

VOLUME CONTROL
ON-OFF SWITCH

HORIZ.
VERT.
HOLD

CONTRAST
BRIGHTNESS

CHANNEL
SELECTOR
FINE TUNING

PACKARD - BELL MODEL 2293-TV

TRADE NAME	Packard-Bell Models 2291-TV, 2292-TV, 2293-TV, 2294-TV, 2295-TV, 2296-TV, 2297-TV Standard, 2297-TV Deluxe, 2298-TV.		
MANUFACTURER	Packard-Bell Co., 3443 Wilshire Blvd., Los Angeles, Calif.		
TYPE SET	Television Receiver		
TUBES	Twenty Two		
POWER SUPPLY	110-120 Volts AC - 60Cycle	RATING	2Amp. at 117 Volts AC
TUNING RANGE	Channels 2 thru 13		

INDEX

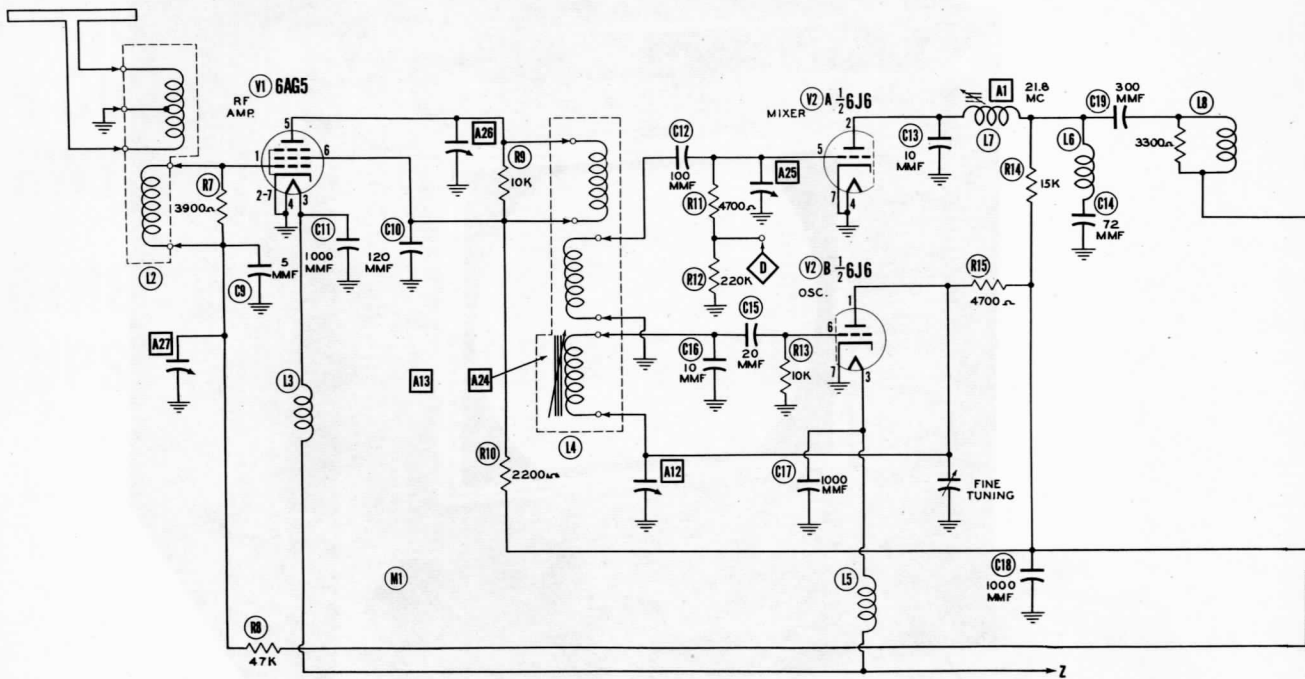
Alignment Instructions	6, 7	Photographs (continued)	
Block Diagram	13	RF Tuner	10
Horiz. Sweep Circuit Adj.	7	Resistor Identification	12, 17
Parts List and Description	14, 15, 16	Trans., Inductor and Alignment Identification	4, 9
Photographs		Schematic	2
Cabinet-Rear View	13	Tube Placement Chart	5
Capacitor Identification	11, 18	Voltage and Resistance Measurements	8
Chassis-Top View	3		

PACKARD-BELL MODELS 2291-TV, 2292-TV, 2293-TV,
2294-TV, 2295-TV, 2296-TV, 2297-TV, 2298-TV

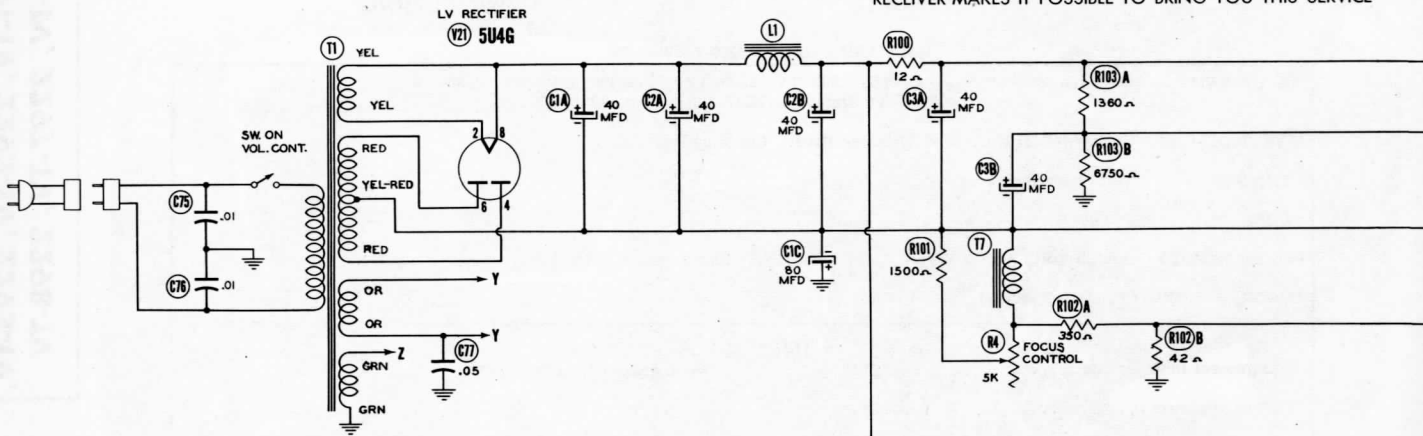
HOWARD W. SAMS & CO., INC. • Indianapolis 1, Indiana

"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed."
"Reproduction or use, without express permission, of editorial or pictorial con-

tent, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1950 by Howard W. Sams & Co., Inc., Indianapolis 1, Indiana, U. S. of America. Copyright under International Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America



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



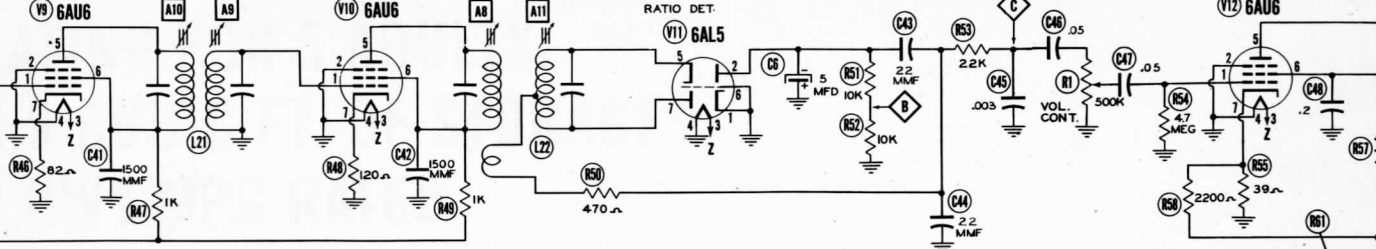
A PHOTOFAC STANDARD NOTATION SCHEMATIC
© Howard W. Sams & Co., Inc. 1950

1ST. SOUND IF AMP

2ND. SOUND IF AMP

RATIO DET.

AF AMP



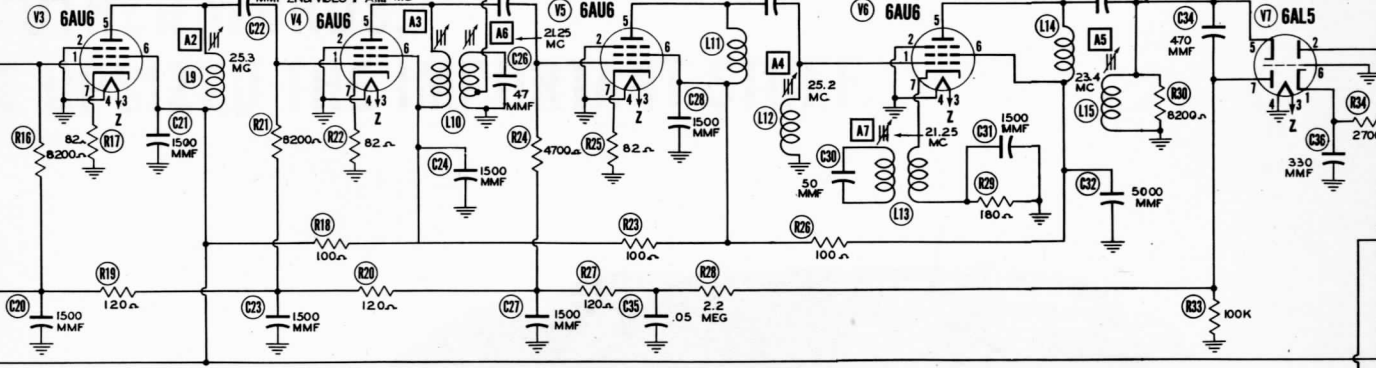
1ST VIDEO IF AMP

2ND VIDEO F AMP

3RD VIDEO IF AMP

4TH VIDEO IF AMP

VIDEO DET. - AGC RE



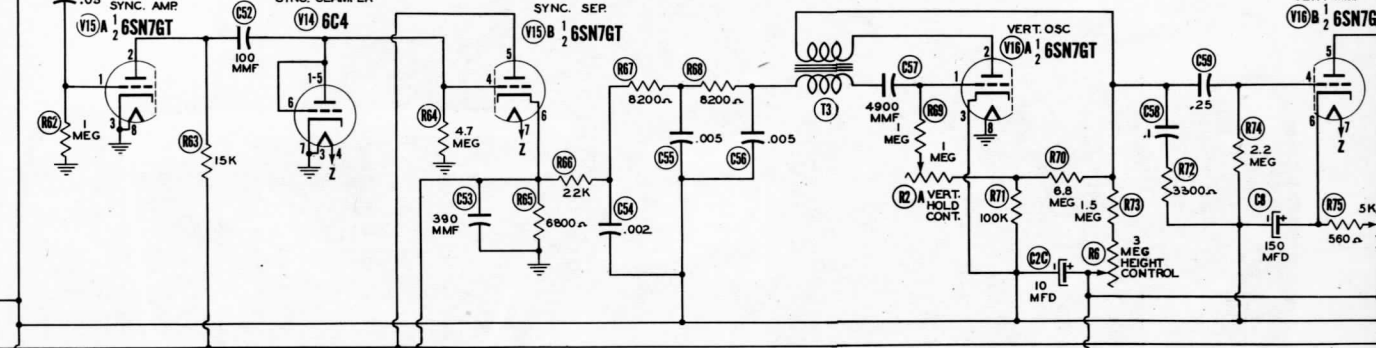
.05 SYNC. AMP

SYNC. CLAMPER

SYNC. SEP

VERT. OSC

VERT. AMP

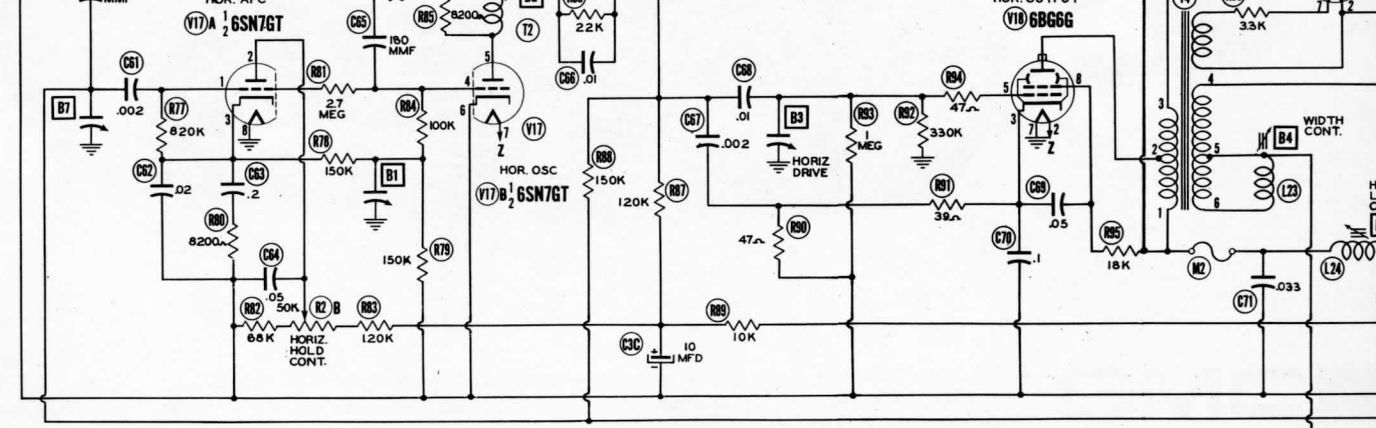


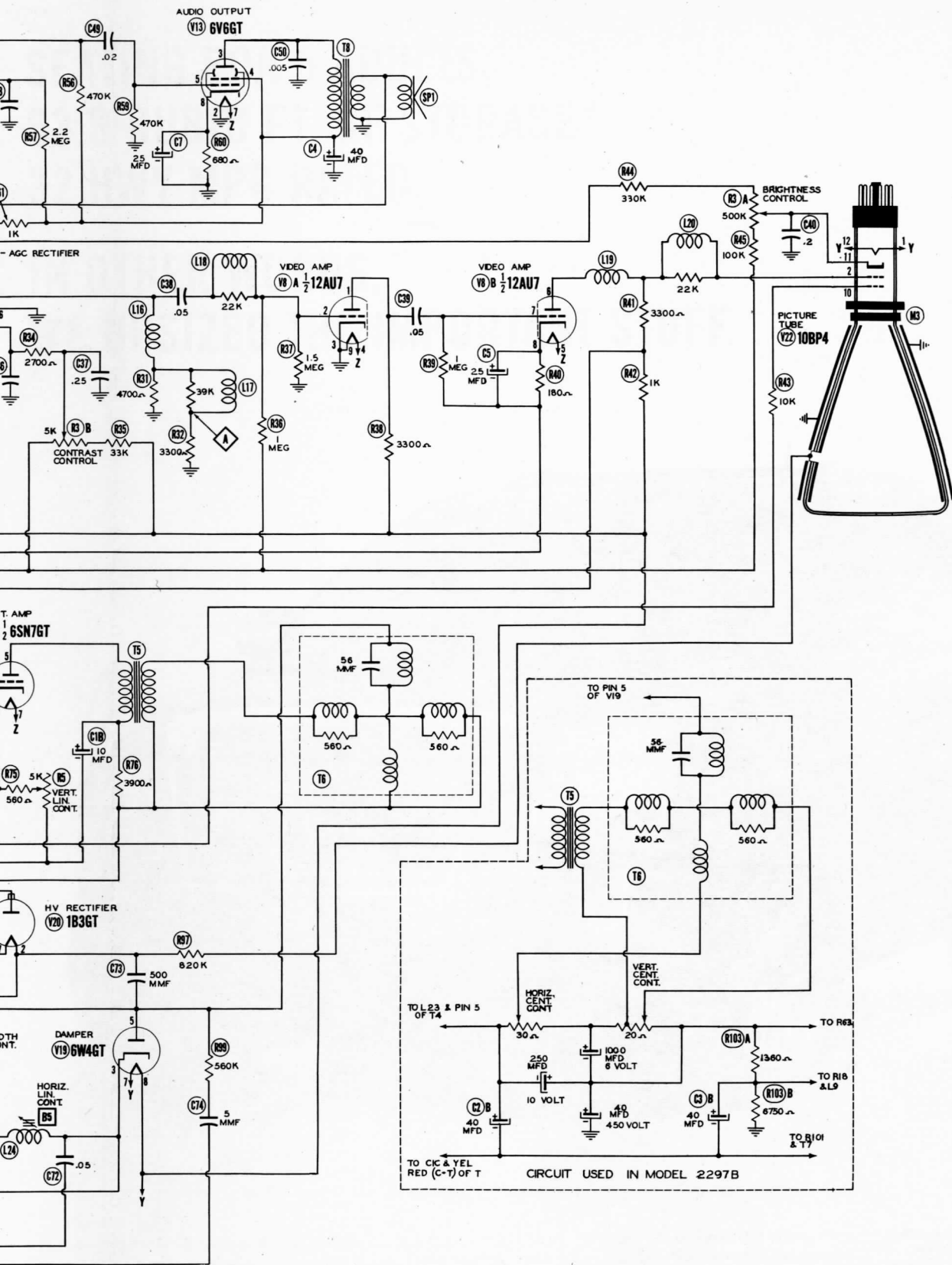
HOR. AFC

HOR. OSC

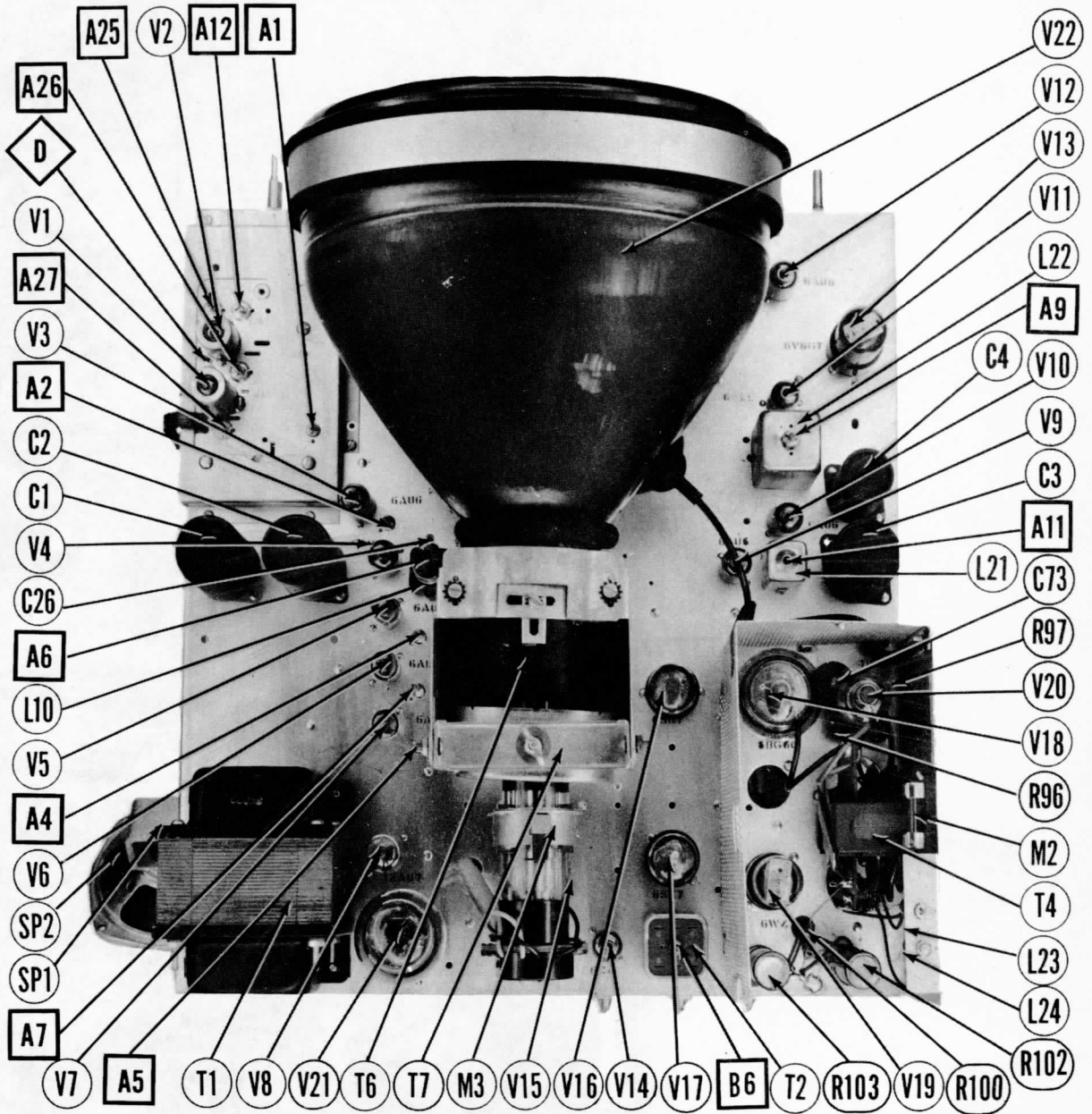
HOR. OUTPUT

WIDTH CONT.

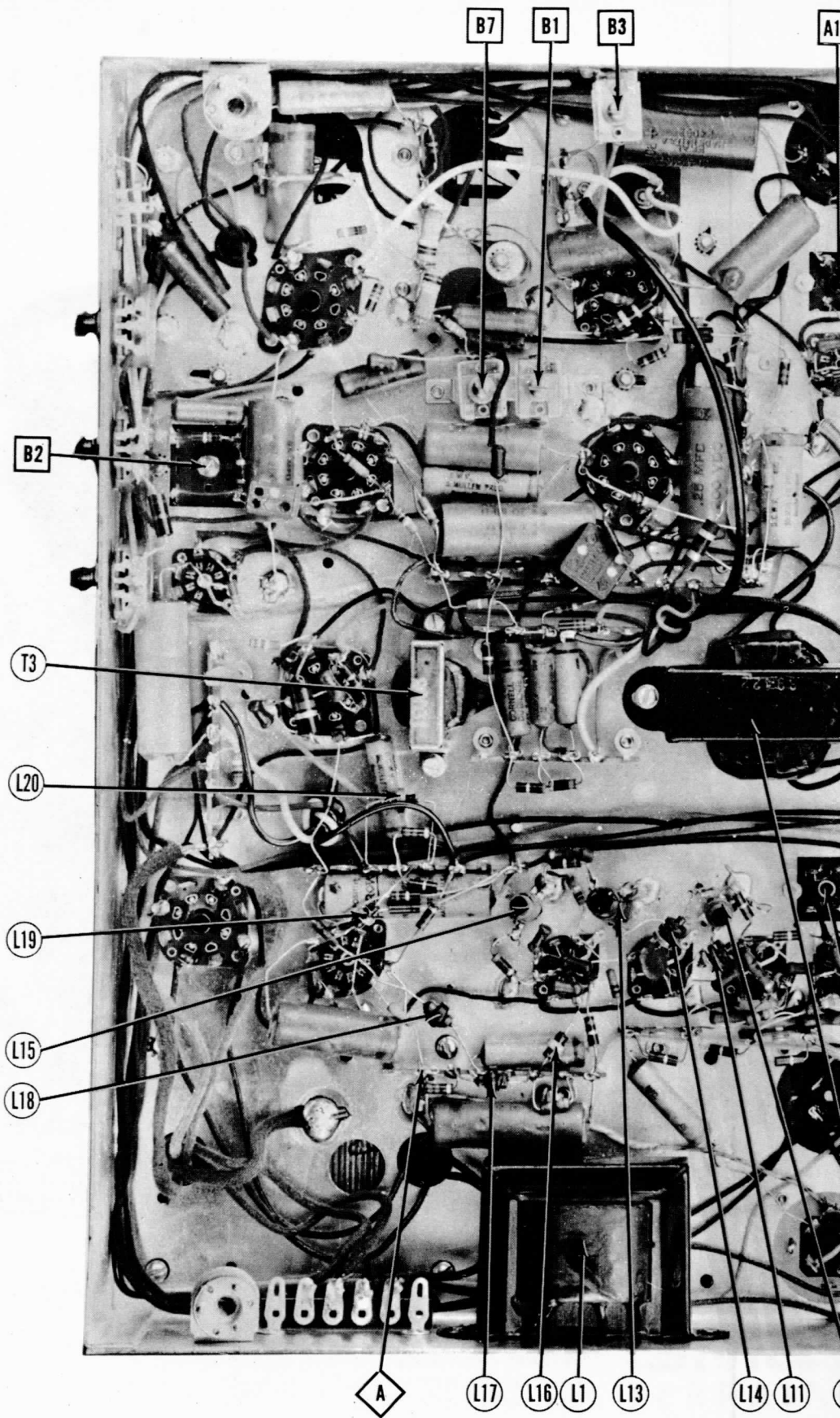




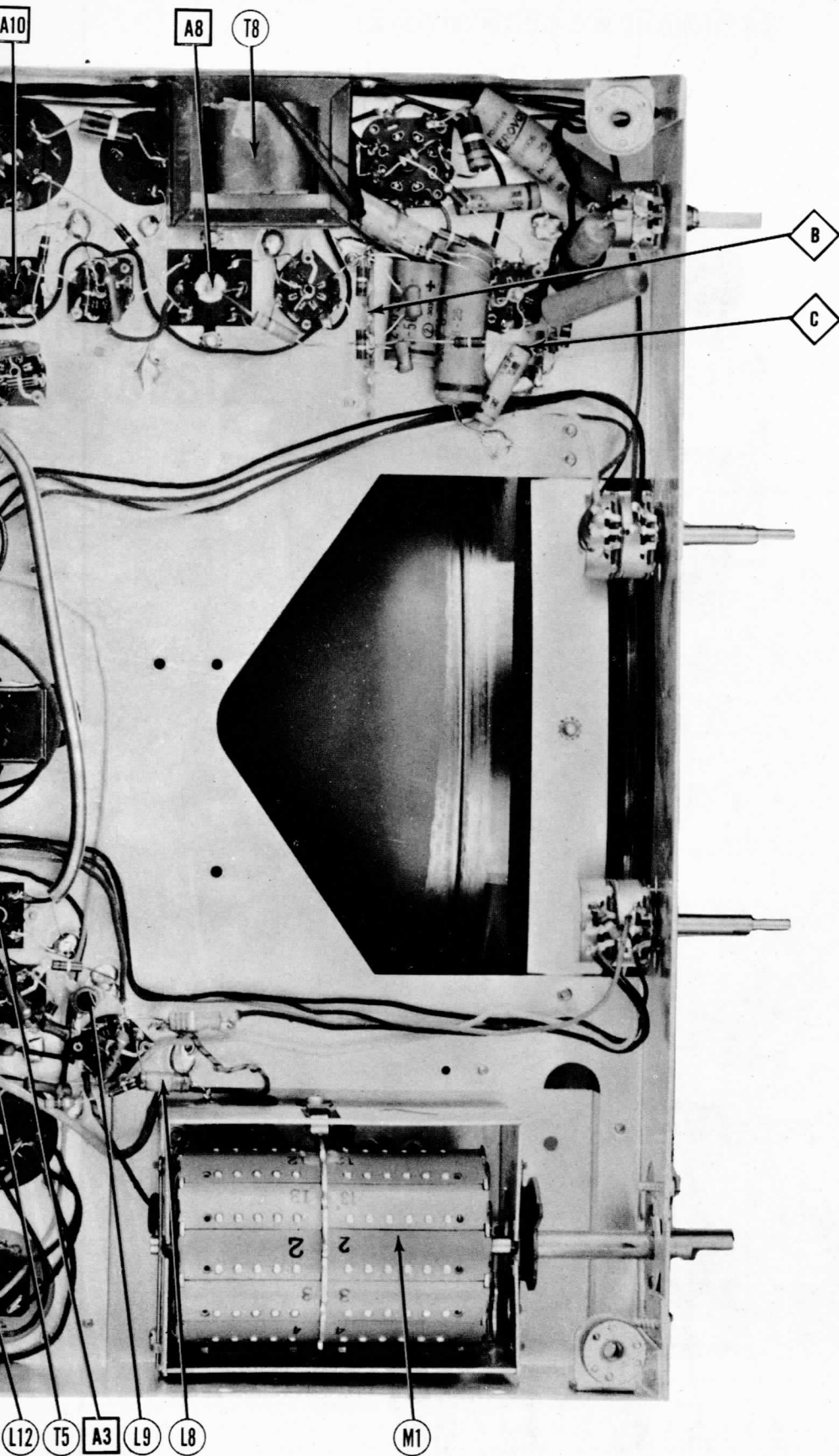
PACKARD-BELL MODELS 2291-TV, 2292-TV, 2293-TV,
2294-TV, 2295-TV, 2296-TV, 2297-TV, 2298-TV



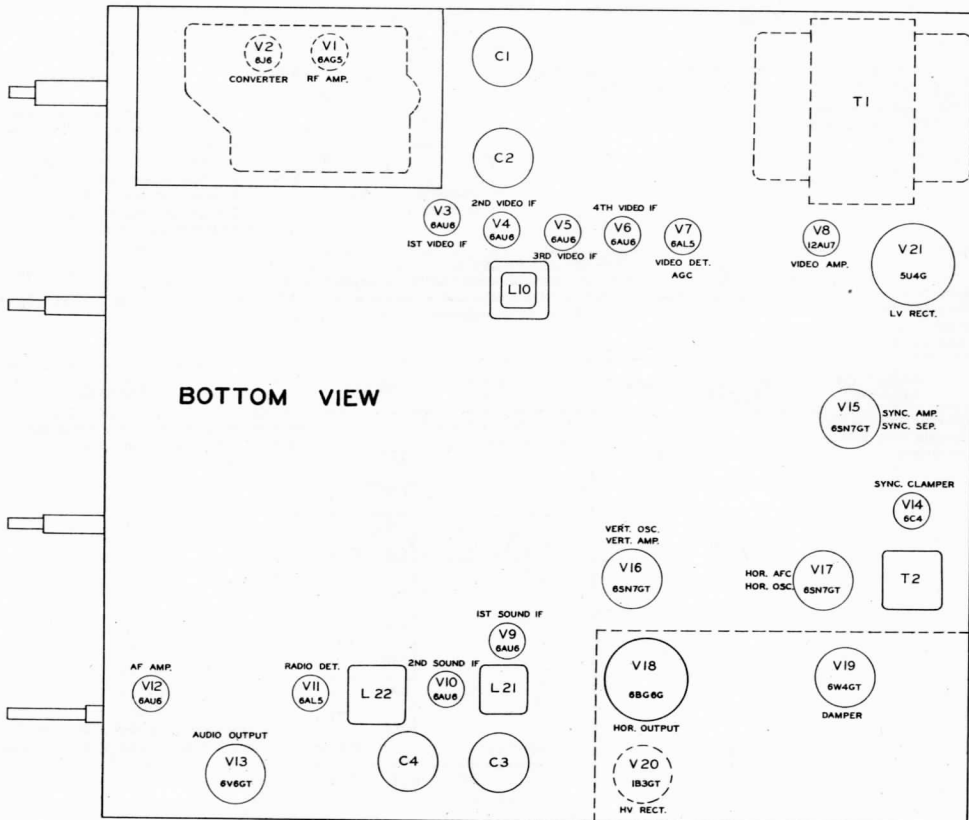
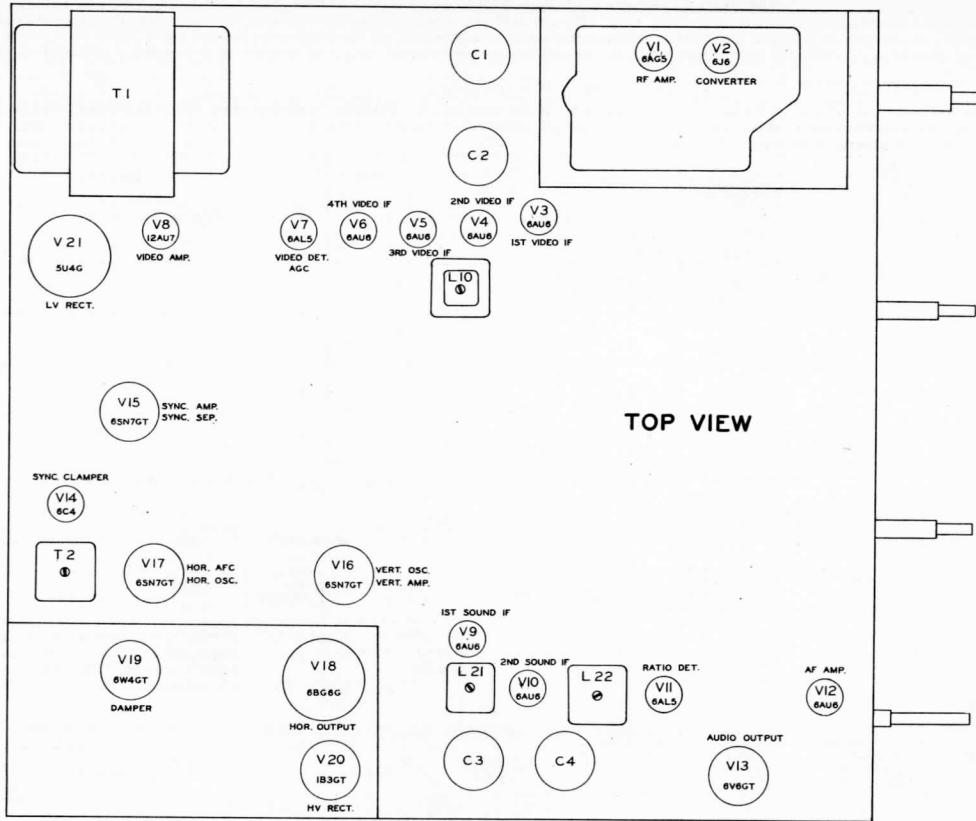
CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW-TRANS., INDUC












VECTOR AND ALIGNMENT IDENTIFICATION



TUBE PLACEMENT CHART

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT							
The alignment frequencies for models 2291, 2292, 2293, 2294 and 2295 are indicated by an asterisk (*). The alignment frequencies for models 2297 and 2298 are indicated by a dagger (†). Determine the model set to be aligned and use the frequencies for that set. If the set is to be aligned with the picture tube removed, the high voltage power supply should be disabled by removing the horizontal oscillator tube (V17).							
VIDEO IF ALIGNMENT							
Remove the channel 13 segment of the oscillator section (front) of the tuner turret. Turn the channel selector switch to channel 13 during video IF alignment. This disables the local oscillator and removes the possibility of erroneous indications. Turn the contrast control to maximum clockwise position.							
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS	
1. Direct	Across antenna terminals.	21.8MC * 20.5MC † (Unmod)	13 (See note above)	DC Probe to Point  Common to chassis	A1	Adjust for maximum deflection.	
2. Direct	"	25.3MC * 24.55MC †	"	"	A2	"	
3. Direct	"	22.8MC * 21.55MC †	"	"	A3	"	
4. Direct	"	25.2MC * 21.45MC †	"	"	A4	"	
5. Direct	"	23.4MC * 22.65MC †	"	"	A5	"	
6. Direct	"	21.25MC * 20.5MC †	"	"	A6, A7	Adjust for MINIMUM deflection.	
OVERALL VIDEO IF RESPONSE CHECK							
Set the contrast control to read 2.5 volts on VTVM connected across C35. If the set is to be operated in a "fringe" area, set this voltage to approximately 1 volt.							
DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7. Direct	Across antenna terminals.	24MC (10MC Sweep)	21.25MC * 20.5MC † 22.3MC * 21.55MC † 25.75MC * 25.0MC †	13	Vert. Amp. to Point  Low side to chassis.		Check for response curve and marker placement as per Fig 1. If necessary slightly retouch A1 thru A5 for proper response and marker placement.
SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM							
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS	
8. .01MFD	High side to pin 1 (Grid) of 6AU6 (V9). Low side to chassis.	21.25MC * 20.5MC † (Unmod.)	Any	DC Probe to Point  Common to chassis.	A8, A9, A10	Adjust for maximum deflection.	
9. .01MFD	"	"	"	DC Probe to Point  Common to Point 	All	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.	
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.							
DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8. .01MFD	High side to pin 1 (Grid) of 6AU6 (V9). Low side to chassis.	21.25MC (450KC Sweep)	21.25MC * 20.5MC †	13	Vert. Amp. to Point  Low side to chassis.	A8, A9, A10	Disconnect stabilizer capacitor C6. Adjust for maximum amplitude and symmetry as per Fig 2.
9. .01MFD	"	"	"	"	Vert. Amp. to Point  Low side to chassis.	A11, A8	Reconnect capacitor C6. Adjust A11 so 21.25MC occurs at center of crossover lines as per Fig 3. SLIGHTLY retouch A8 for maximum amplitude and straightness of crossover lines.
OSCILLATOR ALIGNMENT							
The overall oscillator circuit adjustment (A12) is pre-set at the factory and should not require further adjustment in the field. The individual channel oscillator adjustments are reached through a hole just to the right of the channel switch shaft. The correct adjustment screw is accessible through this hole as the channel switch is turned to each channel. Replace the channel 13 segment of the tuner turret. Set the fine tuning control to the mid-position of its range.							
DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS	
10. Two 120Ω carbon res.	Across antenna terminals with 120Ω in each lead.	215.75MC (Unmod.) 209.75MC 203.75MC 197.75MC 191.75MC 185.75MC 179.75MC 87.75MC 81.75MC 71.75MC 65.75MC 59.75MC	13 12 11 10 9 8 7 6 5 4 3 2	DC Probe to Point  Common to Point 	A13 A14 A15 A16 A17 A18 A19 A20 A21 A22 A23 A24	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.	

ALIGNMENT INSTRUCTIONS (CONT.)

RF and MIXER ALIGNMENT

The RF and mixer lines of these receivers have been properly aligned at the factory and the adjustments are very stable. Alignment should not be attempted unless they are definitely known to be out of alignment.

The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms. Set the contrast control to read 1.5 volts on VTVM connected across C35.

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
11. Two 120Ω carbon res.	Across antenna terminals with 120Ω in each lead.	207MC (10MC Sweep)	205.25MC 209.75MC	12	Vert. Amp. thru 10KΩ to Point \diamond Low side to chassis.	A25, A26, A27	Adjust for response curve similar to Fig 4 with markers above 70%.
12. "	"	213MC (10MC Sweep)	211.25MC 215.75MC	13	"		Check all channels for response similar to Fig 4. If optimum results are desired on any channel, make slight adjustment of A25, A26, and A27 with channel switch set for that channel. Recheck all channels to see that they have not been seriously effected.
		201MC (10MC Sweep)	199.25MC 203.75MC	11			
		195MC (10MC Sweep)	193.25MC 197.75MC	10			
		189MC (10MC Sweep)	187.25MC 191.75MC	9			
		183MC (10MC Sweep)	181.25MC 185.75MC	8			
		177MC (10MC Sweep)	175.25MC 179.75MC	7			
		85MC (10MC Sweep)	83.25MC 87.75MC	6			
		79MC (10MC Sweep)	77.25MC 81.75MC	5			
		69MC (10MC Sweep)	67.25MC 71.75MC	4			
		63MC (10MC Sweep)	61.25MC 65.75MC	3			
		57MC (10MC Sweep)	55.25MC 59.75MC	2			

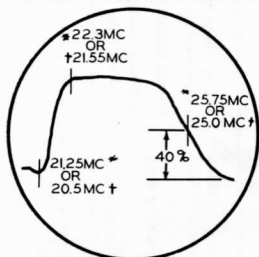


FIG. 1

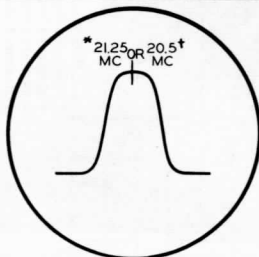


FIG. 2

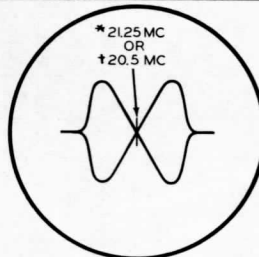


FIG. 3

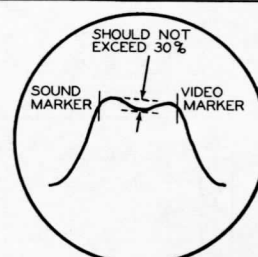


FIG. 4

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

HORIZONTAL OSCILLATOR AND LINEARITY ADJUSTMENTS

Tune in a TV station, preferably a test pattern, and sync the picture vertically with the vertical hold control. Turn the horizontal hold control to its maximum clockwise position. Adjust the horizontal frequency trimmer (B1), and the horizontal frequency slug (B2) until the picture is just out of sync and the blanking bar appears in the picture as a vertical bar. Turn the horizontal hold control 1/4 turn counter-clockwise: the picture should synchronize normally. Adjust the horizontal drive (B3), horizontal width (B4), and the horizontal linearity (B5) alternately until the picture is symmetrical from left to right. If adjustment of B3, B4, or B5 was necessary, repeat the adjustments of B1, and B2.

HORIZONTAL WAVEFORM ADJUSTMENT

Connect the vertical amplifier of an oscilloscope thru 1 megohm to terminal "C" of the horizontal oscillator transformer. Turn the horizontal hold control to sync the picture horizontally. Adjust the waveform adjustment (B6) until the broad and narrow peaks are of equal amplitudes (See Fig. 5 below). If necessary, keep the picture in sync with the hold controls while making this adjustment.

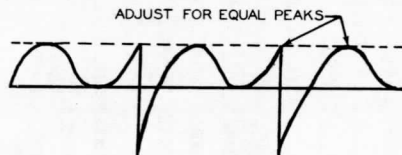


FIG. 5

HORIZONTAL LOCKING RANGE ADJUSTMENT

Turn the horizontal hold control fully counter-clockwise and momentarily interrupt the signal by switching to another channel and back again. Slowly turn the hold control clockwise and note the least number of bars present just before the picture falls into synchronization. If more than three bars are present, turn the horizontal lock trimmer (B7) 1/2 turn counter-clockwise. If less than three bars are present, turn B7 1/2 turn clockwise. Repeat this check and adjustment procedure until three bars are present just before the picture falls into synchronization.

**PACKARD-BELL MODELS 2291-TV, 2292-TV, 2293-TV,
2294-TV, 2295-TV, 2296-TV, 2297-TV, 2298-TV**

VOLTAGE AND RESISTANCE MEASUREMENTS

VOLTAGE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AG5	- .7VDC	0V	6.3VAC	0V	100VDC	100VDC	0V		
V 2	6J6	95VDC	75VDC	6.3VAC	0V	-1.6VDC	8-4.8VDC	0V		
V 3	6AU6	- .4VDC	0V	6.3VAC	0V	120VDC	120VDC	.6VDC		
V 4	6AU6	- .3VDC	0V	6.3VAC	0V	120VDC	120VDC	.6VDC		
V 5	6AU6	0V	0V	6.3VAC	0V	117VDC	117VDC	16VDC		
V 6	6AU6	0V	0V	6.3VAC	0V	117VDC	117VDC	1.1VDC		
V 7	6AL5	10VDC	- .2VDC	6.3VAC	0V	0V	0V	0V		
V 8	12AU7	105VDC	- .8VDC	0V	6.3VAC	1160VDC	12.3VDC	167VDC	0V	
V 9	6AU6	0V	0V	6.3VAC	0V	112VDC	112VDC	.7VDC		
V 10	6AU6	0V	0V	6.3VAC	0V	112VDC	112VDC	.9VDC		
V 11	6AL5	0V	- .3VDC	6.3VAC	0V	- .3VDC	0V	- .3VDC		
V 12	6AU6	- .6VDC	0V	6.3VAC	0V	105VDC	25VDC	0V		
V 13	6Y6GT	0V	0V	220VDC	240VDC	0V	0V	6.3VAC	15VDC	
V 14	6C4	-6.2VDC	0V	0V	6.3VAC	-6.2VDC	-6.2VDC	0V		
V 15	6SN7GT	-1VDC	170VDC	0V	-6.2VDC	260VDC	2.4VDC	6.3VAC	0V	
V 16	6SN7GT	1-2.6VDC	133VDC	197VDC	10V	1285VDC	114VDC	6.3VAC	0V	
V 17	6SN7GT	1-2.2VDC	1000VDC	12VDC	1-32VDC	1165VDC	10V	6.3VAC	0V	TOP CAP
V 18	6BG6G	0V	6.3VAC	110VDC	1- .3VDC	1- .5VDC	15.4VDC	0V	1250VDC	*
V 19	6W4GT	0V	0V	320VDC	0V	250VDC	240VDC	120VDC	120VDC	
V 20	1B3GT	* DO	NOT MEASURE							
V 21	5U4G	0V	260VDC	0V	325VAC	0V	325VAC	0V	260VDC	
V 22	10BP4	120VDC	70VDC	310VDC	160VDC	120VDC				

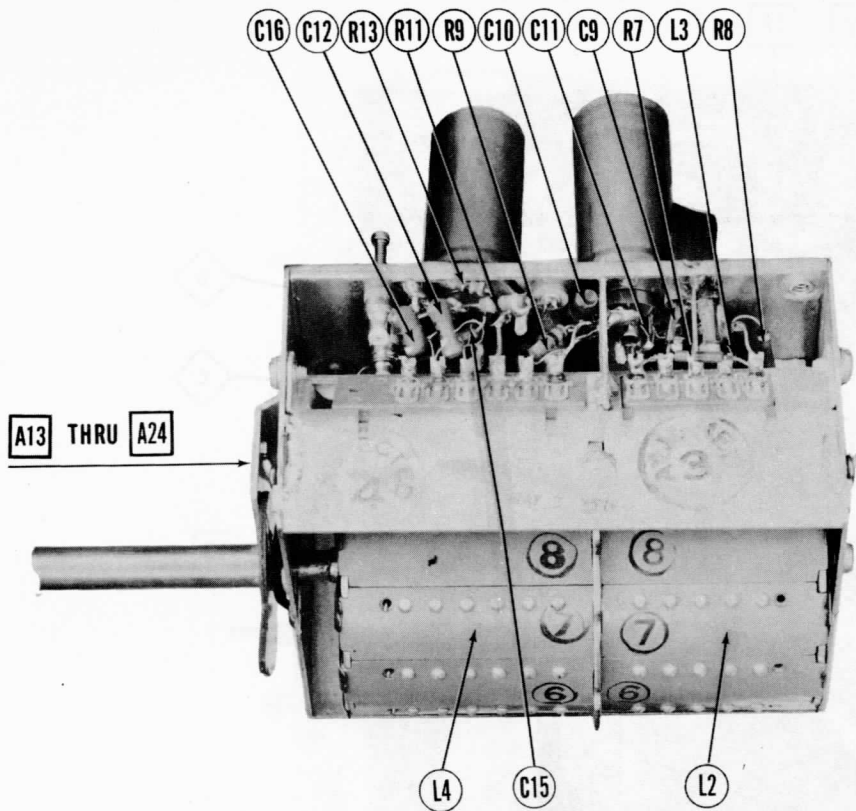
§ Taken with vacuum tube voltmeter.
 ¶ Measured from pin 3 of V16.
 * 6.3VAC measured across filament.
 Note. Contrast control set at maximum for these measurements.

RESISTANCE READINGS

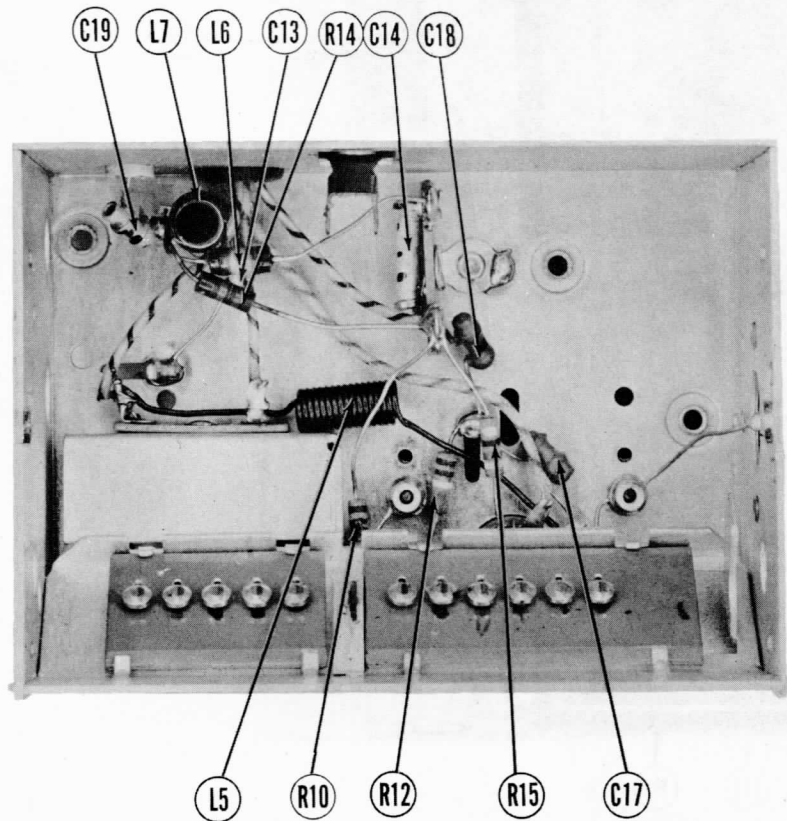
Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6AG5	2.3 Meg.	∞	.∞	.∞	13.6KΩ	13.6KΩ	∞		
V 2	6J6	16KΩ	16KΩ	.∞	220KΩ	10KΩ	10KΩ	∞		
V 3	6AU6	2.3 Meg.	∞	.∞	11.4KΩ	11.4KΩ	82Ω	82Ω		
V 4	6AU6	2.3 Meg.	∞	.∞	11.5KΩ	11.5KΩ	82Ω	82Ω		
V 5	6AU6	2.3 Meg.	∞	.∞	11.6KΩ	11.6KΩ	82Ω	82Ω		
V 6	6AU6	.2Ω	∞	.∞	11.7KΩ	11.7KΩ	180Ω	180Ω		
V 7	6AL5	3KΩ	2KΩ	.∞	.2Ω	∞	100KΩ	100KΩ		
V 8	12AU7	14.8KΩ	600KΩ	∞	.∞	15.8KΩ	15.8KΩ	1 Meg.	1180Ω	∞
V 9	6AU6	∞	∞	.∞	.∞	12.4KΩ	12.4KΩ	82Ω		
V 10	6AU6	∞	∞	.∞	∞	12.4KΩ	12.4KΩ	120Ω		
V 11	6AL5	∞	20KΩ	.∞	∞	∞	∞	∞		
V 12	6AU6	4.7 Meg.	∞	.∞	∞	1470KΩ	12.2 Meg.	39Ω		
V 13	6Y6GT	∞	∞	11.5KΩ	1100Ω	470KΩ	∞	.∞	680Ω	
V 14	6C4	4.7 Meg.	∞	∞	.∞	4.7 Meg.	4.7 Meg.	∞		
V 15	6SN7GT	1 Meg.	15KΩ	∞	4.7 Meg.	150Ω	6.9KΩ	.∞	∞	
V 16	6SN7GT	1.1 Meg.	#3 Meg.	∞	12.2 Meg.	15KΩ	1550Ω	.∞	∞	
V 17	6SN7GT	1 Meg.	#180KΩ	3300KΩ	1250KΩ	#130KΩ	10Ω	.∞	∞	TOP CAP
V 18	6BG6G	∞	.∞	166Ω	1280KΩ	1280KΩ	147Ω	∞	#10KΩ	#200Ω
V 19	6W4GT	∞	∞	190KΩ	∞	150Ω	1560KΩ	11.4KΩ	11.4KΩ	TOP CAP
V 20	1B3GT	∞	∞	∞	∞	∞	∞	∞	∞	#590Ω
V 21	5U4G	∞	7KΩ	∞	425Ω	∞	427Ω	∞	7KΩ	
V 22	10BP4	11.4KΩ	15.5KΩ	456KΩ	200KΩ	11.4KΩ				

† Measured from pin 8 of V21.
 # Measured from from pin 3 of V19.
 ♦ Measured from center tap of power transformer.
 ¶ Measured from pin 3 of V16.

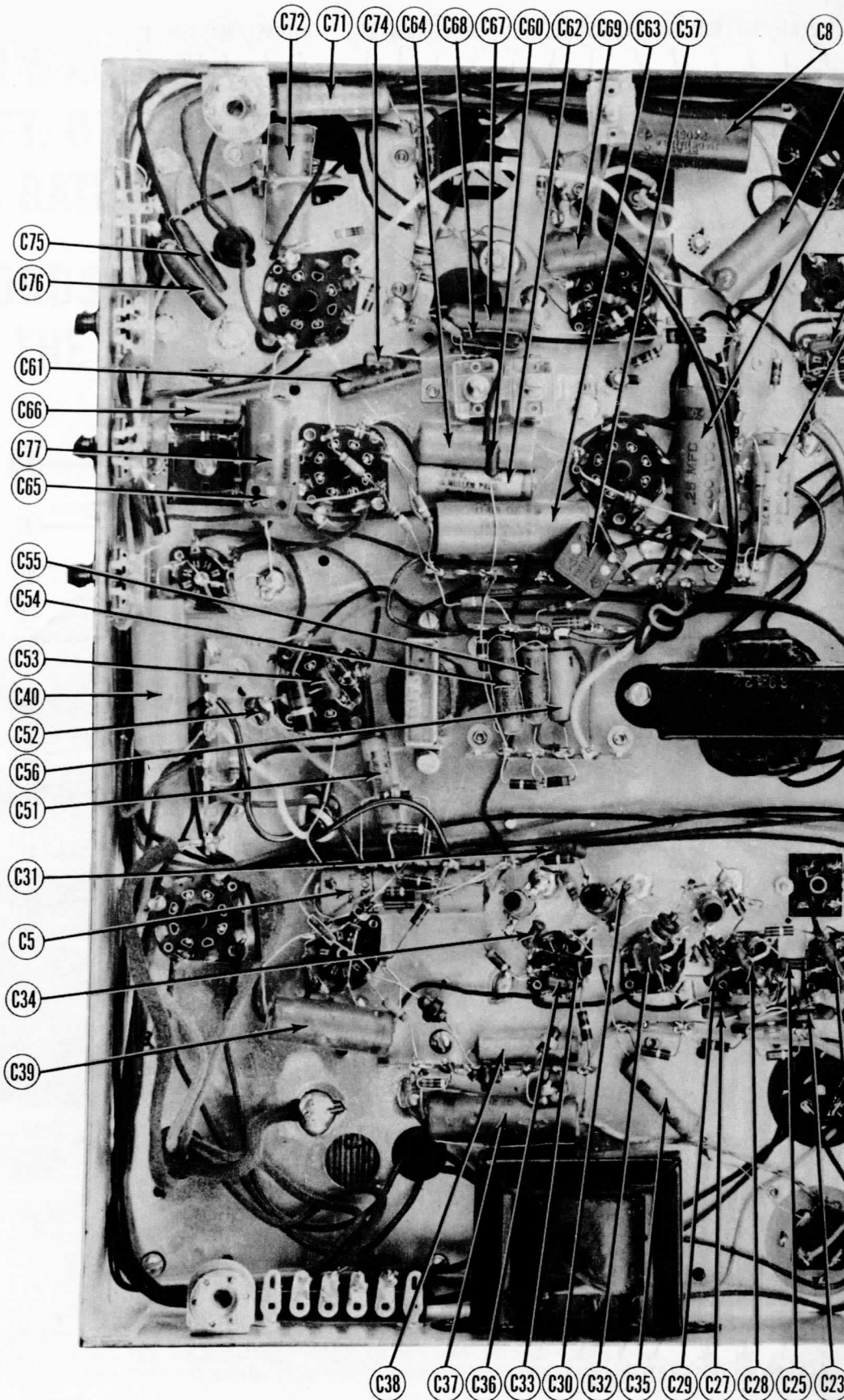
1. DC Voltage measurements are at 20,000 ohms per volt; AC Voltage measured at 1,000 ohms.
2. Pin numbers are counted in a clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line voltage maintained at 117 volts for voltage readings.
5. Front panels controls set at minimum.
6. Where readings may vary according to the setting of the service controls, both minimum and maximum readings are given.



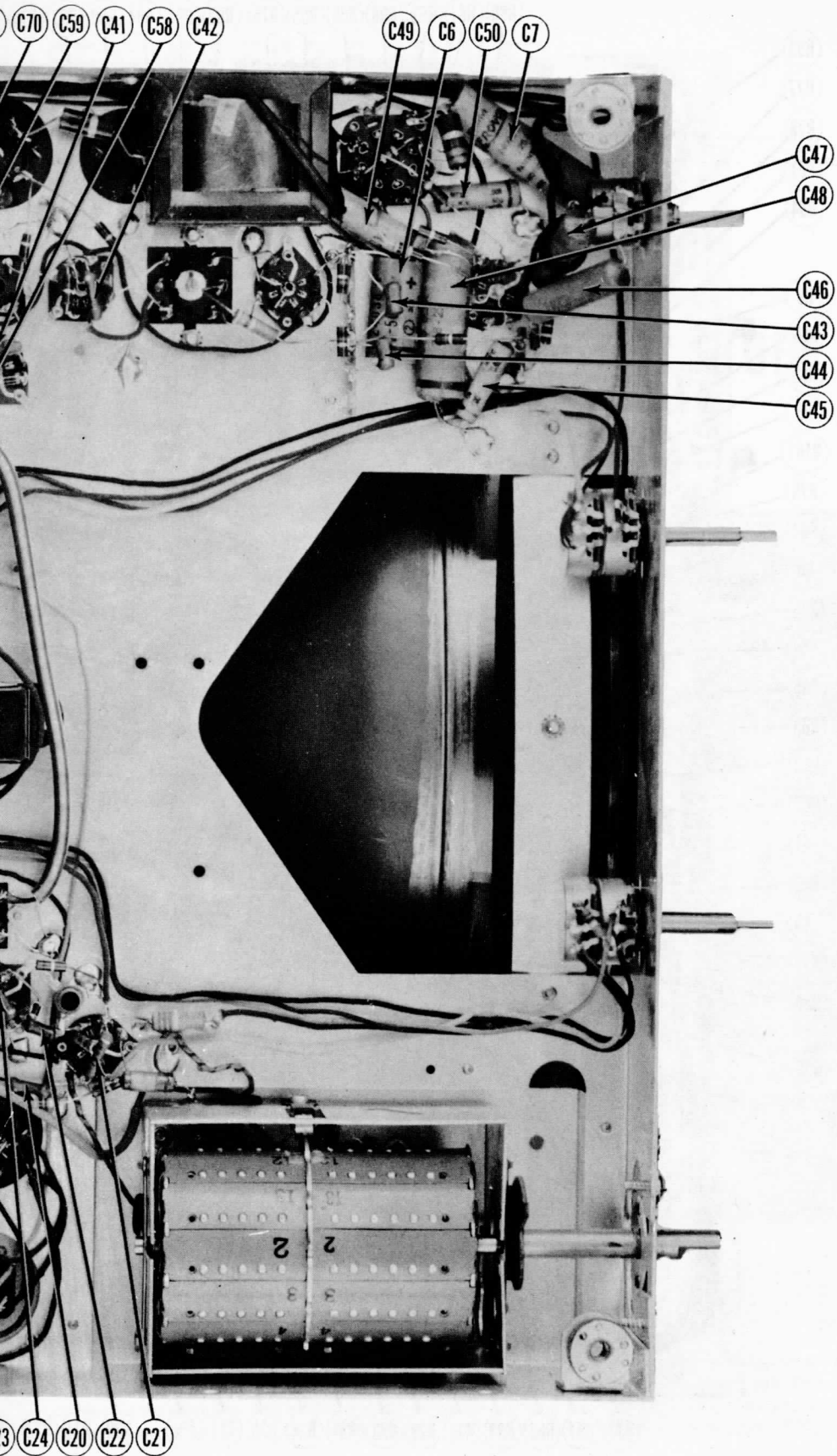
RF TUNER-RIGHT SIDE



RF TUNER-BOTTOM VIEW

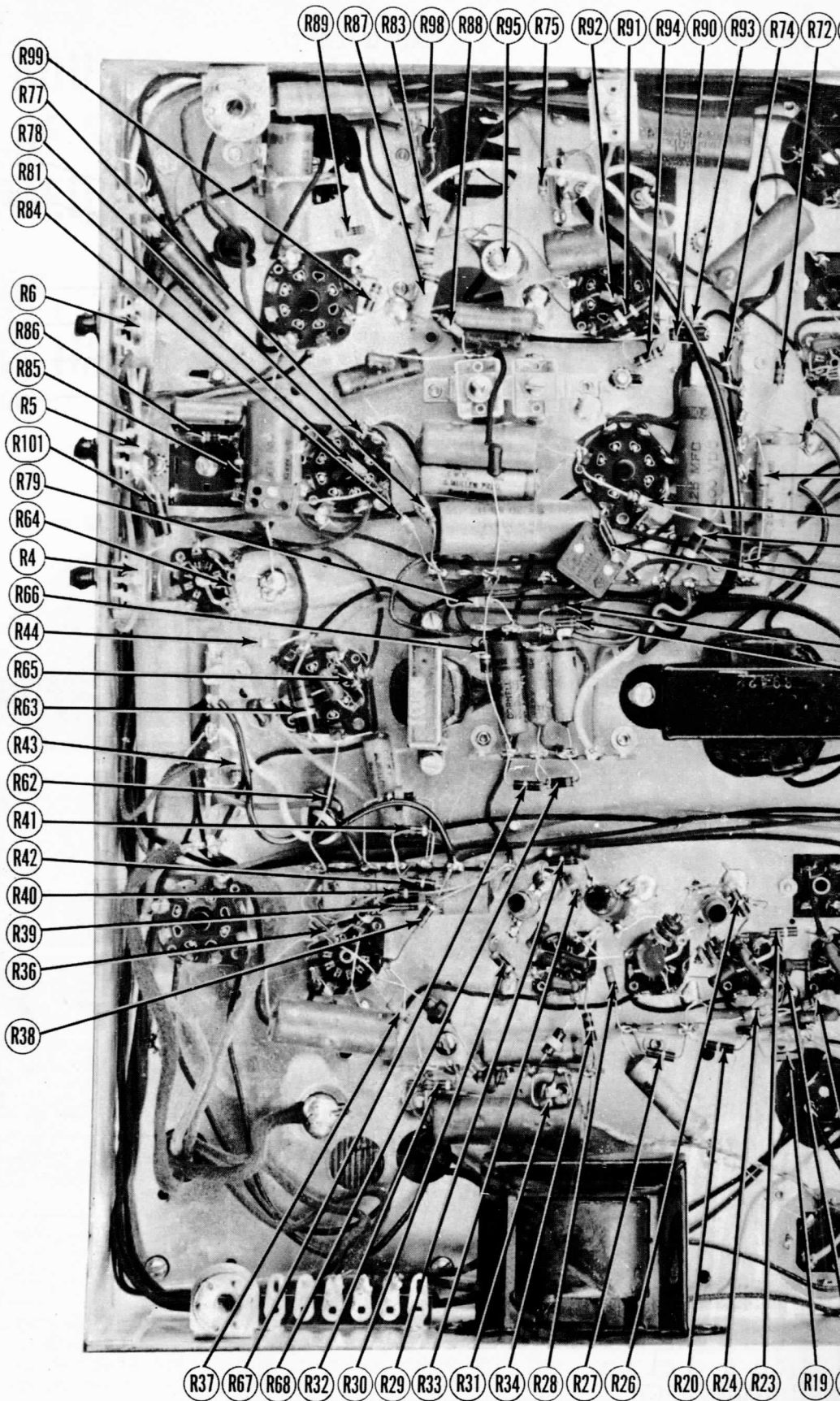


CHASSIS BOTTOM VIEW-CAP

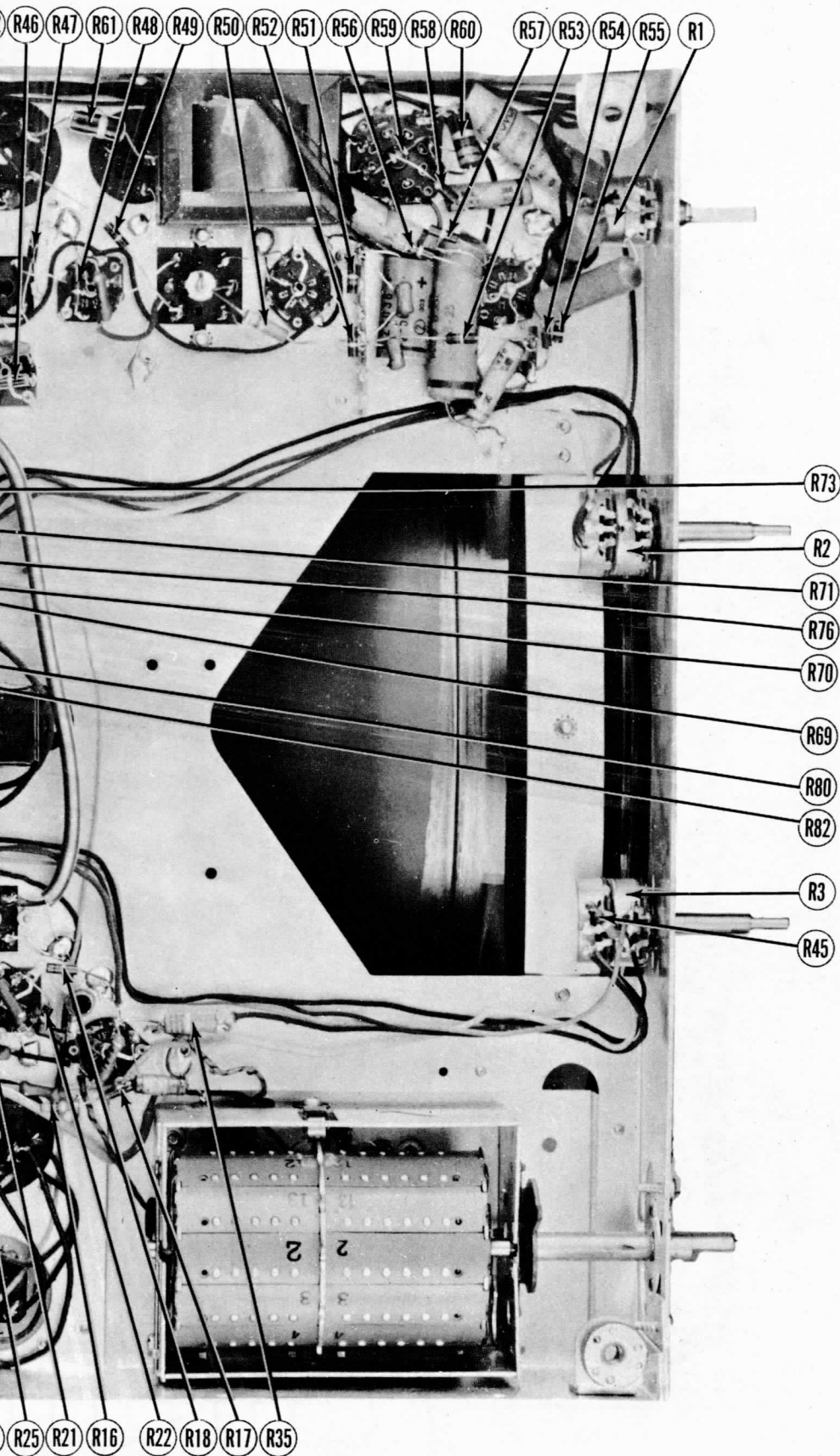


PACKARD-BELL MODELS 2291-TV, 2292-TV, 2293-TV,
 2294-TV, 2295-TV, 2296-TV, 2297-TV, 2298-TV

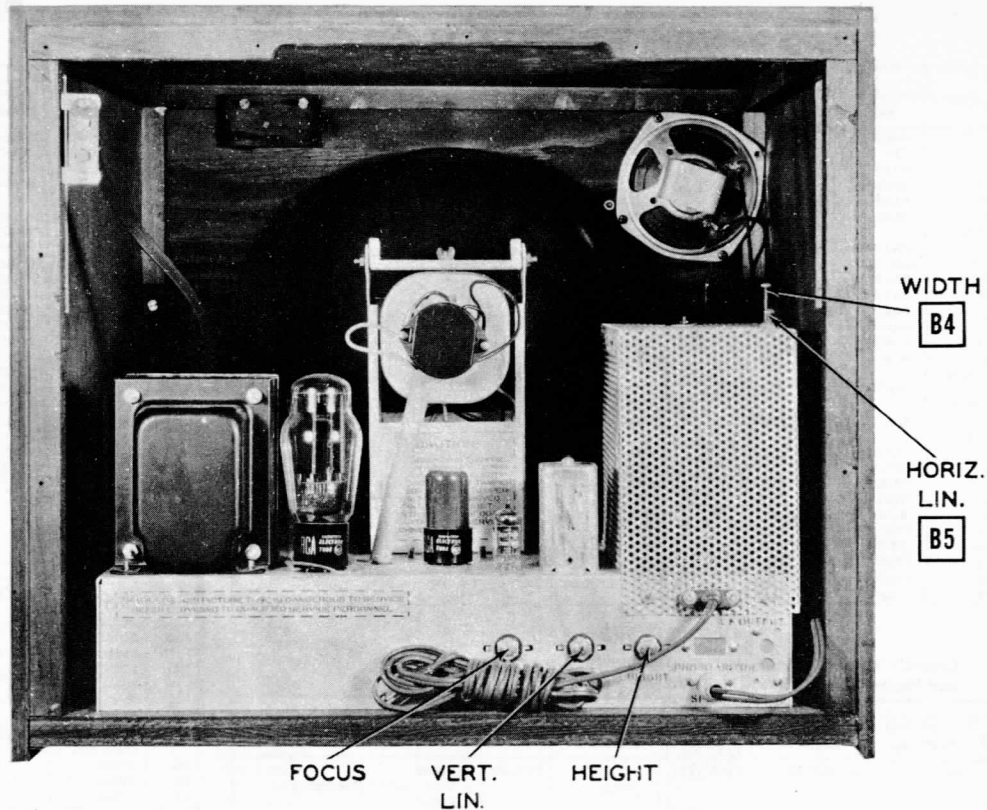
PACAPITOR IDENTIFICATION



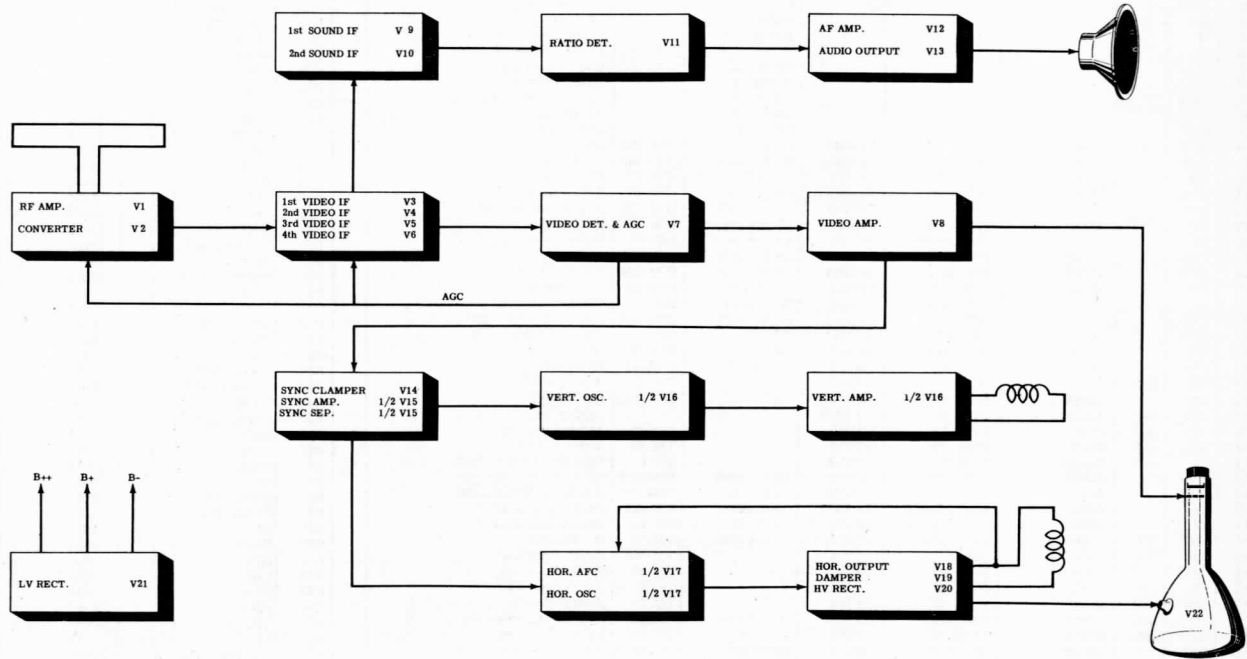
CHASSIS BOTTOM VIEW-RE



RESISTOR IDENTIFICATION



CABINET-REAR VIEW



BLOCK DIAGRAM

PACKARD-BELL MODELS 2291-TV, 2292-TV, 2293-TV,
2294-TV, 2295-TV, 2296-TV, 2297-TV, 2298-TV

TUBES (SYLVANIA or Equivalent)

Table with columns: ITEM No., USE, REPLACEMENT DATA (PACKARD-BELL, STANDARD), RMA BASE TYPE, NOTES. Lists various tube types and their equivalents.

CAPACITORS

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

Table with columns: ITEM No., RATING (CAP., VOLT), REPLACEMENT DATA (PACKARD-BELL, AEROVOX, CORNELL-DUBILIER, ERIE, SPRAGUE), IDENTIFICATION CODES AND INSTALLATION NOTES. Lists capacitor specifications and part numbers.

Table with columns: ITEM No., RATING (CAP., VOLT), REPLACEMENT DATA (Packard-Bell, AEROVOX, CORNELL-DUBILIER). Lists capacitor specifications and part numbers.

* When either items C43 or C44 are replaced, replace both

Table with columns: ITEM No., RATING (RESISTANCE, WATTS), REPLACEMENT DATA (Packard-Bell, IRC, CLAR). Lists capacitor specifications and part numbers.

* Additional parts to be used with "Concentrikit".

Table with columns: ITEM No., RATING (RESISTANCE, WATTS), REPLACEMENT DATA (PACKARD-BELL, IRC). Lists capacitor specifications and part numbers.

PARTS LIST AND DESCRIPTIONS

CAPACITORS (CONT.)

ITEM No.	RATING		REPLACEMENT DATA					IDENTIFICATION CODES AND INSTALLATION NOTES
	CAP.	VOLT	Packard-Bell PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	ERIE PART No.	SPRAGUE PART No.	
C56	.005	600	23004	P688-005	GT6D5	GP2M-005	TM-25	Integrator Net.
C57	4900	500	23207	1467-005	ID5D5	GP2M-005	IFM-25	Vert. Osc. Grid Cap.
C58	.1	400	23011	P488-1	GT4P1		TM-1	Vert. Discharge
C59	.25	200	23021	P488-25	GT2P25		TC-2	Vert. Sweep Coupling
C60	100		23914	1468-0001	5W5T1	GPIK-100	IFM-31	Hor. Sync. Coupling
C61	.002	600	23002	P688-002	GT6D2	GP2M-002	TM-22	Hor. Sync. Coupling
C62	.02	600	23007	P688-02	GT6S2		TM-12	AFC Filter
C63	.2	400	23020	P488-22	GT4P2		TC-2	AFC Filter
C64	.05	600	23010	P688-05	GT6S5		TM-15	AFC Plate Bypass
C65	180	500	23216			GP2K-180		Hor. Osc. Grid Cap.
C66	.01	500	23023	P688-01	GT6S1	GP2-335-01	TM-11	Fixed Trimmer
C67	.002	600	23002	P688-002	GT6D2	GP2M-002	TM-22	Hor. Discharge
C68	.01	500	23023	P688-01	GT6S1	GP2-335-01	TM-11	Hor. Sweep Coupling
C69	.05	600	23010	P688-05	GT6S5		TM-15	Hor. Output Screen Bypass
C70	.1	400	23011	P488-1	GT4P1		TM-1	Hor. Output Cath. Bypass
C71	.033	400	23026	P488-033				Damper Filter
C72	.05	600	23010	P688-05	GT6S5		TM-15	Damper Filter
C73	500	10000	23938					HV Filter
C74	5		23919	1468-000005	5W5V5	N750K-5	MS-55	Hor. Feedback
C75	.01	125AC	23932	P688-01	GT6S1		TM-11	Line Filter
C76	.01	125AC	23932	P688-01	GT6S1		TM-11	Line Filter
C77	.05	600	23010	P688-05	GT6S5		TM-15	RF Bypass

* When either items C43 or C44 are replaced, replace both with capacitors of equal value.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA			INSTALLATION NOTES	
	RESISTANCE	WATTS	Packard-Bell PART No.	IRC PART No.	CLAROSTAT PART No.		
R1A	500KΩ		25022	QJ3-133	M-60-Z	Voltage control	
B	Switch		Not Req.	76-1	SW-A	Attach to R1A per instructions	
R2A	1 Meg.		25820	B11-137 *		Vert. hold control, front (Dual Concentric)	
B	50KΩ			B11-123 *			Horiz. hold control, rear (Dual Concentric)
C	Shaft End			E202 *			
R3A	500KΩ		25821	B11-133 *	Brightness control, front (Dual Concentric)		
B	5000Ω			B11-114 *		Contrast control, rear (Dual Concentric)	
C	Shaft End			E202 *			Attach per instructions in "Concentrikit".
R4	5000Ω		25807	Q11-114	M-19-S		
R5	5000Ω		25807	Q11-114	M-19-S	Vert. linearity control	
R6	3 Meg.		25805D	Q11-140		Height control	

* Additional parts to be used with "Concentrikit".

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	PACKARD-BELL PART No.	IRC PART No.	
R7	3900Ω 20%			BTS-3900	RF Grid
R8	47KΩ 20%				AGC Network
R9	10KΩ 20%				RF Plate Coil Shunt
R10	2200Ω 20%			BTS-2200	RF Decoupling
R11	4700Ω				Conv. Grid
R12	220KΩ 20%				Conv. Grid
R13	10KΩ 20%				Osc. Grid
R14	15KΩ 20%				Conv. Plate Decoupling
R15	4700Ω				Osc. Plate
R16	8200Ω		73036	BTS-8200	1st Video IF Grid
R17	82Ω		73012		1st Video IF Cathode
R18	100Ω		73013		Decoupling Network
R19	120Ω		73014		AGC Network
R20	120Ω		73014		AGC Network
R21	8200Ω		73036	BTS-8200	2nd Video IF Grid
R22	82Ω		73012		2nd Video IF Cathode
R23	100Ω		73013		Decoupling Network
R24	4700Ω		73033	BTS-4700	3rd Video IF Grid See Note 1
R25	82Ω		73012		3rd Video IF Cathode
R26	100Ω		73013		Decoupling Network
R27	120Ω		73014		AGC Network
R28	2.2 Meg. 20%		73165	BTS-2.2 Meg.	AGC Network
R29	180Ω		73016		4th Video IF Cathode
R30	8200Ω		73036	BTS-8200	Video Det. Diode Load See Note 2
R31	4700Ω		73033	BTS-4700	Video Det. Diode Load
R32	3300Ω		73031	BTS-3300	Video Det. Diode Load
R33	100KΩ 20%		73149	BTS-100K	AGC Rect. Load
R34	2700Ω		73030	BTS-2700	AGC Filter Network
R35	33KΩ		73243	BTA-33K	Voltage Divider
R36	1 Meg. 20%		73161	BTS-1 Meg.	Bias Network
R37	1.5 Meg. 20%		73163	BTS-1.5 Meg.	Video Amp. Grid
R38	3300Ω		73031	BTS-3300	Video Amp. Plate
R39	1 Meg. 20%		73161	BTS-1 Meg.	Video Amp. Grid
R40	180Ω		73016		Video Amp. Cathode
R41	3300Ω		73031	BTS-3300	Video Amp. Plate
R42	1000Ω		73025	BTS-1000	Video Amp. Plate
R43	10KΩ		73037	BTS-10K	Video Amp. Plate
R44	330KΩ 20%		73155	BTS-330K	Acc. Anode Load
R45	100KΩ 20%		73149	BTS-100K	Voltage Divider See Note 3
R46	82Ω		73012		Voltage Divider
R47	1000Ω		73025	BTS-1000	1st Sound IF Cathode
R48	120Ω		73014		1st Sound IF Decoupling
R49	1000Ω		73025	BTS-1000	2nd Sound IF Cathode
R50	470Ω		73021	BTS-470	2nd Sound IF Decoupling
R51	10KΩ		73037	BTA-470	Balancing
R52	10KΩ		73037	BTS-10K	Ratio Det. Diode Load
R53	22KΩ		73041	BTS-22K	Ratio Det. Diode Load
R54	4.7 Meg. 20%		73169	BTS-4.7 Meg.	De-emphasis
R55	39Ω		73008	BW-1-39	AF Grid
R56	470KΩ 20%		73157	BTS-470K	AF Cathode
R57	2.2 Meg.		73165	BTS-2.2 Meg.	AF Plate
R58	2200Ω		73029	BTS-2200	AF Screen
R59	470KΩ 20%		73157	BTS-470K	Feedback
					Output Grid

ITEM No.	RATING		Packard PART
	RESISTANCE	WATTS	
R60	680Ω	2	73423
R61	1000Ω	2	73425
R62	1 Meg. 20%	2	73161
R63	15KΩ	2	73439
R64	4.7 Meg. 20%	2	73169
R65	6800Ω		73035
R66	22KΩ		73041
R67	8200Ω		73036
R68	8200Ω		73036
R69	1 Meg. 20%		73161
R70	6.8 Meg.		73171
R71	100KΩ 20%		73149
R72	3300Ω		73031
R73	1.5 Meg. 20%		73163
R74	2.2 Meg.		73165
R75	560Ω		73022
R76	3900Ω	1	73232-2
R77	820KΩ		73060
R78	150KΩ 20%		73151
R79	150KΩ 20%		73151
R80	8200Ω		73036
R81	2.7 Meg.		73066
R82	68KΩ 20%		73147
R83	120KΩ	1	73250
R84	100KΩ 20%	1	73149
R85	8200Ω		73036
R86	22KΩ		73041
R87	120KΩ	1	73250
R88	150KΩ 20%	1	73151
R89	10KΩ		73037
R90	47Ω	1	73209
R91	39Ω	1	73208
R92	330KΩ 20%	1	73155
R93	1 Meg. 20%	1	73161
R94	47Ω		73009
R95	18KΩ	10	73644
R96	3.3Ω		73279
R97	820KΩ	1	73260
R98	56KΩ		73046
R99	560KΩ		73058
R100	12Ω	1	73202
R101	1500Ω 5%		
R102A	35Ω	1	73667
B	42Ω	1	
R103A	1360Ω	25	
B	6750Ω	5	73666

Note 1. Some models use 8200Ω res.
 Note 2. Not used in all models.
 Note 3. Not used in early production.
 Note 4. Some models use 5.6Ω res.

ITEM No.	RATING			
	PRI.	SEC. 1	SEC. 2	
T1	117VAC at 2A	750VCT .270ADC	5VAC at 3A	6. at SE

* Rewire heaters as required.

ITEM No.	RATING			PACKARD PART No.
	DC RESISTANCE	PRI.	SEC.	
T2	120Ω Tap. at 85Ω	36Ω		29048
T3	230Ω	1350Ω		89031
T4	470Ω Tap. at 165Ω	SEC. 1 10.6Ω		29511
		SEC. 2 6Ω		
T5	920Ω	12Ω		89422
T6A	13Ω			29501
B	62Ω			
T7	340Ω			29521

§ Drill one new mounting hole.

ITEM No.	RATING				
	IMPEDANCE	DC RES.	PRI.	SEC.	
T8	5500Ω	3.5Ω	570Ω	7Ω	894

DESCRIPTIONS

(CONT.)

ERIE PART No.	SPRAGUE PART No.	IDENTIFICATION CODES AND INSTALLATION NOTES
GP2M-005	TM-25	Integrator Net.
GP2M-005	1FM-25	Vert. Osc. Grid Cap.
	TM-1	Vert. Discharge
	TC-2	Vert. Sweep Coupling
GPIK-100	1FM-31	Hor. Sync. Coupling
GP2M-002	TM-22	Hor. Sync. Coupling
	TM-12	AFC Filter
	TC-2	AFC Filter
	TM-15	AFC Plate Bypass
GP2K-180		Hor. Osc. Grid Cap.
GP2-335-01	TM-11	Fixed Trimmer
GP2M-002	TM-22	Hor. Discharge
GP2-335-01	TM-11	Hor. Sweep Coupling
	TM-15	Hor. Output Screen Bypass
	TM-1	Hor. Output Cath. Bypass
		Damper Filter
	TM-15	Damper Filter
		HV Filter
N750K-5	MS-55	Hor. Feedback
	TM-11	Line Filter
	TM-11	Line Filter
	TM-15	RF Bypass

capacitors of equal value.

ROLS

INSTALLATION NOTES
Volume control
Attach to RIA per instructions
Vert. hold control, front (Dual Concentric)
Horiz. hold control, rear (Dual Concentric)
Attach per instructions in "Concentrikit".
Brightness control, front (Dual Concentric)
Contrast control, rear (Dual Concentric)
Attach per instructions in "Concentrikit".
Focus control
Vert. linearity control
Height control

TORS

IDENTIFICATION CODES
ALL RESISTORS ARE ± 10% UNLESS OTHERWISE STATED.

RF Grid
AGC Network
RF Plate Coil Shunt
RF Decoupling
Conv. Grid
Conv. Grid
Osc. Grid
Conv. Plate Decoupling
Osc. Plate
1st Video IF Grid
1st Video IF Cathode
Decoupling Network
AGC Network
AGC Network
2nd Video IF Grid
2nd Video IF Cathode
Decoupling Network
3rd Video IF Grid See Note 1
3rd Video IF Cathode
Decoupling Network
AGC Network
AGC Network
4th Video IF Cathode
Video Det. Diode Load See Note 2
Video Det. Diode Load
Video Det. Diode Load
AGC Rect. Load
AGC Filter Network
Voltage Divider
Bias Network
Video Amp. Grid
Video Amp. Plate
Video Amp. Grid
Video Amp. Cathode
Video Amp. Plate
Video Amp. Plate
Acc. Anode Load
Voltage Divider See Note 3
Voltage Divider
1st Sound IF Cathode
1st Sound IF Decoupling
2nd Sound IF Cathode
2nd Sound IF Decoupling
Balancing
Ratio Det. Diode Load
Ratio Det. Diode Load
De-emphasis
IF Grid
IF Cathode
IF Plate
IF Screen
Feedback
Output Grid

RESISTORS (CONT.)

ITEM No.	RATING		REPLACEMENT DATA		IDENTIFICATION CODES
	RESISTANCE	WATTS	Packard-Bell PART No.	IRC PART No.	
R60	680Ω	2	73423	BT-2-680	Output Cathode
R61	1000Ω	2	73425	BW-2-1000	Filter
R62	1 Meg. 20%	2	73161	BTS-1 Meg.	Sync. Amp. Grid
R63	15KΩ	2	73439	BT-2-15K	Sync. Amp. Plate
R64	4.7 Meg. 20%	2	73169	BTS-4.7 Meg.	Sync. Sep. Grid
R65	6800Ω	2	73035	BTS-6800	Sync. Sep. Cathode
R66	22KΩ	2	73041	BTS-22K	Integrator
R67	8200Ω	2	73036	BTS-8200	Integrator
R68	8200Ω	2	73036	BTS-8200	Integrator
R69	1 Meg. 20%	2	73161	BTS-1 Meg.	Vert. Osc. Grid
R70	6.8 Meg.	2	73171	BTS-6.8 Meg.	Voltage Divider
R71	100KΩ 20%	2	73149	BTS-100K	Voltage Divider
R72	3300Ω	2	73031	BTS-3300	Vert. Peaking
R73	1.5 Meg. 20%	2	73163	BTS-1.5 Meg.	Vert. Osc. Plate
R74	2.2 Meg.	2	73165	BTS-2.2 Meg.	Vert. Amp. Grid
R75	560Ω	2	73022	BTS-560	Vert. Amp. Cathode
R76	3900Ω	2	73232-2	BTA-3900	Vert. Amp. Plate Decoupling
R77	820KΩ	2	73060	BTS-820K	Horiz. AFC Grid
R78	150KΩ 20%	2	73151	BTS-150K	Horiz. AFC Cathode
R79	150KΩ 20%	2	73151	BTS-150K	Horiz. AFC Cathode
R80	8200Ω	2	73036	BTS-8200	Horiz. AFC Filter Network
R81	2.7 Meg.	2	73066	BTS-2.7 Meg.	Voltage Divider
R82	68KΩ 20%	2	73147	BTS-68K	Voltage Divider
R83	120KΩ	2	73250	BTA-120K	Voltage Divider
R84	100KΩ 20%	2	73149	BTS-100K	Horiz. Osc. Grid
R85	8200Ω	2	73036	BTS-8200	Horiz. Osc. Transformer Shunt
R86	22KΩ	2	73041	BTS-22K	Horiz. Osc. Transformer Shunt
R87	120KΩ	2	73250	BTA-120K	Horiz. Osc. Plate
R88	150KΩ 20%	2	73151	BTS-150K	Horiz. AFC Filter Network
R89	10KΩ	2	73037	BTS-10K	Filter
R90	47Ω	2	73209	BW-1-47	Bias Network
R91	39Ω	2	73208	BW-1-39	Horiz. Output Cathode
R92	330KΩ 20%	2	73155	BTS-330K	Horiz. Output Grid
R93	1 Meg. 20%	2	73161	BTS-1 Meg.	Voltage Divider
R94	47Ω	2	73009		Parasitic Supp.
R95	18KΩ	2	73644	AB-18,000	Horiz. Output Screen, Wire Wound
R96	3.3Ω	2	73279		HV Rect. Filament
R97	820KΩ	2	73260		HV Filter
R98	56KΩ	2	73046	BTS-56K	Filter
R99	560KΩ	2	73058	BTS-560K	Feedback
R100	12Ω	2	73202	BW-1-12	Filter, See Note 4
R101	1500Ω 5%	2		BTA-1500-5%	Focus Coil Shunt
R102A	350Ω	2	73667	DG-350	Bias Network, Wire Wound
B	42Ω	2			Bias Network, Wire Wound
R103A	1300Ω	2	73666		Filter, Wire Wound
B	6750Ω	2		AB-7000	Bleeder, Wire Wound

Note 1. Some models use 8200Ω resistor in this application.
 Note 2. Not used in all models.
 Note 3. Not used in early production models.
 Note 4. Some models use 5.6Ω resistor in this application.

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA			
	PRI.	SEC. 1	SEC. 2	SEC. 3	PACKARD-BELL PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.
T1	117VAC at 2A	750VCT .270ADC	5VAC at 3A	6.3VAC at 6.9A SEC. 4 6.3VAC at 1.8A	89032	P-8156 ▲		

▲ Rewire heaters as required.

TRANSFORMER (SWEEP CIRCUITS)

ITEM No.	RATING		REPLACEMENT DATA				NOTES
	DC RESISTANCE PRI.	SEC.	PACKARD-BELL PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
T2	120Ω	36Ω	29048				Hor. Osc. Trans.
	Tap. at 85Ω						
T3	230Ω	1350Ω	89031	A-8111 §	A-3000 §	TBO-1 §	Vert. Block Osc. Trans.
T4	470Ω	SEC. 1	29511	A-8117		TFB-1	Hor. Output Trans.
	Tap. at 10.8Ω						
	Tap. at 165Ω						
		SEC. 2					
		0Ω					
T5	920Ω	12Ω	89422	A-8113	A-3035	TSO-5	Vert. Output Trans.
T6A	13Ω		29501	DY-1			Hor. Deflection Coil
B	62Ω						Vert. Deflection Coil
T7	340Ω		29521	FC-10			Focus Coil

§ Drill one new mounting hole.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	RATING				REPLACEMENT DATA				INSTALLATION NOTES
	IMPEDANCE PRI.	SEC.	DC RES. PRI.	SEC.	PACKARD-BELL PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
T8	5500Ω	3.5Ω	570Ω	.7Ω	89405	A-3825	A-2902 §	RO-9	§ Drill one new mounting hole.

PACKARD-BELL MODELS 2291-TV, 2292-TV, 2293-TV, 2294-TV, 2295-TV, 2296-TV, 2297-TV, 2298-TV

PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS		REPLACEMENT DATA			INSTALLATION NOTES
			Packard-Bell PART No.	JENSEN PART No.	QUAM PART No.	
SP1A B C	FIELD	V. C. IMP.	83202 † 83302 ‡ 83705 #	ST-105 MOD. P5-X	5A1 6A1 10A31	† Used in models 2293TV and 2294TV. ‡ Used in models 2292TV and 2296TV, and 2297TV STD., 2298TV. # Used in models 2291TV, 2295TV and 2297TV Deluxe. ∅ Replace output transformer to match 6-8Ω voice coil.
	PM	3.6Ω		ST-108 MOD. P6-X		
	PM			ST-119 ∅ MOD. P10-T		
SP2A B C	CONE DIA.	V. C. DIA.	† ‡ #			
	4 3/8"	9/16"				
	6 1/2"					
	10"					

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA				INSTALLATION NOTES
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 cps)	Packard-Bell PART No.	STANCOR PART No.	MERIT PART No.	CHICAGO PART No.	
L1	.270A	44Ω	1.9 Henries	27005	C-2326	C-2991	TR-3300 §	§ Drill one new mounting hole.

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA		NOTES
		PRI.	SEC.	Packard-Bell	MEISSNER	
				PART No.	PART No.	
L2	Ant. Coils	0Ω				Part of tuner.
L3	Fil. Choke	0Ω				Part of tuner.
L4	RF Mixer					
	Grid & Osc. Coils	0Ω				
L5	Fil. Choke	0Ω				Part of tuner.
L6	RF Choke	0Ω				Part of tuner.
L7	1st Video IF	0Ω				Part of tuner.
L8	RF Choke	1Ω				3.35 microhenries. Wound on 33KΩ resistor.
L9	2nd Video IF	.2Ω		29028		
L10	3rd Video IF & Sound Take Off	.1Ω		29047		
L11	3rd Video IF Plate Choke	6.7Ω		29115		55 microhenries, some sets may have an 8.2KΩ 1/2 W. carbon resistor in this application.
L12	4th Video IF	.2Ω		29028		
L13	Sound Trap	0Ω	0Ω	29516		
L14	4th Video IF Plate Choke	6.7Ω		29115		55 microhenries.
L15	5th Video IF	.2Ω		29028		
L16	Peaking	3.5Ω		29520		36 microhenries. Black identification dot.
L17	Peaking	7Ω		29508		180 microhenries. Wound on 39KΩ resistor. White identification dot.
L18	Peaking	6.7Ω		29506		120 microhenries. Wound on 22KΩ resistor. Blue identification dot.
L19	Peaking	3.5Ω		29520		36 microhenries. Black identification dot.
L20	Peaking	6.7Ω		29506		120 microhenries. Wound on 22KΩ resistor. Blue identification dot.
L21	Sound IF	0Ω	0Ω	29025		
L22	Ratio Det. Trans.	.1Ω	0Ω	29031		
L23	Width Cont.	.2Ω		29503		
L24	Hor. Linearity	35Ω		29504		

MISCELLANEOUS

ITEM No.	PART NAME	PACKARD - BELL PART No.	NOTES
M1	RF Tuner	10528	
M2	Fuse	45003	Type 3AG - .25 Amp.
M3	Ion Trap	21079	Permanent Type
	Cabinet	21082	Models 2291-TV, 2292-TV, 2295-TV, 2296-TV
	Cabinet	21082	Models 2293-TV, 2294-TV
	Knob	52049	Volume
	Knob	52065	Volume (Models 2297-TV, 2298-TV)
	Knob	52050	Contrast - Bright. or Vert. Hold - Horiz. Hold.
	Knob	52057	Contrast - Bright. or Vert. Hold - Horiz. Hold. (Models 2297-TV, 2298-TV)
	Knob	52044	Channel Selector
	Knob	52064	Channel Selector (Models 2297-TV, 2297-TV)
	Knob	52045	Fine Tuning
	Knob	52054	Fine Tuning (Models 2297-TV, 2298-TV)
	Escutcheon	41027	10" Picture Tube
	Escutcheon	41028	12 1/2" Picture Tube
	Escutcheon	41032	Channel Selector
	Trimmer Strip	23414	Horiz. Lock (10 -160 MMF), Horiz. Freq. (40 - 370 MMF)
	Trimmer	23402	Horiz. Drive (300 - 800 MMF)