

# Service Manual

**CIRCUIT DESCRIPTIONS  
REPAIR & ADJUSTMENTS**



**ORDER NO.  
ARP1185-A**

**STEREO POWER AMPLIFIER**

# M-90(BK)

**MODEL M-90 (BK) COMES IN FIVE VERSIONS DISTINGUISHED AS FOLLOWS:**

Type	Power requirement	Export destination
KU	AC120V only	U.S.A.
HE	AC220V, 240V (switchable) *	European continent
HEZ	AC220V, 240V (switchable) *	West Germany
HB	AC220V, 240V (switchable) *	United Kingdom
S/G	AC110V, 120V, 220V, 240V (switchable)	U.S. Military

\*Change the primary wiring of the power transformer.

- This service manual is applicable to the HEZ type.
- As to the HE, HB, KU and S/G types, please refer to the additional service manual (ARP1206).

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# 1. SPECIFICATIONS

## Amplifier Section

Continuous average power output is 200 watts\* per channel, min., at 8 ohms from 20 Hertz to 20,000 Hertz with no more than 0.003% total harmonic distortion.

DIN power (both channels driven)	
1 kHz, 0.7%, 8 Ω	250 W + 250 W
Dynamic power (EIA test signal)	
8 Ω	300 W + 300 W
4 Ω	550 W + 550 W
2 Ω	800 W + 800 W
Harmonic distortion	
20 Hz — 20 kHz, 200 W, 8 Ω	0.003%
Cross modulation distortion (50 Hz: 7 kHz = 4:1)	
During effective output	0.002%
Input terminals (sensitivity/input impedance)	
CONTROL AMP IN, CD DIRECT IN, LINE DIRECT IN	1 V/50 kΩ
Frequency response	
CONTROL AMP IN, CD DIRECT IN, LINE DIRECT IN, 20 Hz — 20 kHz	+0 dB/ -0.1 dB
SN ratio (short circuit, A network)	
CONTROL AMP IN, CD DIRECT IN, LINE DIRECT IN	125 dB

## Power section, etc.

Power requirements	
European model	AC 220 V~, 50/60 Hz
U.K., Australian models	AC 240 V~, 50/60 Hz
U.S., Canadian models	AC 120 V, 60 Hz
Other destination models	~AC 110 V/120 V/ 220 V/240 V (switchable), 50/60 Hz
Power consumption	
European, U.K., Australian models	1,300 W
U.S., Model	430 W
Other destination models	430 W
External dimensions	
	457 (W) x 430 (D) x 154 (H) mm. 18 (W) x 16-7/8 (D) x 6-1/16 (H) in
Weight	22.6 kg (49 lb 13 oz)

## Accessories

Operating Instructions	1
Pin-plug cord	1

### NOTE:

- Specifications and design subject to possible modification without notice due to improvements.
- \*Measured pursuant to the Federal Trade Commission's Trade Regulation rule on Power Claims for Amplifier.

## Precautions for installation

To ensure optimum sound quality, observe the following precautions.

- This unit is heavy. Be sure to install it on a firm base which can support its weight. Also, to prevent the flow of cooling air from being blocked off, do not place the unit on soft material such as a carpet or cushion, or install it in a confined space. When installing the unit in a rack, provide adequate space around it to allow heat to dissipate.
- To prevent the control amplifier from picking up noise due to leakage flux from the power amplifier when the control amplifier and power amplifier are installed adjacent to each other, install the control amplifier on the right of the power amplifier. Also, if you install the control amplifier above or below the power amplifier, place a partition between them to separate them by at least 10 cm from each other.
- Install the unit on a level surface so that the feet of the unit are all touching the installation surface.

## 2. PANEL FACILITIES

### FRONT PANEL

#### INPUT SELECTOR

Use to select the component you wish to play back (amplify).

[CONTROL AMP]—The component connected to the control amplifier.

[CD DIRECT]— The compact disc player connected to the rear panel CD DIRECT IN terminals.

[LINE DIRECT]—The audio component connected to the rear panel LINE DIRECT IN terminals.

#### POWER switch

Press to turn power to this unit ON/OFF.

#### PROTECTION/POWER indicator

Lights when the power is turned ON.

Red (protection): Lights immediately after turning on the power, or in the event of a malfunctioning input from the control amplifier. When lighted, the amplifier will not operate.

Yellow (power): Indicates normal operating condition.

#### Power level meters

When the display selector switch is in the ON position, these meters display the power level. The meters feature a "peak hold" function which allows the meters to remain lighted for 0.2 to 0.3 seconds after reaching a peak value.

#### INPUT indicator

Indicates the position of the input selector control.

#### PHONES jack

When using headphones, connect their plug here.

#### SPEAKERS selector switch

Use to select the speaker system used.

[A]— Sound is heard from the speaker systems connected to the SPEAKERS A terminals.

[B]— Sound is heard from the speaker systems connected to the SPEAKERS B terminals.

Turn this switch OFF when using headphones.

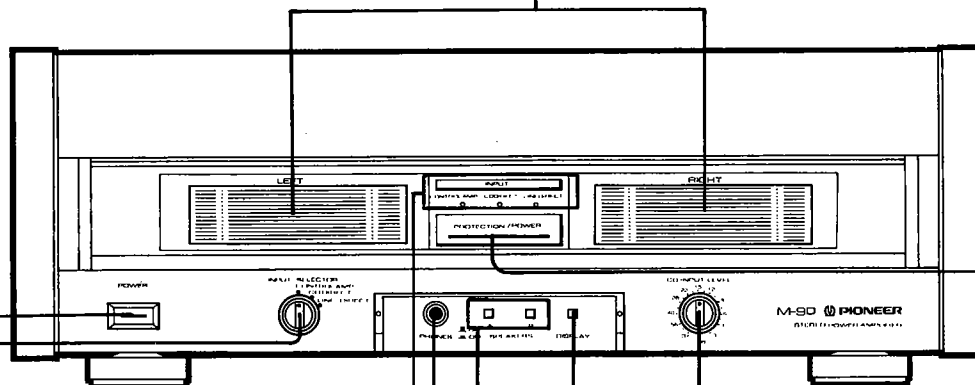
#### DISPLAY selector switch

Use to turn the power level meters ON/OFF.

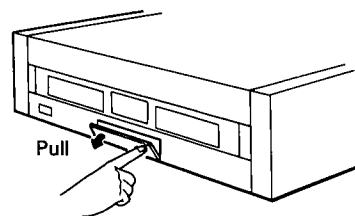
In the OFF condition, the meters will not be displayed.

#### CD/LINE INPUT LEVEL control

Use to adjust the input level connected to the rear panel CD DIRECT IN and LINE DIRECT IN terminals.



Method of opening cover

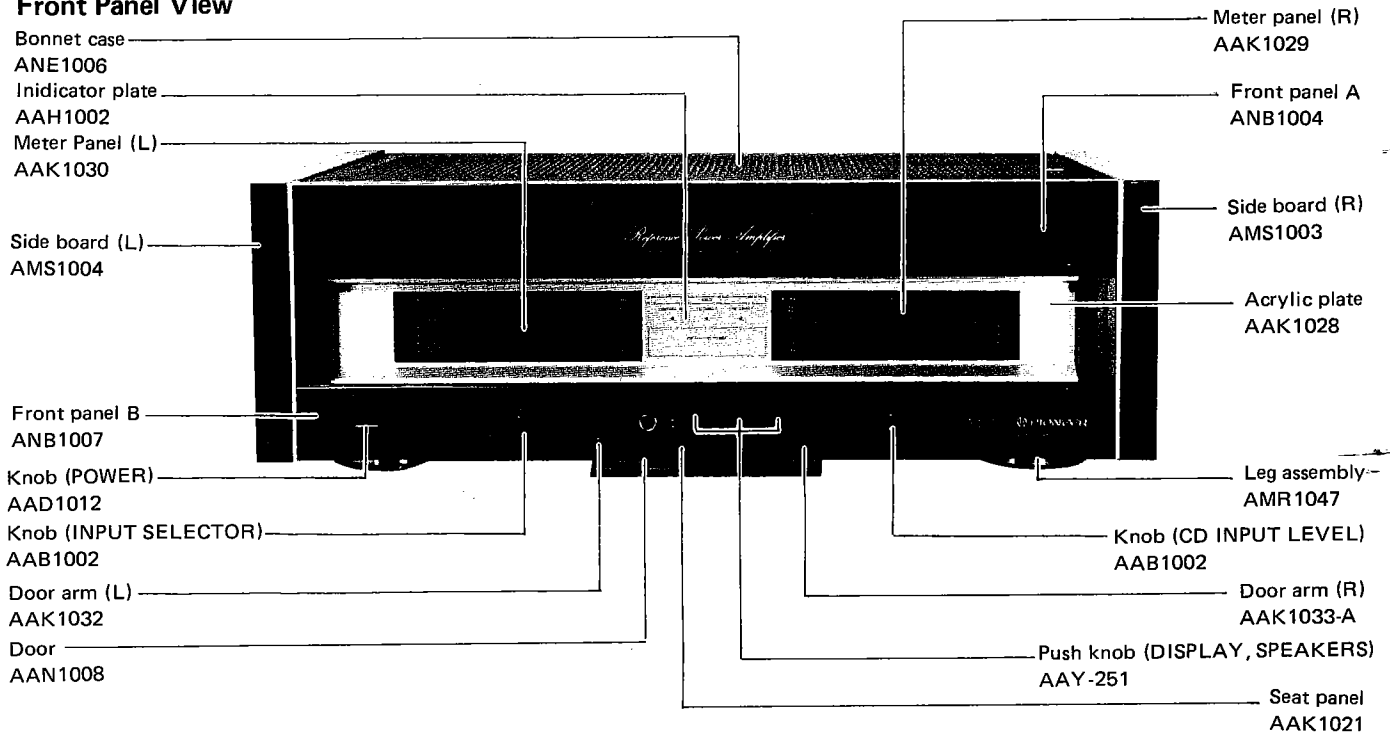


### 3. PARTS LOCATION

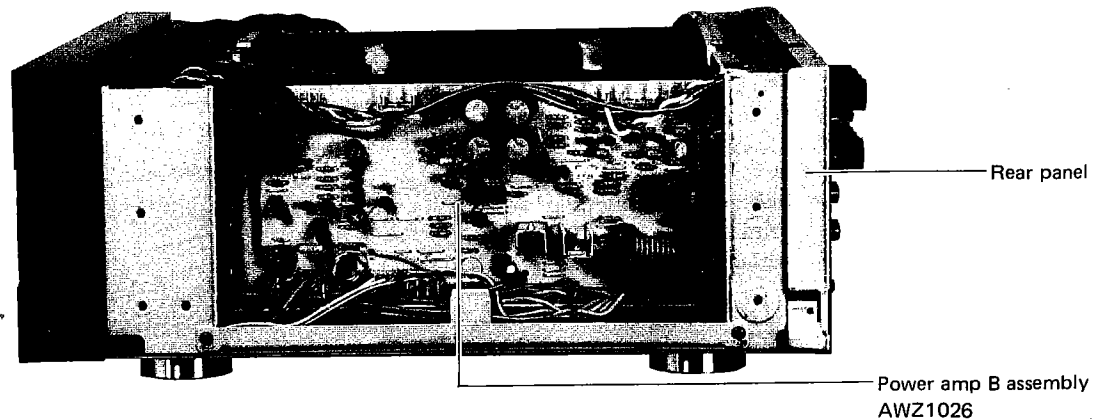
**NOTES:**

- Parts without part number cannot be supplied.
- The  $\Delta$  mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
- For your Parts Stock Control, the fast moving items are indicated with the marks **★★** and **★**.  
**★★ GENERALLY MOVES FASTER THAN ★**  
 This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- Parts marked by "  $\odot$  " are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.

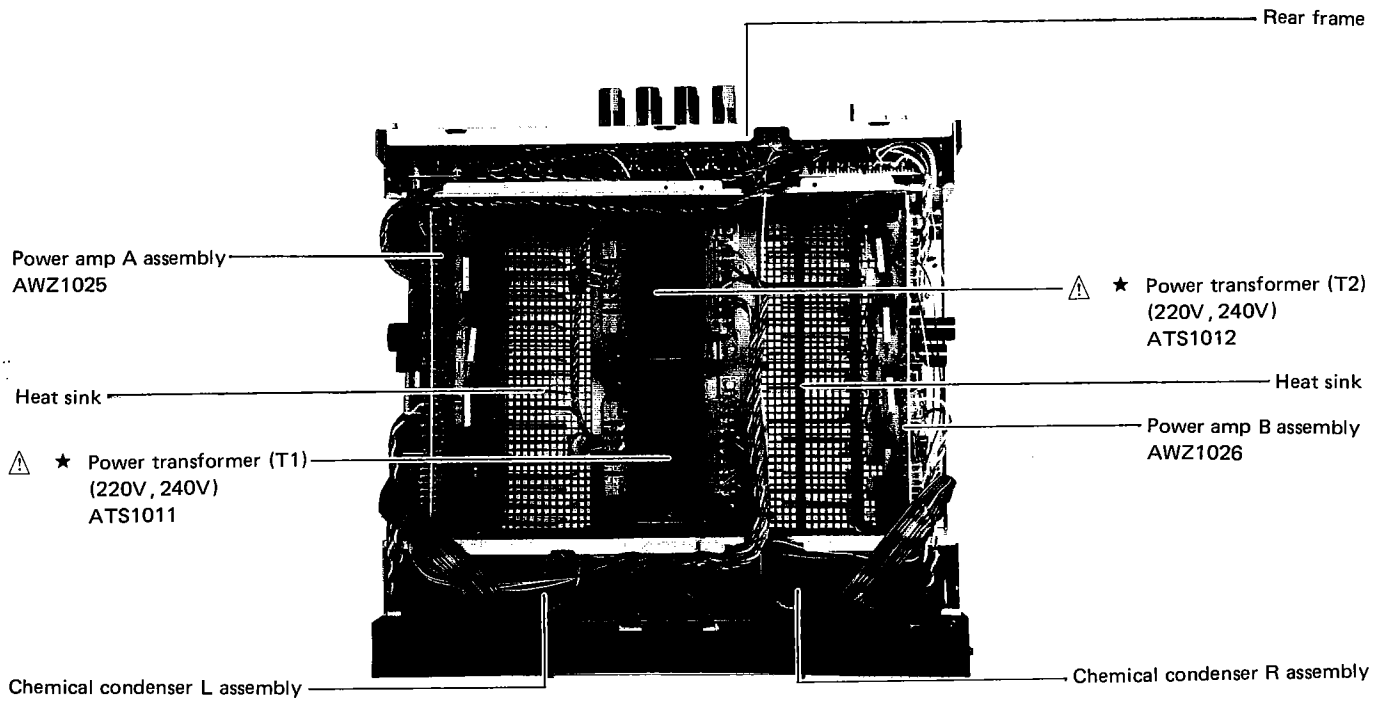
**Front Panel View**



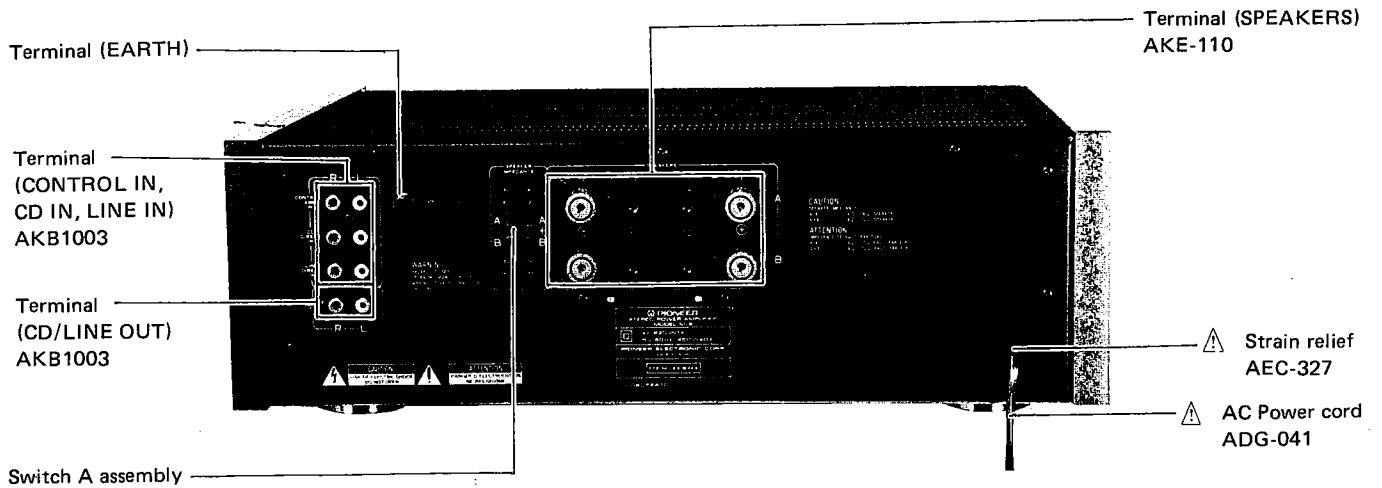
**Side View with Bonnet Case Removed**



Top View with Bonnet Case Removed



Rear Panel View



## 4. EXPLODED VIEWS AND PARTS LIST

### NOTES:

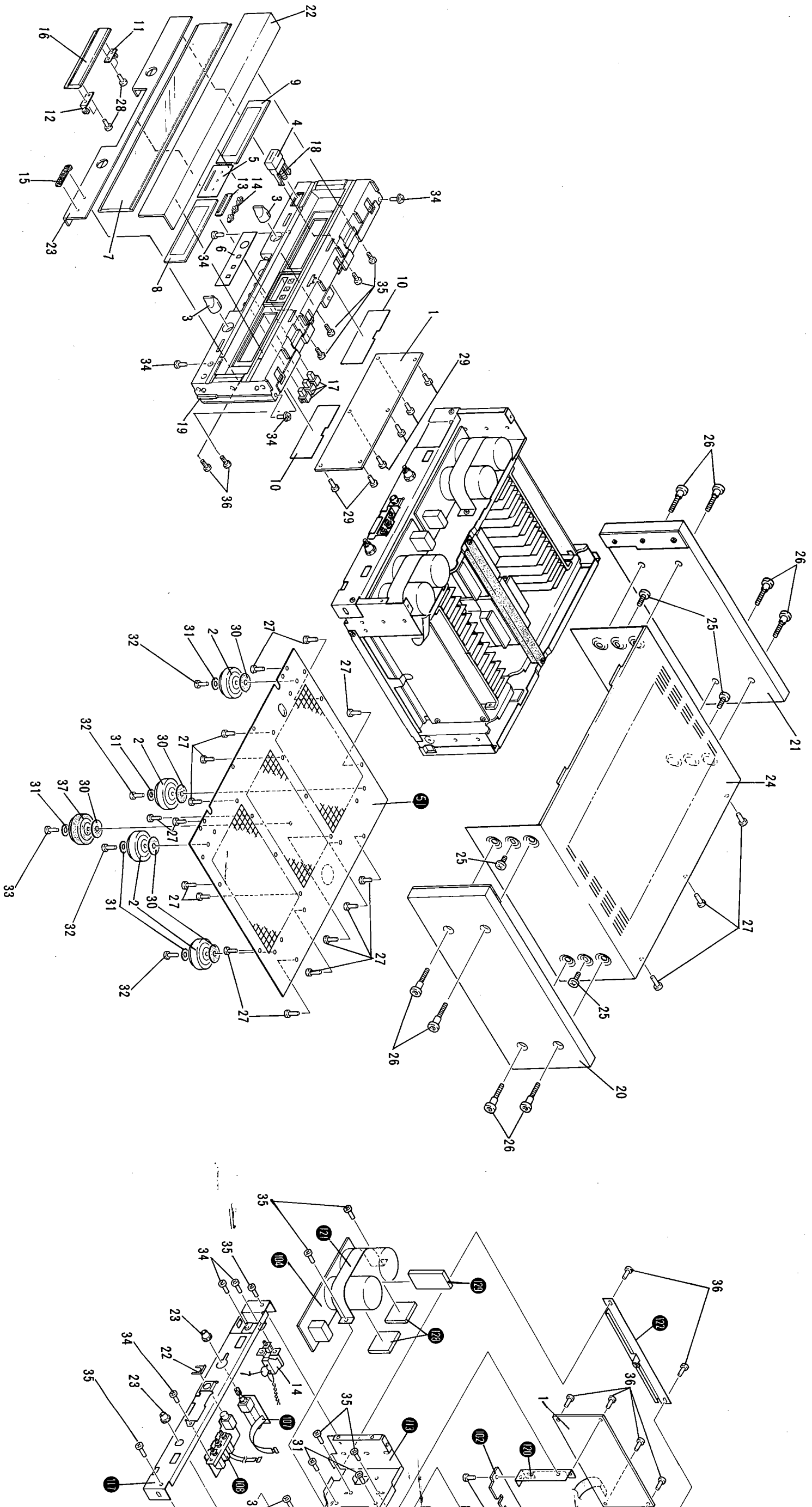
- Parts without part number cannot be supplied.
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- For your Parts Stock Control, the fast moving items are indicated with the marks **\*\*** and **\***.  
**\*\* GENERALLY MOVES FASTER THAN \***  
*This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.*
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### Parts List of Exterior

Mark	No.	Part No.	Description
	1	AWZ1037	FL assembly
	2	AMR1047	Leg assembly
	3	AAB1002	Knob (INPUT SELECTOR, CD INPUT LEVEL)
	4	AAD1012	Knob (POWER)
	5	AAH1002	Indicator plate
	6	AAK1021	Seat panel
	7	AAK1028	Acrylic plate
	8	AAK1029	Meter panel (R)
	9	AAK1030	Meter panel (L)
	10	AAK1031	Filter
	11	AAK1032	Door arm (L)
	12	AAK1033	Door arm (R)
	13	AAK1036	Indicator lens A
	14	AAK1075	Lens
	15	AAM1001	Name plate
	16	AAN1008	Door
	17	AAY-251	Knob (DISPLAY, SPEAKERS)
	18	ABH1005	Coil spring
	19	AMB1014	Panel bass
	20	AMS1003	Side board R
	21	AMS1004	Side board L
	22	ANB1004	Front panel A
	23	ANB1007	Front panel B
	24	ANE1006	Bonnet case
	25	FBT40P080FZK	Screw
	26	ABA1002	Decorative screw
	27	ABA1006	Screw
	28	CMZ30P060FZK	Screw
	29	ABA-298	Screw
	30	ABE1002	Washer
	31	ABE1003	Washer
	32	ABA1007	Screw
	33	VMZ30P120FCU	Screw
	34	ABA1011	Screw
	35	VMZ30P060FMC	Screw
	36	VMZ30P080FMC	Screw
	37	AMR1102	Leg assembly
	51		Bottom plate

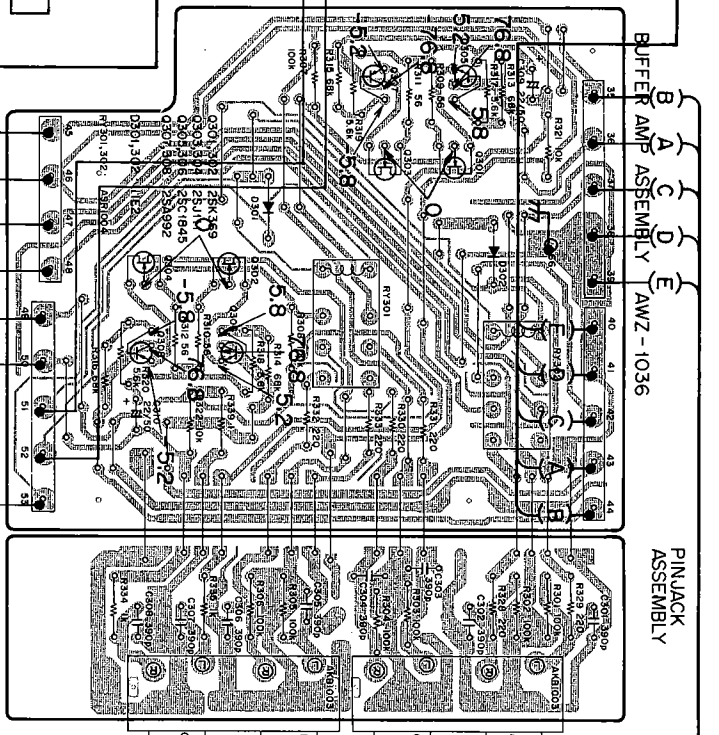
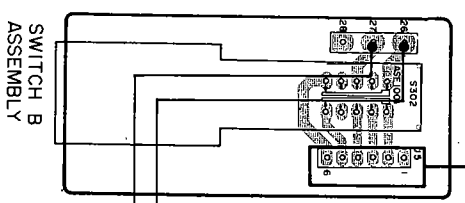
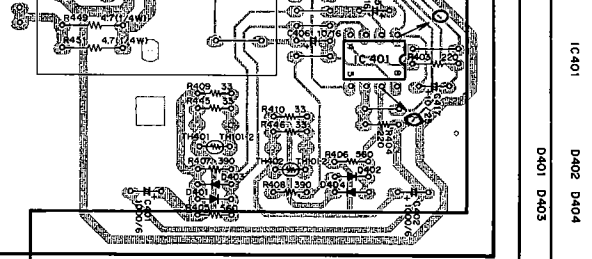
Exterior

Interior

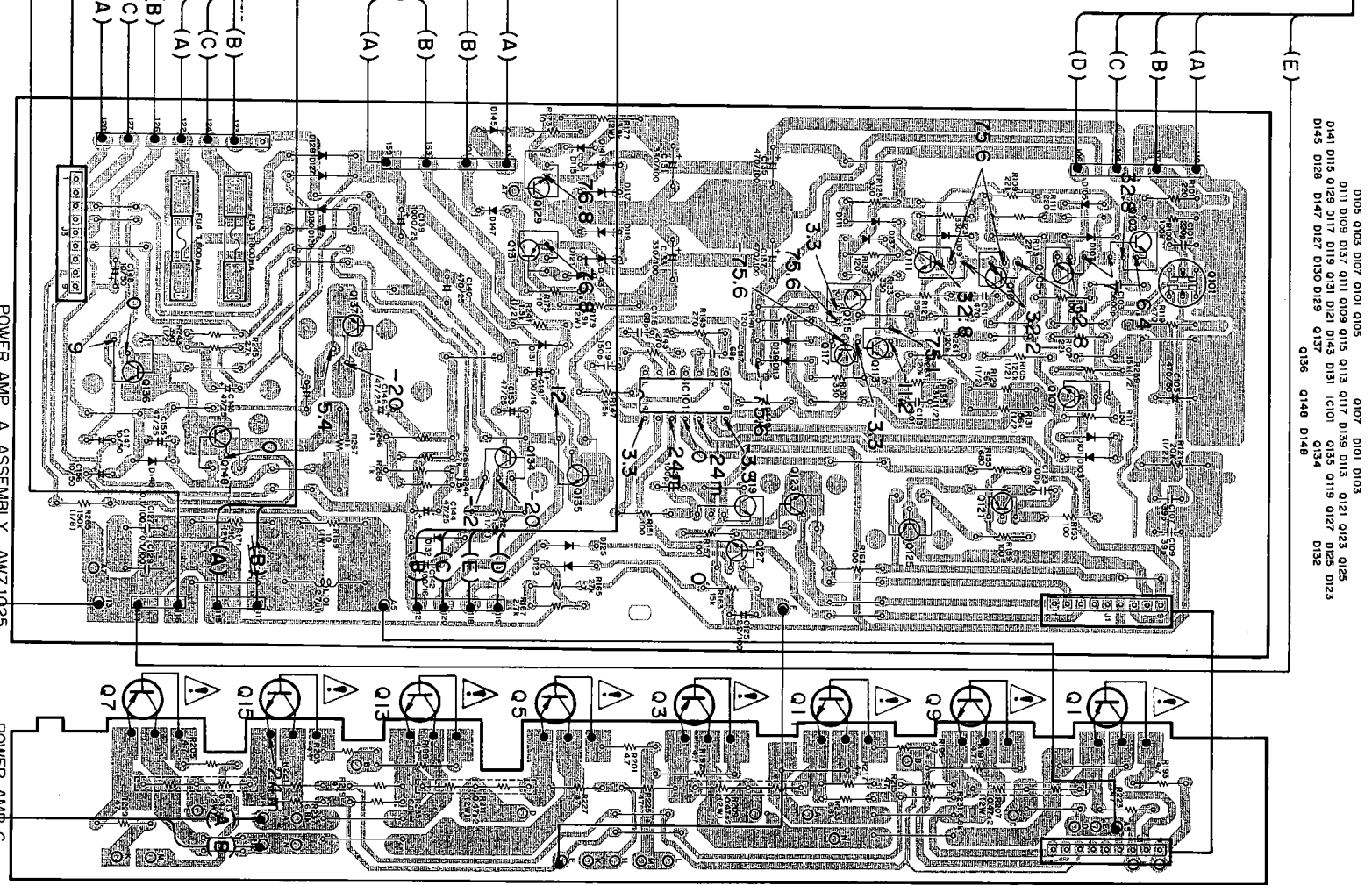
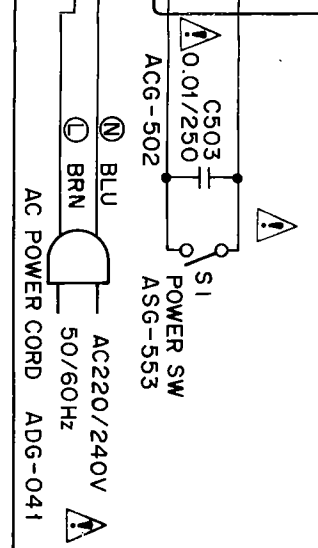
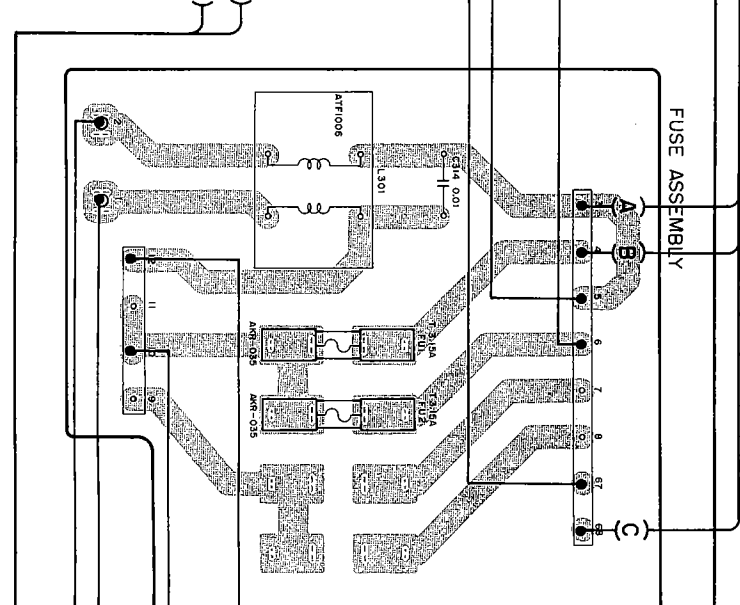
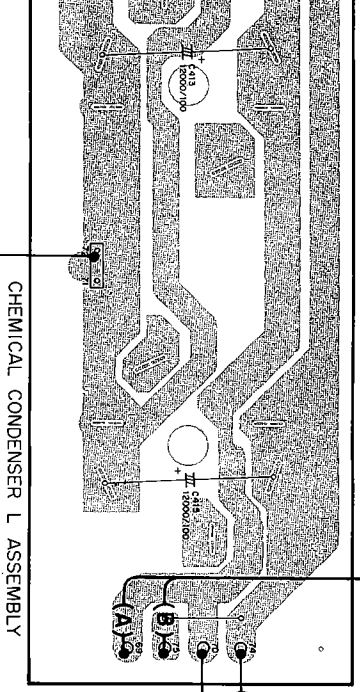
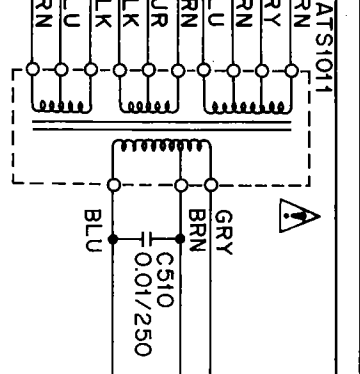
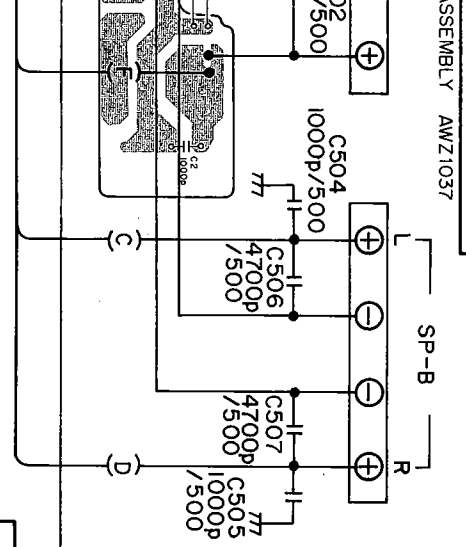
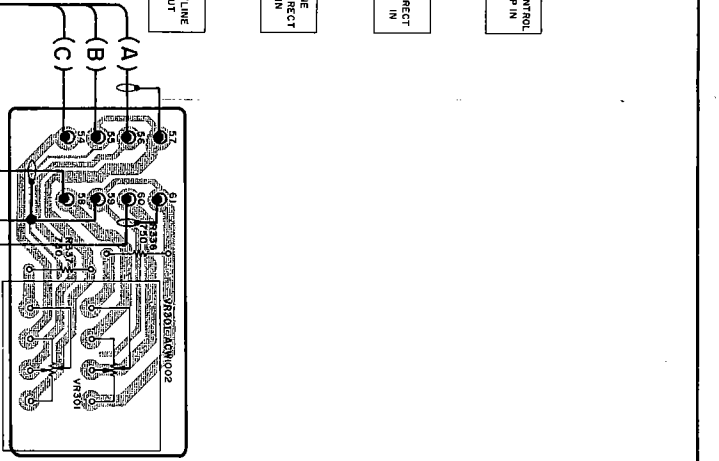


**NOTE:**  
 The sound quality of parts with the  mark denotes that these are fail-safe parts. Be sure that the designated parts are in the positions prescribed.

7 8 9 10 11 12



PINJACK ASSEMBLY



POWER AMP C ASSEMBLY

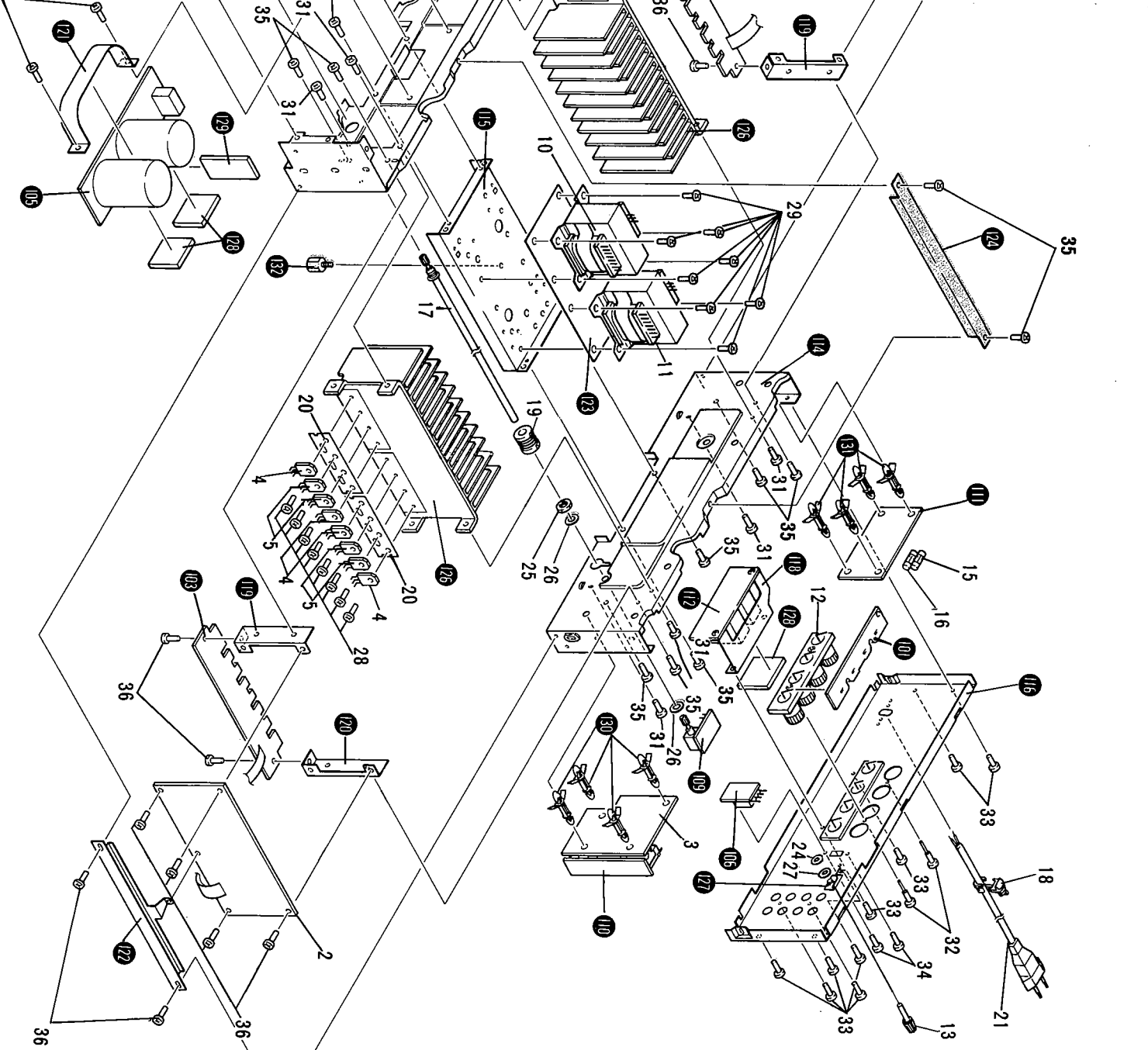
- D105 Q103 D107 Q101 Q105
- D111 D109 D117 Q111 Q109 Q115 Q113 Q117 D139 D113 Q121 Q123 Q125
- D141 D115 Q129 D117 Q119 Q131 D121 D143 D131 C101 Q135 Q119 Q127 D125 D123
- D145 D128 D147 D127 D130 D129 Q137 Q136 Q148 D148
- Q107 D101 D103
- Q101 Q102 Q104 Q106 Q108 Q110 Q112 Q114 Q116 Q118 Q120 Q122 Q124 Q126 Q128 Q130 Q132 Q134 Q136 Q138 Q140 Q142 Q144 Q146 Q148

A B C D


7 8 9 10 11 12



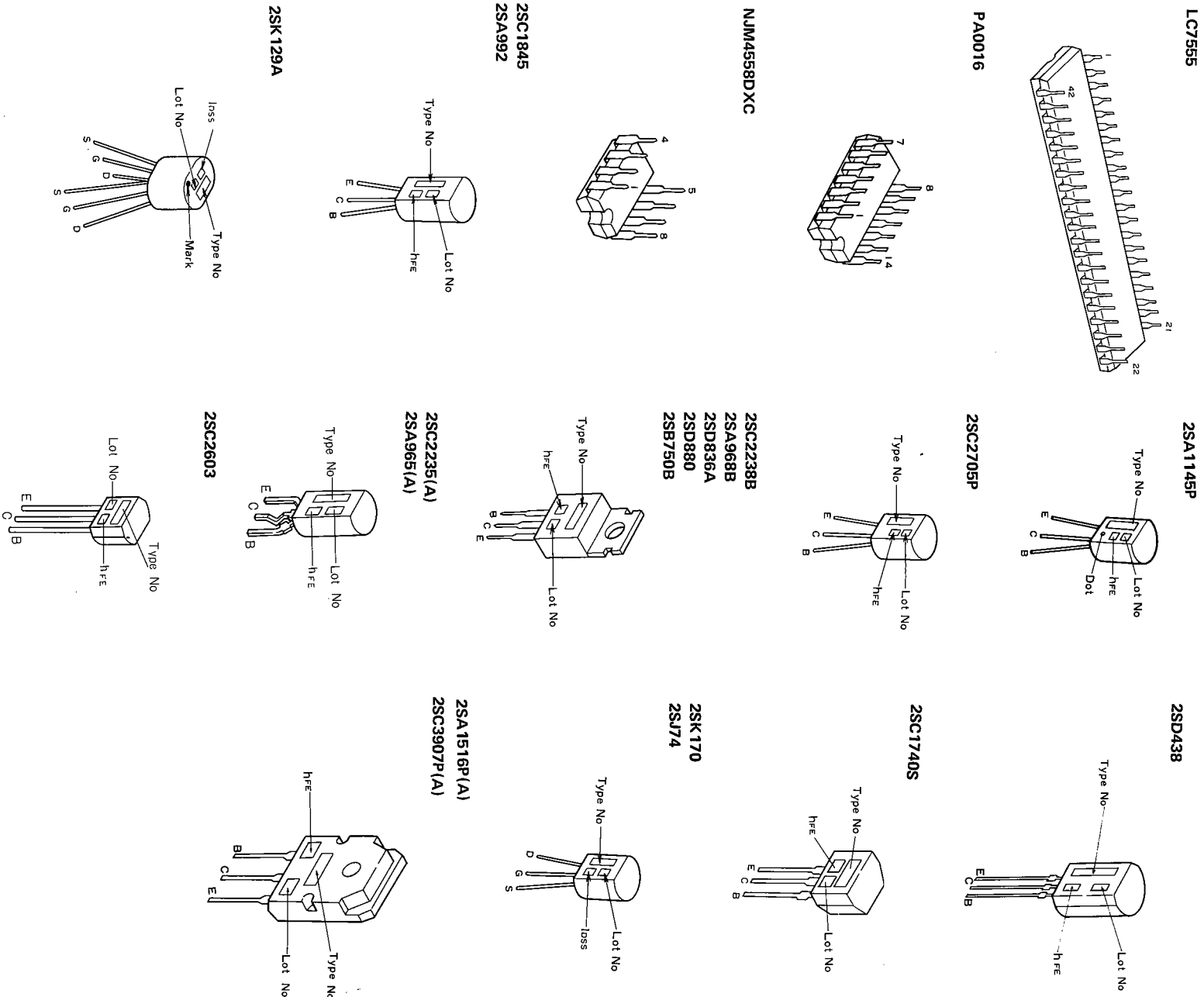
Parts List of Interior



Mark	No.	Part No.	Description	Mark	No.	Part No.	Description
	1	AWZ1025	Power amp A assembly		101		SP Terminal A assembly
	2	AWZ1026	Power amp B assembly		102		Power amp C assembly
	3	AWZ1036	Buffer amp assembly		103		Power amp D assembly
***	4	2SA1516P(A)	Transistor (Q1-Q8)		104		Chemical condenser L assembly
***	5	2SC3907P(A)	Transistor (Q9-Q16)		105		Chemical condenser R assembly
	6	ACG-019	Capacitor (C509)(0.01μF/150V)				
	7	ACG-502	Capacitor (C503, C508, C510)		106		Switch A assembly
	8	CKDYB102K500	Ceramic capacitor (C504, C505)		107		Switch B assembly
	9	CKDYB472K500	Ceramic capacitor (C501, C502, C506, C507)		108		Switch C assembly
△	10	ATS1011	Power transformer (T1)		109		Volume assembly
△	11	ATS1012	Power transformer (T2)		110		Terminal assembly
△	12	AKE-110	Power transformer (T2)		111		Fuse assembly
△	13	AKM-039	(220V/240V)		112		Relay assembly
△	14	ASG-553	Terminal 4P (SPEAKER)		113		Front frame
△	15	AEK-031	Terminal		114		Rear frame
△	16	AEK-042	Switch (POWER)		115		Frame (Transformer frame)
△	17	AXA1001	Fuse (FU3, FU4)(7800mA)				
△	18	AEC-327	Fuse (FU1, FU2)(T3, 15A)		116		Rear panel
△	19	AEP-098	Long shaft assembly		117		Panel stay
△	20	AMR1021	Strain relief		118		P.C.B. Holder-F
	21	ADG-041	Universal joint		119		P.C.B. Holder-A
	22	AKF-102	Mica sheet		120		P.C.B. Holder-B
	23	ABN-028	AC Power cord		121		Holder (Chemical condenser)
	24	NK70FUC	Mount plate		122		Side frame
	25	NK90FUC	Nut		123		Damper plate
	26	ABE1001	Nut		124		Center frame
	27	WG70FUC	Nut		125		.....
	28	ABA-297	Washer		126		Heat sink
	29	ABA1016	Washer		127		Earth plate
	31	ABA1007	Screw		128		Shield cushion
	32	ABA1008	Screw (3x10)		129		Cushion
	33	ABA1006	Screw (3x12)		130		P.C.B. Support
	34	VMZ30P060FCU	Screw		131		P.C.B. Support
	35	ABA1009	Screw		132		Sound pillar
	36	ABA1011	Screw				
	37	VMZ30P120FCV	Screw				

NOTE:  
The sound quality of parts with the  mark denotes that these are failsafe parts. Be sure that the designated parts are in the positions prescribed.

External Appearance of Transistors and ICs



7. ELECTRICAL PARTS LIST

- NOTES:**
- When ordering resistors, first convert resistance values into code form as shown in the following examples.
  - Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J=5%, and K=10%).
 

560Ω	56 × 10 <sup>1</sup>	561	RD½PS 5 6 1 J
47kΩ	47 × 10 <sup>3</sup>	473	RD½PS 4 7 3 J
0.5Ω	0R5	0R5	RN2H 0 5 K
1Ω	010	010	RS1P 0 1 0 K
  - Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).
 

5.62kΩ	562 × 10 <sup>1</sup>	5621	RN½SR 5 6 2 1 F
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  - The  $\Delta$  mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
  - For your Parts Stock Control, the fast moving items are indicated with the marks **★★** and **★**.
  - ★★ **GENERALLY MOVES FASTER THAN ★**
  - This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
  - Parts marked by "  $\odot$  " are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.

Miscellaneous Parts

P.C. BOARD ASSEMBLIES

Mark	Symbol & Description	Part No.
	Power amp A assembly	AWZ1025
	Power amp B assembly	AWZ1026
	FL assembly	AWZ1037
	Buffer amp assembly	AWZ1036
	SP Terminal A assembly	Non supply
	Power amp C assembly	Non supply
	Power amp D assembly	Non supply
	Chemical condenser L assembly	Non supply
	Chemical condenser R assembly	Non supply
	Switch A assembly	Non supply
	Switch B assembly	Non supply
	Switch C assembly	Non supply
	Volume assembly	Non supply
	Terminal assembly	Non supply
	Fuse assembly	Non supply
	Relay assembly	Non supply

TRANSFORMERS

Mark	Symbol & Description	Part No.
$\Delta$	T1 Power transformer (Lch) (220V, 240V)	ATS1011
$\Delta$ ★	T2 Power transformer (Rich) (220V, 240V)	ATS1012

CAPACITORS

Mark	Symbol & Description	Part No.
$\Delta$	C509 Ceramic capacitor (0.01μF/150V)	ACG-019
$\Delta$	C503, C508, C510 Ceramic capacitor (0.01μF/400V)	ACG-502
$\Delta$	C504, C505 Ceramic capacitor	CKDYB102K500
$\Delta$	C501, C502, C506, C507 (Ceramic capacitor)	CKDYB472K500

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
$\Delta$ ★★	O1-O8	2SA1516P(A)
$\Delta$ ★★	O9-O16	2SC3907P(A)

FUSES

Mark	Symbol & Description	Part No.
$\Delta$ ★★	FU3, FU4 Fuse (T800mA)	AEK-031
$\Delta$ ★★	FU1, FU2 Fuse (T3.15A)	AEK-042

SWITCH

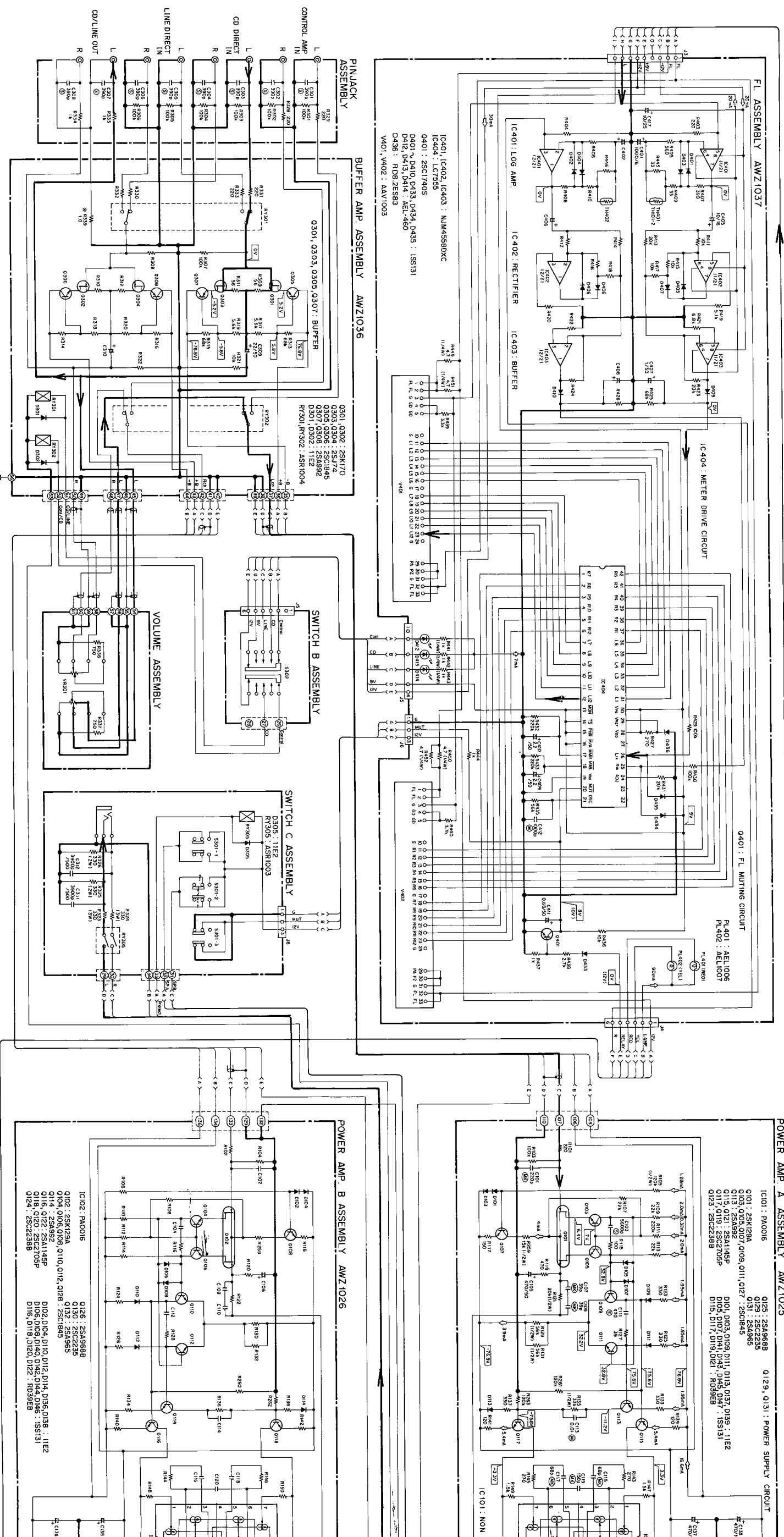
Mark	Symbol & Description	Part No.
$\Delta$ ★★	S1 Push switch (POWER)	ASG-553

OTHERS

Mark	Symbol & Description	Part No.
$\Delta$	Terminal 4P (SPEAKERS)	AKE-110
$\Delta$	Terminal (GND)	AKM-039
$\Delta$	AC Power cord	ADG-041

# 6. SCHEMATIC DIAGRAM

1 2 3 4 5 6



1 2 3 4 5 6

