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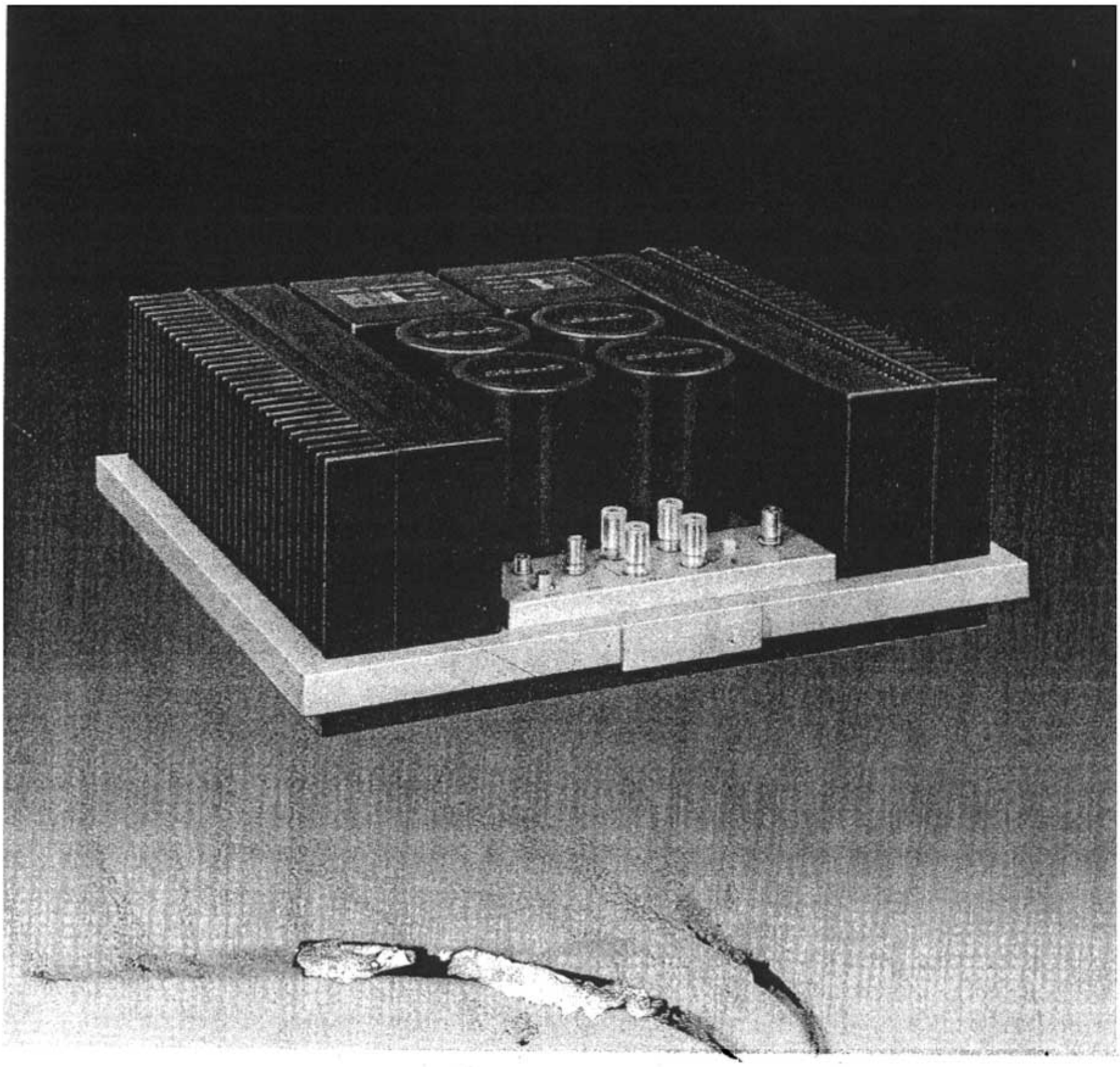
please visit www.hifiengine.com



Service Manual

STEREO AMPLIFIER

M-25

PIONEER®

CONTENTS

1. SPECIFICATIONS

Semiconductors

Transistors 55
Diodes 51

Amplifier Section

Circuitry . . . First stage current mirror loaded, Three-stage Darlington, Parallel push-pull, Pure complementary OCL (class AB operation)

Continuous Power Output of 120 watts* per channel, min., at 8 ohms from 5 Hertz to 30,000 Hertz with no more than 0.01 % total harmonic distortion, or 120 watts*per channel at 4 ohms from 5 Hertz to 20,000 Hertz with no more than 0.02% total harmonic distortion.

Total Harmonic Distortion (20 Hertz to 20,000 Hertz, 8 ohms)
Continuous rated power output . .No more than 0.008%
Total Harmonic Distortion (5 Hertz to 30,000 Hertz, 8 ohms)
Continuous rated power output . . No more than 0.01%
60 watts per channel
power output . . . . . No more than 0.008%
1 watt per channel
power output . . . . . .No more than 0.008%
Intermodulation Distortion (50 Hertz : 7,000 Hertz=4:1)
Continuous rated power output . . No more than 0.006%
60 watts per channel
power output . . . . . .No more than 0.005%
1 watt per channel
power output . . . . . .No more than 0.005%
Frequency Response . . . . 5 Hertz to 200,000 Hertz $^{+0}_{-1}$ dB
Input (Sensitivity / Impedance) . . . . . 1V/50 kilohms
Output
Speaker . . . . . .4 ohms to 16 ohms
Damping Factor (5 Hertz to 30,000 Hertz, 8 ohms) 60
Hum and Noise (IHF, short-circuited, A network) . . 120dB

Miscellaneous

Power Requirements . . . . . .120V, 60Hz only
Power Consumption . . . . . 320 watts (UL)
Dimensions . . . . . .420(W) x 153(H) x 370(D)mm
16-9/16 x 6-1/32 x 14-9/16 in.
Weight without package 23.5kg; 51lb 11oz
with package 26.2kg; 57lb 10oz

Furnished Parts

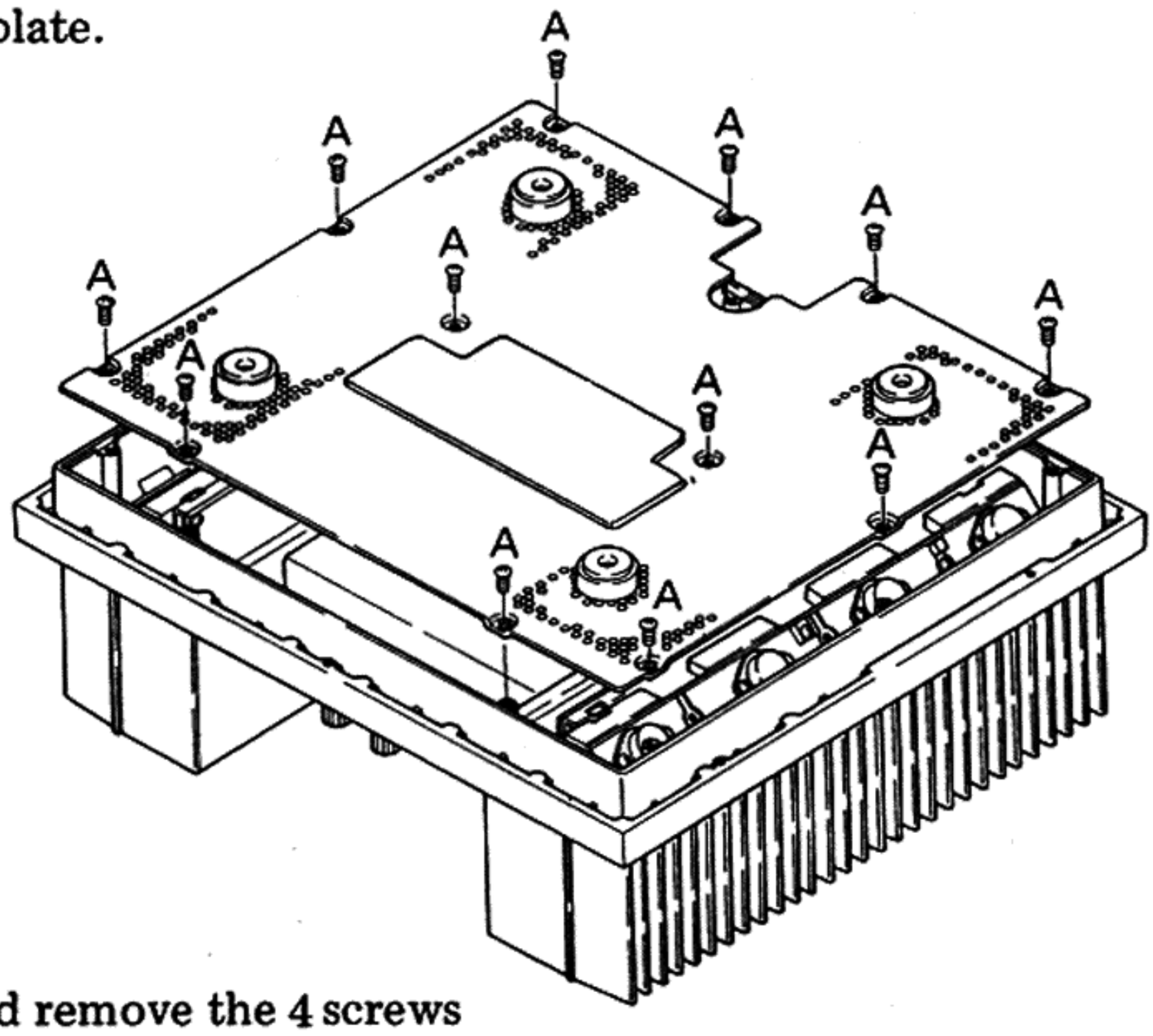
Connection Cord with Pin Plugs 1
Operating Instructions 1

**Measured pursuant to Federal Trade Commission's Trade Regulation rule on Power Output Claims for Amplifiers.*

NOTE:
Specifications and the design subject to possible modification without notice due to improvements.

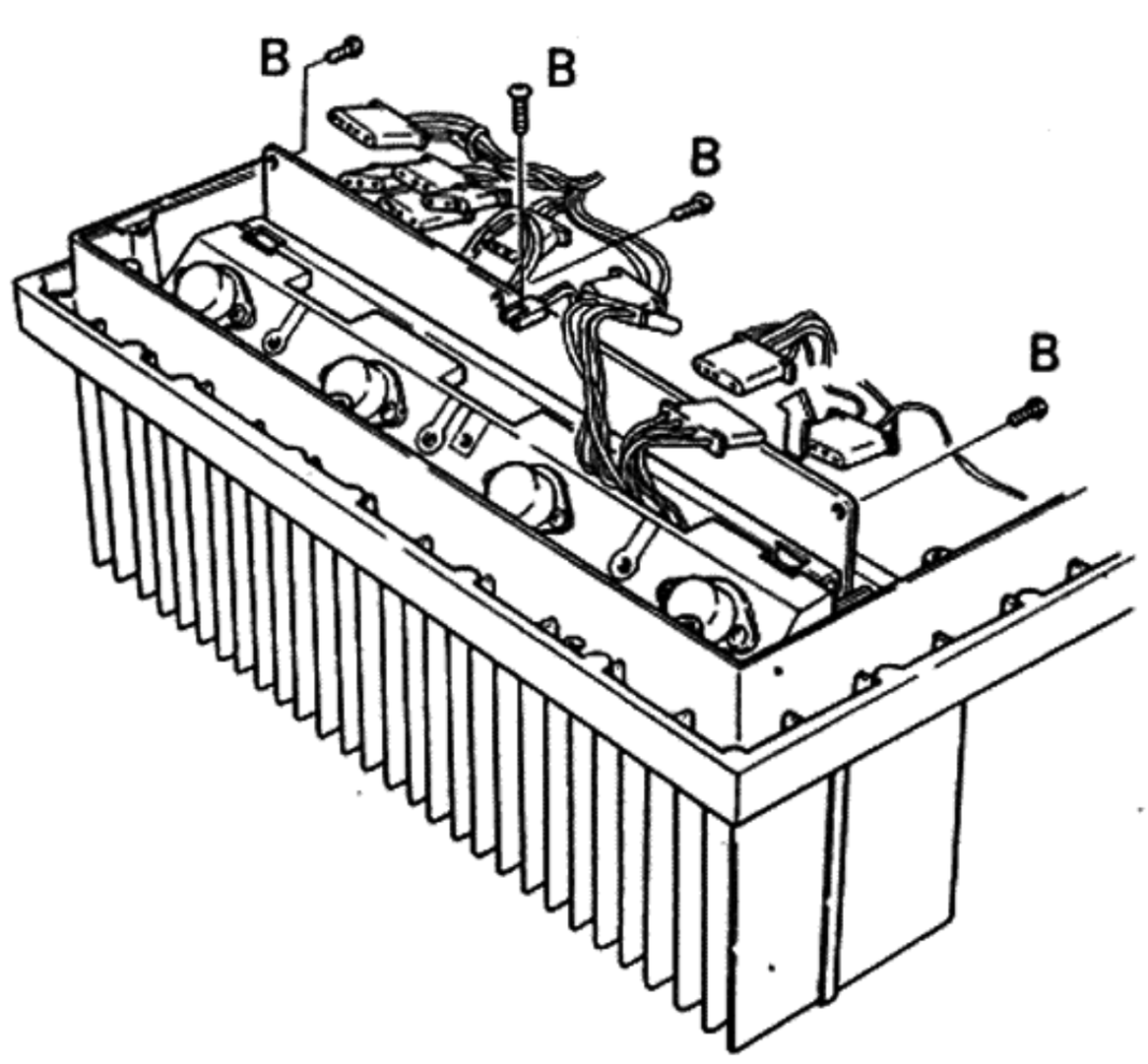
2. DISASSEMBLY

Remove the 12 mounting screws (A) at the bottom plate and lift off the bottom plate.



AF Power Assembly

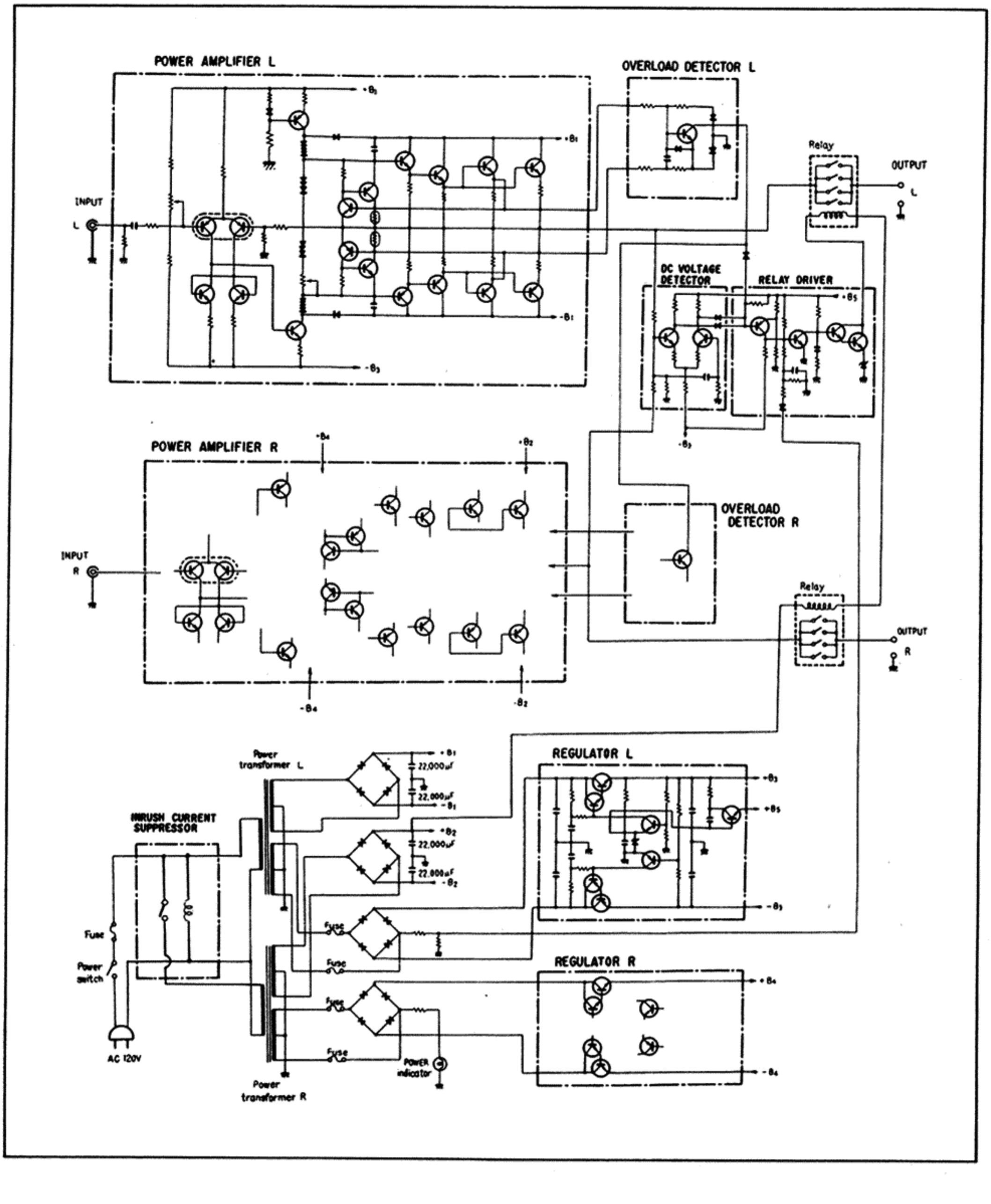
Disconnect the connectors and remove the 4 screws (B). Pull off the P.C. board.



Heat Sink

Remove the 4 screws (C).

3. BLOCK DIAGRAM



4. CIRCUIT DESCRIPTIONS

The block diagram of this unit is given on page 5.

4.1 POWER AMP (Fig. 1)

The first stage is a PNP silicon dual transistor differential amp (Q_1) with a current mirror load (Q_2, Q_3) that porvides a stable high gain. The voltage amplification stage (Q_5) has a constant-current circuit (Q_4) as its load, and performs high-linearity, high gain amplification. D_1 and E_1 in Fig. 1 limit the peak value of the positive drive voltage, and D_2 and E_3 limit the peak value of the negative drive voltage to prevent clipping at the power stage. The bias circuit maintains the bias voltage constant by detecting the temperature of the drive transistor and power stage with a thermister.

The current control circuit (Q_6, Q_7, Q_8, Q_9) prevents overcurrent flowing, and controls the power at a 4Ω load. If an overcurrent should flow in the power transistor at a 4Ω load for any reason, the voltage drop across the emitter resistance of the transistor becomes higher than that during normal operation. Since this voltage is divided and applied to the base of Q_7 and Q_8, Q_6 and Q_9 are turned ON, and the signal voltage applied to the power stage is reduced. The output stage is a 3-stage Darlington parallel push-pull SEPP circuit. Since the newly developed power transistor RET (Ring Emitter Transistor) uses an NPN. PNP pair, and the emitter resistor is an extremely low-inductance, non-inductive winding wire-wound resistor, maximum output is obtained up to the ultra-high region.

4.2 PROTECTION CIRCUIT (Fig. 2)

A protection circuit is provided that automatically turns tha output circuit on and off using a relay, to protect the amp and speakers. A four-circuit relay is employed. One of these relays is used for each channel and the contacts are connected in parallel for improved reliability. The Pioneer standard protection circuit consists of the three sections shown in Fig. 2.

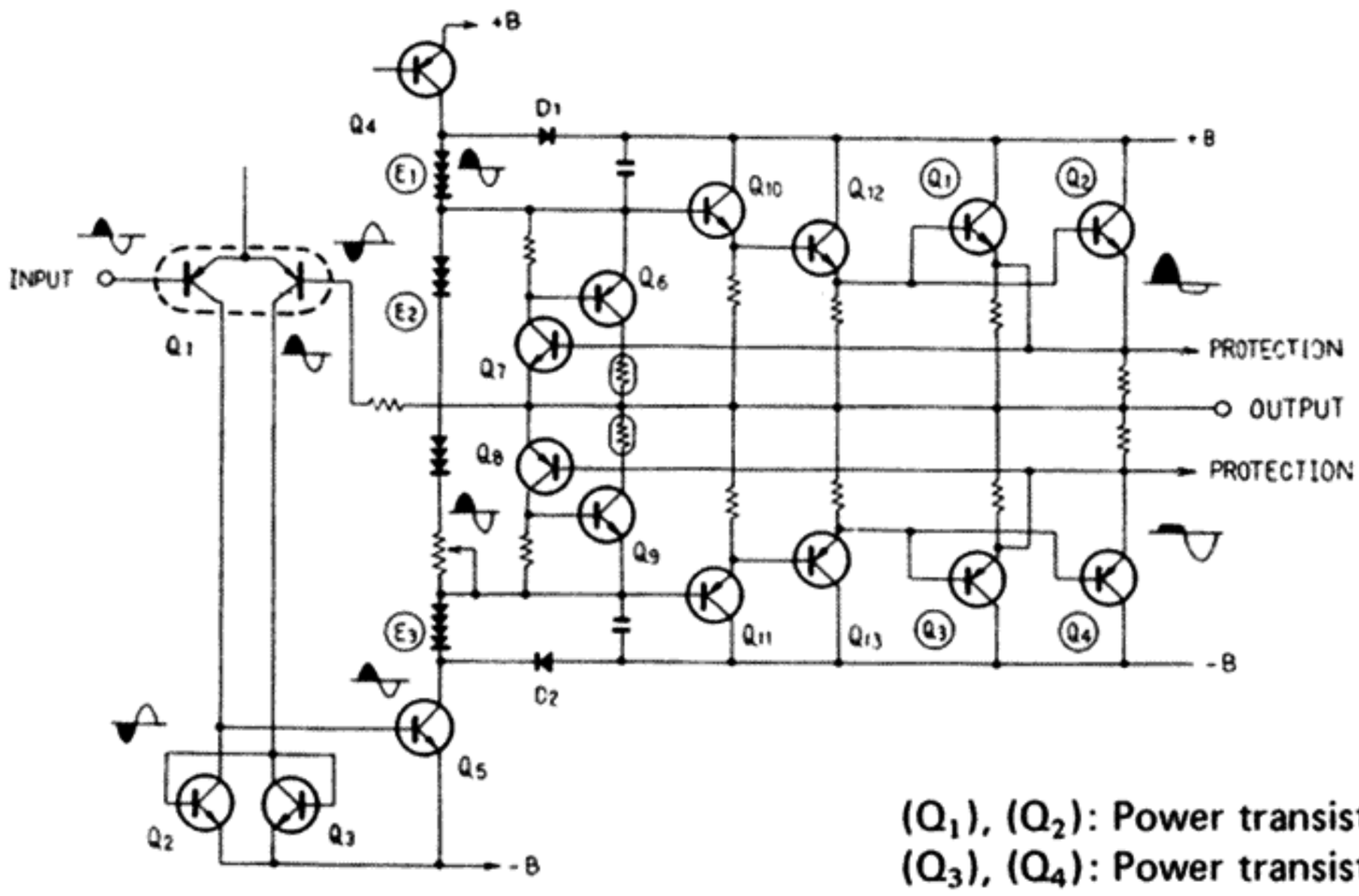
- **Relay drive section**

This circuit controls operation of the relay. When the power switch is set to the ON position, the signal is gradually faded in (muting); and when the power switch is set to the OFF position, power is quickly cut off. The output is opened by command from the DC-voltage detector and overcurrent detector.

During normal operation, reverse bias is applied to the base of Q_{18}, and Q_{18} is cut off. When an abnormal voltage is detected by the DC-voltage detector, current flows thru R_{65}, and base potential of Q_{18} suddenly drops, and Q_{18} is turned ON. Since forward bias is applied to Q_{19}, Q_{19} is turned ON, and the voltage at point (A) drops, Q_{20} and Q_{21} are turned OFF (relay contacts released).

- **DC voltage detector**

This circuit detects the DC voltage generated at the output center point. This circuit employs a differential amp with capacitors connected between the bases of the transistors, and one terminal connected to the output center point. The outputs are in phase and cancel mutually for AC signals, and the balance is disturbed for DC voltages and only the DC voltage is detected.



(Q_1), (Q_2): Power transistor MN25
(Q_3), (Q_4): Power transistor MP25

Fig. 1

When the DC balance of the power stage is disturbed for some reason, a differential voltage is generated between the bases of the differential transistors, the collector currents of Q_{16} or Q_{17} are unbalanced, and diode D_{16} or D_{17} conducts. Therefore, Q_{18} is turned ON and a signal is sent to the relay drive circuit so that the output circuit is opened.

- **Overload detector**

This circuit detects shorting of the output circuit or excessively low load resistance. There are two bridge circuits with the load (speaker, etc.) as one leg. When these bridge circuits are unbalanced, or V_{BE} of Q_{14} exceeds 0.6V, a signal is sent to the relay drive circuit to open the output circuit.

4.3 POWER SUPPLY CIRCUIT (Fig. 3)

Two power transformers are used, and the left and right amp power supplies are completely independent. Power is supplied to the power amp stage by a bridge rectifier and two large 22,000μF capacitors. power is supplied to the drive stage from a winding separate from the power stage thru a bridge rectifier and voltage regulator.

- **Surge killer circuit**

When the power switch of an amp having two high-capacity power supplies, such as this unit, is set to the ON position, an extremely large inrush current flows, and the primary side fuse-having a capacity that allows safe normal operation, would be blown, or the AC line is adversely affected. Moreover, the surge current of the rectification diode also becomes large because the capacity of the smoothing capacitor is large. Therefore, a surge killer is provided at the primary side of the power transformer to protect the AC line, and thus control the surge current of the rectification diode.
When the power switch (S_1) is set to the ON position, current flows in the relay (RL_3), and the relay contacts are closed. The closing time of these contacts are closed is utilized to control the surge current.
Since this period is shorter than the muting time of the output circuit when the power switch is set to the ON position, it has no affect on normal operation.

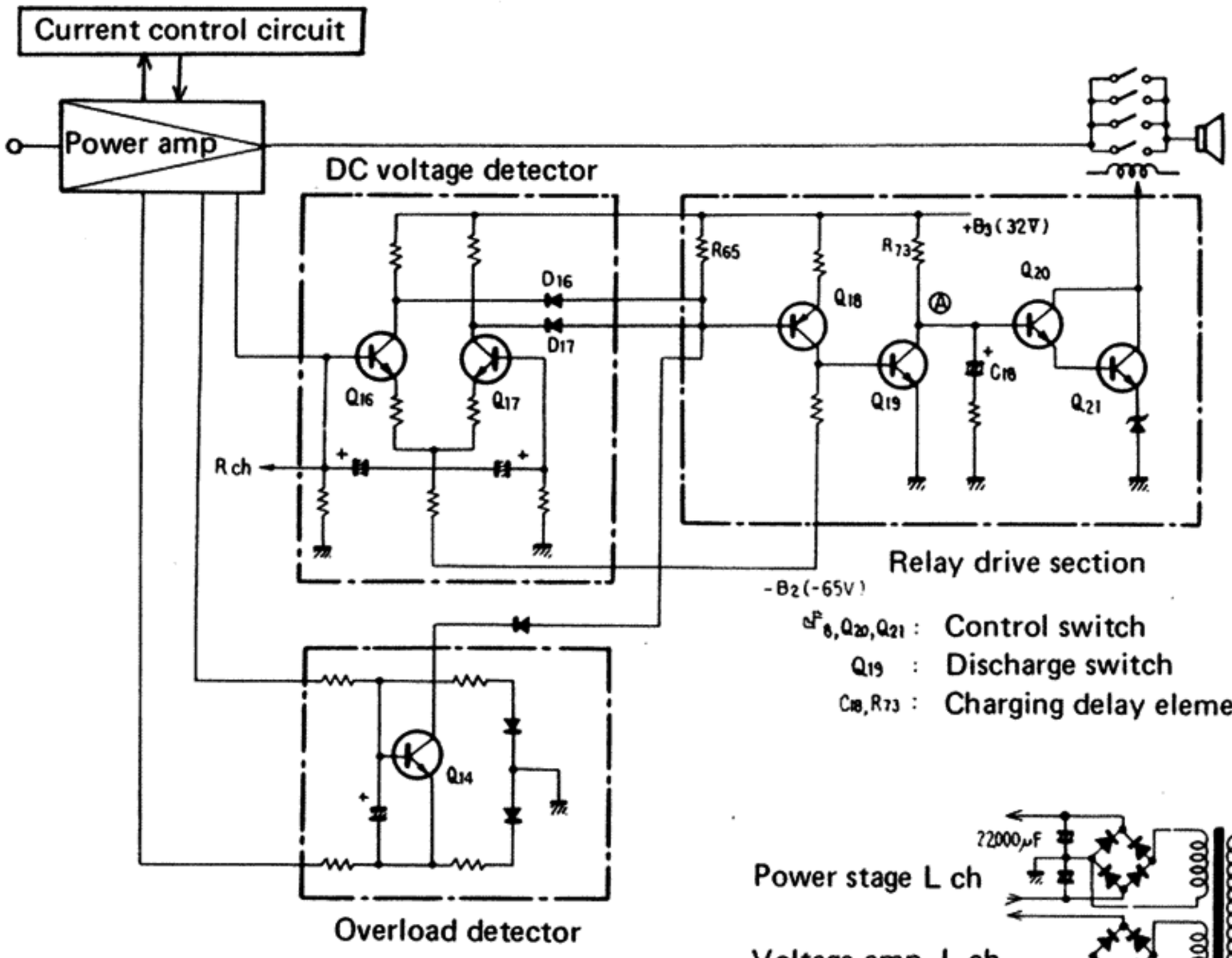


Fig. 2

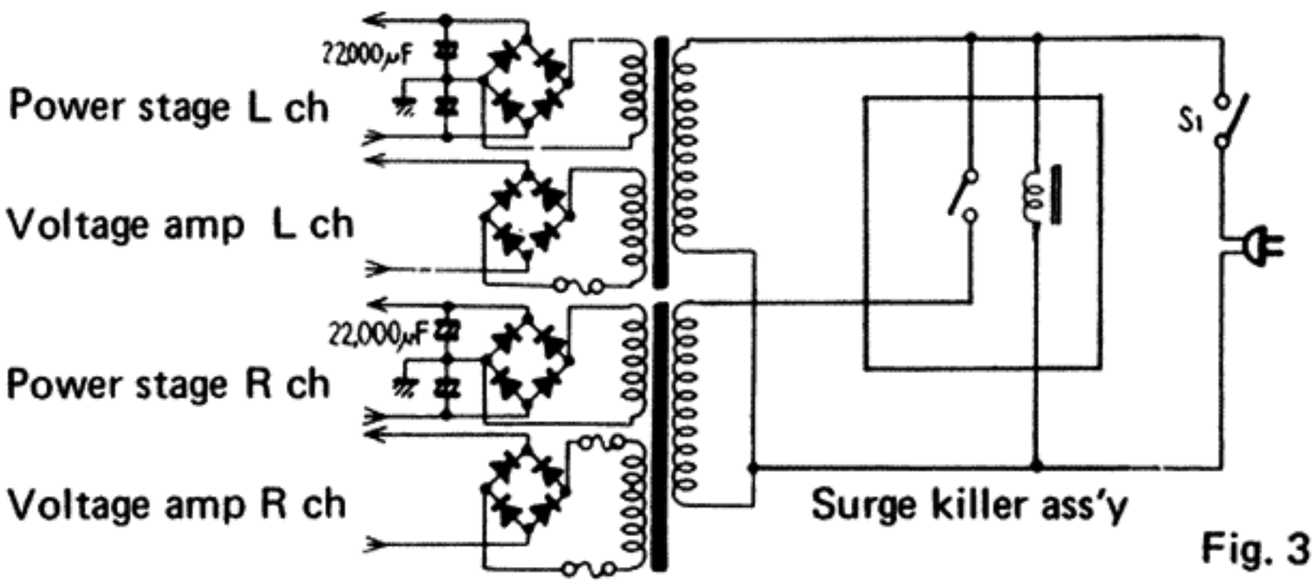
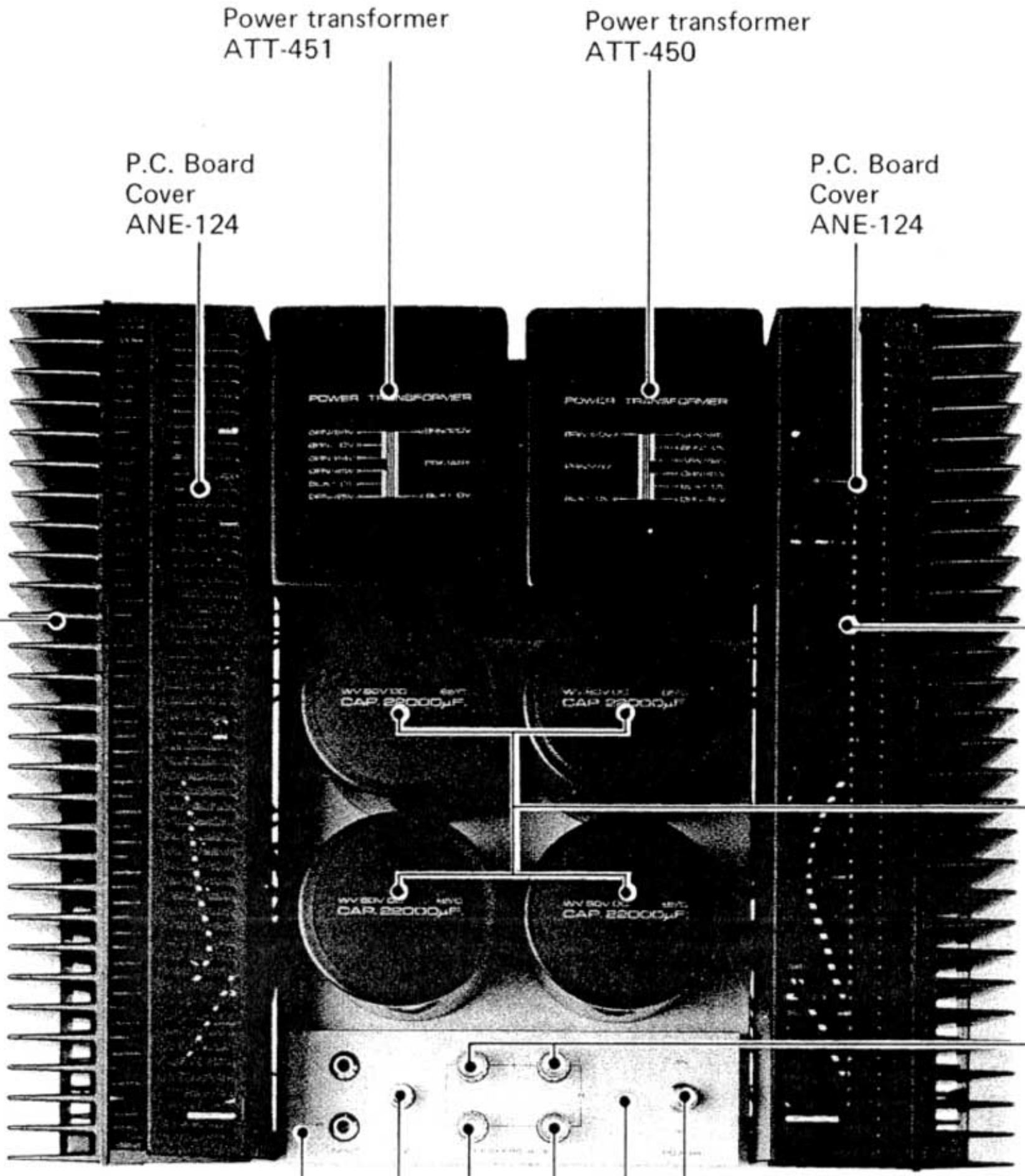


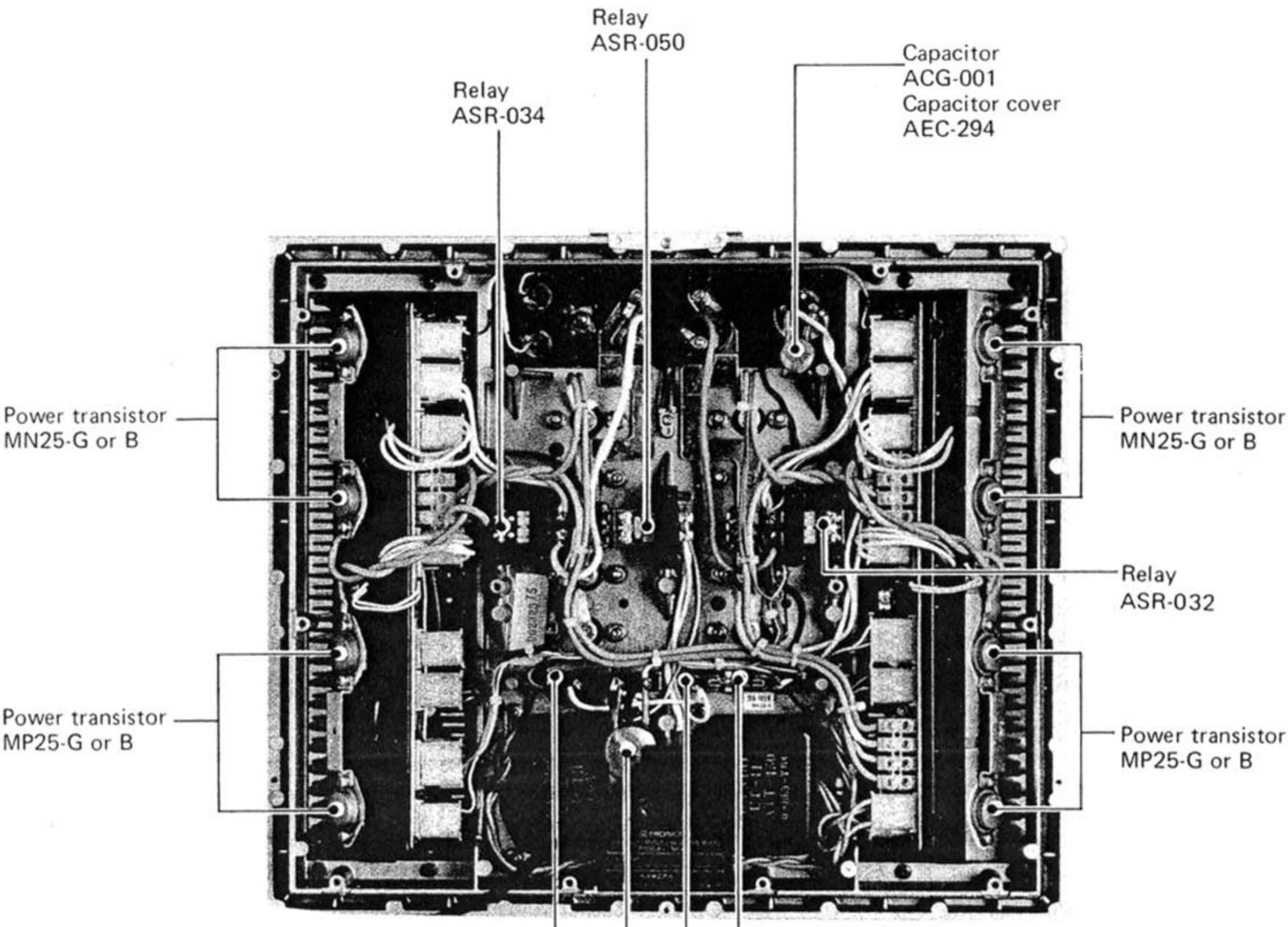
Fig. 3

5. PARTS LOCATION

5.1 TOP VIEW



5.2 BOTTOM VIEW



6. ADJUSTMENT

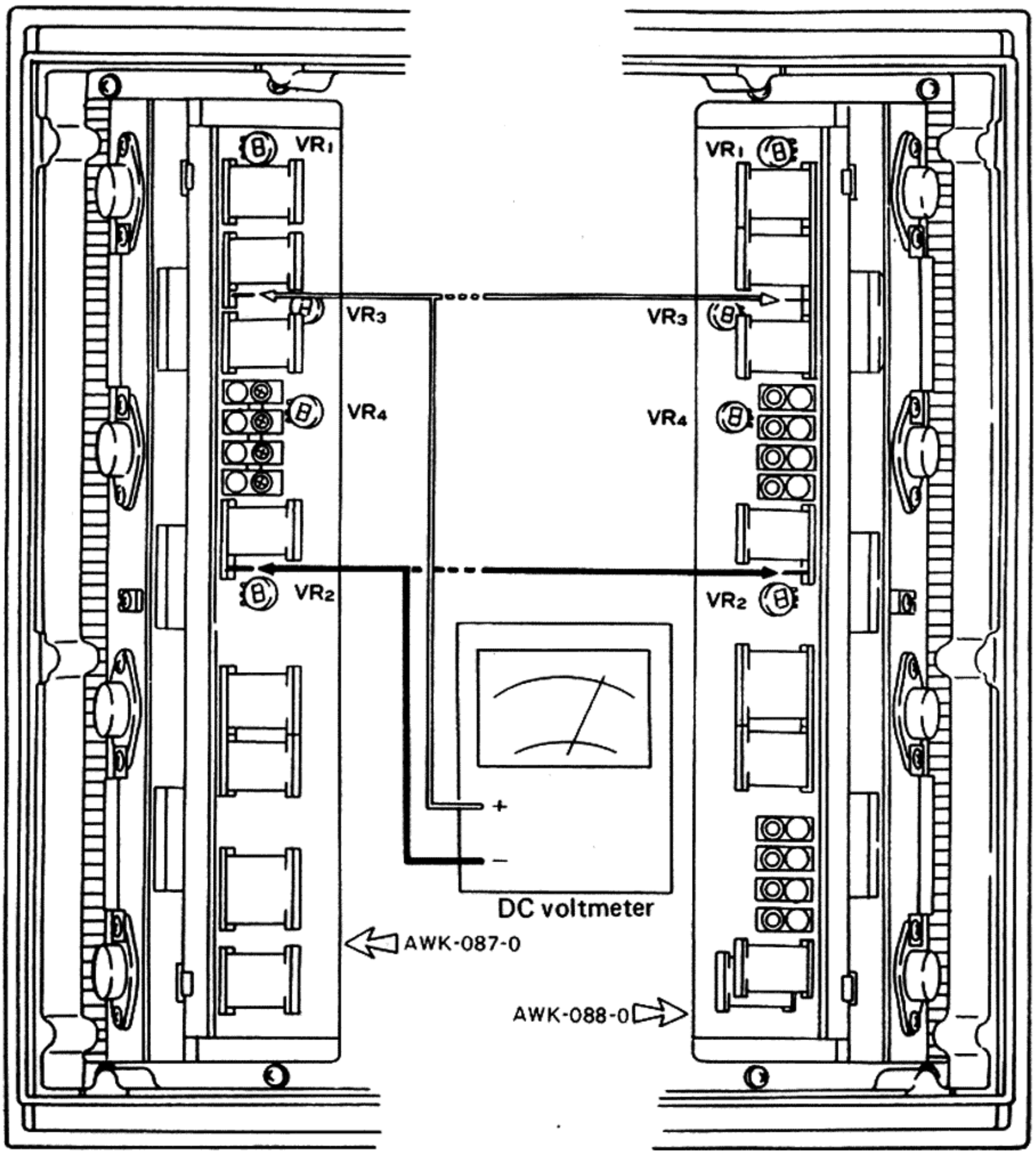
- Open the input output terminals.
- The left channel is AWK-087, and the right channel is AWK-088. Both the left and right channels are adjusted in the same manner.
- Turn the amp upside down.

6.1 IDLE CURRENT ADJUSTMENT

1. Connect a DC voltmeter between the TP terminals, and adjust VR_2 to obtain a voltmeter reading of 0.2V.
2. Ten minutes or more after the power has been turned on, re-adjust VR_2 to obtain a voltmeter reading of 0.09V.

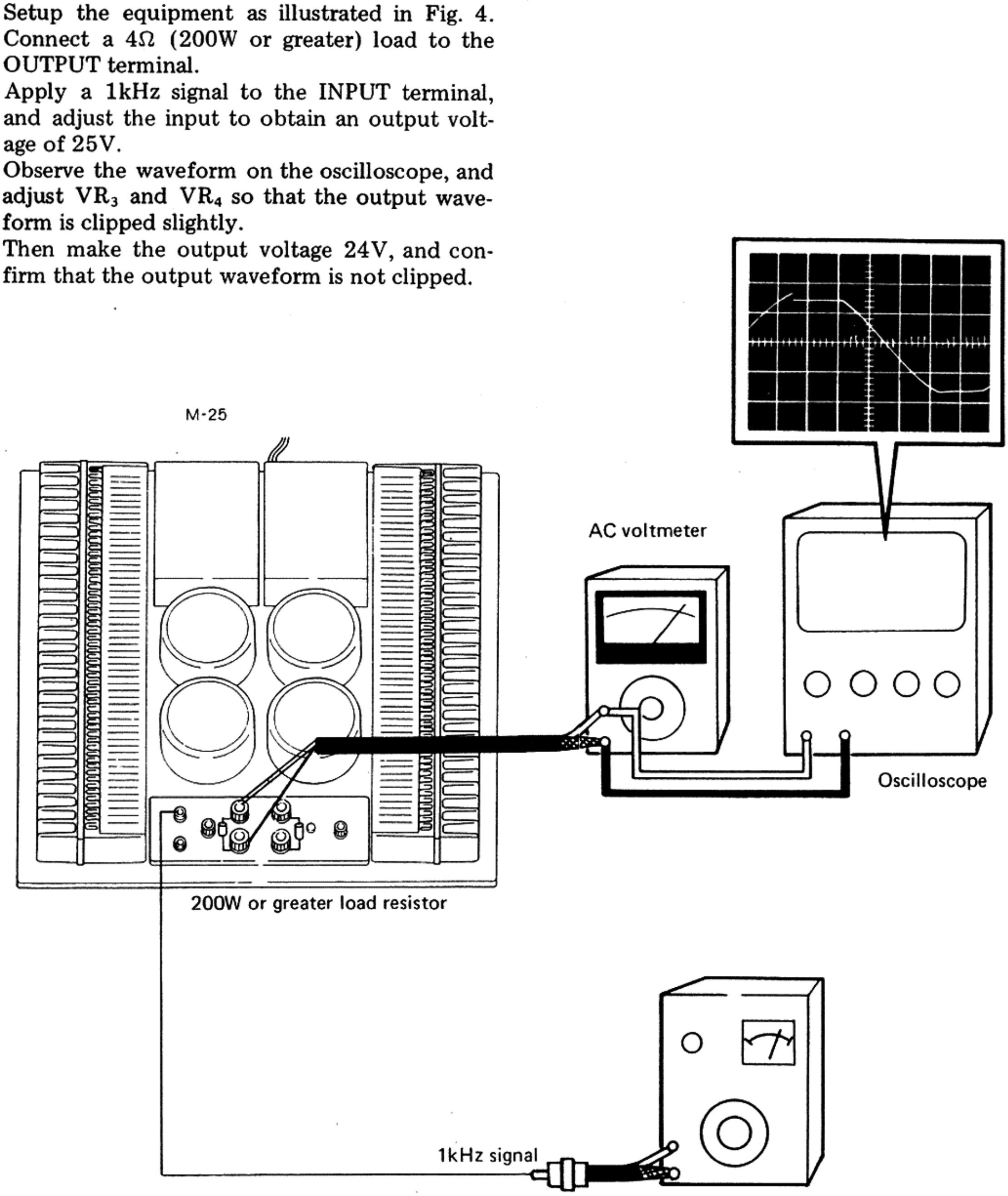
6.2 CENTER POTENTIAL ADJUSTMENT

1. Adjust VR_1 to obtain a voltage of 20mV across the output terminals (+, −).



6.3 CURRENT CONTROL CIRCUIT ADJUSTMENT

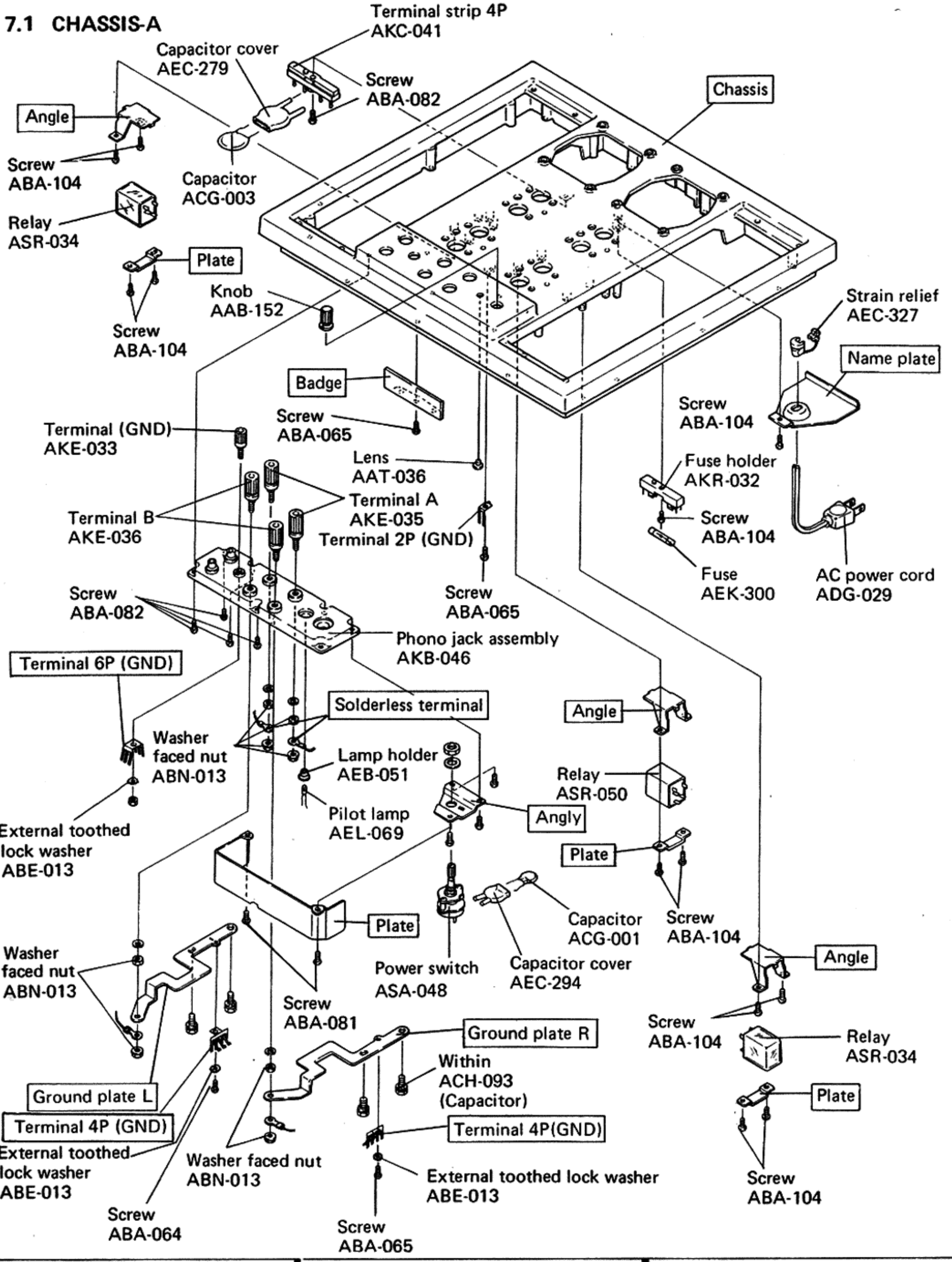
1. Setup the equipment as illustrated in Fig. 4. Connect a 4Ω (200W or greater) load to the OUTPUT terminal.
2. Apply a 1kHz signal to the INPUT terminal, and adjust the input to obtain an output voltage of 25V.
3. Observe the waveform on the oscilloscope, and adjust VR_3 and VR_4 so that the output waveform is clipped slightly.
4. Then make the output voltage 24V, and confirm that the output waveform is not clipped.



7. EXPLODED VIEW

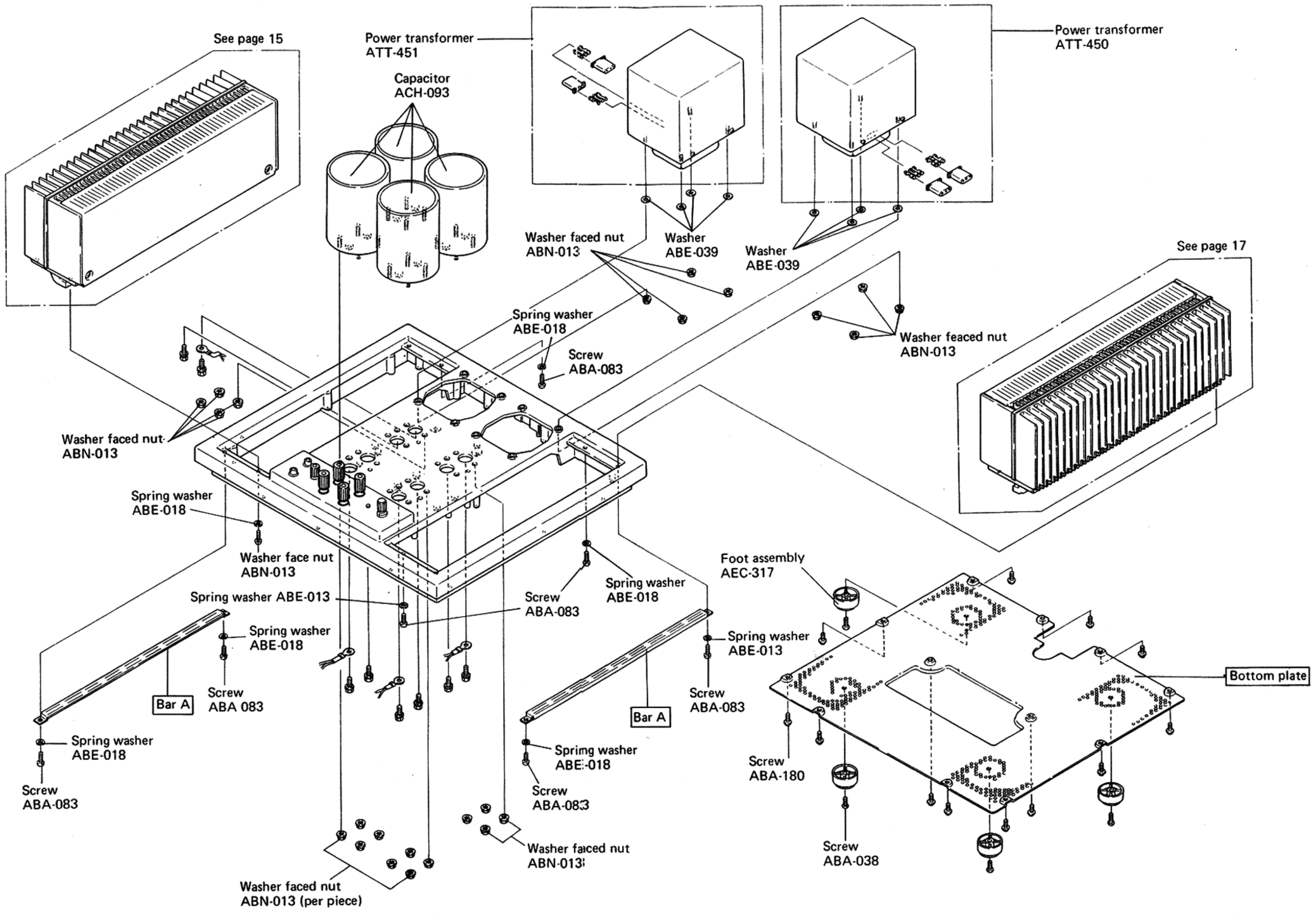
NOTE:
marked parts cannot be supplied.

7.1 CHASSIS-A



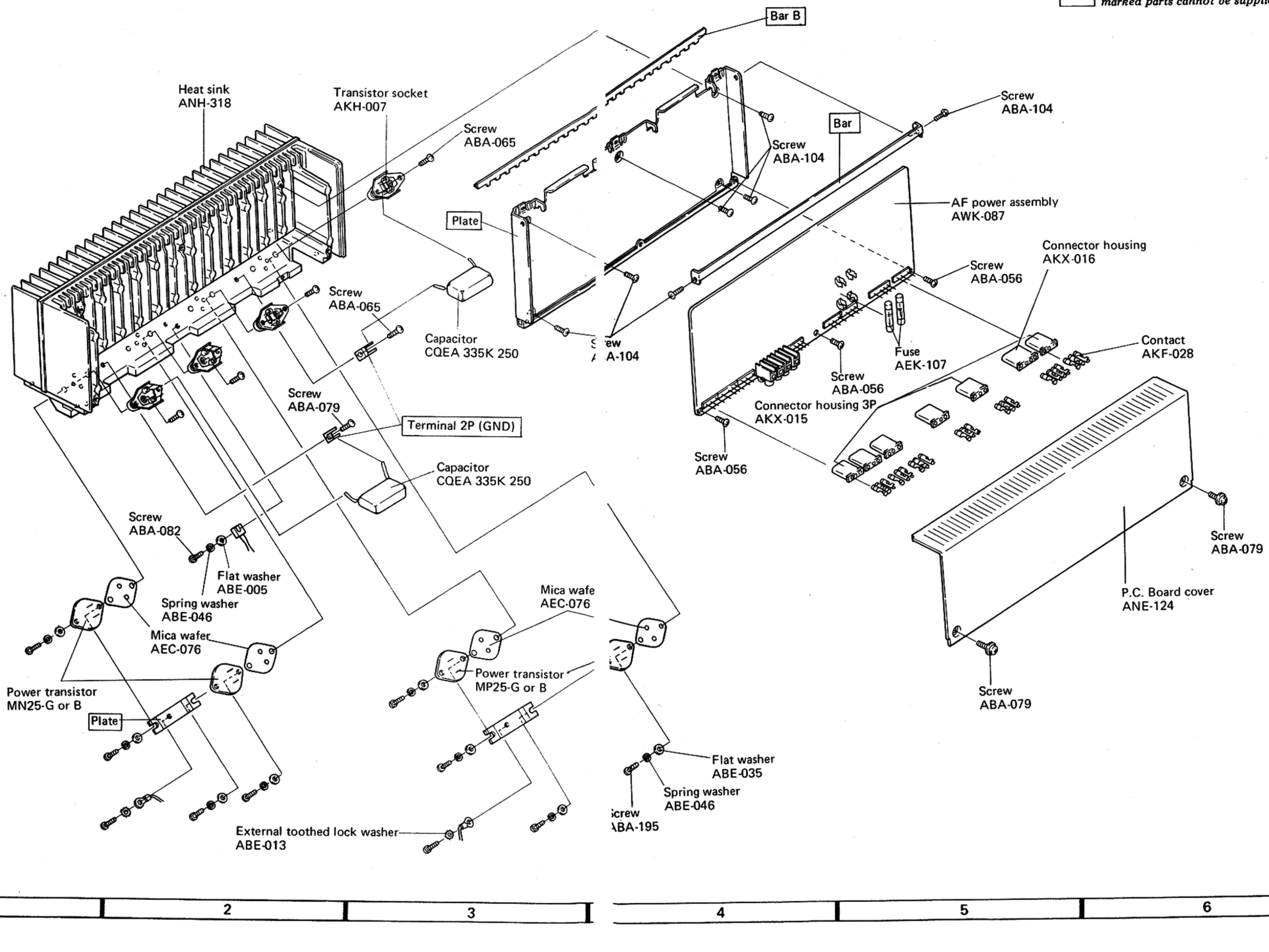
7.2 CHASSIS-B

NOTE:
marked parts cannot be supplied.



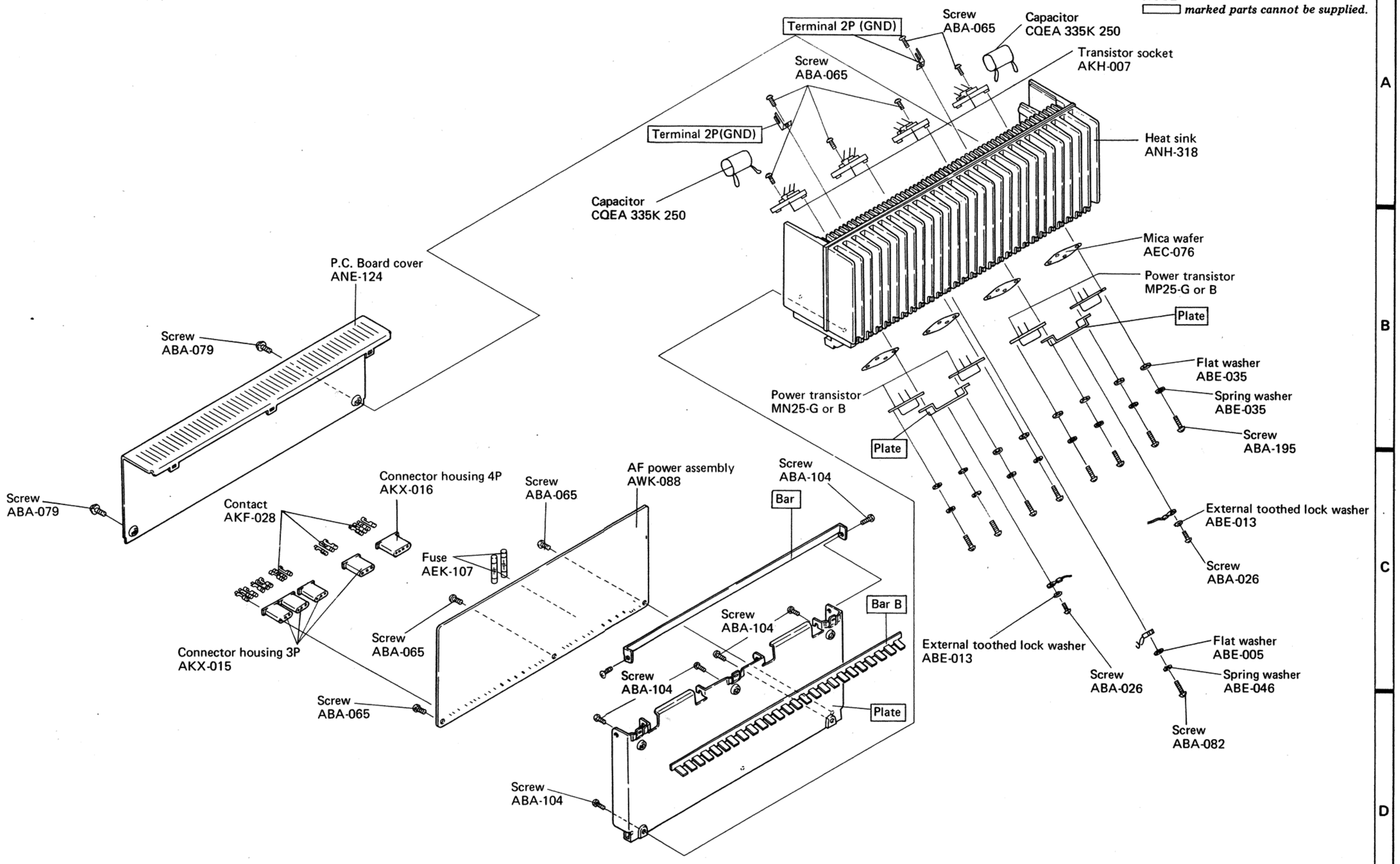
7.3 POWER AMPLIFIER (L)

NOTE:
marked parts cannot be supplied.

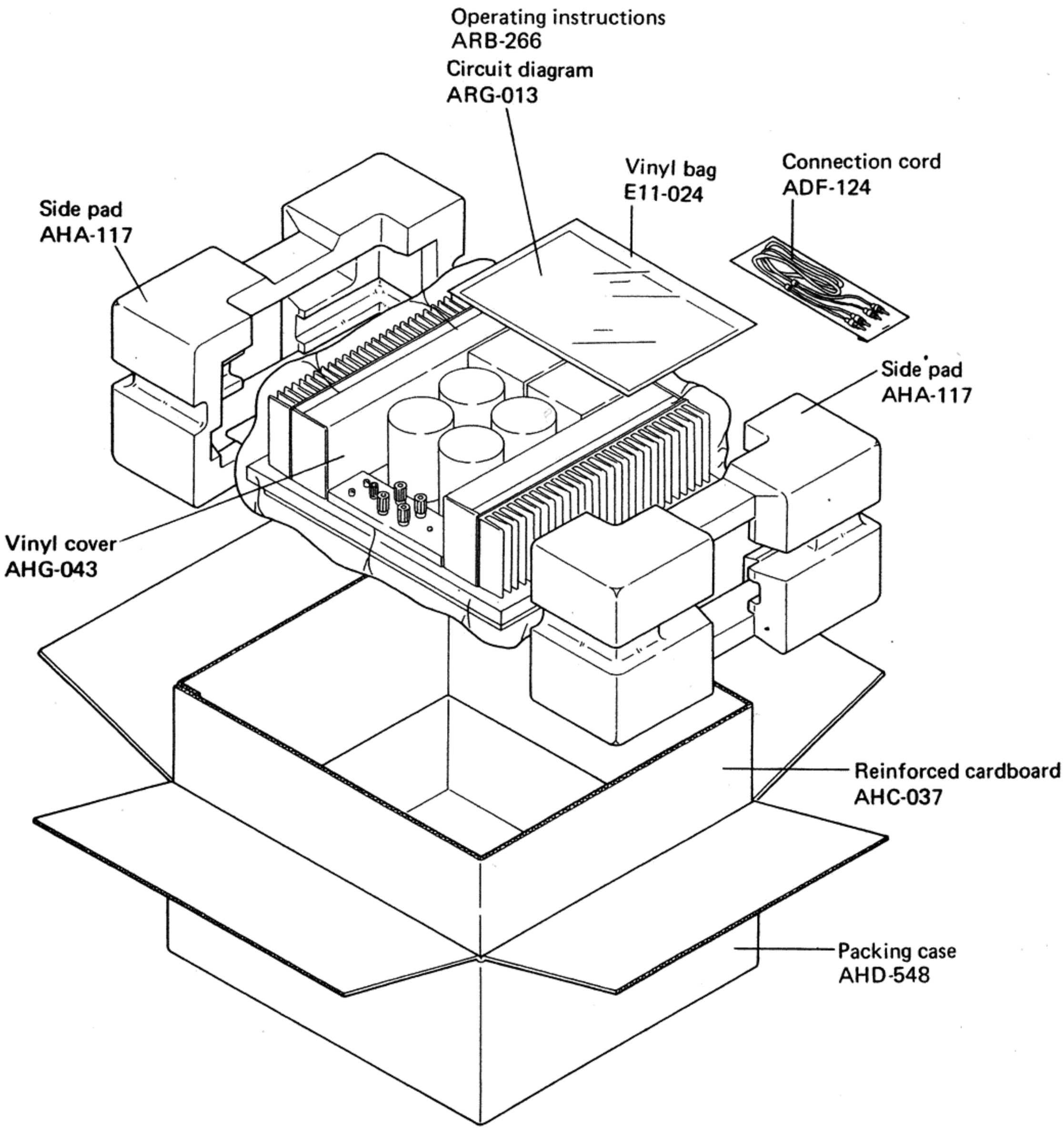


7.4 POWER AMPLIFIER (R)

NOTE:
marked parts cannot be supplied.



8. PACKING


Operating instructions
ARB-266
Circuit diagram
ARG-013
Vinyl bag
E11-024
Connection cord
ADF-124
Side pad
AHA-117
Side pad
AHA-117
Vinyl cover
AHG-043
Reinforced cardboard
AHC-037
Packing case
AHD-548

9. SCHEMATIC DIAGRAM, P.C. BOARD PATTERNS AND PARTS LIST

9.1 MISCELLANEA

NOTE:
When ordering resistors, first covert 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 × 10¹*	*561*	*RD¼PS 5 6 1 J*
47kΩ	*47 × 10³*	*473*	*RD¼PS 4 7 3 J*
0.5Ω	*0R5*		*RN2H 0 R 5 K*
1Ω	*010*		*RSIP 0 1 0 K*

Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).

5.62kΩ	*562 × 10¹*	*5621*	*RN¼SR 5 6 2 1 F*

Miscellaneous Parts

CAPACITORS

Part No.	Symbol & Description
ACH-093	C1—C4
CQEA 335K 250	C5—C8
ACG-001	C9
ACG-003	C10

Part No.	Description
AKE-033	Terminal (GRD)
AKC-041	Terminal 4P
AKR-032	Fuse holder
ADG-029	AC Power cord
AKH-007	Transistor socket

SEMICONDUCTORS

Part No.	Symbol & Description
MN25-G or B	Q1, Q2, Q5, Q6
MP25-G or B	Q3, Q4, Q7, Q8

LAMP, FUSE

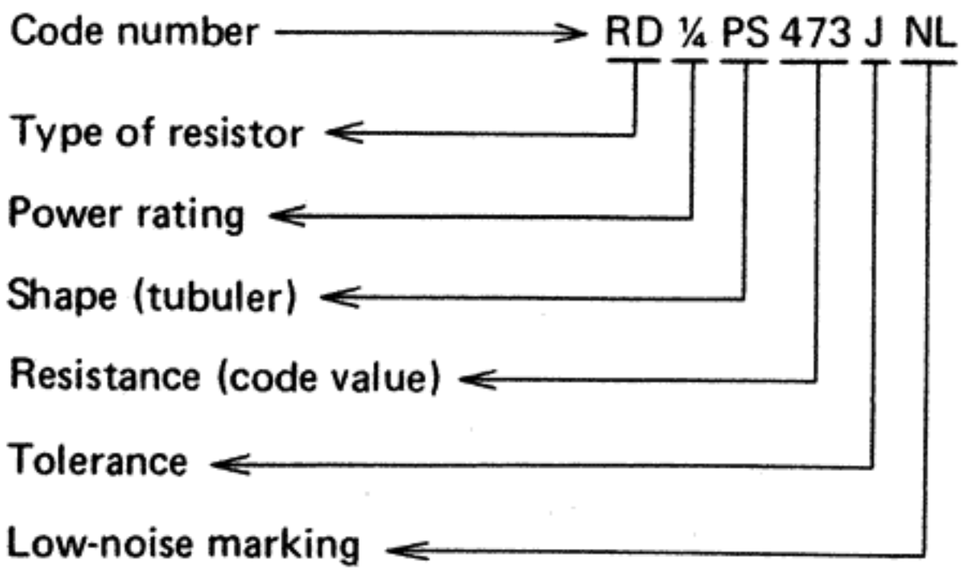
Part No.	Symbol & Description
AEK-300	FU1
AEK-107	FU2—FU5
AEL-069	PL1

OTHERS

Part No.	Symbol & Description	
ATT-451	PT1	Power transformer
ATT-450	PT2	Power transformer
ASA-048	S1	Power switch
ASR-034	RL1, RL2	Relay
ASR-050	RL3	Relay
AWK-087		AF power assembly
AWK-088		AF power assembly
AKB-046		Terminal assembly (INPUT)
AKE-035		Terminal (RED mark)
AKE-036		Terminal (WHITE mark)

RESISTANCE VALUE CODES

Code numbers of resistors used in Pioneer equipment are expressed in the following way:—



Furthermore, in the list of parts found in the Service Manual, the resistance (code value) part of the above code number is expressed as □□□ or □□□□.

Resistors included in the Service Manual list of parts

↓

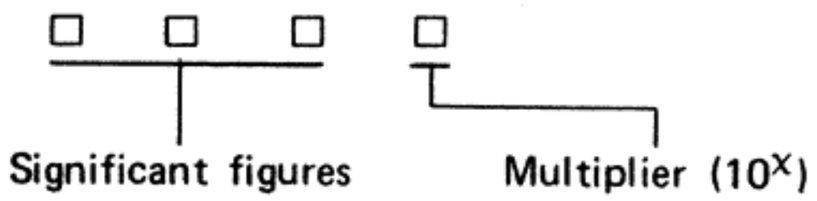
Ex. RD ¼ PS □□□ JNL

When ordering resistor components, first ascertain the actual resistance value from the circuit diagram, and then convert it into code no. form as shown in the following examples.

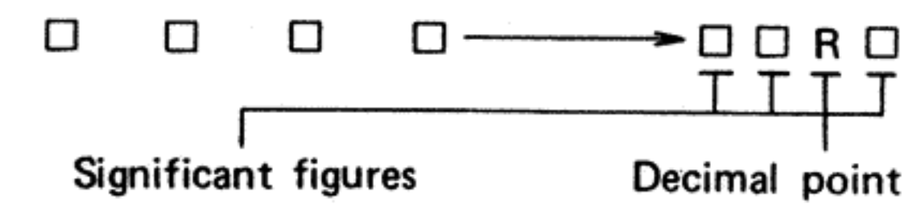
For further details on code numbers, refer to "Tuning Fork" VOL. 1.

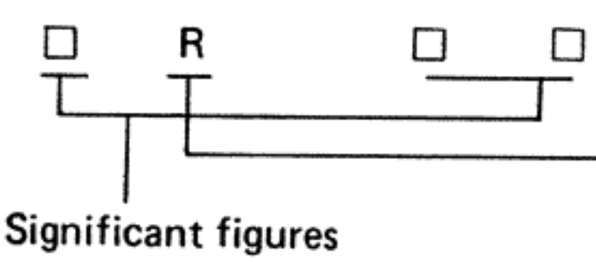
Ex. 1 For □□□□ Codes

* **General resistors**



* **Resistors with fractional values**



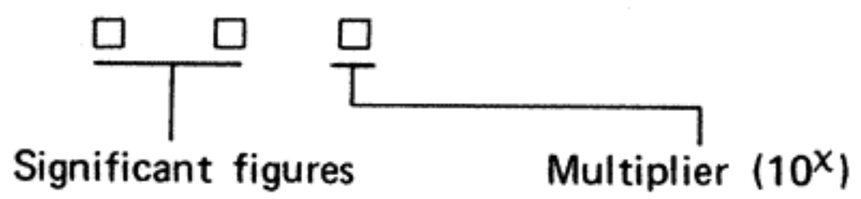


Ex. 1

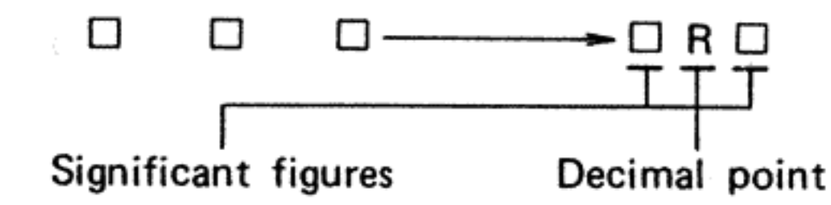
Nominal resistance (Ω)	Significant figure (three figures)	Multiplier (10X)	Resistance value code
5.1	510	.....	5R10
5.62	562	.....	5R62
10	100	.....	10R0
22.5	225	.....	22R5
110	110	$\times 10^0$	1100
1k (1000)	100	$\times 10^1$	1001
1.56k (1560)	156	$\times 10^1$	1561
10k (10000)	100	$\times 10^2$	1002
33.6k (33600)	336	$\times 10^2$	3362
112k (112000)	112	$\times 10^3$	1123
1M (1000000)	100	$\times 10^4$	1004
1.56M (1560000)	156	$\times 10^4$	1564

Ex. 2 For □□□ Codes

* **General resistors**



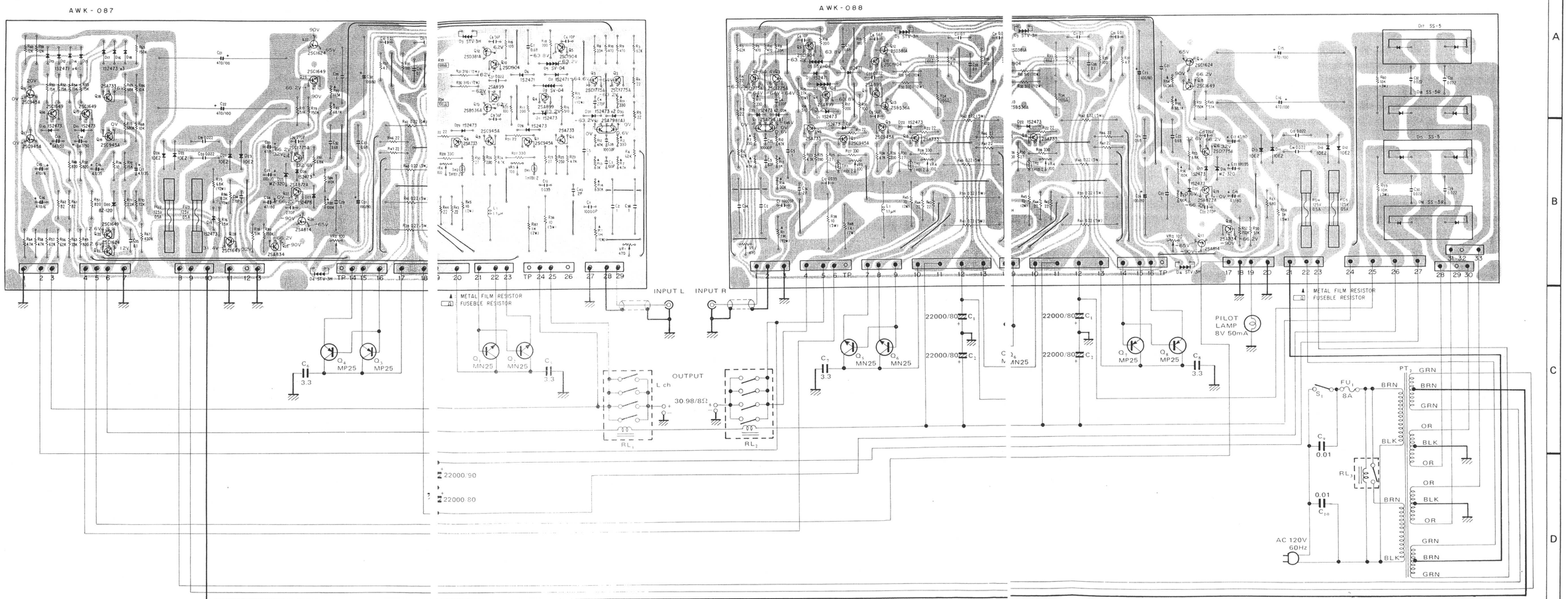
* **Resistors with fractional values**



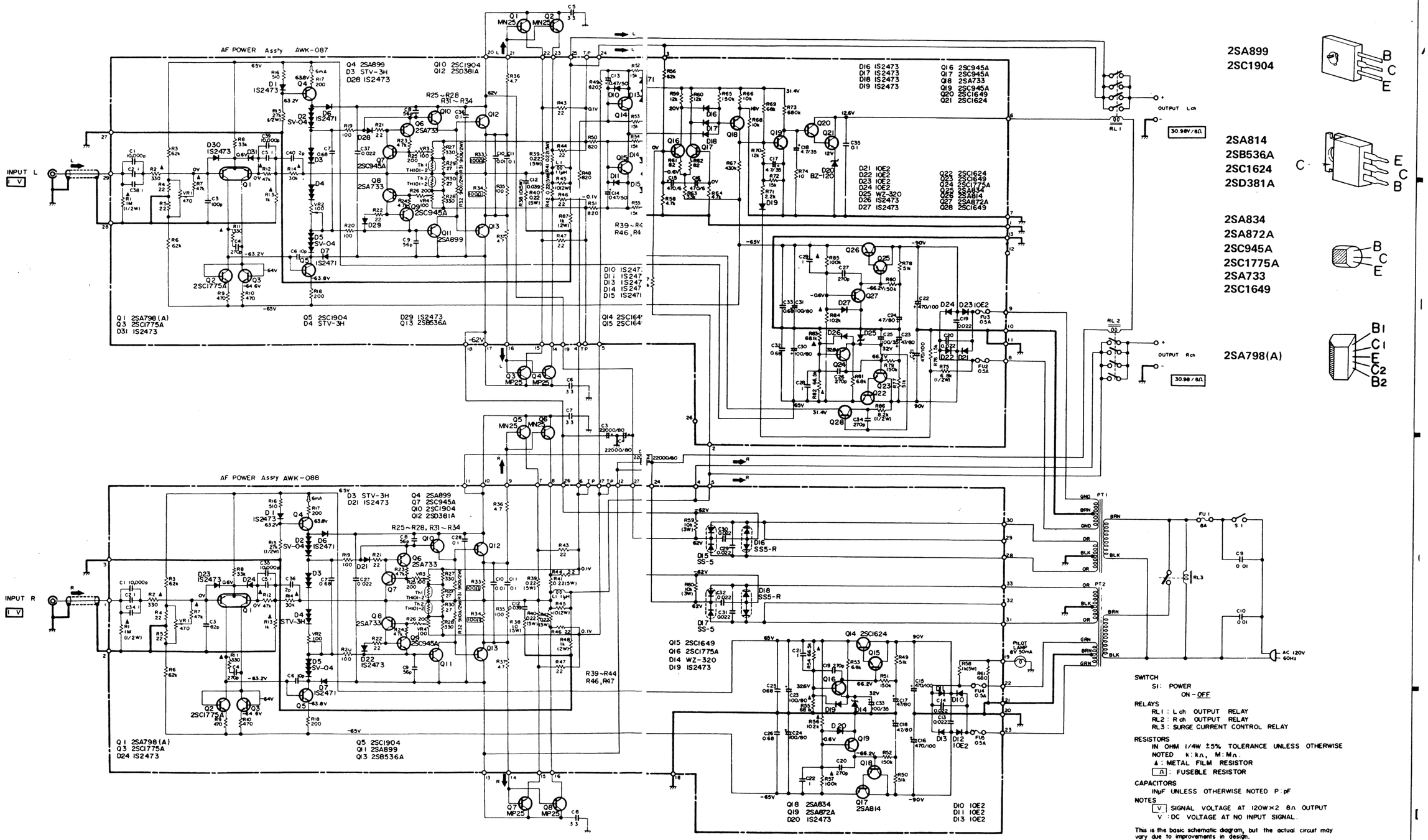
Ex. 2

Nominal resistance (Ω)	Significant figure (two figures)	Multiplier (10X)	Resistance value code
0.5	05	.....	0R5
1.5	15	.....	1R5
1	01	$\times 10^0$	010
22	22	$\times 10^0$	220
330	33	$\times 10^1$	331
1k (1000)	10	$\times 10^2$	102
5.6k (5600)	56	$\times 10^3$	562
68k (68000)	68	$\times 10^3$	683
820k (820000)	82	$\times 10^4$	824
1M (1000000)	10	$\times 10^5$	105
2.2M (2200000)	22	$\times 10^5$	225

9.2 P.C. BOARD CONNECTION DIAGRAM



9.3 SCHEMATIC DIAGRAM



2SA899
2SC1904

2SA814
2SB536A
2SC1624
2SD381A

2SA834
2SA872A
2SC945A
2SC1775A
2SA733
2SC1649

2SA798(A)

SWITCH
S1: POWER ON – OFF

RELAYS
RL1 : L ch OUTPUT RELAY
RL2 : R ch OUTPUT RELAY
RL3 : SURGE CURRENT CONTROL RELAY

RESISTORS
IN OHM 1/4W ±5% TOLERANCE UNLESS OTHERWISE NOTED k: kΩ, M: MΩ.
▲: METAL FILM RESISTOR
⚠: FUSEBLE RESISTOR

CAPACITORS
INμF UNLESS OTHERWISE NOTED P: pF

NOTES
V: SIGNAL VOLTAGE AT 120W×2 8Ω OUTPUT
V: DC VOLTAGE AT NO INPUT SIGNAL.

This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.

9.4 PARTS LIST OF AF POWER ASSEMBLY (AWK-087)

Part List

CAPACITORS

Part No.	Symbol & Description
ACE-027	C1, C39
ACE-020	C2, C38
ACE-025	C4, C26, C27, C34
CQEA 105K 250	C5
ACE-023	C6
CQEA 684K 250	C7, C32, C33
ACE-024	C8, C9
CQMA 103K 50	C10
CQMA 104K 50	C11
CQMA 393K 50	C12
CEA R47P 50	C13, C14
CEA 471P 6	C15, C16
CEA 4R7P 35	C17, C18
CQEA 223K 400	C19, C20 C37
CEB 471P 100	C21, C22
CEA 470P 80	C23, C24
CEA 101P 35	C25
ACE-022	C40
CQEA 105K 250	C28, C29
CEB 101P 80	C30, C31
CQMA 104K 250	C35, C36
ACE-029	C3

RESISTORS

Part No.	Symbol & Description
ACP-033	VR1
ACP-032	VR2–VR4
RN½PT □□□□ G	R1
RN⅕SQ □□□□ F	R2, R7, R11–R14, R82, R83, R85
RD¼PS □□□ JNL	R3, R6
RD¼PS □□□ J	R4, R5, R8–R10, R23, R24, R29, R30 R35, R48–R74, R76–R81
RD½PS □□□ J	R15, R75, R86
RD¼PSF □□□ J	R16–R22, R25–R28, R36, R37, R43 R44, R46, R47
RD½PSF □□□ J	R31, R32
ACN-016	R33, R34
RT5B □□□ K	R38
ACN-017	R39–R42
RS2P □□□ J	R45, R87
RN¼PT □□□□ G	R84

OTHERS

Part No.	Symbol & Description
ATH-012	L1
AKC-067	Terminal 4P
AKR-013	Fuse holder
ANH-340	Heat sink
ANH-317	Heat sink

SEMICONDUCTORS

Part No.	Symbol & Description
2SA798/A/-F or G	Q1
2SC1775A-E or F	Q2, Q3, Q24
2SA899-V (2SA899A-V)	Q4, Q11
2SC1904-V (2SC1904A-V)	Q5, Q10
2SA733-Q or R (2SA823-Q)	Q6, Q8, Q18
2SC945A-Q or P (2SC1649-P)	Q7, Q9, Q16, Q17, Q19
2SD381A-L or K	Q12
2SB536A-L or K	Q13
2SC1649-P	Q14, Q15, Q20, Q23, Q28
2SC1624-O or Y (2SD381-M,L or K)	Q21, Q22
2SA834-P	Q25
2SA814-O or Y (2SB536-M,L or K)	Q26
2SA872A-E or F	Q27
1S2473 (1S1555)	D1, D10, D11, D16–D19, D26–D29
SV-04	D2, D5
STV3H	D3, D4
1S2471	D6, D7, D12–15
BZ-120	D20
10E2 (1S1886)	D21–D24
WZ-320	D25
TH101-2	TH1, TH2

9.5 PARTS LIST OF AF POWER ASSEMBLY (AWK-088)

Parts List

CAPACITORS

Part No.	Symbol & Description
ACE-027	C1, C35
ACE-020	C2, C34
ACE-028	C3
ACE-025	C4
CQEA 105K 250	C5
ACE-023	C6
CQEA 684K 250	C7, C25, C26
ACE-024	C8, C9
CQMA 103K 50	C10
CQMA 104K 50	C11
CQMA 393K 50	C12
CQEA 223K 400	C13, C14, C27, C29—C32
CEB 471P 100	C15, C16
CEA 470P 80	C17, C18
ACE-025	C19, C20
CQEA 105K 250	C21, C22
CEB 101P 80	C23, C24
CQMA 104K 250	C28
CEA 101P 35	C33
ACE-022	C36

RESISTORS

Part No.	Symbol & Description
ACP-033	VR1
ACP-032	VR2—VR4
RN½PT □□□□G	R1
RN⅕SQ □□□□F	R2, R7, R11—R14, R54, R55, R57
RD¼PS □□□JNL	R3, R6
RD¼PS □□□J	R4, R5, R8—R10, R23, R24, R29, R30 R35, R49—R53, R16—R18
RD½PS □□□J	R15
RD¼PSF □□□J	R19—R22, R25—R28, R36, R37, R43, R44 R46, R47
RD½PSF □□□J	R31, R32
ACN-016	R33, R34
RT5B □□□K	R38, R58
ACN-017	R39—R42
RS2P □□□J	R45, R48
RN¼PT □□□□G	R56
RS3P □□□J	R59, R60

OTHERS

Part No.	Symbol & Description
ATH-012	L1
AKC-067	Terminal 4P
AKR-013	Fuse holder
ANH-340	Heat sink
ANH-317	Heat sink

SEMICONDUCTORS

Part No.	Symbol & Description
2SA798/A/-F or G	Q1
2SC1775A-E or F	Q2, Q3, Q16
2SA899-V (2SA899A-V)	Q4, Q11
2SC1904-V (2SC1904A-V)	Q5, Q10
2SA733-Q or R (2SA823-Q)	Q6, Q8
2SC945A-Q or P (2SC1649-P)	Q7, Q9
2SD381A-L or K	Q12
2SB536A-L or K	Q13
2SC1624-O or Y (2SD381-L,M or K)	Q14
2SC1649-P	Q15
2SA814-O or Y (2SB536-M,L or K)	Q17
2SA834-P	Q18
2SA872A-E or F	Q19
1S2473 (1S1555)	D1, D19—D24
SV-04	D2, D5
STV3H	D3, D4
1S2471	D6, D7
10E2 (1S1886)	D10—D13
WZ-320	D14
SS5	D15, D17
SS5R	D16, D18
TH101-2	TH1, TH2