

<ART-083-0>

SERVICE MANUAL

**ELECTRONIC
CROSSOVER NETWORK**

SF-850

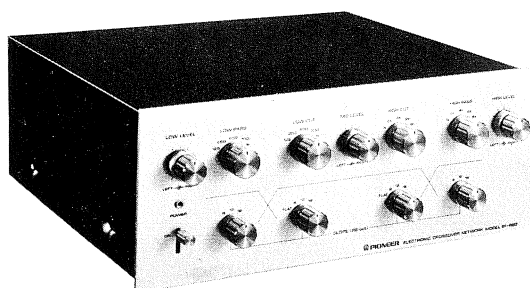
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1. SPECIFICATIONS

SEMICONDUCTORS

Transistors	21
Diodes	2
Output Voltage	3.5V
Channels	2 channels 3 channels
Total Harmonic Distortion	Less than 0.3%
Insertion Loss	-2dB
Signal-to-Noise Ratio	85dB
Input Impedance	100k Ω /1kHz
Output Impedance	1k Ω /1kHz
Load Impedance	More than 15k Ω
Cut-off Frequency (Hz)	
LOW PASS	125, 250, 500, 700, 1kHz
LOW CUT	125, 250, 500, 700, 1kHz
HIGH CUT	1k, 2k, 4k, 6k, 8kHz
HIGH PASS	1k, 2k, 4k, 6k, 8kHz
Slope (dB/oct)	
LOW PASS	6, 12, 18dB/oct.
LOW CUT	FLAT, 6, 12, 18dB/oct.
HIGH CUT	FLAT, 6, 12, 18dB/oct.
HIGH PASS	6, 12, 18dB/oct.

MISCELLANEOUS

Power Requirements	AC 120V,60Hz
Power Consumption	5W
AC Outlets	Switched 2, Unswitched 1
Dimensions	350(W) x 138(H) x 329(D) mm 13-3/4 x 5-7/16 x 12-15/16 in.
Weight: Without Package	5.9kg (13 lb)
With Package	7.2kg (16 lb)

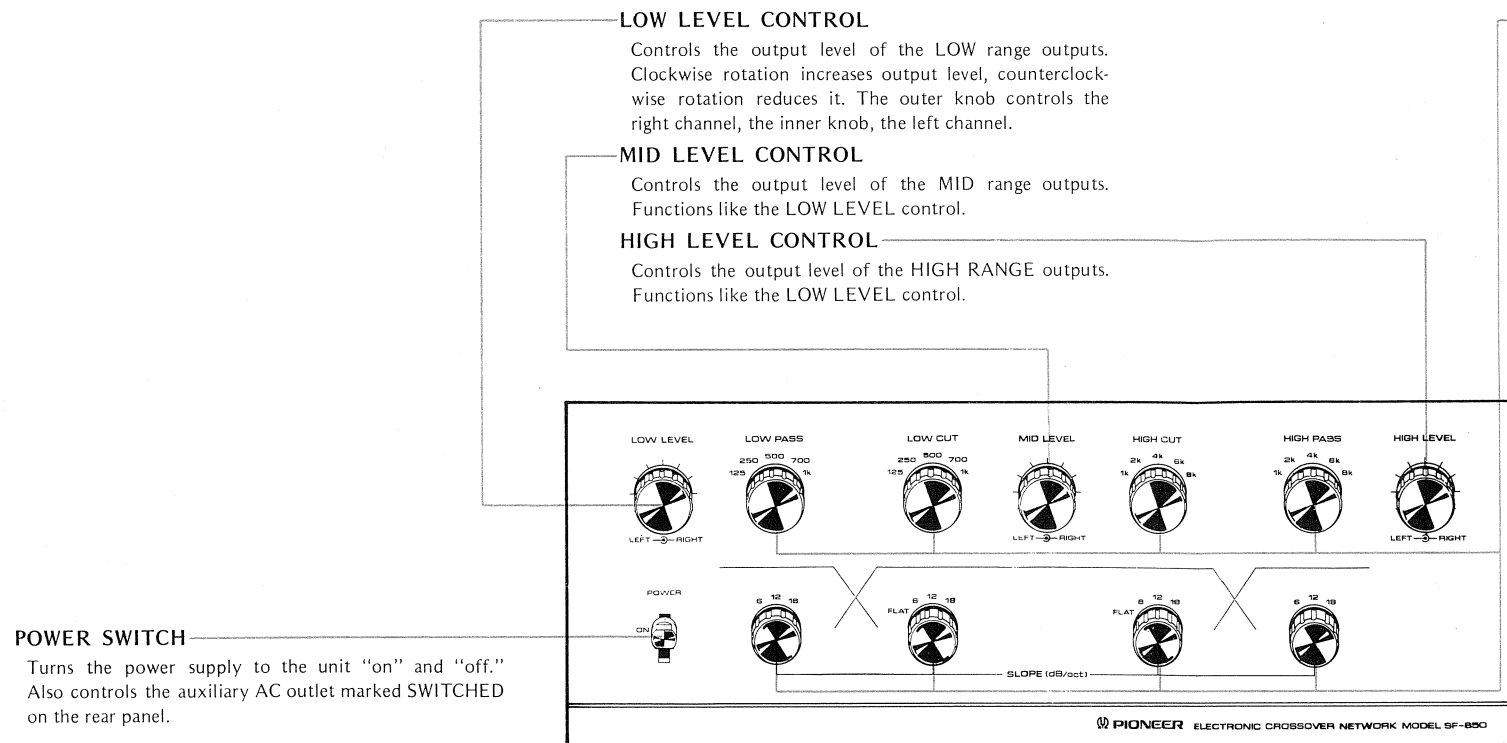
FURNISHED PARTS

Connection Cord with Pin Plugs	2
Operating Instructions	1

NOTE:

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

2. FRONT PANEL FACILITIES



CROSSOVER FREQUENCY & SLOPE SELECTOR SWITCHES

In each case, the upper switch selects the cut-off frequency, and the lower switch selects the steepness of the slope, with which frequencies above or below that frequency are attenuated.

This cut-off slope becomes increasingly steep as the knob is set to 6, 12 and 18. See Fig. 1.

With the lower switch in position FLAT, the upper (frequency select) switch becomes inoperative.

LOW PASS

Selects cut-off frequency and cut-off slope at upper end of low range. See Fig. 2-a.

LOW CUT

Selects cut-off frequency and cut-off slope at lower end of MID range. See Fig. 2-b.

HIGH CUT

Selects cut-off frequency and cut-off slope at upper end of MID range. See Fig. 2-c.

HIGH PASS

Selects cut-off frequency and cut-off slope at lower end of HIGH range. See Fig. 2-d.

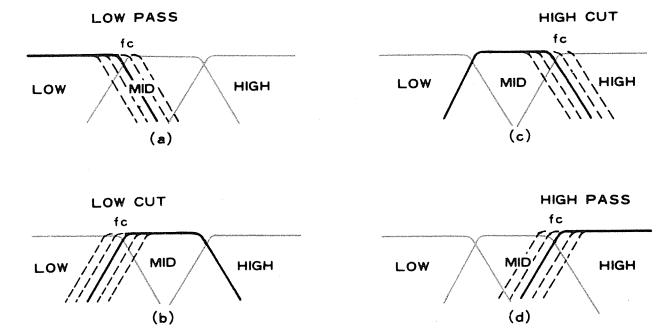


Fig. 2

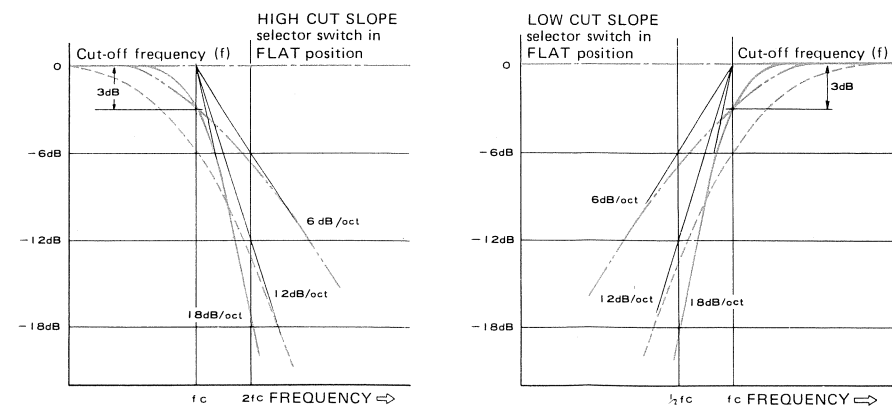
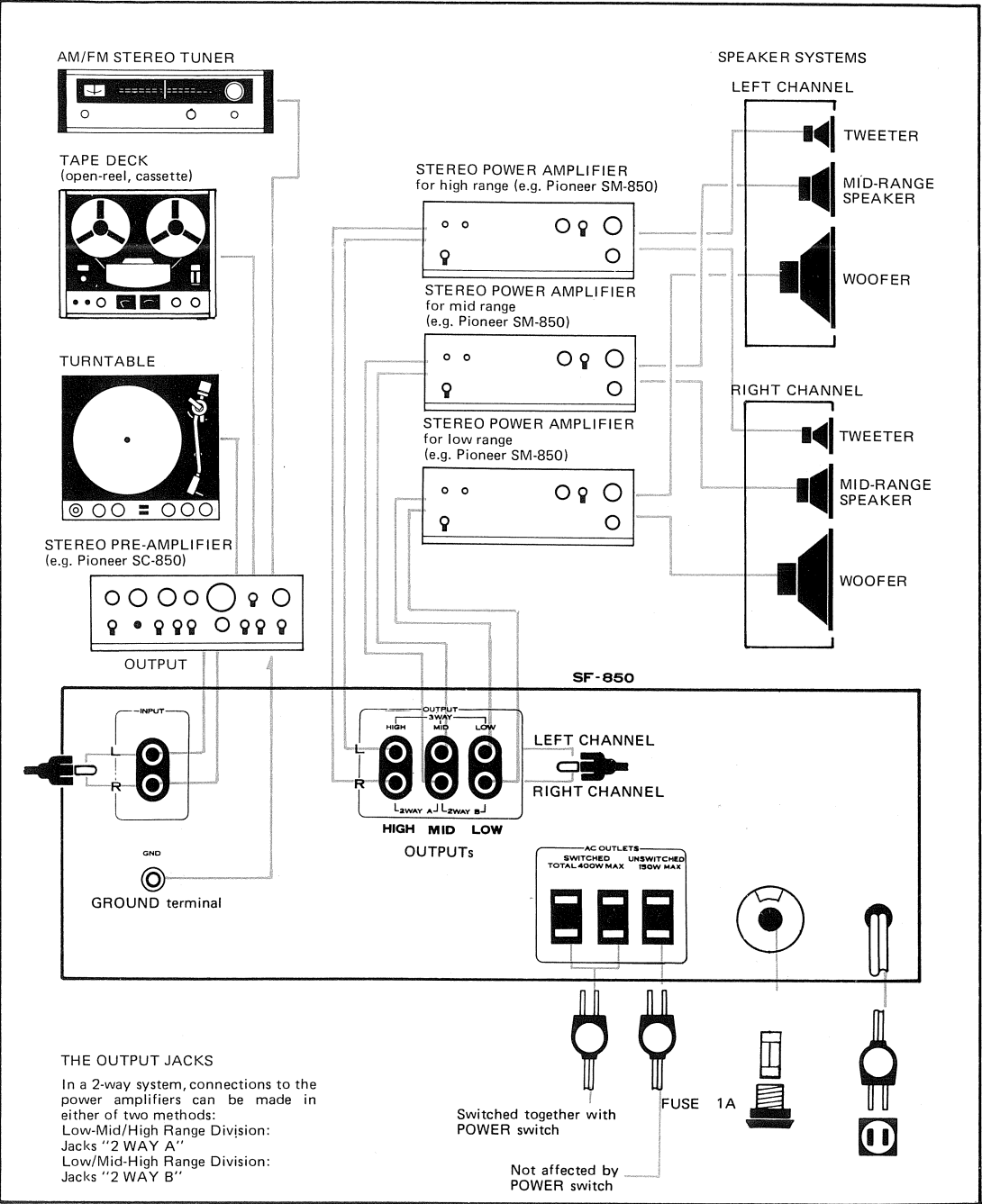
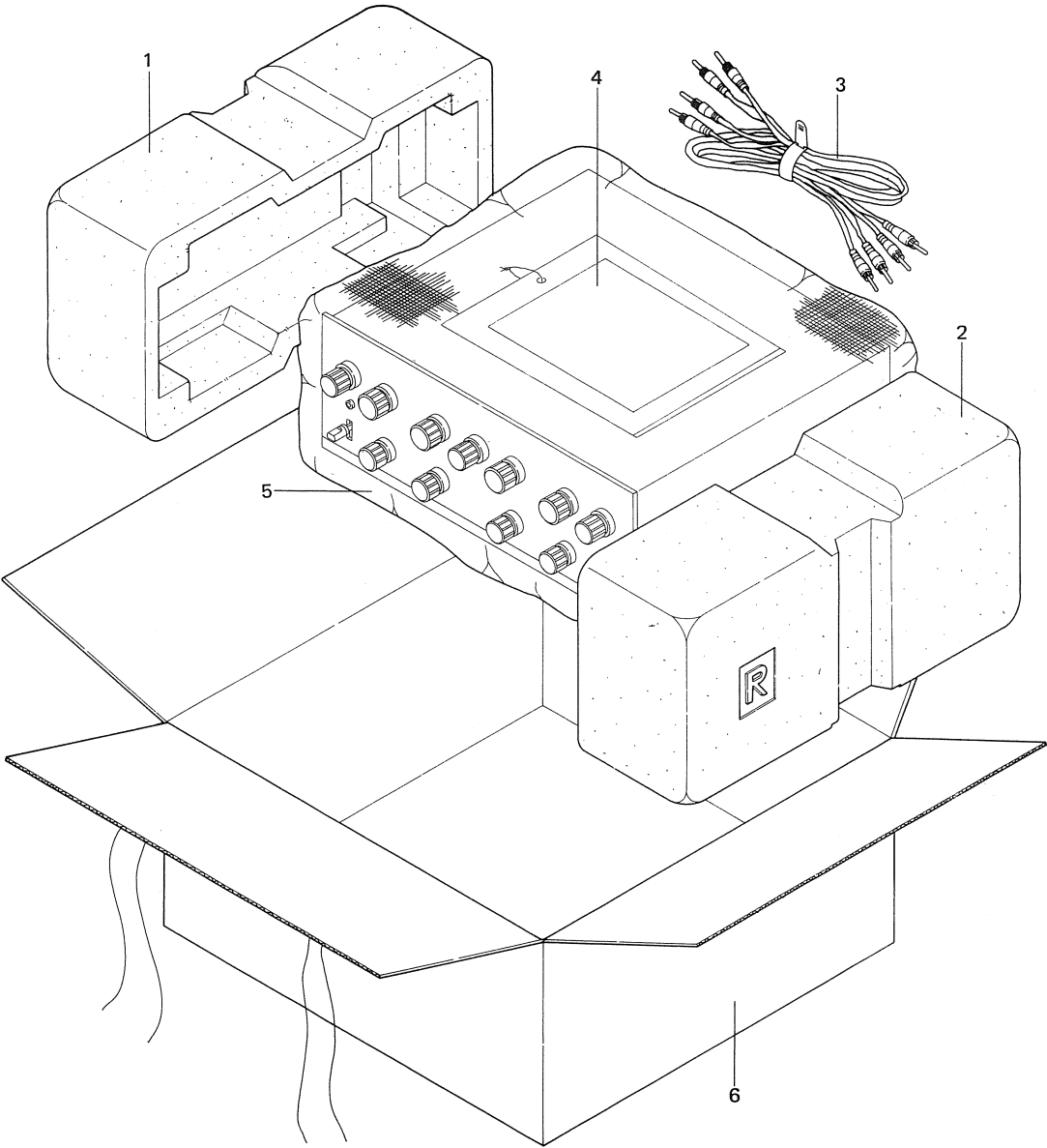


Fig. 1

3. CONNECTION DIAGRAM



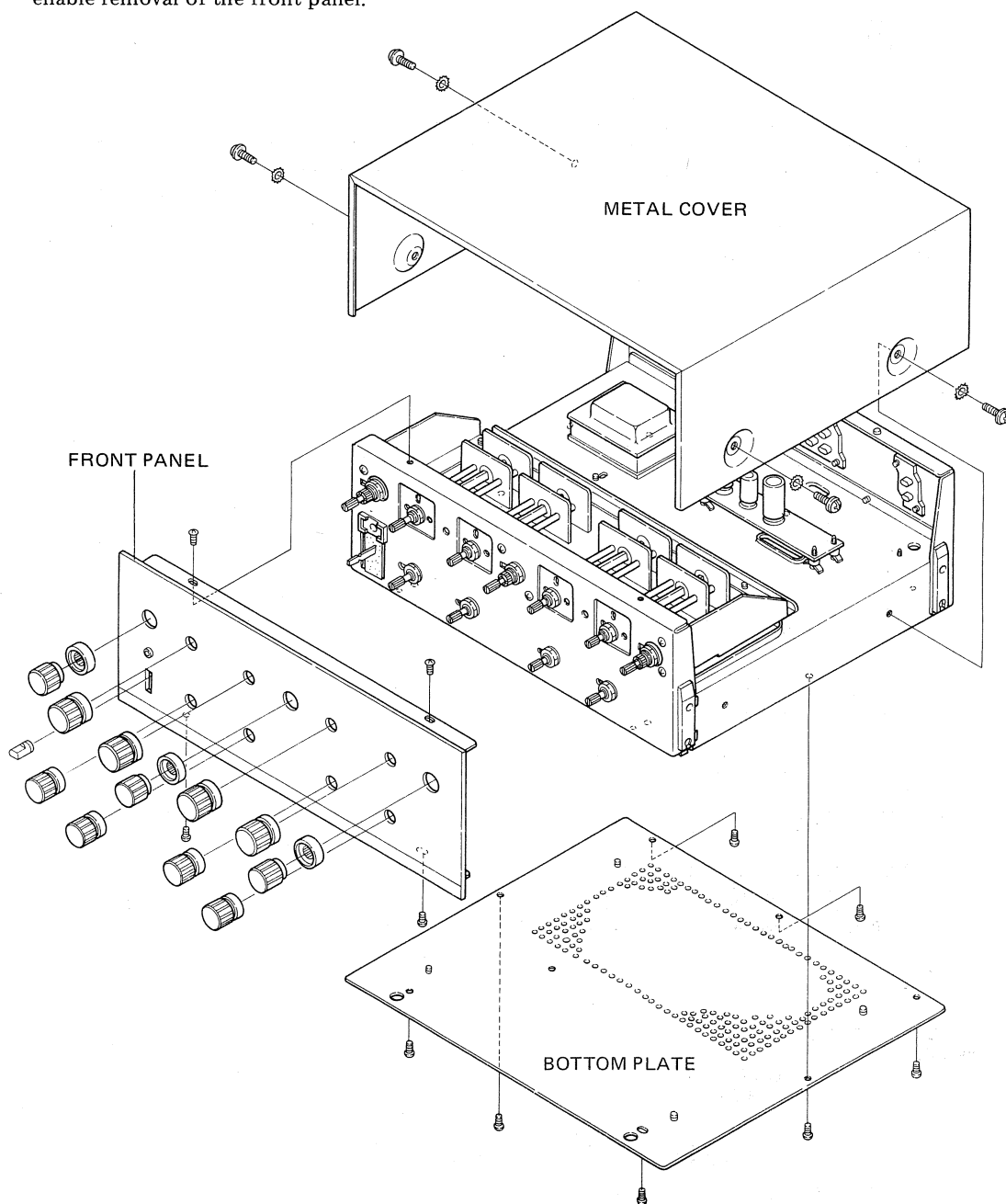
4. PACKING METHOD AND PART NUMBERS



Key No.	Description	Part No.	
1	Side pad (L)	AHA-042-0	
2	Side pad (R)	AHA-043-0	
3	Connection cords	ADE-005-0	
4	Operating instructions	ARB-127-0	
5	Cloth bag	AHG-015-0	
6	Packing case	AHD-205-0	

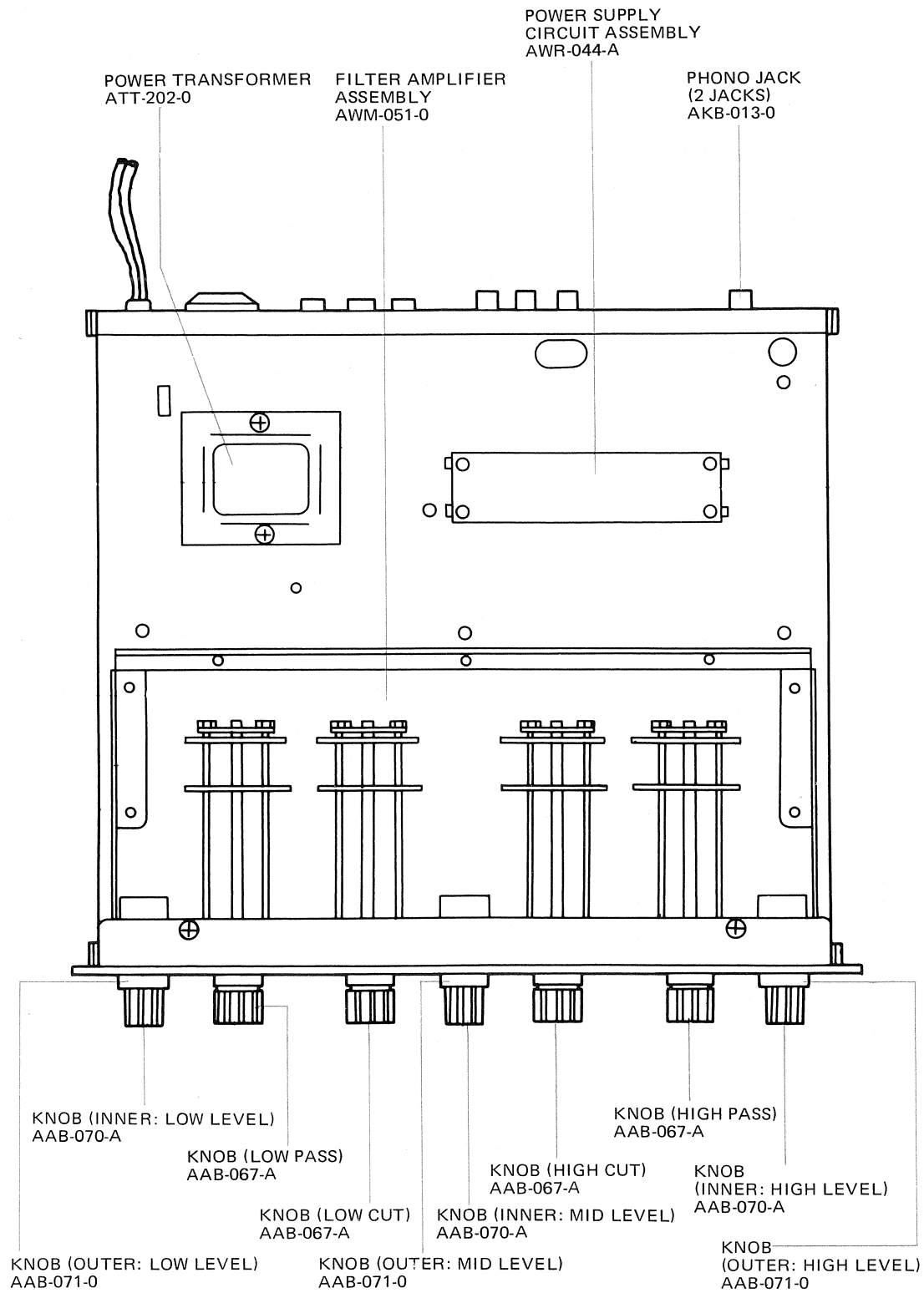
5. DISASSEMBLY

1. Unscrew the two screws on each side of the metal cover securing the sides of the cover. This will enable removal of the cover.
2. Unscrew the seven screws securing the bottom plate. This will enable removal of the bottom plate.
3. Pull off the control knobs, and then unscrew the two screws each at the top and bottom of the front panel respectively. This will enable removal of the front panel.

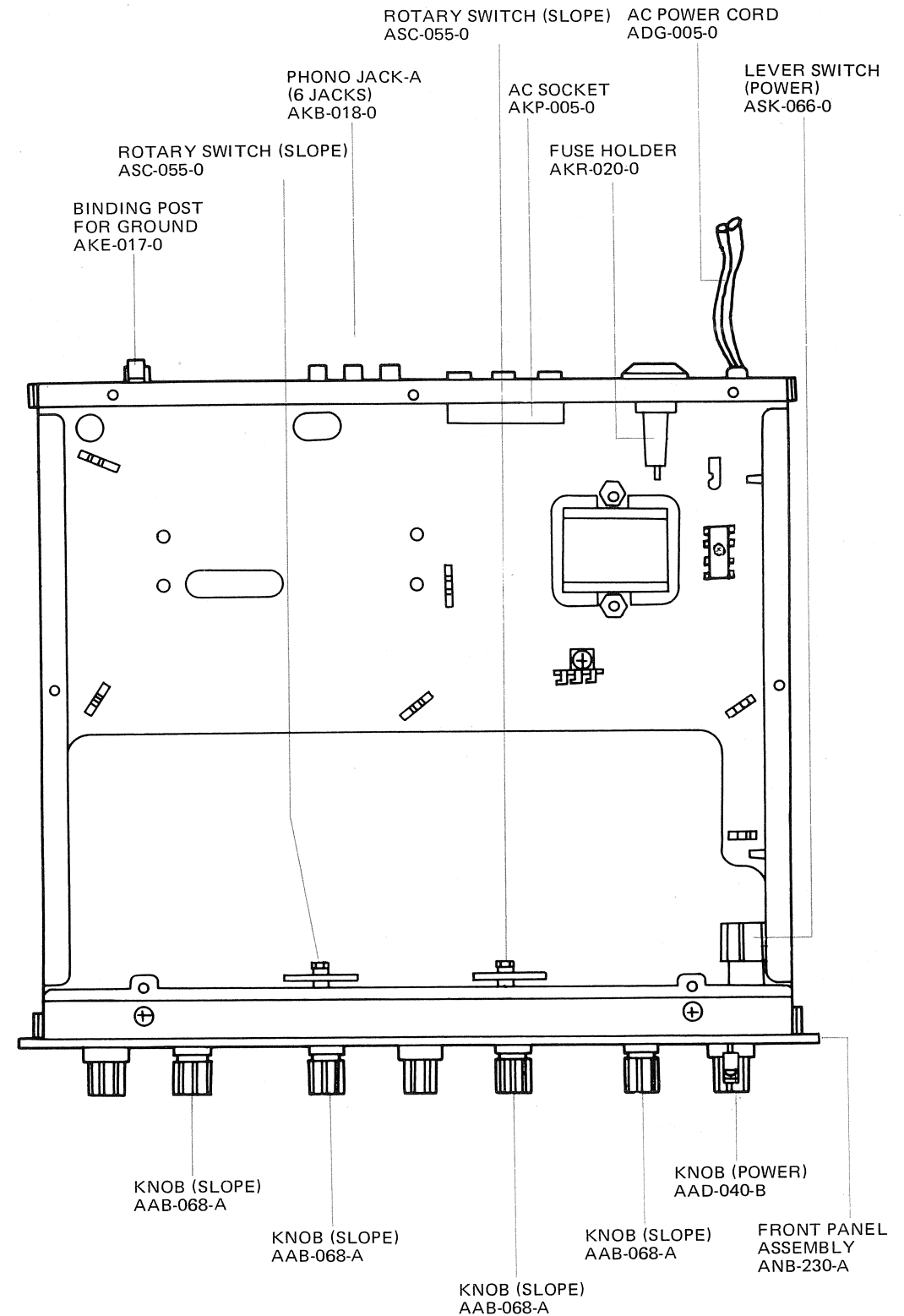


6. PARTS AND P.C. BOARD LOCATION

Top View



Bottom View



7. CIRCUIT DESCRIPTION

Input Circuitry

Please refer to the block diagram.

The input circuit transistors (Q17 & Q19) operate in an emitter-follower circuit featuring a high impedance input and low impedance output, in order that the performance characteristics of the filter circuit are not affected when an amplifier is connected to the inputs. In units of this type manufactured heretofore, there generally were large variations in the amount of insertion loss at different f_c (cutoff frequency) settings. In particular, in the lower ranges (Low Pass), the amount of insertion loss at an f_c of 125Hz was almost as high as 4dB.

In the SF-850, through the use of a large-value capacitor and a low value resistor, the amount of insertion loss is less than 2dB. However, when a large value capacitor and low value resistor are used, the low pass circuit is liable to affect performance in the mid- and high-ranges. To avoid this, a special emitter-follower circuit expressly for the Low Pass circuit is incorporated in the input circuitry.

Filter Circuit

The operating principle of the filter circuitry will be explained using the High Pass circuit as an example.

Figure 2 shows a 6dB/octave circuit. The cutoff frequency is determined by the values of the capacitor and resistor on the emitter side. Since this circuit has one R-C stage, it provides 6dB/octave of attenuation.

Figure 3 shows a 12dB/octave circuit.

In the latter case, the two capacitors, each with 1/2 the capacity of "C" in the output, connected in series and the 4R resistors on the base side provide an attenuation of 6dB/octave, while the capacitor and resistor on the emitter side provide another 6dB/octave of attenuation. Since both circuits have the same cutoff frequency, total attenuation is 12dB/octave.

Figure 4 is an 18dB/octave circuit.

This is an instance of an active filter that makes full use of transistors. It provides very sharp attenuation slope.

The only difference between a High Pass circuit like this and a Low Pass circuit is that the capacitors and resistors change places with each other; the basic thinking is the same.

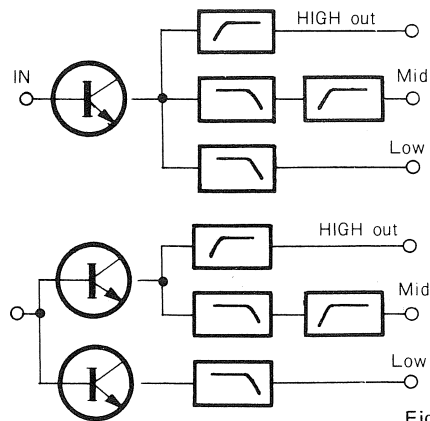


Fig. 1

6dB/oct.

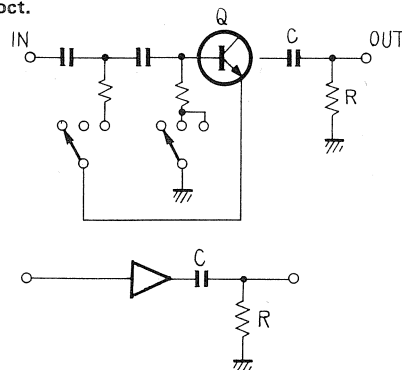
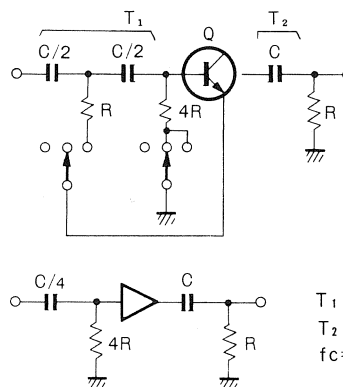


Fig. 2

12dB/oct.



$$\begin{aligned} T_1 &= C \cdot R \\ T_2 &= C \cdot R \\ f_c &= 1/2\pi \cdot C \cdot R \end{aligned}$$

Fig. 3

18dB/oct.

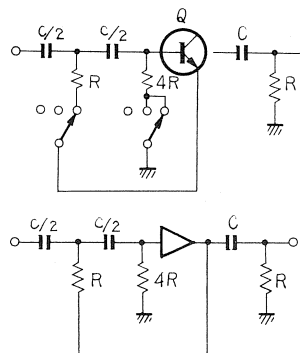
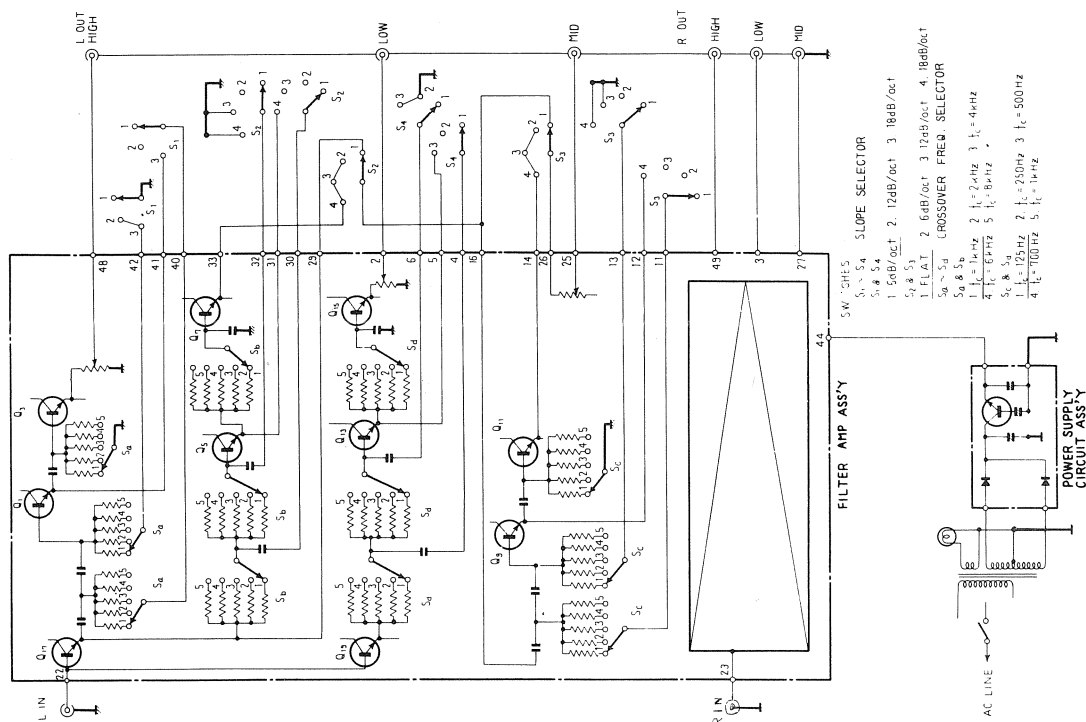


Fig. 4

8. BLOCK DIAGRAM



9. EXPLODED VIEW AND PARTS LIST

NOTE:

Parts number is subject to change for the purpose of improvement with notice of a service bulletin.

Service bulletin will be furnished whenever necessary and you are requested to amend parts number in this manual according to the instructions.

NOTICE: Any parts asterisked(*) are subject to being not supplied.

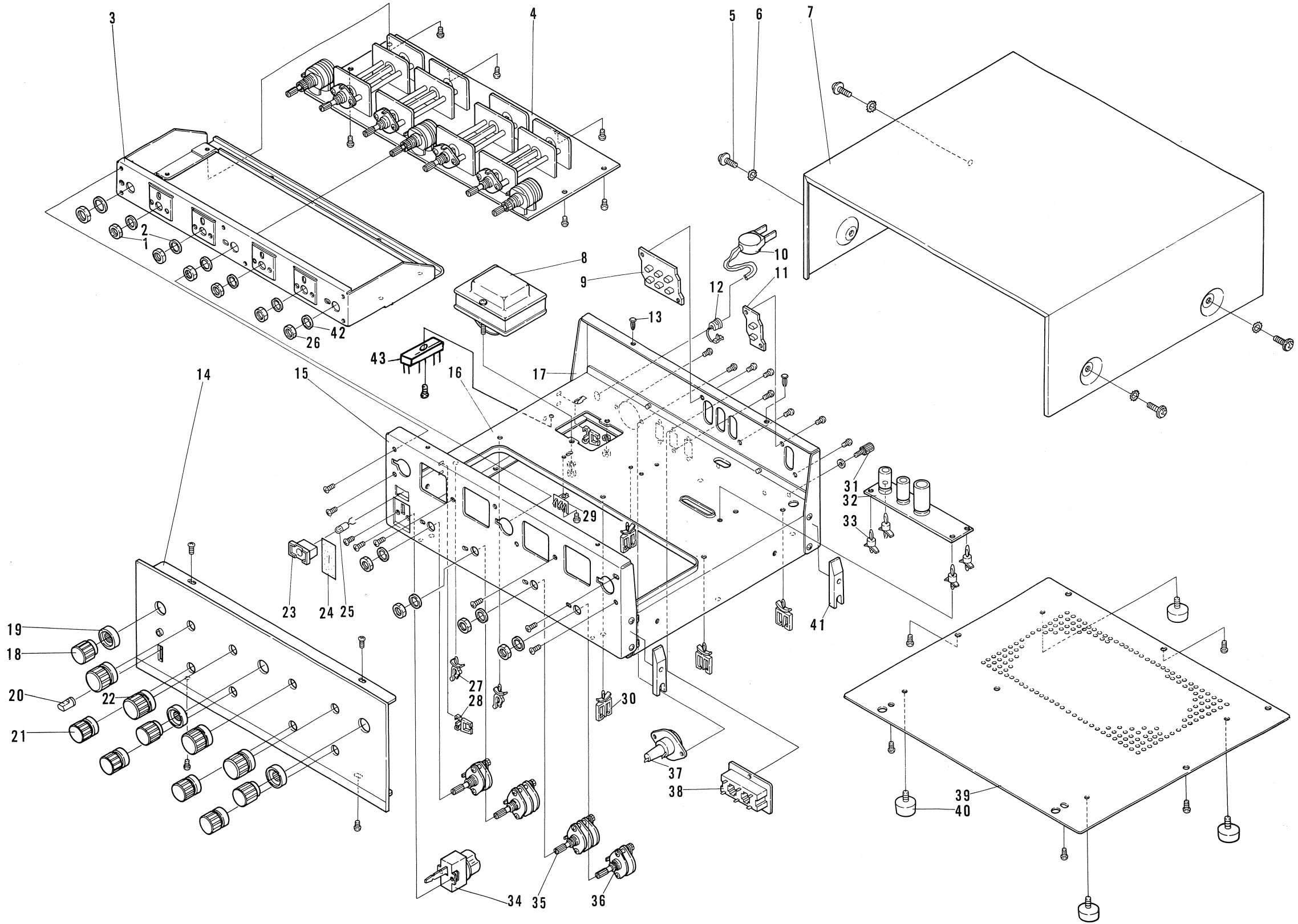
Key No.	Description	Part No.	
1	Nut 9φ		
2	Spacer 9φ x 1t		
3*	P.C. board-held metal		
4	Filter amplifier assembly	AWM-051-0	
5	Screw M4 x 15	ABA-010-A	
6	Washer	B21-011-0	
7	Metal cover	ANE-037-0	
8	Power transformer	ATT-202-0	
9	Phono jack-A (6 jacks)	AKB-018-0	
10	AC power cord	ADG-004-0	

(Continued on the next page.)

NOTICE: Any parts asterisked(*) are subject to being not supplied.

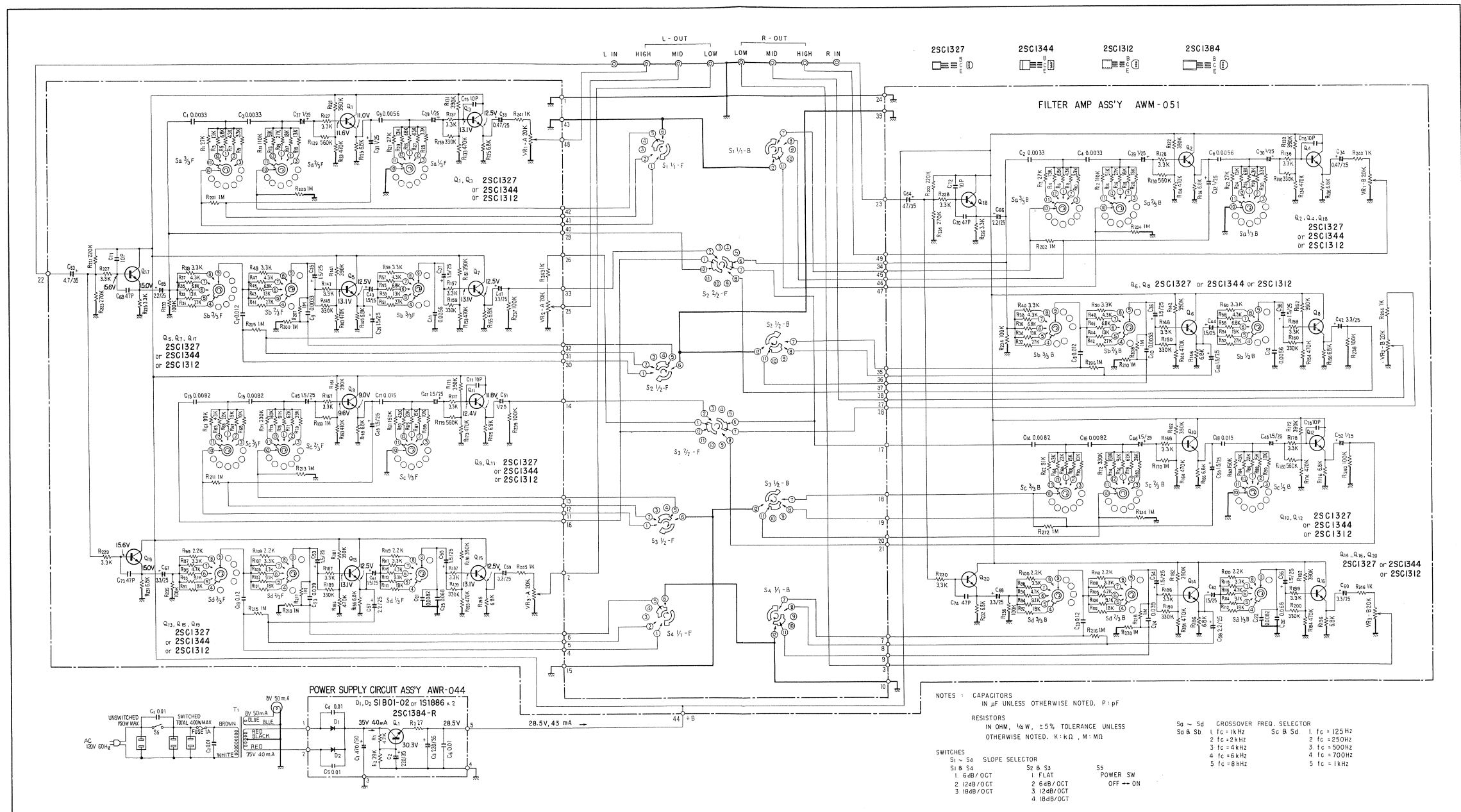
Key No.	Description	Part No.	
11	Phono jack (2 jacks)	AKB-013-0	
12	AC cord grommet	AEC-079-0	
13	Rubber grommet	AEB-045-0	
14	Front panel assembly	ANB-230-A	
15*	Sub panel	AND-067-0	
16*	Chassis	ANA-057-A	
17*	Rear panel	ANC-092-0	
18	Knob (inner; LOW LEVEL, MID LEVEL, HIGH LEVEL)	AAB-070-A	
19	Knob (outer; LOW LEVEL, MID LEVEL, HIGH LEVEL)	AAB-071-0	
20	Knob (POWER)	AAD-040-B	
21	Knob (SLOPE)	AAB-068-A	
22	Knob (LOW PASS, LOW CUT, HIGH CUT, HIGH PASS)	AAB-067-A	
23	Rubber grommet	AEB-034-A	
24	Shading plate	AED-018-0	
25	Pilot lamp 8V, 50mA	AEL-023-0	
26	Nut 11φ	B71-004-0	
27*	Wire clip (S)	AEC-037-0	
28*	Wire clip (C)	AEC-007-0	
29	Ground terminal strip (4P)	K13-047-0	
30*	Wire clip (D)	AEC-024-0	
31	Binding post for ground	AKE-017-0	
32	Power supply circuit assembly	AWR-044-A	
33*	P.C. board holder	AEB-019-0	
34	Lever switch (POWER)	ASK-066-0	
35	Rotary switch (SLOPE)	ASC-055-0	
36	Rotary switch (SLOPE)	ASC-056-0	
37	Fuse holder	AKR-020-0	
38	AC socket	AKP-005-0	
39*	Bottom plate	ANE-038-0	
40	Foot	AEC-083-A	
41	Rubber grommet	AEB-047-0	
42	Spacer 11φ x 1t	M45-086-A	
43	Terminal strip (4P)	AKC-031-0	

Exploded View



10. SCHEMATIC DIAGRAMS, P.C. BOARD PATTERNS AND PARTS LIST

10.1 CIRCUIT CONNECTION DIAGRAM AND MISCELLANEOUS PARTS



Miscellaneous Parts

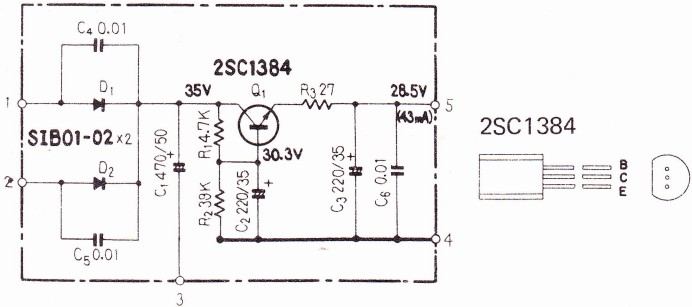
CAPACITORS ● CAPACITORS: IN μF UNLESS OTHERWISE NOTED p: pF
 ● RESISTORS: IN Ω , $\frac{1}{4}\text{W}$ UNLESS OTHERWISE NOTED k: k Ω , M: M Ω

Symbol	Description	Part No.	
C1	Ceramic 0.01 250V	ACG-001-0	
C2	Ceramic 0.01 250V	ACG-003-0	

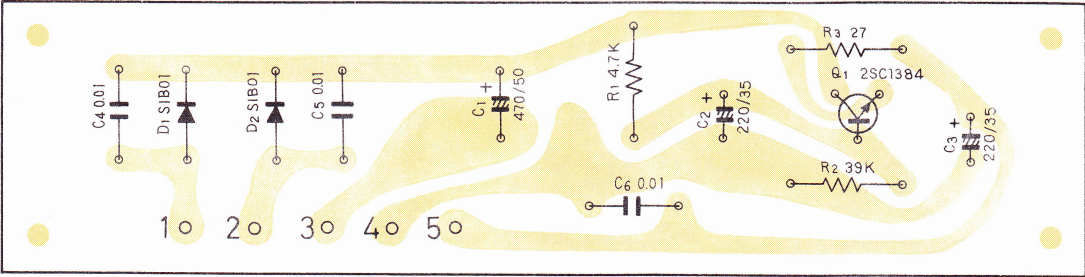
OTHERS

Symbol	Description	Part No.	
	Filter amplifier assembly	AWM-051-0	
	Power supply circuit assembly	AWR-044-A	
	Front panel assembly	ANB-230-A	
	Metal cover	ANE-037-0	
	Phono jack-A (6 jacks)	AKB-018-0	
	Phono jack (2 jacks)	AKB-013-0	
T1	Power transformer	ATT-202-0	
F1	Fuse 0.5A (AC power)	AEK-106-0	
	Pilot lamp 8V, 50mA	AEL-023-0	
S1	Rotary switch (SLOPE)	ASC-056-0	
S2	Rotary switch (SLOPE)	ASC-055-0	
S3	Rotary switch (SLOPE)	ASC-055-0	
S4	Rotary switch (SLOPE)	ASC-056-0	
S5	Lever switch (POWER)	ASK-066-0	
S6	Fuse holder (AC power)	AKR-020-0	
	AC socket	AKP-005-0	
	Screw M4 x 15	ABA-010-A	
	Binding post for ground	AKE-017-0	
	AC power cord	ADG-005-0	
	Operating instructions	ARB-127-0	
	Connection cord	ADE-005-0	

10.2 POWER SUPPLY CIRCUIT ASSEMBLY (AWR-044-A)



Foil Side (AWR-044-A)



CAPACITORS

Symbol	Description			Part No.	
C1	Electrolytic	470	50V	CEA 471P 50	
C2	Electrolytic	220	35V	CEA 221P 35	
C3	Electrolytic	220	35V	CEA 221P 35	
C4	Ceramic	0.01	150V	ACG-004-0	
C5	Ceramic	0.01	150V	ACG-004-0	
C6	Ceramic	0.01	150V	ACG-004-0	

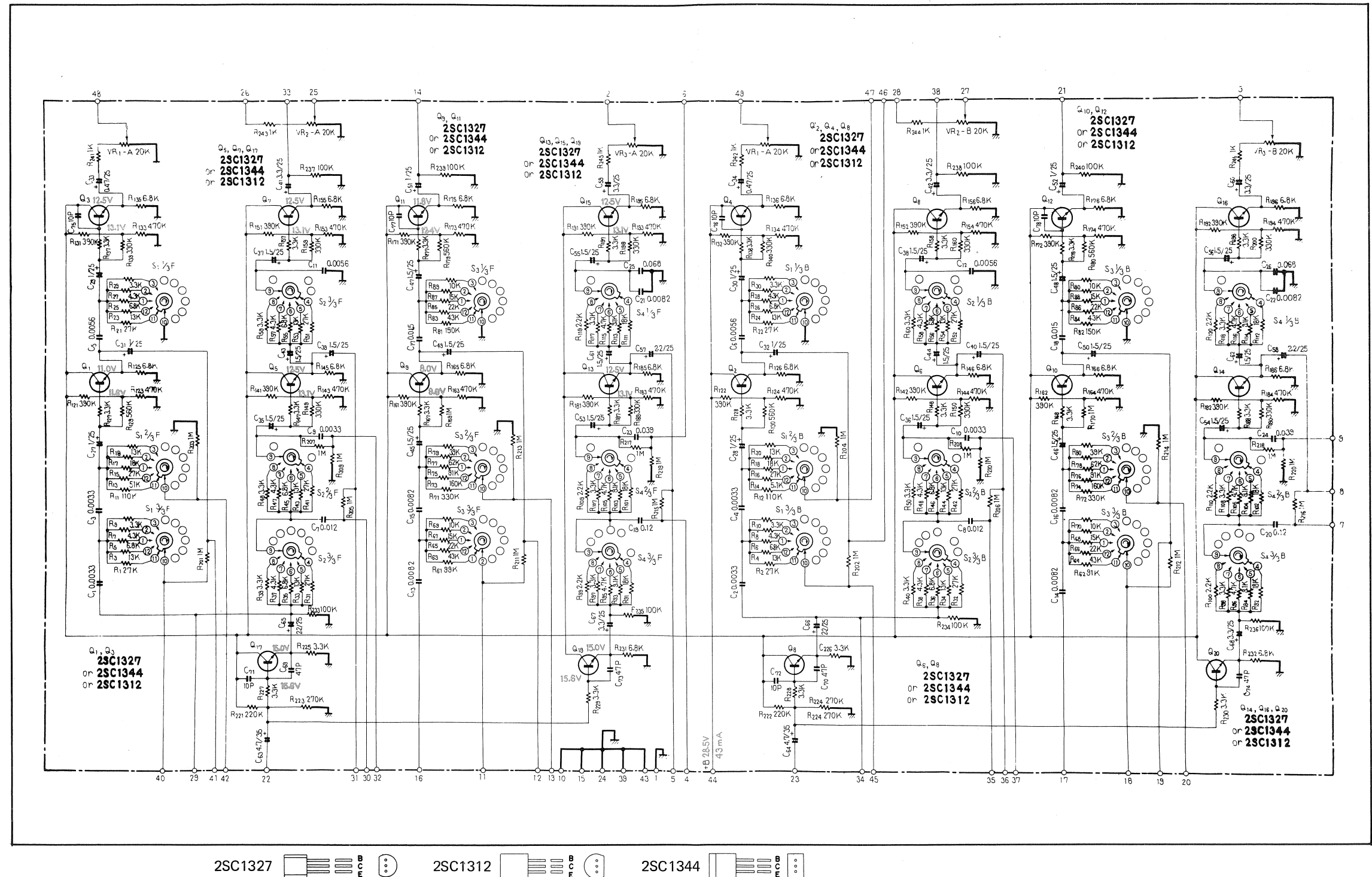
RESISTORS

Symbol	Description			Part No.	
R1	Carbon film	4.7k		RD¼PS 472J	
R2	Carbon film	39k		RD¼PS 393J	
R3	Carbon film	27		RD¼PS 270J	

SEMICONDUCTORS

Symbol	Description			Part No.	
D1	Diode	SIB01-02(1S1886)			
D2	Diode	SIB01-02(1S1886)			
Q1	Transistor	2SC1384-R or S			

10.3 FILTER AMPLIFIER ASSEMBLY (AWM-051-0)



Parts List of Filter Amplifier Assembly (AWM-051-0)
CAPACITORS

Symbol	Description			Part No.
C1	Mylar	0.0033	50V	CQMA 332J 50
C2	Mylar	0.0033	50V	CQMA 332J 50
C3	Mylar	0.0033	50V	CQMA 332J 50
C4	Mylar	0.0033	50V	CQMA 332J 50
C5	Mylar	0.0056	50V	CQMA 562J 50
C6	Mylar	0.0056	50V	CQMA 562J 50
C7	Mylar	0.012	50V	CQMA 123J 50
C8	Mylar	0.012	50V	CQMA 123J 50
C9	Mylar	0.0033	50V	CQMA 332J 50
C10	Mylar	0.0033	50V	CQMA 332J 50
C11	Mylar	0.0056	50V	CQMA 562J 50
C12	Mylar	0.0056	50V	CQMA 562J 50
C13	Mylar	0.0082	50V	CQMA 822J 50
C14	Mylar	0.0082	50V	CQMA 822J 50
C15	Mylar	0.0082	50V	CQMA 822J 50
C16	Mylar	0.0082	50V	CQMA 822J 50
C17	Mylar	0.015	50V	CQMA 153J 50
C18	Mylar	0.015	50V	CQMA 153J 50
C19	Mylar	0.12	50V	CQMA 124J 50
C20	Mylar	0.12	50V	CQMA 124J 50
C21	Mylar	0.0082	50V	CQMA 822J 50
C22	Mylar	0.0082	50V	CQMA 822J 50
C23	Mylar	0.039	50V	CQMA 393J 50
C24	Mylar	0.039	50V	CQMA 393J 50
C25	Mylar	0.068	50V	CQMA 683J 50
C26	Mylar	0.068	50V	CQMA 683J 50
C27	Electrolytic	1	25V	CSSA 010M 25
C28	Electrolytic	1	25V	CSSA 010M 25
C29	Electrolytic	1	25V	CSSA 010M 25
C30	Electrolytic	1	25V	CSSA 010M 25
C31	Electrolytic	1	25V	CSSA 010M 25
C32	Electrolytic	1	25V	CSSA 010M 25
C33	Electrolytic	0.47	25V	CSSA R47M 25
C34	Electrolytic	0.47	25V	CSSA R47M 25
C35	Electrolytic	1.5	25V	CSSA 1R5M 25
C36	Electrolytic	1.5	25V	CSSA 1R5M 25
C37	Electrolytic	1.5	25V	CSSA 1R5M 25
C38	Electrolytic	1.5	25V	CSSA 1R5M 25
C39	Electrolytic	1.5	25V	CSSA 1R5M 25
C40	Electrolytic	1.5	25V	CSSA 1R5M 25
C41	Electrolytic	3.3	25V	CSSA 3R3M 25
C42	Electrolytic	3.3	25V	CSSA 3R3M 25
C43	Electrolytic	1.5	25V	CSSA 1R5M 25
C44	Electrolytic	1.5	25V	CSSA 1R5M 25
C45	Electrolytic	1.5	25V	CSSA 1R5M 25
C46	Electrolytic	1.5	25V	CSSA 1R5M 25
C47	Electrolytic	1.5	25V	CSSA 1R5M 25
C48	Electrolytic	1.5	25V	CSSA 1R5M 25
C49	Electrolytic	1.5	25V	CSSA 1R5M 25
C50	Electrolytic	1.5	25V	CSSA 1R5M 25

Symbol	Description			Part No.
C51	Electrolytic	1	25V	CSSA 010M 25
C52	Electrolytic	1	25V	CSSA 010M 25
C53	Electrolytic	1.5	25V	CSSA 1R5M 25
C54	Electrolytic	1.5	25V	CSSA 1R5M 25
C55	Electrolytic	1.5	25V	CSSA 1R5M 25
C56	Electrolytic	1.5	25V	CSSA 1R5M 25
C57	Electrolytic	2.2	25V	CSSA 2R2M 25
C58	Electrolytic	2.2	25V	CSSA 2R2M 25
C59	Electrolytic	3.3	25V	CSSA 3R3M 25
C60	Electrolytic	3.3	25V	CSSA 3R3M 25
C61	Electrolytic	1.5	25V	CSSA 1R5M 25
C62	Electrolytic	1.5	25V	CSSA 1R5M 25
C63	Electrolytic	4.7	35V	CEA 4R7P 35
C64	Electrolytic	4.7	35V	CEA 4R7P 35
C65	Electrolytic	2.2	25V	CSSA 2R2M 25
C66	Electrolytic	2.2	25V	CSSA 2R2M 25
C67	Electrolytic	3.3	25V	CSSA 3R3M 25
C68	Electrolytic	3.3	25V	CSSA 3R3M 25
C69	Ceramic	47p	50V	CCDSL 470K 50
C70	Ceramic	47p	50V	CCDSL 470K 50
C71	Ceramic	10p	50V	CCDSL 100F 50
C72	Ceramic	10p	50V	CCDSL 100F 50
C73	Ceramic	47p	50V	CCDSL 470K 50
C74	Ceramic	47p	50V	CCDSL 470K 50
C75	Ceramic	10p	50V	CCDSL 100F 50
C76	Ceramic	10p	50V	CCDSL 100F 50
C77	Ceramic	10p	50V	CCDSL 100F 50
C78	Ceramic	10p	50V	CCDSL 100F 50

RESISTORS AND POTENTIOMETERS

Symbol	Description			Part No.
R1	Carbon film	27k		RD¼PM 273J
R2	Carbon film	27k		RD¼PM 273J
R3	Carbon film	13k		RD¼PM 133J
R4	Carbon film	13k		RD¼PM 133J
R5	Carbon film	6.8k		RD¼PM 682J
R6	Carbon film	6.8k		RD¼PM 682J
R7	Carbon film	4.3k		RD¼PM 432J
R8	Carbon film	4.3k		RD¼PM 432J
R9	Carbon film	3.3k		RD¼PM 332J
R10	Carbon film	3.3k		RD¼PM 332J
R11	Carbon film	110k		RD¼PM 114J
R12	Carbon film	110k		RD¼PM 114J
R13	Carbon film	51k		RD¼PM 513J
R14	Carbon film	51k		RD¼PM 513J
R15	Carbon film	27k		RD¼PM 273J
R16	Carbon film	27k		RD¼PM 273J
R17	Carbon film	18k		RD¼PM 183J
R18	Carbon film	18k		RD¼PM 183J
R19	Carbon film	13k		RD¼PM 133J
R20	Carbon film	13k		RD¼PM 133J

Symbol	Description	Part No.
R21	Carbon film 27k	RD¼PM 273J
R22	Carbon film 27k	RD¼PM 273J
R23	Carbon film 13k	RD¼PM 133J
R24	Carbon film 13k	RD¼PM 133J
R25	Carbon film 6.8k	RD¼PM 682J
R26	Carbon film 6.8k	RD¼PM 682J
R27	Carbon film 4.3k	RD¼PM 432J
R28	Carbon film 4.3k	RD¼PM 432J
R29	Carbon film 3.3k	RD¼PM 332J
R30	Carbon film 3.3k	RD¼PM 332J
R31	Carbon film 27k	RD¼PM 273J
R32	Carbon film 27k	RD¼PM 273J
R33	Carbon film 13k	RD¼PM 133J
R34	Carbon film 13k	RD¼PM 133J
R35	Carbon film 6.8k	RD¼PM 682J
R36	Carbon film 6.8k	RD¼PM 682J
R37	Carbon film 4.3k	RD¼PM 432J
R38	Carbon film 4.3k	RD¼PM 432J
R39	Carbon film 3.3k	RD¼PM 332J
R40	Carbon film 3.3k	RD¼PM 332J
R41	Carbon film 27k	RD¼PM 273J
R42	Carbon film 27k	RD¼PM 273J
R43	Carbon film 13k	RD¼PM 133J
R44	Carbon film 13k	RD¼PM 133J
R45	Carbon film 6.8k	RD¼PM 682J
R46	Carbon film 6.8k	RD¼PM 682J
R47	Carbon film 4.3k	RD¼PM 432J
R48	Carbon film 4.3k	RD¼PM 432J
R49	Carbon film 3.3k	RD¼PM 332J
R50	Carbon film 3.3k	RD¼PM 332J
R51	Carbon film 27k	RD¼PM 273J
R52	Carbon film 27k	RD¼PM 273J
R53	Carbon film 13k	RD¼PM 133J
R54	Carbon film 13k	RD¼PM 133J
R55	Carbon film 6.8k	RD¼PM 682J
R56	Carbon film 6.8k	RD¼PM 682J
R57	Carbon film 4.3k	RD¼PM 432J
R58	Carbon film 4.3k	RD¼PM 432J
R59	Carbon film 3.3k	RD¼PM 332J
R60	Carbon film 3.3k	RD¼PM 332J
R61	Carbon film 91k	RD¼PM 913J
R62	Carbon film 91k	RD¼PM 913J
R63	Carbon film 43k	RD¼PM 433J
R64	Carbon film 43k	RD¼PM 433J
R65	Carbon film 22k	RD¼PM 223J
R66	Carbon film 22k	RD¼PM 223J
R67	Carbon film 15k	RD¼PM 153J
R68	Carbon film 15k	RD¼PM 153J
R69	Carbon film 10k	RD¼PM 103J
R70	Carbon film 10k	RD¼PM 103J

(Continued on the next page.)

Symbol	Description	Part No.
R71	Carbon film 330k	RD%PM 334J
R72	Carbon film 330k	RD%PM 334J
R73	Carbon film 160k	RD%PM 164J
R74	Carbon film 160k	RD%PM 164J
R75	Carbon film 91k	RD%PM 913J
R76	Carbon film 91k	RD%PM 913J
R77	Carbon film 62k	RD%PM 623J
R78	Carbon film 62k	RD%PM 623J
R79	Carbon film 39k	RD%PM 393J
R80	Carbon film 39k	RD%PM 393J
R81	Carbon film 150k	RD%PM 154J
R82	Carbon film 150k	RD%PM 154J
R83	Carbon film 43k	RD%PM 433J
R84	Carbon film 43k	RD%PM 433J
R85	Carbon film 22k	RD%PM 223J
R86	Carbon film 22k	RD%PM 223J
R87	Carbon film 15k	RD%PM 153J
R88	Carbon film 15k	RD%PM 153J
R89	Carbon film 10k	RD%PM 103J
R90	Carbon film 10k	RD%PM 103J
R91	Carbon film 18k	RD%PM 183J
R92	Carbon film 18k	RD%PM 183J
R93	Carbon film 9.1k	RD%PM 912J
R94	Carbon film 9.1k	RD%PM 912J
R95	Carbon film 4.7k	RD%PM 472J
R96	Carbon film 4.7k	RD%PM 472J
R97	Carbon film 3.3k	RD%PM 332J
R98	Carbon film 3.3k	RD%PM 332J
R99	Carbon film 2.2k	RD%PM 222J
R100	Carbon film 2.2k	RD%PM 222J
R101	Carbon film 18k	RD%PM 183J
R102	Carbon film 18k	RD%PM 183J
R103	Carbon film 9.1k	RD%PM 912J
R104	Carbon film 9.1k	RD%PM 912J
R105	Carbon film 4.7k	RD%PM 472J
R106	Carbon film 4.7k	RD%PM 472J
R107	Carbon film 3.3k	RD%PM 332J
R108	Carbon film 3.3k	RD%PM 332J
R109	Carbon film 2.2k	RD%PM 222J
R110	Carbon film 2.2k	RD%PM 222J
R111	Carbon film 18k	RD%PM 183J
R112	Carbon film 18k	RD%PM 183J
R113	Carbon film 9.1k	RD%PM 912J
R114	Carbon film 9.1k	RD%PM 912J
R115	Carbon film 4.7k	RD%PM 472J
R116	Carbon film 4.7k	RD%PM 472J
R117	Carbon film 3.3k	RD%PM 332J
R118	Carbon film 3.3k	RD%PM 332J
R119	Carbon film 2.2k	RD%PM 222J
R120	Carbon film 2.2k	RD%PM 222J

Symbol	Description	Part No.
R121	Carbon film 390k	RD%PM 394J
R122	Carbon film 390k	RD%PM 394J
R123	Carbon film 470k	RD%PM 474J
R124	Carbon film 470k	RD%PM 474J
R125	Carbon film 6.8k	RD%PM 682J
R126	Carbon film 6.8k	RD%PM 682J
R127	Carbon film 3.3k	RD%PM 332J
R128	Carbon film 3.3k	RD%PM 332J
R129	Carbon film 560k	RD%PM 564J
R130	Carbon film 560k	RD%PM 564J
R131	Carbon film 390k	RD%PM 394J
R132	Carbon film 390k	RD%PM 394J
R133	Carbon film 470k	RD%PM 474J
R134	Carbon film 470k	RD%PM 474J
R135	Carbon film 6.8k	RD%PM 682J
R136	Carbon film 6.8k	RD%PM 682J
R137	Carbon film 3.3k	RD%PM 332J
R138	Carbon film 3.3k	RD%PM 332J
R139	Carbon film 330k	RD%PM 334J
R140	Carbon film 330k	RD%PM 334J
R141	Carbon film 390k	RD%PM 394J
R142	Carbon film 390k	RD%PM 394J
R143	Carbon film 470k	RD%PM 474J
R144	Carbon film 470k	RD%PM 474J
R145	Carbon film 6.8k	RD%PM 682J
R146	Carbon film 6.8k	RD%PM 682J
R147	Carbon film 3.3k	RD%PM 332J
R148	Carbon film 3.3k	RD%PM 332J
R149	Carbon film 330k	RD%PM 334J
R150	Carbon film 330k	RD%PM 334J
R151	Carbon film 390k	RD%PM 394J
R152	Carbon film 390k	RD%PM 394J
R153	Carbon film 470k	RD%PM 474J
R154	Carbon film 470k	RD%PM 474J
R155	Carbon film 6.8k	RD%PM 682J
R156	Carbon film 6.8k	RD%PM 682J
R157	Carbon film 3.3k	RD%PM 332J
R158	Carbon film 3.3k	RD%PM 332J
R159	Carbon film 330k	RD%PM 334J
R160	Carbon film 330k	RD%PM 334J
R161	Carbon film 390k	RD%PM 394J
R162	Carbon film 390k	RD%PM 394J
R163	Carbon film 470k	RD%PM 474J
R164	Carbon film 470k	RD%PM 474J
R165	Carbon film 6.8k	RD%PM 682J
R166	Carbon film 6.8k	RD%PM 682J
R167	Carbon film 3.3k	RD%PM 332J
R168	Carbon film 3.3k	RD%PM 332J
R169	Carbon film 1M	RD%PM 105J
R170	Carbon film 1M	RD%PM 105J

Symbol	Description	Part No.
R171	Carbon film 390k	RD4PM 394J
R172	Carbon film 390k	RD4PM 394J
R173	Carbon film 470k	RD4PM 474J
R174	Carbon film 470k	RD4PM 474J
R175	Carbon film 6.8k	RD4PM 682J
R176	Carbon film 6.8k	RD4PM 682J
R177	Carbon film 3.3k	RD4PM 332J
R178	Carbon film 3.3k	RD4PM 332J
R179	Carbon film 560k	RD4PM 564J
R180	Carbon film 560k	RD4PM 564J
R181	Carbon film 390k	RD4PM 394J
R182	Carbon film 390k	RD4PM 394J
R183	Carbon film 470k	RD4PM 474J
R184	Carbon film 470k	RD4PM 474J
R185	Carbon film 6.8k	RD4PM 682J
R186	Carbon film 6.8k	RD4PM 682J
R187	Carbon film 3.3k	RD4PM 332J
R188	Carbon film 3.3k	RD4PM 332J
R189	Carbon film 330k	RD4PM 334J
R190	Carbon film 330k	RD4PM 334J
R191	Carbon film 390k	RD4PM 394J
R192	Carbon film 390k	RD4PM 394J
R193	Carbon film 470k	RD4PM 474J
R194	Carbon film 470k	RD4PM 474J
R195	Carbon film 6.8k	RD4PM 682J
R196	Carbon film 6.8k	RD4PM 682J
R197	Carbon film 3.3k	RD4PM 332J
R198	Carbon film 3.3k	RD4PM 332J
R199	Carbon film 330k	RD4PM 334J
R200	Carbon film 330k	RD4PM 334J
R201	Carbon film 1M	RD4PM 105J
R202	Carbon film 1M	RD4PM 105J
R203	Carbon film 1M	RD4PM 105J
R204	Carbon film 1M	RD4PM 105J
R205	Carbon film 1M	RD4PM 105J
R206	Carbon film 1M	RD4PM 105J
R207	Carbon film 1M	RD4PM 105J
R208	Carbon film 1M	RD4PM 105J
R209	Carbon film 1M	RD4PM 105J
R210	Carbon film 1M	RD4PM 105J
R211	Carbon film 1M	RD4PM 105J
R212	Carbon film 1M	RD4PM 105J
R213	Carbon film 1M	RD4PM 105J
R214	Carbon film 1M	RD4PM 105J
R215	Carbon film 1M	RD4PM 105J
R216	Carbon film 1M	RD4PM 105J
R217	Carbon film 1M	RD4PM 105J
R218	Carbon film 1M	RD4PM 105J
R219	Carbon film 1M	RD4PM 105J
R220	Carbon film 1M	RD4PM 105J

Symbol	Description	Part No.
R221	Carbon film 220k	RD¼PM 224J
R222	Carbon film 220k	RD¼PM 224J
R223	Carbon film 270k	RD¼PM 274J
R224	Carbon film 270k	RD¼PM 274J
R225	Carbon film 3.3k	RD¼PM 332J
R226	Carbon film 3.3k	RD¼PM 332J
R227	Carbon film 3.3k	RD¼PM 332J
R228	Carbon film 3.3k	RD¼PM 332J
R229	Carbon film 3.3k	RD¼PM 332J
R230	Carbon film 3.3k	RD¼PM 332J
R231	Carbon film 6.8k	RD¼PM 682J
R232	Carbon film 6.8k	RD¼PM 682J
R233	Carbon film 100k	RD¼PM 104J
R234	Carbon film 100k	RD¼PM 104J
R235	Carbon film 100k	RD¼PM 104J
R236	Carbon film 100k	RD¼PM 104J
R237	Carbon film 100k	RD¼PM 104J
R238	Carbon film 100k	RD¼PM 104J
R239	Carbon film 100k	RD¼PM 104J
R240	Carbon film 100k	RD¼PM 104J
R241	Carbon film 1k	RD¼PM 102J
R242	Carbon film 1k	RD¼PM 102J
R243	Carbon film 1k	RD¼PM 102J
R244	Carbon film 1k	RD¼PM 102J
R245	Carbon film 1k	RD¼PM 102J
R246	Carbon film 1k	RD¼PM 102J
VR1	Variable resistor 20k-B	ACV-203-0
VR2	Variable resistor 20k-B	ACV-203-0
VR3	Variable resistor 20k-B	ACV-203-0

SEMICONDUCTORS

Symbol	Description	Part No.
Q1	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F	
Q2	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F	
Q3	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F	
Q4	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F	
Q5	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F	
Q6	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F	

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Symbol	Description	Part No.	
Q7	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		
Q8	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		
Q9	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		
Q10	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		
Q11	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		
Q12	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		
Q13	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		
Q14	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		
Q15	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		
Q16	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		
Q17	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		
Q18	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		
Q19	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		
Q20	Transistor 2SC1327-T or U 2SC1312-G or H 2SC1344-E or F		

SWITCHES

Symbol	Description	Part No.	
S1	Rotary switch (For P.C. BOARD)	ASD-009-0	
S2	Rotary switch (For P.C. BOARD)	ASD-009-0	
S3	Rotary switch (For P.C. BOARD)	ASD-009-0	
S4	Rotary switch (For P.C. BOARD)	ASD-009-0	

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