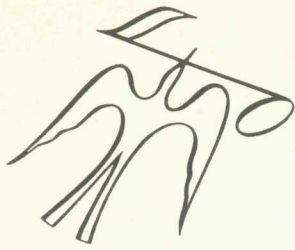
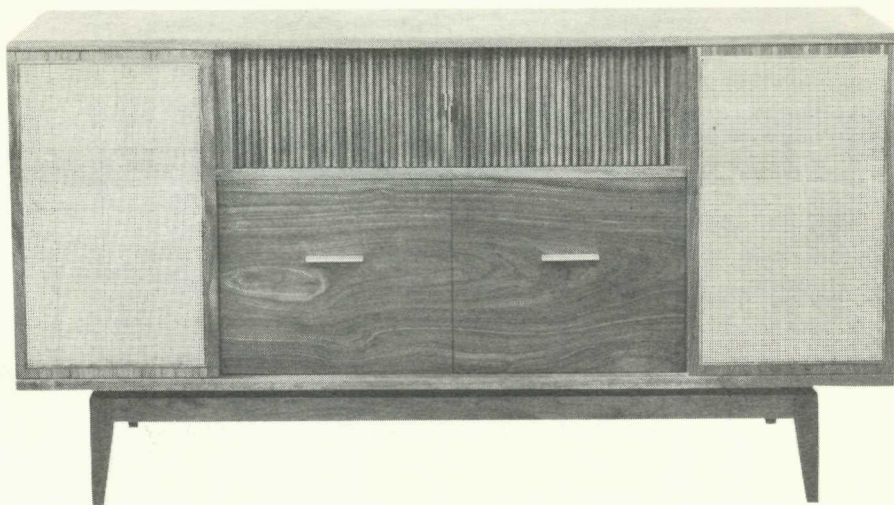


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# VOLTAGE MEASUREMENTS

## FM-AM TUNER-4000R

All readings taken with vacuum-tube voltmeter with respect to chassis ground, subject to 10% normal variation unless otherwise noted. Set dial pointer at extreme low end of scale. AM Selector at SHARP, FM Selector at LISTEN. Set line voltage at 117 volts AC, 50-60 cycles. Readings are in DC volts with respect to chassis ground, unless otherwise noted. Use vacuum-tube voltmeter.

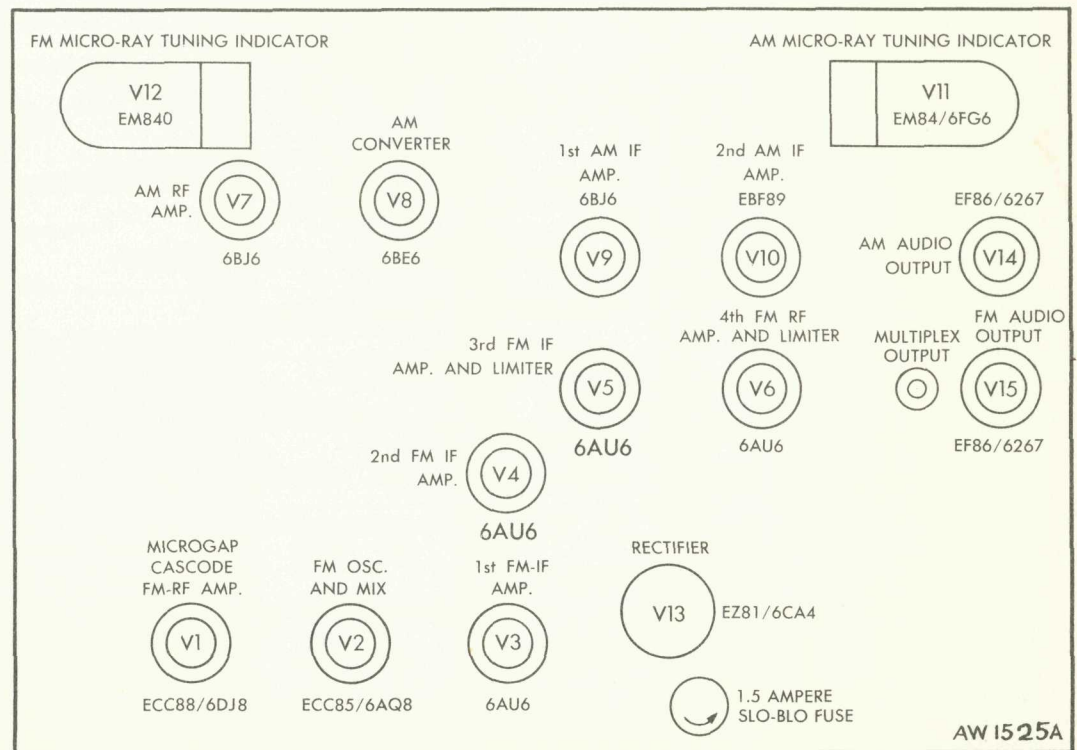
TUBE SOCKET PIN NUMBER									
SYMBOL TUBE	1	2	3	4	5	6	7	8	9
V1 - ECC88/6DJ8	190	95	96	0	6.3AC	98	-0.3	1.5	0
V2 - ECC85/6AQ8	175	-2.1	0	6.3AC	0	170	-2.7	0	0
V3 - 6AU6	-0.3	0	6.3AC	0	205	77	0.5	-	-
V4 - 6AU6	0	0	6.3AC	0	205	70	0.6	-	-
V5 - 6AU6	0.5	0	6.3AC	0	205	76	0	-	-
V6 - 6AU6	6	0	6.3AC	0	205	90	0	-	-
V7 - 6BJ6	-0.1	0.9	6.3AC	0	203	80	0	-	-
V8 - 6BE6	-7.5	0	6.3AC	0	207	90	-0.4	-	-
V9 - 6BJ6	-0.4	0.6	6.3AC	0	205	68	0	-	-
V10 - EBF89	95	0	2.1	6.3AC	0	200	1.9	-0.1	0
V11 - EM84/6FG6	0.6	NC	2.1	0	6.3AC	209	38	NC	38
V12 - EM840	0.6	NC	0	0	6.3AC	209	46	NC	46
V13 - EF86/6267	240AC	NC	290	0	6.3AC	NC	240AC	NC	NC
V14 - EZ81/6CA4	105	1.5	1.5	6.3AC	0	78	1.5	1.5	0
V15 - EF86/6267	90	1.5	1.5	6.3AC	0	90	1.5	1.5	0

ELECTROLYTIC CAPACITOR	TERMINAL SYMBOL	VOLTAGE	NOTES AC=AC volts NC=No Connection
C25	◐	280	
C25	◑	255	
C36	◒	230	
C36	◓	210	
C36	◔	190	

# TUBE LAYOUT

## FM-AM TUNER-4000R



# ALIGNMENT INSTRUCTIONS • FM-AM TUNER-4000R

**Read These Instructions With Extreme Care Before Attempting Alignment.**

**CHASSIS:** Turn the station selectors completely counterclockwise, without forcing. Dial pointers should be at zero index mark on logging scale. If not, reset the dial pointers. Disconnect the external antennas and the antenna link. When using an oscilloscope for alignment, set the output level controls for no overload, as shown by the proper waveform shape.

**SIGNAL GENERATORS:** The signal generator equipment must be able to supply the following: AM RF modulated 30% at 400 cps, FM RF modulated 30% ( $\pm 22.5$  KC deviation) at 400 cps, accurately

calibrated 10 KC audio output for adjusting the 10 KC AM whistle filter, AM IF with 30 KC sweep for AM bandwidth adjustment.

**INDICATOR:** DC VTVM and scope for alignment. AC VTVM for 10 KC AM whistle filter adjustment.

**ALIGNMENT:** Allow the chassis and test instruments to warm up for at least fifteen minutes. Adjust the line voltage for 117 volts AC, 50-60 cycles. Use fully insulated tools: a small screwdriver for all capacitors and L17; a K-Tran tool for Z1, Z2, Z3, Z6, Z7, Z8 and Z9; a hex tool for Z4, Z5, L2, L8 and L9.

## AM ALIGNMENT

STEPS	CHASSIS			SIGNAL GENERATOR			INDICATOR		ALIGNMENT	
	AM SELECTOR	FM SELECTOR	STATION SELECTOR	COUPLING	FREQ.	MOD.	TYPE	CONNECTION	ADJUST	INDICATION
1	BROAD	FM OFF	Point of no signal and no interference	Audio Gen. connected to Pin 7 of V10	10 KC	None	AC VTVM to AM Stereo Output		C52	Minimum output
2	SHARP	FM OFF	Point of no signal and no interference	01-uF cap. in series with hot lead to V8, Pin 7	455 KC	30% AM at 400 cps	DC VTVM to Pin 1 of V11		Z7, Z8, Z9 top and bottom	Maximum negative voltage
3	BROAD	FM OFF	Point of no signal and no interference	01-uF cap. in series with hot lead to V8, Pin 7	455 KC	30 KC sweep	Scope to AM Stereo Output		Z9 top	Adjust slightly for symmetrical curve
4	SHARP	FM OFF	600 KC	220-uF cap. in series with hot lead to antenna terminal 3	600 KC	30% AM at 400 cps	DC VTVM to Pin 1 of V11		L17, Z6	Maximum negative voltage
5	SHARP	FM OFF	1400 KC	220-uF cap. in series with hot lead to antenna terminal 3	1400 KC	30% AM at 400 cps	DC VTVM to Pin 1 of V11		C6F, C6D, C6B	Maximum negative voltage
6	Repeat steps 4 and 5 at least once for proper dial calibration and maximum output.									

## FM ALIGNMENT

7	AM OFF	LISTEN	Point of no signal and no interference	Ungrounded tube shield of V2	10.7 MC	None	DC VTVM to the junction of R67 and C82		Z1, Z2, Z3 top & bottom & Z4 bottom	Maximum negative voltage
8	AM OFF	LISTEN	Point of no signal and no interference	Ungrounded tube shield of V2	10.7 MC	None	DC VTVM to C93 negative terminal		Z5 bottom	Maximum negative voltage
9	AM OFF	LISTEN	Point of no signal and no interference	Ungrounded tube shield of V2	10.7 MC	None	Connect two matched 47K resistors across C93. Connect DC VTVM to the junction of the two 47K Res. Ground side of VTVM to the junction of R75 and C87.		Z5 top	Zero reading on zero center scale
10	AM OFF	LISTEN	106 MC	Two 120-ohm carbon resistors in series with lead to antenna terminals 4 and 5	106 MC	30% FM (22.5 KC Dev.) at 400 cps	DC VTVM to the junction of R67 and C82 and scope to FM Stereo Output		C32	Check for sine waveform and adjust for maximum negative voltage
11	AM OFF	LISTEN	90 MC	Two 120-ohm carbon resistors in series with lead to antenna terminals 4 and 5	90 MC	30% FM (22.5 KC Dev.) at 400 cps	DC VTVM to the junction of R67 and C82 and scope to FM Stereo Output		L9	Check for sine waveform and adjust for maximum negative voltage
12	AM OFF	LISTEN	106 MC	Two 120-ohm carbon resistors in series with lead to antenna terminals 4 and 5	106 MC	30% FM (22.5 KC Dev.) at 400 cps	DC VTVM to the junction of R67 and C82 and scope to FM Stereo Output		C3 and C20	Check for sine waveform and adjust for maximum negative voltage
13	AM OFF	LISTEN	90 MC	Two 120-ohm carbon resistors in series with lead to antenna terminals 4 and 5	90 MC	30% FM (22.5 KC Dev.) at 400 cps	DC VTVM to the junction of R67 and C82 and scope to FM Stereo Output		L2 & L8	Check for sine waveform and adjust for maximum negative voltage
14	Repeat steps 10 through 13 at least once for proper dial calibration and maximum output.									
<b>NOTE:</b> For calibrating both the RF and IF, use as low an output voltage as possible from your signal generator.										

**CAPACITORS**

20% tolerance for all fixed capacitors, unless otherwise noted or marked GMV [guaranteed minimum value.]

Symbol	Description	Part No.
C1	Ceramic, 24uuf 5% N150, 1000V	C50070-8
C2	Ceramic, 8uuf $\pm$ .5uuf NPO, 500V	CC20CJ080D5
C3	Ceramic Trimmer	C662-123
C4	Ceramic, 10uuf NPO, 500V	CC20CH100G5
C5	Ceramic, 100uuf 10% N1500, 1000V	C50070-6
C6	Variable, AM	C684-127
C7	Variable, FM	C662-113
C8	Ceramic, 100uuf GMV N1500, 1000V	C50070-5
C9	Ceramic, 100uuf 10% N1500, 1000V	C50070-6
C10, 11, 12	Ceramic, Feedthru, 1000uuf GMV	C592-187
C13	Ceramic, .02uf +80—20%, 500V	C50089-4
C14	Molded, .01uf, 600V	C2747
C15	Ceramic, Feedthru, 1000uuf GMV	C592-187
C16	Ceramic, .02uf +80—20%, 500V	C50089-4
C17	Ceramic, .005uf, 500V	C50089-1
C18	Ceramic, Feedthru, 100uuf GMV	C592-187
C19	Ceramic, .005uf, 500V	C50089-1
C20	Ceramic Trimmer	C662-123
C21	Ceramic, .68uf, 500V	C50077-6N
C22	Ceramic, 5uuf $\pm$ .5uuf NPO, 500V	CC20CJ050D5
C23	Ceramic, 100uuf 10% N1500, 100V	C50070-6
C24	Ceramic, 10uuf NPO, 500V	CC20CH100G5
C25	Electrolytic, two sections: 40uf, 350V 40uf, 300V	C684-122
C26	Ceramic, Feedthru, 100uuf GMV	C592-187
C27	Ceramic, 68uuf 10% N750, 500V	CC20UJ680K5
C28	Ceramic, 100uuf 10% N1500, 1000V	C50070-6
C29	Ceramic, 100uuf, $\pm$ .5uuf N220, 500V	CC20RH100D5
C30	Ceramic, 47uuf 10% N750, 1000V	C50070-4
C31	Ceramic, Feedthru, 1000uuf GMV	C592-187
C32	Ceramic Trimmer	C662-123
C33	Ceramic, 24uuf 5% N150, 1000V	C50070-8
C34	Ceramic, 100uuf 10% N1500, 1000V	C50070-6
C35	Ceramic, 100uuf GMV N1500, 1000V	C50070-5
C36	Electrolytic, three section: 40uf, 300V 40uf, 300V 20uf, 250V	C684-119
C37	Ceramic, .005uf, 500V	C50089-1
C38	Ceramic, 1000uuf 10%, 1000V	C50072-3
C39	Ceramic, 8uuf $\pm$ .25uuf	CC20VK080C5
C40	Ceramic, .02uf +80—20%, 500V	C50089-4
C41	Ceramic, .005uf, 500V	C50089-1
C42	Ceramic, Feedthru, 1000uuf GMV	C592-187
C43	Ceramic, .02uf +80—20%, 500V	C50089-4
C44	Mica, 470uuf 5%, 300V	C3334
C45, 46	Ceramic, .005uf, 500V	C50089-1
C47	Ceramic, .0027uf, 1000V	C50071-5
C48	Mica, 470uuf 5%, 300V	C3334
C49	Ceramic, .005uf, 500V	C50089-1
C50, 51	Molded, .047uf 10%, 250V	C50074-27
C52	Mica, Trimmer, 160uuf-500uuf	C629-151-5
C53	Ceramic, 47uuf 10% N750, 1000V	C50070-4
C54	Ceramic, 560uuf, 10%, 1000V	C50072-14
C55	Ceramic, .02uf +80—20%, 500V	C50089-4
C56	Ceramic, .005uf, 500V	C50089-1
C57	Mica, 470uuf 5%, 300V	C3334
C58	Ceramic, .005uf, 500V	C50089-1
C59	Molded, .1uf 10%, 250V	C50074-28
C60	Molded, .1uf 10%, 250V	C50074-28
C61	Electrolytic, 25uf, 6V	C639-114
C62	Ceramic, .0027uf, 1000V	C50071-5
C63	Mica, 470uuf 5%, 300V	C3334
C64	Ceramic, .005uf, 500V	C50089-1
C65	Ceramic, 10uuf NPO, 500V	CC20CH100G5
C66	Ceramic, .02uf +80—20%, 500V	C50089-4

C67	Ceramic, 47uuf 10% N750, 1000V	C50070-4
C68, 69	Ceramic, .005uf, 500V	C50089-1
C70	Ceramic, .0027uf, 1000V	C50071-5
C71	Ceramic, .005uf, 500V	C50089-1
C72	Ceramic, 1uuf P100, 1000V	C50070-1
C73	Ceramic, 220uuf 10%, 500V	CC21GP221K5
C74	Molded, .1uf 10%, 250V	C50074-28
C75	Molded, .047uf 10%, 250V	C50074-27
C76	Electrolytic, 25uf, 6V	C639-114
C77	Ceramic, .005uf, 500V	C50089-1
C78	Ceramic, .0027uf, 1000V	C50071-5
C79	Ceramic, 100uuf GMV N1500, 1000V	C50070-5
C80	Ceramic, .005uf, 500V	C50089-1
C81	Ceramic, 330uuf, 10%, 1000V	C50072-1
C82	Molded, .047uf 10%, 250V	C50074-27
C83	Ceramic, .02uf +80—20%, 500V	C50089-4
C84	Ceramic, .005uf, 500V	C50089-1
C85	Ceramic, 330uuf 10%, 1000V	C50072-1
C86	Ceramic, 24uuf 5% N150, 1000V	C50070-8
C87	Ceramic, .0022uf 10%, 1000V	C50072-5
C88	Ceramic, .02uf +80—20%, 500V	C50089-4
C89	Molded, .01uf 10%, 250V	C50074-25
C90	Molded, .047uf 10%, 250V	C50074-27
C91, 92	Ceramic, 330uuf 10%, 1000V	C50072-1
C93	Electrolytic, 8uf, 50V	C629-138
C94	Ceramic, 100uuf GMV N1500, 100V	C50070-5

**RESISTORS AND POTENTIOMETERS**

In ohms, 10% tolerance, 1/2 watt, unless otherwise noted. K = kilohm, M = megohm.

Symbol	Description	Part No.
R1	Composition, 1K	RC20BF102K
R2	Composition, 270	RC20BF271K
R3	Composition, 4.7	RC20BF47K
R4	Composition, 100K	RC20BF104K
R5	Composition, 1.8M	RC20BF185K
R6	Composition, 1.2K	RC20BF122K
R7	Composition, 4.7M	RC20BF475K
R8	Composition, 100	RC20BF101K
R9	Composition, 330K	RC20BF334K
R10	Composition, 47K	RC20BF473K
R11	Composition, 330K	RC20BF334K
R12	Composition, 1K	RC20BF102K
R13	Composition, 4.7	RC20BF47K
R14	Composition, 2.2K	RC20BF222K
R15	Composition, 22	RC20BF220K
R16	Wirewound, 75, 5W	R684-140
R17	Composition, 820K	RC20BF824K
R18, 19	Wirewound, 270, 5W	R684-141
R20	Composition, 470K	RC20BF474K
R21	Composition, 22K	RC20BF223K
R22	Composition, 100	RC20BF101K
R23	Wirewound, 270, 5W	R684-141
R24	Composition, 1K	RC20BF102K
R25	Composition, 22K, 1W	RC30BF223K
R26	Composition, 2.2K, 1W	RC30BF222K
R27	Composition, 1K	RC20BF102K
R28	Composition, 100	RC20BF101K
R29	Composition, 1K	RC20BF102K
R30	Composition, 82K	RC20BF823K
R31	Composition, 47K	RC20BF473K
R32	Potentiometer, 500K 20%	R520-139
R33	Composition, 1K	RC20BF102K
R34	Composition, 100	RC20BF101K
R35	Composition, 330K	RC20BF334K
R36	Composition, 5.6K	RC20BF562K
R37	Composition, 2.2M	RC20BF225K
R38	Composition, 1M	RC20BF105K
R39	Composition, 82K	RC20BF823K
R40	Composition, 1K	RC20BF102K
R41	Composition, 47K	RC20BF473K
R42	Composition, 560	RC20BF561K
R43	Composition, 120	RC20BF121K
R44	Composition, 150K	RC20BF154K
R45	Composition, 82K	RC20BF823K
R46	Composition, 1K	RC20BF102K
R47	Composition, 2.2M	RC20BF225K
R48	Composition, 1.8M	RC20BF185K
R49	Composition, 820K	RC20BF824K
R50	Composition, 1.8M	RC20BF185K
R51	Composition, 180	RC20BF181K
R52	Composition, 120K	RC20BF124K
R53	Composition, 47K	RC20BF473K
R54	Composition, 82K	RC20BF823K
R55, 56	Composition, 1K	RC20BF102K
R57	Composition, 3.3M	RC20BF335K
R58	Composition, 56K	RC20BF563K
R59	Composition, 22K	RC20BF223K
R60, 61	Composition, 330K	RC20BF334K
R62	Composition, 470K	RC20BF474K
R63	Composition, 22K	RC20BF223K
R64	Composition, 10M	RC20BF106K
R65	Composition, 39K	RC20BF393K
R66	Composition, 560	RC20BF561K
R67	Composition, 2.2M	RC20BF225K
R68	Composition, 330K	RC20BF334K
R69	Composition, 1.8M	RC20BF185K
R70	Composition, 1M	RC20BF105K
R71	Composition, 1K	RC20BF102K
R72	Composition, 470K	RC20BF474K
R73	Composition, 330K	RC20BF334K
R74	Composition, 270	RC20BF271K
R75	Composition, 33K	RC20BF333K
R76	Composition, 1K	RC20BF102K
R77	Composition, 22K	RC20BF223K
R78	Potentiometer, 500K 20%	R520-139
R79	Composition, 15K	RC20BF153K
R80	Composition, 1.5K	RC20BF152K

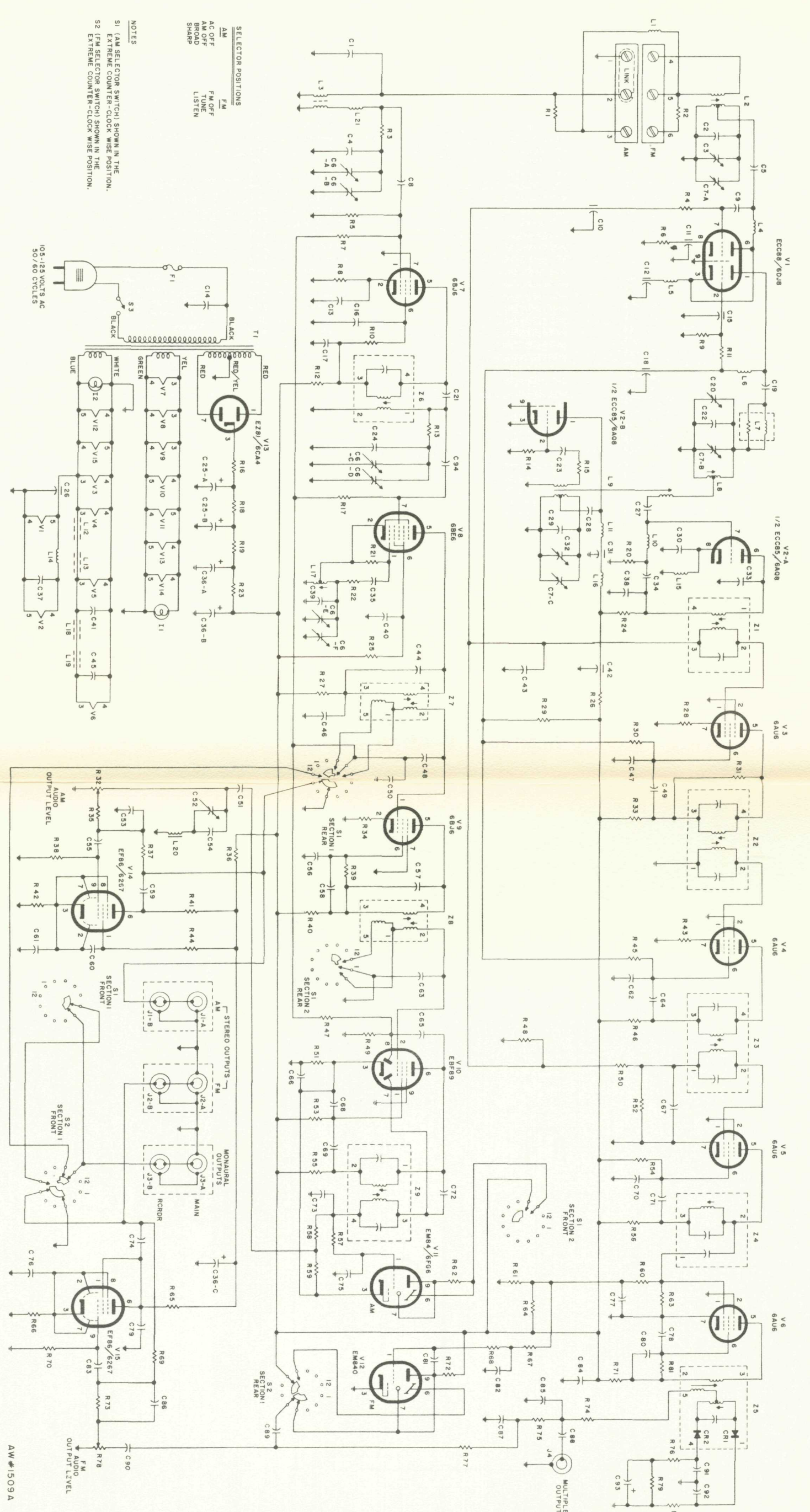
**COILS, TRANSFORMERS, CHOKES**

Symbol	Description	Order No.
L1	Choke, RF 3.3 Micro Henries	L50066-8
L2	Coil, Tuned, FM Antenna	L662-124
L3	Coil, AM Antenna	L721-139
L4	Choke, RF 1.2 Micro Henries	L50066-3
L5, 6	Choke, RF .56 Micro Henries	L50066-19
L7	Choke, RF	L629-180
L8	Coil, Tuned, FM-RF	L662-125
L9	Coil, Tuned, FM Oscillator	L662-126
L10, 11	Choke, RF 1.2 Micro Henries	L50066-3
L12, 13	Choke, Ferrite Bead, Filament	LS92-189
L14	Choke, RF 1.2 Micro Henries	L50066-3
L15	Choke, RF .56 Micro Henries	L50066-19
L16	Choke, RF 1.2 Micro Henries	L50066-3
L17	Coil, AM Oscillator	LS50-122
L18, 19	Choke, Ferrite Bead, Filament	LS92-189
L20	Coil, 10k Filter	L644-120
L21	Loop, AM	L721-136
T1	Transformer, Power	T684-124
Z1	Transformer, FM-IF	ZZ662-117
Z2, 3	Transformer, FM-IF	ZZ629-142
Z4	Coil, FM Limiter	L670-145
Z5	Transformer, FM Detector	ZZ592-170
Z6	Transformer, AM-RF	L670-151
Z7, 8	Transformer, AM-IF	ZZ509-132
Z9	Transformer, AM-IF	ZZ2984

**MISCELLANEOUS**

CR1, 2	Crystal Diode, Matched Pair, FM Detector	V-1N542
F1	Fuse, 1 1/2 Ampere, Slo-Blo	F684-143
LI, 2	Lamp, Dial Edge Lighting	150082
S1	Switch, AM Selector	S684-123
S2	Switch, FM Selector	S684-120
S3	Switch, AC Power	Part of 51

# SCHEMATIC DIAGRAM • FM-AM TUNER-4000R



**SELECTOR POSITIONS**

AM	FM
AC OFF	FM OFF
AM OFF	AM OFF
BROAD	LISTEN
SHARP	

**NOTES**

S1 (AM SELECTOR SWITCH) SHOWN IN THE EXTREME COUNTER-CLOCK WISE POSITION.

S2 (FM SELECTOR SWITCH) SHOWN IN THE EXTREME COUNTER-CLOCK WISE POSITION.

105-125 VOLTS AC  
50/60 CYCLES

AW#1509A

RESISTORS	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26	R27	R28	R29	R30	R31	R32	R33	R34	R35	R36	R37	R38	R39	R40	R41	R42	R43	R44	R45	R46	R47	R48	R49	R50	R51	R52	R53	R54	R55	R56	R57	R58	R59	R60	R61	R62	R63	R64	R65	R66	R67	R68	R69	R70	R71	R72	R73	R74	R75	R76	R77	R78	R79	R80																	
CAPACITORS	C1	C2	C3	C4	C5	C6-A	C6-B	C7-A	C7-B	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25-A	C25-B	C26	C27	C28	C29	C30	C31	C32	C33	C34	C35	C36-A	C36-B	C37	C38	C39	C40	C41	C42	C43	C44	C45	C46	C47	C48	C49	C50	C51	C52	C53	C54	C55	C56	C57	C58	C59	C60	C61	C62	C63	C64	C65	C66	C67	C68	C69	C70	C71	C72	C73	C74	C75	C76	C77	C78	C79	C80	C81	C82	C83	C84	C85	C86	C87	C88	C89	C90	C91	C92	C93

# VOLTAGE MEASUREMENTS

## MASTER CONTROL AMPLIFIER-X-1000

All readings taken with vacuum tube voltmeter and, except where indicated, are with respect to chassis ground. Volume control at minimum setting. Bass and Treble tone controls at mid-position. 16-ohm load at speaker terminals. Line voltage 117 volts, 50-60 cycles. All readings are DC unless otherwise noted.

TUBE SYMBOL	TUBE SOCKET PINS								
	1	2	3	4	5	6	7	8	9
V1	86	-0.7	0	12	23.5	80	0	0.8	18.0
V2	147	0	1.1	3.1*	3.1*	147	0	1.1	3.1*
V3	210	105	105	3.1*	3.1*	105	0	1.1	3.1*
V4	NC	12.0**	23.5***	3.1*	3.1*	NC	400	NC	370
V5	NC	12.0**	23.5***	3.1*	3.1*	NC	400	NC	370
V6	86	-0.7	0	0	12.0	87	0	1.1	6.0
V7	150	0	1.1	3.1*	3.1*	150	0	1.1	3.1*
V8	210	105	105	3.1*	3.1*	105	0	1.1	3.1*
V9	NC	12.0**	23.5***	3.1*	3.1*	NC	400	NC	370
V10	NC	12.0**	23.5***	3.1*	3.1*	NC	400	NC	370
V11	NC	430	NC	360AC	NC	360AC	NC	430	—

CAPACITOR	TERMINAL SYMBOL	VOLTAGE	NOTES NC No connection * AC voltage measured between center tap of filament and pin indicated. ** For Serial Nos. 40001-49999 reading is 8.5 volts. *** For Serial Nos. 40001-49999 reading is 21.0 volts.
C34A	▲	305	
C34B	■	260	
C34C	◐	180	
C37A	◑	400	
C37B	▲	350	

# ADJUSTMENT INSTRUCTIONS

## MASTER CONTROL AMPLIFIER-X-1000

### PHASE INVERTER BALANCE ADJUSTMENT

The phase inverter balance adjustments for Channel A and Channel B are located on the top surface of the chassis. These adjustments should not be attempted unless you have an audio generator and a harmonic or intermodulation distortion analyzer. To make the adjustment, proceed as follows:

1. Connect the audio generator to the AUX or TUNER INPUT of the appropriate channel of the X-101 Master Control Amplifier.
2. Load the output of the amplifier and connect the distortion analyzer to it.
3. Set the audio generator to 1000 cycles or use an intermodulation analyzer. Adjust the output so that the amplifier is slightly (approx. 1 db) below the clipping point.
4. Keeping this output constant, adjust the phase inverter balance control (R74 or R77 on the Schematic Diagram) for minimum distortion as observed on the analyzer.

# PARTS DESCRIPTION LIST • MASTER CONTROL AMPLIFIER-X-1000

## CAPACITORS

20% tolerance for all fixed capacitors, unless otherwise noted or marked GMV (guaranteed minimum value.)

Symbol	Description	Order No.
C1	Ceramic, 820uuf 10%, 1000V	C50072-7
C2, 3	Ceramic, 390uuf 10%, 1000V	C50072-6
C4	Ceramic, 1800uuf 10%, 1000V	C50072-8
C5	Ceramic, 82uuf 10% N1500, 1000V	C50070-7
C6	Ceramic, 1800uuf 10%, 1000V	C50072-8
C7, 8	Ceramic, 560uuf 10%, 1000V	C50072-14
C9, 10		
11, 12	Molded, .01uf 10%, 250V	C50074-25
C13, 14	Ceramic, .005uf, 500V	C50089-1
C15, 16	Molded, .022uf 10%, 250V	C50074-26
C17	Ceramic, 7uuf 10% NPO, 1000V	C50070-20
C18	Ceramic, 8uuf 10% NPO, 1000V	C50070-14
C19, 20	Ceramic, 68uuf 10%, 500V	CC21GP680K5
C21, 22	Electrolytic, 25uf, 6V	C639-114
C23, 24	Molded, .01uf 10%, 250V	C50074-25
C25	Ceramic, 1000uuf 10%, 1000V	C50072-3
C26	Molded, .022uf 10%, 250V	C50074-26
C27	Ceramic, 1000uuf 10%, 1000V	C50072-3
C28	Molded, .022uf 10%, 250V	C50074-26
C29	Electrolytic, 100uf, 100V	C663-143
C30	Ceramic, 150uuf 10%, 500V	CC21GP151K5
C31	Molded, .0027uf 10%, 200V	C68P272K2
C32	Ceramic, 150uuf 10%, 500V	CC21GP151K5
C33	Molded, .0027uf 10%, 200V	C68P272K2
C34	Electrolytic, three section: 40uf, 450V 40uf, 450V 20uf, 450V	C563-127
C35, 36	Molded, .01uf 10%, 250V	C50074-25
C37	Electrolytic, two section: 60uf, 450V 40uf, 450V	C663-136
C38, 39,		
40, 41,	Molded, .01uf 10%, 250V	C50074-25
C42, 43	Not used	
C44, 45	Ceramic, 68uuf 10%, 500V	CC21GP680K5
C46, 47	Ceramic, 47uuf 10%, 500V	CC21GP470K5
C48	Not used	
C49	Molded, .0047uf, 400V	C68P472K2
C50	Not used	
C51, 52,		
53	Molded, .0047uf, 400V	C68P472K2
C54	Molded, .01uf, 600V	C2747

## RESISTORS AND POTENTIOMETERS

In ohms, 10% tolerance, 1/2 watt, unless otherwise noted. K = kilohm, M = megohm.

Symbol	Description	Order No.
R1, 2	Potentiometer, 250K 20%	R657-134
R3	Composition, 10K	RC20BF103K
R4	Composition, 100K	RC20BF104K
R5	Composition, 10K	RC20BF103K
R6	Composition, 100K	RC20BF104K
R7, 8	Composition, 2.7K, 1W	RC30BF272K
R9	Composition, 3.3M	RC20BF335K
R10	Composition, 2.2M	RC20BF225K
R11	Composition, 1.2M	RC20BF125K
R12	Composition, 270K	RC20BF274K
R13	Composition, 10M	RC20BF106K
R14	Composition, 270K	RC20BF274K
R15	Composition, 10M	RC20BF106K
R16, 17	Composition, 120K	RC20BF124K
R18, 19	Potentiometer, 250K 20%	R657-134
R20, 21	Composition, 330K, 1W	RC30BF334K
R22, 23	Composition, 220K	RC20BF224K
R24, 25	Composition, 10M	RC20BF106K
R26, 27	Composition, 3.3M	RC20BF335K
R28, 29	Composition, 2.2M	RC20BF225K
R30, 31	Composition, 3.3M	RC20BF335K
R32	Composition, 100K	RC20BF104K
R33	Composition, 1.2K	RC20BF122K
R34	Composition, 100K	RC20BF104K
R35	Composition, 1.2K	RC20BF122K
R36, 37	Composition, 15M	RC20BF156K
R38, 39	Composition, 180K	RC20BF184K
R40	Composition, 220K	RC20BF224K
R41	Potentiometer, Dual, 1M	R663-134
R42	Composition, 15K	RC20BF153K
R43	Composition, 220K	RC20BF224K
R44	Composition, 15K	RC20BF153K
R45, 46	Composition, 47K	RC20BF473K
R47	Potentiometer, Dual, 1M	R663-134
R48	Wirewound, 920, 5%, 5W	R592-167
R49	Composition, 100K	RC20BF104K
R50	Composition, 1.2K	RC20BF122K
R51	Composition, 100K	RC20BF104K
R52	Composition, 1.2K	RC20BF122K
R53	Composition, 47K	RC20BF473K
R54	Potentiometer, Dual Volume 500K	R663-138
R55	Composition, 10K, 1W	RC30BF103K
R56, 57	Composition, 47K	RC20BF473K
R58, 59	Composition, 120K	RC20BF124K
R60	Composition, 4.7K, 1W	RC30BF472K
R61, 62	Composition, 270K	RC20BF274K

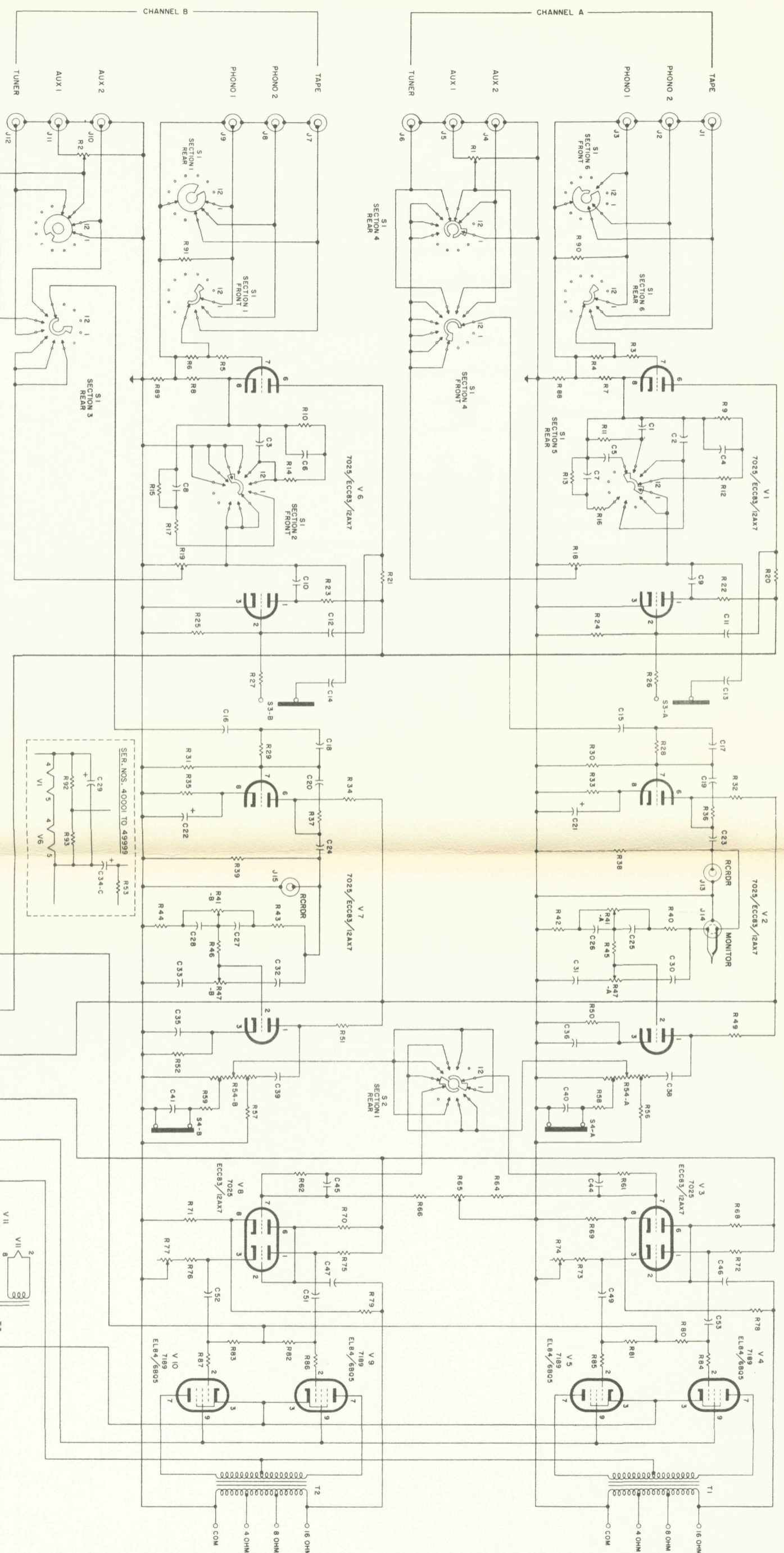
R63	Wirewound, 2.2K, 7W	R563-148
R64	Composition, 68K	RC20BF683K
R65	Potentiometer, Balance 500K, 20%	R663-131
R66	Composition, 68K	RC20BF683K
R67	Wirewound, 250, 7W (Two Used in Parallel or Wirewound, 600, 5W (Three Used in Parallel))	R539-121
R68	Composition, 390K	R643-157
R69	Composition, 1.5K	RC20BF394K
R70	Composition, 390K	RC20BF152K
R71	Composition, 1.5K	RC20BF394K
R72	Composition, 100K	RC20BF152K
R73	Composition, 82K	RC20BF104K
R74	Potentiometer, 50K, 20%	RC20BF823K
R75	Composition, 100K	R50103-3
R76	Composition, 82K	RC20BF104K
R77	Potentiometer, 50K, 20%	RC20BF823K
R78, 79	Composition, 47K	R50103-3
R80, 81		RC20BF473K
82, 83	Composition, 390K	RC20BF394K
R84	Composition, 2.2K	RC20BF222K
R85	Composition, 33K	RC20BF333K
R86	Composition, 2.2K	RC20BF222K
R87	Composition, 33K	RC20BF333K
R88, 89	Composition, 10	RC20BF100K
R90, 91	Composition, 100K	RC20BF104K
R92	Composition, 10K	RC20BF103K
R93	Composition, 6.8K	RC20BF682K

## TRANSFORMERS

Symbol	Description	Order No.
T1	Transformer, Output	T663-135
T2	Transformer, Output	T663-114
T3	Transformer, Power	T663-115

## MISCELLANEOUS

Symbol	Description	Order No.
F1	Fuse, 3.2 Ampere, Slo-Blo	F3319
I1	Lamp Panel	A50118
S1	Switch, Input Selector	S663-132
S2	Switch, Output Selector	S663-130
S3, 4	Switch, Slide	S663-133
S5	Switch, AC Power	Part of R54



**INPUT SELECTOR POSITIONS**

S1  
7B (MONAURAL)  
7B (MONAURAL)  
LIAA1 (STEREO)  
LIAA2 (STEREO)  
7A (STEREO)  
AUX1 (STEREO)  
AUX2 (STEREO)

**OUTPUT SELECTOR POSITIONS**

S2  
REVERSE (STEREO)  
CHANNEL A+B (MONAURAL)  
CHANNEL B+A (MONAURAL)

**NOTES**

S1 SHOWN IN THE 7B (MONAURAL) POSITION "EXTREME CCW".  
S2 SHOWN IN THE REVERSE (STEREO) POSITION "EXTREME CCW".  
S3 RUMBLE FILTER SHOWN IN THE OFF POSITION.  
S4 LOUDNESS CONTROL SHOWN IN THE OFF POSITION.

SER. NOS. 40001 TO 49999

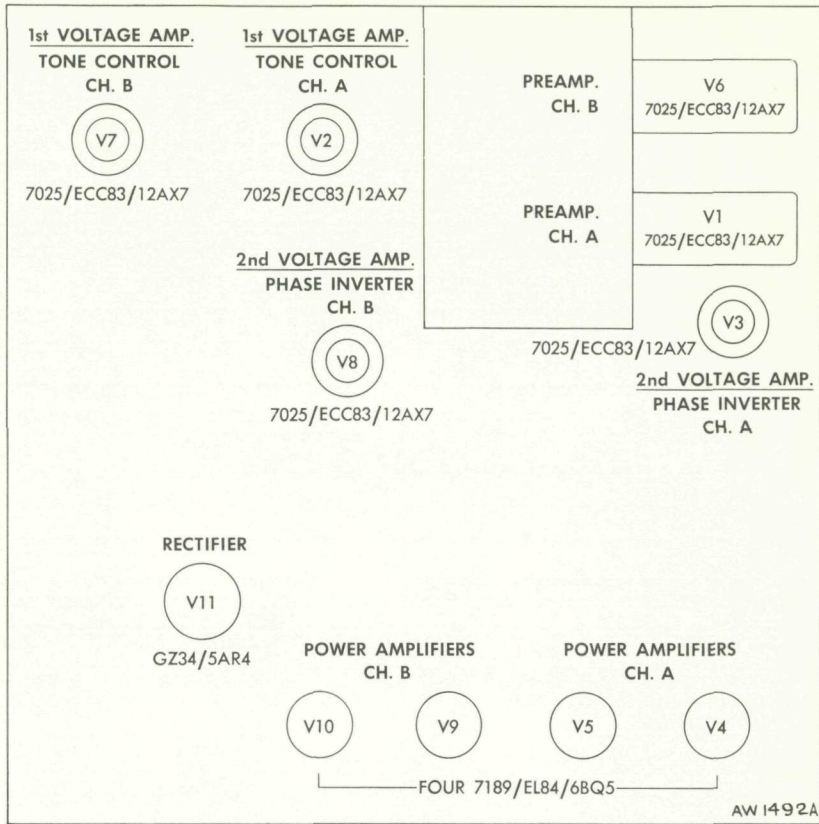
RESISTORS	R1	R2	R3	R7	R8	R9	R11	R12	R16	R17	R18	R20	R22	R24	R26	R27	R28	R30	R32	R36	R38	R40	R44	R48	R50	R54	R58	R62	R66	R70	R74	R78	R82	R86	R90		
CAPACITORS	C1	C2	C3	C4	C7	C8	C9	C10	C11	C12	C13	C14	C16	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30	C34	C37	C40	C44	C45	C46	C49	C51	C52	C53	C54

105-125 VOLTS  
50/60 CYCLES AC

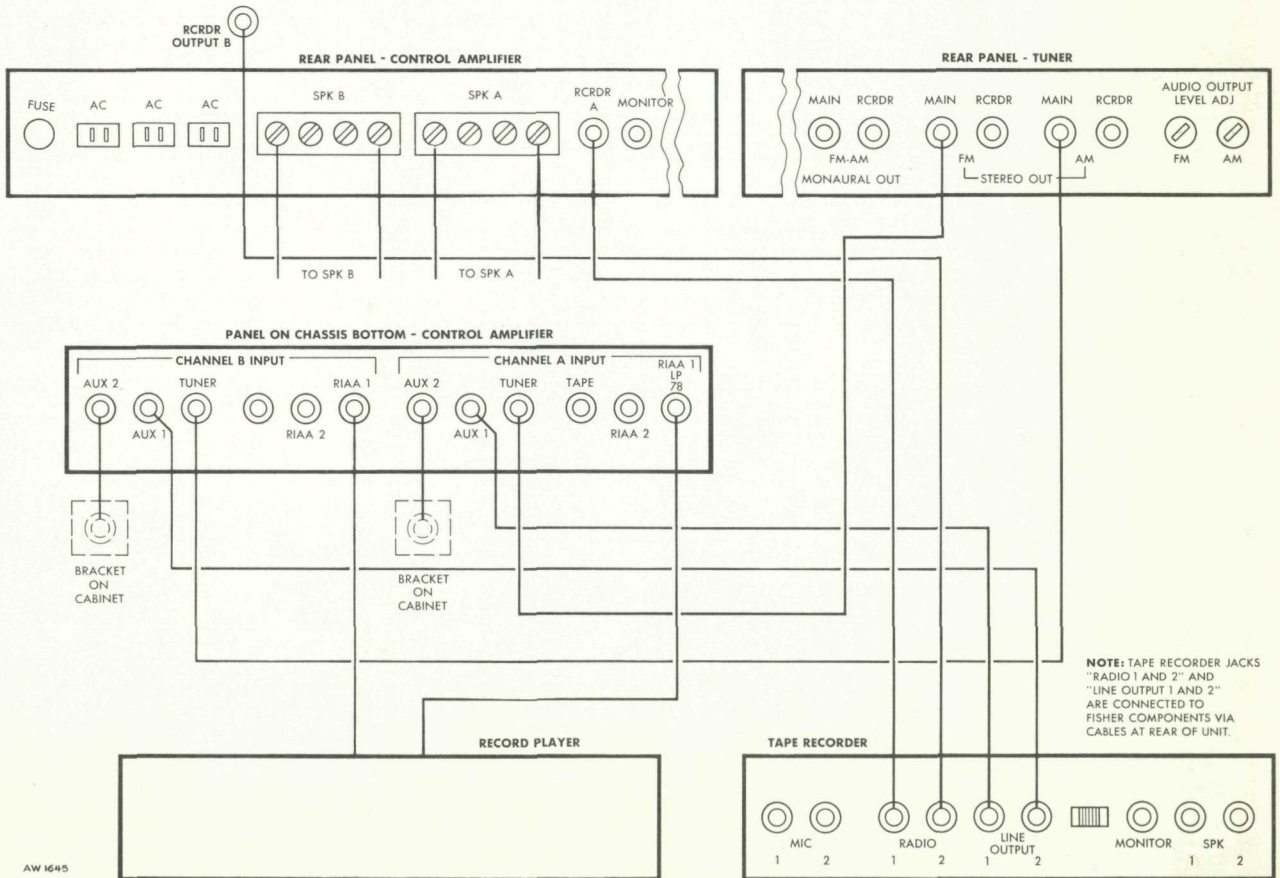


# TUBE LAYOUT

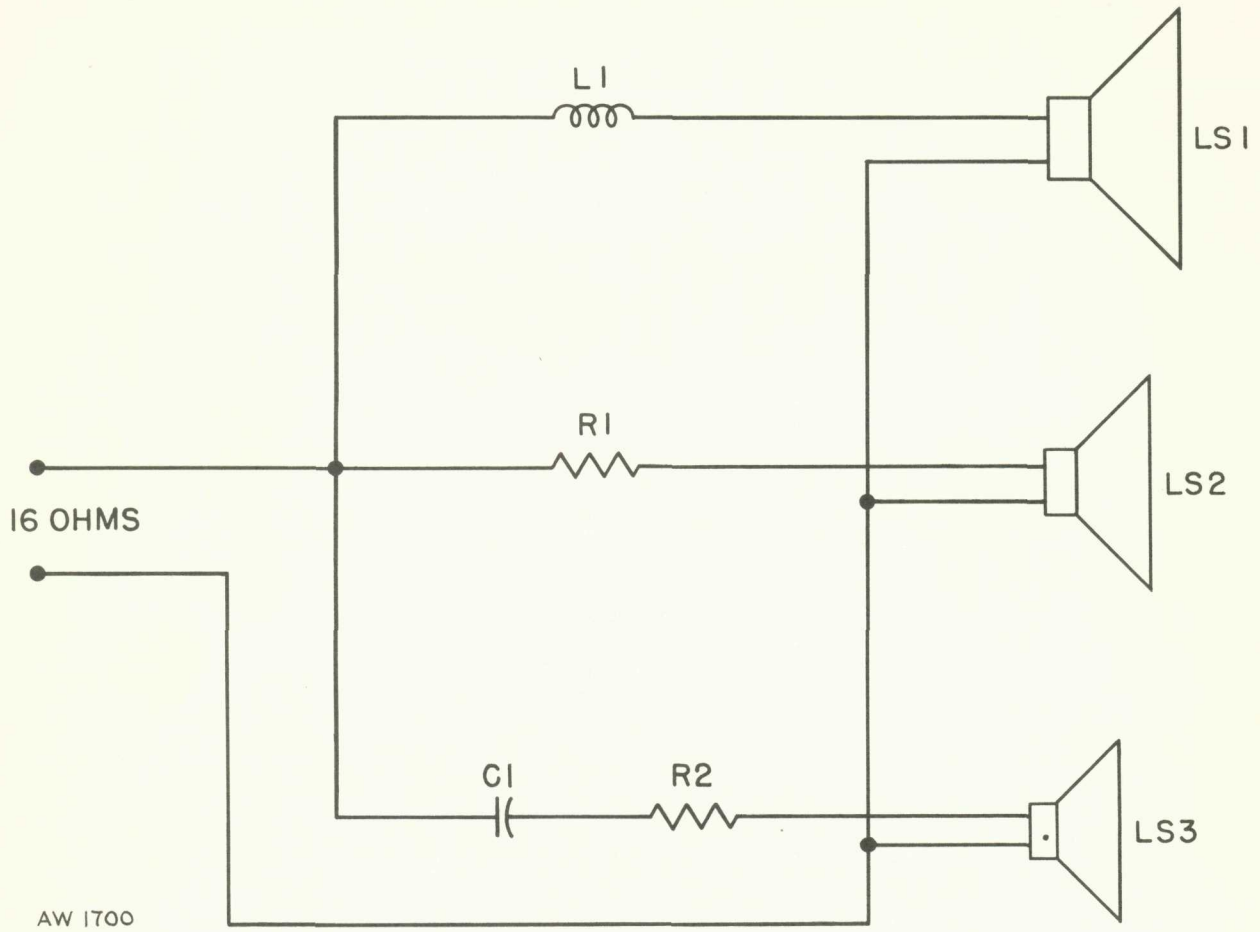
## MASTER CONTROL AMPLIFIER—X-1000



## COMPONENT HOOK-UP CHART



# SCHEMATIC DIAGRAM • SPEAKER SYSTEMS



# PARTS DESCRIPTION LIST • SPEAKER SYSTEMS

Symbol	Description	Part No.
C1	Capacitor, Paper, 2uf, 50V	C547-118
L1	Coil, 3MH	L547-120
LS1	Speaker, Woofer, 12-Inch, 16 Ohms	LS688-116
LS2	Speaker, Mid-Range, 8-Inch, 16 Ohms	L550123
LS3	Speaker, Tweeter, 16 Ohms	LS547-124
R1	Resistor, Wirewound, 6.8 Ohms, 10%, 5W	R671-113
R2	Resistor, Wirewound, 30 Ohms, 10%, 5W	R689-103



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