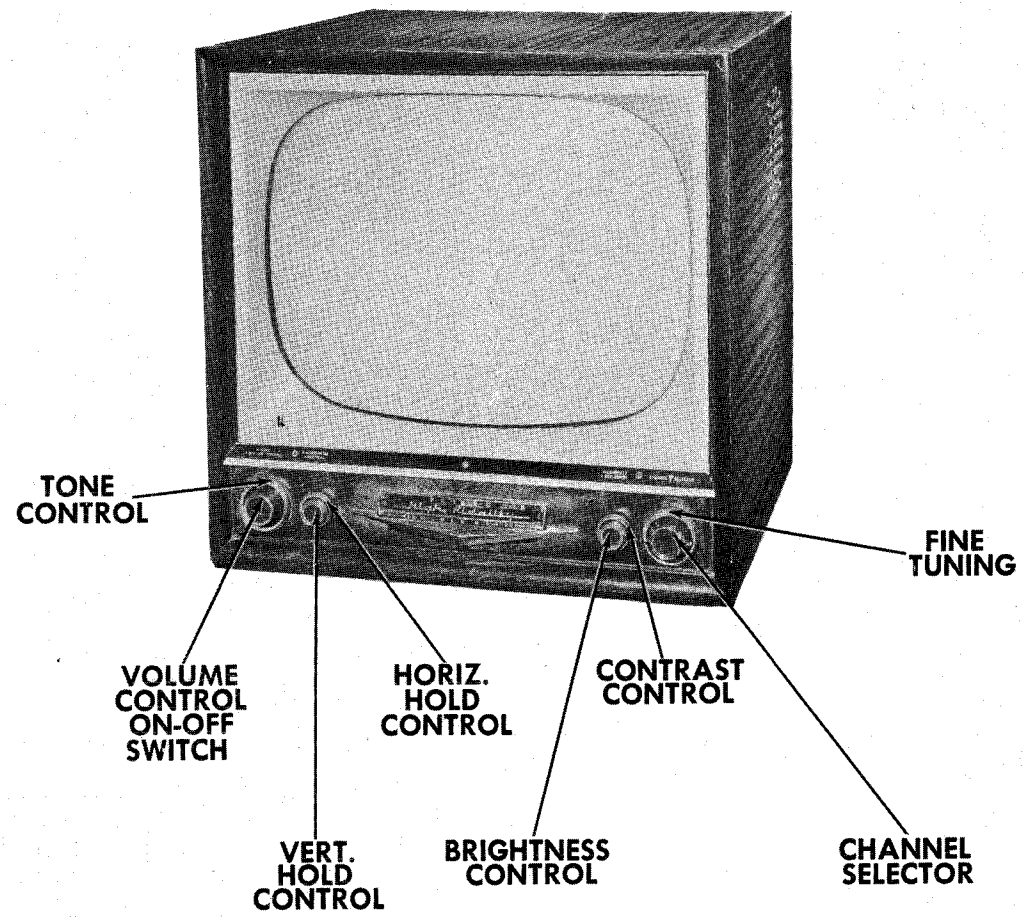
PHILCO MODELS 18B3104, 18BU3104, 22B4008, 22BU4008, 22B4009, 22BU4009, 22B4108, 22BU4108, 22B4110, L, 22BU4110, L, 22B4308, 22BU4308 (Ch. D-201 & R-201) (Code 150)



PHILCO MODEL 22B4008

TRADE NAME	Philco	Models 18B3104, 18BU3104, 22B4008, 22BU4008, 22B4009, 22BU4009, 22B4108, 22BU4108, 22B4110, L, 22BU4110, L, 22B4308, 22BU4308 (Deflection Ch. D-201, RF Ch. R-201) Code 150.
MANUFACTURER	Philco Corp., Tioga & "C" Sts., Philadelphia, Pa.	
TYPE SET	Television Receiver	
TUBES	Twenty-two	
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING 1.42 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video 45.75MC, Sound IF 41.25MC (Intercarrier)	

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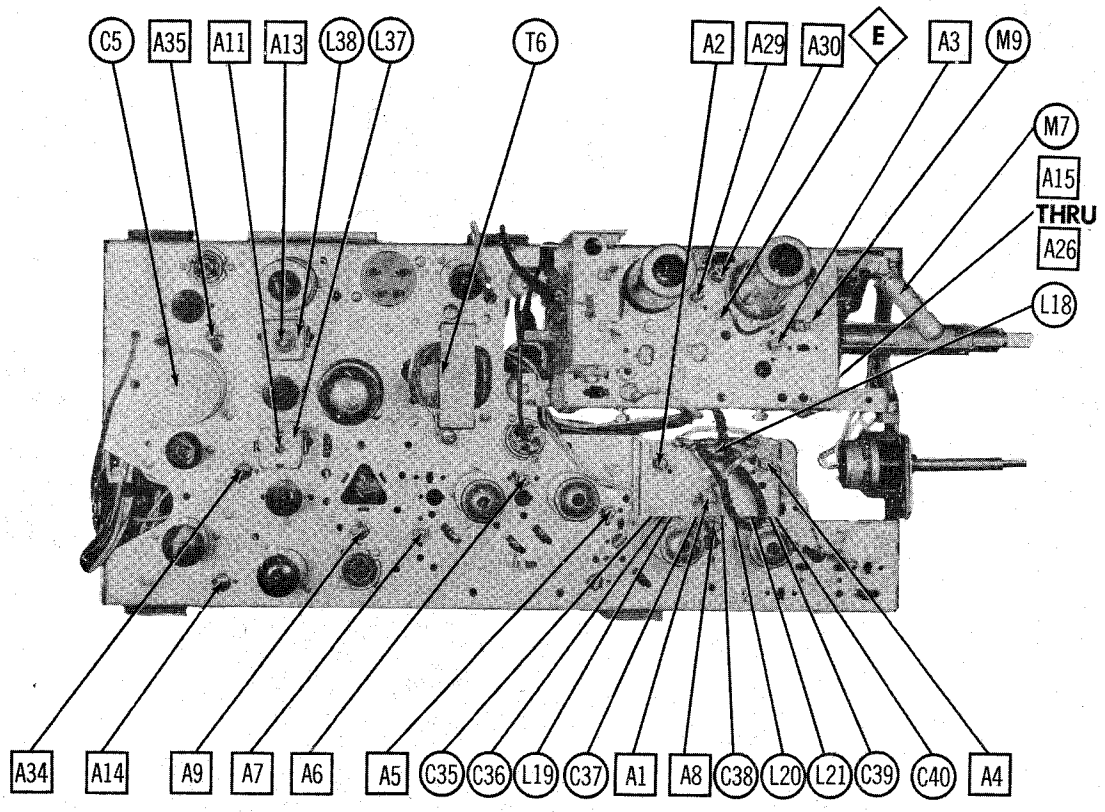
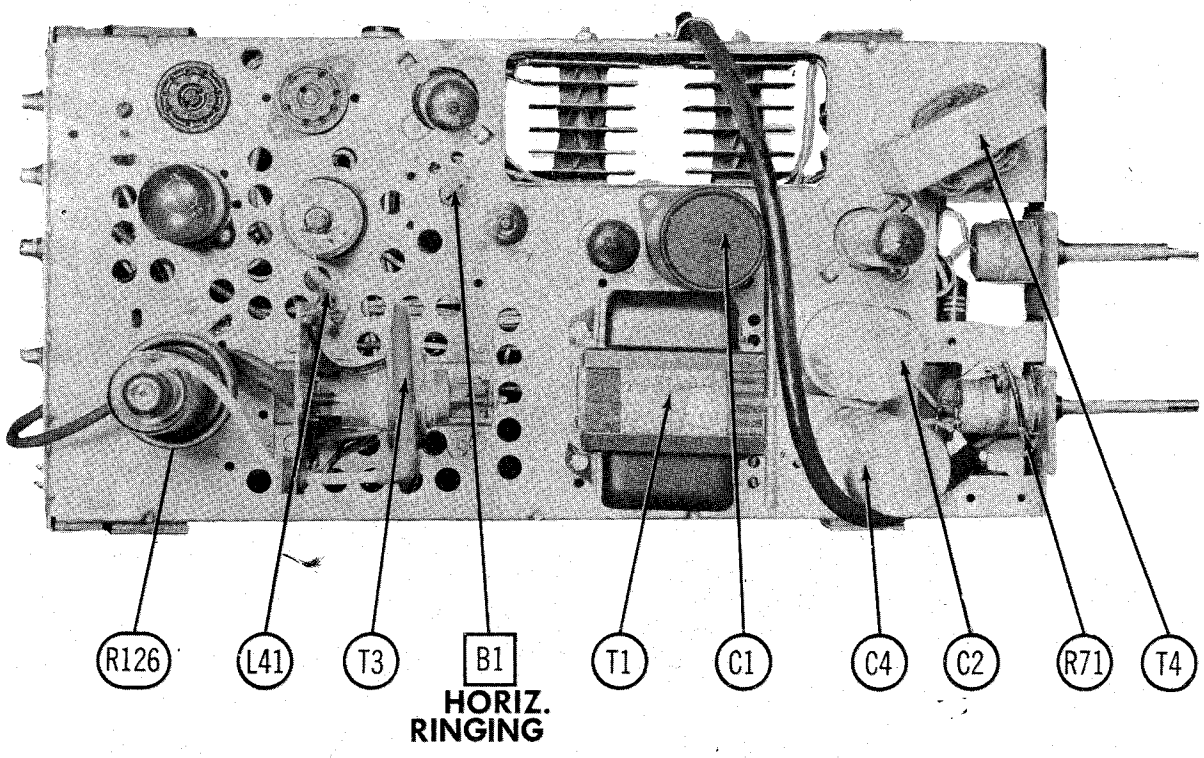
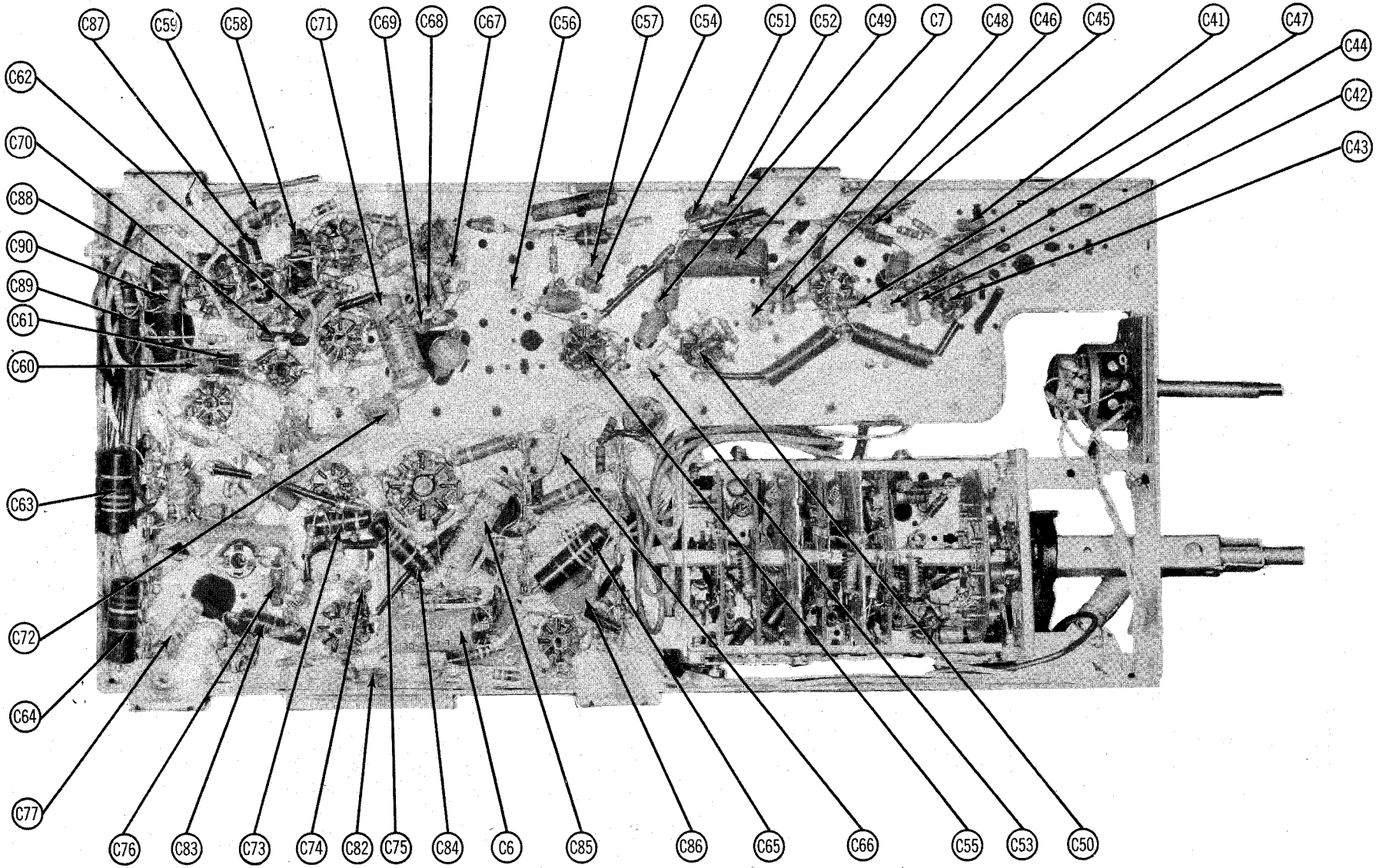


RF-IF CHASSIS-TOP VIEW

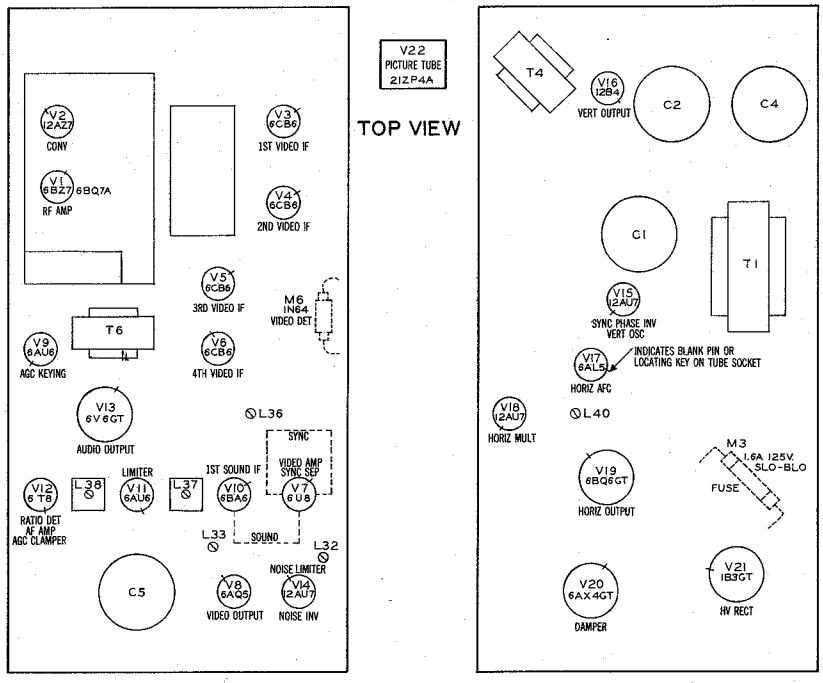


SWEEP CHASSIS-TOP VIEW



RF-IF CHASSIS-BOTTOM VIEW-CAPACITOR IDENTIFICATION

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - Selenium Rectifier (M1 & M2) fuse (M3 & M4)

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V2, V3, V4, V5, V6
No pic, no sound, has snow -V1, V2, V3
No pic, has sound, has raster - V7, V18, V22
Has pic, no sound - V10, V11, V12, V13
Overloaded picture - V9, V12

SYNC FAILURE
No vert. sync - V15
No horiz. sync - V15, V17, V18
No vert. or horiz. sync - V7, V15

SWEEP FAILURE
No raster, has sound - V18, V19, V20, V21, V22
No vertical deflection - V15, V16
Poor vert. linearity or foldover - V15, V16
Poor horiz. linearity or foldover - V18, V19, V20
Narrow picture - V18, V19, V20, V21, M1, M2
Vert. off freq. - V15
Horiz. off freq. - V15, V17, V18

PHILCO MODELS 18B3104, 18BU3104, 22B4008, 22BU4008, 22B4009, 22BU4009, 22B4108, 22BU4108, 22B4110, L, 22BU4110, L, 22B4308, 22BU4308 (Ch. D-201 & R-201) (Code 150)

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be securely taped and kept away from the chassis. Do not remove the horizontal oscillator tube (V18) to disable the high voltage.
Use an isolation transformer to protect the test equipment.

VIDEO IF ALIGNMENT

Set the contrast and brightness controls at maximum counter clockwise rotation.
Connect a 10KΩ carbon resistor to pin 1 of the video AGC test jack and another 10KΩ resistor to pin 5 of the same jack. Connect the free ends of the 10KΩ resistors together and attach the negative lead of a 10 volt bias supply to their junction. Connect the positive lead of the battery to chassis.
The IF shield must be in place during alignment.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over converter tube (V2). Low side to chassis.	Not used	47.25MC (400∿Mod)	4	Vert. Amp. thru 15KΩ to point (A). (Pin 2 of Video AGC test jack). Low side to chassis.	A1	Adjust for MINIMUM 400∿ indication on scope.
2.	"	"	"	41.25MC	"	"	A2	"
3.	"	"	"	42.7MC	"	"	A3	Adjust for maximum 400∿ indication on scope.
4.	"	"	"	44.75MC	"	"	A4	"
5.	"	"	"	45.7MC	"	"	A5	"
6.	"	"	"	44.4MC	"	"	A6	"
7.	"	"	"	43.0MC	"	"	A7	"
8.	"	"	"	42.0MC	"	"	A8	Adjust for maximum 400∿ indication on scope. Increase bias until pattern on scope is reduce 50% in amplitude and retouch A8 for maximum 400∿ indication on scope. Restore bias to -10 volts.
9.	"	"	44MC (10MC Swp)	42.0MC 45.75MC	"	"		Check for response curve similar to Fig. 1. If necessary, adjust A6 and A7 for maximum improvement. A6 affects tilt and A7 affects dip. A3 affects slope at 42.0MC side of curve, Adjust A4 and A5 for proper level at 45.75MC.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Remove the first video IF tube (V3) from its socket.
Connect two matched 100KΩ (±1%) resistors in series from point (B) to chassis. The junction of these two resistors is alignment point (D) as shown on the schematic.
Leave the bias connected as under "Video IF Alignment ". This will help to reduce circuit noise indications.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
10.	2200Ω carbon resistor	High side to point (A). Low side to chassis.	4.5MC (Unmod)	Any	DC Probe to point (B). Common to chassis.	A9, A10, A11, A12	Adjust for maximum deflection. Attenuate generator to maintain not more than 5 volts at VTVM.
11.	"	"	"	"	DC Probe to point (C). Common to point (D).	A13	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting Replace V3 in its socket.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.
Remove V3 from its socket. Leave bias connected as under "Video IF Alignment".

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	2200Ω Carbon Resistor	High side to point (A). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. Amp. to point (B). Low side to chassis.	A9, A10, A11, A12	Disconnect stabilizing capacitor C6. Adjust for curve of maximum amplitude and symmetry similar to Fig. 2.
11.	"	"	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A13	Reconnect stabilizing capacitor. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 3. SLIGHTLY adjust A12 for maximum amplitude and straightness of crossover lines. Replace V3 in its socket.

4.5MC TRAP ALIGNMENT

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
12.	2200Ω Carbon Resistors	High side to point (A). Common to chassis.	Not used	4.5MC (400 ∿Mod)	Any	Vert. Amp. thru detector (Fig.4) to picture tube grid (pin 2). Low side to chassis.	A14	Adjust signal generator for maximum output and set vertical gain of scope to maximum. Adjust A14 for MINIMUM 400∿ indication on scope.

ALTERNATE 4.5MC TRAP ALIGNMENT

Tune in a TV station and turn the fine tuning control clockwise until a 4.5MC beat pattern appears in picture. Adjust A14 for minimum 4.5MC beat in picture (screw should be out of chassis approximately 5/8").

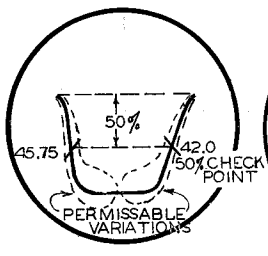


FIG.1

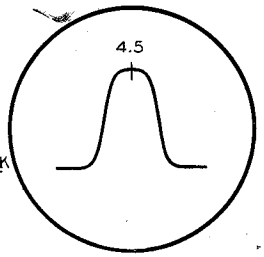


FIG.2

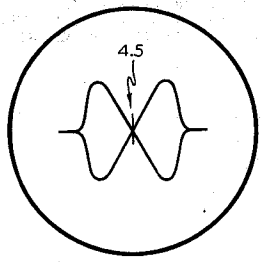


FIG.3

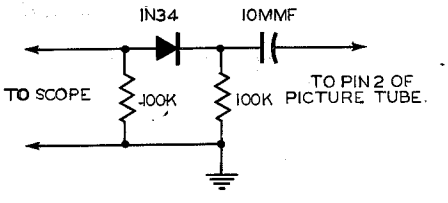


FIG.4

ALIGNMENT INSTRUCTIONS (cont)

OSCILLATOR ALIGNMENT

Connect the negative lead of a 1.5 volt battery to the white lead on top of the tuner. Connect the positive lead to chassis.
Remove the gate pulse plug from its socket. Couple the 45.75MC output of a second signal generator to the first video IF amplifier tube (V3) by removing the tube shield and attaching the output leads of the generator to the ends of a few turns of wire wrapped around the tube.
The output is set at 45.75MC throughout the entire oscillator alignment.
Set the fine tuning control at the middle of its range (with the cam stop opposite the channel 8 oscillator tuning core).
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
13.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	Not used	211.25MC	13	Vert. Amp. thru 15KΩ to point (A). Low side to chassis.	A15	Adjust for zero beat with 45.75MC marker IF signal as indicated on scope.
				205.25MC	12		A16	
				199.25MC	11		A17	
				193.25MC	10		A18	
				187.25MC	9		A19	
				181.25MC	8		A20	
				175.25MC	7		A21	
				83.25MC	6		A22	
				77.25MC	5		A23	
				67.25MC	4		A24	
				61.25MC	3		A25	
				55.25MC	2		A26	

RF AND MIXER ALIGNMENT

Leave the 1.5 volt bais battery connected as under Oscillator alignment.
Adjust the scope controls so that the width of the response curve is double the height.
Overload may then be checked by varying the generator output. Readjust the scope vertical gain control to maintain the 2 to 1 ratio as the generator output is increased. Any change in shape of response curve indicates overload and generator output should be reduced.
The 2 to 1 width to height ratio should be maintained when comparing the response curves from channel to channel.
Disconnect the tuner coupling link at the IF terminal strip (near V3) and solder a 68Ω carbon resistor to the open end of the link. Remove the first IF tube (V3) from its socket.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
14.	Two 120Ω carbon resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	213MC	13	Vert. amp. thru 100KΩ to point (E). Low side to chassis.	A27, A28	Check for a symmetrical approximately centered band pass similar to Fig. 5. If response is not flat between limits shown detune A28 counter clockwise until single peak appears. Adjust A27 until peak falls at 213MC. Adjust A28 for response similar to Fig. 5.
15.	"	"	177MC (10MC Swp)	177MC	7	"	A29, A30	Check for response as indicated by dotted lines in Figs. 6A and 6B. Adjust A29 and A30 for mirror image of original response curve (tilt in opposite direction); for example, if response curve appears as in Fig. 6A, adjust A29 and A30 until curve appears as in 6B. This adjustment over compensates to allow for channel 13 adjustment in next step. Repeat steps 14 and 15 until centered and symmetrical response curves are obtained on channels 13 and 7.
16.	"	"	85MC (10MC Swp)	85MC	6	"	A31, A32 A33	Adjust A31 and A32 for symmetrical approximately centered band pass. Detune A32 counter clockwise until single peak appears. Adjust A31 until peak falls at 85MC. Adjust A33 for maximum curve height and symmetry. Readjust A31 and A32 for symmetrical response as in Fig. 5.

VIDEO PEAKING COIL ADJUSTMENTS

In cases of excessive overshoot or smear on some stations it may be necessary to adjust A34 and A35. Alignment of the tuner and IF portions of the receiver must be correct before these adjustments are made. Counter clockwise adjustment will reduce the amount of overshoot and clockwise adjustment will reduce the amount of smear. Proper adjustment is the point of minimum smear and trailing whites.

UHF TUNER ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable.
Alignment of this portion of the receiver should not be required in the field.

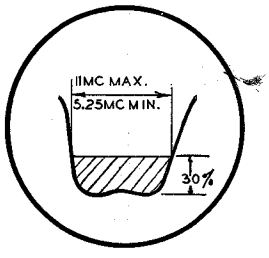


FIG.5

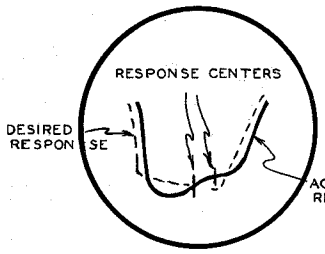


FIG.6A

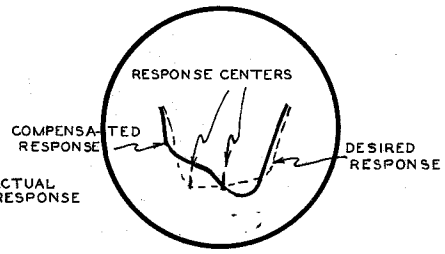
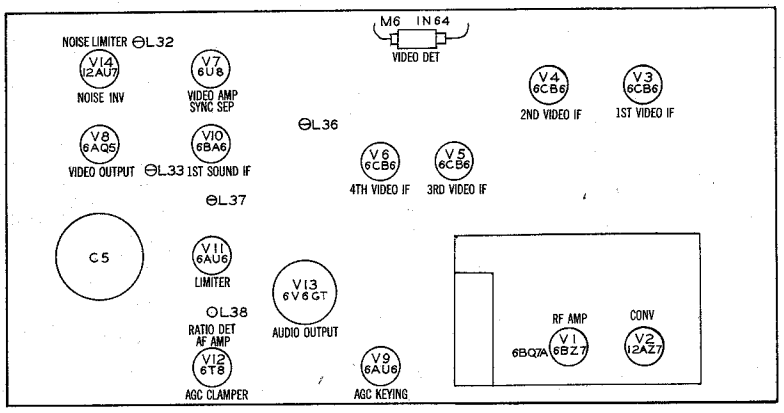


FIG.6B

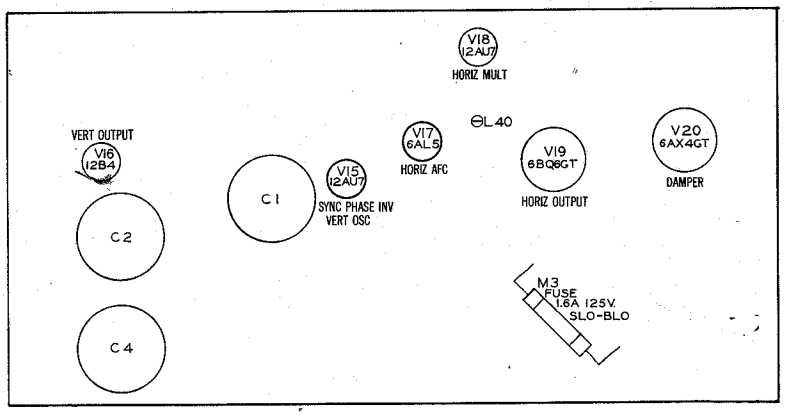
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BZ7	†1KΩ	1 Meg	INF	0Ω	.1Ω	INF	570KΩ	0Ω	0Ω
V 2	12AZ7	† 16KΩ	100KΩ	0Ω	.1Ω	.1Ω	† 15KΩ	10KΩ	0Ω	0Ω
V 3	6CB6	110KΩ	68Ω	.1Ω	0Ω	† 2.4KΩ	† 2.4KΩ	0Ω		
V 4	6CB6	47KΩ	68Ω	.1Ω	0Ω	† 2.4KΩ	† 2.4KΩ	0Ω		
V 5	6CB6	1.5Ω	150Ω	.1Ω	0Ω	† 7.6KΩ	† 7.6KΩ	0Ω		
V 6	6CB6	1.5Ω	150Ω	.1Ω	0Ω	† 2.2KΩ	† 2.2KΩ	0Ω		
V 7	6U8	† 50KΩ	3.3KΩ	■ 4.7K	0Ω	.1Ω	■ 8.1KΩ	33Ω	0Ω	2.7 Meg
V 8	6AQ5	1.5Meg	390Ω	.1Ω	0Ω	† 2.5KΩ	† 0Ω	1.5 Meg		
V 9	6AU6	■ 52KΩ	22KΩ	.1Ω	0Ω	180KΩ	† 10KΩ	22K		
V 10	6BA6	† 540KΩ	■ 100Ω	.1Ω	0Ω	† 220Ω	† 220Ω	■ 100Ω		
V 11	6AU6	100KΩ	0Ω	.1Ω	0Ω	† 12KΩ	† 12KΩ	0Ω		
V 12	6T8	INF	33KΩ	INF	.1Ω	0Ω	600KΩ	0Ω	10 Meg	† 275KΩ
V 13	6V6GT	INF	.1Ω	† 5.2K	† 4.7KΩ	680KΩ	† 0Ω	0Ω	120Ω	
V 14	12AU7	■ 22 Meg	47KΩ	0Ω	0Ω	0Ω	■ 180KΩ	■ 22Meg	3.3KΩ	.1Ω
V 15	12AU7	† 14KΩ	1 Meg	2.2KΩ	0Ω	0Ω	▲ 1.8Meg	350KΩ	1KΩ	.1Ω
V 16	12B4	470Ω	4.2Meg	0Ω	.1Ω	.1Ω	INF	4.2Meg	INF	† 284Ω
V 17	6AL5	4.8Meg	4.8Meg	0Ω	.1Ω	15KΩ	INF	15KΩ		
V 18	12AU7	† 57KΩ	140KΩ	1.2KΩ	.1Ω	.1Ω	† 25KΩ	9.4Meg	1.2KΩ	0Ω
V 19	6BQ6GT	1.6Meg	.1Ω	† 11.4KΩ	† 4.6KΩ	1 Meg	47KΩ	0Ω	0Ω	TOP CAP ▲ 27Ω
V 20	6AX4GT	† 0Ω	INF	150KΩ	INF	† 2Ω	▲ 45Ω	0Ω	.1Ω	
V 21	1B3GT	PINS 1-8 HAVE INF. RESISTANCE								TOP CAP ▲ 867Ω
V 22	21ZP4A	0Ω	470KΩ	PIN 10 ▲ 47KΩ	PIN 11 † 220KΩ	PIN 12 .1Ω				

† MEASURED FRO M OURPUT OF M1.
■ MEASURED FROM PIN 7 OF V10.
▲ MEASURED FROM PIN 3 OF V20.



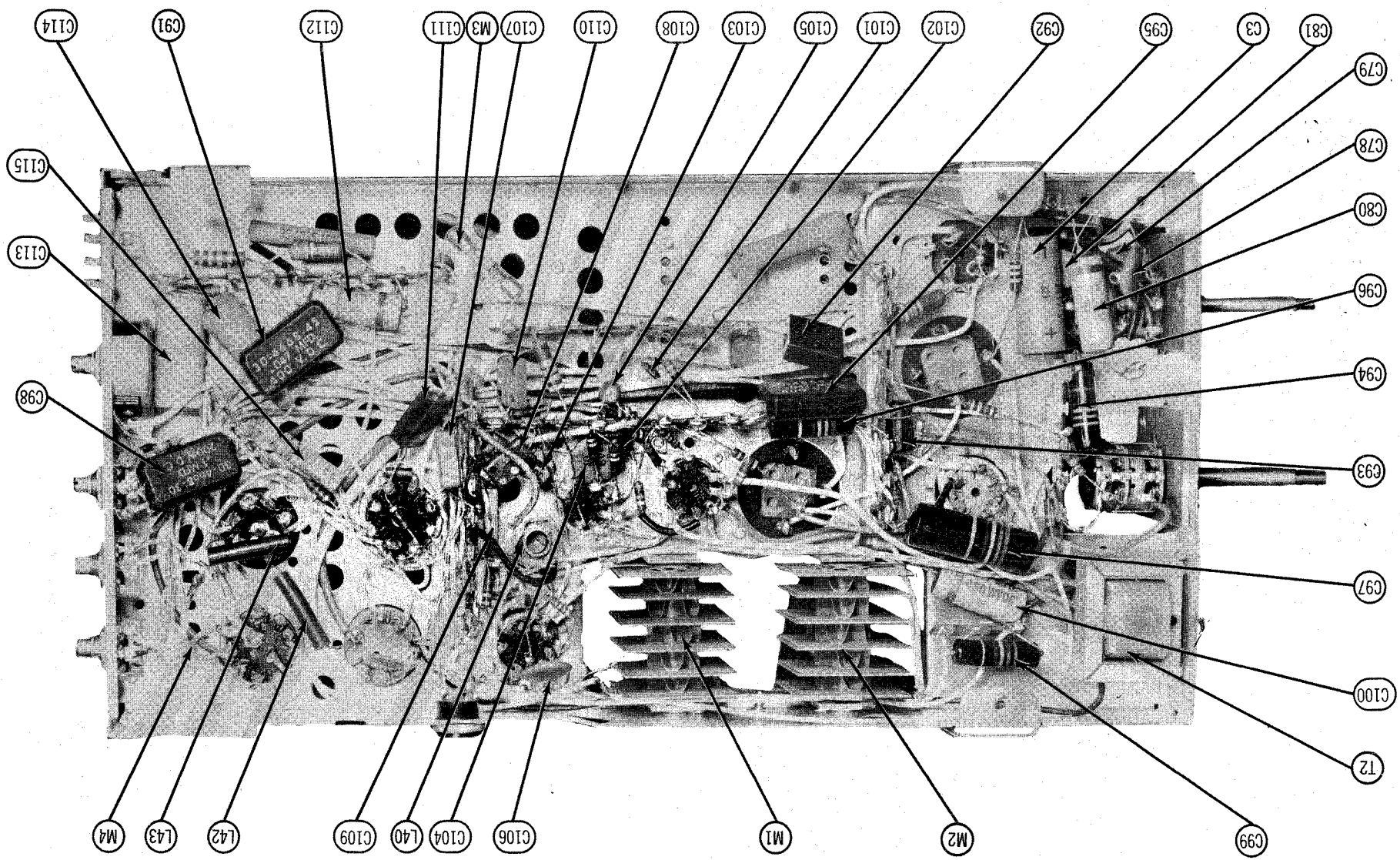
BOTTOM VIEW

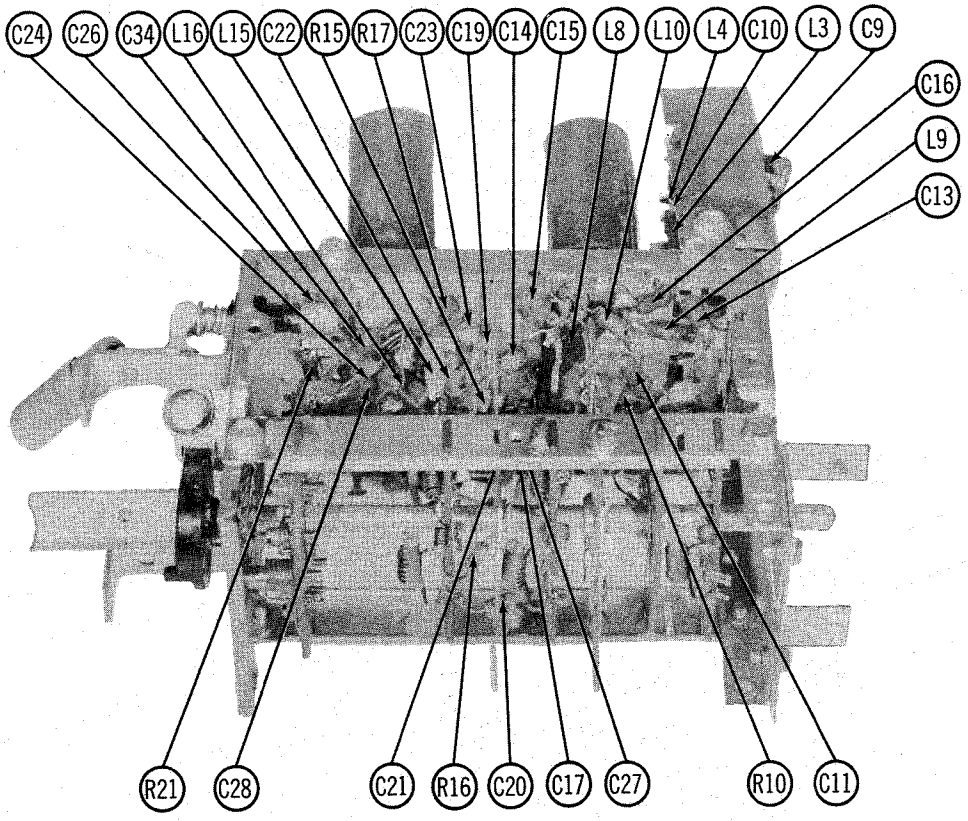


TUBE PLACEMENT CHART

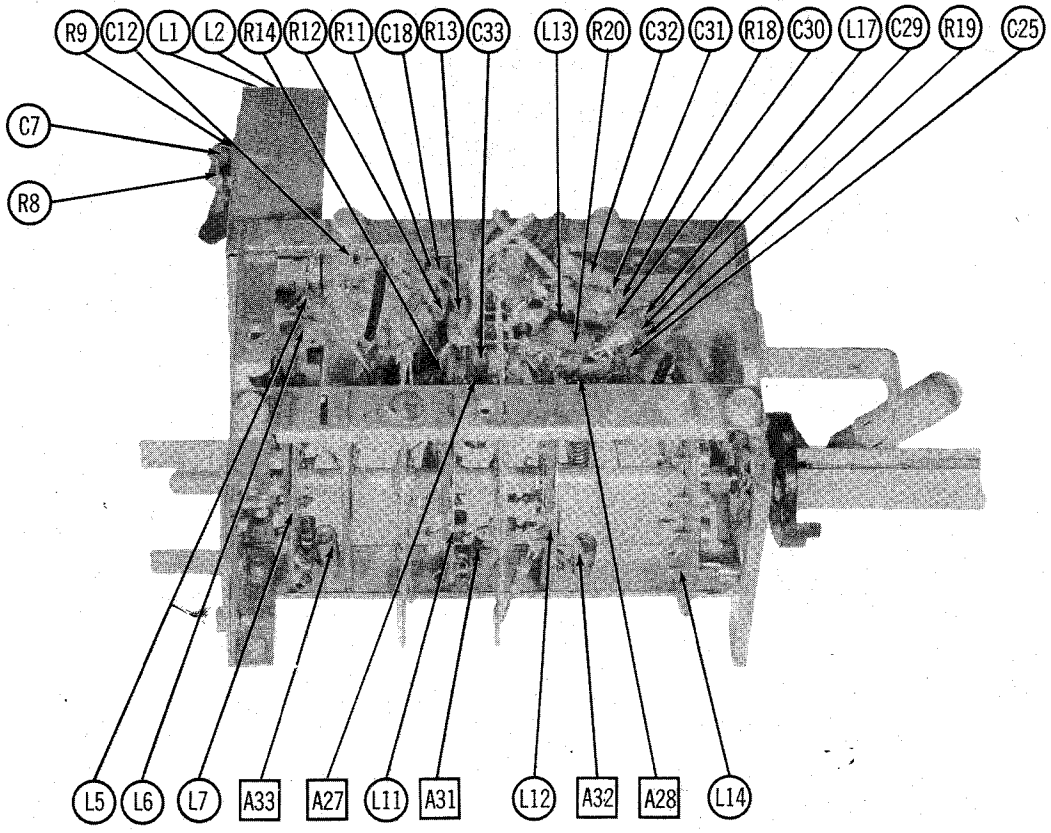
PHILCO MODELS 18B3104, 18BU3104, 22B4008, 22BU4008, 22B4009, 22BU4009, 22B4108, 22BU4108, 22B4110, L, 22BU4110, L, 22B4308, 22BU4308 (Ch. D-201 & R-201) (Code 150)

SWEEP CHASSIS-BOTTOM VIEW-CAPACITOR & MISC. IDENTIFICATION

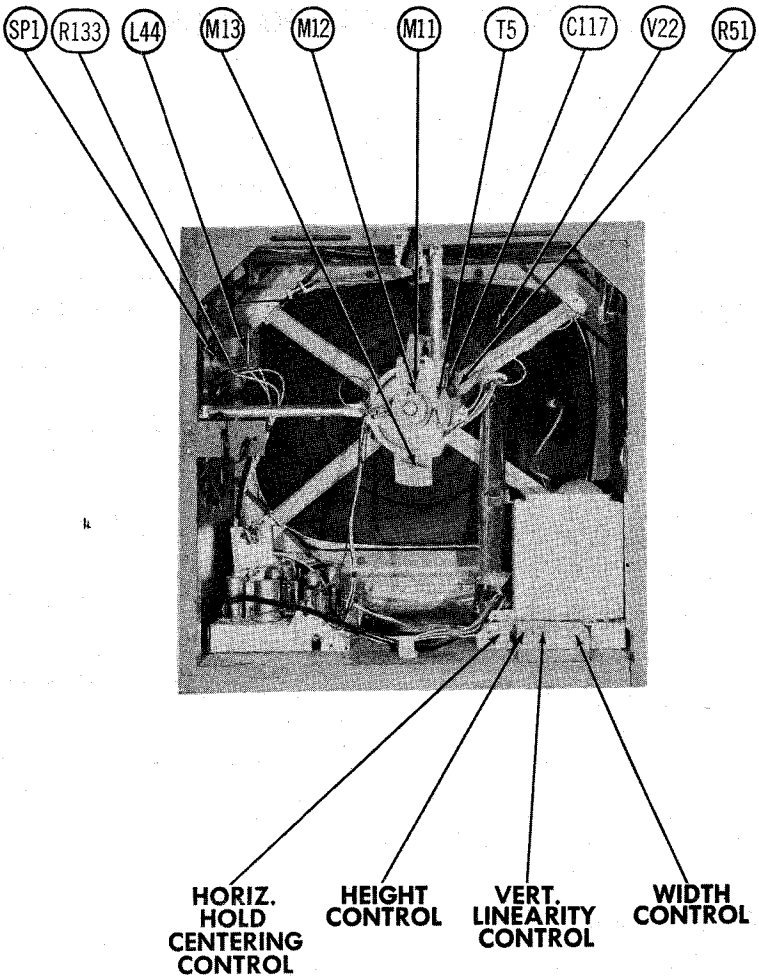




VHF TUNER-RIGHT SIDE



VHF TUNER-LEFT SIDE



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

Reduce the picture width until approximately one inch of blank screen appears on each side of the picture. Increase the brightness control setting until the blanking time becomes visible as indicated by a dark bar at each side of picture.

Connect a .1MFD capacitor from pin 2 of the gate pulse socket to chassis.

Set the horizontal hold control at the center of its range.

Adjust the horizontal hold centering control until the picture is centered between the two blanking bars.

Remove the 1 MFD capacitor.

Adjust the horizontal ringing coil slug (B1) until the picture is again centered between the two blanking bars.

Rotate the horizontal hold control through its range. The picture should lose sync at both extremes of rotation. If it does not, readjust the horizontal hold centering control until that condition is obtained. Check the number of diagonal bars on either side of the pull in range of the horizontal hold. There should be 1 or 2 bars present. If proper pull-in is not obtained, repeat the above procedure.

Adjust the horizontal width control for a picture slightly wider than necessary to fill the picture mask horizontally.

TROUBLE SHOOTING AIDS

CAUTION

Use a line isolation transformer of at least 225 watts rating, to remove shock hazzard and prevent damage to receiver and/or test equipment.

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss of High Vol tage".

INSUFFICIENT SWEEP

Check by substitution V18, V19 and V20. Check adjustment of the width control. Check waveform W18.

If Satisfactory	If Unsatisfactory
Check T3, T5A, C112, C113, C114, R120, R124, R125 and other associated components.	Check C108, C109, C111, R111, R112, R114, R115, R119 and other associated components.

DRIVE LINES

Check by substitution V18, V19 and V20. Check C110, C111, C114, C116, T3, T5A, R116, R124 and other associated components.

COMPRESSED AT LEFT SIDE

Check by substitution V18, V19 and V20. Check components associated with the horizontal output and damper stages especially T3 and T5A.

FOLDS

Follow procedure outlined under Drive Lines.

PIE CRUST EFFECT

Check by substitution V18, V19 and V20. Check C106 for open. Check T3 and T5A.

XMAS TREE EFFECT

Substitute V18. Check L40, C107, C108, C109 and other associated components.

VERTICAL

LOSS OF SWEEP

Check by substitution V15 and V16. Check waveform W12.

If Satisfactory	If Unsatisfactory
Check T4, T5B, R103 and other associated components.	Check R102, C96, C97, T2 and other associated components.

INSUFFICIENT SWEEP

Check adjustment of height and vertical linearity controls. Follow procedure outlined under "Loss of Sweep".

COMPRESSED AT BOTTOM

Check by substitution V15 and V16. Check T4, T5B, C4D and other associated components.

COMPRESSED AT TOP

Check by substitution V15 and V16. Check T2, C95, C97 and other associated circuit components.

FOLDS

Check by substitution V15 and V16. Check associated components especially T2, T4, C95 and C97.

SYNC

LOSS OF VERTICAL AND HORIZONTAL SYNC

Check by substitution V7, V14 and V15. Check C87, C88, C89, C91, R87, R89, R90, R80, R83, and other associated components.

LOSS OF VERTICAL SYNC-HORIZONTAL SYNC SATISFACTORY

Check by substitution V7, V14 and V15. Check waveform W10.

If Satisfactory	If Unsatisfactory
Check components associated with V15B especially T2 and R96.	Check vertical integrator and other associated components. Check video IF stages for overloading.

LOSS OF HORIZONTAL SYNC-VERTICAL SYNC SATISFACTORY

Check by substitution V17 and V18. Check C100, C102, C107, C108, C109, R113, R114, R109, R117, C103, C104 and other associated components.

HORIZONTAL BENDING

Check by substitution V7, V14, V15, V17 and V18. Check horizontal AFC filter network . Check waveform W15 for vertical sync pulses.

VIDEO

LOSS OF VIDIO

Check by substitution V7 and V8. Check C61, C63, R43, R46, picture tube and other associated components.

SOUND BARS (4.5MC BEAT)

Adjust tuner fine tuning for best picture and sound. Check 4.5MC trap adjustment (A14). Check video IF alignment.

POOR CONTRAST

Check by substitution V7 and V8. Check video detector crystal and assembly. Check contrast control, picture tube and other associated components.

NEGATIVE PICTURE

Check by substitution V9, V8, V7, V4, V3 and V1. Check video detector assembly. Check AGC operation. Check picture tube.

SMEAR

Check by substitution V7 and V8. Check video detector assembly. Check C61, C63, R40, R42, R43, R44, R46, R48, L35, picture tube and other associated components.

WIDE BLACK BAR ACROSS PICTURE

Check V1, V3, V4, V5, V6, V7 and V8 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V10, V11, V12 and V13. Check stages V12B and V13 using audio signal generator. Apply audio signal across R72.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF alignment and components.	Check components associated with V12B and V13 especially C84 and T6.

BUZZ

Adjust tuner fine tuning for best picture and sound. Adjust A13 for minimum buzz. If still unsatisfactory, substitute V12. Check C6 and C74 for leakage.

DISTORTED

Follow procedure outlined under "Weak or No Sound".

PARTS LIST & DESCRIPTION

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		PHILCO PART No.	STANDARD REPLACEMENT		
V1A	RF Amplifier	6BZ7	6BZ7	9AJ	
B	RF Amplifier	6BQ7A	6BQ7A	9AJ	
V2	Converter	12AZ7	12AZ7	9A	
V3	1st. Video IF Amp.	6CB6	6CB6	7CM	
V4	2nd. Video IF Amp.	6CB6	6CB6	7CM	
V5	3rd. Video IF Amp.	6CB6	6CB6	7CM	
V6	4th. Video IF Amp.	6CB6	6CB6	7CM	
V7	Video Amplifier-Sync Separator	6U8	6U8	9AE	
V8	Video Output	6AQ5	6AQ5	7BZ	
V9	AGC Keying	6AU6	6AU6	7BK	
V10	Sound IF Amp.	6BA6	6BA6	7BK	
V11	Limiter	6AU6	6AU6	7BK	
V12	Ratio Detector-AF Amp.-AGC Clamper	6T8	6T8	9E	
V13	Audio Output	6V6GT	6V6GT	7S	
V14	Noise Limiter-Noise Inverter	12AU7	12AU7	9A	
V15	Sync Phase Inv.-Vert. Oscillator	12AU7	12AU7	9A	
V16	Vert. Output	12B4	12B4	9AG	
V17	Horiz. AFC	6AL5	6AL5	6BT	
V18	Horiz. Mult.	12AU7	12AU7	9A	
V19	Horiz. Output	6BQ6GT	6BQ6GT	6AM	
V20	Damper	6AX4GT	6AX4GT	4CG	
V21	HV Rectifier	1B3GT	1B3GT	3C	

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA				RETMA BASE TYPE	NOTES
	PHILCO PART No.	SYLVANIA PART No.	GENERAL ELECTRIC PART No.	WESTINGHOUSE PART No.		
V22	21ZP4A	21ZP4A 21ZP4B 21ZP4① 21YP4 ① 21YP4A ①	21ZP4A	21ZP4A	12N 12N 12N 12L 12L	① Circuit changes necessary

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA							NOTES
	CAP.	VOLT	PHILCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	
C1	120	150	30-2568-51	AFHS1-73		XA007		FP140	TVL-1428	
C2	120	150	30-2568-51	AFHS1-73		XA007		FP140	TVL-1428	
C3	10	50	30-2417-3	PRS350/10		BR105		TC32	TVA-1304	
C4A	■100	300	30-2584-27			D117		FP465	TVL-4802	
B	▲10	300						2N531		
C	▲10	475								
D	100	25								
C5A	▲40	300	30-2570-57	AFH4-18		D111		FP476	TVL-4578	
B	▲10	300								
C	10	300								
D	■20	300								
C6	2	50	30-2417-7	E26E6		BBR2-50		TC302	TVA-1301	
C7	2	50	30-2417-7	E26E6		BBR2-50		TC302	TVA-1301	
C8	470		30-1225-18	SI470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C9	470		30-1225-18	SI470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C10	20		62-020309 011	SI20NP0	TCZ-20	TZ13	NP0K-200	ZT-542	5TCC-Q2	
C11	39		62-03940901l	SI39	D6-390	TP28	GP1K-390	UC-5439	5GA-Q39	
C12	1000		30-1245-1	EF-001	MFT-1000				503C-D1	
C13	220		62-122001001	SI220	D6-221	TP39	GP2K-221	UC-5322	5GA-T22	
C14	.5-3		31-6520-3		829-3		3115-01-0R5	CT565A		
C15	680		62-168001001	SI680	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C16	220		62-122001011	SI220	D6-221	TP39	GP2K-221	UC-5322	5GA-T22	
C17	150		30-1238-9	BPD-00015	D6-151	G046	811-151	UC-5315	5GA-T15	
C18	10000		30-1238-2	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C19	.6		311-5050-3							
C20	1.45									
C21	3									
C22	39		62-03940901l	SI39	D6-390	TP28	GP1K-390	UC-5439	5GA-Q39	
C23	.5-3		31-6520-3		829-3		311-01-0R5	CT565A		
C24	1.5		30-1221-8							
C25	12		30-1224-57							
C26	5		30-1224-35	SI5N750	TCN-5	N011	N750K-050		5TCUB-V5	
C27	1000		30-1245-1	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C28	220		62-122001011	SI220	D6-221	TP39	GP2K-221	UC-5322	5GA-T22	
C29	7.5		30-1224-13							
C30	1-5		31-6520-11		829-6		3139-01-10			
C31	680		62-168001021	SI680	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C32	680		62-168001021	SI680	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C33	1000		30-1245-1	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C34	220		62-122001011	SI220	D6-221	TP39	GP2K-221	UC-5322	5GA-T22	
C35	5		30-1224-28	SI5NP0	TCZ-4.7	Z011	NP0-831-050	ZT-555	5TCCB-V47	
C36	1-5		31-6520-9		829-6		3139-01-10			
C37	5		30-1224-28	SI5NP0	TCZ-4.7	Z011	NP0-831-050	ZT-555	5TCCB-V47	
C38	1-5		30-6520-9		829-6		3139-01-10			
C39	1-5		30-6520-9		829-6		3139-01-10			
C40	100		30-1224-18	SI100	D6-101	TP34	GP1K-101	UC-531	5GA-T1	
C41	680		62-168001001	SI680	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C42	1500		62-215001011	SI1500	D6-152	TP54	GP2L-152	UC-5215	5HK-D15	
C43	18		62-018400021	SI18	D6-180	TP12	GP1K-180	UC-5418	5GA-Q18	
C44	1-5		31-6520-9		829-6		3139-01-10			
C45	680		62-168001001	SI680	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C46	680		62-168001001	SI680	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C47	680		62-168001001	SI680	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA PHILCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C48	1-5		31-6520-9		829-6		3139-01-10			
C49	2000			SI2000	D6-202	TP56	GP2-333-202	UC-522	5HK-D2	
C50	2000			SI2000	D6-202	TP56	GP2-333-202	UC-522	5HK-D2	
C51	680		62-168001001	SI680	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C52	680		62-168001001	SI680	D6-681	TP50	GP2K-681	UC-5368	5GA-T68	
C53	1-5		31-6520-9		829-6		3139-01-10			
C54	2000			SI2000	D6-202	TP56	GP2-333-202	UC-522	5HK-D2	
C55	2000			SI2000	D6-202	TP56	GP2-333-202	UC-522	5HK-D2	
C56	1-5		31-6520-9		829-6		3139-01-10			
C57	10		62-010409001	SI10	D6-100	TP09	GP1K-100	UC-541	5GA-Q1	
C58	.015	200		P688-015		CUB6S15			6TM-S15	
C59	68		62-06840901l	SI68	D6-680	TP32	GP1K-680	UC-5468	5GA-Q68	
C60	33		62-033009001	SI33	D6-330	TP27	GP1K-330	UC-5433	5GA-Q33	
C61	.047	200		P288-047	DF-503	CUB4S47		PT4147	2TM-S47	
C62	220	500	60-10225417	1469-00025		22R5T22		MCB240		
C63	.047	400		P488-047	DF-503	CUB4S47		PT4147	4TM-S47	
C64	.1	200		P288-1	DF-104	CUB2P1		PT401	2TM-P1	
C65	.047	200		P288-047	DF-503	CUB4S47		PT4147	2TM-S47	
C66	.01	400		P488-01	D6-103	CUB4S1	GP2-333-103	PT411	4TM-S1	
C67	2.2		30-1221-6	SI2.2NP0	TCZ-2.2	TZ05	NP0K-2R2		5TCCB-V22	
C68	18		62-018400021	SI18NP0	TCZ-18	TZ12	NP0K-180		5TCC-Q18	
C69	1500			SI1500	D6-152	TP54	GP2L-152	UC-5215	5HK-D15	
C70	.0015	400		P688-0015	D6-152	CUB6D15	GP2L-152	PT6215	6TM-D15	
C71	.047	400		P488-047	DF-503	CUB4S47		PT4147	4TM-S47	
C72	56		30-1224-25	SI56	D6-560	TP31	GP1K-560	UC-5456	5GA-Q56	
C73	.0022	400		P688-0022	D6-222	CUB6D22	GP2-333-222	PT6222	6TM-D22	
C74	330		62-133001001	SI330	D6-331	TP43	GP2K-331	UC-5333	5GA-T33	
C75	330		62-133001001	SI330	D6-331	TP43	GP2K-331	UC-5333	5GA-T33	
C76	1500			SI1500	D6-152	TP54	GP2L-152	UC-5215	5HK-D15	
C77	.0022	400		P688-0022	D6-222	CUB6D22	GP2-333-222	PT6222	6TM-D22	
C78	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C79	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C80	.03	400		P688-03		CUB6S3		PT613	6TM-S3	Note 1
C81	5000			BPD-005	DD-502	K080	811-005	DC-521	5HK-D5	
C82	1500			SI1500	D6-152	TP54	GP2L-152	UC-5215	5HK-D15	
C83	.01	400		P488-01	D6-103	CUB4S1	GP2-333-103	PT411	4TM-S1	
C84	.0068	400		P688-0068	D6-682	CUB6D68	GP2-333-682		6TM-D68	
C85	.0068	1000	30-4650-91	P1088-0068		CUB16D68			MB-D68	
C86	10000			BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C87	.01	400		P488-01	D6-103	CUB4S1	GP2-333-103	PT411	4TM-S1	
C88	.1	200		P288-1	DF-104	CUB2P1		PT401	2TM-P1	
C89	.0047	600		P688-0047	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C90	470		30-1225-18	SI470	D6-471	TP46	GP2K-471	UC-5347	5GA-T47	
C91	.047	400		P488-047	DF-503	CUB4S47		PT4147	4TM-S47	
C92	.01	400		P488-01	D6-103	CUB4S1	GP2-333-103	PT411	4TM-S1	
C93	.0022	400		P688-0022	D6-222	CUB6D22	GP2-333-222	PT5222	6TM-D22	
C94	.033	200		P488-033				PT4133		
C95	.047	400		P488-047	DF-503	CUB4S47		PT4147	4TM-S47	
C96	.015	400		P688-015		CUB6S15			6TM-S15	
C97	.22	400		P488-22		CUB4P22		PT4025	4TM-P22	
C98	.1	200		P288-1	DF-104	CUB2P1		PT401	2TM-P1	
C99	.022	400		P488-022	DF-203	CUB4S22		PT4122	4TM-S22	
C100	.047	400		P488-047	DF-503	CUB4S47		PT4147	4TM-S47	
C101	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C102	1000			BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C103	.01	400		P488-01	D6-103	CUB4S1	GP2-333-103	PT411	4TM-S1	
C104	10000		30-1238-2	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C105	1000		30-1238-3	BPD-001	DD-102	K069	801-001	DC-521	5HK-D1	
C106	10000		30-1238-2	BPD-01	DD-103	K082	811-01	DC-511	5HK-S1	
C107	2200	500	60-20225004			1R5D22				
C108	82	500	60-00825317			22R5Q82				
C109	390	500	60-10395417	1469-0004		5R5T39		MCB243	MS-34	
C110	390	500	60-10395417	1469-0004		5R5T39		MCB243	MS-34	
C111	.0047	600		P688-0047	D6-472	CUB6D47	GP2-333-472	PT6247	6TM-D47	
C112	.047	400		P488-047	DF-503	CUB4S47		PT4147	4TM-S47	
C113	.47	200	30-4651-16	P288-47		CUB2P47		PT4047	2TM-P47	
C114	.047	600		P688-047	DF-503	CUB6S47		PT6147	6TM-S47	
C115	.01	400		P488-01	D6-103	CUB4S1	GP2-333-103	PT411	4TM-S1	
C116	68	2000	30-1246-1	HVD30-000068						
C117	.01	600		P688-01		CUB6S1		PT611	6TM-S1	

Note 1. Value may vary from .01MFD to .05MFD. Use same value for replacement.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA PHILCO PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	5 Meg	½	33-5563-44	* QJ-340	RTV-360	SBBT-652-S	UF106L	Tone-Panel
B	2 Meg	½	Not Req.				UR26T95	Volume-tapped at 1 Meg -Rear
C	Switch		Not Req.				US-26	Attach to R1B
R2A	50KΩ	½	33-5563-50	♦ QJ-356	RTV-358	SBB-718	UF54L } †	Horiz. Hold - Panel
B	250KΩ	½	Not Req.				UR254L }	Vert. Hold-Rear
R3A	2500Ω	2	33-5563-51	■ QJ-357	RTV-359		WF252	Contrast-Panel Wire wound
B	100KΩ	½	Not Req.				UR15L	Brightness-Rear
R4A	12, 500Ω	2	33-5546-51	WK-12, 500	A43-15000	††VK-137	R15000L	Width - Wire wound
B	Shaft		Not Req.	Not Req.	FKS-1/4	Not Req.	Not Req.	Attach to R4A
R5A	5 Meg	½	33-5565-31	Q11-141	A47-5Meg-S	AB-87	SU-67	Vert. Linearity
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Not Req.	Attach to R5A
R6A	2.5Meg	½	33-5565-32	Q11-239	A47-2.5Meg-S	AB-83	SU-565	Height
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Not Req.	Attach to R6A
R7A	250KΩ	½	33-5565-17	Q11-130	A47-250K-S	AB-50	SU-46	Horiz. Hold Centering
B	Shaft		Not Req.	RQ	FKS-1/4	AK-1	Not Req.	Attach to R7A

* CONCENTRIKIT EQUIVALENT KIT K-2 BASE ELEMENTS & SHAFTS B12-141 & P1-200 (Panel) B18-139 & R1-216 (Rear) & SWITCH 76-1.

♦ CONCENTRIKIT EQUIVALENT KIT K-2 BASE ELEMENTS & SHAFTS B11-123 & P1-200 (Panel) B11-130 & R1-216 (Rear)

■ CONCENTRIKIT EQUIVALENT KIT K-3 BASE ELEMENTS & SHAFTS W17-111 & P3-131 (Panel) B11-128 & R1-216 (Rear)

† Universal replacement (Mallory exact duplicate Part No. UE966)

†† Add 2500Ω resistor in series with the control.

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA PHILCO PART No.	IRC PART No.	NOTES
R8	1 Meg	½		BTS-1 Meg	
R9	1 Meg	½		BTS-1 Meg	
R10	10KΩ	½		BTS-10K	
R11	1000Ω	½		BTS-1000	
R12	1 Meg 5%	½		BTS-1 Meg 5%	
R13	1 Meg 5%	½		BTS-1 Meg 5%	
R14	1000Ω	½		BTS-1000	
R15	820Ω	½		BTS-820	
R16	4700Ω	½		BTS-4700	
R17	100KΩ	½		BTS-100K	
R18	1000Ω	½		BTS-1000	
R19	10KΩ	½		BTS-10K	
R20	15KΩ	1		BTA-15K	
R21	10Ω	½		BTS-10	
R22	15KΩ	½		BTS-15K	
R23	68Ω	½		BTS-68	
R24	220Ω	½		BTS-220	
R25	47KΩ	½		BTS-47K	
R26	47KΩ	½		BTS-47K	
R27	47KΩ	½		BTS-47K	
R28	68Ω	½		BTS-68	
R29	220Ω	½		BTS-220	
R30	150Ω	½		BTS-150	
R31	220Ω	½		BTS-220	
R32	5600Ω	1	66-2564340	BTA-5600	
R33	15KΩ	½		BTS-15K	
R34	150Ω	½		BTS-150	
R35	220Ω	½		BTS-220	
R36	12KΩ	½		BTS-12K	
R37	3300Ω	½		BTS-3300	
R38	6800Ω	½		BTS-6800	
R39	33Ω	½		BTS-33	
R40	3300Ω	½		BTS-3300	
R41	47KΩ	½		BTS-47K	
R42	4700Ω	½		BTS-4700	
R43	4700Ω	½		BTS-4700	
R44	1. 5Meg	½		BTS-1. 5Meg	
R45	1 Meg	½		BTS-1 Meg	
R46	2500Ω	7	33-1335-93		
R47	3300Ω	½		BTS-3300	
R48	470KΩ	½		BTS-470K	
R49	180KΩ	½		BTS-180K	
R50	22KΩ	½		BTS-22K	
R51	470KΩ	1	66-4474340	BTA-470K	
R52	560KΩ	½		BTS-560K	
R53	47KΩ	½		BTS-47K	
R54	5. 6Meg	½		BTS-5. 6Meg	
R55	10KΩ	½		BTS-10K	
R56	47KΩ	½		BTS-47K	
R57	470KΩ	½		BTS-470K	
R58	10KΩ	½		BTS-10K	
R59	330KΩ	½		BTS-330K	
R60	2200Ω	½		BTS-2200	
R61	1 Meg	½		BTS-1 Meg	
R62	1 Meg	½		BTS-1 Meg	
R63	100Ω	½		BTS-100	
R64	220Ω	½		BTS-220	
R65	100KΩ	½		BTS-100K	
R66	22KΩ	½		BTS-22K	
R67	12KΩ	1	66-3124340	BTA-12K	
R68	270Ω	½		BTS-270	
R69	22KΩ	½		BTS-22K	

* 20 inches of # 24 wire.

TRANSFORME

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	PHILCO PART No.	Stancor PART No.
T1	117VAC @.65A	6.3VAC @9.1A		32-8574-1	P-6308②

① Tape center tap on 6.3 volt winding.
② Drill new mounting holes.

TRANSFORMERS (S

ITEM No.	USE	PHILCO PART No.	Stancor PART No.
T2	Vert. Osc. Trans.	32-8431-8 32-8431-2 ①	A-8126 ②
T3	Horiz. Output Trans.	32-8607	A-8220③④
T4	Vert. Output Trans.	32-8539-1 32-8539 ⑦	A-8147 DY-12⑧⑨
T5A	Yoke-Horiz. (29MH)	32-9648	
B	Yoke-Vert. (40MH)		

① Alternate vertical oscillator transformer.
② Drill one new mounting hole.
③ Connect as in original circuit.
④ Use original mounting plate.
⑤ Connect terminal #8 to terminal #7, then connect original ter original #6 to new # "T", original #1 to new #1. Connect primary AFC and AGC. If picture is out of phase reverse secondary.
⑥ Connect original terminal #5 to new terminal #2, original #2 connect primary of WC-20 across terminals #5 and #6, seconda
⑦ Alternate vertical output transformer.
⑧ Use original yoke network.
⑨ Use original yoke plug and leads connected as in original cir
⑩ Connect original terminal #5 to new terminal #10, original #2 original #7 to new #1. Disconnect one end of C115 and insert R12

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA PHILCO PART No.	REPLACEMENT DATA IRC PART No.	NOTES
R8	1 Meg	1/2		BTS-1 Meg	
R9	1 Meg	1/2		BTS-1 Meg	
R10	10KΩ	1/2		BTS-10K	
R11	1000Ω	1/2		BTS-1000	
R12	1 Meg 5%	1/2		BTS-1 Meg 5%	
R13	1 Meg 5%	1/2		BTS-1 Meg 5%	
R14	1000Ω	1/2		BTS-1000	
R15	820Ω	1/2		BTS-820	
R16	4700Ω	1/2		BTS-4700	
R17	100KΩ	1/2		BTS-100K	
R18	1000Ω	1/2		BTS-1000	
R19	10KΩ	1/2		BTS-10K	
R20	15KΩ	1		BTA-15K	
R21	10Ω	1/2		BTS-10	
R22	15KΩ	1/2		BTS-15K	
R23	68Ω	1/2		BTS-68	
R24	220Ω	1/2		BTS-220	
R25	47KΩ	1/2		BTS-47K	
R26	47KΩ	1/2		BTS-47K	
R27	47KΩ	1/2		BTS-47K	k
R28	68Ω	1/2		BTS-68	
R29	220Ω	1/2		BTS-220	
R30	150Ω	1/2		BTS-150	
R31	220Ω	1/2		BTS-220	
R32	5600Ω	1	66-2564340	BTA-5600	
R33	15KΩ	1/2		BTS-15K	
R34	150Ω	1/2		BTS-150	
R35	220Ω	1/2		BTS-220	
R36	12KΩ	1/2		BTS-12K	
R37	3300Ω	1/2		BTS-3300	
R38	6800Ω	1/2		BTS-6800	
R39	33Ω	1/2		BTS-33	
R40	3300Ω	1/2		BTS-3300	
R41	47KΩ	1/2		BTS-47K	
R42	4700Ω	1/2		BTS-4700	
R43	4700Ω	1/2		BTS-4700	
R44	1. 5Meg	1/2		BTS-1. 5Meg	
R45	1 Meg	1/2		BTS-1 Meg	
R46	2500Ω	7	33-1335-93		
R47	3300Ω	1/2		BTS-3300	
R48	470KΩ	1/2		BTS-470K	
R49	180KΩ	1/2		BTS-180K	
R50	22KΩ	1/2		BTS-22K	
R51	470KΩ	1	66-4474340	BTA-470K	
R52	560KΩ	1/2		BTS-560K	
R53	47KΩ	1/2		BTS-47K	
R54	5. 6Meg	1/2		BTS-5. 6Meg	
R55	10KΩ	1/2		BTS-10K	
R56	47KΩ	1/2		BTS-47K	
R57	470KΩ	1/2		BTS-470K	
R58	10KΩ	1/2		BTS-10K	
R59	330KΩ	1/2		BTS-330K	
R60	2200Ω	1/2		BTS-2200	
R61	1 Meg	1/2		BTS-1 Meg	
R62	1 Meg	1/2		BTS-1 Meg	
R63	100Ω	1/2		BTS-100	
R64	220Ω	1/2		BTS-220	
R65	100KΩ	1/2		BTS-100K	
R66	22KΩ	1/2		BTS-22K	
R67	12KΩ	1	66-3124340	BTA-12K	
R68	270Ω	1/2		BTS-270	
R69	22KΩ	1/2		BTS-22K	
R70	33KΩ	1/2		BTS-33K	
R71	68KΩ	1/2		BTS-68K	
R72	10 Meg	1/2		BTS- 10 Meg	
R73	15KΩ	1/2		BTS-15K	
R74	270KΩ	1/2		BTS-270K	
R75	680KΩ	1/2		BTS-680K	
R76	1. 5 Meg	1/2		BTS-1. 5 Meg	
R77	120Ω	1	66-1124340	BTA-120	
R78	4700Ω	10	33-3446-1		
R79	47KΩ	1/2		BTS-47K	
R80	22Meg	1/2		BTS-22Meg	
R81	3300Ω	1/2		BTS-3300	
R82	47KΩ	1/2		BTS-47K	
R83	220KΩ	1/2		BTS-220K	
R84	470KΩ	1/2		BTS-470K	
R85	33KΩ	1/2		BTS-33K	
R86	68KΩ	1/2		BTS-68K	
R87	2. 7Meg	1/2		BTS-2. 7Meg	
R88	150KΩ	1/2		BTS-150K	
R89	47KΩ	1/2		BTS-47K	
R90	1 Meg	1/2		BTS-1 Meg	
R91	3900Ω	1/2		BTS-3900	
R92	10KΩ	1/2		BTS-10K	
R93	22KΩ	1/2		BTS-22K	
R94	2200Ω	1/2		BTS-2200	
R95	4700Ω	1/2		BTS-4700	
R96	220KΩ	1/2		BTS-220K	
R97	1000Ω	1/2		BTS-1000	
R98	56KΩ	1/2		BTS-56K	
R99	330KΩ	1/2		BTS-330K	
R100	6800Ω	1/2		BTS-6800	
R101	1 Meg	1/2		BTS-1 Meg	
R102	2. 2Meg	1/2		BTS-2. 2Meg	
R103	470Ω	1		BTA-470	
R104	1000Ω	1/2		BTS-1000	
R105	1000Ω	1/2		BTS-1000	
R106	100KΩ	1/2		BTS-100K	
R107	100KΩ	1/2		BTS-100K	
R108	4. 7Meg	1/2		BTS-4. 7Meg	
R109	15KΩ	1/2		BTS-15K	
R110	4. 7Meg	1/2		BTS-4. 7Meg	
R111	1200Ω	1/2		BTS-1200	
R112	15KΩ	1/2		BTS-15K	
R113	56KΩ	1/2		BTS-56K	
R114	47KΩ	1/2		BTS-47K	
R115	10KΩ	1/2		BTS-10K	
R116	10KΩ	1/2		BTS-10K	
R117	47KΩ	1	66-3474340	BTA-47K	
R118	1 Meg	1/2		BTS-1 Meg	
R119	1 Meg	1/2		BTS-1 Meg	
R120	4200Ω	5	33-1335-101		
R121	82KΩ	1	66-3824340	BTA-82K	
R122	47KΩ	1	66-3474340	BTA-47K	
R123	6800Ω	1/2		BTS-6800	
R124	27KΩ	1/2		BTS-27K	
R125	470Ω	1/2		BTS-470	
R126	4. 7Ω	1	66-9474340		
R127	5Ω	10	33-3448-5	1 3/4A-5	
R128	47KΩ	1/2	66-3474340	BTS-47K	
R129	*				
R130	15KΩ	1		BTA-15K	
R131	10Ω	1/2		BTS-10	
R132	10Ω	1/2		BTS-10	
R133	20Ω	5			
R134	2000Ω	7			

* 20 inches of # 24 wire.

TRANSFORMER (FILAMENT)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA PHILCO PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	RCA TYPE No.	Halldorson PART No.	Thordarson PART No.
T1	117VAC @.65A	6.3VAC @9.1A		32-8574-1	P-6308 ②	P-2948 ①	F-21A ①			

① Tape center tap on 6.3 volt winding.
② Drill new mounting holes.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA PHILCO PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	RCA TYPE No.	Halldorson PART No.	Thordarson PART No.
T2	Vert. Osc. Trans.	32-8431-8 32-8431-2 ①	A-8126 ②	A-3004		232T1 ⑩		
T3	Horiz. Output Trans.	32-8607	A-8220 ③④		D-24 & WC-11 ⑤			FLY-8 & WC-20 ⑥
T4	Vert. Output Trans.	32-8539-1 32-8539 ⑦	A-8147 DY-12 ⑧⑨	MDF-71 ⑧ ⑨	Y-24 ⑧⑨		DF604 ⑧⑨	
T5A B	Yoke-Horiz. (29MH) Yoke-Vert. (40MH)	32-9648						

① Alternate vertical oscillator transformer.
② Drill one new mounting hole.
③ Connect as in original circuit.
④ Use original mounting plate.
⑤ Connect terminal #8 to terminal #7, then connect original terminal #5 to new terminal #9, original 2 to new #5, original #6 to new # "T", original #1 to new #1. Connect primary of WC-11 across terminals #1 and #3. Secondary to AFC and AGC. If picture is out of phase reverse secondary.
⑥ Connect original terminal #5 to new terminal #2, original #2 to new #8, original #6 to new #7, original #1 to new #5, connect primary of WC-20 across terminals #5 and #6, secondary to AFC and AGC. If picture is out ph ase, reverse secondary.
⑦ Alternate vertical output transformer.
⑧ Use original yoke network.
⑨ Use original yoke plug and leads connected as in original circuit.
⑩ Connect original terminal #5 to new terminal #10, original #2 to new #9, original #1 to new #3, original #8 to new #2, original #7 to new #1. Disconnect one end of C115 and insert R124 in series with it.

TIONS (Continued)

RATING OHMS	RATING WATT	REPLACEMENT DATA PHILCO PART No.	REPLACEMENT DATA IRC PART No.	NOTES
33KΩ	1/2		BTS-33K	
68KΩ	1/2		BTS-68K	
10 Meg	1/2		BTS- 10 Meg	
15KΩ	1/2		BTS-15K	
270KΩ	1/2		BTS-270K	
680KΩ	1/2		BTS-680K	
1. 5 Meg	1/2		BTS-1. 5 Meg	
120Ω	1	66-1124340	BTA-120	
4700Ω	10	33-3446-1		
47KΩ	1/2		BTS-47K	
22Meg	1/2		BTS-22Meg	
3300Ω	1/2		BTS-3300	
47KΩ	1/2		BTS-47K	
220KΩ	1/2		BTS-220K	
470KΩ	1/2		BTS-470K	
33KΩ	1/2		BTS-33K	
68KΩ	1/2		BTS-68K	
2. 7Meg	1/2		BTS-2. 7Meg	
150KΩ	1/2		BTS-150K	
47KΩ	1/2		BTS-47K	
1 Meg	1/2		BTS-1 Meg	
3900Ω	1/2		BTS-3900	
10KΩ	1/2		BTS-10K	
22KΩ	1/2		BTS-22K	
2200Ω	1/2		BTS-2200	
4700Ω	1/2		BTS-4700	
220KΩ	1/2		BTS-220K	
1000Ω	1/2		BTS-1000	
56KΩ	1/2		BTS-56K	
330KΩ	1/2		BTS-330K	
6800Ω	1/2		BTS-6800	
1 Meg	1/2		BTS-1 Meg	
2. 2Meg	1/2		BTS-2. 2Meg	
470Ω	1		BTA-470	
1000Ω	1/2		BTS-1000	
1000Ω	1/2		BTS-1000	
100KΩ	1/2		BTS-100K	
100KΩ	1/2		BTS-100K	
4. 7Meg	1/2		BTS-4. 7Meg	
15KΩ	1/2		BTS-15K	
4. 7Meg	1/2		BTS-4. 7Meg	
1200Ω	1/2		BTS-1200	
15KΩ	1/2		BTS-15K	
56KΩ	1/2		BTS-56K	
47KΩ	1/2		BTS-47K	
10KΩ	1/2		BTS-10K	
10KΩ	1/2		BTS-10K	
47KΩ	1	66-3474340	BTA-47K	
1 Meg	1/2		BTS-1 Meg	
1 Meg	1/2		BTS-1 Meg	
4200Ω	5	33-1335-101		
82KΩ	1	66-3824340	BTA-82K	
47KΩ	1	66-3474340	BTA-47K	
6800Ω	1/2		BTS-6800	
27KΩ	1/2		BTS-27K	
470Ω	1/2		BTS-470	
4. 7Ω	1	66-9474340		
5Ω	10	33-3448-5	1 3/4A-5	
47KΩ *	1/2	66-3474340	BTS-47K	
15KΩ	1		BTA-15K	
10Ω	1/2		BTS-10	
10Ω	1/2		BTS-10	
20Ω	5			
2000Ω	7			

(FILAMENT)

REPLACEMENT DATA erit T No.	Triad PART No.	RCA TYPE No.	Halldorson PART No.	Thordarson PART No.
948①	F-21A ①			

P CIRCUITS)

REPLACEMENT DATA erit T No.	Triad PART No.	RCA TYPE No.	Halldorson PART No.	Thordarson PART No.
04		232T1 ⑩		
	D-24 & WC-11 ⑤			FLY-8 & WC-20⑥
-71⑧ ⑨	Y-24⑧⑨		DF604⑧⑨	

5 to new terminal #9, original 2 to new #5,
-11 across terminals #1 and #3. Secondary to

#8, original #6 to new #7, original #1 to new #5,
FC and AGC. If picture is out ph ase, reverse secondary.

#9, original #1 to new #3, original #8 to new #2,
ies with it.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA PHILCO PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.	NOTES
T6	4.2KΩ	3.4Ω	32-8582	A-3849	A-3019	S-5X①	Z1002		① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V. C. IMP.	REPLACEMENT DATA PHILCO PART No.	JENSEN PART No.	QUAM PART No.	NOTES
SP1	6"	PM	3.4Ω	36-1641-16	ST-108 Mod. P6-X	6A21	

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA PHILCO PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Ant. Trans.	. 7Ω	. 7Ω	32-4432-3				
L2	Ant. Trans.	. 7Ω	. 7Ω	32-4432-3				
L3	IF Trap	0Ω		32-4552-1				Wound on 22MMF capacitor
L4	FM Trap	0Ω		32-4550-3				
L5	UHF IF Input Coil	0Ω		312-5146-19				
L6	UHF IF Input Coil	0Ω		312-5146-16				
L7	Ant. Coils	0Ω		76-7610				Includes switch wafer with coils
L8	Fil. Choke	0Ω		32-4550-1				
L9	IF Trap	. 1Ω		32-4548-13				
L10	Neutr. Coil	0Ω		312-5146-22				
L11	RF Coils	0Ω		76-7608				Includes switch wafer with coils
L12	Mixer grid coils	0Ω		76-7606				Includes switch wafer with coils
L13	Fil. Choke	0Ω		32-4550-1				
L14	Osc. Coils	0Ω		76-8604				Includes switch wafer with coils
L15	Feedback Coil	. 9Ω		32-4551-1				
L16	RF Choke	0Ω		312-5146-8				
L17	RF Choke	. 3Ω		312-5151-6				Wound on 12KΩ resistor
L18	IF Coupling Trans.	0Ω	0Ω	32-4599-2	17-4524 *			
L19	47. 25MC Trap	. 1Ω		32-4597-2	19-1000		4604	1. 2Microhenries
L20	41. 25MC Trap	. 6Ω		32-4112-31	19-1001		4604	1. 62Microhenries
L21	IF Coupling	. 1Ω		32-4597-3	19-3001	TV-189	6175	. 84 Microhenry
L22	Fil. Choke	. 1Ω		32-4112-15	19-3001	TV-189	4606	2. 9 Microhenries
L23	1st Video IF	. 1Ω	. 1Ω	32-4598-5	20-1045		6219	
L24	Fil. Choke	. 1Ω		32-4112-15	19-3001	TV-189	4606	2. 9 Microhenries
L25	2nd Video IF	. 1Ω	. 1Ω	32-4598-3	17-4523		6219	
L26	3rd Video IF	. 1Ω	. 1Ω	32-4548-26	17-4523		6219	
L27	4th Video IF	. 1Ω	. 1Ω	32-4548-27	17-4523		6219	
L28	Series Peak. Coil	8. 2Ω		32-4422-27	19-1005		4612	10 Microhenries; IRC Part # CL-1
L29	Series Peak. Coil	. 4Ω		32-4480-17	19-1002		4606	3 Microhenries
L30	Shunt Peak. Coil	4. 8Ω		32-4480-9	19-3180	TV-184	6180	180 Microhenries
L31	Series Peak. Coil	6Ω		32-4480-18	19-3160	TV-184	4644	150 Microhenries
L32	4. 5MC Trap	1. 7Ω		32-4463-2	20-1004	TV-151	1470	
L33	Variable Shunt Peaking Coil	6. 5Ω		32-4467-20				60-230 Microhenries
L34	Variable Shunt Peaking Coil	7Ω		32-4467-19				60-230 Microhenries
L35	Series Peak. Coil	2. 1Ω		32-4480-1	19-3036	TV-180	6176	40 Microhenries
L36	1st Sound IF	4. 2Ω		32-4463-9	17-3400	TV-151	1469	
L37	2nd Sound IF	2Ω	2Ω	32-4497A	16-3445	TV-113	6203	
L38	Ratio Det.	5. 5Ω	. 8ΩCT	32-4450-6A	17-3497	TV-115	6205	Tertiary winding= . 8Ω
L39	Fil. Choke	. 1Ω		32-4112-15	19-3007	TV-189	4606	2. 9 Microhenries
L40	Horiz. Osc.	170Ω		32-4557	19-1576	TV-163	6210	
L41	RF Choke	1. 8Ω			19-1005		4624	15 Microhenries; Part of T3
L42	RF Choke	1. 8Ω		32-4112-24	19-1005		4612	11. 4 Microhenries
L43	RF Choke	1. 8Ω		32-4112-24	19-1005		4612	11. 4 Microhenries

* Drill mounting hole.

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ∿)	REPLACEMENT DATA PHILCO PART No.	Stancor PART No.	Merit PART No.	Triad PART No.	Halldorson PART No.	Thordarson PART No.
L44	.246ADC	37Ω	1 Hy.	Part of Spkr.	C-2326①	C-2996①	C-23X ①	C5037①	

① Drill one new mounting hole.

PARTS LIST AND DESCRIPTIONS (Continued)

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA					NOTES
	CURRENT	PHILCO PART No.	SELETRON PART No.	FEDERAL PART No.	MALLORY PART No.	SARKES TARZIAN PART No.	
M1	.280ADC	34-8003-7	5QS1	1023	6S350A	350A	
M2	.280ADC	34-8003-7	5QS1	1023	6S350A	350A	

FUSES

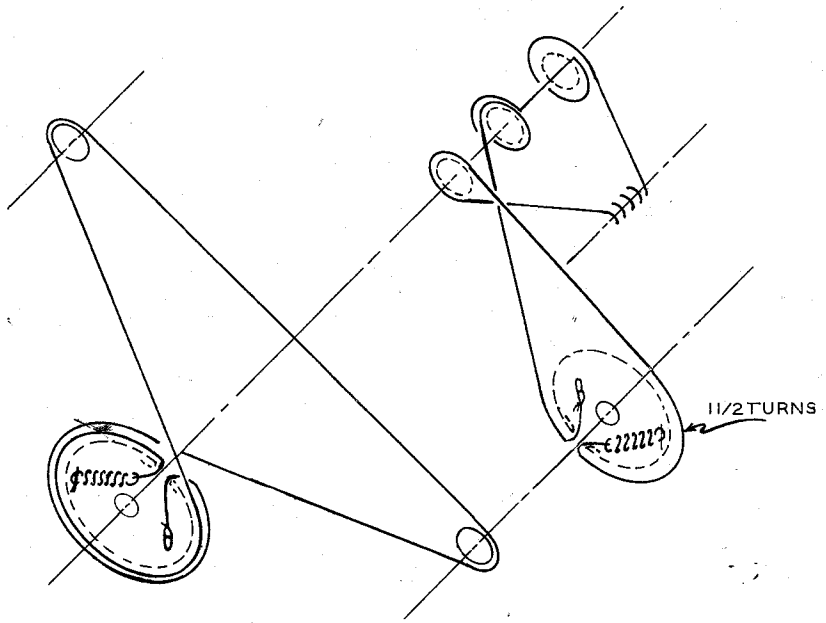
ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			PHILCO PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M3	3AG S/B P/T	1.6A 125V	45-2656-23		31501.6 (3AG S/B P/T 1.6A)		MDV 1 6/10	
M4			Piece of #26 Wire 1" long.					

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		PHILCO PART No.	SYLVANIA PART No.	FEDERAL PART No.	
M5	1N64	34-8022	1N132	1N64A	Video detector
M6		34-8026	1N82 or A		UHF Mixer

MISCELLANEOUS

ITEM No.	PART NAME	PHILCO PART No.	NOTES
M7	Dial Light	34-2068	VHF (Two added for UHF) #47 bayonet
M8	Tuner	43-6701	UHF adaptor UT20B
M9	Tuner	76-7600-3	VHF
M10	Switch	42-1996-6	UHF-VHF changeover
M11	Focus Magnet	76-6126-4	Includes centering device
M12	Ion Trap	76-6077-2	
M13	Correction Magnet		2 used
	Cabinet	10979-9 or-10	18B3104 & 18BU3104
	Cabinet	11015	22B4008, 22BU4008
	Cabinet	10993 or -1	22B4110, 22BU4110
	Cabinet	10993-2	22B4110L, 22BU4110L
	Cabinet	11016	22B4308, 22BU4308
	Cabinet	10997 or -1	22BU4108, 22B4108
	Knob	76-8457	Brightness and vertical hold
	Knob	76-8455	Channel Selector
	Knob	76-6048-5	Contrast and horizontal hold
	Knob	76-8456	Fine tuning
	Knob	76-6213-4	Tone
	Knob	76-8459	Off/on/volume
	Knob	76-8457-3	Brightness and vertical hold } For light finish cabinets
	Knob	76-8455-4	Channel Selector
	Knob	76-6048-6	Contrast and horizontal hold
	Knob	76-8459-1	Off/on/volume
	Knob	76-8508	UHF Selector
	Knob	54-8993	UHF dial background
	Safety glass	54-7943-57	3104 Models
	Safety glass	54-7943-62	4008 Models
	Safety glass	54-7943-56	4108 and 4308 Models
	Safety glass	54-7943-69	4110 Models



UHF DRIVE CORD STRINGING

TROUBLE SHOOTING AIDS (cont)

POWER

DEAD SET

If filaments fail to light, check fuse M4, AC interlock assembly, switch on volume control and T1. If filaments light, check M1, M2, M3, C1, C2, C4A and other associated components.

SMALL AND/OR DIM PICTURE

Measure B+ at 240V point.

If Satisfactory	If Unsatisfactory
Proceed as outlined under "Insufficient High Voltage".	Check M1, M2, C1, C2, C4A and other associated components.

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V18, V19, V20 and V21. Check waveform W18.

If Satisfactory	If Unsatisfactory
Check R126, T3, T5A, C112, R120, R4 and other associated components.	Check R119, R114, R111, C109, C111 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V18, V19, V20 and V21. Check picture tube. Proceed as outlined under "Loss of High Voltage".

BLOOMING

Check by substitution V18, V19, V20 and V21. Check R126, T3, T5A, C112, R120, R4 and other associated circuit components.

GENERAL

RASTER SOUND NO PICTURE

Follow procedure outlined under "Loss of Video".

RASTER PICTURE NO SOUND

Follow procedure outlined under "Weak or No Sound".

RASTER NO SOUND NO PICTURE

Check by substitution V1, V2, V3, V4, V5, and V6. Check video detector assembly. Check video IF and tuner components.

NO RASTER NO SOUND

Follow procedure outlined under "Dead Set".

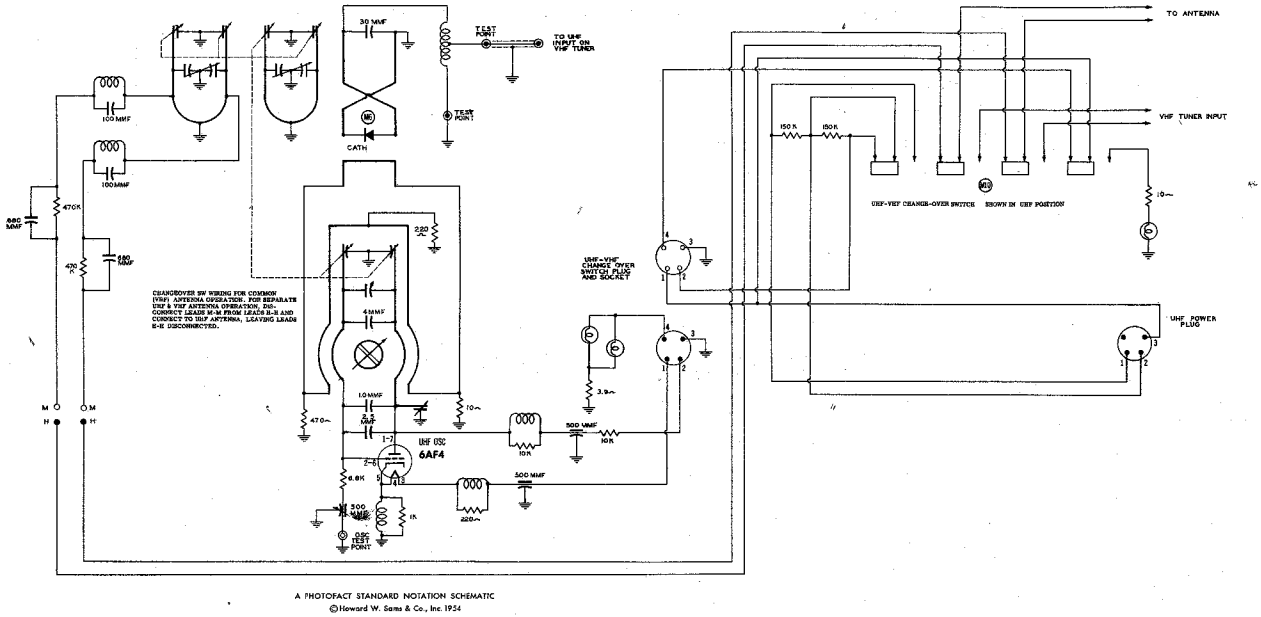
KEYSTONE EFFECT

Check T5, C116, R124, R104, and R105.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.



A PHOTOFACT STANDARD NOTATION SCHEMATIC

UHF TUNER SCHEMATIC

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removing the channel selector and fine tuning knobs.

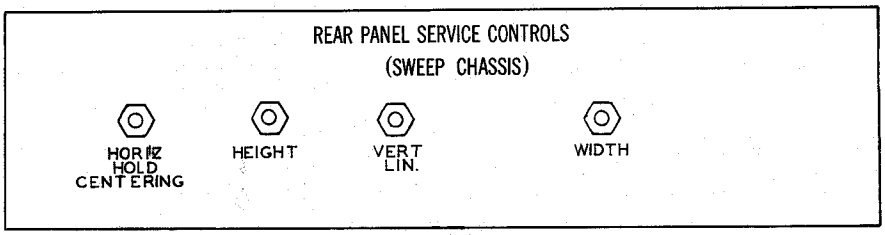
PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass remove 3 wood screws holding wood strip at bottom of safety glass. Remove wood strip and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary tor remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION



HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horizontal oscillator circuit can be made from the rear panel of the chassis. Set the horizontal hold control at the mid-position of its range and adjust the horizontal hold centering control until picture synchronizes horizontally. If results are unsatisfactory, see horizontal sweep circuit adjustments on page 11.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (L38) located on top of chassis. (See tube placement chart).

FUSES

Two fuses are used. One for LV power supply protection and one for filament protection. (For location, see tube placement chart).

CENTERING

Centering is accomplished mechanically by means of a centering lever on the PM focusing assembly. Adjust the centering lever from side to side and up and down until the picture is properly centered.

BUILT-IN ANTENNA TUNING

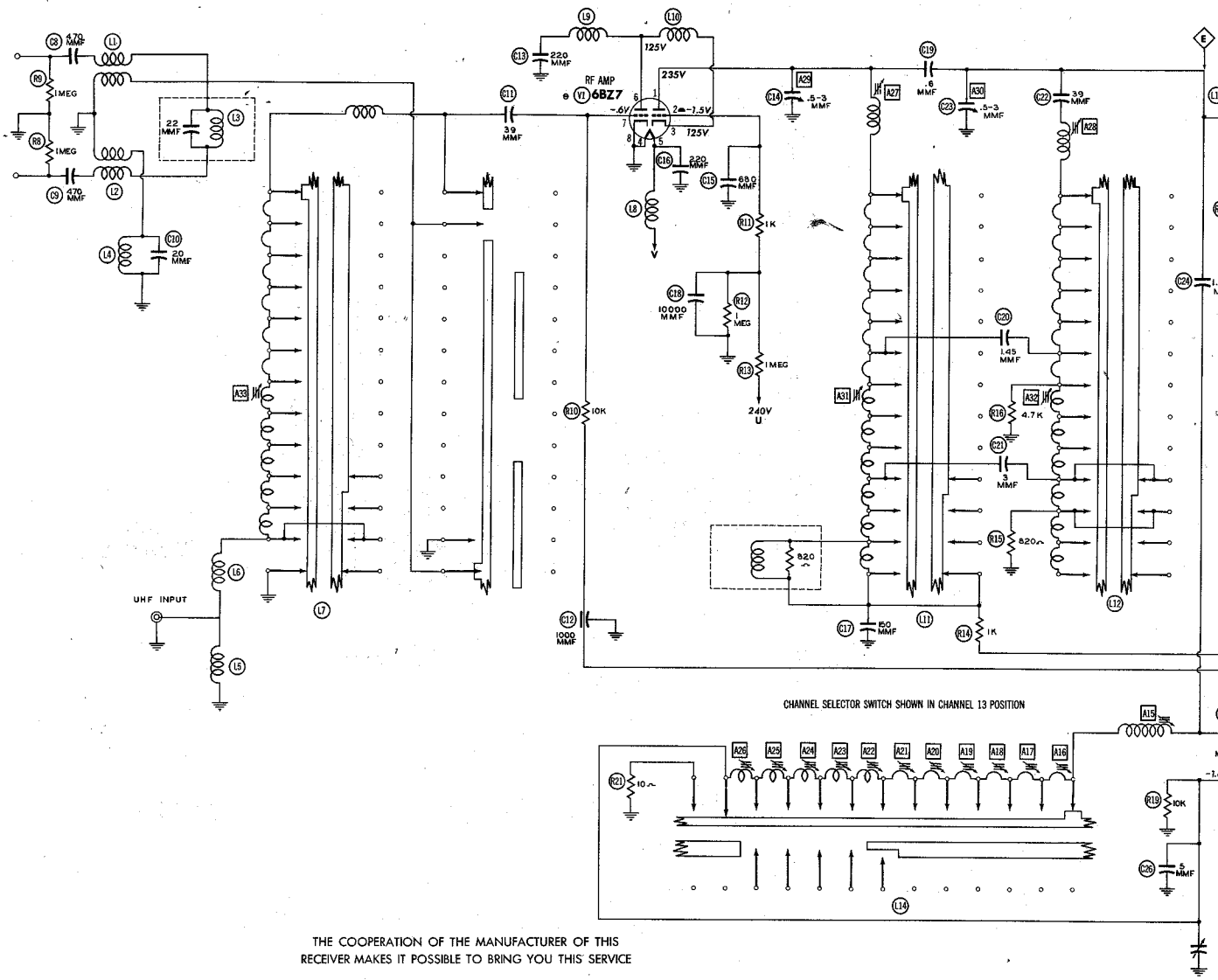
The built-in antenna can be adjusted from top rear of cabinet. Adjust for a picture of maximum contrast and minimum ghost.

ANTI-PIN CUSHION ADJUSTMENTS

Reduce the picture size so that the sides of the raster are visible, and position the magnets so that all sides are straight lines and the coreners are at right angles.

DISASSEMBLY INSTRUCTIONS

1. Remove 9 push on type control knobs from front panel.
2. Disconnect built-in antenna and transmission line.
3. Remove 10 wood screws. Remove rear cover.
4. Disconnect speaker plug, CRT socket, HV plug, inter-chassis plugs and yoke plug.
5. Remove 4 chassis bolts from each chassis. Remove both chassis.
6. Remove 4 speaker nuts. Remove speaker.



THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

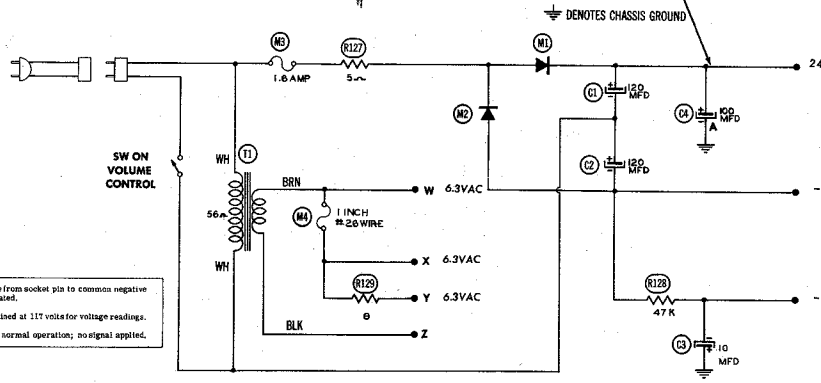
- MEASURED FROM PIN 3 OF V1
- MEASURED FROM 125V LINE
- SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DOTTED IN PARTS ARE NOT USED IN ALL MODELS. WHEN DOTTED IN PARTS ARE USED POINTS MARKED X ARE BROKEN.

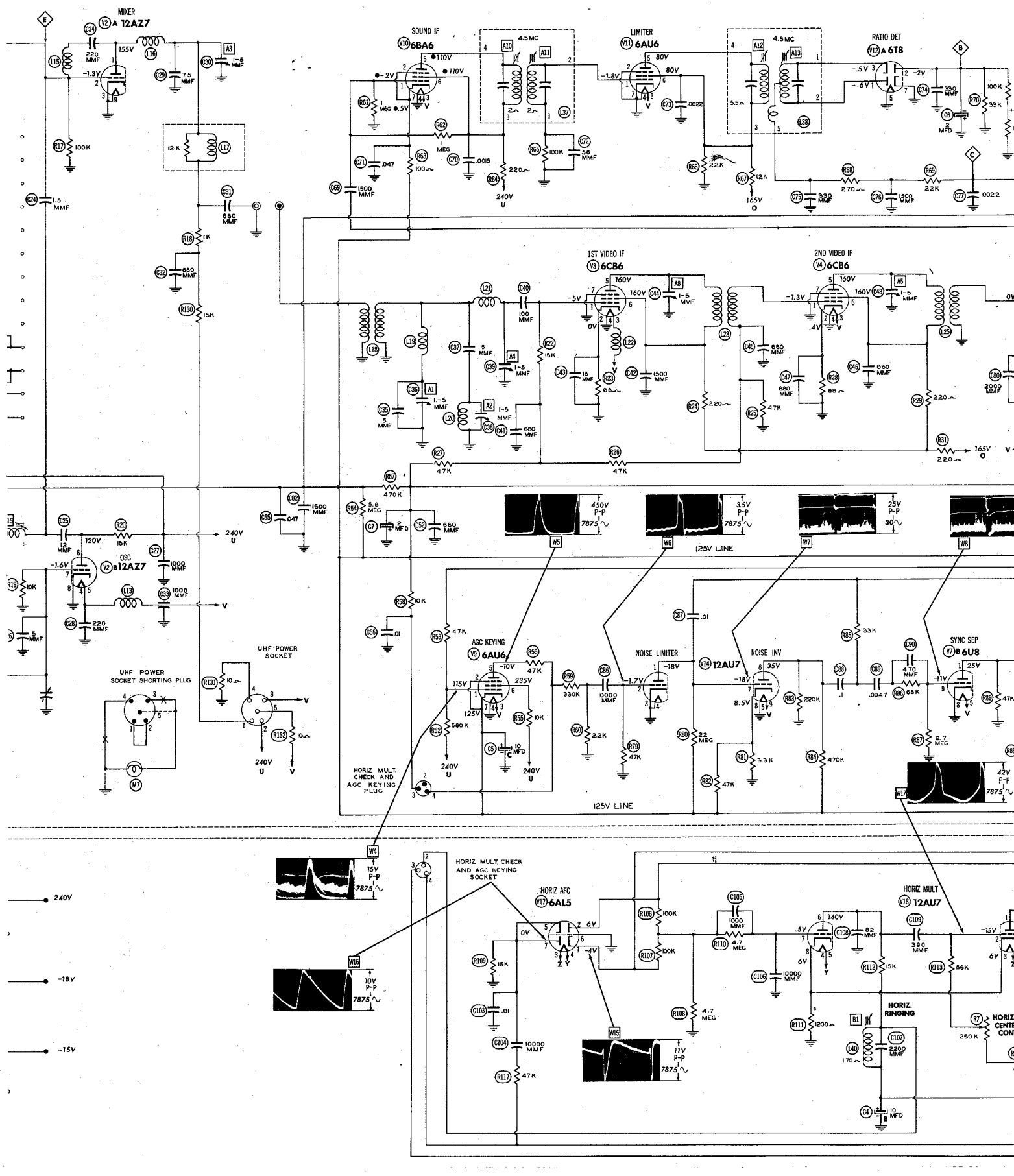
DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM. (SEE PARTS LIST)

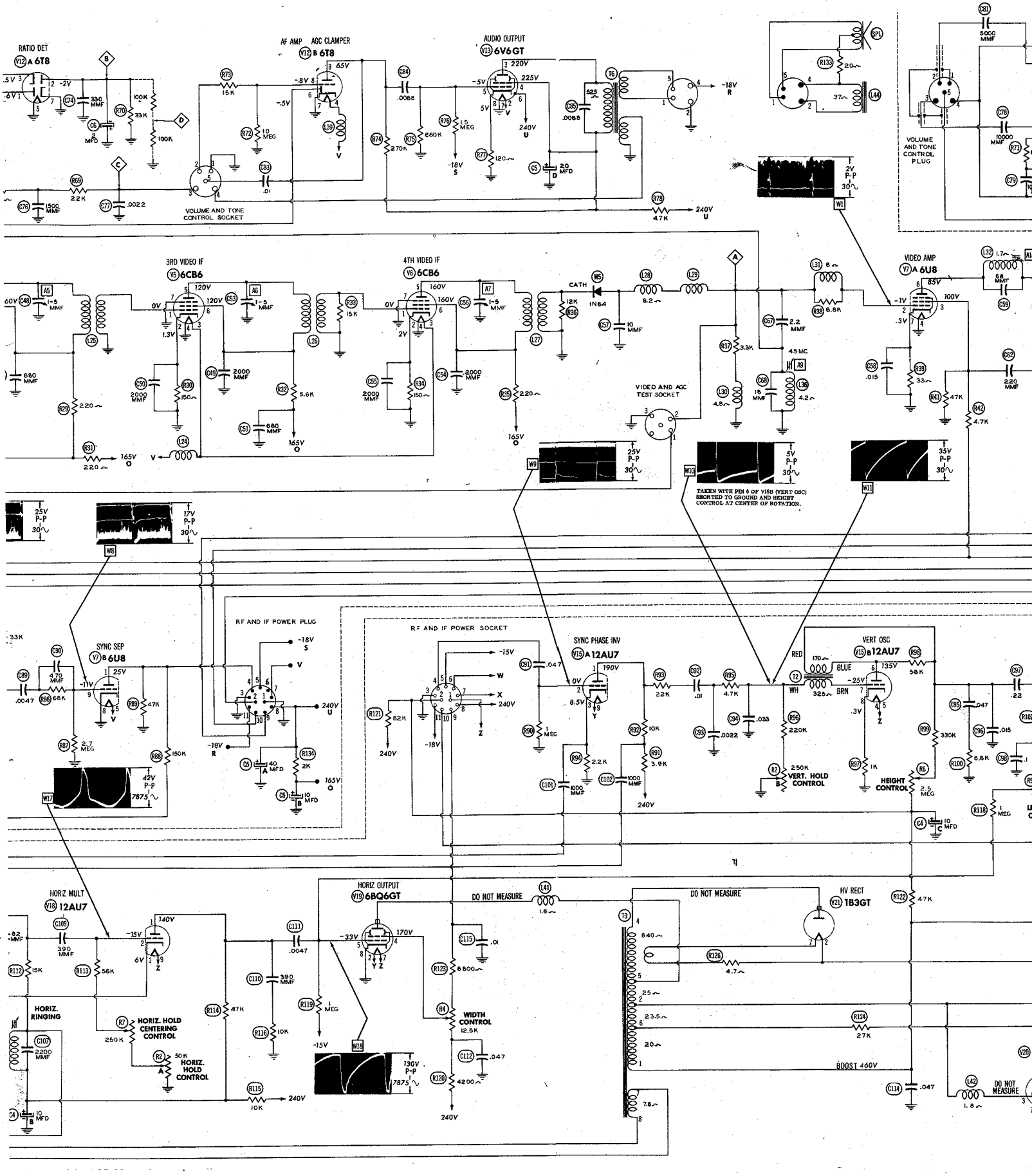
WAVE FORMS TAKEN WITH CONTROLS SET TO PRODUCE 50 VOLTS PEAK-TO-PEAK SIGNAL AT PICTURE TUBE

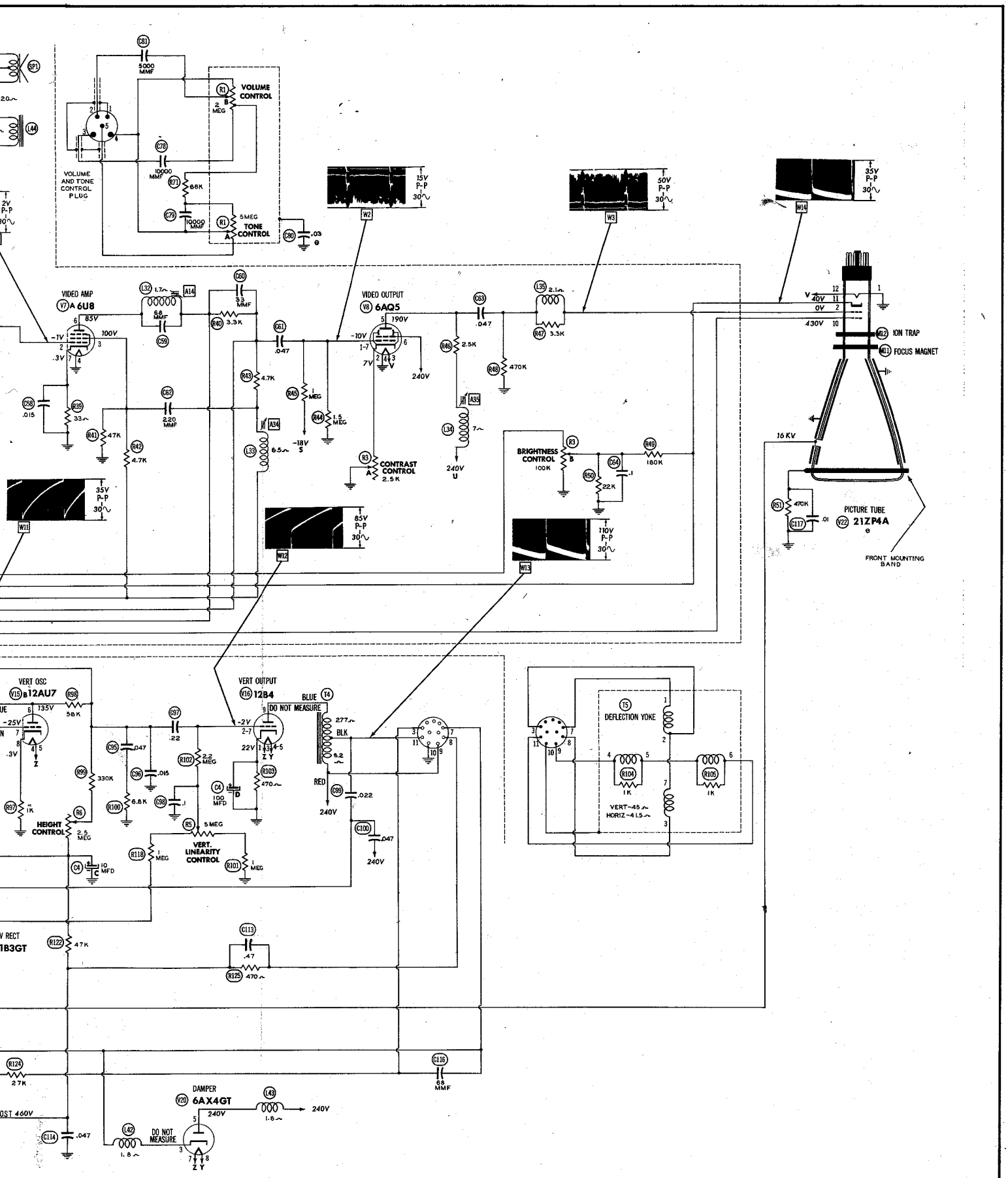
1. DC voltage measurements taken with vacuum tube voltmeter; AC voltage measured at 1,000 ohms per volt.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. All controls set for normal operation; no signal applied.



A PHOTOFACT STANDARD NOTATION SCHEMATIC


MIXER
V2A 12AZ7
SOUND IF
V10 6BA6
4.5MC
LIMITER
V11 6AU6
RATIO DET
V12A 6T8
1ST VIDEO IF
V3 6CB6
2ND VIDEO IF
V4 6CB6
OSC
V2B 12AZ7
240V U
125V LINE
AGC KEYING
V9 6AU6
NOISE LIMITER
V14 12AU7
NOISE INV
SYNC SEP
V7B 6U8
UHF POWER SOCKET
UHF POWER SOCKET SHORTING PLUG
HORIZ MULT. CHECK AND AGC KEYING PLUG
HORIZ MULT CHECK AND AGC KEYING SOCKET
HORIZ AFC
V17 6AL5
HORIZ MULT
V18 12AU7
HORIZ. RINGING
240V
-18V
-15V


RATIO DET
V12A 6T8
AF AMP AGC CLAMPER
V12B 6T8
AUDIO OUTPUT
V13 6V6GT
VOLUME AND TONE CONTROL SOCKET
VOLUME AND TONE CONTROL PLUG
3RD VIDEO IF
V5 6CB6
4TH VIDEO IF
V6 6CB6
CATH
IN64
VIDEO AMP
V7A 6U8
VIDEO AND AGC TEST SOCKET
TAKEN WITH PIN 6 OF V15B (VERT OSC) SHORTED TO GROUND AND HEIGHT CONTROL AT CENTER OF ROTATION.
RF AND IF POWER PLUG
RF AND IF POWER SOCKET
SYNC SEP
V7B 6U8
SYNC PHASE INV
V15A 12AU7
VERT OSC
V15B 12AU7
VERT. HOLD CONTROL
HEIGHT CONTROL
HORIZ MULT
V18 12AU7
HORIZ. RINGING
HORIZ. HOLD CENTERING CONTROL
HORIZ. HOLD CONTROL
HORIZ OUTPUT
V19 6BQ6GT
WIDTH CONTROL
DO NOT MEASURE
HV RECT
V21 1B3GT
BOOST 460V

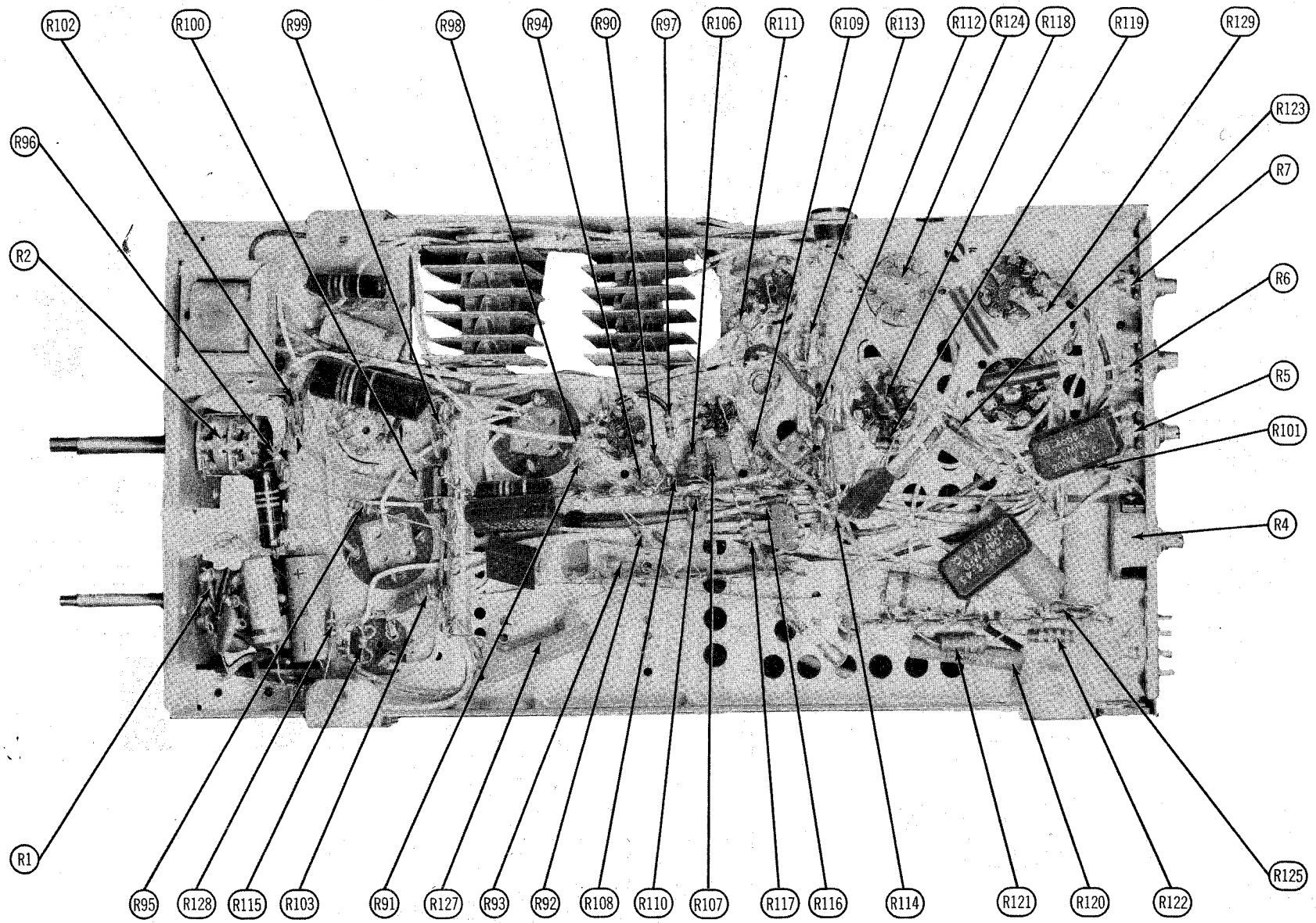


PHILCO MODELS 18B3104, 18BU3104, 22B4008, 22BU4008, 22B4009, 22BU4009, 22B4108, 22BU4108, 22B4110, L, 22BU4110, L, 22B4308, 22BU4308 (Ch. D-201 & R-201) (Code 150)

PHILCO MODELS 18B3104, 18BU3104, 22B4008, 22BU4008, 22B4009, 22BU4009, 22B4108, 22BU4108, 22B4110, L, 22BU4110, L, 22B4308, 22BU4308 (Ch. D-201 & R-201) (Code 150)

RF-IF CHASSIS-BOTTOM VIEW- INDUCTOR AND ALIGNMENT IDENTIFICATION

RF-IF CHASSIS-BOTTOM VIEW-RESISTOR IDENTIFICATION



SWEEP CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION