

Canon

AS-100M
AS-100C

FIELD SERVICE
MANUAL

CONTENTS

- Chapter 1 Outline
- Chapter 2 Specifications
- Chapter 3 Disassembly/Reassembly and Nomenclature of
Each Section
- Chapter 4 Installation
- Chapter 5 Replacement and Adjustment of Units
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PREFACE

Differences between first and this version and as shown in following table:

Model No. OXXXXX	Model No. 1XXXXX
<p>Three P.C.B.'s in MAIN UNIT</p> <ol style="list-style-type: none"> 1. CPU P.C.B. <ol style="list-style-type: none"> (1) Basic memory of 256KB (2) Optional memory <ol style="list-style-type: none"> 1) Chip expansion (memory) 128KB each 2. I/O CONT P.C.B. 3. CRT CONT-X P.C.B. 	<p>Two P.C.B.'s in MAIN UNIT</p> <ol style="list-style-type: none"> 1. CPU+I/O-CONT P.C.B. <ol style="list-style-type: none"> (1) Original Formen CPU+I/O-CONT (2) Basic memory 128KB (3) Optional memory <ol style="list-style-type: none"> 1) Expansion board (memory) 128KB, 256KB or 384KB 2) RS 232C-2 expansion 3) RTC expansion 2. CRT-CONT2-X <ol style="list-style-type: none"> (1) Gate array (2) Option (B/W display) <ol style="list-style-type: none"> 1) Chip expansion (VRAM) 32KB (3) Additional functions of optional memory is for B/W display <ol style="list-style-type: none"> 1) Partial high brightness 2) Partial blink
<ol style="list-style-type: none"> 1. Memory chip expansion 128KB 2. RS232C on I/O MOTHER 3. CENTRONICS interface 4. COMMUNICATION interface 5. POINTING DEVICE 	<ol style="list-style-type: none"> 1. Memory board expansion 128KB, 256KB or 384KB 2. RS232C on I/O MOTHER RS232C-2 on CPU+I/O-CONT 3. CNT I/F-2 on I/O MOTHER (CENTRONICS) 4. SIO on I/O MOTHER (Communication) 5. VIDEO RAM chip expansion 32KB for B/W display 6. POINTING DEVICE

			7. RTC 8. CURRENT LOOP 9. 5" HARD DISK		
<u>FAN</u>	Below CRT	Rear Cover	<u>FAN</u>	Below CRT	Rear Cover
B/W display	None	None	B/W display	None	1
Color display	1	None	Color display	1	1
UNIT CRT UNIT B/W . Normal brightness			UNIT CRT UNIT B/W . Normal brightness . Partial high brightness . Partial blink		

Chapter 1 Outline

1.1 Configurations

- 1.1.1 System configuration
- 1.1.2 Models
- 1.1.3 Software configuration

1.2 Description of Functions

- 1.2.1 CPU
- 1.2.2 I/O CONT (I/O Controller)
- 1.2.3 DISPLAY CONT (Display Controller)
- 1.2.4 KEYBOARD
- 1.2.5 5" FDD
- 1.2.6 8" FDD
- 1.2.7 PRINTER
- 1.2.8 I/O MOTHER (option)
- 1.2.9 RS232C (option)
- 1.2.10 CENTRONICS (option)
- 1.2.11 COMMUNICATION (option)
- 1.2.12 CURRENT LOOP (option)
- 1.2.13 5" HARD DISK (option)

Chapter 1 Outline

1.1 Configurations

1.1.1 System Configuration

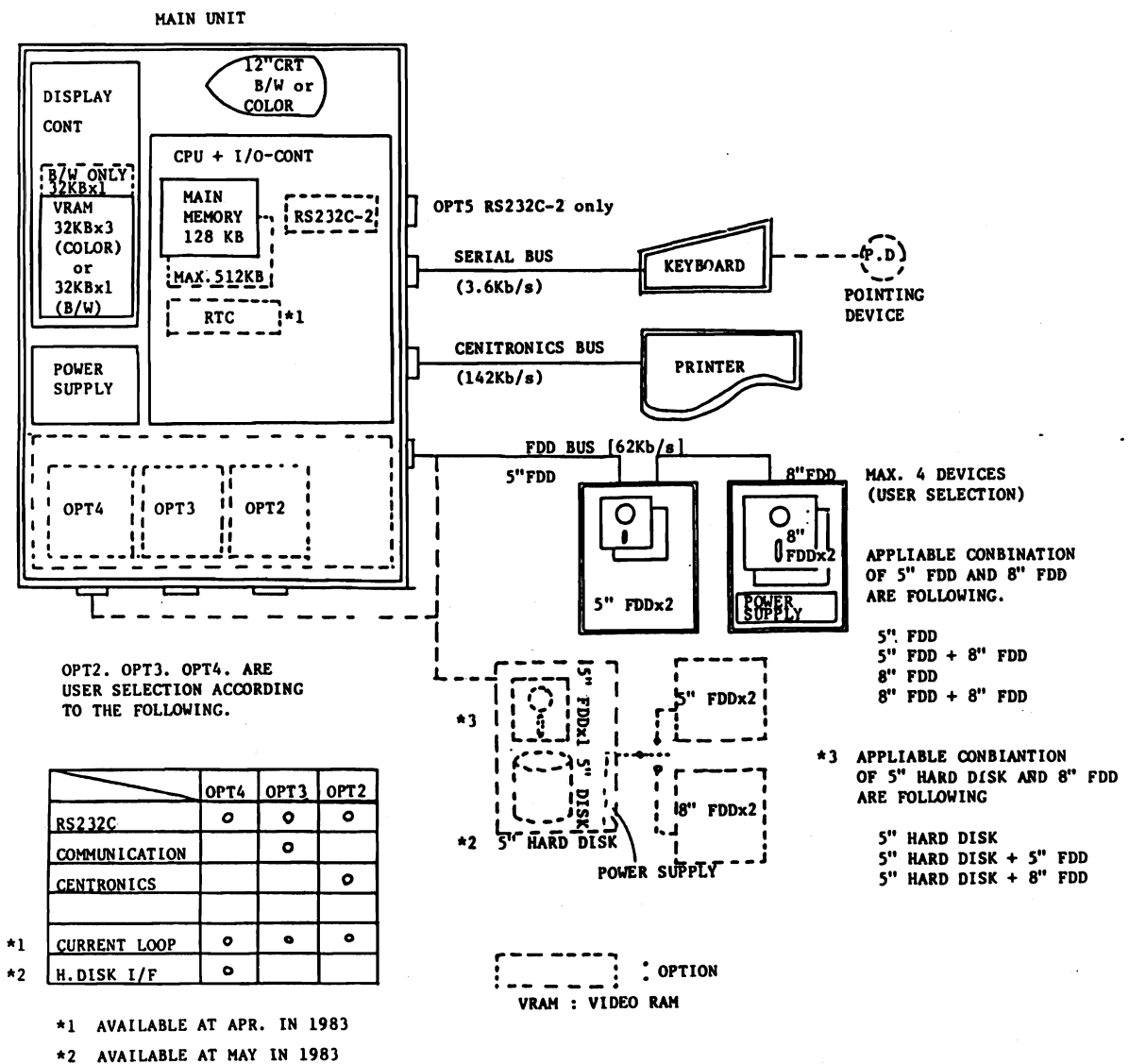


Fig. 1.1.1 System Configurations

1.1.2 Models

Table 1.1.1

Abbrevia- tion	Model	Symbol	Configuration & outline	Remarks
MAIN UNIT	AS-100C	E21-0021	<ul style="list-style-type: none"> . 12" color graphic display . Standard 256KB main memory . The interfaces respectively for printer, keyboard, and floppy disk are incorporated. 	
	AS-100M	E21-0011	<ul style="list-style-type: none"> . 12" B/W graphic display . Standard 256KB main memory . The interfaces respectively for the printer, keyboard, and floppy disk are incorporated. 	
KEYBOARD	AS KEYBOARD ASCII A-1111	E21-0040	. ASCII Key + 10-key	
5" FDD	Minifloppy disk A-1300	E71-0050	<ul style="list-style-type: none"> . 2 sides, double density, double tracks, mini drive x 2 . File capacity: 1.4MB (max) 	
8" FDD	Floppy disk A-1330	E71-0061	<ul style="list-style-type: none"> . 2 sides, double desntiy, standard slim drive x 2 . File capacity: 2.5MB (max) 	
PRINTER	Dot impact printer A-1200	E71-0081	<ul style="list-style-type: none"> . 9-pin wire dot, serial . 80 characters, 120CPS . 480-dot image print 	DP-7RG and X-8220A are applicable
	Color printer A-1210	E63-0011	<ul style="list-style-type: none"> . 4-nozzle inkjet . 80 characters, 40 CPS . 560-dot image print . 7-color print 	

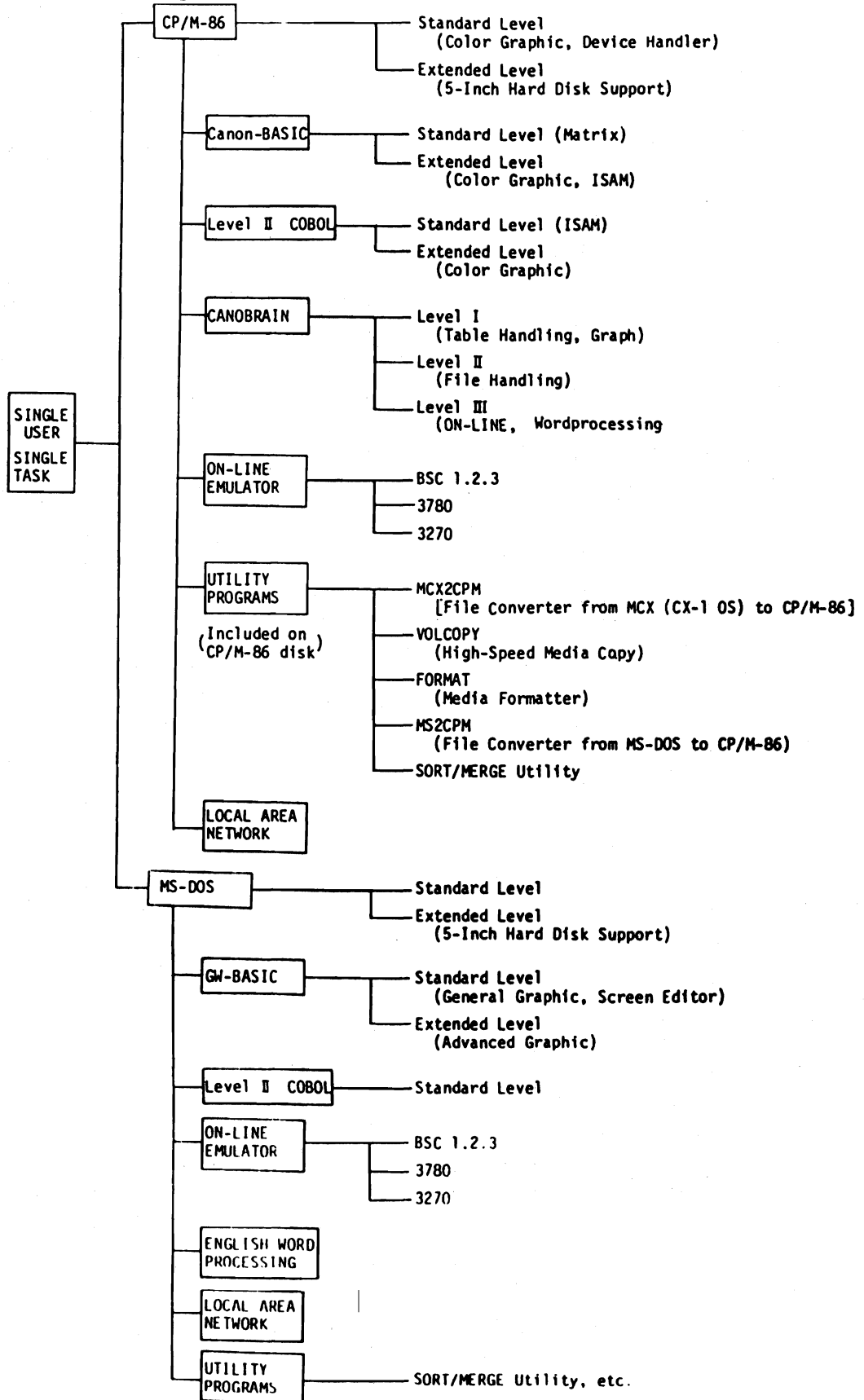
Note: KSR for AP400/500 is applicable

Option	Model	Symbol	Configuration & outline	Remarks
	Optional memory A-1020	E71-0270	• 128KB RAM board	To CPU+I/O- CONT P.C.B.
	Optional memory A-1021	E71-0280	• 256KB RAM board	
	Optional memory A-1022	E71-0290	• 384KB RAM board	
*1 RTC	Real time clock A-1002	E71-0310	• With calendar, watch and battery	
RS 232C-2	Serial data interface A-1500II		• RS-232-C interface	
VRAM	Video memory A-1004	E71-0320	• For B/W display	To CRT-CONT2- B/W
1-3 I/O MOTHER	Expansion board A-1010	E71-0210	• I/O optional MOTHER board	
	RS232C	Serial data interface A-1500	• RS-232C interface	
	CENTRONICS	Parallel data interface A-1502	• CENTRONICS interface	
COMMUNICA- TION	Communication interface A-1503	E71-0180	• Transmission	To A-1011
*2 5" HARD DISK	Hard disk A-1350	E71-0331	• 5" hard disk + mini drive x 1 • File capacity of hard disk 8.4MB • Transfer rate of hard disk max. 500KB	H.DISK I/F: to A-1011
P.D.	Pointing device A-1100	E71-0260	• Smooth cursor shift device	
*1 CURRENT LOOP	Current loop interface A-1505	S13-1010	Interface of data transmission by current mode	

*1 Available from April 1983

*2 Available from May 1983

1.1.3 Software Configuration



1.2.1 CPU

16-bit processor 8088 executes the microprogram which has been loaded previously from floppy disks into the system memory RAM, and the ROM (8KB) to control the entire functions.

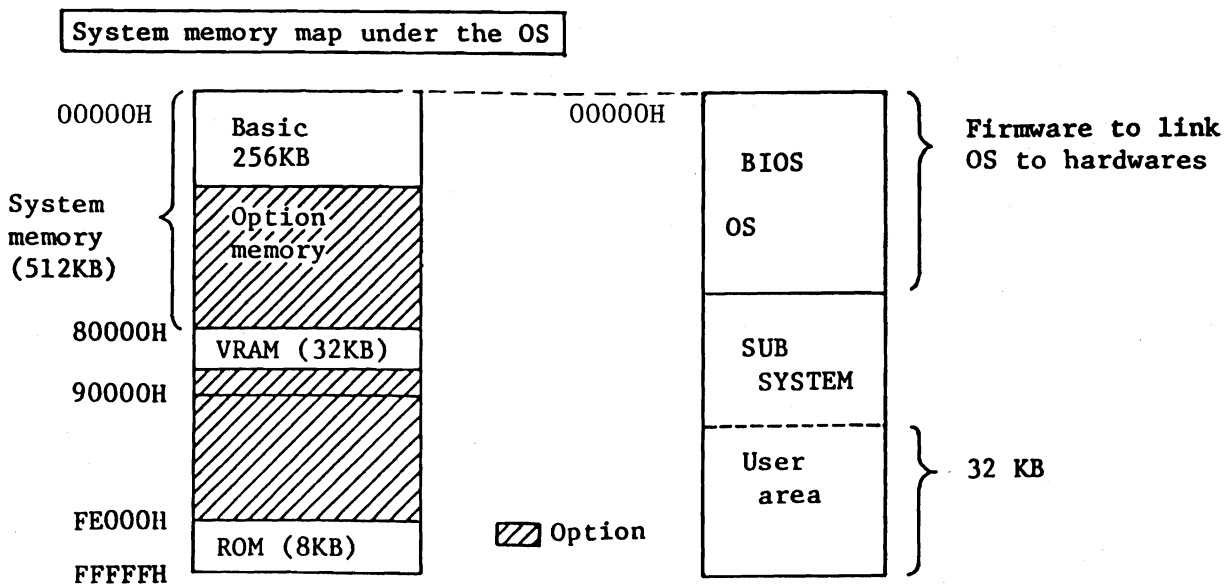
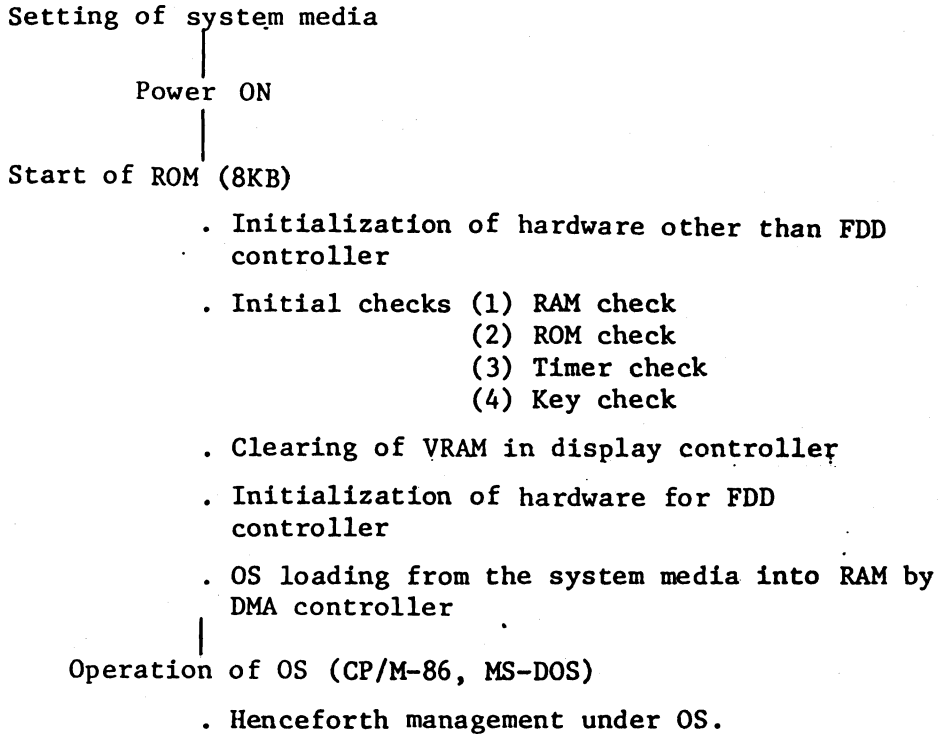


Fig. 1.2.2 System Memory Configuration

SYSTEM BUS

A system bus is used for 16-bit processor 8088 to control the entire system. The system bus consists of a 20-bit address bus with 1 MB address space, 8-bit data bus, and a control bus for read/write control and system bus controlled by a microprogram.

The memory area appropriated for 8088 processor is divided into two as shown in Fig. 1.2.3; One is the system memory area and the other is I/O memory area.

This memory area division is performed automatically within the same address area of 20 bits - 1 MB by a microprogram.

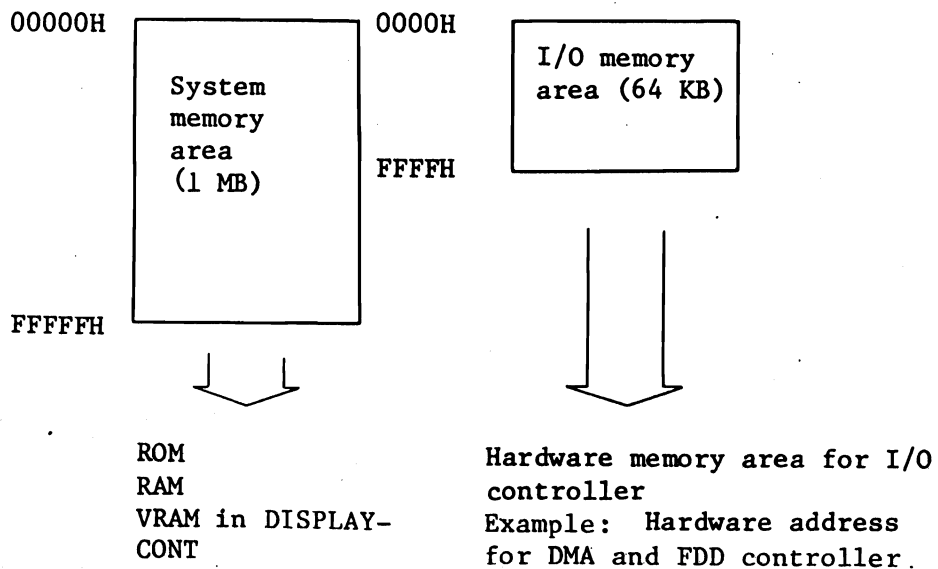
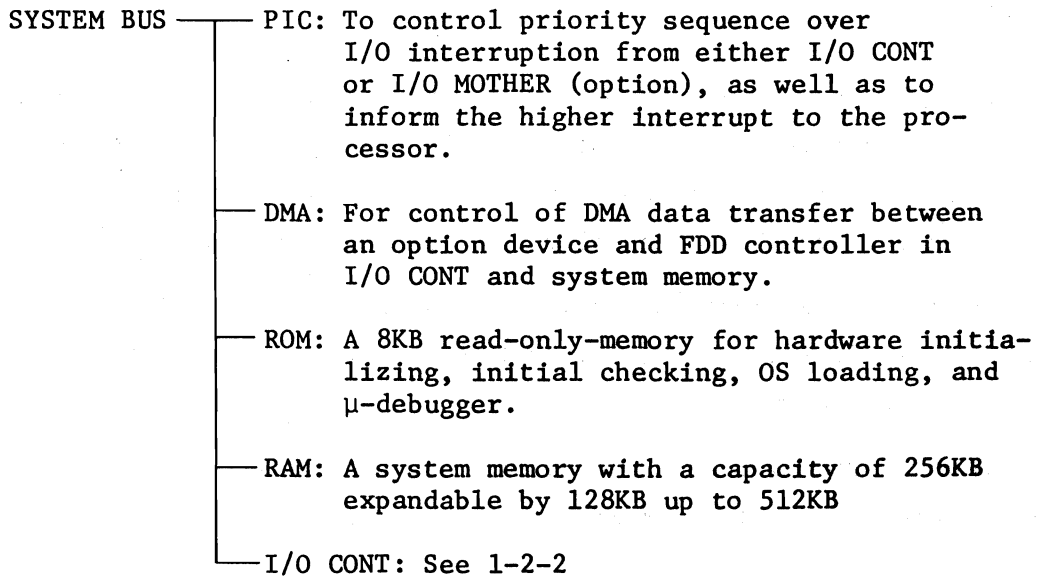


Fig. 1.2.3



Option involved in the CUP

- System memory (RAM) ... Up to 512KB (max.) by expansion of each board 128, 256, 384KB.
- Real Time Clock (RTC) ... Data and time control. It functions by backup of battery when power OFF.

1.2.2 I/O CONT

I/O CONT modifies the system bus into the I/O bus in order to control the circuit of device, option device and display controller which are connected to I/O bus.

Device controllers inside I/O controller is connected to I/O bus, and address is designated to a certain I/O memory area.

Modified is connected with DISPLAY CONT and optional device controller as I/O BUS.

SYSTEM BUS — [FDD CONT]

With FDC μ PD765AC, four floppy disk drive FDD is controlled via DMA data transfer. FDD units connected to this FDD CONT are 5" FDD 5" x 2 and 8" FDD 8" x 2.

Respective interfaces of these FDD units are different from each other, so each of these units has its interface circuit.

[CENTRO CONT]

Controls the centronics interface of 8-bit parallel data bus and allows connection of mainly the printer with a centronics interface.

[TIMER]

Software timer for firmware of CPU.

[BAUD RATE]

Provides three different frequency pulse signals which varied by firmware of CPU.

Output to change tone of speaker output and a data transfer clock pulse to RS 232C of *1.

[KEY INPUT]

Converts Key matrix code which is to be serially transferred from the keyboard, and, then to the parallel code.

Converted parallel code is directly transferred to CPU.

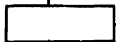
Firmware of CPU converts it to internal code and controls the repeat function.

[SPEAKER AMP]

500 Hz \sim 4 KHz sound generating circuit

[RS232C-2]

RS232C-2 serial interface (option)



Bus driver and bus control

I/O BUS

[Option in I/O CONT]

RS232C-2 ----- Serial data interface output to OPT5 port.

1.2.3 DISPLAY CONT

When video memory data (VRAM) [black/white display: 32KB x 1 (VRAM-B) and color display: 32KB x 3 (VRAM-B.G.R)]

Black/white or color display gives a full graphic presentation of characters or figures. Display control too graphic display controller (GDC) is μ PD 7220D. 32KB x 1 or 32KB x 3 VRAM is accessible on a time sharing basis either the GDC or the CPU via the I/O bus.

Picture structure of both black/white and color display is as shown in Fig. 1.2.4.

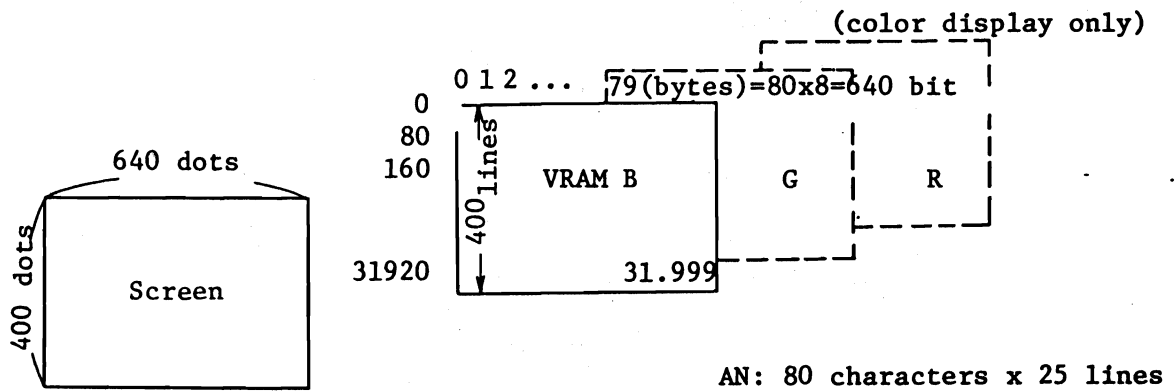


Fig. 1.2.4

For black/white and color displays, a pallet display system is employed and eight different patterns made from 1 or 3 VRAMs enhances display performance. Fig. 1.2.5 shows pallet display system concept.

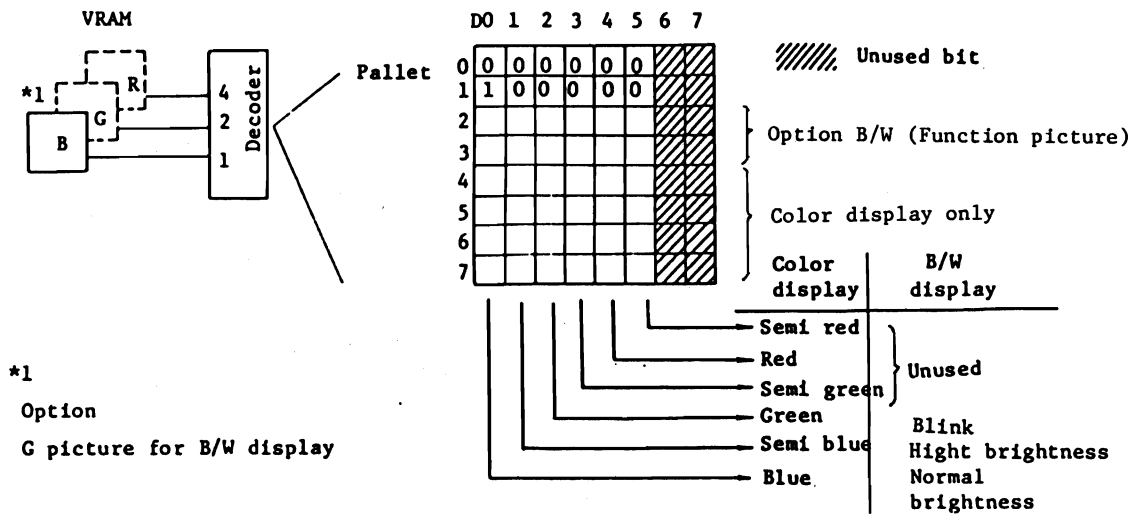


Fig. 1.2.5

Eight different patterns previously set on pallets 0 ~ 7 are selected according to VRAM output which is sent out synchronously with the dot timing of a can sweep signal of separately display.

Black/white display

Referring to Fig. 1.2.5, dot timing is as in Table 1.2.1.

Table 1.2.1

Bit output			Selected pallet	Output to display
R	G	B		
-	-	0	Pallet 0	No display
-	-	.	Pallet 1	Normal display

Option VRAM-G included

-	1	0	Pallet 2	Partial high brightness display
-	1	1	Pallet 2	Partial normal brightness blink

Color display

Like the black/white display, depending on the contents of selected pallets, six different chromatic signals, semi red, red, semi green, green, semi blue and blue are output.

For a half-tone chromatic display, two chromatic signals of a primary color and a semi color are required but no combination is available between a primary and a semi color of same color type.

Therefore, a display with 27 different colors is possible as shown in Fig. 1.2.6.

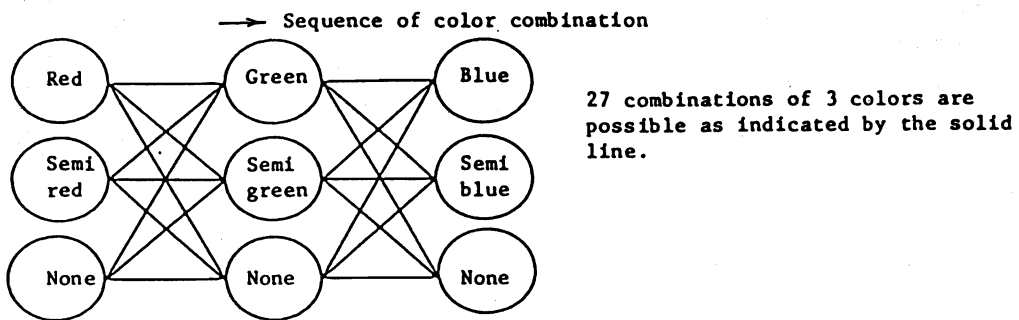


Fig. 1.2.6

Referring to Fig. 1.2.5, eight different patterns are selected in advance on the pallets; therefore, eight colors be selected differently from the 27 colors.

Option in DISPLAY CONT

VRAM Optional chip of 32 KB x 1 for B/W display

1.2.4 KEYBOARD

I/O CONT

KEY BOARD

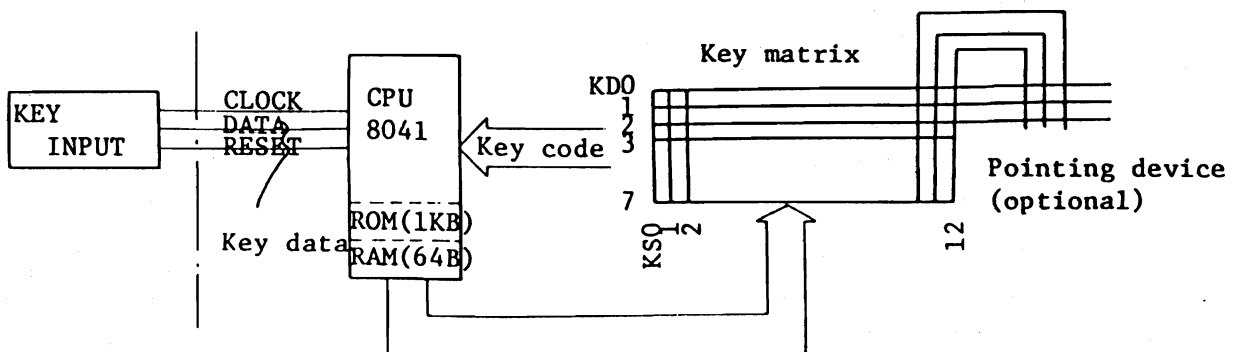
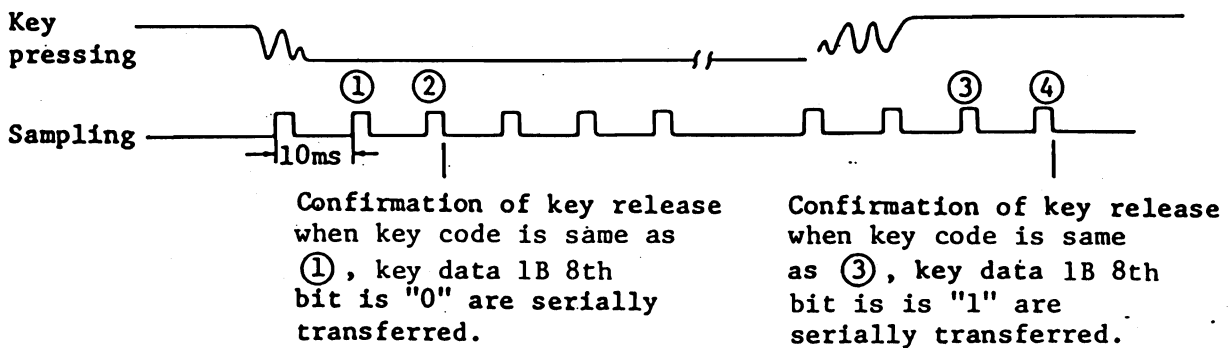


Fig. 1.2.7 Block diagram of the keyboard

8401 processor is used for key code generation control and has a 1KB ROM incorporated to control the timing of key code generation, selected key code designation, and serial output. The key matrix comprises of 13 sampling timings, KS0 ~ KS12 and key code KD0 ~ KD7 of 8 bits, thus, $13 \times 8 = 104$ different keys can be discriminated. Pointing device is connected onto key matrix with eight keys of 104 appropriated for pointing device.

Concept of key code generation



Key data are generated respectively when a key is pressed and released, then, serially transferred to key input circuit. CPU converts key data into internal codes. When key release time exceeds 640ms, CPU automatically generates an internal code continuously as repeat mode.

KEY BOARD option

Pointing deviceCarsol control for graphic.

1.2.5 5" FDD

The 5" FDD has two built-in MDD-220 units and is connected to I/O controller via FDD controller, using a star chain.

FDD controller also drives the 8" FDD (YD-180 x 2) with same bus line; therefore, 5" FDD incorporates an interface circuit consisting of VFO circuit, condition generator circuit, bus driver/receiver circuit for common application of one same bus. Power supply is provided from main unit separately from signal bus.

1.2.6 8" FDD

Except for the following, 8" FDD is the same as 5" FDD (MDD220 x 2).

Drive	YD-180 x 2 (daisy chain)
Interface circuit	VFO circuit
Power source	Built-in

1.2.7 PRINTER

Refer to PRINTER TECHNICAL GUIDE.

1.2.8 I/O MOTHER (option)

The I/O MOTHER is for optional interface and devices to be connected to I/O bus. I/O mother keeps a 96KB system memory area for optional use and a 3-port (OPT2, OPT3, OPT4) for optional interface addressed in I/O memory area.

The following optional device and interface are connected to I/O MOTHER.

- o System memory area (90000H - A7FFFH) ... Option use
- o I/O memory area

I/O memory area is normally allocated to meet the respective port select and status read, for optional interface-use by three ports.

CPU recognizes the optional interface connected to each port through status read, and I/O memory area is allocated for individual interfaces via port select.

Table 1.2.2

Option port	Port select									Status read								
	A8	A7	A6	A5	A4	A3	A2	A1	A0	A8	A7	A6	A5	A4	A3	A3	A1	A0
OPT2	1	0	0	0	Address within port					1	0	1	1					-
OPT3	1	0	0	1					"	1	1	0	0					-
OPT4	1	0	1	0					"	1	1	0	1					-

Note: A0 ~ A8 are address buses.

Optional port	Option interface	
OPT2	RS232C	CENTRONICS CURRENT LOOP
OPT3	RS232C	COMMUNICATION CURRENT LOOP
OPT4	RS232C	H.DISK I/F CURRENT LOOP

1.2.9 RS232C (option)

RS232C serial interface connected to I/O MOTHER.

1.2.10 CENTRONICS (Option)

CENTRONICS interface connected to I/O MOTHER.

1.2.11 COMMUNICATION (Option)

COMMUNICATION interface connected to I/O MOTHER

1.2.12 CURRENT LOOP (Option)

CURRENT LOOP interface connected to I/O MOTHER.

1.2.13 5" HARD DISK (option)

5" HARD DISK consists of a M4863 hard disk, a MDD220 and power supply unit.

M4863 connects to H.DISK interface circuit which provides in MAIN UNIT through the disk controller built-in M4863.

MDD-220 connects to FDD CONT through 5"FDD interface circuit.

Chapter 2 Specifications

2.1 MAIN UNIT

2.2 5" FDD

2.3 8" FDD

2.4 KEYBOARD

2.5 PRINTER

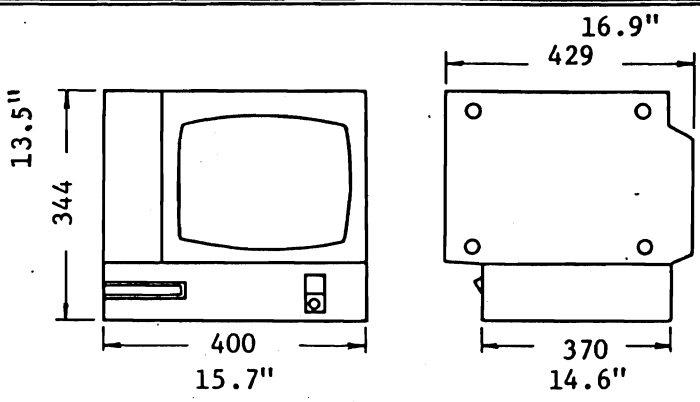
2.6 Option Interface

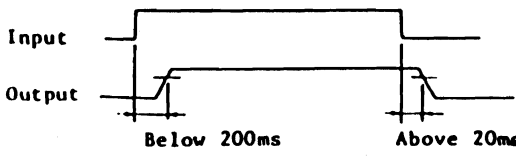
2.7 Option (Others)

2.8 General Specification

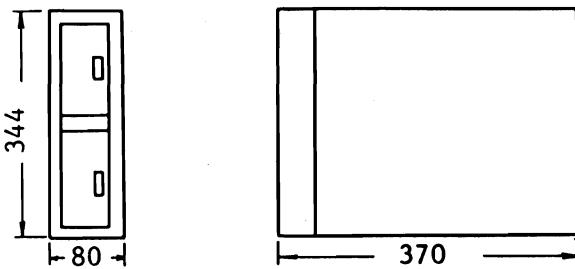
Chapter 2 Specifications

2.1 MAIN UNIT

Items	Description	Remarks														
Size (mm)																
Weight	Black/white: 19.5 kg (43 lbs) Color: 23 kg (50.7 lbs)															
Power consumption	Black/white: 125W Color: 150W															
CPU	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Processor</td> <td>16-bit processor 8088</td> </tr> <tr> <td>Control system</td> <td>Microprogram</td> </tr> <tr> <td>Clock</td> <td>4 MHz</td> </tr> <tr> <td>Interruption</td> <td>8 types</td> </tr> <tr> <td>ROM capacity</td> <td>8K bytes</td> </tr> <tr> <td>I/O bus</td> <td>(1) Serial bus 36. KB/S (2) Centronics bus 142 KB/S (3) FDD bus 62 KB/S</td> </tr> <tr> <td>Speaker output</td> <td>500 Hz to 4 KHz, programmable</td> </tr> </table>	Processor	16-bit processor 8088	Control system	Microprogram	Clock	4 MHz	Interruption	8 types	ROM capacity	8K bytes	I/O bus	(1) Serial bus 36. KB/S (2) Centronics bus 142 KB/S (3) FDD bus 62 KB/S	Speaker output	500 Hz to 4 KHz, programmable	Option B/W VRAM 32KB x 1 can be added. Additional functions are artrial high brightness and partial blink. Screen inversion
Processor	16-bit processor 8088															
Control system	Microprogram															
Clock	4 MHz															
Interruption	8 types															
ROM capacity	8K bytes															
I/O bus	(1) Serial bus 36. KB/S (2) Centronics bus 142 KB/S (3) FDD bus 62 KB/S															
Speaker output	500 Hz to 4 KHz, programmable															
CRT	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="4" style="writing-mode: vertical-rl; transform: rotate(180deg); text-align: center;">CRT Common</td> <td style="width: 20%;">Size</td> <td>12"</td> </tr> <tr> <td>No. of dots</td> <td>640 horizontal dots x 400 vertical dots</td> </tr> <tr> <td>Character</td> <td>AN: 80 characters x 25 lines</td> </tr> <tr> <td>Other functions</td> <td>Ruled line drawing in inter-line space, full graphic smooth scrolling</td> </tr> </table>	CRT Common	Size	12"	No. of dots	640 horizontal dots x 400 vertical dots	Character	AN: 80 characters x 25 lines	Other functions	Ruled line drawing in inter-line space, full graphic smooth scrolling						
CRT Common	Size		12"													
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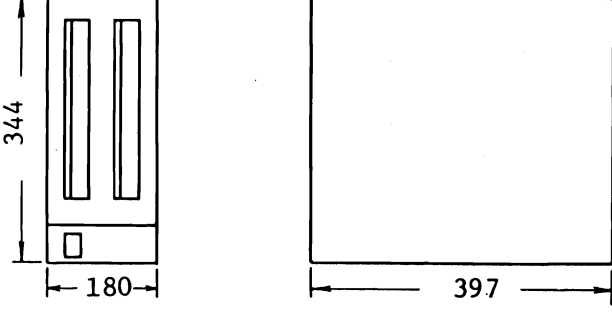
Items	Description			Remarks
CRT	Black/white	Color	Green	
		VRAM	32 KB x 1	
		Other function	Partial reverse	
	Color	Color	8 colors selectable from 27 colors.	
		Output system	Pallet display system	
		VRAM	32KB x 3/screen	
MAIN MEMORY	Capacity		256 KB max. 512 KB	Option memory for every expansion of 128 KB
	Cycle time		330 ns	
	Element		MOS LSI - 64 KB dynamic RAM	
	User memory		32 KB	
Options	VRM set 128/256/384KB MEMORY BOARD RS 232C-1/RS 232C-2 interface CENTRONICS/COMMUNICATION interface RTC set CURRENT LOOP interface HARD DISK interface			Refer to 2.6. Refer to 2.6. Refer to 2.7. Refer to 2.6.
Power Source	Input	Voltage	AC115V +10% AC120V +10% AC230V +10% AC240V +10%	OC: Over Current Protection For main unit For options For 5" FDD
		Frequency	48 ~ 440 Hz	
		Phase	Single phase, 2-wire	
	Output	+5V	Max 8A OC provided	
		+12V	Max 2.5A "	
		-12V	Max 0.1A	
		Connector	CN3: +5V, +12V, GND	
		CN4: +5V, +12V, GND	For options	
		CN5: +5V, +12V, GND	For 5" FDD	
	Efficiency	60%		
				

2.2 5" FDD

Items	Description		Remark
Size (mm)			
Type	2-side, double-density, double-track, mini floppy disk drive x 2		MDD-220
Weight	6.3 kg		
Power consumption	Included in CPU power consumption		
Media Items	9 sectors/80 tracks		
Capacity	Total	737 KB	1-drive specifications henceforth
	Track	4.6 KB	
	Sector	512 KB	
No. of tracks	80		
No. of sectors	9 sectors		
Recording density	5922 BPI		
Data transfer speed	250 Kb/S		
Recoding system	MFM		
Access Time	Seek time	4 ms	
	Settling time	15 ms	
	Latency time	100 ms	
Error rate	10 ⁻¹² /b 10 ⁻⁶ /seek		
Power source	+12V: 1.3A max +5V: 2A max		Power supply from CPU

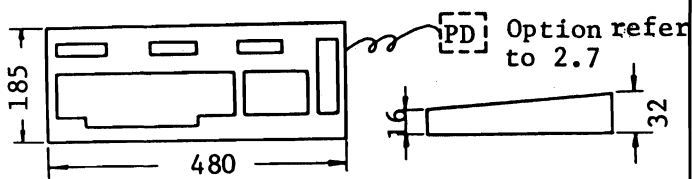
Media: Canon-specified MDD. 512DD (512B/sector)

2.3 8" FDD

Item	Description		Remarks
Size (mm)			
Type	2-side, double-density, slim type floppy disk drive x 2		YD-180
Weight	15 kg		
Power consumption	50W		
Capacity	Total	1.25MB	1-drive specifications henceforth In case of media given in format of 1024B/sector
	Track	8KB	
	Sector	1024B	
No. of tracks	77		
No. of sectors	8		
Recording density	6816 BPI		
Data transfer speed	500 Kb/s		
Recording system	MFM		
Access Time	Seek time	3ms	
	Settling time	15ms	
	Latency time	83ms	
Error rate	10 ⁻¹² /B	10 ⁻⁶ /SEEK	
Power source	+24V: 3.0A	+5V: 3.6A	Built-in

Media: Canon specified MDD-256D (256B/sector)

2.4 KEYBOARD

Items	Description	Remarks
Size (mm)		4.5° ~ 8.5° angle adjustable
Weight	2.2 kg	
Power consumption	Included in the CPU power consumption	
Type of keys	See Fig. 2.4.1	
Data transfer speed	3.6 Kb/S	

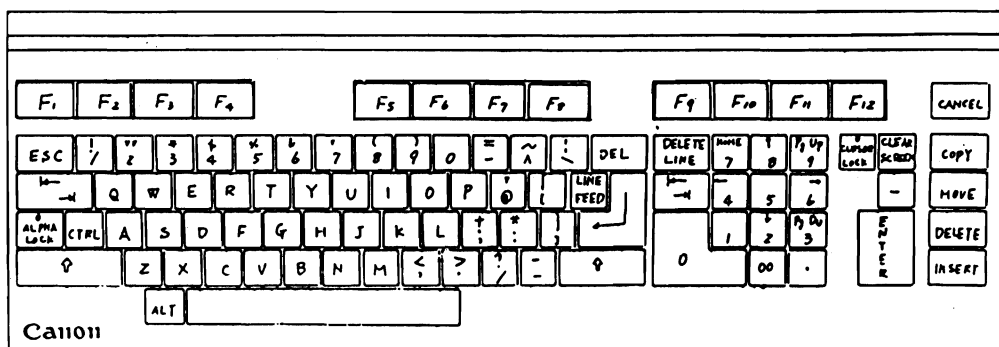


Fig. 2.4.1 Keyboard

2.5 PRINTER

Refer to "PRINTER TECHNICAL GUIDE".

2.6 Option Interfaces

RS232C

Items	Description	Remarks
Inter-connection circuit	AA, AB, BA, BB, CA, CB, CC, CF, DD (Conform to EIA RS-232-C and CCITT V-24)	
Signal level	±12V	
Data format	5, 6, 7 or 8 bits + 1 or 2 stop bit + odd/even parity or none.	
Data transfer speed	110 ~ 9600 BPS (1) Asynchronous data transfer (2) 2-wire or 4-wire public/leased line (3) Inter-connection (max. 15 m) with terminal equipment	

CENTRONICS

Item	Description
Interface	Conforms to interface produced by CENTRONICS Co., standard
Data format	Parallel data Bit configuration ... 7 or 8 bits

COMMUNICATION

Communication Control unit	Synchronization mode	SYN system/start-stop system
	Baud rate	300, 600, 1200, 2400, 4800 9600 MODEM synchronization
	Error control	CRC check horizontal/vertical parity
	Communication system	Half-duplex/full duplex
	Applicable lines	Public leased communication line
	Line configuration	2-wire/4-wire system
	Line interface	MODEM interface(JIS C6361)

CURRENT LOOP

Available soon

2.7 Other Options

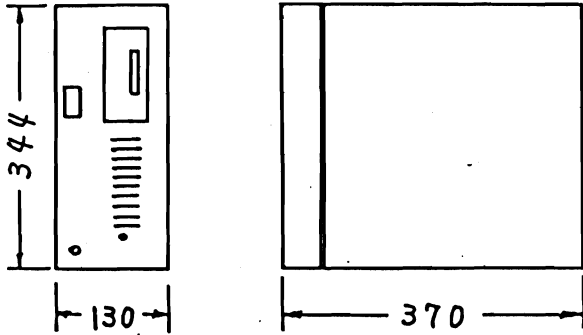
POINTING DEVICE

Item	Description	Remark
Size (mm)		
Weight	0.2 kg	
Power consumption	Included in CPU	
Transfer rate	Conforms to keyboard	

R T C

Item	Description	Remark
LSI used	HD 146818 (Real time clock + RAM)	
Accuracy	50 sec/month	
Power supply	1. DC 5V \pm 10% (At operating) 2. Min 3.0VDC (Back up)	
BATTERY	More than 36 hours operation after the battery is fully recharged. (Recharging time; 40 hours)	

5" HARD DISK

Item	Description	Remark
Size(mm)		
Weight	14 kg	
Power Consumption	65 W	
Hereinafter describes the HARD DISK DRIVE		
Total Memory	8.68 MB	Refer to mini floppy disk specification page 2-2.
Track	9.216 KB/track	
Sector	1240 B/sector	
No. Sector in Track	9 sector/track	
Cylinder	157 (user area)	
No. of Track	960	
Recording Density	7900 bPi	
Recording Method	MFM	
Data Transmission Speed	625 KB/sec. (MAX)	
Average Access Time	75 m sec.	
Disk Revolution	3600 v.p.m.	
Start up	15 sec.	
Error rate	$10^{-12}/b$ $10^{-12}/SEEK$	
Power	+12 V 2 A(MAX.4.0 A) +5 V 1.6 A	

2.8 General Specification

Item	Description			Remark
	Operating	Storage	Variation gradient	
Temperature	+10°C - 35°C (50°F - 95°F)	-10°C - +50°C (14°F - 122°F)	15°C/h	
Humidity	30% - 80%	10% - 80%	30%/day	No mist
Vibration	Below 0.25G	Below 1G		
Shock	Below 5G			
Power Supply	AC115V, AC120V, AC230V, AC240V ±10% 50/60 Hz			
Noise Resistance	(1) Pulse peak		0.6KV	
	(2) Pulse width		800ns	
	(3) Repetitive frequency		50 Hz	
Insulation	(1) Leak current		Below 0.4mA	
	(2) Insulation resistance	Below 10MΩ under DC500V		
	(3) Withstanding voltage	1 minute under AC100V		
Other				

Chapter 3 Disassembly/Reassembly and Nomenclature of Each Section

3.1 MAIN UNIT

3.1.1 External view

3.1.2 Internal view

3.2 KEYBOARD

3.2.1 External view

3.2.2 Internal view

3.3 5" FDD

3.3.1 External view

3.3.2 Internal view

3.4 8" FDD

3.4.1 External view

3.4.2 Internal view

3.5 PRINTER

3.1 MAIN UNIT is same as black/white and color

3.1.1 External View

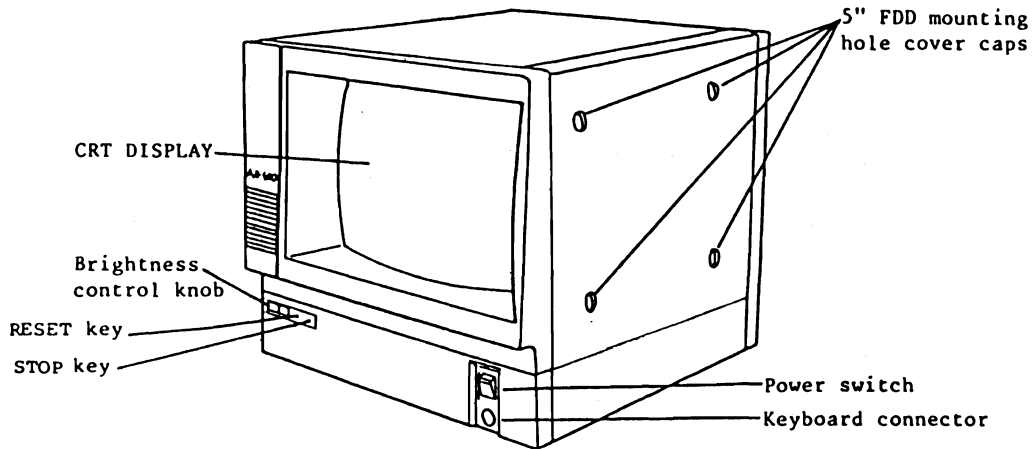


Fig. 3.1.1 Front View

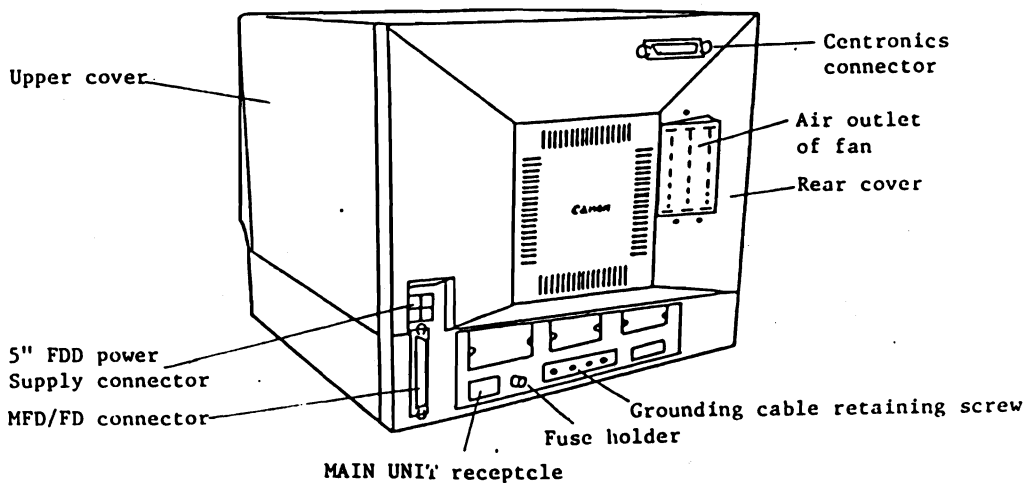


Fig. 3.1.2 Rear View

(1) Removal procedure of housing frame cover

① Remove three retaining screws from rear cover.

*1 A-plate to cover option interface connector

*2 B-plate to cover option interface connector

*3 3C-Plate to cover optional interface connector

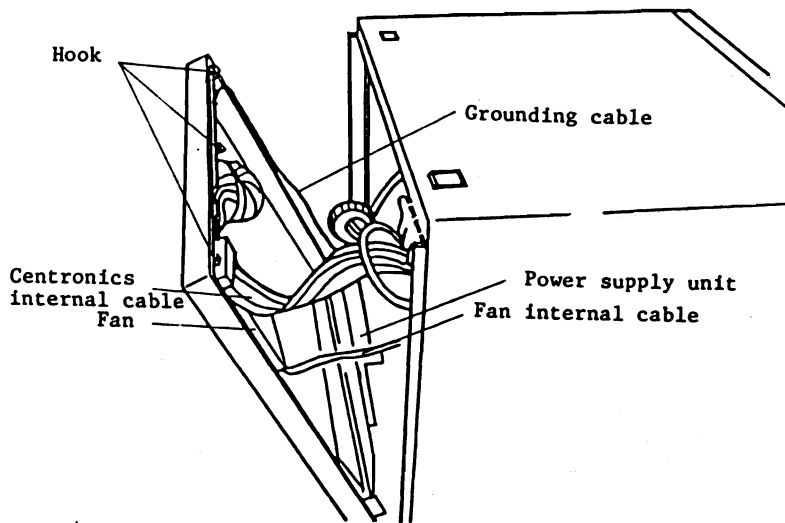


Fig. 3.1.3

- ② Remove hook from upper cover first, then, disconnect CENTRONICS internal cable from CPU+I/O-CONT P.C.B, and fan internal cable from rear cover.
- ③ Remove three grounding cables (Fig. 3.1.3) which are clamped to power supply unit, then, remove rear cover.

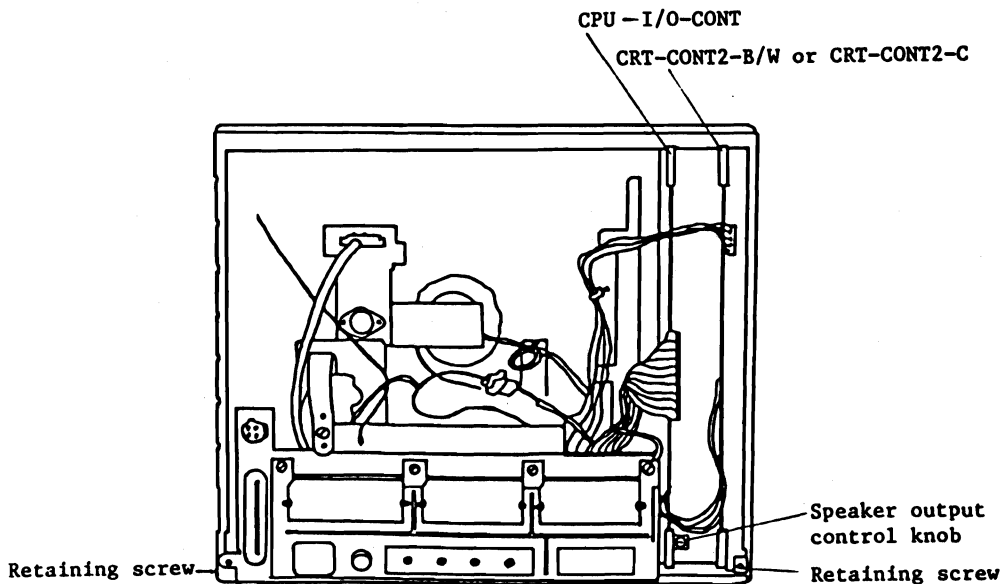


Fig. 3.1.4

- ④ Remove two retaining screws from the upper cover, and slightly pull the upper cover toward yourself, lifting it and removing it.

3.1.2 Internal View

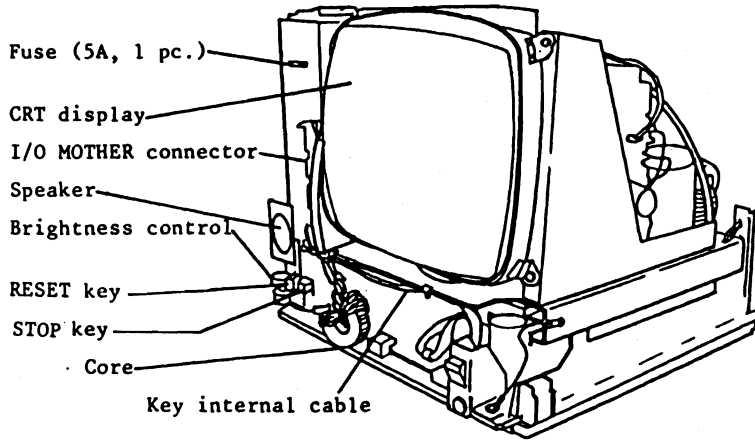


Fig. 3.1.5

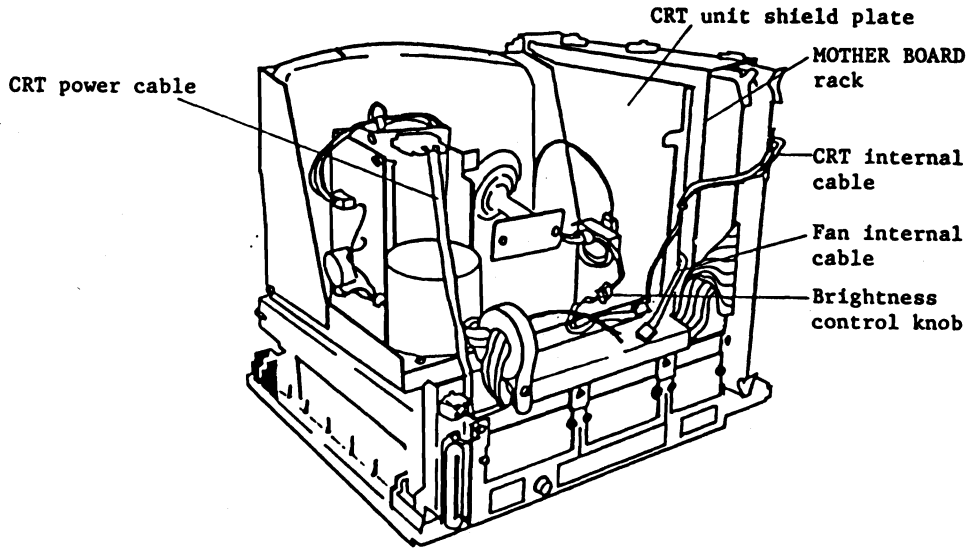


Fig. 3.1.6

3.2 KEYBOARD

3.2.1 External View

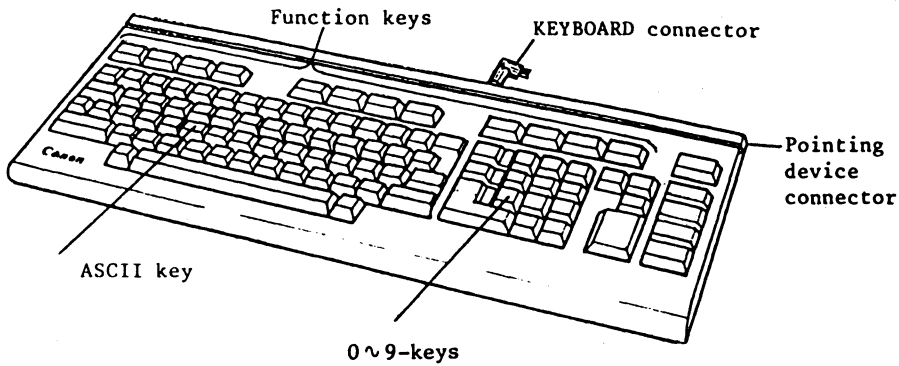


Fig. 3.1.7

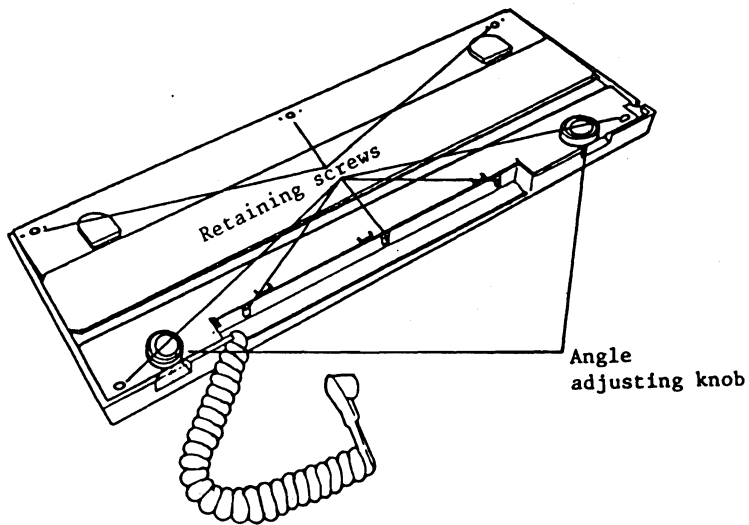


Fig. 3.1.8

(1) Removal procedure of bottom cover

- ① Bottom cover is removed first, five retaining screws from bottom cover, and loosening three retaining screws of rear cover.

3.2.2 Internal View

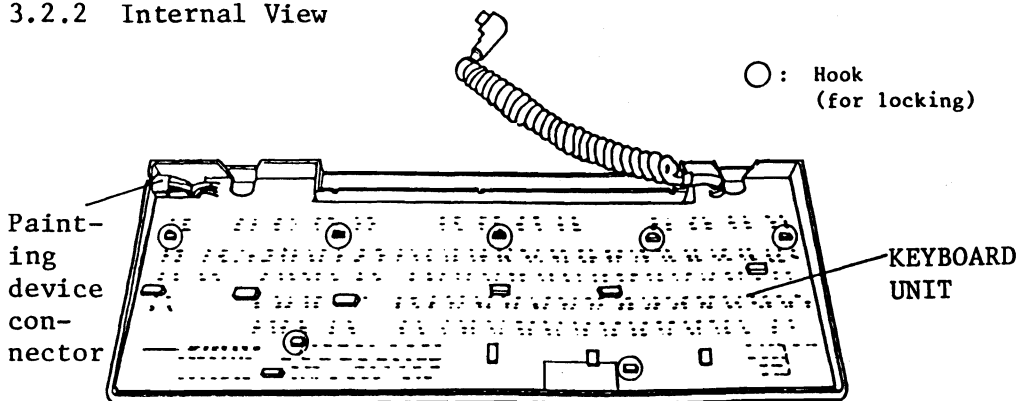


Fig. 3.1.9

3.3 5" FDD

3.3.1 External View

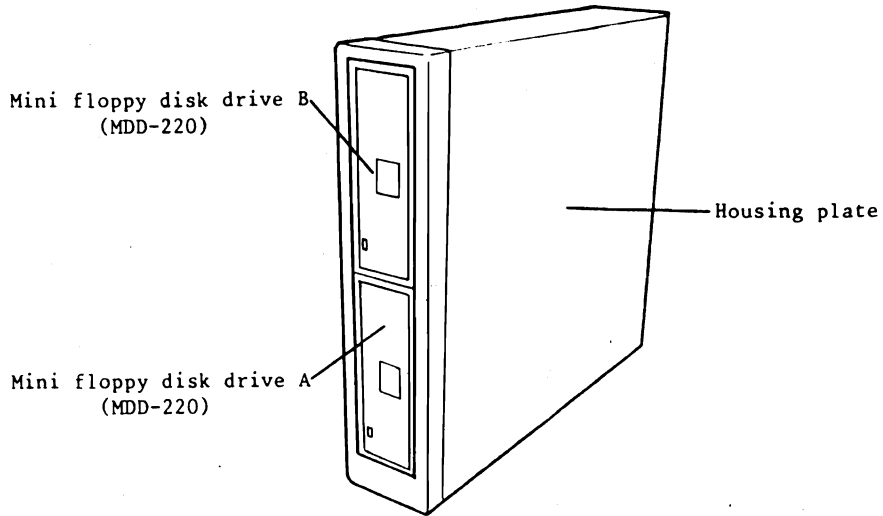


Fig. 3.3.1

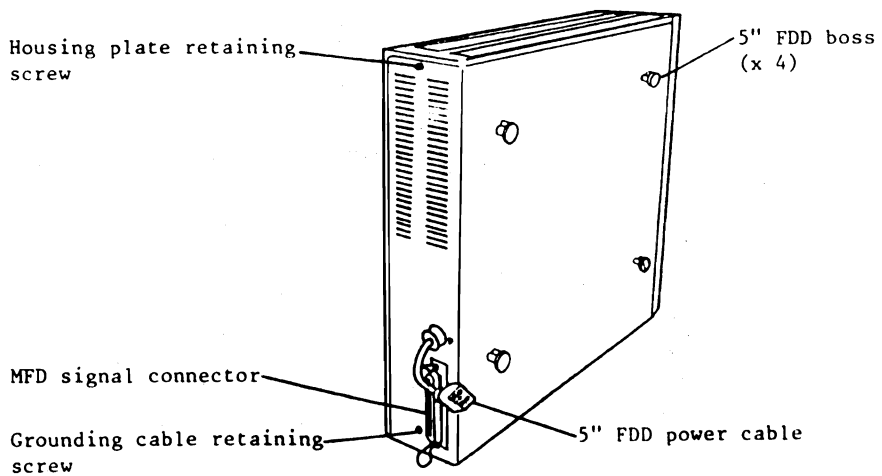


Fig. 3.3.2

(1) Removal procedure of housing plate

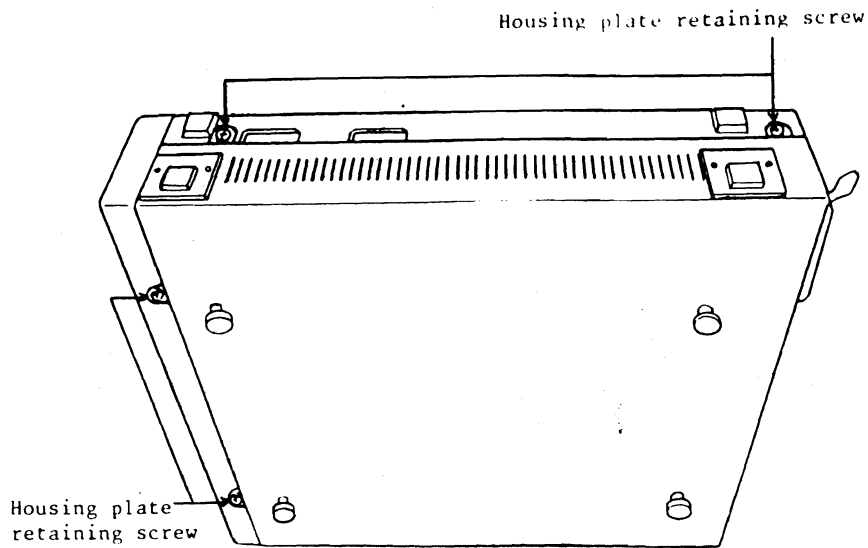


Fig. 3.3.3

- ① Insert shipping sheet 5" into MDD-220.
- ② Loosen two retaining screws (Fig. 3.3.3) at the left of front housing plate.
- ③ Remove one retaining screw from rear cover, and two retaining screws (Fig. 3.3.3) from bottom plate.

3.3.2 Internal View

Fig. 3.3.4 shows the inside of 5" FDD with housing removed.

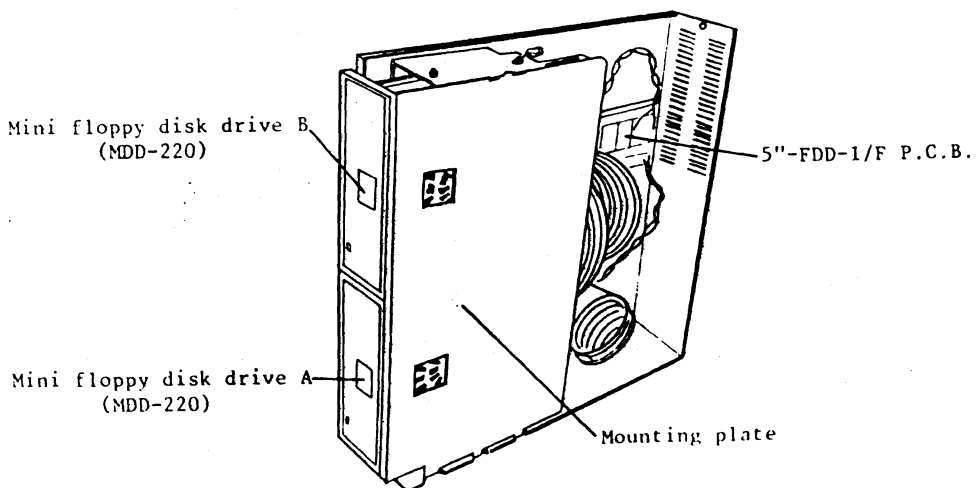


Fig. 3.3.4

3.4 8" FDD

3.4.1 External View

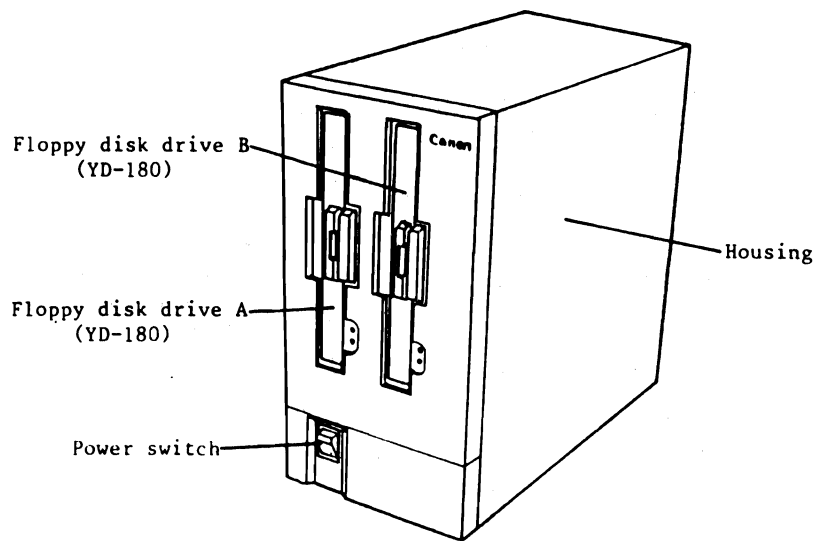


Fig. 3.4.1

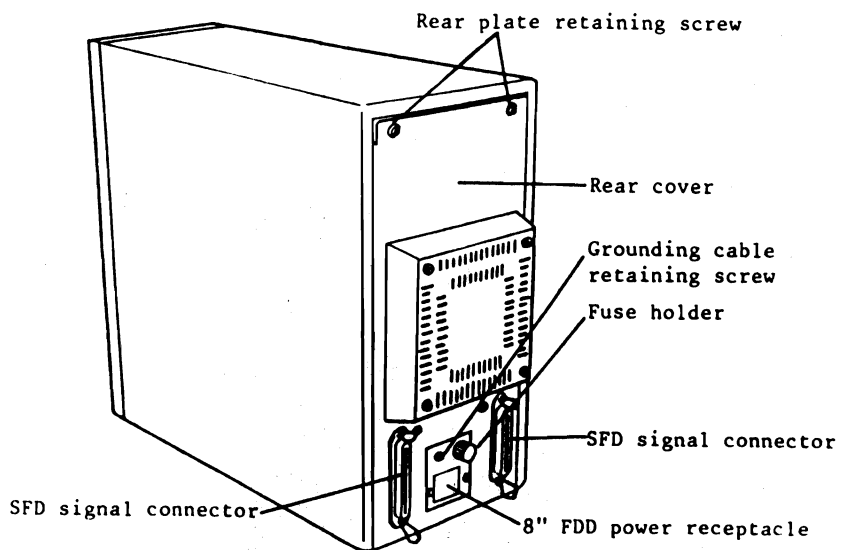


Fig. 3.4.2

- (1) Removal procedure of housing plate
- ① Insert the shipping sheet 8" into YD-180.
- ② Remove two retaining screws (Fig. 3.4.2) from rear cover.
- ③ Remove four retaining screws (Fig. 3.4.3) from bottom cover.
- ④ Pull housing toward yourself while slightly lifting it.

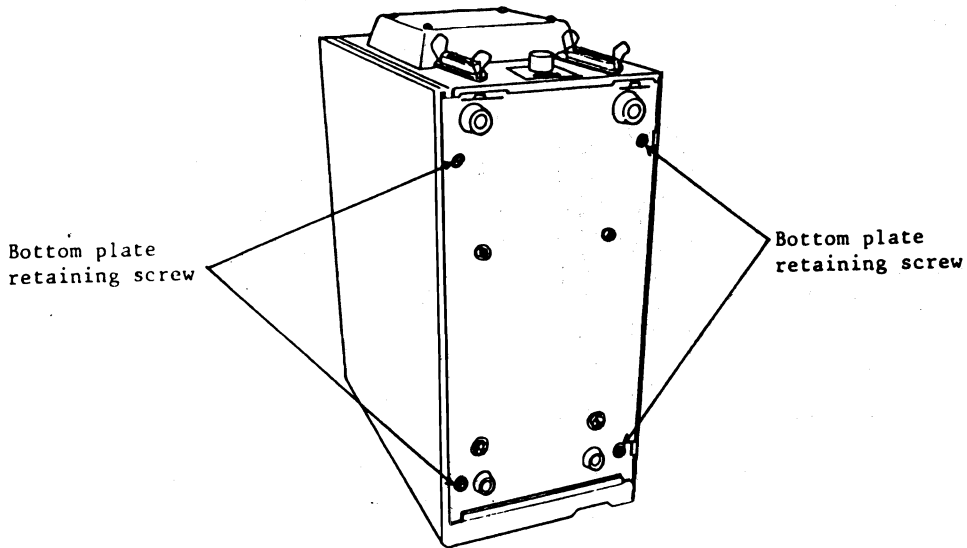


Fig. 3.4.3

3.4.2 Internal View

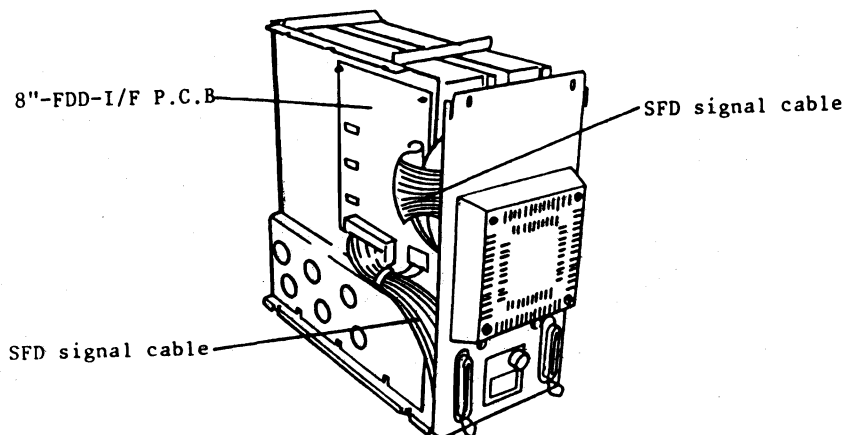


Fig. 3.4.4

3.5 PRINTER

Refer to "PRINTER TECHNICAL GUIDE".

Chapter 4 Installation

4.1 Installation

4.2 Installation Procedure

4.2.1 Unpacking

4.2.2 Switch setting and confirmation

4.2.3 Cable connections

4.2.4 Turning-ON power supply, brightness adjustment, and speaker output adjustment

4.2.5 Execution of test program and confirmation

4.3 Installation of Options

4.3.1 I/O MOTHER-E P.C.B

4.3.2 Optiona interface

4.3.3 Video Memory

4.3.4 Option Memory Board

4.3.5 Pointing Device

Chapter 4 Installation

4.1 Installation

For details regarding installation, refer to paragraph 2.8 "General Specifications".

Table 4.1.1

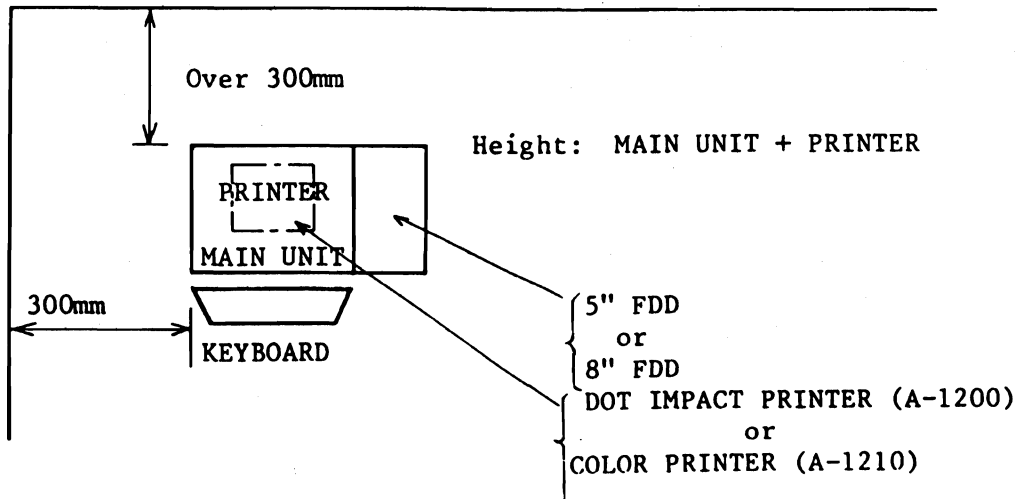
MAIN UNIT		Wattages	8" FDD	Wattages	PRINTER	Wattages
115V 120V 230V 240V	B/W	125W	115V 120V 230V 240V	50W	A-1200	MAX. 85W
	COLOR	150W			A-1210	MAX. 25W
Both the keyboard and the 5" FDD are included in the MAIN UNIT.						
					X-8220A	MAX. 90W
					AP400/ 500 KSR	MAX. 85W

Table 4.1.2 For 115V,120V,230V,240V

Model		Wattages	Model		Wattages	Model		Wattages	Model		Wattages
M.UNIT	B/W	125W	M.UNIT	B/W	175W	M.UNIT	B/W	175W	M.UNIT	B/W	225W
+			+			+			+		
5" FDD	COLOR	150W	8" FDD	COLOR	200W	5"+8" FDD	COLOR	200W	8"+8" FDD	COLOR	250W

Note At least three power receptacles are required.

Never connect the system directly to an AC line receptacle or to a noise-generating machine such as induction motor, electrostatic copy machine etc. The equipment should not be exposed to direct sunlight.



4.2 Installation Procedure

- (1) Unpacking includes confirmation of component parts) →
- (2) Switch setting and confirmation → (3) Cable connections →
- (4) Turning-on power supply, brightness adjustment, and speaker output adjustment → (5) Execution of test program

Refer to paragraph 4.3 for the method of installing options.

4.2.1 Unpacking (including confirmation of the component parts)

- (1) Unpacking

- ① MAIN UNIT (BLACK/WHITE, COLOR)

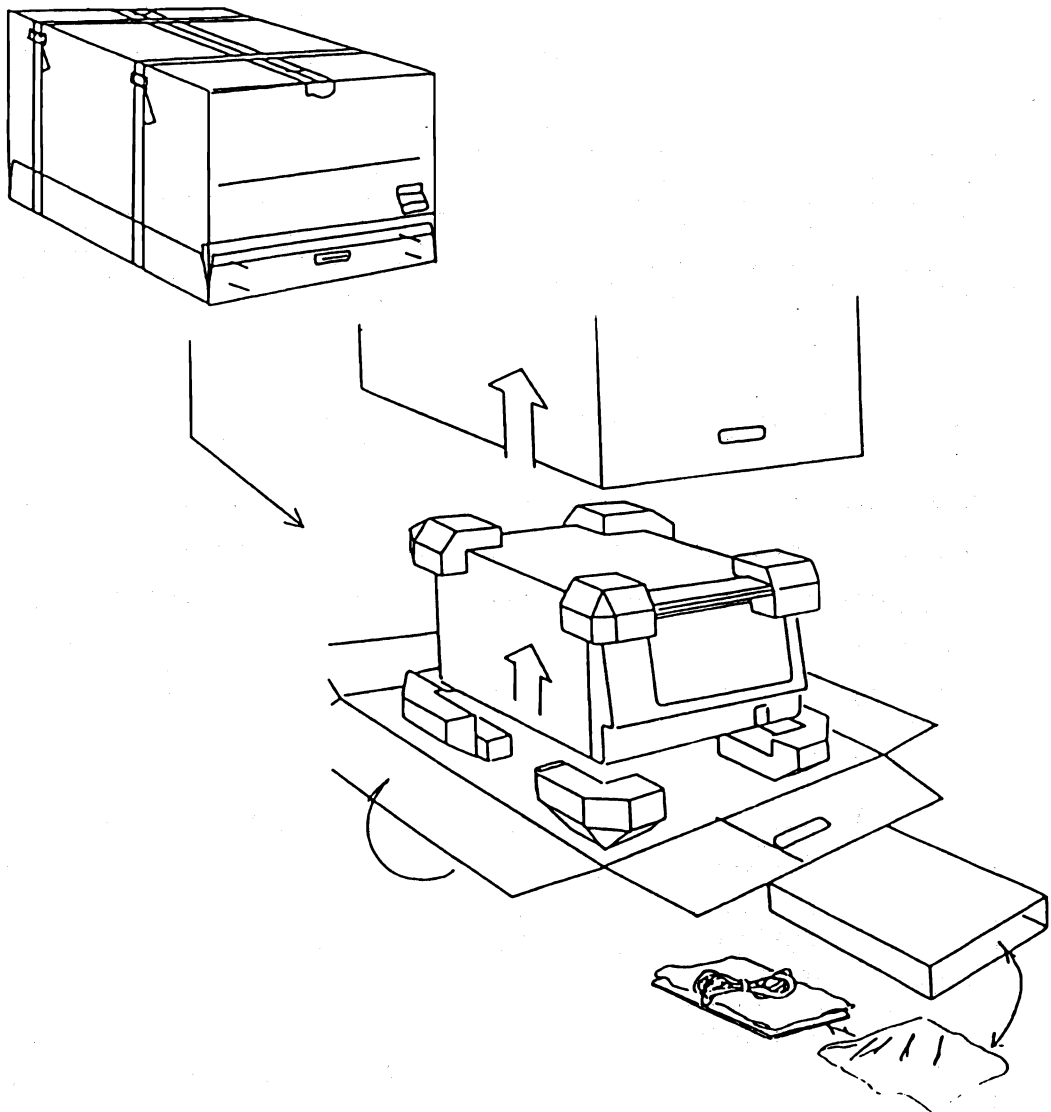


Fig. 4.2.1

② KEYBOARD

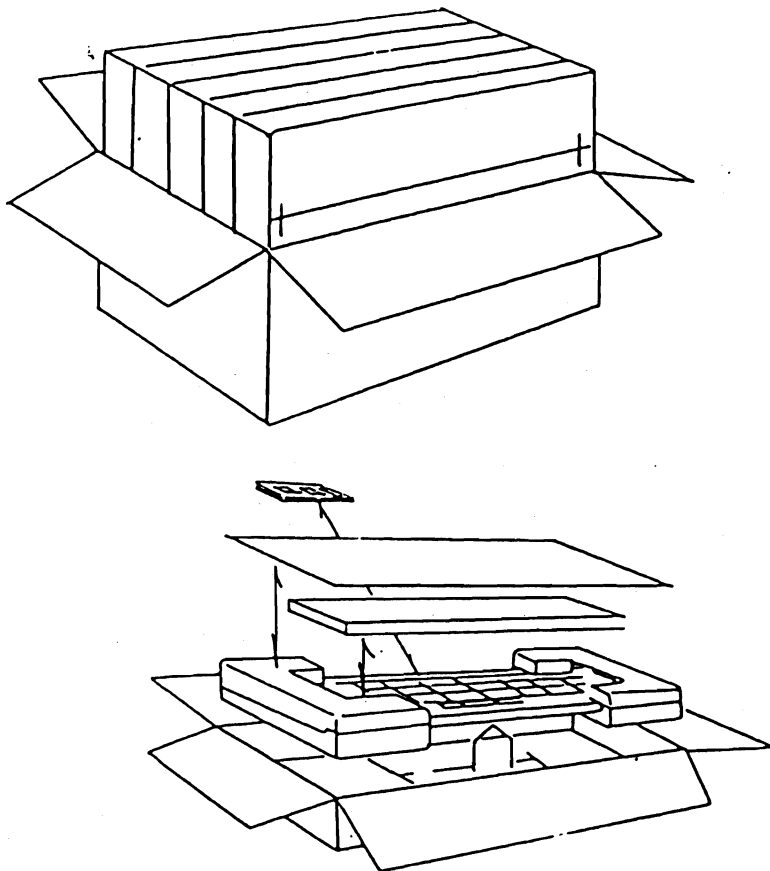


Fig. 4.2.2

③ 5" FDD

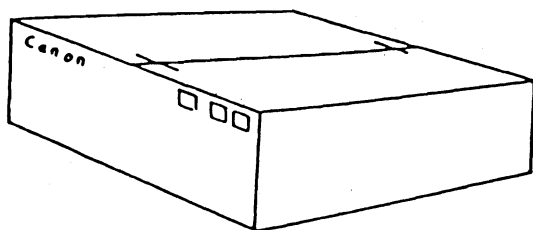


Fig. 4.2.3

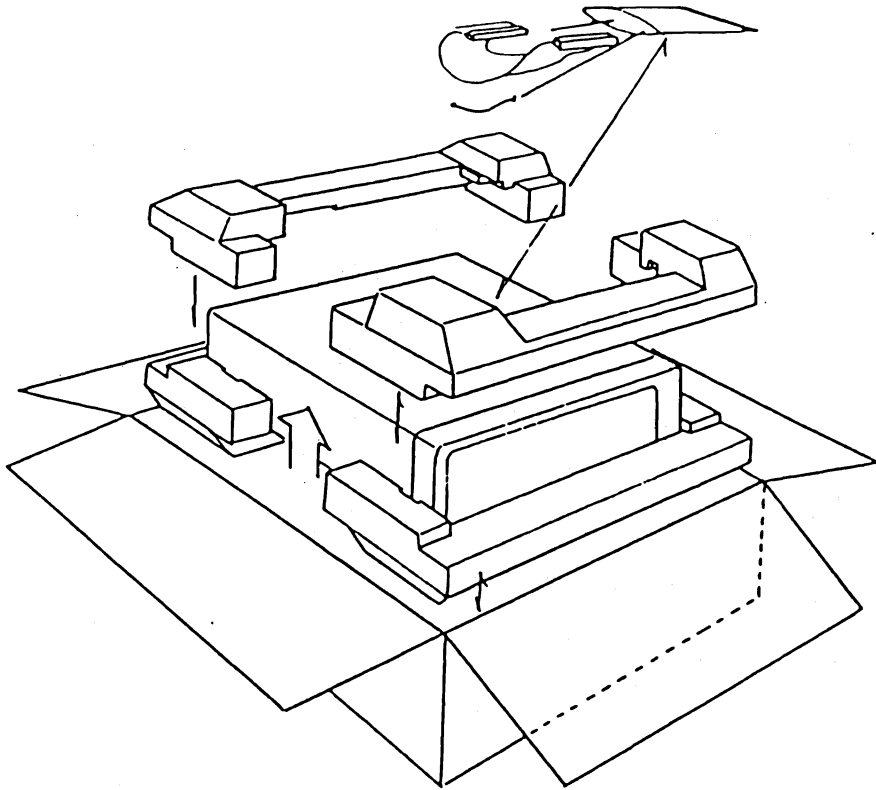
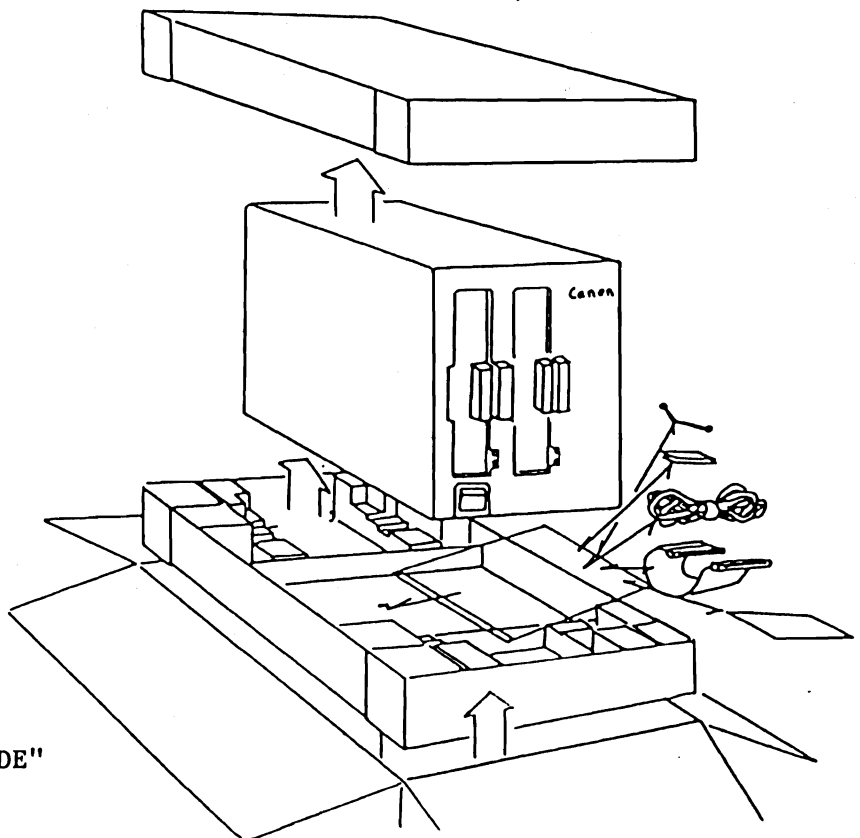
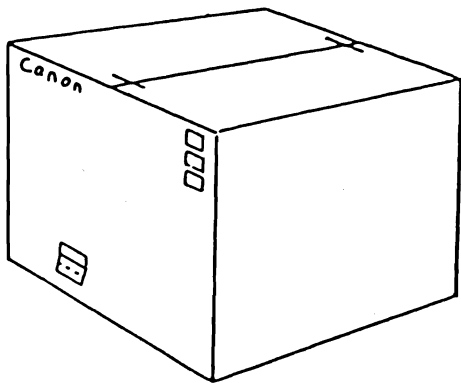


Fig. 4.2.4

④ 8" FDD



⑤ PRINTER

Refer to
"PRINTER TECHNICAL GUIDE"

Fig. 4.2.5

(2) Confirmation of the component parts

①

	AS-100M C	AS KEY ASCII A-1111	MINI FLOPPY A-1300	FLOPPY A-1330
Model	o	o	o	o
Power cord	o			o
Dust cover	o			
Instruction manual	o			
Packing material	o	o	o	o
Grounding cable			o	o
FDD cable			o	o
Device No. seal plate C				o
Device No. seal plate D				o
Overlay		o		

Table 4.2.1

②

EX. BOARD II A-1011	I/O-MOTHER-E P.C.B and mounting place with a locking support
SERIAL I/F A-1500	RS232C P.C.B, 25P mounting plates A and B
OP. MEMORY A-1020 128K A-1021 256K A-1022 384K	Expansion memory board and four retaining screws
VEDEO RAM A-1004	Expansion video memory chip 16
COMMUN. I/F A-1503	SIO P.C.B
PARALLEL I/F A-1502 II	CNT-I/F-2 P.C.B
SERIAL I/F A-1500 II	RS 232C-2 P.C.B, RS 232C-2 cable and four retaining screws
CLOCK SET A-1002	Available soon
POINTING DEVICE A-1100	POINTING DEVICE
CURRENT LOOP I/F A-1050	Available soon

Table 4.2.2

4.2.2 Switch setting and confirmation

Switch setting is required only the following four kinds of system configuration.

- 1 MAIN UNIT (B/W, COLOR) + 5" FDD
- 2 MAIN UNIT (B/W, COLOR) + 8" FDD
- 3 MAIN UNIT (B/W, COLOR) + 5" FDD + 8" FDD
- 4 MAIN UNIT (B/W, COLOR) + 8" FDD + 8" FDD

Necessary to confirm and set the switches in the P.C.B according to each system configuration.

(1) Description of the switch bits in each P.C.B

① CPU+I/O-CONT P.C.B

o SW1 (Printed name)

	1	2	3	4
At the time of factory-shipment	ON	ON	OFF	ON

Clock chip
 Provided: OFF
 Not provided: ON

Unused
 (Set at the OFF position)

Future use

Future use

ON: 0
 OFF: 1

Table 4.2.3

② I/O-CONT P.C.B

o SW2 (Printed name)

	1	2	3	4	5	6	7	8
At the time of factory-shipment	OFF	OFF	OFF	ON	ON	X	OFF	OFF

Unused
(Set to OFF position)

Unused
(Set to OFF position)

CRT
{ ON: B/W
{ OFF: White

CRT
{ ON: 1 Picture
{ OFF: 2 Pictures, Color

JIS/ASCII
{ ON: ASCII
{ OFF: JIS

Unused
(Set to OFF position)

Unused
(Set to OFF position)

DEBUGGER CONSOL
{ ON: Unused
{ OFF: CRT/KBD (MAIN UNIT)

{ ON: 0
{ OFF: 1
For the significance of X, see the description concerned.

Table 4.2.4

③ 5"-FDD-I/F P.C.B

o SW1

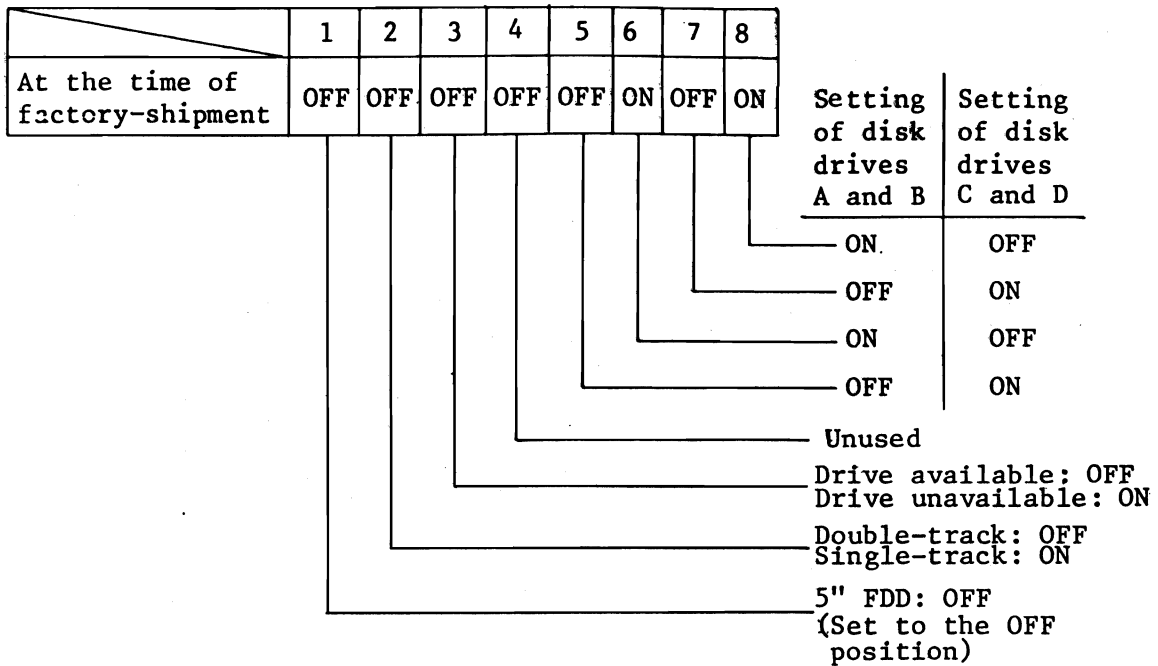


Table 4.2.5

④ 8"-FDD-I/F P.C.B

o SW1

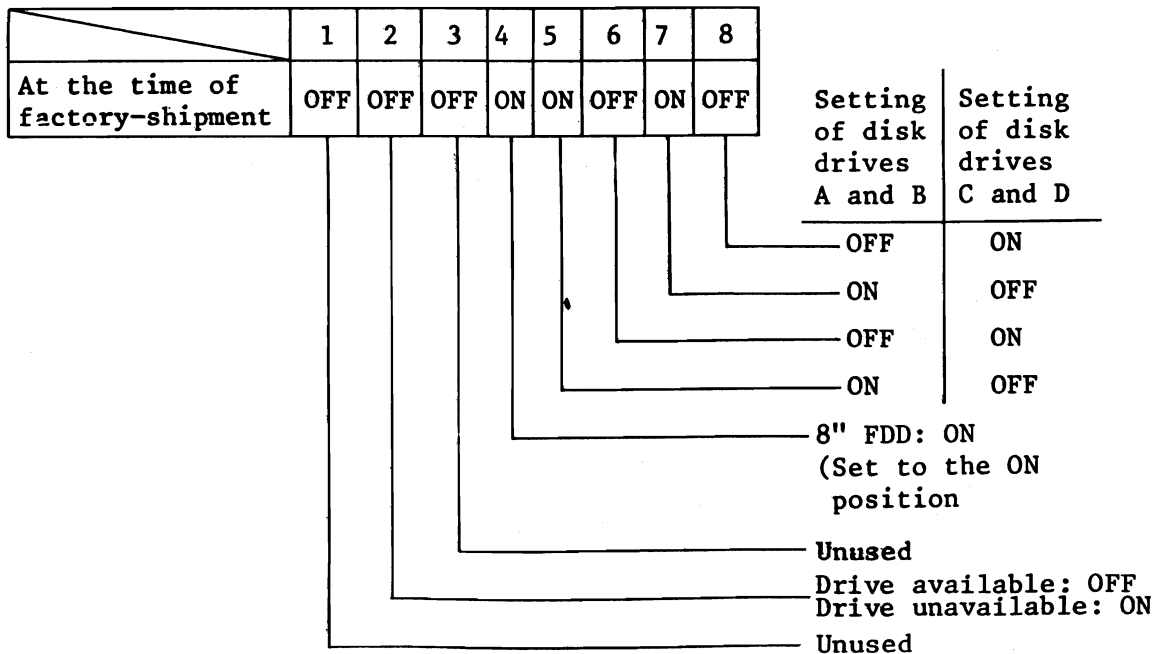


Table 4.2.6

Refer to paragraph (3) that the switches in respective P.C.B. inside are present MDD-220 and YD-180.

(2) Switch setting for MAIN UNIT

- ① MAIN UNIT (B/W, COLOR) + 5" FDD
- ② MAIN UNIT (B/W, COLOR) + 8" FDD

Unnecessary to set the switches, only confirm the switches.
Refer to each table in paragraph (1).

- ③ MAIN UNIT (B/W, COLOR) + 5" FDD(A,B) + 8" FDD(C,D)
- ④ MAIN UNIT (B/W, COLOR) + 8" FDD(A,B) + 8" FDD(C,D)

In each of above system configurations, it is necessary to set switches located in following P.C.B.

- 1) 8" FDD-I/F P.C.B (C and D sides)

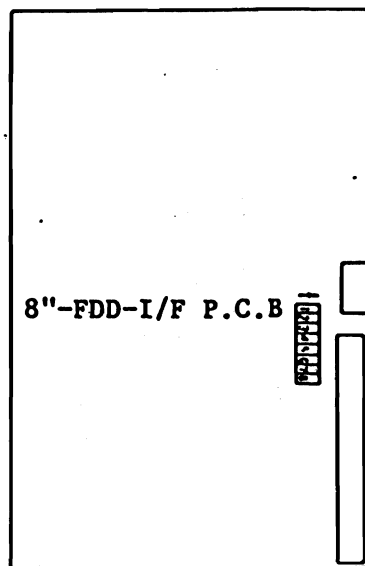


Fig. 4.2.7

Set following switches of SW1
switch in 8" FDD-I/F P.C.B to
specified positions.

- No. 5 → "OFF"
- No. 6 → "ON"
- No. 7 → "OFF"
- No. 8 → "ON"

The switches specified in each of P.C.B, other than those above
must go through only the confirmation for normally.

(3) Setting and confirmation of P.C.B switches in disk drive.

① MDD-220

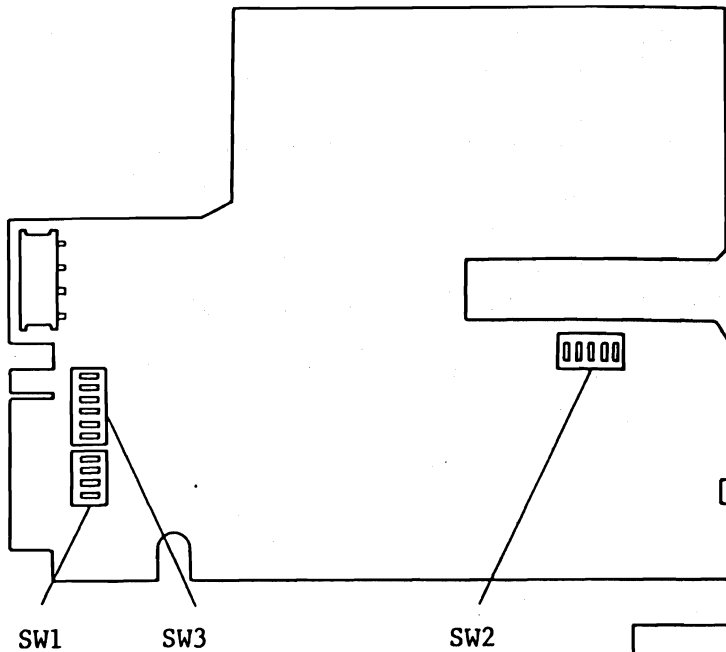


Fig. 4.2.8

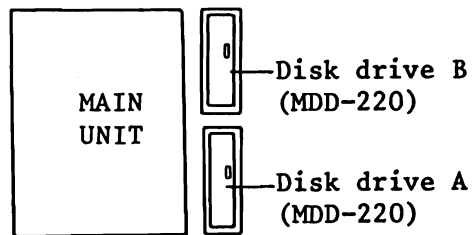


Fig. 4.2.9

These switches are set to the positions as specified in Table.

o SW1

	1	2	3	4
At time of factory-shipment	ON	OFF	OFF	OFF

Table 4.2.7

o SW2

	1	2	3	4	5
At time of factory-shipment	ON	OFF	ON	OFF	OFF

Table 4.2.8

These switches are set to the positions as specified in Table.

o SW3

	1	2	3	4	5	6
At time of factory-shipment	ON	OFF	OFF	ON	ON	OFF

Table 4.2.9

These switches are set to the positions as specified in Table.

Note: Disk drives A and B switches are set in same position.

② YD-180

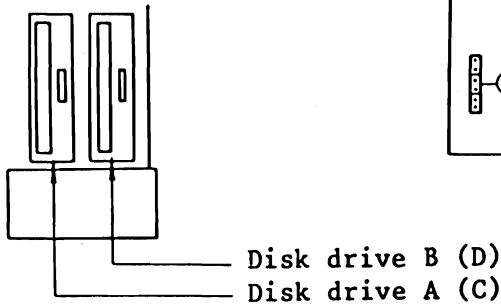
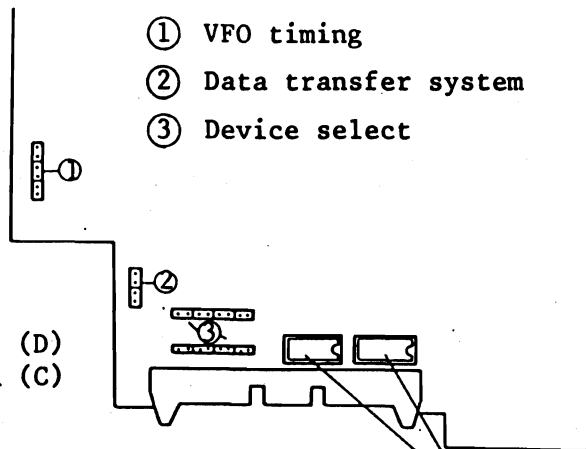


Fig. 4.2.10



Terminator

Fig. 4.2.11

Set the jumper plug and terminator of each disk drive as shown in the table below. Fig. 4.2.10 shows the disk drive location, and Fig. 4.2.11 shows respective positions of jumper plug and terminator.

Disk drive	Terminator	VFO timing	Data transfer system	Device select
A(C)	Provided	Fig. 4.2.12	Fig. 4.2.13	Fig. 4.2.14
B(C)	Not provided			Fig. 4.2.15

Table 4.2.10



Fig. 4.2.12 VFO timing

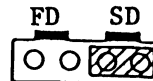


Fig. 4.2.13 Data transfer system

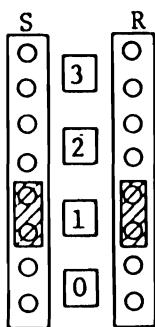


Fig. 4.2.14 DEVICE SELECT A (C)

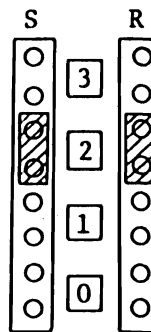


Fig. 4.2.15 DEVICE SELECT B (D)

4.2.3 Cable connections

The installation of AS-100 Series is done with connections of seven cables which are FDD cable (for 5" and 8" FDDs), centronics cable, KEYBOARD cable, 5" or 8" FDD power cable, printer cable, MAIN UNIT power cable, and grounding cable.

The printer to be installed on MAIN UNIT is either DOT IMPACT PRINTER A-1200 or COLOR PRINTER A-1210.

(1) Installation of 5" FDD

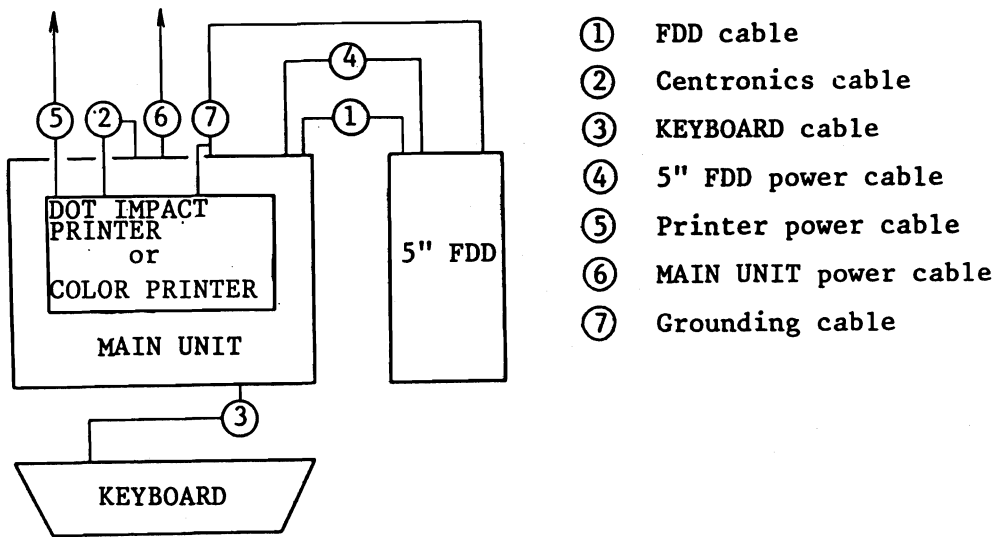


Fig. 4.2.16

(2) Installation of 8" FDD

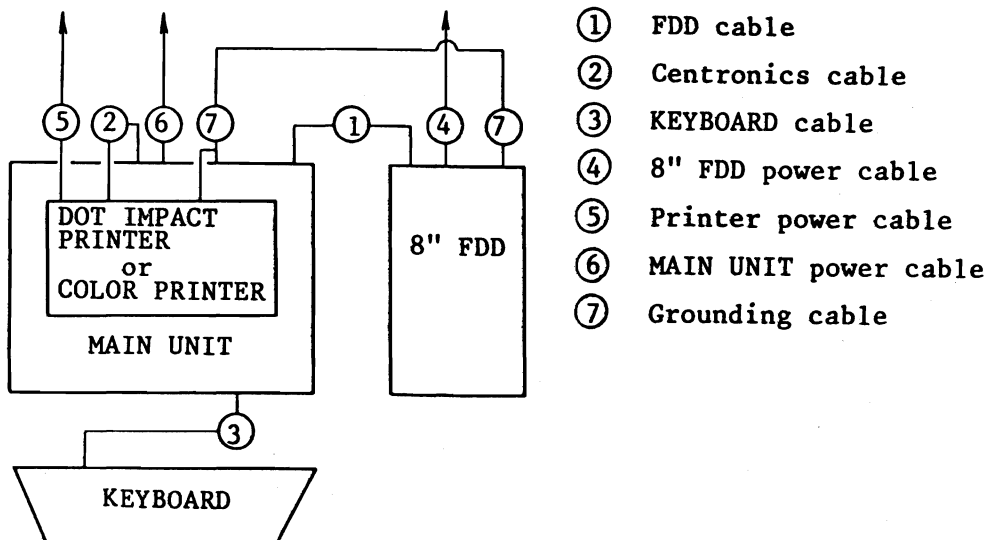


Fig. 4.2.17

(3) Installation of 5" & 8" FDDs

When both 5" and 8" FDDs are installed, use FDD expansion cable for two floppy disk drives instead of 1 shown in paragraph 4.2.16.

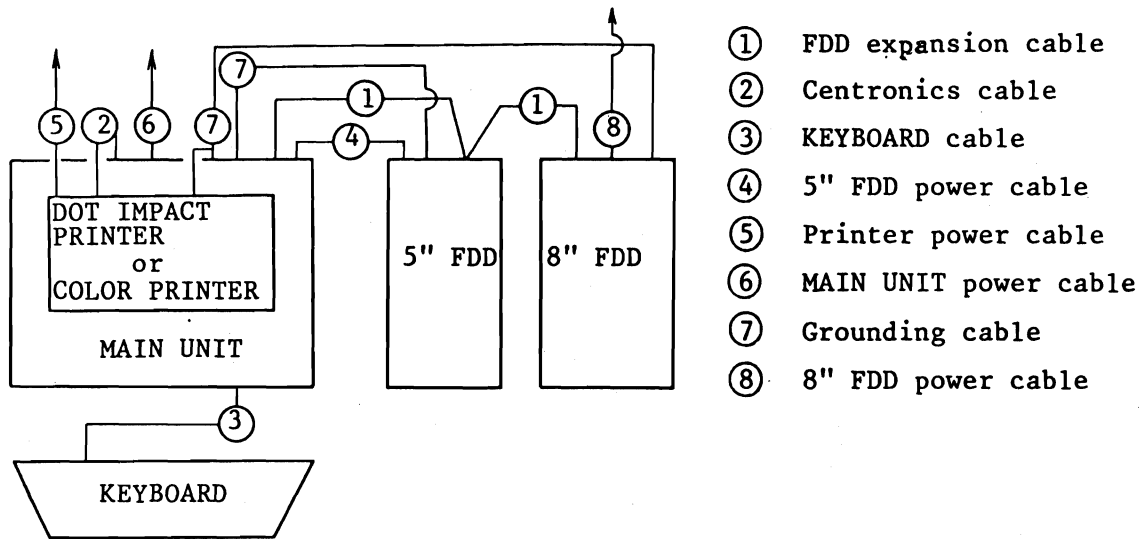


Fig. 4.2.18

(4) Installation of two 8" FDDs

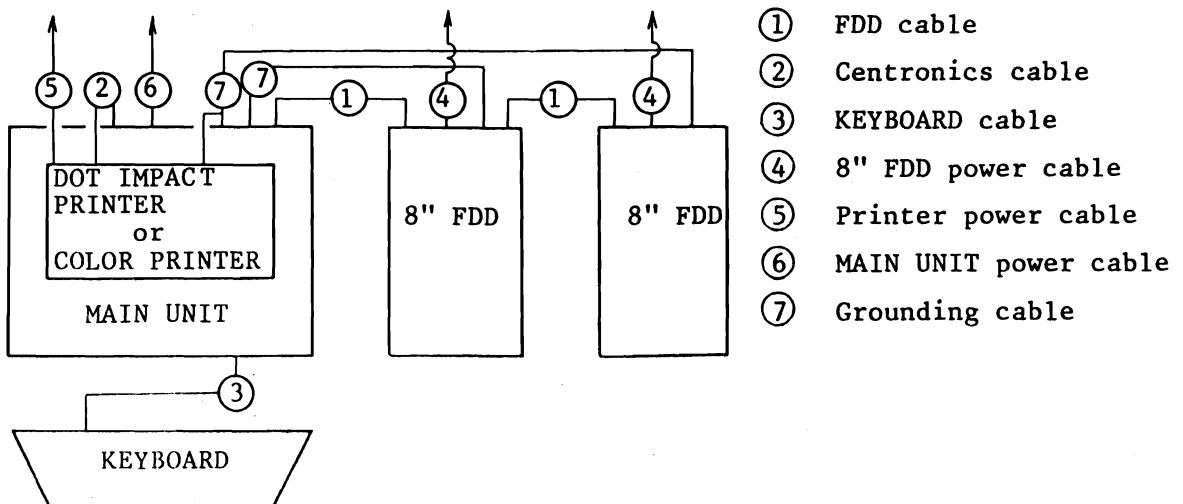


Fig. 4.2.19

The following is the installation procedure.

MAIN UNIT + 5" FDD

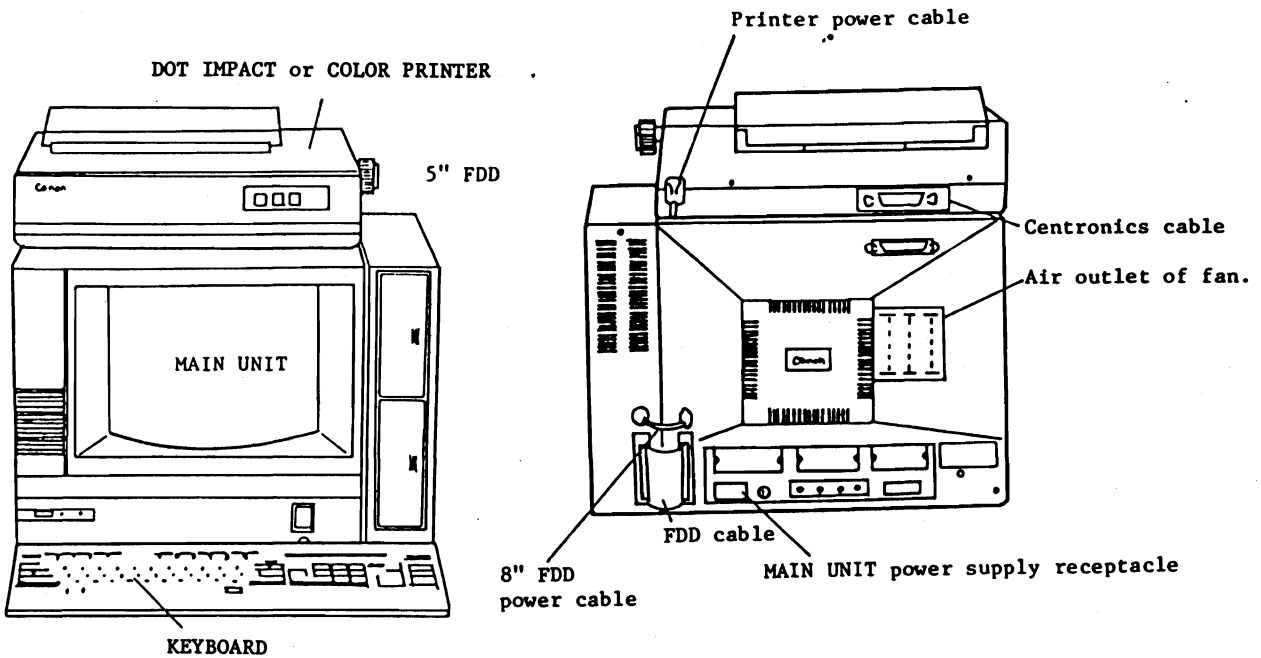


Fig. 4.2.20

- ① After unpacking, set MAIN UNIT power switch to OFF (set downward). Then, remove 5" FDD mounting hole cover caps from MAIN UNIT. See Fig. 3.1.1.
- ② Confirm set position of P.C.B switch in MAIN UNIT and 5"-FDD I/F P.C.B. See paragraph 4.2.3. Then mount 5" FDD on 5" FDD boss of properly with 5" FDD mounting holes of MAIN UNIT.
- ③ Connect keyboard cable, centronics and FDD cable to respective connectors of MAIN UNIT as in Fig. 4.2.20.
- ④ Clamp both centronics cable and FDD cable, with connector lock pins.
- ⑤ Connect 5" FDD power cable to its corresponding connector of MAIN UNIT, and connect MAIN UNIT power cable to power supply receptacle of MAIN UNIT.

- ⑥ Power switch of printer should be OFF, then connect each power supply cable to its AC plug socket.

- ⑦ Attach grounding cable of printer to lower side of printer power supply cable, and clamp it to grounding cable connection position of MAIN UNIT together with grounding cable of 5" FDD.

MAIN UNIT + 8" FDD

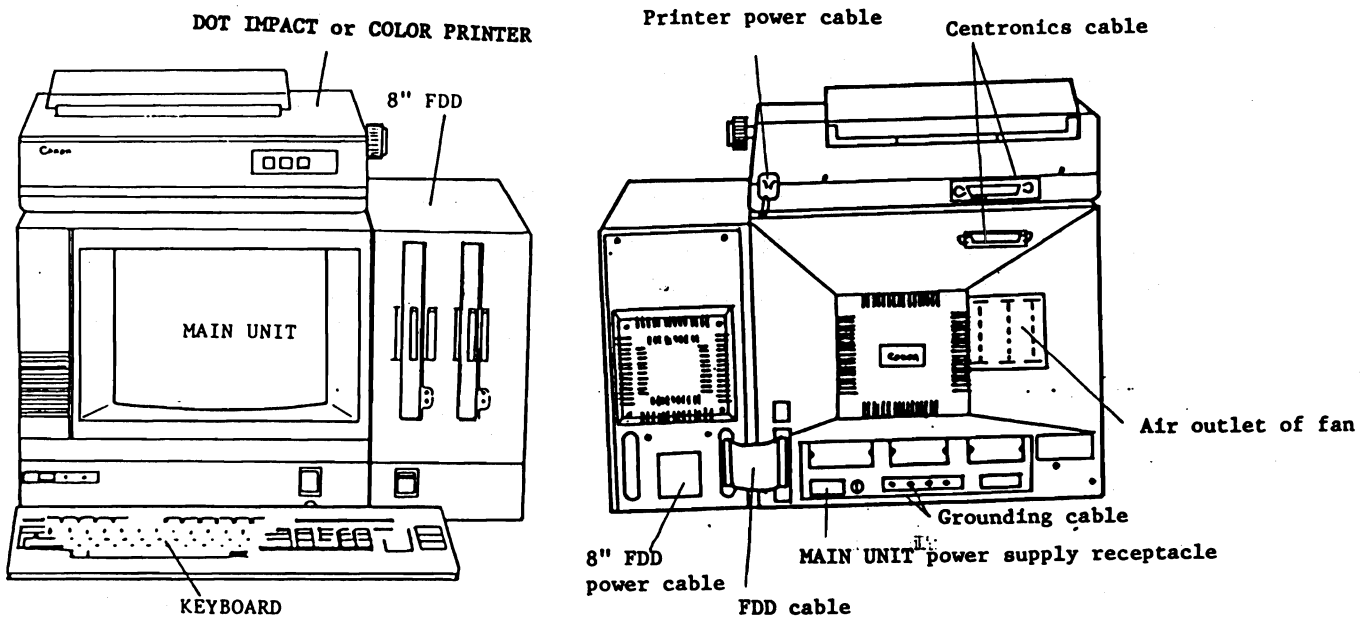


Fig. 4.2.21

- ① After unpacking, set power switch of MAIN UNIT and 8" FDD to OFF, confirm set positions of P.C.B switches in MAIN UNIT and 8" FDD-I/F P.C.B. See paragraph 4.2.3. Connect KEYBOARD cable, centronics cable, and 8" FDD cable to respective connectors of MAIN UNIT, as in Fig. 4.2.21.
- ② Clamp both centronics cable and 8" FDD cable with connector lock pins.
- ③ Connect main unit power supply cable and 8" FDD power supply cable to their corresponding receptacle.
- ④ After checking that printer power switch set to OFF, connect printer power supply cable to AC power receptacle.
- ⑤ Clamp printer grounding cable to the part below printer power supply cable. Then, lock it together with 8" FDD grounding cable with grounding cable retaining screw of MAIN UNIT.

MAIN UNIT + 5" FDD + 8" FDD

Installation is the same as in MAIN UNIT +5" FDD or the MAIN UNIT +8" FDD, except for the application of a FDD expansion cable for FDD connector 1, as in Fig. 4.2.18.

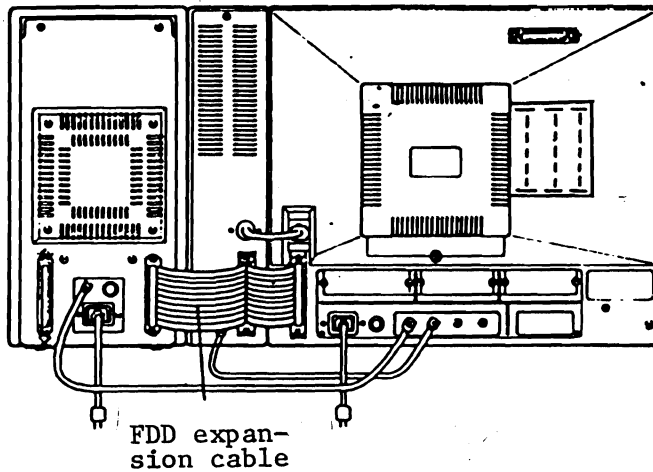


Fig. 4.2.22

Note: Attach device seals C and D to positions marked A and B on the front of 8" FDD.

MAIN UNIT + 8" FDD + 8" FDD

Refer to installation of MAIN UNIT + 8" FDD.

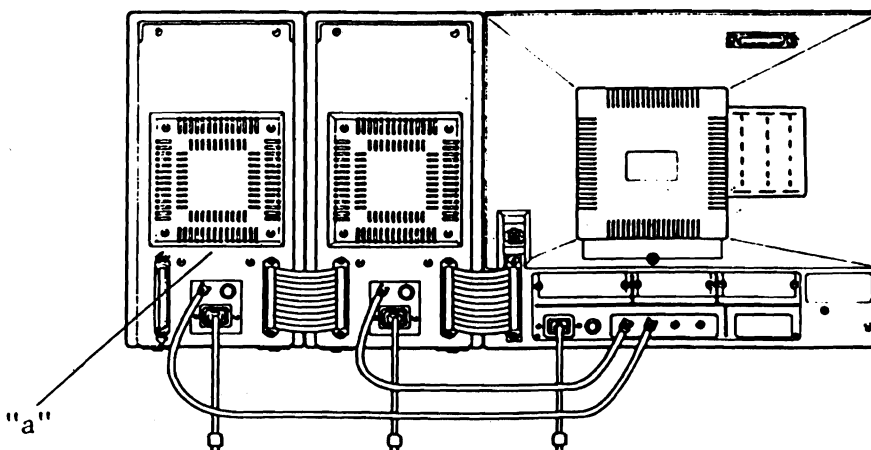


Fig. 4.2.23

Note: Attach device seals C and D to positions marked A and B on the front of 8" FDD. Refer to "a" of Fig. 4.2.23.

4.2.4 Turning-on of power supply, brightness adjustment, and speaker output adjustment

1. Turning-on of power supply.

When 5" FDD is to be connected to MAIN UNIT according to following sequence.

(1) Turning-on power supply

- ① Turn on power supply to printer.
- ② Set system media to 5" FDD.
- ③ Turn on power supply to MAIN UNIT.

(2) Turning-off power supply

- ① Turn off printer power supply.
- ② Turn off MAIN UNIT power supply.

When 8" FDD is to be connected to MAIN UNIT

(1) Turn on power supply

- ① Turn on power supply to printer.
- ② Turn on power supply to 8" FDD.
- ③ Set system media to 8" FDD.
- ④ Turn on power supply to MAIN UNIT.

(2) Turning-off power supply

- ① Turn off printer power supply.
- ② Turn off 8" power supply.
- ③ Turn off MAIN UNIT power supply.

2. Brightness adjustment

Approximately 15 minutes after power supply is turned on MAIN UNIT and with brightness control knob on left front of MAIN UNIT panel, adjust brightness of CRT display.

3. Speaker output adjustment

Remove the rear cover of MAIN UNIT (see paragraph 3.1 of Chapter 3). Remove system media after OS is loaded in, then adjust speaker tone with entering keys by the speaker output control knob on I/O-CONT-P.C.B. as in Fig. 3.1.4.

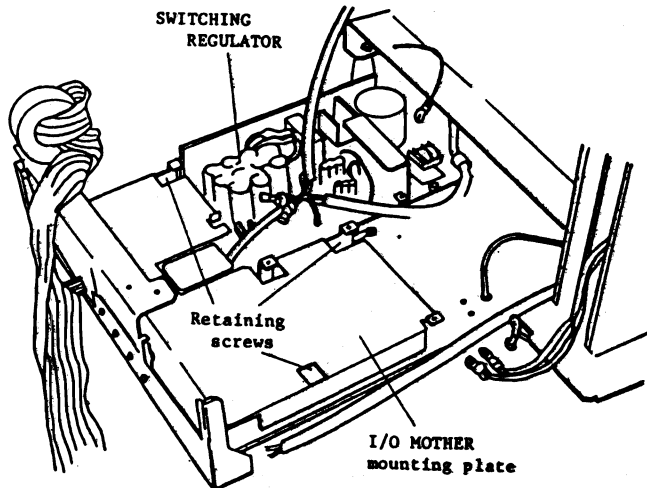
4.2.5 Execution of test program and confirmation

Refer to "TEST PROGRAM OPERATIONAL MANUAL" separately provided for details regarding the execution of a test program.

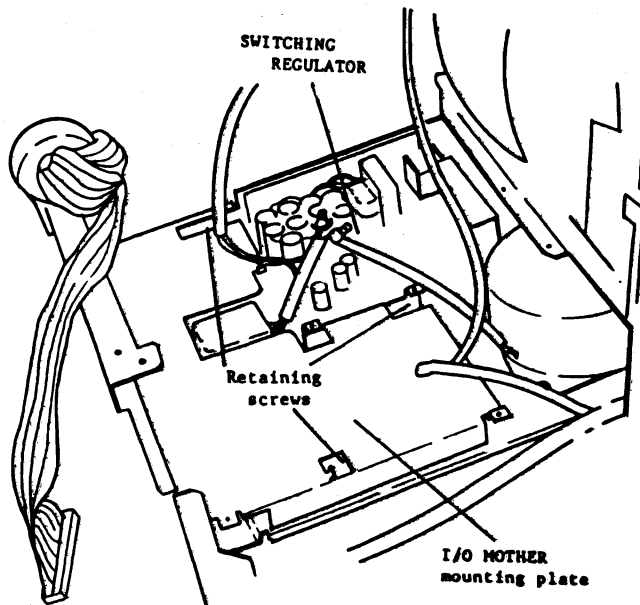
4.3 Installation of Options

4.3.1 I/O-MOTHER-E P.C.B

- ① Remove both rear cover and upper cover. See paragraph 3.1.
- ② Referring to paragraph 5.2.2 of Chapter 5, pull out power supply unit half its entire depth, and disconnect each cable.



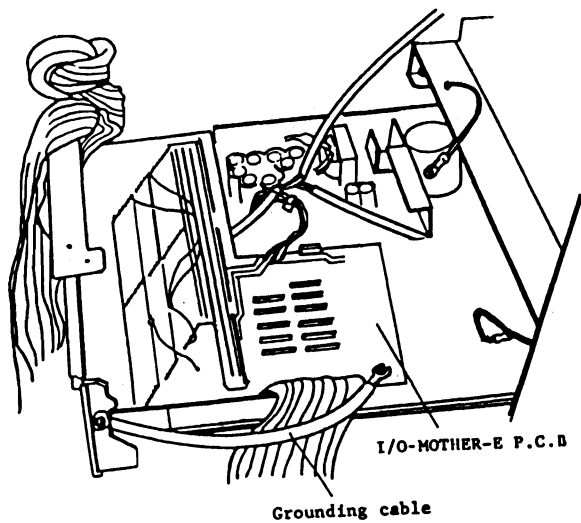
(For 115,120V)



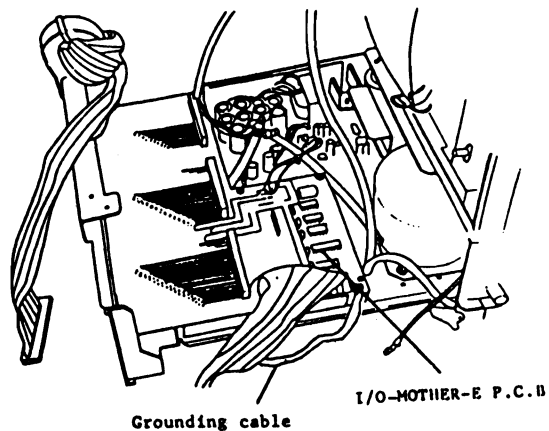
(For 230,240V)

Fig. 4.3.1

- ③ Install the I/O MOTHER mounting plate, using three retaining screws as shown in Fig. 4.3.1.



(For 115,120V)



(For 230,240V)

Fig. 4.3.2

- ④ Clamp I/O-MOTHER-E P.C.B. to I/O MOTHER mounting plate, with six retaining screws, in Fig. 4.3.2.
- ⑤ Connect I/O MOTHER DC cable of I/O-MOTHER-E P.C.B. to No. 4 connector (Fig. 5.2.4) of switching regulator.
- ⑥ Lock grounding cable from I/O-MOTHER-E P.C.B. to chassis of power supply unit, as in Fig. 5.2.2.
- ⑦ Pass I/O MOTHER internal cable between MOTHERBOARD rack and CRT unit.
- ⑧ Connect I/O MOTHER internal cable to I/O MOTHER connector (Fig. 3.1.5) on MOTHERBOARD with alignment ▲ mark.

4.3.2. Optional interface

The installation location varies with each option interface as shown in Fig. 1.1.1.

(1) Serial data interface

For serial data interface, two types are available, one to be connected to I/O-MOTHER-E P.C.B., and the other to CPU+I/O-CONT P.C.B.

i) RS232C P.C.B.

However, be careful because the 25P mounting plate of RS232C P.C.B. is different according to the location.

(The rear side of each 25P mounting plate has an A mark.)

No. 2 and 3 marked → Make sure whether or not 25P mounting plate A (alphanumeric mark: EA4-0079) is fitted to RS232C P.C.B.

No. 4 marked on rear panel → Exchange 25P mounting plate A to B

- ① Remove both rear and upper covers. See paragraph 3.1 of Chapter 3.
- ② Pull out power supply unit half its depth (paragraph 5.2.2), and remove power supply unit reinforcement mount with four retaining screws as in Fig. 4.3.3.

- ③ Remove cover plate clamped to power supply unit with two retaining screws.

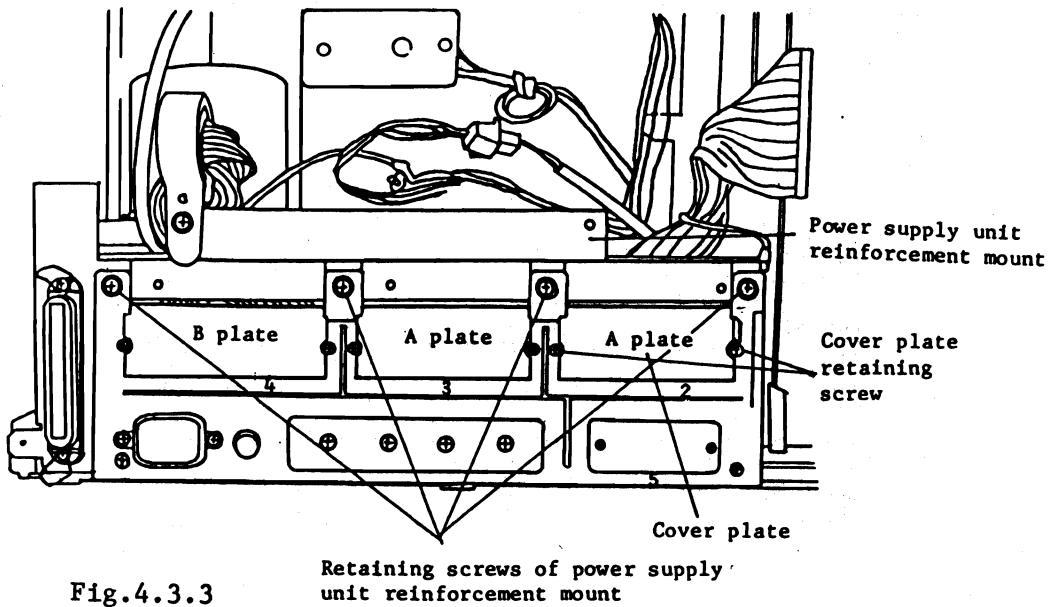


Fig.4.3.3

- ④ Referring to paragraph 4.3.1 of Chapter 4, install I/O MOTHER mounting plate and I/O-MOTHER-E P.C.B.
- ⑤ As in Fig. 4.3.4, fit RS232C P.C.B to I/O-MOTHER-E P.C.B

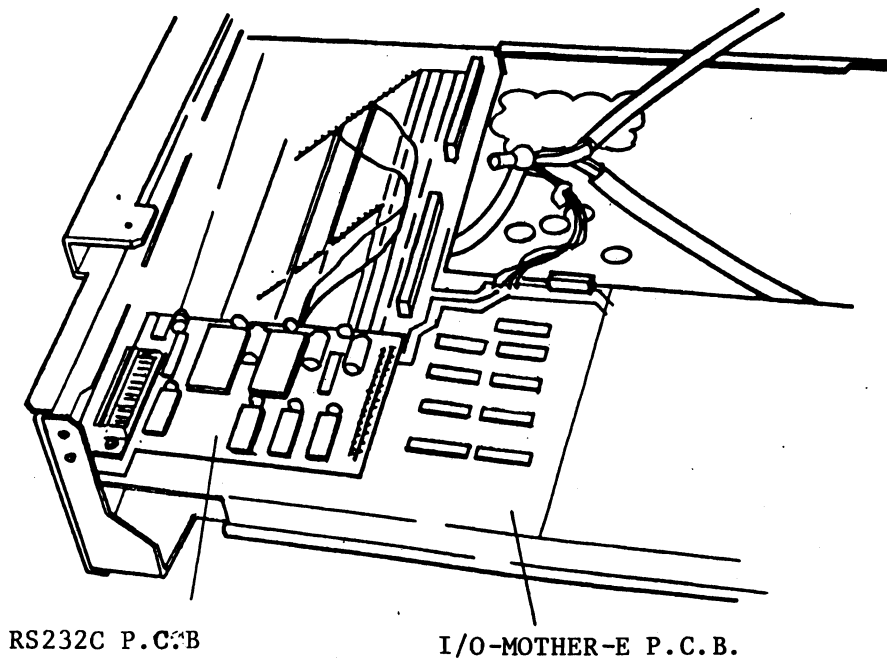


Fig. 4.3.4

- ⑥ Fix power supply unit reinforcement mount in position, and clamp grounding cable from I/O-MOTHER-E P.C.B. to chassis of power supply unit (see Fig. 5.2.2).

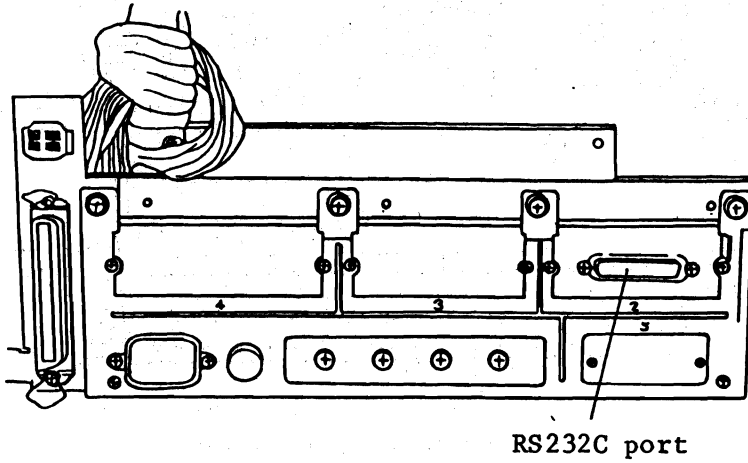


Fig. 4.3.5

ii) RS232C-2 P.C.B. .

RS232C-2 P.C.B. is connected to CPU+I/O-CONT P.C.B. with only No. 5 marked on rear panel.

- ① Remove rear and upper covers. Refer to 3.1.
- ② Remove CPU+I/O-CONT P.C.B. from MAIN UNIT by reference to 5.2.1.

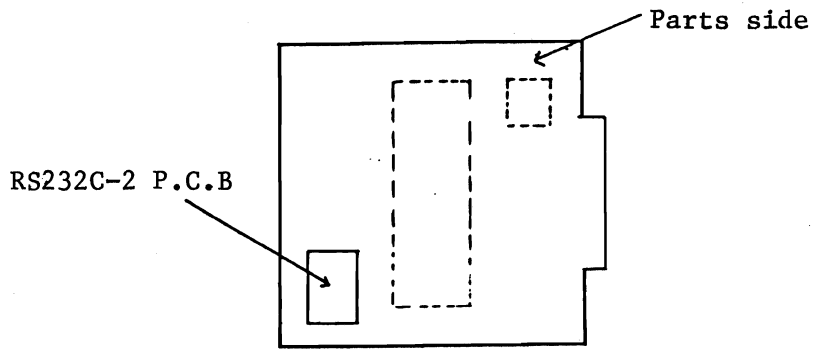


Fig. 4.3.6 CPU+I/O-CONT P.C.B

- ③ As in Fig. 4.3.6, connect RS232C 2 P.C.B. to CPU+I/O-CONT P.C.B while paying attention to the connector. (Fix it using two screws on soldered side of CPU-I/O-CONT P.C.B.)

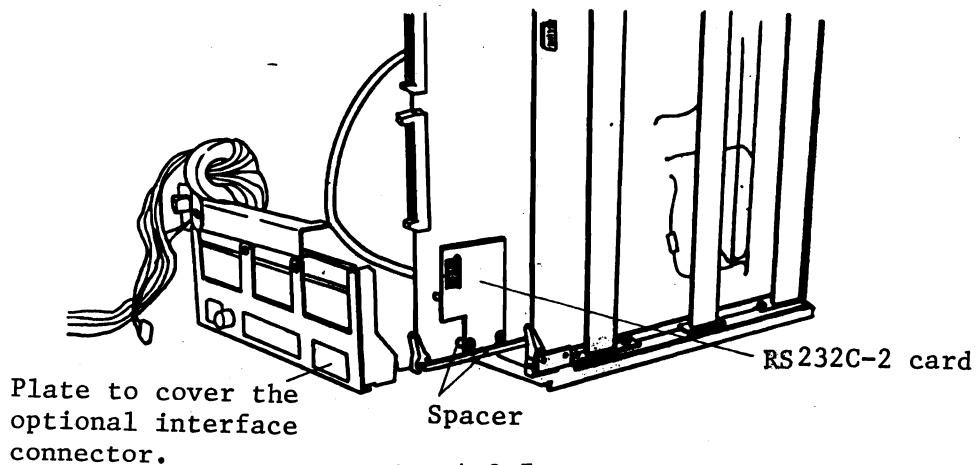


Fig. 4.3.7

- ④ As in Fig. 4.3.7, remove the palte to cover option interface connector.

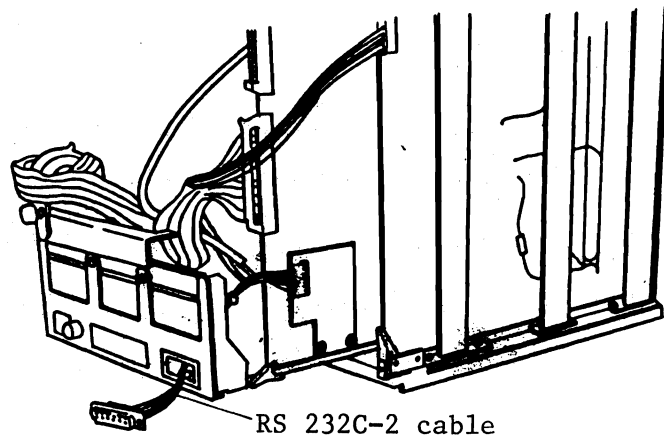
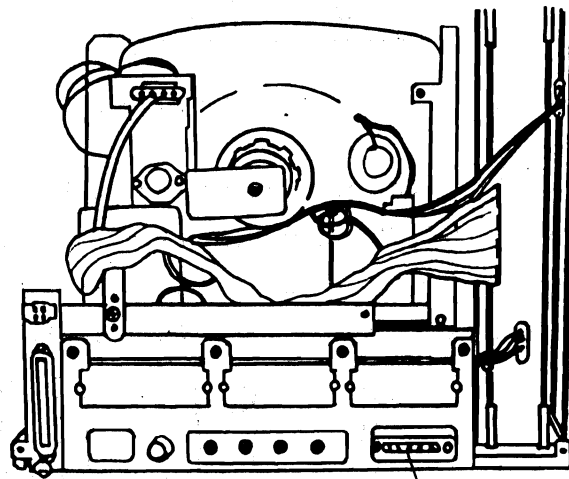


Fig. 4.3.8

As in Fig. 4.3.8, connect RS 232C-2 cable to RS 232C 2 P.C.B.



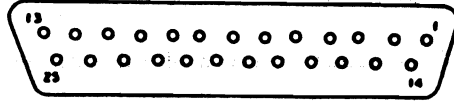
RS 232C-2 port connector:

Fig. 4.3.9

As in Fig. 4.3.9, fix connector with 2 screws.

Connection of RS232C

(1) Pin assignment



RS232C Port (See Fig. 4.3.5 and 4.3.9)

Pin	Signal	EIA Signal
1	FG (Protective Ground)	AA
2	TXD (Transmitted Data) Transmission data from DEVICE	BA
3	RXD (Received Data) Receiving data to DEVICE	BB
4	RTS (Request to Send) Data transmission REQUEST	CA
5	CTS (Clear to Send) AS-100 is ready for sending	CB
6	DSR (Data Set Ready) AS-100 READY	CC
7	SG (Signal Ground)	AB
8	DCD (Received Line Signal Detector) Carrier detector	CF
20	TRDY (Data terminal Ready) DEVICE READY	CD

Note: Other pins are none connector.

(2) Connections

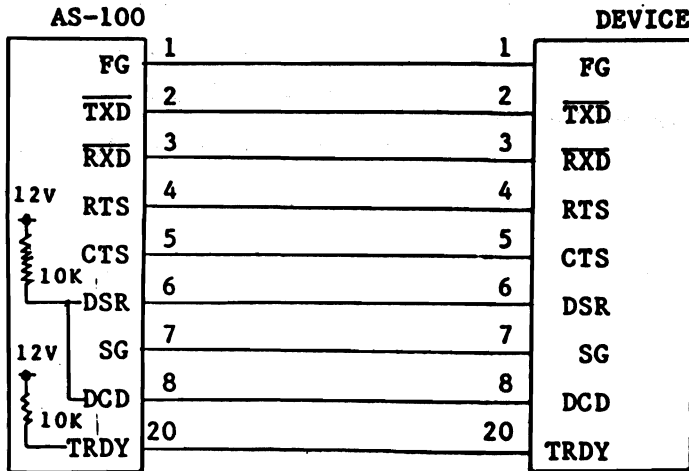


Fig. 4.3.6

- * Connect device as in Fig. 4.3.6.
- * When the device has not some of the signals such as TXD, CTS and DCD, these signals are required no connection.

(2) Parallel data interface CNT I/F P.C.B.

For CNT I/F-2 P.C.B, number 2 marked on the rear panel is only connectable.

Connection method is the same as for RS232C P.C.B.

(3) Communication interface (SIO P.C.B)

For SIO P.C.B, number 3 marked on the rear panel is only connectable.

Connection method is the same as for RS232C P.C.B.

(4) SIO PCB SWITCH

SW (Printed name)

	1(H)	2(G)	3(F)	4(E)	5(D)	6(C)	7(B)	8(A)
At the time of factory-shipment	OFF	OFF	OFF	OFF	OFF	ON	ON	ON

Setting by user's software

Synchronous	Asynchronous
ON	OFF
OFF	ON
ON	OFF
OFF	ON

* Selectable each bit by software.

4.3.3 VIDEO MEMORY

Video memory expansion is performed only for B/W display.

When the video memory is added, the "CPU + I/O-COUNT" P.C.B. and the JP circuit of the "CPT-CONT2-B/W" P.C.B are required to be switched.

- ① Remove the rear and upper covers. (Refer to 3.1 in Chapter 3.)
- ② Remove CRT-CONT2-B/W P.C.B. from MAIN UNIT by

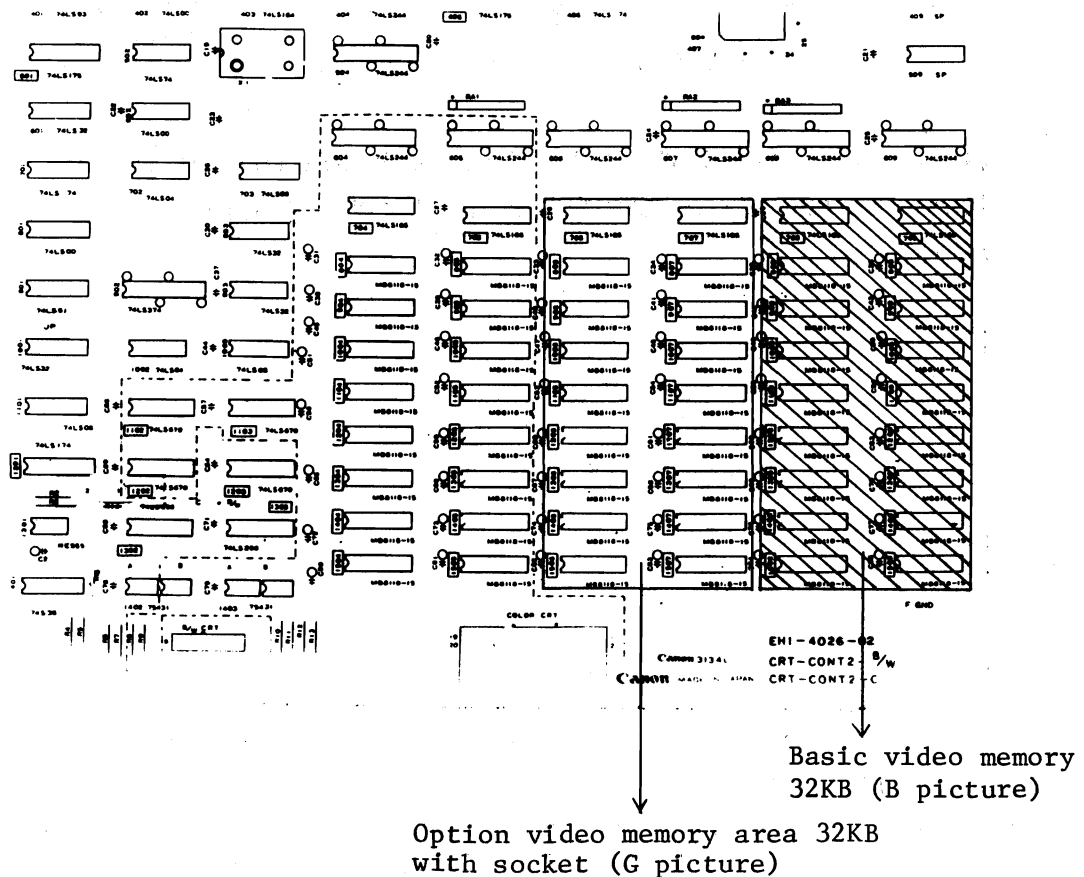


Fig. 4.3.11

- ③ Expansion area of option video memory is provided with socket for 16 additional video memory chips (32KB).

Note: Pay attention direction of each video memory chip prior to expansion.

- ④ After the additional installation has been completed, solder the JP circuit of (a) section illustrated in Fig. 4.3.11 as in Fig. 4.3.12.

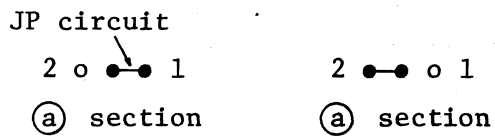


Fig. 4.3.12

Switch JP circuit from screen 1 to screen 2.
(Re solder JP circuit screen 1, on screen 2.)

- ⑤ Remove CPU + I/O-CONT P.C.B from MAIN UNIT and set SW2 No. 5 located on CPU + I/O-CONT P.C.B to "OFF". (Refer to 1.2.2 of Chapter 1).

4.3.4 Optional Memory Board

Three kinds, board I, board II and board III are available for optional memory boards. Expansion memory capacity is different in 128KB, 256KB and 384KB types.

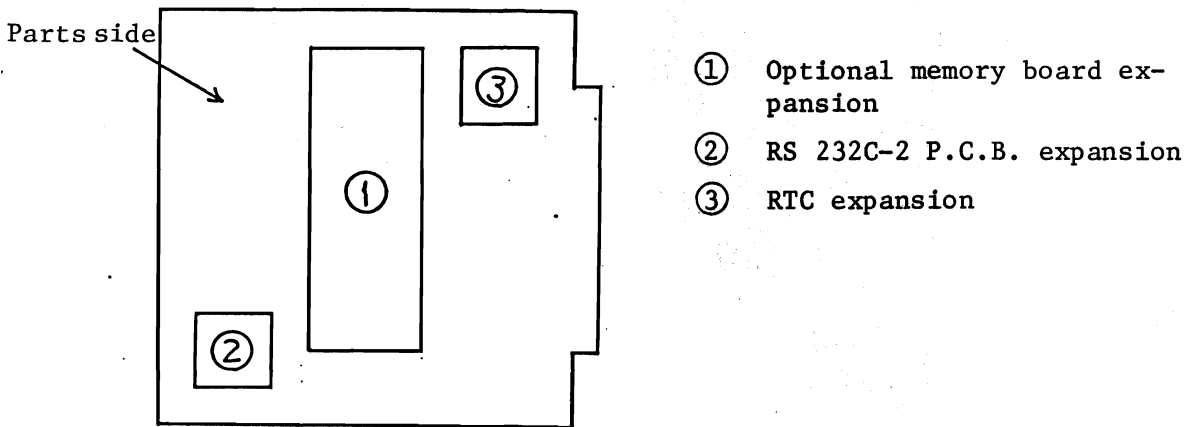


Fig. 4.3.12 CPU+I/O-CONT P.C.B.

- ① Remove rear and upper covers. See paragraph 3.1 of Chapter 3.
- ② Remove CPU+I/O-CONT P.C.B from MAIN UNIT by referring to 5.2.2 in Chapter 5.
- ③ As in Fig. 4.3.13, attach memory board to CPU+I/O-CONT P.C.B. with care in connecting connector. Attach it with 4 screws on soldered side of CPU+I/O-CONT P.C.B.

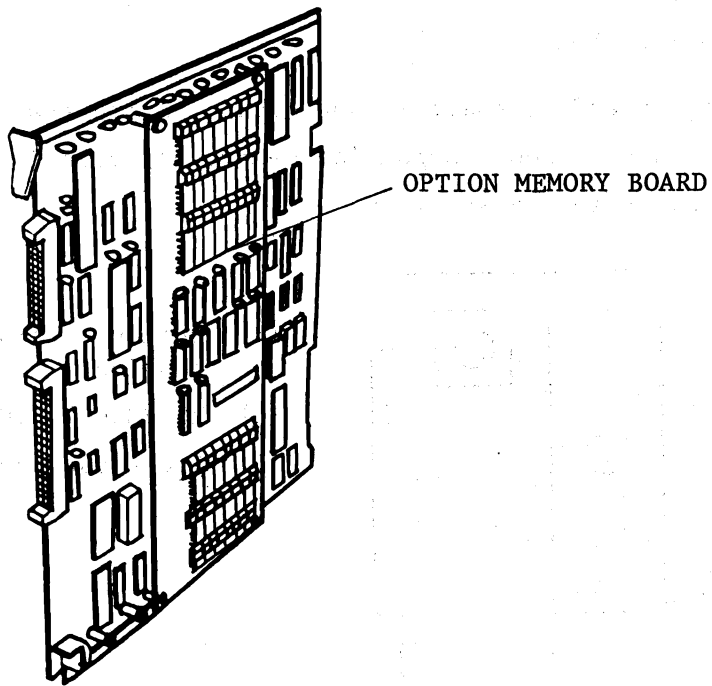


Fig. 4.3.13

4.3.5 Pointing Device

Connect pointing device connector to its position on **KEYBOARD**.

(See Fig. 3.1.7.)

Chapter 5 Replacement and Adjustment of Units

5.1 Unit configuration

5.2 MAIN UNIT

5.2.1 P.C.B

5.2.2 Power supply unit

5.2.3 CRT unit

5.2.4 Fuse replacement

5.3 KEYBOARD

5.3.1 KEYBOARD

5.3.2 Key top

5.4 5" FDD

5.4.1 MDD-220

5-4.2 5" FDD-I/F

5-5 8" FDD

5.5.1 YD-180

5.5.2 8" FDD-I/F

5.5.3 Power supply unit

Chapter 5 Replacement of Units and Adjustment after Replacement

Prior to replacing each units, turn off power switch and unplug power cord from receptacle.

5.1 Unit configuration and general assembly

Refer to APPENDIX.

5.2 MAIN UNIT

5.2.1 P.C.B

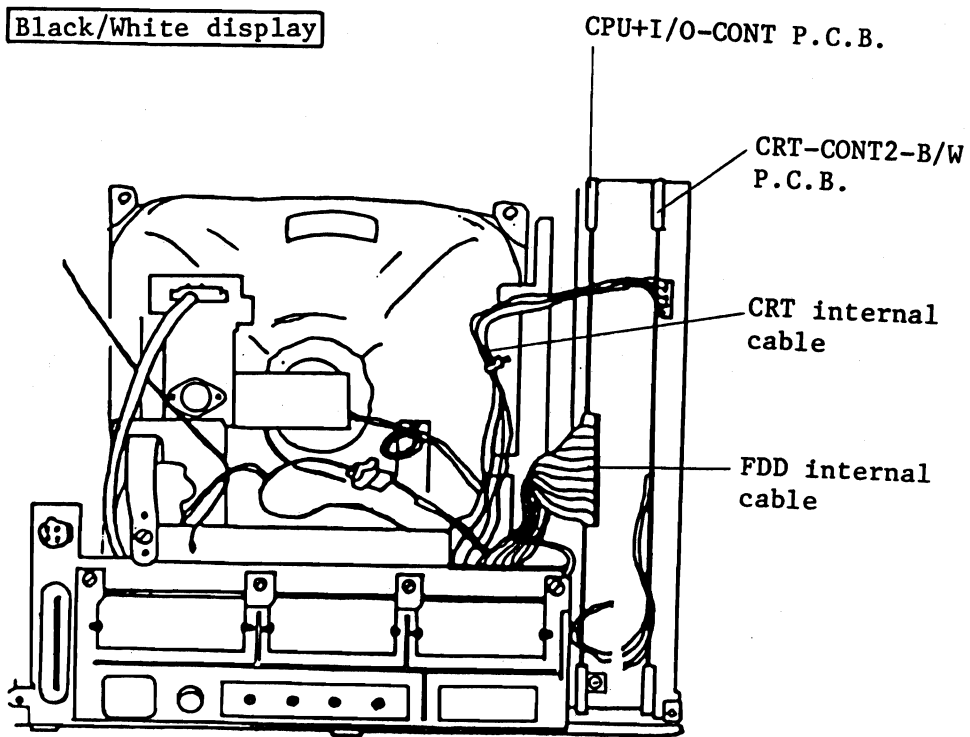


Fig. 5.2.1

(1) CPU+I/O-CONT P.C.B.

- ① First remove rear and upper covers (see paragraph 3.1 of Chapter 3). Then, disconnect CRT internal cable from CRT-CONT2-B/W P.C.B.
- ② Disconnect grounding cables from individual P.C.B. and chassis of power supply unit.
- ③ Disconnect FDD internal cable from CPU+I/O-CONT P.C.B.
- ④ Remove CPU+I/O-CONT P.C.B from MAIN UNIT.
- ⑤ After confirming switch set position for CPU+I/O-CONT P.C.B (see paragraph 4.2.2), connect it in reverse order of above steps.

(2) CRT-CONT 2-B/W P.C.B.

- ① First remove rear and upper covers (see paragraph 3.1). Then, disconnect CRT internal cable from CRT-CONT2-B/W P.C.B.
- ② Disconnect the grounding cables, which are extending from individual P.C.Bs, from the chassis of the power supply unit.
- ③ Remove CRT-CONT2-B/W P.C.B from MAIN UNIT.
- ④ Connect spare CRT-CONT2-B/W P.C.B in reverse order of above steps.

Color Display

(1) CPU+I/O-CONT P.C.B

- ① First remove rear and upper covers (see paragraph 3.1). Then, disconnect CRT internal cable from CRT unit.
- ②~⑤ Same as for B/W display

(2) CRT-CONT2-C

① Remove rear and upper covers (see paragraph 3.1). Then, disconnect CRT internal cable from CRT unit.

②~④ Same as for B/W display

[Adjustment]

Test program check of operation.

5.2.2 Power supply unit

Procedure of power supply unit replacement is the same for B/W and color displays

(1) SWITCHING REGULATOR

- ① Remove both rear and upper covers (see paragraph 3.1.1 of Chapter 3).
- ② Disconnect FDD internal cable from CPU+I/O-CONT P.C.B
- ③ Disconnect grounding cables which are attached to individual P.C.Bs, power supply unit, and MOTHERBOARD RACK.

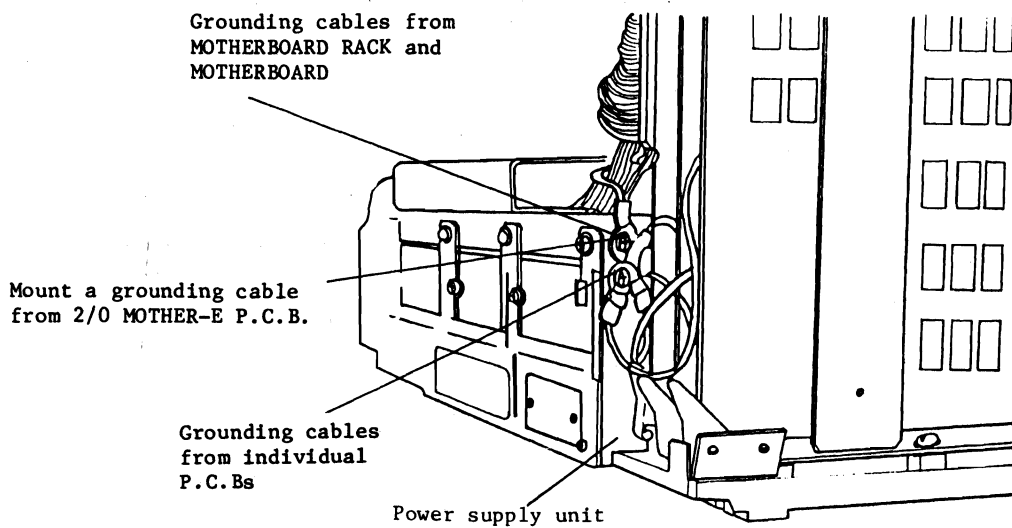


Fig. 5.2.2

- ④ Remove two retaining screws from power supply unit. Fig. 5.2.3 shows location of these retaining screws.

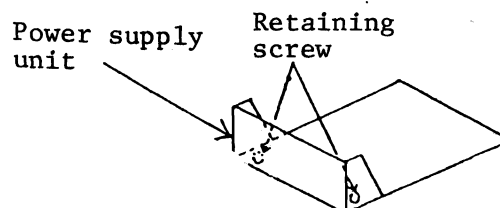
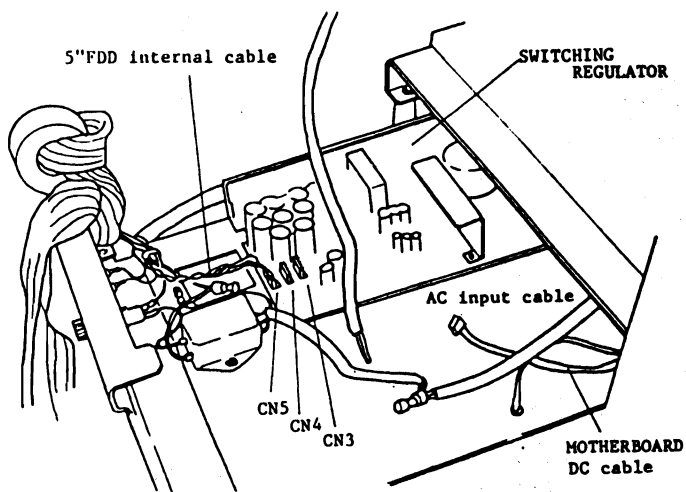
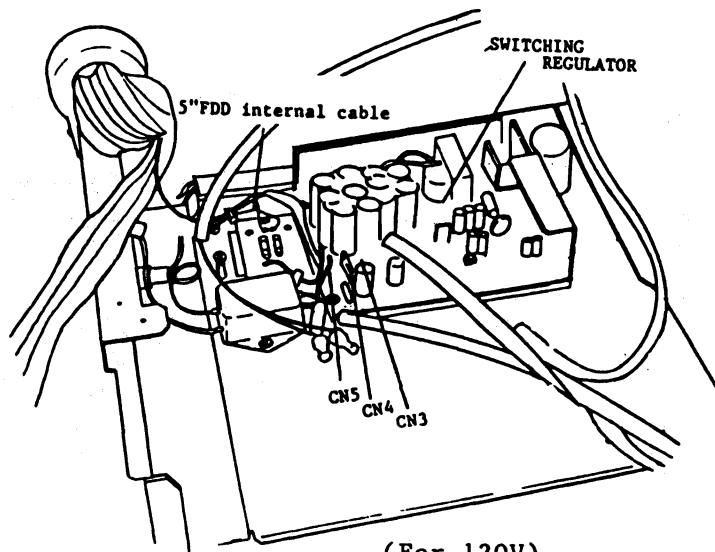


Fig. 5.2.3

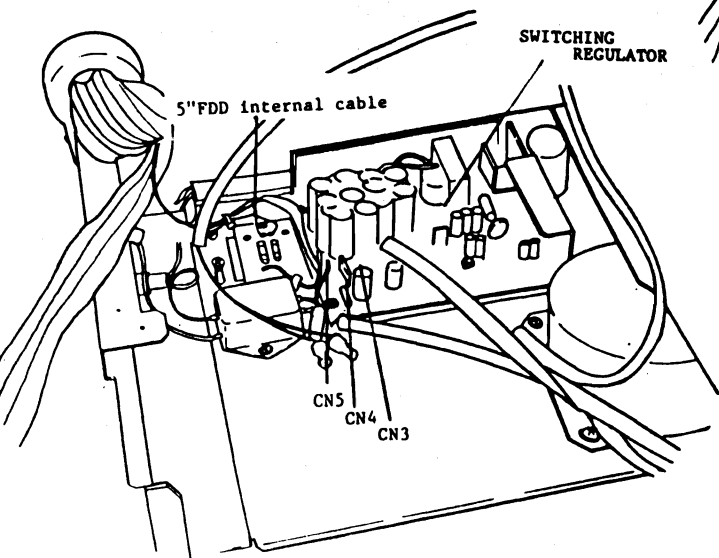
- ⑤ Pull out power supply unit half its depth as in Fig. 5.2.4. Then, disconnect 5" FDD internal cable and MOTHERBOARD DC cable from SWITCHING REGULATOR.



(For 115V)



(For 120V)



(For 230,240V)

Fig. 5.2.4

- ⑥ Pull out power source unit from MAIN UNIT, and disconnect AC input cable and grounding cable (Fig. 5.2.5) from SWITCHING REGULATOR.
- ⑦ Remove four retaining screws of SWITCHING REGULATOR to remove it. (Fig. 5.2.5).

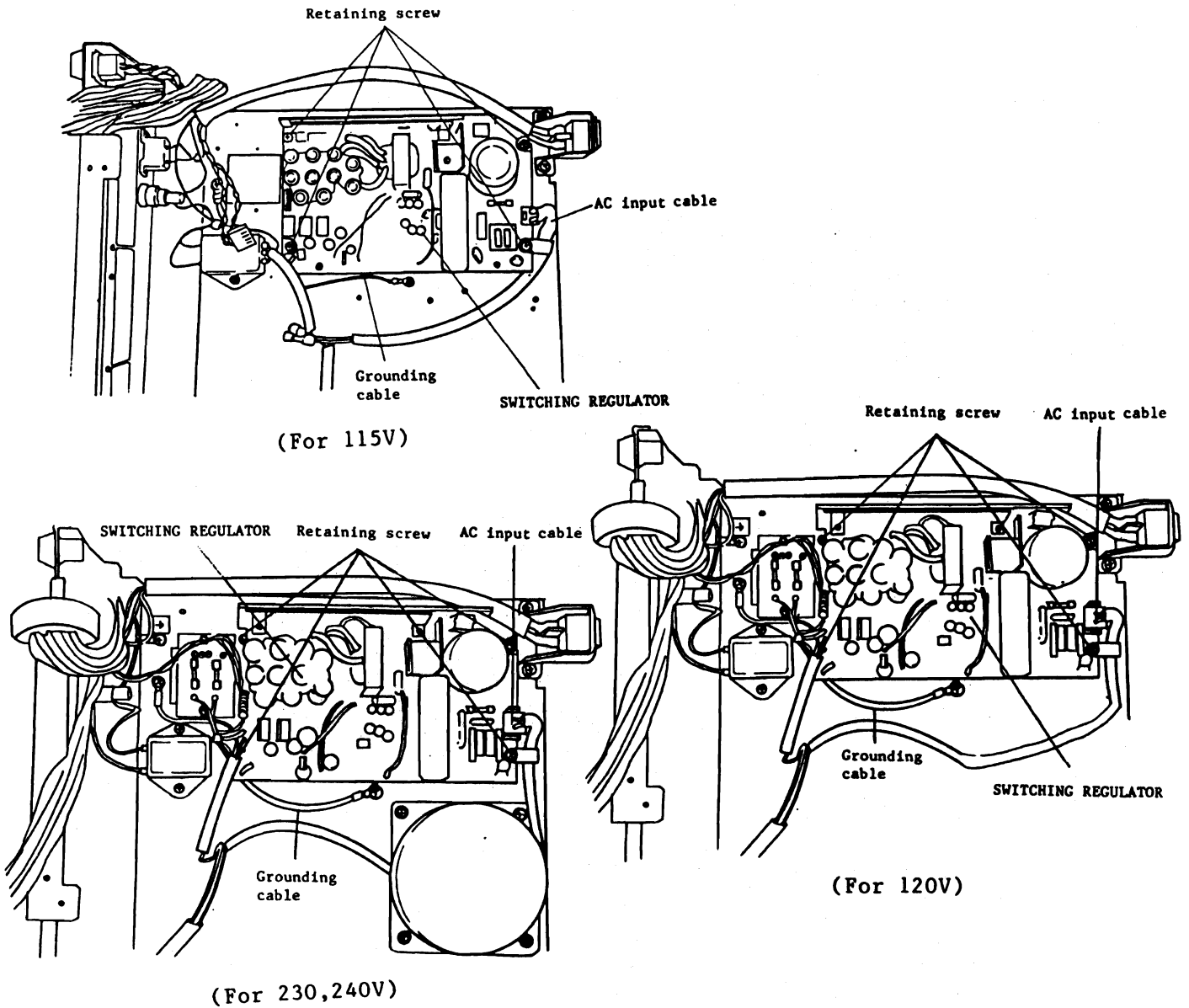


Fig. 5.2.5

- ⑧ Mount replaced SWITCHING REGULATOR in position, and connect both AC input cable and grounding cable to SWITCHING REGULATOR and 5" FDD connector to red CN5.

[Adjustment]

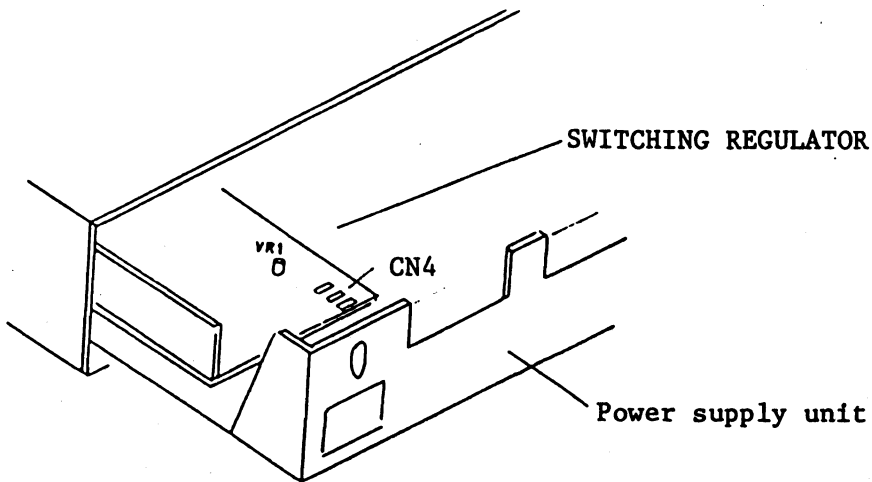


Fig. 5.2.6

Adjust VR1 of SWITCHING REGULATOR shown in Fig. 5.2.6, with insulated screwdriver so that +5V of MOTHERBOARD will be +5.1V.

Use an insulated screw driver since high voltage are applied to heat sink and collector of transistors having caution labe.

Connectors	Connector No.	Pin No.	Voltage
5" FDD internal power supply connector	CN5	1	+12V
		2	GND
		3	GND
		4	+5V
I/O MOTHER power supply connector	CN4	1	-12V
		2	+12V
		3	GND
		4	+5V
MOTHERBOARD power supply connector	CN3	1	-12V
		2	+12V
		3	GND
		4	+5V

Table 5.2.1

5.2.3 CRT unit

Black/White display

- ① Remove both rear and upper covers (see paragraph 3.1)
- ② Disconnect brightness control VR cable and CRT power supply cable from CRT unit and CRT internal cable from CRT-CONT 2 B/W P.C.B.
- ③ As shown in Fig. 5.2.7, mark set position of CRT unit.
- ④ Remove five retaining screws (Fig. 5.2.7) of CRT Unit, and remove it from MAIN UNIT.

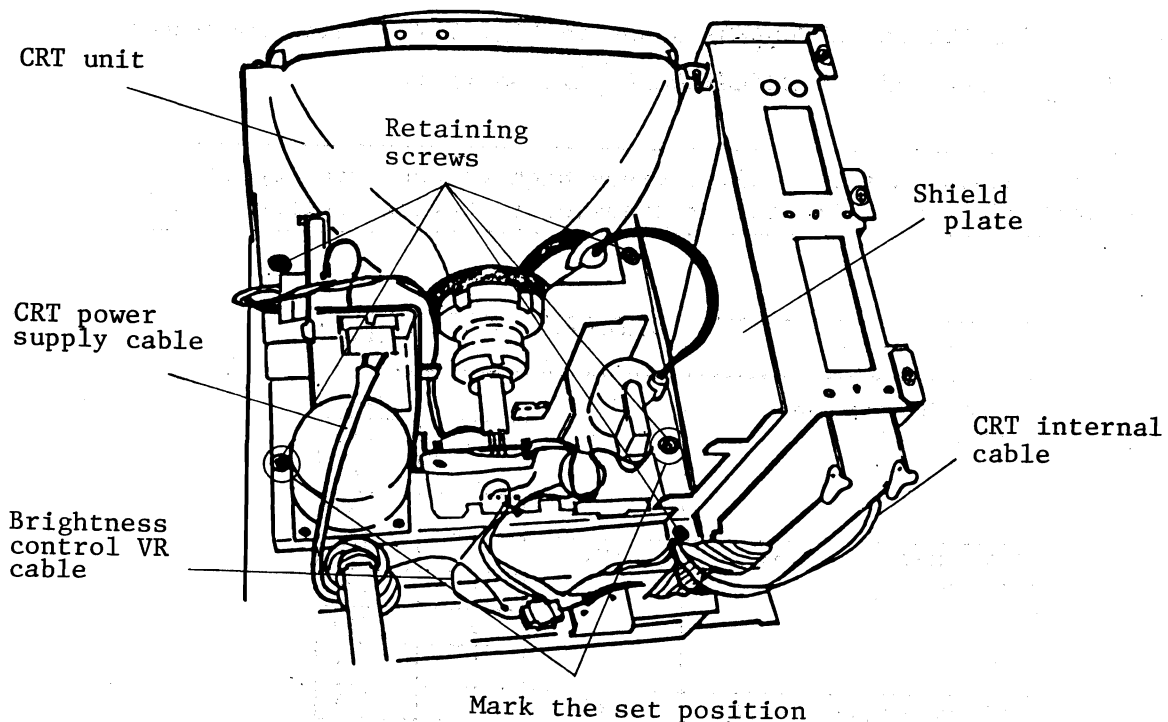


Fig. 5.2.7

- ⑤ Remove shield plate from removed CRT unit by loosening two retaining screws.
- ⑥ Fit shield plate to spare CRT unit.
- ⑦ Mount spare CRT unit to MAIN UNIT, and tighten retaining screws while aligning it to marked set position.
- ⑧ Connect disconnected cables.

Color display

- ① Remove both rear and upper covers as in paragraph 3.1 of chapter 3.
- ② Disconnect brightness control VR, CRT internal cable and CRT power supply cables from CRT unit in Fig. 5.2.8.

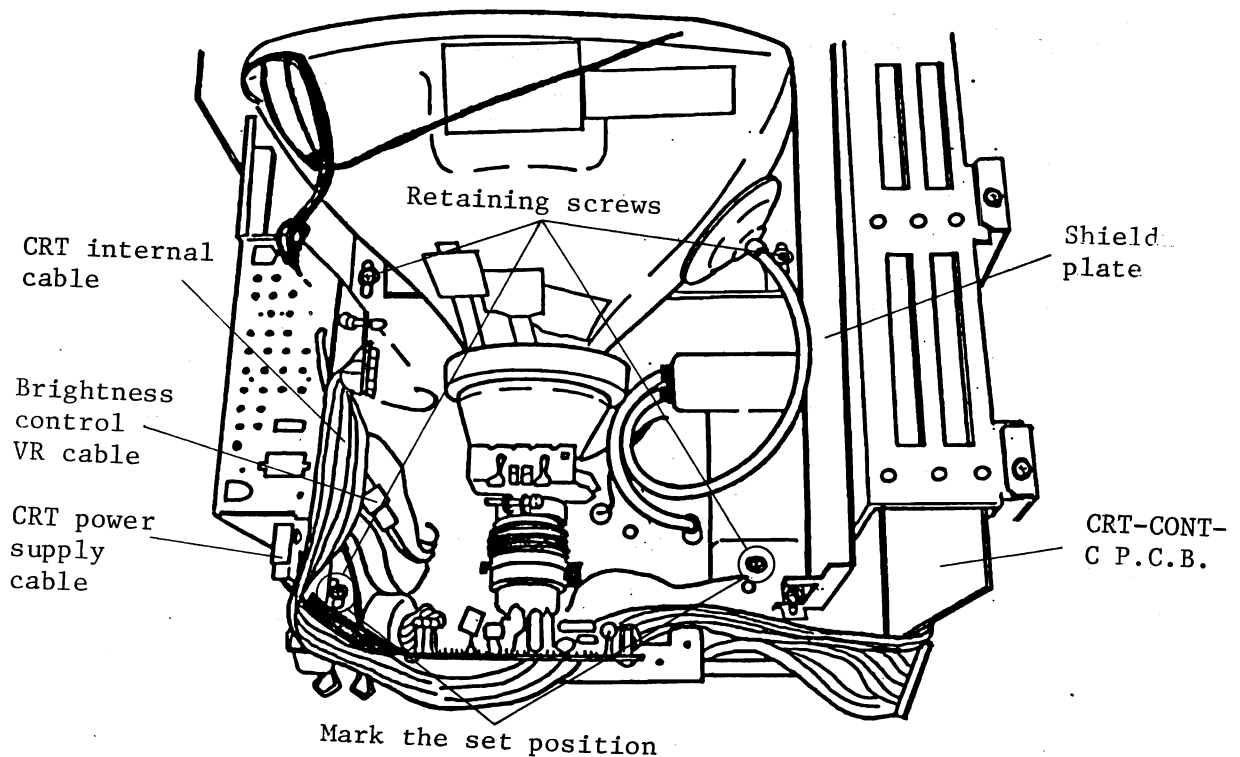


Fig. 5.2.8

- ③ Set position mark of CRT unit.
- ④ Remove four retaining screws of CRT unit. (Fig. 5.2.8)
- ⑤ Cut off the band binding key internal cables which are fixed at the front of CRT unit, and take out the fan cable.
- ⑥ Remove CRT unit from MAIN UNIT, then remove the shield plate from CRT unit by two retaining screws.
- ⑦ Fit shield plate to spare CRT unit.
- ⑧ Mount spare CRT unit to MAIN UNIT, and tighten retaining screws while aligning it to the marked set position.
- ⑨ Connect all disconnected cables.

[Adjustment] (Same for B/W and COLOR)

Confirm the operation with a test program

5.2.4 Fuse replacement

(1) Keyboard fuse on MOTHERBOARD

- ① Remove both rear and upper covers (see paragraph 3.2).
- ② Replace fuse shown in Fig. 5.2.9 on MOTHERBOARD.

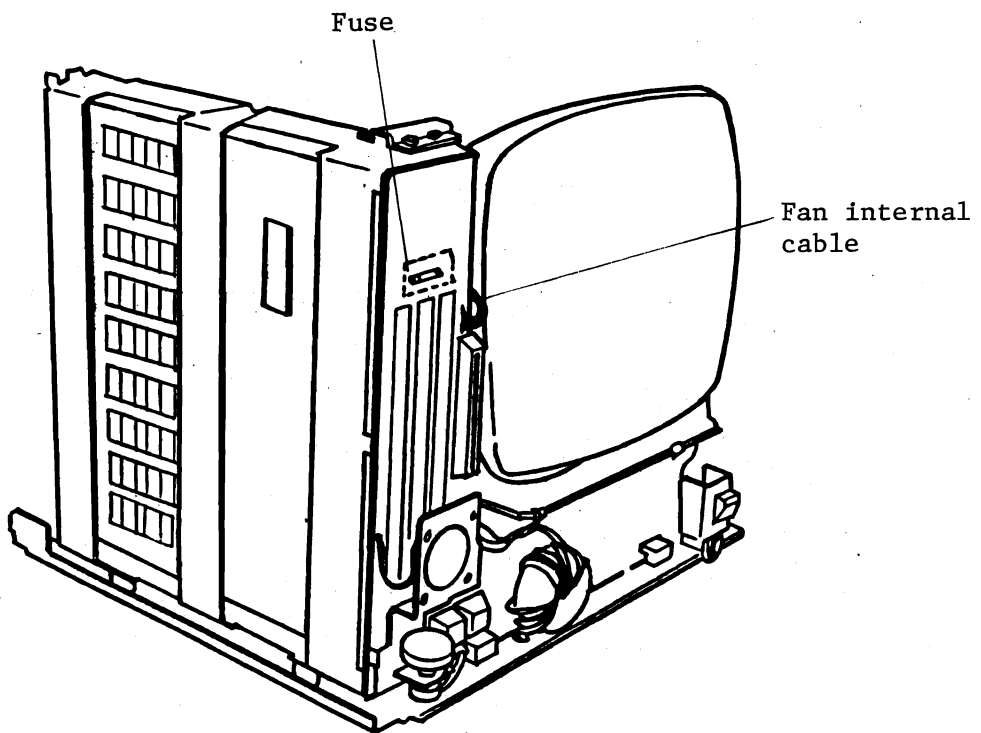


Fig. 5.2.9

(2) 5" FDD fuse

- ① Remove both rear and upper covers (see paragraph 3.2).
- ② Pull out power supply unit about half its depth.
Refer to 5.2.2.
- ③ Replace two 5A fuses as in Fig. 5.2.10.

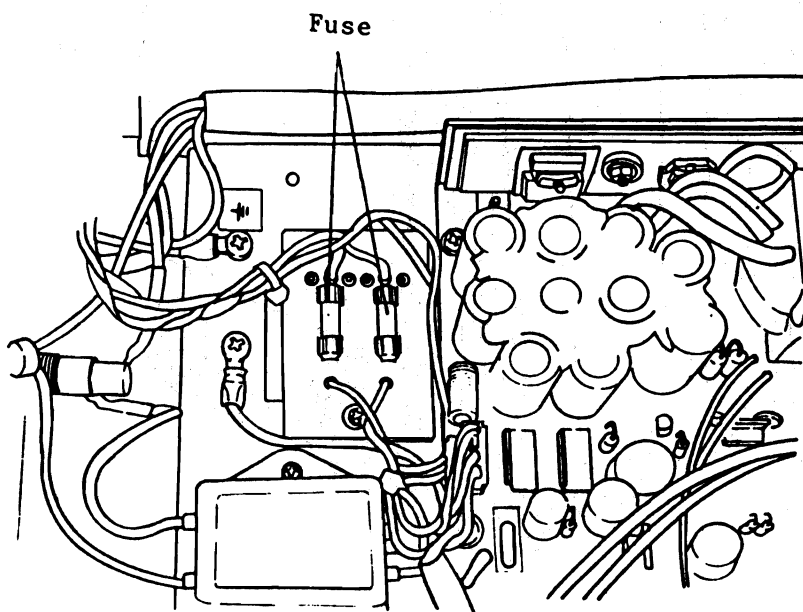


Fig. 5.2.10 (For 120,230,240V)

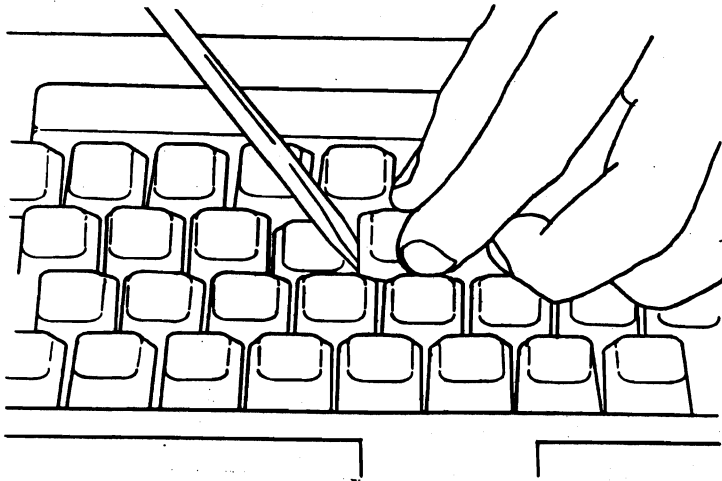
5.3 KEYBOARD

5.3.1 KEYBOARD (outer cover)

- ① Remove outer cover according to paragraph 5.3.2.
- ② Care should be taken not to accidentally cut pointing device cable inside keyboard in removal.

5.3.2 KEY TOP

- ① Remove key top requiring replacing as shown in Fig. 5.2.11.



Fgi. 5.2.11

- ② Apply adhesive to rear side of key top, and set it on its corresponding key stem, firmly pressing key top against stem.

5.4 5" FDD

5.4.1 Mini floppy disk drive (MDD-220)

(1) Replacement

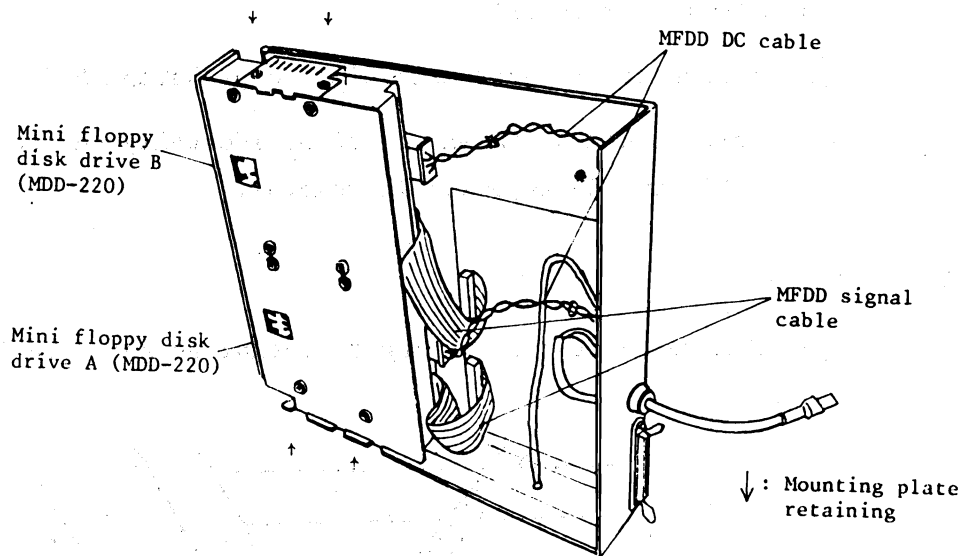


Fig. 5.4.1

- ① Insert shipping sheet 5" into MDD-220
- ② Remove housing plate (see (1) of paragraph 3.3.1)
- ③ Disconnect MFDD signal cable and MFDD DC cable from each MDD-220.
- ④ Remove four retaining screws in Fig. 5.4.1 from mounting plate.
- ⑤ Remove MFDD retaining screws of defective mini floppy disk drive A or B, to remove it from its mounting plate.

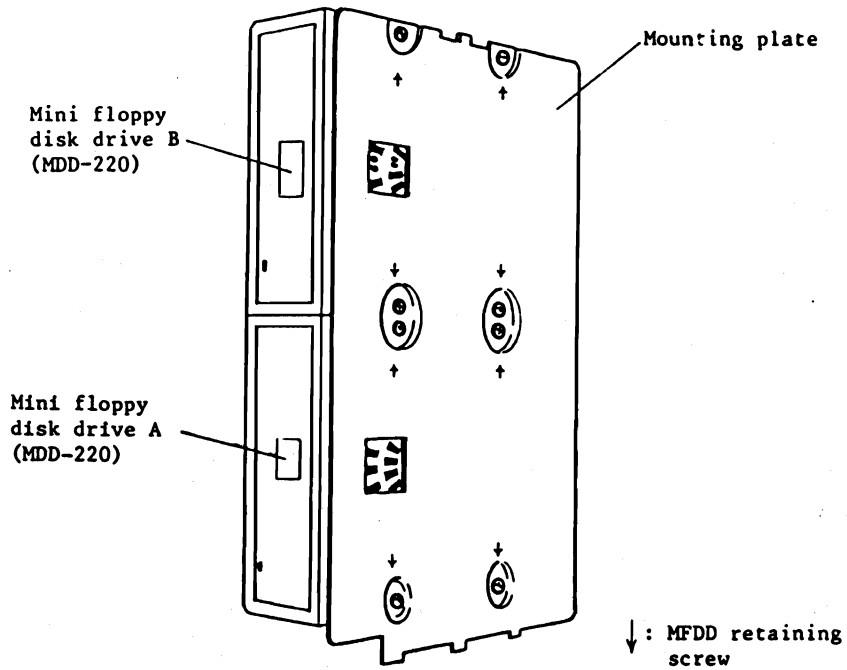


Fig. 5.4.2

- ⑥ Check set position of DIP switch of replacing mini floppy disk drive (see (3) or paragraph 4.2.2), mount mini floppy disk drive according to dismounting reverse procedure.

(2) Adjustment

Check the operation a test program.

5.4.2 5" FDD-I/F P.C.B.

(1) Replacement

- ① Remove housing plate ((1) of paragraph 3.3.1).
- ② Disconnect both MFDD signal cable and MFDD DC cable from mini floppy disk drives A and B.
- ③ Disconnect grounding cable from 5" FDD-I/F P.C.B.
- ④ Remove five retaining screws from 5" FDD-I/F.
- ⑤ Remove 5" FDD power cable clamp from two retaining screws from chassis of 5" FDD-I/F P.C.B.
- ⑥ After confirming set positions of 5" FDD-I/F P.C.B. switches (see (2) of paragraph 4.2.2), mount the replaced 5" FDD-I/F P.C.B. according to dismount reverse procedure.

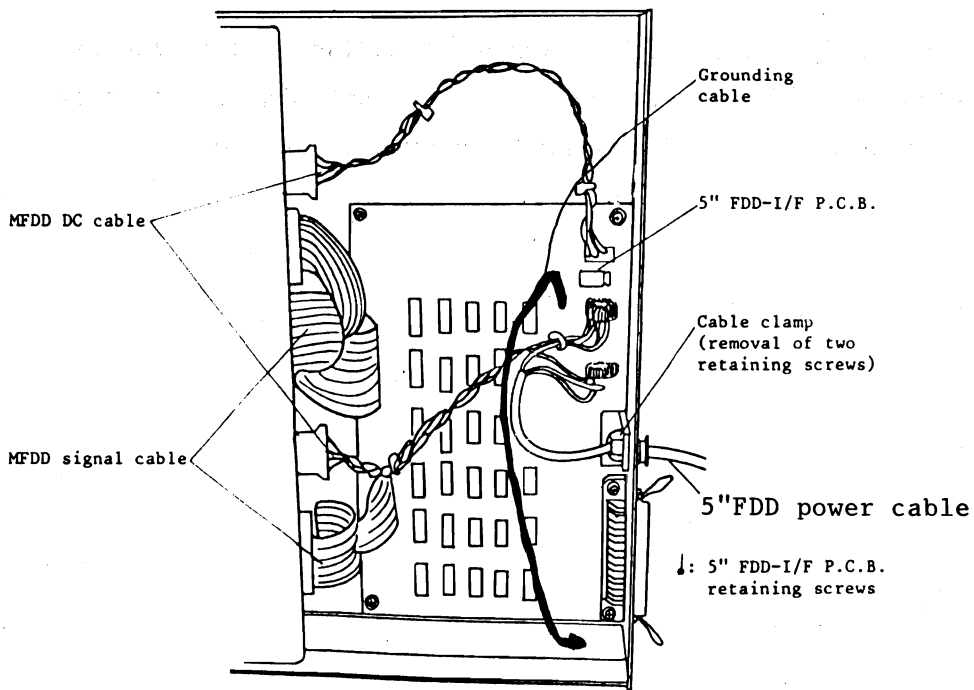


Fig. 5.4.3

(2) Adjustment

Check the operation with a test program.

5.5 8" FDD

5.5.1 Floppy disk drive (YD-180)

(1) Replacement

- ① Insert shipping sheet 8" into YD-180.
- ② Remove outer cover (see (1) or paragraph 3.4.1).
- ③ Take out SFD signal cable from tie band.
- ④ Disconnect SFD signal cable and DC cable from 8" FDD-I/F PCB.
- ⑤ Disconnect DC cable from YD-180 and also fan DC cable.
- ⑥ Remove six retaining screws specified in Fig. 5.5.1.

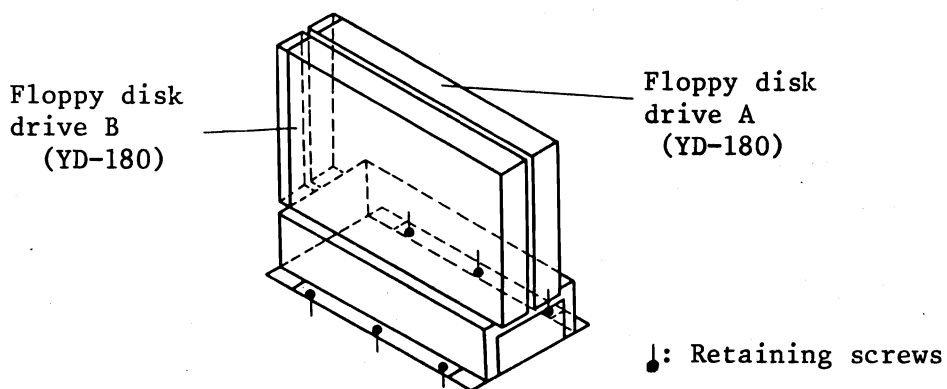


Fig. 5.5.1

- ⑦ Disconnect SFDD signal cable from YD-180.
- ⑧ Remove six retaining screws of floppy disk drive mounting plate (A).

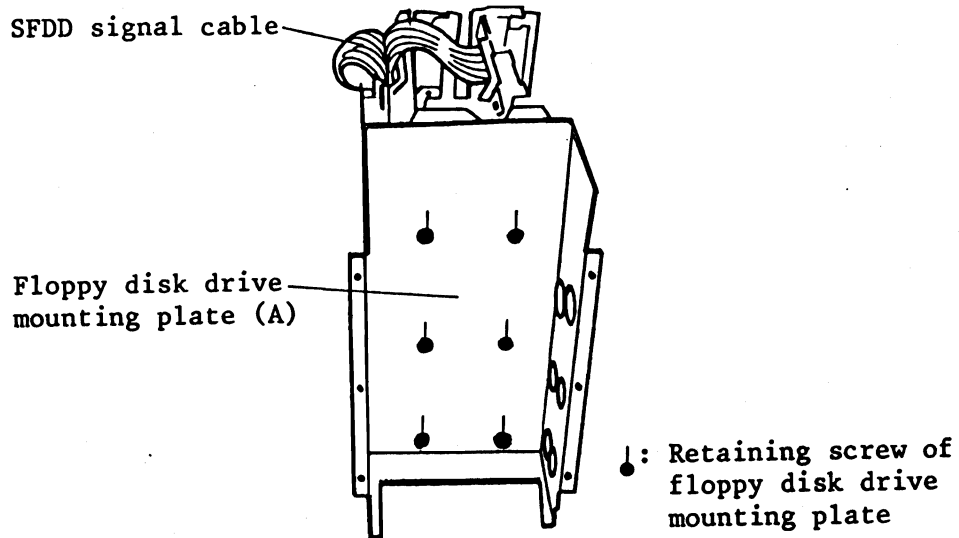


Fig. 5.5.2

- ⑨ Remove defective YD-180 from floppy disk drive mounting plate (B).

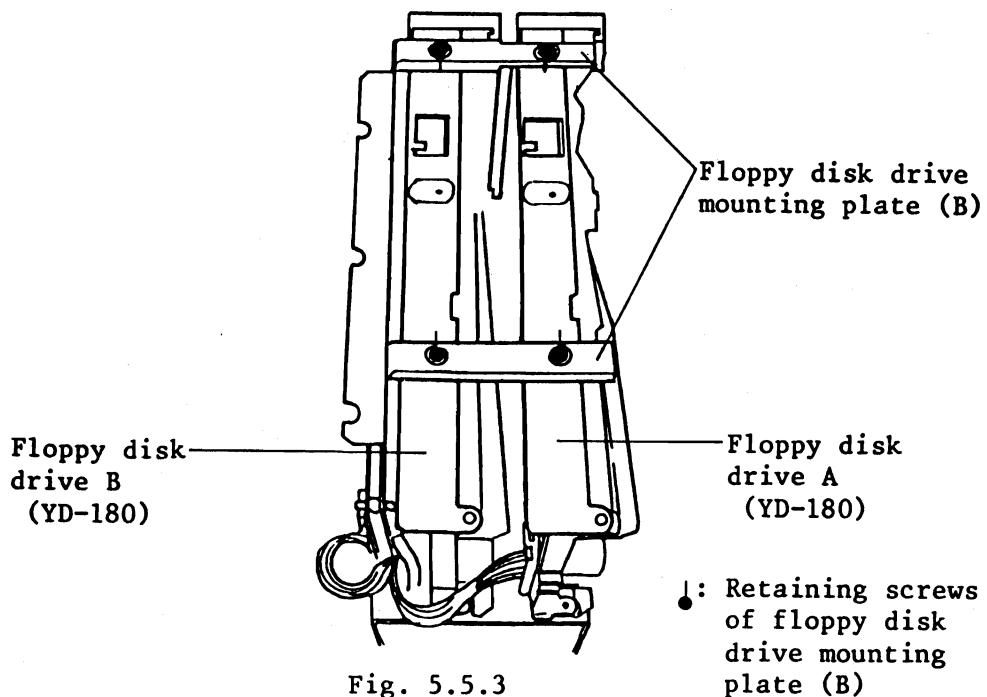


Fig. 5.5.3

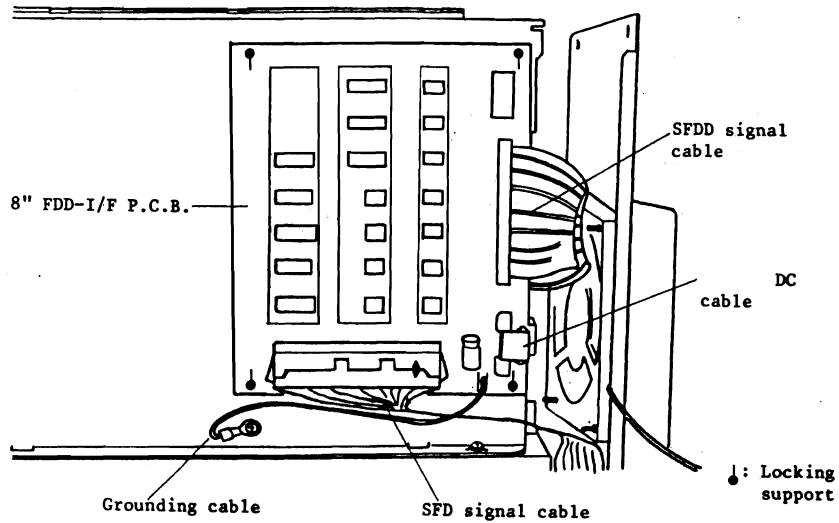
⑩ After confirming set positions of replacing YD-180 switches (3) of paragraph 4.2.2 , mount YD-180 in removal reverse procedure.

(2) Adjustment

Confirm the operation with a test program.

5.5.2 8" FDD-I/F P.C.B.

(1) Replacement



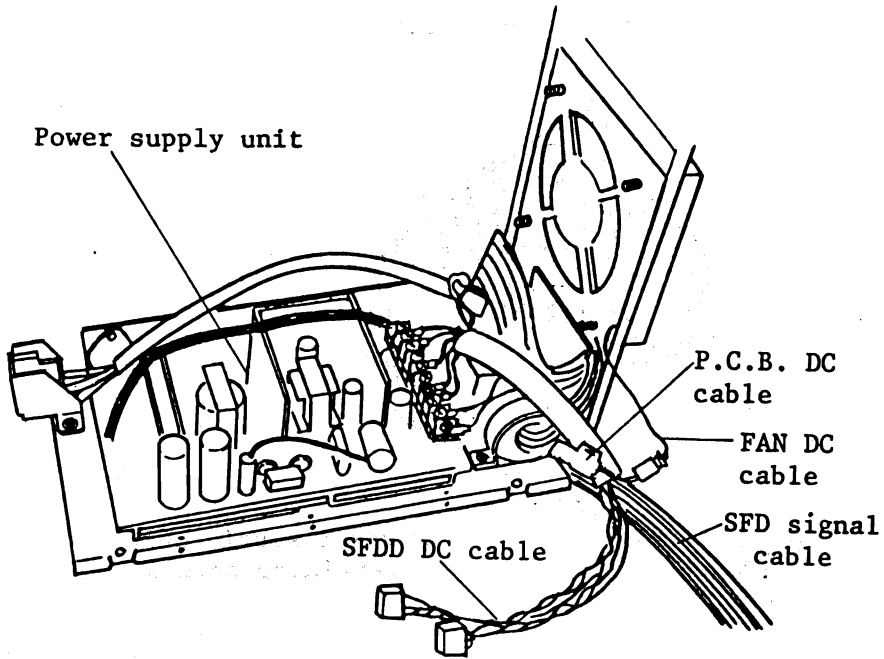
- ① Remove housing plate ((1) of paragraph 3.4.1).
- ② Disconnect grounding cable from 8" FDD-I/F P.C.B.
- ③ Disconnect FDD signal cable and DC cable from 8" FDD-I/F P.C.B.
- ④ Disconnect SFDD cable from YD-180.
- ⑤ Remove four locking support from 8" FDD-I/F P.C.B.
- ⑥ After confirming set positions of replacing 8" FDD-I/F P.C.B switches (see paragraph 4.2.2), mount 8" FDD-I/F P.C.B according to opposite removal procedure.

(2) Adjustment

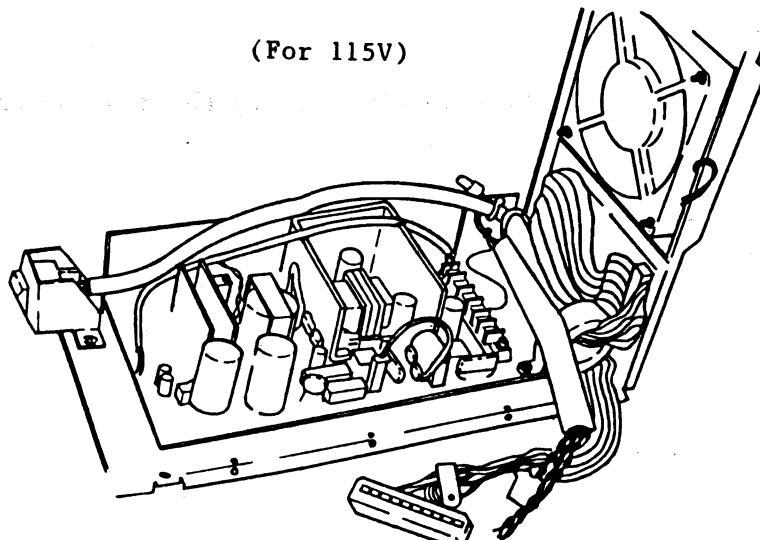
Confirm the operation with a test program.

5.5.3 Power supply unit

5.5.1 Referring to ② ~ ⑥ of paragraph 5.5.1 (1) remove power supply unit.



(For 115V)

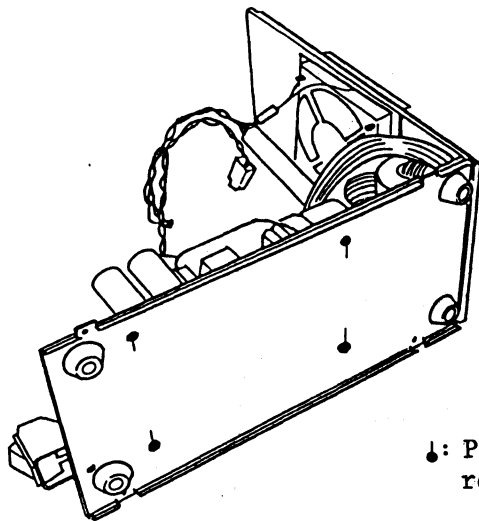


(For 120, 230, 240V)

Fig. 5.5.5

Replacement of power supply unit

- ① Disconnect all cables from power supply unit.
- ② Remove four retaining screws from rear side of base plate to remove power supply unit.



•: Power supply unit retaining screws

- ③ Mount replacing power supply unit in the reverse way to the removal.

8" FDD Fuse

- 1) Replace two 5A fuses 8" FDD as in Fig. 5.5.7.

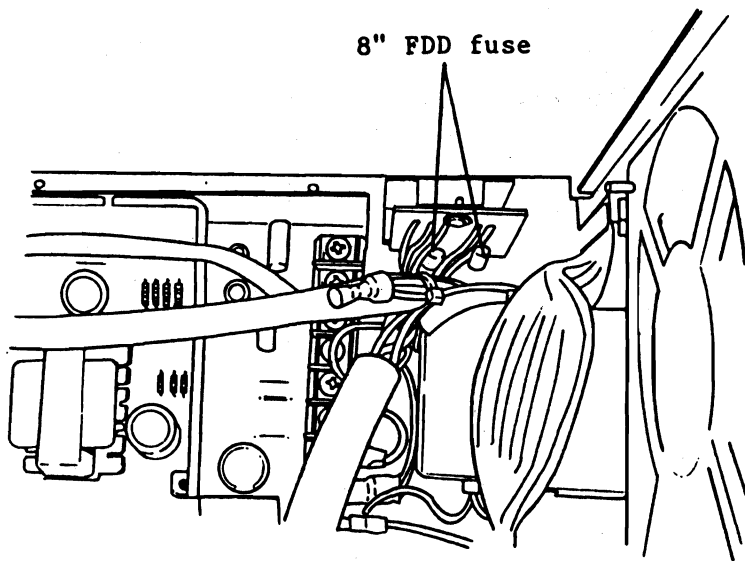
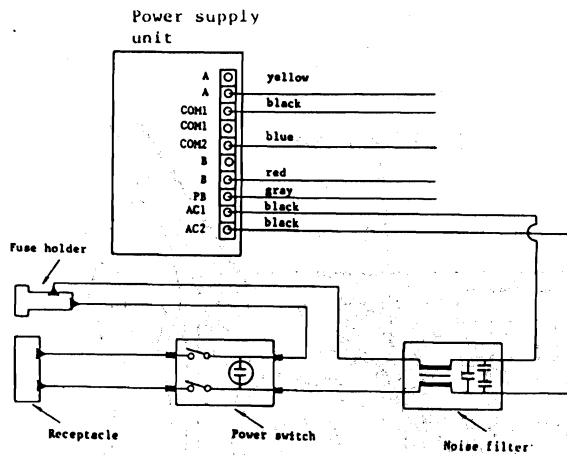


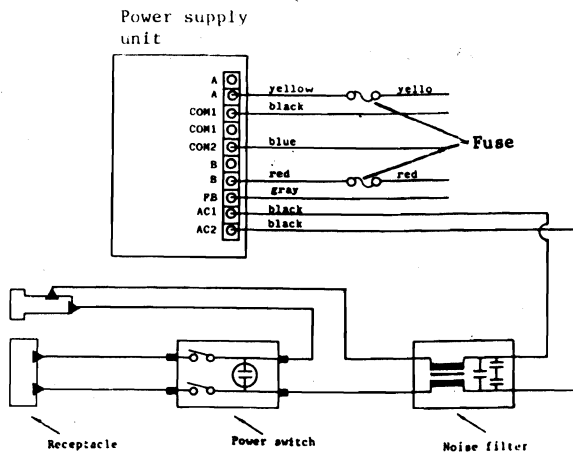
Fig. 5.5.7

Table 5.5.1

Cables	Pin No.	Cable color	Voltage	Destination
SFDD DC cable	1	Red	+24V	YD-180 x 2
	2	Blue	GND	
	3	Yellow	+5V	
	4	Black	GND	
	6	Brown	GND	
P.C.B. DC cable	1	Yellow	+5V	8"-FDD-I/F P.C.B.
	2	Black	GND	
FAN DC cable	1	Blue	GND	FAN
	2	Red	+24V	



(For 115V)



(For 120,230,240V)

Fig. 5.5.8

ADJUSTMENT

Adjust the VR101 with an insulated screw-driver so that +5V may be obtained at the +5V terminal of the power supply.

Chapter 6 Periodical Maintenance

6.1 5" FDD

6.1.1 Periodical maintenance items

6.1.2 Periodical maintenance

6.2 8" FDD

6.2.1 Periodical maintenance

6.2.2 Periodical maintenance

6.3 PRINTER

Chapter 6 Periodical Maintenance

Following units require periodical maintenance.

- ① 5" FDD (MDD-220) Yearly
- ② 8" FDD (YDD-180) Yearly
- ③ PRINTER

Following tools are necessary for periodical maintenance.

- 1) CLEANING DISKETTE 5"
- 2) CLEANING DISKETTE 8"

Periodical maintenance includes cleaning MAIN UNIT and other devices.

6.1 5" FDD (MDD-220)

6.1.1 Periodical maintenance items

- (1) Cleaning head Yearly

6.1.2 Periodical maintenance procedure

With CLEANING DISKETTE 5", clean head of 5" FDD for 5 seconds while running "TRK ADJ" test program.

For details regarding TRK ADJ test program, refer to "TEST PROGRAM OPERATIONAL MANUAL" provided separately.

6.2 8" FDD (YD-180)

6.2.1 Periodical maintenance items

- (1) Cleaning head Yealy

6.2.2 Periodical maintenance procedure

With CLEANING DISKETTE 8", clean head of 8" FDD for 1 minute while running TRK ADJ test program.

For details regarding TRK ADJ test program, refer to the "TEST PROGRAM OPERATIONAL MANUAL" provided separately.

6.3 PRINTER

Refer to certain printer "TECHNICAL GUIDE".

Chapter 7 Troubleshooting

7.1 At System Up.

7.1.1 Error message 1

7.2 OS control error

7.3 System and μ debugger commands

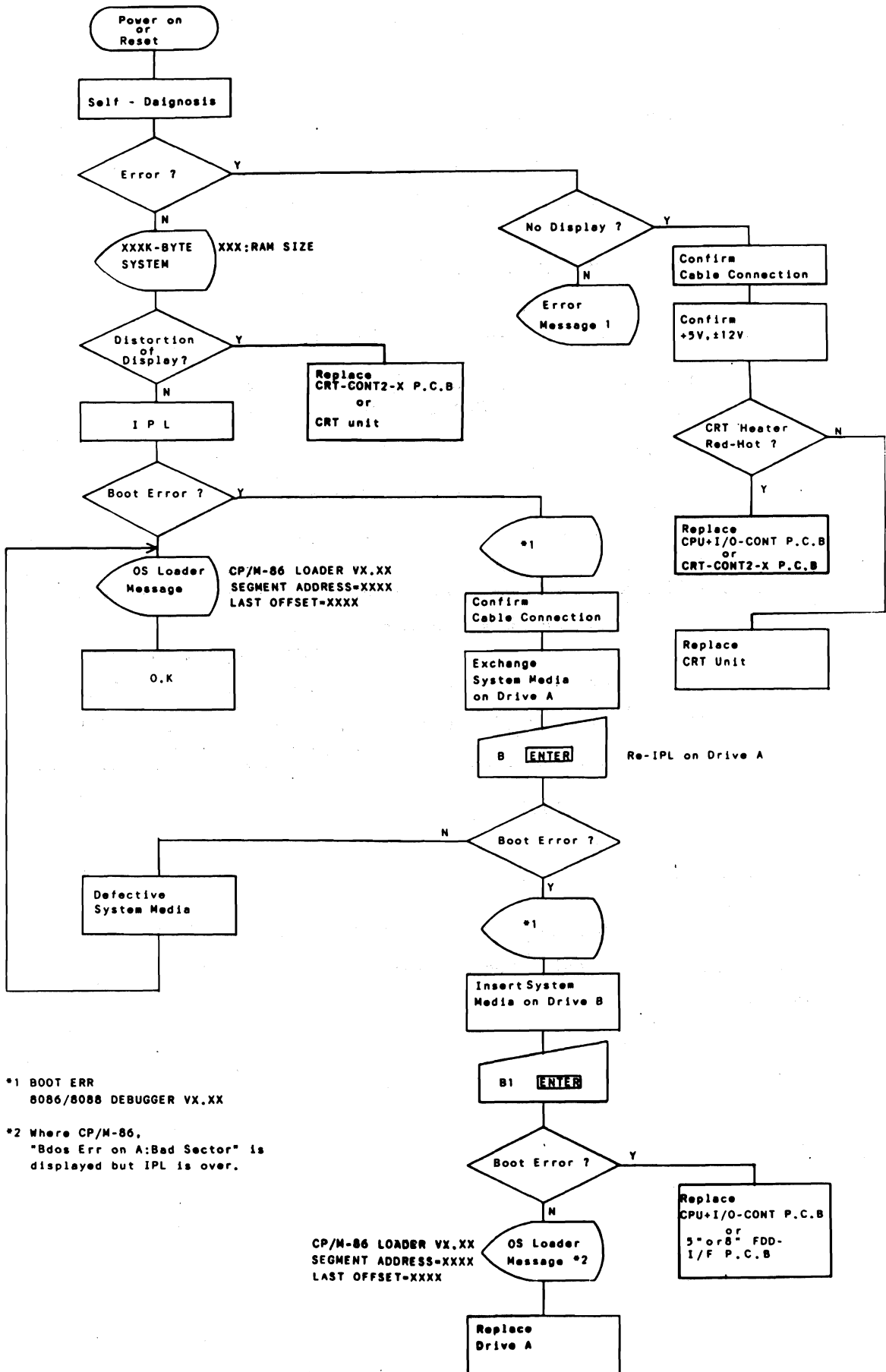
7.3.1 MSDOS system command

7.3.2 CP/M-86 system command

7.4 DCOPY (media copy program) operation

Chapter 7 Troubleshooting

7.1 At System Up.



*1 BOOT ERR
8086/8088 DEBUGGER VX.XX

*2 Where CP/M-86,
"Bdos Err on A:Bad Sector" is
displayed but IPL is over.

Fig. 7.1.1

7.1.1 Error message 1

When a trouble is detected in initial check of self-analysis, CRT display displays the following error message:

① RAM ERR AT XXXX : XXXX
 └─── Offset
 └─── Segment

Remedy: Replace CPU + I/O-CONT P.C.B.
 Optional memory P.C.B

② ERR CODE = XX
 └─── Error code No.

Error code No.	Cause	Remedy
02	ROM check sum error	Replace ROM Replace CPU-E P.C.B.
03	PTM-6840 error	Replace CPU-E P.C.B.
04	Key circuit error	Replace I/O CONT P.C.B. Replace KEYBOARD

Table 7.1.1

7.2 OS control error

For error correction, refer to CP/M Users 'Guide or MSDOS Users' Guide. After troubleshooting, always apply a test program to the system.

7.3 System and μ -debugger commands

Two MSDOS and CP/M-86 system commands are available, depending on the application of OS control.

Command concerning to hardware are described here, and for other commands and their details, see MSDOS User's Guide or CP/M-86 User's Guide.


μ -debugger commands are debugger commands designated in firmware.

7.3.1 MSDOS system commands

(1) Control character commands

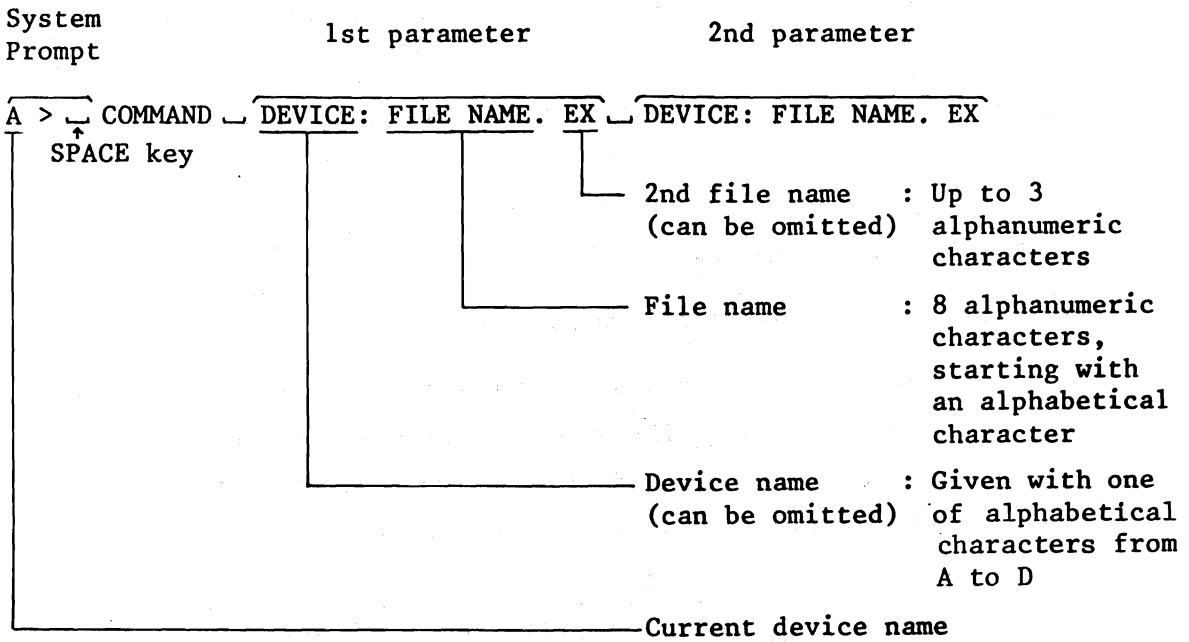
Each of control character commands is entered by combination of **CTRL** key with some specific key.

Each of these commands is applicable even when the CRT display is not showing system prompt (for ex. A>).

Control characters	Description of controls
CTRL-C	Return of system from execution program (control is effective when input of program output).
CTRL-P	Halt hard copy operation.
CTRL-P	Restart hard copy operation.
CTRL-S	Temporary stop (release is by any key).
CTRL-CANCEL	Same as CTRL-C (command clears previous data entry).
CTRL-ALTER-DELETE	Software reset (execute at IPL)
CTRL-  -CLEAR SCREEN	Hard copy.

(2) Built-in commands

The built-in commands is entered only when CRT display is showing system prompt (For ex. A >) which are used in combination with certain parameters.



For file name and EX, wild card "*" and character conversion symbol "?" are available.

Command entry is terminated by pressing [↵] key or [ENTER] key.

2nd file name	Comment
BAT	Batch file
COM	Command file
EXE	User-program object

Table 7.3.2

COPY (File Copy)

COPY \curvearrowright 1st parameter \curvearrowright 2nd parameter
(2nd parameter is omissible.)

Contents of the 1st parameter file are copied in 2nd parameter file.

• 2nd parameter file, a new file is prepared.

• When 2nd parameter is omitted,

1st parameter matches current device \rightarrow Error

1st parameter unmatches current device \rightarrow Copy onto
current device

• Command ends with message "0 File(s) Copied" at error.

DEL (File Delete)

DEL \curvearrowright 1st parameter

1st parameter file is deleted.

DIR (Directory Display)

DIR \curvearrowright 1st parameter

(1st parameter is omissible.)

Directory of 1st parameter file is displayed.

• When 1st parameter is omitted, directory for all files is displayed.

REN (File Rename)

REN \curvearrowright 1st parameter \curvearrowright 2nd parameter

Name of 1st parameter file is renamed into 2nd parameter file name.

- . The 2nd parameter device name is omitted.
- . Both the wild card (*) and the character conversion symbol (?) cannot be used with 1st parameter.

TYPE (Type File Contents)

TYPE ↵ 1st parameter

Contents of 1st parameter file are displayed in character format.

DATE (Date Entry) (Media must be set as required.)

DATE

Current date is MM-DD-YYYY

Enter a new date:

Current date display and registration of new date.

- . When there is no reregistration only enter **ENTRY** key.
- . For a misinput, "INVALID DATE" is displayed and requests re-entry.

TIME (Time Entry) (Media must be set as required.)

TIME

Current time is HH:MM:SS:CC.

Enter a new time:

Current time display and registration of new time.

- . When there is no reregistration, only enter **ENTRY** key.
- . For misinput, "INVALID TIME" is displayed and request re-entry.

FORMAT (Formatter)

FORMAT \lfloor 1st parameter

Initialize media of 1st parameter device.

- . 1st parameter is only device name.
- . 5" floppy disk 512 bytes/sector
- 8" floppy disk 1024 bytes/sector

7.3.2 CP/M-86 system commands

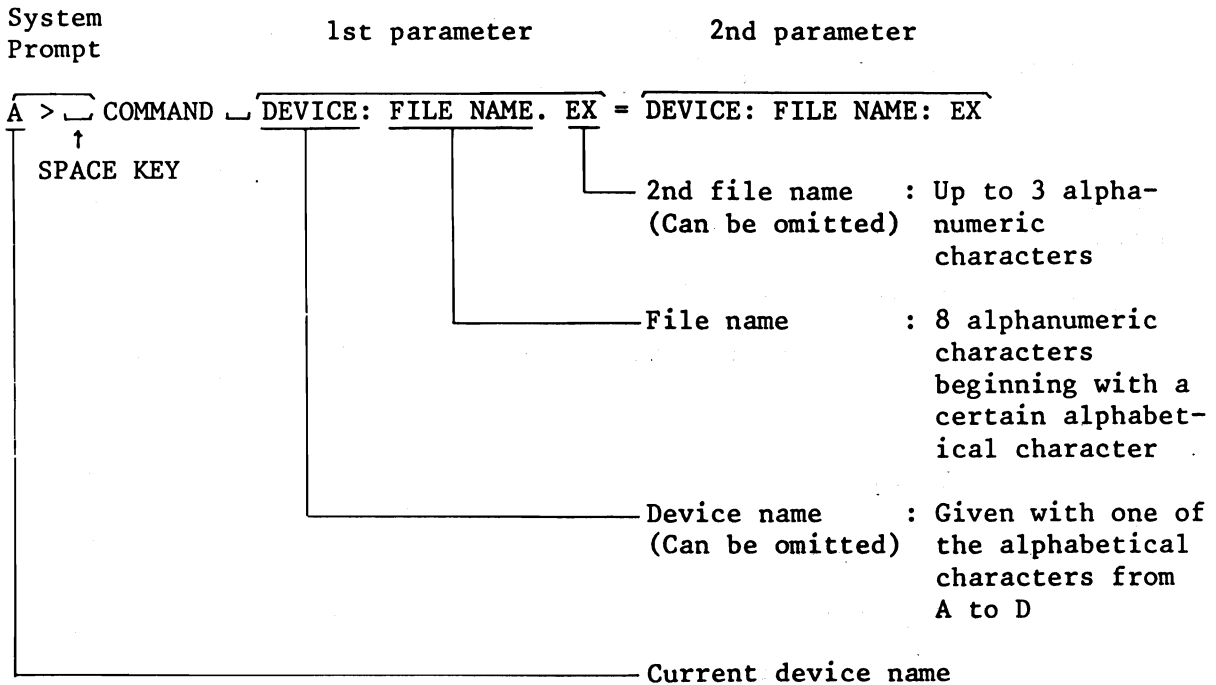
(1) Control character commands

Characters	Description
CTRL-C	Current program under specified console is suspended.
CTRL-E	Returns printer carriage, but this command is not transferred to CP/M-86.
CTRL-H	Back space
CTRL-J	Ends data input and line feed.
CTRL-M	Similar to command of carriage return.
CTRL-P	This command echoes all commands designated from the console to the printer. When this command is input once more, it stops echoing the via console commands to the printer. This command is effective only when the printer is connected to the computer system.
CTRL- <u>R</u>	Current command typed in again, CTRL-R command is serviceable after pressing RUN or DEL key.
CTRL-S	Temporarily stops output of list into console, however, same command is input once more, the output is resumed. Console list.
CTRL-U	Deletes line. While at the same time, CRT display shows#, with console moving down by one line and waiting for a new command.
CTRL-X	All characters in line with are deleted.
CTRL-Z	String or field separator.

Table 7.3.3

(2) Built-in commands

The built-in commands can be entered only when CRT display is showing system prompt (for ex. A>) which are in combination with some parameters.



For file name and EX, the wild card "*" and the character conversion symbol "?" are available.

Command entry ends by pressing or ENTER key.
 key.

2nd file names	Comment
SUB	Batch file
COM	User-prepared object
SYS	Module of the CP/M-86

Table 7.3.4

DIR (Directory Display)

DIR \hookrightarrow 1st parameter

Directory of 1st parameter file is displayed.

- . When 1st parameter is omitted, all directories of user numbers (specified by user command) of current device are displayed; however, SYS file is not displayed.

DIRS (System Directory Display)

DIRS \hookrightarrow 1st parameter

DIRS is the same as DIR, except for SYS file display.

ERA (File Erase)

ERA \hookrightarrow 1st parameter

1st parameter file is deleted.

- . Enter Y or N while "ALL=Y/N ?" is displayed.

REN (File Rename)

REN \hookrightarrow 1st parameter = 2nd parameter

1st parameter file name is renamed in 2nd parameter file name.

- . Note that designation of 1st parameter device name must be the same as 2nd parameter device name.

TYPE (Type File Contents)

TYPE \hookrightarrow 1st parameter

The contents of 1st parameter file are displayed in character format.

USER (User Number)

USER \hookrightarrow n n = 0 \sim 15

CRT display shows a current user number; n, the user number is changed by entering parameter n.

Following commands are available only when system media is set as required.

COPY DISK (Copy Disk)

COPY DISK

Entire contents of one floppy disk are copied onto another floppy disk. Enter following parameters after entering this command.

Enter Source Disk Drive (A-D)?

Destination Disk Drive (A-D)

Is this what you want to do (Y/N)?

Copy another disk (Y/N)?

PIP (Peripheral Interchange Program)

PIP \hookrightarrow 1st parameter \hookrightarrow Gn = 2nd parameter
(n of Gn is a user number)

Contents of 2nd parameter file are copied in 1st parameter file.

. When 1st parameter represents a device number only, 2nd parameter is copied as it is.

- . When Gn is not designated, copy onto a current user number file.

STAT (Status Display)

STAT \lfloor d: \lfloor (d means drive number)

CRT display shows floppy disk status.

- . When "d" is not designated, the status of each of the entire usable floppy disk drives is displayed.
- . Status over the usable area is given in the K-byte unit.

STAT \lfloor 1st parameter \lfloor SIZE

Attribute of file is displayed as follows:

- . When SIZE is omitted, the file size is not displayed.

File size	No. of records	File capacity	<u>FCB</u> number
Attribute	File name		(File Control Block)

STAT \lfloor 1st parameter \lfloor $\begin{matrix} \text{RO} \\ \text{RW} \end{matrix}$ \lfloor $\begin{matrix} \text{SYS} \\ \text{DIR} \end{matrix}$

RO : Read only	}	These two cannot be specified at the same time.
RW : Read/Write		

SYS: System access	}	These two cannot be specified at the same time.
DIR: Directory access		

Specify attribute of file

- . No omission of both RO/RW and SYS/DIR.

STAT \lfloor d: \lfloor $\begin{matrix} \text{DSK:} \\ \text{USR:} \end{matrix}$

Status of the designated floppy disk drive (DSK) or a user number (USR) is displayed.

STAT \lfloor VAL:

CRT display displays a general type of STAT command and a physical device name.

Commands are also applied in other means. For details, see CP/M Users' Guide.

TOD (Time or Date)

TOD \lfloor TIME SPEC
P

Current date and time display and exchange them.

- . TIME SPEC is designated in format of MM/DD/YY, HH:MM:SS.
- . With P parameter, the date and time are displayed continuously (display stops by entering any key).

FORMAT (Formatter)

FORMAT \lfloor 1st parameter

Media of 1st parameter device is initialized.

- . 1st parameter is only device name.
- . 5" floppy disk 512 bytes/sector
- . 8" floppy disk 1024 bytes/sector

7.3.3 μ -debugger commands

The μ -debugger is built in ROM of CPU. The vector tables other than those of single step, NMI, and break point and addresses from 400H \sim FFFFF_H (address from 350_H \sim 3FF_H is appropriated for μ -debugger) within system memory area are accessible.

I/O memory area except in DISPLAY CONT are also accessible.

(1) Command table

Commands and their meanings	Key operations (See abbreviations)
B (Boot)	B[<N>] [D]<CR>
D (Display Memory)	D[W]<ADDR>[,<ADDR2>]<CR>
G (Go)	G<CS:IP><OLD>[<ADDR>[,<BRK>]]<CR>
I (Port Input)	I[W]<PORT><CR/,>
N (Single Step)	N<CS:IP><OLD>[<ADDR>]<CR/,>
O (Port Output)	O[W]<PORT>,<NEW><CR/,>
R (Read Hex File)	R[<BIAS>]<CR>
S (Substitute Memory)	S[W]<ADDR>,<OLD>[<NEW>]<CR/,>
X (Examine/Modify Register)	X<CR> X<REG><OLD>[<NEW>]<CR/,>

Table 7.3.5

Any of alphabetical characters within [] can be omitted from designation.

Underlined alphabetic characters are debugger outputs.

Any of alphabetical characters within < > is an abbreviation.

Abbreviations

D:

Sometimes specified with a BOOT command which signifies that a debugger return is effected after ending Boot.

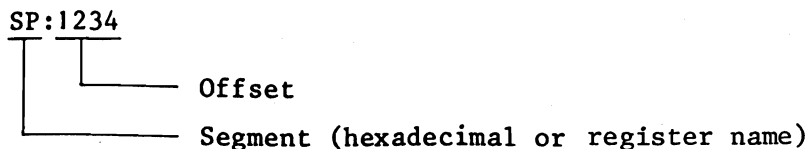
W:

Sometimes specified after a command which signifies that the contents of operation to be done with this command are word unit. If W is not designated, the contents above are byte unit.

<ADDR>

For address which designates address both segment and offset. When an omission is made from specified segment, contents of CS are specified. The specification with numeric value in hexadecimal notation of four digits. The name <REG> register is specified for a numeric value.

[Example]



<ADDR2>

For 2nd address with value of segment given with a <ADDR>, therefore, the designation is of an address only with numeric value in hexadecimal within four digits. The name of the register is specified for a numeric value.

<BIAS>

Represents bias at program loading with designation of a numeric value in hexadecimal and within four digits. The name of the register is a designatable for a numeric value.

<BRK>

Signifies break point with designation been the same as <ADDR>.

<CR>

Key entry of carriage return.

<CR/,>

For key entry of carriage return or comma. When the carriage return key is entered, μ -debugger is waiting for command entry. On the other hand, if comma key is entered, the same command will be executed at succeeding address. The succeeding address remarked here signifies the following.

- . Current address +1 (however, I and O commands are excluded) in the case of the byte access command.
- . Current address +2 in the case of the word access command.
- . Current address + number of bytes of the executed command in the case of the single step command.

<CS:IP>

For display message with contents of code segment and instruction pointer displayed in hexadecimal and within four digits.

<N>

Designated Boot device No. with n=0 corresponding to drive A.

<NEW>

New data is to be loaded into each register or memory. Depending on command, data is designated in hexadecimal and with two or four digits.

<OLD>

Read data in each register or memory. The data is displayed in the hexadecimal and with two or four digits, depending on the command.

<PORT>

Designated port address in hexadecimal with four digits.

<REG>

Each register of 8088 is indicated with two alphabetical characters as in the Table below:

Register Name	Abbreviation
Accumulator	AX
Base	BX
Count	CX
Data	DX
Stack Pointer	SP
Base Pointer	BP
Source Index	SI
Destination Index	DI
Code Segment	CS
Data Segment	DS
Stack Segment	SS
Extra Segment	ES
Instruction Pointer	IP
Flag	FL

Table 7.3.6

(2) Operation Procedure

START

Following two methods are available for starting debugger.

- (1) Turn on power switch of MAIN UNIT without media setting in drive "A". At this CRT display gives the message of debugger start and it successively indicates "*" and waiting for debugger command entry.
- (2) Press **STOP** key when running. Contents of CS and IP are displayed in hexadecimal with four digits following "@". Then, CRT display shows "*" for command entry. Initial display of each content is not always given on the left side or the *-display area of CRT screen.

COMMANDS

B (Boot)

B [<N>][D]<CR>

Initial boot is performed with the floppy disk drive "A". N is fixed to "0". If D has been designated, a debugger returns into initial boot.

D (Display Memory)

D[W]<ADDR>[,<ADDR2>]<CR>

Contents of respective addresses from <ADDR> to <ADDR2> are displayed in word or byte unit. If <ADDR2> is omitted, address contents of <ADDR> are displayed. Both segment and address concerned are displayed, prior to the display.

When address <ADDR2> is smaller than that of <ADDR>, error message is displayed.

G (Go)

G<CS:IP><OLD>[<ADDR>[,<BRK>]]<CR>

Execute the program

If=<CS:IP> is set execution begins at the address specified to execution start at address specified, enter <CR>, or to change execution address, enter <ADDRESS> as specified, to set break point, enter <CR> after <BRK> input. When <BRK> is designated, following message BR@<CS:IP> displayed and returns to command.

I (Port Input)

I[W]<PORT><CR/,>

When contents of designated port are displayed, then enter <CR/,>. When comma is entered, contents of the same port is displayed at a time difference of same displayed port.

N (Single Step)

N<CS:IP><OLD>[<ADDR>]<CR/,>

Contents of designated CS and IP are displayed in hexadecimal and with four digits. Enter <CR/,> to execute single step. To change the address of the program execution, enter <ADDR> with its entry, and next instruction CS and IP is displayed after current instruction has been executed.

O (Port Output)

O[W]<PORT>,<NEW><CR/,>

Data set at designated port. If comma is entered,

the hyphen is displayed, allowing the succeeding data to be set at the same port (at this time, the designated same port is given some time difference).

R (Read Hex File)

R[<BIAS>]<CR>

Data of Intel Hexa Format is transferred from RS-232C inside I/O controller to memory. When <BIAS> is designated, each load address + <BIAS> is done before data load.

S (Substitute Memory)

S[W]<ADDR>,<OLD>[<NEW>]<CR/,>

Contents of the address <ADDR> are displayed. To examine the contents, enter <CR/,> and change the contents, enter <NEW> before <CR/,> entry.

* Execute read-after-write check.

X (Examine/Modify Register)

X<CR> X<REG><OLD>[<NEW>]<CR/,>

When X CR is only designated, name and contents of each register are displayed. If REG is entered, contents of a designated register is displayed. To modify the register contents, enter <CR/,>. To modify register contents, enter <NEW> and then, <CR/,>. When comma is entered, the contents of register with succeeding priority are displayed according to the Table of REG (sequence of register contents display is AX → FL).

ERROR PROCESS

Error message "#" is displayed when command entry or operator error occurs and line change is performed for command re-entry. If numeric value of some digits is greater than specified, particular digits at the head part of numeric are cut off with no error message displayed.

Once an misinput happens, no correction step is possible except to intentionally make an error.

For example; Enter misinput "a" then error message "#" for command re-entry appears.

(**Entry** is only for alphanumeric.)

7.4 D COPY (media copy program) operation

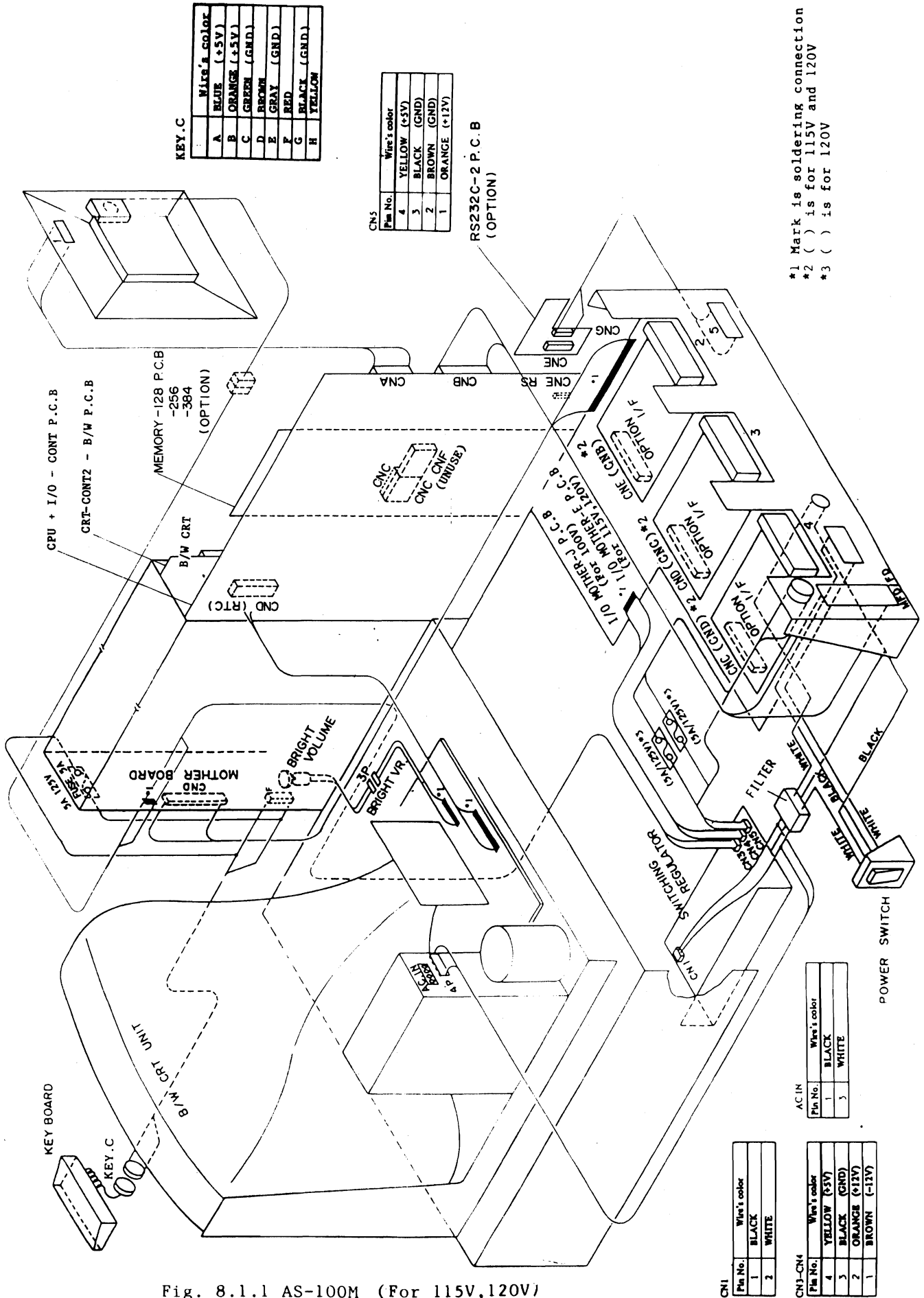
Execute program "D COPY" to copy a test program.

For details of D COPY operation, refer to TEST PROGRAM OPERATIONAL MANUAL.

Chapter 8 Appendix

8.1 Unit Configuration and General Wiring

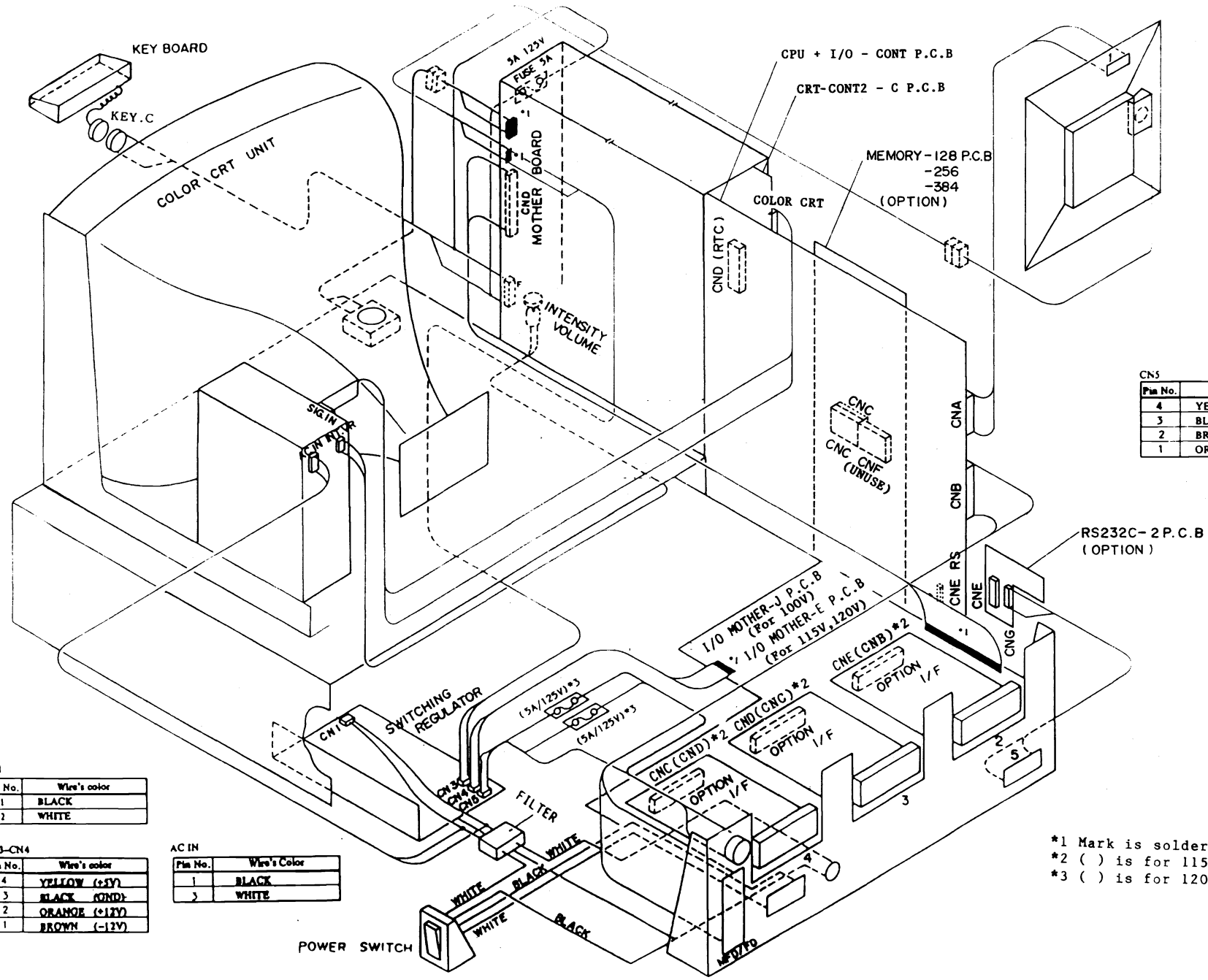
8.1 Unit Configurations and General Wiring



*1 Mark is soldering connection
 *2 () is for 115V and 120V
 *3 () is for 120V

Fig. 8.1.1 AS-100M (For 115V,120V)

FIG. 8.1.2 AS-100C (FOR 115,120V)



KEY.C

	Wire's color
A	BLUE (+5V)
B	ORANGE (+5V)
C	GREEN (GND)
D	BROWN
E	GRAY (GND)
F	RED
G	BLACK (GND)
H	YELLOW

CNS

Pin No.	Wire's color
4	YELLOW (+5V)
3	BLACK (GND)
2	BROWN (GND)
1	ORANGE (+12V)

CN1

Pin No.	Wire's color
1	BLACK
2	WHITE

CN3-CN4

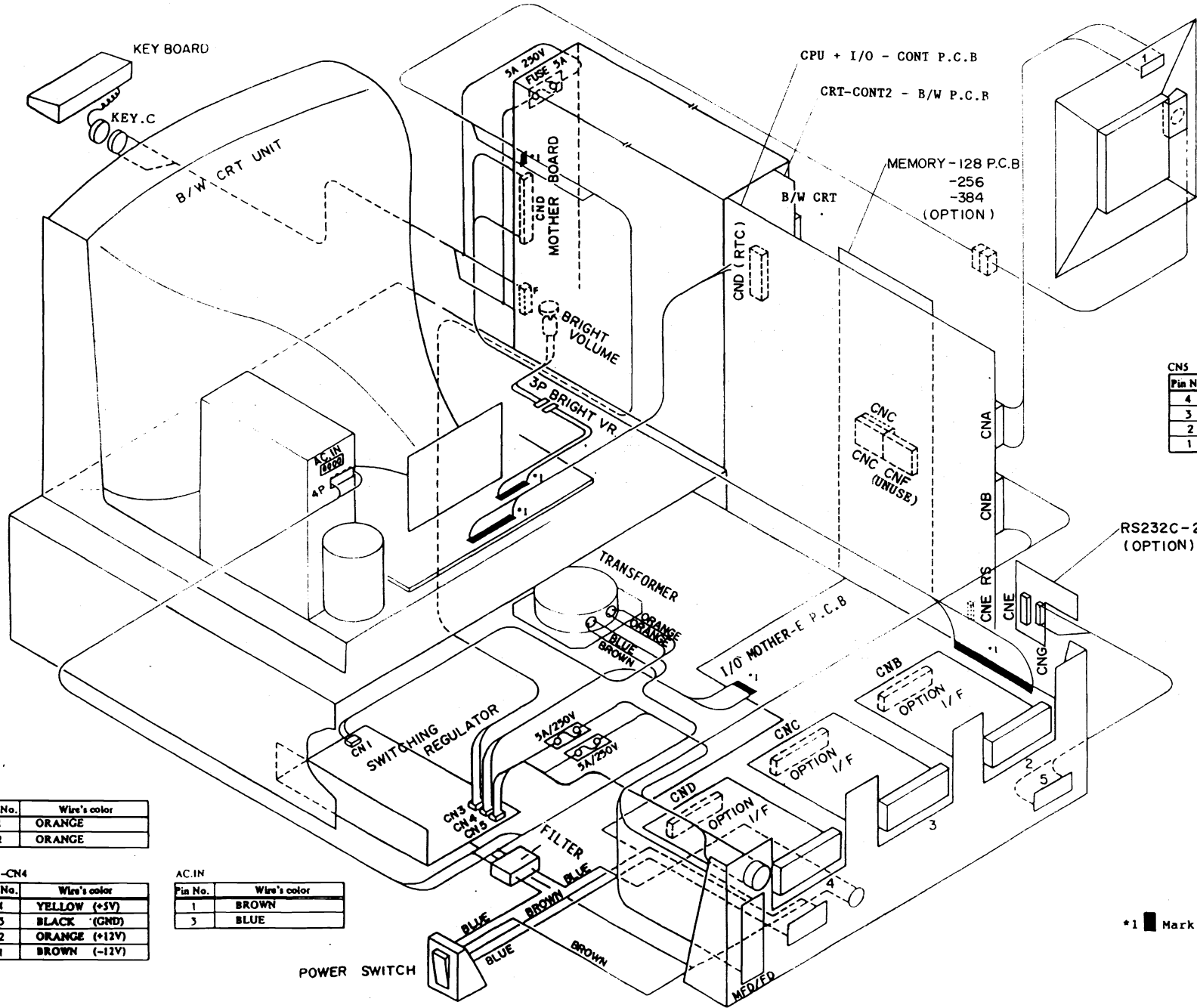
Pin No.	Wire's color
4	YELLOW (+5V)
3	BLACK (GND)
2	ORANGE (+12V)
1	BROWN (-12V)

AC IN

Pin No.	Wire's Color
1	BLACK
2	WHITE

*1 Mark is soldering connection
 *2 () is for 115V and 120V
 *3 () is for 120V

FIG. 8.1.3 AS-100M (For 230, 240V)



KEY.C

	Wire's color
A	BLUE (+5V)
B	ORANGE (+5V)
C	GREEN (GND)
D	BROWN
E	GRAY (GND)
F	RED
G	BLACK (GND)
H	YELLOW

CN5

Pin No.	Wire's color
4	YELLOW (+5V)
3	BLACK (GND)
2	BROWN (GND)
1	ORANGE (+12V)

CN1

Pin No.	Wire's color
1	ORANGE
2	ORANGE

CN3-CN4

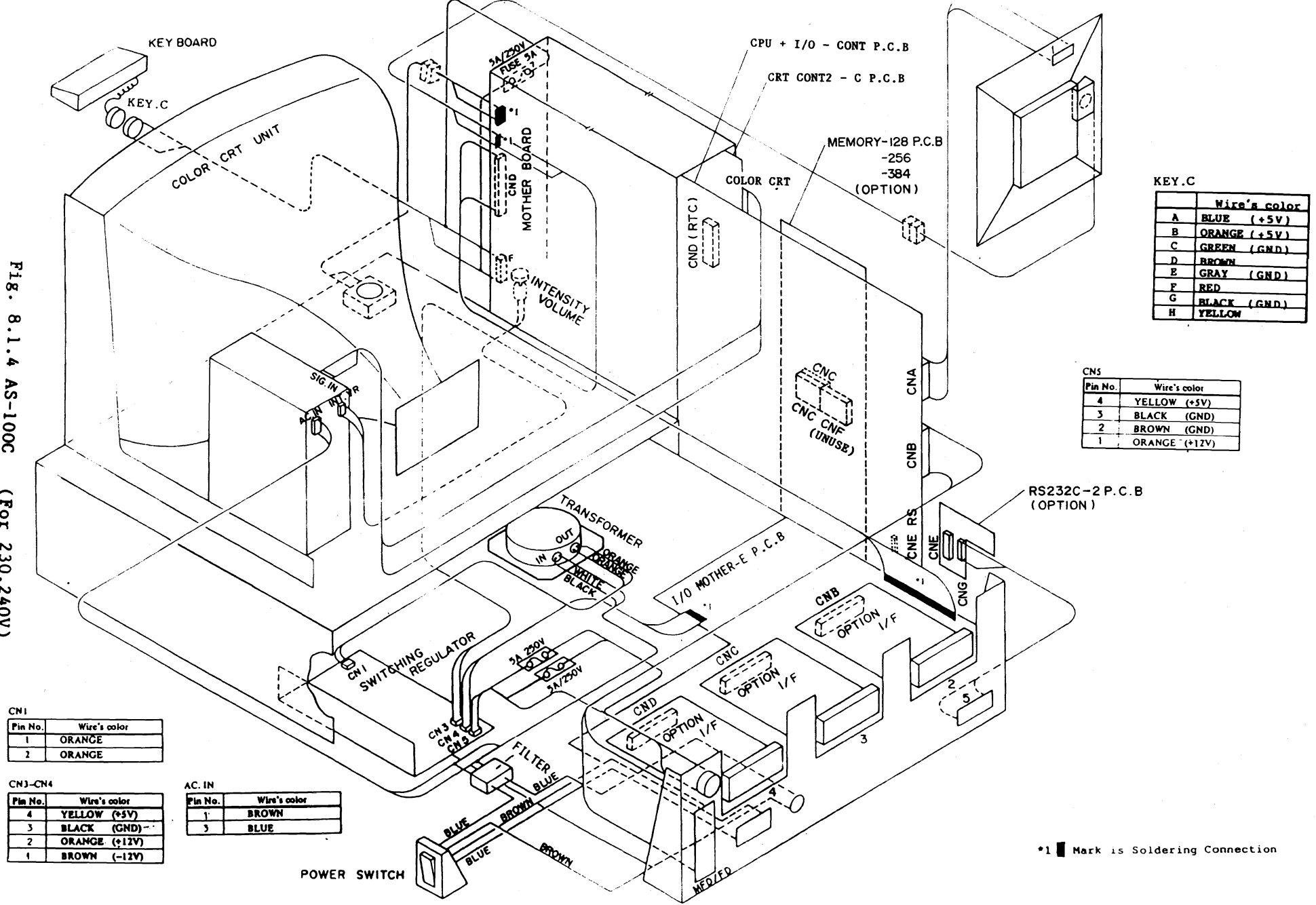
Pin No.	Wire's color
4	YELLOW (+5V)
3	BLACK (GND)
2	ORANGE (+12V)
1	BROWN (-12V)

AC.IN

Pin No.	Wire's color
1	BROWN
3	BLUE

*1 Mark is Soldering Connection

FIG. 8.1.4 AS-100C (FOR 230, 240V)



KEY.C

	Wire's color
A	BLUE (+5V)
B	ORANGE (+5V)
C	GREEN (GND)
D	BROWN
E	GRAY (GND)
F	RED
G	BLACK (GND)
H	YELLOW

CNS

Pin No.	Wire's color
4	YELLOW (+5V)
3	BLACK (GND)
2	BROWN (GND)
1	ORANGE (+12V)

CN1

Pin No.	Wire's color
1	ORANGE
2	ORANGE

CN3-CN4

Pin No.	Wire's color
4	YELLOW (+5V)
3	BLACK (GND)
2	ORANGE (+12V)
1	BROWN (-12V)

AC. IN

Pin No.	Wire's color
1	BROWN
3	BLUE

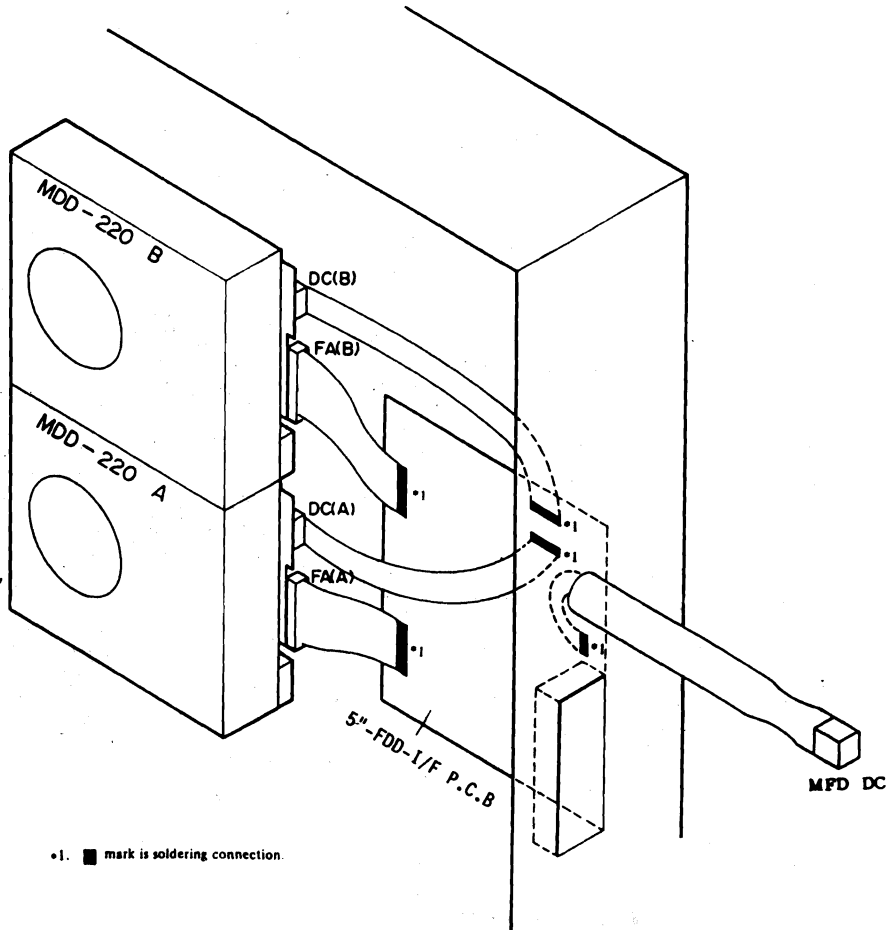
*1 Mark is Soldering Connection

MFD DC

Pin No.	Wire's color
2	GREEN (+5V)
1	RED (GND)
3	WHITE (GND)
4	BLACK (+12V)

DC(A) - DC(B)

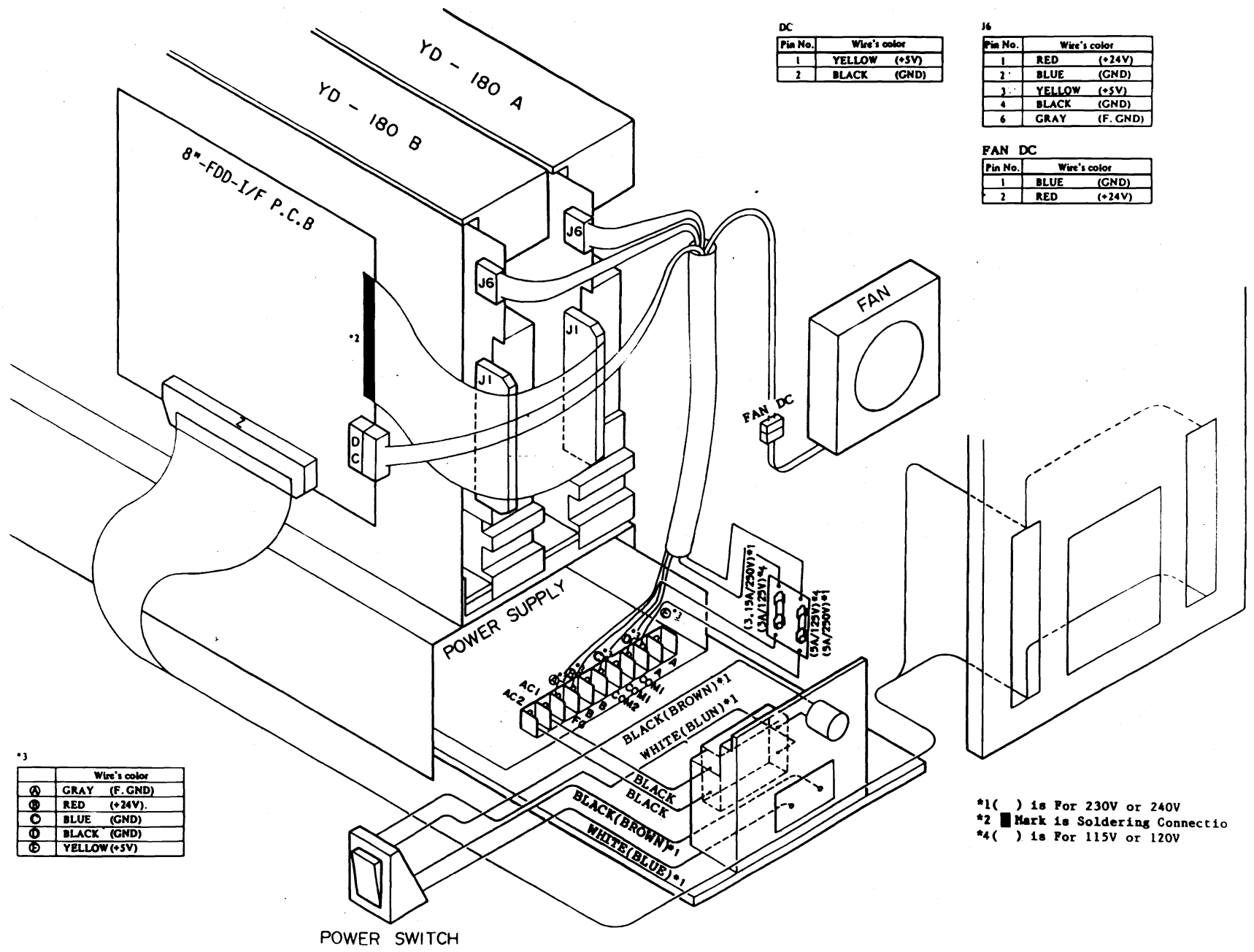
Pin No.	Wire's color
1	ORANGE (+12V)
2	BLUE (GND)
3	BLACK (GND)
4	YELLOW (+5V)



•1. ■ mark is soldering connection.

Fig. 8.1.5 5" FDD (For 115, 120, 230, 240V)

FIG. 8.1.6 8" FDD (For 115, 120, 230, 240V)



DC

Pin No.	Wire's color
1	YELLOW (+5V)
2	BLACK (GND)

16

Pin No.	Wire's color
1	RED (+24V)
2	BLUE (GND)
3	YELLOW (+5V)
4	BLACK (GND)
6	GRAY (F. GND)

FAN DC

Pin No.	Wire's color
1	BLUE (GND)
2	RED (+24V)

*3

Wire's color
Ⓐ GRAY (F. GND)
Ⓑ RED (+24V)
Ⓒ BLUE (GND)
Ⓓ BLACK (GND)
Ⓔ YELLOW (+5V)

*1() is For 230V or 240V
 *2 ■ Mark is Soldering Connectio
 *4() is For 115V or 120V

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