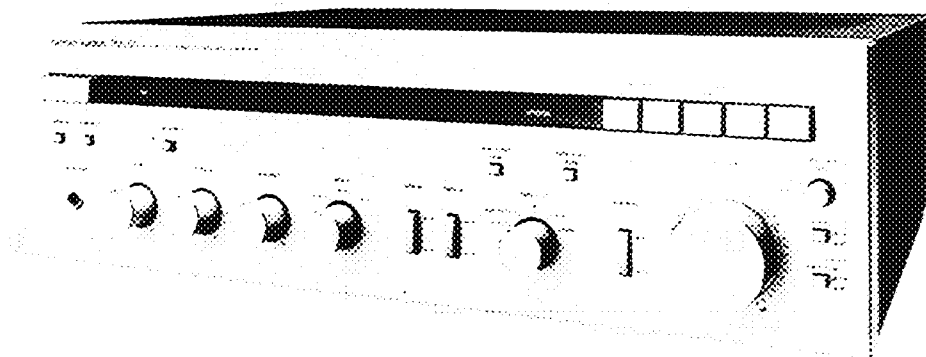


The Harman Kardon Model PM660

Manual No. 42A

HI-CURRENT CAPABILITY INTEGRATED AMPLIFIER

Technical Manual



PM660

harman/kardon

240 CROSSWAYS PARK WEST, WOODBURY, N.Y. 11797
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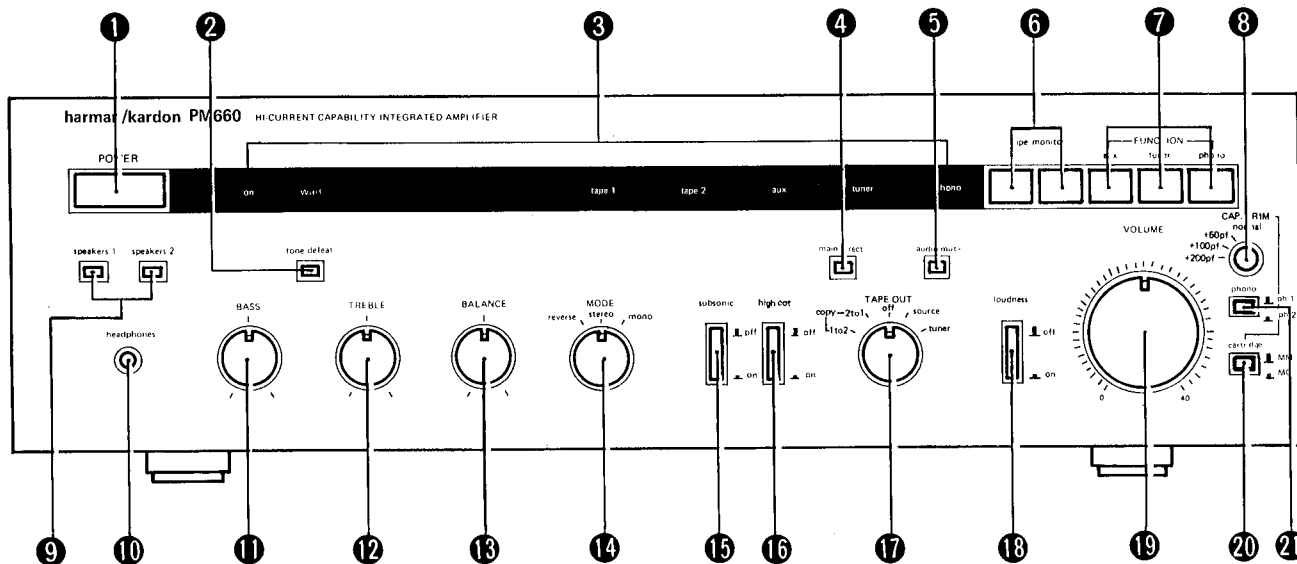
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SPECIFICATIONS

R.M.S. Power Output	80W+80W at 0.06% T.H.D.(8Ω)	Semiconductors	100 Transistors, 8 FETs, 16 Diodes, 20 Zener Diodes, 2 Bridge Silicon Diodes, 2 Varistors
Frequency Response	0.5Hz ~ 140kHz (-3dB)	Power Supply	
IM Distortion	Less than 0.06%	General model	AC 110/120/220/240V, 50/60Hz
Slew Rate	100V/μsec.	European model	AC 220V, 50Hz
Overall Negative Feedback	15dB	Power Consumption	328W
S/N (IHF-A)		Dimensions	440(W)x122(H)x360(D) mm (17-5/16"x4-13/16"x14-3/16")
Phono	78dB	Weight	12.1kg (26 lbs. 11 oz.)
AUX	80dB	Specifications and components subject to change without notice.	
Phono Overload		Overall performance will be maintained or improved.	
MM	More than 220mV at 1kHz		
MC	More than 5mV at 1kHz		

COMPONENTS AND THEIR FUNCTIONS

FRONT PANEL



1 POWER SWITCH (POWER)

For power on and off.

When this switch is pressed after AC cord connection to an outlet, the "wait" indicator illuminates. In about 8 seconds, the "on" indicator illuminates. Operate your PM660 after illumination of the "on" indicator.

2 TONE DEFEAT SWITCH (tone defeat)

For defeating tone control by TONE CONTROL knobs (BASS, TREBLE).

At the depressed position, flat frequency characteristic is obtained irrespective of TONE CONTROL knob positions.

3 DISPLAY PANEL

(on/wait/tape 1/tape 2/aux/tuner/phono)

The DISPLAY panel indicates the current status of the unit.

on, wait: The "wait" indicator illuminates when the POWER switch is pressed. When the circuit is stabilized, the "wait" indicator goes off and the "on" indicator illuminates. In case of short-circuit at speaker terminals, it illuminates to indicate the abnormality.

tape 1, tape 2: TAPE MONITOR switch indicators. **aux, tuner, phono:** Indicators for FUNCTION selectors.

4 MAIN DIRECT SWITCH (main direct)

When this switch is depressed, the signal from the source is directly input to the power amplifier so as to enable sound quality improvement.

5 AUDIO MUTE SWITCH (audio mute)

For attenuation of the signal level by -20dB.

Depress this switch to reduce the reproduced sound temporarily for answering a phone call, during tuning to another station, tape cueing and other purposes.

6 TAPE MONITOR SWITCHES (tape monitor 1,2)

For monitoring the equalizer or tape deck connected to the TAPE 1 INPUT/OUTPUT jacks or TAPE 2 INPUT/OUTPUT jacks.

The monitored tape deck is displayed as "tape 1" or "tape 2" in red color on the DISPLAY panel.

7 FUNCTION SELECTORS (FUNCTION)

AUX switch: Press this switch to select the program source connected to the AUX INPUT jacks.

TUNER switch: Press this switch to select the tuner connected to the TUNER INPUT jacks.

PHONO switch: Press this switch to select the turntable connected to the PHONO INPUT 1 or 2 jacks.

The selected function is indicated as "aux", "tuner" or "phono" in green color on the DISPLAY panel.

8 CAPACITANCE TRIM SELECTOR (CAP. TRIM)

For adjustment of the capacitance of the MM type cartridge of your turntable connected to the PHONO 1 INPUT jacks.

Set this Knob as follows:

Cartridge capacitance	Position
0 – 300pF	normal
300 – 350pF	+50pf
350 – 400pF	+100pf
Over 400pF	+200pf

9 SPEAKER SELECTORS (speakers 1, speakers 2)

For selection of speakers to be sounded.

2 speaker systems can be connected to this unit. When listening to speaker sound, depress the corresponding selector. To sound both speaker systems, depress both switches. Release the switch to listen with headphones only.

10 STEREO HEADPHONES JACK (headphones)

For connection of stereo headphones.

Output signal is always supplied to this jack.

11 BASS CONTROL KNOB (BASS)

For emphasis or attenuation of low-pitched tone.

Turn it clockwise for emphasis, or counterclockwise for attenuation.

12 TREBLE CONTROL KNOB (TREBLE)

For emphasis or attenuation of high-pitched tone.

Turn it clockwise for emphasis, or counterclockwise for attenuation.

13 BALANCE CONTROL KNOB (BALANCE)

For balance adjustment between left and right channels. Normally place it at the center position.

14 MODE SELECTOR (MODE)

MONO position: Select this position for a monaural source program.

STEREO position: Select this position for stereo playback, reception or recording.

REVERSE position: Select this position to reverse the right and left channel signals.

15 SUBSONIC FILTER SWITCH (subsonic)

For filtering very low frequencies.

When depressed, the subsonic filter is validated to prevent distortion resulting from turntable rumble and speaker damage caused by superlow tones.

16 HIGH CUT FILTER SWITCH (high cut)

For attenuation of high frequency noise.

At depressed position, the high cut filter is validated to cut off high frequency noise such as tape hissing sound.

17 TAPE OUT SELECTOR (TAPE OUT)

TUNER position: The tuner signals appear at TAPE 1/2 OUTPUT jacks irrespective of the selected function. This position enables listening to turntable or the source connected to the AUX INPUT jacks while recording a broadcasting program (air check).

SOURCE position: The signals of the source selected by the FUNCTION selector appear at the TAPE 1/2 OUTPUT jacks.

OFF position: During tape playback or listening to a program source selected by the FUNCTION selector, the output signals to the TAPE 1/2 OUTPUT jacks are cut off to prevent sound degradation.

COPY-2 TO 1 position: Enables dubbing from the tape deck connected to TAPE 2 INPUT jacks to the deck connected to TAPE 1 OUTPUT jacks.

To monitor the source tape sound, press the TAPE MONITOR 2 switch. To monitor the sound being recorded, press the TAPE MONITOR 1 switch.

When the FUNCTION switch (AUX, TUNER or PHONO) is pressed with the TAPE MONITOR switches OFF, you can enjoy the selected source sound while copying the tape (dubbing).

COPY-1 TO 2 position: Reverse of the above position.

18 LOUDNESS SWITCH (loudness)

For emphasis of the low and high frequency ranges to enable impressive reproduction when listening at a low sound volume.

19 VOLUME CONTROL KNOB (VOLUME)

For increase/decrease of the sound volume.

Clockwise turn increases the sound volume, and counterclockwise turn decreases it. Set this knob at a minimum level before turning the power on to prevent speaker from being damaged by a sudden booming sound.

20 CARTRIDGE SELECTOR (cartridge)

For selection between the MM and MC type cartridges. If your turntable uses an MC type cartridge, connect the turntable to PHONO 2 INPUT jacks, select the ph. 2 position by the PHONO selector, and depress this switch.

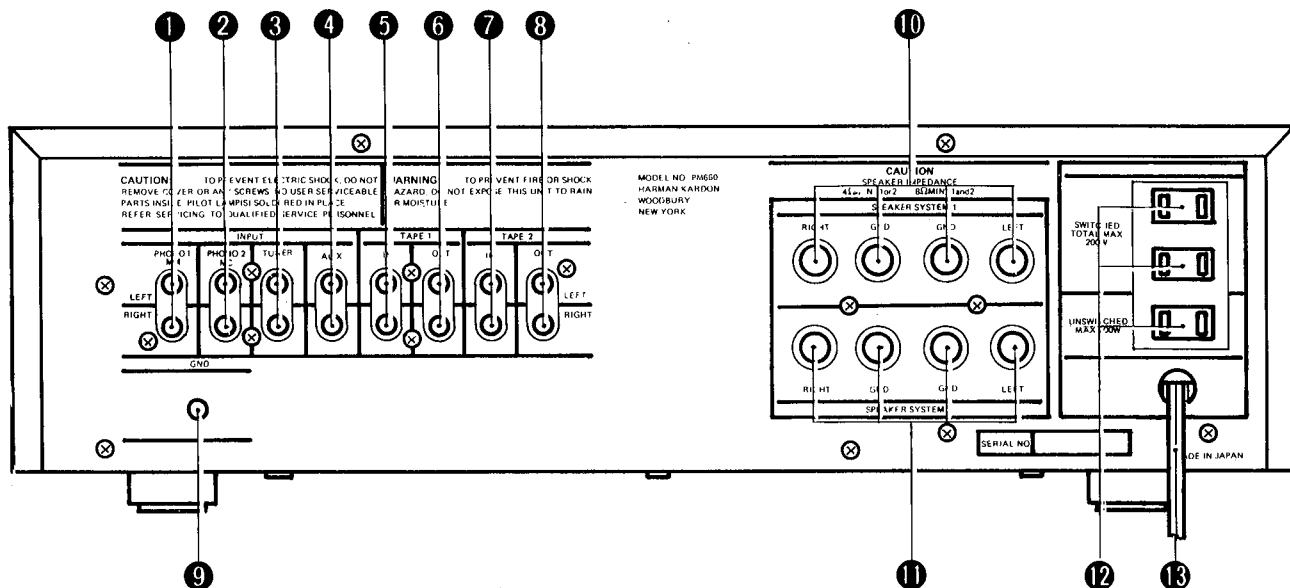
NOTE: No switch is provided at this position in the unit manufactured according to West Germany specification. This selector is combined with the PHONO selector above and the combined selector is located at the above position as the CARTRIDGE selector.

21 PHONO SELECTOR (phono)

For selection of the turntable connected to this unit. Place this switch at the ph. 1 position to select the turntable connected to PHONO 1 INPUT jacks. Place this switch at the ph. 2 position to select the turntable connected to PHONO 2 INPUT jacks.

NOTE: This selector is combined with the CARTRIDGE selector below in the unit manufactured according to West Germany specification. If your turntable uses an MM type cartridge, connect it to the PHONO 1 INPUT jacks and place the selector here at the MM position. If it uses an MC type cartridge, connect your turntable to the PHONO 2 INPUT jacks and place the selector here at the MC position.

REAR PANEL



1 PHONO 1 INPUT JACKS (INPUT PHONO 1 MM)
Connect the output cables from your turntable using an MM type cartridge here.

NOTE: When using either PHONO 1 or PHONO 2 INPUT jacks, please insert the attached SHORTING PLUGS into the PHONO INPUT jacks not in use.

2 PHONO 2 INPUT JACKS (INPUT PHONO 2 MM/MC)
Connect the output cables from your turntable using an MC type cartridge here. You can also connect a turntable using an MM type cartridge here.

NOTE: Only a turntable using an MC type cartridge can be connected here in case of a unit manufactured according to West Germany specification.

3 TUNER INPUT JACKS (INPUT TUNER)
Connect the output cables from your tuner here.

4 AUX INPUT JACKS (INPUT AUX)
Connect the output cables from your TV tuner, etc. here.

5 TAPE 1 INPUT JACKS (TAPE 1 IN)
Connect the output cables from your tape deck or equalizer here.

6 TAPE 1 OUTPUT JACKS (TAPE 1 OUT)
Connect the input cables to your tape deck or equalizer here.

7 TAPE 2 INPUT JACKS (TAPE 2 IN)
Connect the output cables from another tape deck here.

8 TAPE 2 OUTPUT JACKS (TAPE 2 OUT)
Connect the input cables to another tape deck here.

9 GROUND TERMINAL (GND)
Connect the grounding cable from your turntable here.

10 SPEAKER SYSTEM 1 CONNECTORS (SPEAKER SYSTEM 1)
Connect the cables for your speaker system here. Carefully connect speaker cables so as not to mistake left and right channels and polarities.

11 SPEAKER SYSTEM 2 CONNECTORS (SPEAKER SYSTEM 2)
Connect the cables for the second speaker system here in the same way as explained for the first speaker system. When using one speaker system, it may be connected to either SPEAKER SYSTEM 1 connectors or SPEAKER SYSTEM 2 connectors.

CAUTION:
2 speaker systems can be connected to this unit. The minimum speaker impedance shall be 4Ω when only one speaker system is used, or 8Ω when two speaker systems are used.

12 AC CONVENIENCE OUTLETS SWITCHED:
Use these outlets to connect your turntable, tuner, cassette deck and/or other components. The power supply to the connected components is interlocked with power on/off of this unit. The total maximum capacity is 200W.

UNSWITCHED:
This outlet is always supplied with the power regardless of the position of the POWER switch of this unit. Interlocked on/off of the connected component is impossible. The maximum capacity is 200W.

NOTE: In some countries, owing to Safety Agency Electrical requirements, these AC receptacles are eliminated.

13 AC CORD
Connect this cord to mains outlet. Be sure to turn the POWER switch off before connecting the AC cord.

DISASSEMBLY PROCEDURES

CABINET TOP REMOVAL (Fig. 1)

1. Remove 10 black colored screws ① to ⑩ fixing cabinet top.
2. Slide the cabinet top backward gradually to remove.

CABINET BOTTOM ASSEMBLY REMOVAL (Fig. 1)

3. Remove 11 screws ⑪ to ⑳ from the cabinet bottom and remove the cabinet bottom assembly.

FRONT PANEL ASSEMBLY REMOVAL (Fig. 1)

4. Complete steps 1 and 2.
5. Pull off the Volume knob.
6. Remove 6 screws ㉒ to ㉗ fixing front panel.
7. Pull the front panel assembly toward you to remove.

FRONT CHASSIS WITH P.C. BOARD ASSEMBLIES REMOVAL (Fig. 2)

8. Complete steps 1 through 7.
9. Pull off the Cap. Trim knob and Power push button.
10. Remove a nut fixing the capacitance trim switch with P.C. board and detach from the front chassis.
11. Disconnect the connector (J401) from driver P.C. board (PCB-9).
12. Remove 9 screws ① to ⑨ fixing the front chassis.
13. Remove the front chassis while watching out lead wires and the parts around. Unsolder the lead wires, if necessary.

DRIVER P.C. BOARD ASSEMBLY (PCB-9) REMOVAL (Fig. 3)

14. Complete steps 1, 2 and 11.
15. Remove 2 screws ① and ② fixing the driver P.C. board (PCB-9) and pull out the P.C. board straight up.

PHONO AMP. P.C. BOARD ASSEMBLY (PCB-1) REMOVAL (Fig. 3)

16. Complete steps 1 through 13.
17. Remove 2 screws ③ and ④ fixing the phono amp. P.C. board (PCB-1).
18. Raise up the 2 pawls fixing the upper part of the phono amp. P.C. board (PCB-1) and incline the P.C. board then remove the P.C. board by sliding upward.

INDICATION LAMP REFLECTOR REMOVAL (Fig. 4)

19. Complete steps 4 through 7.
20. Since the indication plate in front of the reflector is only fit into the edge of the reflector, strip the edge along the reflector and slide the indication plate right or left to remove.
21. As the reflector is only fit into the front chassis, remove the reflector while pushing the fit-in part. In this case, pay attention not to damage the indication lamp for power and function lamps.

INDICATION LAMPS REMOVAL (Fig. 4)

22. Complete steps 1 and 2.
23. Insert a screwdriver for slotted screw from the circuit side of the indication lamp P.C. board (PCB-8) and turn it counterclockwise.

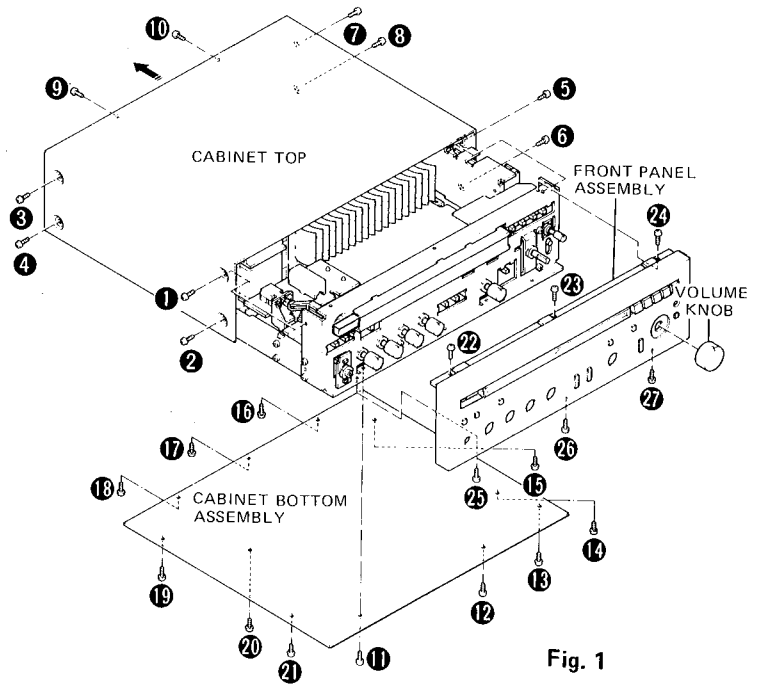


Fig. 1

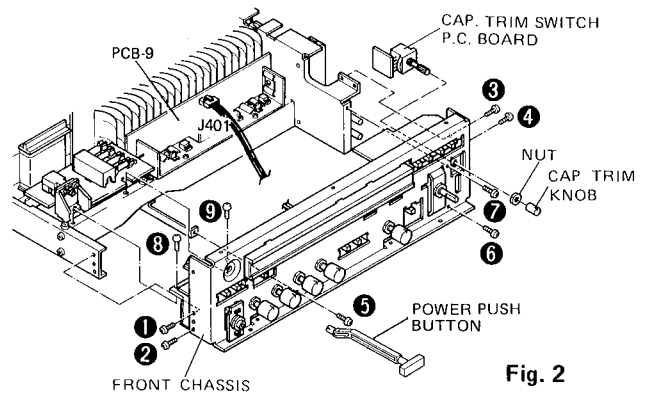


Fig. 2

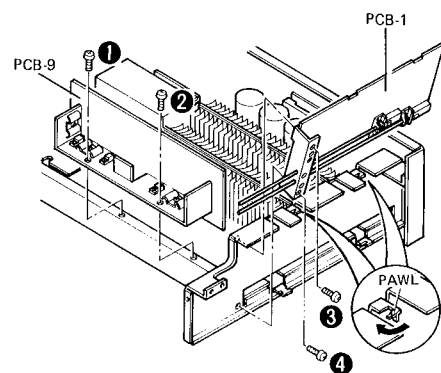


Fig. 3

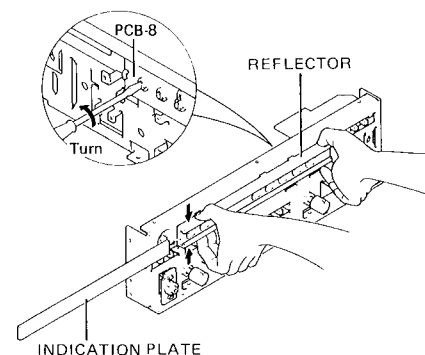


Fig. 4

tone control P.C. Board Assembly (PCB-2) Removal (Fig. 5)

24. Complete steps 8 through 12.
25. Pull off the Bass, Treble, Balance, Mode selector and Tape Out knobs.
26. Remove 5 nuts fixing bass, treble and balance controllers and mode selector and tape out switches.
27. Remove 4 screws ① to ④ fixing subsonic, high cut and loudness switches and take out P.C. board.

Volume Control P.C. Board Assembly (PCB-3) Removal (Fig. 5)

28. Complete steps 8 through 12.
29. Remove a nut fixing volume control with P.C. board and remove it.

Indication Lamp P.C. Board Assembly (PCB-8) Removal (Fig. 5)

30. Complete steps 8 through 12.
31. Raise up the 4 pawls fixing indication lamp P.C. board to free the P.C. board.

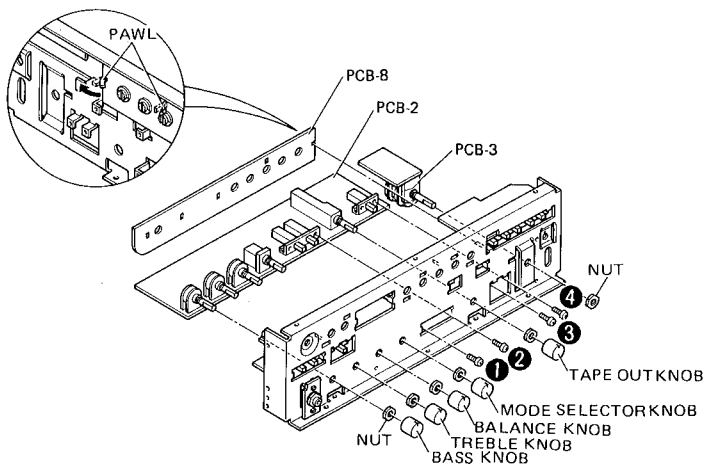


Fig. 5

ALIGNMENT PROCEDURES

IDLING CURRENT ADJUSTMENT

Instrument: DC Voltmeter

- Notes:**
1. Set function selector switch to AUX position.
 2. Set volume control to minimum position.
 3. Proceed with the adjustment at least 20 minutes after the power has been switched on to stabilize idling current.

Step	Connect Output Meter To	Adjust	Adjust For
1	DC voltmeter to TP1 (+) and TP2 (-)	VR403	50mV on DC voltmeter
2	DC voltmeter to TP3 (+) and TP4 (-)	VR404	Same as above

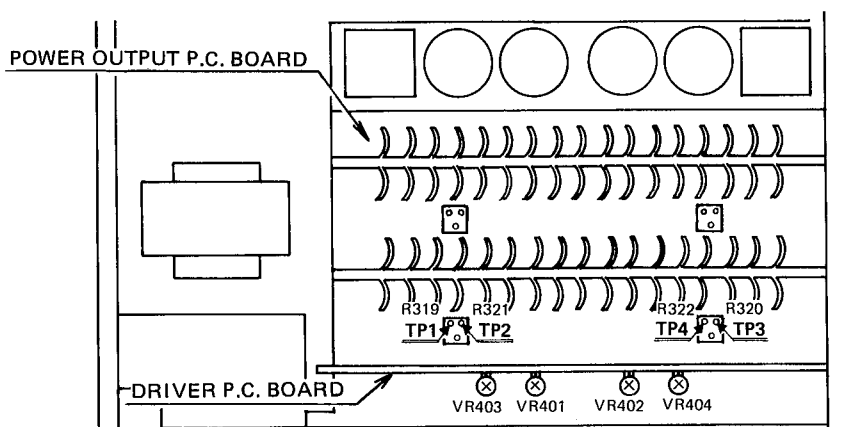
DC VOLTAGE BALANCE ADJUSTMENT

Instrument: DC Voltmeter

- Notes:**
1. Set function selector switch to AUX position.
 2. Set volume control to minimum position.
 3. Press in main direct switch to ON position.
 4. Press in speakers 1 push button to ON position.
 5. Proceed with the adjustment at least 20 minutes after the power has been switched on to stabilize idling current.

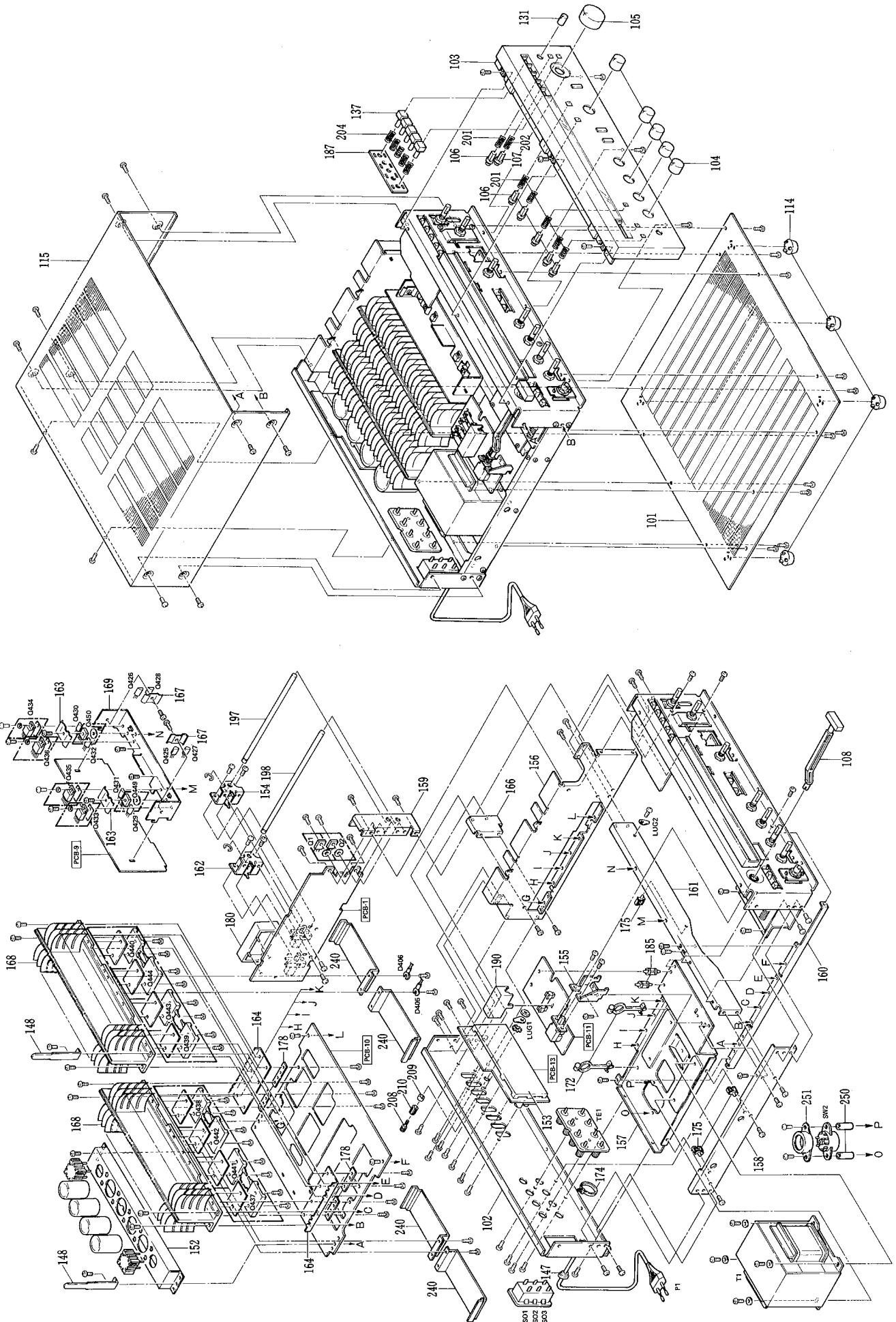
Step	Connect Output Meter To	Adjust	Adjust For
1	DC voltmeter to Lch terminal of Speaker System 1	VR401	0V±10mV on DC voltmeter
2	DC voltmeter to Rch terminal of Speaker System 1	VR402	Same as above

ALIGNMENT POINTS LOCATION



1 2 3 4 5 6

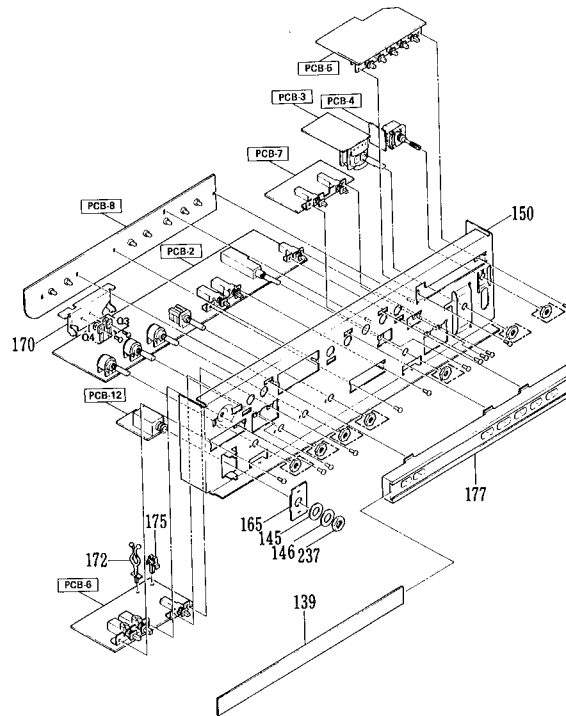
GENERAL UNIT EXPLODED VIEW



A
B
C
D
E
F
G
H
I

GENERAL UNIT EXPLODED VIEW

A
B
C
D



GENERAL UNIT PARTS LIST

DESTINATION ABBREVIATIONS

E : General SEV : Switzer
SK : European G : German

Ref. No.	Part No.	Description	Market
101	A423-PM660	Cabinet Bottom Assembly	
102	1424-06306	Cabinet Back	E
102	1424-07502	Cabinet Back	SK, SEV
102	1424-07503	Cabinet Back	G
103	A443-PM660	Front Panel Assembly (Includes : Subsonic, High Cut and Loudness Push Buttons)	E, SK, SEV
103	A443-PM660-C	Front Panel Assembly (Includes : Subsonic, High Cut and Loudness Push Buttons)	G
104	A630-PM660-A	Knob Assembly, Bass, Treble, Balance, Mode, Tape Out	
105	A630-PM660-B	Knob Assembly, Volume	
106	A662-PM660	Push Button Assembly, Speakers 1 Speakers 2, Tone Defeat, Main Direct, Audio Mute, Phono (German model is Cartridge)	
107	A662-PM660	Push Button Assembly, Cartridge	E, SK, SEV
108	A662-PM660-B	Push Button Assembly, Power	

Ref. No.	Part No.	Description	Market
114	1319-0139	Foot	
115	1414-02501	Cabinet Top	
131	1634-02701	Knob, Cap. Trim	
137	1662-08101BW	Push Button, Tape Monitor 1/2, AUX, Tuner, Phono	
139	1721-01902	Indication Plate	
145	2111-1356	Felt	
146	2114-72167	Bushing	
147	2114-415027	Bushing	
148	2218-7011	Holding Bracket	
150	2211-7219	Chassis	
152	2216-7116	Shield Plate	
153	2216-7117	Shield Plate	
154	2219-7794	Bracket	
155	2219-7787	Bracket	
156	2219-7788	Bracket	
157	2219-7789	Bracket	
158	2219-7790	Bracket	
159	2219-7791	Bracket	
160	2219-7792	Bracket	
161	2219-7793	Bracket	
162	2219-7794	Bracket	E, SK, SEV
163	2219-7795	Bracket	
164	2219-7804	Bracket	
165	2219-7726	Bracket	
166	2219-7816	Bracket	
167	2222-7066	Heat Sink	
168	2222-7122	Heat Sink	
169	2222-7123	Heat Sink	
170	2222-7125	Heat Sink	
172	2240-7050	Holder	
174	2240-7120	Holder	
175	2240-7061	Holder	
177	2223-7044	Reflector	
178	2224-7069	Insulator	
180	2240-7183	Holder	
185	2240-7151	Holder	
187	2240-7167	Holder	
190	2240-7176	Holder	SK, SEV, G
197	2601-7097	Shaft	
198	2601-7096	Shaft	E, SK, SEV
201	2651-210187	Spring	
202	2651-210187	Spring	E, SK, SEV
204	2651-210195	Spring	
208	2310-7015	Special Screw	
209	2410-7005	Special Washer	
210	2440-7011	Special Nut	
237	2440-61	Special Nut	
240	2222-7137	Heat Sink	
250	2132-01701	Spacer	E
251	2240-7130	Protector	E

ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description	Market
CHASSIS MISCELLANEOUS			
P1	4161-71120	AC Line Cord with Plug	E, SEV
P1	4161-71119	AC Line Cord with Plug	SK, G
SO1,2,3	4474-156	AC Outlet, Switched, Unswitched	E
SW2	4467-5	Power Source Voltage Selector	E
T1	5584-701387	Power Transformer	E
T1	5584-701386	Power Transformer	SK, SEV, G
CO1,2	4443-712	Connector	SK, SEV, G
TE1	4214-121	Speaker Terminals, Speaker System 1/2	
J401	4163-72653	Connector with Lead Wire, 5-Pin, Female	
JM1	4242-047025	Jumper Lead, 4-Wire	
JM301	4242-030022	Jumper Lead, 3-Wire	
JM501	4242-050032	Jumper Lead, 5-Wire	
JM502	4242-050072	Jumper Lead, 5-Wire	
JM503,801	4242-050042	Jumper Lead, 5-Wire	
JM802,803	4242-050062	Jumper Lead, 5-Wire	
JM804,805	4242-070052	Jumper Lead, 7-Wire	
JM806	4242-070062	Jumper Lead, 7-Wire	
LUG1,2	4211-4	Lug Terminal	

PCB-1 PHONO AMP. P.C. BOARD

RESISTORS

R2,6	5102-2704713	27Ω, ±2%, 1/4W, Fuse
R617,618	5174-681381	680Ω, ±1%, 1/4W, Metal
R623,624	5174-Z316228	31.6kΩ, ±0.5%, 1/4W, Metal
R629,630	5174-514381	510kΩ, ±1%, 1/4W, Metal

CAPACITORS

C13,14	5345-476E041	47μF, ±20%, 35V, Electrolytic
C17,18	5345-107D041	100μF, ±20%, 25V, Electrolytic
C601,602	5345-476B0226	47μF, ±20%, 10V, Electrolytic
C605	5345-106-16	10μF, +50% -10%, 16V, Electrolytic
C607,608	5345-477B0228	470μF, ±20%, 10V, Electrolytic
C609,610	5359-182771	1800pF, ±2%, 50V, Polypropylene
C611,612	5359-222771	2200pF, ±2%, 50V, Polypropylene
C615,616	5359-822771	8200pF, ±2%, 50V, Polypropylene
C617,618,619,620	5345-226F0228	22μF, ±20%, 50V, Electrolytic
C621,622,631,632	5345-475D0951	4.7μF, ±20%, 25V, Electrolytic
C701,702,703,704	5345-106F0228	10μF, ±20%, 50V, Electrolytic
C705,706	5345-107C0226	100μF, ±20%, 16V, Electrolytic

TRANSISTORS

Q1	5614-669(C)	2SD669(C), Voltage Regulator	
Q2	5612-649(C)	2SB649(C), Voltage Regulator	
Q601,602,603,604	5613-2240(BL)	2SC2240(BL),	} MM Amp.
Q605,606	5613-2603(E)or(F)	2SC2603(E) or 2SC2603(F),	
Q607,608,609,610	5611-970(BL)	2SA970(BL),	
Q611,612	5612-646(C)	2SB646(C),	
Q613,614	5614-666(C)	2SD666(C),	
Q615,616	5616-2SK163(M)or(N)	F.E.T., 2SK163(M) or 2SK163 (N), Phono Muting	
Q617	5613-2603(E)or(F)	2SC2603(E) or 2SC2603(F),	} Phono Switch
Q618	5611-1115(E)or(F)	2SA1115(E) or 2SA1115(F),	} Muting
Q619	5611-1115(E)or(F)	2SA1115(E) or 2SA1115(F),	} Phono ON/OFF
Q620	5613-2603(E)or(F)	2SC2603(E) or 2SC2603(F),	} Muting
Q701,702,707,708	5611-1190(E)or(D)	2SA1190(E) or 2SA1190(D),	} MC Amp.
Q703,704,705,706	5613-2855(E)or(D)	2SC2855(E) or 2SC2855(D),	
Q709	5611-1115(E)or(F)	2SA1115(E) or 2SA1115(F), Current Regulator	
Q710	5613-2603(E)or(F)	2SC2603(E) or 2SC2603(F), Current Regulator	

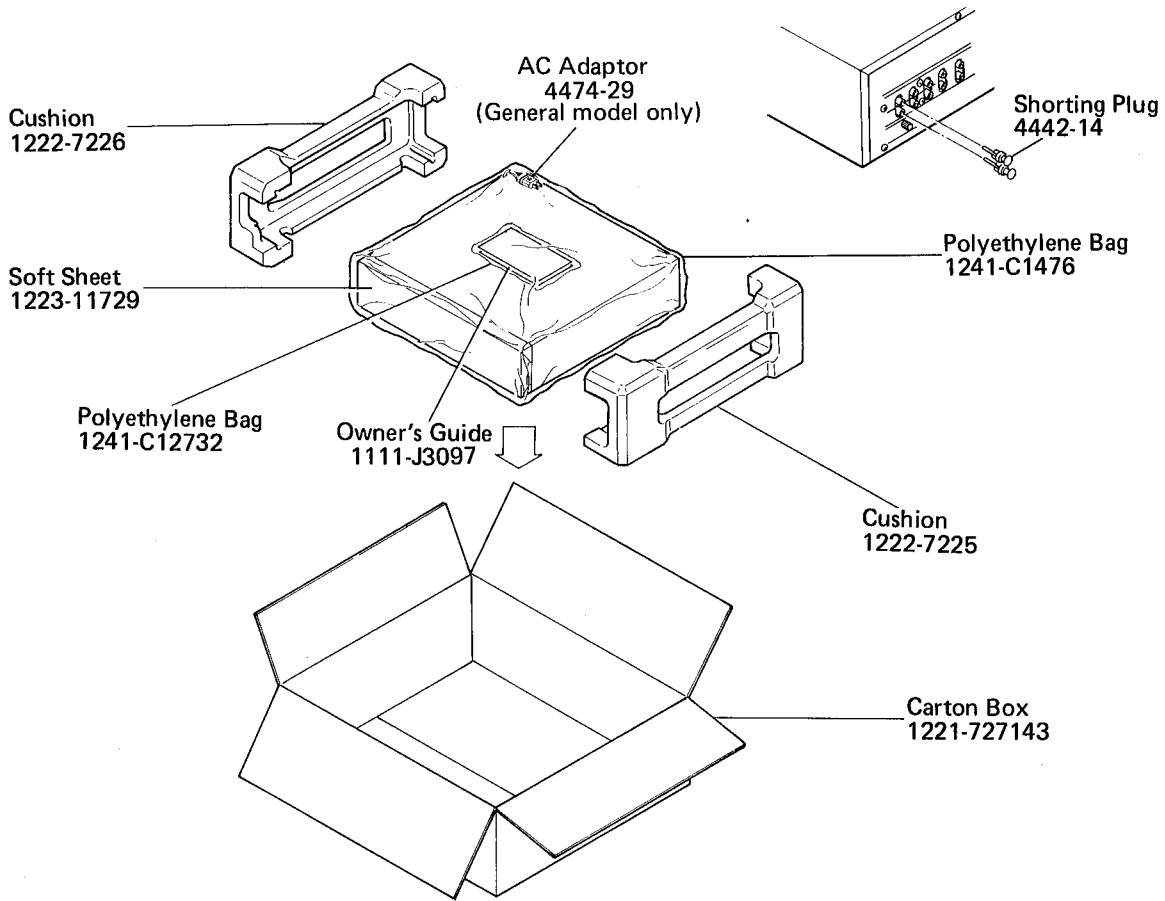
Ref. No.	Part No.	Description	Market
DIODES			
D4,5	5635-RD24EB4	Zener, RD24EB4	
D601,602,604,605, 606,607	5631-1S2473	1S2473	
D603	5635-RD5R1EB2	Zener, RD5.1EB2	
D701,702	5635-RD15JB2	Zener, RD15JB2	
D703,704	5635-RD3R0EB1	Zener, RD3.0EB1	
MISCELLANEOUS			
SW701	4431-01048494	Push Switch, Phono (German model is Cartridge)	
SW702	4431-01068594	Push Switch, Cartridge	E, SK, SEV
PCB-2 TONE CONTROL P.C. BOARD			
RESISTORS			
R7	5102-1004713	10 Ω , \pm 2%, 1/4W, Fuse	
R16	5102-2204713	22 Ω , \pm 2%, 1/4W, Fuse	
R25,26	5102-3304713	33 Ω , \pm 2%, 1/4W, Fuse	
CONTROLS			
VR501	5113-10478122	100k Ω (A), Bass Control	
VR502	5113-50377122	50k Ω (A), Treble Control	
VR503	5113-50381122	50k Ω (M,N), Balance Control	
CAPACITORS			
C11,12	5345-227E041	220 μ F, \pm 20%, 35V, Electrolytic	
C19,20	5345-227D041	220 μ F, \pm 20%, 25V, Electrolytic	
C507,508	5345-476B0226	47 μ F, \pm 20%, 10V, Electrolytic	
C509,510	5345-107F0228	100 μ F, \pm 20%, 50V, Electrolytic	
C511,512	5353-010934	1pF, \pm 0.5pF, 500V, Mica	
C905,906	5345-226F0228	22 μ F, \pm 20%, 50V, Electrolytic	
C907,908	5345-106C0226	10 μ F, \pm 20%, 16V, Electrolytic	
C909,910	5345-107C0226	100 μ F, \pm 20%, 16V, Electrolytic	
TRANSISTORS			
Q3	5614-669(C)	2SD669(C), Voltage Regulator	
Q4	5612-649(C)	2SB649(C), Voltage Regulator	
Q501,502,503,504	5616-170(GR)or(BL) or(V)	F.E.T., 2SK170(GR) or 2SK170(BL) or 2SK170(V),	} Flat Amp.
Q505,506,507,508	5611-1115(E)or(F)	2SA1115(E) or 2SA1115(F),	
Q509,510	5612-646(C)	2SB646(C),	
Q511,512	5614-666(C)	2SD666(C),	
Q901,902,903,904	5613-1845(F)	2SC1845(F), Subsonic Filter, High-Cut Filter	
DIODES			
D6,7	5635-RD24EB4	Zener, RD24EB4	
MISCELLANEOUS			
SW502	4411-403711	Rotary Switch, Mode	
SW503,504	4431-02087759	Push Switch, Subsonic, High-Cut	
SW505	4431-01028694	Push Switch, Loudness	
SW806	4412-045732	Rotary Slide Switch, Tape Out	
PCB-3 VOLUME CONTROL P.C. BOARD			
VR504	5116-1047343	Variable Resistor, 100k Ω (B), Volume Control	
PCB-4 CAP. TRIM SWITCH P.C. BOARD			
C627,628	5353-680534	Capacitor, 68pF, \pm 5%, 500V, Mica	
SW601	4411-204713	Rotary Switch, Cap. Trim	
PCB-5 FUNCTION SWITCH P.C. BOARD			
SW801,802,803,804 805	4431-05207247	Push Switch, Tape Monitor 1, Tape Monitor 2, AUX, Tuner, Phono	

Ref. No.	Part No.	Description	Market
PCB-6 SPEAKERS AND TONE DEFEAT SWITCHES P.C. BOARD			
RESISTORS			
R341,342	5171-270581	27Ω, ±5%, 1W, Metal	
R545,546	5174-242381	2.4kΩ, ±1%, 1/4W, Metal	
MISCELLANEOUS			
L405,406	5991-7125	Coil, RF Choke	
SW401,402	4431-02087651	Push Switch, Speakers 1, Speakers 2	
SW501	4431-01047994	Push Switch, Tone Defeat	
PCB-7 MAIN DIRECT AND AUDIO MUTE SWITCHES P.C. BOARD			
SW506,507	4431-02087659	Push Switch, Main Direct, Audio Mute	
PCB-8 INDICATION LAMP P.C. BOARD			
DIODES			
D10,15	5635-RD4R7EB1	Zener Diode, RD4.7EB1	
D11,12,13,14	5635-RD3R6EB2	Zener Diode, RD3.6EB2	
MISCELLANEOUS			
PL1,2,3,4,5,6,7	5731-1407154	Lamp, 50mA, 14V	
PCB-9 DRIVER P.C. BOARD			
RESISTORS			
R301,302,303,304, 417,418,419,420	5174-182381	1.8kΩ, ±1%, 1/4W, Metal	
R305,306,497,498	5102-1504713	15Ω, ±2%, 1/4W, Fuse	
R307,308	5174-823381	82kΩ, ±1%, 1/4W, Metal	
R345,346,347,348	5102-8204713	82Ω, ±2%, 1/4W, Fuse	
R409,410,415,416	5102-3314713	330Ω, ±2%, 1/4W, Fuse	
R451,452	5174-681381	680Ω, ±1%, 1/4W, Metal	
R453,454	5174-150381	15Ω, ±1%, 1/4W, Metal	
R455,456,463,464	5102-1224713	1.2kΩ, ±2%, 1/4W, Fuse	
R467,468,469,470, 471,472,473,474, 475,476,477,478	5174-562381	5.6kΩ, ±1%, 1/4W, Metal	
R487,488,491,492	5102-1014713	100Ω, ±2%, 1/4W, Fuse	
R489,490,493,494	5102-2R2579	2.2Ω, ±5%, 1/4W, Fuse	
R495,496	5102-5605114	56Ω, ±5%, 1/2W, Fuse	
CONTROLS			
VR401,402	5101-4728175	4.7kΩ(B)	
VR403,404	5101-1027875	1kΩ(B)	
CAPACITORS			
C401,402	5353-100934	10pF, ±0.5pF, 500V, Mica	
C403,404,405,406	5345-106-16	10μF, +50% -10%, 16V, Electrolytic	
C407,408,411,412	5352-1041960	0.1μF, ±10%, 100V, Metalized Polyester	
C409,410	5353-050934	5pF, ±0.5pF, 500V, Mica	
C413,414	5352-1051960	1μF, ±10%, 100V, Metalized Polyester	
C415,416,417,418	5352-1041957	0.1μF, ±10%, 250V, Metalized Polyester	
C431,432,433,434	5345-106J0226	10μF, ±20%, 100V, Electrolytic	
TRANSISTORS			
Q401,402	5616-2SK270BL	Dual F.E.T., 2SK270(BL),	} Power Amp.
Q403,404,405,406, 411,412	5613-1845(E)	2SC1845(E),	
Q407,408,409,410, 423,424	5611-999L(F)	2SA999L(F),	
Q415,416,419,420	5611-992(E)	2SA992(E),	
Q417,418,421,422	5613-2320L(F)	2SC2320L(F),	
Q425,426	5611-1145(Y)	2SA1145(Y),	
Q427,428	5613-2705(Y)	2SC2705(Y),	
Q429,430	5613-2235(Y)	2SC2235(Y),	
Q431,432	5611-965(Y)	2SA965(Y),	
Q433,434	5611-968(O)	2SA968(O),	
Q435,436	5613-2238(O)	2SC2238(O),	
Q449,450	5614-414(Q)	2SD414(Q),	

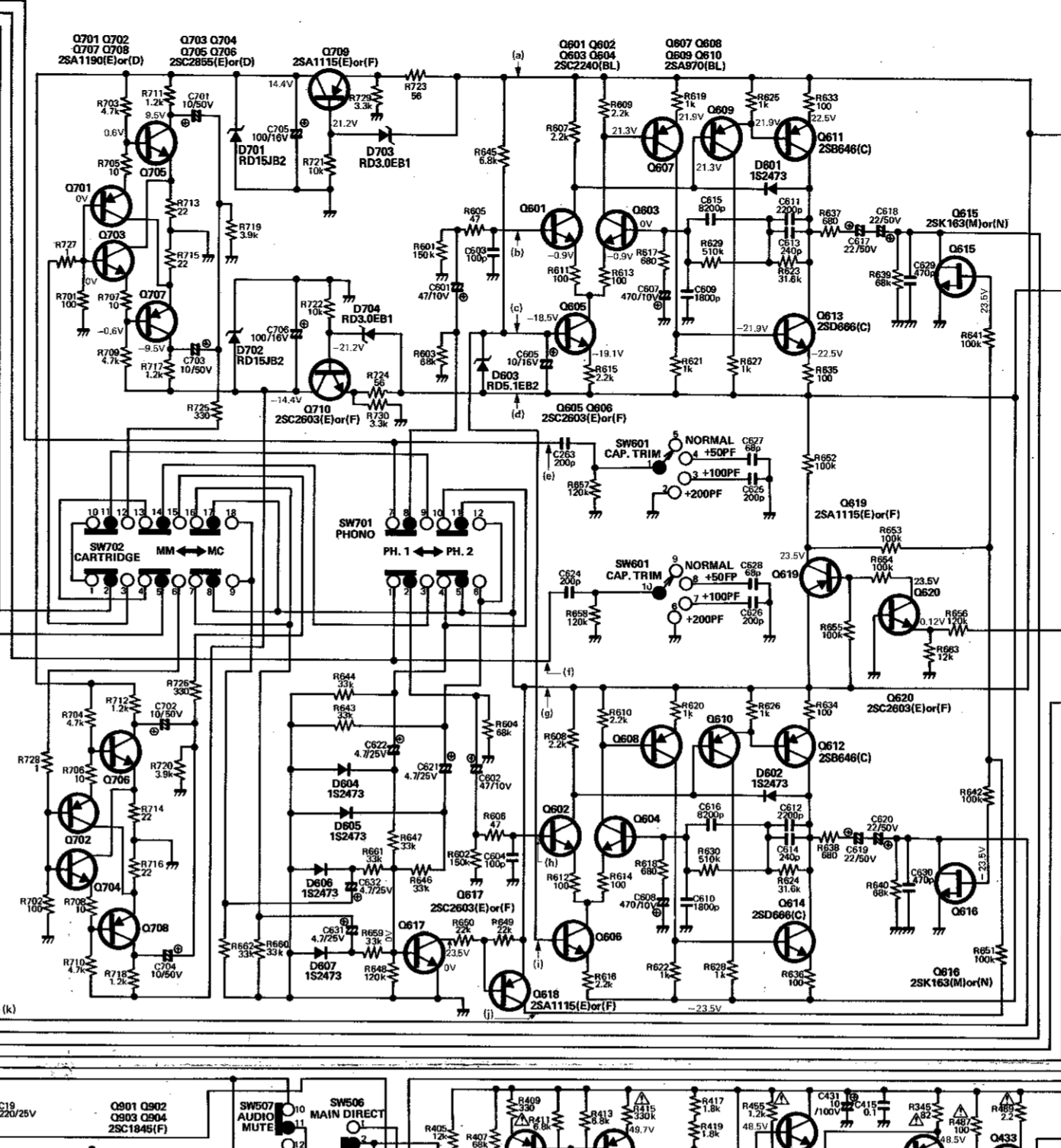
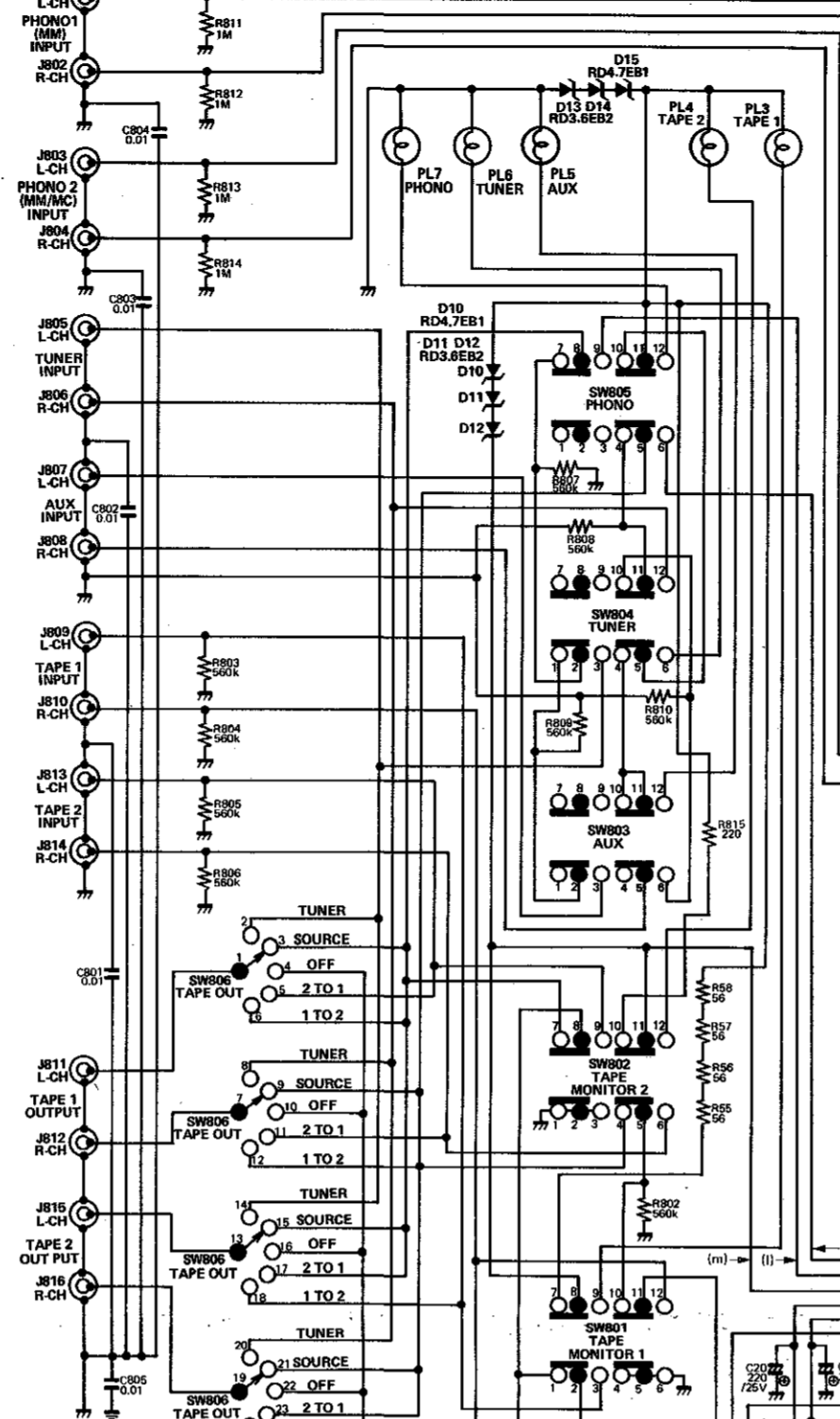
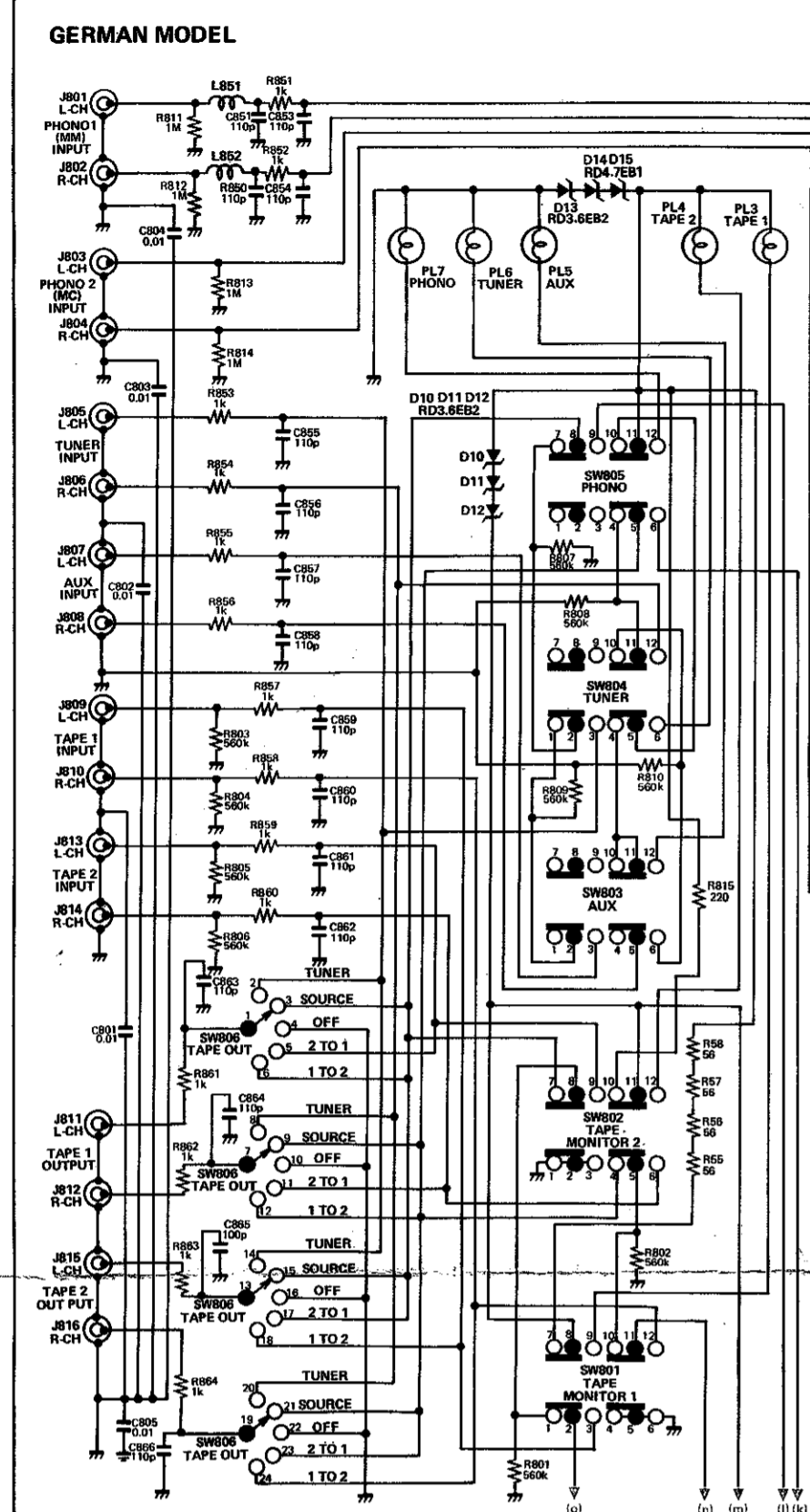
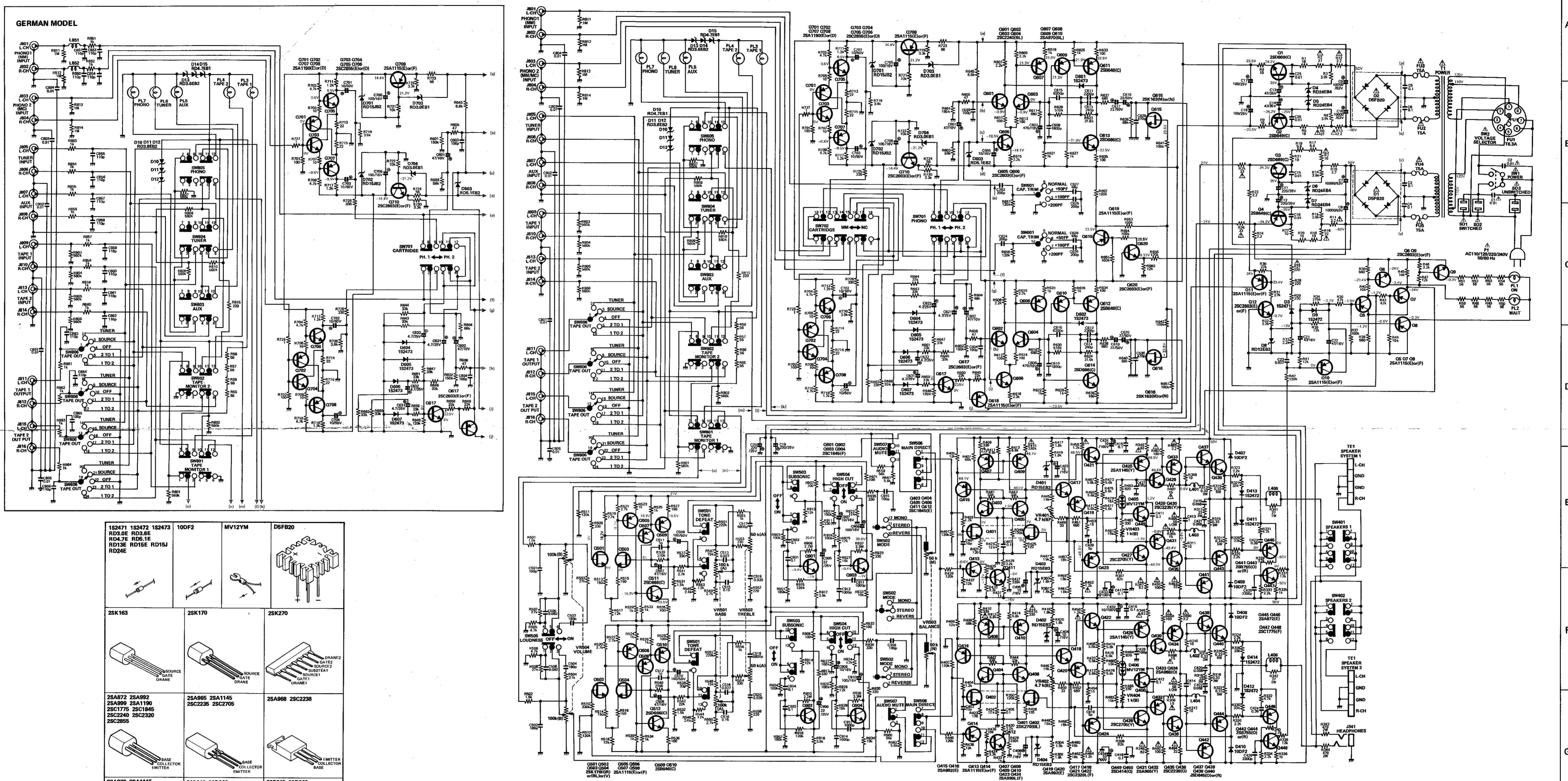
Ref. No.	Part No.	Description	Market
DIODES			
D401,402,403,404	5635-RD15EB3	Zener, RD15EB3	
MISCELLANEOUS			
P301,302	4443-10418	Connector, 10-Pin, Male	
P401	4443-050158	Connector, 5-Pin, Male	
PCB-10 POWER OUTPUT P.C. BOARD			
RESISTORS			
R10,11,12,13	5102-2R2579	2.2 Ω , \pm 5%, 1/4W, Fuse	
R27	5102-2214713	220 Ω , \pm 2%, 1/4W, Fuse	
R313/315,314/316, 319/321,320/322	5275-R33671	0.33 Ω , \pm 10%, 5Wx2, Cement (Special Dual)	
R317,318	5175-220571	22 Ω , \pm 5%, 3W, Metal	
CAPACITORS			
C3,4,5,6	5352-1041957	0.1 μ F, \pm 10%, 250V, Metalized Polyester	
C7,8,9,10	5341-109G0958	10000 μ F, \pm 20%, 63V, Electrolytic	
C21,22	5345-476C0951	47 μ F, \pm 20%, 16V, Electrolytic	
C50,51	5352-4740962	0.47 μ F, \pm 20%, 400V	G
TRANSISTORS			
Q5	5611-1115(E)or(F)	2SA1115(E) or 2SA1115(F), Audio Muting/ Protector	
Q6,9,12	5613-2603(E)or(F)	2SC2603(E) or 2SC2603(F),	} Lamp Muting
Q7,8,11	5611-1115(E)or(F)	2SA1115(E) or 2SA1115(F),	
Q10	5611-1115(E)or(F)	2SA1115(E) or 2SA1115(F), Protector	
Q413,414	5611-1115(E)or(F)	2SA1115(E) or 2SA1115(F),	} Power Amp.
Q437,438,439,440	5614-845(O)or(R)	2SD845(O) or 2SD845(R),	
Q441,442,443,444	5612-755(O)or(R)	2SB755(O) or 2SB755(R),	
Q445,446	5611-872(E)	2SA872(E), Protector	
Q447,448	5613-1775(F)	2SC1775(F), Protector	
DIODES			
D1,2	5685-D5FB20	Bridge Silicon, D5FB20	
D3	5636-1S2471	1S2471	
D8	5635-RD13EB3	Zener, RD13EB3	
D9,411,412,413,414	5636-1S2472	1S2472	
D405,406	5641-MV12YM	Varistor, MV12YM	
D407,408,409,410	5632-10DF2	10DF2	
MISCELLANEOUS			
L401,402,403,404	5597-45502	Ferrite Bead	
J301,302	4443-107149	Connector, 10-Pin, Female	
	2132-5049	Spacer, R313/315, R314/316,R319/320, R321/322	
	2132-7049	Spacer, R317, R318	
PCB-11 FUSE P.C. BOARD			
SW1	4431-01028058	Push Switch, Power	
FU1	5732-632030	Fuse, T6.3A, 250V	
FU2,3,4,5	5732-502030	Fuse, T5A, 250V	
C1,2	5352-1030961	Capacitor, 0.01 μ F, \pm 20%, AC250V, Metalized Polyester	E
C2	5352-1030961	Capacitor, 0.01 μ F, \pm 20%, AC250V, Metalized Polyester	SK, G
C2	5352-1030958	Capacitor, 0.01 μ F, \pm 20%, AC250V, Metalized Polyester	SEV
	4472-7122	Fuse Holder	

Ref. No.	Part No.	Description	Market
PCB-12 HEADPHONES JACK P.C. BOARD			
R343,344	5173-471581	Resistor, 470 Ω , \pm 5%, 2W, Metal	
J341	4451-00121	Jack, Headphones	
PCB-13 PIN JACK P.C. BOARD			
L851,852	5995-220128	Coil	G
J801,802,803,804	4484-27	4-Pin Jack, Phono 1, Phono 2	
J805,806,807,808, 809,810,811,812, 813,814,815,816	4486-8	6-Pin Jack, Tuner, AUX , Tape 1, Tape 2	

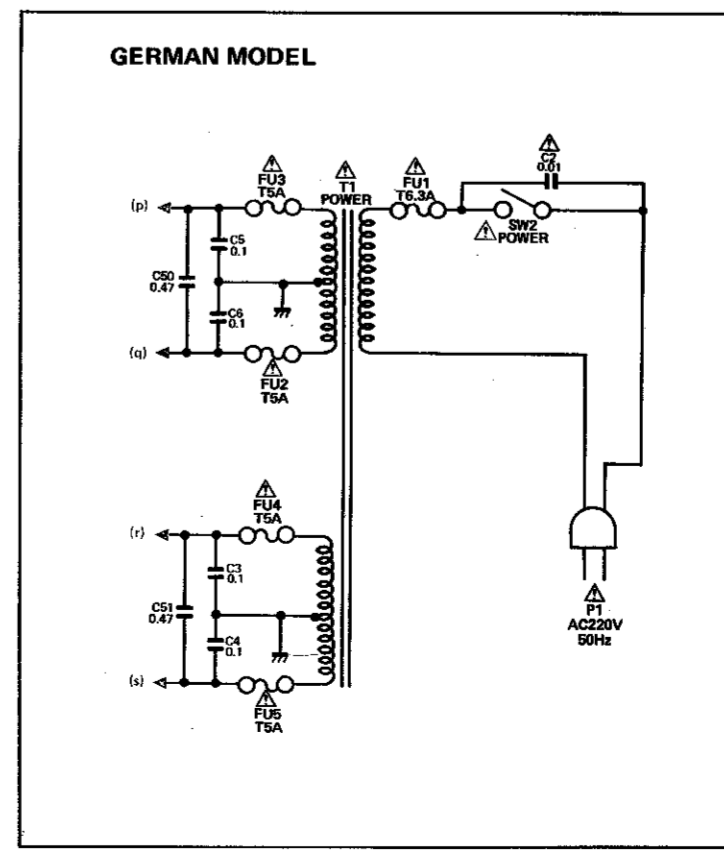
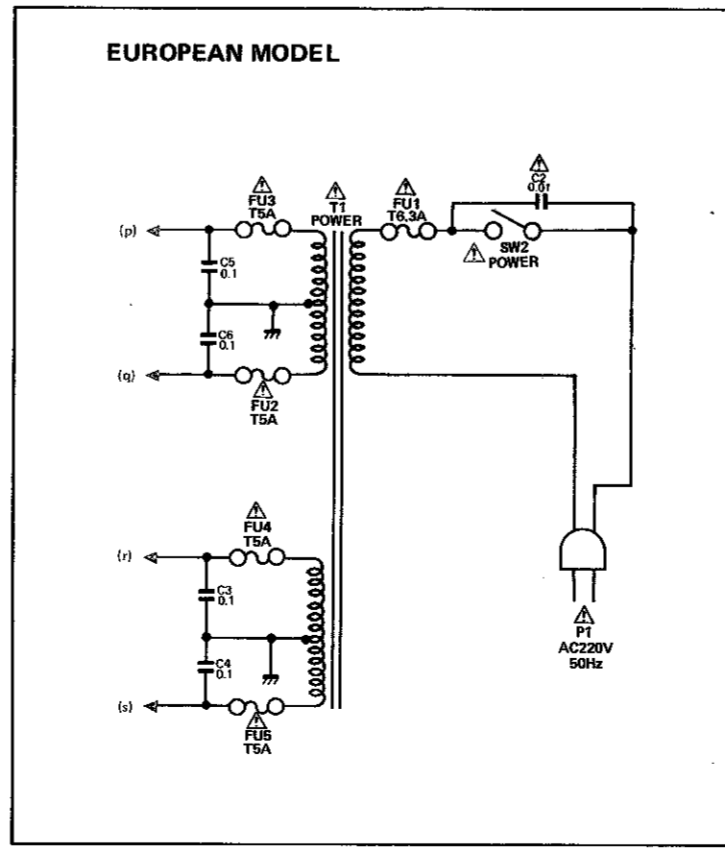
PACKAGE



SCHEMATIC DIAGRAM



1S2471 1S2472 1S2473 RD3.0E RD3.6E RD4.7E RD6.1E RD13E RD15E RD15J RD24E	100F2	MV12YM	D5FB20
25K163	25K170	25K270	
25A872 25A992 25A999 25A1190 25C1175 25C1845 25C2240 25C2320 25C2855	25A965 25A1145 25C2235 25C2705	25A968 25C2238	
25A970 25A1115 25C2893	25B646 25D666	25B649 25D669	
25B775	25D414	25D645	

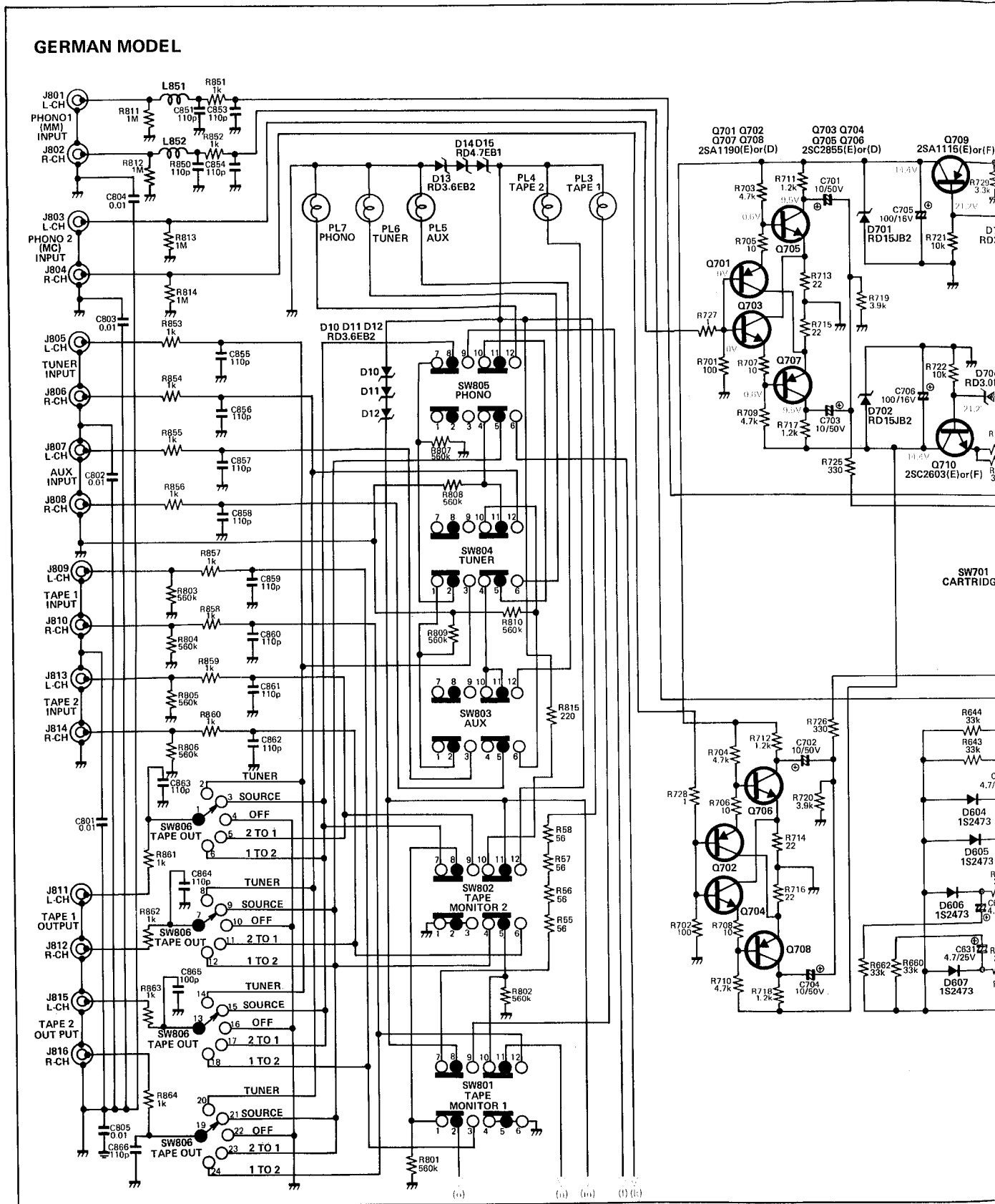


NOTES:

- ALL RESISTANCES ARE 1/4 WATTS, UNLESS OTHERWISE NOTED, VALUES ARE IN Ω .
 $k=1000 \Omega$, $M=1000k\Omega$
- ALL CAPACITANCE VALUES ARE IN μF UNLESS OTHERWISE NOTED. $pF=\mu\mu F$
- ALL VOLTAGES READING FROM CHASSIS ARE MEASURED WITH V.T.V.M. UNDER NO SIGNAL CONDITIONS.
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SCHEMATIC DIAGRAM

GERMAN MODEL

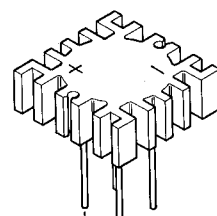
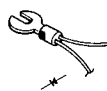


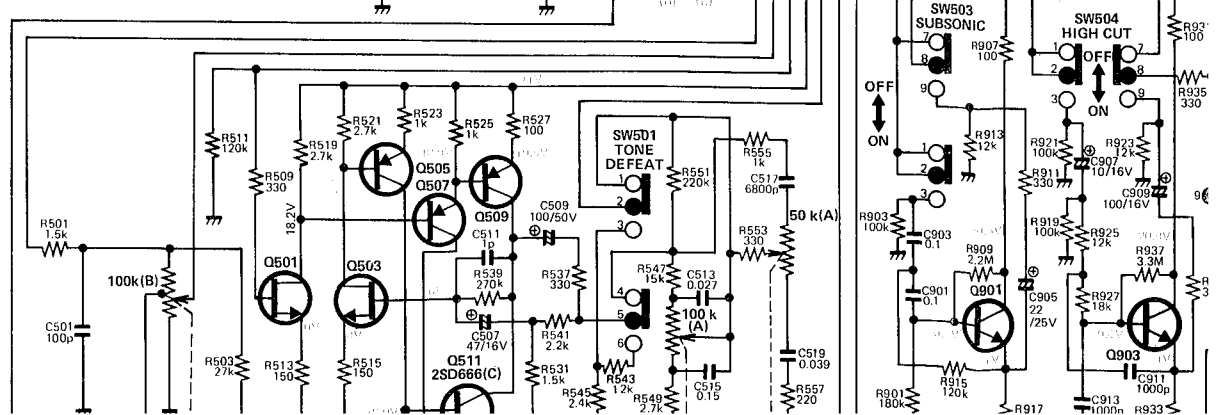
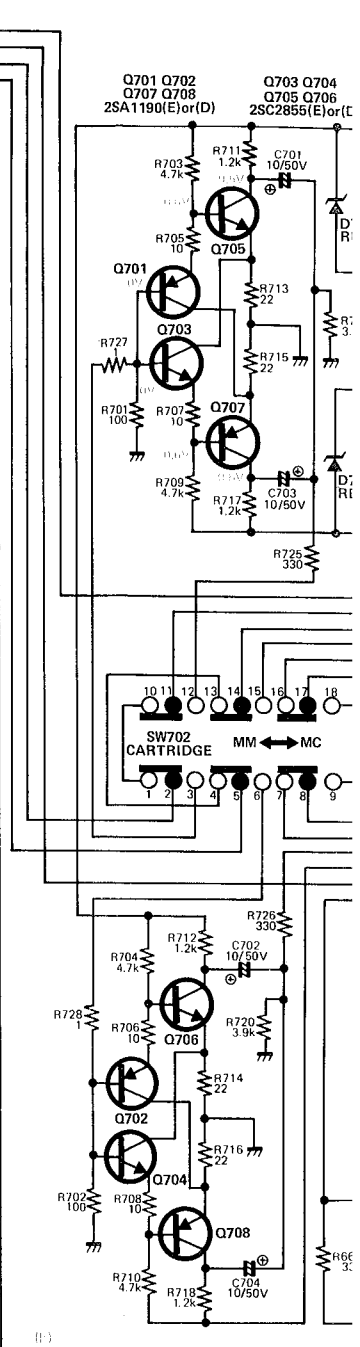
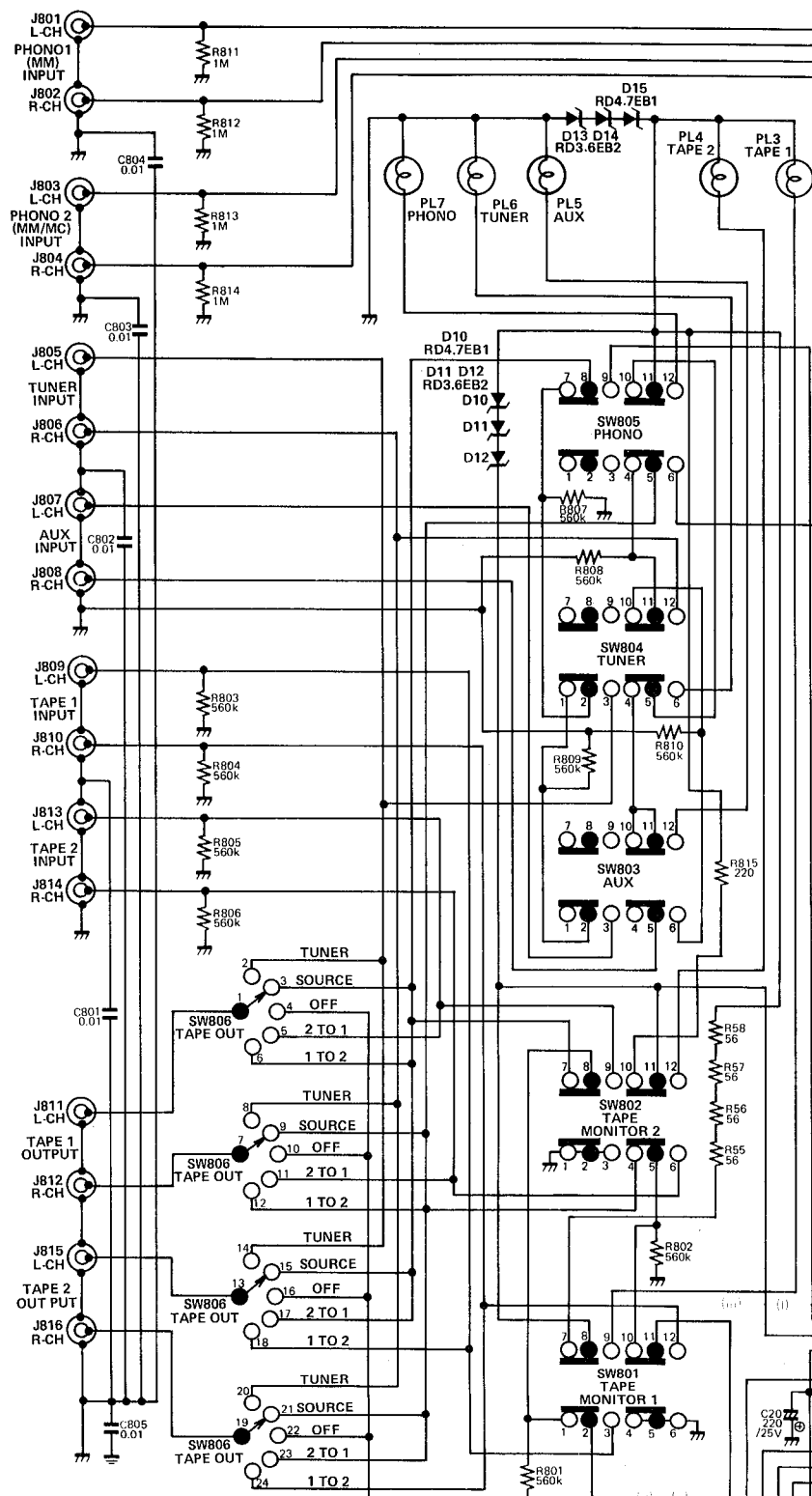
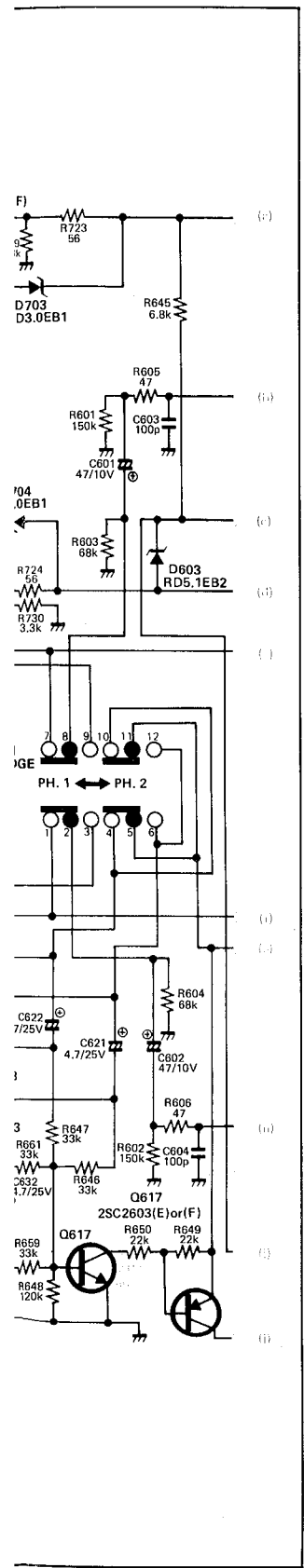
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RD3.0E RD3.6E
RD4.7E RD5.1E
RD13E RD15E RD15J
RD24E

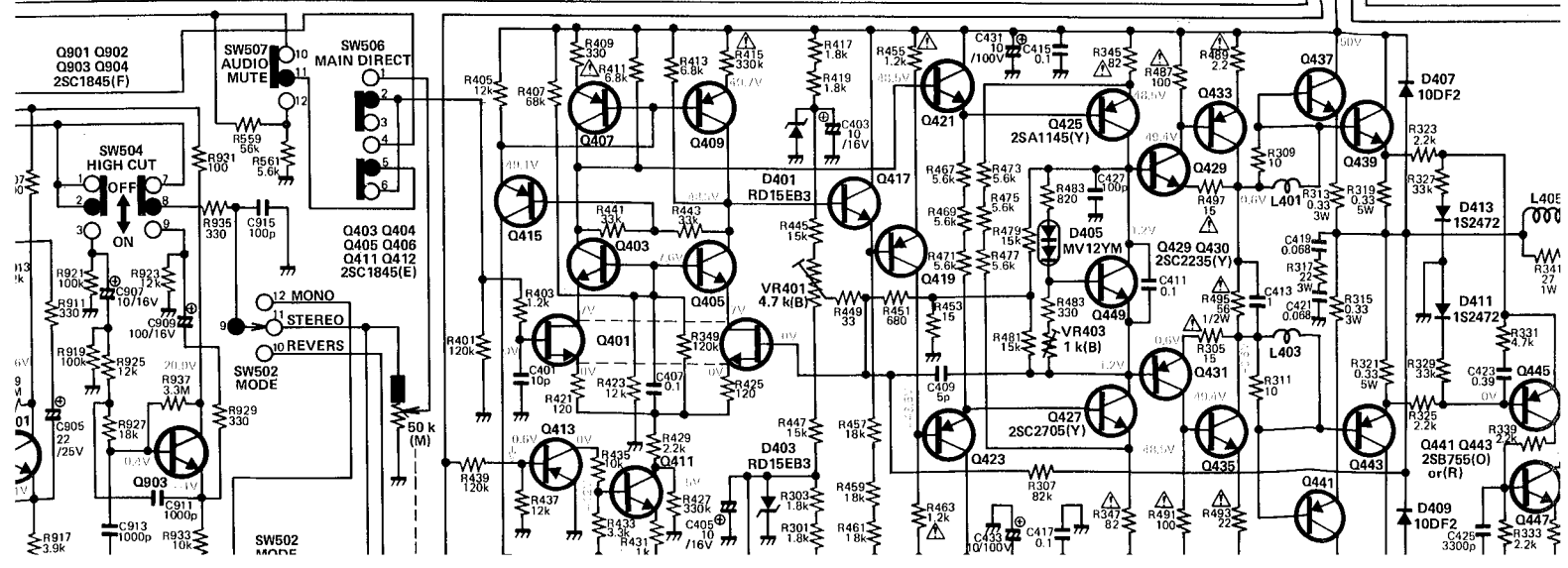
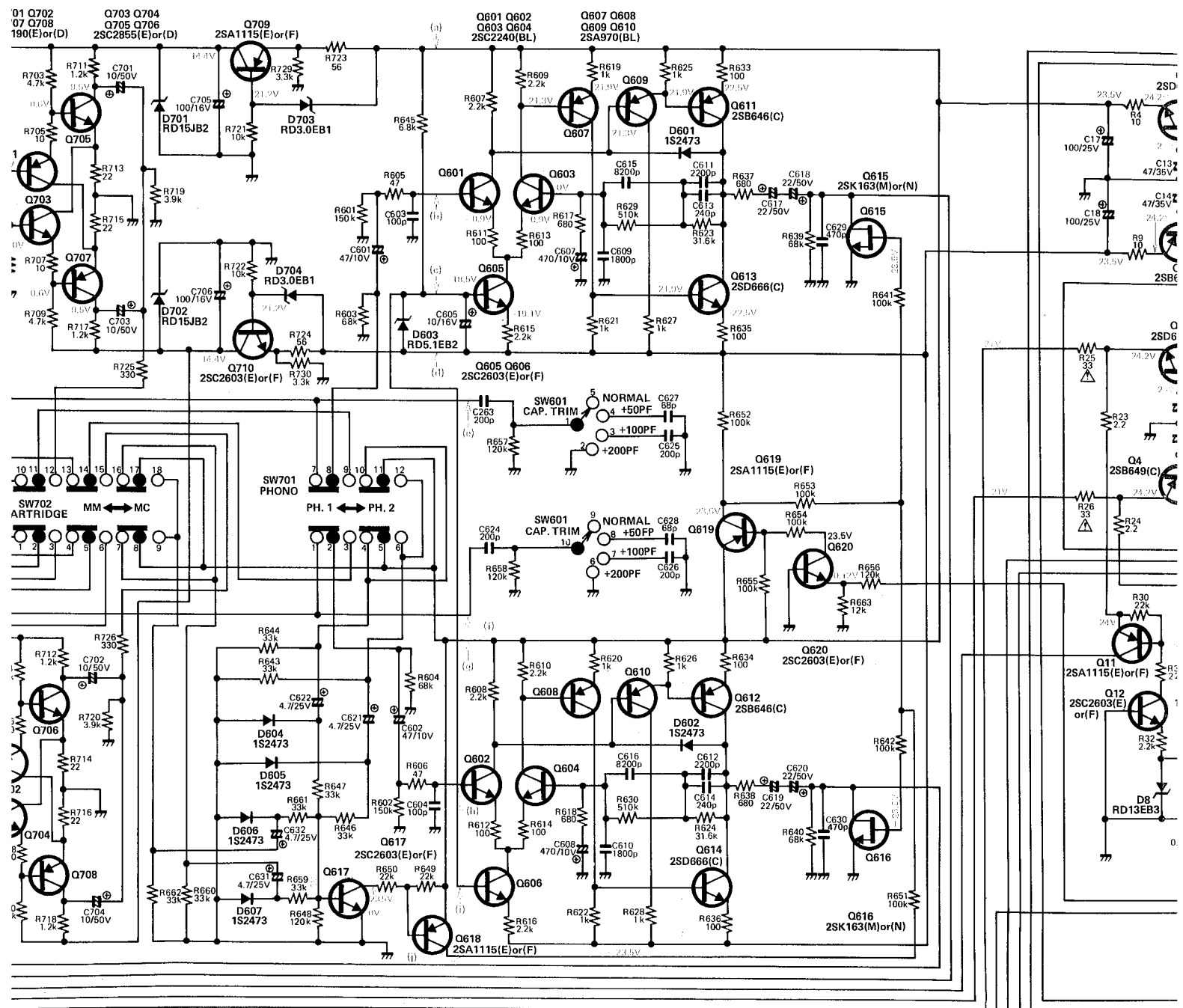
10DF2

MV12YM

D5FB20







11

12

13

14

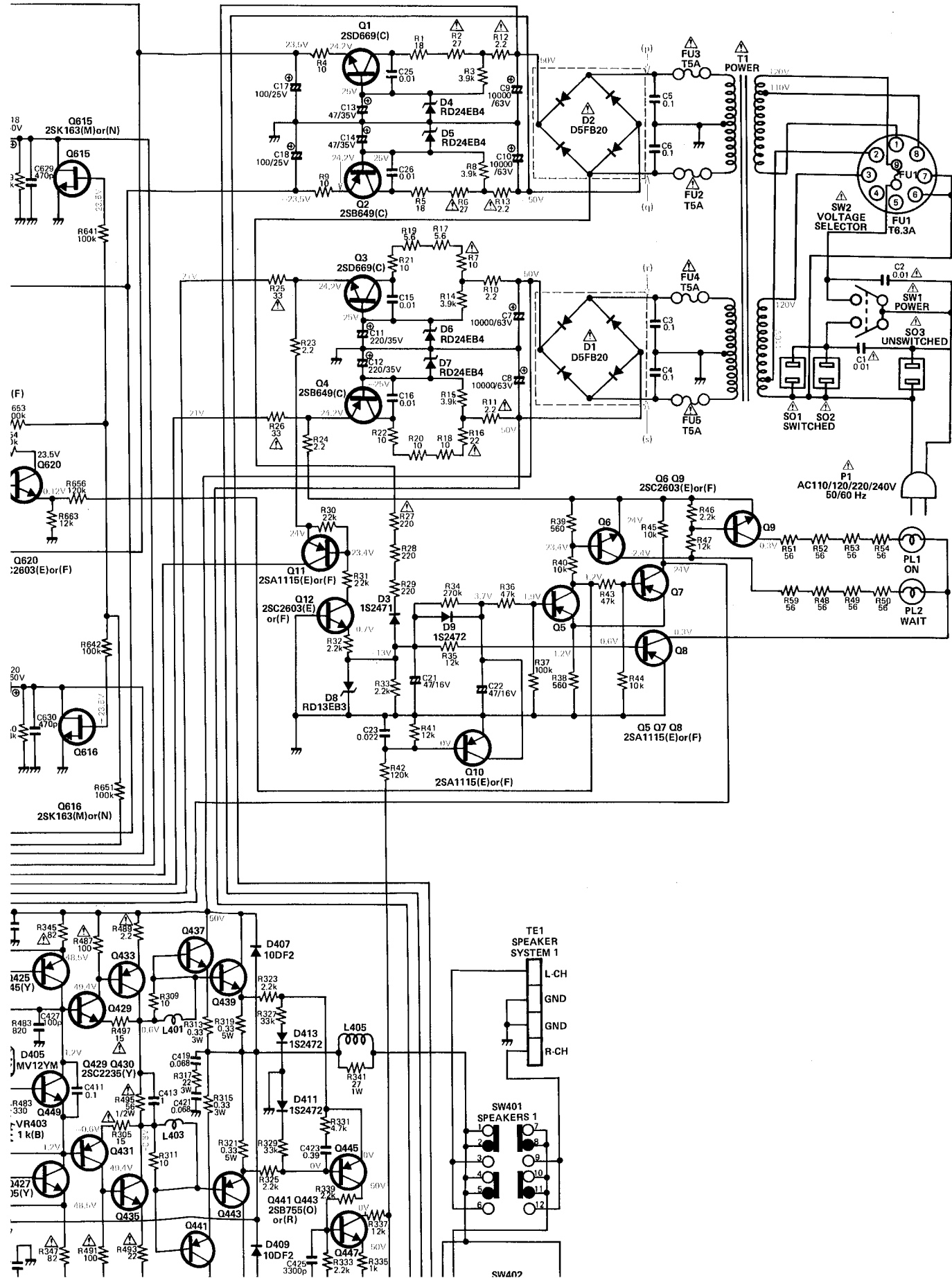
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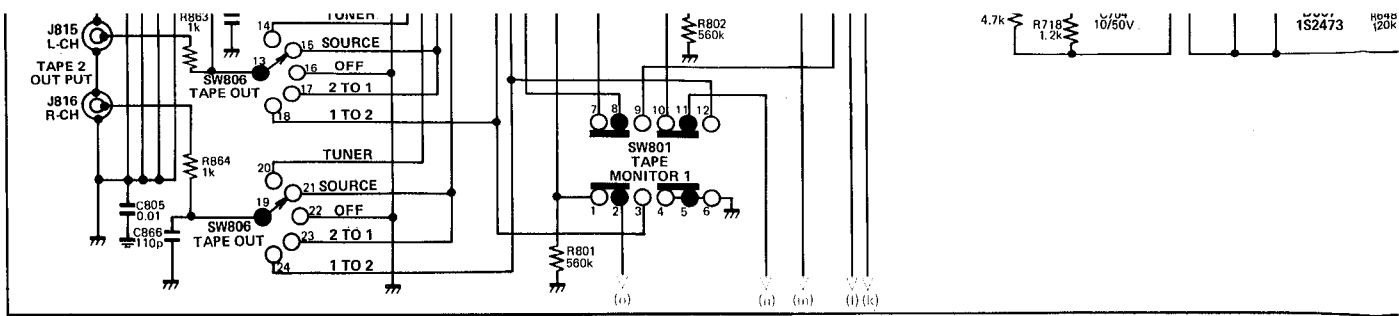
B

C

D

E

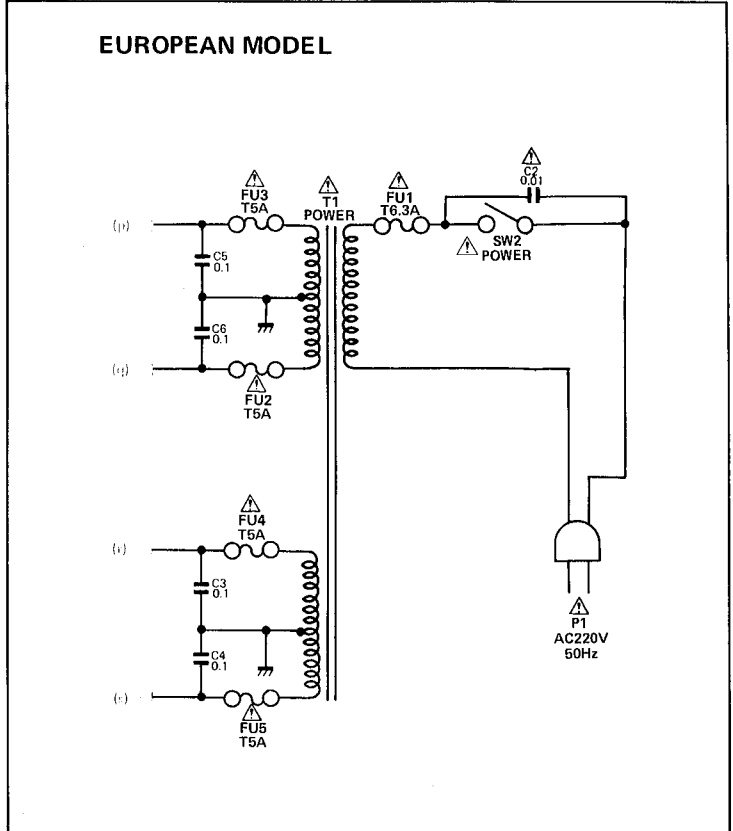
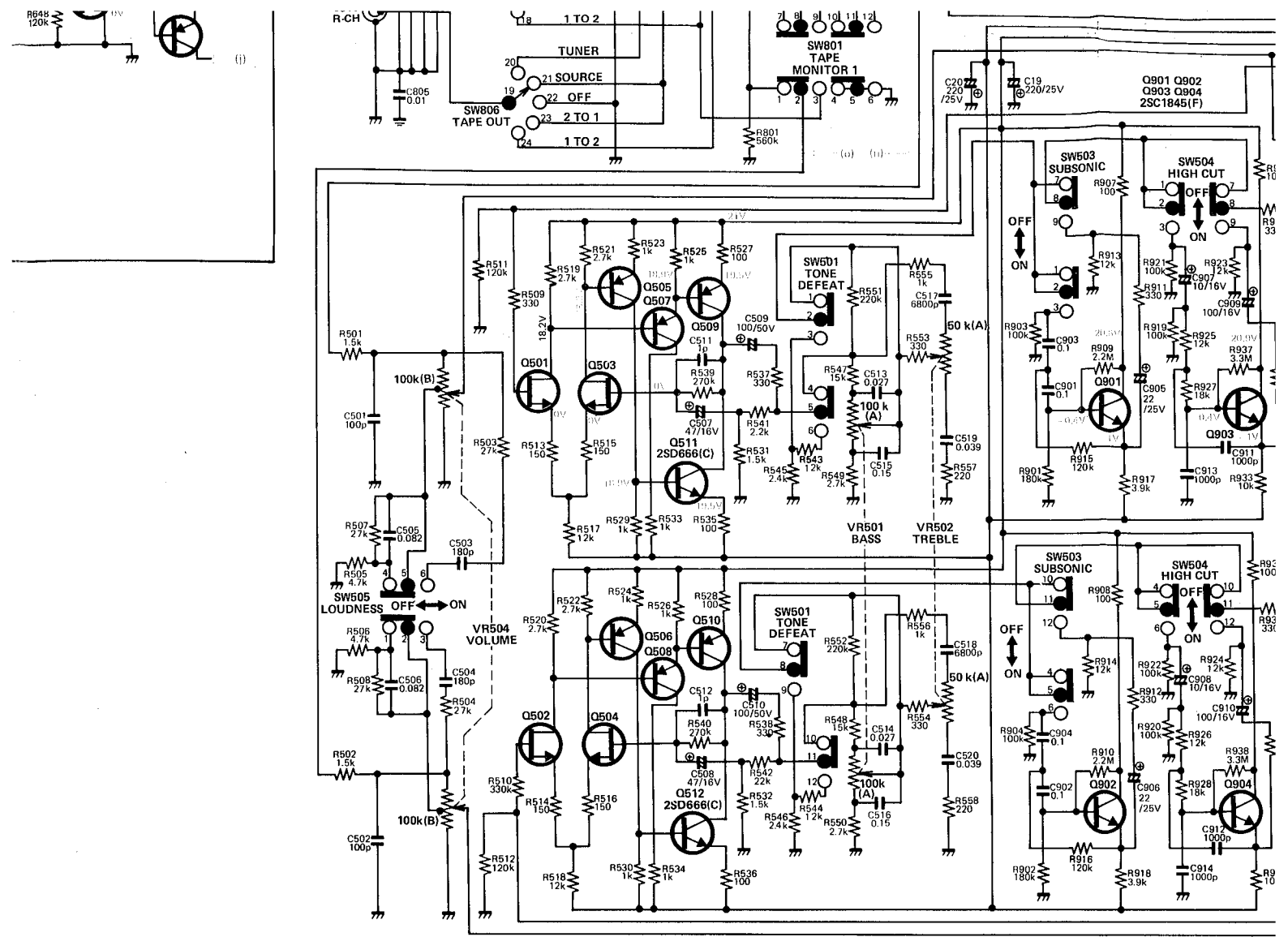


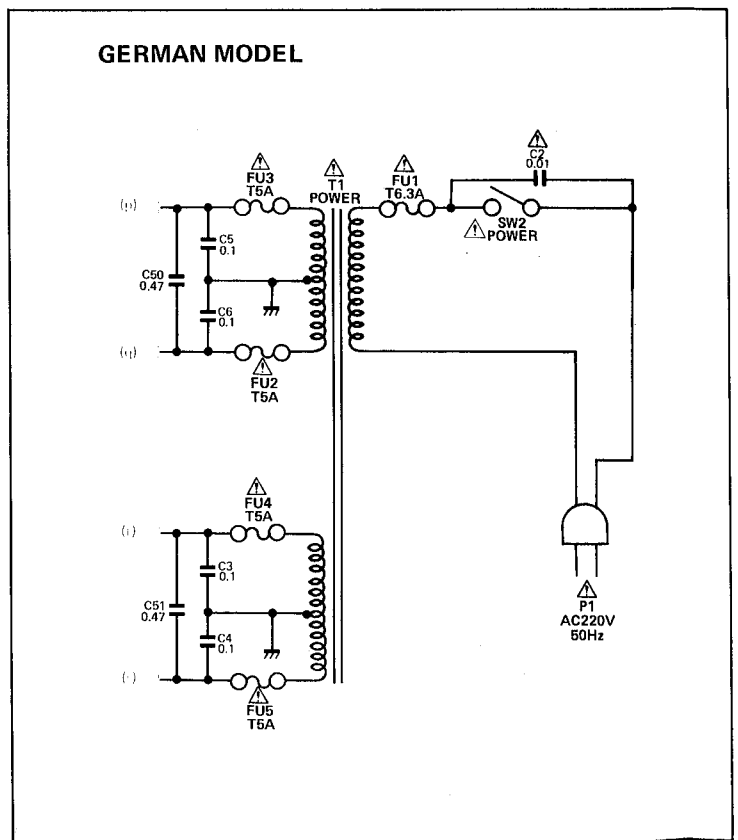
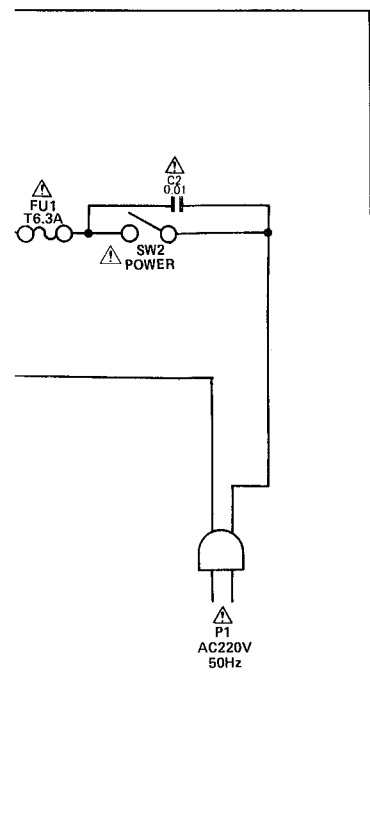
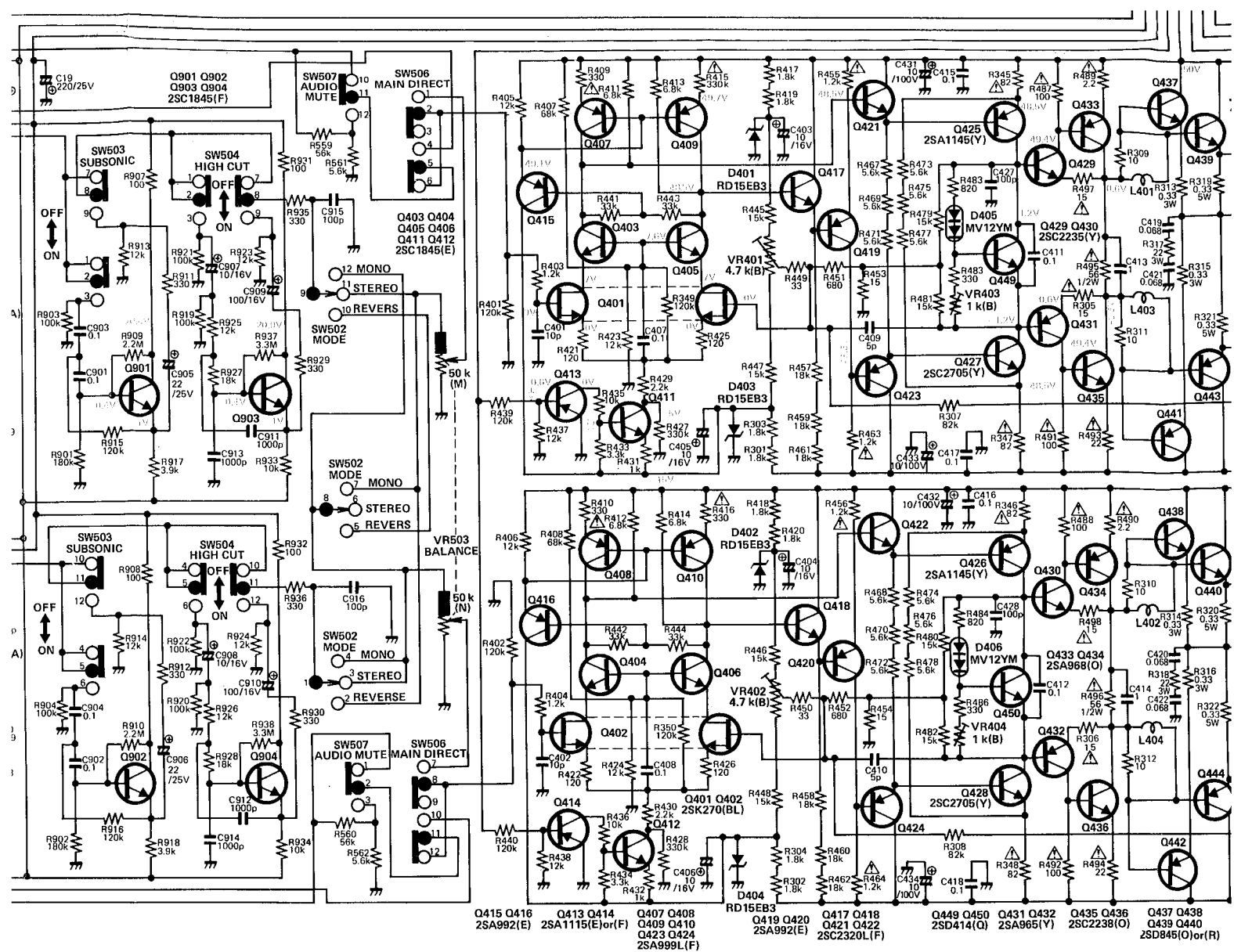


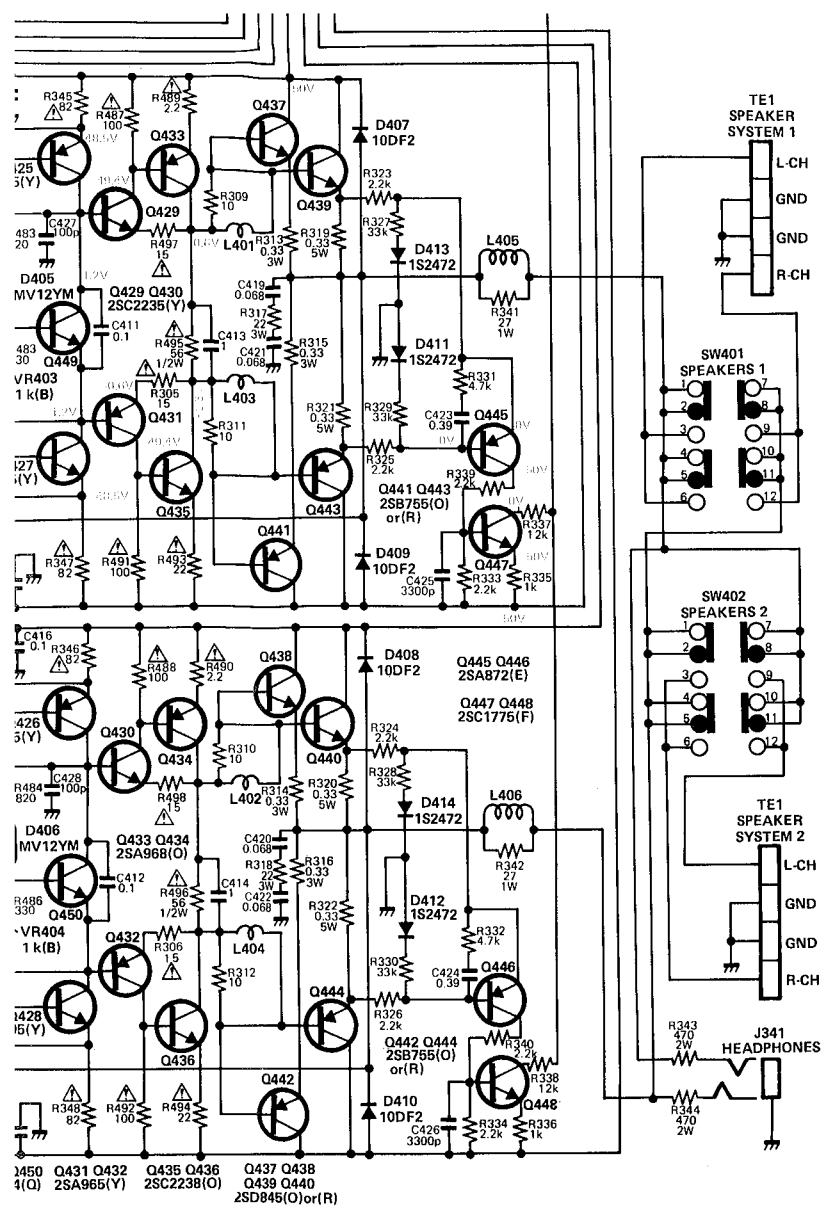
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<p>2SK163</p>	<p>2SK170</p>	<p>2SK270</p>	
<p>2SA872 2SA992 2SA999 2SA1190 2SC1775 2SC1845 2SC2240 2SC2320 2SC2855</p>	<p>2SA965 2SA1145 2SC2235 2SC2705</p>	<p>2SA968 2SC2238</p>	
<p>2SA970 2SA1115 2SC2603</p>	<p>2SB646 2SD666</p>	<p>2SB649 2SD669</p>	
<p>2SB775</p>	<p>2SD414</p>	<p>2SD845</p>	

NOTES:

- ALL RESISTANCES ARE 1/4 WATTS, UNLESS OTHERWISE NOTED, VALUES ARE IN Ω .
k=1000 Ω , M=1000k Ω
- ALL CAPACITANCES VALUES ARE IN μF UNLESS OTHERWISE NOTED. pF= $\mu\mu\text{F}$
- ALL VOLTAGES READING FROM CHASSIS ARE MEASURED WITH V.T.V.M. UNDER NO SIGNAL CONDITIONS.
- SAFETY-REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS, THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.



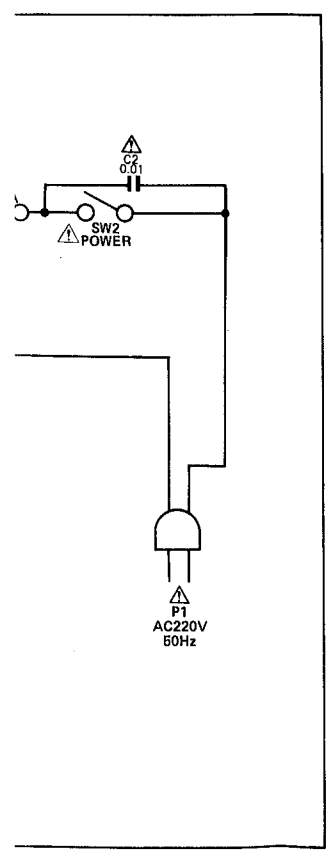




E

F

G



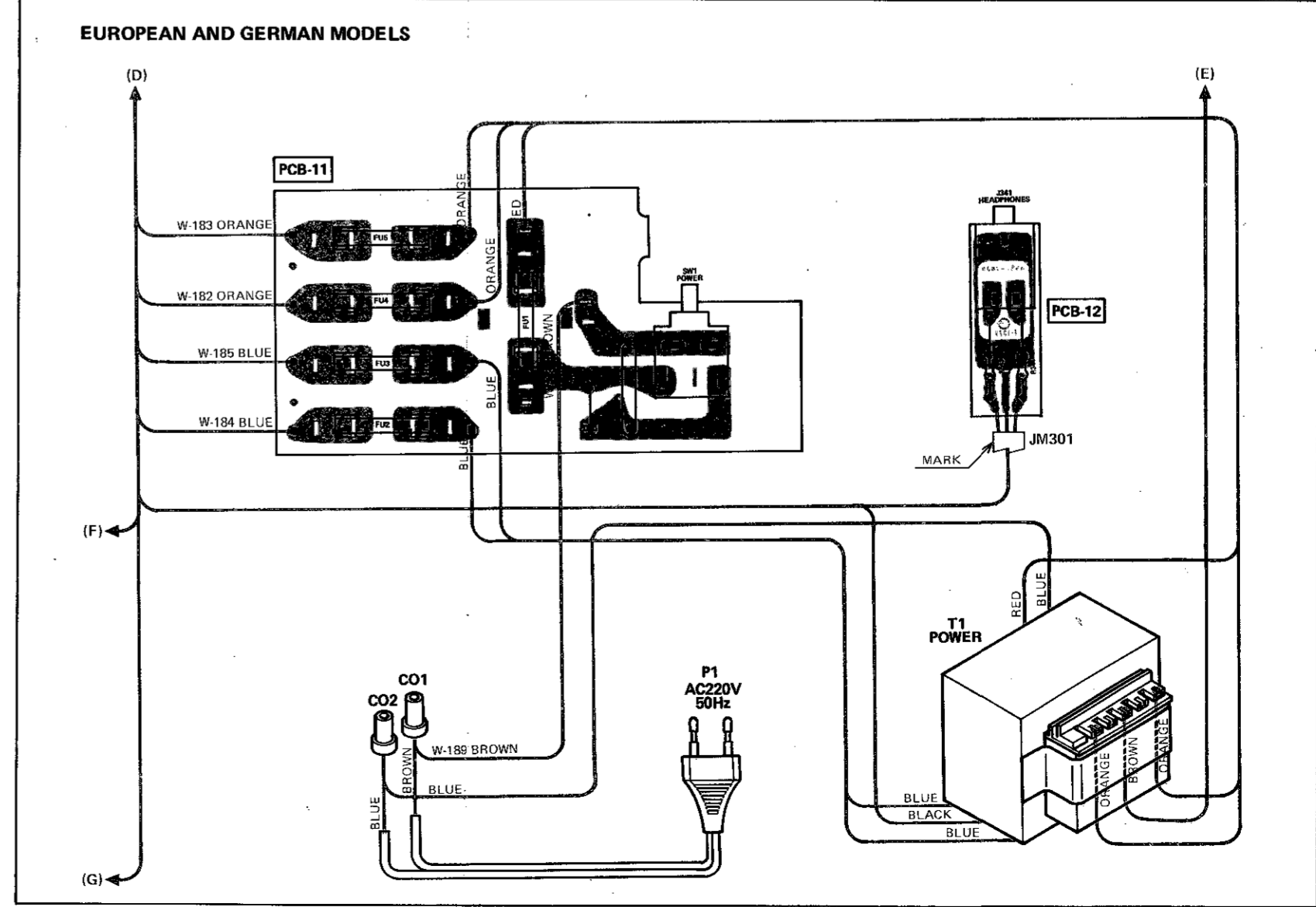
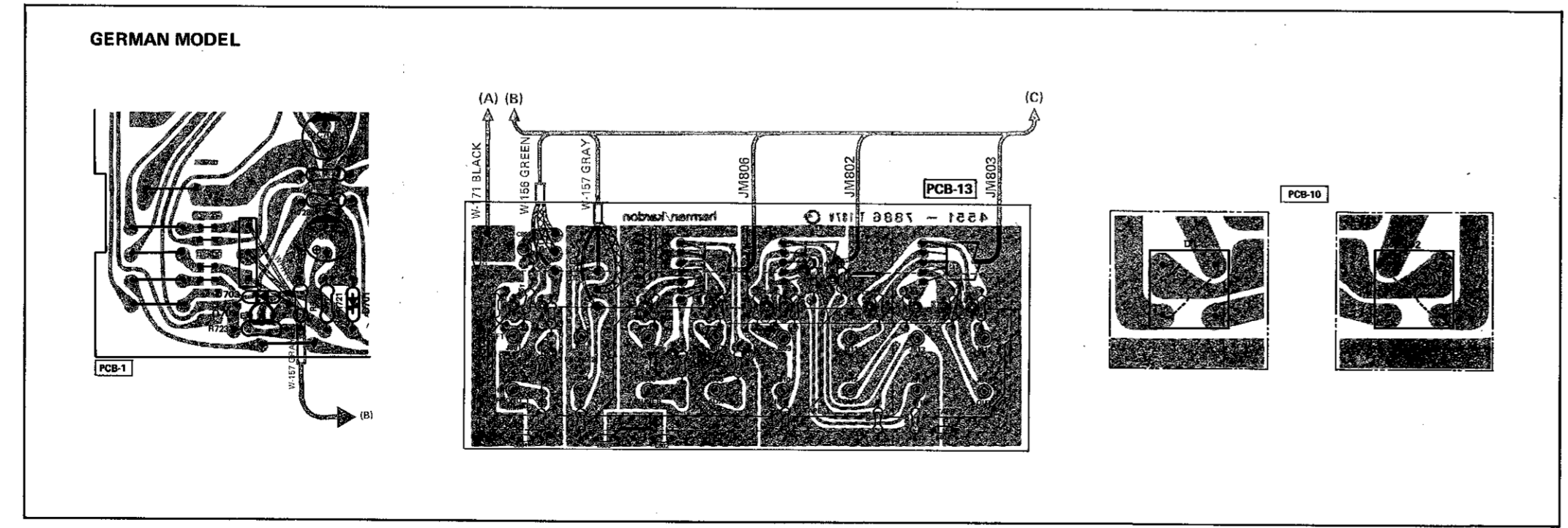
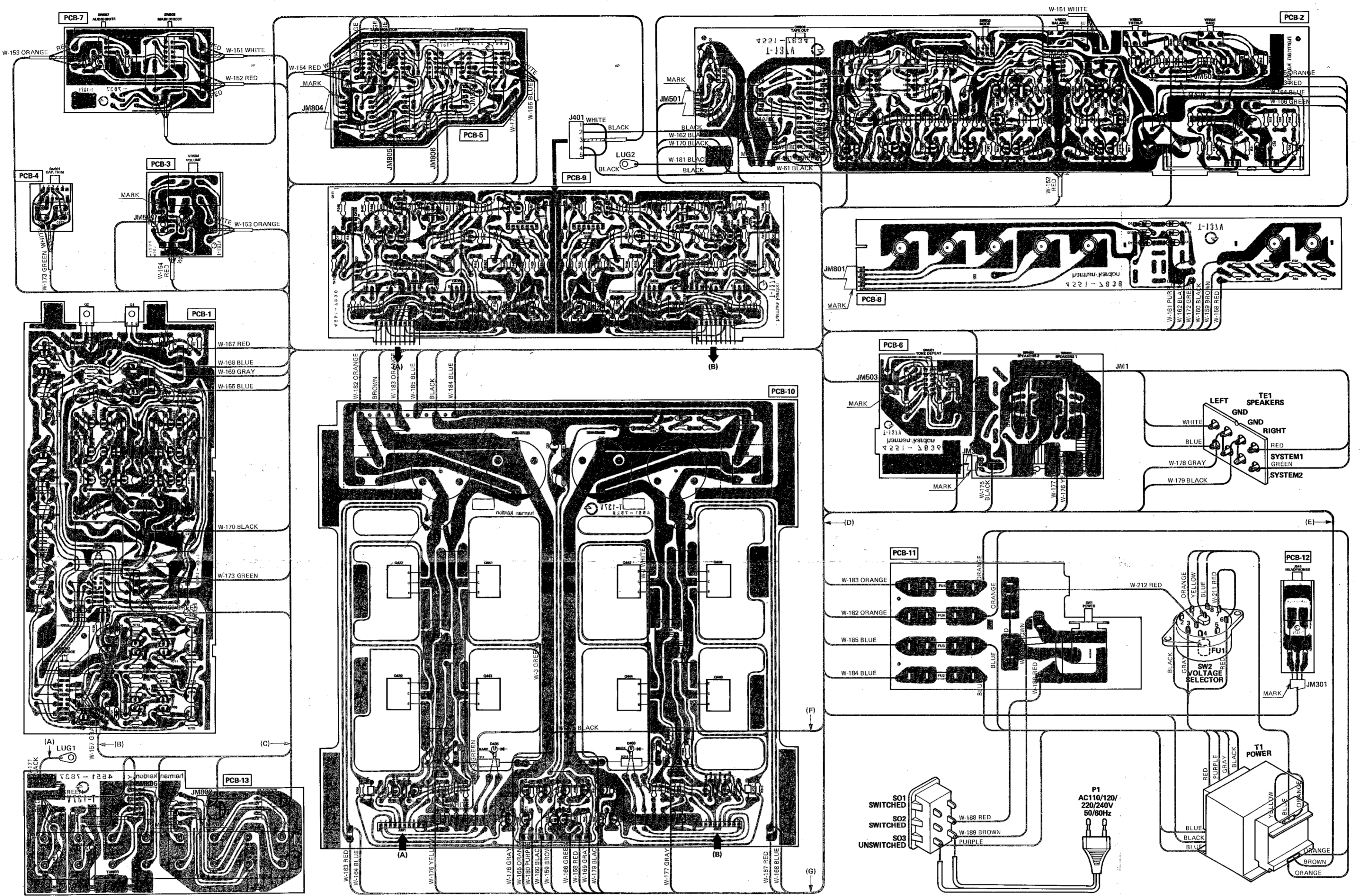
H

I

WIRING DIAGRAM

1 2 3 4 5 6 7 8 9 10 11 12 13 14

A B C D E F G H I



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4

WIRING DIAGRAM

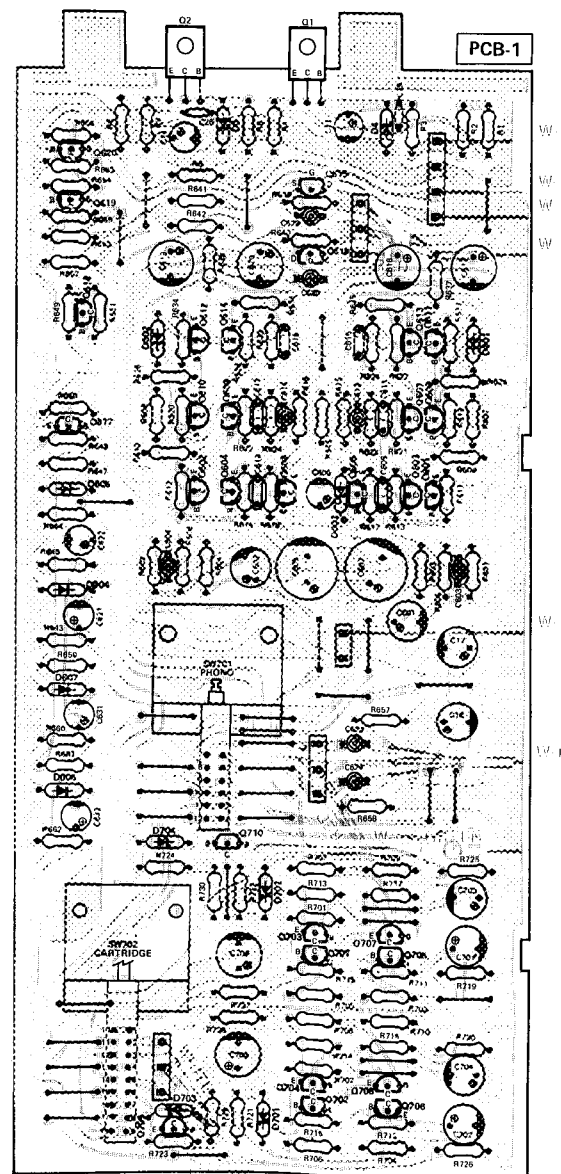
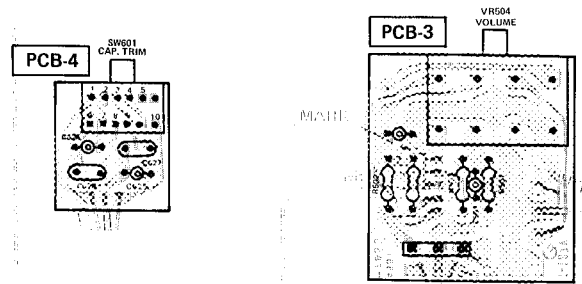
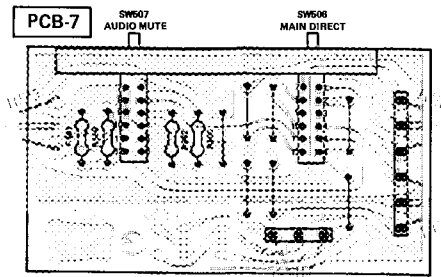
A

B

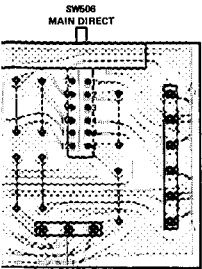
C

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E



(A) (B) (C)



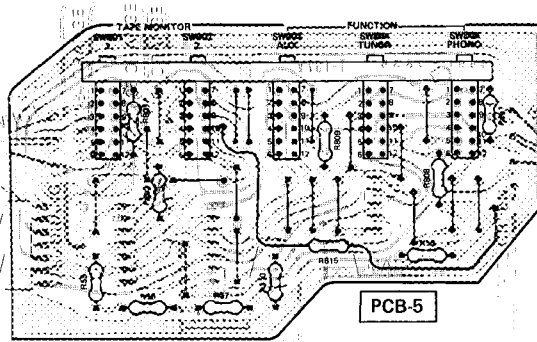
W 151 WHITE

W 152 RED

W 153 RED

W 154

W 155



PCB-5

WHITE
BLACK

PCB-9

W 156

W 157

W 158

W 159

W 160

W 161

W 162

W 163

W 164

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W 167

W 168

W 169

W 170

W 171

W 172

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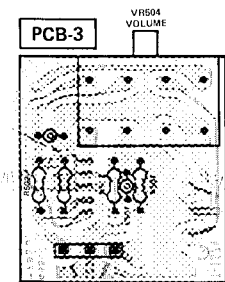
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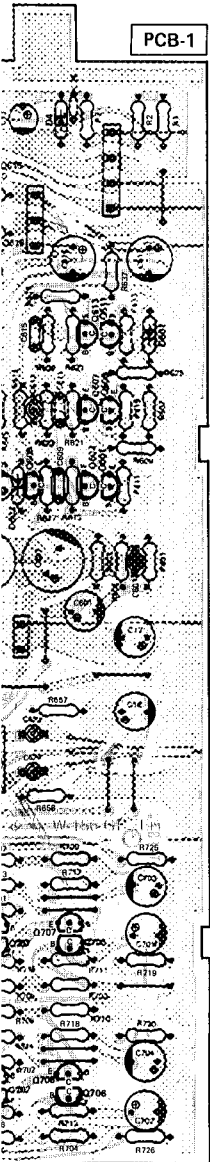
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W 192

W 193



W 156 ORANGE



PCB-1

W 157 RED

W 158 RED

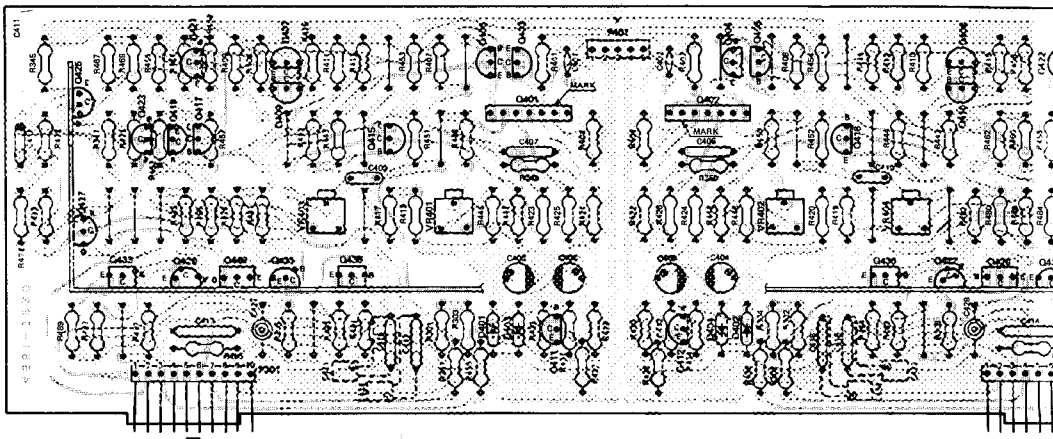
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W 160 RED

W 161 RED

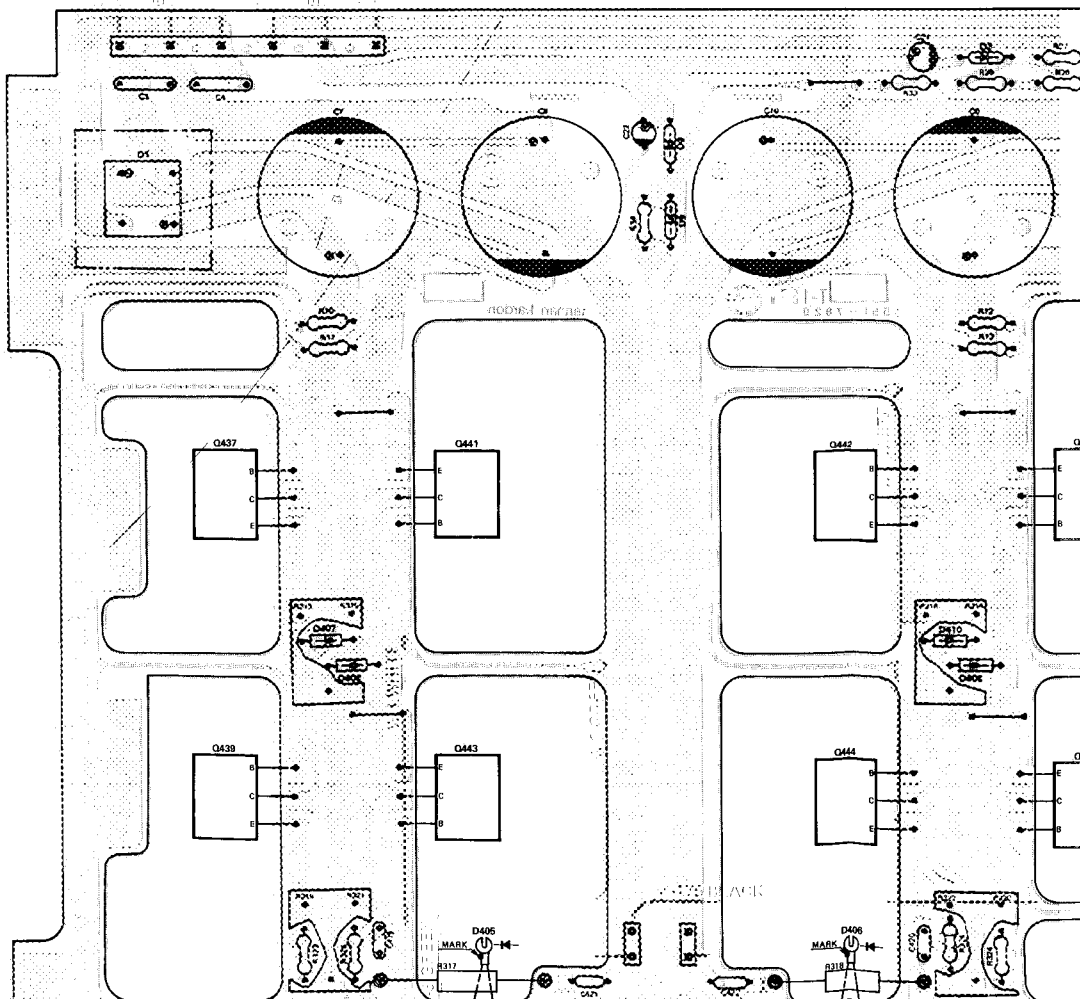
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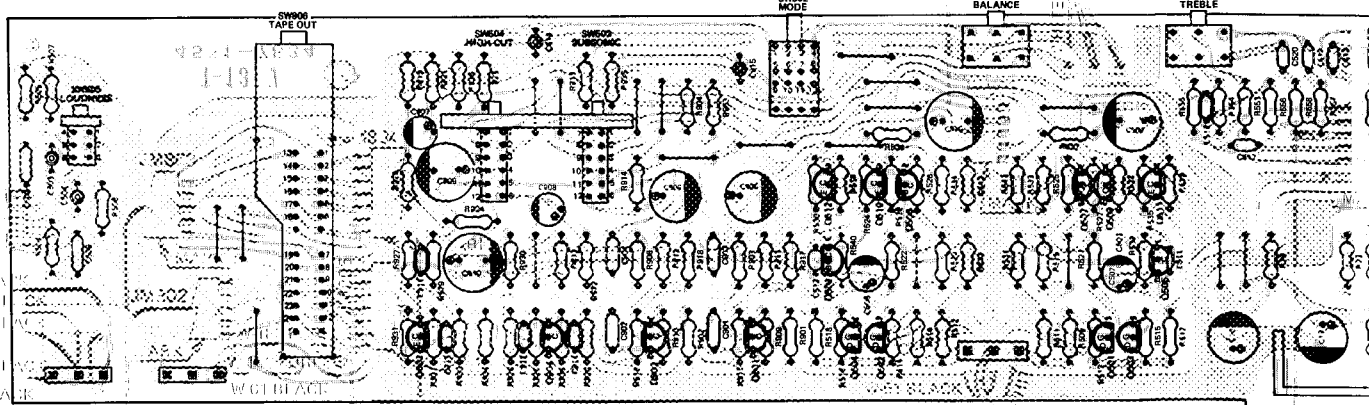


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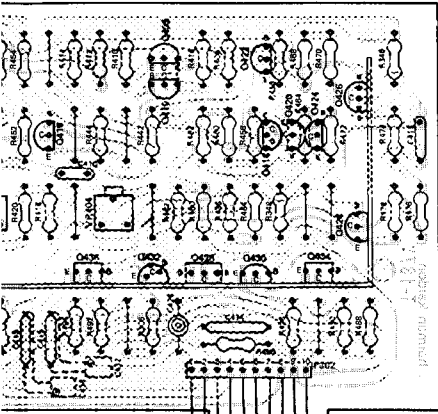
(B)



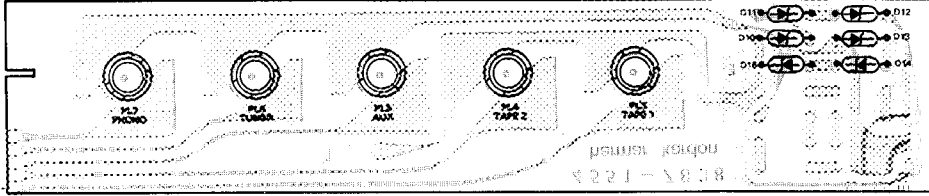
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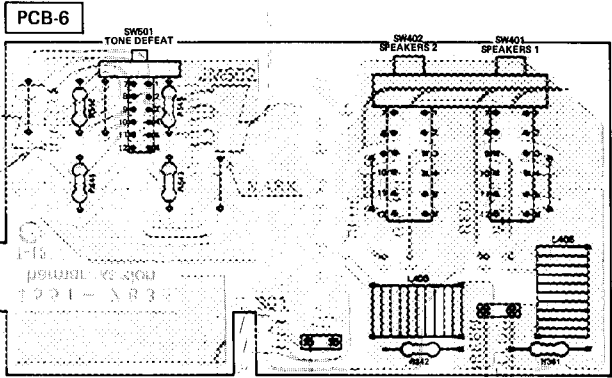
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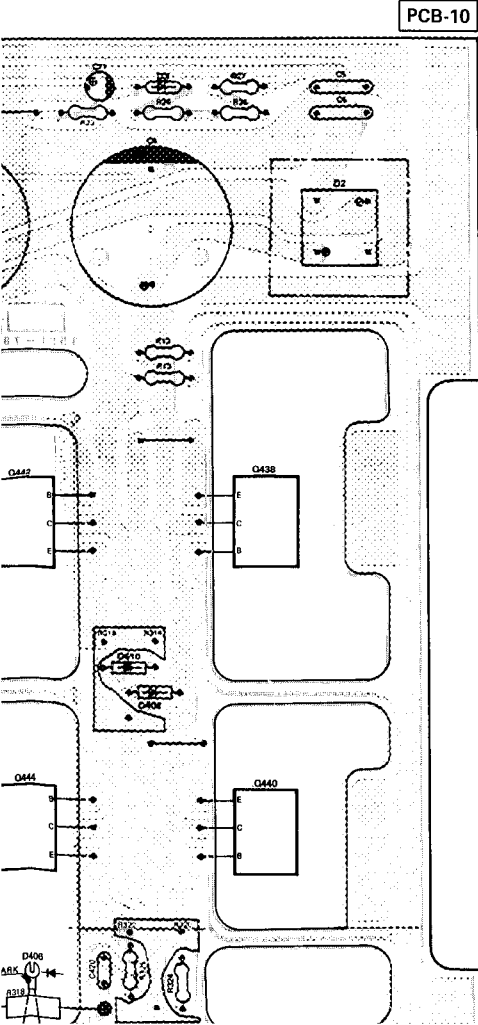
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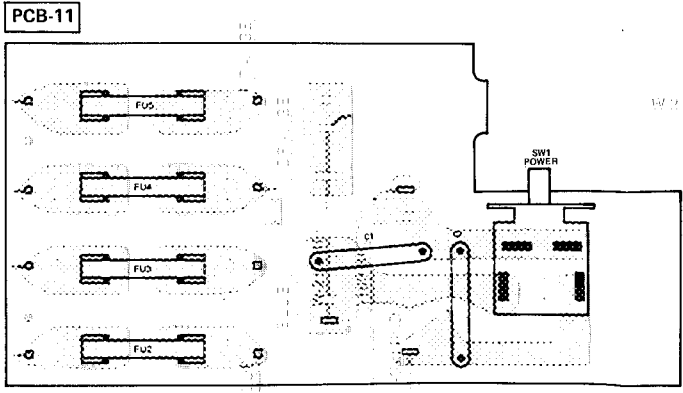
PCB-8



PCB-6

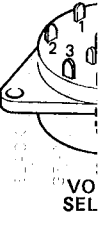


PCB-10



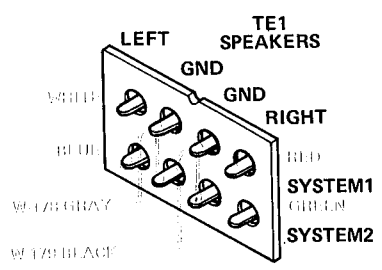
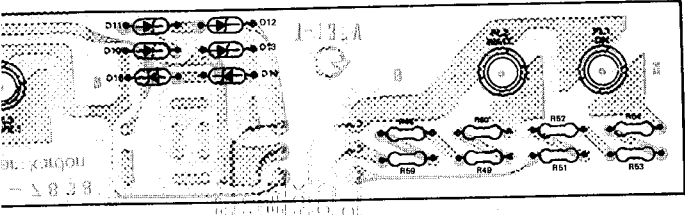
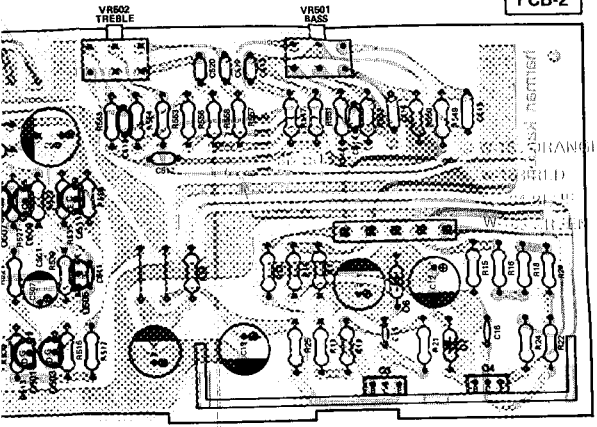
PCB-11

W 1001 RECHARGE
W 1002 RECHARGE
W 1003 RECHARGE
W 1004 RECHARGE

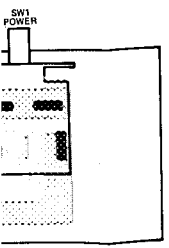
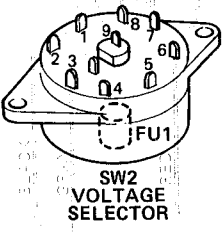
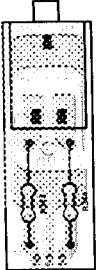


VO
SEL

PCB-2



PCB-12



T1 POWER

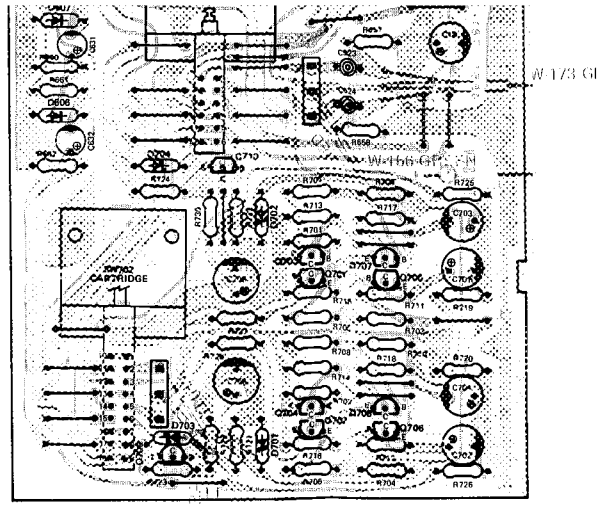
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F

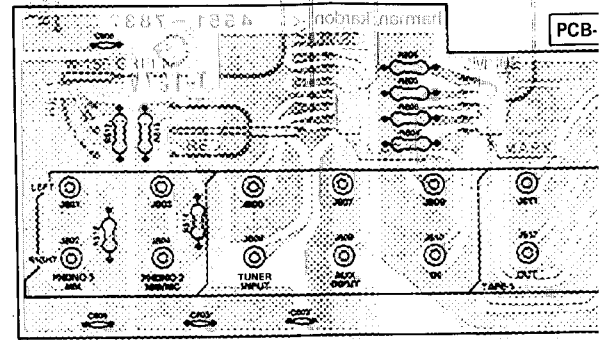
G

H

I

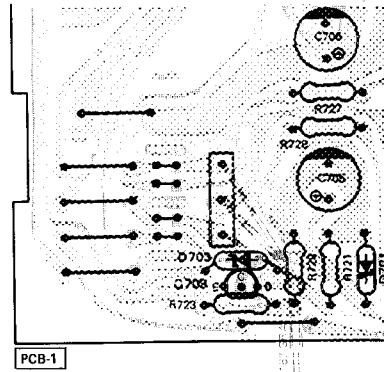


(A) (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100)



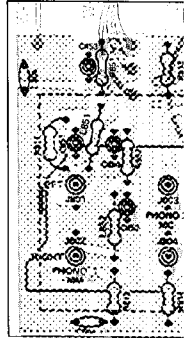
PCB-

GERMAN MODEL

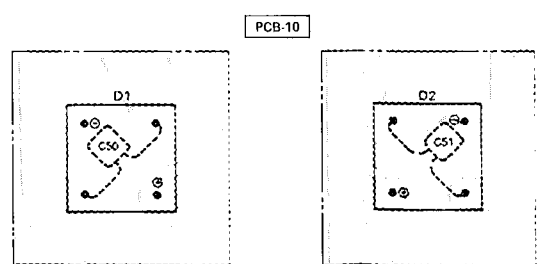
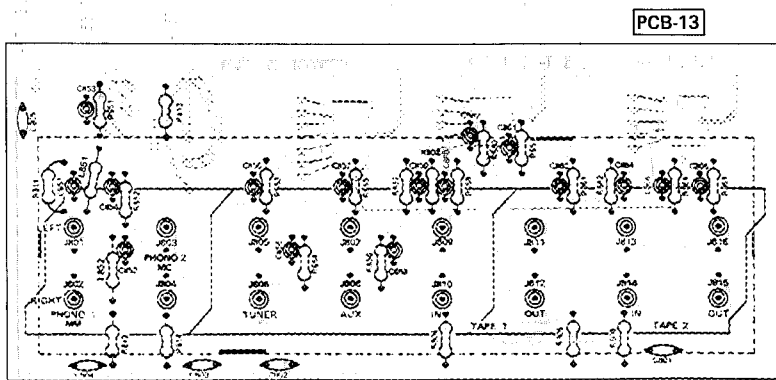
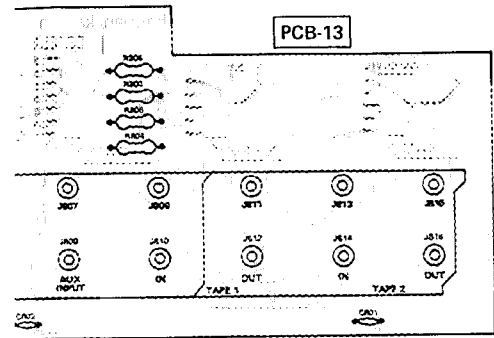
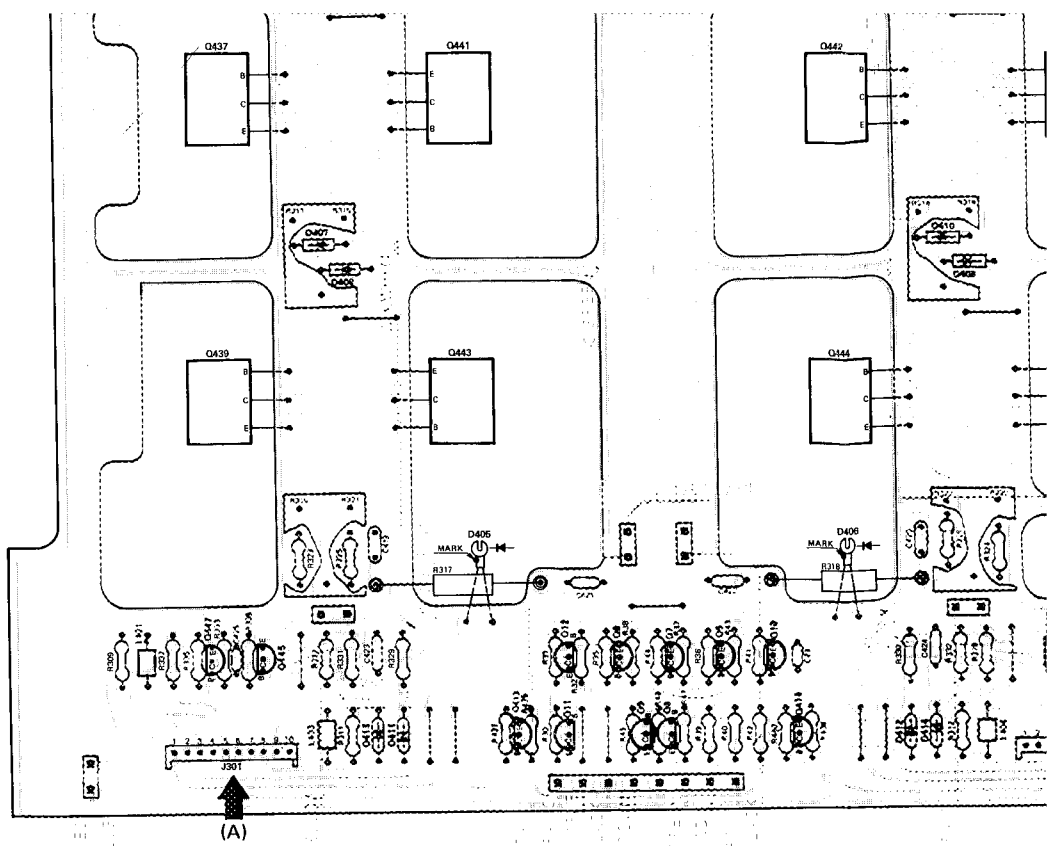
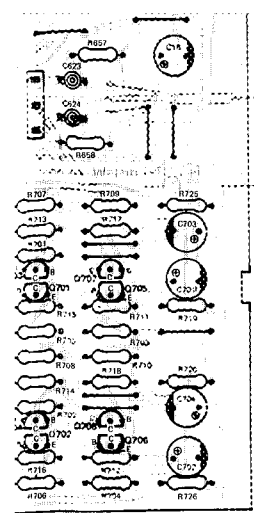


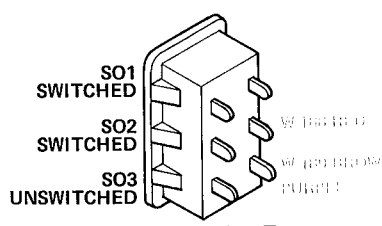
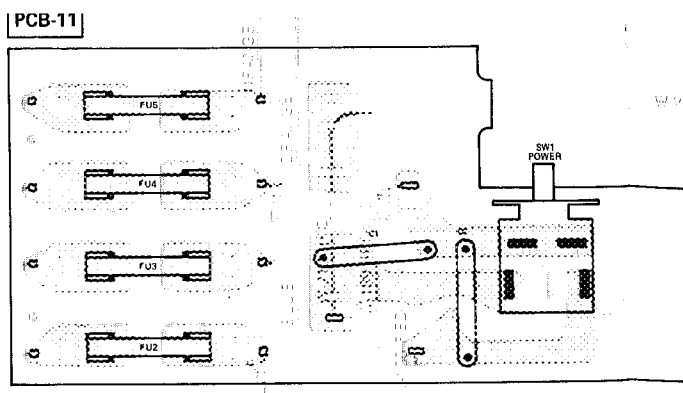
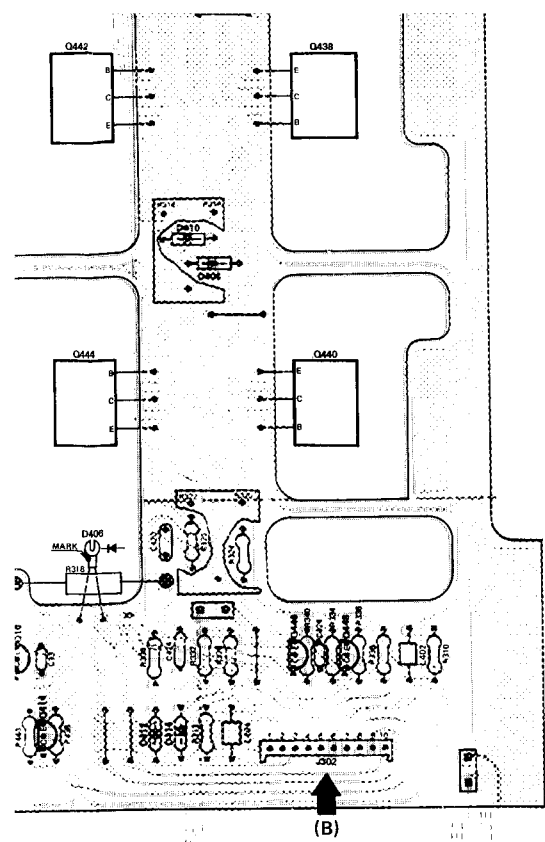
PCB-1

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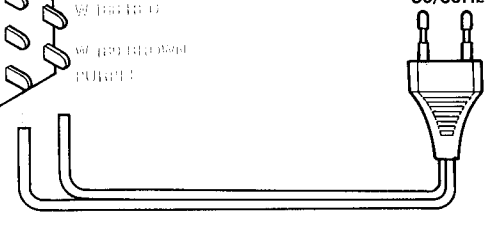


(1)

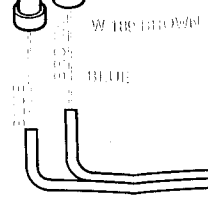
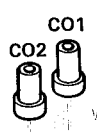
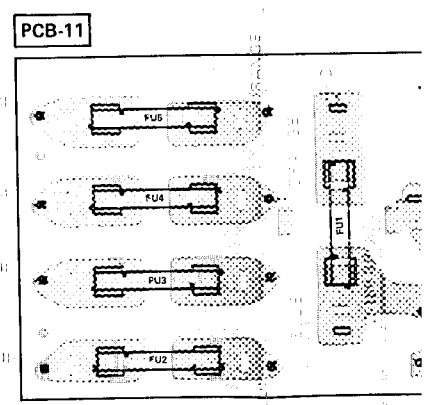


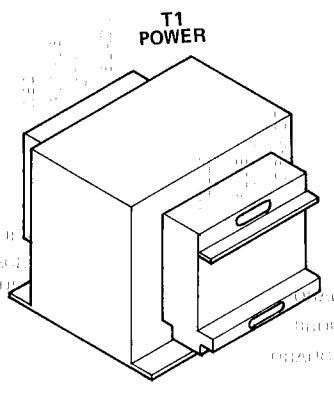
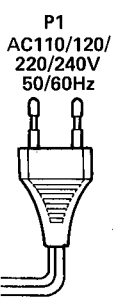
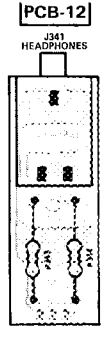
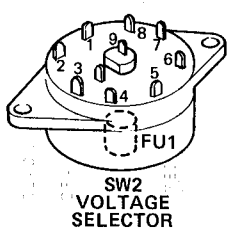
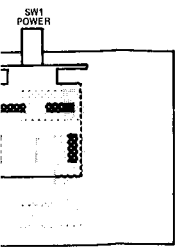


P1
AC110/120/
220/240V
50/60Hz



EUROPEAN AND GERMAN MODELS





ELS

