Nakamichi

Service Manual

Nakamichi 420

power amplifier

CONTENTS

1. GENERAL

Nakamichi 420 control functions are shown below.

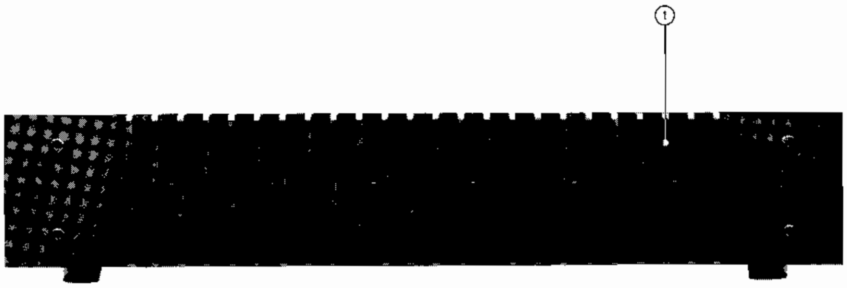


Fig. 1.1

1. Power Indicator Pilot Light
2. AC Power Cord
3. Voltage Selector
4. Output Terminals
5. Input Jacks

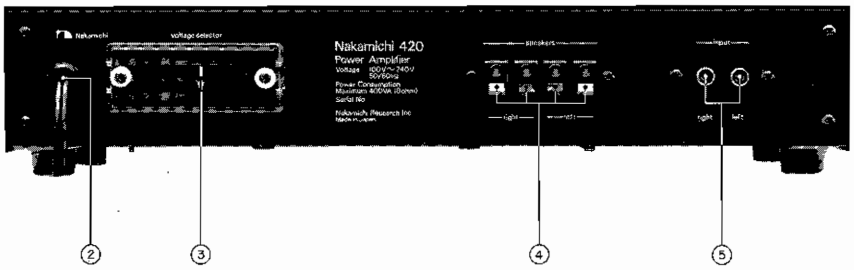


Fig. 1.2

Cautions

The Nakamichi 420 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 100Ω – 300Ω, approx. 20W.

Voltage Selector

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

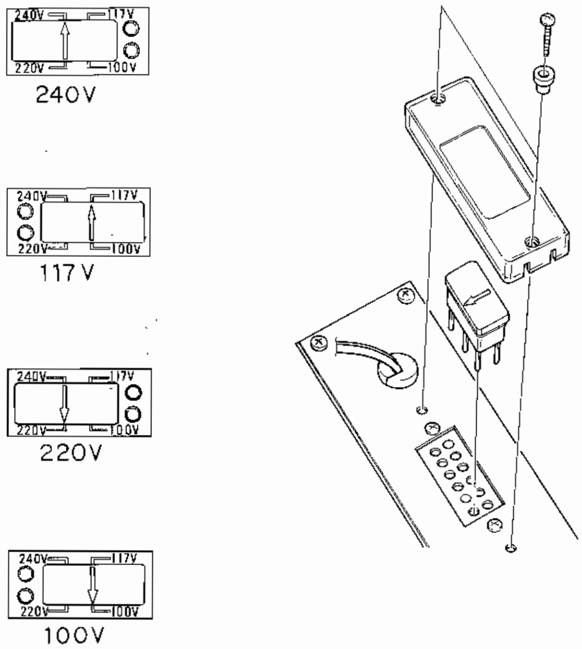


Fig. 1.3

2. PRINCIPLE OF OPERATION

2.1. Power Supply

Refer to Fig. 2.1.

The 420 has a thermostat in the power transformer primary circuit to prevent overheating of the system that may lead to a fire. If the heat sink of the 420 is heated to reach a temperature of approx. 85°C, the thermostat will open to interrupt the power supply to the system. When the temperature decreases to below approx. 65°C, the thermostat will be automatically reclosed.

Note: Keep the power cord off the system until the thermostat restores to normal.

A 147°C 2A 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 420 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.

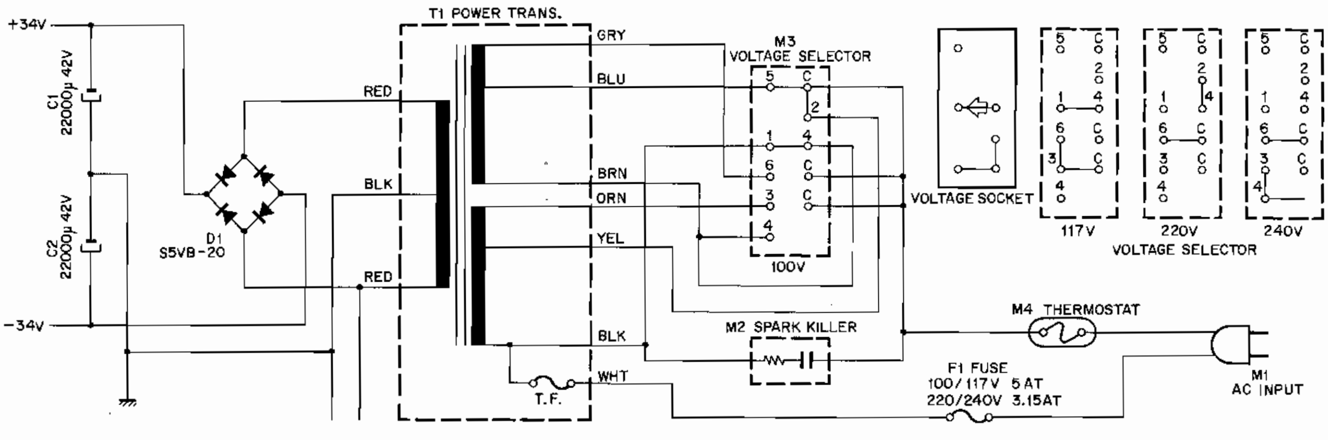


Fig. 2.1

2.3. Power Block Output Stage

In the Nakamichi 420 for making a bias voltage, varistor used in the conventional design of amplifier is replaced with transistor base-emitter so that the 420 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 420, 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 50 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).

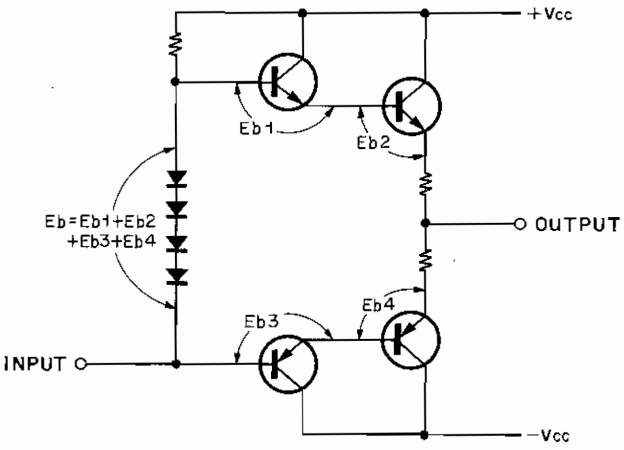


Fig. 2.4

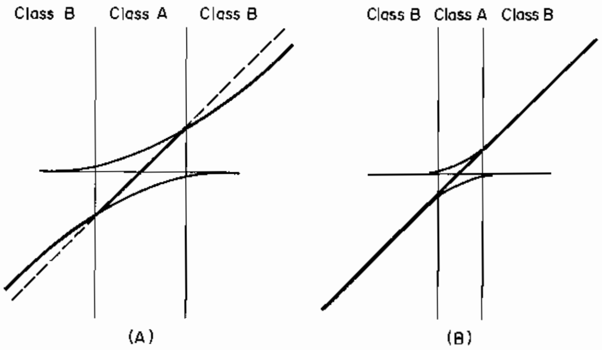


Fig. 2.5

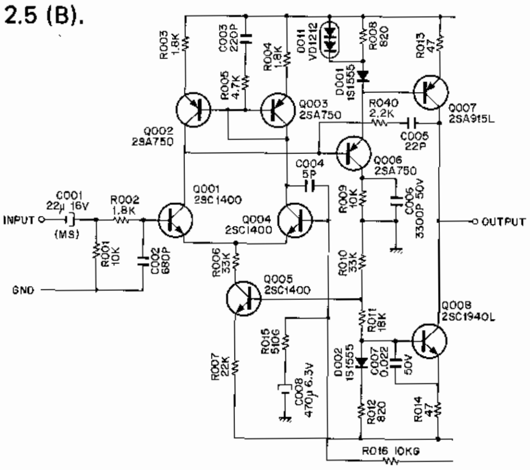


Fig. 2.2

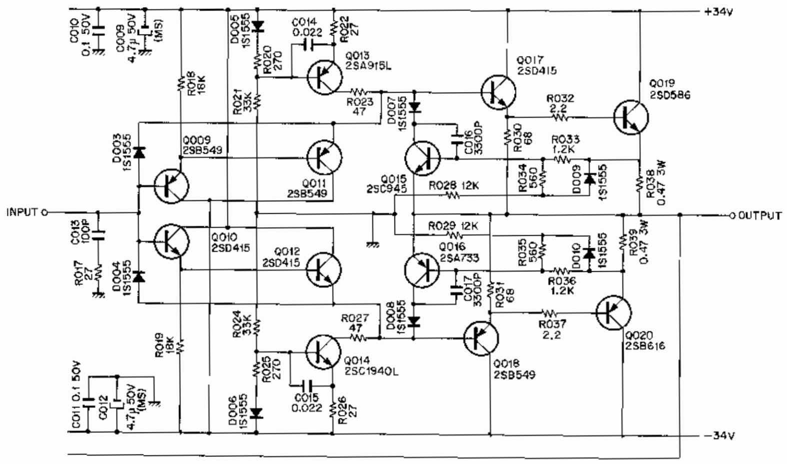


Fig. 2.3

Fig. 2.6 illustrates a simplified version of the circuit shown in Fig. 2.3.

Since the direct-coupled two-stage emitter-followers can be regarded to be one emitter-follower having greater current amplification, the Q009–Q011, Q010–Q012, Q017–Q019, and Q018–Q020 will be designated respectively to be Q1, Q2, Q3 and Q4 as shown in Fig. 2.6.

When i_d is applied with the input used as current-source, i_1 and i_2 are given as follows because of the Q1 and Q2 input impedances:

Input impedance of Q1 $\beta_1(\beta_3 r_1 + r_3)$
Input impedance of Q2 $\beta_2(\beta_4 r_2 + r_4)$

Therefore;

$$i_1 = \frac{\beta_2(\beta_4 r_2 + r_4)}{\beta_1(\beta_3 r_1 + r_3) + \beta_2(\beta_4 r_2 + r_4)}\, id$$

$$i_2 = \frac{\beta_1(\beta_3 r_1 + r_3)}{\beta_1(\beta_3 r_1 + r_3) + \beta_2(\beta_4 r_2 + r_4)}\, id$$

$$i_0 = i_3 + i_4 = \beta_1\beta_3 i_1 + \beta_2\beta_4 i_2$$

$$= \frac{\beta_1\beta_2\beta_3(\beta_4 r_2 + r_4) + \beta_1\beta_2\beta_4(\beta_3 r_1 + r_3)}{\beta_1(\beta_3 r_1 + r_3) + \beta_2(\beta_4 r_2 + r_4)}\, id$$

$$= \frac{\beta_1\beta_2\beta_3\beta_4 \left\{(r_2 + r_4/\beta_4) + (r_1 + r_3/\beta_3)\right\}}{\beta_1\beta_3(r_1 + r_3/\beta_3) + \beta_2\beta_4(r_2 + r_4/\beta_4)}\, id$$

If β of the Q_1-Q_3 pair is equal to that of the Q_2-Q_4 pair, then $\beta_1\beta_3=\beta_2\beta_4$ (assumed as β_0).

The following equation will be obtained:

$$i_0 = \frac{\beta_0^2 \left\{(r_2 + r_4/\beta_4) + (r_1 + r_3/\beta_3)\right\}}{\beta_0 \left\{(r_1 + r_3/\beta_3) + (r_2 + r_4/\beta_4)\right\}}\, id$$

$$= \beta_0 id$$

As a result, the same gain is obtained over the entire range as shown in Fig. 2.7.

Thus, the rate of current amplification in the idling current range (Class A) is quite the same as that in the class B amplifier. It must be noted, however, that the idling current is not included in the conditions for making the equation valid. In other words, a change in idling current will neither change the linearity of curves nor produce distortion.

Q013 and Q014 form a constant-current source; D005 and D006 are for temperature compensation; D003 and D004 prevent reverse-biased voltage from being applied in abnormal state; Q015 and Q016 form a current limiter that prevents overloading on the power transistor.

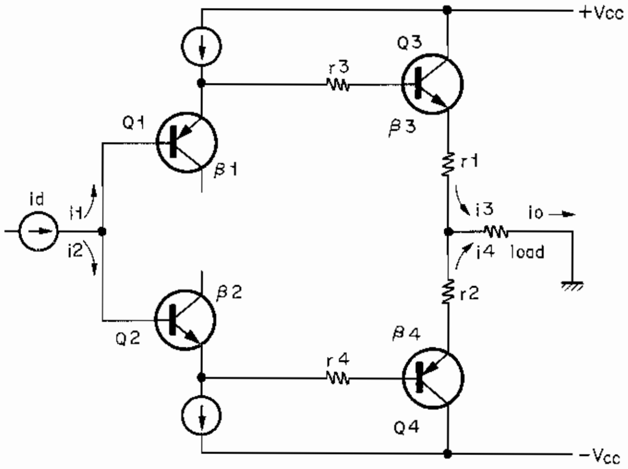


Fig. 2.6

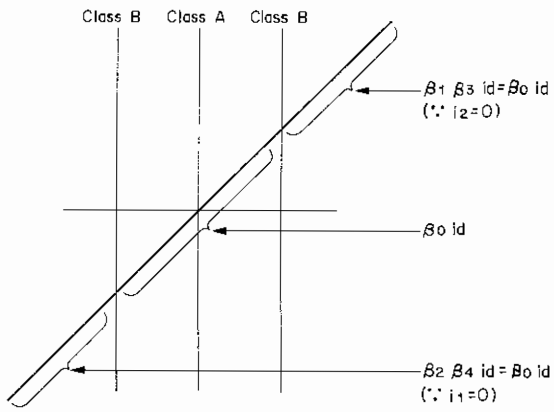


Fig. 2.7

3. REMOVAL PROCEDURES

3.1. Top Cover Ass'y
Refer to Fig. 3.1 and remove F01 then remove F02 (top cover ass'y) by sliding in the indicated direction.

3.2. Power Block Ass'y
Remove top cover ass'y (item 3.1). Refer to Fig. 3.2 and remove F01 and F03, then F02 and F04 (power block ass'y).

3.3. Front Panel Ass'y, Lamp and Thermostat
Remove top cover ass'y (3.1). Refer to Fig. 3.3 and remove F01 and F02 (front panel ass'y), F03, F04 (lamp holder) and F05 (lamp), then F06 and F07 (thermostat).

3.4. Transformer, Capacitors etc.
Remove top cover ass'y (3.1). Refer to Fig. 3.4 and remove F01 and F02 (transformer), F03, F04, F05 and F06 (capacitors), F08 and F09 (rectifier bridge), F10 (fuse), F12 and F13 (fuse holder), F14 and F15 (3P terminal), then F16 and F17 (output P.C.B. ass'y).

3.5. 2P Pin Jack and Push Terminal
Remove top cover ass'y (3.1). Refer to Fig. 3.5 and remove F01, F02, F03 (earth lug) and F04 (2P pin jack), then F05, F06 (push terminal holder) and F07 (push terminal).

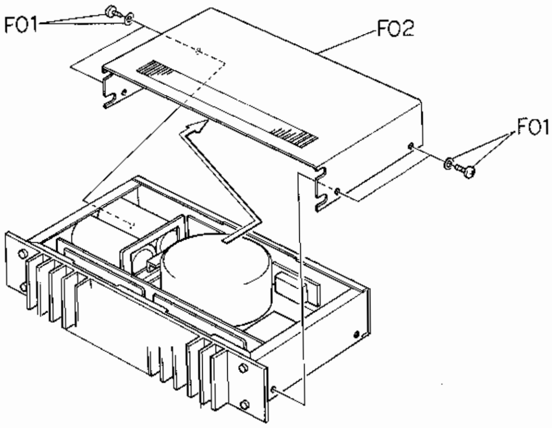


Fig. 3.1

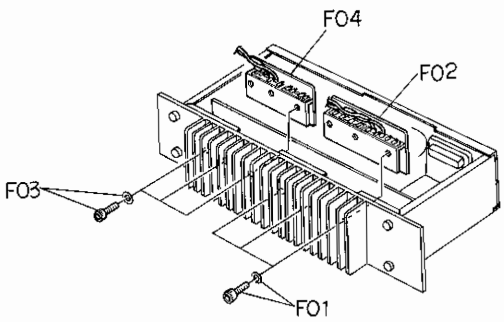


Fig. 3.2

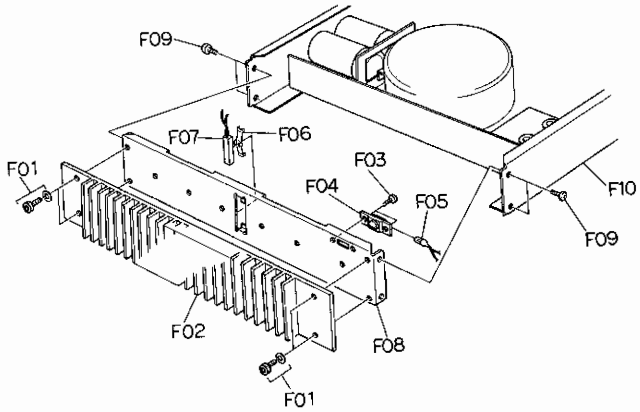


Fig. 3.3

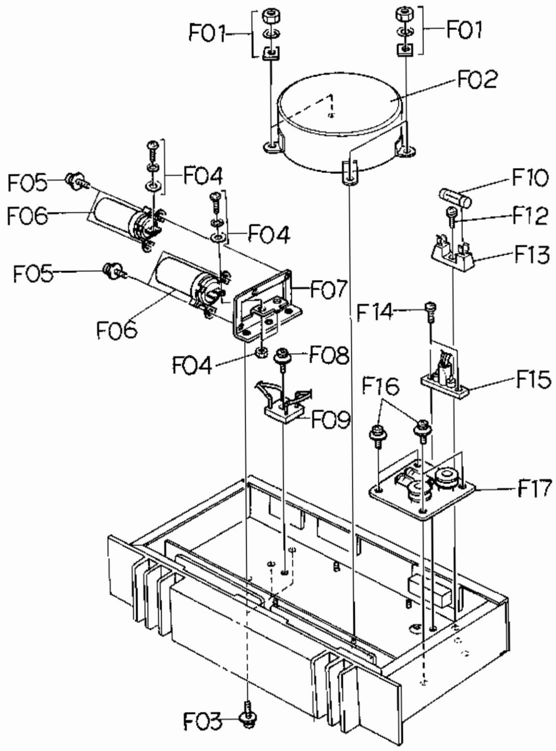


Fig. 3.4

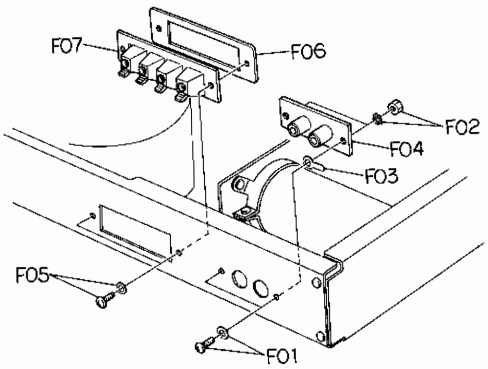


Fig. 3.5

4. READJUSTMENT OF POWER BLOCK

The 420 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. It must be noted that an incompletely soldered fuse in the output P.C.B. assembly will cause higher distortion.

4.4. Loudspeaker cords must be securely connected to the output terminals. A loose cord-to-terminal connection may cause poor contacting and, as a result, higher distortion.

4.5. 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 8Ω 50W 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 0.008%

(2) Output 50 watts, 1 and 10 KHz input signals;
less than 0.00B%

Note: Following semiconductors are used as a pair.
Q009·Q011 – Q010·Q012
Q017·Q019 – Q018·Q020

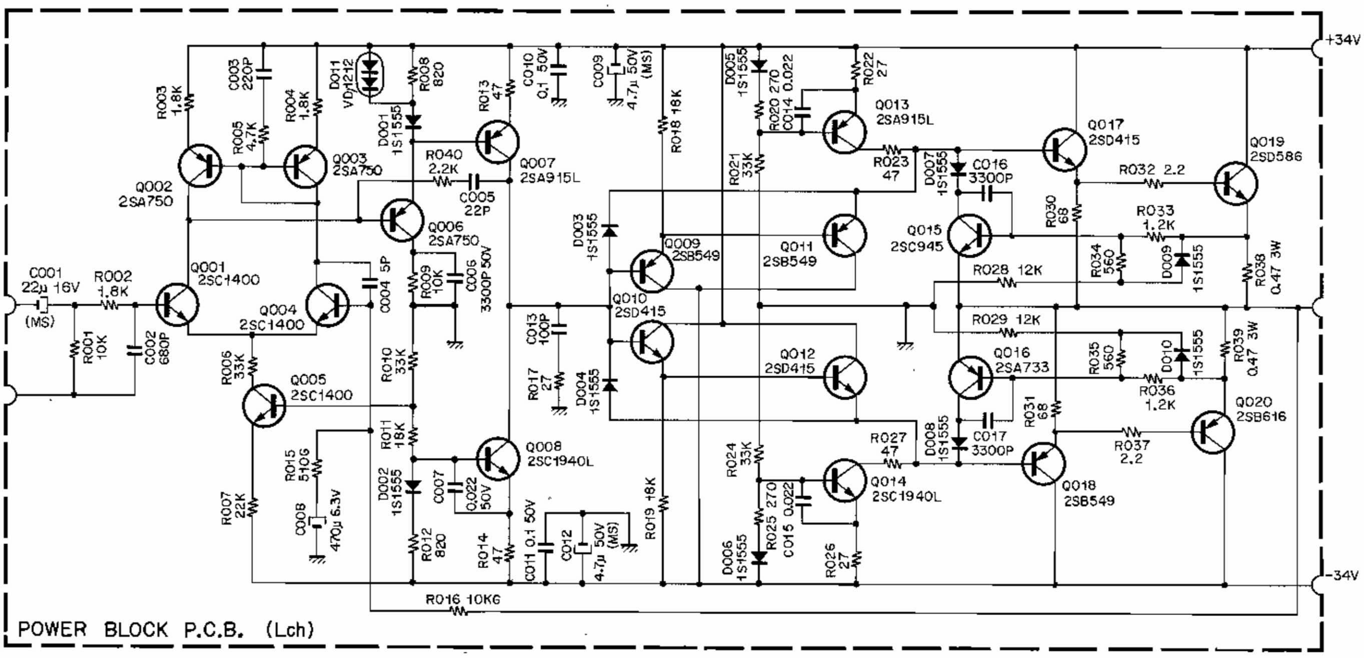


Fig. 4

5. MECHANISM ASS'Y AND PARTS LIST

5.1. Synthesis

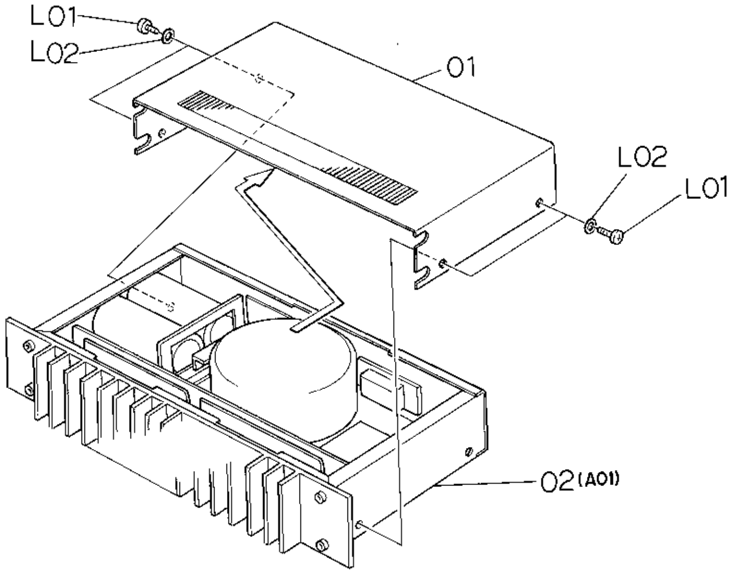


Fig. 5.1

5.2. Mechanism Ass'y (A01)

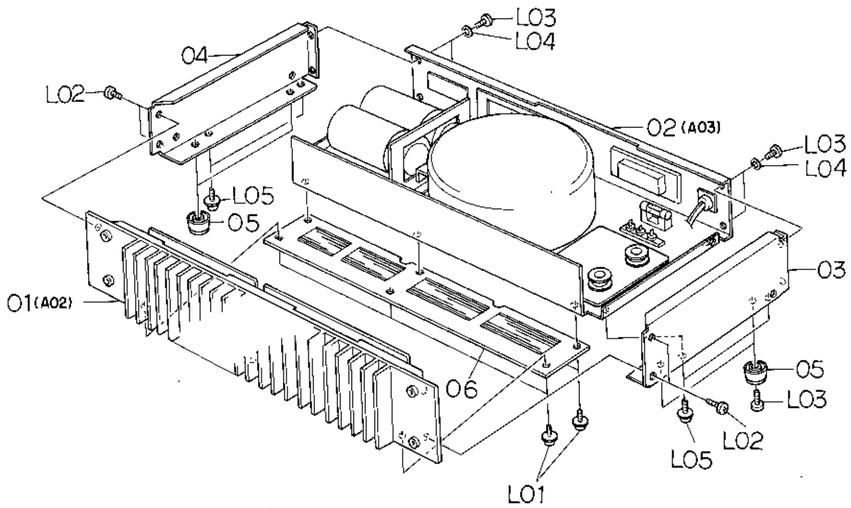


Fig. 5.2

Schematic Ref. No.	Part No.	Description	Q'ty
		Synthesis	
01	HA03695A	Top Cover Ass'y	1
	0H03470B	Top Cover	1
	0J03579A	Blind Hemilor	1
	0J03580A	Top Cover Hemilor	1
02		Mechanism Ass'y	1
L01	0E00593A	Screw M3x6 Philips Binding Head (Bronze)	4
L02	0E00157A	Washer 3mm (Plastics)	4
A01		Mechanism Ass'y	1
01	HA03686A	Front Panel Ass'y	1

Schematic Ref. No.	Part No.	Description	Q'ty
02	JA03139A	Rear Panel Ass'y	1
03	0J03562A	Side Chassis R	1
04	0J03563A	Side Chassis L	1
05	0J03564A	Foot T-H	4
06	0J03565A	Rear Cover	1
L01	0E00606A	Screw M3x6 Philips Pan Head (3A)	6
L02	0E00738A	Screw M4x6 Philips Binding Head (Bronze)	4
L03	0E00594A	Screw M3x8 Philips Binding Head (Bronze)	8
L04	0E00197A	Washer 3mm (Bronze)	4
L05	0E00607A	Screw M3x8 Philips Pan Head (3A)	4

5.3. Front Panel Ass'y (A02)

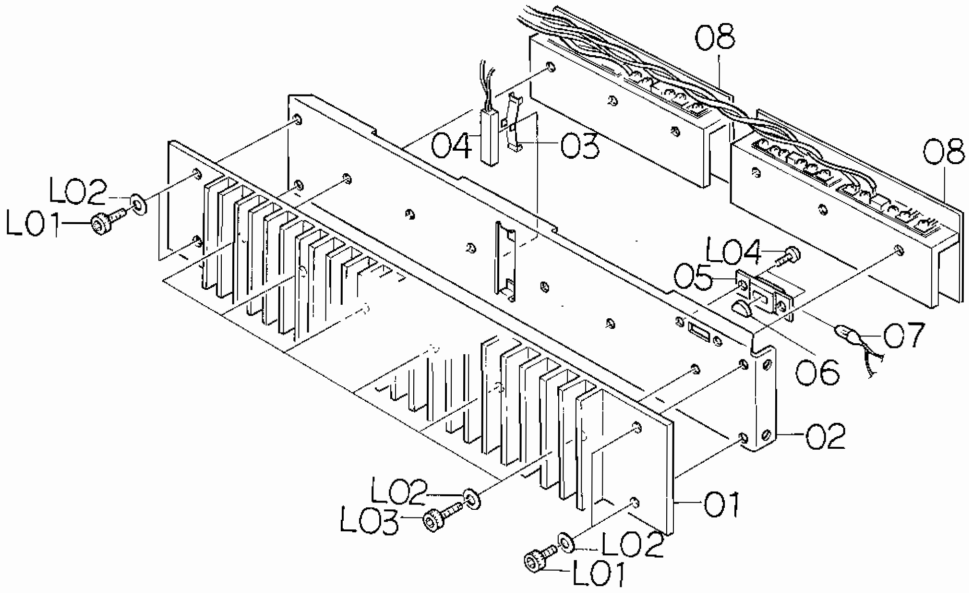


Fig. 5.3

Schematic Ref. No.	Part No.	Description	Q'ty
A02	HA03686A	Front Panel Ass'y	1
01	0H03469C	Front Panel	1
	0H03468C	Power Indicator	1
02	0J03566B	Front Chassis	1
03	0J03567B	Thermostat Holder	1
04	0B08338A	Thermostat	1
05	0J03568A	Lamp Holder	1
06	0H03467A	Lamp Filter (Orange)	1
07	0J03570A	Lamp 16V 40mA	1
08	JA03140A	Power Block Ass'y	2
L01	0E00745A	Screw M4x10 Hex. Socket Head	4
L02	0J03556A	Washer 4mm	10
L03	0E00733A	Screw M4x12 Hex. Socket Head	6
L04	0E00649A	Screw M3x4 Philips Truss Head (Bronze)	2
A03	JA03138A	Rear Panel Ass'y	1
01		Rear Panel Sub-ass'y	1
02	0B06553U	Power Transformer	1
03	0J03576A	Capacitor Holder	1
04	0B05908A	Electrolytic Capacitor 22000μF 42V	2
05	0B0610BA	Rectifier Bridge S5VB-20	1
06	0B08282U	Fuse 5A (Time Lag) (100, 117V)	1
06	0B08281U	Fuse 3.15A (Time Lag) (220, 240V)	1
07	0B08310U	Fuse Holder	1
08	0B08024U	3P Terminal	1
09	BA03812A	Output P.C.B. Ass'y	1
	0J03634A	Isolation Spacer	1
L01	0E00513A	Nut Hex. M5	4
L02	0E00709A	Washer 5mm Spring	4
L03	0J03511A	Transformer Holder Washer	4

Schematic Ref. No.	Part No.	Description	Q'ty
L04	0E00606A	Screw M3x6 Philips Pan Head (3A)	11
L05	0E00659A	Screw M3x10 Philips Pan Head	2
L06	0E00723A	Washer 3mm Spring	2
L07	0E00732A	Washer 3mm	2
L08	0E00612A	Screw M3x6 Philips Pan Head (2A)	1
L09	0E00510A	Screw M3x8 Philips Pan Head (2A)	2
L10	0E00610A	Screw M3x12 Philips Pan Head (3A)	1
L11	0E00718A	Nut Hex. M3	2
B01		Rear Panel Sub-ass'y	1
01	JA03138A	Main Chassis	1
02	0B03900U	Power Cord	1
03	0B08037U	Cord Bushing	1
04	0A03154B	Cord Spacer	1
05	0B03877U	Voltege Selector Socket	1
06	0H03335A	Voltage Selector Cover SO	1
07	0H03334B	Acrylic Cover	1
08	0B08240U	Spark Killer	1
09	0B08233U	Push Terminal	1
10	0J03502A	Push Terminal Holder	1
11	0B03072A	2P Pin Jack	1
L01	0E00594A	Screw M3x8 Philips Binding Head (Bronze)	4
L02	0E00157A	Washer 3mm (Plastics)	6
L03	0E00037A	Eerth Lug B-5	1
L04	0E00172A	Washer 3mm Toothed Lock	4
L05	0E00507A	Nut Hex. M3	4
L06	0E00590A	Screw M3x12 Philips Pan Head (Bronze)	2
L07	0E00591A	Screw M3x20 Philips Pan Head (Bronze)	2
L08	0H03366A	Washer for Voltage Selector Cover	2

5.4. Rear Panel Ass'y (A03)

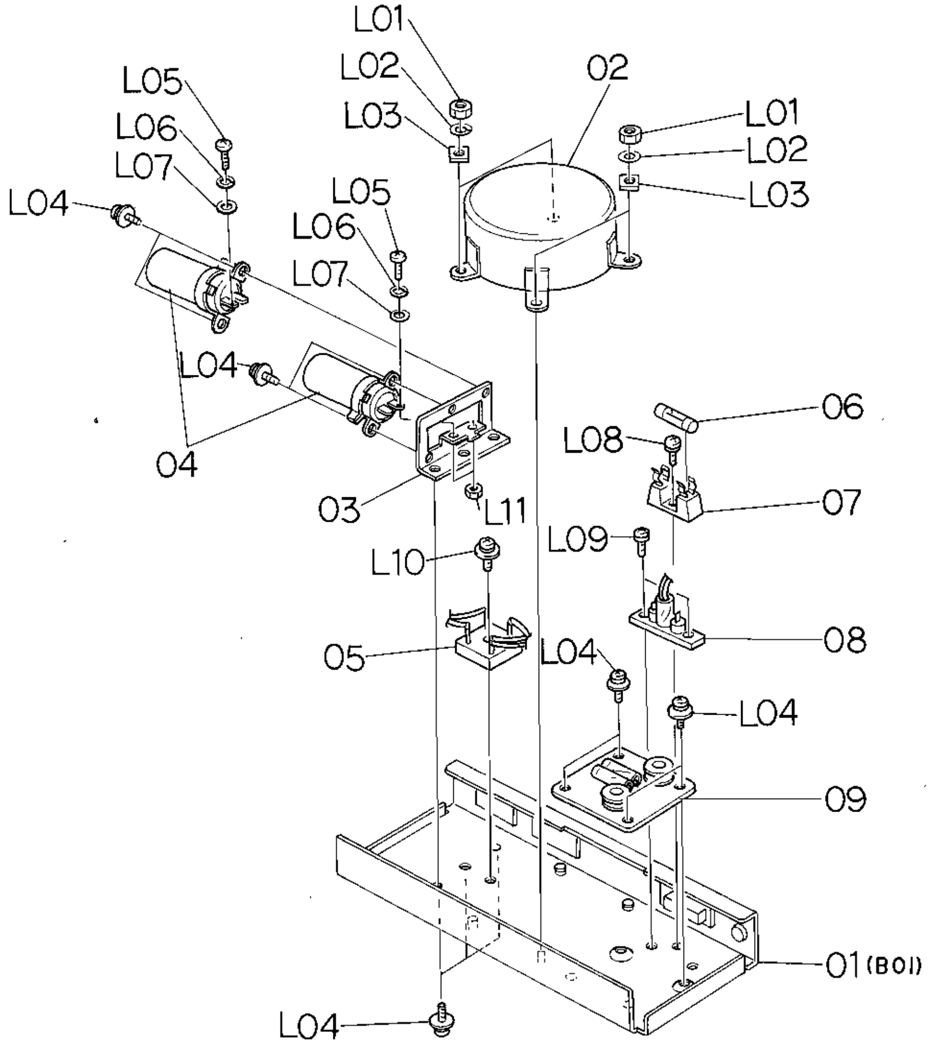


Fig. 5.4

5.5. Rear Panel Sub-ass'y (B01)

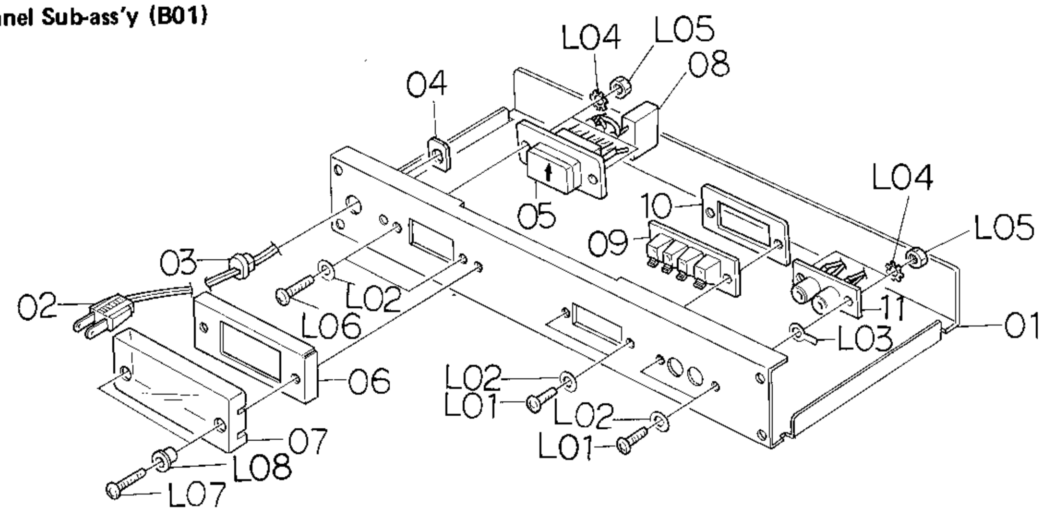


Fig. 5.5

6. MOUNTING DIAGRAMS AND PARTS LIST

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

6.1. Power Block Ass'y

6.1.1. Power Block P.C.B. Ass'y

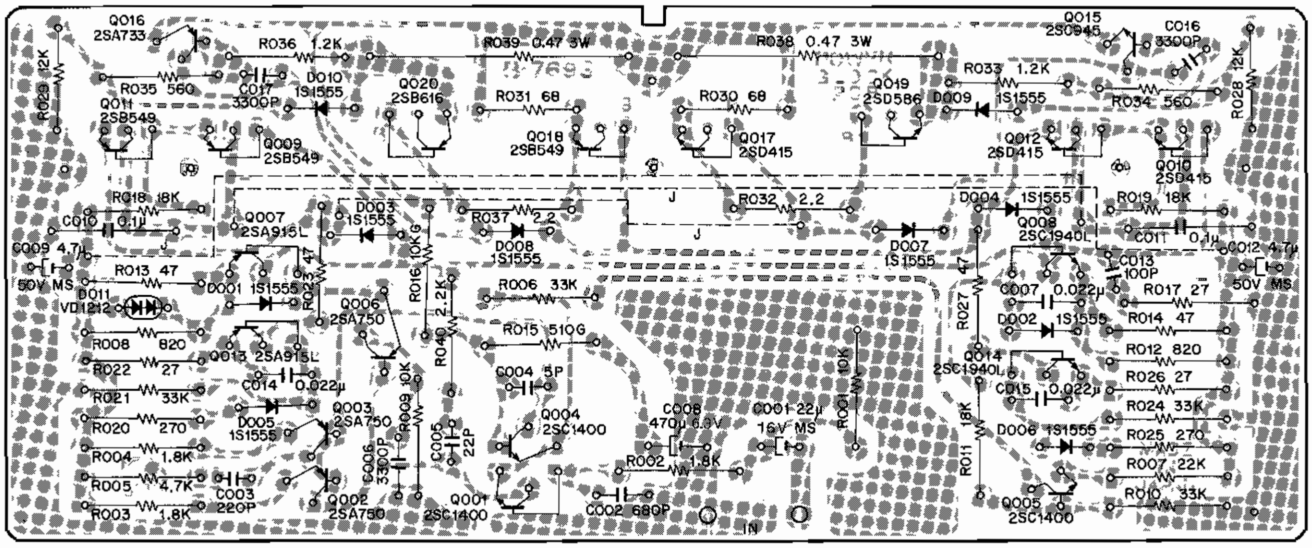


Fig. 6.1

Note: Diode FDH-999 is compatible with 1S1555.

6.2. Output P.C.B. Ass'y

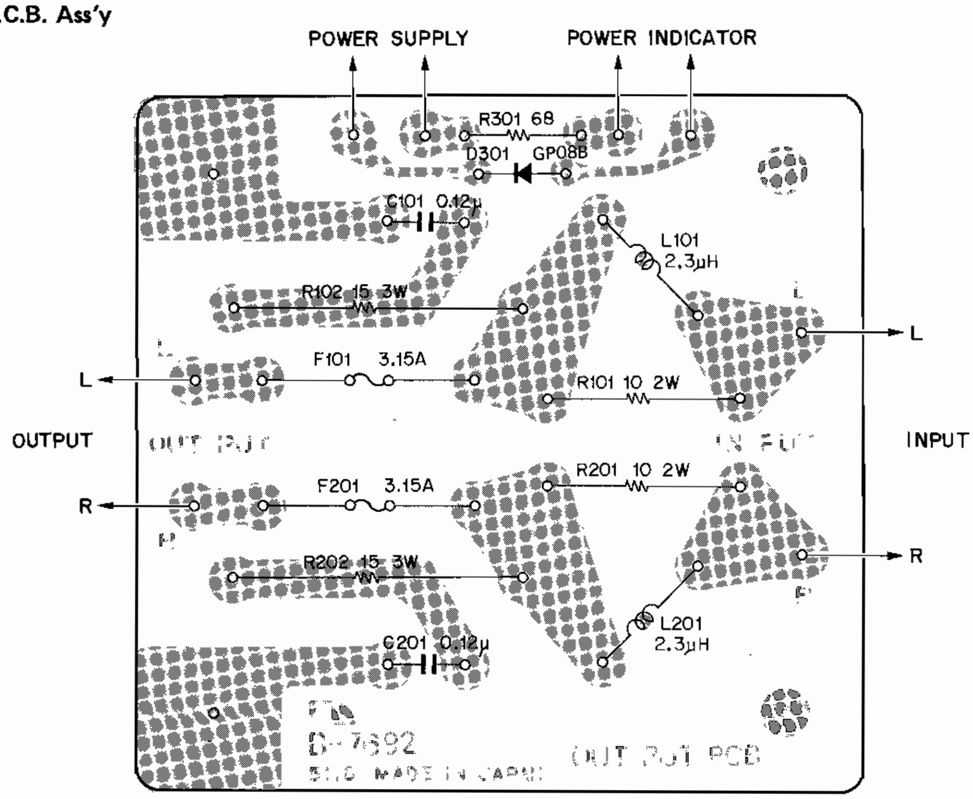


Fig. 6.2

Schematic Ref. No.	Part No.	Description
	JA03140A	**Power Block Ass'y**
	BA03811A	**Power Block P.C.B. Ass'y**
	0J03572A	Heat Sink 420
	0J03560A	Spring Pin (2 pcs.)
	0E00231A	Screw M2.6x8 Philips Pan Head FT (3 pcs.)
	0J03494A	Transistor Bushing (10 pcs.)
	0J03573A	Transistor Plate (2 pcs.)
	0J03574A	Transistor R Holder (1 pce.)
	0J03575A	Transistor L Holder (1 pce.)
	0E00722A	Screw M3x12 Philips Pan Head (10 pcs.)
	0E00732A	Washer 3mm (8 pcs.)
	0E00723A	Washer 3mm Spring (10 pcs.)
	BA03811A	**Power Block P.C.B. Ass'y**
	0B07693A	Power Block P.C.B.
Q001, 004 005	0B06078A	Transistor 2SC1400
Q002, 003 006	0B06074A	Transistor 2SA750
Q007, 013	0B06102A	Transistor 2SA915 (L)
Q008, 014	0B06101A	Transistor 2SC1940 (L)
Q009, 011 018	0B06103A	Transistor 2SB549
Q010, 012 017	0B06104A	Transistor 2SD415
Q015	0B06100A	Transistor 2SC945 (A)
Q016	0B06013A	Transistor 2SA733
Q019	0B06106A	Transistor 2SD586 (A)
Q020	0B06105A	Transistor 2SB616 (A)
D001, 002 003, 004 005, 006 007, 008 009, 010	0B01909A	Silicon Diode 1S1555
D011	0B06107A	Silicon Diode VD1212
R001, 009	0B01888A	Carbon Resistor 10K ERD-14 TJ
R002, 003 004	0B05614A	Carbon Resistor 1.8K ERD-14 TJ
R005	0B01846A	Carbon Resistor 4.7K ERD-14 TJ
R006, 010 021, 024	0B05509A	Carbon Resistor 33K ERD-14 TJ
R007	0B05615A	Carbon Resistor 22K ERD-14 TJ
R008, 012	0B01680A	Carbon Resistor 820 ERD-14 TJ
R011, 018 019	0B05560A	Carbon Resistor 18K ERD-14 TJ
R013, 014 023, 027	0B01706A	Carbon Resistor 47 ERD-14 TJ
R015	0B05903A	Metal Film Resistor 510 ERO-25 CKG
R016	0B05878A	Metal Film Resistor 10K ERO-25 CKG
R017, 022 026	0B05875A	Carbon Resistor 27 ERD-14 TJ
R020, 025	0B05645A	Carbon Resistor 270 ERD-14 TJ
R028, 029	0B05771A	Carbon Resistor 12K ERD-14 TJ
R030, 031	0801704A	Carbon Resistor 68 ERD-14 TJ
R032, 037	0B05580A	Carbon Resistor 2.2 ERD-14 TJ
R033, 036	0B05623A	Carbon Resistor 1.2K ERD-14 TJ
R034, 035	0B05575A	Carbon Resistor 560 ERD-14 TJ
R038, 039	0B05902A	Metal Film Resistor 0.47 ERX-3AN

Schematic Ref. No.	Part No.	Description
R040	0B05622A	Carbon Resistor 2.2K ERD-14 TJ
C001	0B05820A	Electrolytic Capacitor 22μ 16V M(MS)
C002	0B05893A	Ceramic Capacitor 680P 50V K
C003	0B05879A	Ceramic Capacitor 220P 50V K
C004	0B05905A	Ceramic Capacitor 5P 50V K
C005	0B05806A	Ceramic Capacitor 22P 50V K
C006, 016 017	0B05881A	Ceramic Capacitor 3300P 50V M
C007, 014 015	0B05882A	Ceramic Capacitor 0.022μ 50V M
C008	0B05842A	Electrolytic Capacitor 470μ 6.3V
C009, 012	0B05904A	Electrolytic Capacitor 4.7μ 50V M(MS)
C010, 011	0B01356A	Ceramic Capacitor 0.1μ 50V M
C013	0B05892A	Ceramic Capacitor 100P 50V K
	BA03812A	**Output P.C.B. Ass'y**
	0B07692A	Output P.C.B.
D301	0B06109A	Silicon Diode GP08B
L101, 201	BA03784A	Output Coil Ass'y 2.3μH
R101, 201	0B05906A	Metal Film Resistor 10 ERX-2AN
R102, 202	0B05907A	Metal Film Resistor 15 ERX-3AN
R301	0B01704A	Carbon Resistor 68 ERD-14 TJ
C101, 201	0B01772A	Mylar Capacitor 0.12μ 50V K
F101, 201	0B08278A	Fuse 3.15A

7. WIRING DIAGRAM

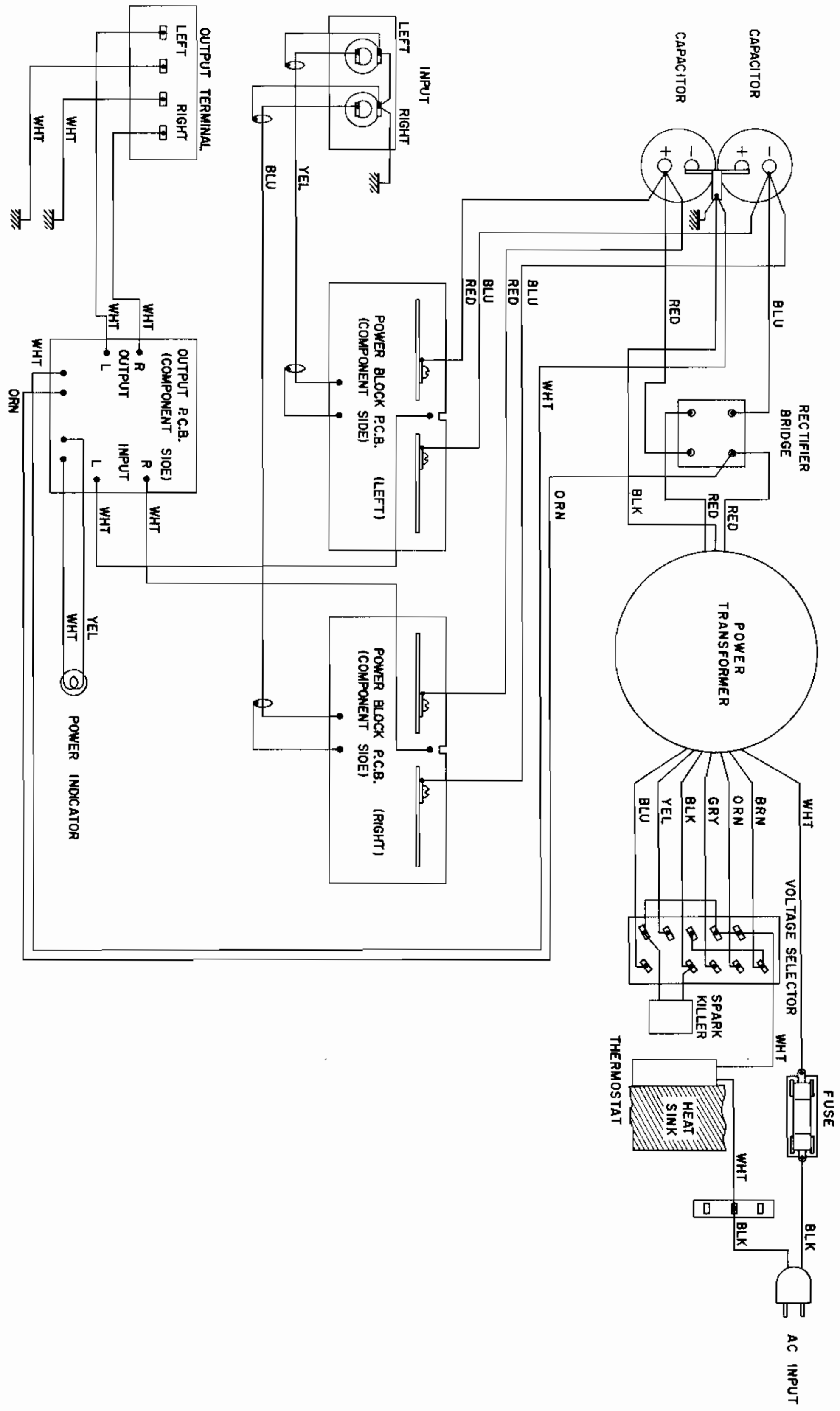
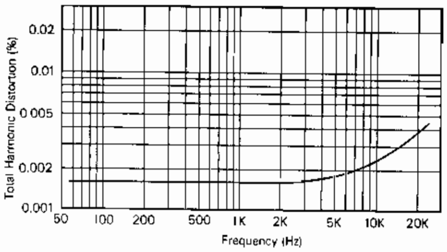
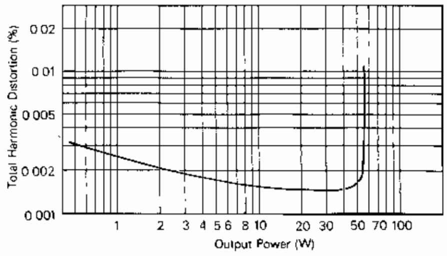


Fig. 7

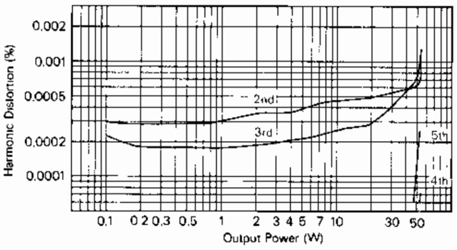
8. PERFORMANCE DATA



Frequency vs Total Harmonic Distortion
Output: 25W Constant
Load Impedance: 8 ohms

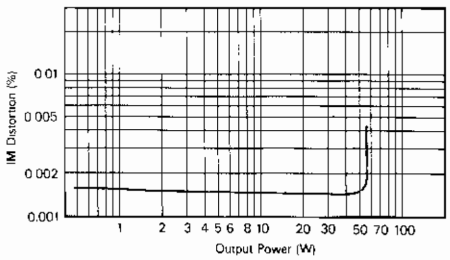


Output vs Total Harmonic Distortion
Frequency: 1 kHz
Load Impedance: 8 ohms



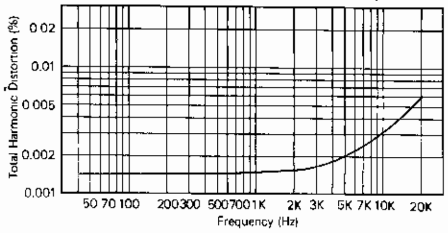
Output vs Harmonic Distortion※
Frequency: 1 kHz
Load Impedance: 8 ohms

※This Data 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.



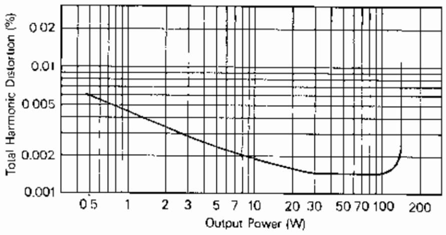
Output vs IM Distortion
60Hz : 7kHz (4 : 1)
Load Impedance: 8 ohms

BA-100 and 420 Bridged for Monaural Operation



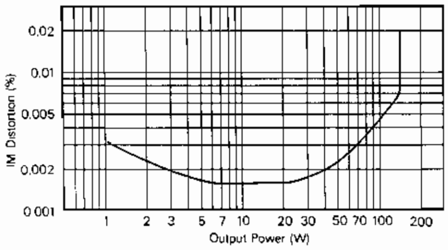
Frequency vs Total Harmonic Distortion
Output: 60W
Load Impedance: 8 ohms

BA-100 and 420 Bridged for Monaural Operation

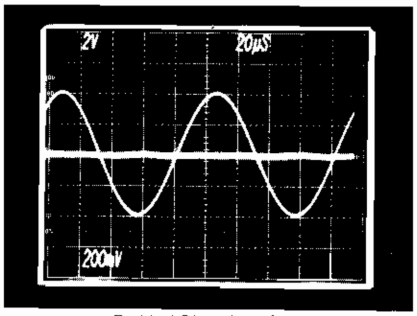


Output vs Total Harmonic Distortion
Frequency: 1 kHz
Load Impedance: 8 ohms

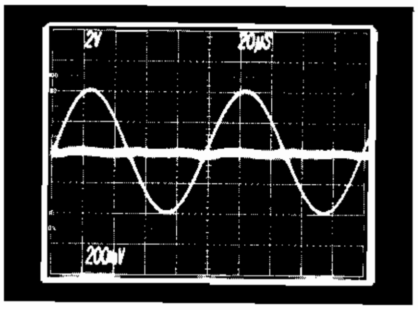
BA-100 and 420 Bridged for Monaural Operation



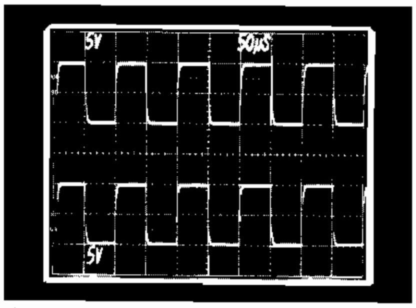
Output vs IM Distortion
60Hz : 7kHz (4 : 1)
Load Impedance: 8 ohms



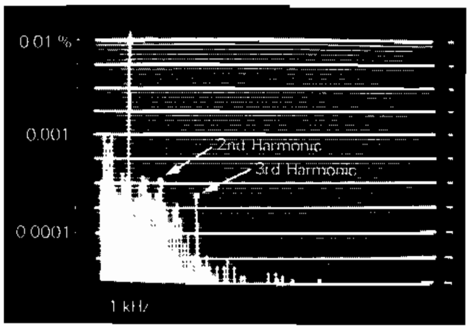
Residual Distortion of
Test Instruments @10 kHz: 0.0018% THD



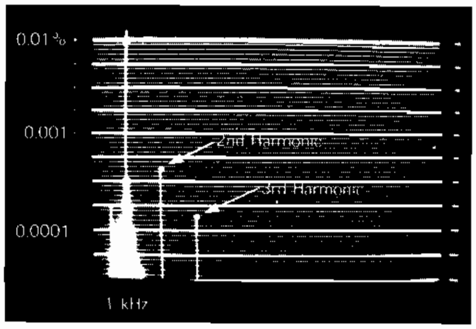
Combined Distortion of Test Instruments and
420 @10 kHz, 250 mW/8 ohm load: 0.0022% THD



Upper Trace: 10 kHz Square Wave/8 ohms
Lower Trace: 10 kHz Square Wave/0.1μF//8 ohms



Spectral Analysis @1 kHz, 100 mW, 8 ohms※



Spectral Analysis @1 kHz, 25 W, 8 ohms※

※B & K 3348 Real Time Spectrum Analyzer

Fig. 8

9. BLOCK DIAGRAM

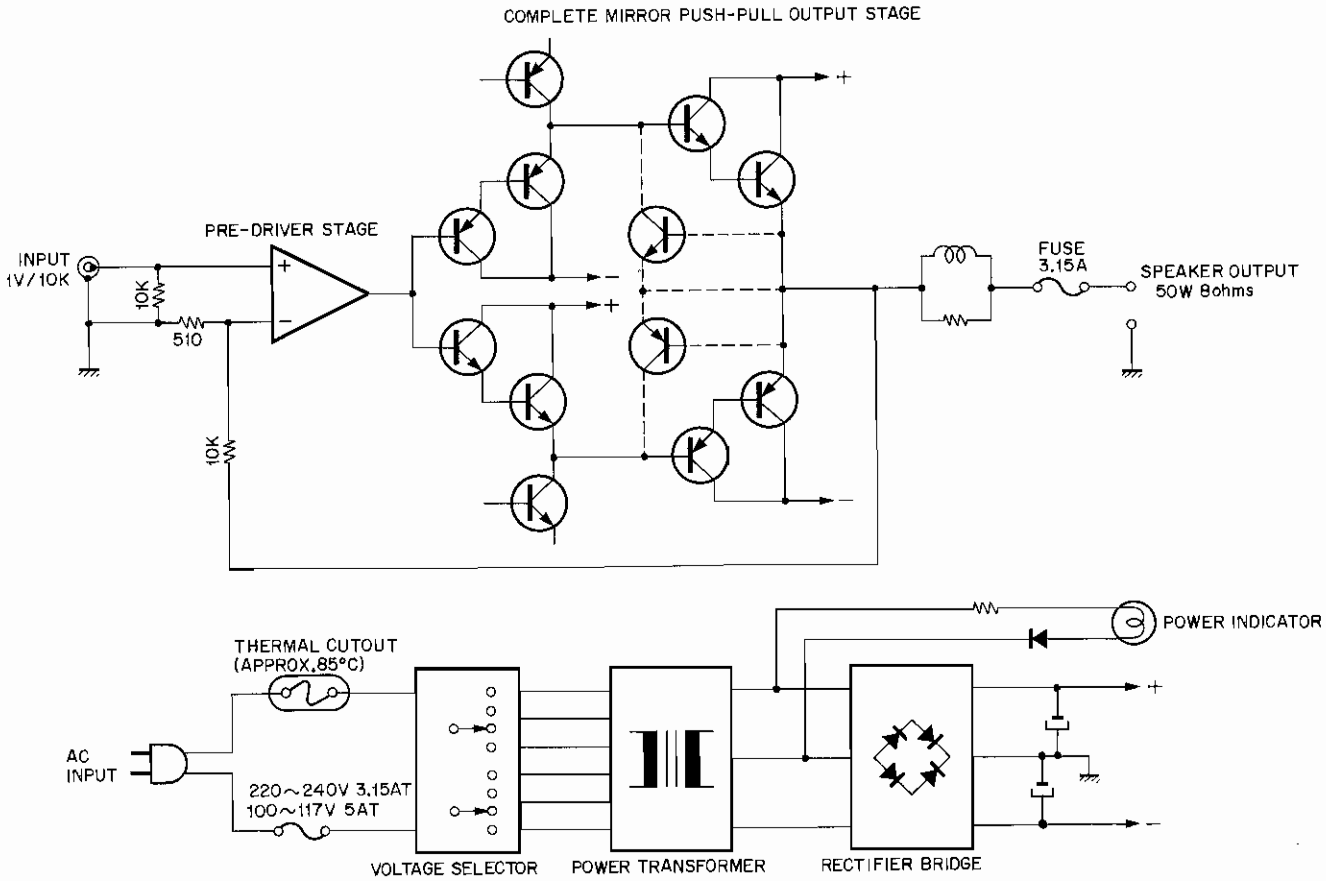


Fig. 9

10. SCHEMATIC DIAGRAM

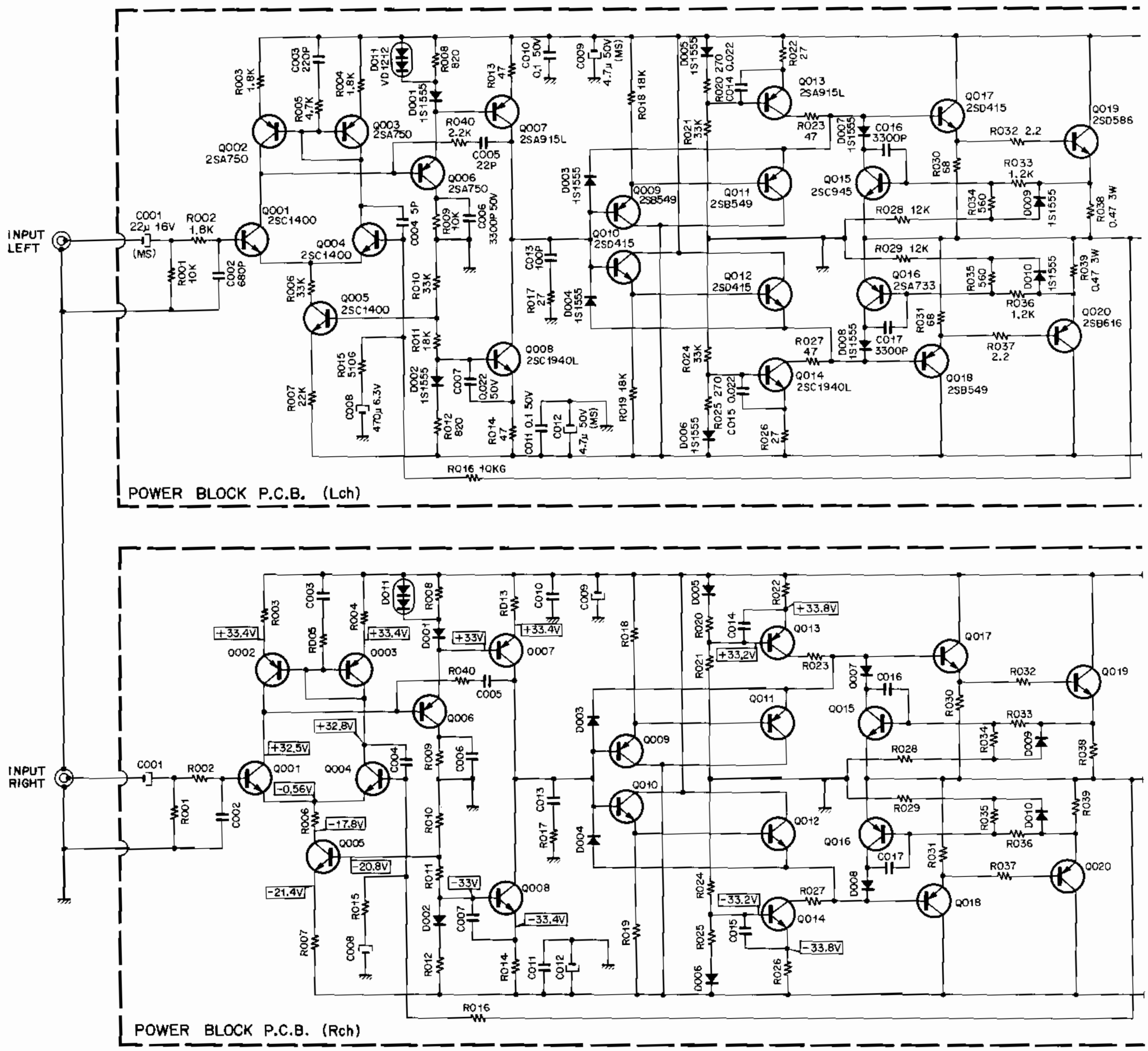


Fig. 10

Note: ▭ shows the reference circuit voltage at approx. 50-watt output.

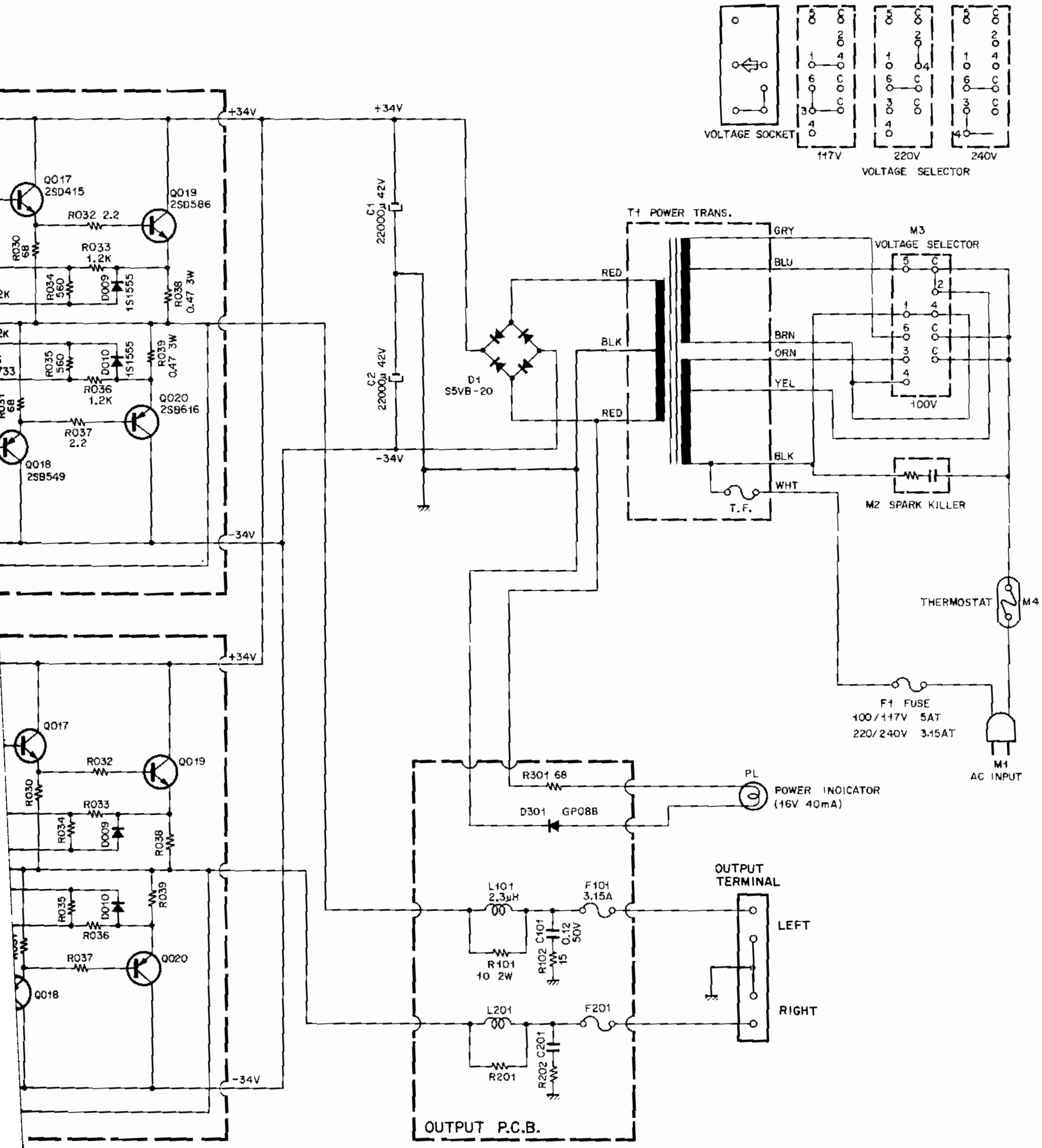

VOLTAGE SOCKET
117V
220V
240V
VOLTAGE SELECTOR
T1 POWER TRANS.
M3
VOLTAGE SELECTOR
GRY
BLU
BRN
ORN
YEL
BLK
WHT
RED
BLK
RED
100V
T.F.
M2 SPARK KILLER
+34V
-34V
C1 22000μ 42V
C2 22000μ 42V
D1 S5VB-20
Q017 2SD415
Q019 2SD586
R032 2.2
R033 1.2K
R030 68
R034 560
D009 1S1555
R038 0.47 3W
R035 560
D010 1S1555
R039 0.47 3W
R036 1.2K
Q020 2SB616
R037 2.2
Q018 2SB549
THERMOSTAT
M4
F1 FUSE
100/117V 5AT
220/240V 3.15AT
M1
AC INPUT
R301 68
PL
POWER INDICATOR
(16V 40mA)
D301 GP08B
L101 2.3μH
F101 3.15A
C101 0.12 50V
R101 10 2W
R102 15
OUTPUT TERMINAL
LEFT
RIGHT
L201
F201
C201
R201
R202
OUTPUT P.C.B.

Fig. 10

11. BRIDGING ADAPTOR BA-100 (OPTION)

Mechanism Ass'y, Circuit Diagram, Mounting Diagram and Parts List

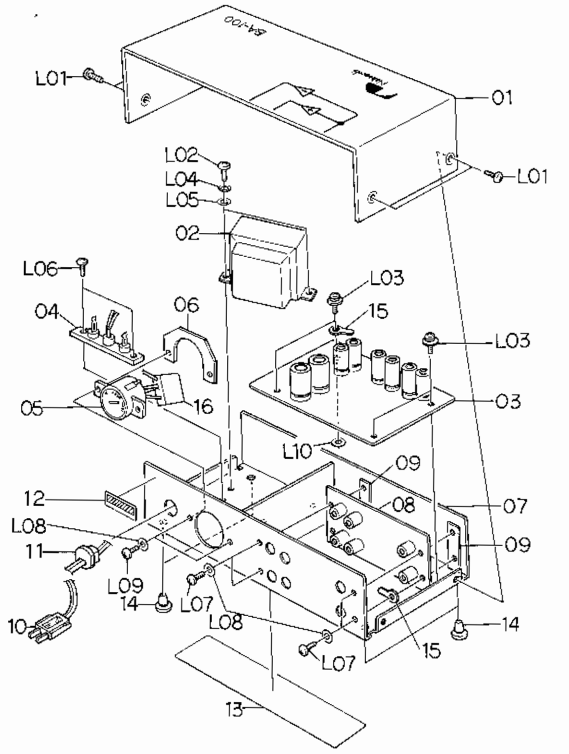


Fig. 11.1

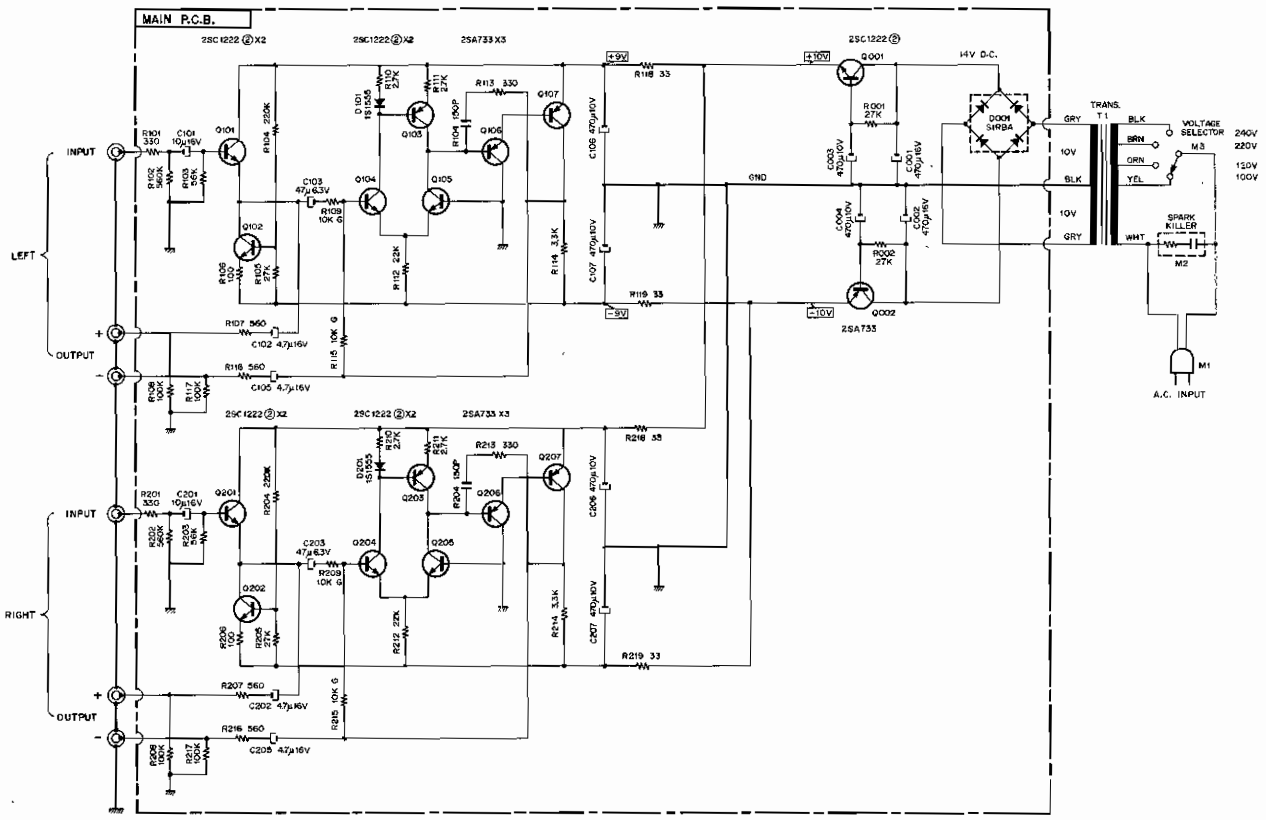


Fig. 11.2

Schematic Ref. No.	Part No.
01	0H0347
02	0B0652
03	BA0381
04	0B0802
05	0B0715
06	0J03585
07	HA0368
08	0B0829
09	0J03277
10	0B0821
11	0B0803
12	0M0355
13	0M0354
14	0H0343
15	0E0003
16	0B0824
L01	0E0071
L02	0E0054
L03	0E0060
L04	0E0058
L05	0E0063
L06	0E0059
L07	0E0059
L08	0E0015
L09	0E0059
L10	0E0025

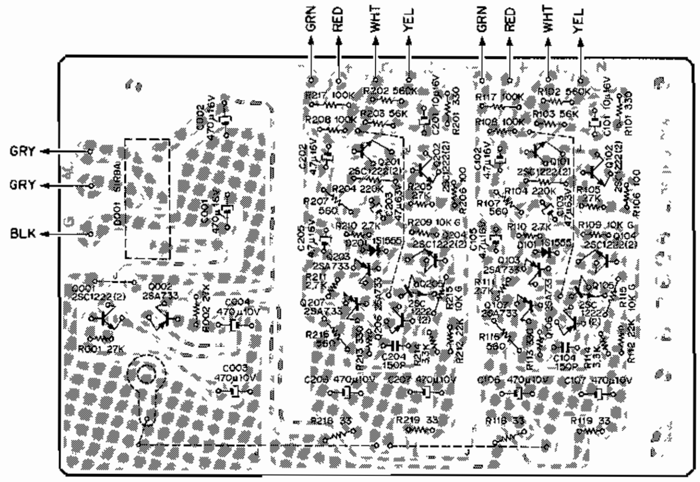


Fig. 11.3

Schematic Ref. No.	Part No.	Description	Q'ty
		BA-100 Mechanism	
01	0H03477A	Upper Cover	1
02	0B06521U	Power Transformer	1
03	BA03816A	Main P.C.B. Ass'y	1
04	0B08024U	3P Terminal	1
05	0B07152U	Voltage Selector	1
06	0J03585A	ESE Nut	1
07	HA03687A	Main Chassis Sub Ass'y	1
08	0B08290A	6P Pin Jack	1
09	0J03277A	Bolt Receptacle Plate	2
10	0B08219A	Power Cord	1
11	0B08037U	Cord Bushing C	1
12	0M03551A	Pass Label B	1
13	0M03544A	Caution Label B	1
14	0H03437A	Rubber Foot	4
15	0E00037A	Earth Lug B-5	2
16	0B08240U	Spark Killer	1
L01	0E00713A	Screw M3x6 Philips Truss Head (Bronze)	4
L02	0E00540A	Screw M3x5 Philips Binding Head (Bronze)	2
L03	0E00606A	Screw M3x6 Philips Pan Head (3A)	4
L04	0E00581A	Washer 3mm Spring	2
L05	0E00637A	Washer 3mm	2
L06	0E00594A	Screw M3x8 Philips Binding Head (Bronze)	2
L07	0E00594A	Screw M3x8 Philips Binding Head	4
L08	0E00159A	Washer 3mm (Plastics)	6
L09	0E00593A	Screw M3x6 Philips Binding Head (Bronze)	2
L10	0E00254A	Washer 3.1mm (Mylar)	1

Schematic Ref. No.	Part No.	Description
	BA03816A	**Main P.C.B. Ass'y**
	0B07698A	Main P.C.B.
Q001	0B06062A	Transistor 2SC1222 (2)
101, 201		
102, 202		
104, 204		
105, 205		
Q002	0B06013A	Transistor 2SA733
103, 203		
106, 206		
107, 207		
D001	0B06088A	Silicon Diode S1RBA
D101, 201	0B01909A	Silion Diode 1S1555
R001, 002	0B05538A	Carbon Resistor 27K ERD-14 VJ
105, 205		
R101, 201	0B01789A	Carbon Resistor 330 ERD-14 VJ
113, 213		
R102, 202	0B05665A	Carbon Resistor 560K ERD-14 VJ
R103, 203	0B05563A	Carbon Resistor 56K ERD-14 VJ
R104, 204	0B05596A	Carbon Resistor 220K ERD-14 VJ
R106, 206	0B05558A	Carbon Resistor 100 ERD-14 VJ
R107, 207	0B05678A	Carbon Resistor 560 ERD-14 VJ
116, 216		
R108, 208	0B01920A	Carbon Resistor 100K ERD-14 VJ
117, 217		
R109, 209	0B05895A	Metal Film Resistor 10K ERO-25 VKG
115, 215		
R110, 210	0B01782A	Carbon Resistor 2.7K ERD-14 VJ
111, 211		
R112, 212	0B05661A	Carbon Resistor 22K ERD-14 VJ
R114, 214	0B01793A	Carbon Resistor 3.3K ERD-14 VJ
R118, 218	0B05567A	Carbon Resistor 33 ERD-14 VJ
119, 219		
C001, 002	0B01392A	Electrolytic Capacitor 470μ 16V
C003, 004	0B05884A	Electrolytic Capacitor 470μ 10V
106, 206		
107, 207		
C101, 201	0B01412A	Electrolytic Capacitor 10μ 16V
C102, 202	0B01389A	Electrolytic Capacitor 4.7μ 16V
105, 205		
C103, 203	0B01404A	Electrolytic Capacitor 47μ 6.3V
C104, 204	0B05599A	Ceramic Capacitor 150P 50V

12. SPECIFICATIONS

Power Source	100/117/220/240V AC, 50/60 Hz
Power Consumption	30VA at idling 400VA with both channels driven to clipping into 8 ohm loads
Power Output	60 Watts per channel minimum continuous sine wave ("RMS") at 4 ohms 5–20,000 Hz, with less than 0.05% THD 50 Watts per channel minimum continuous sine wave ("RMS") at 8 ohms 5–20,000 Hz, with less than 0.02% THD 25 Watts per channel minimum continuous sine wave ("RMS") at 16 ohms 5–20,000 Hz, with less than 0.02% THD
IHF Power Bandwidth (both channels driven)	5–100,000 Hz for less than 0.1% THD 5–25,000 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 0.008% @ 10 kHz or below
Intermodulation Distortion	Less than 0.002% (60 Hz: 7 kHz, 4:1, 8 ohm load, 50 W output)
Frequency Response	5–50,000 Hz +0, -1 dB
Input Sensitivity	1V
Input Impedance	10 k ohms
Residual Noise Level	Less than 50 microvolts (IHF-A)
Signal-to-Noise Ratio	Better than 110 dB at rated output (IHF-A, input shorted)
Crosstalk	Better than -70 dB @ 1 kHz
Dimensions	16(W) x 3-5/32(H) x 8-7/8(D) inches 400(W) x 80(H) x 225(D) m/m
Weight	15.4 lbs. (approx.) 7 kg

Specifications for Nakamichi 420 power amplifier with BA-100 bridging adaptor and outputs bridged for monaural operation.

Power Output	120 Watts minimum continuous sine wave "RMS" at 8 ohms, 5 – 20,000 Hz with less than 0.05% THD
Power Bandwidth	5 – 100,000 Hz (IHF, for under 0.05% THD)
Damping Factor	greater than 50 (at 1 kHz, 8 ohms)
Total Harmonic Distortion	less than 0.004% up to 1 kHz less than 0.025% up to 10 kHz
Intermodulation Distortion	0.003% (60 Hz: 7 kHz, 4:1)
Frequency Response	5–50,000 Hz (+0, -2 dB)
Residual Noise	100μV (IHF-A)
Signal-to-Noise Ratio	better than 110 dB (IHF-A, inputs shorted)

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

Service Manual
Nakamichi 420

NAKAMICHI RESEARCH INC.
1-153 Suzukicho, Kodaira, Tokyo
Phone: (0423) 42-1111
Telex: 2832610 (NAKREI J)
Cable: NAKREI KKB

NAKAMICHI RESEARCH (U.S.A.), INC.
West Coast Office
1101 Colorado Avenue
Santa Monica, Calif. 90401
Phone: (213) 451-5901
Telex: 652429 (NAKREI SNM)

NAKAMICHI RESEARCH (U.S.A.), INC.
New York Office
220 Westbury Avenue
Carle Place, N.Y. 11514
Phone: (516) 333-5440
Telex: 144513 (NAKREI CAPL)

O-70410A Printed in Japan

Service Information

NAKAMICHI

Model: Nakamichi 420 (Power Amplifier)
Serial No.: from 4504581

Subject: Addition of Protector Circuit

No. 00D-M-0043 (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 420 would induce possible breakage of speakers.

Note: When the protector circuit is activated (speaker terminals shorted with relay contacts), the power supply for 420 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:

Current power block circuit has partly been modified in parallel with an addition of the protector circuit.
Refer to Fig. 1, assembled Protector P.C.B. Ass'y.

Modified Parts

Part No. BA03811A Power Block P.C.B. Ass'y .... resistors R034 and R035 (560Ω) have been shorted with a jumper wire (both channels).

Rear Panel Ass'y .... Part No. has been changed from JA03839A to JA03839B (including Protector P.C.B. Ass'y).

Additional Parts

BA03865A	Protector P.C.B. Ass'y	.....	1 pce.
0J03688A	E.P. Stud B	.....	2 pcs.

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: