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Television

Servicing Information

VOLUME TV-29

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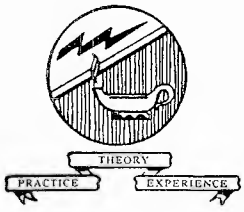

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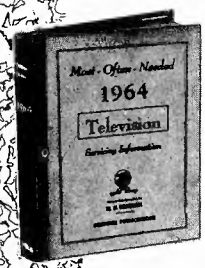

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	TV-17	1960
	TV-16	Late 1959
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	20	1960
	19	1959
	18	1958
	16	1956
	15	1955
	14	1954
	13	1953
	12	1952
	11	1951
	10	1950
	9	1949
	8	1948
	7	1947
	6	1946
	5	1942
	4	1941
	3	1940
	1	1926-1938

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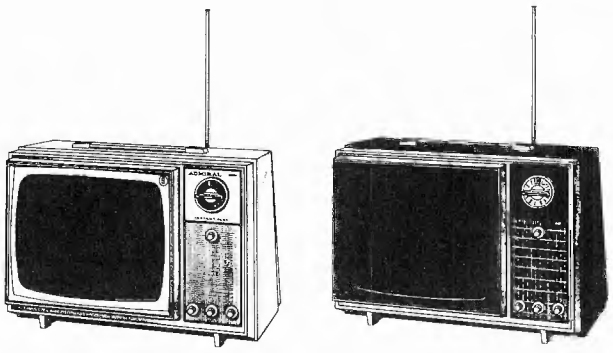
MODEL CHART

MODEL	NAME	COLOR	SIZE	TUNER	CHASSIS
9P209	Playmate	White	*9''	94E360–1 VHF 94E361–1 UHF	TL2–1A
9P210	Playmate	Black			
9P212	Playmate	Red			
9P215	Playmate	White			
9P227	Playmate	Walnut/Black			
SK9P210	Playmate	Black			

* Picture diagonal measurement.



9P209 9P210, 212

HORIZONTAL LOCK ADJUSTMENT

The Horizontal Lock 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 slight adjustment of the Horizontal Lock control.

To determine a faulty horizontal oscillator circuit, short TP "R" to ground with short jump. It should be possible to lock the picture in with the Horizontal Lock control with a slight weaving back and forth in the picture.

To determine a correct horizontal phase detector action, short TP "V" to ground and check the voltage from the grid of the horizontal oscillator to ground. When the horizontal lock coil is varied back and forth, the voltage reading should vary between 0 volt to negative 0.5 volts.

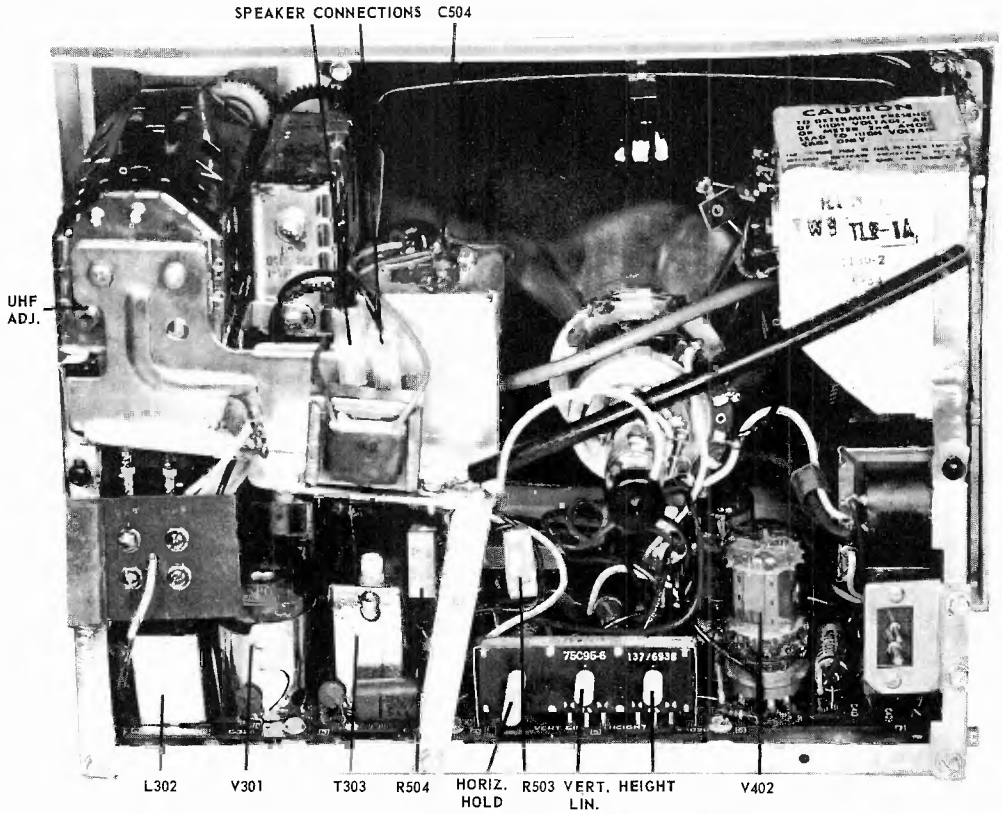


FIG. 1 TOP VIEW OF CHASSIS SHOWING ALIGNMENT & SERVICE ADJUSTMENT LOCATIONS

CHASSIS VOLTAGES WITH SIGNAL

Listed below are DC voltages for each stage when an average level (snow free) program is tuned in. These voltages must be used carefully or else they can be misleading. Remember that they may vary with different level signals, program information and control adjustments.

17BF11	
Pin #	Volts
1	Fil
2	2.1
3	0
4	0
5	0
6	70
7	130
8	0
9	7.6
10	120
11	145
12	Fil

8BM11	
Pin #	Volts
1	Fil
2	106
3	106
4	0
5	1.35
6	0
7	107
8	0
9	107
10	.6
11	.03
12	Fil

8JV8	
Pin #	Volts
1	0
2	-1.2
3	66
4	Fil
5	Fil
6	0
7	-2.5
8	124
9	80

17JZ8	
Pin #	Volts
1	Fil
2	28
3	0
4	Do Not Measure
5	
6	-16
7	-16
8	110
9	0
10	-64
11	0
12	Fil

8FQ7	
Pin #	Volts
1	84
2	.55
3	3.5
4	Fil
5	Fil
6	94
7	-9
8	3.5
9	0

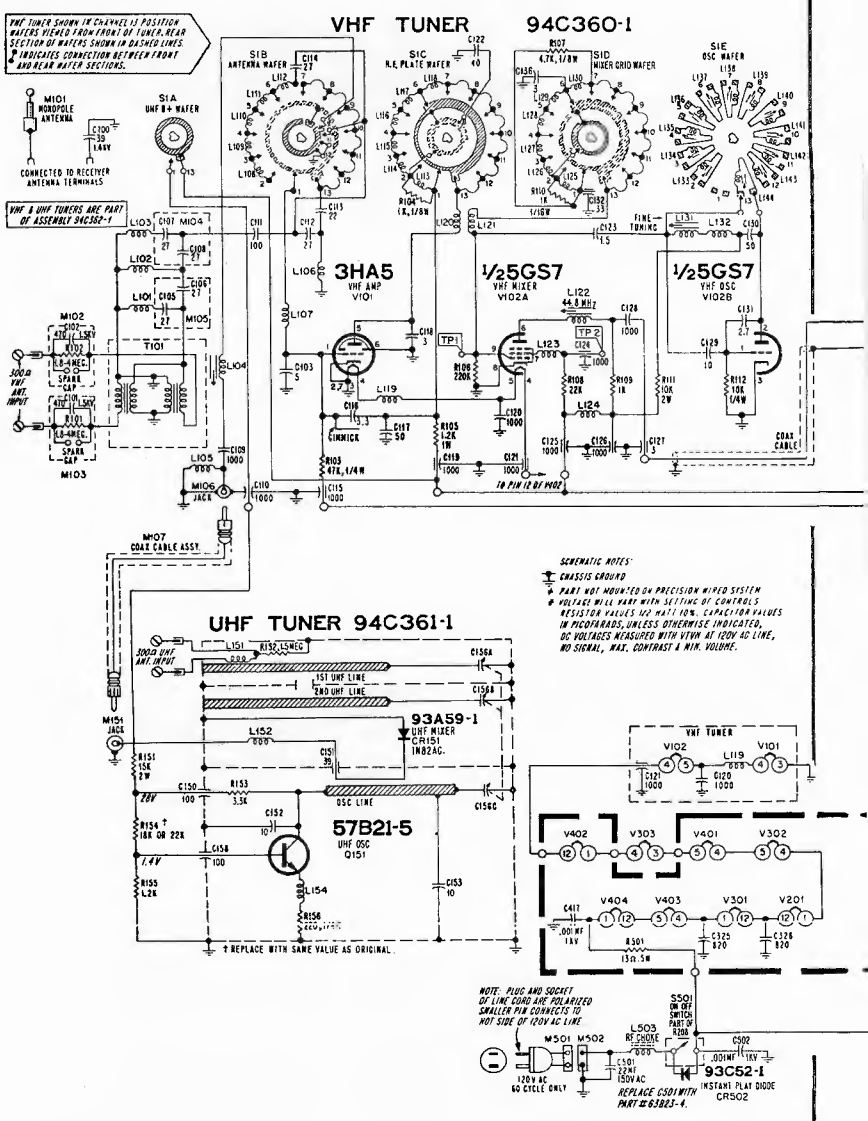
33GY7A	
Pin #	Volts
1	Fil
2	138
3	
4	Do Not Measure
5	Do Not Measure
6	
7	
8	0
9	-14
10	0
11	82
12	Fil

6GH8A	
Pin #	Volts
1	52
2	80
3	350
4	Fil
5	Fil
6	-68
7	104
8	0
9	-21

IF AGC TP "I" -11V
RF AGC TP "R" -2.6

SERVICE HINT

After the start of production C410, C422, C427 and C429 were moved to the bottom of the etched circuit board to improve the performance and reliability.



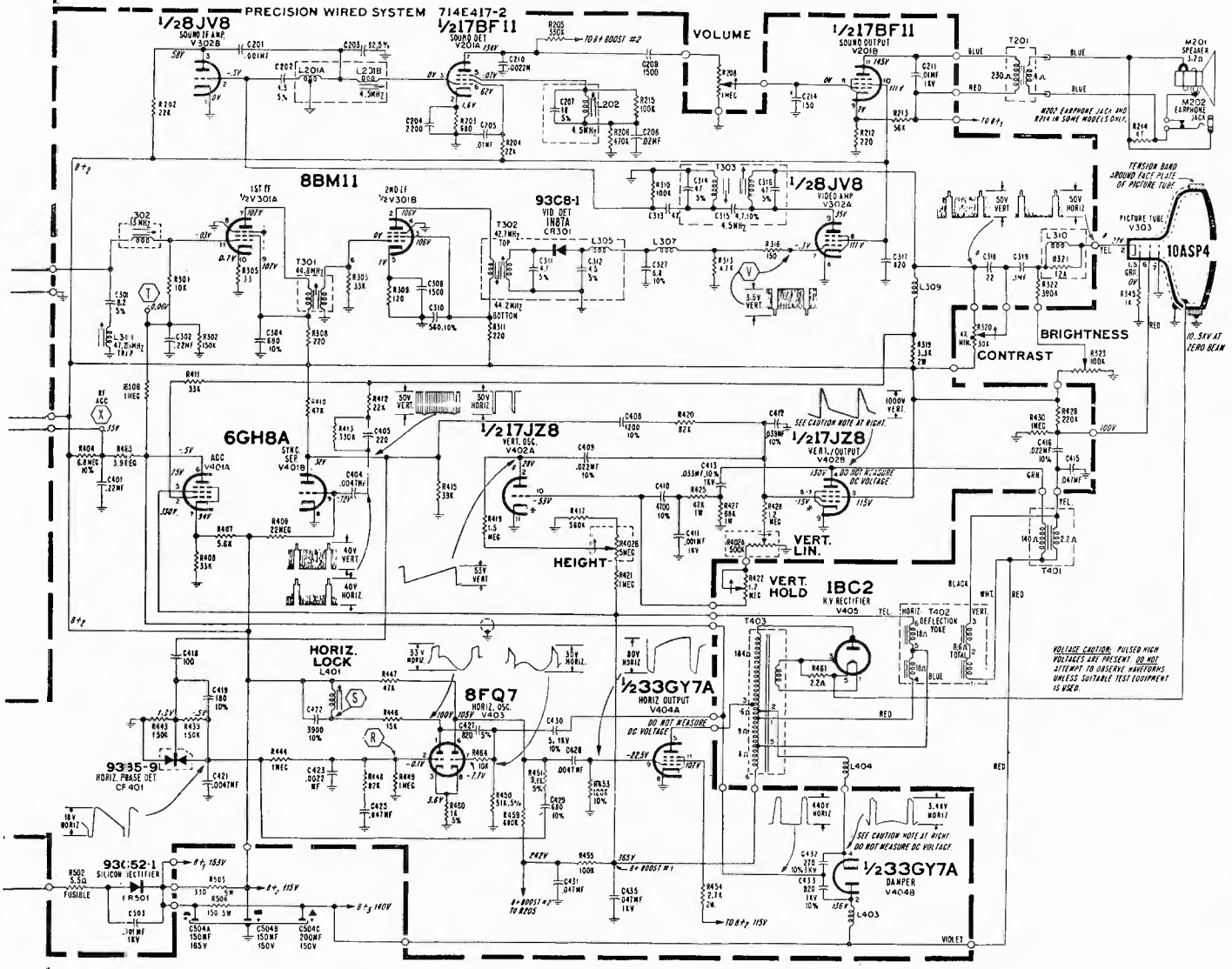
VHF AND UHF CHANNEL ADJUSTMENT

These sets are provided with a VHF channel adjustment slug for each channel. 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 and VHF indicator.
4. Using a non-metallic alignment blade, carefully adjust channel slug located through a hole at 7 o'clock on the tuner shaft for best picture and sound. Note: Sound may not be loudest at this point. Repeat procedure for each channel to be adjusted.

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 L104 for best picture, consistent with good sound.



TL2-1A SCHEMATIC DIAGRAM

IF AMPLIFIER ALIGNMENT

Connect isolation transformer between AC line and receiver. Connect negative of 6 volt bias supply to test point "T" (IF AGC), & "X" (RF AGC) and connect the positive lead to chassis ground.

Using needle nose aligator clip or looped end of hookup wire, connect a 50 or 90 ohm mixer matching pad to match your equipment impedance shown on page 4 to test point TP1 low side directly to tuner, see figure 1. Connect signal generator to matching pad.

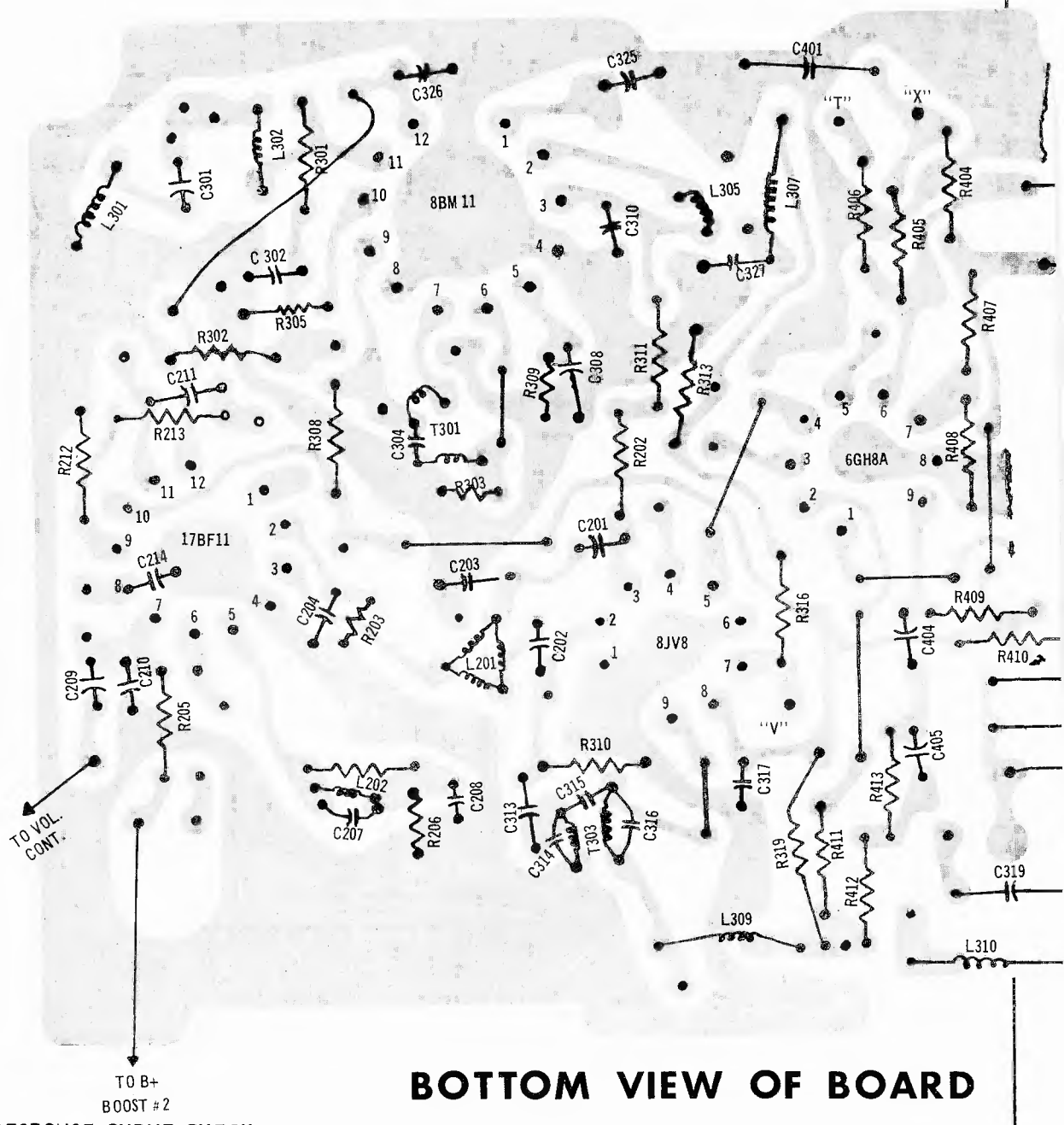
Connect VTVM high side to test point "V" through a decoupling filter. See page 4. Connect low side to chassis.

Set channel selector to unused Channel 12 or 13. Connect jumper wire across antenna terminals. Set RF generator output to give reading 1-2 volts over residual reading for all pre-peaking IF adjustments.

Allow about 15 minutes for receiver and test equipment to warm up. Use a non-metallic alignment tool.

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

1. Set generator at 47.25MHz and adjust L301 for minimum with 6 volt bias reduced to zero for this step only.
2. Set generator at 42.7MHz and adjust T302 top slug for maximum. Use – 6 volts bias for steps 2 - 12.
3. Set generator at 44.2MHz and adjust T302 bottom slug for maximum.
4. Set generator at 44.8MHz and adjust T301 for maximum.
5. Connect wire jumper across IF input coil L302.
6. With generator at 44.8MHz, adjust L122 on tuner for maximum. See page 4.
7. Remove wire jumper of step 5.
8. Set generator at 43MHz and adjust L302 for maximum.
9. A. This completes pre-peaking.
   B. Disconnect signal generator and connect sweep generator. Feed all signals through mixer matching pad connections to test point TP1 on tuner.
10. Transfer VTVM decoupling network to oscilloscope calibrated for 3 volts P to P to network.
11. Set sweep frequency at 43MHz, sweep width approximately 7MHz. Maintain 3 volts P to P sweep display by adjusting sweep RF. Keep marker at low level to prevent overloading. A reduction in sweep output should reduce amplitude without altering the shape of the response curve.
12. If 45.75MHz marker is not within tolerance or markers not in proper location on curve, adjust L122 to position 45.75MHz marker. Adjust T302 top to correct shape of curve. Avoid reducing amplitude of curve as much as possible. See the IF curve drawing on page **8.**



BOTTOM VIEW OF BOARD

IF RESPONSE CURVE CHECK

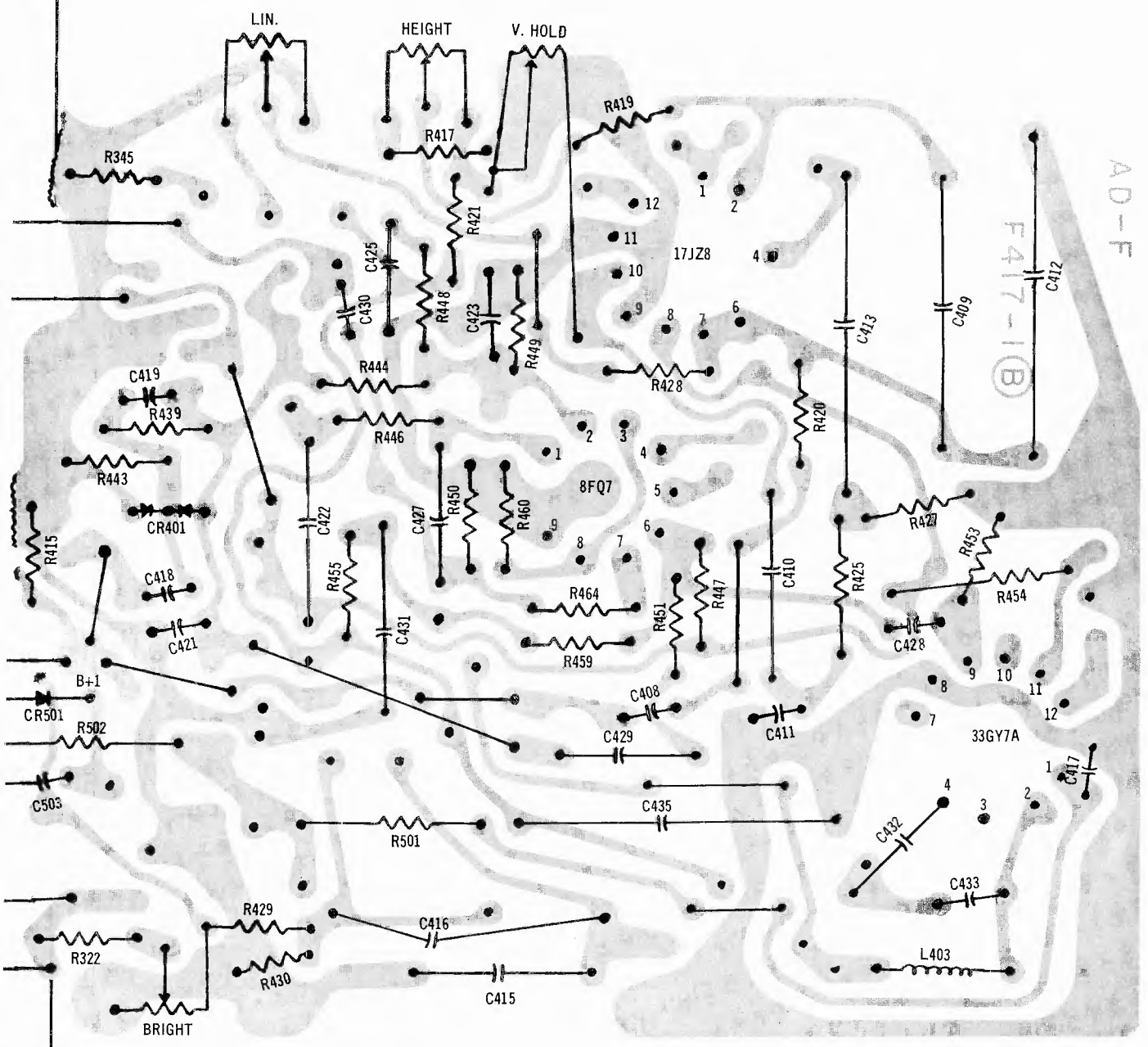
1. Allow about 15 minutes for receiver and test equipment to warm up. Use an AC line isolation transformer.
2. Set VHF tuner to Channel 12. Connect negative of 6 volts bias supply to test points "X" and "T"; positive to chassis.
3. Connect sweep generator to VHF tuner to test point TP1 through the mixer matching pad of page 4. Ground low side nearby. The mixer matching pad must match your generator impedance.
4. Connect oscilloscope high side to test point "V" through decoupling filter of page 4, low side to chassis.
5. The IF curve now obtained should be checked against the IF response curve, on page 4. Maintain sweep output at 3V P to P as alignment progresses. Keep markers low. A reduction in sweep output should reduce curve amplitude without appreciably altering the shape of the response curve.
6. If the curve is not within tolerance or markers not in proper location, L122 VHF Tuner Mixer Plate Coil should be adjusted for 45.75MHz video marker and T302 Top for rounded curve nose.

ALIGNMENT OF 4.5MC TRAP

Alignment of 4.5MC (beat interference) trap T303 top slug requires use of a hexagonal non-metallic alignment tool.

To align 4.5MC trap T303 top slug, tune in television station with beat interference pattern in picture. While closely observing picture, adjust slug T303 top slug for minimum interference pattern.

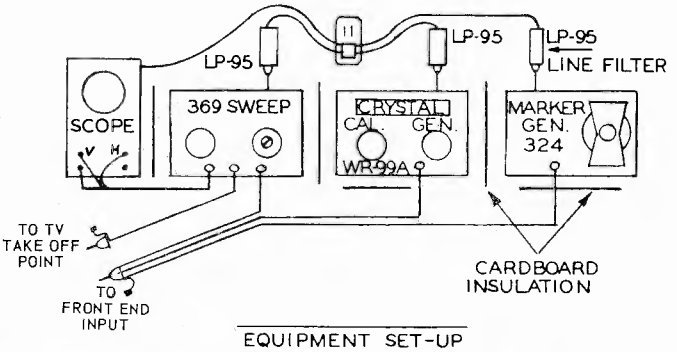
Note that adjustment T303 top slug is slug farthest from bottom of coil. Use caution so as not to disturb bottom slug, slug nearest bottom of coil, as sound IF alignment will be affected.



SHOWING COMPONENT CONNECTIONS

OVER-ALL VHF-IF RESPONSE CURVE CHECK

1. Set VHF Channel Selector on Channel 12. Connect negative of 6 volt bias supply to test point "T" (IF AGC) and negative 1.5 volt to test point "X" (RF AGC) positive to chassis.
2. Connect isolation transformer between AC line and receiver. Allow about 15 minutes for receiver and test equipment to warm up.
3. Attach the sweep generator at the VHF tuner antenna terminals, using 50 or 90 ohm VHF isolation network to match your generator impedance.
4. Connect oscilloscope high side to test point "V" through decoupling filter, low side to chassis. Adjust sweep generator for 3 volt P to P at test point "V"
5. Compare response curve obtained against ideal overall curve shown on page 8.

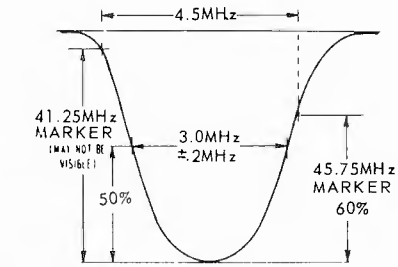


EQUIPMENT SET-UP

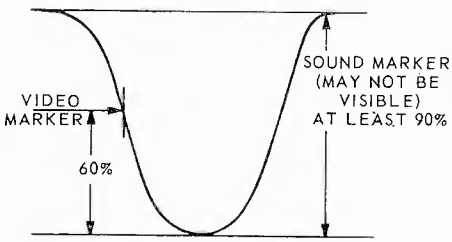
4.5MC SOUND IF ALIGNMENT

1. Tune in normal picture on strongest TV station. Allow about 15 minutes for set to warm up. See page 3 for adjustment locations.
2. Using non-metallic alignment tool, slowly turn slug L202 to several turns to left until a buzz is heard in sound. Then slowly turn slug L202 to the right for loudest and clearest sound. NOTE: There may be two points (Approximately ½ 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 L201B for loudest and clearest sound with minimum hiss. If hiss disappears during alignment, reduce signal to maintain hiss level. Re-adjust slug L201B. NOTE: Slug L201B should be at end nearest bottom of coil.
5. Carefully adjust slug T303 bottom slug for loudest and clearest sound with minimum hiss. If hiss disappears during alignment, reduce signal to maintain hiss level. Re-adjust slug T303. Caution: Slug T303 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 re-adjust slug L202 unless sound is distorted. If L202 is re-adjusted, all steps in alignment procedure should be repeated exactly as instructed.

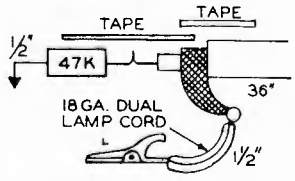


IF CURVE

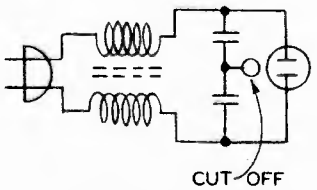


IDEAL OVERALL RESPONSE CURVE

Curves can be reversed or up or down depending on equipment and termination.

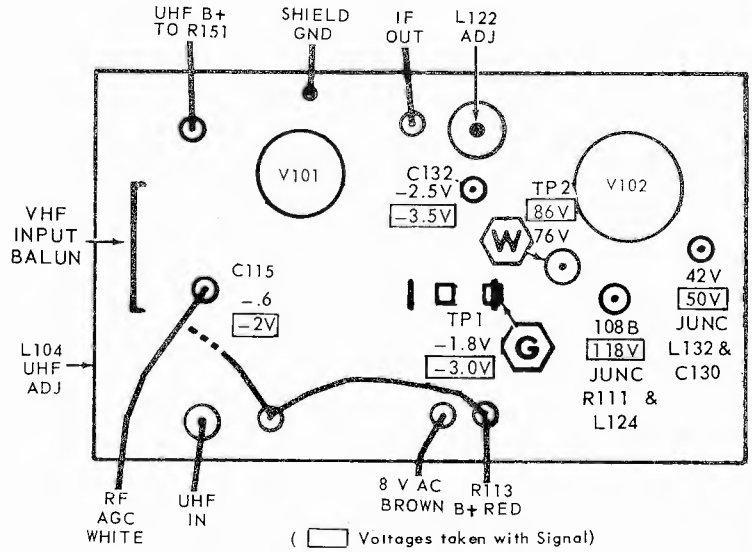


DECOUPLING FILTER

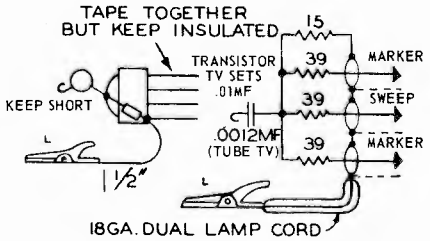


CALRAD LP-95 FILTER

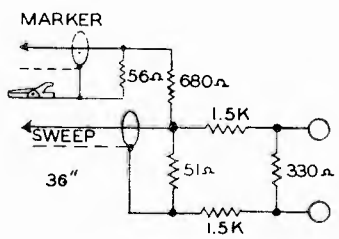
98A103-3



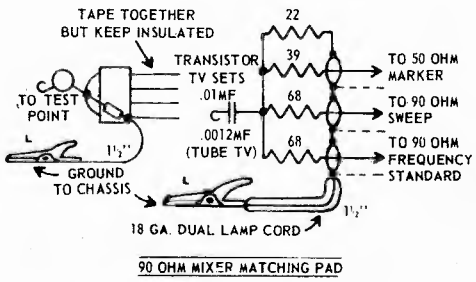
TOP VIEW OF TUNER



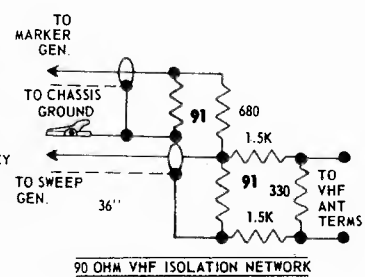
50 OHM MIXER MATCHING PAD



50 OHM VHF ISOLATION NETWORK



90 OHM MIXER MATCHING PAD



90 OHM VHF ISOLATION NETWORK

ALL LEADS 3/8" UNLESS OTHERWISE SPECIFIED!
ALL SHIELDED CABLE MUST BE RG58A/U FOR 50 OHM AND RG62A/U FOR 90 OHM EQUIPMENT.

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The schematic on pages 10-11 is exact only for the chassis types as marked under the schematic and can be applied in all respects to the corresponding models. The other sets among those listed on this page use very similar circuits, but in many cases with different tuners. This brief service information will be helpful in repairing any of these sets.

MODEL CHART

MODEL	COLOR	SIZE	TUNER	CHASSIS
16P18CF	Gray	*16''	94C363-1 VHF 94C361-1 UHF	T2H3-1A
C1634FP	Beige			
C1657FP	Walnut			
AC1660FP	Walnut			
AC1667FP	Walnut			
18H19	Beige	*18''	94C363-1 VHF 94C361-1 UHF	T11H4-1A
18P28F	Gray			
1881FP	Tan			
C1881FP	Tan			
C1897FP	Walnut			
AC1837FP	Walnut			T16H4-1A
19P11CF	Brown	*19''	94C363-1 VHF 94C361-1 UHF	T12H4-1A
19P15CF	Avocado			
C1953FP	Sungold			
C1955FP	Avocado			
19P27CF	Walnut			T13H4-1A
C1977FP	Walnut			
AC1990FP	Walnut			

MODEL CHART

MODEL	NAME	COLOR	SIZE	TUNER	CHASSIS
16P18CFM	Rancher	Gray	*16''	94E281-7 VHF	TH3-1A
19P27CFM	Suburban	Walnut	*19''	94E296-4 UHF	T8H4-1A
19P11F	Cavalier	Brown	*19''	94C363-1 VHF 94C361-1 UHF	T12H4-1A
19P15F	Cavalier	Avocado			
AC1987FP		Black			
AC1987FPM		Black		94E281-7 VHF 94E296-4 UHF	T3H4-1A
C18P28FM		Gray	18''	94E281-7 VHF 94E296-4 UHF	TH4-1A

MODEL CHART

MODEL	NAME	COLOR	SIZE	TUNER	CHASSIS
AC1667PFM		Walnut	*16''	94E281-7 VHF 94E296-4 UHF	TH3-1A
19P11FM	Cavalier	Brown	*19''	94E281-7 VHF 94E296-4 UHF	T3H4-1A
19P15FM	Cavalier	Avocado			

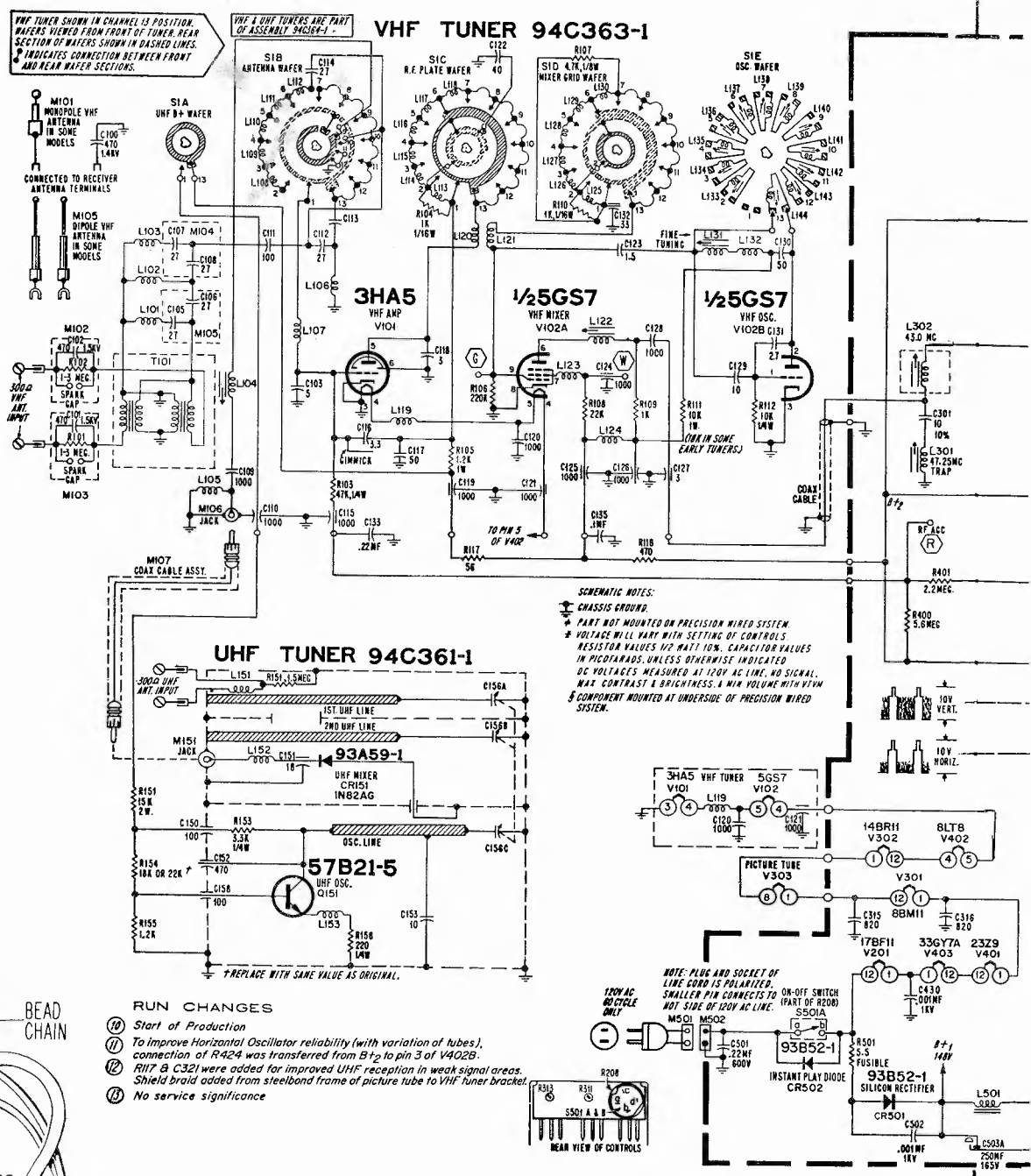
MODEL CHART

MODEL	NAME	COLOR	SIZE	TUNER	CHASSIS
X16P18FM		Gray	*16''	94E281-7 VHF 94E296-4 UHF	TH3-1A
X18P28FM		Gray	*18''		TH4-1A
18P28FM	Explorer	Gray			
1881FPM	Windsor	Tan			
C1881FPM	Windsor	Tan			
C1897FPM	Oxford	Walnut			
18H19M		Beige			
X1881FPM	Windsor	Tan			
C1953FPM	Canterbury	Sungold	*19''		T3H4-1A
C1955FPM	Canterbury	Avocado			
19P11CFM	Cavalier	Brown			
19P15CFM	Cavalier	Avocado			

MODEL CHART

MODEL	NAME	COLOR	SIZE	TUNER	CHASSIS
C1634FPM	Wilshire	Beige	*16''	94E281-7 VHF 94E296-4 UHF	TH3-1A
C1657FPM	Chelsey	Walnut			
AC1660FPM		Walnut			

*Picture measured diagonally.



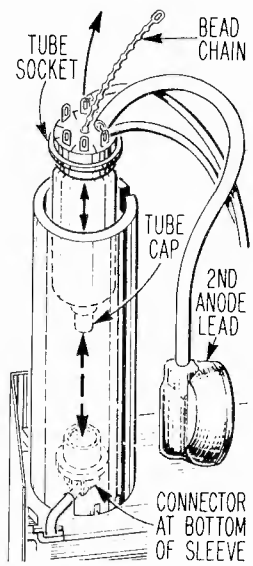
RUN CHANGES

(10) *Start of Production*

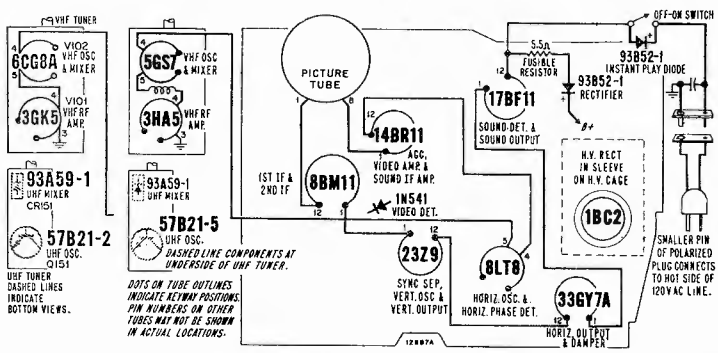
(11) *To improve Horizontal Oscillator reliability (with variation of tubes), connection of R424 was transferred from B+2 to pin 3 of V402B.*

(12) *R117 & C321 were added for improved UHF reception in weak signal areas. Shield braid added from steelbond frame of picture tube to VHF tuner bracket.*

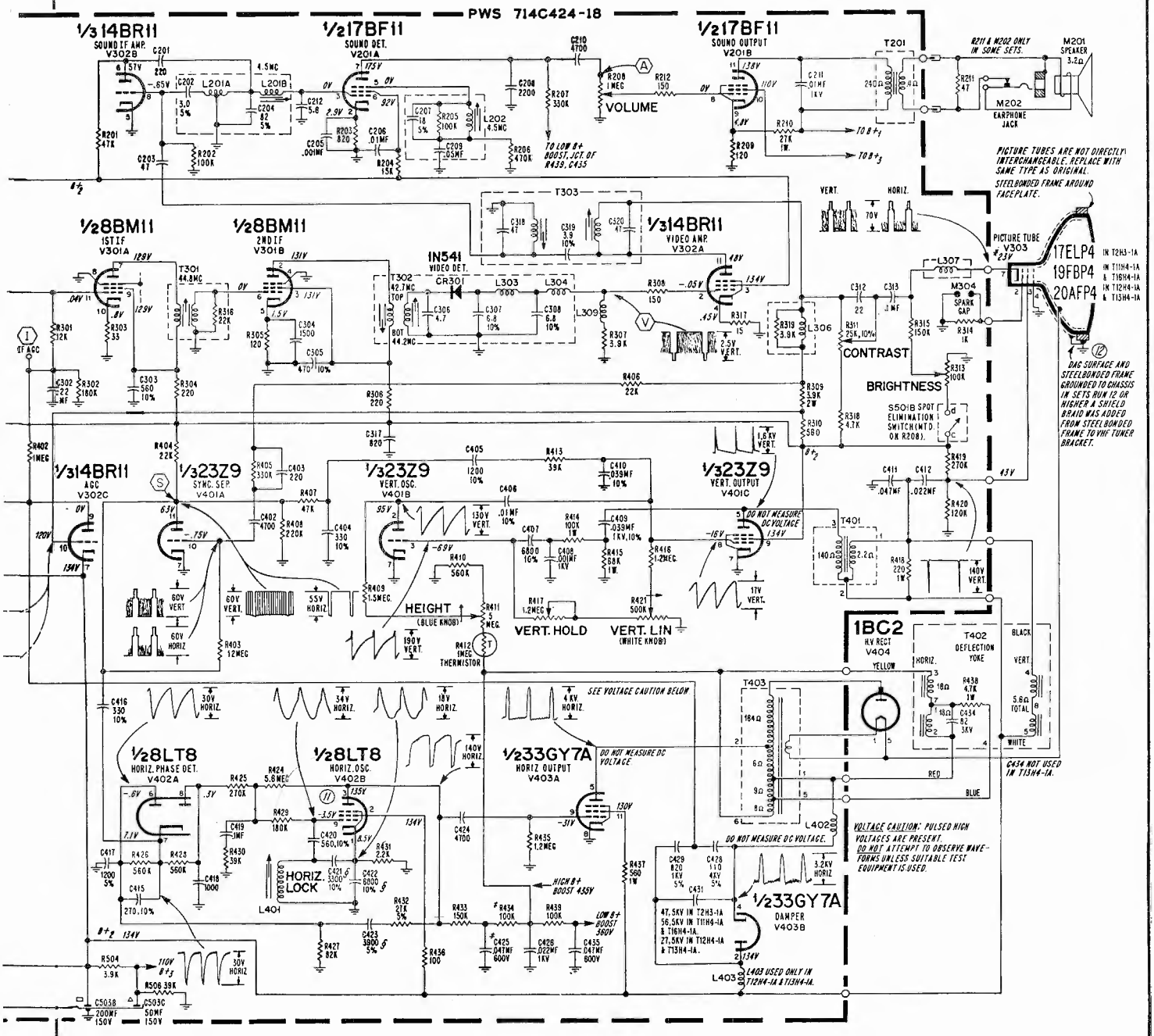
(13) *No service significance*



HIGH VOLTAGE RECTIFIER HOUSING



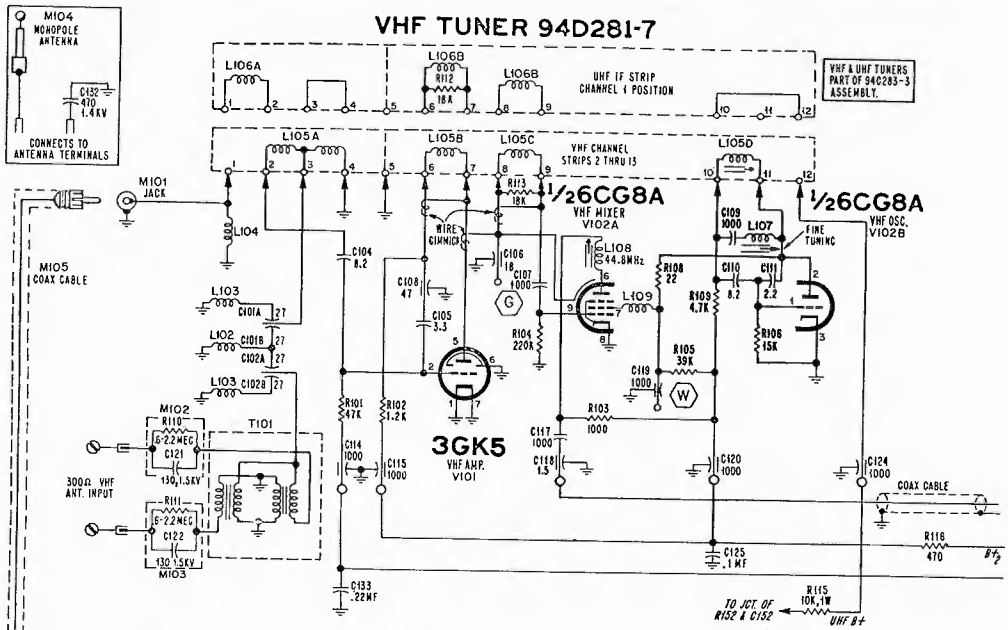
TUBE LOCATION CHART

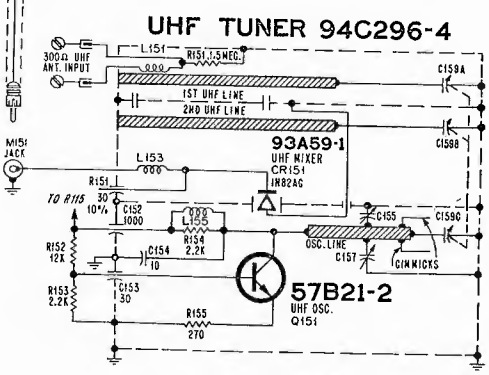


T2H3-1A, T11H4-1A, T12H4-1A, T13H4-1A, T16H4-1A CHASSIS

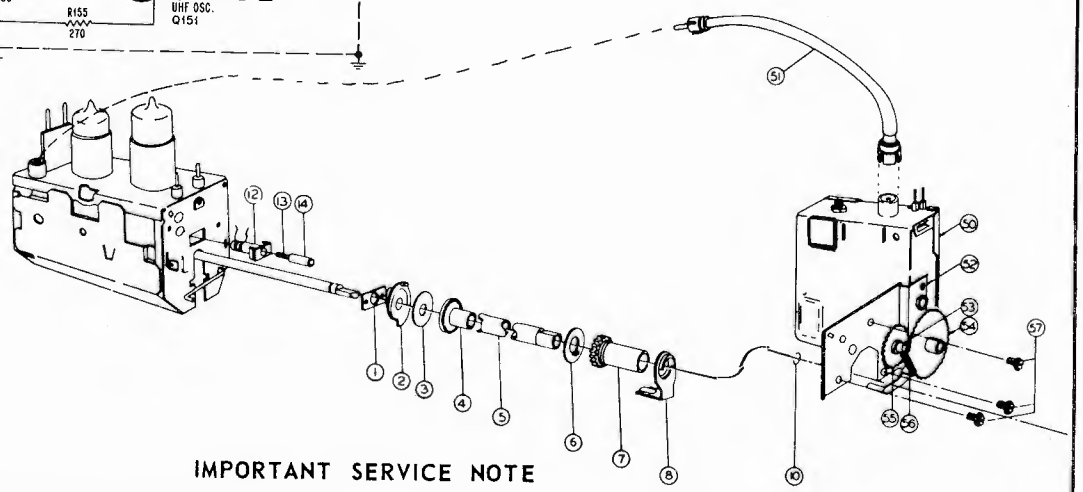
50 CYCLE POWER SUPPLY WIRING FOR MODELS WITH "X" PREFIX

ADMIRAL Tuner 94D281-7 used in Chassis TH3-1A, TH4-1A, etc.





EXPLODED VIEW OF 94E281-7 VHF & 94E296-4 UHF TUNER



IMPORTANT SERVICE NOTE

High Voltage Warning: Usual monochrome television high voltage is present at some points in these models. Operation of receiver outside of cabinet or with back removed involves a shock hazard.

1. Use an isolation transformer when servicing chassis with back removed.
2. This chassis has an "Instant Play" feature. Remove the AC line cord to turn set completely off.
3. Make sure all chassis and high voltage shielding is in place before returning the set to consumer.
4. Make sure that polarized AC line cord feature has not been defected by clipping off the wider prong.
5. Handle the picture tube only when wearing shatter-proof goggles, after discharging high voltage completely.
6. After repair, with an ohmmeter, check the resistance between the exposed metal parts *outside* the cabinet to the disconnected AC line cord prongs. With the On/Off switch in the On position there must be a minimum of 300,000 ohms and a maximum of 4 meg. The less resistance indicates a leakage path which must be corrected before consumer use. More resistance indicates an open static discharge path.

Admiral

The service material on pages 13 through 18 is exact for the group of sets listed directly below which are most recent of this series.

MODEL CHART

MODEL	NAME	COLOR	SIZE	TUNER	CHASSIS
16P57CFM	Chesley	Walnut	*16"	94C347–1 VHF 94C336–2 UHF	T3K3–2A
16P40CF	Villager	Black		94C363–2 VHF 94C361–2 UHF	T3K3–1A
16P43CF	Villager	Gold			
16P57CF	Diplomat	Walnut			
SK16P41CF		Brown			
X16P40F		Black			
19P31CF		Brown	*19"		
19P47CF		Walnut			T3K3–1B
19P297CFW	Uptown	Walnut			
SK19P263CF		Gold			

Except for minor differences, the sets listed below are electrically like the sets listed above and covered in this material.

MODEL CHART

MODEL	NAME	COLOR	SIZE	TUNER	CHASSIS
19P280CF	Sportman	Black	*19"	94C363–2 VHF 94C361–2 UHF	T3K4–1A
19P289CF		White			
19P297CF	Uptown	Walnut			T3K4–1B

The earlier 12" sets listed below are also similar to sets covered in this material, but there are differences such as tuner types, HV rectifier 33GY7A used for V403, etc.

MODEL CHART

MODEL	NAME	COLOR	SIZE	TUNER	CHASSIS
12P206	Playmate	Blue	*12"	94D363–2 VHF 94D361–2 UHF	TK2–1A
12P215	Playmate	Avocado			
12P227	Playmate	Walnut			
12P229	Playmate	White			

*Picture diagonal measurement.

HORIZONTAL LOCK ADJUSTMENT

The Horizontal Lock control is set at the factory and seldom requires readjustment. Adjustment need only be made if 8LT8 tube (V402) has been replaced and the picture cannot be locked in with slight adjustment of the Horizontal Lock control.

To determine a faulty horizontal oscillator circuit, short the plate of the sync separator to ground. It should be possible to lock the picture in with the Horizontal Lock control with a slight weaving back and forth in the picture.

To determine a correct horizontal phase detector action, short the plate of the sync separator to ground and check the voltage from the grid of the horizontal oscillator to ground. When the horizontal lock coil is varied back and forth, the voltage reading should vary between negative 1 volt to negative 6 volts.

WIDTH ADJUSTMENT

A resistance jumper is provided on the chassis to vary the width by applying 3 different voltages to the screen of the horizontal output tube. With the jumper located on the top of the vertical output transformer on 'C' maximum width will be given. Connect the jumper to the terminal that will just provide full width with the lowest line voltage for your area.

IF AMPLIFIER ALIGNMENT

Connect isolation transformer between AC line and receiver. Connect negative of 6 volt bias supply to test point "I" (IF AGC), & "R" (RF AGC). Positive to chassis. See figure 1.

Using needle nose aligator clip or looped end of hookup wire, connect a 50 or 90 ohm mixer matching pad to match your equipment impedance shown on page 4 to test point TP1, low side directly to tuner, see figure 1. Connect signal generator to matching pad.

Connect VTVM high side to test point "V" through a decoupling filter. See page **18.** Connect low side to chassis.

Set channel selector to unused Channel 12 or 13. Connect jumper wire across antenna terminals. Set RF generator output to give reading 1-2 volts over residual reading for all pre-peaking IF adjustments.

Allow about 15 minutes for receiver and test equipment to warm up. Use a non-metallic alignment tool.

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

1. Set generator at 47.25MHz and adjust L301 for minimum with 6 volt bias reduced to zero for this step only.
2. Set generator at 42.7MHz and adjust T302 top slug for maximum. Use – 6 volts bias for steps 2-12.
3. Set generator at 44.2MHz and adjust T302 bottom slug for maximum.
4. Set generator at 44.8MHz and adjust T301 for maximum.
5. Connect wire jumper across IF input coil L302.
6. With generator at 44.8MHz, adjust L122 on tuner for maximum. See page 4.
7. Remove wire jumper of step 5.
8. Set generator at 43MHz and adjust L302 for maximum.
9. A. This completes pre-peaking.
   B. Disconnect signal generator and connect sweep generator. Feed all signals through mixer matching pad connections to test point TP1 on tuner.
10. Transfer VTVM decoupling network to oscilloscope calibrated for 3 volts P to P to network.
11. Set sweep frequency at 43MHz, sweep width approximately 7MHz. Maintain 3 volts P to P sweep display by adjusting sweep RF. Keep marker at low level to prevent overloading. A reduction in sweep output should reduce amplitude without altering the shape of the response curve.
12. If 45.75MHz marker is not within tolerance or markers not in proper location on curve, adjust L122 to position 45.75MHz marker. Adjust T302 top to correct shape of curve. Avoid reducing amplitude of curve as much as possible. See the IF curve drawing on page **18.**

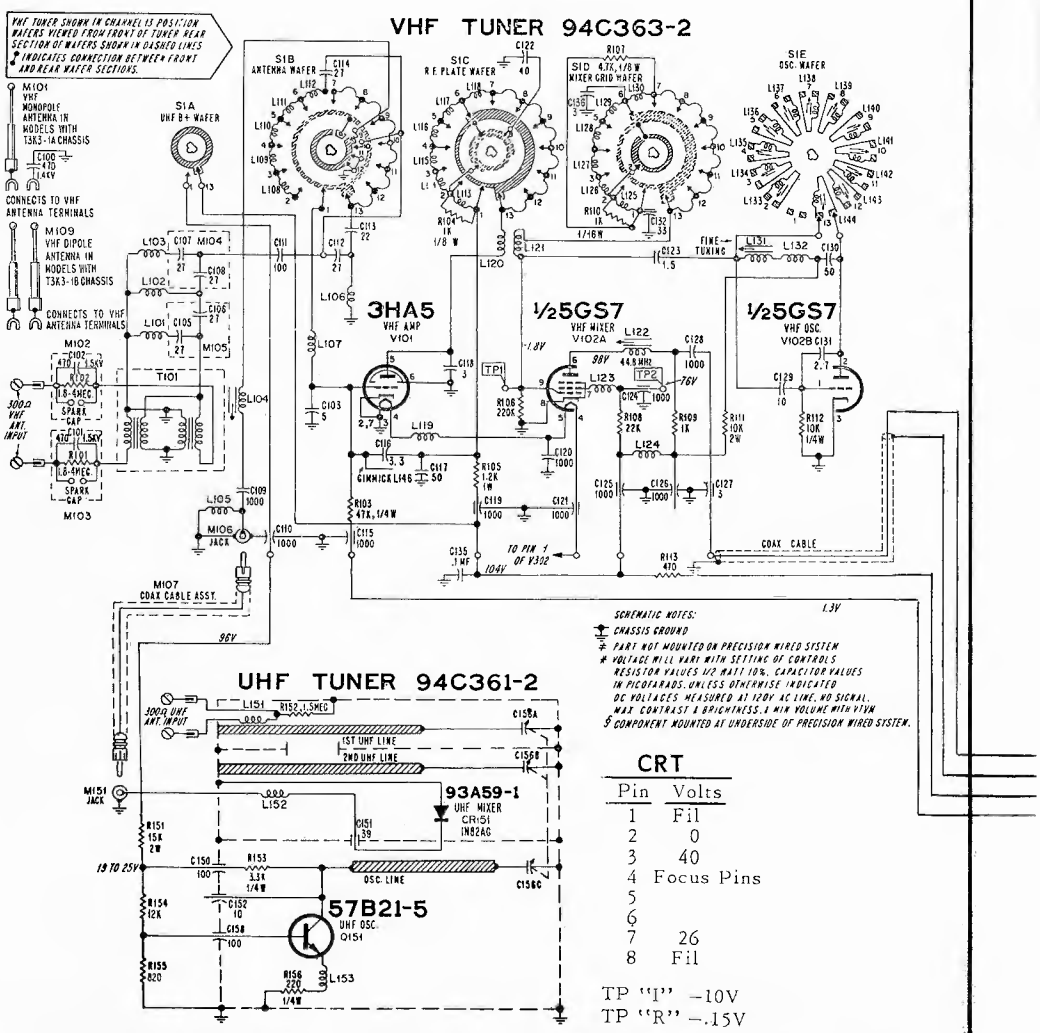
CHASSIS VOLTAGES WITH SIGNAL

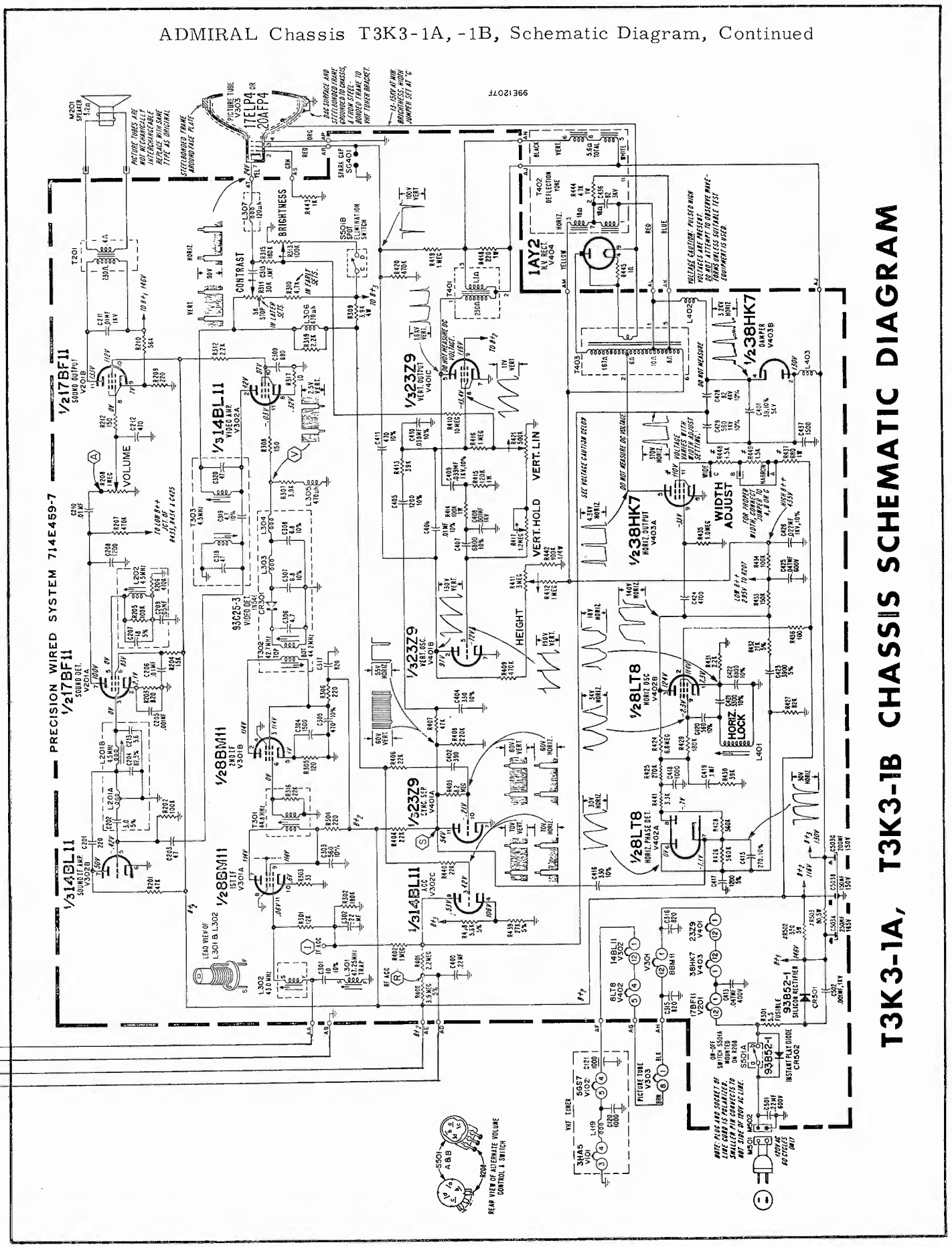
Listed below are DC voltages for each stage when an average level (snow free) program is tuned in. These voltages must be used carefully or else they can be misleading. Remember that they may vary with different level signals, program information and control adjustments.

17BF11		8BM11	
Pin	Volts	Pin	Volts
1	Fil	1	Fil
2	2.6	2	114
3	0	3	114
4	0	4	0
5	0	5	1.2
6	74	6	0
7	136	7	120
8	0	8	0
9	6.8	9	120
10	121	10	15
11	130	11	0
12	Fil	12	Fil

14BL11		23Z9	
Pin	Volts	Pin	Volts
1	Fil	1	Fil
2	78	2	76
3	80	3	-60
4	108	4	
5	-.8	5	
6	0	6	
7	68	7	0
8	0.15	8	-15
9	-60	9	126
10	112	10	-30
11	-1.5	11	104
12	Fil	12	Fil

8LT8		38HK7	
Pin	Volts	Pin	Volts
1	8	1	Fil
2	126	2	134
3	128	3	
4	Fil	4	
5	Fil	5	
6	.1	6	
7	23	7	Fil
8	-.1	8	0
		9	-30
		10	0
		11	
		12	Fil




T3K3-1A, T3K3-1B CHASSIS SCHEMATIC DIAGRAM
PRECISION WIRED SYSTEM 714E459-7
1/2 17BF11
SOUND OUTPUT
1/2 14BL11
SOUND IF AMP
1/2 88M11
2ND IF
1ST IF
1/2 14BL11
VIDEO AMP
1/2 14BL11
VIDEO AMP
1/2 14BL11
VIDEO DET.
1/2 14BL11
SYNC SEP
1/2 14BL11
SYNC INV.
1/2 32Z9
VERT. OSC.
1/2 32Z9
VERT. OUTPUT
1/2 38HK7
HORIZ. OUTPUT
1/2 8LT8
HORIZ. OSC
1/2 8LT8
HORIZ. PHASE DET.
1AY2
H.V. RECT.
1/2 38HK7
DAMPER
1TELP4 OR 20AFP4
PICTURE TUBE
93B52-1
SILICON RECTIFIER
93B52-1
INSTANT FLAT DIODE
CR502
VOLUME
CONTRAST
BRIGHTNESS
VERT. HOLD
VERT. LIN
HEIGHT
WIDTH ADJUST
HORIZ LOCK
VHF TUNER
REAR VIEW OF ALTERNATE VOLUME CONTROL & SWITCH
LEAD VIEW OF L301 & L302
DO NOT MEASURE DC VOLTAGE
SEE VOLTAGE CAUTION BELOW
VOLTAGE CAUTION: PULSED HIGH VOLTAGES ARE PRESENT. DO NOT ATTEMPT TO OBSERVE WAVE-FORMS UNLESS SUITABLE TEST EQUIPMENT IS USED.
WHITE PLUG AND SOCKET OF SMALL CAP. PROVIDE A MEANS TO BY-PASS CAP. WHEN SERVICING SET WITH SIDE OF 120V AC LINE.
120V AC 60 CYCLES
ON-OFF SWITCH S501A MOUNTED ON R208
S501B CHANNEL SELECTOR SWITCH
S501A
S501B
R208
M501
M502
CR501
CR502
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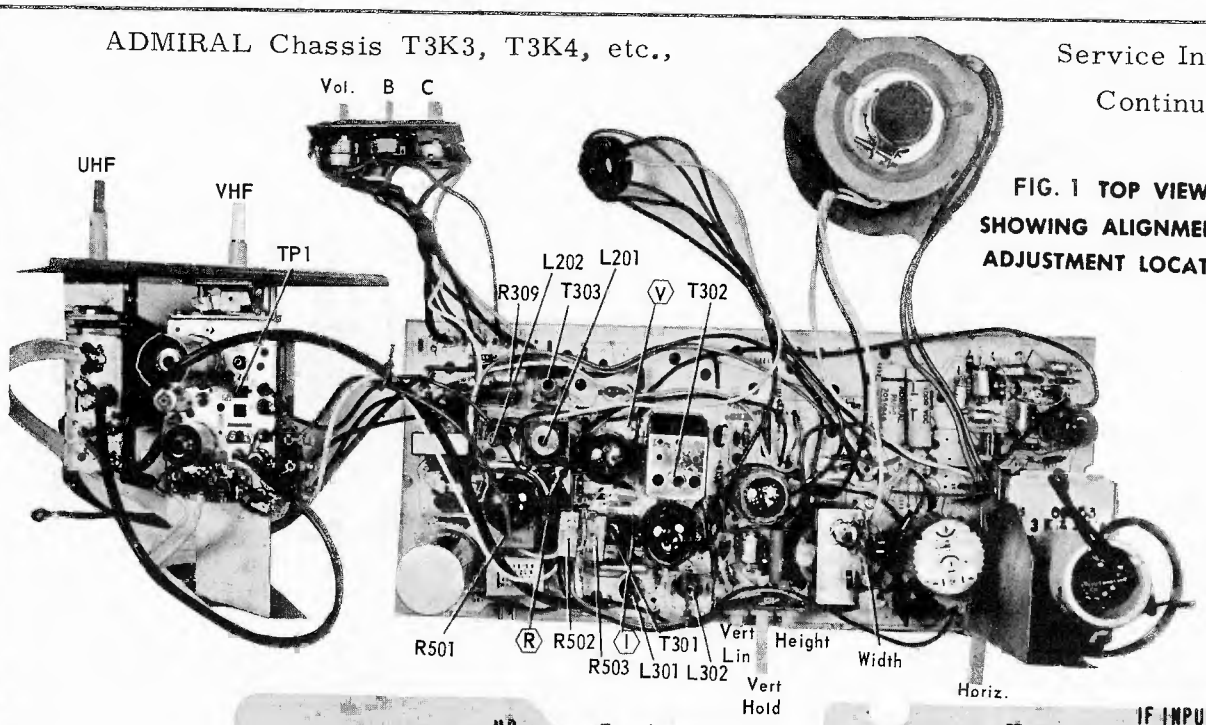
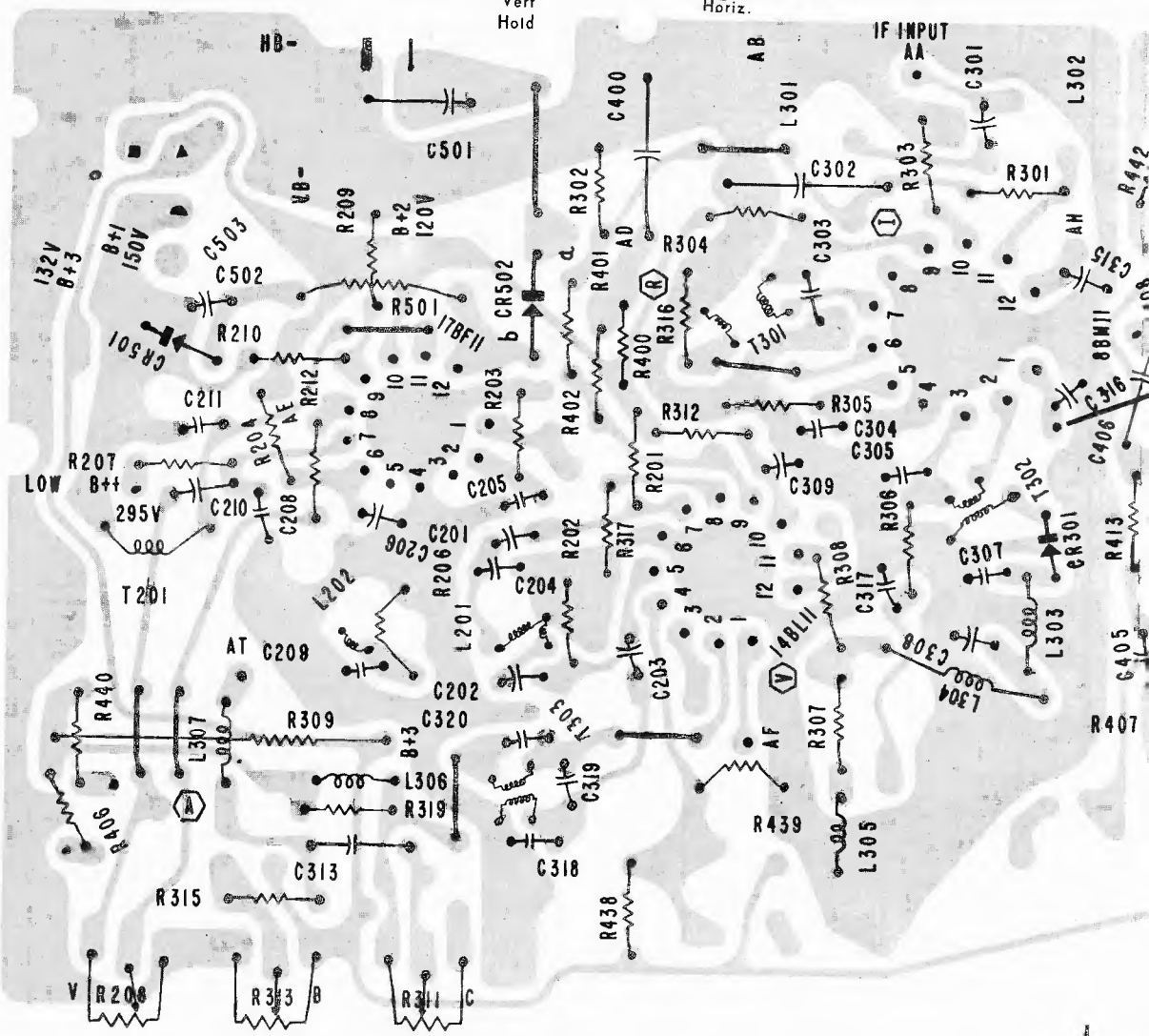


FIG. 1 **TOP VIEW OF CHASSIS SHOWING ALIGNMENT & SERVICE ADJUSTMENT LOCATIONS**



BOTTOM VIEW OF BOARD

ADMIRAL Chassis T3K3, T3K4, etc.

IF RESPONSE CURVE CHECK

1. Allow about 15 minutes for receiver and test equipment to warm up. Use an AC line isolation transformer.
2. Set VHF tuner to Channel 12. Connect negative of 6 volts bias supply to test points "R" and "I"; positive to chassis.
3. Connect sweep generator to VHF tuner to test point TP1 through the mixer matching pad of page **18**. Ground low side nearby. The mixer matching pad must match your generator impedance.
4. Connect oscilloscope high side to test point "V" through decoupling filter of page **18**, low side to chassis.
5. The IF curve now obtained should be checked against the IF response curve, on page **18**. Maintain sweep output at 3V P to P as alignment progresses. Keep markers low. A reduction in sweep output should reduce curve amplitude without appreciably altering the shape of the response curve.
6. If the curve is not within tolerance or markers not in proper location, L122 VHF Tuner Mixer Plate Coil should be adjusted for 45.75MHz video marker and T302 Top for rounded curve nose.

OVER-ALL VHF-IF RESPONSE CURVE CHECK

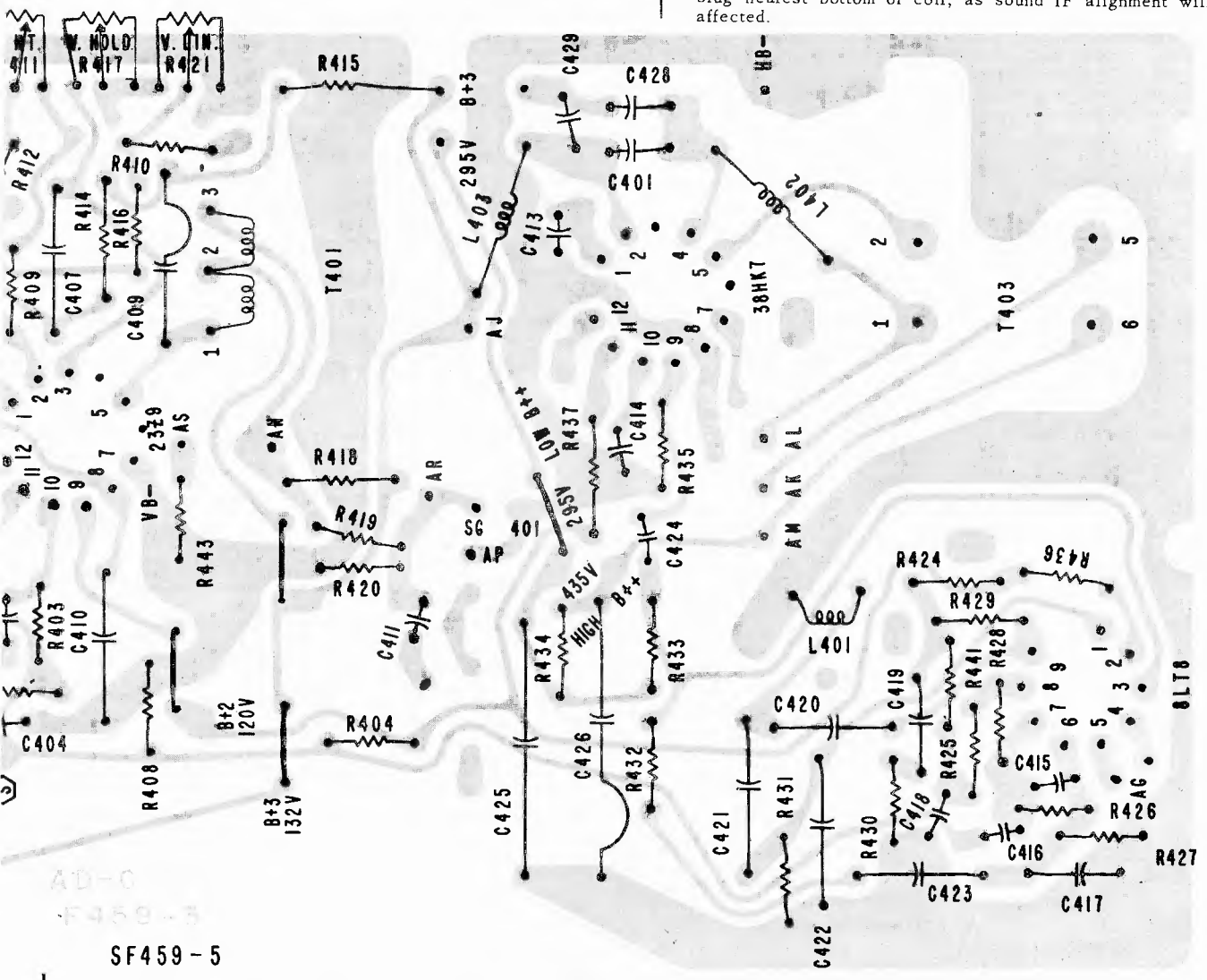
1. Set VHF Channel Selector on Channel 12. Connect negative of 6 volt bias supply to test point "I" (IF AGC) and negative 1.5 volt to test point "R" (RF AGC) positive to chassis.
2. Connect isolation transformer between AC line and receiver. Allow about 15 minutes for receiver and test equipment to warm up.
3. Attach the sweep generator at the VHF tuner antenna terminals, using 50 or 90 ohm VHF isolation network to match your generator impedance.
4. Connect oscilloscope high side to test point "V" through decoupling filter, low side to chassis. Adjust sweep generator for 3 volt P to P at test point "V".
5. Compare response curve obtained against ideal overall curve shown on page **18**.

ALIGNMENT OF 4.5 MHz TRAP

Alignment of 4.5MHz (beat interference) trap T303 top slug requires use of a hexagonal non-metallic alignment tool.

To align 4.5 MHz trap T303 top slug, tune in television station with beat interference pattern in picture. While closely observing picture, adjust slug T303 top slug for minimum interference pattern.

Note that adjustment T303 top slug is 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.

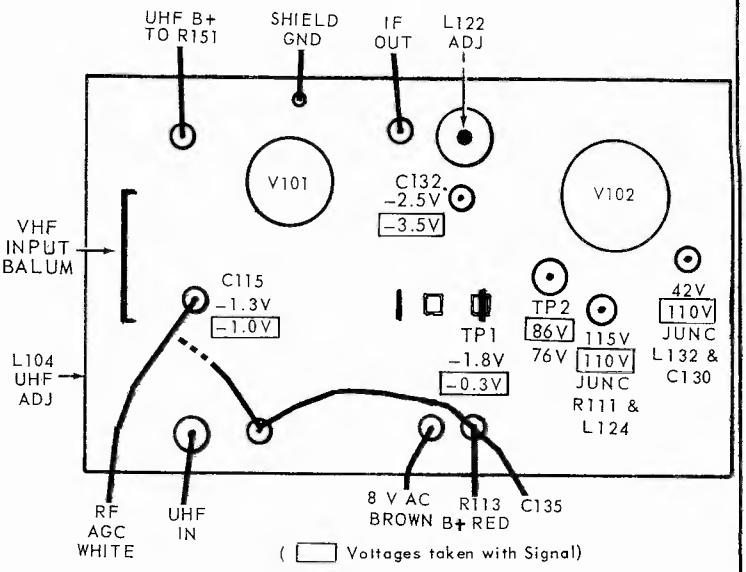


SHOWING COMPONENT CONNECTIONS

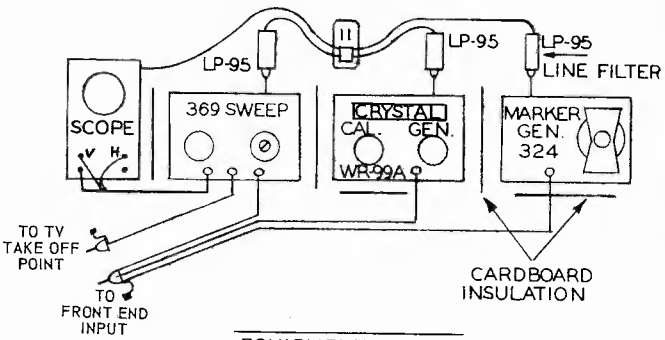
4.5MHz SOUND IF ALIGNMENT

1. Tune in normal picture on strongest TV station. Allow about 15 minutes for set to warm up. See page 16 for adjustment locations.
2. Using non-metallic alignment tool, slowly turn slug L202 to several turns to left until a buzz is heard in sound. Then slowly turn slug L202 to the right for loudest and clearest sound. NOTE: There may be two points (Approximately ½ 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 L201B for loudest and clearest sound with minimum hiss. If hiss disappears during alignment, reduce signal to maintain hiss level. Re-adjust slug L201B. NOTE: Slug L201B should be at end nearest bottom of coil.
5. Carefully adjust slug T303 bottom slug for loudest and clearest sound with minimum hiss. If hiss disappears during alignment, reduce signal to maintain hiss level. Re-adjust slug T303. Caution: Slug T303 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.

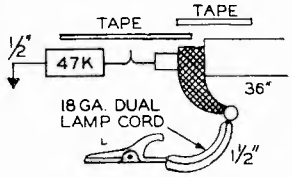
CAUTION: Do not re-adjust slug L202 unless sound is distorted. If L202 is re-adjusted, all steps in alignment procedure should be repeated exactly as instructed.



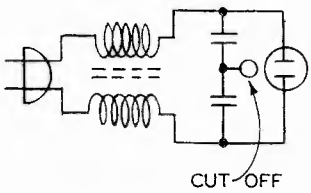
TOP VIEW OF TUNER



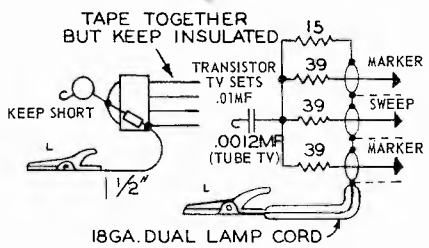
EQUIPMENT SET-UP



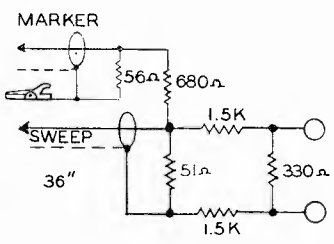
DECOUPLING FILTER



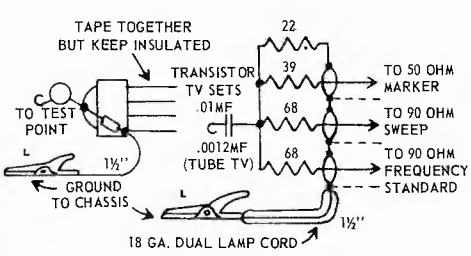
CALRAD LP-95 FILTER
98A103-3



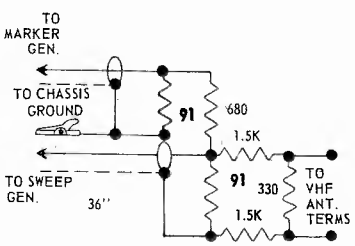
50 OHM MIXER MATCHING PAD



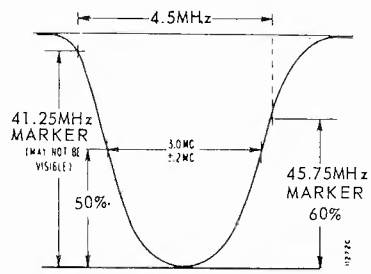
50 OHM VHF ISOLATION NETWORK



90 OHM MIXER MATCHING PAD

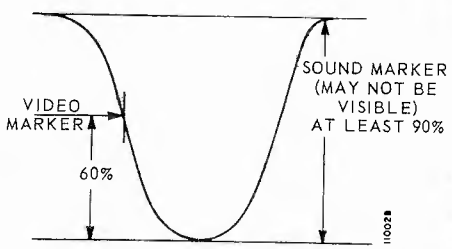


90 OHM VHF ISOLATION NETWORK



IF CURVE

Curves can be reversed or up or down depending on equipment and termination.



IDEAL OVERALL RESPONSE CURVE

EMERSON

MODEL NO.	CHASSIS NO.	VHF TUNER	UHF TUNER	CRT TYPE
15P23,	120914-A	471815	471816	16DPC4A
15P24	120914-B		471819	

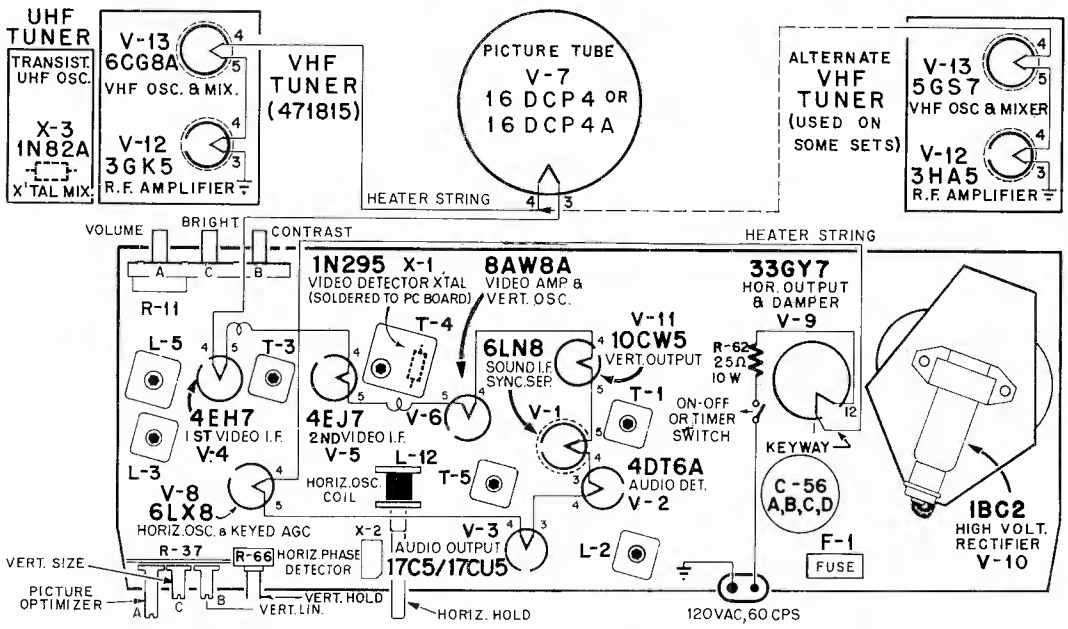


FIG. 1 – TUBE LOCATIONS AND ALIGNMENT POINTS

RESISTANCE READINGS

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	6LN8	#40K	10K	#40K	(Filament)		#40K	220	0	3 Meg	–	–	–
V-2	4DT6A	7.5Ω	470Ω	(Filament)		1.2 Meg	#35K	470K	–	–	–	–	–
V-3	17C5/17CU5	180Ω	0 to 1 Meg	(Filament)		0 to 1 Meg	#35K	#35K	–	–	–	–	–
V-4	4EH7	140Ω	110K	140Ω	(Filament)		0	#33K	#33K	0	–	–	–
V-5	4EJ7	100Ω	0	100	(Filament)		0	#33K	#33K	0	–	–	–
V-6	8AW8A	0	500K to 2M	5 Meg to 6.1 Meg	(Filament)		15Ω	300	#35K	#35K	–	–	–
V-7	CRT	4.3K	150K to 300K	(Filament)		4.3K	270K	0	–	–	–	–	–
V-8	6LX8	210K	350K	#33K	(Filament)		#52K	2.2K	5K to 50K	#26K	–	–	–
V-9	33GY7	(Fil)	#33K	N.C	650K	650K	N.C	N.C	0	560K	560K	#33K	(Fil)
V-10	1BC2	INF	INF	–	INF	INF	INF	–	INF	INF	(Cap) 650K	–	–
V-11	10CW5	–	2.5 Meg to 3 Meg	22Ω	(Filament)		–	#33K	–	#33K	–	–	–

NOTES: All resistance readings are in ohms, unless otherwise specified, "K" denotes kilohms; "M" denotes megohms.
"N.C." denotes no connection to terminal indicated.
Reading affected by Electrolytic Capacitor in circuit.

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–27 and C–30.
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. 3. (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 overcoupled response as shown in Fig. 4. (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 rocking 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–13) 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. 5
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–9) 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–9) 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. 10. '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–9), this time tuning for maximum gain midway between the peaks of the band-pass as indicated in Fig. 6. 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. 7. 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–9), 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. 8.
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. 9.
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. 9. Minor deviations may be corrected by slight touch-up of specific coils to make response conform to Fig. 9. 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.

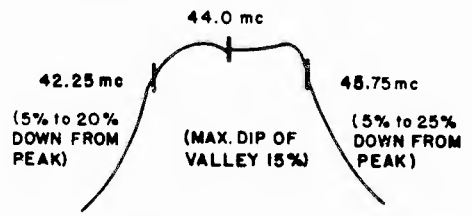


FIG. 3

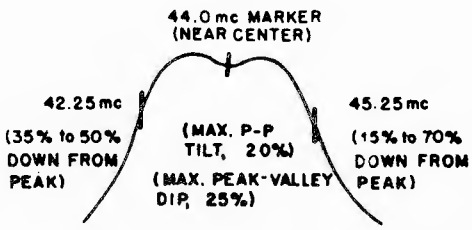


FIG. 4

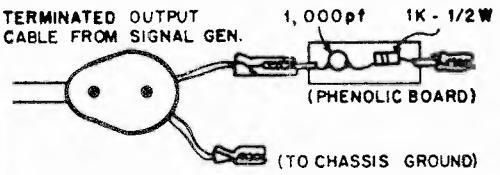


FIG. 5 - GENERATOR COUPLING NETWORK (REFER TO STEP NO.8)

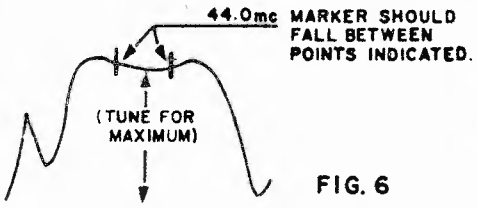


FIG. 6

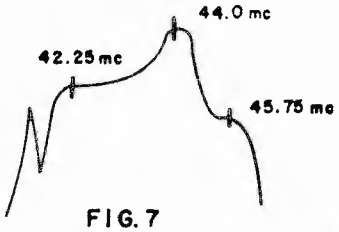


FIG. 7

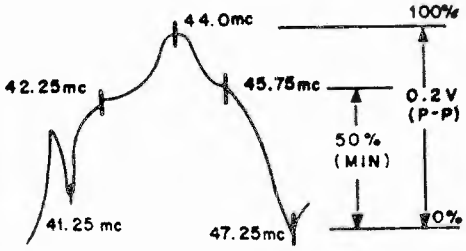


FIG. 8

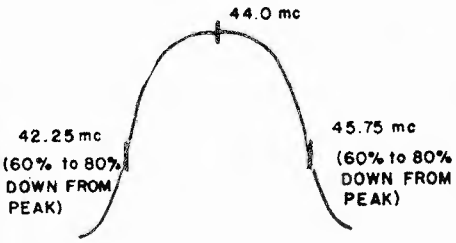


FIG. 9

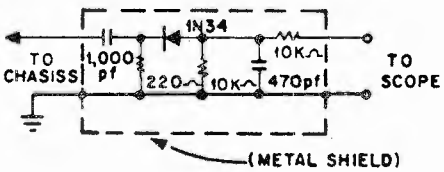


FIG.10- LOW IMPEDANCE CRYSTAL DETECTOR PROBE. (REFER TO STEP NO. 13)

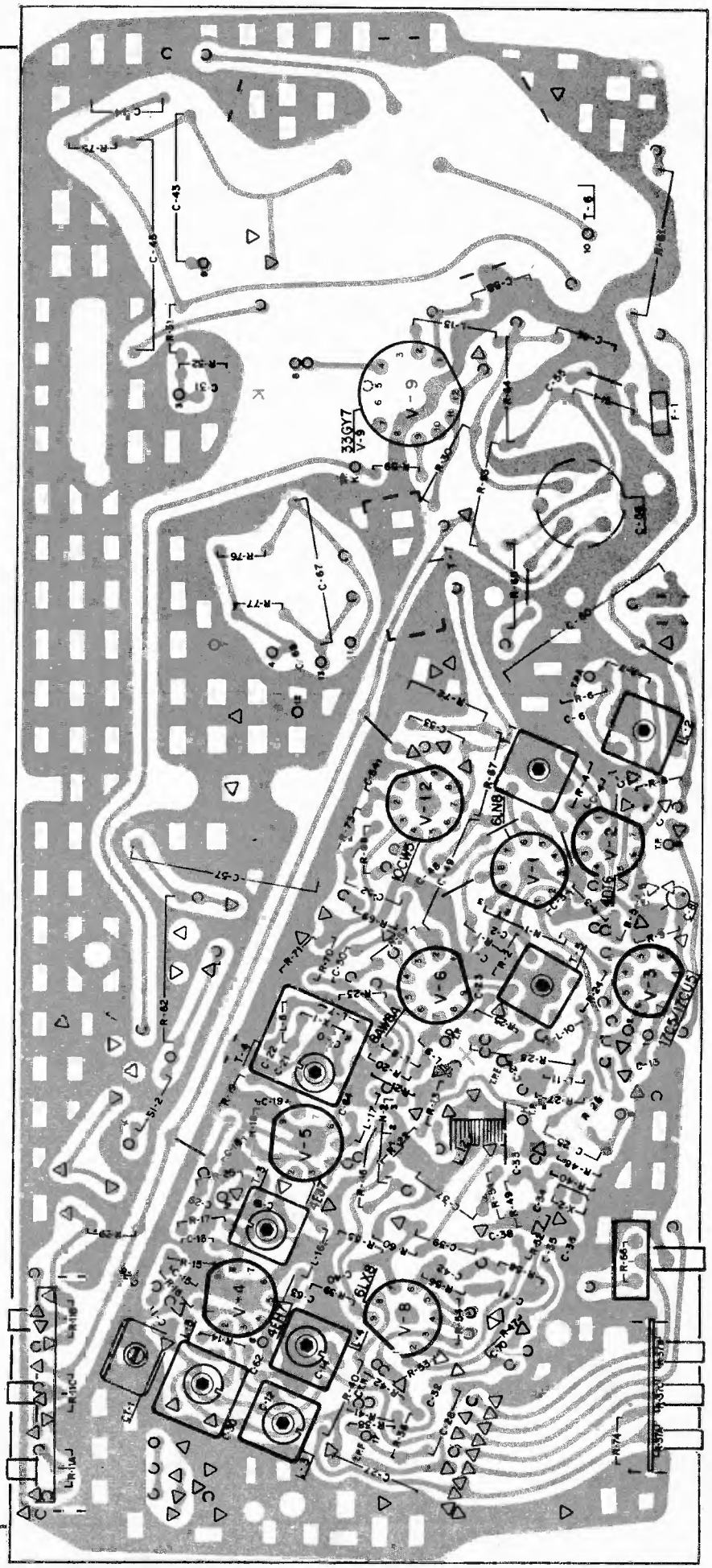
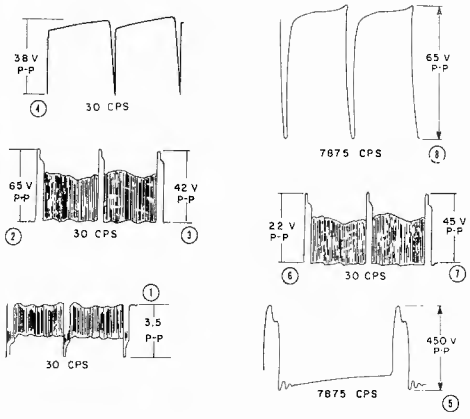
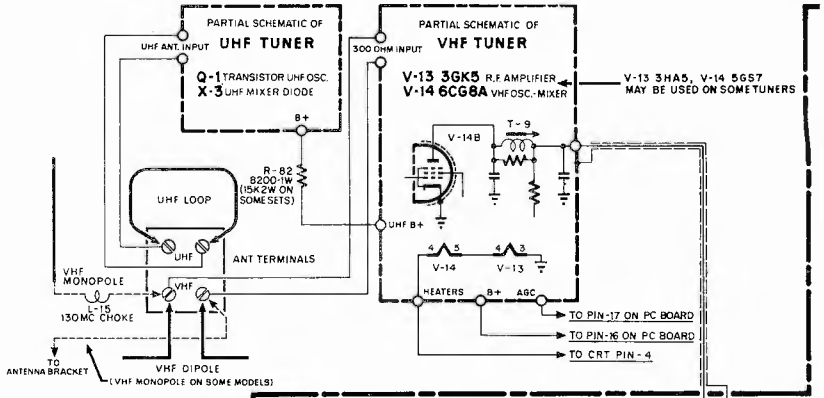
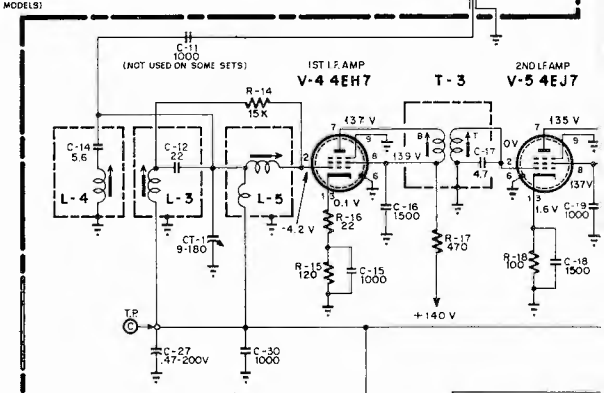
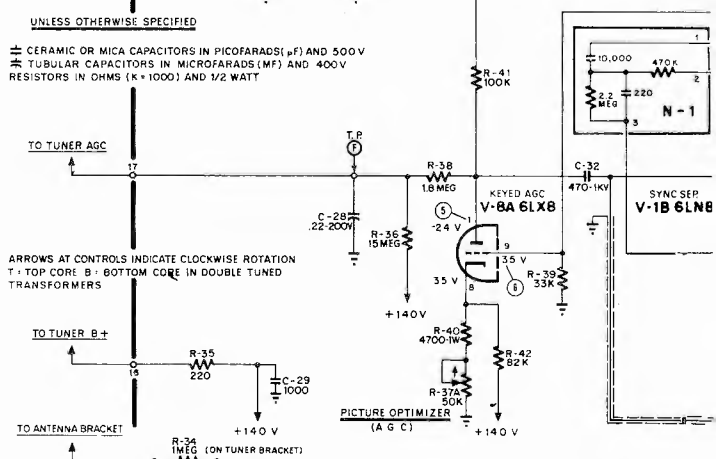


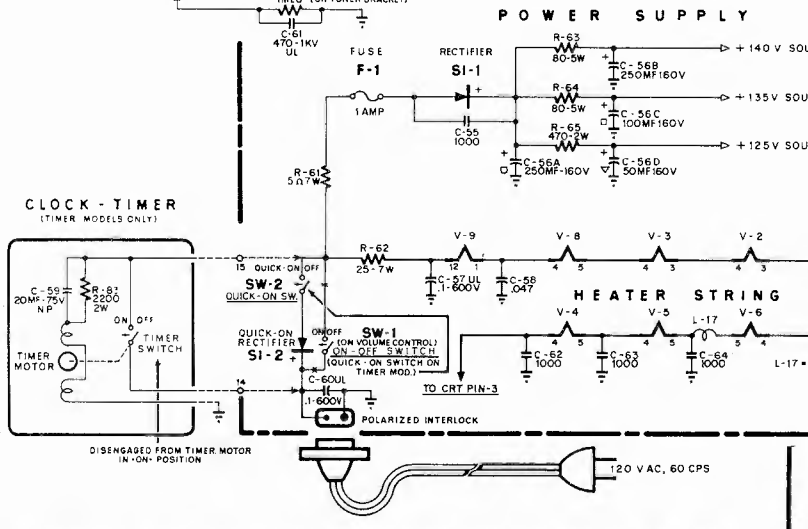
FIG. 11
ETCHED CIRCUIT BOARD
TV CHASSIS 120914
(TOP VIEW)











CONDITIONS FOR CHASSIS READINGS

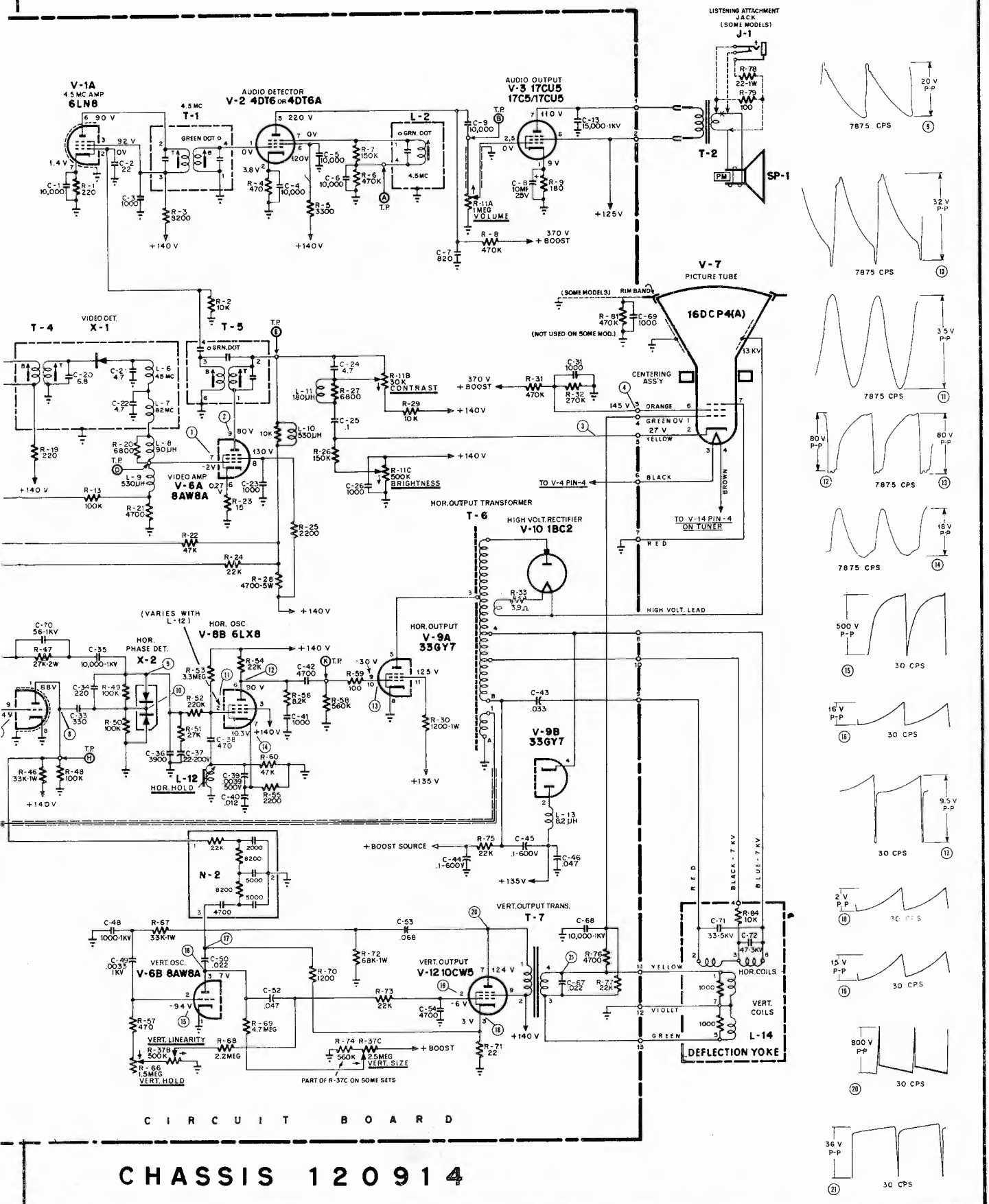
VOLTAGES AND WAVESHAPES were taken under actual operating conditions, with normal picture and sound being received. AGC voltage developed on the I-F AGC line (test point C) was minus 13 volts. Input voltage to chassis under test was 120 volts, 60-cycle AC. Frequencies indicated for the waveshapes shown 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.

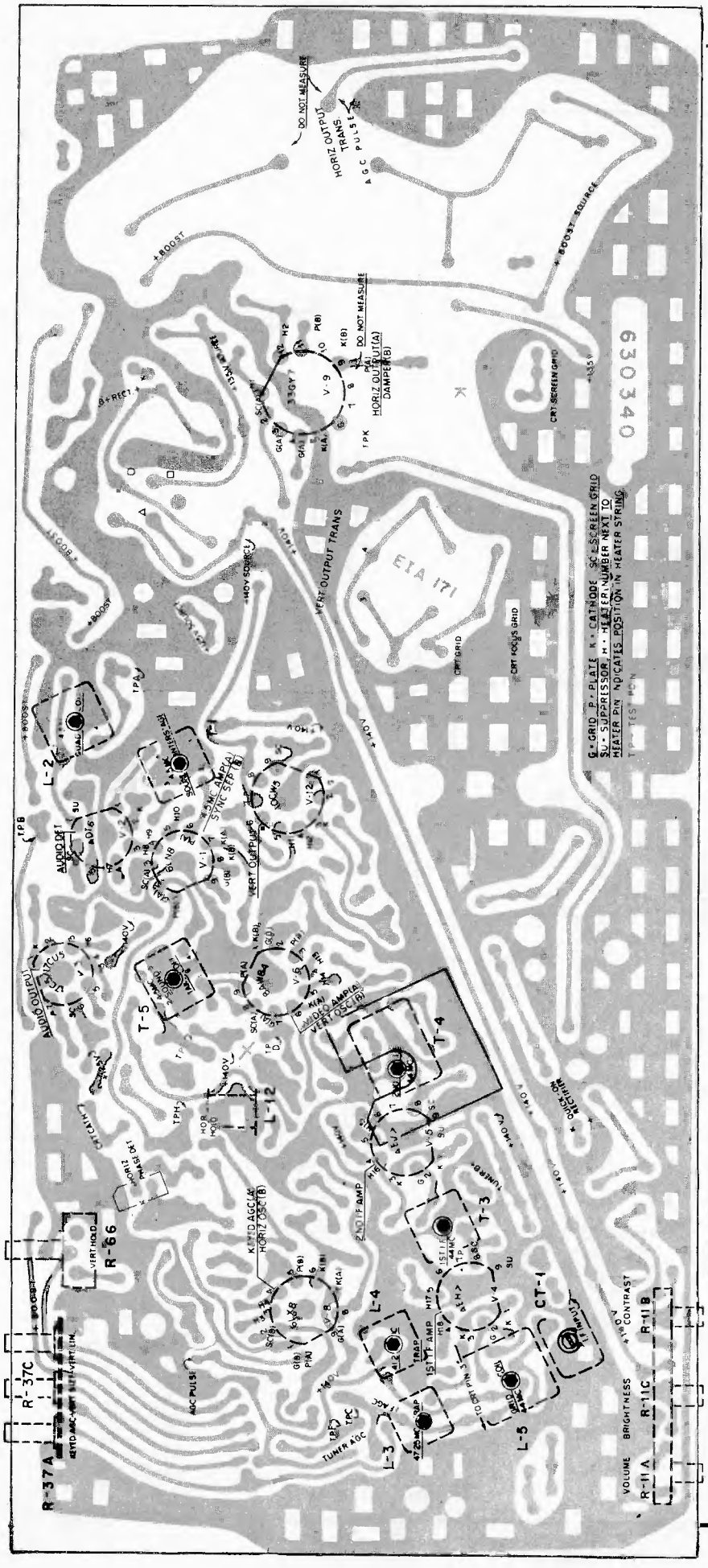
ALL MEASUREMENTS were taken between points indicated and chassis ground (unless otherwise noted), using an RCA Voltohmyst or equivalent VTVM. A low-capacity probe was used for all waveshapes shown in the schematic diagram. All readings obtained may vary ±10% due to normal component tolerances and strength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

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 (T–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 T–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.



CHASSIS 120914



EMERSON Chassis 120914A, B

SYM.	DESCRIPTION OF COMPONENTS
R-11A	Volume Control - 1 Megohm
R-11B	Contrast Control - 30,000 ohms
R-11C	Brightness Control - 500 Kilohms
R-37A	Picture Optimizer Control - 50 Kilohms
R-37B	Vertical Linearity Control - 500 Kilohms
R-37C	Vertical Size Control - 2.5 Megohms
R-28	Resistor - 4700 ohm wirewound ±10% Tol. 5 w
R-61	Resistor - 5 ohm wirewound ±10% Tol. 7 watt
R-62	Resistor - 25 ohm wirewound ±10% Tol. 7 watt
R-63,64	Resistor - 80 ohm wirewound ±10% Tol. 5 watt
R-65	Resistor - 470 ohm wirewound ±10% Tol. 2 watt
R-66	Vertical Hold Control - 1.5 Megohms
CT-1	Capacitor - Variable Trimmer - 9 to 180 pf.
C-1,4,6	Capacitor - Ceramic - 10,000pF GMV Z5U
C-2	Capacitor - Ceramic - 22pF ±10% Tol. NPO
C-3	Capacitor - Ceramic - 1,000 pF ±10% Tol. X5F
C-5	Capacitor - Ceramic - 10,000 pF ±20% Tol. Z5U
C-7	Capacitor - Ceramic - 820 pF ±10% Tol. X5F
C-8	Capacitor - Electrolytic - 10 MFD @ 25V
C-9	Capacitor - Ceramic - 10,000 pF ±20% Tol. Z5U
C-10	Capacitor - Ceramic - 1,000 pF GMV
C-11	Capacitor - Ceramic - 1,000 pF ±10% Tol. X5F
C-12	Capacitor, Ceramic – 22 pF ±10% Tol. NPO
C-13	Capacitor - Ceramic - 15,000 pF±20% Tol. 1KV
C-14	Capacitor - Ceramic - 5.6 pF ±10% Tol. NPO
C-15, 19	Capacitor - Ceramic - 1,000 pF±10% Tol. X5F
C-16, 18	Capacitor - Ceramic - 1,500 pF ±10% Tol. X5F
C-17	Capacitor - Ceramic - 4.7 pF±10% Tol. X5F
C-20	Capacitor - Ceramic - 6.8 pF ±10% Tol. NPO
C-21,22,24	Capacitor - Ceramic - 4.7 pF ±10% Tol. X5F
C-23	Capacitor - Ceramic - 1,000 pF ±20% Tol. Y5S
C-25	Capacitor - Durez - .1 MFD ±20% Tol. 400V
C-26	Capacitor - Ceramic - 47 pF±10% Tol. X5F
C-27	Capacitor - Molded - .47 MFD ±20% Tol. 200V
C-28	Capacitor - Durez - .22 MFD ±20% Tol. 200V
C-29,30	Capacitor - Ceramic - 1,000 pF GMV
C-31	Capacitor - Ceramic - 1,000 pF GMV
C-32	Capacitor - Ceramic - 470 pF ±10% Tol. 1 KV
C-33	Capacitor - Ceramic - 330 pF ±10% Tol. X5F
C-34	Capacitor - Ceramic - 220 pF ±10% Tol. X5F
C-35	Capacitor - Ceramic - 10,000 pF ±20% Tol.
C-36	Capacitor - Ceramic - 3,900 pF ±10% Tol. X5F
C-37	Capacitor - Durez - .22 MFD ±20% Tol. 200V
C-38	Capacitor - Ceramic - 470 pF ±10% Tol. X5F
C-39	Capacitor - Polystyrene - .0039 MFD ±10% Tol 500V
C-40	Capacitor - Durez - .012 MFD ±10% Tol. 400V
C-41	Capacitor - Ceramic - 1,000 pF ±10% Tol. X5F
C-42	Capacitor - Ceramic - 4,700 pF ±20% Tol. Y5S
C-43	Capacitor - Molded - .033 MFD ±20% Tol. 400V
C-44	Capacitor - Molded - .1 MFD ±20% Tol. 600V
C-45	Capacitor - Molded - .1 MFD ±20% Tol. 600V
C-46	Capacitor - Durez - .047 MFD ±20% Tol. 400V
C-48	Capacitor - Ceramic - 1,000 pF 10% Tol. 1KV
C-49	Capacitor - Molded - .0033 MFD ±10% Tol. 1KV
C-50	Capacitor - Molded - .022 MFD ±20% Tol. 400V
C-52	Capacitor - Durez - .047 MFD ±20% Tol. 400V
C-53	Capacitor - Durez - .068 MFD ±20% Tol. 400V
C-54	Capacitor - Ceramic - 4,700 pF ±20% Tol. Y5S
C-55	Capacitor - Ceramic - 1,000 pF GMV
C-57	Capacitor - Molded - .1 MFD 20% Tol. 600V
C-58	Capacitor - Molded - .047 MFD ±20% Tol. 400V
C-59	Capacitor - Electrolytic - 20 MFD @ 75V (Non-Pol.) (Some Sets)
C-60	Capacitor - Molded - .1 MFD (UL) ±20% Tol. 600
C-62,63,64	Capacitor - Ceramic - 1,000pF GMV
C-68	Capacitor - Ceramic - 10,000pF ±20% Tol. 1KV
C-69	Capacitor - Ceramic - 1,000pF GMV
C-70	Capacitor - Ceramic - 56pF ±10% Tol. N1500

FIG. 12 (LEFT)
ETCHED CIRCUIT BOARD
TV CHASSIS 120914
(BOTTOM VIEW)

EMERSON

MODEL/CHASSIS/CRT CROSS – REFERENCE CHART

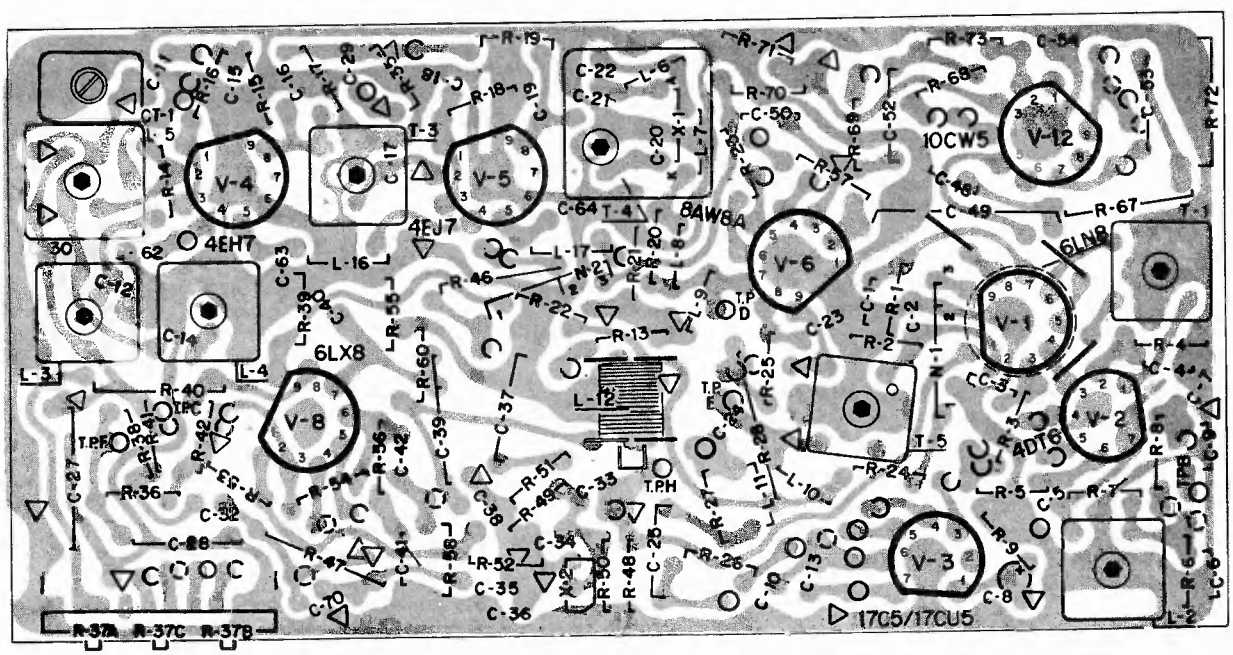
MODEL NO.	CHASSIS NO.	VHF TUNER	UHF TUNER	CRT TYPE
18P42	120904A	471737	471674	19FJP4(A) or 19GJP4(A)
	120904B		471670A	
18P45	120911A		471674	
	120911B		471670A	
19P77	120906A		471674	20ADP4
	120906B		471670A	
19P78	120907A		471674	

Additional models using same chassis or similar types released at a later date.

MODEL NO.	CHASSIS NO.	VHF TUNER	UHF TUNER	CRT TYPE
18P45	120911C	471737	471813	19FJP4(A) or 19GHP4 (A)
	120904A		471674	
18P46	120904C		471813	
18P47	120905A		471674	20ADP4
19P81	120934A	471827		
19P82	120935A			
	120935C		471813	

Also Model 18P48 using Chassis 120911A.

Service material which follows applies to all these sets, but exact schematic for Chassis 120904A and 120911A only is printed, others almost identical.



ETCHED CIRCUIT BOARD (TOP VIEW)

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–27 and C–30.
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 overcoupled 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 rocking 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. ½" 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–9) for maximum gain and symmetry about the 44.0 mc marker.
11. Adjust the 41.25 mc trap (L–4) and the 47.25 mc trap (L–3) 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–9) 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–9), 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–9), if necessary.
17. With generator output increased to maximum, check the position of the 41.25 mc and 47.25 mc traps (L–4 and L–3), 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-9, the tuner output coil.

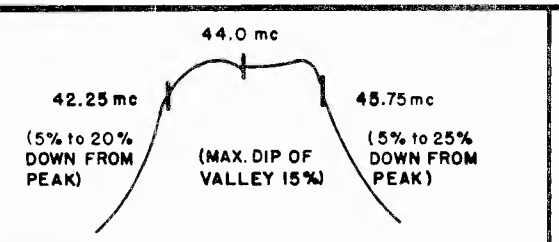


FIG. 1

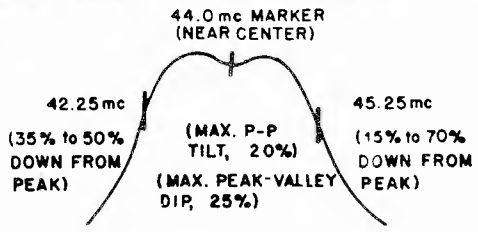


FIG. 2

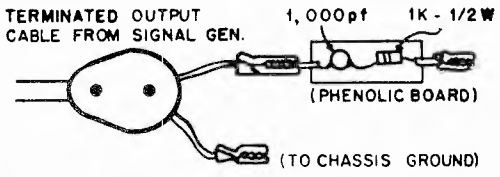


FIG. 3 - GENERATOR COUPLING NETWORK (REFER TO STEP NO. 8)

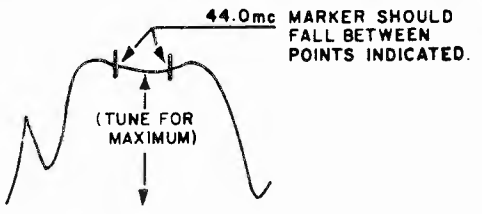


FIG. 4

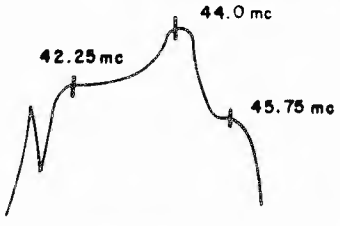


FIG. 5

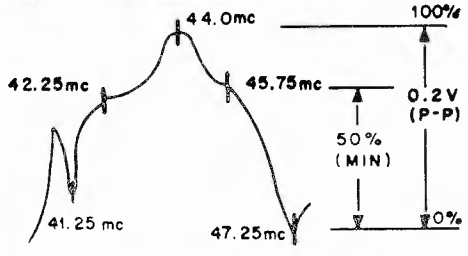


FIG. 6

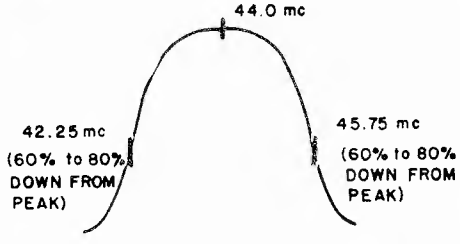


FIG. 7

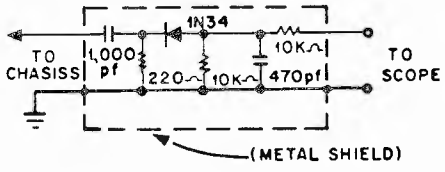
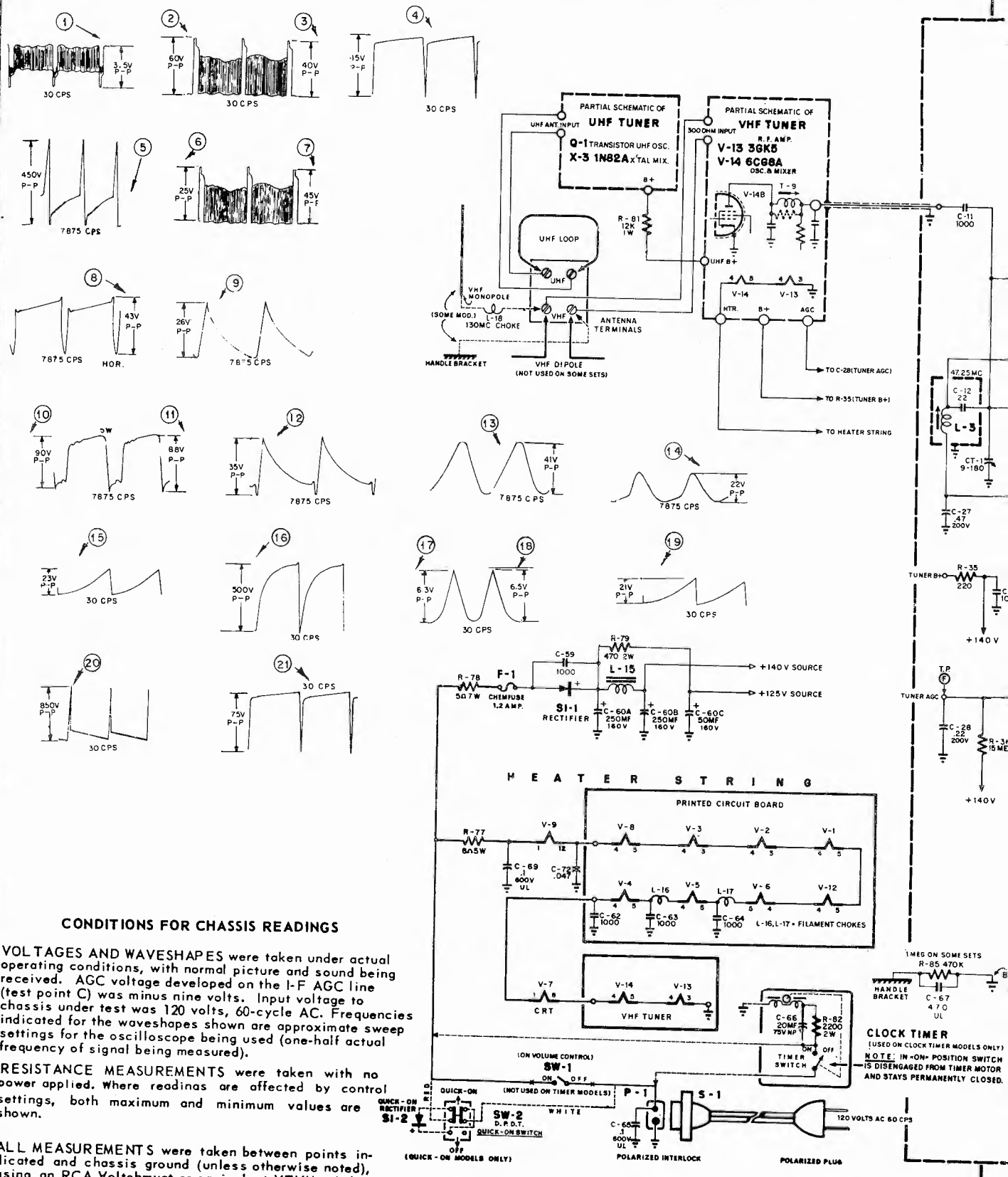


FIG. 8 - LOW IMPEDANCE CRYSTAL DETECTOR PROBE. (REFER TO STEP NO. 13)

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 (T–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 T–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 Chassis 120904A, 120911A, Schematic Diagram



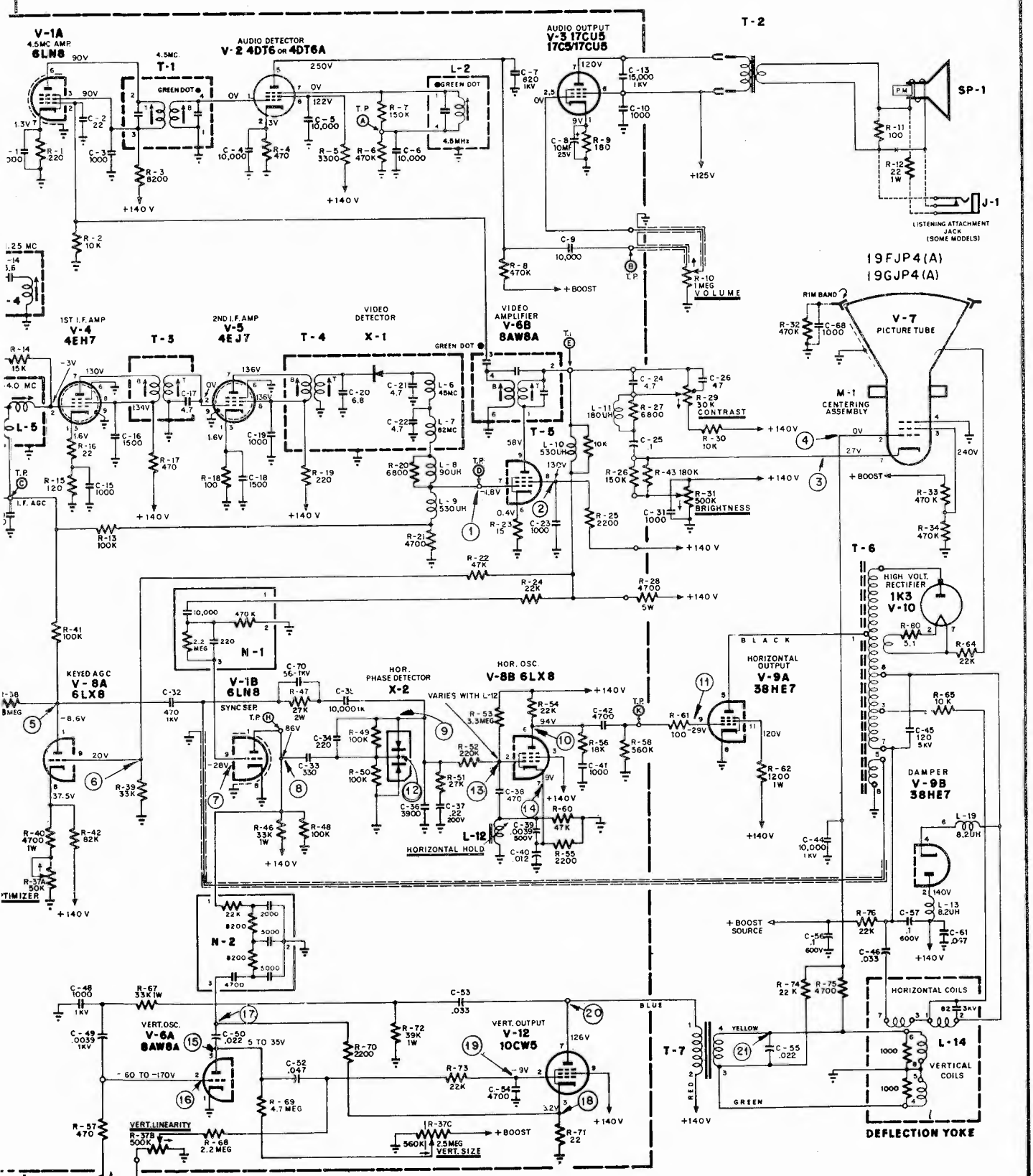
CONDITIONS FOR CHASSIS READINGS

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).

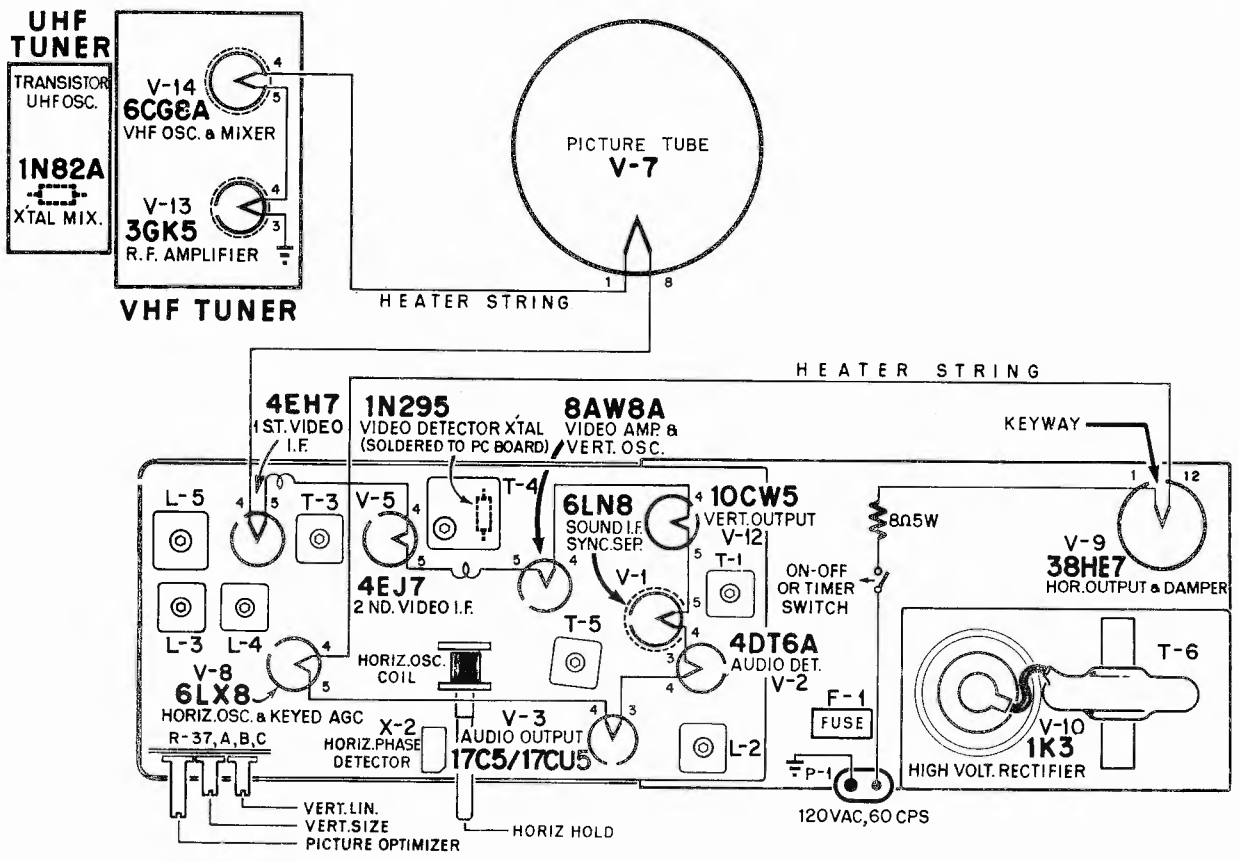
RESISTANCE MEASUREMENTS were taken with no power applied. Where readings are affected by control settings, both maximum and minimum values are shown.

ALL MEASUREMENTS were taken between points indicated and chassis ground (unless otherwise noted), using an RCA Voltohmyst 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.

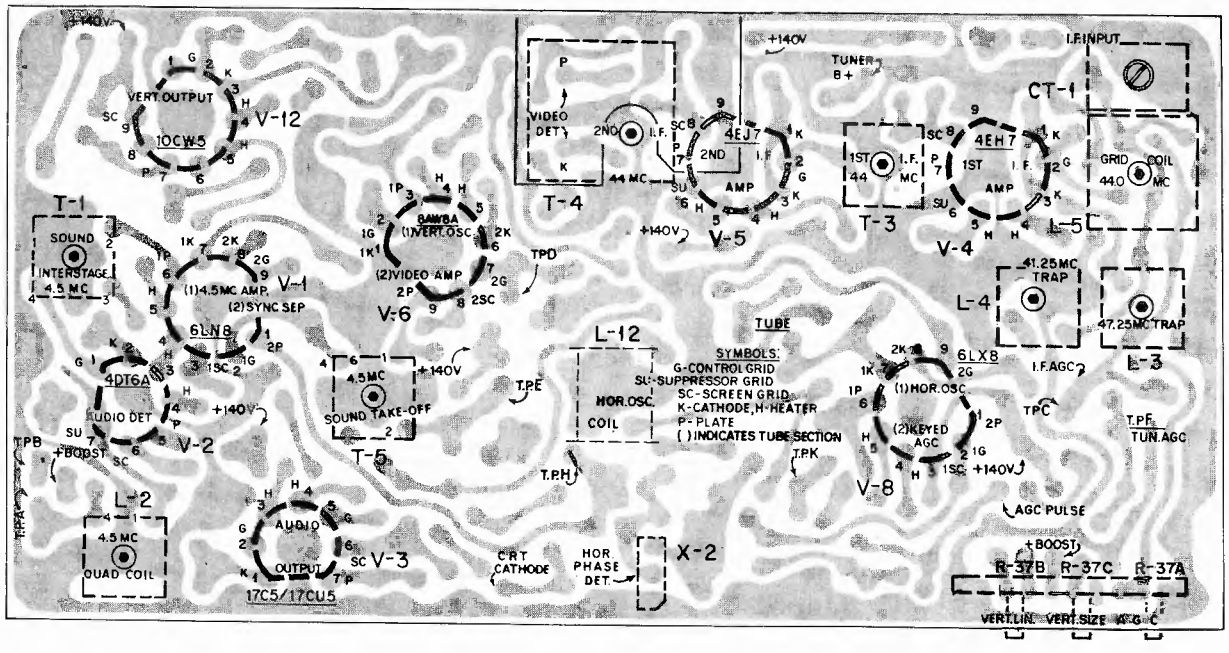
= CERAMIC OR MICA CAPACITORS, CAPACITY IN PICOFARADS (pF)
* TUBULAR CAPACITORS, CAPACITY IN MICROFARADS (MF)
RESISTORS IN OHMS (K = 1000) AND ½ WATT UNLESS OTHERWISE SPECIFIED
ALL CERAMICS AND MICAS 500V, ALL TUBULARS 400 V UNLESS NOTED
T INDICATES TOP CORE B INDICATES BOTTOM CORE IN DOUBLE TUNED TRANSFORMERS
ARROWS AT CONTROLS INDICATE CLOCKWISE ROTATION



CH. 120904, 911



TUBE LOCATION AND ALIGNMENT POINTS



ETCHED CIRCUIT BOARD (BOTTOM VIEW)

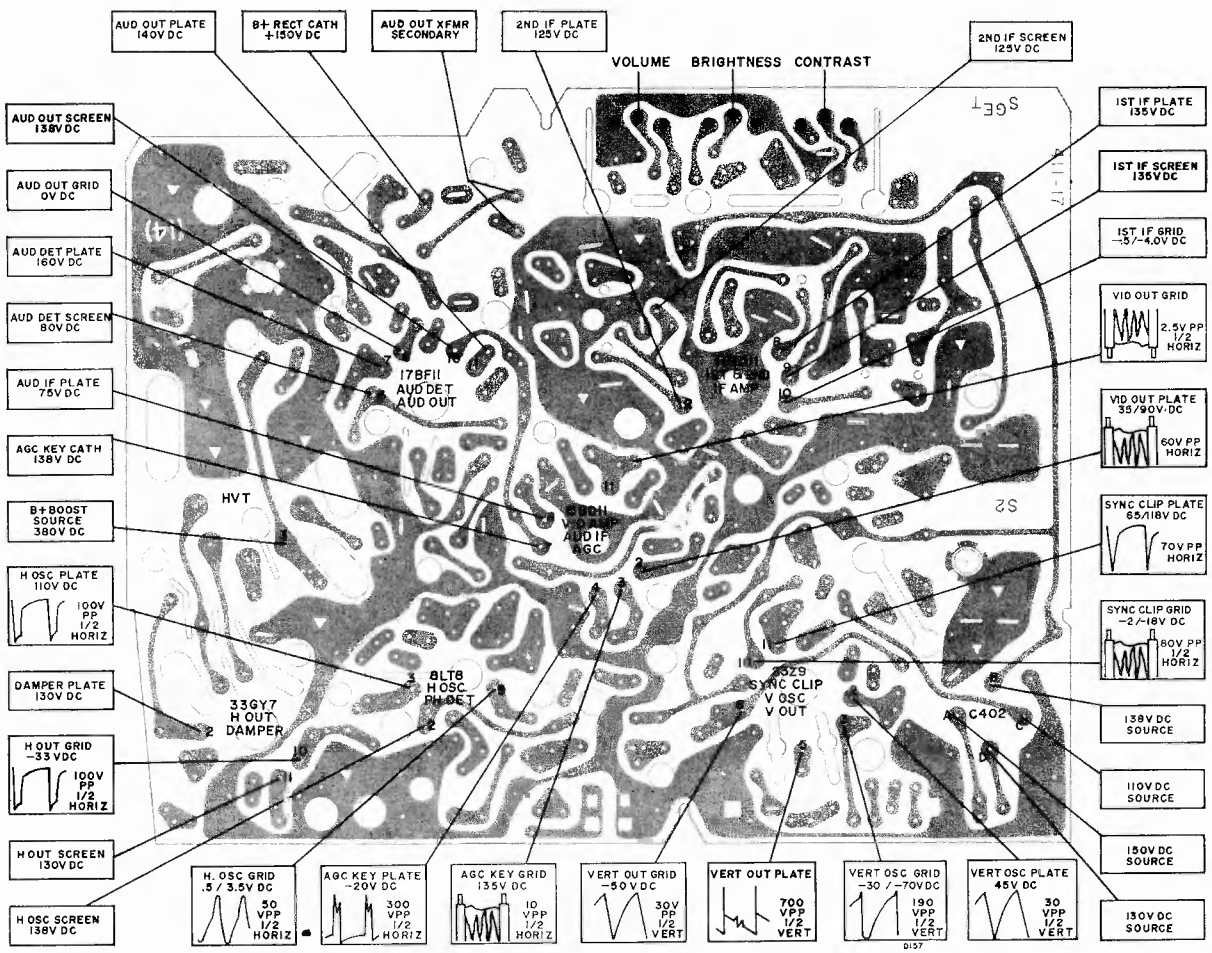
GENERAL ELECTRIC

S-2 CHASSIS

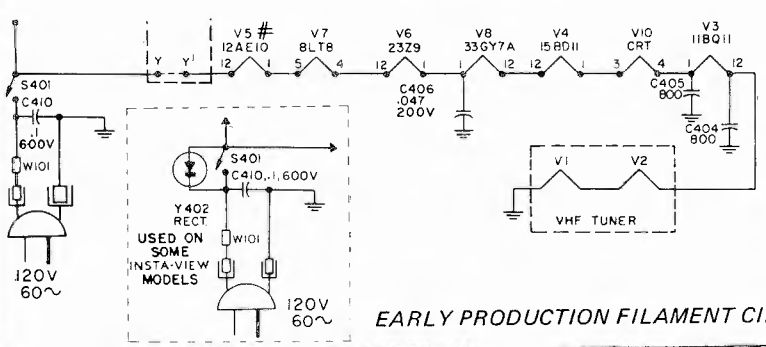
MODELS
WM153SAV-2
WM155SEB-2
WM158SCG-2

MODELS
WM160SEB-2
WM160SMD-2
WM163SWD-2
WM164SEB-2
WM169SWD-2

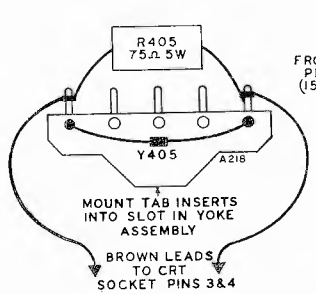
MODELS
WM506SVY-2
WM510SEB-2

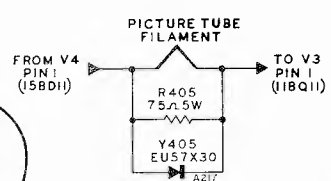


TROUBLESHOOTING GUIDE – BOTTOM VIEW OF CIRCUIT BOARD



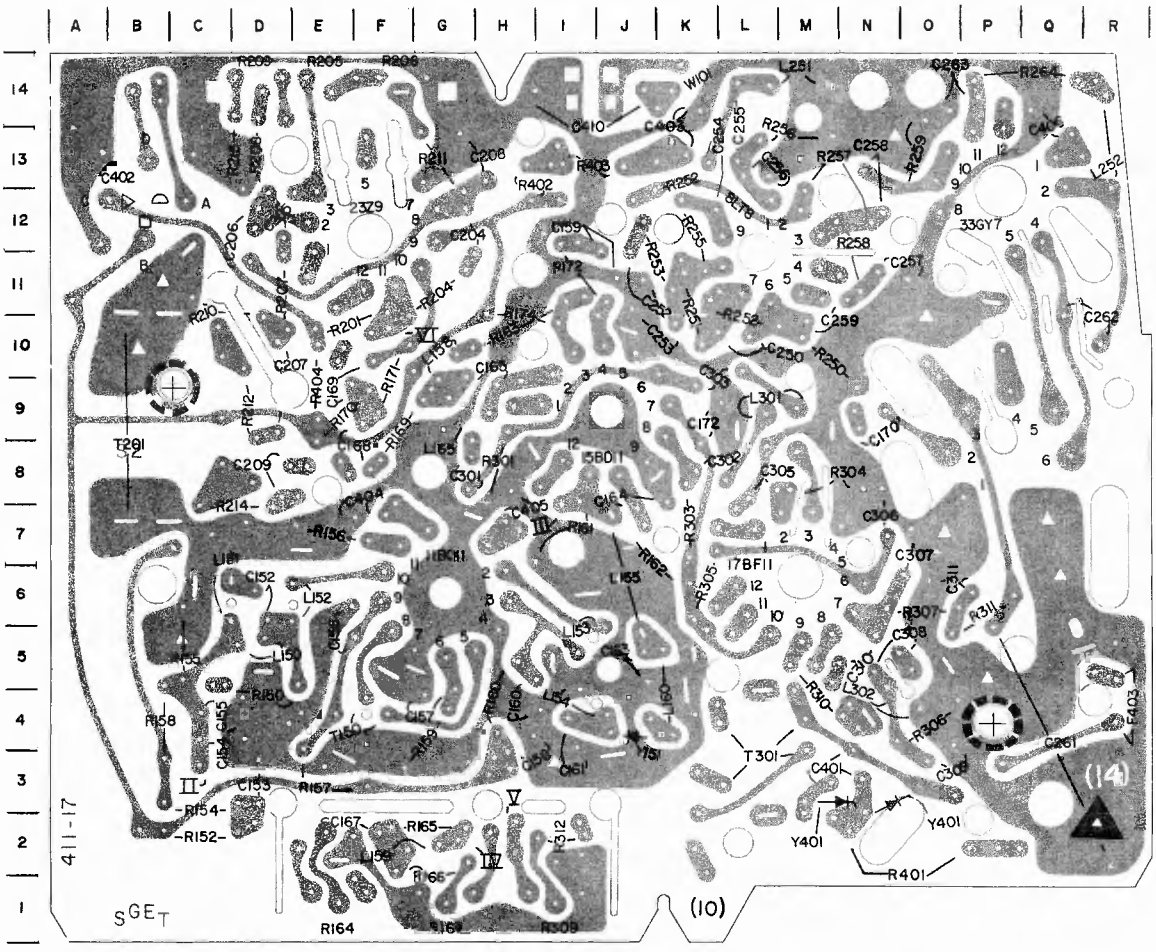
EARLY PRODUCTION FILAMENT CIRCUIT





SHUNT CIRCUIT FOR 12BZP4 OR 16CNP4

GENERAL ELECTRIC Chassis S-2, Printed Board Information

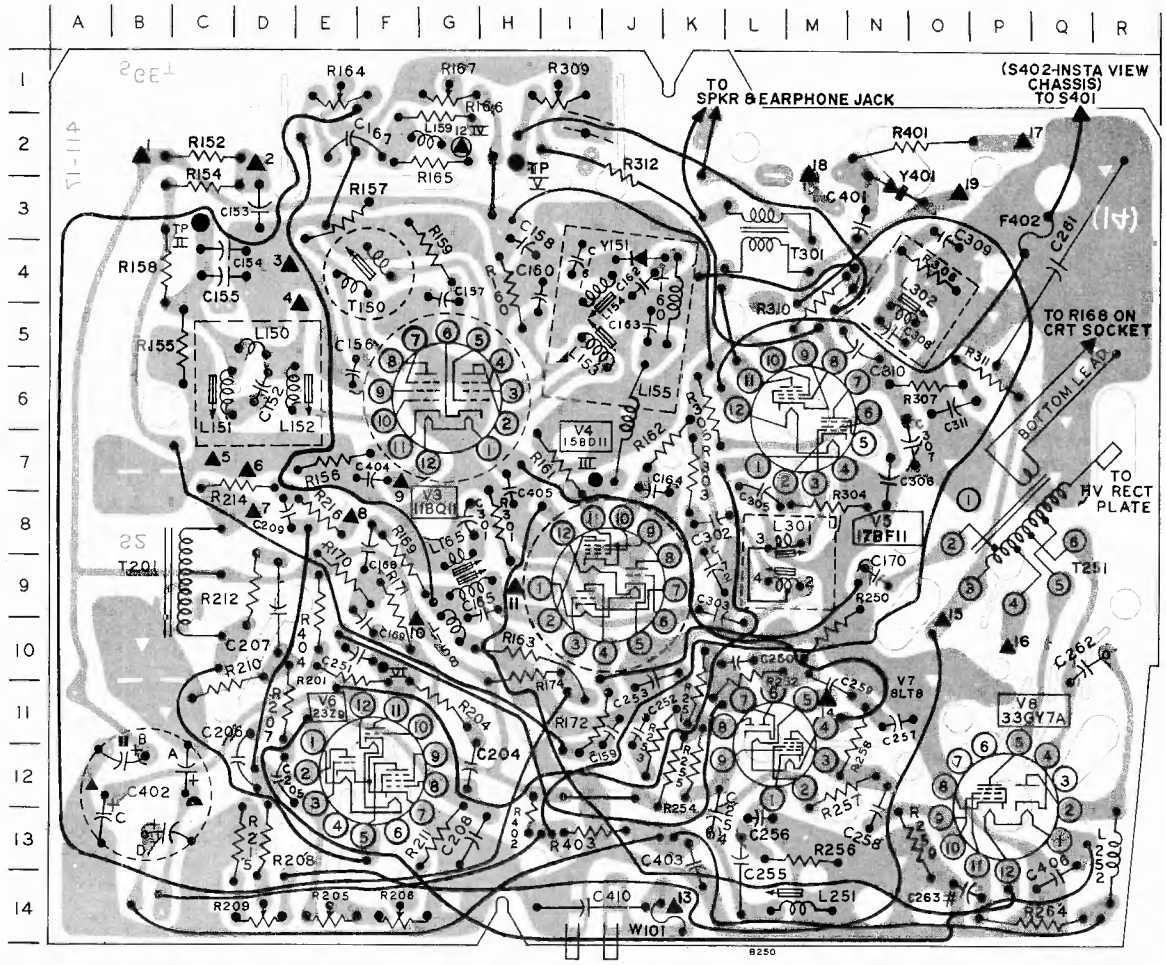


COPPER SIDE VIEW

RESISTORS		CAPACITORS		COILS	TEST POINTS
R152 – C2	R214 – D7	C152 – D6	C255 – L13	L150 – D5	TP II – C3
R154 – C3	R215 – D13	C153 – D3	C256 – L13	L151 – C6	TP III – I7
R155 – C5	R216 – E8	C154 – C4	C257 – N11	L152 – E6	TP IV – G2
R156 – E7	R250 – M10	C155 – C4	C258 – N12	L153 – I5	TP V – H2
R157 – E3	R251 – K11	C156 – E6	C259 – M10	L154 – I4	TP VI – F10
R158 – B4	R252 – L10	C157 – G4	C261 – Q4	L155 – J6	TUBES
R159 – G4	R253 – J12	C158 – H4	C262 – Q10	L158 – G10	
R160 – H4	R254 – K12	C159 – J11	C263 – P14	L159 – G2	V3 – G6
R161 – I7	R255 – K12	C160 – H4	C301 – G8	L160 – K4	V4 – J9
R162 – J7	R256 – M13	C161 – I4	C302 – K8	L165 – G9	V5 – M6
R163 – H10	R257 – M12	C162 – J4	C303 – K9	L251 – M14	V6 – E12
R164 – E1	R258 – N11	C163 – J5	C305 – L7	L252 – R13	V7 – L11
R165 – G2	R259 – O13	C164 – J7	C306 – N7	L301 – M8	V8 – P12
R166 – G2	R264 – Q14	C165 – H9	C307 – O7	L302 – N5	
R167 – G1	R301 – H8	C167 – E2	C308 – N5	DIODES	
R169 – F9	R303 – K7	C168 – F8	C309 – O3		
R170 – E9	R304 – M8	C169 – F10	C310 – N5	Y151 – J4	
R171 – F9	R305 – K6	C170 – N9	C311 – 06	Y401 – N3	
R172 – I11	R306 – O4	C172 – K9	C401 – N3	FUSES	
R174 – H10	R307 – O6	C204 – G12	C402 – B12		
R201 – E10	R309 – I1	C205 – D12	C403 – K13	W101 – J14	
R204 – G11	R310 – M4	C206 – D12	C404 – F7	TRANSFORMERS	
R205 – E14	R311 – P6	C207 – D9	C405 – H7		
R206 – F14	R312 – J2	C208 – G13	C406 – Q13	T150 – F4	
R207 – D11	R401 – O2	C209 – D8	C410 – I14	T201 – C9	
R208 – D13	R402 – H13	C250 – L10		T251 – P8	
R209 – D14	R403 – I13	C251 – F10		T301 – L3	
R210 – C11	R404 – E9	C252 – J11			
R211 – G13		C253 – J10			
R212 – D9		C254 – K13			

NOTE: On WM160 and WM520 Series Receivers, the front control section is broken away from the main circuit board and mounted on the tuner and control assembly bracket.

Wiring connections to the main circuit board remain as shown. A shielded, two-conductor cable is used for audio connections to the volume control R309.



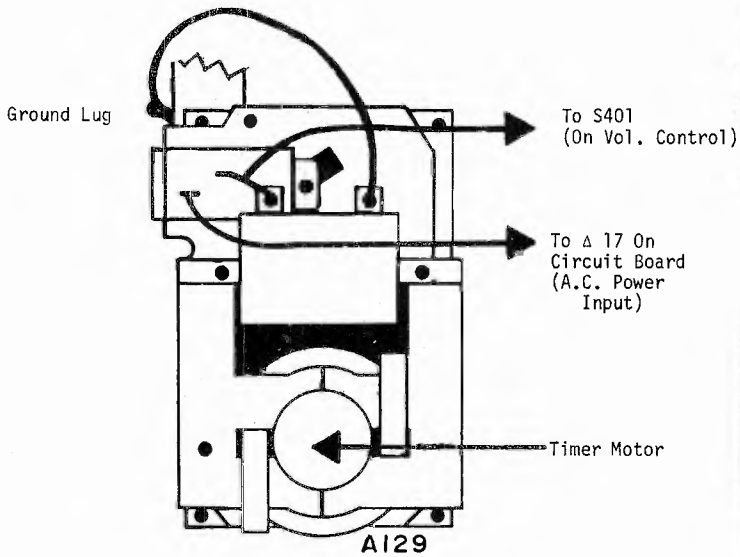
COMPONENT SIDE VIEW

WIRE LEAD CONNECTIONS TO CIRCUIT BOARD		
▲	Location	Description
▲ 1.	B2	Orange lead to VHF Tuner, B+ Term.
▲ 2.	D2	White lead to VHF Tuner, AGC Term.
▲ 3.	D4	Shield of coax to VHF Tuner, I-F Term.
▲ 4.	E4	Center lead of coax to VHF Tuner, I-F Term.
▲ 5.	C7	Black lead to VHF Tuner Chassis
▲ 6.	D7	Black lead to CRT, Pin 7
▲ 7.	D8	Yellow lead to yoke, Term. 2
▲ 8.	E8	Green lead to CRT, Pin 6
▲ 9.	F7	Brown lead to VHF Tuner, Fil. Term.
▲ 10.	F10	Orange lead to yoke, Term. 4
▲ 11.	H9	Brown lead to CRT, Pin 4
▲ 12.	G2	Yellow lead to CRT, Pin 2
▲ 13.	K14	Brown lead to S401 (On Rear of R309)
▲ 14.	M11	Brown lead to CRT, Pin 3
▲ 15.	O9	Red lead to yoke, Term. 1
▲ 16.	P10	White lead to yoke, Term. 5
▲ 17.	P2	Brown lead to S401 (on Rear of R309)
▲ 18.	M2	Orange/black lead to S402, (Term. 2 (Insta-View)
▲ 19.	O3	Red/blue lead to S402, Term. 3 (Insta-View)

ELECTRICAL ADJUSTMENTS

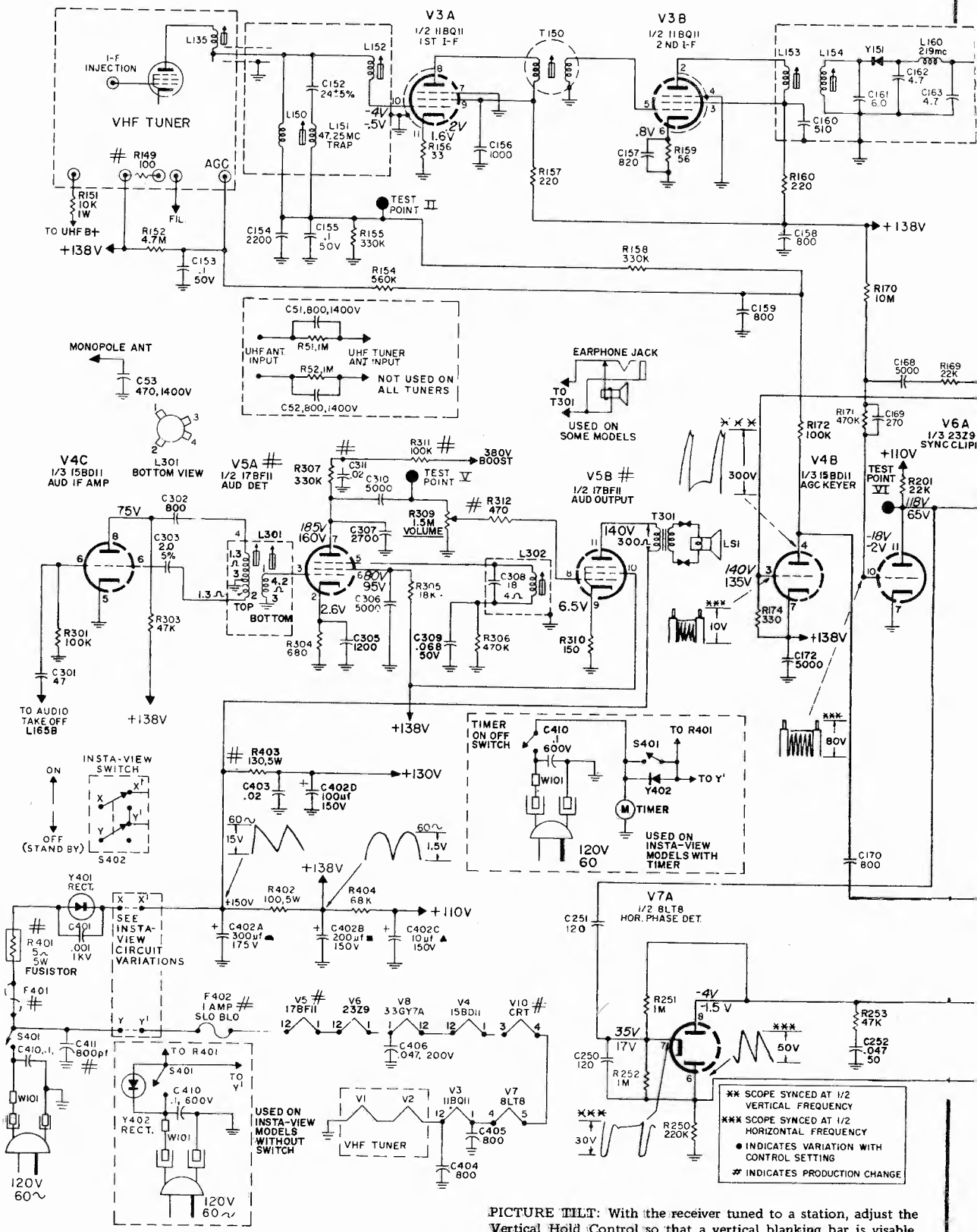
HEIGHT AND VERTICAL LINEARITY: Adjust R209 and R206 simultaneously for proper vertical size and linearity. Picture should extend 1/8-inch beyond top and bottom edges of mask.

HORIZONTAL HOLD: With controls set for normal operation, tune in a station. Connect a .1 uf capacitor between Test Point VI and ground. Adjust L251 for a picture which barely floats across the screen; then remove the capacitor.



TIMER MOTOR WIRING DIAGRAM

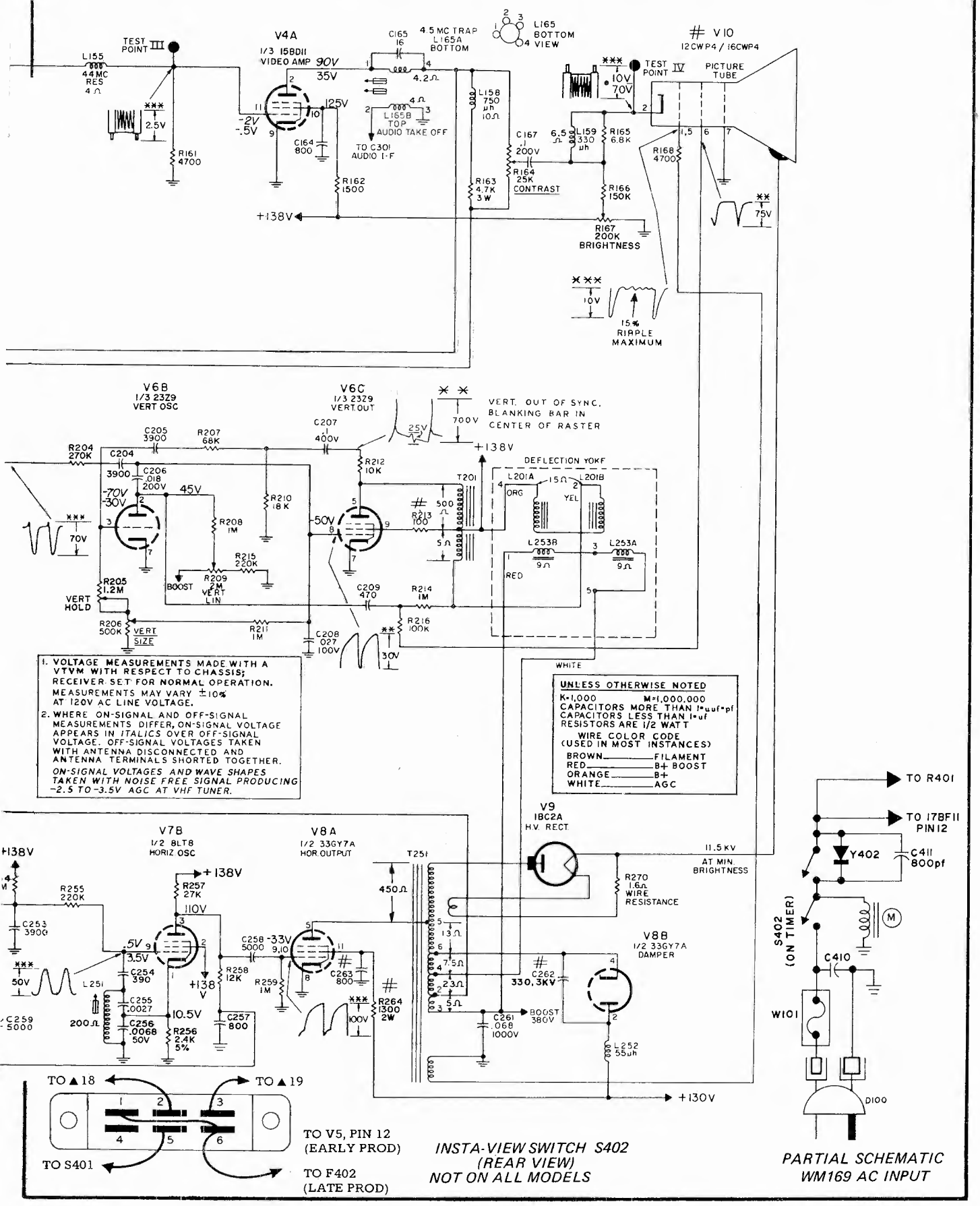
GENERAL ELECTRIC Chassis S-2 Schematic Diagram



PICTURE TILT: With the receiver tuned to a station, adjust the Vertical Hold Control so that a vertical blanking bar is visable. Loosen the yoke clamp and carefully adjust the yoke so that the blanking bar is level. Then tighten the clamp to secure the yoke.

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

GENERAL ELECTRIC Chassis S-2 Schematic Diagram, Continued



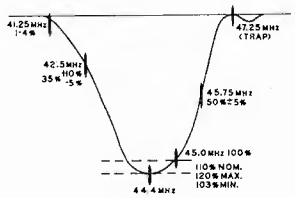
INSTA-VIEW SWITCH S402 (REAR VIEW) NOT ON ALL MODELS

PARTIAL SCHEMATIC WM169 AC INPUT

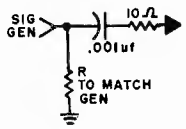
GENERAL ELECTRIC Chassis S-2, Alignment Information

VIDEO I-F SYSTEM

1. Turn volume control and fine tuning counterclockwise, and contrast control fully clockwise. Set channel selector to Channel 11. Short antenna terminals together.
2. Connect an oscilloscope to Test Point III through a 22K resistor, with the resistor not more than 1.5 inches away from the Test Point. Connect a variable bias supply (0-20V) between Test Point II and chassis. Set bias at -3.5V.
3. Inject signals from a properly terminated generator through the I-F INJECTION NETWORK shown, to the I-F injection point on 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.



I-F RESPONSE CURVE



I-F INJECTION NETWORK

STEP	SIGNAL FREQUENCY	ADJUST	REMARKS
1	47.25 MHZ AM	L151 for minimum scope deflection	Use maximum scope sensitivity and smallest possible signal.
2	44.4 MHZ AM, scope calibrated 3V PP for 2" deflection	L154, then L153 for maximum.	Position L153 core at end of coil nearer circuit board. Maintain 2" deflection on scope by adjusting signal strength.
3		T150 for maximum.	
4	38-48 MHZ sweep generator, with scope calibrated 3 volts peak to peak for 2" deflection; markers at 41.25, 42.5, 44.4, 45.0, 45.75 MHZ, 47.25 MHZ	L135 for maximum deflection of the 45.75 MHZ marker.	Symmetry of the nose is important. No portion of the nose should be out of symmetry by more than 3%. Repeat Step 7 to shape nose after Steps 8 and 9.
5		L152 for proper nose shaping.	
6		Turn L135 core clockwise to place 45.75 MHZ marker at 50%.	
7		Readjust L152 to shape nose around 44.4 MHZ pivot.	
8		Readjust T150 for proper placement of 42.5 MHZ marker if curve is too narrow.	
9		Spread or knife turns of L150 if 42.5 MHZ marker is above 30%.	

AUDIO ALIGNMENT PROCEDURE

GENERAL: Allow the receiver and test equipment at least 20 minutes warm-up. Power the receiver from 120 Volts AC through an isolation transformer. A speaker, or a 3.2 ohm, 5 watt resistor should be connected across the audio output transformer secondary at all times.

CHASSIS PREPARATION:

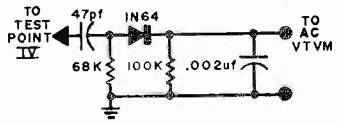
1. Brightness, Horizontal, and Vertical controls should be set for a normal picture.
2. Set the contrast control to maximum and the volume control to minimum.
3. Connect a -10 Volt DC bias to Test Point II with the positive lead grounded to the chassis.
4. Connect a -0.5 Volt DC bias to Test Point III through a 750 uh isolation choke (ET36X376).

4.5 MHZ TRAP ADJUSTMENT:

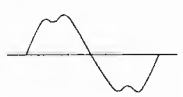
1. Pre-set the Quadrature coil (L302) with the core flush to the top of the coil form, away from the circuit board.
2. Connect the DETECTOR NETWORK shown to Test Point IV (CRT, Pin 2) and feed the output to an AC VTVM.
3. Apply a 100 mv, 40% modulated, 4.5 MHZ AM signal through a DC blocking capacitor (.05 mhz) to Test Point III.
4. Adjust L165A 4.5 MHZ Trap (bottom core) for minimum reading on the VTVM at Test Point IV (± 1/4 turn).
5. Remove the 4.5 MHZ AM signal and the detector network.

AUDIO ALIGNMENT:

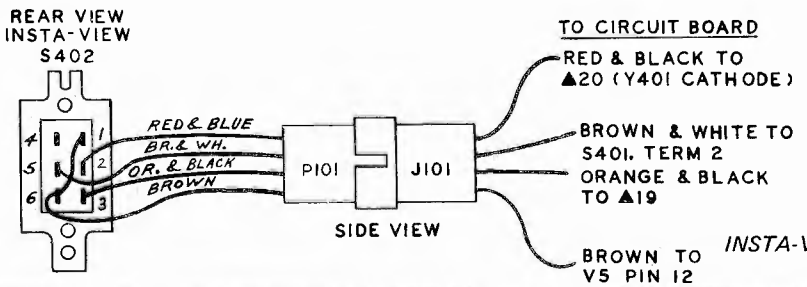
1. Connect an oscilloscope to Test Point V through a 22,000 ohm resistor.
2. Feed in a 50 uv, 4.5 MHZ,± 7.5KHZ FM signal at Test Point III through a blocking capacitor.
3. Adjust Quad Coil L302 for maximum undistorted sine wave on the oscilloscope. Start with the core away from the circuit board and tune into the coil form for the second peak indication.
4. Reduce the level of the FM input signal until distortion breakup of the sine wave appears.
5. Align the Audio Interstage (L301) secondary (bottom core) until the break-up of the sine wave is symmetrical, as shown in the diagram below.
6. Align the Sound Take-Off L165B (top core) as in steps 4 and 5 above.
7. Align the Interstage primary (L301 top core) as in steps 4 and 5 above.
   NOTE: Each core should be aligned once only. Do not go back and touch up previously adjusted cores while aligning.
8. Disconnect signal generator, oscilloscope, and bias supplies.

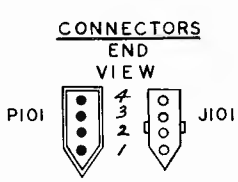


DETECTOR NETWORK



SYMMETRICAL BREAKUP





INSTA-VIEW SWITCH CONNECTOR WIRING DIAGRAM (NOT USED ON ALL RECEIVERS)

GENERAL ELECTRIC

CHASSIS T-5, MODEL TR100TEB-5

DISASSEMBLY

SIGNAL BOARD

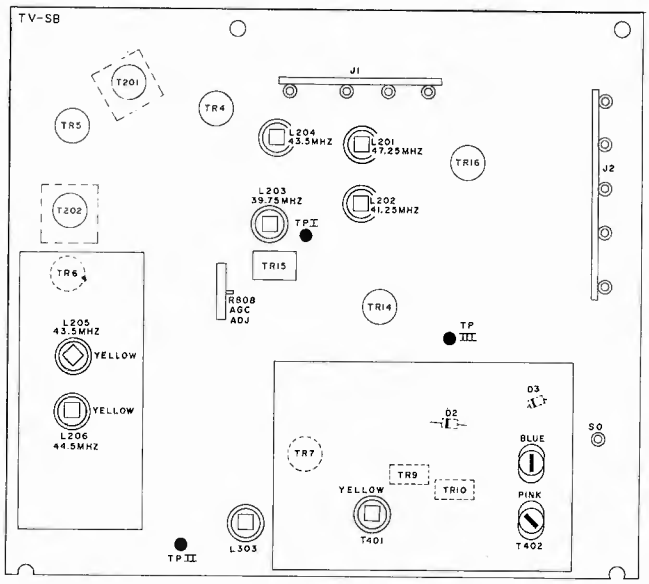
1. Remove four Phillips head screws that secure circuit board. Signal board may now be turned over for servicing.

TUNER ASSEMBLY

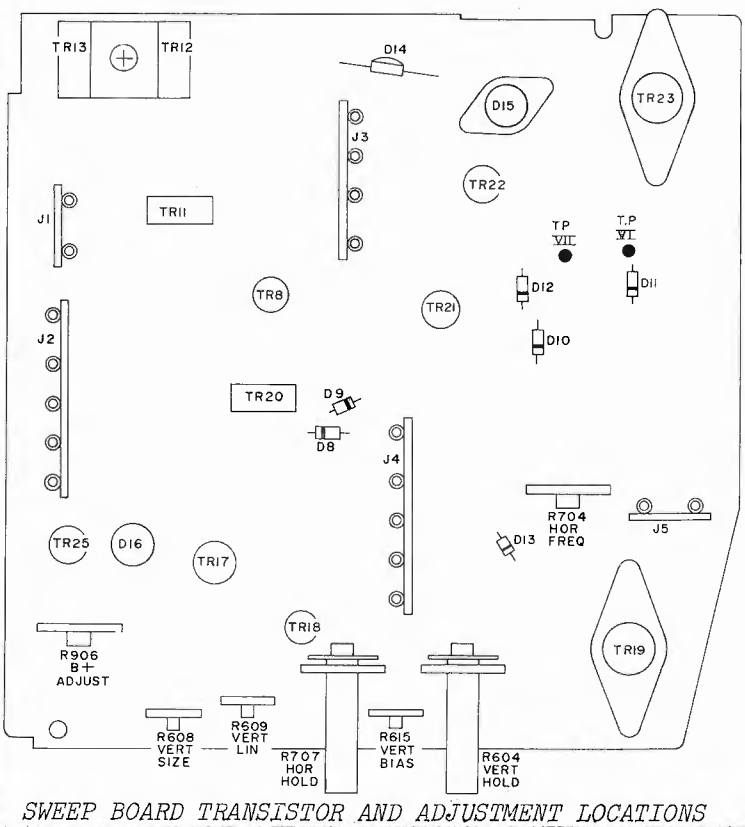
1. Remove UHF and VHF channel select and fine tune knobs.
2. Remove two Phillips head screws securing tuner bracket to cabinet front. One at the top and one at the side.
3. Loosen the Phillips head screw that is in front of and between the VHF tuner. Insert screwdriver at left side of chassis between UHF tuner output plug and UHF B+ terminal.
4. The tuner package may now be tilted back or lifted clear to permit access to the following: Volume, Contrast, Brightness controls, Power Transformer, Power Plug, Fuse Panel, TR24, and VHF tuner mounting screws.

SWEEP BOARD ASSEMBLY

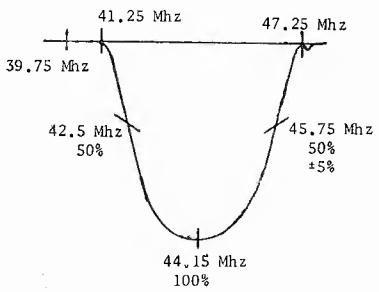
1. Position receiver on side with power supply down.
2. Remove Phillips head screw from bracket above HVT.
3. Remove Phillips head screw that secures sweep assembly to cabinet front.
4. Remove Phillips head screw that secures sweep assembly at rear of main chassis.
5. The sweep assembly will now swing down allowing easy access to all components mounted on the sweep board. CAUTION: BE SURE TO RELIEVE STRAIN ON LEADS AS THE PANEL IS SWUNG DOWN.
6. To facilitate servicing, power can be applied with the assembly in this position. Reasonable caution should be exercised to insure that accidental shorts are prevented.



SIGNAL BOARD TRANSISTOR AND ADJUSTMENT LOCATIONS



SWEEP BOARD TRANSISTOR AND ADJUSTMENT LOCATIONS



I-F RESPONSE CURVE

ADJUSTMENTS

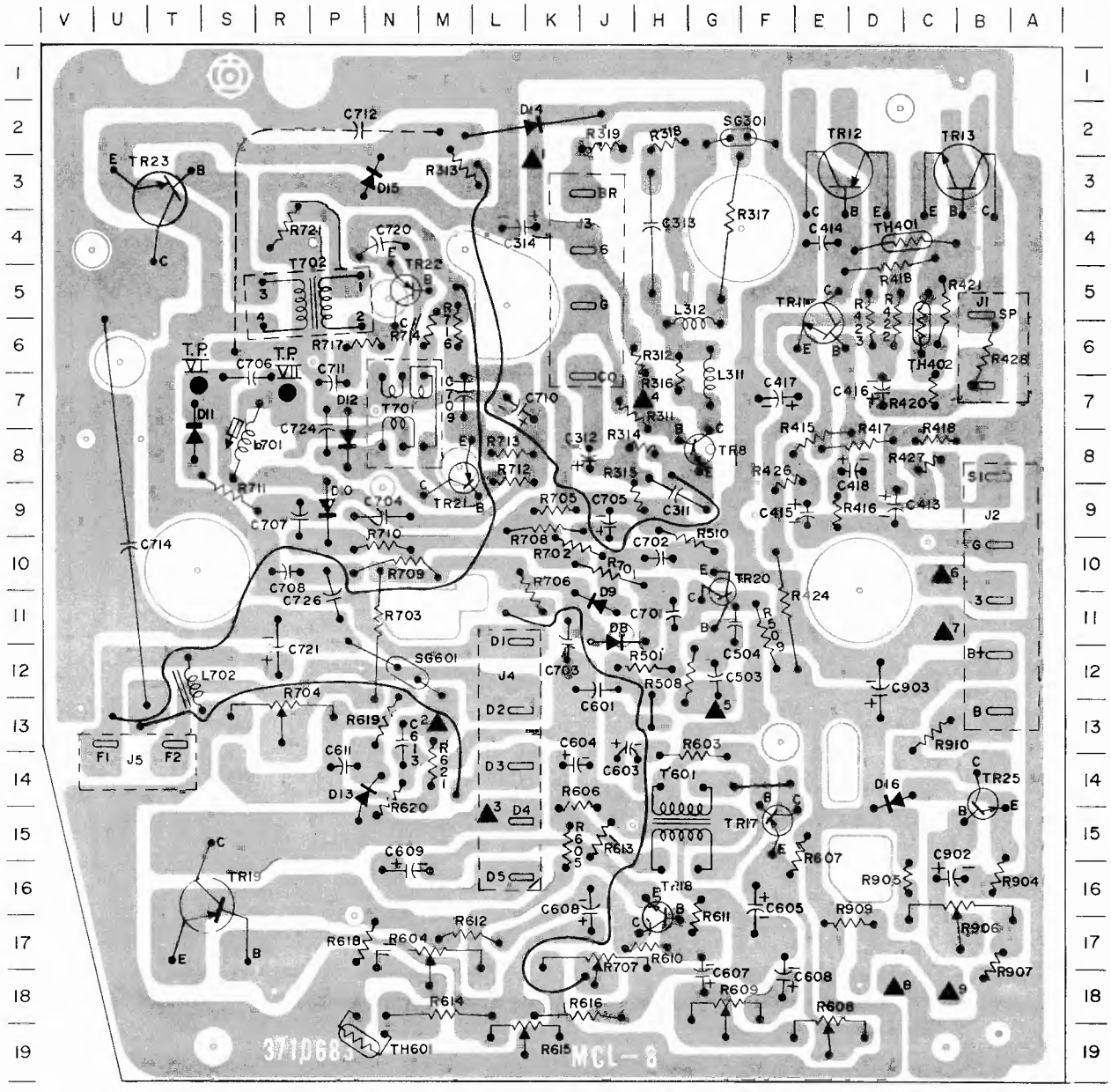
HORIZONTAL FREQUENCY CONTROLS

R704 (Horizontal Frequency) is a Horizontal-Hold Range-Control and requires re-adjustment after any horizontal oscillator component is replaced.

To properly adjust R704:

1. Short TPVI to TPVII.
2. Connect 0.1uf paper capacitor from point 12 (input to TR20) on power board to chassis ground.
3. Looking from rear of receiver, set R704 to full counter-clockwise position. WARNING: DO NOT TURN FULLY CLOCKWISE.
4. Set Horizontal Hold control(R707)at center of its range.
5. Turn set on and adjust horizontal frequency control (R704) for floating picture.
6. Turn set off, disconnect jumper between TPVI and TPVII.
7. Turn set on, adjust L701 for floating picture.
8. Remove capacitor from point 12 on power board.
9. Picture should remain synchronized. If it does not, look for troubles in the AFC circuit.

GENERAL ELECTRIC Chassis T-5 Printed Board Information



SWEEP BOARD - COPPER VIEW

COMPONENT LOCATIONS

RESISTORS

R311	J-7	R424	F-11	R613	J-15	R711	S-9		
R312	H-6	R426	F-8	R614	M-18	R712	L-8		
R313	M-3	R427	C-8	R615	L-19	R713	L-8		
R314	H-8	R428	B-6	R616	J-18	R714	M-6		
R315	H-9	R508	G-11	R618	P-17	R716	M-6		
R316	H-7	R509	F-11	R619	N-13	R717	N-6		
R317	G-4	R510	G-10	R620	N-14	R721	R-4		
R318	H-2	R601	H-12	R621	M-14	R904	B-16		
R319	J-2	R603	G-14	R701	J-10	R905	D-16		
R415	E-8	R604	M-17	R702	K-10	R906	B-16		
R416	E-9	R605	K-15	R703	N-11	R907	B-17		
R417	D-8	R606	K-15	R704	R-13	R909	D-17		
R418	C-8	R607	E-15	R705	K-9	R910	C-13		
R419	C-5	R608	E-19	R706	K-11				
R420	C-7	R609	G-19	R707	J-17				
R421	C-5	R610	H-17	R708	K-9				
R422	D-5	R611	G-16	R709	N-10				
R423	D-5	R612	M-17	R710	N-10				

CAPACITORS

C311	H-9	C608	J-16	C721	R-12		
C312	J-8	C609	N-16	C724	P-8		
C313	H-4	C611	P-14	C726	P-11		
C314	L-4	C613	N-13	C902	C-16		
C413	D-9	C701	H-11	C903	D-12		
C414	E-4	C702	H-10				
C415	E-9	C703	K-11				
C416	D-7	C704	N-9				
C417	F-7	C705	J-9				
C418	D-8	C706	S-7				
C503	G-12	C707	R-9				
C504	G-11	C708	R-10				
C601	J-12	C709	M-7				
C603	J-15	C710	L-7				
C604	K-14	C711	P-7				
C605	F-16	C712	P-2				
C606	F-18	C714	U-10				
C607	G-18	C720	N-4				

COILS

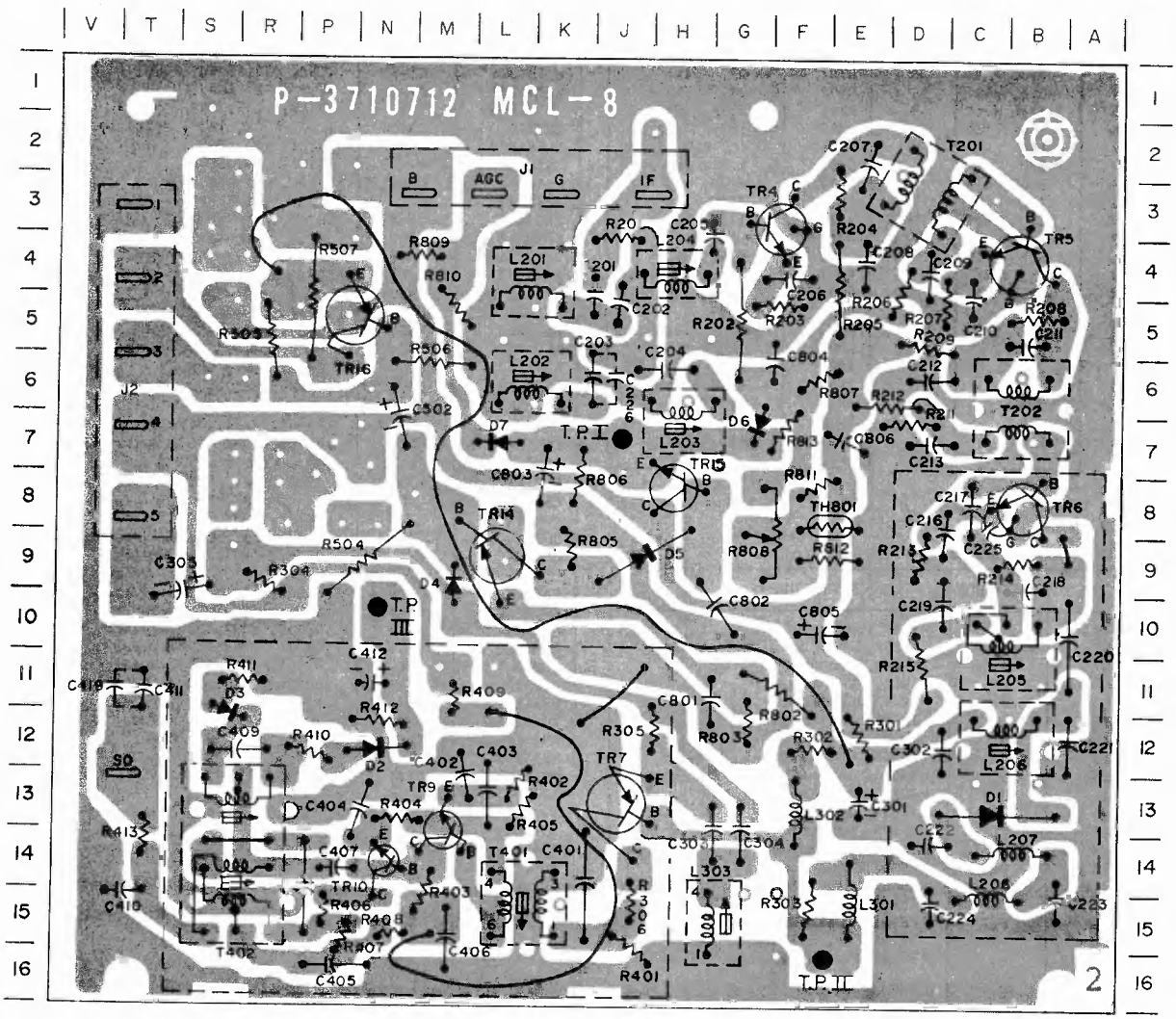
L311	G-7
L312	G-6
L701	S-8
L702	T-12

DIODES

D8	J-11
D9	J-11
D10	P-9
D11	T-8
D12	P-8
D13	P-14
D14	K-2
D15	N-3
D16	D-14

TRANSISTORS

TR8	G-8
TR11	E-6
TR12	E-4
TR13	B-4
TR17	F-15
TR18	H-16
TR19	S-16
TR20	G-11
TR21	M-8
TR22	N-5
TR23	T-3
TR25	B-15



SIGNAL BOARD - COPPER VIEW

COMPONENT LOCATIONS

RESISTORS

R201	J-3	R407	P-15
R202	G-5	R408	N-15
R203	F-4	R409	M-11
R204	E-3	R410	P-12
R205	E-4	R411	R-11
R206	D-4	R412	N-12
R207	C-5	R413	T-13
R208	B-5	R504	N-9
R209	D-5	R505	R-5
R211	D-7	R506	M-6
R212	E-6	R507	P-4
R213	D-9	R802	F-11
R214	B-9	R803	G-12
R215	D-11	R805	K-9
R301	E-12	R806	K-8
R302	F-12	R807	F-6
R303	F-15	R808	F-8
R304	R-9	R809	M-4
R305	H-12	R810	M-5
R306	J-14	R811	F-8
R401	J-15	R812	F-9
R402	L-13	R813	F-7
R403	M-14		
R404	N-13		
R405	L-13		
R406	P-14		

CAPACITORS

C201	J-4	C303	G-13
C202	J-5	C304	G-13
C203	K-6	C305	S-9
C204	H-6	C401	K-14
C205	G-4	C402	M-12
C206	F-4	C403	L-13
C207	E-2	C404	N-13
C208	E-4	C405	P-16
C209	D-4	C406	M-15
C210	C-4	C407	P-14
C211	B-5	C408	P-14
C212	D-6	C409	S-12
C213	D-7	C410	T-14
C216	C-8	C411	T-11
C217	C-8	C412	N-11
C218	B-9	C419	U-11
C219	C-10	C502	N-6
C220	A-10	C801	G-11
C221	A-12	C802	G-10
C222	D-14	C803	K-7
C223	A-15	C804	F-6
C224	D-15	C805	F-10
C225	C-8	C806	E-7
C226	J-6		
C301	E-13		
C302	C-12		

DIODES

D1	C-13
D2	N-12
D3	S-11
D4	M-9
D5	J-9
D6	G-7
D7	L-7

COILS

L201	L-4
L202	L-6
L203	H-6
L204	H-4
L205	B-10
L206	B-12
L207	B-14
L208	C-15
L301	E-15
L302	F-13
L303	G-15

TRANSISTORS

TR4	F-3
TR5	B-4
TR6	B-8
TR7	J-13
TR9	M-14
TR10	N-14
TR14	L-9
TR15	H-8
TR16	N-5

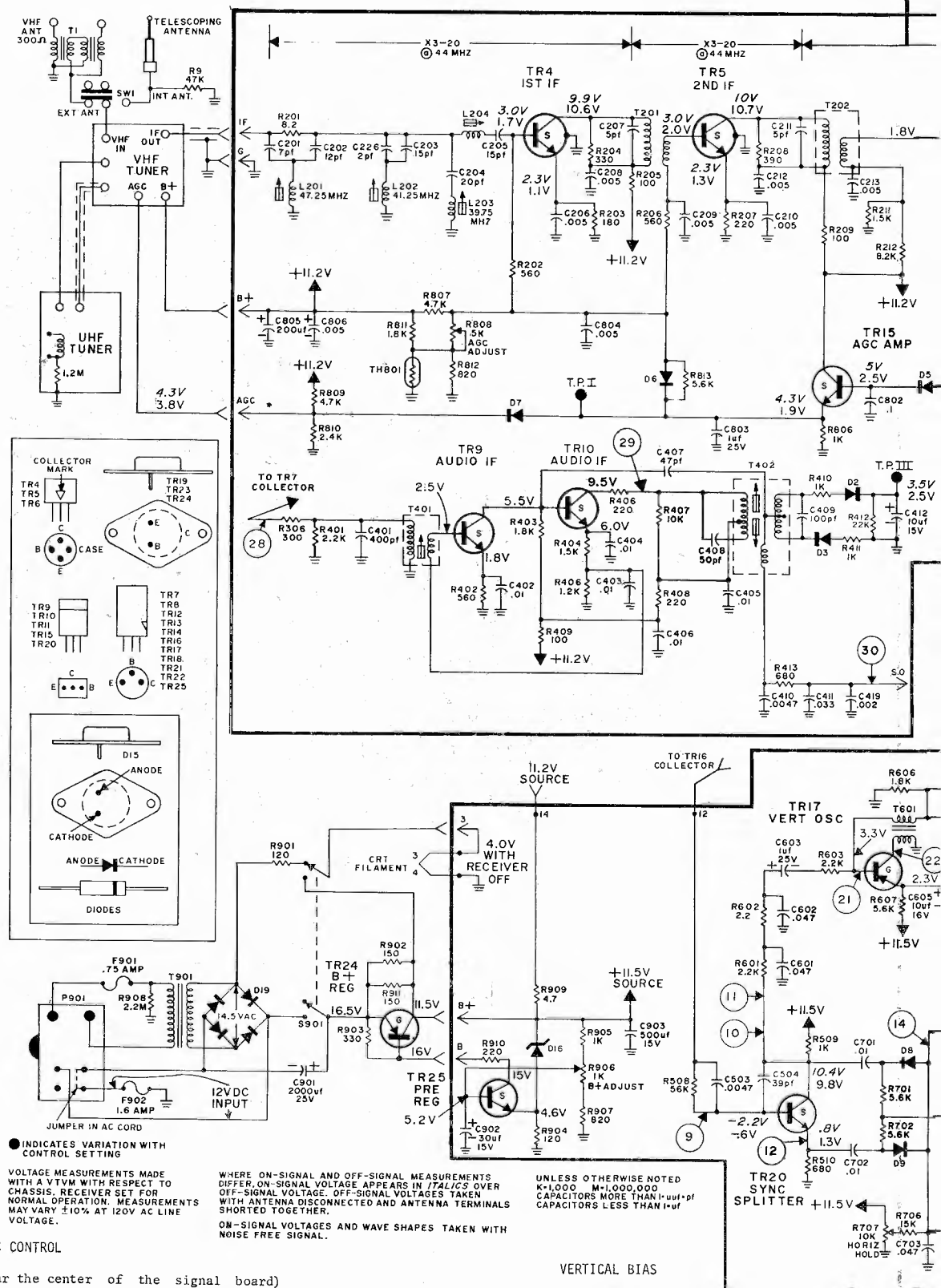
TEST POINTS

TPI	J-7
TPII	E-15
TPIII	N-10

TRANSFORMERS

T201	D-3
T202	B-6
T401	L-15
T402	S-15

GENERAL ELECTRIC Chassis T-5 Schematic Diagram



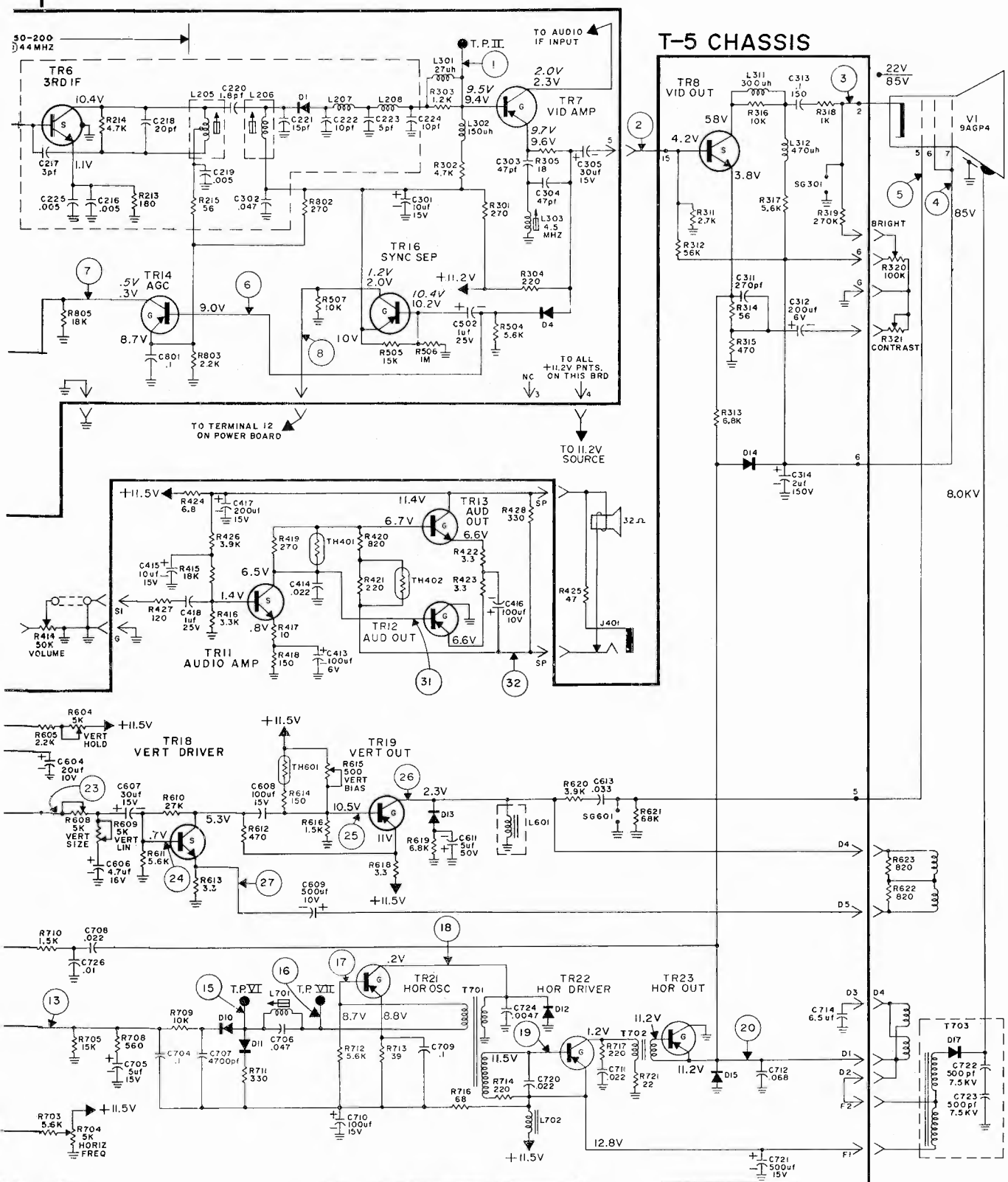
AGC CONTROL

R808 (located near the center of the signal board) should be adjusted with a one millivolt signal applied to the antenna terminals. The proper setting will produce +3.9V, ±0.1V at TP1 with a test pattern signal. An alternate method of setting the AGC control is to tune the receiver to a strong local channel and adjust the AGC control until sync instability can be detected in the picture. Reduce the AGC control approximately 1/8 turn and check on all other channels to be sure AGC circuit functions properly.

VERTICAL BIAS

Proper adjustment of the vertical bias control (R615) is necessary to limit the current through TR19 to a safe level. The proper procedure for adjusting R615 is to disconnect the yellow lead from L601, insert a milliampere meter in series with L601, and adjust R615 for a reading of 165ma. A second way to check this setting is to use a DC voltmeter across L601 and adjust R615 for an indication of 2.1V. This procedure is required after any vertical circuit repair.

GENERAL ELECTRIC Chassis T-5 Schematic Diagram, Continued



VERTICAL SIZE AND LINEARITY

Properly tune the receiver to one of the local television channels. To obtain the best linearity, use a test pattern, if one is available.

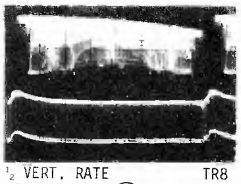
Adjust vertical size (R608) and vertical linearity (R609) simultaneously for proper vertical size and linearity. The picture should over-fill the screen 1/8" at top and bottom.

B+ ADJUST CONTROL

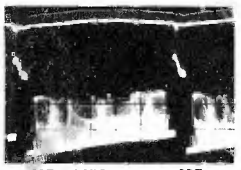
The B+ adjust control (R906) (located on the rear section of sweep board) should be adjusted to produce 11.5V, ±0.3V at the collector of TR24 (mounted on the large vertical heat sink). NOTE: Setting the B+ voltage to a value higher than 11.5 volts will cause poor performance on AC power and reduced battery life when operated on a storage battery.

GENERAL ELECTRIC Chassis T-5, Waveform Information, Continued

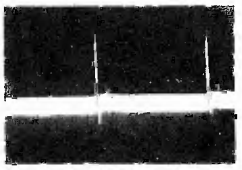
½ VERT. RATE
1 VPP
TP11
(1)



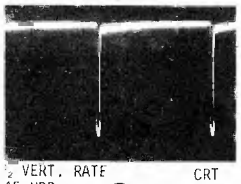
½ VERT. RATE
.9 VPP
TR8
BASE
(2)



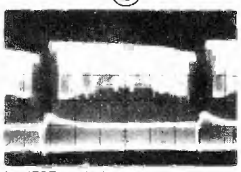
½ VERT. RATE
40 VPP
CRT
CATHODE
(3)



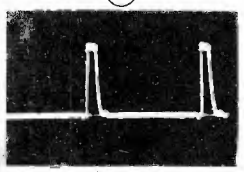
½ HORIZ. RATE
4.5 VPP
CRT
PIN 6
(4)



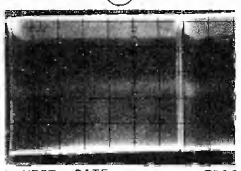
½ VERT. RATE
45 VPP
CRT
PIN 5
(5)



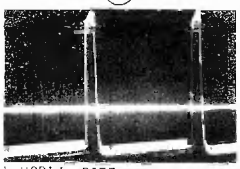
½ VERT. RATE
.9 VPP
TR14
BASE
(6)



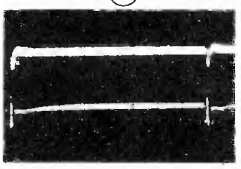
½ HORIZ. RATE
10 VPP
TR14
COL.
(7)



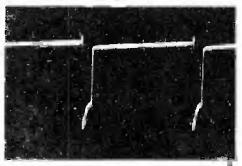
½ VERT. RATE
10 VPP
TR16
COL.
(8)



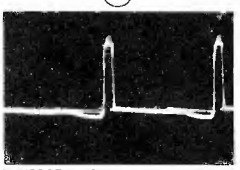
½ HORIZ. RATE
10 VPP
TR20
BASE
(9)



½ VERT. RATE
7 VPP
TR20
COL.
(10)

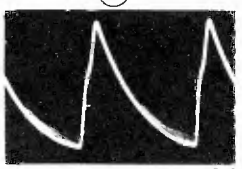


½ HORIZ. RATE
7 VPP
TR20
COL.
(11)

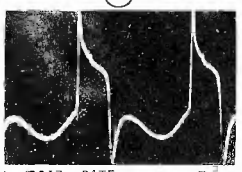


½ HORIZ. RATE
6 VPP
TR20
EMITTER
(12)

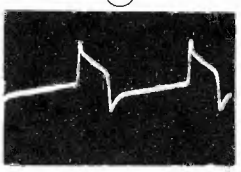
½ HORIZ. RATE
0.3 VPP
JCT. R701
R702
(13)



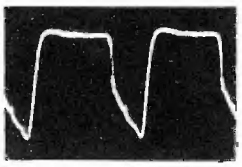
½ HORIZ. RATE
5 VPP
JCT. R710
D8-D9
(14)



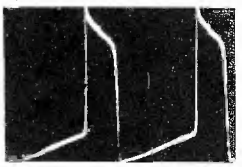
½ HORIZ. RATE
12 VPP
TPVI
(15)



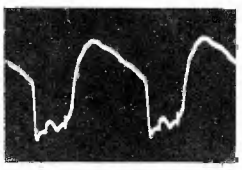
½ HORIZ. RATE
13 VPP
TPVII
(16)



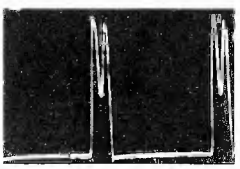
½ HORIZ. RATE
4.5 VPP
TR21
BASE
(17)



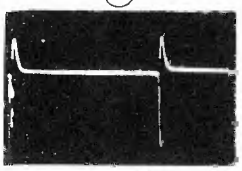
½ HORIZ. RATE
12 VPP
TR21
COL.
(18)



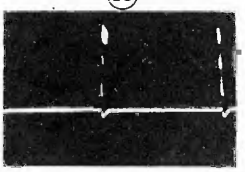
½ HORIZ. RATE
3.6 VPP
TR22
BASE
(19)



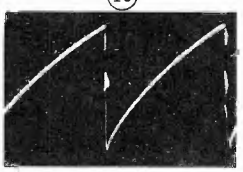
½ HORIZ. RATE
100 VPP
TR23
EMITTER
(20)



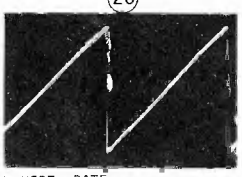
½ VERT. RATE
5 VPP
TR17
BASE
(21)



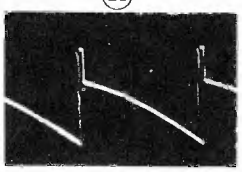
½ VERT. RATE
3 VPP
TR17
COL.
(22)



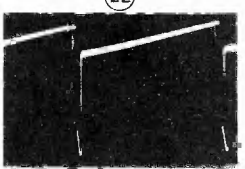
½ VERT. RATE
2.5 VPP
TR17
EMITTER
(23)



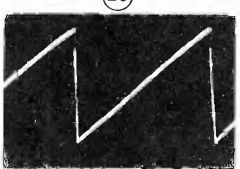
½ VERT. RATE
1 VPP
TR18
BASE
(24)



½ VERT. RATE
2 VPP
TR19
BASE
(25)

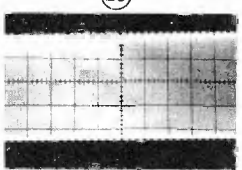


½ VERT. RATE
50 VPP
TR19
COL.
(26)

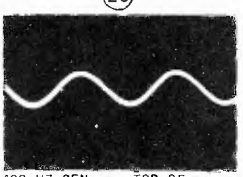


½ VERT. RATE
1 VPP
TR18
EMITTER
(27)

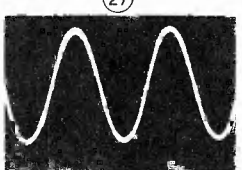
½ VERT. RATE
0.2 VPP
JCT.
R306 - T401
(28)



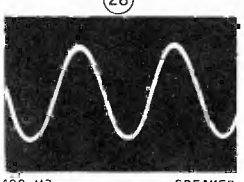
½ VERT. RATE
8 VPP
TR10
COL.
(29)



400 HZ GEN SIGNAL
0.1 VPP
TOP OF VOL. CONTROL
(30)



400 HZ
9 VPP
TR12
BASE
(31)



400 HZ
8 VPP
SPEAKER
(32)

WAVEFORMS FOR POINTS INDICATED

GENERAL ELECTRIC

CHASSIS D1

MODELS

AM400WD-D1
M401EWD
M401WD-D1
WM401WD-D1
XSM401WD-D1
M403EVY
M403EWD
M403VY-D1
M403WD-D1
WM403WD-D1
R403EWD
R403WD-D1
M407EWD
M407WD-D1
WM420BR-D1
WM426BG-D1
WM432WD-D1
WM432BG-D1
WM433WD-D1
M434WD-D1
WM434WD-D1
M435WD-D1
WM435WD-D1
M452EWD
M452WD-D1
M454EWD
M454WD-D1
CBM601EVY
CBM601VY-D1

MODELS

CAM603EVY
CAM603VY-D1
CBM603EVY
CBM603VY-D1
CHR621EVY
CHR621VY-D1
CNR621EVY
CNR621VY-D1

Dissassembly Instructions for Some Models

CABINET BACK; Disconnect any external antenna wire. Remove the 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 antenna input leads that are located inside of the cabinet back. Unplug the VHF antenna lead from the VHF tuner input terminals and the UHF leads are unplugged from the terminals on the cabinet back.

CHASSIS; Remove the cabinet back as previously described. Remove the VHF & UHF tuner knobs. Unplug the picture tube socket and high voltage anode lead. On model R403 remove the power tuning and Remote Receiver assembly by taking out the bracket on which these units are mounted as follows:

a. Take out 4 screws, 2 from the top & 2 from the bottom.
b. Take out 2 screws that retain the 2 ground leads.
c. Unplug the remote plug and the transducer cable.
d. Slide the complete assembly back away from the VHF tuner.

Chassis disassembly for all listed models as follows:

1. Remove 4 hex head screws from the tuner plastic bracket assembly.
2. Remove 2 hex head screws from the secondary control bracket and the rocker switch bracket.
3. Take out the hex head screw from the left front corner of the chassis that retains the ground strap.
4. Take out 2 hex head chassis retaining screws from the bottom corners of chassis.
5. Unsolder the speaker leads from the speaker.

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

PICTURE TUBE; Place the receiver face down on a soft cloth covered surface and either remove the tube sling screw and spread the sling to remove the tube, or remove all four sling straps by taking out the two hex head screws from each strap.

ELECTRICAL ADJUSTMENTS

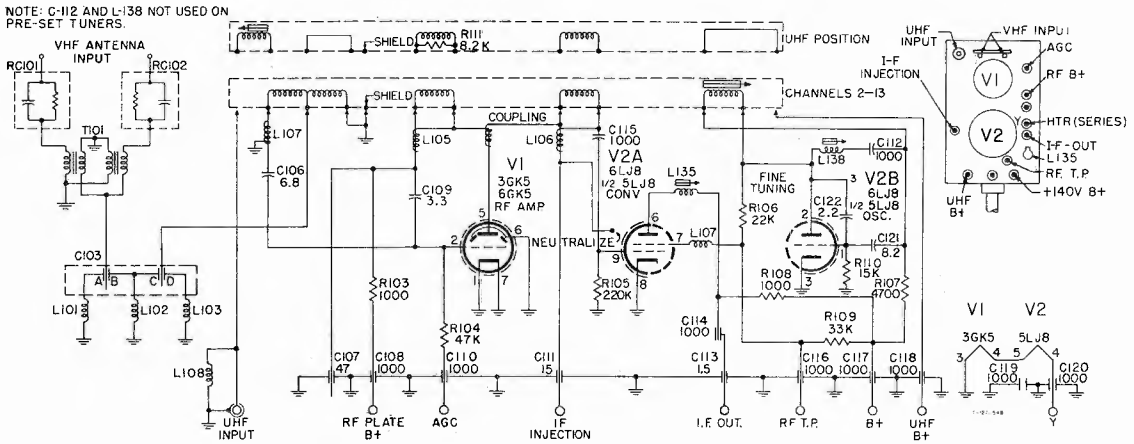
HEIGHT AND VERTICAL LINEARITY: Adjust R214 and R207 simultaneously for proper vertical-size and linearity. Picture should extend 1/8-inch beyond top and bottom edges of mask.

HORIZONTAL HOLD: With controls set for normal operation, adjust L251 to the point where the picture "locks in".

PICTURE TUBE ADJUSTMENTS

PICTURE TILT: To correct picture tilt, loosen the YOKE CLAMP. Adjust the yoke to correct the tilt. Secure the clamp.

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



ET86X260, ET86X277, ET86X279, ET86X307
VHF TUNER SCHEMATIC DIAGRAM

RECEIVER ALIGNMENT

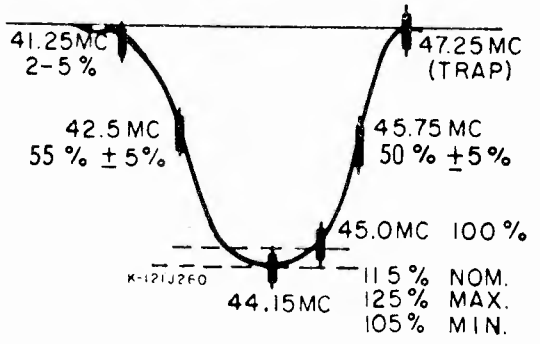
VIDEO I-F SYSTEM

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 11. 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 a variable bias supply (0–20V) 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.

AM PRE-PEAKING & TRAP FREQUENCIES

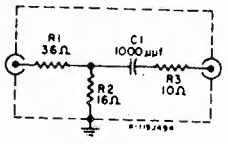
L150	Min. 47.25 MC	T151	Max. 42.8 MC
L160	Min. 41.25 MC	L151	Max. 42.50 MC
L135	Max. 45.00 MC	L154, L153	Max. 44.15 MC



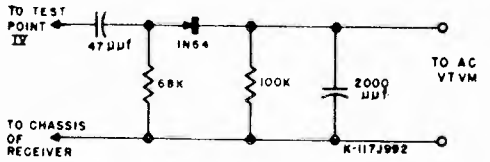
I-F RESPONSE CURVE

VIDEO I-F ALIGNMENT CHART

STEP	SIGNAL FREQUENCY	ADJUST	REMARKS
1	47.25 MC AM (Bias OV)	Adjust L150 for minimum scope deflection	Use maximum scope sensitivity and smallest possible signal for the 47.25 MC AM and 41.25 MC AM adjustments.
2	41.25 MC AM (Bias OV)	Adjust L160 for min. deflection	
3	42.8 MC AM (Bias OV)	Adjust T151 for max. deflection	
4	44.15 MC AM (Bias -3.5V)	Adjust L154, then L153 for max.	Position L153 core barely in the top of the coil, then peak L154. Next peak L153. Do not retouch these adjustments.
5	(Bias -3.5V)	L135 for max. at 45 MC and placement of 45.75 MC marker	
6	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	T151 for placement of 42.5 MC marker.	Symmetry of the nose is important. No portion of the nose should be out of symmetry by more than 3%.
7		L151 for max. at 42.5 MC and shaping of nose around 44.15 MC	
8		Knife the coil of L152 if the 42.5 MC marker is above 55% on the curve.	Repeat last four steps if necessary.



I-F INJECTION NETWORK



DETECTOR NETWORK

4.5 MC TRAP ALIGNMENT

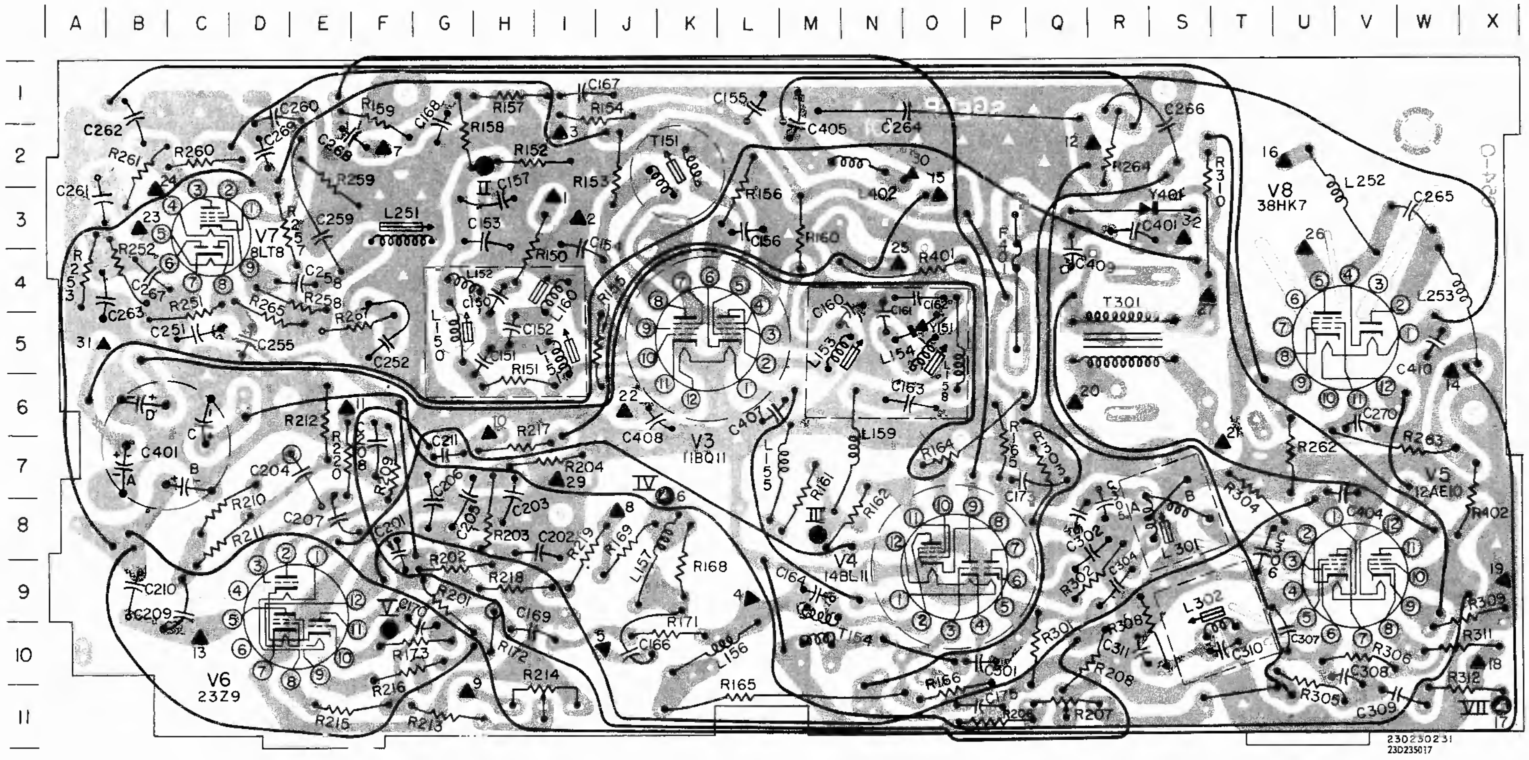
1. Connect a -15V bias to Test Point II, with the positive bias lead grounded to chassis.
2. Detune L302 by placing the core at the top of the coil.
3. Turn contrast control to maximum, volume to minimum.
4. Connect the DETECTOR NETWORK shown to Test Point IV and feed its output to an AC VTVM.
5. Apply 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 take-off.

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.

GENERAL ELECTRIC Chassis D1, Printed Board Information



COMPONENT VIEW OF CIRCUIT BOARD

COMPONENT LOCATION

RESISTORS

R150–H4	R168–K9	R214–I11	R263–W7
R151–H6	R169–J8	R215–E11	R264–R2
R152–H2	R171–K10	R216–F11	R265–D4
R153–J2	R172–H10	R217–H7	R267–E5
R154–J1	R173–G10	R218–H9	
R155–J4	R201–G9	R219–I8	R301–Q10
R156–L3	R202–G9	R220–E7	R302–Q9
R157–H1	R203–H8	†R221–H6	R303–Q7
R158–G2	R204–I7	R251–C4	R304–T8
R159–F1	R206–P11	R252–B4	R305–U11
R160–M3	R207–Q11	R253–A4	R306–V10
R161–M8	R208–R10	R257–D3	R308–R10
R162–N8	R209–F7	R258–E4	R309–X9
R163–P7	R210–C8	R259–E2	R310–T3
R164–07	R211–C9	R260–C2	R311–X10
R165–L11	R212–E6	R261–B2	R312–X11
R166–011	R213–G11	R262–I17	R401–N4
			R402–X8

COILS

L150–G5	L160–I4
L151–I5	L251–F3
L152–H4	L252–V2
L153–M5	L253–W4
L154–O5	L301–S8
L155–L7	L402–N3
L156–L10	
L157–J9	T151–K2
L158–O6	T154–M10
L159–N7	T301–R5

TEST POINTS

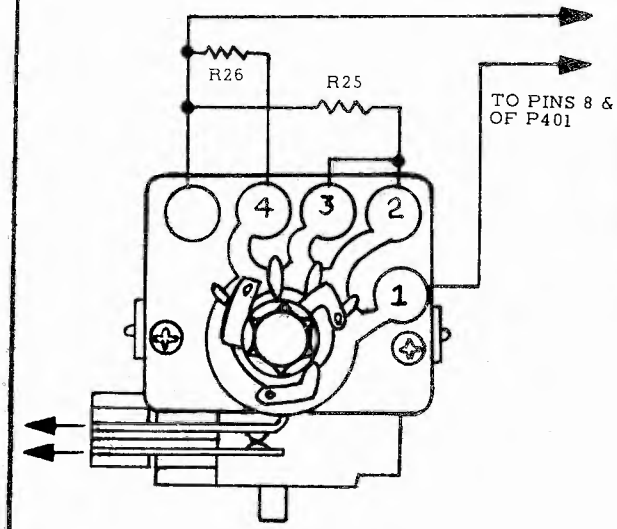
II – H2
III – M7
IV – K8
V – F10
VII – X11

MISC.

F401–P4
Y151–O5
Y401–S3
V3 - K5
V4 - O9
V5 - V9
V6 - D10
V7 - C3
V8 - V5

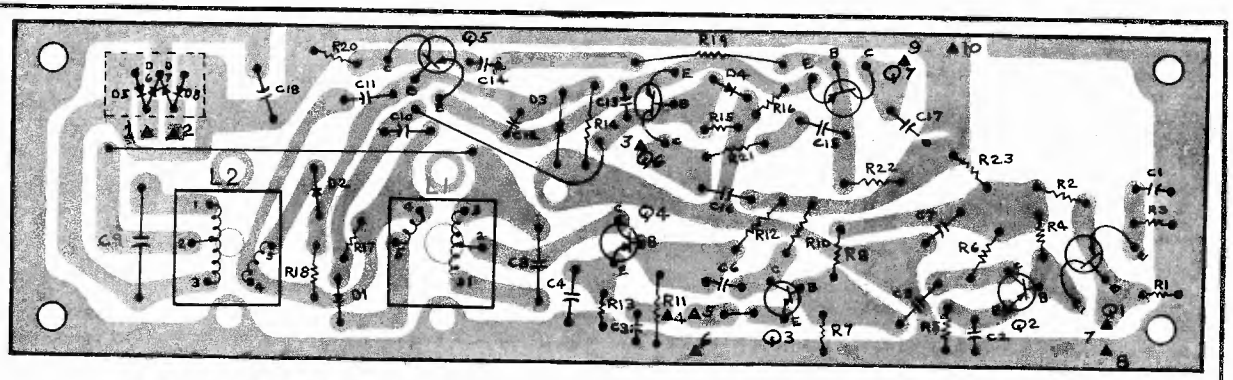
CAPACITORS

C150–H4	C169–H10	C255–D5	C305–R8
C151–H5	C170–G10	C258–E4	C306–T8
C152–H5	C173–P7	C259–E3	C307–U10
C153–H3	C175–11D	C260–D1	C308–V11
C154–J5	C201–F8	C261–A2	C309–V11
C155–L1	C202–I8	C262–B1	C310–T10
C156–L3	C203–H8	C263–B5	C311–R10
C157–3H	C204–D7	C264–01	C401–R3
C160–M2	C205–G8	C265–W3	C402–B7
C161–N5	C206–G8	C266–S2	C404–V8
C162–O4	C207–E8	C267–B4	C405–M2
C163–O6	C208–F7	C268–E2	C407–L6
C164–M9	C209–B9	C269–D2	C408–J6
C165–N11	C210–B9	C270–6V	C409–Q4
C166–J10	C211–G7	C301–P10	C410–W5
C167–J1	C251–C5	C302–Q8	
C168–G1	C252–F5	C303–Q8	
		C304–R9	



INTERCONNECTING WIRING

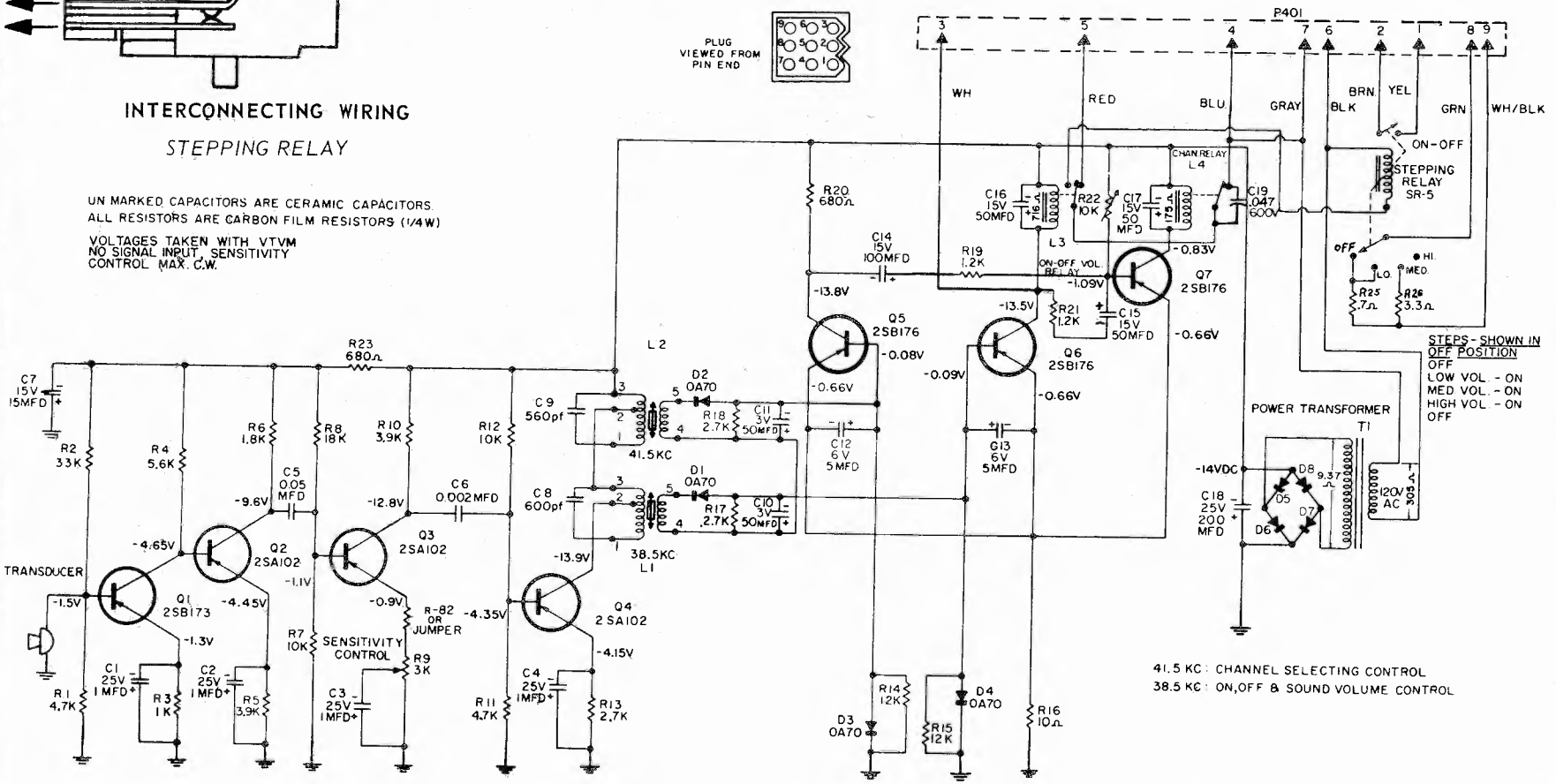
STEPPING RELAY



CIRCUIT BOARD COMPONENT VIEW

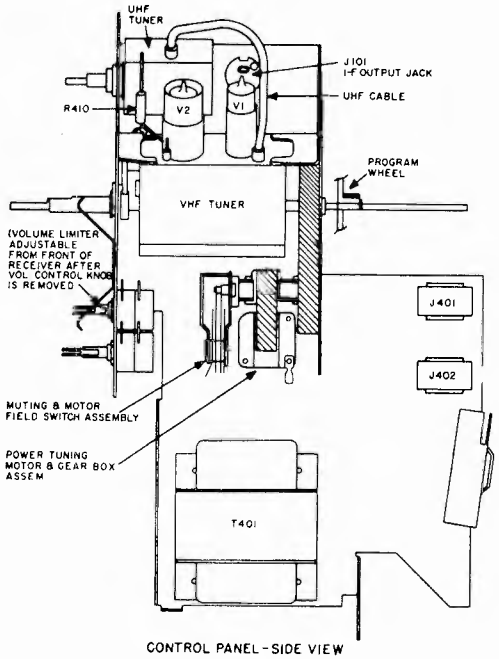
UN MARKED CAPACITORS ARE CERAMIC CAPACITORS.
ALL RESISTORS ARE CARBON FILM RESISTORS (1/4W)

VOLTAGES TAKEN WITH VTVM
NO SIGNAL INPUT, SENSITIVITY
CONTROL MAX. C.W.

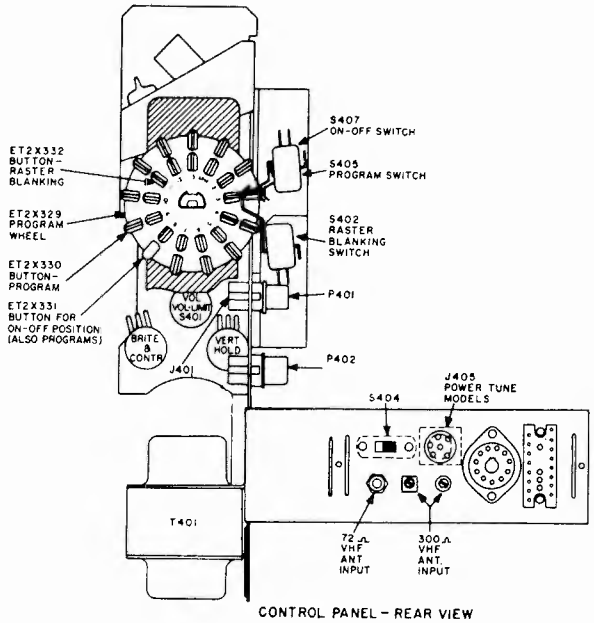


2R100 REMOTE RECEIVER SCHEMATIC DIAGRAM

TO PINS 1 & 2
OF P401

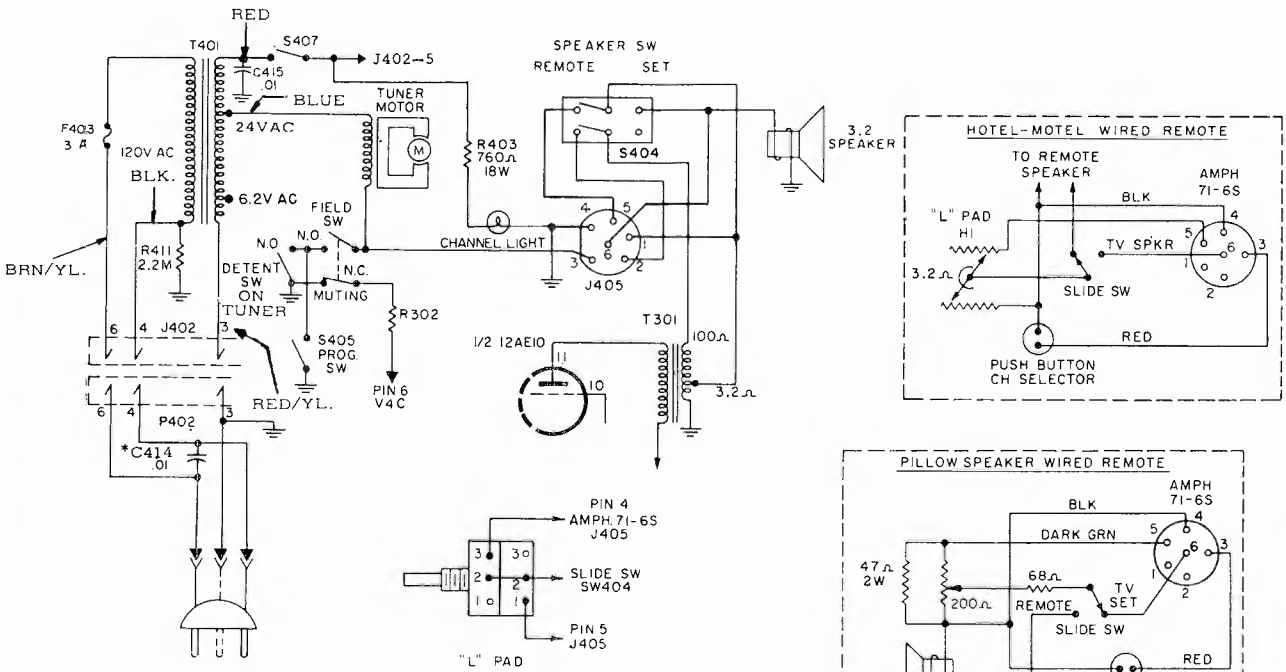


CONTROL PANEL-SIDE VIEW



CONTROL PANEL - REAR VIEW

CONTROL PANEL

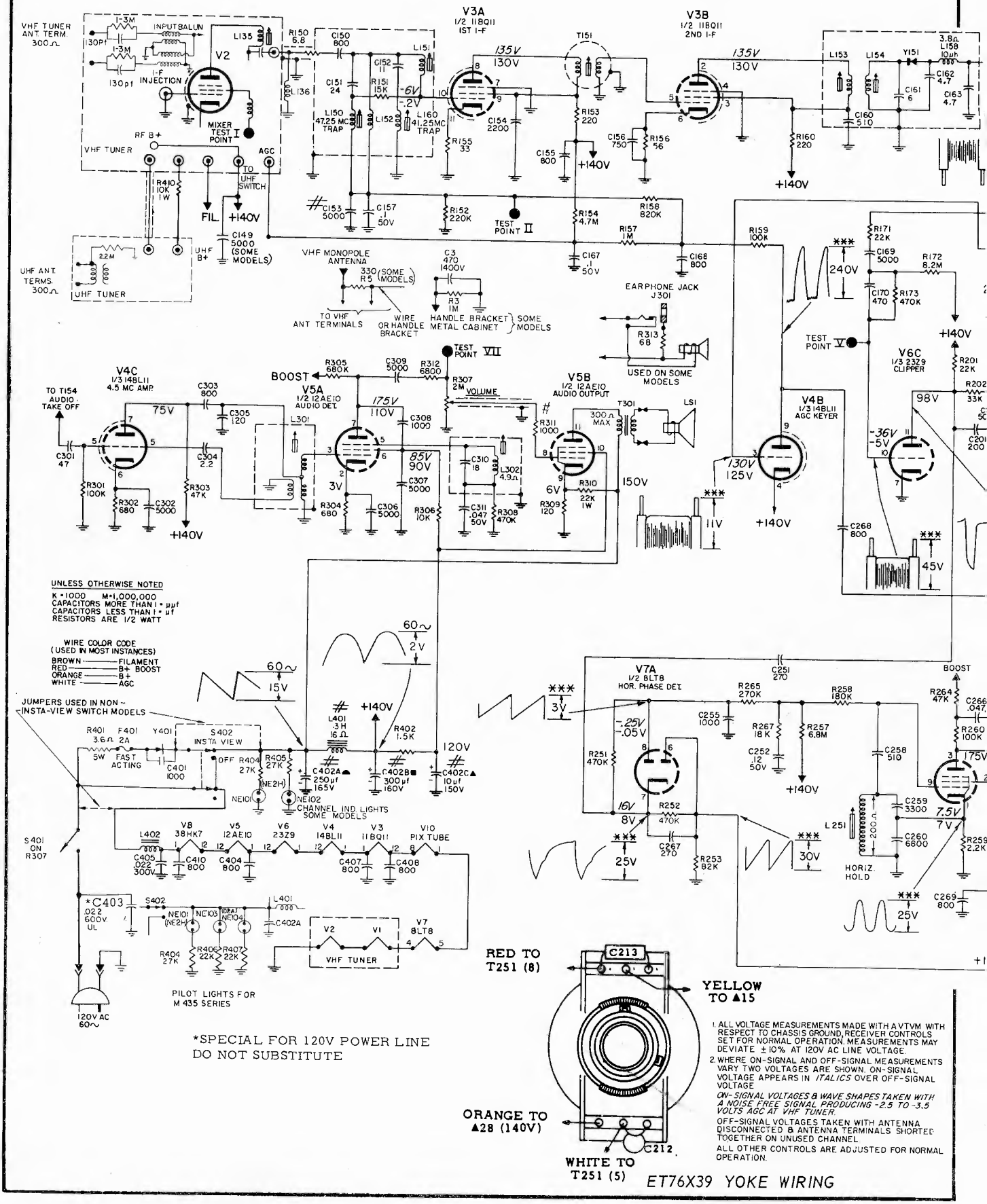


*SPECIAL FOR 120V POWER LINE
DO NOT SUBSTITUTE

NOTE FOR USE WITH 100Ω SPEAKER CONNECT DARK GREEN LEAD FROM VOLUME CONTROL TO TERMINAL #2 ON 71-6S

POWER TUNING SCHEMATIC DIAGRAM VARIATION

GENERAL ELECTRIC Chassis D1, 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.

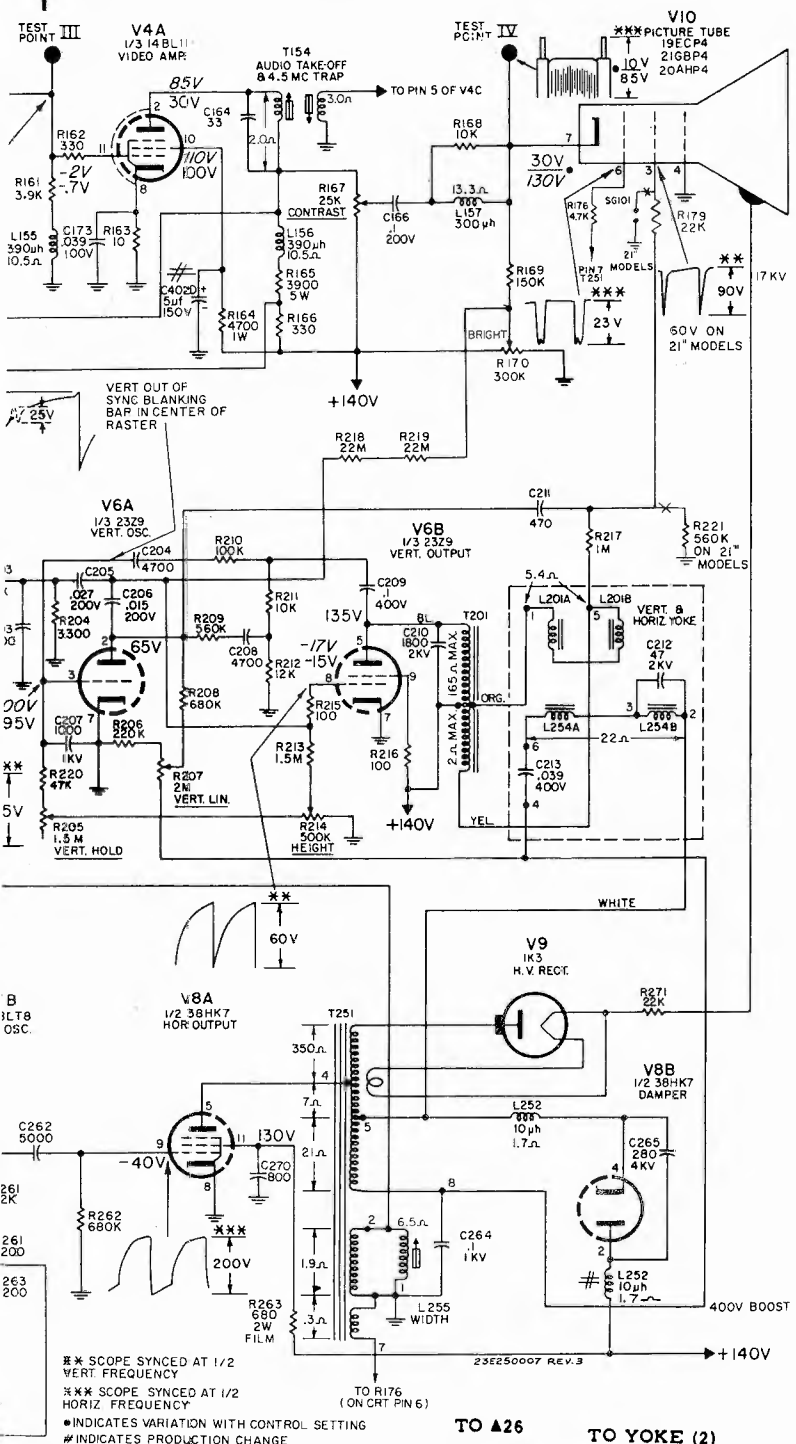
ON-SIGNAL VOLTAGES & WAVE SHAPES TAKEN WITH A NOISE FREE SIGNAL PRODUCING -2.5 TO -3.5 VOLTS AGC AT VHF TUNER.

OFF-SIGNAL VOLTAGES TAKEN WITH ANTENNA DISCONNECTED & ANTENNA TERMINALS SHORTED TOGETHER ON UNUSED CHANNEL.

ALL OTHER CONTROLS ARE ADJUSTED FOR NORMAL OPERATION.

Celebrity

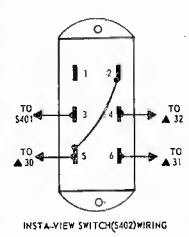
GENERAL ELECTRIC Chassis D1, Schematic Diagram, Continued

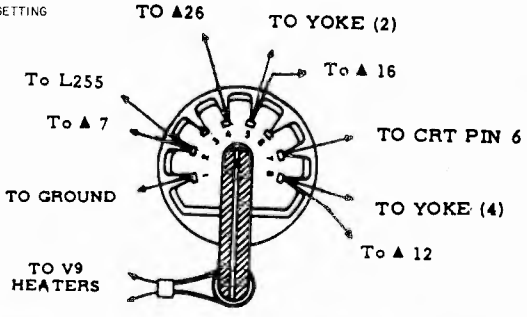


TRIANGLE (▲-O) NUMBERS

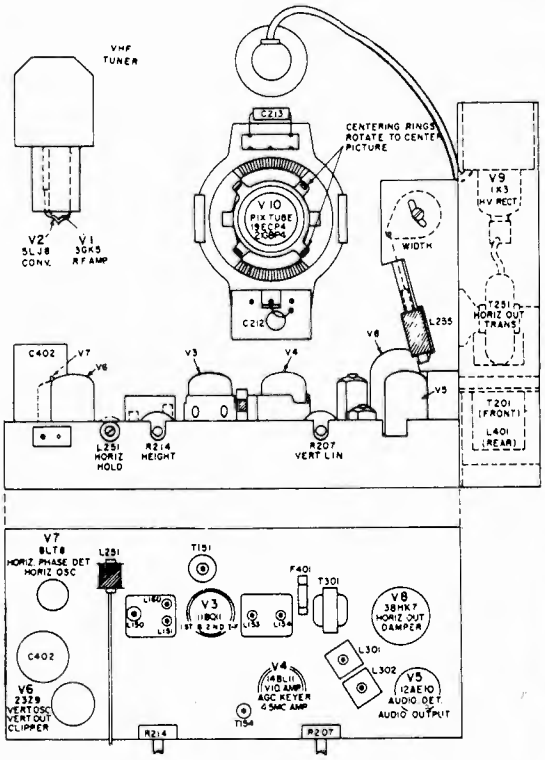
REPRESENT INTERCONNECTING WIRES ON COMPONENT BOARD FOR CONNECTION TO POINTS INDICATED.

- ▲1. I-F INPUT LEAD
- ▲2. I-F SHIELD
- ▲3. TO TUNER AGC
- ▲4. TO R167 (CONTRAST)
- ▲5. TO R167 ARM
- ▲6. TO V10, PIN 7
- ▲7. TO T251, PIN 2
- ▲8. TO R170 (BRIGHT) ARM
- ▲9. TO R205 (V. HOLD) ARM
- ▲10. TO V10, PIN 3
- ▲11. TO R205 (V HOLD)
- ▲12. TO T251, TERM. 8 & YOKE TERM. 4 (BOOST)
- ▲13. TO T201, (BLUE)
- ▲14. TO T201 (ORANGE) & L401
- ▲15. TO YOKE TERM. 5 & T201 (YELLOW)
- ▲16. TO YOKE TERM. 2 (WHITE) & T251 TERM. 5
- ▲17. TO R307 (VOLUME)
- ▲18. TO R307 ARM
- ▲19. AUDIO CABLE GROUND
- ▲20. TO SPEAKER
- ▲21. TO SPEAKER
- ▲22. TO V10 PIN 8
- ▲23. TO V10 PIN 1
- ▲24. TO TUNER FIL.
- ▲25. TO S401
- ▲26. TO T251 TERM. 4
- ▲27. YELLOW LEAD TO L401
- ▲28. ORANGE (+140V) TO VHF TUNER, R167 (CONTRAST) & YOKE TERM. 1
- ▲29. To V10, pin 4 (21" Models only)
- ▲30. TO LUG 5 of S402
- ▲31. TO LUG 6 of S402
- ▲32. TO LUG 4 of S402



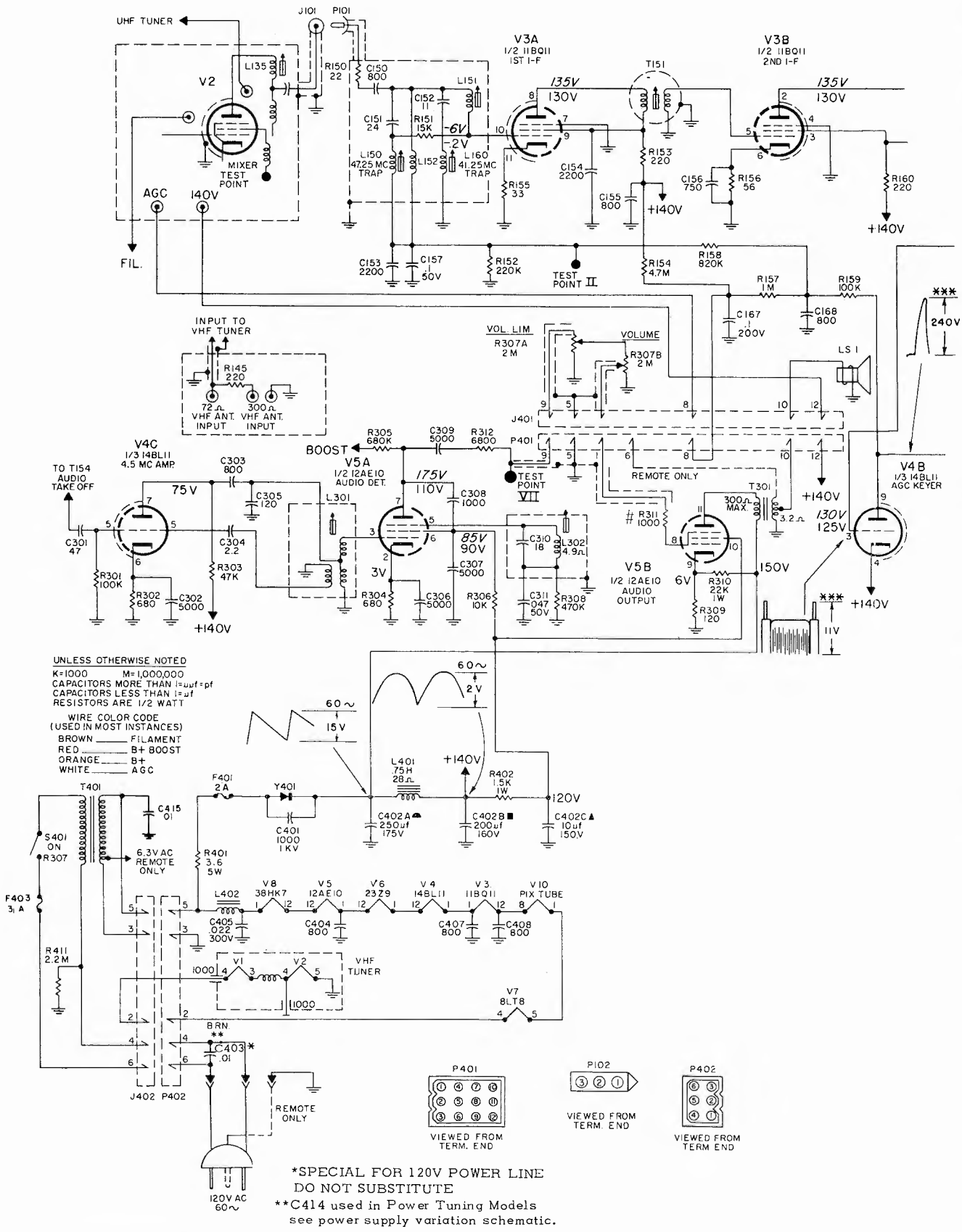


T251 WIRING



TUBE AND ADJUSTMENT LOCATIONS

GENERAL ELECTRIC Chassis D1, Schematic Diagram Variations



Some variations in Models M603/R621 as shown in partial schematic above.

Magnavox

T941 SERIES TELEVISION CHASSIS

GENERAL

The T941 series television chassis uses solid state circuitry throughout. The chassis is designed for use in portable instruments and may be powered from either a 120 VAC line or a 12 volt DC electrical system. The AC jumper plug must be connected at the rear of the chassis during AC operation. Either Battery Pack & Charger 1A9175 or Cigarette Lighter Power Cord 1A9185 may be used to provide 12 VDC to the chassis. Most components are mounted on one of four circuit boards. Component locations are indicated on the three primary circuit boards.

Chassis Identification

These chassis are identified by a label located on the chassis. The first three numbers (941) indicate the basic chassis series. The next two numbers (01) indicate the chassis version within the series. The last two letters (AA) are used to indicate production changes. When ordering parts or requesting technical assistance or information, the complete chassis designation must be supplied, e.g. T941-01-AA.

DISASSEMBLY & CRT REMOVAL INSTRUCTIONS

Disassembly Instructions

1. Remove all knobs.
2. Remove the sunshield (see instructions on bottom of cabinet).
3. Place instrument with front (CRT) down on a protective surface.
4. Remove the four cabinet back retaining screws.
5. Lift off the cabinet back and disconnect the VHF antenna switch ground lead at the chassis.
6. Disconnect the UHF & VHF tuner antenna leads at the cabinet back.
7. Remove the three cabinet retaining screws from the bottom of the instrument.
8. Lift the cabinet off of the chassis-CRT-mask assembly.

CRT Removal Instructions

1. Complete all steps under "Disassembly Instructions".
2. Discharge the CRT anode lead.
3. Remove the CRT base connector.
4. Loosen the Deflection Yoke clamp.
5. Remove the four chassis-mask retaining screws located top and bottom at the forward corners of the chassis.
6. Slide the CRT-mask assembly away from the chassis and disconnect the CRT anode lead.

ADJUSTMENTS

B+ Voltage

Adjust R813 (on Power Supply & Audio Circuit Board) to provide 12 VDC, ±0.5 volts at F8 (terminal 8 on Horizontal Output Transformer T105).

Focus

The white lead at Pin 7 of the CRT supplies focus voltage from terminal 2, 5, or 7 of Horizontal Output Transformer T105. Connect this lead to the terminal which provides the most sharply focused picture.

VHF Oscillator

If rotation of the VHF Fine Tuning Control does not provide adequate fine tuning on a given channel, the oscillator for that channel may require adjustment. Set the VHF Fine Tuning control to its mechanical center. Remove the VHF Channel Selector and Fine Tuning knobs to gain access to the oscillator slug. Adjust the slug (using a non-metallic alignment tool) to properly fine tune the channel.

Vertical Oscillator

Set the V-Hold Control to its mechanical center. Adjust V-Frequency Control (R809 on the Deflection Circuit Board) as required to stabilize the picture vertically. The picture should still go out of vertical sync as the V-Hold Control approaches either end of its travel.

Vertical Linearity and Sub-Linearity

Adjust these controls (accessible through the cabinet back) to obtain a picture of uniform vertical linearity which slightly overfills the screen at top and bottom. Adjustment of either of these controls may necessitate readjustment of the V-Hold control.

Horizontal Oscillator

Set the H-Hold Control fully CCW and set the H-Frequency Control (R810 on the Deflection Circuit Board) to its mechanical center. View the screen and adjust the Horizontal Stability Coil (L110 on the Deflection Circuit Board) until the oscillator is out of sync by a count of approximately 12-14 bars. Rotate the H-Hold Control fully CW and adjust the Horizontal Frequency Control to obtain approximately the same number of bars as noted before. Set the H-Hold Control to its mechanical center (the picture should now be in horizontal sync).

Centering

To center the picture properly, adjust the two centering rings on the rear of the deflection yoke.

Width

Remove or add jumpers as required between terminals 4-5 or between terminals 9-10 on Horizontal Output Transformer T105 to produce a picture of desired width.

Sub-Brightness

The Sub-Brightness Control (R814) is mounted on a terminal strip just above the Horizontal Output Transformer and should not normally require adjustment. If a touch-up of the control is required, e.g. when the CRT has been replaced, proceed by tuning to an unused channel. Set the Brightness control fully CW. Connect jumpers between terminals 4-5 and between terminals 9-10 on Horizontal Output Transformer T105. Adjust R814 to obtain 80 microamps, ±2 microamps of CRT cathode current as measured at terminal S17.

AGC

Tune to an unused channel. Set the AGC Level Control (R811) fully CW. NOTE: This control is vertically mounted on the IF, AGC, Video, & Sync Circuit Board and is accessible through a hole in the cabinet back which is labelled AGC. Adjust the AGC Control R812 to obtain 0.3-0.35 VDC at TP-B. NOTE: R812 is horizontally mounted on the IF, AGC, Video & Sync Circuit Board. Tune to a local station and adjust AGC Level Control R811 to produce a noise-free picture that is also free of bending or tearing. Turn R811 CCW to decrease sensitivity or CW to increase sensitivity.

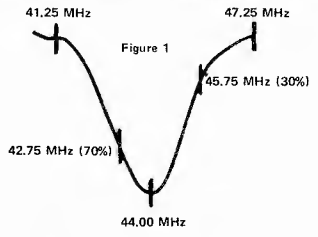
SOUND ALIGNMENT

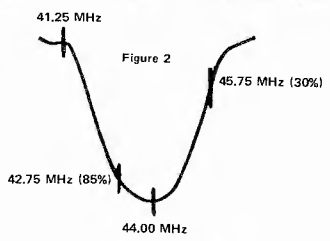
1. Tune a strong local station and adjust Fine Tuning and Contrast controls for the best picture with maximum contrast.
2. Adjust L107 (4.5 MHz Trap) for minimum sound interference in the picture.
3. Loosely couple an unmodulated 4.5 MHz signal to TP-C (Base of Q104).
4. Connect VTVM between TP-F and ground.
5. Adjust SIF-1, SIF-2, & L106 for maximum DC reading on VTVM.
6. Connect common side of VTVM to TP-E and adjust SIF-3 for a meter reading of zero (0 VDC).

VIDEO ALIGNMENT

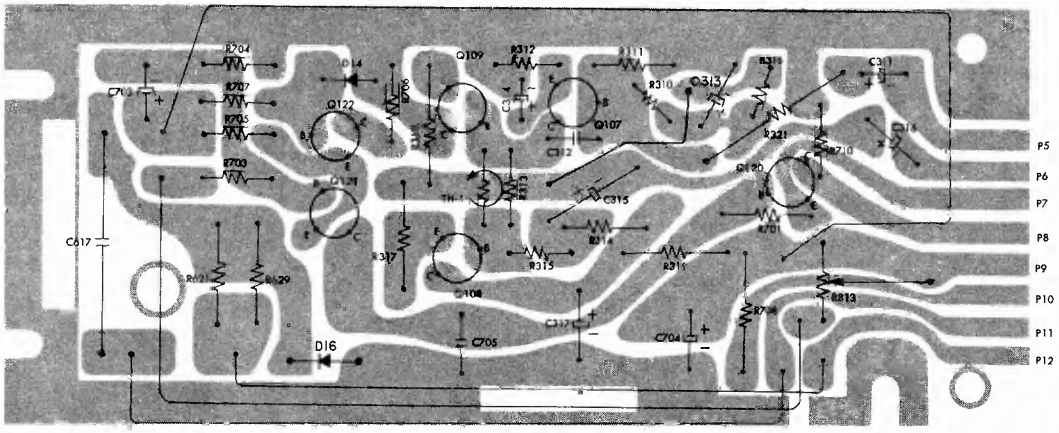
1. Connect oscilloscope to TP-C (Base of Q104) through 10K resistor.
2. Use an isolation transformer and allow approximately 20 minutes of warm-up time for the chassis and test equipment.
3. Set AGC Level Control (R811) fully CW.
4. Adjust AGC Control (R812) to obtain approximately 0.85V DC at TP-B (Emitter of Q101).
5. Adjust generator signal to obtain a 1.5V P/P response curve.

SWEEP GENERATOR CONNECTION	MARKER FREQUENCIES	GENERATOR FREQUENCY	ADJUSTMENTS AND REMARKS
S15 (on IF,AGC, Video, & Sync Circuit Board.	41.25 MHz 42.75 MHz 44.00 MHz 45.75 MHz 47.25 MHz	44 MHz 10 MHz Sweep	Adjust L102 (47.25 MHz) & L103 (41.25 MHz) to center markers in trap suckout (see Figure 1). Adjust PIF-1,PIF-2, PIF-3, & PIF-4 for maximum gain at 44 MHz while maintaining the 42.75 MHz & 45.75 MHz markers within the limits specified in Figure 1. Repeat all steps to obtain curve similar to Figure 1.
VHF Antenna Terminals	41.25 MHz 42.75 MHz 44.00 MHz 45.75 MHz	High Unused VHF Channel	Set VHF Fine Tuning to place 45.75 MHz (Picture) marker at 30%. Adjust T2 (VHF Tuner Mixer Collector Coil) & PIF-1 to obtain curve similar to Figure 2.
Make AGC adjustments as described in "Adjustments" section and check operation on all channels.			

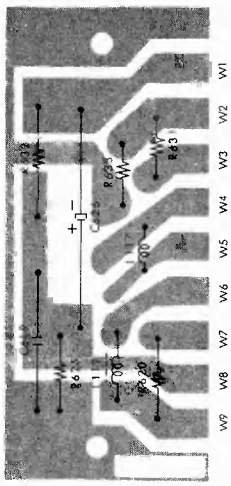




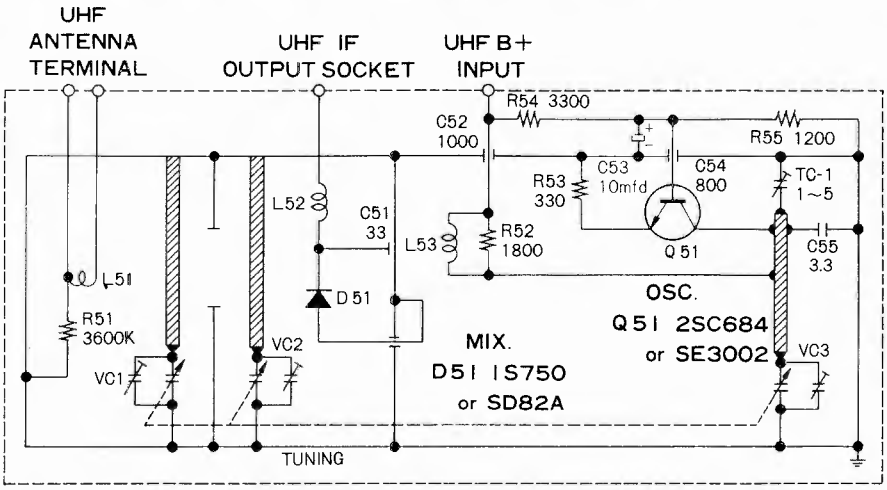
POWER SUPPLY & AUDIO CIRCUIT BOARD LAYOUT (VIEWED FROM COPPER SIDE)



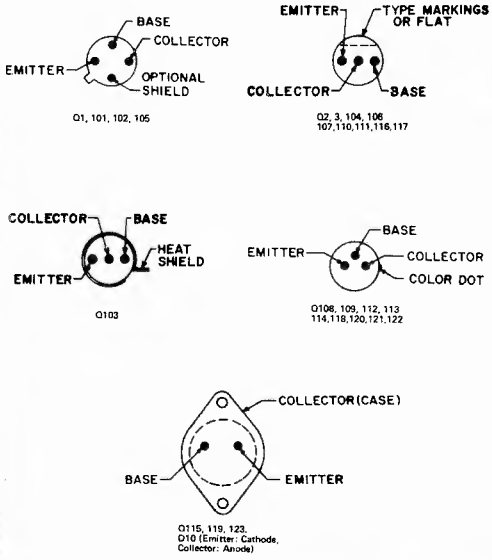
AUXILIARY CIRCUIT BOARD LAYOUT (VIEWED FROM COPPER SIDE)



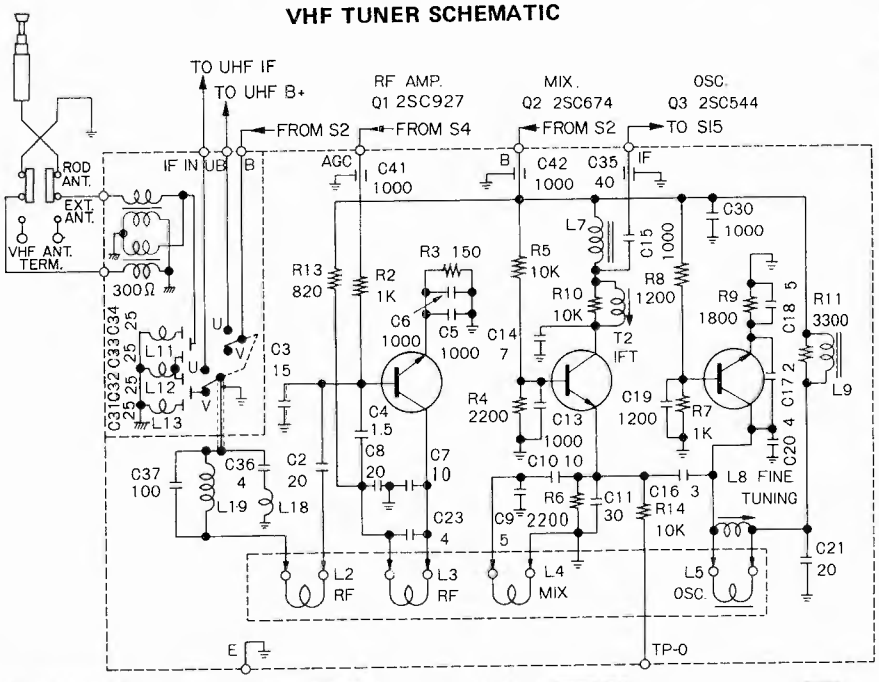
UHF TUNER SCHEMATIC



TRANSISTOR BASING DIAGRAMS (BOTTOM VIEW)

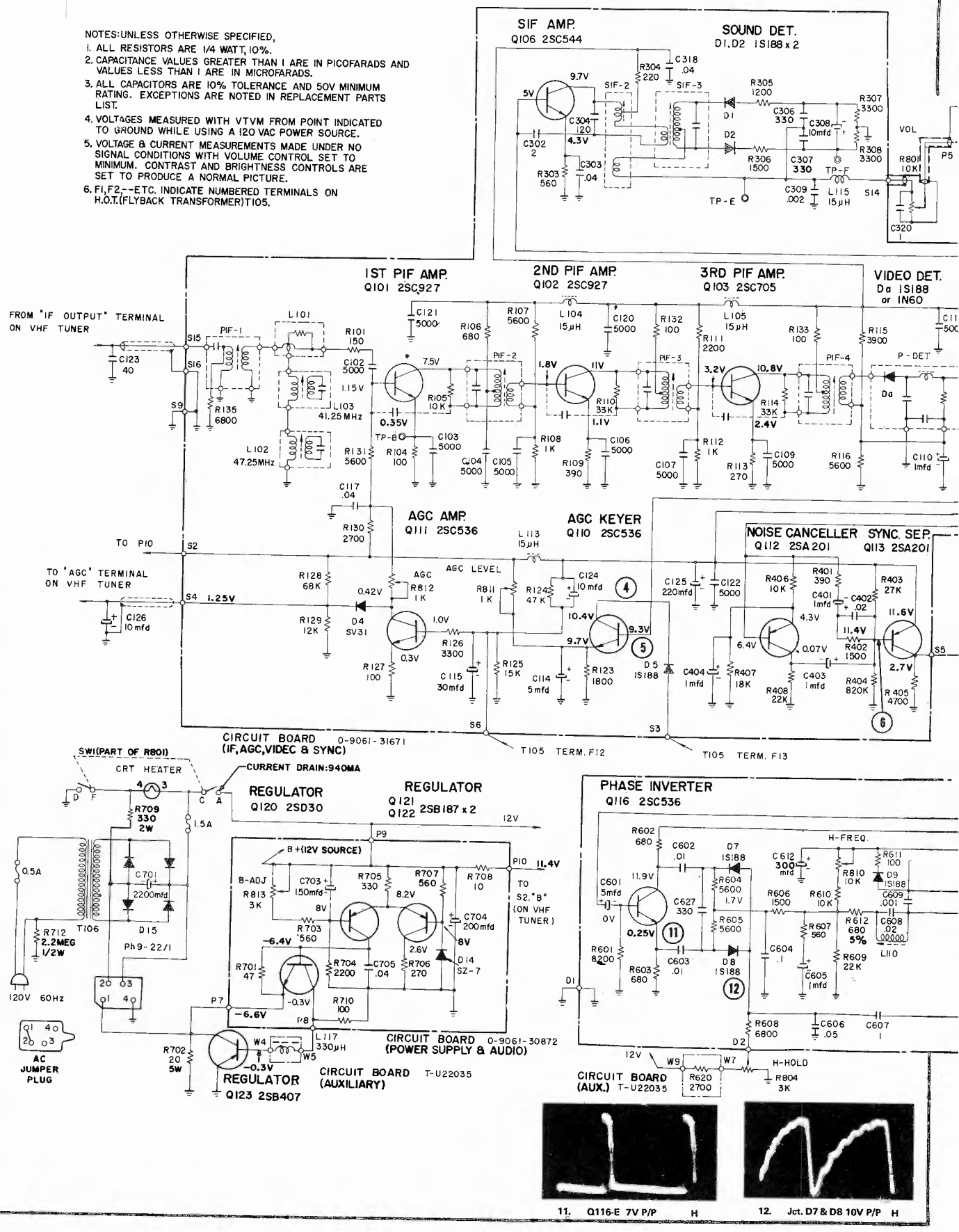


VHF TUNER SCHEMATIC



MAGNAVOX Chassis T941 Schematic Diagram

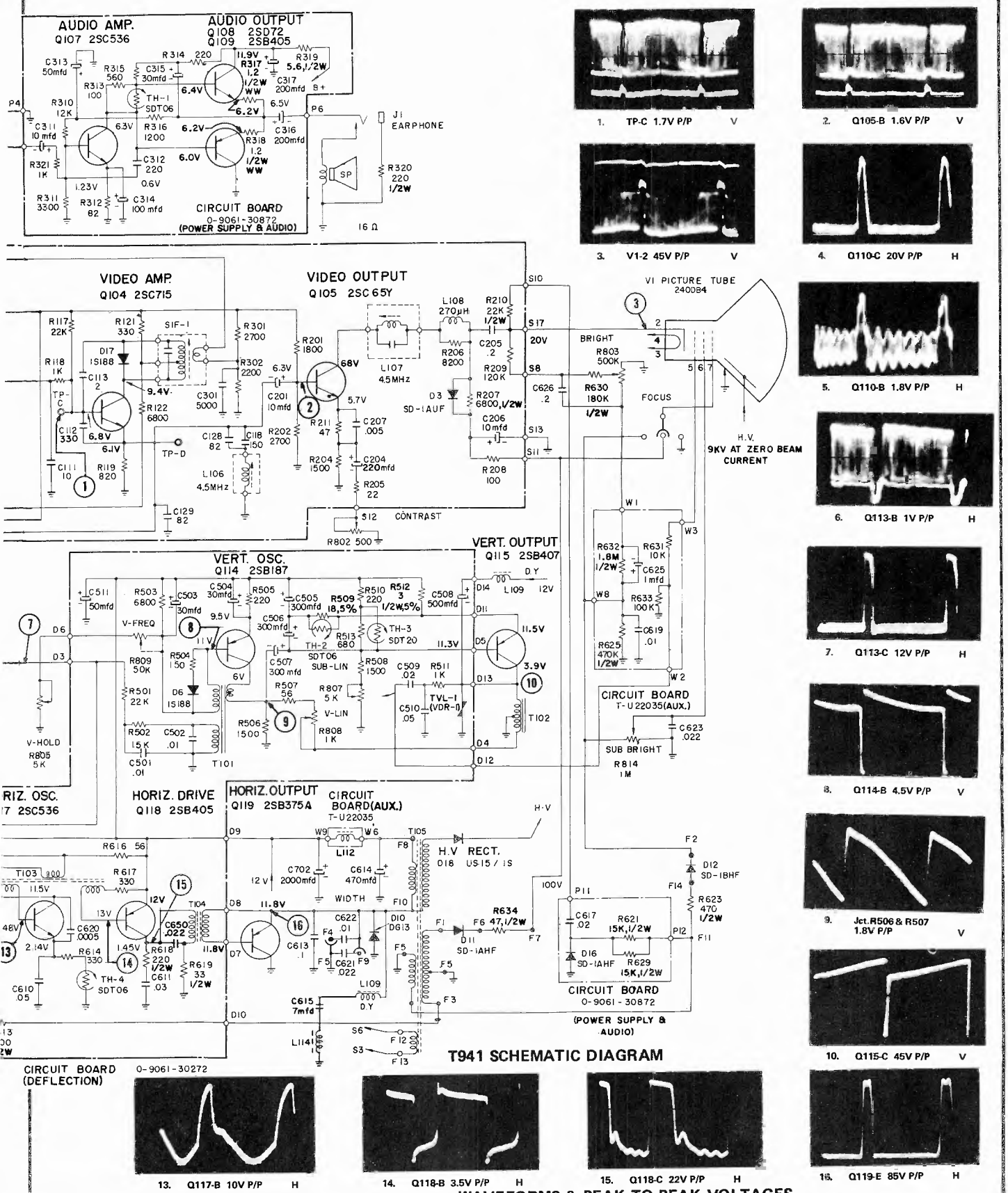
NOTES: UNLESS OTHERWISE SPECIFIED,
1. ALL RESISTORS ARE 1/4 WATT, 10%.
2. CAPACITANCE VALUES GREATER THAN 1 ARE IN PICOFARADS AND VALUES LESS THAN 1 ARE IN MICROFARADS.
3. ALL CAPACITORS ARE 10% TOLERANCE AND 50V MINIMUM RATING. EXCEPTIONS ARE NOTED IN REPLACEMENT PARTS LIST.
4. VOLTAGES MEASURED WITH VTVM FROM POINT INDICATED TO GROUND WHILE USING A 120 VAC POWER SOURCE.
5. VOLTAGE & CURRENT MEASUREMENTS MADE UNDER NO SIGNAL CONDITIONS WITH VOLUME CONTROL SET TO MINIMUM. CONTRAST AND BRIGHTNESS CONTROLS ARE SET TO PRODUCE A NORMAL PICTURE.
6. F1, F2, --ETC. INDICATE NUMBERED TERMINALS ON H.O.T. (FLYBACK TRANSFORMER) T105.



11. Q116-E 7V P/P H

12. Jct. D7 & D8 10V P/P H

MAGNAVOX Chassis T941 Schematic Diagram, Continued



1. TP-C 1.7V P/P V

2. Q105-B 1.6V P/P V

3. V1-2 45V P/P V

4. Q110-C 20V P/P H

5. Q110-B 1.8V P/P H

6. Q113-B 1V P/P H

7. Q113-C 12V P/P H

8. Q114-B 4.5V P/P V

9. Jct.R506 & R507 1.8V P/P V

10. Q115-C 45V P/P V

13. Q117-B 10V P/P H

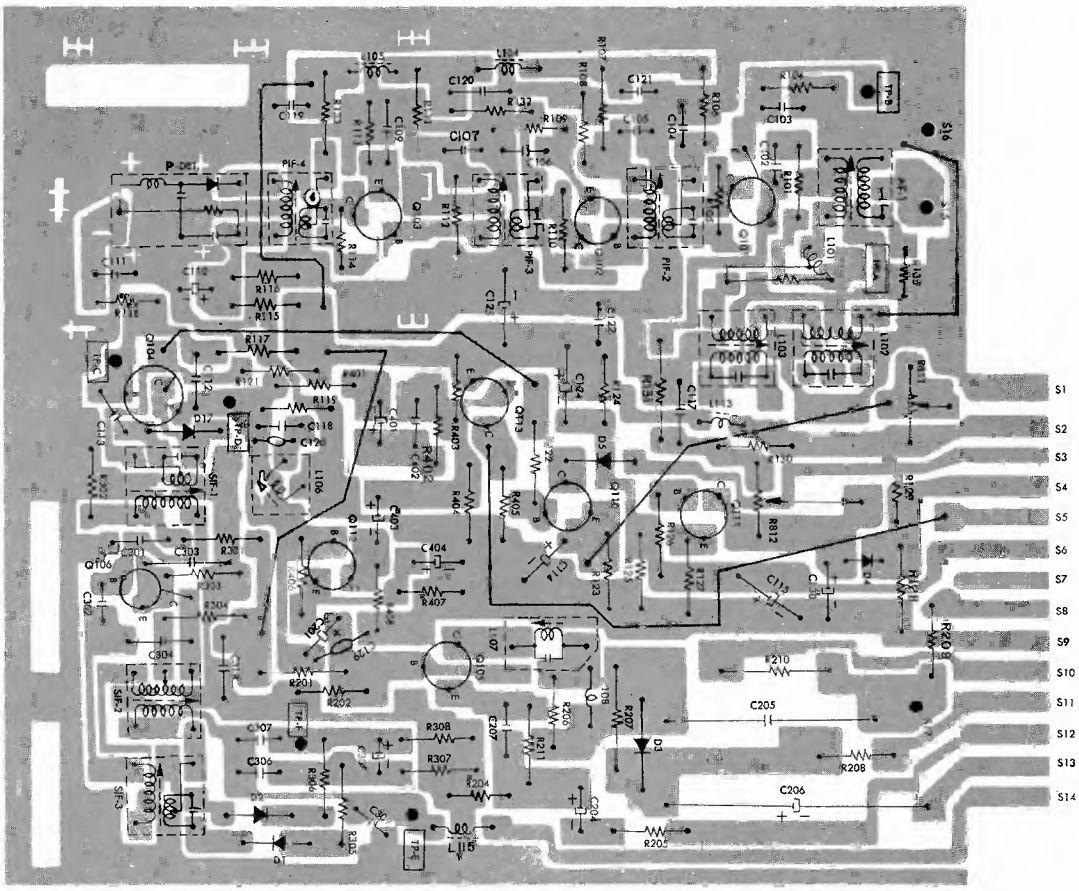
14. Q118-B 3.5V P/P H

15. Q118-C 22V P/P H

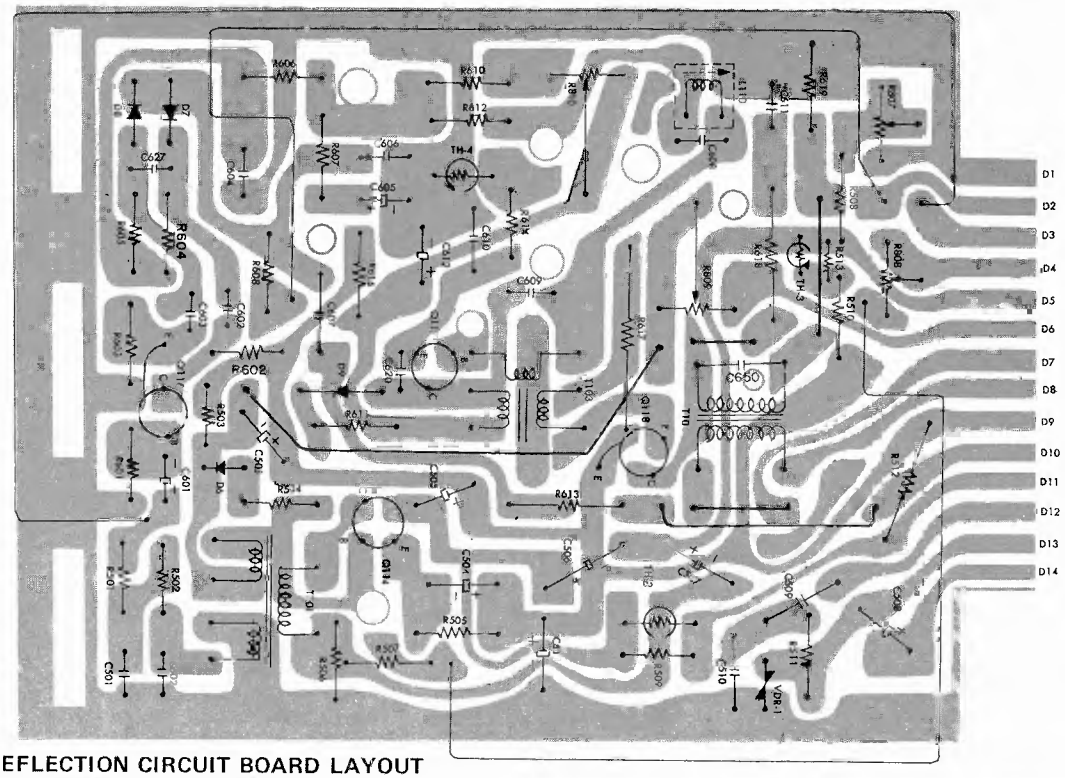
16. Q119-E 85V P/P H

WAVEFORMS & PEAK TO PEAK VOLTAGES

Waveforms measured with signal, controls set for normal operation and 45V P/P signal at CRT cathode.



IF,AGC,VIDEO, & SYNC CIRCUIT BOARD LAYOUT
(VIEWED FROM COPPER SIDE)



DEFLECTION CIRCUIT BOARD LAYOUT
(VIEWED FROM COPPER SIDE)

VIDEO IF ALIGNMENT

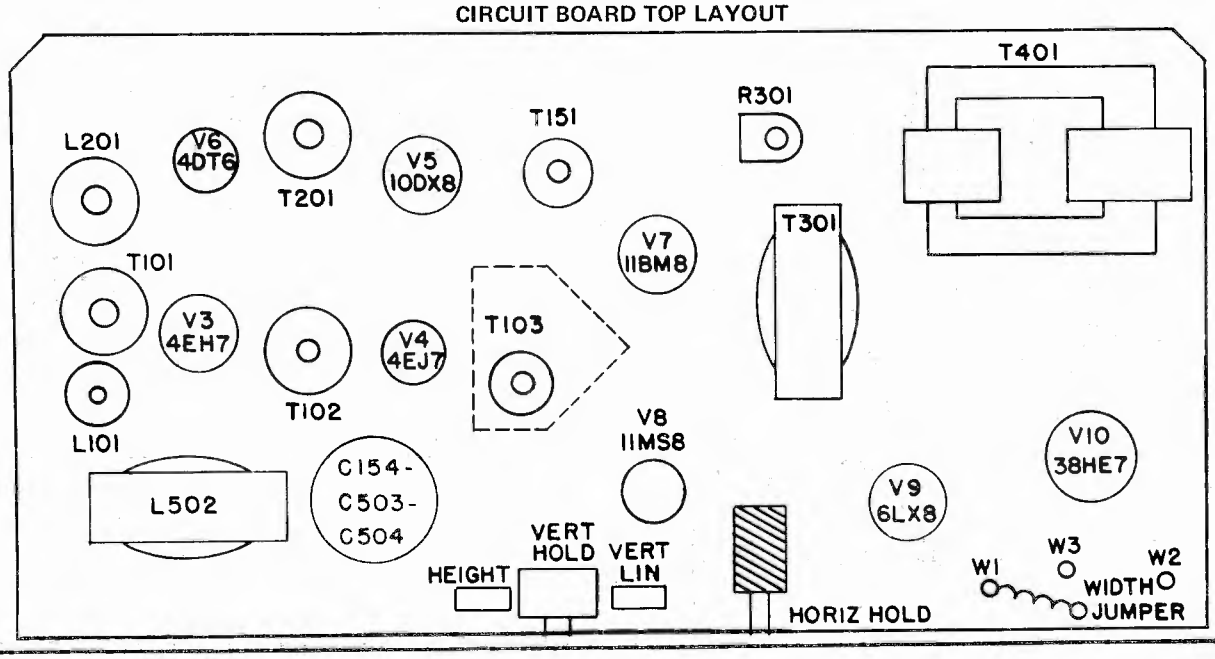
1. Use an isolation transformer and allow 20-30 minutes of warm-up time for TV and test equipment.
2. Use a low impedance bias supply and apply -4V DC to TP1.
3. Connect scope through a 10K isolation resistor to TP3 and use only enough generator signal to obtain a 3V P/P curve.

SWEEP GENERATOR CONNECTION	MARKER FREQUENCIES	GENERATOR FREQUENCY	ADJUSTMENTS AND REMARKS
TP2	42.75MC 45MC 45.75MC	44MC 10MC Sweep	T103 Top & Bottom. Adjust bottom slug to shift marker positions and then adjust top slug to shape curve to match Figure 1. Proper setting is obtained with slugs farthest apart.
Tuner Mixer Grid Test Point	47.25MC 45.75MC 45.00MC 44.00MC 42.67MC 39.75MC	44MC 10MC Sweep	Set tuner to an unused channel. Adjust L101 to position curve at 47.25 marker or use a modulated 47.25 signal and adjust for minimum output. Peak T102, T101, and the mixer plate coil at 44MC. Then alternately adjust T101 and T102 until curve is shaped as shown in Figure 2. Retouch Mixer Plate Coil as necessary. T101 has the greatest affect above 44MC, T102 below 44MC, and the Mixer Plate Coil between 43 and 45MC.

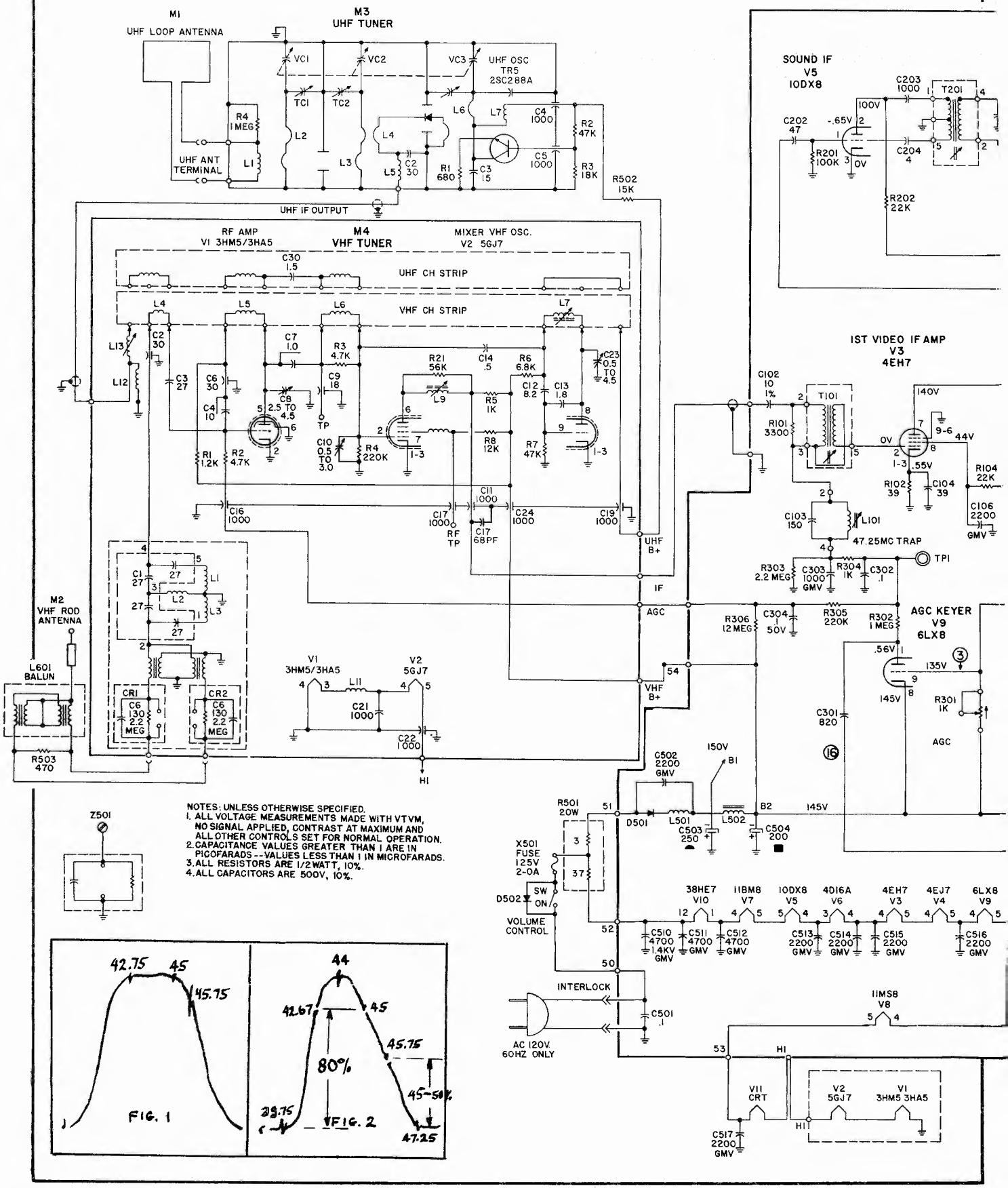
SOUND ALIGNMENT

1. Turn the Quadrature Coil (L201) to minimum inductance (core out).
2. Tune the receiver to a strong local station (preferably a tone signal or music). Adjust the Quadrature Coil (L201) just past the point of maximum sound with minimum distortion.
3. Reduce the signal level by removing an antenna lead (or placing an adjustable pad across the antenna terminals) so that with the Volume Control at near maximum, the sound level is low. Tune the Fine Tuning Control through undistorted sound, leaving it set on the verge of distortion.
4. Adjust T201, T151 (Top) and T151 (Bottom) for minimum distortion.
5. Readjust Fine Tuning as necessary to maintain the conditions described in Step 3 while adjusting T201 and T151.

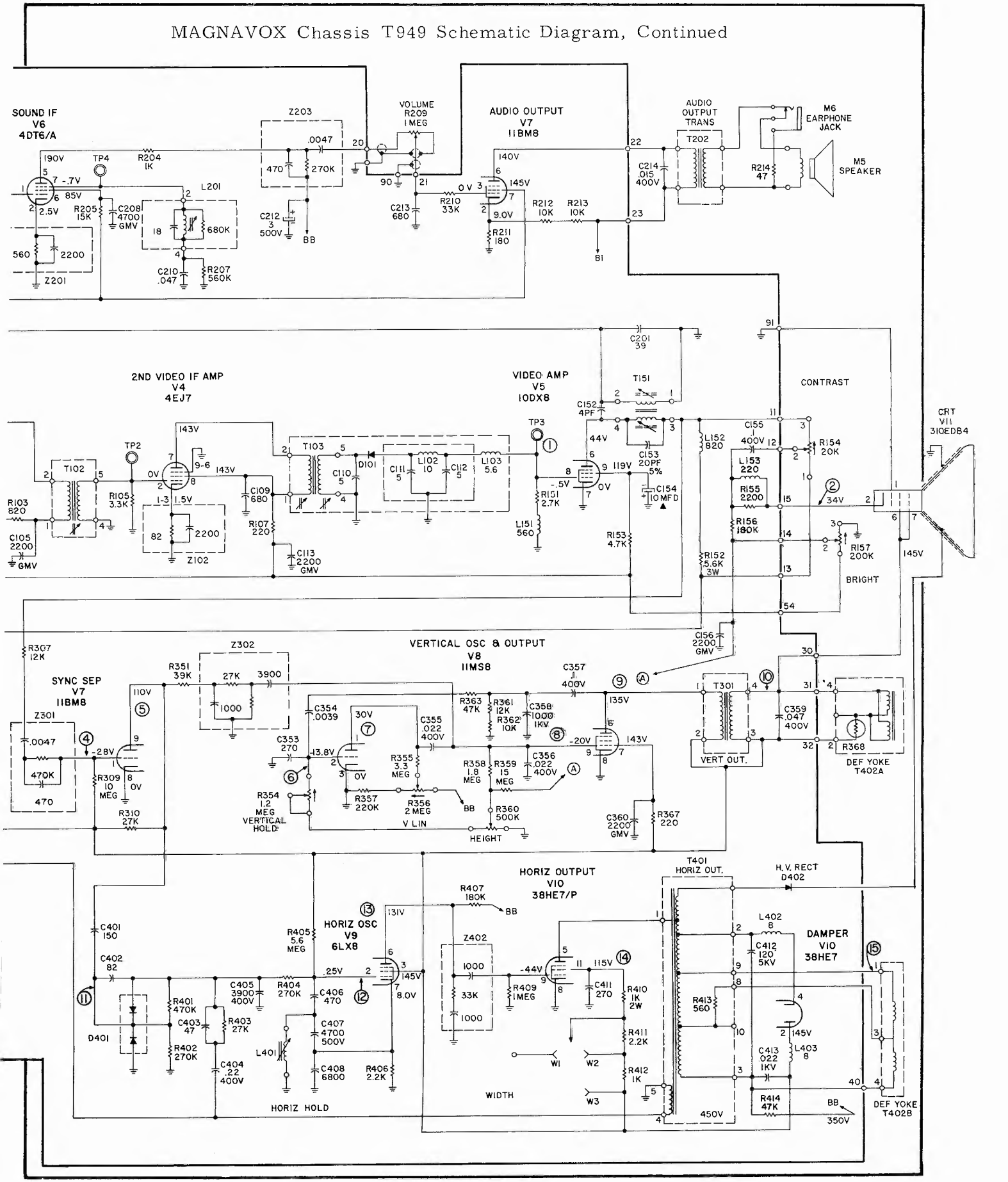
CIRCUIT BOARD TOP LAYOUT



MAGNAVOX Chassis T949 Schematic Diagram



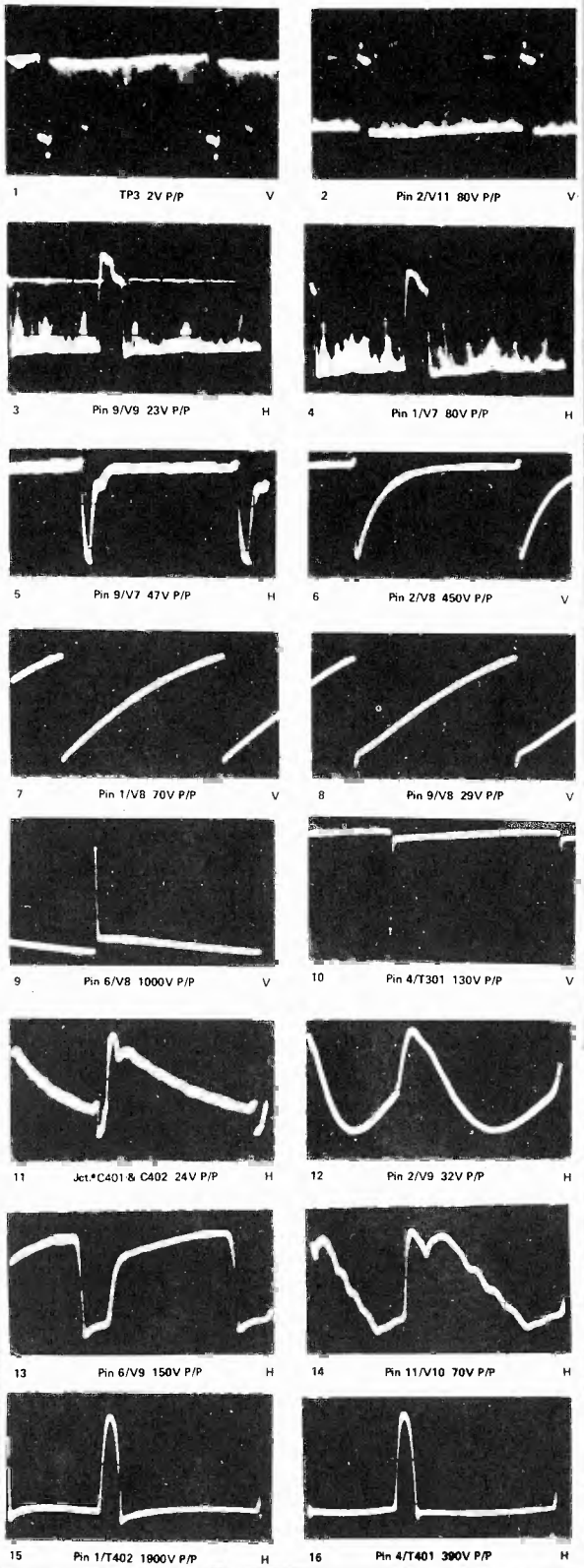
MAGNAVOX Chassis T949 Schematic Diagram, Continued



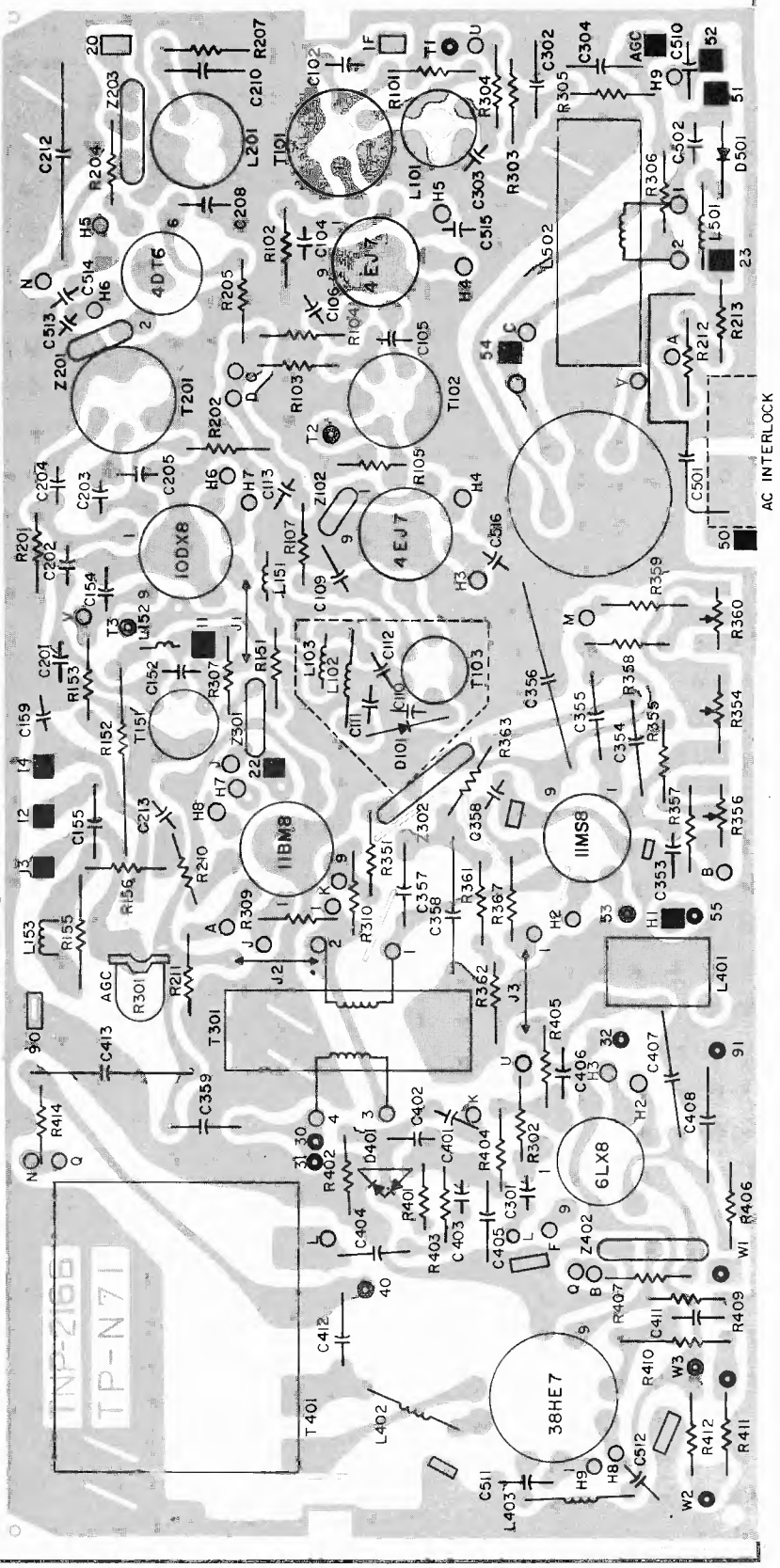
WAVEFORMS

Waveforms measured with signal, controls set for normal operation, and 5.5 VDC at TP1.

V=Vertical Sweep Rate H=Horizontal Sweep Rate



CIRCUIT BOARD LAYOUT (VIEWED FROM COPPER SIDE)



MODELS GCI-14829B, GHJ-14829A, GCI-14849B, GHJ-14849A, B, GCI-14859C, and GHJ-14859A, B

CHASSIS REMOVAL

1. Detach cabinet back. Pull off front panel control knobs.
2. Disconnect external antenna lead-in wires from antenna board. Detach antenna terminal board.
3. Disconnect yoke plug from receptacle located on side of high voltage compartment. Observe orientation of yoke plug with respect to chassis for proper reinsertion of plug.
4. Disconnect high voltage lead from picture tube. Discharge circuit by grounding lead to chassis. Similarly, discharge anode well connection on picture tube by using insulated wire lead or screwdriver shorted to chassis.
5. Disconnect picture tube socket, audio output clip leads from Left Speaker, and ground lead from picture tube mounting frame.
6. Remove six 5/16 inch hex head screws securing chassis to cabinet bottom.
7. Remove tuner assembly from front panel by removing the spanner nuts from the Vertical Hold and Volume shafts (Figure 2) and the hex nut from the top of tuner mounting bracket. (To remove spanner nuts use Standard Equipment Item No. 21547 or equivalent.)
8. Remove tuner and chassis from rear of cabinet.

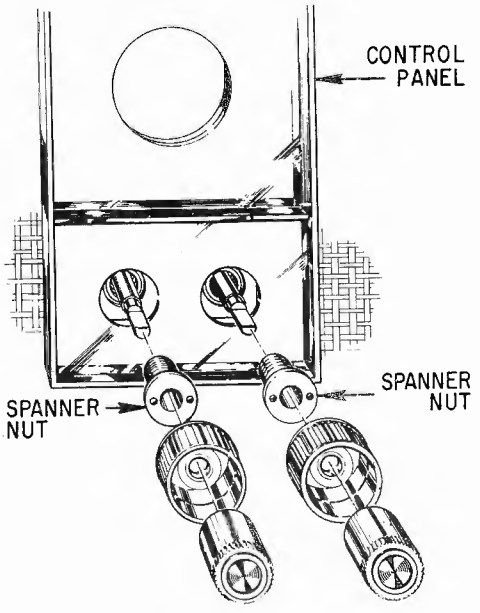


Figure 2. — Spanner Nut Removal

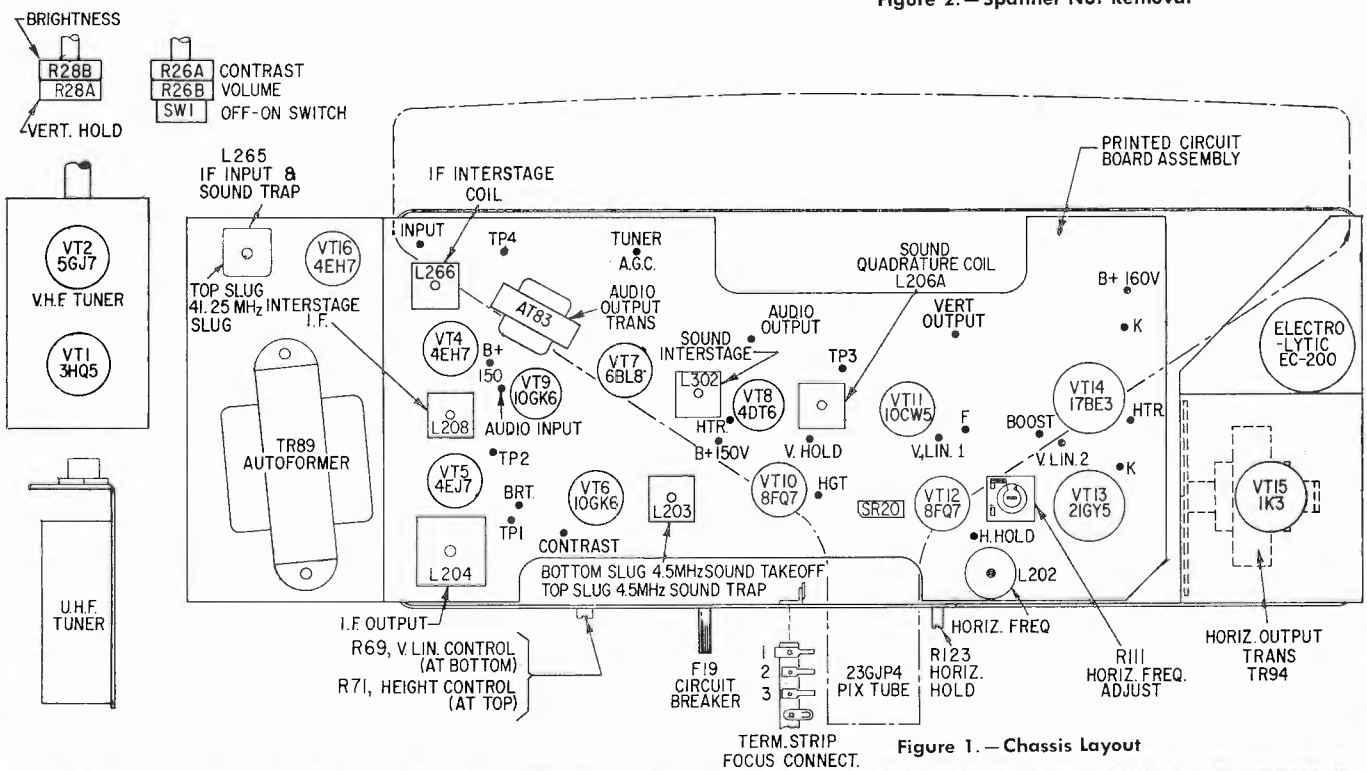


Figure 1. — Chassis Layout

CIRCUIT BREAKER

This receiver is equipped with a re-setable type circuit breaker. If any abnormal condition causes the receiver to be inoperative, it will be necessary to re-set the circuit breaker. The reset button is located on the lower rear of the receiver. To re-set, momentarily depress the red button. Frequent resetting indicates an overload condition in the receiver which must be corrected to prevent circuitry damage.

C.R.T. REMOVAL AND REPLACEMENT

Following the removal of the chassis, tilt the instrument forward and carefully set it face down on a rolled pad or suitable cushion.

1. Remove chassis following procedure outlines under "Chassis Removal."
2. Remove yoke retainer clamp, deflection yoke and width device from neck of tube.
3. Remove six hex head screws securing picture tube mounting pan to cabinet. (2 inside, 4 underside.)
4. Carefully lift picture tube and mounting pan out of cabinet.
5. Remove tube harness and sponge rubber insulating material.
6. Reassemble new tube in harness and pan.

CAUTION: A high voltage shock hazard exists if all insulating material is not placed in the original position. Check with an ohmmeter to insure that no short exists between chassis ground and picture tube frame.

7. Replace the tube in cabinet and remount deflection yoke, yoke retainer clamp and width device and make all necessary connections to insure proper operation of receiver.

ALIGNMENT INSTRUCTIONS

SOUND ALIGNMENT

1. Connect Sweep Generator set at 4.5 MHz center frequency ±7.5 KHz deviation to TP1 shown on schematic.
2. Connect Oscilloscope across voice coil of speaker.
3. Connect VTVM to TP3. Set meter to read at least −5 V.D.C.
4. Adjust Sweep Generator for approximately 200 millivolts output and set Volume control of receiver for an audible level.
5. Adjust L206A, quadrature coil, for maximum audio output on the Oscilloscope. During this adjustment two peaks may occur. It is important to select the peak which gives the maximum voltage. The VTVM will normally measure approximately −2.5 V.D.C.
6. Reduce the 4.5 MHz signal level from 200 millivolts to a point where the audio output pattern on the Oscilloscope starts to break up.
7. Adjust L203 (bottom core), sound take-off coil, and L302 (top and bottom core), interstage transformer, for cleanest maximum audio output on the Oscilloscope.
8. Further reduce the 4.5 MHz signal level until the audio output pattern breaks up again and reset L203 (bottom core) and L302 (top and bottom core) for cleanest maximum output. Final adjustment of these two coils should be made at a minimum signal level at which undistorted audio output is just obtainable.

ALTERNATE SOUND ALIGNMENT

1. Tune in a strong local station.
2. Connect Output Meter across voice coil of speaker.
3. Connect VTVM to TP3 shown on schematic.
4. Adjust L206A, quadrature coil, for maximum audio output. During this adjustment two peaks may occur. It is important to select the peak which gives the maximum voltage. The VTVM will normally measure approximately −2.5 V.D.C.
5. Reduce the signal strength by disconnecting antenna and/or detuning Fine Tuning control until audio distortion occurs.
6. Adjust L203 (bottom core), sound take-off coil, and L-302 (top and bottom core), interstage transformer, for maximum undistorted audio output.
7. Further reduce the signal strength and reset L203 (bottom core) and L302 (top and bottom core) for maximum undistorted audio output. Final adjustment of these two coils should be made at minimum signal strength or when undistorted audio output is just obtainable.
8. It may be advisable in some cases to repeat above procedure to make certain that the alignment is accurate.

4.5 MHz SOUND TRAP ALIGNMENT

1. Connect a Signal Generator (4.5 MHz, unmodulated) to TP1. Connect ground lead of generator cable to chassis.
2. Connect VTVM RF probe to TP2.
   Note: A diode detector, shown in Figure 6, may be used with the VTVM in place of a commercial RF probe.
3. Adjust L203 (top core), 4.5 MHz sound trap coil, for minimum reading.

VIDEO I.F. SWEEP ALIGNMENT

1. Connect the sweep voltage from the Sweep Generator to the horizontal input of the Oscilloscope.
2. Connect vertical input of Oscilloscope in series with a 47,000 ohm isolation resistor to TP1; connect ground lead to chassis.

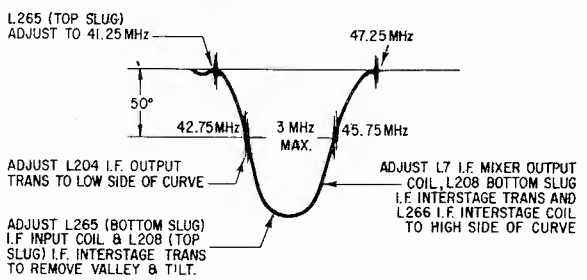


Figure 3.—Video I.F. Phase Pattern

3. Connect R.F. sweep signal (and marker if built into Sweep Generator) in series with a terminating network (See Figure 5) to the R.F. Test Point on the VHF tuner (See Figure 9).
4. Loosely couple Marker Generator to Sweep Generator cable for markers.
5. Connect the negative side of a 3.0 volt bias supply to TP4; connect positive side to chassis.
6. Connect VTVM to TP4, to check bias voltage.
7. Set the VHF Channel Selector to any unassigned channel and set the output of the Sweep Generator to 40–50 MHz, I.F.
8. Set Marker Generator to 41.25 MHz and adjust L265 (top core) for minimum gain of 41.25 MHz marker. (See Figure 3).
9. Set Marker Generator to 42.75 MHz and adjust L204; 44.00 MHz and adjust L208 (top core) and L265 (bottom core); 45.75 MHz and adjust L7, L208 (bottom core) and L266; for maximum gain and symmetry of response curve with markers as shown in Figure 3.
10. Disconnect R.F. sweep signal from the R.F. Test Point on tuner and connect to the VHF tuner antenna terminals.
11. Check I.F./R.F. response within limits shown in Figure 8A.
12. Reset L7 I.F. output coil and L265 (bottom core) I.F. input coil to center response curve at approximately 44.50 MHz.

MATCHING PADS AND TEST BLOCKS

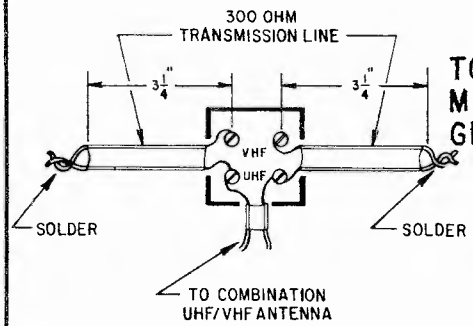


Figure 4.—UHF/VHF Antenna

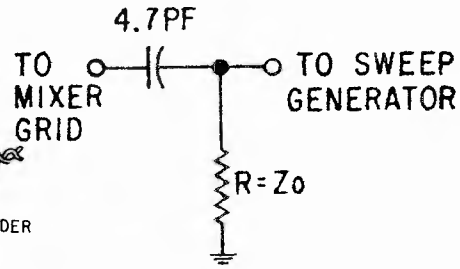


Figure 5.—Terminating Network

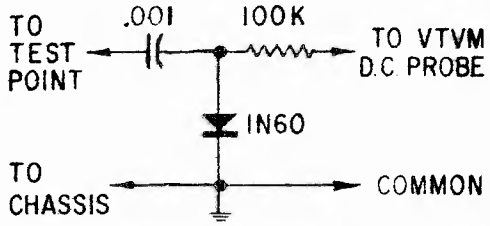


Figure 6.—Diode Detector

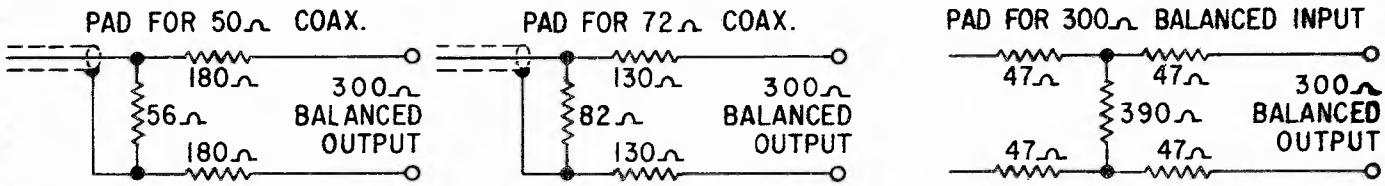


Figure 7.—Sweep Attenuator Matching Pads

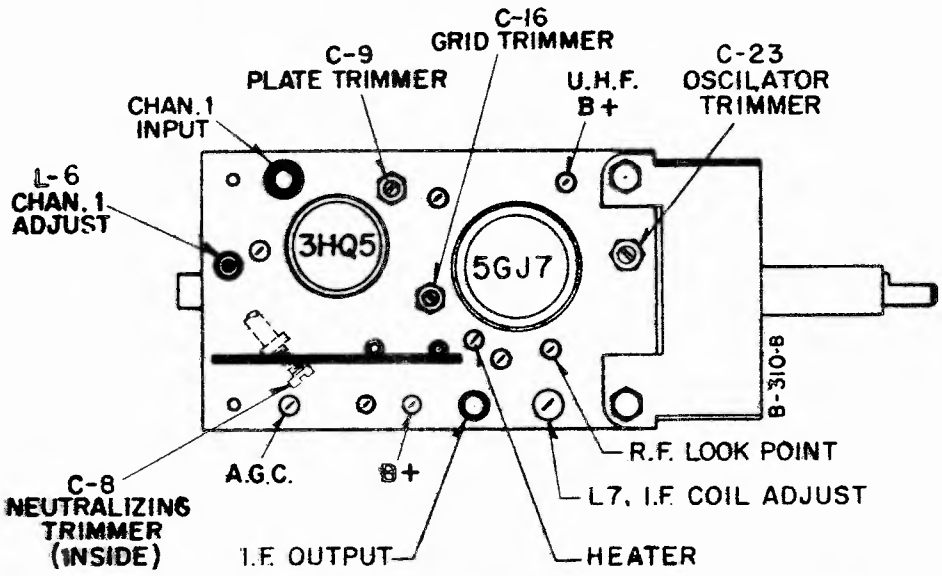
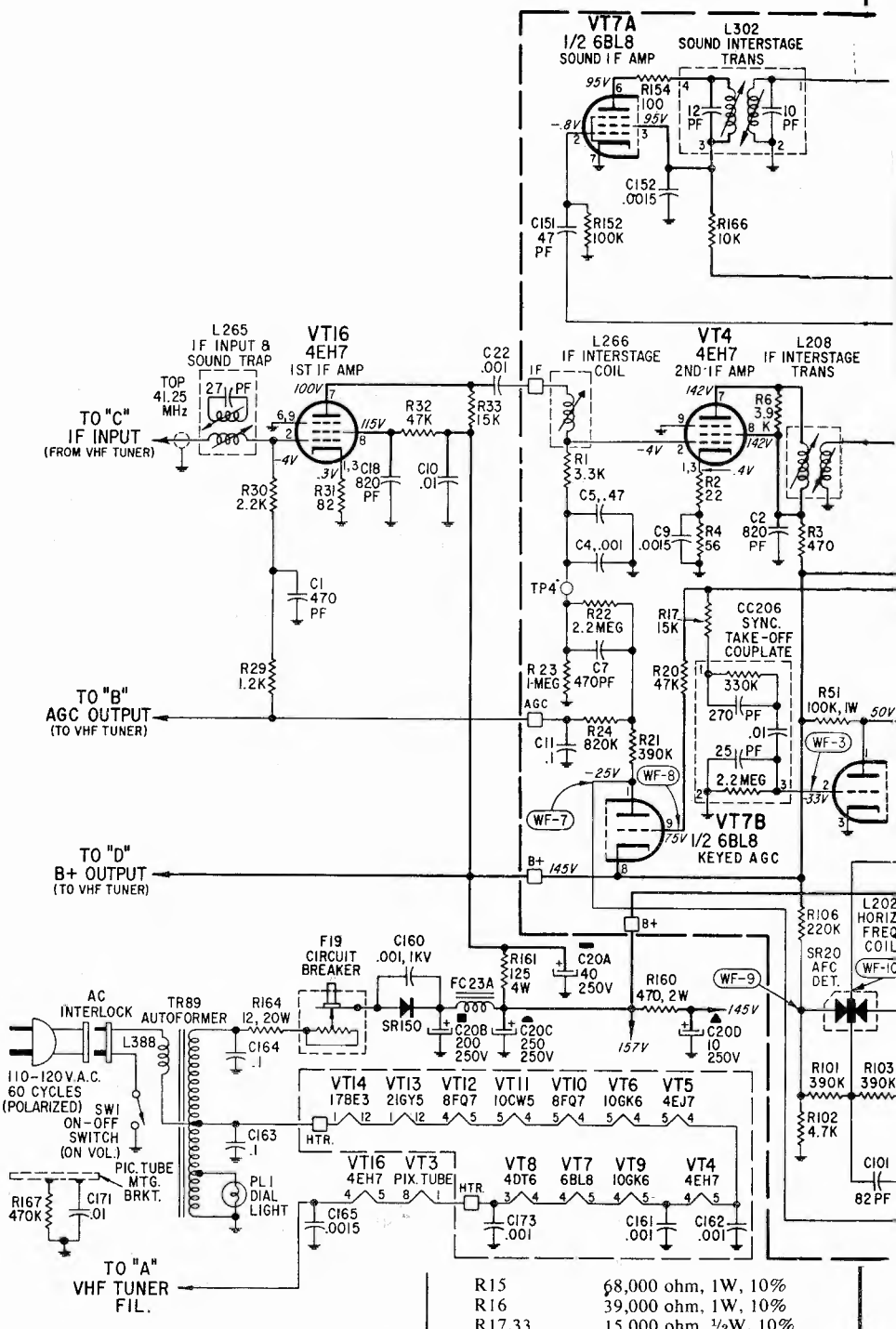


Figure 9.—VHF Tuner Adjustments

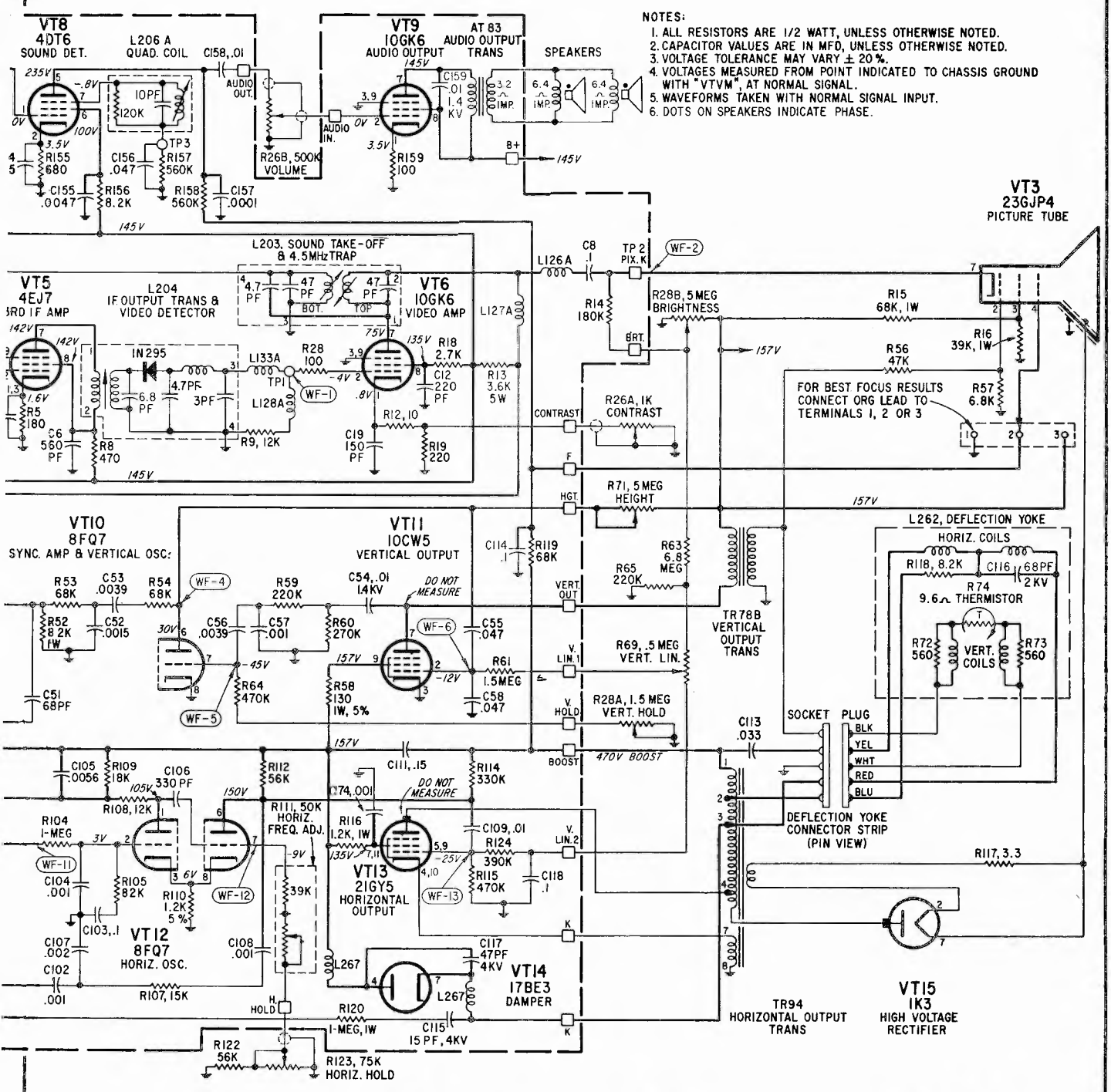
MONTGOMERY WARD Chassis GCI-14829B, etc., Schematic Diagram



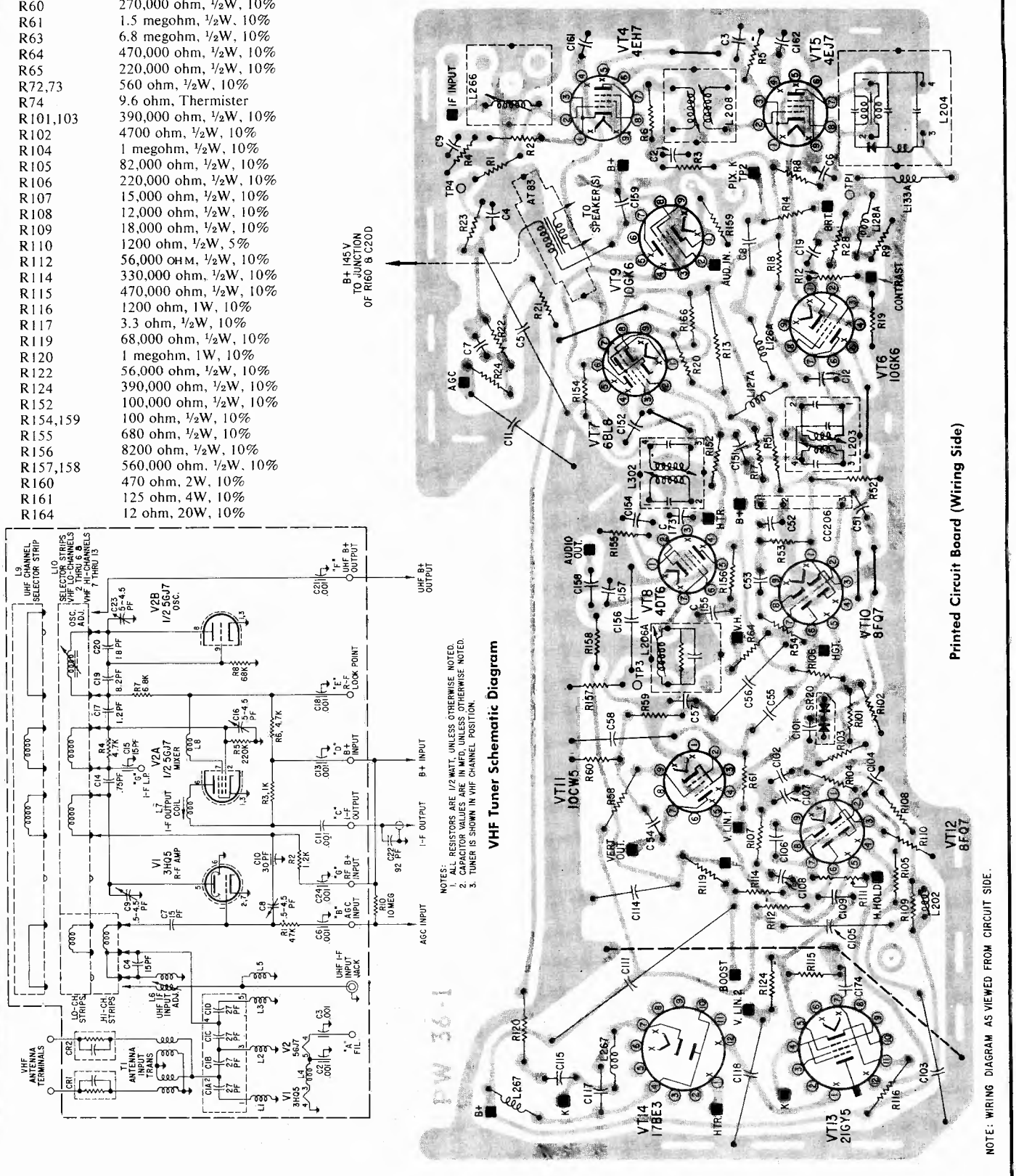
Schematic Symbol	Description
	CAPACITORS
C1	470PF, 500V, 10%, disc ceramic
C2,18	820PF, 500V, 20%, disc ceramic
C3,4,22	1000PF, 500V, 10%, disc ceramic
C5	.47mf, 100V, 20%, molded tubular
C6	560PF, 500V, 10%, disc ceramic
C7	470PF, 500V, 10%, disc ceramic
C8	.1mf, 400V, 20%, molded tubular
C9	1500PF, 500V, 20%, disc ceramic
C10	.01mf, 500V, 10%, disc ceramic
C11	.1mf, 200V, 20%, molded tubular
C12	220PF, 500V, 10%, disc ceramic
C19	150PF, 500V, 20%, disc ceramic
C20A,B, C,D	40mf (A), 200mf (B), 250mf (C), 10mf (D), 250 V.D.C.
C51	68PF, 500V, 10%, disc ceramic
C52	1500PF, 500V, 20%, disc ceramic
C53	3900PF, 500V, 10%, disc ceramic
C54	.01mf, 1.4KV, 20%, disc ceramic
C55	.047mf, 400V, 10%, molded tubular
C56	3900PF, 400V, 10%, disc ceramic
C57	1000PF, 500V, 10%, disc ceramic
C58	.047mf, 200V, 10%, disc ceramic
C101	82PF, 500V, 10%, disc ceramic
C102,104, 108	1000PF, 500V, 10%, disc ceramic
C103	.1mf, 200V, 20%, disc ceramic
C105	5600PF, 400V, 10%, disc ceramic
C106	330PF, 500V, 5%, mica
C107	2000PF, 500V, 10%, disc ceramic
C109	.01mf, 500V, 20%, disc ceramic
C111	.15mf, 600V, 20%, disc ceramic
C113	.033mf, 600V, 10%, ceramic
C114	.1mf, 600V, 20%, molded tubular
C115	15PF, 4KV, 10%, disc ceramic
C116	68PF, 2KV, 10%, disc ceramic
C117	47PF, 4KV, 10%, disc ceramic
C118	.1mf, 200V, 20%, disc ceramic
C151	47PF, 500V, 10%, disc ceramic
C152	1500PF, 500V, 10%, disc ceramic
C154,165	1500PF, 500V, 20%, disc ceramic
C155	4700PF, 500V, 20%, disc ceramic
C156	.047mf, 200V, 10%, disc ceramic
C157	100PF, 500V, 10%, disc ceramic
C158	.01mf, 500V, 20%, disc ceramic
C159	.01mf, 1.4KV, 20%, disc ceramic
C160	.001mf, 1KV, 20%, disc ceramic
C161,162	1000PF, 500V, 10%, disc ceramic
C163,164	.1mf, 600V, 20%, UL tubular
C171	.01mf, 1.4KV, disc ceramic
C173,174	1000PF, 500V, 10%, disc ceramic

Schematic Symbol	Description
	RESISTORS
R1	3300 ohm, ½W, 10%
R2	22 ohm, ½W, 10%
R3,8	470 ohm, ½W, 10%
R4	56 ohm, ½W, 10%
R5	180 ohm, ½W, 10%
R6	3900 ohm, ½W, 10%
R9	12,000 ohm, ½W, 10%
R12	10 ohm, ½W, 10%
R13	3.6K ohm, 5W, 10%
R14	180,000 ohm, ½W, 10%
R15	68,000 ohm, 1W, 10%
R16	39,000 ohm, 1W, 10%
R17,33	15,000 ohm, ½W, 10%
R18	2700 ohm, ½W, 10%
R19	220 ohm, ½W, 10%
R20,32	47,000 ohm, ½W, 10%
R21	390,000 ohm, ½W, 10%
R22	2.2 megohm, ½W, 10%
R23	1 megohm, ½W, 10%
R24	820,000 ohm, ½W, 10%
R28	100 ohm, ½W, 10%
R29	1200 ohm, ½W, 10%
R30	2200 ohm, ½W, 10%
R31	82 ohm, ½W, 10%
R51	100,000 ohm, 1W, 10%
R52	82,000 ohm, 1W, 10%
R53,54	68,000 ohm, ½W, 10%

MONTGOMERY WARD Chassis GCI-14829B, etc., Schematic Diagram, Continued



R56	47,000 ohm, ½W, 10%
R57	6800 ohm, ½W, 10%
R58	130 ohm, 1W, 5%
R59	220,000 ohm, ½W, 10%
R60	270,000 ohm, ½W, 10%
R61	1.5 megohm, ½W, 10%
R63	6.8 megohm, ½W, 10%
R64	470,000 ohm, ½W, 10%
R65	220,000 ohm, ½W, 10%
R72,73	560 ohm, ½W, 10%
R74	9.6 ohm, Thermister
R101,103	390,000 ohm, ½W, 10%
R102	4700 ohm, ½W, 10%
R104	1 megohm, ½W, 10%
R105	82,000 ohm, ½W, 10%
R106	220,000 ohm, ½W, 10%
R107	15,000 ohm, ½W, 10%
R108	12,000 ohm, ½W, 10%
R109	18,000 ohm, ½W, 10%
R110	1200 ohm, ½W, 5%
R112	56,000 ohm, ½W, 10%
R114	330,000 ohm, ½W, 10%
R115	470,000 ohm, ½W, 10%
R116	1200 ohm, 1W, 10%
R117	3.3 ohm, ½W, 10%
R119	68,000 ohm, ½W, 10%
R120	1 megohm, 1W, 10%
R122	56,000 ohm, ½W, 10%
R124	390,000 ohm, ½W, 10%
R152	100,000 ohm, ½W, 10%
R154,159	100 ohm, ½W, 10%
R155	680 ohm, ½W, 10%
R156	8200 ohm, ½W, 10%
R157,158	560,000 ohm, ½W, 10%
R160	470 ohm, 2W, 10%
R161	125 ohm, 4W, 10%
R164	12 ohm, 20W, 10%



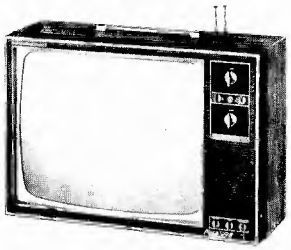
MOTOROLA

CHASSIS

C19TS-599
C,D21TS-599

MODELS

XP517FW
XT627FN
XT628FW



Model XT628FW

MODEL BREAKDOWN CHART

MODEL	CHASSIS	VHF TUNER	UHF TUNER	CRT
XP517FW	C19TS-599	CPTT-413	KTT-622 or KTT-626	20WP4
XT627FN XT628FW	C21TS-599 D21TS-599	OPTT-413 ↓	↓	22ZP4 ↓

See last page of this Motorola section for differences applicable to Chassis 22TS-599B used in Models XT767GN, XT768GW, and XU772GK.

SERVICE ADJUSTMENTS

FINE TUNING ADJUSTMENT

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.

VIDEO BIAS ADJUSTMENT

1. Set VHF channel selector to the highest unused channel.

2. Disconnect antenna, short at tuner if necessary (no video must be present).

3. Set contrast to maximum and brightness to normal level.

4. Adjust video bias control to maximum in direction which causes white limiting (absence of snow).

5. Adjust video bias control in reverse direction until normal snow appears on screen (no evidence of white limiting).

RF AGC DELAY ADJUSTMENT

VISUAL METHOD CONDITIONS: Select a channel with medium signal strength. To determine if the signal strength is proper, rotate RF AGC delay control from one extreme to the other. One setting of the control should produce some visible snow in picture. The other setting should produce a snow free picture. Adjust or disconnect antenna as required to provide these conditions.

NOTE: If the above conditions are not attainable and only a very weak signal (with snow) is available, adjust RF AGC delay control for minimum snow. If such is the case, disregard Steps 1 thru 3.

1. Adjust set for normal picture.

2. Adjust RF AGC delay control to maximum in direction which produces snow in picture.

3. Adjust control in reverse direction. Stop when the snow just disappears or is minimized.

OPTIMIZER CONTROL

The purpose of the optimizer control is to reduce the effects of high frequency noise in the picture. If a strong noise-free signal is being received, the optimizer should be set in the clockwise or "SHARP" position to obtain maximum picture detail. However, under noisy signal conditions, the control should be turned toward the "SOFT" position to reduce the effect of noise peaks.

HORIZONTAL FREQ ADJUSTMENT

To center the horizontal frequency range, place a jumper from T.P. "E" to chassis ground. Adjust horizontal oscillator coil (L500) until the horizontal lines become straight.

Remove jumper and rock tuner off and on channel to check for stable horizontal sync.

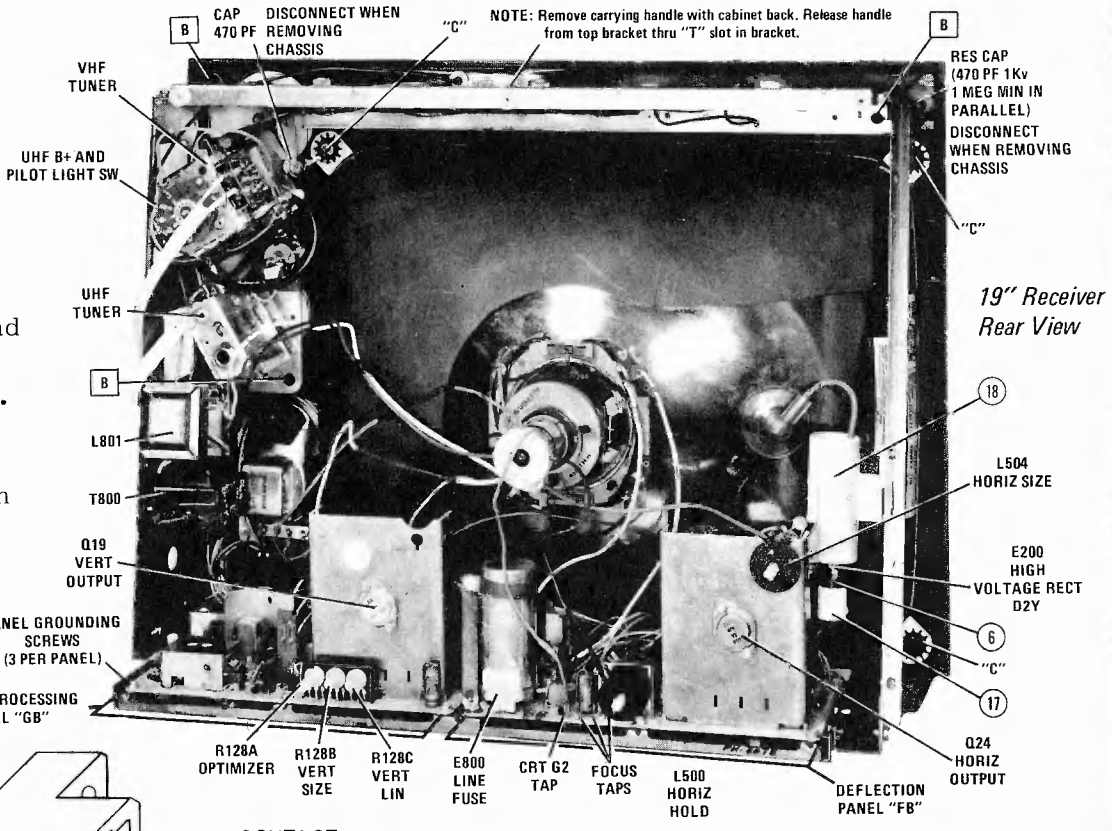
PICTURE TUBE REPLACEMENT

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.

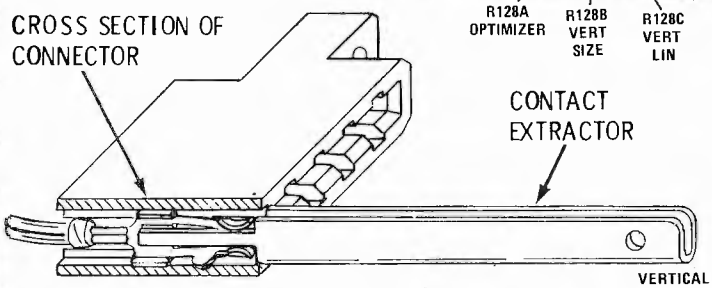
CRT is removed from rear of cabinet.

To remove picture tube, remove chassis then remove corner screws "C" securing picture tube to cabinet.

CAUTION: This receiver is powered by an auto transformer with center tap connected to the chassis. The chassis is always at approximately 55V AC above earth ground regardless of the line cord polarity. To avoid damage to set or test equipment, use an isolation transformer when servicing set.



19" Receiver Rear View

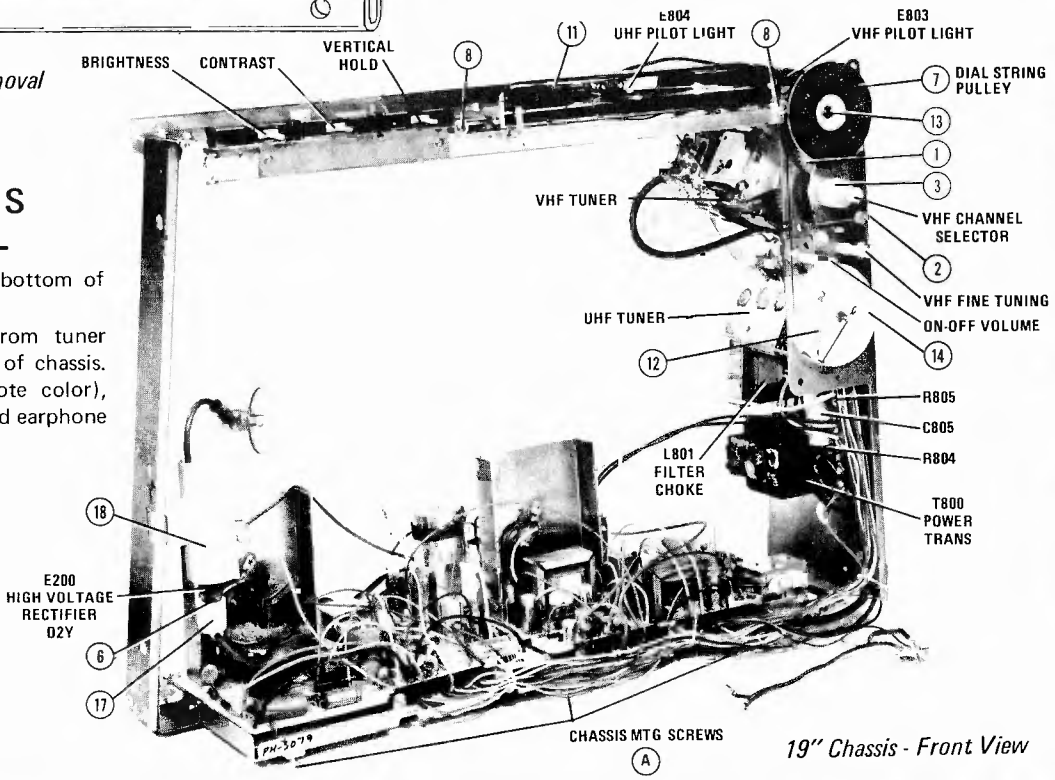


Panel Connector Contact Removal

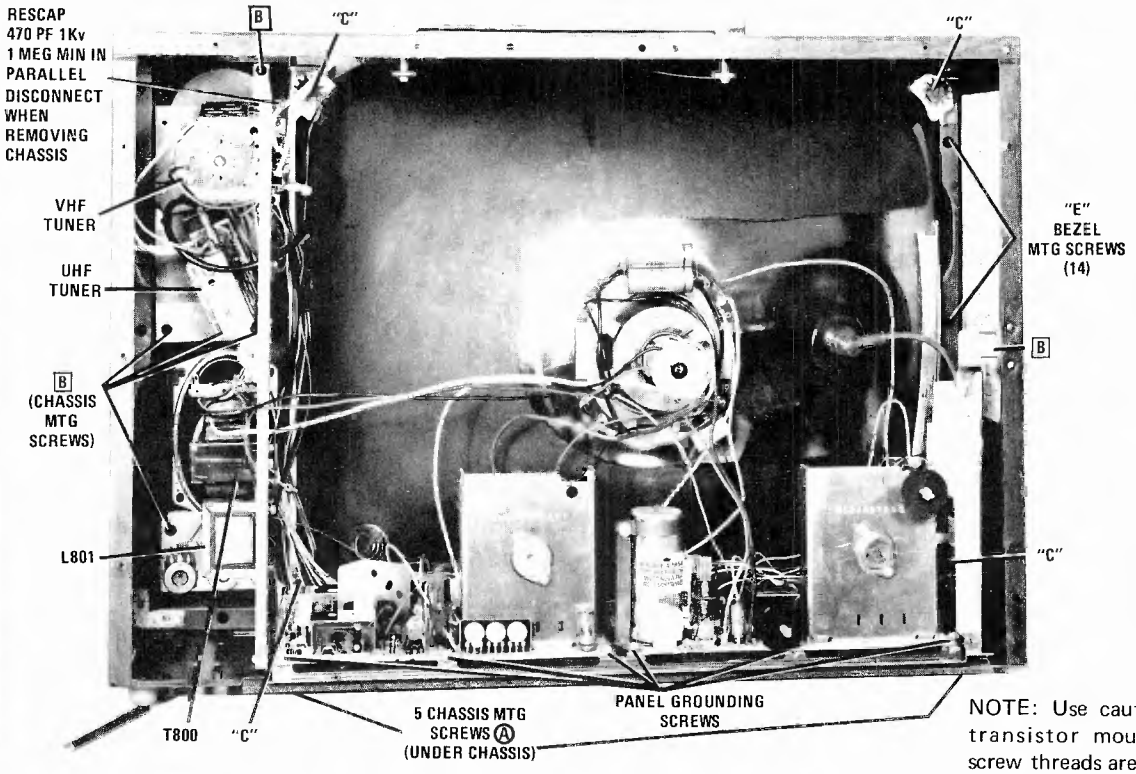
19" CHASSIS REMOVAL

Loosen 3 screws "A"on bottom of chassis.

Remove 3 screws "B" from tuner bracket and upper corners of chassis. Disconnect yoke leads (note color), 2nd anode, CRT socket, and earphone jack.

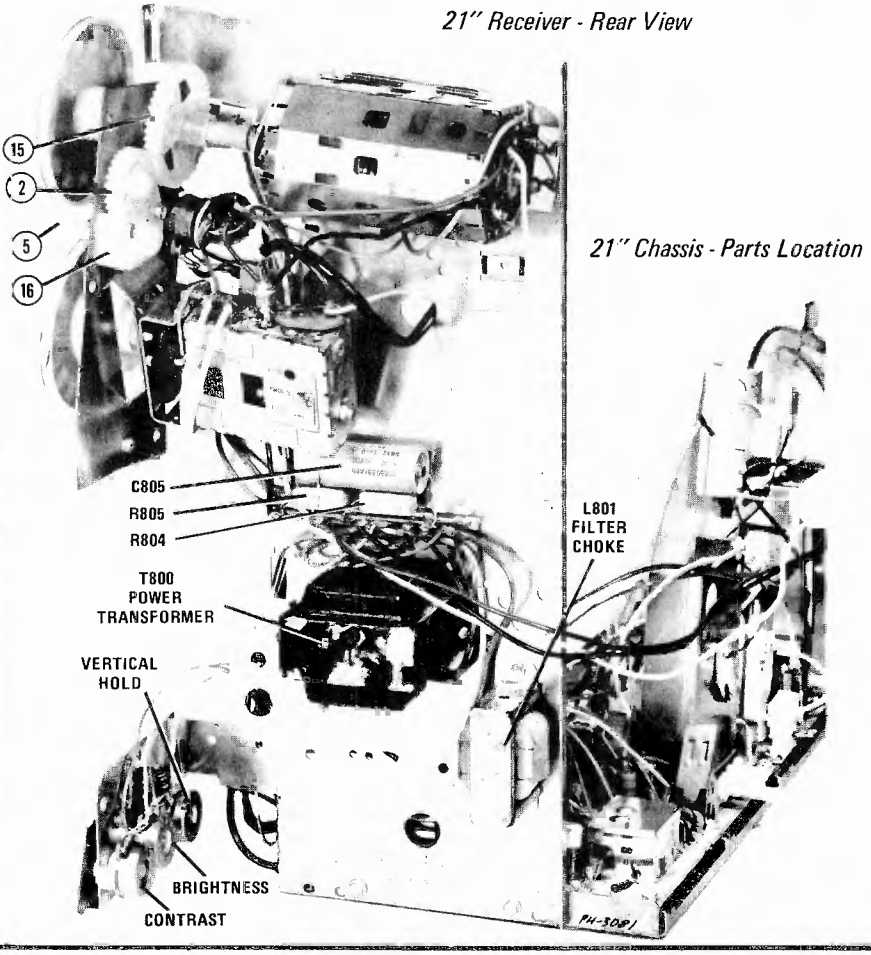


19" Chassis - Front View



21" Receiver - Rear View

NOTE: Use caution when tightening transistor mounting screws. If the screw threads are stripped by excessive pressure, a poor electrical and mechanical connection can result.



21" Chassis - Parts Location

21" CHASSIS REMOVAL

Remove 5 screws "A" on bottom of chassis.

Remove 6 screws "B" from tuner bracket and H.V. rectifier support bracket.

Disconnect yoke leads (note color), 2nd anode, CRT socket, and earphone jack.

BEZEL REMOVAL

1. Remove knobs.
2. Remove chassis as described above.
3. Remove 14 screws "E".

CRT REMOVAL

CAUTION: USE CARE IN HANDLING CRT.

1. Remove chassis as described above.
2. Remove 4 screws "C" and remove CRT from rear of cabinet.

CHASSIS ALIGNMENT

PRE-ALIGNMENT INSTRUCTIONS

Before alignment of the video IF section is attempted, it is advisable to thoroughly check the system. If alignment is attempted on an IF 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 over heated components as well as for obvious wiring defects.

VIDEO IF & MIXER ALIGNMENT

Preliminary Steps

1. Maintain line voltage at 120 with variac.

2. Disable horizontal sweep by unplugging yoke leads.

3. Disable local oscillator by setting tuner between channels.

4. Apply the positive lead of a 6.2 volt bias supply to IF AGC (T.P. "A") buss and negative lead to chassis ground.

5. Check for correct 1st video amplifier bias by measuring 2nd video amplifier collector voltage. Voltage should read 20V with no signal input. If necessary, adjust bias by bypassing the 3rd IF collector to ground thru a .001 mf capacitor and adjusting the video bias control for 20V on the 2nd video amplifier collector.

6. Set the contrast and brightness control at maximum (extreme clockwise position). Set optimizer control maximum clockwise.

7. Short across tuner input terminals.

8. Maintain 1 volt peak to peak at the base of video amplifier except when specific values are given in the procedure chart

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

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

SOUND ALIGNMENT

(Station Signal Method)

Reduce signal input into receiver by disconnecting one side or both antenna leads from receiver. Signal should be reduced considerably until some background noise is present.

1. Adjust both cores of 4.5MHz trap and A.T.O. transformer T300 for maximum audio.

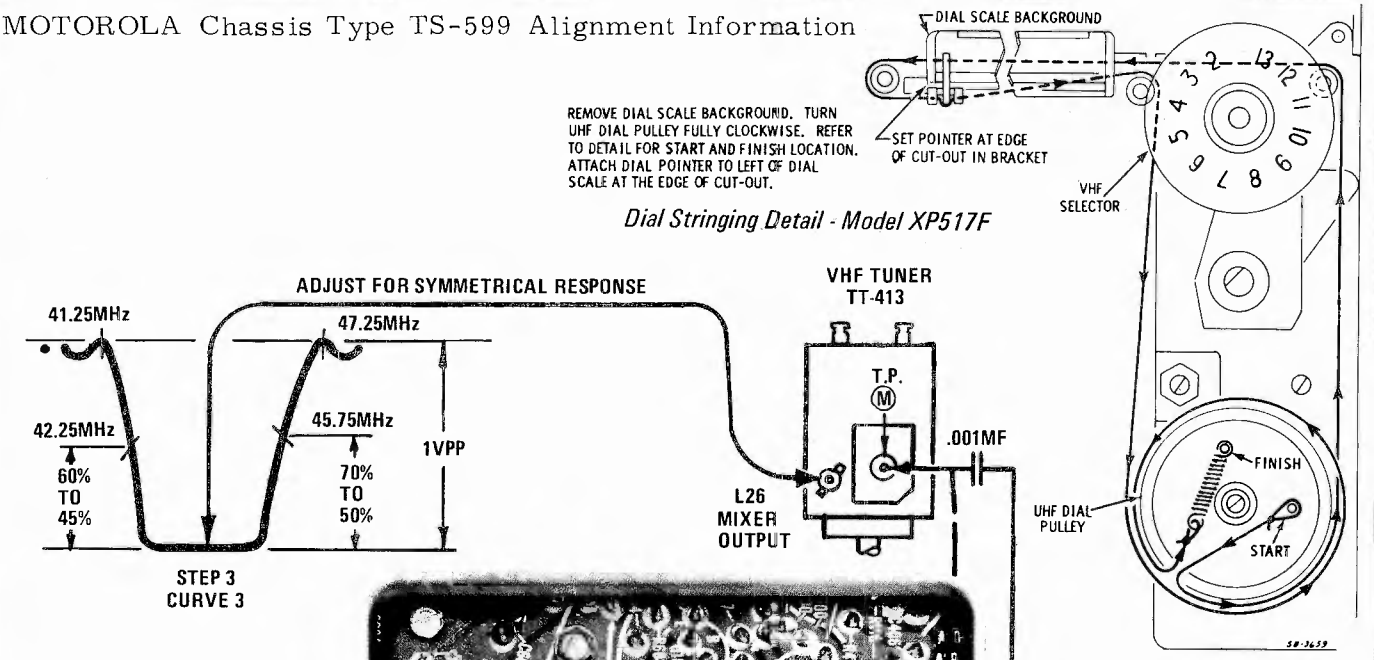
2. Adjust primary (top core) of FM detector transformer T301 for maximum audio.

3. Adjust secondary (bottom core) of T301 for best sound with least noise.

4. Repeat Steps 2 and 3 until no further inprovement is noted in the sound.

VIDEO IF AND MIXER ALIGNMENT PROCEDURE

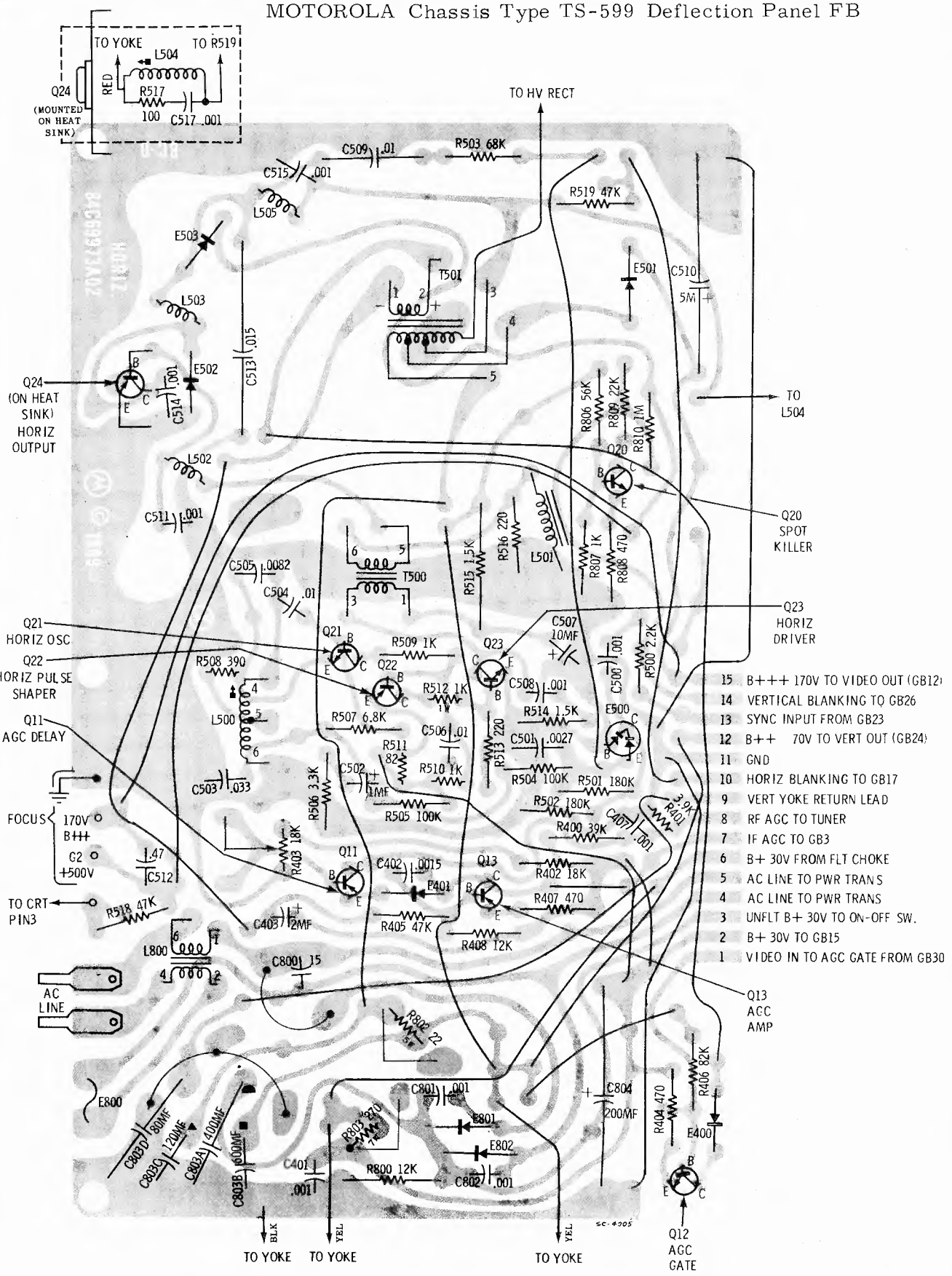
STEP	SWEEP GENERATOR AND MARKER	INDICATOR	ADJUST	ADJUST FOR AND/OR REMARKS
1.	To 1st IF base thru 120 ohm resistor in series with .001 mf capacitor. Set sweep to 44MHz, markers as required. Short junction of L103 & C106 to ground.	Scope to base of 1st video amplifier thru 47K ohm resistor	Both cores of 3rd IF transformer (L107 & L108)	Adjust for maximum response at 44MHz (see curve No. 1). NOTE: The 3rd IF transformer consists of two individual coils inductively coupled.
2.	To mixer T.P. M thru 120 ohm resistor .001 mf capacitor. Remove short from junction of L103 and C106 to ground	Same as Step No. 1	41.25MHz trap L101 47.25MHz trap L102	Minimum response at proper trap frequency. See curve No. 2. NOTE: Temporary reduction of bias and increase of generator output maybe required to see trap clearly.
3.	Same as Step No. 2	Same as Step No. 1	Mixer output coil L26 on tuner	Adjust for symmetrical response. See curve No. 3.



Dial Stringing Detail - Model XP517F

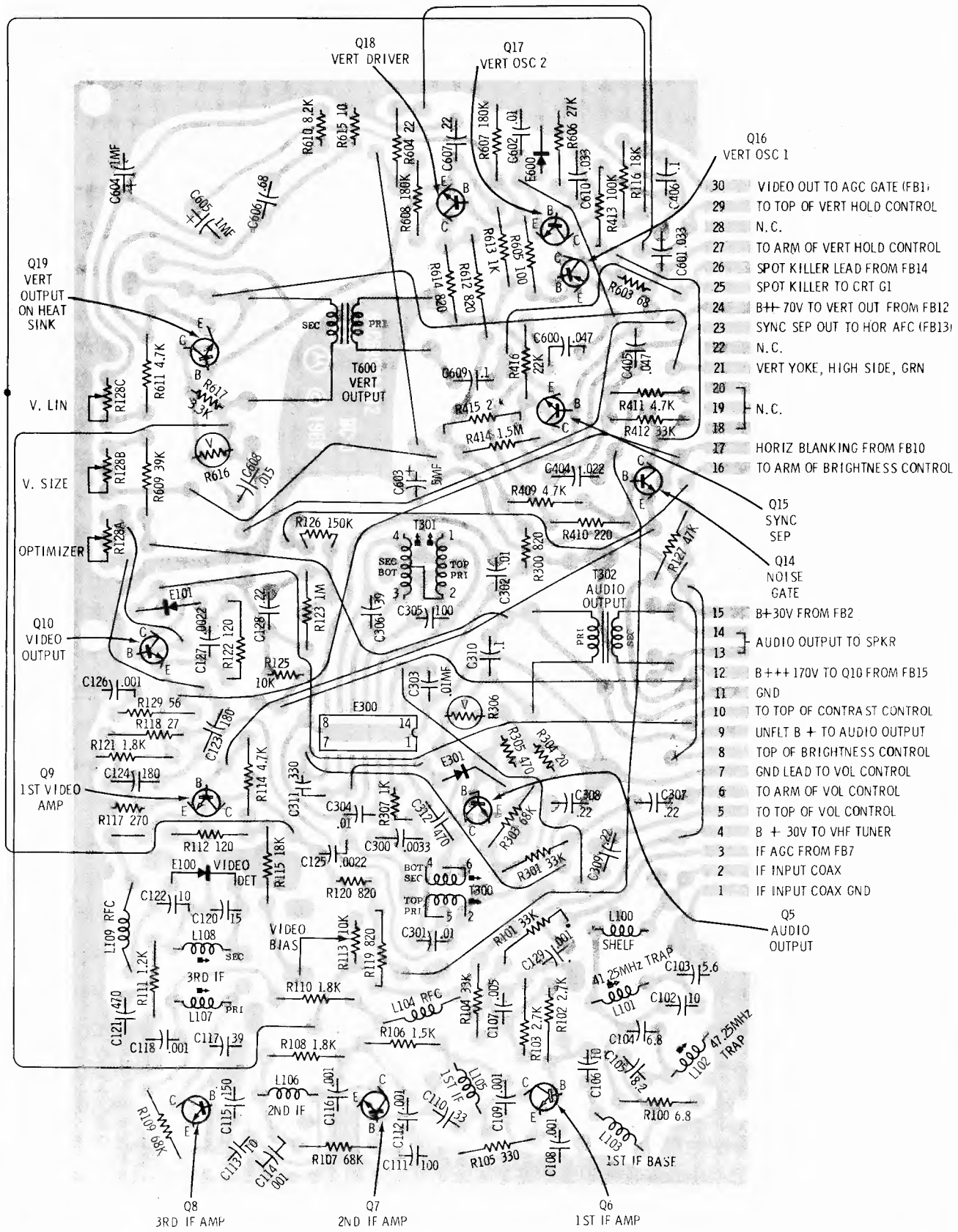
Video IF And Sound Alignment Points And Response Curves

MOTOROLA Chassis Type TS-599 Deflection Panel FB

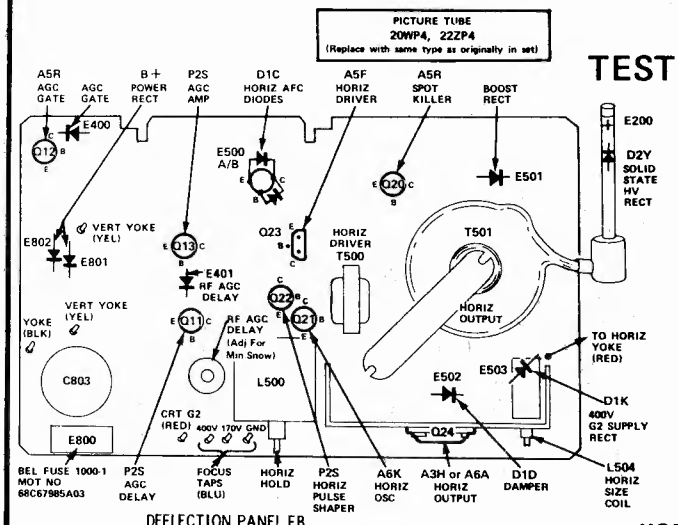


Deflection Panel FB - Circuit Side

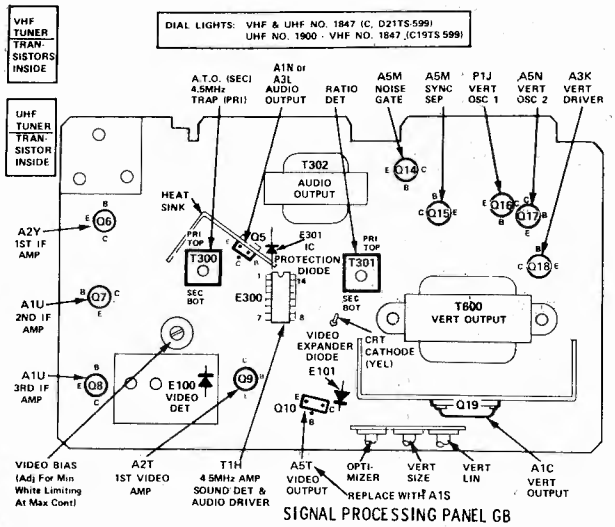
MOTOROLA Chassis Type TS-599 Signal Panel GB



Signal Processing Panel GB - Circuit Side



DEFLECTION PANEL FB



SIGNAL PROCESSING PANEL GB

Transistor Location Detail

POWER TRANSISTOR REPLACEMENT

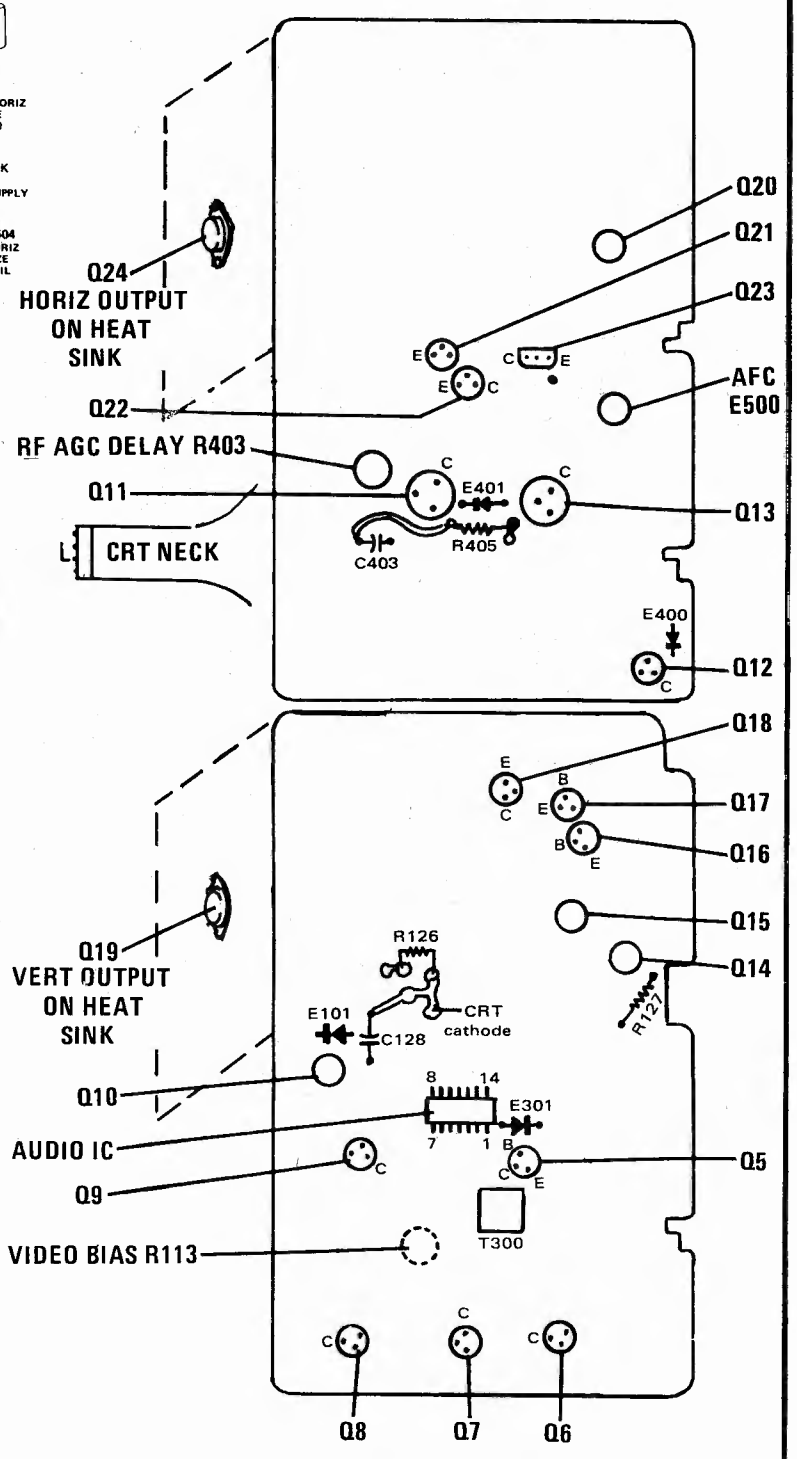
When replacing any "plug-in" transistor, i.e., the horizontal output and vertical output, please observe the following precautions:

1. The transistor sockets are not "Captive," that is, the transistor mounting screws also secure the socket. When installing the transistor, the socket must be held in its proper location. This location is indicated by flanges on the socket which fit into the heat sink.

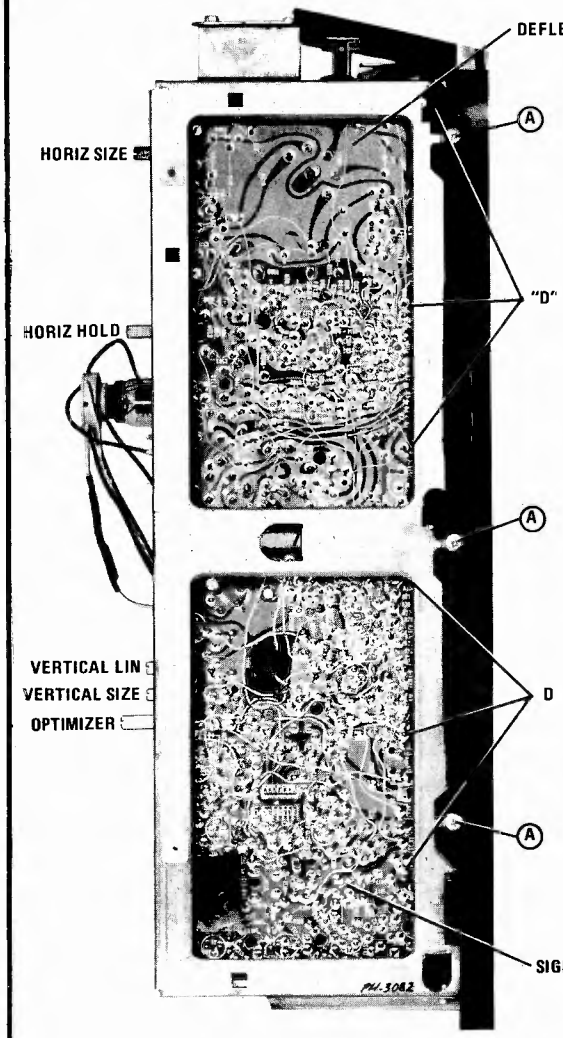
2. When replacing the output transistors, silicon grease (Motorola Part No. IIM490487) should be applied evenly to both sides of the mica insulator.

TEST POINT & COMPONENT LOCATION GUIDE

The following detail gives relative position of test points and component location on chassis.



Chassis Bottom View



Chassis Bottom View - Service Position

CHASSIS SERVICING

The bottom of the 19TS-599 chassis is exposed for servicing when cabinet back cover is removed. The bottom of the 21TS-599 chassis can be exposed for servicing by removing the fibre-board cover from the bottom of the receiver.

PANEL REMOVAL

1. Remove grounding screws at rear of panel. See rear view of receivers.

2. To unplug panel - grasp panel at rear corners and pull toward rear. If panel is tight, exert pressure from side to side to work panel out of multipin connector.

3. In stubborn cases, insert screw-driver at slots "D" and pry off panel.

ETCHED BOARD CIRCUIT TRACING

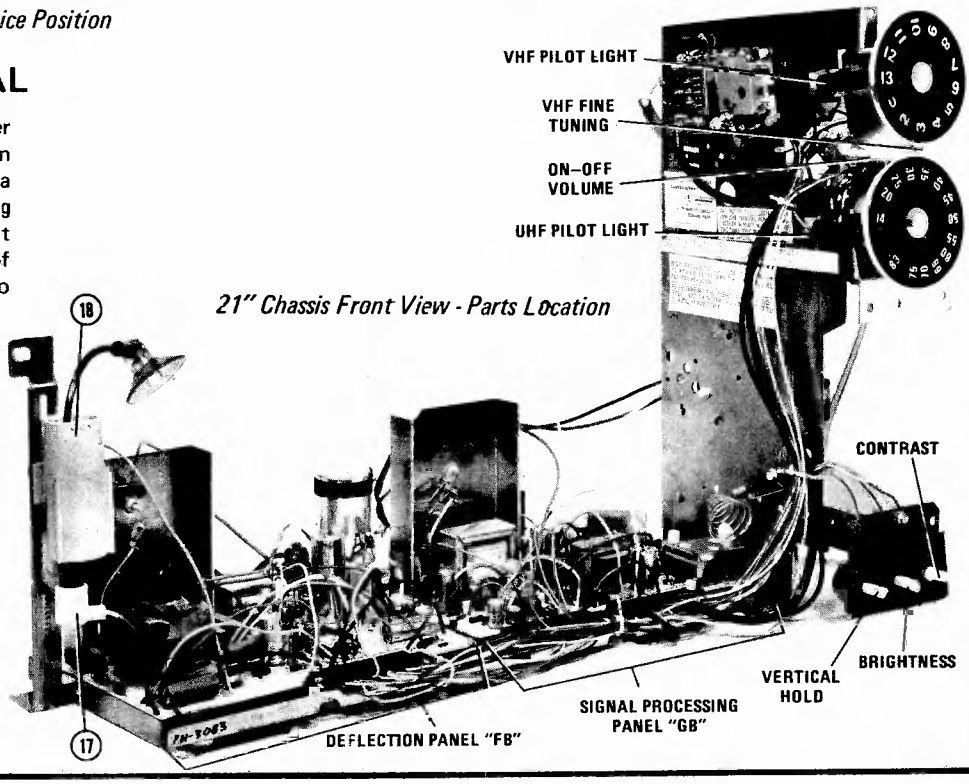
The top (component side) of the chassis board contains a complete legend of the chassis circuit that appears on the bottom and identification of all components by reference numbers that are related to the reference numbers on the schematic diagram. The circuit may be traced from the top of the chassis board and all components can be identified eliminating the need of making any reference to the bottom of the chassis board.

The circuit side (bottom) of the chassis board also contains a complete legend which includes component reference numbers, transistor identification, and the wiring (jumper wires) is traced in to provide easy circuit tracing of the wiring that appears on the top side of the chassis board. Each wire trace begins and ends with an arrow.

The transistors are identified by their function as well as the reference number. The transistor elements are identified as follows: E-emitter, B-base and C-collector.

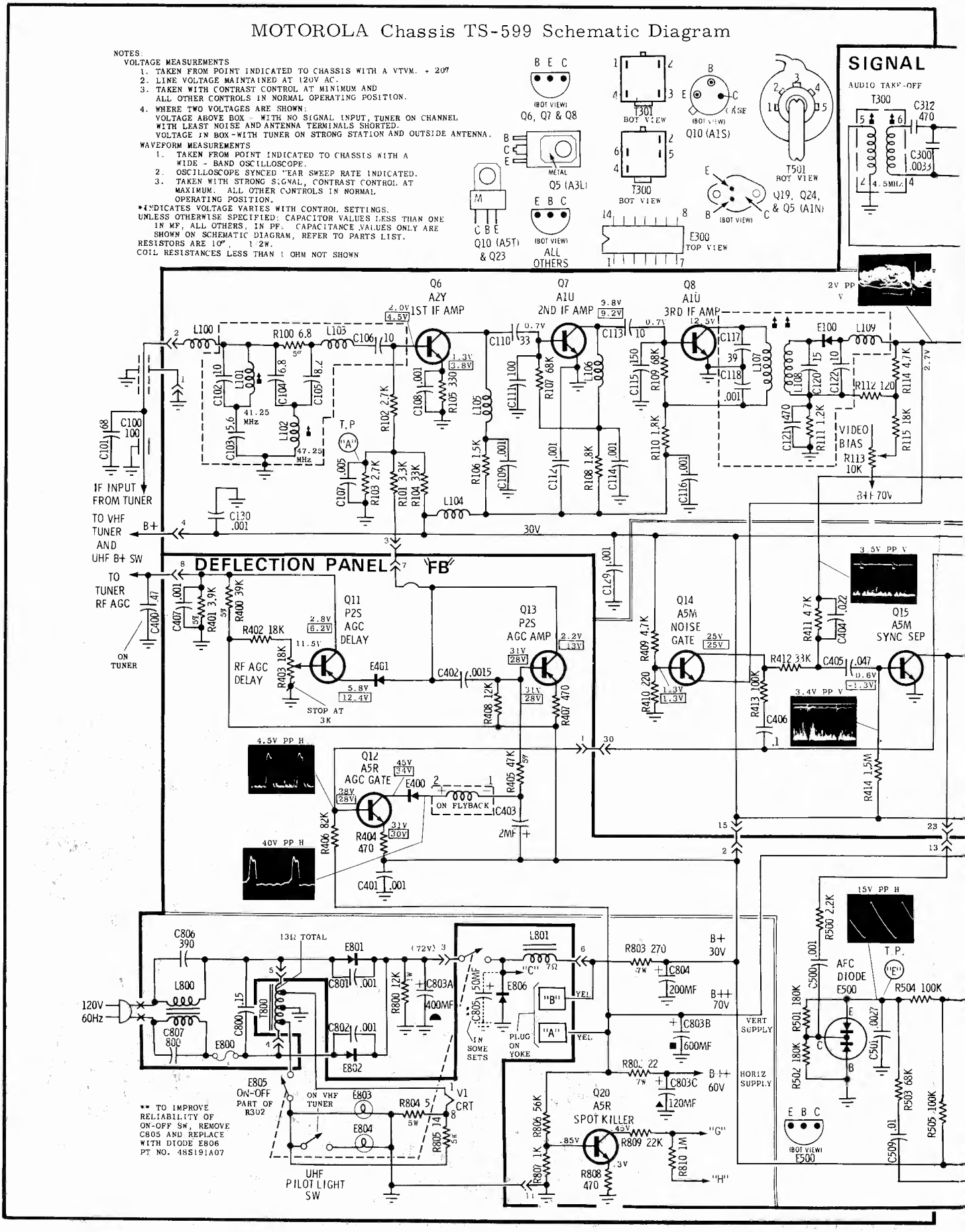
COMPONENT REMOVAL

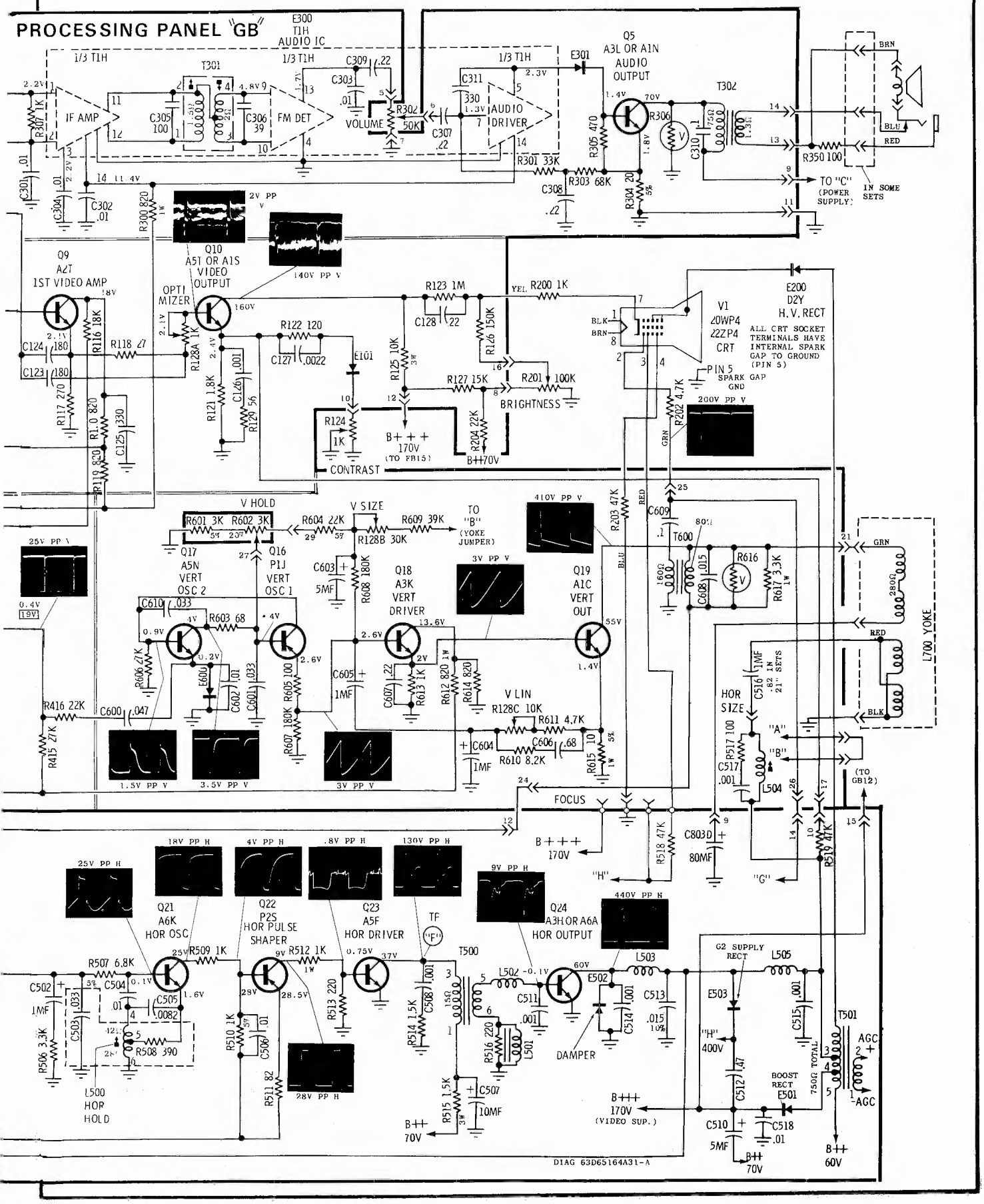
It is recommended that a solder extracting gun be used to aid in component removal. An iron with a temperature controlled heating element would be desirable since it would reduce the possibility of damaging the board due to over-heating.



21" Chassis Front View - Parts Location

MOTOROLA Chassis TS-599 Schematic Diagram




PROCESSING PANEL "GB"
E300
T1H
AUDIO IC
1/3 T1H
T301
IF AMP
FM DET
C305 100
C306 39
C309 .22
C303 .01
R302 50K
VOLUME
C307 .22
C311 330
AUDIO DRIVER
E301
Q5
A3L OR A1N
AUDIO
OUTPUT
R306
T302
R305 470
R301 33K
R303 68K
C308 .22
R304 20 5%
C310
R350 100
BRN
BLU
RED
TO "C" (POWER SUPPLY)
IN SOME SETS
R307 1K
C301 .01
C304 .01
C302 .01
R300 820 1W
2V PP V
140V PP V
Q10
A5I OR A1S
VIDEO
OUTPUT
Q9
A2T
1ST VIDEO AMP
OPTI MIZER
R123 1M
R200 1K
C128 .22
R126 150K
R122 120
C127 .0022
E101
R125 10K 3W
R127 15K
R201 100K
BRIGHTNESS
R124 1K
CONTRAST
B+++ 170V (TO FB15)
R204 22K
B++70V
R128A 1K
R121 1.8K
C126 .001
R129 56
C124 180
C123 180
R116 18K
R118 47
R117 270
R1.0 820
C125 330
R119 820
E200
D2Y
H.V. RECT
V1
20WP4
22ZP4
CRT
ALL CRT SOCKET TERMINALS HAVE INTERNAL SPARK GAP TO GROUND (PIN 5)
PIN 5
SPARK GAP
GND
R202 4.7K
200V PP V
V HOLD
R601 3K
R602 3K
R604 22K
V SIZE
R609 39K
R128B 30K
TO "B" (YOKE JUMPER)
410V PP V
R203 47K
C609
T600
R616
R617 3.3K 1W
L700 YOKE
GRN
RED
BLK
25V PP V
0.4V
Q17
A5N
VERT
OSC 2
Q16
P1J
VERT
OSC 1
C603 5MF
R608 180K
Q18
A3K
VERT
DRIVER
3V PP V
Q19
A1C
VERT
OUT
C610 .033
R603 68
C606 .01
C602 .033
C601 .033
R606 47K
R605 100
R607 180K
C605 1MF
C607 .22
R613 1K
R612 820 1W
R614 820
R416 22K
C600 .047
R415 27K
1.5V PP V
3.5V PP V
3V PP V
V LIN
R128C 10K
R611 4.7K
C606 .68
R610 8.2K
C604 1MF
R615 10 1W 5%
HOR SIZE
C516 1MF .82 IN 21" SETS
R517 100
C517 .001
L504
"A"
"B"
(TO GB12)
FOCUS
B+++ 170V
"H"
"G"
C803D 80MF
R518 47K
R519 47K
18V PP H
4V PP H
.8V PP H
130V PP H
25V PP H
9V PP H
440V PP H
Q21
A6K
HOR OSC
Q22
P2S
HOR PULSE
SHAPER
Q23
A5F
HOR DRIVER
TF
"F"
T500
Q24
A3H OR A6A
HOR OUTPUT
R507 6.8K
R509 1K
R512 1K 1W
R513 220
R514 1.5K
C508 .001
L502
C511 .001
L503
E502
C513 .015 10%
C514 .001
DAMPER
G2 SUPPLY RECT
L505
E503
C515 .001
T501
AGC
C502 1MF
C504 0.1
C505 .0082
R508 390
L500 HOR HOLD
R506 3.3K
C503 .033
R510 1K
C506 .01
R511 82
28V PP H
R516 220
L501
R515 1.5K 3W
C507 10MF
B++ 70V
"H" 400V
C512 .47
BOOST RECT
E501
750Ω TOTAL
B+++ 170V (VIDEO SUP.)
C510 5MF
C518 .01
B++ 70V
B++ 60V
DIAG 63D65164A31-A

MOTOROLA Chassis 22TS-599B used in Models XT767GN, XT768GW, XU772GK

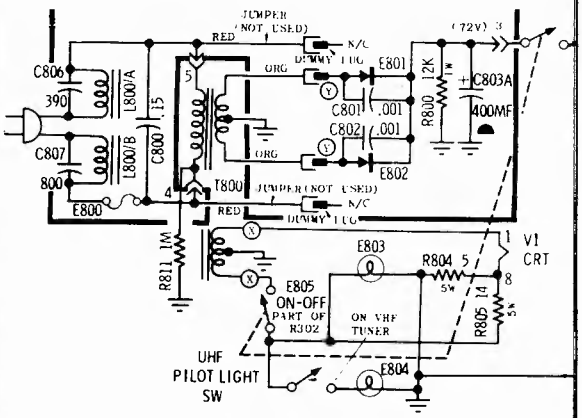
MAIN DIFFERENCES FROM D21TS-599 ("A" version)

The 22TS-599 "B" Chassis used in models listed at top of the page, employ a power line isolation type transformer as opposed to the auto type power transformer used in the original TS-599 Chassis covered in the preceding section.

Deflection Panel FB has been redesigned for these later sets. Terminals and jumper wires have been provided to allow panel to be used in either chassis.

CHASSIS & PANEL CODING CHANGES

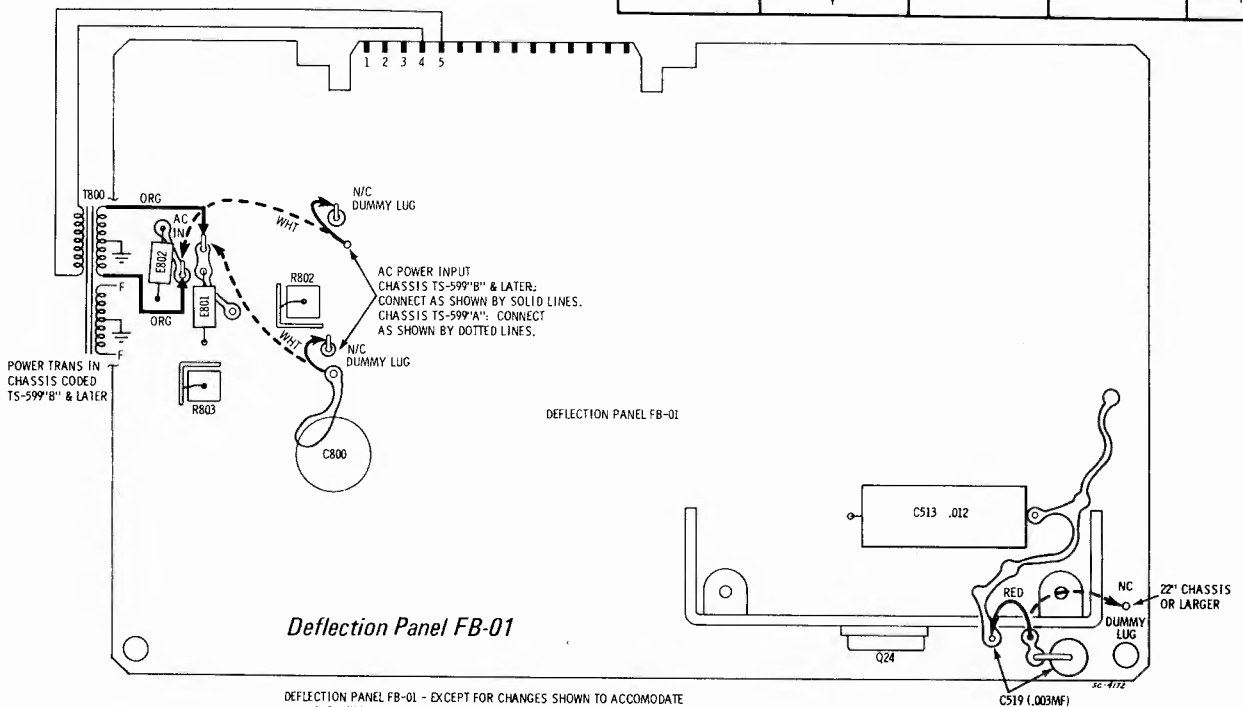
CHASSIS CODE	DESCRIPTION OF CHANGE
TS-599A-01	RELIABILITY CHANGE - C805 removed and replaced by Diode E806 to prevent current surge thru on-off switch. Insulating tape added to vertical member adjacent to dial light bulbs to prevent possibility of shock hazard. TO IMPROVE SPOT KILLER - R127 changed from 47K to 22K. R204 added from junction of R127 and board terminal 8 to B++ 70V. RELIABILITY CHANGE - Video output Q10 changed from A5T to A1S.
TS-599B-00	DESIGN CHANGE - FB Panel circuit revised and jumper wires added to accomodate "B-00" Chassis equipped with isolation type power transformer. C513 (.015) changed to .012 and C519 (.003 uf) added in parallel with C513 for 21" chassis and smaller only. See FB Panel detail.



MODEL BREAKDOWN CHART

MODEL	CHASSIS	VHF TUNER	UHF TUNER	CRT
XT767GN XT768GW XU772GK	22TS-599B ↓	OPTT-413 or OPTT-436	KTT-622 or KTT-626	23JEP4 ↓

MOTOROLA



Deflection Panel FB-01

DEFLECTION PANEL FB-01 - EXCEPT FOR CHANGES SHOWN TO ACCOMODATE ISOLATION TYPE POWER TRANSFORMER AND CAPACITOR (C519) ADDITION, THIS PANEL IS IDENTICAL TO FB PANEL SHOWN IN ORIGINAL TV6 SERVICE MANUAL.

C519 (.003MF) IS PARALLEL WITH C513 (.012MF) IN 21" OR SMALLER CHASSIS

Olympic®

LEAR SIEGLER, INC. / OLYMPIC RADIO & TELEVISION DIVISION (LSi)

CHASSIS 9P90 - 9P91

CHASSIS REMOVAL

1. Remove push-on type knobs from front of cabinet.
2. Remove black head screws holding upper chassis and remove.
3. Remove black head screws holding lower chassis.
4. Remove yoke plug, high voltage lead, speaker lead, picture tube socket and picture tube ground lead (also earphone jack when applicable).
5. Remove chassis from rear of cabinet.

PICTURE TUBE REMOVAL

1. Remove high voltage lead, deflection yoke plug and picture tube socket.
2. Remove nut holding picture tube band.
3. Remove picture tube fixing brackets.
4. Pull picture tube and safety window straight out rear of cabinet.

FOCUS

The focus may be varied by changing the connection at the focus terminal. The orange lead from terminal D may be connected to terminals A, B or C to obtain best focus. To protect the picture tube, the set should be turned off before making a change.

HORIZONTAL HOLD CONTROL

If there is difficulty in maintaining horizontal sync within the range of the Horizontal Hold Control VR105, check the adjustment of the Horizontal Frequency Control, L208.

HEIGHT AND VERTICAL LINEARITY ADJUSTMENTS

Adjust Height Control VR201A and Vertical Linearity Control VR201B until the picture or test pattern is symmetrical from top to bottom. Make the final adjustment to overscan the mask approximately 1/4 inch at both top and bottom.

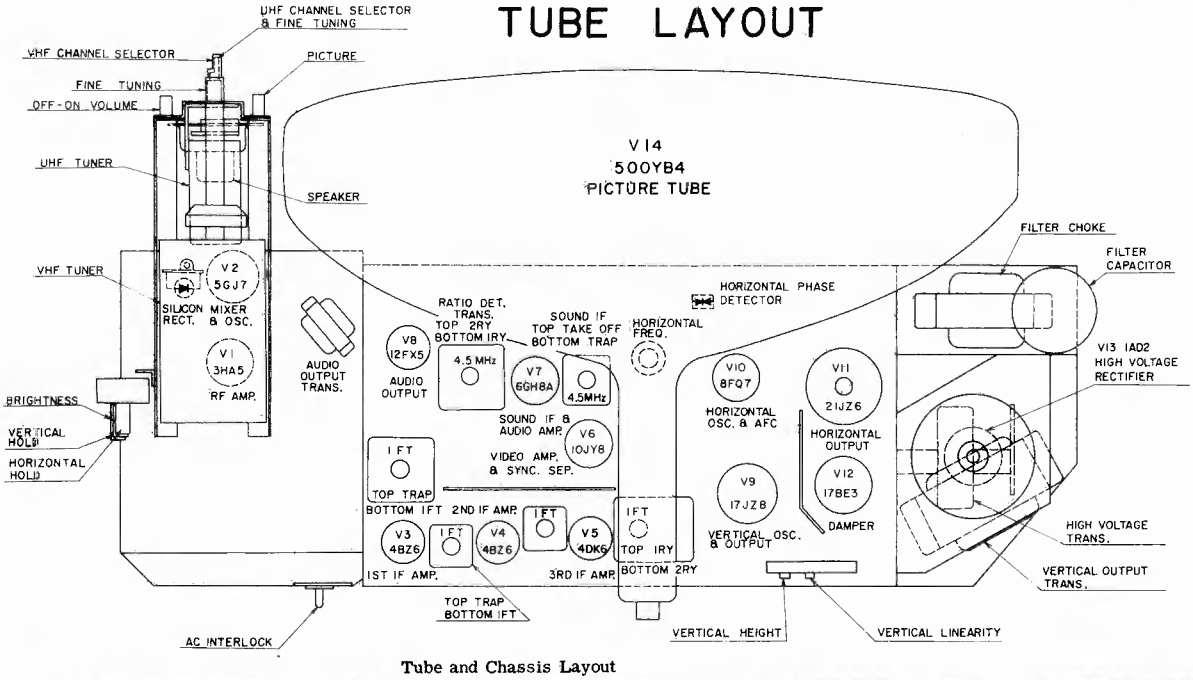
CENTERING ADJUSTMENTS

The centering adjustment is made by positioning the two magnetic rings located at the rear of the deflection yoke on the neck of the picture tube. Shifting of these rings moves the picture both horizontally and vertically so that correct centering is obtained.

Television Chassis

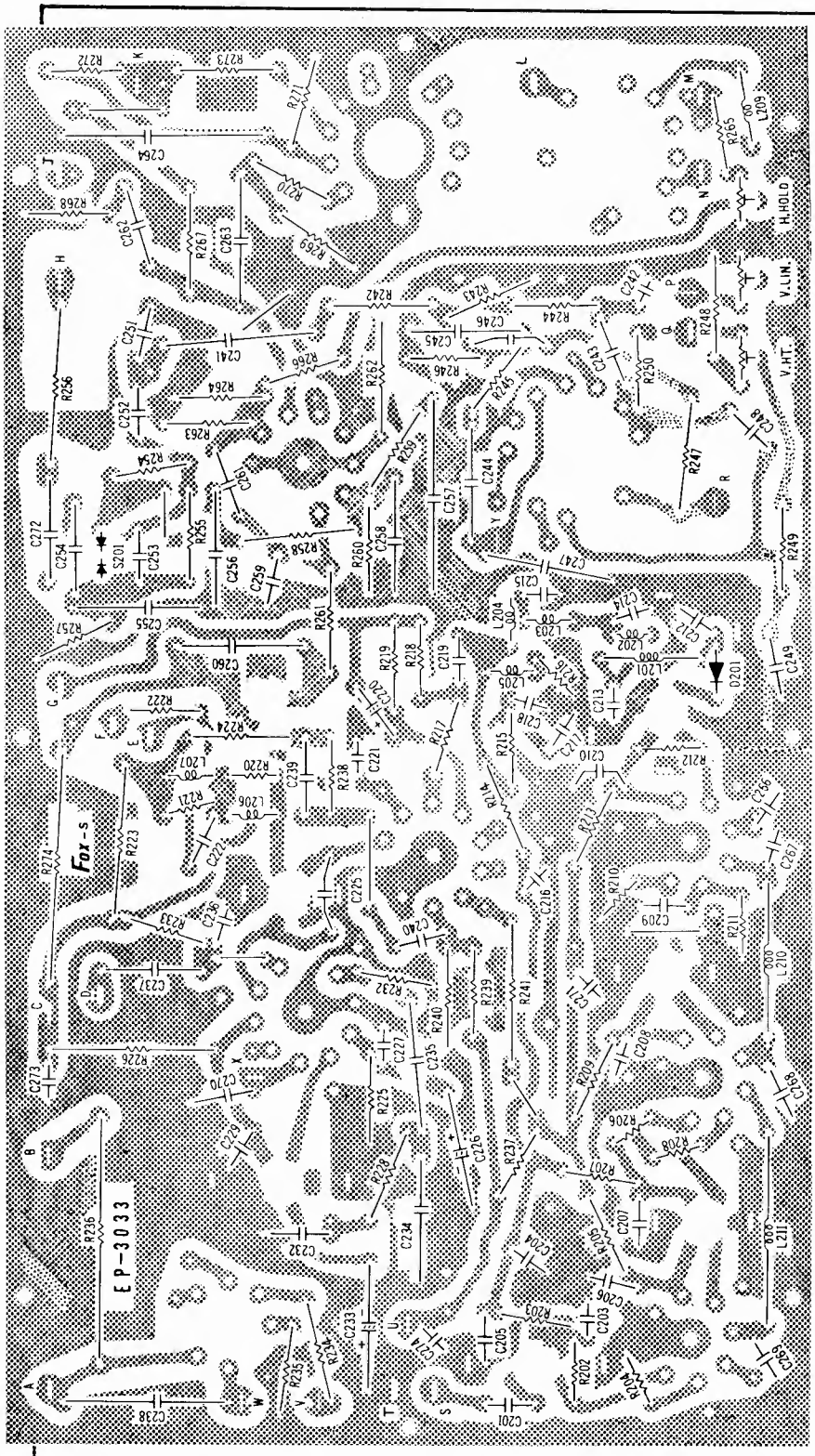
4BZ6 (V3)	1st Picture IF Amplifier
4BZ6 (V4)	2nd Picture IF Amplifier
4DK6 (V5)	3rd Picture IF Amplifier
10JY8 (V6)	Video Amplifier and Sync Separator
6GH8A (V7)	Sound IF Amplifier and Audio Amplifier
12FX5 (V8)	Audio Output
17JZ8 (V9)	Vertical Oscillator and Vertical Output
8FQ7 (V10)	Horizontal Oscillator
21JZ6(V11)	Horizontal Output
17BE3 (V12)	Damper
1AD2 (V13)	High Voltage Rectifier
500YB4	Picture Tube
Silicon Diode (S101)	Power Supply Rectifier
Dual Selenium (S201)	Horizontal Phase Detector
1N60 (D201)	Video Detector
1N60 (D202)	Audio Detector
1N60 (D203)	Audio Detector

TUBE LAYOUT

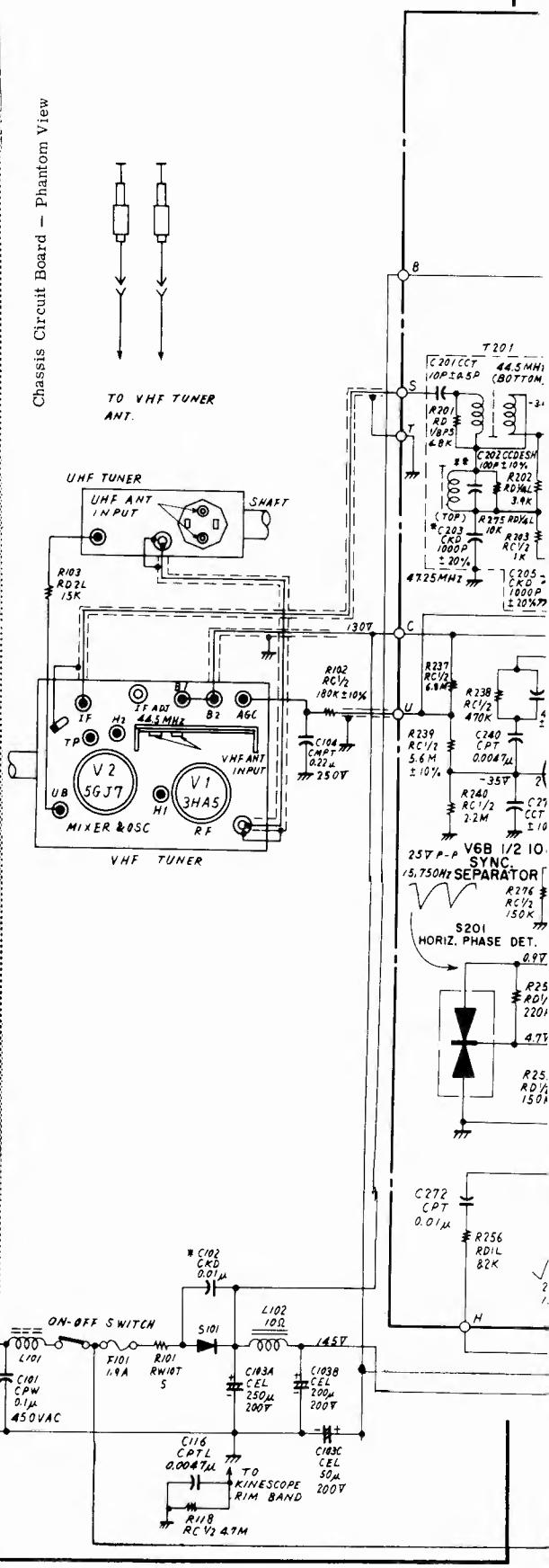


Tube and Chassis Layout

OLYMPIC Chassis 9P90, 9P91 (Continued)



Chassis Circuit Board – Phantom View

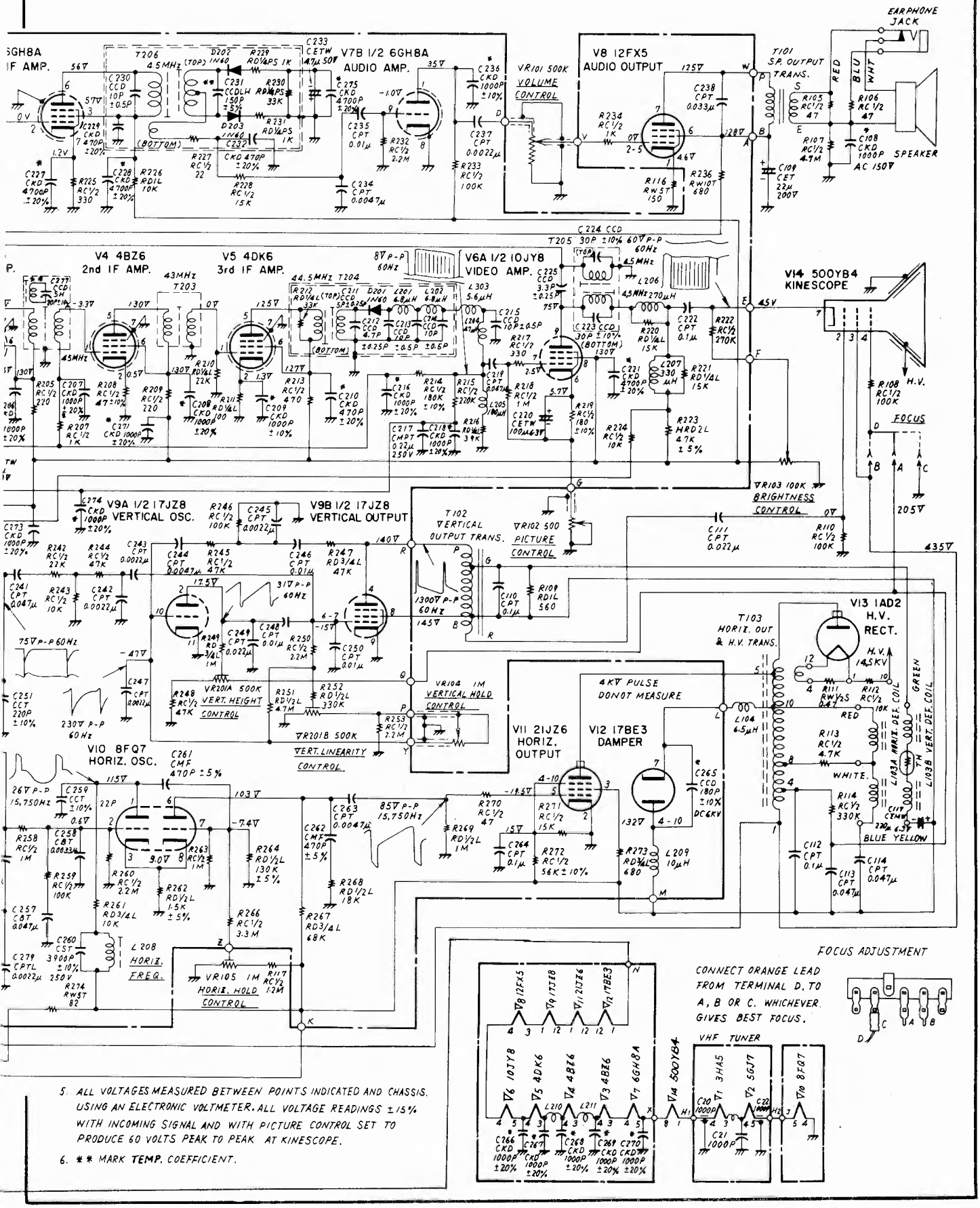


CHASSIS COMPONENT LOCATION GUIDE

NOTE:

1. ALL CARBON FILM RESISTOR (RD) VALUES IN OHMS ± 10% TOLERANCE 1/2 WATT UNLESS OTHERWISE NOTED.
2. ALL CARBON COMPOSITION RESISTOR (RC) VALUES IN OHMS ± 20% TOLERANCE 1/2 WATT UNLESS OTHERWISE NOTED.
3. ALL MICA AND PAPER CONDENSERS ± 20% TOLERANCE UNLESS OTHERWISE NOTED.
4. ALL CERAMIC CONDENSERS (* MARK DISC TYPE) VALUES IN MICRO-MICRO FARADS $\pm^{100}_{0}$ % TOLERANCE UNLESS OTHERWISE NOTED.

OLYMPIC Chassis 9P90, 9P91 Schematic Diagram, Continued



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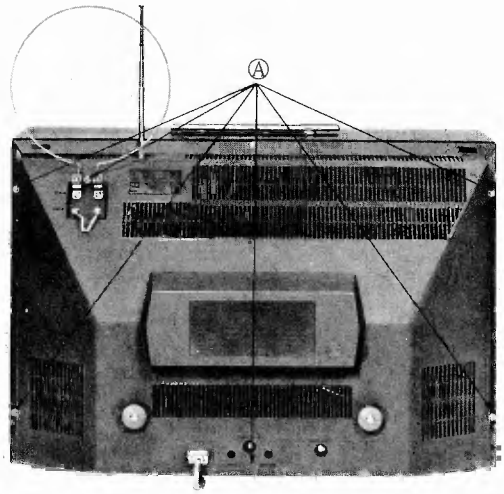
MATSUSHITA ELECTRIC CORP. OF AMERICA

MODELS **AN-169, AN-179**

DISASSEMBLY INSTRUCTIONS

REAR COVER REMOVAL

1) Remove the seven rear cover screws Ⓐ
2) Disconnect leads from the UHF & VHF antenna.
3) Remove the back cover by pulling it straight away from cabinet.

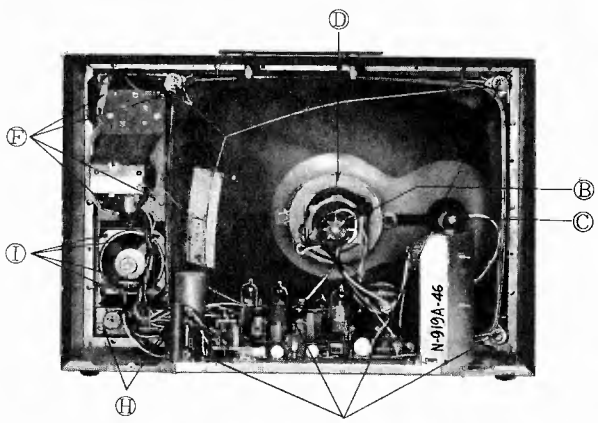


CHASSIS REMOVAL

1) Disconnect the CRT anode Ⓑ CRT socket Ⓒ and deflection coil Ⓓ
2) Remove the six chassis holder screws Ⓔ
3) The chassis assembly can be removed from the cabinet

TUNER AND CONTROL ASSEMBLY REMOVAL

1) Remove the four tuner bracket holder screws Ⓕ
2) Remove the four control Volume bracket holder screws (AN-179) Ⓖ
3) Remove the two control Volume bracket holder screws (AN-169) Ⓗ

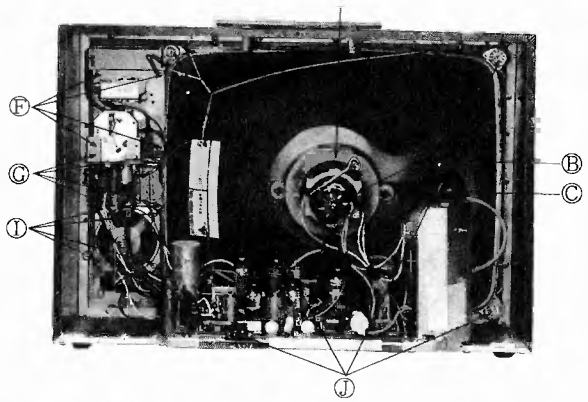


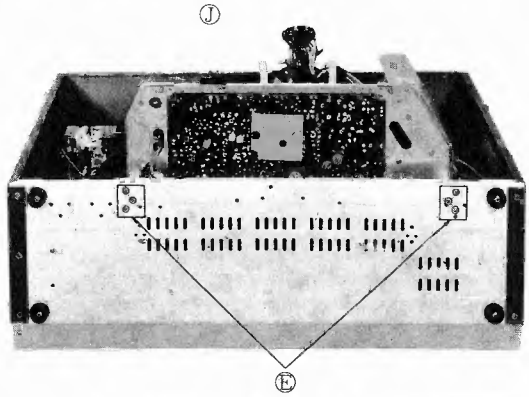
SPEAKER REMOVAL

1) Remove the four speaker holder screws Ⓘ

PICTURE TUBE REMOVAL

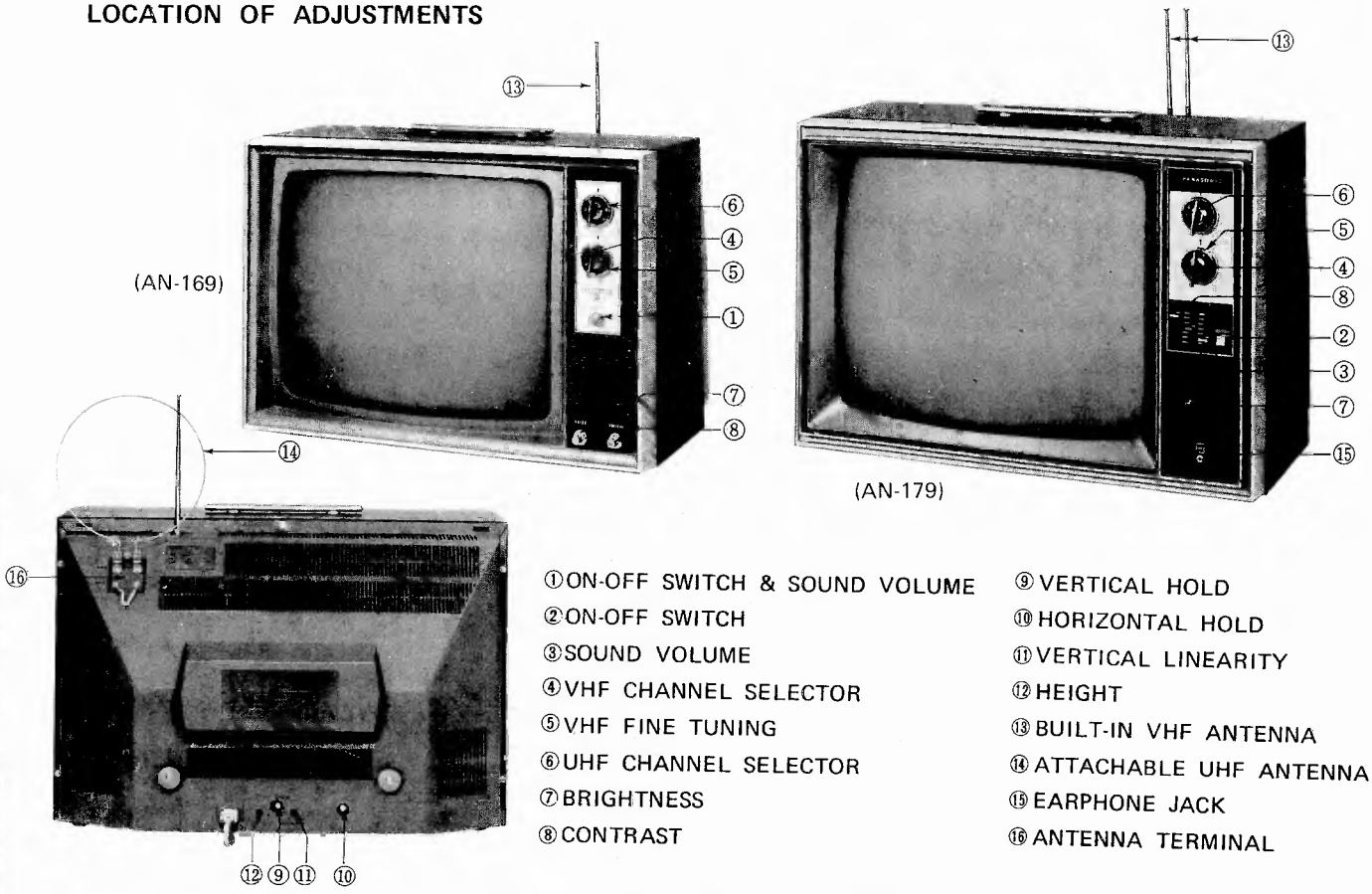
1) Remove the picture tube mounting screws Ⓙ
2) Remove the picture tube carefully.





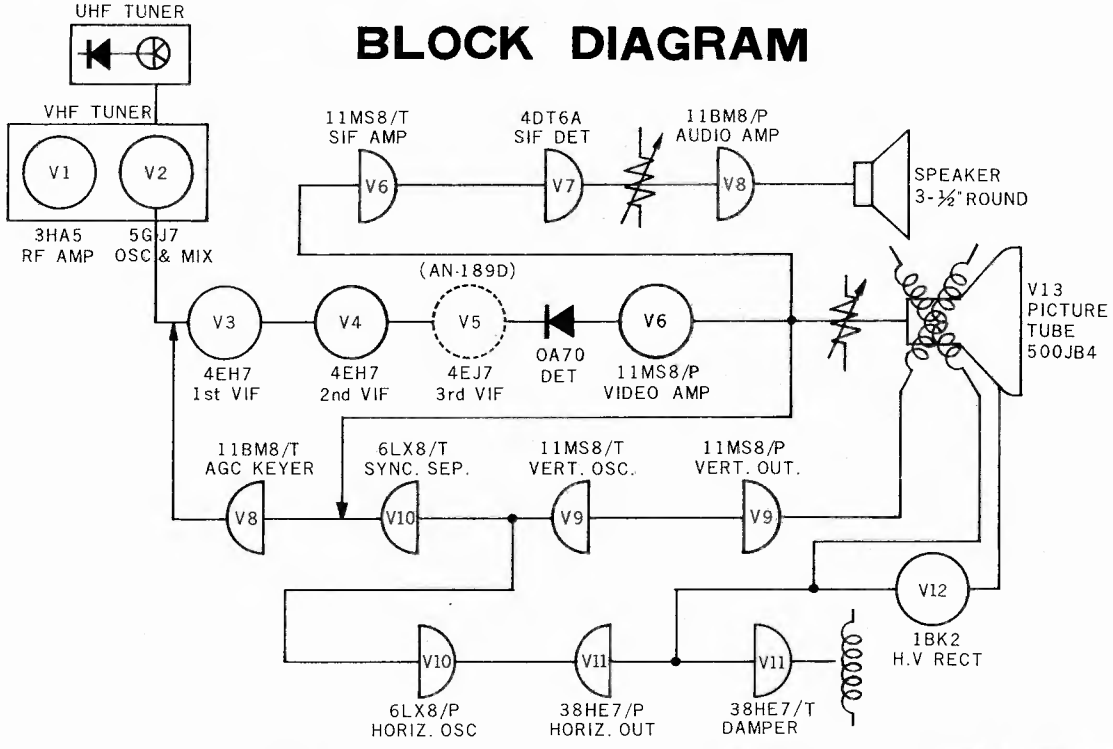
SERVICE ADJUSTMENTS

LOCATION OF ADJUSTMENTS



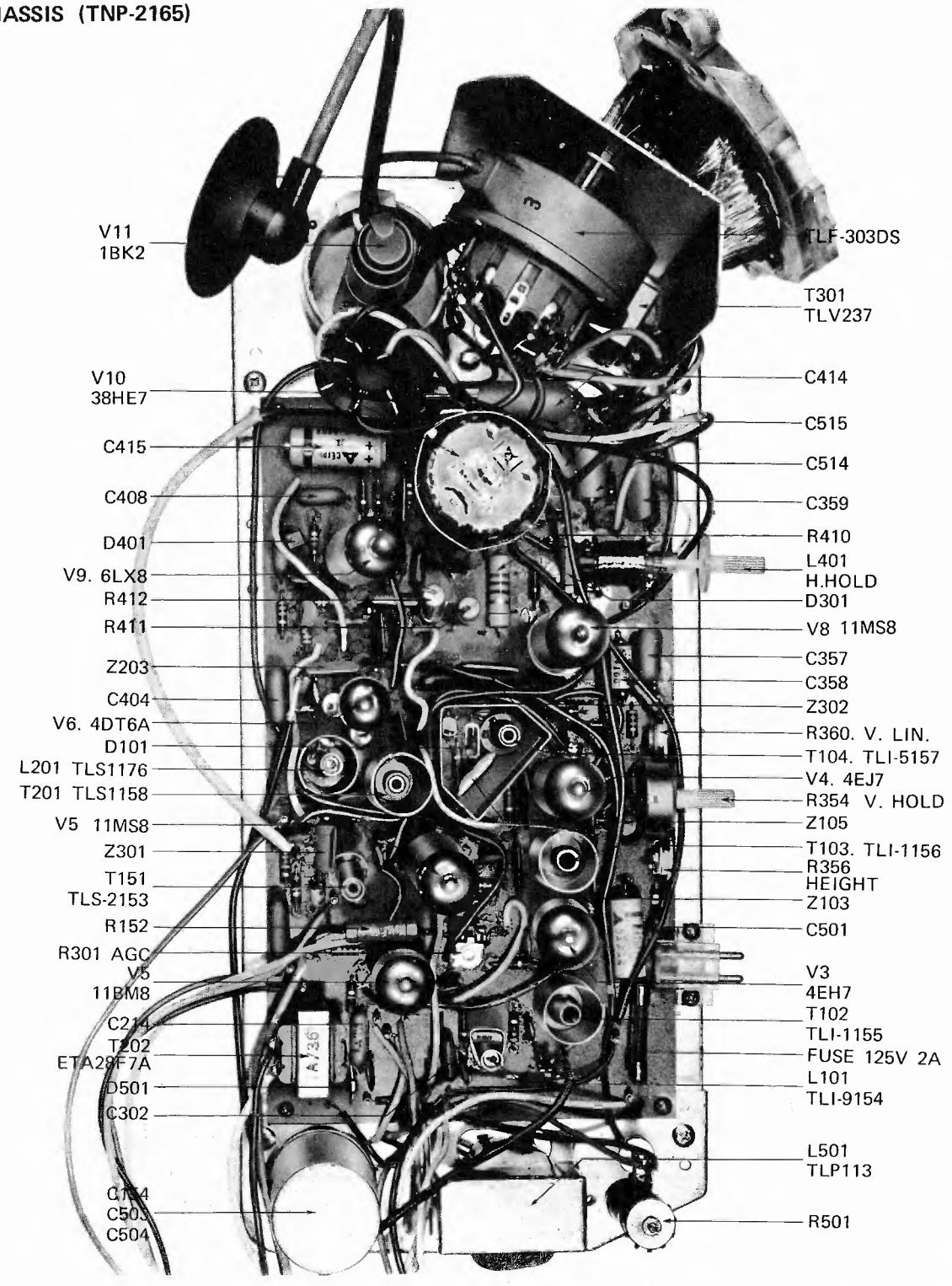
①ON-OFF SWITCH & SOUND VOLUME
②ON-OFF SWITCH
③SOUND VOLUME
④VHF CHANNEL SELECTOR
⑤VHF FINE TUNING
⑥UHF CHANNEL SELECTOR
⑦BRIGHTNESS
⑧CONTRAST
⑨VERTICAL HOLD
⑩HORIZONTAL HOLD
⑪VERTICAL LINEARITY
⑫HEIGHT
⑬BUILT-IN VHF ANTENNA
⑭ATTACHABLE UHF ANTENNA
⑮EARPHONE JACK
⑯ANTENNA TERMINAL

BLOCK DIAGRAM



LOCATION OF PARTS

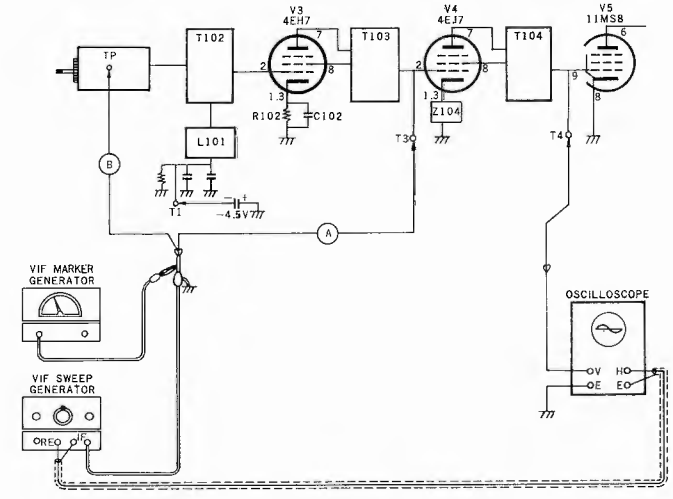
CHASSIS (TNP-2165)



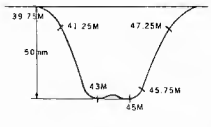
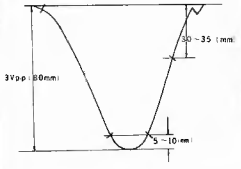
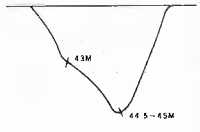
GENERAL ALIGNMENT INSTRUCTIONS

VIDEO I-F ALIGNMENT

1. Apply a −4.5V bias voltage to the AGC circuit (T1) of the VIF as the earth (ground).
2. Connect the vertical terminal of the oscilloscope with G1 (T4) of V5 11MS8.
3. Connect the output terminal of the VIF sweep with G1(T3) of V4 4EJ7, and adjust the Detector Transformer (T104)
4. Next, connect the output terminal of the VIF sweep with the Test Point of the tuner and adjust each step of the transformer.
5. Adjust the 47.25 M trap after adjustment of the VIF's overall wave shape.
6. After adjustment, be sure that abnormal oscillation is not present after the bias is removed.
7. Prior to the adjustments noted above, make the sound volume minimum, and make both the contrast and the brightness maximum.

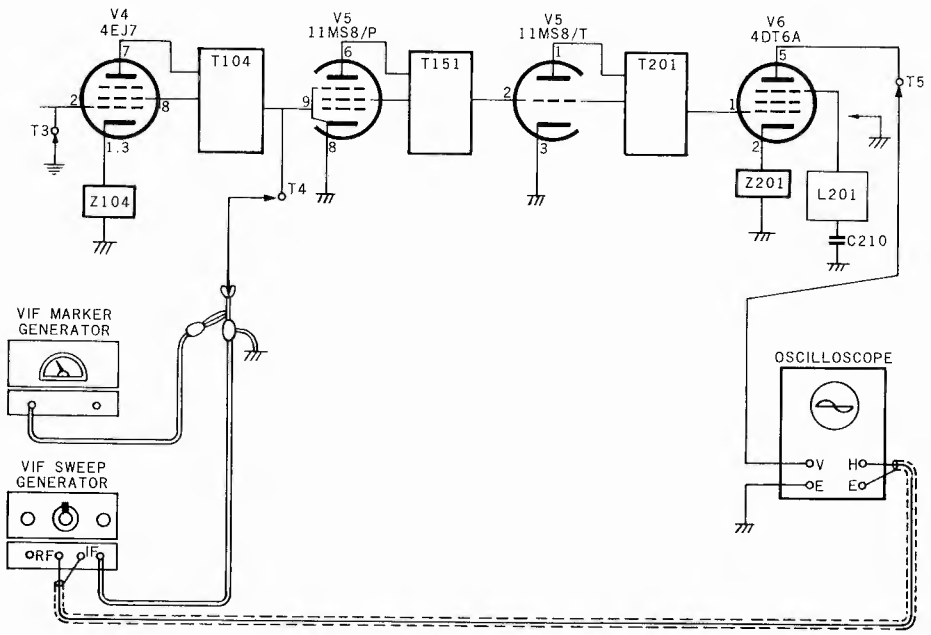


VIDEO IF ALIGNMENT CHART

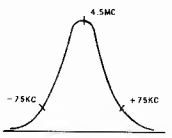
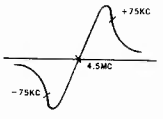
STEP	Ⓐ	Ⓑ		
INJECTION POINT	OSCILLOSCOPE . . . . . T4 SWEEP GENERATOR . T3	OSCILLOSCOPE . . . . . 4 SWEEP GENERATOR . . TUNER T.P.		
ALIGNMENT	T104	T102, T103 & VHF TUNER CONVERTER	L101	
RESPONSE CORVE				
NOTE	TLI-5157 Top & Bottom Cores	TLI-1155(45M) TLI-1156(44.5M) V.Tuner Converter(43M)	TLI-9154(47.25M)	VIF⊖Bias . . 0V

SOUND I-F ALIGNMENT

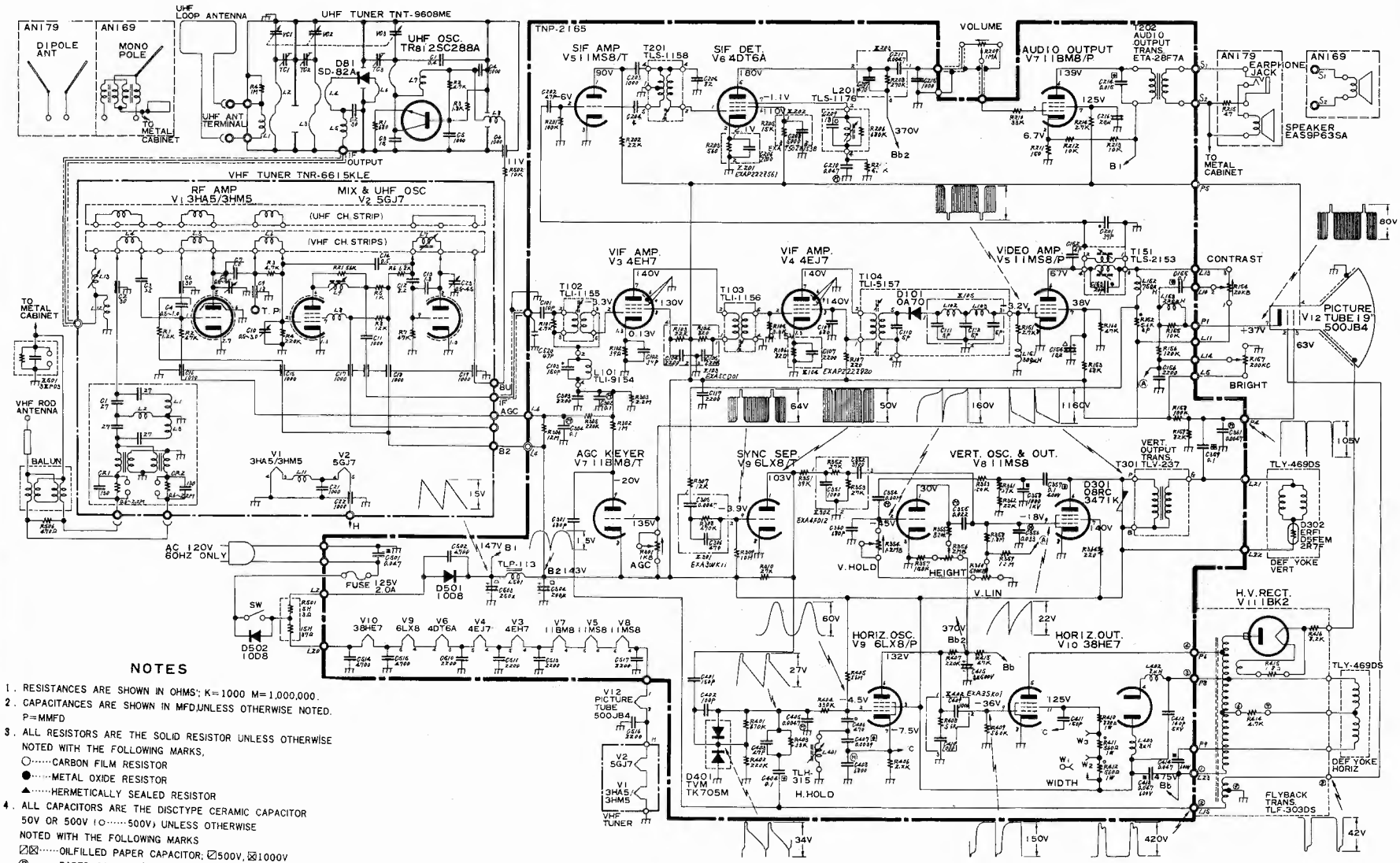
1. Connect the output terminal of the SIF sweep to G1 (T4) of V5 (N919B: V6) 11MS8.
2. Earth G1 (T3) of V4 (N919B: V5) 4EJ7.
3. Connect the input terminal of the oscilloscope with the plate (T5) of V6 (N919B: V7) 4DT6A.
4. Earth G3 of V6 (N919B: V7) 4DT6A.
5. Adjust T151 and T201. Make the response curve maximum.
6. When the adjustment of the SIF AMP is finished, remove the earth of G3 of V6 (N919B: V7) 4DT6A.
7. After adjusting coil L201, make the 4.5M marker come to the center of the inclined part of the S curve.



SOUND I-F ALIGNMENT

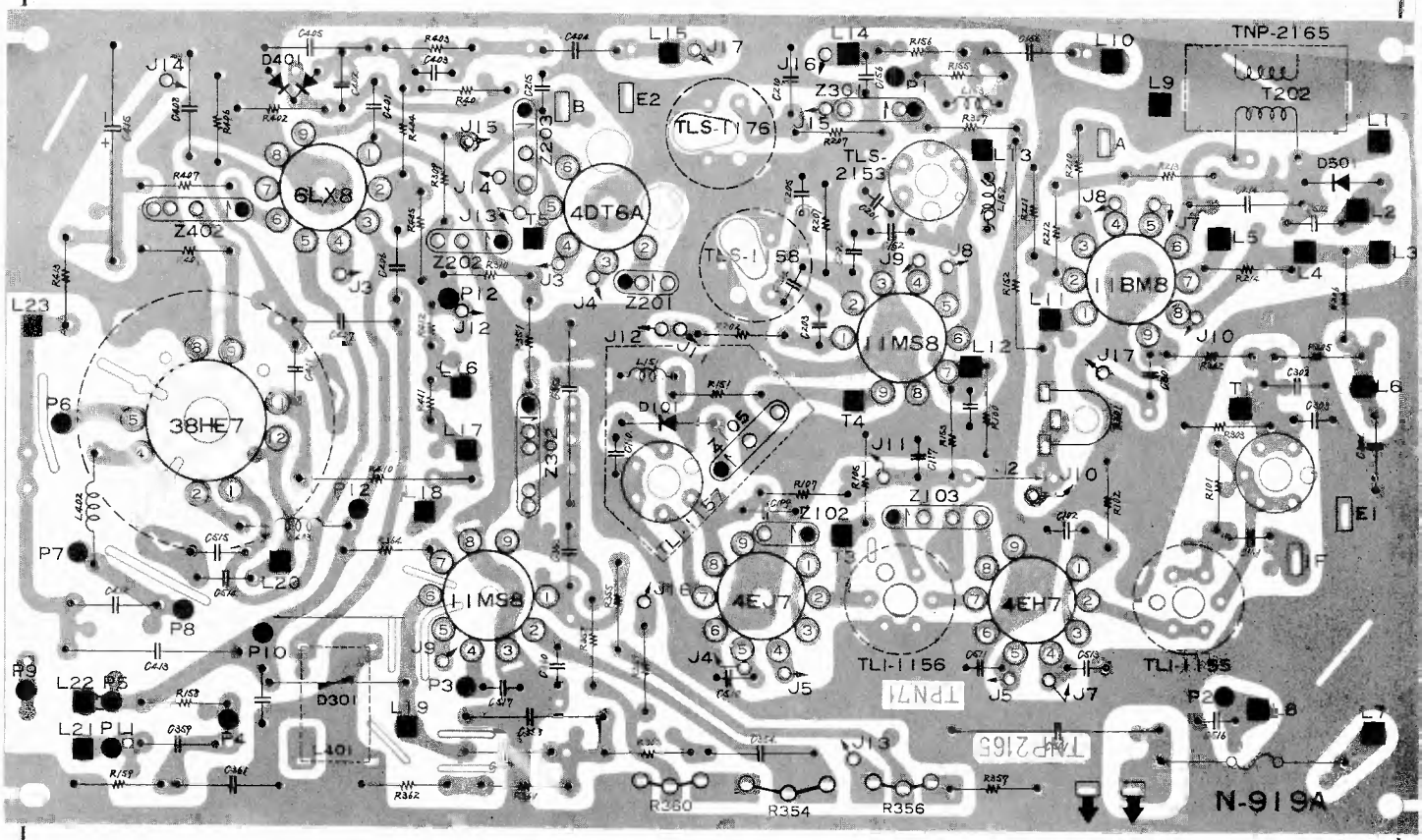
STEP	Ⓐ	Ⓑ
INJECTION POINT	OSCILLOSCOPE . . . . . T5 SWEEP GENERATOR . . T4	OSCILLOSCOPE . . . . . T5 SWEEP GENERATOR . . T4
RESPONSE CORVE		
NOTE	V4 4ET7 G1(T3) . . . Ground V6 4DT6 (T5) . . . . . Ground	V4 4EJ7 G1(T3). . . . Ground V6 4DT6 (T5) . . . . . Disconnect Ground

SCHEMATIC DIAGRAM AN-169 & AN-179

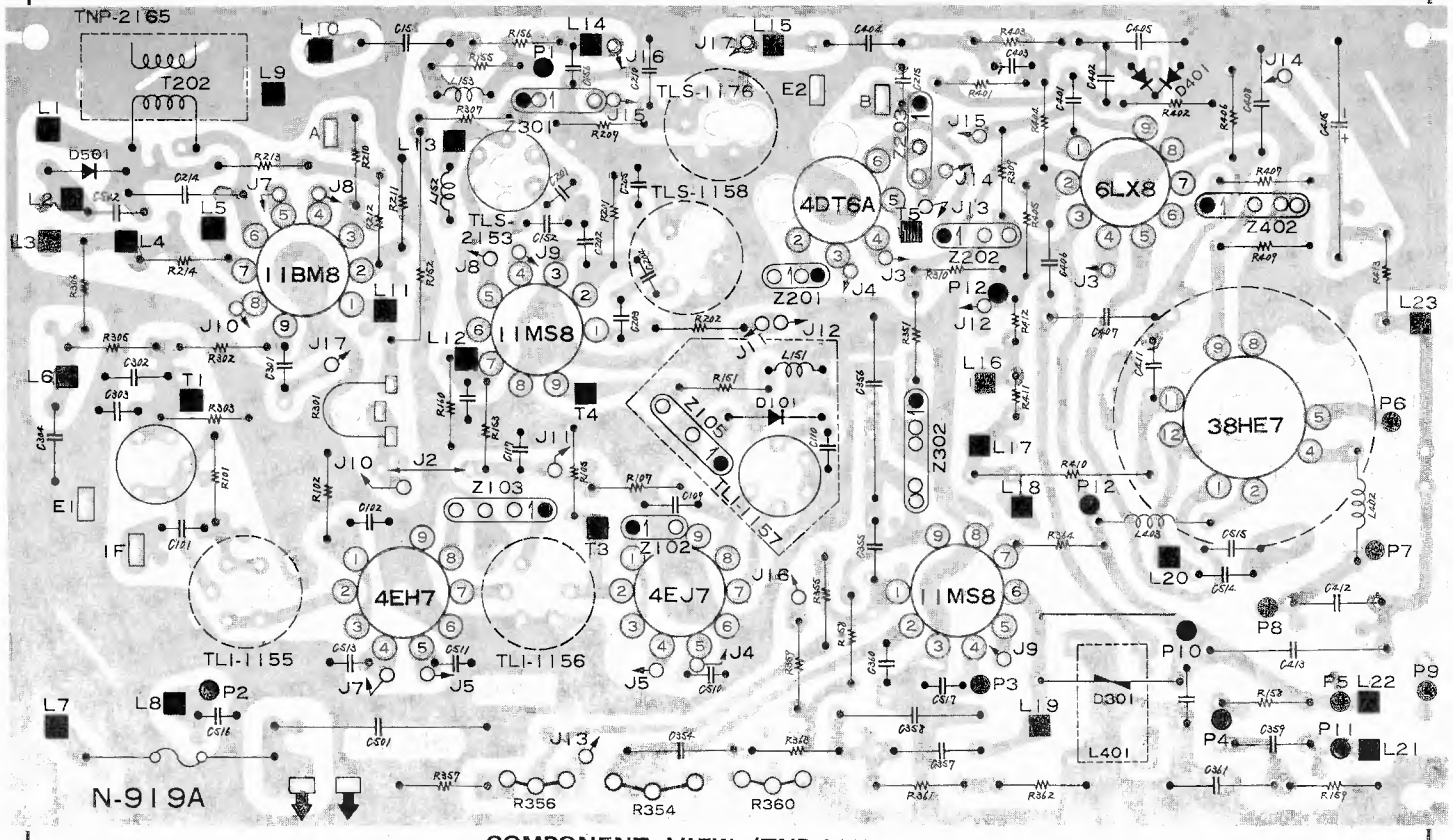


NOTES

1. RESISTANCES ARE SHOWN IN OHMS; K=1000 M=1,000,000.
2. CAPACITANCES ARE SHOWN IN MFD.UNLESS OTHERWISE NOTED. P=MMFD
3. ALL RESISTORS ARE THE SOLID RESISTOR UNLESS OTHERWISE NOTED WITH THE FOLLOWING MARKS,
   - ○……CARBON FILM RESISTOR
   - ●……METAL OXIDE RESISTOR
   - ▲……HERMETICALLY SEALED RESISTOR
4. ALL CAPACITORS ARE THE DISCTYPE CERAMIC CAPACITOR 50V OR 500V (○……500V) UNLESS OTHERWISE NOTED WITH THE FOLLOWING MARKS
   - ◪⊠……OILFILLED PAPER CAPACITOR; ◪500V, ⊠1000V
   - Ⓟ……PAPER CAPACITOR; 400V
   - Ⓢ……POLYSTYRENE CAPACITOR
   - ⓃⓂ△Ⓜ……POLYESTER CAPACITOR; Ⓝ50V, Ⓜ100V △400V, Ⓜ600V
5. TOLERANCES OF RESISTANCE J……±5%,OTHERWISE ±10%
   TOLERANCES OF CAPACITANCE J……±5%,OTHRWISE ±10% OR 20%
   RESISTORSWITHOUT WATTAGE INDICATION ARE ¼ WATT OR ½WATT
6. VOLTAGES ARE WITH SIGNAL
   - ▲……NO SIGNAL



CONDUCTOR VIEW (TNP-2165: N919A)



COMPONENT VIEW (TNP-2165: N919A)

PANASONIC

MATSUSHITA ELECTRIC CORP. OF AMERICA

MODEL TR-415B AND TR-415BC

Fig. 3-1

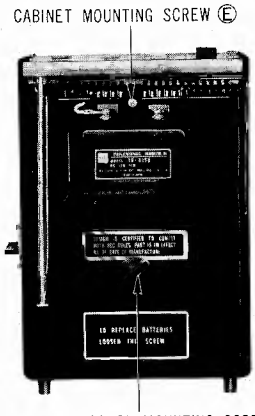


Fig 3-3

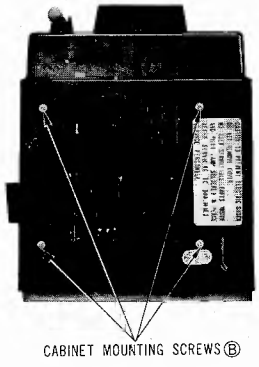


Fig. 3-2

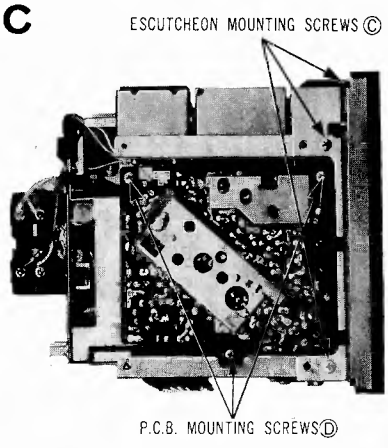
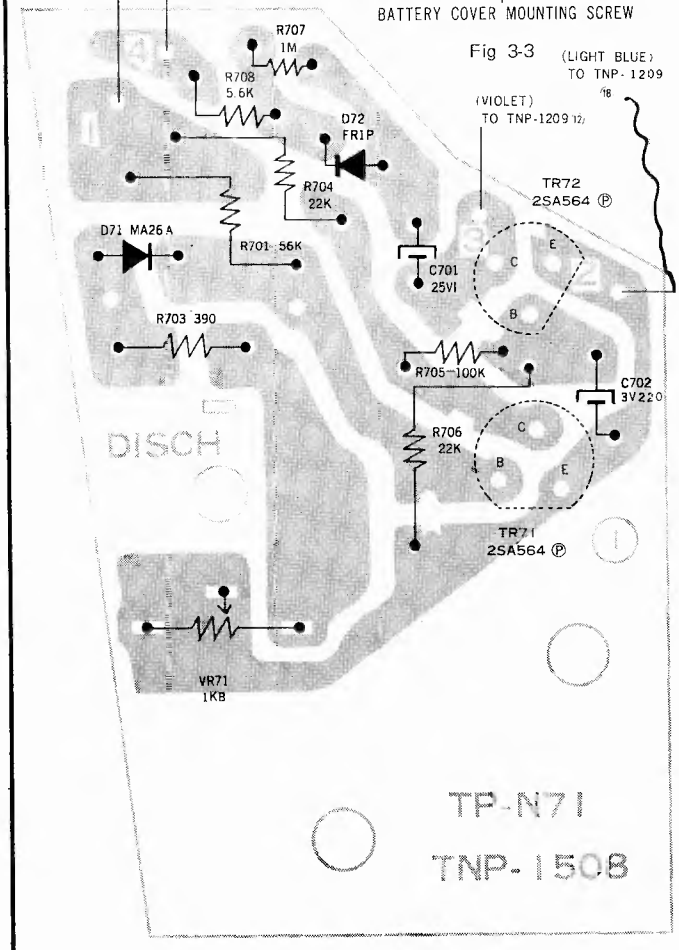


Fig 3-4



ADDP CIRCUIT BOARD (TNP-1508)

CONDUCTOR VIEW

DISASSEMBLY INSTRUCTIONS

CABINET (Fig. 3-1 , Fig. 3-2 , Fig. 3-3)

(1) Remove two screws Ⓐ from the cabinet and four screws Ⓑ at the bottom and one screw Ⓔ at the back of the cabinet.

(2) The cabinet may now be easily removed.

ESCUTCHEON (Fig. 3-4)

(1) Remove four screws Ⓒ under front section of the cabinet and on both side of the cabinet.

(2) The escutcheon may now be easily removed by pulling it upward.

PICTURE TUBE

(1) Remove the cabinet and escutcheon.

(2) Disconnect the picture tube socket, anode cap, green wire and yellow wire.

(3) Unsolder the black wire. Pull the picture tube forward and remove the picture tube mounting screws.

INSPECTION OR REMOVAL OF CIRCUIT BOARD

(A) VIDEO AND SOUND IF SECTION (TNP-1114-12) (Fig. 3-4)

To inspect conductor side, remove the cabinet
To inspect component side, remove three red screws Ⓓ.
To remove entire board, pull it out of its 8P multiple connector.
Unplug two connecting wires and one shielded cable.

(B) DEFLECTION SECTION (TNP-1318S)

To inspect conductor side, remove the cabinet.
To inspect component side, remove three red screws.
To remove entire board, unplug two wires on component side and carefully pull it out of its 16P multiple connector.

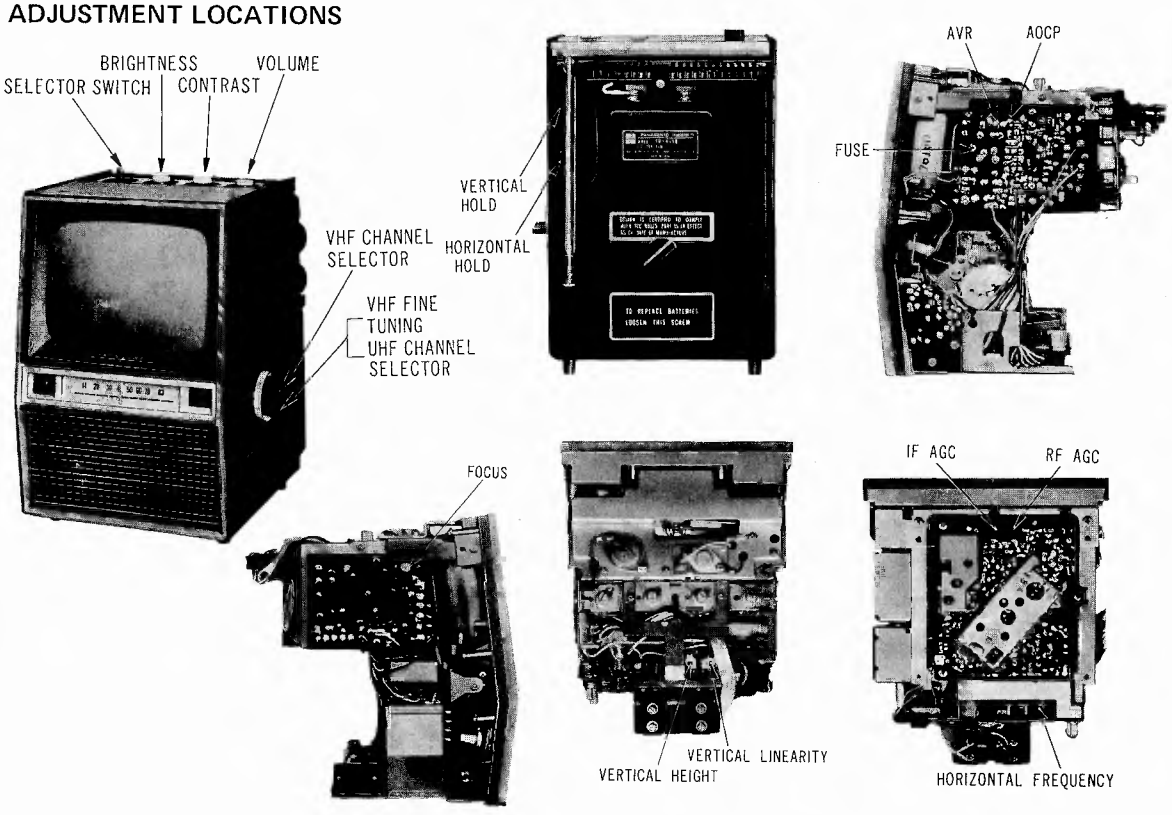
(C) SOUND OUTPUT AND AOCP SECTION (TNP-1209)

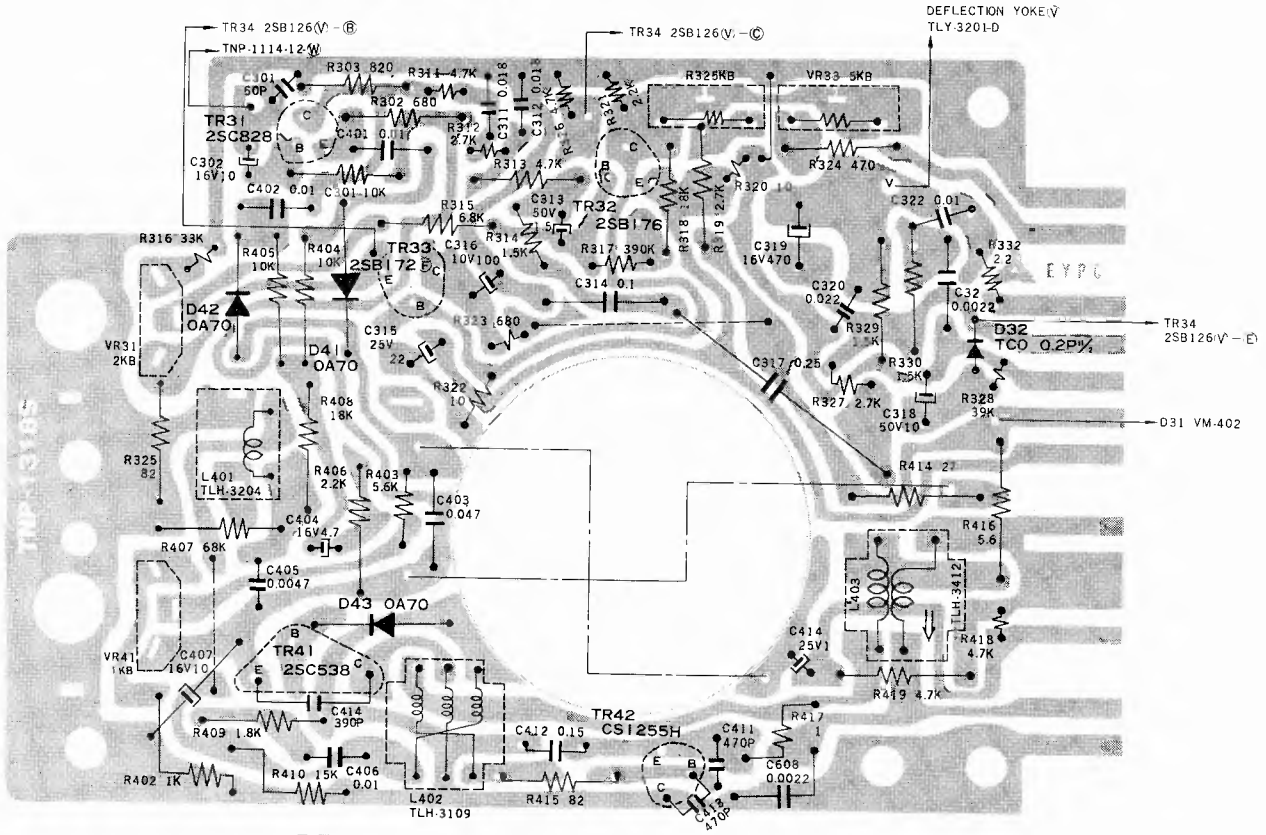
To inspect conductor side, remove the cabinet.
To inspect component side, remove three red screws.
To remove entire board, unplug two wires and unsolder wires and one shielded cable.

(D) FBT SECTION (TNP-1915)

To inspect conductor side, remove the cabinet.
To inspect component side, remove three red screws.
To remove entire board, unsolder wires and unplug one wire.

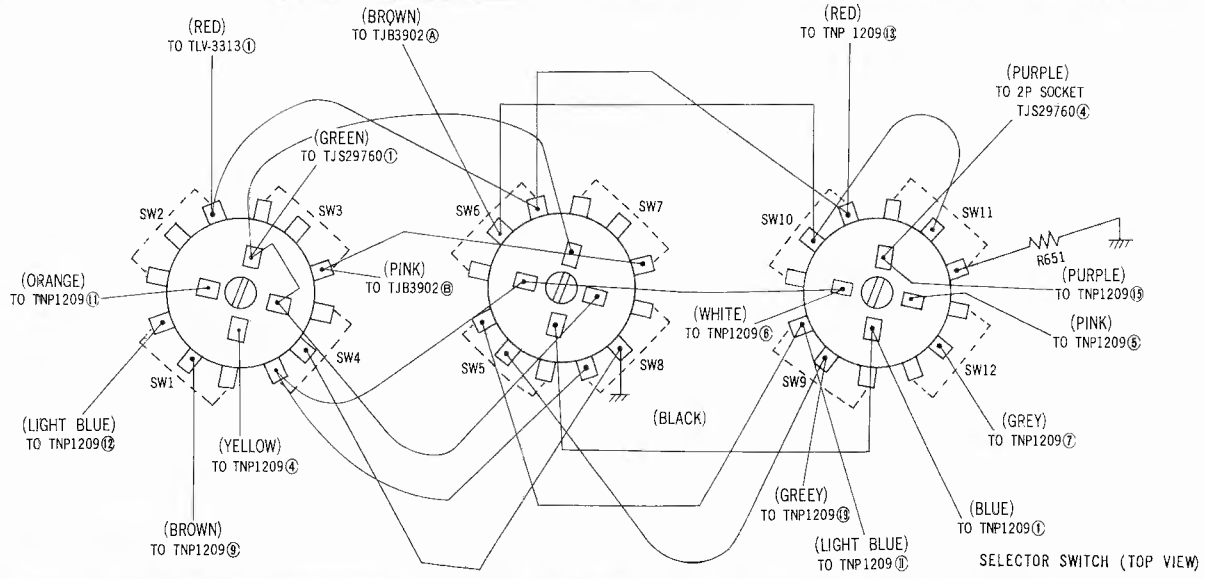
ADJUSTMENT LOCATIONS

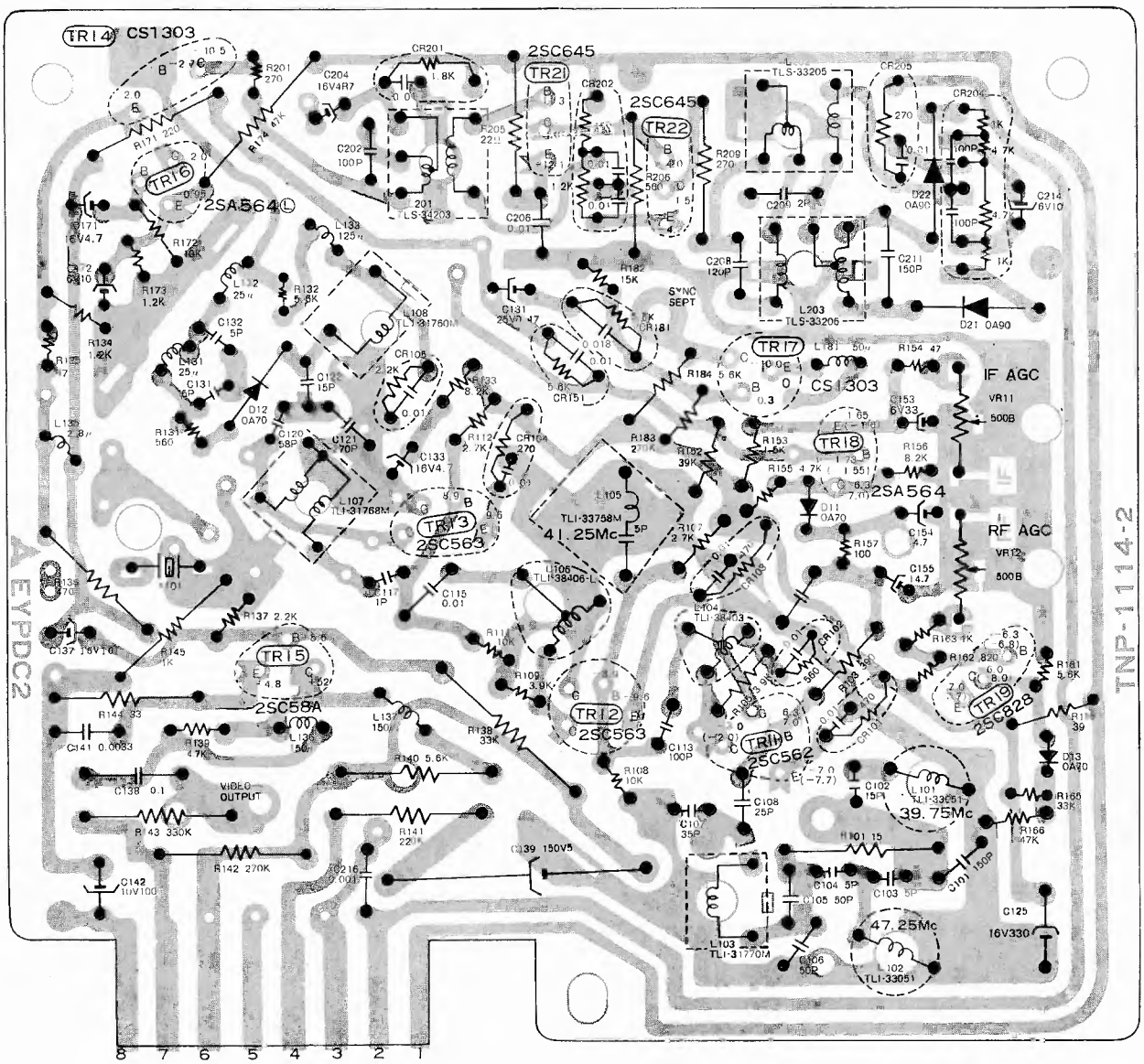




DEFLECTION CIRUCUIT BOARD (TNP-1318S)

CONDUCTOR VIEW

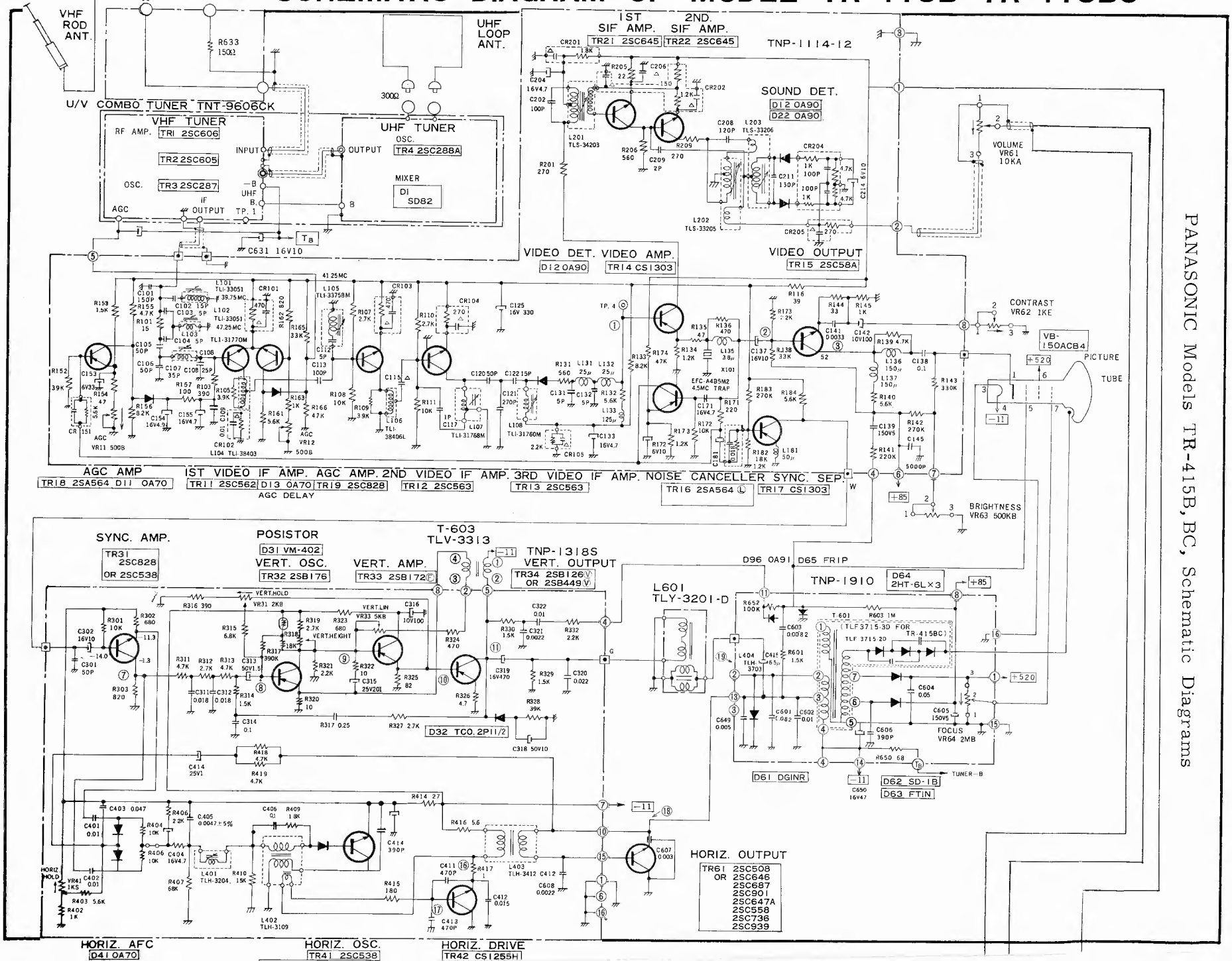


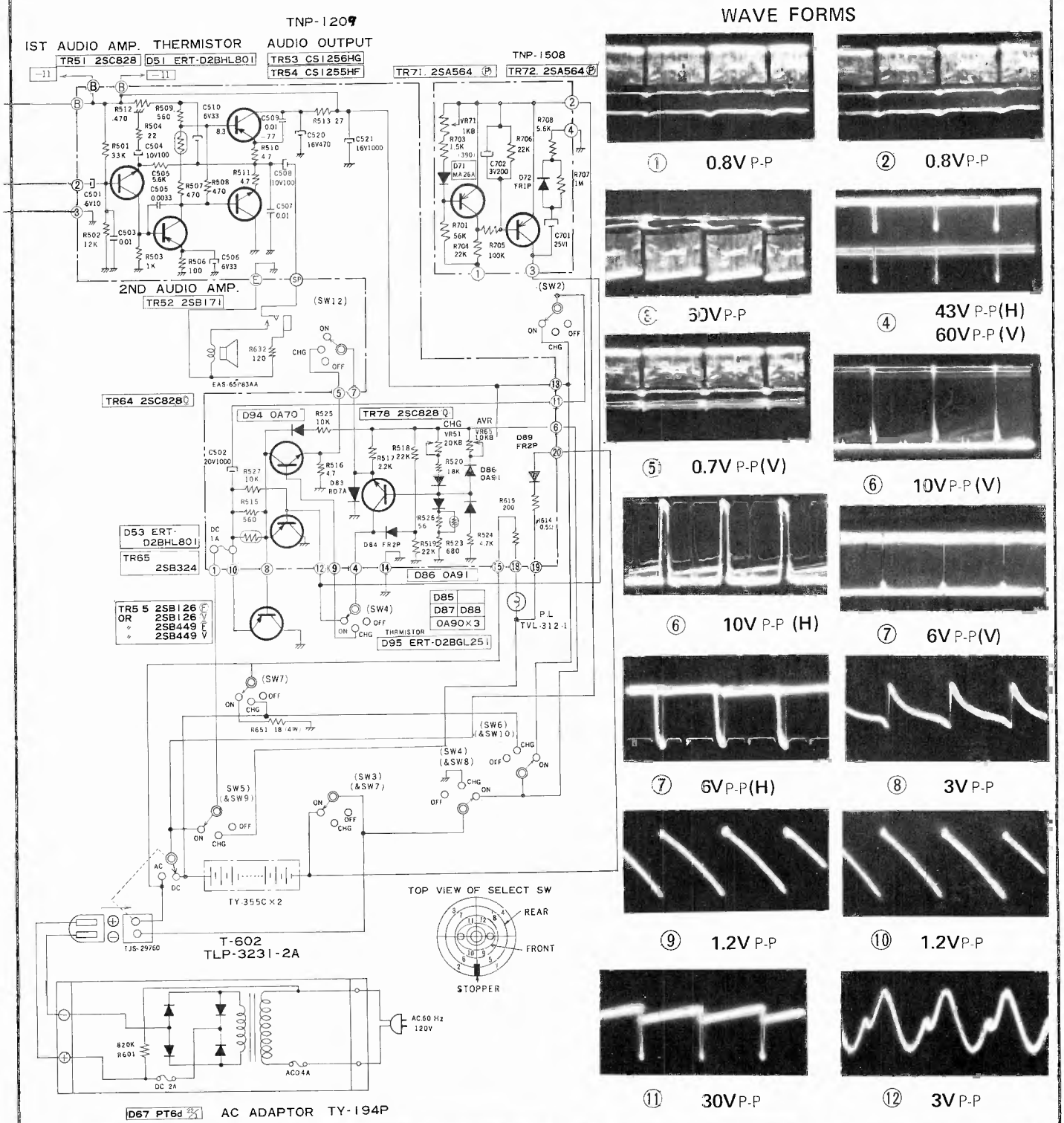


VIDEO AND SOUND IF CIRCUIT BOARD (TNP-1114-12)

CONDUCTOR VIEW

SCHEMATIC DIAGRAM OF MODEL TR-415B TR-415BC





WAVE FORMS

① 0.8V P-P

② 0.8V P-P

③ 30V P-P

④ 43V P-P (H)
60V P-P (V)

⑤ 0.7V P-P (V)

⑥ 10V P-P (V)

⑥ 10V P-P (H)

⑦ 6V P-P (V)

⑦ 6V P-P (H)

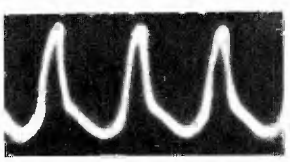
⑧ 3V P-P

⑨ 1.2V P-P

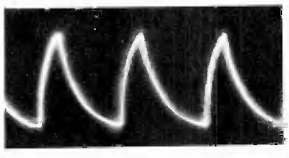
⑩ 1.2V P-P

⑪ 30V P-P

⑫ 3V P-P

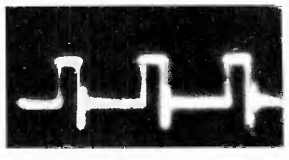


⑬ 8V P-P

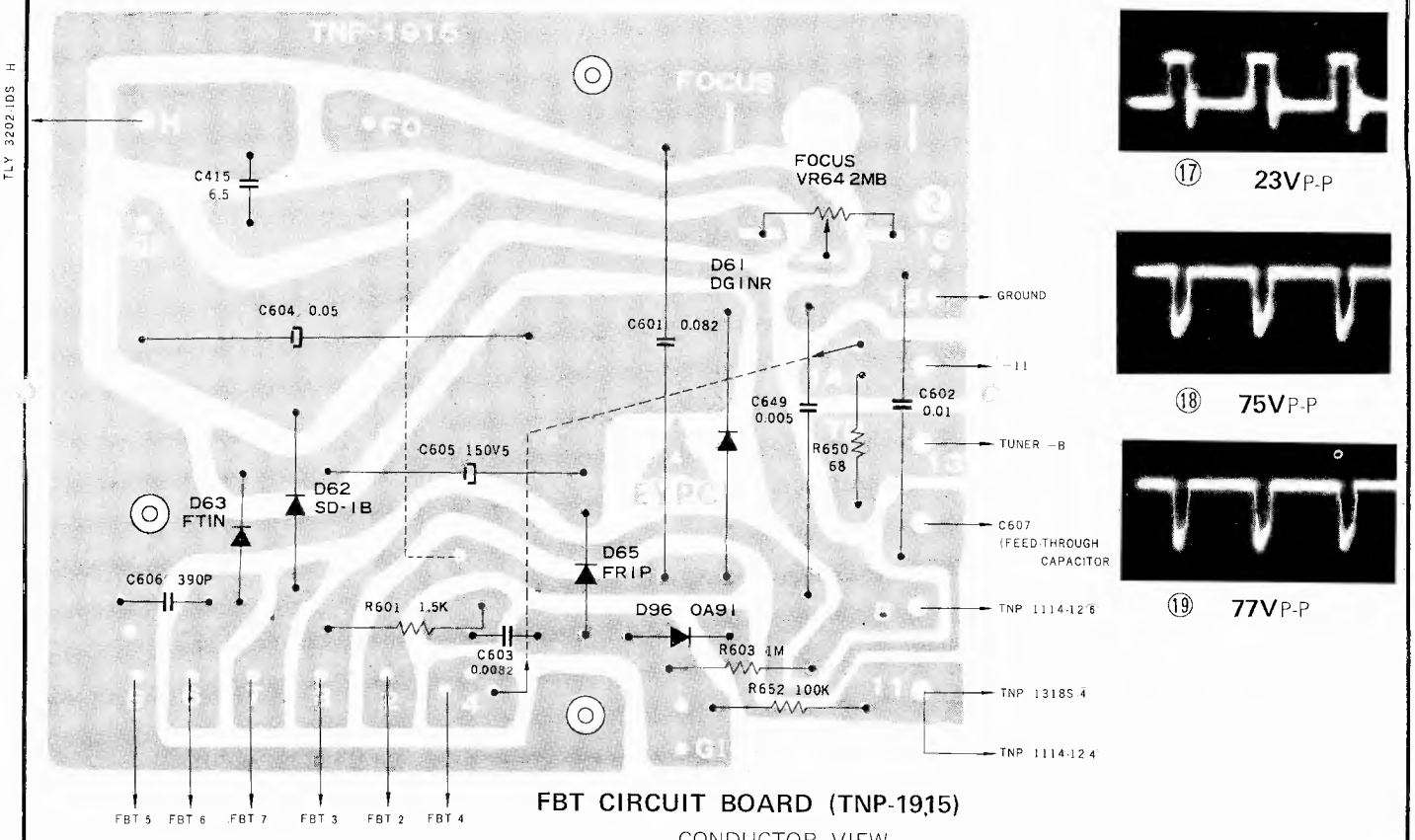


⑭ 6.6V P-P

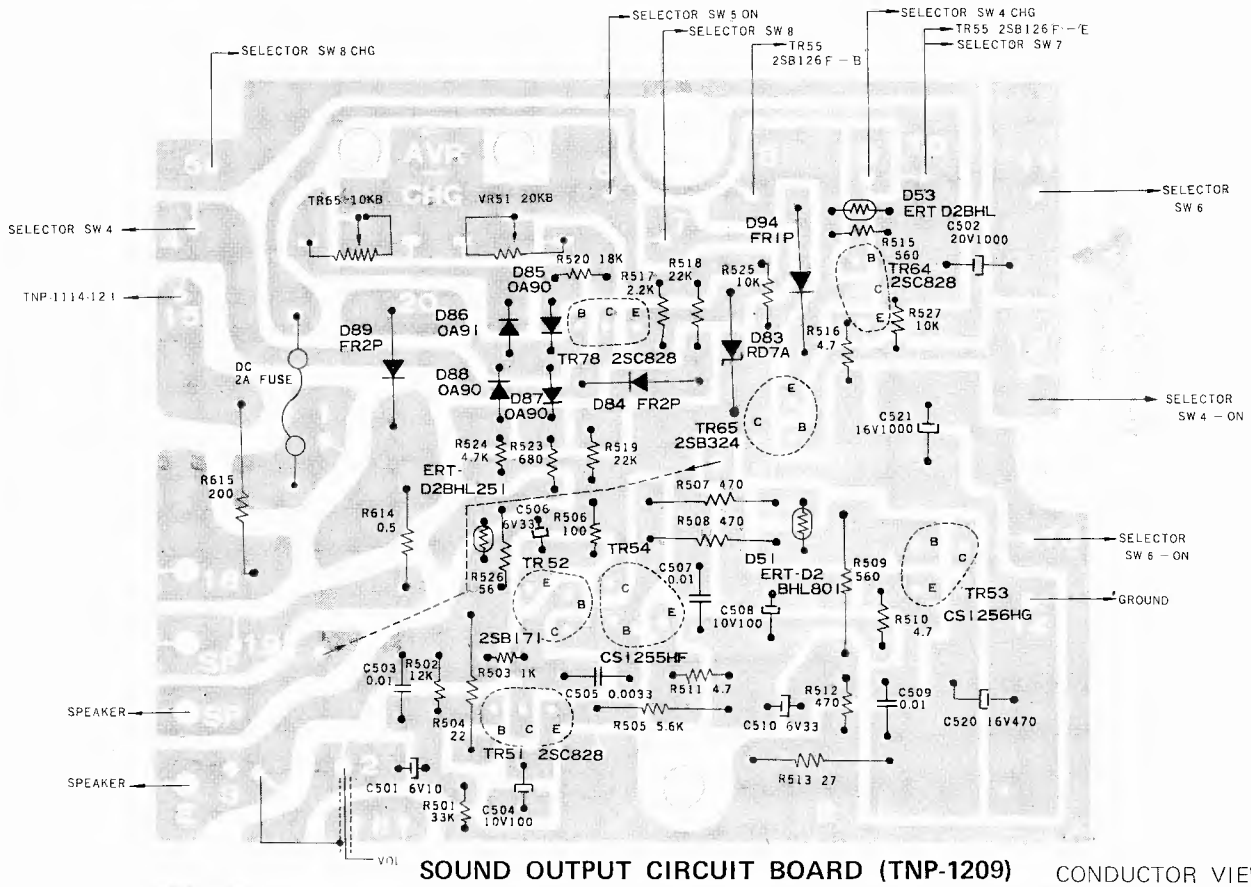
⑮ 14V P-P



⑯ 22V P-P



FBT CIRCUIT BOARD (TNP-1915) CONDUCTOR VIEW

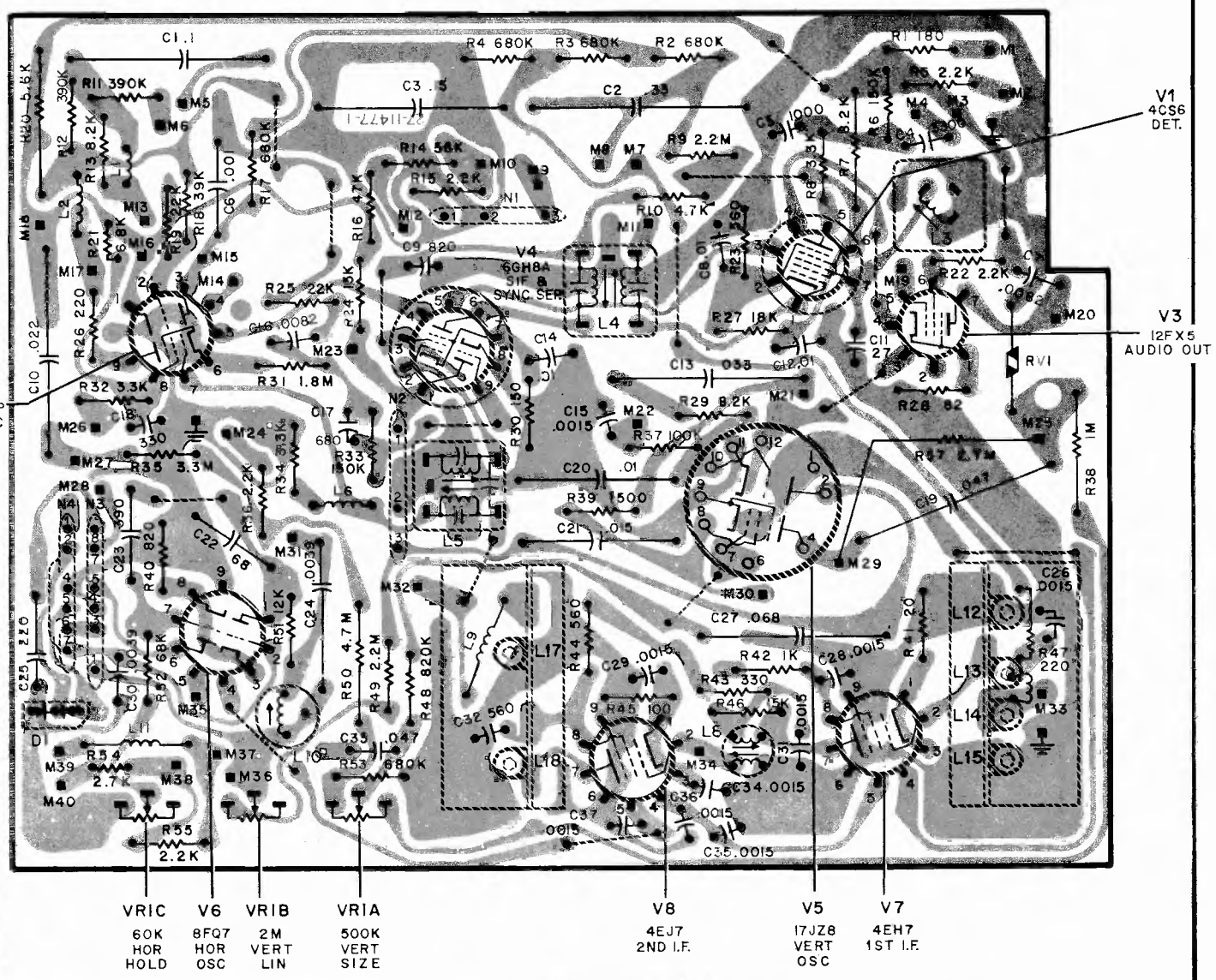


SOUND OUTPUT CIRCUIT BOARD (TNP-1209) CONDUCTOR VIEW

PHILCO Ford

"S" LINE

Chassis 19L21 used in Models S1240TN, S1260BR, S1262BK,,WH, S1264WD, S1265WA, has applicable service material on pages 95 through 98.
Chassis 19P22 used in Models S2732WH, S2734WH, see pages 99 through 102.
Chassis 19S32 used in Model S3804WA, material on pages 103 through 106.

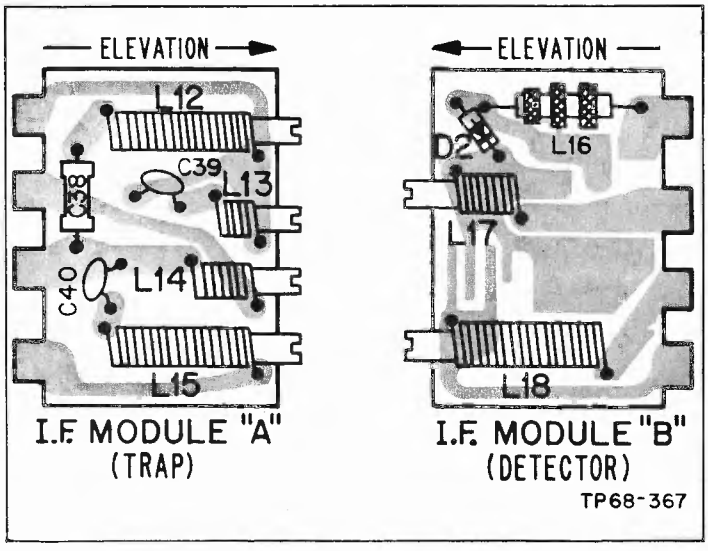


Bottom View Perma Circuit Panel--19L21 Chassis

RESISTANCE CHART

SYMBOL	TUBE	FUNCTION	PIN NUMBERS											
			1	2	3	4	5	6	7	8	9	10	11	12
V1	4CS6	Sound Detector	5.5Ω	560Ω	FIL.	FIL	200K	12K	2.5Ω					
V2	10JY8	Video Amp. & Gated AGC	4.5K	25K	1.8M	FIL	FIL	0Ω	3.3K	14K	10K			
V3	12FX5	Audio Output	82Ω	0Ω	FIL	FIL	0Ω	16K	14K					
V4	6GH8A	Snd. IF & Sync. Sep.	15K	3Ω	13K	FIL	FIL	13K	150Ω	0Ω	1.9M			
V5	17JZ8	Vert. Osc.	FIL	3.5M	INF.	14K	INF.	1.3M	1.3M	14K	0Ω	150K	0Ω	FIL
V6	8FQ7	Horiz. Osc.	23K	2.1M	820Ω	FIL	FIL	40K	120K	820Ω	0Ω			
V7	4EH7	1st Video IF	20Ω	600K	20Ω	FIL	FIL	0Ω	14K	26K	0			
V8	4EJ7	2nd Video IF	100Ω	0Ω	100	FIL	FIL	0Ω	14K	14K	0Ω			
V9	38EH7	Horiz. Out & Damper	FIL	13K	NC	8M	8M	NC	NC	0Ω	330K	NC	18K	FIL

*Depends on meter polarity



IF Trap & Detector Modules

19L21 PANEL LUG CONNECTIONS

FROM	TO	FROM	TO
M1	C11T TT-164B, TT-164C C6T TT-170	M20	A.O.T. (BLUE)
		M21	YOKE-#4
M2	VR4-#1	M22	VR5-#1
M3	VR3-#1	M23	SYNC T.P.
M4	VR2-#3 (AUDIO T.P.)	M24	FOCUS +225V
M5	VR4-#2	M25	R57
M6	VR3-#2	M26	C41-C, FOCUS +100V
M7	I.F. TEST POINT	M27	H.O.T.-#1
M8	C17T TT-164B, TT-164C C8T TT-170	M28	V9-#9
		M29	V.O.T. (BLUE) & R57
M9	VR5-#2	M30	V.O.T. (RED)
M10	CRT-#6	M31	HORIZ. OSC. T.P.
M11	L4-1 (SND T.P.)	M32	2ND DET. TEST
M12	CRT-#3	M33	J1T
M13	CRT-#7	M34	V8-#2
M14	V9-#12	M35	CRT-#1
M15	YOKE-#11	M36	C41-B
M16	M37 & C41-A	M37	M16
M17	VR4-#3	M38	WIDTH ADJ. LINK
M18	N/C	M39	V9-#2
M19	VR2-#2	M40	V9-#11

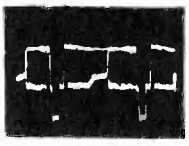
PANEL INTERCONNECTING LEADS

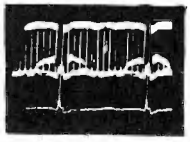
A TO A
B TO B
C TO C
D TO D
E TO F

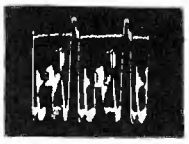
POINTS ARE INDICATED BY BALLOONS Ⓐ, Ⓑ ETC.

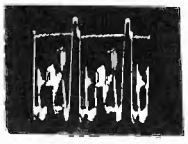
OSCILLOSCOPE WAVEFORMS

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 1450 B&K Oscilloscope.

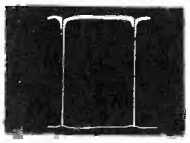

❶ 4 Volts p/p, 15,750 Hz (max contrast)

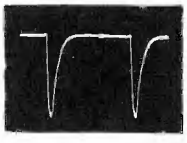

❷ 4 Volts p/p, 60 Hz (max contrast)


❸ 90 Volts p/p, 15,750 Hz (max contrast)


❹ 80 Volts p/p, 15,750 Hz


❺ 80 Volts p/p, 60 Hz


❻ 50 Volts p/p, 60 Hz


❼ 50 Volts p/p, 15,750 Hz

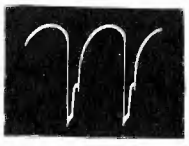

❽ 48 Volts p/p, 60 Hz

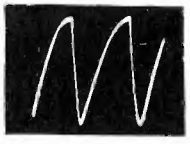

❾ 60 Volts p/p, 60 Hz

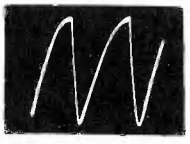

❿ 45 Volts p/p, 60 Hz


⓫ 1000 Volts p/p total, 180 Volts p/p, sawtooth, 60 Hz

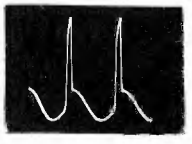

⓬ 55 Volts p/p, 60 Hz

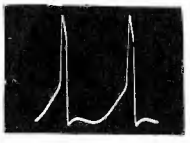

⓭ 8 Volts p/p, 15,750 Hz


⓮ 11 Volts p/p, 15,750 Hz

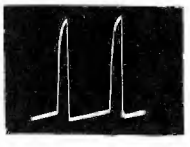

⓯ 14 Volts p/p, 15,750 Hz

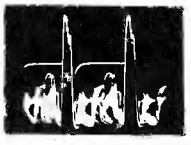

⓰ 11 Volts p/p, 15,750 Hz

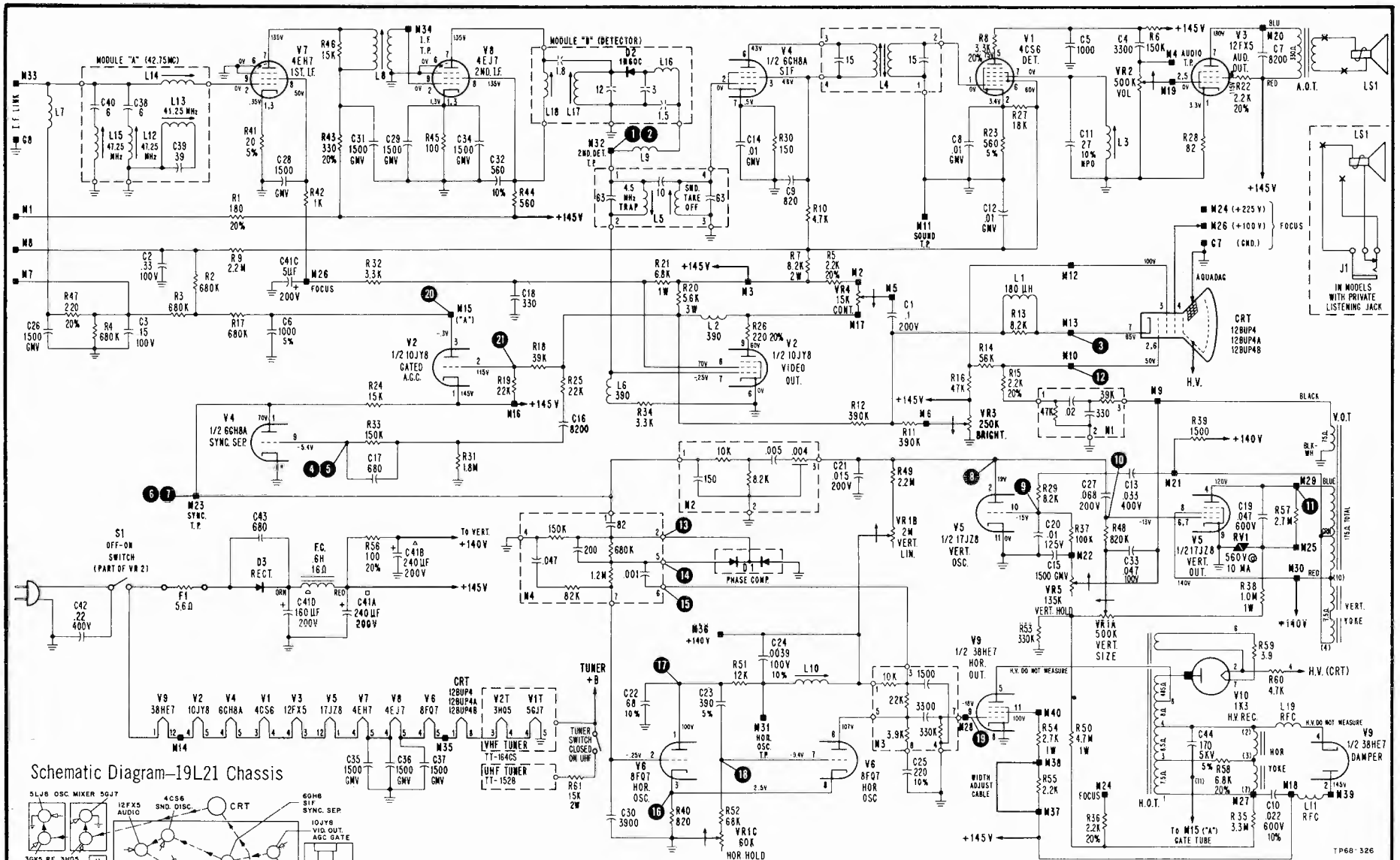

⓱ 45 Volts p/p, 15,750 Hz


⓲ 45 Volts p/p, 15,750 Hz

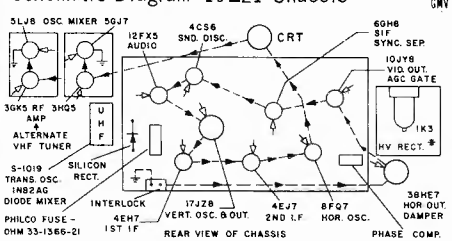

⓳ 86 Volts p/p, 15,750 Hz


⓴ 400 Volts p/p, 15,750 Hz


㉑ 50 Volts p/p, 15,750 Hz



Schematic Diagram—19L21 Chassis



Dotted lines indicate filament string

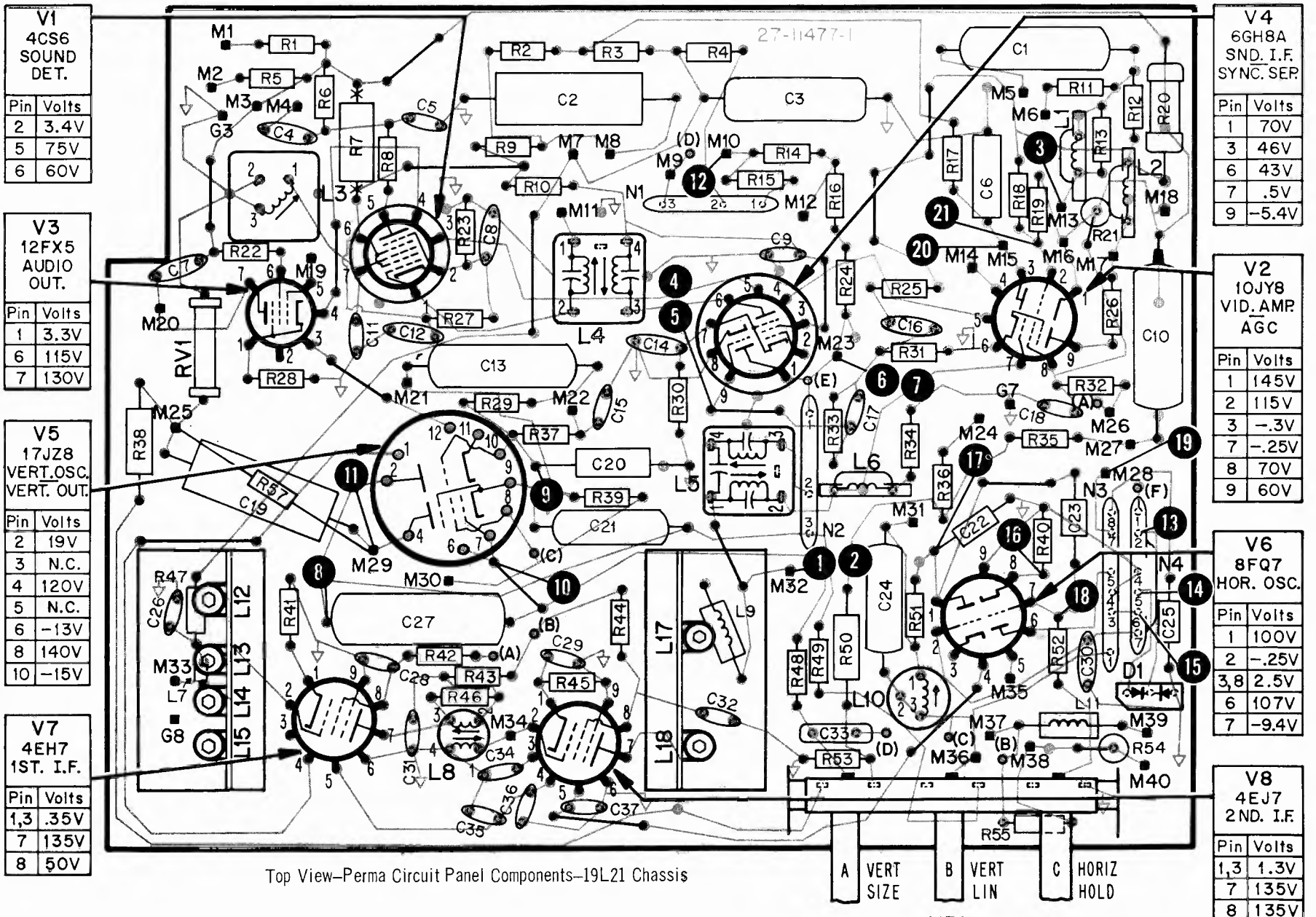
* This tube in high voltage cage

Note: Arrows at socket circles indicate large spacing on miniature tubes, or key position on other tubes.

Filament Connection—19L21 Chassis

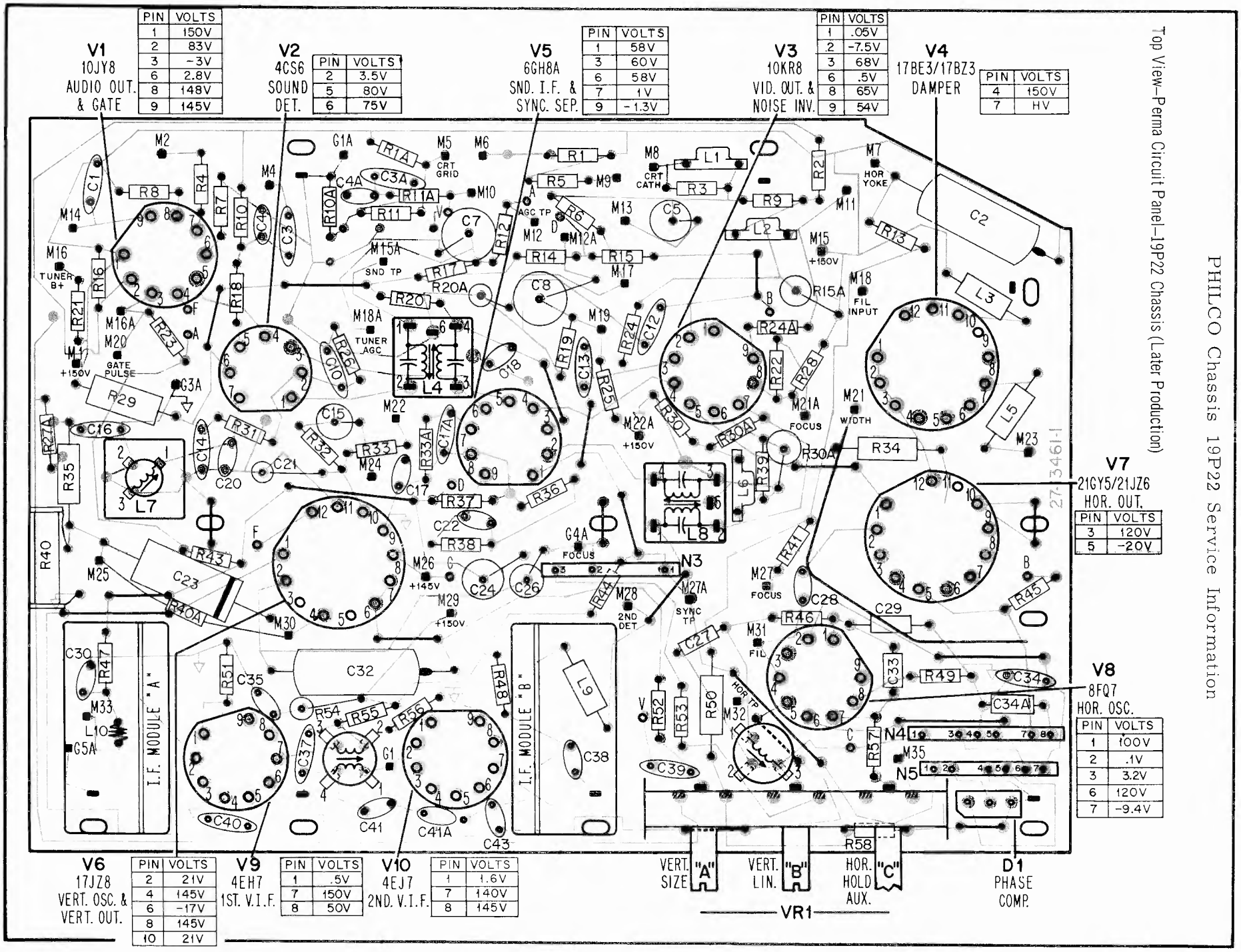
NOTES:
1. ALL VOLTAGES TAKEN UNDER NO SIGNAL CONDITIONS. ANTENNA REMOVED AND TUNER OFF CHANNEL.
2. VOLTAGES MEASURED WITH A V.T.V.M. FROM POINT INDICATED TO CHASSIS GROUND.
3. COIL RESISTANCES READ WITH COIL IN CIRCUIT.
4. BALLOONS (10) (11) ETC. SHOWN ON SCHEMATIC INDICATE WAVEFORM TEST POINTS.
5. CONTROL SETTINGS:
   - VOLUME - MINIMUM
   - CONTRAST - MID-RANGE
   - BRIGHTNESS - MID-RANGE
   - ALL OTHER CONTROLS SET FOR NORMAL OPERATION.

PHILCO Chassis 19L21 Schematic Diagram



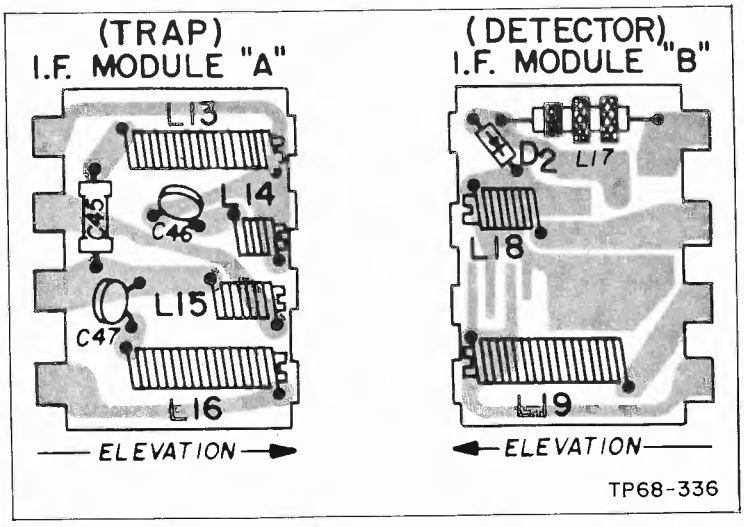
Top View–Perma Circuit Panel Components–19L21 Chassis

Top View–Perma Circuit Panel–19P22 Chassis (Later Production)



VOLTAGE AND RESISTANCE CHART

TUBE	USE	PIN NUMBERS											
		1	2	3	4	5	6	7	8	9	10	11	12
V1 10JY8	Aud. Out. & Gate	150V 12KΩ	83V 36KΩ	−3V 1.3MΩ	FIL	FIL	2.8V 100Ω	0V 260Ω	148V 12KΩ	145V 12KΩ			
V2 4CS6	Sound Detector	0V 6Ω	3.5V 500Ω	FIL	FIL	80V 200KΩ	75V 12KΩ	0V 3.5Ω					
V3 10KR8	Video Out. & N.I.	.05V 300Ω	−7.5V 900KΩ	68V 35KΩ	FIL	FIL	.5V 15Ω	0V 300Ω	65V 25KΩ	54V 12KΩ			
V4 17BE3	Damper	FIL	INF	INF	150V 12KΩ	INF	INF	HV 9MΩ	INF	INF	150V 12KΩ	INF	FIL
V5 6GH8	Snd. IF & Sync. Sep.	58V 12KΩ	0V 2Ω	60V 12KΩ	FIL	FIL	58V 12KΩ	1V 270Ω	GND	−1.3V 1.9MΩ			
V6 17JZ8	Vert. Osc. & Output	FIL	21V 3.8MΩ	INF	145V 12KΩ	INF	−17V 1.8MΩ	−17V 1.8MΩ	145V 12KΩ	GND	−21V 200KΩ	GND	FIL
V7 21GY5	Horiz. Output	FIL	INF	120V 12KΩ	0V GND	−20V 300KΩ	120V 12KΩ	120V 12KΩ	120V 12KΩ	−20V 300KΩ	0V GND	120V 12KΩ	FIL
V8 8FQ7	Horiz. Osc.	100V 25KΩ	.1V 2.2MΩ	3.2V 750Ω	FIL	FIL	120V 45KΩ	−9.4V 95KΩ	3.2V 750Ω	GND			
V9 4EH7	1st Vid. IF	.5V 24Ω	0V 420KΩ	.5V 24Ω	FIL	FIL	GND	150V 12KΩ	50V 20KΩ	GND			
V10 4EJ7	2nd Vid. IF	1.6V 100Ω	0V 0Ω	1.6V 100Ω	FIL	FIL	GND	150V 12KΩ	145V 12KΩ	GND			



IF & Detector Panel–19P22 Chassis

19P22 PANEL LUG CONNECTIONS

FROM	TO
M1	A.O.T. & C48 A
M2	VR7-#2
M4	VR7-#3
M5	CRT #2, #6
M6	M24 & YOKE #4
M7	YOKE #7 & H.O.T. #4
M8	CRT #5
M9	VR4-4
M10	VR6-#2 & V.O.T.
M11	VR4-6
M12	AGC T.P.
M12A	TO GND
M13	VR4-5
M14	A.O.T.
M15	M22A & C48A
M15A	E (GND) SND T.P.
M16	C11T TUNER B+
M17	VR4-#2
M18	B1-4
M18A	C17T TUNER AGC
M19	CRT-#3
M20	YOKE #11 (C49)
M21	VR4-1
M21A	C48C & FOCUS
M22	VR6-1

FROM	TO
M22A	M15 & M29
M23	H.O.T. #7
M24	M6 & V.O.T.
M26	C48B & YOKE #6
M27	FOCUS
M28	2ND DETECTOR T.P.
M29	M22A & C48A
M30	V.O.T. & R40A
M31	CRT-#1
M32	HOR. OSC. T.P.
M33	J1T (TUNER IF)
M35	CHASSIS GND
M35A	IF T.P.

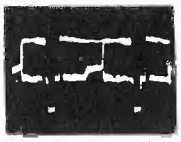
PANEL INTERCONNECTING LEADS

A	TO	A
B	TO	B
C	TO	C
D	TO	D
F	TO	F
G	TO	G

POINTS ARE INDICATED BY BALLOONS A, B ETC.

OSCILLOSCOPE WAVEFORMS

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 1450 B&K Oscilloscope.

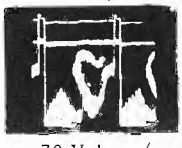


1 2.5 Volts p/p, 15,750 Hz (max contrast)

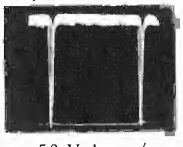
2 2.5 Volts p/p, 60 Hz (max contrast)

3 110 Volts p/p, 15,750 Hz (max contrast)

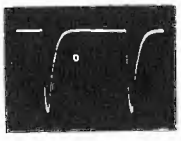
4 70 Volts p/p, 15,750 Hz



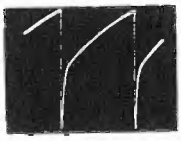
5 70 Volts p/p, 60 Hz



6 50 Volts p/p, 60 Hz

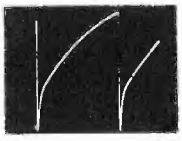


7 50 Volts p/p, 15,750 Hz

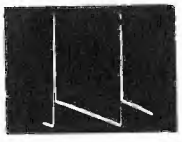


8 40 Volts p/p, 60 Hz

9 80 Volts p/p, 60 Hz

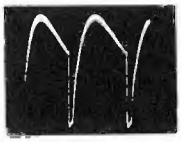


10 40 Volts p/p, 60 Hz

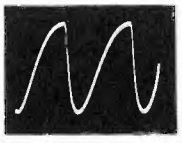


11 1300 Volts p/p, 60 Hz

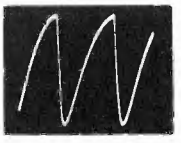
12 60 Volts p/p, 60 Hz



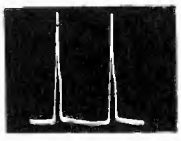
13 8 Volts p/p, 15,750 Hz



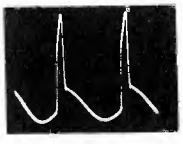
14 11 Volts p/p, 15,750 Hz



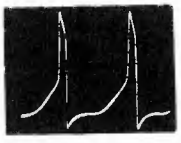
15 .15 Volts p/p, 15,750 Hz



16 9 Volts p/p, 15,750 Hz



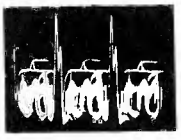
17 34 Volts p/p, 15,750 Hz



18 29 Volts p/p, 15,750 Hz

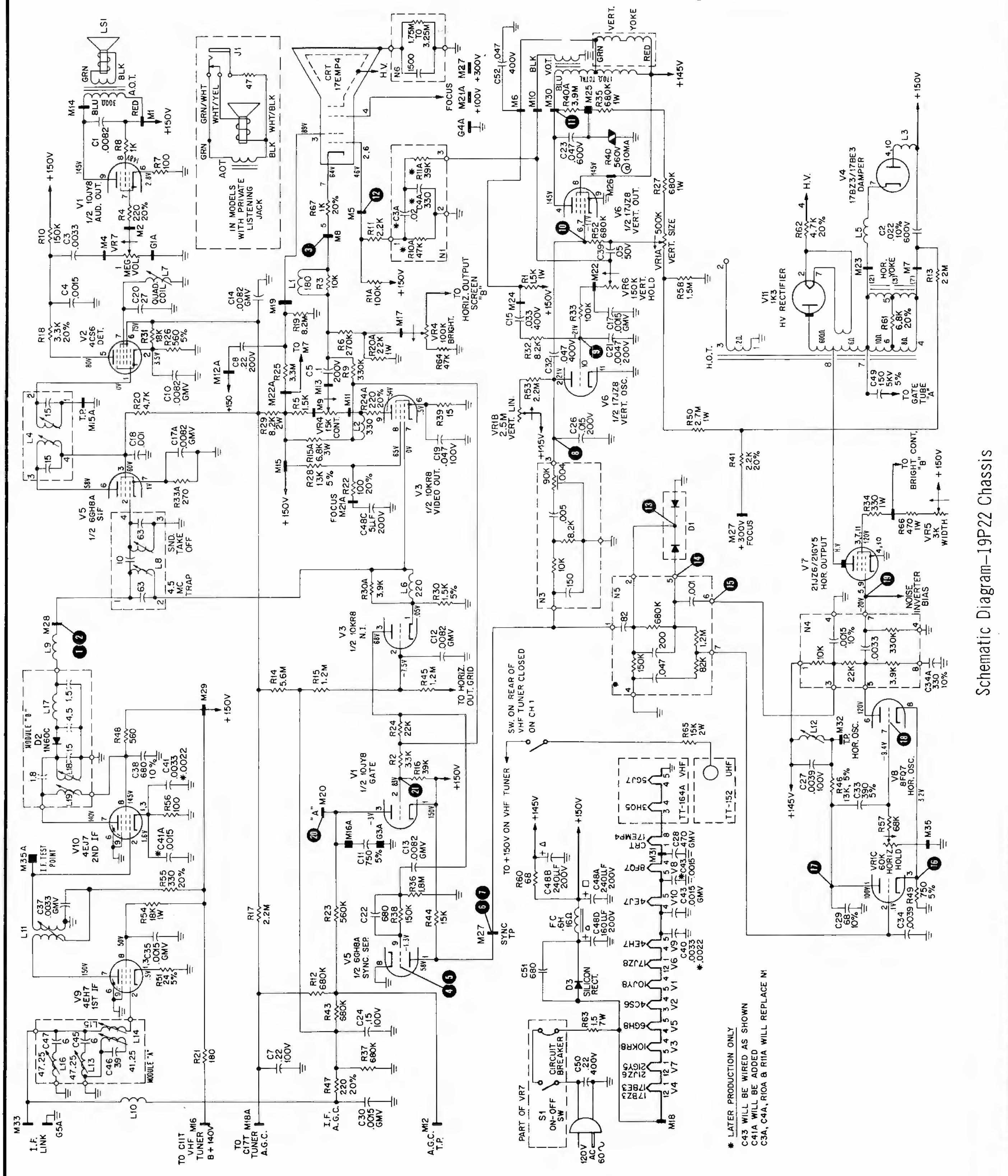
19 100 Volts p/p, 15,750 Hz

20 400 Volts p/p, 15,750 Hz

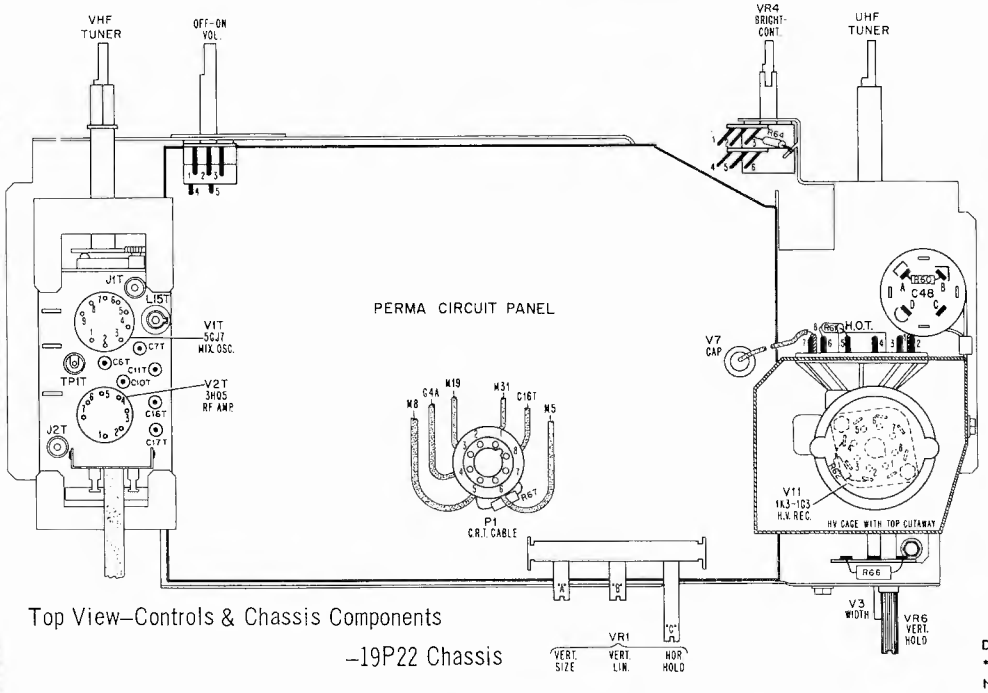


21 70 Volts p/p, 15,750 Hz

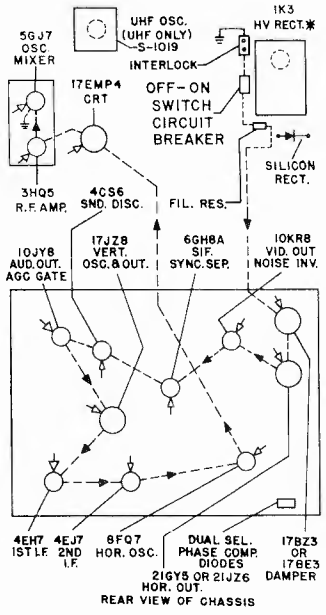
PHILCO Chassis 19P22 Schematic Diagram



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) (11) ETC. SHOWN ON SCHEMATIC INDICATE WAVEFORM TEST POINTS.
5. CONTROL SETTINGS: CONTRAST - MID-RANGE, BRIGHTNESS - MID-RANGE, VOLUME - MINIMUM, ALL OTHER CONTROLS SET FOR NORMAL OPERATION.



Top View–Controls & Chassis Components –19P22 Chassis



Dotted lines indicate filament string

* This tube in high voltage cage

Note: Arrows at socket circles indicate large spacing on miniature tubes, or key position on other tubes.

Filament Connection–19P22 Chassis

PIN	VOLTS
4	150V
7	HV

V7 21GY5/21JZ6 HOR. OUT.

V4 17BE3/17BZ3 DAMPER

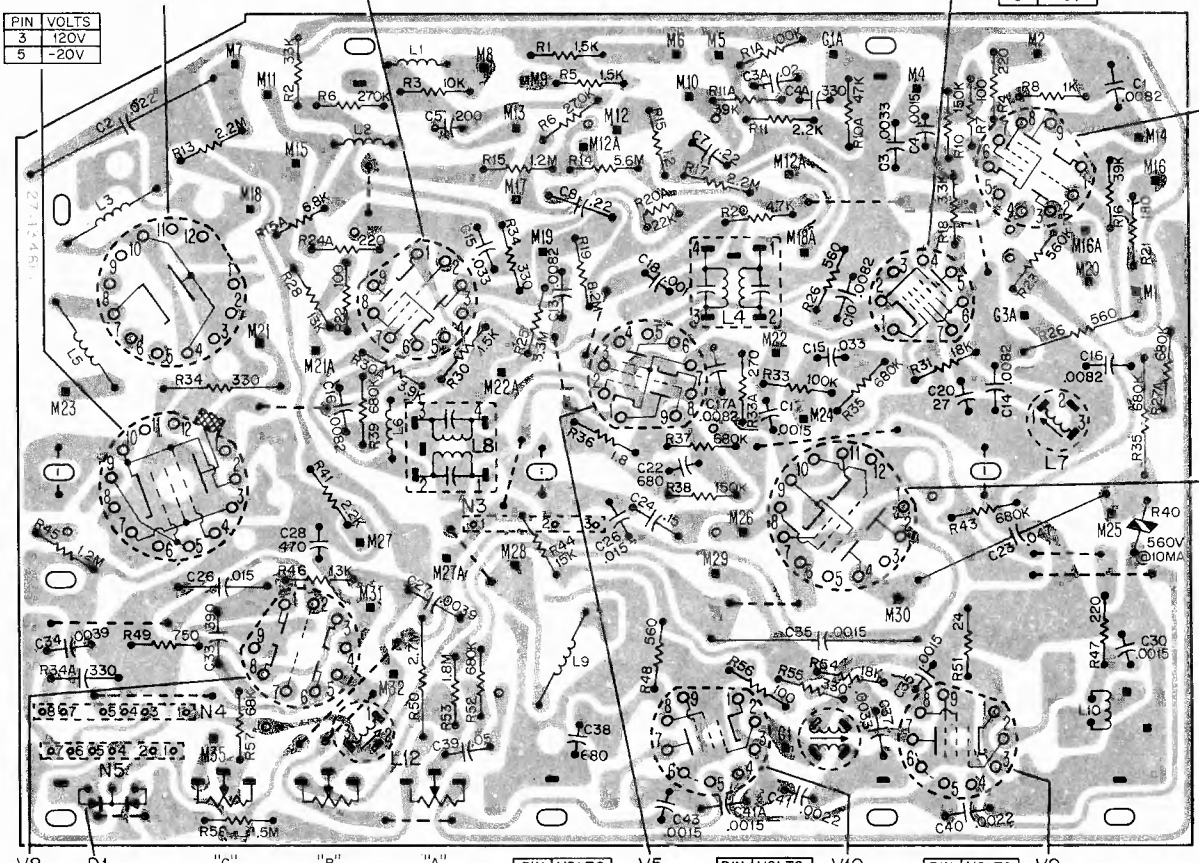
PIN	VOLTS
3	120V
5	-20V

V3 10KR8 VID. OUT. & NOISE. INV.

PIN	1	2	3	6	8	9
VOLTS	.05V	-7.5V	68V	.5V	65V	54V

V2 4CS6 SND. DET.

PIN	VOLTS
2	3.5V
5	80V
6	75V



PIN	VOLTS
1	150V
2	83V
3	-3V
6	2.8V
8	148V
9	145V

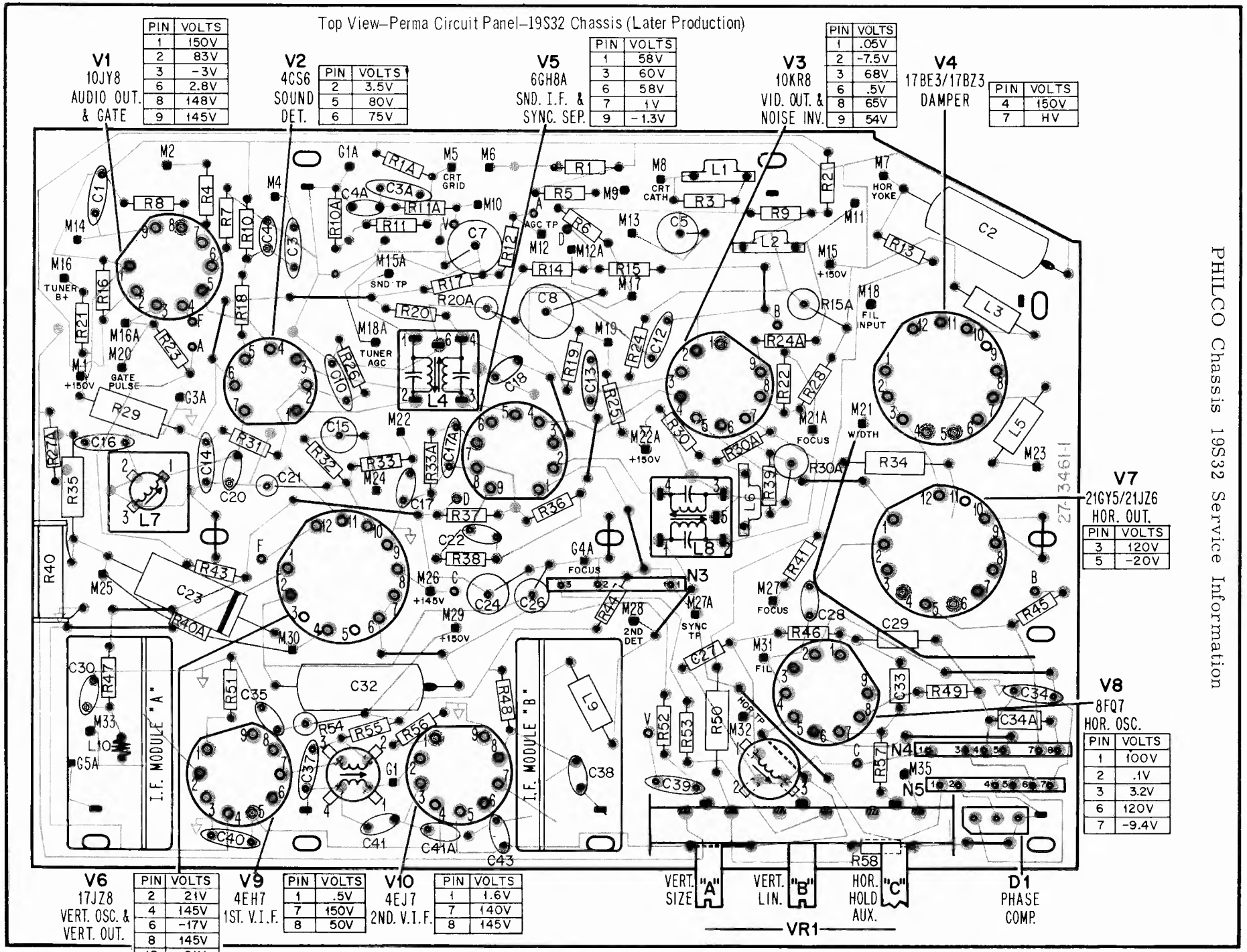
PIN	VOLTS
2	21V
4	145V
6	-17V
8	145V
10	-21V

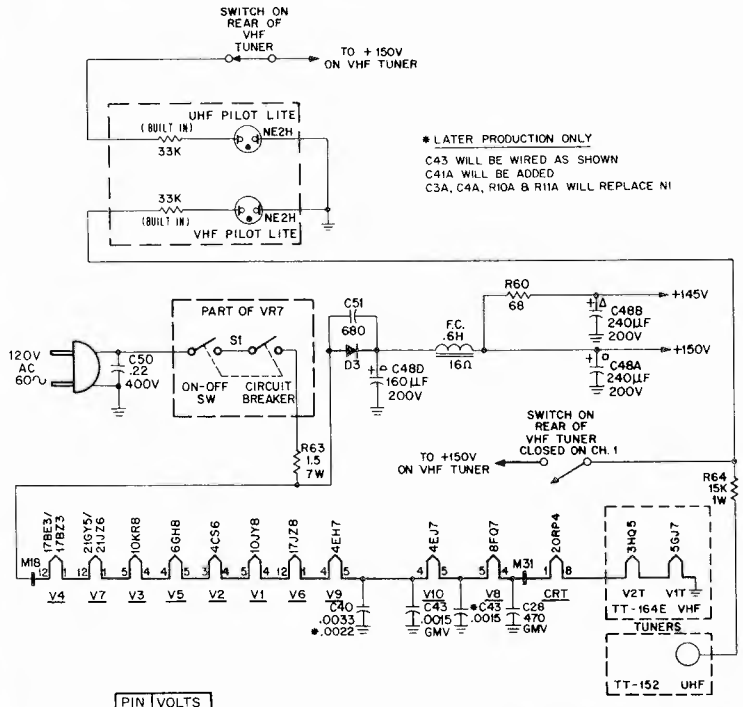
PIN	1	2	3	6	7
VOLTS	100V	.1V	3.2V	120V	-9.4V

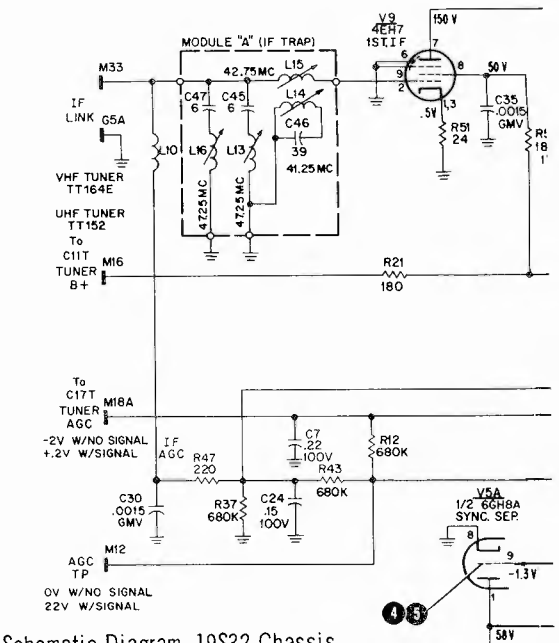
PIN	VOLTS
1	58V
3	60V
6	58V
7	1V
9	-1.3V

PIN	VOLTS
1	1.6V
7	140V
8	145V

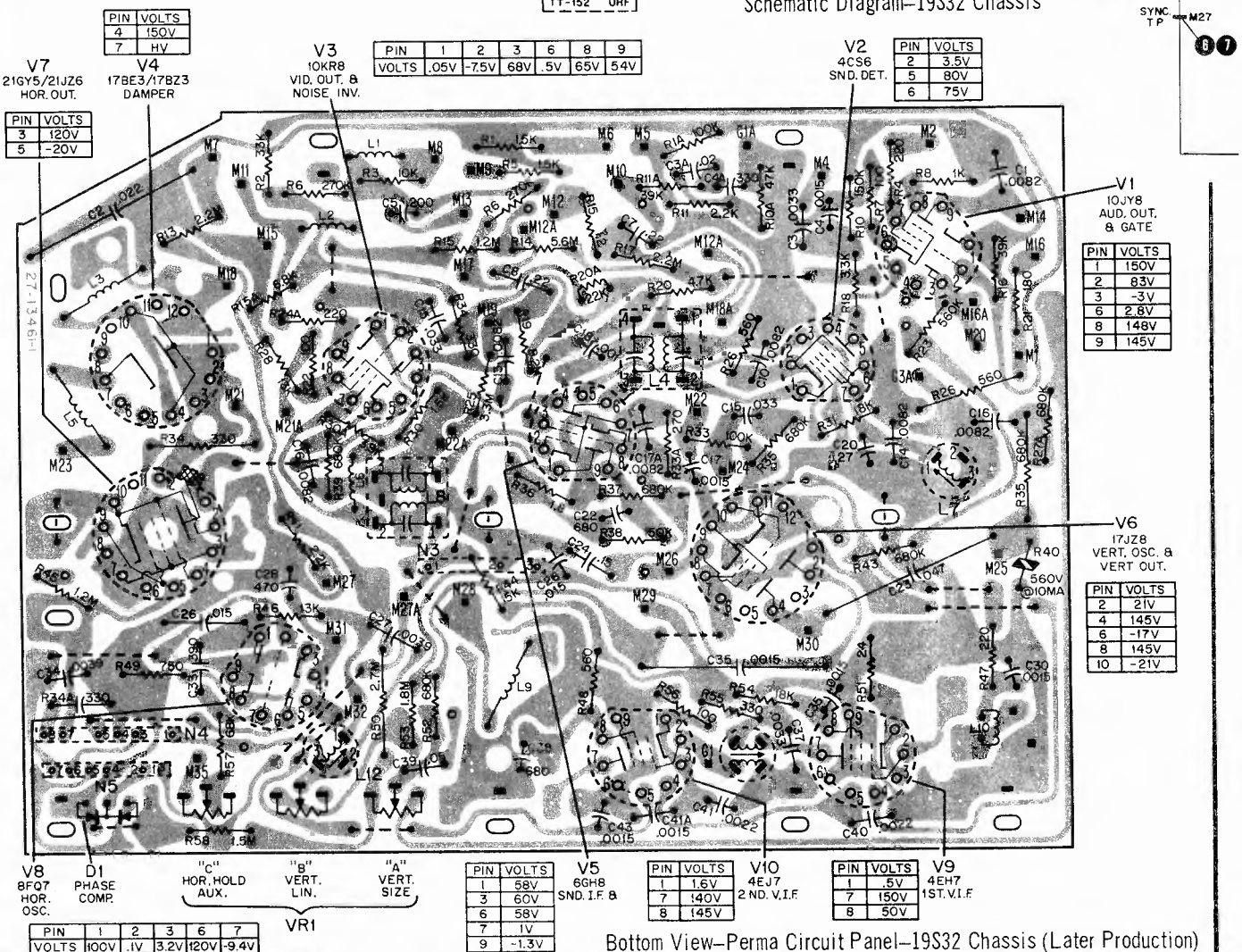
PIN	VOLTS
1	.5V
7	150V
8	50V


Top View–Perma Circuit Panel–19S32 Chassis (Later Production)
V1
10JY8
AUDIO OUT. & GATE
PIN VOLTS
1 150V
2 83V
3 -3V
6 2.8V
8 148V
9 145V
V2
4CS6
SOUND DET.
PIN VOLTS
2 3.5V
5 80V
6 75V
V5
6GH8A
SND. I.F. & SYNC. SEP.
PIN VOLTS
1 58V
3 60V
6 58V
7 1V
9 -1.3V
V3
10KR8
VID. OUT. & NOISE INV.
PIN VOLTS
1 .05V
2 -7.5V
3 68V
6 .5V
8 65V
9 54V
V4
17BE3/17BZ3
DAMPER
PIN VOLTS
4 150V
7 HV
V7
21GY5/21JZ6
HOR. OUT.
PIN VOLTS
3 120V
5 -20V
V8
8FQ7
HOR. OSC.
PIN VOLTS
1 100V
2 .1V
3 3.2V
6 120V
7 -9.4V
V6
17JZ8
VERT. OSC. & VERT. OUT.
PIN VOLTS
2 21V
4 145V
6 -17V
8 145V
10 21V
V9
4EH7
1ST. V.I.F.
PIN VOLTS
1 .5V
7 150V
8 50V
V10
4EJ7
2ND. V.I.F.
PIN VOLTS
1 1.6V
7 140V
8 145V
I.F. MODULE "A"
I.F. MODULE "B"
VERT. SIZE "A"
VERT. LIN. "B"
HOR. HOLD AUX. "C"
VR1
D1
PHASE COMP.
M2
M4
G1A
M5
CRT GRID
M6
M8
CRT CATH
M7
HOR YOKE
M10
M11
M12
M12A
M13
M14
M15
+150V
M15A
SND TP
M16
TUNER B+
M16A
M17
M18
FIL INPUT
M18A
TUNER AGC
M19
M20
GATE PULSE
M21
W/DTH
M21A
FOCUS
M22
M22A
+150V
M23
M24
M25
M26
+145V
M27
FOCUS
M27A
SYNC TP
M28
2ND DET
M29
+150V
M30
M31
FIL
M32
HOR TP
M33
M35
G3A
G4A
FOCUS
G5A
N3
N4
N5
L4
L7
L8
L9
L10
C2
C3
C3A
C4
C4A
C5
C7
C8
C12
C13
C14
C15
C16
C17
C17A
C18
C20
C21
C22
C23
C24
C26
C27
C28
C29
C30
C32
C33
C34
C34A
C35
C37
C38
C39
C40
C41
C41A
C43
R1
R1A
R2
R3
R4
R5
R6
R7
R8
R9
R10
R10A
R11
R11A
R12
R13
R14
R15
R15A
R16
R17
R18
R19
R20
R20A
R21
R22
R23
R24
R24A
R25
R26
R27
R27A
R28
R29
R30
R30A
R31
R32
R33
R33A
R34
R35
R36
R37
R38
R39
R40
R40A
R41
R43
R44
R45
R46
R47
R48
R49
R50
R51
R52
R53
R54
R55
R56
R57
R58
27-3461-1



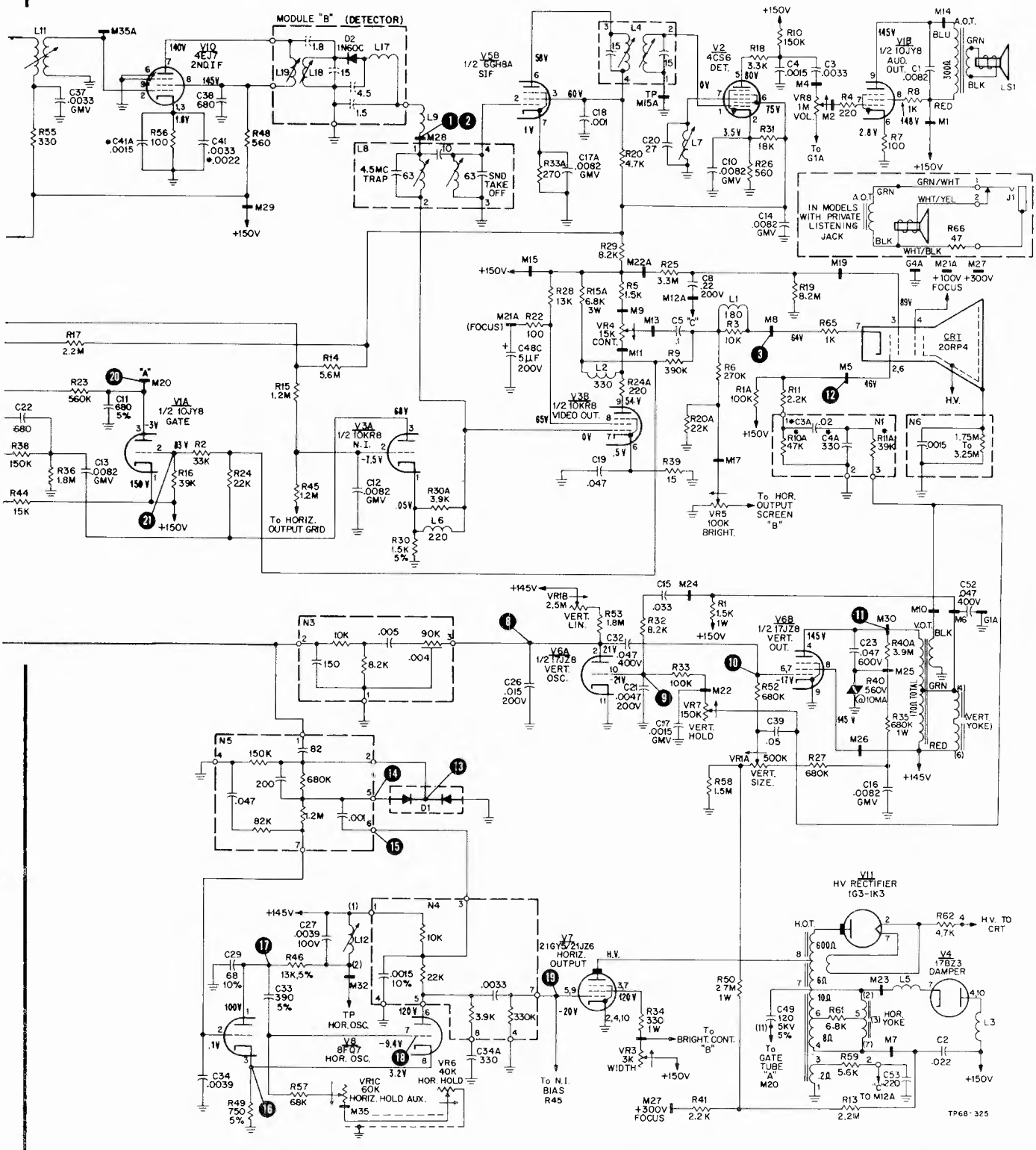


Schematic Diagram–19S32 Chassis



Bottom View–Perma Circuit Panel–19S32 Chassis (Later Production)

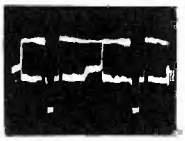
PHILCO Chassis 19S32 Schematic Diagram, Continued



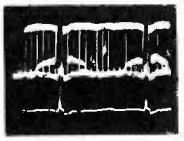
NOTES:
1. ALL VOLTAGES TAKEN UNDER NO SIGNAL CONDITIONS. . ANTENNA REMOVED AND TUNER OFF CHANNEL.
2. VOLTAGES MEASURED WITH A V.T.V.M. FROM POINT INDICATED TO CHASSIS GROUND.
3. COIL RESISTANCES READ WITH COIL IN CIRCUIT.
4. BALLOONS (10) (11) ETC. SHOWN ON SCHEMATIC INDICATE WAVEFORM TEST POINTS.
5. CONTROL SETTINGS:
   - VOLUME - MINIMUM
   - CONTRAST - MID-RANGE
   - BRIGHTNESS - MID-RANGE
   - ALL OTHER CONTROLS SET FOR NORMAL OPERATION.

OSCILLOSCOPE WAVEFORMS

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 1450 B&K Oscilloscope.

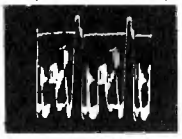


1 2.5 Volts p/p, 15,750 Hz (max contrast)



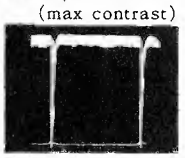
2 2.5 Volts p/p, 60 Hz (max contrast)

3 110 Volts p/p, 15,750 Hz (max contrast)

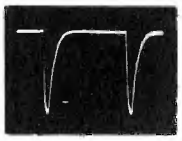


4 70 Volts p/p, 15,750 Hz

5 70 Volts p/p, 60 Hz

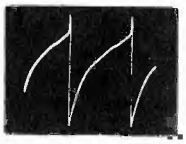


6 50 Volts p/p, 60 Hz

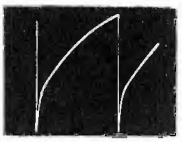


7 50 Volts p/p, 15,750 Hz

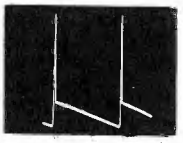
8 40 Volts p/p, 60 Hz



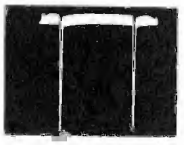
9 80 Volts p/p, 60 Hz



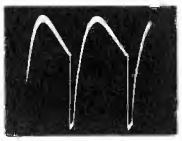
10 40 Volts p/p, 60 Hz



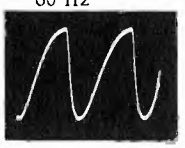
11 1300 Volts p/p total, 120 Volts p/p, sawtooth, 60 Hz



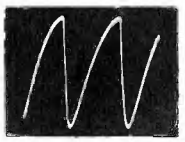
12 60 Volts p/p, 60 Hz



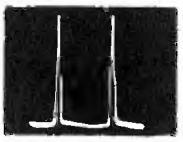
13 8 Volts p/p, 15,750 Hz



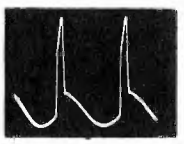
14 11 Volts p/p, 15,750 Hz



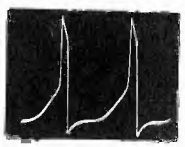
15 15 Volts p/p, 15,750 Hz



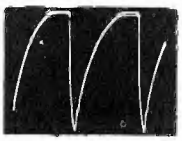
16 9 Volts p/p, 15,750 Hz



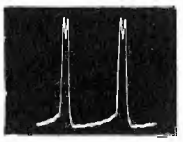
17 34 Volts p/p, 15,750 Hz



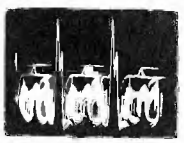
18 29 Volts p/p, 15,750 Hz



19 100 Volts p/p, 15,750 Hz



20 440 Volts p/p, 15,750 Hz

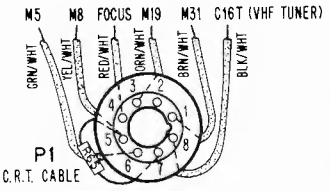


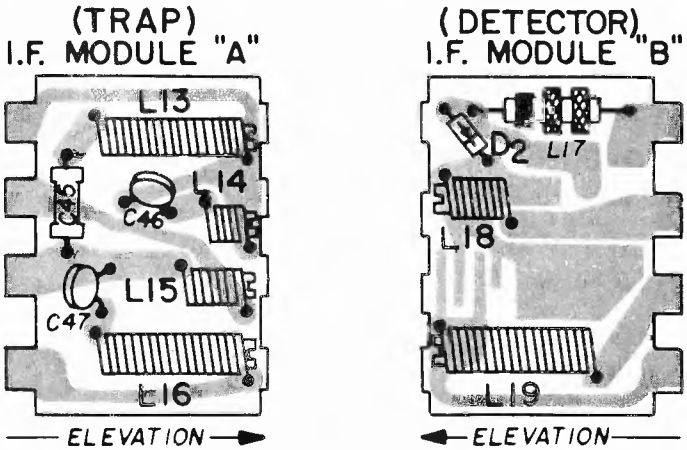
21 70 Volts p/p, 15,750 cps

VOLTAGE & RESISTANCE CHART

SYM-BOL	TUBE	USE	PIN NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12
V1	10JY8	Audio Out. & A.G.C.	12K	36K	1.3M	FIL	FIL	100	260	12K	12K			
V2	4CS6	Sound Detector	6	500	FIL	FIL	160K	12K	3.5					
V3	10KR8	Video Out. & Noise Inv.	*300	900K	35K	FIL	FIL	15	*300	25K	12K			
V4	17BE3/17BZ3	Damper	FIL	INF	INF	12K	INF	INF	9M	INF	INF	12K	INF	FIL
V5	6GH8	Sound IF & Sync Sep.	12K	2	12K	FIL	FIL	12K	270	0	1.9M			
V6	17JZ8	Vert. Osc. & Output	FIL	3.8M	INF	12K	INF	1.8M	1.8M	12K	0	200K	0	FIL
V7	21GY5/21JZ6	Horiz. Output	FIL	0	12K	0	300K	12K	12K	12K	300K	0	12K	FIL
V8	8FQ7	Horiz. Osc.	25K	2.2M	750	FIL	FIL	45K	95K	750	0			
V9	4EH7	1st Video IF	24	420K	24	FIL	FIL	0	12K	20K	0			
V10	4EJ7	2nd Video IF	100	0	100	FIL	FIL	0	12K	12K	0			

ALL RESISTANCES ARE MEASURED IN OHMS
*DEPENDS ON POLARITY OF METER USED





IF Trap & Detector Panel–19S32 Chassis

19S32 PANEL LUG CONNECTIONS

FROM	TO
M1	A.O.T. & C48A
M2	VR7 #2
M4	VR7 #1
M5	CRT #2, #6
M6	M24 & YOKE #4
M7	YOKE #7 & H.O.T. #4
M8	CRT #5
M9	VR5 #1
M10	VR6 #2 & V.O.T.
M11	VR5 #3
M12	AGC T.P.
M12A	H.O.T. #2
M13	VR5 #2
M14	A.O.T.
M15	M22A & VR3 #2
M15A	E (GND)
M16	C11 (TUNER B+)
M17	VR4 #2
M18	B1-4
M18A	C17T (TUNER AGC)
M19	CRT #3
M20	YOKE #11 (C49)
M21	VR3 #1 & VR4 #1
M21A	C48C & FOCUS
M22	VR6 #1
M22A	M15 & M29

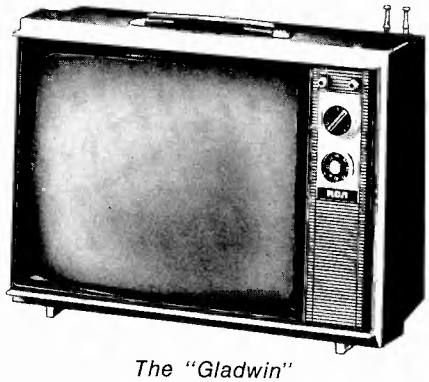
FROM	TO
M23	H.O.T. #7
M24	M6 & V.O.T.
M26	C48B & YOKE #6
M27	FOCUS
M28	2ND DETECTOR T.P.
M29	M22A
M30	V.O.T. & R40A
M31	CRT #1
M32	HOR. OSC. T.P.
M33	J1T (TUNER IF)
M35	CHASSIS GND
M35A	IF T.P.

PANEL INTERCONNECTING LEADS

A TO A
B TO B
C TO C
D TO D
E TO M15A
F TO F
V TO V

POINTS ARE INDICATED BY LETTERS (A), (B) ETC.

Chassis
KCS 178 Series



The "Gladwin"

Model and Chassis Cross Reference

MODEL	NAME	CHASSIS	TMA	TUNER	PICTURE TUBE	ANTENNAS VHF/UHF
AM 162W	*"GLADWIN"*	KCS 178A	158A	KRK 148A/152A	17EWP4	Dipole/Ring

Instrument Disassembly

1. Remove seven back cover screws: two at the top, one at the antenna terminal board, one at the AC interlock, one under the right cord arm, and two underneath the cabinet. Disconnect the UHF and VHF antennas and remove the back cover. All chassis components and test points are accessible upon removal of the back cover.
2. If further disassembly is required, remove five front control knobs and the UHF channel indicator. Remove three hex-head screws securing the TMA front plate to cabinet. Disconnect the picture tube socket, the high voltage lead, the speaker cable at the speaker, and the yoke socket. Remove two chassis mounting screws underneath the chassis. Move the chassis to the rear and remove the screw from the bottom of the TMA rear support bracket. Rotate the TMA 180° and mount it in the test position (two screws and a slot in the bracket above the AC interlock).
3. Place the cabinet face down on a soft protective surface. Loosen the picture tube retaining ring bolt sufficiently to permit slipping the ring out of the four corner retainers. Carefully remove the picture tube.

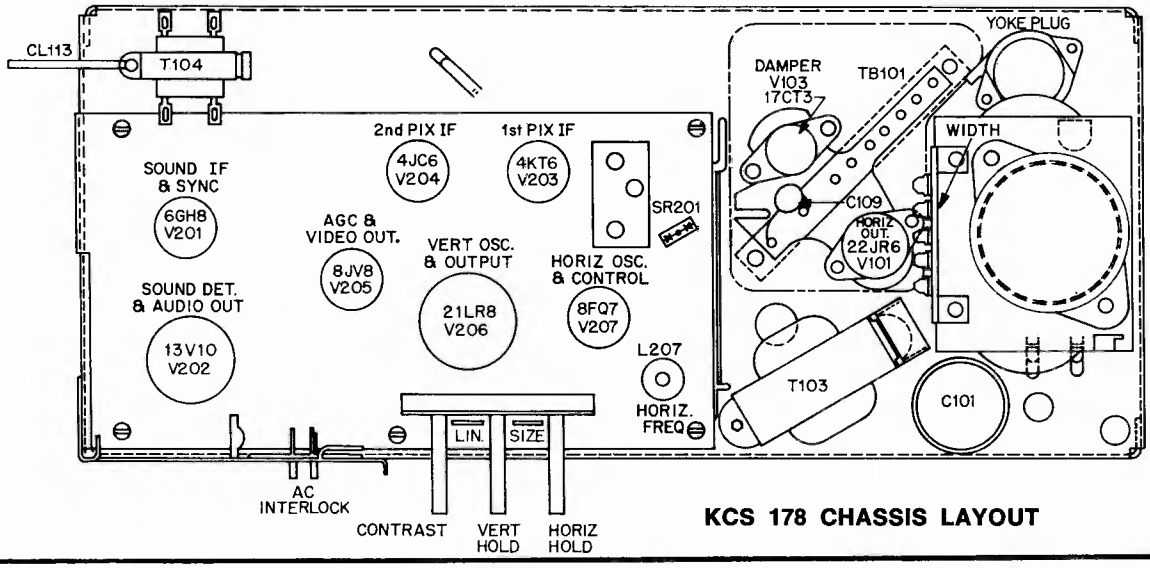
SERVICE ADJUSTMENTS

WIDTH AND HORIZONTAL CENTERING

The width adjustment of the KCS 178 Chassis is a jumper wire-terminal board arrangement mounted on top of the high voltage cage.

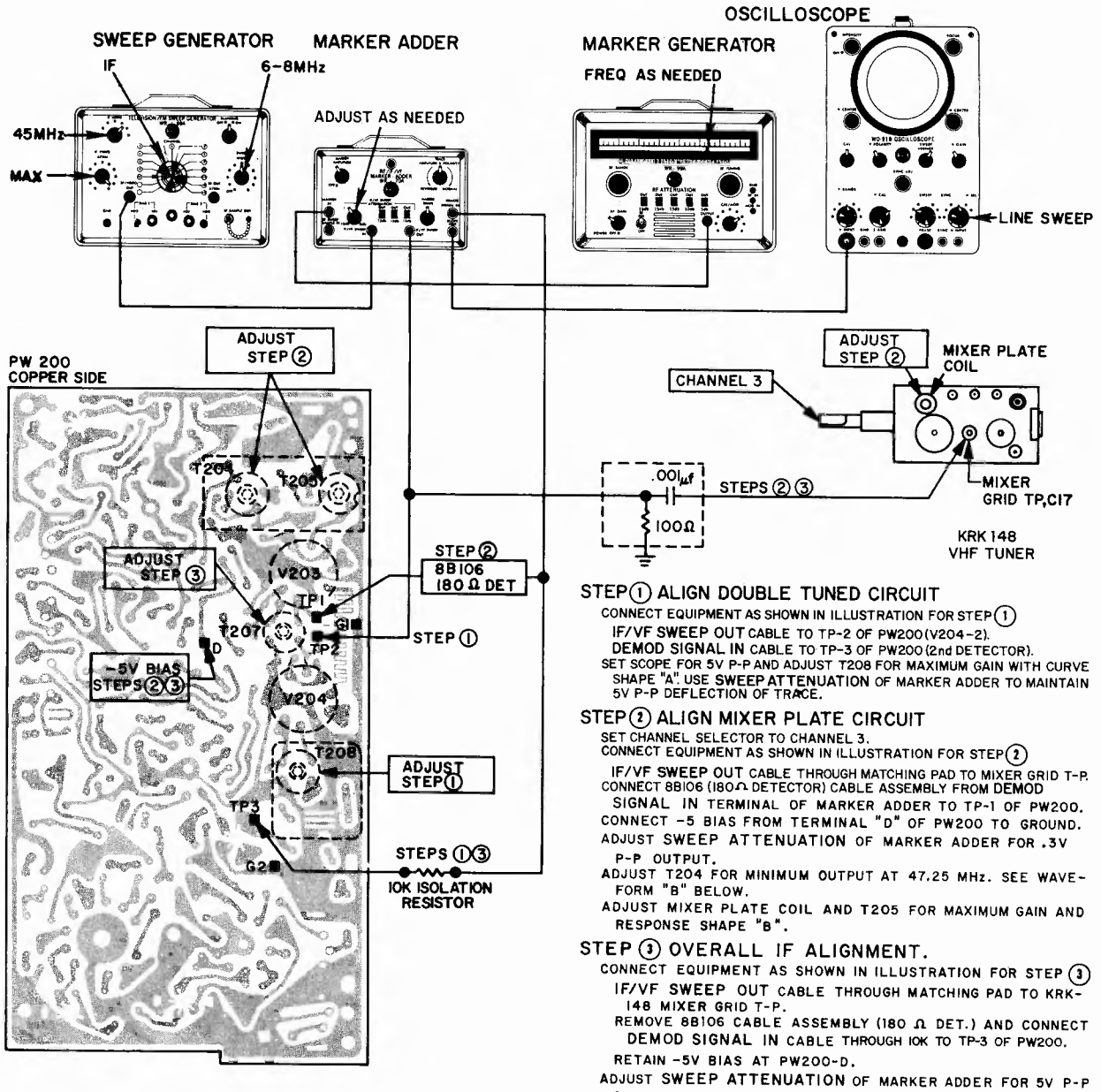
With the AC line set at 108 volts, adjust contrast and brightness controls to maximum. Adjust the horizontal hold control to the middle of the horizontal oscillator pull-in range. Place the insulated clip on one of the spade terminals which allows a small portion of black to be visible on the edge of the raster. With the centering tabs located on the rear of the yoke cover, center the raster in the mask by making the amount of black on the left and right sides equal. Now choose the first width terminal progressing from the rear of the chassis which allows the raster to just fill the mask.

NOTE: Centering and width must be properly adjusted to maintain proper horizontal linearity, AGC, and high voltage requirements.



KCS 178 CHASSIS LAYOUT

PICTURE I F ALIGNMENT—KCS 171 & 178 CHASSIS



STEP ① ALIGN DOUBLE TUNED CIRCUIT

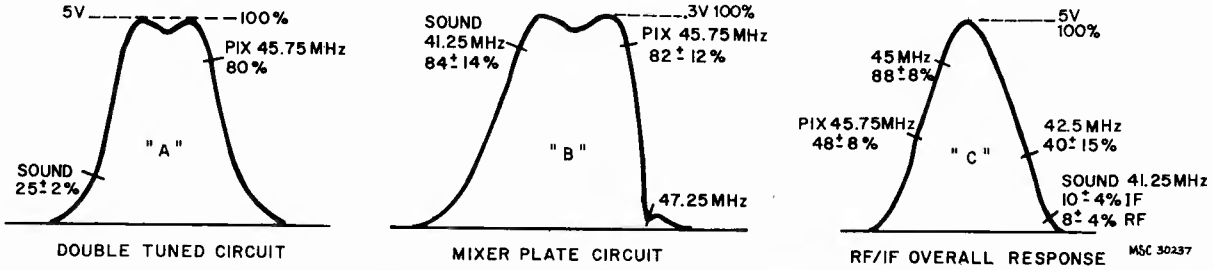
CONNECT EQUIPMENT AS SHOWN IN ILLUSTRATION FOR STEP ①
IF/VF SWEEP OUT CABLE TO TP-2 OF PW200 (V204-2).
DEMOD SIGNAL IN CABLE TO TP-3 OF PW200 (2nd DETECTOR).
SET SCOPE FOR 5V P-P AND ADJUST T208 FOR MAXIMUM GAIN WITH CURVE SHAPE "A". USE SWEEP ATTENUATION OF MARKER ADDER TO MAINTAIN 5V P-P DEFLECTION OF TRACE.

STEP ② ALIGN MIXER PLATE CIRCUIT

SET CHANNEL SELECTOR TO CHANNEL 3.
CONNECT EQUIPMENT AS SHOWN IN ILLUSTRATION FOR STEP ②
IF/VF SWEEP OUT CABLE THROUGH MATCHING PAD TO MIXER GRID T-P.
CONNECT 8B106 (180Ω DETECTOR) CABLE ASSEMBLY FROM DEMOD SIGNAL IN TERMINAL OF MARKER ADDER TO TP-1 OF PW200.
CONNECT -5 BIAS FROM TERMINAL "D" OF PW200 TO GROUND.
ADJUST SWEEP ATTENUATION OF MARKER ADDER FOR .3V P-P OUTPUT.
ADJUST T204 FOR MINIMUM OUTPUT AT 47.25 MHz. SEE WAVEFORM "B" BELOW.
ADJUST MIXER PLATE COIL AND T205 FOR MAXIMUM GAIN AND RESPONSE SHAPE "B".

STEP ③ OVERALL IF ALIGNMENT.

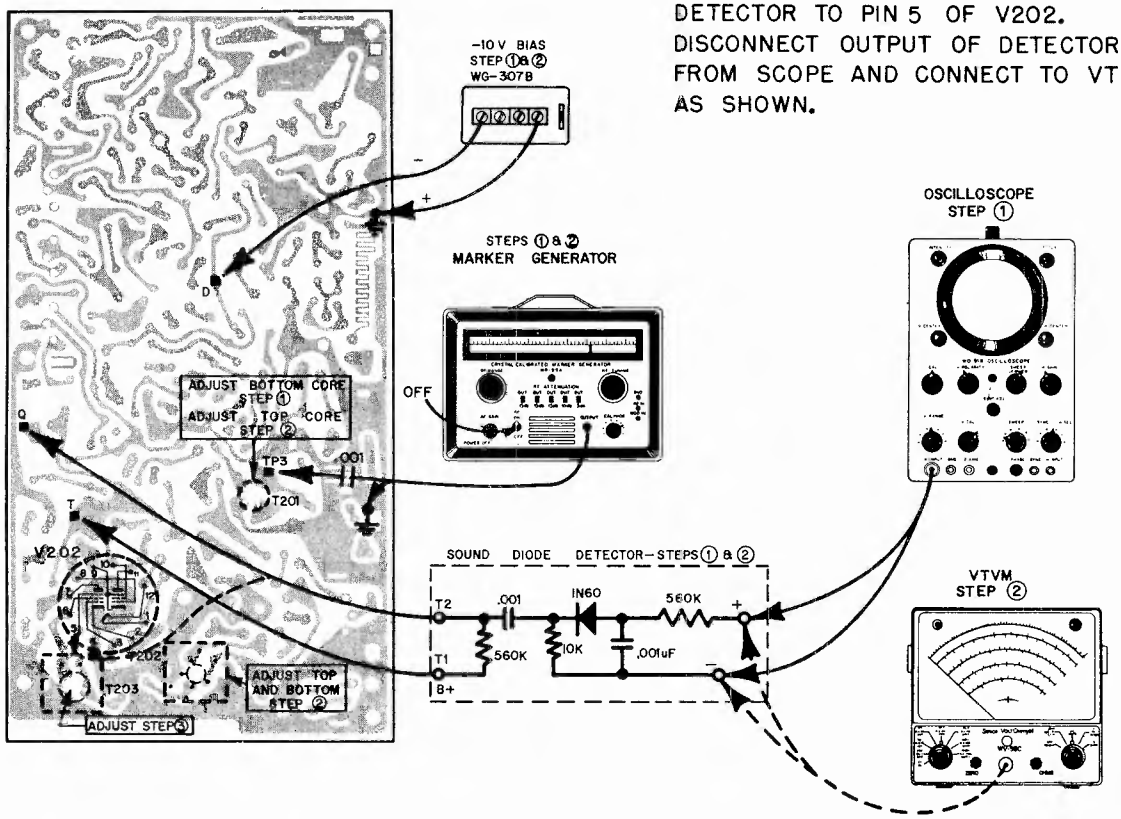
CONNECT EQUIPMENT AS SHOWN IN ILLUSTRATION FOR STEP ③
IF/VF SWEEP OUT CABLE THROUGH MATCHING PAD TO KRK-148 MIXER GRID T-P.
REMOVE 8B106 CABLE ASSEMBLY (180 Ω DET.) AND CONNECT DEMOD SIGNAL IN CABLE THROUGH 10K TO TP-3 OF PW200.
RETAIN -5V BIAS AT PW200-D.
ADJUST SWEEP ATTENUATION OF MARKER ADDER FOR 5V P-P DEFLECTION OF OSCILLOSCOPE TRACE.
ADJUST T207 IF NECESSARY TO GIVE RESPONSE SIMILAR TO "C" BELOW.



SOUND ALIGNMENT—KCS 171, 173, 174, & 178 CHASSIS

STEP ① APPLY -10 VOLTS TO THE IF AGC - TERMINAL "D" ON PW200. CONNECT OSCILLOSCOPE THROUGH DIODE DETECTOR TEST BLOCK AS SHOWN TO PW200 TERMINALS "T" AND "Q". CONNECT MARKER GENERATOR THROUGH .001 TO TP-3 ON PW200. SET GENERATOR 4.5 MHz / 600Hz MODULATION. TURN OFF GENERATOR RF. ADJUST CONTRAST CONTROL TO MAXIMUM (FULLY CW) AND DISCONNECT YOKE PLUG. ADJUST T-201B (BOTTOM CORE) FOR MINIMUM 600Hz INDICATION ON SCOPE. RECONNECT YOKE PLUG.

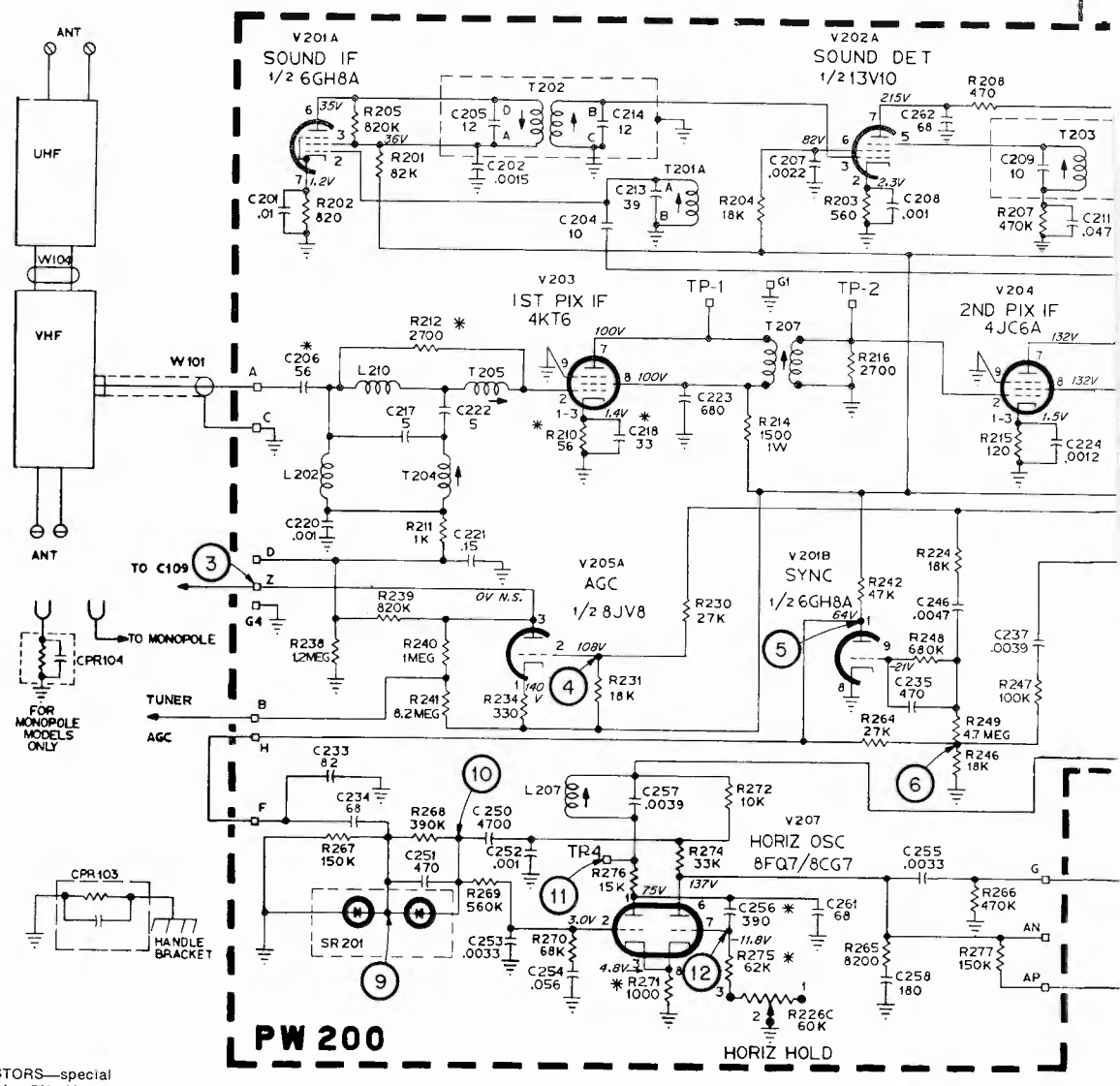
STEP ② SWITCH SWEEP GENERATOR TO 4.5 MHz UNMODULATED. MOVE THE T2 TERMINAL CONNECTION OF DIODE DETECTOR TO PIN 5 OF V202. DISCONNECT OUTPUT OF DETECTOR FROM SCOPE AND CONNECT TO VTVM AS SHOWN.

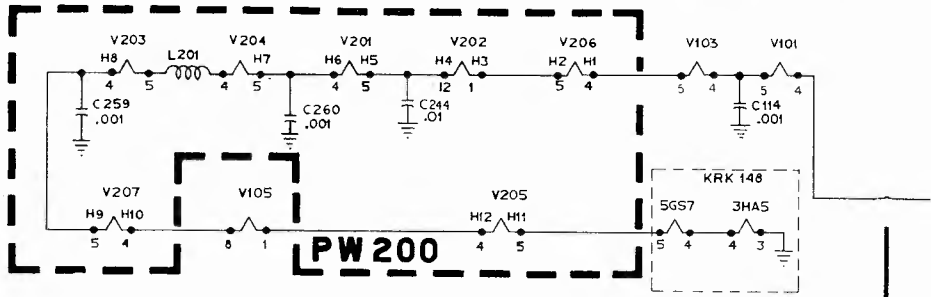


ADJUST DRIVER COIL, T202 (BOTTOM CORE) AND SOUND TAKE-OFF COIL, T201A (TOP CORE), FOR MAXIMUM NEGATIVE D.C. ON VTVM. USE ONLY ENOUGH GENERATOR OUTPUT TO PRODUCE ABOUT 0.5 VOLT ON METER WHEN FINALLY PEAKING EACH CIRCUIT. NOW ADJUST T202 TOP CORE FOR MAXIMUM D.C. ON METER. T202 BOTTOM CORE SHOULD PENETRATE THE COIL FROM THE BOARD END AND THE TOP CORE FROM THE TOP OF THE COIL FROM WHEN FINALLY PEAKED.

STEP ③ DISCONNECT TEST EQUIPMENT AND TURN OFF SIGNAL GENERATOR. TUNE IN STRONG LOCAL STATION AND ADJUST VOLUME CONTROL TO NORMAL. TURN CORE OF QUADRATURE COIL (T203) FLUSH WITH TOP OF COIL FORM. DISCONNECT ANTENNA OR REDUCE SIGNAL INPUT WITH TUNING UNTIL A HISS IS HEARD IN SOUND. TURN CORE OF T203 CLOCKWISE TO SECOND PEAK FOR MAXIMUM RECOVERED AUDIO.

RCA Chassis KCS-178 Schematic Diagram

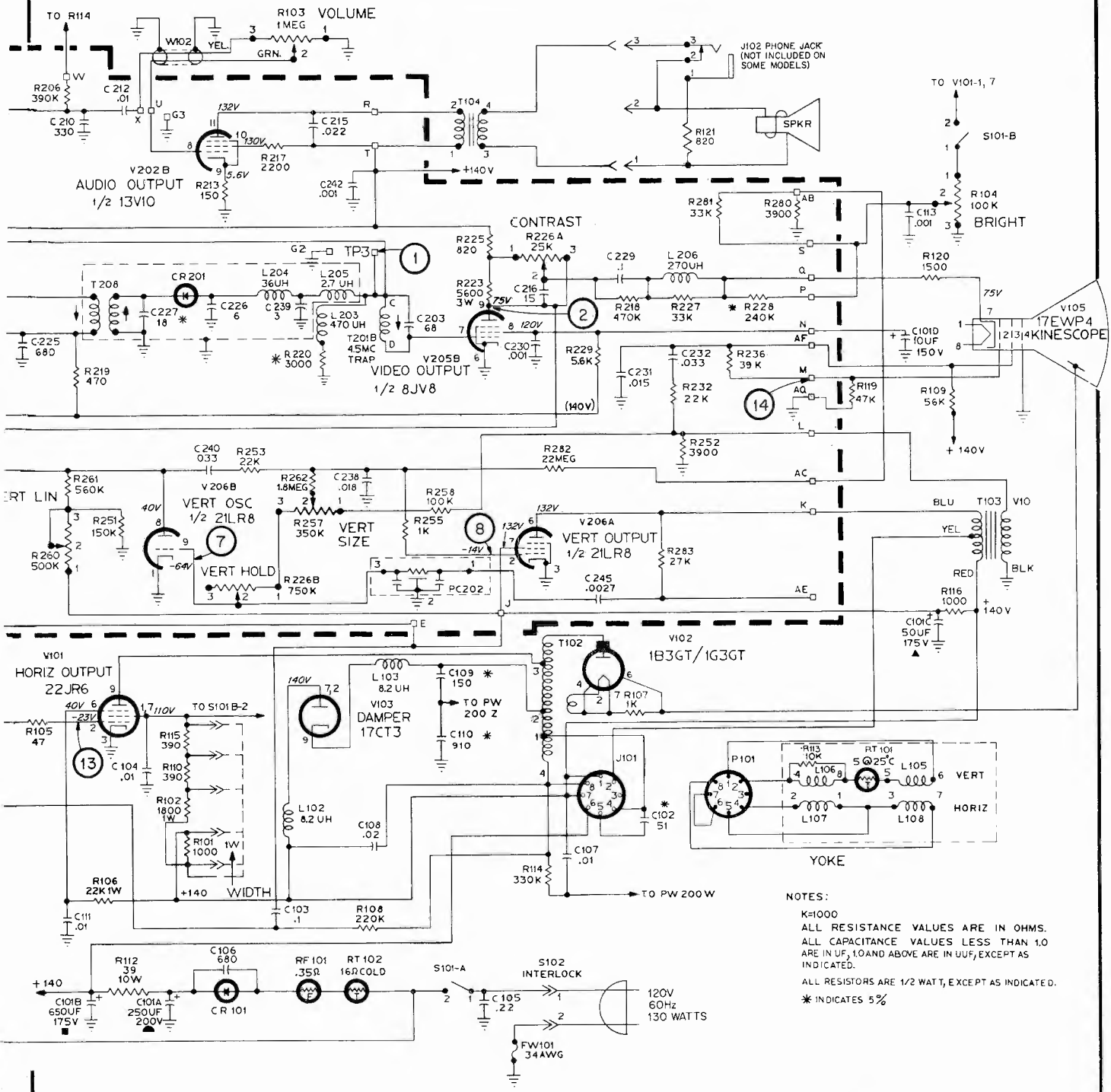




KCS 178 SERIES CHASSIS CIRCUIT SCHEMATIC DIAGRAM

		RESISTORS—special
R112	124272	39 ohm 5%, 10w., wirewound
R210	228605	56 ohm 5%, 1/2w., film
R212	239935	2700 ohm 5%, 1/2w., film
R220	227097	3000 ohm 5%, 1/2w., film
R223	104180	5600 ohm 10%, 3w., film
R226	121222	control, contrast,vert./ horiz. hold
R228	124273	240,000 ohm 5%, 1/2w., film
R257	121223	control, vert. size
R260	121944	control, vert. linearity
R271	224254	1000 ohm 5%, 1/2w., film
R275	233094	62,000 ohm 5%, 1/2w., film
RF101	124263	Thermistor—fuse, 0.35 ohm, 1.1 amp.
S102	100029	Connector—AC interlock
SR201	109474	Diode—selenium
		TRANSFORMERS
T102	124462	horiz. output
T103	127812	vertical output
T104	124275	audio output
T201	114489	4.5mc
T202	118411	sound, I.F.
T203	118410	quadrature
T204	113097	47.25mc trap
T205	113097	video I.F. grid
T207	124276	video I.F.
T208	121779	2nd detector
	121216	Shield—quadrature
	118698	Cap—hi voltage tube socket
	127767	Connector—2nd anode
	121215	Shield—pix detector
	121217	Shield—sound I.F.

RCA Chassis KCS-178 Schematic Diagram, Continued



HORIZONTAL SINE WAVE ADJUSTMENT

Remove the sync by placing a clip lead between PW200-H and chassis ground. Short out the sine wave coil, L207, by placing another clip lead between PW200-E and TP-4. Adjust the horizontal hold control so that the free running frequency of the oscillator is 15.75 kHz (picture sides vertical).

Remove the shorting jumper from the sine wave coil (PW200-E to TP-4). Adjust the core of L207 until the picture sides are again vertical (15.75 kHz). Remove the short from PW200-H.

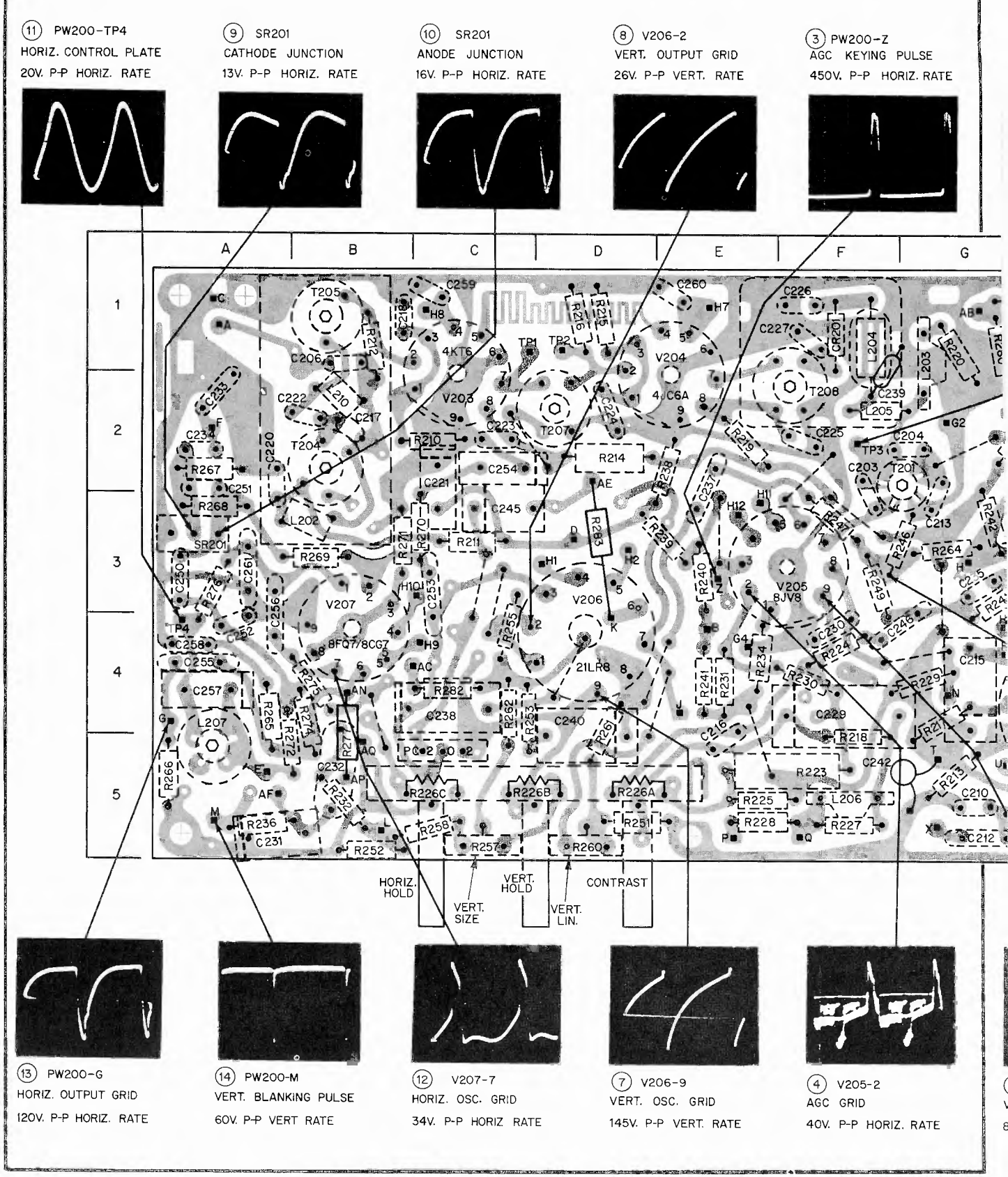
VERTICAL LINEARITY, SIZE, AND CENTERING

The width must be correct before making vertical adjustments. With the AC line set at 108 volts, adjust the contrast control to minimum and the brightness control so that the raster is just visible. Adjust the size (R257) and linearity (R260) controls for a linear raster which just fills the mask at top and bottom. Check the raster at 120V AC line for a slight overscan and proper linearity.

NOTE: Care should be taken when centering the raster vertically that the previously adjusted horizontal centering is maintained.

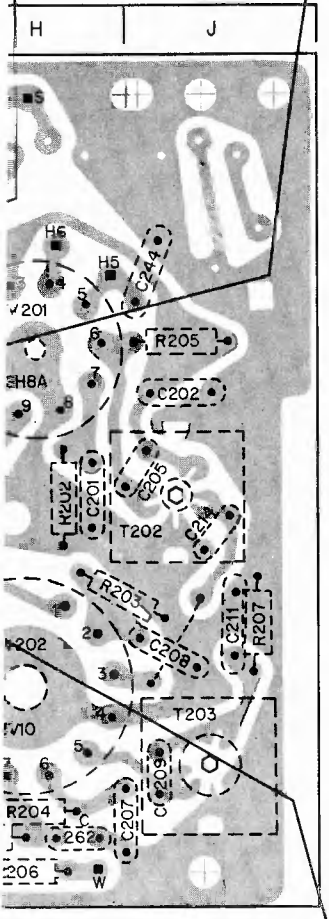
PW200 CIRCUIT BOARD ASSEMBLY

The waveform identification numbers shown below correspond to those shown on the schematic diagram.

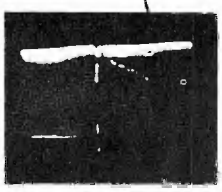


O–TP3
2ND DETECTOR
'ERT. RATE

(5) V201-1
HORIZ. SYNC PULSE
50V. P-P HORIZ. RATE



5–9
JTPUT PLATE
VERT. RATE



(6) R249-R246 JUNCTION
VERT. SYNC PULSE
22V. P-P VERT. RATE

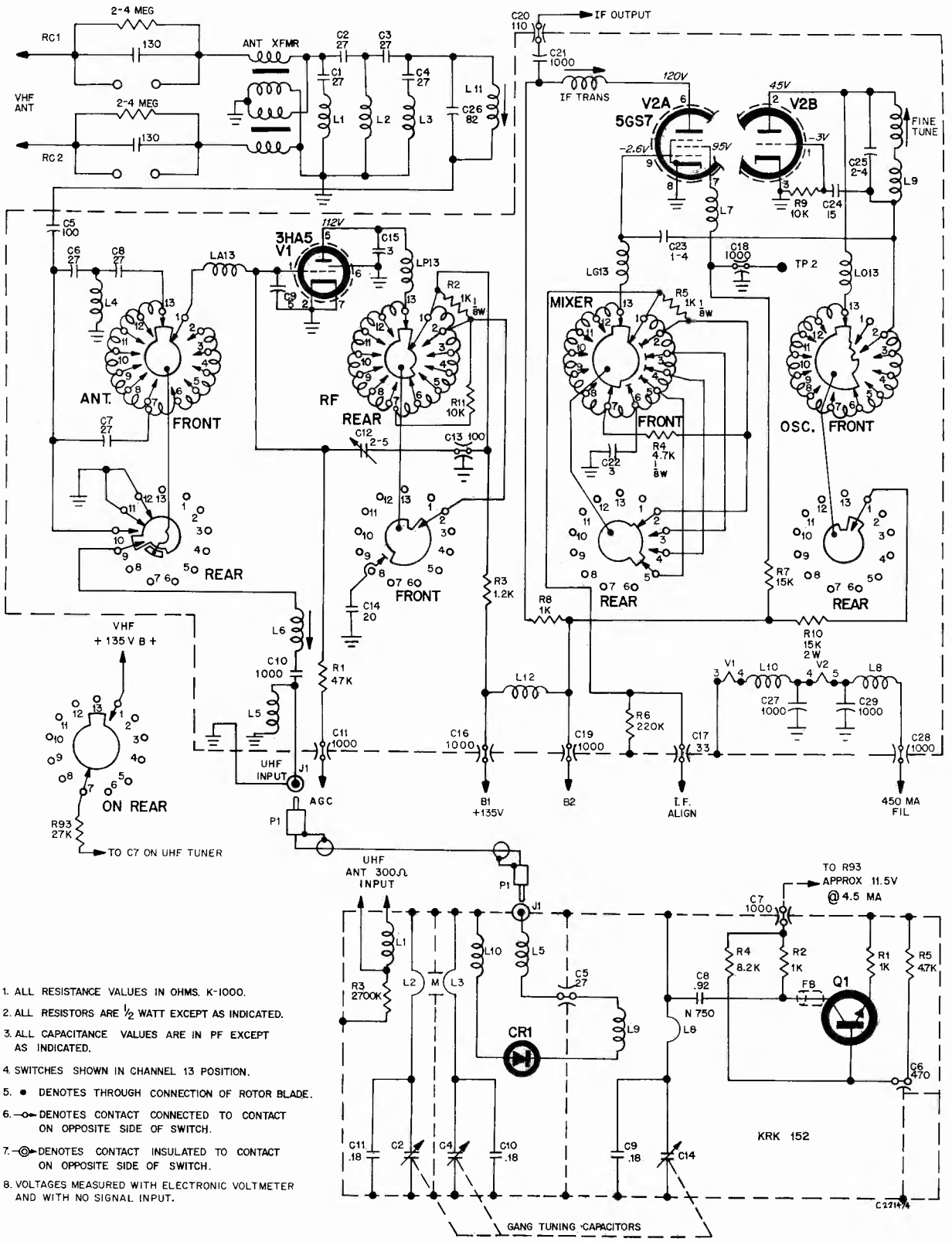
PW200 Component Location Guide

C201 ..... 3H	R201 ..... 2G	R281 ..... 1H
C202 ..... 3J	R202 ..... 3H	R282 ..... 4C
C203 ..... 2F	R203 ..... 4H	R283 ..... 3D
C204 ..... 2G	R204 ..... 5H	
C205 ..... 3J	R205 ..... 2J	SR201 ..... 3A
C206 ..... 1B	R206 ..... 5H	
C207 ..... 5J	R207 ..... 4J	T201 ..... 2G
C208 ..... 4J	R208 ..... 5H	T202 ..... 3J
C209 ..... 5J	R210 ..... 2C	T203 ..... 5J
C210 ..... 5G	R211 ..... 3C	T204 ..... 2B
C211 ..... 4J	R212 ..... 1B	T205 ..... 1B
C212 ..... 5G	R213 ..... 5G	T207 ..... 2D
C213 ..... 3G	R214 ..... 2D	T208 ..... 2F
C214 ..... 3J	R215 ..... 1D	
C215 ..... 4G	R216 ..... 1D	**TEST POINTS**
C216 ..... 4E	R217 ..... 4G	
C217 ..... 2B	R218 ..... 4F	A 1A
C218 ..... 1B	R219 ..... 2E	AB 1G
C220 ..... 2A	R220 ..... 1G	AC 4B
C221 ..... 2C	R223 ..... 5F	AE 2D
C222 ..... 2B	R224 ..... 4F	AF 5A
C223 ..... 2C	R225 ..... 5E	AN 4B
C224 ..... 2D	R226A 5D	AP 5B
C225 ..... 2F	R226B 5C	AQ 5B
C226 ..... 1F	R226C 5C	B 4E
C227 ..... 1F	R227 ..... 5F	C 1A
C229 ..... 4F	R228 ..... 5E	D 3D
C230 ..... 4F	R229 ..... 4G	E 5A
C231 ..... 5A	R230 ..... 4F	F 2A
C232 ..... 5B	R231 ..... 4E	G 4A
C233 ..... 2A	R232 ..... 5B	G2 ..... 2G
C234 ..... 2A	R234 ..... 4E	G4 ..... 4E
C235 ..... 3G	R236 ..... 5A	H 3G
C237 ..... 2E	R238 ..... 2E	H1 ..... 3D
C238 ..... 4C	R239 ..... 3E	H2 ..... 3D
C239 ..... 2F	R240 ..... 3E	H3 ..... 4H
C240 ..... 4D	R241 ..... 4E	H4 ..... 4G
C242 ..... 5G	R242 ..... 3G	H5 ..... 2H
C244 ..... 2J	R246 ..... 3G	H6 ..... 2H
C245 ..... 3C	R247 ..... 3F	H7 ..... 1E
C246 ..... 4F	R248 ..... 3G	H8 ..... 1C
C250 ..... 3A	R249 ..... 3F	H9 ..... 4C
C251 ..... 2A	R251 ..... 5D	H10 ..... 3B
C252 ..... 4A	R252 ..... 5B	H11 ..... 3E
C253 ..... 3C	R253 ..... 4C	H12 ..... 3E
C254 ..... 2C	R255 ..... 4C	J 4E
C255 ..... 4A	R257 ..... 5C	K 4D
C256 ..... 3A	R258 ..... 5C	L 5B
C257 ..... 4A	R260 ..... 5D	M 5A
C258 ..... 4A	R261 ..... 4D	N 4G
C259 ..... 1C	R262 ..... 4C	P 5E
C260 ..... 1E	R264 ..... 3G	Q 5F
C261 ..... 3A	R265 ..... 4A	R 4G
C262 ..... 5H	R266 ..... 5A	S 1H
CR201 ..... 1F	R267 ..... 2A	T 5G
	R268 ..... 3A	TP1 ..... 1C
L202 ..... 3B	R269 ..... 3B	TP2 ..... 1D
L203 ..... 1G	R270 ..... 3C	TP3 ..... 2F
L204 ..... 1F	R271 ..... 3B	TP4 ..... 4A
L205 ..... 2F	R272 ..... 5B	U 5G
L206 ..... 5F	R274 ..... 4B	W 5H
L207 ..... 5A	R275 ..... 4B	X 5G
L210 ..... 2B	R276 ..... 3A	Z 3E
	R277 ..... 5B	
PC202 ..... 5C	R280 ..... 1G	

CHASSIS ASSEMBLY KCS 178A

SYMBOL NO.	STOCK NO.	DESCRIPTION
		CAPACITORS
C101	129099	4 section electrolytic
C101A	129099	250 *uf*, 200v.
C101B	129099	650 *uf*, 175v.
C101C	129099	50 *uf*, 175v.
C101D	129099	10 *uf*, 150v.
C102	116010	51 *pf* 5%, 2500v., N1500, cer.
C103	242290	0.1 *uf* 20%, 400v., paper
C104	73960	0.01 *uf* 500v., GMV, cer.
C105		0.22 *uf* 20%, 600v., paper
C106	113165	680 *pf* 20%, 1000v., cer.
C107	73960	0.01 *uf* 500v., GMV, cer.
C108	127040	0.02 *uf* 10%, 600v., paper
C109	124269	150 *pf* 5%, 4000v., N1500, cer.
C110	126440	910 *pf* 5%, 500v., plastic
C111	73960	0.01 *uf* 500v., GMV, cer.
C114	112660	0.001 *uf* 20%, 500v., cer.
C201	73960	0.01 *uf* 500v., GMV, cer.
C202	104890	0.0015 *uf* 20%, 500v., cer.
C203	104224	68 *pf* 20%, 500v., N750, cer.
C204	103847	10 *pf* 20%, 500v., NPO, cer.
C205	112042	12 *pf* 10%, 500v., N330, cer.
C206	107745	56 *pf* 5%, 500v., N750,
C207	104899	0.0022 *uf* 20%, 500v., cer.
C208	112660	0.001 *uf* 20%, 500v., cer.
C209	109572	10 *pf* 10%, 500v., N470, cer.
C210	105301	330 *pf* 20%, 500v., cer.
C211		0.047 *uf* 20%, 100v., cer.
C212	73960	0.01 *uf* 500v., GMV, cer.
C213	109931	39 *pf* 10%, 500v., N150, cer.
C214	112042	12 *pf* 10%, 500v., N330, cer.
C215		0.022 *uf* 20%, 400v., paper
C216		15 *pf* 20%, 500v., N750, cer.
C217	116026	5 *pf* ±0.5 *pf* 500v., N150, cer.
C218		33 *pf* 5%, 500v., N750, cer.
C220	112660	0.001 *uf* 20%, 500v., cer.
C221	120056	0.15 *uf* 20%, 75v., mylar
C222	116026	5 *pf* ±0.5 *pf* 500v., N150, cer.
C223	104135	680 *pf* 10%, 500v., cer.
C224	104384	0.0012 *uf* 10%, 500v., cer.
C225	104135	680 *pf* 10%, 500v., cer.
C226	121225	6 *pf* ±0.5 *pf* 500v., NPO, cer.
C227	116028	18 *pf* 5%, 500v., N150, cer.
C229	230449	0.1 *uf* 20%, 200v., paper
C230	112660	0.001 *uf* 20%, 500v., cer.
C231		0.015 *uf* 20%, 200v., paper
C232		0.033 *uf* 20%, 200v., paper
C233	104214	82 *pf* 20%, 500v., N750, cer.
C234	104224	68 *pf* 20%, 500v., N750, cer.
C235	102230	470 *pf* 20%, 500v., cer.
C237	114485	0.0039 *uf* 10%, 500v., N5600, cer.
C238		0.018 *uf* 10%, 200v., paper
C239	128414	3 *pf* ±0.5 *pf* 500v., cer.
C240		0.033 *uf* 10%, 200v., paper
C242	112660	0.001 *uf* 20%, 500v., cer.
C244	73960	0.01 *uf* 500v., GMV, cer.
C245	124472	0.0027 *uf* 10%, 600v., paper
C246	106547	4700 *pf* 20%, 500v., cer.
C250	106547	4700 *pf* 20%, 500v., cer.
C251	102230	470 *pf* 10%, 500v., cer.
C252	112660	0.001 *uf* 10%, 500v., cer.
C253	104205	0.0033 *uf* 20%, 500v., cer.
C254		0.056 *uf* 20%, 100v., mylar
C255	104205	0.0033 *uf* 20%, 500v., cer.
C256	121227	390 *pf* 5%, 500v., N750, cer.
C257	126821	0.0039 *uf* 10%, 100v., mylar
C258	102562	180 *pf* 10%, 500v., cer.
C259	112660	0.001 *uf* 20%, 500v., cer.
C260	112660	0.001 *uf* 20%, 500v., cer.
C261	109232	68 *pf* 20%, 500v., NPO, cer.
C262	104224	68 *pf* 20%, 500v., cer.
J101	102787	Connector—yoke
		COILS
L102	107385	8.2 *uh*
L103	107385	8.2 *uh*
L202	114315	AGC
L203	124271	470 *uh*
L204	116056	36 *uh*
L205	107463	2.7 *uh*
L206	115427	270 *uh*
L207	114486	stabilizer
L210	114314	R.F.
PC202	114916	Circuit—printed
PW200	127849	Circuit—printed sound, video

KRK 148A/152A VHF/UHF TUNER SCHEMATIC DIAGRAM



1. ALL RESISTANCE VALUES IN OHMS. K-1000.
2. ALL RESISTORS ARE 1/2 WATT EXCEPT AS INDICATED.
3. ALL CAPACITANCE VALUES ARE IN PF EXCEPT AS INDICATED.
4. SWITCHES SHOWN IN CHANNEL 13 POSITION.
5. • DENOTES THROUGH CONNECTION OF ROTOR BLADE.
6. —o— DENOTES CONTACT CONNECTED TO CONTACT ON OPPOSITE SIDE OF SWITCH.
7. —◎— DENOTES CONTACT INSULATED TO CONTACT ON OPPOSITE SIDE OF SWITCH.
8. VOLTAGES MEASURED WITH ELECTRONIC VOLTMETER AND WITH NO SIGNAL INPUT.

Chassis
KCS 176 Series

Model and Chassis Cross Reference

MODEL	CHASSIS	TMA	TUNER	KINESCOPE	ANTENNAS VHF/UHF
AP-100L	KCS 176E	156B	KRK 157A/150A	10ATP4	Monopole/Ring
AP-101S	KCS 176E	156B	KRK 157A/150A	10ATP4	Monopole/Ring
AP-094W	KCS 176D	156A	KRK 157A/150A	10ATP4	Monopole/Ring

The earlier sets also using KCS-176 are practically identical electrically to sets covered, but use 9AEP4 picture tube.

Model and Chassis Cross Reference

MODEL	NAME	CHASSIS	TMA	TUNER	KINESCOPE	ANTENNAS VHF/UHF
AM-093B, M, Y	*"ELFIN"*	KCS 176A	156A	KRK 157A/150A	9AEP4	Monopole/Ring
AM-097E	*"GAMIN"*	KCS 176A	156A	KRK 157A/150A	9AEP4	Monopole/Ring
AM-100L	*"CABOT"*	KCS 176B	156B	KRK 157A/150A	9AEP4	Monopole/Ring
AM-101S	*"ALAMADA"*	KCS 176B	156B	KRK 157A/150A	9AEP4	Monopole/Ring

The letter following the third numeral in the model number designates the cabinet finish as follows: B—LIGHT BLUE/TARNISHED SILVER METALLIC; E—BLACK AND WHITE OPTILE ROLLER GRAIN VINYL/FOG WHITE; L—ANTIQUED COLONIAL MAPLE/BLACK JAVA; M—FAWN BROWN/TARNISHED SILVER METALLIC; S—ANTIQUED SIERRA PECAN/BLACK JAVA; Y—FOG WHITE/DESERT BEIGE METALLIC.

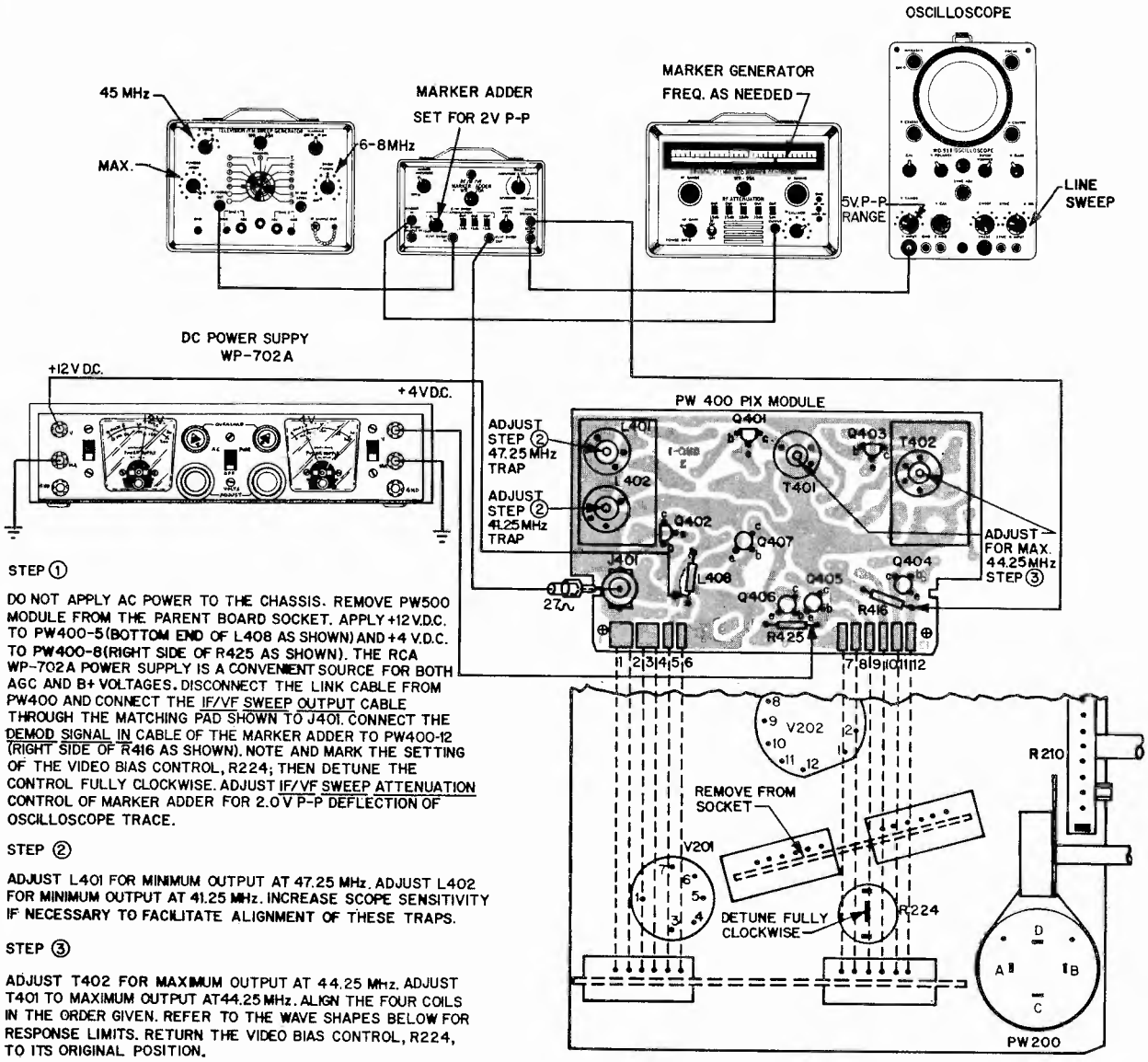
Models using Chassis KCS-177 are electrically very similar to KCS-176.

MODEL	CHASSIS	TMA	TUNER	PICTURE TUBE	ANTENNAS VHF/UHF
AP-133B, N, Y	KCS 177C	157A	KRK 157A/150A	12DSP4	Dipole/Ring
AP-136Y	KCS 177C	157A	KRK 157A/150A	12DSP4	Dipole/Ring
AM-133B, G, Y	KCS 177A	157A	KRK 157A/150A	12DFP4	Dipole/Ring
AM-139YK	KCS 177A	157A	KRK 157A/150A	12DFP4	Dipole/Ring

INSTRUMENT DISASSEMBLY

1. Remove five 1/4" hex-head back cover screws: two in handle recess, one at antenna board and two underneath. Remove back cover.
2. The parent board assembly may now be moved to the rear far enough to permit access to most components. However, when the parent board is moved to the rear, the kinescope grounding provision is disabled. If the set is to be operated in this position, connect a clip lead between the kinescope retaining ring and a convenient ground on the parent board.
3. Should further disassembly be required, disconnect the anode lead, the picture tube socket and the speaker cable at the speaker. Loosen the yoke retaining ring screw and move the yoke to the test mounting position (a slot in the bracket above the horizontal hold control.)
4. Remove five control knobs and the UHF dial from the cabinet front. Remove three 1/4" hex-head screws from the Tuner Mounting Assembly front bracket. Remove the TMA and the parent board assembly.
5. Loosen the kinescope retaining ring bolt sufficiently to permit slipping the ring out of the four corner retainers. Remove the kinescope. In replacing the kinescope, be certain that the kinescope grounding strap is replaced and the retaining ring is replaced in its original position (bolt at the top with the vinyl insulator adjacent to the ultor anode well).

PICTURE I F ALIGNMENT—KCS 176 & 177 CHASSIS



STEP ①

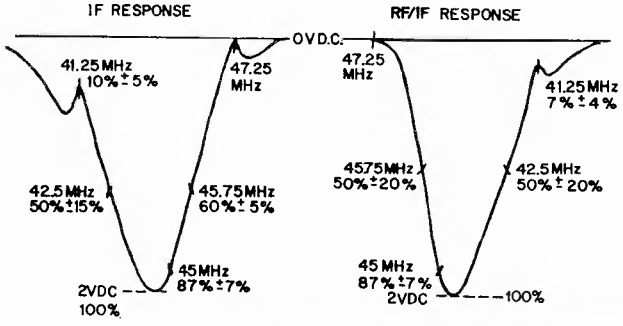
DO NOT APPLY AC POWER TO THE CHASSIS. REMOVE PW500 MODULE FROM THE PARENT BOARD SOCKET. APPLY +12 V.D.C. TO PW400-5 (BOTTOM END OF L408 AS SHOWN) AND +4 V.D.C. TO PW400-8 (RIGHT SIDE OF R425 AS SHOWN). THE RCA WP-702A POWER SUPPLY IS A CONVENIENT SOURCE FOR BOTH AGC AND B+ VOLTAGES. DISCONNECT THE LINK CABLE FROM PW400 AND CONNECT THE IF/VF SWEEP OUTPUT CABLE THROUGH THE MATCHING PAD SHOWN TO J401. CONNECT THE DEMOD SIGNAL IN CABLE OF THE MARKER ADDER TO PW400-12 (RIGHT SIDE OF R416 AS SHOWN). NOTE AND MARK THE SETTING OF THE VIDEO BIAS CONTROL, R224; THEN DETUNE THE CONTROL FULLY CLOCKWISE. ADJUST IF/VF SWEEP ATTENUATION CONTROL OF MARKER ADDER FOR 2.0 V P-P DEFLECTION OF OSCILLOSCOPE TRACE.

STEP ②

ADJUST L401 FOR MINIMUM OUTPUT AT 47.25 MHz. ADJUST L402 FOR MINIMUM OUTPUT AT 41.25 MHz. INCREASE SCOPE SENSITIVITY IF NECESSARY TO FACILITATE ALIGNMENT OF THESE TRAPS.

STEP ③

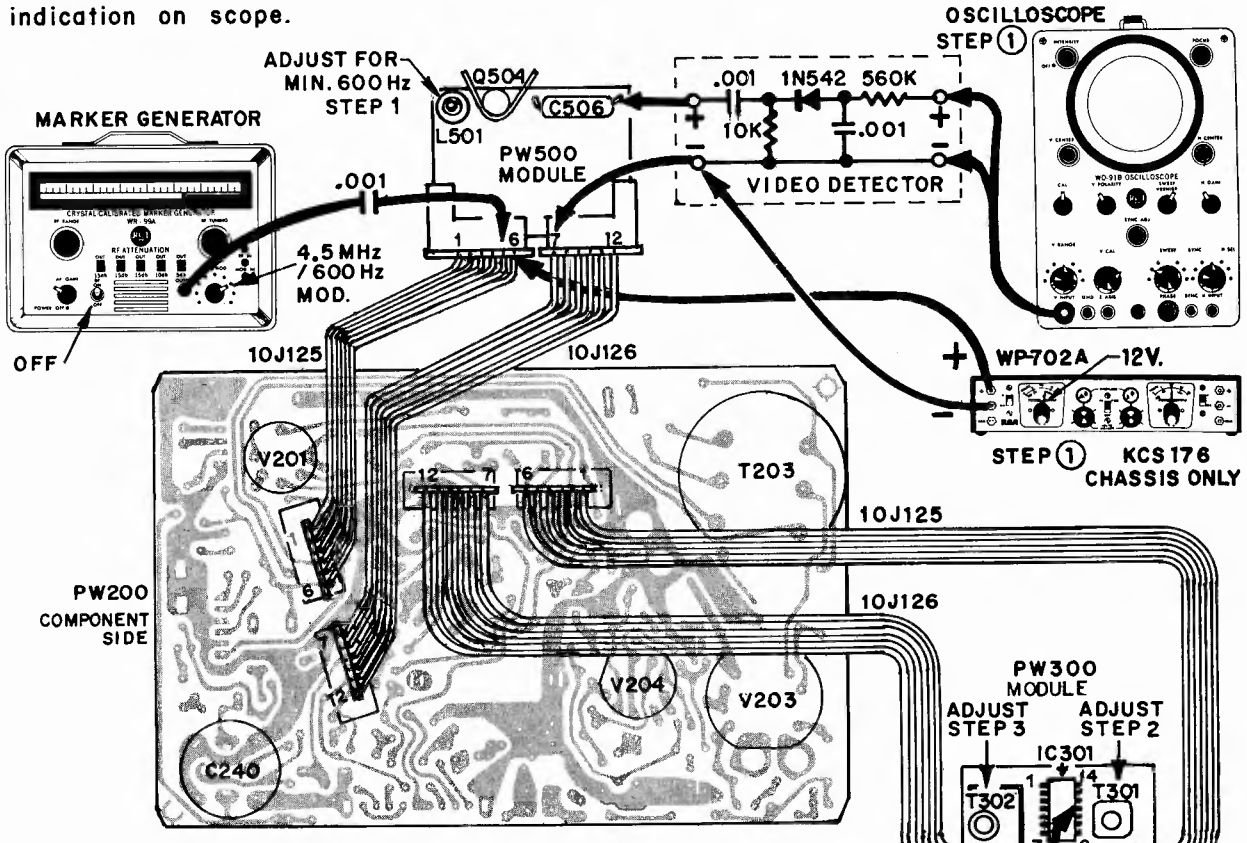
ADJUST T402 FOR MAXIMUM OUTPUT AT 44.25 MHz. ADJUST T401 TO MAXIMUM OUTPUT AT 44.25 MHz. ALIGN THE FOUR COILS IN THE ORDER GIVEN. REFER TO THE WAVE SHAPES BELOW FOR RESPONSE LIMITS. RETURN THE VIDEO BIAS CONTROL, R224, TO ITS ORIGINAL POSITION.



SOUND ALIGNMENT—KCS 176 & 177 CHASSIS

STEP ①

Connect PW500 Module to parent board through extension cables (Stock Nos. 10J125 and 10J126). Disconnect picture tube socket to disable high voltage. Connect 12V. D.C. source (WP-702A) to PW500-6 (KCS176 chassis only). Connect Marker Generator through .001 capacitor to PW500-5. Adjust generator frequency to 4.5 MHz/600 Hz modulation. Turn RF switch to OFF. (Connect Oscilloscope through Video Detector probe shown to PW500-12 (Right side of C506). Adjust 4.5 MHz trap (L501) for minimum 600 Hz indication on scope.



STEP ②

Disconnect test equipment used in Step1 and return PW500 Module to parent board socket. Connect PW300 Sound Module through extension cables to parent board. Reconnect picture tube socket and tune in a strong local channel. Connect an Electronic Voltmeter between IC301-11 (Positive probe) and PW300-7 (Negative probe). Adjust top core of T301 for 0 ±.1 V.D.C. Adjust bottom core of T301 for maximum recovered audio.

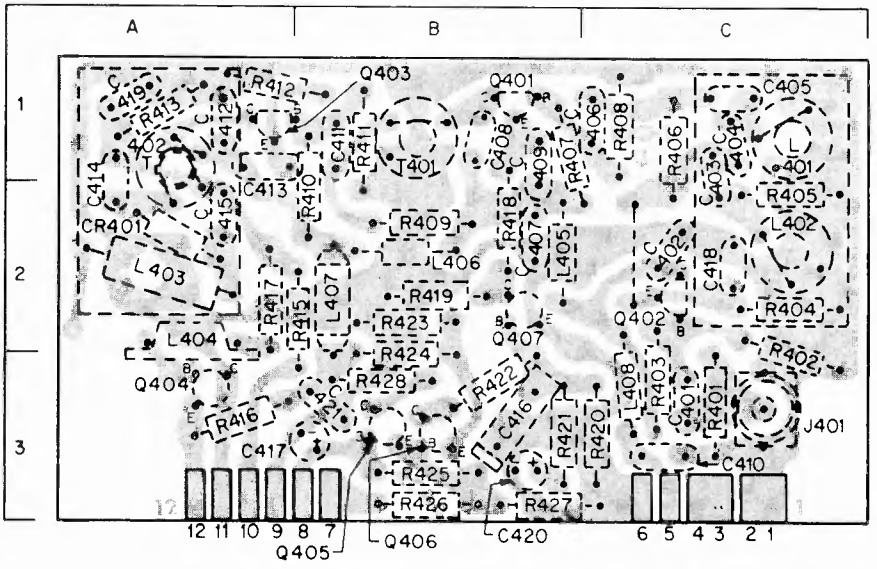
STEP ③

Reduce the signal strength with fine tuning until hiss is heard in sound. Adjust T302 for maximum recovered audio.

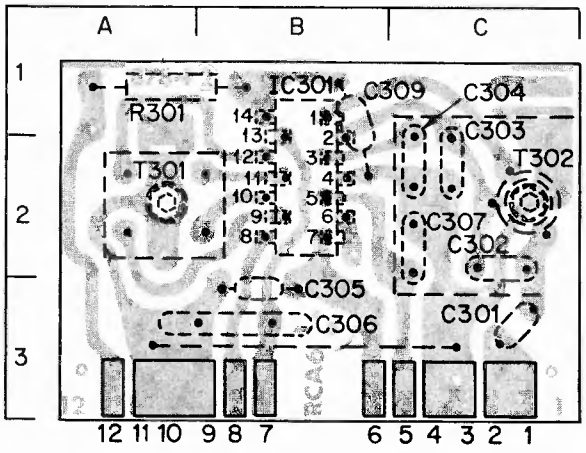
PW400 PIX MODULE CIRCUIT ASSEMBLY

PW400 Location Guide

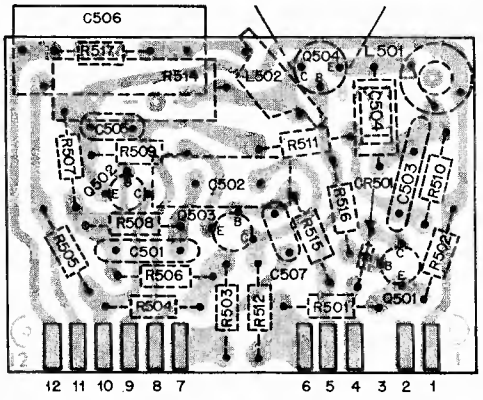
C401	.....	3C
C402	.....	2C
C403	.....	1C
C404	.....	1C
C405	.....	1C
C406	.....	1C
C407	.....	2B
C408	.....	1B
C409	.....	1B
C410	.....	3C
C411	.....	1B
C412	.....	1A
C413	.....	2A
C414	.....	2A
C415	.....	2A
C416	.....	3B
C417	.....	3A
C418	.....	2C
C419	.....	1A
C420	.....	3B
C421	.....	3B
CR401	....	2A
J401	.....	3C
L401	.....	1C
L402	.....	2C
L403	.....	2A
L404	.....	2A
L405	.....	2B
L406	.....	2B
L407	.....	2B
L408	.....	3C
Q401	.....	1B
Q402	.....	2C
Q403	.....	1B
Q404	.....	3A
Q407	.....	2B
R401	.....	3C
R402	.....	3C
R403	.....	3C
R406	.....	1C
R407	.....	1B
R408	.....	1C
R409	.....	2B
R410	.....	2B
R411	.....	1B
R412	.....	1A
R413	.....	1A
R415	.....	2B
R416	.....	3A
R417	.....	2A
R418	.....	2B
R419	.....	2B
R420	.....	3C
R421	.....	3B
R422	.....	3B
R423	.....	2B
R424	.....	3B
R425	.....	3B
R426	.....	3B
R427	.....	3B
R428	.....	3B
T401	.....	1B
T402	.....	1A



PW300 SOUND MODULE CIRCUIT ASSEMBLY



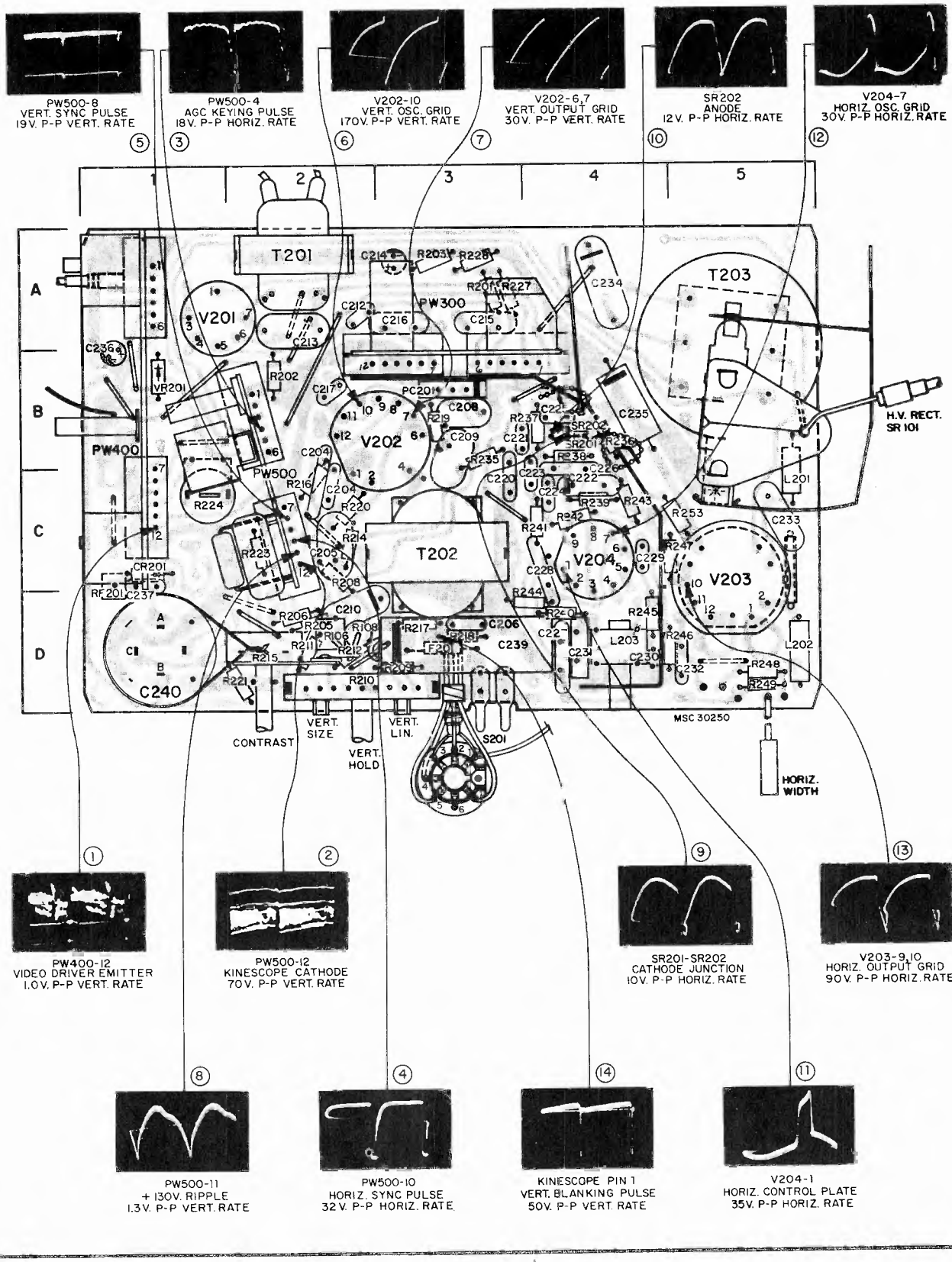
PW500 VIDEO MODULE CIRCUIT ASSEMBLY



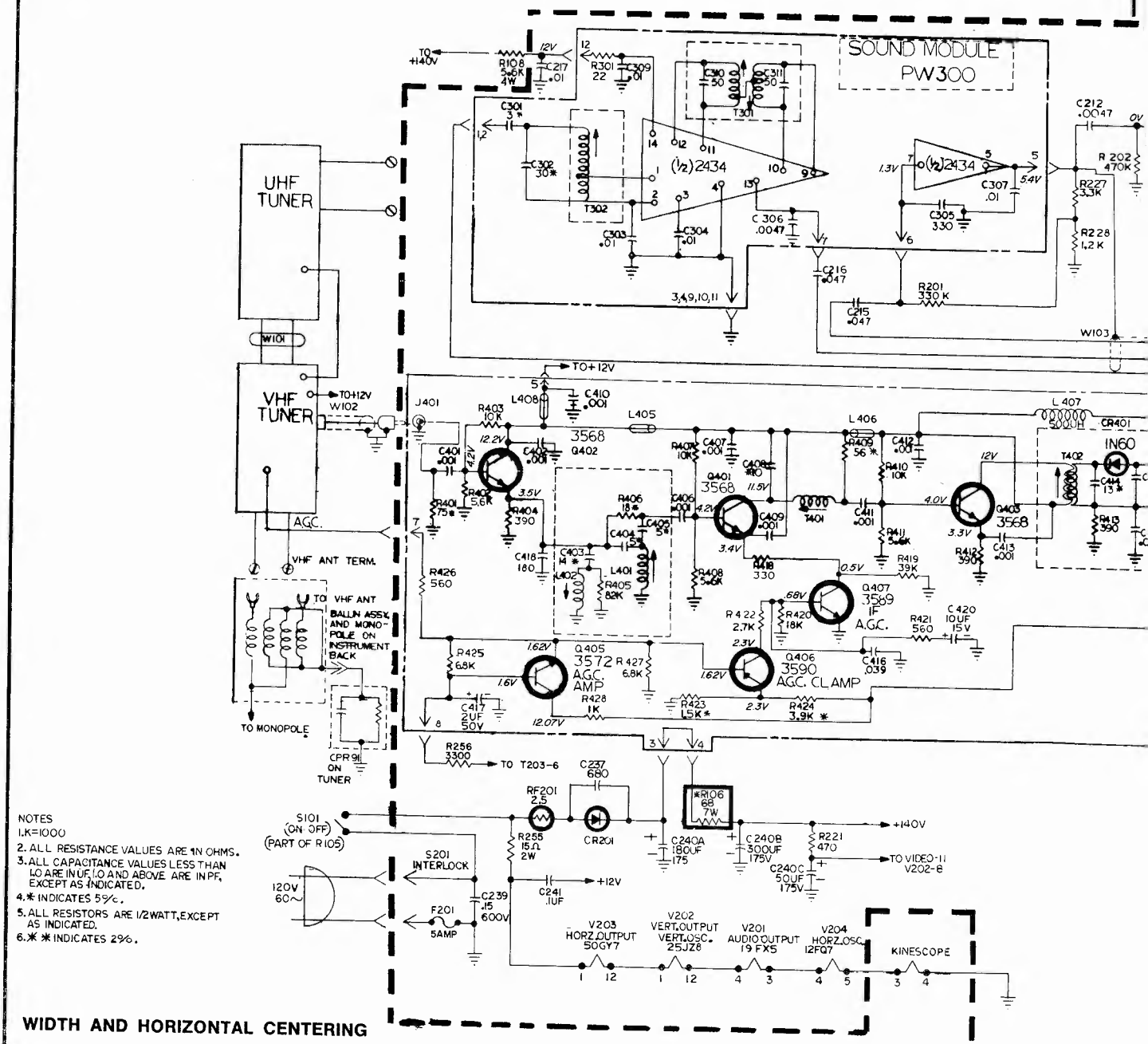
PW200 Component Location Guide

C204	.....	2B
C205	.....	2C
C206	.....	3D
C208	.....	3B
C209	.....	3B
C210	.....	2D
C212	.....	2A
C213	.....	2A
C214	.....	3A
C215	.....	3A
C216	.....	3A
C217	.....	2B
C220	.....	3C
C221	.....	3B
C222	.....	4C
C223	.....	4C
C224	.....	4C
C225	.....	4B
C226	.....	4C
C227	.....	4D
C228	.....	4C
C229	.....	4C
C230	.....	4D
C231	.....	4D
C232	.....	5D
C233	.....	5C
C234	.....	4A
C235	.....	4B
C236	.....	1A
C237	.....	1C
C239	.....	3D
C240	.....	1D
CR201	....	1C
F201	.....	3D
L201	.....	5C
L202	.....	5D
L203	.....	4D
PC201	....	3B
PW300	....	3A
PW400	....	1B
PW500	....	2C
R106	.....	2D
R108	.....	2D
R201	.....	3A
R202	.....	2B
R203	.....	3A
R205	.....	2D
R206	.....	2D
R208	.....	2C
R209	.....	3D
R210	.....	2D
R211	.....	2D
R212	.....	2D
R214	.....	2C
R215	.....	2D
R216	.....	2C
R217	.....	3D
R218	.....	3D
R219	.....	3B
R220	.....	2C
R221	.....	2D
R223	.....	2C
R224	.....	1C
R227	.....	3A
R228	.....	3A
R235	.....	3B
R236	.....	4B
R237	.....	4B
R238	.....	4B
R239	.....	4C
R240	.....	4D
R241	.....	4C
R242	.....	4C
R243	.....	4C
R244	.....	4D
R245	.....	4D
R246	.....	5D
R247	.....	5C
R248	.....	5D
R249	.....	5D
R253	.....	5C
RF201	....	1C
S201	.....	3D
SR201	....	4B
SR202	....	4B
T201	.....	2A
T202	.....	3C
T203	.....	5A
V201	.....	1A
V202	.....	3B
V203	.....	5C
V204	.....	4C
VR201	....	1B

PW200 PARENT BOARD ASSEMBLY AND CHASSIS SIGNAL WAVEFORMS



RCA Chassis KCS-176 Schematic Diagram



NOTES
1. K=1000
2. ALL RESISTANCE VALUES ARE IN OHMS.
3. ALL CAPACITANCE VALUES LESS THAN 1.0 ARE IN UF, 1.0 AND ABOVE ARE IN PF, EXCEPT AS INDICATED.
4. * INDICATES 5%.
5. ALL RESISTORS ARE 1/2 WATT, EXCEPT AS INDICATED.
6. * * INDICATES 2%.

WIDTH AND HORIZONTAL CENTERING

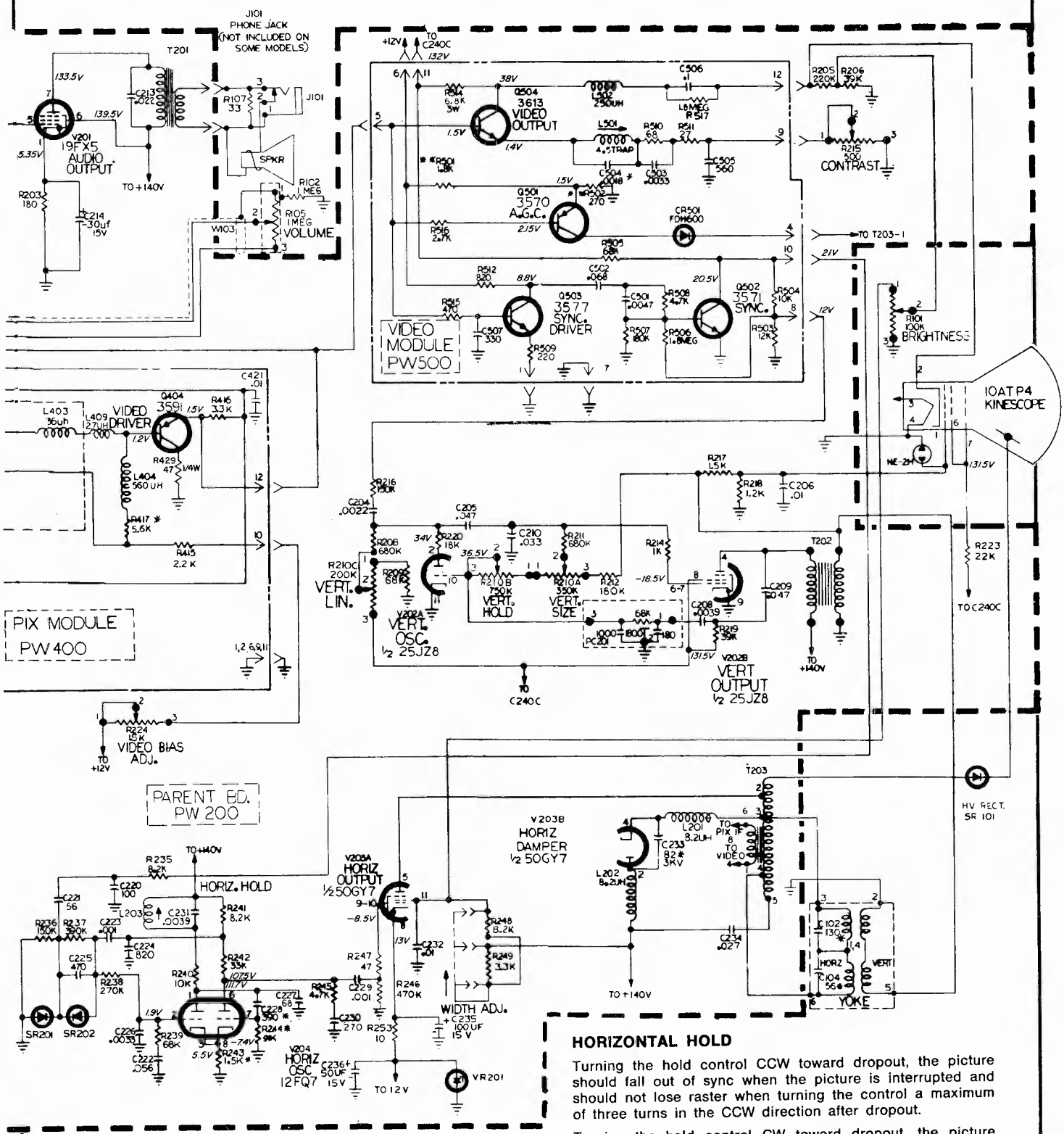
All adjustments should be made at 108 volts AC line. Adjust the horizontal hold control to the middle of the horizontal oscillator pull-in range. Vertical height and linearity should be approximately correct. Set the brightness and contrast controls to maximum (fully clockwise).

The width control is an insulated jumper arrangement located in the right rear corner of the parent board assembly. Choose one of the three taps provided which allows a small portion of black to be visible on the edge of the raster. Center the raster with the centering tabs located on the yoke housing by leaving equal amounts of black at the left and right sides of the mask.

Now choose the first width tap, progressing from left to right (looking at the rear of the instrument) that allows the raster to just fill the mask. The width adjustment varies the screen voltage of the horizontal output tube. It must be set properly to insure proper high voltage operation and should be adjusted before performing the following adjustments.

VERTICAL LINEARITY, HEIGHT, AND CENTERING

With 108 VAC line, set the contrast control to minimum and the brightness control to low brightness. Use station signal or test pattern generator. Adjust the height and linearity controls for the proper height and optimum overall linearity. The height and centering should be such that the raster overscans the mask by 1/8" at the top and bottom.



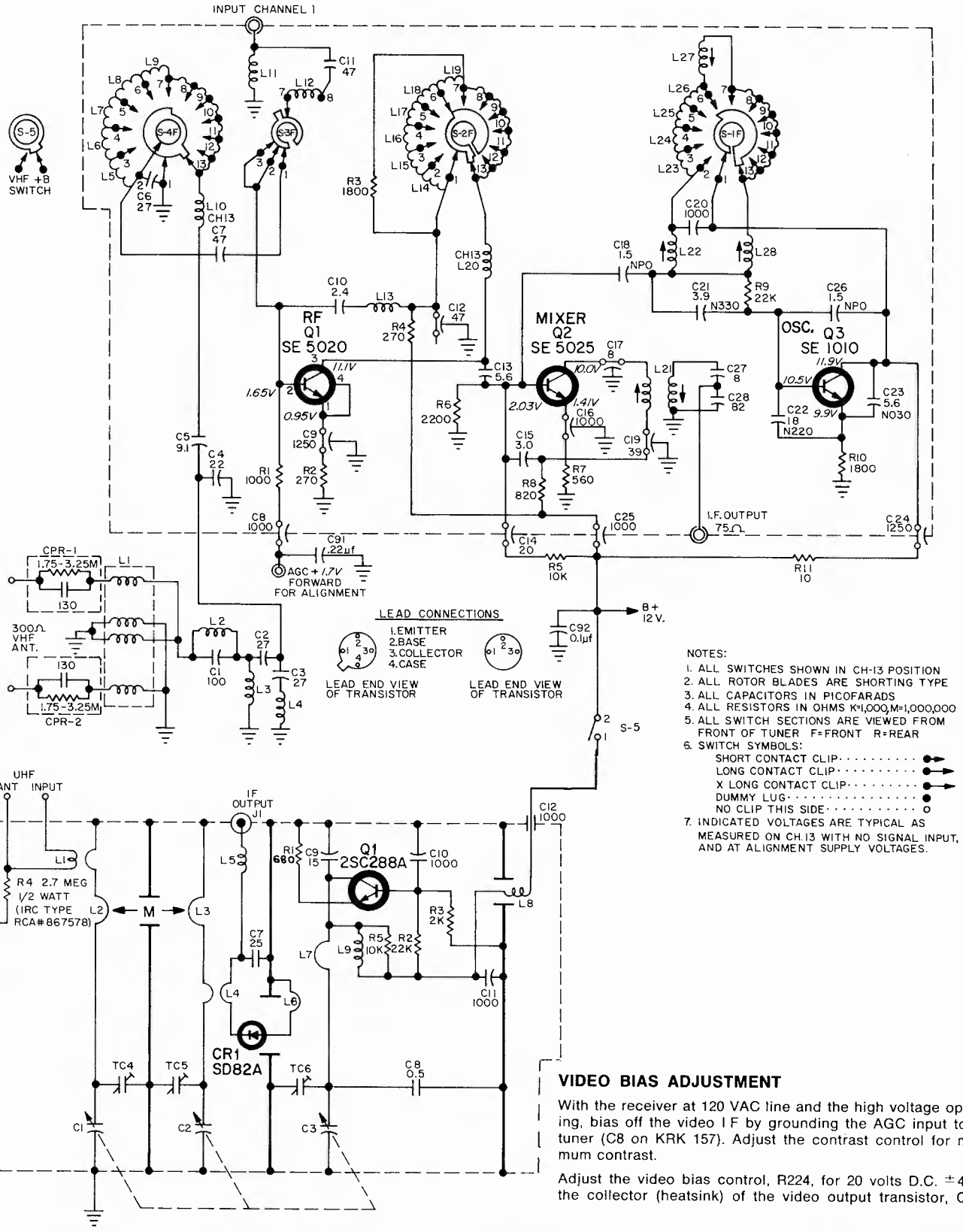
KCS 176 SERIES CHASSIS CIRCUIT SCHEMATIC

HORIZONTAL HOLD

Turning the hold control CCW toward dropout, the picture should fall out of sync when the picture is interrupted and should not lose raster when turning the control a maximum of three turns in the CCW direction after dropout.

Turning the hold control CW toward dropout, the picture should fall out of sync when the signal is interrupted and should not go into spurious oscillation when turning the control a maximum of three turns in the CW direction after dropout. Turning the control CW toward pull-in from the high frequency side, the picture should pull into sync from a minimum of one bar and a maximum of five bars. Turning the control toward pull-in from the low frequency side, the picture should pull in from one to four bars.

KRK 157A/150A VHF/UHF TUNER SCHEMATIC DIAGRAM



NOTES:

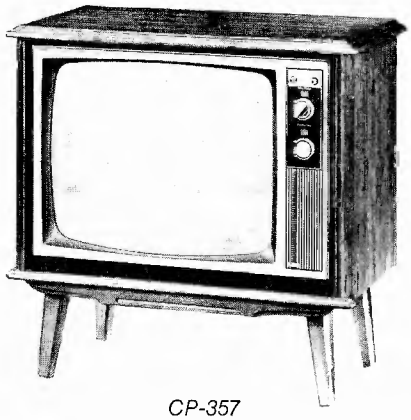
1. ALL SWITCHES SHOWN IN CH-13 POSITION
2. ALL ROTOR BLADES ARE SHORTING TYPE
3. ALL CAPACITORS IN PICOFARADS
4. ALL RESISTORS IN OHMS K=1,000,M=1,000,000
5. ALL SWITCH SECTIONS ARE VIEWED FROM FRONT OF TUNER F=FRONT R=REAR
6. SWITCH SYMBOLS:
   - SHORT CONTACT CLIP
   - LONG CONTACT CLIP
   - X LONG CONTACT CLIP
   - DUMMY LUG
   - NO CLIP THIS SIDE
7. INDICATED VOLTAGES ARE TYPICAL AS MEASURED ON CH.13 WITH NO SIGNAL INPUT, AND AT ALIGNMENT SUPPLY VOLTAGES.

VIDEO BIAS ADJUSTMENT

With the receiver at 120 VAC line and the high voltage operating, bias off the video I F by grounding the AGC input to the tuner (C8 on KRK 157). Adjust the contrast control for maximum contrast.

Adjust the video bias control, R224, for 20 volts D.C. ±4V at the collector (heatsink) of the video output transistor, Q504.

Chassis
KCS 183 Series



CP-357

Model and Chassis Cross Reference

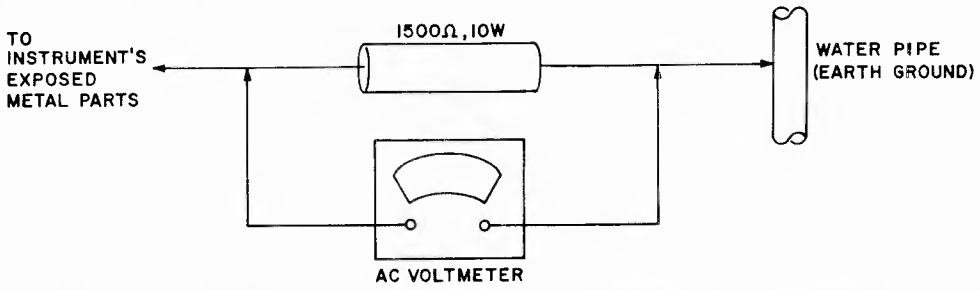
MODEL	CHASSIS	TMA	TUNERS	PICTURE TUBE
CP-357W	KCS 183A	171E	KRK 149C/152A	22VABP4
CP-363L	KCS 183A	171E	KRK 149C/152A	22VABP4
CP-369S	KCS 183A	171E	KRK 149C/152A	22VABP4
CP-371W	KCS 183A	171E	KRK 149C/152A	22VABP4

The letter following the third numeral in the model number designates the cabinet finish as follows: W—WALNUT GRAIN; L—COLONIAL MAPLE GRAIN; S—ANTIQUED MISION PECAN GRAIN.

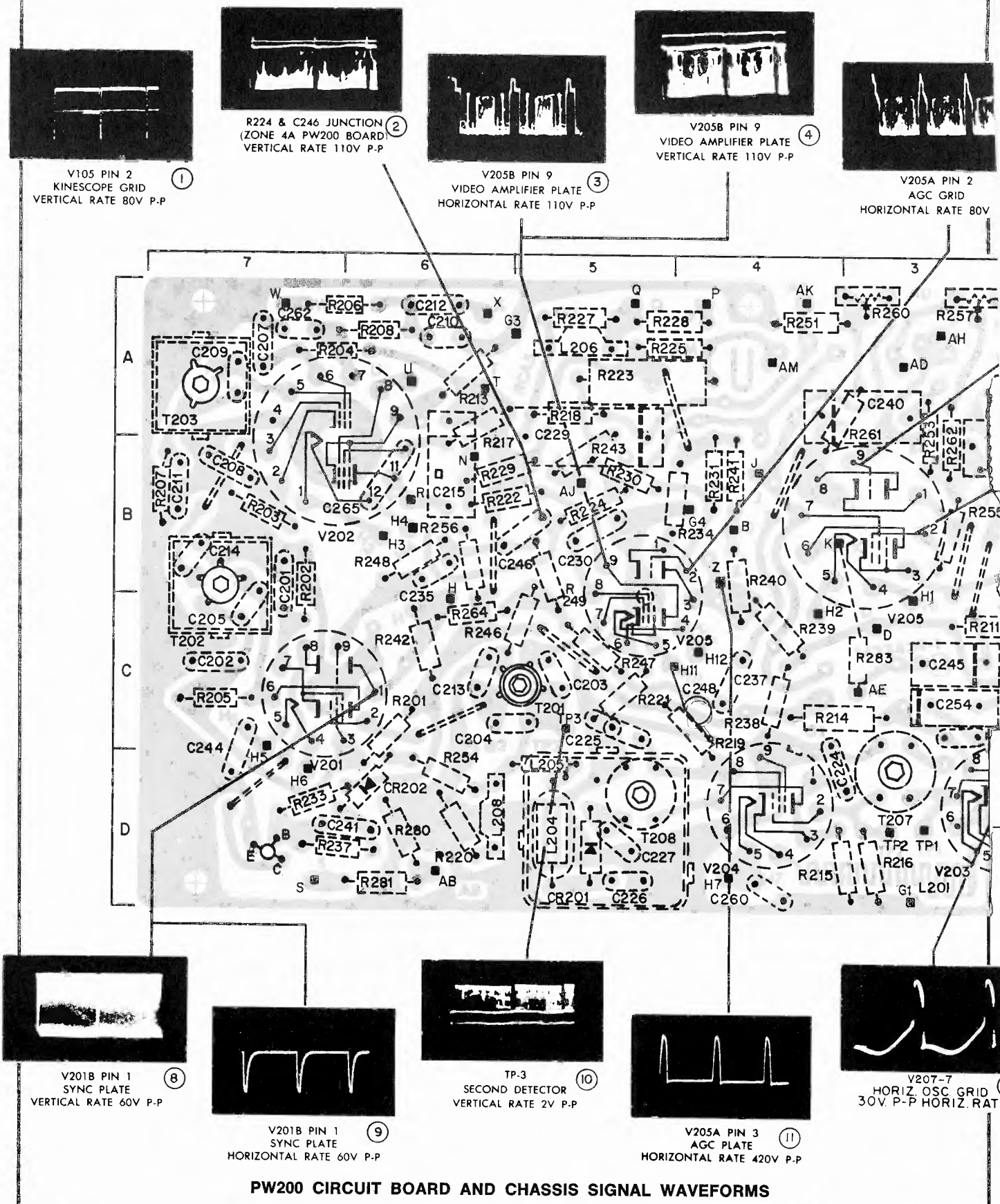
SERVICING PRECAUTIONS

WARNING: Since the chassis of some receivers are connected to one side of the AC supply during operation, service should not be attempted by anyone not familiar with the precautions necessary when working on this type of equipment. The following precautions should be observed.

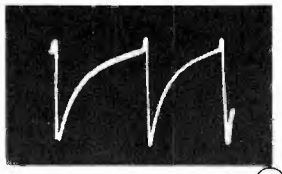
1. **An isolation transformer should be inserted in the power line between the receiver and the AC supply before any service is performed on the receiver.**
2. **When the receiver must be operated directly from the AC supply, the power plug should always be inserted in the proper direction to connect the chassis to the ground side of the AC line. Check with an AC voltmeter to see if a potential exists between the chassis and the power source ground. 0V reading should be obtained. If a reading is obtained, reverse the power plug and recheck for zero meter reading.**
3. **When replacing a chassis in the cabinet, always be certain that all the protective devices are put back in place, such as: non-metallic control knobs, insulating "fishpapers," adjustment and compartment covers or shields, isolation resistor—capacitor networks, etc. Before replacing the back cover of the instrument, thoroughly inspect inside the cabinet to see that no stray parts or tools have been left inside.**
4. **Before returning any instrument to the customer, the Service Technician must be sure that no shock hazard exists. Plug the AC line cord directly into a 120V AC outlet (do not use an isolation transformer for this check). Using two clip leads of sufficient length, place a 1500 ohm/10 watt resistor in series with an exposed metal cabinet part and a known earth ground (water pipe, conduit, etc.). Measure the potential across the resistor with an AC voltmeter of 1000 ohms/volt or more resistance. Move the resistor connection to each exposed metal part (antennas, handle bracket, metal cabinet, screwheads, metal overlays control shafts, etc.) and measure the potential across the resistor at each new connection. Now reverse the plug in the AC outlet and repeat each measurement. Any reading of 3.0 volts or more is excessive and indicative of a potential shock hazard which must be corrected before returning the instrument to the owner.**



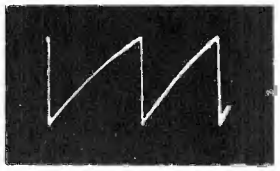
RCA Chassis KCS-183 Printed Board and Waveform Information



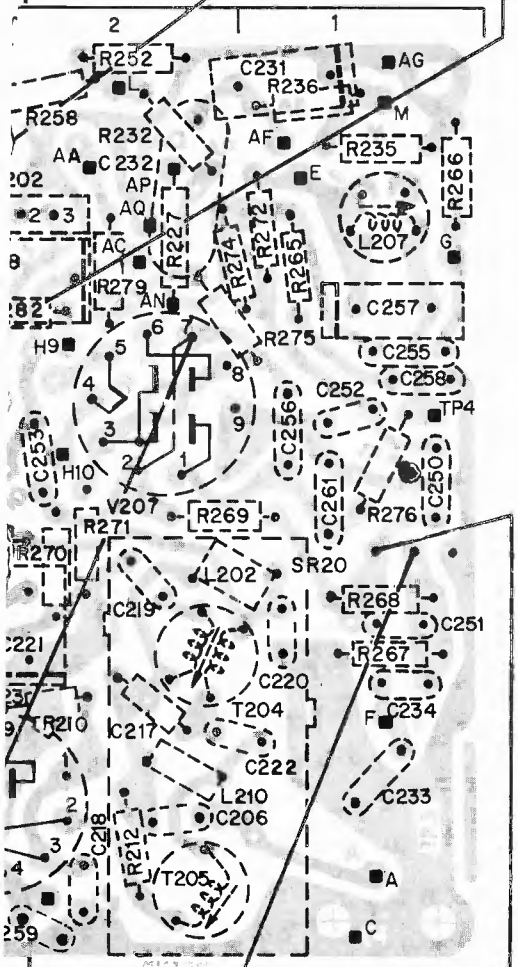
PW200 CIRCUIT BOARD AND CHASSIS SIGNAL WAVEFORMS



V206B PIN 9 (6)
VERTICAL OSCILLATOR GRID
VERTICAL RATE 180V P-P

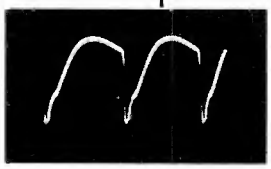


V206A PIN 2 (7)
VERTICAL OUTPUT GRID
VERTICAL RATE 28V P-P

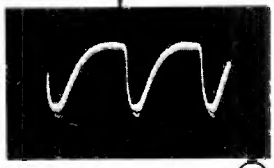


TERMINALS

A	1D
AA	2A
AB	6D
AC	2B
AD	3A
AE	3C
AF	1A
AG	1A
AH	3A
AK	4A
AM	4A
AP	2A
B	4B
C	1D
D	3C
E	1A
F	1C
G	1A
G1	4C
G2	6C
G3	5A
G4	4B
H	6B
H1	3C
H2	4C
H3	6B
H4	6B
H5	7C
H6	7D
H7	4D
H8	2D
H9	2B
H10	2B
H11	4C
H12	4C
J	4B
K	3B
L	2A
M	1A
N	6B
P	4A
Q	5A
R	6B
S	7D
T	6A
U	6A
W	7A
X	6A
Z	4B
TP1	3D
TP2	3D
TP3	5C
TP4	1B



SR201 CATHODE JUNCTION (13)
HORIZONTAL PHASE DETECTOR
HORIZONTAL RATE 12V P-P



SR201 ANODE (14)
HORIZONTAL PHASE DETECTOR
HORIZONTAL RATE 15V P-P

PW200 COMPONENT LOCATION GUIDE

C201	7B	C253	2B	R220	6D	R266	1A
C202	7C	C254	3C	R221	2C	R267	1C
C203	5C	C255	1B	R222	6B	R268	1C
C204	5C	C256	1B	R223	5A	R269	2C
C205	7C	C257	1B	R224	5B	R270	2C
C207	7A	C258	1B	R225	4A	R271	2C
C208	7B	C259	2D	R227	5A	R272	1A
C209	7A	C260	4D	R228	4A	R274	2B
C210	6A	C261	1B	R229	5B	R275	2B
C211	7B	C262	7A	R230	5B	R276	1B
C212	6A	CR201	5D	R231	4B	R277	2A
C213	5C	CR202	6D	R232	2A	R279	2B
C214	7B	L201	3D	R233	7D	R280	6D
C215	6B	L202	2C	R234	5B	R281	6D
C217	2C	L203	6D	R235	1A	R282	2B
C218	2D	L204	5D	R236	1A	R283	3C
C220	1C	L205	5D	R237	7D	SR201	1C
C221	2C	L206	5A	R238	4C	SR202	1C
C222	1D	L207	1A	R239	4C	T201	5C
C223	3C	L210	2D	R240	4B	T202	7B
C224	3D	PC202	2A	R241	4B	T203	7A
C225	5C	Q201	7D	R242	6C	T204	2C
C226	5D	R201	6C	R243	5B	T205	2D
C227	5D	R202	7B	R246	5C	T207	3D
C229	5B	R203	7B	R247	5C	T208	5D
C231	1A	R204	6A	R248	6B		
C232	2A	R205	7C	R249	5B		
C233	1D	R206	6A	R251	4A		
C234	1C	R207	7B	R252	2A		
C235	6B	R208	6A	R253	3B		
C237	4C	R210	2C	R254	6D		
C238	2B	R211	3C	R255	3B		
C240	3B	R212	2D	R256	6B		
C241	7D	R213	6A	R257	3A		
C244	7C	R214	3C	R258	2A		
C245	3C	R215	3D	R260	3A		
C246	5B	R216	3D	R261	3B		
C248	4C	R217	6B	R262	3B		
C250	1B	R218	5A	R264	6C		
C251	1C	R219	4C	R265	1A		
C252	1B						

SERVICE ADJUSTMENTS
(continued)

HORIZONTAL SINE WAVE ADJUSTMENT

Remove the sync by placing a clip lead between PW200-H (Zone 6B) and chassis ground. Short out the sine wave coil, L207, by placing another clip lead between PW200-E (Zone 1A) and TP-4 (Zone 1B).

Adjust the horizontal hold control so that the free-running frequency of the oscillator is 15.750kc (picture sides vertical). Remove the shorting jumper from the sine wave coil (PW200-E to TP-4).

Adjust L207 (Zone 1A) until the picture sides are again vertical (15.750kc). Remove the short from the sync (PW200-H) to ground.

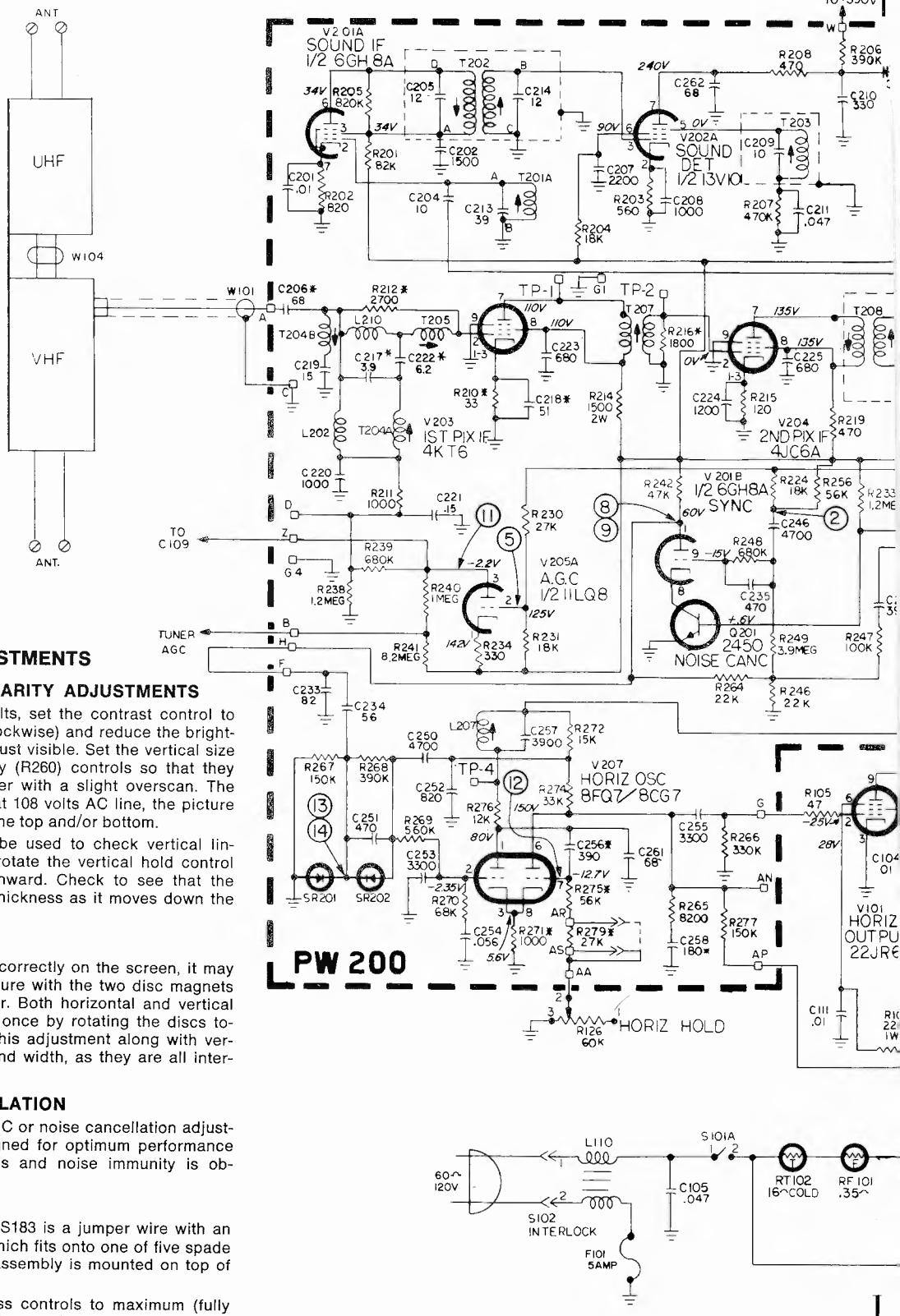
SERVICE CONTROL LOCATION

The VHF/UHF Tuning, Brightness Control and the combined Volume Control and the On/Off Switch are located on the front of the receiver cabinet. The Contrast, Horizontal and Vertical Controls are mounted behind a pull down door located at the lower front edge of cabinet below the VHF/UHF Tuning. The Vertical Height and Vertical Linearity Controls are screw driver adjustable, accessible through holes provided in the cabinet back.

FOCUS

The focus adjustment is a Terminal Board and Jumper assembly mounted on rear of high voltage cage, provides from zero to "B" boost voltage at the kinescope focus anode. Place the jumper on terminal which provides best focus.

RCA Chassis KCS-183 Schematic Diagram



SERVICE ADJUSTMENTS

VERTICAL SIZE AND LINEARITY ADJUSTMENTS

With the AC line set at 120 volts, set the contrast control to minimum (maximum counter clockwise) and reduce the brightness control until the raster is just visible. Set the vertical size (R257) and the vertical linearity (R260) controls so that they coact to produce a linear raster with a slight overscan. The overscan should be such that at 108 volts AC line, the picture fills the mask to $+1/4''$, $-0''$ at the top and/or bottom.

A cross hatch pattern should be used to check vertical linearity. If one is not available, rotate the vertical hold control to roll the picture slowly downward. Check to see that the blanking bar does not vary in thickness as it moves down the screen.

CENTERING

If the picture is not positioned correctly on the screen, it may be necessary to center the picture with the two 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.

AGC AND NOISE CANCELLATION

No controls are provided for AGC or noise cancellation adjustment. The AGC circuit is designed for optimum performance under varying signal conditions and noise immunity is obtained by Q201 noise gate.

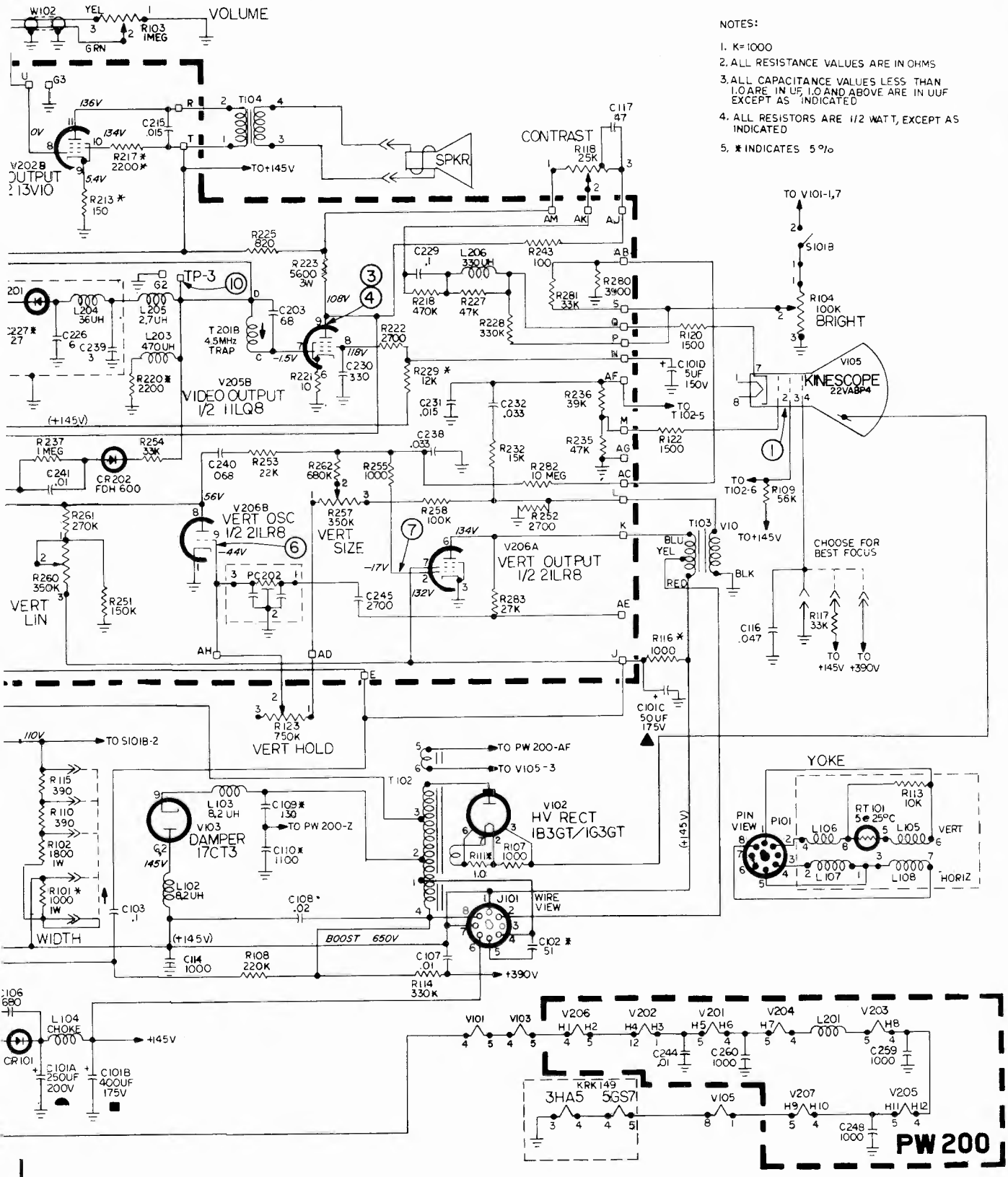
WIDTH ADJUSTMENT

The width adjustment of the KCS183 is a jumper wire with an attached insulated speed clip which fits onto one of five spade terminals. This terminal board assembly is mounted on top of the high voltage cage.

Turn the contrast and brightness controls to maximum (fully clockwise). Set the A.C. line voltage at 108 volts. Starting with the first terminal on the left (as viewed from the rear), move the width adjustment from one terminal to the next until the raster just fills the mask. NOTE: Vertical height and linearity should be adjusted before adjusting the width.

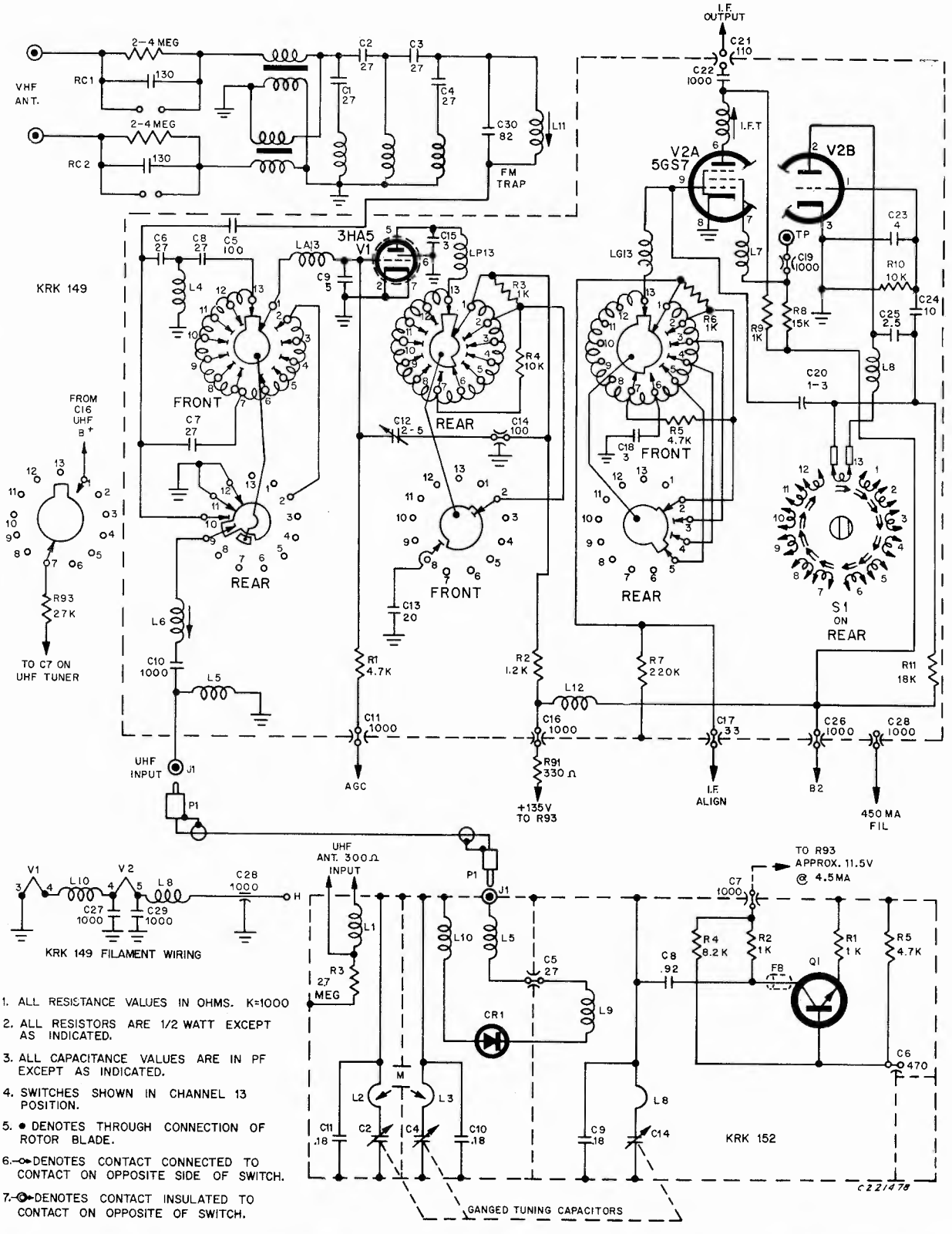
DEFLECTION YOKE

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



KCS 183 SERIES CHASSIS CIRCUIT SCHEMATIC

KRK 149C/152A TUNER SCHEMATIC



1. ALL RESISTANCE VALUES IN OHMS. K=1000
2. ALL RESISTORS ARE 1/2 WATT EXCEPT AS INDICATED.
3. ALL CAPACITANCE VALUES ARE IN PF EXCEPT AS INDICATED.
4. SWITCHES SHOWN IN CHANNEL 13 POSITION.
5. ● DENOTES THROUGH CONNECTION OF ROTOR BLADE.
6. —o— DENOTES CONTACT CONNECTED TO CONTACT ON OPPOSITE SIDE OF SWITCH.
7. —⊙— DENOTES CONTACT INSULATED TO CONTACT ON OPPOSITE OF SWITCH.

SEARS, ROEBUCK and CO.

Silvertone

CHASSIS NO. 528.70580

USED IN TELEVISION MODEL
5005

MECHANICAL DISASSEMBLIES

CABINET BACK REMOVAL

Refer to Figure 1:

1. Place TV set face down on a soft surface.
2. Disconnect UHF and VHF antennas from antenna terminal board.
3. Remove Phillips screws as indicated in Figure 1.
4. Lift cabinet back up and away from TV set.
5. When replacing the cabinet back, be sure the line cord receptacle fits firmly into the AC interlock plug. Reverse the previous steps to replace the cabinet back.

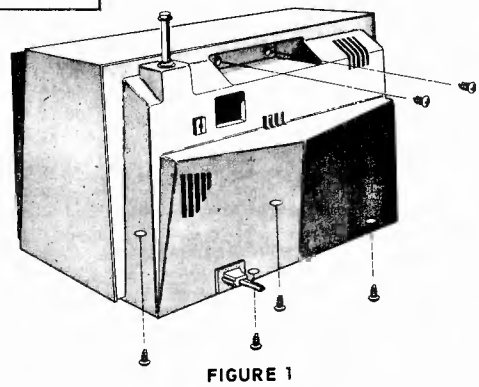


FIGURE 1

CHASSIS REMOVAL

- Remove control knobs and nut which secures earphone jack (Figure 2, Item 6) from the front of the set.
- Place set face down on a soft surface and remove cabinet back.
- Remove chassis mounting screws (as indicated by the unnumbered arrows in Figure 2).
- Remove the width device and yoke assembly from the neck of the CRT (refer to Figure 2, Item 2).
- Remove screw (as indicated in Figure 2, Item 3) and remove ground wire, then replace screw.
- Unsolder ground strap from bracket as shown in Figure 2, Item 4. (DO NOT REMOVE SCREW!)
- Loosen screw (refer to Figure 2, Item 5) and remove chassis brace.

CAUTION: When servicing chassis, support tuner bracket to prevent damage to the circuit board.

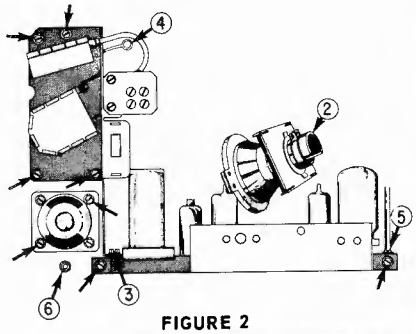


FIGURE 2

FUSE REPLACEMENT

For protection against current surge, this set is equipped with a special chemical fuse (Bel Fuse type 1200-1, Sears part number 43-41-0). To replace the fuse, perform the following steps (refer to Figure 5):

1. Remove the cabinet back (as indicated in Figure 1).
2. Remove the fuse from its socket. Socket is located below the antenna terminals at left of chassis, as viewed from rear of set.
3. Install a known, good fuse of same type and number as indicated above.

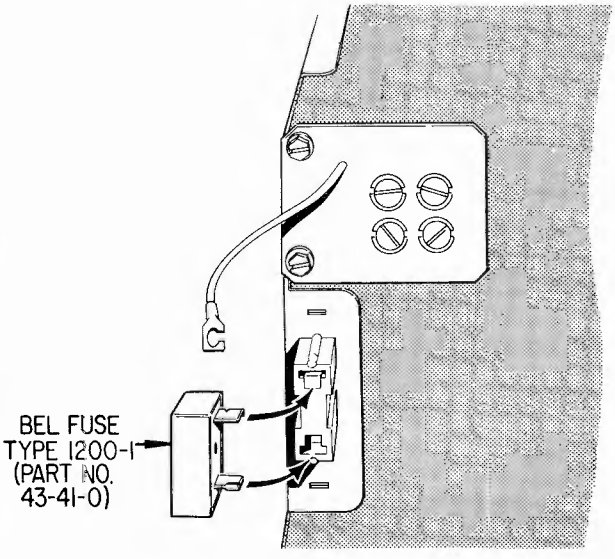


FIGURE 5

ANTENNA REMOVAL

1. Unsolder antenna lead from antenna bracket.
2. Extend bottom portion or antenna rod until the base of the rod is directly behind the lip of the antenna bracket.
3. Using the antanna rod as a lever, pry upward and outward on the antenna bracket until it springs loose.
4. Withdraw the antenna rod downward through the hole in the cabinet.

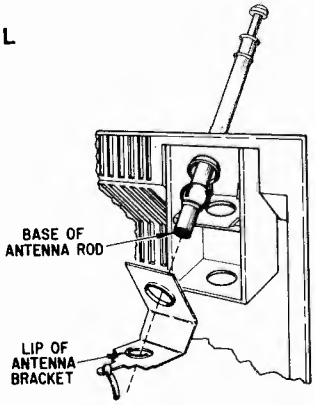


FIGURE 4

HIGH VOLTAGE RECTIFIER TUBE REMOVAL

If it becomes necessary to remove V60, the 1AD2, High voltage Rectifier tube, use the following procedure (refer to Figure 6):

1. Remove the cabinet back as indicated in Figure 1.
2. Gently, remove the tube socket from the 1AD2 High voltage rectifier.
3. Remove the 1AD2, tube from the tube holding clamp.
4. To replace the 1AD2 tube, place tube in socket, then place in tube holding clamp.

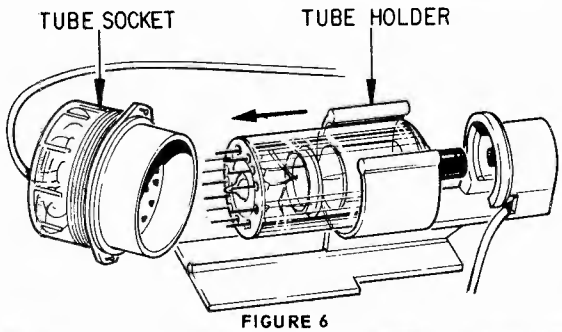


FIGURE 6

TELEVISION ALIGNMENT PROCEDURE

PRELIMINARY

Alignment is an exacting procedure and should be undertaken only when necessary. The following equipment is required for alignment work:

1. Hickok 610, 610A Signal Generator or equivalent where a 4.5 MHz Crystal controlled frequency (CW) is available. The following I.F. carriers are necessary:
   - 4.50 MHz Intercarrier Sound IF
   - 41.25 MHz Video IF Sound Carrier Frequency
   - 42.55 MHz Video IF Bandwidth Marker
   - 44.15 MHz Video IF Center Frequency
   - 45.75 MHz Video IF Picture Carrier Frequency
   - 47.25 MHz Marker
2. Electronic voltmeter (VTVM).
3. RF Sweep generator with a frequency range of 40 to 50 MHz, with a sweep width of at least 10 MHz, having an adjustable output of at least 0.1 volts.
4. Cathode ray oscilloscope, preferably with a wide band vertical amplifier and an input calibrating source.
5. Isolation transformer.
6. I.F. load – Video Detector probe (see Figure 8).

PRELIMINARY ALIGNMENT NOTES

a. It is recommended that the receiver be connected to an isolation transformer during alignment. Allow at least 5 minutes for set to warm up before any alignment is attempted.
b. Connect sweep generator as shown in chart below.
c. Connect I.F. load (Fig. 8) from V20 plate (Pin 7) and ground.
d. Connect a jumper between J601 and J252 (Point B). Apply -3v. DC bias between Point B and ground.
e. Connect sweep generator as shown in chart below.
f. Clip hot lead of marker generator to the insulation of the R.F. sweep generator hot lead. Connect ground lead to chassis.
g. Connect scope probe through 10K ohm resistor to J251 Video detector output Point (C).

NOTE: Before hooking up to Point C, I.F. inj. point on tuner, rotate tuner to channel 13 and mechanically center fine tuning.

VIDEO I.F. ALIGNMENT

Step	Sweep Generator (40-50 MHz) Connect to	Marker Generator See Note Above	Output Waveform	Adjust	Remarks
1.	Pin 2 of 4EJ7 (V25) thru .001 Cap.	44.25 MHz	Figure A	T250 (Top and Bottom)	Adjust T250 (Top) for symmetry with marker at center. Adj. bottom for flat curve.
2.	Mixer Grid Point "E" on tuner	44.25 MHz	Figure B	L905 on tuner T200 (bottom)	Move scope to I.F. load and adj. Scope for .2v. pp. Sens, adj. Sweep gen. to maintain .2v. PP. Adj. Mixer plate coil L905 and I.F. input transformer T200 (bottom) for gain and symmetry.
3.	Same	41.25 MHz	Figure B	T200 (Top core)	Adj. T200 top core for minimum response.
4.	Same	47.25 MHz	Figure B	L200	Adj. L200 for minimum reaponse.
5.	If necessary repeat Steps 1 & 2 for proper response curve.				
6.	If necessary, readjust traps as in Steps 3 & 4.				
7.	Move scope input to point "C" (J251) and adjust sens for 2v. PP. Disconnect I.F. load. Reset sweep gen. for 2v. PP. on scope.				
8.	Mixer Grid Point "E" on tuner	45.75 MHz 42.55 MHz	Figure C	T201	Adj. T201 top & bottom core for symmetrical response, position bandwidth loop on side of coil for proper bandwidth. (See below)
9.	If necessary, repeat Steps 1, 2, 7 & 8 to obtain curve of Figure A.				

SOUND ALIGNMENT

PRELIMINARY

Connect -6 volts bias to Point "B". This will disable the Video I.F. circuits.

STEP	SIGNAL GENERATOR		METER CONNECTION VTVM	ADJUST
	FREQUENCY	CONNECT TO		
1.	4.5 MHz. Xtal controlled	Pin 8 of 11AF9 (V30A)	Pin 3 of V30B thru a diode detector probe.	T350 (top & bottom) and T300 (top & bottom) for max. output on VTVM.
2.	Same - output should be greater than 10MV.	Same	Point "A"	L350 for maximum. NOTE: Two peaks may be observed, tune to the highest peak. This is a sharp peak and must be adjusted carefully.
3.	Remove all equipment			
4.	Set fine tuning for a normal picture and if necessary touch up quadrature coil (L350) for best sound.			
5.	Touch up the 4.5 MHz trap (T301), Top core only, for minimum sound beat in picture.			

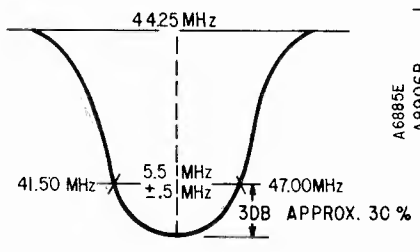


FIGURE A

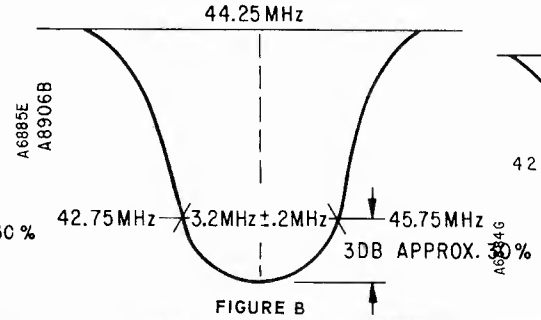


FIGURE B

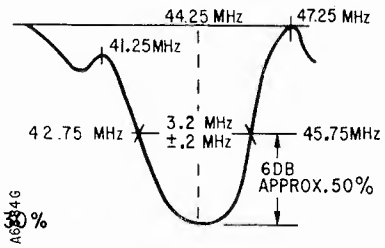
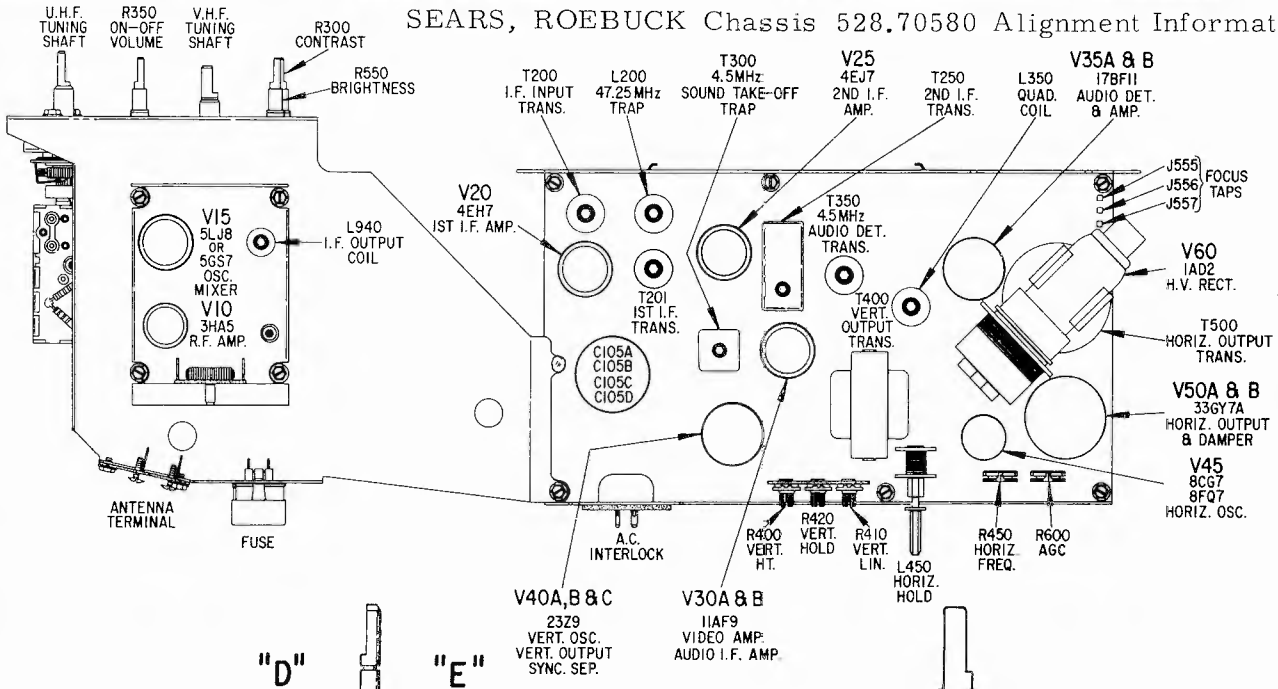
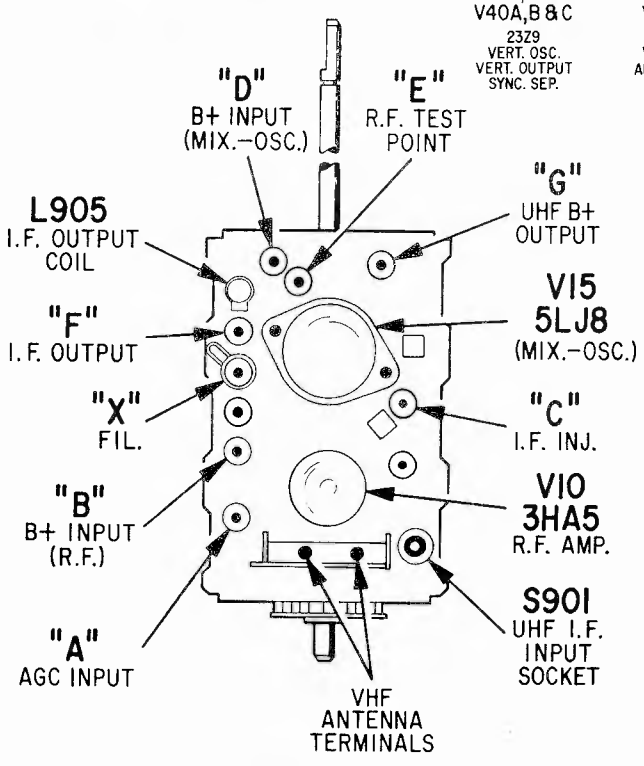
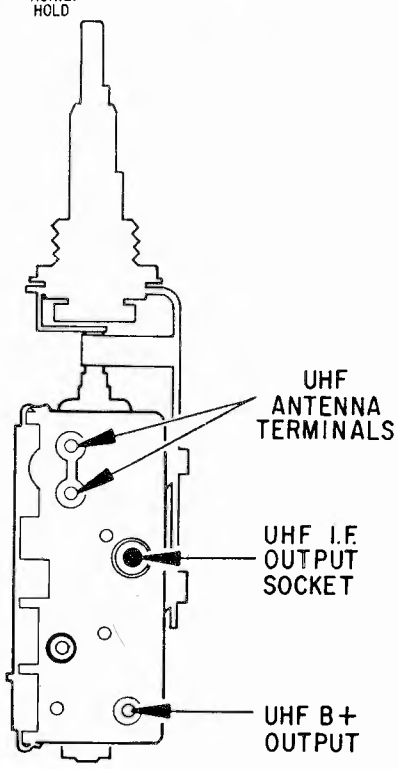


FIGURE C

SEARS, ROEBUCK Chassis 528.70580 Alignment Information







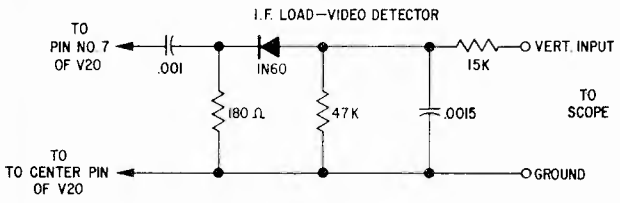


FIGURE 8

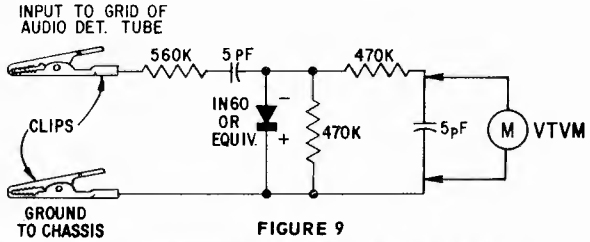


FIGURE 9

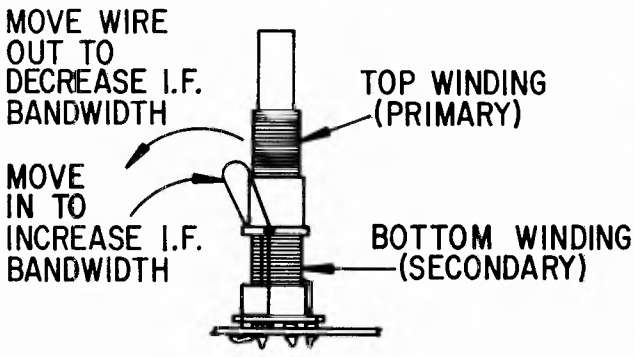
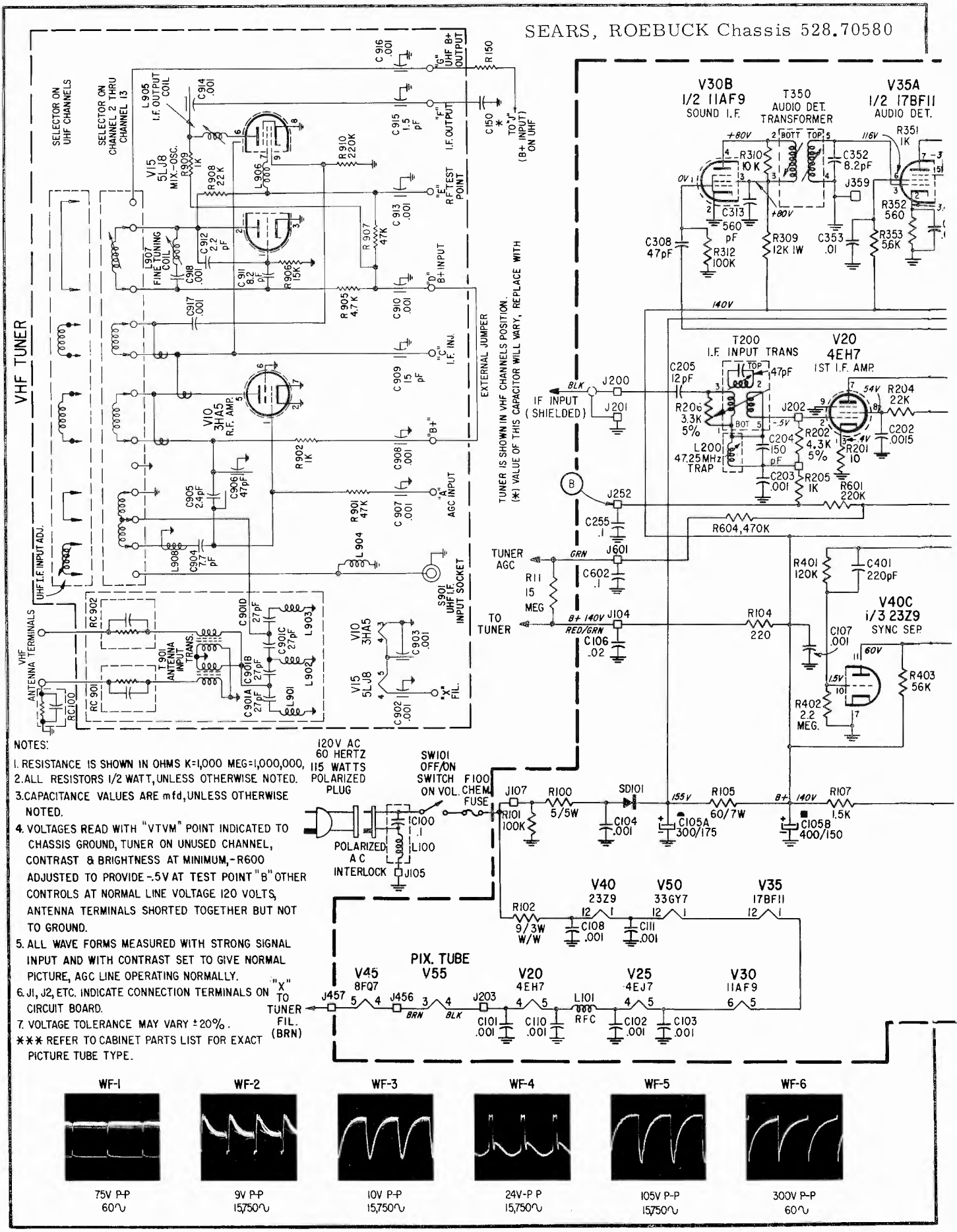


FIGURE 10

SEARS, ROEBUCK Chassis 528.70580



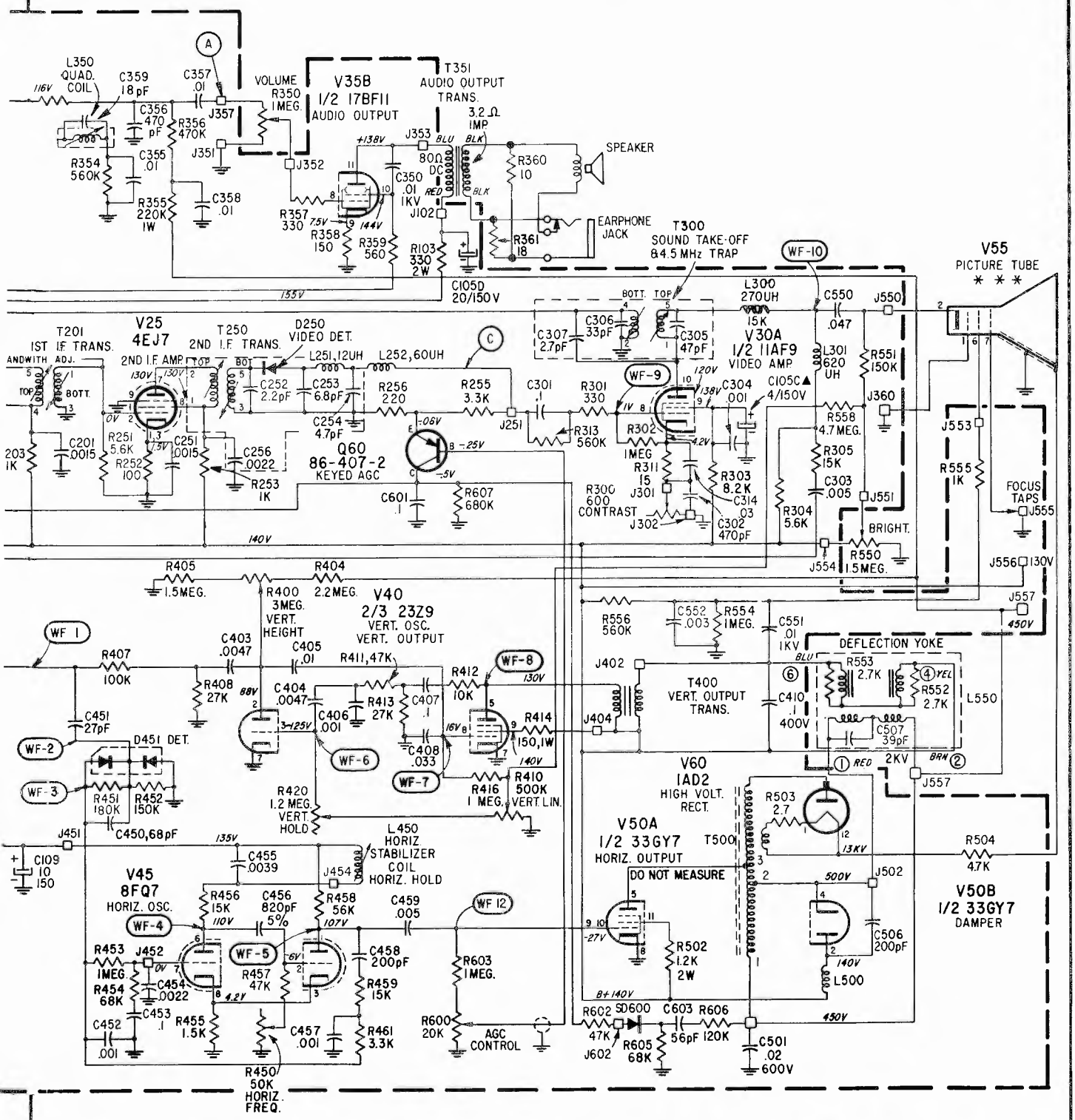
NOTES:

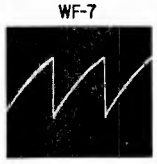
1. RESISTANCE IS SHOWN IN OHMS K=1,000 MEG=1,000,000.
2. ALL RESISTORS 1/2 WATT, UNLESS OTHERWISE NOTED.
3. CAPACITANCE VALUES ARE mfd, UNLESS OTHERWISE NOTED.
4. VOLTAGES READ WITH "VTVM" POINT INDICATED TO CHASSIS GROUND, TUNER ON UNUSED CHANNEL, CONTRAST & BRIGHTNESS AT MINIMUM, -R600 ADJUSTED TO PROVIDE -.5V AT TEST POINT "B" OTHER CONTROLS AT NORMAL LINE VOLTAGE 120 VOLTS, ANTENNA TERMINALS SHORTED TOGETHER BUT NOT TO GROUND.
5. ALL WAVE FORMS MEASURED WITH STRONG SIGNAL INPUT AND WITH CONTRAST SET TO GIVE NORMAL PICTURE, AGC LINE OPERATING NORMALLY.
6. J1, J2, ETC. INDICATE CONNECTION TERMINALS ON CIRCUIT BOARD.
7. VOLTAGE TOLERANCE MAY VARY ±20%.

*** REFER TO CABINET PARTS LIST FOR EXACT PICTURE TUBE TYPE.

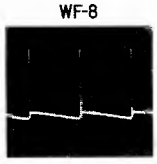
WF-1	WF-2	WF-3	WF-4	WF-5	WF-6
75V P-P 60∿	9V P-P 15,750∿	10V P-P 15,750∿	24V-P P 15,750∿	105V P-P 15,750∿	300V P-P 60∿

SEARS, ROEBUCK Chassis 528.70580 Schematic Diagram, Continued




WF-7

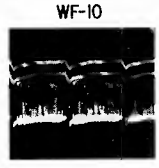
30V P-P
60∿


WF-8

900V P-P
60∿


WF-9

3V P-P
60∿


WF-10

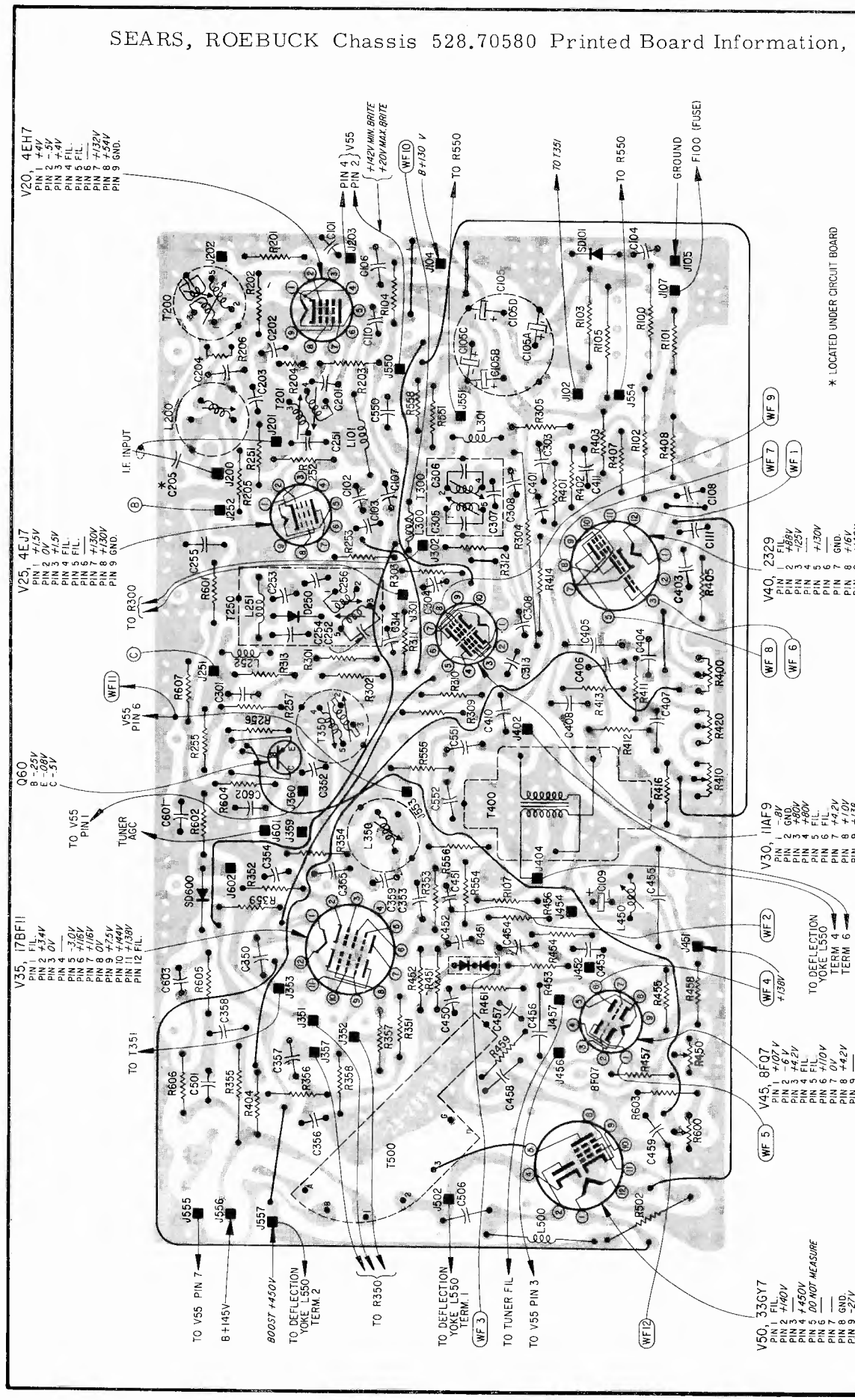
70V P-P
60∿


WF-11

150V P-P
60∿


WF-12

100V P-P
15,750∿



HORIZONTAL FREQUENCY and HORIZONTAL STABILIZER CONTROL ADJUSTMENT (Field & Shop)

1. Tune set to an active channel.
2. Short out L450 (Horizontal Stabilizer Coil) by connecting a jumper across J454 and J451, also short J452 to ground with jumper lead.
3. Turn variable Horizontal Frequency control (R450) completely counter-clockwise.
4. Advance R450 SLOWLY clockwise until picture just locks in.
5. Remove jumper from horizontal stabilizer coil.
6. Lock in picture by adjusting the Horizontal Hold Control, finally remove J452 ground jumper lead.

SEARS, ROEBUCK and CO.

Silvertone

CHASSIS NO. 528.71330

USED IN TELEVISION MODELS:

5117 5118 5119

CABINET BACK REMOVAL

1. Remove power plug from wall outlet.
2. Remove the two Phillips head screws from the top of the cabinet back.
3. Remove the two Phillips head screws from the bottom lip of the cabinet back.
4. Disconnect antennas.
5. Remove the three side friction held knobs.
6. Reverse procedure to replace cabinet back. NOTE: When cabinet back is set into place make sure the circuit reset button extension and the Horizontal Hold Rod are positioned in their proper openings at rear of cabinet back.

CHASSIS REMOVAL

1. Remove the Channel Selector Knobs and the OFF/ ON Volume Knob from the front of the set.
2. Lay set face down between two firm supports so that no pressure is placed on the face of the picture tube. NOTE: These supports should be covered with a soft cloth to prevent marring the the finish.
3. Remove the picture tube socket, deflection yoke plug, anode lead at picture tube and speaker terminals.
4. Loosen chassis mounting screws on bottom of cabinet. (See Figure 5.)
5. Remove chassis and tuner mounting screws.

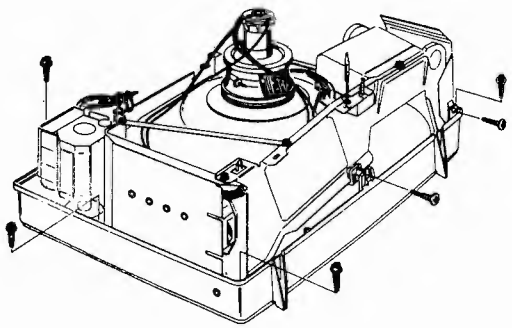
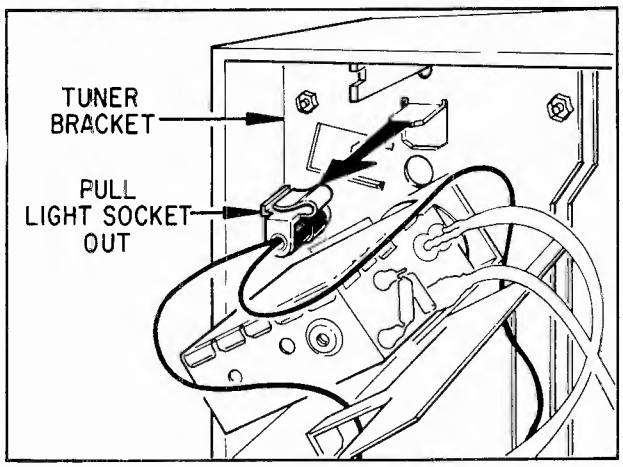
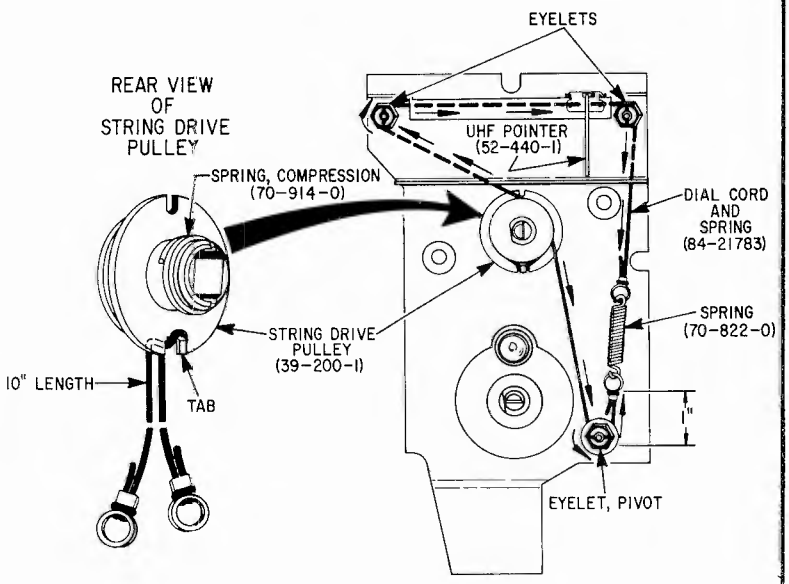


Figure 5 - Chassis Removal





STRINGING DIAGRAM

DIAL STRING REPLACEMENT

1. Place the UHF tuner gang fully open.
2. Measure 10 inches of dial cord and hook this measured length on to the tab located on the rear of the tuning drum. See Figure 8. Pull both lengths forward through slot in drum. NOTE: Do not cross dial cord.
3. Take the shorter of the two strings and make 1¾ turns around drum in a clockwise direction.
4. Using the 10 inch length make a ½ turn around the drum in a counter-clockwise direction.
5. Bring the 10 inch length up and around both eyelets on the dial scale and let the cord hang over the right eyelet.
6. Take the opposite string down and around the eyelet beneath the drum in a counter-clockwise direction. See Figure 8.
7. Attach spring to the two eyelets on the dial cord. NOTE: The spring should be located near the bottom pivot point approximately 1 inch from eyelet.
8. Attach pointer to dial scale and string, so that it is centered over channel 83. CAUTION: Make sure the dial string is resting on all pivot point eyelets.
9. Rotate UHF knob through its tuning range to position the cord on the tuning drum.

TELEVISION ALIGNMENT PROCEDURE

PRELIMINARY

Alignment is an exacting procedure and should be undertaken only when necessary. The following equipment is required for alignment work.

1. Hickok 610, 610A Signal Generator or equivalent where a 4.5MHzCrystal controlled frequency (CW) is available.
   The following I.F. Carriers are necessary. Diode Detector Probe (See Figure 3)
   - 4.5 MHz Intercarrier Sound IF
   - 41.25 MHz Video IF Sound Carrier Frequency
   - 42.55 MHz Video IF Bandwidth Marker
   - 44.15 MHz Video IF Center Frequency
   - 45.75 MHz Video IF Picture Carrier Frequency
   - 47.25 MHz Marker
2. Electronic voltmeter (VTVM)
3. RF Sweep generator with a frequency range of 40 to 50 MHz with a sweep width of at least 10 MHz, having an adjustable output of at least 0.1 volts.
4. Cathode ray oscilloscope, preferably with a wide band vertical amplifier and an input calibrating source.
5. Isolation transformer.
6. Diode Detector Probe (See Figure 3)

PRELIMINARY ALIGNMENT NOTES

a. It is recommended that the receiver be connected to an isolation transformer during alignment. Allow at least 5 minutes for set to warm up before any alignment is attempted.
b. Connect oscilloscope hot lead through 10K ohm isolation resistor to Point (C) Connect ground lead of oscilloscope directly to main chassis. (Adjust signal input to maintain 2 volts peak to peak).
c. Apply –6 volts bias to AGC IF line, –side to Point (B) +side to chassis.
d. Connect correct signal generator as shown in chart below.
e. Clip hot lead of marker generator to the insulation of RF sweep generator hot lead. Connect ground lead to chassis.
NOTE: Before hooking up to Point "C" I.F. INJ. Rotate Tuner To Channel 13.

VIDEO I.F. ALIGNMENT

Step	Sweep Generator (40-50 MHz) Connect To	Marker Generator See Note Above	Output Waveform	Adjust	Remarks
1	Pin 2 of 4EH7 (V3) thru .001 mfd. Cap.	44.15 MHz	Figure 1	T4	Adjust T4 for maximum response at 44.15 MHz
2	Same	Same	Same	T3 (Top)	Turn bottom core of T3 to bottom of coil form before adjusting T3 top. Adjust T3 top for maximum response at 44.15 MHz.
3	Same	45.75 MHz 42.55 MHz	Same	T3	Adjust T3 (Bottom) for symmetry of response shown in Figure 1.
4	Same	45.75 MHz	Same	T3 (Top)	Readjust T3 top to position the 45.75 MHz Marker at the 3 db point of the response curve
5	If necessary, repeat steps 1 through 4 to obtain proper response. NOTE: If proper 3.0 MHz bandwidth is not obtained. (3.0 MHz ± .2 MHz, refer to Bandwidth Loop Adjustment.)				
6	Point "C" IF INJ. See Fig. 3	41.25 MHz	Figure 2	L6	Adjust L6 top for minimum response at 41.25 MHz.
7	Same	47.25 MHz	Same	L7	Adjust 47.25 trap for minimum response at 47.25 MHz.
8	Same	45.75 MHz	Same	L207 Tuner IF Output Coil	Adjust L207 to position the 45.75 MHz marker at the 6 db point of response curve.
9	Same	42.55 MHz 45.75 MHz	Same	L6 (Bottom)	Adjust L6 (bottom) for symmetry of response in Figure 2.
10	If necessary, repeat steps 6 through 8 to obtain response curve of Figure 2.				

SOUND ALIGNMENT

PRELIMINARY

Connect –10 volts bias to point (B). This will disable the Video I.F. circuits.

Step	SIGNAL GENERATOR		METER CONNECTION VTVM	ADJUST
	FREQUENCY	CONNECT TO		
1	4.5 MHz Xtal Controlled	Pin 7 of 11KV8 (V2B)	Pin 3 of V1A thru a diode detector probe. See Fig. 3.	T1 (single core) T2 (top & bottom) for maximum output on VTVM.
2	Same – Output should be greater than 10MV.	Same	Point "D"	L1 (single core) for maximum. NOTE: Two peaks may be observed, tune to the highest peak. This is a sharp peak and must be adjusted carefully.
3	Remove all equipment.			
4	Set fine tuning for a normal picture and if necessary touch up quadrature coil (L1) for best sound.			
5	Touch up the 4.5 MHz trap (top of T2) Top Core only for minimum sound beat in picture.			

BANDWIDTH LOOP ADJUSTMENT

The first I.F. transformer has a vertical hairpin loop in the secondary winding. This loop must not be touched unless the bandwidth specifications (3 MHz ± .2 MHz) are incorrect. Adjust as follows:

1. To narrow the I.F. response curve, pull the loop away from the primary of T3 (top). Repeat steps 2 through 5 of the Video I.F. Alignment. See Figure 4.
2. To broaden the I.F. response curve, press the loop toward the primary of T3 (top). Repeat steps 2 through 5 of the Video I.F. Alignment. See Figure 4.

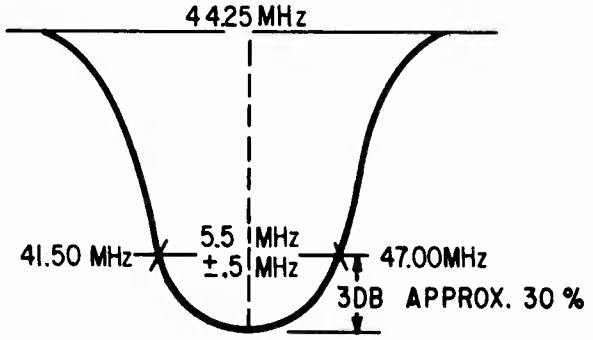


FIGURE 1

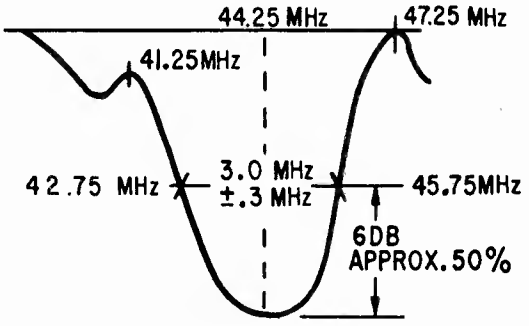
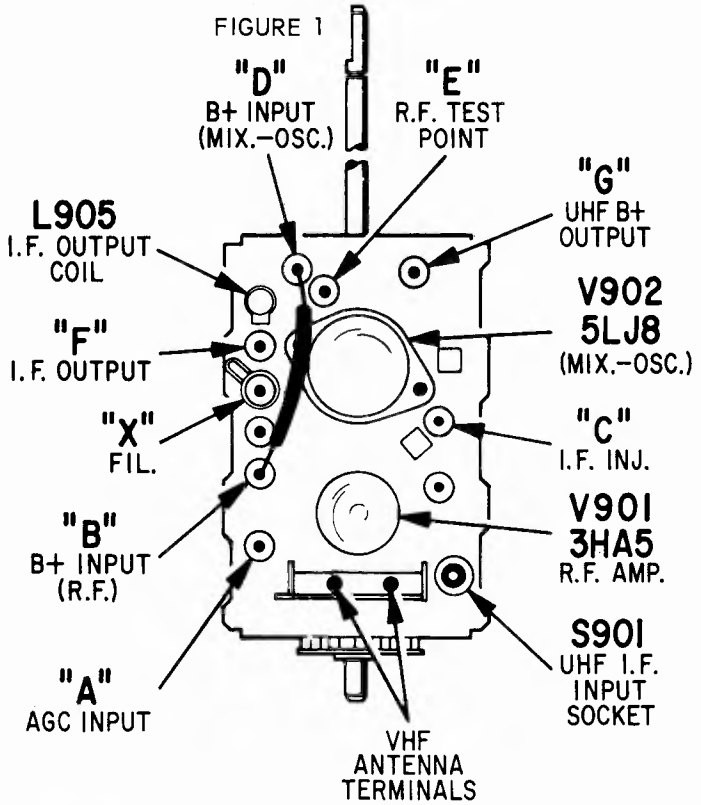
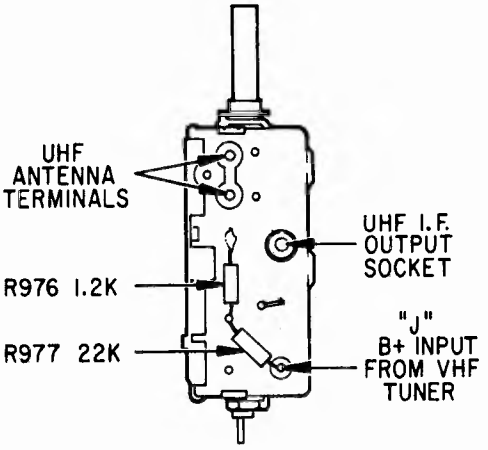


FIGURE 2





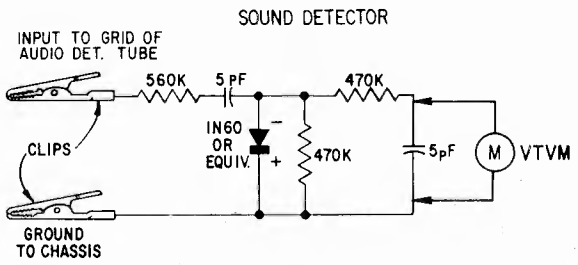


FIGURE 3 - Diode Detector Probe

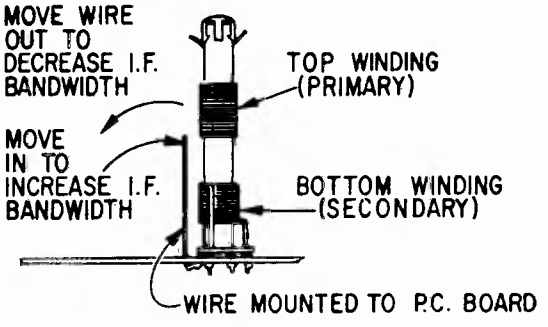
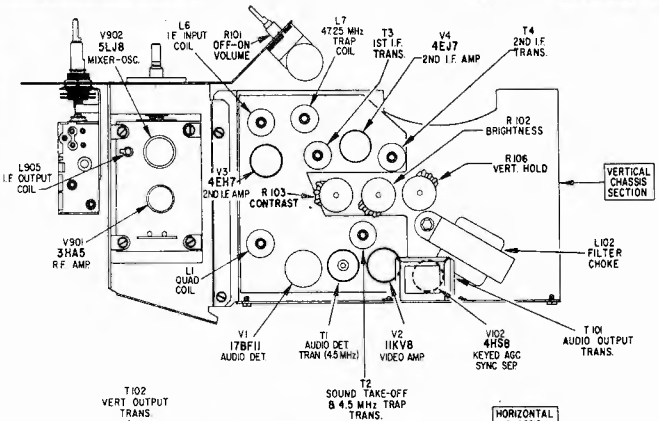
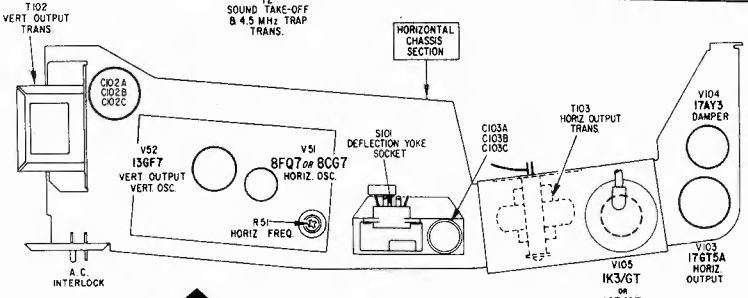
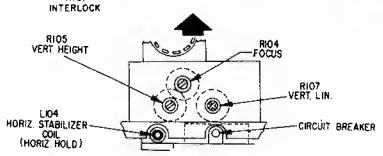


FIGURE 4 - Bandwidth Adjustment

SEARS, ROEBUCK Chassis 528.71330

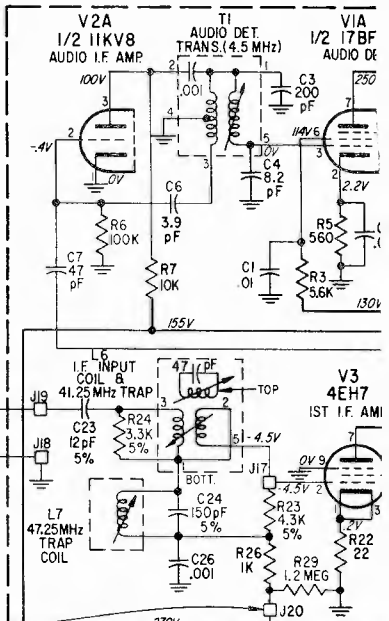


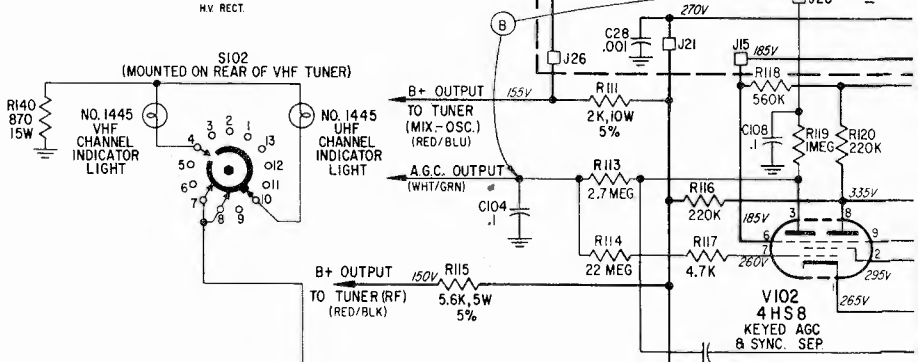


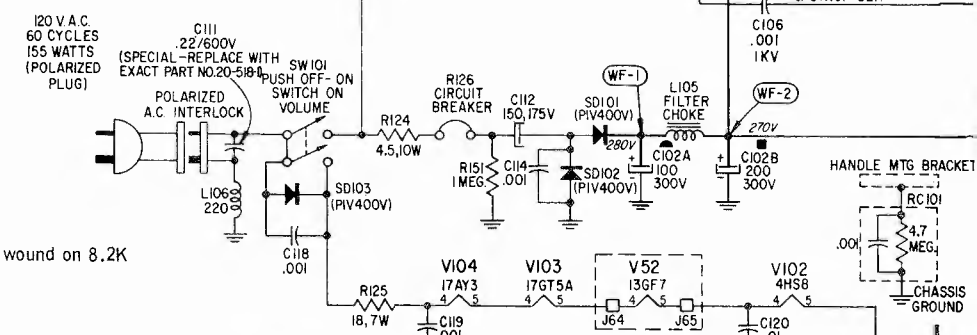


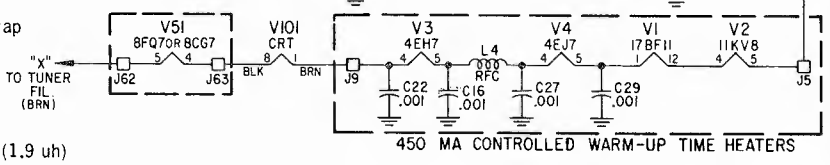
CAUTION

IT IS GOOD SOUND SERVICE PRACTICE WHEN REPLACING TRANSISTORS, COMPONENTS OR ATTACHING TEST EQUIPMENT TO REMOVE ALL POWER FROM THE UNIT UNDER TEST OR REPAIR.









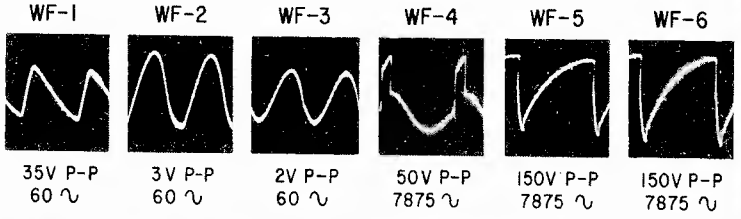
WOUND CHANNEL STICKS

Color Code on Forward Edge of Stick

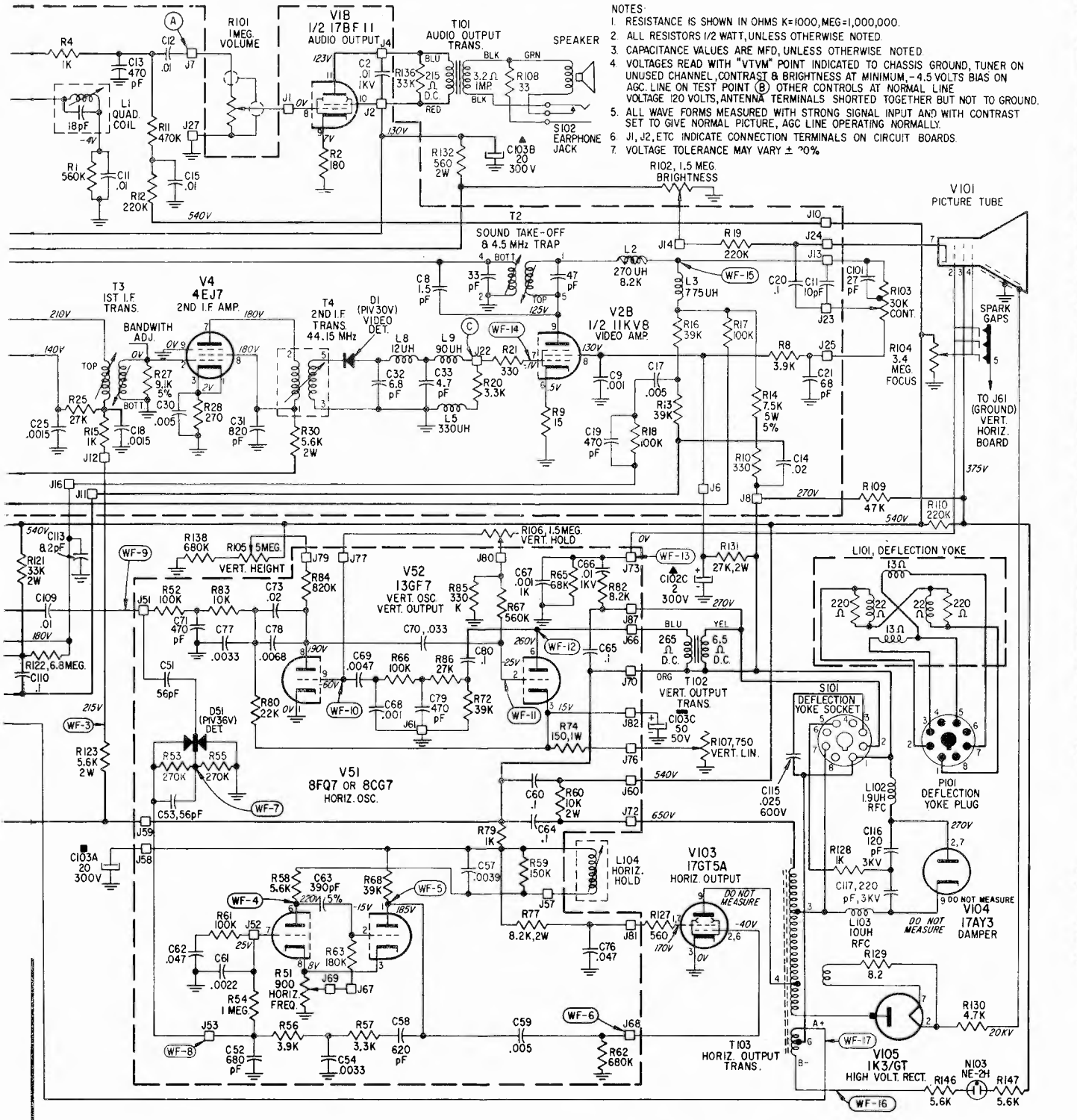
Channel UHF	46-10802	Brown
Channel 2	46-10804	Red
Channel 3	46-10805	Orange
Channel 4	46-10806	Yellow
Channel 5	46-10807	Green
Channel 6	46-10808	Blue
Channel 7	46-10809	Violet
Channel 8	46-10810	Yellow
Channel 9	46-10811	White (none)
Channel 10	46-10812	Black
Channel 11	46-10813	Brown
Channel 12	46-10814	Red
Channel 13	46-10815	Orange

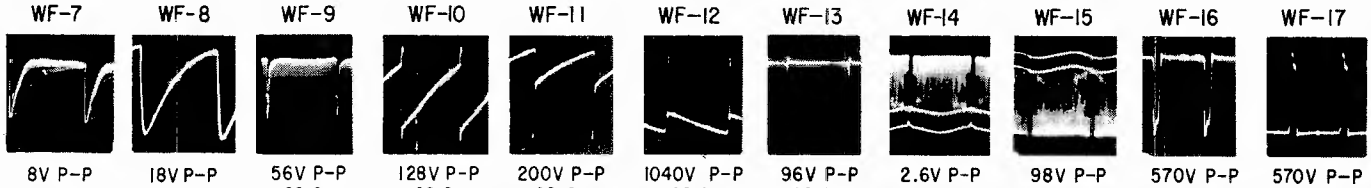
TRANSFORMERS AND COILS

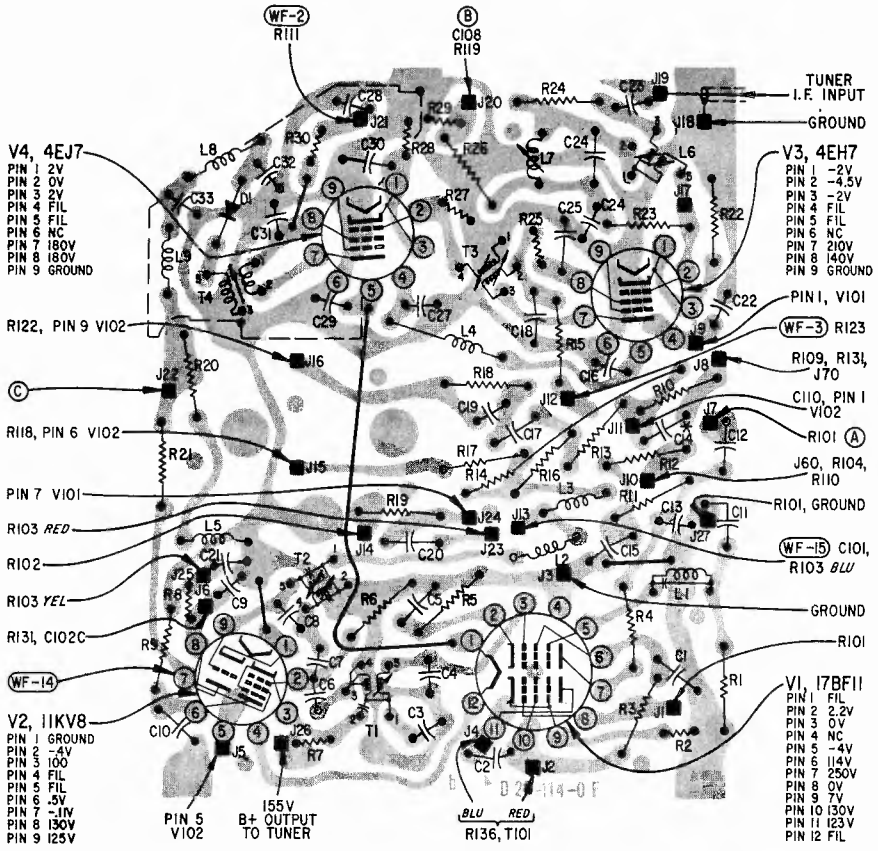
L1	10-74-5	Coil Quadrature
L2	10-170-1	Coil, Peaking, 270 uh wound on 8.2K ohm resistor
L3	10-254-1	Coil Peaking, 775 uh
L4	10-156-1	Coil, Filament Choke
L5	10-253-1	Coil, Peaking, 330 uh
L6	10-62-3	Coil, I.F. Input & 41.25 MHz Trap
L7	10-86-3	Coil, 47.25 MHz Trap
L8	10-325-1	Coil, Tweet, 12 uh
L9	10-256-1	Coil, Peaking, 90 uh
L101	80-72-4	Deflection Yoke & Plug
L102	10-242-1	Choke, Horizontal Suppression (1.9 uh)
L103	10-124-1	Coil, Choke RF, (10 uh)
L104	10-75-5	Coil, Horizontal Hold
L105	80-20-6	Choke Filter
L106	10-264-1	Choke line Radiation
T1	10-53-3	Transformer, 4.5 MHz Sound, I.F.
T2	10-209-1	Transformer, 4.5 MHz Trap & sound Take Off
T3	10-58-3	Transformer, 1st, I.F.
T4	10-59-3	Transformer, I.F. Output
T101	80-253-1	Transformer, Audio Output
T102	80-20-2	Transformer, Vertical Output
T103	80-86-3	Transformer, Horizontal Output



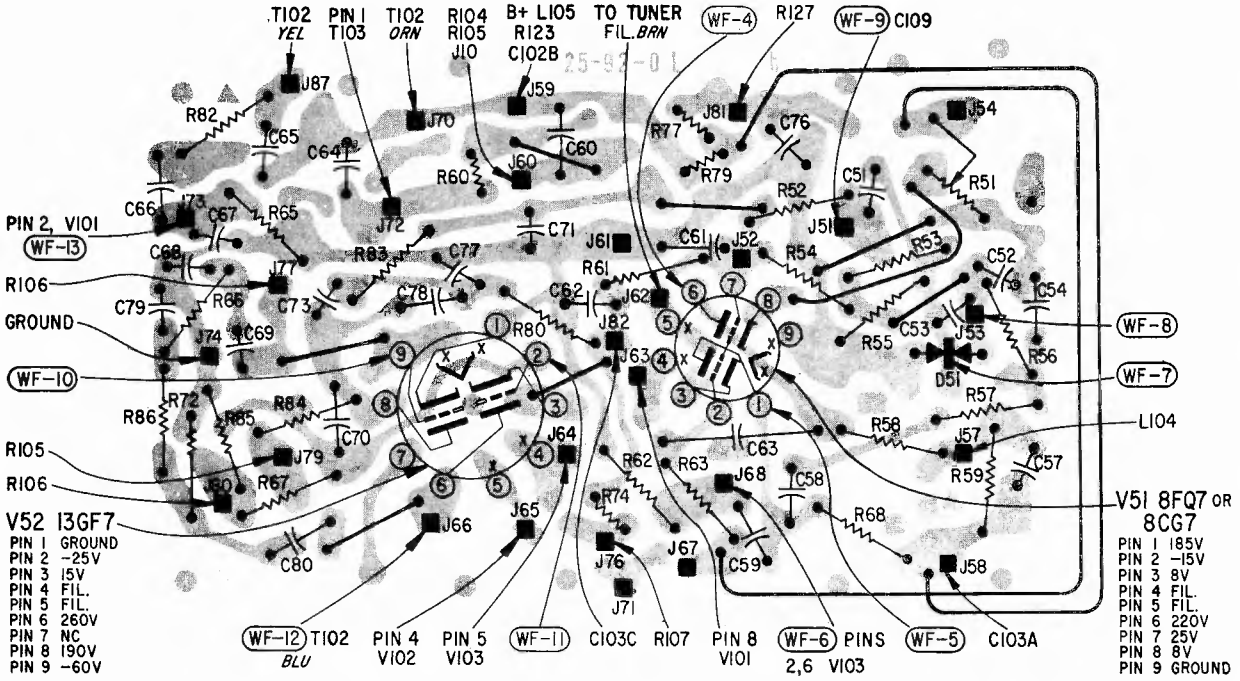
SEARS, ROEBUCK Chassis 528.71330 Schematic Diagram, Continued







WIRING DIAGRAM I.F. SYNC, SOUND BOARD



WIRING DIAGRAM HORIZONTAL-VERTICAL BOARD

SHARP

SHARP ELECTRONICS CORPORATION

MODELS TW-87P, TW-88P

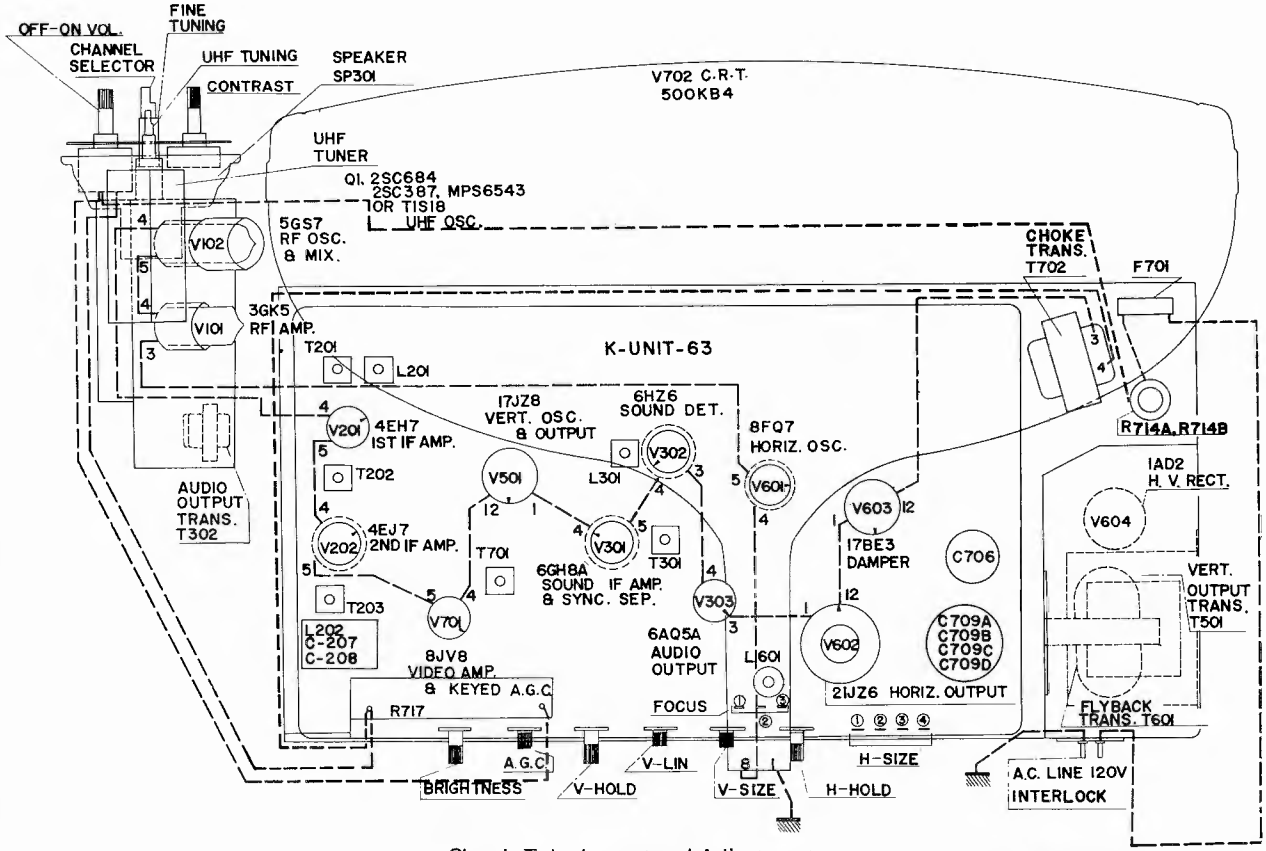
Chassis Assembly Removal

Whenever it becomes necessary to remove the chassis from the cabinet, proceed in the following manner:

1. Lay the cabinet face down on a soft pad so as not to map the picture tube.
2. Remove the six back cover retaining screws.
3. Remove the back cover and disconnect the VHF and UHF antenna feeders.
4. When removing the tuner assembly.
   a) Remove the VHF Channel Selector, VHF Fine Tuning and UHF Dial Knobs from the front of the cabinet.
   b) Remove the speaker leads.
   c) Remove the four screws retaining the tuner mounting bracket and the tuner assembly from the cabinet.
5. When removing the control bracket
   a) Remove the OFF-ON Volume and Contrast Knobs from the front of the cabinet.
   b) Remove the two screws retaining the control bracket.
6. When removing the chassis from the cabinet
   a) Remove the three screws retaining the chassis to the cabinet.
   b) Remove the anode lead and picture tube socket and the deflection yoke after loosening its clamp ring.
   The chassis may now be completely removed from the cabinet.

Fuse

For overload protection, a 2.0A fuse has been installed in the AC input of this receiver. This fuse is mounted on a terminal strip that is located at the front of high voltage cage.



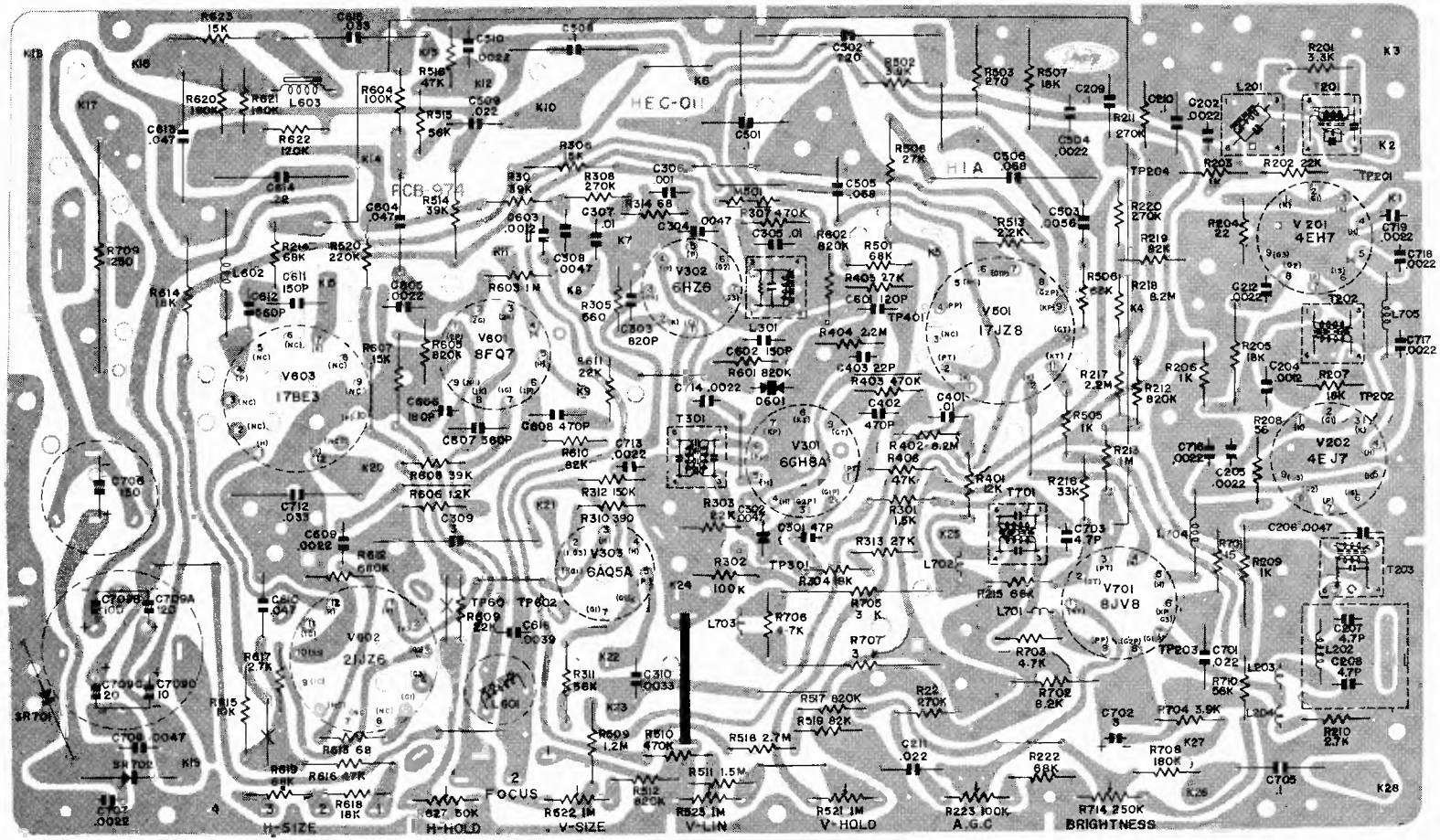
Chassis Tube Layout and Adjustment

Removing and Installing Picture Tube

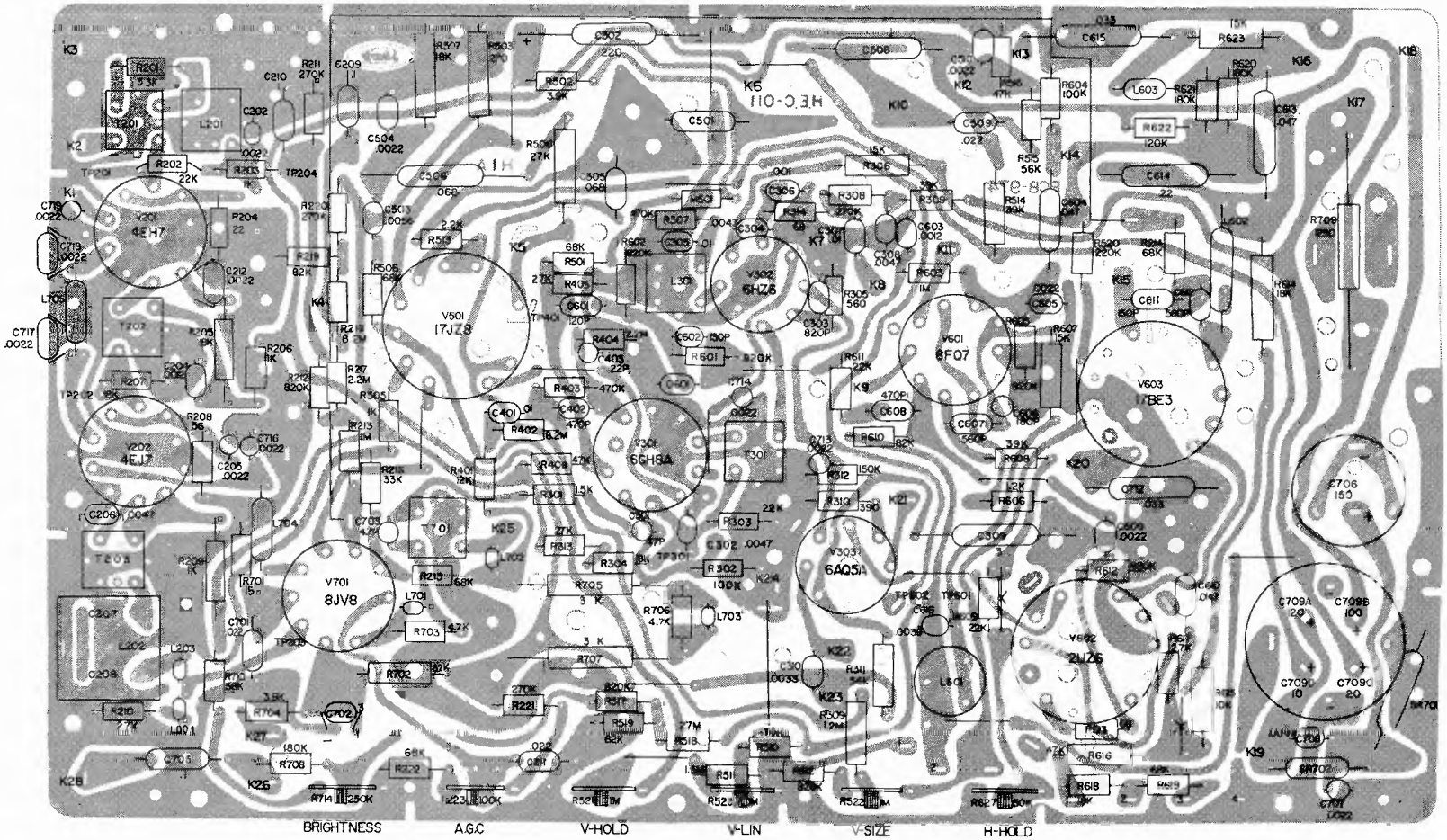
In order to remove or replace the picture tube, the chassis assemblies must be removed.

Refer to CHASSIS ASSEMBLY REMOVAL procedure. When the chassis has been removed, proceed as follows:

1. Remove the nut and screw of the picture tube retaining ring.
2. Remove the picture tube from the cabinet.
   CAUTION: Refer to the caution label on the high voltage cage.
   (Always avoid handling the neck of the picture tube.)
3. Place the picture tube in proper position in the cabinet.
4. Secure the nut and screw of the picture tube retaining ring.
5. Reassemble the chassis assemblies.



Wiring Side of P.C. Board



Component Side of P.C. Board

Width Adjustment

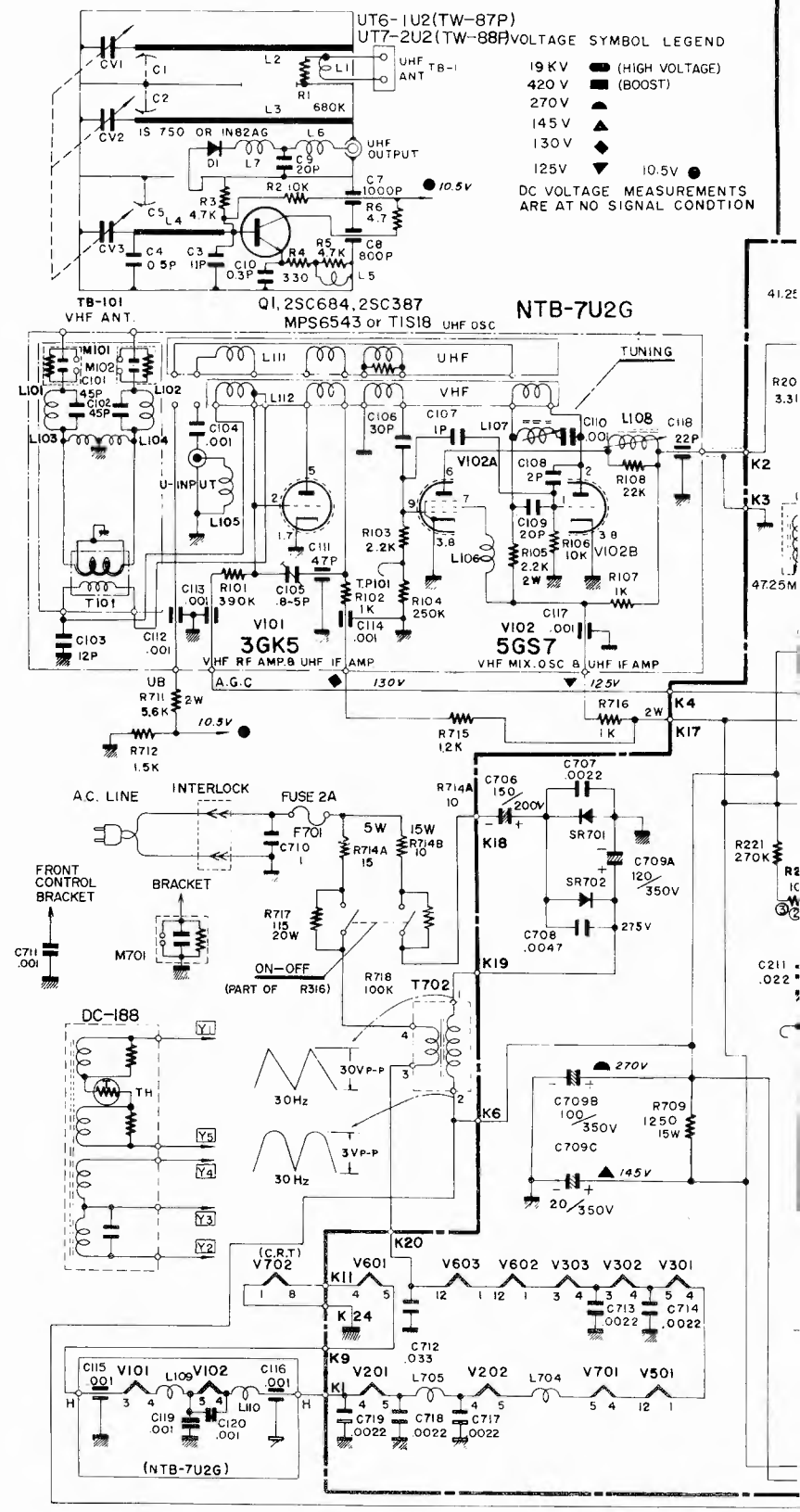
With line voltage set at 108 volts, select the proper connection on the horizontal size adjustment (H-SIZE 1, 2, 3, 4) so that both sides of the picture just fill the mask horizontally. Under normal operating conditions and with the line voltage set at 120 volts, the picture should overscan the mask about 1 inch on each side.

Check RF Oscillator Adjustment (VHF Tuner)

Tune in all available VHF stations to see if the receiver local oscillator is adjusted to the proper frequency on all VHF channels. If adjustments are required, they can be made without removing the chassis from the cabinet. Access to the individual local oscillator adjustments on the VHF tuner is obtained in the following manner.

1. Remove the channel selector knob, fine tuning knob and felt washer from the shaft.
2. Set the channel to be adjusted.
3. Adjust local oscillator by turning the screw from the large hole on the insulator fiber.

SHARP Models TW-87P/TW-88P Schematic Diagram



Deflection Yoke Adjustment

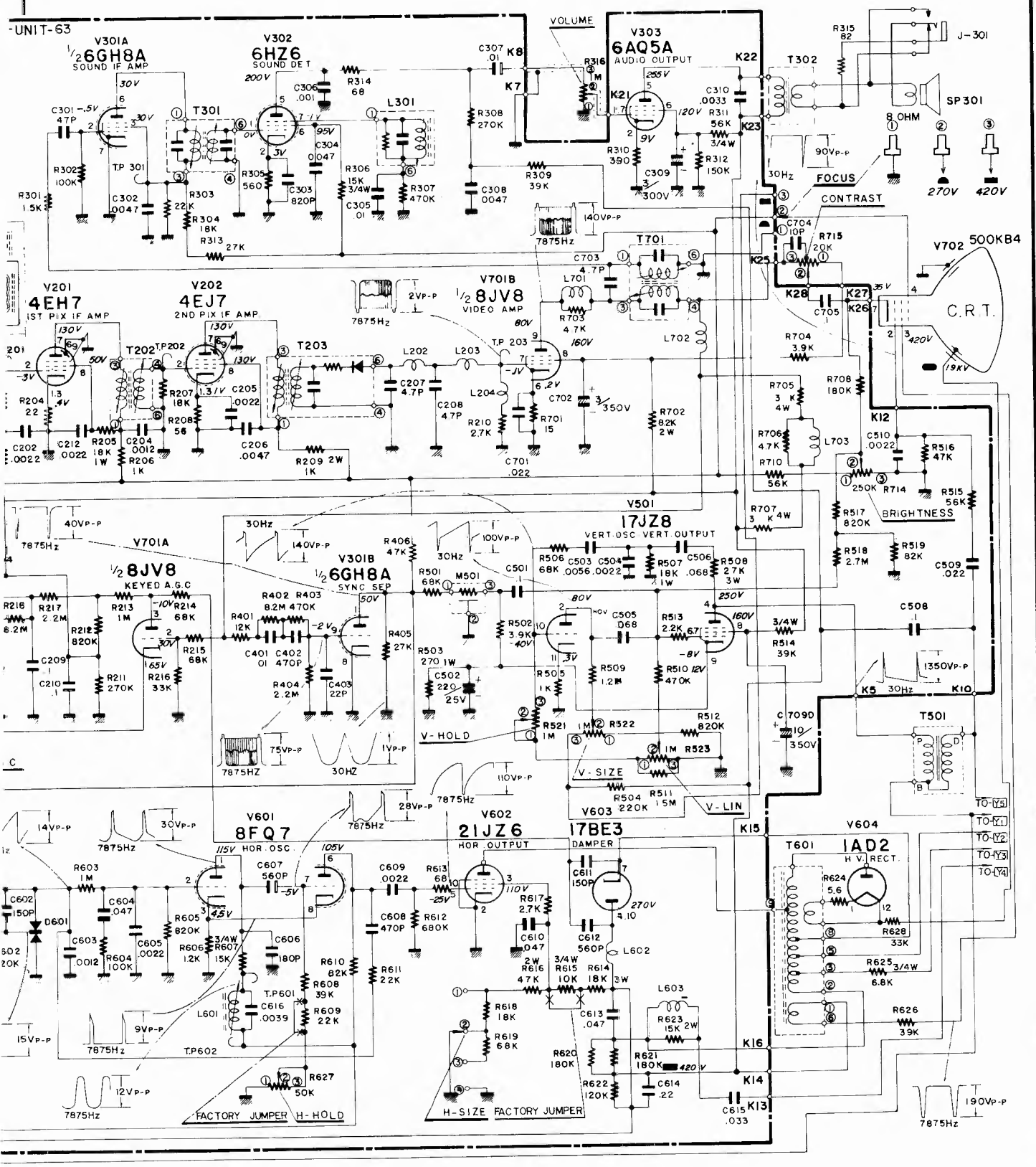
If the lines of the raster are not horizontal or squared with the picture mask, loosen the yoke clamp and rotate the deflection yoke until this condition is corrected. To obtain best results, the deflection yoke should be positioned as far forward on the neck of the picture tube as possible.

Centering Adjustment

Both horizontal and vertical centerings are accomplished by rotating the centering rings mounted on the back of the deflection yoke assembly.

Vertical Size and Linearity Adjustment

Adjust vertical height and vertical linearity for the best overall linearity and desired picture height. After this adjustment, a slight readjustment of the centering rings may be necessary.


UNIT-63
V301A
1/2 6GH8A
SOUND IF AMP
V302
6HZ6
SOUND DET
V303
6AQ5A
AUDIO OUTPUT
VOLUME
T301
T302
L301
SP301
8 OHM
J-301
FOCUS
CONTRAST
V201
4EH7
1ST PIX IF AMP
V202
4EJ7
2ND PIX IF AMP
V701B
1/2 8JV8
VIDEO AMP
T201
T202
T203
T701
V702 500KB4
C.R.T.
V501
17JZ8
VERT. OSC. VERT. OUTPUT
V701A
1/2 8JV8
KEYED A.G.C.
V301B
1/2 6GH8A
SYNC SEP.
V-HOLD
V-SIZE
V-LIN
BRIGHTNESS
V601
8FQ7
HOR. OSC.
V602
21JZ6
HOR. OUTPUT
17BE3
DAMPER
V604
1AD2
H.V. RECT.
T501
T601
FACTORY JUMPER H-HOLD
H-SIZE FACTORY JUMPER
TO-Y5
TO-Y1
TO-Y2
TO-Y3
TO-Y4

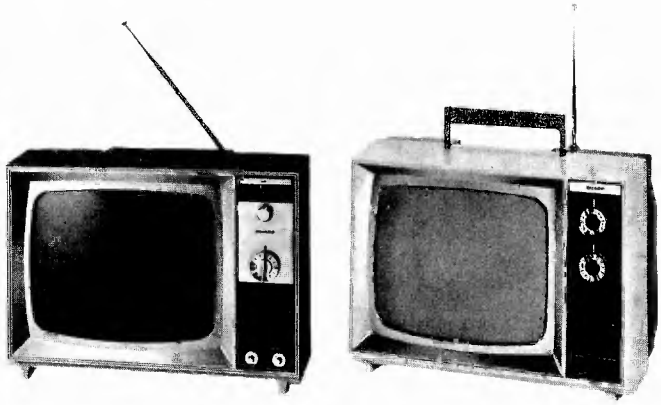
SHARP

SHARP ELECTRONICS CORPORATION

MODEL

TU-47P/TU-58P

Portable TV



TU-47P TU-58P

(Service material on pages 146 through 152)

Deflection Yoke Adjustment

If the lines of the raster are not horizontal or squared with the picture mask, loosen the yoke clamp and rotate the deflection yoke until this condition is corrected. To obtain best results, the deflection yoke should be positioned as far forward on the neck of the picture tube as possible.

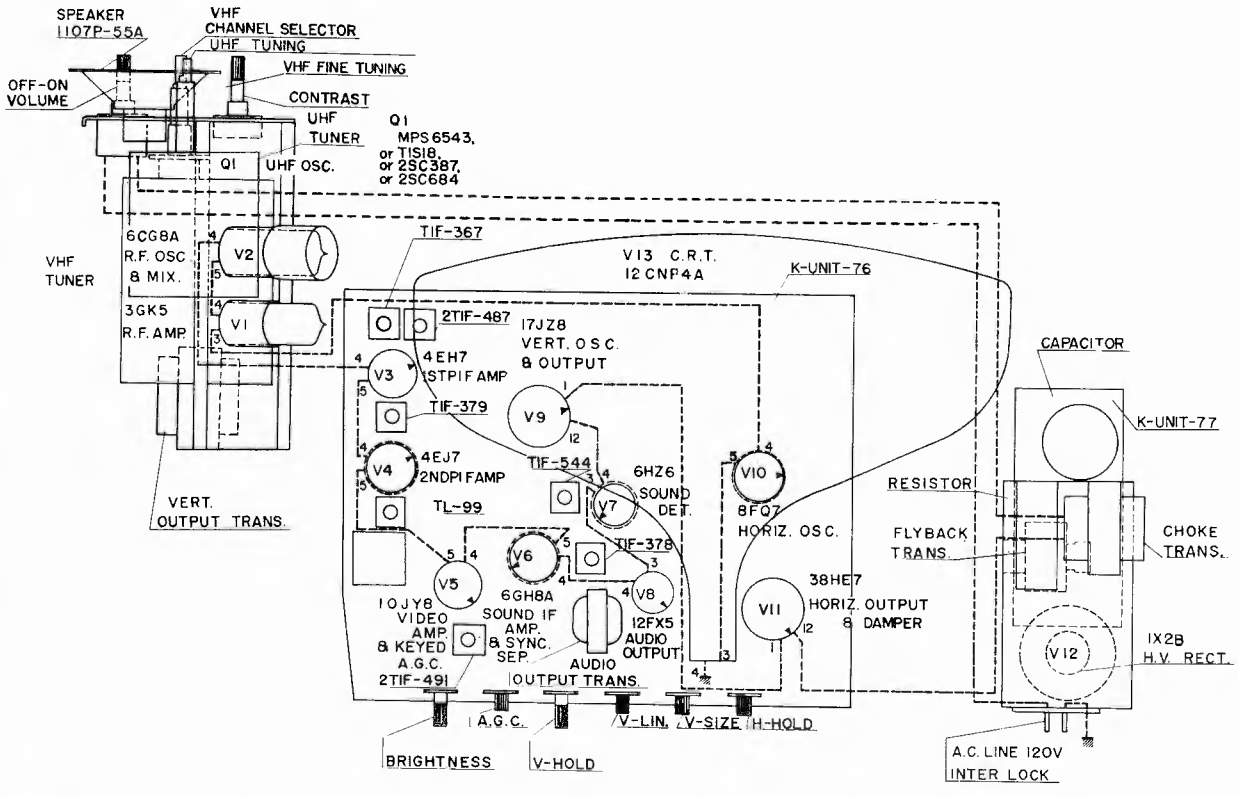


Figure 1 Chassis Tube Layout and Adjustment

Centering Adjustment

Both horizontal and vertical centering are accomplished by rotating the centering rings mounted on the back of the deflection yoke assembly.

Vertical Size and Linearity Adjustment

Adjust V-SIZE and V-LIN. for the best overall linearity and sufficient picture height. After this adjustment, a slight readjustment of the centering rings may be necessary.

Check RF Oscillator Adjustment (VHF Tuner)

Tune in all available VHF stations to see if the receiver local oscillator is adjusted to the proper frequency on all VHF channels. Access to the individual local oscillator adjustments on the VHF tuner is obtained in the following manner.

1. Remove the channel selector knob, fine tuning knob and felt washer from the shaft.
2. Set the tuner to the channel where adjustment is required.
3. Adjust local oscillator by turning the screw from the large hole on the insulative paper.

Fuse

For overload protection, a 1.6A fuse has been installed in the AC input of this receiver. This fuse is mounted on a terminal strip that is located at the back of high voltage cage.

High voltage assembly must be removed from the cabinet whenever replacement is required.

Chassis Assembly Removal

Main part of this chassis can be removed individually, proceed as follows.

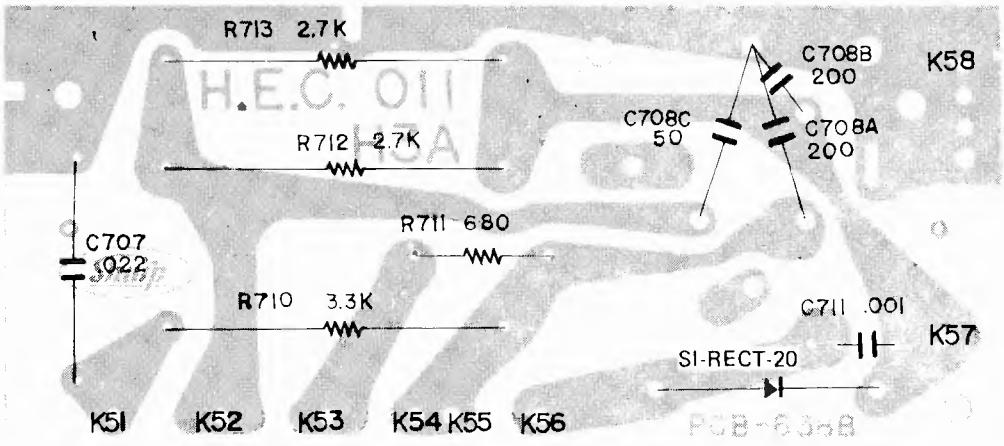
1. Lay the cabinet face down on a soft pad so as not to mar the picture tube.
2. Remove the seven back cover retaining screws.
3. Remove the back cover and disconnect the antenna wires and ground wire.
4. When removing the tuner assembly.
   a. Remove the insulating barrier with three screws; one at the tuner support bracket, two at the tuner mounting bracket.
   b. Remove the ON-OFF Volume, Contrast, VHF Channel Selector, VHF Fine Tuning and UHF Tuning Knobs from the front of the cabinet.
   c. Remove the four screws retaining tuner support bracket; two of which are at the bottom of the cabinet and the another two screws are at the back of the VHF Tuner.
   d. Remove the four screws retaining tuner mounting bracket and remove the tuner assembly from the cabinet.
   e. Remove the three screws retaining the variable resistor assembly and remove it from the cabinet.
5. When removing the printed circuit assembly
   Remove the speaker leads from the printed circuit board at terminals K22 & K23. Pull out the board along the guide rail after removing one screw retaining the printed circuit board near 7T-179.
6. When pulling the high voltage and power source assembly.
   a. Remove the anode lead and loosen the deflection yoke clamp. Remove the deflection yoke from the picture tube neck.
   b. Remove two screws retaining the side of high voltage cage and two screws retaining the lower part and one screw retaining the upper part.
7. The chassis may now be completely removed from the cabinet.

Removing and Installing Picture Tube

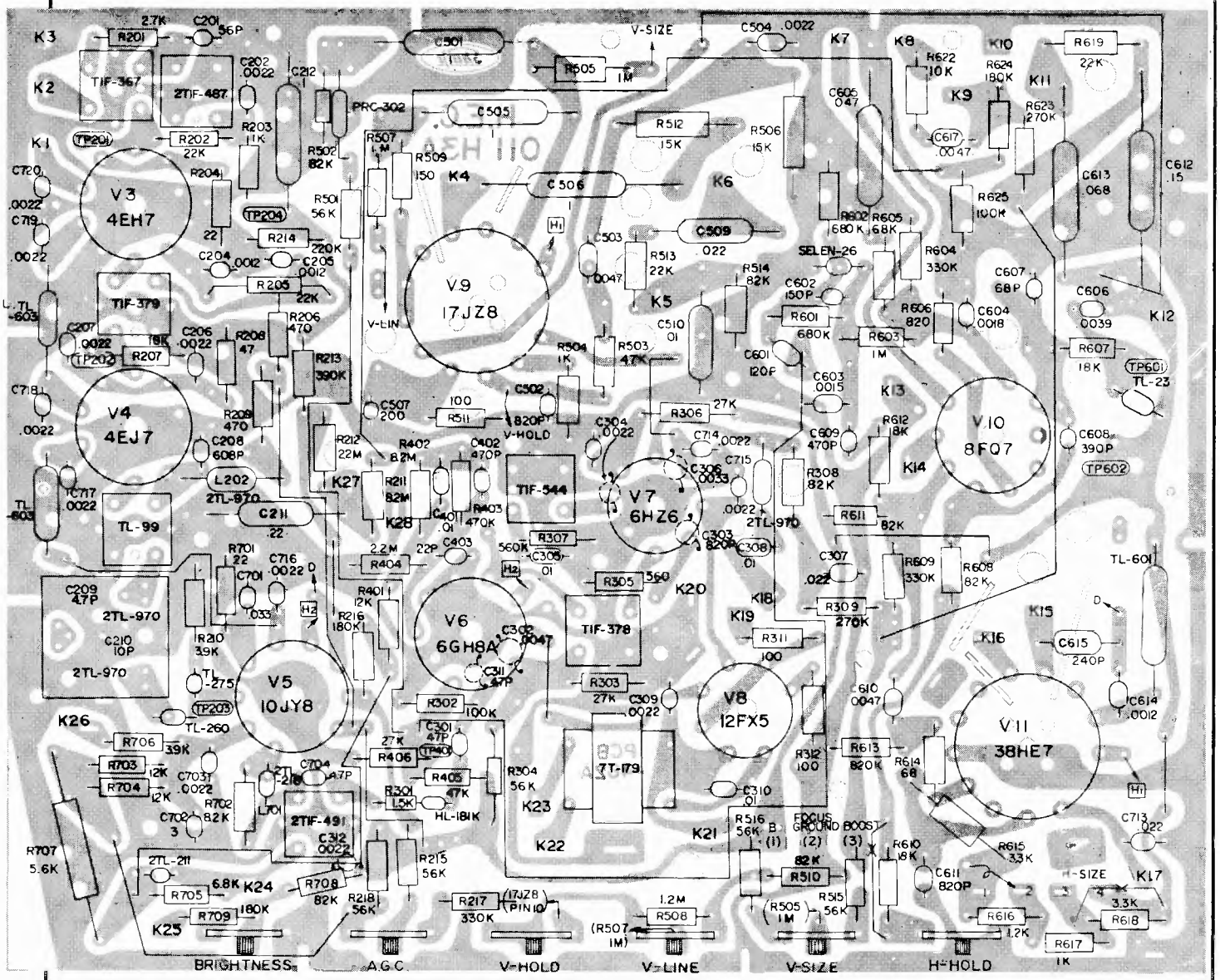
In order to remove or replace the picture tube, the chassis assemblies must be removed.

Refer to CHASSIS ASSEMBLY REMOVAL procedure. When the chassis has been removed, proceed as follows:

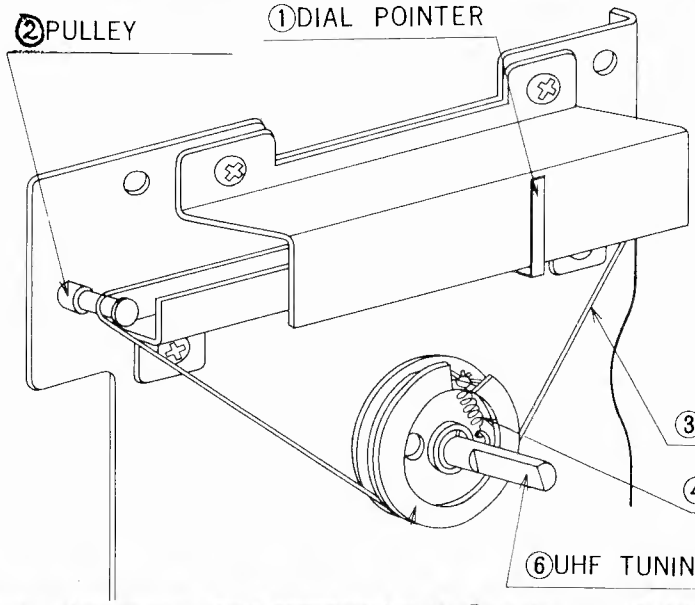
1. Remove the picture tube retaining ring.
2. Remove the picture tube from the cabinet.
   CAUTION: Refer to the caution label on the high voltage cage.
   (Always avoid handling the neck of the picture tube.)
3. Place the picture tube in proper position in the cabinet.
4. Mount the picture tube retaining ring.
5. Reassemble the chassis assemblies.

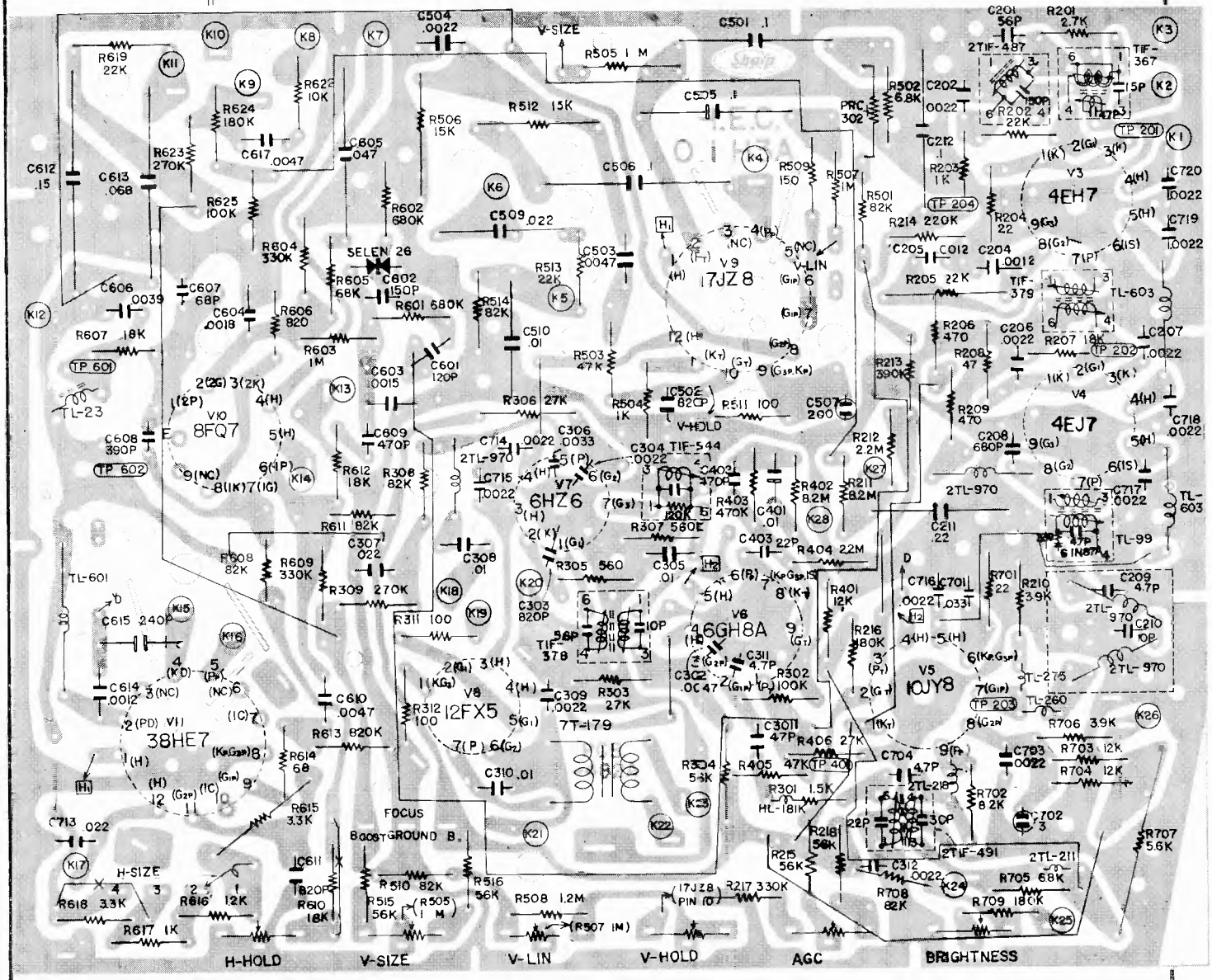


BOTTOM VIEW OF P.C. BOARD (K-UNIT-77)



TOP VIEW OF P.C. BOARD (K-UNIT-76)





BOTTOM VIEW OF P.C. BOARD (K-UNIT-76)

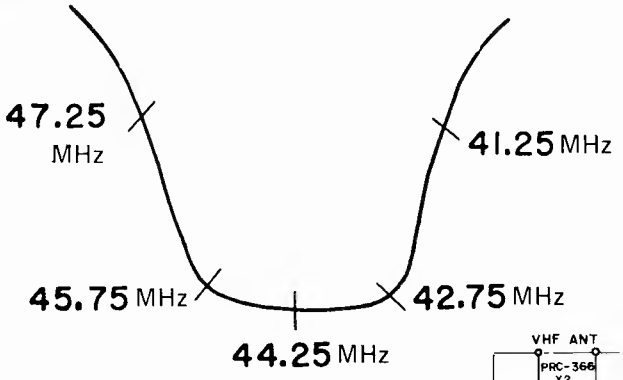


Figure 2

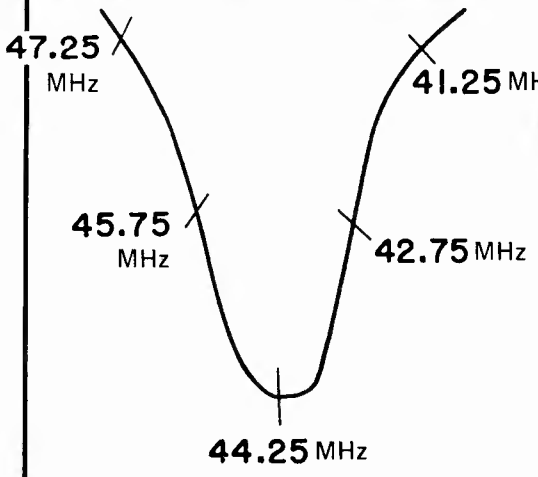


Figure 3

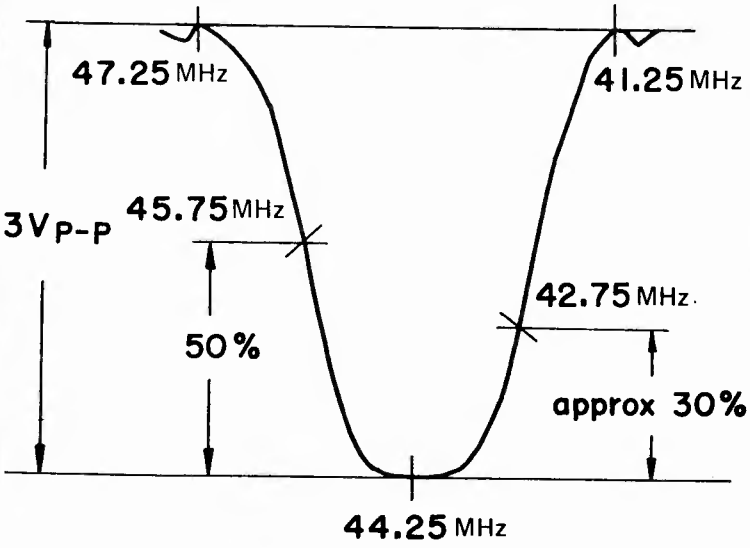
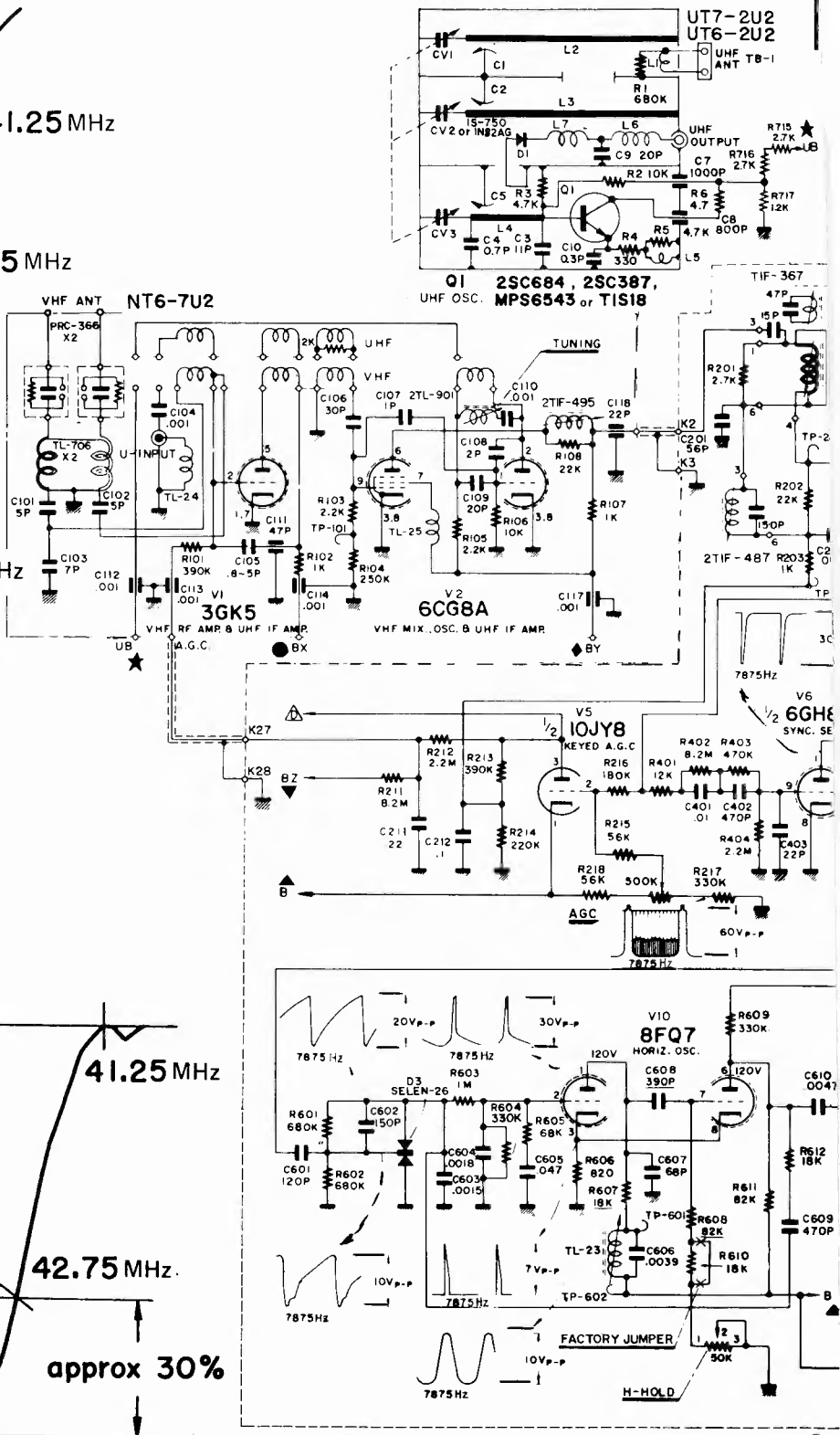
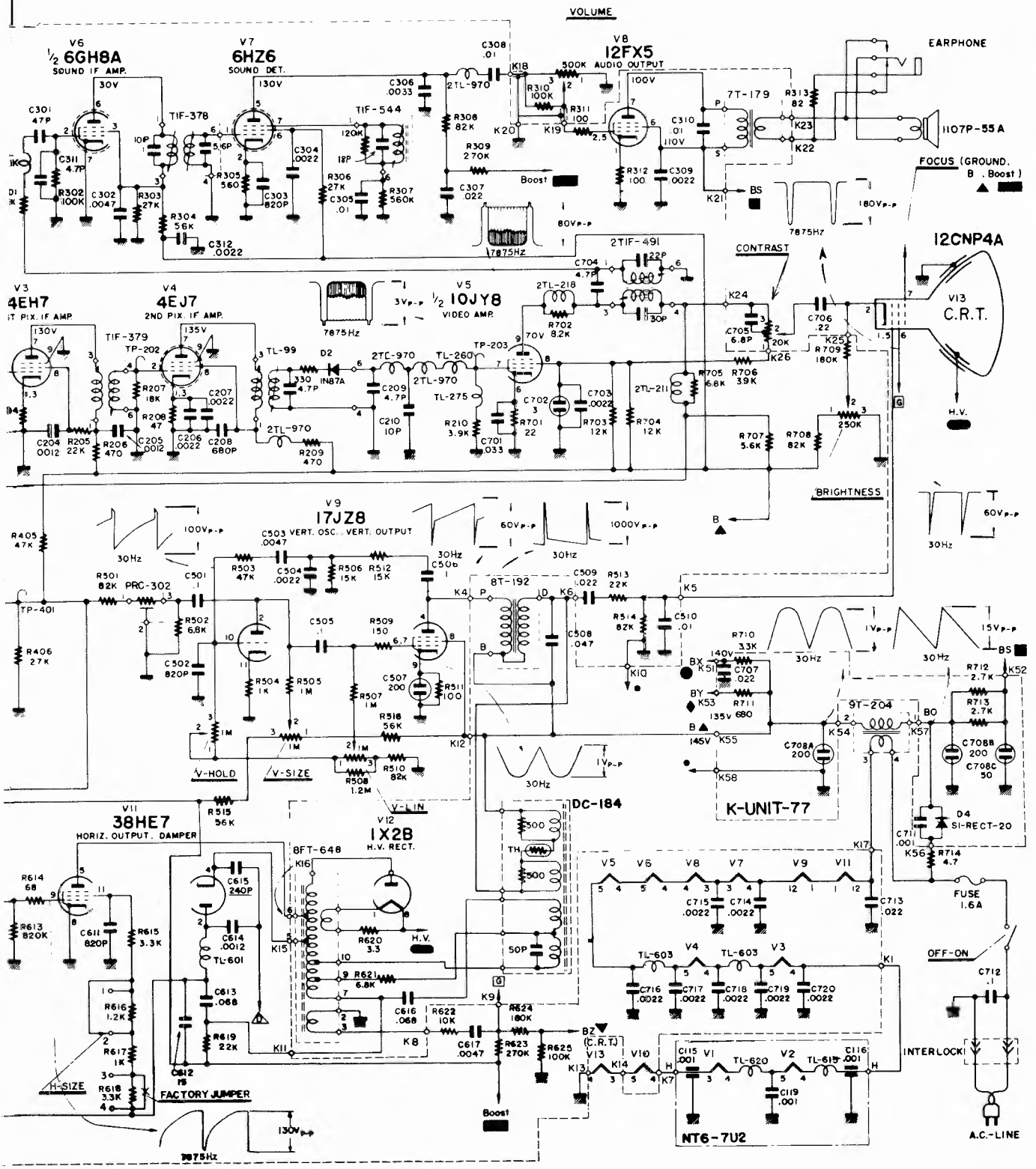


Figure 4




VOLUME
V6
½ 6GH8A
SOUND IF AMP.
V7
6HZ6
SOUND DET.
V8
12FX5
AUDIO OUTPUT
EARPHONE
1107P-55A
FOCUS (GROUND. B . Boost)
12CNP4A
V13
C.R.T.
CONTRAST
BRIGHTNESS
H.V.
V3
4EH7
1ST PIX. IF AMP
V4
4EJ7
2ND PIX. IF AMP.
V5
½ 10JY8
VIDEO AMP.
V9
17JZ8
C503 VERT. OSC.. VERT. OUTPUT
V-HOLD
V-SIZE
V-LIN
H-SIZE
V11
38HE7
HORIZ. OUTPUT. DAMPER
V12
1X2B
H.V. RECT.
FACTORY JUMPER
DC-184
K-UNIT-77
NT6-7U2
D4
SI-RECT-20
FUSE
1.6A
OFF-ON
INTERLOCK
A.C.-LINE
Boost
7875Hz
15734Hz
30Hz

ALIGNMENT INSTRUCTIONS

Equipment

1. Television Sweep Generator
2. Television Marker Generator
3. Oscilloscope
4. Bias Supply
5. Output Meter

Picture IF Alignment

1. Television receiver and test equipment should be turned on and allowed to warm up for 10 minutes before alignment.
2. Set the VHF channel selector to channel 10. (Antenna disconnected from tuner input.)
3. Set the sweep generator for a 44 MHz IF output and adjust the sweep width for 10 MHz.
4. Loosely couple the marker generator output lead to the output cable of the sweep generator.
5. Apply −3.5V bias to TP 204.
6. Connect the vertical input of the oscilloscope through a 10K Ohm resistor to TP 203.
7. Connect the output of the sweep generator through a .005 MFD capacitor to TP 202. Adjust the output of sweep generator to maintain a level not exceeding 2~3V pp at the oscilloscope reading.
8. Set the marker generator to produce the desired marker frequencies and adjust TL-99 (Top and Bottom) to obtain a waveform on the oscilloscope similar to the pattern shown in Figure 2.
9. Move the output of the sweep generator to TP 201.
10. Adjust TIF-379 (Top & Bottom) to obtain a waveform on the oscilloscope similar to the pattern in Figure 3.
11. Move the output of the sweep generator to TP 101 on the VHF tuner.
12. Adjust TIF-367 (Top & Bottom), 2TIF-487, 2TIF-495 and touch up TIF-379 to obtain a waveform on the oscilloscope equivalent to the pattern shown in Figure 4. (Top slug of TIF-367 is to dip 41.25MHz and 2TIF-487 is to dip 47.25MHz.
13. Repeat steps 7 through 12 until the best result is obtained.

Sound IF Alignment

1. With the receiver in normal operating condition, tune in a strong local station for best reception of picture.
2. Adjust TIF-544 for maximum sound without buzz and distortion.
3. Attenuate the received station signal by disconnecting the antenna.
4. Adjust TIF-378 for maximum sound with minimum buzz.
5. Adjust 2TIF-491 (Top) for maximum sound.
6. Repeat steps 2, 3, 4 and 5 to obtain the best result.

4.5 MHz Trap Alignment

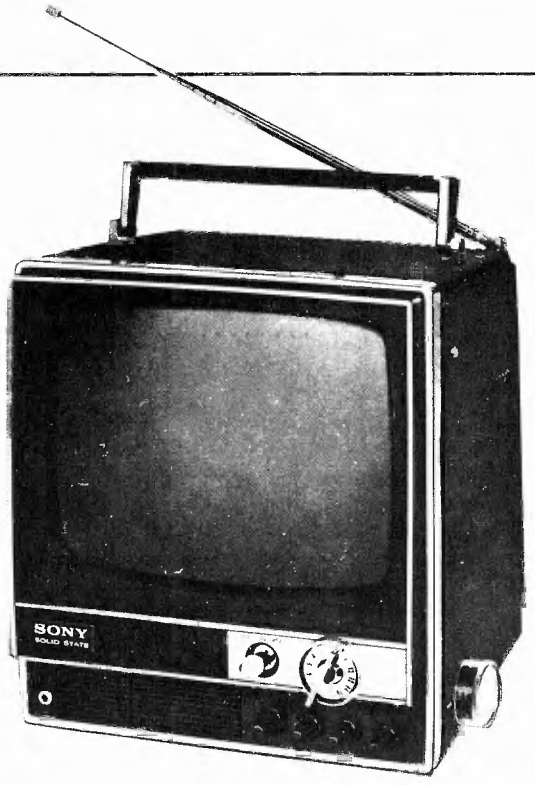
1. The receiver and test equipment should be turned on and allowed to warm up before alignment.
2. Set the channel selector to an unused channel, set the contrast control in fully clockwise position and disconnect the antenna from the tuner input.
3. Connect 4.5 MHz signal from the marker generator to TP203.
4. Adjust 2TIF-491 (Bottom) to obtain minimum contrast on the face of the picture tube.

Horizontal AFC Alignment

1. The receiver should be turned on and allowed to warm up before alignment.
2. Tune in a local station and adjust for normal picture.
3. Short-circuit both ends of horizontal ringing coil TL-23 (TP 601 and TP 602).
4. Connect 0.5 MFD capacitor between TP401 and the chassis to eliminate the sync signal output.
5. Turn the Horizontal Hold control to bring the picture moving slowly to the right or left, disregard vertical movement of the picture.
6. Open the short-circuit of Horizontal Ringing Coil TL-23 and adjust its core to produce the same condition as in step 5.
7. Remove the 0.5 MFD capacitor connected at step 4.
8. Repeat steps 4, 5 and 6 until the Horizontal Sync is obtained at the mechanical center of the H-HOLD control range.

Width Adjustment

With line voltage set at 108 volts, select the proper connection on the H-SIZE adjustment so that both side of the picture just fills the mask. Under normal operating conditions and with the line voltage set at 120 volts, the picture should horizontally overscan the mask about 1/2 inch on each side.



SONY

Model

TV-920U

CANADA: Serial No. 10001 and later.
USA: Serial No. 32615 and later.

Rear Cabinet Removal

1. Pull out the UHF tuning knob and UHF dial.
2. Place the set rear-side-up on a padded work surface.
3. Remove the three screws labeled A1-3 in Fig. 6.
4. Remove a screw labeled B1 in Fig. 7.
5. Lift up the rear cabinet slowly.
6. Remove the adhesive tape which fixes the leads and cables on the cabinet.
7. Pull out the 4-pole connector shown in Fig. 8.
8. Unsolder the two grounding wires and antenna cable connected to the antenna jack as shown in Fig. 8.
9. Remove the rear cabinet.

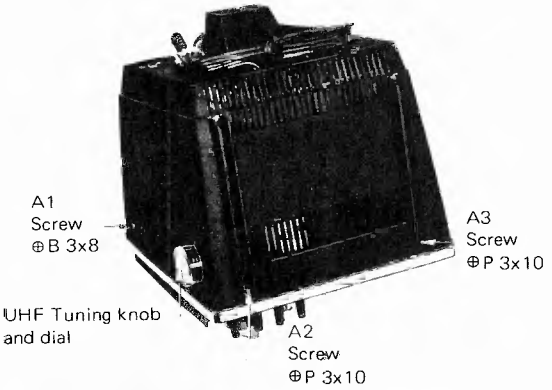


Fig. 6 Rear Cabinet Removal, step 3.

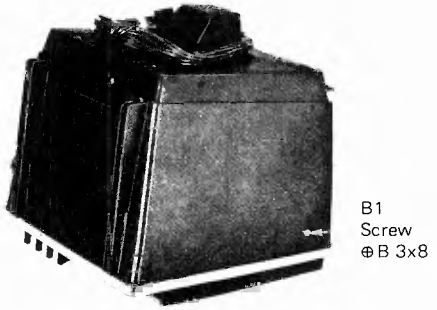


Fig. 7 Rear Cabinet Removal, step 4.

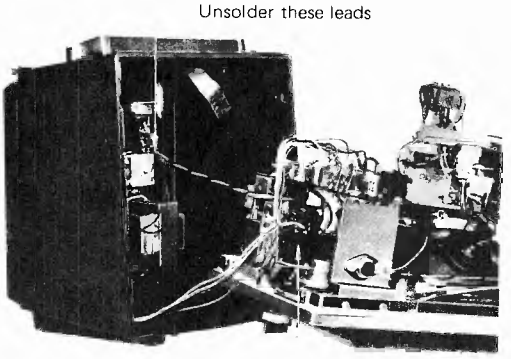


Fig. 8 Rear Cabinet Removal, steps 7 and 8.

Printed Circuit Board Removal

1. Remove the rear cabinet.
2. Place the set rear-side-up on a padded work surface.
3. Remove the clamp band which secures the lead wires of the picture-tube socket.
4. Pull off the picture-tube socket.
5. Remove the anode cap.
6. Remove the five screws labeled C1-5 in Fig. 9.
7. Unsolder the all lead wires connected to the printed circuit board.
8. Remove the printed circuit board.

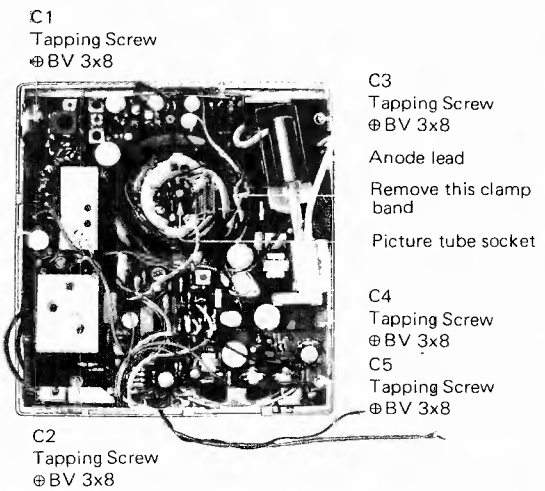


Fig. 9 Printed Circuit Board Removal

Protector Removal

1. Remove the rear cabinet.
2. Remove the four screws labeled D1-4 in Fig. 10.
3. Push slightly on the part of the protector that is unscrewed with a small screw driver as shown in Fig. 11.
4. Pull out the protector.

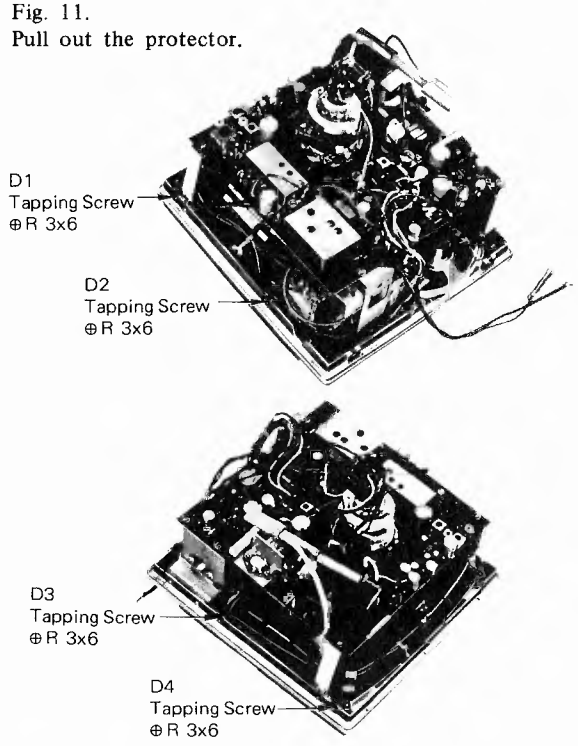


Fig. 10 Protector Removal, step 2.

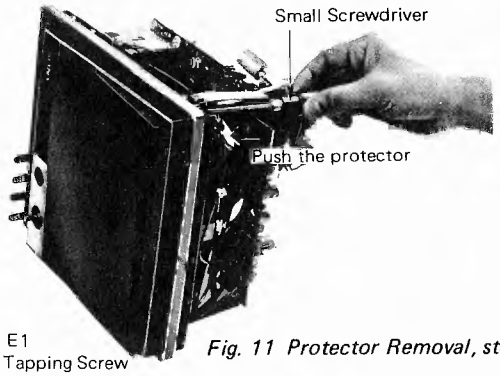


Fig. 11 Protector Removal, step 3.

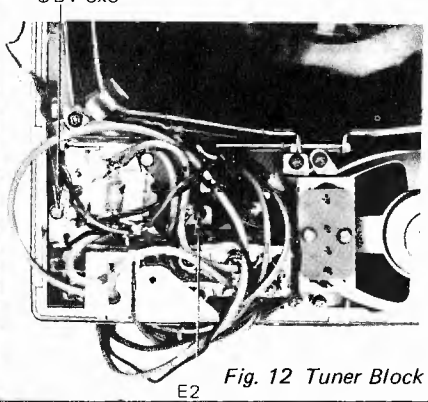


Fig. 12 Tuner Block Removal

Tuner Block Removal

1. Pull out the VHF channel selector and fine-tuning knob.
2. Pull out the UHF tuning knob and UHF dial.
3. Remove the rear cabinet.
4. Remove the printed circuit board.
5. Remove the two screws labeled E1-2 in Fig. 12.
6. Unsolder the two leads that are connected to the 3-P terminal board.
7. Lift out the tuner block.

Speaker Removal

1. Remove the rear cabinet.
2. Remove the printed circuit board.
3. Unsolder the resistor lead and the other two leads.
4. Remove the three screws labeled F1-3 in Fig. 13.
5. Lift out the speaker.

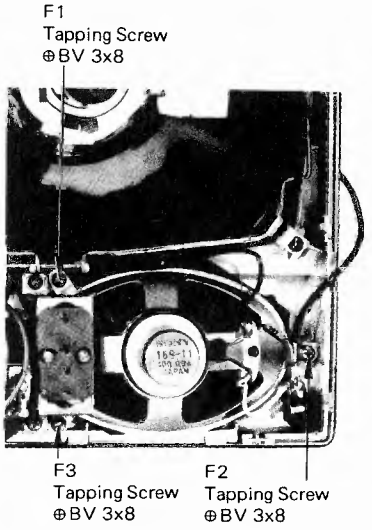


Fig. 13 Speaker Removal

Picture-tube Removal

1. Remove the rear cabinet.
2. Remove the printed circuit board.
3. Loosen the clamp band on the funnel of the picture-tube.
4. Remove the four screws labeled G1-4 in Fig. 14.
5. Lift out the picture-tube.

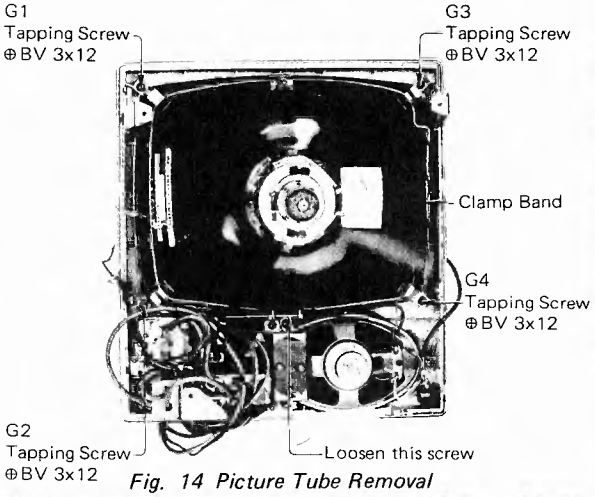


Fig. 14 Picture Tube Removal

VIF Response Curve Adjustments

Equipment needed

Sweep generator – covering the range of 39 to 48 MHz
Marker generator – covering the range of 39 to 48 MHz
Potentiometer – 500 k-ohm
Oscilloscope
VOM

Procedure

1. Unsolder the keying-pulse lead.
2. Connect the VOM to the emitter of 1st VIF amplifier Q301. (See Fig. 15)
3. Turn the set's power switch ON.
4. Confirm that the emitter voltage of Q301 is between 0.65V and 0.75V on the VOM. If the specified voltage is not obtained, change R326 to the value needed for getting the specified voltage.
5. Turn the set's power switch OFF.
6. Connect a 500 k-ohm potentiometer across resistor R326 as shown in Fig. 15.
7. Unsolder the VIF cable which is connected to the BF circuit board in Fig. 15.
8. Connect a sweep generator to the point where the VIF cable was connected. Use a 0.01μF isolation capacitor as shown in Fig. 15.
9. Loosely couple a marker generator to the output lead of the sweep generator.
10. Connect a scope to the VIF output terminals (across D401) through a noise filter consisting of a 10 k-ohm resistor and 200 pF capacitor as shown in Fig. 15.

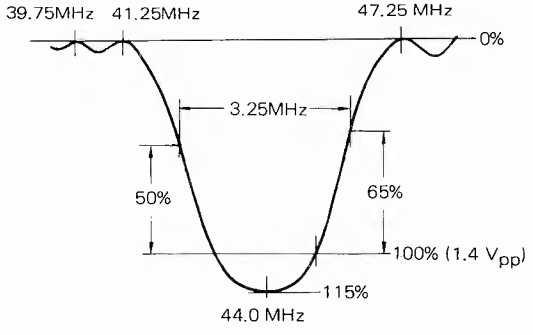


Fig. 16 Idealized VIF response curve

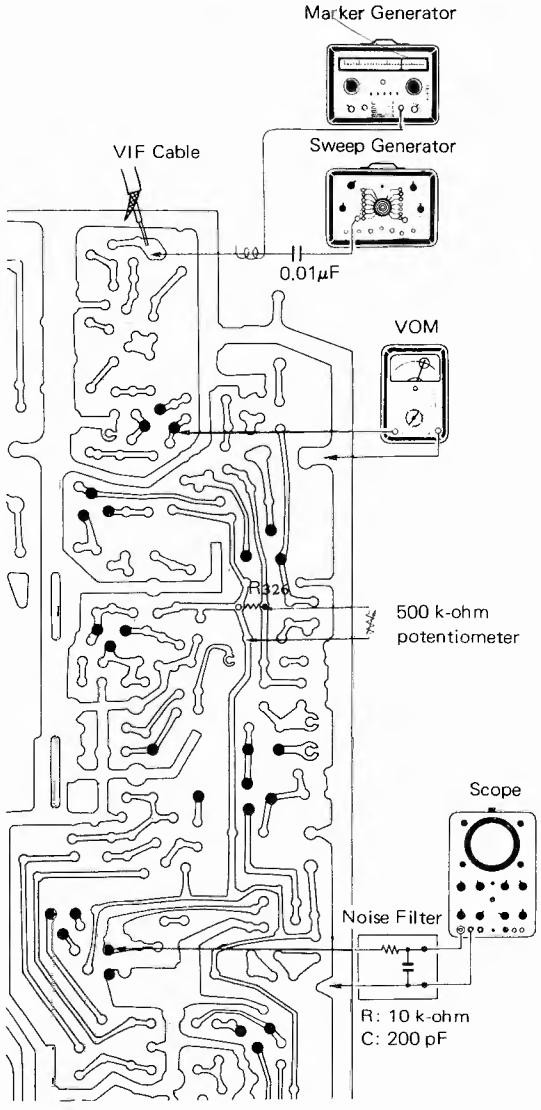


Fig. 15 Preparation for VIF adjustments.

11. Turn the set's power switch ON.
12. Adjust the 500 k-ohm potentiometer for a voltage reading of 1.4V at the emitter of Q301.
13. Disconnect the VOM.
14. Turn on all of the test equipment. Allow 10 minutes for warm up, then make the adjustments specified in Table 1.

TABLE 1. VIF ADJUSTMENTS

Step	Marker Frequency (MHz)	Adjust	Remarks
1	33.75	L304	Adjust the coil for minimum indication on the scope.
2	39.75	L303	Same as above.
3	41.25	L301	Same as above.
4	47.25	L302	Same as above.
5	45.75	T302 (pink core)	Adjust T302 for maximum distance between the marker point and baseline.
6	45.0	T303 (blue core)	Same as above.

15. Disconnect the sweep generator and scope.
16. Resolder the VIF cable and keying-pulse lead.

SIF Response Curve Adjustments

Equipment needed

Signal generator – 4.5 MHz with 400 — 600 Hz AM modulation
Sweep generator – covering the range of 4 – 5 MHz
Marker generator – covering the range of 4 – 5 MHz
Oscilloscope
VOM
Potentiometer – 500 k-ohm

Procedure

1. Set the channel selector to a highest inactive channel in the area.
2. Connect the 500 k-ohm potentiometer across resistor R326. (See Fig. 15)
3. Set the 500 k-ohm potentiometer to make all video disappear from the picture-tube (blank raster).
4. Connect a signal generator to the video-detector output as shown in Fig. 17.
5. Set the brightness control for optimum reproduction and the contrast control to maximum.
6. Adjust coil L402 for minimum 4.5 MHz stripes in the picture.
7. Disconnect the signal generator.
8. Connect a sweep generator to the video-detector output.
9. Loosely couple a marker generator to the output lead of the sweep generator.
10. Connect a scope to the SIF output terminals (C420) as shown in Fig. 17, then make the adjustments specified in the following Table 2.

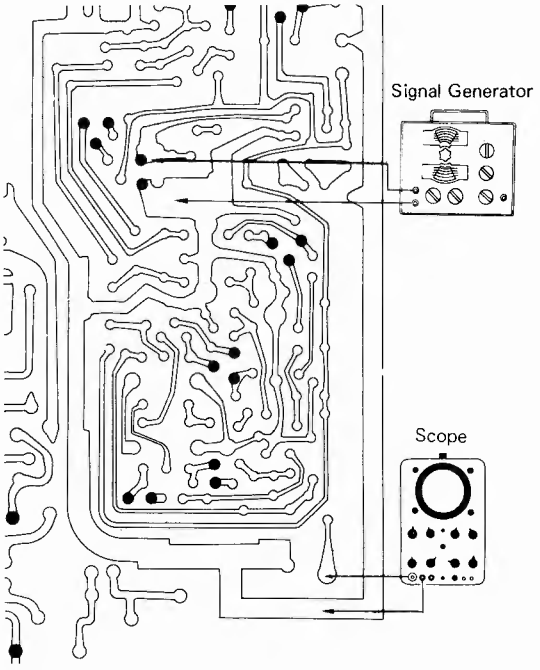


Fig. 17 Prearation for SIF adjustments

11. Repeat the above steps as necessary to produce the waveform shown in Fig. 18.

TABLE 2. SIF ADJUSTMENTS

Step	Marker Frequency (MHz)	Adjust	Remarks
1	4.5	T401 T402	Turn up sweep output to produce an S curve. Adjust T401 and T402 for maximum deflection on the scope.
2	4.5	T403 (pink core)	Turn the core to make the S curve symmetrical, and have it cross the baseline at 4.5 MHz.
3	4.5 MHz with 400 – 600 Hz AM modulation	T403 (blue core)	Turn the core for minimum indication of the 400 – 600 Hz signals on the scope.

Deflection Circuit Adjustments

Equipment needed

VOM
Oscilloscope

Procedure

1. Connect an antenna to the receiver and tune the receiver to a local channel.
2. Make the adjustments specified for each circuit in Table 3.

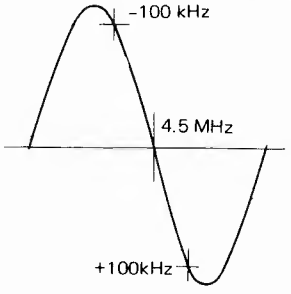
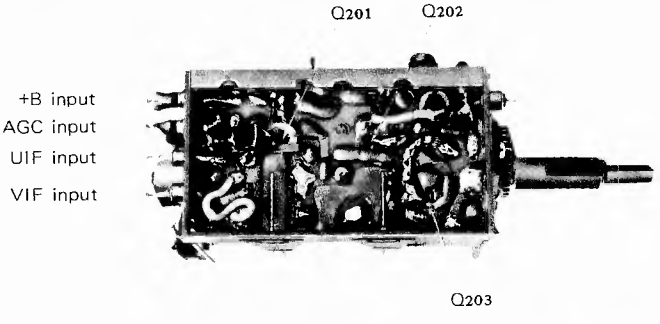
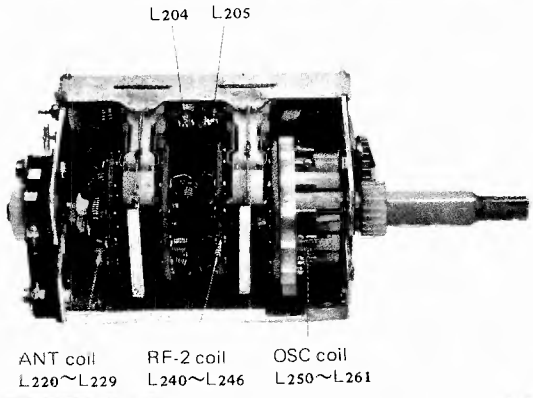


Fig. 18 Idealized SIF response curve

TABLE 3. DEFLECTION CIRCUIT ADJUSTMENTS

Items	Adjust	Preparation	Adjustment Procedure
Horizontal frequency adjustment	R621	1. Receive an off-the-air signal. 2. Short-circuit the horizontal stabilizing coil. 3. Adjust the brightness and contrast controls to obtain the best picture.	Adjust R621 so that the numbers of diagonal bars are the same with the horizontal hold control set at both extremes of rotation. Turn the set on and off a few times to make sure that the picture locks from a cold start.
Horizontal pulse-width adjustment	C805	4. Connect the scope to the emitter of the horizontal oscillator (Q801). 5. Set the horizontal hold to mid-range.	Select values for C805, between 0.0022 – 0.01μF to obtain the pulse-width of 12.5 – 13.5μsec.
Horizontal stabilizing coil (HSC) adjustment	HSC (L801)	6. Remove the short-circuit from HSC.	Adjust the core of HSC (L801) until the picture stabilizes. Note: Recheck the horizontal pulse-width, and if it is not within the range of 12.5 – 13.5μsec, replace C805 by trial and error to produce the correct pulse-width.
Horizontal size adjustment	C811	1. Receive an off-the-air signal. 2. Adjust H. and V. hold for correct sync. 3. Adjust the brightness and contrast controls to obtain the best picture.	Adjust C811 while observing the picture to produce optimum picture size.
Ic of Q501	R501	1. Set the channel selector to an inactive channel in the area. 2. Check the 12V power supply. 3. Connect a VOM across resistor R506.	Adjust resistor R501 for a reading of 43.5V.
Vertical height and linearity	VR702 VR703	1. Receive the test pattern. 2. Set H. and V. hold for correct sync. 3. Adjust brightness and contrast to obtain the best picture.	Adjust linearity control VR702 and height control VR703 while observing the picture, to produce the best picture height and linearity.
Ic of Q703 (V. output)	R711	1. Receive an off-the-air signal. 2. Set H. and V. hold for correct sync. 3. Connect a VOM across resistor R714.	Adjust the resistor R711 for a reading of approx. 0.44V.
Focus adjustment	Focus lead	1. Receive an off-the-air signal. 2. Set H. and V. hold for correct sync. 3. Set the brightness and contrast controls for normally bright picture.	Try connecting the focus lead to each of the connecting point on the BF board. Connect it permanently at the point that gives best picture.

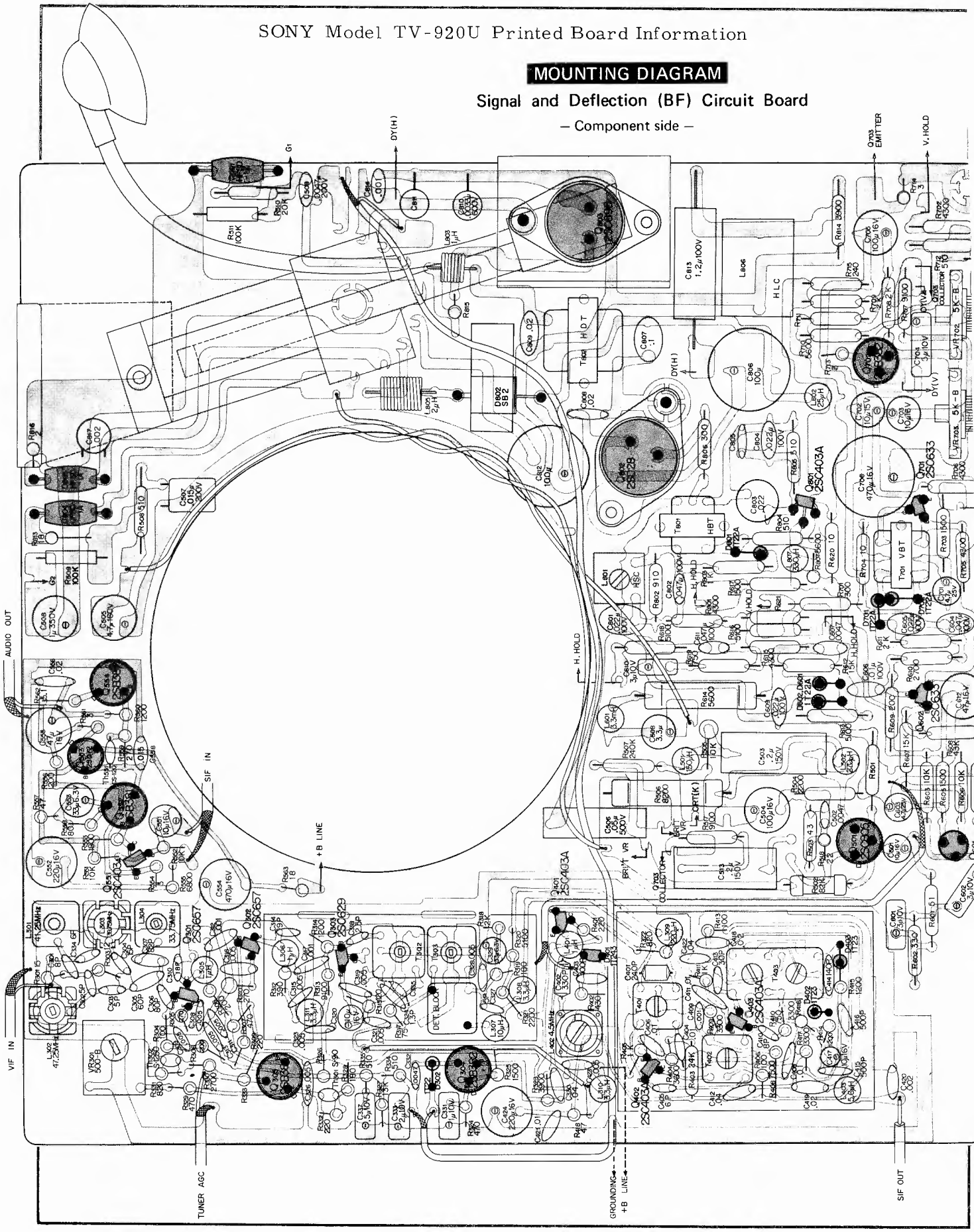




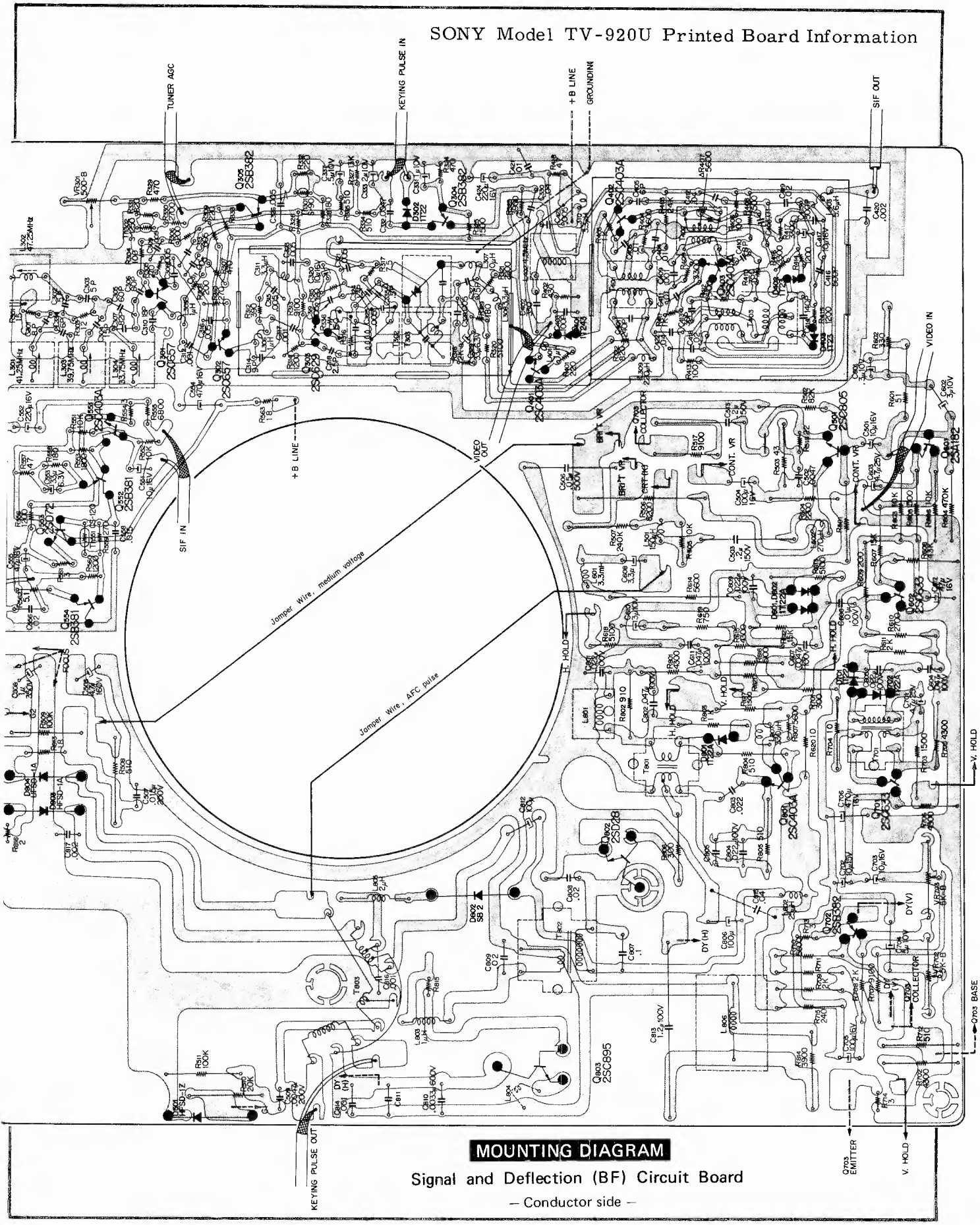
MOUNTING DIAGRAM

Signal and Deflection (BF) Circuit Board

– Component side –



SONY Model TV-920U Printed Board Information

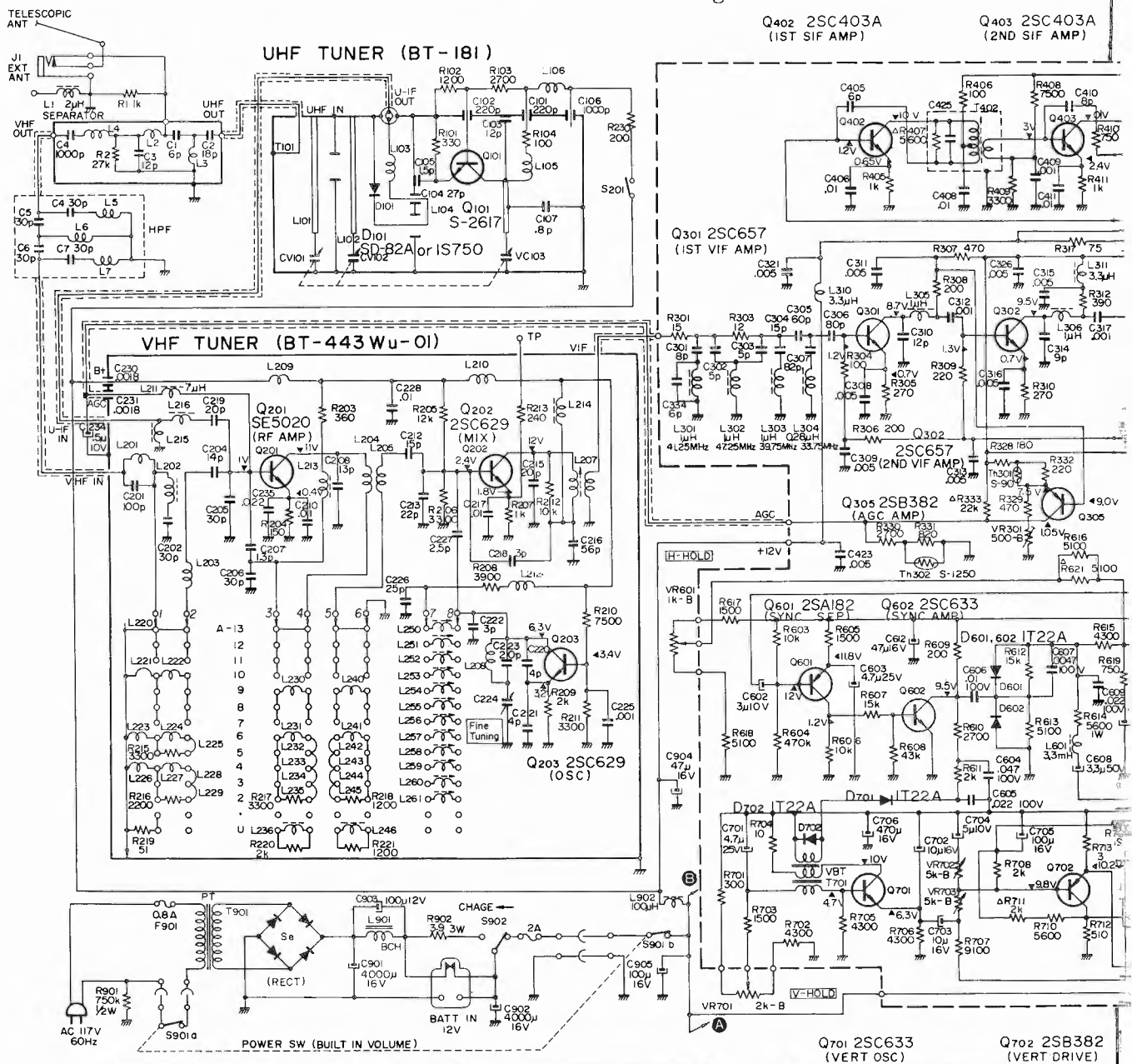


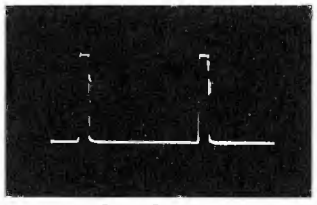
MOUNTING DIAGRAM

Signal and Deflection (BF) Circuit Board

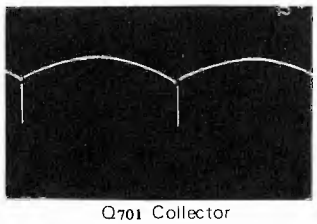
— Conductor side —

SONY Model TV-920U Schematic Diagram

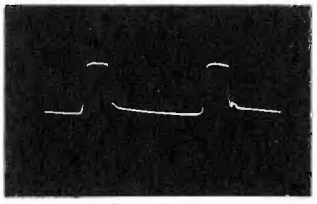




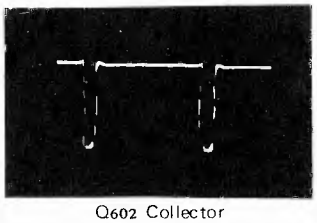
Q601 Collector
12Vp-p Horiz.



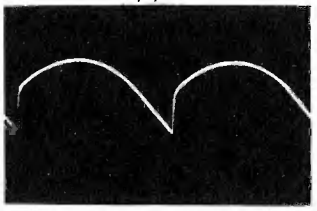
Q701 Collector
5.5Vp-p Vert.



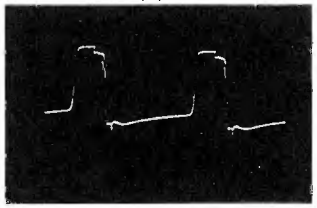
Q801 Emitter
13.5Vp-p Horiz.



Q602 Collector
12Vp-p Horiz.

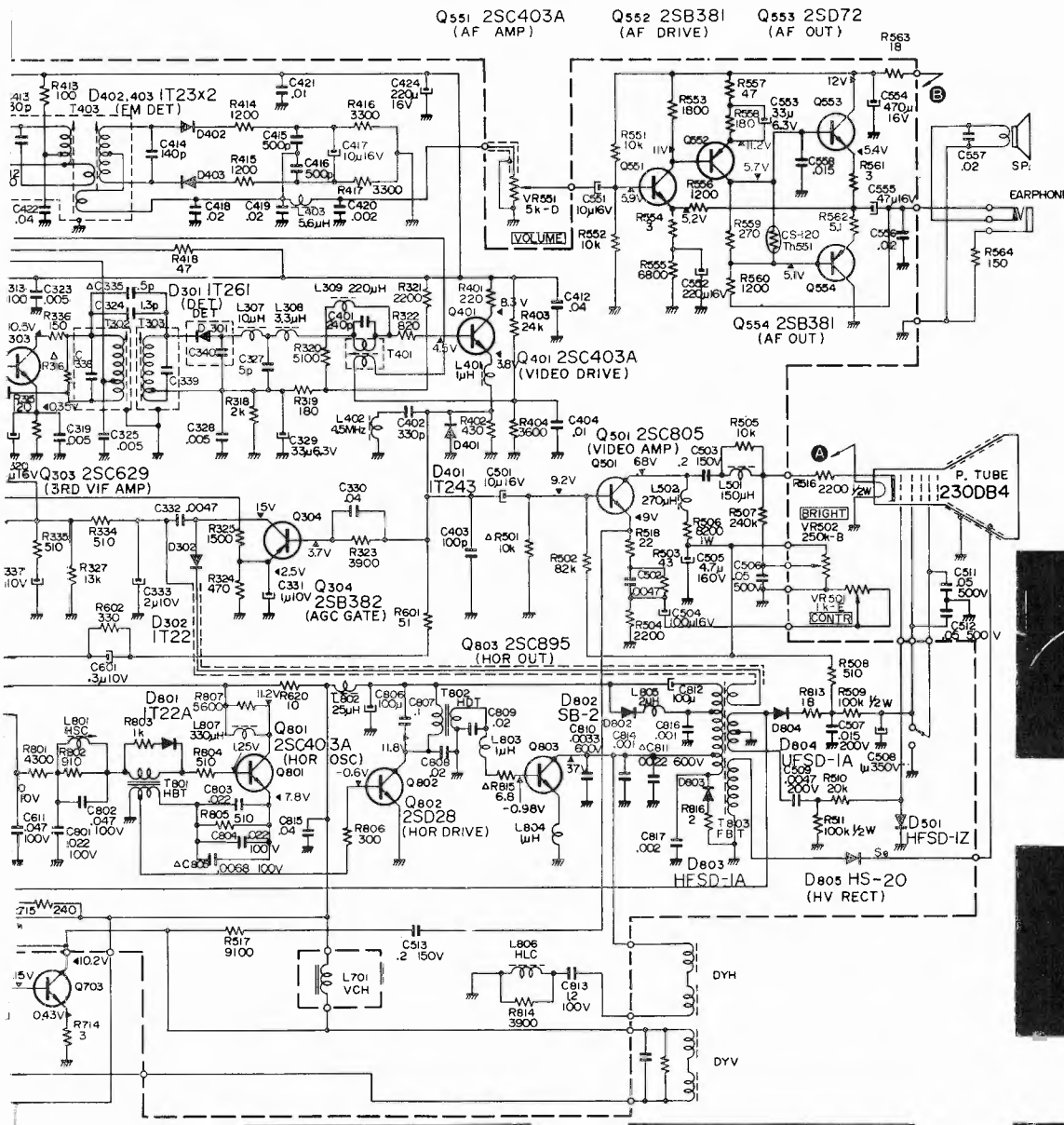


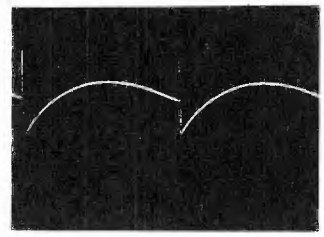
Q702 Base
1.6Vp-p Vert.



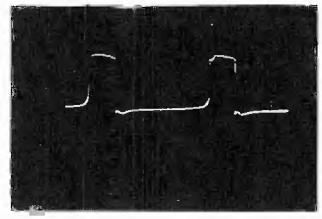
Q802 Base
1.2Vp-p Horiz.

SONY Model TV-920U Schematic Diagram, Continued





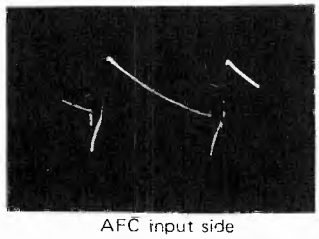
Q701 Base
5.1Vp-p Vert.



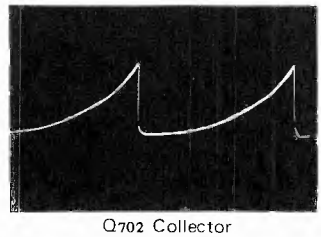
Q801 Base
15Vp-p Horiz.

TV-920U

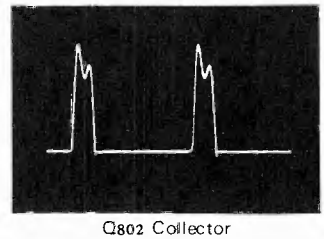
WAVEFORMS



AFC input side
13.5Vp-p Horiz.

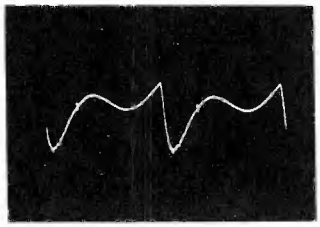


Q702 Collector
1.2Vp-p Vert.

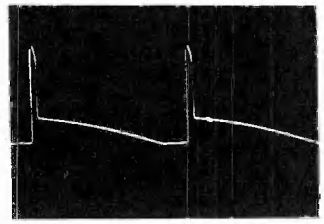


Q802 Collector
110Vp-p Horiz.

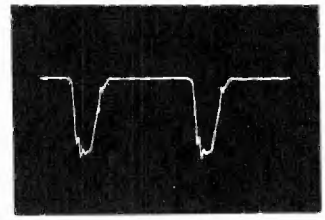
NOTE:
Vert.: 30 Hz
Horiz.: 7875 Hz



HBT input side
1.8Vp-p Horiz.

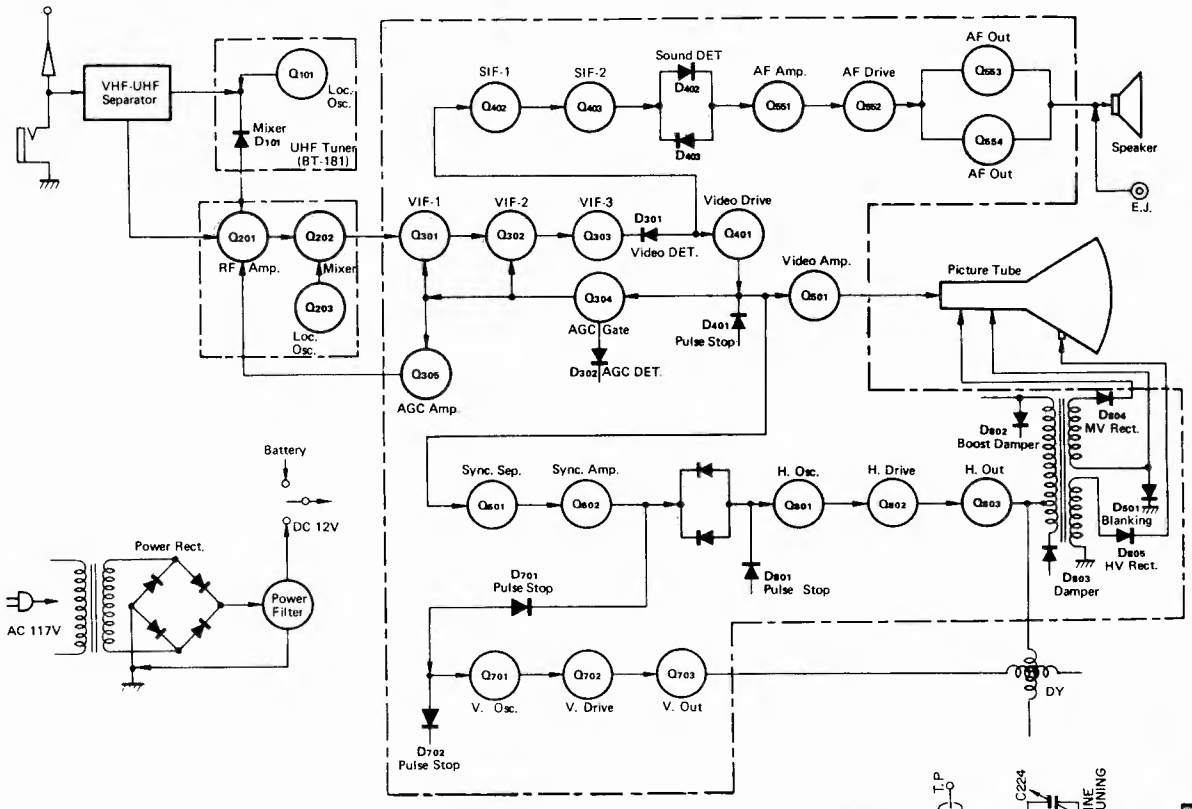


Q703 Collector
55Vp-p Vert.



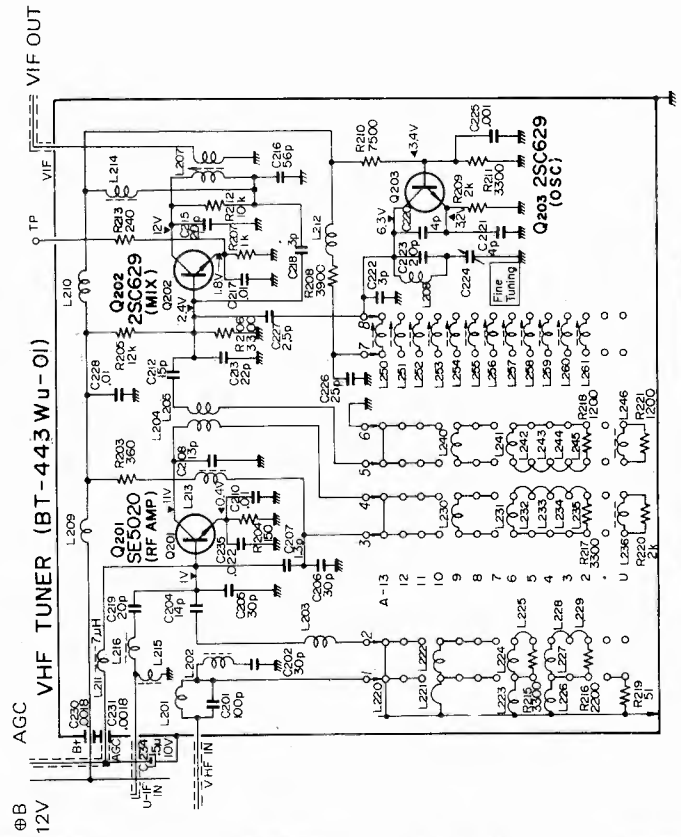
Q803 Base
5Vp-p Horiz.

BLOCK DIAGRAM

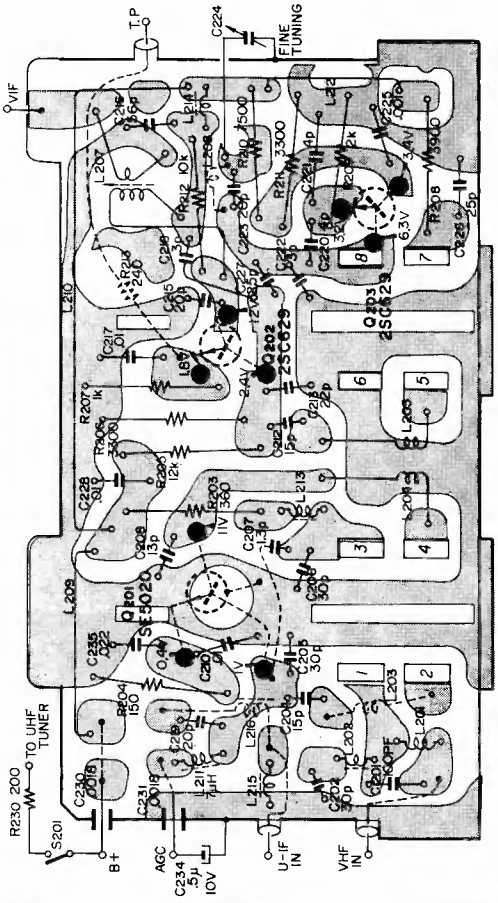


SCHEMATIC DIAGRAM

– VHF Tuner Circuit Board –



MOUNTING DIAGRAM



SYLVANIA

Chassis B12-1, used in Model MZ122
Chassis B12-2, used in Models MZ123, Mz200

ADJUSTMENTS

BRIGHTNESS-CONTRAST ADJUSTMENT - Rotate contrast control fully counterclockwise (minimum contrast). Adjust brightness control so that a known black object is a true black with little or no grey shading. Readjust contrast control for most pleasing picture. NOTE: once correct brightness setting has been established, it is not normally necessary to readjust the brightness control. Use the contrast control to adjust for variations in room lighting.

AGC - Use this control only if normal contrast cannot be obtained with CONTRAST Control, or if the picture is not steady. Tune in a strong channel and then rotate clockwise until the picture "jumps" or is unsteady, then back off until the picture becomes steady and normal.

HEIGHT-VERTICAL LINEARITY - These two controls are interdependent. If the picture is out of proportion vertically, or compressed at top or bottom, adjust both controls until the picture assumes normal proportions. The Height Control especially affects the bottom of the picture. Linearity the top. NOTE: The Vertical Hold Control should be checked after any changes in adjustment of Height or Vertical Linearity Controls.

WIDTH - If the picture is out of proportion horizontally, adjust this control until the picture assumes normal proportion.

HORIZONTAL LINEARITY

Before attempting to adjust Horizontal Linearity coil L404, make certain all other controls are adjusted for normal picture viewing. Using a test pattern, preferably a circle, rotate core of L404 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 L404.

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.

HORIZONTAL OSCILLATOR ADJUST

1. Back off AGC to a light grey scale picture.
2. Connect a jumper shorting pin 2 of V5A to ground (Pin 3 of PP300 accessible on top of board may also be used)
3. Pull horizontal hold knob out approximately 1/2 inch to allow adjustment past mechanical stop.
4. Adjust L400 until picture is as stable as possible (floating). Use vertical hold to stop excessive vertical running.
5. If after completing oscillator adjustment the stop on back of horizontal knob is not centered away from tab on chassis, pull knob completely out and reinsert 180 degrees away from tab to allow proper control range.
6. Reset AGC as described under controls.

CHASSIS REMOVAL

NOTE: To provide sufficient access for normal servicing, follow Steps 1 through 3 only.

1. Disconnect AC power cord and antenna connection. Remove interlock cover.
2. Pry out on spring retainer on each side of chassis (See Illustration pg. 5) and slide chassis to the rear as far as lead length will allow.
3. Lay cabinet on its side, on a soft clean cloth, with the high voltage section end up.

NOTE: If further removal is desired, place cabinet on its feet and continue below.

4. Disconnect the following plug and socket connections.
   A. Yoke - at chassis.
   B. Tuner cluster - at chassis.
   C. Picture Tube Cable - at picture tube.
   D. High Voltage Lead - at picture tube.
   E. IF Input - at chassis.
   F. Speaker Leads - at speaker.
   G. Wire Braid - at chassis.
5. Slide chassis to rear by prying out the spring retainers on either side of chassis (See photo pg. 5).

NOTE: Lower front control knobs will automatically disconnect while chassis is being removed.

6. Remove tuner cluster knobs by pulling straight outward.
7. Remove screws securing antenna board to cabinet.
8. Remove tuner mounting screw securing tuner cluster to cabinet.
9. Lift tuner cluster upward slightly and then back. Remove tuner cluster.
10. To replace chassis, reverse the above procedure.

NOTE: To remove yoke, loosen screw on yoke retaining ring. Slide yoke to the rear until clear from the neck of the picture tube. To replace yoke, reverse the above procedure being careful not to strike the neck of the picture tube.

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 picture tube mounting wire bracket.
4. Remove the four brackets and screws securing picture tube to cabinet.
5. USING GOGGLES AND GLOVES, reach under face of tube and lift from cabinet, DO NOT GRASP NECK OF PICTURE TUBE AT ANY TIME.
6. To install picture tube, reverse the preceding steps. Exercise caution not to scratch face of picture tube.

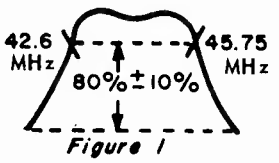
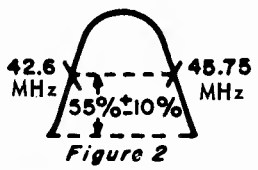
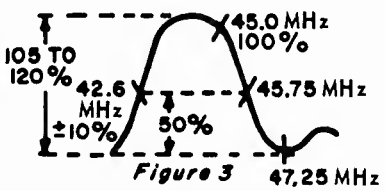
ALIGNMENT PROCEDURE

VIDEO IF, SOUND IF AND 4.5MHz TRAP ALIGNMENT PROCEDURES

PRELIMINARY INSTRUCTIONS

1. Line voltage should be maintained at 120 volts.
2. Keep marker generator coupling at a minimum to avoid distortion of the response curve.
3. Do not use tubular capacitors for coupling sweep into receiver. Disc ceramics are best.
4. For best results, solder the sweep generator ground to chassis, do not use clips.
5. Sweep generator "hot" lead must make good electrical contact at all points given under TEST EQUIPMENT HOOK -UP.
6. Adjust sweep generator output for maximum peak-to-peak response curve on the scope.
7. Receiver and test equipment should warm up for approximately 15 minutes before alignment.

—VIDEO IF ALIGNMENT—

STEP	ALIGNMENT SET - UP NOTES	TEST EQUIPMENT HOOK - UP	ADJUST
1	Connect -12V DC source to Tie Point (B) and pin 2 of SK500. Remove yoke plug, PL400 to disable horizontal and vertical scan.	SWEEP GENERATOR - Through a .002 MFD capacitor to pin 2 of V4 Set generator to 43.5MHz with 10MHz sweep. SIGNAL GENERATOR - Loosely coupled as a marker to sweep generator lead. OSCILLOSCOPE - Through a 10K resistor connected to test point (A)	[L205] and [L206] so that the 42.6MHz marker and the 45.75MHz marker are of equal amplitude. See Figure 1.  *Figure 1* [L205] Positions marker amplitude. [L206] Adjusts for tilt.
2	Same as Step 1.  *Figure 2*	SWEEP GENERATOR - Through a .002 MFD capacitor to IF test point on tuner. Set generator to 43.5MHz with 10MHz sweep. SIGNAL GENERATOR - Same as Step 1. OSCILLOSCOPE - Same as Step 1.	[T200] so that both the 42.6MHz and 45.75 MHz markers are of equal amplitude and at 55% of response curve. See Figure 2.
3	Same as Step 1.  *Figure 3*	SWEEP GENERATOR - Same as Step 2. SIGNAL GENERATOR - Same as Step 1. OSCILLOSCOPE - Same as Step 1.	[L204] for maximum dip at 47.25 MHz TUNER MIXER COIL - To position 45.75MHz marker at 50% of response curve while 45MHz marker is maintained at 100%. [L202] To obtain response as shown in Figure 3. Top of response curve should be smooth and rounded and should rise from 105% to 120%.

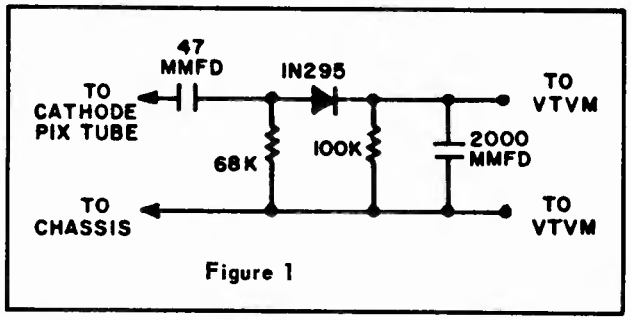


Figure 1

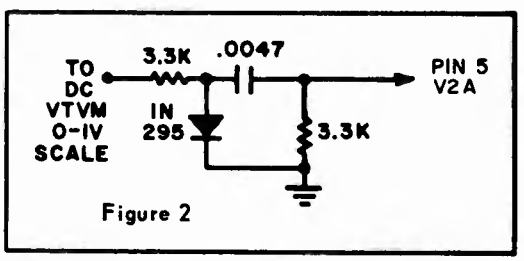
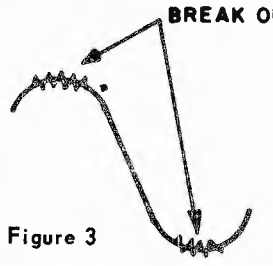
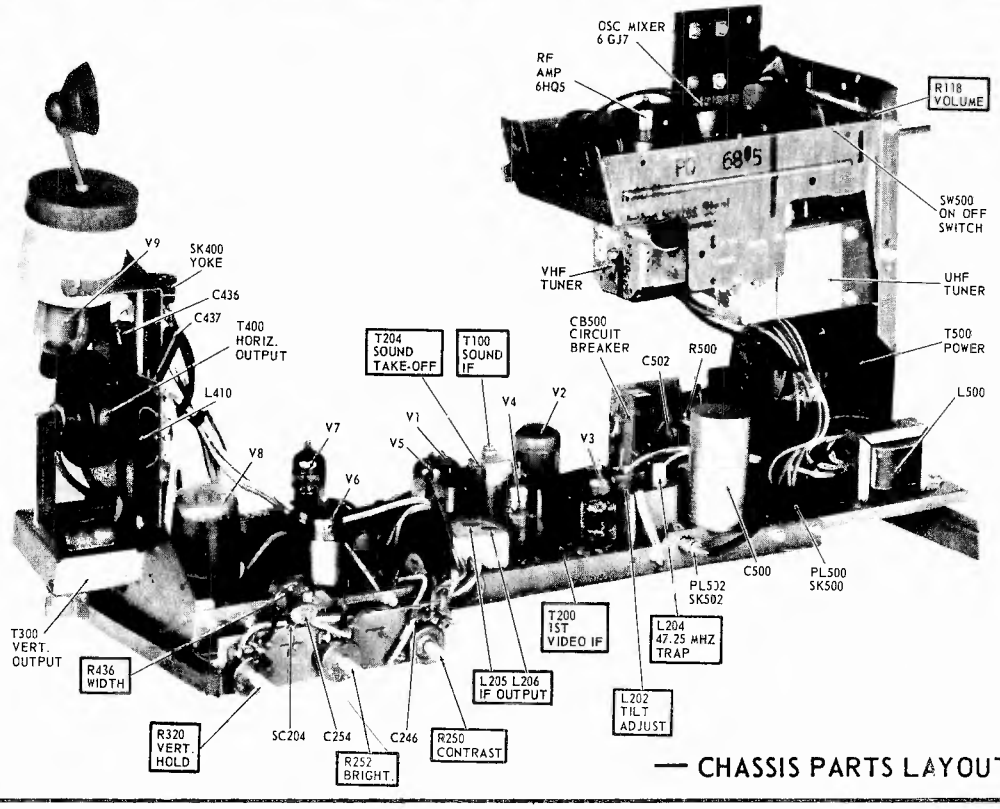


Figure 2

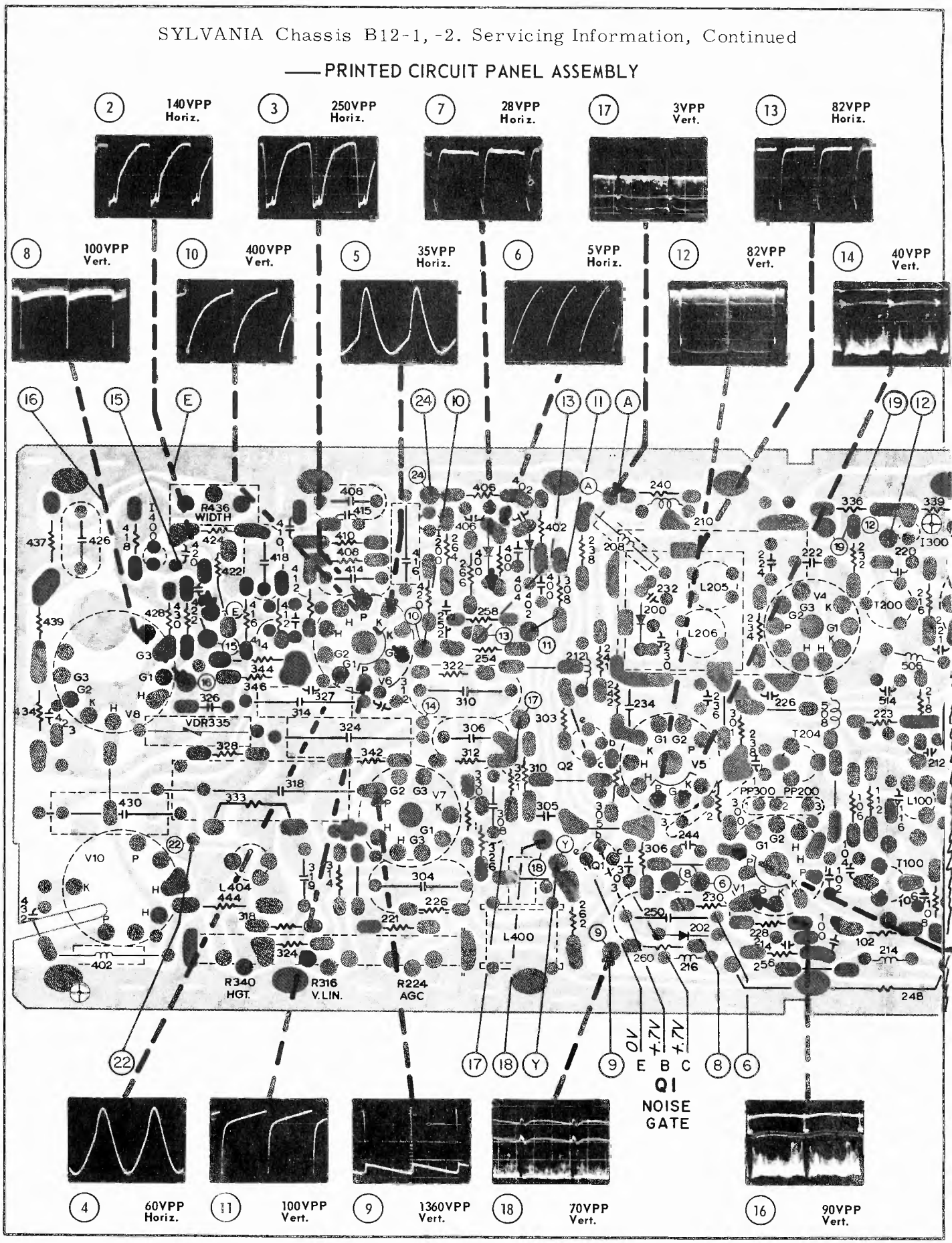
— 4.5MHz TRAP AND SOUND IF ALIGNMENT —

STEP	ALIGNMENT SET - UP NOTES	TEST EQUIPMENT HOOK - UP	ADJUST
1	Connect a -12V DC source to Tie Point (B). Remove yoke plug PL400 to disable horizontal and vertical scan.	SIGNAL GENERATOR - Through a .0047 MFD capacitor to test point (A). Set signal generator to 4.5 MHz preferably crystal calibrated or controlled, with at least 100 millivolts output. VTVM - Through detector network shown in Figure 1, to cathode of picture tube - tie point (9).	Separate cores of T204 then Adjust top core of T204 for minimum reading on meter.
2	Same as Step 1.	SIGNAL GENERATOR - Same as Step 1. VTVM - Through detector network shown in Figure 2. to pin 5 of V2A	T100 Bottom core T100 Top core T204 Bottom core For maximum meter reading using weakest possible signal.
3	Same as Step 1.  Figure 3	SIGNAL GENERATOR - Same as Step 1. OSCILLOSCOPE - Through .0047 MFD capacitor pin 1 of SK500.	With core of L100 at the top of coil form, rotate core inward (clockwise). (NOTE: Coil has two (2) peaks of resonance): Tune through the first peak and adjust the core for maximum amplitude on the second peak. Decrease signal strength until break out occurs. then readjust top core of T100 until break out occurs simultaneously on both peaks. See Figure 3.
4	Remove all test equipment leads etc. Connect antenna and check receiver on a strong local station.		



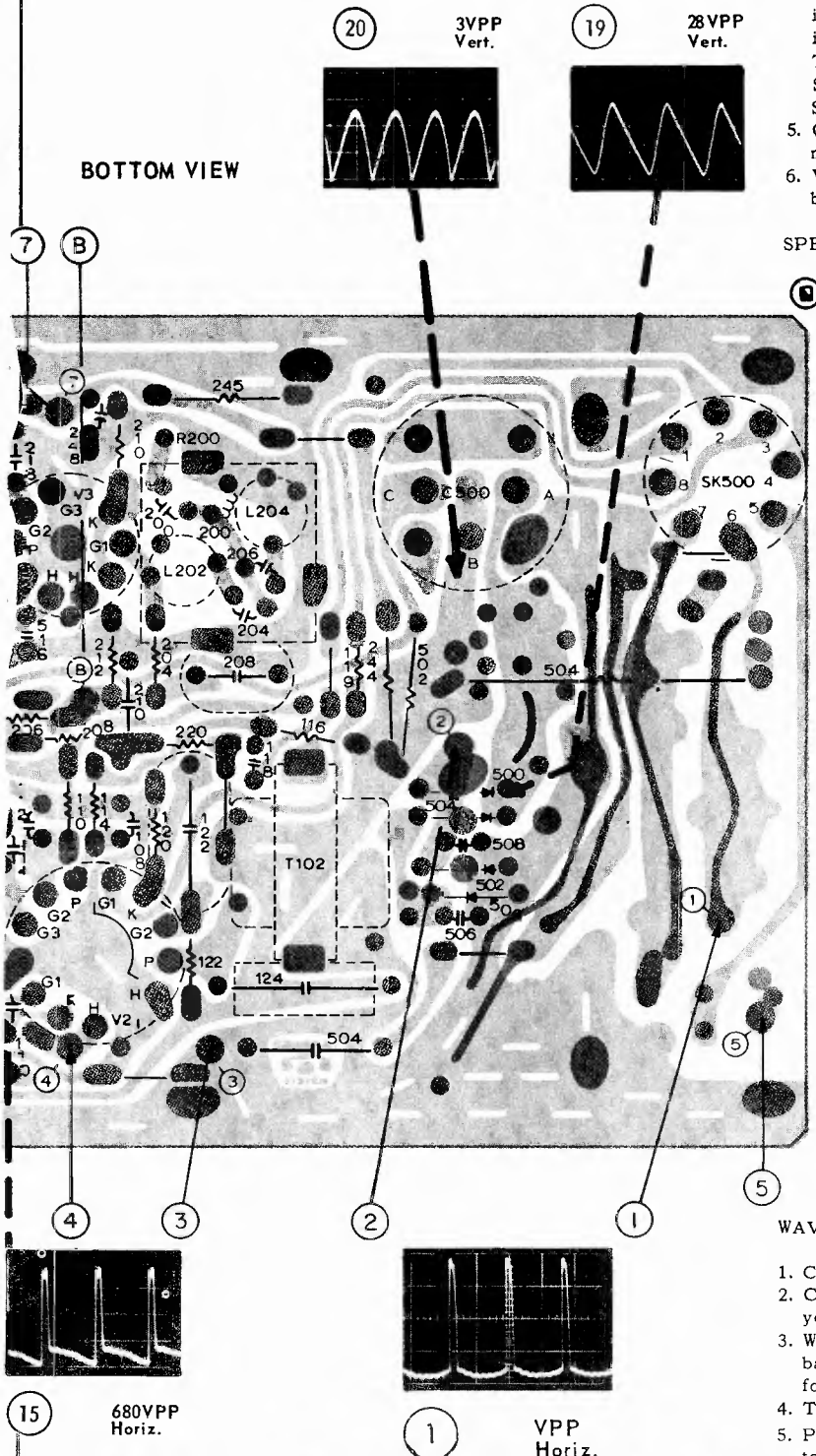
— CHASSIS PARTS LAYOUT —

—PRINTED CIRCUIT PANEL ASSEMBLY



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



15 680VPP Horiz.

1 VPP Horiz.

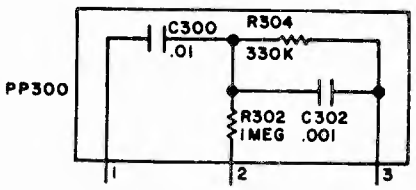
SCHEMATIC NOTES

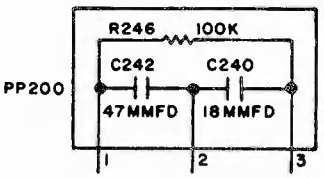
VOLTAGE MEASUREMENT CONDITIONS UNLESS OTHERWISE SPECIFIED.

1. Voltages measured to chassis using VTVM.
2. AC power source 120 volt 60 nertz(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

(9) 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.

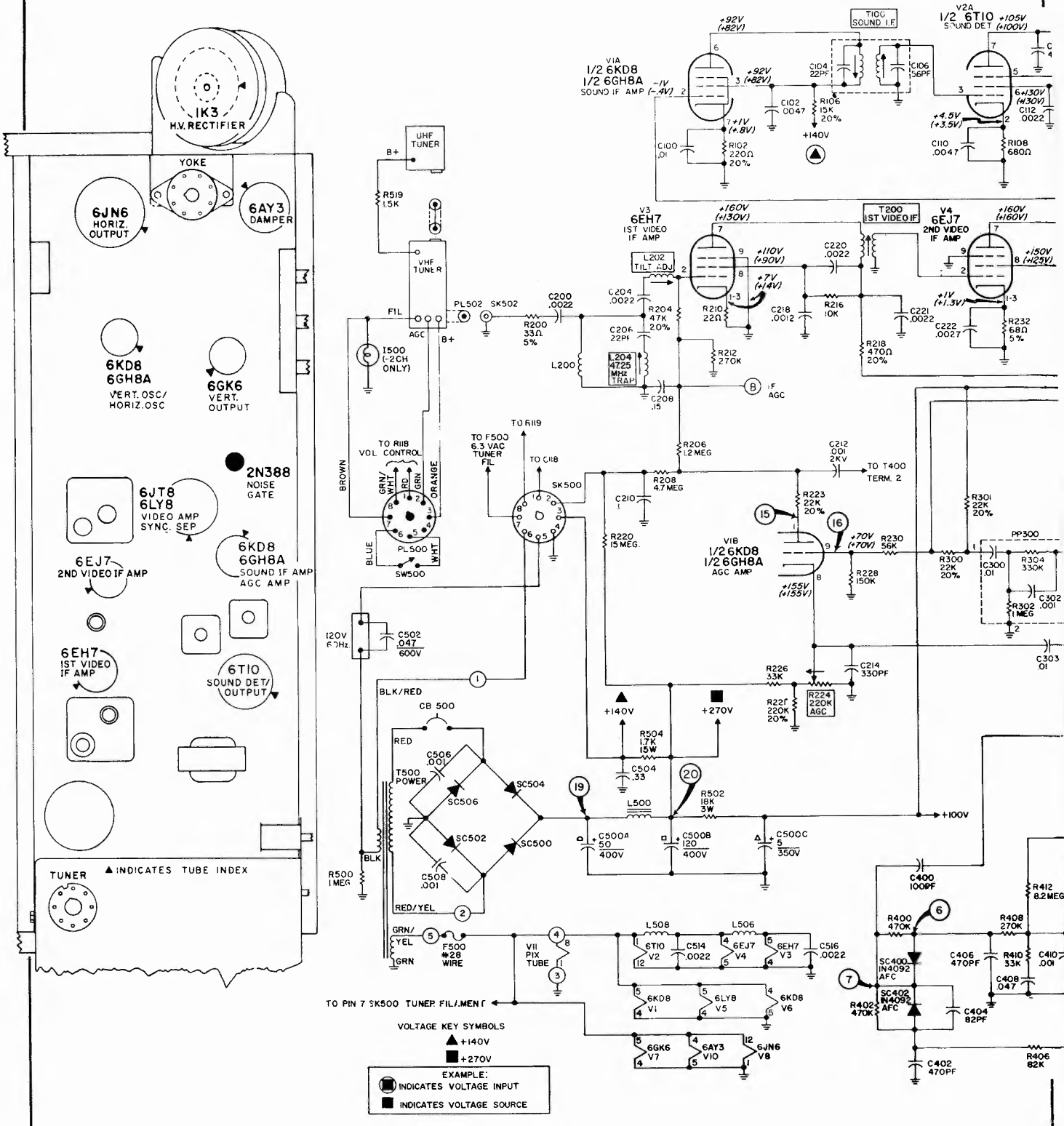




WAVEFORM MEASUREMENT CONDITIONS

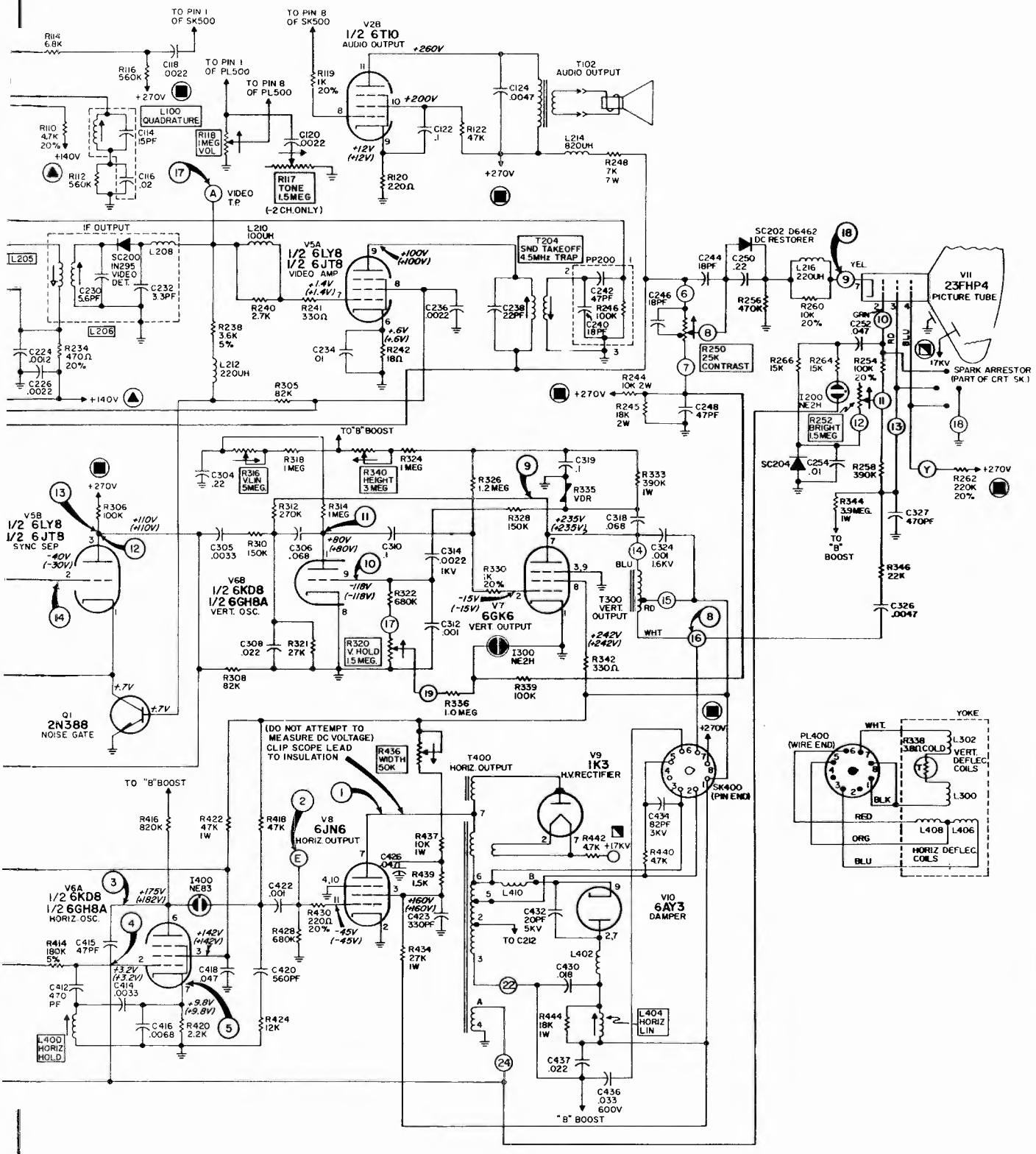
1. Channel selector set to strong channel.
2. Contrast control set for signal of 70 volt peak to peak at yellow lead of picture tube. (tie point (9)).
3. Waveform measured with respect to chassis using a wide band oscilloscope. (Other type oscilloscopes may alter waveform shapes or amplitudes.)
4. The terms "VERT" or "HORIZ" refer to scope frequency.
5. Peak to peak voltage depends on the amount of the coupling to scope probe.

SYLVANIA Chassis B12-1, -2, Schematic Diagram



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.

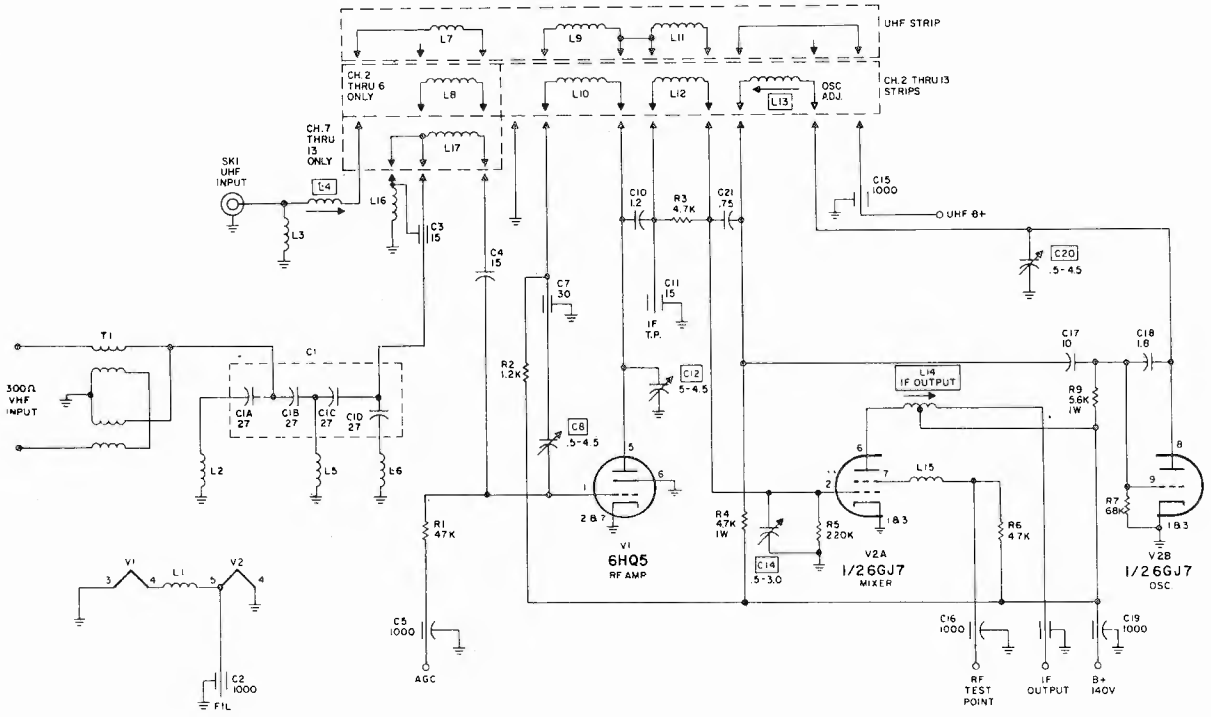


ALTERNATE SOUND ALIGNMENT USING TRANSMITTED SIGNAL

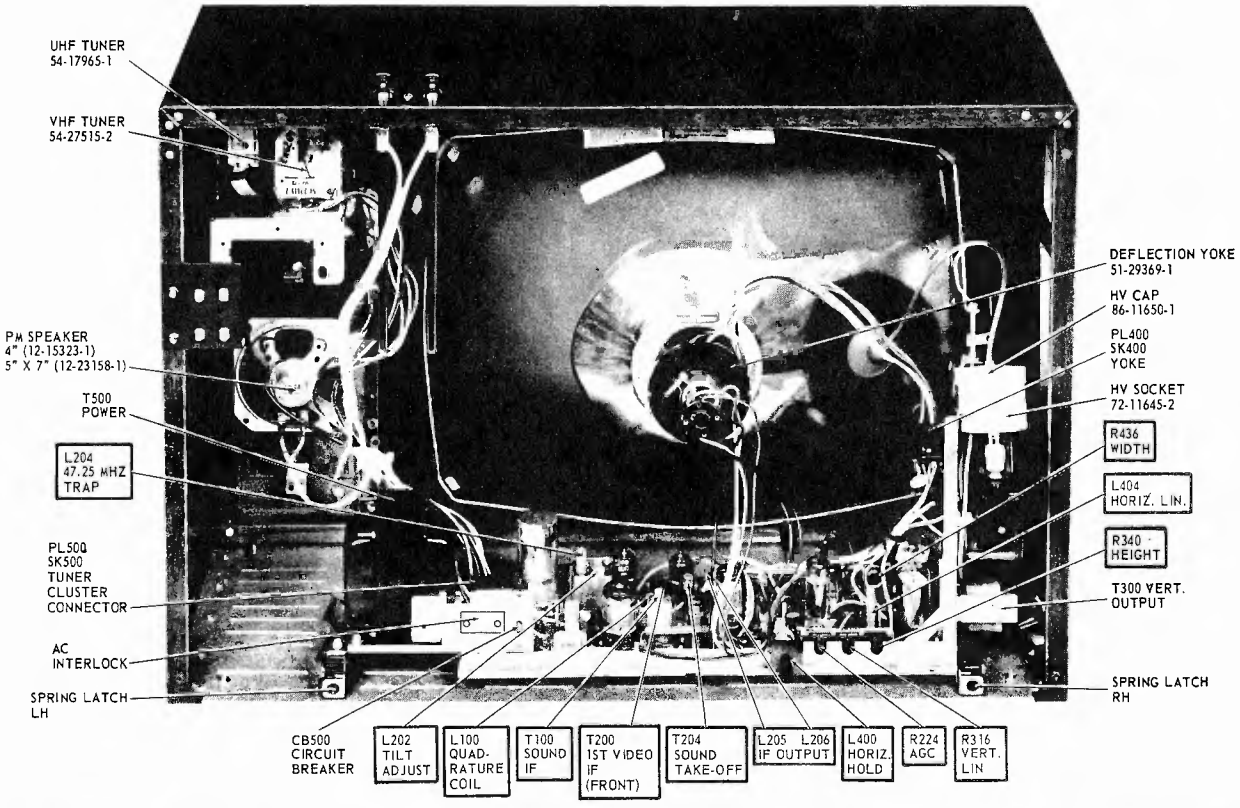
Tune in strongest available channel and adjust for best picture. Turn AGC control clockwise until picture begins to distort and adjust L100 for best sound and minimum buzz. Use tuning point where core is closest to chassis board.

Turn AGC counterclockwise until sound gets weak and noisy. Adjust T100 top and bottom core and T204 bottom core for loudest and clearest sound and minimum hiss.

SCHEMATIC DIAGRAM (54-27515-2)



ADJUSTMENT LOCATIONS



TRUETONE

WESTERN AUTO STORES

2DC1803 Television
Model No. WEG1803A-86

SERVICE ADJUSTMENTS

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.

WIDTH SLEEVE ADJUSTMENT—The width sleeve should be adjusted so that the picture just fills the screen.

PROCEDURE FOR ADJUSTING HORIZONTAL OSCILLATOR COIL IN SETS USING A MULTIVIBRATOR OSCILLATOR — Short sync out by shorting grid (pin #2) of sync separator (V-301A) to chassis base. Short out horizontal oscillator coil (L-401). Adjust horizontal hold control (Fine R-412) to mechanical center. Then adjust horizontal hold control (Coarse R-403) so that picture is trying to lock in. Remove short across L-401 and adjust core in L-401 so that picture is trying to lock in. Remove short on grid of V-301A. Picture should lock in. The horizontal oscillator coil should never need adjustment after being aligned. If picture does not lock in, check the dual selenium diode and associated circuitry.

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. Adjustment of any control will require a re-adjustment of the other control.

DETECTOR LEVEL CONTROL — Connect Oscilloscope to detector (TPA) adjust R-212 for 4 volts peak to peak. If Oscilloscope is not available the following procedure may be used.

Set channel selector to the strongest station in the area and adjust detector level control so the set overloads. Then turn the control in the opposite direction just below the overload point.

SERVICE SUGGESTIONS

RECEIVER COMPLETELY INOPERATIVE — This condition may be caused by the following:

1. Tube filaments may be open.
2. No +B voltage.

NO RASTER ON PICTURE TUBE — If raster cannot be obtained, check below for the possible causes:

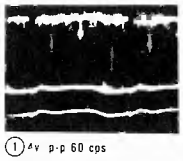
1. No +B voltage. Reset circuit breaker. Replace if defective. If circuit breaker continually opens check:
   A. For short in +B.
   B. Silicon rectifier.
   C. Check DC resistance of horizontal output transformer.
2. No high voltage. Check V-401, V-402, V-403 and V-404 tubes and circuits. If horizontal deflection circuits are operating as evidenced by the correct voltage (500V) measured on terminal number 1 of the horizontal output transformer, the trouble can be isolated to the high voltage rectifier circuit. Either the high voltage winding to the V-402 plate and the V-403 plate is open or pix tube elements shorted internally.
3. Defective picture tube Cathode return circuit open.

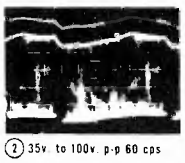
HORIZONTAL DEFLECTION ONLY — If only horizontal deflection is obtained as evidenced by a straight line across the face of the picture tube, it can be caused by the following:

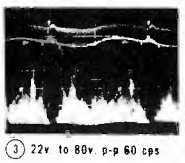
1. V-301B or V-302 inoperative. Check socket voltages.
2. Vertical output transformer open or shorted.
3. Yoke vertical coils open or shorted.
4. Vertical hold, height or linearity controls may be defective.

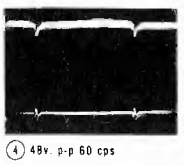
POOR VERTICAL LINEARITY — If adjustment of the height and linearity controls will not correct this condition, any of the following may be the cause:

1. Check variable resistors R-314, R-315 and R-316.
2. Vertical output transformer defective.
3. V-301B or V-302 defective, check voltages.
4. Excess leakage or incorrect value of capacitors C-305, C-306, C-307, C-308, C-309, C-311 or open or incorrect value of resistors R-306, R-307 and R-308.
5. Low plate voltages. Check power supply.
6. Vertical deflection coils defective.


(1) 4v. p-p 60 cps


(2) 35v. to 100v. p-p 60 cps

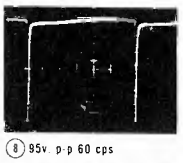

(3) 22v. to 80v. p-p 60 cps

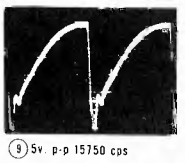

(4) 48v. p-p 60 cps


(5) 48v. p-p 15750 cps

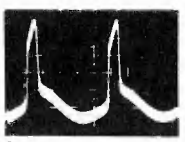

(6) 70v. p-p 60 cps

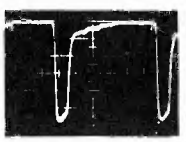

(7) 210v. p-p 60 cps

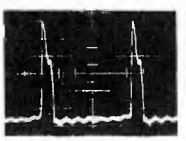

(8) 95v. p-p 60 cps

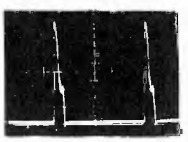

(9) 5v. p-p 15750 cps

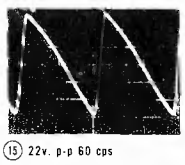

(10) 9v. p-p 15750 cps

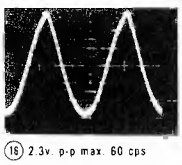

(11) 35v. p-p 15750 cps

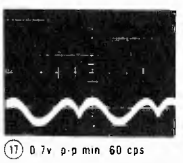

(12) 110v. p-p 15750 cps


(13) 32v. p-p 15750 cps


(14) 10v. to 32v. p-p 15750 cps


(15) 22v. p-p 60 cps


(16) 2.3v. p-p max. 60 cps


(17) 0.7v. p-p min. 60 cps

SERVICE SUGGESTIONS—(continued)

POOR HORIZONTAL LINEARITY

1. Check or replace V-402 & V-404.
2. Check capacitor C-417 for defects.
3. Horizontal deflection coils defective.

TRAPEZOIDAL OR NONSYMMETRICAL RASTER

1. Defective yoke.
2. Wiring of yoke socket.

WRINKLES ON LEFT SIDE OF RASTER — This condition can be caused by:

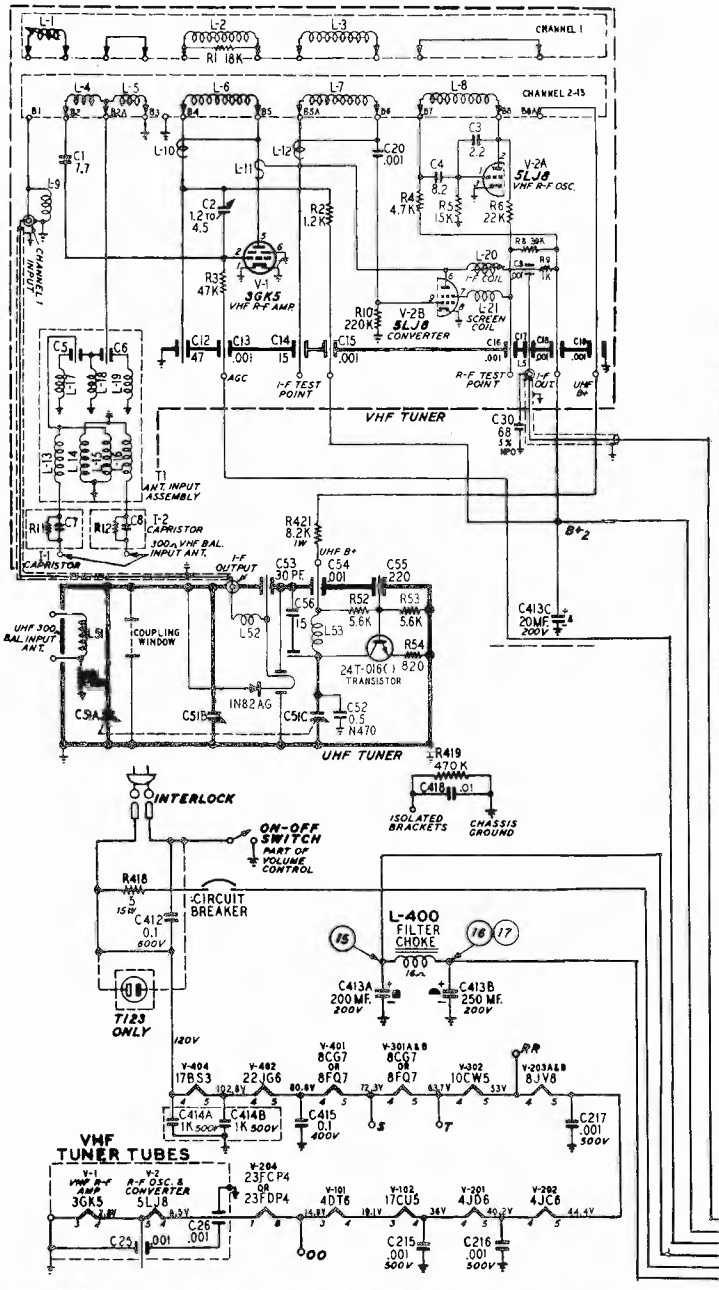
1. Defective yoke:
2. V-404 defective.
3. R-416 or C-417 defective.

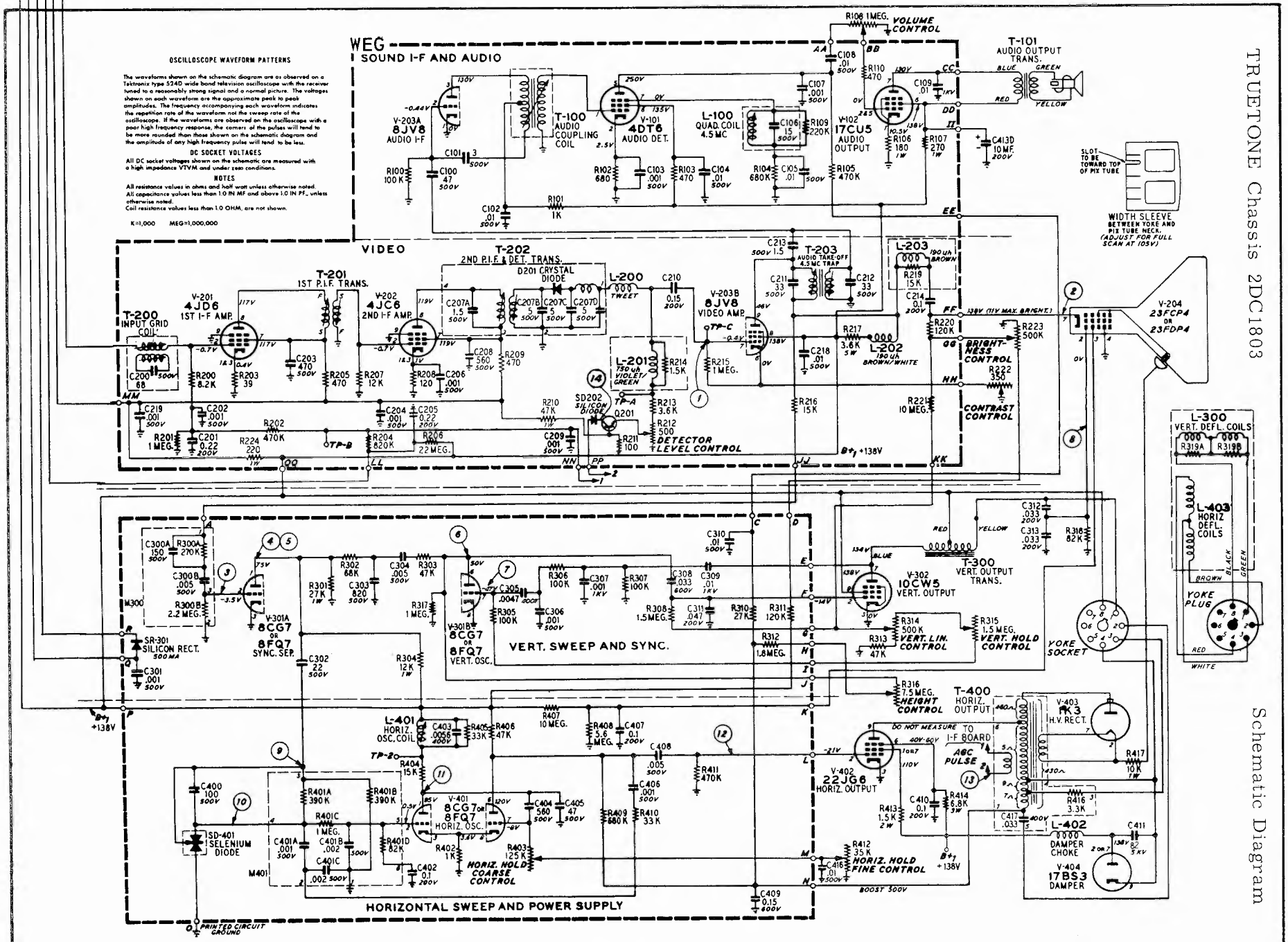
SMALL RASTER — This condition can be caused by:

1. Low +B or line voltage. Check silicon rectifier.
2. Insufficient output from V-402. Replace tube.
3. Insufficient output from V-301A and V-401. Replace tubes.
4. V-404 defective.

PICTURE STABLE BUT WITH POOR RESOLUTION — If the picture resolution is not up to standard, it may be caused by any of the following:

1. Defective pix I-F tubes V-201 & V-202.
2. Defective pix detector crystal. (CK D-201.)
3. V-203B Defective.
4. Defective picture tube.
5. Open video peaking coil. Check all peaking coils L-201, L-202, L-203 for continuity.
   Note that L-201 and L-203 have shunting resistors.
6. Leakage in V-203B grid capacitor C-210. If the capacitor is not found to be defective, check the following:
   A. This trouble can also originate at the transmitter. Check reception from another station.
   B. Check all potentials in video circuits.
   C. Check picture tube grid circuit for poor or dirty contact.
   D. Check and realign, if necessary, the picture I-F and R-F circuits.




WEG
SOUND I-F AND AUDIO
VIDEO
VERT. SWEEP AND SYNC.
HORIZONTAL SWEEP AND POWER SUPPLY
OSCILLOSCOPE WAVEFORM PATTERNS
DC SOCKET VOLTAGES
NOTES
R108 1MEG. VOLUME CONTROL
T-100 AUDIO COUPLING COIL
T-101 AUDIO OUTPUT TRANS.
T-102 17CU5 AUDIO OUTPUT
T-200 INPUT GRID COIL
T-201 1ST P.I.F. TRANS.
T-202 2ND P.I.F. & DET. TRANS.
T-203 AUDIO TAKE-OFF 4.5 MC TRAP
T-300 VERT. OUTPUT TRANS.
T-400 HORIZ. OUTPUT
L-100 QUAD. COIL 4.5 MC
L-200 TWEET
L-202 190 UH BROWN/WHITE
L-203 190 UH BROWN
L-300 VERT. DEFL. COILS
L-401 HORIZ. OSC. COIL
L-402 DAMPER CHOKE
V-201 4JD6 1ST I-F AMP.
V-202 4JC6 2ND I-F AMP.
V-203A 8JV8 AUDIO I-F
V-203B 8JV8 VIDEO AMP.
V-204 23FCP4 OR 23FDP4
V-301A 8CG7 OR 8FQ7 SYNC. SEP.
V-301B 8CG7 OR 8FQ7 VERT. OSC.
V-302 10CW5 VERT. OUTPUT
V-401 8CG7 OR 8FQ7 HORIZ. OSC.
V-402 22JG6 HORIZ. OUTPUT
V-403 1X3 H.V. RECT.
V-404 17BS3 DAMPER
SD202 SILICON DIODE
SD-401 SELENIUM DIODE
SR-301 SILICON RECT.
D201 CRYSTAL DIODE
Q201
BRIGHTNESS CONTROL
CONTRAST CONTROL
DETECTOR LEVEL CONTROL
VERT. LIN. CONTROL
VERT. HOLD CONTROL
HEIGHT CONTROL
HORIZ. HOLD COARSE CONTROL
HORIZ. HOLD FINE CONTROL
AGC PULSE
TO I-F BOARD
DO NOT MEASURE
BOOST 500V
B+1 +138V
B+2 +138V
PRINTED CIRCUIT GROUND
YOKE SOCKET
YOKE PLUG
WIDTH SLEEVE BETWEEN YOKE AND PIX TUBE NECK. (ADJUST FOR FULL SCAN AT 105V)
SLOT TO BE TOWARD TOP OF PIX TUBE

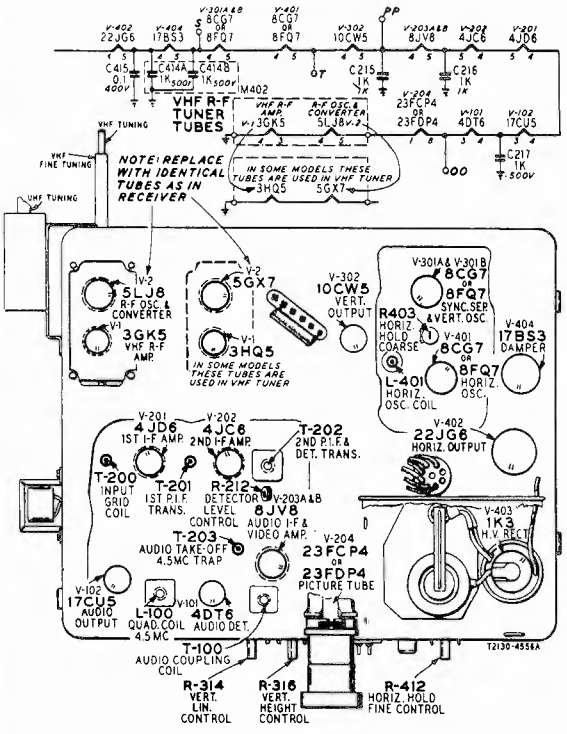
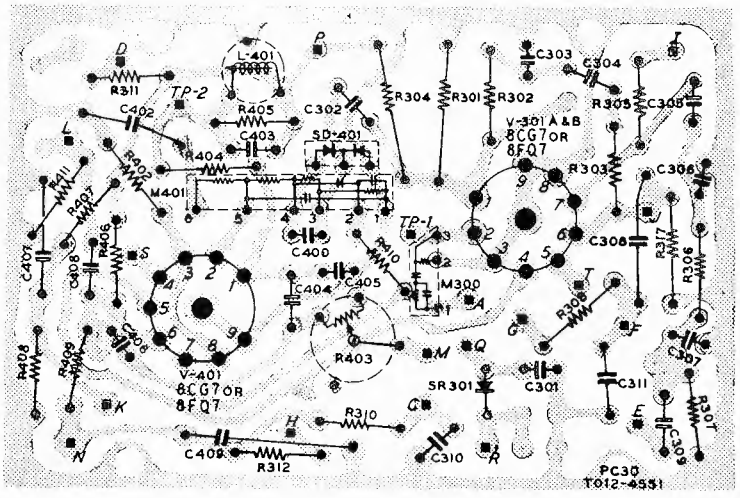


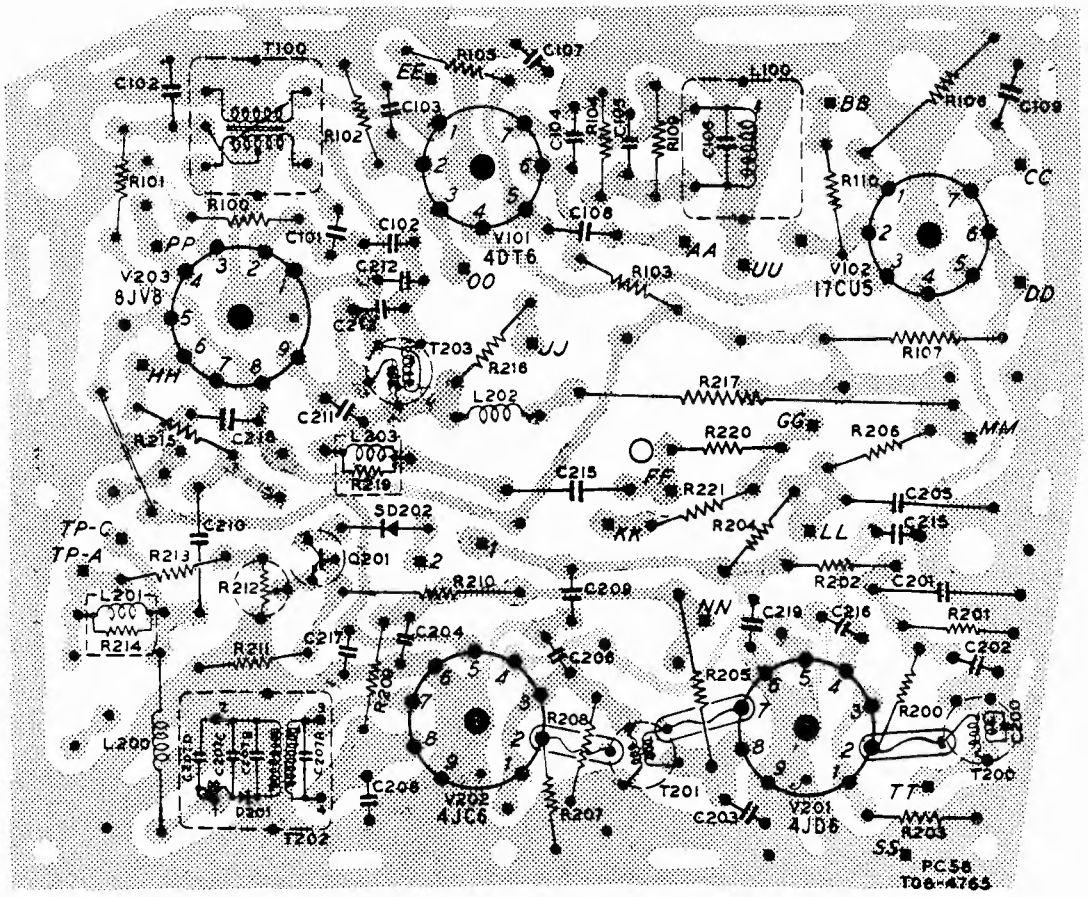
Fig. 1—Chassis Tube Layout and Trimmers

PRINTED CIRCUIT BOARDS—REPLACEMENT OF PARTS

—Components such as resistors and condensers may be easily replaced on the top of the printed boards by clipping the leads close to the body of the component and then soldering the new component to the existing leads.



38A3103-000 PRINTED CIRCUIT BOARD ASSEMBLY (SWEEP)



38A3505-000 PRINTED CIRCUIT BOARD ASSEMBLY (I.F.)

ZENITH RADIO CORPORATION

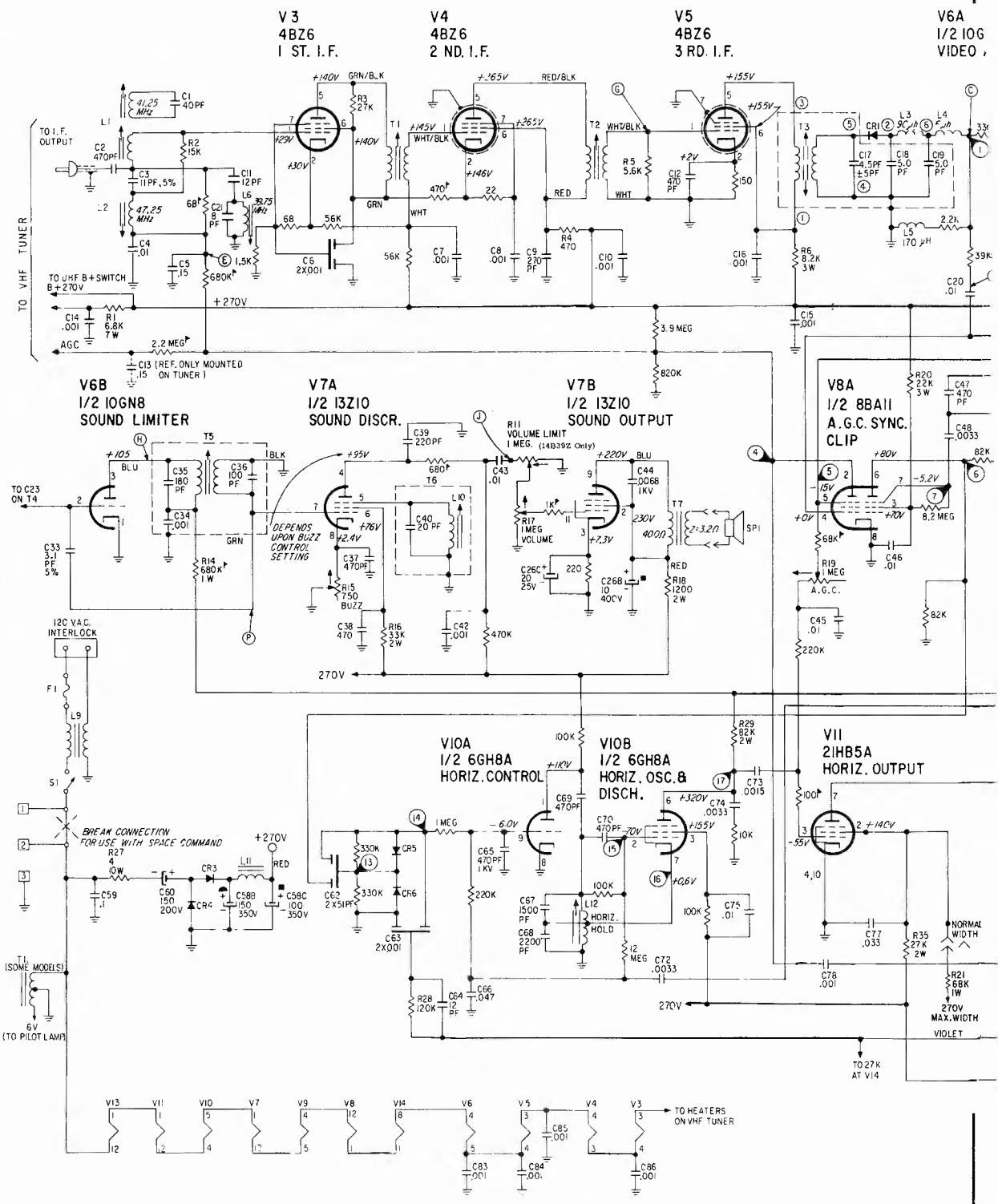
MODELS WITH 13A12, 13A12M, 13A12S, 13A12T, 13A12TZ, 13A16, 13A16M, 13A16S, 13A16Z, 13A16MZ, 13A16SZ, 14B35, 14B36, 14B38, 14B38Z, and 14B39Z CHASSIS.

MODEL AND CHASSIS INFORMATION

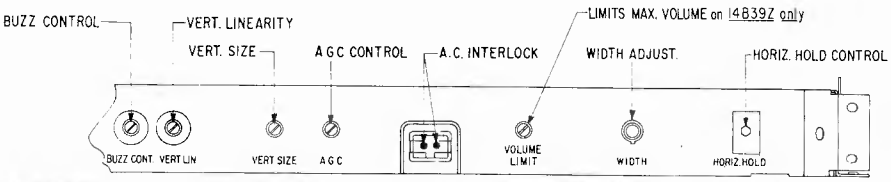
MODEL	TYPE	CHASSIS	CRT
B1331C, F, J, L	Portable	13A12S	12DKP4
B1331C1, F1, J1, L1	Portable	13A12	12DKP4
B1331C2, F2, J2, L2	Portable	13A12M	12DKP4
B1331C3, F3, J3, L3	Portable	13A12T	12DKP4
B1331C4, F4, J4, L4	Portable	13A12TZ	12DKP4
B1333W	Portable	13A12S	12DKP4
B1333W1	Portable	13A12	12DKP4
B1333W2	Portable	13A12M	12DKP4
B1333W3	Portable	13A12T	12DKP4
B1333W4	Portable	13A12TZ	12DKP4
B1810C, X	Portable	13A16S	16VAJP4
B1810C1, X1	Portable	13A16	16VAJP4
B1810C2, X2	Portable	13A16M	16VAJP4
B1810C3, X3	Portable	13A16SZ	16VAJP4
B1810C4, X4	Portable	13A16Z	16VAJP4
B1810C5, X5	Portable	13A16MZ	16VAJP4
B1820P, W	Portable	13A16S	16VAJP4
B1820P1, W1	Portable	13A16	16VAJP4
B1820, P2, W2	Portable	13A16M	16VAJP4
B1820W3	Portable	13A16SZ	16VAJP4
B1820W4	Portable	13A16Z	16VAJP4
B1820W5	Portable	13A16MZ	16VAJP4
B2002J2, J3	Portable	14B38Z	19VALP4
B2005W2, W3	Portable	14B38Z	19VALP4
B2009W3	Portable	14B38Z	19VALP4
B2044W2	Portable (SC "300")	14B38	19VALP4
B2044W3	Portable (SC "300")	14B38Z	19VALP4
B2213W3	Table	14B36	21VAGP4
B2224P3	Table	14B36	21VAGP4
S2647W	Portable	14B36	19VALP4
S2696W2	Portable (Hospital)	14B35	19VALP4
S2697L4, L5	Portable (Hotel-Motel)	14B39Z	19VALP4
T2613W	Portable	13A12S	12DKP4
T2613W1	Portable	13A12	12DKP4
T2613W2	Portable	13A12M	12DKP4
T2613W3	Portable	13A12T	12DKP4
T2613W4	Portable	13A12TZ	12DKP4
T2626W3	Portable	13A16SZ	12DKP4
T2626W4	Portable	13A16Z	12DKP4
T2626W5	Portable	13A16MZ	12DKP4
T2654L2, L3	Portable	14B38	19VALP4
T2655W2, W3	Portable	14B38Z	19VALP4
T2673W4	Portable (SC "300")	14B38	19VALP4
T2673W5	Portable (SC "300")	14B38Z	19VALP4
T2696W3	Table	14B36	21VAGP4

(Service material on pages 176 through 190)

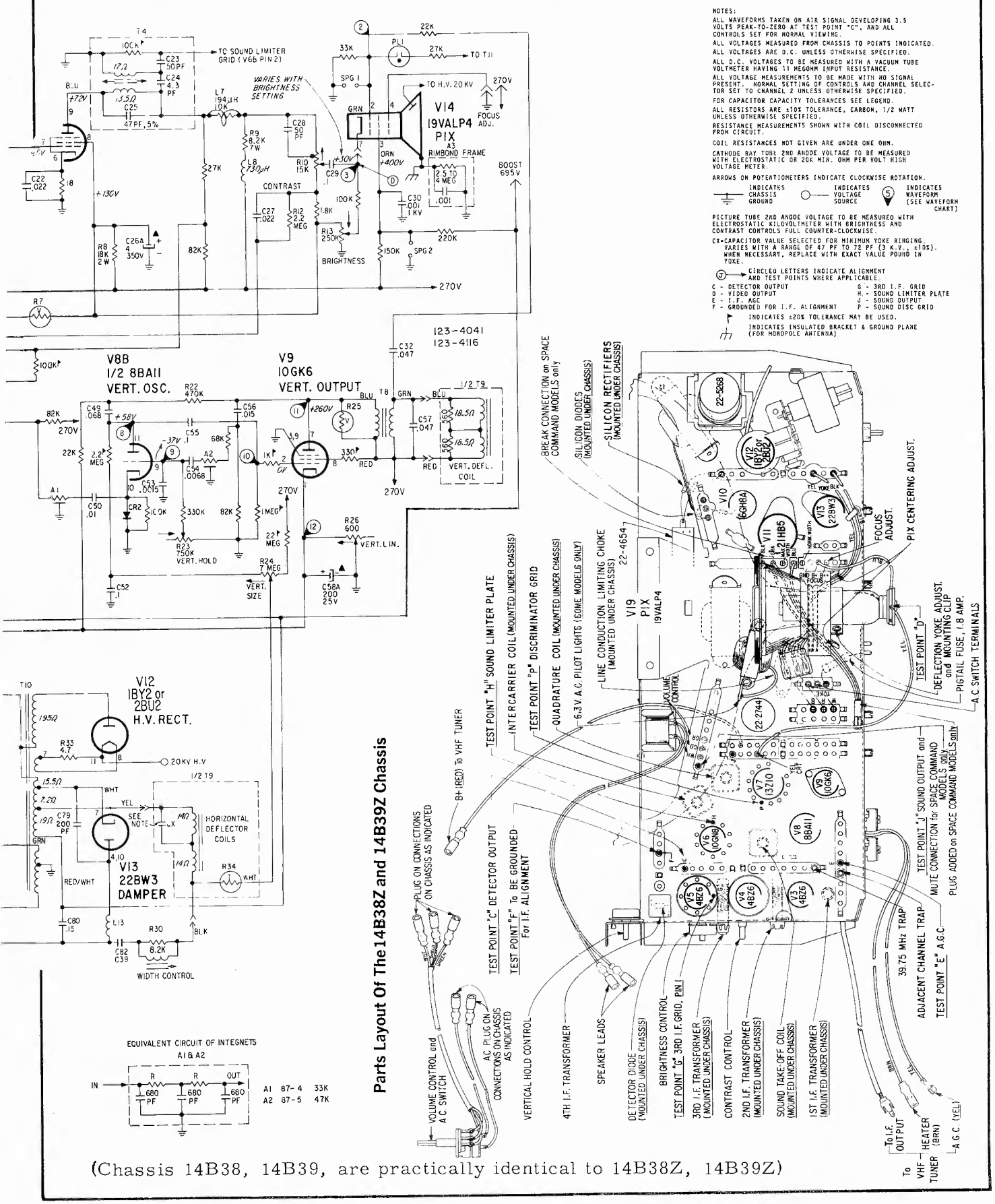
ZENITH Chassis 14B38Z, 14B39Z, Schematic Diagram



Schematic Diagram Of The 14B38Z and 14B39Z Chassis



ZENITH Chassis 14B38Z, 14B39Z, Schematic Diagram, Continued



Parts Layout Of The 14B38Z and 14B39Z Chassis

(Chassis 14B38, 14B39, are practically identical to 14B38Z, 14B39Z)

ADJUSTMENTS

WIDTH AND HORIZONTAL LINEARITY ADJUSTMENTS

13A12 and 13A16 Chassis: Width-Linearity sleeve on neck of picture tube.

Adjustment is made by sliding the metal width sleeve along the neck of the picture tube until both proper width and best linearity is obtained.

14B38, 14B39 chassis: Width Control and Linearity sleeve. 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 to the left when facing the rear of set. The initial width and linearity adjustment is made by turning the width control to its maximum counterclockwise position and sliding the sleeeve to optimize linearity. The width control is then advanced to obtain correct width.

14B35, 36, 14B38Z, 39Z Chassis: Width coil and two position width selector. Adjust the width coil so that the picture fills both sides of the screen, with the WIDTH selector in the NORMAL position. In the event additional width is required, place the selector in the MAXIMUM position and re-adjust the width coil to fill both sides of the screen.

AGC ADJUSTMENT

Tune in a strong TV signal and slowly turn the AGC 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 in general to 3 volts peak-to-peak at the Video Detector stage in the 14B35, 36, 14B38, 38Z, 14B39, 39Z chassis and 2 volts peak-to-peak in the 13A12 and 13A16.

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.

HORIZONTAL HOLD ADJUSTMENT (AFC)

The horizontal hold control is equipped with a stop which limits knob rotation to aproximately 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.

FOCUS

13A12, 13A16, 14B35, 36 14B38, 38Z 14B39, 39Z chassis:

Adjustment is by means of a three position tap.

ALIGNMENT

SOUND ALIGNMENT 13A12, 13A16

Alignment of the 4.5 MHz intercarrier sound channel, employing the locked Oscillator Sound Detector, requires the reduction of the signal to the receiver antenna terminals. Various methods may be used to reduce the signal level, however, a step attenuator is recommended for best results. Proceed as follows:

1. Connect the step attenuator between the antenna and the receiver antenna terminals.

2. With no attenuation, using a strong signal; adjust the quadrature coil for best quality sound.

3. Add some attenuation to the signal until some hiss is heard in the sound.

4. Re-adjust the quadrature coil for best quality sound, with minimum hiss.

5. Add some additional attenuation to the signal until hiss is heard again. Adjust the intercarrier coil for best sound with minimum hiss.

6. Add additional attentuation until the hiss is heard again. Adjust the intercarrier coil for minimum hiss.

7. With hiss still present, adjust the Sound take-off coil primary (top core) then bottom for minimum hiss and best sound.

8. Remove all attenuation from the incoming signal. With a strong signal, adjust the Sound Take-off for minimum 4.5 MHz interference in the picture.

SOUND ALIGNMENT—14B35, 36, 14B38, 38Z, 14B39, 39Z

Proper alignment of the 4.5 MHz 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 sound take-off coil (top and bottom cores), for minimum 4.5 MHz interference in the picture.

3. Adjust the step attenuator until the signal is attenuated to a level where a "hiss is heard with the audio."

4. Adjust the 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.

IF ALIGNMENT

A suitable VHF and UHF sweep generator in conjuction with an accurate marker must be used for IF and tuner alignment work. It is extremely important to terminate the output cable properly and to check for a reactive attenuator. If the attenuator is reactive or if the output cable is improperly terminated, correct alignment cannot be made since the degree of attenuation may change the shape as well as the amplitude of the response curve. The attenuator should only vary the amplitude and not the shape of the response curve.

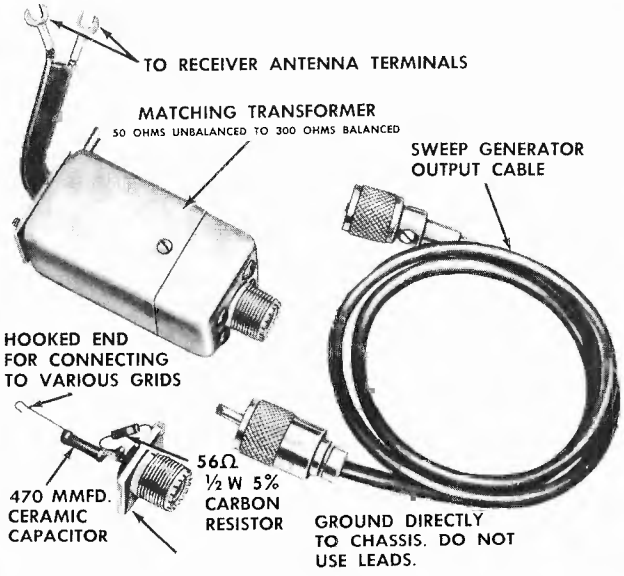


Fig. 1 Alignment Fixtures for RF-IF Alignment.

IF ALIGNMENT 13A12, 13A16 CHASSIS

Refer to the appropriate schematic diagram, chassis tube and trimmer layout, and tuner drawings for reference test points.

1. Slowly turn the channel selector until the tuner rotor is made to rest between two channels. This will prevent an erroneous response. For generators with high output, set the channel selector to channel 13.

2. Connect an oscilloscope through a 10,000 ohm isolation resistor to terminal "C" (detector). Connect the ground lead to chassis.

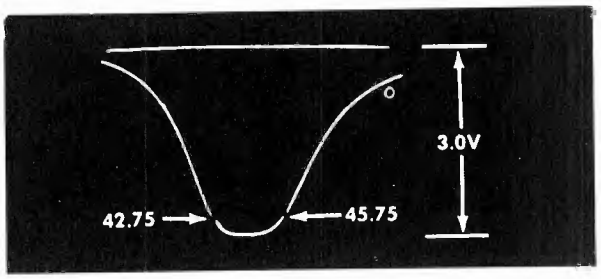


Fig. 2 4th IF Response Curve

3. Feed the sweep generator through a special terminating network as shown in Fig. 1. to Point "G" (Pin 1 of the 3rd IF). Adjust generator to obtain a response similar to Fig. 2. 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 MHz and alternately adjust the top and bottom cores of the 4th IF for maximum gain and symmetry with the 45.75 MHz and the 42.75 MHz markers positioned as shown in Fig. 2. 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.

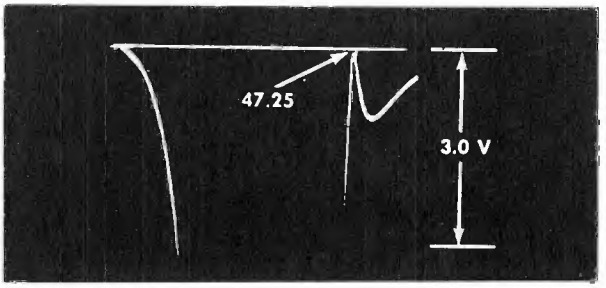


Fig. 3 Expanded View of the 47.25 MHz Trap Frequency.

5. Connect the sweep generator to Test Point "A" on VHF tuner. Short test points "E" and "F" to chassis ground. This will provide a "blow up" of the 47.25 MHz trap response as shown in Fig. 3. Adjust the 47.25 MHz trap (top slug of T1) for minimum marker amplitude.

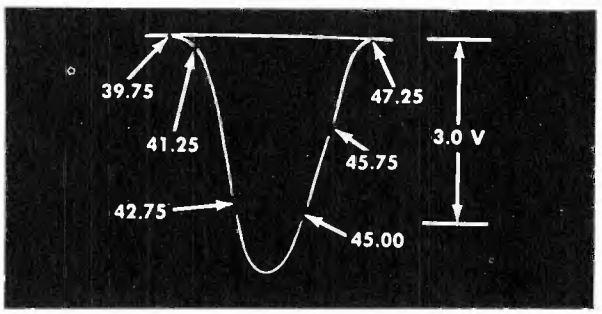


Fig. 4 Overall IF Response Curve.

6. Disconnect the jumper between test point "E" and chassis. Apply negative 6 or 7 volts bias to test point "E," positive lead to chassis ground. Adjust sweep generator for 3 volts peak to peak output as shown on the oscilloscope (output of Picture Detector). Alternately, adjust the 2nd, 3rd and 1st IF coils and the converter (mixer) plate coil until an overall response similar to Fig. 4 is obtained.

IF ALIGNMENT 14B35, 14B36, 14B38, 38Z, 14B39, 39Z

Refer to the appropriate schematic diagram, chassis tube and trimmer layout, and tuner drawings for reference test points.

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.

3. Feed the sweep generator through a special terminating network as shown in Fig. 1 to Point 'G' (Pin 1 of the 3rd IF). Adjust generator to obtain a response similar to Fig. 5. 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 MHz and alternately adjust the top and bottom cores of the 4th IF for maximum gain and symmetry with the 45.75 MHz and the 42.75 MHz markers positioned as shown in Fig. 5. 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.

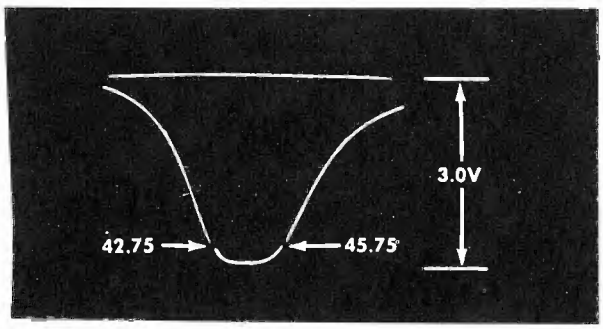


Fig. 5 4th IF Response Curve

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).

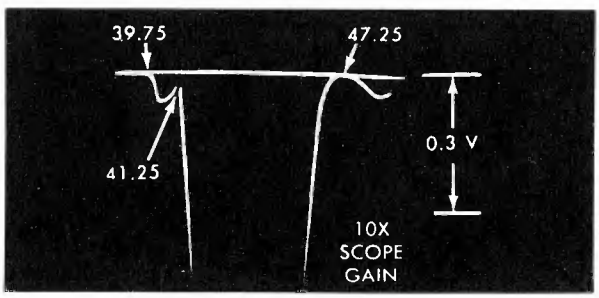


Fig. 6 Expanded View of Traps

6. Refer to Fig. 6 and adjust the 39.75 MHz and the 41.25 MHz traps for minimum marker amplitude. Connect jumper between 'E' and the junction of the 68 ohm and 1500 ohm resistors in the cathode circuit of the 1st IF. This provides an additional 'blow up' of the 47.25 MHz traps (Fig. 7). Adjust the 47.25 MHz trap for minimum marker amplitude.

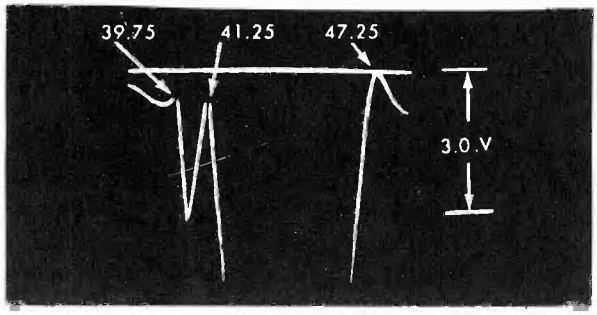


Fig. 7 Further Expansion of Fig. 6 for Detail View of the 39.75 and 47.25 MHz Traps

7. Disconnect jumper between 'E' and the 68 ohm and 1500 ohm cathode resistors. Connect this jumper between 'E' and chassis. Adjust sweep generator for 3 volts peak to peak output at the second detector. Alternately, adjust the 2nd, 3rd, 1st IF and the converter plate coil until an overall response similar to Fig. 8 is obtained. It will be found that the 2nd IF affects the low side (42.75 MHz) and the 3rd IF, the high side of the response curve.

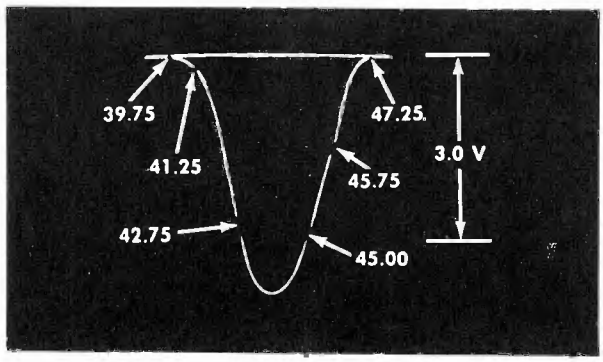


Fig. 8 Overall IF Response Curve

VHF TUNER CHANNEL OSCILLATOR ADJUSTMENT

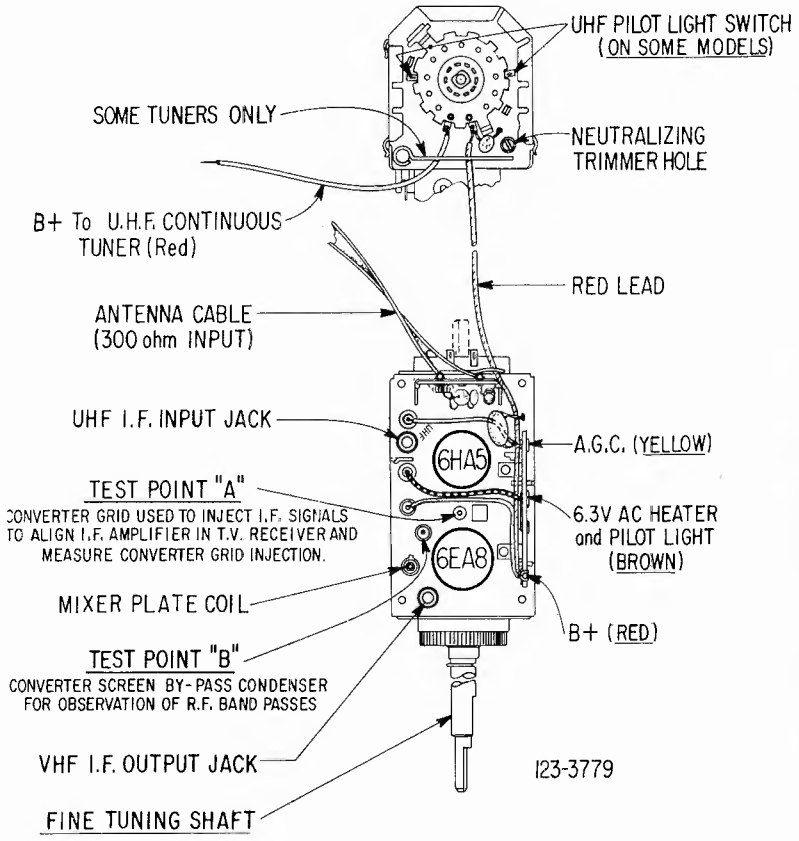
In all VHF tuners, each channel can be adjusted individually with the receiver fine tuning knob without interaction with other channels. Several turns of the knob are permissible, in either direction, to obtain proper adjustment.

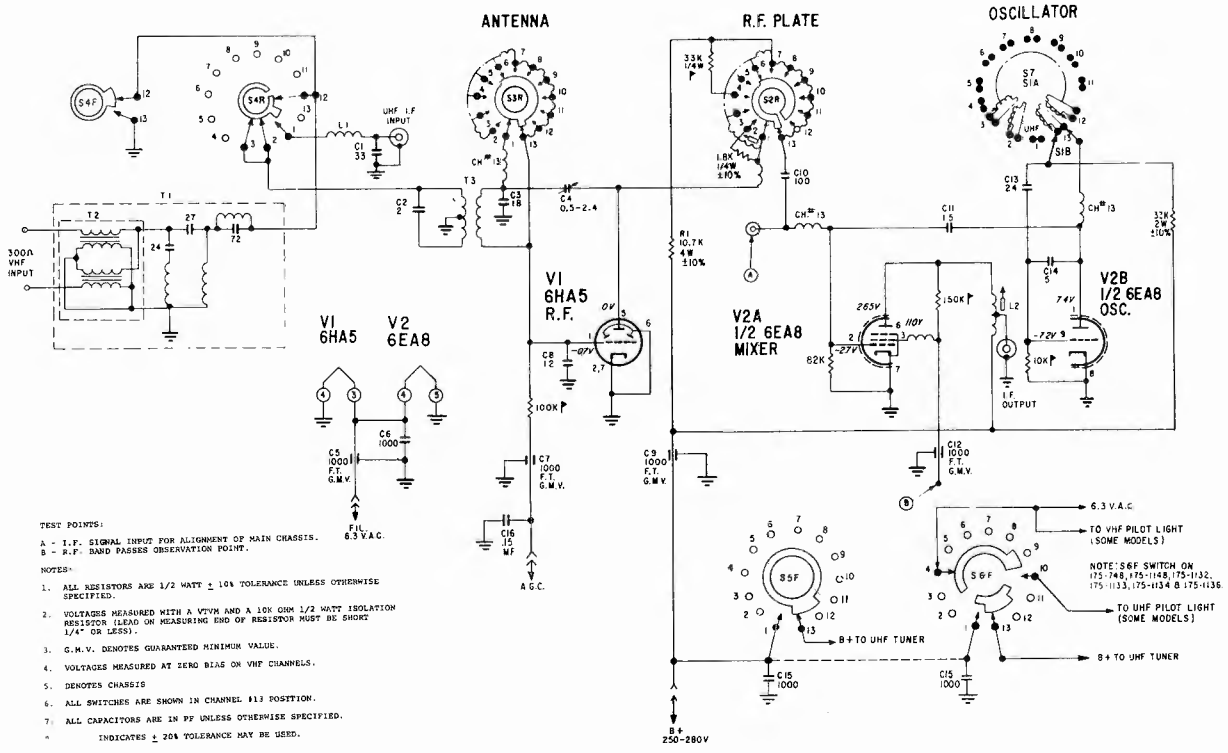
SPECIFICATIONS

CHASSIS	POWER USED AT 120V 60 Hertz
13A12, M, S, S1, T, TZ	115 Watts
13A16, M, S, Z, MZ, SZ	120 Watts
14B35, 36	190 Watts
14B38, 38Z	175 Watts
14B39, 39Z	175 Watts

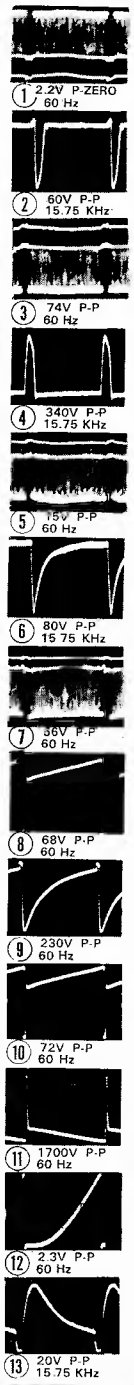
For Space Command Models Add 50 Watts to Power Used

ITEM NO.	PART NUMBER	DESCRIPTION	
C1	22-3985	33 PF N750 DISC ±20%	500 V
C2	22-3683	2 PF GIMMICK ±10%	500 V
C3	22-3548	18 PF NPO DISC ±5%	500 V
C4	22-3545	0.5—2.4 PF TRIMMER	500 V
C5	22-3987	1000 PF FT GMV	500 V
C6	22-3797	1000 PF DISC +100% −20%	500 V
C7	22-3987	1000 PF FT GMV	500 V
C8	22-3547	12 PF N750 DISC ±5%	500 V
C9	22-3986	1000 PF FT GMV	500 V
C10	22-3984	100 PF N1500 DISC ±20%	500 V
C11	22-2424	1.5 PF GIMMICK ±10%	500 V
C12	22-3987	1000 PF FT GMV	500 V
C13	22-3835	24 PF N330 DISC ±3%	500 V
C14	22-3836	5 PF NPO DISC ±.25 PF	500 V
C15	22-3797	1000 PF DISC +100% −20%	500 V
C16	22-5317	.15 MF CAP. 20%	100 V
T1	S-74546	ANTENNA BALUN & FILTER	
T2	S-74413	ANTENNA BALUN	
T3	S-64259	ANTENNA TRANSFORMER	
L1	20-1185	UHF I.F. INPUT COIL	
L2	S-75825		
S2	S-75890	SW. SECT. 2 WIRING (R.F.)	
S3	S-79753	SW. SECT. 3 WIRING (ANT.)	
S4	S-79754	SW. SECT. 4 WIRING (UHF IF)	
S5	85-1009	SW. SECT. 5 (UHF B+)	
S6	85-1006	SW. SECT. 5 (UHF B+ UHF PILOT LIGHT) (FOR 175-1133, 175-1136)	
S7	SEE BELOW	SW. SECT. 1 ASSEMBLY (OSC. ROT. & STAT.)	
R1	63-5012	10.7K OHM ±10%	4 W
	S-83017	OSCILLATOR SWITCH, DETENT & SHAFT ASSY. FOR 175-1133 ONLY	
	S-83020	OSCILLATOR SWITCH, DETENT & SHAFT ASSY. FOR 175-1136 ONLY	
	S-83021	OSCILLATOR SWITCH, DETENT & SHAFT ASSY. FOR 175-1147 ONLY	





Schematic Diagram and Top View of VHF Tuners 175-1133, 1136 and 1138



NOTES:

ALL WAVEFORMS TAKEN ON AIR SIGNAL DEVELOPING 2.2 VOLTS PEAK-TO-ZERO AT TEST POINT "C", AND ALL CONTROLS SET FOR NORMAL VIEWING.

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.

FOR CAPACITOR CAPACITY TOLERANCES SEE LEGEND.

ALL RESISTORS ARE ±10% 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.

INDICATES CHASSIS GROUND — INDICATES VOLTAGE SOURCE — INDICATES WAVEFORM (SEE WAVEFORM CHART)

PICTURE TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC KILOVOLTMETER WITH BRIGHTNESS AND CONTRAST CONTROLS FULL COUNTER-CLOCKWISE.

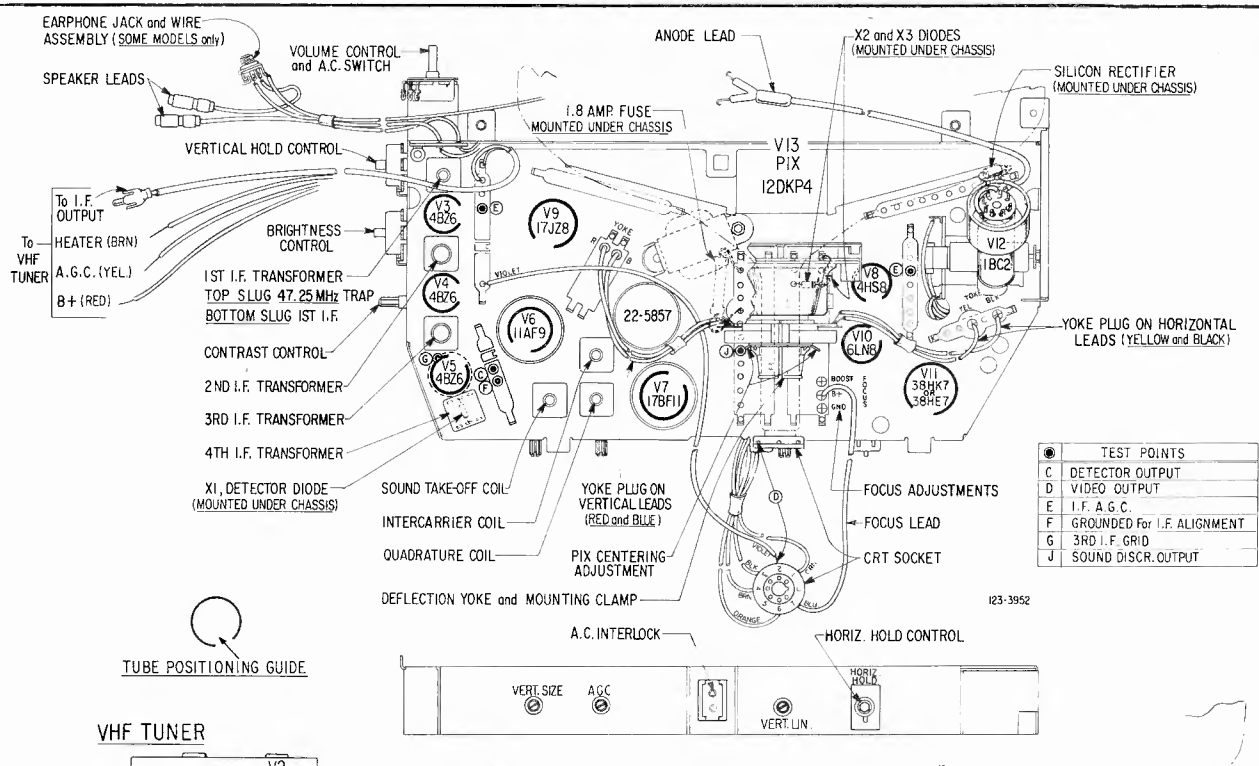
CX-CAPACITOR VALUE SELECTED FOR MINIMUM YOKE RINGING. VARIES WITH A RANGE OF 47 PF TO 72 PF (3 K.V., ±10%). WHEN NECESSARY, REPLACE WITH EXACT VALUE FOUND IN YOKE.

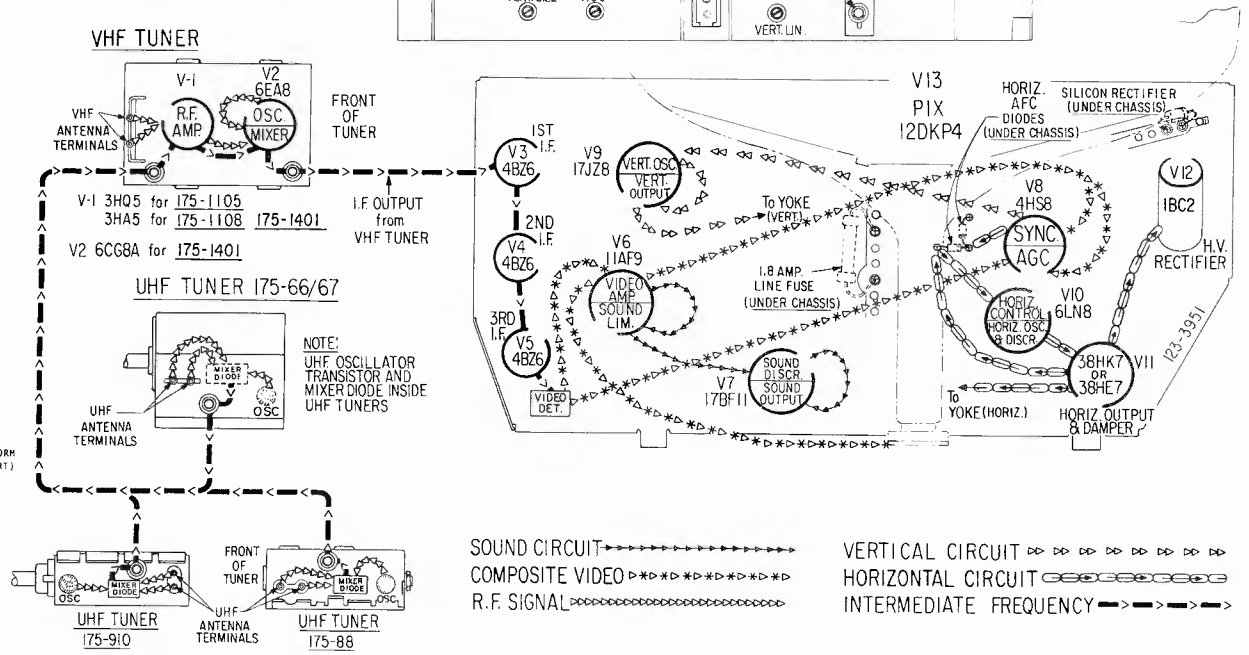
CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS WHERE APPLICABLE.

C - DETECTOR OUTPUT
D - VIDEO OUTPUT
E - I.F. AGC
F - GROUNDED FOR I.F. ALIGNMENT
G - 3RD I.F. GRID
H - SOUND LIMITER PLATE
J - SOUND OUTPUT
P - SOUND DISC GRID

INDICATES ±20% TOLERANCE MAY BE USED.

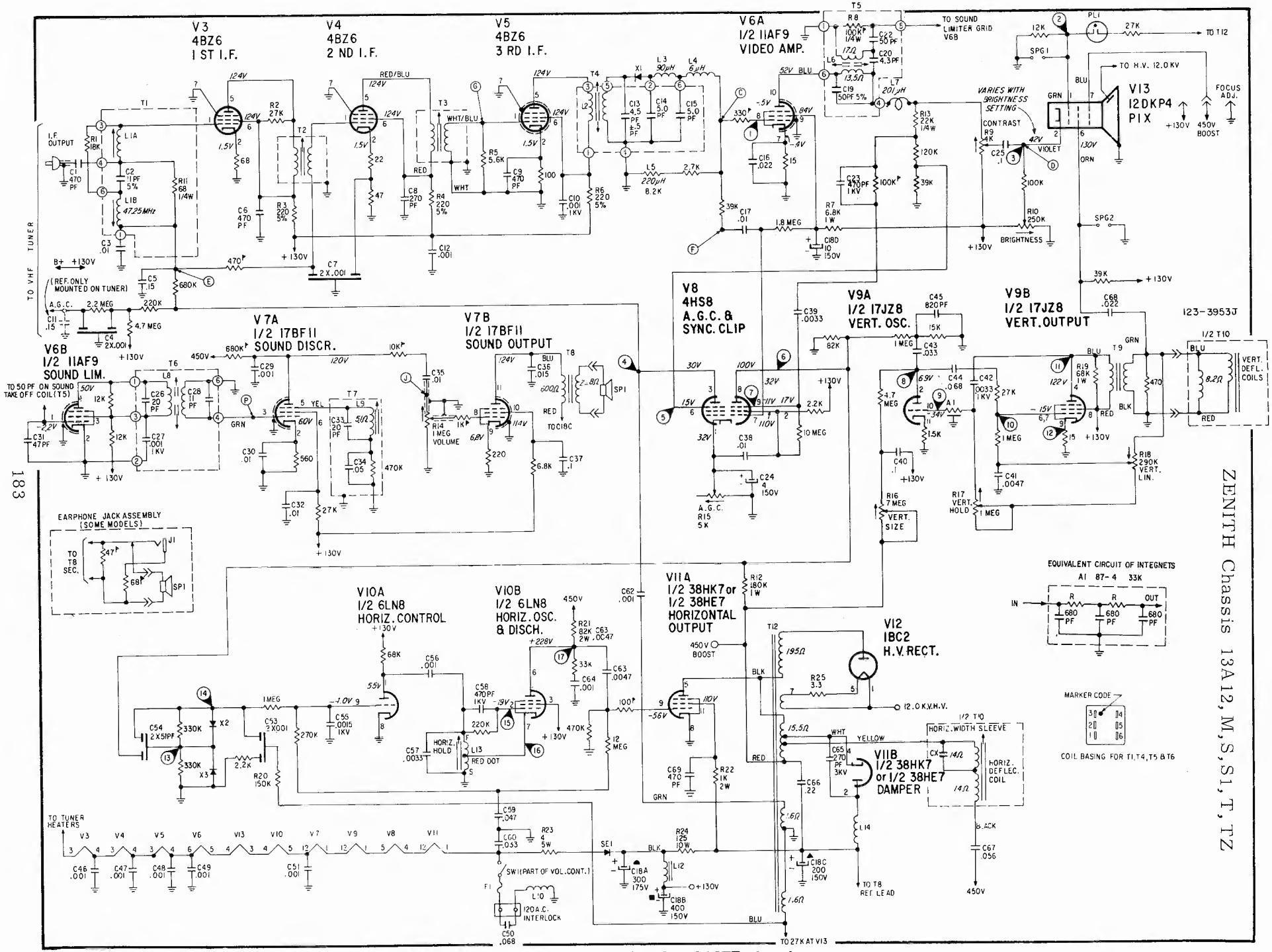
INDICATES INSULATED BRACKET & GROUND PLANE (FOR MONOPOLE ANTENNA)





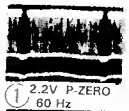
SOUND CIRCUIT
COMPOSITE VIDEO
R.F. SIGNAL
VERTICAL CIRCUIT
HORIZONTAL CIRCUIT
INTERMEDIATE FREQUENCY

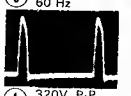
Signal Path and Parts Layout Of The 13A12, 13A12M, 13A12S, 13A12S1, 13A12T, and 13A12TZ Chassis

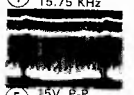


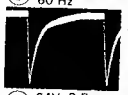
Schematic Diagram Of The 13A12, 13A12M, 13A12S, 13A12S1, 13A12T and 13A12TZ Chassis

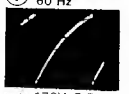
Signal Path and Parts Layout Of The Late Production 13A16, 13A16M, 13A16S, 13A16Z, 13A16MZ, and 13A16SZ Chassis

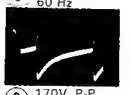


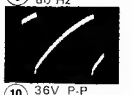


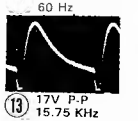


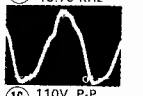


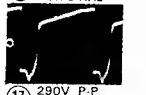












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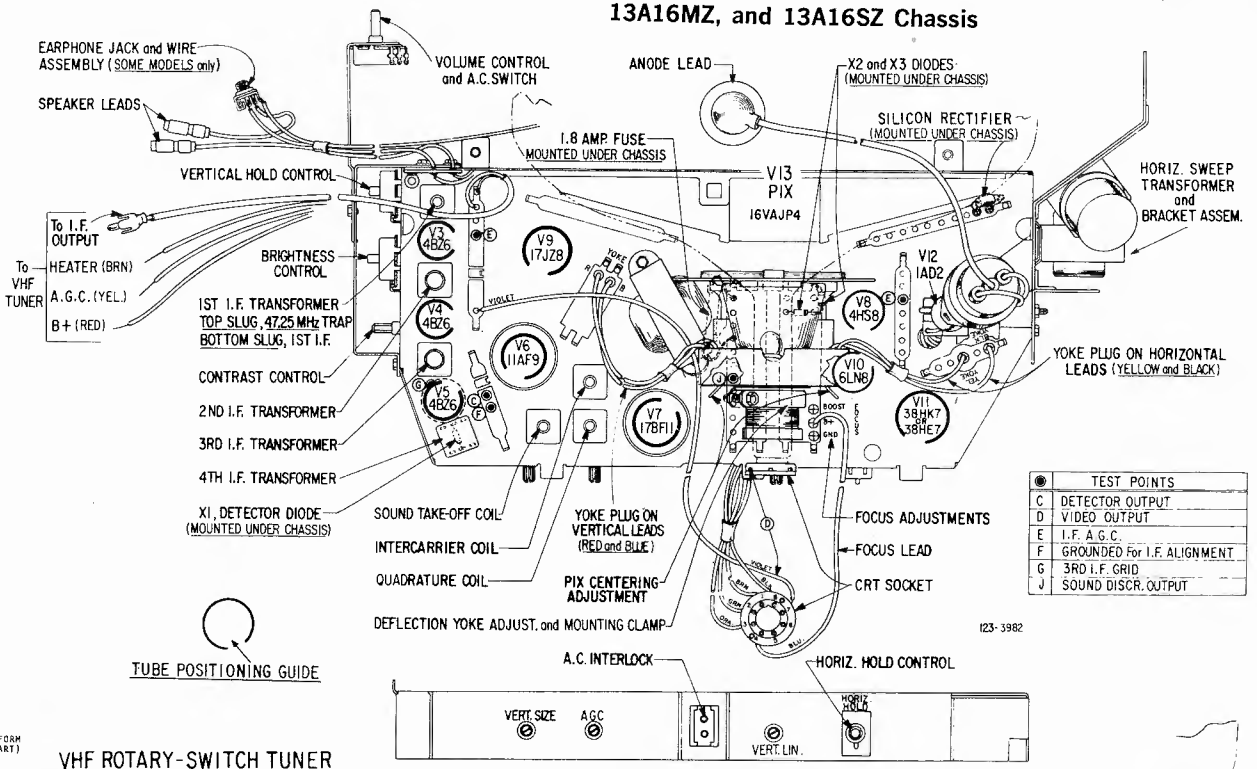
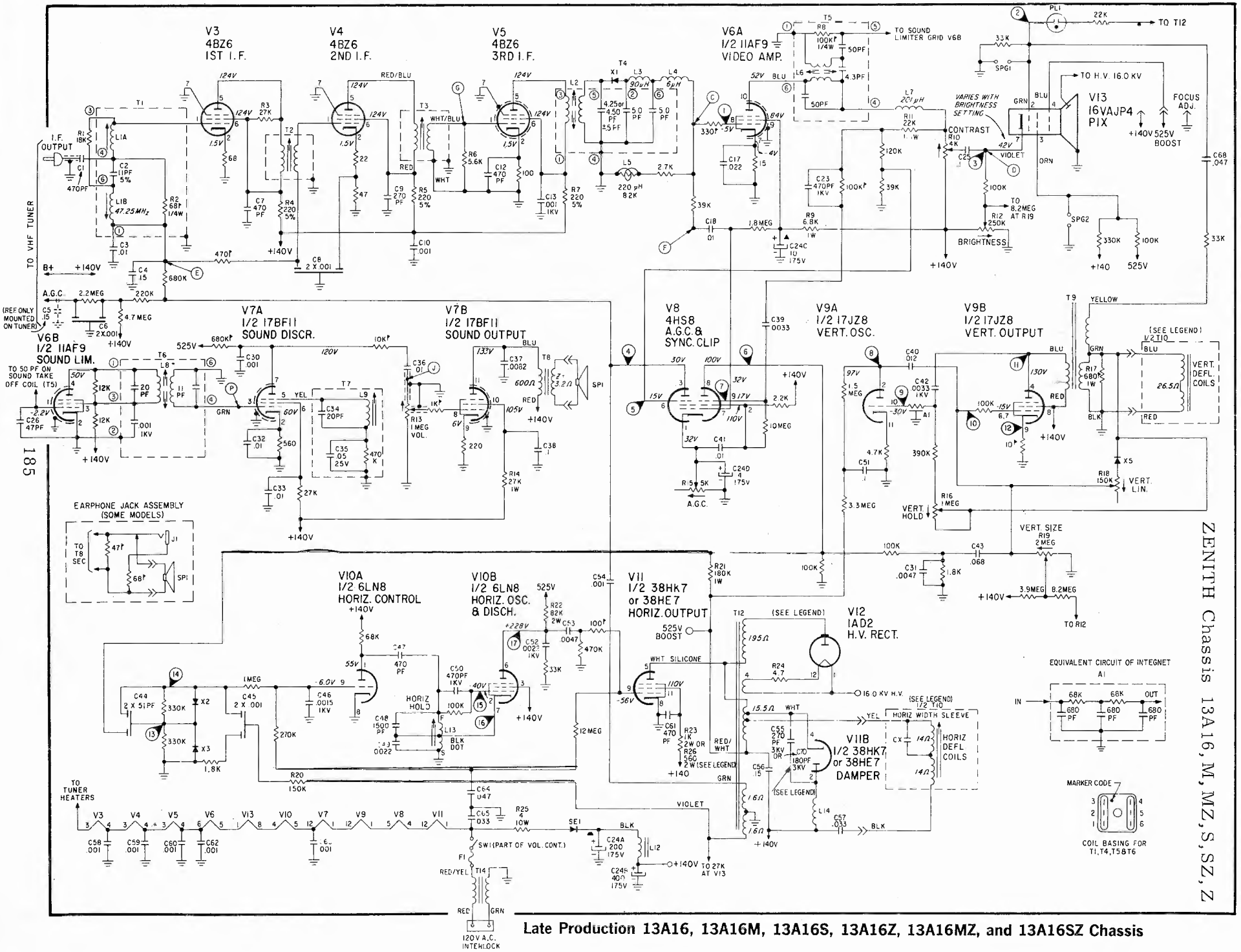


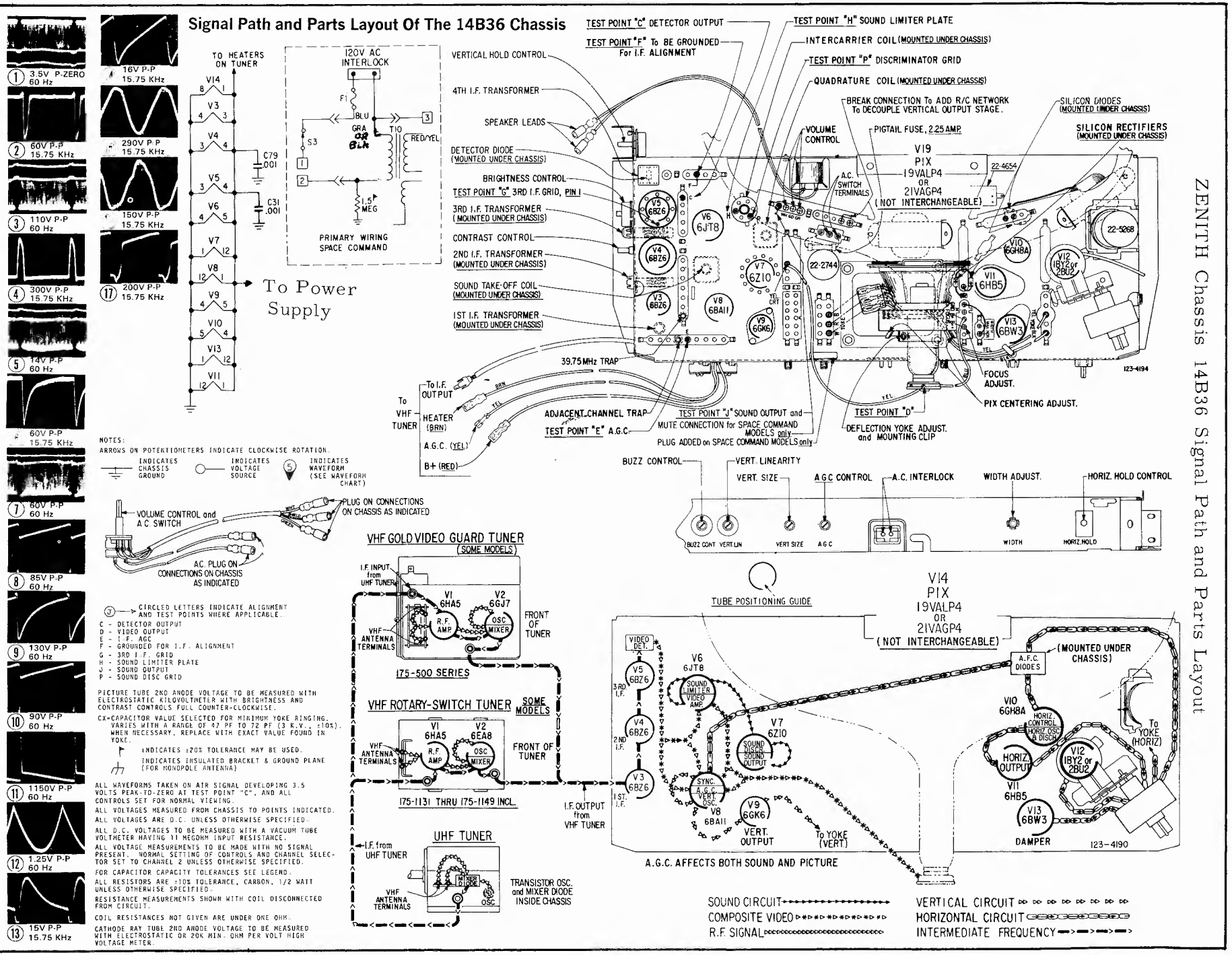


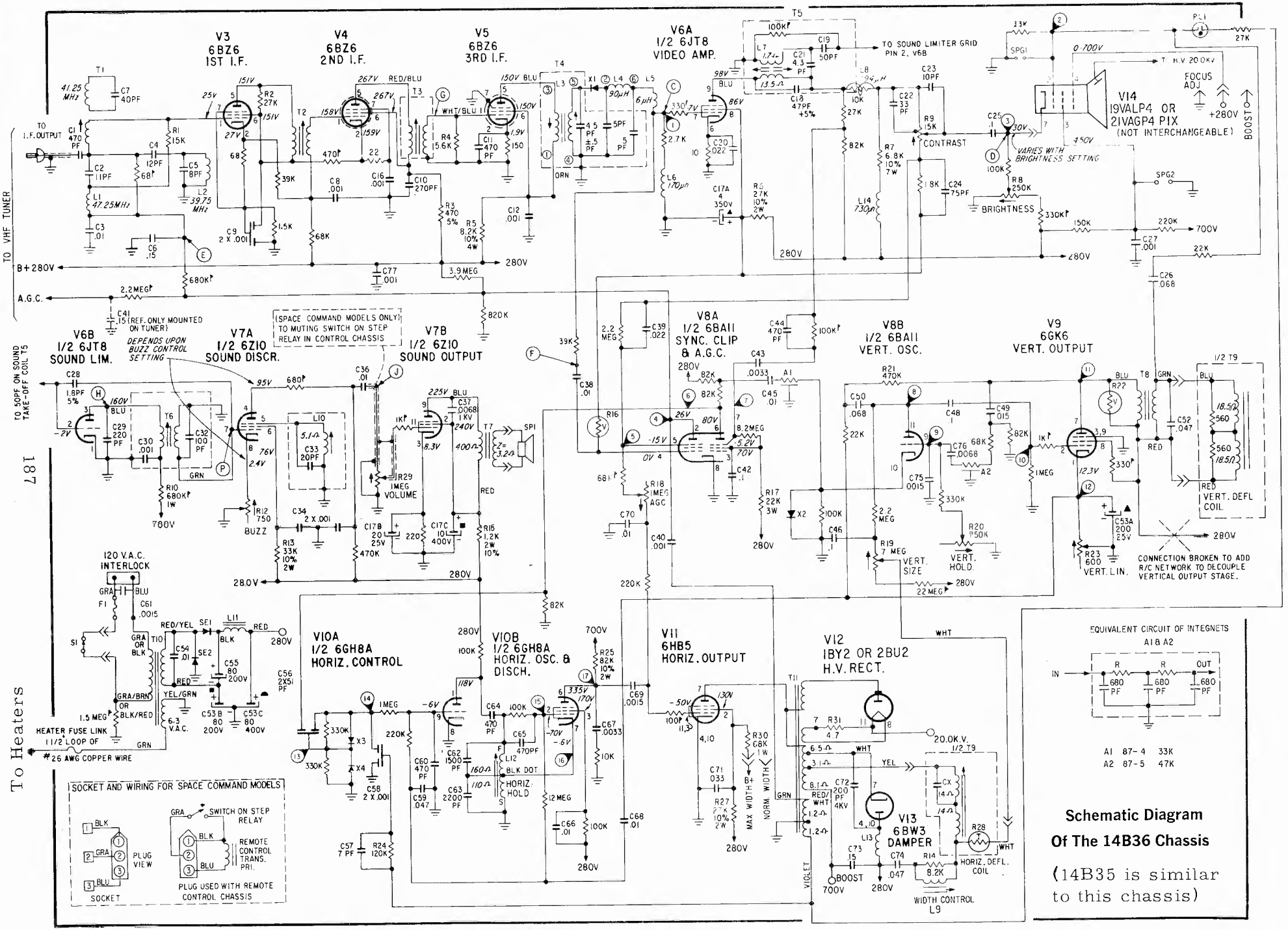
Late Production 13A16, 13A16M, 13A16S, 13A16Z, 13A16MZ, and 13A16SZ Chassis

ZENITH Chassis 13A16, M, MZ, S, SZ, Z

T4
65-3240
SK4-7015

Signal Path and Parts Layout Of The 14B36 Chassis



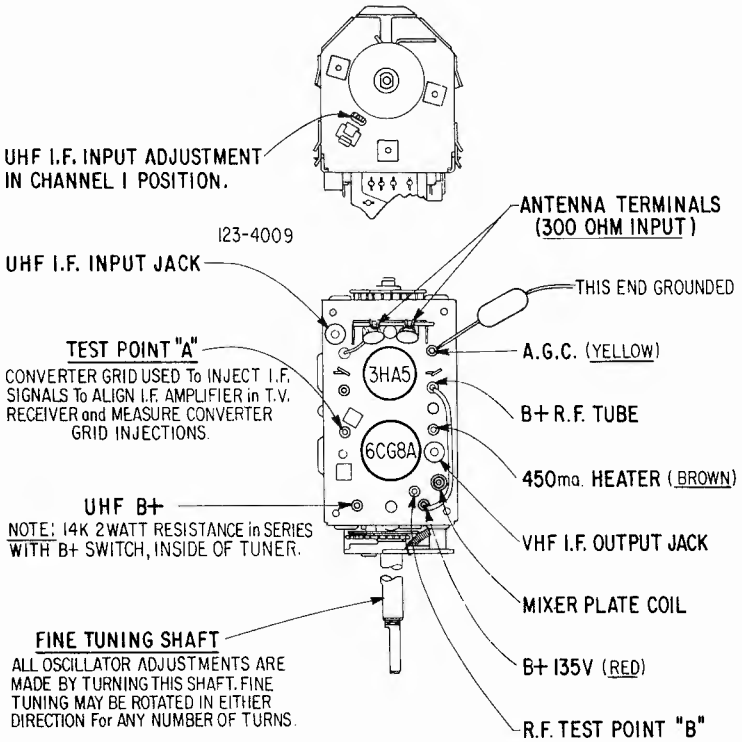


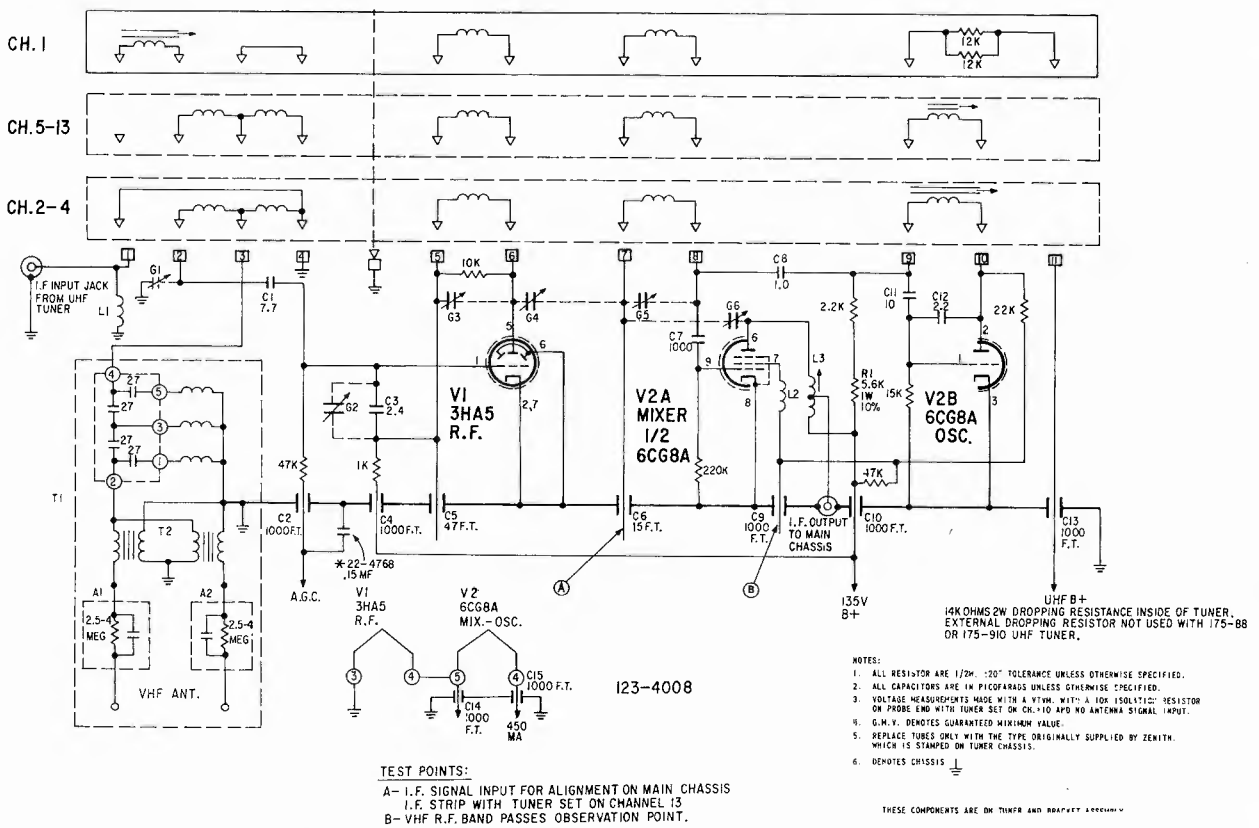
Schematic Diagram Of The 14B36 Chassis

(14B35 is similar to this chassis)

To Heaters

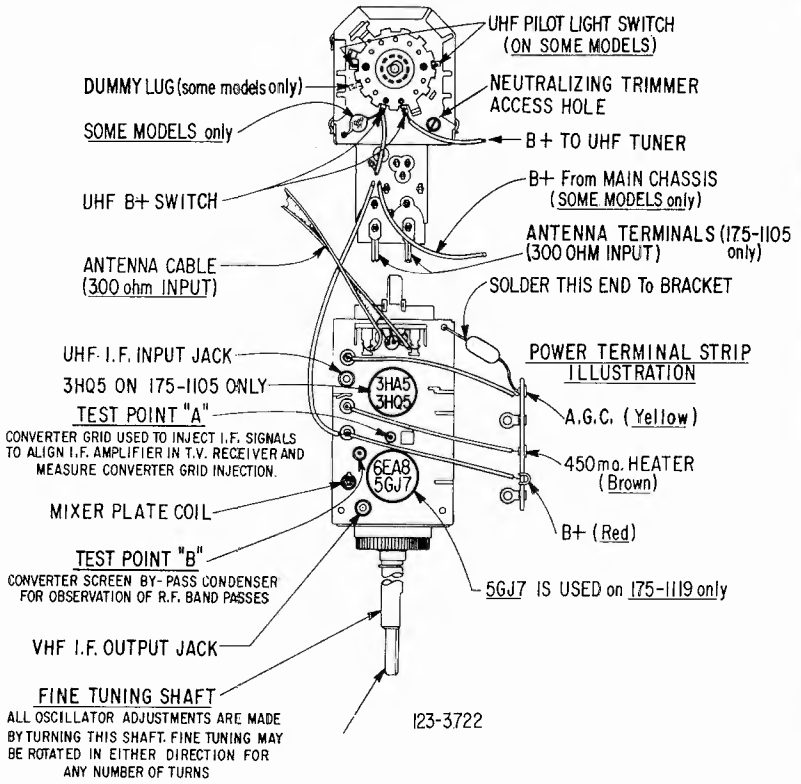
ITEM NO.	PART NUMBER	DESCRIPTION	
C1	22-5973	7.7 PF ±.5 PF DISC CAP. N470	500 V
C2	22-5974	1000 PF GMV F.T.	500 V
C3	22-5975	2.4 PF GIMMICK CAP.	500 V
C4	22-5974	1000 PF GMV F.T.	500 V
C5	22-5976	47 PF ±5% F.T. N1500	500 V
C6	22-5977	15 PF F.T.	500 V
C7	22-5978	1000 PF ±5% DISC CAP. N470	500 V
C8	22-5979	1 PF GIMMICK CAP.	500 V
C9	22-5980	1000 PF GMV F.T.	500 V
C10	22-5974	1000 PF GMV F.T.	500 V
C11	22-5981	10 PF ±.5 PF DISC CAP. N330	500 V
C12	22-5982	2.2 PF ±.5 PF DISC CAP. NPO	500 V
C13	22-5974	1000 PF GMV F.T.	500 V
C14	22-5974	1000 PF GMV F.T.	500 V
C15	22-5974	1000 PF GMV F.T.	500 V
G1		ANTENNA GIMMICK	
G2		NEUTRALIZING GIMMICK	
G3	WIRE	R.F. RESPONSE ALIGNMENT	
G4	GIMMICKS	R.F. RESPONSE ALIGNMENT	
G5		R.F. RESPONSE ALIGNMENT	
G6		R.F. RESPONSE ALIGNMENT	
R1	63-6101	5.6K OHM 10%	
L1	20-1730	D.C. RETURN COIL	
L2	20-1731	SCREEN COIL	
L3	S-84477	MIXER PLATE COIL	
T1	S-84831	ANTENNA FILTER ASSEMBLY	
A1	105-108	R/C NETWORK	
A2	105-108	R/C NETWORK	
CH#1	174-941	I.F. STRIP ASSEMBLY	
CH#2	174-942	CH#2 STRIP ASSEMBLY	
CH#3	174-943	CH#3 STRIP ASSEMBLY	
CH#4	174-944	CH#4 STRIP ASSEMBLY	
CH#5	174-945	CH#5 STRIP ASSEMBLY	
CH#6	174-946	CH#6 STRIP ASSEMBLY	
CH#7	174-947	CH#7 STRIP ASSEMBLY	
CH#8	174-948	CH#8 STRIP ASSEMBLY	
CH#9	174-949	CH#9 STRIP ASSEMBLY	
CH#10	174-950	CH#10 STRIP ASSEMBLY	
CH#11	174-951	CH#11 STRIP ASSEMBLY	
CH#12	174-952	CH#12 STRIP ASSEMBLY	
CH#13	174-953	CH#13 STRIP ASSEMBLY	

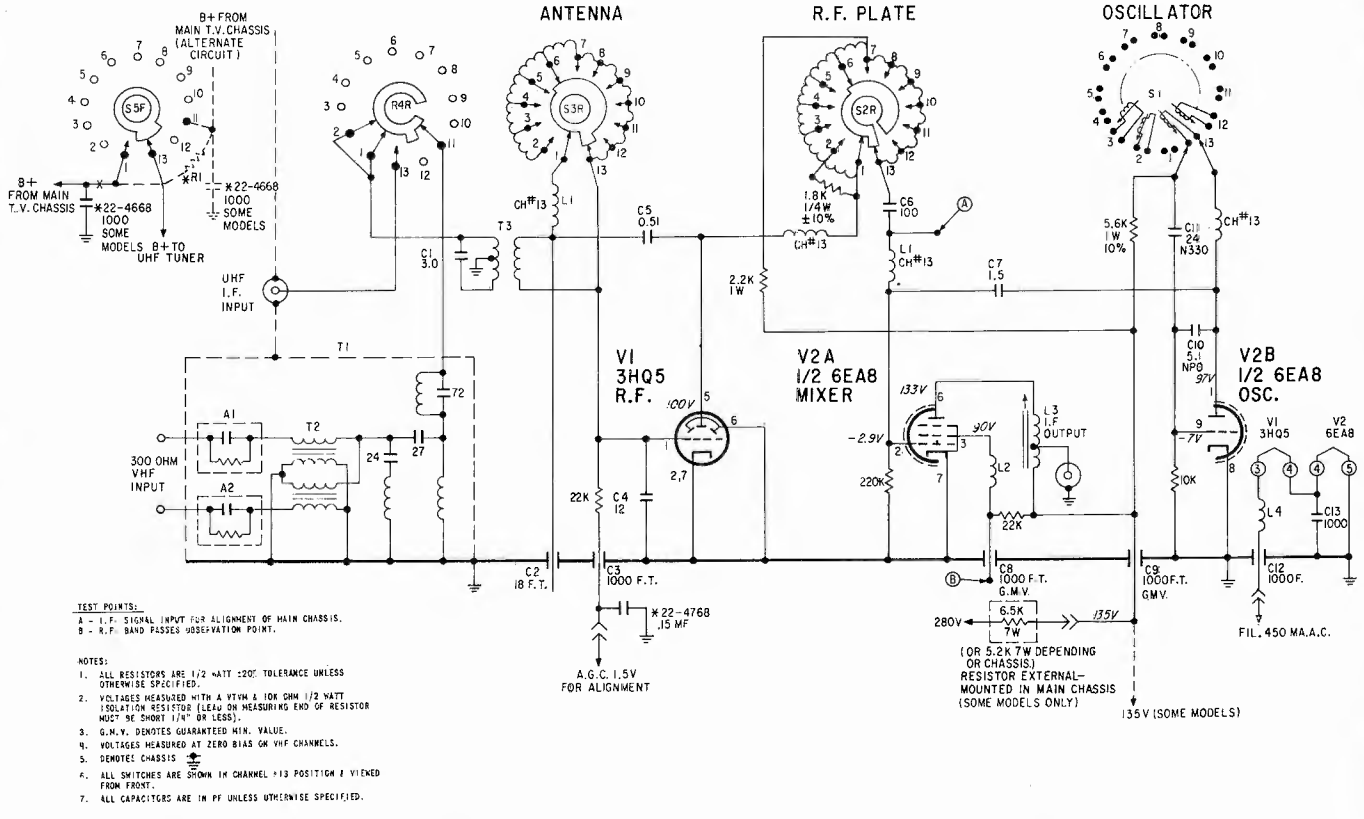




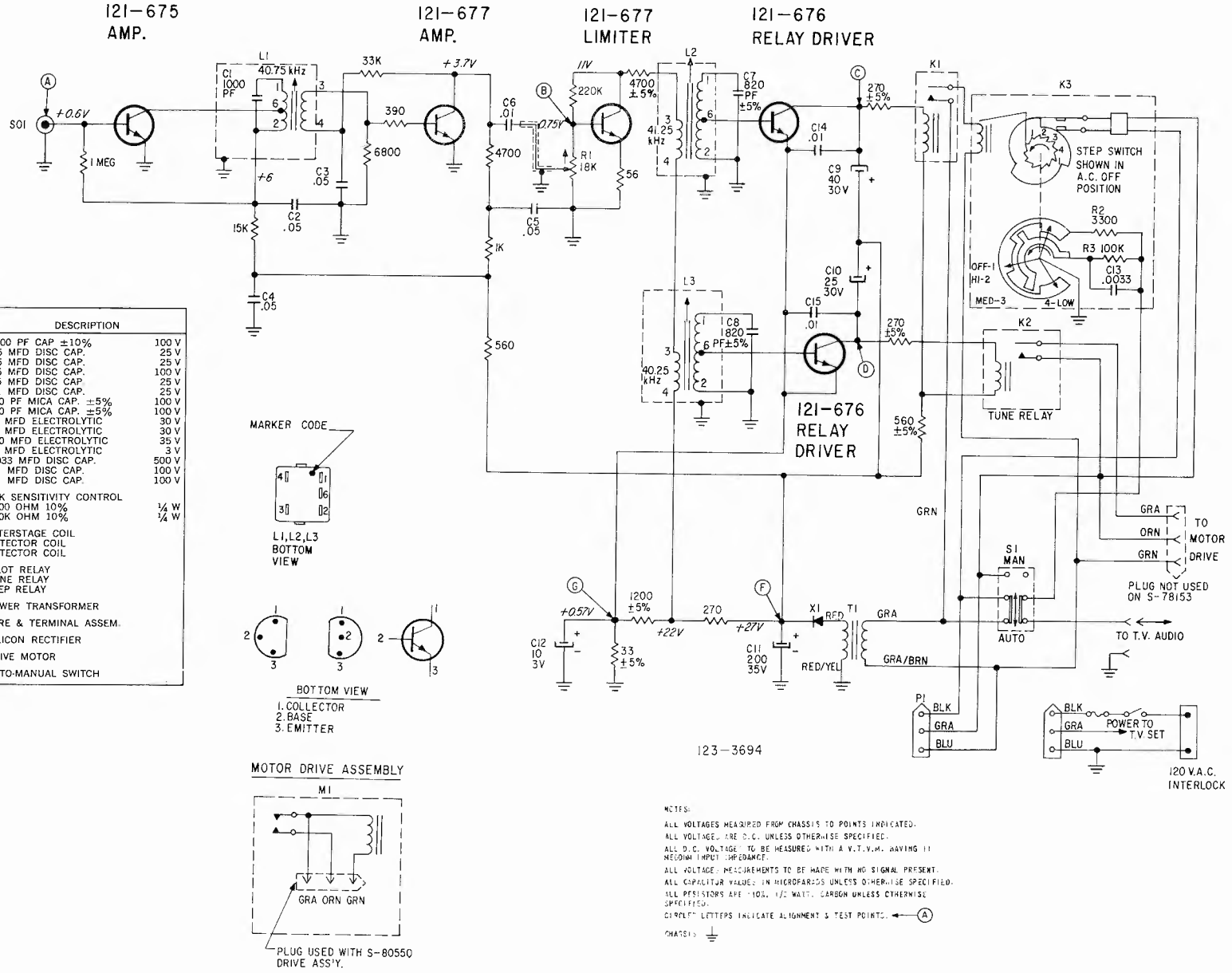
Schematic Diagram and Top View of VHF Tuner 175-1401

ITEM NO.	PART NUMBER	DESCRIPTION	
C1	22-3813	3.0 PF GIMMICK ±5%	500 V
C2	22-4684	18 PF F.T. ±5%	500 V
C3	22-3987	1000 PF F.T. GMV	500 V
C4	22-3547	12 PF N750 DISC ±5%	500 V
C5	22-5806	0.51 PF GIMMICK ±5%	500 V
C6	22-3984	100 PF N1500 DISC ±20%	500 V
C7	22-5289	1.5 PF GIMMICK ±5%	500 V
C8	22-3987	1000 PF F.T. GMV	500 V
C9	22-3986	1000 PF F.T. GMV	500 V
C10	22-5808	5.1 PF NPO DISC ±0.25 PF	500 V
C11	22-5253	24 PF N330 DISC ±3%	500 V
C12	22-3987	1000 PF F.T. GMV	500 V
C13	22-3797	1000 PF DISC +100% −20%	500 V
T1	S-82124	ANTENNA BALUN & FILTER ASSEM.	
T2	S-74413	ANTENNA BALUN ASSEM.	
T3	S-64259	ANTENNA TRANSFORMER ASSEM.	
L1	20-1276	CH13 ANTENNA COIL	
L2	20-1277	CONVERTER SCREEN COIL	
L3	S-75809	CONVERTER PLATE COIL	
L4	20-838	FILAMENT CHOKE	
R1		SEE UHF TUNER	
S1	S-82129	OSC. SW. DETENT & SHAFT (FOR 175-1105 ONLY)	
S2	S-82125	SW. SECT. 2 WIRING (R.F.)	
S3	S-82126	SW. SECT. 3 WIRING (ANT.)	
S4	S-82127	SW. SECT. 4 WIRING (UHF I.F.)	
S5	S-82128	SW. SECT. 5 (UHF B+)	
A1	105-105	R.C. ISOLATION NETWORK (PART OF T1) (R = 2.5 − 4 MEG., C = 450 PF GMV)	
A2	105-105	R.C. ISOLATION NETWORK (PART OF T1) (R = 2.5 − 4 MEG., C = 450 PF GMV)	





Schematic Diagram and Top View of VHF Tuners 175-1105 and 1108



ITEM NO.	PART NUMBER	DESCRIPTION	
C1	PT. OF L1	1000 PF CAP. ±10%	100 V
C2	22-3034	.05 MFD DISC CAP.	25 V
C3	22-3034	.05 MFD DISC CAP.	25 V
C4	22-3661	.05 MFD DISC CAP.	100 V
C5	22-3034	.05 MFD DISC CAP.	25 V
C6	22-3393	.01 MFD DISC CAP.	25 V
C7	22-3644	820 PF MICA CAP. ±5%	100 V
C8	22-3644	820 PF MICA CAP. ±5%	100 V
C9	22-5592	40 MFD ELECTROLYTIC	30 V
C10	22-5591	25 MFD ELECTROLYTIC	30 V
C11	22-3721	200 MFD ELECTROLYTIC	35 V
C12	22-3705	10 MFD ELECTROLYTIC	3 V
C13	22-4784	.0033 MFD DISC CAP.	500 V
C14	22-4904	.01 MFD DISC CAP.	100 V
C15	22-4904	.01 MFD DISC CAP.	100 V
R1	63-7534	18K SENSITIVITY CONTROL	
R2	63-4206	3300 OHM 10%	½ W
R3	63-4269	100K OHM 10%	¼ W
L1	95-2411	INTERSTAGE COIL	
L2	95-1966	DETECTOR COIL	
L3	95-1967	DETECTOR COIL	
K1	195-45	PILOT RELAY	
K2	195-45	TUNE RELAY	
K3	195-49	STEP RELAY	
T1	95-2622	POWER TRANSFORMER	
P1	S-78664	WIRE & TERMINAL ASSEM.	
X1	212-51	SILICON RECTIFIER	
M1	141-181	DRIVE MOTOR	
S1	85-1016	AUTO-MANUAL SWITCH	

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 V.T.V.M. HAVING 11 MEGOHM INPUT IMPEDANCE.
ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT.
ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
ALL RESISTORS ARE ±10%, 1/2 WATT, CARBON UNLESS OTHERWISE SPECIFIED.
CIRCLED LETTERS INDICATE ALIGNMENT & TEST POINTS. ← (A)
CHASSIS ⏚

Schematic Diagram of "300" Space Command Chassis S-85833

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.

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Another

Supreme Publications

Service Manual