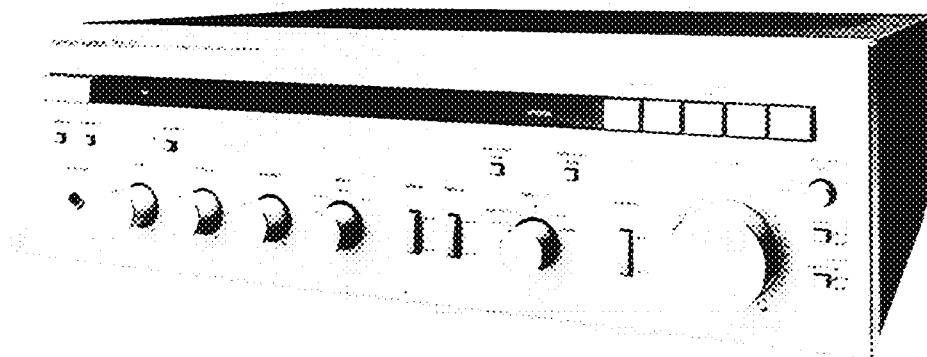


# The Harman Kardon Model PM660

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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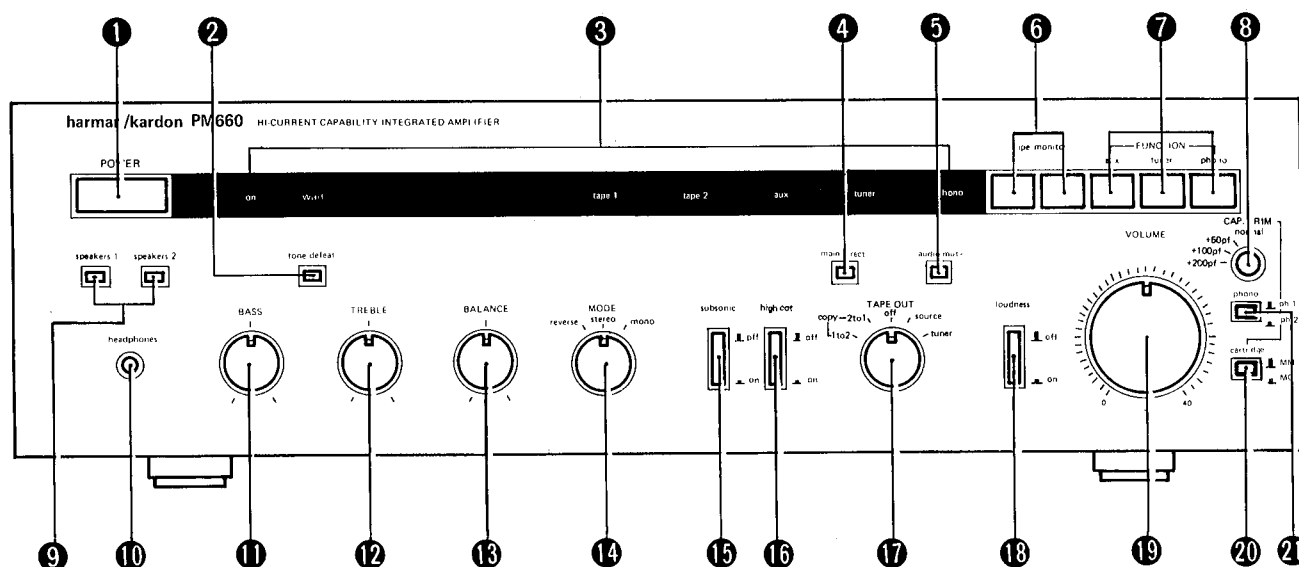
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## SPECIFICATIONS

|                           |                             |   |  |
|---------------------------|-----------------------------|---|--|
| R.M.S. Power Output       | 80W+80W at 0.06% T.H.D.(8Ω) | Semiconductors  | 100 Transistors, 8 FETs,<br>16 Diodes, 20 Zener Diodes,<br>2 Bridge Silicon Diodes,<br>2 Varistors |
| Frequency Response        | 0.5Hz ~ 140kHz<br>(-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<br>(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.

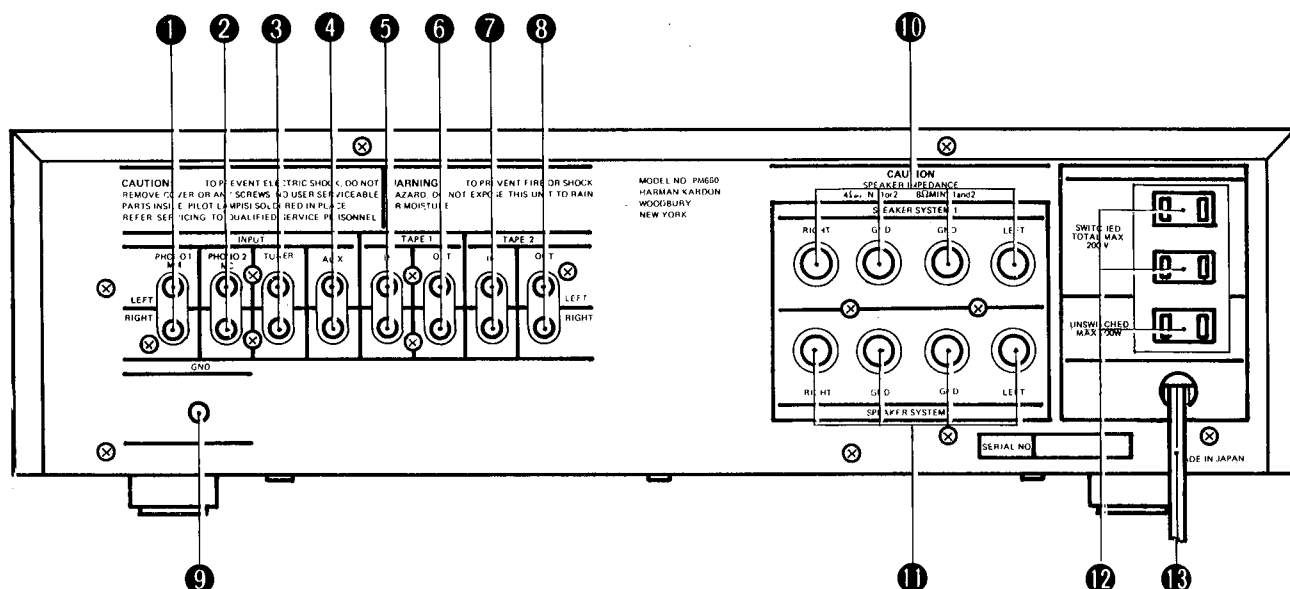
**NOTE:** No switch is provided at this position in the unit manufactured according to West Germany specification. This selector is combined with the PHONO selector above and the combined selector is located at the above position as the CARTRIDGE selector.

**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  $4\Omega$  when only one speaker system is used, or  $8\Omega$  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.

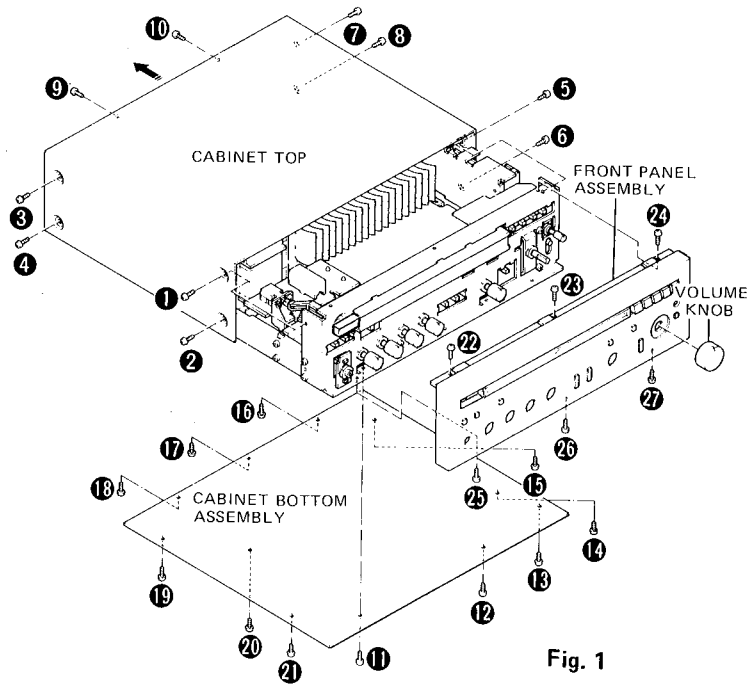


Fig. 1

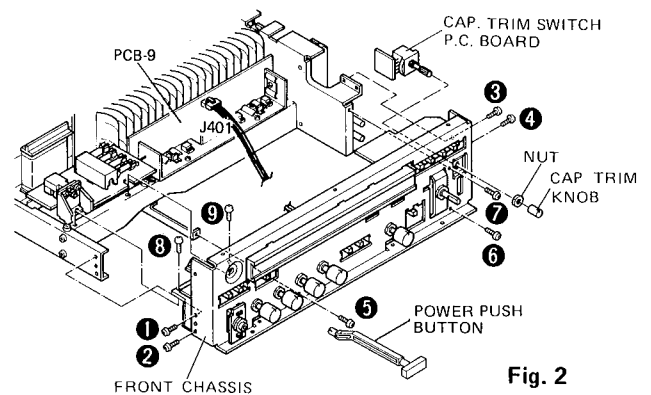


Fig. 2

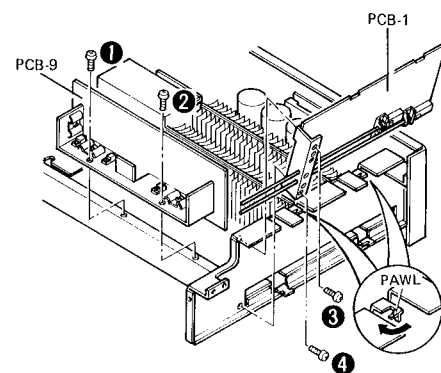


Fig. 3

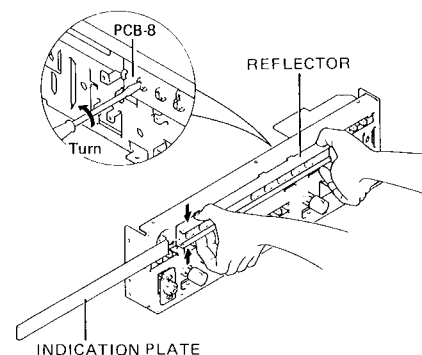


Fig. 4

**TONE CONTROL P.C. BOARD ASSEMBLY (PCB-2)****REMOVAL (Fig. 5)**

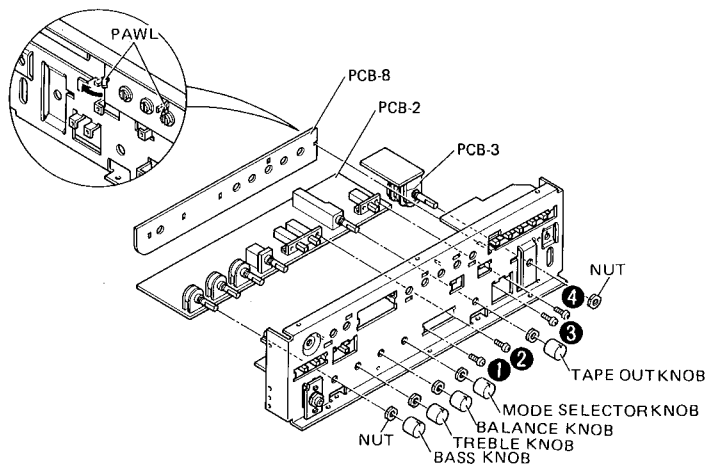
24. Complete steps 8 through 12.
25. Pull off the Bass, Treble, Balance, Mode selector and Tape Out knobs.
26. Remove 5 nuts fixing bass, treble and balance controllers and mode selector and tape out switches.
27. Remove 4 screws ① to ④ fixing subsonic, high cut and loudness switches and take out P.C.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

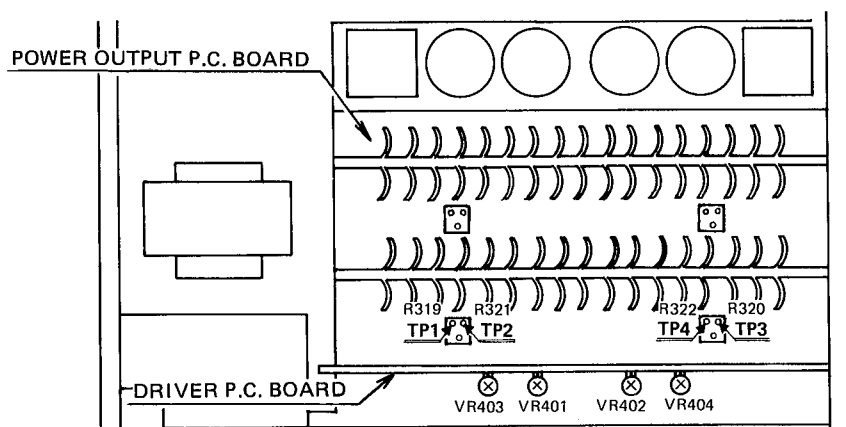
- Notes:**
1. Set function selector switch to AUX position.
  2. Set volume control to minimum position.
  3. Proceed with the adjustment at least 20 minutes after the power has been switched on to stabilize idling current.

| 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

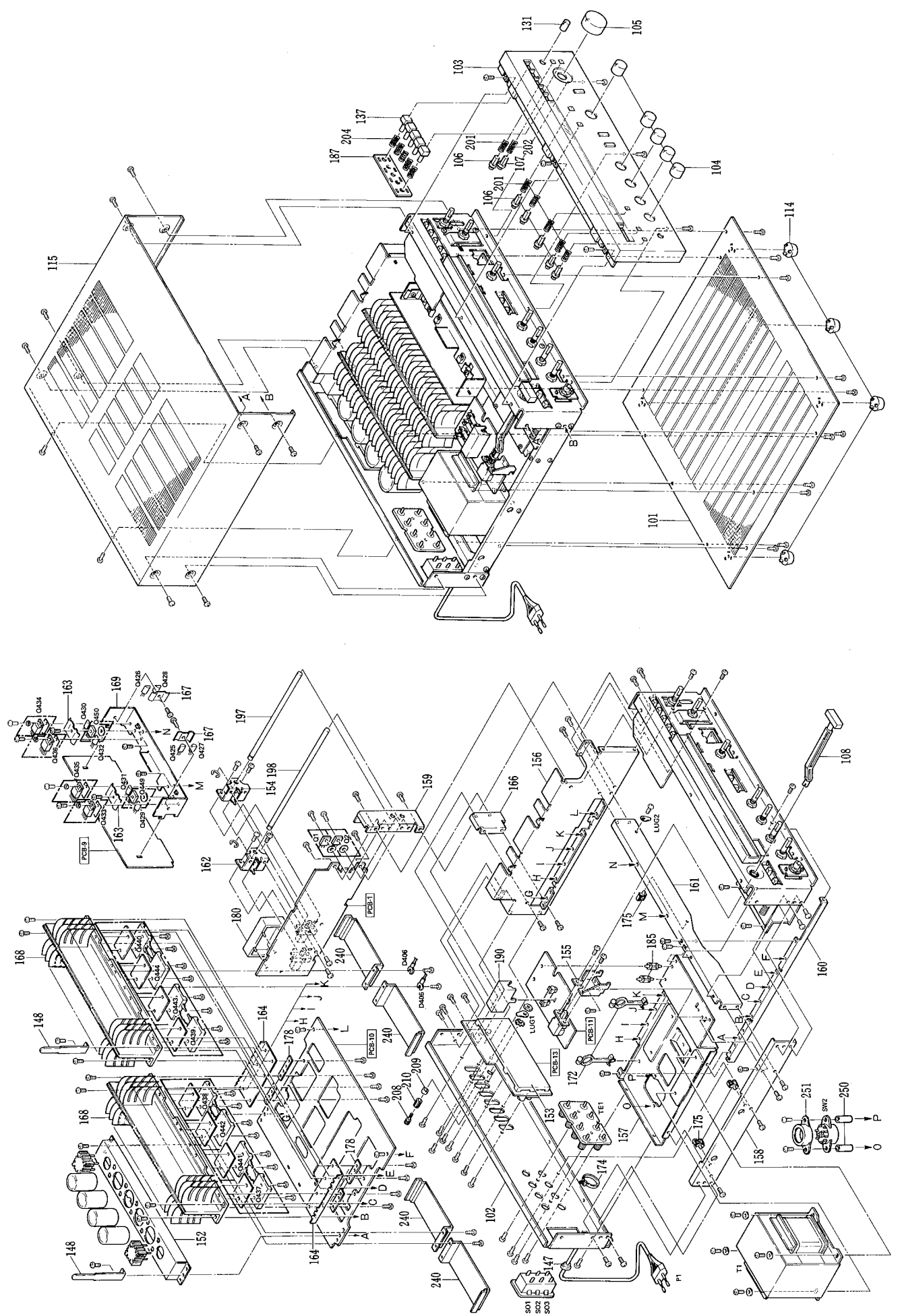
- Notes:**
1. Set function selector switch to AUX position.
  2. Set volume control to minimum position.
  3. Press in main direct switch to ON position.
  4. Press in speakers 1 push button to ON position.
  5. Proceed with the adjustment at least 20 minutes after the power has been switched on to stabilize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

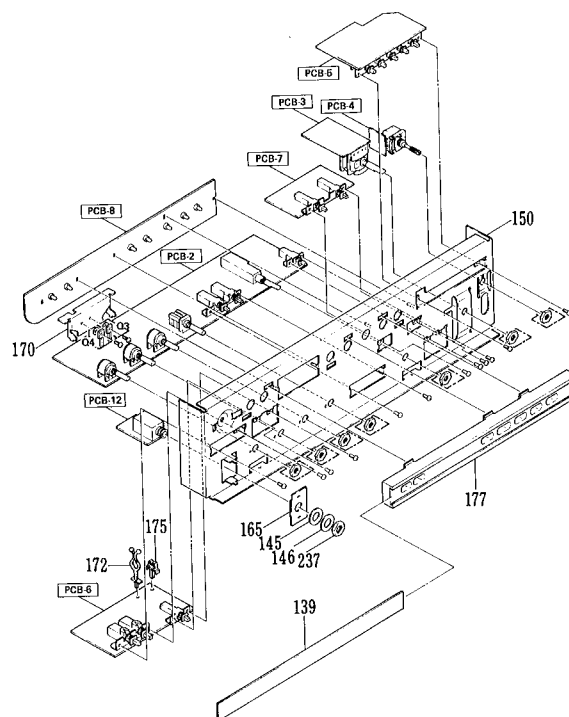
1 2 3 4 5 6

GENERAL UNIT EXPLODED VIEW



A  
B  
C  
D  
E  
F  
G  
H  
I

# GENERAL UNIT EXPLODED VIEW



## 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,<br>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        | 27 $\Omega$ , $\pm 2\%$ , 1/4W, Fuse           |                |
| R617,618                    | 5174-681381         | 680 $\Omega$ , $\pm 1\%$ , 1/4W, Metal         |                |
| R623,624                    | 5174-Z316228        | 31.6k $\Omega$ , $\pm 0.5\%$ , 1/4W, Metal     |                |
| R629,630                    | 5174-514381         | 510k $\Omega$ , $\pm 1\%$ , 1/4W, Metal        |                |
| CAPACITORS                  |                     |  |                |
| C13,14                      | 5345-476E041        | 47 $\mu$ F, $\pm 20\%$ , 35V, Electrolytic     |                |
| C17,18                      | 5345-107D041        | 100 $\mu$ F, $\pm 20\%$ , 25V, Electrolytic    |                |
| C601,602                    | 5345-476B0226       | 47 $\mu$ F, $\pm 20\%$ , 10V, Electrolytic     |                |
| C605                        | 5345-106-16         | 10 $\mu$ F, $\pm 50\%$ -10%, 16V, Electrolytic |                |
| C607,608                    | 5345-477B0228       | 470 $\mu$ F, $\pm 20\%$ , 10V, Electrolytic    |                |
| C609,610                    | 5359-182771         | 1800pF, $\pm 2\%$ , 50V, Polypropylene         |                |
| C611,612                    | 5359-222771         | 2200pF, $\pm 2\%$ , 50V, Polypropylene         |                |
| C615,616                    | 5359-822771         | 8200pF, $\pm 2\%$ , 50V, Polypropylene         |                |
| C617,618,619,620            | 5345-226F0228       | 22 $\mu$ F, $\pm 20\%$ , 50V, Electrolytic     |                |
| C621,622,631,632            | 5345-475D0951       | 4.7 $\mu$ F, $\pm 20\%$ , 25V, Electrolytic    |                |
| C701,702,703,704            | 5345-106F0228       | 10 $\mu$ F, $\pm 20\%$ , 50V, Electrolytic     |                |
| C705,706                    | 5345-107C0226       | 100 $\mu$ F, $\pm 20\%$ , 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),                                     | } Phono Switch |
| 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),                      |                |
| Q618                        | 5611-1115(E)or(F)   | 2SA1115(E) or 2SA1115(F),                      |                |
| 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),                      |                |
| 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    |                |

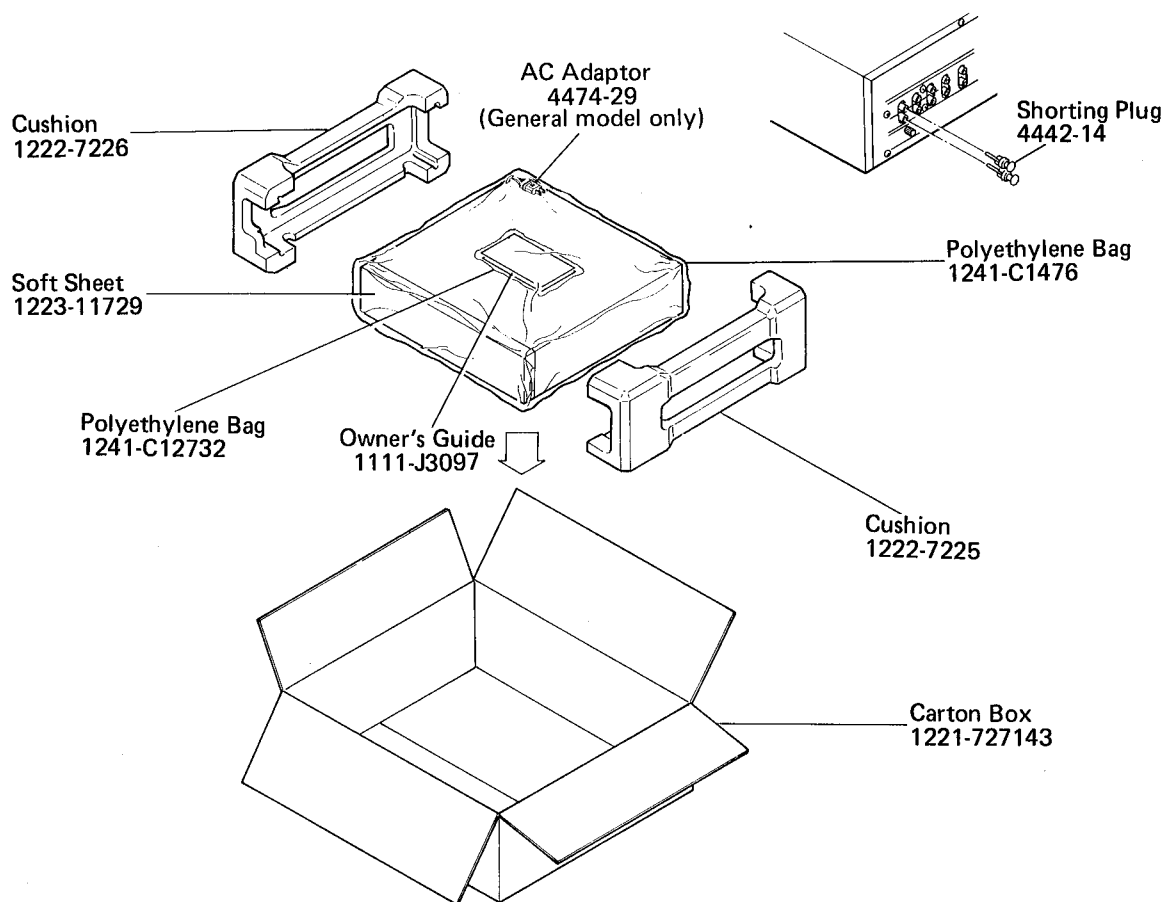
| Ref. No.                          | Part No.                    | Description   | Market     |
|-----------------------------------|-----------------------------|---|------------|
| DIODES                            |                             |   |            |
| D4,5                              | 5635-RD24EB4                | Zener, RD24EB4  |            |
| D601,602,604,605,<br>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                | 10Ω, ±2%, 1/4W, Fuse  |            |
| R16                               | 5102-2204713                | 22Ω, ±2%, 1/4W, Fuse  |            |
| R25,26                            | 5102-3304713                | 33Ω, ±2%, 1/4W, Fuse  |            |
| CONTROLS                          |                             |   |            |
| VR501                             | 5113-10478122               | 100kΩ(A), Bass Control  |            |
| VR502                             | 5113-50377122               | 50kΩ(A), Treble Control   |            |
| VR503                             | 5113-50381122               | 50kΩ(M,N), Balance Control  |            |
| CAPACITORS                        |                             |   |            |
| C11,12                            | 5345-227E041                | 220μF, ±20%, 35V, Electrolytic                                    |            |
| C19,20                            | 5345-227D041                | 220μF, ±20%, 25V, Electrolytic                                    |            |
| C507,508                          | 5345-476B0226               | 47μF, ±20%, 10V, Electrolytic                                     |            |
| C509,510                          | 5345-107F0228               | 100μF, ±20%, 50V, Electrolytic                                    |            |
| C511,512                          | 5353-010934                 | 1pF, ±0.5pF, 500V, Mica   |            |
| C905,906                          | 5345-226F0228               | 22μF, ±20%, 50V, Electrolytic                                     |            |
| C907,908                          | 5345-106C0226               | 10μF, ±20%, 16V, Electrolytic                                     |            |
| C909,910                          | 5345-107C0226               | 100μF, ±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)<br>or(V) | F.E.T., 2SK170(GR) or<br>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, 100kΩ(B), Volume Control                       |            |
| PCB-4 CAP. TRIM SWITCH P.C. BOARD |                             |   |            |
| C627,628                          | 5353-680534                 | Capacitor, 68pF, ±5%, 500V, Mica                                  |            |
| SW601                             | 4411-204713                 | Rotary Switch, Cap. Trim  |            |
| PCB-5 FUNCTION SWITCH P.C. BOARD  |                             |   |            |
| SW801,802,803,804<br>805          | 4431-05207247               | Push Switch, Tape Monitor 1, Tape Monitor 2,<br>AUX, Tuner, Phono |            |

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

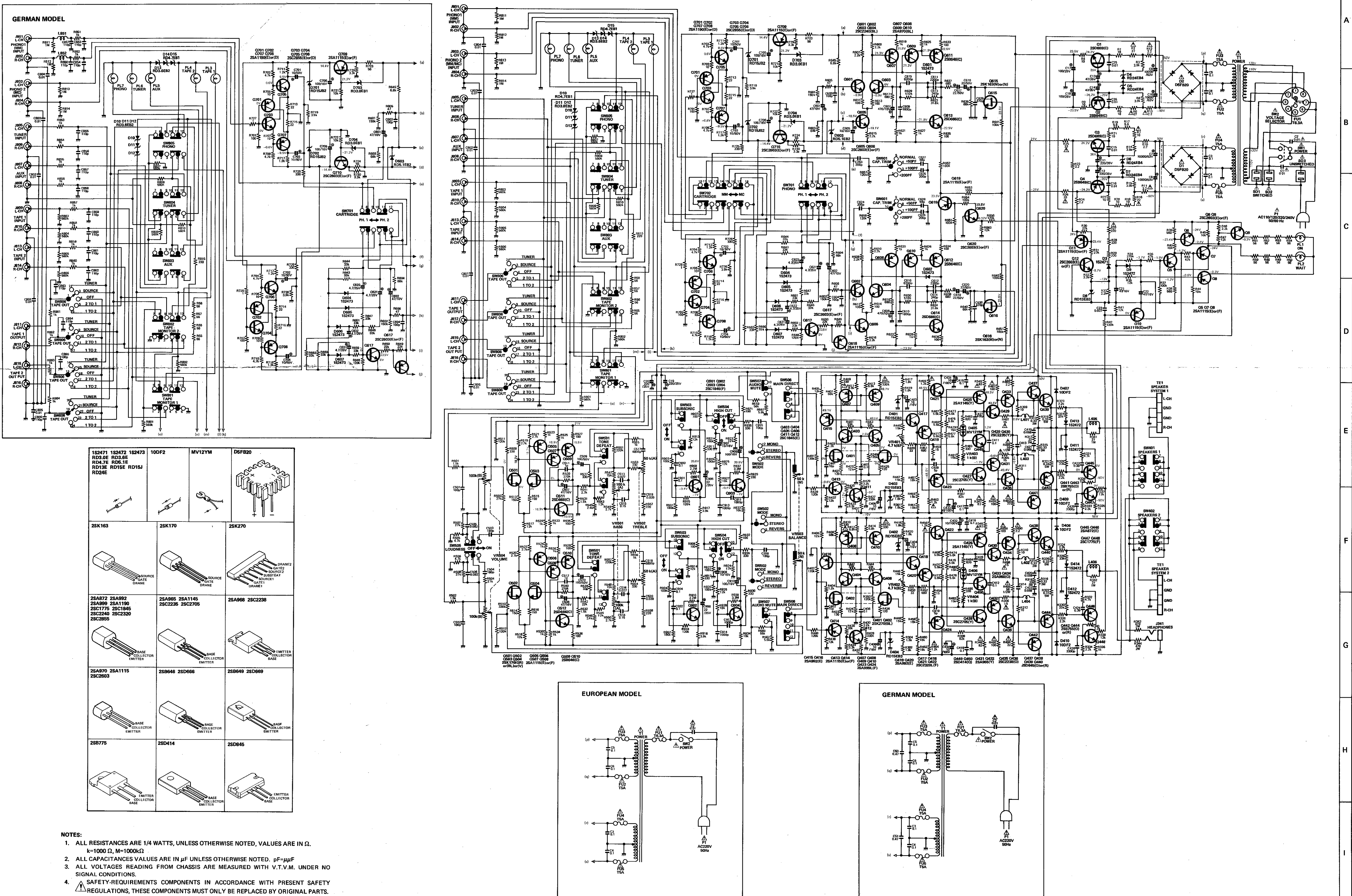
| Ref. No.                              | Part No.          | Description  | Market        |
|---------------------------------------|-------------------|--|---------------|
| <b>DIODES</b>                         |                   |  |               |
| D401,402,403,404                      | 5635-RD15EB3      | Zener, RD15EB3   |               |
| <b>MISCELLANEOUS</b>                  |                   |  |               |
| P301,302                              | 4443-10418        | Connector, 10-Pin, Male  |               |
| P401                                  | 4443-050158       | Connector, 5-Pin, Male   |               |
| <b>PCB-10 POWER OUTPUT P.C. BOARD</b> |                   |  |               |
| <b>RESISTORS</b>                      |                   |  |               |
| R10,11,12,13                          | 5102-2R2579       | 2.2 $\Omega$ , $\pm$ 5%, 1/4W, Fuse                                |               |
| R27                                   | 5102-2214713      | 220 $\Omega$ , $\pm$ 2%, 1/4W, Fuse                                |               |
| R313/315,314/316,<br>319/321,320/322  | 5275-R33671       | 0.33 $\Omega$ , $\pm$ 10%, 5Wx2, Cement (Special Dual)             |               |
| R317,318                              | 5175-220571       | 22 $\Omega$ , $\pm$ 5%, 3W, Metal                                  |               |
| <b>CAPACITORS</b>                     |                   |  |               |
| C3,4,5,6                              | 5352-1041957      | 0.1 $\mu$ F, $\pm$ 10%, 250V, Metalized Polyester                  |               |
| C7,8,9,10                             | 5341-109G0958     | 10000 $\mu$ F, $\pm$ 20%, 63V, Electrolytic                        |               |
| C21,22                                | 5345-476C0951     | 47 $\mu$ F, $\pm$ 20%, 16V, Electrolytic                           |               |
| C50,51                                | 5352-4740962      | 0.47 $\mu$ F, $\pm$ 20%, 400V                                      | G             |
| <b>TRANSISTORS</b>                    |                   |  |               |
| Q5                                    | 5611-1115(E)or(F) | 2SA1115(E) or 2SA1115(F), Audio Muting/<br>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  |               |
| <b>DIODES</b>                         |                   |  |               |
| 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  |               |
| <b>MISCELLANEOUS</b>                  |                   |  |               |
| 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   |               |
| <b>PCB-11 FUSE P.C. BOARD</b>         |                   |  |               |
| 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 $\mu$ F, $\pm$ 20%, AC250V, Metalized<br>Polyester | E             |
| C2                                    | 5352-1030961      | Capacitor, 0.01 $\mu$ F, $\pm$ 20%, AC250V, Metalized<br>Polyester | SK, G         |
| C2                                    | 5352-1030958      | Capacitor, 0.01 $\mu$ F, $\pm$ 20%, AC250V, Metalized<br>Polyester | SEV           |
|                                       | 4472-7122         | Fuse Holder  |               |

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

## PACKAGE

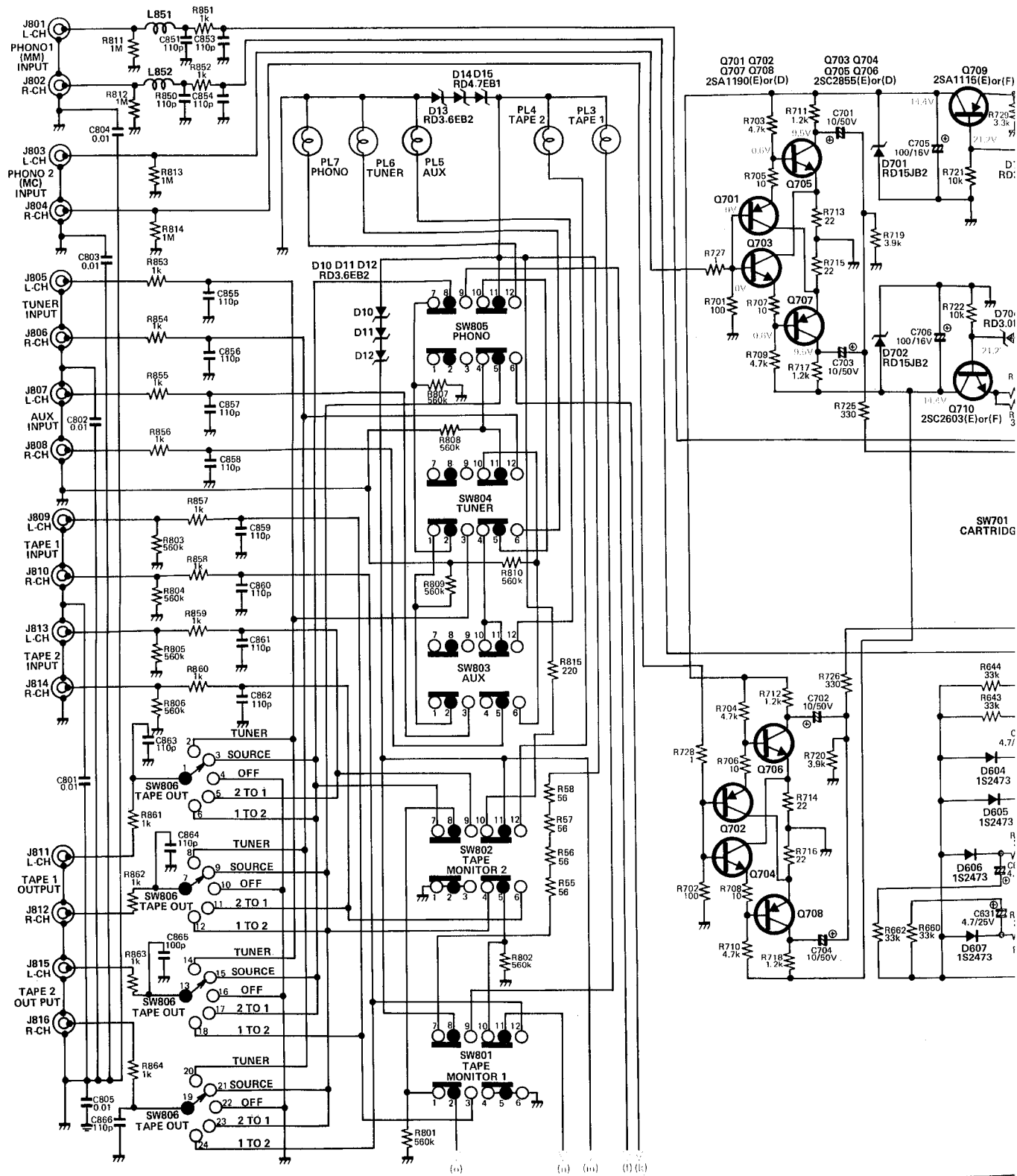


## SCHEMATIC DIAGRAM



## SCHEMATIC DIAGRAM

## GERMAN MODEL

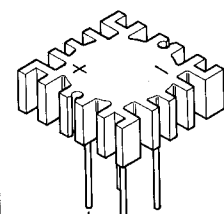
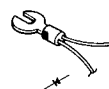
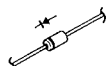


1S2471 1S2472 1S2473  
RD3.0E RD3.6E  
RD4.7E RD5.1E  
RD13E RD15E RD15J  
RD24E

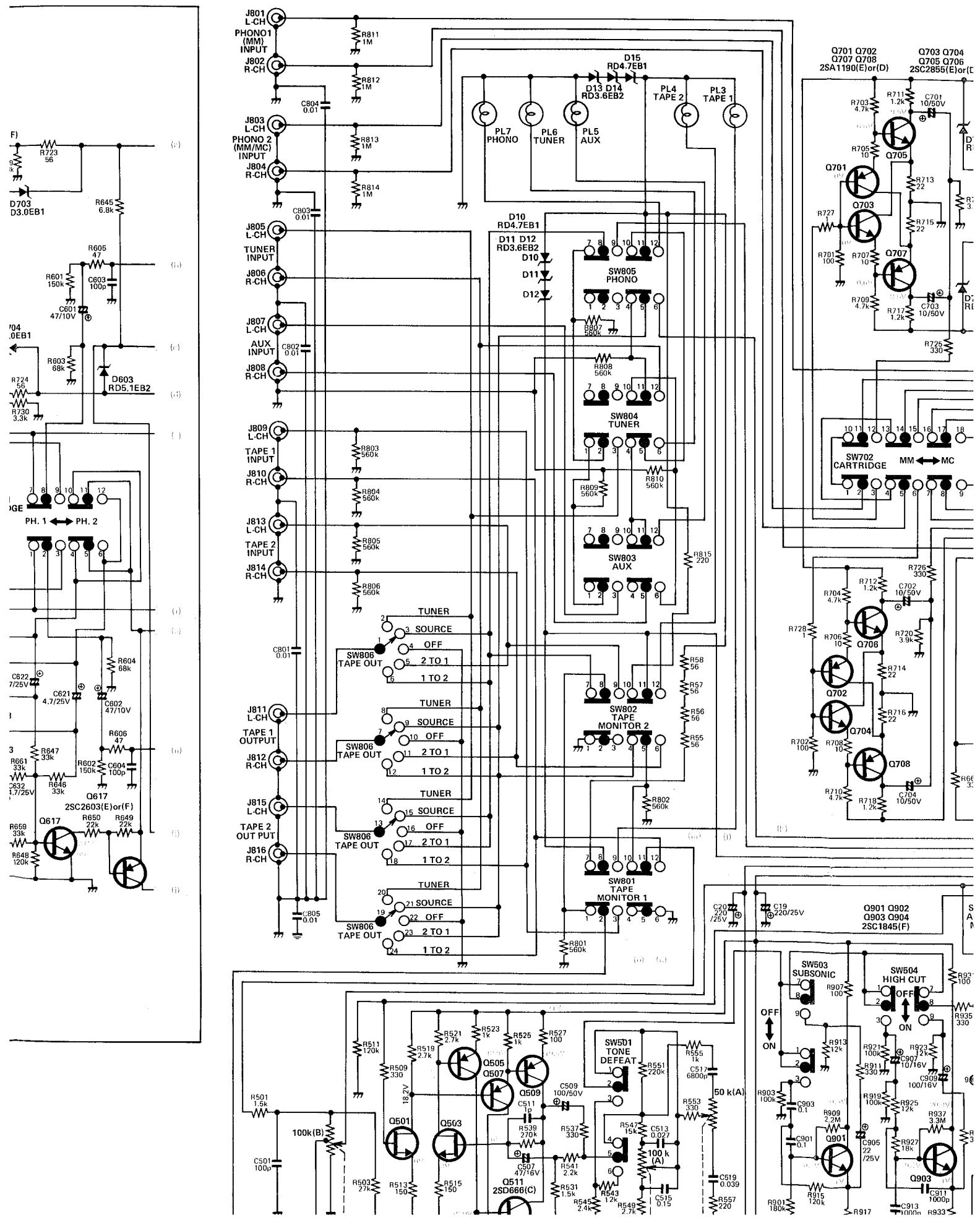
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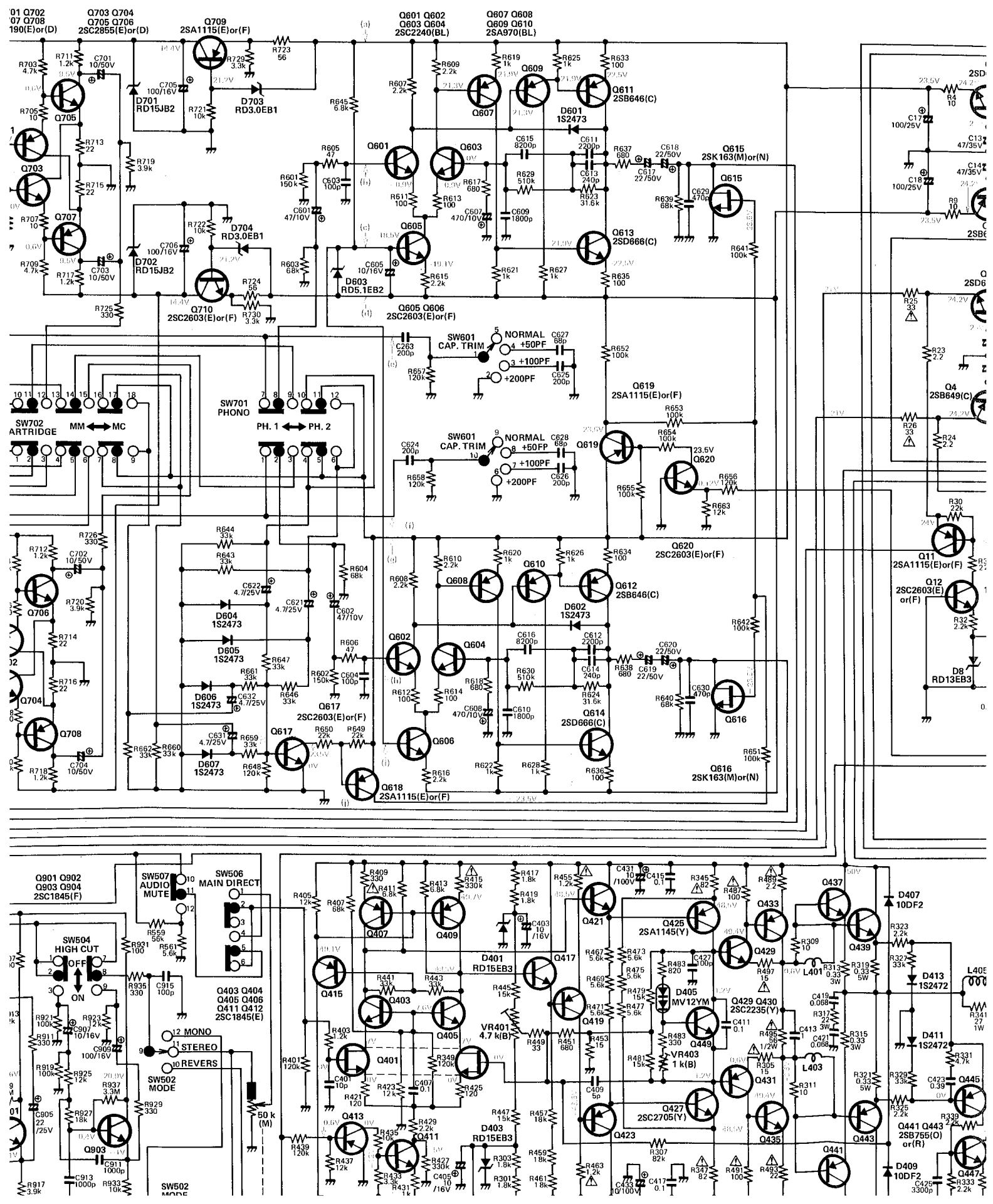
MV12YM

D5FB20









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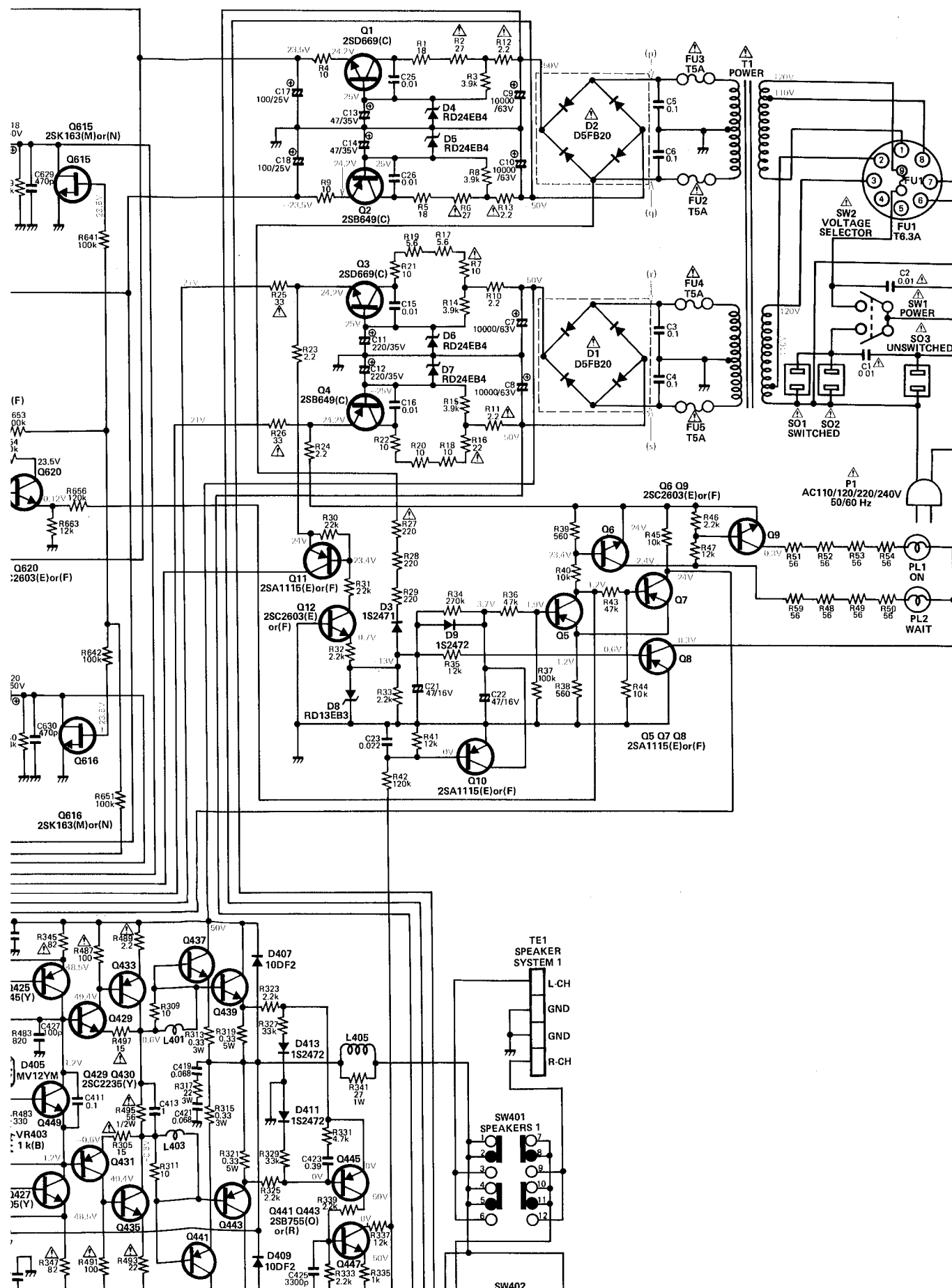
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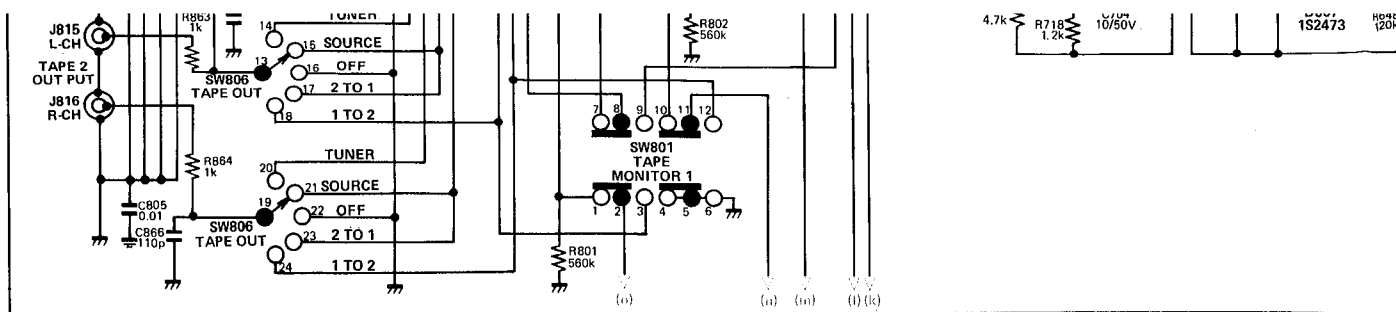
B

C

D

E

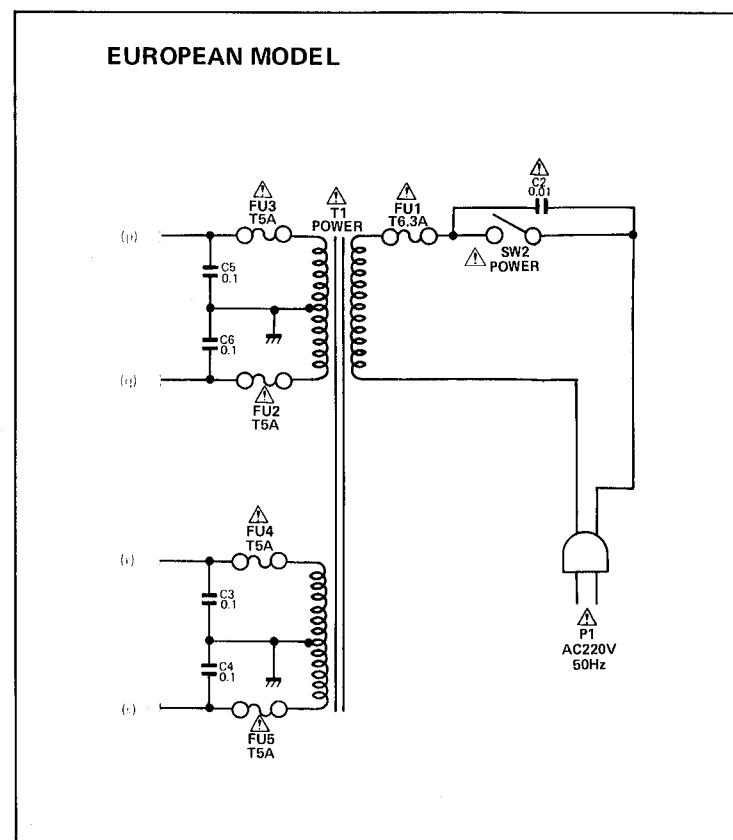
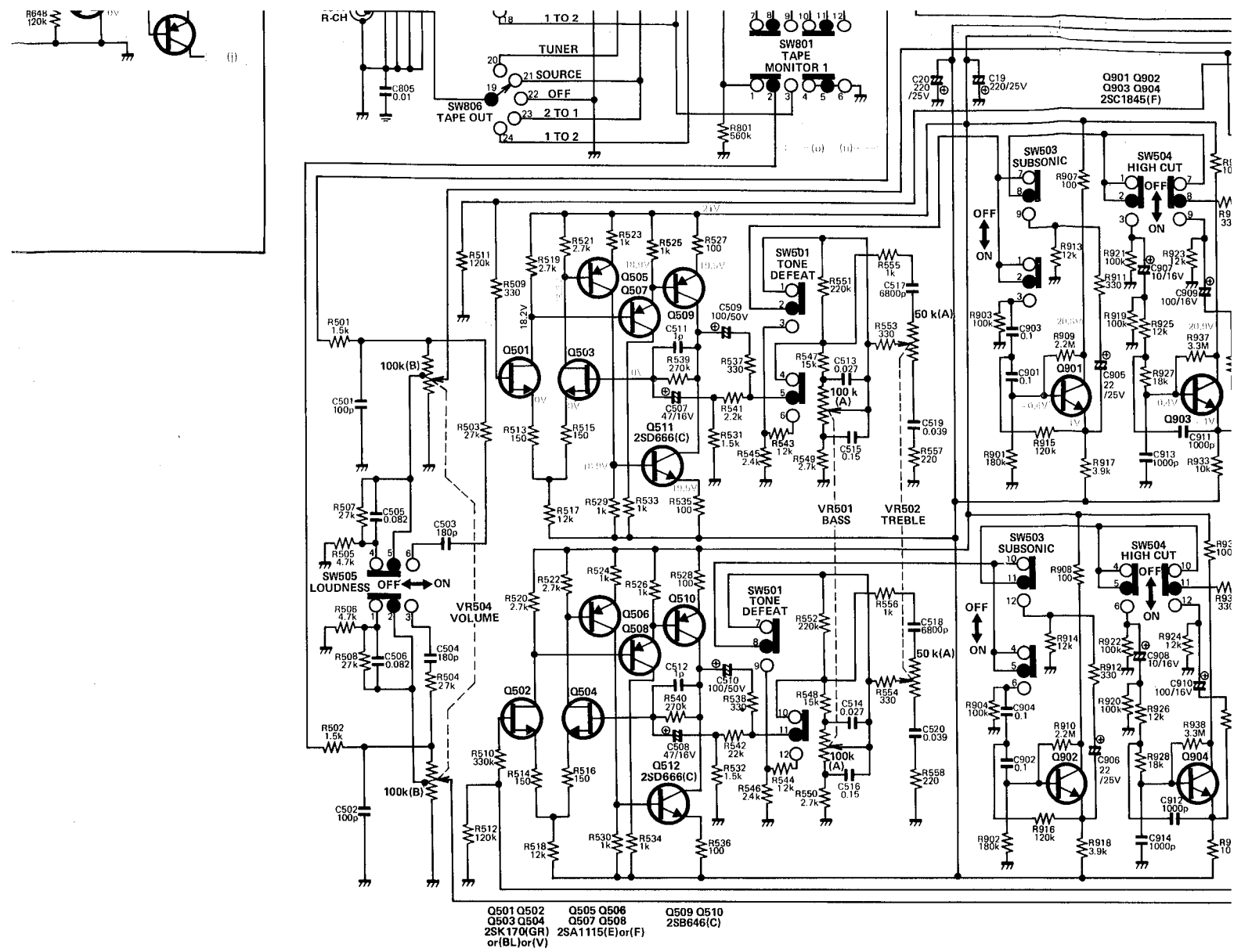


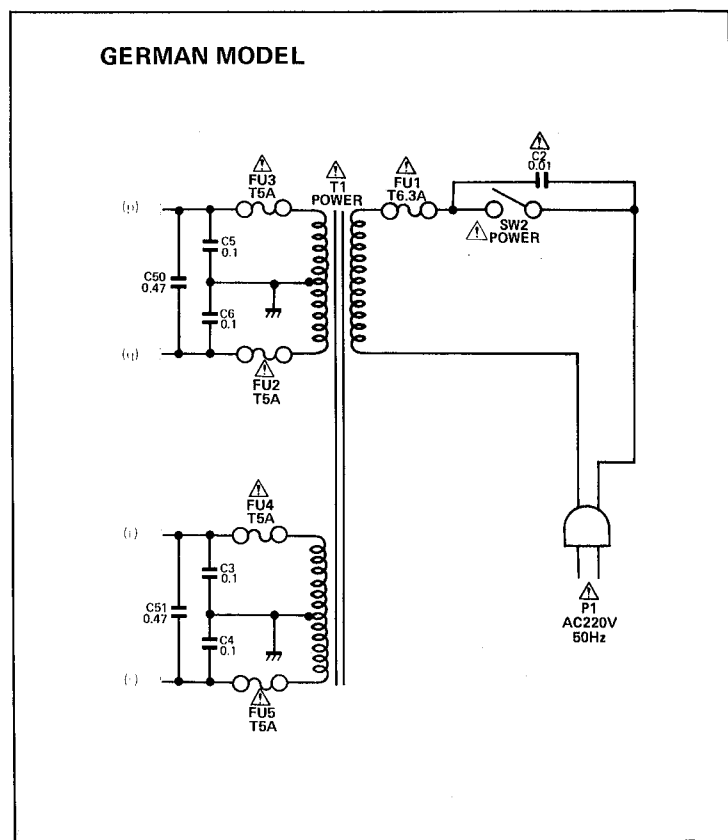
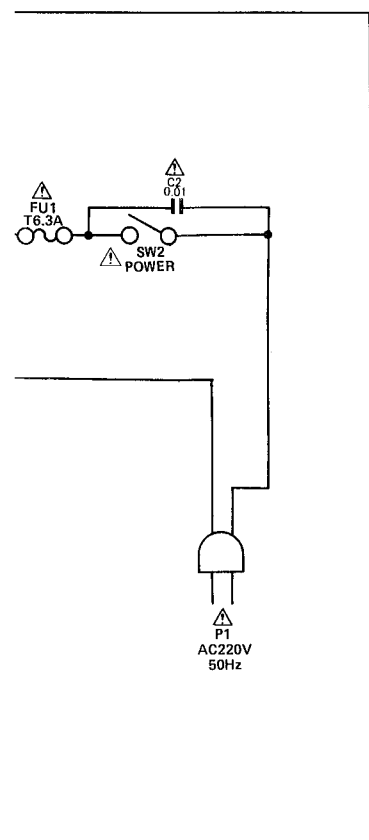
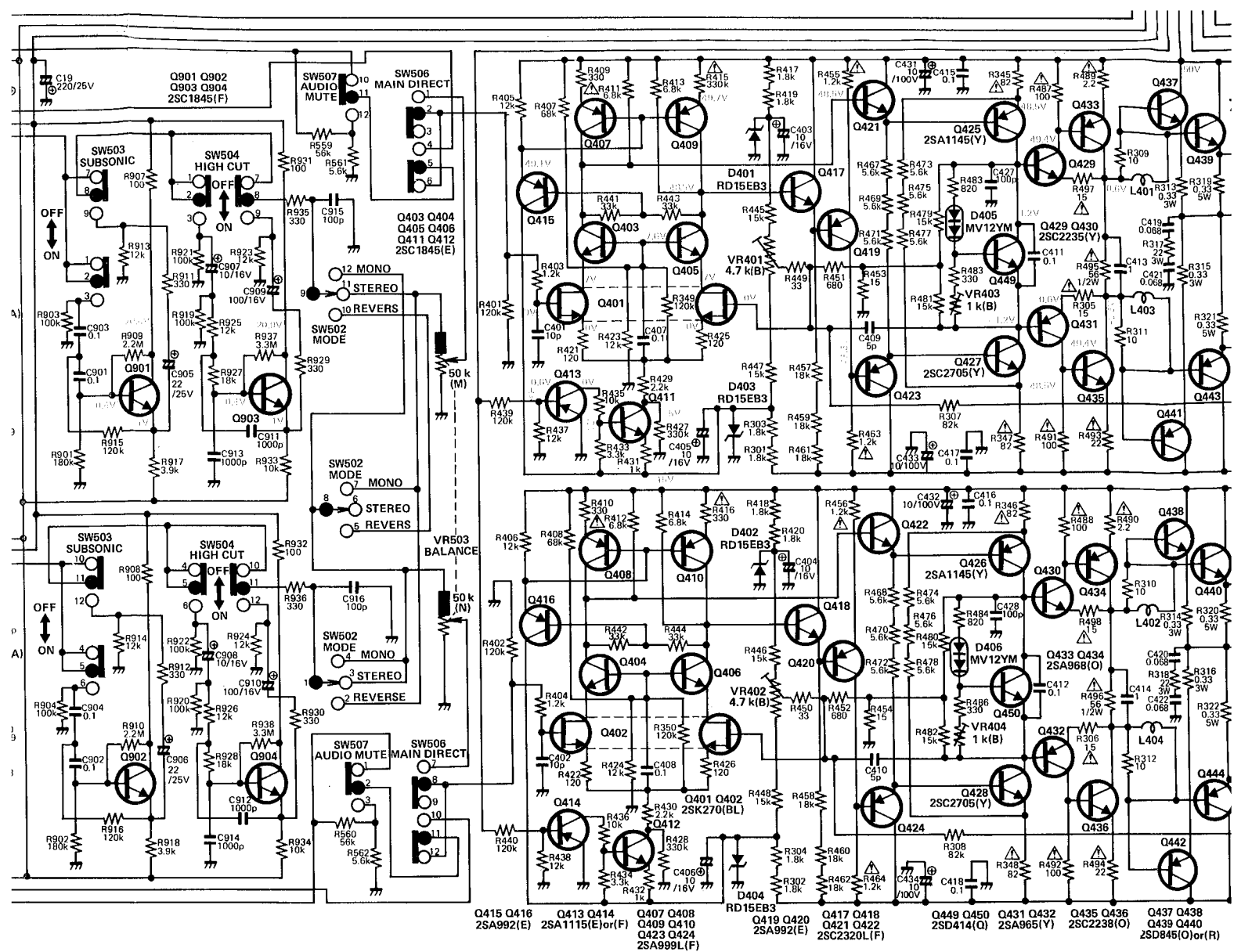


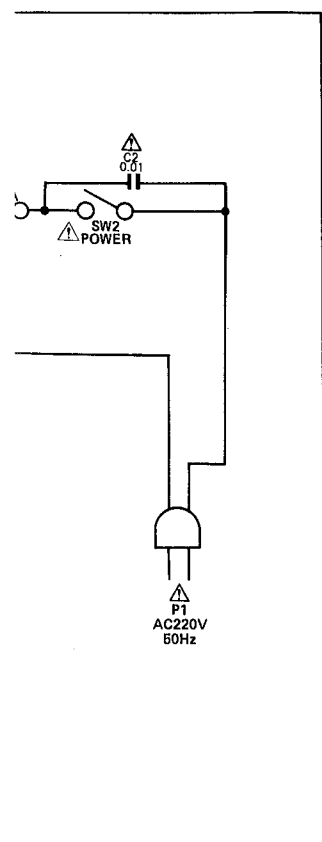
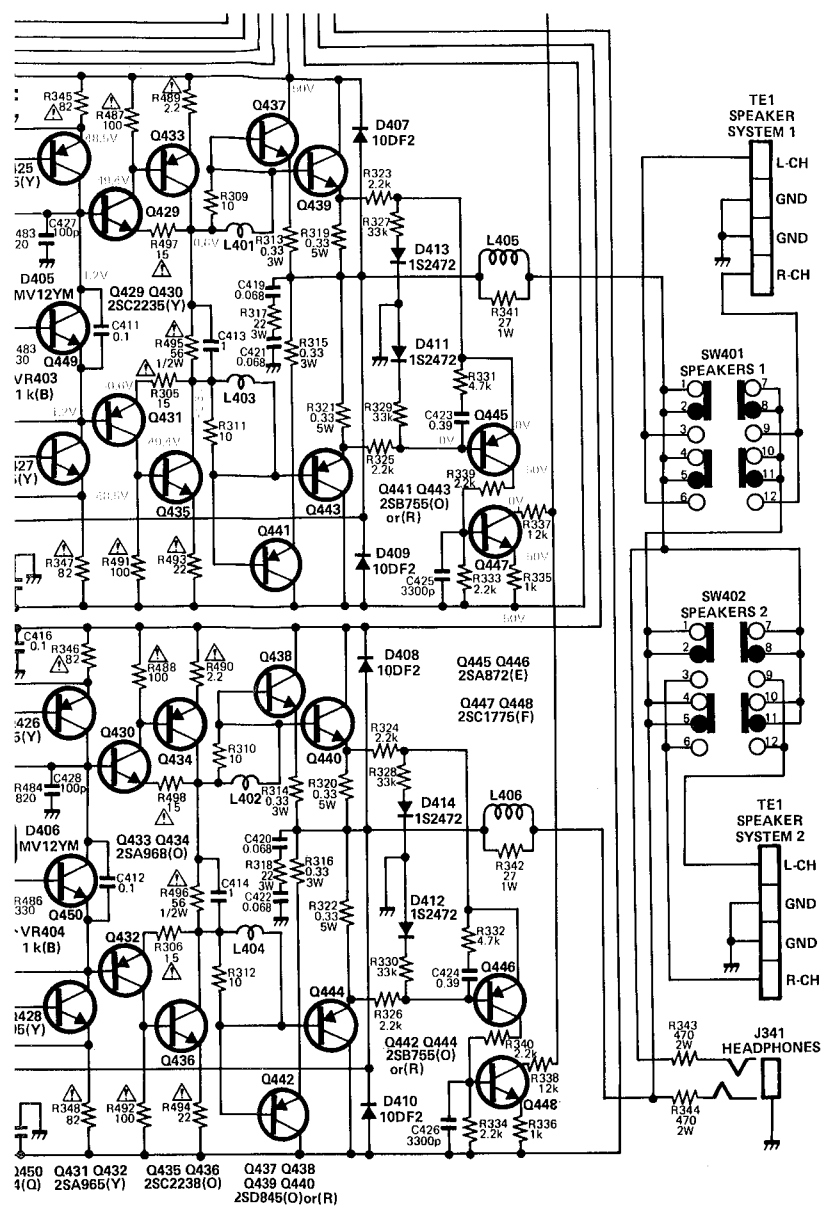
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|---|---|-----------------------|---------------|
| <b>1S2471 1S2472 1S2473</b><br>RD3.0E RD3.6E<br>RD4.7E RD5.1E<br>RD13E RD15E RD15J<br>RD24E                         | <b>10DF2</b>                                    | <b>MV12YM</b>         | <b>D5FB20</b> |
| <b>2SK163</b>   | <b>2SK170</b>                                   | <b>2SK270</b>         |               |
| <b>2SA872 2SA992</b><br><b>2SA999 2SA1190</b><br><b>2SC1775 2SC1845</b><br><b>2SC2240 2SC2320</b><br><b>2SC2855</b> | <b>2SA965 2SA1145</b><br><b>2SC2235 2SC2705</b> | <b>2SA968 2SC2238</b> |               |
| <b>2SA970 2SA1115</b><br><b>2SC2603</b>   | <b>2SB646 2SD666</b>                            | <b>2SB649 2SD669</b>  |               |
| <b>2SB775</b>   | <b>2SD414</b>                                   | <b>2SD845</b>         |               |

#### NOTES:

- ALL RESISTANCES ARE 1/4 WATTS, UNLESS OTHERWISE NOTED, VALUES ARE IN  $\Omega$ .  
k=1000  $\Omega$ , M=1000k $\Omega$
- ALL CAPACITANCES VALUES ARE IN  $\mu F$  UNLESS OTHERWISE NOTED. pF= $\mu\mu F$
- 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

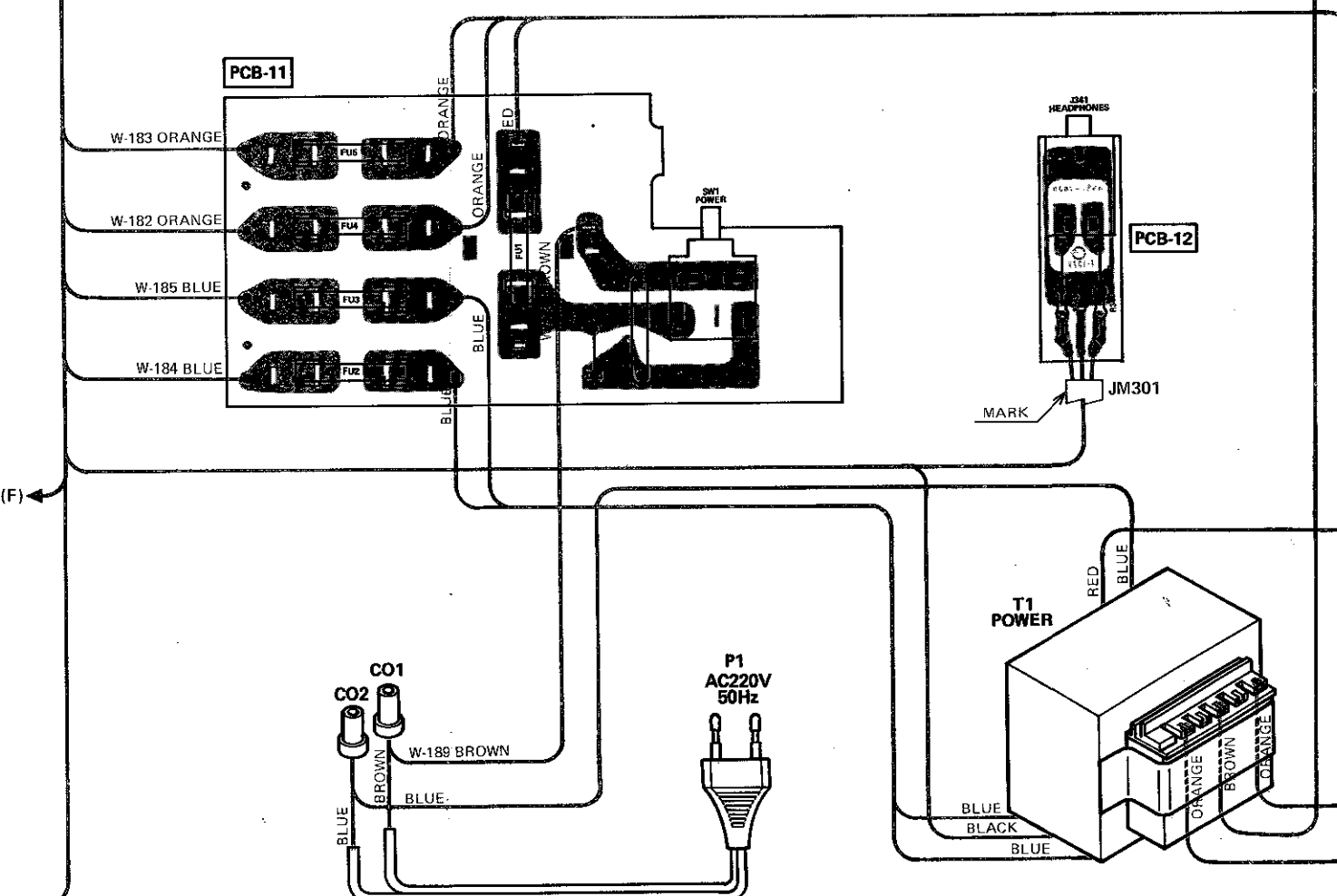
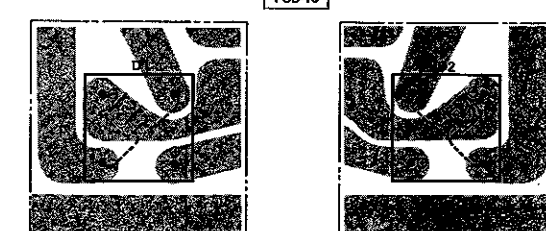
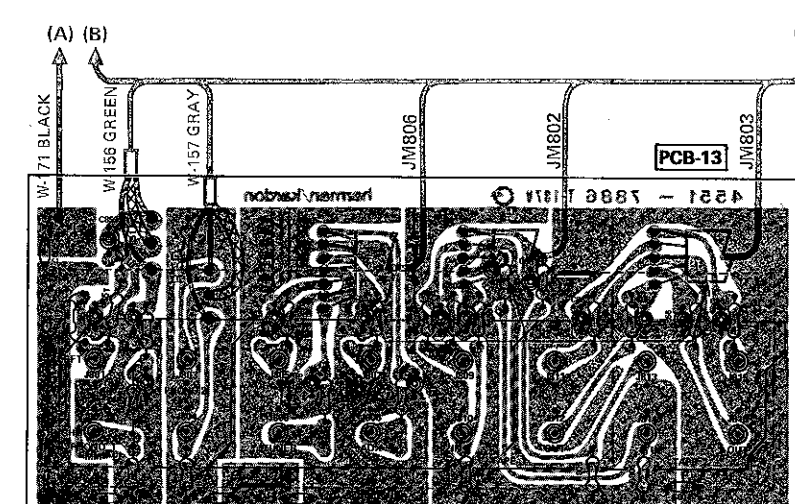
F

G

H

I







1

2

3

4

# WIRING DIAGRAM

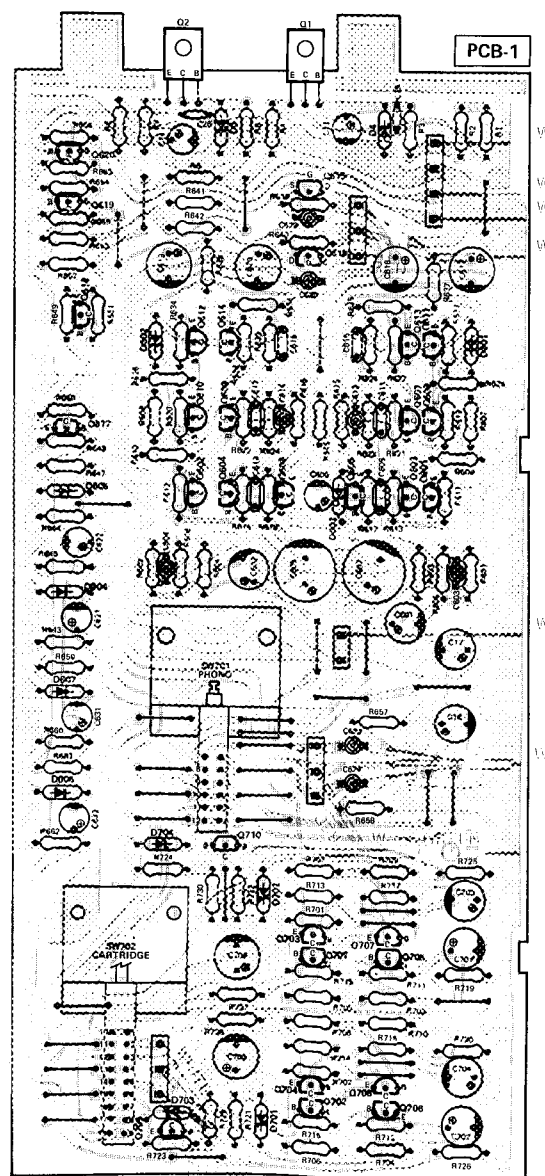
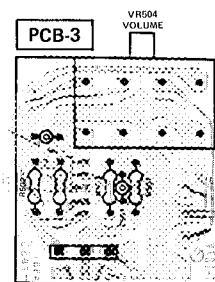
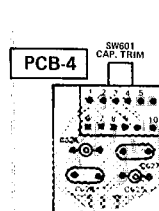
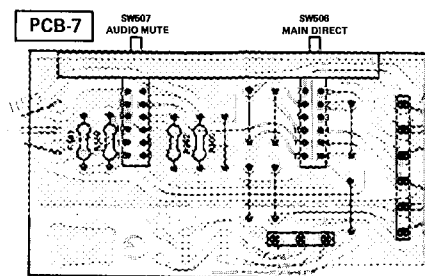
A

B

C

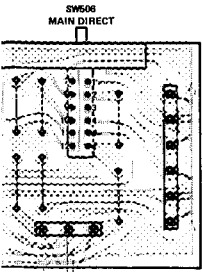
D

E



(A) (B) (C)

WIRING



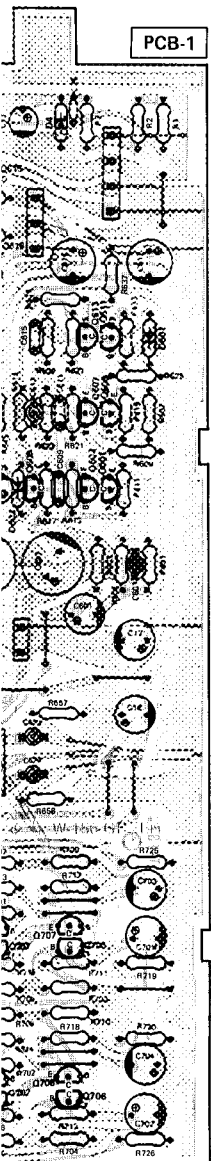
W 151 WHITE

W 152 RED

PCB-3

VR504  
VOLUME

W 153 ORANGE



W 157 RED

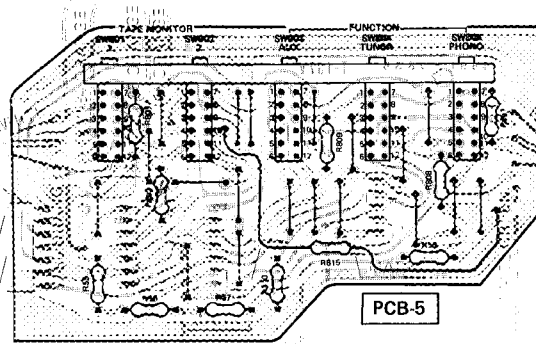
W 158 BLUE

W 159 GREEN

W 155 BLUE

W 170 BLACK

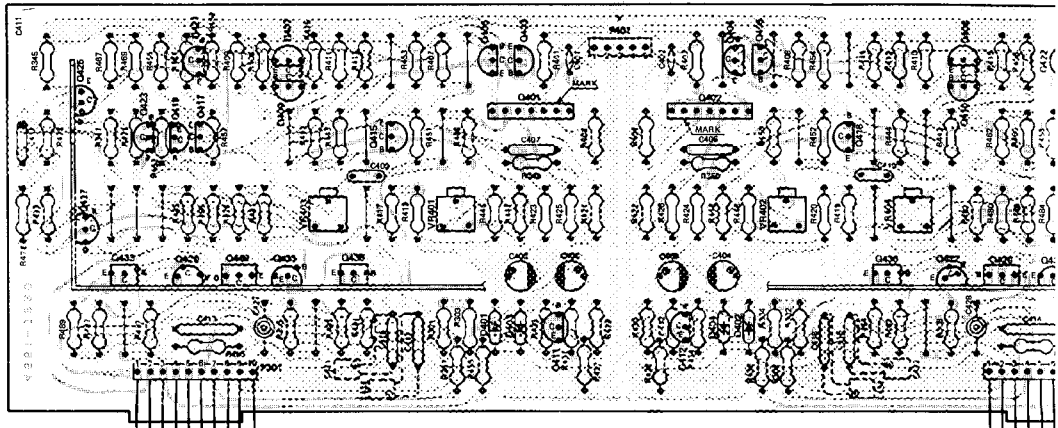
W 173 GREEN



PCB-9

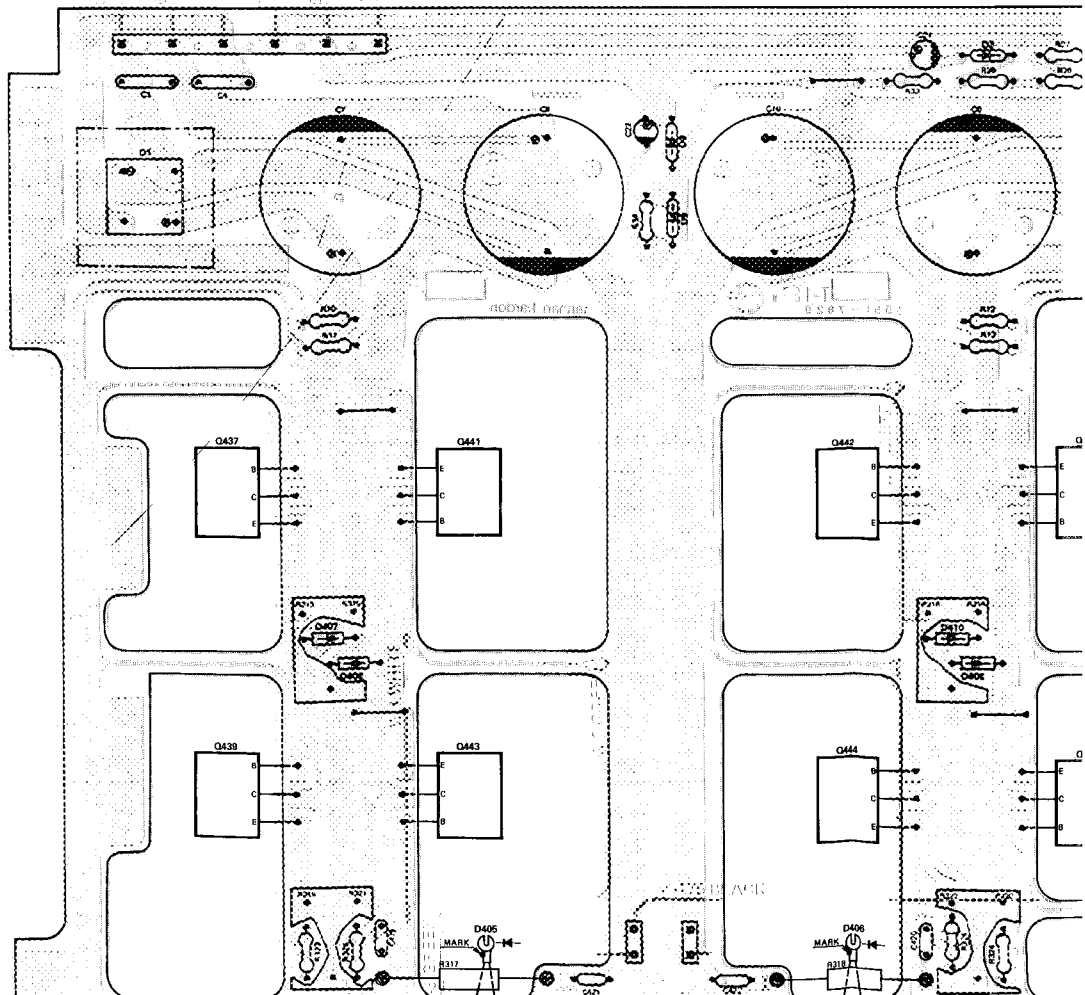
WHITE  
BLACK

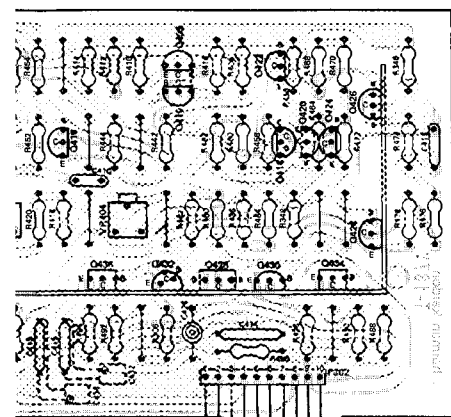
BLACK



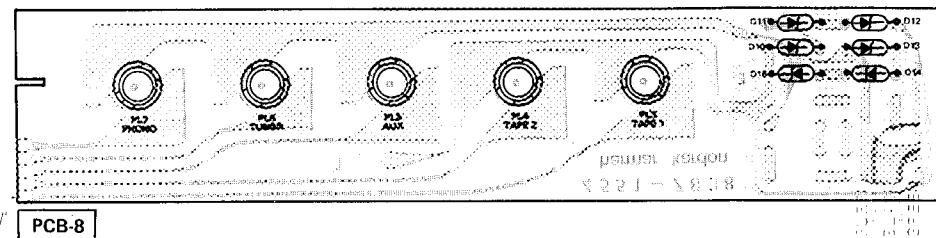
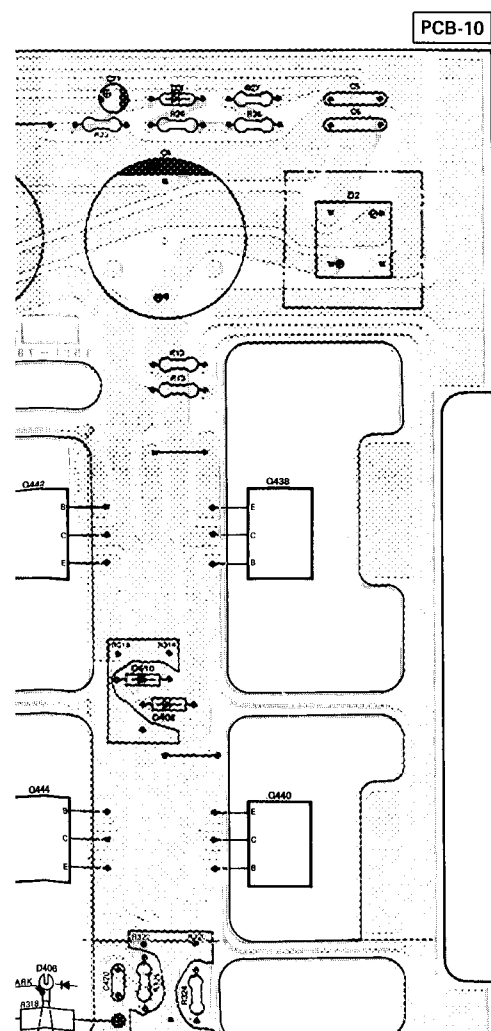
(A)

(B)

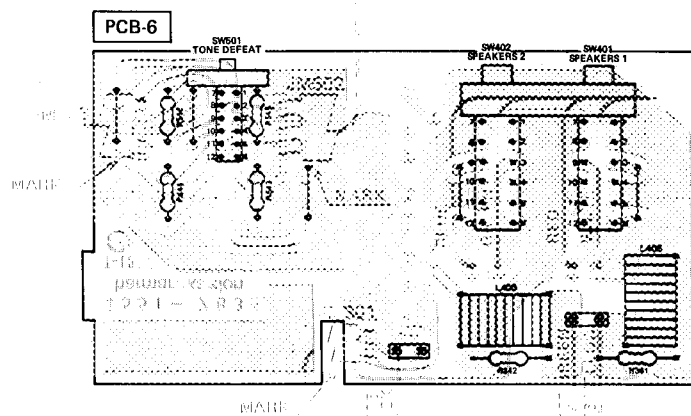




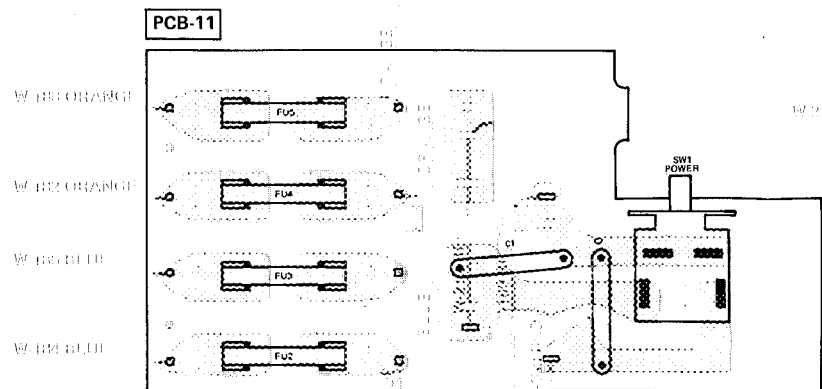
(B)



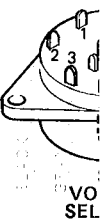
PCB-8

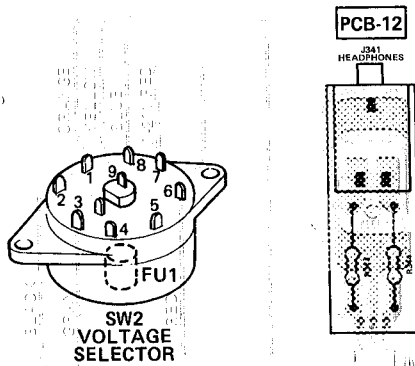
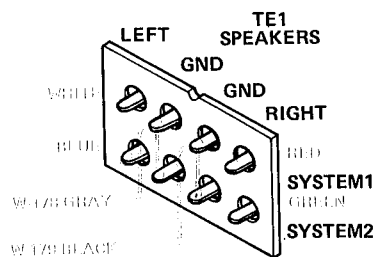
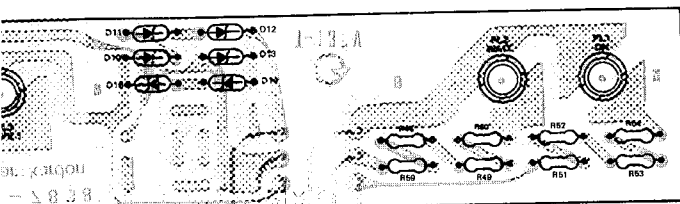
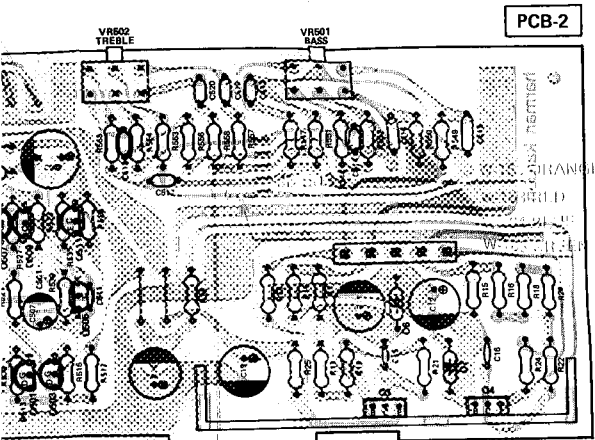


PCB-6

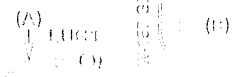
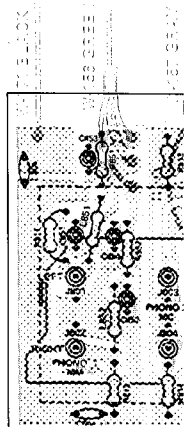


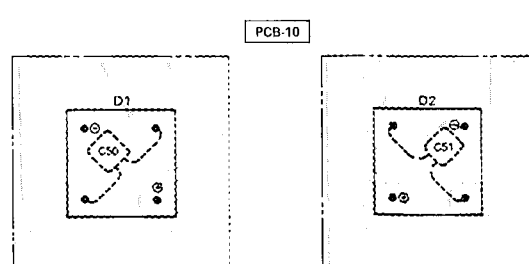
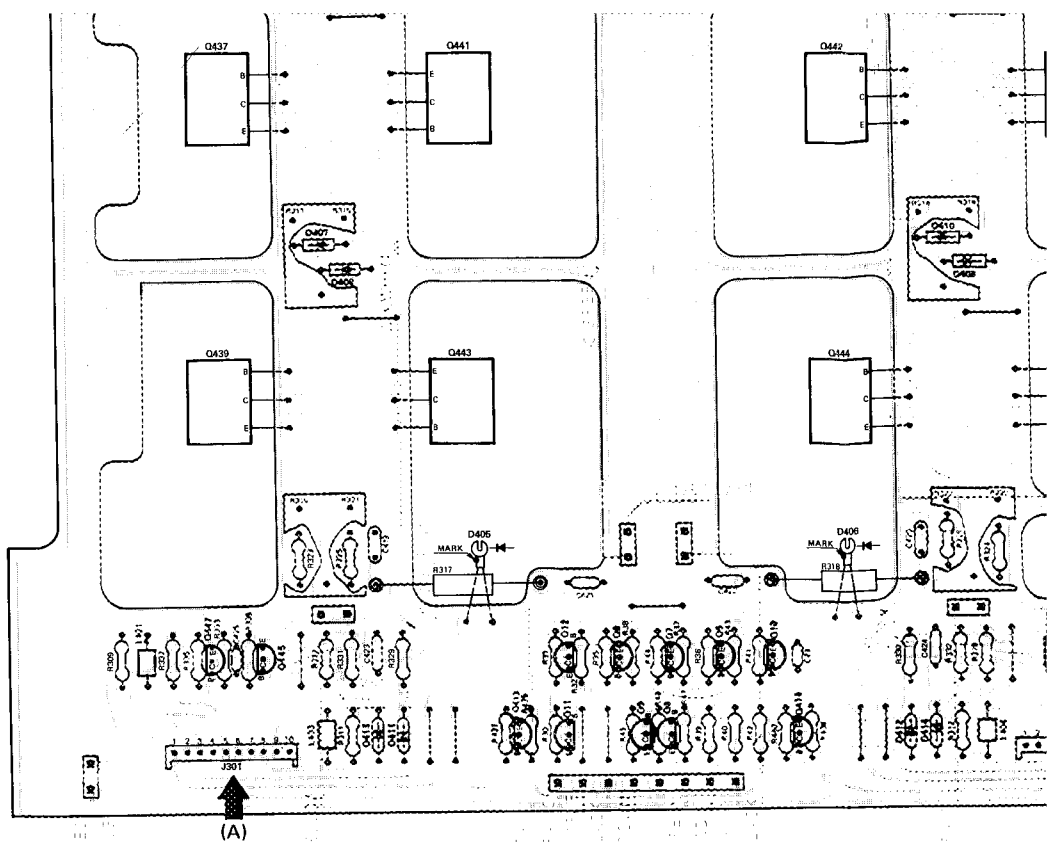
PCB-11

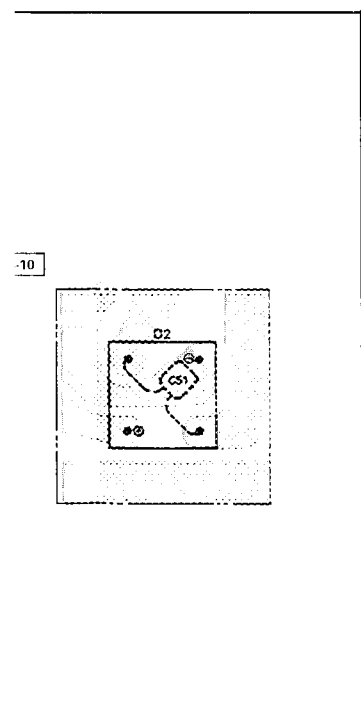
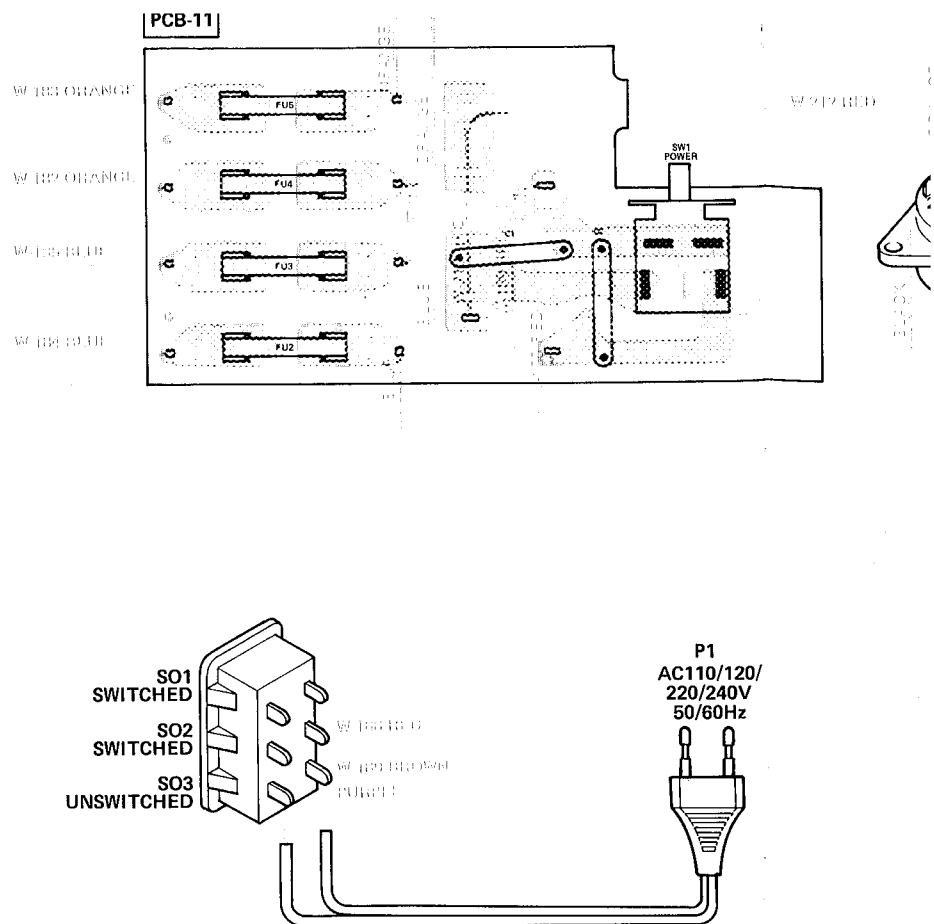
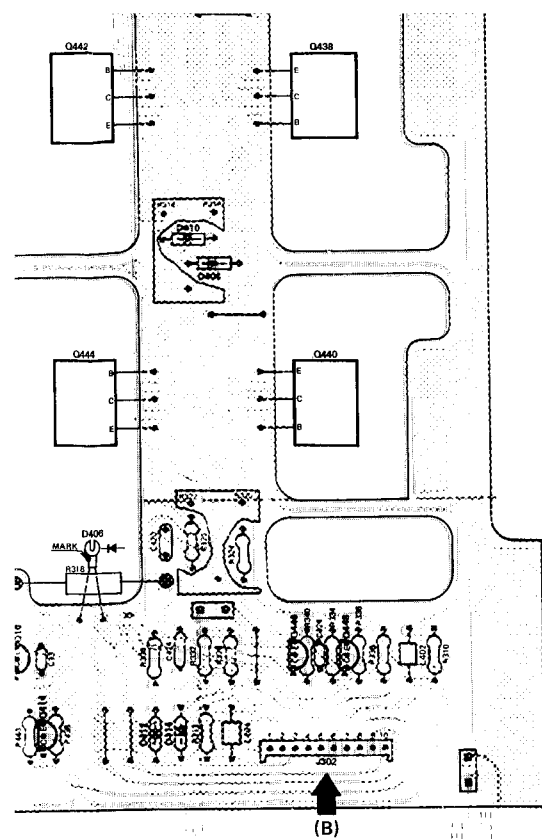




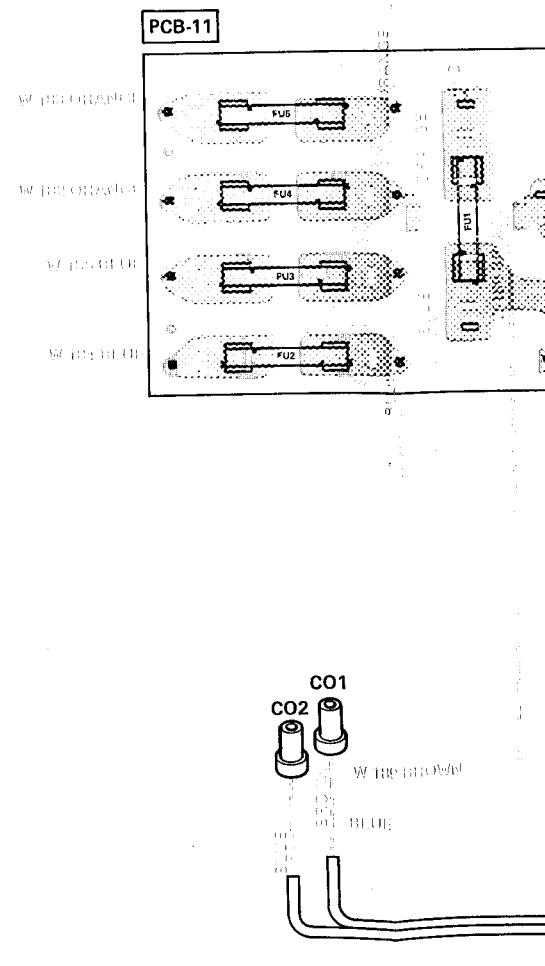
1

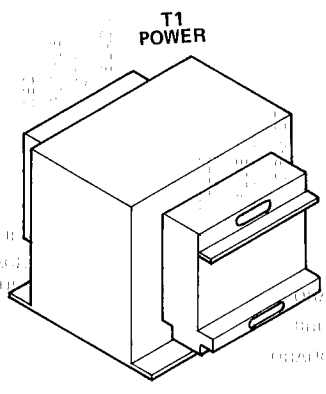
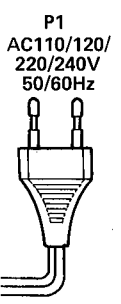
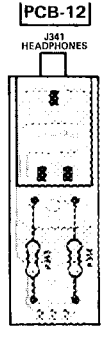
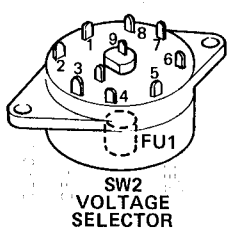
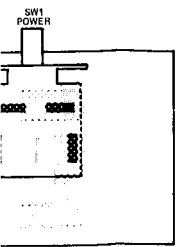

$$\begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$






## EUROPEAN AND GERMAN MODELS





E L S

