X'press 16

User's Manual

SVI®
SPECTRAVIDEO

X'press 16

User's Manual

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RADIO INTERFERENCE

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may causes interference to radio and television reception. It has been designed to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that the computer and the receiver are on different branch circuits

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

WARNING 1

This equipment has been certified to comply with the limits for a class B computing device, pursuant to Subpart J of Part 15 of FCC Rules.

WARNING 2

The user is warned that the shielded cables provided with this equipment must be used. A failure to use shielded cables may result in excessive radio-frequency emissions in violation of FCC rules, for which the user would be responsible. If any extension cables are used, they must also be shielded and the shields connected by means of metal shell connectors so that there is a full 360 degrees of connection; digital connection is not good enough for radio frequencies.

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IMPORTANT NOTES

To ensure years of trouble-free operation of the X'press 16,

1. Do not expose it to direct sunlight, extreme temperature, or high humidity for a long time.

2. Be sure the AC power voltage of the computer matches with that of the wall outlet.

3. Insert the head-protection card or a blank disk into the drive before shipping the computer.

4. Clean with a soft, dry cloth.

CHAPTER 1
INTRODUCTION

1.1 UNPACKING

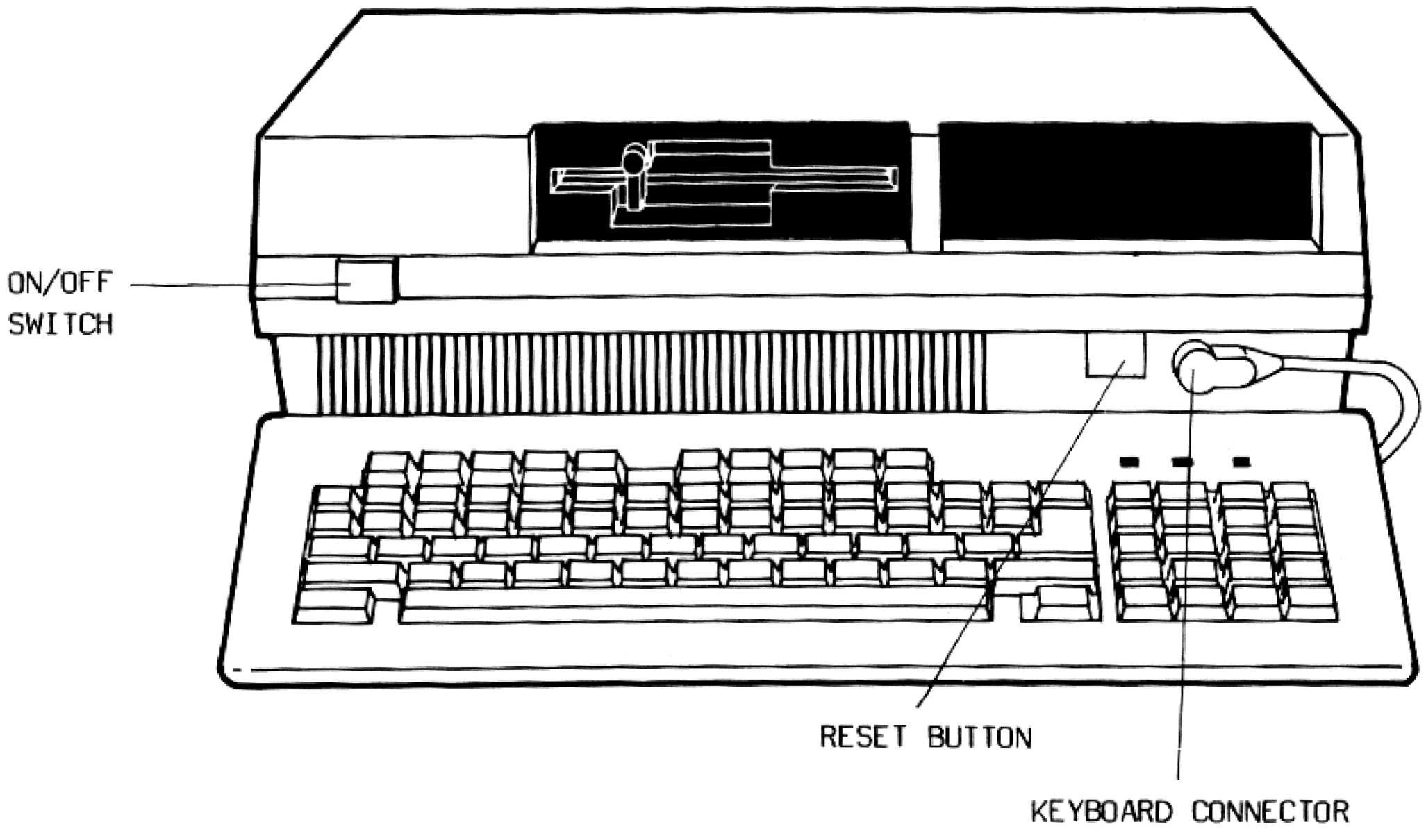
The X'press 16 is securely packed in foam-cushioned cartons. Remember to save all the packing materials in case you have to ship the computer in the future.

The package includes:

1. SVI-838 X'press 16 system unit
2. Keyboard
3. Composite video cable
4. QuickShot X joystick
5. MS-DOS and GW BASIC system diskette
6. X'press 16 and MS-DOS User's Guide (this manual)
7. GW BASIC User's Guide

If any of the above items are missing, inform your dealer immediately.

1.2 STANDARD FEATURES OF THE X'PRESS 16



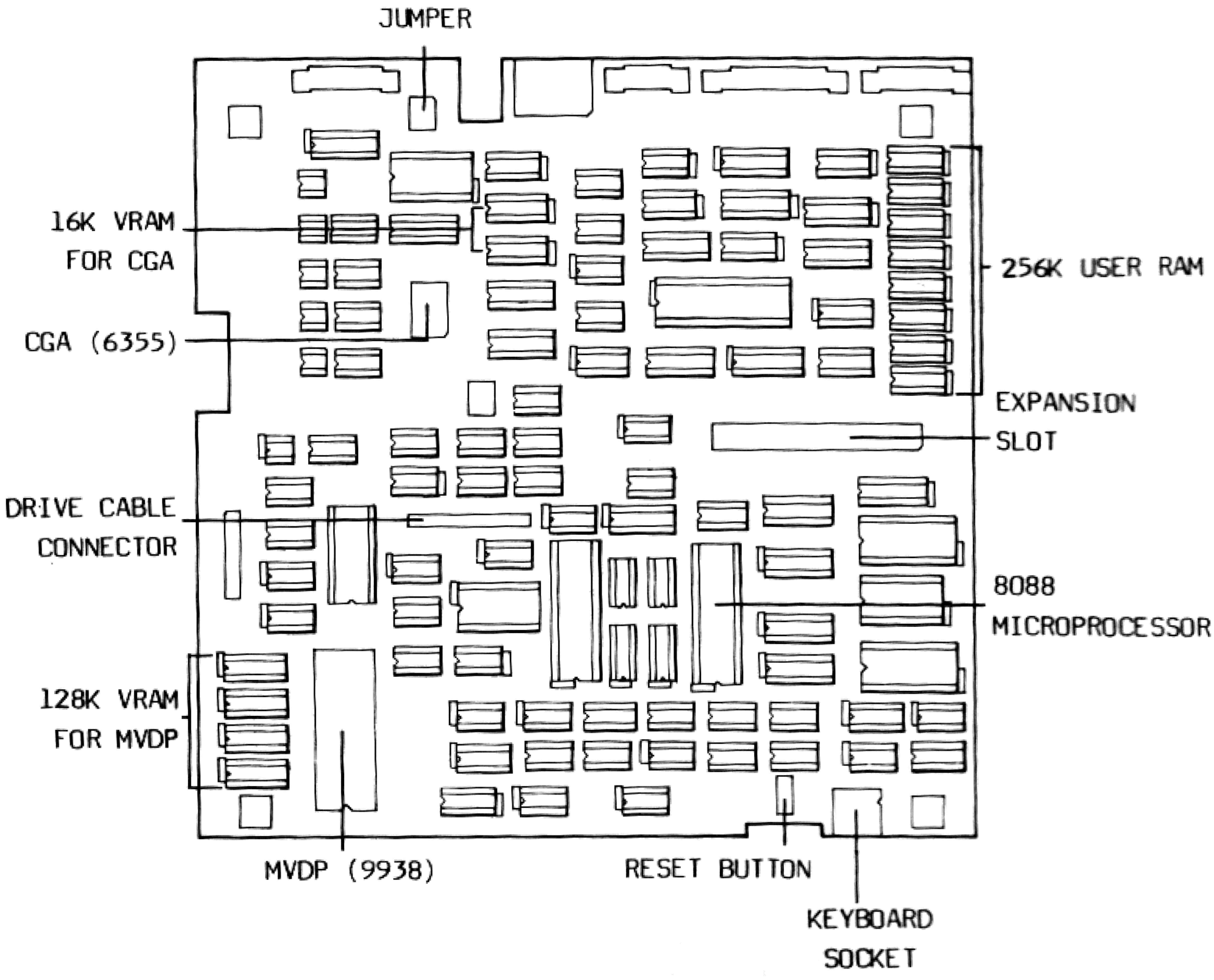


Fig. 1.1 The Standard Features of the X'press 16

1. MICROPROCESSOR

   8088, 4.77MHz

2. MEMORY

   User RAM : 256K expandable to 640K (with an add on card)
   Video RAM: 16K for standard PC mono/color graphics
              128K for enhanced high resolution graphics

3. KEYBOARD

   83 keys including 10 function keys and a 10-key numeric keypad
   Full stroke, detachable

4. DISK DRIVE

   360K, 5¼", double sided, double density

5. PC STANDARD VIDEO CAPABILITY

   PC standard flicker-free color graphics adapter (CGA)
   Color palette with 512 combinations

6. EXPANSION

   1 expansion slot
   Second disk drive cavity

7. POWER SUPPLY

   Built-in 26 watt switching power supply

8. I/O PORT

   Keyboard socket
   Parallel printer port
   Mouse/Light pen port
   Game port
   Composite video port
   RGB port

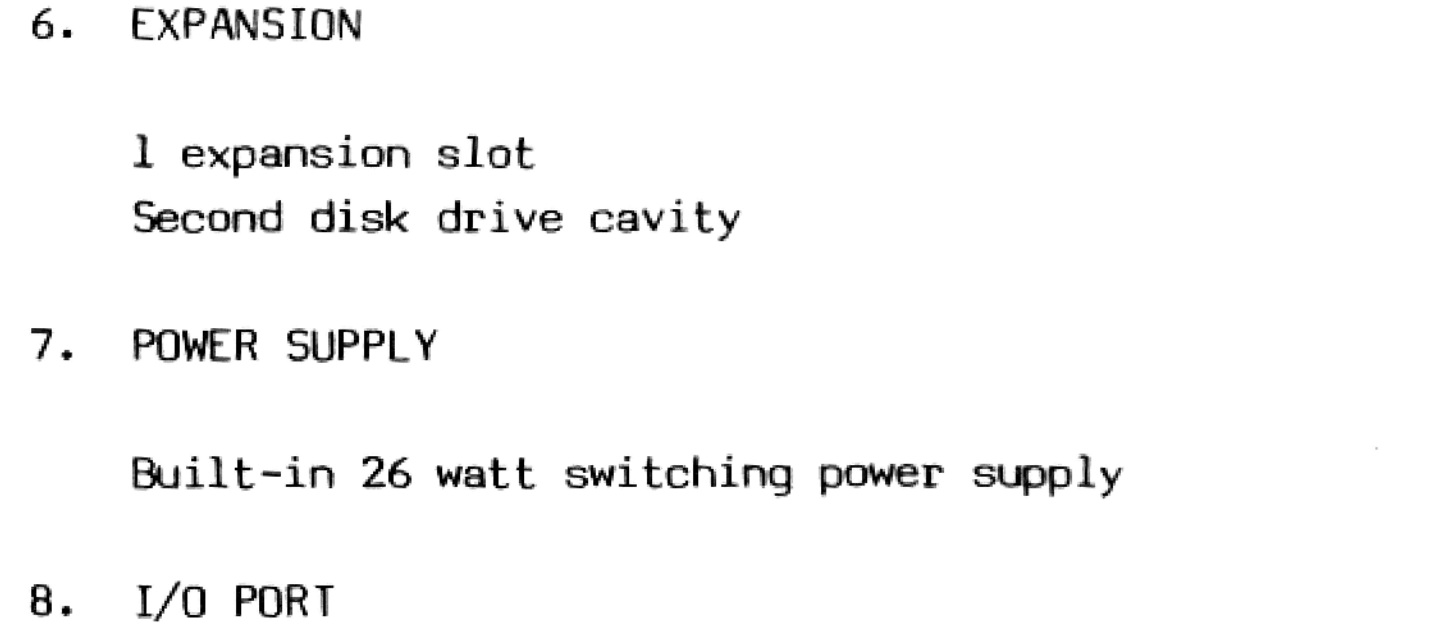


Fig. 1.2 The I/O Ports

1.3 ENHANCED FEATURES

1.3.1 Video Enhancement

The X'press 16 has 2 display interfaces: CGA (Color Graphics Adapter) and MVDP (MSX2 Video Display Processor). The CGA enables the X'press 16 to run most PC-compatible graphics software while the MVDP gives the X'press 16 more sophisticated and colorful graphics than the CGA can offer. Both interfaces can work together to generate composite images of a complexity never before possible on a home computer.

1.3.2 Audio Enhancement

The X'press 16 is equipped with a sophisticated sound chip which provides 3 noise channels and 3 sound channels with 8 octaves each.

The sound generation module of the X'press 16 consists of 2 sub-modules: PC sound generation module and Programmable Sound Generator (PSG). Output of the 2 sub-modules are mixed with a summing amplifier and fed to an internal 8 ohm speaker and an output jack which can be connected to the audio jack of your monitor.

1.4 OPTIONAL PERIPHERALS

A number of peripherals are available to further increase the capability of the X'press 16. You can get them separately from your dealer.

1.4.1 SVI-811 MSX Game Adapter

The game adapter allows up to 2 MSX joysticks to be connected directly to the system. It is compatible with most MSX game cartridges and draws power directly from the computer.

1.4.2 SVI-812 Low-cost Multifunction Card

All the most popular enhancements are integrated in this affordable three-way expansion card. With the multifunction card installed, your system has an additional 384K RAM, an RS232C port, and a real-time calendar/clock.

1.4.3 SVI-813 Cooling Fan

This is a peripheral to air cool the computer. It is attached to the back of the X'press and draws DC power from the system.

1.4.4 SVI-814PAL/NTSC RF Adapter

These are modulators which convert the analog RGB signal to PAL or NTSC TV signals. Either is required if you intend to use a TV set or composite color monitor with your X'press 16. Every modulator comes with a TV cable which facilitates connection to a TV set.

1.4.5 Monitor Cables

MODEL NO.	TYPE OF MONITOR	DESCRIPTION
SVI-815	Analog RGB	D15 male to 21 pins peritel
SVI-816	Analog RGB	D15 male to 8 pins RGB Rectangular Socket
SVI-817	Digital RGBI	To bridge the D15 male connector of the computer and D9 female connector of the monitor

1.5 THE DISK

1.5.1 What Disk to Use

The X'press 16 uses 5¼", double-sided, double-density minifloppy disks. You can get them from any computer shop.

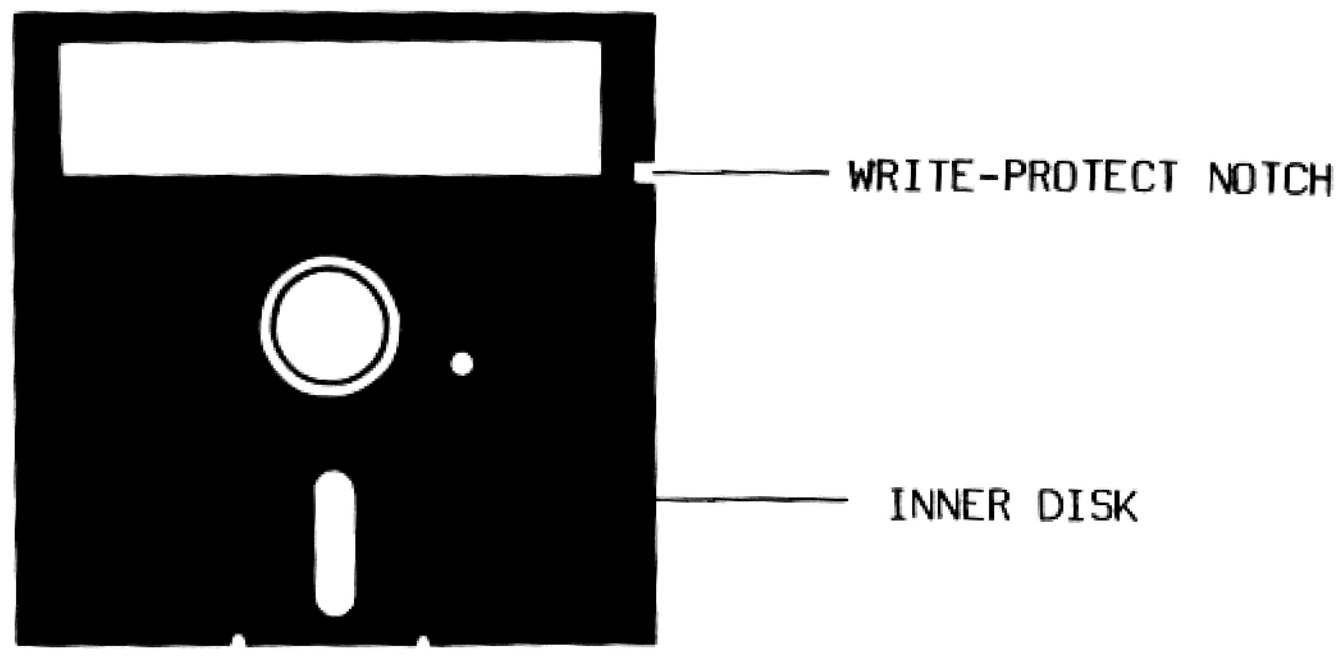


Fig. 1.3 A 5¼" Minifloppy Disk

1.5.2 Write-protecting Disks

Write-protecting a disk prevents your important data from being altered or erased. A write-protected disk can only be read from but not written on. To write-protect a disk, conceal the write-protect notch with one of the protection tabs that came with the diskettes.

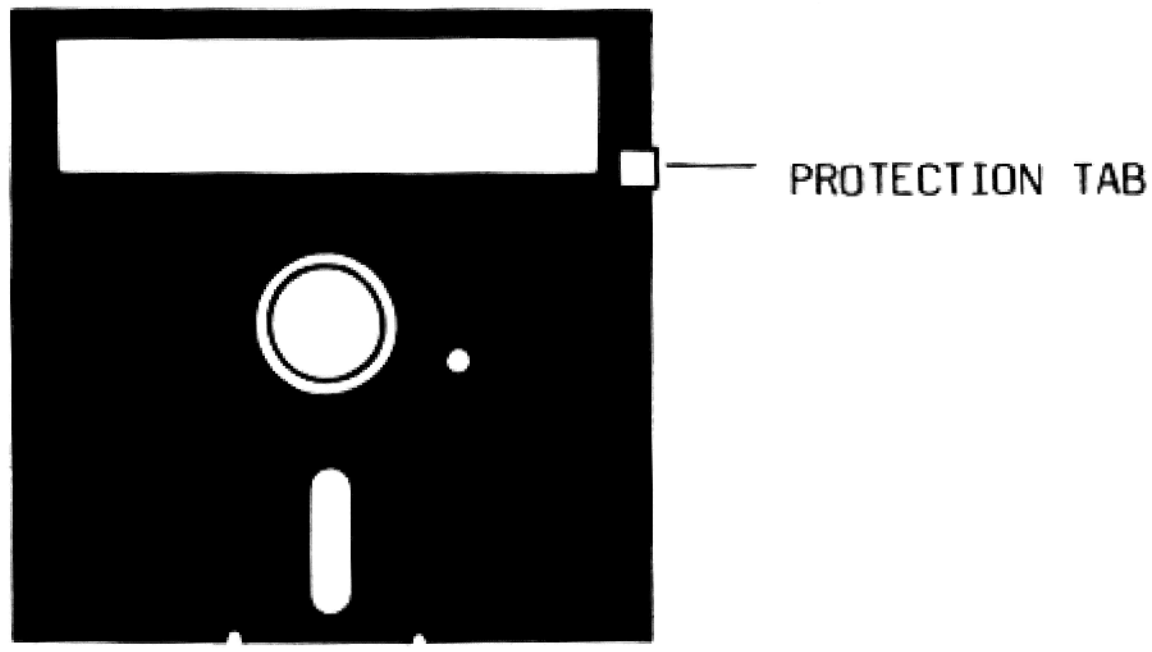


Fig. 1.4 Write-protecting a Disk

Peeling off the tape will enable you to write data on the disk again.

1.5.3 How to Handle a Disk

To ensure safe storage,

1. Keep the disk away from magnetic fields, extreme temperature, dust, pressure, and high humidity.

2. Do not touch the exposed inner disk.

3. Do not bend.

4. Store the disk at 10 to 52°C (50 to 125°F).

5. Insert or remove disks only when the power is on. Sudden electrical pulses will scratch the disks.

6. Backup all program disks and any important data disks.

1.6 THE KEYBOARD

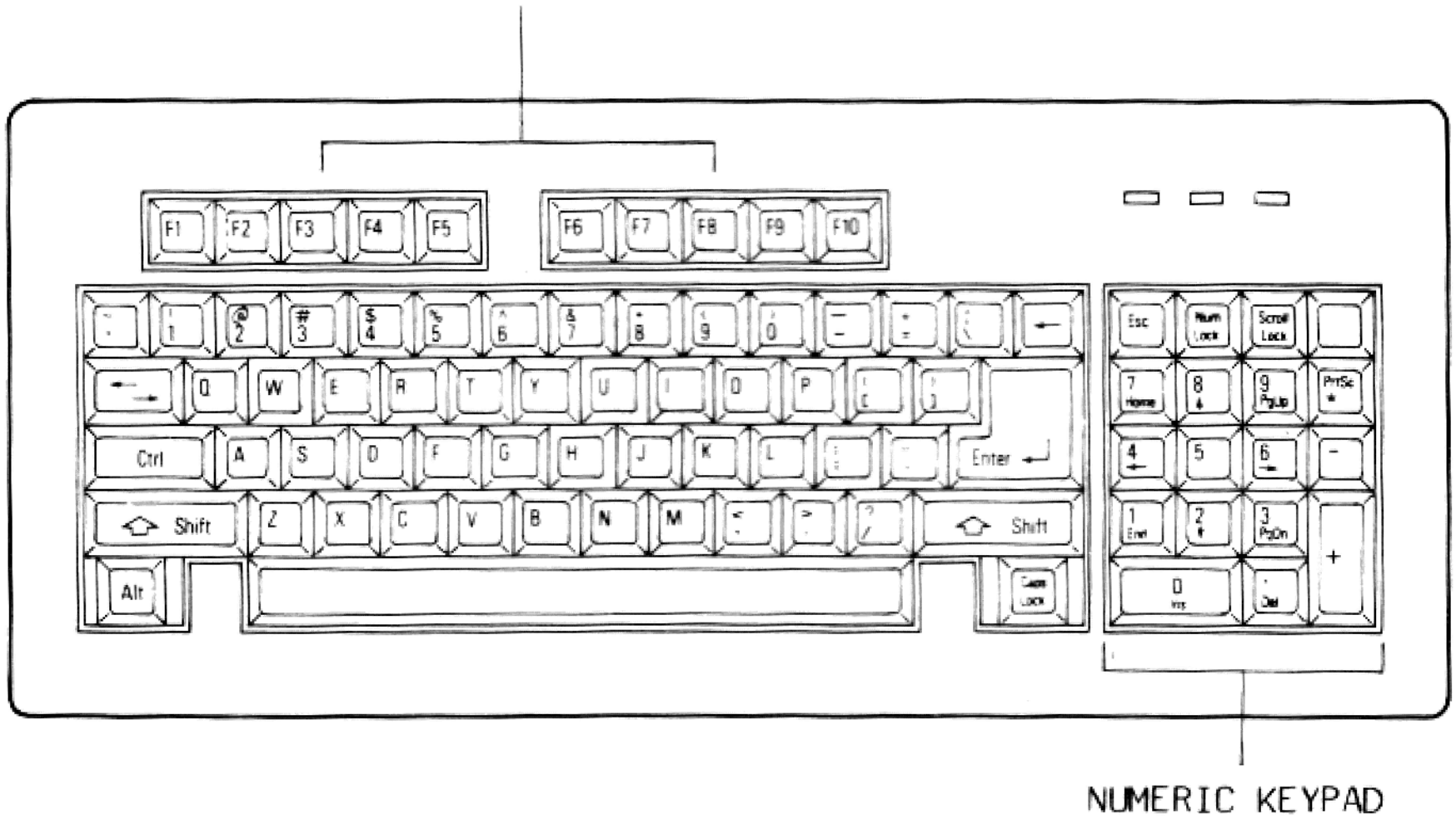


Fig. 1.5 The Keyboard

1.6.1 The Cursor Movement Keys

A cursor is a blinking line on the screen that indicates where the next character will appear. The Cursor Movement Keys, locating in the numeric keypad, allow you to move the cursor around the screen.

1.6.2 The Numeric Keypad

The 10-key numeric keypad is laid out like the keyboard of a calculator. It is convenient for entering numeric data. To activate the keypad, press NUM LOCK once or hold down SHIFT.

1.6.3 Special Function Keys

KEY	FUNCTION
ESC	To escape from errors or swap between menus.
RETURN	To confirm a command or issue a carriage return.
CTRL	Pressed simultaneously with another key to perform a special function determined by the software.
←	To backspace one character.
CAPS LOCK	To lock in upper case, press again to release.
SHIFT	To alter the case of characters or symbols.
TAB	To move to the next tab position.
DEL	To delete one character to the left of the cursor.
INS	To toggle the Insert Mode.
NUM	To activate the numeric keypad.
ALT	To change the value of the other keys. It also allows you to enter any character code from 0 to 255 to produce special character. Refer to Appendix C for details.

KEY	FUNCTION
PRTSC	Pressed simultaneously with SHIFT to output the current screen to the printer.
SCROLL LOCK	Pressed with CTRL to perform the same function as CTRL-C or BREAK.

1.6.4 The Programmable Function Keys

These function keys, F1 through F10, are different from the Special Function Keys in that they are user-programmable. They perform functions which are determined by the software. Refer to the MS-DOS User's Guide for their functions in MS-DOS.

1.7 NOTES BEFORE USING

Before you continue, we suggest you:

1. Read this manual thoroughly.

2. Familiarize yourself with the parts of your computer and the standard operating procedure.

3. Consult the related sections in this manual whenever you are in doubt.

4. Consider how the computer can help you in your home and select the appropriate application software.

CHAPTER 2
INSTALLATION

2.1 CONFIGURATING THE JUMPER

The jumper on the X'press 16 mother board gives you the option to disable the on-board color graphics adapter, floppy disk controller, game controller port, and printer port. This may become necessary if one or more of these features is also present on the expansion card.

The jumper defaults to enable all the features. To disable any of them, simply remove the shunt according to the list below;

SW #	FEATURE
SW1	Floppy disk controller
SW2	Color graphics adapter
SW3	Printer port
SW4	Game port

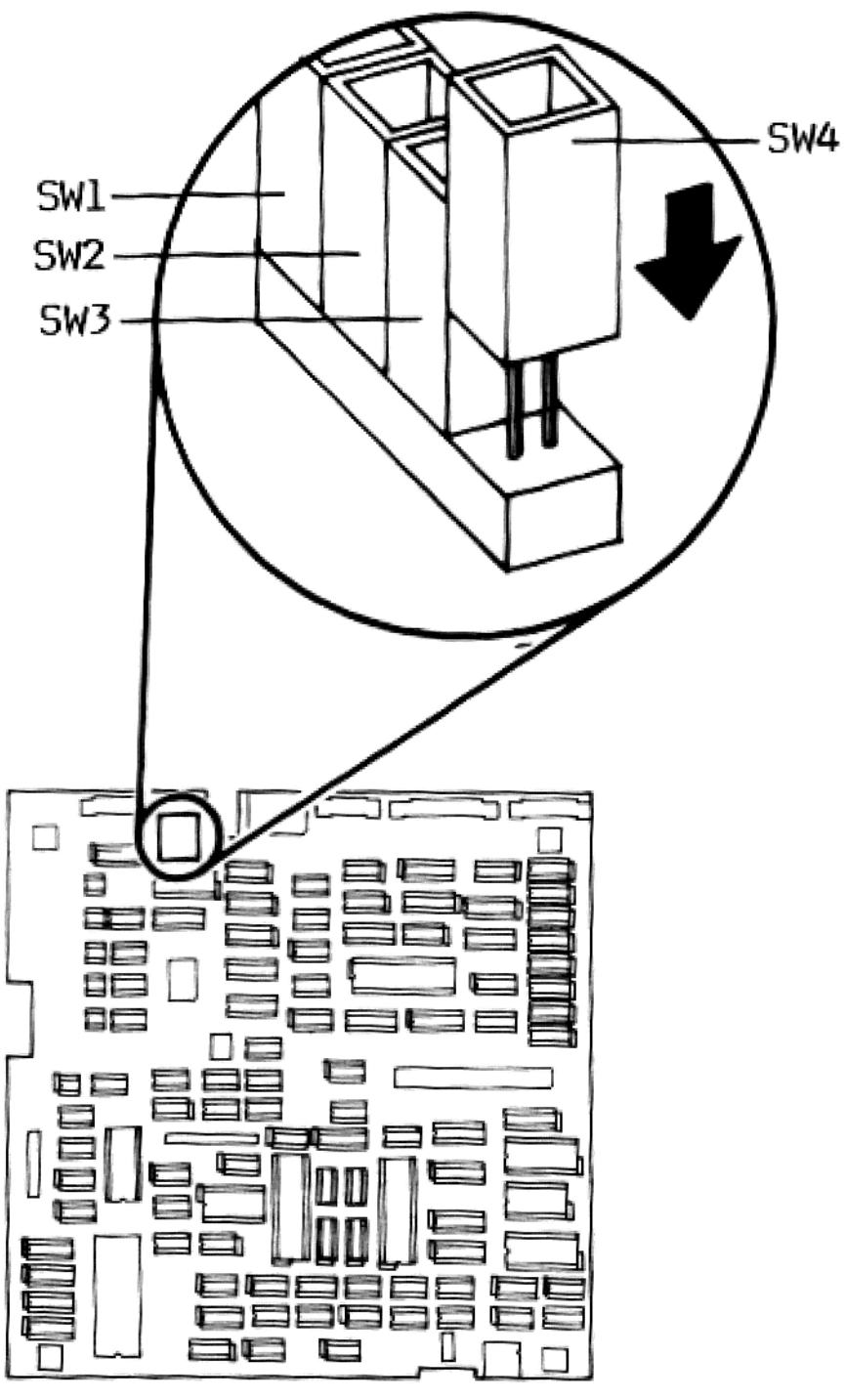


Fig. 2.1 The Jumper

2.2 SETTING UP THE SYSTEM

To set up the system,

1. Place the computer and peripherals on your workspace.

2. Remove the head-protection card and keep it for future use. You will need to reinsert it before shipping the computer.

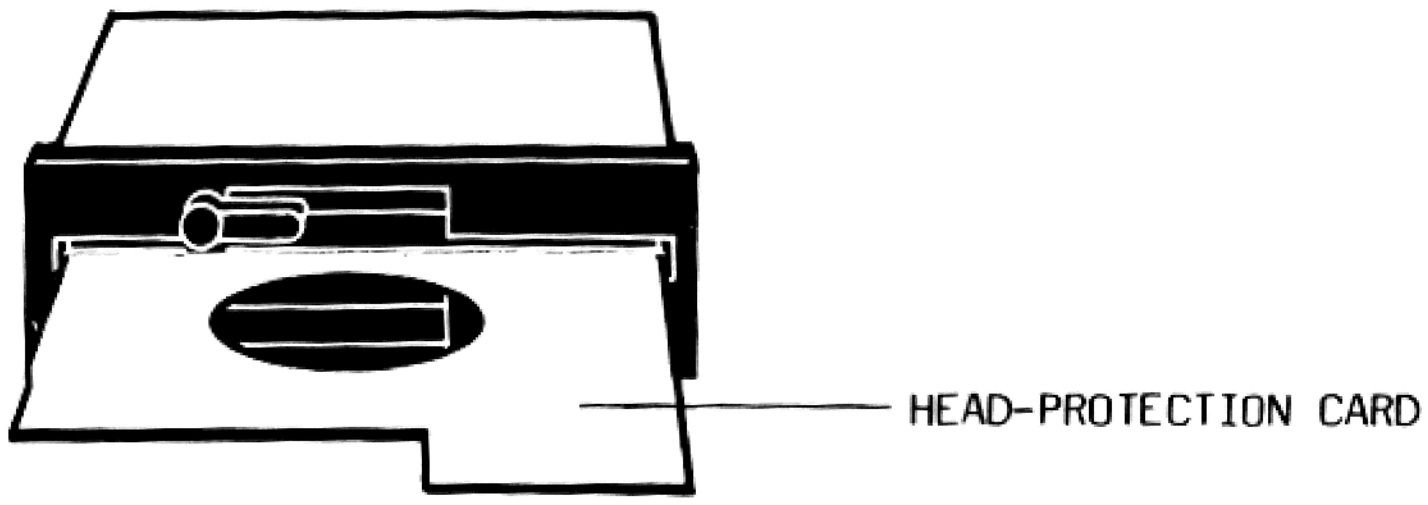


Fig. 2.2 Removing the Head-protection Card

3. Attach the keyboard to the keyboard connector.

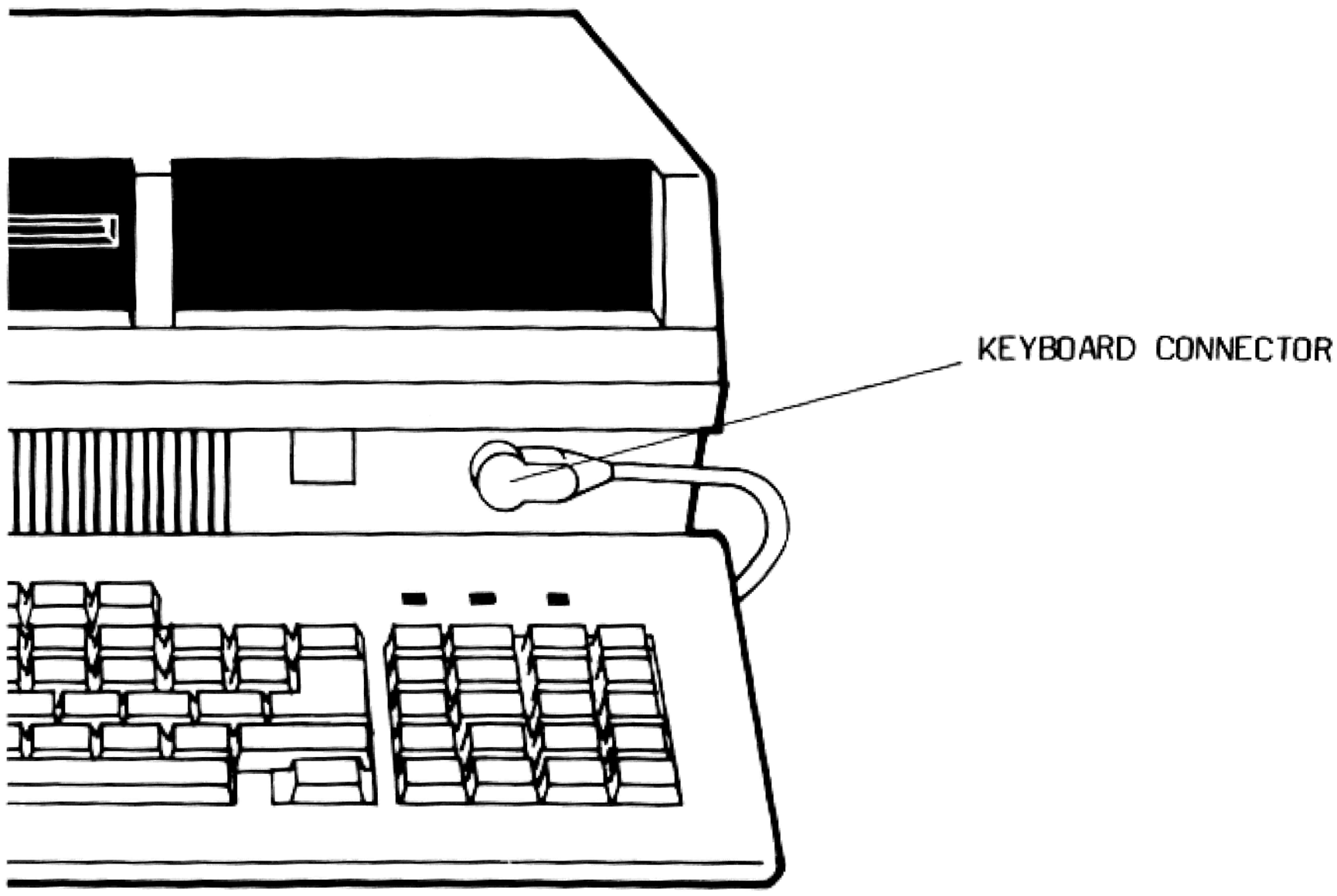


Fig. 2.3 Connecting the Keyboard

4. Connect the video cable of the monitor to the correct video port and its power cable to the wall outlet. Read 2.2 for details.

5. Plug the system power cord of the computer into the wall outlet.

6. Switch on the computer and then the monitor.

To reboot the computer, use the ON/OFF switch or Reset Button. You can also warm-boot the computer by pressing DEL while holding down CTRL and ALT simultaneously.

The warm boot and Reset Button are preferable since turning on and off your computer too often will eventually wear out the switch mechanism.

NOTE

Below is the general procedures of installing peripherals. Since the procedures may vary from brand to brand, when you install the peripherals, refer to their manuals as well.

2.3 HOOKING UP TO A MONITOR

The X'press 16 has 2 video output ports: Video and Monitor. The monitors your X'press 16 can support and their required accessories are:

MONITOR	RESOLUTION	COLOR	INTERFACE SUPPORTED		REQUIRED ACCESSORY	LIMITATION
			CGA	MVDP		
Analog RGB	High	More than 256 colors	*	*	SVI-815 or -816	
Digital RGB	High	8	*		SVI-817 or -816	
Digital RGBI	High	16	*		SVI-817, -815, or -816	
NTSC Composite Color	Medium	More than 256 colors	*	*	SVI-814N and provided video cable	Resolution may not support 80-column text
PAL Composite Color	Medium	More than 256 colors	*	*	SVI-814P and provided video cable	Resolution may not support 80-column text
Composite Green	Medium	1	*	*	Provided video cable	
NTSC TV	Low	More than 256 colors	*	*	SVI-814N	80-column text not supported
PAL TV	Low	More than 256 colors	*	*	SVI-814P	80-column text not supported

To connect a monitor,

1. Switch off the power of the system and peripherals.

2. Connect the video cable to the video port. The types of monitors and the ports they should be connected to are:

MONITOR	VIDEO PORT
RGB Analog	Monitor
RGB Digital	Monitor
RGBI Digital	Monitor
NTSC Composite Color	SVI-814N RF Modulator
PAL Composite Color	SVI-814P RF Modulator
Composite Green	Video
NTSC TV	SVI-814N RF Modulator
PAL TV	SVI-814P RF Modulator

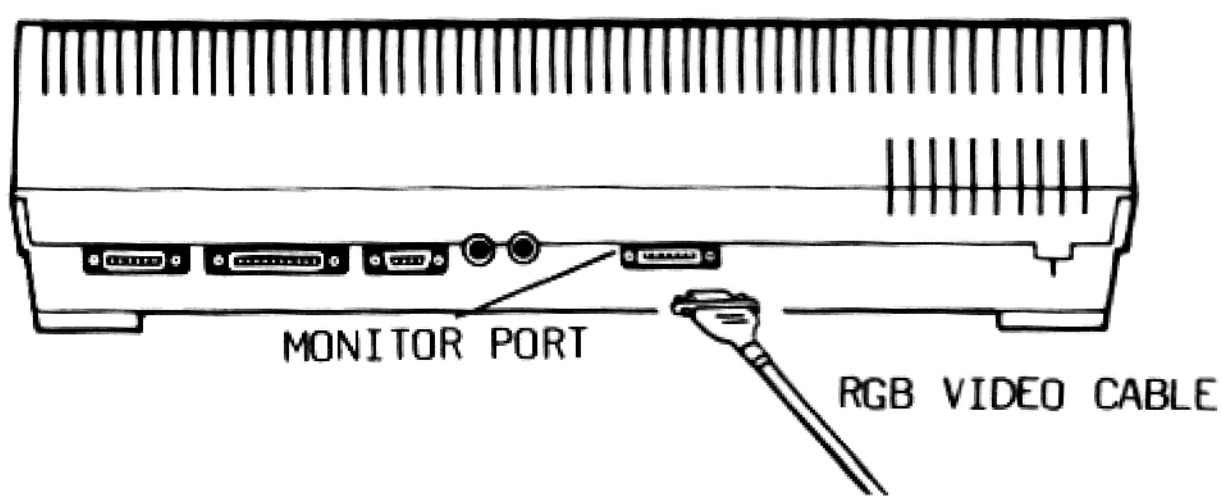


Fig. 2.4 Connecting a Monitor

3. Plug the power cord of the monitor into the wall outlet.

Since your X'press 16 is equipped with a built-in speaker, you need not connect its audio port to the monitor. If you desire to have it connected, obtain a video cable from your dealer.

To connect an RF modulator,

1. Connect the DI5 connector of the SVI-814N or SVI-814P to the RGB video port.

2. Fasten the screws on the modulator.

3. Connect the composite color monitor to the video port of the modulator with the cable provided. If yours is a TV set, use the TV cable instead.

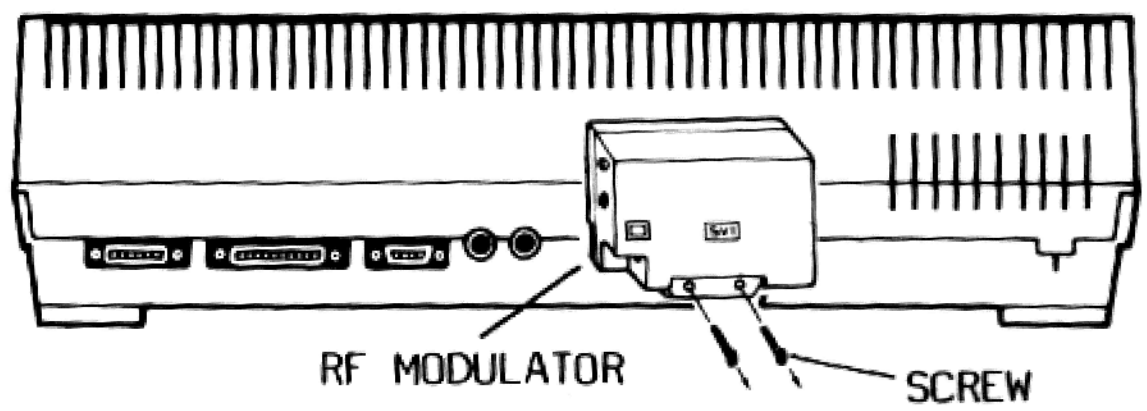


Fig. 2.5 Connecting an RF Modulator

2.4 CONNECTING A PARALLEL PRINTER

To connect a parallel printer,

1. Switch off the computer and peripherals.

2. Plug the Centronics printer cable into the parallel printer port.

2.5 INSTALLING A SECOND DISK DRIVE

A second disk drive may be installed in the cavity next to the first. To do this,

1. Switch off the computer and peripherals.

2. Remove the screws from the system unit and lift up the cover.

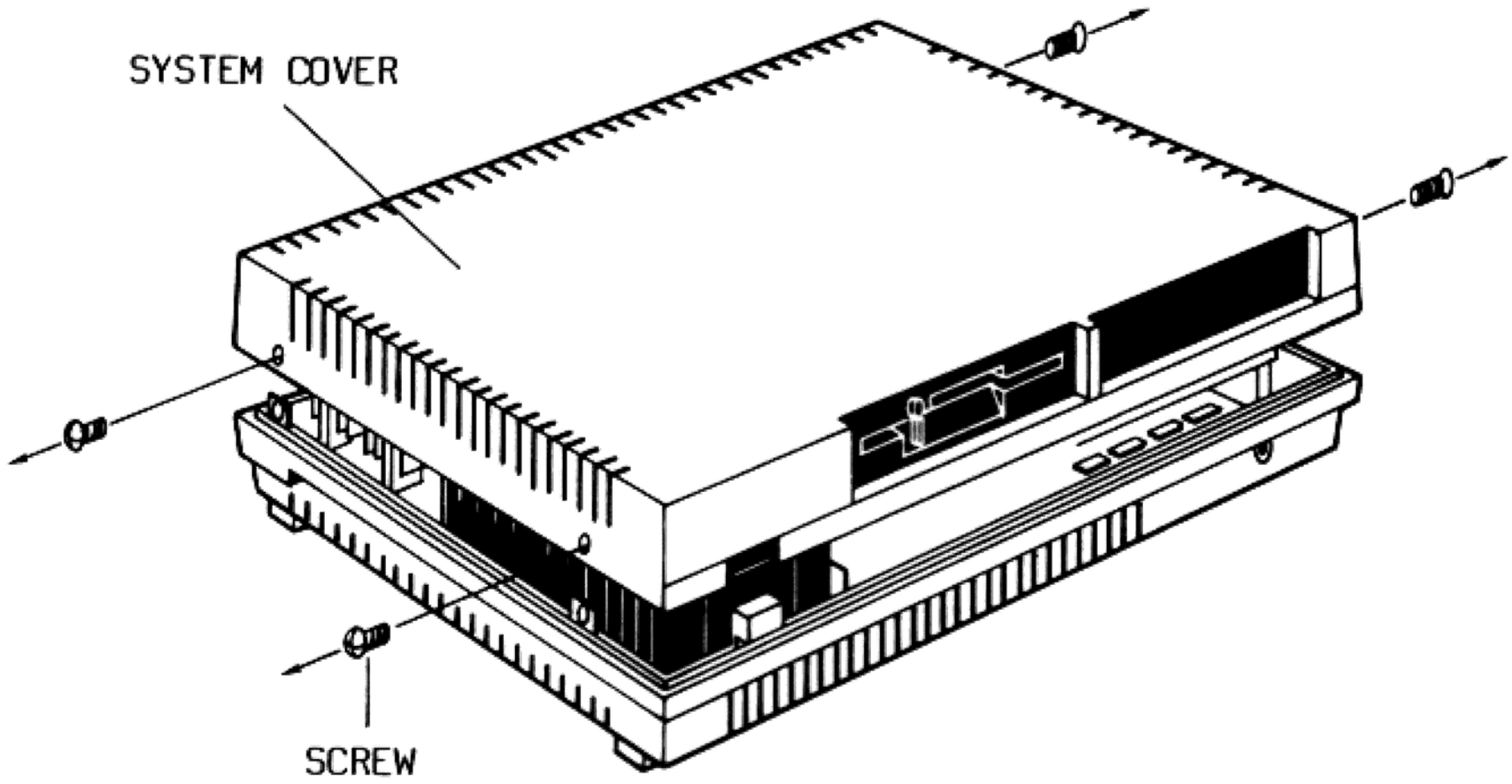


Fig. 2.6 Removing the Cover of the System Unit

3. Loosen the screws holding the disk drive expansion cover and pull the latter away. Then remove the drive mounting plate and the 4 screws from the corners. Remember to save all the screws for later use.

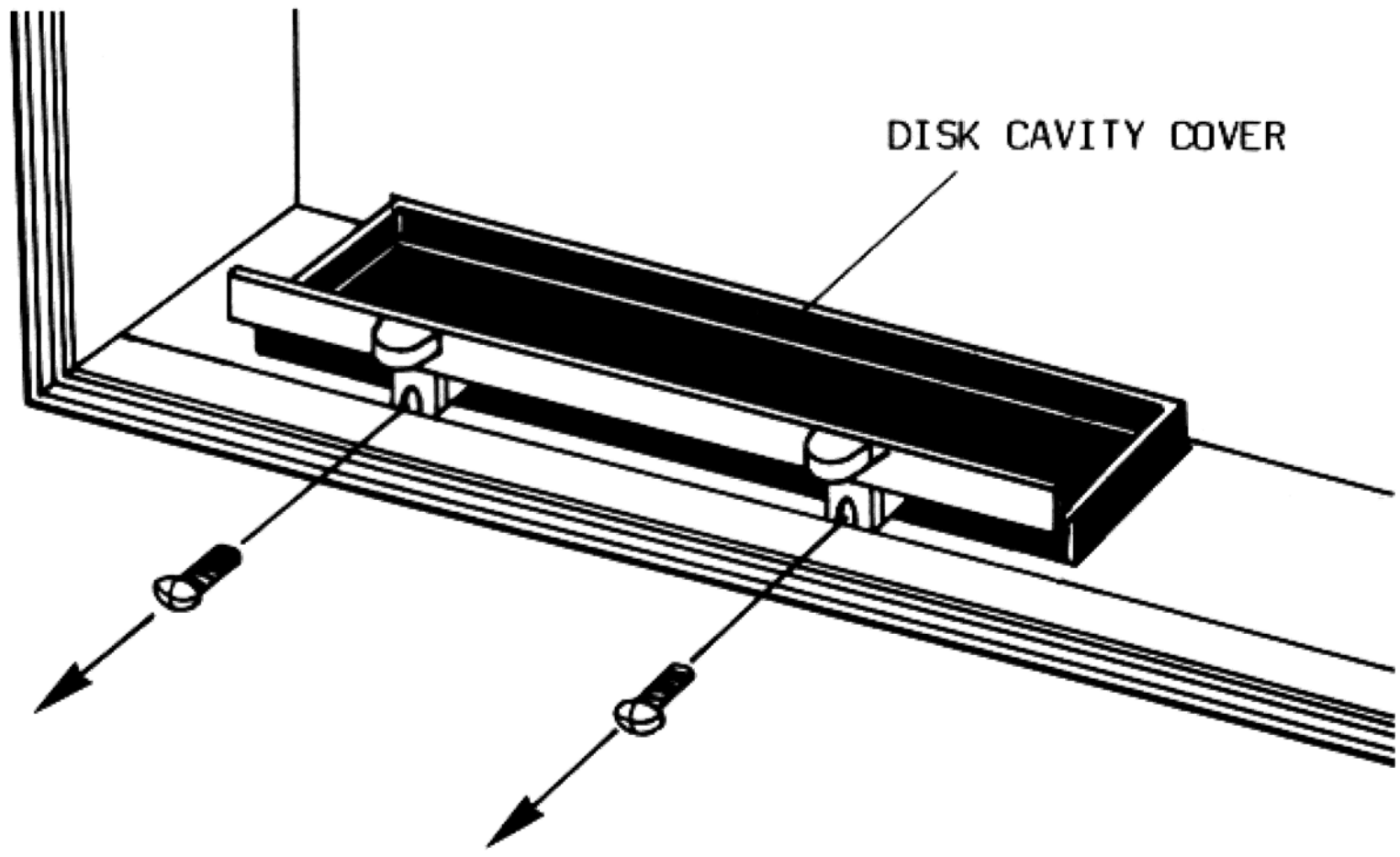


Fig. 2.7 Pushing out the Disk Drive Cover

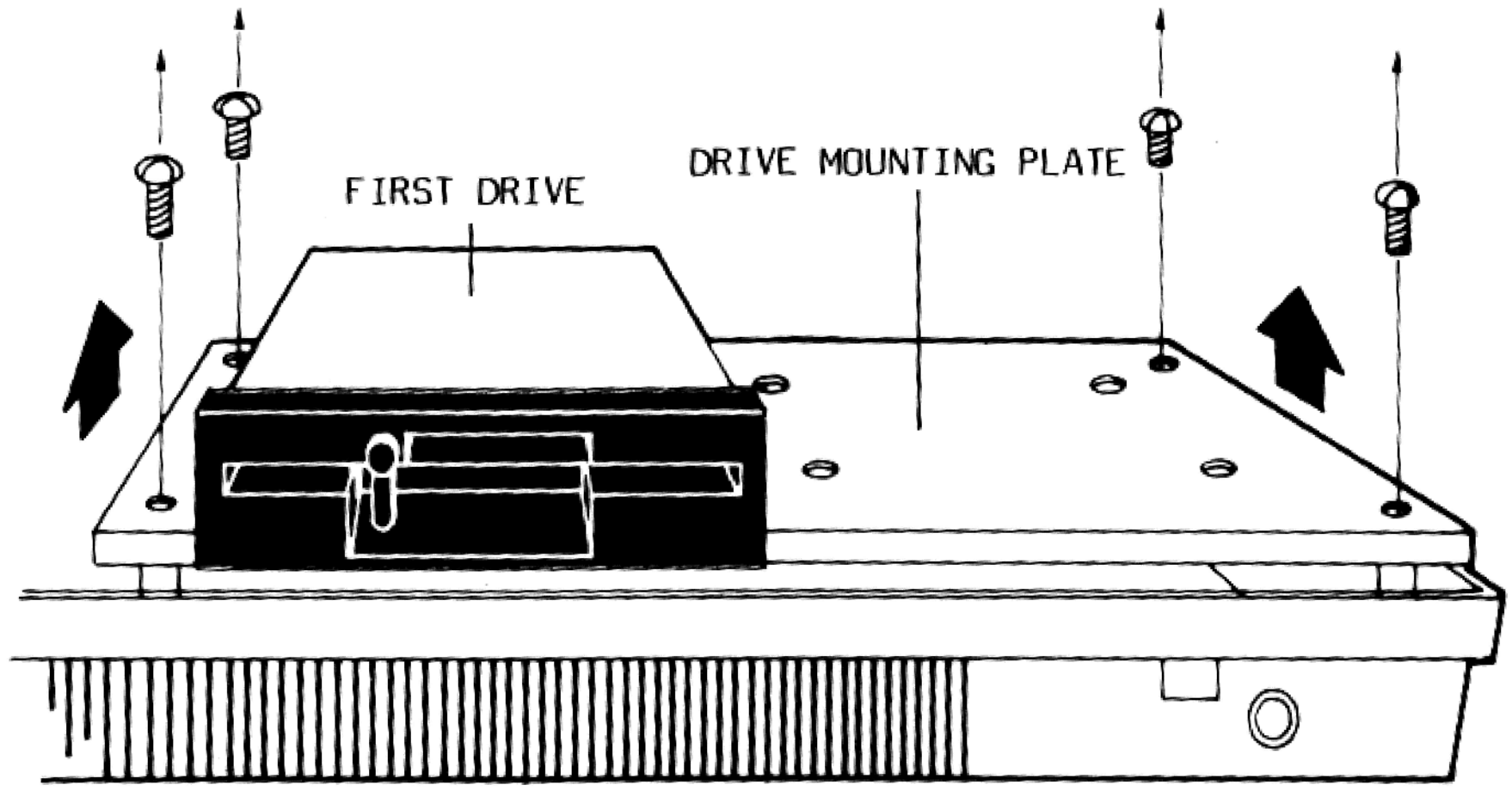


Fig. 2.8 Removing the Drive Mounting Plate

4. Screw the second drive onto the mounting plate. Carefully replace the mounting plate and fasten all the screws.

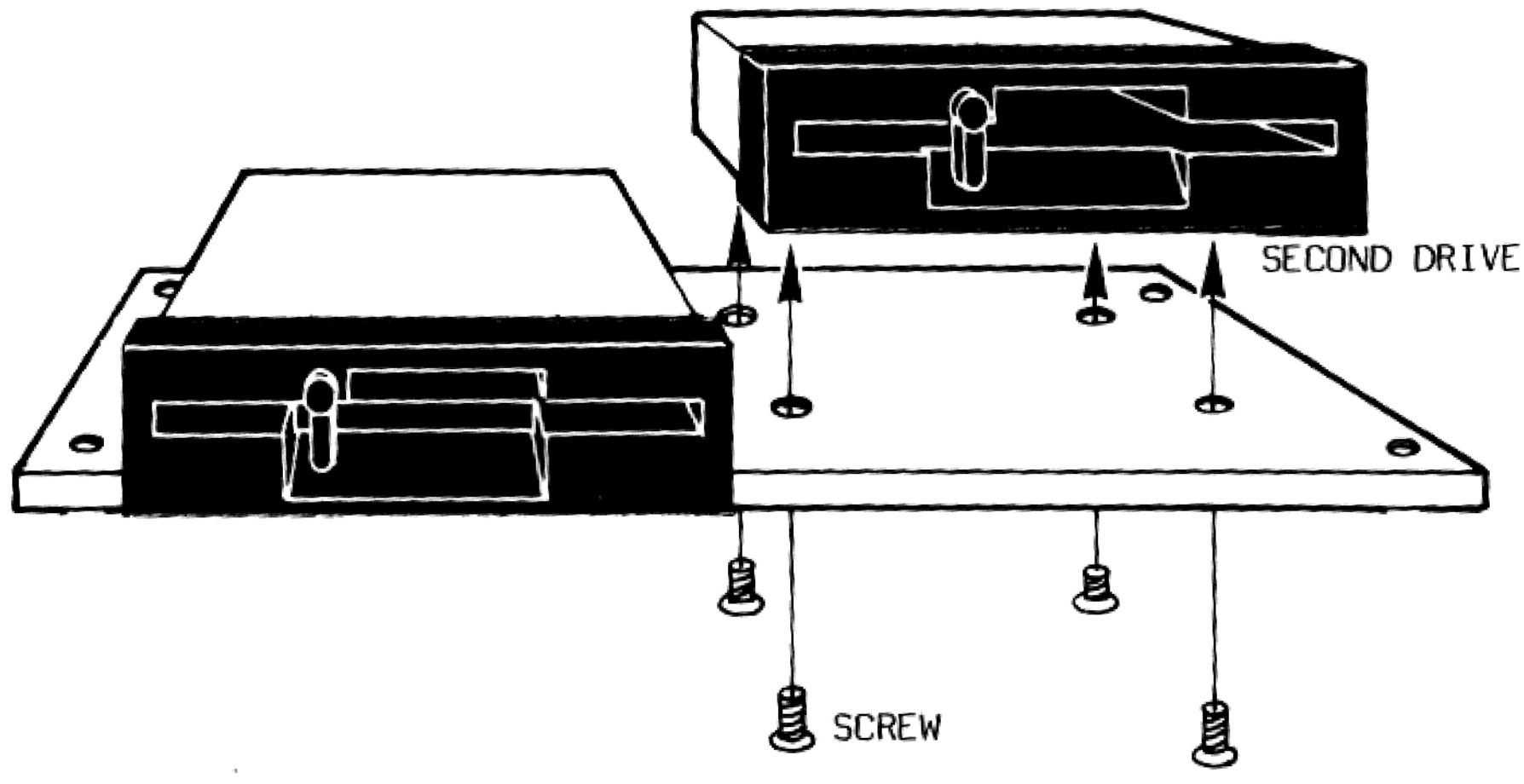


Fig. 2.9 Screwing the Second Drive onto the Mounting Plate

5. Connect the second drive power cable to the second drive.

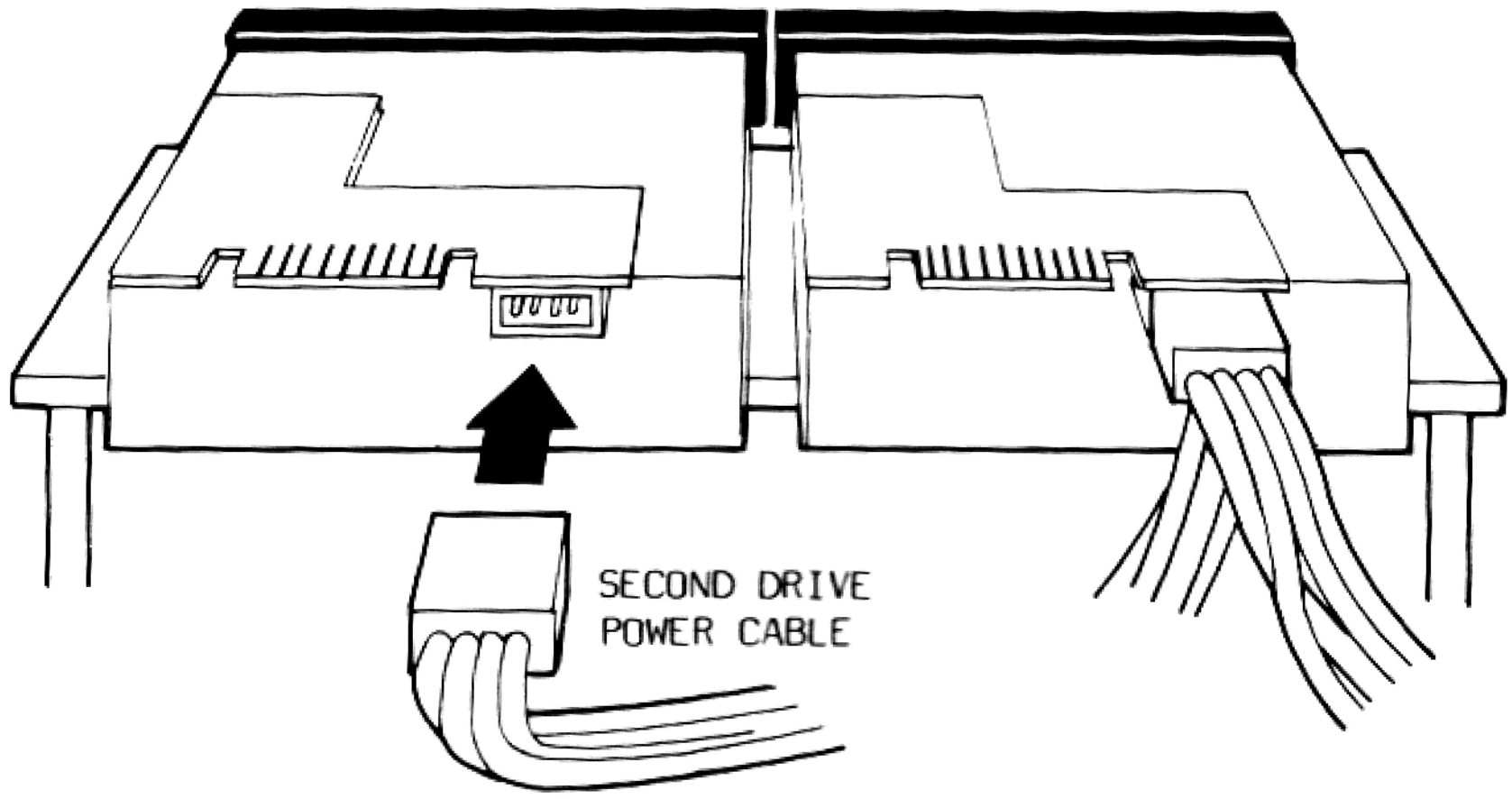


Fig. 2.10 Connecting the Power Cable to the Disk Drive

6. Connect the disk drive adapter to the second disk drive.

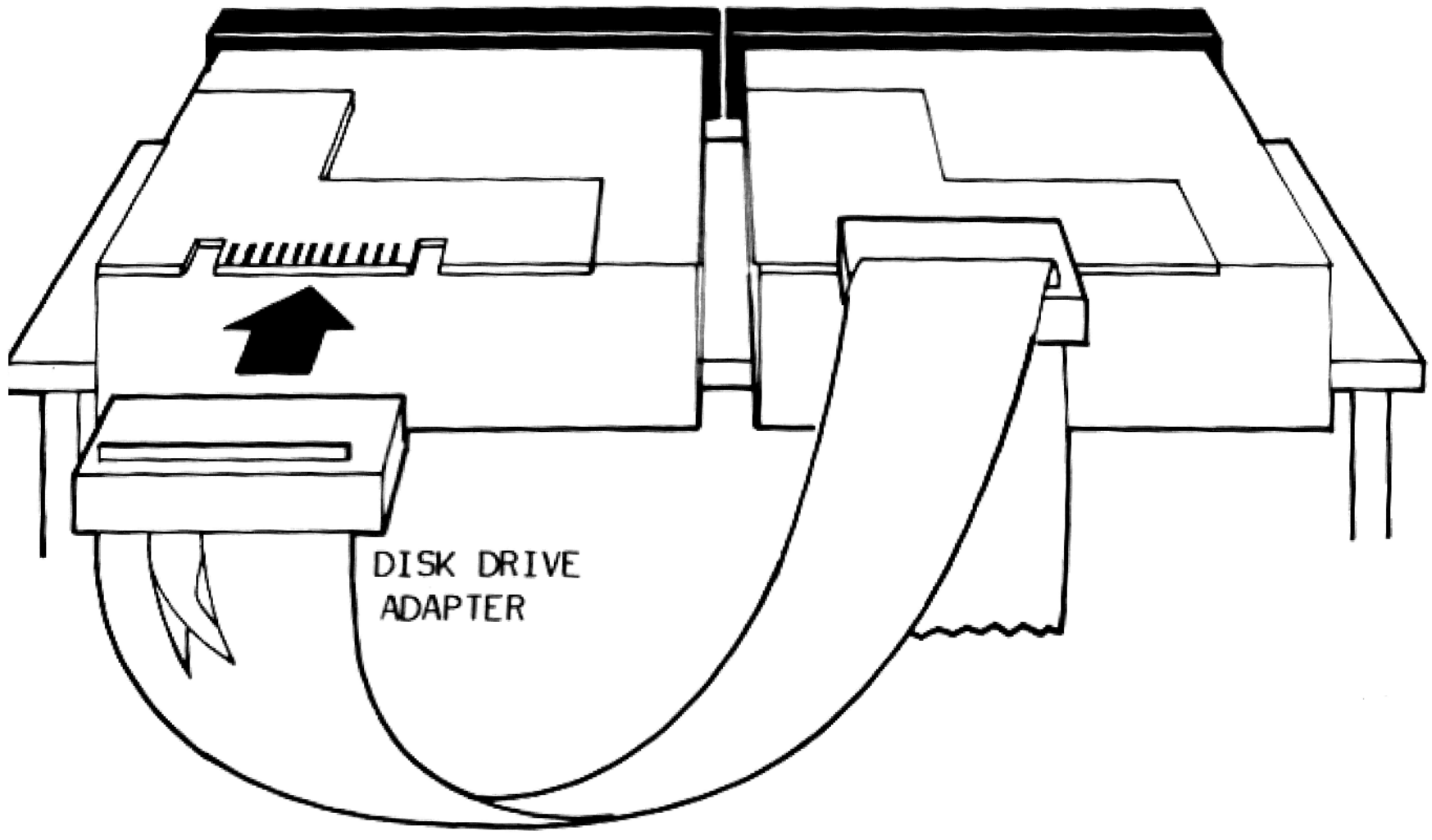


Fig. 2.11 Connecting the Disk Drive Adapter to the Second Drive

7. Carefully replace the cover onto the system unit and fasten all the screws.

2.6 INSTALLING AN EXPANSION CARD

To install the SVI-812 Multifunction Card,

1. Switch off the computer and peripherals.

2. Remove the screws from the system unit and lift off the cover.

3. Insert the multifunction card horizontally into the expansion slot.

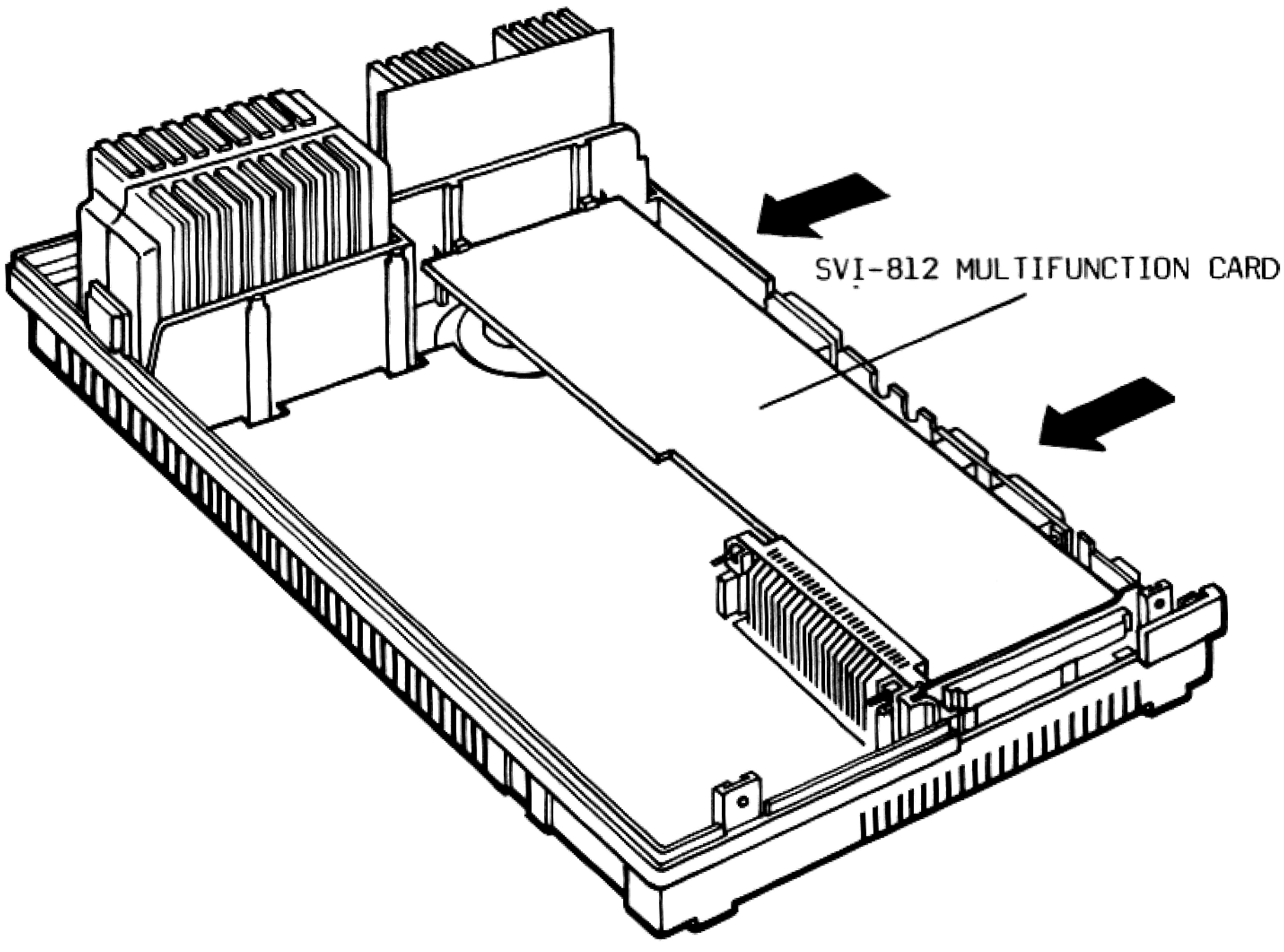


Fig. 2.12 Inserting the SVI-812 Multifunction Card

4. Replace the cover onto the system unit and fasten all the screws.

The procedure of installing other expansion card is similar to the above. Refer to the manual of the card for details. If your expansion card has an I/O port, twist off the cut-out cover on the right-hand side of the system unit.

NOTE

The built-in 26 watt switching power supply of the X'press 16 is sufficient to support most PC-compatible cards. However, it is not designed to use those power-hungry expansion cards such as the 2M multifunction card, 1.5M RAM card, hard card, etc. Before purchasing an expansion card, other than those designed specifically for the X'press 16, you are advised to consult your dealer about compatibility.

2.7 CONNECTING THE QUICKSHOT X

A QuickShot X joystick is included free with your X'press 16. To install the QuickShot X,

1. Switch off the computer and peripherals.

2. Plug the cable of QuickShot X into the game port.

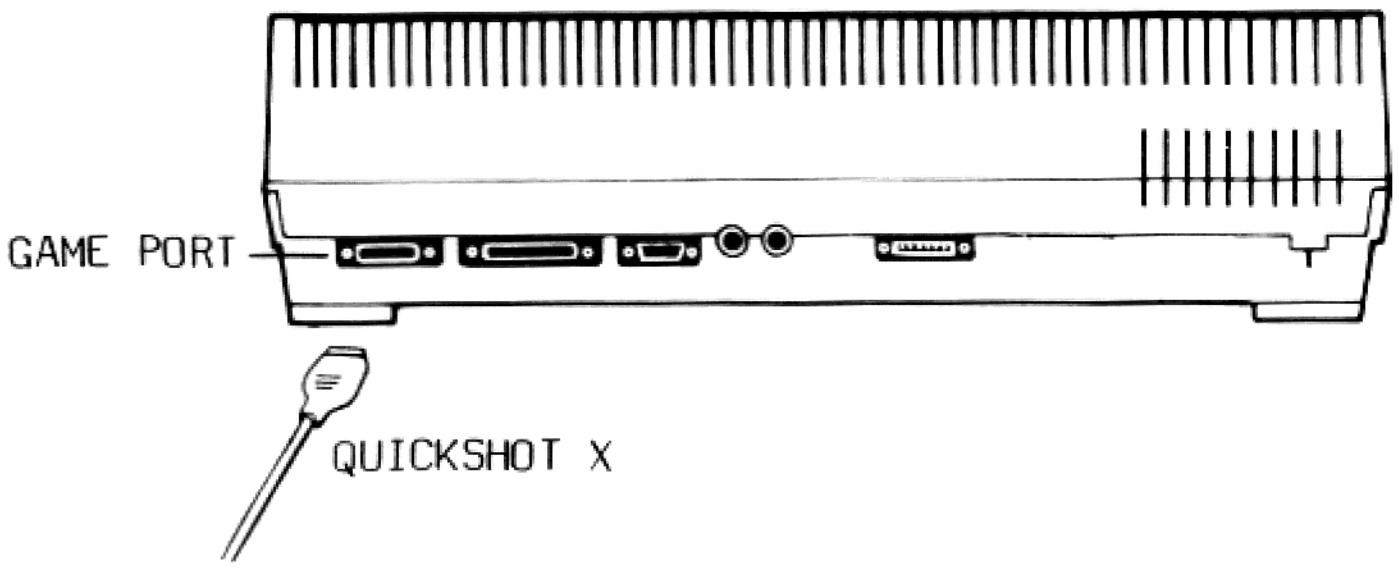


Fig. 2.13 Connecting the QuickShot X

2.8 CONNECTING A GAME ADAPTER

To install the game adapter,

1. Remove the system cover.

2. Insert the expansion card of the game adapter into the expansion slot.

3. Twist off the cut-out cover.

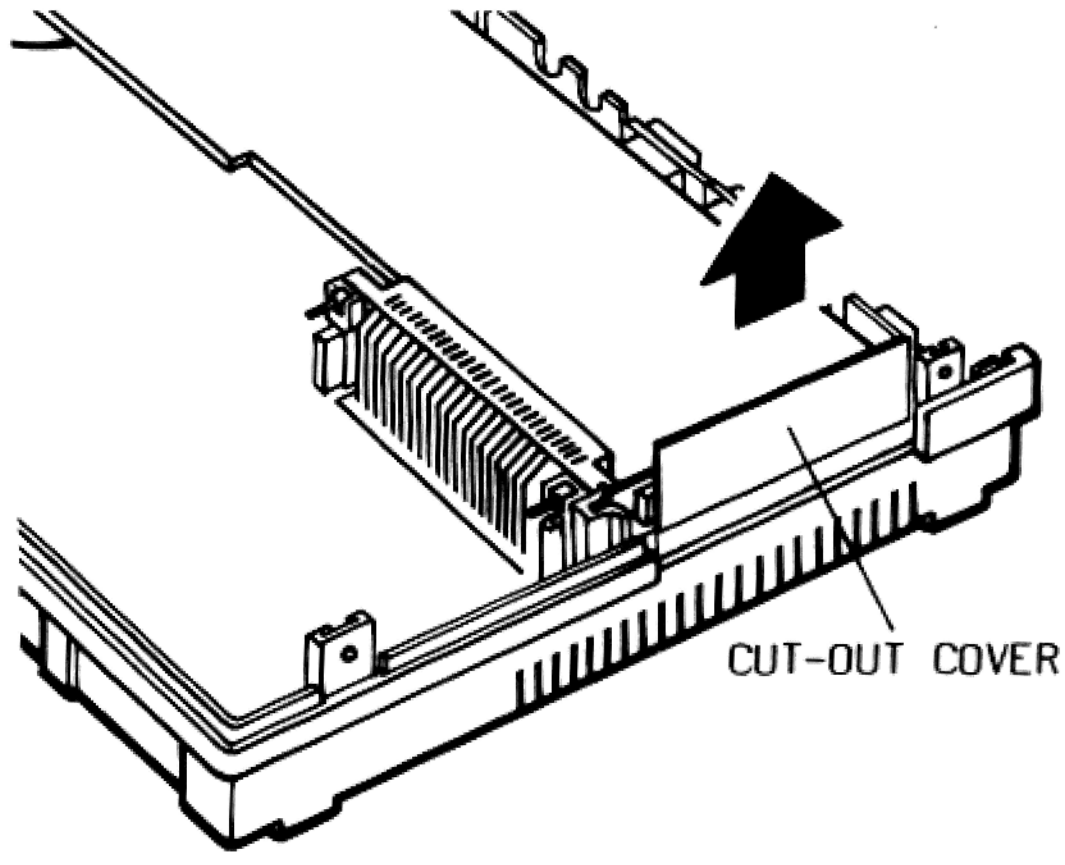


Fig. 2.14 Twisting off the Cut-out Cover

4. Connect the cartridge holder to the edge connector of the expansion card through the cut-out cover. Then press the button on top of the cartridge holder to lock the two together.

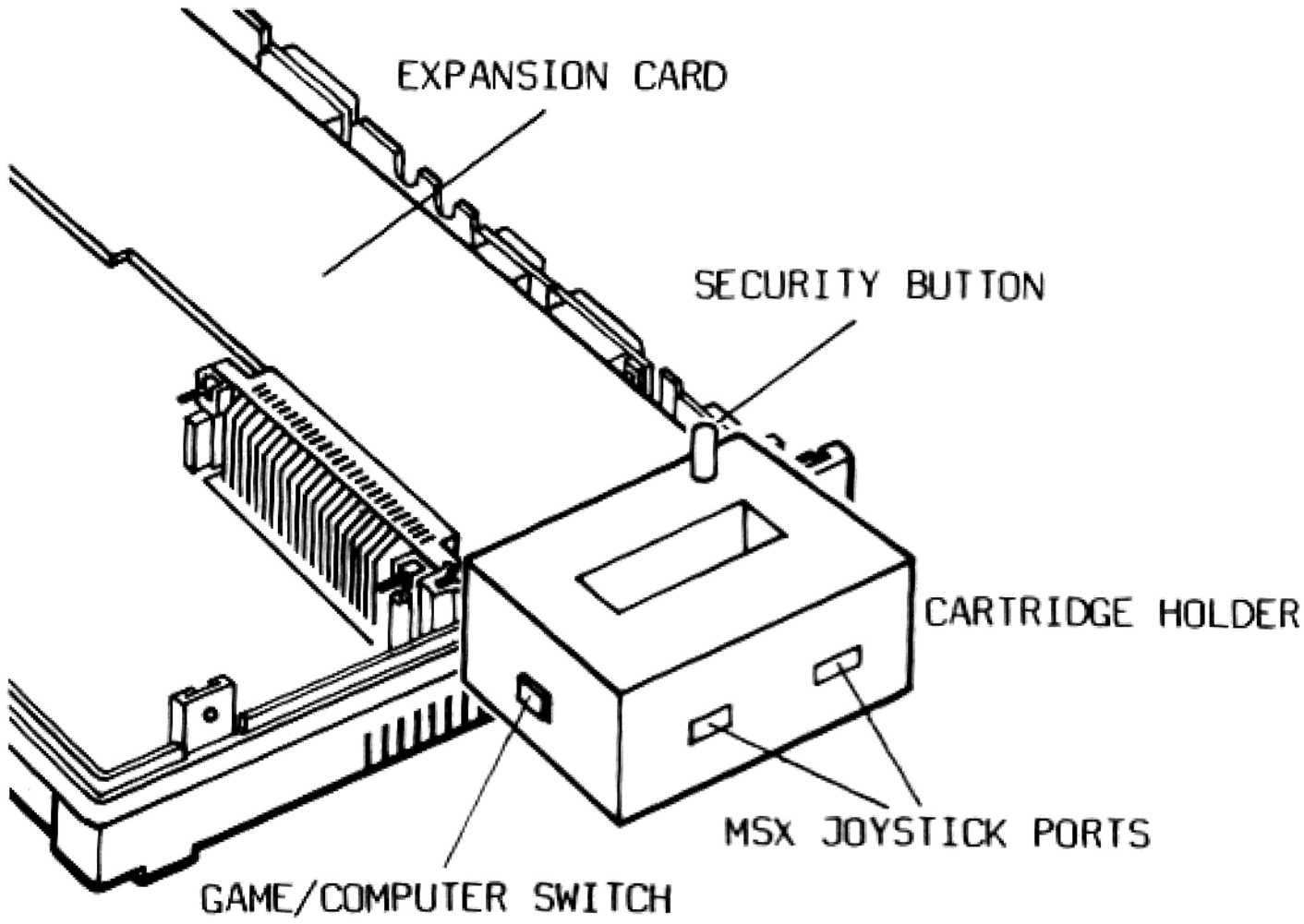


Fig. 2.15 Connecting the Cartridge Holder and Expansion Card

5. Replace the system cover and fasten all the screws.

6. Connect your MSX joysticks to the ports on the cartridge holder.

A switch is located on the front panel of the cartridge holder to toggle between GAME and COMPUTER.

To insert an MSX game cartridge,

1. Switch off the system.

2. Plug the game cartridge into the slot on the cartridge holder until it is fully seated.

3. Turn the GAME/COMPUTER switch to GAME. It signals the computer not to read the disk in the disk drive upon boot up. It will load the program in the cartridge instead.

4. Switch on the system.

If you wish to switch back to MS-DOS, simply turn the switch to COMPUTER after turning off the system. You need not disconnect the expansion card and cartridge holder from the system.

2.9 CONNECTING A MOUSE OR LIGHT PEN

To connect a light pen or mouse,

1. Switch off the computer and peripherals.

2. Plug the connector of the mouse or light pen into the mouse/light pen port.

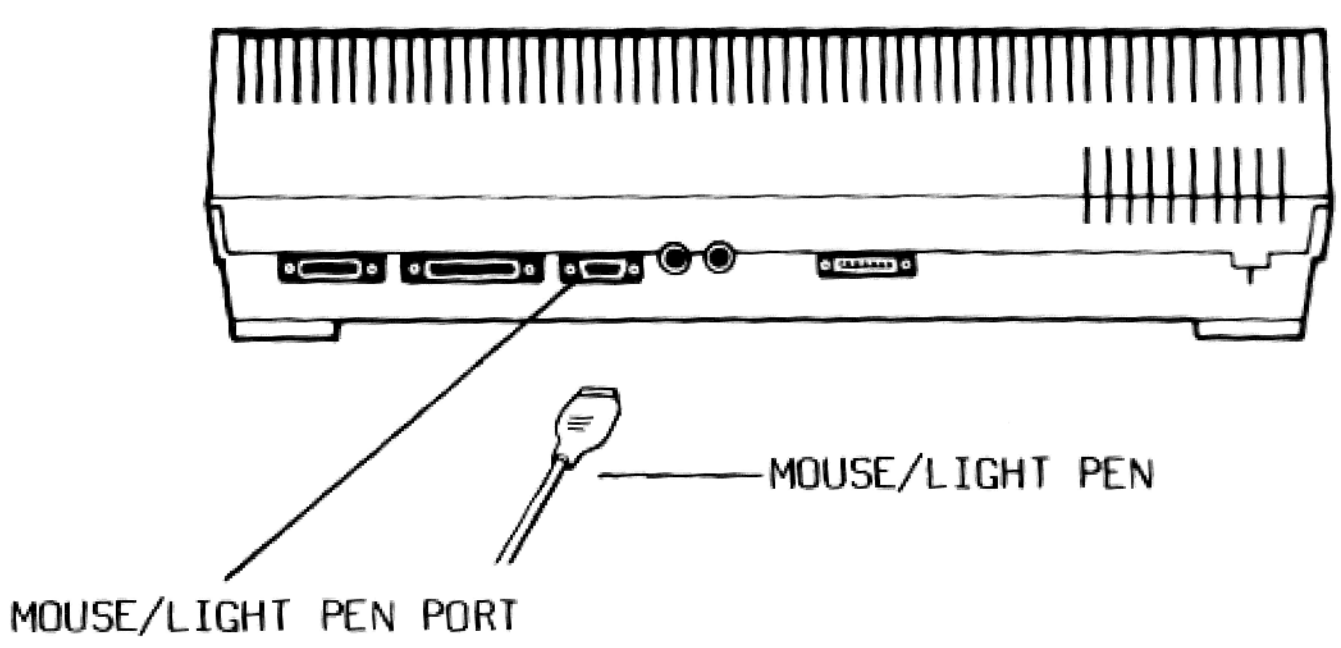


Fig. 2.16 Connecting a Mouse or Light Pen

NOTE

You need to run the software driver for the mouse before operating it. For added convenience, you can save the driver in AUTOEXEC.BAT file so that the command is executed automatically every time the computer is turned on.

2.10 CONNECTING A COOLING FAN

To connect a cooling fan,

1. Switch off the computer and peripherals.

2. Remove the system cover.

3. Plug the power socket of the fan into the header on the power board.

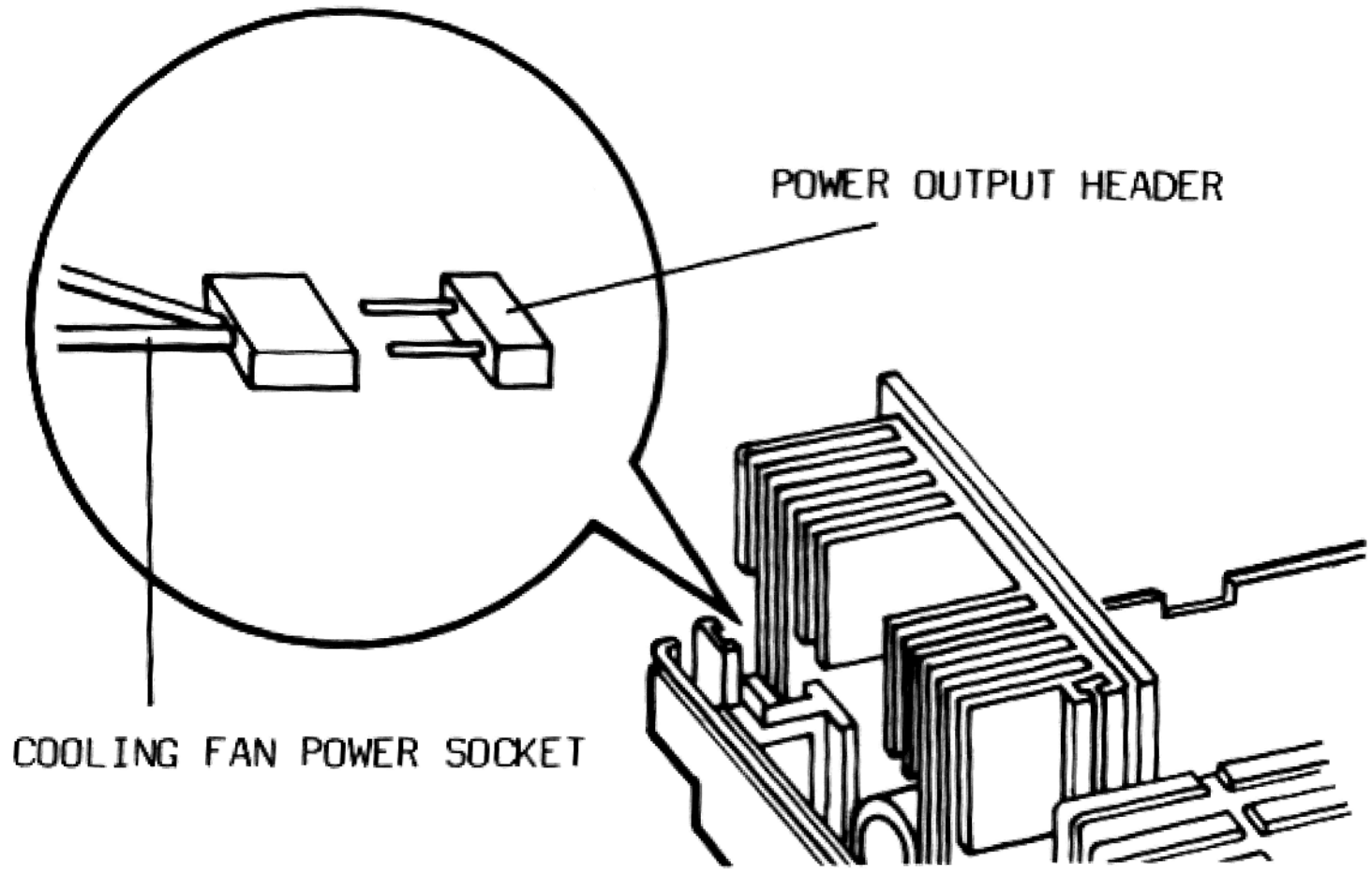


Fig. 2.17 Connecting the Power Supply

4. Replace the system cover and fasten all the screws. The power cord of the fan should thread through the same opening as the system power cord.

5. Attach the fan to the slots at the rear of the computer.

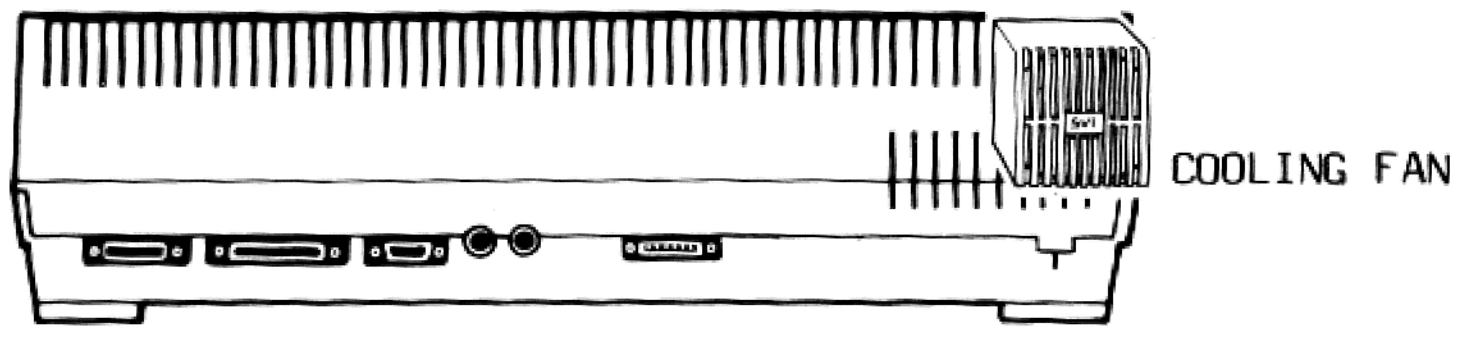


Fig. 2.18 Attaching the Fan to the Computer

CHAPTER 3
UTILITIES

3.1 THE RAM DISK AND PRINTER SPOOLER

The RAM disk is a virtual disk which uses a portion of the RAM to store data and programs. The main advantage of the RAM disk is its speed. It is as much as 50 times faster than a floppy disk and up to 10 times faster than a hard disk. However, a RAM disk is volatile, which means that data stored on it is lost when the computer is turned off.

The printer spooler is a buffer, which is an area of memory set aside from the RAM, compensating for the differences in transfer rates between the computer and printer. Once the printer spooler is installed, the computer transfers the information you intend to print to the buffer at a rapid rate. You can then continue working with the computer while the buffer feeds the printer.

3.2 INSTALLING THE RAM DISK AND PRINTER SPOOLER UTILITIES

The system disk that comes with your X'press 16 contains 2 utilities: RDISK.SYS and CONTROL.COM. RDISK is responsible for installing the RAM disk and printer spooler, whereas CONTROL helps you abort, suspend, or resume printing.

To install the RAM disk and printer spooler,

1. Copy RDISK.SYS and CONTROL.COM into your working MS-MOS system diskette.

NOTE

The following procedure will erase the previous content of the CONFIG.SYS file. TYPE the file to see if it contains any important commands. If it does, retype them into the file in Step 3.

2. Type:

   COPY CON: CONFIG.SYS

   Press ENTER.

3. Include one of the following in the CONFIG.SYS files:

DEVICE = RDISK.SYS	(To use the default settings, 64K RAM disk and 64K printer spooler)
DEVICE = RDISK.SYS /1	(To create 128K printer spooler)
DEVICE = RDISK.SYS /2	(To create 64K RAM disk and 64K printer spooler)
DEVICE = RDISK.SYS /3	(To create 128K RAM disk)

4. When you have finished defining the CONFIG.SYS file, press CTRL Z and then ENTER.

   The RAM disk and printer spooler are then installed after a reboot.

3.3 USING THE RAM DISK

The RAM disk behaves very much like an ordinary floppy disk. You access the RAM disk by specifying the drive designation C.

You can use it to store programs by coping the files from the floppy disk drive into the RAM disk. If the RAM disk stores any data you intend to retain, remember to backup the RAM disk onto a floppy disk before switching off the computer.

3.4 CONTROLLING PRINTING OPERATIONS

Since all data sent to the printer is first channelled through the printer spooler, it is out of the control of the application software. However, you can suspend or abort the printing using the internal commands of the printer spooler.

Whenever you want to invoke these commands, type CONTROL after the system prompt and press ENTER. The following control options will be displayed:

1. Suspend Printing
2. Continue Printing
3. Abort Printing

To enter your choice, type 1, 2, or 3 and press ENTER. The printer spooler will respond accordingly. Note that you can only issue one command at a time. You are brought back to the system prompt as soon as you enter your choice.

NOTE

Since Screen Modes 3, 4, and 5 of GW BASIC occupy the same MVDP video RAM as the RAM disk and printer spooler, do not use them when the RAM disk and printer spooler are installed.

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1. CGA MODULE

1.1 Major Components

- CGA (V6355)
- 16K video RAM (4416 @ 120ns)
- 4K character ROM (2732 @ 250ns)
- Video RAM mapped into address space B8000..BBFFFH
- Character ROM not accessible through CPU

1.2 Display Modes

- 40 x 25 text, 7 x 7 character fonts in 8 x 8 character type, 16 foreground colors, 8 background colors, blinking attribute for foreground colors

- 80 x 25 text, same character fonts and color capability as 40 x 25 Mode

- 320 x 200 color graphics, 16 background colors, 4 foreground colors

- 640 x 200 black and white graphics

1.3 Enhanced Features

- 16 x 16 dot sprite cursor can be displayed as a AND or EXOR pattern on the screen locatable on dot unit positions

- 16 address x 9 bit data 512-color palette

- Generation of the IOCHRDY signal to enable flicker free scrolling

- Built-in mouse/light pen port

1.4 Output Signals

- Digital RGB (RGBI), IBM color display compatible
- Analog RGB output
- Composite monochrome output

1.5 Compatibility

The V6355 is compatible with the IBM CGA. It contains a restricted implementation of the 6845 CRTC internal registers:

REG. NO.	REGISTER TYPE
R10	Cursor start line
R11	Cursor end line
R12	Start address (H)
R13	Start address (R)
R14	Cursor address (H)
R15	Cursor address (L)
R16	Light pen (H) / Mouse X
R17	Light pen (L) / Mouse Y

The other registers, which are not supported, are automatically decided by mode selection bits of the mode register. These values are the same as those of the 3 modes of IBM CGA (40 x 25 text, 80 x 25 text, and graphics Mode).

The restricted register implementation will cause the V6355 to fail in the Display Adapter Test of the PC Advanced Diagnostics Test since this test will exercise all the registers of the 6845. However, this limitation has no other effects on most other software.

2. MVDP MODULE

2.1 Major Components

- MVDP (V9938)
- 128K video RAM (DRAW 4464 @ 120ns)
- Video RAM accessed through MVDP only

2.2 Display Modes

- Text 1 : 40 x 24 characters
  2 out of 512 colors
  32 display pages

- Text 2 : 80 x 24 (26.5) characters
  4 out of 512 colors
  16 display pages

- Multicolor : 64 x 48 color blocks
  16 out of 512 colors
  32 display pages

- Graphics 1 : 32 x 24 patterns / 256 types
  16 out of 512 colors
  32 display pages

- Graphics 2,3 : 32 x 24 patterns / 768 types
  16 out of 512 colors
  8 display pages
  Graphics 2 Mode uses Sprite 1 Mode
  Graphics 3 Mode uses Sprite 2 Mode

- Graphics 4 : 256 x 192 (212) bit-mapped graphics
  16 out of 512 colors
  4 display pages

- Graphics 5 : 512 x 192 (212) bit-mapped graphics
  4 out of 512 colors
  4 display pages

- Graphics 6 : 512 x 192 (212) bit-mapped graphics
  16 out of 512 colors
  2 display pages

- Graphics 7 : 256 x 192 (212) bit-mapped graphics
  256 colors
  2 display pages

2.3 Sprite Graphics

- Sprite 1 : 8 x 8 or 16 x 16 dot size
  1 out of 16 colors
  Single color sprites
  32 sprites per screen
  Operates in Multicolor, Graphics 1 and 2 Modes

- Sprite 2 : 8 x 8 or 16 x 16 dot size
  1 out of 16 color for each row
  Multicolor sprites
  32 sprites per screen
  8 sprites per row
  Operates in Graphics 3 to 7 Modes

2.4 MVDP Graphics Commands

- High speed move : CPU to VRAM
  VRAM to VRAM
  VDP to VRAM
- Logical move : CPU to VRAM
  VRAM to CUP
  VRAM to VRAM
- Line drawing
- Search

2.5 I/O Locations

The MVDP is not a standard IBM peripheral. It is placed in a reserved I/O space as mentioned in the IBM XT Technical Manual.

I/O ADDRESS	DESCRIPTION
3C0H MVDP	Port #0
3C1H MVDP	Port #1
3C2H MVDP	Port #2
3C3H MVDP	Port #3

2.6 Output Signals

- Analog RGB signal
- Composite monochrome signal

3. SUPERIMPOSE MODULE

3.1 Major Components

- Signal level adjusting circuit

- Video synchronization
- Black level detection circuit
- Video switches
- Video selection control

3.2 Modes of Operation

- CGA Mode — This mode will enable the output of the CGA to be fed to the output sockets directly. The output of the MVDP is blocked.

- MVDP Mode — This mode will enable the output of the MVDP to be fed to the output sockets directly. The output of the CGA is blocked.

- Mixed Mode — In this mode, the output of the CGA is treated as a foreground video signal, whereas that of the MVDP becomes the background signal. The black level detection circuit monitors the foreground CGA video signal. If the signal is anything other than black, it will turn on the foreground signal; otherwise, the background signal will be turned on.

3.3 Output Specification

The video output of both the CGA Module and MVDP Module will be routed through the Superimpose Module, which controls the final output signal level of the X'press 16.

There are 2 output sockets:

1. RCA socket — The output will be the superimposed composite monochrome video of the CGA and MVDP. The output voltage level is 1Vpp/75 ohm.

2. D-sub 15 pin male socket:

PIN #	DESCRIPTION	SIGNAL LEVEL
1.	Analog Ground	_
2.	Digital R	TTL
3.	Digital G	TTL
4.	Digital B	TTL
5.	Digital I	TTL
6.	Horizontal Syn	TTL
7.	Vertical Ground	TTL
8.	Digital Ground	_
9.	+12V	_
10.	Analog R	0.7Vpp/75 ohm
11.	Analog G	0.7Vpp/75 ohm
12.	Analog B	0.7Vpp/75 ohm
13.	-Comp. Syn	TTL (active low)
14.	Audio	0.5VRMS/1 Kohm
15.	Comp. Video	1Vpp/75 ohm

4. SOUND GENERATION MODULE

4.1 IBM Sound Module

This module contains the same speaker interface as described in the IBM XT Technical Manual. However, the 8255 port bits are replaced by random logic. The I/O locations remain the same.

4.2 PSG Sound Module

The sound generator used is the AY-3-8912. This chip is driven by a 1.78MHz clock. Its specifications are:

- Tone generator : 3 channels
  Generate 27Hz - 122KHz square wave
  Individually programmable

- Noise generator : 1 channel
  Frequency modulated pseudo random pulse width square wave
  3.6K - 112KHz period programmable

- Mixer : Output of the noise generator can be selectively mixed with one or all of the tone generator channels

- Amplitude : Signals from the 3 channels of the tone generator can be controlled in 16 programmable amplitude levels

- Envelope generator : Signals from the 3 channels of the tone generator can also be amplitude-modulated by the envelope generator. The shape and period of the envelope can be programmed individually for each sound channel. Envelope period is programmable from 0.1Hz to 7KHz.

The PSG is not a standard IBM peripheral. It is placed in the reserved I/O locations as mentioned in the IBM XT Technical Manual.

I/O ADDRESS	DESCRIPTION
3C8H	Address latch
3C9H	Data write
3CAH	Data read

4.3 Output Specifications

The output of the summing amplifier is fed to both the D-15 monitor connector and RCA jack. The output level is 0.5 VRMS at 1 Kohm load.

NOTE

Please contact your dealer for further details.

To change the keyboard configuration, enter one of the following after the system prompt:

KEYBFR	(French)
KEYBGR	(German)
KEYBSW	(Swedish)
KEYBDM	(Danish)
KEYBIT	(Italian)
KEYBSP	(Spanish)
KEYBUK	(English, UK)

To swap between the non-default setting and default setting,

1. While you are in a non-default keyboard setting, pressing f1 while holding down CTRL and ALT will bring you back to the default setting.

2. Pressing F2 while holding down CTRL and ALT will change the keyboard configuration back to the last non-default setting.

   Note that if you want to swap from the default setting to a non-default setting other than the one last selected, you have to configure the keyboard again for that particular language setting.

However, the non-default keyboard configurations are effective only when the power of the computer is on. You have to execute the KEYB file every time you turn on the computer.

For added convenience, you can save the KEYB command in AUTOEXEC.BAT, so that the program is executed automatically whenever the computer is switched on. Refer to the section on batch files in your MS-DOS User's Guide for further details.

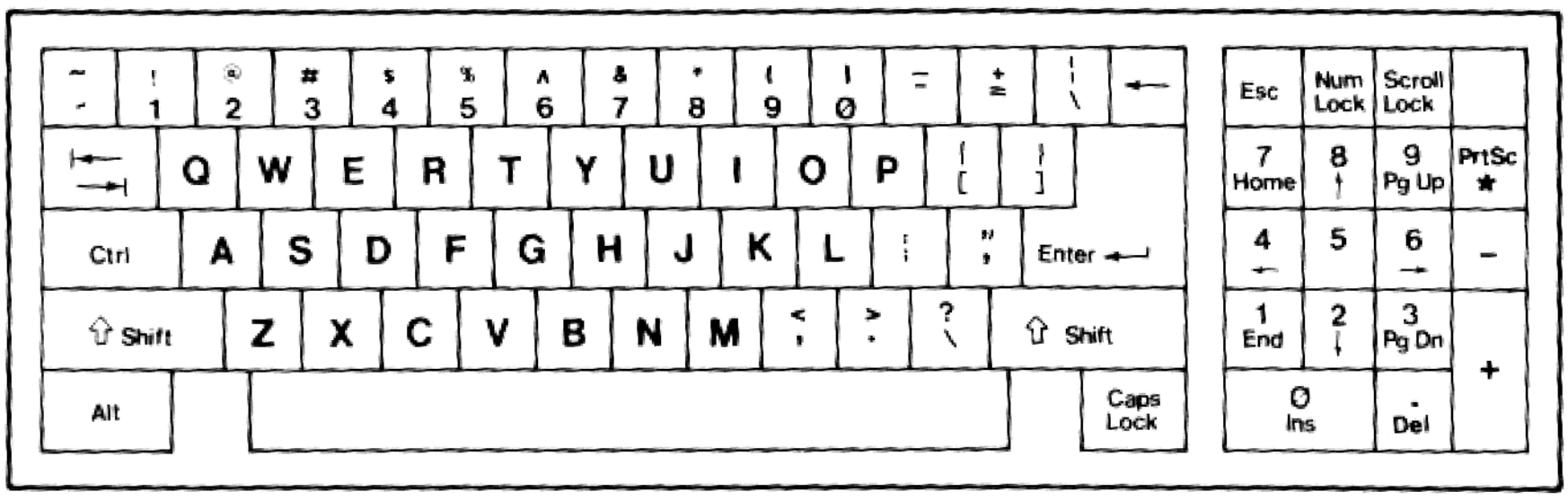


Fig. B-1 US Keyboard Layout

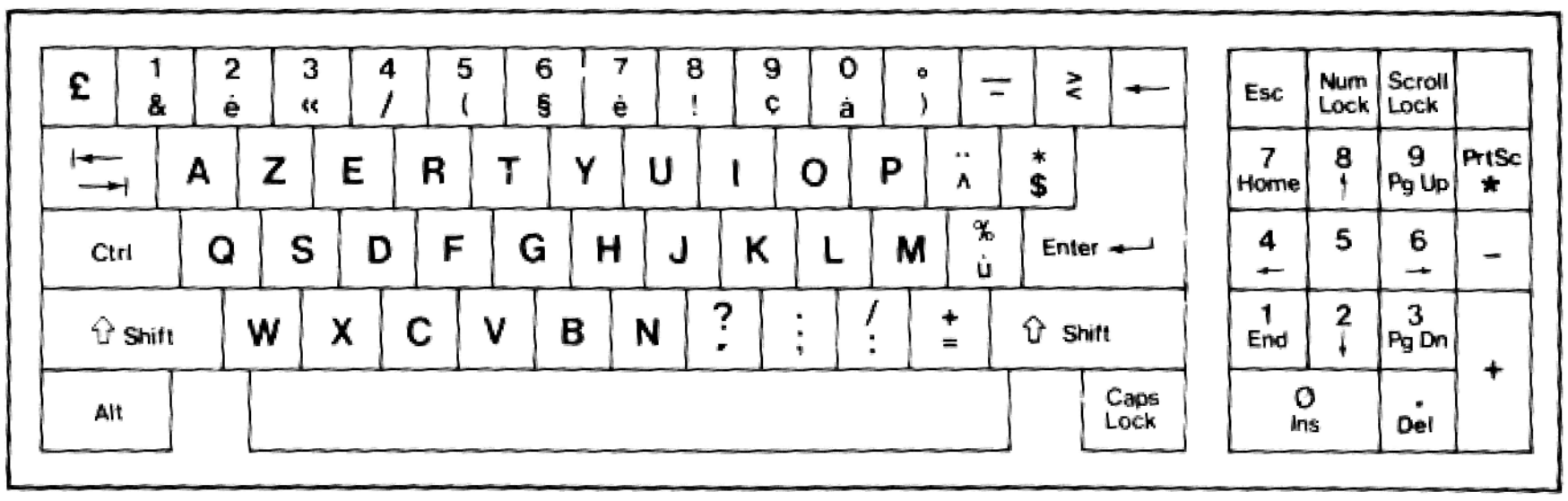


Fig. B-2 French Keyboard Layout

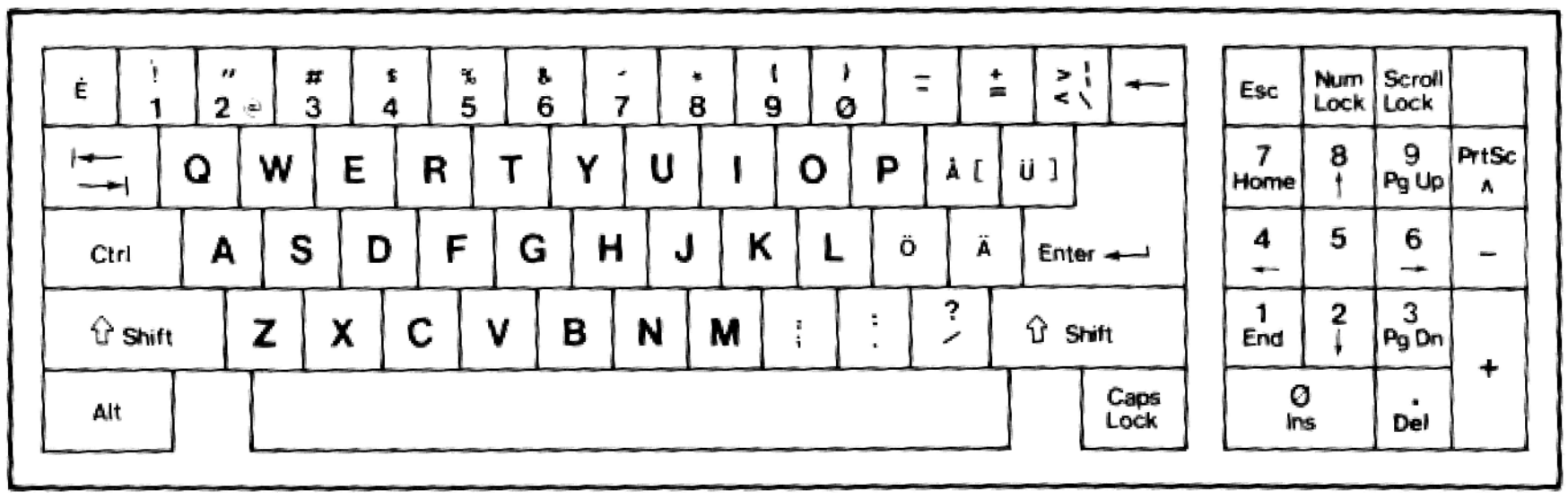


Fig. B-3 Swedish Keyboard Layout

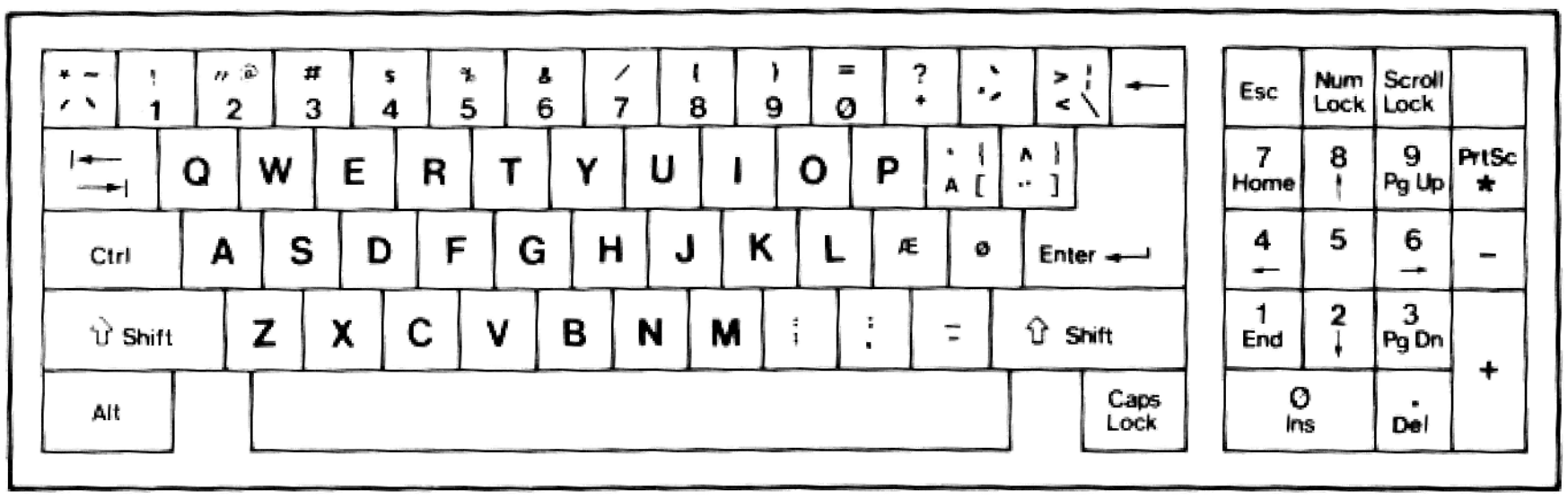


Fig. B-4 Danish Keyboard Layout

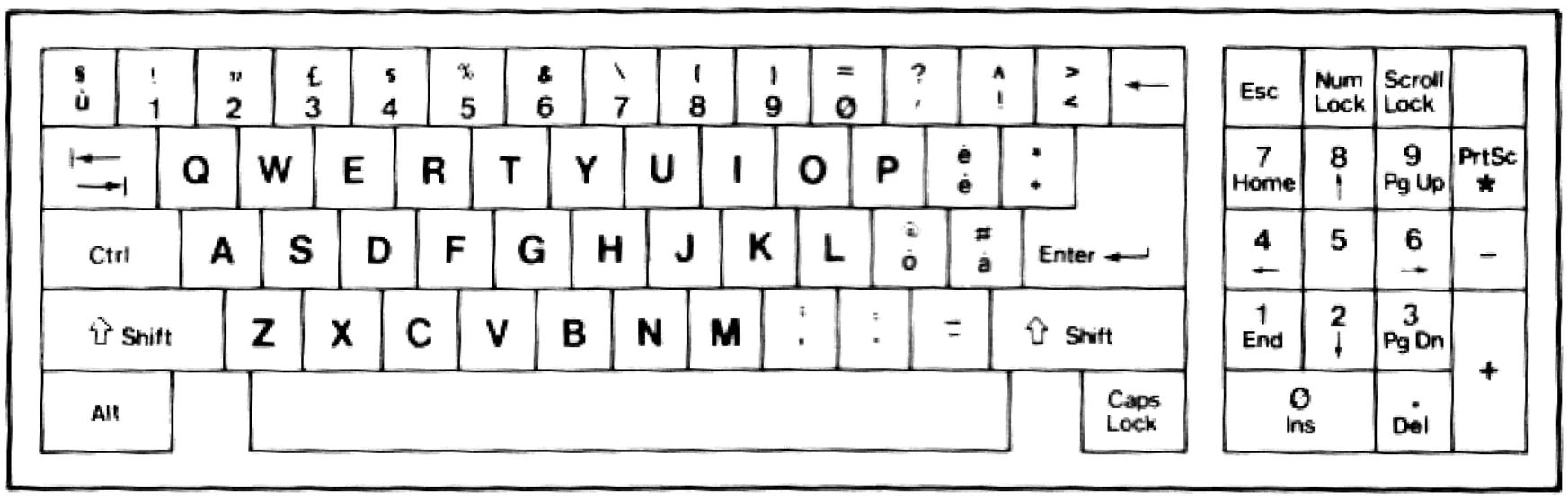


Fig. B-5 Italian Keyboard Layout

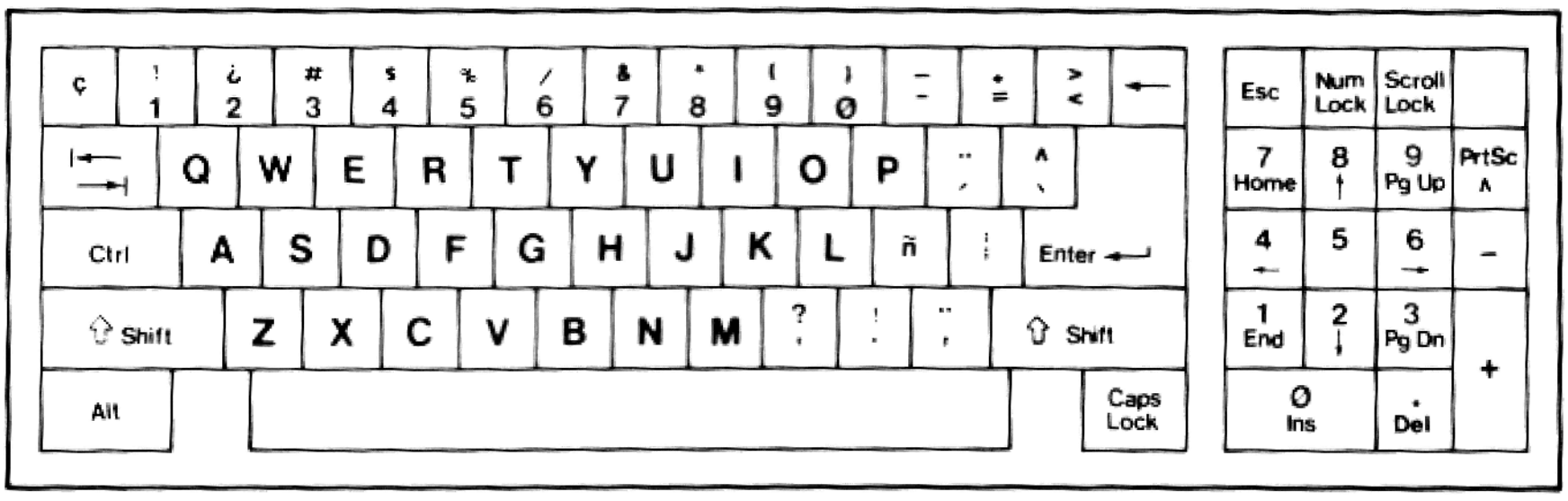


Fig. B-6 Spansih Keyboard Layout

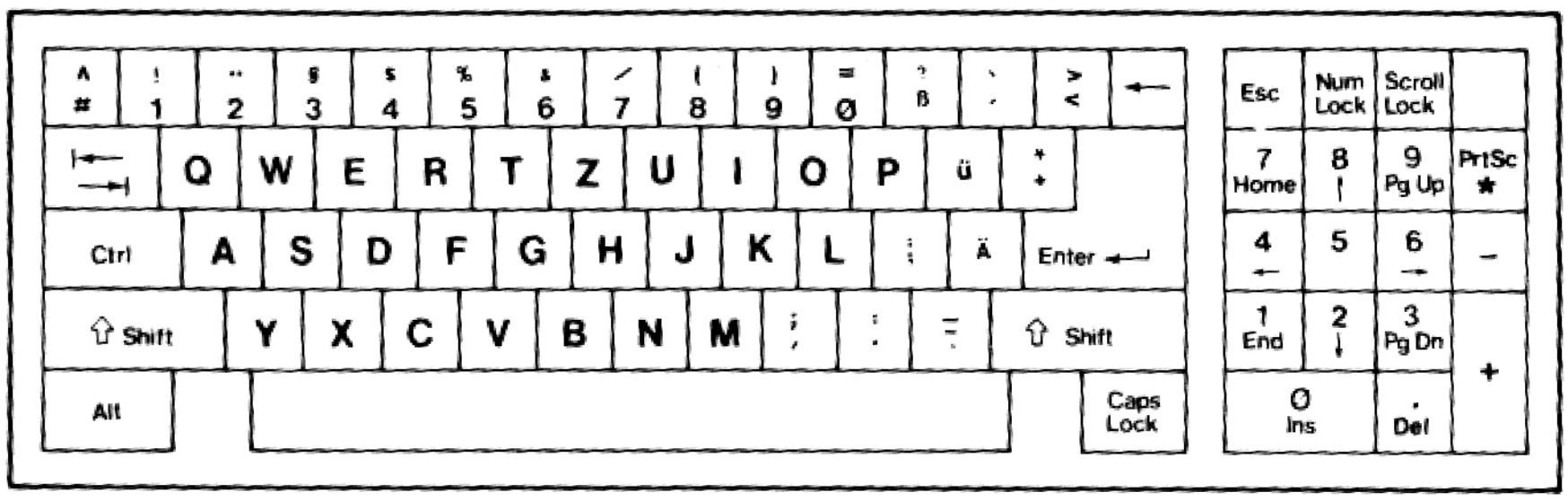


Fig. B-7 German Keyboard Layout

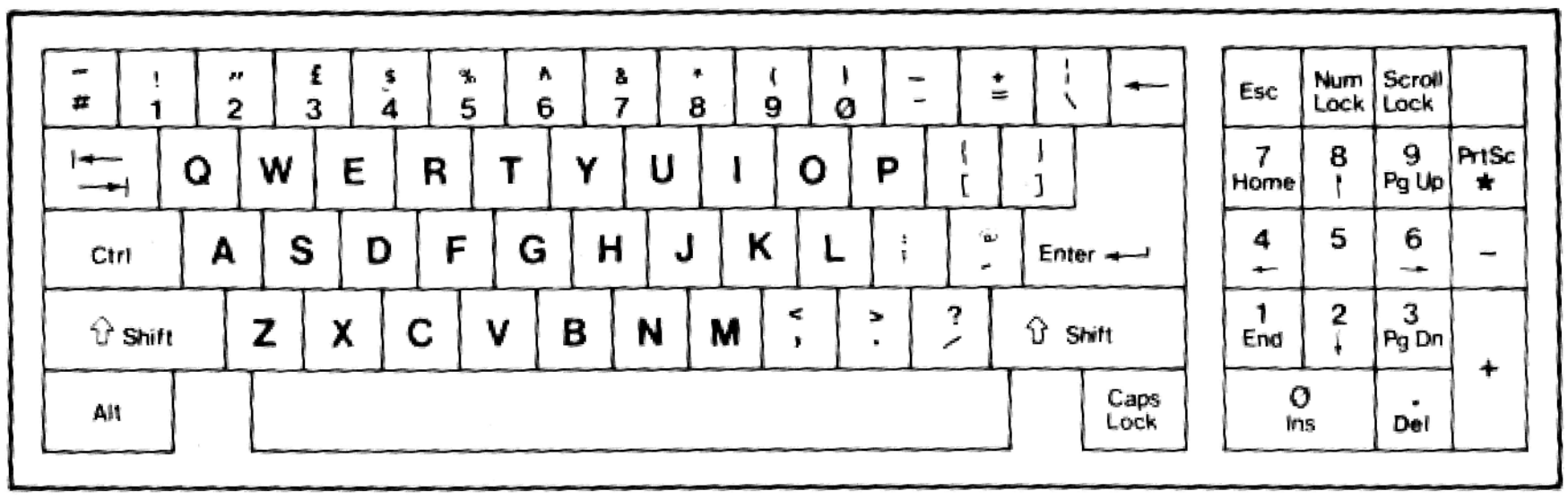


Fig. B-8 UK Keyboard Layout

APPENDIX C
CHARACTER SET

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
00	0	Blank (Null)	Ctrl 2		Black	Black
01	1	☺	Ctrl A		Black	Blue
02	2	☻	Ctrl B		Black	Green
03	3	♥	Ctrl C		Black	Cyan
04	4	♦	Ctrl D		Black	Red
05	5	♣	Ctrl E		Black	Magenta
06	6	♠	Ctrl F		Black	Brown
07	7	•	Ctrl G		Black	Light Grey
08	8	■	Ctrl H, Backspace, Shift Backspace		Black	Dark Grey

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
09	9	○	Ctrl I		Black	Light Blue
0A	10	○	Ctrl J, Ctrl ↵		Black	Light Green
0B	11	♂	Ctrl K		Black	Light Green
0C	12	♀	Ctrl L,		Black	Light Red
0D	13	♪	Ctrl M, ↵ Shift ↵		Black	Light Magenta
0E	14	♫	Ctrl N		Black	Yellow
0F	15	☼	Ctrl O		Black	White
10	16	►	Ctrl P		Blue	Black
11	17	◄	Ctrl Q		Blue	Blue

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
12	18	↕	Ctrl R		Blue	Green
13	19	!!	Ctrl S		Blue	Cyan
14	20	¶	Ctrl T		Blue	Red
15	21	§	Ctrl U			Magenta
16	22	▬	Ctrl V		Blue	Brown
17	23	↨	Ctrl W		Blue	Light Grey
18	24	↑	Ctrl X		Blue	Dark Grey
19	25	↓	Ctrl Y		Blue	Light Blue
1A	26	→	Ctrl Z		Blue	Light Green

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
1B	27	←	Ctrl [, Esc, Shift Esc, Ctrl Esc		Blue	Light Cyan
1C	28	└	Ctrl \		Blue	Light Red
1D	29	↔	Ctrl]		Blue	Light Magenta
1E	30	▲	Ctrl 6		Blue	Yellow
1F	31	▼	Ctrl -		Blue	White
20	32	Blank Space	Space Bar, Shift, Space, Ctrl Space, Alt Space		Green	Black
21	33	!	!	Shift	Green	Blue

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
22	34	"	"	Shift	Green	Green
23	35	#	#	Shift	Green	Cyan
24	36	$	$	Shift	Green	Red
25	37	%	%	Shift	Green	Magenta
26	38	&	&	Shift	Green	Brown
27	39	'	'		Green	Light Grey
28	40	(	(	Shift	Green	Dark Grey
29	41	)	)	Shift	Green	Light Blue
2A	42	*	*	Note 1	Green	Light Green
2B	43	+	+	Shift	Green	Light Cyan

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
2C	44	,	,		Green	Light Red
2D	45	—	—		Green	Light Magenta
2E	46	.	.	Note 2	Green	Yellow
2F	47	/	/		Green	White
30	48	0	0	Note 3	Cyan	Black
31	49	1	1	Note 3	Cyan	Blue
32	50	2	2	Note 3	Cyan	Green
33	51	3	3	Note 3	Cyan	Cyan
34	52	4	4	Note 3	Cyan	Red
35	53	5	5	Note 3	Cyan	Magenta

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
36	54	6	6	Note 3	Cyan	Brown
37	55	7	7	Note 3	Cyan	Light Grey
38	56	8	8	Note 3	Cyan	Dark Grey
39	57	9	9	Note 3	Cyan	Light Blue
3A	58	:	:	Shift	Cyan	Light Green
3B	59	;	;		Cyan	Light Cyan
3C	60	<	<	Shift	Cyan	Light Red
3D	61	=	=		Cyan	Light Magenta
3E	62	>	>	Shift	Cyan	Yellow

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
3F	63	?	?	Shift	Cyan	White
40	64	@	@	Shift	Red	Black
41	65	A	A	Note 4	Red	Blue
42	66	B	B	Note 4	Red	Green
43	67	C	C	Note 4	Red	Cyan
44	68	D	D	Note 4	Red	Red
45	69	E	E	Note 4	Red	Magenta
46	70	F	F	Note 4	Red	Brown
47	71	G	G	Note 4	Red	Light Grey
48	72	H	H	Note 4	Red	Dark Grey

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
49	73	I	I	Note 4	Red	Light Blue
4A	74	J	J	Note 4	Red	Light Green
4B	75	K	K	Note 4	Red	Light Cyan
4C	76	L	L	Note 4	Red	Light Red
4D	77	M	M	Note 4	Red	Light Magenta
4E	78	N	N	Note 4	Red	Yellow
4F	79	O	O	Note 4	Red	White
50	80	P	P	Note 4	Magenta	Black
51	81	Q	Q	Note 4	Magenta	Blue

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
52	82	R	R	Note 4	Magenta	Green
53	83	S	S	Note 4	Magenta	Cyan
54	84	T	T	Note 4	Magenta	Red
55	85	U	U	Note 4	Magenta	Magenta
56	86	V	V	Note 4	Magenta	Brown
57	87	W	W	Note 4	Magenta	Light Grey
58	88	X	X	Note 4	Magenta	Dark Grey
59	89	Y	Y	Note 4	Magenta	Light Blue
5A	90	Z	Z	Note 4	Magenta	Light Green
5B	91	[	[		Magenta	Light Cyan

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
5C	92	\	\		Magenta	Light Red
5D	93	]	]		Magenta	Light Magenta
5E	94	^	^	Shift	Magenta	Yellow
5F	95	-	- _	Shift	Magenta	White
60	96	`	`		Yellow	Black
61	97	a	a	Note 5	Yellow	Blue
62	98	b	b	Note 5	Yellow	Green
63	99	c	c	Note 5	Yellow	Cyan
64	100	d	d	Note 5	Yellow	Red
65	101	e	e	Note 5	Yellow	Magenta

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
66	102	f	f	Note 5	Yellow	Brown
67	103	g	g	Note 5	Yellow	Light Grey
68	104	h	h	Note 5	Yellow	Dark Grey
69	105	i	i	Note 5	Yellow	Light Blue
6A	106	j	j	Note 5	Yellow	Light Green
6B	107	k	k	Note 5	Yellow	Light Cyan
6C	108	l	l	Note 5	Yellow	Light Red
6D	109	m	m	Note 5	Yellow	Light Magenta
6E	110	n	n	Note 5	Yellow	Yellow

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
6F	111	o	o	Note 5	Yellow	White
70	112	p	p	Note 5	White	Black
71	113	q	q	Note 5	White	Blue
72	114	r	r	Note 5	White	Green
73	115	s	s	Note 5	White	Cyan
74	116	t	t	Note 5	White	Red
75	117	u	u	Note 5	White	Magenta
76	118	v	v	Note 5	White	Brown
77	119	w	w	Note 5	White	Light Grey
78	120	x	x	Note 5	White	Dark Grey

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
79	121	y	y	Note 5	White	Light Blue
7A	122	z	z	Note 5	White	Light Green
7B	123	{	{	Shift	White	Light Cyan
7C	124	|	|	Shift	White	Light Red
7D	125	}	}	Shift	White	Light Magenta
7E	126	~	~	Shift	White	Yellow
7F	127	Δ	Ctrl←		White	White

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
80	128	Ç	Alt 128	Note 6	Black	Black
81	129	ü	Alt 129	Note 6	Black	Blue
82	130	é	Alt 130	Note 6	Black	Green
83	131	â	Alt 131	Note 6	Black	Cyan
84	132	ä	Alt 132	Note 6	Black	Red
85	133	à	Alt 133	Note 6	Black	Magenta
86	134	á	Alt 134	Note 6	Black	Brown
87	135	ç	Alt 135	Note 6	Black	Light Grey
88	136	ê	Alt 136	Note 6	Black	Dark Grey
89	137	ë	Alt 137	Note 6	Black	Light Blue

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
8A	138	è	Alt 138	Note 6	Black	Light Green
8B	139	ï	Alt 139	Note 6	Black	Light Cyan
8C	140	î	Alt 140	Note 6	Black	Light Red
8D	141	i	Alt 141	Note 6	Black	Light Magenta
8E	142	Ä	Alt 142	Note 6	Black	Yellow
8F	143	Å	Alt 143	Note 6	Black	White
90	144	É	Alt 144	Note 6	Blue	Black
91	145	æ	Alt 145	Note 6	Blue	Blue
92	146	Æ	Alt 146	Note 6	Blue	Green
93	147	ô	Alt 147	Note 6	Blue	Cyan

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
94	148	ö	Alt 148	Note 6	Blue	Red
95	149	ò	Alt 149	Note 6	Blue	Magenta
96	150	û	Alt 150	Note 6	Blue	Brown
97	151	ù	Alt 151	Note 6	Blue	Light Grey
98	152	ÿ	Alt 152	Note 6	Blue	Dark Grey
99	153	ö	Alt 153	Note 6	Blue	Light Blue
9A	154	ü	Alt 154	Note 6	Blue	Light Green
9B	155	¢	Alt 155	Note 6	Blue	Light Cyan
9C	156	£	Alt 156	Note 6	Blue	Light Red

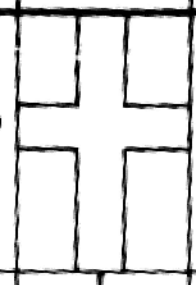
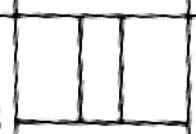
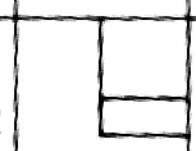
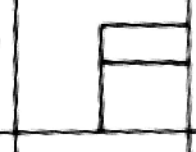
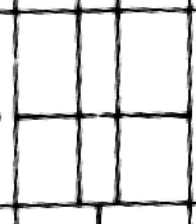
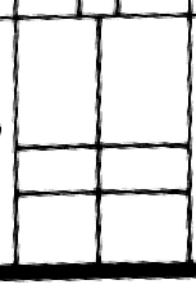
VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
9D	157	¥	Alt 157	Note 6	Blue	Light Magenta
9E	158	Pt	Alt 158	Note 6	Blue	Yellow
9F	159	ƒ	Alt 159	Note 6	Blue	White
A0	160	á	Alt 160	Note 6	Green	Black
A1	161	í	Alt 161	Note 6	Green	Blue
A2	162	ó	Alt 162	Note 6	Green	Green
A3	163	ú	Alt 163	Note 6	Green	Cyan
A4	164	ñ	Alt 164	Note 6	Green	Red
A5	165	Ñ	Alt 165	Note 6	Green	Magenta
A6	166	a	Alt 166	Note 6	Green	Brown
A7	167	o	Alt 167	Note 6	Green	Light Grey

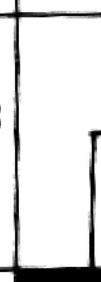
VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
A8	168	¿	Alt 168	Note 6	Green	Dark Grey
A9	169	⌐	Alt 169	Note 6	Green	Light Blue
AA	170	¬	Alt 170	Note 6	Green	Light Green
AB	171	½	Alt 171	Note 6	Green	Light Cyan
AC	172	¼	Alt 172	Note 6	Green	Light Red
AD	173	i	Alt 173	Note 6	Green	Light Magenta
AE	174	<<	Alt 174	Note 6	Green	Yellow
AF	175	>>	Alt 175	Note 6	Green	White
B0	176	▒	Alt 176	Note 6	Cyan	Black

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
B1	177	▒	Alt 177	Note 6	Cyan	Blue
B2	178	▓	Alt 178	Note 6	Cyan	Green
B3	179	│	Alt 179	Note 6	Cyan	Cyan
B4	180	┤	Alt 180	Note 6	Cyan	Red
B5	181	╡	Alt 181	Note 6	Cyan	Magenta
B6	182	╢	Alt 182	Note 6	Cyan	Brown
B7	183	╖	Alt 183	Note 6	Cyan	Light Grey
B8	184	╕	Alt 184	Note 6	Cyan	Dark Grey
B9	185	╣	Alt 185	Note 6	Cyan	Light Blue
BA	186	║	Alt 186	Note 6	Cyan	Light Green

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
BB	187		Alt 187	Note 6	Cyan	Light Cyan
BC	188		Alt 188	Note 6	Cyan	Light Red
BD	189		Alt 189	Note 6	Cyan	Light Magenta
BE	190		Alt 190	Note 6	Cyan	Yellow
BF	191		Alt 191	Note 6	Cyan	White
C0	192		Alt 192	Note 6	Red	Black
C1	193		Alt 193	Note 6	Red	Blue
C2	194		Alt 194	Note 6	Red	Green
C3	195		Alt 195	Note 6	Red	Cyan
C4	196		Alt 196	Note 6	Red	Red

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
C5	197		Alt 197	Note 6	Red	Magenta
C6	198		Alt 198	Note 6	Red	Brown
C7	199		Alt 199	Note 6	Red	Light Grey
C8	200		Alt 200	Note 6	Red	Dark Grey
C9	201		Alt 201	Note 6	Red	Light Blue
CA	202		Alt 202	Note 6	Red	Light Green
CB	203		Alt 203	Note 6	Red	Light Cyan
CC	204		Alt 204	Note 6	Red	Light Red
CD	205		Alt 205	Note 6	Red	Light Magenta

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
CE	206		Alt 206	Note 6	Red	Yellow
CF	207		Alt 207	Note 6	Red	White
D0	208		Alt 208	Note 6	Magenta	Black
D1	209		Alt 209	Note 6	Magenta	Blue
D2	210		Alt 210	Note 6	Magenta	Green
D3	211		Alt 211	Note 6	Magenta	Cyan
D4	212		Alt 212	Note 6	Magenta	Red
D5	213		Alt 213	Note 6	Magenta	Magenta
D6	214		Alt 214	Note 6	Magenta	Brown
D7	215		Alt 215	Note 6	Magenta	Light Grey
D8	216		Alt 216	Note 6	Magenta	Dark Grey

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
D9	217		Alt 217	Note 6	Magenta	Light Blue
DA	218		Alt 218	Note 6	Magenta	Light Green
DB	219		Alt 219	Note 6	Magenta	Light Cyan
DC	220		Alt 220	Note 6	Magenta	Light Red
DD	221		Alt 221	Note 6	Magenta	Light Magenta
DE	222		Alt 222	Note 6	Magenta	Yellow
DF	223		Alt 223	Note 6	Magenta	White
E0	224	α	Alt 224	Note 6	Yellow	Black
E1	225	β	Alt 225	Note 6	Yellow	Blue

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES	
					COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
E2	226	Γ	Alt 226	Note 6	Yellow	Green
E3	227	π	Alt 227	Note 6	Yellow	Cyan
E4	228	Σ	Alt 228	Note 6	Yellow	Red
E5	229	σ	Alt 229	Note 6	Yellow	Magenta
E6	230	μ	Alt 230	Note 6	Yellow	Brown
E7	231	τ	Alt 231	Note 6	Yellow	Light Grey
E8	232	φ	Alt 232	Note 6	Yellow	Dark Grey
E9	233	θ	Alt 233	Note 6	Yellow	Light Blue
EA	234	Ω	Alt 234	Note 6	Yellow	Light Green
EB	235	δ	Alt 235	Note 6	Yellow	Light Cyan

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
EC	236	∞	Alt 236	Note 6	Yellow	Light Red
ED	237	ϕ	Alt 237	Note 6	Yellow	Light Magenta
EE	238	∈	Alt 238	Note 6	Yellow	Yellow
EF	239	∩	Alt 239	Note 6	Yellow	White
F0	240	≡	Alt 240	Note 6	White	Black
F1	241	±	Alt 241	Note 6	White	Blue
F2	242	≥	Alt 242	Note 6	White	Green
F3	243	≤	Alt 243	Note 6	White	Cyan
F4	244	⌠	Alt 244	Note 6	White	Red
F5	245	⌡	Alt 245	Note 6	White	Magenta

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
F6	246	÷	Alt 246	Note 6	White	Brown
F7	247	≈	Alt 247	Note 6	White	Light Grey
F8	248	O	Alt 248	Note 6	White	Dark Grey
F9	249	●	Alt 249	Note 6	White	Light Blue
FA	250	•	Alt 250	Note 6	White	Light Green
FB	251	√	Alt 251	Note 6	White	Light Cyan
FC	252	η	Alt 252	Note 6	White	Light Red
FD	253	2	Alt 253	Note 6	White	Light Magenta
FE	254	■	Alt 254	Note 6	White	Yellow

VALUE		AS CHARACTERS			AS TEXT ATTRIBUTES COLOR/GRAPHICS MONITOR ADAPTER	
HEX	DEC	SYMBOL	KEYSTROKES	MODES	BACKGROUND	FOREGROUND
FF	255	BLANK	Alt 255	Note 6	White	White

Character Set (00-7F) Quick Reference

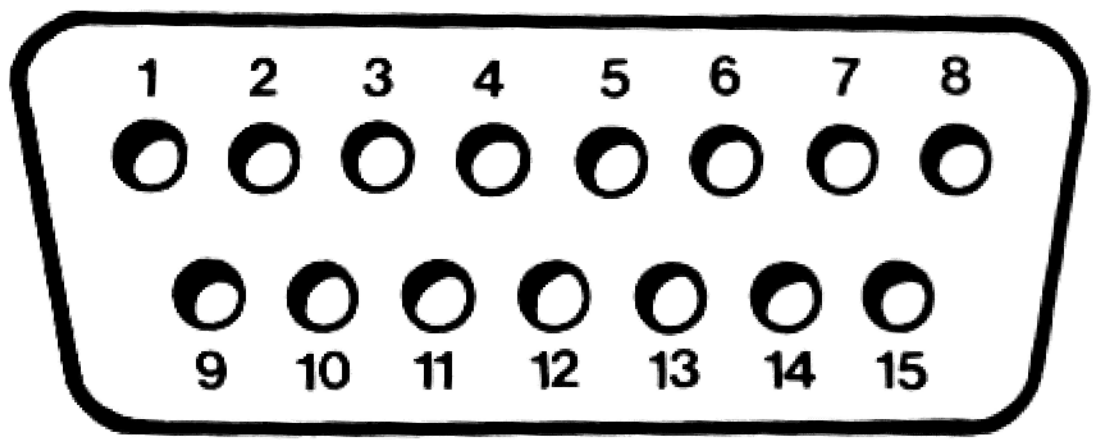
DECIMAL VALUE	➡	0	16	32	48	64	80	96	112
⬇	HEXA DECIMAL VALUE	0	1	2	3	4	5	6	7
0	0	BLANK (NULL)	►	BLANK (SPACE)	0	@	P	‘	p
1	1	☺	◄	!	1	A	Q	a	q
2	2	☻	↕	"	2	B	R	b	r
3	3	♥	!!	#	3	C	S	c	s
4	4	♦	¶	$	4	D	T	d	t
5	5	♣	§	%	5	E	U	e	u
6	6	♠	▬	&	6	F	V	f	v
7	7	•	↨	’	7	G	W	g	w
8	8	◘	↑	(	8	H	X	h	x
9	9	○	↓	)	9	I	Y	i	y
10	A	◙	→	*	:	J	Z	j	z
11	B	♂	←	+	;	K	[	k	{
12	C	♀	∟	,	<	L	\	l	¦
13	D	♪	↔	—	=	M	]	m	}
14	E	♫	▲	.	>	N	^	n	~
15	F	☼	▼	/	?	O	_	o	△

Character Set (80-FF) Quick Reference

DECIMAL VALUE ➡	128	144	160	176	192	208	224	240
⬇ HEXA DECIMAL VALUE	8	9	A	B	C	D	E	F
0 0	Ç	É	á	▒	└	╨	∝	≡
1 1	ü	æ	í	▒	┴	╤	β	±
2 2	é	Æ	ó	▒	┬	╥	Γ	≥
3 3	â	ô	ú	┤	├	╙	π	≤
4 4	ä	ö	ñ	┐	─	╘	Σ	⌠
5 5	à	ò	Ñ	╡	┼	╒	σ	⌡
6 6	å	û	ª	╢	╞	╓	µ	÷
7 7	ç	ù	º	╖	╟	╫	τ	≈
8 8	ê	ÿ	¿	╕	╚	╪	Φ	°
9 9	ë	Ö	⌐	╣	╔	┘	Θ	∙
10 A	è	Ü	¬	║	╩	┌	Ω	•
11 B	ï	¢	½	╗	╦	█	δ	√
12 C	î	£	¼	╝	╠	▄	∞	n
13 D	ì	¥	¡	╜	═	▌	φ	2
14 E	Ä	₧	«	╛	╬	▐	∈	■
15 F	Å	ƒ	»	┐	╧	▀	∩	BLANK 'FF'

APPENDIX D
I/O PORT PINOUTS

THE MONITOR (RGB) PORT



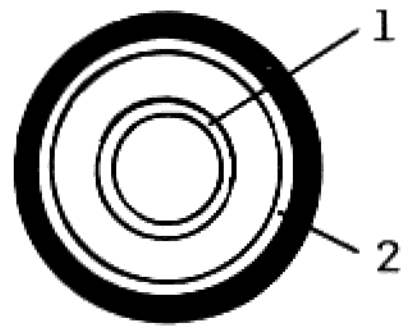
MONITOR (RGB) PORT

1	A.GND	
2	DR	
3	DG	
4	DB	
5	DI	
6	HSY	
7	VSY	
8	D.GND	

MONITOR (RGB) PORT

9	+12V
10	R (ANALOG)
11	G (ANALOG)
12	B (ANALOG)
13	-CSYNC
14	AUDIO O/P
15	COMP. VIDEO

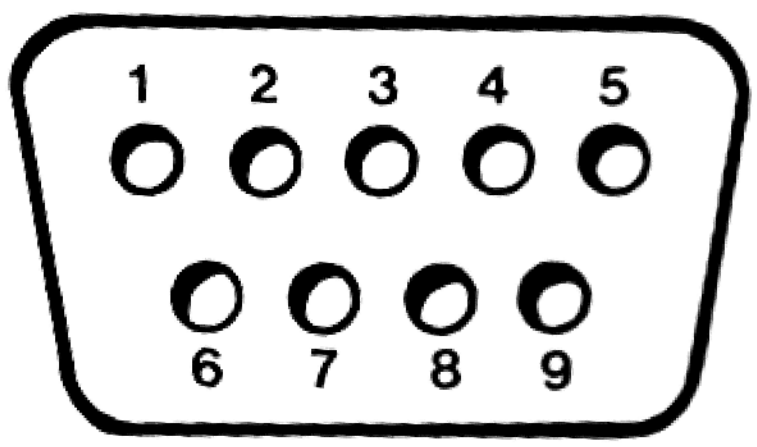
THE COMPOSITE (VIDEO) PORT



COMPOSITE (VIDEO) PORT

1	1VPP/75 OHM
2	CHASSIS GROUND

MOUSE/LIGHT PEN PORT



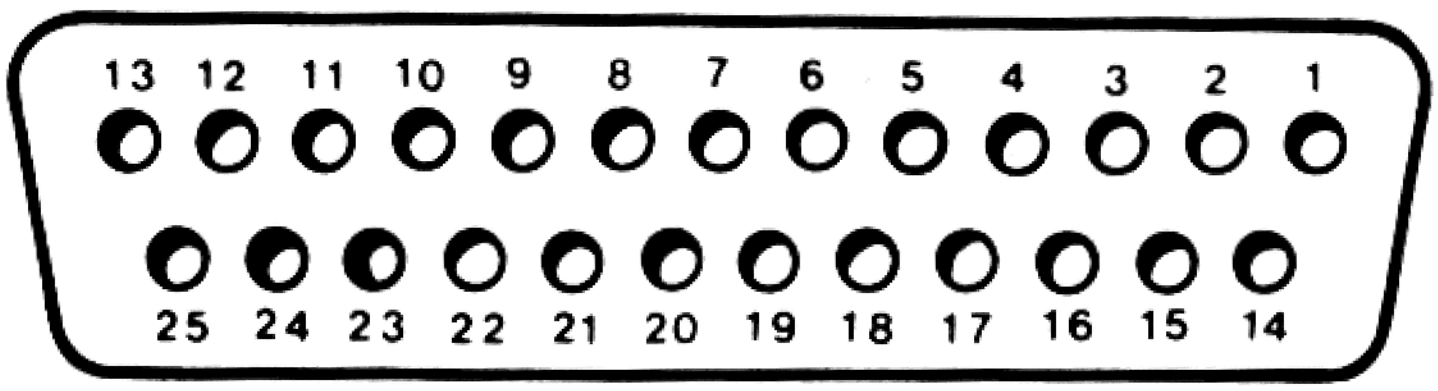
MOUSE/ LIGHT PEN PORT

	MOUSE	LIGHT PEN
1	X PULSE B	-
2	X PULSE A	-
3	Y PULSE A	-
4	Y PULSE B	-

MOUSE/
LIGHT
PEN
PORT

5	N.C.	N.C.
6	LEFT BUTTON	SWITCH
7	+5V	+5V
8	GROUND	GROUND
9	RIGHT BUTTON	TRIGGER

CENTRONICS PRINTER PORT



CENTRONICS PRINTER PORT

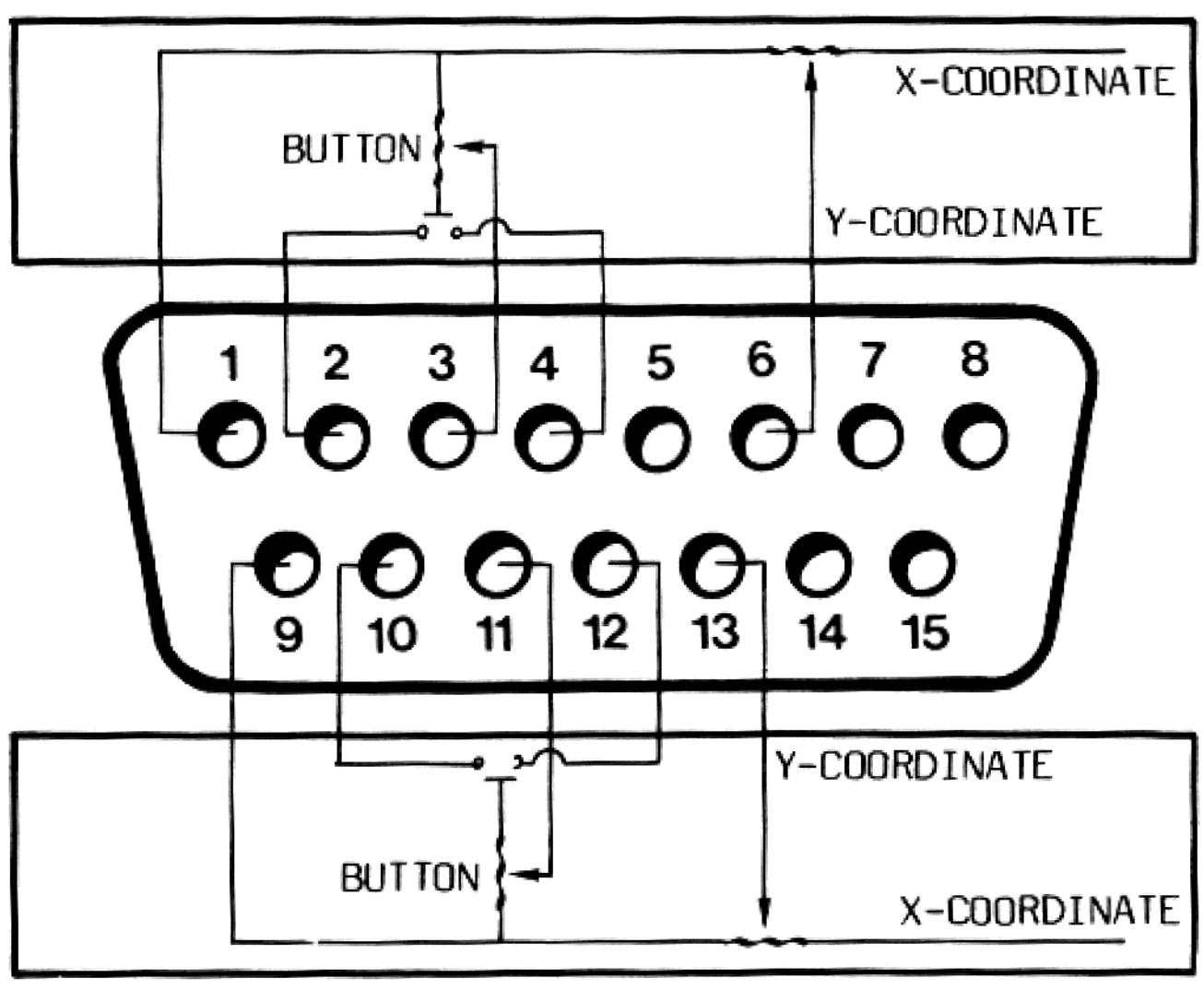
1	-STROBE
2	+ DATA BIT 0
3	+ DATA BIT 1
4	+ DATA BIT 2
5	+ DATA BIT 3
6	+ DATA BIT 4
7	+ DATA BIT 5
8	+ DATA BIT 6
9	+ DATA BIT 7
10	- ACKNOWLEDGE
11	+ BUSY
12	+ P.END (OUT OF PAPER)

CENTRONICS PRINTER PORT

13	+ SELECT
14	- AUTO FEED
15	- ERROR
16	- INITIALIZE PRINTER
17	- SELECT INPUT
18-25	GROUND

GAME PORT

JOYSTICK A



JOYSTICK B

APPENDIX E
SYSTEM MEMORY MAP

<table>
<tr><th>MEMORY ADDRESS</th><th colspan="2">FUNCTION</th></tr>
<tr><td>0 - 3FFFF</td><td colspan="2">256K Read/Write Memory on System Board</td></tr>
<tr><td>40000 - 9FFFF</td><td colspan="2">384K R/W Memory Expansion in I/O Channel</td></tr>
<tr><td>A0000 - AFFFF</td><td></td><td rowspan="6">128k Reserved</td></tr>
<tr><td>B0000 - B3FFF</td><td>Monochrome</td></tr>
<tr><td>B4000 - B7FFF</td><td></td></tr>
<tr><td>B8000 - BBFFF</td><td>Color Graphics</td></tr>
<tr><td>BC000 - BFFFF</td><td></td></tr>
<tr><td>C0000 - C7FFF</td><td></td><td rowspan="3">192K Read Only Memory
Expansion and Control</td></tr>
<tr><td>C8000 - CBFFF</td><td>Fixed Disk Control</td></tr>
<tr><td>CC000 - EFFFF</td><td></td></tr>
<tr><td>F0000 - FDFFF</td><td colspan="2">Reserved</td></tr>
<tr><td>FE000 - FFFFF</td><td colspan="2">8K BIOS</td></tr>
</table>

APPENDIX F
I/O ADDRESS MAP

HEX RANGE	USAGE
000-00F	DMA Chip 8237A-5
020-021	Interrupt 8259A
040-043	Timer 8253-5
060-063	PPI 8255A-5
080-083	DMA Page Registers
0AX*	NMI Mask Register
200-20F	Game Control
378-37F	Parallel Printer
3C0	MVDP PORT #0
3C1	MVDP PORT #1
3C2	MVDP PORT #2
3C3	MVDP PORT #3
3C4-3C7	Reserved
3C8	PSG Address Latch
3C9	PSG Data Write
3CA	PSG Data Read
3CB-3CF	Reserved
3D0-3DF	CGA (Color Graphic Mode)
3F0-3F7	Diskette

* At power-on time the Non Mask Interrupt (NMI) is masked off. This mask bit can set and reset via system software as follows:
Set mask: write hex 80 to I/O Address hex A0 (enable NMI)
Clear mask: write hex 00 to I/O Address hex A0 (disable NMI)

APPENDIX G

8088 HARDWARE INTERRUPT LISTING

NUMBER	USAGE
NMI	Parity
0	Timer
1	Keyboard/MVDP
2	Reserved
3	Asynchronous Communications (Secondary) SDLC Communications
4	Asynchronous Communications (Primary) SDLC Communications
5	Fixed Disk
6	Diskette
7	Parallel Printer

APPENDIX H
ENHANCEMENTS TO GW-BASIC VERSION 3.2

Included with your computer is an enhanced version of the GW BASIC 3.2 Interpreter which supports the MVDP (MSX2 Video Display Processor) and PSG (Programmable Sound Generator) of the SVI-838 X'press 16.

This appendix only describes the differences between the GW BASIC 3.2 and the enhanced version for X'press 16. Information on the semantics and syntax of GW BASIC commands can be found in the provided GW BASIC Reference Manual.

1. SOUND COMMANDS

- SOUND ON / OFF

  These are new commands. SOUND OFF uses the standard PC sound generator (8253). This is the default setting. SOUND ON uses PSG instead.

- NOISE <voice>,<period>,<duration>

  This new command programs the noise channel of the PSG. It is valid only after SOUND ON is executed. <voice> can be 0 to 7:

0	To disable all noise channels
1	To enable Noise Channel A
2	To enable Noise Channel B
3	To enable Noise Channel A, B
4	To enable Noise Channel C
5	To enable Noise Channel A, C
6	To enable Noise Channel B, C
7	To enable Noise Channel A, B, C

  <period> programs the frequency of the noise source. It ranges from 0 to 31. The noise frequency equation is:

$$\text{Noise Frequency} = \frac{1.78977\text{MHz}}{16 \times \langle\text{period}\rangle}$$

  <duration> means noise duration. It is specified in clock ticks, which occur 18.2 times per second.

- SOUND <frequency>,<time>[,<volume>][,<voice>]

  Two new options are added to this command: <volume> and <voice>. These 2 options are only valid after SOUND ON is executed.

  <volume> can be 0 to 16. For further information, please refer to the PLAY statement.

  <voice> is the sound channel number:

NUMBER	CHANNEL
0	Channel A
1	Channel B
2	Channel C

- PLAY <string1>[,[<string2>] [,<string3>]]

  This is an enhanced command. <string2> and <string3> are valid only after SOUND ON is executed.

  Under this command, 3 channels can be programmed to produce sound simultaneously:

STRING	CHANNEL
<string1>	Channel A
<string2>	Channel B
<string3>	Channel C

  Furthermore, the following Music Macro Language strings are added:

  Vx - To set volume. "x" can be 0 to 16. The numbers 0 to 15 controls the volume, whereas 16 enables the envelope generator control.

  OSx - To set envelope shape. "x" can be 0 to 15.

OPx - To set envelope period. "x" can be 0 to 99999. The envelope frequency equation is:

$$\text{Envelope Frequency} = \frac{1.78977\text{MHz}}{256 \times \langle x \rangle}$$

2. GRAPHICS COMMANDS

- SCREEN [<mode>][,<burst>][,<apage>][,<vpage>][,<clearscreen>][,<superimpose>]

This command sets the specifications for the display screen. The screen modes are defined as follows:

SCREEN MODE	DESCRIPTION	
0	80-column text	(CGA)
1	320 x 200 4 colors	(CGA)
2	640 x 200 2 colors	(CGA)
3	256 x 212 16 colors	(MVDP)
4	512 x 212 16 colors	(MVDP)
5	256 x 212 256 colors	(MVDP)

If you have included the RDISK.SYS in your CONFIG.SYS file, you cannot use Screen Modes 3, 4, and 5.

For Screen Mode 3, <apage> and <vpage> can be 0 to 3. For Screen Modes 4 and 5, <apage> and <vpage> can only be 0 or 1.

Set <clearscreen> to 1 if you do not want to clear the screen. Otherwise, set it to 0, which is the default value.

Set <superimpose> to 1 if you want to superimpose the output of CGA on that of the MVDP. If you do not intend to use this feature, set <superimpose> to 0. This is the default value.

- COLOR <parameter>

For Screen Modes 3, 4, and 5, this command changes the screen background color.

- PAINT (<x>,<y>)[,<paint attribute>[,<border color>]
  [,<background attribute>]]

  For Screen Modes 3, 4, and 5, <paint attribute> only defines the paint pattern in horizontal patterns.

APPENDIX I
DIFFERENCES BETWEEN THE GW-BASIC 2.0 AND 3.2 INTERPRETERS

1. INTRODUCTION

The syntax changes implemented in GW-BASIC 3.10 support the functionality of GW-BASIC in a network environment which includes capabilities for opening files while limiting access by other processes, and for locking and unlocking entire opened files or record ranges within files.

These changes have been implemented in conjunction with those of the Microsoft GW-BASIC 2.0 Compiler, which supports the identical syntax and functionality.

2. CHANGES TO THE OPEN STATEMENT

The functionality of the OPEN statement in a network environment revolves around two new sets of circumstances which this environment may generate:

1. Devices may be shared on a network for certain purposes only, so that OPENS may be restricted to certain modes among those which might be requested (INPUT, OUTPUT, APPEND, default (random)).

2. Files may be themselves restricted by the implementation of an enhanced OPEN syntax which allows a process to specify an access to the successfully opened file. This access determines a guaranteed exclusivity range on that file by that process while that open is in effect.

The new syntax is:

OPEN <filespec> [FOR <mode>][<access>]AS[#]n [LEN=<reclen>]

The OPEN statement has been enhanced to include access control, where <access> is one of the following:

default

"compatibility" mode, where compatibility is understood as referencing previous BASIC versions. No access is specified. The file may be opened any number of times by a process, provided that the file is not currently open on another process. Other processes

"Path/File Access Error." An example of a situation generating such an error is that of a process attempting to OPEN a file for output on a directory which has been shared for read only.

NOTE

GW-BASIC supports two forms of the OPEN statement. The form discussed here is the only one in which file sharing is supported.

---

3. THE LOCK STATEMENT

An entirely new LOCK statement restricts access to all or part of an opened file by other processes which also have opened that file.

1. An entire open file, or a range of records within an opened file (in the case of a random file), may be locked, thus denying access to those records to any other process which has also opened the file.

2. If the file has been opened for sequential input or output, the entire file is locked regardless of any record range specified. The specification of a range in a LOCK statement regarding a sequential file will not be considered an error, but will be disregarded.

3. The record range specified must be from lower to (the same or) higher record numbers.

4. If a starting record number is not specified, record number 1 is assumed.

5. If an end record number is not specified, then one record is locked.

6. The range of legal record numbers is 1 to 16,777,215 (2-24th - 1). The limit on record size is 32767 bytes.

The new syntax is:

LOCK [#]n [,[<record number>][TO <record number>]]

are denied access to the file while it is open with default access. Therefore it is functionally "exclusive."

SHARED

"deny none" mode. No restrictions are placed on the read/write accessibility of the file to another process, except that default mode is not allowed by any of the modes including SHARED.

LOCK READ

"deny read" mode. Once a file is opened with LOCK READ access, no other process is granted read access to that file. An attempt to open a file with this access will be unsuccessful if the file is currently open in default mode or with a read access.

LOCK WRITE

"deny write" mode. A file successfully opened with LOCK WRITE access may not be opened for write access by another process. An attempt to open a file with this access will be unsuccessful if the file has been opened in default mode or with a write access by another process.

LOCK READ WRITE

"deny all" or "exclusive" access. If a file successfully opened with this access, the process' access to the file is exclusive. A file currently open in this mode cannot be opened again in any mode by any process.

OPEN may now generate the trappable error 70 "Permission Denied." This error is generated upon OPEN when the OPEN must be denied because of another process' previous access. This error message is associated with the error code formerly identified as "Disk Write Protect" and replaces it in that it generalizes read/write protection by the operating system. An example of a situation generating this error is that in which a process attempts to OPEN SHARED on a file which is already OPEN LOCK READ WRITE on another process.

If an OPEN fails because the <mode> is incompatible with network-installed sharing access to a device, the error generated is

Example

Examples of legal LOCK statements:

```
LOCK #n          ; locks the entire file [n]
LOCK #n, X       ; locks record X only
LOCK #n,TO Y     ; locks records 1 through Y
LOCK #n, X TO Y  ; locks records X through Y
```

Possible Errors

Possible errors generated by the LOCK statement include:

Permission denied

Syntactically correct LOCK request cannot be granted.

Illegal function call

Record range specified does not meet necessary criteria, or when a range/record length combination exceeds the legal limit for the size of a file.

NOTE

The proper usage of files on shared devices requires that a LOCK be executed on a file or record range within a file before the effort is made to read or write to that file. Proper usage also requires that the file or range be UNLOCKed before the file is closed (see below). Failure to execute UNLOCK may jeopardize future access to that file in a network environment, and is to be avoided.

It is expected that the time in which files or regions within files are locked will be short, and thus the suggested usage of the LOCK statement is within short-term paired LOCK/UNLOCK statements (see below).

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4. THE UNLOCK STATEMENT

The UNLOCK statement is the mirror image to the LOCK statement (see above). UNLOCK releases locks applied to an opened file. In the case of files opened in random mode, if a range of record numbers is specified, this range must match exactly the record number range given by the LOCK statement.

Thus, while the following UNLOCK would be legal:

```
LOCK #1, 1 TO 4
LOCK #1, 5 TO 8
UNLOCK #1, 1 TO 4
UNLOCK #1, 5 TO 8
```

this UNLOCK would be illegal:

```
LOCK #1, 1 TO 4
LOCK #1, 5 TO 8
UNLOCK #1, 1 TO 8
```

Possible errors generated by the UNLOCK statement include those for LOCK and, in addition, "Permission Denied" in the case where the UNLOCK range for a file opened in random mode does not exactly match that of a preceding LOCK statement.

NOTE

Proper usage of files in a network environment requires that UNLOCK be performed on all locked files or ranges within files before that file is closed or the process terminates. Failure to UNLOCK may jeopardize future access to that file in a network environment, and is to be avoided.

IMPORTANT NOTE

The system diskette that comes with your X'press 16 has a README file which contains information that was not available in time to be printed with the rest of this manual. For further details, type README after the system prompt and press ENTER.

X'press 16

User's Manual

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