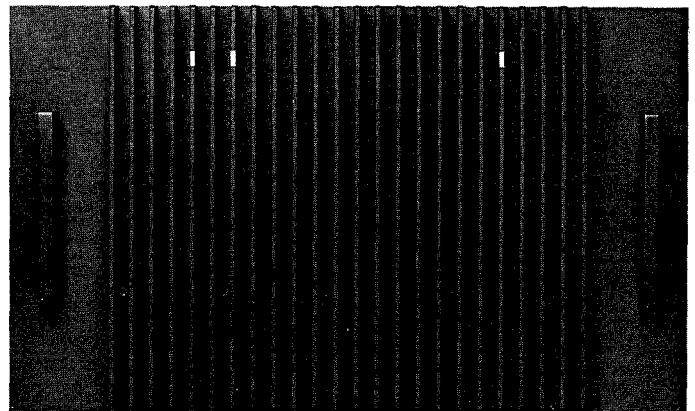




# Service Manual

# Nakamichi 620 power amplifier

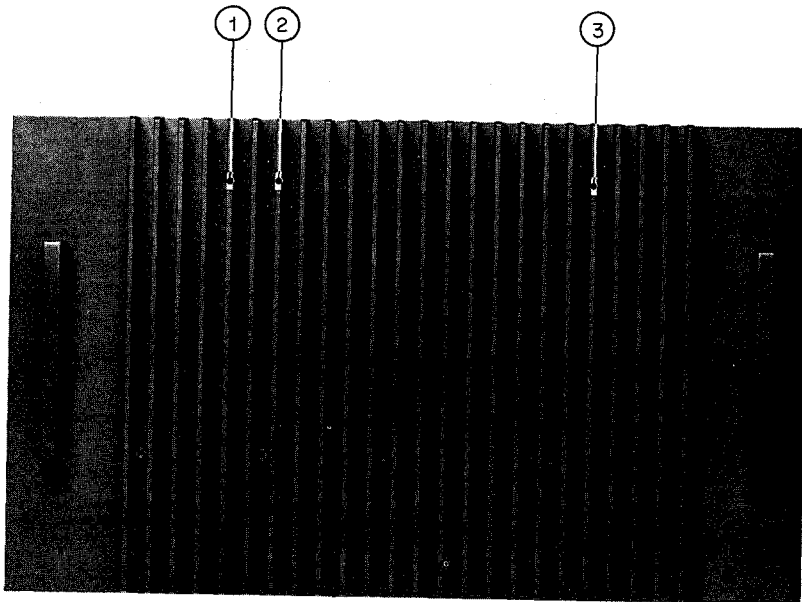


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## 1. GENERAL

Nakamichi 620 control functions are shown below.



1. Peak Power Indicator (L ch)
2. Peak Power Indicator (R ch)
3. AC Power Indicator
4. Power Switch
5. Power Indicator Threshold Selector Switch (High)
6. Power Indicator Threshold Selector Switch (Low)
7. Fuse
8. Voltage Selector
9. Output Terminals
10. Input Jacks

Fig. 1.1

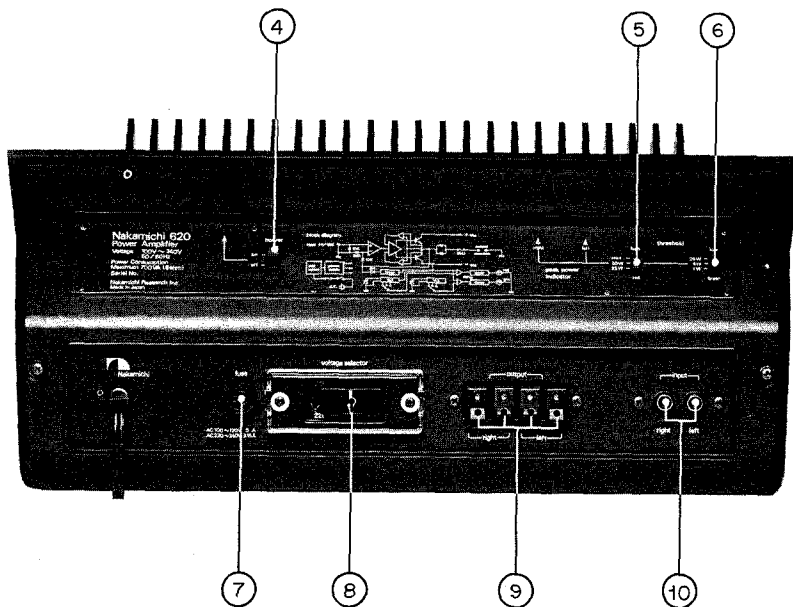


Fig. 1.2

### CAUTIONS

The Nakamichi 620 incorporates large capacitances. It is very dangerous to access the capacitor for a duration of about 3 minutes after the power switch has been turned off because of incomplete discharging. Use extreme care when accessing the capacitor for repair purposes.

Never short the capacitor terminals with a screwdriver or a similar tool after the power switch is turned off, with an attempt to discharging the capacitor. (Shorting the terminal in such a way can melt the shorted point leading to a hole, and will give adverse effects on the capacitor itself.)

The recommended way to discharge the capacitor as quickly as possible is to turn off the power supply with sound emitting through the loudspeaker or to discharge the capacitor with resistances of  $100\Omega - 300\Omega$ , approx. 20W.

**Voltage Selector**

Change over to 100V, 117V, 220V or 240V.

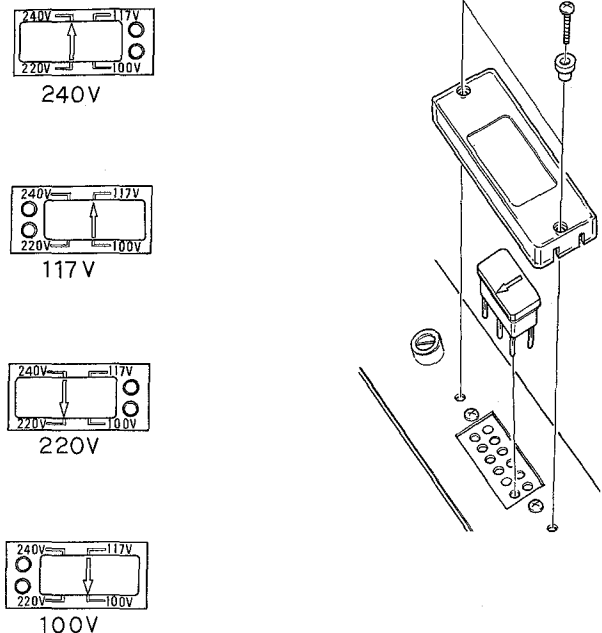


Fig. 1.3

**2. PRINCIPLE OF OPERATION**

**2.1. Power Supply**

Refer to Fig. 2.1.

The power transformer used in the 620 is of a toroidal type. Generally, a toroidal transformer is attacked by large rush current when the power switch is turned on. For the 620, such rush current is reduced by supplying input voltage to the primary of the transformer via a resistor (6.8Ω, 10 watts) only during the time of approx. 20 msec

when the power switch is turned on, and then by shorting the resistance at a relay contact and supplying the input voltage directly to the transformer primary. A 130°C thermal fuse is contained within the transformer and protects it from unusual heating. If the fuse is blown, it is necessary to replace the transformer itself.

**2.2. Power Block Pre-stage**

Refer to Fig. 2.2.

As all the output stage consists of emitter-followers, the voltage gain is 1. Therefore, the gain required for power amplifier and NFB is obtained at the pre-stage. Generally, an increase in the number of transistor stages of an amplifier circuit increases distortion and phase shift. In large current amplification as seen with a power amplifier, a certain extent of distortion cannot be avoided and should be limited through use of NFB. However, excessive NFB is likely to cause unstable amplification as a result of phase shift in the amplifier or differences in loudspeaker impedance. This is one of the drawbacks inherent to an NFB amplifier.

The power amplifier used in the 620 employs 8 transistors, of which only two serve for voltage amplification and the remaining six are used to provide the former two with the best operating conditions. A gain of approx. 100dB is obtained through these two transistors to perform power amplification and NFB. The amplifier of this configuration assures stable NFB with low noise and low distortion and with little phase shift.

Q001 and Q007 are for voltage amplification; Q002 and Q003 form a current mirror circuit (the same current at both collectors); Q005 and Q008 provide a constant-current source; Q006 is for impedance conversion (emitter-follower); Q004 and Q001 make up a differential amplifier circuit. Thus, stable NFB is applied through a circuitry using these transistors.

C005 determines the high-band characteristic of the voltage amplifier to prevent NFB from becoming unstable because of unbalanced performance. R016 is a resistor for NFB.

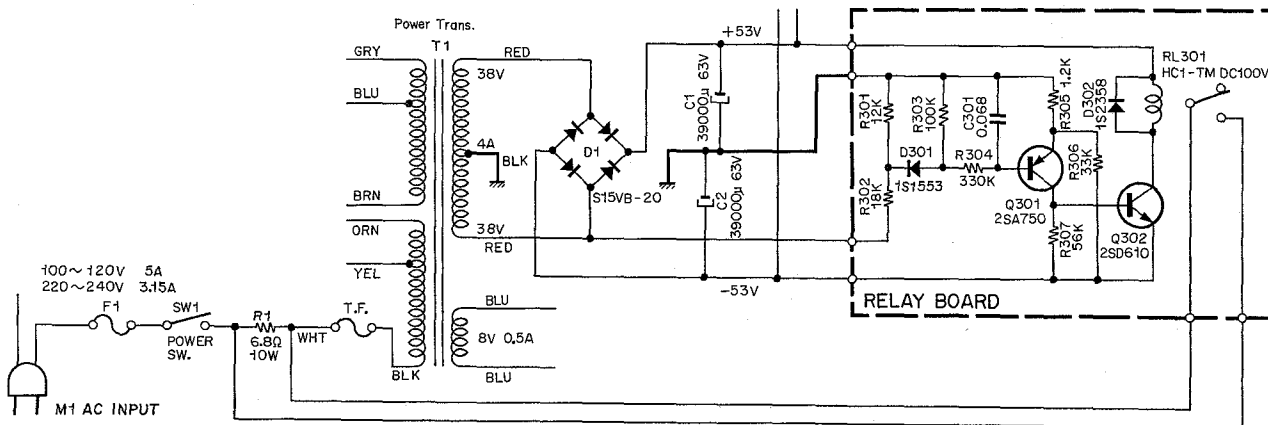


Fig. 2.1

### 2.3. Power Block Output Stage

In the Nakamichi 620, for making a bias voltage, varistor used in the conventional design of amplifier is replaced with transistor base-emitter so that the 620 design improves bias stability (against temperature or current changes) with lower distortion.

Especially for a class B push-pull amplifier, distortion cannot be reduced unless the positive and negative signal amplifiers are well balanced. The amplifier in the 620, however, is best balanced thanks to the vertically and horizontally symmetric configuration as shown in Fig. 2.3. This circuit allows distortion of only 0.1% at 1KHz 100 watts output even without NFB. This degree of distortion is low enough to make the amplifier used as a high-fidelity unit even if it is given no NFB.

Fig. 2.4 shows that a change in current flowing across the diode varies the terminal voltage and that  $E_B$  changes with signal current. These changes result in the generation of distortion. It is a matter of course that signal current flowing across the diode will produce distortion. See Fig. 2.3. Transistors Q009, Q011, Q010 and Q012 that generate bias voltage form an emitter-follower circuit of class A operation. Thus this circuit does not induce distorted signals.

Unless corrected perfectly against temperatures, the bias voltage of power amplifiers in the class B amplifier will increase distortion at low temperature or become unstable at high temperature. It may safely be said that temperature compensation of a transistor can be more properly and effectively carried out by the transistor of the same structure than a diode.

For an ordinary class B amplifier, crossover distortion is reduced by increasing idling current thus overlapping the operating ranges of the positive and negative transistors. The overlap portion acts as a class A amplifier. Generally, the degree of amplification decreases where a change takes place from class A to B and no linear curve is obtained as shown in Fig. 2.5 (A). However, if the circuit shown in Fig. 2.3 is current-driven, a linear curve can be obtained at the point of change from class A to B as shown in Fig. 2.5 (B).

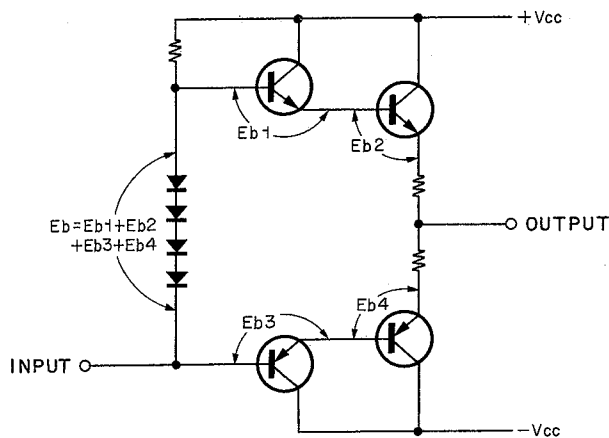


Fig. 2.4

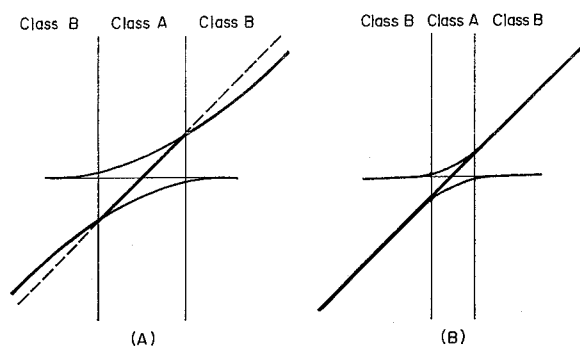


Fig. 2.5

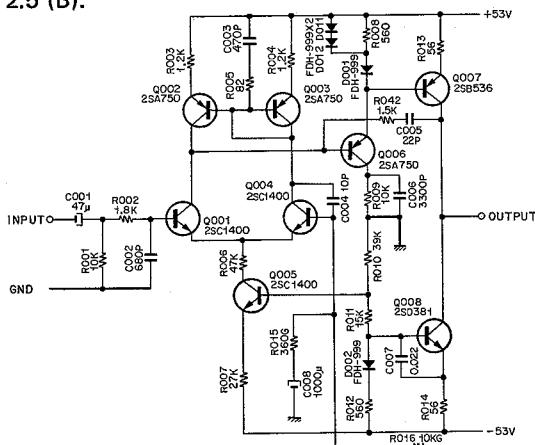


Fig. 2.2

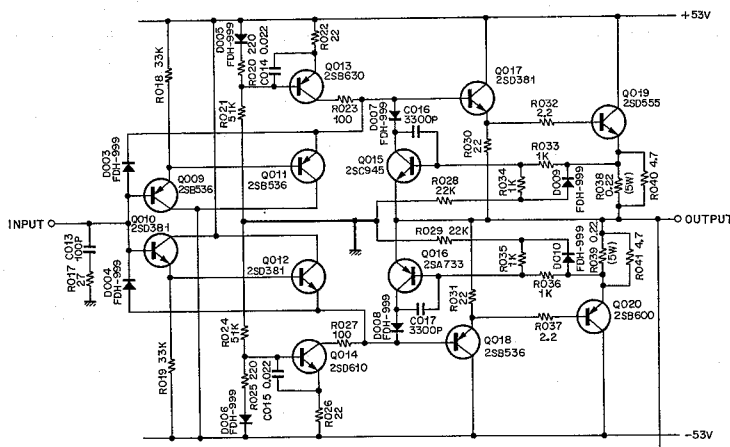


Fig. 2.3

**3. REMOVAL PROCEDURES**

**3.1. Cabinet Ass'y**

Refer to Fig. 3.1 and remove F01 and F02.

**3.2. Rear Panel Ass'y**

Remove cabinet ass'y (item 3.1). Refer to Fig. 3.2 and remove F01 and F02.

**3.3. Lamp**

Remove rear panel ass'y (3.2). Refer to Fig. 3.3 and remove F01 and F02, then remove F03, F04 and F05.

**3.4. Switch**

Remove rear panel ass'y (3.2). Refer to Fig. 3.4 and remove F01 and F02, then remove F03 and F04 (power sw.), and F05 and F06 (indicator sw. ass'y).

**3.5. Power Block Ass'y**

Remove cabinet ass'y (3.1). Refer to Fig. 3.5 and remove F01 through F04.

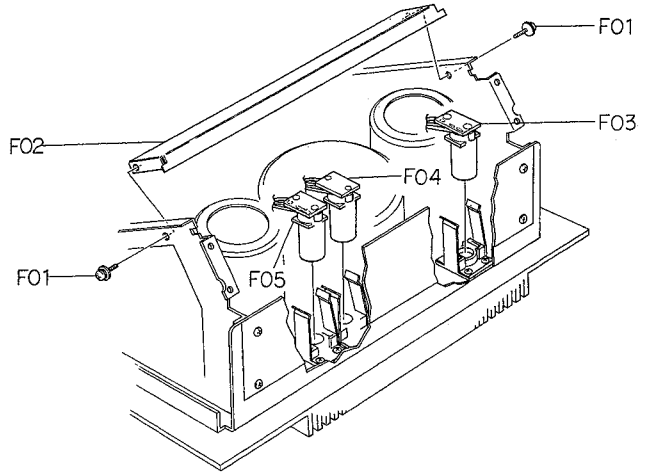


Fig. 3.3

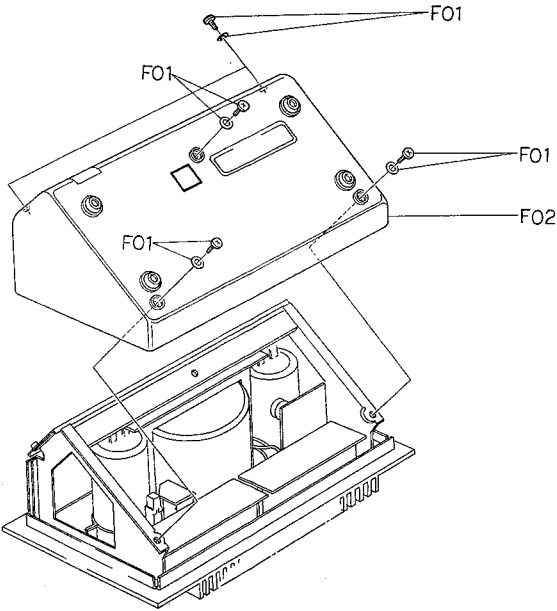


Fig. 3.1

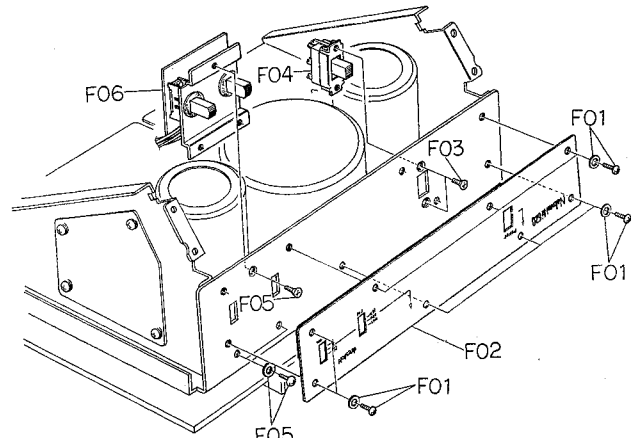


Fig. 3.4

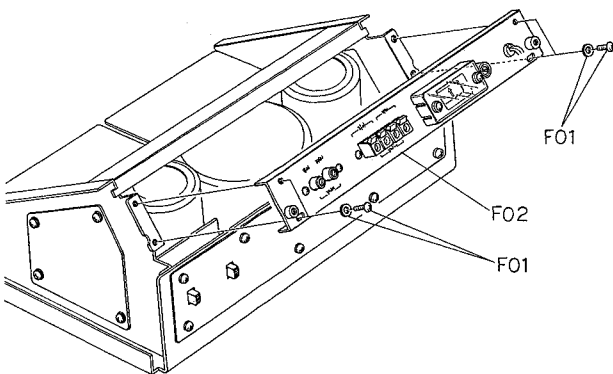


Fig. 3.2

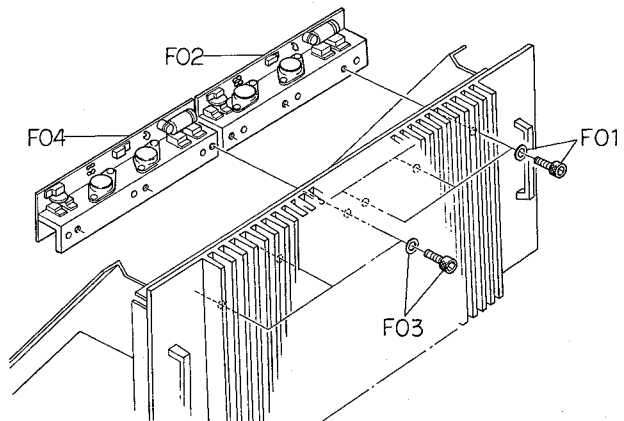


Fig. 3.5

**3.6. Jack**

Remove rear panel ass'y (3.2). Refer to Fig. 3.6 and remove F01 through F04 (2-pin jack) and F05 through F07 (push terminal).

**3.7. Indicator P.C.B. Ass'y**

Remove cabinet ass'y (3.1). Refer to Fig. 3.7 and remove F01 through F03.

**3.8. Relay P.C.B. Ass'y and Cement Resistor**

Remove cabinet ass'y (3.1). Refer to Fig. 3.8 and remove F01 and F02 (cement resistor), and F03 through F05 (relay P.C.B. ass'y).

**3.9. Diode and Output P.C.B. Ass'y**

Remove cabinet ass'y (3.1). Refer to Fig. 3.9 and remove F01 and F02 (diode), and F03 and F04 (output P.C.B. ass'y).

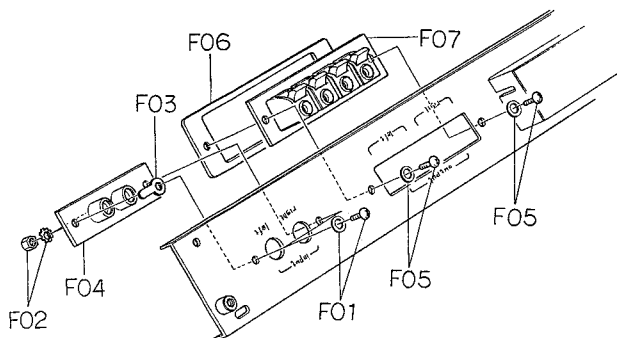


Fig. 3.6

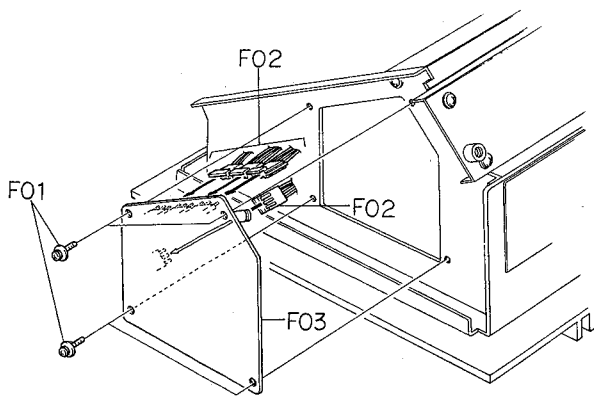


Fig. 3.7

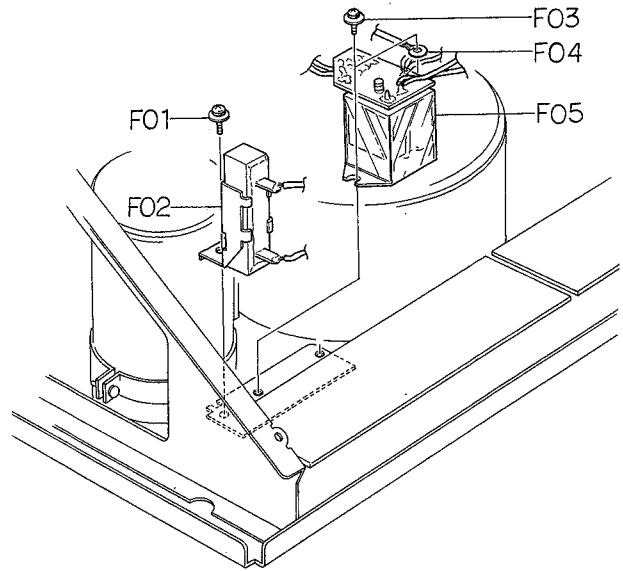


Fig. 3.8

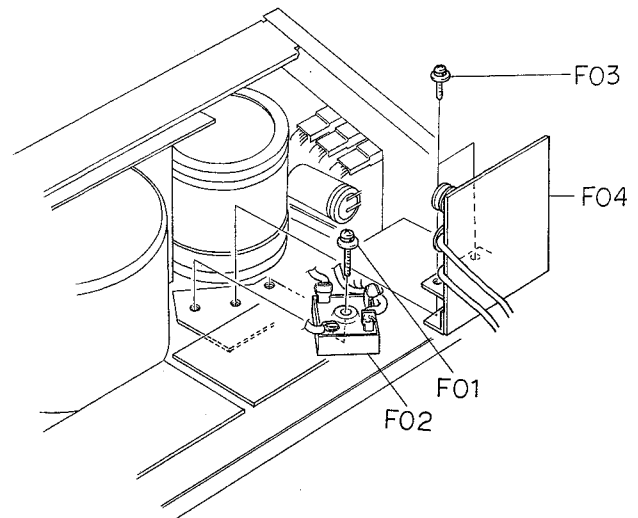


Fig. 3.9

### 3.10. Transformer and Capacitor

Remove cabinet ass'y(3.1). Refer to Fig. 3.10 and remove F01 through F06, F07 and F08 (transformer), F09 through F11 (capacitor) and F12 through F14 (capacitor).

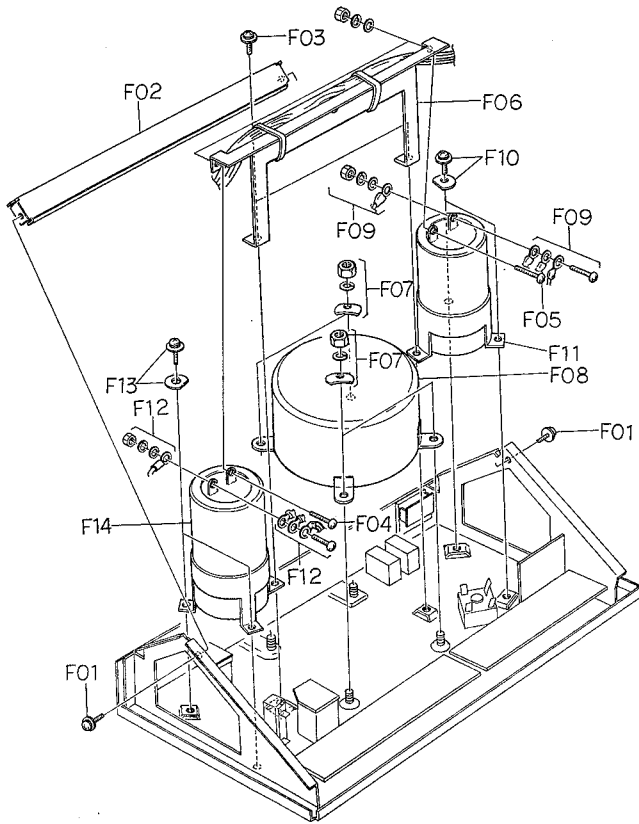


Fig. 3.10

#### 4. READJUSTMENT OF POWER BLOCK

The 620 uses no semi-fixed parts to enhance reliability. As long as all parts meet the specification, the published characteristics can be obtained without readjustment. Generally, no readjustment is required if only defective parts are replaced at repair.

Observe the following precautions when repairing defective parts:

- 4.1. Relocating a wiring can cause larger distortion. Do not relocate the wiring.
- 4.2. Fully tighten or retighten the screws on the chassis to decrease the resistance between GND terminals.
- 4.3. If a new semiconductor is installed in the power block, a perfect balance should be held between it and the existing semiconductors in the block. An imperfect balance can cause larger distortion or unwanted oscillation.

To maintain a good balance, connect an  $8\Omega$  100W load resistance to the output terminal, measure distortion and check that it meets the following requirements: (In this case, the residual distortion factor of the instrument should be lower than the specified value.)

- (1) Output 1 watt, 1 and 10 KHz input signals;  
less than 0.005%
- (2) Output 100 watts, 1 and 10 KHz input signals;  
less than 0.007%

Described here are the possible causes for defects and the recommended remedial steps:

- (1) The characteristic of one transistor does not match that of the other transistor when they are used as a pair.

- (2) Usually, the idling current of power transistors Q019 and Q020 is approx. 20mA – 30mA. If it is lower, the distortion at 1 watt will increase. In such a case, solder additional  $33K\Omega$  parallel to R018 and R019 ( $33K\Omega$ ), respectively, from the dip side of the printed circuit board.
- (3) Improper locations of power supply wiring will increase the distortion at 100 watts.
- (4) If oscillation occurs, the distortion will become large at both 1 watt and 100 watts. Sometimes, oscillation cannot be observed even on a synchroscope if it involves frequencies as high as several MHz. Oscillation may have occurred if the distortion is large though the external operating voltage remains normal. Try the following steps to eliminate oscillation:
  - (a) Add ceramic capacitors of the same capacity parallel to C010 and C011 ( $0.047\mu$ , 100V).
  - (b) Increase C013 (100pF) (by adding a 47pF in parallel) or decrease the capacitance (by replacing it with a 47p or removing it. If C013 is removed, make a short circuit by jumper wire.)
  - (c) Short R017 ( $27\Omega$ ) or increase it to  $47\Omega$ .

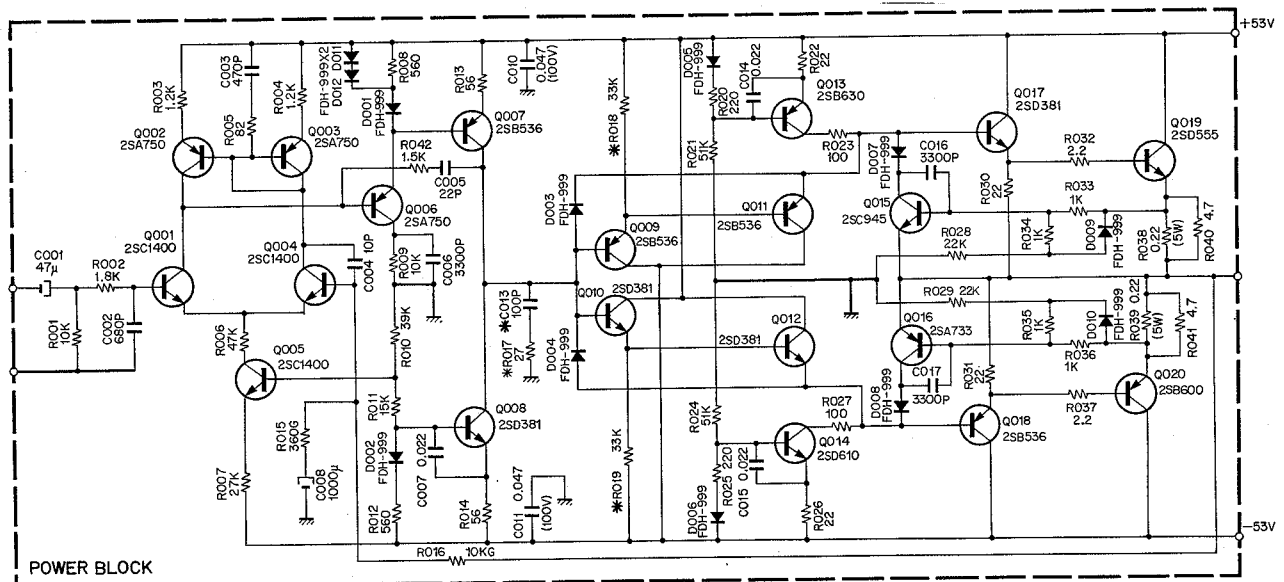


Fig. 4.

### 5. MOUNTING DIAGRAM AND PARTS LIST

Note: Mounting diagram shows a dip side view of the printed circuit board.

#### 5.1. Power Block Ass'y

##### 5.1.1. Power Block P.C.B. Ass'y

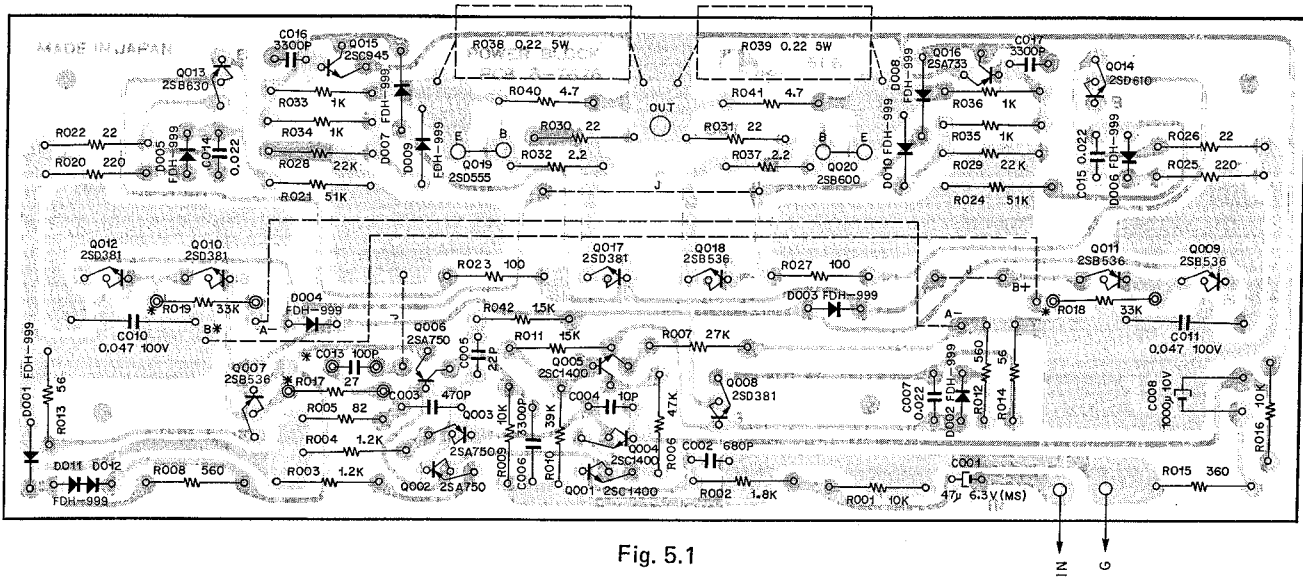


Fig. 5.1

- Note: 1. Resistors R018, 019 and capacitor C013 (\* marks) are the parts for adjustment, and so typical value is shown. Refer to "4. Readjustment of Power Block".
2. Diode 1S1555, transistors 2SB628 and 2SD608 are the same as diode FDH-999, transistors 2SB536 and 2SD381, respectively.

##### 5.1.2. Power Transistor P.C.B. Ass'y

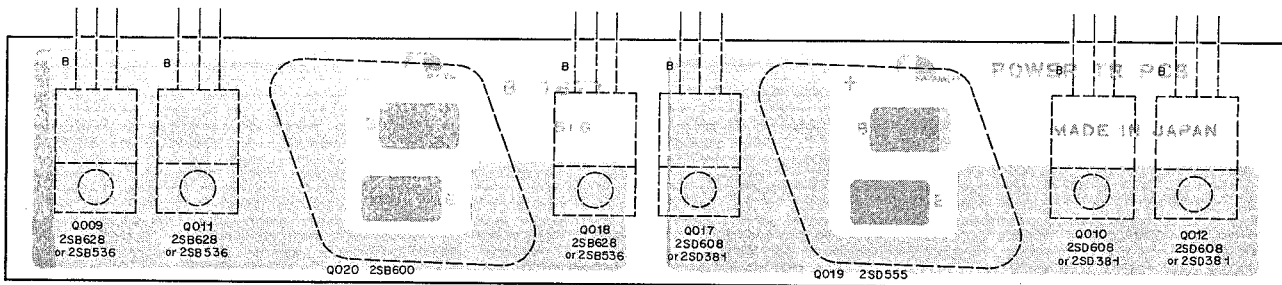


Fig. 5.2

##### 5.2. Output P.C.B. Ass'y

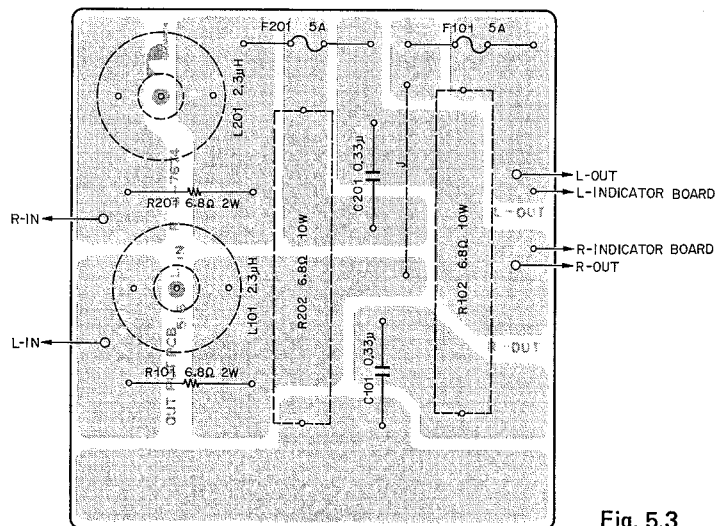


Fig. 5.3

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
	JA03107A	Power Block Ass'y	C007, 014 015 C008	OB05882A OB05852A	Ceramic Capacitor 0.022 $\mu$ 50V M Electrolytic Capacitor 1000 $\mu$ 10V
	BA03781A BA03780A 0E00231A 0E00026A	Power Block P.C.B. Ass'y Power Transistor P.C.B. Ass'y Screw M2.6x8 Philips Pan Head FT (4 pcs.) Washer 2.6mm Spring (4 pcs.)	C010, 011 C013	OB05883A OB05892A 0E00566A 0E00718A 0J03505A	Ceramic Capacitor 0.047 $\mu$ 100V M Ceramic Capacitor 100P 50V K Screw M3x6 Philips Pan Head (4 pcs.) Nut Hex. M3 (4 pcs.) Washer 3mm (Fiber) (2 pcs.)
Q001, 004 005 Q002, 003 006 Q007 Q008 Q013 Q014 Q015 Q016 D001, 002 003, 004 005, 006 007, 008 009, 010 011, 012 R001, 009 R002 R003, 004 R005 R006 R007 R008, 012 R010 R011 R013, 014 R015 R016 R017 R018, 019 R020, 025 R021, 024 R022, 026 030, 031 R023, 027 R028, 029 R032, 037 R033, 034 035, 036 R038, 039 R040, 041 R042 C001 C002 C003 C004 C005 C006, 016 017	BA03781A OB07676B OB06078A OB06074A OB06096A OB06097A OB06098A OB06099A OB06100A OB06013A OB06091A OB01888A OB05614A OB05623A OB05631A OB05641A OB05743A OB05575A OB01854A OB01683A OB05890A OB05877A OB05878A OB05875A OB05509A OB01933A OB05876A OB05579A OB01679A OB05615A OB05580A OB01857A OB05871A OB05891A OB05698A OB05864A OB05893A OB05880A OB05798A OB05806A OB05881A	Power Block P.C.B. Transistor 2SC1400 Transistor 2SA750 (1) Transistor 2SB536 (K, L, M) Transistor 2SD381 (K, L, M) Transistor 2SB630 (Q, R, S) Transistor 2SD610 (Q, R, S) Transistor 2SC945A (K, P, Q) Transistor 2SA733 Silicon Diode FDH-999 Carbon Resistor 10K ERD-14 TJ Carbon Resistor 1.8K ERD-14 TJ Carbon Resistor 1.2K ERD-14 TJ Carbon Resistor 82 ERD-14 TJ Carbon Resistor 47K ERD-14 TJ Carbon Resistor 27K ERD-14 TJ Carbon Resistor 560 ERD-14 TJ Carbon Resistor 39K ERD-14 TJ Carbon Resistor 15K ERD-14 TJ Carbon Resistor 56 ERD-14 TJ Metal Film Resistor 360 ERO-25 CKG Metal Film Resistor 10K ERO-25 CKG Carbon Resistor 27 ERD-14 TJ Carbon Resistor 33K ERD-14 TJ Carbon Resistor 220 ERD-14 TJ Carbon Resistor 51K ERD-14 TJ Carbon Resistor 22 ERD-14 TJ Carbon Resistor 100 ERD-14 TJ Carbon Resistor 22K ERD-14 TJ Carbon Resistor 2.2 ERD-14 TJ Carbon Resistor 1K ERD-14 TJ Cement Resistor 0.22 5W Carbon Resistor 4.7 ERD-14 TJ Carbon Resistor 1.5K ERD-14 TJ Electrolytic Capacitor 47 $\mu$ 16V M (MS) Ceramic Capacitor 680P 50V K Ceramic Capacitor 470P 50V K Ceramic Capacitor 10P 50V K Ceramic Capacitor 22P 50V K Ceramic Capacitor 3300P 50V M	Q009 Q010 Q011, 018 Q012, 017 Q019 Q020 0J03488C 0J03493A 0J03494A 0J03560A 0E00719A 0E00720A 0E00721A 0E00723A 0E00718A 0E00741A 0E00731A 0E00732A L101, 201 R101, 201 R102, 202 C101, 201 F101, 201	BA03780A OB07677A OB06094A OB06095A OB06096A OB06097A OB06083A OB06081A 0J03488C 0J03493A 0J03494A 0J03560A 0E00719A 0E00720A 0E00721A 0E00723A 0E00718A 0E00741A 0E00731A 0E00732A BA03777A OB07674B BA03784A OB05872A OB05870A OB01602A OB08239U 0J03510A 0E00166A 0E00606A	Power Transistor P.C.B. Ass'y Power Transistor P.C.B. Transistor 2SB536 (L) Transistor 2SD381 (L) Transistor 2SB536 (K, L, M) Transistor 2SD381 (K, L, M) Transistor 2SD555 Transistor 2SB600 Power Transistor Heat Sink (1 pce.) Power Transistor Bush (4 pcs.) Transistor Bush (6 pcs.) Spring Pin (4 pcs.) Screw M4x15 Philips Pan Head (4 pcs.) Washer 4mm Spring (4 pcs.) Nut Hex. M4 (4 pcs.) Washer 3mm Spring (6 pcs.) Nut Hex. M3 (6 pcs.) Screw M3x12 Philips Binding Head (6 pcs.) Washer 4mm (4 pcs.) Washer 3mm (12 pcs.) Output P.C.B. Ass'y Output P.C.B. Output Coil Ass'y 2.3 $\mu$ H Metal Oxide Resistor 6.8 2W Cement Resistor 6.8 10W Mylar Capacitor 0.33 $\mu$ 50V K Fuse 5A (2 pcs.) Output P.C.B. Holder (1 pce.) Screw M2x4 Cylinder Head (2 pcs.) Screw M3x6 Philips Pan Head (3A) (3 pcs.)

5.3. Indicator P.C.B. Ass'y

Note: Diode 1S1555 is the same as FDH-999.

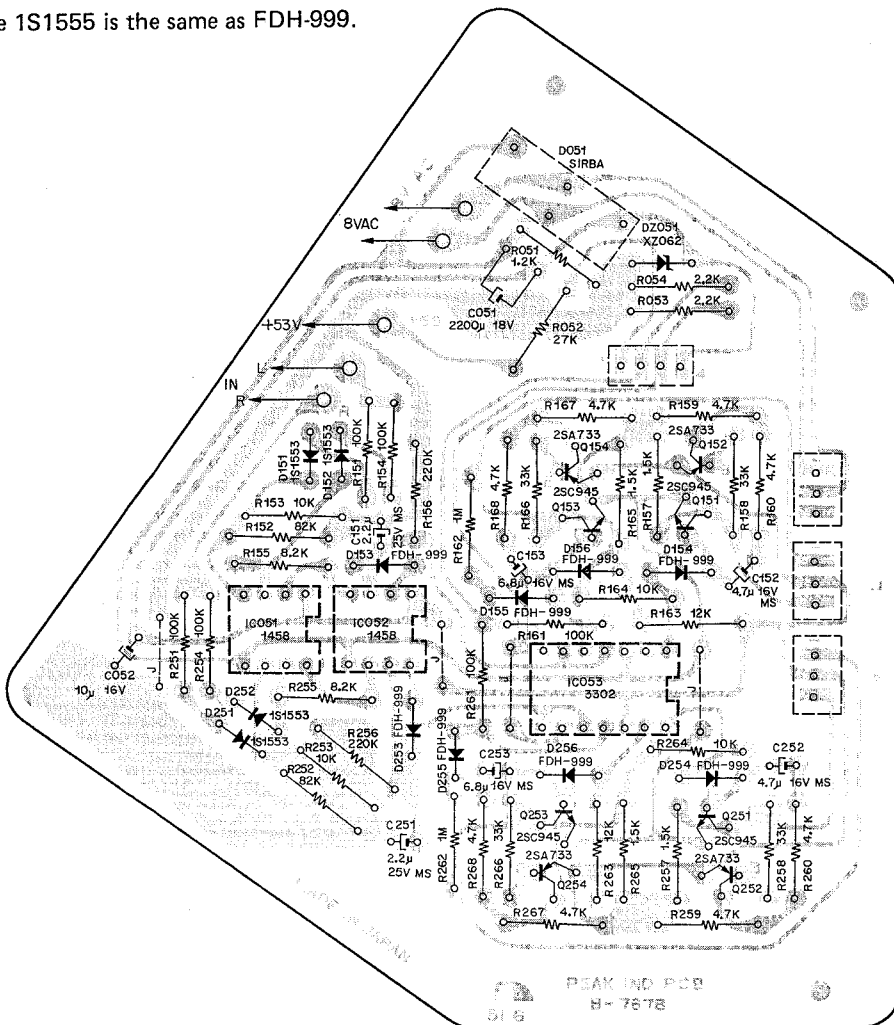


Fig. 5.4

5.4. Indicator Sw. P.C.B. Ass'y

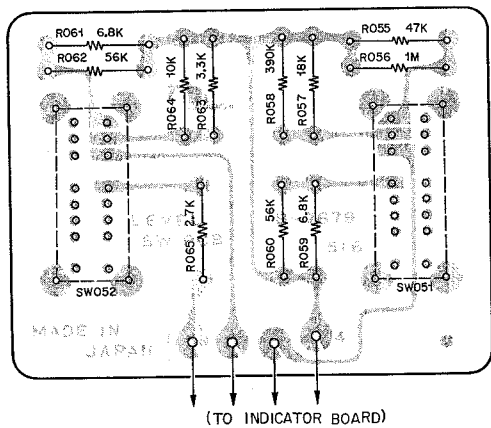


Fig. 5.5

5.5. Indicator Lamp P.C.B. Ass'y

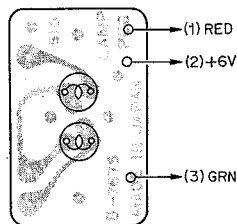


Fig. 5.6

5.6. Power Lamp P.C.B. Ass'y

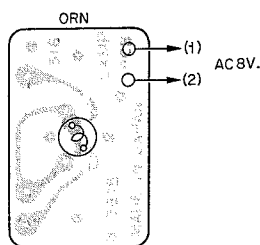


Fig. 5.7

5.7. Relay P.C.B. Ass'y

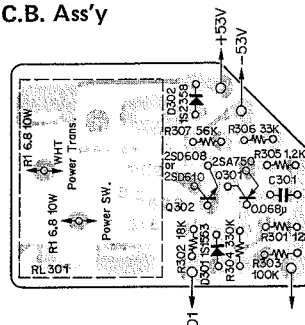


Fig. 5.8

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
	<b>BA03776A</b>	<b>Indicator P.C.B. Ass'y</b>		<b>BA03779A</b>	<b>Indicator Sw. P.C.B. Ass'y</b>
	OB07678C	Indicator P.C.B.		OB07679B	Indicator SW. P.C.B.
IC051, 052	OB06086A	IC 1458	R055	OB05641A	Carbon Resistor 47K ERD-14 TJ
IC053	OB06087A	IC 3302	R056	OB05776A	Carbon Resistor 1M ERD-14 TJ
Q151, 153	OB06100A	Transistor 2SC945A (K, P, Q)	R057	OB05560A	Carbon Resistor 18K ERD-14 TJ
251, 253			R058	OB05676A	Carbon Resistor 390K ERD-14 TJ
Q152, 154	OB06013A	Transistor 2SA733	R059, 061	OB01682A	Carbon Resistor 6.8K ERD-14 TJ
252, 254			R060, 062	OB05508A	Carbon Resistor 56K ERD-14 TJ
DZ051	OB06089A	Silicon Diode XZ062	R063	OB01681A	Carbon Resistor 3.3K ERD-14 TJ
D051	OB06088A	Silicon Diode SIRBA	R064	OB01888A	Carbon Resistor 10K ERD-14 TJ
D151, 152	OB06076A	Silicon Diode 1S1553	R065	OB05629A	Carbon Resistor 2.7K ERD-14 TJ
251, 252			SW051, 052	OB07105A	Slide SW.
D153, 154	OB06091A	Silicon Diode FDH-999		OB08237A	4P-H Connector Ass'y (1 pce.)
155, 156				OJ03501A	Indicator SW. P.C.B. Holder (1 pce.)
253, 254				OE00166A	Screw M2x4 Cylinder Head (4 pcs.)
255, 256				<b>BA03783A</b>	<b>Indicator Lamp P.C.B. Ass'y</b>
R051	OB05623A	Carbon Resistor 1.2K ERD-14 TJ		OB07675A	Lamp P.C.B.
R052	OB05743A	Carbon Resistor 27K ERD-14 TJ		OB08234U	Lamp 12V 60mA (2 pcs.)
R053, 054	OB05622A	Carbon Resistor 2.2K ERD-14 TJ		OB08235A	3P-H Connector Ass'y C (1 pce.)
R151, 154	OB01889A	Carbon Resistor 100K ERD-14 TJ		<b>BA03782A</b>	<b>Power Lamp P.C.B. Ass'y</b>
161, 251				OB07675A	Lamp P.C.B'
254, 261				OB08234U	Lamp 12V 60mA (1 pce.)
R152, 252	OB05668A	Carbon Resistor 82K ERD-14 TJ		OB08238A	3P-H Connector Ass'y D (1 pce.)
R153, 164	OB01888A	Carbon Resistor 10K ERD-14 TJ		<b>BA03778A</b>	<b>Relay P.C.B. Ass'y</b>
253, 264				OB07673B	Relay P.C.B.
R155, 255	OB01856A	Carbon Resistor 8.2K ERD-14 TJ	Q301	OB06074A	Transistor 2SA750
R156, 256	OB05625A	Carbon Resistor 220K ERD-14 TJ	Q302	OB06099A	Transistor 2SD610
R157, 165	OB05698A	Carbon Resistor 1.5K ERD-14 TJ	D301	OB06076A	Silicon Diode 1S1553
257, 265			D302	OB06077A	Silicon Diode 1S2358
R158, 166	OB05509A	Carbon Resistor 33K ERD-14 TJ	R301	OB05650A	Carbon Resistor 12K ERD-14 VJ
258, 266			R302	OB05561A	Carbon Resistor 18K ERD-14 VJ
R159, 160	OB01846A	Carbon Resistor 4.7K ERD-14 TJ	R303	OB01920A	Carbon Resistor 100K ERD-14 VJ
167, 168			R304	OB01921A	Carbon Resistor 330K ERD-14 VJ
259, 260			R305	OB05565A	Carbon Resistor 1.2K ERD-14 VJ
267, 268			R306	OB01879A	Carbon Resistor 33K ERD-14 VJ
R162, 262	OB05776A	Carbon Resistor 1M ERD-14 TJ	R307	OB05563A	Carbon Resistor 56K ERD-14 VJ
R163, 263	OB05771A	Carbon Resistor 12K ERD-14 TJ	C301	OB05586A	Mylar Capacitor 0.068μ 50V K
C051	OB01835A	Electrolytic Capacitor 2200μ 18V	RL301	OB08228A	Relay HCI-TMCD 100VDC
C052	OB01412A	Electrolytic Capacitor 10μ 16V			
C151, 251	OB05598A	Tantalum Capacitor 2.2μ 25VM			
C152, 252	OB05819A	Electrolytic Capacitor 4.7μ 16V			
		M (MS)			
C153, 253	OB05861A	Electrolytic Capacitor 6.8μ 16V			
		M (MS)			
	OB08185A	3P-T Post (3 pcs.)			
	OB08236A	4P-T Post (1 pce.)			

## 6. MECHANISM ASS'Y AND PARTS LIST

## 6.1. Synthesis (A01)

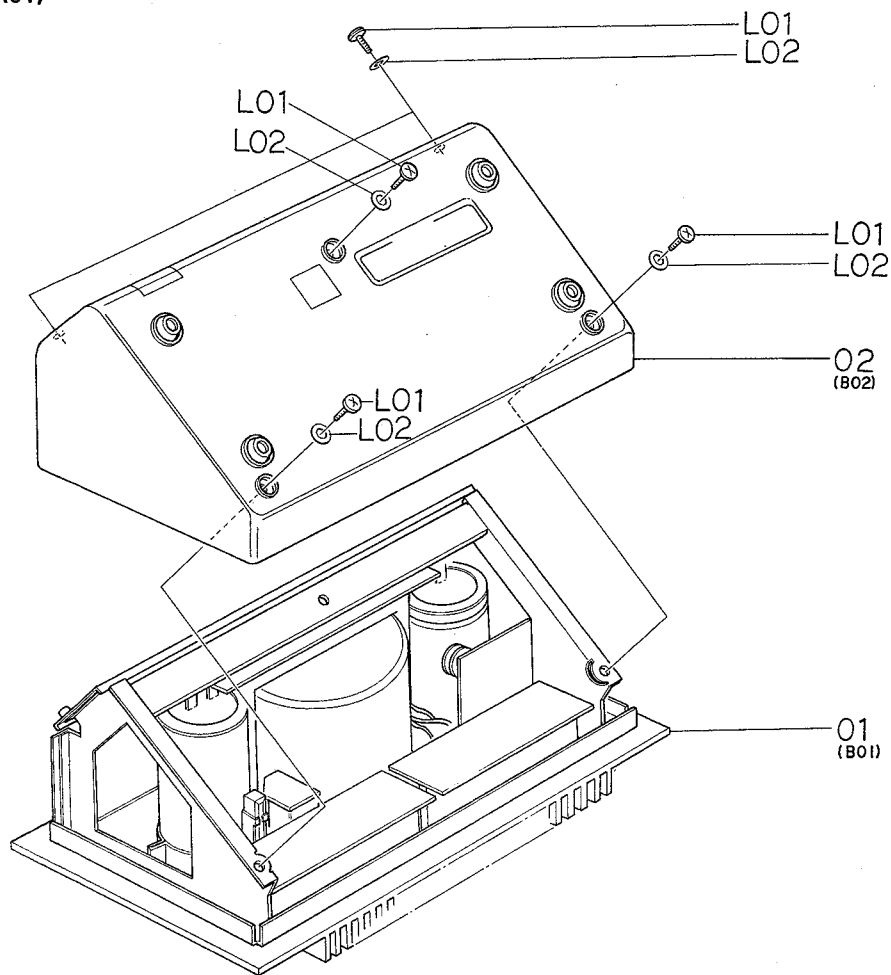


Fig. 6.1

Schematic Ref. No.	Part No.	Description	Q'ty	Schematic Ref. No.	Part No.	Description	Q'ty
<b>A01</b>		<b>Synthesis</b>			0B05122A	Cord with Terminal B	1
	01	Mechanism Ass'y	1		0B05123A	Cord with Terminal C	1
	02	Cabinet Ass'y	1		0B05124A	Cord with Terminal D	1
L01	0E00594A	Screw M3x8 Philips Binding head (Bronze)	5		0B05125A	Cord with Terminal E	1
L02	0E00197A	Washer 3mm (Bronze)	5		0B05126A	Cord with Terminal F	1
				L01	0E00733A	M4x12Bolt (Hex.Socket Head)	6
				L02	0J03556A	Washer 4mm (Black)	6
<b>B01</b>	<b>JA03103A</b>	<b>Mechanism Ass'y</b>	<b>1</b>	L03	0E00657A	Screw M3x5 Philips Pan Head	8
	01	Handle (B)	2	L04	0E00677A	Washer 3mm (Black)	8
	02	Front Panel Ass'y	1	L05	0E00606A	Screw M3x6 Philips Pan Head (3A)	6
	03	Light-Intersecting Shade	2	L06	0E00718A	Nut Hex. M3	5
	04	OM03683B	1	L07	0E00723A	Washer 3mm Spring	5
	05	BA03776A	1	L08	0E00732A	Washer 3mm	5
	06	JA03104A	1	L09	0E00659A	Screw M3x10 Philips Pan Head	5
	07	JA03106A	2	L10	0E00700A	Screw M5x16 Philips Pan Head (2A)	4
	08	JA03105A	1				
	09	JA03108A	1	L11	0E00593A	Screw M3x6 Philips Binding Head	4
	10	JA03107A	2				
	11	0J03506A	1	L12	0E00197A	Washer 3mm (Bronze)	4
		0B05121A	1	L13	0E00037A	Earth Lug B-5	2

6.2. Mechanism Ass'y (B01)

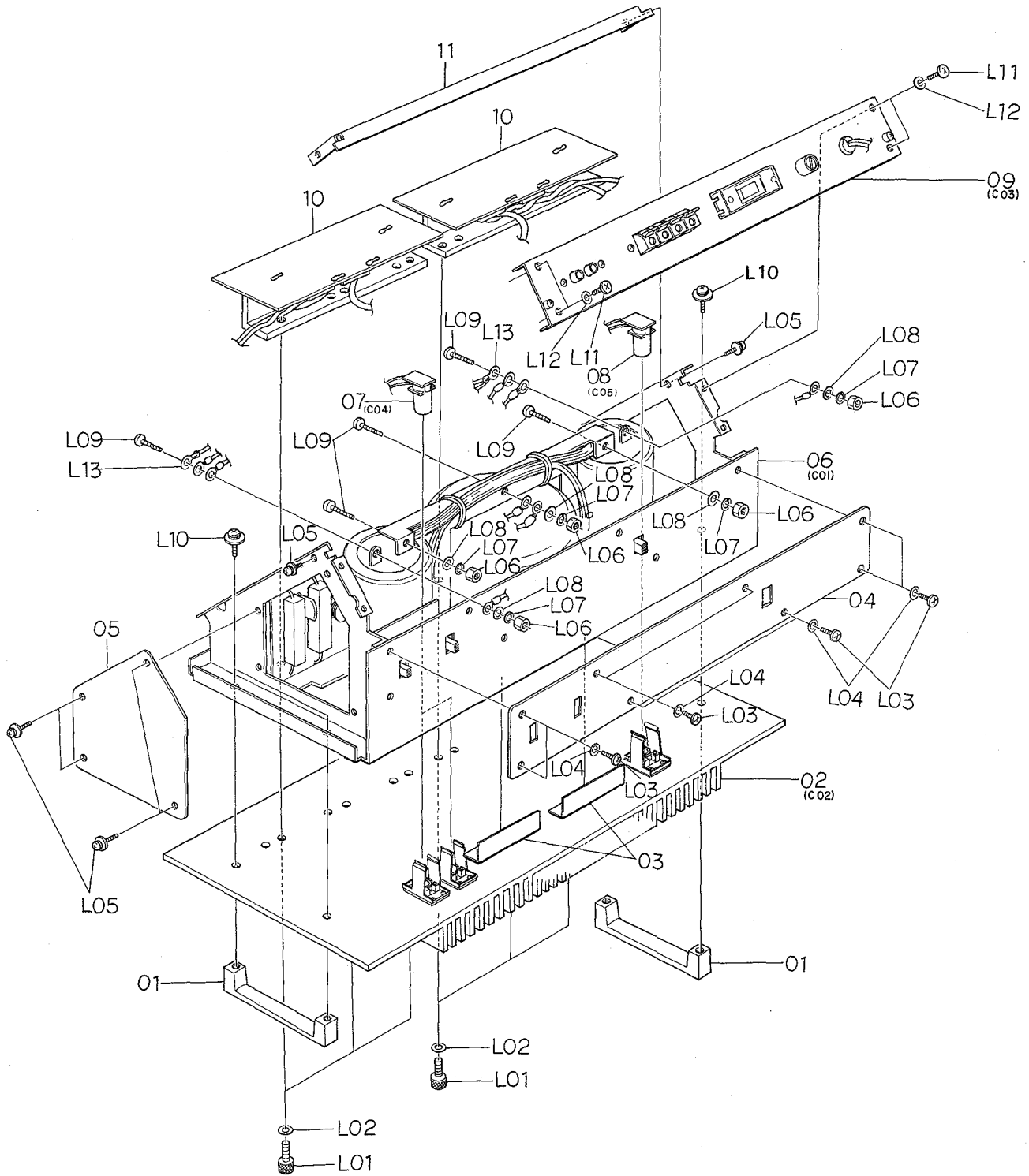


Fig. 6.2

## 6.3. Cabinet Ass'y (B02)

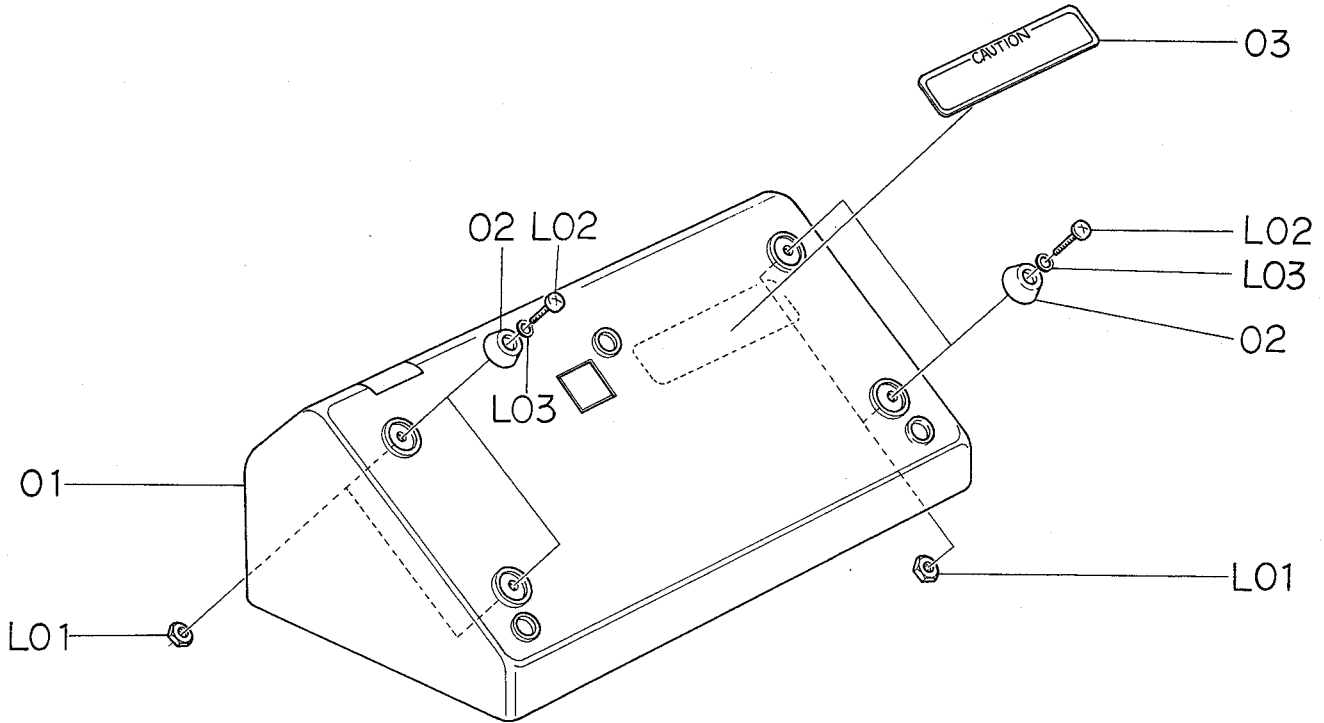


Fig. 6.3

Schematic Ref. No.	Part No.	Description	Q'ty	Schematic Ref. No.	Part No.	Description	Q'ty
<b>B02</b>	<b>HA03634A</b>	<b>Cabinet Ass'y</b>	<b>1</b>	10	0B06554U	Power Transformer	1
01	0A03254A	Cabinet	1	11	0J03508B	Earth Angle	1
02	0A00518C	Gum Foot	4	L01	0E00533A	Screw M3x5 Philips Counter-sunk	2
03	0M03339A	Caution Label	1	L02	0E00007A	Screw M2.6x5 Philips Countersunk	1
	0M03674A	Shield Foil 610	1	L03	0E00219A	Screw M2.6x5 Philips Pan Head	2
L01	0E00552A	Nut Hex. M3	4	L04	0E00606A	Screw M3x6 Philips Pan Head (3A)	5
L02	0E00701A	Screw M3x10 Philips Binding Head (Bronze)	4	L05	0E00037A	Earth Lug B-5	1
L03	0E00253A	Washer 3.3mm	4	L06	0J03512A	Capacitor Holder Washer	4
	0M03619A	Gate Bind Plate	1	L07	0E00667A	Screw M4x6 Philips Pan Head (2A)	4
<b>C01</b>	<b>JA03104A</b>	<b>Main Chassis Ass'y</b>	<b>1</b>	L08	0J03511A	Transformer Holder Washer	4
01	JA03109A	Main Chassis Sub Ass'y	1	L09	0E00709A	Washer 5mm Spring	4
02	0B07092U	Power SW.	1	L10	0E00513A	Nut Hex. M5	4
03	BA03779A	Indicator SW. P.C.B. Ass'y	1	L11	0E00727A	Screw M4x8 Philips Pan Head (2A)	2
04	0J03469A	SW. Shade	2	L12	0E00726A	Screw M4x15 Philips Pan Head (3A)	1
05	BA03777A	Output P.C.B. Ass'y	1	L13	0E00142A	Washer 2.6mm	2
06	0B06085A	Silicon Diode S15VB-20	1				
07	0B05874A	Cement Resistor 6.8Ω 10W	1				
08	BA03778A	Relay P.C.B. Ass'y	1				
09	0B05873B	Electrolytic Capacitor 39,000μF 63V	2				

6.4. Main Chassis Ass'y (C01)

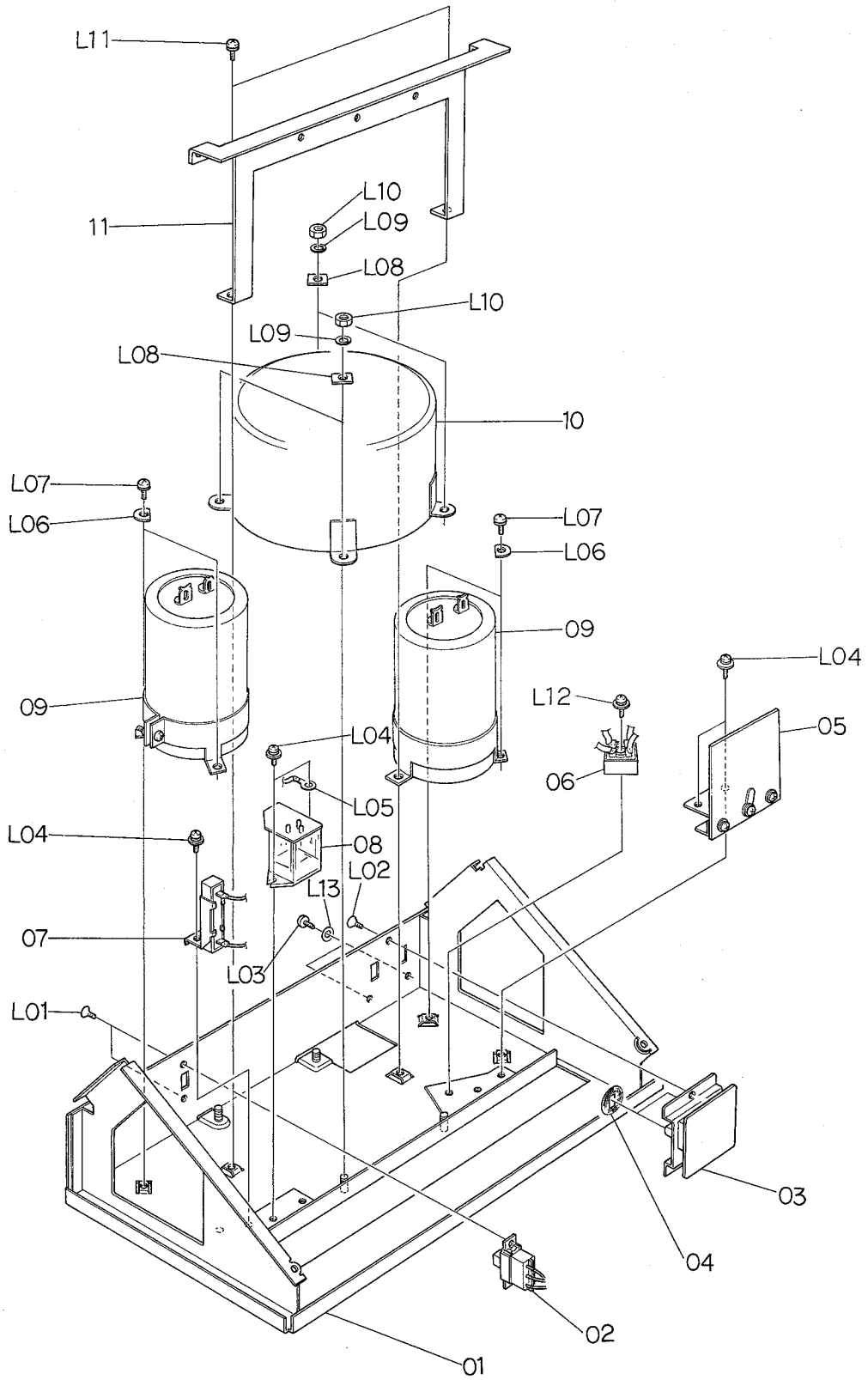


Fig. 6.4

6.5. Front Panel Ass'y (C02)

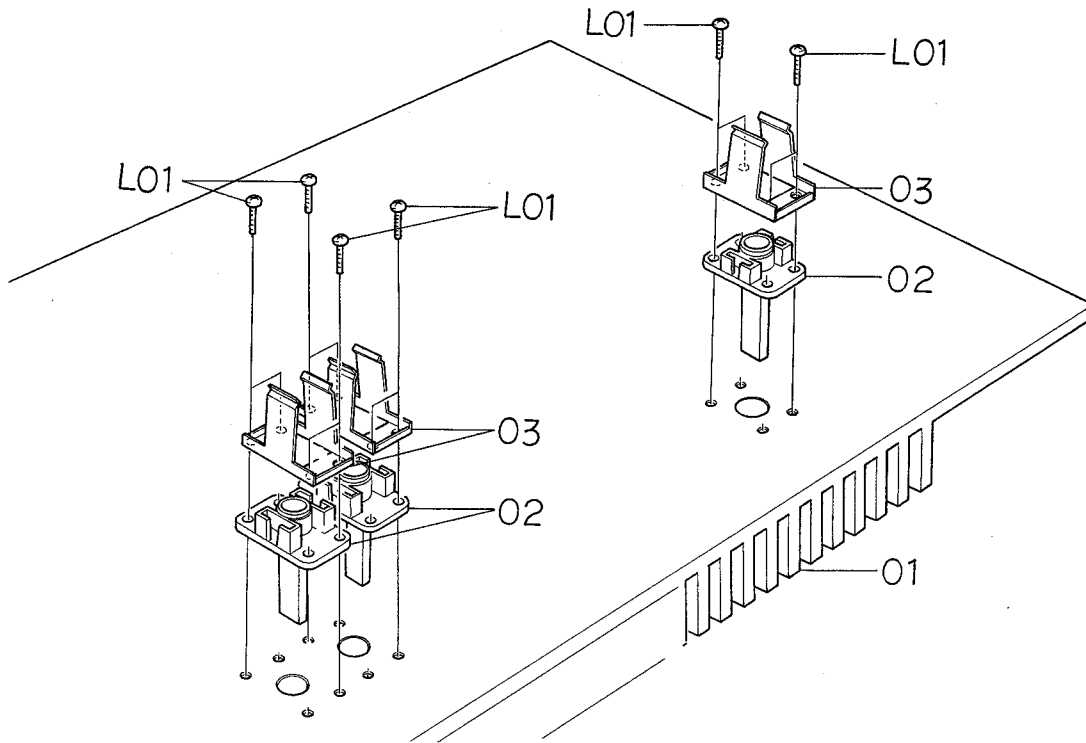


Fig. 6.5

6.6. Rear Panel Ass'y (C03)

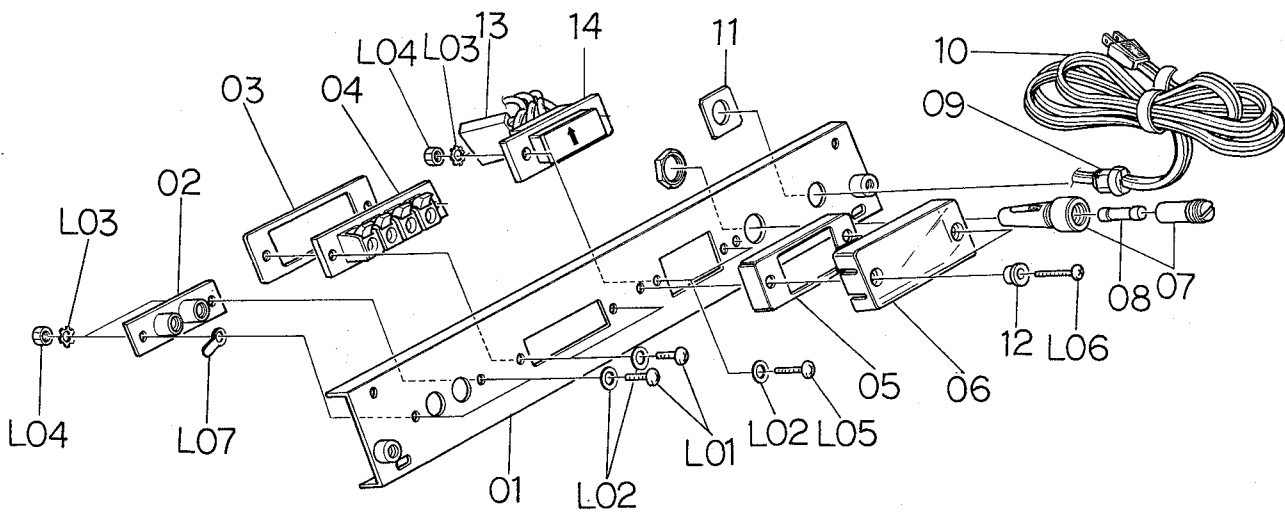


Fig. 6.6

## 6.7. Indicator Lamp Ass'y (C04)

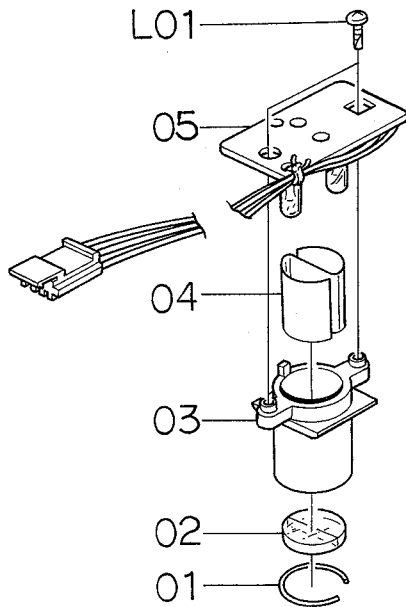


Fig. 6.7

## 6.8. Power Lamp Ass'y (C05)

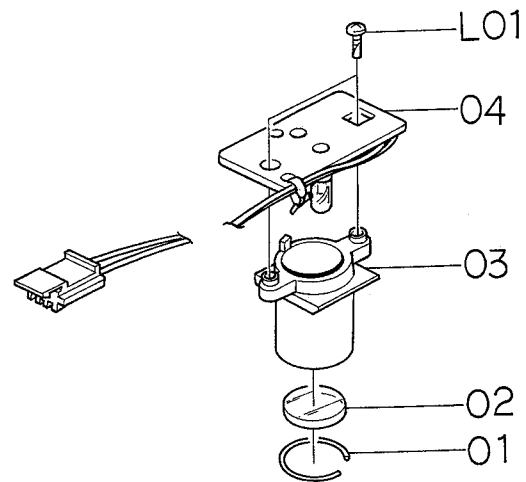


Fig. 6.8

Schematic Ref. No.	Part No.	Description	Q'ty	Schematic Ref. No.	Part No.	Description	Q'ty
C02	HA03658A	Front Panel Ass'y	1	C04	JA03106A	Indicator Lamp Ass'y	2
01	0H03452B	Front Panel	1	01	0J03509A	Filter Stopper	1
02	0H03453C	Indicator Base	3	02	JA03111A	Filter Ass'y	1
03	0J03559B	Lamp House Holder Spring (B)	3	03	0J03489A	Lamp House	1
L01	0E00740A	Screw M2x8 Cylinder Head	12	04	0J03507C	Light-Intercepting Plate	1
C03	JA03108A	Rear Panel Ass'y	1	05	BA03783A	Indicator Lamp P.C.B. Ass'y	1
01	JA03110A	Rear Panel Sub Ass'y	1	L01	0E00724A	Screw M2.6x5 Philips Pan Head (Tapping)	2
02	0B03072A	2P Pin Jack	1	C05	JA03105A	Power Lamp Ass'y	1
03	0J03502A	Push Terminal Holder	1	01	0J03509A	Filter Stopper	1
04	0B08233U	Push Terminal	1	02	0J03490A	Orange Filter	1
05	0H03335A	Voltage Selector Cover S0	1	03	0J03489A	Lamp House	1
06	0H03334B	Acrylic Cover	1	04	BA03782A	Power Lamp P.C.B. Ass'y	1
07	0B08231U	Fuse Socket	1	L01	0E00724A	Screw M2.6x5 Philips Pan Head (Tapping)	2
08	0B08230U	Fuse 3.15A (220, 240V)	1				
08	0B08232U	Fuse 5A (100, 117V)	1				
09	0B08037U	Cord Bush (C)	1				
10	0B03900U	Power Cord	1				
11	0A03154B	Cord Spacer	1				
12	0H03366A	Washer for/Voltage Selector Cover	2				
13	0B08240U	Spark Killer	1				
14	0B03877U	Voltage Selector Socket	1				
L01	0E00594A	Screw M3x8 Philips Pan Head (Bronze)	4				
L02	0E00157A	Washer 3mm (Black)	6				
L03	0E00172A	Washer 3mm Toothed Lock	4				
L04	0E00507A	Nut Hex. M3	4				
L05	0E00590A	Screw M3x12 Philips Pan Head (Bronze)	2				
L06	0E00591A	Screw M3x20 Philips Pan Head (Bronze)	2				
L07	0E00037A	Earth Lug B-5	1				

7. WIRING DIAGRAM

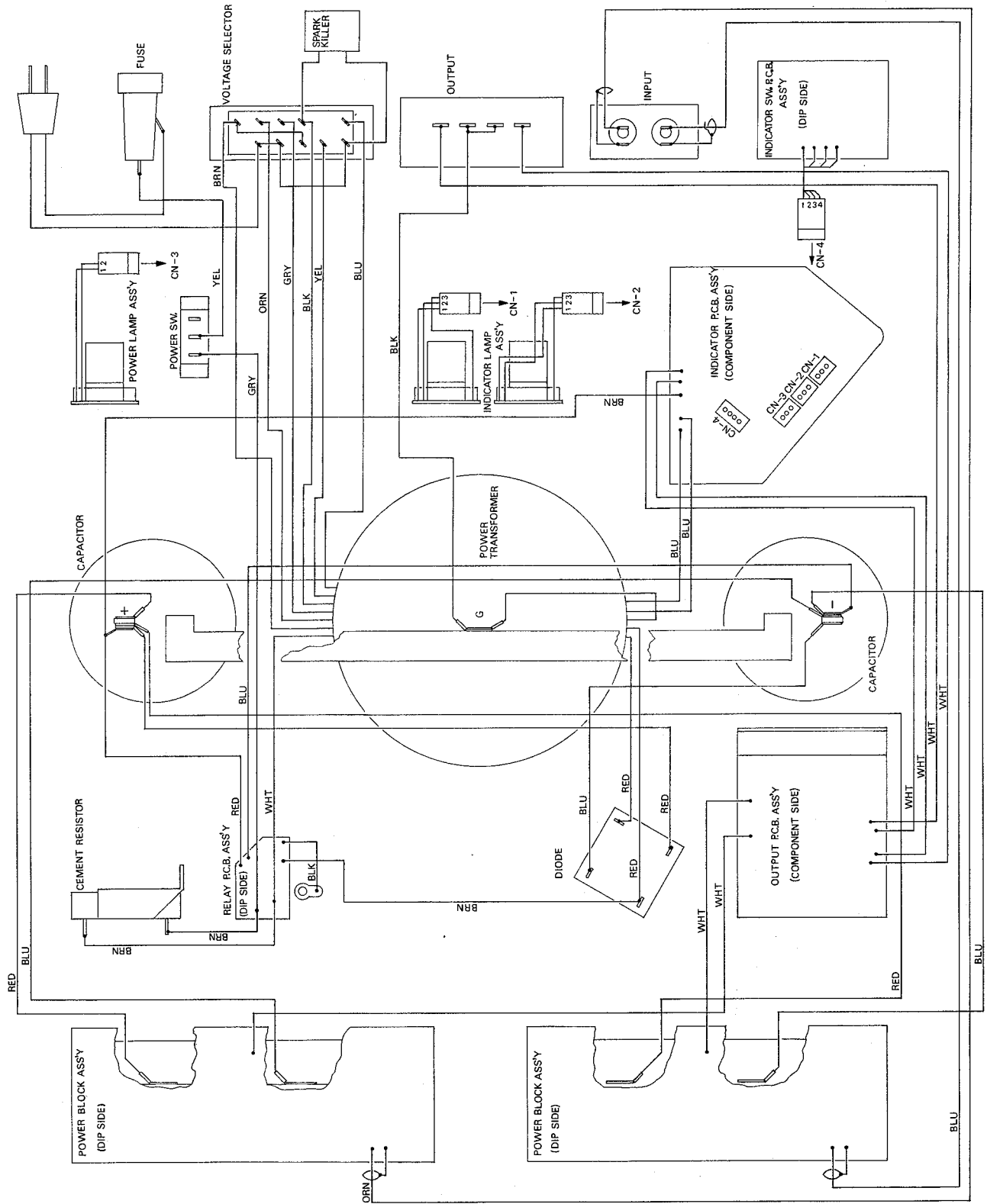
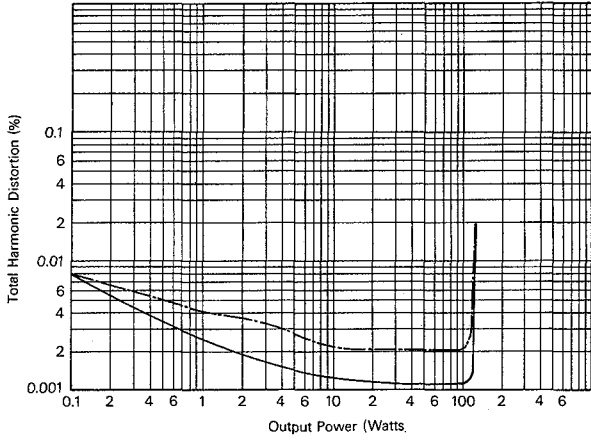


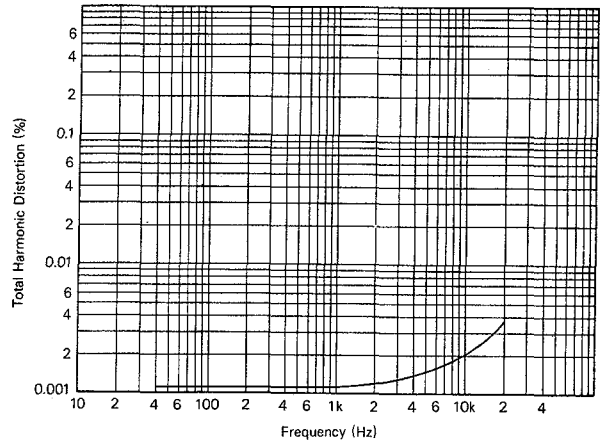
Fig. 7

8. PERFORMANCE DATA

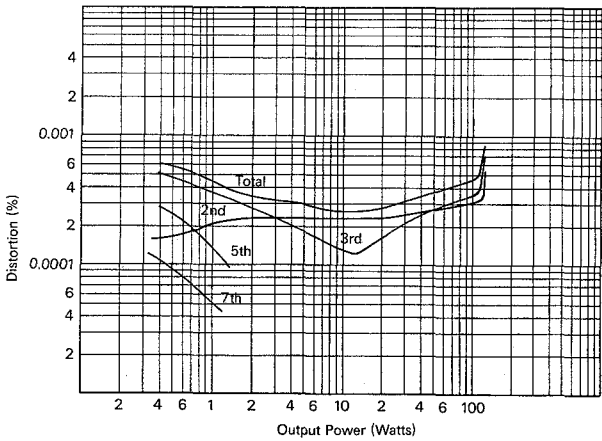
Output vs Total Harmonic Distortion  
 Distortion  
 — : 1kHz  
 - - - : 10kHz  
 Load Imp: 8 ohms  
 Filter: 400Hz H.P.  
 80kHz L.P.



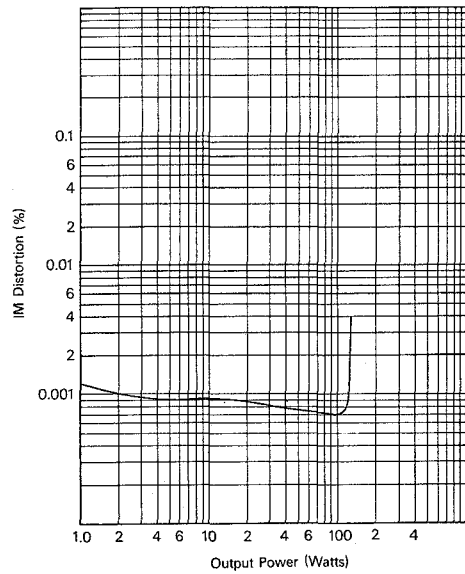
Frequency vs Total Harmonic Distortion  
 Output: 100 Watts Constant  
 Load Imp: 8 ohms



Output vs Harmonic Distortion  
 Frequency: 1kHz  
 Load Imp: 8 ohms



Output Power vs IM Distortion  
 60Hz : 7kHz (4 : 1)



The distortion data immediately above was obtained with the aid of a Bruel & Kjaer 3348 Real Time Analyzer. These measurements cannot be made with conventional distortion analyzers because of noise factors.

Fig. 8

9. BLOCK DIAGRAM

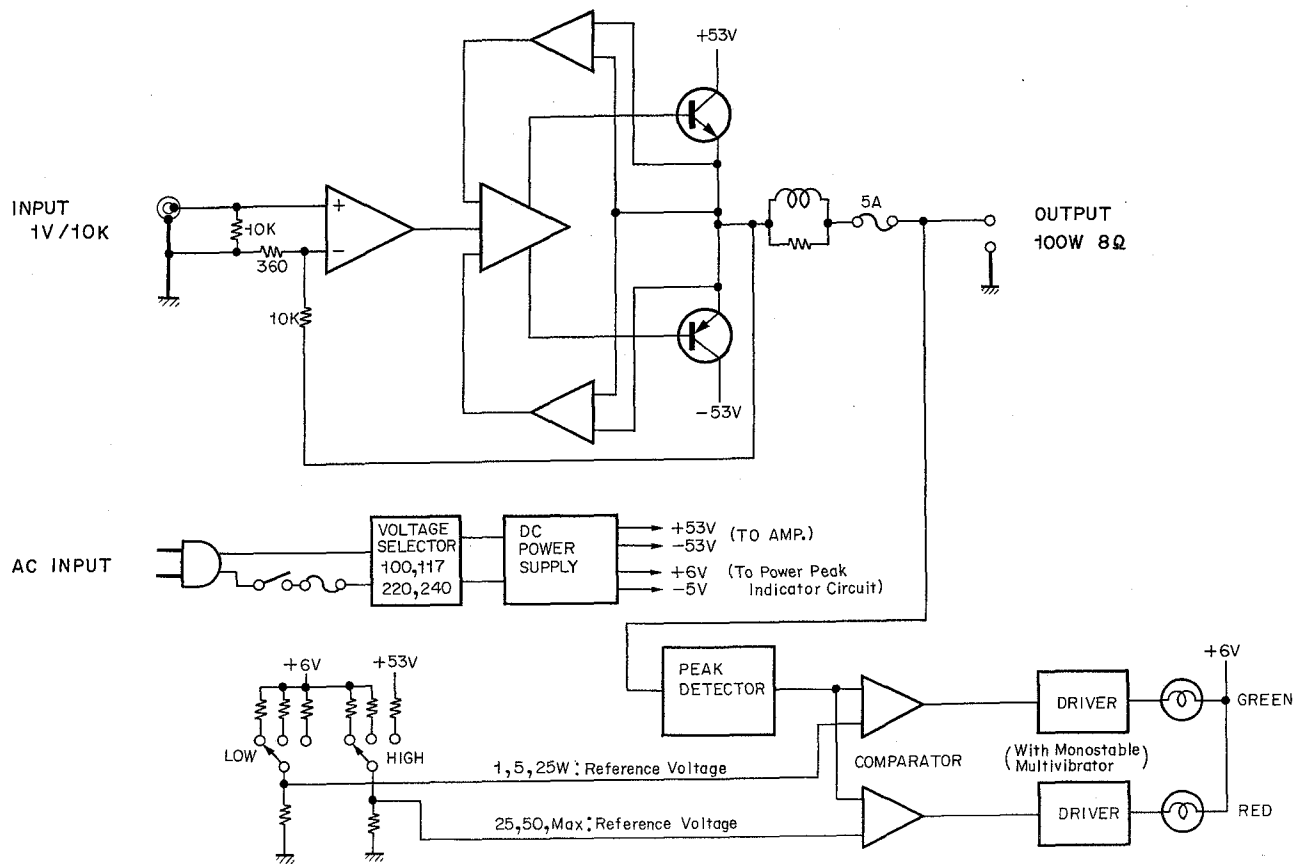
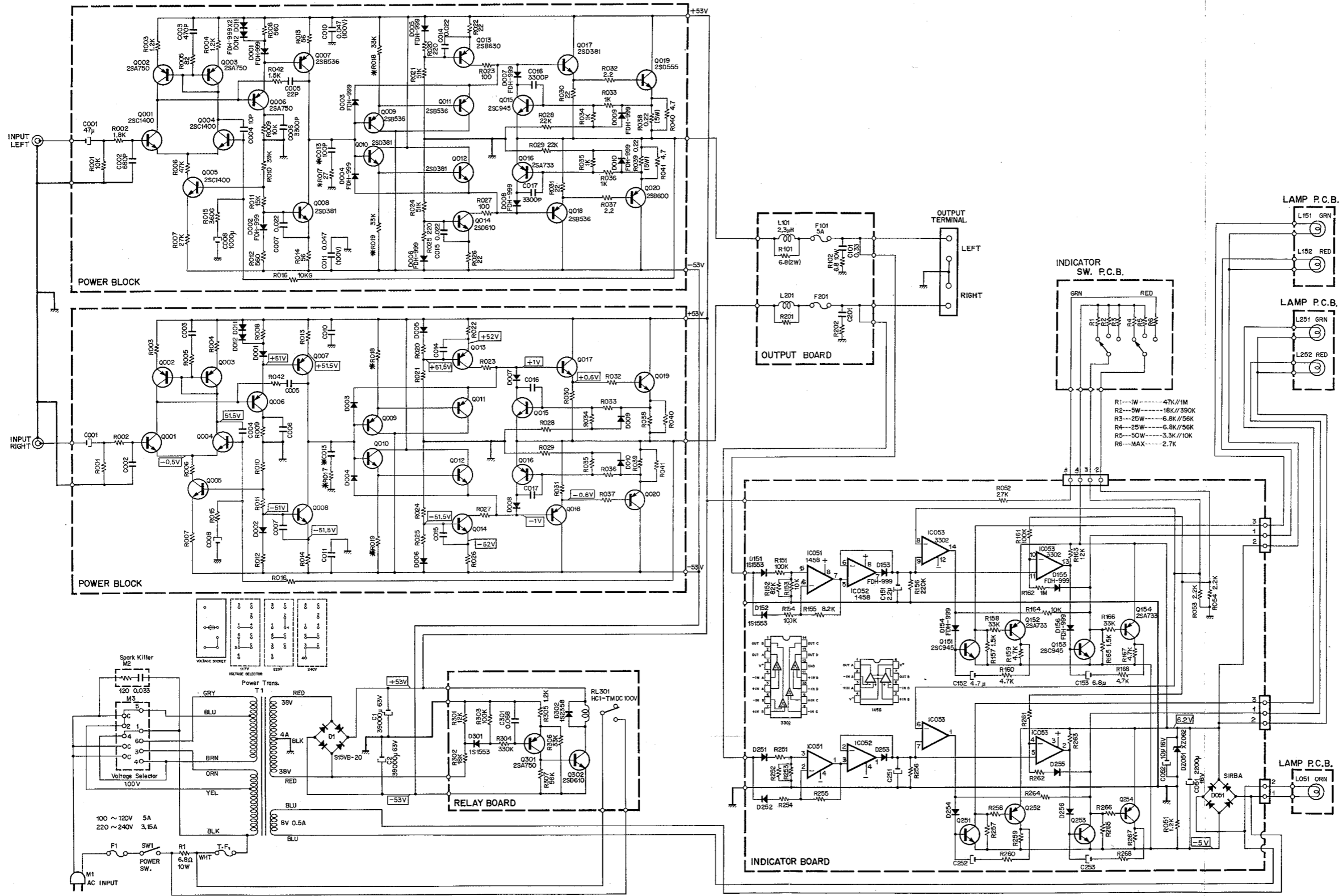


Fig. 9

10. SCHEMATIC DIAGRAM



Note: 1.  shows the reference circuit voltage at approx. 30 watts output.

2. In the power block circuit, resistor R018,019 and capacitor C013 (\* marks) are the parts for adjustment, and so typical value is shown.

Fig. 10



## 11. SPECIFICATIONS

Power Source .....	100/117/220/240 V AC, 50/60 Hz
Power Consumption .....	50 VA at idling
Power Output .....	700 VA with both channels driven to clipping into 8 ohm loads 100 Watts per channel minimum continuous sine wave ("RMS") at 8 ohms, 5-20,000 Hz with less than 0.01%THD
IHF Power Bandwidth .....	50 Watts per channel at 16 ohms
(both channels driven)	5 - 50,000 Hz for less than 0.1%THD 5 - 20,000 Hz for less than 0.01%THD 5 - 10,000 Hz for less than 0.005%THD
Damping Factor .....	Greater than 100 (1 KHz, 8 ohms)
Total Harmonic Distortion .....	Less than 0.002% @ 1 KHz or below Less than 0.005% @ 10 KHz or below
Intermodulation Distortion .....	Less than 0.002% (60 Hz: 7 KHz, 4:1, 8 ohm load, 100 W output)
Frequency Response .....	5 - 100,000 Hz +0, -1 dB
Input Impedance .....	10 K ohms
Residual Noise Level .....	Less than 0.05 mV (IHF A Network) Less than 0.1 mV (linear)
Signal-to-Noise Ratio .....	Better than 120 dB at rated output (IHF A, input shorted)
Crosstalk .....	Better than -70 dB @ 1 KHz
Peak Power Indicators .....	Green at 1 W, 5 W, 25 W, selectable Red at 25 W, 50 W, Maximum (110-130 W) selectable (Response time: responds to 0.1 ms pulse - off after 0.3 sec)
Dimensions .....	15.75"(W) x 7.44"(H) x 9.76"(D)
Weight .....	400mm (W) x 189mm (H) x 248mm (D) 27.6 lbs. (12.5 kg)

- Specifications and appearance design are subject to change for further improvement without notice.

# Service Manual

# Nakamichi 620

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# Service Information



NAKAMICHI

Model Nakamichi 620 (Power Amplifier)  
Serial No. from 4104902  
Subject Addition of Protector Circuit

No. OOD-M-0044 (1/5)  
Date 1 September, 1977

## I. General:

### A. Purpose:

A protector circuit has been added to prevent speakers from breakage, as the breakage of transistors in 620 would induce possible breakage of the speaker.

Note: When the protector circuit is activated (speaker terminals shorted with relay contacts), the power supply for 620 is required to be once switched off so as to release the protecting function. The power should again be supplied for at least 5 minutes after switching off.

### B. Modification:

#### Additional Parts:

Part No.	BA03865A Protector P.C.B. Ass'y	....	1 pce.
	OJ03687A E.P. Stud A	....	2 pcs.
	OE00030A Washer 3mm	....	1 pce.

#### Modified Parts:

Main Chassis Ass'y .... Part No. has been changed from JA03104A to JA03104B (including Protector P.C.B. Ass'y).

Mechanism Ass'y ..... Part No. has been changed from JA03103A to JA03103B (including Protector P.C.B. Ass'y).

### C. Principle of Operation:

The protector circuit aims at protecting the speaker with a shortcut from the speaker terminals to GND by operating the relay in Protector P.C.B. Ass'y when D.C. voltage is impressed between speaker terminals against any possible accident.

The time length required for protector to operate are specified as below according to D.C. voltages (either plus or minus) impressed between the speaker terminals:

<u>D.C. Voltage between Speaker Terminals</u>	<u>Time required till Protector operates</u>
50V DC	approx. 0.5 sec or less
20V DC	approx. 1.2 sec $\pm$ 30%

<u>D.C. Voltage between Speaker Terminals</u>	<u>Time required till Protector operates</u>
10V DC	approx. 2.5 sec $\pm$ 30%
5V DC	approx. 4 ~ 10 sec

Once the protector circuit is activated, the protecting state is retained until the power supply to 620 is disconnected to release it.

The power should be supplied after power capacitors are fully discharged (for approximately 5 minutes or more).

Note: The protector circuit in 620 may occasionally be activated if a high transient D.C. voltage is delivered from the preamplifier connected with 620 at the time when the power supply for the preamplifier is turned on.

The cause is not from any trouble in 620.

For its countermeasure, the power for 620 is recommended to be supplied last of all.

II . Parts List:

Part No. BA03865A	Protector P.C.B. Ass'y	....	1 pce.
OJ03687A	E.P. Stud A	....	2 pcs.
OE00030A	Washer 3mm	....	1 pce.

<u>Schematic Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
	BA03865A	Protector P.C.B. Ass'y
	OB07727A	Protector P.C.B.
Q401,402 403	OB06078A	Transistor 2SC1400
Q404	OB06074A	Transistor 2SA750
D401,402	OB01909A	Silicon Diode 1S1555
D403	OB06109A	Silicon Diode GP08B
ZD401	OB06073A	Zener Diode 10S
ZD402	OB06002A	Zener Diode 15R
R401,402	OB01921A	Carbon Resistor 330K ERD-25V J
R403,404 407	OB05650A	Carbon Resistor 12K ERD-25V J
R405,406	OB01781A	Carbon Resistor 1K ERD-25V J
R408	OB05593A	Carbon Resistor 150K ERD-25V J
R409,410	OB01920A	Carbon Resistor 100K ERD-25V J
R411,414	OB05607A	Carbon Resistor 180 ERD-25V J
R412	OB01795A	Carbon Resistor 4.7K ERD-25V J
R413,415	OB01833A	Carbon Resistor 10K ERD-25V J
C401,402	OB05885A	Electrolytic Capacitor 100 $\mu$ F 10V
C403	OB01290A	Ceramic Capacitor 0.01 $\mu$ F 50V
RY401	OB07171A	Relay HB-2T

### III. Mounting Diagram and Schematic Diagram:

Refer to Figs. 2 and 3.

### IV. Modification Procedures for the Current Models:

Following shows the way how to assemble the Protector P.C.B. Ass'y in the current Models.

#### A. Parts to be required:

Part No. BA03865A Protector P.C.B. Ass'y	....	1 pce.
OJ03687A E.P. Stud A	....	2 pcs.
OE00030A Washer 3mm	....	1 pce.

#### B. Modification Procedures:

Refer to Fig. 1.

1. Disassemble the Cabinet by removing five screws.
2. Remove two screws from the Relay P.C.B. Ass'y and replace with E.P. Studs. Note to add a washer as shown in the figure.
3. Loosen the screw which fixes the cement resistor  $6.8\Omega$  10W to the chassis, then move the cement resistor to prevent contacting the Protector P.C.B. Ass'y.
4. Assemble the Protector P.C.B. Ass'y.
5. Disassemble the Rear Angle by removing two screws.
6. Solder the signal wires (WHT,WHT) of the Protector P.C.B. Ass'y to the speaker terminal (output terminal) plus side of both channels.
7. Solder the RED wire of the Protector P.C.B. Ass'y to the plus terminal (RED wires are already soldered) of the capacitor C1 39,000 $\mu$ F 63V.
8. Solder the BLU wire of the Protector P.C.B. Ass'y to the minus terminal (BLU wires are already soldered) of the capacitor C2 39,000 $\mu$ F 63V.
9. Bind these wires at an appropriate point.
10. Assemble the Rear Angle.
11. Assemble the Cabinet.



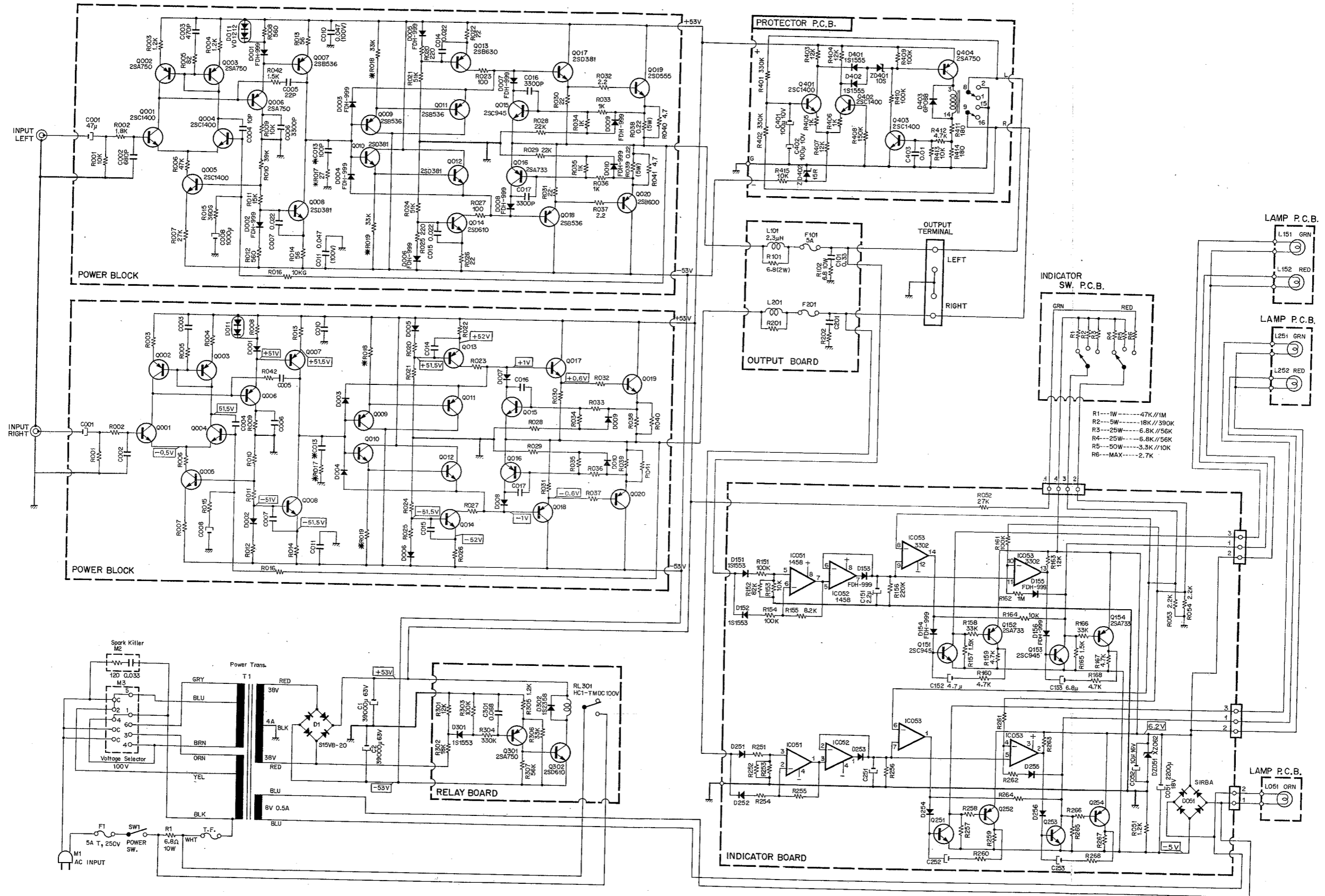


Fig. 3