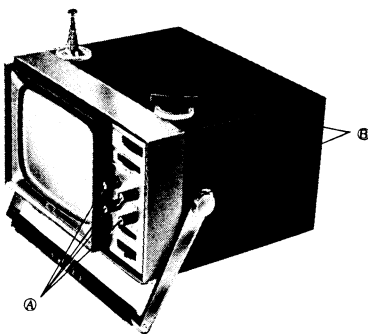
When operating from battery pack or from the *car or *boat battery, the DC cord should be inserted here.

* Special DC cord available

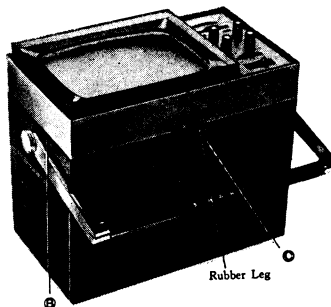
ON-CHARGE

Always leave this switch in "ON" position except for charging.

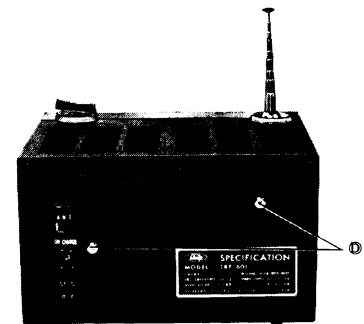
See "CHARGING" on the following page.



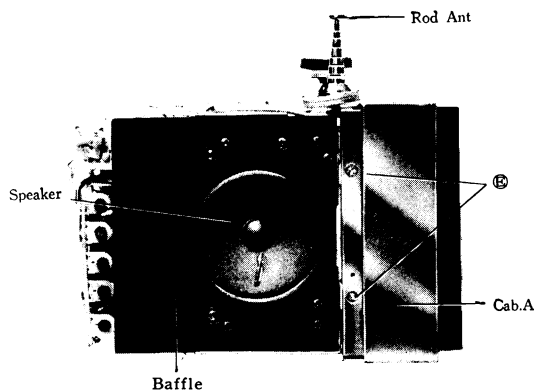
Pix. 4



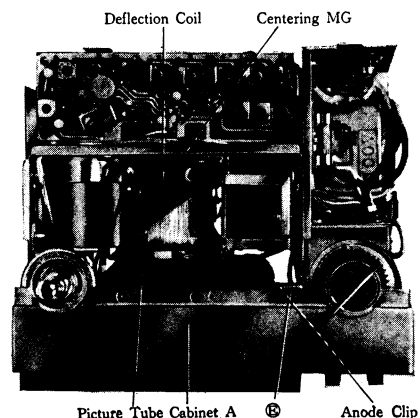
Pix. 5



Pix. 6

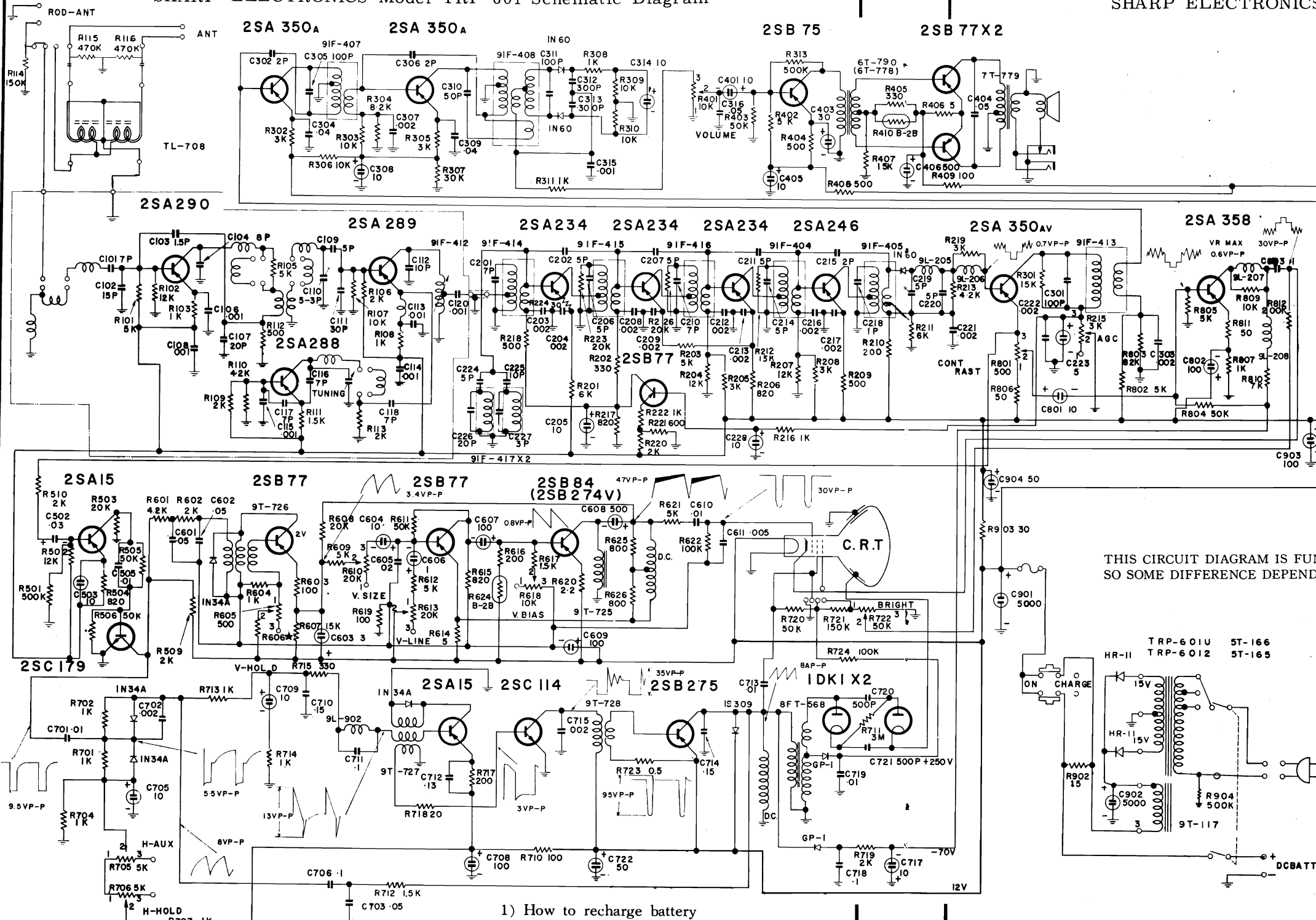


Pix. 7



Pix. 8

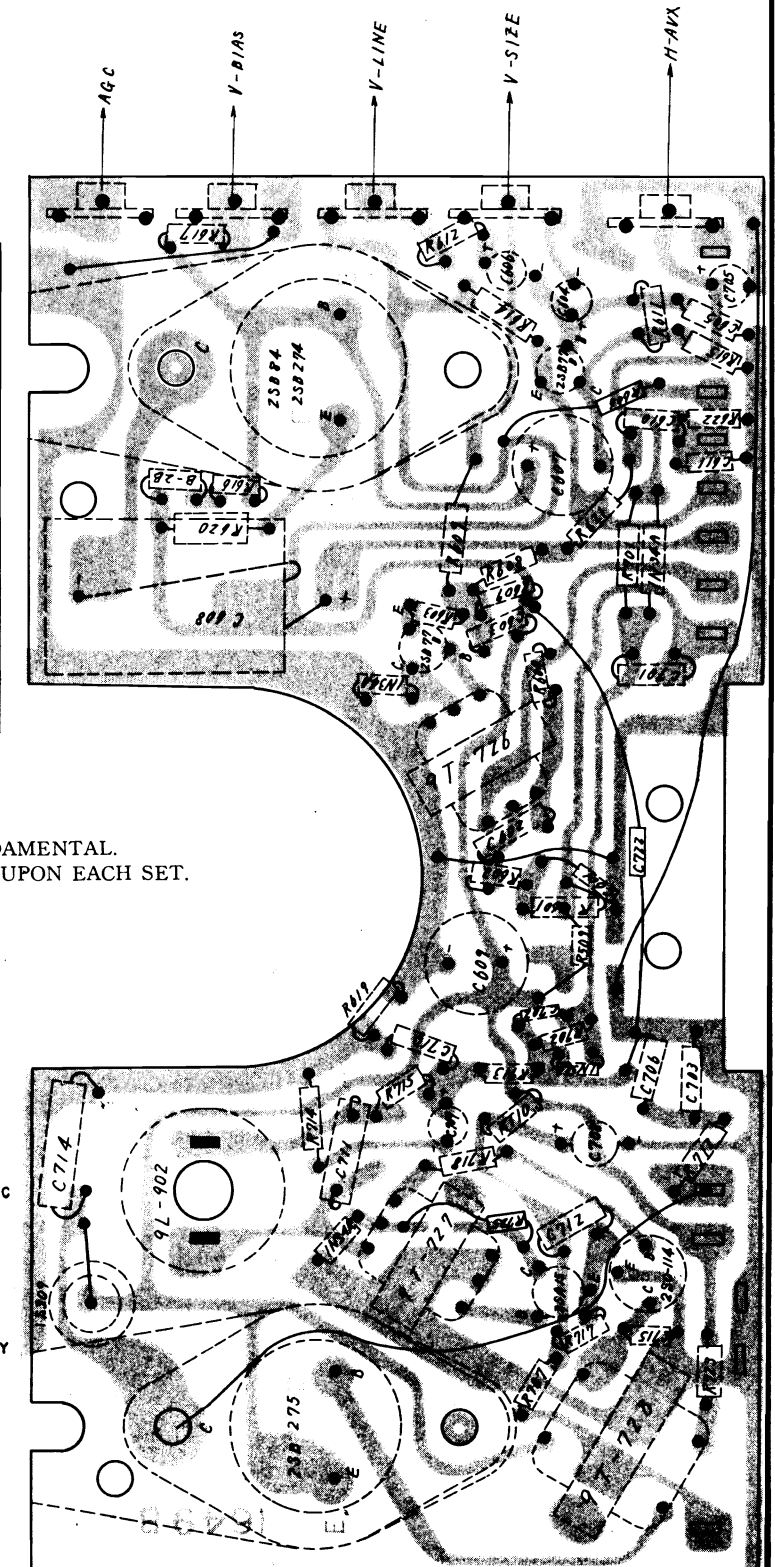
SHARP ELECTRONICS Model TRP-601 Schematic Diagram



CHARGING →

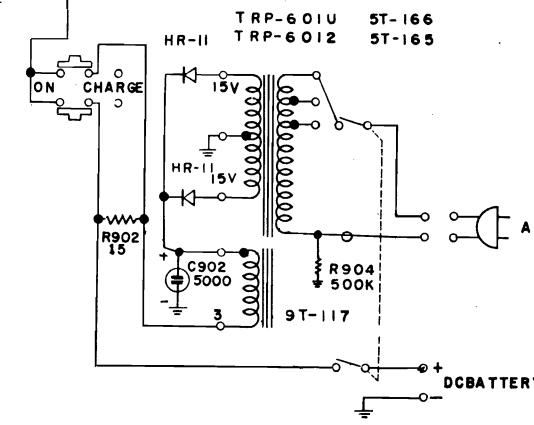
- 1) How to recharge battery
 - a) Connect AC cord to AC power line.
 - b) Connect DC cord to DC receptacle and the other end to battery.
Turn charging switch to charge position.
 - c) Turn front ON-OFF switch to ON position.

SHARP ELECTRONICS Model TRP-601 (Continued)



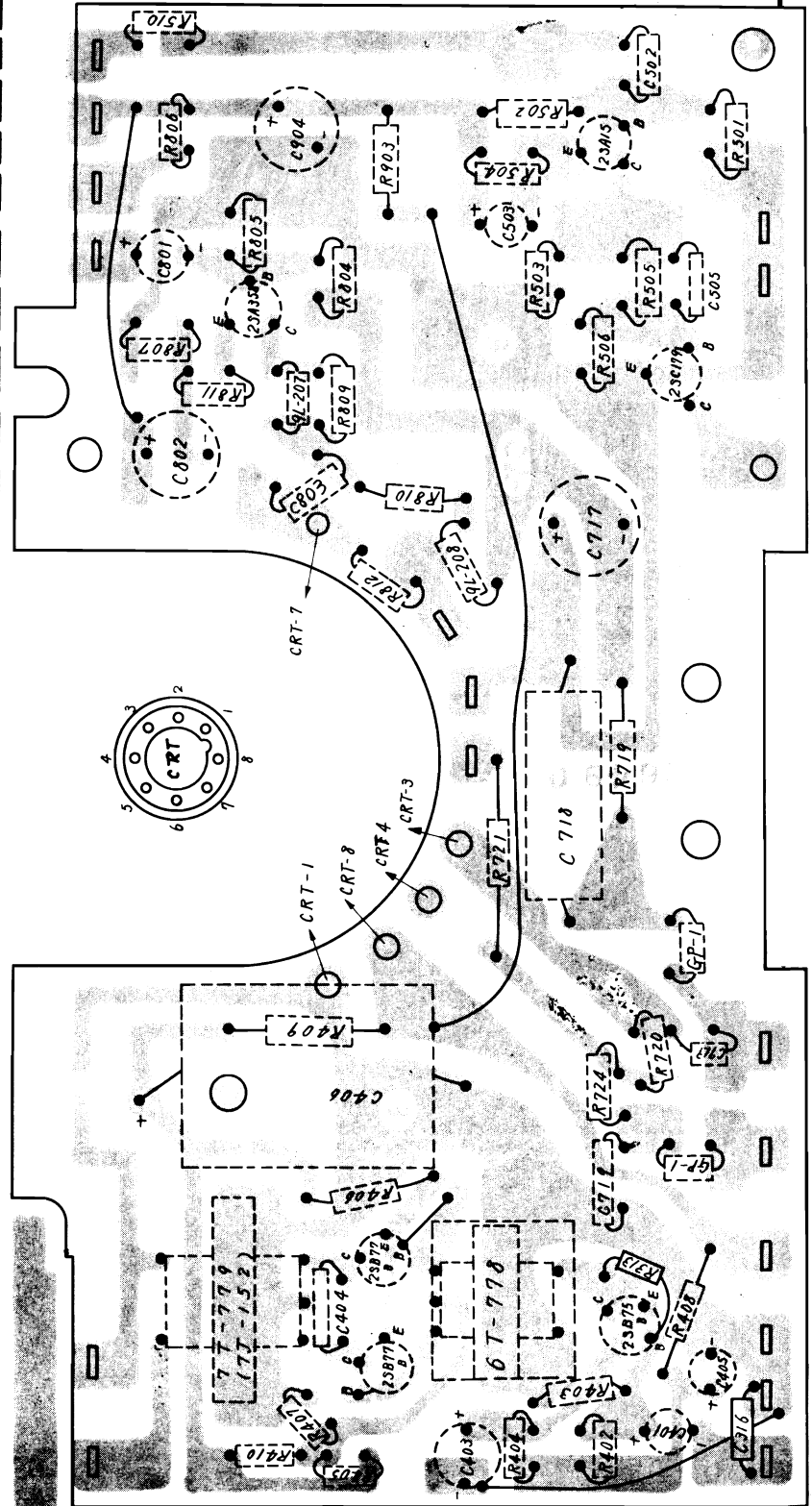
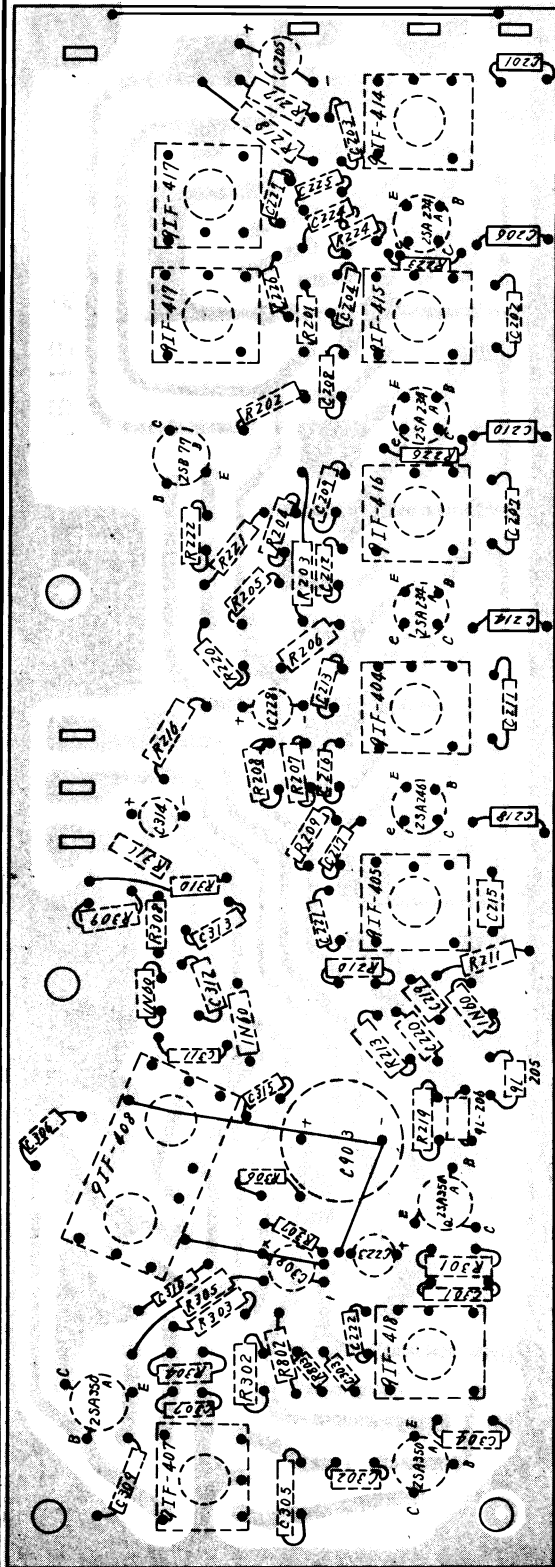
PRINTED CIRCUIT BOARD

THIS CIRCUIT DIAGRAM IS FUNDAMENTAL. SO SOME DIFFERENCE DEPENDS UPON EACH SET.



- 2) When to stop charging.
 - a) Charging time is about three times the time used.
Note: Return charge switch to "ON" position.

SHARP ELECTRONICS Model TRP-601 Printed Circuit Boards



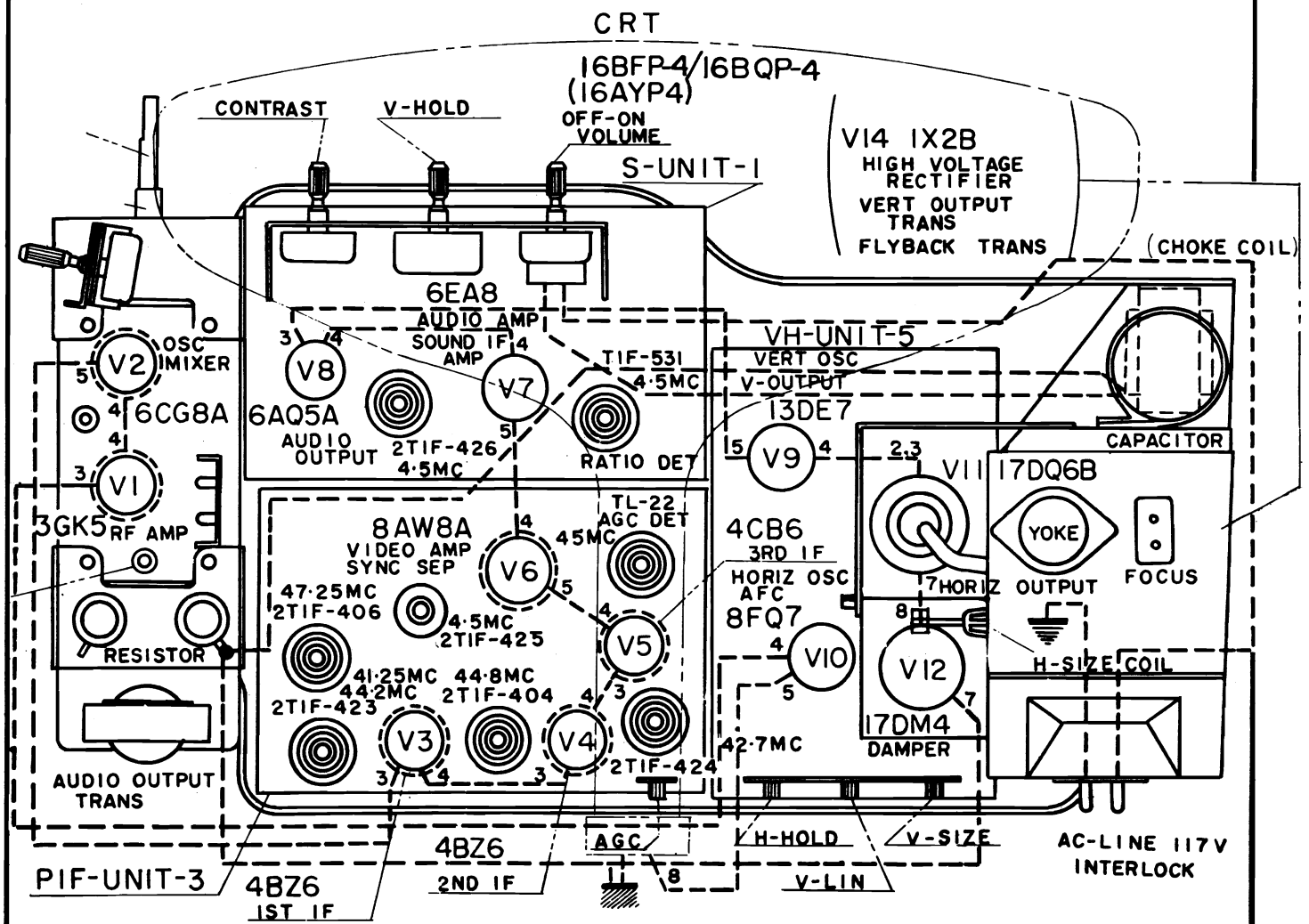
SHARP ELECTRONICS CORPORATION

MODELS 16TP-5, 16TP-5V

(Service material on pages 147 through 151)

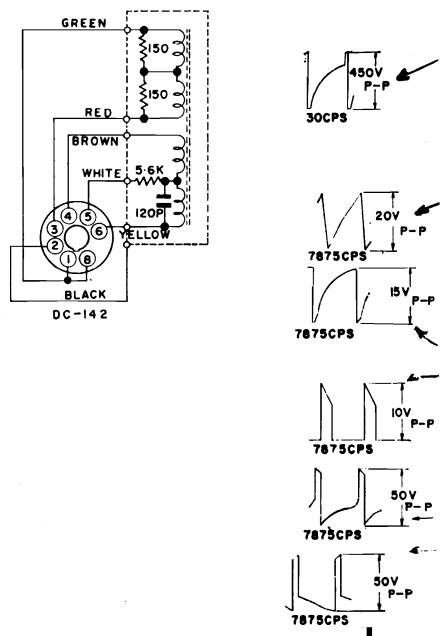
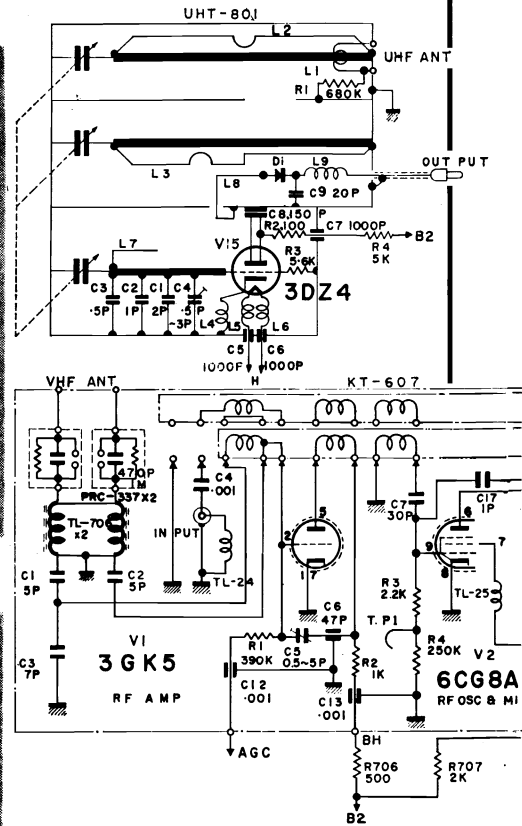
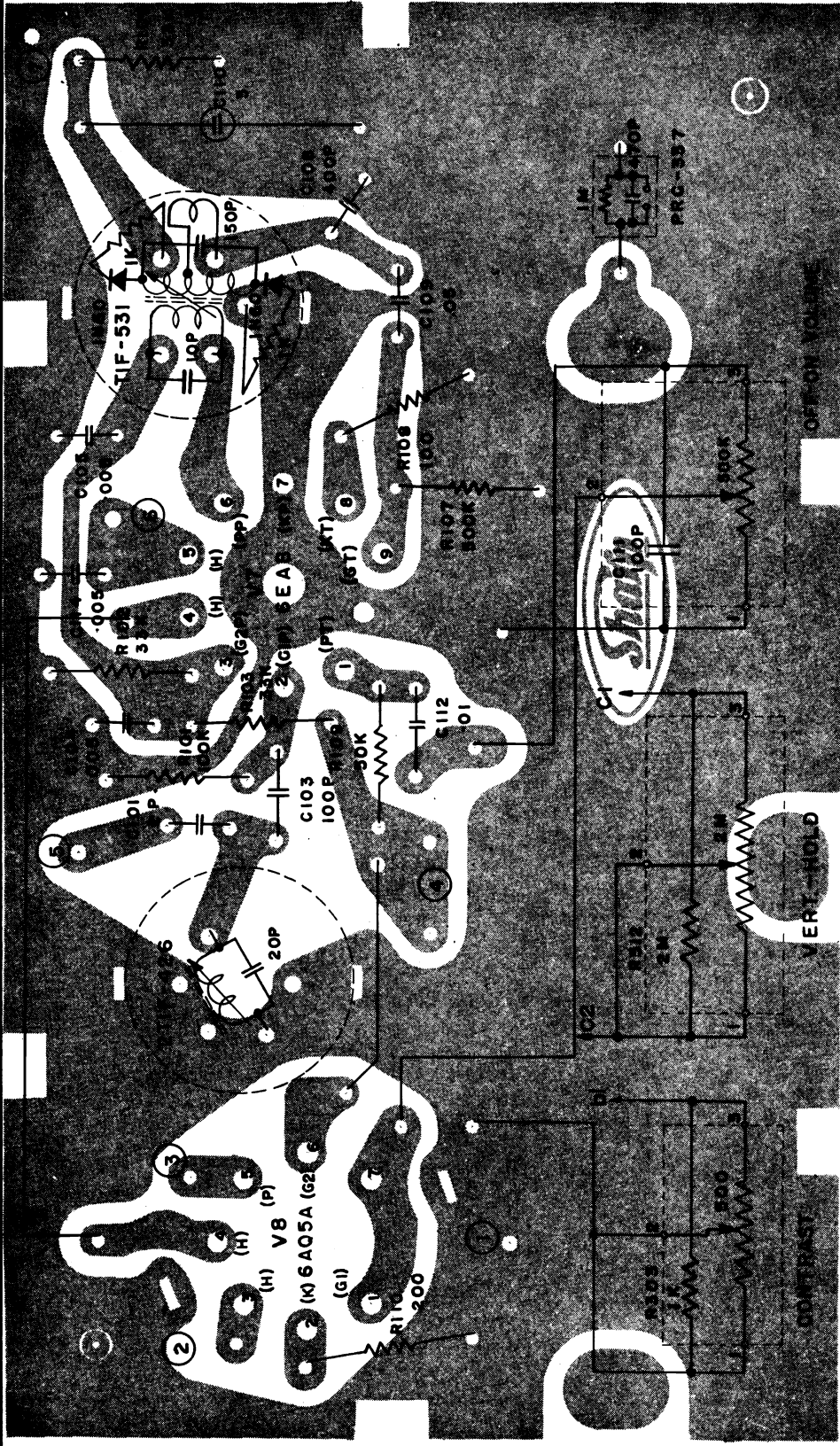
AGC. Adjustment :

- Turn the channel selector to the strongest station in the area and adjust the fine tuning control to correct the tuning point.
- Turn the contrast and brightness controls to their maximum.
- Turn round the A.G.C. clockwise until the picture "bends" or "jumps" sideways.
- Reverse the turning of A.G.C. counterclockwise until the picture becomes stabilized horizontally and vertically.
- Reduce the contrast and brightness to a normal setting and turn the fine tuning control to correct the tuning point, so that the best picture may be observed.



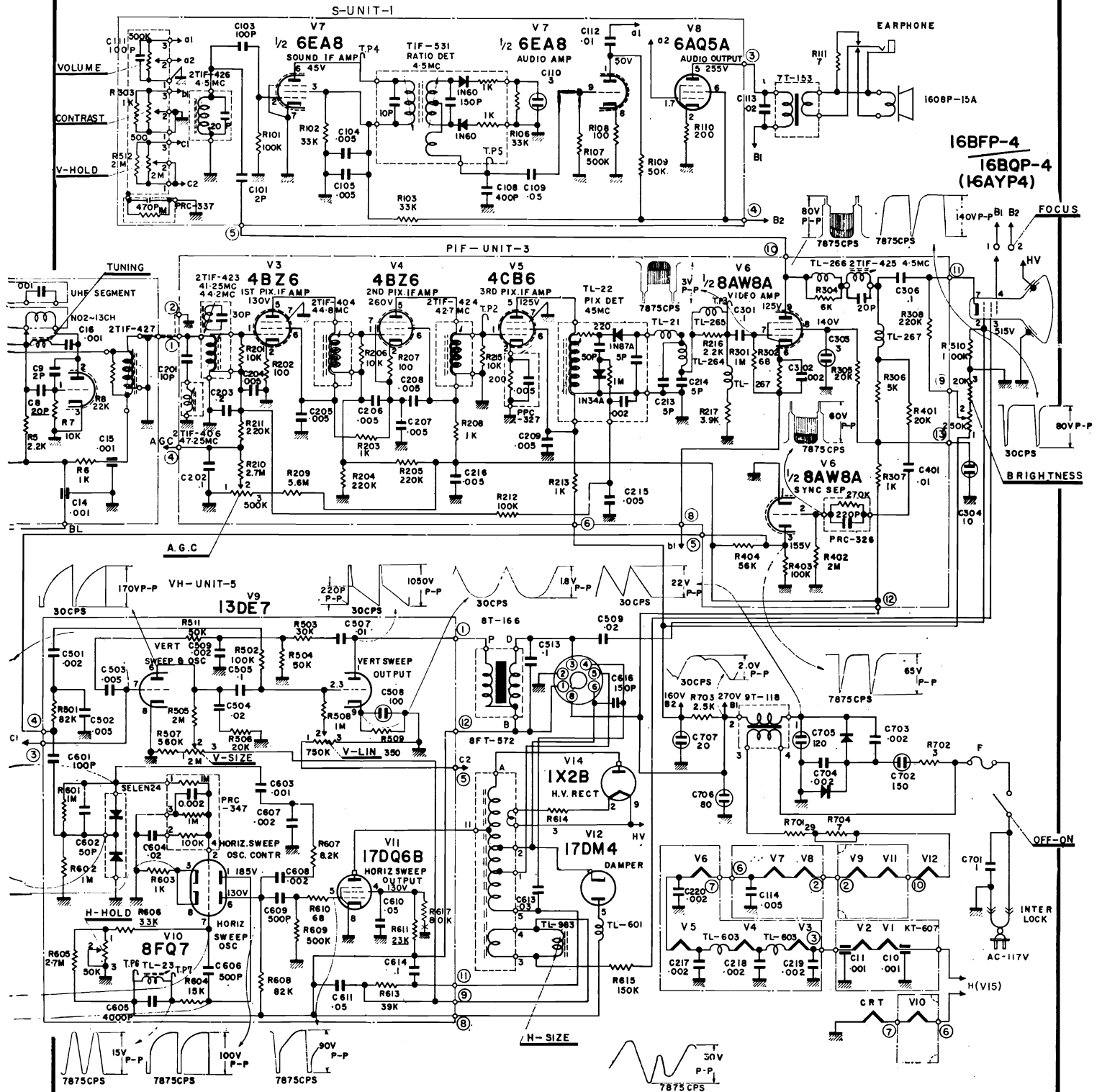
SHARP ELECTRONICS Models 16TP-5, -5V (Continued)

PRINTED CIRCUIT BOARD S-UNIT

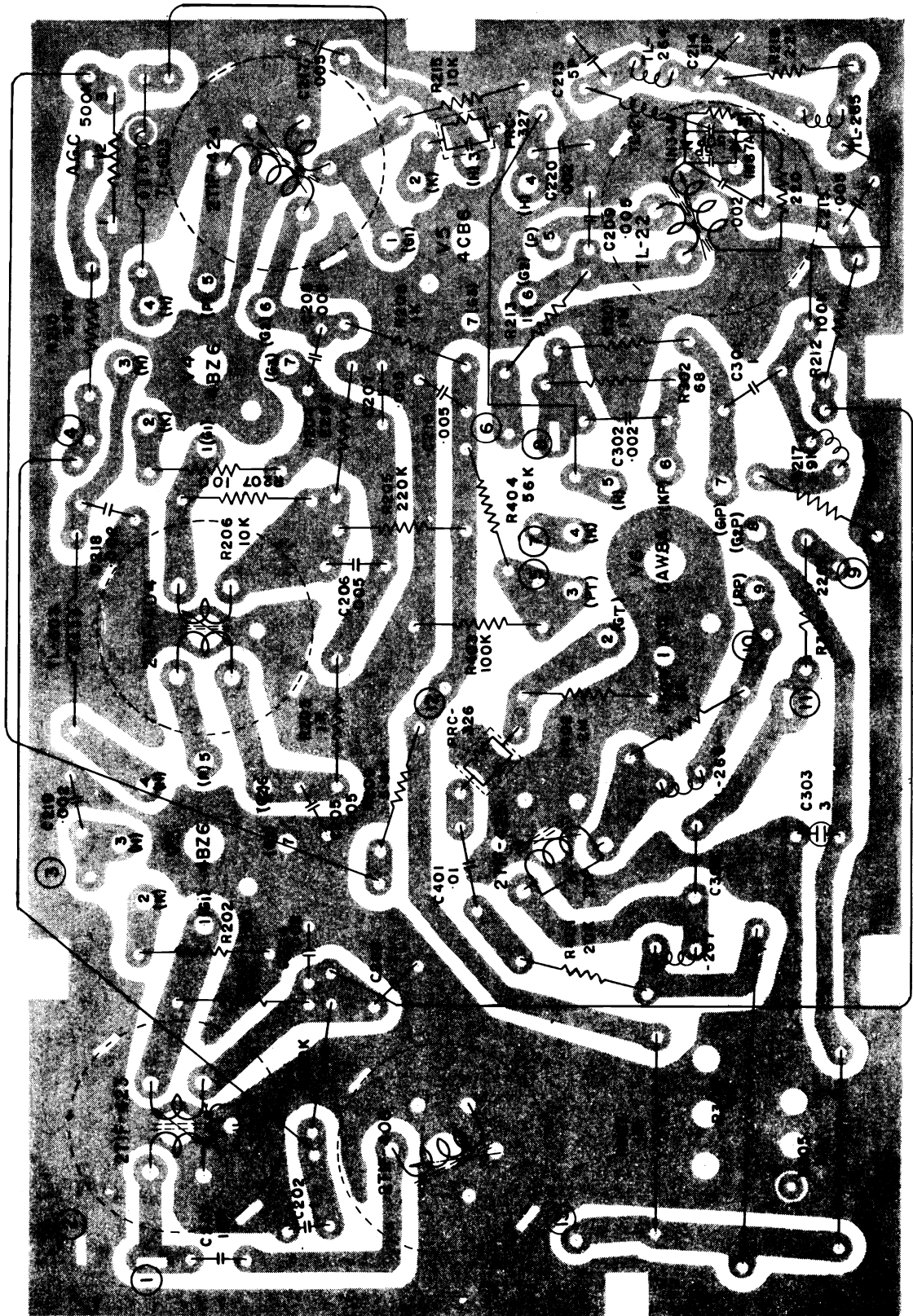


VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

SHARP ELECTRONICS Models 16TP-5, -5V Schematic Diagram (Continued)

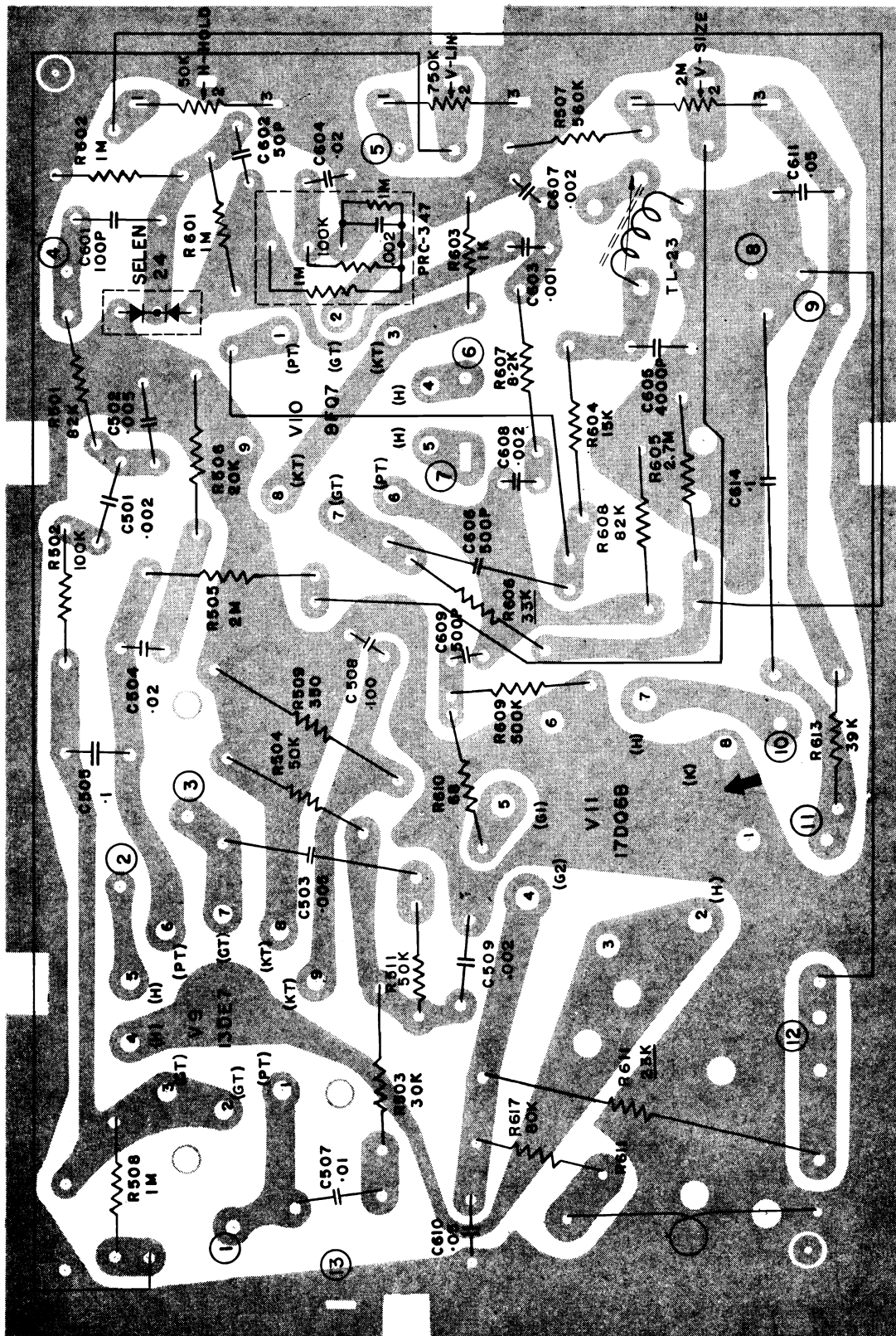


PRINTED CIRCUIT BOARD PIF-UNIT



SHARP ELECTRONICS Models 16TP-5, -5V Printed Circuit Board, Continued

PRINTED CIRCUIT BOARD VH-UNIT

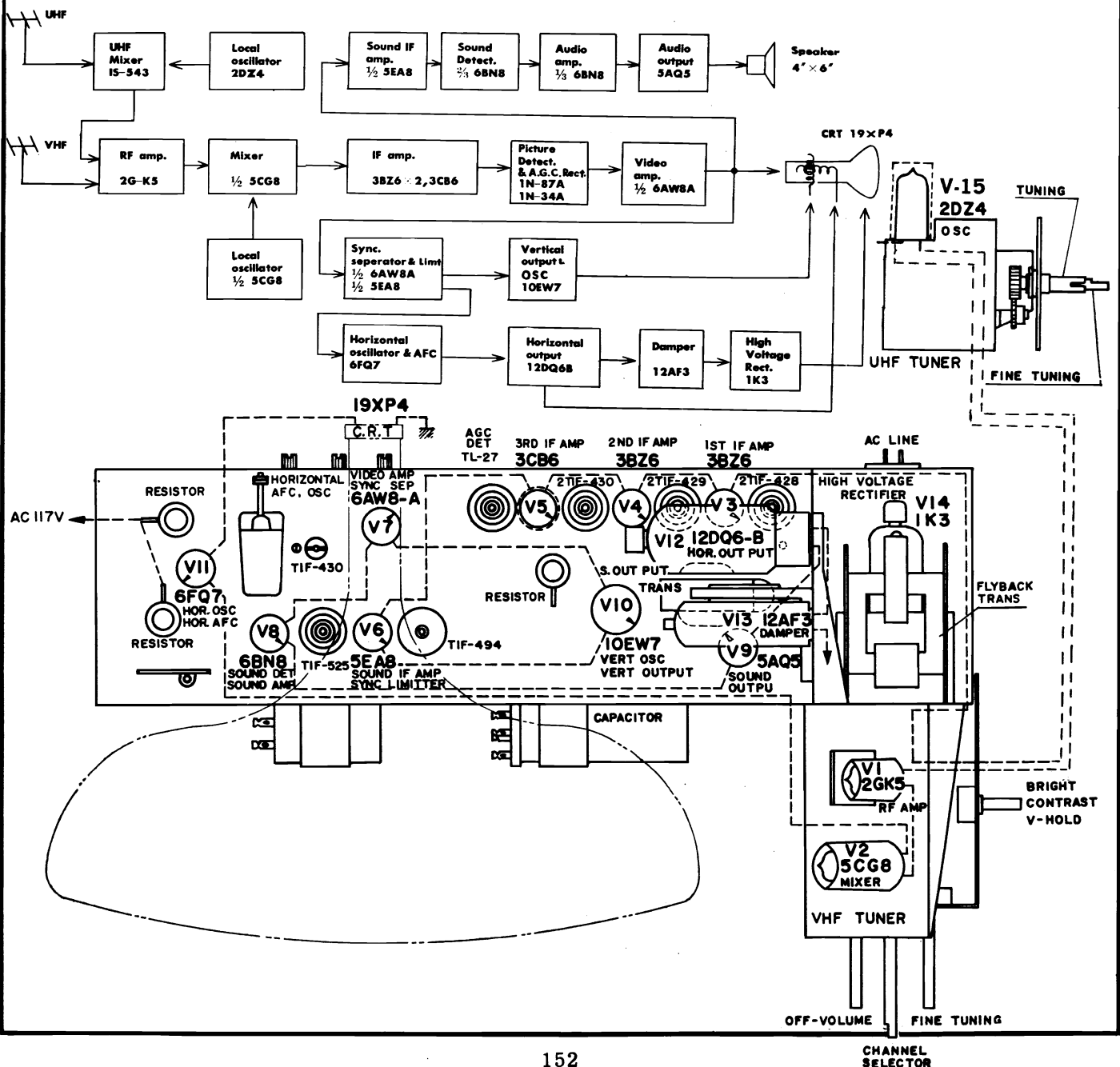


SHARP ELECTRONICS CORPORATION

MODEL 19TS-6(V)

Service material on pages 152 through 154.

To correct AGC adjustment, tune in the strongest local station. Turn contrast and brightness controls to their maximum. Turn AGC adjustment clockwise until the picture "bends" or "jumps" sideways. Turn AGC back (counter-clockwise) until the picture becomes stabilized horizontally and vertically. Reduce contrast and brightness to normal setting, retune with fine tuning control for a satisfactory picture.



SYLVANIA

CHASSIS: 581-1,-2,-3,-4

Model Series 23C111, 23L121, 23L124, 23T101, 23T102, 23V128

CENTERING ADJUSTMENT

1. Position deflection yoke as far forward as possible on the neck (against the flare) of the picture tube.
2. Rotate centering adjustment rings (located on yoke cover) individually or together, until picture is centered. Turn brightness control to a low level and check that no corner cutting exists in the picture.

FOCUS

With contrast and brightness at normal settings connect focus jumper to either tie point X, Y, Z whichever gives maximum sharpness and clarity of fine detail in center and edges of picture.

HORIZONTAL AFC ADJUSTMENT

Before performing the following procedure, check AGC adjustment as described.

1. Set channel selector to strongest channel in area and adjust fine tuning control to correct tuning point.
2. Adjust vertical height, vertical linearity, and width control for normal picture.
3. Short pin 7 of V7 (6CS6) to ground and adjust **R414** Horiz. Hold Control until the picture becomes as stable as possible.
4. Remove short from pin 7 of V7 and adjust **L400** Horiz. Frequency for 9 Volts AC with hot lead of probe at horiz. test point **Ⓣ**, ground lead to chassis.
5. Rotate channel selector to a position on which no signal is received; then return to the original station. The picture should immediately fall into sync. If not, repeat steps 3,4,5.

HORIZONTAL LINEARITY

Before attempting to adjust Horizontal Linearity coil **L406**, make certain all other controls are adjusted for normal picture viewing. Using a test pattern, preferably a circle, rotate core of **L406** until it is all the way out. Then slowly turn core inward until the right hand side of test pattern (as viewed from the front) is pulled out to its maximum. When maximum is reached, reverse rotation of the core very slightly until both sides of the circle are linear. Final adjustment of the Vertical Height, Vertical Linearity and width controls may become necessary after adjusting **L406**.

CHASSIS REMOVAL

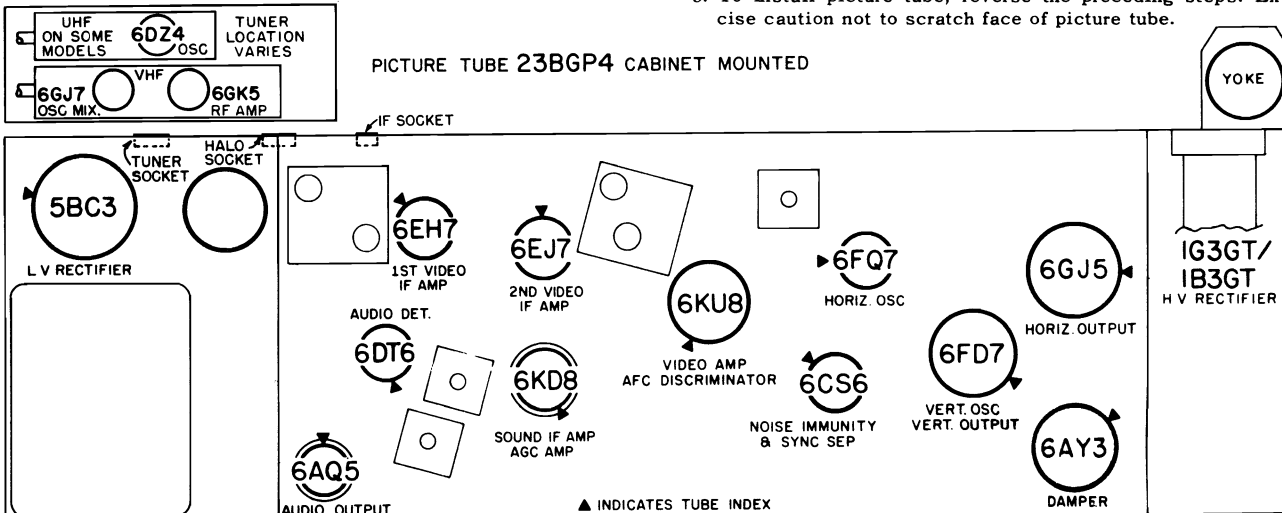
1. Disconnect AC power cord and antenna connections. Remove interlock cover.
2. Disconnect the following plug and socket connections:
 - A. Yoke - at chassis.
 - B. Tuner cluster - at chassis.
 - C. Halo-Light (on some models) - at chassis.
 - D. Picture tube cable - at picture tube.
 - E. High voltage lead - at picture tube.
 - F. IF input - at chassis.
 - G. Speaker leads - at speaker.
3. Remove screw securing braided cable grounding tuner assembly to main chassis.
4. Remove chassis mounting screw.
5. Slide chassis to the left until clear of slots and then to the rear until clear of cabinet. **NOTE:** Lower front control knobs will automatically disconnect while chassis is being removed.

NOTE: To remove yoke loosen screw on deflection yoke retaining ring. Slide yoke back on neck of picture tube until clear from tube.

6. Remove tuner cluster knobs by pulling straight outward.
7. Remove screws securing antenna board to cabinet.
8. Remove tuner mounting screws securing tuner cluster to cabinet. (On some models remove screw securing tuner to mounting bracket.)
9. Lift tuner cluster upward slightly and then back. Remove tuner cluster.
10. To replace chassis, reverse the above procedure, engaging lower front controls by pressing ends of shaft assemblies over control shafts. Reconnect all plug and socket connections.

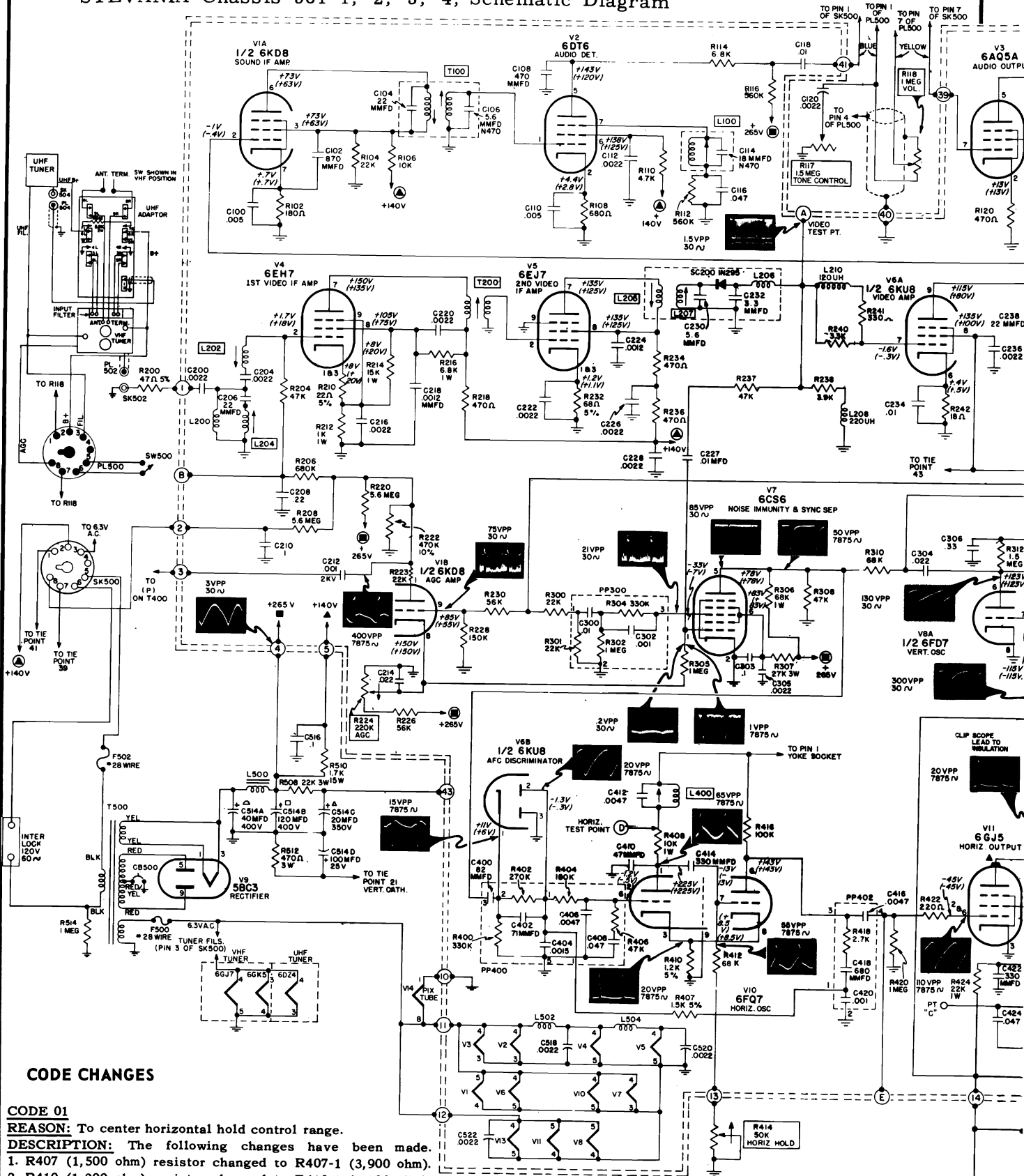
PICTURE TUBE REMOVAL

1. Remove chassis and tuner assembly as outlined under "Chassis Removal" procedure.
2. Lay cabinet face down on a soft material so as not to scratch or mar the face of the picture tube or finish on cabinet.
3. Remove the four brackets and screws securing picture tube to cabinet.
4. **USING GOGGLES AND GLOVES**, reach under face of tube and lift from cabinet, **DO NOT GRASP NECK OF PICTURE TUBE AT ANY TIME.**
5. To install picture tube, reverse the preceding steps. Exercise caution not to scratch face of picture tube.



VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

SYLVANIA Chassis 581-1, -2, -3, -4, Schematic Diagram



CODE CHANGES

CODE 01

REASON: To center horizontal hold control range.

DESCRIPTION: The following changes have been made.

1. R407 (1,500 ohm) resistor changed to R407-1 (3,900 ohm).
2. R410 (1,200 ohm) resistor changed to R410-1 (1,300 ohm).
3. R412 (68,000 ohm) resistor changed to R412-1 (82,000 ohm).

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

SYLVANIA Chassis 581-1, -2, -3, -4, Schematic Diagram, Continued

SCHEMATIC NOTES

PICTURE TUBE HIGH VOLTAGE ANODE MAY HAVE A POTENTIAL OF 19,000 VOLTS. OBSERVE ALL HIGH VOLTAGE PRECAUTIONS WHEN SERVICING THE CHASSIS. DO NOT OPERATE THE RECEIVER WITH THE HIGH VOLTAGE COVER REMOVED. USE SAFETY GOGGLES AND GLOVES WHEN HANDLING THE PICTURE TUBE.

VOLTAGE MEASUREMENT CONDITIONS UNLESS OTHERWISE SPECIFIED.

1. Voltages measured to chassis using VTVM.
2. AC power source 120 volt 60 cycle line.
3. Voltage readings in brackets taken with no input; channel selector set to a free channel, antenna disconnected, antenna terminals shorted together and grounded to chassis.
4. Voltage readings not in brackets taken with a strong signal input; tuner set to a strong local station developing approximately -7 volt on AGC Buss. NOTE: AGC VOLTAGE AT TEST POINT (B) WILL VARY FROM -7 VOLT ON A VERY STRONG SIGNAL TO A +20 VOLT ON A VERY WEAK SIGNAL.
5. Contrast control set to maximum. Brightness control set to minimum.
6. Voltage values shown are average readings. Variations may be observed due to normal production tolerances.

SPECIAL VOLTAGE MEASUREMENT CONDITIONS

- (B) Picture tube anode voltage measured with VTVM high voltage probe at line voltage of 120 volts under conditions of normal signal, no brightness and correct scan size.
- ▲ High peak voltage of short duration may damage meter used for this measurement.

WAVEFORM MEASUREMENT CONDITIONS

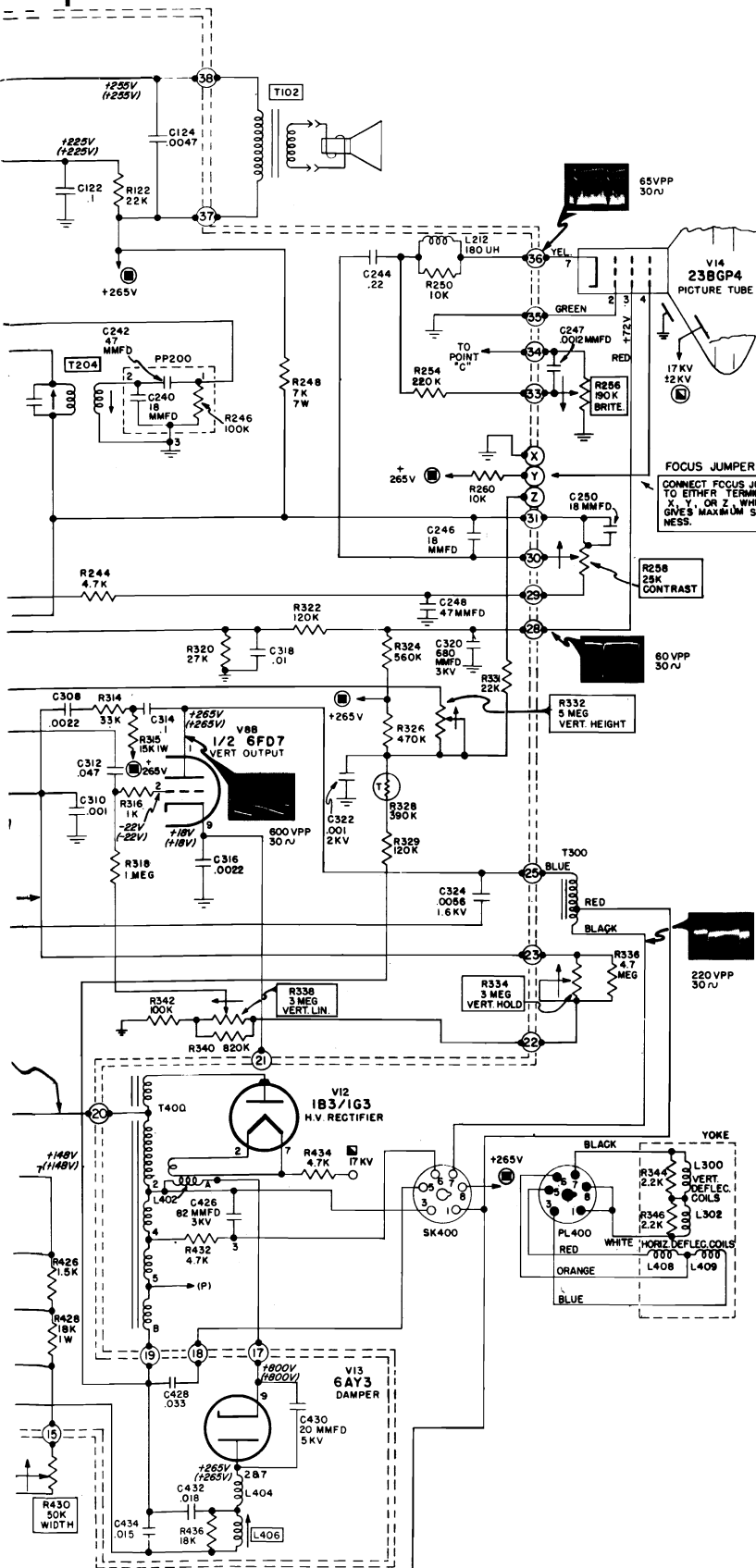
1. Channel selector set to strong channel.
2. Contrast control set for signal of 65 volt peak to peak at yellow lead of picture tube.
3. Waveforms measured with respect to chassis using a wide band oscilloscope. (Other type oscilloscopes may alter waveform shapes or amplitudes.)
4. The terms "30 μ " or "7875 μ " refer to scope frequency used.

GENERAL SCHEMATIC NOTES

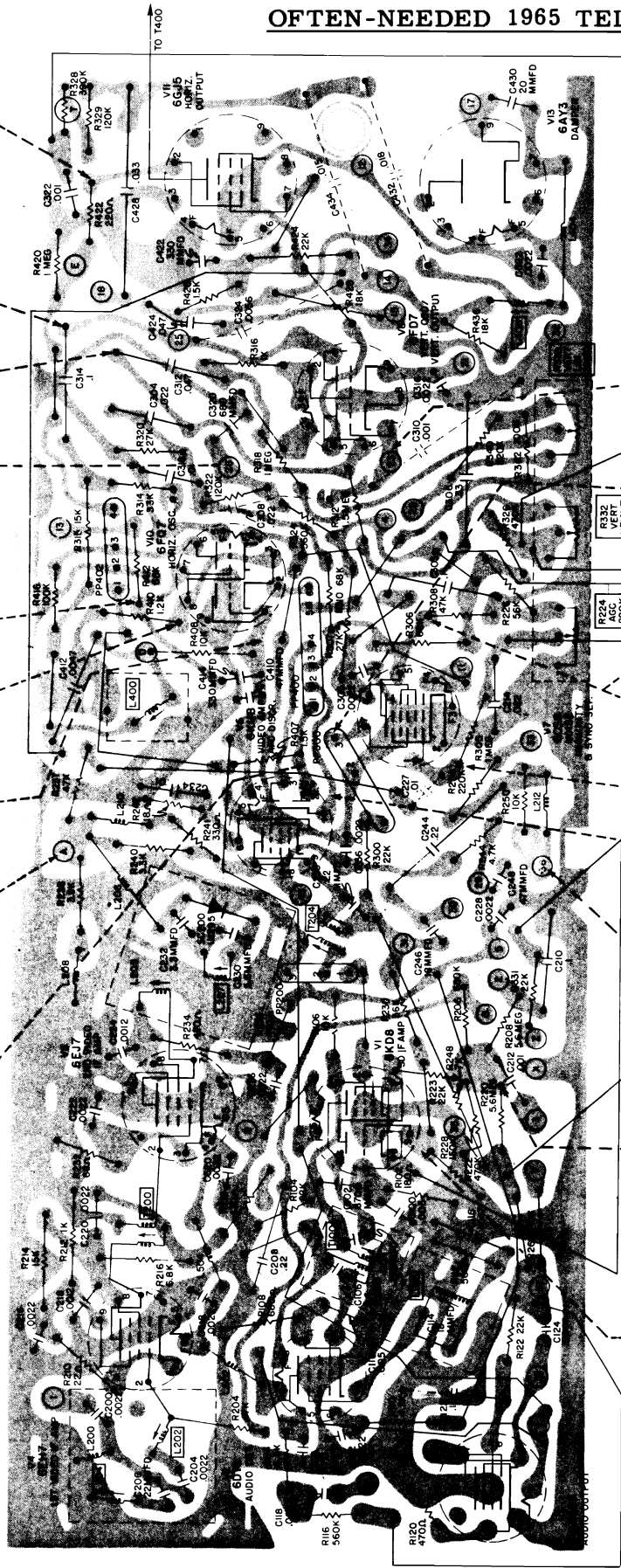
1. Voltage sources are indicated by encircled symbols, corresponding symbols without circles indicate voltage tie points.
2. Average resistances of coils and transformers are shown and are measured with component connected in circuit.
3. Encircled numbers on edge of printed circuit indicate tie points, corresponding with those shown on parts layout of printed board.
4. All capacitors are in microfarads unless otherwise specified.
5. Coils, transformers, plugs and sockets are shown as viewed from the bottom.
6. Arrows on controls indicate direction of clockwise rotation.

PARTS CODING

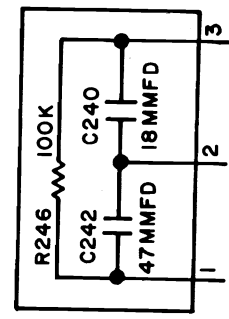
Sound Section	100-199
Video Section	200-299
Vert. and Sync Section	300-399
Horiz. and H.V. Section	400-499
L.V. Supply, Fil., Misc.	500-599



SYLVANIA
Chassis 581-1,-2,-3,-4

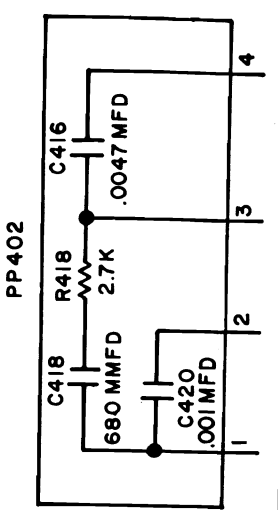
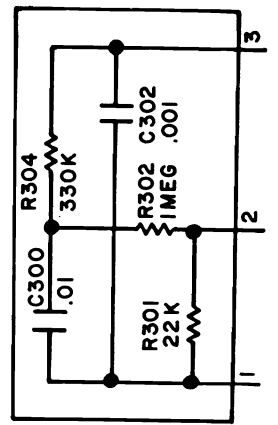
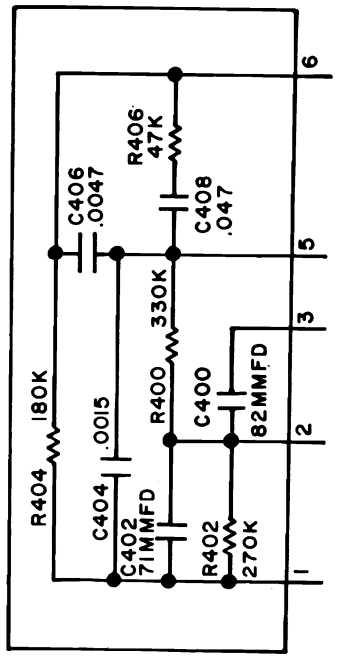


- 110VPP 7875 \sim 30 \sim
- 600VPP 30 \sim
- 130 VPP 30 \sim
- 60 VPP 30 \sim
- 55 VPP 7875 \sim
- 20 VPP 7875 \sim
- 65 VPP 7875 \sim
- 1-5 VPP 30 \sim
- 20 VPP 7875 \sim



- 300 VPP 30 \sim
- 21VPP 30 \sim
- 85 VPP 30 \sim
- 50 VPP 7875 \sim
- 15VPP 7875 \sim
- 1 VPP 7875 \sim
- 65 VPP 30 \sim
- 400 VPP 7875 \sim
- 75 VPP 30 \sim

VIEWED FROM COMPONENT SIDE.



Westinghouse

CHASSIS V-2446-1, -2, -3, -4, -5,
V-2446-6, -10

Cross index of models and chassis is below, service material on pages 160 through 165

MODEL AND CHASSIS CHART

MODEL	CHASSIS	TUNERS	UHF ADAPTABILITY	FEATURES
H-P3009 H-P3010 H-P3014	V-2446-1	470V135H01	EXTERNAL CONVERTER REQUIRED	VHF
H-P3010U H-P3014J	V-2446-2	470V137H01 VHF 472V041H01 UHF	FACTORY EQUIPPED	VHF/UHF
H-P3011 H-P3012 H-P3019	V-2446-3	470V135H01	EXTERNAL CONVERTER REQUIRED	VHF INSTANT ON
H-P3011U H-P3012U H-P3019U	V-2446-4	470V137H01 VHF 472V041H01 UHF	FACTORY EQUIPPED	VHF/UHF INSTANT ON
H-P3015	V-2446-5 V-2418-5 (Remote Receiver)	470V139H01	UHF STRIPS (Four Maximum)	VHF INSTANT ON REMOTE CONTROL

Chart for Additional Models and Chassis

MODEL	CHASSIS	TUNERS	FEATURES
H-P3010UA H-P3014UA	V-2446-6	470V137H01 VHF & 472V044H01 UHF	FACTORY EQUIPPED VHF/UHF
H-P3011UA	V-2446-10	470V137H01 VHF & 472V044H01 UHF	FACTORY EQUIPPED VHF/UHF, INSTANT ON

WESTINGHOUSE Chassis V-2446-1, etc., Service Information, Continued

CHASSIS REMOVAL

(The speaker and CRT remain in the cabinet.)

1. Remove the control knobs.
2. Disconnect the antenna leads and remove the back cover.
3. V-2446-5 ONLY: Remove the remote switch by prying out the trimount fasteners.
4. V-2446-5 ONLY: Slide the remote receiver out from the cabinet. Disconnect CA400 and PL400. Unplug the lead to the transducer.
5. Unsolder the speaker leads at the output transformer.
6. Remove the CRT socket, yoke, and width insert.
7. Discharge and disconnect the anode lead at the CRT.
8. Remove the chassis retaining screws (refer to Figure 1).
9. Carefully remove the chassis.

DEFLECTION YOKE

The deflection yoke should be as far forward as possible (touching the bell of the CRT). Rotation of the deflection yoke is used to level the raster.

HEIGHT AND VERTICAL LINEARITY

The Height and Vertical Linearity controls are located on the PC board, and are accessible when the back cover of the set is removed (refer to Figure 3).

With a narrow screwdriver, adjust these controls alternately until a picture of proper height and linearity is obtained.

AGC ADJUSTMENT

Connect a scope to TP Ⓢ. Tune in the strongest station and use an insulated screwdriver to adjust C420 for a zero to peak reading of 2.75 volts.

If a scope is not available, tune in the strongest station. Adjust C420 with an insulated screwdriver until the picture bends at the top. Then turn the screw back slightly until the bend disappears.

CENTERING

The centering rings, located at the rear of the deflection yoke, should be rotated to center the raster.

HORIZONTAL FREQUENCY AND RINGING COIL

1. Short out the ringing coil with a jumper wire between G & H.
2. Set the horizontal hold control to the center of its range. Do not change this setting during the steps that follow.
3. Connect a VTVM to TP Ⓞ for measuring the DC voltage between TP Ⓞ and B-. Set meter to center scale.
4. With the receiver tuned to a station of normal signal strength, adjust R415 (H.M.V. Range) for 0 volts DC on the meter (refer to Figure 3).
5. Remove the jumper from the ringing coil.
6. With horizontal sync locked in, adjust the ringing coil for 0 volts DC on the meter. Check the adjustment by switching to another channel and back again. The receiver should pull into horizontal sync on all channels.
7. If R410 is 82K and C413 is .047 (later production), adjust for -0.5 volts in steps 4 and 6.

WIDTH ADJUSTMENT

This adjustment is a plastic tab with a copper rectangle bonded on to one side. It protrudes out from between the yoke and the bottom of the neck of the picture tube. The shiny side of the copper rectangle goes up against the picture tube while the clamp opening goes to the top. The rectangle must be centered at the bottom of the CRT neck.

To adjust the width, loosen the yoke clamp. Pushing the tab into the yoke decreases width. Pulling the tab out of the yoke increases width. Best linearity, however, is possible with the width tab pushed all the way in. If insufficient width occurs, pull out the tab for just enough scan without causing poor linearity.

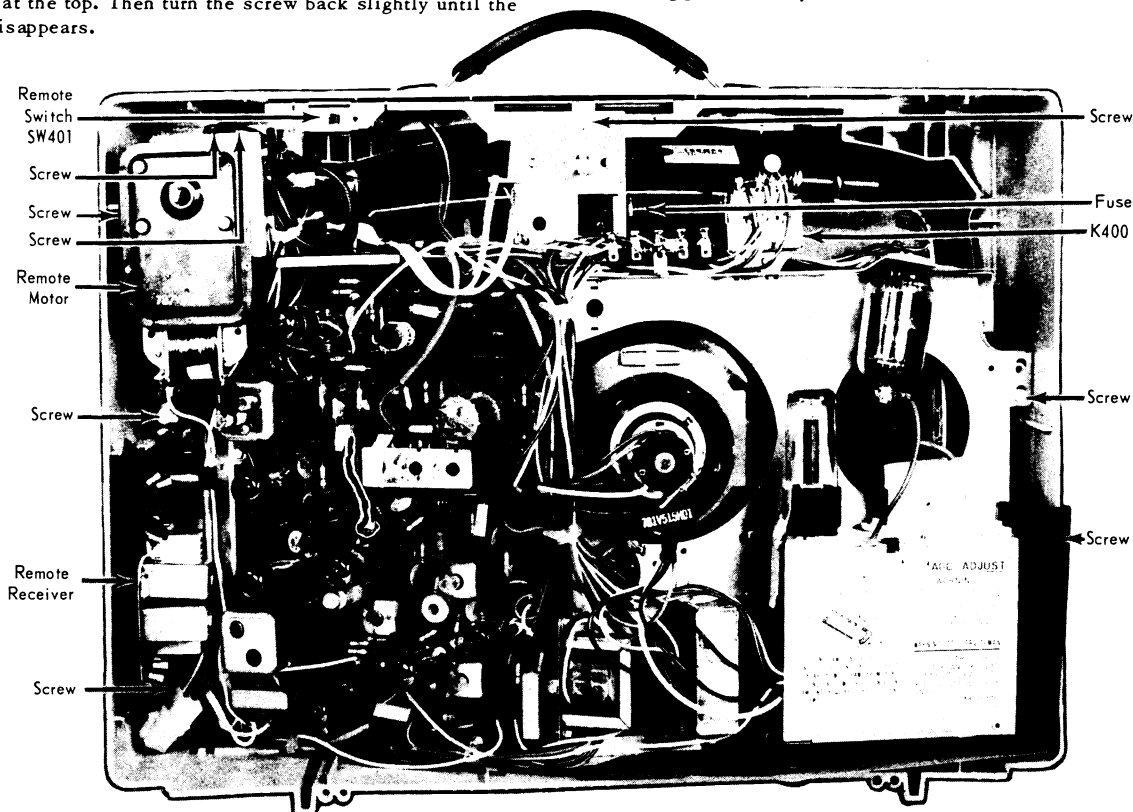
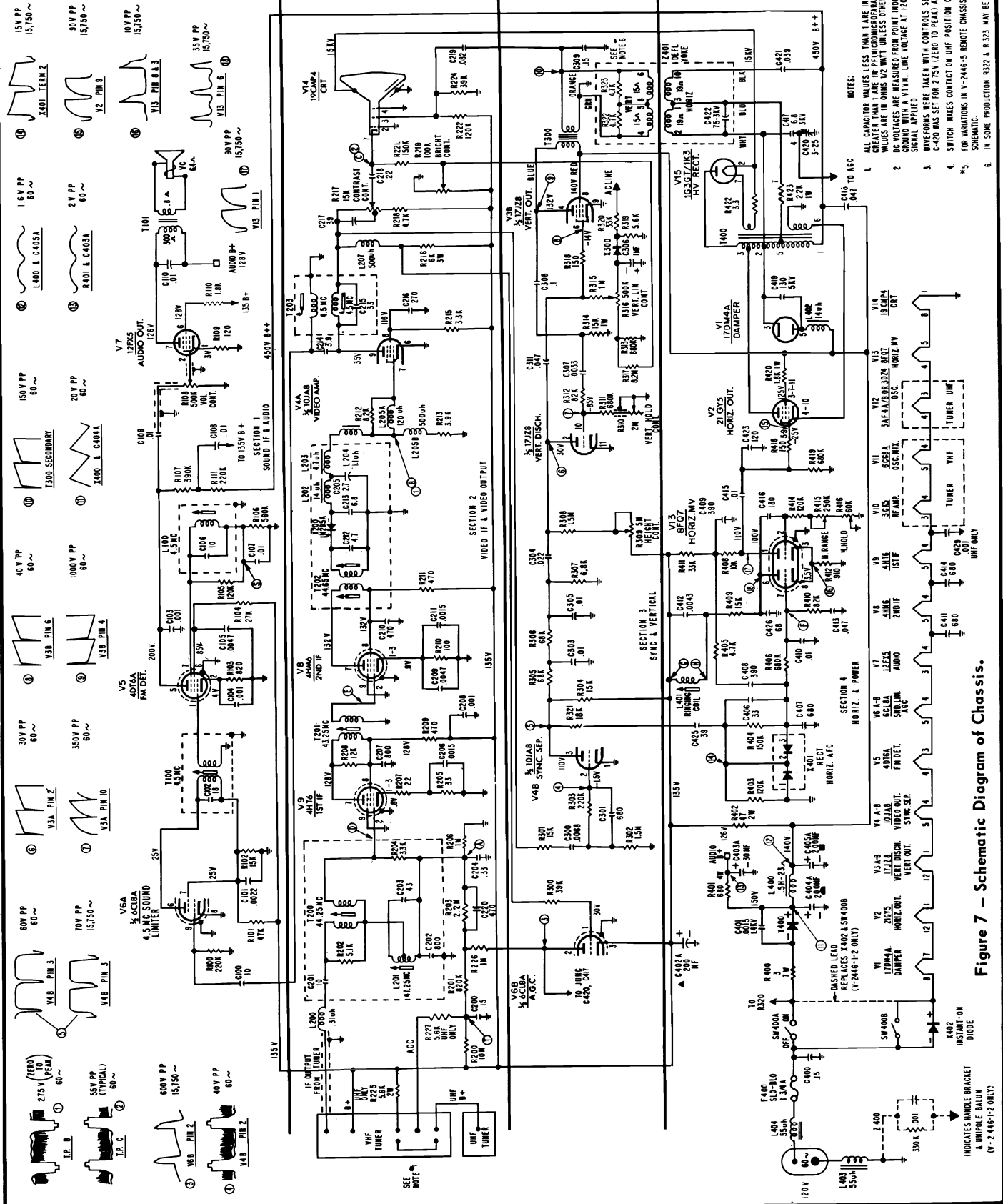


Figure 1 - Rear view of chassis V-2446-5, showing location of screws for chassis removal.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING

WESTINGHOUSE Chassis V-2446-1, etc., Schematic Diagram

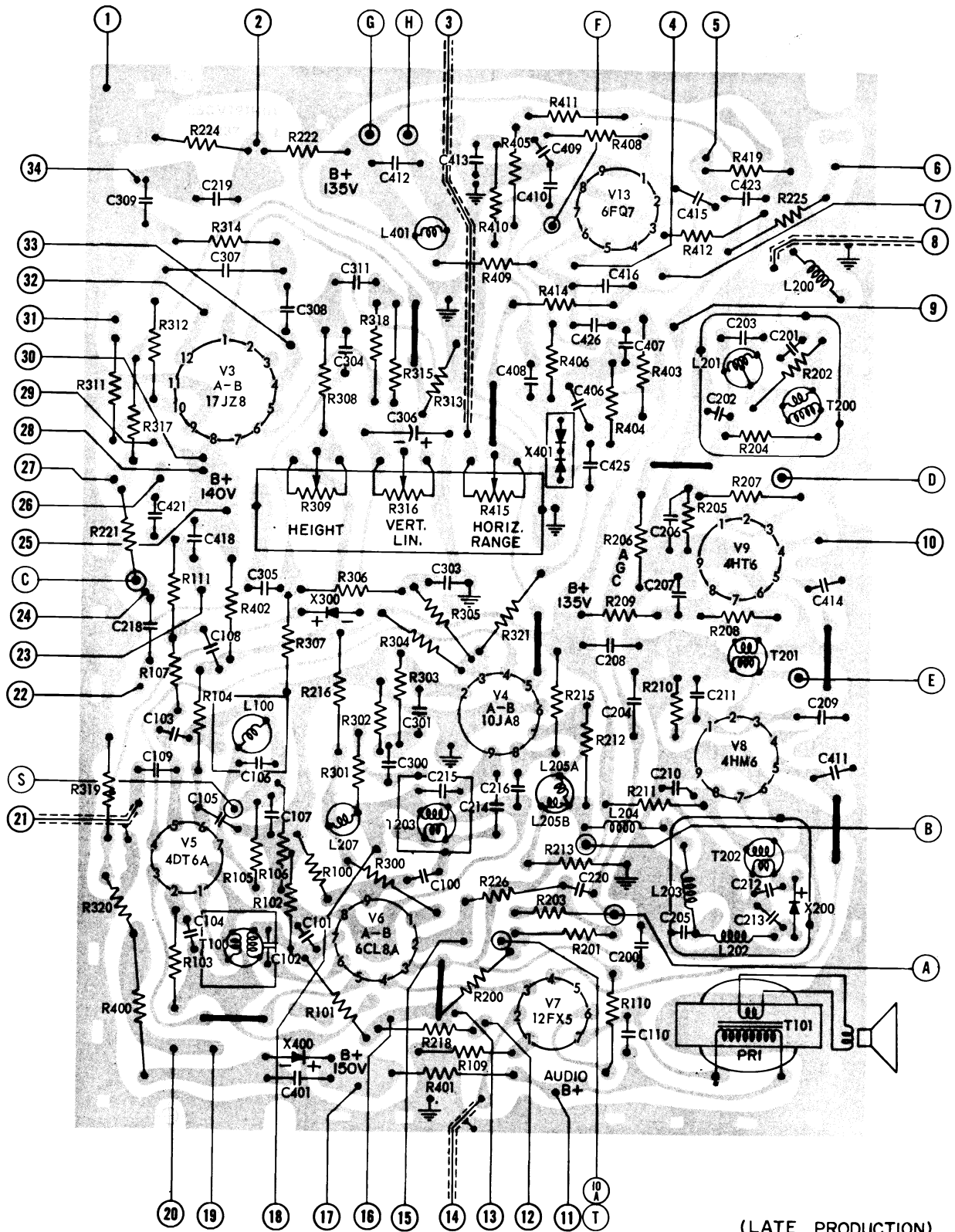


- NOTES:**
1. ALL CAPACITOR VALUES LESS THAN 1 μF ARE IN P.F. AND VALUES GREATER THAN 1 μF ARE IN μF UNLESS OTHERWISE INDICATED.
 2. DC VOLTAGES ARE MEASURED FROM POINT INDICATED TO CIRCUIT SIGNAL APPLIED.
 3. WAVEFORMS WERE TAKEN WITH CONTROLS SET FOR A NORMAL PICTURE C-420 WAS SET FOR 2.75V (ZERO TO PEAK) AT 1 P. Ⓢ.
 4. SWITCH MAKES CONTACT ON UHF POSITION ONLY.
 5. IN SOME PRODUCTIONS V-2446-5 REMOTE CHASSIS SEE SUPPLEMENTAL SCHEMATIC.
 6. IN SOME PRODUCTIONS R322 & R 323 MAY BE OMITTED.

Figure 7 - Schematic Diagram of Chassis.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

WESTINGHOUSE Chassis V-2446-1, etc., PC Board Information



(LATE PRODUCTION)

Figure 6 - Bottom view of PC board. Top components are shown in solid outline.
Tube pin numbering is for bottom of socket.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

WESTINGHOUSE Chassis V-2446-1, etc., Servicing Information, Continued

PC BOARD LEGEND

1. Ground for CRT and chassis
2. Pin 3 of CRT
3. R416, Horiz Hold control, top
4. Pin 8 of CRT
5. R418, horiz drive
6. UHF tuner B+
7. Tuner filament
8. IF input from tuner
9. VHF tuner B+
10. Tuner filament
- 10A. Tuner AGC
11. C403A, 200 mf
12. R217, Contrast control, bottom
13. C402A, 200 mf
14. R108, arm of Vol control
15. Jct of C420 & C417
16. R219, Brightness control, bottom
17. Jct of C404A & L400
18. R217, arm of Contrast control
19. 120VAC
20. Pin 8 of V1
21. R108, top of Vol control
22. R217, top of Contrast control
23. Lug 1 of T400, 450V B++
24. Pin 7 of CRT
25. L402, B+
26. Z400, yoke return
27. R219, Brightness arm
28. Jct of C405A & L400
29. R420, 140V, B+
30. T300, vert transf, red lead
31. R310, Vert Hold control
32. Pin 1 of V2, fil
33. T300, vert transf, blue lead
34. T300, secondary, retrace

TEST POINTS

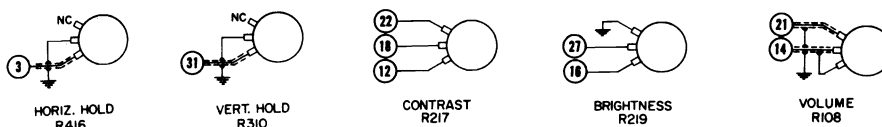
- A AGC for IF
- B Video detector
- C CRT cathode
- D 1st IF input
- E 2nd IF grid
- F Horizontal MV
- G Ringing coil
- H Ringing coil
- S Quad coil
- T AGC for tuner

TUBE COMPLEMENT AND RESISTANCE CHART

TUBE	TYPE	FUNCTION	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	17DM4A	Damper	NC	NC	INF.	NC	*1	NC	30	35	
V2	21GY5	Horiz Out.	25	680K	NC	1	N.C.	*0	N.C.	N.C.	680K
V3	17JZ8	Vert Disch. Vert Out.	20	*3.5M	NC	*150	N.C.	1M	N.C.	*0	0
V4	10JA8	Vid out. Sync. Sep.	0	1.7M	*15K	16	20	0	50	*3.3K	*4.5K
V5	4DT6A	FM det	0	820	15	16	INF.	*27K	560K		
V6	6CL8A	Snd Lim AGC	*53K	4.2M	*47	13	15	12K	12K	0	220K
V7	12FX5	Audio	120	0-500K	13	9	N.C.	*1.8K			
V8	4HM6	2nd IF	100	0	100	7	9	0	*470	*470	0
V9	4HT6	1st IF	55	1M	55	5	7	0	*470	*470	0
V10	3GK5	RF amp	0	3M	5	4.5	*2.2K	0	0		
V11	6CG8A	Osc-mixer	10K	*6K	0	4	4.5	*1K	*1K	0	220K
V12	3AF4A/B 3DZ4	UHF osc.	*5.6K	5.6K	3.5	4	0	5.6K	*5.6K		
V13	8FQ7	HMV	*43K	300K	910	3.5	2	*15K	2M	910	0
V14	19CMP4	CRT	0	0	35K	0	N.C.	N.C.	200K	2	
V15	1G3GT/1K3	H.V. Rect	INFINITE								

Resistance measured from pin of tube to B- (except *).

* To junction of R402 and L400.



All views seen from the rear.

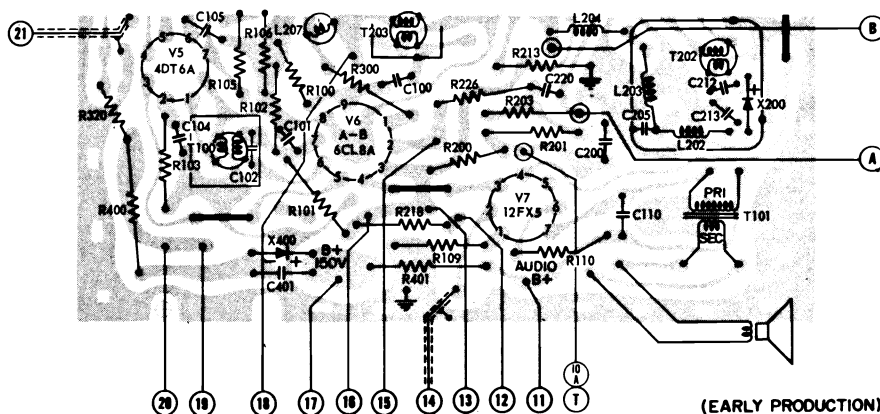


Figure 5 - Early production variation in PC board.

SOUND ALIGNMENT

EQUIPMENT: VTVM

PROCEDURE:

1. Select the strongest station available (preferably with test pattern and test tone) and adjust the FINE TUNING for best reception. Adjust the VOLUME control so that the station sound is audible.
2. Adjust the quad coil (L100) for maximum sound from the speaker.
3. Disconnect the antenna. Use a jumper wire to short TP@ to B-.
4. Connect the VTVM to TPⓈ.
5. Adjust interstage transformer T100 for maximum negative voltage on the VTVM.
6. Remove the jumper wire used to Short TP@ to B-.
7. Place the antenna input close to the antenna terminals so that the signal is loosely coupled to the receiver and the picture is barely visible. A pronounced noisiness (hiss)

should accompany the sound.

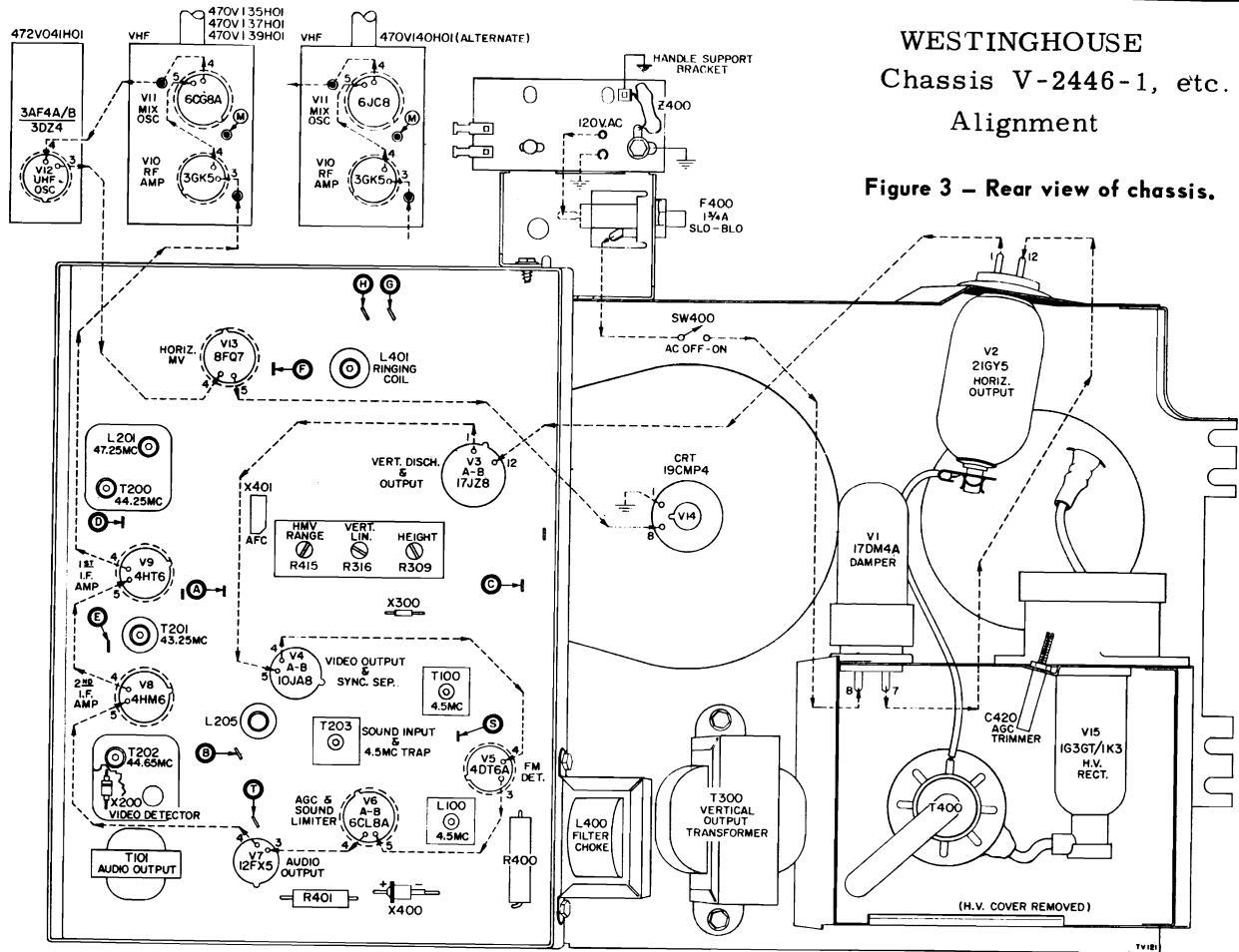
8. Adjust the limiter input coil (T203 top slug) for maximum negative voltage on the VTVM. If the VTVM indicates a broad response while making this adjustment, the receiver input signal is too strong. When the signal coupling described in step 7 is at the necessary low point, no limiting takes place and the VTVM will indicate a sharp response to the limiter input coil adjustment.

4.5 MC TRAP ALIGNMENT

Disconnect the antenna and turn contrast control to maximum clockwise. Inject a 4.5 MC CW signal through a .001mf capacitor to TP@. Connect a .001mf capacitor to a demodulation probe tip. Connect the other end of the probe to a VTVM and the capacitor to TPⓈ. Set the VTVM to 1.5-2V DC range. Turn the set on and allow ten minutes for warmup. Then adjust T203 bottom slug for minimum on the VTVM.

WESTINGHOUSE
Chassis V-2446-1, etc.
Alignment

Figure 3 - Rear view of chassis.



IF ALIGNMENT

EQUIPMENT

1. Sweep Generator with a 10 MC wide sweep at center frequencies from 10 MC to 90 MC and 170 MC to 216 MC.
2. CW (Marker) Generator which accurately produces the IF and RF frequencies from 4.5 MC to 216 MC.
3. Oscilloscope with good low frequency response characteristics.
4. VTVM.
5. Bias Supply of -2.5 volts and -3 volts.
6. Standard Alignment Tool with a 3/32" hexagonal tip (long enough to reach bottom slugs).

TERMINATION AND ADJUSTMENT OF EQUIPMENT

These instructions on termination and adjustment of equipment will apply throughout the IF Alignment procedure.

All test equipment cables and leads should be as short and direct as possible.

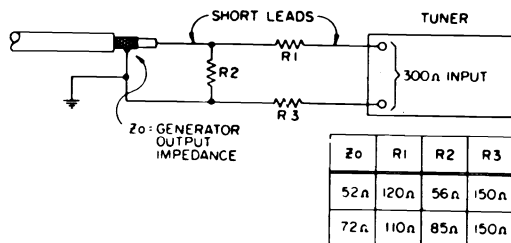


Figure 11 - Impedance Matching Network.

Oscilloscope and VTVM - Use a low-capacitance direct probe terminated with the decoupling network shown in Figure 13. Keep the oscilloscope calibrated for 2 volts peak to peak (P-P). Use a VTVM range suitable for measuring -1.5 volts.

Generators - Except where otherwise noted, all signal generating equipment should be terminated as shown in Figure 12. Connect the signal cable ground near the ground of the stage where the signal is injected.

Adjust the CW generator output so that: (1) When the VTVM is being used its reading remains near the -1 volt point. (2) When the oscilloscope is being used, the marker frequencies do not distort the response curve.

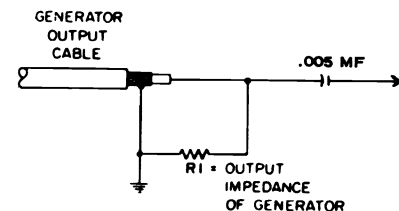


Figure 12 - Generator Cable Termination.

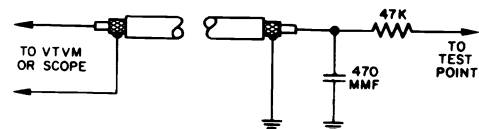


Figure 13 - VHF Decoupling Network.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

WESTINGHOUSE Chassis V-2446-1, etc., Alignment Information, Continued

IF ALIGNMENT

Step	Test Equipment and Connection	Adjustment
1.	-3V bias to TP Ⓐ and -2.5V bias to TP Ⓞ. Short antenna terminals. Channel selector to channel 10. Connect jumper from Pin 2 of V6B to B- to disable the AGC pulse.	
2.	Oscilloscope and VTVM to TP Ⓐ. IF sweep generator with CW marker to TP Ⓞ. a. 44.65 MC. b. 45.75 MC.	a. T202 primary (top slug): Maximum amplitude on VTVM. T202 secondary (bottom slug): Rocking symmetrical response at 44.65 MC. b. Place 45.75 MC marker at 70% of peak response (see Figure 14) for waveshape and marker placement.
3.	CW generator to TP Ⓞ. a. 43.25 MC.	a. T201: Maximum amplitude on VTVM.
4.	CW generator to TP Ⓞ. a. 44.25 MC. b. 44.25 MC. c. 47.25 MC. It may be necessary to increase generator output and/or decrease bias.	a. Tuner mixer output coil: Maximum on VTVM. b. T200: Maximum on VTVM. c. L201: Minimum on VTVM.
5.	Connect sweep generator to TP Ⓞ at 44.25 MC. Couple CW generator with marker at 44.25 MC to sweep generator cable. Keep marker amplitude low to avoid distorting response. Adjust scope for 2V PP.	Mixer output coil for maximum amplitude. T200 for "rocking symmetrical response with waveshape and markers" as shown in Figure 16.
6.	CW generator to TP Ⓞ at 47.25 MC.	Repeat step 4c.
7.	Oscilloscope, 2V PP. Sweep generator thru impedance matching network (see Figure 11) to antenna terminals. Set pix marker at 211.25 MC, channel 13. Inject 45.75 MC marker into IF section by connecting CW output cable to outer shield of IF link cable.	Fine tuning to center of range Channel selector to channel 13. Oscillator slug setting: Picture carrier should fall at 45.75 MC (± 300 KC) marker on scope. (See Figure 17).
8.	Repeat step 7 for all channels in descending order.	

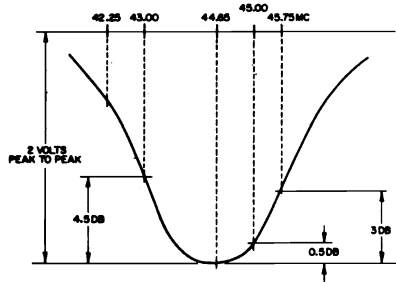


Figure 14 - Typical IF Response, 2nd IF Amp Grid to 2nd Det.

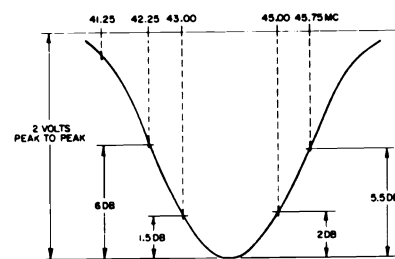


Figure 15 - Typical IF response, 1st IF Amp Grid to 2nd Det.

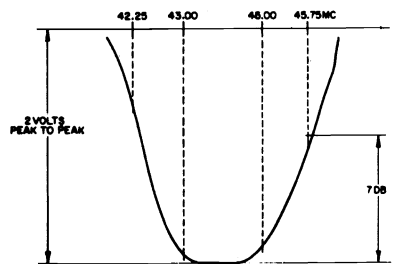


Figure 16 - Typical IF response, Mixer Amp grid to 2nd Det.

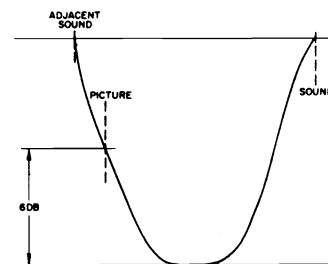


Figure 17 - Typical RF-IF response.

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CHASSIS V-2472-1, -2

MODEL AND CHASSIS CHART

MODEL	CHASSIS	TUNERS	UHF ADAPTABILITY	FEATURES
H-P3020	V-2472-1	470V135H01	EXTERNAL	VHF INSTANT ON
		470V141H01 (ALTERNATE)	CONVERTER REQUIRED	
H-P3020U	V-2472-2	470V137H01 VHF 472V041H01 UHF	FACTORY EQUIPPED	VHF/UHF INSTANT ON

CHASSIS REMOVAL

(The speaker and CRT remain in the cabinet).

1. Remove the control knobs.
2. Disconnect the antenna leads and remove the back cover.
3. Unsolder the speaker leads at the output transformer.
4. Remove the CRT socket, yoke, and width insert.
5. Discharge and disconnect the anode lead to the CRT.
6. Remove the chassis retaining screws (refer to Figure 1).
7. Carefully remove the chassis.

FUSE

The power supply fuse (F400) is located at the rear of the chassis below the AC input plug (refer to Figure 1). The fuse is a 2-amp, 125-volt slo-blo type.

PC BOARD ACCESSIBILITY

To provide access to the underside of the PC board with the set operating:

1. Remove the chassis.
2. Turn the chassis around.
3. Connect the yoke and width insert, CRT socket, and high-voltage lead (use a jumper). A test speaker may be connected to the audio output transformer.

CAUTION: To operate the set partially disassembled, connect a jumper from the aquadag CRT coating to chassis ground. Be careful that the high-voltage anode lead does not short or arc to the frame.

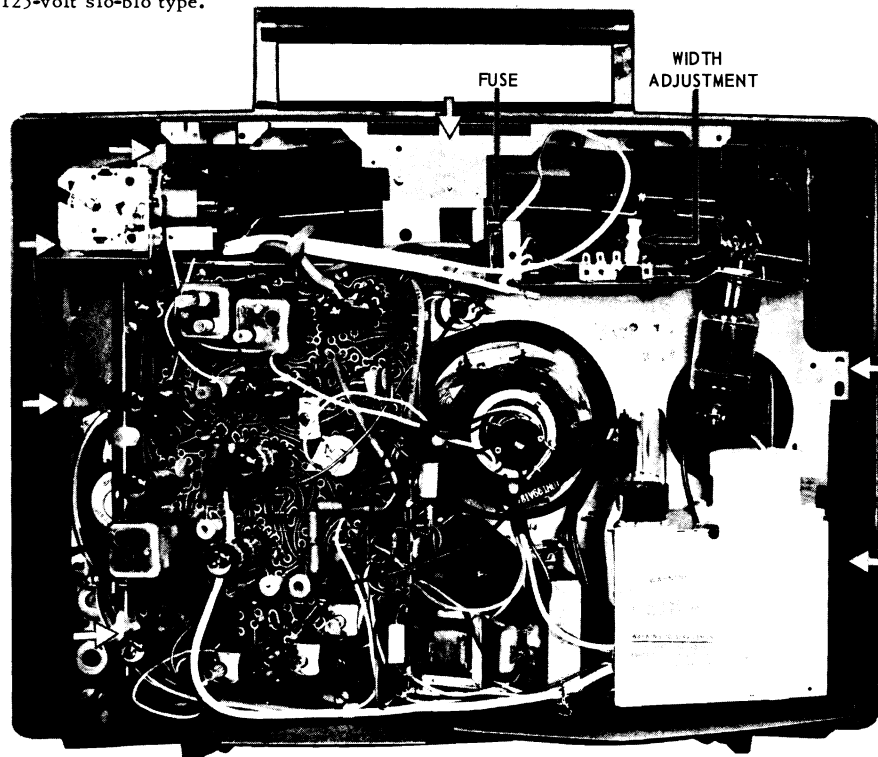


Figure 1 - Rear view of chassis, showing location of screws for chassis removal.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

WESTINGHOUSE Chassis V-2472-1, -2, Service Information, Continued

ADJUSTMENTS

CENTERING

The centering rings, located at the rear of the deflection yoke, should be rotated to center the raster.

DEFLECTION YOKE

The deflection yoke should be as far forward as possible (touching the bell of the CRT). Rotation of the deflection yoke is used to level the raster.

HORIZONTAL FREQUENCY AND RINGING COIL

- Short out the ringing coil (L401) with a jumper wire.
- Set the horizontal hold control to the center of its mechanical range. Do not change this setting during the steps that follow.
- Calibrate a VTVM to 0V Center scale on the 1.5V range and connect to test point (F) for measuring the DC voltage between (F) and ground.
- With the receiver tuned to a station of normal signal strength, adjust trimmer C421 so that moving it one way causes the meter to swing to the left and moving it the other way causes it to swing to the right. Then carefully adjust trimmer C421 for center scale on this meter.
- Remove the jumper from the ringing coil.

- Adjust the ringing coil for center scale on the VTVM. Check by switching to another channel and back again. The receiver should snap into horizontal sync on all channels.

FOCUS TAPS

The focus tap has been set at the factory. If the CRT is replaced, use the tap that provides the best focus.

WIDTH

For width adjustment, a push-on connector can be attached to any one of three terminals over coil L403 at the top of the chassis (refer to Figure 1). The width terminals are connected to a separate width winding on the horizontal output transformer.

HEIGHT AND VERTICAL LINEARITY

Two holes in the front of the cabinet allow the Height control to be reached with a narrow screwdriver through the hollow shaft of the Horizontal Hold control, and the Vertical Lin. control through the hollow shaft of the Vertical Hold control.

SOUND ALIGNMENT

EQUIPMENT: VTVM PROCEDURE:

- Select the strongest station available (preferably with test pattern and test tone) and adjust the FINE TUNING for best reception. Adjust the VOLUME control so that the station sound is audible.
- Adjust the quad coil (L101) for maximum sound from the speaker.
- Disconnect the antenna. Use a jumper wire to short TP (B) to B-.
- Connect the VTVM to TP (S).
- Adjust interstage transformer T100 for maximum negative voltage on the VTVM.
- Remove the jumper wire used to short TP (B) to B-.
- Place the antenna input close to the antenna terminals so that the signal is loosely coupled to the receiver and the picture is barely visible. A pronounced noisiness (hiss) should accompany the sound.

- Adjust the limiter input coil (L100) for maximum negative voltage on the VTVM. If the VTVM indicates a broad response while making this adjustment, the receiver input signal is too strong. When the signal coupling described in step 7 is at the necessary low point, no limiting takes place and the VTVM will indicate a sharp response to the limiter input coil adjustment.

4.5 MC TRAP ALIGNMENT

Disconnect the antenna and turn contrast control to maximum clockwise. Inject a 4.5 MC CW signal through a .001mf capacitor to TP (B). Connect a .001mf capacitor to a demodulation probe tip. Connect the other end of the probe to a VTVM and the capacitor to TP (C). Set the VTVM to 1.5-2V DC range. Turn the set on and allow five minutes for warmup. Then adjust L209 for minimum on the VTVM.

TUBE COMPLEMENT AND RESISTANCE CHART

TUBE	TYPE	FUNCTION	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9
V1	17AX4GTA	Damper	NC	NC	*3M	NC	*40	NC	28	33	
V2	17GW6	Horiz out	*0	28	470K	*15K	470K	NC	21	0	
V3	6AQ5A	Audio out	330-500K	660	20	21	*1.8K	*1.5K	330-500K		
V4	10GN8	Vid out & sync sep	0	1.8M	*33K	17	20	12	500		
V5	6FV8A	Noise Inv & AGC	3.6M	*27K	660	15	17	270K	47	25K	*27K
V6	6HZ6	FM Det	4	820	15	16	3M	*82K	560K		
V7	4AU6	Sound Lim	100K	0	14	15	12K	12K	0		
V8	8CS7	Vert disch & Vert out.	7M	100	0	14	12	*680K	1.5K		
V9	4HM6	3rd IF amp	120	.1	120	11	12	0	*5.6K	*47K	0
V10	4BZ6	2nd IF amp	*60K	*100K	10	11	*470	*470	*100K		
V11	4BZ6	1st IF amp	*800K	1.8K	9	10	*100K	*100K	1.8K		
V12	3DZ4/3AF4	UHF Osc	*15K	5.6K	9	9	.1	5.6K	*15K		
V13	6CG8A	Mixer - Osc	10K	*10K	0	9	7.5	*5K	*5K	0	220K
V14	3GK5	RF amp	0	4M	5	7.5	*6K	0	0		
V15	8FQ7	HMV	*56K	250K	1.1K	2.5	5	*47K	250K	1.1K	0
V16	19BWP4	CRT	0	33K	7M	*6K	NC	NC	*300K	2.5	
V17	1K3/1G3GT	HV Rect	INFINITE								

Resistance measured from tube pin indicated to circuit ground.

*Resistance measured from pin indicated to junction of X401, L400, R402.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

WESTINGHOUSE Chassis V-2472-1, -2, Schematic Diagram

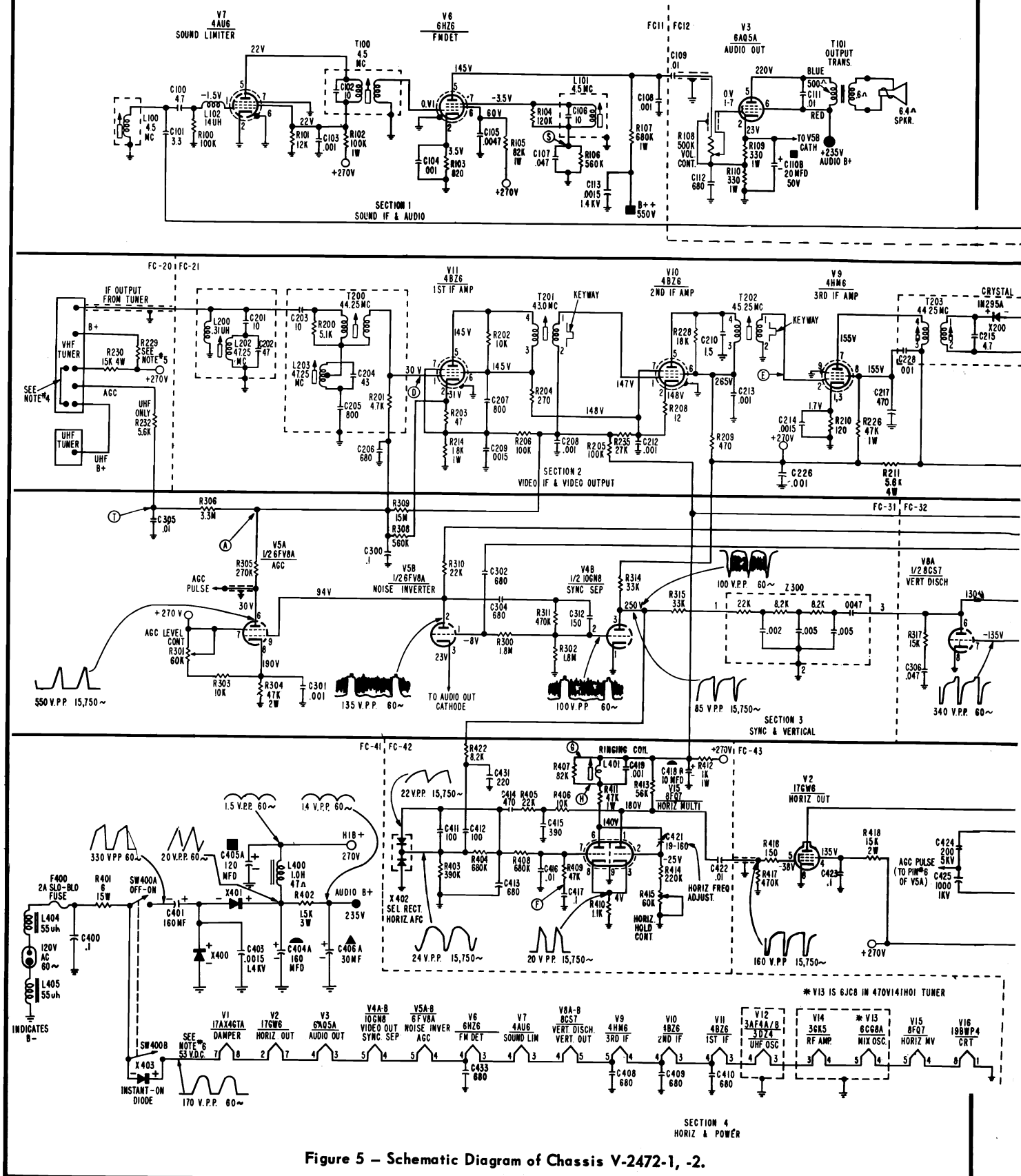


Figure 5 - Schematic Diagram of Chassis V-2472-1, -2.

WESTINGHOUSE Chassis V-2472-1, -2, Continued

INSTANT ON

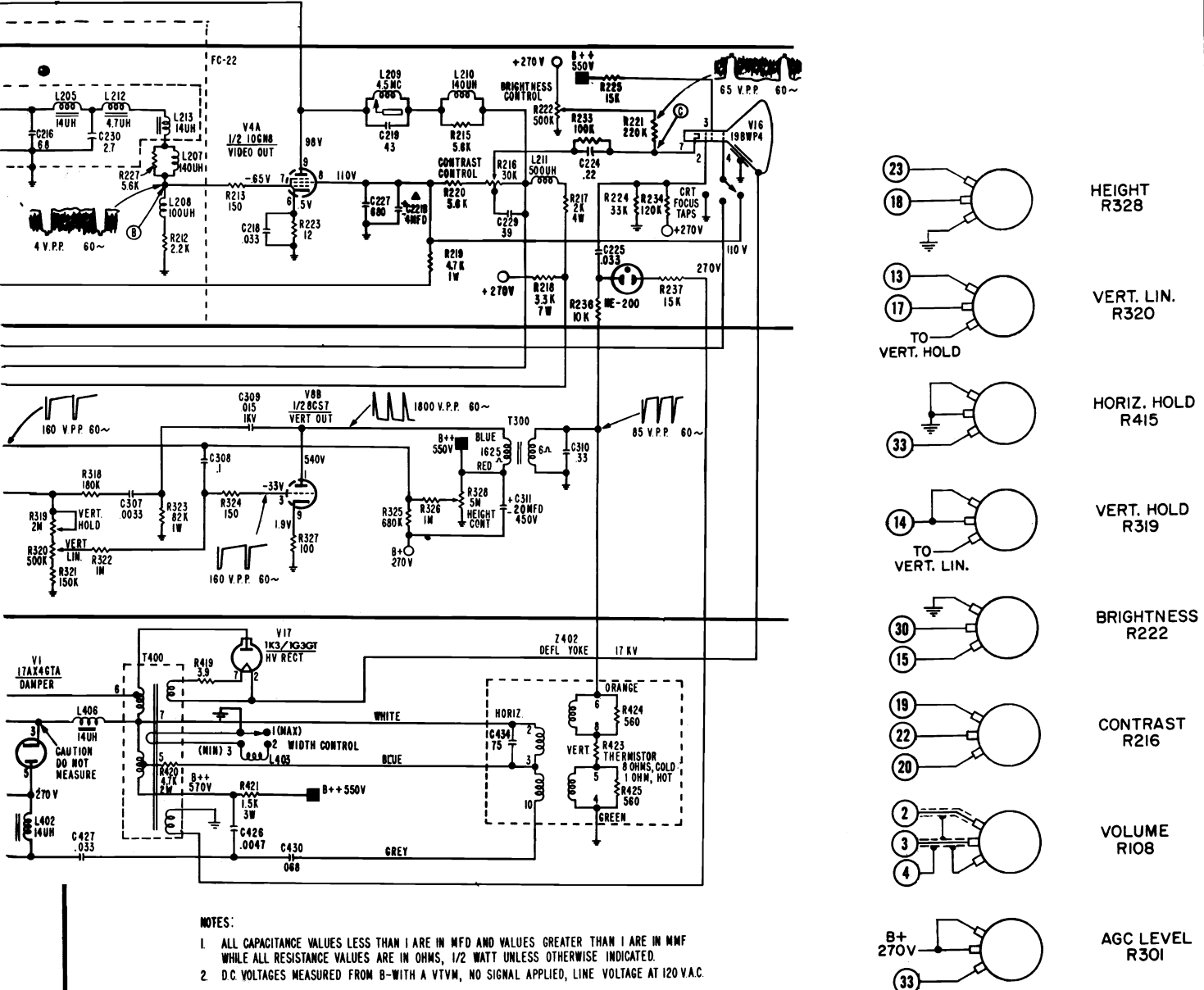
"Instant On" provides immediate operation when the set is turned on, because no tube warm-up time is necessary. Silicon diode X403 is connected in series with the AC line, R401, and the tube filament string. With the line cord plugged into an AC receptacle and the OFF-ON switch in the OFF position, the AC line voltage is rectified by silicon diode X403. This permits a pulsating direct current to flow thru the tube filament string to keep the tubes warm. No B+ is present when the OFF-ON switch is in the OFF position.

When the On-Off switch is turned ON, one section of the switch provides voltage for B+ and the other section shorts out diode X403.

AGC LEVEL CONTROL

This adjustment is factory set. Normally, no adjustment will be needed in the field.

Should adjustment be necessary, select the channel with the strongest signal. Turn the control clockwise until a slight bend appears at the top of the picture. Then turn the control slowly counter-clockwise about 1/4 turn past the point at which the bend disappears.



- NOTES:
1. ALL CAPACITANCE VALUES LESS THAN 1 ARE IN MFD AND VALUES GREATER THAN 1 ARE IN MMF WHILE ALL RESISTANCE VALUES ARE IN OHMS, 1/2 WATT UNLESS OTHERWISE INDICATED.
 2. D.C. VOLTAGES MEASURED FROM B+ WITH A VTVM, NO SIGNAL APPLIED, LINE VOLTAGE AT 120 V.A.C.
 3. WAVEFORMS WERE TAKEN WITH CONTROLS SET FOR NORMAL PICTURE WITH CONTRAST CONTROL SET FOR 65 V.P.P. AT T.P. °C
 4. MAKES CONTACT ON CHAN #1.
 5. R-229 IS SHORTED WHEN 470V141H0I TUNER IS USED. R-229 3.9K 7W WHEN 470V135H0I OR 470V137H0I TUNERS ARE USED.
 6. READ THIS VOLTAGE WITH SW400 IN "OFF" POSITION.

Figure 3 - Control wiring diagram. All views are as seen from the rear.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

WESTINGHOUSE Chassis V-2472-1, -2, PC Board Information

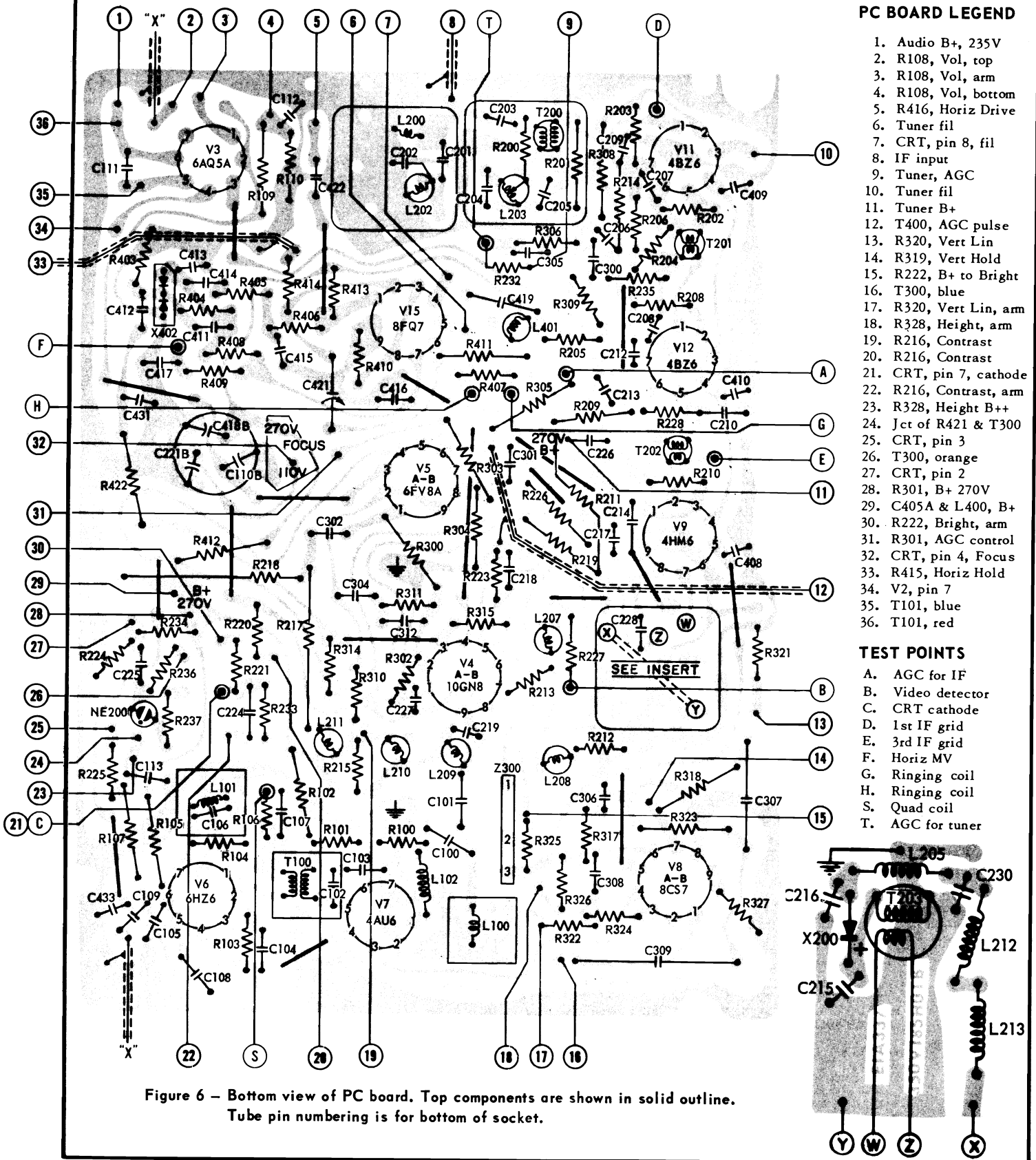


Figure 6 - Bottom view of PC board. Top components are shown in solid outline. Tube pin numbering is for bottom of socket.

WESTINGHOUSE Chassis V-2472-1, -2, Alignment Information, Continued

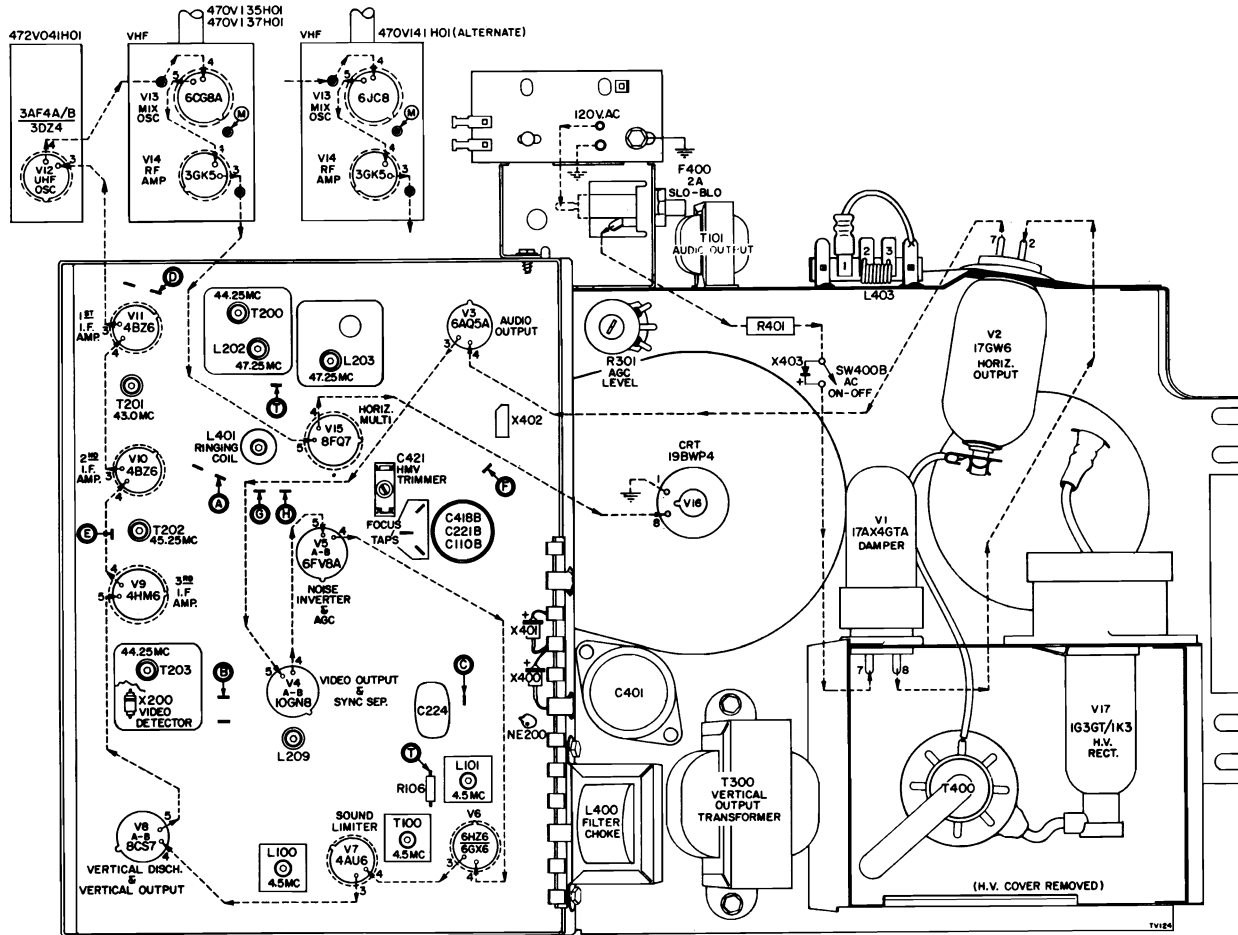


Figure 7 - Rear view of Chassis V-2472-1, -2.

IF ALIGNMENT

EQUIPMENT

1. Sweep Generator with a 10 MC wide sweep at center frequencies from 10 MC to 90 MC and 170 MC to 216 MC.
2. CW (Marker) Generator which accurately produces the IF and RF frequencies from 4.5 MC to 216 MC.
3. Oscilloscope with good low frequency response characteristics.
4. VTVM
5. Bias Supply of -2.5 volts.
6. Standard Alignment Tool with a 3/32" hexagonal tip. (long enough to reach bottom slugs)

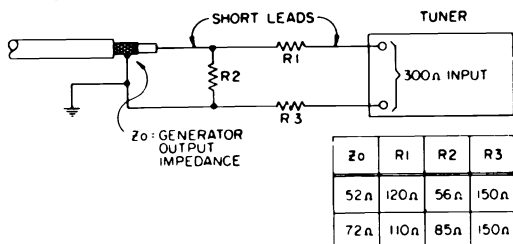


Figure 8 - Impedance Matching Network

TERMINATION AND ADJUSTMENT OF EQUIPMENT

These instructions on termination and adjustment of equipment will apply throughout the IF Alignment procedure.

All test equipment cables and leads should be as short and direct as possible.

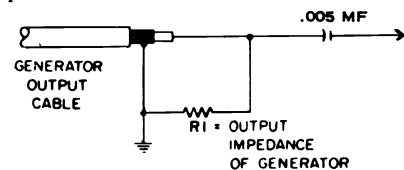


Figure 9 - Generator Cable Termination

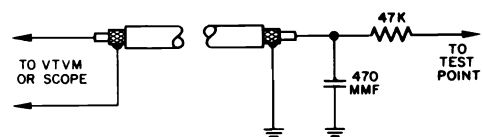


Figure 10 - Decoupling Network

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

WESTINGHOUSE Chassis V-2472-1, -2 I. F. Alignment, Continued

Oscilloscope and VTVM - Use a low-capacitance direct probe terminated with the decoupling network shown in Figure 10. Keep the oscilloscope calibrated for 2 volts peak to peak (P-P). Use a VTVM range suitable for measuring -1.5 volts.

Generators - Except where otherwise noted, all signal generating equipment should be terminated as shown in Figure 9. Connect the signal cable ground near the ground of the stage where the signal is injected. Adjust the CW generator output so that: (1) When the VTVM is being used its reading remains near the -1 volt point. (2) When the oscilloscope is being used the marker frequencies do not distort the response curve.

STEP	TEST EQUIPMENT AND CONNECTION	ADJUSTMENT
1.	Jumper from B- to TP (A), -2.5v to TP (T)	Channel selector to channel 10
2.	Oscilloscope and VTVM to TP (B) IF sweep generator with CW Marker at 44.25 MC to TP (E)	Short antenna terminals. T203 primary (top slug): Maximum amplitude T203 secondary (bottom slug): Rocking symmetrical response (see Figure 11)
3.	CW generator to TP (D) at: a. 45.25 MC b. 43.00 MC	T202: Maximum amplitude T201: Maximum amplitude
4.	Sweep generator at 44.25 MC to TP (D). Couple CW marker generator to sweep generator cable. Keep marker amplitude at minimum to avoid distorting response.	T201, T202, T203: Slight retouching may be necessary to obtain response curve with correctly placed markers as shown in Figure 12. Use T203 (bottom slug) to flatten peak of curve, T201 to adjust low frequency slope and T202 to adjust high frequency slope.
5.	CW generator to TP (M): a. 44.25 MC b. 44.25 MC c. 47.25 MC It may be necessary to increase d. 47.25 MC generator output and/or decrease bias.	Tuner mixer output coil: Maximum on VTVM T200: Maximum on VTVM L202: Minimum on VTVM L203: Minimum on VTVM
6.	Connect sweep generator to TP (M) at 44.25 MC. Couple CW generator with marker at 44.25 MC to sweep generator cable. Keep marker amplitude low to avoid distorting response. Adjust scope for 2V-PP.	Adjust mixer output coil and T200 for a "rocking" symmetrical response at approximately 44.25 MC with maximum amplitude and markers as shown in Figure 13.
7.	CW generator to TP (M) at 47.25 MC.	L203: Minimum amplitude (see Step 5d).
8.	Sweep generator to TP (M) at 44.25 MC.	Wave shape as shown in Figure 13.
9.	Oscilloscope, 2V-PP. Sweep generator thru impedance matching network (See Figure 8) to antenna terminals. Set pix marker at 193.25 MC Channel 10. Inject 45.75 MC marker into IF section by connecting CW output cable to outer shield of IF link cable.	Fine tuning to center of range. Channel selector to Channel 10. Oscillator slug setting: Picture carrier should fall at 45.75 MC (± 300 KC) marker on scope. (See Figure 14).
10.	Repeat step 9 for all channels using corresponding channel markers.	

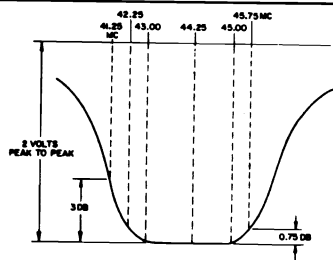


Figure 11 - Typical IF response, 3rd IF Amp grid to 2nd Det.

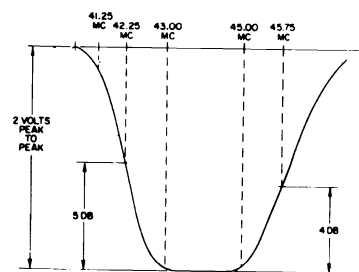


Figure 12 - Typical IF response, 1st IF Amp grid to 2nd Det.

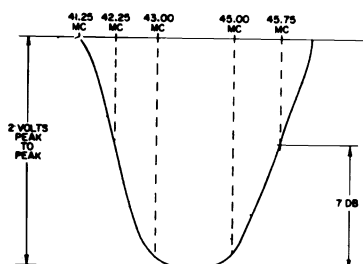


Figure 13 - Typical IF response, Mixer Amp grid to 2nd Det.

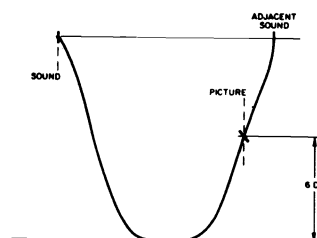
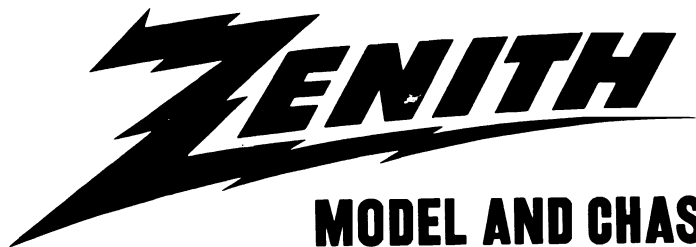


Figure 14 - Typical RF-IF response.

ZENITH RADIO CORPORATION



CHASSIS 14L20, 14L26, 15L22, 15L23, 15L27, 16L24

(Chassis 14L25 is similar to 14L26)

MODEL AND CHASSIS INFORMATION

MODEL	SPACE COMMAND	TYPE	CHASSIS	TUNER	PICTURE TUBE
L1615B3,L3		Luggage Portable	14L20	DeLuxe Channel	16BCP4
L1620L3,Y3		Luggage Portable	14L20	DeLuxe Channel	16BCP4
L2004C3,F3		Table	14L30	Custom Channel	19CRP4
L2005C3,F3		Table	14L26	DeLuxe Channel	19CXP4
L2009R3,W3		Table	14L26	DeLuxe Channel	19CXP4
L2012L		Table	14L36	DeLuxe Channel	19CXP4
L2012J3,L3		Table	14L26	DeLuxe Channel	19CXP4
L2014L3,R3,W3		Table	14L26	Super Target	19CXP4
L2109F3,J3		Table	15L27	Super Gold Video Guard	19CXP4
L2110L3,R3,W3		Table	15L27	Super Gold Video Guard	19DBP4
L2127B3,L3,W3		Table	15L27	Super Gold Video Guard	19CXP4
L2127B3Z,L3Z,W3Z		Table	15L37	Super Gold Video Guard	19CXP4
L2150L3,Y3		Luggage Portable	14L20	DeLuxe Channel	19DBP4
L2155B3,J3,L3,Y3		Luggage Portable	14L20	DeLuxe Channel	19DBP4
L2210L3	"300"	Table	14L26	Super Target	19CXP4
L2214L3	"300"	Table	15L27	Super Gold Video Guard	19CXP4
L2231L3,R3,W3	"300"	Table	15L27	Super Gold Video Guard	19CXP4
L2231W3Z	"300"	Table	15L37	Super Gold Video Guard	19CXP4
L2240F3,J3	"400"	Table	14L26	Super Target	19CXP4
L2240JD,LD	"400"	Table	14L36	Super Target	19CXP4
L2705R3,Y3		Table	15L23	DeLuxe Channel	23ECP4
L2705R4,Y4		Table	15L33	DeLuxe Channel	23EYP4
L2708E3,R3,W3		Table	15L23	DeLuxe Channel	23ECP4
L2708RU1,WU1		Table	15L33	DeLuxe Channel	23ECP4
L2717E3,R3,W3		Table	15L22	Super Gold Video Guard	23EDP4
L2735E3,L3,R3,W3		Console	15L23	Super Target	23ECP4
L2736E3,M3,R3,W3		Console	15L23	Super Target	23ECP4
L2737H3,M3,R3,W3		Console	15L23	Super Target	23ECP4
L2737W1		Console	15L33	Super Target	23ECP4
L2738E3,R3,W3		Console	15L23	Super Target	23ECP4
L2742H3,M3,R3,W3		Console	15L22	Super Gold Video Guard	23EDP4
L2746H3		Console	15L22	Super Gold Video Guard	23EDP4
L2748H3,M3,R3,W3		Console	15L22	Super Gold Video Guard	23EDP4
L2756L3,R3,W3		Console	15L22	Super Gold Video Guard	23EDP4
ML2784R3,W3		Console	16L24	Super Target	23ECP4
ML2785M3,R3,W3		Console	10L22		
			16L24	Super Target	23ECP4
			10L23		
ML2786W3		Console	16L24	Super Gold Video Guard	23ECP4
			10L23		
RL2784R3,W3		Console	16L24	Super Target	23ECP4
			7L22		
L3308R3,Y3	"300"	Table	15L23	Super Target	23ECP4
L3308YD	"300"	Table	15L33	Super Target	23DNP4
L3311R3,W3,Y3	"400"	Table	15L22	Super Gold Video Guard	23EDP4
L3340E3,R3,W3	"300"	Console	15L23	Super Target	23ECP4
L3340ED	"300"	Console	15L33	Super Target	23ECP4
L3341H3,M3,R3,W3	"300"	Console	15L23	Super Target	23ECP4

(Listing continued on page 174, service material through page 190)

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

ZENITH Cross Index of Models and Chassis Covered, Continued

MODEL	SPACE COMMAND	TYPE	CHASSIS	TUNER	PICTURE TUBE
L3342H3,M3,R3,W3	"300"	Console	15L23	Super Target	23ECP4
L3350R3,W3	"400"	Console	15L22	Super Gold Video Guard	23EDP4
L3355H3	"400"	Console	15L22	Super Gold Video Guard	23EDP4
SA2022R,W		Console	15L33	Super Target	23DNP4
SA2054W3		Console	15L23	Super Target	23DNP4
SA3080WD	"400"	Console	15L33	Super Target	23DNP4
T1981C,G		Table	14L30	DeLuxe Channel	19CRP4
T1981C1,G1		Table	14L30	Custom Channel	19CRP4
T1985C3,J3		Table	14L26	DeLuxe Channel	19CXP4
T1987R,W		Table	14L36	Super Target	19CXP4
T1987R3,W3		Table	14L26	DeLuxe Channel	19CXP4
T1990F3,L3		Table	14L26	Super Target	19CXP4
T1990F4,L4		Table	14L36	Super Target	19CXP4
T2023R3,W3		Console	15L23	Super Target	23DNP4
T2024H,M,R,W		Console	15L33	Super Target	23DNP4
T2024H3,M3,R3,W3		Console	15L23	Super Target	23DNP4
T2028W3		Console	15L23	Super Target	23DNP4
T2029A		Console	15L33	Super Target	23DNP4
T2029H3,R3		Console	15L23	Super Target	23DNP4
T2030M3		Console	15L23	Super Target	23DNP4
T2040R3,W3		Console	15L23	Super Target	23DNP4
T2045R3,W3		Console	15L23	Super Target	23DNP4
T2055H3,M3,R3,W3		Console	15L23	Super Target	23DNP4
T2070R3,W3		Console	15L23	Super Target	23DNP4
T2080E3,R3,W3		Console	15L23	Super Target	23DNP4
T2081R3,W3		Console	15L23	Super Gold Video Guard	23DNP4
T2707W3		Console	15L23	DeLuxe Channel	23DNP4

Additional Later Models using these Chassis

MODEL	TYPE	CHASSIS	TUNER	SPACE COMMAND	PICTURE TUBE
L2708RU3D,WU3D	Table	15L23	Deluxe Channel		23ECP4
M1615L1,LU1	Portable	14L20	Deluxe Channel		16BCP4
M1620Y1,YU1	Portable	14L20	Deluxe Channel		16BCP4
M2127L1,LU1,W1,WU1	Portable	15L27	Super Gold Video Guard		19CXP4
M2150L1,LU1,Y1,YU1	Portable	14L20	Deluxe Channel		19DBP4
M2155L1,LU1,Y1,YU1	Portable	14L20	Deluxe Channel		19DBP4
M2231L1,LU1,R1,RU1, W1,WU1	Portable	15L27	Super Gold Video Guard	300	19CXP4
M2735R1,RU1,W1,WU1	Console	15L23	Super Channel		23ECP4
M2737H1,HU1,M1,MU1, R1,RU1,W1,WU1	Console	15L23	Super Channel		23ECP4
SA2031R,RU,W,WU	Console	15L23	Super Channel		23ECP4
SA2032R,RU,W,WU	Console	15L23	Super Channel		23ECP4
SA2707W3,WU3	Table	15L23	Super Channel		23ECP4
SA2780WU	Combo.	16L24/10L23†	Super Channel		23DNP4
T2028WU3	Console	15L23	Super Channel		23DNP4

Refer to Service Manual TV-22 for service information on "L" chassis not included in this manual. Combination TV-Radio-Phono units use the 16L24 TV chassis. The 16L24 TV chassis power supply is common to TV, radio and phono units. Some UHF models use a motor drive for VHF tuning. Suffix "U" is added to the chassis and model number if the receiver is factory equipped with a UHF continuous tuner.

TUNER ADJUSTMENT

FINE TUNING

Each channel can be adjusted individually with the receiver fine tuning knob without interaction with other channels. Several turns of the knob are permissible, in either direction, to obtain proper adjustment.

The Super Target Tuner is equipped with an auxiliary oscillator trimmer to be used if adjustment cannot be made with the fine tuning knob.

FOCUS

14L20, 14L25, 14L26, 15L23 and 16L24 Chassis:
Adjusted by means of a three position tap.

15L22 Chassis:

Screwdriver focus adjustment located front left of chassis.

15L27 Chassis:

The focus control is part of the picture tube socket. Adjustment is made by rotating the outer rim of the socket.

ZENITH Service Material applicable to various chassis, Continued

WIDTH AND HORIZONTAL LINEARITY ADJUSTMENTS

15L23, 16L24 and 15L22 Chassis:

Adjustment is made by sliding the metal width sleeve along the neck of the picture tube until proper width and linearity is obtained.

14L20, 14L25, 14L26 and 14L27 Chassis:

A screwdriver adjustment at the rear of the chassis is used to adjust width and the sleeve on the neck of the picture tube is used to adjust linearity.

The sleeve is installed with the slot facing the picture tube anode button. The initial width and linearity adjustment is made by turning the width control to its maximum counterclockwise position and sliding the sleeve to optimize linearity. The width control is then advanced to obtain correct width.

AGC ADJUSTMENT

Tune in a strong TV signal and slowly turn the A.G.C. control until a point is reached where the picture distorts and buzz is heard in the sound. The control should then be backed down from this position and set at a point comfortably below the level of inter-carrier buzz, picture distortion and improper sync.

This setting corresponds with 3 to 3.5 V peak to peak output from the video detector (2.5 V.P.P. in the 15L22, 15L23 and 15L27 chassis).

CAUTION: Misadjustment of the AGC control can result in a washed-out picture, distorted picture, buzz in the sound or complete loss of picture and sound.

CORRECTOR MAGNET ADJUSTMENT

Two corrector magnets are used in all 23 inch models to obtain straight, sharply focused sweep lines across the face of the picture tube. The magnets are mounted on the deflection coil support bracket. Adjustment is made by bending the flexible arms sideways and up and down. Correct adjustment has been made at the factory and readjustment should not be required unless the brackets have been accidentally bent out of position. If this occurs, proceed as follows:

1. With the vertical and horizontal size controls, reduce the size of the picture to a point where the four corners and sides are visible. (In some receivers it is not possible to reduce the picture sufficiently to see all sides and it may be necessary to shift the picture with the centering control to view one side at a time.)

2. Bend the corrector magnet arms until the corners become right angles and the top of the raster is parallel with the bottom and the left side is parallel with the right side. After adjustment, the picture should be restored to normal size.

NOTE: Misadjustment of the corrector magnets may cause pincushioning, barreling, keystoneing, poor linearity, etc.

AFC ADJUSTMENT

The horizontal hold control is equipped with a stop which limits knob rotation to approximately 270 degrees. To adjust the AFC, remove the knob and turn the shaft to a position where it is virtually impossible to disrupt horizontal synchronization when switching from channel to channel. After adjustment, install the knob with its pointer centered between the stops.

CENTERING ADJUSTMENT

The centering assembly is built into the yoke housing. This assembly is made of two magnetic rings which can be rotated by means of tabs. Centering is accomplished by gradually rotating each tab separately and/or rotating both tabs simultaneously until the picture is centered.

PEAK PICTURE CONTROL

ALL MODELS EXCEPT 14L20 CHASSIS

This customer control is part of the video detector load having a decided effect on the video response. The picture can be changed from slight smear at the at the extreme counterclockwise position to an exaggerated overshoot in the maximum clockwise position of the control.

The control is adjusted at the factory for best picture detail under normal signal conditions, however, it can be changed in the field to suit a particular signal or program condition. As an example, an old movie can be "crispended" or the texture of "snow" in a fringe area can be changed for a more pleasing picture.

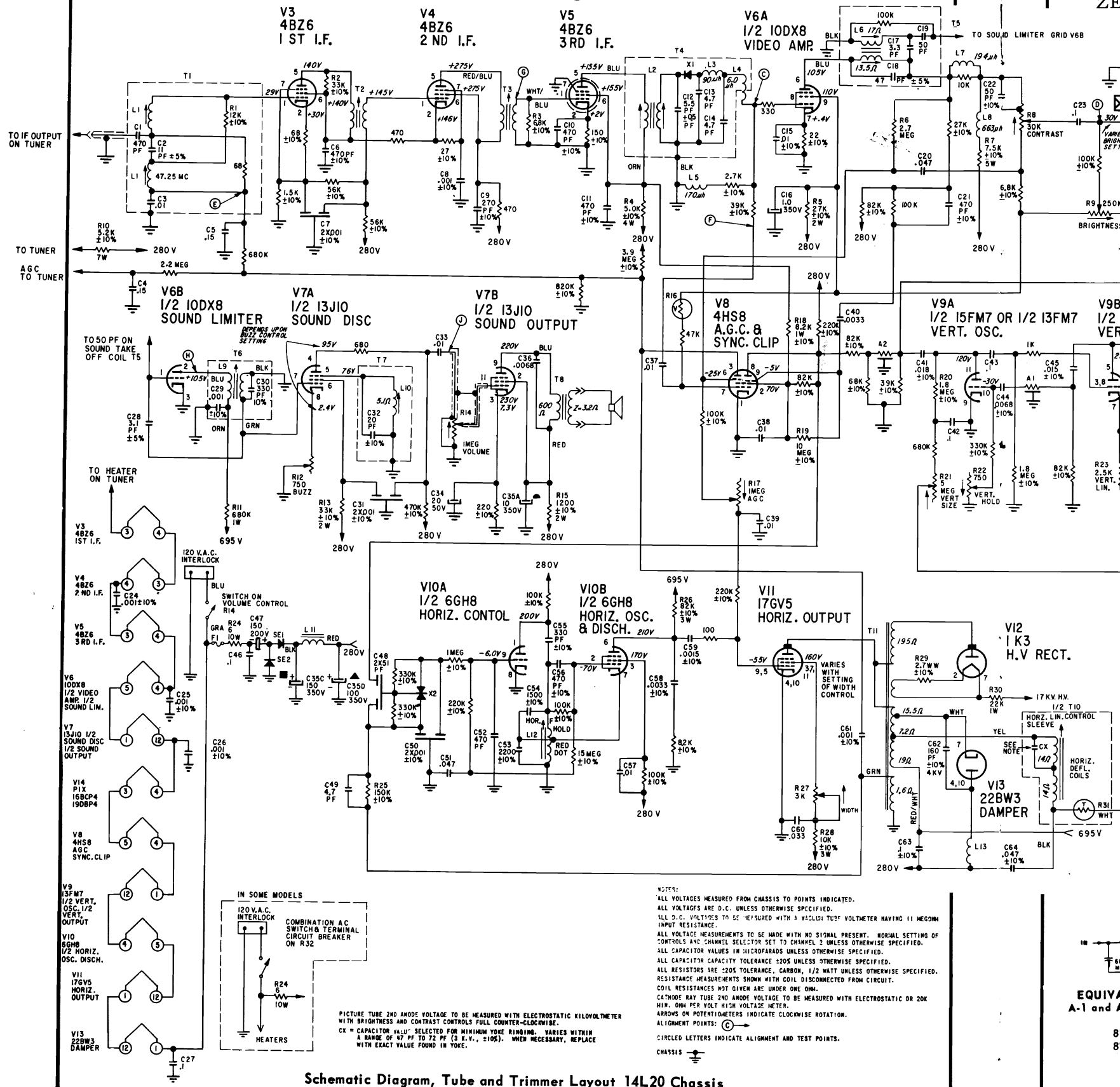
SOUND ADJUSTMENTS

Proper alignment of the 4.5 Mc intercarrier sound channel can only be made if the signal to the receiver antenna terminals is reduced to a level below the limiting point of the Gated Beam Sound Detector. This level can be easily identified by the "hiss" that accompanies the sound. Various methods may be used to reduce the signal level; however, a step attenuator is recommended for most satisfactory results. Alignment is made as follows:

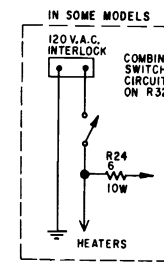
1. Connect the step attenuator between the antenna and the receiver antenna terminals.
2. Tune in a TV signal. Adjust the step attenuator until the signal is attenuated to a level where a "hiss" is heard with the audio.
3. Adjust the sound take-off coil (top and bottom cores), intercarrier transformer, quadrature coil and buzz control for the best quality sound and minimum buzz. It must be remembered that any of these adjustments may cause the "hiss" to disappear and further reduction of the signal will be necessary to prevent the "hiss" from disappearing during alignment.

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

ZENITH Chassis 14L20 Schematic Diagram



Schematic Diagram, Tube and Trimmer Layout 14L20 Chassis

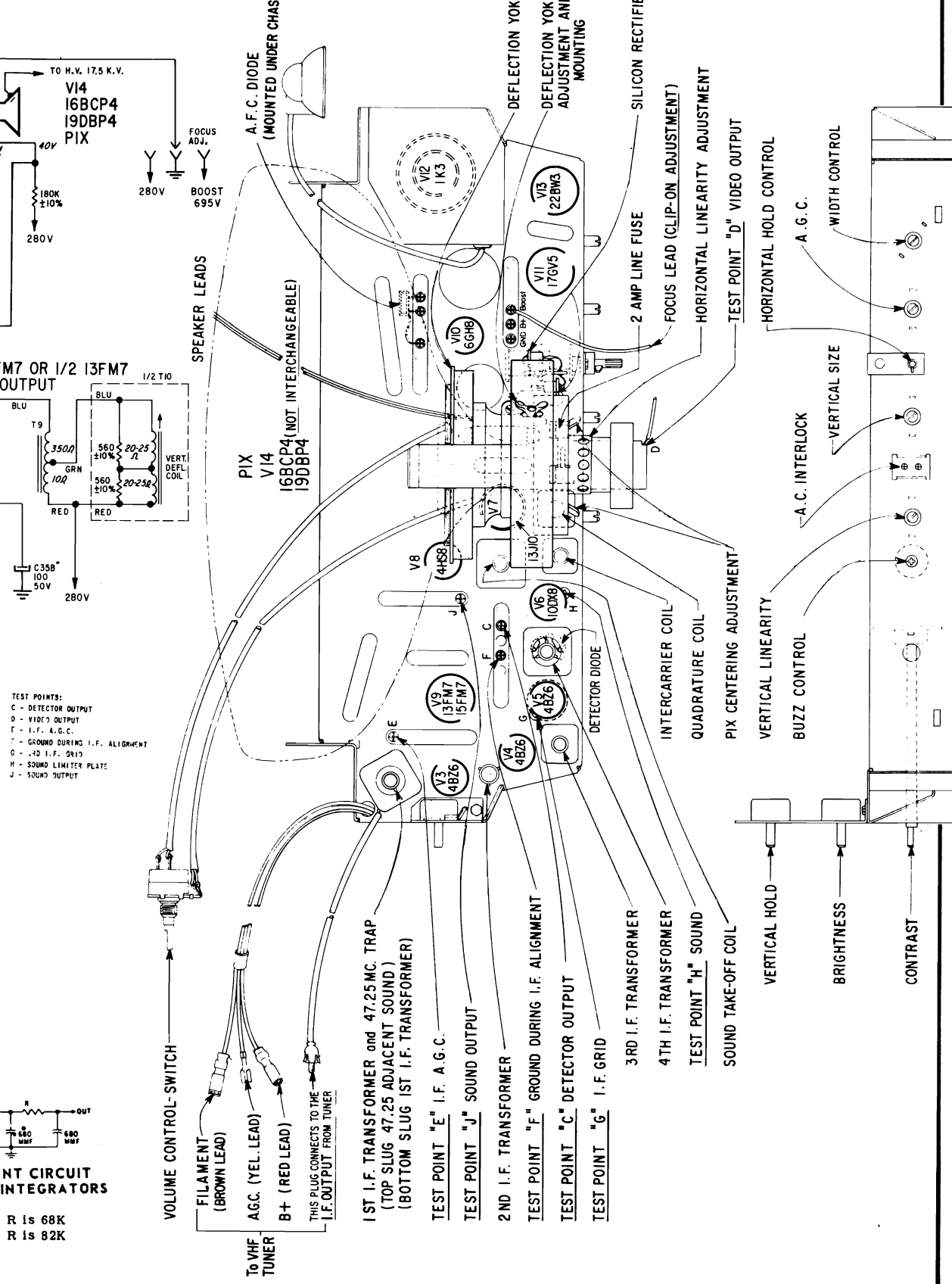


PICTURE TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC KILOVOLT METER WITH BRIGHTNESS AND CONTRAST CONTROLS FULL COUNTER-CLOCKWISE.
 CX = CAPACITOR VALUE SELECTED FOR MINIMUM YOKE KINKING. VARIES WITHIN A RANGE OF 47 PF TO 72 PF (3 E.V. ± 10%). WHEN NECESSARY, REPLACE WITH EXACT VALUE FOUND IN YOKE.

NOTES:
 ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.
 ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
 ALL D.C. VOLTAGES TO BE MEASURED WITH A VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.
 ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT. NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO CHANNEL 2 UNLESS OTHERWISE SPECIFIED.
 ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
 ALL CAPACITOR CAPACITY TOLERANCE ±20% UNLESS OTHERWISE SPECIFIED.
 ALL RESISTORS ARE ±20% TOLERANCE, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED.
 RESISTANCE MEASUREMENTS SHOWN WITH COIL DISCONNECTED FROM CIRCUIT.
 COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM.
 CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 20K MIN. OHM PER VOLT HIGH VOLTAGE METER.
 ARROWS ON POTENTIOMETERS INDICATE COUNTERCLOCKWISE ROTATION.
 ALIGNMENT POINTS: ○
 CHASSIS

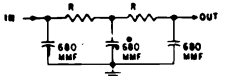
VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

ZENITH Chassis 14L20



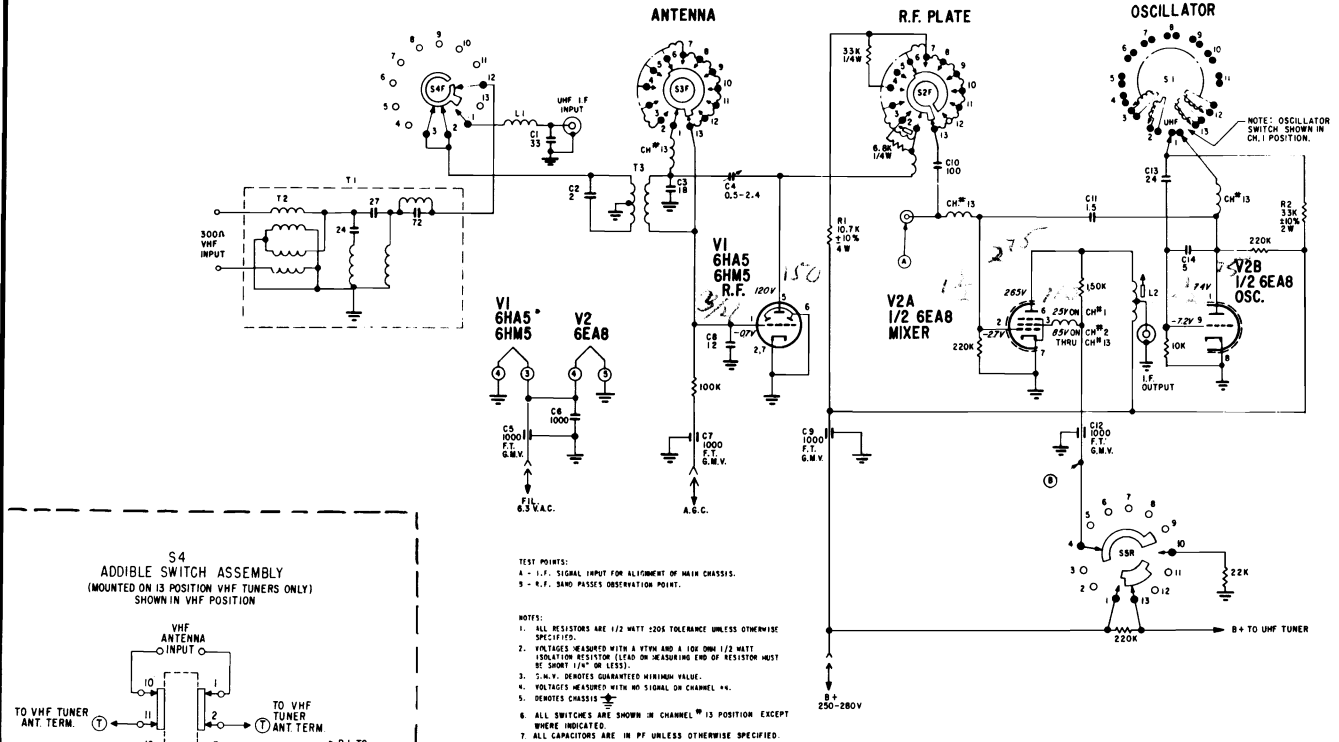
TEST POINTS:
 C - DETECTOR OUTPUT
 D - VIDEO OUTPUT
 E - I.F. A.G.C.
 F - GROUND DURING I.F. ALIGNMENT
 G - 2ND I.F. GRID
 H - SOUND LIMITER PLATE
 J - SOUND OUTPUT

EQUIVALENT CIRCUIT A-1 and A-2 INTEGRATORS

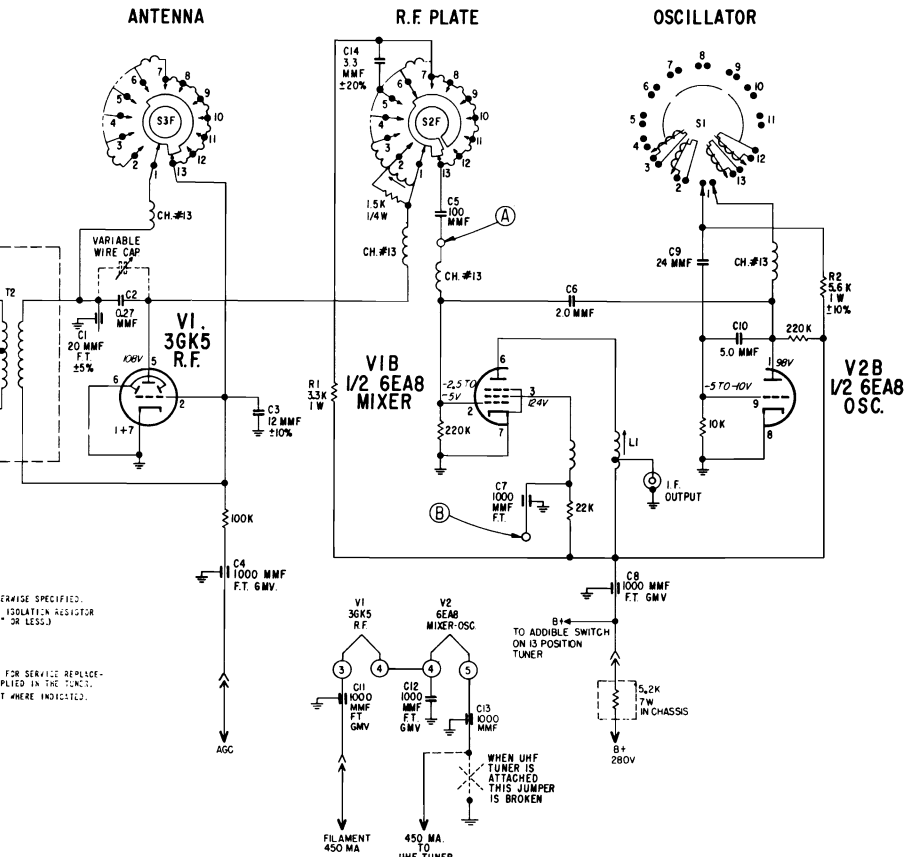
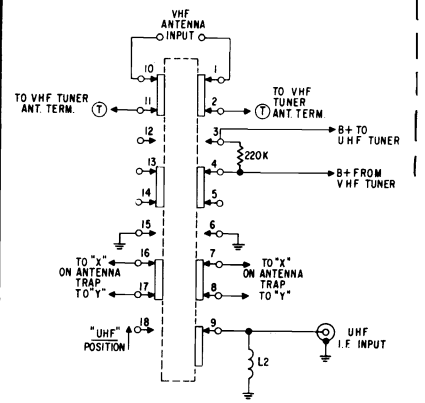
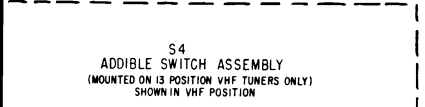


87-7 R is 68K
 87-8 R is 82K

ZENITH Tuner Schematics, Continued

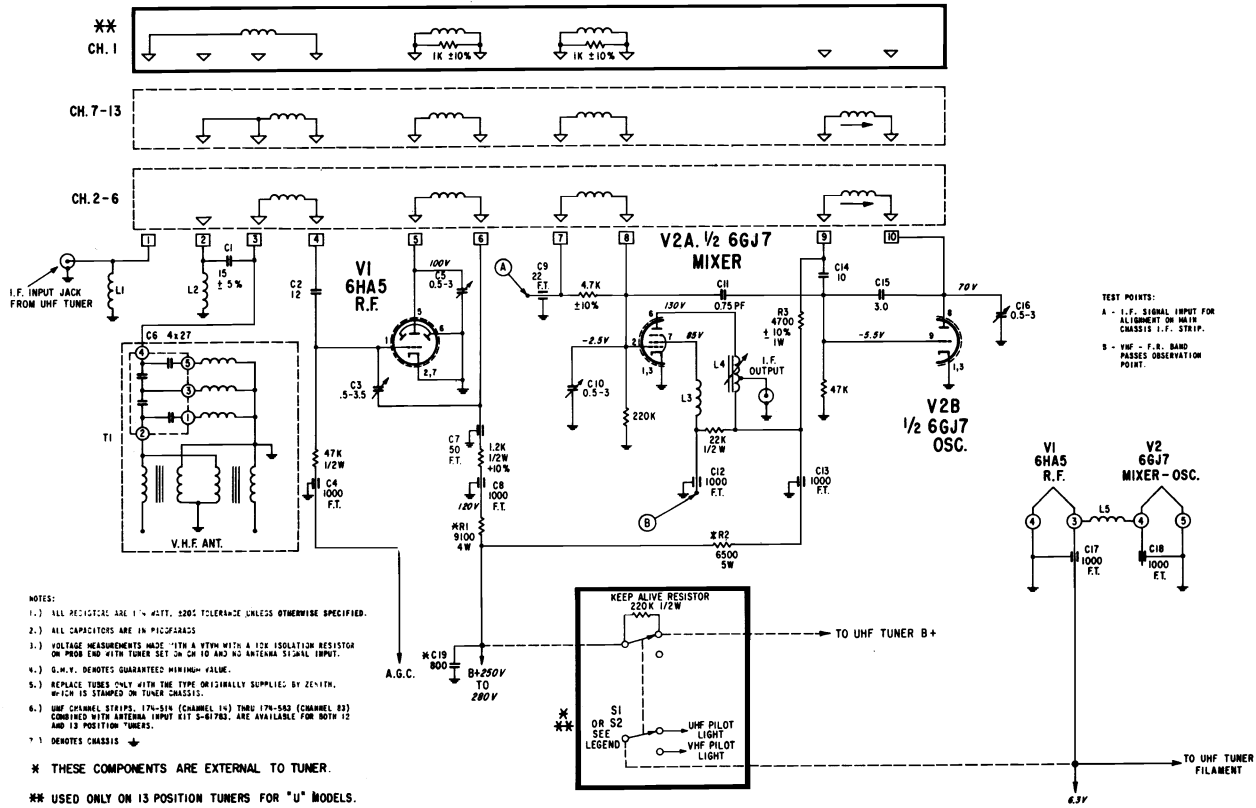


Schematic Diagram 700 Series DeLuxe Channel Tuners

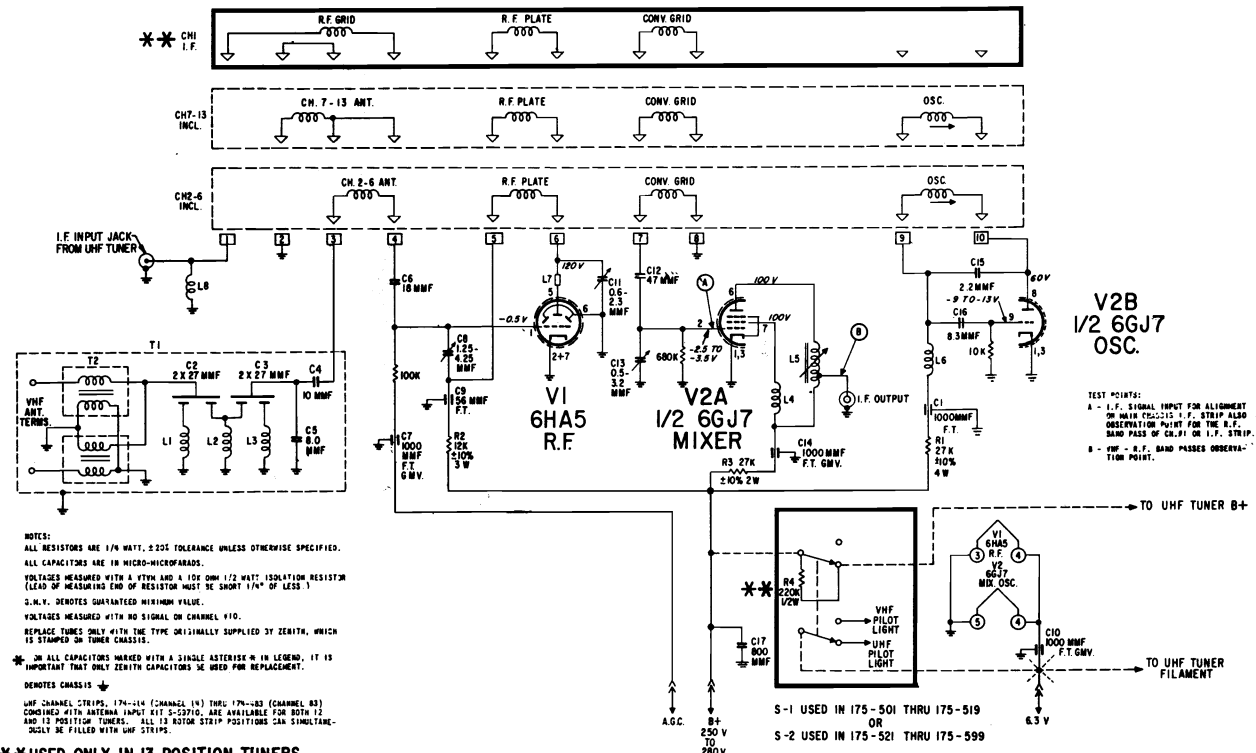


Schematic Diagram DeLuxe Channel Tuner, No. 175-284

ZENITH Tuner Schematics, Continued



Schematic Diagram 600 Series 12 & 13 Position, Super Target Tuner



Schematic Diagram, 500 Series, Super Gold Video Guard Tuner

ZENITH Alignment Information for sets covered, Continued

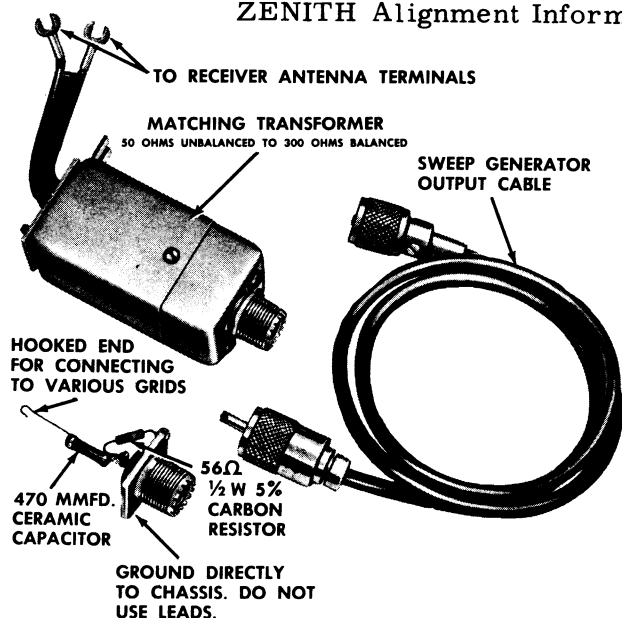


Fig. 4 IF-RF Alignment Fixtures

VIDEO IF ALIGNMENT

15L22, 15L23, 16L24 & 15L27 CHASSIS

1. Slowly turn the channel selector until the tuner rotor is made to rest between two channels. This will prevent an erroneous response.
2. Connect an oscilloscope through a 10,000 ohm isolation resistor to terminal "C" (detector). Connect the ground lead to chassis. In the 15L22, 15L23 and 16L24 chassis, turn the peak picture control to the extreme counterclockwise position. In the 15L27 chassis, the control should be set at mid range.
3. Feed the sweep generator through a special terminating network as shown in Fig. 4 to Point "G" (Pin 2 of the 3rd IF). Adjust generator to obtain a response similar to Fig. 5 with a detector output of 3 volts peak to peak. Do not exceed this level during any of the adjustments.
4. Set the marker generator to 45.75 Mc and alternately adjust the top and bottom cores of the 4th IF for maximum gain and symmetry with the 45.75 Mc marker positioned as shown in Fig. 5. The two peaks must be equal in height and the high frequency

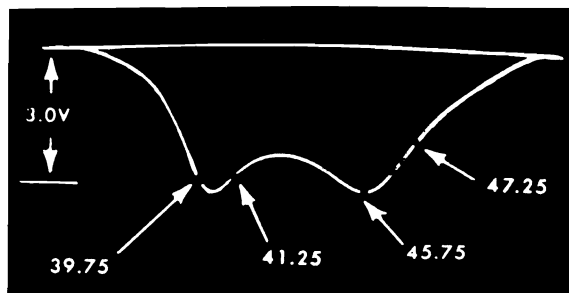


Fig. 5 4th IF Response

peak at 45.75 Mc. If the correct response cannot be obtained, check the position of the cores to see that they are not butted. The cores should be entering their respective windings from the opposite ends of the coils.

5. Connect the sweep generator to terminal "A" (converter grid). Connect terminal "F" to chassis and connect a jumper between terminal "E" and chassis. Adjust the sweep to obtain a 3V.P.P. response similar to Fig. 8. Switch oscilloscope to 10X gain to "blow up" the traps, (Fig. 6).
6. Refer to Fig. 6 and adjust the 39.75 Mc and the 41.25 Mc traps for minimum marker amplitude. Disconnect the jumper between "E" and chassis. Connect this jumper between "E" and the junction of the 22 (68 in the 15L27 chassis) and 1800 ohm resistors in the cathode of the first IF. This provides an additional "blow up" of the 47.25 Mc traps (Fig. 7). Adjust the 47.25 Mc traps (the 15L23, 15L27 and 16L24 chassis have one 47.25 Mc trap) for minimum marker amplitude.

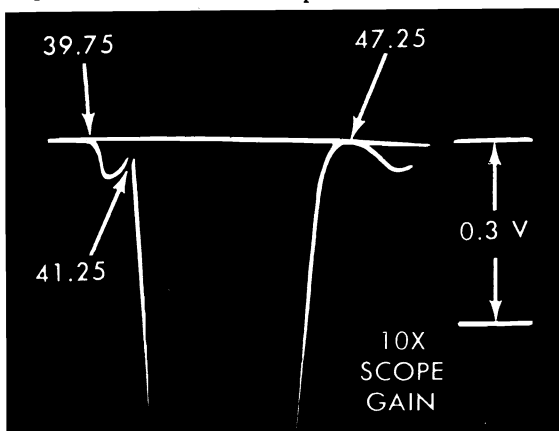


Fig. 6 Expanded View of Traps

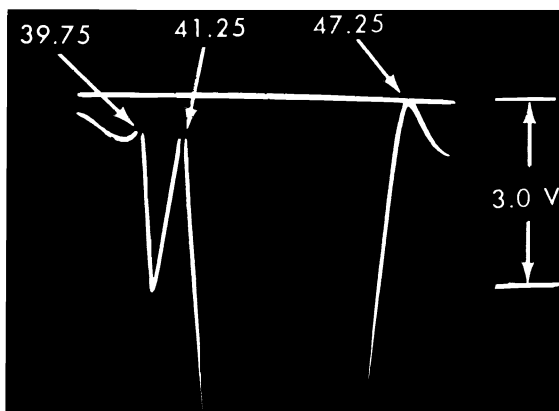


Fig. 7 Further Expansion of Fig. 6 for Detail View of the 39.75 and 47.25 Mc Traps.

7. Disconnect the jumper between "E" and the 22 and 1800 ohm cathode resistors. Connect this jumper between "E" and chassis. Adjust sweep generator for 3 volts peak to peak output. Alternately adjust the 2nd, 3rd, 1st IF and the converter plate coil until an overall response similar to Fig. 8 (Fig. 9 for the 15L27 chassis) is obtained.

ZENITH Alignment Information for sets covered, Continued

It will be found that the 2nd IF affects the low side (42.75 Mc) and the 3rd IF, the high side of the response.

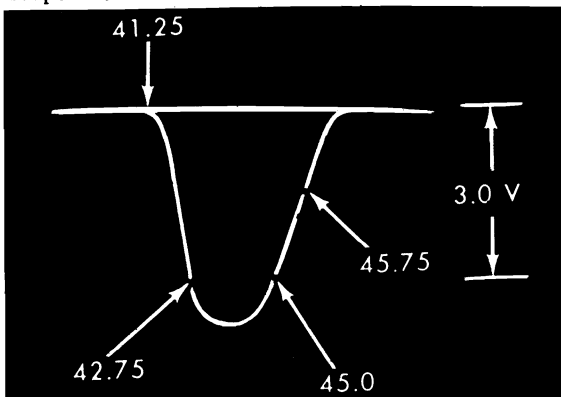


Fig. 8 Overall IF Response

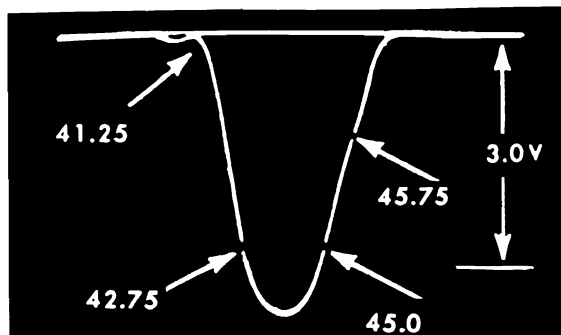


Fig. 9 Overall IF Response
15L27 CHASSIS

VIDEO IF ALIGNMENT

14L20, 14L25 & 14L26 CHASSIS

1. Slowly turn the channel selector until the tuner rotor is made to rest between two channels. This will prevent an erroneous response.
2. Connect an oscilloscope through a 10,000 ohm isolation resistor to terminal "C" (detector). Connect the ground lead to chassis. In the 14L25 and 14L26 chassis, set the peak picture control to mid-range.
3. Feed the sweep generator through a special terminating network as shown in Fig. 4 to Point "G" (Pin 1 of the 3rd IF). Adjust generator to obtain

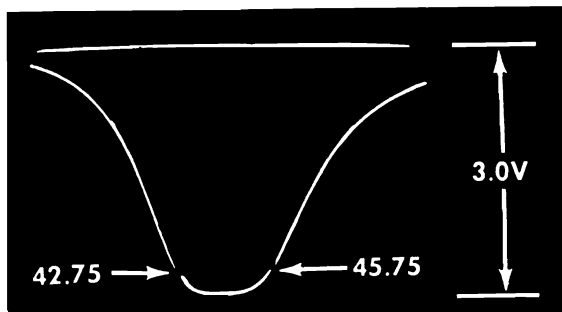


Fig. 10 4th IF Response
14L20, 14L25 & 14L26 CHASSIS

a response similar to Fig. 10. Do not exceed the 3 volt peak to peak detector output during any of the following adjustments.

4. Set the marker generator to 45.75 Mc and alternately adjust the top and bottom cores of the 4th IF for maximum gain and symmetry with the 45.75 Mc and the 42.75 Mc markers positioned as shown in Fig. 10. If the correct response cannot be obtained, check the cores to see that they are not butted but are entering their respective windings from the opposite ends of the coil.

5. Connect the sweep generator to terminal "A" (converter grid. Refer to appropriate tuner tube and trimmer layout). Connect terminal "F" to chassis and connect a jumper between terminal "E" and the junction of the 68 and 1800 ohm resistors (1500 in 14L20 chassis) in the cathode of the first IF. This provides a "Blow Up" of the 47.25 Mc trap (Fig. 11). Adjust the 47.25 Mc trap for minimum marker amplitude.

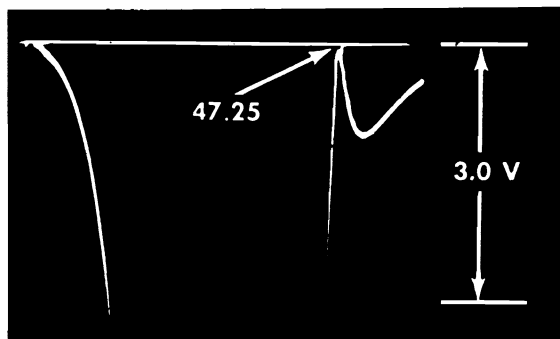


Fig. 11 Expanded View of the 47.25 Mc Trap,
14L20, 14L25 & 14L26 CHASSIS

6. Disconnect the jumper between "E" and the 68 and 1800 ohm (1500 in 14L20 chassis) cathode resistors. Connect this jumper between "E" and the chassis. Adjust sweep generator for 3 volts peak to peak output. Alternately adjust the 2nd, 3rd, 1st IF and the converter plate coil until an overall response similar to Fig. 12 is obtained. It will be found that the 2nd IF affects the low side (42.75 Mc) and the 3rd IF the high side of the response. Remove jumpers after alignment.

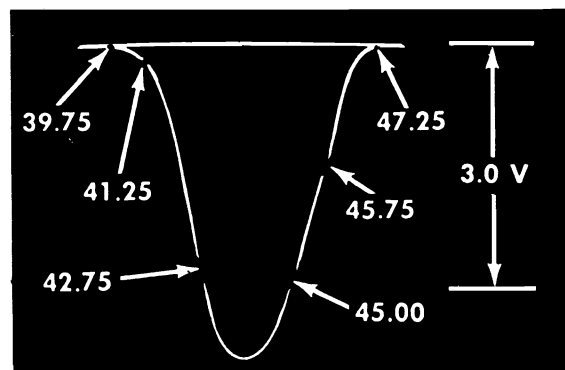
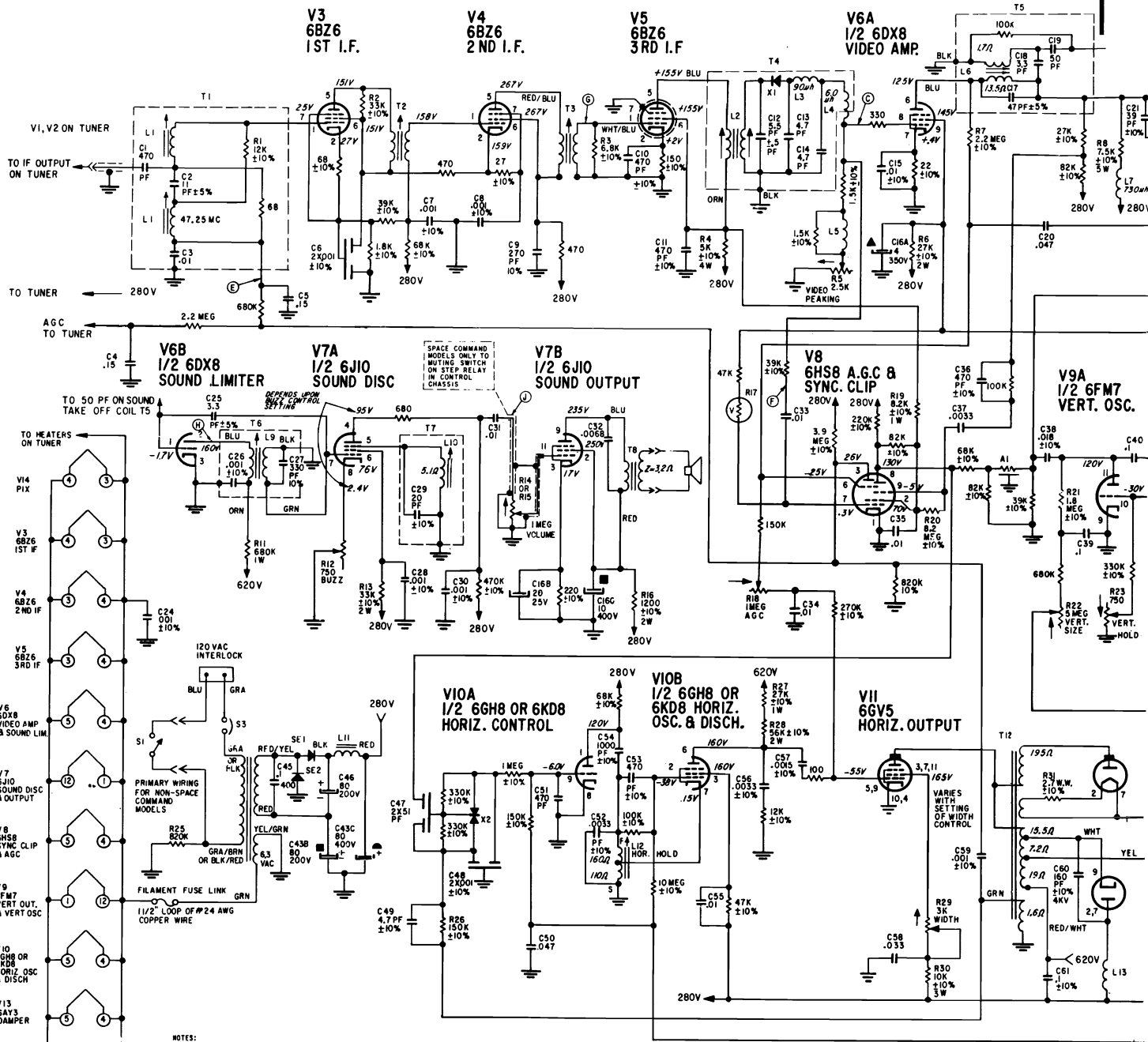


Fig. 12 Overall IF Response
14L20, 14L25 & 14L26 CHASSIS

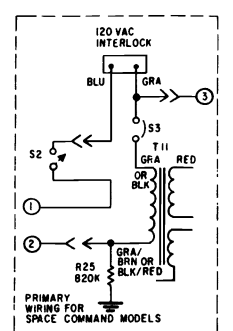
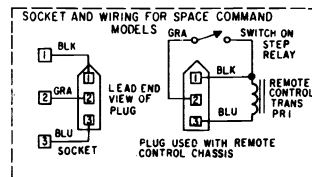
VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

ZENITH Chassis 14L26 Schematic Diagram, Continued



NOTES:
 ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.
 ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
 ALL D.C. VOLTAGES TO BE MEASURED WITH A VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.
 ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT. NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO CHANNEL 2 UNLESS OTHERWISE SPECIFIED.
 ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
 ALL CAPACITOR CAPACITY TOLERANCE 20% UNLESS OTHERWISE SPECIFIED.
 ALL RESISTORS ARE 20% TOLERANCE, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED.
 RESISTANCE MEASUREMENTS SHOWN WITH COIL DISCONNECTED FROM CIRCUIT.
 COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM.
 CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 20K MIN. OHM PER VOLT HIGH VOLTAGE METER.
 ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
 ALIGNMENT POINTS: (C)
 CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS.
 CHASSIS

PICTURE TUBE SECOND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC
 KILOVOLTMETER WITH BRIGHTNESS AND CONTRAST CONTROLS FULL COUNTERCLOCKWISE.
 CX = CAPACITOR VALUE SELECTED FOR MINIMUM YOKE RINGING. VALUES WITHIN
 A RANGE OF 47 PF TO 72 PF (3 K.V., 210%). WHEN NECESSARY, REPLACE
 WITH EXACT VALUE FOUND IN YOKE.

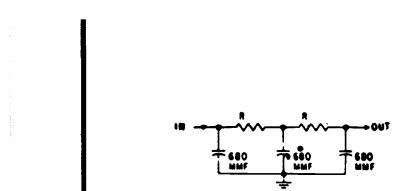
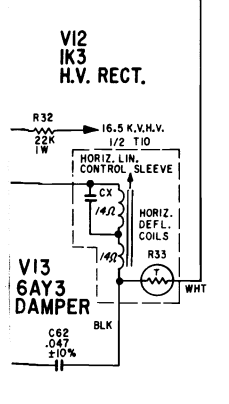
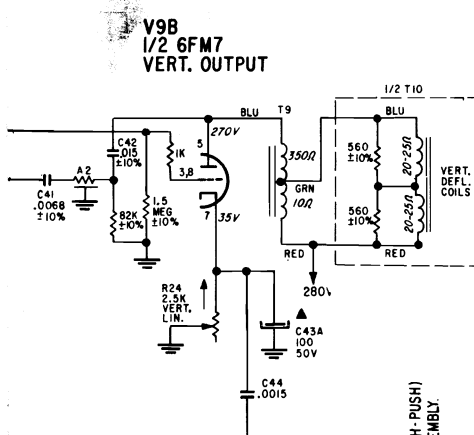
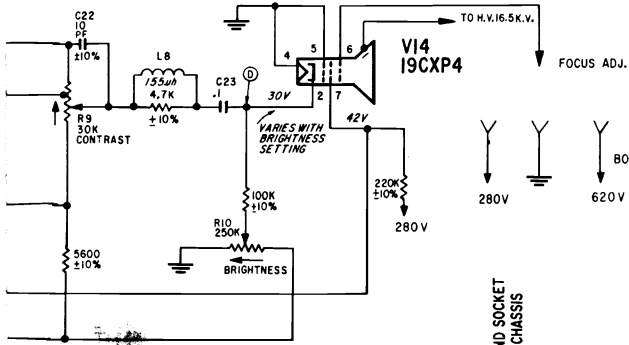


Schematic Diagram, Tube and Trimmer Layout 14L26 Chassis

VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

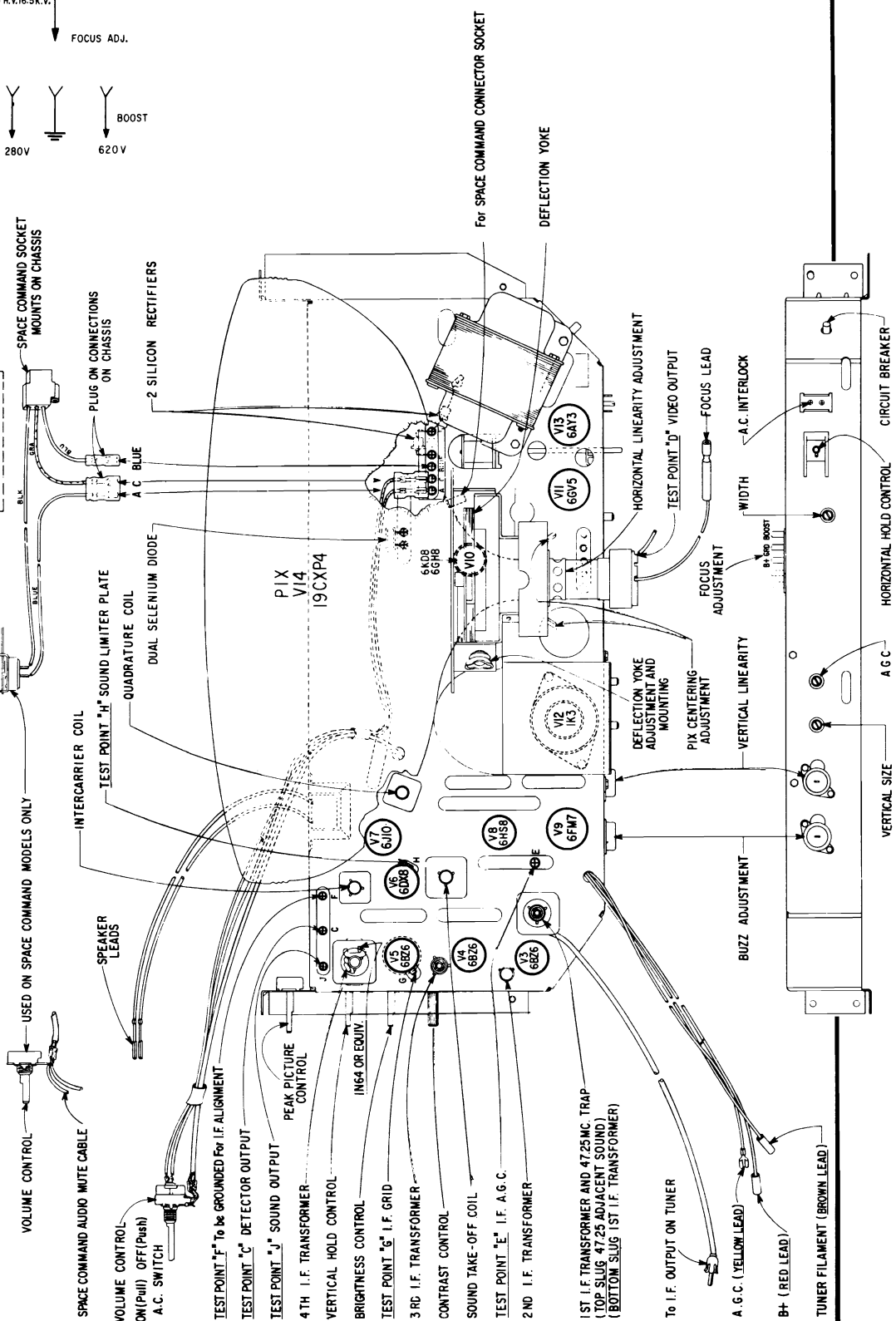
ZENITH Chassis 14L26 Schematic Diagram, Continued

TO SOUND LIMITER GRID V6B



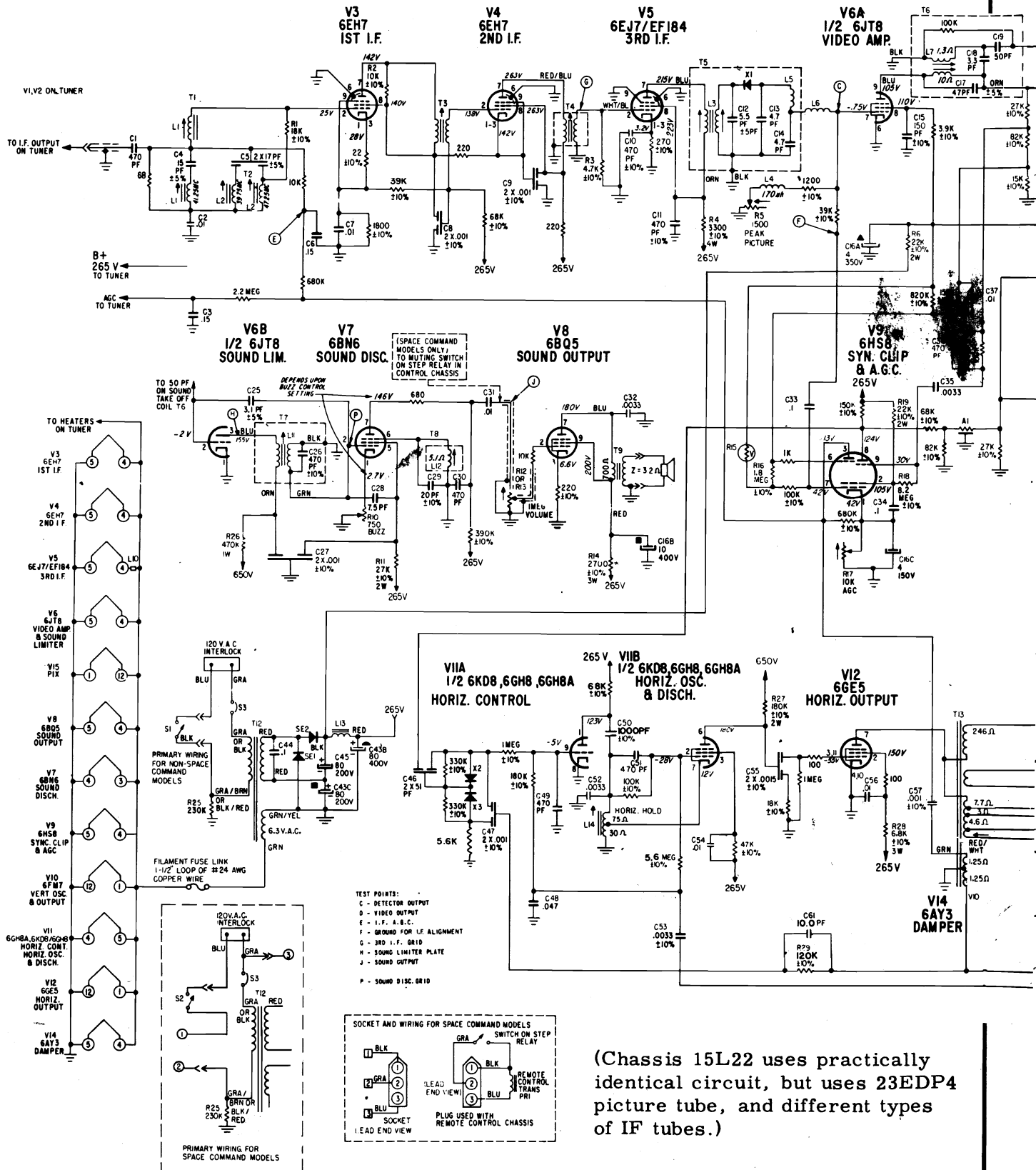
**EQUIVALENT CIRCUIT
A-1 and A-2 INTEGRATORS**

87-7 R is 68K
87-8 R is 82K



VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

ZENITH Chassis 15L23 Schematic Diagram, Continued



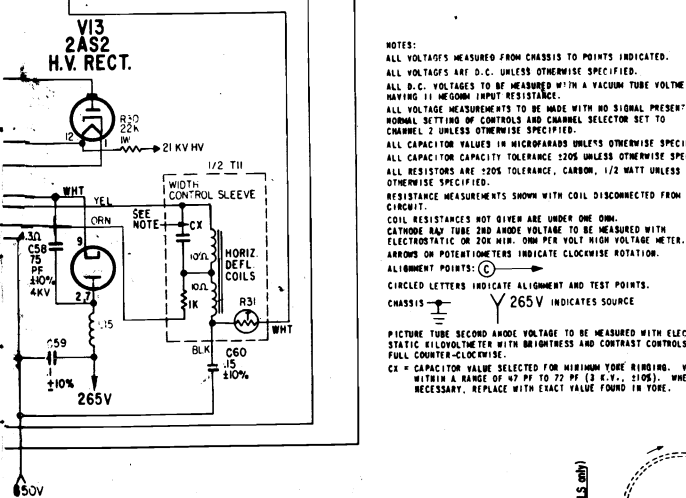
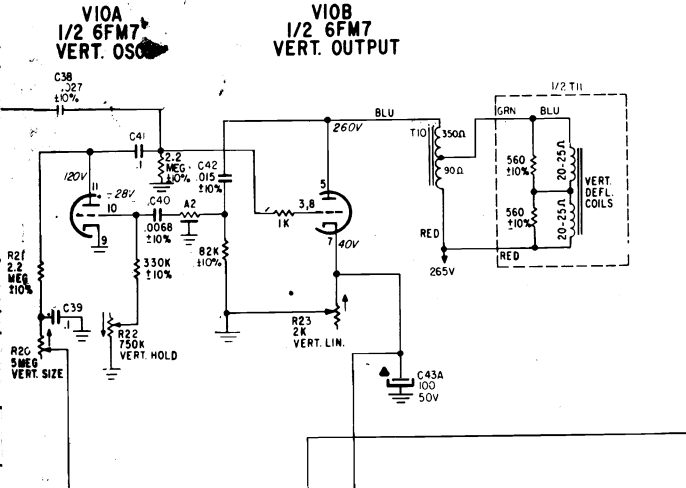
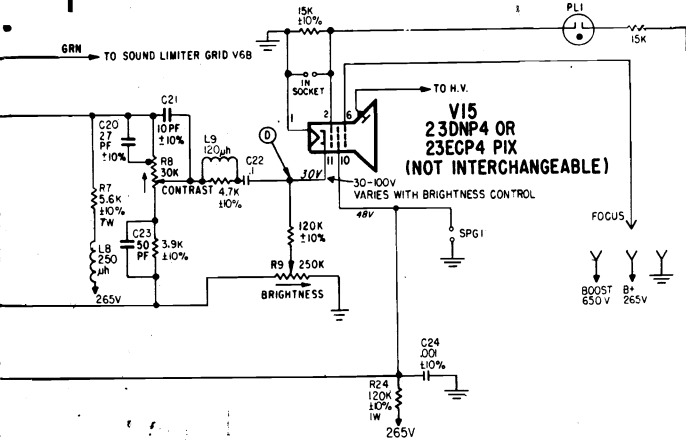
Schematic Diagram and Signal Path Chart 15L23 Chassis

(Chassis 15L22 uses practically identical circuit, but uses 23EDP4 picture tube, and different types of IF tubes.)

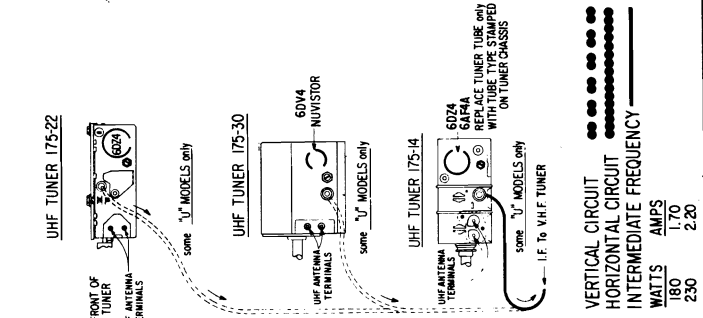
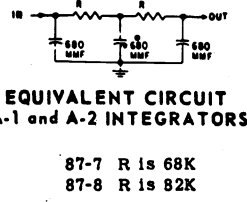
VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

ZENITH Chassis 15L23 Schematic Diagram, Continued

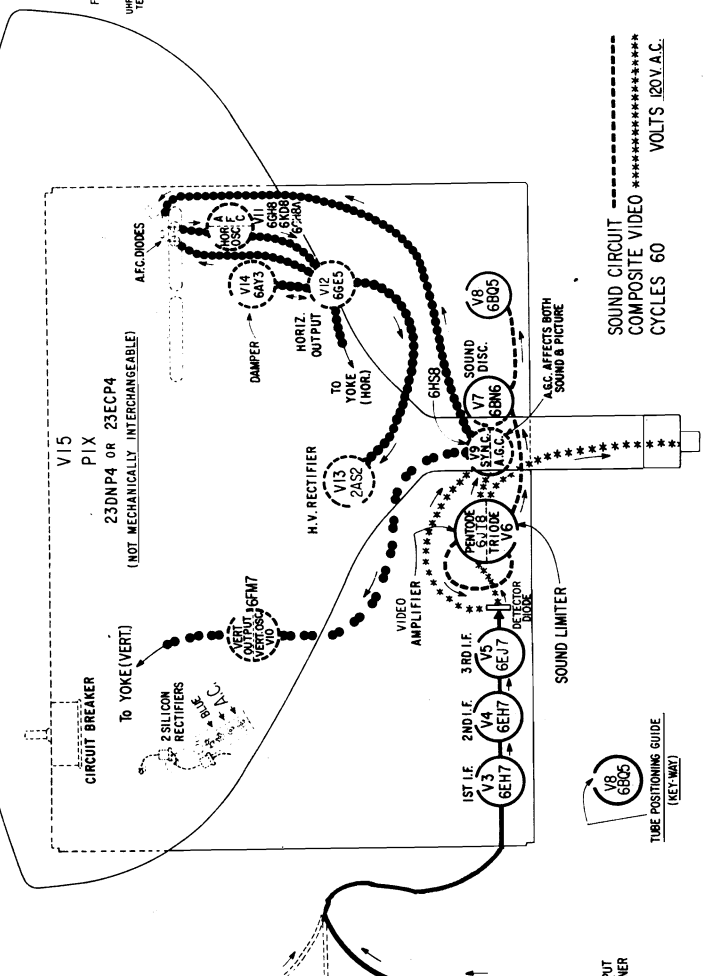
(Chassis 15L22 uses practically identical circuit.)



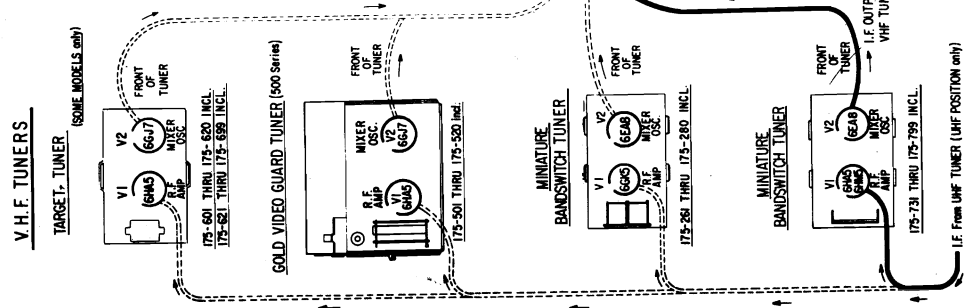
NOTES:
 ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.
 ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
 ALL D.C. VOLTAGES TO BE MEASURED WITH A VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.
 ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT.
 NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO CHANNEL 2 UNLESS OTHERWISE SPECIFIED.
 ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
 ALL CAPACITOR CAPACITY TOLERANCE 20% UNLESS OTHERWISE SPECIFIED.
 ALL RESISTORS ARE 20% TOLERANCE, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED.
 RESISTANCE MEASUREMENTS SHOWN WITH COIL DISCONNECTED FROM CIRCUIT.
 COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM.
 CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC C OR 20K OHM, 0.01M PER VOLT HIGH VOLTAGE METER.
 ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
 ALIGNMENT POINTS: (C) →
 CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS.
 CHASSIS: Y 265V INDICATES SOURCE.
 PICTURE TUBE SECOND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC RELOVOLT METER WITH BRIGHTNESS AND CONTRAST CONTROLS FULL COUNTER-CLOCKWISE.
 CX = CAPACITOR VALUE SELECTED FOR MINIMUM YOKE RINGING. VARIES WITHIN A RANGE OF 47 PF TO 77 PF (±10%). WHEN NECESSARY, REPLACE WITH EXACT VALUE FOUND IN YOKE.



VERTICAL CIRCUIT	●●●●●●●●●●
HORIZONTAL CIRCUIT	●●●●●●●●●●
INTERMEDIATE FREQUENCY	●●●●●●●●●●
AMPS	170
WATTS	230

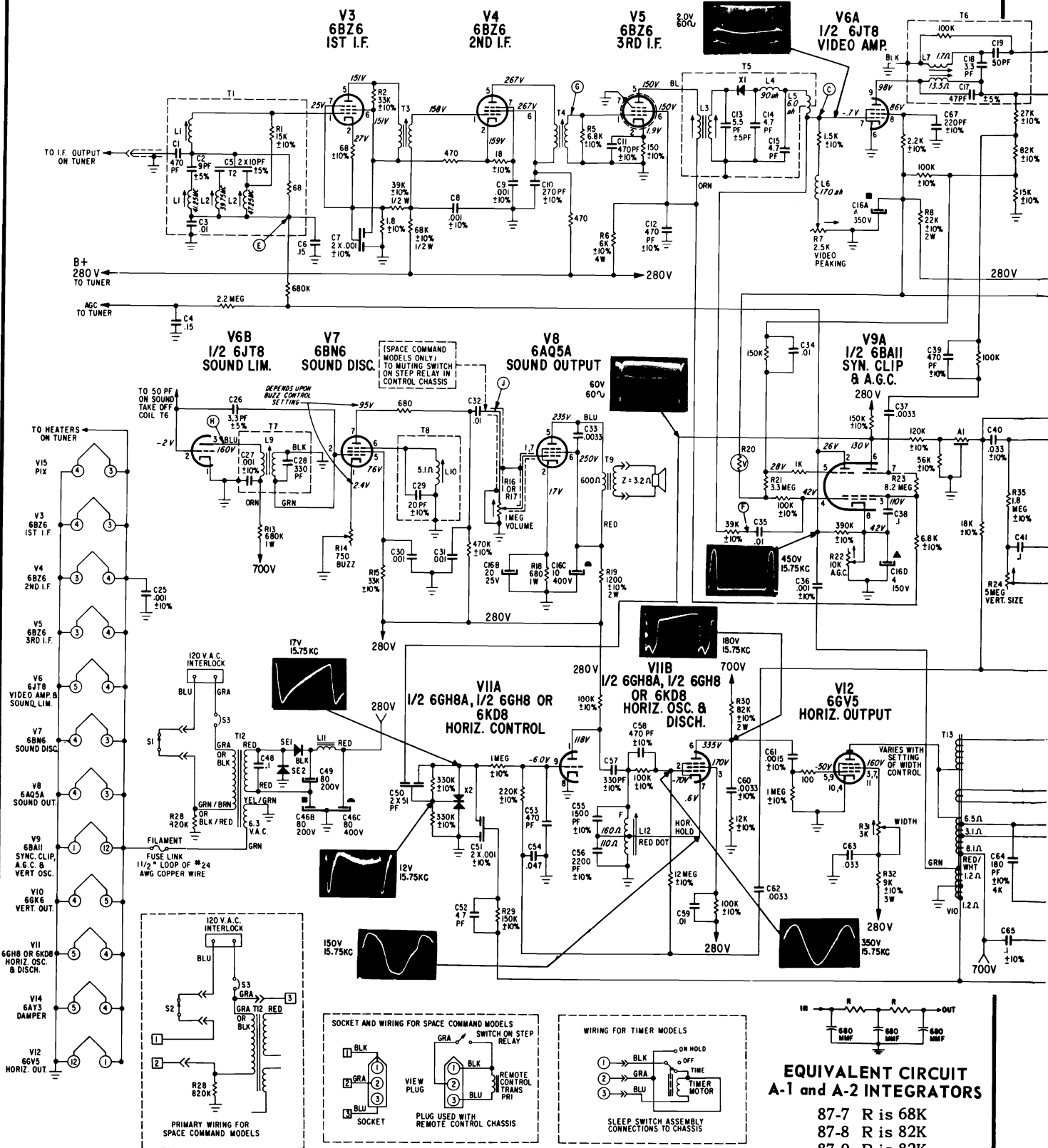


SOUND CIRCUIT	-----
COMPOSITE VIDEO	*****
CYCLES 60	*****
VOLTS 20V A.C.	*****



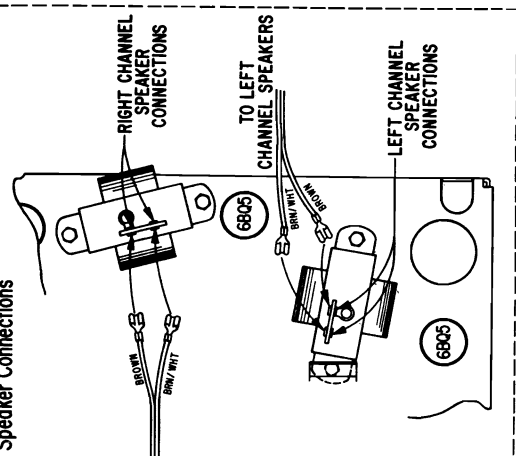
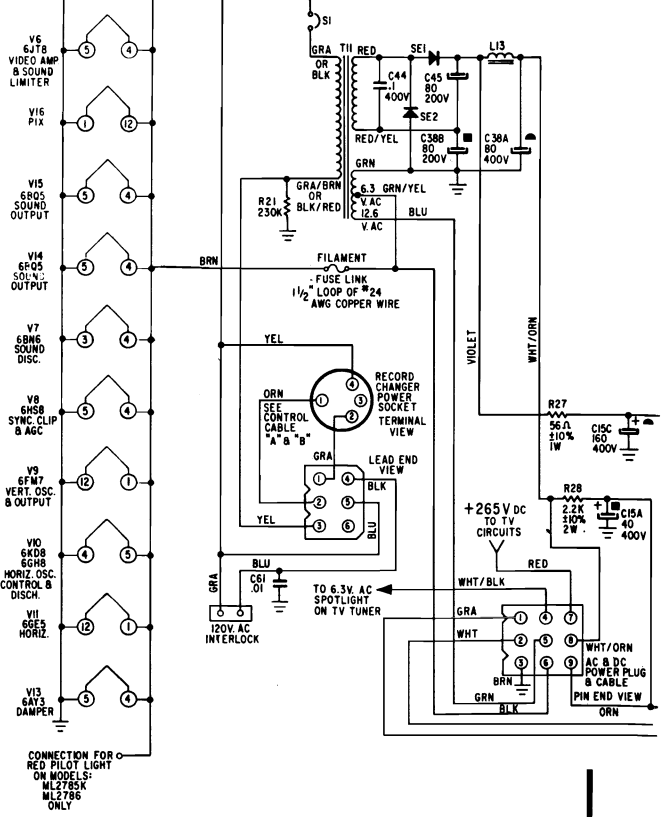
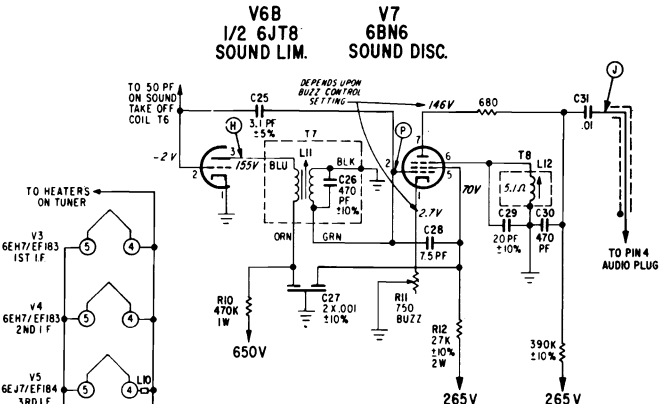
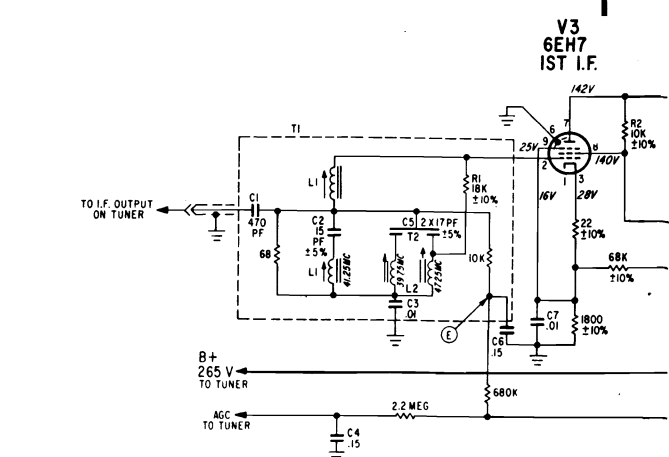
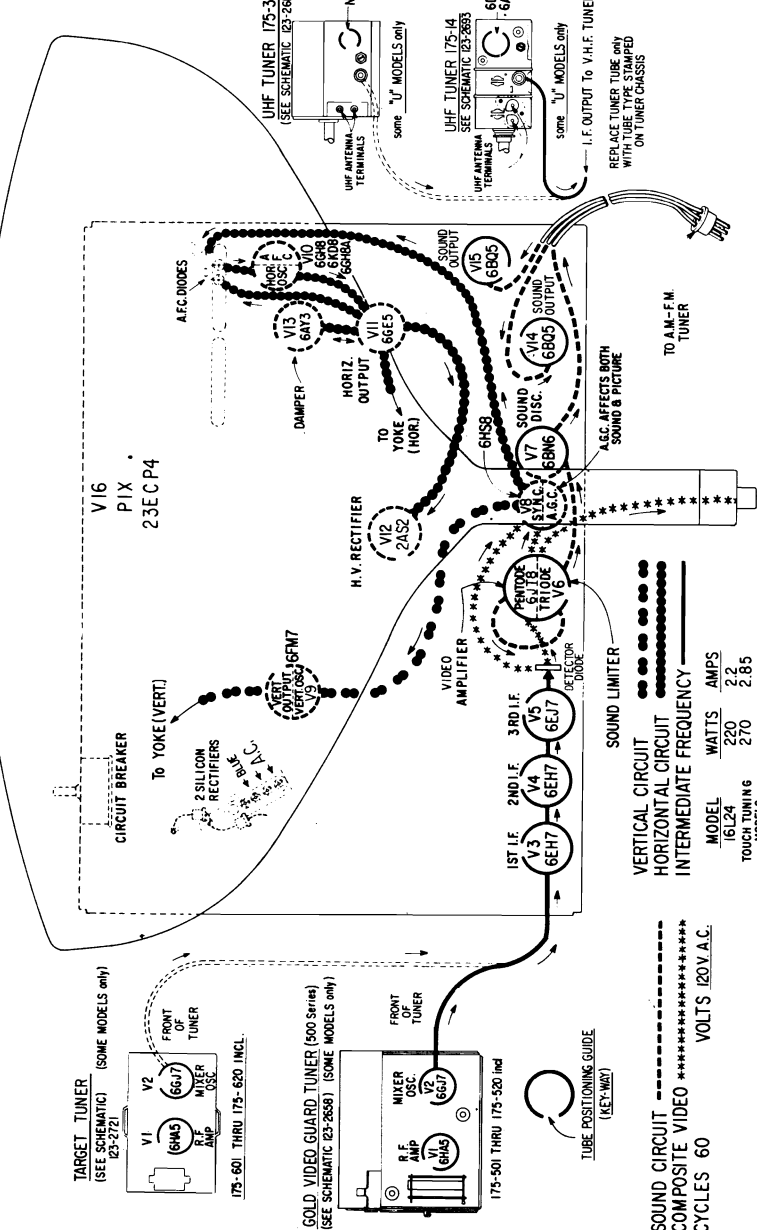
VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

ZENITH Chassis 15L27 Schematic Diagram, Continued



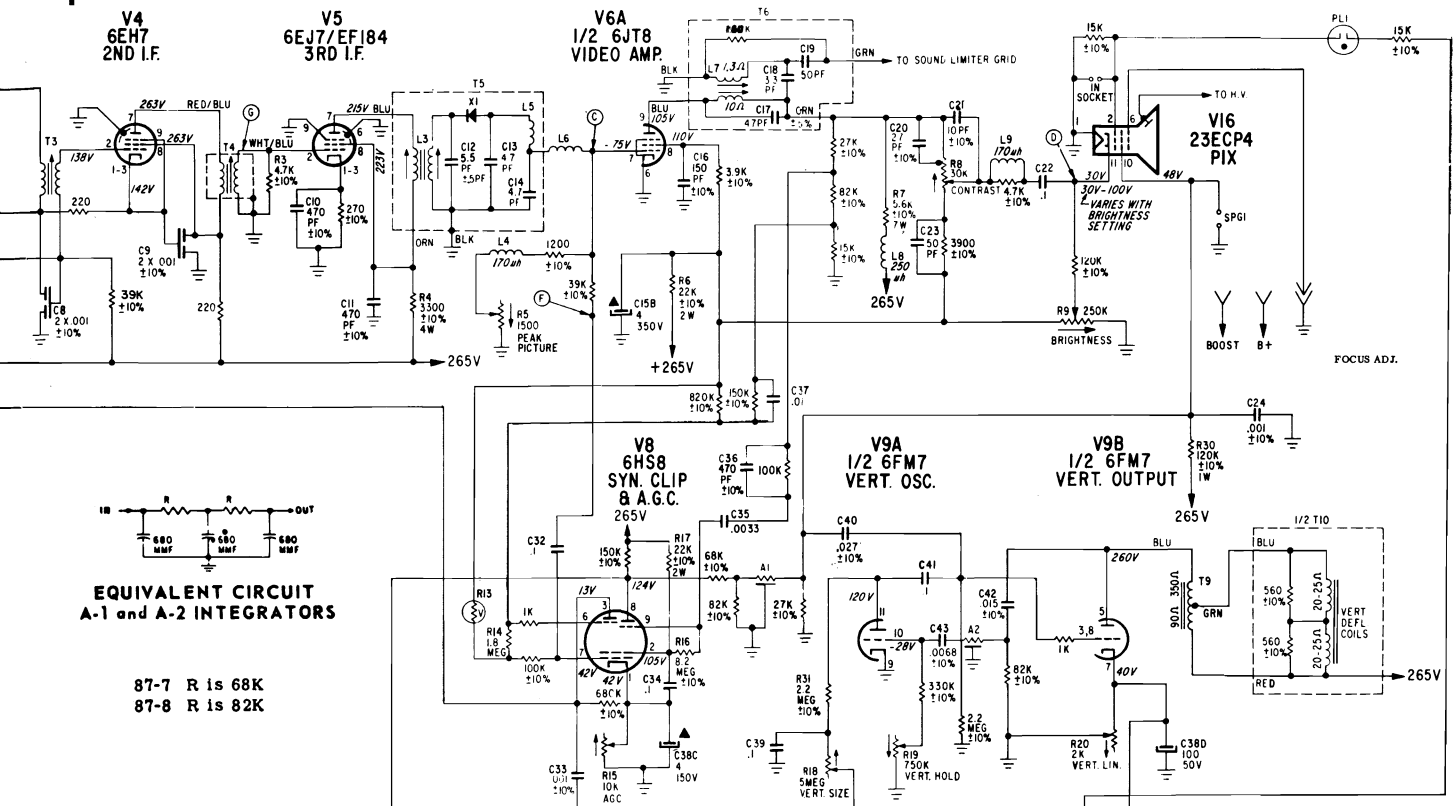
Schematic Diagram, Tube and Trimmer Layout, and Peak to Peak Voltages 15L27 Chassis (Waveforms representative of other "L" Chassis)

ZENITH Chassis 16L24 Schematic Diagram



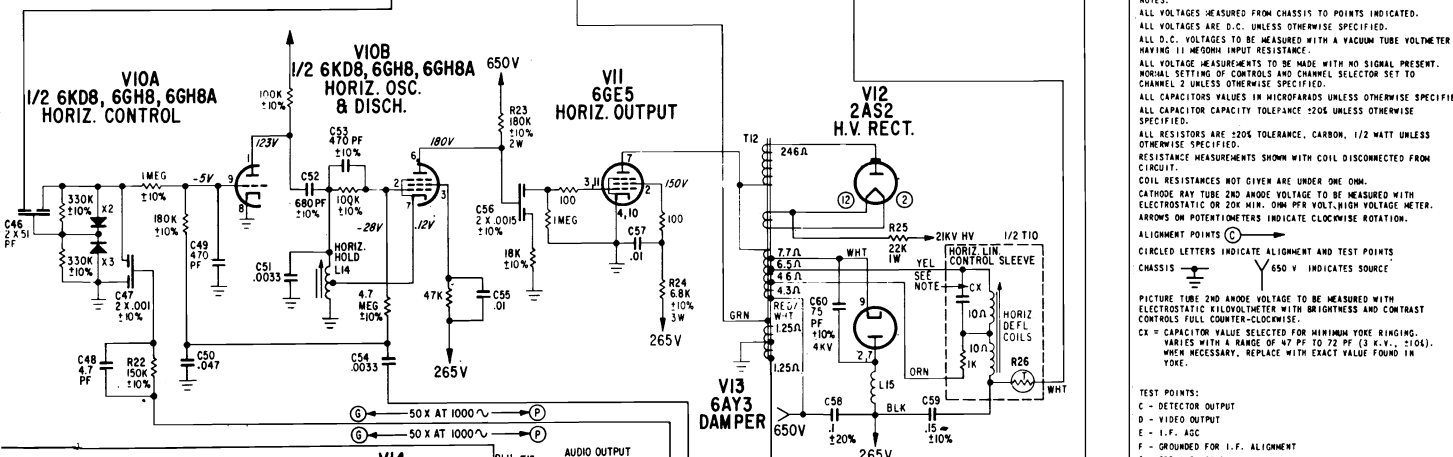
VOLUME TV-23, MOST-OFTEN-NEEDED 1965 TELEVISION SERVICING INFORMATION

ZENITH Chassis 16L24 Schematic and Layout Diagrams, Continued



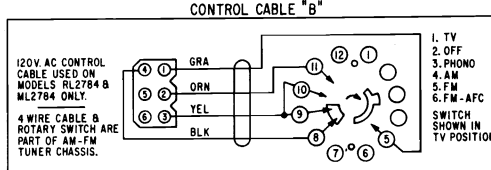
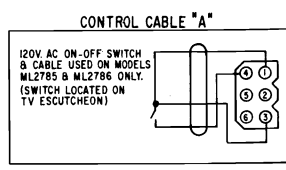
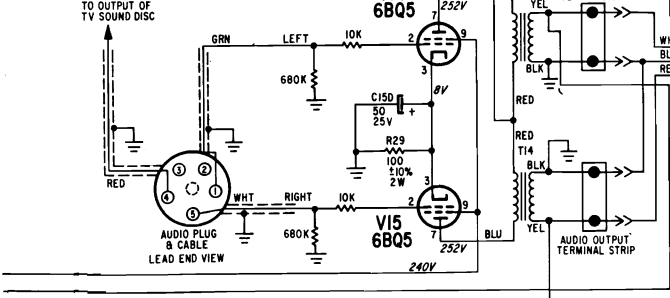
EQUIVALENT CIRCUIT A-1 and A-2 INTEGRATORS

87-7 R is 68K
87-8 R is 82K



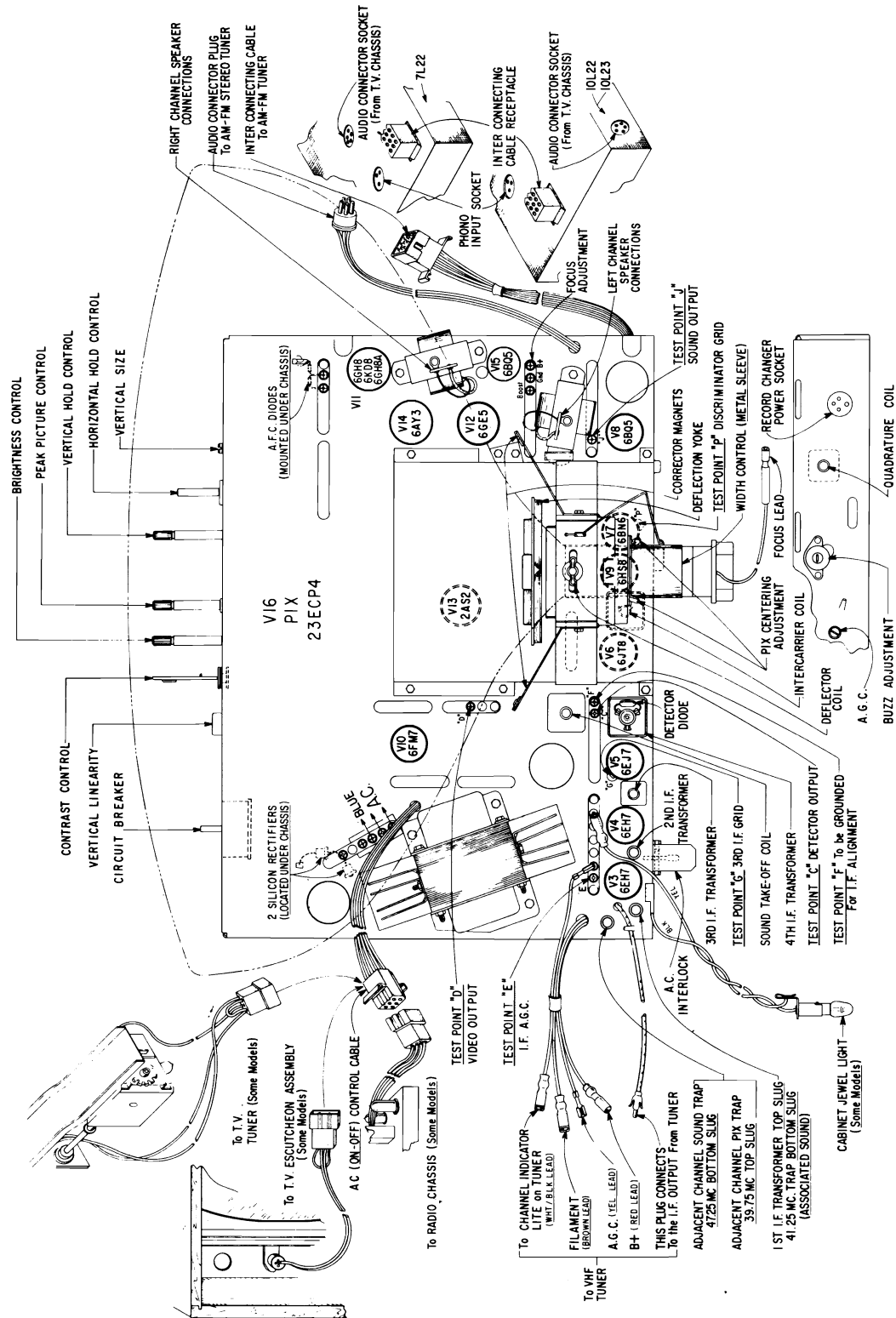
NOTES:
ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.
ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
ALL D.C. VOLTAGES TO BE MEASURED WITH A VACUUM TUBE VOLTMETER HAVING 11 MEGOHM INPUT RESISTANCE.
NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO CHANNEL 2 UNLESS OTHERWISE SPECIFIED.
ALL CAPACITORS VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
ALL CAPACITOR CAPACITY TOLERANCE ±20% UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS ARE ±20% TOLERANCE, CARBON, 1/2 WATT UNLESS OTHERWISE SPECIFIED.
RESISTANCE MEASUREMENTS SHOWN WITH COIL DISCONNECTED FROM CIRCUIT.
COIL RESISTANCES NOT GIVEN ARE UNDER ONE OHM.
CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 20K MIN. OHM PER VOLTS HIGH VOLTAGE METER. ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
ALIGNMENT POINTS (C)
CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS
CHASSIS (G)
PICTURE TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC RIVOLTMETER WITH BRIGHTNESS AND CONTRAST CONTROLS FULL COUNTER-CLOCKWISE.
CX = CAPACITOR VALUE SELECTED FOR MINIMUM YORE RINGING. VARIES WITH A RANGE OF 47 PF TO 72 PF (3 K.V., ±10%). WHEN NECESSARY, REPLACE WITH EXACT VALUE FOUND IN YORE.

TEST POINTS:
C - DETECTOR OUTPUT
D - VIDEO OUTPUT
E - I.F. ASC
F - GROUNDED FOR I.F. ALIGNMENT
G - 3RD I.F. GRID
H - SOUND OUTPUT
P - SOUND DISC GRID



Schematic Diagram, Signal Path Chart and Speaker Connections 16L24 Chassis

ZENITH Chassis 16L24 Tube and Trimmer Layout, Continued



Tube and Trimmer Layout Chart 16L24 Chassis

INDEX

Under each manufacturer's name, at left there are listed that make chassis and models in numerical order. The corresponding page number at right of each listing refers to the first page of the section dealing with such material.

<u>Admiral Corp.</u>	<u>Admiral, Cont.</u>	<u>Admiral, Cont.</u>	<u>Emerson, Cont.</u>	<u>G.E. Cont.</u>
1D4 3	P6204 15	UP9752 9	T1860 41	M181A++ 63
1D42-2 3	UP6204 15	UP9808 3	U1860 41	PAM200AVY 59
1D413-2 3	P6209 15		C2011 41	PAM201AVY 59
2D4 3	UP6209 15	<u>Airline</u>	D2011 41	PAM203AEB 59
2D42-1 3	P9414 3	see Mont. Ward	120671A 41	M205AVY 59
2D413-1 3	UP9414 3		120671B 41	SAM207A++ 59
2D413-4 3	P9421 3		120671C 41	SAM211AVY 59
D4 3	UP9421 3	<u>Delmonico</u>	120673C 41	SAM211AWD 59
7D43-1 15	P9423 3	4T-20U 21	120673D 41	RW365 58
7D413-1 15	UP9423 3	PTV-19UHF 25	120674A 35	M400ASD 53
8D418-1 3	P9428 3	CTM-235 29	120675B 35	M401ASD 53
D42-1 3	UP9428 3		120675E 35	M402A++ 53
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+ stands for any one of several different letters used.

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