

ERIC NELSON

The Harman Kardon Model hk 450

**AM/FM/Stereo FM
Solid State Receiver**

Technical Manual

harman/kardon

PRECAUTIONS

1. Always disconnect the chassis from power line when soldering. Turning the power switch OFF is not enough. Power line leakage passing through the heating element may destroy the transistors.
2. Never attempt to do any work on the transistor amplifiers without first disconnecting the AC line cord and waiting until the power supply filter capacitors have discharged.
3. Replacement for output and driver transistors, if necessary, must be made from the same beta group as the original type.
4. If one output transistor burns out (open or short) always remove all the output transistors in that channel and check the bias adjustment, the control and other parts in the network with an ohmmeter before inserting a new transistor. All transistors in one channel will be destroyed if the base biasing circuit is open on the emitter end.
5. When mounting a replacement power transistor, be sure that the bottom of the flange, the mica insulators and the surface of the heat sink are free of foreign matter, for they may cause transistor failure.
6. Silicon grease must be applied between the transistor and the mica insulator, and between the mica insulator and the heat sink for better heat conduction.
7. Fuses must be replaced with size and type indicated. Use of other types can expose components to destructive current levels.

NOTE TO WARRANTY STATIONS: Printed circuit board assembly numbers are shown for reference only. Harman/Kardon does not normally supply assembled printed circuit boards.

NOTE: To speed handling of your order be sure to include both the model and serial numbers, in addition to the quantity, part number and part description of the items ordered. Orders from independent dealers, independent servicemen, and retail customers will be shipped on a cash in advance basis. Harman/Kardon reserves the right to substitute equivalent parts for those originally installed in this chassis. All parts should be ordered from Harman/Kardon, 55 Ames Court, Plainview, L.I., N.Y. 11803, Att: Parts Department.

ALIGNMENT PROCEDURES

AM ALIGNMENT PROCEDURE

INSTRUMENTS: * AM Signal Generator modulated with 400Hz at 30%.
 * AM IF Sweep Generator.
 * Oscilloscope.
 * V. T. V. M..

NOTE: * Set function selector switch to AM position.
 * Connect signal into standard loop to radiate signals into AM antenna loop stick (L251).

Step	SIGNAL SOURCE		CONNECT OUTPUT METER TO	DIAL SETTING	ADJUST	ADJUST FOR
	GENERATOR	FREQUENCY				
1	AM IF sweep generator	455 kHz	V. T. V. M. and oscilloscope for R267 (4.7 k ohm)	Quiet point on band	T251	Maximum output and best symmetry on oscilloscope
2					T252	
3	Repeat steps 1 and 2 for best sensitivity					
4	AM signal generator	600 kHz	V. T. V. M. and oscilloscope to R267 (4.7 k ohm)	600 kHz	L252	Maximum otuput
5		1400 kHz		1400 kHz	TC202	
6	Repeat steps 4 and 5 for best dial accuracy					
7	AM signal generator	600 kHz	V. T. V. M. and oscilloscope to R267 (4.7 k ohm)	600 kHz	L251	Maximum output
8		1400 kHz		1400 kHz	TC201	
9	Repeat steps 7 and 8 for best sensitivity					

TUNING METER ADJUSTMENT

INSTRUMENTS: * FM Signal Generator modulated with 1000Hz at 100%.
 * Oscilloscope.
 * V. T. V. M..

NOTE: * Set function selector switch to FM position.
 * Connect signal source to FM antenna terminals.

Step	SIGNAL SOURCE		CONNECT OUTPUT METER TO	DIAL SETTING	ADJUST	ADJUST FOR
	FREQUENCY	STRENGTH				
1	98 MHz	20 μ V	V. T. V. M. and oscilloscope to tape out 1 jack	Near 98 MHz	Tuning control	Maximum tuning meter indication
2		1 mV		Preset point	VR201	Indicating 9 on tuning meter

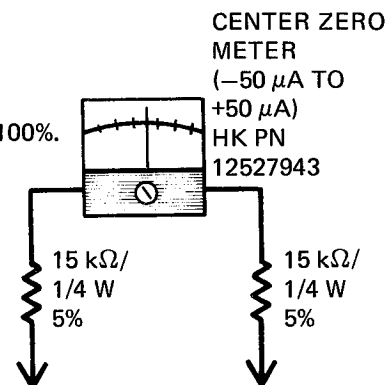
FM ALIGNMENT PROCEDURE

INSTRUMENTS:

- * FM Signal Generator modulated with 1000Hz at 100%.
- * Oscilloscope.
- * Distortion Meter.
- * Center Zero Meter. (Described at right →)
- * V. T. V. M..

NOTE:

- * Set function selector switch to FM position.
- * Set FM muting switch to OFF (button out) position.
- * Connect signal source to FM antenna terminals.



Step	SIGNAL SOURCE		CONNECT OUTPUT METER TO	DIAL SETTING	ADJUST	ADJUST FOR
	FREQUENCY	STRENGTH				
1			Oscilloscope to R217 (10 k ohm)	Quiet point on band	T101	Maximum noise
2			Center zero meter to R214 (47 k ohm) and LP108. Oscilloscope to tape out 1 jack		T201	Indicating zero on center zero meter
3	98 MHz	1mV		Near 98 MHz	Tuning control	
4		1 mV	Distortion meter to tape out 1 jack	Preset point	T202	Minimum reading on distortion meter
5	Repeat steps 2 through 4 until no further improvement is noticed					
6	90 MHz	2 μ V	V. T. V. M. and oscilloscope to tape out 1 jack	90 MHz	L105	Maximum output
7	106 MHz			106 MHz	TC103	
8	Repeat steps 6 and 7 until no further improvement is noticed.					
9	90 MHz	1 μ V	V. T. V. M. and oscilloscope to tape out 1 jack	90 MHz	L102, L103	Maximum output
10	106 MHz			106 MHz	TC101, TC102	
11	Repeat steps 9 and 10 until no further improvement is noticed.					

MUTING SENSITIVITY AND BANDWIDTH ADJUSTMENT

INSTRUMENTS: *FM Signal Generator modulated with 1000Hz at 100%.
 *Oscilloscope.
 *V. T. V. M..
 *Frequency Counter.

NOTE: *Set function selector switch to FM position.
 *Set the FM muting switch to ON (button in) position.
 *Connect signal source to FM antenna terminals.

Step	SIGNAL FREQUENCY	SOURCE STRENGTH	CONNECT OUTPUT METER TO	DIAL SETTING	ADJUST	ADJUST FOR
1	98 MHz	20 μ V	V. T. V. M. and oscilloscope to tape out 1 jack	Near 98 MHz	Tuning control	Maximum tuning meter indication
2		3.16 μ V		Preset point	VR203	Mute threshold; signal appears on scope
3		1 mV			FM signal generator frequency	Turn frequency dial clockwise until signal disappears from oscilloscope, and note the frequency of FM signal on frequency counter
4						
5					VR202	Repeat steps 3 and 4, and adjust until the difference of frequencies from step 3 and 4 becomes 125 $\pm$ 25kHz

FM STEREO INDICATOR ADJUSTMENT

INSTRUMENTS: *FM Stereo Signal Generator.
 *Oscilloscope.
 *V. T. V. M..

NOTE: *Set function selector switch to STEREO FM position.
 *Connect signal source to FM antenna terminals.
 *Set main signal OFF, and Pilot signal to 10% on FM Stereo signal generator.

Step	SIGNAL SOURCE		CONNECT OUTPUT METER TO	DIAL SETTING	ADJUST	ADJUST FOR
	FREQUENCY	STRENGTH				
1	98 MHz	20 μ V	V. T. V. M. and oscilloscope to tape out 1 jack	Near 98 MHz	Tuning control	Maximum tuning meter indication
2		25 μ V		Preset point	VR204	FM stereo indicator lights

SEPARATION ADJUSTMENT

INSTRUMENTS: * FM Stereo Signal Generator.
* Oscilloscope.
* V. T. V. M..

NOTE: * Set function selector switch to STEREO FM position.
* Connect signal source to FM antenna terminals.

Step	SIGNAL SOURCE		CONNECT OUTPUT METER TO	DIAL SETTING	ADJUST	ADJUST FOR
	FREQUENCY	STRENGTH				
1	Set main signal OFF, and pilot to 10% on FM stereo signal generator					
2	98 MHz	20 μ V	V. T. V. M. and oscilloscope to tape out 1 jack	Near 98 MHz	Tuning control	Maximum tuning meter indication
3		1 mV	V. T. V. M. to Rch tape out 1 jack	Preset point	VR302	Minimum output
4			V. T. V. M. to Lch tape out 1 jack		VR302	Best compromise between present and previous output $\pm$ 4dB
5	Set main signal ON, and pilot signal to 10% on FM stereo signal generator.					
6	98 MHz (Right chan. modulation)	1 mV	V. T. V. M. to Lch tape out 1 jack	Preset point	VR303	Minimum output
7	98 MHz (Left chan. modulation)		V. T. V. M. to Rch tape out 1 jack		VR303	Best compromise between present and previous output $\pm$ 3dB

MPX OSCILLATOR FREQUENCY ADJUSTMENT

INSTRUMENTS: * Frequency Counter.
* FM Signal Generator.
* Oscilloscope.
* V. T. V. M..

NOTE: * Set function selector switch to STEREO FM position.
* Connect signal source to FM antenna terminals.

Step	SIGNAL SOURCE		CONNECT OUTPUT METER TO	DIAL SETTING	ADJUST	ADJUST FOR
	FREQUENCY	STRENGTH				
1	98 MHz	20 μ V	V. T. V. M. and oscilloscope to tape out 1 jack	Near 98 MHz	Tuning control	Maximum tuning meter indication
2	98 MHz (No modulation)	1 mV	Frequency Counter to R333 (100 k ohm)	Preset point	VR301	76 kHz $\pm$ 200 Hz

OUTPUT DC VOLATGE ZERO ADJUSTMENT

INSTRUMENT

REQUIRED: *D. C. V. T. V. M..

NOTE: *Set function selector switch to AUX position.
*Set volume control to minimum position.
*Press in speaker 1 push switch to ON (button in) position.

Step	CONNECT OUTPUT METER TO	ADJUST	ADJUST FOR
1	D. C. V. T. V. M. to Rch terminal of speaker system 1	VR401	0 ± 10 mV D. C.
2	D. C. V. T. V. M. to Lch terminal of speaker system 1	VR402	

POWER AMPLIFIER IDLING ADJUSTMENT

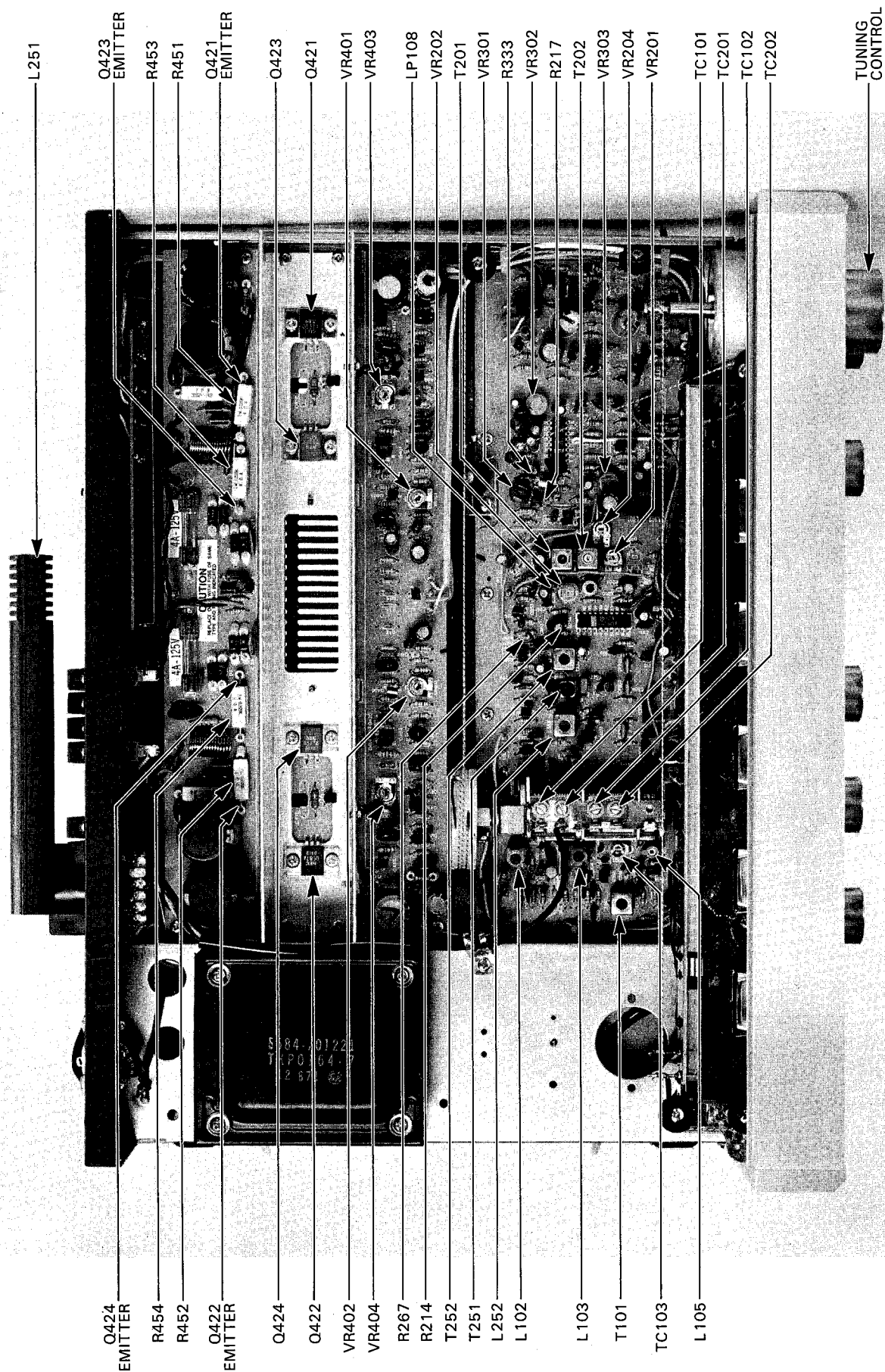
INSTRUMENT

REQUIRED: *D. C. V. T. V. M..

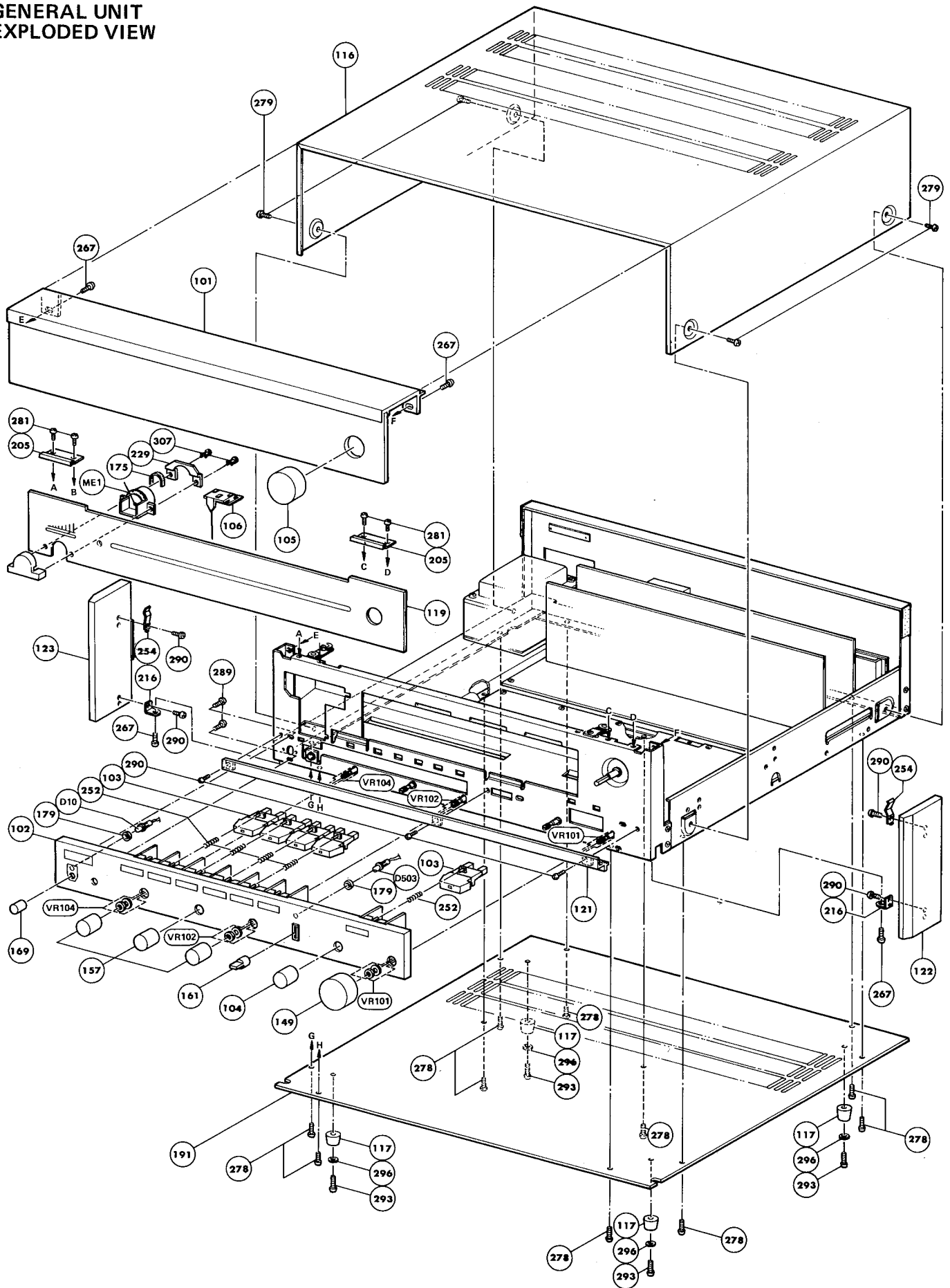
NOTE: *Set function selector switch to AUX position.
*Set volume control to minimum position.
*Adjustment to be performed with NO loads at output terminals.

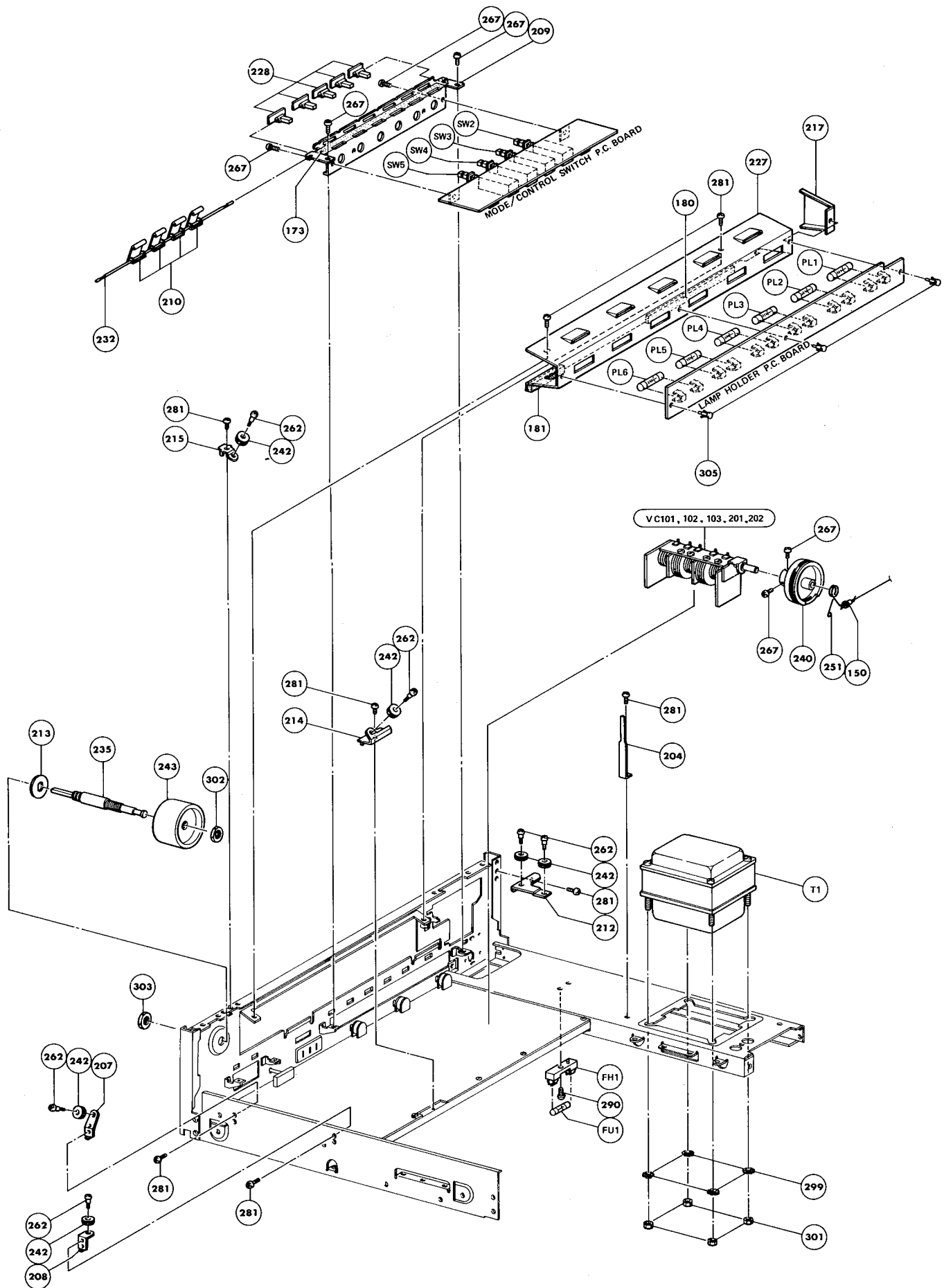
Step	CONNECT OUTPUT METER TO	ADJUST	ADJUST FOR
1	D. C. V. T. V. M. to Q421 (emitter) and Q423 (emitter)	VR403	33 mV ± 1.0 mV
2	D. C. V. T. V. M. to Q422 (emitter) and Q424 (emitter)	VR404	

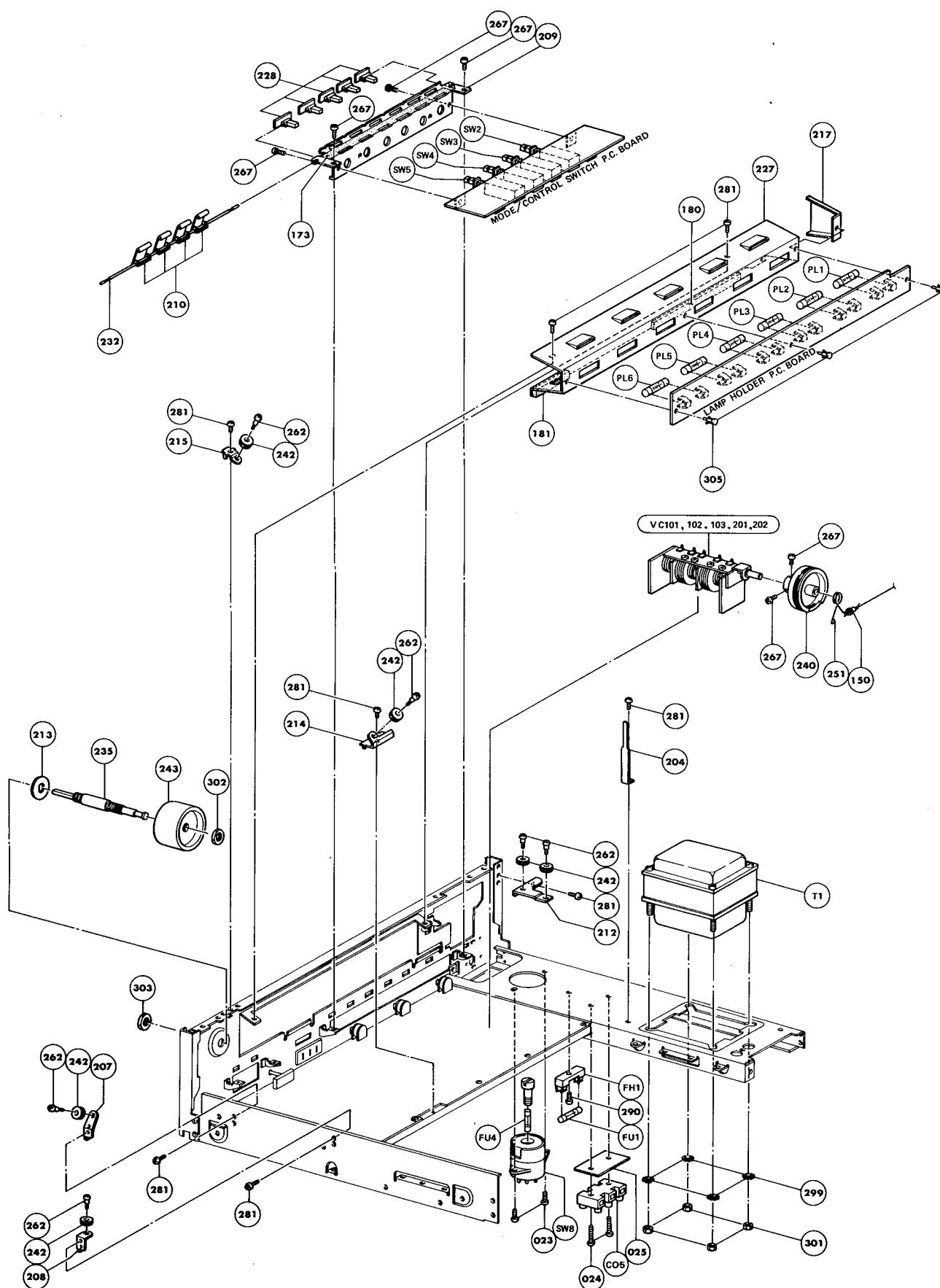
ALIGNMENT POINTS



GENERAL UNIT EXPLODED VIEW

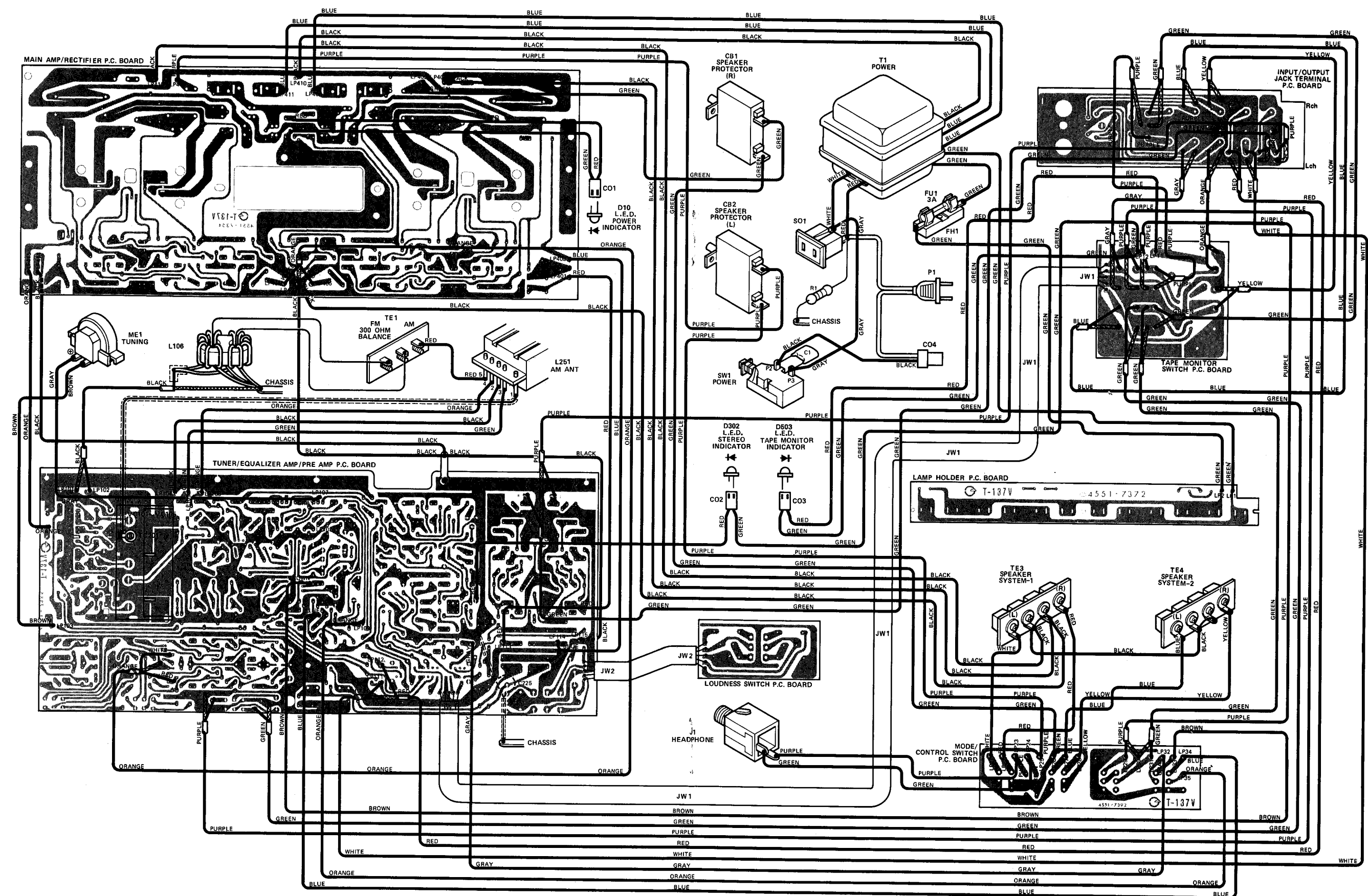




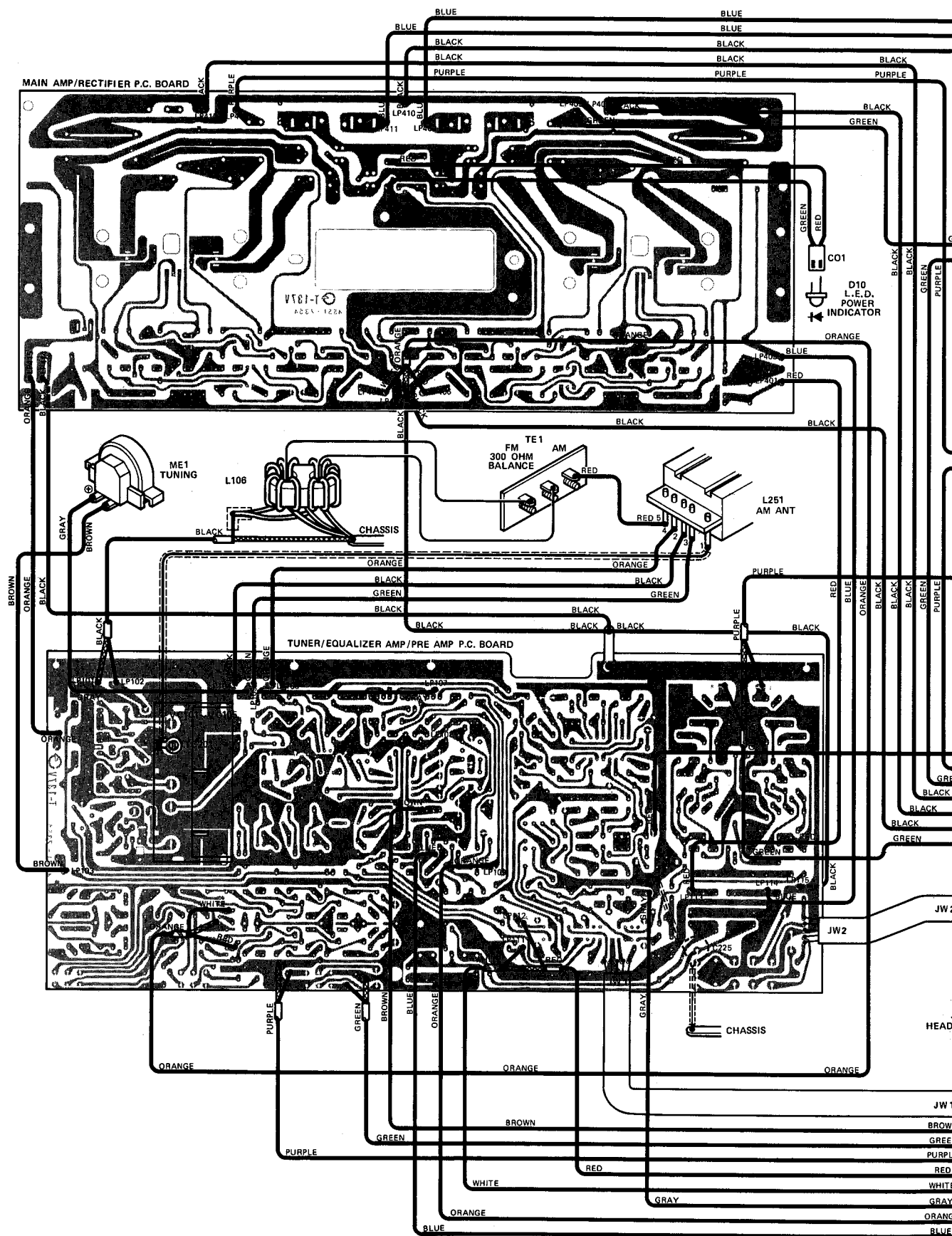


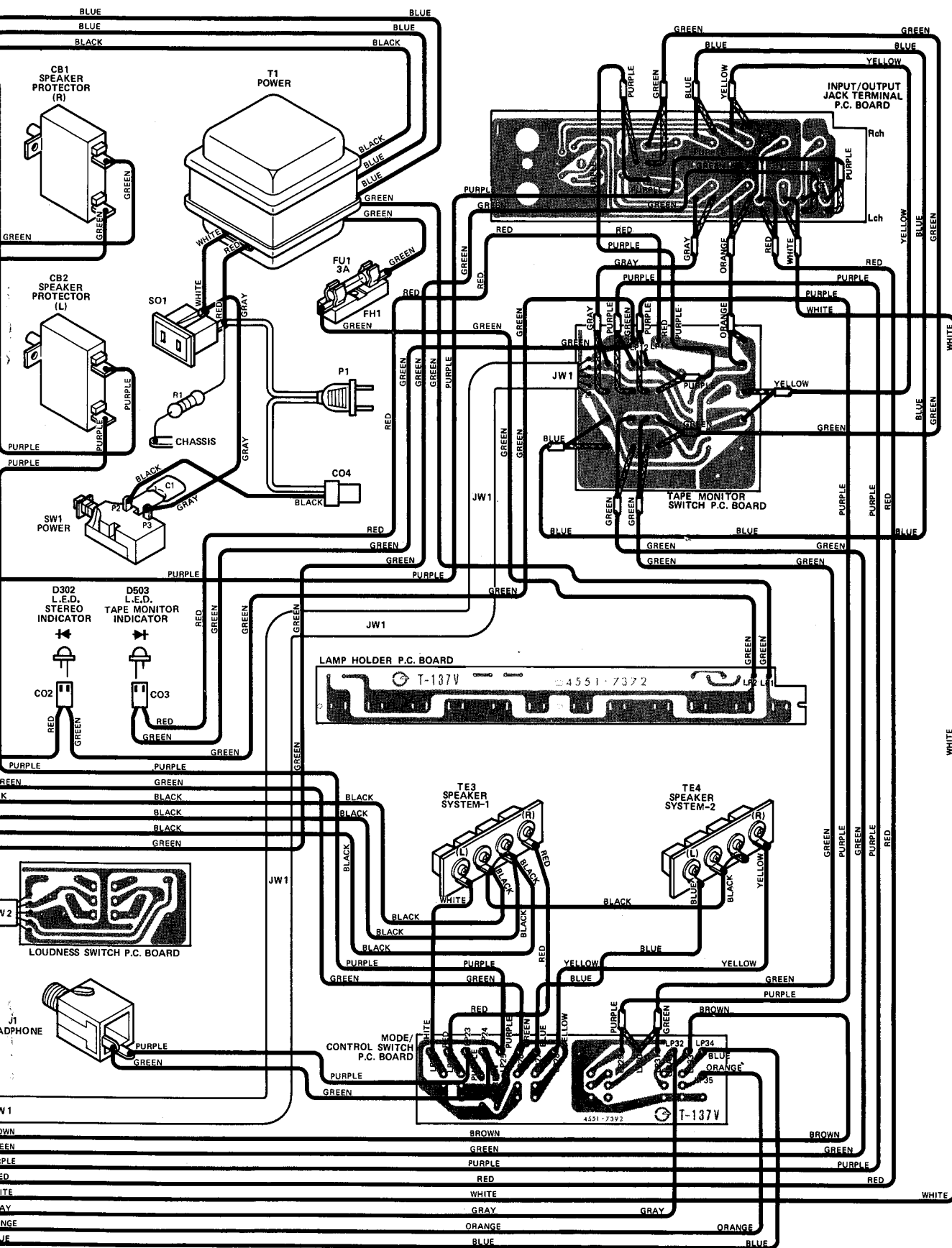


WIRING DIAGRAM

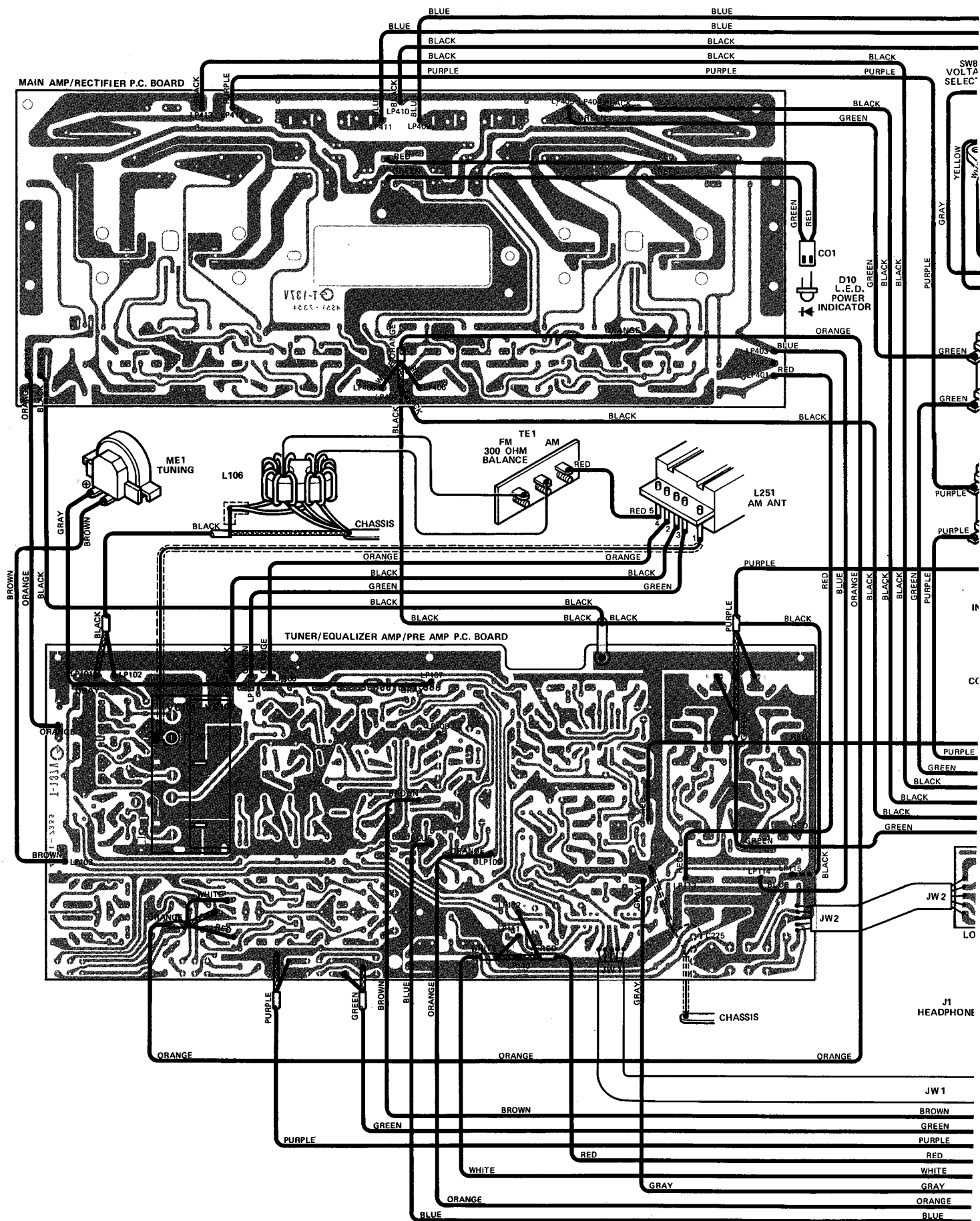


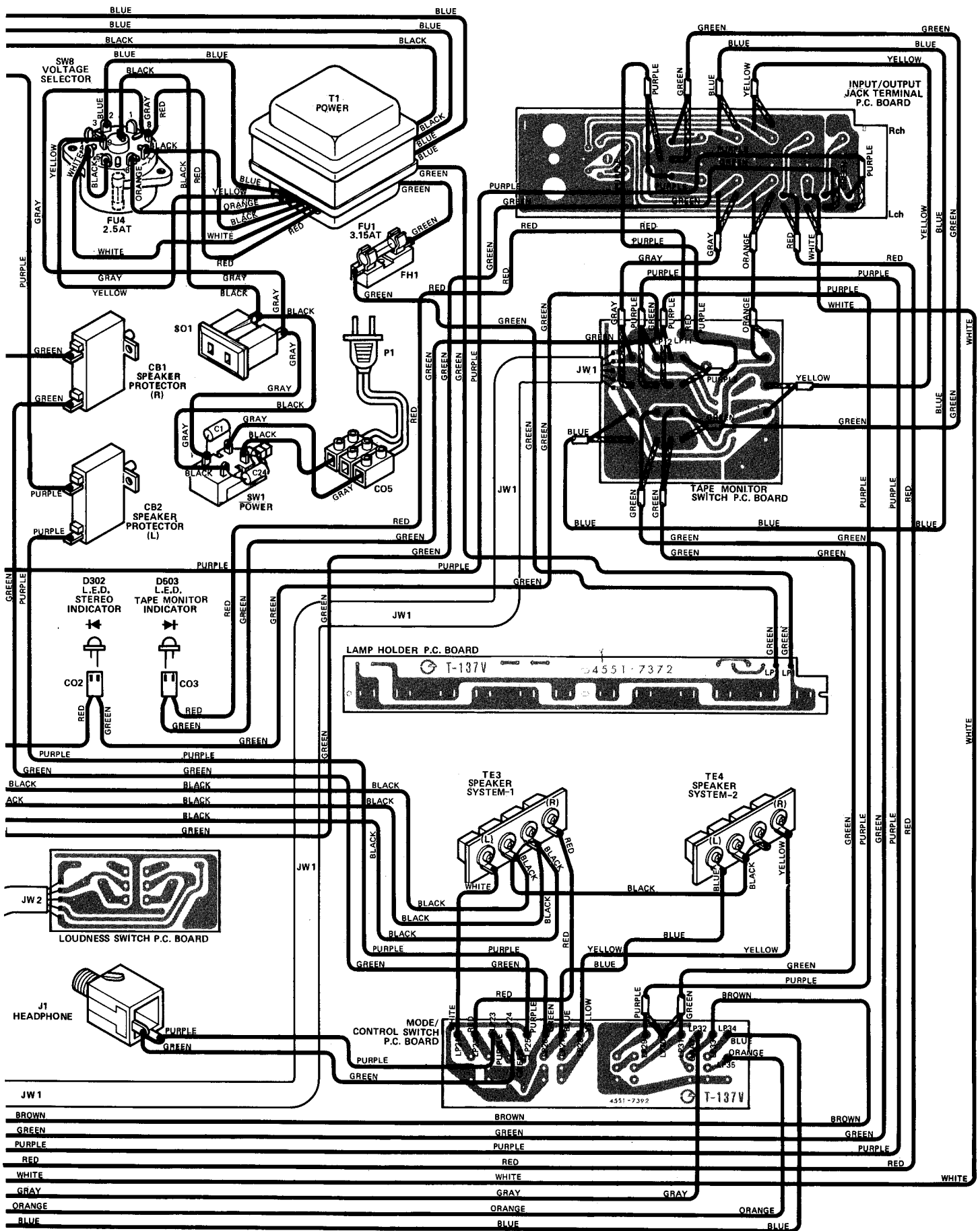
WIRING DIAGRAM



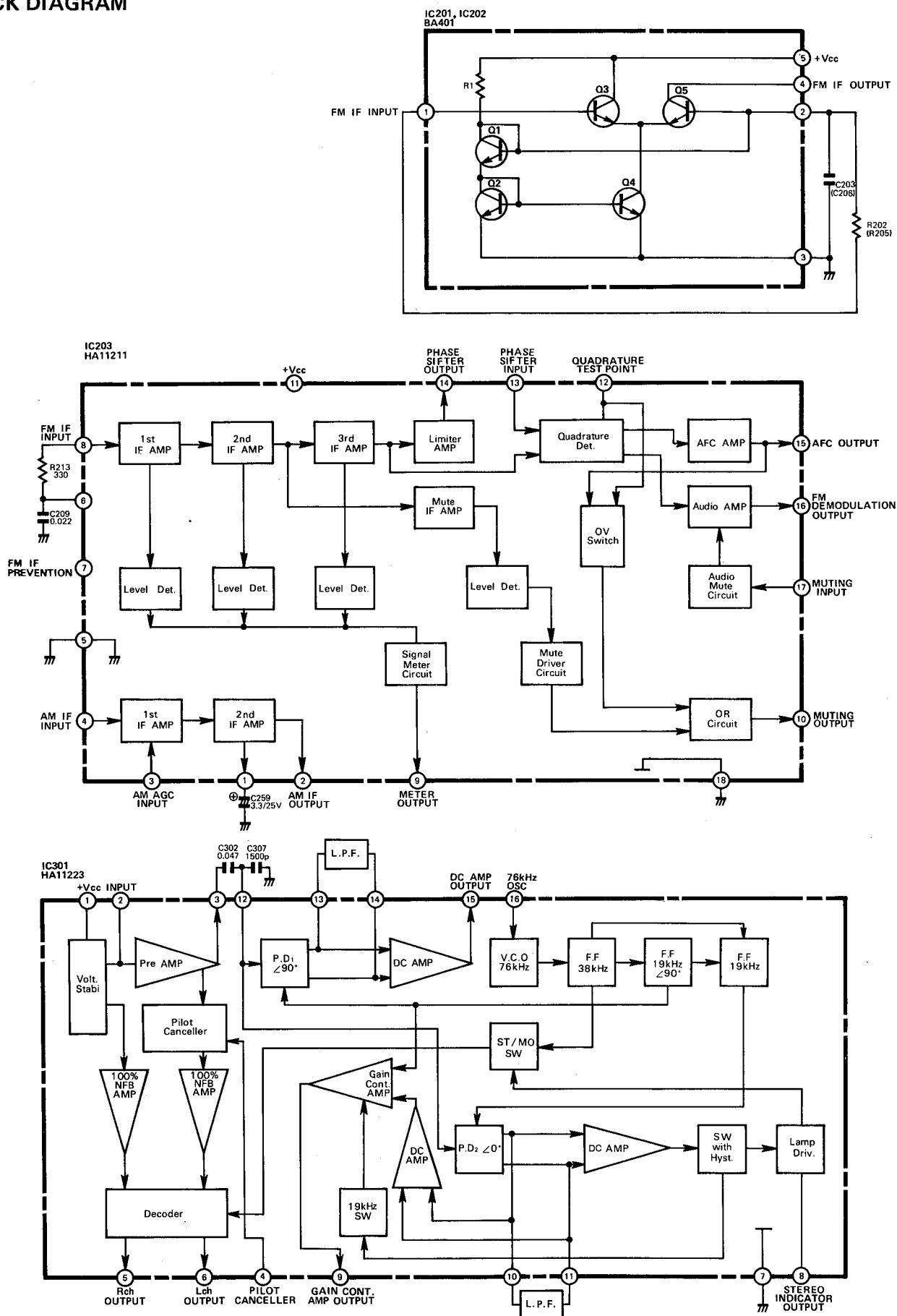


WIRING DIAGRAM MULTI

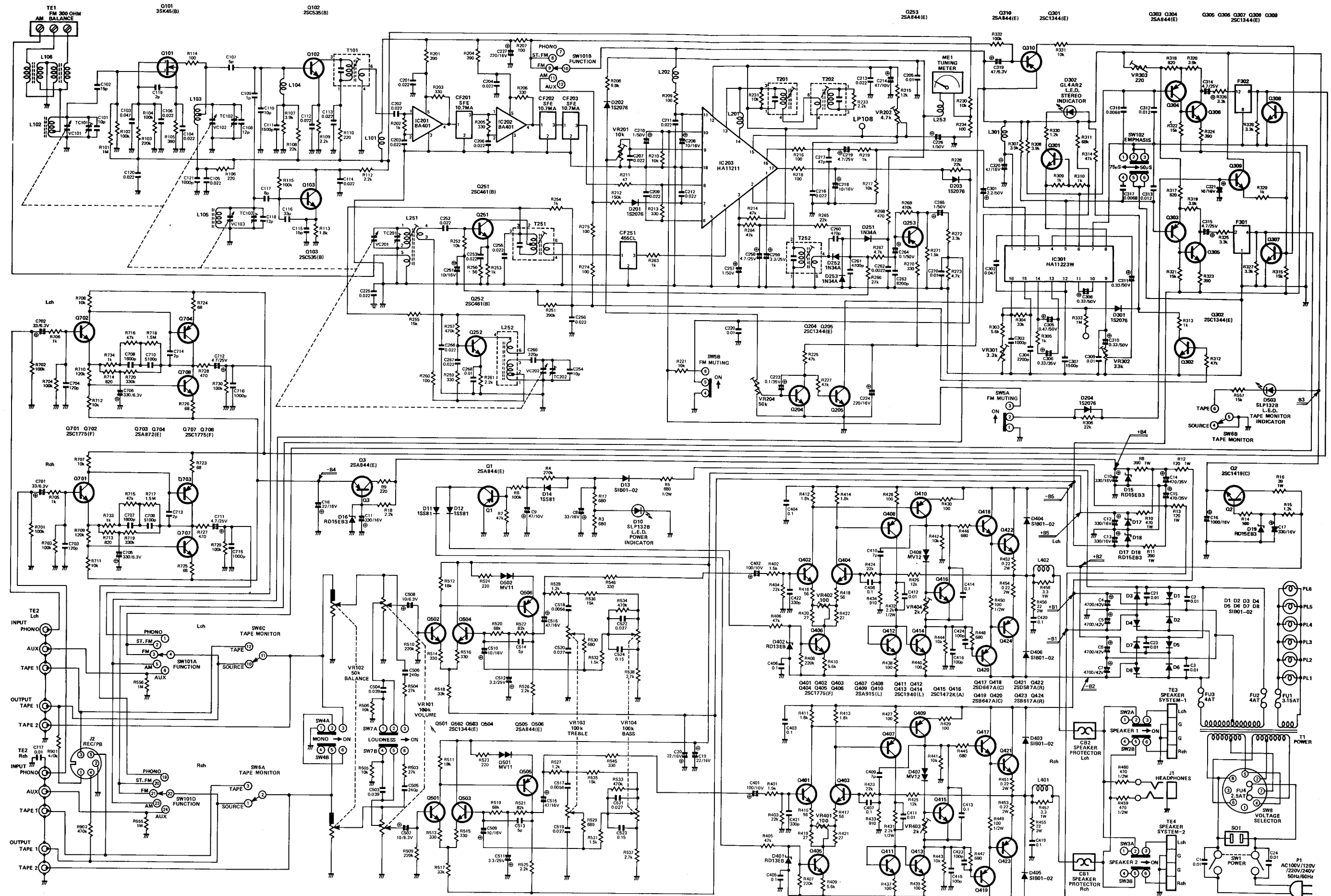




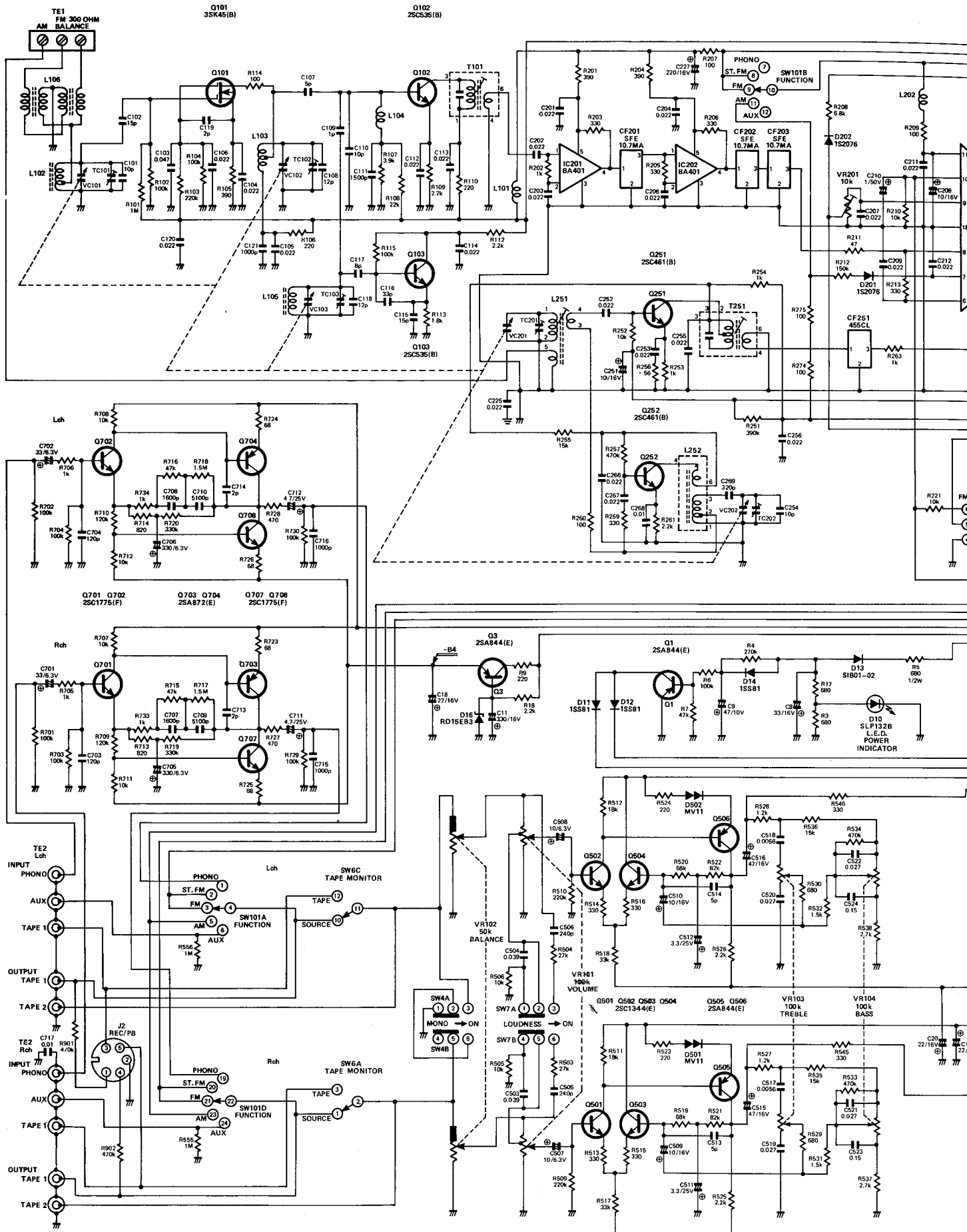
IC BLOCK DIAGRAM



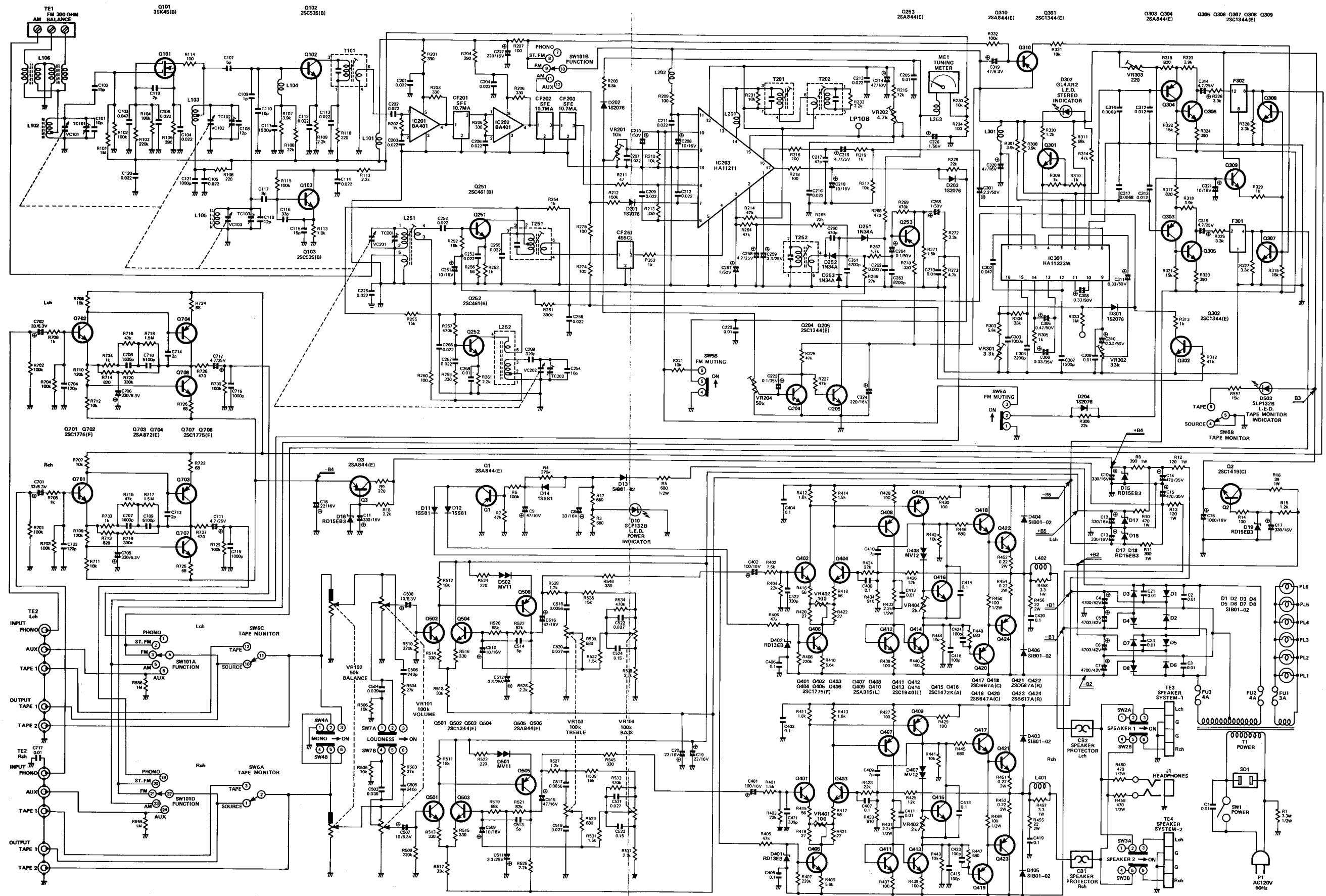
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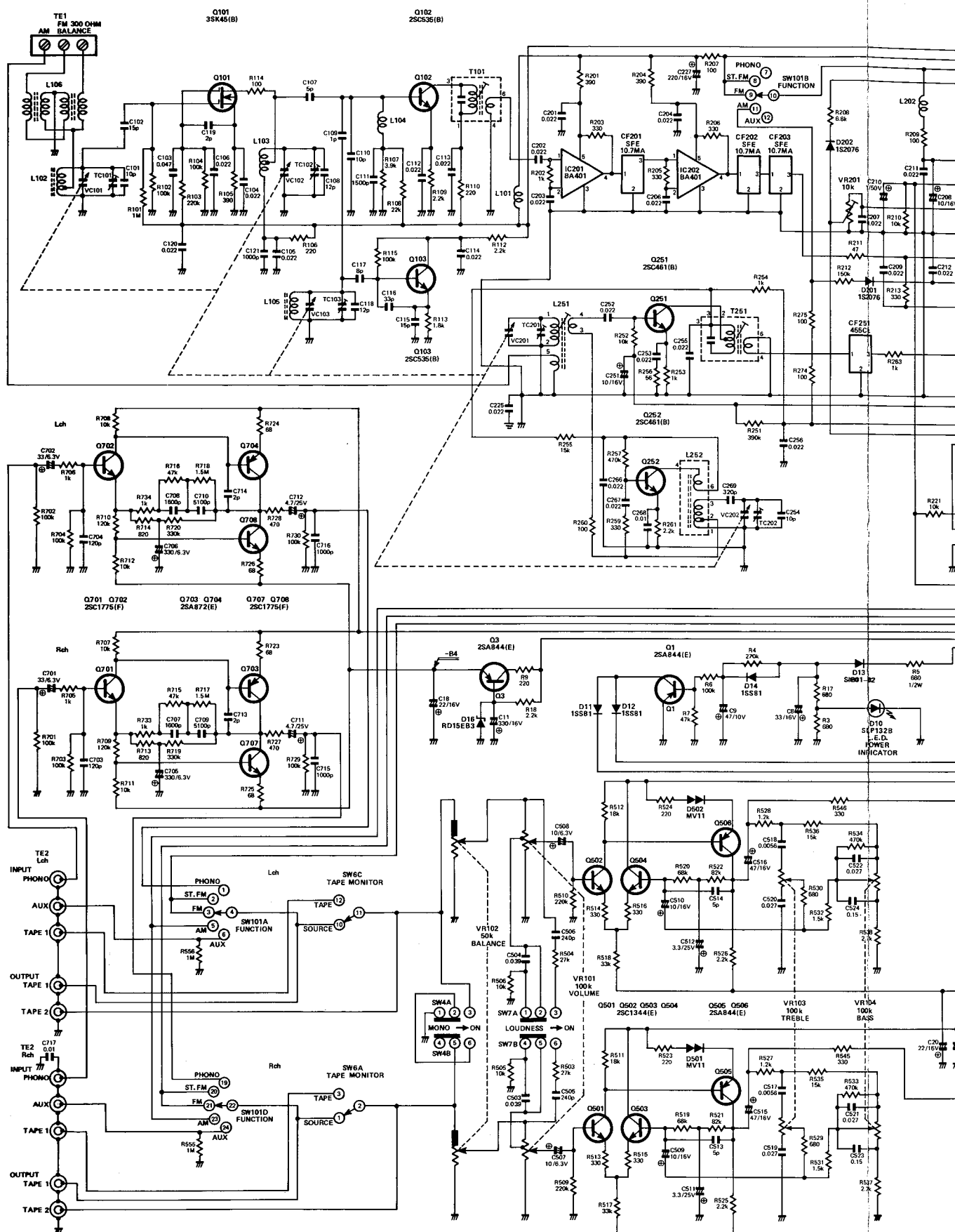
SCHEMATIC DIAGRAM MULTI



SCHEMATIC DIAGRAM REGULAR



SCHEMATIC DIAGRAM REGULAR



SCHEMATIC NOTES AND VOLTAGES

NOTES:

Unless otherwise specified.

1. All resistors are 1/4 watt, $\pm 5\%$. Values are in ohms. K=1000 M=1000k.

2. All capacitance values are in MF. PF=MMF.

3. Function selector switch (SW101) is in FM position.

VOLTAGE CHART

AC120V
No Signal
Chassis Ground

Volume Control at Minimum
Tone Controls at Mechanical Center

+B1 +32V
-B1 -32V
+B2 +32V
-B2 -32V
B3 +14.4V

+B4 +15V
-B4 -14.4V
+B5 +15V
-B5 -15V

FM POSITION

	base	emitter	collector
Q1	-0.63V	0V	0V
Q2	+15.0V	+14.4V	+29.0V
Q3	-15.0V	-14.4V	-25.0V
Q102	+1.8V	+1.3V	+12.3V
Q103	+4.5V	+4.0V	+7.4V
Q204	0V	0V	+7.1V
Q205	+0.66V	0V	+0.05V
Q301	+0.05V	0V	+12.4V
Q302	+0.13V	0V	+13.5V
Q303, 304	+10.0V	+11.6V	-12.4V
Q305, 306	-12.4V	-13.0V	-2.5V
Q307, 308	+2.4V	0V	0V
Q309	0V	-0.6V	+13.6V
Q310	+13.5V	+13.6V	+0.13V
Q401, 402	-0.03V	-0.62V	+30.0V
Q403, 404	-0.03V	-0.62V	+30.0V
Q405, 406	-19.4V	-20.0V	-0.7V
Q407, 408	+30.0V	+30.6V	-8.0V
Q409, 410	+30.0V	+30.6V	+1.2V
Q411, 412	-30.0V	-30.6V	-30.0V
Q413, 414	-30.0V	-30.6V	-1.2V
Q415, 416	-0.5V	-1.2V	+1.2V
Q417, 418	+1.15V	+0.6V	+32.0V
Q419, 420	-1.15V	-0.6V	-32.0V
Q421, 422	+0.6V	+0.016V	+32.0V
Q423, 424	-0.6V	-0.016V	-32.0V
Q501, 502	0V	-0.6V	+11.0V
Q503, 504	0V	-0.6V	+15.0V
Q505, 506	+11.0V	+11.6V	0V
Q701, 702	0V	-0.6V	+13.5V
Q703, 704	+13.5V	+14.1V	-1.0V
Q707, 708	-12.9V	-13.5V	-1.0V

IC201

1. +1.4V
2. +1.4V
3. 0V
4. +9.5V
5. +10.0V

IC202

1. +1.3V
2. +1.3V
3. 0V
4. +9.5V
5. +10.0V

IC301

1. +13.8V
2. +3.5V
3. +4.8V
4. +0.7V
5. +10.0V
6. +10.0V
7. 0V
8. 0V

IC203

FM

1. +2.6V
2. 0V
3. +3.4V
4. +0.7V
5. 0V
6. +2.0V
7. +2.0V
8. +2.0V
9. 0V
10. +5.0V
11. +11.8V
12. +5.6V
13. +5.6V
14. +5.6V
15. +7.4V
16. +7.4V
17. 0V
18. 0V

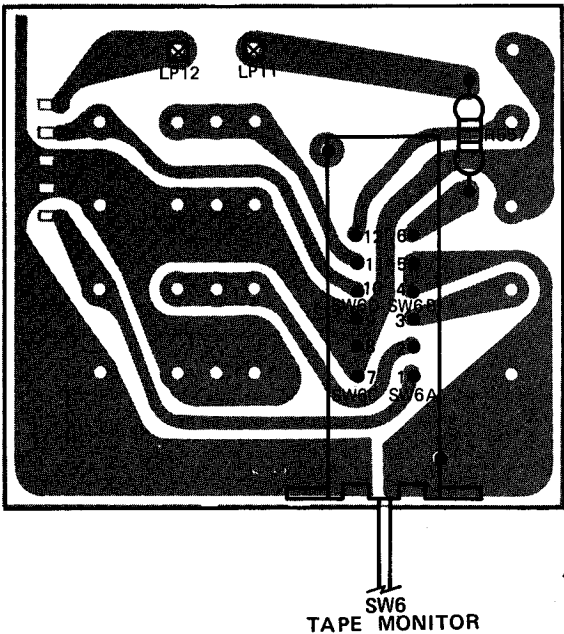
AM

+2.6V
0V
+3.4V
+0.7V
0V
+2.7V
+2.7V
+2.7V
0V
+5.2V
+11.7V
+5.6V
+5.6V
+5.6V
+6.5V
+6.6V
0V
0V

AM POSITION

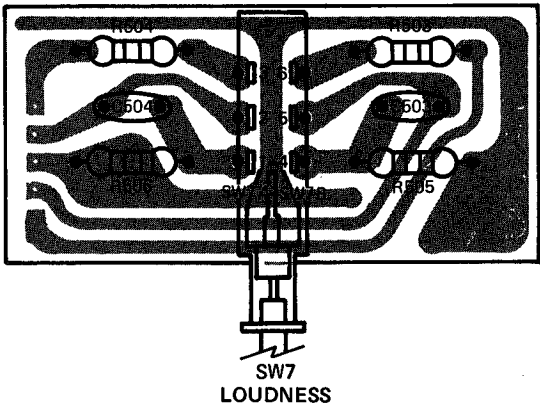
	base	emitter	collector
Q251	+0.93V	+0.33V	+12.7V
Q252	+1.8V	+1.2V	+4.6V
Q253	+11.0V	+11.6V	+6.5V

TAPE COPY/TAPE MONITOR SWITCH PC BOARD



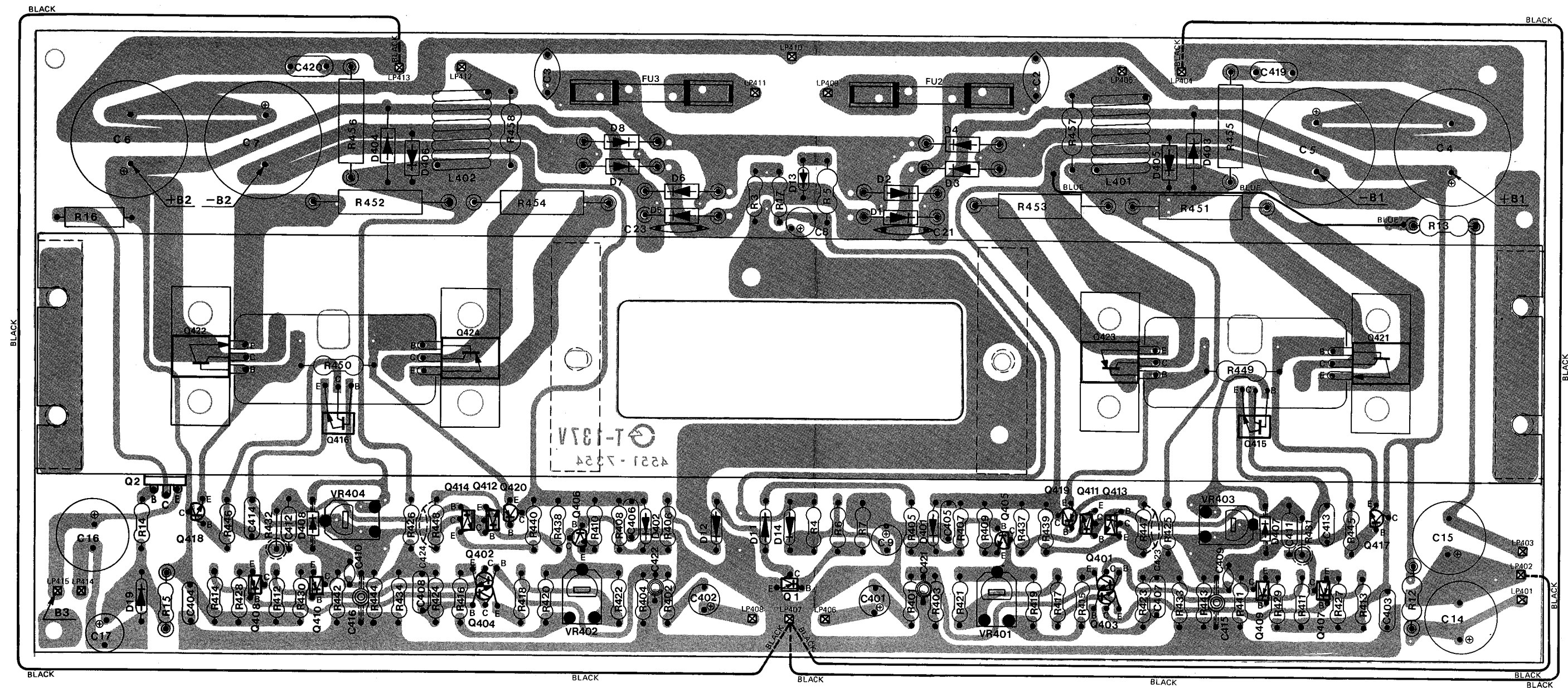
CIRCUIT REF.	H/K PART NO.	DESCRIPTION
LEVER SWITCH		
SW8	26535632	Tape Copy
SW9	26535669	Tape Monitor

LOUDNESS SWITCH PC BOARD



CIRCUIT REF.	H/K PART NO.	DESCRIPTION
SWITCH PUSHBUTTON		
SW10	25035633	Push Switch, Loudness

MAIN AMP/RECTIFIER PC BOARD

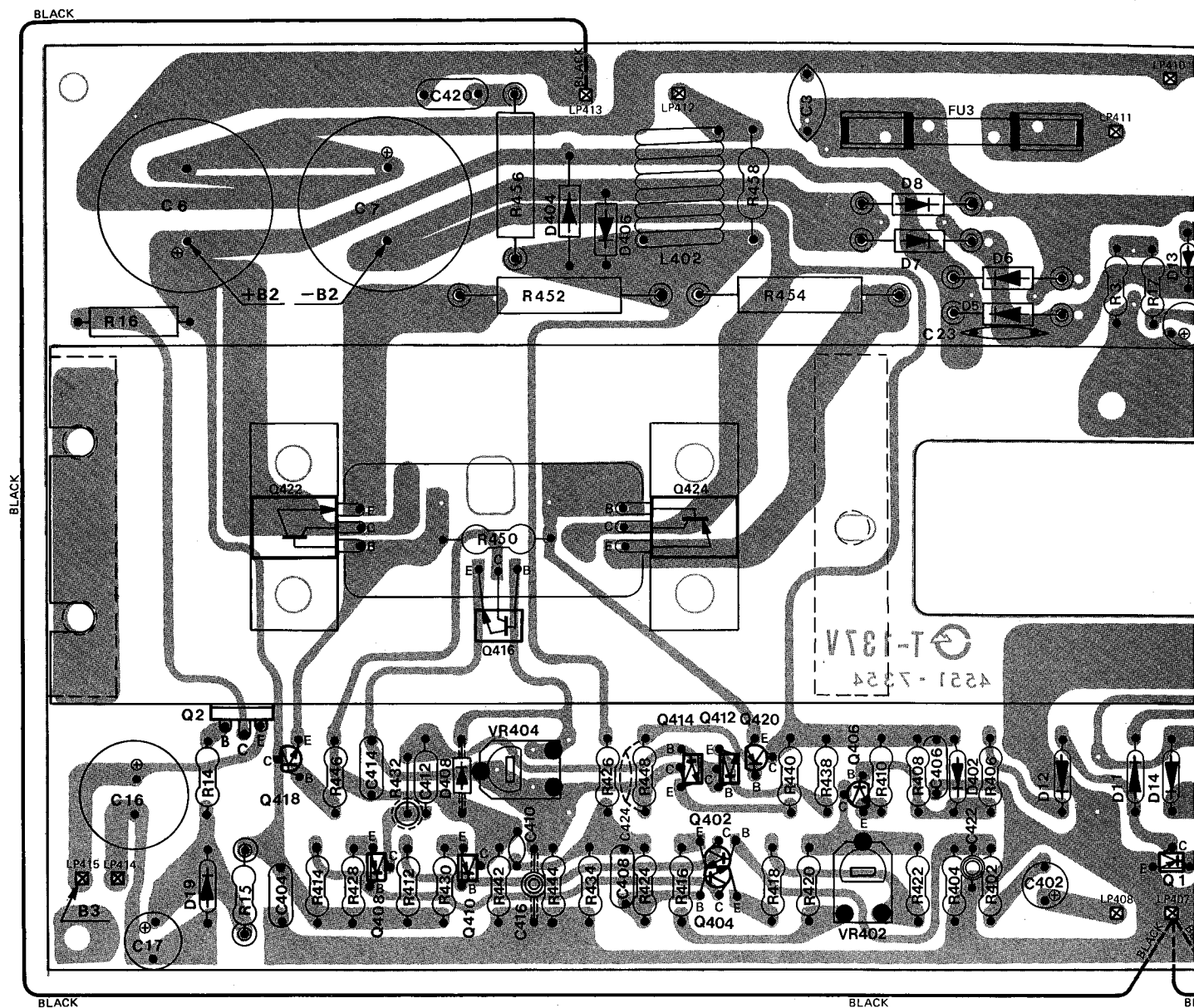


CIRCUIT REF.	H/K PART NO.	DESCRIPTION
RESISTORS		
VR401, 402	23535613	Variable Resistor, 100 ohm
VR403, 404	23535614	Variable Resistor, 2 k ohm
CAPACITORS, ELECTROLYTIC		
C4, 5, 6, 7	31535615	4700MF +30% -10% 42V
C8	31835616	33MF +50% -10% 16V
C9	31835575	47MF +50% -10% 10V
C14,15	31835617	470MF +50% -10% 35V
C16	31835618	1000MF +50% -10% 16V
C17	31835571	330MF +50% -10% 16V
C401, 402	31835619	100MF +50% -10% 10V

CIRCUIT REF.	H/K PART NO.	DESCRIPTION
TRANSISTOR		
Q1	43031312	2SA844(E) Audio Muting
Q2	43035620	2SC1419(C) Voltage Regulator
Q401, 402	43035592	2SC1775(F) Differential Amp., Current Regulator
403, 404, 405, 406	43035621	2SA915(L) Differential Amp.
Q407, 408, 409, 410	43035622	2SC1940(L) Current Regulator
Q411, 412, 413, 414	43035623	2SC1472K(A) Bias Stabilization
Q415, 416	43035624	2SD667A(C) Driver
Q417, 418	43035625	2SB647A(C) Driver
Q419, 420	43035626	2SD587A(R) Power Amp.
Q421, 422	43035627	2SB617A(R) Power Amp.
Q423, 424	41631295	Diode, SIB01
D1, 2, 3, 4, 5, 6		Diode, SIB01
7, 8, 13		

CIRCUIT REF.	H/K PART NO.	DESCRIPTION
D11, 12, 14	41035628	Diode, ISS81
D19	42035595	Zener Diode, RD15EB3 14.72V ±0.37V
D401, 402	42032760	Zener Diode, RD13EB 13.2V ±0.8V
D403, 404, 405, 406	41631295	Diode, SIB01-02
D407, 408	41035629	Varistor, MV12
COIL		
L401, 402	12035630	RF Choke

MAIN AMP/RECTIFIER PC BOARD



CIRCUIT REF.

H/K PART NO.

DESCRIPTION

RESISTORS

VR401, 402

23535613

Variable Resistor, 100 ohm

VR403, 404

23535614

Variable Resistor, 2 k ohm

CAPACITORS, ELECTROLYTIC

C4, 5, 6, 7

31535615

4700MF +30% -10% 42V

C8

31835616

33MF +50% -10% 16V

C9

31835575

47MF +50% -10% 10V

C14, 15

31835617

470MF +50% -10% 35V

C16

31835618

1000MF +50% -10% 16V

C17

31835571

330MF +50% -10% 16V

C401, 402

31835619

100MF +50% -10% 10V

CIRCUIT REF.

H/K PART NO.

TRANSISTOR

Q1

43031312

Q2

43035620

Q401, 402

43035592

403, 404, 405, 406

Q407, 408, 409, 410

43035621

Q411, 412, 413, 414

43035622

Q415, 416

43035623

Q417, 418

43035624

Q419, 420

43035625

Q421, 422

43035626

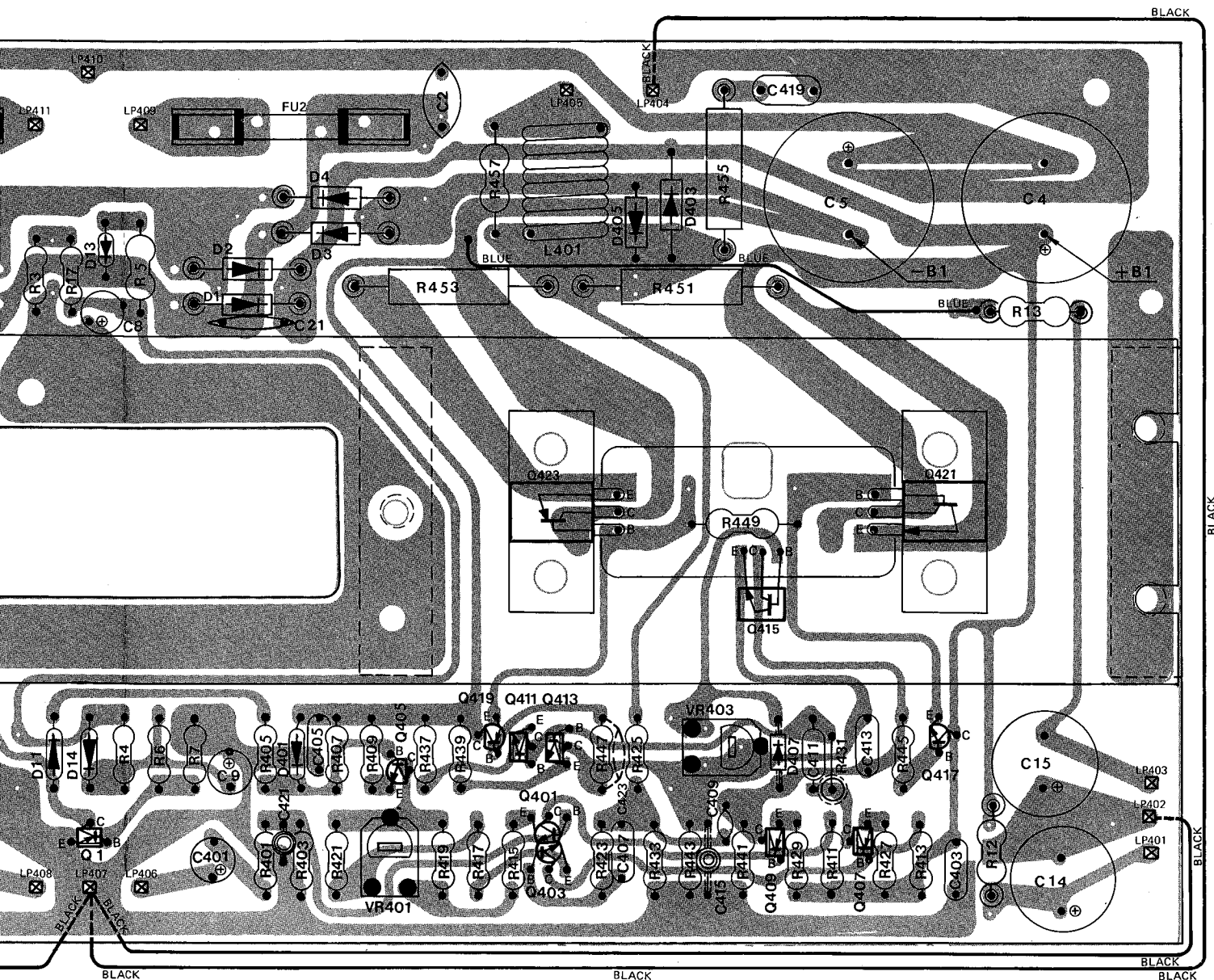
Q423, 424

43035627

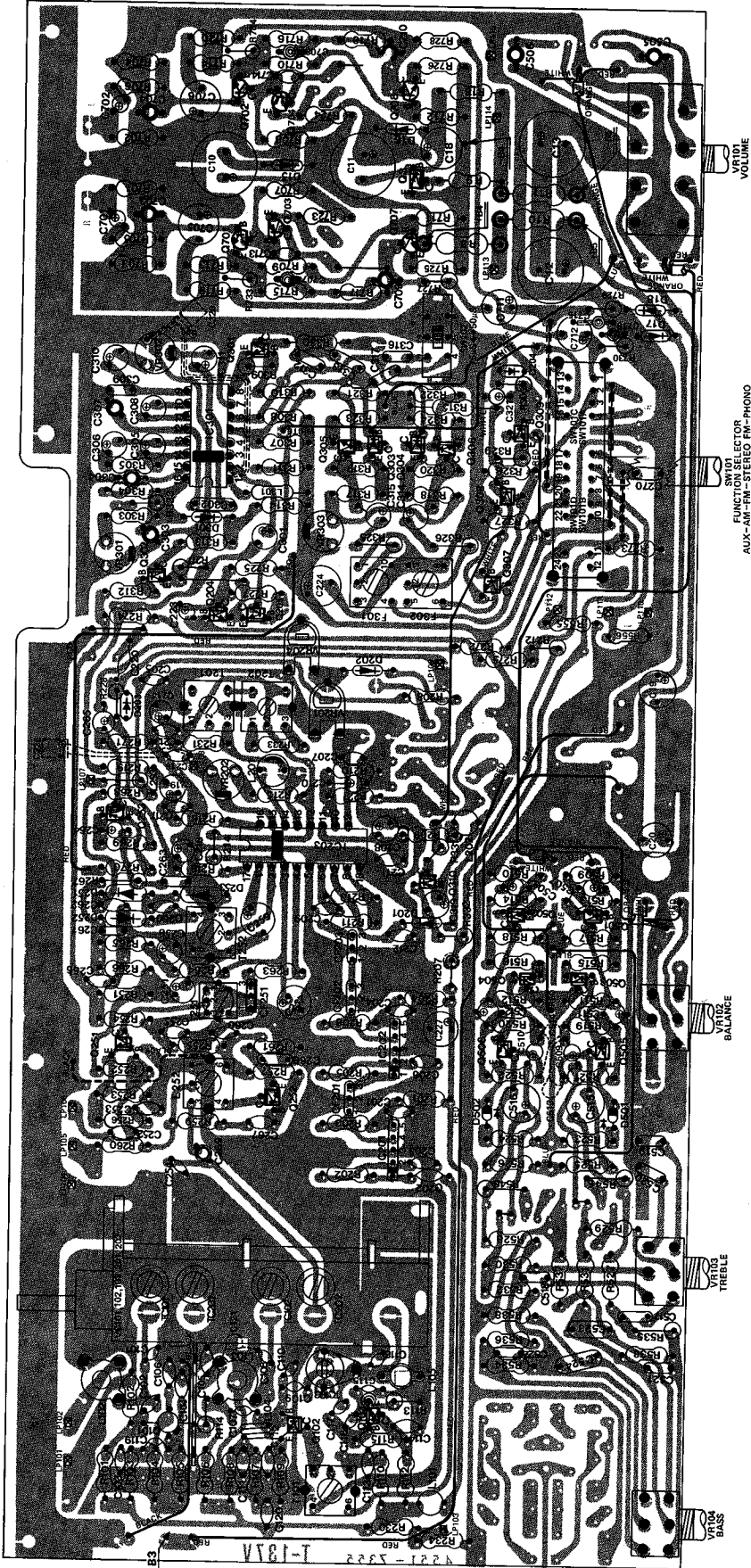
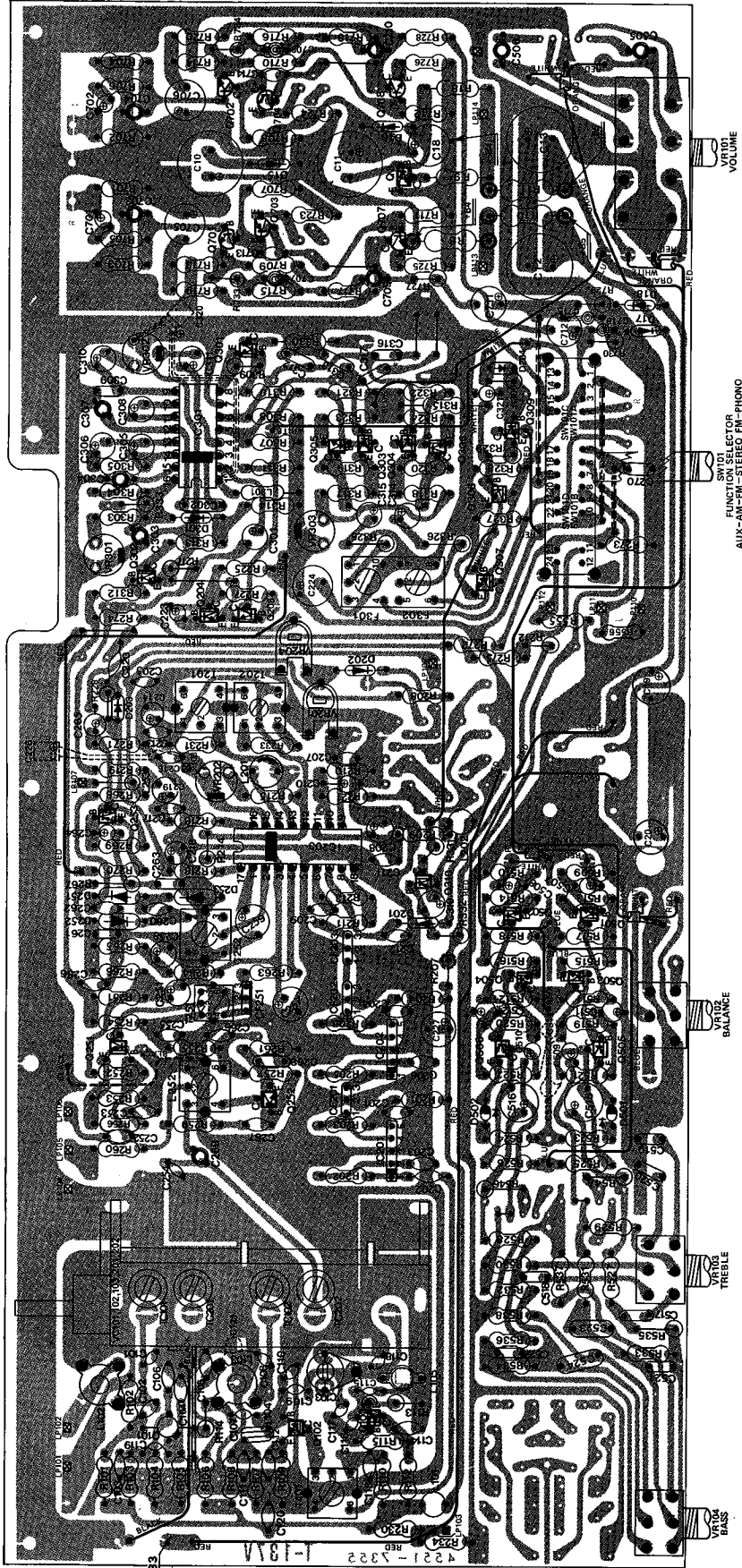
D1, 2, 3, 4, 5, 6

41631295

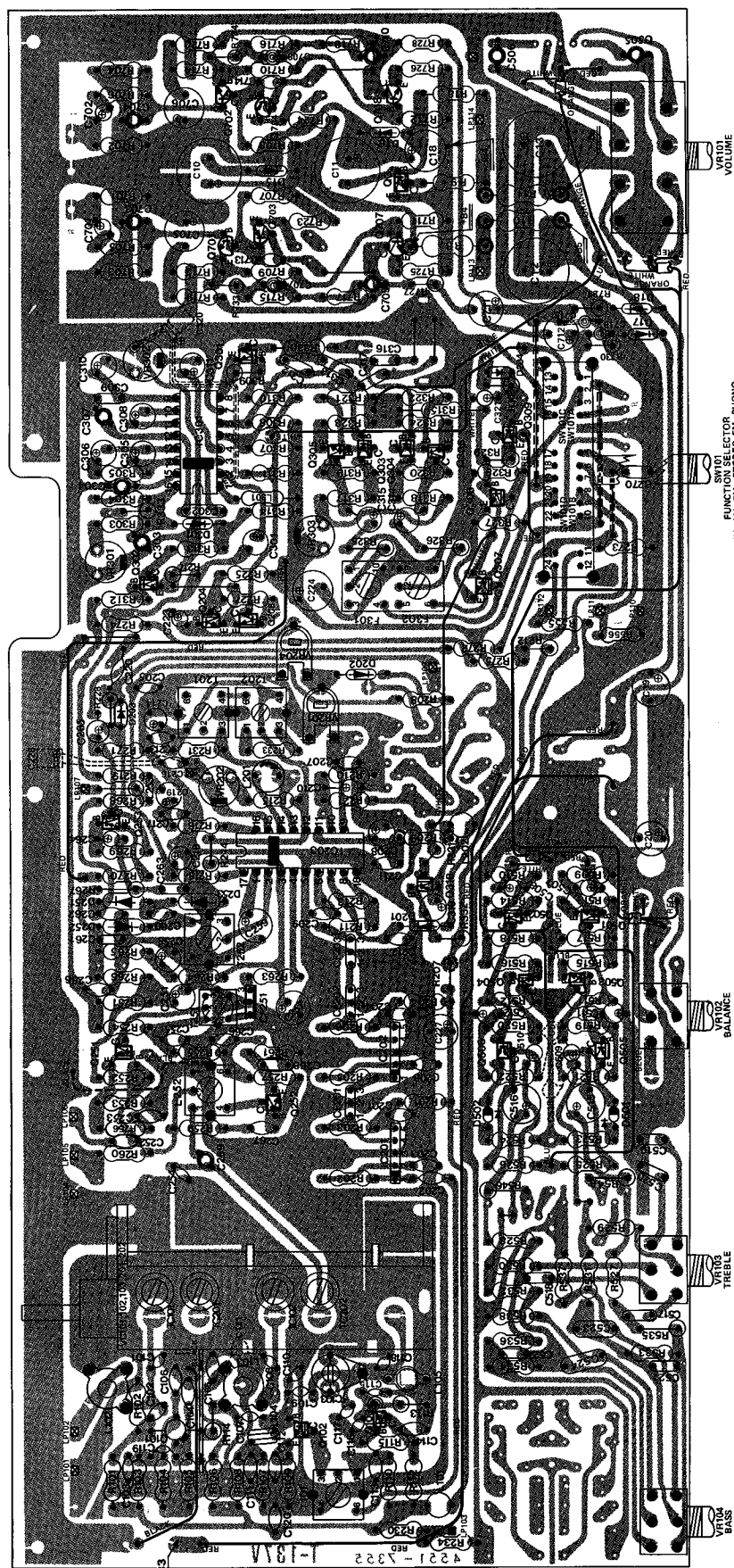
7, 8, 13



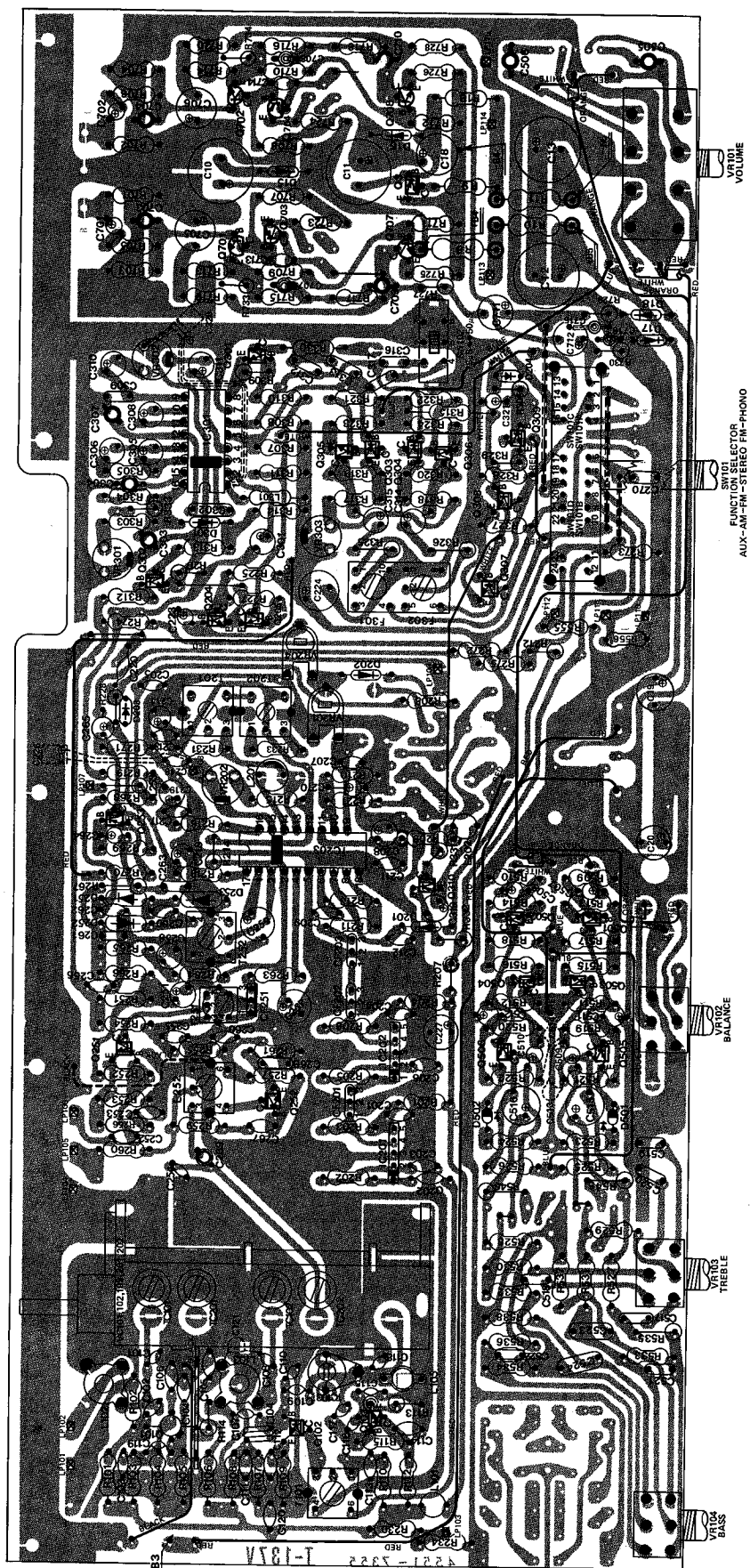
PART NO.	DESCRIPTION	CIRCUIT REF.	H/K PART NO.	DESCRIPTION
312	2SA844(E) Audio Muting	D11, 12, 14	41035628	Diode, ISS81
5620	2SC1419(C) Voltage Regulator	D19	42035595	Zener Diode, RD15EB3 14.72V $\pm 0.37V$
5592	2SC1775(F) Differential Amp., Current Regulator	D401, 402	42032760	Zener Diode, RD13EB 13.2V $\pm 0.8V$
5621	2SA915(L) Differential Amp.	D403, 404, 405, 406	41631295	Diode, SIB01-02
5622	2SC1940(L) Current Regulator	D407, 408	41035629	Varistor, MV12
5623	2SC1472K(A) Bias Stabilization			
5624	2SD667A(C) Driver	COIL		
5625	2SB647A(C) Driver	L401, 402	12035630	RF Choke
5626	2SD587A(R) Power Amp.			
5627	2SB617A(R) Power Amp.			
295	Diode, SIB01			



TUNER/EQUALIZER AMP/PRE AMP PC BOARD



TUNER/EQUALIZER AMP/PRE AMP PC BOARD MULTI



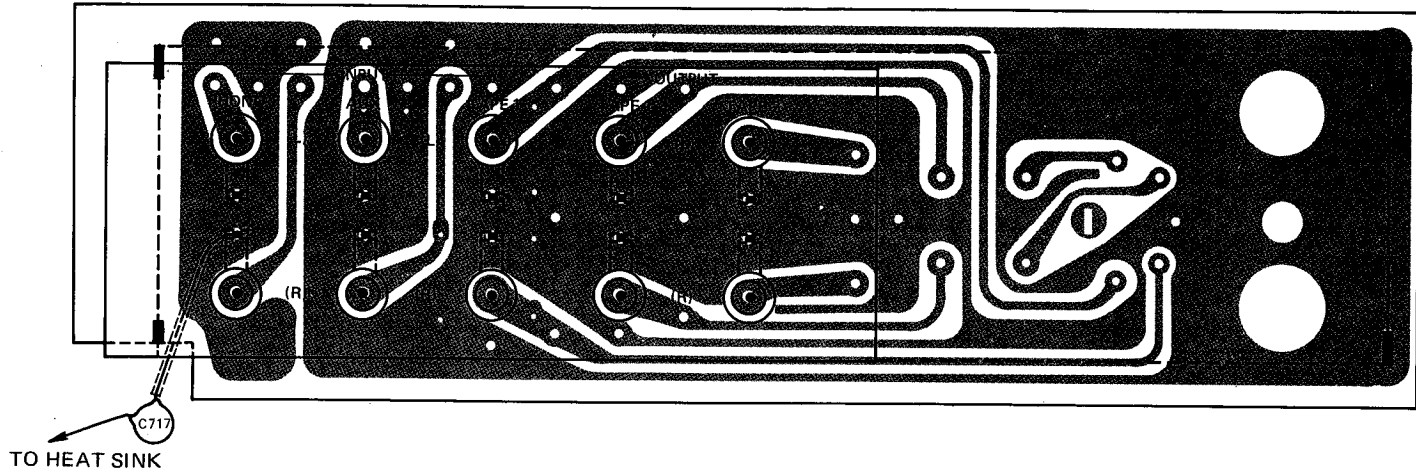
CIRCUIT REF.	H/K PART NO.	DESCRIPTION
RESISTORS (All resistors 1/4W, ±5% Carbon unless otherwise noted)		
VR101	22035563	Variable Resistor, 100 k ohm, Volume Control
VR102	22035564	Variable Resistor, 50 k ohm, Balance Control
VR103, 104	22035565	Variable Resistor, 100 k ohm, Treble and Bass Control
VR201	23535566	Variable Resistor, 10 k ohm
VR202	23535567	Variable Resistor, 4.7 k ohm
VR204	23535568	Variable Resistor, 50 k ohm
VR301	23535569	Variable Resistor, 3.3 k ohm
VR302	23535570	Variable Resistor, 33 k ohm
VR303	23532130	Variable Resistor, 220 ohm
CAPACITORS, ELECTROLYTIC		
C10, 11, 12, 13	31835571	330MF +50% -10% 16V
C18, 19, 20	31835572	22MF +50% -10% 16V
C208, 218, 321	31835573	10MF +50% -10% 16V
C210, 226	31835574	1MF +75% -10% 50V
C214, 319	31835575	47MF +50% -10% 10V
C219	31835576	4.7MF +50% -10% 25V
C224, 227	31835577	220MF +50% -10% 16V
C257, 265	31835574	1MF +75% -10% 50V
C258	31835576	4.7MF +50% -10% 25V
C259	31835578	3.3MF +75% -10% 25V
C301	31835579	2.2MF +75% -10% 50V
C305	31835580	0.47MF ±20% 50V
C306, 308, 310, 311	31835581	0.33MF ±20% 50V
C314, 315	31835576	4.7MF +50% -10% 25V
C320	31835582	47MF +50% -10% 16V
C507, 508	31835583	10MF ±20% 6.3V Tantalum
C509, 510	31835584	10MF ±20% 16V
C511, 512	31835585	3.3MF ±20% 25V
C515, 516	31835582	47MF +50% -10% 16V
C701, 702	31835586	33MF ±20% 6.3V Tantalum
C705, 706	31835587	330MF +50% -10% 6.3V
C711, 712	31835588	4.7MF ±20% 25V
VC101, 102, 103, 201, 202	30834831A	Variable Capacitor (w/Trimmers TC101, 102, 201, 202)
TRANSISTOR		
Q3	43031312	2SA844(E) Voltage Regulator
Q101	43035590	F. E. T., 3SK45(B) FM RF Amp.
Q102, 103	43034834	2SC535(B) FM Mixer, FM Osc.
Q204, 205, 307, 308, 309	43028535	2SC1344(E) Stereo Indicator
Q251, 252	43035591	2SC461(B) AM Mixer, AM Osc.
Q253	43031312	2SA844(E) AM Demodulation
Q301, 302, 305, 306	43028535	2SC1344(E) Stereo/Mono Switching, MPX Osc. Stop Switching, MPX Output Amp.
Q303, 304, 310	43031312	2SA844(E) MPX Output Amp., Switch Muting Driver

CIRCUIT REF.	H/K PART NO.	DESCRIPTION
TRANSISTORS (continued)		
Q501, 502, 503, 504	43028535	2SC1344(E) Pre. Amp.
Q505, 506	43031312	2SA844(E) Pre. Amp.
Q701, 702, 707, 708	43035592	2SC1775(F) Equalizer Amp.
Q703, 704	43032151	2SA872(E) Equalizer Amp.
IC201, 202	43131313	Integrated Circuit, BA401 FM IF Amp.
IC203	43135593	Integrated Circuit, HA11211 FM IF Amp./FM Det./AM IF Amp.
IC301	43135594	Integrated Circuit, HA11223(W) FM Multiplex
D15, 16, 17, 18	42035595	Zener Diode, RD15EB3 14.72V ±0.37V
D201, 202, 203, 204	41028593	Diode, 1S2076
D251, 252, 253	41528591	Diode, 1N34A
D301	41028593	Diode, 1S2076
D501, 502	38128520	Variator, MV11
COILS		
L101	12035596	RF Choke
L102	12035597	FM RF
L103	12035598	FM RF
L104	12034838	FM IF Trap
L105	12035599	FM Osc.
L201	12035600	Phase Shifter
L202	12035596	Bypass Filter
L252	12035602	AM Osc.
L253, 301	12035603	RF Choke, FA Choke
TRANSFORMERS		
T101	11035604	FM IF
T201	11035605	Quadrature Det.
T202	11035606	Quadrature Det.
T251	11035607	AM IF
T252	11035608	AM IF
MISCELLANEOUS		
CF201, 202, 203	12035609	Ceramic Filter, FM IF
CF251	12035610	Ceramic Filter, AM IF
F301, 302	12035611	L. C. Component, Low Pass Filter
SW101	24035612	Rotary Slide Switch, Function Selector

CIRCUIT REF.	H/K PART NO.	DESCRIPTION
RESISTORS (All resistors 1/4W, $\pm 5\%$ Carbon unless otherwise noted)		
VR101	22035563	Variable Resistor, 100 k ohm, Volume Control
VR102	22035564	Variable Resistor, 50 k ohm, Balance Control
VR103, 104	22035565	Variable Resistor, 100 k ohm, Treble and Bass Control
VR201	23535566	Variable Resistor, 10 k ohm
VR202	23535567	Variable Resistor, 4.7 k ohm
VR204	23535568	Variable Resistor, 50 k ohm
VR301	23535569	Variable Resistor, 3.3 k ohm
VR302	23535570	Variable Resistor, 33 k ohm
VR303	23532130	Variable Resistor, 220 ohm
CAPACITORS, ELECTROLYTIC		
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C18, 19, 20	31835572	22MF $+50\%$ -10% 16V
C208, 218, 321	31835573	10MF $+50\%$ -10% 16V
C210, 226	31835574	1MF $+75\%$ -10% 50V
C214, 319	31835575	47MF $+50\%$ -10% 10V
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C259	31835578	3.3MF $+75\%$ -10% 25V
C301	31835579	2.2MF $+75\%$ -10% 50V
C305	31835580	0.47MF $\pm 20\%$ 50V
C306, 308, 310, 311	31835581	0.33MF $\pm 20\%$ 50V
C314, 315	31835576	4.7MF $+50\%$ -10% 25V
C320	31835582	47MF $+50\%$ -10% 16V
C507, 508	31835583	10MF $\pm 20\%$ 6.3V Tantalum
C509, 510	31835584	10MF $\pm 20\%$ 16V
C511, 512	31835585	3.3MF $\pm 20\%$ 25V
C515, 516	31835582	47MF $+50\%$ -10% 16V
C701, 702	31835586	33MF $\pm 20\%$ 6.3V Tantalum
C705, 706	31835587	330MF $+50\%$ -10% 6.3V
C711, 712	31835588	4.7MF $\pm 20\%$ 25V
VC101, 102, 103, 201, 202	30834831A	Variable Capacitor (w/Trimmers TC101, 102, 201, 202)
TRANSISTOR		
Q3	43031312	2SA844(E) Voltage Regulator
Q101	43035590	F. E. T., 3SK45(B) FM RF Amp.
Q102, 103	43034834	2SC535(B) FM Mixer, FM Osc.
Q204, 205, 307, 308, 309	43028535	2SC1344(E) Stereo Indicator
Q251, 252	43035591	2SC461(B) AM Mixer, AM Osc.
Q253	43031312	2SA844(E) AM Demodulation
Q301, 302, 305, 306	43028535	2SC1344(E) Stereo/Mono Switching, MPX Osc. Stop Switching, MPX Output Amp.
Q303, 304, 310	43031312	2SA844(E) MPX Output Amp., Switch Muting Driver

CIRCUIT REF.	H/K PART NO.	DESCRIPTION
TRANSISTORS (continued)		
Q501, 502, 503, 504	43028535	2SC1344(E) Pre. Amp.
Q505, 506	43031312	2SA844(E) Pre. Amp.
Q701, 702, 707, 708	43035592	2SC1775(F) Equalizer Amp.
Q703, 704	43032151	2SA872(E) Equalizer Amp.
IC201, 202	43131313	Integrated Circuit, BA401 FM IF Amp.
IC203	43135593	Integrated Circuit, HA11211 FM IF Amp./ FM Det./AM IF Amp.
IC301	43135594	Integrated Circuit, HA11223(W) FM Multiplex
D15, 16, 17, 18	42035595	Zener Diode, RD15EB3 14.72V $\pm 0.37V$
D201, 202, 203, 204	41028593	Diode, 1S2076
D251, 252, 253	41528591	Diode, 1N34A
D301	41028593	Diode, 1S2076
D501, 502	38128520	Variator, MV11
COILS		
L101	12035596	RF Choke
L102	12035597	FM RF
L103	12035598	FM RF
L104	12034838	FM IF Trap
L105	12035599	FM Osc.
L201	12035600	Phase Shifter
L202	12035596	Bypass Filter
L252	12035602	AM Osc.
L253, 301	12035603	RF Choke, FA Choke
TRANSFORMERS		
T101	11035604	FM IF
T201	11035605	Quadrature Det.
T202	11035606	Quadrature Det.
T251	11035607	AM IF
T252	11035608	AM IF
MISCELLANEOUS		
CF201, 202, 203	12035609	Ceramic Filter, FM IF
CF251	12035610	Ceramic Filter, AM IF
F301, 302	12035611	L. C. Component, Low Pass Filter
SW101	24035612	Rotary Slide Switch, Function Selector

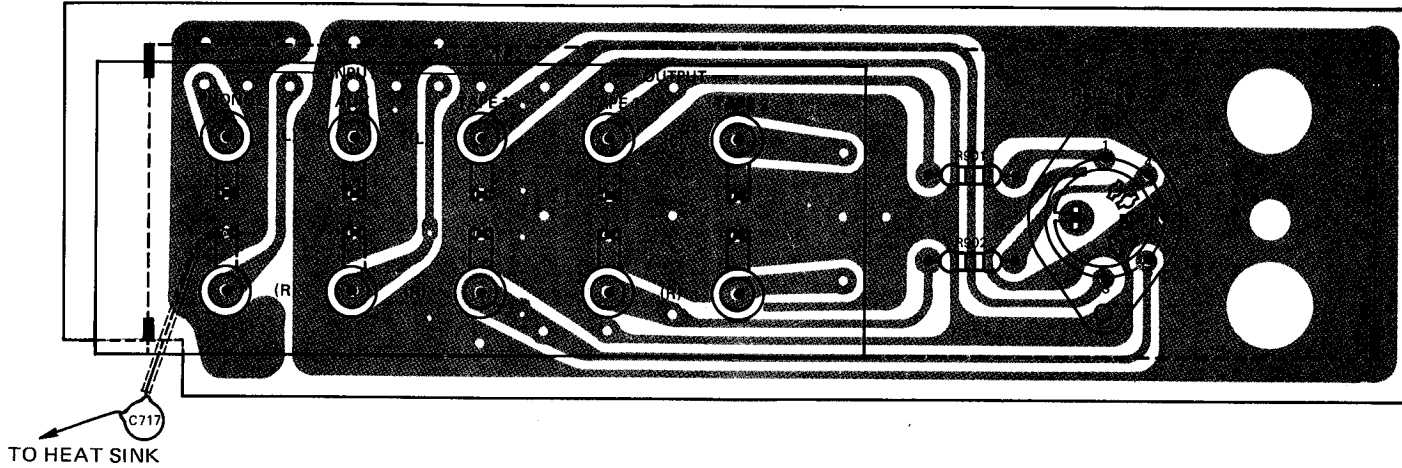
INPUT/OUTPUT JACK TERMINAL PC BOARD



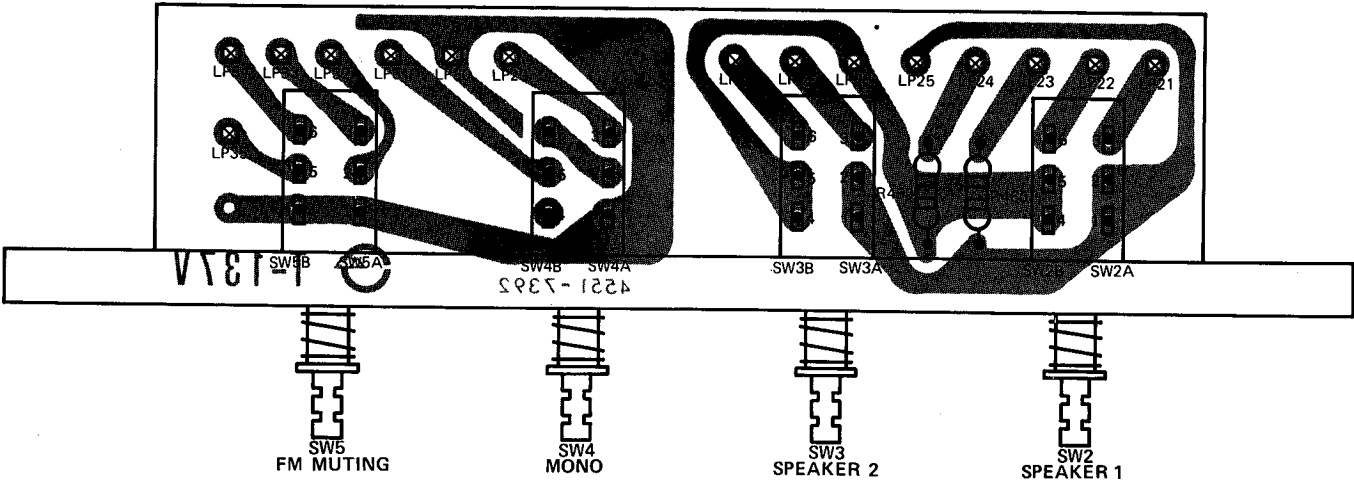
INPUT/OUTPUT JACK TERMINAL PC BOARD

CIRCUIT REF.	H/K PART NO.	DESCRIPTION
TE2	65433653	10-Pin Jack, Phono/Aux./Tape In/ Tape Out 1/Tape Out 2

INPUT/OUTPUT JACK TERMINAL PC BOARD
MULTI

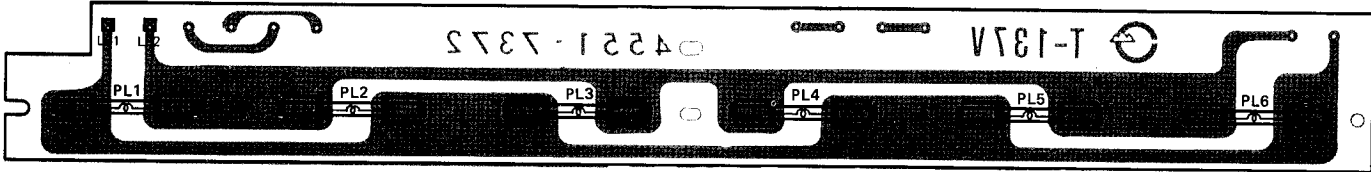


MODE/CONTROL SWITCH PC BOARD

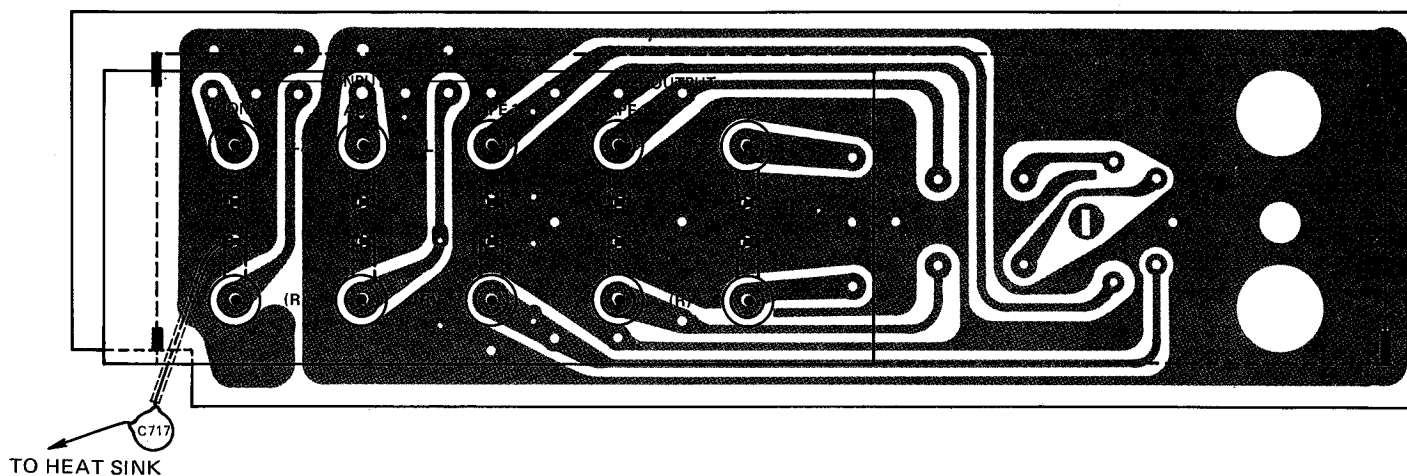


CIRCUIT REF.	H/K PART NO.	DESCRIPTION
SW2, 3, 4, 5	25035631	Push Switch, Speaker 1/Speaker 2/ Mono/FM Muting

LAMP HOLDER PC BOARD



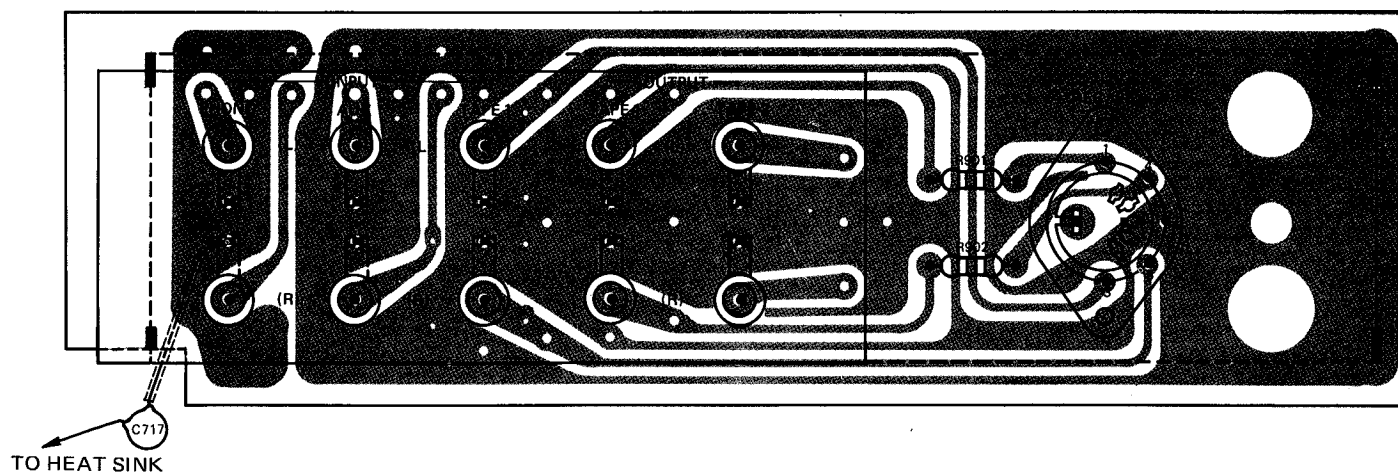
INPUT/OUTPUT JACK TERMINAL PC BOARD



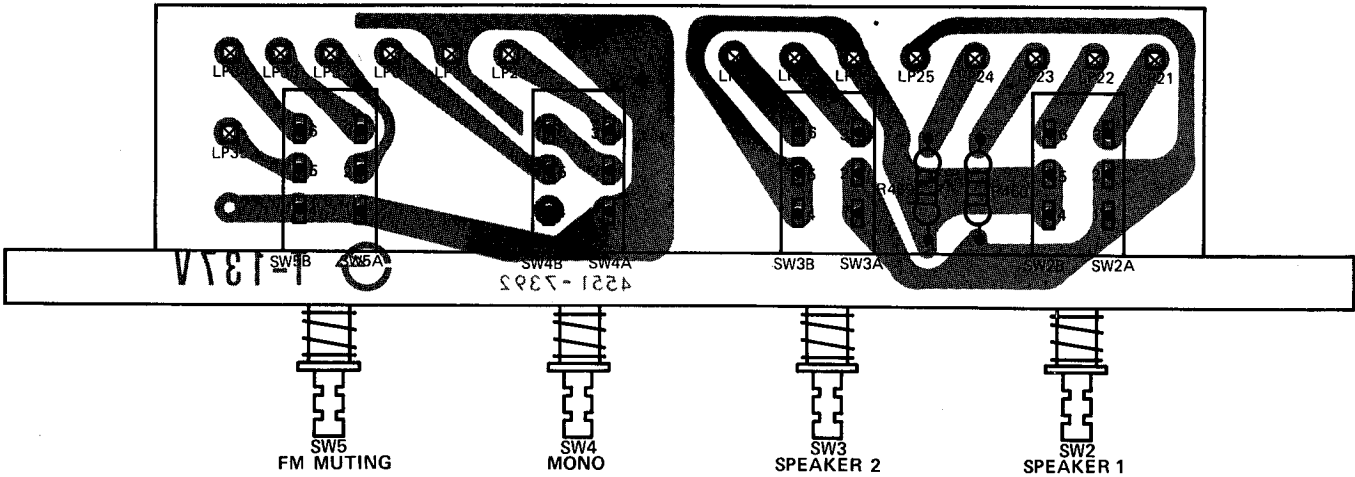
INPUT/OUTPUT JACK TERMINAL PC BOARD

CIRCUIT REF.	H/K PART NO.	DESCRIPTION
TE2	65433653	10-Pin Jack, Phono/Aux./Tape In/ Tape Out 1/Tape Out 2

INPUT/OUTPUT JACK TERMINAL PC BOARD MULTI



MODE/CONTROL SWITCH PC BOARD



CIRCUIT REF.	H/K PART NO.	DESCRIPTION
SW2, 3, 4, 5	25035631	Push Switch, Speaker 1/Speaker 2/ Mono/FM Muting

LAMP HOLDER PC BOARD



CHASSIS PARTS LIST

CIRCUIT REF.	H/K PART NO.	DESCRIPTION
GENERAL UNIT		
101	00235536	Clear Panel Assembly
102	00235537	Front Panel Assembly
103	00135538	Push Button Assembly, Speaker 1/ Speaker 2/Mono/FM Muting/Loudness (X5)
104	00235539	Knob Assembly, Function
105	00235540	Knob Assembly, Tuning
106	00235541	Dial Pointer Assembly
115	60135542	Cabinet Back
116	60135543	Cabinet Top
117	62035544	Feet, Cabinet Bottom (X4)
119	61035545	Dial Panel
121	64235546	Bracket, Clear Panel
122	64235547	Bracket, Front Panel Right
123	64235548	Bracket, Front Panel Left
146	60135549	Dressing Plate, Cabinet Back
149	63235550	Knob, Volume
157	63235551	Knob, Bass/Treble/Balance (X3)
161	63235552	Knob, Tape Monitor
169	63233663	Push Button, Power

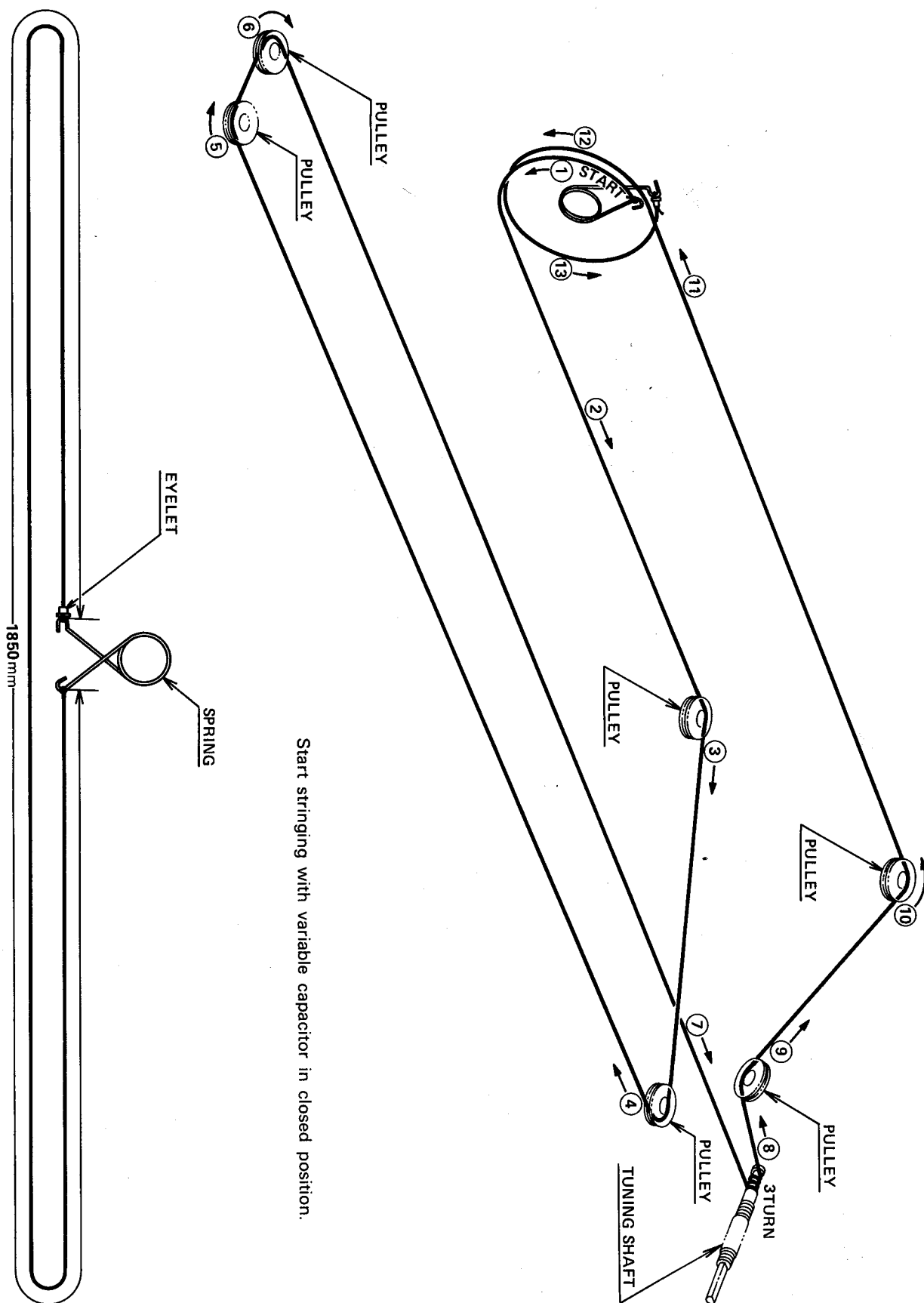
ELECTRICAL

T1	10135553	Power Transformer
SW1	25035554	Push Switch, Power
ME1	12535555	Tuning Meter
J1	65432119	Headphones Jack
SO1	67435556	External AC Socket, Switched
CB1, 2	45535557	Speaker Protector
TE1	65129518	FM/AM External Antenna Terminal
TE3, 4	65434823A	Speaker Output Terminal
FU1	45035558	Fuse, 3A 125V
FU2, 3	45035559	Fuse, 4A 125V
D10, 503	46735560	Light Emitting Diode, SLP132B Power Indicator, Tape Monitor Indicator
D302	46735561	Light Emitting Diode, GL4AR2 Stereo Indicator
L106	12031333	Coil, FM RF BALUN
L251	20535562	AM Ferrite Bar Antenna
PL1, 2, 3, 4, 5, 6	46529502	Dial Illuminator Lamp, 8V 300mA

MULTI VOLTAGE RECEIVER

T1	10135634	Power Transformer
SW1	25035635	Push Switch, Power
FU1	45035636	Fuse, 3.15AT 250V
FU2, 3	45035637	Fuse, 4AT 250V
FU4	45035638	Fuse, 2.5AT 250V
SW8	24035639	Rotary Switch, Power Source Voltage Selector
SW102	24531335	Slide Switch, Emphasis
J2	65432127	5-Pin DIN Jack, REC/PB

DIAL CORD STRINGING



Start stringing with variable capacitor in closed position.