EPSON®

EQUITY® 386SX/16 PLUS

User's Guide

EPSON®

EQUITY® 386SX/16 PLUS

User's Guide

Important Safety Instructions

1. Read all of these instructions and save them for later reference.

2. Follow all warnings and instructions marked on the product.

3. Unplug this product from the wall outlet before cleaning. Use a damp cloth for cleaning, not liquid cleaners or aerosol cleaners.

4. Do not use this product near water.

5. Do not place this product on an unstable cart, stand, or table.

6. Slots and openings in the cabinet and the back or bottom are provided for ventilation; these openings must not be blocked or covered. This product should never be placed near or over a radiator or heat register.

7. This product should be operated from the type of power source indicated on the marking label. If you are not sure of the type of power available, consult your dealer or local power company.

8. Connect all equipment to properly grounded (earthed) power outlets. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Avoid using outlets on the same circuit as photocopiers or air control systems that regularly switch on and off.

9. Do not locate this product where the cord will be walked on.

10. If an extension cord is used with this product, make sure that the total of the ampere ratings on the products plugged into the extension cord do not exceed the extension cord ampere rating. Also, make sure that the total of all products plugged into the wall outlet does not exceed 15 amperes.

11. Never push objects of any kind into this product through the cabinet slots. Never spill liquid of any kind on the product.

12. Except as specifically explained in the User's Guide, do not attempt to service this product yourself. Refer all servicing to qualified service personnel.

13. Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

    A. When the power cord or plug is damaged.

    B. If liquid has entered the product.

    C. If the product does not operate normally when the operating instructions are followed. Adjust only those controls that are covered by the operating instructions, since improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore the product to normal operation.

    D. If the product has been dropped or the cabinet has been damaged.

    E. If the product exhibits a distinct change in performance.

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Introduction

The Epson® Equity® 386SX/16 PLUS is a high-performance personal computer which offers exceptional speed and convenience in a compact design.

Your 16 MHz, 80386SX system includes 2MB of internal memory, a built-in VGA (video graphics array) display adapter, built-in parallel and serial interfaces, and an IBM@ PS/2™ compatible mouse port. These interfaces allow you to connect most of your peripheral devices directly to the computer, so you do not have to install option cards.

The Equity 386SX/16 PLUS also provides four option slots (three 16-bit and one 8-bit) in which you can install additional devices, such as a modem or a network card.

Your computer can support up to three internal drives: either two diskette drives and one hard disk drive, or one diskette drive and two hard disk drives.

Additionally, your system offers shadow RAM to speed up processing by moving the ROM BIOS and the video ROM into the RAM area of memory. This allows the computer to access and display information faster.

Optional Equipment

You can easily upgrade your computer by installing additional memory and adding just about any optional device that is compatible with the IBM Personal Computer, PC XT,™ or PC AT.™

By adding memory modules to the main system board, you can expand the computer's memory up to 24MB. The first 16MB can be used as either extended or expanded memory; any memory above 16MB can be used only as expanded.

You may want to install an 80387SX, 16 MHz math coprocessor in your computer to speed up mathematical calculations in certain application programs.

Check with your authorized Epson dealer for information on optional equipment.

Operating Systems and Other Software

You probably have a version of MS-DOS® to use with your computer. However, you can run any operating system compatible with MS-DOS, OS/2, UNIX® or XENIX®. If you use another operating system, refer to the documentation that came with it to install and run it on your computer.

You can use virtually any application program designed for the IBM PC, PC XT, PC AT, or compatible computers on your Equity 386SX/16 PLUS.

VGA Utilities

Epson has included special VGA device drivers and utilities that you can use with your built-in VGA adapter. With these utilities, you can take advantage of extended VGA features such as 16-color graphics mode resolutions up to 800 x 600 and 132-column text mode. The VGA device drivers and utilities are described in the VGA Utilities booklet that came with your system.

How to Use This Manual

This manual explains how to set up and operate your computer, install options, and run diagnostic checks. Although the illustrations show a computer with a 5¼-inch diskette drive, instructions for using a 3½-inch drive are included.

Note
This manual covers basic operating instructions for using your computer but does not explain howto use MS-DOS See your MS-DOS manual **for comprehensiv**e instructions on installing and using the **operating system**.

You do not need to read everything in this book; see the following chapter summaries.

Chapter 1 provides simple step-by-step instructions for setting up your system. On the back cover foldout are illustrations identifying the different parts of your computer; refer to these as you set up your system.

Chapter 2 describes how to run the SETUP program to define your computer's configuration. Do this before you use your computer. You may need to do it again later, if you change the configuration.

Chapter 3 provides instructions for important operating procedures, such as using and caring for disks and disk drives.

Chapter 4 describes specialized features you can use to enhance your system's performance.

Chapter 5 describes some of the options you can use in your computer and contains instructions for removing the cover, setting jumpers, replacing the battery, and installing options.

Appendix A gives the technical specifications for the computer.

Appendix B describes how to install and remove disk drives.

Appendix C outlines the system diagnostic tests you can run to diagnose hardware problems.

Appendix D contains troubleshooting tips.

At the end of the manual, you'll find a glossary and an index.

Where to Get Help

If you purchased your Epson product in the United States, Epson America provides local customer support and service through a nationwide network of authorized Epson dealers and Service Centers.

Epson also provides the following support services through the Epson Consumer Resource Center at (800) 922-8911:

❏ Assistance in locating your nearest Authorized Epson Reseller or Service Center

❏ Technical assistance with the installation, configuration, and operation of Epson products

❏ Epson technical information library fax service

❏ Product literature with technical specifications on our current and new products

❏ Sales of ribbons, supplies, parts, documentation, and accessories for your Epson product

❏ Customer Relations.

Setting Up Your System

Setting up your Equity 386SX/16 PLUS personal computer is easy. Just follow the eight steps in this chapter. As you set up your system, you may want to leave this manual's back cover foldout open so you can refer to the illustrations identifying the different parts.

Note
The illustrations in this manual show the computer with a 5¼-inch diskette drive. If your system has a 3½-inch diskette drive instead, and you need instructions for using it, see Chapter 3.

1 *Choosing a Location*
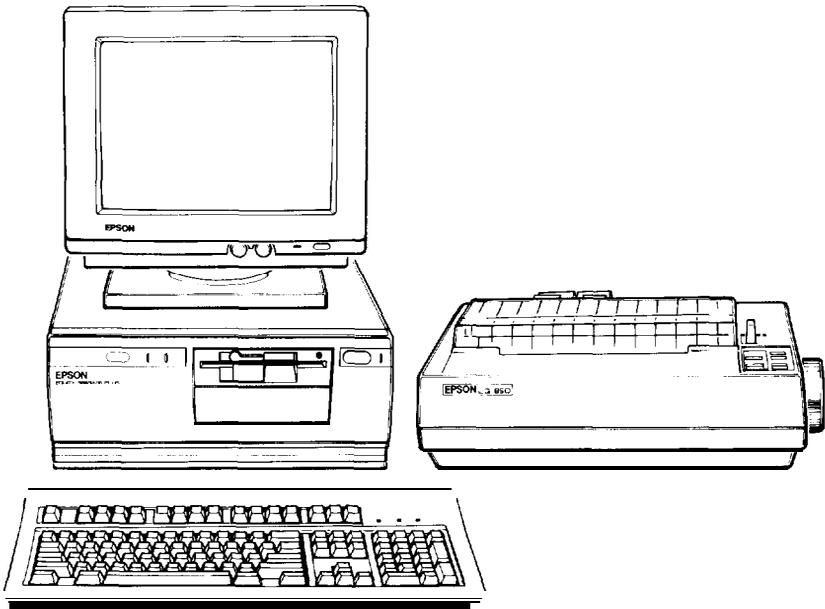
Before you set up your computer, it's important to choose a safe, convenient location that provides the following:

❏ A sturdy desk or table strong enough to support the weight of your system and all of its components.

❏ A flat, hard surface. Soft surfaces like beds and carpeted floors attract static electricity, which can erase data on your disks, damage the computer's circuitry, and prevent proper ventilation.

❏ Good air circulation. Leave several inches of space around the computer so air can move freely.

❏ Moderate environmental conditions. Select a cool, dry area and protect your computer from extremes in temperature, humidity, dust, and smoke. Avoid direct sunlight or any other source of heat.

❏ Appropriate power sources. To prevent static charges, connect all your equipment to three-hole, 120-volt *grounded* outlets. You need one outlet for the computer, one for the monitor, and additional outlets for a printer and any other peripheral devices.

❏ No electromagnetic interference. Do not place your system too close to any electrical device, such as a telephone, which generates an electromagnetic field.

2 Removing the Protector Card

If you have a 5¼-inch diskette drive, there is a protector card
in the diskette slot. This card is inserted at the factory to
protect the read/write heads in the drive. To remove it, flip
the latch up to pop the card out part way, as shown below;
then pull it out.
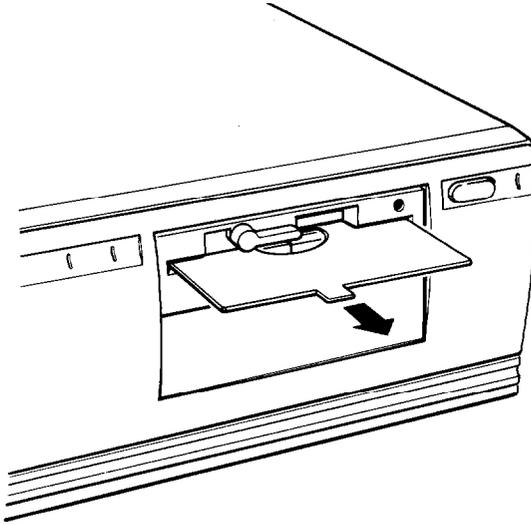
(If you have a second 5 ¼-inch diskette drive, be sure to
remove the protector card from it.)

Save the protector card. If you transport your computer, you
may want to insert the card into your diskette drive prior to
shipping. This will protect the read/write heads during the
shipping process.

3 *Connecting a Monitor*

The way you connect your monitor to the computer depends
on the type of monitor you have. If you have a VGA monitor
(or a multi-frequency monitor with an analog connector),
you can connect it to the computer's built-in VGA port. See
"Using the VGA Interface" below. If you have any other type
of monitor, see "Using a Display Adapter Card" on page 1-7.

Using the VGA Interface

Follow these steps to connect your VGA monitor to the VGA
port on the computer:

1. Make sure your monitor is turned off.

2. Place your monitor on top of or near the computer. For
   easy access, turn the monitor and computer around so
   the backs of both components are facing you.

3. If necessary, connect the monitor cable to the monitor.
   (Your monitor may have a permanently attached cable.)

4. Examine the connector end of the monitor cable, and position the plug to match the orientation of the monitor port (marked with a monitor icon). Then insert the plug into the port, as shown below.
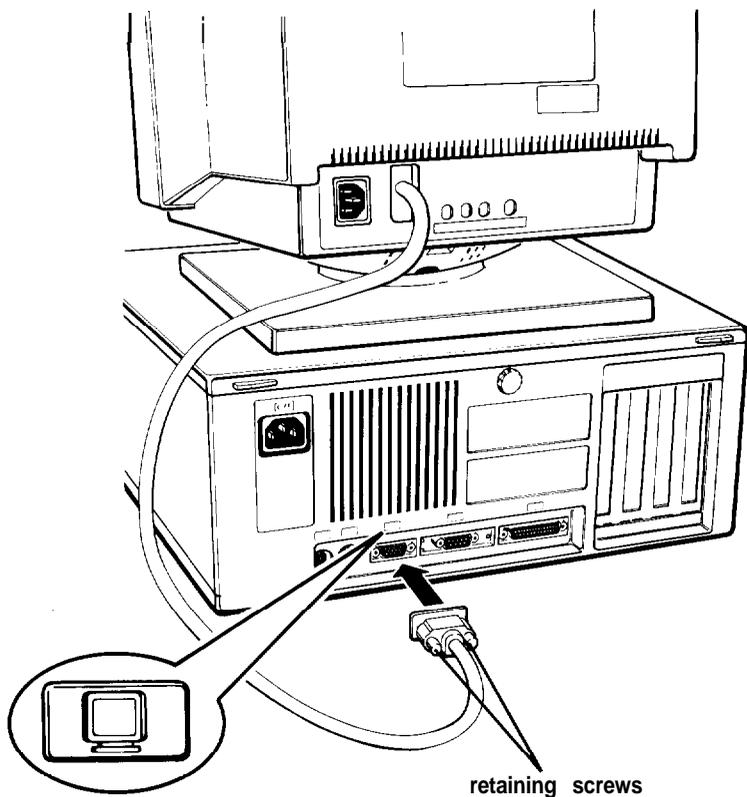
retaining screws

Caution
To avoid damaging the connector, take care not to bend the pins when inserting the plug.

5. If the connector has retaining screws, be sure to tighten them.

6. Plug the monitor power cord into the monitor's power inlet, as shown below.
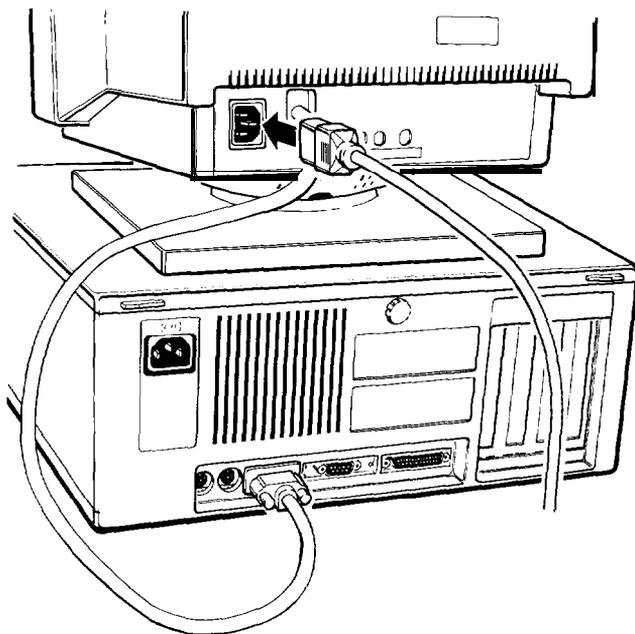
7. Plug the other end of the power cord into an electrical outlet.

Using a Display Adapter Card

If you are using a non-VGA monitor, you'll need to install a display adapter (video) card in one of the computer's option slots before you can connect the monitor. (Your dealer may have already installed the video card for you.)

If the video card has not yet been installed, you'll need to follow the instructions in Chapter 5 to install an option card. But first, check the following table to make sure your display adapter card and monitor are properly matched.

Monitor/video card compatibility

Monitor	Video card
Monochrome	Monochrome display adapter (MDA) Multi-mode graphics adapter (MCA) Enhanced graphics adapter (EGA) Hercules® graphics card
Color or EGA	Color graphics adapter (CGA) Multi-mode graphics adapter (MGA) Enhanced graphics adapter (EGA)*

* EGA cards support only EGA monitors.

When you are installing the video card, check to make sure any switches or jumpers on the card are set properly. For example, you may need to change a switch setting to select color or monochrome. See the documentation that came with your monitor or video card for instructions.

Note
If you install a display adapter card, you must set jumper J1 on the main system board to disable the built-in VGA interface so that your card can operate as the primary display adapter. You may also need to set jumper J3 to indicate whether a color or monochrome monitor is installed. See Chapter 5 for instructions on changing jumper settings.

Once you have installed your video card, return to this
section to connect your monitor to the computer. If your
monitor came with its own manual, follow the instructions
there. Otherwise, you can follow the steps in "Using the VGA
Interface" above; just insert your monitor connector into the
video card port instead of the built-in VGA port.

4 *Connecting a Printer or Other Device*

Your computer has both parallel and serial interfaces. To
connect a printer or other peripheral device to one of these
interfaces, follow the instructions below.

Using the Parallel Interface

The parallel interface on your computer is Centronics®
compatible and uses a DB-25S connector.

To connect your printer and computer, you need an IBM
compatible printer cable. If you are not sure which cable you
need, check with your Epson dealer.

Once you have the right printer cable, follow these steps:

1. Place the printer next to the computer with their backs
   facing you.

2. One end of the printer cable has a 25-pin, D-shell
    connector. Position the plug to match the orientation of
    the parallel interface (marked with a special icon shown
    in the illustration below). Then plug the connector into
    the port, as shown below. If the plug has retaining
    screws, tighten them by hand or with a screwdriver,
    depending on the screw type.

retaining screws
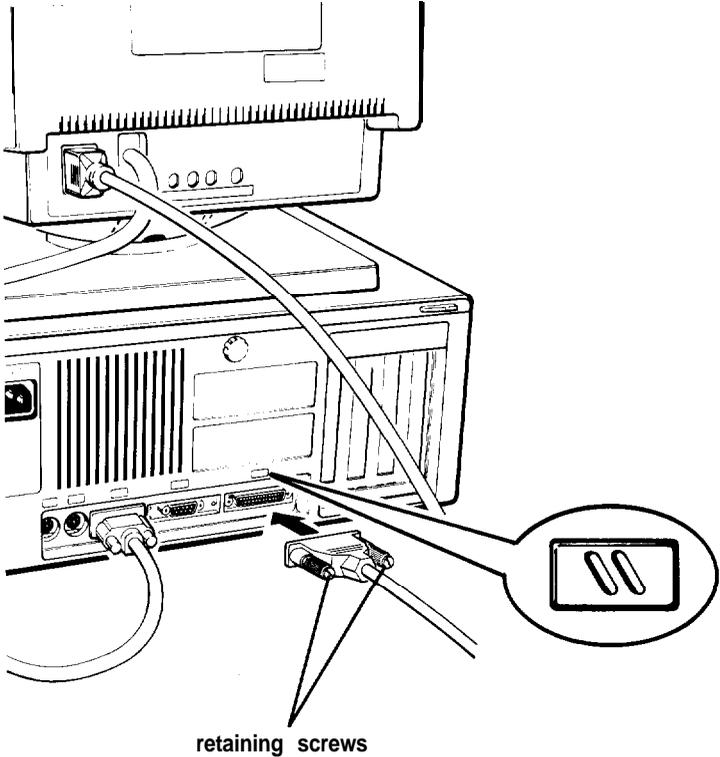
3. Connect the other end of the cable to the printer as shown below. To secure the cable, squeeze the clips at each side of the printer port and push them into place,

clips
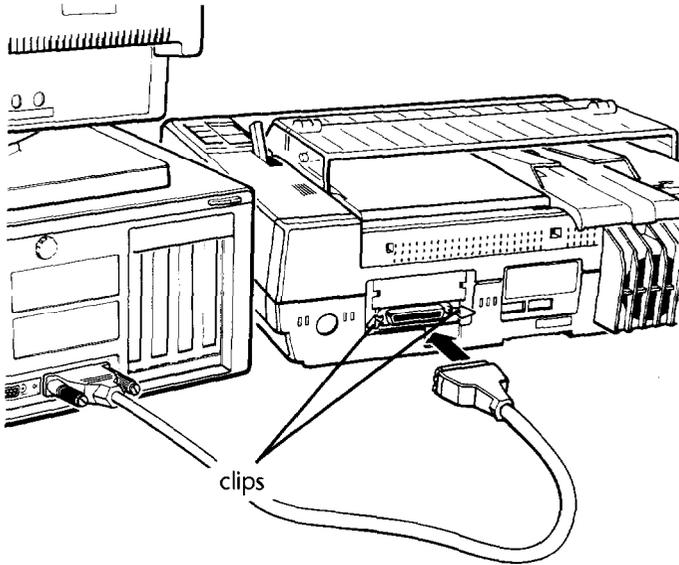
4. Plug the printer's power cord into a three-hole, 120-volt, grounded electrical outlet.

Using the Serial Interface

If you have a printer, a modem, or other peripheral device
with a serial interface, you can connect it to the serial
(RS-232C) port on the back of the computer.

The serial port uses a DB-9P connector, so be sure you have a
compatible cable. To connect a serial device, follow the same
steps as above for connecting a parallel device but insert the
connector into the serial port, marked with a special icon, as
shown below.
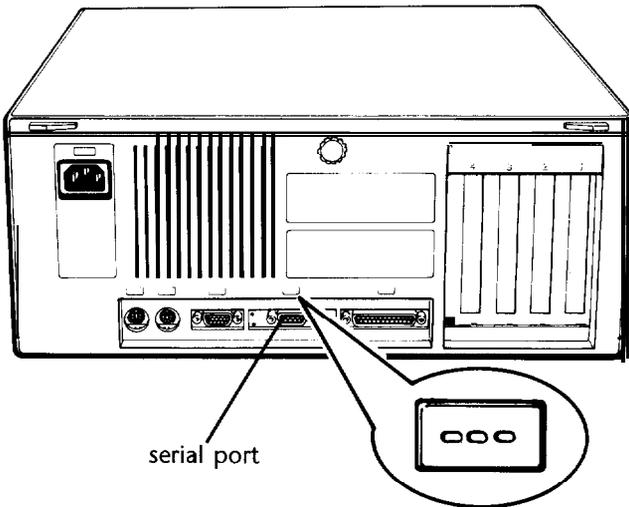
serial port

Note
You need to ensure that the serial port is set up so it
functions properly. If you are using the port for a serial
printer, you need to redirect printer output to the serial
port instead of the parallel port. To do this, you can use
the MS-DOS MODE or SETMODE command. See your
MS-DOS Reference Manual for instructions.

5 *Connecting the Keyboard*

Follow these steps to connect the keyboard:

1. Hold the keyboard cable connector so the indicator on the housing faces up. Insert the plug into the appropriate socket, marked with a keyboard icon, as shown below.

keyboard connector
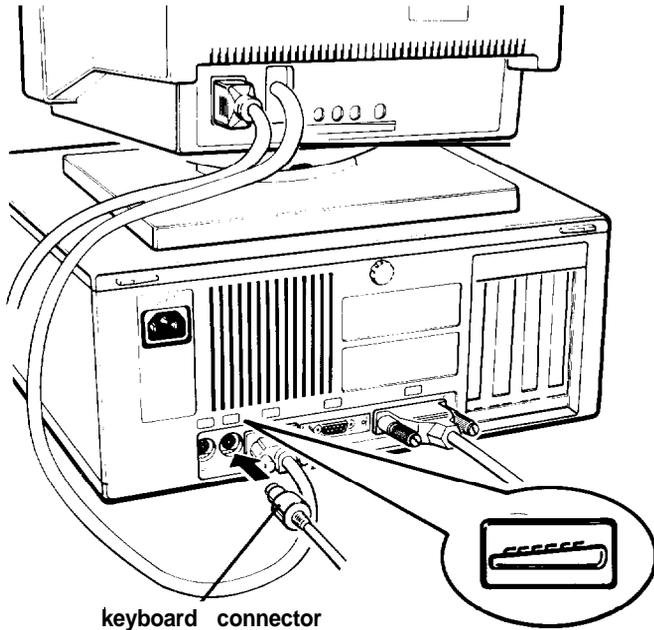
Caution
Although the keyboard and mouse connectors are physically identical, they cannot **be** used interchangeably. Be sure to insert the keyboard plug into the keyboard socket.

2. You can raise the keyboard by adjusting the legs on the bottom. To change the angle of the keyboard, turn it over and flip each leg upward until it locks into place, as shown below.
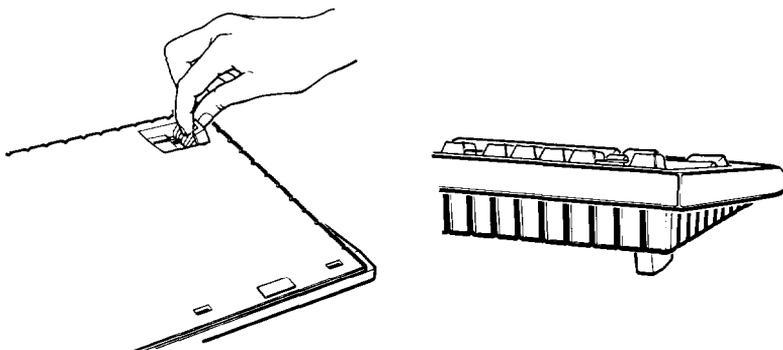
6 *Connecting the Mouse*

Your computer has an auxiliary port for an IBM PS/2 compatible mouse that uses a miniature DIN (6-pin) connector.

If your mouse has this type of connector, you can connect it to the built-in port on your computer. If you have a mouse that requires a different interface port, you can connect it to the built-in serial port or install an option card to provide the interface.

To connect a mouse to the built-in mouse port, hold the mouse plug so it is oriented properly with the computer socket. Insert the plug into the appropriate socket, marked with a mouse icon, as shown in the following illustration.
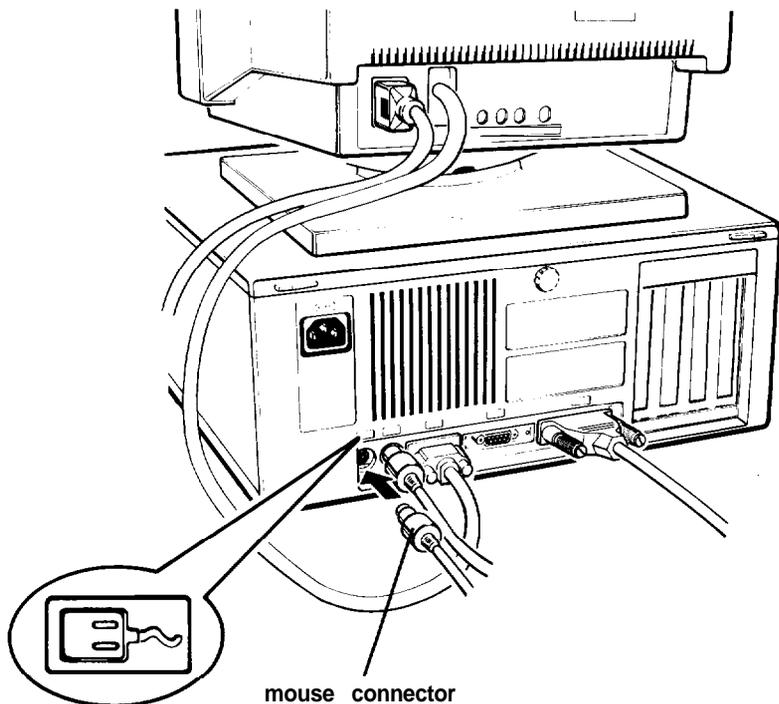
mouse connector

caution
Although the mouse and keyboard connectors are
physically identical, they cannot be used interchangeably.
Be sure to insert the mouse plug into the mouse port.

Once you have connected a mouse, you may need to add
commands to your MS-DOS CONFIG.SYS file to enable your
computer to use a mouse. See your MS-DOS Reference
Manual and the manual that came with your mouse for
instructions.

Note
If you want to use a mouse or other pointing device
connected to a port on an option card in your computer,
you can disable the built-in mouse connector by changing
the setting of jumper J4. See Chapter 5 for instructions.

7 *Connecting the Power Cord*

Follow these steps to connect the power cord:

1. Plug the power cord into the AC power inlet on the back panel, as shown below.

    WARNING
    To avoid an electric shock, be sure to plug the cord into the computer before plugging it into the wall socket.
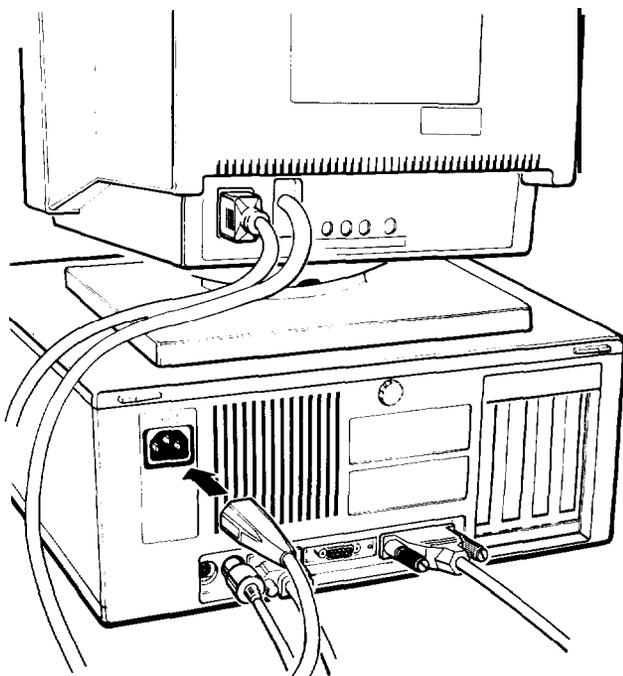
2. Plug the other end of the power cord into a three-hole, 120-volt, grounded electrical outlet.

8 *Turning On the Computer*

After you set up your system, you're ready to turn on the power. But first, read the following safety rules to avoid accidentally damaging your computer or injuring yourself:

❏ Do not connect or disconnect any cables when the computer's power is on.

❏ Never turn on the computer with a protector card in the diskette drive.

❏ Never turn off or reset your computer while a disk drive light is on. This can destroy data stored on the disk.

❏ Always wait at least five seconds after you turn off the power before you turn it on again. This allows the computer to clear and reset its memory.

❏ Do not leave a beverage near your system or any of its components. Spilled liquid can damage the circuitry of your equipment.

❏ Always turn off the power, disconnect the computer's power cord, and wait 30 seconds before you remove the cover. Only remove the cover to access internal devices, add memory, change jumper settings, or replace the battery.

Follow these steps to turn on your system:

1. Make sure the power cord is plugged into the AC power inlet on the back panel of the computer and into a three-hole, 120-volt, grounded electrical outlet.

2. Turn your computer around so the front panel faces you and place your other system components in an arrangement that suits you. (See step 1, "Choosing a Location," for a typical arrangement.)

3. Turn on the monitor, printer, and any other peripheral devices connected to the computer.

---

4. To turn on the computer, press the power button located on the right side of the front panel, as shown below.
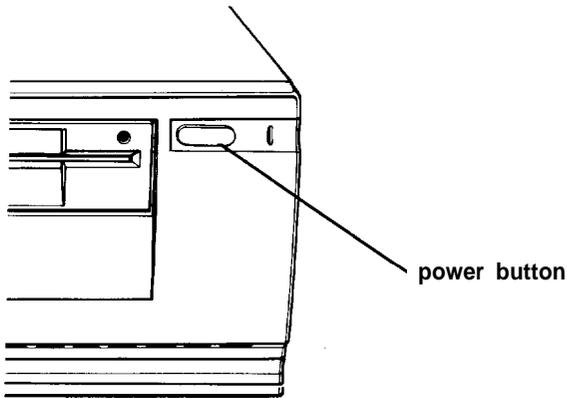
power button

The power indicator next to the button lights up. After a few seconds, the computer counts the amount of memory in your computer, and then performs a diagnostic self test. This is a series of checks the computer completes each time you turn it on to make sure everything is working correctly.

If necessary, use the controls on your monitor to adjust the brightness and contrast until characters on the screen are clear and at a comfortable level of intensity. If your monitor has horizontal and vertical hold controls, you may need to use them to stabilize the display.

Note
If you or your dealer have made a major change to your system, such as adding a disk drive, you may need to wait a few minutes for your computer to complete power-on diagnostics the first time you turn it on.

When the system has successfully completed its self test, you see the following prompt:

Press <Del> to start SETUP

Do not press any key yet. If MS-DOS has already been installed on your system, you'll see a prompt to enter the date. (For information about loading the operating system, see your MS-DOS Installation Guide or Reference Manual.)

If there is no operating system on your computer, you see an error message. Ignore the message for now. Follow the instructions below to turn off the computer and then go on to Chapter 2 for instructions on running the SETUP program.

Note
If your computer's configuration does not match the information stored in the computer's CMOS RAM (defined through the SETUP program), you see an error message and a prompt to press the F1 key. Press F1 to continue. Then run the SETUP program to correct the information. (See Chapter 2 for instructions.)

Turning Off the Computer

When you are ready to turn off your system, reverse the sequence of steps you followed to turn it on. Turn off the computer first, then turn off the monitor and any peripheral devices.

Now go on to Chapter 2 and follow the instructions to run the SETUP program.

Chapter 2
Running the SETUP Program

When you use your computer for the first time, you need to run the SETUP program to define how your system is set up. This is a simple procedure which you must do at least once. You may need to run it again later if you change some part of your configuration.

The SETUP program is stored in the computer's read-only memory (ROM), so you can run the program any time you turn on or reset your computer. You do not need to insert a diskette or access the hard disk.

SETUP lets you verify or change the following:

❏ Current date and time

❏ Type of diskette drives(s) installed

❏ Type of hard disk drive(s) installed

❏ Type of video display adapter you are using

❏ Keyboard testing function

❏ Shadow RAM function

❏ CPU clock speed

❏ EMS size

❏ Password feature

❏ Built-in interface settings.

The configuration you define through SETUP is stored in a special area of memory called CMOS RAM. This memory is backed up by a battery, so it will not be erased when you turn off or reset the computer. Whenever you reboot the computer, it checks the settings, and if it discovers a difference between the information in the CMOS RAM and your system's configuration, it prompts you to run SETUP. You see a message such as the following:

```
CMOS memory size mismatch
RUN SETUP UTILITY
Press <F1> to RESUME
```

Press **F1** to run SETUP and correct the setting.

Starting the SETUP Program

To start the SETUP program, make sure there is no diskette in the diskette drive; then turn on your computer. (If the computer is already on, press the **RESET** button on the front panel to reset it.)

After the computer completes its self test, you see the following prompt:

```
Press <Del> to start SETUP
```

As soon as you see this message, press the **Del** key. If you do not press **Del** within five seconds, the computer starts loading the operating system and you will not be able to run SETUP. If this happens, reset the computer and try again.

You see the following options:

```
Start operating system
Run SETUP
```

The first option is highlighted. Press ↓ to highlight **Run SETUP**, and then press **Enter.** The SETUP menu appears on the screen.

The menu automatically displays the base memory size, the extended memory size, and whether a math coprocessor (numeric processor) is installed. Additionally, the SETUP menu lists the parameters you can change.

Selecting Options

A solid cursor bar highlights the parameter currently selected. You can scroll through the parameters using the four arrow keys ($\leftarrow$, $\rightarrow$, $\uparrow$, $\downarrow$). When you reach a parameter you want to change, press **Page Up** or **Page Down** to display and select the available options.

An information window appears at the bottom of the menu; it describes the options available or any other keys to press to change the highlighted configuration parameter.

The rest of this chapter describes how to choose the correct SETUP parameters for your system.

Setting the Date and Time

The real-time clock in your computer continuously tracks the date and time-even when the computer is turned off. Once you set the date and time using SETUP, you should not need to change either parameter, except to adjust the time for daylight savings, if necessary. (The computer automatically changes the date for leap years.)

The current month is highlighted and a calendar on the right side of the screen shows all the days for the month. The current day is flashing. Press **Page Up** or **Page Down** to select the correct month, day, and year.

To change the time, move the cursor to the next line and press **Page Up** or **Page Down** to enter the correct hour and minutes according to a 24-hour clock. For example, 5 p.m. would be hour 17. You cannot set the number of seconds.

Setting the Diskette Drive(s)

Your system probably came with one diskette drive installed. You may have added another drive or replaced the existing drive with one of a different size or capacity. The SETUP menu offers five possible selections for your diskette drives (A and B):

❏ 1.2MB 5¼-inch

❏ 360KB 5¼-inch

❏ 1.44MB 3½-inch

❏ 720KB 3½-inch

❏ Not installed.

Check the settings displayed for both drives and correct them if necessary. (If you have only one diskette drive, select **Not installed** for drive B.)

Note
If you do not know the capacity of your diskette drive, ask your dealer.

Setting the Hard Disk Drive(s)

The SETUP program lets you select the type of hard disk drive(s) installed in your computer. If you have two hard disk drives, the first one is C and the second one is D. Be sure to choose the correct setting for both drives.

Follow these guidelines:

❏ If your system does not have a hard disk, select Not installed for drives C and D. If you have only one hard disk drive, select Not installed for drive D.

❏ If your computer came with an Epson 40MB hard disk drive (or if you installed this drive yourself), select number 17 for drive C.

❏ If you have installed another type of hard disk drive, you need to select the drive type number that matches your drive. See "Hard Disk Drive Types" below.

Hard Disk Drive Types

If you have installed a hard disk in your computer that is not the standard Epson 40MB drive (type 17), you need to select the correct type number to match your drive.

The following table lists the types of standard hard disk drives you can use in your computer. Check this table and the documentation supplied with your hard disk to find the correct type number for your drive. (Your drive's documentation should list all the parameters necessary to identify it in this table.) If none of the types listed match your drive, see "Defining your own drive type," below.

Hard disk drive types

Type no.	Cylinders	Heads	Sectors (Sec)	Precomp (WPcom)	Landing Zone	Size (in MB)	Drive name/ manufacturer
1	306	4	17	128	305	10	
2	615	4	17	300	615	20	ST225, ST4026, WD-93024
3	615	6	17	300	615	31	
4	940	8	17	512	940	62	
5	940	6	17	512	940	47	
6	615	4	17	none	615	20	
7	462	8	17	256	511	31	
8	733	5	17	none	733	30	ST-4038
9	900	15	17	none	901	112	
10	820	3	17	none	820	20	
11	855	5	17	none	855	35	
12	855	7	17	none	855	50	
13	306	8	17	128	319	20	
14	733	7	17	none	733	43	
15							−reserved−
16	612	4	17	0	663	20	
17	977	5	17	300	977	41	CP-3044
18	977	7	17	none	977	57	
19	1024	7	17	512	1023	60	
20	733	5	17	300	732	30	
21	733	7	17	300	732	43	
22	733	5	17	300	733	30	
23	306	4	17	0	336	10	Compatible IBM
24	977	5	17	none	976	41	ST-4051
25	1024	9	17	none	1023	77	ST-4096, CDC-94155
26	980	5	17	none	980	41	CP-3044, translate mode
27	969	10	17	none	969	80	CP-3184 translate mode
28	1224	15	17	none	1223	152	Maxtor 2190
29	683	16	38	none	683	203	CP-3204 default mode
30	832	6	33	none	832	80	CP-3184 default mode
31	482	25	17	none	482	100	CP-3104 UNIX mode
32	925	9	17	none	926	69	CDC-9415
33	981	5	17	none	981	41	Miniscribe 8051A Tran
34	678	36	17	none	678	203	CP-3204 UNIX mode
35	1024	12	17	none	1024	102	
36	1024	14	17	none	1024	119	
37	1024	16	17	none	1024	136	
38	1024	7	35	none	1024	123	HH-2120 (ESDI)
39	1024	5	17	none	1023	43	HH-1050

Hard disk drive types (continued)

Type no.	Cylinders	Heads	Sectors (Sec)	Precomp (WPcom)	Landing Zone	Size (in MB)	Drive name/ manufacturer
40	820	6	17	none	820	41	ST-251
41	615	6	17	none	615	31	OPC 30MB
42	754	11	17	128	754	69	Fujitsu 80M (M2243AS)
43	1314	7	17	1314	1314	76	Miniscribe
44	615	6	26	none	615	47	Seagate 40MB
45	820	6	26	544	819	62	
46	642	8	17	128	664	43	NEC D-3142
47	—	—	—	—	—	—	User defined type
60	776	8	33	none	776	100	CP-3104
64	683	16	38	none	683	203	CP-3204

Defining your own drive type

If the parameters for your hard disk (listed in its documentation) do not match any of the types listed in the table above, you can define your own type. Follow these steps:

1. With the cursor at the **Hard disk type** option, press **Page Up** or **Page Down** to scroll through the types until you come to **47 = USER TYPE**.

2. Use the numeric keys to enter the appropriate values for these parameters:

   Cyl n = the number of cylinders on the disk.

   Head = the number of read/write heads in the drive.

   WPcom = the precompensation cylinder.

   LZone = the landing zone (the area on which the computer parks the heads when you run the HDSIT program).

   Sec = the number of sectors on the disk.

   Size = the total amount of storage capacity for the disk.

Press Enter after typing each number. If you enter an invalid number, the computer beeps and does not go on to the next parameter. Check your drive documentation and try again. You do not enter a value for **Size**; SETUP does this automatically based on the other values you have entered.

Setting the Primary Display Type

This option lets you define the type of adapter you are using in your computer for your primary display device:

❏ VGA or EGA

❏   Color 80 x 25

❏ Monochrome

❏   Color 40 x 25.

Note that this option defines the display adapter (the built-in VGA port or an optional video interface card in your computer), not the monitor connected to it.

If you have connected your monitor to the computer's built-in VGA port, select **VGA** or **EGA**. Otherwise, follow these guidelines to select the correct adapter type:

❏   If you have a color graphics adapter (CGA) or a multi-mode graphics adapter (MGA) attached to an RGB (color) monitor, select **Color 80x25**. (**Also** be sure to set the color/mono switch on the MGA card to color.)

❏   If you have a monochrome display adapter (MDA), an MGA, or a Hercules MGA attached to a monochrome monitor, choose **Monochrome**. (Also remember to set the color/mono switch on the MGA card to mono.)

❏ If you have a composite color monitor, such as a color
   television with a video input, try selecting Color
   80x25. If you find that the monitor's resolution is poor,
   run SETUP again and select Color 40x25.

If you have two display adapters of different types, select the
setting for the one you want to be your primary display
adapter. The other one is your secondary adapter.

Note

if you have installed an EGA or VGA display adapter card,
or another type of card that you want to **be the primary**
display adapter, you must set jumper J1 on the main
system board to disable the built-in VGA interface.

If you change the type of monitor you are using you also
need to set jumper J3 to indicate either a monochrome or
color monitor. If you have two types of cards, set the
jumper to match the monitor that: is your primary display.
See Chapter 5 far instructions on changing jumper
settings.

Setting the Keyboard Test Function

There are two options for the keyboard test function:
Installed or Not installed. Select Installed if you want the
computer to test the operation of the keyboard each time you
turn it on or reset it. Select **Not installed** if you want the
computer to skip the keyboard test to save time as you boot
the system.

Setting the Shadow RAM

Your computer can access RAM (random access memory) faster than ROM (read-only memory). The Shadow RAM feature enables the Equity 386SX/16 PLUS to copy the contents of its system BIOS and/or video ROM into RAM so it can perform certain operations faster.

The SETUP Shadow RAM option lets you choose what to place in the shadow RAM area:

❏ System

❏ Video

❏ System and video

❏ None.

Select **System+Video** unless you have installed a memory card or video card that provides its own shadow RAM (in which case you can select just **System** or just **Video)**. Select **None** if you do not want to use the Shadow RAM function.

Note
Shadow RAM uses 128KB of the RAM available between *640KB* and 1MB in your system (384KB). If you use the shadow RAM feature, 256KB of this memory is available for use as extended or expanded memory. If you do not use shadow RAM, you can use all of the 384KB of RAM as extended memory, but only 256KB of it as expanded memory, See "Using Expanded Memory Above 640KB" in Chapter 4 for more information.

Setting the CPU Clock Speed

This option lets you set the default speed at which your computer's processor operates when you turn it on:

❏ High speed (16 MHz)

❏ Low speed (8 MHz)

❏ Auto speed.

When it is running at high speed, the **TURBO** light on the front panel is illuminated.

At high speed, it can access memory faster, so your programs work faster. You should use high speed for everything you do unless you are using an application program that requires the slower speed. Some programs (especially older ones) have specific timing requirements when accessing diskettes, Check your application program manual.

You can also set the processor to change speed automatically. This enables the computer to switch to low speed whenever it needs to access a diskette but run at high speed for all other operations.

Select **High speed** for 16 MHz, **Low speed** for 8 MHz, or **Auto speed** to have the computer switch to low speed automatically when necessary.

Note

You may not want to use the automatic setting for certain copy-protected programs. See "Changing the Processor Speed" in Chapter 4 for more information.

In addition to selecting the default operating speed through SETUP, you can change the speed temporarily by giving a keyboard command or by running the ESPEED program. See "Changing the Processor Speed" in Chapter 4 for more information.

EMS Size

The EMS Size option provides a simple way to set the amount of memory you want to use as expanded. Expanded memory can be used by application programs conforming to the Lotus/Intel®/Microsoft® Expanded Memory Specification (LIM EMS). The Equity 386SX/16 PLUS is compatible with version 4.0 of the LIM EMS.

Once you have set the expanded memory size with the EMS Size option, you also need to use a memory manager to convert the memory to expanded memory. Many application programs come with a memory manager and there are a variety of other memory managers available. If you already have a memory manager (such as the one provided with MS-DOS), you should use that manager along with EMS Size.

If you do not have another memory manager, you can use the EMM386SX.SYS memory manager which is on your Reference diskette. See "Using Memory Beyond 640KB" in Chapter 4 for instructions.

Note
Do not use EMS Size to define expanded memory if you plan to install Windows on your system. See your Windows documentation for more information.

The total amount of your computer's extended memory appears in the information window. You can define how much of it you want to use as expanded memory in units of 256KB.

For example, with 2MB of memory, you can specify any of the following as expanded memory:

❏ 0KB

❏ 256KB

❏ 512KB

❏ 768KB

❏ 1024KB

❏ 1280KB.

> **Note**
> You cannot set any of the 640KB of base memory or 128KB of the memory between 640KB and 1MB as expanded memory. See "Using Expanding Memory Beyond 640KB" in Chapter 4 for more information.

Setting the Password

The SETUP program lets you set an optional password to control who can use your system. If you do not want to set a password for your computer, skip this section.

Once you set a password through SETUP, you must enter it every time you turn on your computer or reset it by pressing the **RESET** button. If you do not enter it correctly, you cannot access your system.

To set a password, move the cursor to the **Password** option. Next to it, you see **Not installed**. (If you have already set a password you see Installed.) Press **Page Up** or **Page Down** to display the following:

New Install | ******** |

Now type the password you want to use. You can type up to eight characters using the letter or number keys, in upper- or lowercase. For example, you could enter the following:

123aBc!

You can use the backspace key to correct mistakes. After you type the password, press **Enter.**

Note
Be sure to remember the password you enter or write it down and keep it in a safe place. If you cannot remember it, you will not be able to access the computer the next time you turn it on. If you forget your password, however, there is a way to disable the function. See "Password Problems" in Appendix D for more information.

Changing or Deleting a Password

If you want to change the current password, highlight the **Password** option and press **Page Up** or **Page Down** to display **New** Install. Then enter a new password, as described above.

To delete the password, press **Page Up** or **Page Down** to display **Not installed.**

Be sure to save your settings (as described at the end of this chapter) when you exit the SETUP program.

Setting the Built-in Interfaces

This option lets you define how the following built-in interfaces operate:

❏ Parallel port (LPT1, LPT2, LPT3)

❏ Serial port (COM1 or COM2)

❏ Hard disk drive controller (HDC)

❏ Floppy disk drive controller (FDC).

Setting the Parallel Interface

The built-in parallel port is set to act as the primary (LPT1). If you install an option card that provides an additional parallel interface, you may need to select LPT2 or LPT3 for the built-in port. Follow these guidelines:

❏ If you are using only the built-in port, select LPT1. Also select LPT1 if you have installed an additional port but want to keep the built-in port the primary adapter.

❏ If you have installed an additional port that is pre-set to act as the primary port or one that you want to be the primary port, select **LPT2**. For example, if you have installed an IBM monochrome adapter/parallel interface card, the parallel port on the card must be the primary adapter and you need to select LPT2 for the built-in port.

❏ If you have installed two additional parallel ports and want them to be primary and secondary, select **LPT3**.

❏ If you have installed three additional parallel ports and you do not want to use the built-in port, select **Disable.**

Note
Be sure to set any jumpers on the card(s) to indicate how you want the port to be recognized (LPT1, LPT2, or **LPT3)**.

Setting the Serial Interface

The built-in serial port in your computer is set to act as the primary port (COM1). If you install an option card that provides an additional serial port, that port automatically becomes secondary (COM2). However, if you want the port on the card to be COM1, select **COM2** for the built-in port.

If you install a card (or cards) that provide two additional serial ports and you want them to act as the primary and secondary ports, select **Disable** for the built-in port.

Note
Be sure to set **any** jumper(s) on the card(s) to indicate whether you want the port(s) to be primary or secondary.

Setting the Disk Drive Controllers

If you are using the standard drives that came with your computer, the hard disk drive controller (HDC) and diskette drive controller (FDC) should be set to **Enable.**

However, if you install an option card that provides a controller for a diskette drive or hard disk drive, you need to disable the built-in controller.

Saving Your Settings

After you have made your selections for SETUP, press **Esc** to exit. You see the following prompt:

        Save SETUP configuration (Y/N)?

Press **Esc** to return to the menu to make corrections. Press Y and **Enter** to save the settings in the CMOS RAM. Press **N** and **Enter** to exit SETUP without saving your changes.

If you saved your changes, the SETUP program resets your system and the computer runs through its power-on diagnostic tests.

If something is wrong, however, you see an error message and a prompt to run SETUP. Follow the instructions on the screen to run SETUP again to correct it. (You may need to reset the computer.)

If you have just run SETUP for the first time, the next thing you need to do is install MS-DOS on your computer. See your MS-DOS Installation Guide for instructions. (If you are using a different operating system, follow the installation instructions provided with it.)

Chapter 3
Using Your Computer

This chapter briefly describes the following procedures for using your computer:

❏ Installing MS-DOS or another operating system

❏ Using special keys on the keyboard

❏ Stopping a command or program

❏ Resetting the computer

❏ Using a password

❏ Using disks and disk drives.

Installing MS-DOS or Another Operating System

After you connect the components of your system and run the SETUP program, you must install the operating system on your computer. If you are installing MS-DOS, follow the instructions in your MS-DOS Installation Guide. If you are installing another operating system, such as MS OS/2 or UNIX, see the manual that comes with that system for instructions on installing and using it. The procedures in this manual assume that you are using MS-DOS with your computer.

Note
Be sure to make backup copies of your original operating system diskettes.

Special Keys on the Keyboard

Certain keys on your keyboard serve special functions when your computer is running MS-DOS or application programs. The special keys are described in the table below.

Special key functions

Key	Purpose
Tab $\mid\leftarrow$ **Tab** $\rightarrow\mid$	Moves the cursor one tab to the right in normal mode and one tab to the left in Shift mode.
Caps Lock	Changes the letter keys from lower- to uppercase; changes back to lowercase when pressed again. The numeric/symbol keys on the top row of the keyboard and the symbol keys in the main part of the keyboard are not affected.
Shift	Produces uppercase characters or the top symbols on the keys when used with the main character keys. Produces lowercase characters when the Caps Lock function is on.
Ctrl	Works with other keys to perform special (control) functions, such as editing operations in MS-DOS and various application programs.
Alt	Works with other keys to enter alternate character codes or functions.
$\leftarrow$**Backspace**	Moves the cursor back one space, deleting the character to the left of the cursor.
↵ **Enter**	Ends a line of keyboard input or executes a command.
Insert (Ins)	Turns the Insert function on and off.
Delete (Del)	Deletes the character marked by the cursor.
Home, End **Page Up (PgUp)** **Page Down (PgDn)** ↑ $\leftarrow$ ↓ $\rightarrow$	Control cursor location.

Special key functions (**continued**)

Key	Purpose
Num Lock	**Changes the function of the numeric/cursor keys from entering numbers to positioning the cursor; changes back when pressed again.**
Esc	**Cancels the current command line or operation.**
F1-F12	**Perform special functions within application programs.**
Print Screen	**Prints the screen display on a printer.**
Sys Rq	**Generates the System Request function in some application programs (used with Alt).**
Scroll Lock	**Controls scrolling in some applications.**
Pause	**Suspends the current operation.**
Break	**Terminates the current operation (when used with Ctrl).**

The **Caps Lock, Num Lock,** and **Scroll Lock** keys work as
toggles; press the key once to turn on a function and again to
turn it off. When the function is enabled, the corresponding
light in the upper right corner of the keyboard is on.

Stopping a Command of Program

You may sometimes need to stop a command or program
while it is running. Many programs provide a command you
can use to cancel or even undo an operation. If you have
entered an MS-DOS command that you want to stop, try one
of the following commands:

❏ Hold down the **Ctrl** key and press C

❏ Hold down the **Ctrl** key and press **Break,**

These methods may also work in your application program. If not, you may need to reset the computer, as described below.

Caution
It is best not to turn off the computer to stop a program or command. If you created new data and have not yet stored it, the data will be erased if you turn off the computer. The computer stores your data in its memory area (RAM) until you save it; but the data is erased each time you turn off or reset the computer.

Resetting the Computer

Occasionally, you may want to clear the computer's current settings or its memory without turning it off. You can do this by resetting the computer.

For example, if an error occurs and the computer does not respond to your keyboard entries, you can reset it to reload MS-DOS and try again. However, resetting erases any data in memory that you have not saved; so reset only if necessary.

Caution
Do not reset the computer as a means to exit a program. Some programs classify and store new data when you exit them in the normal manner. If you reset the computer without properly exiting a program, you may lose data.

To reset the computer, MS-DOS must be either on the hard disk or on a diskette in drive A; so if you do not have a hard disk, insert the Startup diskette in drive A.

There are two ways to reset the computer:

❏ If you are using MS-DOS, hold down **Ctrl** and **Alt** and press the **Del** key. The screen goes blank for a moment and then the computer should reload MS-DOS. If it doesn't, try the next method.

❏ Press the **RESET** button on the front panel. This method works even when the computer does not respond to your keyboard entries.

If resetting the computer does not correct the problem, you probably need to turn it off and reboot it. Remove any diskette(s) from the diskette drive(s). Turn off the computer and wait five seconds. If you do not have a hard disk, insert the Startup diskette in drive A. Then turn on the computer.

Using a Password

If you set a password when you ran the SETUP program, you must enter it every time you turn on the computer or press the **RESET** button. Follow these steps to use your password:

1. If you do not have a hard disk, insert your Startup diskette in drive A.

2. Turn on the computer or press **RESET**. After the computer completes its memory test, the screen displays the following prompt:

        Enter Password :

3. Type your password at the prompt. The screen does not display the characters you type. Then press **Enter.**

After you type the password correctly and press **Enter, you see** the **Press <Del> to start SETUP** prompt. If you do not press **Del,** the computer loads MS-DOS and displays the MS-DOS command prompt.

If you do not enter the correct password the first time, press **Enter** and try again.

If you want to change or delete your current password, you must run the SETUP program. See Chapter 2 for instructions.

Using Disks and Disk Drives

The disk drives in your computer allow you to store data on disk, and then retrieve and use your stored data. This section explains how disks work and tells you how to:

❏ Use different types of diskettes and diskette drives

❏ Care for your diskettes and diskette drives

❏ Write-protect diskettes

❏ Use a single diskette drive system

❏ Insert and remove diskettes

❏ Format diskettes

❏ Make backup copies

❏ Use a hard disk drive.

How Disks Store Data

Diskettes are made of flexible plastic coated with magnetic material. This plastic is enclosed in a square jacket that is either slightly flexible (5¼-inch diskette), or hard (3½-inch diskette).

Unlike a diskette, a hard disk is rigid and fixed in place. It is sealed in a protective case to keep it free of dust and dirt. A hard disk stores data the same way that a diskette does, but it works much faster and has a much larger storage capacity.

All disks are divided into data storage compartments by sides, tracks, and sectors. Double-sided diskettes store data on both sides. On each side are concentric rings, called tracks, on which a disk can store data.

A disk is further divided by sectors, which are similar in shape to pie slices. The figure below provides a simple representation of tracks and sectors.
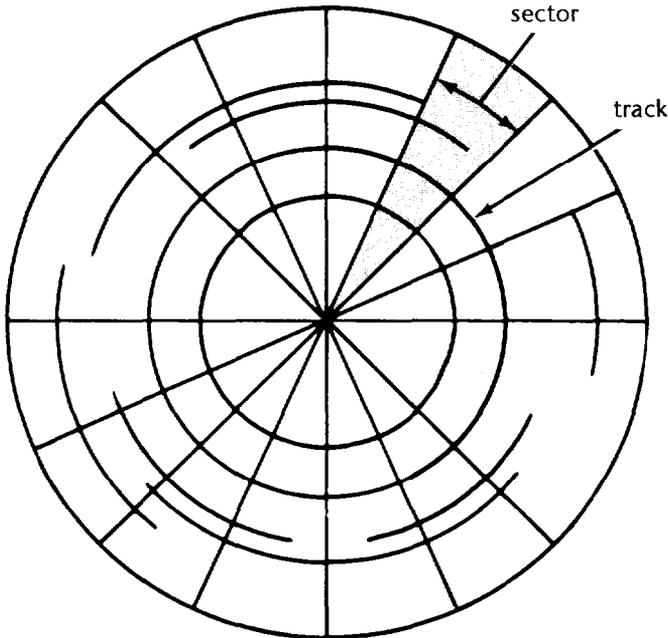
Double-sided, double-density diskettes have either 40 or 80 tracks on each side, and double-sided, high-density diskettes have 80 tracks on each side. Diskettes can have 8, 9, 15, or 18 sectors per track.

A hard disk consists of two or more platters stacked on top of one another and thus has four or more sides. In addition, a hard disk has many more tracks per side than a diskette, but the number of tracks depends on the capacity of the hard disk. The number of sectors depends on the type of hard disk.

Your computer uses the read/write heads in a disk drive to store and retrieve data on a disk. To write to a disk, the computer spins it in the drive to position the disk so that the area where the data is to be written is under the read/write head. A diskette has an exposed area where the read/write head can access it.

Because data is stored magnetically, you can retrieve it, record over it, and erase it-just as you play, record, and erase music on a cassette tape.

Types of Diskette Drives

The following list describes the four types of diskette drives you can use in your computer and which diskettes to use with them:

❏ 1.44MB drive-Use 3½-inch, double-sided, high-density, 135 TPI, 1.44MB diskettes. These diskettes contain 80 tracks per side, 18 sectors per track, and hold up to 1.44MB of information, which is approximately 600 pages of text.

❏ 1.2MB drive-Use 5¼-inch, double-sided, high-density, 96 TPI (tracks per inch), 1.2MB diskettes. These diskettes contain 80 tracks per side, 15 sectors per track, and hold up to 1.2MB of information, which is approximately 500 pages of text.

> **Note**
> MB stands for megabyte, which equals 1024KB (or 1,048,576 bytes). KB stands for kilobyte, which equals 1024 bytes. Each byte represents a single character, such as A, $, or 3.

❏ 720KB drive-Use 3½-inch, double-sided, double-density, 135 TPI, 720KB diskettes. These diskettes contain 80 tracks per side, 9 sectors per track, and hold up to 720KB of information, which is approximately 300 pages of text.

❏ 360KB drive-Use 5¼-inch, double-sided, double-density, 48 TN, 360KB diskettes. (You can also use single-sided, 160KB or 180KB diskettes.) These diskettes contain 40 tracks per side and 8 or 9 sectors per track. With 8 sectors per track, a diskette holds up to 320KB. With 9 sectors per track, a diskette holds up to 360KB of information, which is approximately 150 pages of text.

Note
You must format a new diskette before you can store data on it. See "Formatting Diskettes," later in this section.

Drive and *diskette incompatibilities*

If your computer has more than one type of diskette drive, or if you use different types of diskettes, you need to be aware of certain incompatibilities between the drives and diskettes.

Because of the type and size differences, you cannot use a 3½-inch diskette in a 5¼-inch drive or vice versa. There are also limitations on using diskettes that are the same size as the drive but have different capacities. The following tables summarize the possibilities and limitations.

5 1/4--inch drive/diskette compatibility

Drive type	Diskette types it can read from and write to
360KB	360KB, 320KB, 180KB, 160KB
1.2MB	1.2MB, 360KB*; 320KB*, 180KB*, 160KB*

* If you write to this diskette in a **1.2MB drive, you may not be able to read it or write to it in a 360KB drive later.**

3 ½-inch drive/diskette compatibility

Drive type	Diskette types it can read from and write to
720KB	720KB
1.44MB	1.44MB, 720KB

Because of these incompatibilities, always indicate the
diskette type and density when you label your diskettes.
(Usually this information appears on the manufacturer's
label.)

If you have any combination of the above drives (1.44 MB,
1.2MB, 720KB, or 360KB), you can copy files from one drive
to another-using COPY or XCOPY-as long as the correct
diskette type is in each drive. You can also use these
commands to copy files between a hard disk and any type of
diskette. However, you cannot use the MS-DOS DISKCOPY
command to copy from one diskette drive to another if the
two drives are not the same type. For more about copying
files and diskettes, see your MS-DOS Reference Manual.

Caring for Diskettes and Diskette Drives

Follow these basic precautions to protect your diskettes and
avoid losing data:

❏ If you have a diskette that contains data you don't want
  to accidentally write over or erase, be sure you write-
  protect it. This is especially important for your operating
  system and application program diskettes. See "Write-
  protecting Diskettes," below, for more details.

❏ Do not remove a diskette from the diskette drive or reset
  or turn off the computer while the drive light is on. This
  light indicates that the computer is copying data to or
  from a diskette. If you interrupt this process, you can
  destroy data.

❏ Remove all diskettes before you turn off the computer.

❏ Keep diskettes away from dust and dirt. Small particles of
  dust or dirt can scratch the magnetic surface, destroy
  data, and ruin the read/write heads in a diskette drive.

❏ Never wipe, brush, or try to clean diskettes in any way.

❏ Keep diskettes in a moderate environment. Don't leave diskettes sitting in the sun, or in extreme cold or heat.

❏ Keep diskettes away from magnetic fields, such as electrical appliances, telephones, and loudspeakers. (Remember that diskettes store information magnetically.)

❏ Do not place diskettes on top of your monitor or near an external hard disk drive.

❏ Always hold a 5¼-inch diskette by its protective jacket and never touch the magnetic surface (exposed by the read/write slot). The oils on your fingertips can damage it.

❏ Do not place anything on top of your diskettes, and be sure they do not get bent.

❏ Carefully label your diskettes and indicate the type and density. Attach the label only along the top of a diskette (next to the manufacturer's label). Do not stick several labels on top of one another; this can make it difficult to insert and remove the diskette in the drive.

❏ Write on a diskette label before you attach it to the diskette. If you need to write on a label that is already on the diskette, use only a soft-tip pen-not a ballpoint pen or a pencil.

❏ Store diskettes in their protective envelopes and in a proper location, such as a diskette container. Do not store diskettes flat or stack them on top of each other.

Write-protecting Diskettes

You can write-protect a diskette to prevent its data from being altered. When a diskette is write-protected, you can read it and copy data from it, but you cannot store new data on it or delete any files it contains. If you try to change data stored on a write-protected diskette, MS-DOS displays an error message.

To write-protect a 5¼-inch diskette, cover the small, rectangular notch (shown below) with an adhesive write-protect tab. Write-protect tabs usually are included in a new package of blank 5¼-inch diskettes.

write-protect **notch**
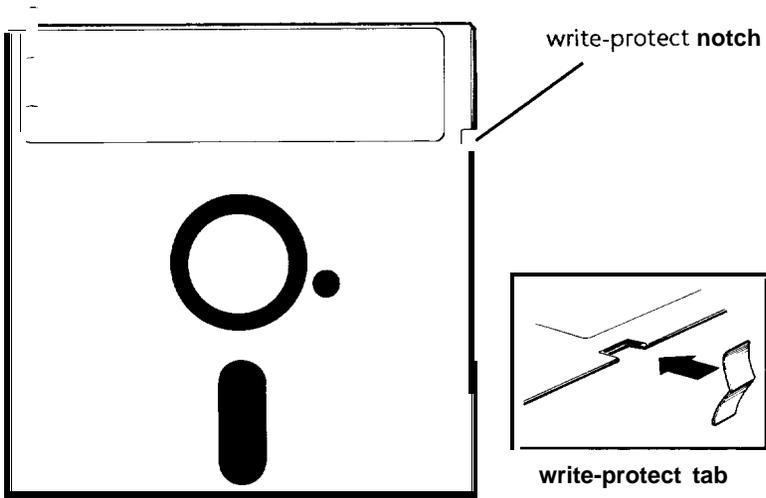
write-protect tab

To remove the write protection, peel off the write-protect tab.

On a 3½-inch diskette, the write-protect device is a small
switch on the back of the diskette in the lower right corner,
shown below. To write-protect a 3½-inch diskette, slide the
switch toward the edge of the diskette until it clicks into
position, exposing a hole in the corner.

write-protect switch
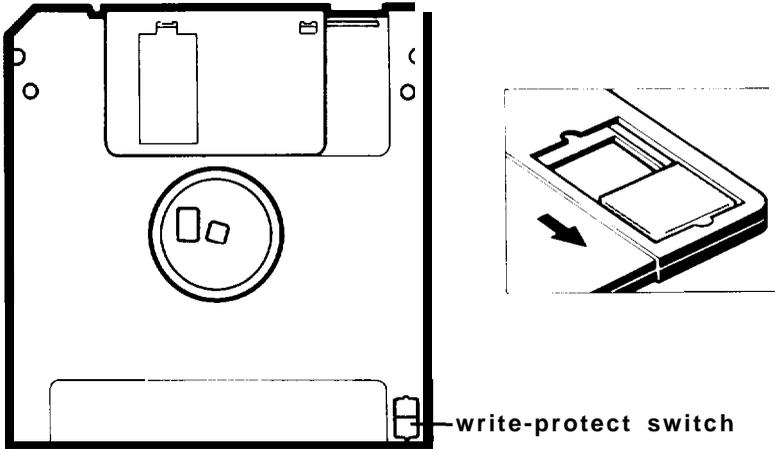
To remove the write protection, slide the switch toward the
center of the diskette until it clicks into position and the hole
is covered.

Note
Some program diskettes have no notch or switch so they
are permanently write-protected. This protects them from
being accidentally erased or altered.

Using a Single Diskette Drive System

MS-DOS expects the computer to have at least two diskette drives and displays prompts and messages accordingly. Usually, MS-DOS recognizes the first diskette drive (the top drive) as A and a second diskette drive as B. If you have only one diskette drive, MS-DOS can treat it as both A and B when you need to perform operations that normally require two diskette drives.

For example, if you enter a command to copy data from A to B, MS-DOS copies the data from the first diskette you place in the drive (which would be drive A) to the computer's memory. Then MS-DOS prompts you to insert another diskette (for drive B) and copies the data from memory to the new diskette. When copying is complete, you see a prompt to insert the original diskette (A).

Because you may often swap diskettes this way, it is important to remember which diskette is which. It is also a good idea to write-protect your original diskette. See "Write-protecting Diskettes," above.

If you have a hard disk and one diskette drive, you can load the operating system and application programs from the hard disk, create and store your data there, and use the diskette drive just for copying data to or from diskettes.

However, if you have only one diskette drive and no hard disk, you need to use that drive to load the operating system as well as any application program you are using. First, insert the operating system diskette (the Startup diskette, for example) in drive A and load the operating system; this copies it to the computer's memory (RAM) so you do not need to leave the system diskette in the drive. Then remove the system diskette and insert your application program diskette to load that data into memory, too. See your application program manual for detailed instructions.

Inserting and Removing Diskettes

If you have a 5¼-inch diskette drive, insert a diskette as
follows: hold the diskette with the label facing up and the
read/write slot leading into the drive, as shown below.
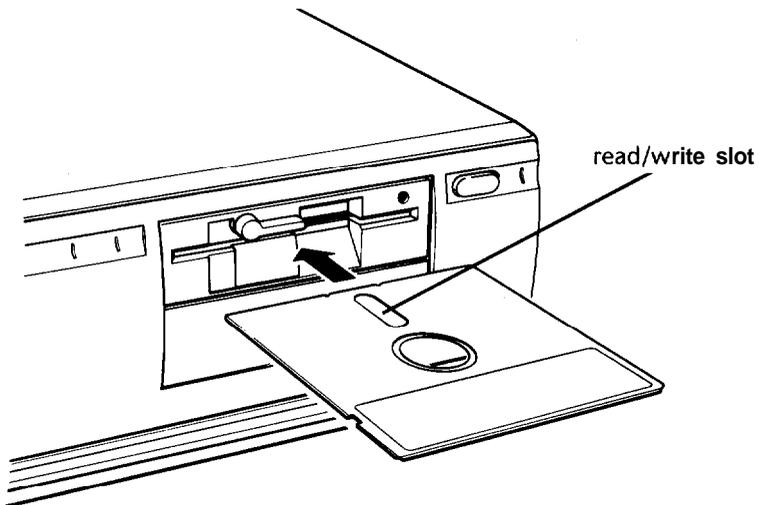
Slide the diskette into the slot until it is in all the way. Then
turn the latch down to lock it in a vertical position. This
keeps the diskette in place and enables the read/write heads
in the drive to access the diskette.

When you want to remove a diskette, first make sure the disk
drive light is off. Then flip up the latch and carefully pull out
the diskette. Place it in its protective envelope and store it in
a proper location, such as a diskette container.

If you have a 3 1/2-inch diskette drive, insert the diskette with the label facing up and the metal shutter leading into the drive, as shown in the following illustration. Slide the diskette into the drive until it clicks into place.
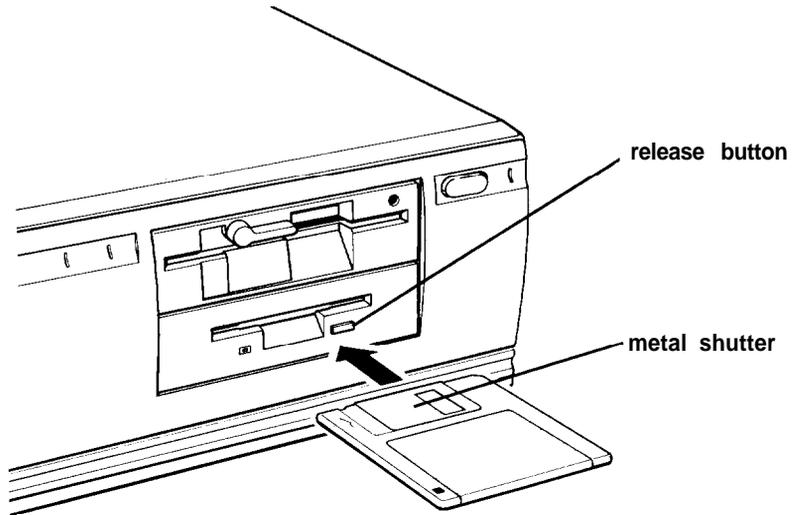
When you want to remove the diskette, make sure the drive light is off; then press the release button. When the diskette pops out, remove it and store it properly.

Caution
Never remove a diskette or reset or turn off the computer while a diskette drive light is on. You could lose data. Also, be sure to remove all diskettes before you turn off the computer.

Formatting Diskettes

Before you can store data on a new diskette, you must format it using the FORMAT command. Formatting prepares the diskette so that MS-DOS can write data on it. You need to do this only once, before you use the diskette for the first time.

You can also reformat previously used diskettes to store new data. This process erases all the data on the diskette, so be sure you do not want to save any of the files on a used diskette before you format it. See your MS-DOS Reference Manual for instructions on using the FORMAT command.

Making Backup Copies

It is important to make copies of all your data and system diskettes. Make backup (or working) copies of all diskettes that contain programs, such as your MS-DOS, Reference, and Utility diskettes; then use only the copies. Store the original diskettes away from your working diskettes. Also, copy your data diskettes regularly, whenever you revise them and store them away from your originals.

If you have a hard disk, you'll probably use it to store the programs and data files you use regularly. Keep backup copies of all your files on diskettes.

You can copy your data in several ways. See your MS-DOS Reference Manual for instructions on using the following commands:

❏ You can use the COPY or XCOPY command to copy individual files or groups of files.

❏ You can use the DISKCOPY command to make an exact duplicate of a diskette.

❏ You can use the BACKUP command to back up hard disk files to diskettes. Because BACKUP can split large files across two or more diskettes, it makes more efficient use of diskette space than COPY or XCOPY.

Using a Hard Disk Drive

Using a hard disk is similar to using a diskette. However, the hard disk provides several advantages:

❏ A 40MB hard disk can store as much data as approximately thirty-three 1.2MB diskettes, and a 100MB hard disk can store as much data as approximately eighty-two 1.2MB diskettes.

❏ Your computer can perform all disk-related operations faster.

❏ You can store frequently used programs and data files on the hard disk, eliminating the inconvenience of swapping diskettes to access different files.

The added storage capacity makes it easy to move back and forth between different programs and data files. However, because it is so easy to add programs and files to your hard disk, you may find yourself trying to organize hundreds of files.

MS-DOS lets you keep related files together in directories and subdirectories so they are easy to find and use. See your MS-DOS Reference Manual for instructions on managing your files and directories.

A hard disk must be partitioned and formatted before you can use it. Be sure you have performed the procedures in your MS-DOS Installation Guide to prepare your hard disk for use.

Backing up the hard disk

While the hard disk is very reliable, it is essential to back up your hard disk files to diskettes in case you lose some data accidentally. Make copies of all your system and application program diskettes before copying the programs to the hard disk. After you create data files on the hard disk, be sure to copy them to diskettes whenever you revise them to keep your backup diskettes up-to-date.

Caring for your hard *disk* drive

Follow these precautions to protect your hard disk drive from damage and to avoid losing data:

❏ Never turn off or reset the computer when the hard disk access light is on. This light indicates that the computer is copying data to or from the hard disk. If you interrupt this process, you can lose data.

❏ Never attempt to open the hard disk drive. The disk itself is enclosed in a sealed container to protect it from dust.

❏ Before you move your computer even a short distance, you may need to run the HDSIT program to prepare the hard disk for moving, as described below.

Preparing *the hard disk for moving*

If you need to move your computer to a new location, you may want to run the HDSIT program-provided on your Reference diskette-to protect the hard disk during the move.

HDSIT moves (or *parks)* the disk drive's read/write heads to a region on the disk surface that does not contain data, and locks them securely in position. This protects the hard disk from being damaged if the computer is bumped accidentally.

Many hard disk drives, including all Epson drives, automatically park their heads when you turn off the computer. If your hard disk drive does not do this, or if you are not sure that it does, be sure to run HDSIT.

Follow these steps to run HDSIT:

1. Insert the Reference diskette in drive A. Then type A : and press **Enter** to log onto that drive.

2. Type the following and press **Enter:**

    HDSIT

You see a message on the screen that tells you the disk drive's read/write heads will remain locked until you reset the computer or turn the power off and on again. The computer locks the heads and disables the keyboard. Remove any diskettes and turn off the computer. You are now ready to move it to the new location.

Note

For convenience, you may want to copy the following two files from the Reference diskette to your hard disk:

  HDSIT.COM   HDSIT.VER

Then, when you want to run HDSIT, just log onto the directory on your hard disk where you stored the files, type **HDSIT**, and press **Enter.** See your MS-DOS Reference manual for instructions on using the COPY command.

If you have a 5¼-inch diskette drive and you still have the original diskette drive protector card, you may want to insert it into the drive prior to shipping your computer to protect the read/write heads.

Chapter 4
Enhancing System Operations

This chapter tells you how to use the following procedures to enhance the operation of your computer:

❏ Using AUTOEXEC.BAT and other batch files

❏ Changing the processor speed

❏ Using expanded memory beyond 640KB

❏ Using the VGA utilities.

Using AUTOEXEC.BAT and Other Batch Files

As you get used to using MS-DOS and your application programs, you may find that there are commands you need to run frequently. You can automate the execution of these commands by listing them in a special file called a *batch* file. When you type the name of the batch file and press **Enter,** MS-DOS executes the commands in the file just as if you had typed each command from the keyboard.

If you have a word processing program that can save a file as a text-only file (sometimes called an ASCII file), you can use it to create a batch file. You can also use the MS-DOS COPY or EDLIN command, or a text editor, to create the file.

One batch file that you may find particularly useful is called AUTOEXEC.BAT. Every time you turn on your computer, MS-DOS looks for the AUTOEXEC.BAT file and automatically executes each of the commands.

When you install MS-DOS, it creates an AUTOEXEC.BAT file
for you. To modify the file or replace it with a new one, you
can use the COPY or EDLIN command, a text editor, or a
word processing program that can save a file as a text-only
file. However, be sure to name the file AUTOEXEC.BAT and
store it in the root directory of the hard disk or diskette from
which you load MS-DOS.

See your MS-DOS Reference Manual for more information
about creating and using batch files.

Changing the Processor Speed

Your computer's processor can operate at two speeds: high
and low. High speed is 16 MHz, low is 8 MHz. On high, the
computer can access memory faster than on low. Your
processor is set to operate at high speed (by default) in the
SETUP program unless you change the speed to low or set the
speed to change automatically.

Note
When your computer is operating at high speed, the
TURBO light on the front panel is on, and it is off when
operating at low speed.

You should use high speed for almost everything you do
since your programs will work faster. However, certain
application programs have specific timing requirements for
diskette access and can run only at the slower speed. See your
software manual to determine if this is the case.

Some copy-protected programs require the computer to run
at low speed while accessing the program on a diskette. These
programs also usually require you to leave a key disk-the
diskette that contains the copy protection-in the diskette
drive. If you use a copy-protected program often, you may
want to set your processor speed to change automatically to
low speed when accessing the diskette and return to high
speed when it is finished.

There are different types of copy-protected programs. Depending on the type you have, you may or may not want to set the processor to automatic speed. Follow these guidelines:

❏ If you are using a copy-protected program that can run only on a diskette or that requires a key disk, try to start the program on high speed. If this works, you do not need to set the speed to change automatically. If you can't load the program on high, set the speed to change automatically.

❏ If you are using a copy-protected program that does not require a key disk but requires a special procedure to install the program on a hard disk, set the speed to low while you are installing the program. Once it is installed, set the speed to high, where you should be able to leave it while you load and run the program.

If this does not work, try installing *and* loading the program at low speed and then change to high speed to run it. Do not set the speed to change automatically.

There are three ways to change the processor speed:

❏ Run the SETUP program

❏ Enter a keyboard command

❏ Run the ESPEED program.

If you frequently use programs that require the processor to operate at low speed or require the automatic speed change when your computer is accessing a diskette, use SETUP to change the processor speed. See Chapter 2 for instructions.

If you use these programs only occasionally, you should use the keyboard commands or the ESPEED program (described below) to change the processor speed.

Entering Keyboard Commands

You can change the processor speed by entering one of the commands shown in the following table.

Speed setting commands

Main keyboard commands	Numeric keypad commands	Speed setting
Ctrl Alt 2	Ctrl Alt +	16 MHz
Ctrl Alt 1	Ctrl Alt –	8 MHz

To enter these commands, hold down the **Ctrl** key and the **Alt** key simultaneously and then press the 2, +, **1,** or - key. Use the + or - key on the numeric keypad or the **1** or 2 key on the main keyboard.

Note
You can use the commands listed above while you are running a program. However, if the program uses one of the same commands for another function, you cannot use it to change the processor speed. For example, if you are running a program that uses the **Ctrl Alt** - command to move the cursor, you cannot enter Ctrl **Alt** - to change the processor speed to low. Another alternative is to use the ESPEED program, described below.

The speed setting remains in effect until you press the RESET button or turn off the computer, or until you change it again using the SETUP program, another keyboard command, or the ESPEED program.

Using the ESPEED Program

ESPEED provides an easy way to change the processor speed
if your application program does not recognize the **Ctrl**
keyboard commands or if you want to include the program
command in a batch file.

The ESPEED program is provided with your system on the
Reference diskette. If you do not have a hard disk, insert your
Reference diskette in drive A and log onto drive A before you
enter the command to start the program.

If you have a hard disk drive, copy the file ESPEED.COM
from your Reference diskette onto your hard disk and run the
program from there.

For information on how to run the ESPEED program, type
the following at the MS-DOS command prompt and press
Enter:

>   **ESPEED ?**

You see this display:

>   **Format: ESPEED [H¦L¦?]**

> **No Parm : Displays current CPU Speed**
> **H   : Set to High Speed**
> **L   : Set to Low Speed**
> **?   : Help Message**

The message tells you the switches you should use to set the
speed to high or low. For example, to select low speed, type
the following and press **Enter:**

>   **ESPEED L**

To change the processor speed back to high, enter this
command:

>   **ESPEED H**

To display the current CPU speed, type **ES P E ED** only and press **Enter.** You see the following:

```
                <+>   :  Speed Up
16. 0   MHz  <- >   :   Speed Down
                <Esc> :  Exit
```

To change the speed when you see this display, press the + or - key; then press **Esc** to exit.

The processor speed you set remains in effect until you change it using the ESPEED program again, a keyboard command, or the SETUP program; or until you press the **RESET** button or turn off the computer.

Entering the ESPEED command in a batch file

You may want to run the ESPEED program by including the command in a batch file. For example, if you have a program called SLOWDOWN which requires a slower processor speed, you could include the following commands in a batch file to start the SLOWDOWN program:

ESPEED L
SLOWDOWN

You could name the batch file SLOW.BAT. Whenever you need to run the SLOWDOWN program, insert the program diskette in drive A. Then type S **LOW** and press **Enter. The** computer changes the speed to low and starts the SLOWDOWN program.

See your MS-DOS Reference Manual for instructions on creating and using batch files.

Using Expanded Memory Beyond 640KB

The Equity 386SX/16 PLUS comes with 2MB of random access memory. MS-DOS and your application programs that run under MS-DOS use the first 640KB of memory. You can use any memory above 1MB as extended memory (up to 16MB) or expanded memory (up to 24MB).

Shadow RAM uses 128KB of the RAM available between 640KB and 1MB in your system (384KB). If you use the shadow RAM feature, 256KB of this memory is available for use as extended or expanded memory. If you do not use shadow RAM, you can use all of the 384KB of RAM as extended memory but only 256KB of it as expanded memory (to allow room for the expanded memory page frame).

Expanded memory is required by certain programs (such as Lotus 1-2-3) that support the Lotus/Intel/Microsoft Expanded Memory Specification (LIM 4.0 EMS). To take advantage of expanded memory, you need to use a memory manager to convert the computer's extended memory to expanded memory. If you do not have another memory manager (such as HIMEM), you can use the one provided on your Reference diskette, EMM386SX.SYS. Follow the steps given below.

> **Note**
> Microsoft Windows comes with its own expanded memory manager. Do not use EMM386SX.SYS (or the EMS Size SETUP option) if you are installing Windows on your system. See your Windows documentation for more information.

1. Run the SETUP program to allocate the amount of memory you want to use as expanded memory. See "EMS Size" in Chapter 2 for instructions.

2. Copy the file EMM386SX.SYS from your Reference diskette to the root directory of your hard disk (or the Startup diskette).

3. Add a command to the CONFIG.SYS file to include the memory manager as a device driver, as described in the next section. The CONFIG.SYS file is used by MS-DOS to set up the computer's system configuration requirements.

Modifying the CONFIG.SYS File

If you have a word processing program that can save a file as a text-only file (also called an ASCII file), you can use it to add the memory manager to the CONFIG.SYS file. Follow these steps:

1. Start your word processing program.

2. Load the file CONFIG.SYS and add the following command line:

   DEVICE=EMM386SX. SYS

   For information on optional parameters, see "Using EMM386SX.SYS options," below.

   Note
   you can copy the EMM386SX.SYS file to a directory other than the root directory as long as you either enter that directory in a PATH command (for example, in your AUTOEXEC.BAT file), or include the pathname on the DEVICE= command line. For example, if EMM386SX.SYS is in the directory \DRV on drive C, include the pathname like this:

   DEVICE=C: \DRV\EMM386SX. SYS

   If you plan to use any of your expanded memory to create a virtual disk with the MS-DOS VDISK device driver, be sure to insert the EMM386SX.SYS command line before the VDISK command line in your CONFIG.SYS file. See your MS-DOS Reference Manual for information about VDISK.

3. Save the file as an ASCII text file.

4. Reset the computer.

If you do not have a word processing program capable of
saving an ASCII text file, you can modify CONFIG.SYS using
the MS-DOS EDLIN or COPY CON command, or a text
editor. See your MS-DOS Reference Manual for instructions.

Using EMM386SX.SYS options

You can include optional parameters in the DEVICE=
command line to tailor the way the memory manager works.
The table below summarizes the EMM386SX.SYS parameters.

EMM386SX.SYS *parameters*

Parameter	Description
/D or-D	**Tells EMM386SX.SYS to run expanded memory diagnostics each time you load the driver**
/M[n] or -M[n]	**Specifies the page frame address**
/P[nnn] or -P[nnn]	**Specifies the maximum number of handles (process IDs) available to EMM386SX.SYS**
/X[nnnn-nnnn] or *-X[nnnn-nnnn]*	**Specifies a hexadecimal memory address range to exclude from expanded memory mapping**

The D parameter specifies whether you want EMM386SX.SYS
to run diagnostics on your expanded memory page frame
each time you load the program. It does not run the
diagnostics unless you include the D parameter.

The M[n] parameter specifies a particular 64KB page frame
address for EMM386SX.SYS. The value n must be a number
from 1 to 9 to indicate one of the following addresses:

n	Moves the page frame to this address
1	0C0000h
2	0C4000h
3	0C8000h
4	0CC000h
5 *	0D0000h
6	0D4000h
7	0D8000h
8	0DC000h
9	0E0000h

* Default setting

For example, to specify a page frame address of 0CC000h,
add the following command line to your CONFIGSYS file:

   DEVICE-EMM386SX. SYS   /M4

Note
If you have installed an EGA or VGA display adapter card,
you cannot enter the following values for *n*:
   /M1   -M1   /M2   -M2

The P[nnn] parameter specifies the number of handles (or
process IDs) available to EMM386SX.SYS. The value for nnn
must be in the range of 64 to 256. The default value is 64.

The X[nnnn-nnnn] parameter specifies a hexadecimal
memory address range to exclude from mapping by
EMM386SX.SYS. The first address (nnnn) is the beginning
address of the range and the second address (nnnn) is the
ending address.

EMM386SX.SYS automatically excludes from mapping any addresses that are reserved for use by your system ROM and RAM. If you install an option card, such as a network card, that uses the memory address range C000 through E000, include the X parameter in the DEVICE= command line to exclude this memory range from expanded memory mapping.

For more information about your system's memory, see "System Memory Map" in Appendix A.

Using the VGA Utilities

Your built-in VGA (video graphics array) display adapter supports both standard VGA monitors and multi-frequency monitors with analog connectors. The VGA adapter operates in all standard VGA resolutions without requiring any device drivers. However, if you are using a monitor that supports extended VGA features, you may want to use one or more of the device drivers provided on the Utility diskettes that came with your computer.

You need to install the VGA device drivers if you want to use extended VGA features such as these:

❏ Resolutions up to 800 x 600 in graphics modes with 16 colors

❏ 132-column text mode in 16 colors

❏ Graphics cursor movement performed by the built-in VGA hardware.

You can use the VGA utilities (also provided on the Utility diskettes) to take advantage of other special features of your VGA adapter. Even if you do not use any device drivers, you may want to install some of the VGA utilities, such as the following:

VGAMODE   Provides 132-column text in text-based
                programs such as Wordstar® and
                WordPerfect®.

SETVGA   Sets the built-in VGA adapter to emulate
                the operation of other adapters, such as
                Hercules@ and CGA adapters.

SNOOZE   Turns off your VGA display when you
                have not used your computer for a
                specified period of time.

The VGA device drivers and utilities are described in the VGA Utilities booklet that came with your system.

Installing and Removing Options

You can enhance the performance of your computer by adding a variety of options, including the following:

❏ Option cards

❏ Memory modules

❏ A math coprocessor.

An option card is a circuit board you install in your computer to add a particular function. Most option cards contain a device, such as a modem, or provide an interface, such as a connector to which you connect to a network. This chapter describes how to install option cards and configure your computer for use with them.

Memory modules-also called SIMMs (single inline memory modules)-allow you to increase the amount of memory in your computer. This chapter describes the types and amounts of SIMMs you can use in your computer. If you want to install memory modules, you may prefer to ask your dealer to do it for you. You can, however, follow the instructions in this chapter to install them yourself.

Note
It is best not to expand your system's memory by installing an optional memory card. Using memory modules is more efficient since you do not need to use one of your option slots to add memory. Your computer can also access memory installed on memory modules faster than memory installed on a card.

A math coprocessor speeds up the numeric calculations your computer performs when using certain application software. If you purchase a math coprocessor, it is a good idea to ask your dealer to install it for you, because it can be damaged easily. If you decide to install it yourself, follow the appropriate steps in this chapter.

This chapter also explains how to change the jumper settings inside the computer. You may need to change jumper settings if you install certain types of options or if you want to change the way your computer operates.

If you need to replace the battery for your computer's real-time clock and CMOS RAM, you can follow the instructions in this chapter.

To change jumper settings, replace the battery, or install any of the options mentioned above, you need to remove the cover from the computer. You may also need to remove the subassembly. Be sure to heed all the warnings in this chapter so you do not injure yourself or damage the computer.

Removing the Cover

To access any internal components, you need to remove the computer's cover. Follow these steps:

1. Turn off the computer and then any peripheral devices (including the monitor and printer).

2. Disconnect the computer's power cable from the electrical outlet and from the back panel. Then disconnect any cables that are connected to the computer, including the keyboard cable.

3. If the monitor is on top of the computer, lift it off and set it to one side.

4. Turn the computer around so you are facing the back panel. The cover is secured by a large screw on the back panel, as shown below. Turn the screw counterclockwise to unlock the cover.

screw
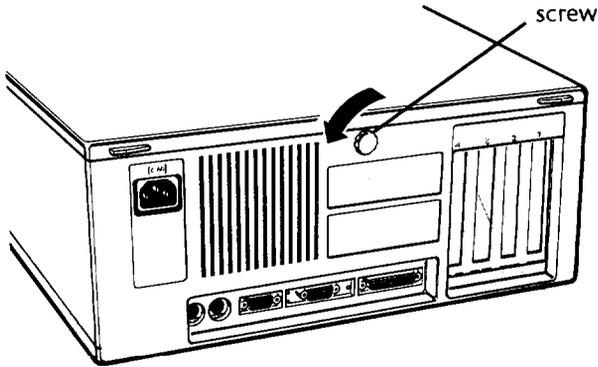
5. The cover is also secured by two latches on the back of the cover near the corners. Press both latches inward and then lift up the cover from the back panel. You might meet some resistance from the grounding tabs along the inside of the cover.

latches
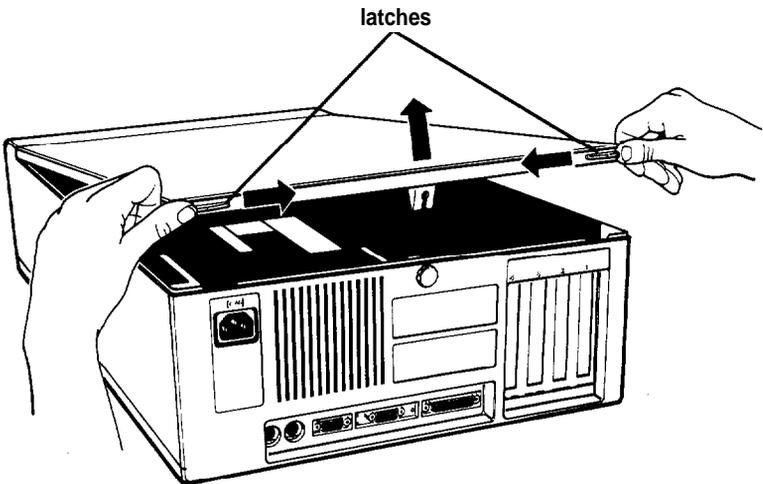
6. Pull the cover away from the front of the computer to completely remove it. Then set it aside.

7. Before you touch any of the components, touch the inside of the computer's back panel, as shown below, to ground yourself and avoid an electric shock.
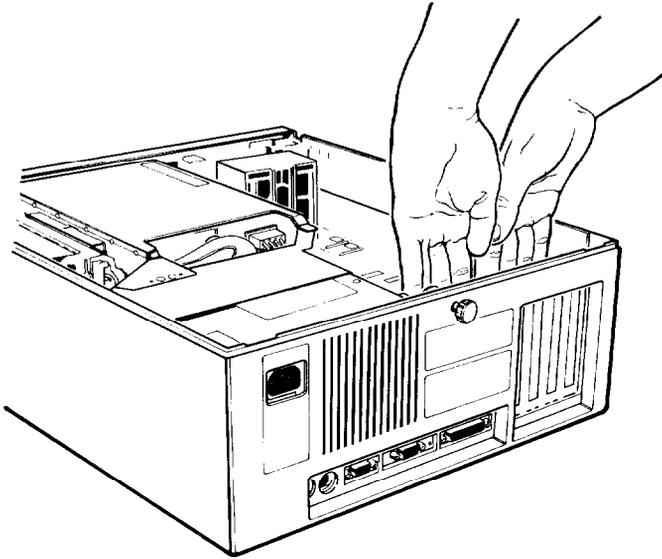
WARNING
Be sure to ground yourself to the inside back panel of the computer every time you remove the cover. If you are not properly grounded, you could generate an electric shock when you touch a component.

Changing the Jumper Settings

If you change your computer's configuration or need to alter the way it operates, you may need to change a jumper setting inside the computer.

A jumper is a small electrical connector that controls one of the computer's functions. The jumper settings in your computer are preset at the factory; however, you can alter the following functions by changing the standard settings:

❏ Enable or disable the built-in VGA display adapter

❏ Enable or disable the password function

❏ Set the computer to use a color or monochrome monitor

❏ Enable or disable the built-in mouse connector.

If you need to change any jumper settings, follow the instructions in this section.

Setting the Jumpers

The illustration below shows the locations of the jumpers on your computer's main system board.
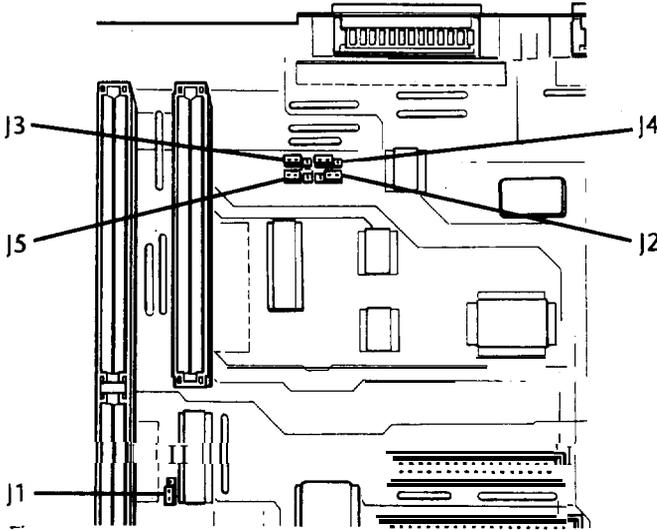
A jumper's setting is determined by where the jumper is placed on the pins. It connects either pin A and the middle pin (position A) or pin B and the middle pin (position B), as shown below.
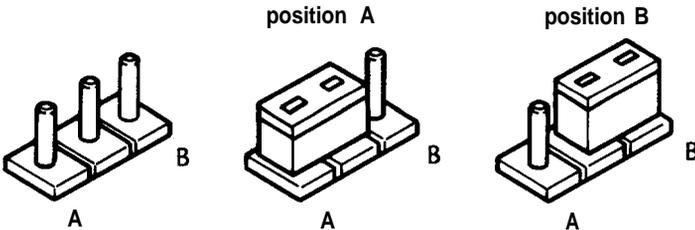
To move a jumper from one position to the other, use needle-nose pliers or tweezers to pull it off its pins and gently move it to the desired position.

Caution
Be careful not to bend the jumper pins or damage any surrounding components on the main system board.

The following table lists the jumper settings and their functions.

Main system board jumper settings

Jumper number	Jumper setting	Function
J1	A	Disables the built-in VGA display adapter so you can use a display adapter on an option card in your computer as your primary adapter
	B*	Enables the built-in VGA display adapter
J2	A	Disables the password function
	B*	Enables the password function
J3	A*	A color monitor is installed
	B	A monochrome monitor is installed
J4	A*	Enables the built-in mouse connector
	B	Disables the built-in mouse connector so you can use a mouse or other pointing device connected to a port on an option card in your computer
J5	A*	Enables the IRQ9 signal for the built-in VGA display adapter
	B	Enables the IRQ9 signal for a display adapter on an option card

* Factory setting

If you need to change any jumper settings, follow these steps:

1. Remove any option cards that may be blocking your access to the jumpers. See page 5-16 for instructions.

2. Change the jumper settings.

3. Replace any option cards you removed. See "Installing an Option Card" on page 5-12.

4. Follow the instructions on page 5-40 to replace the computer's cover.

Replacing the Battery

Your computer comes with a 3.6 volt lithium battery that provides power for the real-time clock and the CMOS RAM. The real-time clock keeps track of the time for your computer, and the CMOS RAM stores the information about your system configuration that was saved by the SETUP program.

This battery lasts approximately three to five years. If it loses power, you will see an error message when you turn on or reset your computer. Contact your dealer to obtain a replacement battery pack. Your dealer can also install the battery for you. If you want to replace the battery yourself, you can follow the instructions in this section.

Note
When the battery runs out, your computer loses the information stored in the CMOS RAM and the time stored in the real-time clock. After you replace the battery, you must run the SETUP program to reconfigure your system and set the real-time clock.

If necessary, follow the instructions on page 5-2 to remove the computer's cover. Then follow these steps to replace the battery:

1. Turn the computer so that the front panel is facing you. The battery is attached to the bottom of the computer case, just behind the front panel, as shown below.
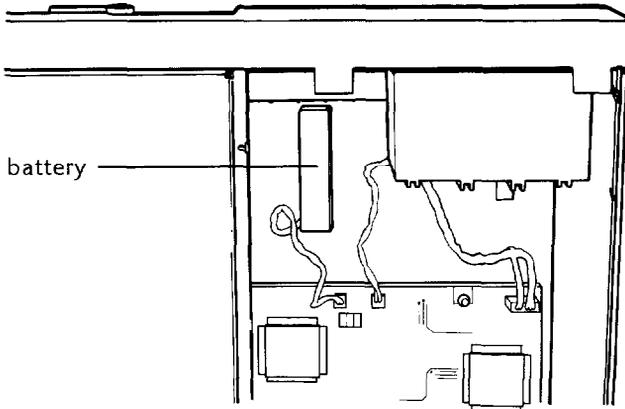

To disconnect the battery from the main system board, pull up on the connector plugged into socket CN1, as shown below.
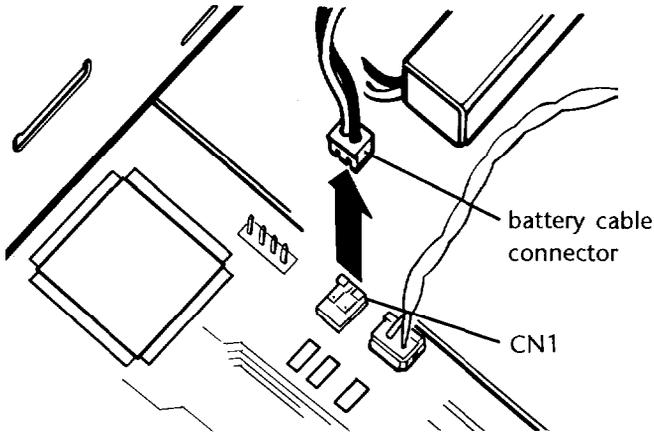
2. The battery is attached to the computer with Velcro?
    Remove the battery by pulling it up from the bottom of
    the computer case, as shown below. Then set it aside.
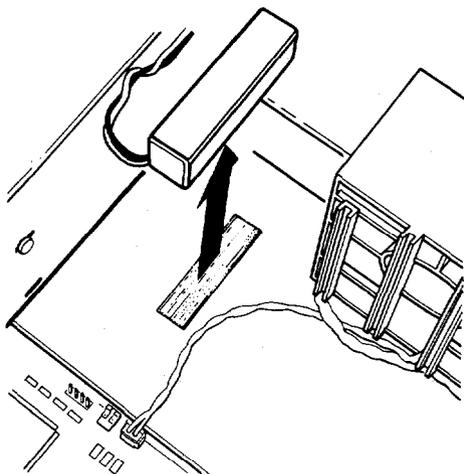
3. Remove the new battery from its package and position it
    so the Velcro faces down and the cable faces connector
    CN1. Then attach it to the bottom of the computer case,
    as shown below.
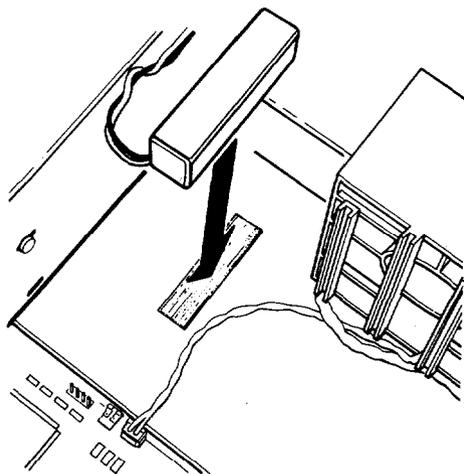
4. Connect the battery cable to connector CN1.

battery cable
connector

CN1
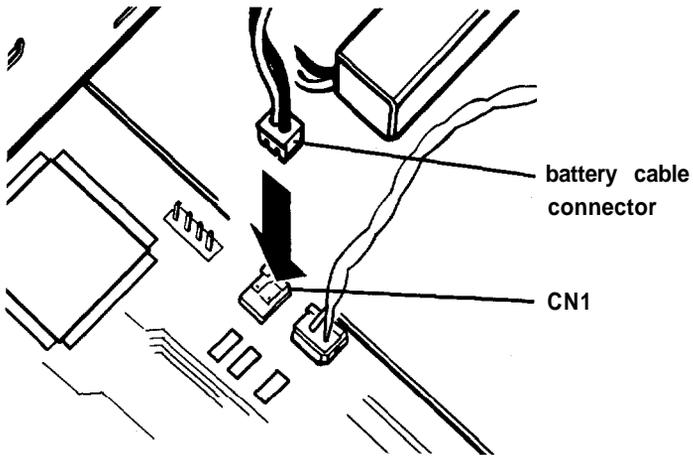
5. Follow the steps on page 5-40 to replace the computer's
   cover. Then run the SETUP program to reconfigure your
   system and reset the time for the real-time clock. See
   Chapter 2 for instructions.

Installing an Option Card

Your computer has four standard option slots: three 16-bit slots and one 8-bit slot. Each slot can accommodate an option card. You can buy option cards from authorized Epson dealers as well as other vendors.

This section explains how to install option cards in your computer. If you need to remove an option card later (to access jumpers, memory modules, or a math coprocessor), see "Removing an Option Card" on page 5-16 for instructions.

Nate
After you install or remove an option card, see "Post-installation Setup" at the end of this chapter for information about reconfiguring your computer.

The illustration below shows the four standard option slots inside your computer.
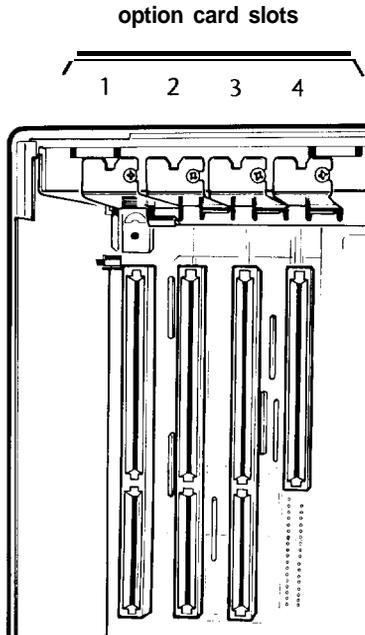
option card slots

Slots 1 through 3 are designed for 16-bit option cards and slot 4 is designed for an 8-bit card. As you can see below, a 16-bit card has an extra connector along the bottom.
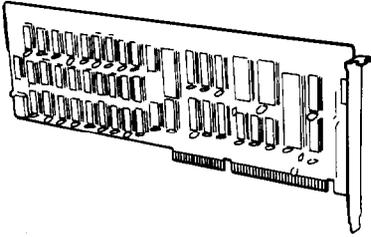
16-bit option card　　　　　　**8-bit option card**
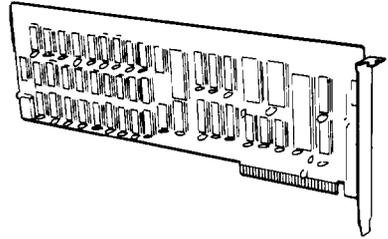
Usually it does not matter which slot an option card occupies as long as the card fits in the slot. For example, you can place some 8-bit cards in a 16-bit slot. However, you must follow these guidelines when deciding which slot to use:

❏ An 8-bit card with an additional tab along the bottom must go into an 8-bit slot.

❏ If you install a disk drive controller card, place the card as close as possible to the drive it is controlling.

❏ Some option cards must be installed in a specific slot. Consult the instructions that come with the card to see if this is the case.

Follow these steps to install an option card:

1. If you have not already done so, remove the cover from the computer. (See page 5-2 for instructions.)

   WARNING
   After you remove the cover, touch the inside back panel of the computer to ground yourself and avoid an electric shock.

2. If you are installing an option card that controls a mouse, you need to change the setting of jumper J4 on the main system board before you install the card. If you install a display adapter card, you may need to change the settings of jumpers J1, J3, and J5. See page 5-7 for instructions.

3. Remove the retaining screw from the top of the metal option slot cover; hold on to the screw so it doesn't fall into the computer. Lift out the slot cover.
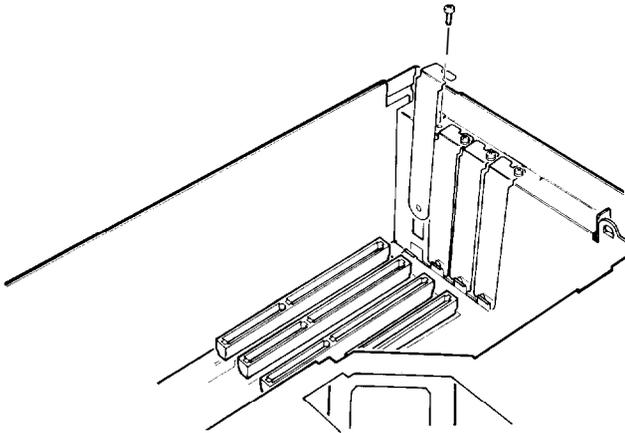
   Keep the screw to secure the option card to the computer. Store the slot cover in a safe place in case you remove the option card later.

4. Unpack the option card and adjust any switches or jumpers on it, if necessary. (Check the option card instructions.) When you handle the card, be careful not to touch any of the components on the circuit board or the gold-edged connectors. If you need to set it down before you install it, place it gently on top of its original packing material with the component side facing up. Keep the packing materials in case you remove the card later.

5. Grip the card firmly by the top corners and make sure the connectors point down, as shown below.
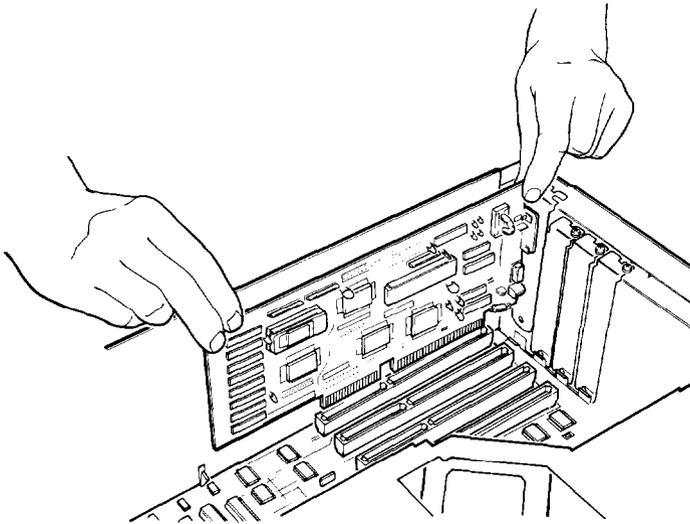
6. Insert the card into the slot, guiding it straight down. Once the connectors reach the slot, push the card downward firmly (but carefully) to insert it fully. You should feel the card fit into place.

   If the card does not go in smoothly, do not force it; pull it all the way out and try again, keeping it straight as you insert it. Examine the card to verify that it is fully seated in the slot along the length of the connector.

7. Secure the end of the card to the back of the computer with the retaining screw.
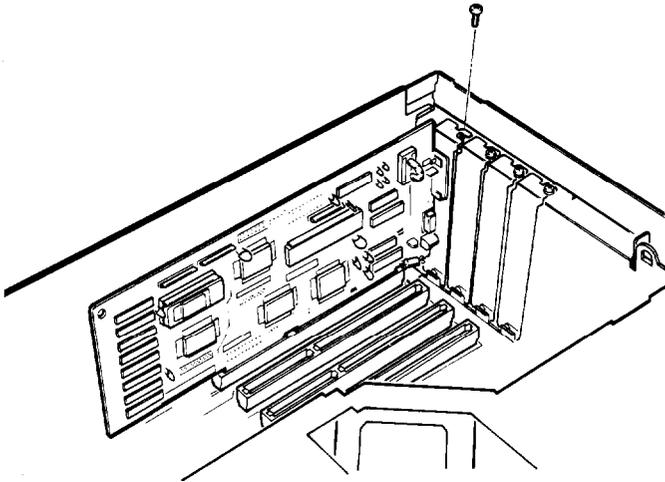
8. Follow the instructions at the end of this chapter to replace the cover. Then see "Post-installation Setup," following that section.

Removing an Option Card

If you need to remove an option card, follow these steps:

1. First, remove the cover from the computer. See page 5-2 for instructions.

2. Remove the screw securing the card to the back of the computer and pull it straight up and out of the slot. Either set the card aside by placing it gently on a soft surface with the component side facing up or carefully wrap the card, preferably with the original packing materials, and place it inside its box for safe storage.

3. Cover the option slot opening with the original metal cover and secure it with the retaining screw.

4. If you are removing an option card that controls a mouse, you need to change the setting of jumper J4 on the main system board. If you are removing a display adapter card, you may need to change the settings of jumpers J1, J3, and J5. See page 5-7 for instructions.

5. Replace the cover. See page 5-40 for instructions.

Removing the Subassembly

You need to remove the subassembly to access the SIMM sockets and the math coprocessor socket on your computer's main system board. The subassembly is the large metal casing that holds the horizontal drive bays and the power supply, as shown below.
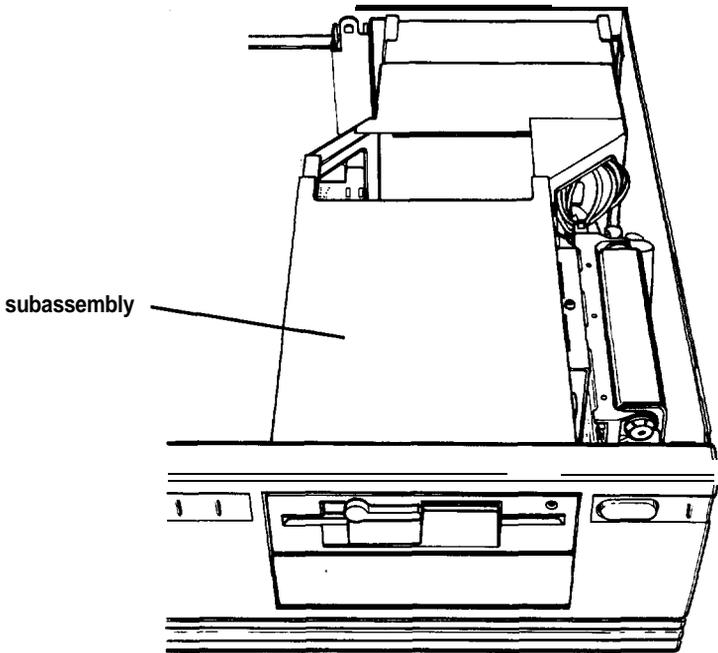
Follow these steps to remove the subassembly:

1. Remove the front panel from the computer by lifting up slightly on the three clips at the top of the panel and tilting it toward you. Then set it aside.

clips
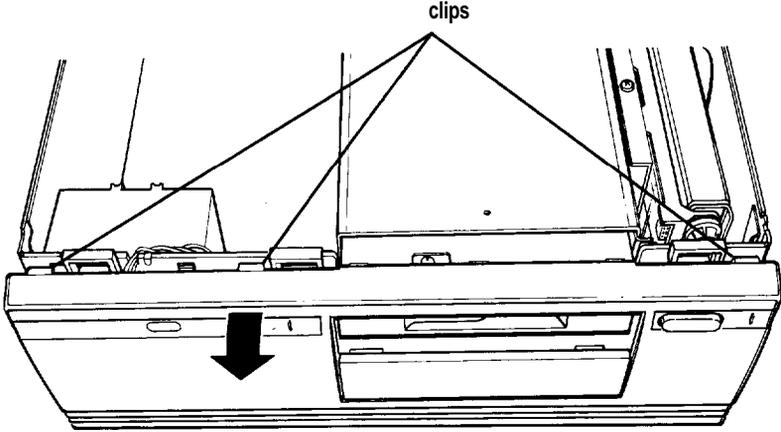
2. If you have a hard disk drive, the drive cable is connected to the main system board on the left side of the subassembly, as shown below.

diskette
drive cable

hard disk
drive cable
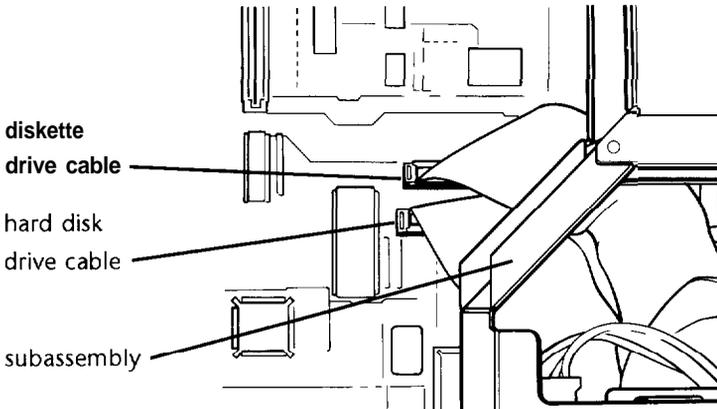
subassembly

Grasp the connector and pull it straight up to remove it from the socket. Do not pull only on the cable.

3. The diskette drive cable is connected to the socket behind the hard disk drive socket; disconnect it in the same manner.

4. To lift the subassembly from the front of the computer, place your thumbs under the diskette drive and grasp the top edge of the computer with the rest of your fingers, as shown in the following illustration. (If you have a diskette drive installed in the lower horizontal drive bay, place your thumbs underneath that drive instead.)
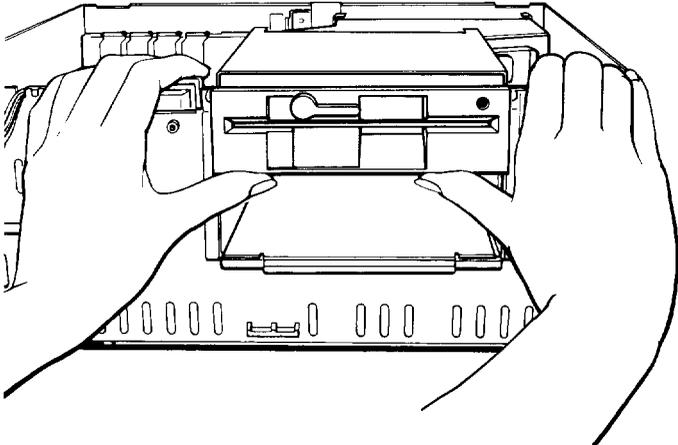
5. Raise the front of the subassembly, as shown below.
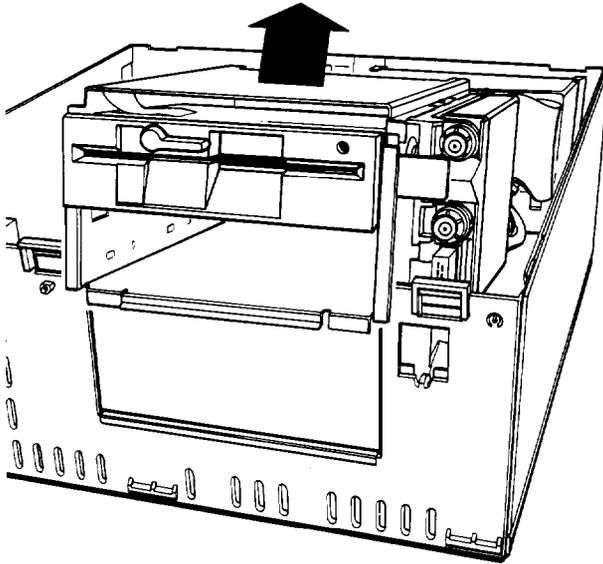
6. Reach back underneath the subassembly and disconnect
    the two power supply cables connected to the right side
    of the main system board, as shown below. Pull each
    connector straight up. Do not pull only on the cables.
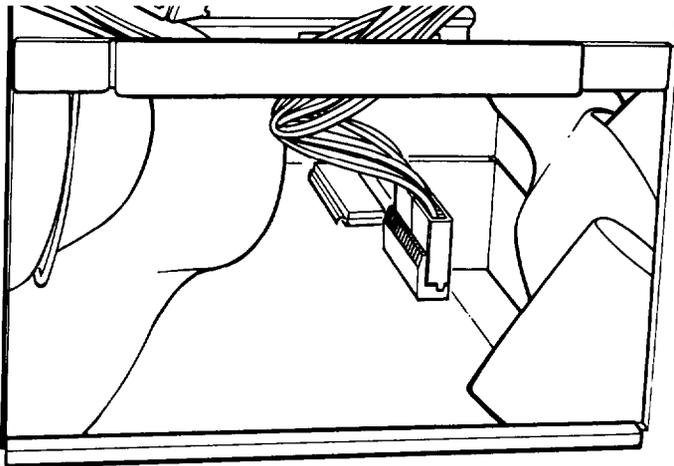
7. Lift the entire subassembly out of the computer and carefully place it on your work surface.

Adding Memory Modules

Your computer comes with 2MB of memory soldered directly onto the main system board. By installing SIMMs (single inline memory modules), you can increase the memory in your computer up to 24MB. The first 16MB can be used as either extended or expanded; any memory above 16MB can be used only as expanded. You can install 256KB, 1MB, or 4MB SIMMs, as described in this section.

Caution
It is best to have your dealer install memory modules for you because they can be damaged easily if installed incorrectly. If you prefer, you can install them yourself by carefully following the instructions in this section. However, you could transmit an electrostatic discharge and damage your components; so read this entire section before you begin.

Before you install SIMMs, check the following guidelines to ensure that they will work properly:

❏ Use fast page mode SIMMs that operate at an access speed of 80ns (nanoseconds) or faster. Be sure all the SIMMs operate at the same speed.

❏ The Equity 386SX/16 PLUS can use any industry standard SIMM; however, you should use Epson SIMM option kits to ensure reliability and compatibility.

❏ Use the correct SIMM configuration to add the amount of memory you want. See the table on the next page.

Once you have the SIMMs you need, you or your dealer can install them in your computer. If you are going to install them yourself, follow the instructions in this section.

Installing Memory Modules

There are six SIMM sockets on the main system board organized in three banks consisting of two sockets each. The sockets are labeled SIMM1 through SIMM6.

The following table shows all the possible SIMM configurations for your computer. Do not install SIMMs in any configuration that is not listed below. Keep in mind that 2MB of memory is already soldered directly on the main system board.

SIMM configurations for the Equity 386SX/16 PLUS

| Bank 1 sockets		Bank 2 sockets		Bank 3 sockets		
SIMM1	SIMM2	SIMM3	SIMM4	SIMM5	SIMM6	Total memory
K	K	K	K			3MB
1	1					4MB
1	1	K	K	K	K	5MB
1	1	1	1			6MB
1	1	1	1	1	1	8MB
4	4					10MB
4	4	K	K	K	K	11MB
1	1	4	4			12MB
4	4	4	4			18MB *
1	1	4	4	4	4	20MB *
4	4	4	4	4	4	24MB ● †

K=256KB SIMM   1=1MB SIMM   4=4MB SIMM

* **If you install this amount of system memory, only 16MB of it can be used as extended memory. Any memory above 16MB must be used as expanded memory.**

† **If you install 24MB of total memory on SIMMs, the computer disables the 2MB of memory soldered on your main system board.**

Follow these steps to install SIMM:

1. Remove the computer's cover. See page 5-2.

2. Remove the subassembly. See page 5-17.

3. The SIMM sockets are located on the front of the main system board near the math coprocessor socket, as shown below.

SIMM sockets

SIMM6
SIMM5
SIMM4
SIMM3
SIMM2
SIMM1

math coprocessor socket
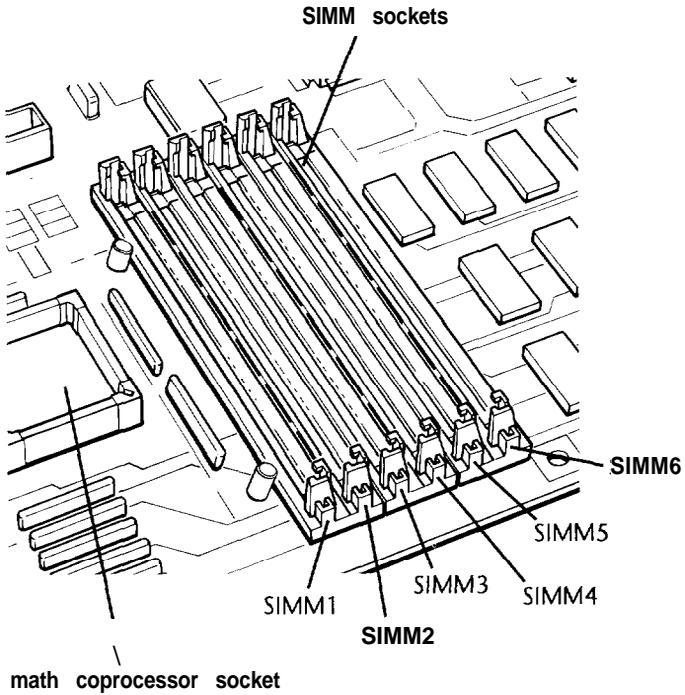
4. Install the SIMMs in the sockets closest to the right side of the main system board first. Position each SIMM so the notch on its edge faces the front of the computer and place it on the left side of the tabs at an angle, as shown below.
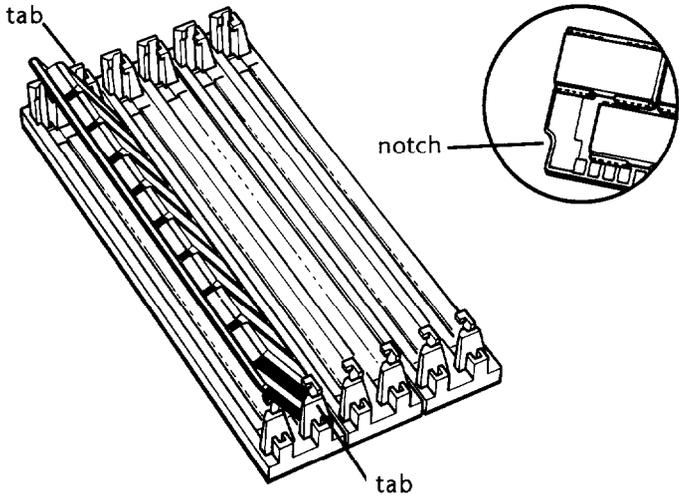
5. Gently push down on the SIMM and, at the same time, guide the top of the SIMM to the right until it is vertical,
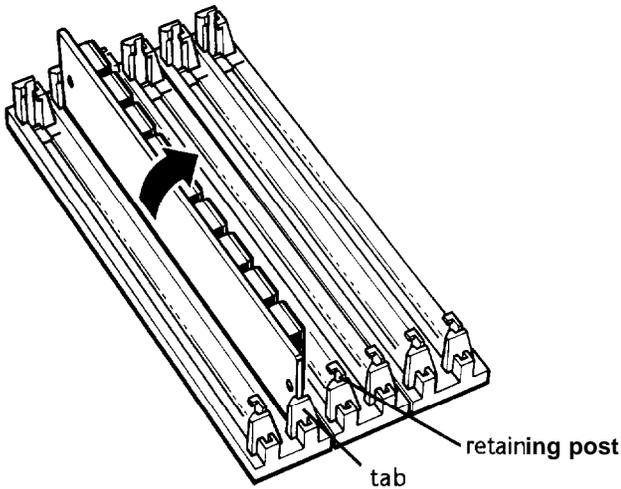
The SIMM should snap into place between the tabs and the retaining posts. If it does not go in smoothly, do not force it; pull it all the way out and try again.

Make sure the SIMM is fully inserted into the socket and that the pins on the retaining posts extend through the holes in both ends.

6. Repeat steps 4 and 5 for each SIMM you want to install.

7. Replace the subassembly. See page 5-32 for instructions.

8. Follow the steps on page 5-40 to replace the computer's cover. Then see "Post-installation Setup" on page 5-42 for instructions on configuring your computer for use with your new memory.

Removing Memory Modules

If you need to remove memory modules from your computer, have your dealer do it for you or follow the steps below. If you remove them yourself, check the table on page 5-22 to be sure you remove SIMMs from the correct sockets.

Caution
It is safer to have your dealer remove SIMMs for you since there is a danger of transmitting an electrostatic discharge and damaging your components.

1. Remove the cover. See page 5-2 for instructions.

2. Remove the subassembly. See page 5-17.

3. The SIMM sockets are located on the front of the main system board near the math coprocessor socket, as shown below.

SIMM sockets

SIMM6

SIMM5

SIMM3   **SIMM4**

SIMM1

SIMM2

math coprocessor socket
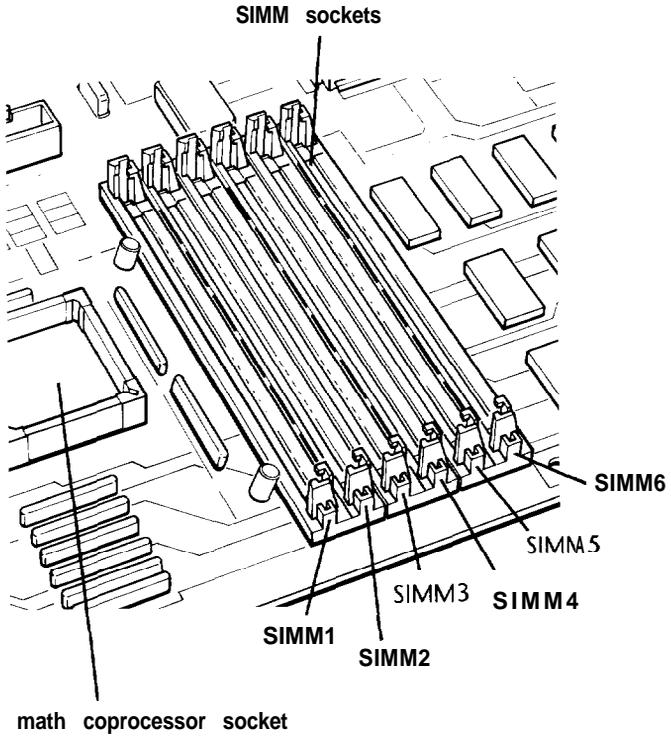
4. Remove the SIMMs in the sockets closest to the left side of the main system board first. Use your fingers or two small screwdrivers to pull away the tabs that secure the SIMM at each end. Be careful not to pull the tabs too far, or they may break.

tab

SIMM

tab
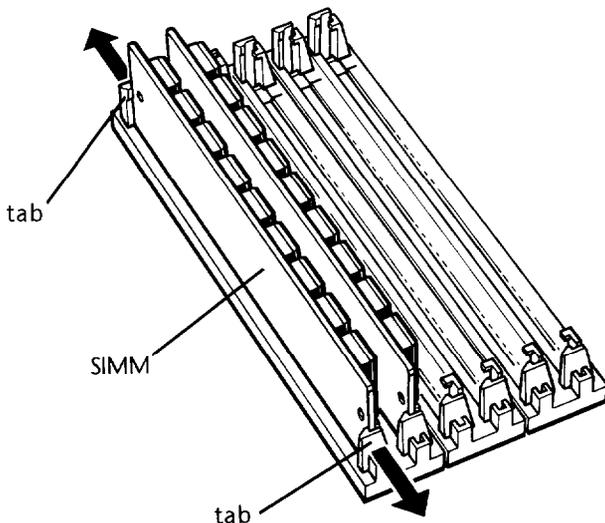
As you pull away the tabs, the SIMM falls to the left. When the SIMM is at an angle, release the tabs and carefully remove it from the socket.

5. Repeat step 4 for each SIMM you need to remove.

6. Replace the subassembly. See page 5-32.

7. Follow the steps on page 5-40 to replace the computer's cover. Then see "Post-installation Setup" on page 5-42 for instructions on configuring your computer for use with your decreased memory.

Installing a Math Coprocessor

Your computer has a socket on the main system board to accommodate an 80387SX, 16 MHz math coprocessor. A math coprocessor speeds up your computer's numeric calculations and graphic image displays when you are using certain application software.

It is best to have your dealer install a math coprocessor for you, since it is a delicate component that can be damaged easily if it is installed incorrectly.

If you install it yourself, be sure to read the manual that came with your math coprocessor, if you received one. Then follow the steps in this section to install it in your computer. Before you begin, be sure to read all of the instructions and warnings carefully so you do not injure yourself or damage the coprocessor or your computer.

Caution
To avoid generating static electricity and damaging your math coprocessor, remain stationary when you install it.

Carefully follow these steps to install a math coprocessor:

1. Remove the computer's cover. See page 5-2 for instructions.

2. Remove the subassembly. See page 5-17.

3. Remove the math coprocessor from its package and set it aside.

4. The math coprocessor socket is located on the front of the main system board near the SIMM sockets, as shown below.

SIMM sockets

math coprocessor socket
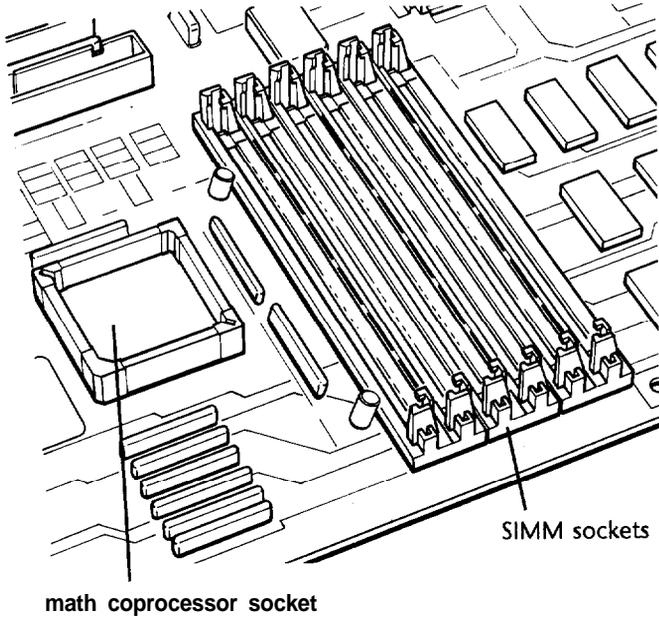
5. The math coprocessor socket is hollow and square, and has a notch in the lower left corner, as shown below.
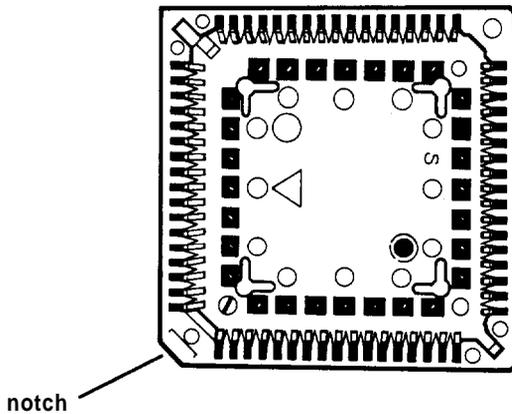
notch

The math coprocessor also has a notch in one corner, marked by a dot, as shown below.
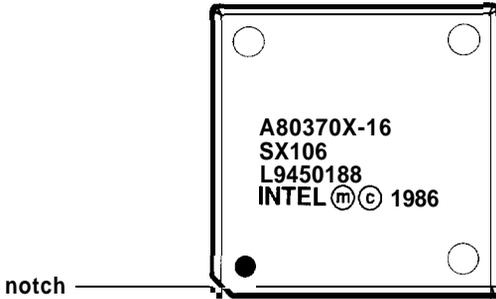

notch

Align the notched corner of the coprocessor with the notched corner of its socket. The notched sides must be aligned for the coprocessor to operate properly, so be sure its position is correct before you go to the next step.

Caution
If you insert the math coprocessor in the wrong position, you could permanently damage it and destroy the components on the main system board.

6. Gently push the coprocessor into the socket, pressing evenly on all sides, as shown below.
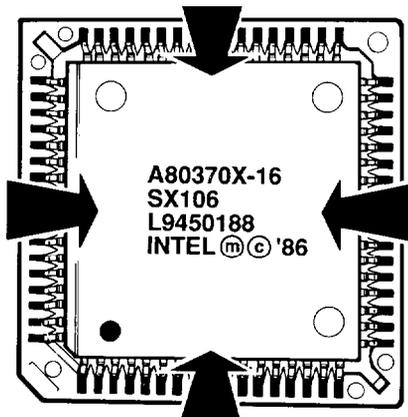
If the coprocessor does not go in smoothly, do not force it; pull it all the way out and try again, keeping it straight as you insert it.

It is completely inserted when the surface of the coprocessor is flush (even) with the surface of the socket. Be sure it is inserted all the way.

7. Replace the subassembly. See page 5-32.

8. Follow the steps on page 5-40 to replace the computer's cover. Then see "Post-installation Setup" on page 5-42 for instructions on configuring your computer for use with your math coprocessor.

Removing a Math Coprocessor

If you need to remove a math coprocessor from your computer, contact your dealer for assistance. You need a special extracting tool to remove the coprocessor without damaging it. Do not attempt to remove it without this tool; you can easily damage it.

Follow the steps described earlier in this chapter to remove the subassembly. Then remove the coprocessor with the tool and replace the subassembly and the computer's cover.

After you remove the coprocessor, run the SETUP program to configure your system for use without it. See Chapter 2 for instructions.
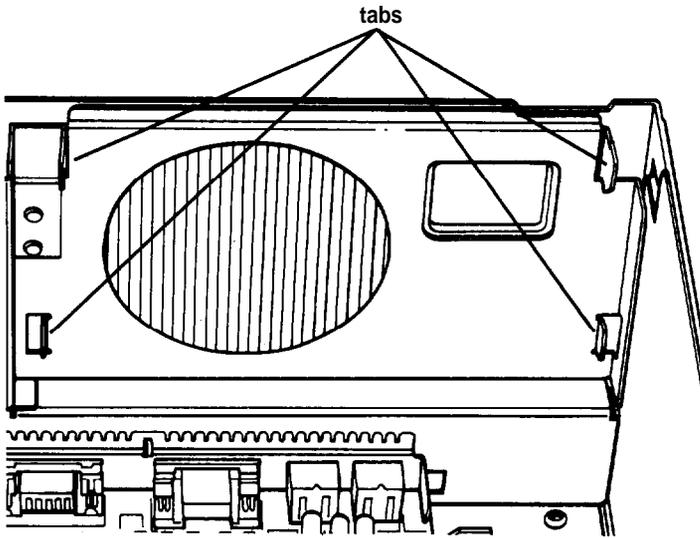
Replacing the Subassembly

Follow the steps below to replace the subassembly inside your computer:

1. Notice that there are four mounting slots on the back of the subassembly: two in the upper corners and two in the lower corners.


lower slots

upper slots
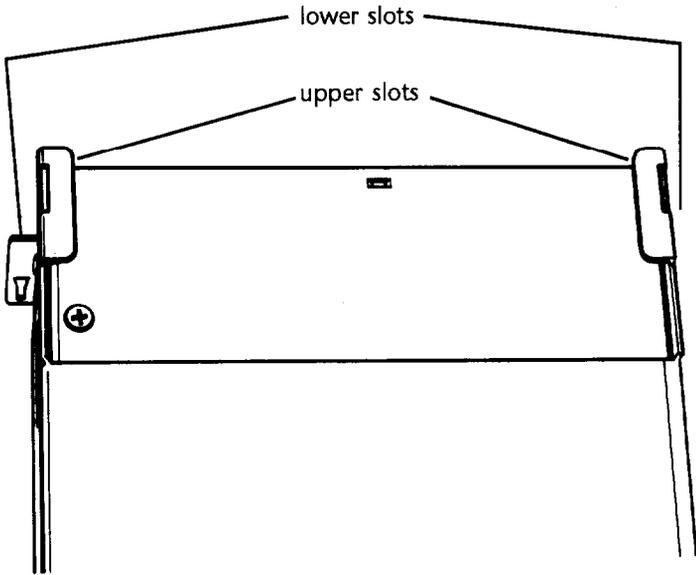
There are four corresponding tabs on the inside back panel of the computer which fit into the openings in the subassembly slots.

tabs

Lift up the subassembly from your work surface and lower the back end into the computer, guiding the top slots on the subassembly into the top tabs on the computer.

2. Hold up the front of the subassembly at a slight angle and arrange the ribbon cables so they curve underneath the subassembly and extend out its left side. Then grasp the two power supply cables, labeled P4 and P5. Each connector has six pin holes and a large tab on one side, as shown below.
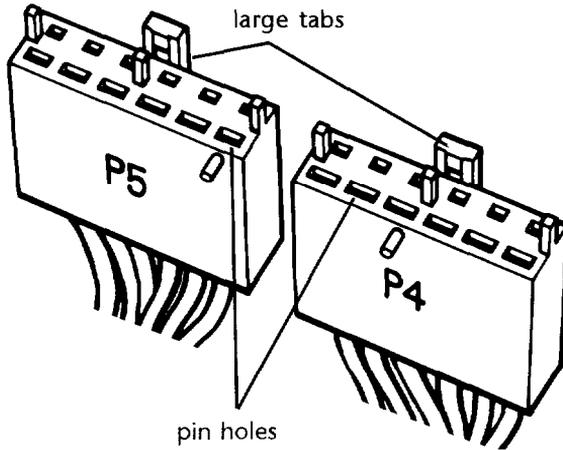
There is one 12-pin power supply socket on the right side of the main system board (toward the back) that holds both of the power supply connectors, as shown below.
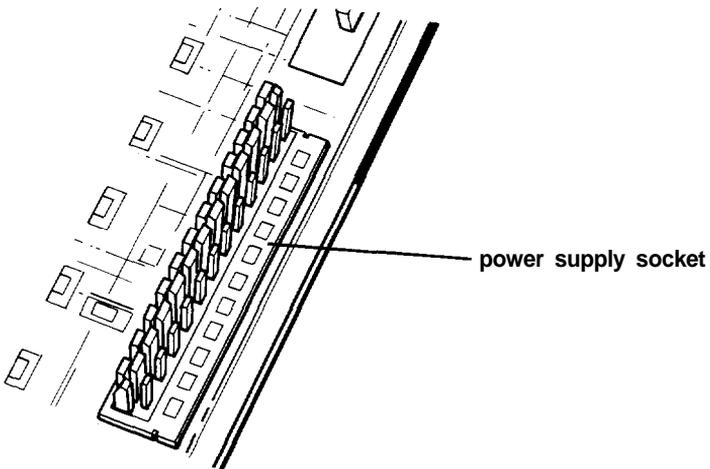
3. Position power supply connector P4 so the large tab on the connector faces the right side of the computer. Beginning with the six pins toward the back of the computer, carefully line up the holes in the connector with the pins in the socket and then push in the connector.
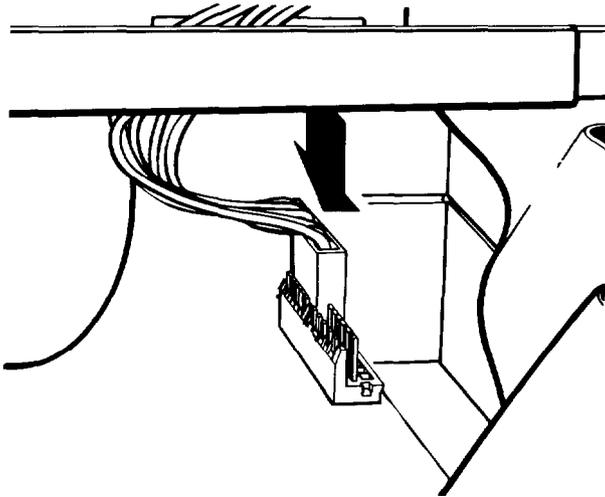
Caution
If you do not correctly align the holes with the pins in the socket, you could severely damage your computer when you push in the connector.

4. Connect power supply connector P5 to the remaining six pins in the socket using the same procedure.

5. Carefully lower the front of the subassembly onto the computer. Make sure that all four tabs on the back of the computer are inserted into the slots on the subassembly as you lower it.

large tab
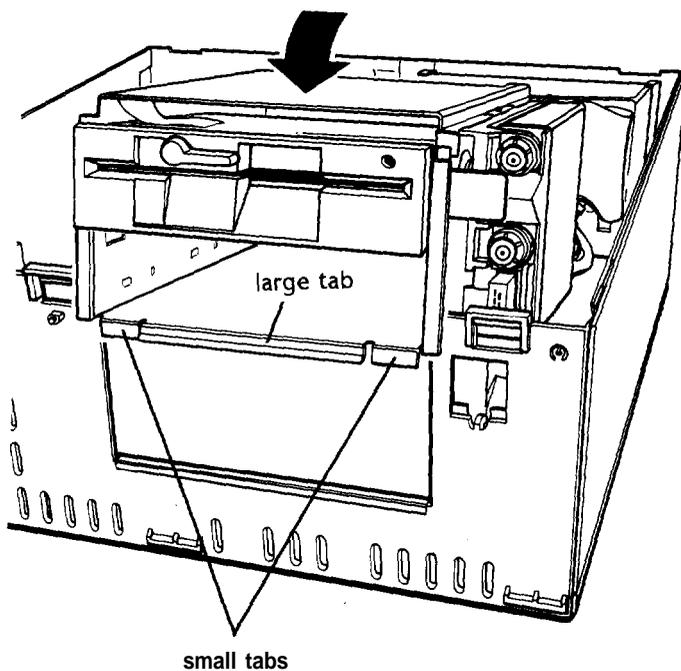
small tabs

Guide the tabs on the front of the subassembly over the
opening in the front of the computer so the two small
tabs sit behind the opening and the large tab with the
curved lip sits over the front of the opening. If necessary,
press on the large tab until the subassembly snaps into
place.

6. Locate the hard disk drive and diskette drive ribbon
   cables. (The hard disk drive cable is slightly longer than
   the diskette drive cable.) Look at the back of each drive to
   make sure you know which cable is which.

Both the diskette drive and hard disk drive sockets are located on the main system board on the left side of the subassembly, as shown below.

diskette
drive socket

hard disk
drive socket

subassembly - - E I -
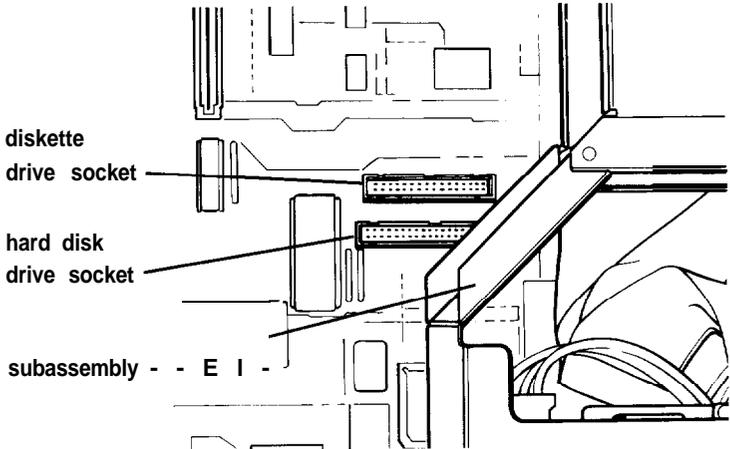
Both sockets have a notch on one side. Connect the diskette drive cable first. As shown below, there is a tab on one side of the connector.

diskette drive connector

-tab

diskette drive socket
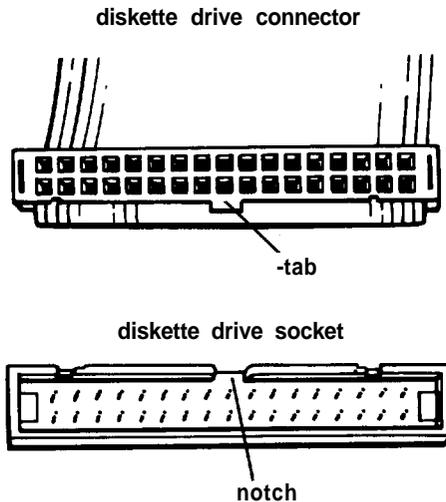
notch

Align the connector with the socket so the tab on the
connector lines up with the notch in the socket. Make
sure the holes in the connector fit over all the pins in the
socket and then push in the connector.

Caution
If you do not correctly align the holes with the pins,
you could severely damage your computer when you
push in the connector.

7. Now connect the hard disk drive cable in the same
manner.

8. To replace the front panel, fit the three ridged tabs on its
bottom edge into the three notches on the lower edge of
the computer, as shown below.

tabs
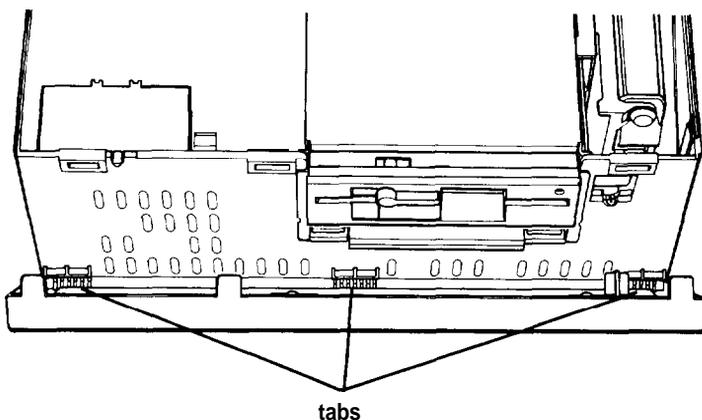
9. Tilt up the front panel until the clips on the top of the
panel touch the computer. Then push on the top of the
panel until it clicks into place.

10. Follow the steps on page 5-40 to replace the computer's
cover. Then see "Post-installation Setup" on page 5-42 for
instructions on configuring your computer.

Replacing the Cover

Follow these steps to replace the computer's cover:

1. Facing the back of the computer, hold the cover so that the side with three tabs on the edge faces away from you, as shown below.
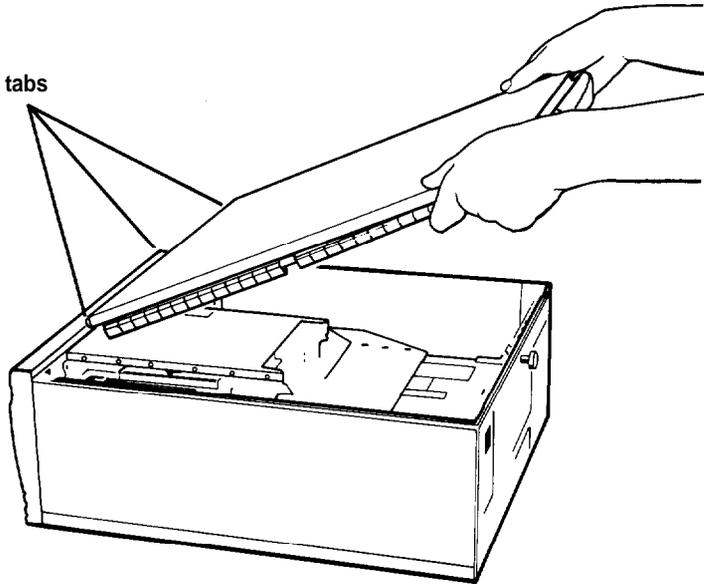
tabs

2. Insert the three tabs into the three notches in the back of the front panel of the computer.

3. Lower the back of the cover onto the computer and press down firmly on all edges of the cover to form a tight seal.

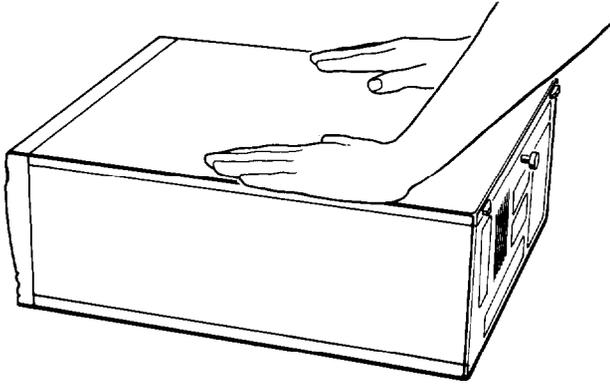4. Turn the large screw on the back panel clockwise to secure the cover to the computer.

5. Reconnect the computer to the monitor, printer, keyboard, and any other peripheral devices you have. Then reconnect the power cable to the back of the computer and to an electrical outlet.

Post-installation Setup for Memory Cards

After you install an optional memory card, you need to configure your computer to use it. Follow these guidelines:

❏ Run the SETUP program to reset your computer's configuration to include the memory on your memory card. See Chapter 2 for instructions.

❏ Use the setup program that comes with your memory card to configure the computer for use with your particular card. See your memory card manual for instructions.

❏ If you want to use any of the memory on your card as *expanded* memory, see "Using Expanded Memory Beyond 640KB" in Chapter 4.

Also see "Post-installation Setup," below, for more information on setting up your computer for use with an option card.

Post-installation Setup

After you install or remove options such as memory modules, a math coprocessor, or a disk drive, you need to run the SETUP program to update the computer's configuration information. For example, if you add a hard disk drive, you need to let the computer know the type of drive you have installed. See Chapter 2 for instructions.

If you replaced the battery for the real-time clock and CMOS RAM, you must run SETUP to reconfigure your system and reset the clock. See Chapter 2.

Note
If you installed additional extended memory and want to use any of it as expanded memory, see "Using Expanded Memory Beyond 640KB" in Chapter 4 for instructions.

If you install a hard disk drive that has never received a hardware level format (such as some non-Epson hard disk drives), you need to format the disk. Check the manual that came with your drive, and then, if necessary, follow the instructions in Appendix C to format your new hard disk.

If you have added a hard disk drive and you want to load MS-DOS or another operating system from that drive, you need to install the operating system on it. See your MS-DOS Installation Guide or the documentation that came with your operating system for instructions.

If you install an optional memory card, use the setup program that comes with it to configure the computer for use with the card. See your memory card manual for instructions.

Additionally, you may need to add some commands to your configuration files. See your MS-DOS Reference Manual and the manual that comes with your optional equipment for instructions.

You may also want to test a newly-installed option. Some options come with their own diagnostics test programs, and you can use the diagnostic programs on your Reference diskette to test the following:

❏ System memory

❏ Serial and parallel ports

❏ Disk drives

❏ Monitors and display adapters.

See Appendix C for instructions.

Appendix A
Specifications

CPU and Memory

16-bit CPU	80386SX microprocessor, 16 MHz system clock speed, 16 MHz or 8 MHz processor speed; user selectable
	0 wait state memory access speed at 16 MHz
System memory	2MB RAM standard; expandable using 256KB, 1MB, or 4MB SIMMs up to 24MB (the first 16MB can be extended or expanded memory; above 16MB can be only expanded memory); SIMM access speed must be 80ns or faster
ROM	128KB (includes system BIOS and VGA BIOS)
Shadow RAM	0 wait state access speed; system ROM BIOS and video ROM can be copied into RAM through SETUP
Math coprocessor (optional)	80387SX, 16 MHz support
Clock/calendar	Real-time clock, calendar, and CMOS RAM for configuration; battery backup
Battery	Replaceable, 3.6V lithium battery; 3-5 year life

Controllers

Diskette	Supports up to two drives in any of four formats: 5¼-inch, high-density, 1.2MB; 5¼-inch, double-density, 360KB; 3½-inch, high-density, 1.44MB; 3½-inch, double-density, 720KB; controller on main system board
Hard disk	Supports up to two drives; embedded controllers; interface on main system board

Interfaces

Monitor	Standard VGA with 256KB of video memory; supports up to 800 x 600 pixels in 16-color or gray scale mode; 15-pin, D-shell connector
Serial	RS-232C, programmable, asynchronous; 9-pin, D-shell connector
Parallel	Standard 8-bit parallel, mono-directional; 25-pin, D-shell connector
Mouse	Mini DIN, 6-pin connector for PS/2 compatible mouse or other device
Keyboard	Mini DIN, 6-pin connector for PS/2 compatible keyboard
Option slots	Four standard input/output expansion slots (three 16-bit ISA compatible and one 8-bit ISA compatible); 8 MHz bus speed
Speaker	Internal, programmable

Power Supply

Type	145W, fan-cooled
Input ranges	98 VAC to 132 VAC, 47 Hz to 63 Hz
Maximum outputs	+5 VDC at 18 Amps, +12 VDC at 4.2 Amps
	-12 VDC at 0.3 Amps, -5 VDC at 0.3 Amps

Mass Storage

	Three half-height drives maximum (one vertical mount and two horizontal mounts) configurable using the following drive types:
Diskette drives	5¼-inch diskette drive, 1.2MB (high-density) storage capacity
	3½-inch diskette drive, 1.44MB (high-density) storage capacity
	5¼-inch diskette drive, 360KB (double-density) storage capacity
	3½-inch diskette drive, 720KB (double-density) storage capacity
Hard disk drives	3½-inch form factor hard disk drive(s), up to half height size; the first mounted vertically, second mounted horizontally
Other devices	Half-height tape drive, CD-ROM, or other storage device; 5¼-inch form factor or 3½-inch with 5¼-inch mounting frames

Keyboard

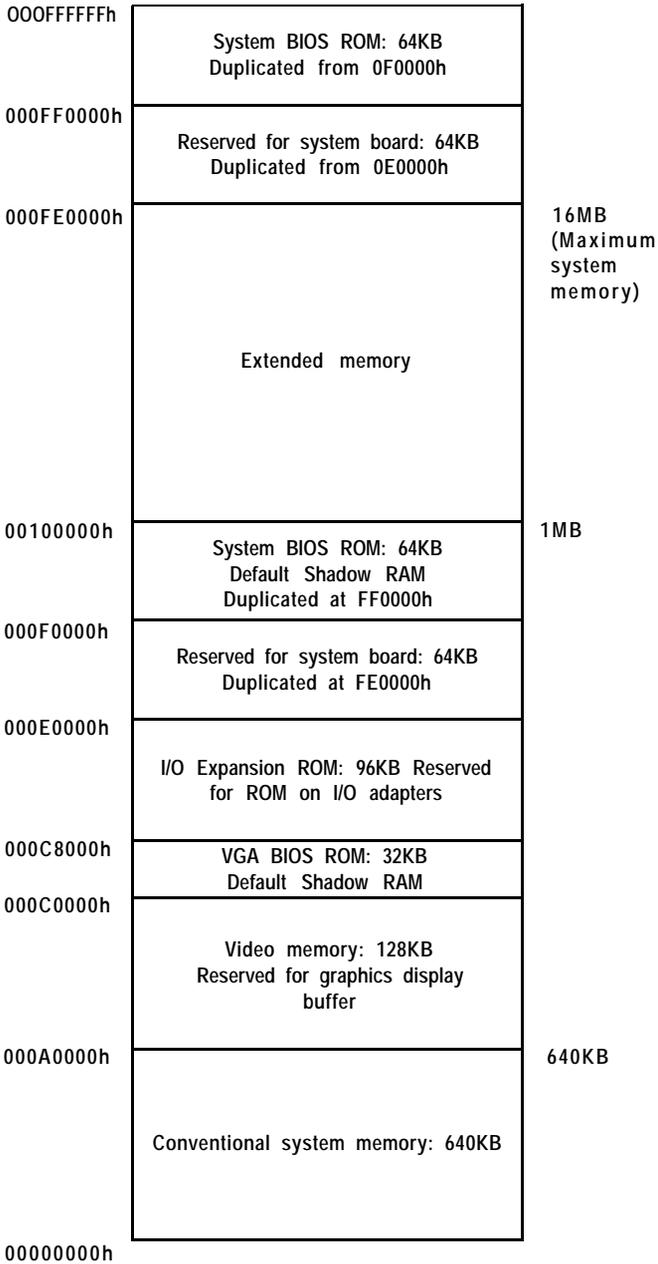|	Detachable, two position; 101 sculpted keys
Layout	58-key QWERTY main keyboard; 17-key numeric/cursor pad; 10 cursor keys; additional 4-key cursor pad; 16 function keys (user-definable)
Function	Four levels (normal, shift, control, alternate); user-definable

Environmental Requirements

Condition	Operating range	Non-operating range	Storage range
Temperature	41° to 95°F (5° to 35° C)	-4° to 140° F (-20° to 60° C)	-4° to 140° F (-20° to 60° C)
Humidity (non-condensing)	20% to 80%	10% to 90%	5% to 95%
Altitude	-330 to 9900 ft (-100 to 3000 m)	-330 to 11880 ft (-100 to 3600 m)	-330 to 39600 ft (-100 to 12000 m)
Maximum wet bulb	68° F (20° C)	104°F (400° C)	* 134°F (57° C)

Physical Characteristics

| Width	14.75 inches (375 mm)
Depth	17.5 inches (444 mm)
Height	5.9 inches (150 mm)
Weight	Single diskette drive model without keyboard: 20.6 lb (9.4 kg)

System Memory Map

```
OOOFFFFFFh  ┌─────────────────────────────┐
            │   System BIOS ROM: 64KB      │
            │   Duplicated from 0F0000h    │
000FF0000h  ├─────────────────────────────┤
            │ Reserved for system board: 64KB │
            │   Duplicated from 0E0000h    │
000FE0000h  ├─────────────────────────────┤   16MB
            │                             │   (Maximum
            │                             │   system
            │                             │   memory)
            │                             │
            │      Extended  memory       │
            │                             │
            │                             │
            │                             │
00100000h   ├─────────────────────────────┤   1MB
            │   System BIOS ROM: 64KB      │
            │   Default Shadow RAM         │
            │   Duplicated at FF0000h      │
000F0000h   ├─────────────────────────────┤
            │ Reserved for system board: 64KB │
            │   Duplicated at FE0000h      │
000E0000h   ├─────────────────────────────┤
            │ I/O Expansion ROM: 96KB Reserved │
            │   for ROM on I/O adapters    │
000C8000h   ├─────────────────────────────┤
            │   VGA BIOS ROM: 32KB         │
            │   Default  Shadow  RAM       │
000C0000h   ├─────────────────────────────┤
            │   Video memory: 128KB        │
            │   Reserved for graphics display │
            │          buffer              │
000A0000h   ├─────────────────────────────┤   640KB
            │                             │
            │                             │
            │ Conventional system memory: 640KB │
            │                             │
            │                             │
00000000h   └─────────────────────────────┘
```

Appendix B
Installing and Removing Disk Drives

This appendix describes how to do the following:

❏ Install a hard disk or diskette drive

❏ Remove a hard disk or diskette drive

❏ Change the hard disk drive jumper settings.

Your system can include up to three drives: either two diskette drives and one hard disk drive or one diskette drive and two hard disk drives. Your computer has two horizontal drive bays and one vertical mounting position to hold the drives, as shown below.
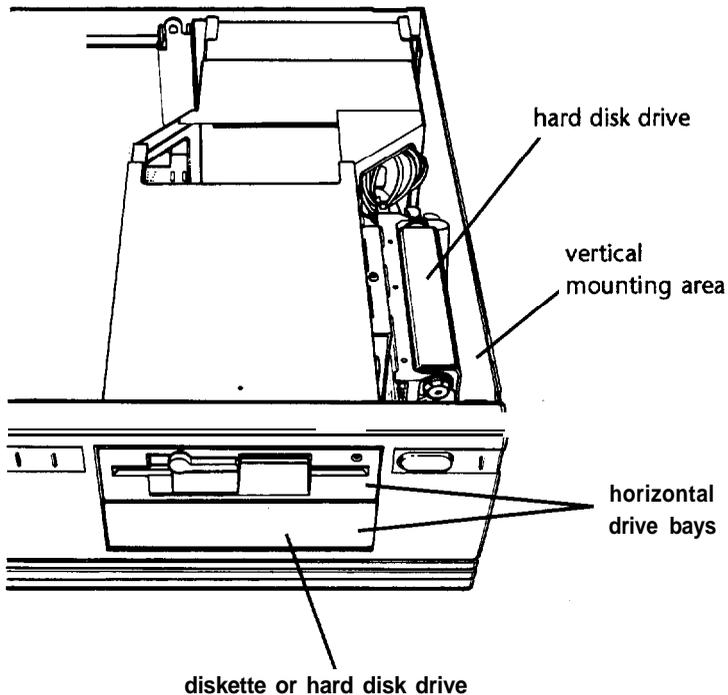
Caution
Installing or removing a disk drive is a complicated procedure, so you may want to ask your dealer to do it for you. If you decide to do it yourself, you must carefully follow all the instructions in this appendix or you could damage your equipment.

Using the Correct Drive Bay

The upper horizontal drive bay probably contains the diskette drive that came with your system. That drive can be one of the following types:

❑ 5¼-inch diskette drive

❑ 3½-inch diskette drive with a 5¼-inch mounting frame installed on it.

You can install an additional drive of one of the following types in the lower horizontal drive bay:

❑ 5¼-inch diskette drive, tape drive, CD-ROM, or other storage device

❑ 3½-inch diskette drive, hard disk drive, or other storage device with 5¼-inch mounting frames installed on it.

Your computer may have come with a hard disk drive already installed in the vertical mounting position. If not, you can install one 3½-inch hard disk drive in this position.

If you are installing your first hard disk drive, it is best to install it in the vertical mounting position. If you add a second hard disk drive or diskette drive, use the lower horizontal drive bay.

How to Use This Appendix

The instructions in this appendix describe how to install and remove optional Epson diskette and hard disk drives. All drives sold by Epson for the Equity 386SX/16 PLUS are qualified and recommended for use in this system. Your drive may look a bit different from the one illustrated in this appendix, but you install it the same way.

If you are installing or removing a non-Epson drive, some of the steps in this appendix may not apply to your drive; see the documentation that came with it for more information.

Each section describes a part of the process you may need to perform. Here are the guidelines:

❏ Before you begin any of the procedures described in this appendix, follow the steps in Chapter 5 to remove the computer's cover.

❏ If you are removing your only hard disk drive, see "Removing a Hard Disk from the Vertical Position" on page B-24.

❏ If you are installing a hard disk drive or removing one and leaving another in the computer, follow the steps under "Setting the Hard Disk Drive Jumpers" on page B-4 first.

❏ If you are installing or removing a diskette drive and there is a hard disk drive installed in the vertical mounting position, see "Removing a Hard Disk from the Vertical Position" on page B-24.

❏ If you are installing or removing a diskette drive and there is no hard disk drive installed in the vertical mounting position, see "Installing or Removing a Disk Drive in the Horizontal Position" on page B-27.

Additional instructions in each section tell you which steps to perform next.

Setting the Hard Disk Drive jumpers

You need to check or change the jumper settings on the hard disk drive if you are installing or removing any hard disk drives. The jumpers tell the computer whether you are using one hard disk drive or two.

> **Note**
> You do not need to set these jumpers if you are removing your only hard disk drive.

If you remove one hard disk drive and leave another in your computer, you need to change the jumper settings on the remaining drive to indicate that you now have only one hard disk drive installed.

If you are installing your first hard disk drive and it is the only one you are going to install, see "Changing the Jumper Settings" on the next page to check the jumpers on your drive.

If you'll be using two hard disk drives, see "Setting the Jumpers for Two Hard Disk Drives," below.

Setting the Jumpers for Two Hard Disk Drives

If you install two hard disk drives in your system, you must change the jumper settings on each drive to indicate which drive is the "master" drive and which is the "slave" drive.

A master drive is the drive on which you'll install the operating system that the computer loads into its memory each time you turn it on. You can run application programs and store data on both the master drive and the slave drive, but the operating system must be contained on the master drive.

Follow the instructions in the next section to change the jumper settings on both of your hard disk drives.

Changing the Jumper Settings

The hard disk drive jumpers are located on the drive's circuit board, near the large cable connector.
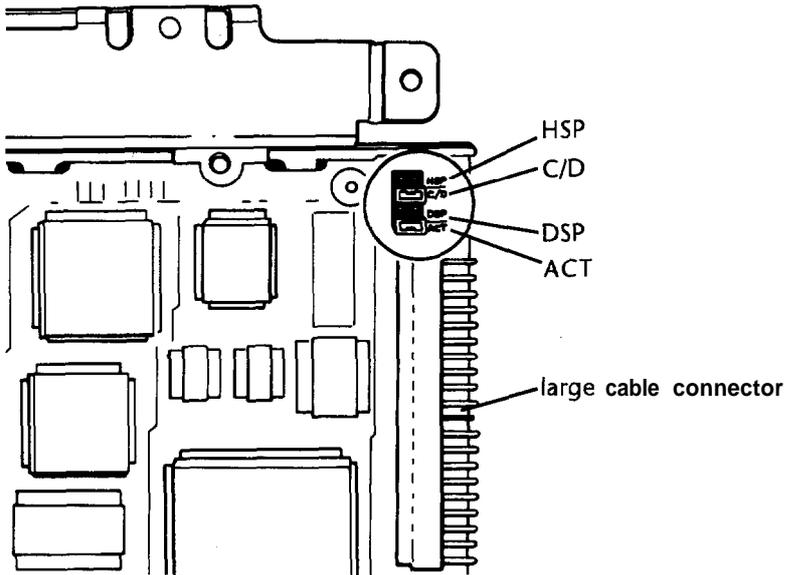
The jumpers on your drive may be in a slightly different location, but you set them the same way.

There are four positions for the jumpers on each hard disk drive. Jumpers are installed in only two of the positions and the other two positions are left open.

The following table lists the jumper settings for all the possible hard disk drive configurations.

Jumper positions	One hard disk drive	Two hard disk drives: master	Two hard disk drives: slave
H S P		-	-
C/D	X	X	
DSP	-	X	-
ACT	X	X	X

X = jumper installed
- = no jumper installed

To move a jumper from one position to the other, use your fingers, needle-nose pliers, or tweezers to pull it off its pins and gently move it to the other position. Be careful not to drop the jumper or damage the pins as you install it.

If you are going to use only one hard disk drive, the jumpers should be set in positions **C/D** and **ACT.** If not, change them to these settings. Then see "Installing a Hard Disk in the Vertical Position" on page B-7 for instructions on installing your first hard disk drive.

If you'll be using two hard disk drives, you have a total of four jumpers for eight jumper positions. Two jumpers are included with each drive. Install three of the jumpers on the master drive in positions **C/D, DSP,** and **ACT.** Install the fourth jumper on the slave drive in position **ACT.**

If you are installing both of your hard disk drives at one time, you should install the drive in the horizontal drive bay first. See "Installing or Removing a Disk Drive in the Horizontal Position" on page B-27 for instructions.

If one of your hard disk drives is already installed in the computer, follow the steps under "Removing a Hard Disk From the Vertical Position" on page B-24 to remove it. Then set the jumpers on both drives while they are out of the computer. The steps in that section tell you which instructions to follow next.

Note
If you are removing one hard disk drive and leaving one in your computer, be sure to set the jumpers on the remaining drive to indicate that you have only one hard disk drive. See the table above for the jumper settings. Then follow the instructions under "Removing a Hard Disk From the Vertical Position" on page B-24 so you can access the jumpers on the drive.

Installing a Hard Disk in the Vertical Position

Follow the instructions in this section to install (or reinstall) a hard disk drive in the vertical mounting position. You may need to perform the following procedures:

❏ Remove the mounting frames from a new hard disk drive

❏ Remove the mounting plate from the computer and connect it to the drive

❏ Install the drive

❏ Connect the drive and power cables.

If you are installing a new drive in the vertical mounting position, you should follow all of the steps in this section. If you are reinstalling a drive that you previously removed from this position, see "Installing the Drive" on page B-12.

Removing the Mounting Frames From the Drive

Your hard disk drive comes with 5 ¼-inch mounting frames attached to each side of the hard disk drive, as shown below.
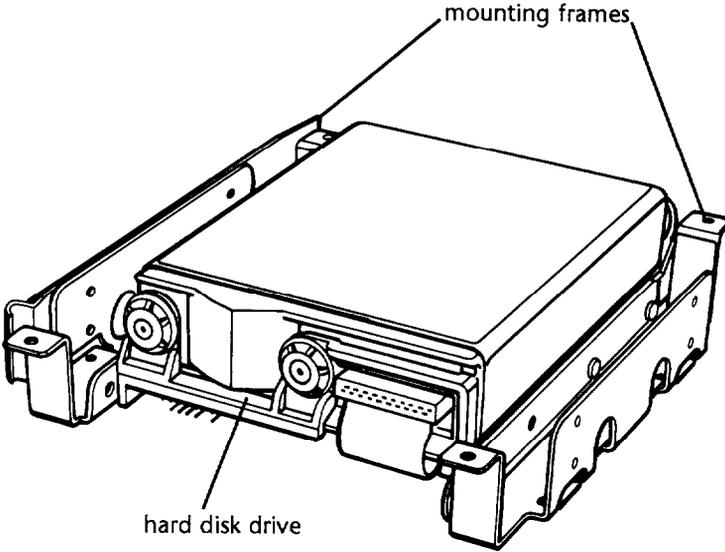
On one side, there may also be a plastic guiderail. Follow these steps to remove the mounting frames (and guiderail) from the drive:

1. If necessary, remove the screws securing the plastic guiderail and the metal grounding plate to one of the mounting frames, as shown below.
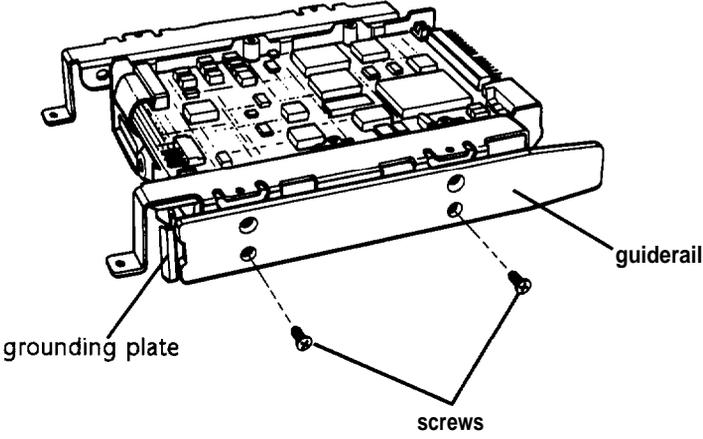
2. Remove the four screws securing the mounting frames to the hard disk drive. There are two screws securing each frame, as shown below.
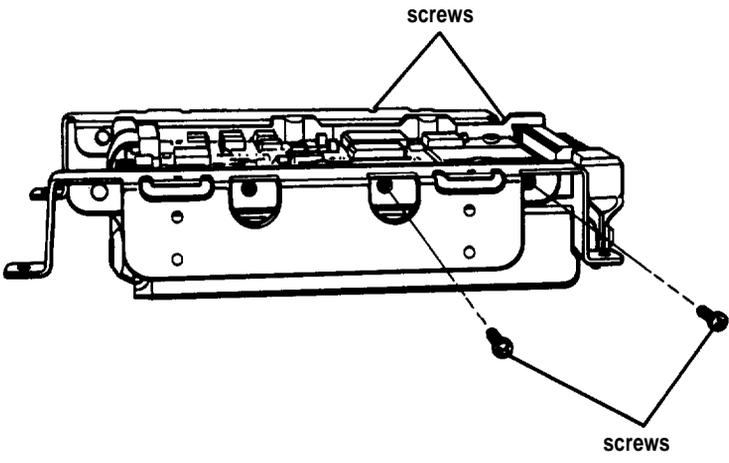
Keep the four screws so you can use them to secure the mounting plate to the hard disk drive. Then set the drive aside with the component side facing up.

Removing and Attaching the Mounting Plate

If you are installing a new hard disk drive in your computer, you need to attach a hard disk drive mounting plate to the drive. This mounting plate is currently attached to the side of the subassembly, as shown below.
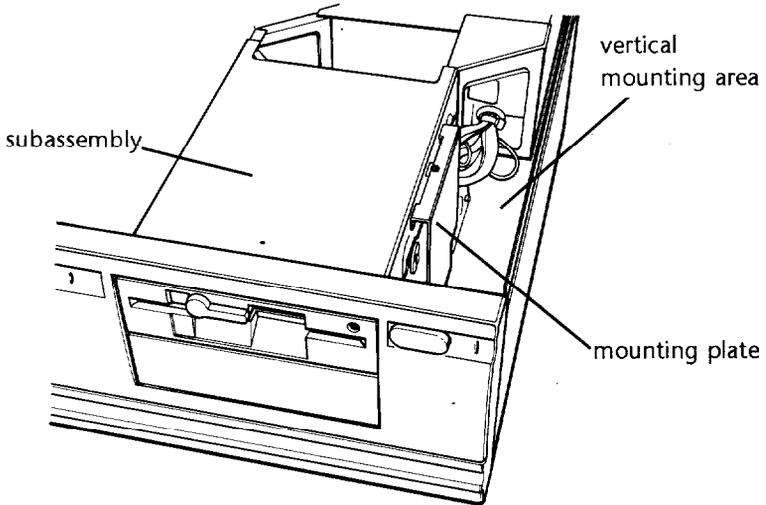
Follow these steps to remove the mounting plate from your computer:

1. Turn the computer so that the front panel is facing you. The vertical mounting area is located behind the front panel on the right side of the subassembly.

2. Remove the screw securing the mounting plate to the computer and set it aside. Then lift up the mounting plate to remove it.

retaining   screw
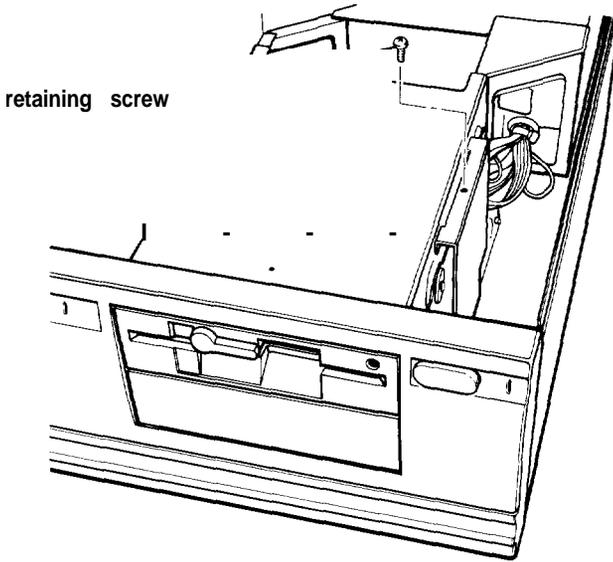
3. Turn your hard disk drive so the components are facing up and the connectors at the back of the drive are facing to the right.

Then place the flat side of the mounting plate on the hard disk drive and align the four holes on the plate with the four holes on the drive, as shown below.
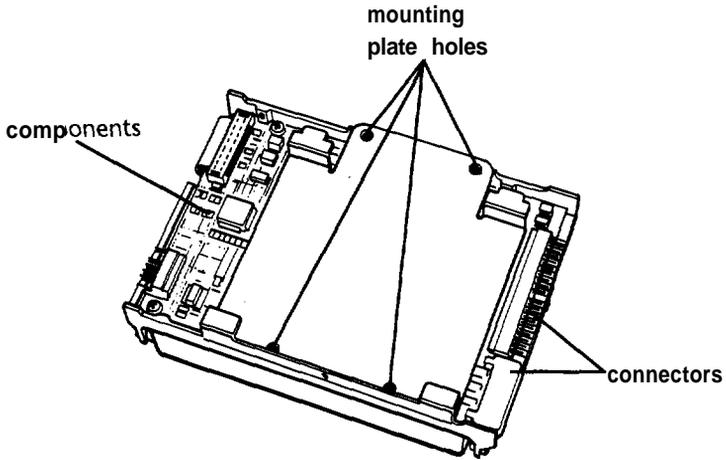
4. Locate the four screws that you removed from the 5¼-inch mounting frames and use them to secure the mounting plate to the hard disk drive.

Installing the Drive

Follow these steps to install the hard disk drive in the vertical mounting position:

1. Locate the hard disk drive ribbon cable that came with your computer. It is a flat cable with three connectors on it (one on each end and one in the middle).

The connector at one end of the cable has two rows of
holes, one of which is blocked with a plug, as shown
below.

The ribbon cable socket on the back of the drive has two
rows of pins. In one of the rows, a pin is missing.

ribbon cable connector
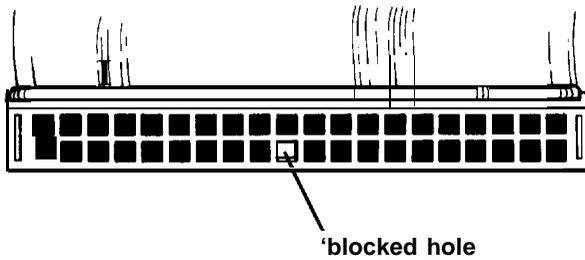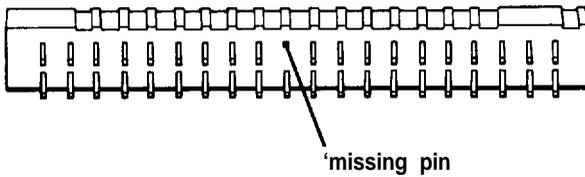
'blocked hole

ribbon cable socket

'missing pin

Align the connector with the socket so that the row in
the connector with the blocked hole lines up with the
row in the socket with the missing pin, as shown below.

missing pin

blocked hole
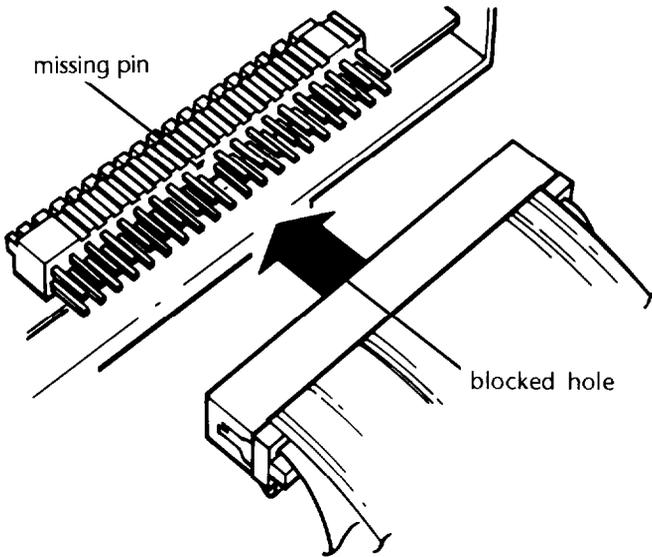
Make sure the holes fit over all the pins and then push in
the connector.

Caution
If you do not correctly align the holes with the pins,
you could severely damage your hard disk drive when
you push in the connector.

2. Place the hard disk drive on top of the subassembly with
    the mounting plate facing up.

3. Locate one of the power supply cables that lead from the power supply in the computer (behind the horizontal drive bays). The cables are labeled P1, P2, and P3; you can use any one. As shown below, the end of the connector has two notched corners.

power supply cable   **power supply socket**

notched corners
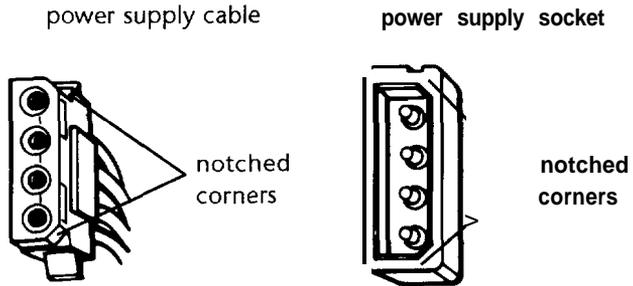
notched corners

The power supply socket is on the back of the hard disk drive, next to the cable you just connected. The socket also has two notched corners, as shown above.

Align the connector with the socket so that the notched corners on the connector line up with the notched corners of the socket.
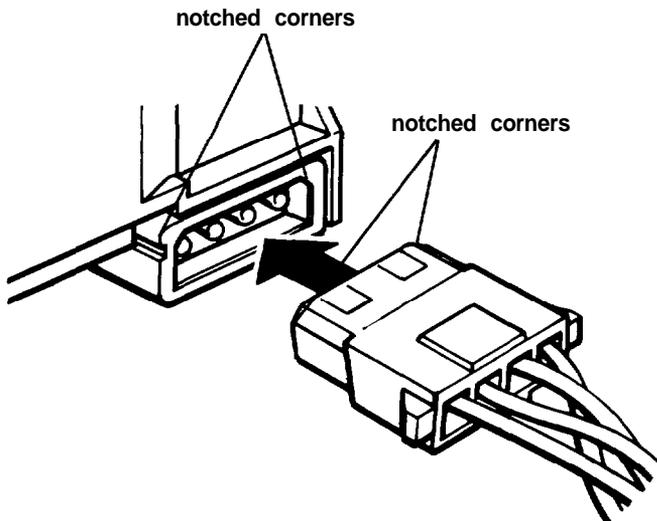
notched corners

notched corners

Make sure the holes fit over all the pins and then push in the connector.

Caution
If you do not correctly align the holes with the pins, you could severely damage your hard disk drive when you push in the connector.

4. Pick up the hard disk drive and hold it above the vertical mounting area so the mounting plate is facing the subassembly, as shown below.
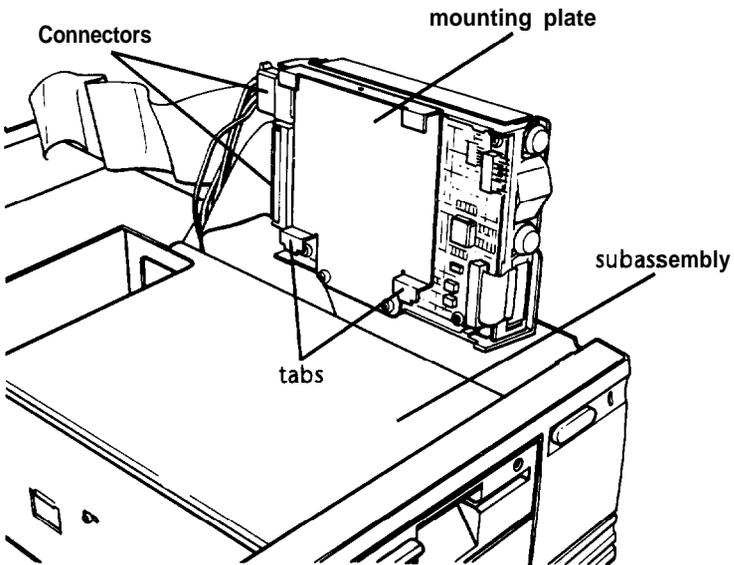
Notice that there are two tabs facing downward on the bottom of the mounting plate. These tabs will fit into two slots in the right side of the subassembly.

5. As you lower the drive into the vertical mounting area, guide the ribbon cable underneath the drive.
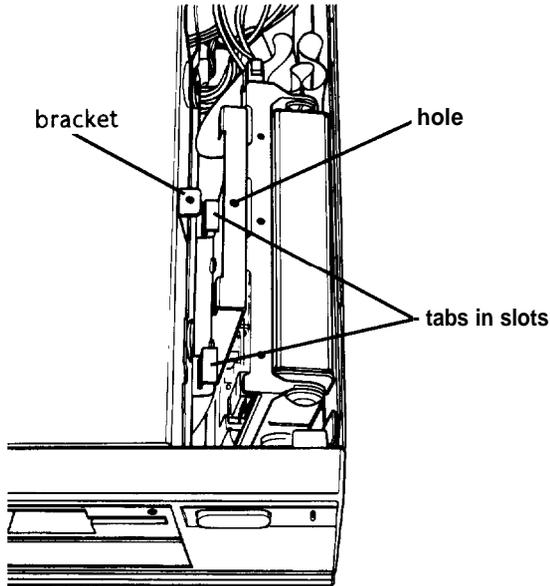
As shown above, fit the tabs on the mounting plate into the slots on the side of the subassembly. Then tilt the drive toward the subassembly and align the retaining screw hole on the mounting plate with the hole in the bracket.

6. Secure the drive to the bracket with the retaining screw.

If you used the instructions above to install your drive while the subassembly is out of the computer, see "Replacing the Subassembly" on page B-46. Do not follow the steps in the next section.

Connecting the Hard Disk Drive Cables

Follow these steps to lift up the subassembly and connect the drive cable to the main system board:

1. Remove the front panel from the computer by lifting up slightly on the three clips at the top of the panel and tilting it toward you. Then set it aside.


clips
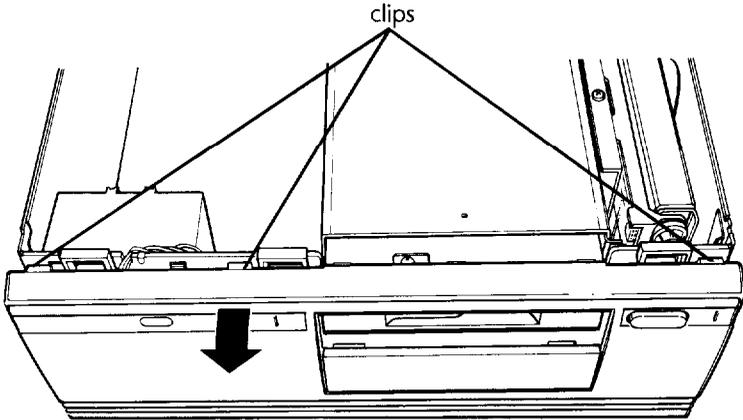
2. To lift the subassembly from the front of the computer, place your thumbs under the diskette drive and grasp the top edge of the computer with the rest of your fingers, as shown in the following illustration. (If you have a diskette drive installed in the lower horizontal drive bay, place your thumbs underneath that drive instead.) Then lift up the subassembly with your thumbs.
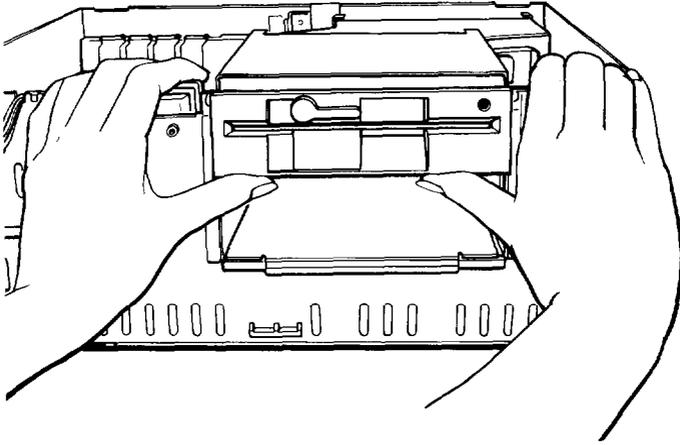
3. Raise the front of the subassembly to a slight angle, as shown below.
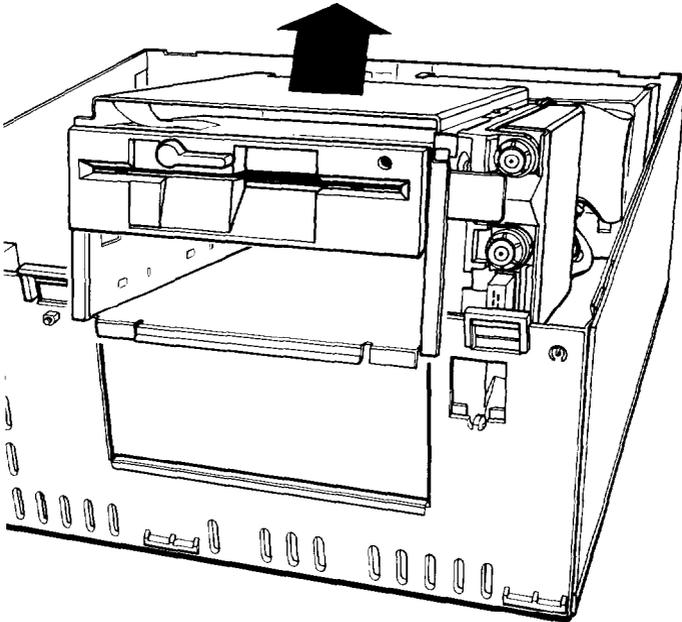
4. Use one of your hands to hold up the subassembly or have someone do it for you. With your other hand, grasp the hard disk drive ribbon cable that you tucked beneath the subassembly. Pull the cable under the subassembly all the way to its left side.

5. Carefully lower the front of the subassembly onto the computer, as shown below.
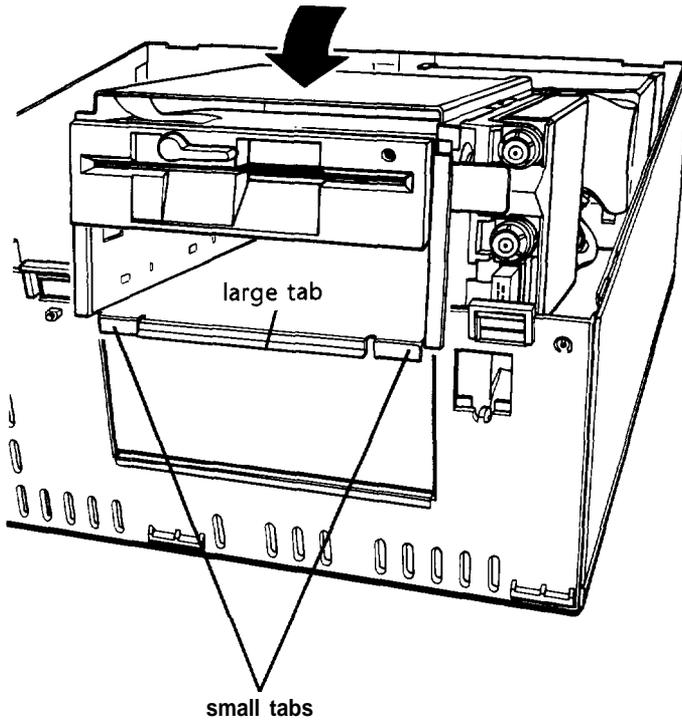
large tab

small tabs

Guide the tabs on the front of the subassembly over the opening in the front of the computer so that the two small tabs sit behind the opening and the large tab with the curved lip sits over the front. If necessary, press on the large tab until the subassembly snaps into place.
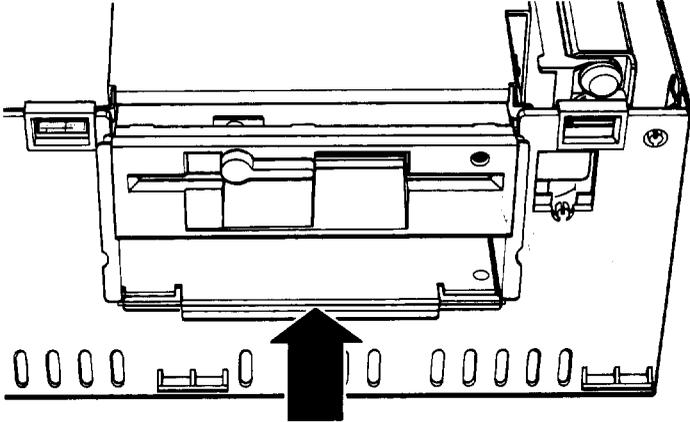
6. Locate the hard disk drive socket on the main system board (in front of the socket that holds the diskette drive ribbon cable). There is a notch on one side of the socket, as shown below.

notch
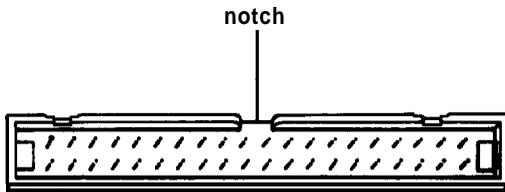
Pick up the hard disk drive cable and notice the
connector on the end of the cable. There is a tab on one
side of the connector, as shown below.

tab
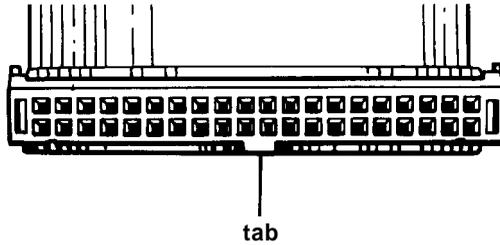
Pull the cable over toward the socket and fold it to align
the connector with the socket. Make sure the side of the
connector with the tab lines up with the side of the
socket with the notch. Then line up the holes over all of
the pins and push in the connector.

Caution
If you do not correctly align the holes with the pins,
you could severely damage your computer when you
push in the connector.

7. To replace the front panel, fit the three ridged tabs on its bottom edge into the three notches on the lower edge of the computer, as shown below.

tabs
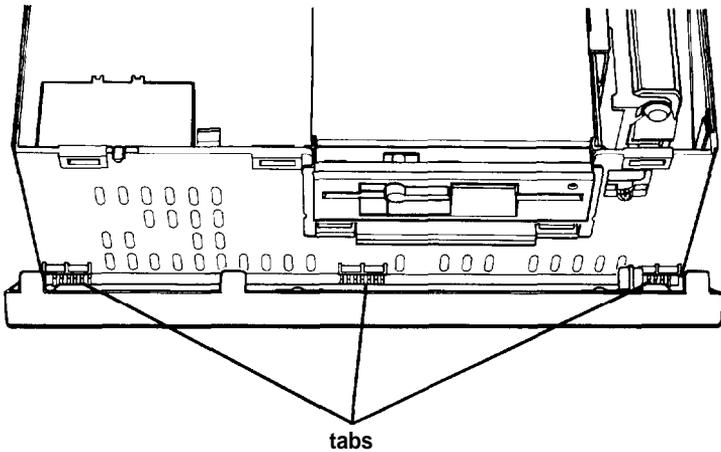
8. Tilt up the front panel until the clips on the top touch the computer. Then push on the top of the panel until it clicks into place. Your diskette drive(s) should be flush with the front of the panel.

9. Follow the steps on page 5-43 to replace the computer's cover. Then see "Post-installation Setup" on page 5-45 for instructions on configuring your computer for use with your new hard disk drive.

Removing a Hard Disk From the Vertical Position

1. Turn the computer so that the front panel is facing you. The vertically mounted drive is attached to the right side of the subassembly, as shown below.
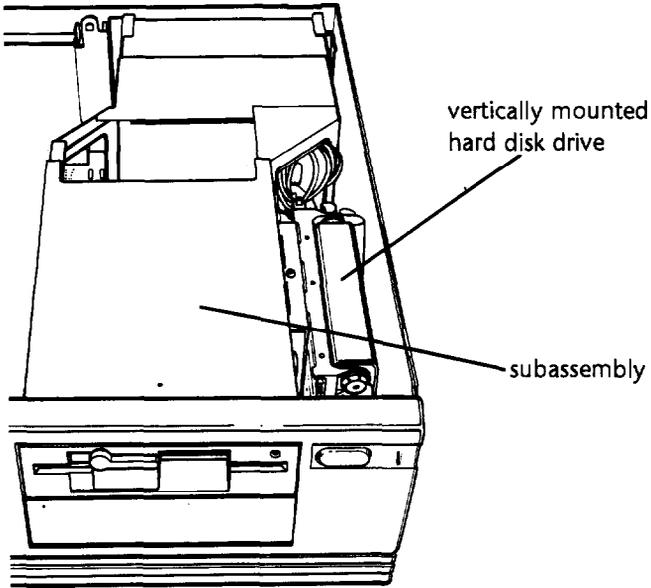
2. Remove the retaining screw securing the hard disk drive mounting plate to the computer and set it aside.

retaining
screw
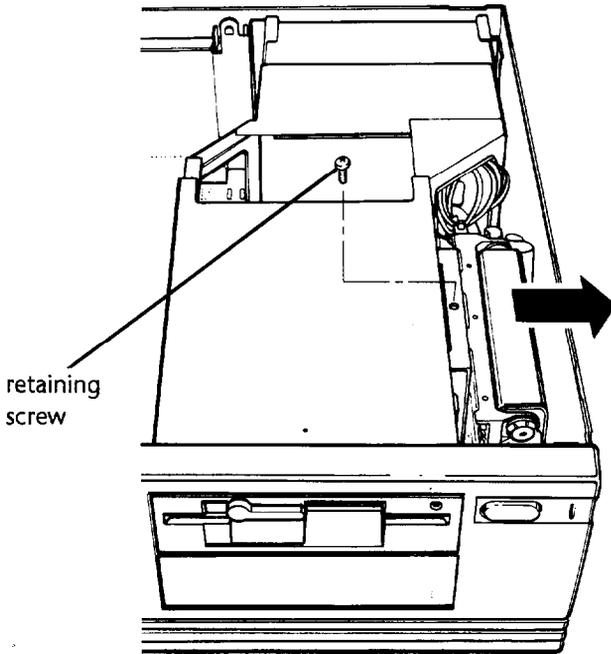
3. Tilt the hard disk drive slightly to the right, away from the subassembly, and lift it out of the vertical mounting area. Turn it over and set it on top of the subassembly with the gray mounting plate facing up. Since the drive is attached to its cables, make sure you do not try to move it too far away from the subassembly as you turn it.

4. Disconnect the power supply connector from the socket on the back of the hard disk drive, as shown below. Firmly pull the connector straight out of the socket so you do not bend the pins. Do not pull too hard on the cable; pull on the plastic connector, if possible.
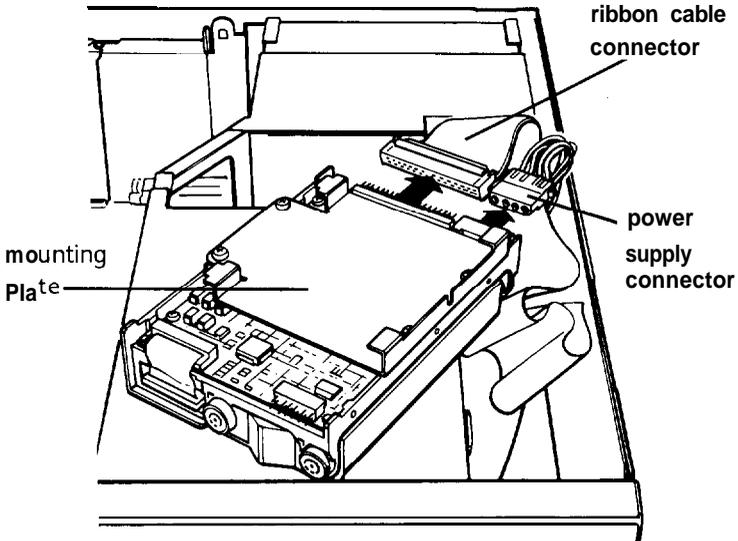
5. Remove the ribbon cable connector from the back of the drive in the same manner, as shown above.

   If you removed the drive because you are going to install or remove a drive in a horizontal drive bay, follow the instructions under "Installing or Removing a Disk Drive in the Horizontal Position" on the next page. Do not perform steps 6 through 9 below.

   If you are *not* going to reinstall the hard disk drive you have just removed., go to step 6.

6. Remove the four screws securing the hard disk drive mounting plate to the hard disk drive. Then remove and store the mounting plate along with the screws.

7. Remove the hard disk drive ribbon cable from its socket on the main system board (near the left side of the subassembly). Store the cable along with the drive.

8. Wrap the hard disk drive in its original packing materials and set it aside. Then carefully arrange the power supply cable so it does not interfere with any other cables or mechanisms.

9. Follow the steps on page 5-43 to replace the computer's cover. Then see "Post-installation Setup" on page 5-45 for instructions on configuring your computer for use without a hard disk drive.

Installing or Removing a Disk Drive in the Horizontal Position

This section describes how to install or remove a drive in the lower horizontal drive bay. You can use these same instructions if you need to install a different diskette drive in the upper drive bay. (The illustrations show the lower bay.)
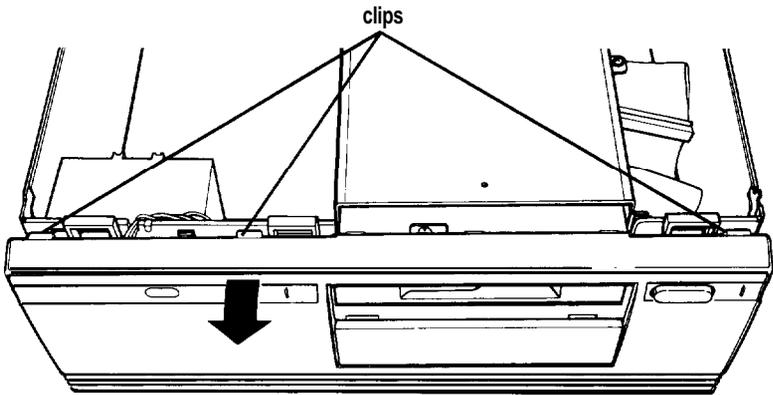
If you are installing a second hard disk or diskette drive, you must install it in the lower horizontal drive bay. If you have a hard disk drive installed in the vertical mounting position, remove it before you remove or install a drive in a horizontal drive bay. See "Removing a Hard Disk From the Vertical Position" on page B-24.

If you do not need to remove a hard disk drive from the vertical position (or have already done so), follow the steps under "Removing the Subassembly," below. You must remove the entire subassembly from the computer before you can access a drive in a horizontal drive bay.

Removing the Subassembly

Follow these steps to remove the subassembly:

1. Turn the computer so that the front panel is facing you.

2. To remove the front panel, lift up slightly on the three clips at the top of the panel and tilt it toward you, as shown below. Then pull the panel away from the front of the computer.

If you are going to install a hard disk drive in the lower horizontal position, set the front panel aside and go to step 4.

If you are installing a diskette drive, remove the slot cover from the front panel, as described in step 3.

3. Place the front panel face down and remove the screws securing the slot cover to the panel. Lift out the slot cover, as shown below.
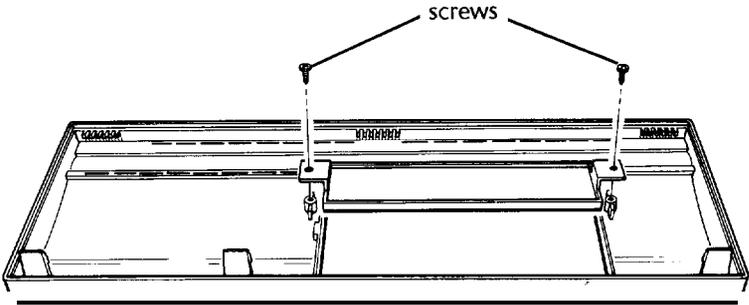

Set the front panel, slot cover, and screws aside.

4. The hard disk drive cable is connected to the main system board on the left side of the subassembly, as shown below.
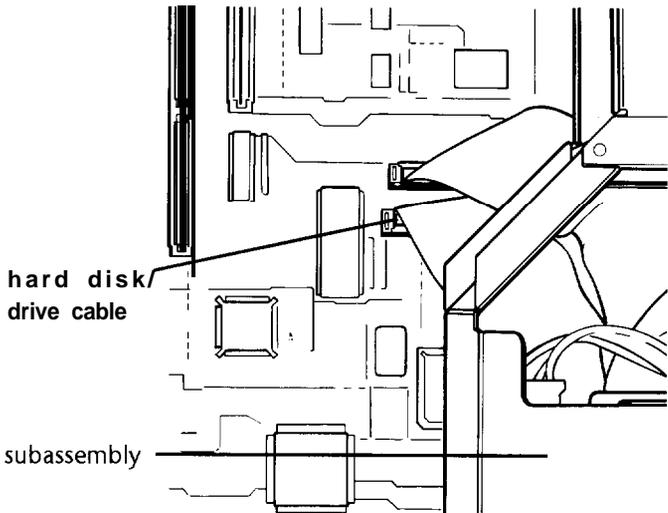

Grasp the connector and pull it straight up to remove it from the socket. Do not pull only on the cable.

5. The diskette drive cable is connected to the socket behind the hard disk drive socket; disconnect it in the same manner.

6. The subassembly is the large metal casing enclosing the horizontal drive bays and the power supply, as shown below.
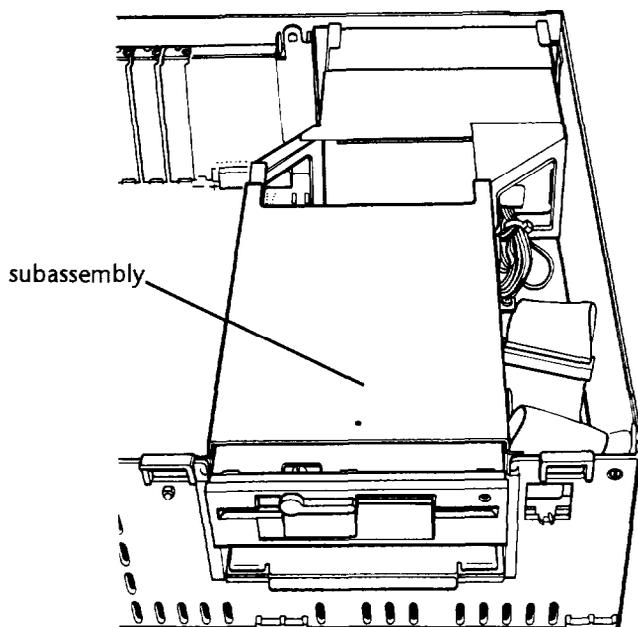
To remove the subassembly, first lift it up from the front only. Place your thumbs under the diskette drive and grasp the top edge of the computer with the rest of your fingers, as shown in the next illustration. (If you have a diskette drive installed in the lower horizontal drive bay, place your thumbs underneath that drive instead.)
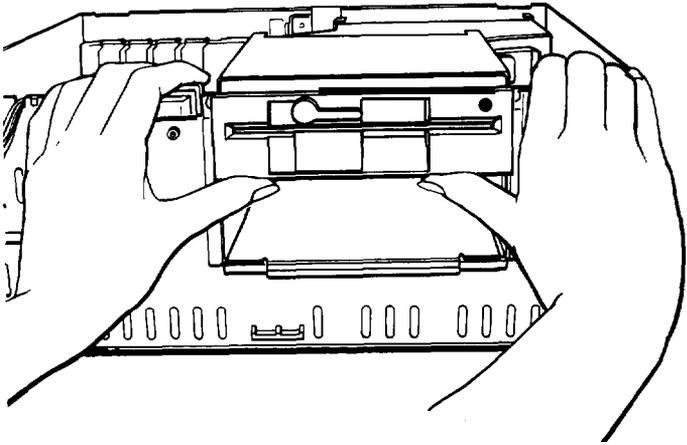
7. Lift up the front of the subassembly with your thumbs. Raise it to a slight angle, as shown below.
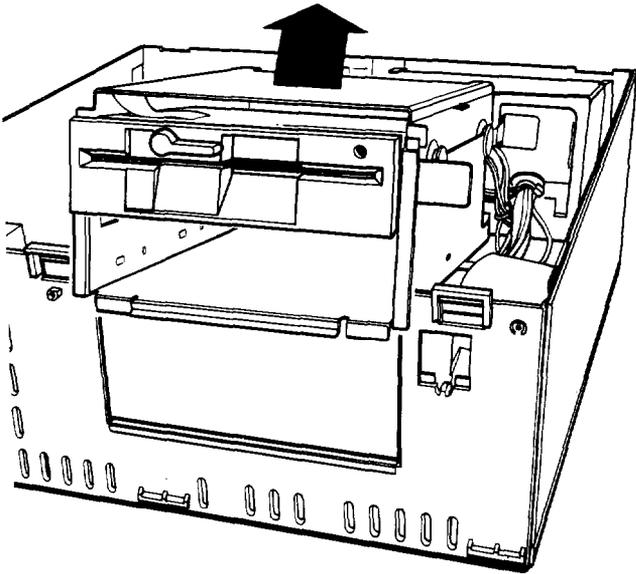
8. Reach back underneath the subassembly and disconnect the two power supply cables connected to the right side of the main system board, as shown below. Pull each of the connectors straight up; do not pull only on the cables.

power supply cables
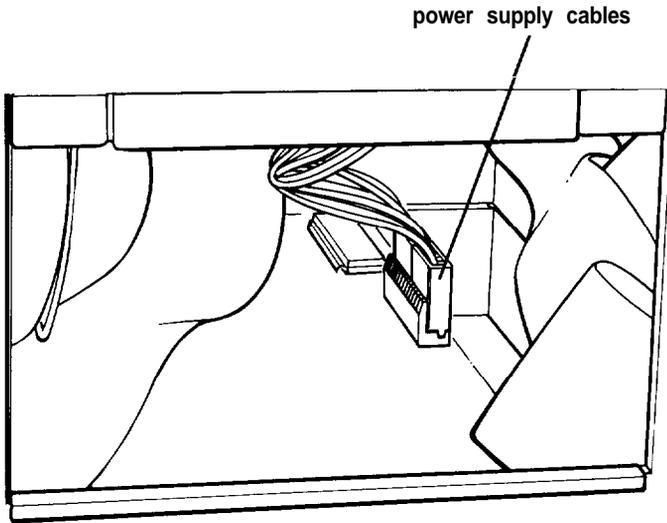
9. Lift the entire subassembly out of the computer and carefully place it on your work surface.

   If you are installing a drive, follow the instructions under "Installing a Disk Drive in the Horizontal Position" on the next page.

   If you are removing a drive, see "Removing a Disk Drive From the Horizontal Position" on page B-43.

Installing a Disk Drive in the Horizontal Position

Before you perform the following steps, be sure that you have set the jumpers on any hard disk drive(s) that you'll be using. (If not, see "Setting the Hard Disk Drive Jumpers" on page B-4 for instructions.)

If you are adding a 3½-inch diskette drive or hard disk drive, you need to make sure that 5¼-inch metal mounting frames are attached to the drive so it fits properly in the drive bay. Epson 3 ½-inch drives come with mounting frames already installed. If your drive did not come with frames installed, follow the instructions in the manual that came with it to attach them.

The illustrations in this section show a diskette drive, but you can use the same instructions to install a hard disk drive.

Follow these steps to install a disk drive:
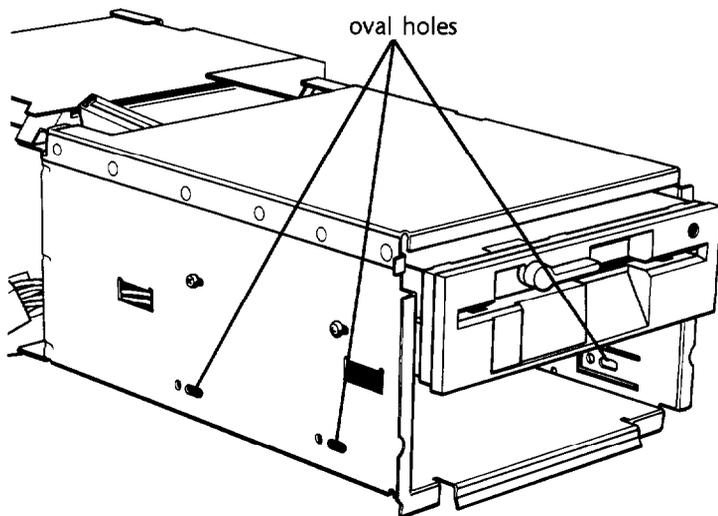
1. If you are installing a 5¼-inch diskette drive, turn it so that the diskette release latch is above the diskette slot.

   If you are installing a 3½-inch diskette drive, turn it so that the diskette release button is on the right and the drive light is on the left.

   If you are installing a hard disk drive, turn it so that the side with the components is facing down.

2. There are two or three holes on each side of the disk
   drive. When you insert the drive, align the appropriate
   round holes in the drive with the two oval holes on each
   side of the drive bay, as shown below.

oval holes

3. Insert the drive in the lower drive bay and slide it toward
   the back of the subassembly. Watch the oval holes on the
   side of the drive bay so you can see when the holes on
   the drive are positioned in the middle of them.

   If you are installing a diskette drive, adjust its position so
   that the front of the drive lines up with the drive in the
   upper bay. (A hard disk drive fits all the way into the
   bay.)

4. Locate the four retaining screws that came with your disk drive, Insert two screws into the oval holes on each side of the drive bay and tighten them with a screwdriver, as shown below.


screws
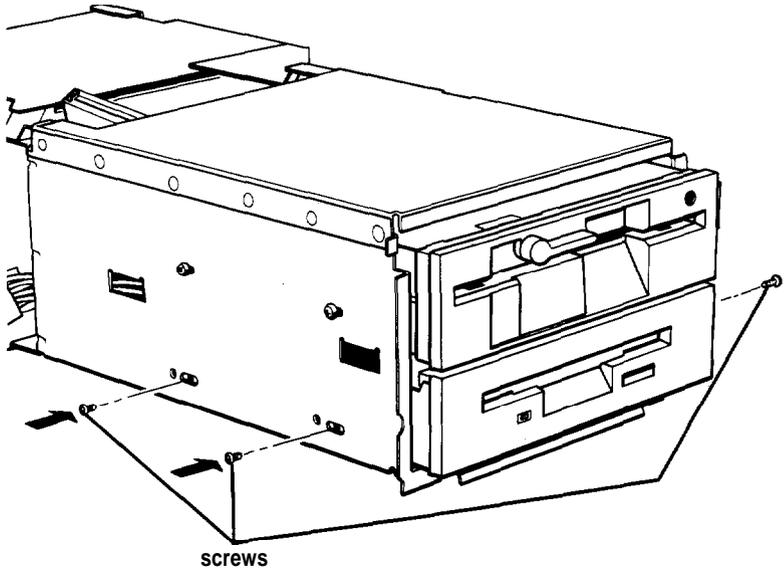
If you are installing a diskette drive, go to step 5. If you are installing a hard disk drive, go to step 6.

5. If you are installing a diskette drive in the lower drive bay, you may want to turn the subassembly upside down and place it on your work surface. Then locate the diskette drive ribbon cable; one end is connected to the top diskette drive and the other end is free. Use the connector in the middle of the cable to connect the second drive.

As shown in the next illustration, there is a large slot in this connector with a small plastic divider near one end of the slot,

The interface that protrudes from the back of the drive
has gold contacts on both sides. Near one end of the
interface, there is a gap to accommodate the plastic
divider on the connector.

Align the connector with the interface so that the plastic
divider on the connector lines up with the gap in the
interface, as shown below.
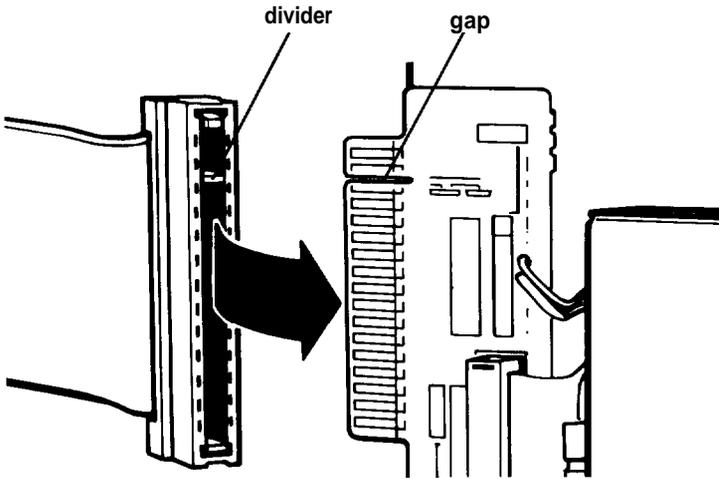
Make sure the cable connector fits properly onto the
drive interface and then push it onto the interface.

Caution
If you do not correctly align the connector, you could
severely damage your diskette drive when you push it
in.

If you removed a hard disk drive from the vertical
mounting position, go to step 6. If you did not, go to
step 8 for instructions on connecting the power cable.

6. Locate the hard disk drive ribbon cable that you removed from the drive in the vertical mounting position. Follow the instructions below to attach the connector on the end of this cable to the drive that will be mounted vertically.

    As shown below, there are two rows of holes in the connector. One of the holes is blocked with a plastic plug.

blocked hole
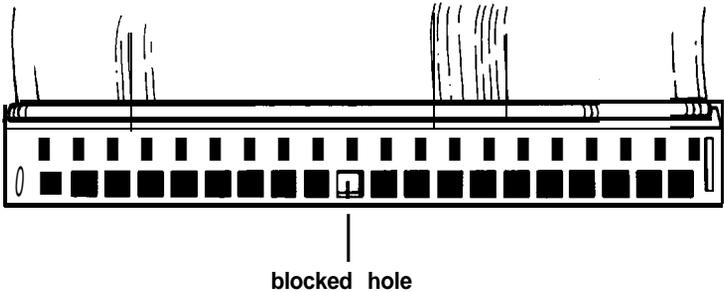
7. Pick up the hard disk drive that you removed from the vertical mounting position. Notice the ribbon cable socket on the back of the drive; you see two rows of pins. In one of the rows, a pin is missing.
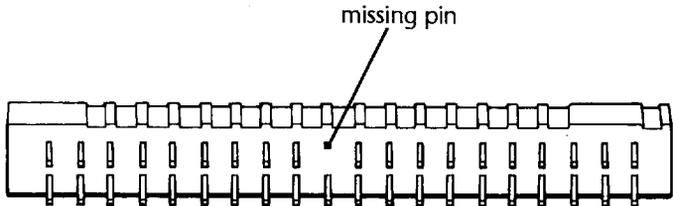
missing pin

Align the connector with the socket so that the row in the connector with the blocked hole lines up with the row in the socket with the missing pin, as shown below. Make sure the holes fit over all the pins and then push in the connector.
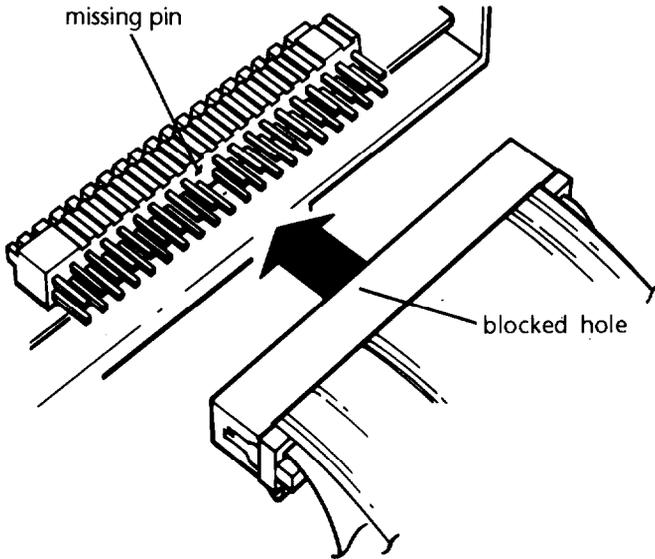
Caution
If you do not correctly align the holes with the pins, you could severely damage your hard disk drive when you push in the connector.

If you will have two hard disk drives in your system, perform the procedures in steps 6 and 7 again. This time, however, attach the connector in the *middle* of the ribbon cable to the horizontally mounted hard disk drive you just installed. (If necessary, turn the subassembly upside down to make it easier to connect the cable.)

8. Looking at the subassembly, locate one of the power supply cables that lead from the power supply (behind the horizontal drive bays). The cables are labeled P1, P2, and P3; you can use any one. As shown below, the end of the connector has two notched corners.

   The power supply socket on the back of the drive is next to the ribbon cable connector. The socket also has two notched corners, as shown below.

   power supply cable   **power supply socket**
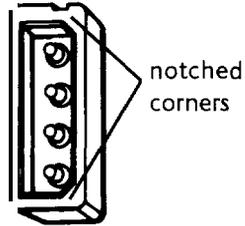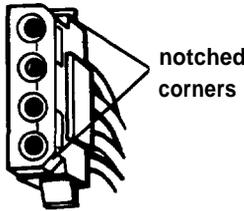
   You must connect a power supply cable to each drive you install in your system. If you'll be reinstalling a hard disk drive in the vertical mounting position, connect the power supply cable to this drive first. If not, connect the power supply cable to the drive you just installed in the lower horizontal drive bay.

Position the power supply cable connector so that the notched corners on the connector line up with the notched corners of the power supply socket on your drive. Make sure the holes fit over all the pins and then push in the connector.
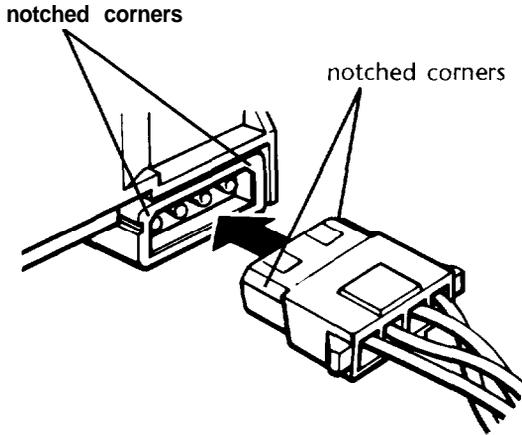
Caution
If you do not correctly align the holes with the pins, you could severely damage your drive when you push in the connector.

If you do not need to reinstall a vertically mounted hard disk drive, see "Replacing the Subassembly" on page B-46.

If you just connected the power supply cable to your vertically mounted hard disk drive, perform step 8 again to connect the power supply cable to the drive you just installed in the horizontal drive bay. Then see "Replacing the Drive on the Subassembly" on the next page for instructions on reinstalling the vertically mounted drive.

Replacing the Drive on the Subassembly

This section describes how to reinstall your hard disk drive in the vertical mounting position. The following illustrations show the subassembly installed inside the computer with the front panel attached. However, if your subassembly is out of the computer you can install the drive in the manner described below. Follow these steps:

1. Pick up the hard disk drive and hold it above the right side of the subassembly with the mounting plate facing the subassembly, as shown below.
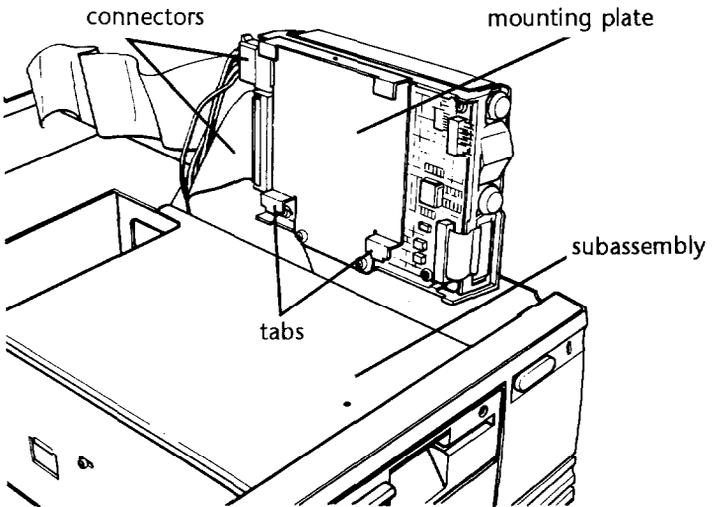
Notice that there are two tabs facing downward on the bottom of the mounting plate. These tabs will fit into two slots in the right side of the subassembly.

2. Lower the drive into the computer, fitting the tabs on the mounting plate into the slots on the side of the subassembly, as shown below. Guide the ribbon cable underneath the drive as you lower it.
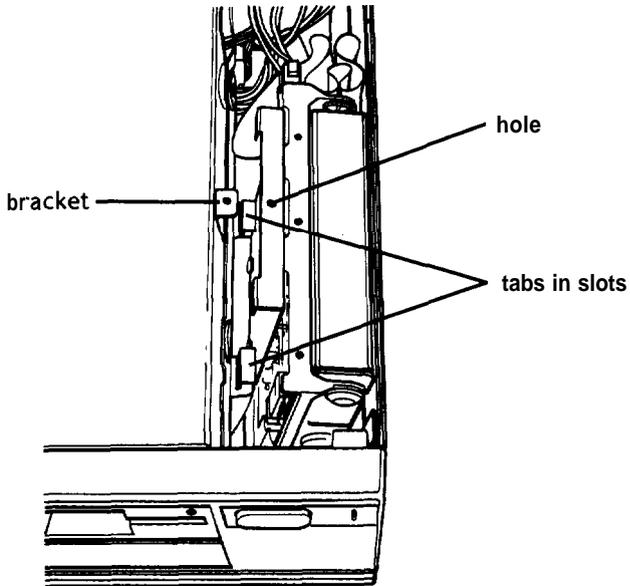
3. Tilt the drive toward the subassembly and align the retaining screw hole on the mounting plate with the hole in the bracket. Secure the drive to the bracket with the retaining screw.

4. To replace the subassembly, see the instructions on page B-46.

Removing a Disk Drive from the Horizontal Position

The figures in this section show a diskette drive in the lower horizontal drive bay, but you can use the same instructions to remove a *hard* disk drive from the lower bay or to remove a diskette drive from the upper bay.

Follow these steps to remove a drive from a horizontal drive bay:

1. Remove the disk drive ribbon cable from the back of the drive, as shown below.
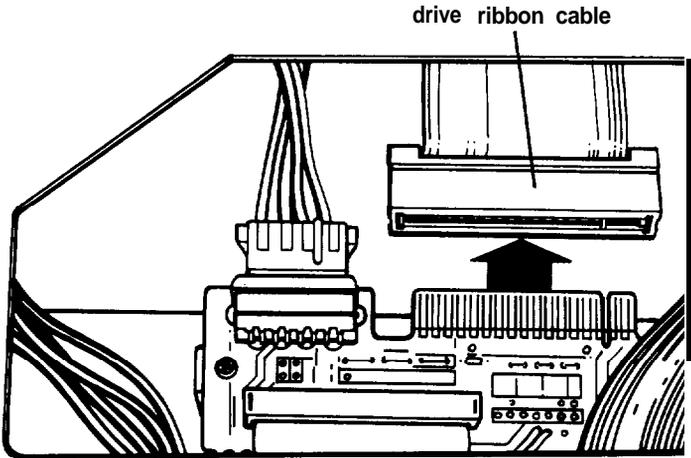
drive ribbon cable

2. Remove the power supply cable from the back of the drive. It is located near the ribbon cable interface, as shown in the next illustration.

power supply cable
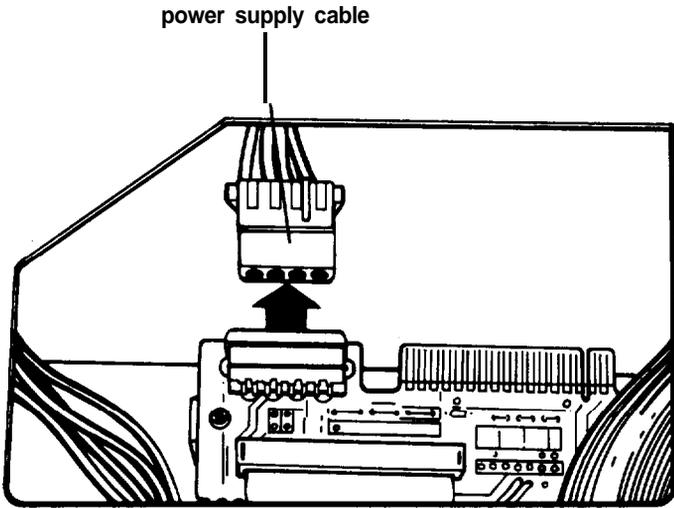
3. Using a screwdriver, remove the screws securing the drive
   to the drive bay. There are two screws on each side, as
   shown below.

screws
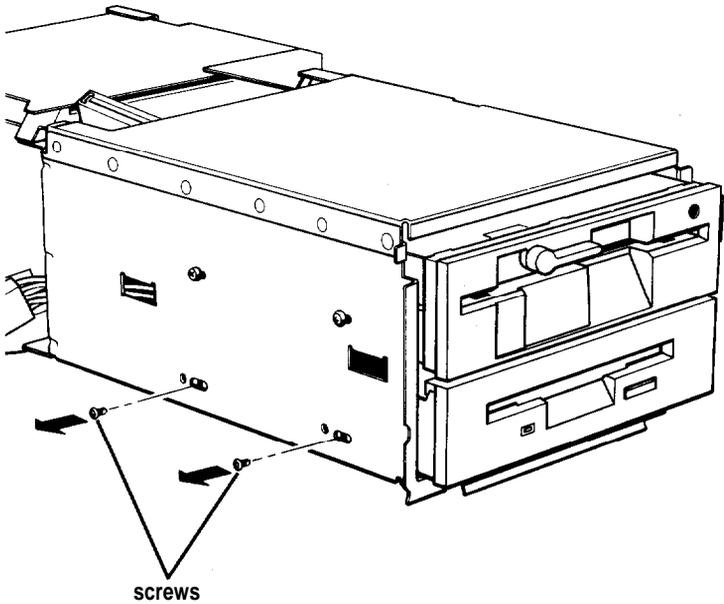
4. Grasp the disk drive from the front of the drive bay, pull it completely out, and set it aside.

5. If you have removed one hard disk drive and are leaving another one in your system, make sure you have set the jumpers on the remaining drive to indicate that you now have only one hard disk drive. (If not, see "Setting the Hard Disk Drive Jumpers" on page B-4 for instructions.)

   If you do not need to replace a hard disk drive in the vertical mounting position, see "Replacing the Subassembly" below.

   If you need to reinstall a hard disk drive in the vertical mounting position, follow the steps under "Installing the Drive" on page B-12. However, it is easier to replace the drive while the subassembly is out of the computer. Follow the steps in that section as if the subassembly was installed. Then see "Replacing the Subassembly," below.

Replacing the Subassembly

Follow the steps below to replace the subassembly inside
your computer:

1. Notice that there are four mounting slots on the back of
   the subassembly: two in the upper corners and two in the
   lower corners.
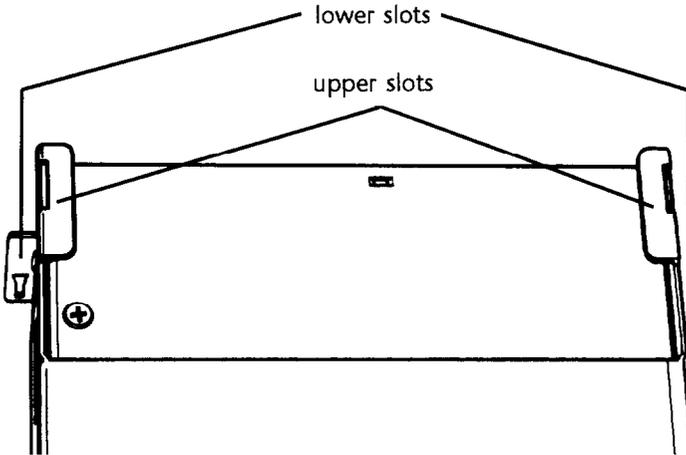
There are four corresponding tabs on the inside back panel of the computer which fit into the openings in the subassembly slots.
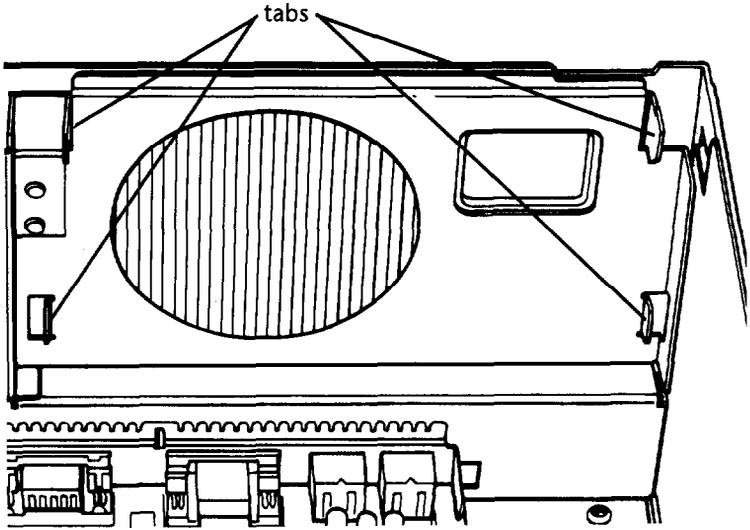
Lift up the subassembly from your work surface and lower the back end into the computer, fitting the top tabs in the computer into the openings in the top slots on the subassembly.

2. Hold up the front of the subassembly at a slight angle and arrange the ribbon cables leading from the back of the drives so they curve underneath the subassembly toward its left side.

3. Reach under the subassembly and grasp the two main system board power supply cables, labeled P4 and P5. Each connector has six pin holes and a large tab on one side, as shown below.
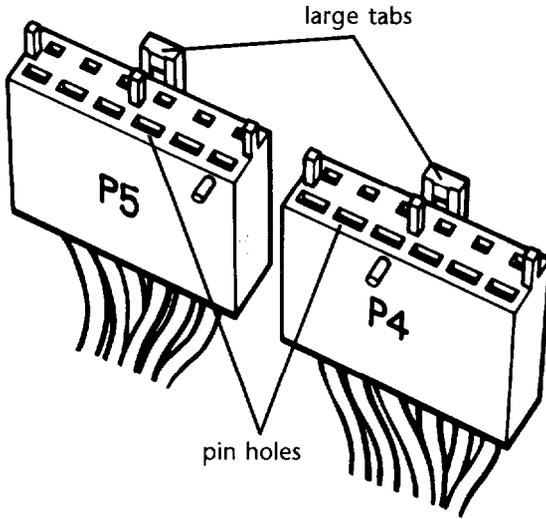
There is one 12-pin power supply socket on the right side of the main system board (toward the back) that holds both of the power supply connectors, as shown below.
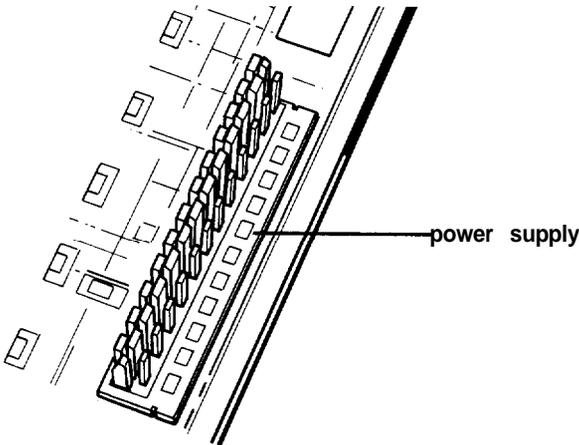
4. Position power supply connector P4 so the large tab on the connector faces the right side of the computer. Beginning with the six pins toward the back of the computer, carefully line up the holes in the connector with the pins in the socket. Make sure the holes fit over all six pins and then push in the connector.
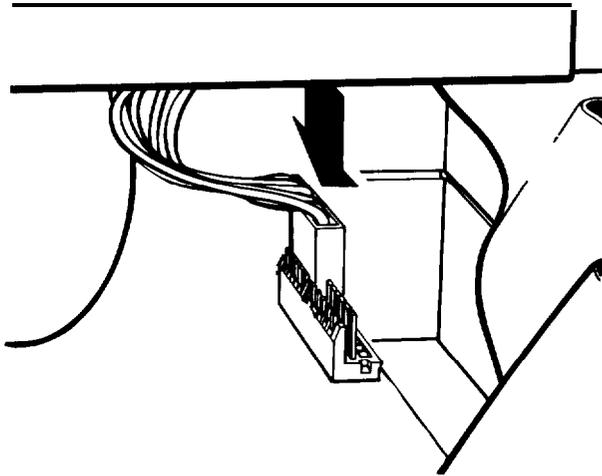
Caution
If you do not correctly align the holes with the pins in the socket, you could severely damage your computer when you push in the connector.

5. Connect power supply connector P5 to the remaining six pins in the socket using the same procedure.

6. Carefully lower the front of the subassembly onto the computer. Make sure that all four tabs on the back of the computer are inserted into the slots on the subassembly as you lower it.

large tab
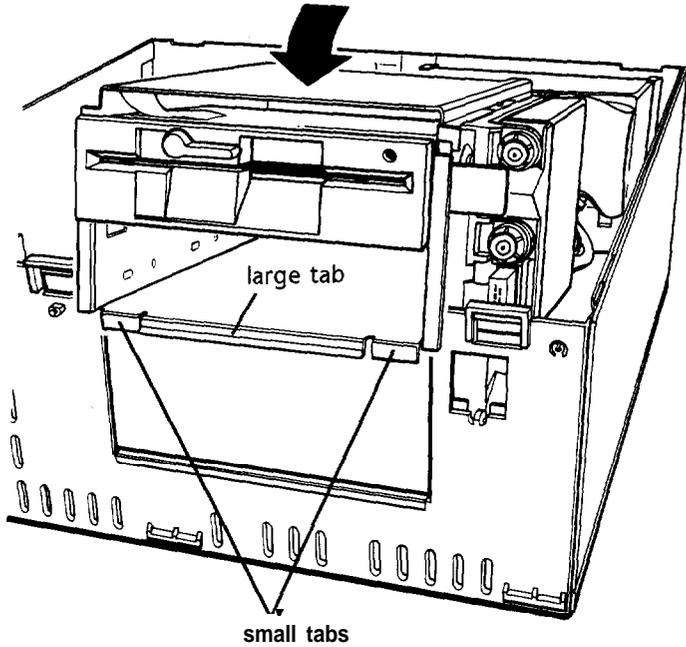
small tabs

Guide the tabs on the front of the subassembly over the opening in the front of the computer so the two small tabs sit behind the opening and the large tab with the curved lip sits over the front of the opening. If necessary, press on the large tab until the subassembly snaps into place.
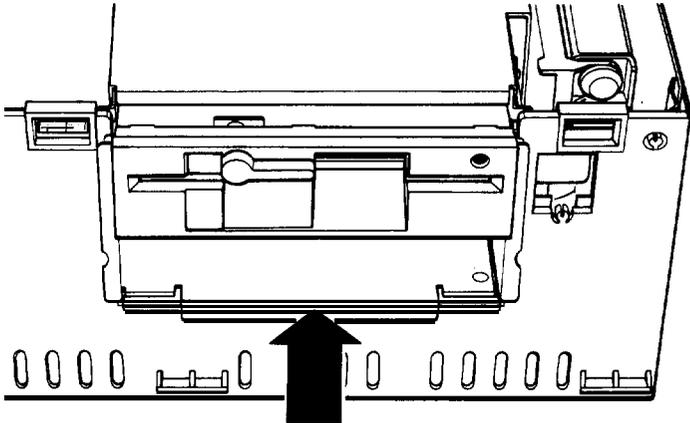
7. Locate the hard disk drive and diskette drive ribbon cables. (The hard disk drive cable is slightly wider than the diskette drive cable.) Check the back of the drives to make sure you know which cable is which.

8. Both the diskette drive and hard disk drive sockets are located on the main system board on the left side of the subassembly, as shown below.
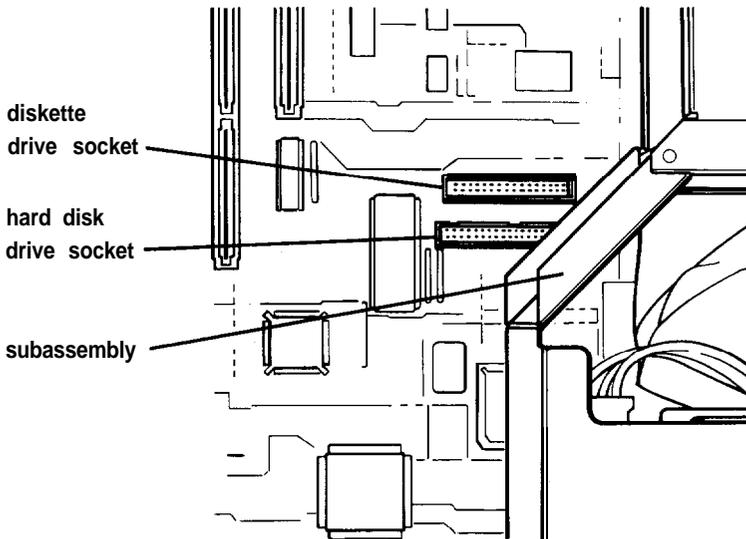
Both sockets have a notch on one side. The hard disk drive socket is a bit longer than the diskette drive socket.

Connect the diskette drive ribbon cable first. As shown
below, there is a tab on one side of the connector.

diskette drive connector

tab
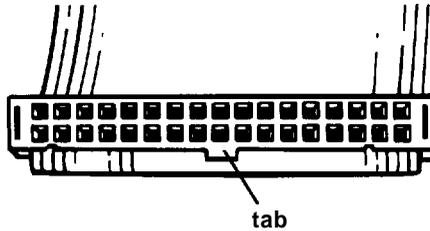
diskette drive socket
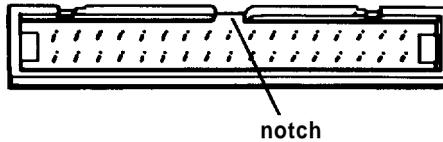
notch

Align the connector with the socket so that the tab on
the connector lines up with the notch in the socket.
Make sure the holes in the connector fit over all the pins
in the socket and then push in the connector.

**Caution**
If you do not correctly align the holes with the ping
you could severely damage your computer when you
push in the connector.

9. Now locate the hard disk drive ribbon cable. Pull the
    cable over toward the socket and fold it so the tab and
    notch are aligned. Then connect it in the same manner as
    the diskette drive cable.

10. To replace the front panel, fit the three ridged tabs on its bottom edge into the three notches on the lower edge of the computer, as shown below.

tabs
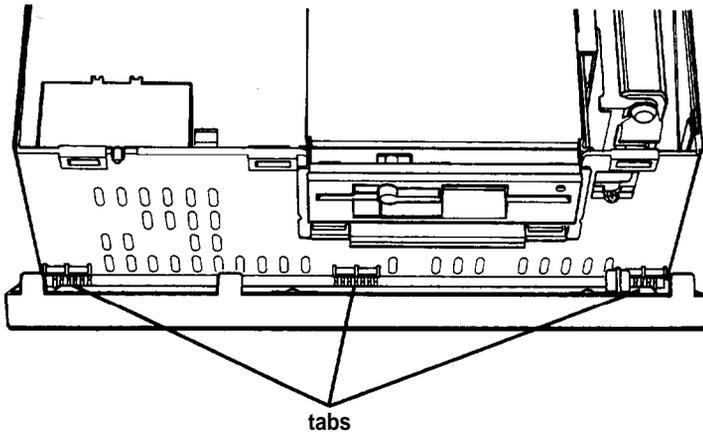
11. Tilt up the front panel until the clips on the top of the panel touch the computer. Then push on the top of the panel until it clicks into place. The diskette drive(s) should be flush with the front panel.

    (If you removed the slot cover, be sure to store it in a safe place in case you need to replace it later.)

12. Follow the steps on page 5-40 to replace the computer's cover. Then see "Post-installation Setup" on page 5-42 for instructions on configuring your computer for use with your new disk drive configuration.

Performing System Diagnostics

This appendix describes how to use the System diagnostics program to test the condition of your computer's main unit and peripheral devices. The diagnostics program provides tests to check the following hardware:

❏ System board

❏ Memory

❏ Hard disk drive(s)

❏ Diskette drive(s)

❏ Keyboard

❏ Video adapter and monitor

❏ Parallel and serial ports.

By changing settings on the System diagnostics main menu, you can run the tests in several different ways. You can specify a certain length of time to run a test, select to run it continuously until you interrupt it, or specify a number of times to run the test.

If an error occurs during a test, note the error message and contact your Epson dealer. Your dealer may be able to solve the problem; if not, see "Where to Get Help" in the Introduction for technical support information.

Starting the Diagnostics Program

To start the diagnostics program, follow these steps:

1. Insert the Reference diskette in drive A and turn on or reset the computer.

2. When you see the following prompt, press the **Del** key:

    Press <Del> to start SETUP

3. At the next prompt, select **Start operating system.**

4. At the **A** : prompt, type **DIAG** and press **Enter** to run System diagnostics. You see a title screen.

5. Press any key to continue. You see the main menu, described below.

The Main Menu Screen

```
System board   Memory   Hard disk   Floppy   Keyboard   Video   Misc.

      ┌──────────────────────────────┐
      │ Basic functionality test     │
      │ CPU protected mode test      │
      │ Processor speed test         │
      │                              │
      │ Coprocessor test             │
      │ DMA controller test          │
      │ Interrupt controller test    │
      │ Timer test                   │
      │ Realtime clock test          │
      │ CMOS validity test           │
      └──────────────────────────────┘

                  Run time parameters

Testing mode :  (T)imebound / (C)ontinuous / (P)assbound ? P
Wait on error (Y/N) ? Y Error logging (Y/N) ? N No. of passes : 00001

Prev/Next window-,tPrev/NexttestTk Run highlighted test<Enter> Exit<Esc>
Set parms<F2> Sel/desel test<F3> Sel all<F4> Desel all<F5> Run sel tests<F6>

Tests basic operation of CPU in real mode
```

When you select a test category from the option line at the top of the menu, you see a submenu of the available diagnostic tests. For example, the submenu for the System board category appears when you first see the main menu because the System board option is selected.

The Run time parameters window, near the bottom of the display, lets you specify how you want to run the test(s).

The help window describes how to use these keys to make menu selections and run diagnostic tests:

Key	Function
→	**Move to the next test** category
←	**Move to the previous test category**
↓	**Move to the next test**
↑	**Move to the previous test**
Enter	**Start the test**
F2	**Set the run time parameters**
F3	**Select a test or cancel selection**
F4	**Select all tests**
F5	**Cancel all selections**
F6	**Run all selected tests**

A short message describing each test appears at the bottom of the screen.

Setting the Run Time Parameters

The tests you select will run in the following manner unless you change the run time parameters:

❏ Each test is performed one time (passbound)

❏ The program waits if an error occurs

❏ No errors are recorded to the printer, disk, or other device.

If you want to change the default run time parameters, press
F2 to move to the Run time parameters window. (Press **Esc** at
any time to exit and return to the submenu of diagnostic
tests.)

The first run time parameter specifies the mode in which to
run the test. You see this prompt:

```
Testing mode: (T)imebound / (C)ontinuous /
(P)assbound ? P
```

In Timebound mode, the program runs the tests for the
amount of time you specify; press **T** and then **Enter.**

In Continuous mode, the tests run until you interrupt them;
press C and **Enter.**

In Passbound mode, the program runs the tests the number
of times you specify. This is the default setting; press **P,** if
necessary, and **Enter** to select the mode.

The next option is:

```
Wait on error (Y/N) ? Y
```

Press Y, if necessary, and **Enter** if you want the program to
pause when an error occurs. This lets you view the error
message, make note of it, and then press **Enter** to continue.
(Y is the default setting.)

Press **N** and **Enter** if you want the diagnostics program to continue when an error occurs.

The next option is:

> Error logging (Y/N) ? N

Press Y and **Enter** to record the errors that may occur during the test. See "Error Logging," below, for details.

Press **N** and **Enter** if you do not want to create the log. (N is the default setting.)

Note
If you press **N** at the Wait on error prompt, you should press **Y** for Error logging so you can review any errors that may occur during the tests.

You may see a prompt requesting additional information the program needs to perform the test(s).

If you selected Continuous testing, the diagnostics program needs no additional information. Instead, you see this message in the Run time parameters window:

> Test mode: continuous

If you selected Timebound testing, you see this prompt:

> Period : 001 hr 00 min

To specify the amount of time you want to run the test(s), type the number of hours (from 000 to 999), and press **Enter.** Then type the number of minutes (from 00 to 59), and press **Enter.** You can use the backspace key to make corrections.

If you selected Passbound testing, you see this prompt:

No. of passes : 00001

Specify the number of times (from 1 to 65535) you want the program to run the test(s). Or press **Enter** without entering a number to select the default of one pass. You can use the backspace key to make corrections.

> **Note**
> In most cases, running a test once is sufficient. Multiple passes test the reliability of essential functions only.

Error Logging

When you request error logging, you see this submenu:

```
Log errors on disk
Log errors to printer (LPT1)
Log errors to serial port
No error logging
```

Press ↓ or ↑ to highlight the device on which you want the program to log the error messages and press **Enter.** (Press **Esc** to exit the menu and return to the Error logging prompt.)

If you select **No error logging**, the program changes the error logging response from Y to **N.**

If you select the printer (LPT1), the program writes the error messages to the device connected to the parallel port assigned LPT1. If you select the serial port, the program writes the error messages to the device connected to the COM1 serial port.

If you select **Log errors** on **d i** s **k,** the program displays
this submenu:

Floppy disk A:
Floppy disk B:
Hard disk C:
Hard disk D:

(You do not see drive D unless you have a second hard disk
drive.) Press ↓ or ↑ to highlight the disk on which you want
to log the error messages and press **Enter.** The program
creates a file called ERROR.LOG in the current directory of
the specified disk drive. After running the tests, you can open
the ERROR.LOG file to review the errors that occurred during
the tests.

The program uses this device for error logging until you
change it or indicate you do not want error logging. When
you specify a new device, the program erases the existing
ERROR.LOG file, if any.

When you specify the device for error logging, one of these
error messages may appear:

Floppy disk A not present
Floppy disk B not present
Hard disk C not present
Printer port not present
Serial port not present
Error in printer status
Error in serial port status
Error in floppy drive A

Record the error message and select a different device for
error logging.

Once you set the run time parameters, you are ready to select
the test(s).

Selecting Diagnostic Tests

To start a single test, press → or ← to highlight the test category on the main menu. Then press ↓ or ↑ to highlight the particular test in the submenu and press **Enter** to run it.

When a test has been completed, you see this prompt:

```
Press <Enter> to return to Main menu.
```

Selecting Multiple Tests

To select several tests at one time, highlight each test you want to perform and press **F3.** To cancel a selection, highlight the test and press **F3** again.

To run the selected group of tests, press **F6.** The program highlights each test name as it runs the test.

You can press F4 to select all tests for all devices, and press **F5** to cancel all selections.

You cannot run certain tests along with other tests. The table below lists the tests that must be run individually.

Diagnostic tests to be run individually

Category	Test
System board	Timer test Real time clock test
Hard disk	Hard disk format Media analysis Force bad tracks
Floppy	Disk change line test
Keyboard	Scan/ASCII code test
Miscellaneous	Printer adapter test Comm. adapter test

You can stop testing at any time and return to the main menu by holding down **Ctrl** and pressing **Break. The** program completes the current test before it stops.

You must enter certain parameters to run the hard disk and diskette drive tests. If you use **F3** to select these tests, the program prompts you for the parameters immediately. If you use **F4,** the program prompts you for the parameters during the first pass of the test. If you perform the tests more than once, the program uses the same parameters for each pass.

If you selected Passbound testing, the program displays the pass number on the right side of the screen above the Run time parameters window. For example:

Pass : **00001**

If you entered Y at the **Wait on** error prompt, the program pauses if an error occurs. When you press **Enter,** the program continues testing,

Note
Tests selected using the **F3** and **F4** keys remain selected until you cancel the selection. Be sure to press **F5** to cancel all selections when you are finished running each set of tests.

Running the Tests

The table below lists all of the available System diagnostic tests and refers you to other sections in this chapter for additional information, if necessary.

System diagnostic tests

Component	Tests	Function
System board	**Basic functionality**	**Tests components such as instructions, registers, and flags of CPU**
	CPU protected mode	**Tests protected mode instructions such as LSL, VERR, and LAR**
	Processor speed	**Identifies current clock speed**
	Coprocessor	**Tests the coprocessor**
	DMA controller	**Tests memory address and page registers of DMA controllers 1 and 2**
	Interrupt controller	**Tests interrupt mask registers**
	Timer	**Compares timer count to RTC**
	Real time clock	**Compares RTC to time 0 interrupt**
	CMOS validity	**Tests the CMOS RAM**
Memory		**See "Memory Diagnostics"**
	BIOS ROM	**Tests data path of BIOS ROM**
	Parity	**Checks for memory parity errors**
	Pattern	**Tests for memory read/write faults**
	Walking 1	**Checks data lines for shorts and bits that are 1**
	Walking 0	**Checks data lines for shorts and bits that are 0**
	Address	**Checks for address line shorts**
	Refresh	**Checks the refresh interval**

System diagnostic tests (continued)

Component	Tests	Function
Hard disk drives	Hard disk format Media analysis Performance Seek Read/verify Check test cylinder Force bad tracks	See "Hard Disk Diagnostics"
Floppy disk drives	Diskette format Drive speed Random read/write Sequential read/write Disk change line	See "Floppy Disk Diagnostics"
Keyboard	Controller	Tests the keyboard controller
	Scan/ASCII code	Tests the scan codes assigned to the keys
	Keyboard clock line	Tests the keyboard clock line
	Keyboard data line	Tests the keyboard data line
Video	Adapter	Tests the display adapter memory
	Attribute	Tests the display adapter attributes
	80 x 25 display	Tests the 80 x 25 display
	40 x 25 display*	Tests the 40 x 25 display
	320 x 200 graphics*	Tests the 320 x 200 graphics display
	640 x 200 graphics*	Tests the 640 x 200 graphics display
	Page selection*	Tests the paging function of the adapter
	Color*	Tests the background and border color mapping

* Test appears only if you have installed a color monitor.

System diagnostic tests (continued)

Component	Tests	Function
Video (continued)	640 x 350 graphics*	Test the 640 x 350 graphics display
	640 x 480 graphics*	Test the 640 x 480 graphics display
Misc.	Printer adapter Comm. adapter	See "Miscellaneous Diagnostics"

* Test appears only if you have installed a color monitor.

Memory Diagnostics

If you have relocated any memory addresses, you must change the addresses to their original locations before running the memory tests or they will not work properly.

If an error occurs during a memory test, the program displays this message:

```
Press <Enter> to view faulty memory chip.
```

Press **Enter.** The program displays a diagram of the main system board and highlights the faulty memory chip.

Hard Disk Diagnostics

Hard disk diagnostic tests may be destructive or non-destructive. Destructive diagnostics destroy data on the hard disk, but non-destructive diagnostics do not. Be sure to back up any data on your hard disk before performing any destructive tests. The following table lists which tests are destructive and which are not.

Destructive tests	Non-destructive tests
Format	Performance
Media analysis	Seek
Force bad tracks	Read/verify
	Check test cylinder

Before performing any destructive test, the program displays the following messages:

```
        W A R N I N G
All data on hard disk you have
specified may be lost...

Do you still want to continue (Y/N)?
```

Press Y and **Enter** to begin the test. Press **N** and **Enter** to stop the operation.

Caution
You should not run any of the destructive tests on a SCSI hard disk drive.

Hard Disk Parameters

The program may ask for the following parameters:

Disk drive identifier
Disk drive type
Interleave factor
Bad track list
Start cylinder number
End cylinder number
Start head number
End head number

Each parameter is described below.

Disk drive identifier

The program displays this prompt for the disk drive
identifier:

> **Disk drive (C/D) ? C**

If only one hard disk is connected to the computer, the
program assumes it is drive C and does not display this
prompt.

Disk drive type

The program determines the type of hard disk drive based on
the type number stored in the CMOS RAM by the SETUP
program and displays the following prompt:

> **Disk drive type   ? 17**

A window on the screen lists the possible drive types. If you
need to change the type, use ↑ or ↓ to highlight the drive
type that matches your hard disk and press **Enter.**

If you select the User defined option (type 47), the program
prompts you for the following information:

    Number of cylinders
    Number of heads
    Number of sectors per track
    Write precompensation presence
    Write precompensation cylinder number
    Landing zone

Interleave factor

The interleave factor affects the performance of your hard
disk. You see the following prompt:

> **Interleave (1-16) ? 3**

The default value is 3. Enter a different interleave factor only
if your hard disk documentation recommends it.

Bad track list

Entering the bad track list is optional. The program displays the following prompt for the bad track list:

Mark bad tracks (Y/N) ? N

You do not need to enter a bad track list for the hard disk that comes with the Equity 386SX/16 PLUS. Press **N,** if necessary, and then press **Enter.**

If you press Y and then **Enter,** you see the following submenu:

Add an entry
Revise an entry
Delete an entry
Clear bad track list
Save and Exit

Use ↓ or ↑ to highlight a menu option and press **Enter.** Then enter the correct track information. When the bad track list is correct, highlight **Save and Exit** and press **Enter.**

> **Note**
> When you run the Media analysis test, the program automatically marks the bad tracks when it formats the disk.

Start and end cylinder **numbers**

The program displays the following prompts for the starting and ending cylinder numbers:

Start cylinder number   ?   0
End cylinder number   ? *nnn*

Enter the first and last cylinder numbers on which you want to perform the tests. The default for the start cylinder number is 0, and the default for the end cylinder number is one less than the highest cylinder number of your hard disk. For example, on the 40MB hard disk, the highest cylinder number is 976.

Start and end head numbers

The program displays the following prompts for the starting and ending head numbers:

```
Start head number        ?   0
End head number          ?   nn
```

Enter the first and last head numbers on which you want to perform the tests. The default for the start head number is 0, and the default for the end head number is one less than the highest head number of your hard disk. For example, the default end head number for the 40MB disk is 4.

After you specify the hard disk parameters, press Y and **Enter** at the **Proceed** prompt to run the test.

Hard Disk Format

The Hard disk format program performs a low-level format on your hard disk. If your computer came with a factory-installed hard disk or if you have installed an optional Epson hard disk, it has already been formatted for you.

You may need to format the hard disk if you have installed a new, non-Epson hard disk in your computer that has never received this type of low-level format and did not come with its own format utility.

You must still partition and format the hard disk for MS-DOS after performing this low-level format. See your MS-DOS Installation Guide for instructions.

You may want to reformat a hard disk if you have a serious
problem with the drive. However, before formatting a disk
with data on it, try every other recovery procedure described
in your MS-DOS Reference Manual. Then back up all the data
on the disk before you begin.

Note
If you do not enter a bad track list before you. format the
disk, the format program analyzes the surface of the hard
disk to determine the bad tracks.

Media Analysis

This test identifies the bad tracks on the hard disk by
analyzing the surface of the disk to find them. The program
uses three different bit patterns; formatting the disk, marking
the bad tracks, and displaying the bad track list.

Caution
The Media analysis test destroys any data on your hard
disk.

Performance Test

This test checks the performance of your hard disk by determining the data transfer rate and track-to-track seek time based on the transfer size, the seek count, and the amount of data transferred.

The program measures the data transfer rate in kilobytes per second. It reads 64KB of data 15 times and counts the number of timer ticks using this formula:

Transfer rate = (64KB x 15 x 18.2) / # timer ticks

The program measures track-to-track seek time in milliseconds using this formula:

Seek time = (# timer ticks x 1000) / 18.2 x 200

(The number of seeks is 200.)

A higher data transfer rate and a lower seek time indicate better disk performance.

Seek Test

This test checks the seek capability of the hard disk on the specified range of cylinders and heads. The program performs a series of sequential seeks followed by random seeks and reports any errors.

Read/Verify Test

This test checks the read and verify capability of the hard disk on the specified range of cylinders and heads. The program performs both sequential and random read and verify operations and reports any errors.

Check Test Cylinder

This test checks the test cylinder, which is the last cylinder on the hard disk. You should perform this test if you receive a hard disk error when you boot the system.

Force Bad Tracks

Use this test to mark bad tracks on the hard disk without formatting it.

Caution
The Force bad tracks test destroys any data on your hard disk.

Hard Disk Error Messages

The diagnostics program displays two types of error messages while testing the hard disk: messages the program generates and those the controller generates.

The following message appears if you try to run the Performance Test with less than 128KB of available memory:

```
Insufficient memory for data transfer
Minimum memory required-is - 128KB
```

The controller displays one of the following messages when an error occurs during a diagnostics procedure:

```
Address mark not found
Attachment failed to respond
Bad ECC on disk read
Bad sector flag detected
Controller has failed
Drive activity failed
ECC corrected data error
Requested sector not found
Reset failed
Seek operation failed
Write fault on selected drive
```

If you see one of these error messages, check the drive, controller, cables, and power connectors. If you still get an error, contact your dealer.

Floppy Disk Diagnostics

Floppy disk diagnostic tests may be destructive or non-destructive. Destructive diagnostics destroy data on the diskette, but non-destructive diagnostics do not. The following table lists which tests are destructive and which are not.

Destructive tests	Non-destructive tests
Diskette format	Drive speed
Random R(ead)/W(rite)	Drive change line
Sequential R(ead)/W(rite)	

Performing the Tests

The Diskette format test checks the format capability of the diskette drive and its controller. In order to run the test, you need a blank diskette that has been formatted using the MS-DOS FORMAT command and that is not write-protected. When the program prompts you to insert a diskette, insert the newly formatted one.

Once the Diskette format test is completed successfully, you must use the test diskette to run any of the tests in the following table. These tests will not run properly unless the diskette has been previously used for the Diskette format diagnostic test.

Tests requiring a specially formatted diskette

Test	Function
Drive speed test	Verifies how fast the diskette drive rotates a diskette. A 1.2MB, 5^1/4-inch diskette drive should rotate a 1.2MB diskette at 360 RPM and a 360KB diskette at 300 RPM. A 1.44MB, 3^1/2-inch drive should rotate a diskette at 300 RPM. (Tolerance allowed: one percent.)
Random R(ead)/W(rite) test	Checks the random seek capability of a diskette drive by performing a random read/write operation.
Sequential R(ead)/W(rite) test	Checks the sequential seek capability of a diskette drive by performing a sequential read/write operation.
Drive change line test	Tests the status of the disk change line that detects when you insert or remove a diskette from a drive.

Note
Be sure to insert a blank diskette that has been formatted
using the MS-DOS FORMAT command before you run the
Diskette format test. Then use that diskette when you run
any of the other destructive tests. Check that you have
inserted the correct diskette before you enter Y at the
Proceed prompt.

You see the following prompt before the program performs a
test:

    Diskette drive (A/B) ?

If necessary, type the drive identifier and press **Enter.** (If you
have only one diskette drive, drive A is already entered for
you.) Press Y and **Enter** at the **Proceed** prompt to begin the
test. Press N and **Enter** to return to submenu.

Note
When you are finished running any of these tests on the
test diskette, you must reformat it using the MS-DOS
FORMAT command before you can use it with MS-DOS.

Floppy Disk Error Messages

The diagnostics program displays two types of error messages
while testing a diskette drive: messages the program generates
and those the controller generates.

The program may display the following error message during
the Disk change line test:

    Warning - Change line inoperational

This message appears if the line is not working properly and
may indicate a problem in the drive or its controller.

You may see the following message if you attempt to run the Change line test on a drive that does not support a change line, such as a 360KB or 720KB drive:

```
Change line not available
```

The controller displays one of these messages when an error occurs during a diagnostics procedure:

```
Bad address mark
Bad CRC error
Bad DMA error
Bad seek error
Diskette write protected
Media change error
Record not found
Timeout error
```

These errors could occur because of a faulty drive, controller, or cable, or if you attempt to run a test on a write-protected or unformatted diskette.

Miscellaneous Diagnostics

These tests are listed in the Miscellaneous diagnostics submenu to provide a complete check of the parallel and serial ports:

```
Printer adapter test
Comm. adapter test
```

Printer Adapter Test

This test checks the parallel port and the printer by sending a pattern to the printer. If the printer does not print the pattern, the test has failed.

Before running the test, be sure that the printer is on-line, paper is loaded, and all connections are secure, or you may see one of the following error messages:

```
Error - Printer out of paper
Error - Printer not selected
Error - Printer interface I/O error
Error - Time out on printer
```

Communication Adapter Test

Before running this test on your serial port, you must connect a special RS-232C, AT-type loopback connector to the port, This connector enables the test to send out data and receive the same data back on one line. You can purchase the connector from most electronic supply stores.

Be sure the connector is configured with the following settings:

❏ RD and TD shorted

❏ DSR and DTR shorted

❏ CTS and RTS shorted.

This test resets the computer to check for possible errors. Then it checks the port by sending and receiving data and testing the following port parameters:

❏ 9600 baud rate

❏ Odd parity

❏ *2* stop bits

❏ 8-bit data length.

If you see one of the following errors, there may be a problem with the controller or the test cable:

```
Error - Break detected
Error - Framing error
Error - Overrun error
Error - Parity error
Error - Time out!
```

Check to make sure that the test connector is securely connected to the port. If the error persists, contact your dealer.

Exiting System Diagnostics

To exit from the System diagnostics program, press **Esc. You** see the following prompt:

```
Do you want to exit diag (Y/N)? N
```

Before you press a key, remove the Reference diskette from drive A. If you do not have a hard disk, insert your MS-DOS Startup diskette in the drive. Then press Y and **Enter to** exit the program. You see this message:

```
Stand by while system is rebooting.
```

The computer loads MS-DOS and you see either the C : or **A :** prompt.

Troubleshooting

You should not encounter any difficulties as you set up and use your computer, but if anything out of the ordinary happens, refer to this appendix. You can correct most problems by adjusting a cable connection, repeating a software procedure, or resetting the computer.

Besides trying the suggestions in this chapter, you can run diagnostics checks on the various components of your computer system. See Appendix C for instructions.

If the suggestions here or in Appendix C do not solve the problem, see "Where to Get Help" in the Introduction.

Identifying Your System

When you request technical assistance, be ready to provide the serial number of your computer, its ROM BIOS version number, its configuration (including the type of disk drives, monitor, and option cards), and the names and version numbers of any software programs you are using.

You can find the serial number on the computer's back panel. If you are able to use your computer, follow the steps below to obtain information about your configuration, as well as your ROM BIOS and MS-DOS version numbers.

1. If you do not have a hard disk, insert the MS-DOS Startup diskette in drive A.

2. Turn on your computer or press the **RESET** button to reboot it.

3. When the computer performs a memory test, the version number of your system ROM BIOS appears at the bottom of the screen. Quickly write down the version number. If you do not have enough time to write down the entire number, press **RESET** and try again.

4. When you see **Press <Del> to start SETUP**, press the **Del** key. Write down the appropriate information about your configuration shown on the main SETUP menu. Then exit SETUP (without saving the configuration).

5. At the MS-DOS command prompt, type **V E R** and press **Enter** to display the MS-DOS version number. Write it down.

Error Messages

Your computer's built-in memory (ROM) contains a series of diagnostics programs, called power-on diagnostics, which your computer runs automatically every time you turn it on. These programs check internal devices such as ROM, RAM, the timer, the keyboard controller, and the hard disk drive.

The RAM test program displays the total amount of memory currently installed in your system. If the computer finds an error, it displays an error message on the screen. Write down the error message and give it to your dealer when reporting a problem.

If the error is serious, the computer cancels further checking and halts system initialization. The error message remains on the screen and the computer locks up. If this happens, contact your dealer as soon as possible. Report this information and both the error message and code number to your dealer.

The Computer Won't Start

If your computer does not start when you turn on the power, check the following:

1. Is the power light on? If not, remove any diskettes and turn off the power. Check that the power cord is securely connected to both the AC inlet on the back panel and an electrical outlet. Replace the Startup or Reference diskette, if necessary, and turn on the computer again.

    > **Caution**
    > If you turn off the computer for any reason, always wait at least five seconds before turning it back on. This allows the computer to clear and reset its memory.

2. If the power light still does not come on, check the electrical outlet for power. Turn off your computer and unplug the power cord from the wall outlet. Plug a lamp into the outlet, and turn it on to see if the outlet supplies power.

3. If you installed or removed any of your system components, such as a disk drive, check to make sure you have reconnected all the internal and external cables correctly.

4. If the electrical outlet is working and all the connections are secure but your computer still won't start, call your dealer.

    > **Note**
    > If the computer starts but you can't see anything on the screen, see "Monitor Problems," below.

The Computer Does Not Respond

If your computer locks up and does not respond when you type on the keyboard, follow these steps:

1. Some operations take longer than others to complete. For example, the computer takes longer to sort a database than to accept a single typed character. If your computer still does not respond after a reasonable length of time, proceed to the next step.

2. Your computer may take a long time to complete its power-on diagnostics if you have just made a change in your system's configuration. The first time you turn on your computer after making such a change, it can take several minutes to finish its self test, depending on what you changed. If the computer does not display the MS-DOS prompt after five minutes, press the **RESET** button and try again. If that doesn't work, insert the Reference diskette in drive A and press the **RESET** button. If the computer still does not boot, contact your Epson dealer.

3. Did you enter the correct password? See "Password Problems," below.

4. Could your software be causing the problem? If you are running an application program, see "Software Problems," later in this appendix.

5. The problem could be caused by your keyboard. See "Keyboard Problems," later in this appendix. If your keyboard is operating properly, proceed to the next step.

6. If you want to stop whatever the computer is doing and return to the MS-DOS command prompt, hold down the **Ctrl** key and press **Break** (or press C). See Chapter 3 for more information on stopping a command or program.

7. If your computer still does not respond, you can reset it using the **Ctrl Alt Del** command or the **RESET** button. See "Resetting Your Computer" in Chapter 3 for more information.

8. If resetting the computer does not work, turn it off and wait at least five seconds. If you do not have a hard disk drive, insert the Startup or Reference diskette in drive A. Then turn on the computer. It should load MS-DOS.

9. If you installed a display adapter card in your computer, and you want to use that adapter as your primary display adapter, you need to change the setting of jumper J1 on the main system board to disable the built-in VGA adapter. If you have not set the jumper, you will not see any display on the screen. You may also need to set jumpers J3 and J5. See "Changing the Jumper Settings" in Chapter 5 for instructions.

Password Problems

If you set a password using the SETUP program, you must enter it before you can use the system. When you turn on the computer, it runs a memory test. Then the screen displays the **Enter Password** prompt. If you do not enter the correct password, you cannot use the computer.

If you have any trouble using your password, try the following:

❏ If you type the password and press **Enter** but nothing happens, type it again and press **Enter.**

❏ If you know the current password but you want to change or delete it, see Chapter 2 for instructions.

❏ If you do not know the current password, follow the steps below.

Accessing Your Current Pass word

If you have forgotten your current password and cannot use your computer, follow these steps:

1. Turn off the computer and follow the instructions under "Changing the Jumper Settings" in Chapter 5 to disable the password function by setting jumper J2 to position A.

   Caution
   Be sure to ground yourself on the back inside panel of the computer before touching any of the interior components. Always replace the cover on the computer before you turn it on again.

2. Turn on the computer. You do not see the **Enter Password** prompt.

3. When the **Press <Del> to start SETUP** prompt appears, press **Del.**

4. Highlight **Run SETUP** and press **Enter. You see** the SETUP menu.

   Follow the instructions in Chapter 2 to either set a new password or select **Not Installed** (if you do not want to set a new password). Be sure to save your SETUP information when you exit the program.

5. Turn off the computer and follow the instructions under "Changing the Jumper Settings" in Chapter 5 to enable the password function by setting jumper J2 to position B.

6. If you do not have a hard disk, insert the Startup diskette in drive A. Turn on the computer.

   If you set a new password, you see the **Enter Password** prompt. Enter the password to access your system. (See "Using the Password" in Chapter 3.)

If you did not set a new password, you do not see the **Enter Password** prompt and you can access your system immediately.

Note

Be sure to remember your new password or write it down and keep it in a safe place. If you forget the password you enter now, you may have to repeat the above procedure the next time you reboot your computer.

Keyboard Problems

If you are having trouble with the keyboard, check the following:

1. If the screen displays a keyboard error when you turn on or reset the computer, make sure the keyboard is securely connected to its port. See "Connecting the Keyboard" in Chapter 1 for instructions.

2. If the cursor keys do not work properly, the num lock function may be on. When num lock is on, the numeric/ arrow keys on the numeric keypad work only as numbers. Check **to** see if the **Num Lock** indicator in the upper right corner of the keyboard is lit; if it is, press the **Num Lock** key to turn off the function.

3. If nothing happens when you type on the keyboard, see "The Computer Does Not Respond," above.

4. If you are still having trouble with your keyboard, run the Keyboard diagnostic tests described in Appendix C. If the diagnostics indicate an error, contact your dealer.

Monitor Problems

For monitor problems, check the following:

1. If there is no display on the screen, check that the
   monitor's power switch is on and that the power light on
   the monitor is lit. If the power light is on but you still do
   not see anything on the screen, check the monitor's
   brightness and contrast controls.

2. If the power switch is on but the power light is not, turn
   off the monitor's power, wait five seconds, and turn the
   power back on. Wait to see if the screen displays any text.

3. If the monitor's power light still does not come on, check
   the electrical outlet for power. Turn off your monitor and
   unplug it from the wall outlet. Plug a lamp into the
   outlet and turn it on to see if the outlet supplies power.

4. If you still do not see anything on the screen, make sure
   your monitor is connected to the computer properly. See
   "Connecting a Monitor" in Chapter 1 for more details.
   Also check the monitor manual for instructions on how
   to connect it to the computer.

5. Make sure your monitor and display adapter match, and,
   if you installed a display adapter card, be sure any
   switches or jumpers on the card are set properly. See
   "Connecting a Monitor" in Chapter 1 and the
   documentation that came with your monitor and display
   adapter card for instructions.

6. Be sure you have chosen the correct display adapter type
   in the SETUP program. See "Setting the Primary Display
   Type" in Chapter 2.

7. If you are running an application program, see if you
   need to set up the program for the type of monitor and
   display adapter you have. Also make sure you are using
   the appropriate monitor and display adapter for your
   software.

Note
If your application program requires a monitor that supports graphics but you have a monochrome monitor, the results will be unpredictable.

8. If you installed a display adapter card in your computer, and you want to use that adapter as your primary display adapter, you need to change the setting of jumper J1 on the main system board to disable the built-in VGA adapter. Otherwise, you will not see any display on the screen. You may also need to set jumpers J3 and J5. See "Changing the Jumper Settings" in Chapter 5 for instructions.

9. If you are still having difficulty with your monitor, run the Video diagnostic tests, described in Appendix C. If the diagnostics program indicates an error, contact the place where you bought the monitor.

Diskette Problems

If you see an error message or have trouble accessing data on a diskette, try the following steps:

1. Did you turn down the diskette drive latch on a 5 ¼-inch drive to secure the diskette in the drive? See Chapter 3 for more information.

2. You may have inserted the diskette upside-down or it may not be inserted all the way. Remove the diskette from the drive and reinsert it with the label facing up. Be sure to turn down the diskette drive latch. (See Chapter 3 for detailed instructions on inserting and removing diskettes.)

3. If reinserting the diskette does not solve the problem and you have access to another diskette drive of the same type, place the diskette in the other drive and repeat the operation. If this works, the trouble may be in your diskette drive. See "Diskette Drive Problems," below.

4. Check to see if you have inserted the right type of diskette. For example, are you trying to read a 1.44MB diskette in a 720KB diskette drive? See "Types of Diskette Drives" in Chapter 3 for more information.

5. If your diskette is the right type for your drive, see if it is write-protected. On a 5 ¼-inch diskette, there may be a write-protect tab over the notch on its side or there may be no notch. On a 3 M-inch diskette, the write-protect switch may be set to the write-protect position or there may be no switch. You cannot alter data on a write-protected diskette. (Some application programs do not function properly if the diskette is write-protected. Check the program manual.) See Chapter 3 for information.

6. Is the diskette formatted? A new diskette must be formatted before you can store data on it. See your MS-DOS Reference Manual for instructions on formatting diskettes.

7. You may have entered an incorrect diskette drive type when you ran the SETUP program. Run SETUP again to check the setting. See Chapter 2 for instructions.

8. Did you receive one of the following MS-DOS error messages?

   ❏ Disk Drive Error: Abort, Ignore, Retry?

   ❏ Disk error reading drive d:

   ❏ Disk error writing drive d:

If you see one of these messages, make sure the diskette is properly inserted in the drive. On a 5 ¼-inch diskette drive, make sure the drive latch is closed. Try the operation again. If the problem persists, try removing the diskette and reinserting it. This may solve the problem if the diskette was not seated properly in the drive.

If the error message still occurs, you may have a defective diskette. Use the MS-DOS COPY command to copy the files from the bad diskette to a new diskette. (See your MS-DOS Reference Manual for instructions.)

9. If you see no error messages but there is something wrong with the data in a file, MS-DOS or an application program may have updated the storage information on the diskette incorrectly. This is probably the case if you have one of these problems:

   ❏ Part of a file is missing

   ❏ A file includes parts of other files

   ❏ An expected output file is missing.

   Use CHKDSK to make the necessary repairs; see your MS-DOS Reference Manual for instructions.

Diskette Drive Problems

If you see an error message or have difficulty with a diskette drive, check the following:

1. If you are having problems with a new diskette drive that your dealer installed for you, consult your dealer about the problem.

2. If you installed the drive yourself, did you carefully follow all the instructions in Appendix B of this manual? Review the instructions and check all the cable connections to make sure you have installed it correctly.

3. Did you run the SETUP program to define the correct type of diskette drive as part of the computer's configuration? (See Chapter 2 for instructions.)

4. If you are still having trouble with the drive, run the Floppy disk system diagnostic tests, described in Appendix C. If the diagnostics program indicates an error, consult your Epson dealer.

5. If the diskette drive is making loud or unusual noises, contact your Epson dealer.

Hard Disk Problems

If you are having a problem with a hard disk, it could be the result of improper installation, incomplete disk preparation, or corrupted data. The suggestions in this section are divided into three categories:

❏ Installing the drive

❏ Preparing the drive for use

❏ Accessing data on the drive.

Consult the section that seems most likely to cover the problem you are having. For example, if you have been able to use data on your disk in the past but suddenly cannot, see "Accessing Data on the Drive."

Caution
If your disk has data on it, be very careful before you perform any procedure that may erase data (such as formatting the disk). Consult your dealer if you have any questions. Always be sure to back up your data before reformatting or repartitioning the disk drive. See the descriptions of COPY, XCOPY, and BACKUP in your MS-DOS Reference Manual.

Installing the Drive

If you are having problems with a newly-installed drive,
check the following:

1. If your dealer installed the drive, consult that person
   about the problem.

2. If you have installed the hard disk in your computer
   yourself, did you carefully follow all the instructions in
   Appendix B of this manual? Review the instructions and
   check all the cable connections to make sure you have
   installed it correctly. Also check the jumper settings on
   your drive to make sure they are set correctly.

3. If you installed a non-Epson hard disk drive, was it
   physically formatted by the manufacturer? A blank, new
   hard disk must be formatted (or *initialized)* before you can
   partition it and install an operating system on it. This
   type of format is usually done by the manufacturer; if
   yours was not, you must do it yourself. If the drive came
   with its own format utility, use that program; if not,
   follow the instructions in Appendix C under "Hard Disk
   Format."

   Note that this physical type of format is different from
   the software-based type of formatting commands (such as
   the MS-DOS SELECT or FORMAT commands. See
   "Preparing the Drive," below, for more information.

4. If you installed a hard disk drive with its controller on an
   option card, did you disable the built-in hard disk drive
   controller and select the correct drive type through
   SETUP? See Chapter 2 for instructions.

Preparing the Drive

Before you can store data on a new hard disk (which has already been physically formatted), you must do the following to prepare it for use:

1. Run the SETUP program to define your hard disk as part of the computer's configuration. (See Chapter 2 for instructions.)

2. Partition the drive, format it for MS-DOS, and install MS-DOS. Step-by-step instructions for performing these procedures are provided in your MS-DOS Installation Guide. If you are using another operating system, follow the instructions that came with it.

If you do not prepare the drive correctly, you will not be able to store data on the disk. For example, if you have partitioned the drive and formatted it for MS-DOS (or for another operating system) but you do not copy the operating system to the drive, you will not be able to load the operating system from the hard disk when you turn on the computer.

If you are sure the hard disk has been installed properly and you have prepared it for use as described above but you cannot access the drive, review the instructions in your MS-DOS Installation Guide. Make sure you performed each step in the installation process correctly for your configuration.

If you cannot identify the problem, consult your dealer.

Accessing Data on the Drive

If you have been using your hard disk drive successfully for some time and notice a reduction in performance, the data on the disk may have become fragmented. You may want to back up all your data and then use a disk compaction utility to reorganize the files on your disk. Contact your dealer for information.

If you still have trouble with your hard disk, you can back up your data and physically reformat the disk. Then you'll need to reinstall MS-DOS and copy your files back onto the disk. See "Hard Disk Format" in Appendix C and your MS-DOS Reference Manual for instructions.

If you cannot access data on your hard disk or you are receiving read/write errors, the disk may have a physical problem. Contact your dealer.

Software Problems

If you are having trouble with an application program, try the following solutions:

1. If the application program does not start, check that you are following the correct procedure for starting the program, and that it is installed correctly. If you have a hard disk and the program is stored in a directory on that drive, make sure you are logged onto or specifying the correct directory. If you don't have a hard disk, make sure you have inserted the correct diskette in drive A.

2. Your computer can run at either high speed (16 MHz) or low speed (8 MHz). While almost all programs work properly at the faster speed, some must run at the slower speed. Check your software manual to see if this is the case, and change the CPU operating speed if necessary. See "Changing the Processor Speed" in Chapter 4 for instructions and for information on accommodating copy-protected programs.

3. If you have entered an MS-DOS command that you want to stop, there are special key combinations you can type to tell MS-DOS to stop what it is doing. These methods may also work in your application programs:

   ❏ Hold down **Ctrl** and press C

   ❏ Hold down **Ctrl** and press **Break.**

4. An application program can occasionally lock the computer, making it unresponsive to the keyboard. If your computer does not respond when you type on the keyboard, you can reset it. Follow the instructions in Chapter 3.

5. If resetting the computer does not help, turn off your system, wait five seconds, and then turn it back on. Then you can restart your application program.

6. If none of these solutions solve your software problem, contact the software manufacturer for technical support.

Printer Problems

Below are some general steps to follow if you are having difficulty with your printer. If the problem persists and you need more detailed information, check your printer manual.

1. If your printer does not work at all, check that the printer has power and is properly connected to the computer. (Also, make sure your printer has paper in it.) See Chapter 1 for instructions or see your printer manual.

2. Check the printer manual for the printer's correct DIP switch or control panel settings. These settings help a printer communicate properly with the computer.

3. If you are using more than one parallel port or more than one serial port, the computer must know which port is the primary and which is the secondary. See Chapter 2 for instructions on how to define the parallel and serial ports using the SETUP program.

4. If your printer is properly set up but is still not functioning, test it from the MS-DOS level. When the screen displays the MS-DOS command prompt (such as C> or A>), hold down **Shift** and press **Print Screen. This** should print the contents of the screen on your printer.

If it does not, you may need to change the internal
setting of the computer's parallel port for a parallel
printer (or serial port for a serial printer). To do this,
use the MS-DOS MODE or SETMODE command. See
your printer manual and the MS-DOS Reference Manual
for more details.

5. Many application programs (such as word processors)
must be set up properly before they can use a printer.
Check your program manual to see what customizing
may be required.

6. If you are using an application program that requires a
printer driver, make sure the driver is installed properly.
See your application program manual for instructions.
Also see your printer manual for additional instructions
on using your printer with application programs.

7. Try running the Printer adapter diagnostics test if you
have a parallel printer, or the Communication adapter
test if you have a serial printer. Appendix C describes
these tests. If the test indicates an error, contact your
printer dealer.

Option Card Problems

If you install an option card and it is not functioning
properly, check the following:

1. Is the option card installed correctly? The most common
problem with option cards is a loose connection. Make
sure the card is well-seated in its slot. Check the
installation procedure described in Chapter 5 and also
see the instructions that come with the card.

2. Did you set the necessary DIP switches or jumpers on the
option card? See the card's manual for instructions.

3. Did you set the necessary jumpers on the main system board? See Chapter 5 for more information.

4. Did you run the SETUP program to update your configuration after installing the card? See Chapter 2.

5. If you used the option card to add an external device to your computer, did you use the proper cable to connect the device to the card's connector on the back panel?

6. Did you perform the correct setup procedures for the software you are using with the option card? If necessary, see your software manual for instructions.

Mouse Problems

If you have trouble with your mouse, check the following:

1. Make sure that your mouse is securely connected to its port on the back of the computer. Also, make sure you have connected it to the correct port. See Chapter 1 for more information.

2. If the mouse is connected properly, make sure that jumper J4 on your computer's main system board is set correctly for your mouse. See Chapter 5 for more information.

3. If you're still having trouble, check the documentation that came with your mouse for any troubleshooting information, or contact your dealer.

Memory Module Problems

If you added extra memory to your system by installing SIMMs and that memory is not operating properly, check the following:

1, If the memory count displayed by the power-on diagnostics program is incorrect, you or your dealer may not have installed the SIMMs correctly. The SIMMs may be installed in the wrong sockets, they may be the wrong type of SIMM, or they may not be inserted all the way into their sockets.

   If your dealer installed SIMMs for you, contact your dealer; do not attempt to correct the problem yourself. If you installed them, see "Adding Memory Modules" in Chapter 5 and make sure you followed all the instructions.

2. Be sure to run the SETUP program after you install or remove memory modules to automatically update your memory configuration. See Chapter 2 for instructions.

3. If you are still having trouble with your SIMMs, write down any error messages and contact your dealer.

Battery Problems

The battery in your computer is a 3.6 volt, lithium battery. It should last from three to five years before you need to replace it. When the battery's life is exhausted, you may see one of the following error messages:

```
CMOS battery state low
CMOS system options not set
```

Purchase a new battery pack and follow the instructions in Chapter 5 to install it. (You may want your dealer to install it for you.)

Math Coprocessor Problems

If your math coprocessor does not seem to be operating properly, check the following:

1. Run the SETUP program and check to make sure that the math coprocessor is listed as Installed on the SETUP display. If it is listed as Not installed, **you** or your dealer may have installed the coprocessor incorrectly. See Chapters 2 and 5 for more information.

    Caution
    Do not attempt to remove the math coprocessor yourself. Contact your dealer for information about a special extraction tool that is needed to remove it.

2. If your math coprocessor is listed as Installed in the SETUP program but still does not seem to be working, check the manual that came with it for troubleshooting information and for any diagnostic procedures you can perform.

Glossary

Address

A number or name that identifies the location where information is stored in a computer's memory.

Analog monitor

A monitor that generates, responds to, or acts upon analog data. Analog data is transmitted by varying the voltage levels in a continuous current.

Application program

A software program designed to perform a specific task, such as a word processing or spreadsheet program.

ASCII

American Standard Code for Information Interchange. A standardized coding system for representing characters, such as numbers, letters, and graphic symbols. An ASCII character occupies one byte of storage. Many different computers, printers, and programs can use files transmitted in ASCII code.

Asynchronous

A method of data transmission in which one machine sends data one character at a time to another machine at irregular intervals that do not need to be synchronized to a timing device.

AUTOEXEC. BAT file

The batch file that is executed automatically when you load MS-DOS. See also *Batch file.*

Automatic speed

The feature that enables the computer to switch
automatically from high speed (16 MHz) to low speed
(8 MHz) when accessing a diskette drive.

Backup

An extra copy of a program, data file, or disk, that is created
in the event your working copy is damaged or lost.

Bose memory

The memory in the computer below 1MB that is available to
MS-DOS and application programs-usually 640KB. Also
called conventional memory or main memory.

Batch file

A type of file that lets you execute a series of MS-DOS
commands by typing one command. Batch files are text files
with the filename extension .BAT. When you type the
filename, MS-DOS executes all the commands in that file
sequentially.

BIOS

Basic Input/Output System. Routines in ROM (Read Only
Memory) that handle basic input/output functions of the
operating system and the video controller.

Bit

A binary digit (0 or 1). The smallest unit of computer storage.
The value of a bit represents the presence (1) or absence (0) of
an electric charge.

Boot

To load the operating system into the computer's memory.

Byte

A sequence or group of eight bits that represents one character.

CGA

Color Graphics Adapter. A type of display adapter card that can generate up to 25 lines of text with 80 characters on each line, monochrome graphics at 640 x 200 resolution, or four-color graphics at 320 x 200 resolution.

Character

Anything that can be printed in a single space on the page or the screen; includes numbers, letters, punctuation marks, and graphic symbols.

CMOS

Complementary Metal-Oxide Semiconductor. A type of low-power silicon chip.

Code

A system of symbols for representing data or instructions. Also any software program or part of a program.

Command

An instruction you enter (usually on a keyboard) to direct your computer to perform a specific function.

Command prompt

The symbol or message that tells you MS-DOS is loaded and ready to receive instructions. The default command prompt displays the current drive and directory. If you are logged onto drive C, the command prompt may look like this: C:>.

Configuration

The particular setup of a group of components. A typical system configuration consists of a computer with one diskette drive and one hard disk drive connected to a monitor and a printer.

Control code

A command (generated when you hold down **Ctrl** and press another key on the keyboard) that instructs the computer to perform a specific function.

Coprocessor

An optional device that enables the computer to process certain mathematical calculations faster.

Copy-protected program

A type of program that cannot be copied. Some copy-protected programs require you to leave the program diskette in the drive while you are using it. Some also require the computer to be running at low speed (8 MHz) instead of high speed (16 MHz). See also *Automatic speed.*

CPU

Central Processing Unit. The primary unit of the computer that interprets instructions, performs the tasks you indicate, keeps track of stored data, and controls all input and output operations.

Cursor

The highlighted marker that shows your position on the screen.

Cylinders

The vertical alignment of tracks in a hard disk that can be lined up under one read/write head. The number of tracks on a disk is equal to the number of cylinders times the number of heads.

Data

Information such as text or graphics stored or processed by a computer.

Data diskette

A formatted diskette on which you store data files (as opposed to program files).

Default

Any value or setting that takes effect when the computer is turned on or reset. A default value stays in effect unless you override it temporarily by changing a setting or you reset the default value itself.

Delimiter

A character or space used to separate different parts of an MS-DOS command.

Device

A piece of equipment that is part of a computer system and performs a specific task, such as a disk drive, a monitor, or a printer.

Device driver

A file containing instructions that allow your computer to recognize and control a device.

Diagnostics

The tests and procedures the computer performs to check its internal circuitry and set up its configuration.

DIP switch

Dual Inline Package switch. A small switch on a computer, option card, or printer that controls a particular function.

Directory

A list of files stored in a particular area on a disk; part of a structure for organizing files into groups. A directory listing shows the name, location, and size of the files in the directory. A directory can contain both files and subdirectories.

Disk

The collective term for diskettes and hard disks.

Disk drive

The physical device that allows the computer to read from and write to a disk. A diskette drive has a disk slot into which you insert a diskette. A hard disk is sealed inside a protective unit.

Diskette

A flat piece of flexible plastic coated with magnetic material used to store data permanently.

Display adapter card

A circuit board that can be installed in one of the computer's option slots to provide the monitor interface. A display adapter card controls the way the monitor displays text and graphics. (In the Equity 386SX/16 PLUS, a VGA display adapter is built into the system board.) Also known as *Video card.*

DOS

>Disk Operating System. A commonly used operating system
that controls the computer's input and output functions. See
also Operating system.

Double-density

>A type of diskette format that allows you to store twice as
much data as the standard-density format. A 5¼-inch double-
density diskette can store 360KB of data. A 3½-inch double-
density diskette can store 720KB of data.

Drive designator

>The letter name of a disk drive, followed by a colon-for
example, C : .

EGA

>Enhanced Graphics Adapter. A type of display adapter card
that allows you to display high-resolution graphics on a
compatible monitor. It can display up to 43 lines of text with
80 characters on each line, or it can display monochrome or
16-color graphics at resolutions up to 640 x 350.

Expanded memory

>Memory that specially written MS-DOS application programs
can use with an Expanded Memory Specification (EMS)
device driver such as EMM386SX.SYS.

Extended Memory

>Memory above 1MB that is accessed by the protected mode
of the 80386SX microprocessor and is available to some
application programs and operating systems.

Extension

>A suffix of up to three characters which you can add to a
filename to better identify it.

file

> A group of related pieces of information called records, or entries, stored together on a disk. Text files consist of words and sentences. Program files consist of codes and are used by computers to interpret and carry out instructions.

Filename

> A name up to eight characters long that MS-DOS uses to identify a file.

Fixed disk

> *See Hard disk.*

Format

> To prepare a new disk (or an old one you want to reuse) so that it can store information. Formatting divides a disk into tracks and sectors and creates addressable locations on it.

Graphics

> Lines, angles, curves, and other nonalphanumeric data.

Hard disk

> The enclosed unit used to store large amounts of data. Unlike a diskette, it is fixed in place. It can process data more rapidly and store many more files than a diskette. Also called fixed *disk.*

Hardware

> Any physical component of a computer system, such as a monitor, printer, keyboard, or CPU.

High-density

A type of format that allows you to store more data than on single- or double-density diskettes. A 5¼-inch high-density diskette can store 1.2MB of data. A 3½-inch high-density diskette can store 1.44MB of data.

Input/output (I/O) *port*

See Port.

interface

A physical or software connection used to transmit data between equipment or programs.

jumper

A small device that connects two pins on an option card, a disk drive, or the main system board to activate a particular function.

Key disk

A diskette containing a copy-protected program that must remain in the diskette drive while you are using the program.

Kilobyte (KB)

A unit used to measure storage space in a computer's memory or on a disk. One kilobyte equals 1024 bytes.

LIM *4.0* **EMS**

Version 4.0 of the Lotus/Intel/Microsoft Expanded Memory Specification-a protocol that allows certain application programs to use memory that MS-DOS cannot use.

Main **system** board

The board built into your computer containing the circuitry the computer requires to operate.

Math coprocessor

An optional device that enables the computer to process certain mathematical calculations faster.

MCGA

Monochrome/Color Graphics Adapter. A type of display adapter that runs either a monochrome or color graphics monitor.

MDA

Monochrome Display Adapter. A type of display adapter that displays text in only one color, such as green or amber.

Megabyte *(MB)*

A unit used to measure storage space in a computer's memory or on a disk. One megabyte equals 1024KB.

Megahertz *(MHz)*

A unit used to measure oscillation frequency (of a computer's internal timing clock). A megahertz is one million cycles per second. The Equity 386SX/16 PLUS operates at 16 MHz or 8 MHz.

Memory

The area where your computer stores data. Memory contents are stored permanently (in ROM) or temporarily (in RAM).

Memory module

A small circuit board that contains memory chips. You can add 256KB, 1MB, or 4MB memory modules to the main system board inside the computer to expand the computer's memory. A memory module is commonly called a SIMM (single inline memory module).

Memory on card

>   The additional memory on an option card installed in the
>   computer.

MGA

>   Multi-mode Graphics Adapter. A type of display adapter card
>   that can display monochrome text and color graphics on the
>   screen.

Microprocessor

>   A small version of a CPU contained on one semiconductor
>   chip.

Modem

>   A device that allows a computer to transmit signals over
>   telephone lines so it can send and receive data. Modem
>   stands for MOdulator/DEModulator.

Monitor

>   The piece of hardware that contains the screen and displays
>   information.

Monochrome monitor

>   A monitor that displays in only one color, such as green or
>   amber, as opposed to a color monitor which can display in
>   several colors.

Mouse

>   A hand-held pointing device with one or more buttons.
>   When you slide the mouse over a flat surface in a certain
>   direction, the cursor moves in the same direction on the
>   screen.

MS- DOS

Microsoft Disk Operating System. The operating system most commonly used with your computer. See also Operating system.

Numeric keypad

The number and cursor control keys grouped to the right of the keyboard.

Operating speed

The speed at which the central processing unit can execute commands. The Equity 386SX/16 PLUS can run at 16 MHz or *8* MHz.

Operating system

A collection of programs (such as MS-DOS, OS/2, or UNIX) that manages a computer's operations. The operating system determines how programs run on the computer and supervises all input and output.

Option card

A circuit board you install inside the computer to provide additional capabilities, such as a modem.

Parallel

The type of interface that transmits all the bits in a byte of data simultaneously over separate lines. See also Interface and *Serial.*

Parameter

A qualifier added to a command that tells MS-DOS what particular conditions to look for and specifies information such as what data to process and where to locate or store a file.

Parity

A method used to verify the accuracy of data transmissions by adding a bit that makes the total of the byte odd for odd parity or even for even parity.

Partition

(1) The area defined on a hard disk for use by an operating system; (2) to divide a hard disk into separate sections or logical drives. You can define a primary partition and one or more extended partitions on a hard disk.

Password

The sequence of characters (up to seven) you type after you turn on the computer in order to access and use your system.

Pathname

The directory name(s) you specify to locate a file. For example, the pathname for the file SALES, stored in the subdirectory BUSINESS, is \BUSINESS\SALES.

Peripheral device

An external device (such as a printer or a modem) connected to a computer that depends on the computer for its operation.

Port

A physical input/output socket on a computer to which you can connect a peripheral device.

Power-on diagnostics

Tests that the computer runs to check its internal circuitry and configuration each time you turn it on.

Processor speed

See Operating speed.

Program

A file that contains coded instructions and tells a computer what to do and how to do it.

Prompt

A message the screen displays to request information or tell you what action you need to perform next. See also *Command prompt.*

RAM

Random Access Memory. The portion of the computer's memory used to run programs and store data while you work. All data stored in RAM is erased when you turn off or reset the computer; so you must store any data you want to keep on disk.

Read

To copy data from one area to another. For example, when you open a text file stored on disk, the computer reads the data from the disk and displays it on the screen.

Read/write head

The physical device inside a disk drive that reads data from and records data on the magnetic surface of a disk.

Real-time clock

A battery-powered clock inside the computer that keeps track of the time and date, even when the computer is turned off.

Reset

>   To reload a computer's operating system so you can retry a
>   task or begin using a different operating system. Resetting
>   erases all information in RAM.

RCB

>   Red Green Blue. A type of color monitor.

ROM

>   Read Only Memory. A portion of memory that can only be
>   read and cannot be used for temporary storage. ROM retains
>   its contents even when you turn off the power.

Root directory

>   The top-level directory in MS-DOS, designated by a \
>   (backslash). All other directories are subdirectories of the root
>   directory.

RS-232C

>   A widely used, standard type of serial interface. You can
>   connect an RS-232C compatible device to the built-in port on
>   your computer.

Sector

>   A contiguous section of a disk track that provides an address
>   at which the computer can access data.

Self lest

>   The initial diagnostics procedures a system performs to check
>   its hardware.

Serial

>   The type of interface that transmits data one bit at a time. See
>   also *Interface* and *Parallel.*

Shadow RAM

The feature provided by the Equity 386SX/16 PLUS that
enables the computer to copy the system ROM BIOS and
video ROM into the RAM area of memory to speed up
processing.

SIMM

See Memory module.

Software

The programs that enable your computer to perform the tasks
and functions you indicate.

Subdirectory

A directory or group of files that branches down from
another subdirectory or from the root directory.

Switch

An option added to an MS-DOS command that modifies the
way the command works. Switches are usually preceded by a
/ (forward slash). For example, if you add the /S switch to a
FORMAT command, MS-DOS installs the operating system
on the diskette as it formats it. See also *Parameter.*

System diagnostics

A series of checks you can perform on the computer to make
sure the hardware is functioning correctly.

System diskette

A diskette that contains the operating system.

Tracks

Addressable, concentric circles on a disk, resembling the
grooves on a record, which help to divide the disk into
separate accessible areas.

VGA

Video Graphics Array. A type of high-resolution display
adapter. The VGA adapter built into the system board of your
computer can display 16-color graphics at resolutions up to
800 x 600 on a compatible VGA monitor.

Video card

A display adapter card that can be installed in one of the
computer's option slots to provide a monitor interface. Your
computer comes with a built-in VGA adapter, so you do not
need to install a video card if you are going to use this
interface.

Write

To store data on a disk.

Write-protect

To protect the data on a diskette from being changed by
placing a write-protect tab over the notch on a 5¼-inch
diskette or by setting the write-protect switch on a 3 ½-inch
diskette. When a diskette is write-protected, you cannot
erase, change, or record over its contents.

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W

X

TURBO speed
light

hard disk
access light

diskette drive

power button

EPSON
EQUITY 386SX/16 PLUS

RESET button

diskette
release latch

hard disk or
diskette drive slot

power light

power inlet

option card slots

mouse port

VGA monitor port

parallel port

keyboard port

-serial port

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