

Chapter2

Operating Instruction

Chapter 2 - Operating Instruction

2.1 System operation

2.1.1 Unit assembly

The PX-16 enables users to construct the system ideal for their particular needs by combining a variety of options with the base unit. In addition to cartridge-type options there are also boards connecting to the expansion interface, and PCBs such as expansion RAM boards, both of which require care in handling.

Please be sure to observe the following cautions when assembling or disassembling the PX-16.

Cautions for assembly

- ① Never touch any of the electronic components inside the PX-16 unless absolutely necessary.
- ② To avoid damaging delicate electronic components through static discharge, touch a metal water pipe or other grounded metal object to discharge first.
- ③ Always turn off all unit power supplies before installing or removing an option.
- ④ When removing or installing the following options always first remove the main battery (NiCd), and turn off the backup switch.
 - 384KB RAM board
 - Standard keyboard
 - Touch keyboard
- ⑤ After completing the removal/installation of the above options, all of the data stored in the PX-16 internal RAM will have been lost. For this reason, all essential data must be transferred to a backup media before beginning the operation.

(1) Assembly procedure

Follow the assembly procedure given below when assembling the PX- 16 system. For the installation procedures to be followed for each individual option, refer to the description of that option in Chapter 4, or the specific operating instructions for that option.

1. Set jumper J7 (Buzzer volume).
2. Install the 384 KB RAM board.
384 KB RAM board
3. Set the ROM switch and install the Application ROM.
4. Install the keyboard.
Standard keyboard or Touch keyboard
5. Install the Main Battery (NiCd battery) and turn the back-up switch
6. Connect an option to the expansion interface.
Asynchronous RS board, Development tool, etc.
7. Connect an option to the cartridge 2 interface.
LCD40, LCD80, CRT/FDD Cartridge, etc
8. Set DIP switch (SW5).
9. Connect the AC adaptor and push the system reset switch. (*1)
10. Connect an option to the cartridge 1 interface.
ROM cartridge, RAM cartridge, Cartridge printer H, etc
11. Connect the Disk unit to the system bus.
Disk unit

(*1) For a full charge the Main battery requires approx. 15 hours. The Sub-battery requires approx. 21 hours. (on condition that AC adapter is connected and power is OFF. When power is ON, recharging time is approx. 16 hours.)

(2) Main battery installation

The PX-16 main battery is installed through the following procedure.

- ① Open the battery box cover, on the rear side of the base unit. It is secured with screws, back them out of the base unit rear cover.
- ② Set the main battery into the battery box. Be sure that the label faces up, as indicated in Fig. 2-1-2.

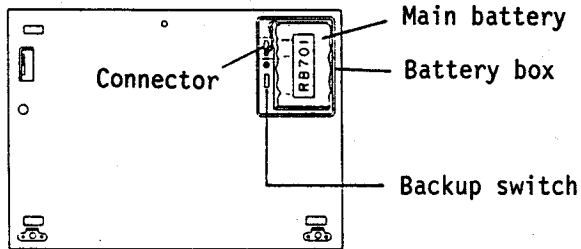


Fig. 2-1-2

- ③ Connect the main battery connector to the base unit.

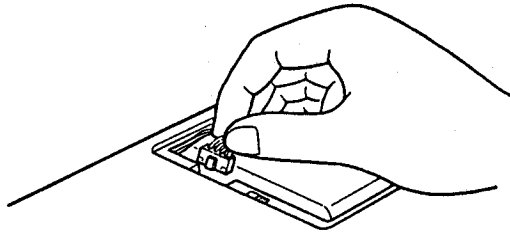


Fig. 2-1-3

- ④ Insert the main battery cable into the gap between the battery and the base unit, so the cover will close easily.
- ⑤ Turn on the battery backup switch.
- ⑥ Close the battery box cover.
- ⑦ Secure the battery box cover with the screws.

(3) RAM board installation

The PX-16 can be fitted with optional main RAM and RAM disk capacity by attaching 384KB RAM boards to the connectors provided on the base unit main PCB. The relation between these connectors and the option RAM boards is:

Usage	Connector
Main RAM expansion (256KB -> 640KB)	CN 14, 15
Expansion RAM disk expansion (0 -> 384KB)	CN 16, 17
Expansion RAM disk expansion (384KB -> 768KB)	CN 18, 19

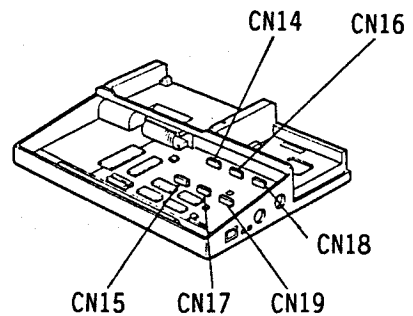


Fig. 2-1-4

Install these RAM boards as indicated below.

- ① Turn off the power to the base unit. Check that the power indicator is out.
- ② Turn the base unit bottom side up, open the battery box cover, and turn off the battery backup switch.
- ③ Remove the main battery connector, and take the main battery out of the battery box.
- ④ Remove the four screws indicated in Fig. 2-1-5.

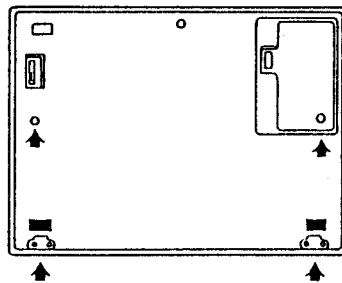


Fig. 2-1-5

- ⑤ Turn the base unit right side up again, and lift up the keyboard toward you, slowly. Be sure not to pull out the keyboard cable. The touch keyboard cable is especially short and requires caution.

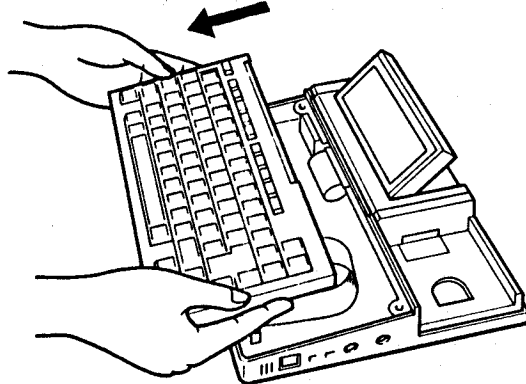


Fig. 2-1-6

- ⑥ Connect the RAM board to the appropriate set of connectors. Be sure that the tabs used to ensure correct board mounting are firmly set into the base board notches (see Fig. 2-1-7).

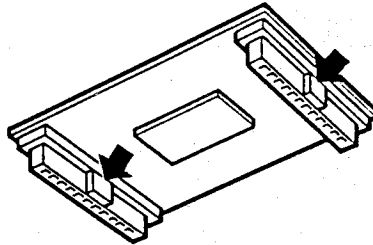


Fig. 2-1-7

- ⑦ Remount the keyboard on the base unit, turn the base unit over, and retighten the four screws to secure the keyboard in place.
- ⑧ Replace the main battery inside the battery box, and reconnect the cable.
- ⑨ Turn the backup power switch on.
- ⑩ Close the battery box cover and retighten the screw.
- ⑪ Press the system reset switch.

(4) Application ROM installation

There are three ZIF ROM sockets on the main PCB in the PX-16, which are used for application ROMs. Each ROM socket is provided with a 2-bit DIP switch, which specifies the ROM capacity.

ROM capacity	Switch 1	Switch 2
256 kbit	ON	OFF
512 kbit	ON	ON
1 Mbit	--	ON
2 Mbit	OFF	ON
4 Mbit	OFF	ON

"--" means do not care.

Table 2-1-1 ROM switch setting

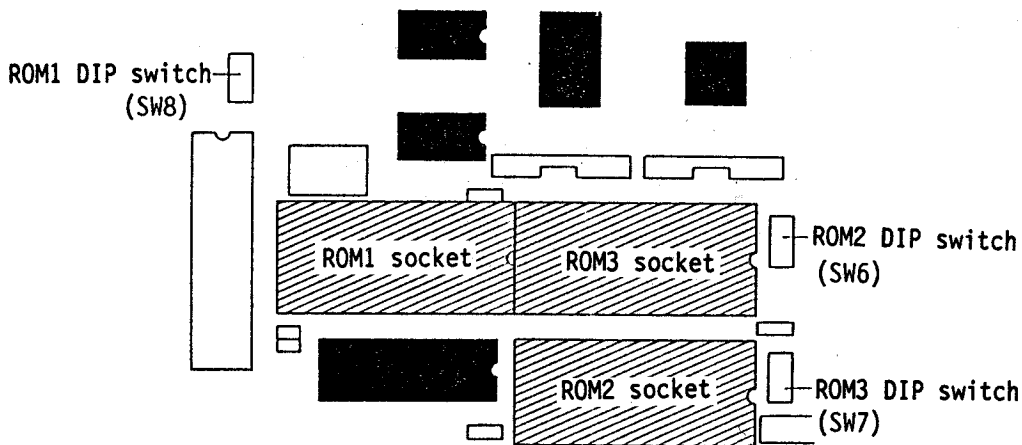


Fig. 2-1-8 Location of the ROM socket

For details of the ROMs used, refer to Section "3.2.3. ROM".

Follow the procedure given below to install application ROMs.

- ① Turn off the base unit power. Verify that the power indicator goes out.
- ② Turn over the base unit, remove the battery box cover screws and the cover itself.
- ③ Remove the main battery from the base unit with the cable still connected (see note 1).

- ④ Remove the four screws indicated in Fig. 2-1-9.

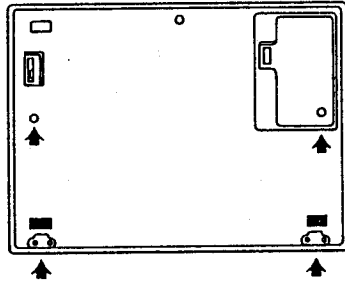


Fig. 2-1-9

- ⑤ Turn the base unit right side up again, taking care that the main battery remains connected.
- ⑥ Slowly lift up and remove the keyboard, taking care that the keyboard cable remains connected. Touch keyboard cables are especially short and caution is required.

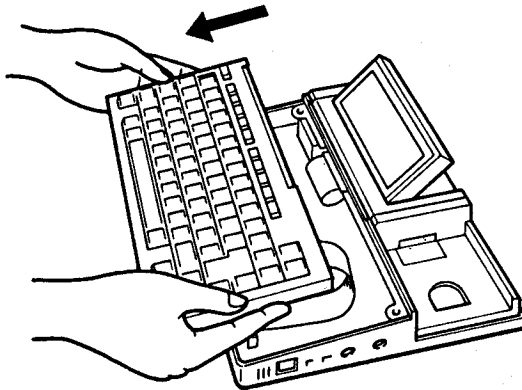


Fig. 2-1-10

- ⑦ You will see three blue application ROM sockets, located just before the main PCB in the base unit (Fig. 2-1-8).
- ⑧ Lift up the lever of the ROM socket that you wish to mount an application ROM in.
- ⑨ Mount the ROM in the ROM socket. Be sure that the notch in the ROM chip is to the right, as indicated in Fig. 2-1-11. Take care that the pins are not bent or broken, and that all pins are mounted correctly in their holes (see note 2).

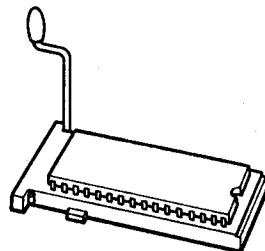


Fig. 2-1-11

- ⑩ After verifying that the ROM is mounted securely, return the lever to its down position to secure the ROM.
- ⑪ Set the ROM switch corresponding to that ROM socket to the capacity of the installed ROM chip.
- ⑫ Insert the keyboard into the base unit, align it carefully, and then turn the base unit rear side up again. Take care that the battery remains connected at all times.
- ⑬ Tighten the four screws indicated in Fig. 2-1-9 to secure the keyboard.
- ⑭ Return the main battery to the battery box.
- ⑮ Close the battery box cover and secure it with the screws.

Note 1: The reason the main battery must remain connected is to maintain the data in the RAM memory. If there is no need to maintain data in RAM or RAM disk memory, then the battery may be disconnected.

Note 2: When a new ROM is used, its pins will be bent outwards. The pins will have to be bent inwards slightly to fit the socket.

2.1.2 Switches

(1) Power switch

The PX-16 power switch is a push-button switch, located on the right side of the base unit.

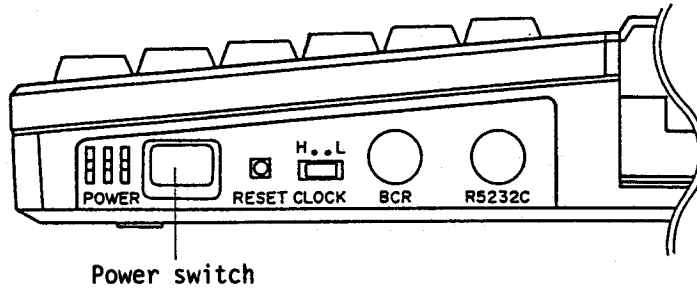


Fig. 2-1-12

It alternates between power on and power off states each time it is pushed. When the power is on and it is pushed, the power will go off, and vice-versa.

(2) Reset switch

The PX-16 reset switch is a small push-button switch located on the right side of the base unit. To make sure that it is not pressed easily by accident, it is recessed within the side of the base unit. This means that the tip of a pen or similar thin object must be used to press it.

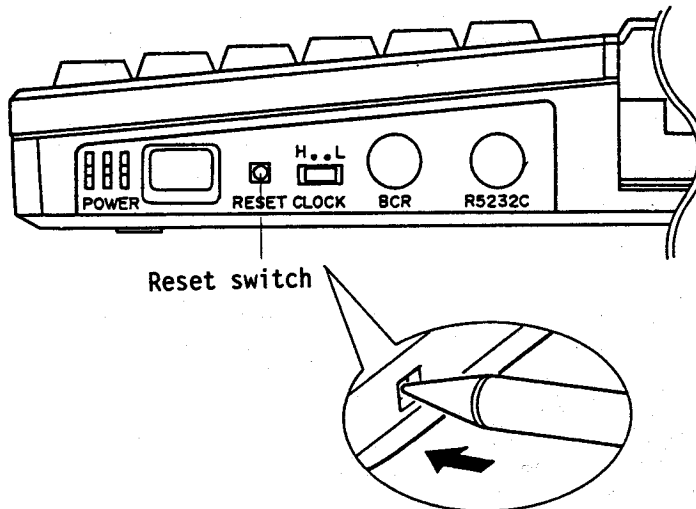


Fig. 2-1-13

When the reset switch is pressed, the main CPU will be reset, and all registers controlled by the main CPU will be cleared. The slave CPU is not reset. This switch is effective regardless of the power switch setting, and the system will be a warm start the next time it starts if the reset switch is pressed in the power off state.

(3) System reset switch

The system reset switch is a small push-button switch like the reset switch, but it is mounted behind the front case. It is located near the cartridge 1 interface, and therefore cannot be used unless the cartridge 1 option is first removed.

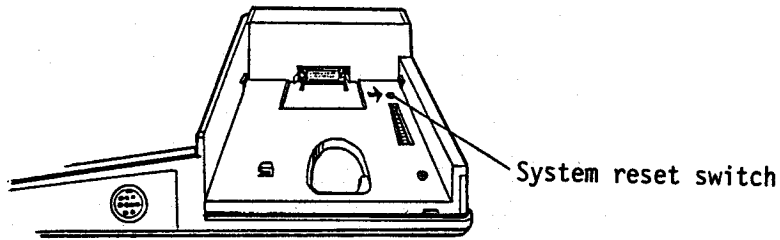


Fig. 2-1-14

When the system reset switch is pressed, the slave CPU is reset, and all registers managed by the PX-16 slave CPU and main CPU are cleared. The system reset is enabled regardless of whether power is on or off. When the system reset switch is pressed while power is on, power will be turned off, and the next power on will be a cold start.

(4) System clock select switch

The PX-16 uses a V20 (8088 compatible) as the main CPU, and it can operate at clock frequencies of 4.77MHz or 10MHz. The system clock select switch is used to make this change in CPU speed. The system clock select switch is located on the right side of the base unit, between the reset switch and the BCR interface. When it is set forward (toward the reset switch) it is 10MHz, and when it is set backward (toward the BCR interface) it is 4.77MHz. This switch is also recessed into the case and requires a pen tip or similar tool to operate.

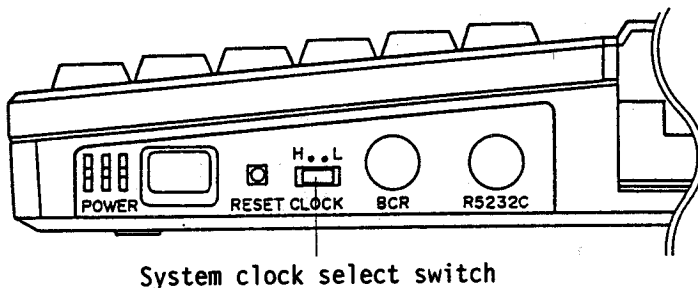


Fig. 2-1-15

Before operating the system clock select switch, be sure to turn off the power first. Operation cannot be guaranteed if the clock is switched while the system is operating.

(5) Cartridge 1 lock

The cartridge 1 lock is located on the rear of the cartridge 1 insertion portion of the PX-16 base unit, and is used to secure the cartridge 1 option in place. After connecting the cartridge 1 option to the cartridge 1 interface, set this switch to the LOCK position to secure the cartridge (see below). To remove the cartridge, set the switch to the FREE position.

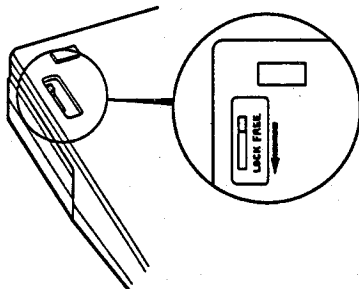


Fig. 2-1-16

(6) Backup switch

The PX-16 memory backup switch is located on the rear of the base unit, inside the battery box.

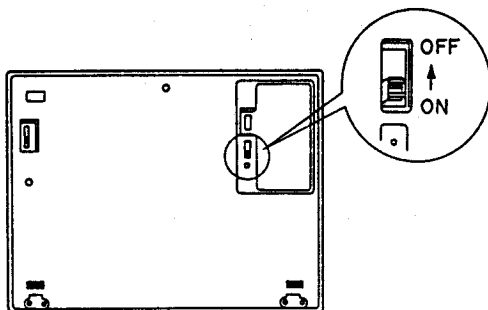


Fig. 2-1-17

This switch turns on/off the sub-battery. When it is ON, the sub-battery will back up the RAM memory in the event of power failure. The backup switch should always be set to ON when the PX-16 is being used. For long periods of disuse, however, set the switch to OFF to prevent overdischarge.

Note: The backup switch is set to OFF at the factory. The user must set it to ON when used for the first time.

(7) DIP switches

① System set switch

The basic PX-16 system set-up is handled with the system set DIP switch (SW5), which is located where the cartridge 1 option is connected.

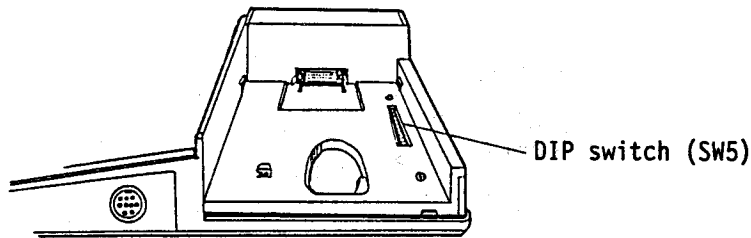


Fig. 2-1-18

This DIP switch consists of ten switches in a row.

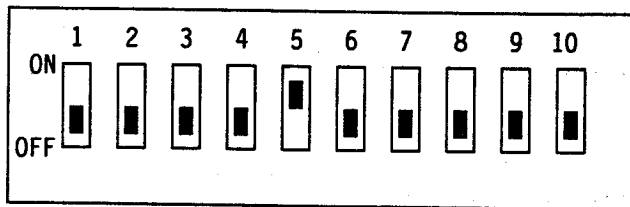


Fig. 2-1-19 DIP switch (SW5)

Note: The number printed on the tenth DIP switch is "0".

These switches are used as follow:

Nation specification:	Switches 1~4
Display type specification:	Switches 5~6
FDD type specification:	Switches 7~8
Boot type setting:	Switches 9~10

Note: All DIP switches must be operated when the system power is OFF.

	1	2	3	4	5	6	7	8	9	10	Function
Nation setting	OFF	OFF	OFF	OFF							ASCII
	ON	OFF	OFF	OFF							U.K
	OFF	ON	OFF	OFF							France
	ON	ON	OFF	OFF							Germany
	OFF	OFF	ON	OFF							Italy
	ON	OFF	ON	OFF							Spain
	OFF	ON	ON	OFF							Denmark
	ON	ON	ON	OFF							Finland
	OFF	OFF	OFF	ON							Norway
	ON	OFF	OFF	ON							Sweden
	OFF	ON	OFF	ON							Swiss (French)
	ON	ON	OFF	ON							Swiss (German)
	OFF	OFF	ON	ON							Reserved
	ON	OFF	ON	ON							Reserved
	OFF	ON	ON	ON							Japan
ON	ON	ON	ON							Japan	
Display					OFF	OFF					Monochrome CRT, LCD40
					ON	OFF					Color CRT, LCD80 or LCD80/2 (80 column x 25 line), LCD40
					OFF	ON					Color CRT, LCD80 or LCD80/2 (40 column x 25 line), LCD40
					ON	ON					No display
FDD							OFF				Two FDD
							ON				One FDD
								OFF			720KB (3.5-inch 2DD)
								ON			1MB (3.5-inch 2HD)
Boot								OFF	OFF		HC boot, no FDD/HDD
								ON	OFF		HC boot, with FDD/HDD, RAM preference
								OFF	ON		HC boot, with FDD/HDD, FDD preference
								ON	ON		PC boot

Note: — frames indicate factory settings

Table 2-1-2 DIP switch settings

② ROM switches

The PX-16 has three application ROM sockets mounted on the main PCB, named ROM1 through ROM3. Each ROM socket is supplied with a DIP switch to specify the size of the ROM chip used. Refer to the following table for specifications.

Dip SW ROM		SW8		SW7		SW6	
		1	2	1	2	1	2
ROM 1	256 kbit	ON	OFF				
	512 kbit	ON	ON				
	1 Mbit	--	OFF				
	2,4 Mbit	OFF	ON				
ROM 2	256 kbit			ON	OFF		
	512 kbit			ON	ON		
	1 Mbit			--	OFF		
	2,4 Mbit			OFF	ON		
ROM 3	256 kbit					ON	OFF
	512 kbit					ON	ON
	1 Mbit					--	OFF
	2,4 Mbit					OFF	ON

Note: == frames indicate factory setting

Table 2-1-3 ROM switch settings

For the positions of the ROM sockets and switches, refer to subsection (4) Application ROM installation.

(8) Jumper switches

The PX-16 has seven jumpers located on the main PCB (refer to Section 1.2.2).

These jumpers are used as follows:

- J1 - unused
- J2 - Fixed to b
- J3~6 - Sets ROM0
- J7 - Sets buzzer

① J3~6 settings

Jumpers J3~6 specify the capacity of the ROM used as ROM0.

	RAM size	J3	J4	J5	J6
RAM 0	1Mbit	b	ON	ON	b
	2,4Mbit	a	OFF	OFF	a

Note: **==** frames indicate factory settings

Table 2-1-4 Jumper setting for ROM0

When J3~6 are set to 1Mbit, it is possible to use 1MBit EPROMs in ROM0 and ROM3 and simulate a 2MBit ROM. This makes it possible to use EPROMs instead of the mask ROM, as 2MBit ROM chips are only available in mask ROM specification. In this case, however, the switch setting for ROM3 must be set to 1MBit.

② J7 setting

Jumper J7 is used to adjust the buzzer volume.

Jumper	Setting	Buzzer level
J 7	a	Small
	b	Large

Note: **==** frames indicate factory settings

Table 2-1-5 Jumper setting for buzzer volume

2.1.3 Batteries and recharging

(1) Batteries

The PX-16 is equipped with two batteries, the main battery and the sub battery. Both are NiCd batteries, and can be recharged.

á Main battery

The PX-16 main battery is mounted in the battery box, located on the rear of the base unit. The battery box cover can be removed by taking out the retaining screw.

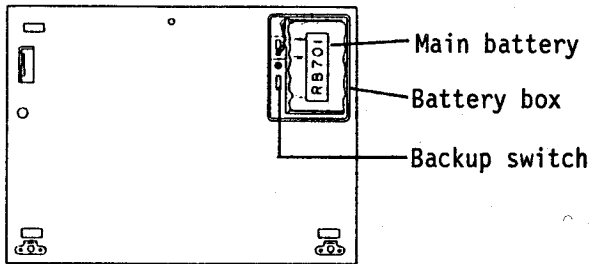


Fig. 2-1-20

The main battery shipped disconnected, and therefore the user must connect the battery before using the unit. Connect the main battery plug to the battery connector on the PX-16 as shown below. At this time, be sure that the label face is upward as indicated in Fig 2-1-20.

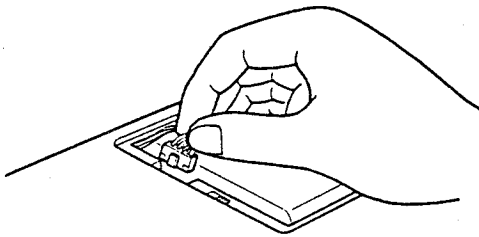


Fig. 2-1-21

Main battery specifications are given below.

Name	RB701 (Main battery)
Type	NiCd battery
Output voltage	4.8 V
Current capacity	2000 mAh
Charging current	Approx. 200 mA
Charging time	Approx. 15 hours(from full discharge)

Table 2-1-6 Main battery specifications

The PX-16 uses a two-way power supply, and can be driven by this main battery alone without AC power through the adapter. If the TF-16 is used separate external power supplies are required, but all other options can be driven by the main battery. However, depending on system configuration the periods of time which each can be connected will differ.

When main battery output voltage drops below 4.75V the system enters a power failure state, and the power indicator LED will flash. Please connect the AC adapter immediately to recharge the system.

② Sub-battery

The PX-16 sub-battery is secured at the very front of the base unit, and is connected to the main PCB.

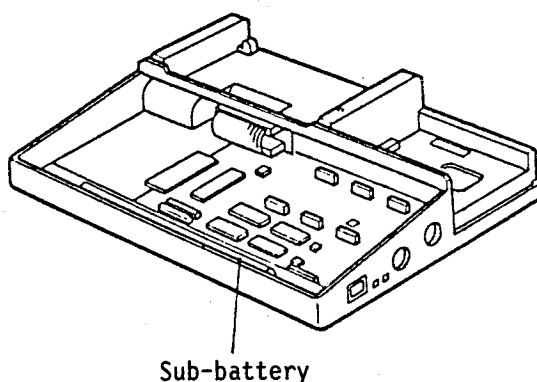


Fig. 2-1-22

The sub-battery is used to backup the memory when a power failure occurs. Power failures could occur because the most common use mode for the PX-16 is battery drive, rather than AC adapter drive. However, there is a switch located inside the battery box which turns this backup on and off.

Sub-battery specifications are given below.

Name	RB104 (Sub battery)
Type	NiCd battery
Output voltage	4.8 V
Current capacity	450 mAh
Charging current	AC adapter is connected Power ON Approx. 20 mA Power OFF Approx. 15 mA AC adapter is not connected Power ON Approx. 5 mA Power OFF Approx. 0 mA 8 hours after system reset switch is pressed Approx. 60 mA 1 hour after power failure is detected Approx. 60 mA
Charging time	AC adapter is connected Power ON Approx. 34 hours Power OFF Approx. 45 hours After system reset switch is pressed Approx. 16 hours After power failure is detected Approx. 25 hours

Table 2-1-7 Sub-battery specifications

(2) AC adapter

The dedicated PX-16 AC adapter provides the following two functions:

- ① Power supply to drive the PX-16
- ② Recharge for PX-16 internal batteries

The PX-16 has a two-way power supply, and can be driven through the AC adapter. Connecting the AC adapter during main battery recharge (power failure) supports normal operation. When the AC adapter is connected, the power supply to the unit is through the AC adapter.

The connection procedures for the AC adapter are given below.

1. Connect the power cable to the AC adapter.
2. Connect the power cable to house current. The AC adapter power lamp will light.

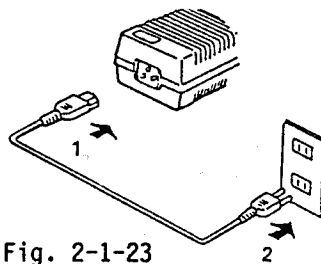


Fig. 2-1-23

3. Plug the AC adapter into the PX-16 AC adapter jack.

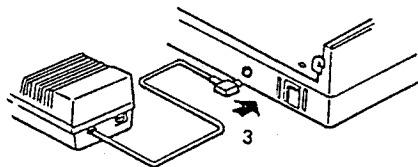


Fig. 2-1-24

AC adapter specifications are given below.

Name	H00KAW	H00KBW	H00KAJ
Input voltage	100 to 240 V		
Output voltage	5.0 V		
Output current	4000 mA		
Country	America, Canada, Taiwan, South Korea	Europe, Hong Kong, Oceania, Singapore	Japan
Standard	UL, CSA	TUV	Dentori-Ko-shu

Table 2-1-8 AC adapter specifications

Note: Always use the dedicated AC adapter only with the PX-16. When using other AC adapters, operation is not assured.

(3) Recharging

The PX-16 uses NiCd cells for the main battery and sub-battery, which can be recharged by connection of the AC adapter. When the AC adapter is connected the main battery is recharged at about 250mA, and the sub-battery at about 15mA. When the AC adapter is connected, the batteries will be recharged regardless of whether the system is on or off. For this reason, where the PX-16 is used for long periods of time with the AC adapter, caution is required to prevent battery degradation (see note 1).

Recharge times from full discharge to full charge are given below.

Type	Capacity	Condition	Recharge current (typ)	Recharge time
Main battery	2000 mA	-----	Approx. 200 mA	Approx. 15 hrs
Sub-battery	450 mA	Power OFF	Approx. 15 mA	Approx. 45 hrs
		Power ON	Approx. 25 mA	Approx. 27 hrs
		8 hrs from system reset is pressed	Approx. 60 mA (Note3)	Approx. 16 hrs
		1 hr from power fail is detected	Approx. 60 mA (Note3)	Approx. 25 hrs

Table 2-1-9 Recharge time

Note 1: The main battery will have more than 60% capacity in one year of recharging at 5~30 degrees Centigrade.

Note 2: If the system is not used for a long period of time, the batteries may only run the system for a short time after being fully recharged. This is a peculiarity of NiCd batteries, and not a system fault. Repeat the recharge cycle several times and they will return to normal operation.

Note3: About 60 mA of recharge current flows for 8 hours after the system reset switch is pressed, or for 1 hour after a power failure occurs. Then the recharge current drops to 25 mA while PX-16's power is on, or to 15 mA while the power is off. Recharging takes the time shown above when the power is off. When the power is on, recharging time is shorter.

2.1.4 Starting and operation

(1) System start

There are basically two modes to start up the PX-16: HC boot and PC boot. Each has its own boot method and content. The initial boot type can be specified with system DIP switches (SW5) numbers 9 and 10.

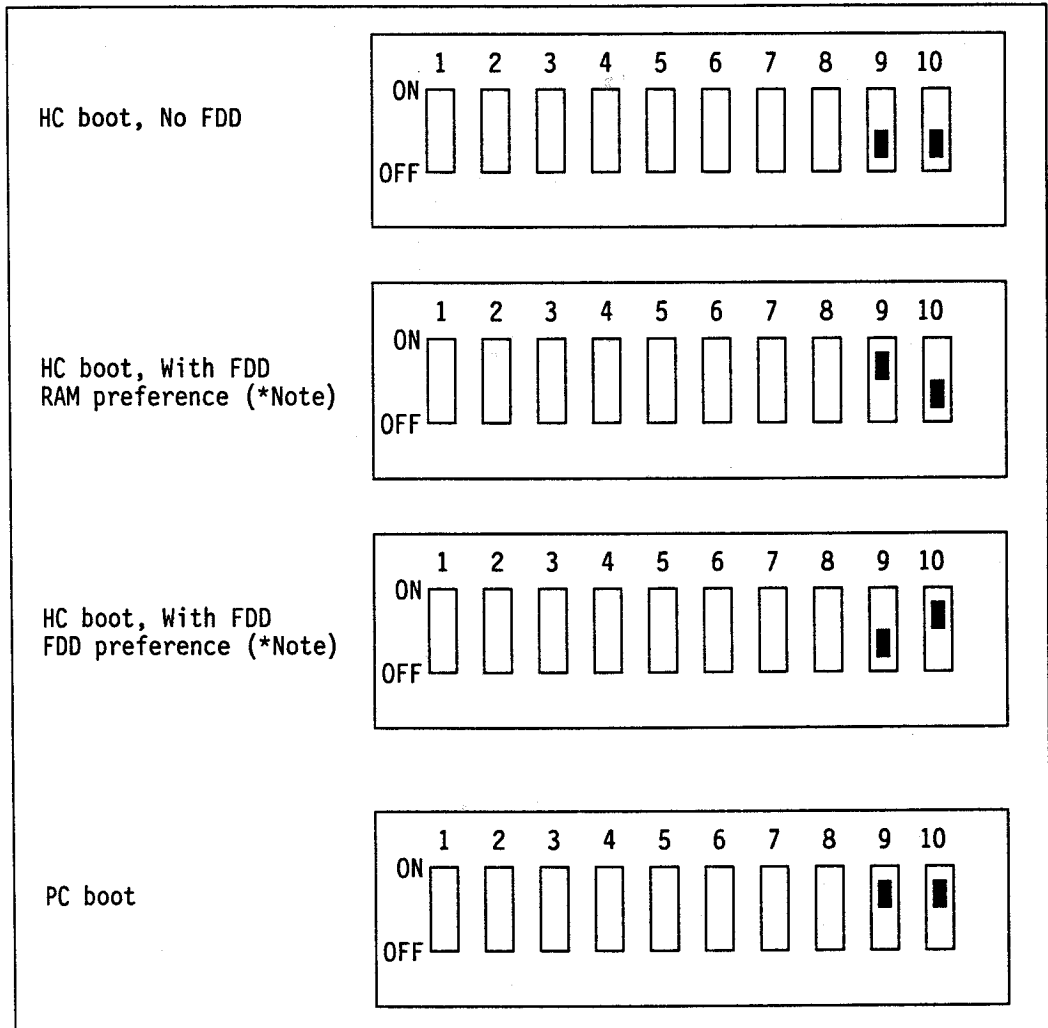


Fig. 2-1-25 Boot Types and DIP Switch (SW5) Settings

Note 1: RAM preference and FDD preference is discussed next page.

Setting these DIP switches in the power off state will specify the boot type to be used the next time the PX-16 is turned on.

① HC boot

HC boot is started from the system internal ROM (ROM0~3). If there is a bootable system in ROM1~3 the system will be booted from there, and if not then the MS-DOS Version 3.20 provided in the system ROM (ROM0) will be used.

For an HC boot from ROM0, all of the unique functions available to the PX-16 can be used, such as expanded interrupts, device driver support, various national character sets and expanded power off mode. For details refer to Section 3.3.1 or Appendix A-1.

② PC boot

The PC boot boots the system loaded from a floppy disk in the FDD, and therefore requires an external disk unit or TF-16. When the system is booted in PC boot, it operates from the OS loaded in from the floppy disk, and therefore cannot support the original PX-16 functions. This PC boot is useful for applications where the OS is provided with the application. For details refer to Section 3.3.1 or Appendix A-1.

The messages and operations used during HC boot and PC boot are described below.

HC boot

a) After system reset (RAM disk size not specified)

- ① The size of the RAM disk within the main RAM has not been specified, and therefore when the power is turned on the RAM check is performed, the results displayed, and a message displayed which asks the size to be allocated the main RAM to the RAM disk.

For the standard system (main RAM of 256KB and no 384KB RAM board)

```
256KB OK + 000 KB OK
00 * 32KB RAM disk assign
```

For maximum expansion of three 384KB RAM boards

```
640 KB OK + 768 KB OK
00 * 32KB RAM disk assign
```

The first number on the top line indicates main RAM capacity and the second figure indicates the amount of expansion RAM disk which is expanded with the 384 KB RAM board. The second line inquires how much of main RAM is used for the RAM disk. Specify RAM disk capacity as multiples of 32KB. (For example, specifying 2 allocates 64KB of the main RAM to the RAM disk.) Note that main RAM capacity after changing the RAM disk size must be at least 128KB.

After inputting the number you wish to assign main RAM to the RAM disk, press RETURN.

- ② Next the date screen will be displayed.

```
Current date is Thu 12-24-1987
Enter new date (mm-dd-yy):
```

Input the month, day and year here. The order as month-day-year, or day-month-year depend on the national character sets by the DIP switches (SW5). Press the return key after input is complete. If there is no need for a change, simply press return.

- ③ Next the current time screen will be displayed.

```
Current date is Thu 12-24-1987
Enter new date (mm-dd-yy):
Current time is 12:20:29.45
Enter new time:
```

This screen is used to set the time. The time is specified in hours, minutes, and seconds up to hundredths of a second. Input in the same format as shown in the message. If there is no need to alter the time, simply press RETURN.

- ④ This concludes the initial set phase. When the message shown below is displayed, MS-DOS Version 3.20 booting is complete.

```
Current date is Thu 12-24-1987
Enter new date (mm-dd-yy)
Current time is 12:20:29.45
Enter new time:
```

```
Microsoft MS-DOS  Version 3.20
(C) Copyright Microsoft Corp. and SEIKO EPSON CORP. 1981, 1987
```

```
A>
```

- b) After reset, after power on/off

The size of the RAM disk has already been set, so the sequence starts with step 2 above.

PC boot

- a) After system reset, or where the previous state of operation was also PC boot, the RAM check after power on will be displayed as indicated below (standard RAM size is 256KB, expanded RAM size is 640KB).

```
256KB OK
```

This message is displayed at the conclusion of the RAM check, and will soon disappear. The system will boot from the floppy disk.

b) If the previous operation state was HC boot, the size of the RAM disk within the main RAM is specified, and the system is started in PC boot, that RAM disk area cannot be used. To the system this portion of the RAM is system area, and cannot be accessed. In that case, the RAM check will produce the following result (where the RAM disk has been set as 384KB of 640KB main RAM).

```
384 KB used by system
256 KB OK
```

This message is displayed at the conclusion of the RAM check, and will soon disappear. The system will boot from the floppy disk.

For details on system boot operations, refer to Section 3.3. For operation after system boot is completed, refer to the PX-16 MS- DOS Reference Manual.

(2)
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101
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101
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(2) Error messages

The PX-16 tests hardware when booted up to check for controller or optional device failures. If an error is detected during these hardware tests, the corresponding error message will be displayed.

101 - System board error (06)

Error detected in interrupt controller (Note 1).

101 - System board error (07)

Error detected in timer 0 set test (Note 1).

xxxxx 201 - Memory error

Error detected during main RAM test. xxxxx indicates the address which generated the error.

101 - System board error (08)

Error detected during DMA refresh request test (Note 1).

301 - Keyboard error

Error detected during keyboard reset request test.

XX 301 - Keyboard error

Error detected during keyboard key press state test. XX indicates the scan code that generated the error.

xxxxx ROM error

Error detected during check sum test of ROM1~3. xxxxx is the address that generated the error.

601 - Diskette error

Error detected during floppy disk drive test.

163 - Time & date not set

Error detected during slave CPU time check.

Note 1: For the "101 - System board error" message, changing the setting of any of the switched in DIP SW5 will cause the number in parenthesis shown above to be displayed.

If an error was detected, the following message will be displayed after the error message:

F1 key to resume

Also, the buzzer will sound twice to notify of an error. Pressing the F1 key will enable processing to continue. When the touch keyboard is used, press "1" instead of the F1 key.

However, where a "101- System board error" message was displayed, processing is impossible even if the F1 key is pressed. In this case, press the system reset switch and reboot. If the error is generated again, a hardware failure is possible.

(3) National character sets

When the PX-16 is started in HC boot, the system which is stored in ROM can not be adjusted for various character sets, unlike the floppy-disk system. For this reason, DIP switch setting is used to specify the national character set to be used.

Setting the DIP switches causes the following processing to be performed:

- ① Keycode conversion
- ② Time and date display change

The DIP switch (SW5) has 10 bit switches, and bit switches 1~4 are used for character set specification.

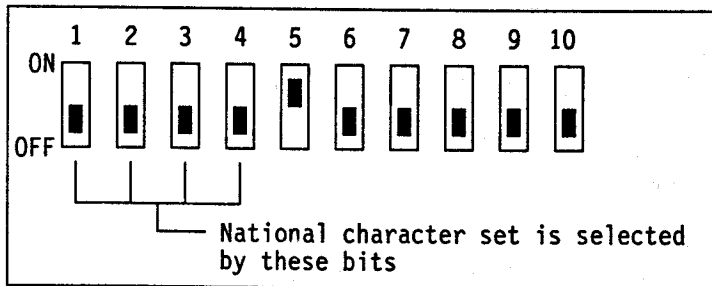


Fig. 2-1-26 Bits for selecting nation character set

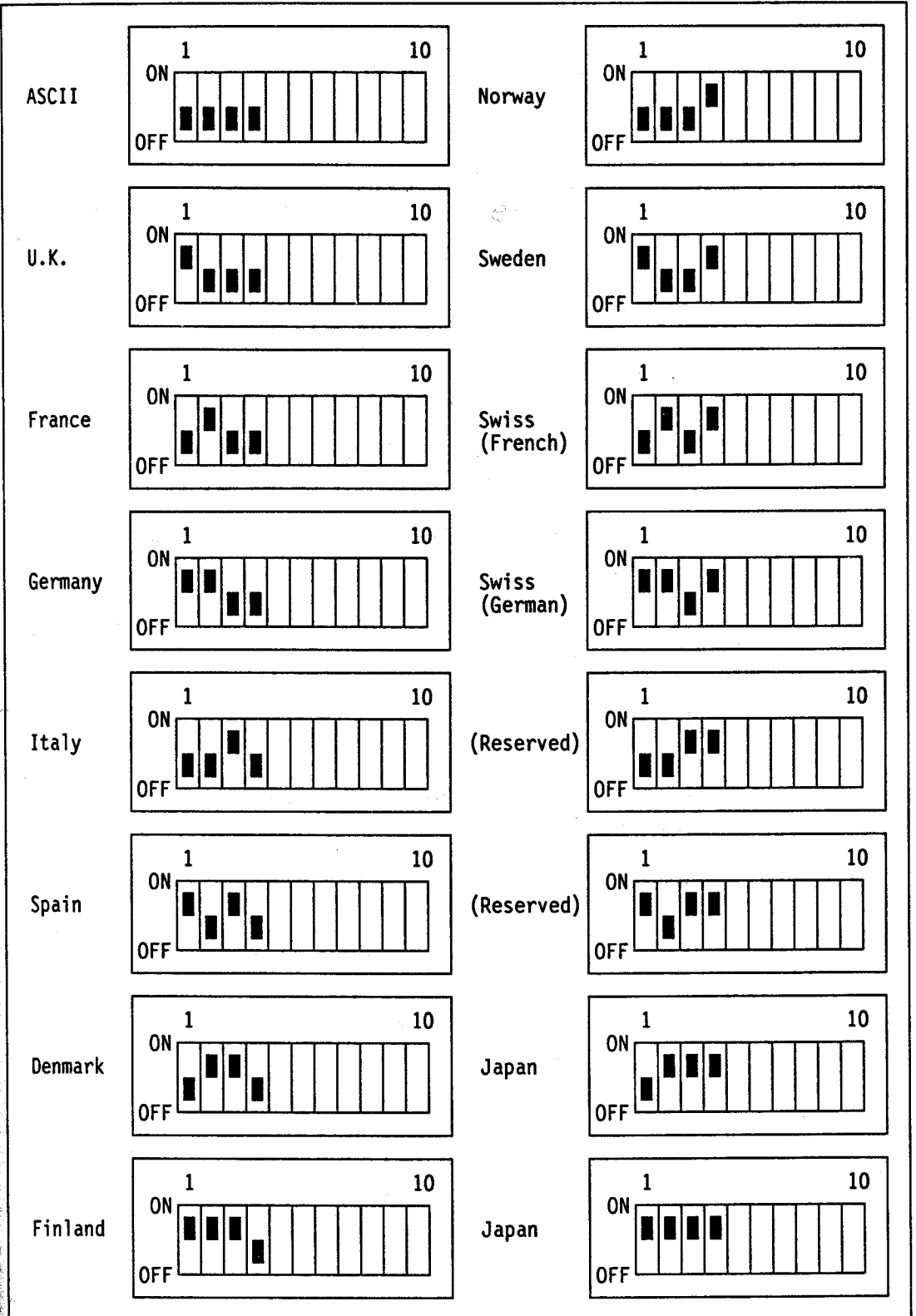


Fig. 2-1-27 Switch setting for National character set

(4) Drive support

① Drive setting

When the PX-16 is started in HC boot, the device drivers unique to the PX-16 are booted up from the system ROM to support various devices. When the system is booted in PC boot, it is dependent on the system stored in the floppy disk. This section described the block devices supported in HC boot. For other devices, refer to Section 3.4.

In HC boot, DIP switches SW5 bits 9~10 can be used to specify the boot type, the presence of FDD/HDD, and whether the system is FDD preference or RAM preference. Depending on these settings, the drive names supported by the system will vary.

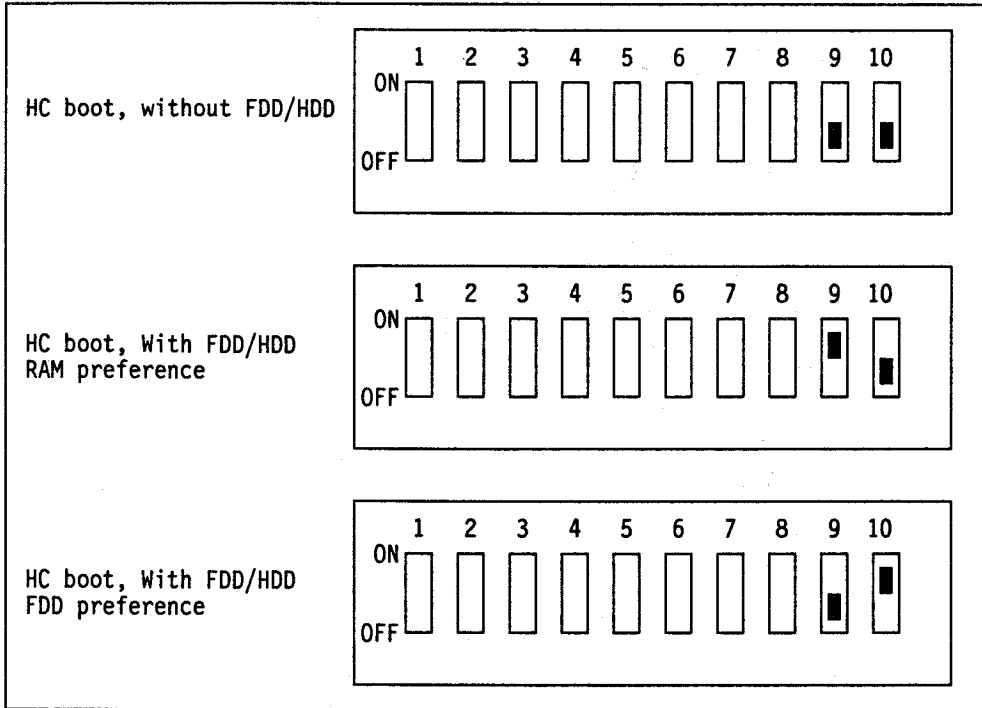


Fig. 2-1-28 Switch setting for FDD/HDD

DIP switch SW5 bit 7 sets the number of floppy disks used. This switch has no meaning when the system is configured for HC boot with no FDD.

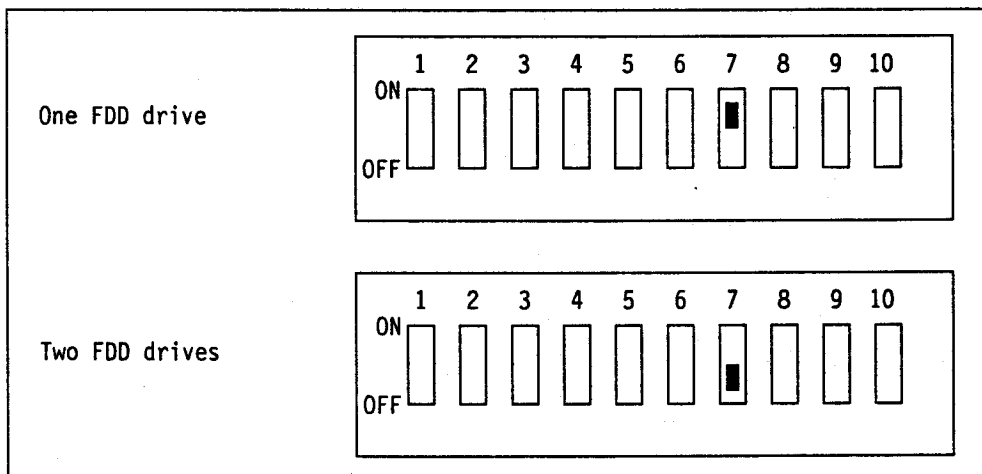


Fig. 2-1-29 Switch Setting for FDD Number

The drive names supported for each mode are given below.

HC boot without FDD

Drive name	Supported device
A	RAM disk (internal RAM disk + expansion RAM disk)
B	ROM disk (ROM0)
C	ROM disk (ROM1)
D	ROM disk (ROM2)
E	ROM disk (ROM3)
F	Cartridge 1 (optional device disk)
G - Z	Reserved for expansion device

Table 2-1-10 Drive name for HC boot without FDD/HDD

HC boot with FDD, RAM preference

Drive name	Supported device
A	RAM disk (internal RAM disk + expansion RAM disk)
B	ROM disk (ROM0)
C	ROM disk (ROM1)
D	ROM disk (ROM2)
E	ROM disk (ROM3)
F	Cartridge 1 (optional device disk)
G	FDD1
H	FDD2 (Indicates FDD1 when SW5-7 is ON)
I	HDD (for expansion if not connected)
J - Z	Reserved for expansion device

Table 2-1-11 Drive name for HC boot with RAM preference

HC boot with FDD, FDD preference

Drive name	Supported device
A	FDD1
B	FDD2 (Indicates FDD1 when SW5-7 is ON)
C	HDD (Note)
D	RAM disk (internal RAM disk + expansion RAM disk)
E	ROM disk (ROM0)
F	ROM disk (ROM1)
G	ROM disk (ROM2)
H	ROM disk (ROM3)
I	Cartridge 1 (optional device disk)
J - Z	Reserved for expansion device

Table 2-1-12 Drive name for HC boot with FDD preference

Note: If there is no HDD connected to the disk unit, the drive names will be moved up one notch.

② ROM disk

The PX-16 accesses its four ROM chips (ROM0~ROM3) as ROM disks. Each ROM slot may be fitted with a 256Kbit, 512Kbit, 1Mbit, 2Mbit or 4Mbit ROM. The size of each ROM chip is specified with the DIP switches (SW6~8) located on the main PCB. For details, refer to Section 3.2.3.

The ROM format is given below.

Bytes/sector - 512
Sectors/track - 16
Tracks/side - Dependent on ROM capacity
Sides/drive - 1

Track 0 Sector 0 is used for IPL, and the first 32 bytes contain the data required for drive access. Refer to Chapter 5 for details on ROM formatting.

The PX-16 ROM disk can assign two ROM chips or three ROM chips for use as a single ROM disk drive (twin ROM or triple ROM). The ROM configurations supported are:

Twin ROM

ROM1 + ROM2: ROM1 start is track 0
ROM2 + ROM3: ROM2 start is track 0

Triple ROM

ROM1 + ROM2 + ROM3: ROM1 start is track 0, followed in order by ROM2 and ROM3.

③ RAM disk

The PX-16 RAM disk is formed of portions of the main RAM (internal RAM disk) and the expansion RAM disk. The sizes of these RAM disks can be increased by adding 384KB expansion RAM boards. The size of the internal RAM disk is specified in 32KB units at cold start (start after system reset). The maximum RAM disk size for each system configuration is given below.

Main RAM size	MAX internal RAM disk size	Expansion RAM disk size	Maximum RAM disk size
256 KByte	128 KByte	0 KByte	128 KB + 0 KB = 128 KB
256 KByte	128 KByte	384 KByte	128 KB + 384 KB = 512 KB
256 KByte	128 KByte	768 KByte	128 KB + 768 KB = 896 KB
640 KByte	512 KByte	0 KByte	512 KB + 0 KB = 512 KB
640K Byte	512 KByte	384 KByte	512 KB + 384 KB = 896 KB
640 KByte	512 KByte	768 KByte	512 KB + 768 KB = 1280 KB

Table 2-1-13 Maximum RAM disk size

When the internal RAM disk is specified, and expansion RAM is mounted, the RAM disks will be supported as a single RAM disk volume.

The main RAM expansion is done with connecting the 384KB RAM board with CN14 and CN15, the increase of RAM disk from 0KB to 384KB with CN16 and CN17, and the increase in RAM disk from 384KB to 768KB with CN18 and CN19.

PX-16 RAM disk formatting is given below.

Disk size	32kB	64kB	128kB	384kB	768kB	896kB	1280kB
Bytes/sector	512 bytes						
Sectors/track	16 sectors						
Tracks/side	4	8	16	48	96	112	160
Sides/drive	1						
Directories	112						

Table 2-1-14 RAM disk format

④ Floppy disks

The PX-16 supports the disk unit and the TF-16 as options. The disk unit is a 3.5-inch FDD, which can be set to 720KB or 1.2MB with DIP SW5 bit 8. The TF-16 is a 5.25-inch FDD for 360KB disks.

<Disk unit>

The disk unit can be set to 720KB (IBM PC compatible) or 1.2MB with the DIP switch SW5 bit 8, as indicated below.

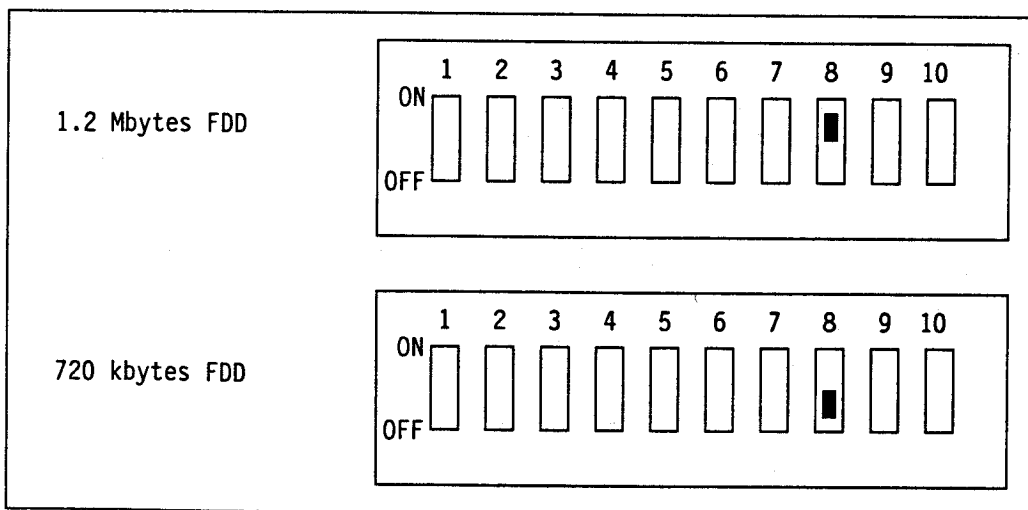


Fig. 2-1-30 Switch setting for FDD size

Whether the disk unit is set as a 720KB or a 1.2MB drive, it can read and write all formats supported by MS-DOS Version 3.20. However, when a floppy disk is formatted as a 320KB or less format in a disk drive, always use that disk on the same drive. If a 360KB disk formatted on one drive is accessed on another, read and write cannot be guaranteed.

Disk formats supported by the disk unit are:

Disk size	160kB/180kB	320kB/360kB	640kB/720kB	1.2 MB
Bytes/sector	512 bytes			
Sectors/track	8/9	8/9	8/9	15
Tracks/side	40	40	80	80
Sides/drive	1	2	2	2
Directories	64	112	112	224

Table 2-1-15 Floppy disk format

When DIP switch SW5 bit 8 is set to 720KB, the drive will be compatible with the 3.5-inch FDD used on the EPSON PCe and IBM PC machines. When the FORMAT command of MS-DOS is used to format a disk, the various parameter settings do not function as indicated in table 2-1-16.

The differences in the FORMAT command are given below.

Drive Format	Disk unit	
	Set to 720 kB	Set to 1.2 MB
Default	720 kB	1.2 MB
/1	x	x
/4	x	360 kB
/8	x	320 kB
/D	x	720 kB
/1/V	x	x
/4/V	x	360 kB
/8/V	x	x
/D/V	x	720 kB
/1/4	x	180 kB
/1/8	x	x
/1/D	x	360 kB
/1/4/V	x	180 kB
/1/8/V	x	x
/1/D/V	x	360 kB
/1/4/8	x	160 kB
/1/D/8	x	320 kB
/D/8	x	640 kB

(Note) x means Error

Table 2-1-16 Format command option

Note: The parameter "/d" has no meaning to the TF-16. "x" will result in an error.