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TH3

REPAIR MANUAL

OLYMPUS

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1. NAME AND SYMBOL IN OLYMPUS

Name	Power supply for lighting 100W/50W halogen lamp
Symbol	TH3

2. OUTLINE OF MERCHANDISE

(1) Power supply for the 100W/50W halogen lamp for the reflected light observation (bright/dark field, Nomarski differential interface, polarization) used mainly in the metal and IC markets.

(2) The applicable models are BH2-UMA series and PME3.

3. FEATURES

(1) Light weight by employing the switching system.

(2) Constant-voltage controlled output is stable against supply voltage and frequency variations. (The lamp brightness is kept constant.)

(3) Designed conformable to the overseas safety standard (UL1262, 1012), and safe.

(4) Conformable to the noise standard of each country (FCC part 15 class A, VDE 0871 class B) to complete the measures to prevent noises.

(5) Complete DC lighting free from flicker.

4. USING CONDITIONS

(1) Operating conditions

Temperature	0 ~ 40°C
Humidity	30 ~ 85%

(2) Usable lamp house

- BH2-HLSH80/100
- BH2-ULSH80/50

(3) Usable lamp

12V/100W halogen lamp	12V/100W HAL 12V/100W HAL-L
12V/50W halogen lamp	12V/50W HAL 12V/50W HAL-L 12V/50W HAL-L-LI

(4) Do not block the ventilation hole. (The elements in the cabinet are heated, the thermal fuses attached to the main switching transistor and the secondary rectifying diode radiation plate are blown (89 ± 1.67°C) and the unit function is stopped. Replace the built-in fuse unit to restore the unit function.

(5) Separate about 10cm from another unit to ensure ventilation.

5. SPECIFICATIONS

	Item	Specification	Remarks
1	Rated input voltage	100V system: 100 ~ 120V 200V system: 220 ~ 240V	Continuous input
2	Rated frequency	50 ~ 60Hz	
3	Rated input current	100V system: 2.5A 200V system: 1.2A	
4	Excess current protection	Breaker is used. (100V system: 4A 200V system: 2A)	
5	Rated output voltage	2.5 ~ 1.26V Continuously variable with the volume. (Output of 2.5 $^{+0}_{-1.0V}$ ~ 13.5 ± 0.3V is permitted by adjusting the internal circuit.)	Value at the output connector With a rated load
6	Usable lamp	12V/50W HAL (Philips 7027) HAL-L (Oslam 64440) HAL-L-LI (Life type JC) 12V/100W HAL (Philips 7023) HAL-L (Philips 7724)	
7	Output excess current protection	Constant current protection by the drooping characteristics For 100W Operating with 11.0 ± 0.5A (using 2/3 pins) For 50W Operating with 5 ~ 7A (using 1/4 pins)	
8	Weight	1.5kg	
9	Outside dimensions	125(W) × 190(D) × 100(H) mm	

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2. Disassembly of BREAKER, MAIN SWITCH ASS'Y and INLET BOARD B-3

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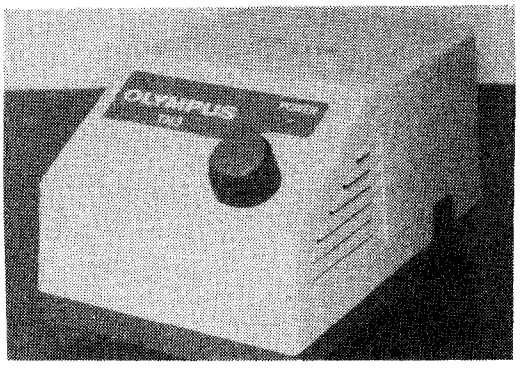
4. Disassembly of OUT CONNECTOR ASS'Y B-5

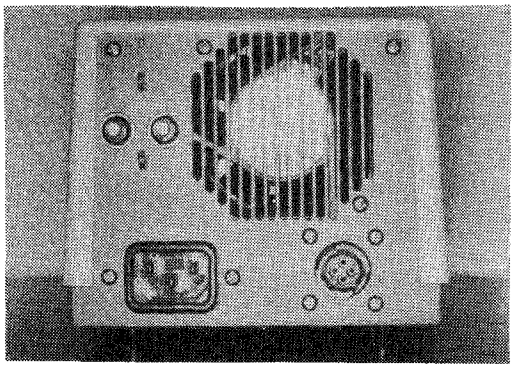
5. Disassembly of HEAT SINKER ASS'Y B-5

6. Disassembly of FILTER BOARD B-5

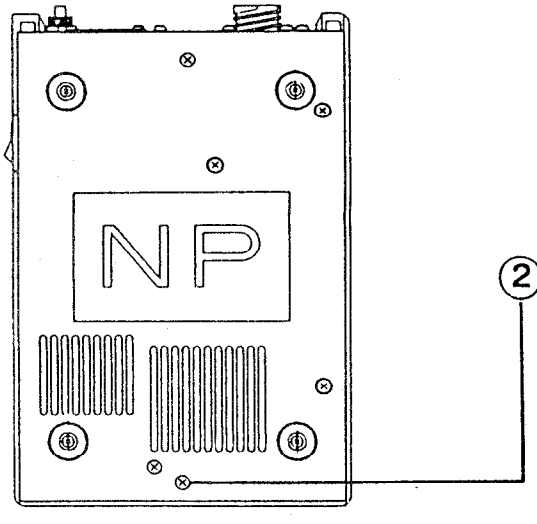
7. Disassembly of S-FUSE ASS'Y B-6

8. Disassembly of MAIN BOARD B-6





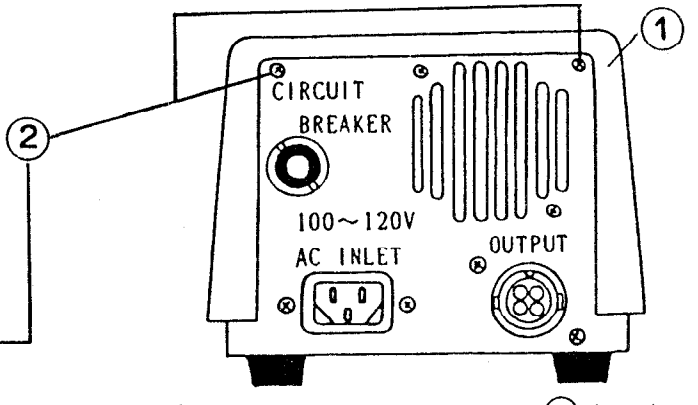
1. DISASSEMBLY OF UPPER CASE ASS'Y



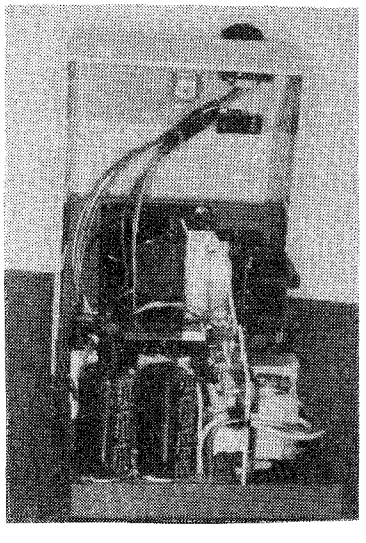
1-1 Remove the UPPER CASE ASS'Y (1).

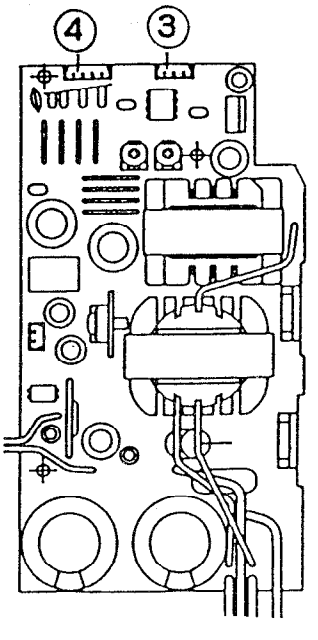
SCREW (2) 3 pcs.

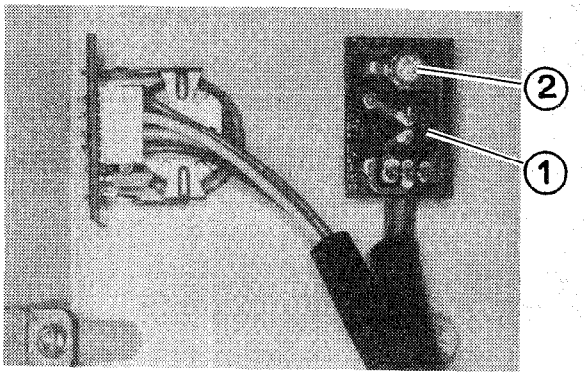
* The two washers come off together.



1-2 Remove the CONNECTOR (3) (CN2) and CONNECTOR (4) (CN3) from the MAIN BOARD.







1-3 Remove the LED board (1).

SCREW (2) 1 pc.

1-4 Disassembly of the VOLUME BOARD

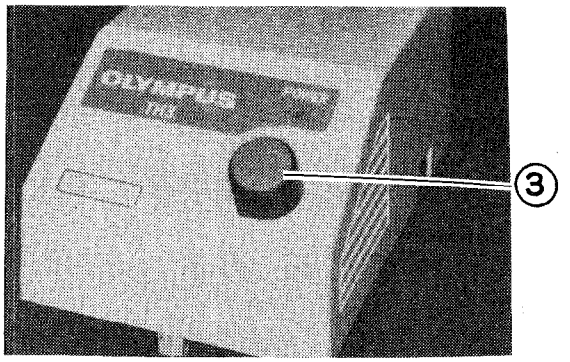
1-4-1 Remove the KNOB ASS'Y (3).

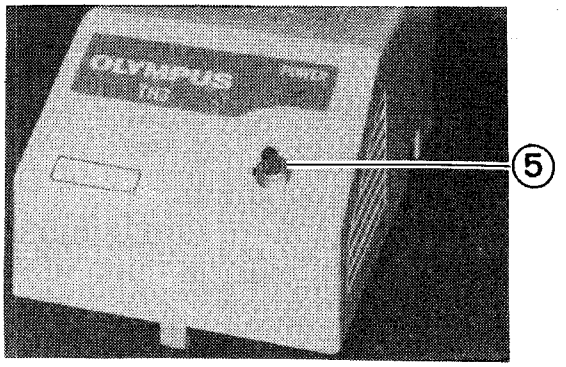
SCREW (2) 1 pc.

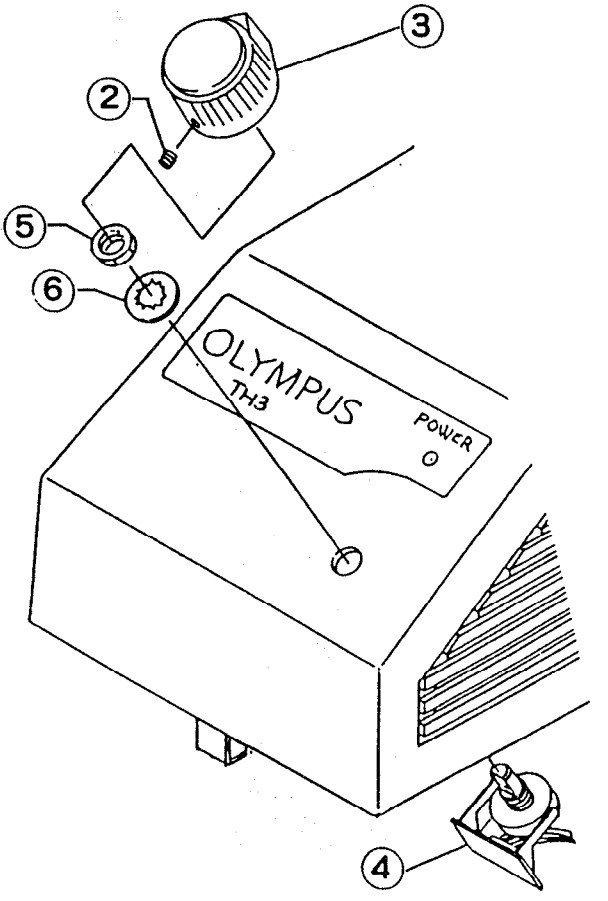
1-4-2 Remove the VOLUME BOARD (4).

NUT (5) 1 pc.

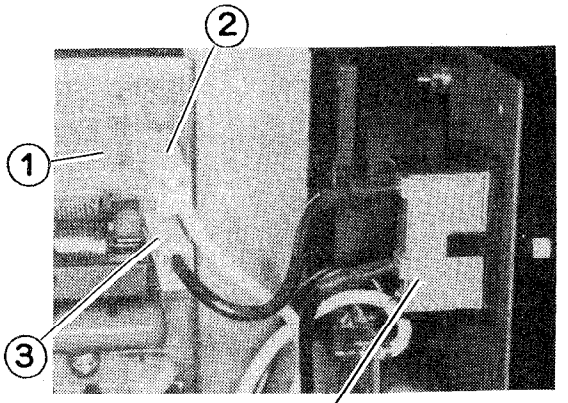
* The WASHER (6) comes off together.



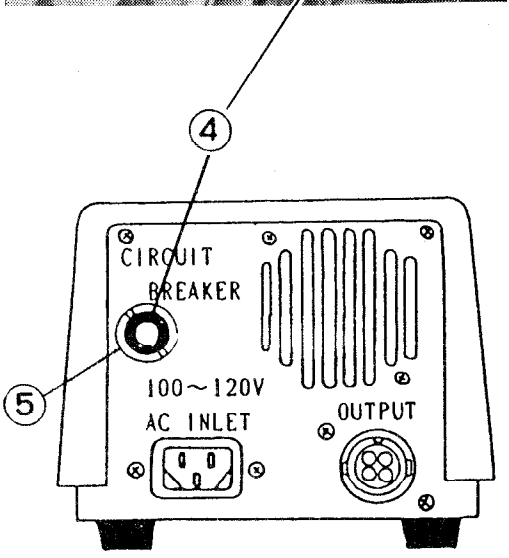




2. DISASSEMBLY OF BREAKER, MAIN SWITCH ASS'Y AND INLET BOARD



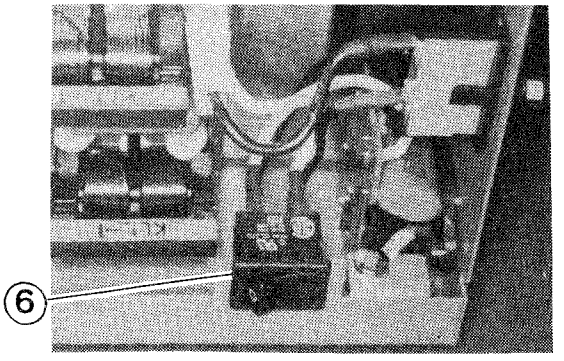
2-1 Remove the TERMINAL L1 ② (white) and TERMINAL L2 ③ (Black) from the FILTER BOARD ①.

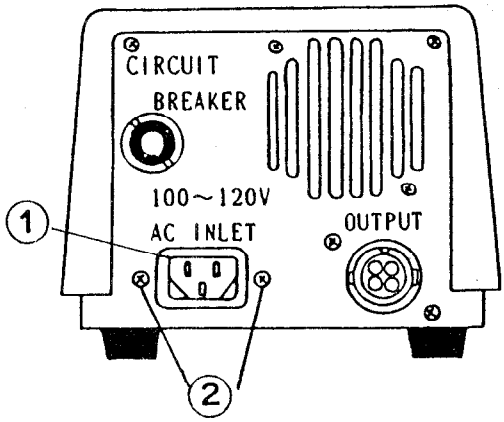


2-2 Remove the BREAKER ④.

NUT ⑤ 1 pc.

2-3 Remove the MAIN SWITCH ASS'Y ⑥.





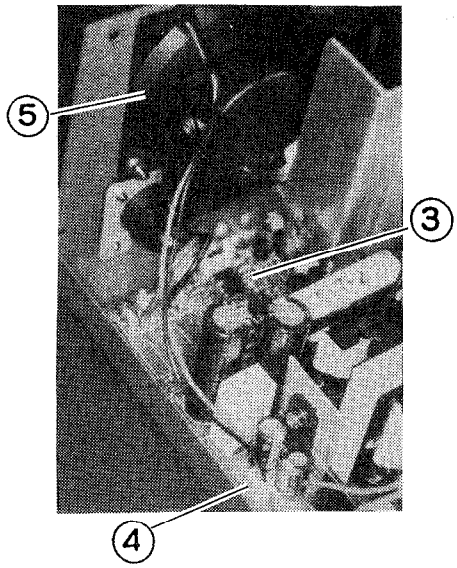
2-4 Remove the INLET BOARD (1).

SCREW (2) 3 pcs.

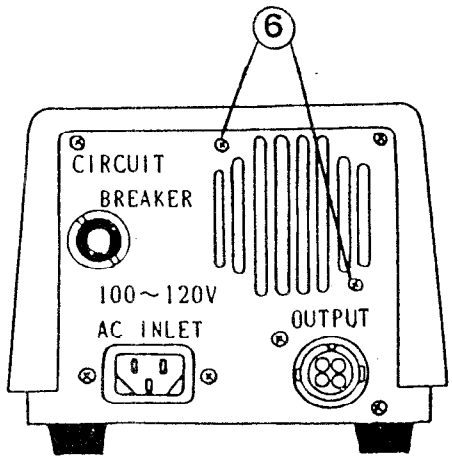
(1 for the grounding wire)

* The three washers come off together.

3. DISASSEMBLY OF FAN ASS'Y



3-1 Remove the CONNECTOR (4) (CN4) from the MAIN BOARD (3).

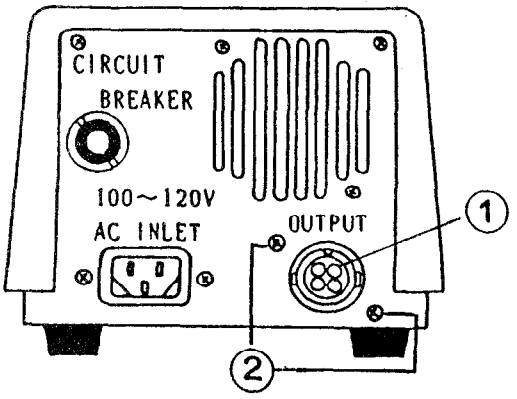


3-2 Remove the FAN ASS'Y (5).

SCREW (6) 2 pcs.

* The six washers and two nuts come off together.

4. DISASSEMBLY OF OUT CONNECTOR ASS'Y

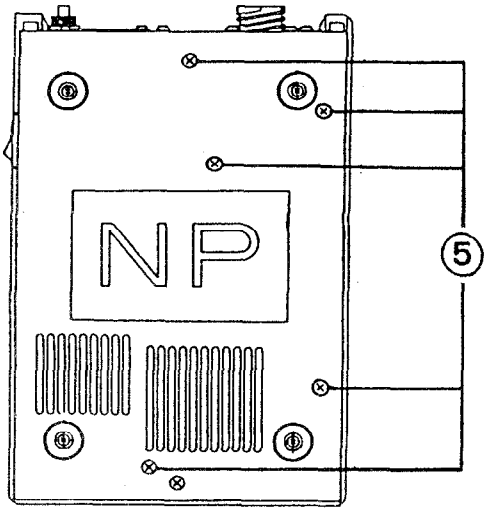


4-1 Remove the OUT CONNECTOR ASS'Y (1).

SCREW (2) 2 pcs.

* The two washers come off together.

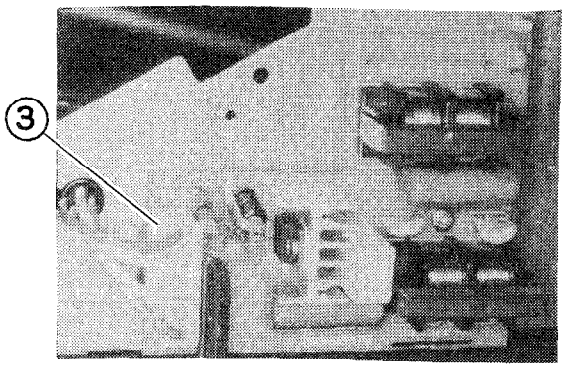
5. DISASSEMBLY OF HEAT SINKER ASS'Y



5-1 Remove the HEAT SINKER ASS'Y.

SCREW (2) 5 pcs.

6. DISASSEMBLY OF FILTER BOARD



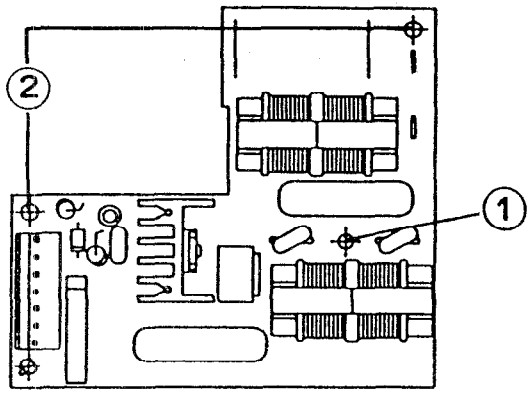
6-1 Remove the CONNECTOR (3) (CN1) from the FILTER BOARD.

6-2 Remove the FILTER BOARD.

SCREW ① 1 pc.

SCREW ② 2 pcs.

* Remove the SCREWs ② from the rear side.

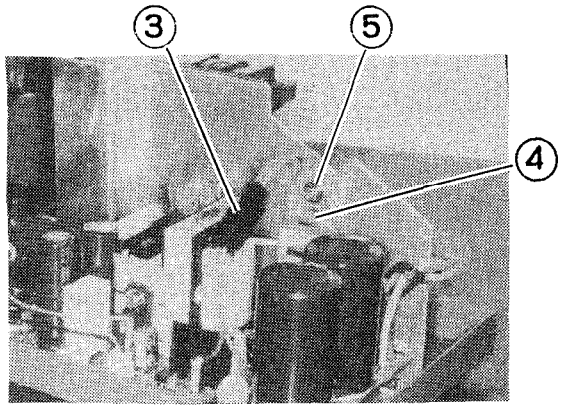


7. DISASSEMBLY OF S-FUSE ASS'Y

7-1 Remove the connector ③ connecting the MAIN BOARD.

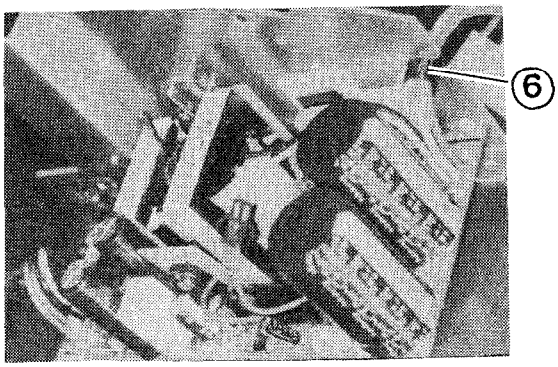
7-2 Remove the S-FUSE ASS'Y ④.

SCREW ⑤ 1 pc.



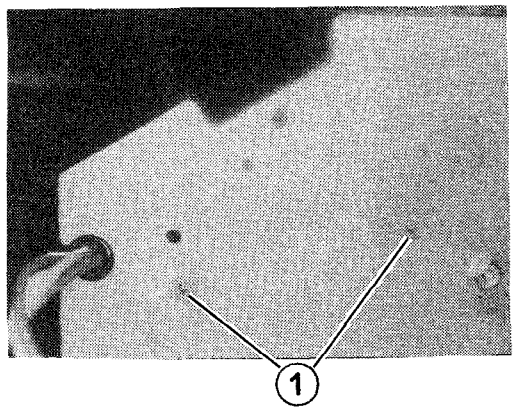
8. DISASSEMBLY OF MAIN BOARD

8-1 Remove the BUSHING ⑥ and disconnect the cord from the hole.



8-2 Remove the main board.

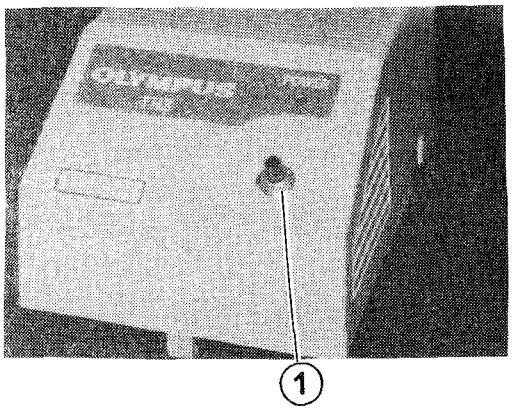
SCREW (1) 2 pcs.

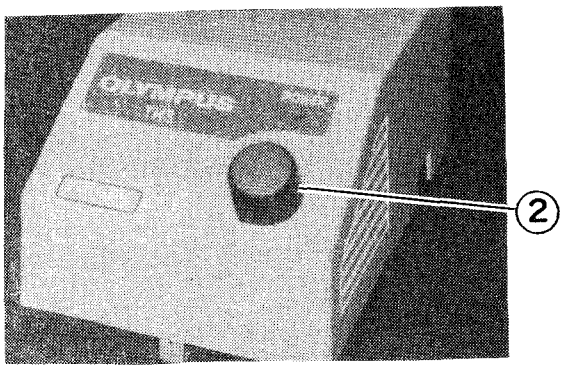


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11. Adjustment of Output Voltage C-6

1. ASSEMBLY OF VOLUME BOARD





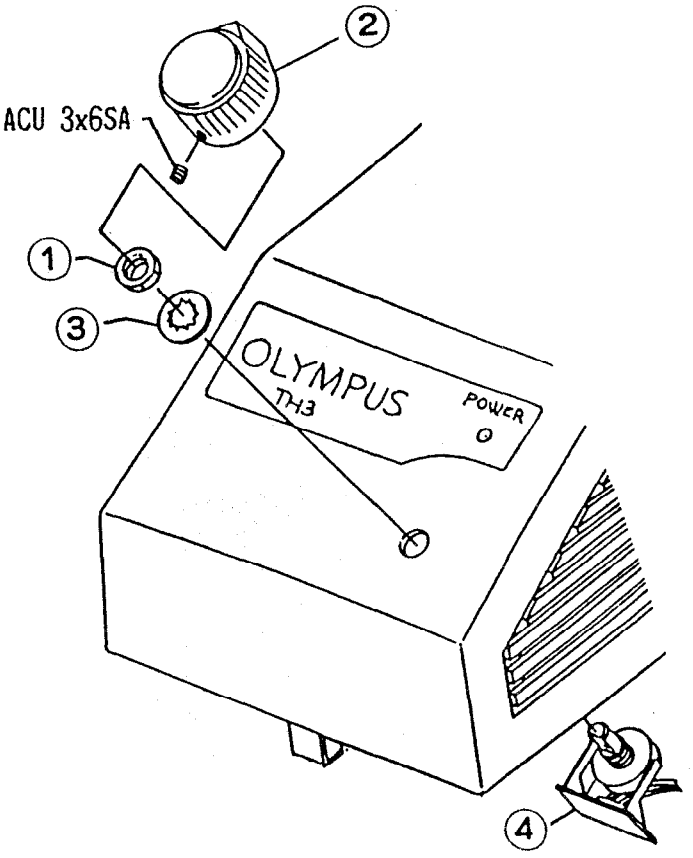
1-1 Attach the VOLUME BOARD ④.

NUT ① 1 pc.

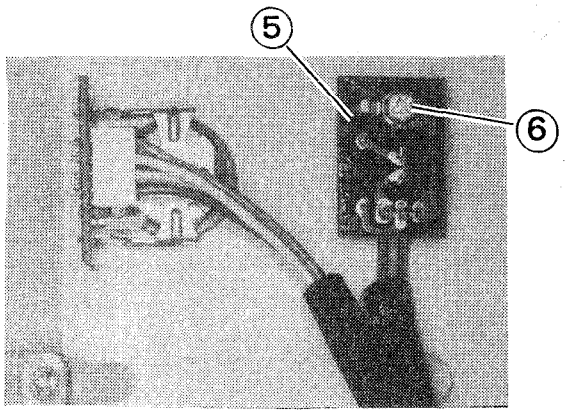
* Attach the washers ③ together.

1-2 Attach the KNOB ②.

SCREW ACU3x6SA 1 pc.



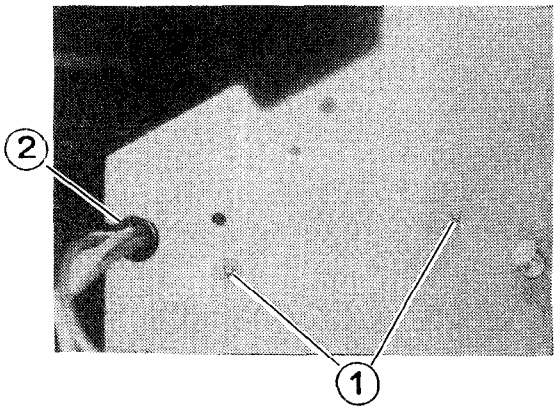
2. ASSEMBLY OF LED BOARD



2-1 Attach the LED BOARD ⑤.

SCREW ⑥ CUTB3x10SA 1 pc.

3. ASSEMBLY OF MAIN BOARD

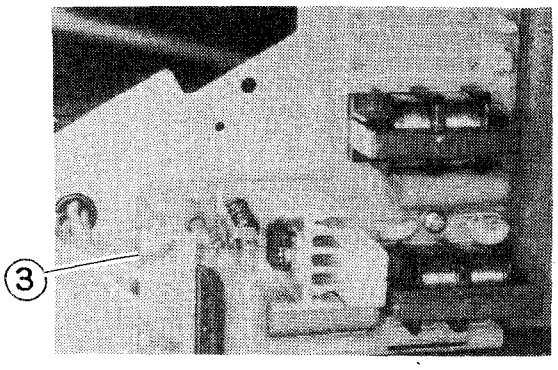


3-1 Attach the MAIN BOARD to the HEAT SINKER ASS'Y.

SCREW ① CSK3x14SA 2 pcs.

3-2 Attach the BUSHING ② and pass the cords through the hole.

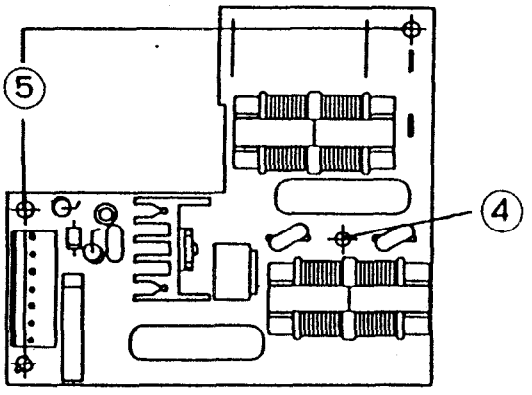
4. ASSEMBLY OF FILTER BOARD



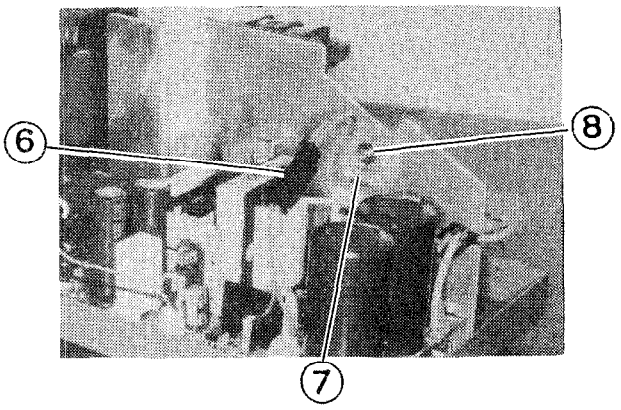
4-1 Attach the FILTER BOARD to the HEAT SINKER ASS'Y and insert the CONNECTOR ③ (CN1).

SCREW ④ CUK3x3SA 1 pc.
SCREW ⑤ CUTB3x8SA 2 pcs.

* Attach from the rear side.



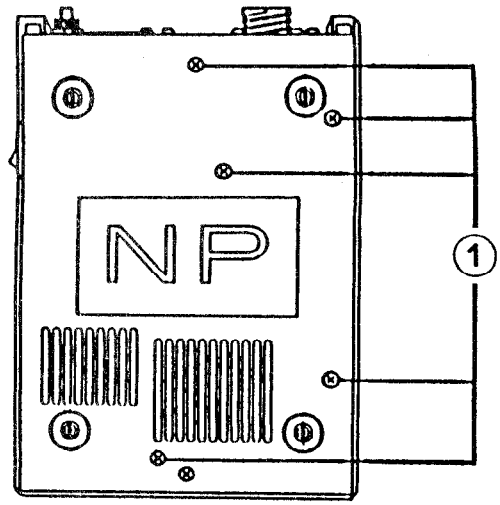
5. ASSEMBLY OF S-FUSE ASS'Y



5-1 Attach the S-FUSE ASS'Y ⑦ to the HEAT SINKER ASS'Y and connect the CONNECTOR ⑥ to make connection with the MAIN BOARD.

SCREW ⑧ CUKSB3x6SA 1 pc.

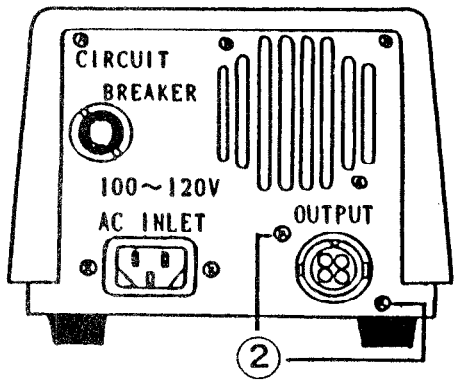
6. ASSEMBLY OF HEAT SINKER ASS'Y



6-1 Attach the HEAT SINKER ASS'Y.

SCREW (1) CUK3x5SA 5 pcs.

7. ASSEMBLY OF OUT CONNECTOR ASS'Y

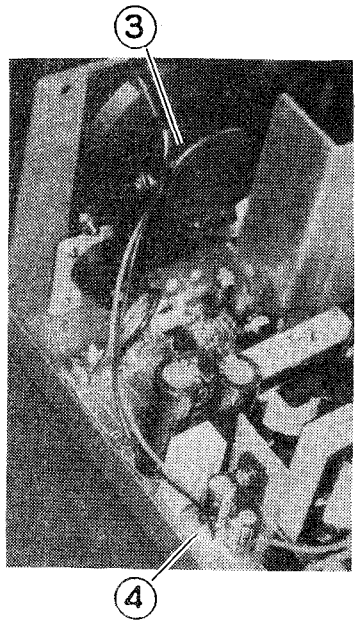


7-1 Attach the OUT CONNECTOR ASS'Y.

SCREW (2) CUK3x10SA 2 pcs.

* Attach the two washers SW 3SA together.

8. ASSEMBLY OF FAN ASS'Y

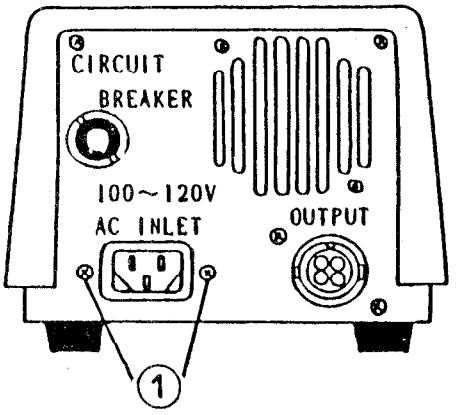


8-1 Attach the FAN ASS'Y (3) and insert the CONNECTOR (4) (CN4) into the MAIN BOARD.

SCREW (4) CUK3x10SA 2 pcs.

* Attach the four washers SW 3SA and two BNW3SA and two nuts 6N 3SA together.

9. ASSEMBLY OF INLET BOARD, BREAKER AND MAIN SWITCH ASS'Y



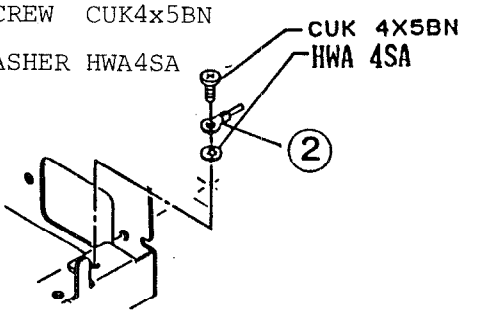
9-1 Attach the INLET BOARD.

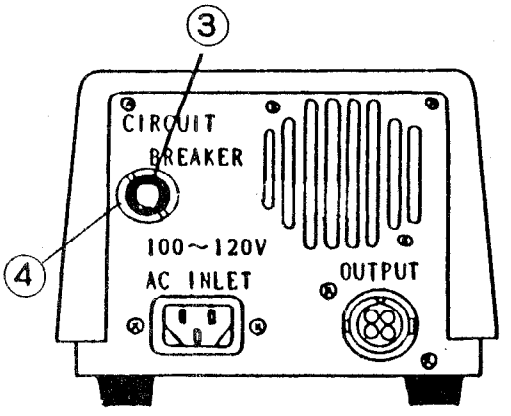
SCREW (1) CUK3x10SA 2 pcs.

* Attach the two washers SA 3SA together.
* Tighten the grounding wire (2) with a screw. Attach the washer at the same time.

SCREW CUK4x5BN

WASHER HWA4SA



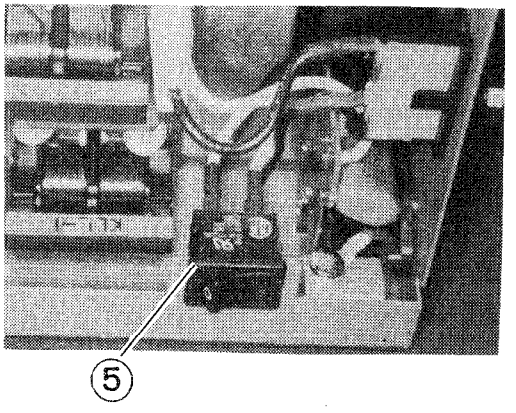


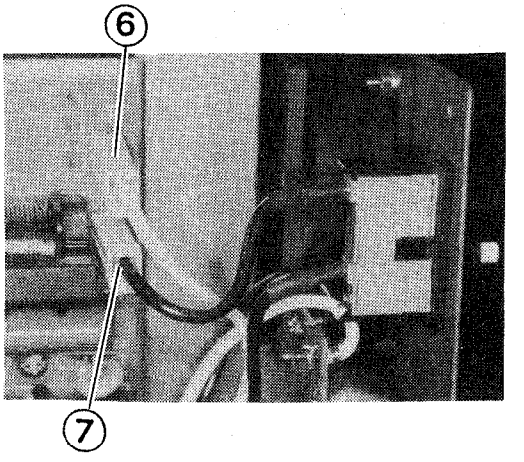
9-2 Attach the breaker (3).

NUT (4) 1 pc.

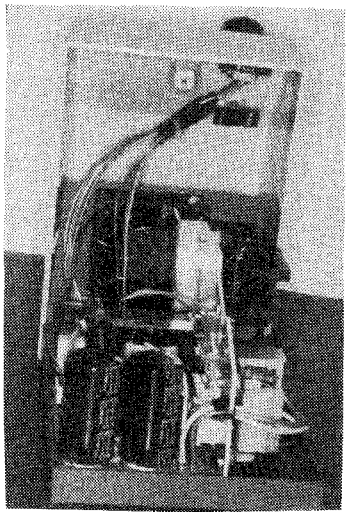
9-3 Fit the MAIN SWITCH ASS'Y (5).

9-4 Attach the TERMINAL L1 (6) (white) and terminal L2 (7) (black) to the FILTER BOARD.

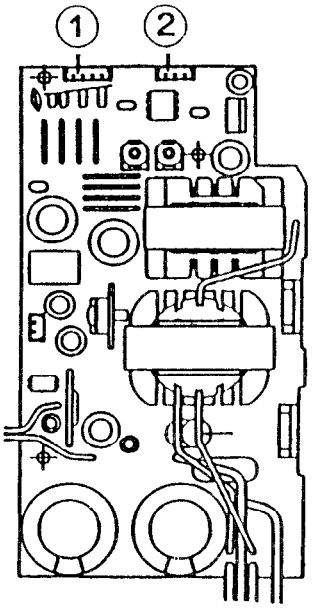




10. ASSEMBLY OF UPPER CASE ASS'Y

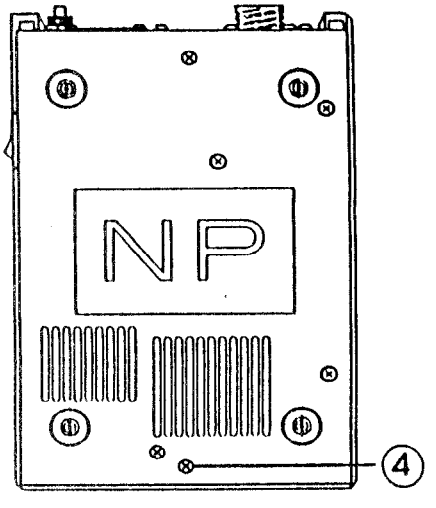


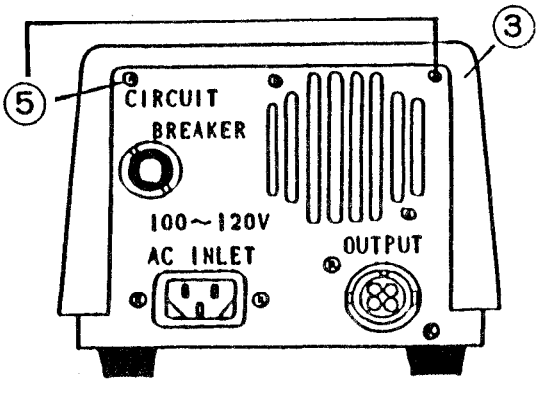
10-1 Attach the CONNECTOR ① (CN2) and CONNECTOR ② (CN3) to the main board.



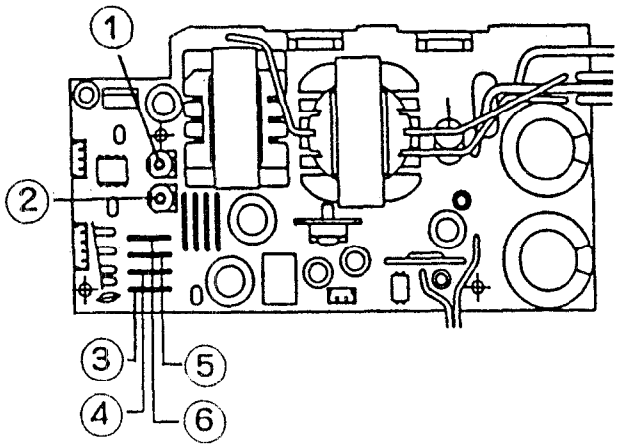
10-2 Attach the UPPER CASE ASS'Y ③.

SCREW ④	CUK3x5SA	1 pc.
SCREW ⑤	CUK3x10SA	2 pcs.
WASHER SW 3SA		2 pcs.





11. ADJUSTMENT OF OUTPUT VOLTAGE



11-1 Connect the lamp, turn VR3 (2) of the MAIN BOARD fully counter-clockwise. (Do not turn VR1 (1).)

Usable lamp housee
BH2-HLSH80/100 BH2-ULSH80/50
Usable lamps
12V100W HAL 12V100W HAL-L 12V50W HAL 12V50W HAL-L 12V50W HAL-L-LI

11-2 Connect a multimeter as shown in the following table.

Lamp	Multimeter	
	HOT	GND
50W	(3)	(6)
100W	(4)	(5)

11-3 Set the input voltage to 100V AC for the 100V system and 200V AC for the 200V system, and turn on the main switch.

11-4 Verify that the LED and lamp are lit, and set the main volume to the MAX position.

11-5 While watching the multimeter, turn VR3 gradually clockwise to set the output voltage to 12.8 ± 0. 3V.

11-6 Set the main volume to the MIN position and verify that the output is 2.5V $^{+0}_{-1.0}$ V.

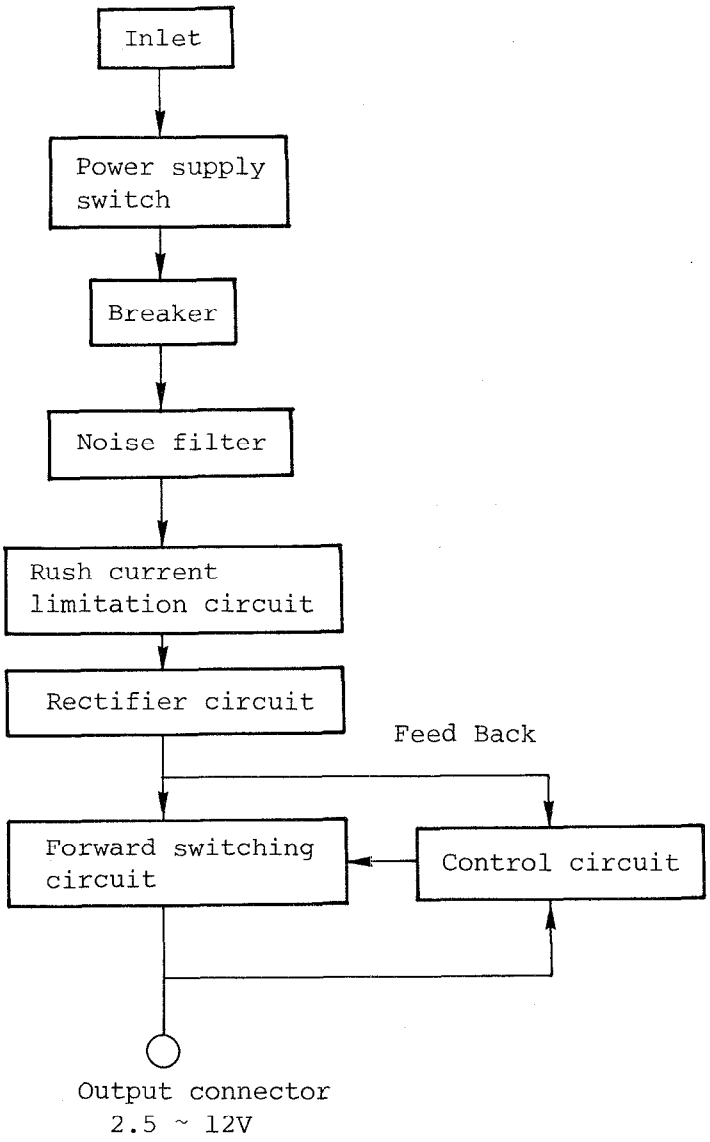
11-7 Turn off the main switch.

CONTENTS

1. Block Diagram D-1

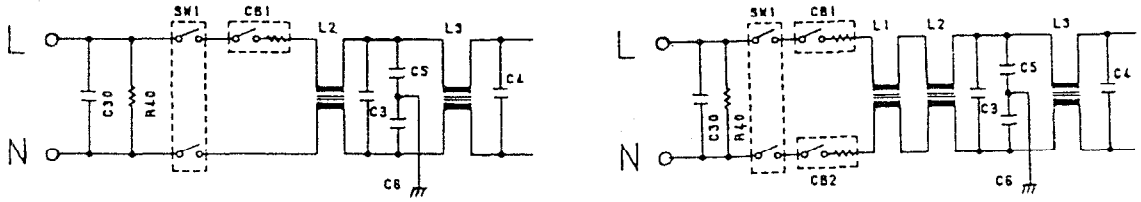
2. Description of Circuits D-2

1. BLOCK DIAGRAM



2. DESCRIPTION OF CIRCUITS

① Noise filter



100V system　　200V system

Fig. 1 Noise filter circuit

The noise filter prevents leakage of the noises generated in the power supply to the outside and ingress of an external noise into the power supply.

② Rush current limitation circuit

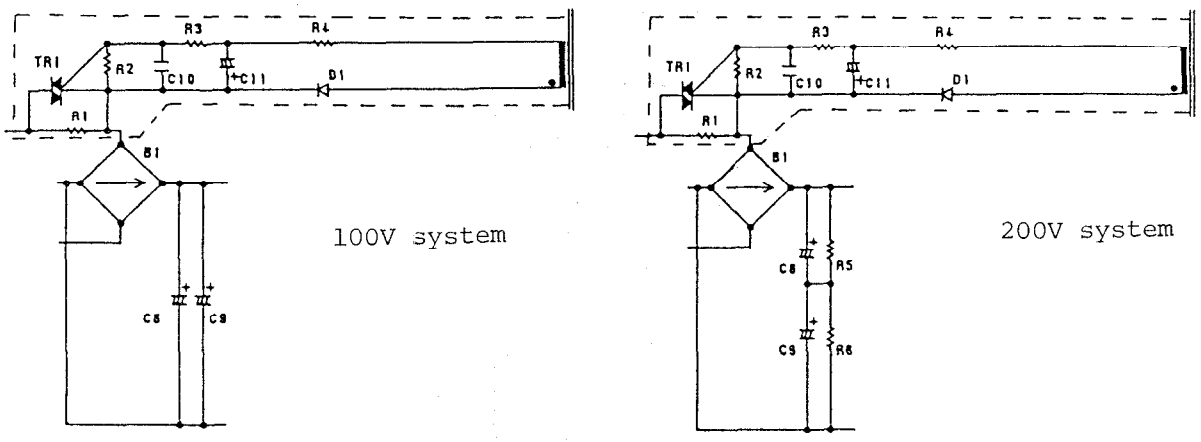


Fig. 2 Rush current limitation circuit
(section indicated by the broken line)

When the power supply is ON, C8 and C9 are in the initial state and very large current flows at the moment of turning of the power causing a damage or defect of the circuit or the other devices. The rush current limitation circuit shown in Fig. 2 prevents it.

When the power switch is turned on, C8 and C9 are charged by the current limited by the resistor R1 and as soon as the main circuit function,, the triac TR1 is triggered to short R1 to prevent resistance loss at usual operation.

If C8 and C9 are not sufficiently charged when the triac TR1 is triggered, a charging current flows in them. This is called "secondary rush current" to discriminate from the "primary rush current" which flows when the power switch is turned on. The secondary rush current depends on the triac triggering timing and the charging amount by R1.

③ Rectifier circuit

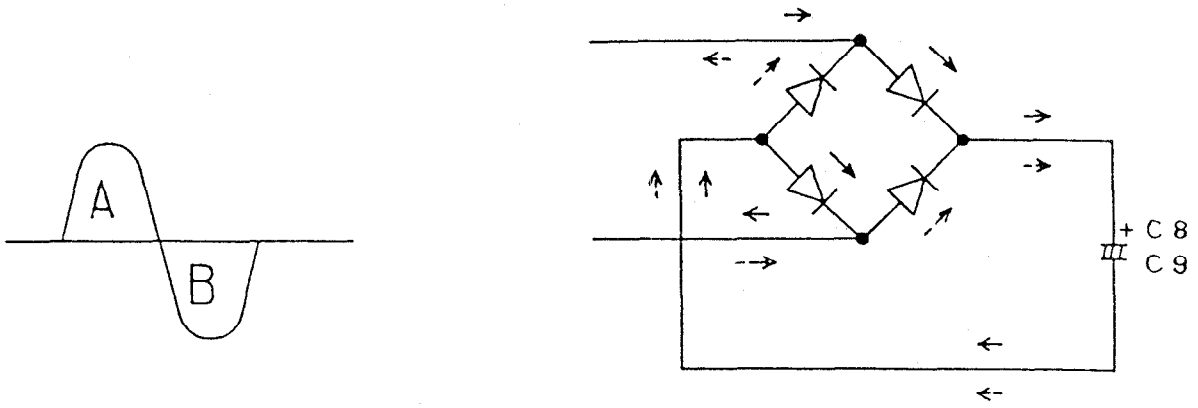


Fig. 3 Rectifier circuit

The part A (positive part) of AC current flows as indicated by a solid line and the part B (negative part) flows as indicated by a broken line, and the smoothing condensers C8 and C9 are charged.

④ Forward system switching circuit

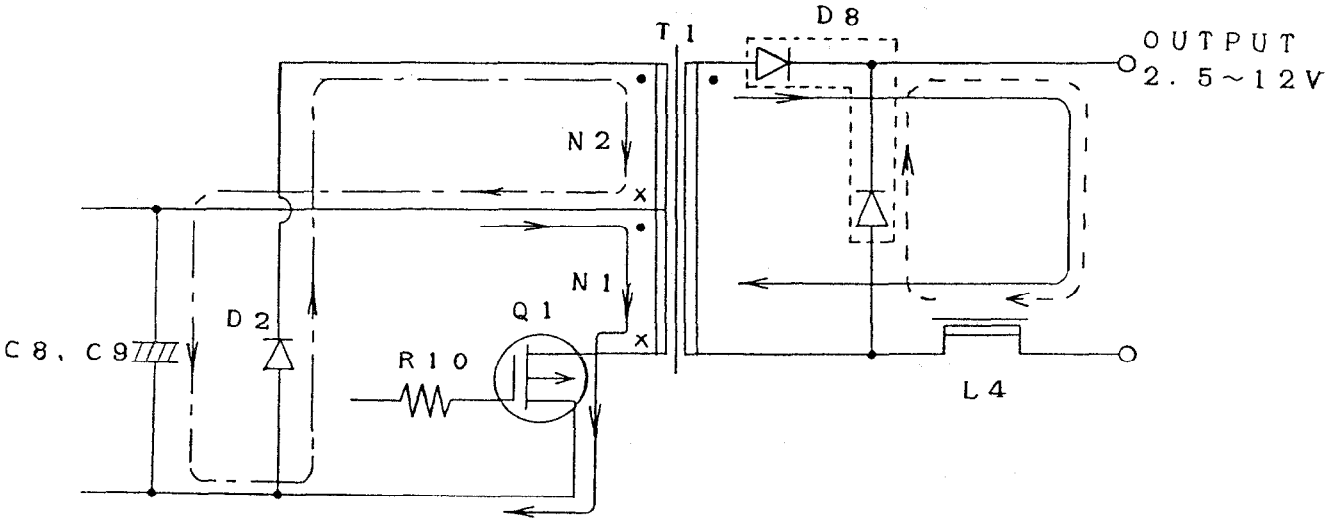


Fig. 4 Forward switching circuit

When a drive signal is applied from the control circuit to the gate FETQ1, Q1 begins to conduct and reaches saturation. V_{IN} winding of T1 transformer. D8 diode connected to the secondary side of T1 is then supplied voltage in positive direction, and becomes conductive and supplies power to a load. (See the solid line in Fig. 4.) When Q1 turns off, D8 is supplied with voltage in the reverse direction, and cuts off and fails to supply power to a load. However, a counter electromotive force is generated in L4 at the timing of turning off and current flows as indicated by the broken line in Fig. 4.

The function of D2 is then explained. While Q1 is being ON, T1 has the residual energy generated by the exciting current. If the next cycle begins without discharging this energy by any means, the transformer is saturated. If the transformer is saturated, N1 inductance becomes a very small value and excessive current flows causing a serious trouble such as broken FET and burnt winding. To prevent such a trouble, provide N2 winding in the form of stacking voltages on N1 winding and connect it to FET source via a diode.

When FET turns off, the "X" marked side in Fig. 4 becomes high potential and a reset current flows through the condensers C8 and C9 of the input side and the diode D2 as indicated by the alternate long and short dash line. That is, the diode D2 functions to return the energy stored in the transformer T1 when FETQ turns on to the input side when FETQ1 turns off. Fig. 5 shows the V_{DS} waveform (100V system) of FETQ1.

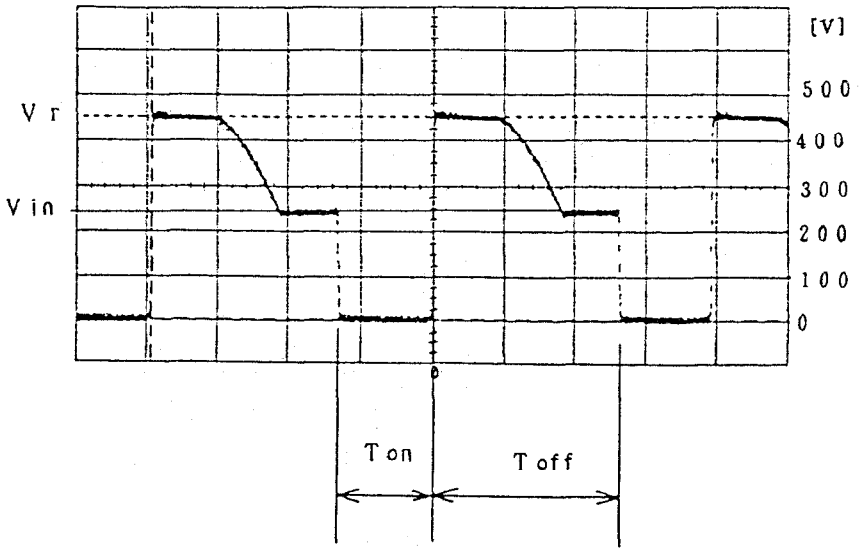


Fig. 5 FETQ1 V_{DS} waveform

⑤ Control circuit

Fig. 6 shows the control circuit block diagram.

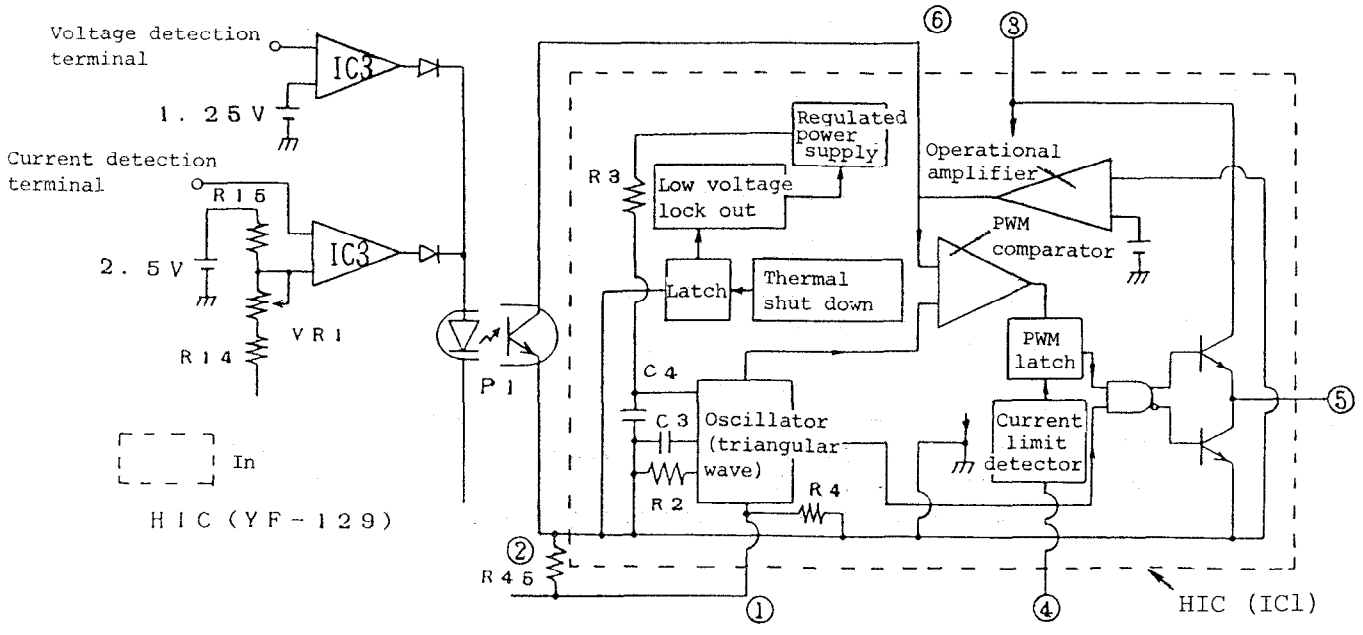


Fig. 6 Control circuit block diagram

D. DESCRIPTION OF MECHANISM

This HIC (IC1) is for the driver of the continuity angle control system of the ON/OFF type inverter, which maintains the output voltage constant by enlarging the pulse width when a load is heavy and narrowing it when a load is light. The functions of each terminal of HIC (YF-129) are explained in the following table.

Pin No.	Function
1	Terminal for dead-time
2	GND
3	V_{CC} terminal About 16V is applied. The voltage is applied from R7 at starting and the voltage from the auxiliary winding is applied after being started.
4	Current limit detection
5	FET (Q1) drive output terminal Generates the signal modulated in pulse width at the fixed frequency (110kHz).
6	Input terminal for PWM control

The functions of each part including the peripheral circuits are explained in the following table.

Operation	Description
Start HIC	HIC operates when 15 ~ 30VDC is applied to pins 2 and 3 of HIC.
Operating frequency	Oscillation frequency is determined by R2, R4 and C3 in HIC and R45 connected to the outside.
Deat time	As the voltage at HIC pin is higher, the maximum pulse is narrower. The maximum pulse angle is set by R4 in HIC and R45 connected to the outside.
Soft-start	The puls width becomes the minimum at the beginning of charging C4 by the regulated power supply in HIC through R4 in HIC, and it is enlarged as the charging advances.
Voltage controller	2.5V is applied as a reference voltage from the shunt regulator. This voltage is divided into 1.25V at used as a reference for the operational amplifier. As the voltage is controlled when 1.25V is applied to the voltage detection terminal of the operational amplifier, the voltage obtained by dividing the output voltage to this terminal to make the control. The output voltage can be continuously varied by adjusting VR3.
Current controller	The output current flows as indicated by the arrow in Fig. 8, causing a voltage drop at both ends of R25 proportional to the output current. Set excess current by varying the reference voltage of the operational amplifier so that it becomes the same level as the voltage dropped at R25. This current value is set to about 10.5A by adjusting VR1.

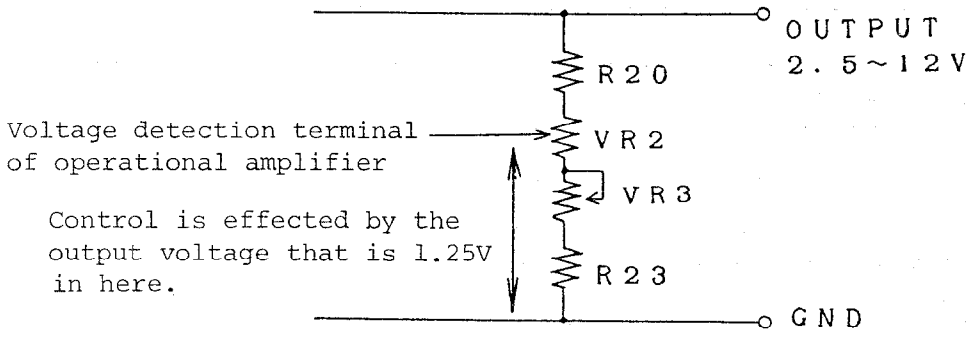


Fig. 7 Voltage controller

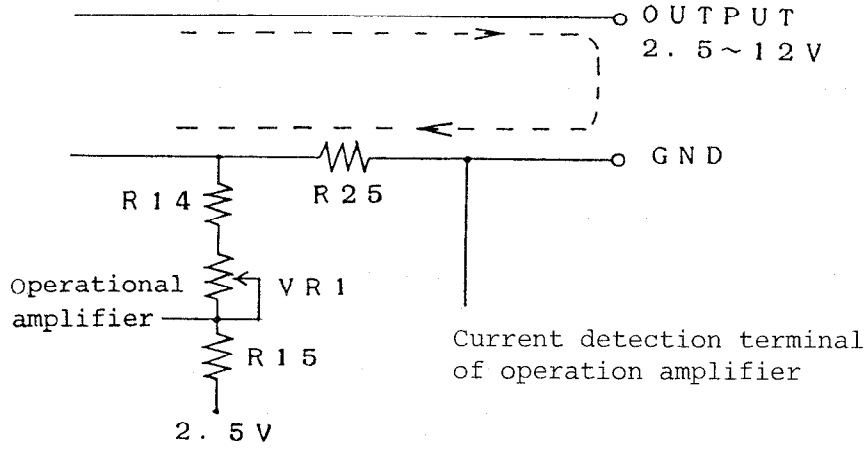


Fig. 8 Current controller

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1. Introduction E-1

2. Lamp E-2

3. LED E-4

4. Fan E-5

5. Power Supply E-6

6. Circuit Diagram E-8

1. INTRODUCTION

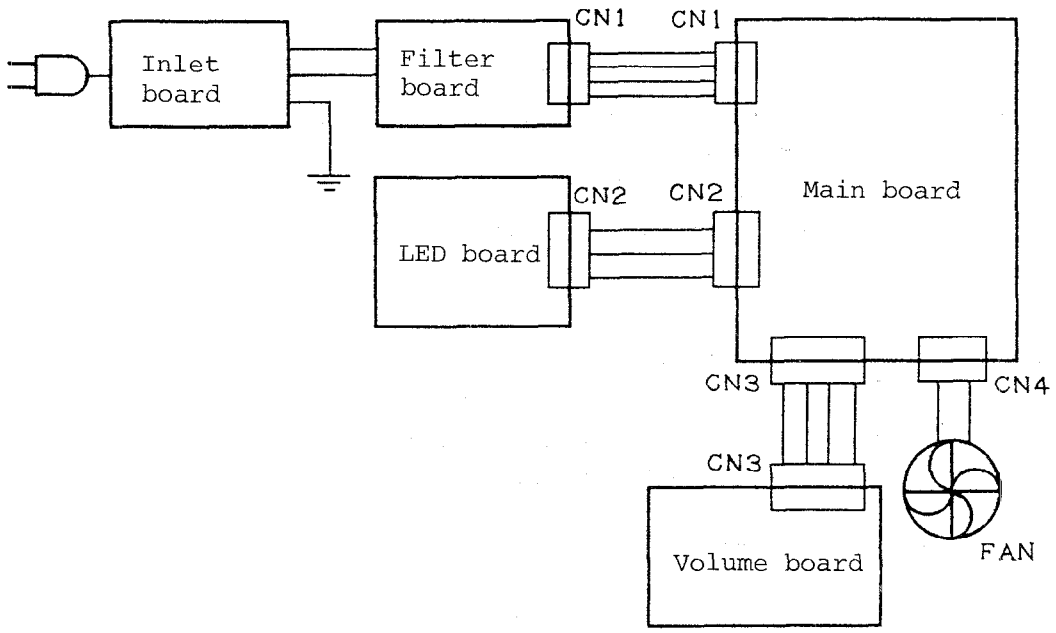
- This section is written in the flow chart format, permitting the user to find out a defective part by following the arrows.
- The number put in a box " ", for example [1] and [2], indicates the number of connector or pin. "TP" means the pin to check; "TP1" indicates the checking pin 1.
- Only a multimeter is used in the troubleshooing.
- "measure the voltage between TP1 and TP2" means "Apply HOT to TP1 and GND to TP2 for measuring the voltage".

  GND → Reference potential in an electronic circuit, 0V.
  HOT → The line to apply the supply voltage is called HOT contrary to GND.
- Ⓐ or Ⓑ means "Jump to Ⓐ or Ⓑ in the same item".
- ⓐ or ⓑ means "Refer to ⓐ or ⓑ in the same item for the checking method and follow it".
- For the replacement and adjustment, refer to "C. ASSEMBLY AND ADJUSTMENT PROCEDURES".

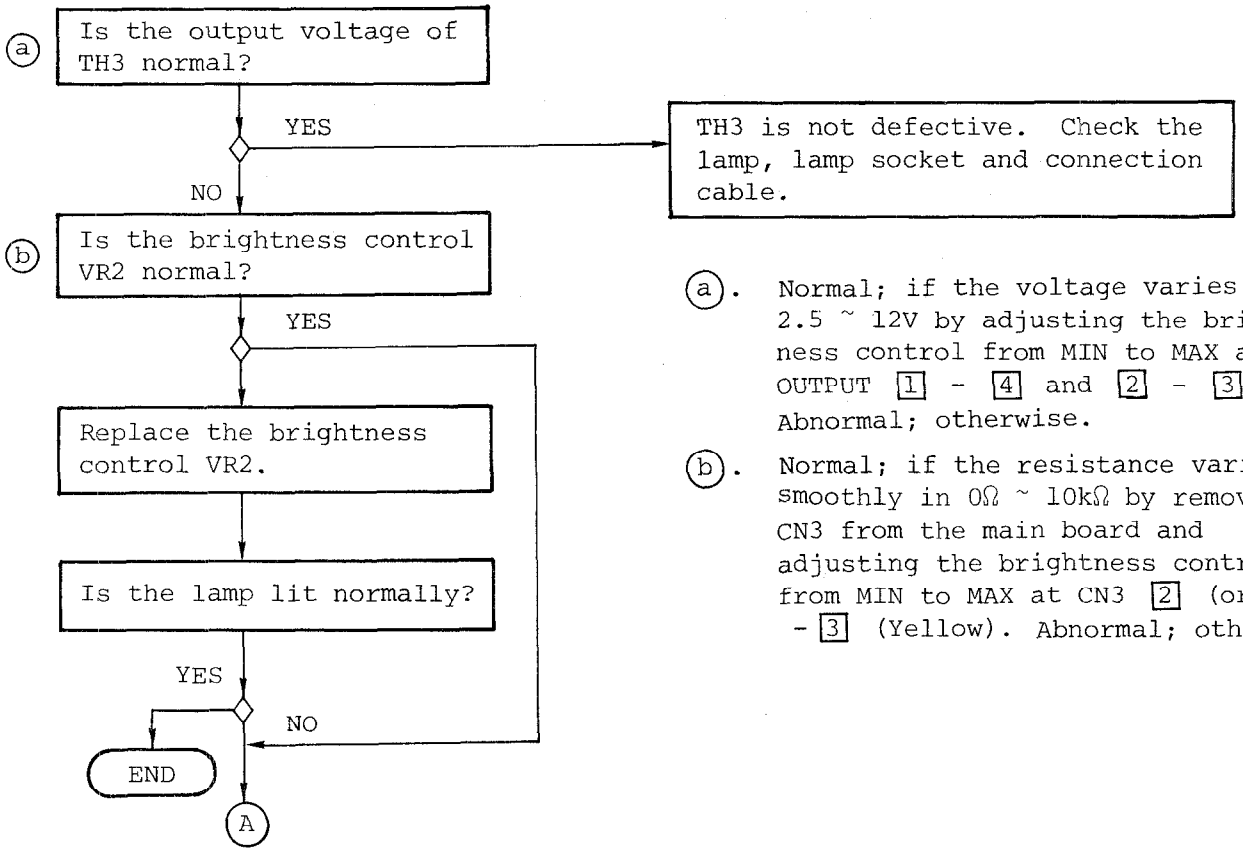
Difference between 100V and 200V system

	100V system	200V system
Number of breakers	1	2
Nameplate	Letter color: Black 100/120V ~ 50/60Hz 2.5A	Letter color: Green 220/240V ~ 50/60Hz 1.2A
Filter board	DZ085100	DZ085200
Inlet board	DZ085300	DZ085400
Main board	DZ084900	DZ085000

2. LAMP

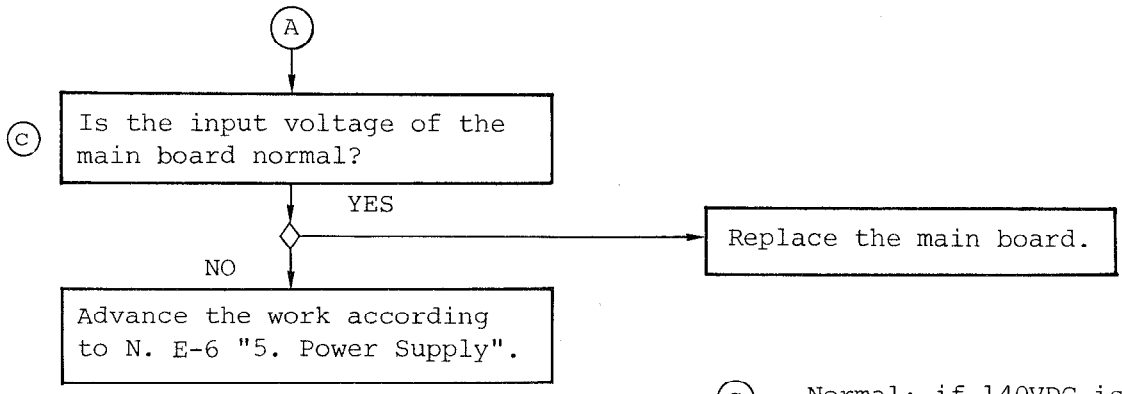


Causes
1. Defective lamp
2. Defective main board
3. Defective brightness control VR2
4. Defective power supply



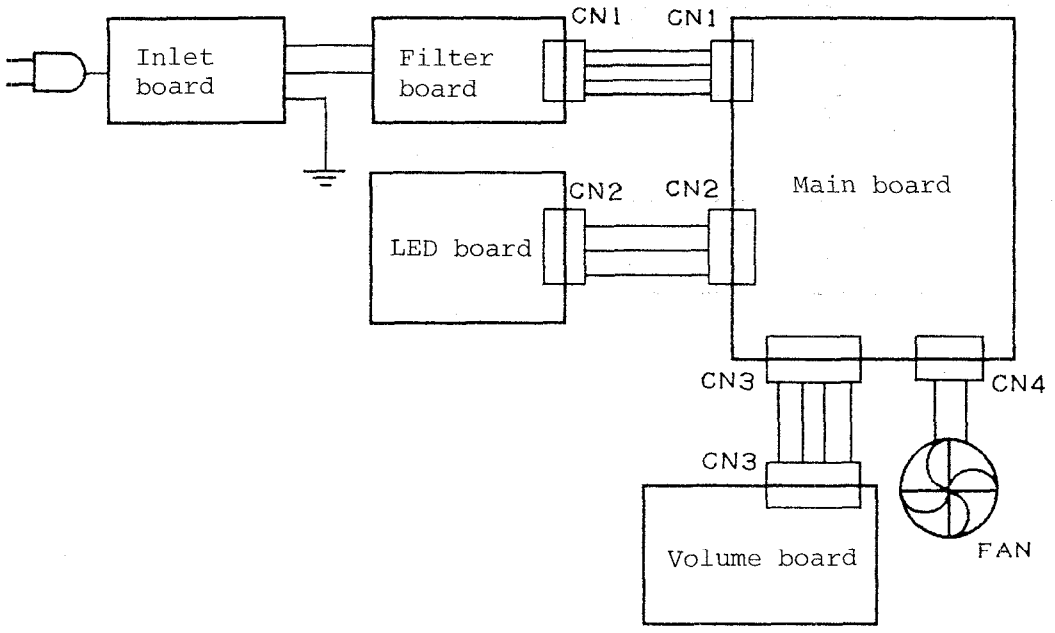
ⓐ. Normal; if the voltage varies in 2.5 ~ 12V by adjusting the brightness control from MIN to MAX at OUTPUT [1] - [4] and [2] - [3]. Abnormal; otherwise.

ⓑ. Normal; if the resistance varies smoothly in 0Ω ~ 10kΩ by removing CN3 from the main board and adjusting the brightness control from MIN to MAX at CN3 [2] (orange) - [3] (Yellow). Abnormal; otherwise.

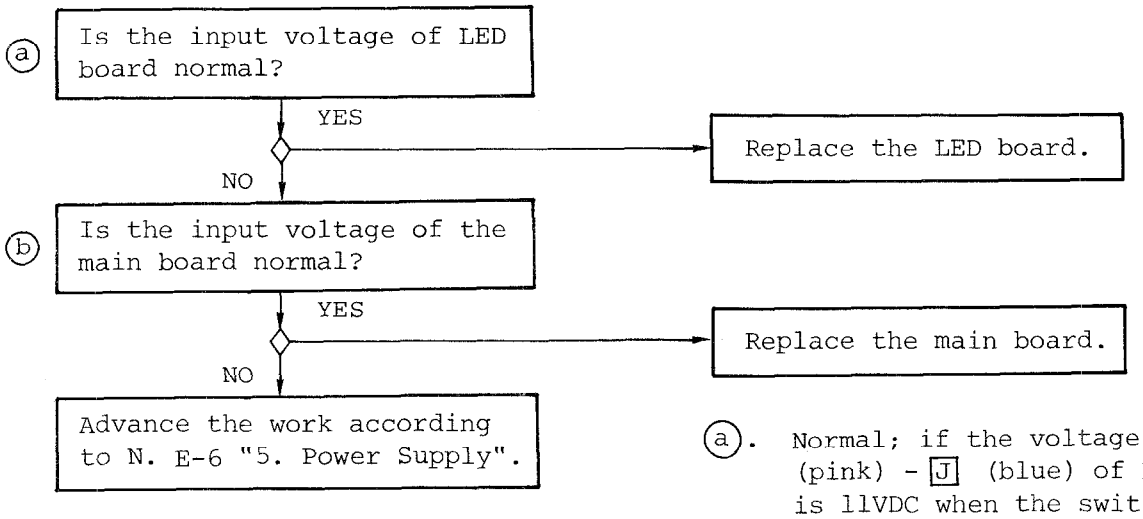


Ⓒ. Normal; if 140VDC is detected at CN1 [5] (orange) - [7] (gray) of the filter board.
Abnormal; otherwise.

3. LED



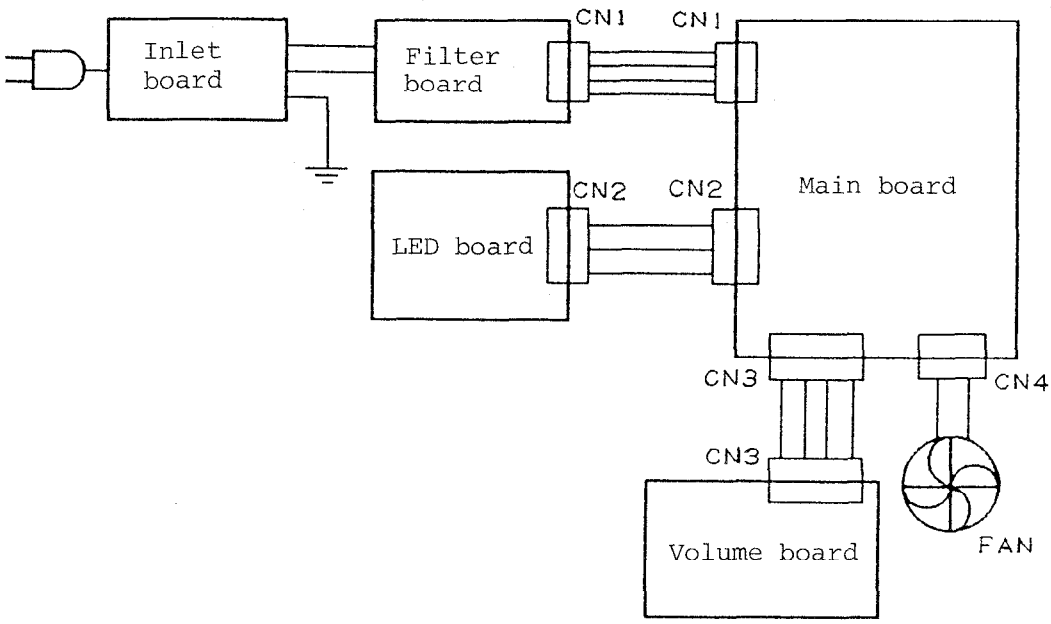
Causes
1. Defective LED 2. Defective main board 3. Defective power supply



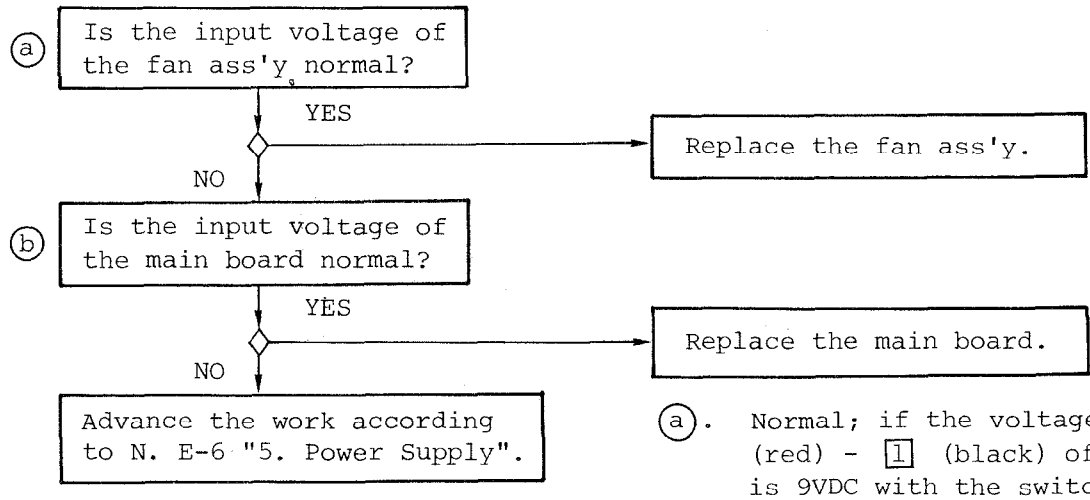
ⓐ. Normal; if the voltage at CN2 [2] (pink) - [J] (blue) of LED board is 11VDC when the switch is ON and goes down to 0V a while after the switch is turned OFF. Abnormal; otherwise.

ⓑ. Normal; if 140VDC is measured at CN1 [5] (orange) - [7] (gray) of the filter board. Abnormal; otherwise.

4. FAN



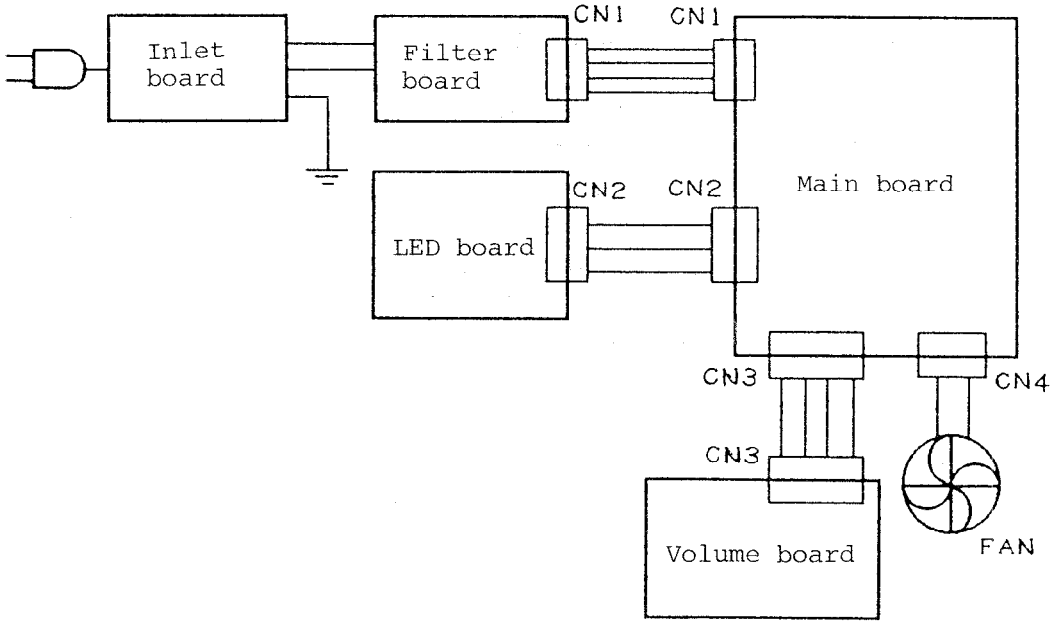
Causes
1. Defective fan ass'y 2. Defective main board 3. Defective power supply



ⓐ. Normal; if the voltage at CN4 [2] (red) - [1] (black) of the main board is 9VDC with the switch ON and 0V with the switch OFF. Abnormal; otherwise. A certain time is required to go back to the steady state.

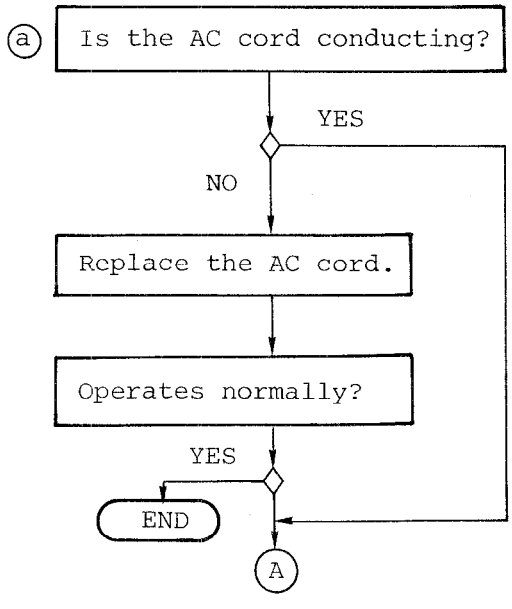
ⓑ. Normal; if 140VDC is measured at CN1 [5] (orange) - [7] (gray) of the filter board. Abnormal; otherwise.

5. POWER SUPPLY

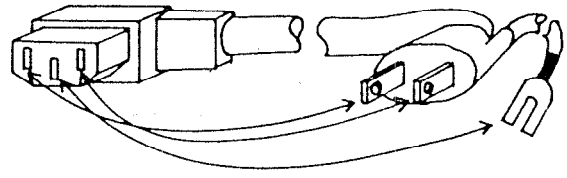


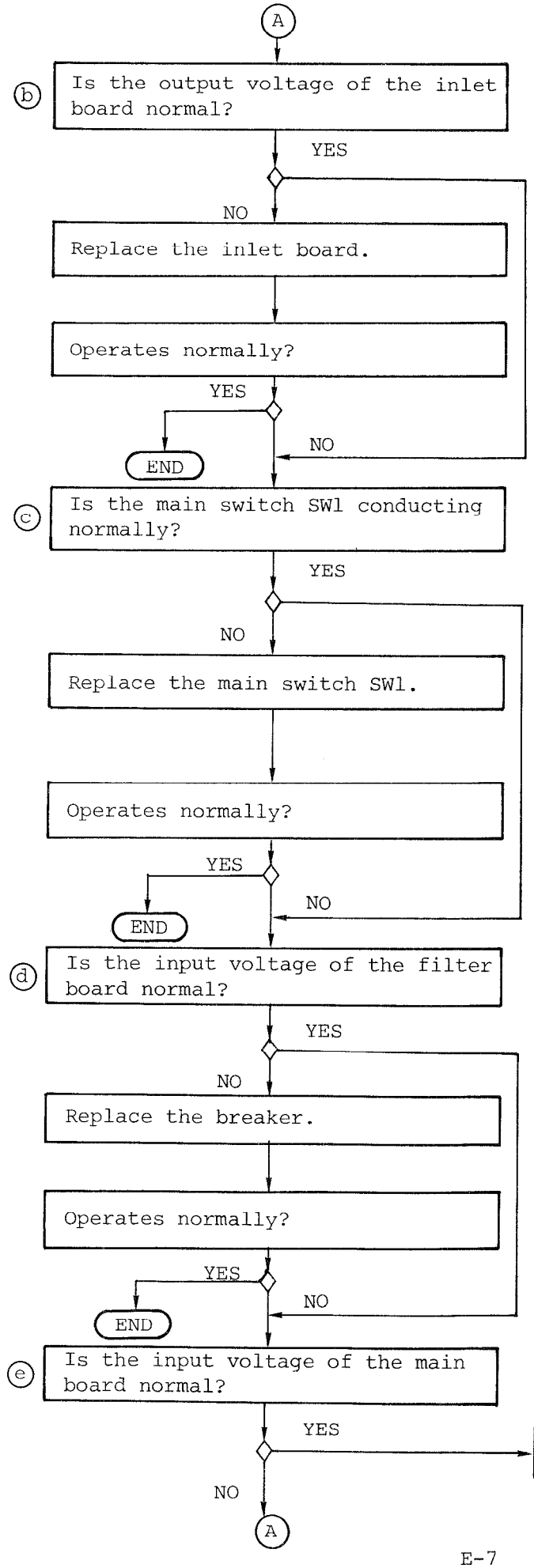
Causes
1. Defective main switch SW1
2. Defective breaker
3. Defective AC cord
4. Defective main board
5. Defective inlet board
6. Defective filter board

* The breaker may function. Press the breaker button to check if it functions normally.



ⓐ. Normal; if the cord conducts between the terminals shown below, and abnormal; otherwise.





(b). Normal; if 100VAC (100V system) or 220VAC (200V system) is measured at (white) - (black) of the inlet board.
Abnormal; otherwise.

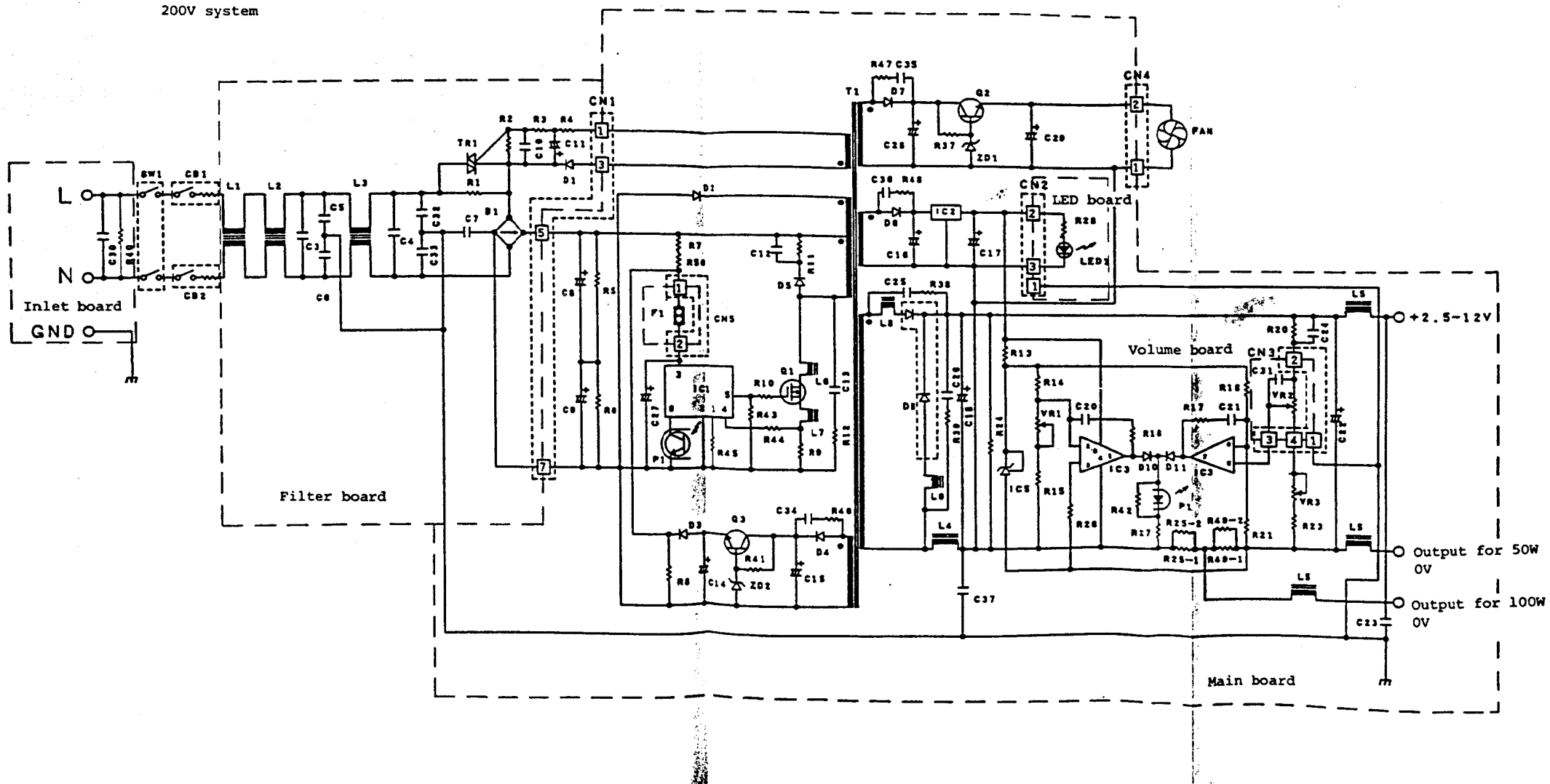
(c). Normal; if the main switch SW1 continuity is as shown in the following table. Abnormal; otherwise.

	SW1	White	Black
White	ON	O	×
	OFF	×	×
Black	ON	×	O
	OFF	×	×

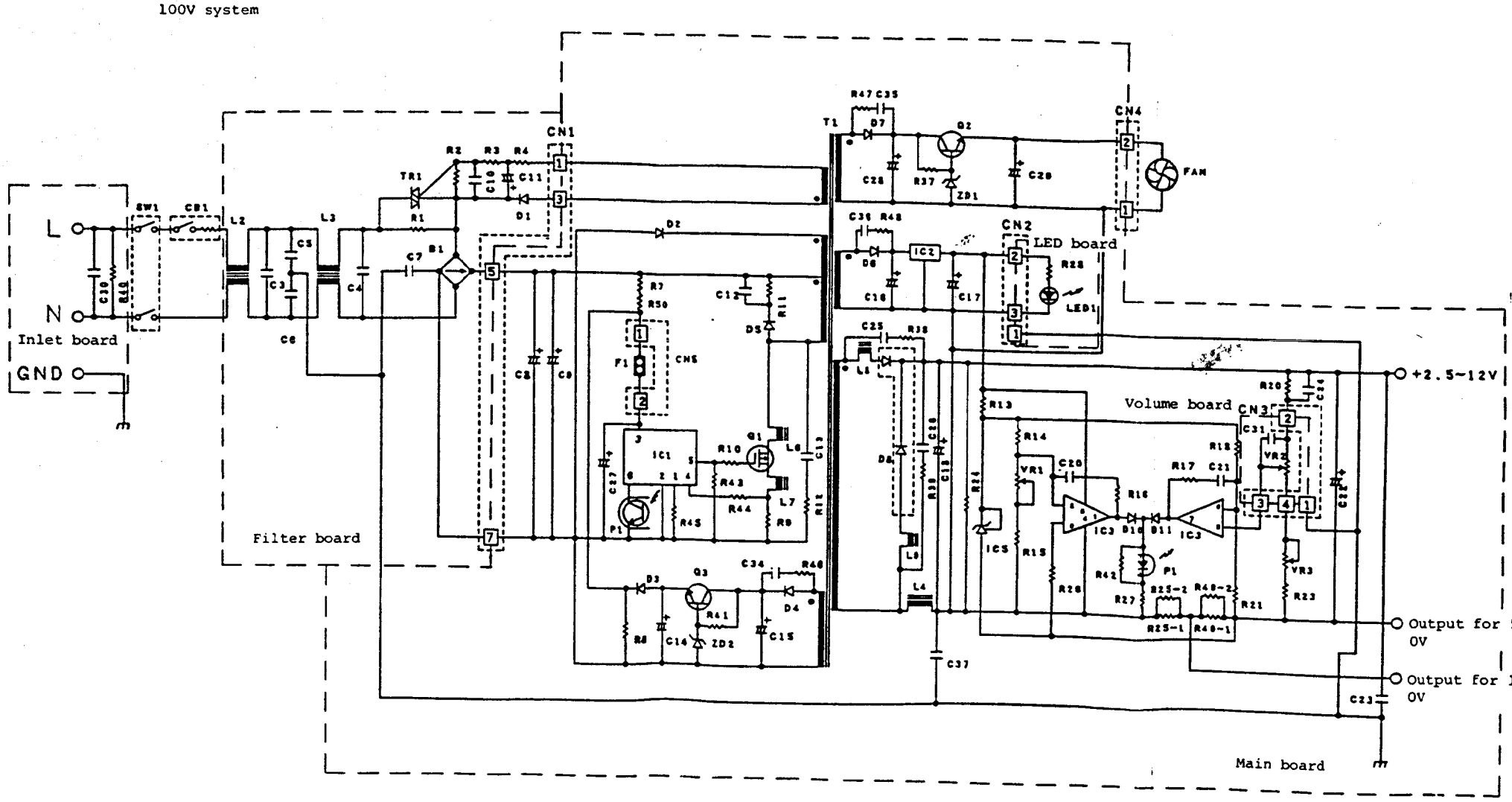
O → Conducting × → Open

(d). Normal; if 100VAC (100V system) or 220VAC (200V system) is applied at (white) - (black) of the filter board. Abnormal; otherwise.

(e). Normal; if 140VDC is measured at CN1 [5] (orange) - [7] (gray) of the filter board. Abnormal; otherwise.


200V system
L
N
GND
Inlet board
Filter board
Main board
LED board
Volume board
FAN
+2.5-12V
Output for 50W
0V
Output for 100W
0V

6. CIRCUIT DIAGRAM



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