

## *Chapter 2*

# ***STARTING UP AND OPERATING THE PX-8***

The first section of this chapter describes how to set up your PX-8 for the first time. The remainder of the chapter deals with the general functions of the computer.

## **2.1 Starting Up**

### **2.1.1 Precautions**

#### **a) The computer**

The PX-8 is a precise machine and in order to achieve the best performance, you should observe the following points:

- i) Avoid using or leaving the PX-8 in a place exposed to direct sunlight.
- ii) Avoid using or leaving the PX-8 in a damp place.
- iii) Avoid using or leaving the PX-8 in a place exposed to strong vibration.
- iv) Avoid using or leaving the PX-8 in a place exposed to high temperatures.
- v) Do not allow the PX-8 to be subjected to shocks of any kind.

#### **b) The AC adapter**

An AC adapter is provided with the PX-8 to re-charge the built-in batteries. When using this AC adapter:

- i) Avoid plugging the adapter plug into the AC adapter jack of the PX-8 without plugging the adapter to an AC outlet.
- ii) The shape of the power plug differs according to the country for which the PX-8 has been shipped. In certain countries there may not be a power plug attached. Your dealer will be able to advise you on the correct plug in this case.
- iii) The PX-8 will take approximately 8 hours to charge if the PX-8 is switched off. However, if the power switch is ON the time will be greater (at least 11 hours if no access is made to any device including the keyboard).

- iv) If you use the PX-8 while charging it at the same time, you will not be able to use it for as long as you might expect. If you intend to use the PX-8 from the battery alone, the adapter should be removed from the PX-8 and then reinserted in order to ensure it will fully charge. You should then ensure that it is left for at least 8 hours before use in order to achieve the maximum length of use.
- v) The maximum length of use on battery power is 15 hours without Input/Output operation.
- vi) There are special circuits to prevent overcharging of the battery.

**WARNING:**  
 Never use any AC adapter other than that provided.

### 2.1.2 Before switching on

Your PX-8 cannot be used immediately after unpacking. The following procedures must be carried out before turning on the power switch.

Your dealer will probably have carried out the procedures in this section when you receive the computer, in which case you can go to section 2.2 to see how to operate the computer.

#### a) Inserting and charging the battery

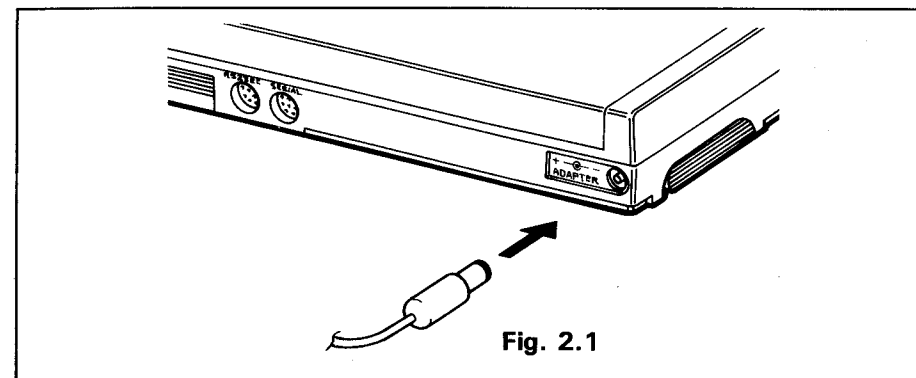
The PX-8 has been designed as a portable computer powered by rechargeable internal batteries. There are two battery units, main and backup. When the main batteries have insufficient power remaining to allow continuous operation, a message appears on the screen for 20 seconds:

#### CHARGE BATTERY

then the power is automatically turned off and the backup battery takes over so that the program or work in progress is retained until the batteries can be re-charged. If the computer is not switched on the batteries are used to retain the contents of the memory. It is possible, therefore, for the batteries to become discharged. In order to prevent this the computer will normally be shipped with no main batteries. You should therefore proceed as follows:

- i) Insert the batteries as described in the addition sheet, or as described in Appendix C.

- ii) Plug the AC adaptor power cable into an AC outlet.
- iii) Plug the AC adaptor output cable into the PX-8 adaptor jack.



- iv) About 8 hours (or 11 hours if the power switch is left on) are required to fully charge the battery units.

If when you come to switch on the computer the "CHARGE BATTERY" message comes up on the screen, it is still possible to use the computer while it is charging.

IF NO DISPLAY IS VISIBLE WHEN YOU FIRST SWITCH ON THE COMPUTER the batteries may be discharged. This can occur at any time. Simply plug in the charger, wait 10 seconds and then switch on again.

IF NO DISPLAY IS VISIBLE AT THIS STAGE, the batteries are so low that all the power is being used to charge them and there is no additional power available to perform the normal functions of the computer. Switch the power switch off, wait a few minutes and try again.

#### b) DIP Switch settings

As mentioned in Chapter 1, all of the layouts of character keys shown in table 2.1 are available with your PX-8 regardless of the markings on the key tops. The keyboard layout can be altered by means of the DIP switch (SW 4) which lies under a cover beneath the PX-8 near the keyboard (see fig 2.2). It is also possible to alter the character set by means of software. This is described in Appendix A 'ESC codes' using ESC "C" and Chapter 3 under the CONFIG.

Open the DIP switch cover underneath the PX-8 (fig 1.1c) and check that the DIP switch settings correspond to the characters for the country you require,

as follows:

When you open the DIP switch cover you will see a silver flexible flap. Lift this out of the way and the DIP switch will be seen on the left (if the DIP switch cover is towards you as you are looking at the base of the PX-8). The DIP switch can then be set. The individual switch is in the ON position when it is towards the side which is marked ON.

Only the first four positions of the DIP switch are used for the character sets. The settings for various keyboard layouts are shown in table 2.1. The switches can be changed with the tip of a ball point pen or a matchstick.

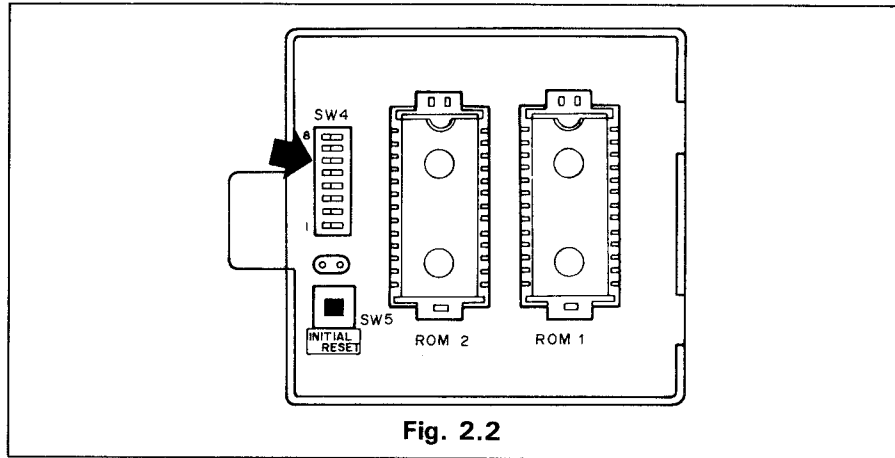


Fig. 2.2

Table 2.1

| Keyboard Layout | DIP switch position |     |     |     |
|-----------------|---------------------|-----|-----|-----|
|                 | 1                   | 2   | 3   | 4   |
| USA (ASCII)     | ON                  | ON  | ON  | ON  |
| French          | OFF                 | ON  | ON  | ON  |
| German          | ON                  | OFF | ON  | ON  |
| English         | OFF                 | OFF | ON  | ON  |
| Danish          | ON                  | ON  | OFF | ON  |
| Swedish         | OFF                 | ON  | OFF | ON  |
| Norwegian       | OFF                 | ON  | ON  | OFF |
| Spanish         | OFF                 | OFF | OFF | ON  |
| Italian         | ON                  | OFF | OFF | ON  |

**NOTES:**

i) **IMPORTANT:** Altering the settings will not cause any change to occur until the reset procedure outlined in section 2.2.5 is carried out.

- ii) Other DIP switch settings are used for different purposes. The position of switch 5 is used to decide whether a RAM check should be carried out if an Intelligent RAM disk is connected. Switch 6 is concerned with certain characters output to the printer when a screen dump is carried out. Both of these will be explained in Chapter 4.
- iii) Switches 7 and 8 are not used. They should be left in the OFF position as set in the factory.

**2.1.3 Initialization**

There are a number of times when it is necessary to reset the system. There are three different ways of resetting the system. The action of these three reset modes are summarised in section 2.2.4.

A complete reset (resetting the sub-CPU) and initialisation must be carried out if:

- i) The batteries have been changed or inserted for the first time on purchasing.
- ii) The system has become so corrupt as to leave no alternative but to carry out a complete reset. This is a very rare occurrence and there are less drastic ways of resetting the computer. The complete reset procedure should only be attempted as a last resort. See section 2.2.4 for a comparison of the different reset situations.
- iii) The optional expansion unit has been installed. (e.g. RAM Disk Unit)

**a) Resetting the sub-CPU**

The procedure for resetting the 7508 sub-CPU is as follows:

- i) Turn off the power switch.

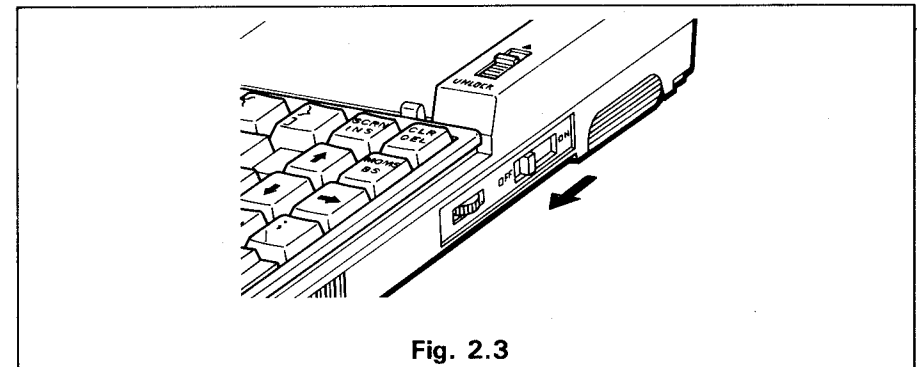


Fig. 2.3

ii) Open the plastic switch cover on the base of the PX-8.

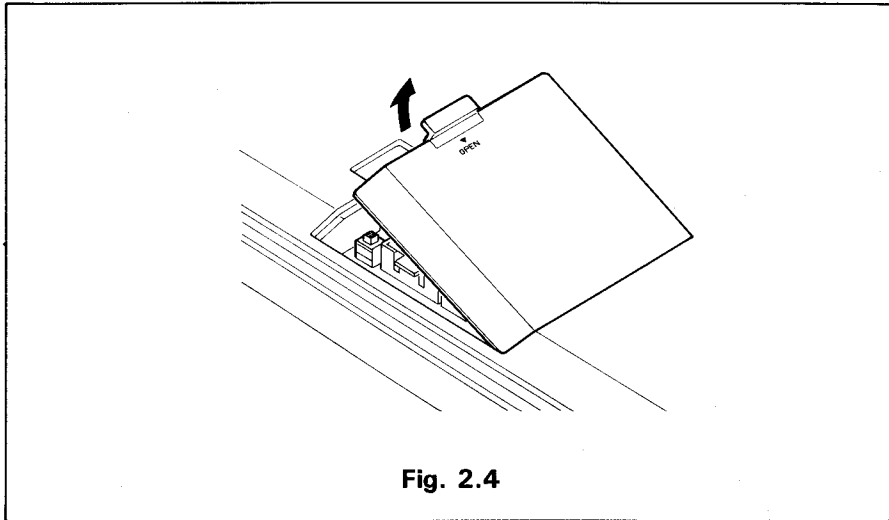


Fig. 2.4

iii) Press the push button reset switch near the DIP switch. The switch is covered to prevent accidental resetting of the sub CPU. It has a hole in the top through which it is possible to push the switch. Do not use a conductive implement to push the switch, or one whose end can break off (e.g. a pencil).

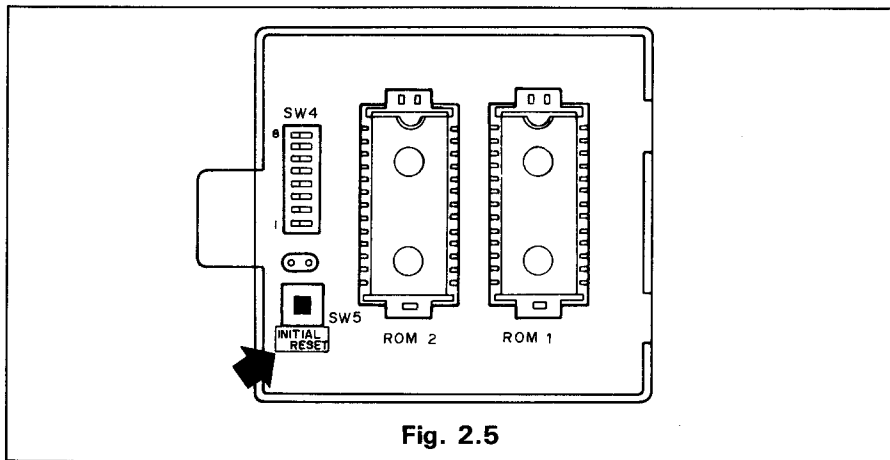


Fig. 2.5

iv) Replace the cover. Turn the PX-8 over and switch the power back on. The following message will then be displayed on the LCD screen:

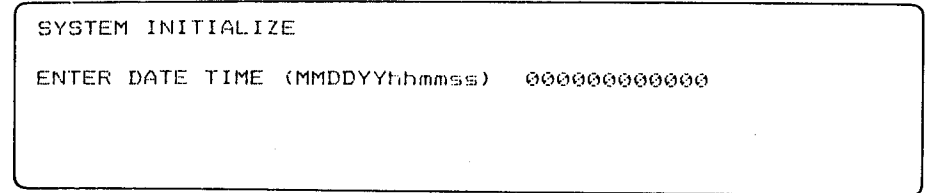


Fig. 2.6

This display image is the same as that displayed after system initialization described in Section 2.2.5b.

The display shows the first of a series of questions. These set the date and time, and the organization of the memory.

The first question the display shows allows the date and time to be entered. The expression:

**MMDDYYhhmmss**

shows the order in which the items have to be entered. The number of items corresponds to the row of zeroes to the right of the message. The first zero is covered by a flashing block. This is the cursor, which is used throughout the operation of the computer to show the position of the next character to be printed. It can sometimes be moved by using the cursor keys which are the keys marked with an arrow on the right of the keyboard. This movement is under the control of either an applications program or the overall controlling program or operating system which on the PX-8 is called CP/M. The use of CP/M is discussed in Chapter 3. In this particular case only two of the cursor keys are active. They are the right and left pointing arrows which allow movement of the cursor within the bounds of the row of zeros. By using these keys the flashing cursor can be placed over any one of the zeros and when you have chosen a particular position the value can be altered by pressing the appropriate numerical key. The cursor then moves to the next position to the right.

The various letters correspond to the date and time as follows:

**MM:** month (e.g. 01 for January and 11 for November)

**DD:** day of the month

**YY:** year (e.g. 84 for 1984)

**hh:** the hour (on a 24-hour clock basis)  
**mm:** minutes past the hour  
**ss:** seconds past the minute

When these figures have been typed in, any mistake can be corrected by moving the cursor to sit over the incorrect number and then retyping that number. The complete values of the time and date are not entered into the memory of the PX-8 until the key marked **RETURN** is pressed. You should check that the values are absolutely correct before pressing the **RETURN** key. Leading zeros must be added if the month etc is less than 10. Failing to do this will result in the information being out of sequence.



**WARNING:**

*The date and time are not actually updated until the day is input. It is possible to update the time and date using either the CONFIG program (see Chapter 3) or using the TIME\$ and DATE\$ commands in BASIC (see the BASIC Reference Manual). These give accurate updating of the time.*

When **RETURN** is pressed, the next question comes up on the screen:

**ENTER DAY (0 to 6)**

The cursor is flashing over a single zero this time, waiting for a number from 0 to 6 to denote the day of the week. The days are represented numerically in the order:

- 0 Sunday
- 1 Monday
- 2 Tuesday
- 3 Wednesday
- 4 Thursday
- 5 Friday
- 6 Saturday

The day is not changed in the memory of the PX-8 until the **RETURN** key is pressed. The day is then stored and the next question is asked.

The third question is

**ENTER RAM DISK SIZE**

The PX-8 allows part of the memory to be reserved to store programs and data. It can be used as if it were a disk drive. Since the memory used is the standard Random Access Memory used to run programs and store working data, the part of memory used as a pseudo-disk drive is known as the RAM disk. In accessing the drive under CP/M the drive A: is assigned to the RAM Disk as described in Chapter 3. It is also possible to have an additional block of memory which gives a further 60 or 120 kilobytes of storage which plugs into the back of the PX-8. Further details are given in Chapter 4. If this extra item, the Intelligent RAM disk, is attached this particular question will not be asked because no internal memory can then be allocated for use as a RAM disk.

The cursor lies over the first digit of the default value of 9 kilobytes (9K) expressed in the form "09". Default means the value the PX-8 thinks you would normally expect to use, and which it will set unless you change this value. Up to 24K of RAM can be reserved for the RAM disk.

```
SYSTEM INITIALIZE
ENTER DATE TIME (MMDDYYhhmmss) 000000000000
ENTER DAY (0 to 6) 0
ENTER RAM DISK SIZE 09
```

Fig. 2.7

The procedure for entering the size of RAM disk you require is the same as with the previous questions. Since the value entered is that displayed, simply press the **RETURN** key if you wish to use the default value of 9K bytes. If you wish to change the size of the RAM disk, alter the value and press the **RETURN** key. The RAM disk size can only be set in 1K byte units and the value 0 and 2 to 20 can be input.

When the RAM disk size has been set the next question is:

**ENTER USER BIOS SIZE 00**

This is a facility for advanced programmers. The cursor will be positioned over the first digit of a pair of zeros. Unless you have a specific need to use the USER BIOS area simply press the **RETURN** key at this stage.

The use of the USER BIOS area is covered in the OS Reference Manual. The location of the USER BIOS area can be seen in the memory map (Appendix F). The number entered in response to this question denotes the number of 256

256 byte blocks. Note that if USER BIOS area is reserved, the total area of the USER BIOS plus the RAM disk cannot exceed 24K bytes. If U is the number entered for the USER BIOS and R is the number entered for the RAM disk, then  $U/4 + R$  must not exceed 24. This is because the RAM disk is assigned in units of 1K and the USER BIOS in units of 1/4 K.

Before the USER BIOS question has been answered the display will show

```

SYSTEM INITIALIZE

ENTER DATE TIME (MMDDYYhhmmss) 000000000000
ENTER DAY (0 to 6) 0
ENTER RAM DISK SIZE 09
ENTER USER BIOS SIZE 00
  
```

Fig. 2.8

On pressing the **RETURN** key it will clear and ask a further question.

### RAM DISK FORMAT (Y/N) ?

Formatting a disk makes it possible for programs and data files to be stored as if the RAM disk were a conventional floppy disk. Until it is formatted data cannot be written to the disk. There are times when it is necessary to go through the initialization procedure when the disk contains files. In this case only it is permissible to say 'N' to this question. The disk will not be formatted, but **there is no guarantee that the files will be intact or that the RAM disk can be read.**

When the Y key is pressed, the RAM disk will be formatted and the display will change to show the MENU screen.

A typical MENU screen would be:

```

*** MENU screen *** 03/01/84 (WED) 04:26:07 54.5k CP/M ver 2.2 PAGE 1/1
C:PIP
C:PIP COM C:STAT COM C:SUBMIT COM C:XSUB COM
C:FILINK COM C:TERM COM C:CONFIG COM B:BASIC COM
  
```

Fig. 2.9

This type of screen makes it easier to run programs and saves typing. The setting up and use of the MENU screen is described in section 2.2.3d.

## 2.2 Operating The Computer

### 2.2.1 The Keyboard

If you are used to using a normal typewriter or another computer, you will see that the keyboard is similar. You will already have used the keyboard if you have set up and initialized the PX-8, but in order to use all of its facilities you will need to study this section to understand the special keys and key combinations. There are also special key combinations which only apply if you are using CP/M, the BASIC language or a particular applications program. Special use of certain keys and key combinations under CP/M are explained in Chapter 3, and under BASIC in the BASIC Reference Manual. Consult the appropriate Manual for any applications software.

#### a) Alphanumeric keys

Most keys on the keyboard generate characters, alphabetic, punctuation and numerals or graphics characters. These keys are called auto-repeat keys. Each auto-repeat key generates a certain character code repeatedly if it is pressed and held on for more than a specified period of time. This normally causes a character to be printed on the screen. Some keys are switch keys which alter the character code output by the character keys, for example to allow one key to output either upper or lower case characters. Other keys are special keys which allow insertion and deletion of characters, for example.

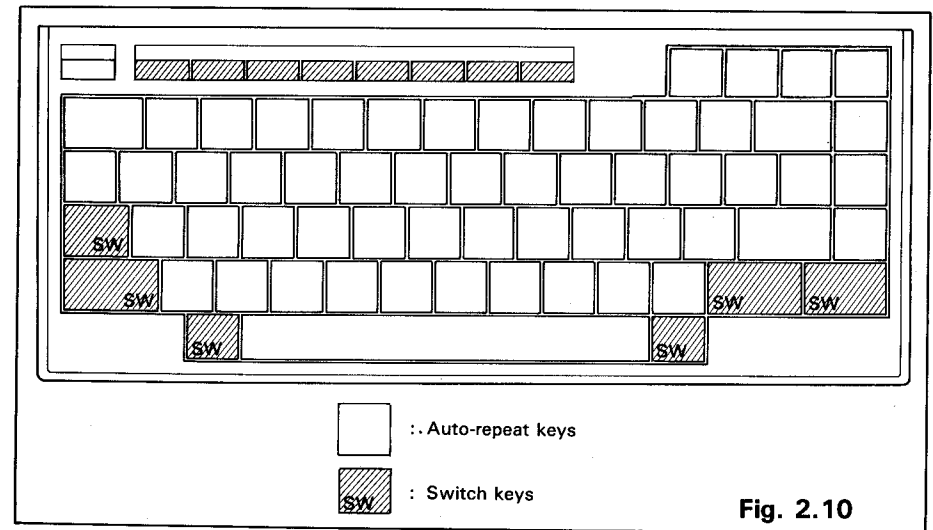


Fig. 2.10

The time before starting repetition and the repetition interval can be set by the

user by means of an ESC code sequence. See Appendix B.

If you are not familiar with a computer with auto repeat keys, you may hold them down too long initially, although you will soon adjust to the response time. If the key is held down past the repetition time, the character will be printed more than once and this could cause a program to respond in a way you might not expect. For example the System Display uses the **ESC** key to move back through the various levels, and also as the exit key. If you hold down the key for too long it is possible to exit when you did not mean to.

Sometimes a key may not appear to respond. This is because a program is processing data. Do not press the key again as the key you have pressed is stored in a buffer and will be retrieved when the program is ready to use your input. Continued pressing of a key may cause action to occur which you did not intend.

### b) Switch keys

Switch keys allow the other keys to perform more than one function. For example, they can allow upper and lower case (capital and small letters) to be obtained from the alphabet keys.

**SHIFT** : Pressing this key together with a key other than a switch key enters the alternative code assigned to that key. The **SHIFT** key should be held down before the other key is pressed. Thus if any numerical key is pressed whilst holding the **SHIFT** key down the alternative character above the numeral on that key will be printed. The **SHIFT** key also allows upper and lower case letters to be obtained from the alphabetical keys.

**CAPS LOCK** : Pressing this key makes the alphabet keys enter upper case letters without pressing the **SHIFT** key. The lock is removed by pressing the key again. When the **CAPS LOCK** is set the LED marked "CAPS" at the top of the keyboard will be lit. If the **SHIFT** key is pressed when the Caps Lock is set, the lower case character is printed instead.

**CTRL** : There are two **CTRL** keys, one to the left of the keyboard above the **SHIFT** key, and one to the right of the space bar. They are equivalent. Pressing either key makes it possible to enter control codes from the keyboard. Control codes are characters which are not printed. Some correspond to characters such as a carriage return, line feed, etc., others are used by applications software packages to perform such functions as clearing the screen or going to the end of the text. Control codes are normally associated with alphabetic keys and are indicated by the word "Control" followed by the associated letter, for example, "Control C". This is often abbreviated with the "CTRL"

joined to the letter by a hyphen. For example pressing the **CTRL** and the **C** key at the same time could be written **CTRL**-**C**. Another common way to show a control character is to place a "^" character in front of the letter. Thus **CTRL** - **C** could also be written as "^C". This will be printed on the screen if a control character is entered on the command line in CP/M. To obtain a control character the **CTRL** key should be held down and then the alphabetic character pressed.

**NUM GRAPH** : This key has two functions. Pressing a character key together with this key enters the graphic character code assigned to the key. Not all keys have graphics characters assigned to them. It is also possible to have user defined characters. Those are defined in the codes indicated in ( ).

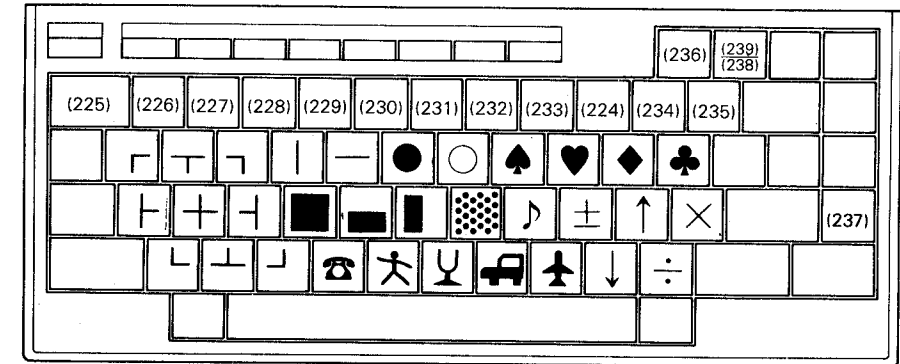


Fig. 2.11a ASCII keyboard

If the **NUM GRAPH** key is pressed while the **SHIFT** key is held down, a block of keys can be used as a numeric key pad. The key layout is as follows:

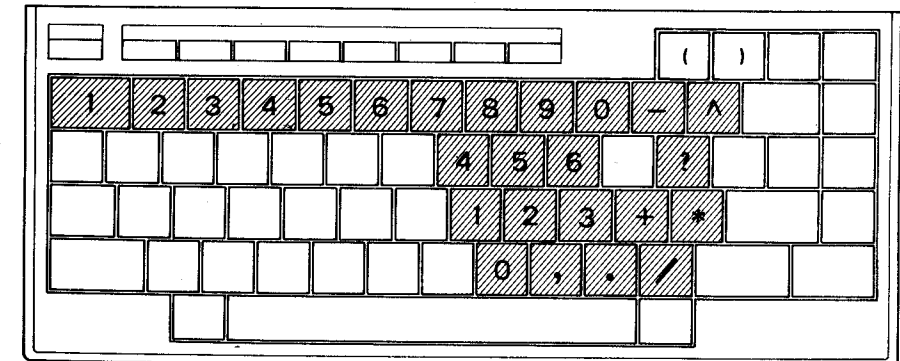


Fig. 2.11b ASCII keyboard

When the PX-8 is in the numeric keypad mode the LED at the top of the keyboard marked "NUM" will be lit. Pressing this key together with the **SHIFT** key when the PX-8 is in this mode returns to the normal state.

### c) Special keys

There are a number of special keys some of which allow control of the cursor and also simplify operation of the PX-8. Some of them also allow interruption of the computer so that, for example, the screen can be dumped to a printer.

The CURSOR KEYS are the keys marked with arrows on the right of the keyboard. They are used to move the cursor on the screen under control of the applications program. As was seen in the initialization, they may not all be active at once and may only allow movement within certain limits. The cursor keys are not supported by CP/M.

**RETURN** : This means carriage return, and is normally used to place the cursor at the beginning of a line. Since this would place the cursor on top of the characters already printed, a line feed is normally added to a carriage return by the software. The **RETURN** key is also used to signal the end of entry when a sequence of characters are being entered into the computer, otherwise the software has no way of knowing when the user has finished. Until the carriage return character is entered, the software will wait for the next character, unless a single character entry is required. The ASCII code for a carriage return is 13 decimal (0D hexadecimal), which corresponds to a **CTRL** - **M** .

**STOP** : In CP/M pressing this key clears the keyboard buffer and makes a warm start of the system. In BASIC it is used to stop a program.

**CTRL** and **STOP**: Pressing these keys simultaneously immediately terminates I/O operation, and makes a warm start of the system.

**ESC** : Pressing this key enters an ESCAPE code (ASCII code 27 decimal). It is used frequently to exit from many of the special function programs of the PX-8.

**PAUSE** : Pressing this key enters a PAUSE code (ASCII code 19 decimal) which can be used to stop printing to the screen. For example if there are too many files on a disk to be displayed on the screen at one time pressing the **CTRL** key can temporarily stop the printing of the filenames. The effect of a pause can be reversed by pressing any other key.

**CTRL** and **ESC** or **PAUSE**: Pressing the **CTRL** and **ESC** or **PAUSE** keys calls a subroutine specified.

**HELP** : Pressing this key enters a **HELP** code (ASCII code 0). This is sometimes used in applications software to show a table of commands etc. On the PX-8 the main use of the key is in combination with the **CTRL** key to enter the System Display.

**CTRL** and **HELP** : Pressing these keys simultaneously turns on the System Display. This is described in full in section 2.2.2.a.

**TAB** : This is a key which moves the cursor to pre-set positions across the screen. These are normally in steps of 8 characters. When the TAB key is pressed it generates an ASCII code 9.

**DEL** : Pressing this key enters a **DEL** character (ASCII code 127 decimal). It is usually used to delete the character under the cursor. However, some application programs use it in different ways. It has a special use on the CP/M command line and this will be explained in Chapter 3.

**CLR** : This is obtained by using the **SHIFT** key with the **DEL** key. Both keys must be pressed even if the **CAPS LOCK** key is active. It enters a - which has the ASCII code 12 decimal. If used in an applications program it normally clears the screen.

**INS** : Pressing this key enters an ASCII code 18 decimal. Normally this is used to allow characters to be inserted. Its use on the CP/M command line is described in Chapter 3, as it has a different function.

**SCRN** : This key is used to change the cursor tracking mode. The PX-8 displays a window on a virtual screen. The cursor moves over the virtual screen. Normally the window follows the cursor. This is called tracking mode. The key (obtained by pressing the **INS** and **SHIFT** key) is used to turn the tracking mode on and off. If the **SCRN** key is pressed while the PX-8 is in tracking mode, the window will be frozen over a particular portion of the virtual screen. This is known as the non-tracking mode. Pressing the **SCRN** key when the PX-8 is in this mode will turn the tracking mode on again and move the window on the virtual screen so that the cursor is displayed in the window.

**BS** : This key causes the cursor to Back-Space and delete the last character. It enters a BACKSPACE character (ASCII code 8). In some applications



software, and on the CP/M command line, it is the only way to delete a character.

**HOME** : The **HOME** key as the name suggests moves the cursor to the top left hand corner of the virtual screen (not the window).

### KEYS **PF1** TO **PF5** : The Programmable Function keys

These are a set of keys which enable the user to enter a string of characters which will be printed when the key is pressed. This is as if they had been typed in by the user at the keyboard. The PX-8 is programmed with a default set of characters which allow the most common CP/M commands to be input with one keystroke. Also when BASIC is entered, a default set is available, which corresponds to the common BASIC commands.

The strings are altered by means of the CONFIG program in CP/M, which is described in Chapter 3. The BASIC Reference Manual describes how to alter them in BASIC.

Pressing a programmable function key together with the **SHIFT** key enters a different user defined string. The names PF6 to PF10 are given to the shifted keys **PF1** to **PF5**, i.e. a value of 5 is added to the number of the programmable function key if it is shifted.

Since there are ten function key strings it is sometimes difficult to remember which key has which string associated with it. The strings assigned to each function key can be displayed on the eighth line of the screen. If the eighth line shows the following display:

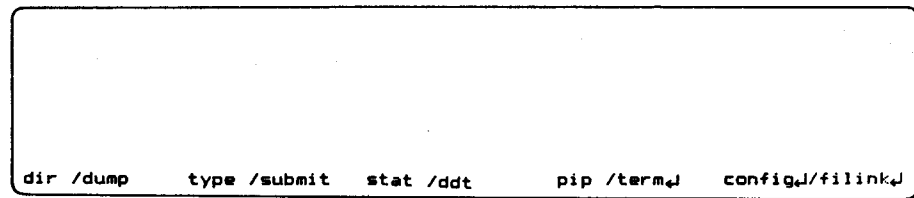


Fig. 2.12

This means function key **PF1** will print the characters "dir" when pressed, and "dump" when pressed with the shift held down (i.e. the **PF6** key is pressed) and so on across the screen. The "␣" character means that the equivalent of pressing the **RETURN** key is also added to the characters printed. A **RETURN** is not added with the characters if it is likely that other commands or parameters

need to be added.

The assignments can be changed using the CONFIG program described in Chapter 3. This also has an option to switch the display of these function key assignments on and off.

Pressing a programmable function key ( **PF1** to **PF4** ) together with the **CTRL** key calls a subroutine specified by the user. If no subroutine is specified, nothing happens.

Pressing the **CTRL** and **PF5** keys simultaneously outputs, the contents of the display screen to the printer.

### 2.2.2 Switching the PX-8 on and off

The PX-8 has a power switch on the right hand side (see fig 2.3) which is the normal way the computer is switched on and off at the beginning and end of a session of using the PX-8. However, the PX-8 is not switched off completely as a mains operated computer would be if the power was turned off. The power switch can be thought of as a means of temporarily halting the operation of the computer, so that the batteries are conserved. As soon as the power is turned on again it is possible to begin exactly where you left off, even if you were in the middle of typing a word or running a program.

The power switch is not the only means by which the power can be switched on and off. The power switch of the PX-8 is controlled by the computer, and can and is switched off under software control. Thus, if it is not used for a length of time (which can be set by the user using the CONFIG program described in Chapter 3), it will switch itself off to conserve power. The user can also program the computer to switch itself off at specific times. Furthermore the PX-8 can switch itself on, run a particular program and then switch itself on again to run the same or another program. This ability to switch itself on and off is a powerful feature of the computer.

To switch the power on when the switch is already in the on position, switch it off and on again. This means, holding the computer with the keyboard nearest to you, moving the switch towards you and then away from you again.

To switch the computer off when it is already in the off position, switch the power switch to the on position and then off again.

Because the computer can switch itself on and off, the power switch position may not reflect the true state of the power. For example if the PX-8 switches itself off, the power switch will still be in the on position, even though the power is off. Similarly, if the PX-8 switches itself on, the power switch will be in the off position even though the power is on. Holding the PX-8 normally with the keyboard towards you, the power switch is on the right hand side of the computer. The ON position is towards the back of the computer. The OFF position is towards the front of the computer.

There are also two ways to switch the power off: **the restart and continue modes**. The selected mode is determined by the conditions prevailing at the time the power is turned off. When the power is switched off in the restart mode, the Menu or CP/M command line display will be activated when the power is turned on again. When the power is switched off in the continue mode, the operation which is being executed when the power is turned off will be continued when the power is turned on again.

i) Conditions under which the restart mode is selected:

- When the power switch is turned off.
- When system initialization is performed.
- When the sub-CPU is reset.
- When the BIOS POWEROFF routine is called. (See Chapter 5)

ii) Conditions under which the continue mode is selected:

- When the power switch is turned off while pressing the **CTRL** key.
- When the auto power off time is reached, because no key has been pressed. (See Chapter 3.)
- When the main battery voltage drops below a certain level (power failure).
- When the BIOS POWEROFF routine is called.(See Chapter 5)

## SWITCHING THE PX-8 ON

As can be seen from the above explanation, when the PX-8 is switched on, a number of routes can be taken by the operating system. If the power was switched off in the continue mode, operation will continue at the point at which it was switched off. If the PX-8 was simply switched off in the restart mode, there are a number of options possible. These also vary with the way the computer is switched on (i.e. manually or under the control of the PX-8). In order to understand these possible situations, an overview of the operating system is necessary. However, to keep the information together for reference, the following summary of what can happen when the PX-8 is switched on is given at this point, even though some of the concepts have not been covered at this stage in the Manual.

- i) If the Password has been set the PX-8 will ask for the Password to be entered. It will not be possible to operate the system any further without entering the correct Password.
- ii) If the PX-8 has been switched off in the continue mode, the program which was being used, will continue at the point it had reached when the PX-8 was switched off. Thus if the program was waiting for input, or was processing information, this would continue.
- iii) If the PX-8 was switched off in the restart mode, either the MENU page or the CP/M command line would be displayed.
- iv) If BASIC was in use when the PX-8 was switched off, it is possible to re-enter BASIC. If the MENU is switched on, this is done simply by pressing the **RETURN** key. If the MENU is switched off, it would appear not to be present. It can be retrieved (see the SAVE command in Chapter 3), but you may not remember that you were using BASIC. It is wise to set the MENU on before switching off when using BASIC, so that it is evident that BASIC was in use, and to prevent any loss of programs stored in the five program areas.

### IF YOU SWITCH THE COMPUTER ON AND NO DISPLAY APPEARS:

First check that the view angle of the LCD is set so that you can see the screen display.

If there is still no display, the battery needs recharging. Plug in the AC charger, wait a few seconds and then switch on again.

## 2.2.3 The PX-8 operating system modules

The operating system of the PX-8 is functionally divided into several units which are referred to as modules. Some of them are part of the CP/M operating system and others supplement it.

- i) **System Display module**  
This module enables the microcassette tape to be operated manually and also to check and reset some of the system parameters. This module can normally be operated while applications software is running. Many of the following modules have parameters which can be changed by using this module.
- ii) **Password module**  
This module makes it possible to stop unauthorised users from using the PX-8 without knowing an entry password.
- iii) **MENU module**  
This module displays program files and data files on the screen and makes it easier for the user to run any program file by selecting it on the screen, using the cursor keys rather than having it to type the full name.
- iv) **Screen dump module**  
This module is used to make a copy of the current screen on a printer.
- v) **Console Command Processor (CCP)**  
This is the part of the CP/M operating system which interprets command strings typed on the keyboard. This module includes the CP/M built-in commands (DIR, TYPE, REN, ERA, SAVE and USER).
- vi) **Basic Disk Operating System (BDOS)**  
This is the part of the CP/M operating system which manages disk files. It also treats the ROM capsule and RAM as disk devices.
- vii) **Microcassette Tape Operating System (MTOS)**  
This module manages microcassette tape files.
- viii) **Basic Input/Output System (BIOS)**  
This part of CP/M which acts as the interface between the operating system and input/output devices e.g. the screen, keyboard and RS232 interface.
- ix) **Microcassette Input/Output System (MIOS)**  
I/O interface between MTOS and microcassette firmware
- x) **Clock module**  
This module controls the alarm and wake functions and updates any time displays.
- xi) **System activator**  
This module controls system activation, deactivation, the auto-start function and initialization.

The best way to understand the operation of the modules which are directly under the control of the user is to check and alter the status of the parameters involved using the System Display module.

#### a) System Display module

The System Display is brought on to the screen by pressing the **CTRL** and **HELP** key simultaneously. The screen is then changed to show a display similar to one of the following:

```

*** SYSTEM DISPLAY ***    03/01/84 (THU) 12:01:34    <MENU> <PASSWORD>
<RAM DISK> 009 kb    <AUTO START>
<USER BIOS> 000 256 b    <MCT MODE> stop, nonverify <COUNT> 65535
<MENU DRIVE> CBA    <MENU FILE> 1 .COM 2 . 3 . 4 .
- Select number or ESC to exit.
 1=password 2=alarm/wake 3=auto start 4=menu 5=MCT
<<- /    <- /mount    #/dirinit    ->> /erase    000/

```

Fig. 2.13a

```

*** SYSTEM DISPLAY ***    03/01/84 (THU) 12:01:34
<RAM DISK> 009 kb    <AUTO START>
<USER BIOS> 000 256 b    <MCT MODE> stop, nonverify <COUNT> 65535
<MENU DRIVE> CBA    <MENU FILE> 1 .COM 2 . 3 . 4 .
- Select number or ESC to exit.
 1=password 2=alarm/wake 3=auto start 4=menu 5=MCT
<<- /    <- /mount    #/dirinit    ->> /erase    000/

```

Fig. 2.13b

This screen image is referred to as the System Display. It shows a number of items of information which would be hard to determine except by running a separate program to interrogate the system. Since the System Display can be obtained even in the middle of an applications program it is a fundamental part of the PX-8 which you will be using regularly, so try altering as many of the parameters as possible to see what they do.

Looking around the screen you will see the following:

The first line shows the title "SYSTEM DISPLAY" in the top left hand corner. Followed by the date and time. It may show one or other of the words "<MENU>" and "<PASSWORD>". Figs 2.13 a and b show cases with and without these options displayed. These are visible if the corresponding options have been set.

The second line shows the ALARM or WAKE time together with the appropriate string. If this option has not been specified, the line will be blank.

The third line shows the size of the RAM disk as set on initialization or using the CONFIG program (see Chapter 3). Next to it will be an Autostart string if one has been specified. The title "<AUTO START>" will still be present even if there is no string specified.

The fourth line shows the size of the USER BIOS, in 256 byte pages as set by initialization or the CONFIG program. To the right of the line are a series of parameters associated with the Microcassette drive.

The fifth line is concerned with the MENU. The drives from which the files will be taken are displayed next to the "<MENU DRIVE>" title on the left. The right hand side of the line shows which file extensions are to be chosen for display on the MENU.

The sixth line shows the prompt string and flashing prompt to enable one of the options on the seventh line to be taken.

The eighth line shows the strings associated with the programmable function keys which are used to control the Microcassette drive. If a cassette has been mounted, only the **PF6** (shifted **PF1**) key will be active.

The following items CANNOT be changed by using the System Display:

- |                                 |            |
|---------------------------------|------------|
| 1) Month/Day/Year (Day of week) | (1st line) |
| 2) Hour:Minute:Second           | (1st line) |
| 3) RAM disk size                | (3rd line) |
| 4) Size of USER BIOS area       | (4th line) |

They are changed either by the initialization procedure, or the CONFIG program described in Chapter 3.

The following sections explore the use of each of the modules which can be changed by using the System Display.

**NOTE:**

*System Display cannot be entered during PASSWORD or ALARM/WAKE display.*

## b) Password module

The Password module makes it possible to prevent the computer system from being used by unauthorised people. It should be used with care. It is not possible for the Password to be determined once it has been assigned. If the Password is being used, make sure that all data and programs including those in the RAM disk are saved to disk or Microcassette tape before switching off. If it is necessary to break the Password, all data and programs will be lost.

From the System Display press the **[1]** key and lines 6 and 7 will change to:

```
*** SYSTEM DISPLAY ***      03/01/84 (THU) 12:01:34
<RAM  DISK> 009 kb      <AUTO START>
<USER  BIOS> 000 256 b  <MCT  MODE>      stop, nonverify <COUNT> 65535
<MENU DRIVE> CBA      <MENU FILE> 1 .COM  2 .      3 .      4 .
- Select number or ESC to return.
<PASSWORD> 1=off 2=assign
```

Fig. 2.14

### i) Setting a password

To assign a password, press the **[2]** key and the prompt will change to:

```
*** SYSTEM DISPLAY ***      03/01/84 (THU) 12:01:34
<RAM  DISK> 009 kb      <AUTO START>
<USER  BIOS> 000 256 b  <MCT  MODE>      stop, nonverify <COUNT> 65535
<MENU DRIVE> CBA      <MENU FILE> 1 .COM  2 .      3 .      4 .
- Input password, ESC to cancel.
```

Fig. 2.15

with the cursor on the seventh line awaiting the password. Type in your password (this is limited to 8 characters) and press the **[RETURN]** key when you have typed in all the characters. Remember the password you have typed because there is no way to find out what it is once you have pressed **[RETURN]**.

The System Display screen will show the word "<PASSWORD>" in the top right hand corner as soon as the **[RETURN]** key is pressed after the password has been entered.

Having entered a password, switch off the PX-8, wait a few seconds and switch it on again. The screen will now show:

PASSWORD

Fig. 2.16

The system cannot be used unless the correct password is typed from the keyboard. Type the password and press the **[RETURN]** key. The letters you type will not be displayed on the screen. If the typed word is incorrect, the cursor will be returned to the starting position. When the correct word is entered, the speaker will beep and the display will change to either the MENU page or the CP/M command line display.

### ii) Removing the PASSWORD

Press the **[CTRL]** and **[HELP]** keys to go back to the System Display again. This time after pressing 1, remove the password by pressing 1 again. If you had pressed 1 to change the password status and then decided not to do so, the **[ESC]** key could be used to return to the options choice line. In general, pressing **[ESC]** anywhere in the System Display will successively take you back a level, so that you eventually leave it altogether.

The user will be asked to supply the password under the following conditions, not just when the PX-8 is switched on:

- If power is turned on by the power switch or the wake time is reached with the password mode specified.
- If the alarm or wake mode is activated while the password is still being entered, both will be treated as an alarm string.

#### NOTE:

The PX-8 will only treat the wake string as if it were an alarm string if the Password is activated. The user will then be asked for the password again after pressing **[ESC]** to exit from the alarm/wake message.

- Pressing the reset button will return the user to the password screen.

The password mode is terminated in one of the following cases:

- a) When the password is typed correctly.
- b) When power is turned off.
- c) When the auto shut-off time is reached.
- d) When power failure is detected.

The password mode is interrupted when the alarm/wake time is reached.



**WARNING:**

*The only way to exit from the password if it is not known is to initialize the system by either pressing the reset button with the right-hand **SHIFT** and **NUM GRAPH** keys held down or by doing a full system reset, as when starting the up the system for the first time.*

*In this case all your programs will be lost and also anything stored in the RAM disk area.*

**c) Clock module - the ALARM and WAKE functions**

The clock module manages the software clock and controls the ALARM and WAKE functions which allow the PX-8 to switch on and present a message or start a program running. If the computer is in use, and alarm or wake time is reached, the program being run will be interrupted. The screen will clear and show the message.

In order to familiarise yourself with the possible ways of setting and using the ALARM and WAKE functions press **CTRL** and **HELP** to turn on the System Display and then press option 2 to change the ALARM and WAKE options. Lines 6 and 7 of the screen then change to:

```

*** SYSTEM DISPLAY ***      03/01/84 (THU) 12:01:34      <MENU>

<RAM  DISK> 009 kb      <AUTO START>
<USER  BIOS> 000 256 b  <MCT  MODE> stop, nonverify <COUNT> 65535
<MENU DRIVE> CBA      <MENU FILE> 1 .COM  2 .  3 .  4 .
- Select number or ESC to return.
<ALARM/WAKE> 1=off 2=alarm 3=wake 4=message/string

```

**Fig. 2.17**

It is not possible to have both the ALARM and WAKE functions operating together. If option 2 is taken it will cancel any WAKE setting and replace it with an ALARM. Option 1 switches off whichever of the ALARM and WAKE has been set, and the message string (option 4) is used with both the ALARM and WAKE functions in a slightly different way.

*i) SETTING THE ALARM*

Before looking at the various options for setting the ALARM, the following example shows how to set the ALARM simply to switch on the computer and display a message at a specific time and date.

Press the **2** key and the prompt changes as follows.

```

*** SYSTEM DISPLAY ***      03/01/84 (THU) 12:01:34      <MENU>

<RAM  DISK> 009 kb      <AUTO START>
<USER  BIOS> 000 256 b  <MCT  MODE> stop, nonverify <COUNT> 65535
<MENU DRIVE> CBA      <MENU FILE> 1 .COM  2 .  3 .  4 .
- Set alarm time, ESC to cancel.
MMDDhham

```

**Fig. 2.18**

The cursor is to the right of the prompt string. The PX-8 now expects you to type in the time at which you wish the alarm to sound. The prompt shows the order in which the date and time should be entered:

**M: Month**  
**D: Day**  
**h: Hour**  
**m: Minute**

Care should be taken to ensure that a leading zero is added to a single digit value.

In order to have the alarm sound within a reasonable time, so that more examples can be tried, set the date to that shown on the top line of the System Display, and the time to two minutes later. As an example if the date and time shows "01/18/84 (WED) 11:38:45" enter "01181140" for the ALARM time. This ensures that the alarm will sound at "11:40" on the same day. When you reach the last character, the cursor will flash over this character, to show you that you are in the last position; otherwise the cursor will move to the next position. If you decide you do not want to enter a value, simply press the **ESC** key. If one or more of the characters are wrong, you can move back and forth along the line using the cursor keys. When you press the **RETURN** key, the ALARM time will be entered onto the second line of the System Display.

The label "<ALARM MSG>" will appear to the right of the alarm time, but the rest of the line will be blank until a message string is inserted. As you have been returned to the prompt line shown in fig 2.17, press the **4** key so that a message string can be inserted. Write a message of up to 40 characters, for example "Time to telephone home". When the **RETURN** key is pressed the message string will be entered next to the "<ALARM MSG>" label.

When the alarm time is reached the speaker will sound a warbling note and the screen will clear to show the display of fig 2.19.

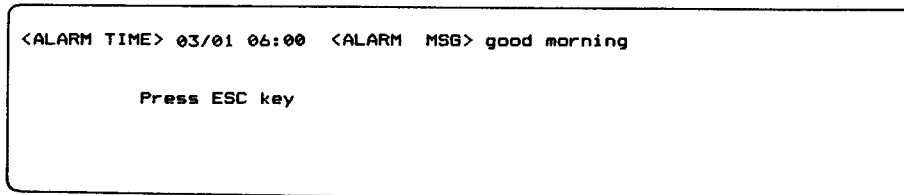


Fig. 2.19

If no message string was entered, the rest of the line after the "<ALARM MSG>" label will be blank.

You can return to whatever was happening when the alarm sounded by pressing the **ESC** key. The alarm might also have occurred when the PX-8 was switched off. In this case the speaker would sound in exactly the same way and the power switched on to display the same screen. As this can happen when you might not be near the computer and the battery could be discharged, the auto power off time will decide when to switch the power off (see section 2.2.2 and the CONFIG program of Chapter 3 for details of how to set this).

The PX-8 will exit from the ALARM screen when:

- The **ESC** key is pressed.
- Fifty seconds has passed.
- The power switch is turned off.
- The battery needs recharging.

Unless the power is switched off the PX-8 will revert to the state it was in immediately before the alarm was sounded.

#### ii) Ways of setting the ALARM

The example above showed how to set the alarm to go off at a specific time on a specific day. There are a number of ways that the alarm can be set, for example to repeat at specific intervals. This involves the use of wildcards. When an ALARM date and time is input, the PX-8 compares the current date and time with the string of characters input character by character. By using an asterisk or question mark as a wildcard in the ALARM string, the comparison will regard the position where the wildcard character was inserted as always matching. For example, type "\*\*\*\*0930" into the string following the "MMDDhhmm" prompt when taking the ALARM option. This will change the alarm time following the "<ALARM TIME>" label to "\*\*/\*/\* 09:30". It will cause the alarm to sound every day at 9.30 am. The wildcard option is not completely flexible. It can only set the alarm to go off at intervals of one minute, ten minutes, one hour, twenty four hours and monthly. It is also possible to set the ALARM to go off at specific intervals in a given period e.g. every ten minutes for an hour. The following table is a summary of how to use the wildcard.

|  | TYPE IN  | DISPLAY READS | NOTES   |
|--|----------|---------------|---|
| Every minute:                                | *****    | **/** **:**   | sounds every minute   |
| Every 10 minutes:                            | *****5   | **/** **:*5   | whenever the 5 matches i.e. at 05, 15, 25 minutes etc       |
| Every hour:                                  | *****21  | **/** **:21   | sounds at 21 mins past every hour                           |
| Every 24 hours:                              | ***1730  | **/** 17:30   | at 17:30 every day  |
| Every minute for ten minutes:                | ***093*  | **/** 09:3*   | from 9.30 am to 9.39 am                                     |
| Every minute for an hour:                    | ***14**  | **/** 14:**   | from 14.00 to 14.59   |
| Every minute for ten minutes ten every hour: | *****3*  | **/** **:3*   | from 30 minutes to 39 minutes ten past the hour every hour: |
| Once a month:                                | *151015  | **/15 10:15   | On the 15th of the month at 10.15 am                        |
| Every day for a month:                       | 06**1415 | 06/** 14:15   | At 14.15 every day in June                                  |
| A specific time:                             | 11111111 | 11/11 11:11   | On Nov 11 at 11.11  |

**NOTE:**

Only the asterisk or question mark should be used as a wildcard character.

The time should be checked before exiting from the System Display as the PX-8 carries out a comparison between your string and the string output by the clock. If the alarm does not go off when you expect it to, check the System Display to see that the time you entered was correct.

*iii) Setting the WAKE function*

The wake function makes it possible to automatically turn on the power and/or start a program or execute a command at any desired time.

Note that the WAKE or ALARM cannot be used together.

The procedure for setting the WAKE time is the same as that for setting the ALARM time, except that option 3 is taken instead of option 2 (Fig 2.17). All the wildcard options can be used in the same way.

The message string (option 4 Fig 2.17) is used to name a program which is to be run. It is used in a similar way to the AUTO START string (see the next module). The string input into the WAKE message is used as if the characters were typed from the keyboard when the WAKE function switches the PX-8 on. Thus the message "A:PROG^M" will run the CP/M COM file "PROG" on drive A: when WAKE switches the PX-8 on. The two characters at the end are a CTRL-M written as "^M". This is the carriage return character. Just as nothing will happen if you do not press the **RETURN** key when typing in a file name, so missing the "^M" from the end of a file name in a message string will normally cause the PX-8 to wait until the auto power off time is reached and then switch off.

For the options and rules to be followed in setting up a WAKE string, see the next module (the AUTO START string). Note that the WAKE string is entered as a message under the ALARM/WAKE option and NOT under the AUTO START string. The AUTO START string does not operate if the WAKE is executed.

When you try out the WAKE function, remember that it won't work unless you switch off the PX-8 before the WAKE time is reached. Set a WAKE time for a couple of minutes ahead and then enter a WAKE string. As an example you could use "DIR^M" to display a directory of the current drive. Make sure you have switched off the MENU for this experiment or one of two error conditions will arise. First, if BASIC is resident when you switch off, it will still be there when the PX-8 WAKES up. When the string "DIR^M" is encountered it will not be recognised by BASIC 'Ok' prompt.

Refer to the rules in the next section on setting the AUTO START string for details of how to overcome this.

**IMPORTANT:** In adding the "^M" to the end of the message string in WAKE, the "M" must be upper case. If the message string following the "<WAKE STRG>" label has a "-" character at the end you have entered "m" and not "^M".

The action taken when the WAKE time is reached differs according to the state of the PX-8 when the wake time is reached.

- If the power is turned on:

The WAKE behaves as if it were an ALARM. This is to prevent the program initiated by the WAKE string from interrupting the task in hand when the WAKE



time is reached. The speaker warbles and the display changes in the same way as if an alarm was sounded. Instead of the WAKE string being a command string it is simply printed as a message string. The screen shows that a WAKE time (and not an ALARM time) has been reached when it appears as shown in Fig. 2.20, for example.

```
*** MENU screen *** 00/00/00 (SUN) 00:12:24 54.5k CP/M ver 2.2 PAGE 1/1
B: BASIC Good morning!
B: BASIC COM
```

Fig. 2.20

The appropriate action can be taken, treating the WAKE as an alarm message. The same criteria apply for termination as apply to the ALARM time being reached.

- If the power is turned off:

The action taken will depend on the state of the PX-8 when switched off.

- If the PX-8 is in the continue mode:

The power will be turned on and the program which was interrupted by switching off will be continued. There will be no message, the computer will simply behave as if it had been turned on manually. ANY WAKE STRING WILL BE IGNORED.

- If the PX-8 is in the restart mode:

- The power will be turned on and the WAKE string executed as if it had been typed in at the keyboard.
- If no WAKE string is specified the situation will be equivalent to the power being switched on manually, except that it will have been switched on automatically. Although the speaker will sound, there may not be anyone near the computer to notice that this has occurred. The PX-8 will then switch itself off when the auto-power-off time is reached.
- If no WAKE string is specified but an AUTO START string has been entered, the AUTO START string WILL BE IGNORED.

#### iv) AUTO START string

The AUTO START string is used to set a string which will be entered as if it had been typed from the keyboard when the PX-8 is switched on.

The AUTO START string will be ignored if the PX-8 is switched on in the continue mode. When the computer has been switched off in the continue mode, this is because the computer has been stopped in the middle of a program execution. To start up again with a new program could destroy valuable data.

To set the AUTO START string, press the **[3]** key when the System Display is as shown in Fig. 2.13a or b.

The prompt changes as follows.

```
*** SYSTEM DISPLAY *** 03/01/84 (THU) 12:01:34 <MENU>
<RAM DISK> 009 kb <AUTO START>
<USER BIOS> 000 256 b <MCT MODE> stop, nonverify <COUNT> 65535
<MENU DRIVE> CBA <MENU FILE> 1 .COM 2 . 3 . 4 .
- Select number or ESC to return.
<AUTO START> 1=off 2=assign
```

Fig. 2.21

To assign the string, press the **[2]** key and the prompt changes as follows:

```
*** SYSTEM DISPLAY *** 03/01/84 (THU) 12:01:34 <MENU>
<RAM DISK> 009 kb <AUTO START>
<USER BIOS> 000 256 b <MCT MODE> stop, nonverify <COUNT> 65535
<MENU DRIVE> CBA <MENU FILE> 1 .COM 2 . 3 . 4 .
- Input auto start string, ESC to cancel.
```

Fig. 2.22

As an example of how to use the AUTO START string from the System Display type 3 to select the AUTO START option.

When lines 6 and 7 show the options as in Fig 2.21 take option 2 and then type in the following string: "B: BASIC^M". This assumes the BASIC interpreter ROM is in the socket assigned to drive B: and should be changed to "C: BASIC^M" if it is in the C: drive socket.

Press the **[RETURN]** key when the string has been correctly entered.

Now ensure that the MENU is off by entering option 4 on the System Display and then taking option 1. MENU is described in the next module.

Switch the PX-8 off in restart mode, i.e. simply switch off WITHOUT holding down the **[CTRL]** key.



#### d) MENU module

When switching on the PX-8 it is sometimes difficult to find a particular program among a number of others on a disk device. Many of them may not be relevant. In many cases the same program is used over and over again, and like using the PF keys it is easier to press one key to load the program. The MENU module simplifies the selection of a program by allowing the types of file names which are displayed to be limited, and allows programs from a mixture of drives to be displayed together. It also allows the programs to be selected by movement around the displayed files using the cursor keys, and then running the program simply by pressing the **RETURN** key.

The MENU is controlled by option 4 of the System Display. Press the **CTRL** and **HELP** key to turn on the System Display. Now press the **4** key and lines 6 and 7 change to:

```
*** SYSTEM DISPLAY ***      03/01/84 (THU) 12:01:34
<RAM DISK> 007 kb      <AUTO START>
<USER BIOS> 000 256 b  <MCT MODE>      stop, nonverify <COUNT> 65535
<MENU DRIVE> CBA      <MENU FILE> 1.COM 2. 3. 4.
- Select number or ESC to return.
<MENU> 1=off 2=on 3=drive 4=ext1 5=ext2 6=ext3 7=ext4
```

Fig. 2.23

Press the **2** key and note how the label “<MENU>” comes up on the top right of the screen on the first line. It can be switched off using option 1 at this level. Before actually displaying the MENU, it is necessary to select which drives the files are to be chosen from and also which types of files are to be chosen from those drives. Chapter 3 explains the types of files. As a first illustration of the use of the MENU, choose option 3 and type “BC” and press the **RETURN** key. Note that these letters appear after the label “<MENU DRIVE>” on the left of the fifth line and mean that files will be chosen from the B: and C: drives, i.e. the ROM drives. In order to select a type of file, take option 4 and type “COM” and press the **RETURN** key. Note how the fifth line has changed so that the first file name extension (next to the label “<MENU FILE>”) has changed to “COM”.

Now press the **ESC** key and the System Display returns to the first state. The MENU mode is set and the MENU screen will be displayed when the power switch is next turned on, or a warm start is made.

Turn off the power switch and then turn it on again. The speaker beeps and the following screen is displayed:

```
*** MENU screen ***      03/01/84 (THU) 12:00:52 54.5k CP/M ver 2.2 PAGE 1/1
C:PIP
C:PIP COM C:STAT COM C:SUBMIT COM C:XSUB COM
C:FILINK COM C:TERM COM C:CONFIG COM B:BASIC COM
```

Fig. 2.24

The MENU screen is divided into three sections as shown below.

|         |                |
|---------|----------------|
| 1 line  | Header         |
| 1 line  | Command line   |
| 6 lines | File name area |

Fig. 2.25

#### Header section

The header section consists of the title “\*\*\* MENU screen \*\*\*”, date, day of the week, time, CP/M comment, current menu page and number of menu pages. If the number of files exceeds 120, “\*” will be displayed at the end of header section.

#### Command line

The command line section displays the currently selected file name, adding any COM file name if the file selected requires a COM file for execution. The System Display is used to decide exactly what is printed on this line for each file, and the method of setting it is explained in the next few pages.

#### File name area

The lower part of the screen shows all the file names set up on the System Display, chosen from the selected drives and the selected file extensions.

#### i) Using the MENU

The command line duplicates the name of the file in the top left of the file area and, to highlight the selected file, the name in the file area flashes. It is possible to change the selected file by using the cursor keys. Pressing the right arrow key moves to the right along a row, and then from left to right on the next

line. When the last filename is reached, the first one of the next line is selected to be displayed on the command line. The left arrow moves to the left in the same way. The up and down cursor keys allow movement in a column, but do not move into another column.

When a file name is on the command line, simply pressing the **RETURN** key will run that particular program. As an example, move the cursor keys until the file STAT is on the command line. As will be seen in Chapter 3, STAT is a program which gives STATistical information about the status of the computer and the disk drives. When STAT.COM (with its appropriate drive name prefix) is flashing, note that the drive name followed by STAT is printed on the command line. Press the **RETURN** key. The screen clears and the STAT program shows information such as the following:

```
A>C:STAT
A: R/W, Space: 8k
C: R/O, Space: 33k
H: R/W, Space: 29k

A>
```

Fig. 2.26

The second line of the screen shows the CP/M prompt and then the command line as would have been typed in had the STAT program been run directly from CP/M. This display shows a situation with the CP/M utilities in drive C: and thus the drive name C: would be displayed before the filename. After a few seconds, when the program has collected the information, the other lines are displayed. These show the space left on the various drives and whether they can be written to (R/W) or are read only (R/O). The CP/M prompt "A>" is then followed by the cursor.

**NOTE:**

*In this case ending the program has returned the user to the CP/M command line. Sometimes when a program ends it will return to the MENU. If the STAT program had returned you to the MENU, all the information would have been erased from the screen before it could have been read.*

Return to the MENU by using either the **STOP** key or **CTRL** - **C** and again place the STAT program on the command line. When the selected file has been placed on the command line, the cursor is placed to the right of the file name and is seen as a flashing underline character. This allows further parameters to be added from the keyboard. As an example of this use of the MENU, with

the STAT program on the command line, type in DEV: and then press the **RETURN** key. As is explained in Chapter 3, this shows the physical devices assigned to the four logical devices. As before the screen will clear and show the command as if it were typed in from the CP/M command line, before displaying the information a few seconds later. A possible display is shown in fig 2.27 below.

```
A>C:STAT DEV:
CON: is CRT:
RDR: is UR1:
PUN: is UP1:
LST: is LPT:

A>
```

Fig. 2.27

*ii) Setting the file extensions on the System Display*

In setting the file extensions on the System Display care has to be taken in setting up files which are to be run as subsidiary files of a main COM file. The most common case of this is the use of BASIC files with the extension ".BAS". Other examples of extensions to filenames which denote subsidiary files are ".OVR" and ".DAT". Attempting to run these files without the appropriate COM file will result in an error. As an example of setting up the MENU to run subsidiary files, the following procedure should be used to set up BASIC files.

Enter the System Display and choose option 4, the MENU option.

Now edit the second extension by choosing option 5.

To specify the subsidiary file type its extension (for BASIC files the extension is ".BAS") followed by the filename of the COM file of which it is a subsidiary files. This is the reverse of normal CP/M conventions, but is necessary to display the extension correctly on line 5 of the System Display. Lines 6 and 7 would thus display:

```

*** SYSTEM DISPLAY ***      03/01/84 (THU) 12:01:34      <MENU>
<RAM DISK> 007 kb      <AUTO START>
<USER BIOS> 000 256 b  <MCT MODE> stop, nonverify <COUNT> 65535
<MENU DRIVE> CBA      <MENU FILE> 1 .COM 2 . 3 . 4 .
- Input extension name 2, ESC to cancel.
  BAS

```

Fig. 2.28


When the **RETURN** key is pressed, the right hand side of the fifth line will show

```
<MENU FILE> 1 .COM 2 .BAS 3 . 4 .
```

However, if a file name is chosen with the extension “.BAS”, for example “a:ZZZZ.BAS” the command line will show

```
b:basic a:ZZZZ.BAS
```

and when the **RETURN** key is pressed, BASIC will be loaded first and then the subsidiary file run.

**WARNING:**  
 If the MENU is used to run a program this way, since the BASIC interpreter is loaded as well, any programs which are in the five program areas will be lost.  
 A way to overcome this is described in the following section.

iii) Using BASIC from the MENU

Details of using BASIC on the PX-8 are given in the BASIC Reference Manual. When BASIC has been loaded and the PX-8 is switched off the first file from the disk drives will not be flashing. Instead the file area will show “BASIC (resident)” in the top left corner which will be flashing, and the command line will be blank. Simply pressing **RETURN** at this stage will cause the BASIC Program Menu to be turned on. Any programs in the five program areas can be run as described in the BASIC Reference Manual.

If BASIC is resident, the above method of selecting a BASIC program from the MENU will load the BASIC interpreter and destroy the programs in the five BASIC program areas. The following method will allow a BASIC program to be selected from the MENU and run while BASIC is resident.

- i) Use either the MENU or the CP/M command line to load BASIC.

- ii) Login to one of the program areas and type “system” or use PF8 (shifted PF3) to return to the CP/M command line or the MENU.
- iii) Either on the MENU or CP/M command line type:

**SAVE # A:GO.COM**

The reason for doing this is explained in Chapter 3 under the SAVE command.

- iv) Enter the System Display and using option 5 on the MENU, alter the extension to read:

**BAS A:GO**

This uses the COM file “GO” as the main file, with the BAS file as the subsidiary file.

When a file with the “BAS” extension is chosen from the MENU, if AND ONLY if BASIC IS RESIDENT, the MENU command line will show:

**A:GO A:ZZZZ.BAS**

when the file “A:ZZZZ.BAS” is chosen from the menu, and the program will run directly in BASIC in program area one.

Note however, that there is no need to resort to this method if BASIC is resident and the WAKE or AUTO START strings are used.

The MENU module is activated under one of the following conditions:

- 1) The MENU mode is specified and the AUTO START string is not specified in the System Display, and power is turned on by the power switch or when the wake time is reached.
- 2) The **STOP** or **CTRL** and **C** keys are pressed together when an application program which has been entered from the menu mode is being executed or the “SYSTEM” statement is executed in the BASIC mode.

Operation of the MENU module is interrupted in one of the following cases.

- 1) When the alarm or wake time is reached.
- 2) When the **CTRL** and **HELP** keys are pressed together. (The system module is activated.)
- 3) When the **CTRL** and **PF5** keys are pressed together. (The screen dump module is activated.)

The MENU module is started at the state at which it was interrupted when the MENU mode is returned to from one of the above conditions.

The MENU mode is terminated in one of the following cases:

- 1) When an application program is selected and the **RETURN** key is pressed.
- 2) When the AUTO POWER OFF time is reached.
- 3) When power failure is detected.
- 4) When the power switch is turned off.
- 5) When the **ESC** key is pressed. (The screen clears and the CP/M system prompt appears on the screen.)

#### e) Microcassette mode

The System Display is used to operate the Microcassette drive manually and also to check on the Microcassette mode settings. Full information on the Microcassette drive is given in Chapter 4.

##### i) Setting the Microcassette mode

To specify the Microcassette mode, choose option 5 on the System Display by pressing the **5** key.

Lines 6 and 7 of the screen then change to:

```
*** SYSTEM DISPLAY ***      03/01/84 (THU) 12:01:34      <MENU>
<RAM  DISK> 009 kb      <AUTO START>
<USER  BIOS> 000 256 b  <MCT  MODE> stop, nonverify <COUNT> 65535
<MENU DRIVE> CBA      <MENU FILE> 1 .COM  2 .BAS  3 .  4 .
- Select number or ESC to return.
<MCT> 1=stop 2=nonstop 3=verify 4=nonverify
```

Fig. 2.29

The stop and nonverify modes are automatically set after system initialization. Pressing the **1** key sets the stop mode, pressing the **2** key sets the nonstop mode, pressing the **3** key sets the verify mode and pressing the **4** key sets the nonverify mode. Full details of the significance of these terms are described in Chapter 4 where the operation of the Microcassette drive is covered in depth.

The current settings for the Microcassette operation are shown on the right of the fourth line of the System Display, following the label "<MCT MODE>". This line also shows the position of the tape counter, following the "<COUNT>" label.

To return to the screen shown in Fig. 2.13b, press the **ESC** key.

##### ii) Manual operation of Microcassette drive

The System Display is also used to allow the Programmable Function keys to operate the Microcassette drive manually. The function assigned to each of these keys is indicated on the 8th line of the system display shown in Fig. 2.13b.

Two of the keys are assigned for fast winding of the tape forward and backwards. These are the **PF1** and **PF4** keys which wind the tape on (<<-) and rewind the tape on (->>) respectively.

The **PF2** key is used to play the tape at normal speed through the speaker.

The **PF7** (shifted **PF2** ) key is used to mount a tape, i.e. make it ready to be read from or written to by reading the directory into memory. When the tape is used first, the **PF8** (shifted **PF3** ) key can be used to initialize the tape by storing space for a directory. It is equivalent to formatting a conventional disk. The **PF9** (shifted **PF4** ) key is used to erase data from a tape. It does this from the current position of the tape.

The **PF5** key is used to reset the tape counter to zero. The current position of the counter can be seen on the right of line 5 of the System Display next to the "<COUNT>" label.

The **PF3** key marked with a ■ character is the key to stop the cassette.

TO STOP THE MICROCASSETTE IN AN EMERGENCY press the **CTRL** and **STOP** keys together.

If a Microcassette has been mounted, the only key which is assigned is **PF6** (shifted **PF1** ). This will show the string "remove" which will allow the tape to be removed from the cassette drive. It is worth getting into the habit of checking the status of the cassette tape in the Microcassette drive, by inspecting the System Display BEFORE removing a tape from the drive. If a tape has been mounted, the eighth line will only show the word remove.

If a tape has been mounted, when the **PF6** (shifted **PF1** ) key is pressed, the screen will clear and show the message "remove" in the top left hand corner of the screen. If the tape has simply been read this will flash up momentarily, and the System Display will be redisplayed but with the eighth line showing the assignments for an unmounted tape.

If the tape has been written to, the revised directory on the tape will have to be written back on to the tape from memory. The tape will thus wind back to the beginning, and then record the updated directory. When this has been carried out, the System Display will be redisplayed but with the eighth line showing the assignments for an unmounted tape.



**WARNING:**

*Do not change a tape and attempt to write to another one, without first removing the first tape and mounting the new one. Failure to observe this will almost certainly mean that data on both tapes will not be able to be read, and may also remove valuable data from the second unmounted tape.*

**f) The screen dump module**

The screen dump module outputs the contents of display screen to a printer. It is activated by pressing the **PF5** key together with the **CTRL** key or calling the BIOS SCRNDUMP routine in CP/M mode. In screen modes 0,1 and 2 data is sent to the printer in ASCII format, and in screen mode 3 in bit image format.

Printing stops when the **CTRL** and **STOP** keys are pressed simultaneously, the power switch is turned off or power failure is detected.

If the printer is not ready, the module waits until it becomes ready.

**NOTE:**

*If there is no printer attached to the PX-8, this creates a lock-up of the system. If this happens, press **CTRL** and **STOP** keys together. User can resume his session with no loss of data.*

## 2.2.4 Alternative reset sequences

Situations occasionally arise where the PX-8 ceases to respond to any instructions from the keyboard when you expect it would. Even the **STOP** key does not appear to work. The computer is said to be "hanging". This should not be confused with the situation where a program is processing data and takes seconds or even a minute to reach a situation where the user can input data again. When the system appears to have hung, it is sometimes possible to gain control by switching off, waiting a few seconds and switching on again. However, in most cases it is necessary to RESET the computer. There are a number of methods of resetting, which affect the system parameters to a different extent.

### a) SUB-CPU RESET

This is the most drastic reset procedure and is carried out as described in section 2.1.3. It must be carried out if the battery is changed, or if all other reset methods fail.

### b) INITIALIZATION RESET

This reset sequence is achieved by holding down the right-hand **SHIFT** and **NUM GRAPH** keys while pressing the reset switch on the left of the PX-8 using the tip of a ball point pen or other similar implement. See fig. 1.1c for the position of the reset switch.

This method of resetting, is for practical purposes as drastic as the sub-cpu reset and will cause loss of the current program, data and possibly destroy the RAM disk.

When this reset method is used, the initialization procedure outlined in section 2.1.3 from item v) onwards will have to be carried out.

### c) SIMPLE RESET

The least drastic method of resetting the PX-8 is to simply press the reset switch on the side of the computer using the tip of a ball point pen etc. In most cases very little harm will have been done to data, and most if not all variables in a program will probably still be intact. A number of system parameters will be changed and details of these are shown in table 2.3.

This method of resetting should be tried first.

### d) Summary of RESET actions

In resetting the computer it is as well to be aware of the parameters which are altered by the reset action. The following table shows which settings are altered. Since these are normally the default settings of the system, these are shown also.

Table 2.3

| RESETPARAMETER      | DEFAULT            | SIMPLE RESET | NUM/GRPH RESET | SUB-CPU RESET | CHANGE WITH |
|---------------------|--------------------|--------------|----------------|---------------|-------------|
| ALARM/WAKE          | off                | -            | d              | d             | s,b         |
| AUTO POWER OFF      | 10 mins            | -            | d              | d             | c,b         |
| AUTO START          | off                | -            | d              | d             | s,b         |
| CHARACTER SET       | DIP switch setting | d            | d              | d             |             |
| CURRENT DRIVE       | A:                 | d            | d              | d             | NOTE 8      |
| CURSOR TYPE         | flashing block     | d            | d              | d             | c,b         |
| DATE/TIME           | NOTE 1             | -            | u              | u             | c,b         |
| DISK ASSIGNMENTS    | NOTE 2             | d            | d              | d             | c           |
| PF KEY DISPLAY      | off                | d            | d              | d             | c,b         |
| PF KEY STRINGS      | NOTE 3             | d            | d              | d             | c,b         |
| I/O BYTE (03H)      | 10101001B          | d            | d              | d             | NOTE 9      |
| KEYBOARD            | NOTE 4             | d            | d              | d             | NOTE 4      |
| MENU                | on                 | -            | d              | d             | s           |
| MENU DRIVES         | CBA                | -            | d              | d             | s           |
| MENU FILE EXT       | .COM               | -            | d              | d             | s           |
| MICROCASSETTE COUNT |                    | -            | destroyed      | destroyed     | s,b         |
| STATE               | unmounted          | d            | d              | d             | s,b         |
| STOP MODE           | stop               | d            | d              | d             | s,b         |
| VERIFY MODE         | non-verify         | d            | d              | d             | s,b         |
| PASSWORD            | off                | d            | d              | d             | s           |
| PRINTER             | RS232C             | d            | d              | d             | c           |
| RAM DISK SIZE       | 9K                 | -            | u              | u             | c           |
| RS232C              | NOTE 5             | d            | d              | d             | c           |
| SCREEN MODE         | mode 0             | d            | d              | d             | c,b         |
| SERIAL INTERFACE    | NOTE 6             | d            | d              | d             | c           |
| USER BIOS SIZE      | 0 pages            | -            | u              | u             | c           |
| USER DEFINED CHARS  |                    |              |                |               |             |
| E0,E1               | del, cr symbols    | d            | d              | d             | NOTE 7      |
| E2 - FE             | NOTE 7             | -            | -              | -             |             |
| WINDOW              | tracking mode      | d            | d              | d             | s,c,b       |

#### KEY TO abbreviations:

d = default mode    u = set by user on reset  
s = System Display    c = CONFIG program    b = BASIC

\* Some functions can also be changed using ESCAPE code sequences as described in Appendix A.



**NOTE 1:**

The DATE and time are set to the default 00/00/00 00:00:00 with the day as zero (Sunday), and the user is asked to change them on reset.

**NOTE 2:**

The disk assignments for the default mode are shown in the explanation of the CONFIG program in Chapter 3.

**NOTE 3:**

The default Programmable Function strings are shown in the explanation of the CONFIG program in Chapter 3, and in section 2.2.1 above.

**NOTE 4:**

The default setting of the keyboard has the auto repeat start time set at 650 ms and the repeat interval at 75 ms. The keyboard is normal, in that all CAPS LOCKS etc are switched off. Any jumps to user functions using the **CTRL** keys and the **ESC**, **PAUSE** and **PF1** to **PF4** keys are set to a return.

**NOTE 5:**

The default RS232C settings are shown under the CONFIG program of Chapter 3.

**NOTE 6:**

The default setting of the Serial Interface are given in the explanation of the use of the CONFIG program in Chapter 3.

**NOTE 7:**

The User Defined Characters ASCII codes 224 to 254 (hexadecimal E0 to FE) can be set using control code sequences as described in Appendix A. They can also be set from BASIC, and a program to do this is shown in Appendix H of the BASIC Reference Manual.

The first two characters 224 and 225 (E0H and E1H) have the default symbols for delete "Δ" and a carriage return assigned to them. These characters are also frequently reset to the defaults at other times for example on power up. The character defined into ASCII code 226 (E2H) may also be corrupted on a reset.

**NOTE 8:**

The current drive is set by the applications program or from the CP/M command line.

**NOTE 9:**

The use of the I/O byte is described in Chapters 3 and 5.

**Priority of system reset**

When a lock-up of the system occurs, reset the system according to the following priority.

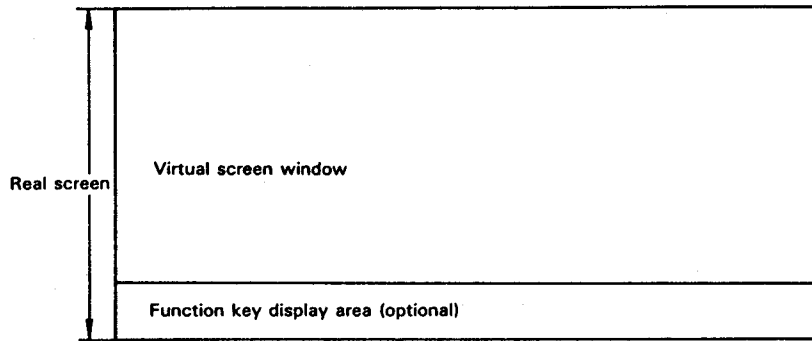
1. Press **STOP** key.
2. Press **CTRL** - **STOP** keys.
3. Press Reset switch on the left hand.
4. Press Reset switch while holding down **SHIFT** - **NUM GRAPH** keys.  
(or press Sub CPU Reset switch)

**2.2.5 Changing parameters**

For a description of how to change the parameters see the CONFIG program in Chapter 3, and section 2.2.3a. Details of which parameters are changed by the CONFIG program and which by the System Display can be found from table 2.2.

## 2.2.6 The Screen of the PX-8

When you view the LCD screen of the PX-8, you are looking at a window on a much larger screen. The screen displayed on the LCD is known as the real screen. This is 8 lines high by 80 columns. The operating system works with a much larger screen, a screen of up to 40 lines and 80 columns. The real screen then displays a window on this larger screen (the virtual screen), which is called the virtual screen window.



There are also four different screen modes (including a graphics mode) which show different types of display. In all but the graphics mode there are two virtual screens.

This section outlines the different screen modes and shows how to use them. Changing between different screen modes can be achieved using the CONFIG program described in Chapter 3. It is also possible to change the screen modes using BASIC commands, and the BASIC Reference Manual contains a practical guide to the screen modes in section 2.14.

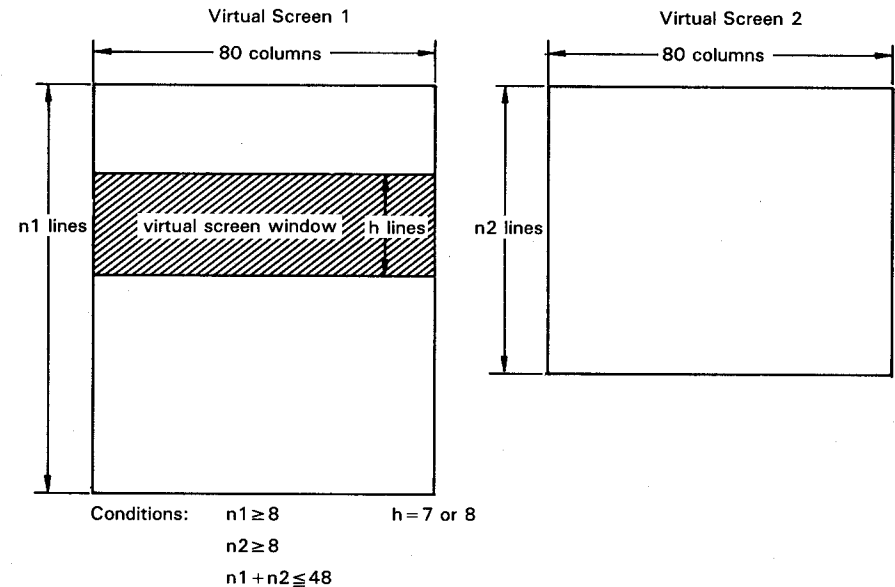
It is unlikely that you will use the different screen modes in the CP/M environment unless a particular applications program has made use of them. However, there are certain benefits to be obtained by learning to use the tracking and non-tracking modes, and to understand the virtual screens. As these would be utilised mainly in screen mode 0, a detailed explanation is given in the following outline of this screen mode.

## i) The Screen Modes

There are four screen modes possible with PX-8. Three of them are text only screens, and the fourth is a mixed text and graphics mode. The difference between the modes is primarily the way the real screen presents the information written on the virtual screens.

### a) Screen mode 0 (the 80 column text screen mode)

This screen mode has two virtual screens each with 80 columns. The number lines on these screens can be set by the user provided that the sum of the number of lines does not exceed 48 and there are at least 8 lines (i.e. one real screenful of lines) on each screen.



The virtual screen window moves over the virtual screen to display a part of the virtual screen on the real screen. This movement is known as scrolling. When the real screen moves over the virtual screen, scrolling with the cursor, this is known as tracking mode. Tracking mode can be switched off by pressing the **SCRN** key (**SHIFT** + **INS**). When this is done the cursor moves over the virtual screen while the real screen stays at the same place on the virtual screen. The real screen becomes locked in a particular position on the virtual screen.

The following illustration will show the effect of scrolling in the tracking and non-tracking modes. It assumes that the virtual screen size of 24 lines on each

screen has been set. The CONFIG program described in Chapter 3 can be used to check this and reset it if necessary.

Go to the System Display and switch off the MENU. Exit from the System Display to display the CP/M command line.

If the screen is not clear, it may be cleared by pressing the **CLR** key (**SHIFT** + **DEL**), or typing CTRL-L by holding down the **CTRL** key while pressing the "**L**" key. In either case the display will show "**^L**" next to the CP/M system prompt. Thus if the currently logged in drive is A:, the following will be displayed:

```
A>^L
```

When the **RETURN** key is pressed, the screen will clear and show a question mark in the top left hand corner. This is because CP/M does not understand **CTRL** - **L**, as a command. After printing a blank line the system prompt is printed again, with the cursor to the right of it.

Now obtain a directory of the utility ROM by typing "DIR C:" if the ROM is in ROM socket 2, or "DIR B:" if it is in ROM socket 1. For the purposes of this illustration it will be assumed that it is in ROM socket 2 as supplied.

The display will show:

```
?
A>dir c:
C: PIP      COM : STAT      COM : SUBMIT  COM : XSUB    COM
C: FILINK   COM : TERM      COM : CONFIG  COM
A>■
```

Because only two lines and a new system prompt have been written on the screen, the screen has not needed to scroll. However if the command is typed again, the "?" will scroll off the top of the real screen, and show the following:

```
A>dir c:
C: PIP      COM : STAT      COM : SUBMIT  COM : XSUB    COM
C: FILINK   COM : TERM      COM : CONFIG  COM
A>dir c:
C: PIP      COM : STAT      COM : SUBMIT  COM : XSUB    COM
C: FILINK   COM : TERM      COM : CONFIG  COM
A>■
```

The "?" is still the first character on the virtual screen. This can be seen in one of two ways. Pressing the **CTRL** and **↑** cursor key will display the first lines of the virtual screen because these keys move the real screen backwards one page (i.e. one real screen) on the virtual screen. Pressing the space bar (or any other key) will return to the original display. Alternatively the screen can be scrolled up by pressing the **SHIFT** and **↓** cursor key. Again pressing the space bar or another key will return the real screen to show the cursor.

To show the effect of this sequence of operations in non-tracking mode, first clear the screen again using **CTRL** - **L** or the **CLR** key. Then press the **SCRN** key (**SHIFT** + **INS**). Nothing will appear to happen. Now obtain two directories of the utility ROM in drive C: by typing "DIR C:" as before. The screen will show:

```
?
A>dir c:
C: PIP      COM : STAT      COM : SUBMIT  COM : XSUB    COM
C: FILINK   COM : TERM      COM : CONFIG  COM
A>dir c:
C: PIP      COM : STAT      COM : SUBMIT  COM : XSUB    COM
C: FILINK   COM : TERM      COM : CONFIG  COM
```

Note how the "?" on the first line remains visible in contrast to the same sequence of operations in the tracking mode. This time the cursor and CP/M system prompt has disappeared off the real screen. They are further down the virtual screen just outside the window. They can be seen by pressing the **SHIFT** + **↓** cursor key to move the screen up. This leaves the real screen window locked on these particular eight lines, so that typing "DIR C:" again will write the directory outside the real screen. Pressing the **SCRN** key again will cause the tracking mode to be restored and the screen will move up to show the cursor. When returning to tracking mode the cursor is positioned in the centre of the screen and so the screen will appear as follows:

```
A>dir c:
C: PIP      COM : STAT      COM : SUBMIT  COM : XSUB    COM
C: FILINK   COM : TERM      COM : CONFIG  COM
A>■
```

Now press the **RETURN** key ten times. This will almost reach the bottom of the virtual screen. Press the **CTRL** and **↑** key to move to the bottom of the virtual screen. Note that there are still two free lines of the virtual screen with nothing printed on them.

Move to the top of the virtual screen by pressing the **CTRL** and **↑** key twice. Note that the first character the “?” is still present. Lock the screen into non-tracking mode by means of the **SCRN** key. Now type “DIR C:” again. This will write the directory of disk C: on the bottom of the virtual screen next to the cursor, and then print a new CP/M system prompt. However, as there are not enough lines on the virtual screen the whole virtual screen must scroll up one line. This causes the window at the top of the screen to change. The line containing the “?” character is pushed off the cap of the virtual screen, and lost forever. The top 8 lines of the virtual screen are still displayed on the real screen, but they are 8 new lines now that scrolling has occurred. Return to tracking mode by pressing the **SCRN** key again and the bottom of the virtual screen, containing the cursor will be shown, with the directory of drive C: and the new CP/M system prompt.

So far only one virtual screen has been used. It is possible to move onto the second virtual screen by using the **CTRL** and **→** key, and back to the first virtual screen using the **CTRL** and **←** key. The two screens can be written to independantly, although there is no guarantee that all applications software will allow you to use the second virtual screen or scroll or go into non-tracking mode.

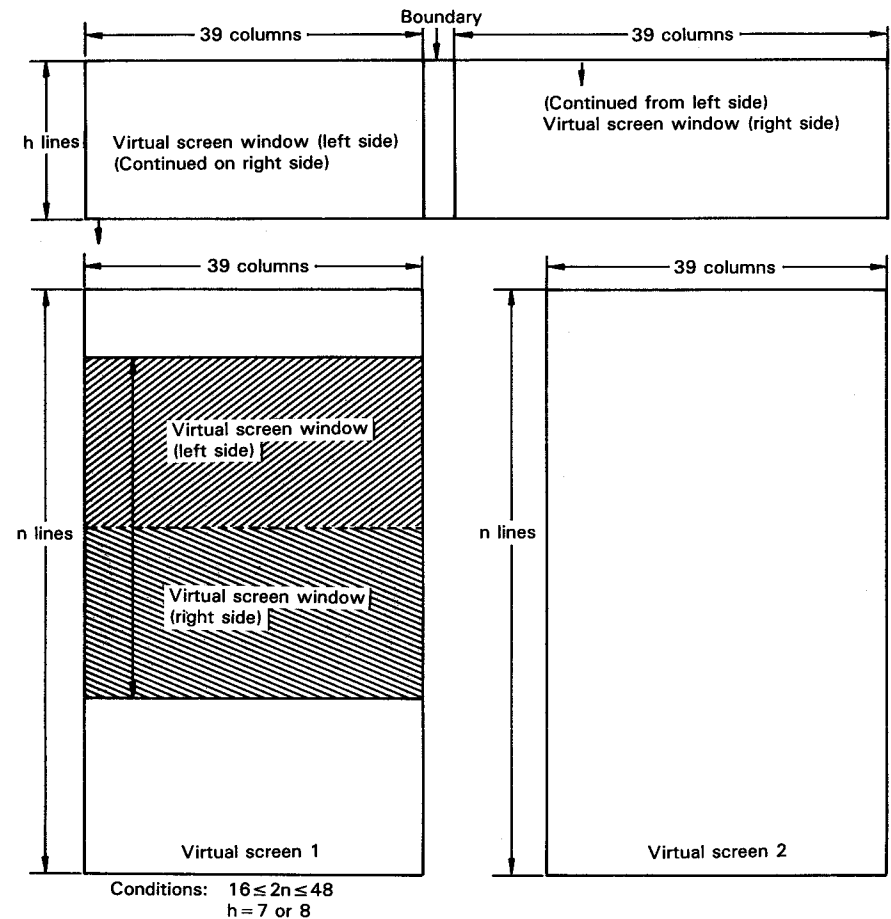
Switch to the second virtual screen using the **CTRL** and **→** keys. The screen should be blank. Type “DIR B:” and contents of the directory of the B: drive will be printed. If you switch back to the first virtual screen using the **CTRL** and **←** keys, the screen will be exactly as you left it. Clear it with a **CTRL** - **L** or by using the **CLR** key and then go back to virtual screen 2 using the **CTRL** and **→** key. Note that the display has not been changed.

One use of the two virtual screens is to store data. For example, frequently one needs to know the contents of the directory of a disk. Go to virtual screen 2, and print the directory of the disk there. If the program will allow it (and the CP/M utilities such as PIP will) you can easily look at the second screen to inspect the directory by using the **CTRL** and **→** keys, and then return to the first virtual screen to continue with the program. In both cases the previously displayed screen, normally where the cursor lies, will appear in the real screen area.

It is not advisable to enter a program command on the second virtual screen if the previous command was executed on the first virtual screen.

**b) Screen Mode 1 (39 column Split screen text mode)**

This screen mode splits the real screen into two halves, each of 39 columns with a boundary of two characters in the centre of the screen. There are two virtual screens but they must both have the same number of lines. The number of lines in the virtual screens must be in the range 16 to 48. Only one virtual screen can be displayed at a time. The real screen can be thought of as a screen of 39 columns, 16 lines long which has been split into two blocks of eight lines which are displayed on the two halves of the real screen. The bottom of the left half of the screen is continued on the top of the right half of the screen.



If the sequence of clearing the screen and printing two directories of the C: drive is performed with screen 1 turned on (it can be chosen by using the CONFIG program described in Chapter 3), then the screen will show the following output.

```

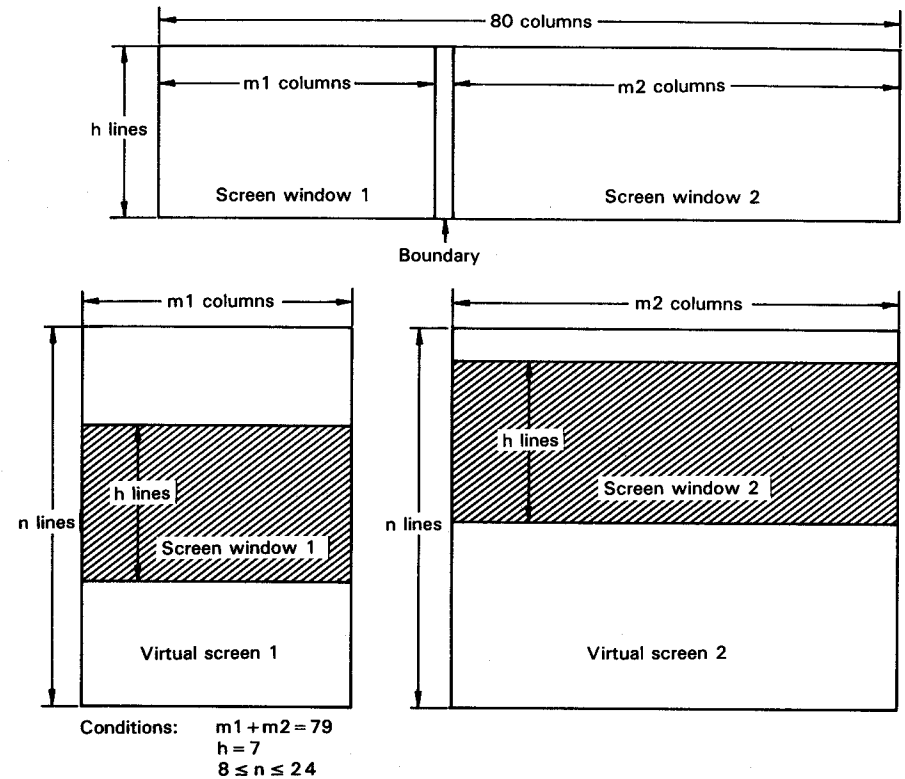
A>dir c:          COM : XSUB      COM
C: PIP          COM : STAT      COM : SUBMIT  C: FILINK  COM : TERM  COM : CONFIG
      COM : XSUB      COM
C: FILINK      COM : TERM      COM : CONFIG  COM
A>dir c:          COM : STAT      COM : SUBMIT
C: PIP          COM : STAT      COM : SUBMIT
  
```

Tracking and non-tracking modes can be set with the SCRNL key, and the two virtual screens can be displayed using the **CTRL** and **→** and **CTRL** and **←** keys just as with screen mode 0.

**c) Screen Mode 2 (the Dual screen mode)**

In this screen mode, the real screen is divided into two halves. There are two virtual screens, and each of the virtual screens are displayed in the two halves of the real screen. While the contents of the two screens can be seen at the same time, they are also independent of one another, and so can be scrolled separately. They cannot be set in the tracking and non-tracking mode independently.

The number of lines of the two virtual screens must be in the range 8 to 48, and must be the same in both virtual screens. The number of columns and the boundary character can be set by the user. The total number of columns must equal 79, and there must be at least one column in one of the screens. The CONFIG program described in Chapter 3, can be used to set these parameters.

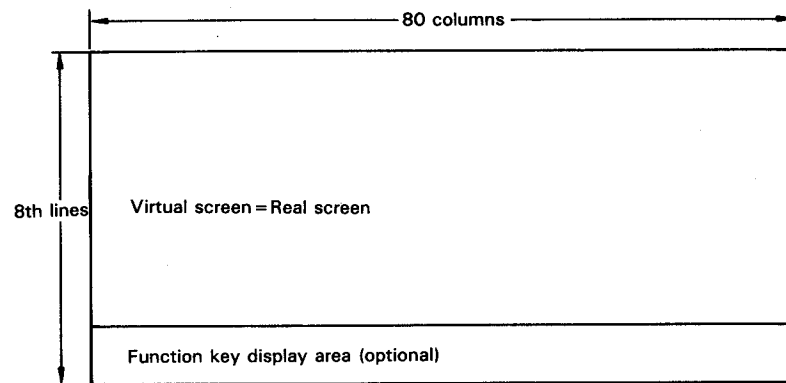


**d) Screen Mode 3 (the graphic screen mode)**

This mode enables graphics to be displayed. Text can also be displayed on this screen. There is only one virtual screen whose size is the same as the size of the real screen. Thus scrolling the real screen over the virtual screen and setting the tracking and non-tracking modes do not apply.

## Chapter 3

# OPERATING THE COMPUTER UNDER CP/M



The screen allows individual dots of the screen to be lit (bit image mode). This is only possible by means of software. The most convenient way to understand this mode is to use BASIC. If this mode is used other than in BASIC, it will be with special applications software and the appropriate manual should be consulted for its use.

Chapter 2 discussed the operation of the computer at the simplest level. This chapter deals with the operation on a day to day level. It mainly covers using the operating system CP/M, housekeeping of files and using the utility and applications programs. For a complete guide to the operation of an applications program, see the appropriate manual for that program.

### 3.1 What Is CP/M?

CP/M is the most popular operating system for microcomputers. An operating system is a collection of computer programs which have been assembled to make it easy for the user to run programs, handle saving and loading of data and generally allow easy transfer of information between software and hardware. The popularity of CP/M is due to the fact that it can be used on a large number of machines.

To understand what an operating system does, consider the analogy of a telephone system linked to the switchboard of a large company. If anyone dials into the company the public telephone network handles the connection to the company. The switchboard in the company then directs the caller to the person to which he wishes to speak. Similarly, if a person inside the company wishes to call out, he again goes through the switchboard to reach the public telephone system.

CP/M is very much like this except that there are a number of 'switchboards' for different parts of the hardware, e.g. the disk, Microcassette and devices such as the keyboard and screen. Anyone writing software for a CP/M based machine only has to use the equivalent of the public telephone system in this analogy. This means that having written a program such as a word-processor, it requires little if any further programming to allow the program to be run on a computer other than the one for which it was originally designed, providing both computers use the CP/M operating system. All interfaces between the