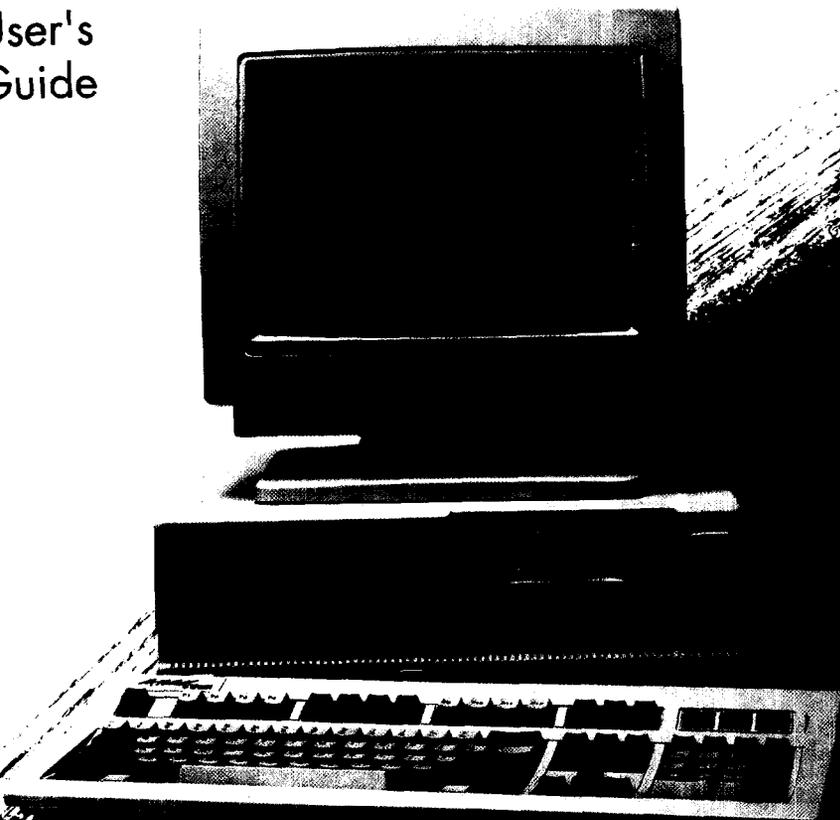*Apex*™ 200\20 & 200\40
by **EPSON**®

■ User's
Guide

Reader Comment Card

Apex 200\20 and Apex 200\40

Please use this card to evaluate this manual. Your comments and suggestions
will help us improve our publications.

Please rate the following:	Excellent	Good	Fair	Poor
■ Organization of this manual	❏	❏	❏	❏
■ Technical accuracy	❏	❏	❏	❏
■ Completeness of instructions	❏	❏	❏	❏
■ Clarity of concepts and wording	❏	❏	❏	❏
■ Quality of examples and pictures	❏	❏	❏	❏
■ Quantity of examples and pictures	❏	❏	❏	❏

Comments : _____

_____

_____

_____

Please list the software and any hardware you are using with your computer:

_____

_____

Name: _____

Title: _____

Company: _____

Address: _____

City: _____

State: _____ Zip: _____

Please cut out and mail in. Thank you!

EPSON

EPSON America, Inc.
2780 Lomita Blvd.
Torrance, CA 90505

M S 4-1

Fold Here

Apex 200\20 & 200\40
by EPSON®

User's Guide
for the
Apex 200\20 and Apex 200\40

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

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

If necessary, consult your dealer or an experienced radio/television technician for additional suggestions. You may find the following booklet prepared by the Federal Communications Commission helpful:

"Television Interference Handbook."

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00450-7.

Note: If the interference stops, it was probably caused by the computer or its peripheral devices. To further isolate the problem: Disconnect the peripheral devices and their input/output cables one at a time. If the interference stops, it is caused by either the peripheral device or its I/O cable. These devices usually require shielded I/O cables. For Epson peripheral devices, you can obtain the proper shielded cable from **your** dealer. For non-Epson peripheral devices contact the manufacturer or dealer for assistance.

WARNING: This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception. The connection of a non-shielded equipment interface cable to this equipment will invalidate the FCC Certification of this device and may cause interference levels that exceed the limits established by the FCC for this equipment.

This digital apparatus does not exceed the Class A/ Class B (whichever is applicable) limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian Department of Communications.

Le present appareil numérique n'émet pas de bruits radioelectriques dépassant les limites applicables aux appareils numériques de Classe A/de Classe B (selon le cas) prescrites dans le règlement sur le brouillage radioelectriques édicté par le Ministère des Communications du Canada.

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Introduction

Your Apex'" personal computer is powerful, versatile, and easy to use. After setting up your system with the simple instructions in this manual, you'll soon be using your favorite software programs.

The Apex 200 computer is available in these configurations:

❏ The Apex 200\20 provides one 1.2MB (megabyte) diskette drive and one 20MB hard disk drive

❏ The Apex 200\40 provides one 1.2MB diskette drive and one 40MB hard disk drive.

Both models come with 640KB (kilobyte) of internal memory, a total of six internal option slots, an MGA (multi-graphics adapter) card, and built-in serial and parallel interfaces. You can connect either a monochrome or color graphics monitor to the MGA card in the computer.

Your computer comes with version 3.3 of MS-DOS®- the operating system by Microsoft? In addition to the introduction to MS-DOS provided in this manual, you'll find a complete reference manual for the operating system packed in the box with the computer.

As a supplement to MS-DOS, Epson has included several time-saving utilities that make MS-DOS easier to use: HELP, MENU, and XTREE? The HELP program lets you display information on the screen about any MS-DOS command. MENU provides an easier way to run many of the most common MS-DOS commands. XTREE is a file management utility that simplifies all file and directory operations; it is especially useful for managing data on a hard disk.

As your needs grow, so can your computer; you can expand your system by adding a wide variety of options. You can install most option cards compatible with the IBM® Personal

Computer. For example, you can add an internal modem card to provide data communications. If you use software that executes lengthy mathematical calculations, you may want to install an 80287 math coprocessor to speed up processing.

How to Use This Manual

This manual explains how to set up and care for your computer. It also describes how to use your computer and run diagnostic checks. The instructions in this manual apply to both the Apex 200\20 and Apex 200\40, except where otherwise indicated.

You probably don't need to read everything in this book; see the following chapter summaries.

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

Chapter 2 describes how to run the Setup program to set up your computer's configuration.

Chapter 3 covers some general operating procedures, including how to use and care for your disks and disk drives.

Chapter 4 provides basic instructions for using MS-DOS with your computer.

Chapter 5 describes how to install option cards in your computer.

Chapter 6 contains troubleshooting tips in case you encounter any problems while using your computer.

Appendix A gives the technical specifications for the Apex 200\20 and Apex 200\40.

Appendix B provides information on the power-on diagnostics.

Appendix C outlines the system diagnostic checks you can perform on your computer. If you are having trouble with any part of the hardware, you may want to run some of these diagnostic checks.

Appendix D describes how to perform a low-level format on the hard disk. You need to do this only if you are having serious problems with the hard disk in your computer or if you have installed a new hard disk that has not received this type of format. (This is not the same type of format provided by the MS-DOS FORMAT command.)

Appendix E explains how to prepare a new hard disk for use. You need to follow these instructions only if you have installed a new hard disk in your computer or if you need to repartition or reformat the one you have been using.

Appendix F lists the types of hard disks you can use in your computer. You need to enter information from this table when you run the Setup program after installing an additional hard disk.

At the back of the manual you'll find a glossary of the computer terms used in this manual and an index.

Where to Get Help

Customer service for Epson products is provided by a network of authorized Epson Customer Care Centers throughout the United States. Call the Epson Consumer Information Center at 1-800-922-8911 for the following:

❏ Customer Care Center referrals

❏ Technical support referrals

❏ Information on Epson User Groups.

To locate or purchase accessories or supplies, contact your nearest Epson dealer or call 1-800-873-7766.

Chapter 1
Setting Up Your System

Setting up your Apex personal computer is easy. Just follow the nine steps in this chapter. You may want to leave the back cover foldout of this book open so you can refer to the two illustrations identifying the different parts of the computer.

> *Note*
> If you have experience setting up computers, you may prefer to follow the brief instructions on the Read This First card included with this manual. (Turn to this chapter if you have any questions, and for instructions on copying your system diskettes.)

When you finish setting up your computer, go on to Chapter 2 and follow the instructions there to run the Setup program. The Setup program updates the list of equipment installed in the computer. You need to run this program the first time you use your computer and any time options are added or changed.

1 Unpacking

As you unpack the different parts of your computer system, be sure to inspect each piece. If anything is missing or looks damaged, contact the place where it was purchased for missing items or replacements. If you cannot obtain the necessary part or parts, call your Epson Customer Care Center for assistance. Please have the computer's serial number ready when you call.
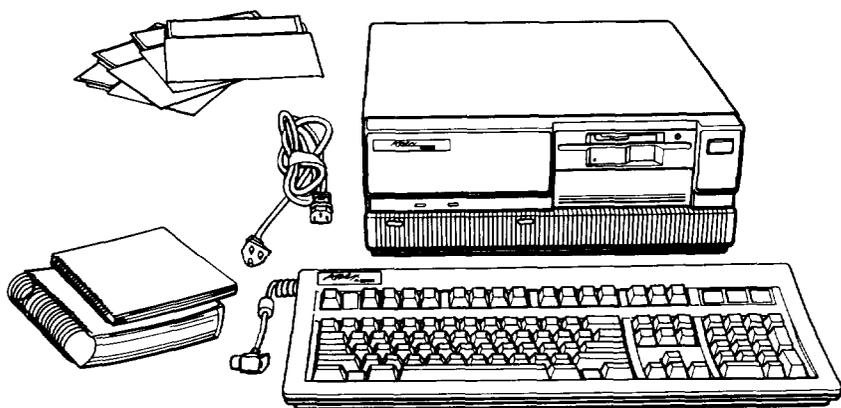
Besides this manual, you should have the following:

❑ The computer and power cord

❑ The keyboard with attached cable

❑ Four diskettes: three that contain the MS-DOS operating system (Startup, Operating 1, and Operating 2), and a Reference diskette

❑ An MS-DOS Reference Manual.

In addition to these items, you need a compatible monitor to use with the computer. With the MGA (multi-graphics adapter) card in the computer, you can use a monochrome or color graphics monitor.

You'll find warranty and registration cards with the computer. Fill out the registration card and mail it to Epson. With this card on file, Epson can send you update information. You also should retain the computer's receipt from the place of purchase. The receipt is all that is required for warranty service.

Be sure to keep your packing materials. They provide the best protection for your computer if you need to transport it later.

Removing the Diskette Drive Protector Card

A protective piece of cardboard occupies the slot of the diskette drive in your computer. This card is inserted at the factory to protect the read/write heads in the drive.

Be sure to remove the card from the diskette drive before you turn on the computer. Turn the diskette drive latch up until it is horizontal and carefully pull out the card.
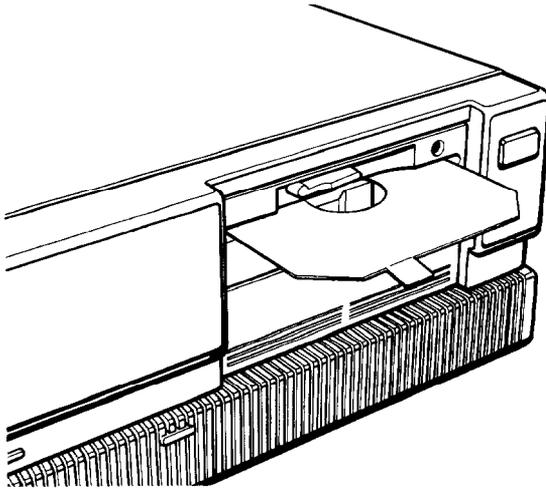
Save the protector card and reinsert it whenever you move the computer. If you don't plan to use your computer for a week or more, reinsert the card to help prevent dust from entering the disk drive.

2 Choosing a Location

Before you set up your computer, it is important to choose the right location. Select a spot that provides the following:

❑ A large, sturdy desk or table that can easily support the weight of your system, including all of its components. Make sure the surface is hard and flat. Soft surfaces like beds and carpeted floors can generate static electricity, which may erase data on your disks and damage the computer's circuitry. Soft surfaces also prevent proper ventilation.

❑ Good air circulation. Air must be able to move freely under the system as well as behind it. Leave several inches of space around the computer to allow ventilation.

❑ Moderate environmental conditions. Protect your computer from extremes in temperature, direct sunlight, or any other source of heat. High humidity also hinders operation, so select a cool, dry area. Avoid dust and smoke, which can damage disks and disk drives and cause you to lose valuable data.

❑ Appropriate power sources. To prevent static charges, connect all your equipment to three-prong, 120-volt AC, grounded outlets. You need one outlet for the computer, one for the monitor, and additional outlets for a printer and any other peripherals.

If it has the appropriate power cord, you can plug the monitor into the auxiliary power outlet on the back panel of the computer, reducing the number of wall outlets you need. (The current required by the peripheral must not exceed 1 amp.) If you need more outlets, you may want to buy a power strip-available at any electronics store-to provide extra outlets. A power strip with surge suppression is recommended.

Cl   No electromagnetic interference. Locate your system away from any electrical device, such as a telephone, that generates an electromagnetic field.

3 Connecting a Monitor

Your computer comes with an MGA (multi-graphics adapter) card installed. This card controls the monitor and provides the connection needed to attach the monitor to the computer. You can connect a monochrome or color graphics monitor to this card.

> Note
> If you are using a monitor that is neither monochrome nor color graphics (such as an EGA or VGA monitor) with your computer, you need a compatible display adapter card to control it. If the optional card is nut already installed in the computer, you need to install it before you can connect the monitor, See Chapter 5 for instructions on adding option cards (in this case, the video card).

The procedure you use to connect your monitor to the computer depends on the type of monitor you have. See your monitor manual for detailed instructions, or follow these general guidelines:

1.   Place your monitor on top of or near the computer. It is easiest to connect the monitor cable if you are facing the back panels of both the monitor and the computer.

2.   If necessary, connect the monitor cable to the monitor. (Some monitors, such as the color Apex monitor, come with permanently attached cables.)

3. Connect the monitor cable to the video card connector on the back of the computer, as shown below. If the plug has retaining screws, tighten them securely.
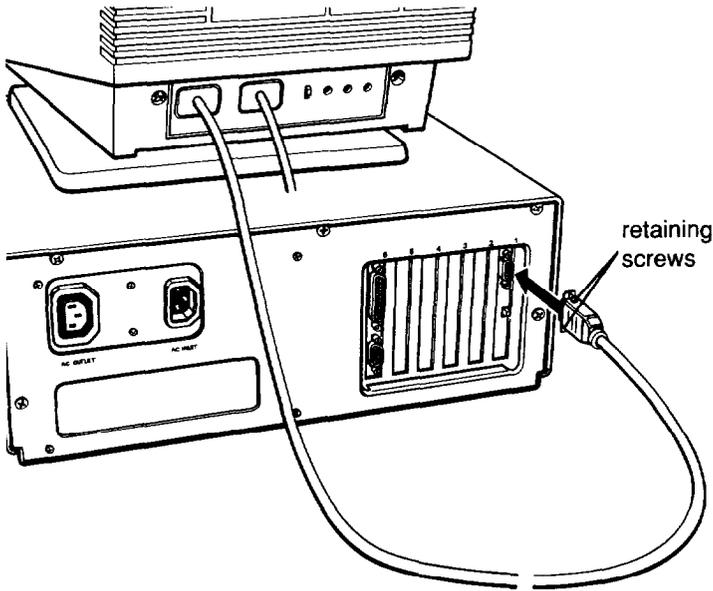
4. If necessary, plug the monitor's power cord into the monitor's power inlet. (The power cord on Apex monitors is already attached.)

5. Plug the other end of the monitor's power cord into an electrical outlet.

    Note
    If the monitor has the proper type of plug, you can plug it into the auxiliary AC outlet next to the AC inlet on the back of the computer.

6. If you connected the monitor to the MGA card in the computer, set the color/mono monitor switch on the card (shown in the following illustration) to match the type of monitor you are using, either color or monochrome.
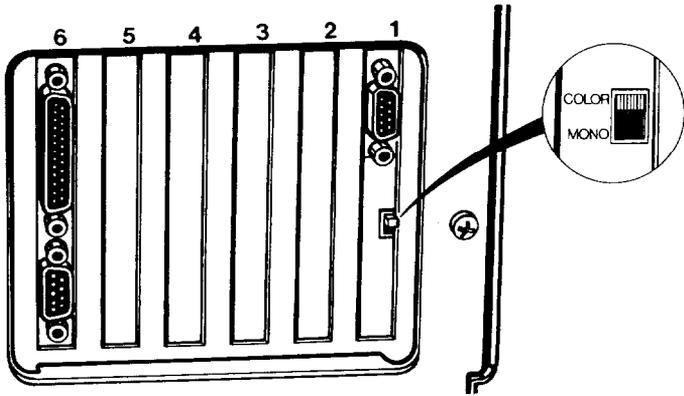
Note
Many color monitors display in only one color (such as green or amber), but are not monochrome monitors. If your monitor is not specifically a monochrome monitor, you should set the color/mono switch to color. Check the documentation that came with your monitor to verify the type of monitor.

4 Connecting a Printer, Mouse, or Modem

The computer has a parallel interface and a serial interface on the back panel, so you can easily connect a printer or other type of device with either type of interface.

For example, you can use the parallel port to connect a parallel printer (most printers have a parallel interface). You can use the serial port to connect a serial printer, a serial mouse, or an external modem.

Follow the steps in this section to connect a printer or other peripheral device to either the parallel or serial interface.

Using the Parallel Interface

The parallel interface on your computer is Centronics®
compatible and uses a 25-pin connector. To connect a parallel
printer to your computer, you need an IBM-compatible printer
cable. If you are not sure which one you need, or whether you
have the right one, check with the store where you purchased
the printer.

Once you have the correct printer cable, follow these steps to
connect the printer to the parallel interface on the computer:

1. Place the printer next to your computer.

2. One end of the printer cable has a 25-pin, male connector.
    Connect this end to the parallel port on the back panel of
    the computer, as shown below. If the plug has retaining
    screws, tighten them securely.

retaining screws
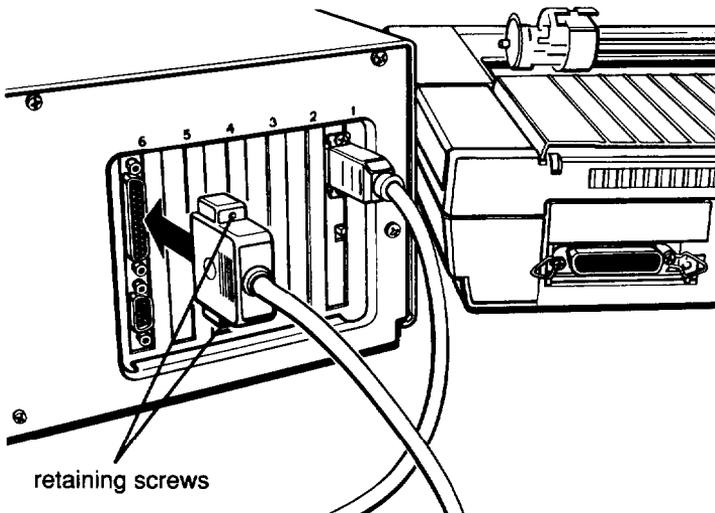
3. Connect the other end of the cable to the printer, as shown below. If the printer has retaining clips on each side of the printer port, squeeze the clips together to secure the cable.

clips
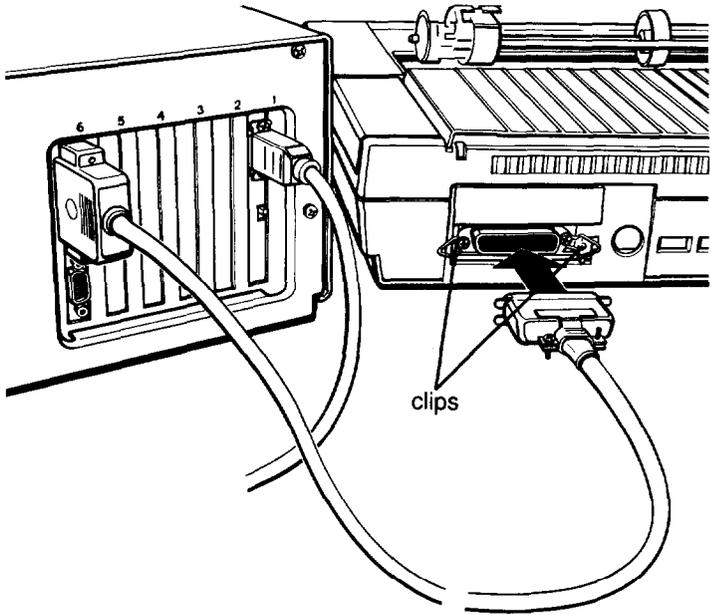
4. Plug the printer's power cord into an electrical outlet.

Using the Serial Interface

If you have a serial printer, modem, mouse, or any other peripheral with a serial interface, you can connect it to the serial (RS-232C) port on the back of the computer. Your computer uses an IBM-compatible, 9-pin, male connector, so be sure you have the proper cable. If you are not sure which one you need, or whether you have the right one, check with the store where you bought the cable.

To connect a serial device, follow the same steps outlined above for a parallel device, but connect the cable to the serial port, shown below.
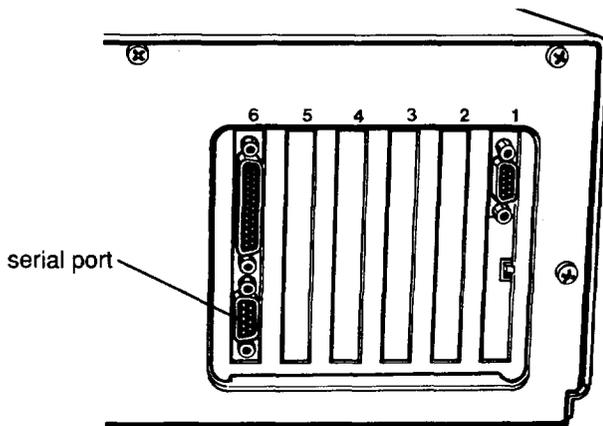
Setting up the serial port for a printer

If you are using a serial printer but your software does not support a serial printer, you must do two things before you can print:

❏ Set up the data transmission parameters for the serial port

❏ Tell the computer to redirect printer data from the parallel port to the serial port.

The MS-DOS MODE command lets you define the baud rate, parity, data length, and number of stop bits for a primary and a secondary serial port. MODE also lets you redirect output from the parallel port to the serial port. (The MENU program offers an easy way to use MODE. For instructions, see the description of the Mode Settings option of the MENU program in your MS-DOS Reference Manual.)

5 Connecting the Power Cord

Follow these steps to connect the power cord:

1. Insert the power cord into the AC inlet on the computer's back panel, as shown below. To avoid an electric shock, be sure to plug the cord into the computer before plugging it into the wall socket.
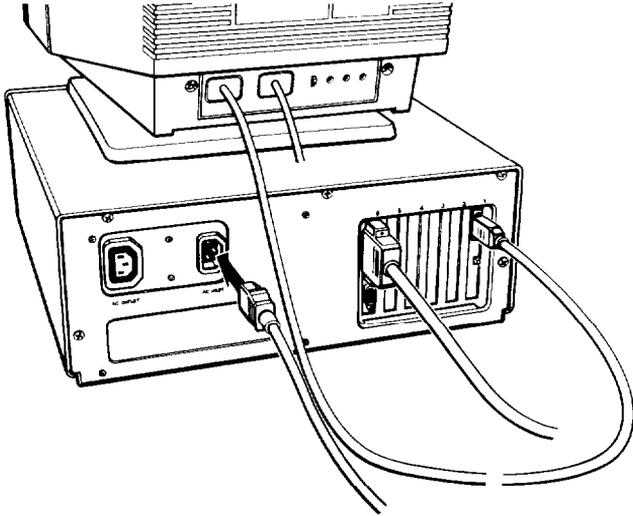
2. Plug the other end of the power cord into a three-prong, grounded electrical outlet.

6 Connecting the Keyboard

Follow these steps to connect the keyboard:

1. Facing the front of the computer, open the cover on the lower left comer. Push the top of the cover inward and then release it.
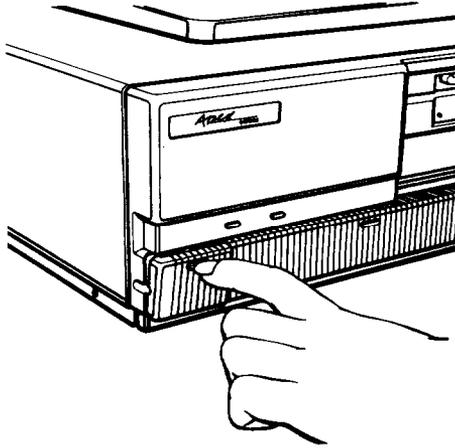
2. Plug the keyboard cable into the socket, as shown in the following illustration. Do not force the connector, but be sure to insert it all the way.
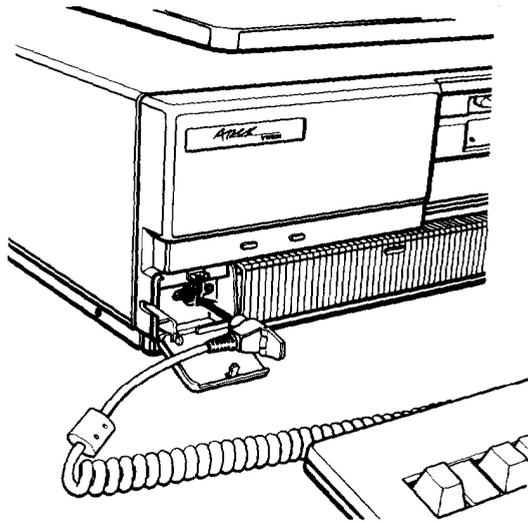
3. Push the cable into the notch at the left side of the computer, as shown below, so the cable leads away to the left side of the computer.

notch
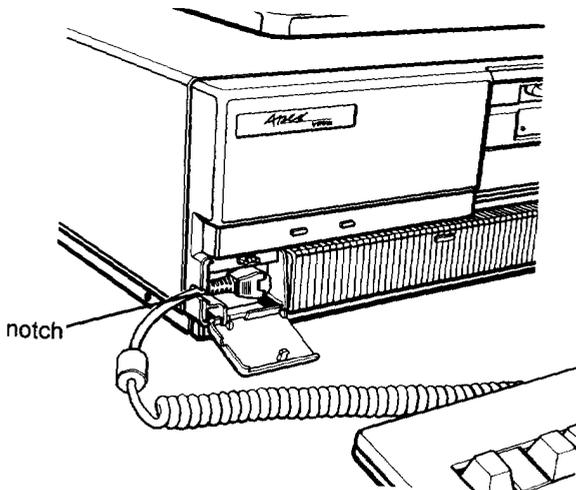
4. Close the keyboard cable cover,

Adjusting the Keyboard Angle

You can change the angle of the keyboard by adjusting the legs
on the bottom. Turn the keyboard over and lift each leg
upward until it locks into place, as shown below. You can lock
the legs into a low or high position, or leave them flat.
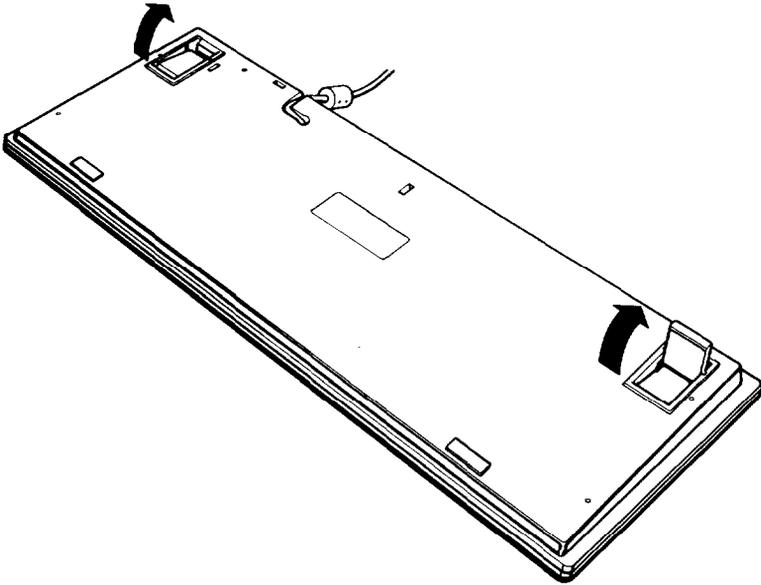
7 Setting the Front Monitor Switch

Set the monitor switch on the front panel of the computer to
match the type of monitor you are using. The monitor switch is
located behind the cover to the right of the keyboard socket
cover, as shown in the following figure. To open this cover,
push the top of the cover inward and then release it.

front panel
color/mono
switch
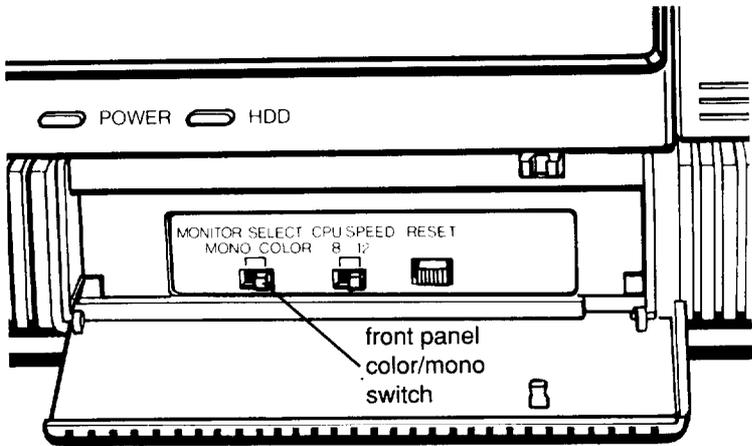
Move the switch to the right to select color and to the left to select monochrome. If you have an EGA or VGA monitor, set the switch to color.

8 Turning On the Computer

Before you turn on your computer, read the following safety rules to avoid accidentally damaging the computer or injuring yourself:

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

❏ Do not unplug cables from the computer when the power switch is on.

❏ Never turn off or reset your computer while a disk drive light is on. This can destroy data stored on disk or make an entire disk unusable. Similarly, never remove a diskette from a diskette drive while the drive light is on.

❑   Always wait at least five seconds after you switch off the power before you switch it on again. Turning the power off and on rapidly can damage the computer's circuitry.

❑   Do not leave a beverage on top of or next to your system or any of its components. Spilled liquid can damage the circuitry of your equipment.

❑   Do not attempt to dismantle any part of the computer. Only remove the cover to install and remove optional devices. If there is a hardware problem you cannot solve after reading the appropriate section in Chapter 6, contact your Epson Customer Care Center.

❑   Always turn off the power, disconnect all cables, and wait five seconds before you remove the computer's cover.

Follow these steps to turn on your system:

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

2.   To turn on the computer, press the power switch.
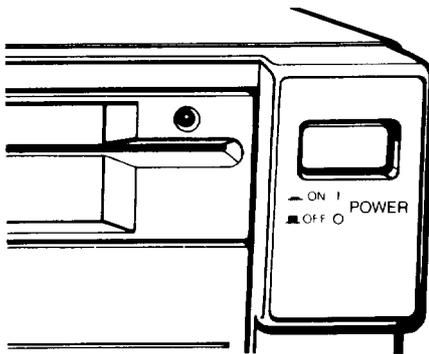
The power indicator on the front panel lights up. After a few seconds, the computer starts to perform an internal self test. This is a series of checks the computer completes each time you turn it on to make sure everything is working correctly. If anything is wrong, an error message appears on the screen.

After the self test is complete, you see a message on the screen similar to this:

```
RAM Testing . . . 256KB
```

The computer continually updates this display as it tests its memory. This test takes about 15 seconds to complete.

You may see a message like this:

```
1 6 2 - System Options not set
        (Run SETUP in DIAGNOSTICS)

Resume = "Fl" key)
```

This means that the computer is not yet set up for the equipment you have installed and you must run the Setup program, described in Chapter 2. For now, press the F1 key on the upper left comer of the keyboard to acknowledge the message and continue.

If you cannot see the screen display clearly, use the controls on your monitor to adjust the brightness and contrast until characters on the screen are clear and bright.

The computer then loads MS-DOS, the operating system, from the hard disk into memory. MS-DOS must be in the computer's memory before you can run any application program, such as a word processing program or a spreadsheet program.

Note
Alternatively, you can load MS-DOS from the Startup diskette in the diskette drive instead of from the hard disk, If your computer does not have a hard disk, you must use this method. See "Loading MS-DOS From a Diskette" in Chapter 4 for instructions.

The Command Prompt

After the computer has loaded MS-DOS from the hard disk,
you see the MS-DOS command prompt on the screen:

    C :\ >

The command prompt tells you that your computer is ready to
receive instructions. It also identifies the current operating
drive: A or C, for example. The command prompt appears on
the screen whenever you load MS-DOS, complete an MS-DOS
command, or exit an application program.

In your computer, the diskette drive is A and the hard disk
is drive C. If you have an optional second diskette drive,
MS-DOS identifies it as B.

9 Copying System Diskettes

Now that you have started your system and loaded MS-DOS,
it is important that you make copies of your MS-DOS and
Reference diskettes right away. Use the copies (called working
copies) as they are needed and store the originals in a safe
place.

Note
If you have only a single diskette drive and no hard disk
 drive, see "Using DISKCOPY With One Drive Only" in
 Chapter 4 for instructions on copying diskettes.

Each of the system diskettes is formatted for 360KB.
(Formatting prepares a diskette to store data and is described
in Chapter 3.) To copy them, you need four 360KB double-
density, 5¼-inch diskettes.

Note
**If you do not have any 360KB diskettes, you can use
unformatted 1.2MB, high-density diskettes. When copying
from 360KB diskettes, the DISKCOPY program fomats the
1.2MB high-density diskettes for 360KB.**

Follow these steps:

1. The C : \> prompt should be on the screen. If not, type C :
    and press Enter.

2. Type the following and press Enter:

        DISKCOPY A: A:

    The screen displays this message:

        Insert SOURCE diskette in drive A:
        Press any key when ready . . .

3. Insert the Startup diskette in drive A, as shown below.
    Hold the diskette with the label facing up and the
    read/write slot leading into the drive.

read/write slot
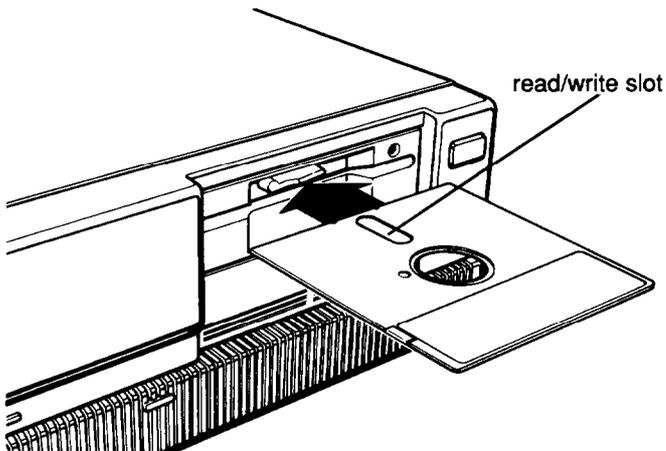
When the diskette is in all the way, turn the latch down (clockwise) to lock the diskette in place.

4. Press any key. The DISKCOPY program copies the contents of the Startup diskette to the computer's memory, and then you see the following:

```
Insert TARGET diskette in drive A:
Press any key when ready . . .
```

5. Remove the Startup diskette and insert a blank diskette (which is to be the target diskette) in drive A. Then press any key.

If the diskette is not formatted, the DISKCOPY program formats it. Then the program begins copying the data from the computer's memory to the formatted diskette. When the copy is complete, you see this prompt:

```
Copy another diskette (Y/N)?
```

6. Press Y so you can make a copy of the Operating 1 diskette. Again, you see the prompt to insert the source diskette.

7. Remove the copy of the Startup diskette which you just made and insert the Operating 1 diskette into drive A. Then press any key. Follow the prompts on the screen to make a copy of this diskette as you did for the Startup diskette.

8. Repeat the procedure to copy the Operating 2 diskette.

9. Repeat the procedure to copy the Reference diskette.

10. When you finish copying the last diskette and the `Copy another diskette (Y/N)?` prompt appears, press N to return to the MS-DOS command prompt C : \>.

After you have copied the four diskettes, be sure to label them carefully so you know which one is which. Write on the labels before you attach them to the diskettes in order to prevent damaging the diskettes. Store the originals in a safe place and use the copies as they are needed.

You are now ready to run the Setup program, which is described in the following chapter.
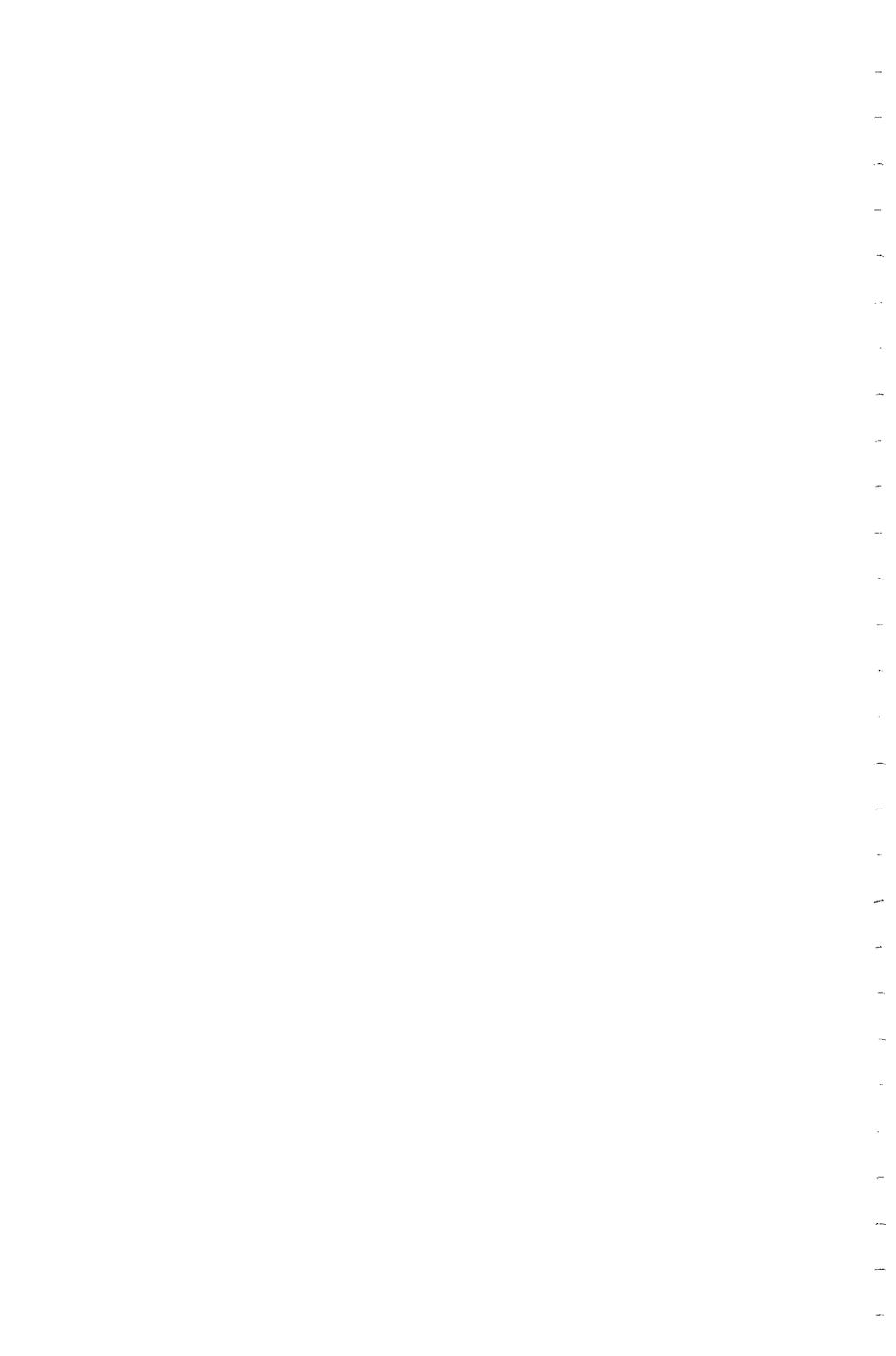
Chapter 2
Running the Setup Program

The first time you use your computer after setting it up, you need to run the Setup program on the Reference diskette. The Setup program lets you update the following for your computer:

❏ The amount of memory installed

❏ The type of video display adapter installed

❏ The math coprocessor status

❏ The number and type of disk drives ("mass storage") installed

❏ The internal clock's time and date.

You probably do not need to change all these settings; just change the ones that apply to your computer. For example, if you have added no extra equipment and have a color graphics monitor, you would use the Setup program to set the internal clock's time and date.

Your computer stores the information you enter with the Setup program in a special memory area, called CMOS RAM, which is backed up by a battery. When you turn off the computer, the computer stores the Setup information in this memory. When you turn the computer on, it searches the CMOS RAM to obtain the correct configuration information. If there is a difference between the information in CMOS RAM and the actual configuration, you see a prompt to run the Setup program.

To start the Setup program, follow these steps:

1. Insert the Reference diskette into drive A.

2. If you are not already logged onto drive A, type A: and press Enter.

3. **Type** SET UP **and press** Enter. The screen displays the main Setup menu with these options:

```
        Exit
       Memory
       Display
     Coprocessor
   Mass  storage
  Real-timeclock
```

You use ↓ and ↑ to move the cursor block (the highlighted bar) through the options on this menu. Once you highlight the option you want, press Enter to select it.

If you do not want to make any changes, or when you have finished making changes, select the E x i t option. See "Leaving the Setup Program" below for instructions.

Note
Another way to start the Setup program is to turn on or reset **the computer with the Reference diskette in the drive. If you do this, you see the following Operation menu:**

```
OPERATION  MENU

1 - Setup
2 - Format hard disk
3 - Format diskette
4 - System diagnostics
5 - Prepare hard disk for moving

0 - Exit to DOS for more utilities

Enter  selectionnumber:
```

This is the menu for the setup and diagnostics programs on the Reference diskette. Press 1 and then Enter to select the Set **up option. The screen then displays the main Setup menu.**

Follow the instructions below to verify or change the values for the Setup options.

Changing the Amount of Memory

Your computer has two types of memory: main memory and extended memory. The main memory in your computer is set at 640KB, which is the maximum value and is recommended for most applications.

> **Note**
> **Although your computer has** 1MB **of main memory, you can access only 640KB; the computer uses the rest for other purposes.**

The value you set for the extended memory depends on the total amount of memory available in your computer above the 1MB of main memory. This amount consists of any additional RAM on an expansion card that you may have installed.

> **Note**
> **Certain MS-DOS applications and other operating** systems **may require extended memory. You can also use extended memory to set up RAM disks for temparary storage, using the VDISK.SYS driver. See your MS-DOS manual for information regarding VDISK.SYS.**

If you have changed the amount of memory in the computer, follow these steps:

1. Highlight Memory and press Enter. This menu appears on the screen:

```
   640 KB  Main
     0 KB  Expansion
** SAVE  SETTINGS **
```

2. To change the Main memory setting press Enter. The value changes to 256KB. Press Enter again to change it to 512KB. If you press Enter again, the value returns to 640KB.

3. To change the Expansion memory setting, highlight the Expansion option. You can increase and decrease the memory in 64KB increments by using the + and -keys. For example, to increase the expansion memory from 0KB to 256KB, press + four times. The screen displays the following:

```
   640 KB Main
   256 KB Expansion
** SAVE SETTINGS **
```

4. When you finish setting the amount of memory, highlight ** SAVE SETTINGS ** and press Enter to return to the main menu.

Setting the Type of Display

Select the Display option in the main menu if you are not using a color graphics monitor or if you change the video card in your computer.

Note
If you are using the **MGA card that came with your computer, make sure that both monitor** switches **(labelled "color/mono") are set correctly if you are using a monochrome or color graphics monitor. One monitor switch is on the MGA card on the back of the compuer and the other is on the front. See Chapter 1 for instructions.**

To change the display type, follow these steps:

1. Highlight Display and press Enter. Another menu appears to show the current setting. If you have an 80-column, color monitor installed, you see:

```
Color/graph.   80 col
 ** SAVE  SETTINGS **
```

2. To change the monitor type, press Enter. This menu appears, listing the various options:

```
 * Special options *
Color/graph.   80 col
Color/graph.   40 col
Monochrome     80 c o l
```

Choose the monitor type according to the combination of monitor and video card you have, as follows:

❏ If you have a monochrome monitor, choose Monochrome 80 col, regardless of the type of video card installed.

❏ If you have a color graphics monitor, select Color/graph. 80 c o l.

❏ If you have an EGA or VGA monitor, and have already installed the correct video card, select * Special Options *. You may also need to set a DIP switch on the video card which overrides the display setting in CMOS RAM. See the instructions that came with the video card.

❏ If you have a composite color monitor, such as a color television with a video input, try selecting Color/graph. 80 col. If resolution is poor, run Setup again and select Color/graph. 40 col.

❑ If you have any other combination of monitor and video card, consult the documentation supplied with your video card.

3. Highlight the appropriate option and press Enter.

4. Highlight ** SAVE SETTINGS ** and then press Enter to save the setting.

Adding an 80287 Coprocessor

Use the Coprocessor option if you add an Intel® 80287 numeric coprocessor to your system. If you later remove the coprocessor, use this option to delete it from the list of equipment that the computer maintains; this prevents software from trying to use the 80287 commands.

Follow these steps:

1. Highlight Coprocessor and press Enter. You see this menu:

```
80287 not installed
*** SAVE SETTINGS ***
```

2. The 80287 not installed line is highlighted. Press Enter to change the setting. This line alternates between 80287 not installed and 80287 installed each time you press Enter. Highlight the correct setting.

3. Highlight *** SAVE SETTINGS *** to save the setting and then press Enter.

Changing the Disk Drive Settings

Use the Mass storage option of the main menu if you
install an additional diskette drive or hard disk drive, or if you
remove an existing drive. Follow these steps:

1. Highlight Mass storage and press Enter. You see a
   menu like this:

   ```
   Drive A:     1.2 MB
   Drive B:     None
   Drive C:     Type2
   Drive D:     none
   ** SAVE SETTINGS **
   ```

2. To change the value for one of the diskette drives—
   drive B, for example-highlight Drive B : and press
   Enter. A second menu appears:

   ```
   Not    installed
   360    KB drive
   720    KB drive (3.5")
   1.2    MB drive
   1.44 MB drive (3.5")
   ```

3. Highlight the type of drive that matches the second
   diskette drive installed in your computer; then press Enter
   to select it. The second menu disappears and the Mass
   storage menu shows the new setting.

4. To change the value for drive C, the hard disk, highlight
   that option. Then use the + or - key to increase or decrease
   the value until the number matches the type of drive
   installed in your computer. See Appendix F for a list of
   hard disk drive types. If you are not sure which one you
   have, consult your dealer.

Use this same procedure if you need to change the setting for a second hard disk drive installed in your computer (drive D).

5. When all the disk drive settings are correct, highlight `** SAVE SETTINGS **` and press Enter.

Setting the Real-time Clock

The real-time clock in your computer keeps track of the time and date at all times-even when the computer is turned off. Use the `Real-time clock` option to set the time and date for your computer after you set it up. You may need to use it again later to adjust the time for daylight savings time. The computer automatically changes the date for leap years.

Note
Another way to change the real-time clock's time and date is with the MS-DOS (version 3.3 or later) TIME and DATE commands. See your MS-DOS Reference Manual for instructions.

Follow these steps to set the real-time clock:

1. Highlight `Real-time clock` and press Enter. You see the current setting for the time and date:

```
17: 10: 54      Time
03 - 21 - 1989    Date
```

2. To change the time, highlight `Time` and press Enter. This box appears:

```
hh : mm : ss

_
```

3. Using a 24-hour time period, enter the time in the exact format shown in the box. Use two digits for each part (you can omit the seconds, if desired); the Setup program automatically inserts the colons (:). For example, to change the time to 1:30 p.m., you would type the following:

    1 3 3 0

    If you enter an invalid time-for example, a number greater than 23 for the hours or greater than 59 for the minutes or seconds-the computer beeps and ignores your entry. Try again. You can use the backspace key, if necessary, to correct mistakes.

    When the time is correct, press Enter.

4. To set the date, highlight D at e and press Enter. You see this box:

    mm-dd-yyyy
    -

5. Enter the date in the exact format shown in the box, using two digits for the month and day and four digits for the year; the program automatically inserts the dashes. For example, to set the date for August 30, 1989, you would type the following:

    0 8 3 0 1 9 8 9

    If you enter an invalid date-for example, a number greater than 12 for the month or greater than the number of days in that month-the computer beeps and ignores your entry. Try again.

    When the date is correct, press Enter.

6. When both the time and date are correct, press ↑ once or twice to return to the main Setup menu.

The time and date are set automatically as soon as you press
Enter after typing the time and date; you do not need to save
these settings. Therefore, if you change either setting in the
Setup program and then exit the program without saving your
changes, the new time or date still takes effect.

Leaving the Setup Program

When you finish setting the options in the Setup menu,
highlight the Exit option and press Enter. You see a
summary such as this:

```
Memory size        Main       640KB
                   Expansion  0 KB

Display type                  Color/graph. 80 col

Coprocessor                   80287 not installed

Mass storage       Drive A:   1.2 MB
                   Drive B:   None
                   Drive C:   Type 11
                   Drive D:   None

Real-time clock    Time       13:30:00
                   Date       08-30-1989

                        Change Settings
                        Exit without saving
                        ** EXIT AND SAVE **
```

Check the list to see if all the information is correct. If any
setting is incorrect, highlight Change settings and
press Enter. The main Setup menu appears and you can change
the setting, as necessary.

If you did not make any changes or you want to cancel the changes you made, highlight Exit without saving and press Enter. The command prompt appears on the screen. (If you turned on or reset the computer with the Reference diskette in the drive, the Operation menu appears on the screen. Press 0 and Enter to return to the MS-DOS command prompt.)

Note
If you changed the time or date, the new setting will be in effect even if you exit the Setup program without saving your changes.

If you want to save the settings you made, follow these steps:

1. Remove the Reference diskette from drive A.

2. Highlight ** EXIT AND SAVE ** and press Enter. The program stores the new settings and resets the computer using the new configuration. The C :\> prompt appears on the screen.

If the computer displays a setup error message while it is starting up, run the Setup program again and check all your settings.

Chapter 3
Using Your Computer

This chapter covers the following basic procedures for using your computer:

❏   Changing the operating speed

❏   Using special keys on the keyboard

❏   Stopping a command or program

❏   Resetting and turning off the computer

❏   Using disks and disk drives.

Changing the Operating Speed

Your computer can operate at two speeds: 8 MHz or 12 MHz. At 12 MHz, the computer performs all tasks faster, and almost all programs may be run at 12 MHz. However, some option cards and application programs require the lower speed. See your option card or application program manual to make sure that you can use the higher speed before selecting it.

Use the CPU SPEED switch on the front panel to change the speed; move it left for 8 MHz or right for 12 MHz.
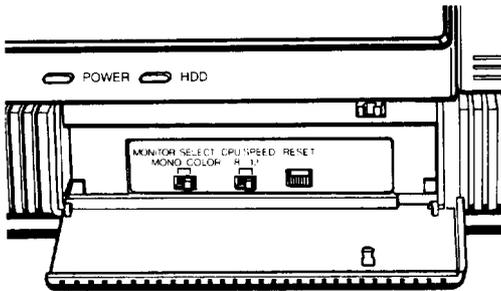
WARNING
You can change the speed while the computer is on, but do not change it while you are running a program. Complete your current operation, exit the program to the MS-DOS command prompt, and then change the speed.

Special Keys on the Apex Keyboard

Certain keys on your keyboard serve special functions when your computer is running application programs. The illustration below shows the Apex keyboard, and the table that follows describes the special keys.
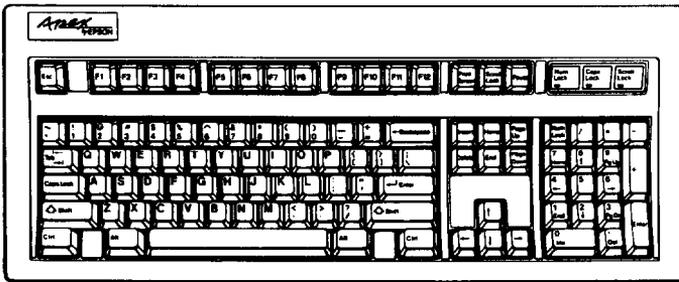
Key	Purpose
F1-F12	Perform special functions within application programs. (Some keys also function with MS-DOS. See your MS-DOS Reference Manual for more information.)
Tab	Moves the cursor one tab to the right in normal mode (and one tab to the left in shift mode when using some application programs).
Ctrl	Works with other keys to perform special (control) functions, such as editing operations.
Shift	Produces uppercase characters or the top symbols on the keys when used with the main character keys. Produces lowercase characters when Caps Lock is on.

Key	Purpose
Alt	Works with other keys to enter alternate character codes or functions.
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 (may be called the Return key in some application program manuals).
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 are not affected.
Esc	Cancels the current command line or operation in MS-DOS. Esc can also have special uses in application programs.
Num Lock	Changes the function of the keys on the numeric/cursor keypad from numeric entry to cursor positioning; changes back when pressed again.
Scroll Lock	Controls scrolling in some application programs.
Break	When pressed with the Ctrl key (hold down Ctrl and press Break), sends a break signal to the computer to terminate the current operation.
Sys Req	Produces the system request function in certain applications.
PrtSc	Prints the screen display on a dot-matrix printer.
Home, End, PgUp, PgDn, ← ↑ ↓ →	Control cursor location in some applications, such as word processors, game programs, and spreadsheets.
Ins	Turns the insert function on and off in some application programs.
Del	Deletes the character at the cursor position.

The Num Lock, **Scroll** Lock, and Caps 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 on the top right corner of the keyboard is on. When the function is disabled, the light is off.
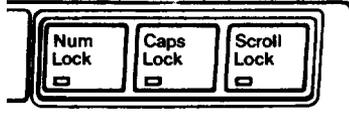
Stopping a Command or Program

You may sometimes need to stop a command or program while it is running. Many application programs provide a command you can use to stop or even cancel (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 programs. If you cannot stop a particular operation, however, you may need to reset the computer, as described in the following section.

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

Resetting the Computer

Occasionally, you may want to stop what the computer is doing entirely and reload MS-DOS. This is called resetting the computer. You may need to do this if an error occurs and the computer does not respond to anything you type on the keyboard. However, resetting erases all data in the computer's memory that you have not stored, so reset your computer only if necessary.

WARNING
Do not reset **the computer to exit a program unless you need** to. Some application progr**ams classify and store new data** when you exit the program. If you reset the computer without properly exiting the program, you may lose data.

There are three ways to reset. Because each is more powerful than the last, try them in the order listed here:

1. If you are using MS-DOS, hold down Ctrl and Alt and press the Del key. The screen should go blank for a moment and then the computer reloads MS-DOS. If this does not correct the problem, try the second method.

2. Press the RESET button on the front panel. This method works even when the keyboard does not respond to your commands. If this does not correct the problem, try the third method.

3. Remove any diskettes from the diskette drive. Turn off the computer and wait five seconds. Then turn the power back on. The computer loads MS-DOS and displays the MS-DOS prompt.

Turning Off the Computer

Before turning off your computer, be sure to save your data and exit the program you are using. Then remove any diskettes from the diskette drive. Turn off the computer first and then turn off the monitor and any peripherals.

Using Disks and Disk Drives

The disk drives in your computer allow you to store data on disk and retrieve it when you want it. The Apex 200\20 has one 1.2MB diskette drive and one 20MB hard disk. The Apex 200\40 has one 1.2MB diskette drive and one 40MB hard disk.

This section explains how disks work and tells you how to do the following:

❑ Choose diskettes

❑ Care for your diskettes and diskette drives

❑ Insert and remove diskettes

❑ Write-protect diskettes

❑ Make backup copies of your diskettes

❑ Use a single diskette drive

❑ Use a hard disk drive.

How Disks Store Data

The diskette you insert in your computer's diskette drive is made of flexible plastic, coated with magnetic material. It is enclosed in a square jacket that is slightly flexible. Your computer stores data on the diskette by recording on the magnetic surface.

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

All disks are divided into data storage compartments by sides, tracks, and sectors. Double-sided diskettes-like the ones you use in your computer-store data on both sides. On your disk there are concentric rings, called tracks, in which a disk can store data. Double-density diskettes (such as 360KB diskettes) have 40 tracks, and high-density diskettes (such as 1.2MB diskettes) have 80 tracks.

A hard disk consists of two or more magnetically-coated platters stacked on top of one another, so it has four or more sides with many more tracks than a diskette.

A disk is further divided by sectors. To understand what a sector is, picture the spokes on a bicycle wheel radiating from the center of the wheel to the tire. The space between one spoke and the next is like a sector on a diskette. (See the figure below.) Each track on a 1.2MB diskette has 15 sectors, and each sector holds 512 bytes.
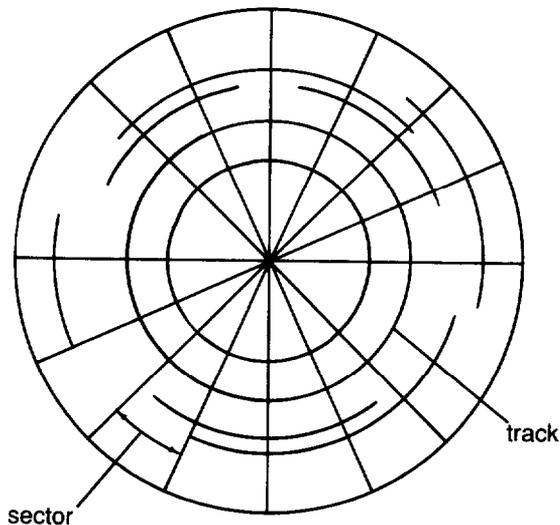
Your computer uses the read/write heads in a disk drive to store and retrieve data on a disk. There is one head above the diskette and one below, so the drive can write to both sides of the diskette. To write to a disk, the computer spins it in the drive to a position where one of the read/write heads can access the diskette through the read/write slot. The read/write slot on a diskette exposes the diskette's magnetic surface so the read/write head can write on the appropriate area.

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

Your computer has at least one 1.2MB diskette drive. With this drive, use 5¼-inch, double-sided, high-density, 96 TPI, 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. You can also format these diskettes for 360KB—see your MS-DOS Reference Manual for more information.

In addition, you may have a diskette drive of a different type. The following list describes the types of optional diskette drives you can use in your computer and which diskettes you should use with them:

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

❏ 720KB drive-With this 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-approximately 300 pages of text.

❏ 1.44MB drive-With this 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-approximately 600 pages of text.

If your computer has more than one type of these drives or if you use diskettes from other computers, you need to be aware of certain incompatibilities between the drives and the diskettes they use.

Note
You must format new diskettes before you can use them with **an operating system. Formatting erases all the data on a diskette and prepares it to receive new data, so be sure to format only new blank diskettes or diskettes that contains data you want to erase. See Chapter 4 for instructions on formatting diskettes.**

Drive and diskette incompatibilities

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

5¼-inch drive/diskette compatibility

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

WARNING
If you write to a 360KB (or 160KB, 180KB, or 320KB)
diskette while it is in a 1.2MB drive, you may not be able to
read it or write it in a 360KB drive later.

3½-inch drive/diskette compatibility

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

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

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

Caring for Diskettes and Diskette Drives

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

❏ Do not remove a diskette from the diskette drive 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 and destroy
data. Dust can also 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. They work best at normal room temperature and in normal humidity. Do not leave your diskettes sitting in the sun, or in extreme cold or heat.

❏ Keep diskettes away from magnetic fields. (Remember that diskettes store information magnetically.) There are many sources of magnetism in your home or office, such as electrical appliances, telephones, and loudspeakers.

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

❏ Never touch a diskette's magnetic surface. The oils on your fingertips can damage it. Always hold a diskette by its protective jacket. If you are using a 3½-inch diskette, do not slide the metal shutter; this exposes the diskette's surface.

❏ Do not place anything on top of your diskettes and be sure they do not get bent. A diskette does not rotate properly in the drive if it has been damaged.

❏ Carefully label your diskettes. Attach labels firmly but gently, and only along the top of a diskette (next to the manufacturer's label). Do not stick several labels on top of one another-too many labels can make it difficult to insert the diskette into the drive.

❏ It is best to write on the label before you attach it to the diskette. If you need to write on a label that is already on a diskette, use only a soft-tip pen, not a ballpoint pen or a pencil. Always indicate the storage capacity and density type on the label.

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

Follow these additional precautions to protect your hard disk drive and its data:

❏ Never turn off the computer when the hard disk drive 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.

❏ If you are going to move your computer, run the HDSIT program before turning it off. See "Preparing the Hard Disk for Moving" at the end of this chapter.

Inserting and Removing Diskettes

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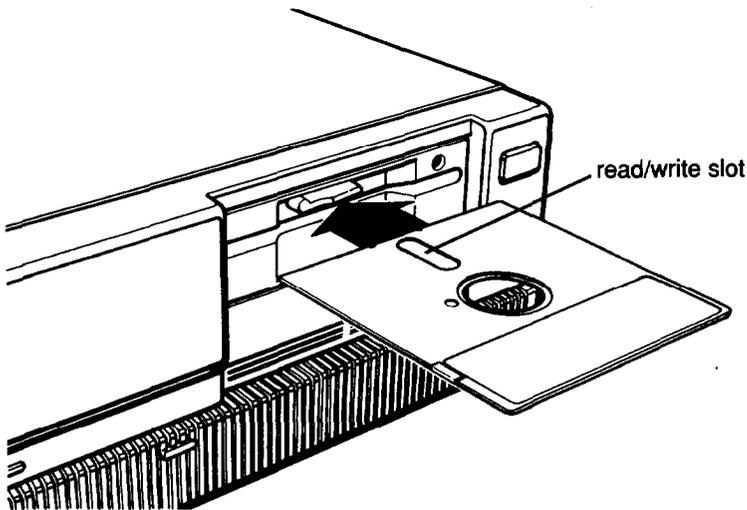
Slide the diskette into the slot until it is in all the way. Then turn the drive latch down to lock it in a vertical position. This keeps the diskette in place and enables the read/write heads in the diskette drive to access the diskette,

If a diskette is in the drive but the latch is up (horizontal) and you enter a command for that drive, the computer cannot tell there is a diskette in the drive and displays an error message such as:

```
Not ready error reading drive A
Abort, fail, retry?
```

Close the latch and press R.

To remove the diskette, turn the drive latch up until it is horizontal and the edge of the diskette pops out. 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 an optional 3½-inch diskette drive, insert the diskette with the label facing up and the metal shutter leading into the drive, as shown below. Slide the diskette into the drive until it clicks into place.
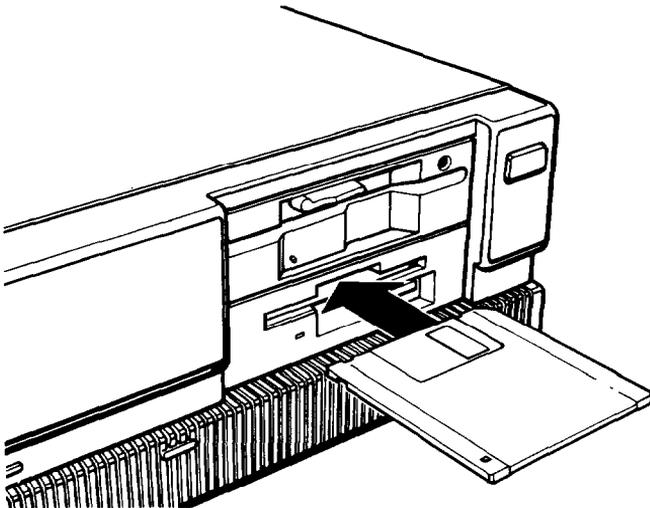
To remove a 3½-inch diskette, press the **release** button to **release** it. When the edge pops out of the drive, pull out the diskette and store it properly.

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

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 the diskette 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 come with new 5¼-inch diskettes when you buy them.
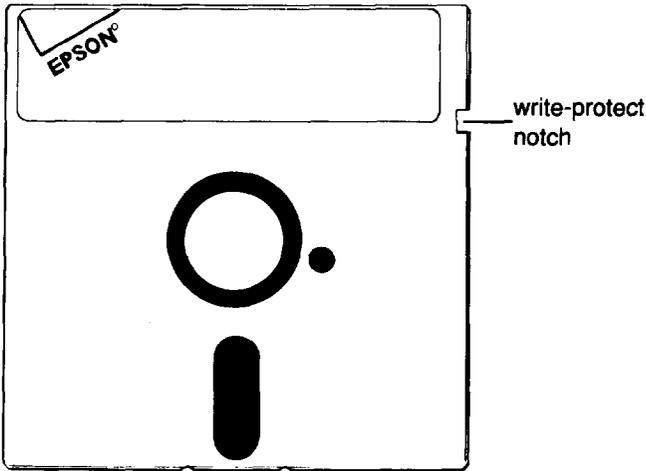
To remove the write protection, peel off the write-protect tab.

Note
Some program diskettes, such as your MS-DOS diskettes, have no notch so they are permanently write-protected. This protects them from being accidentally erased or altered.

On a 3½-inch diskette, the write-protect device is a small switch on the lower-right comer on the back, 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
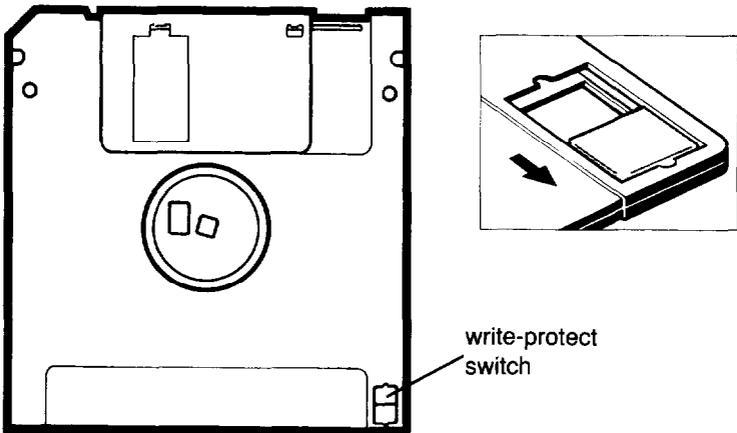
To remove the write protection, slide the switch toward the center of the diskette so the hole is covered.

Making Backup Copies

It is important to make copies of all your data and system diskettes. Copy all diskettes that contain programs, such as the original MS-DOS diskettes that come with your computer, and use only the copies. Store your original MS-DOS diskettes in a safe place away from your working copies. Back up your data diskettes regularly, whenever you revise them, to keep them up-to-date, and store them away from your originals.

Chapter 1 describes how to use DISKCOPY to copy your
MS-DOS and Reference diskettes. To make backups of other
diskettes, use the DISKCOPY command or the MENU
program. See Chapter 4 for more instructions on using
DISKCOPY and MENU.

It is best to put most of the programs and data files you use
regularly on the hard disk. Keep backup copies of all your
program files on diskettes, however, and regularly copy
important data files to diskettes as well. For more information,
see "Backing Up Data" in Chapter 4 and check your MS-DOS
Reference Manual.

Using a Single Diskette Drive

The operating system expects the computer to have at least
two diskette drives, and it displays prompts and messages
accordingly. If the computer has only one diskette drive,
MS-DOS treats the one drive like two logical drives. This helps
you perform operations that normally require two diskette
drives.

Usually, MS-DOS recognizes the first diskette drive (the top
drive) as drive A and the second diskette drive as drive B. If
you have only one diskette drive, MS-DOS recognizes it as
both A and B.

For example, if you give a command to copy from A to B,
MS-DOS copies data from the diskette you place in the single
drive (A) to the computer's memory. Then MS-DOS
automatically prompts you to insert another diskette in the
same drive, which it now identifies as drive B. It copies the
data from memory to the new diskette. When the copying is
complete, MS-DOS identifies the drive as drive A again, and
you see a prompt to insert the original diskette into drive A.

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 and from diskettes.

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

Using the Hard Disk Drive

You can create and revise files on a hard disk just as you can on
a diskette. The hard disk, however, provides several
advantages:

❏ The 20MB hard disk can store more data than 16 1.2MB
   diskettes and the 40MB hard disk can store twice as much.

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

❏ You can store all your frequently used programs and data
   files on the hard disk, eliminating the inconvenience of
   inserting and removing 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 easier to find and use. See Chapter 4
for instructions on how to use directories.

Epson also includes the XTREE utility with MS-DOS. XTREE provides simple menus that allow you to move, create, delete, and rename files and directories. These capabilities are especially useful on the hard disk drive. See Chapter 4 for an introduction to XTREE or see your MS-DOS Reference Manual for complete instructions.

The hard disk in your computer has been prepared at the factory so it contains all the MS-DOS system files and automatically loads MS-DOS when you turn on or reset the computer. If your computer does not seem to be working correctly, however, you may need to repeat some of the procedures necessary to prepare it for use. If you think this may be the case, see Appendix E for instructions.

Backing up hard disk files

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.

You can use the MENU utility or the BACKUP command to back up your hard disk files. Use the MENU utility or the DISKCOPY command to make copies of your system and program diskettes. For instructions on using these programs, see Chapter 4 (or see your MS-DOS manual).

Preparing the hard disk for moving

Before you move the computer, you need to secure the read/write heads inside the hard disk drive. Securing the read/write heads moves them to a region of the disk surface that does not contain data, and locks them in position. This prevents the disk from being damaged if it is bumped accidentally.

To secure the read/write heads for moving, run the HDSIT program. Follow these steps to run HDSIT:

1. Exit any program you are using so the MS-DOS command prompt is on the screen,

2. Insert the Reference diskette in drive A.

3. Type the following and press Enter:

        A: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. You can now turn off the computer and prepare to move it to the new location.

Chapter 4
Using MS-DOS With Your Computer

Your computer comes with version 3.3. of MS-DOS. This operating system manages your computer by organizing the computer's memory, controlling the monitor display, receiving keyboard input, and accessing data.

To communicate with the operating system, you use MS-DOS commands. How much you need to know about MS-DOS depends on how you plan to use your computer. If you plan to use it just to run application programs, the few MS-DOS commands you'll need are introduced in this chapter. If you need more information, see your MS-DOS Reference Manual for a complete description of MS-DOS.

This chapter covers the following topics:

❑ Starting and exiting MS-DOS

❑ Using drive designators

❑ Types of MS-DOS commands

❑ Entering an MS-DOS command

❑ Creating and managing files

❑ Using directories

❑ Formatting diskettes

❑ Backing up data

❑ Using special Epson utilities

❑ Using an AUTOEXEC.BAT file.

Starting and Exiting MS-DOS

Before you can run an MS-DOS application program, MS-DOS must be running in memory.

When you turn on your computer, it loads MS-DOS from the hard disk automatically. The screen then displays the MS-DOS command prompt, `C : \>`. This tells you that MS-DOS is loaded and identifies the current drive.

Before you turn off the computer, make sure the MS-DOS command prompt is displayed. Then remove your diskettes, turn off your computer, and turn off any peripherals.

Another way to load MS-DOS is by turning on the computer with the Startup diskette in drive A. You may need to do this if your hard disk is not functioning. You must use this method if your computer does not have a hard disk. Follow the instructions in the next section.

Loading MS-DOS From a Diskette

Follow these steps to load MS-DOS from a diskette in drive A:

1. When your computer is off, insert the Startup diskette into drive A. (For detailed instructions on inserting diskettes, see "Inserting and Removing Diskettes" in Chapter 3.)

2. Turn on any peripheral equipment, then turn on your computer. The computer loads MS-DOS into its memory where it will remain until you turn off the computer. Once MS-DOS is loaded, you see a date prompt, such as the following, which appears every time you load MS-DOS:

    ```
    Current date is Mon 11-06-89
    Enter new date:
    ```

3. You may enter the correct date in the format shown, such as 12 - 25 - 89 (you do not need to enter the day of the week), or you may accept the date shown by pressing Enter.

4. Next the screen displays the time prompt, like this:

```
Current time is 09:32:21
Enter new time:
```

You may enter the correct time in the format shown (such as 04 : 30 : 00), or you may accept the time shown by pressing Enter. MS-DOS is now loaded and displays the MS-DOS command prompt:

```
A>
```

Starting an Application Program

Once you have loaded MS-DOS, you can start using your application program. If you have already copied the application program to the hard disk, log onto drive C (and the appropriate directory, if necessary). Then just enter the necessary command to start the application program, as described in the program's manual. From this point on, until you return to the MS-DOS command prompt, refer to the application program manual for any instructions on using the program.

Using Drive Designators

MS-DOS uses letters to identify the disk drives in your computer. If you have one diskette drive, it is known as drive A. If you have two diskette drives, the top one is called drive A and the bottom drive is B.

MS-DOS identifies the hard disk as drive C, even if you have only one diskette drive.

The Default Drive

At any given time, MS-DOS considers one disk drive to be the default drive. The default drive is the one on which MS-DOS executes your next command, unless you tell it to do otherwise. For example, if the default drive is C, and you issue the DIR (directory) command, MS-DOS lists the files stored on drive C. If the default drive is A and you type WP and press Enter, MS-DOS looks on the diskette in drive A for a file called WP and executes it.

The MS-DOS command prompt tells you which drive is the current default. The command prompt consists of the drive letter followed by a greater-than symbol, "<". (Depending on how your system has been set up, the command prompt may also include additional information.) Thus, when you see A> displayed on your screen, you know that the default drive is A. The command prompt also lets you know that MS-DOS is ready to receive a command from you.

If you need to access a file or program on another drive, you can either change the default drive or specify the other drive when you give the command.

Changing the Default Drive

To change the default drive, type the letter of the drive you want to change to, followed by a colon. Then press Enter. For example, to change the default from A to C, type the following and press Enter:

c:

MS-DOS acknowledges the change by displaying the command prompt C : \>. Changing to a new drive is also called logging onto that drive.

Specifying the Drive Designator

If you want to access a program or file on another drive without first changing the default drive, type the drive designator along with the filename. For example, if you are logged onto drive A and want to use a file named PROGRAM on drive C, you would type the following and then press Enter:

    C:PROGRAM

MS-DOS loads and executes the file named PROGRAM from drive C, but stays logged onto drive A.

Types of MS-DOS Commands

Each MS-DOS command is either *internal* or external. Internal commands are commands that are built into MS-DOS and can be used at any time once MS-DOS is loaded into memory. External commands are separate program files stored on your hard disk and MS-DOS diskettes.

If you display a directory of the files on your MS-DOS diskettes, you see the names of the external commands but not the internal ones. The following lists show which external commands are on which diskette.

Startup diskette

ANSI.SYS	FDISK.COM	REPLACE.EXE
COMMAND.COM	FORMAT.COM	SELECT.COM
COUNTRY.SYS	KEYB.COM	SYS.COM
DISPLAY.SYS	KEYBOARD.SYS	VDISK.SYS
DRIVER.SYS	MODE.COM	XCOPY.EXE
EGA.CPI	NLSFUNC.EXE	4201.CPI
FASTOPEN.EXE	PRINTER.SYS	

Operating 1 diskette

APPEND.EXE	EDLIN.COM	RECOVER.COM
ASSIGN.COM	FC.EXE	RESTORE.COM
ATTRIB.EXE	FIND.EXE	SHARE.EXE
BACKUP.COM	FORMAT.COM	SORT.EXE
CHKDSK.COM	GRAFTABL.COM	SUBST.EXE
COMMAND.COM	GRAPHICS.COM	TREE.COM
COMP.COM	JOIN.EXE	XTREE.EXE
DEBUG.COM	LABEL.COM	XTREEINS.DAT
DISKCOMP.COM	MORE.COM	XTREEINS.EXE
DISKCOPY.COM	PRINT.COM	TESTBUG.COM

Operating 2 diskette

MENU.EXE	SETATTR.EXE	GRAPH24.COM
SETBCKUP.EXE	SETFC.EXE	EPSON.TXT
SETRSTOR.EXE	SETMODE.EXE	HELP.COM
SETRPLCE.EXE	SETPRINT.EXE	HELP.TXT
SETXCOPY.EXE	DU.EXE	

Reference diskette

ALTPTST.DIG	FDDTST.DIG	MEMTST.DIG
ALTSTST.DIG	FORMAT.COM	MONOTST.DIG
AUTOEXEC.BAT	HDCACHE.EXE	MPRTTST.DIG
CO87TST.DIG	HDDTST.DIG	PARATST.DIG
COLRTST.DIG	HDFMTALL.COM	ROMBIOS.COM
COMMAND.COM	HDSIT.EXE	SERITST.DIG
DIAG.COM	KEYTST.DIG	SETUP.EXE
DIAGSYS.COM	LINK.EXE	SYSTAT.COM
EXE2BIN.EXE	MAINTST.DIG	VDOPTST.DIG

To run an external command, MS-DOS must be able to locate the file containing the command's instructions. If it cannot find the file, MS-DOS gives you an error message. If you have a hard disk, all the external files are on your hard disk (drive C).

If you have no hard disk, you must insert the proper diskette to access an MS-DOS command. For example, if you want to use the FORMAT program, you must insert the Startup diskette in one of the diskette drives. Then you can either log onto that drive and give the FORMAT command or specify the appropriate drive when you enter the command.

For example, if you have two diskette drives, and are logged onto drive A, you could format a diskette in drive B with the command:

```
FORMAT B:
```

In this case, MS-DOS looks on drive A, the default drive, for the file named FORMAT.COM. If the diskette in that drive contains the file FORMAT.COM (as does the Startup diskette), MS-DOS finds it there. If you are logged onto drive B, however, you would need to enter the command like this:

```
A:FORMAT B:
```

This tells MS-DOS to look on drive A for FORMAT.COM.

Entering an MS-DOS Command

To enter an MS-DOS command, you need to type the command in the correct format. The command format provides MS-DOS with the information needed to perform a task.

The MS-DOS command format consists of the command name, parameters, and delimiters. The command name tells MS-DOS the task you want the computer to perform. Parameters specify details such as what data you want to process and where to locate or store a file. Delimiters are characters such as spaces or commas that separate command names and parameters.

For example, the command to format a diskette in drive A is:

```
FORMAT A:
```
command   parameter
      delimiter

FORMAT is the command name to execute the file
FORMAT.COM. The A: is a parameter that tells the
command what to format-in this case, the diskette in drive A.
The space between FORMAT and A: is the delimiter that lets
MS-DOS distinguish the command name (FORMAT) from
the parameter (A:).

Some commands also have optional switches you can use. A
switch is a type of parameter that alters the effect of a
command. For example, suppose you want to make a copy of a
single-sided diskette. To do this, you need to add a switch to
the DISKCOPY command like this:

```
DISKCOPY A: A:/1
```

Without the /1 switch, DISKCOPY would expect the diskette
to be double-sided. Switches are preceded by a forward slash: 1.

See your MS-DOS Reference Manual for more information on
the command format. Also see your MS-DOS manual for
command descriptions that tell you which parameters and
delimiters are required for each command and which optional
parameters and switches you can use.

You can enter an MS-DOS command whenever you see the
MS-DOS command prompt. Type the command name and any
necessary parameters and delimiters and then press Enter to
execute the command. MS-DOS does not execute your
command until you press Enter.

You can type command names and parameters in either
uppercase or lowercase letters. If you make a mistake when
typing a command and you notice it before you press Enter,
you can do either of two things:

❏ Use the backspace key to back up to the error so you can
    correct it

❏ Press Esc to cancel the command line.

If you press Enter when a command line has an error in it, the screen displays an error message. Usually, the command prompt reappears so you can try again. Type the correct command and press Enter.

Creating and Managing Files

All your data and programs are stored in files on disk. A data file contains information, such as words, numbers, or pictures. A program file contains instructions that the computer can understand and execute.

The kind of file you create depends on the MS-DOS command or application program you use to create it. In general, a data file that you create using an application program is stored in a special format. If you use a different application program to read that file, you may encounter problems.

When you create a file, you need to give it a name. You must name your files in a certain format required by MS-DOS.

Naming Files

Each file must have a unique filename so you can retrieve it when you need to. The filename consists of two parts: the name and the extension (which is optional).

You can choose a name up to eight characters long. Create a name that identifies the information the file contains. The name can contain any characters or numbers except for blank spaces and the following symbols:

    * \ / { } : | < > + = ; . ?

The extension is optional and can be up to three characters long. You can use the extension to further identify a file or to describe what type of file it is, such as a text file or program file. When you use an extension, separate it from the filename with a period. For example, an MS-DOS filename might look like this:

```
DATA.TXT
```

Some application programs automatically add extensions to the files you create. These application programs use the extension to determine whether it is a compatible data file. Avoid using the same extensions as your application programs. Also, do not use uppercase and lowercase letters to distinguish between files. MS-DOS does not recognize the difference and displays all filenames in uppercase.

Certain extensions are reserved for program files and you must not use them for your data files. The reserved extensions are .COM, .EXE, and .BAT. Files with these extensions are also sometimes called executable files.

The .BAT extension denotes a particular kind of executable file called a batch file. Batch files can be used to automate sequences of MS-DOS instructions. Even if you are not a programmer, you may want to create some batch files to assist you in your work. A particularly useful kind of batch file, called an *autoexecute* batch file (or "AUTOEXEC" file) is discussed later in this chapter.

Copying Files

You can use the COPY command to copy individual files or groups of files. COPY is an internal command; you can use it any time you see the MS-DOS command prompt.

You can use the COPY command to copy files in several ways:

❏ You can copy individual files from one disk to another

❏ You can copy a group of files at once using wildcard characters

❏ You can copy one or more files and give them new names

❏ You can combine or merge files into one file.

To use the COPY command, type COPY at the command prompt, followed by the drive designators and necessary filenames. Then press Enter to execute the command.

For example, to copy the file named REPORT from the diskette in drive A to the hard disk using the same name for the copy as for the original file, type the following and press Enter:

```
COPY A:REPORT C:
```

You now have two files named REPORT, one on the diskette in drive A and one on the hard disk, drive C.

If you want to copy the file named REPORT from the diskette in drive A to drive C using a new name, FACTS, for the copy, type the following and press Enter:

```
COPY A:REPORT C:FACTS
```

The file REPORT remains unchanged on drive A, but a new file named FACTS now exists on drive C.

To copy the file named REPORT to the same diskette and name the copy FACTS, type the following and press Enter:

```
COPY REPORT FACTS
```

Now you have two files on the default drive that have the same contents but different names. In this example, you can omit the drive designators because the original file and the copy are both on the default drive.

Using wildcards

An easy way to copy a group of files is by using wildcard characters in the filenames. You can use two wildcards: * and ?. The asterisk represents any group of characters and the question mark represents any single character.

For example, to copy all the files on the diskette in drive A to drive C, type the following and press Enter:

```
COPY A:*.* C:
```

To copy all files with names that begin with the four letters **MEMO** and end with any single character (such as MEMO1), type the following and press Enter:

```
COPY A:MEMO? C:
```

You can also use the COPY command to combine several files into one. For example, to create a new file called DATA that consists of the files REPORT, FACTS, and MEMO, type the following and press Enter:

```
COPY REPORT + FACTS + MEMO DATA
```

Now the file DATA consists of REPORT followed by FACTS followed by MEMO. Because the files are located on the current drive, no drive designators are necessary.

To copy **REPORT,** FACTS, and MEMO from drive A to the file named DATA on drive C, type the following and press Enter:

```
COPY A:REPORT + A:FACTS + A:MEMO C:DATA
```

Remember these rules when copying files:

❏ You must tell MS-DOS where to find the original file and where to store the copy; that is, you need to specify the drive (and directory, if necessary) for both.

❏ You cannot create a new file with the same name and in the same directory as an existing file.

❏ If there is a file on the destination diskette or directory that has the same name as the file you are copying, the copy automatically replaces the existing file. There is no warning that the existing file is being replaced. Be careful that you do not accidentally erase a file you want to keep.

❏ If you are copying to a diskette, that diskette must have been previously formatted.

Note
You can also use the XCOPY command to copy individual files or groups of files. XCOPY, an external command, offers an efficient way to copy certain groups of files. For details about XCOPY, see your MS-DOS Reference Manual.

Renaming Files

You can use the RENAME command to change the name of a file or group of files on the same disk and directory. For example, to rename a file named PROSPECT (in the default directory) to CLIENT, type the following and press Enter:

```
RENAME PROSPECT CLIENT
```

Note
RENAME does not rename a file to a new name if a file with that name exists already.

You can shorten the RENAME command to REN. To change
the name of a file from HAMMERS to WRENCHES,
therefore, you can type the following and press Enter:

```
REN  HAMMERS  WRENCHES
```

You can use wildcards to rename groups of files. For example,
to change just the extensions of all files on drive A with the
extension .NEW to .OLD, type the following and press Enter:

```
REN  A:*.NEW  *.OLD
```

To add the extension .OLD to all files that begin with the same
five characters, MEMOS, but end with one varying character,
type the following and press Enter:

```
REN  MEMOS?  MEMOS?.OLD
```

This command would rename files such as MEMOS1 and
MEMOS2 to MEMOS1.OLD and MEMOS2,OLD.

See your MS-DOS Reference Manual for more information on
the RENAME command,

Deleting Files

You can delete files you no longer need with the DEL (delete)
command. For example, to delete REPORT.AUG from drive
C, type the following and press Enter:

```
DEL  C:REPORT.AUG
```

To delete the file WRENCHES from drive C, type the
following and press Enter:

```
DEL  C:WRENCHES
```

You can use wildcards to delete groups of files. For example, to delete all files on the diskette in drive A (in the current directory), type the following and press Enter:

```
DEL A:*.*
```

Because deleting all files is a serious procedure, MS-DOS prompts you to confirm the command when you use the *.* wildcard combination with the DEL command. You see this prompt:

```
Are you sure (Y/N)?
```

Press Y for yes or N for no.

A synonym for DEL is ERASE. Thus, you can substitute ERASE for DEL in any of the preceding examples.

Printing Files

If you have a printer attached to your computer, you can print files with the PRINT command. You will probably be printing files with the application programs you use with MS-DOS, but if you need to print a file from the MS-DOS command prompt, follow the steps below.

To print a file named STATS.NBA from the diskette in drive A:

1. Make sure your printer is on and ready to print.

2. At the command prompt, type the following and press Enter:

    ```
    PRINT  A:STATS.NBA
    ```

    MS-DOS prompts you for the name of the printing device connected to your computer. (This is usually the name of the communications port that the printer cable is connected to, such as PRN.)

3. Type the name of the device, such as PRN, and press Enter. MS-DOS prints the file on your printer.

See your MS-DOS Reference Manual for more information on the PRINT command.

Using Directories

You can create many files on a diskette, and a hard disk can store thousands of files. To help you organize this much information, MS-DOS lets you subdivide a disk into logical units called directories. Directories allow you to arrange the data on your disk so that files of similar type or purpose are kept together.

While you may not need to create directories on a diskette— especially if it contains only a few large files-directories are essential for organizing files on a hard disk.

Whenever you format a disk, MS-DOS creates one main directory for you. This directory is called the root directory. Any subsequent directories you create are logically subordinate to the root directory; that is, they are subdirectories of the root directory. A simple directory structure might look like this:

```
              Root directory
                    |
    _____|_____
   |                |                |
WORDPROC          DOS            SPDSHEET
```
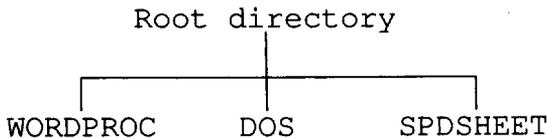
This arrangement would enable you to keep your word processing programs and data files in a directory called WORDPROC, your spreadsheet program and data files in a directory called SPDSHEET, and the MS-DOS files in a directory called DOS. The few files that MS-DOS needs to find as soon as you boot your system (COMMAND.COM, CONFIG.SYS, and perhaps AUTOEXEC.BAT) could remain at the top level of the structure, in the root directory.

As the number of files in your WORDPROC and SPDSHEET directories grows, you can create additional directories subordinate to those two-like this, for example:

```
                 Root directory
         ┌─────────────┼─────────────┐
     WORDPROC         DOS         SPDSHEET
   ┌─────┴─────┐             ┌──────┴──────┐
BUSINESS  PERSONAL        SALES         PROJ
```
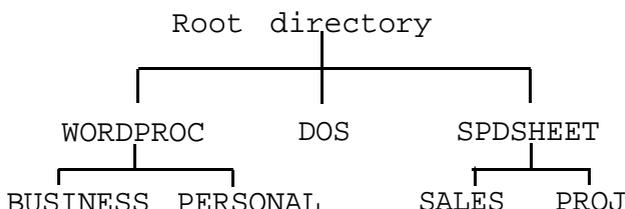
This structure would let you segregate your business word processing files from your personal word processing files and your sales spreadsheets from spreadsheet files used for financial projections.

Your directory structure may be as simple as this example or it could be much more complex. Organize your disk(s) to suit your own needs, and you can always delete old directories and create new ones as your needs change.

Here are some additional points to note about directories:

❏ In the root directory, the total number of files and subdirectories must not exceed 512 on a hard disk and 224 on a 1.2MB diskette.

❏ All directories other than the root directory can have any number of files and subdirectories, as long as there is space on the disk.

❏ Subdirectories are named the same way files are. The name can include as many as eight characters, and you can add an extension of up to three characters.

❏ The root directory does not have a name. It is identified by the backslash character: \ .

❏ Diskettes have root directories, just as hard disks do, and you can create subdirectories on diskettes the same as on hard disks.

The following sections discuss the basics of creating and using directories.

> **Note**
> The XTREE utility provides a simple **way** to see and organize your directories. See the description of XTREE later in this chapter.

The Default Directory

MS-DOS always recognizes one directory as the default or *current* directory, just as it always recognizes one drive as the default drive. The default directory is the one in which MS-DOS performs your commands, unless you tell it to do otherwise.

If you want to run a program or access a data file that is not stored in the default directory, you can either change directories (making a different directory the default) or include a *pathname* in your command.

Changing the Default Directory

To change from one directory to another, use the CHDIR command, or its shorthand equivalent, CD. For example, to change to the root directory of the default drive from anywhere in the directory tree, type the following and press Enter:

```
CHDIR \
```

If you are in the WORDPROC directory and you want to change to PERSONAL, a subdirectory of WORDPROC, type the following and press Enter:

```
CD PERSONAL
```

To change from PERSONAL back to WORDPROC, you can use the special symbol . . (two periods). The . . symbol always designates the parent directory. In other words, you can type:

    CD . .

Using Pathnames

A pathname tells MS-DOS how to find its way to the directory you want to access. There are two basic types of pathnames: relative and absolute. A relative pathname tells MS-DOS how to find its way to the desired directory from the current default directory. An absolute pathname tells MS-DOS how to find its way to the desired directory from the root *directory.*

Here is an example of an absolute pathname:

    \WORDPROC\PERSONAL

The backslash at the beginning of this pathname tells MS-DOS to start at the root directory, proceed down the directory tree to WORDPROC, then continue down the tree to PERSONAL.

Here is an example of a relative pathname:

    SALES

Because this pathname does not begin with a backslash, MS-DOS assumes that the starting point of the path is the current, default directory. This pathname thus tells MS-DOS to find a directory named SALES that is a subdirectory in the current default directory. Using the example above, you would have to be logged onto the SPDSHEET directory for this pathname to be valid.

Relative pathnames can tell MS-DOS to move upward in the directory tree as well as downward. The symbol . . in a pathname tells MS-DOS to move upward one level in the tree.

Thus, if the default directory were WORDPROC (in the above example), the pathname . . \DOS would tell MS-DOS to move up one level from WORDPROC (in this case to the root directory) and then find a subdirectory called DOS.

You can use either relative or absolute pathnames at any time, as long as you give MS-DOS enough information to find the directory or file at the end of the pathname.

Including Filenames With Pathnames

You usually use a pathname when you want to access a file that is not stored in the current default directory. The name of the file you want to access is specified at the end of the pathname, like this:

```
TYPE \WORDPROC\PERSONAL\JEANl204.DOC
```

This command tells MS-DOS to list on screen (TYPE) the contents of the file JEAN1204.DOC, which is stored in the directory \ WORDPROC \ PERSONAL. Note that the filename is connected to the pathname by a backslash character-the same character used to separate the various directories in the pathname itself.

Including Drive Letters With Pathnames and Filenames

As explained earlier, if you want to access a file stored on a drive other than the default drive, you have to include a drive designator (A:, for example) along with the filename. Likewise, if the file you want is not stored in the default directory of that drive, you need to include a pathname as well as the drive designator.

For example, suppose you are logged onto the root directory of drive A, and you want to delete the file JEAN1204.DOC, which is stored in the directory \WORDPROC\PERSONAL of drive C. Enter the command as follows

```
DEL   C:\WORDPROC\PERSONAL\JEANl204.DOC
```

Note that if you change from one drive to another and then try to access a file on the previous drive, MS-DOS remembers which was the default directory when you were last logged onto that drive. For example, suppose the last time you were logged onto drive C, the default directory was the root directory. Now you are logged onto drive A and enter the following command to delete the file JEAN1204.DOC:

```
DEL C:JEAN1204.DOC
```

MS-DOS tries to find the file you want in the root directory of drive C, but the file is not there and an error message appears on the screen. For this case, you would need to enter the complete pathname as in the previous example.

If you do not know what the default directory on another drive is, it is a good idea to include the full pathname whether you need it or not. You can never give MS-DOS too much information.

If you want to change to another directory on another drive, just include the drive designator in the command-like this, for example:

```
CD C:\WORDPROC\PERSONAL
```

Note

MS-DOS provides several commands that make using **pathnames easier:**

❑ **APPEND lets you set a search path for data files and executable files so MS-DOS knows where to find them even if you don't specify the drive and directory.**

❑ **PATH lets you specify a search path for commands and program files so you don't have to type a full pathname every time you want to run an application program or an MS-DOS command.**

❑ **SUBST lets you substitute a drive letter for a directory path, which is convenient if you frequently type long pathnames.**

See your MS-DOS Reference Manual for information on these helpful commands.

Creating Directories

You use the MKDIR command to create directories in MS-DOS. For example, to create a LEDGER directory under your root directory, type the following and press Enter:

```
MKDIR \LEDGER
```

You can abbreviate the name of this command to MD. For example, to create a SALES directory under the LEDGER directory, type the following and press Enter:

```
MD \LEDGER\SALES
```

If you are currently in the LEDGER directory, you could create the SALES subdirectory with this command:

```
MD SALES
```

In this case, you do not need to specify the path to the LEDGER directory because it is the default directory.

Listing the Contents of a Directory

You can use the DIR command to list all the files in a particular directory. For example, to list the files in the current directory, type the following and press Enter:

```
DIR
```

MS-DOS lists the names of the files in the current directory on the current drive, in a format like the following example:

```
Directory  of   C:\WORDPROC\PERSONAL
.                 <DIR>       6-09-89  10 : 16a
..                <DIR>       5-23-89   3 : 24p
LETTER.713        <DIR>       7-13-89   1 : 48p
RESUME               8293     7-29-89   9 : 07a
BOOKRPRT            10866 6 - 1 8 - 8 9  11 : 43p
          5 File(s)  16013560  bytes  free
```

A directory listing includes the following information about each file: the name and extension, the size in bytes, and the date and time the file was created or last modified (whichever is later).

Any subdirectories in the directory are listed along with the files; they are identified by the letters <DIR>. At the bottom of the listing, MS-DOS reports the total number of files (including directories) and the number of bytes on the disk that are still available for use.

If the listing is too long to fit on one screen, you can add the /P switch to the command, like this:

```
DIR /P
```

This switch causes MS-DOS to pause after displaying each screenful of information. To see the next screenful, press any key.

Another way to view a long directory listing is to use the /W switch:

```
DIR /W
```

This displays the directory listing in a wide format, as follows:

```
Directory  of  C:\WORDPROC\PERSONAL
     ..    LETTER.713   RESUME    BOOKRPRT
    5 File(s) 16013560 bytes free
```

As you can see, this type of listing does not show the size of the file or the time and date it was last modified.

To list the contents of a different drive or a different directory, include the appropriate drive designator and/or pathname in the command. For example, to see what is in the root directory of the diskette in drive A, type the following and press Enter:

```
DIR A:\
```

To display the contents of the WORDPROC\PERSONAL directory (on drive C), type the following and press Enter:

```
DIR C:\WORDPROC\PERSONAL
```

Displaying a List of Directories

The TREE command lets you display a list of all the directories on the specified drive. For example, to see the names of all the directories on the default drive, type the following and press Enter:

```
TREE
```

The screen displays a report for every directory on the drive, for example:

```
Path: C:\LEDGER
Sub-directories:RECEIV
                PAYABL
                SALES
```

If you would also like to see a list of all the files in the directories, add the /F switch to the command:

```
TREE /F
```

The screen displays the directory information shown above plus the names of all files in each subdirectory, for example:

```
Path: C:LEDGER\SALES
Sub-directories:None
Files:          DECSALES
                FORECAST.90
                OCTSALES
                NOVSALES
```

To see the list of directories on another drive, include the drive designator:

```
TREE A:
```

Removing Directories

You may sometimes want to remove directories you no longer need. A directory must be empty, however, before you can delete it. If it contains any files or subdirectories, MS-DOS displays an error message and does not delete the directory. (Use the DEL command to delete the files in a directory.)

To delete an empty directory from a disk, use the RMDIR command, or its shorthand equivalent, RD. For example, to remove the directory ACCOUNTS, which is a subdirectory in the LEDGER directory, type the following and press Enter:

```
RD  \LEDGER\ACCOUNTS
```

If you are currently in the LEDGER directory, you can enter the command as follows:

```
RD  ACCOUNTS
```

Formatting Diskettes

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

You can reformat previously used diskettes. This process erases all data on the diskette, however, so be sure you do not want to save any of the data on a used diskette before you format it.

If you plan to use a new diskette to make a backup copy of another diskette, you do not need to format it first; the DISKCOPY program automatically formats a blank diskette if it has never been formatted. (See the description of DISKCOPY later in this chapter.)

Note
Besides the method described below, you can also format diskettes using the Epson MENU utility. This program is easy to use because it lets you select options from a menu. For more information, see the section on MENU later in this chapter or see your MS-DOS Reference Manual.

The following procedure assumes your computer has a hard disk. If it does not, see "Formatting Diskettes With One Diskette Drive (No Hard Disk)" below.

1. If necessary, type C : to log onto drive C.

2. When you see the C : \> prompt, type the following and press Enter:

        FORMAT A:

   You see this prompt:

        Insert new diskette for drive A:
        and strike ENTER when ready

3. Insert the diskette you want to format in drive A and press Enter to start formatting. When the diskette is formatted, you see a message similar to this:

       Format complete
       1213952 bytes total disk space
       1213952 bytes available on disk
       Format another (Y/N)?

4. At this point, you can either format another diskette by pressing Y and Enter, or return to the MS-DOS command prompt by pressing N and Enter.

The formatted diskette is now ready to store data.

Note
You can also format diskettes for 360KB in your Apex computer. See the MS-DOS Reference Manual for information about options you can use with the FORMAT command.

Formatting Diskettes With One Diskette Drive (No Hard Disk)

If your computer has only one diskette drive and no hard disk, follow this procedure to format a diskette:

1. Insert the working copy of your MS-DOS Startup diskette in drive A.

2. When you see the A> prompt, type the following and press Enter:

        FORMAT A:

    You see this prompt:

        Insert new diskette for drive A:
        and strike ENTER when ready

3. Remove the MS-DOS Startup diskette and insert the diskette you want to format into the drive. Press Enter to start formatting. When the diskette is formatted, you see a message similar to this:

        Format complete
        1213952 bytes total disk space
        1213952 bytes available on disk
        Format another (Y/N)?

4. At this point, you can either format another diskette by pressing Y and Enter, or return to the MS-DOS command prompt by pressing N and Enter.

The formatted diskette is now ready to store data.

Note
You can also format diskettes for 360KB in your Apex computer. See the MS-DOS Reference Manual for information about options you can use with the FORMAT command.

Backing Up Data

It's very important to keep backup diskettes containing copies of the files you create. You can copy data and program files several ways:

❏ 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. It also gives you a way to back up files that are larger than the capacity of your diskettes.

DISKCOPY and BACKUP are described below. The COPY command is described in the previous section, "Copying Files." See your MS-DOS manual for information on XCOPY.

Note
Alternative ways to perform the functions listed above are through the MENU and XTREE programs. See the sections on MENU and XTREE later in this chapter.

Using the DISKCOPY Command

The DISKCOPY command lets you make an exact copy of a diskette. (You cannot use DISKCOPY to copy to or from a hard disk.) Because this procedure copies the data byte-by-byte, the two diskettes must be of the same type; that is, you cannot use DISKCOPY to copy a 5¼-inch, 360KB diskette to a 3½-inch 720KB diskette. You can use the COPY command, however, to copy files between incompatible diskettes and to copy files to or from the hard disk.

If the diskette you are copying to has not been formatted, DISKCOPY formats it automatically before copying the data.

The following procedure for copying diskettes assumes that you have a hard disk. If you do not, see "Using DISKCOPY with one drive only" below.

If you have a hard disk and two diskette drives, see "Using DISKCOPY with two diskette drives" below.

1. Make sure the diskette you want to copy is write-protected. (See "Write-protecting Diskettes" in Chapter 3 for instructions.)

2. If necessary, type C : and press Enter to log onto drive C.

3. At the C : \> prompt, type the following and press Enter:

       DISKCOPY A: A:

   MS-DOS displays this message:

       Insert SOURCE diskette in drive A:
       Press any key when ready . . .

4. Insert the diskette you want to copy from (the source) into the diskette drive and press any key. DISKCOPY copies the contents of the diskette to the computer's memory. Then the screen displays this message:

       Insert TARGET diskette in drive A:
       Press any key when ready . . .

5. Remove the original diskette from drive A and insert the blank diskette (the target) into the drive. Press any key. If the new diskette is not formatted, DISKCOPY formats it and then copies the contents of memory to the diskette.

6. If you are copying a 1.2MB diskette, MS-DOS asks you to insert the source and target diskettes again. Follow the prompts on the screen.

When the copy is complete, you see this message:

```
Copy another diskette (Y/N)?
```

7. Press Y and **Enter** to copy another diskette or **N** and **Enter** to return to the MS-DOS command prompt.

Using DISKCOPY with two diskette drives

1. Make sure the diskette you want to copy is write-protected. (See "Write-protecting Diskettes" in Chapter 3 for instructions.)

2. If necessary, type C : and press **Enter** to log onto drive C.

3. At the C : \> prompt, type the following and press **Enter**:

```
DISKCOPY A: B:
```

MS-DOS displays this message:

```
Insert SOURCE diskette in drive A:
Press any key when ready . . .
```

4. Insert the diskette you want to copy from (the source) into the diskette drive and press any key. DISKCOPY copies the contents of the diskette to the computer's memory. Then the screen displays this message:

```
Insert TARGET diskette in drive B:
Press any key when ready . . .
```

5. Insert the blank diskette (the target) into the drive. Press any key. If the new diskette is not formatted, DISKCOPY formats it and then copies the contents of memory to the diskette. When the copy is complete, you see this message:

    ```
    Copy another diskette (Y/N)?
    ```

6. Press Y and Enter to copy another diskette or N and Enter to return to the MS-DOS command prompt.

Using DISKCOPY with one drive only

If your computer has only one diskette drive and no hard disk, follow these steps to copy a diskette:

1. Make sure the diskette you want to copy is write-protected. (See "Write-protecting Diskettes" in Chapter 3 for instructions.)

2. Insert the Operating 1 diskette in the diskette drive.

3. At the A> prompt, type the following and press Enter:

    ```
    DISKCOPY A: A:
    ```

    MS-DOS displays this message:

    ```
    Insert SOURCE diskette in drive A:
    Press any key when ready . . .
    ```

4. Remove the Operating 1 diskette and insert the diskette you want to copy (the source) in the diskette drive and press any key. DISKCOPY copies the contents of the diskette to the computer's memory. Then the screen displays this message:

    ```
    Insert TARGET diskette in drive A:
    Press any key when ready . . .
    ```

5. Remove the original diskette from drive A and insert the blank diskette (the target) in the drive. Press any key. If the new diskette is not formatted, DISKCOPY formats it and then copies the contents of memory to the diskette. When the copy is complete, you see this message:

```
Copy another diskette (Y/N)?
```

6. Press Y and Enter to copy another diskette or N and Enter to return to the MS-DOS command prompt.

Using the BACKUP Command

Use the BACKUP command to back up the data on your hard disk. It provides a convenient and efficient way to copy the files on your hard disk. BACKUP allows you to do the following:

❏ Split large files across two or more diskettes

❏ Copy only those files that have been modified since the most recent backup

❏ Copy only those files that have been created (or modified) after a specified date

❏ Copy files in the current directory together with files in all subdirectories of the current directory

❏ Format diskettes while copying files.

Unlike DISKCOPY and COPY, which make readable copies of files, BACKUP creates files that you cannot access directly. To return files copied with the BACKUP command to their original locations on the hard disk, you must use the RESTORE command.

Make sure you have enough diskettes to back up the data on your hard disk drive. It takes about 17 1.2MB diskettes to back up a 20MB hard disk that is completely full, and about 34 1.2MB diskettes to back up a full 40MB hard disk.

See your MS-DOS Reference Manual for complete instructions on using BACKUP.

Using HELP

The Epson HELP program provides online information about MS-DOS commands and programs. You can use HELP in either of two ways:

❑ You can type HELP at the command prompt and press Enter to display the HELP menu

❑ You can bypass the menu by typing HELP plus the name of the command you want information about.

To use the HELP menu, follow these steps:

1. Type HELP at the MS-DOS command prompt and press Enter.

2. The screen displays a menu of MS-DOS commands. Use the cursor keys to highlight the command you want information about and press Enter.

3. If there is more than one screen of information about the command you selected, you see the prompt PgUp at the top of the screen. Press the PgUp key to display the rest of the text.

4. To return to the HELP menu, press the Esc key. Press ESC again to exit the HELP program.

To bypass the HELP menu and get information about one command, follow these steps:

1. At the command prompt, type HELP, followed by the name of the MS-DOS command you want information about, and press Enter. For example, to see help information for the COPY command, type the following and press Enter:

        HELP COPY

2. If there is more than one page of information about the command you selected, you see the prompt PgUp at the top of the screen. Press PgUp to display the rest of the text.

3. Press Esc to exit the HELP program.

You can also request help information for more than one command. Follow these steps:

1. At the command prompt, type HELP followed by the names of the commands you want information about. Then press Enter. Separate each command name with a space. For example, to see help information for the DISKCOPY, FORMAT, and COPY commands, type the following and press Enter:

        HELP DISKCOPY FORMAT COPY

2. The help information for the first command is displayed first. If there is more than one page of information about the command, you see the prompt PgUp at the top of the screen. Press PgUp to see more.

3. Press Esc to see the help information for the next command.

4. To exit the HELP program, press Esc after viewing the information for the last command.

Using MENU

Your computer comes with a program provided by Epson called
MENU. With this program you can display a menu of
commands and select the one you need. MENU is easy to use
because it lets you execute MS-DOS commands without
having to remember the exact syntax for each command.

Follow these steps to use the MENU program:

1. Log onto drive C.

2. Type MENU at the command prompt and press Enter. You
   see this main menu:

   ```
   EXIT
   File Utilities
   Disk Utilities
   Mode Settings
   Help
   Enter DOS Command
   ```

3. To select an option, use the arrow keys to highlight your
   selection and then press Enter. Most options contain
   submenus; keep highlighting your selection and pressing
   Enter until you have selected the desired operation.

MENU Program Options

Following are descriptions of each option.

File Utilities	Lets you back up and restore files, replace files, compare files, change file attributes, copy files, and copy directories. This option does the work of the MS-DOS commands BACKUP, RESTORE, REPLACE, FC, ATTRIB, and XCOPY.

Disk Utilities	Lets you check, copy, compare, and format diskettes. This option provides an easy-to-use alternative to the MS-DOS CHKDSK, DISKCOPY, DISKCOMP, and FORMAT commands.
Mode Settings	Lets you change your configuration settings, select alternate code pages (character sets), and redirect data from the parallel port to the serial port. Because you can perform so many tasks from the Mode Settings submenus, this option is a simpler alternative to the MS-DOS MODE command.
Help	Lets you access the HELP program.
Enter DOS Command	Lets you run other MS-DOS commands without leaving the MENU program.

For step-by-step instructions on using each MENU option, see your MS-DOS Reference Manual.

Using the XTREE Utility

Epson has included the XTREE program with MS-DOS to make it easier for you to manage files and run other MS-DOS programs. XTREE is especially useful for managing the data on a hard disk, where you may have hundreds of files.

XTREE lets you do the work of many MS-DOS commands through a convenient menu, and provides several features not available elsewhere in MS-DOS. It allows you to do the following:

❏ Display all the directories on a disk as well as all the files in each directory and the statistics for each file

❏ Display, copy, move, print, and delete files individually or in groups, to any directory or diskette

❏ Make new directories, rename directories, delete empty directories, and change from one directory to another

❏ Display data in both ASCII and hexadecimal format

❏ Execute programs without leaving the XTREE program

❏ Display how much space is available on your disks.

Running XTREE

To run XTREE, log onto drive C. Type `XTREE` and press Enter. When XTREE is loaded, you see a menu similar to the following:

```
 Path: \

 \
  └──DOS                                              FILE: *.*

                                                      DISK: A: OPERAT1_400
                                                       Available
                                                          Bytes:       7,168

                                                     DISK Statistics
  APPEND  .EXE      FIND    .EXE      SUBST   .EXE    Total
  ASSIGN  .COM      FORMAT  .COM      TESTBUG .COM      Files:           30
  ATTRIB  .EXE      GRAFTABL.COM      TREE    .COM      Bytes:      337,861
  BACKUP  .COM      GRAPHICS.COM      XTREE   .EXE    Matching
  CHKDSK  .COM      JOIN    .EXE      XTREEINS.DAT      Files:           30
  COMMAND .COM      LABEL   .COM      XTREEINS.EXE      Bytes:      337,861
  COMP    .COM      MORE    .COM                      Tagged
  DEBUG   .COM      PRINT   .COM                        Files:            0
  DISKCOMP.COM      RECOVER .COM                        Bytes:            0
  DISKCOPY.COM      RESTORE .COM                      Current Directory
  EDLIN   .COM      SHARE   .EXE                        \
  FC      .EXE      SORT    .EXE                         Bytes:      337,861

 DIR      Available  Delete  Filespec  Log disk  Makedir  Print  Rename
 COMMANDS  ^Showall  ^Tag  ^Untag  Volume  eXecute
 ↑↓scroll  RETURN file commands    ALT menu          F1 quit F2 help
```

This menu provides the following information:

Path: Shows the pathname for the current
                    directory. A single backslash identifies
                    the root directory.

                    The directory structure illustrated under
L   O   S   the backslash reflects the organization
                    of the directories on the disk. In this
                    case, the DOS directory is the only
                    subdirectory. If there are no entries listed
                    under the backslash, the disk contains no
                    subdirectories under the root directory.

FILE   Shows the files XTREE is set to display.
                    This window shows that XTREE is set to
                    display all files matching the DOS
                    specification * . *, which is all files.

DISK   Shows the name (or letter) of the disk
                    being displayed and the number of bytes
                    still available for data.

DISK Statistics   Summarizes information about the files
                    on the disk.

Files window   Lists the names of all the files in the
                    current directory.

DIR COMMANDS Displays all the key commands you can
                    use while this display is on the screen.
                    Just press the uppercase letter in the
                    command name to perform the function.

You use the cursor keys, letter keys, function keys, the Ctrl key,
and the Alt key to perform various functions in XTREE.

Use the cursor keys to move the highlighted bar. To select a file or directory, use the arrow keys to highlight the name of the file or directory. Press Enter to move the highlighted bar from the directory (top) window to the file (bottom) window. Press Enter to expand the file window, and then press it again to return to the directory window.

Letter keys execute XTREE commands. The available XTREE commands appear on the DIR COMMANDS or FILE COMMANDS line at the bottom of your screen. The highlighted letter of the word (the D in Delete, for example) indicates the key you press to execute the command.

To execute a command on more than one file or directory, press T to tag the desired files or directories with the Tag command. A diamond appears next to each tagged file or directory name. Then hold down the Ctrl key as you press the highlighted letter of the command name. Pressing Ctrl D, for example, deletes all tagged files.

Alt key commands execute additional XTREE commands. Press the Alt key to display the ALT DIR COMMANDS or ALT FILE COMMANDS. These commands appear on the line where the DIR COMMANDS or FILE COMMANDS normally appear. To execute an Alt key command, hold down the Alt key and press the highlighted letter of the command name.

Function keys control XTREE itself. Press F1 to quit XTREE, F2 to display a screen of help information, or F3 to cancel a command. XTREE displays the available commands and the key that executes each command on the lower right comer of your screen.

There are many ways you can put XTREE to work. All disk setup and maintenance functions can benefit from this utility. You can add XTREE to batch files like any other MS-DOS command-you could even put it in an AUTOEXEC.BAT file to display a disk's file structure when you turn on the computer.

Cautions

With a utility as powerful and as fast as XTREE, you must always be aware of the danger of accidentally erasing important files. Follow these guidelines to protect your files:

You can cancel commands, even commands in progress, by pressing F3. This stops any function.

Use **Ctrl A** (the attributes command) to give read-only status to all the files in the directories. Then, in order to erase a file, you must first remove its protection. (See your MS-DOS Reference Manual for details about the ATTRIB command.)

XTREE is limited in the number of files and directories it can handle. If you have more than 2800 files or 180 directories, XTREE displays an error message. If you see this error message, exit XTREE and store your infrequently used files on diskettes, or reorganize and delete some directories. If you use XTREE when you have more files or directories than it can handle, you may accidentally erase or alter files.

XTREE offers too many commands to demonstrate all the various combinations in this introduction; just remember that everything you can do is shown on the screen display. See your MS-DOS Reference Manual for a complete description of XTREE.

Using an AUTOEXEC.BAT File

You may find that there are some commands you want to run every time you turn on your computer. To run a command or a series of commands automatically upon startup, you can type the commands in a special file called AUTOEXEC.BAT. When you load MS-DOS, it always looks for this file. If MS-DOS finds an AUTOEXEC.BAT file in the root directory, it executes the commands in that file.

Here are some tasks you can perform using an
AUTOEXEC.BAT file:

❑ Modify the PATH command to include the directories
   containing other software programs you commonly use.
   This reduces the number of times you need to change
   directories or specify pathnames.

❑ Add the appropriate command to start your most
   commonly used application program (such as a word
   processor or spreadsheet program) so that it loads
   automatically when you turn on or reset the computer.

❑ Change the MS-DOS command prompt so that it displays
   the current directory-or your name, or anything you want.

If you have a hard disk, it comes with an AUTOEXEC.BAT
file that sets a path to all the MS-DOS commands and changes
the command prompt to show the current directory.

See your MS-DOS Reference Manual for instructions on using
the PATH command, the PROMPT command, and any other
commands you want to include in your AUTOEXEC.BAT file.
Also see the chapter on batch processing commands in the
MS-DOS manual for detailed information about
AUTOEXEC.BAT files.

Creating an AUTOEXEC.BAT File

You can create an AUTOEXEC.BAT file using any command
or program that lets you create a text-only file. If you have a
word processing program that can save a file as a text-only file
(sometimes called an ASCII text file), you can use that
program to create your AUTOEXEC.BAT file.

Here's an example of an AUTOEXEC.BAT file:

```
PROMPT $P$G
PATH C:\DOS
```

The first line changes the MS-DOS command prompt so that it displays your current directory.

The second line tells MS-DOS to look for programs or batch files in the DOS directory. This way you can run programs in that directory without having to specify pathnames in the commands.

> **Note**
> The AUTOEXEC.BAT file that came **on your** hard **disk** already includes these two lines.

The MS-DOS COPY command provides an easy way to create an AUTOEXEC.BAT file. Follow these steps:

1. If you are creating an AUTOEXEC.BAT file on your hard disk, log onto the root directory of your hard disk. If you are creating an AUTOEXEC.BAT file on the working copy of your MS-DOS Startup disk, insert the diskette in drive A.

2. At the MS-DOS command prompt, type the following and press Enter:

   ```
   COPY CON: d:\AUTOEXEC.BAT
   ```

   where $d:$ is the drive that is to contain the AUTOEXEC.BAT file you are creating.

3. Now enter the commands you want to include in the file. Type them exactly as you want MS-DOS to execute them, and in the order you want to perform them. Press Enter at the end of each line. After you type the last command, press Enter to move the cursor to the next blank line.

4. Now press F6 and then Enter. MS-DOS copies everything you typed to the AUTOEXEC.BAT file. From now on, MS-DOS runs the commands in the AUTOEXEC.BAT file every time you turn on or reset the computer.

If you need to change anything in the AUTOEXEC.BAT file later, you can use the same procedure to modify the commands. See your MS-DOS Reference Manual for instructions.

Using HDCACHE for the Hard Disk

You can use the MS-DOS program HDCACHE to enhance the performance of your hard disk. This program makes the hard disk work more efficiently by storing data requests in a reserved part of memory. See your MS-DOS Reference Manual for more information.

Chapter 5
Installing Option Cards

Option cards are accessories you can add to your computer to provide extra system capabilities. For example, you may want to install an auto-dial modem or a different display adapter card.

Your computer has six option card slots, so it can hold up to a total of six cards. The parallel and serial interface and floppy disk controller occupies one slot, and the hard disk controller occupies another slot. In addition, one slot is always occupied by the video card that operates your monitor.

Option cards are made by Epson as well as other vendors. In addition, multifunction boards allow you to add more than one feature per slot.

This chapter describes how to:

❏ Remove and replace the computer's cover

❏ Install and remove an option card

❏ Set the jumpers in your computer.

Removing the Cover

Before you install an option card in your computer, you need to remove the cover from your computer.

WARNING
Never open the **case** of the computer while it is plugged into an electrical outlet. **Turn** off the power switch on the **computer and any other peripheral devices connected to it; then unplug** the **power cable before removing the case.**

1. If the monitor is on top of the computer, disconnect it and move it to one side. Disconnect the keyboard and any peripherals and set them out of the way too. Turn the computer around so that the back panel faces you.

2. As shown below, the top cover is secured by five screws on the back panel and four screws on the side panels (two on each side). Remove the screws and put them all safely to one side.

side panel screws

back panel screws
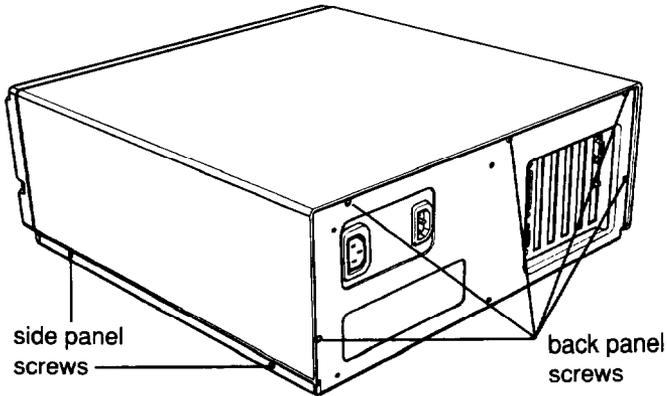
3. Turn the computer around so the front panel faces you. Hold on to the two sides of the cover and carefully pull it straight toward you, away from the back of the computer, as shown in the following illustration.
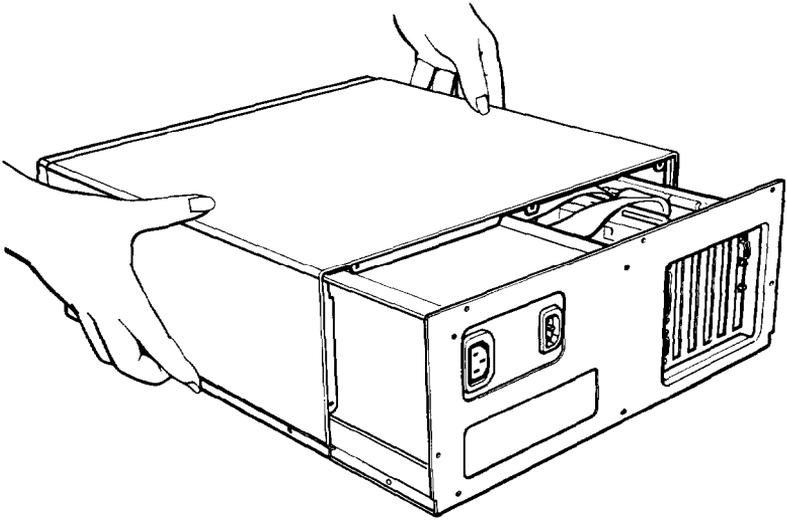
You can separate the sides of the cover from the bottom ledge of the computer by pulling them outward slightly, as shown below.
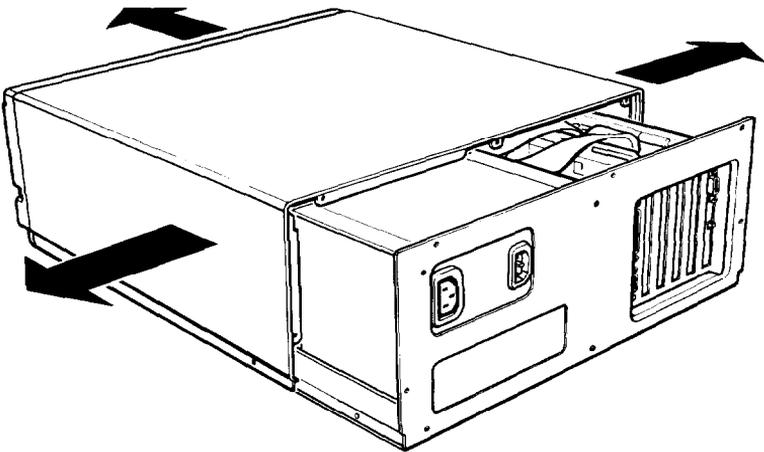
4.   When the back edge of the cover is a few inches away from the back panel, you can lift the cover off, Set the cover aside carefully.

Inserting the Option Card

Most option cards can be placed into any of the option slots.
Some cards, however, must be installed in a specific slot. Check
the option card manual to see if your option card must go in a
specific slot. If you are installing a new video card, you may
remove the MGA card that comes installed in your computer.

The option slots are located in the back of your computer, as
shown below.
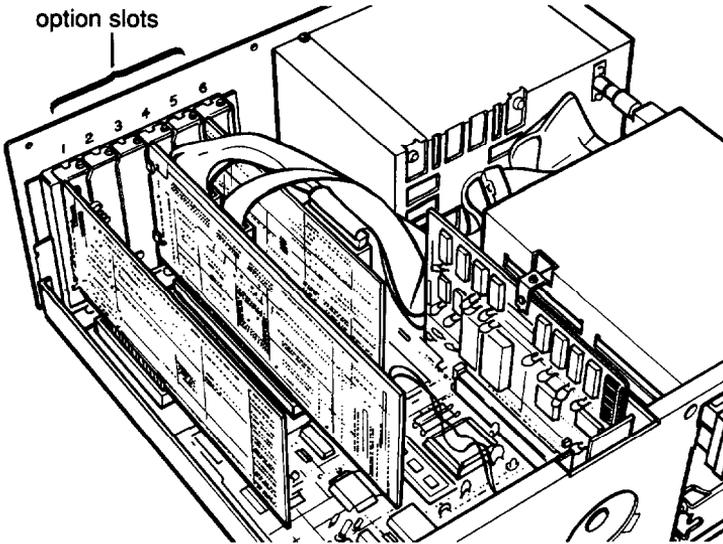
Slots 1, 5, and 6 are designed for 8-bit option cards and the
other three-slots 2 through 4—are designed for 16-bit option
cards. Option cards designed for 16-bit slots have a second
connector, as shown below.

16-bit option card   8-bit option card
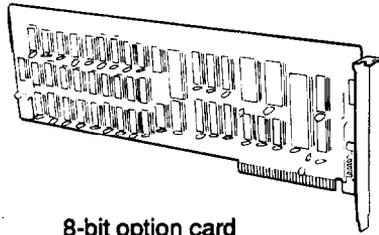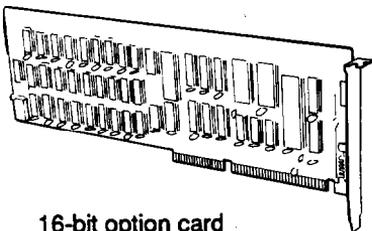
You can place some 8-bit cards in a 16-bit slot. But if an 8-bit card has an additional skirt along the bottom (which looks like an extra long connector), it must go into an 8-bit slot.

If you are installing a video card, be sure to install it in slot 5. Slot 6 contains the parallel and serial interface and the floppy disk controller.

To install the option card, follow these steps:

1. Decide which option slot you want to use, then remove the retaining screw from the metal cover plate at the back of the slot. (Hold onto the screw as you remove it so that it doesn't fall into the computer.) Lift out the metal cover, as shown below.
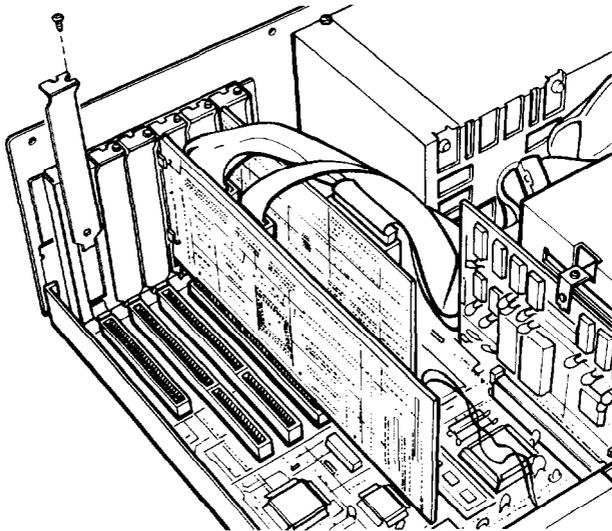
Put the option slot cover in a safe place in case you later remove the option card. Keep the screw and washer. You use them to secure the option card to the computer.

2. Unpack the option card and read all the instructions that come with it. If necessary, adjust switches or jumper connections on the card.

Note
**Pay specific attention to warnings in your option card
instructions. Some devices have delicate CMOS chips
that you should not touch.**

When you handle the card, be careful not to touch any of
the contacts on the circuit board, especially the gold
connector pins. If you need to put the card down before
installing it, place the component side facing down on top
of the original packing. Keep the card's original packing
materials in case you remove the card later.

3. Hold the card by the top comers so the connector pins are
    pointing down and the components are facing the side of
    the computer, as shown below.
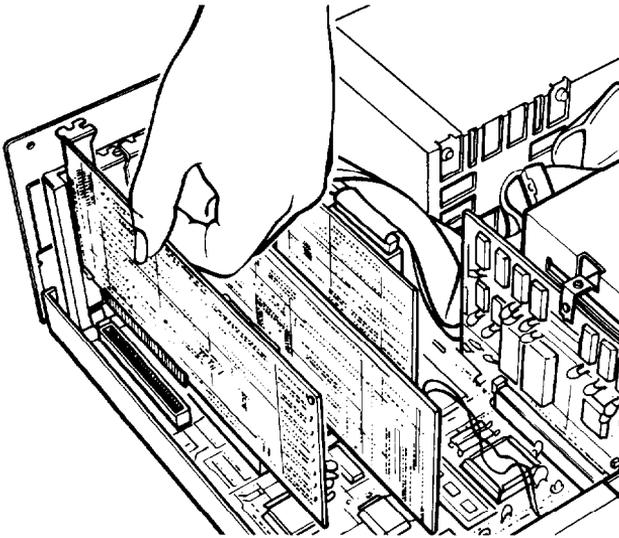
4. Insert the card straight down into the slot. Once the
    connector pins are in the connector slot, push down firmly
    (but carefully) to fully insert the card. If the connector pins
    do not seem to be going in smoothly, do not force the card;
    pull it all the way out and try again. Be sure to keep the
    card straight.

5. Secure the retaining bracket to the frame of the computer with the small screw.

Jumper Settings

Some optional devices require different jumper settings inside the computer. In this case, it is best if your dealer installs the option and makes all the necessary adjustments when you buy it. If you decide to do it yourself, be very careful when you follow the procedures below. There are many system components that can be damaged accidentally.

The jumpers you may need to change are on the Main circuit board, Memory card, and Multi-function card (parallel port, serial port, and floppy disk controller). The location of these cards is shown below.
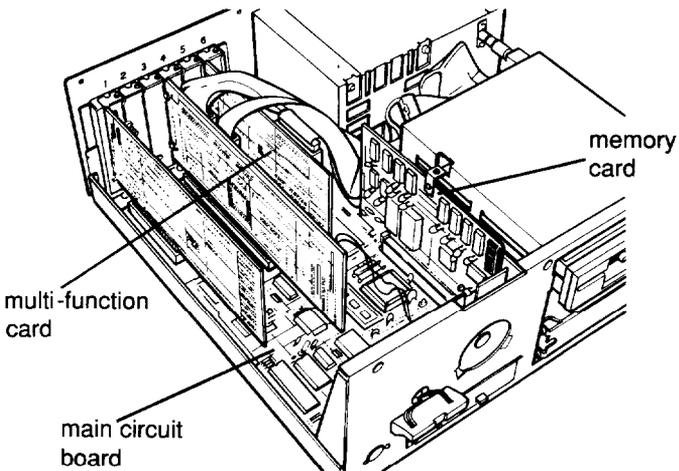
WARNING
The jumpers on these cards are preset at the factory in default positions. Do not change any of them unless you are sure the option card you are installing requires different settings. If you have any questions, ask your Epson Customer Care Center service representative.

The procedure for changing a jumper setting is given first, then the jumper functions and locations for each card are described separately. All the instructions assume you have already removed the cover from the computer.

Changing a Jumper Setting

A jumper setting is determined by the jumper's position: either between pin A and the middle pin (position A) or between pin B and the middle pin (position B). Both positions are shown below.
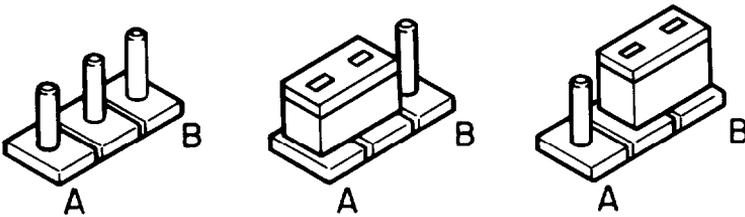
To move a jumper from one position to the other, use needle-nose pliers or tweezers to lift it off the board and gently move it to the other position. Be careful not to lose the jumper or leave it out of the computer.

Memory Card Jumpers

The jumpers on the memory card control the following functions:

❑ Amount of RAM (main memory). If you install a memory card that needs to use part of the main memory, you may need to change the jumper settings to disable some of the main memory on the memory card. Be sure to check your memory card instructions to see if this is necessary.

❑ EPROM size. You can change the EPROM size jumper if you install a different size of EPROM.

The table below shows the functions for the jumpers on the memory card.

Memory card *jumper settings*

| Jumper number | | | Function |
1	2	3	
A	A		640KB *
B	A		512KB (disable upper 128KB)
B	B		256KB (disable upper 384KB)
		A	Select EPROM size 27128*
		B	Select EPROM size 27256

. Default setting

To access the memory card jumpers, you need to remove the card from the computer first:

1. Remove the retaining screw from the bracket on the memory card, as shown below.
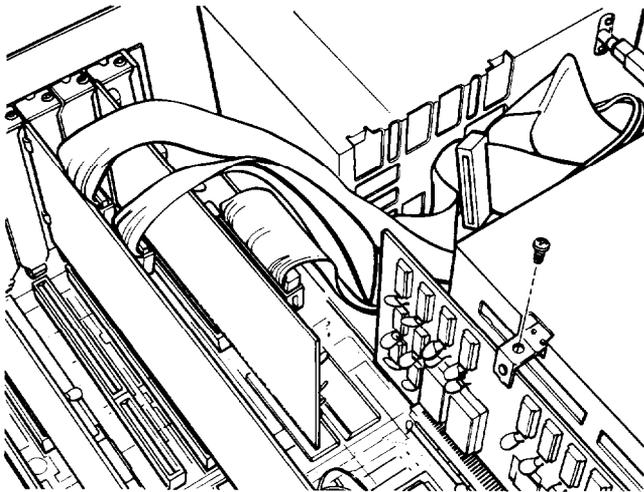
2. Lift the card gently out of the computer. Set it on a soft surface, such as a towel, with the component side facing up. The location of the three jumpers is shown below. Refer to the table above to set them as needed.
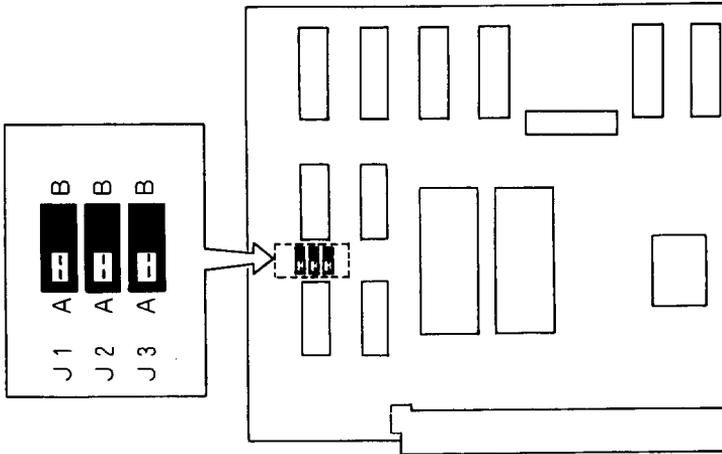
When you finish setting the jumpers, replace the memory card in the computer and secure it with the retaining screw.

Main Circuit Board Jumpers

The jumpers on the main circuit board control the following :

❑ Number of wait states for EPROM. If necessary, you can change the number of wait states (1 or 2) used by the EPROM. Selectable wait states are available only when your computer is running at 12 MHz. Please consult your Epson Customer Care Center for assistance.

❑ Number of wait states for 16-bit device access. If necessary, you can change the number of wait states (1, 2, 3, or 4) required by the 16-bit optional devices. Selectable wait states are available only when your computer is running at 12 MHz. Please consult your Epson Customer Care Center for assistance.

❏ Math coprocessor clock speed. If you install an 80287 math coprocessor, you may need to set the jumpers for a different clock speed. The jumpers determine the speed of the coprocessor.

Since it is easy to damage a math coprocessor, you should have your Epson Customer Care Center install it for you. In addition to checking the jumper settings, you also need to run the Setup program to change the settings in the CMOS RAM, and you may want to test the coprocessor with the System Diagnostics program. See Chapter 2 for instructions on running Setup. See Appendix C for instructions on testing the math coprocessor.

The table below shows the functions for the jumpers on the main circuit board.

Main circuit board jumper settings

Jumper number					Function
1	2	3	4	5	
A					1 wait state for EPROM access *
B					2 wait states for EPROM access
	A	A			1 wait state for 16-bit option card *
	B	A			2 wait states for 16-bit option card
	A	B			3 wait states for 16-bit option card
	B	B			4 wait states for 16-bit option card *
			A	A	Set coprocessor clock at 8 MHz *
			B	B	Set coprocessor at 1/3 of CPU speed

* Default setting

To access the main circuit board jumpers, you must remove the memory card from the computer, as described above. Do not try to access the jumpers while this card is still in the computer.

The locations of jumpers J1-J5 on the main circuit board are shown in the following illustration. Refer to the table above to set them as needed.
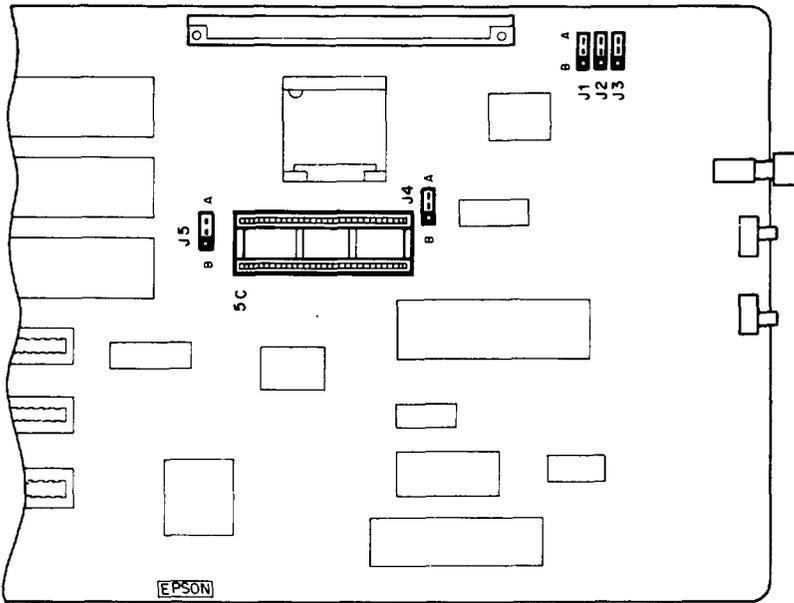
When you finish changing the jumpers, carefully replace the memory card in its slot and secure it with the retaining screw.

Multi-function Card Jumpers

The jumpers on the multi-function card control the parallel port address and the serial port address. You normally address the parallel and serial ports in the computer as the primary ports (LPT1 and COM1). However, if you install an additional parallel or serial port and want it to be the primary port, you need to change the jumpers on the multi-function card so the built-in port becomes secondary (LPT2 and COM2).

The following table shows the jumpers on the multi-function card that control the parallel port.

Multi-function *card jumper settings for* **parallel port**

Jumper number			Function
3	4	10	
A	A	A	Enable built-in port as primary *
A	B	B	Enable built-in port as secondary
B	A	A	Enable compatibility with IBM monochrome display/printer adapter
B	B		Disable built-in port

* Default Setting

The table below shows the jumpers on the multi-function card that control the serial port.

Multi-function *card jumper settings* for serial port

Jumper number			Function
5	6	9	
A	A	A	Enable built-in port as primary *
A	B	B	Enable built-in port as secondary
B			Disable built-in port

* Default setting

To access the multi-function card jumpers, you need to remove the card from the computer:

1. Unplug the disk drive cable from the card as shown below. Pull it straight up and out, then lay it to one side.
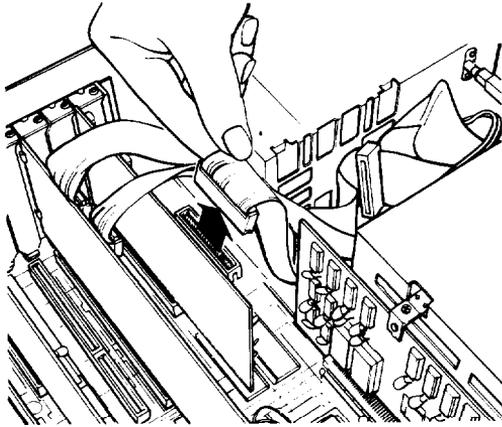
2. Remove the retaining screw from the multi-function card at the back panel of the computer, as shown below.
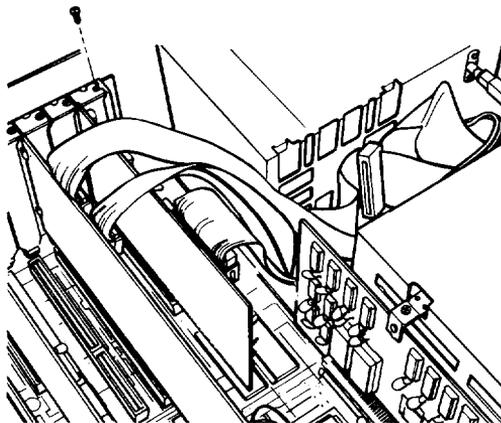
3. Remove the card from the slot (pull it straight up) and set it on a soft surface with the components facing up. The location of the jumpers is shown below. Change them as needed and then reverse the three steps above to reinstall it.
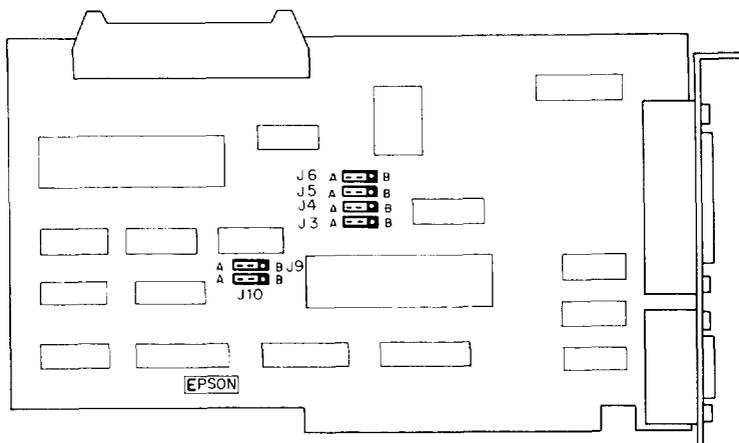
Removing an Option Card

If you need to remove an option card, simply reverse the steps you followed to install it. Remove the screw securing the card to the back of the computer and pull the card straight up and out of the slot. Then carefully wrap the card, preferably in the original packing materials, and place it inside its box for safe storage. Cover the end of the empty option slot with the original metal cover and secure it with the retaining screw.

Replacing the Cover

With the option card properly installed or removed, the last step is to replace the cover of the computer:

1. Facing the front of the computer, position the cover on the computer as shown below.
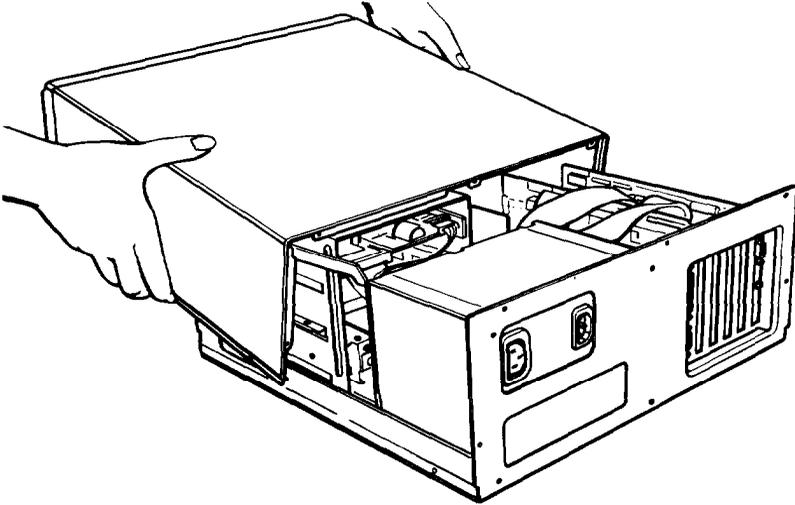
2. Pull the sides of the cover outward slightly and lower the cover over the computer. Guide the curved edge on the bottom of the cover along the bottom of the computer.
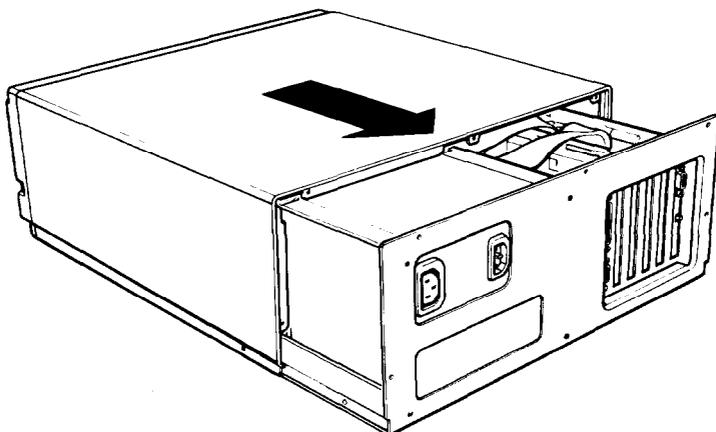
3. Slide the cover straight back until the front panel is flush with the diskette drive. Make sure the power switch fits properly through the opening on the front panel.

4. To secure the cover, replace the screws on the back and side panels.

5. Return the computer to its original position and reconnect it to the monitor, the keyboard, the printer, and any other peripherals you have.

6. Check to make sure the power switch is off. Reconnect the power cable to the back of the computer and to an electrical outlet.

Post-installation Setup

After you install or remove an option card, you may need to run the Setup program to update the configuration information. For example, if you add a second diskette drive, you need to tell the computer that it has the additional drive. See Chapter 2 of this guide for information on the Setup program.

You may also need to add some commands in the configuration files on your system disk as well. See the description of CONFIG.SYS in your MS-DOS Reference Manual for instructions.

When you finish installing an option card and reconfiguring the system, you should test the card if possible. Some option cards come with their own diagnostics programs, and you can test others with the diagnostics programs on your Reference diskette. The options you can test with the diagnostics programs include the following:

❏ Expansion memory

❏ 80287 math coprocessor

❏ Serial and parallel ports

❏ Monitors and display adapters

❏ Disk drives.

See Appendix C for instructions

Chapter 6
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 chapter. You can correct most problems by adjusting a cable connection, repeating a software procedure, or resetting the computer.

If you still have a problem after trying the recommended solution, consult your Epson Customer Care Center. (For the location of the center nearest you, call the Epson Consumer Information Center number: 1-800-922-8911.)

When you contact your Epson Customer Care Center, be ready to provide the serial number of your computer, its configuration (including the type and number of disk drives, monitor, and option cards), as well as the names and version numbers of any application programs you are using. This information helps the customer care representative diagnose the problem.

The Computer Won't Start

If your computer does not start when you turn on the power switch, check the following:

1. Is the power light on the computer's front panel on? If not, remove any diskettes from the diskette drive(s) and turn off the power switch. Check that the power cord is securely connected to both the AC inlet on the back panel and an electrical outlet.

    WARNING
    If you need to turn off the computer for any reason, always wait at least five seconds before switching it back on again. You can damage your computer if you turn it off and on rapidly.

Replace the system (Startup) diskette, if necessary, and turn the computer on again.

2. If the computer's 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 wall outlet, and turn it on to see if the outlet supplies power.

3. If the electrical outlet is working and all the connections are secure but your computer still won't start, call your Epson Customer Care Center.

Note
If the computer starts but you can't see anything on the monitor, check the section below on Monitor Problems.

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 computer operations take longer than others to complete. For example, the computer needs more time to sort a database than to accept a single typed character. If your computer is still locked after a reasonable length of time, proceed to the next step.

2. If you are running an application program, check the section below called "Software Problems." This section covers certain problems caused by application programs.

3. If you want to stop whatever the computer is doing and return to the MS-DOS command prompt, hold the Ctrl key down and press Break. In most cases, this solves the problem. See Chapter 3 for more information on stopping a command or program.

4. If your computer still does not respond, you can reset it. Follow the instructions in Chapter 3 for resetting your computer.

5. If resetting the computer does not solve the problem, turn it off, wait at least five seconds, and turn the computer on again. This procedure causes the computer to load MS-DOS and display the MS-DOS command prompt. If you do not have a hard disk, insert the working copy of the Startup diskette in drive A before turning on the computer.

Keyboard Problems

If you are having trouble with the keyboard, check the following:

1. If a keyboard error is displayed on the screen when you turn on or reset the computer, make sure the keyboard is securely connected to the computer. See "Connecting the Keyboard" in Chapter 1 for instructions.

2. If nothing happens when you type on the keyboard, see the previous section ("The Computer Does Not Respond").

3. If the arrow keys are not working properly, the Num Lock function may be on. When Num Lock is on, the numeric/cursor keys on the numeric keypad work only as numbers. See if the Num Lock indicator on the upper right corner of the keyboard is illuminated; if it is, press the Num Lock key to turn off the function.

Monitor Problems

If you are having difficulty with your monitor, 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 switch 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 a few seconds 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 wall 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 the Monitor" in Chapter 1 for more details. Also check the monitor manual for directions on connecting it to the computer.

5. If you are using the MGA card in your computer, make sure the two color/mono switches are set correctly for your monitor. One switch is on the front of the computer, and one is on the back. See "Connecting the Monitor" in Chapter 1 for instructions.

   Note
   Many monitors display in only one color (such as green or amber), but they are not necessarily monochrome monitors. If your monitor is not specifically a monochrome monitor, set the color/mono switch to color. Check the documentation that came with your monitor to verify which type it is.

6. If you are running an application program, check to make sure the program is set up for the type of monitor you have. Some programs need to be set up specifically for the type of monitor you are using.

    Note
    If your application program requires a monitor that supports graphics but you have a monochrome monitor, the results will be unpredictable.

7. If you are still having difficulty with your monitor, try running either the Monochrome Display Adapter and CRT Check or the Color Graphics Display Adapter and CRT Check, both of which are described in Appendix C of this manual. If the diagnostics program indicates an error, contact the place where you bought the monitor. If you are using an Apex monitor, call your Epson Customer Care Center for assistance.

Diskette Problems

If you have trouble accessing data on a diskette, try the following steps:

1. Remove the diskette from the diskette drive and reinsert it. Repeat the operation that gave you trouble. This usually solves the problem if the diskette was not seated properly in the drive.

2. 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 diskette drive and repeat the operation. If you can successfully perform the operation in the new drive, the trouble may be in your diskette drive. See the section below on "Diskette Drive Problems."

3. If the problem persists in the new diskette drive, make sure the diskette is the correct type for your drive. See Chapter 3 for more information on appropriate diskette types and storage capacities.

4. If your diskette is the right type for your drive, check whether the diskette is write-protected. There may be a write-protect tab over the notch on the side of the diskette (5¼-inch) or the write-protect switch may be set (on a 3½-inch diskette). See Chapter 3 for information on write-protecting diskettes.

   Some application programs do not function properly if the diskette is write-protected. Check your application program manual.

5. If MS-DOS displays errors when you try to access data, your diskette may be defective. MS-DOS error messages that may indicate a defective diskette include these:

   ❑ `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 placed in the diskette drive and the diskette 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 probably have a defective diskette. Use the MS-DOS COPY command to copy the files from the diskette onto another diskette. See "Copying Files" in Chapter 4 for instructions.

If you are not able to copy all the files from the defective diskette, copy as many as you can and then use the MS-DOS program RECOVER. This program recovers all the data that it can read on the diskette. It is specifically designed to work on disks or diskettes that may be defective. See your MS-DOS Reference Manual for instructions on using RECOVER.

WARNING
RECOVER **renames** all files **on the diskette, so use it only** after you have copied as many files as **possible with the MS-DOS COPY command.**

6. 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 file 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.

To make the necessary repairs, use the MS-DOS program CHKDSK.

Note
It is best to make **a** backup **copy of** the entire diskette before making **changes with** CHKDSK.

CHKDSK examines the diskette and if it finds errors, you see the following message:

```
Errors found, F parameter not specified
Corrections will not be written to disk
```

The CHKDSK program can recover data that has been inadvertently lost on the diskette. It makes changes to the diskette if you use the /F switch in the command like this:

```
CHKDSK A: /F
```

See the description of CHKDSK in your MS-DOS Reference Manual before making corrections to the diskette.

Diskette Drive Problems

Follow these steps if you are having difficulty with a diskette drive:

1. If the diskette is not turning or the diskette drive is making loud noises, do not attempt any further examination of it. Instead, contact your Epson Customer Care Center.

   Note
   Diskette drives may make different **sounds with** different diskettes.

2. If your diskette drive read/write heads are dirty, you may occasionally see this MS-DOS error message:

   ```
   Error Reading Drive d
   Abort, Retry, or Fail?
   ```

   To clean the read/write heads, use a diskette head cleaning **kit.** Such kits are available in most computer stores.

3. If you are still having problems with your diskette drive, try running the Floppy Disk Drives and Controller Check described in Appendix C of this manual. If the diagnostics program indicates an error, consult your Epson Customer Care Center.

Hard Disk Problems

If you are having problems with your hard disk, try the
following steps:

1. If the drive is making loud noises, or not functioning at all,
   do not attempt any further examination of it. Instead,
   contact your nearest Epson Customer Care Center.

2. If this is the first time you have used the computer after
   setting it up and the hard disk does not load MS-DOS
   when you turn it on, it may be missing one of the MS-DOS
   system files. Turn off your computer and insert your
   working copy of the Startup diskette into drive A. Then
   turn your computer on again. Press Enter twice to accept
   the date and time prompts.

   Type C : and press Enter to log onto the hard disk. If
   this works, the next step is to make sure the file
   COMMAND.COM is in the root directory of the hard
   disk. Type DIR and press Enter.

   If COMMAND.COM exists in the root directory, use the
   MS-DOS COMPARE command to compare the
   COMMAND.COM file on your diskette with the
   COMMAND.COM file on the hard disk. (See your
   MS-DOS Reference Manual for instructions on using
   COMPARE.) If the files do not match, use the COPY
   command to replace COMMAND.COM on the hard disk
   with the COMMAND.COM file on your diskette. Type
   the following and press Enter:

       COPY A:COMMAND.COM C:

3. If the hard disk still does not work, the root directory of
   your hard disk may be missing some hidden system files.
   (Hidden files are not displayed when you list files using the
   DIR command.)

To copy the hidden system files from your Startup diskette to the root directory of the hard disk, type A : to log onto the diskette drive, then type the following and press Enter:

```
SYS c:
```

4. If you can boot from a diskette but cannot access data stored on your hard disk, you may have accidentally repartitioned or reformatted part or all of the disk.

   Use the Display Partition Information option of the FDISK program to see if your hard disk has an active (bootable) DOS partition on it. If it does not, back up all your files and then use FDISK to create an MS-DOS partition. See your MS-DOS Reference Manual for instructions on using FDISK.

   If your hard disk does have an active DOS partition, back up all your files and then try reformatting your hard disk using SELECT. See Appendix E, "Preparing a Hard Disk for Use" for instructions.

   WARNING
   Reformatting destroys all the data on **the** hard disk, so do this **only after careful consideration and after** trying **the preceding steps.**

5. If your hard disk is producing a lot of read/write errors or you are having other serious problems with it, try running the Hard Disk Drive and Controller diagnostics check, as described in Appendix C of this manual. If the diagnostics program indicates an error, contact your Epson Customer Care Center. Never open the sealed unit that encloses the hard disk.

6. If you have been using your hard disk for a long time and begin to see numerous read/write errors, you may need to reformat the hard disk. If you decide to do this, follow these steps:

    ❏ Back up all the data on the disk using the BACKUP command (described in the MS-DOS manual).

    ❏ Follow the instructions in Appendix D to perform a low-level format.

    ❏ Follow the instructions in Appendix E to prepare the hard disk for use.

7. If you have installed a hard disk drive made by another company in your computer, it may need to be partitioned and formatted. If this is the case, see Appendix E for instructions. If it needs a low-level (physical) format, do that before you partition the disk. (See Appendix D for instructions.)

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 application diskette in the top drive (drive A).

2. Some programs work at only one operating speed. Your computer can run at either 8 MHz or 12 MHz. Check your software manual to see if your application program must run at the slower speed and change the CPU operating speed if necessary. See "Changing the Operating Speed" in Chapter 3 for instructions.

3. If you have entered an MS-DOS command that you want to stop, there are special key combinations you can type to signal MS-DOS to stop what it is doing. These methods may also work in your application programs.

   To interrupt an MS-DOS command while it is executing, try one of the following commands:

   ❏ 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 under "Resetting the Computer" in Chapter 3.

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 correctly immediately after you install it, check that the printer has power and is properly connected to the computer. Check Chapter 1 of this manual or your printer manual for instructions on how to connect your printer to the computer.

   Also make sure your printer has paper in it, since many printers cannot operate without paper.

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 your printer is properly set up but is still not functioning, test it from the MS-DOS level. When the MS-DOS command prompt (such as C : \>) is showing on the screen, press PrtSc. 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 (or serial port for a serial printer). To make this change, use the MS-DOS MODE command or the MENU utility. See your printer manual and the MS-DOS Reference Manual for more information.

4. Many application programs (such as word processors) must be set up properly before they can use a printer. Check your application program manual to see what customization is required.

5. Try running the Parallel Port (Printer Interface) Check if you have a parallel printer, or the Serial Port (RS-232C) Check if you have a serial printer. These diagnostics checks are described in Appendix C of this manual. If the diagnostics test indicates an error, contact the place where you bought the printer.

Option Card Problems

If you install an option card and it is not functioning correctly, check the following:

1. Is the option card installed correctly? Check the installation procedure described in Chapter 5 and also see the instructions that come with the option card. The most common problem with option cards is a loose connection. Make sure the option card is well-seated in its slot.

2. Did you run the Setup program to reconfigure your computer? You must run Setup to update the computer's internal settings if you changed:

   ❏ The amount of memory installed

   ❏ The type of video display adapter installed

   ❏ The presence of a math coprocessor

   ❏ The number or type of disk drives installed.

   See Chapter 2 of this manual for more information about Setup.

3. Did you set the necessary DIP switches or jumpers on the option card? See your option card manual for instructions.

4. 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 on running the software setup procedure.

5. Some option cards work at only one speed. Your computer can run at either 8 MHz or 12 MHz. Check your option card manual to see if your card must run at the slower speed, and change the CPU operating speed if necessary. See "Changing the Operating Speed" in Chapter 3 for instructions.

6. If you changed the configuration of your computer-for example, if you added a disk drive, serial or parallel port, or display adapter card--did you change any necessary jumper settings in the computer? See Chapter 5 for more information.

7. 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 option card connector on the back panel?

Appendix A
Specifications

CPU and Memory

16-bit CPU	80286 microprocessor; 8 or 12 MHz clockrate, switch-selectable
	Real address (8086-compatible) and protected virtual address (multi-tasking) modes
	24-bit address and 16-bit data bus
Main memory	640KB RAM on memory card; expandable to 15.5MB maximum with expansion cards
ROM	32KB, expandable to 64KB, selectable alternate ROM for custom use
Math coprocessor	80287 (8 MHz) support (optional)

Controllers

Diskette	Supports up to two drives available in any of four formats: double-density (360KB), double-density (720KB), high-density (1.2MB), or high-density (1.44MB); controller on multi-function card
Hard disk	Supports up to two drives available in multiple formats; installs in 16-bit option slot, ST 506/412 interface

Interfaces

Serial	RS-232C, programmable, asynchronous, DB-9P male connector
Printer	Standard 8-bit parallel, DB-25S female connector
Option slots	Six IBM PC/AT-compatible input/output expansion slots (three 8-bit and three 16-bit): one 8-bit slot occupied by parallel/serial interface and diskette controller card; one 8-bit slot occupied by multi-graphics adapter card; one 16-bit slot occupied by the hard disk controller card; three available
Speaker	Internal, programmable
Clock/calendar RAM	Real-time clock, calendar, and 64-byte CMOS RAM for configuration; battery backup

Power Supply

Switching type, fan-cooled, 115/230 VAC, 50/60 Hz 140 W (peak); +5 VDC, +12 VDC, -5 VDC, -12 VDC; externally switch-selectable

Mass Storage

Three drives maximum, configurable using three half-height slots (horizontal mounts); two externally accessible

Standard	5 ¼-inch, half-height diskette drive; double-sided, high-density, 1.2MB storage capacity

Hard disk drive	3 ½-inch or 5 ¼-inch, half-height internal hard disk; 20MB or 40MB storage capacity; ST 506/412 interface
Optional	5 ¼-inch, half-height diskette drive; double-sided, high-density, 1.2MB storage capacity
Optional	5 ¼-inch, half-height diskette drive; double-sided, double-density, 360KB storage capacity
Optional	3 ½-inch, half-height diskette drive; double-sided, high-density, 1.44MB storage capacity
Optional	3 ½-inch, half-height diskette drive; double-sided, double-density, 720KB storage capacity
Optional	3 ½-inch or 5 ¼-inch, half-height internal hard disk drive.

Keyboard

	Detachable, 101 sculpted keys
Layout	58-key QWERTY main keyboard; 17-key numeric/cursor pad; 10 cursor keys; 12 function keys (user-definable); 4 dedicated function keys
Function keys	Three levels (normal/shift/alternate), user-definable

Environmental Requirements

Temperature	Operating range: 41° to 95°F
	(5° to 35°C)
	Storage range: -4° to 140°F
	(-20° to 60°C)
Humidity	Operating range: 20% to 80%, non-condensing
	Storage range: 10% to 90%, non-condensing

Physical Characteristics (CPU only)

Width	15.7" (400 mm)
Depth	16.5" (420 mm)
Height	6.1" (155 mm)
Weight	Apex 200\20: 27.5 lbs (12.5 kg)
	Apex 200\40: 28 lbs (12.8 kg)

Power Requirements

115/230 VAC ± 20%, 50/60 Hz, 5 amps
140W output capacity (peak)

Video and Display Options

Standard	Multi-graphics adapter card; color or monochrome, switch-selectable; installed in option slot

Supports Epson- and IBM PC-compatible monochrome monitor: 80-character x 25-line display, 9 x 14 character block; Hercules® monochrome text/graphics, 720 x 348

Supports Epson- and IBM PC-compatible color graphics monitor: 40-character x 25-line display (low-resolution text), 80-character x 25-line display (high-resolution text), 640 x 200 (high-resolution graphics), 320 x 200, four colors; 160 x 200, eight colors

Other Apex Options

Check with the store where you purchased your Apex computer for the following options:

Monitors   13-inch, CGA-compatible color monitor with tilt swivel stand. High-contrast screen; 16 colors; etched surface to reduce glare; 18 MHz video bandwidth (AP1020B)

12-inch, monochrome TTL monitor with tilt swivel stand. High persistence, P-39 green phosphor screen; etched surface to reduce glare; 22 MHz video bandwidth; 35W (AP1040B)

ActionPrinters™ by Epson

T-1000   9-pin, 80-column, dot-matrix printer; 180 cps draft/30 cps near letter quality (CO1801 1)

Black ribbon (8750)

Single bin cut sheet feeder (7341A)

T-750	9-pin, 136-column, dot-matrix printer; 240 cps draft/48 cps near letter quality (CO2001 1)
	Black ribbon (8755)
	Single bin cut sheet feeder (8348)
L-1000	24-pin, 80-column, dot-matrix printer; 180 cps draft/60 cps letter quality (CO1901 1)
	Black ribbon (7753)
	Single bin cut sheet feeder (7341A)
	Optional letter quality font modules: Courier (7400A), Prestige (7401A), Script (7402A)
L-750	24-pin, 136-column, dot-matrix printer; 216 cps draft/72 cps letter quality (C006021)
	Black ribbon (7754)
	Single bin cut sheet feeder (8348)
ActionPrinter accessories	L-1000/L-750 Replacement ribbon (7753)
	T-1000/T-750 Replacement ribbon (8758)
	Universal printer stand (CPD-552-B)
	Printer cable (C1-9E-B)
	Serial interface board (8143)

Intelligent serial interface board (8148)

Intelligent IEEE-488 interface board (8165)

| Computer accessories | Internal 300/1200 baud modem card (C203A-B) |

External 300/1200 baud modem (C202A-B)

Parallel Port Pin Assignments
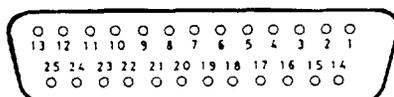
Pin no.	Signal name	Direction	Description
1	-STROBE	O	-STROBE
2	DATA 0	O	Data Bit 0
3	DATA 1	O	Data Bit 1
4	DATA 2	O	Data Bit 2
5	DATA 3	O	Data Bit 3
6	DATA 4	O	Data Bit 4
7	DATA 5	O	Data Bit 5
8	DATA 6	O	Data Bit 6
9	DATA 7	O	Data Bit 7
10	-ACK	I	-Acknowledge
11	BUSY	I	Busy
12	PE	I	Paper empty
13	SLCT	I	Printer selected
14	-AUTO FD	O	-Auto paper feed
15	-ERROR	I	-Error
16	-INIT	O	-Initialize
17	-SELECTIN	O	-Select in
18-25	GND	—	Ground

I = Input   O = Output

Serial Port Pin Assignments
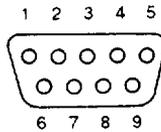
Pin no.	Signal name	Direction	Description
1	DCD	I	Data carrier detect
2	RX	I	Receive data
3	TX	O	Transmit data
4	DTR	O	Data terminal ready
5	GND	–	Signal ground
6	DSR	I	Data set ready
7	RTS	O	Request to send
8	CTS	I	Clear to send
9	RI	I	Ring indicator

I = Input   O = output

Keyboard Connector Pin Assignments
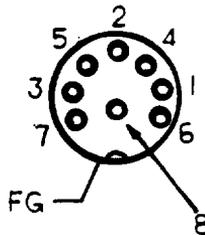
Pin no.	Signal name	Direction	Description
1	KBD CLK	I/0	Keyboard clock
2	KBD DATA	I/0	Keyboard data
3	-KBD RESET	O	-Keyboard **reset**
4	GND	—	Ground
5	+5V	—	Power
6-8	NC	—	No connection

I = Input   O = output

Parallel Port Loop-back Connector Pin Assignments

Output signal name	Pin no.		Pin no.	Input signal name
Strobe	1	—	13	Select
Data bit 0	2	—	15	Error
Auto feed	14	—	12	P.END (out of paper)
Init. printer	16	—	10	Acknowledge
Select input	17	—	11	Busy

Serial Port Loop-back Connector Pin Assignments

Output signal name	Pin no.		Pin no.	Input signal name
Transmit data	3	—	2	Receive data
			1	Data carrier detect
Data terminal ready	4	—	6	Data set ready
			9	Ring indicator
Request to send	7	—	8	Clear to send

Appendix B
Power-On Diagnostics

The built-in memory (ROM) of your computer contains a series of diagnostics programs, which your computer runs automatically every time you turn on the power. These programs check internal devices such as ROM, RAM, the timer, the keyboard controller, and the diskette drive.

When you turn on the power, the computer performs the tests described in this appendix. If it finds an error, it displays a specific error number and error message on the screen.

If the error is serious, the computer cancels further checking and halts system initialization. The error message remains on the screen, and the computer no longer responds to your commands. If this happens, contact your Customer Care Center as soon as possible. Report both the error message and code number.

If the error is not serious, the computer waits for you to resume further checking. You see this prompt:

```
(Resume = "F1" key)
```

Write down the error message and code number, and then press F1 to resume. Report the error message and code number to your Customer Care Center when requesting repairs.

System Device Check

The computer first checks its internal devices such as ROM. If it finds a malfunction, it displays an error message. In some cases, the computer may halt with no further information.

If the computer finds a fault in the main board, it stops and
displays an error message such as this:

```
10n-System board error
```

where n is a number from 1 to 8 that represents the specific LSI
circuit causing the error. Give this error number and message
to your Customer Care Center.

If an I/O ROM checksum error occurs, you see this message:

```
nnnn0 ROM error
```

where nnnn is the number of the segment of the bad I/O ROM
on an option card.

Give the error message and number to your Customer Care
Center.

Timer and CMOS RAM Check

After the computer successfully completes the system device
check, it checks the timer and CMOS RAM. If the
information contained in the RAM does not match the actual
system installation, it displays this message:

```
161-System options  not  set
      (Run SETUP in DIAGNOSTICS)
```

If the system clock has not been set, you see this message:

```
163-Time & Date not set
      (Run SETUP in DIAGNOSTICS)
```

The information stored in the CMOS RAM must be corrected.
To do this, run the Setup program provided on the Reference
diskette. See Chapter 2 for instructions.

RAM Check

The computer now begins to check the RAM installed on the main system board and any option cards. During the check, you see this message:

   nnn KB OK

where *nnn* indicates the amount of memory in which no malfunction is found. This value increases continuously by 64KB up to the amount of RAM installed on the main board, which is 640KB. If the computer detects an error in the first 64KB area, it displays an error message and halts with no further information.

If there are faulty RAM chips in your system, you see this message:

   nnnn0 201-Memory error

Give the error message and number to your Customer Care Center.

Keyboard Controller and Keyboard Check

Next, the computer checks the keyboard controller and keyboard for problems such as failure of one of the keys to release. If there are any errors in the connection between the keyboard and the computer, you see this error message:

   301-Keyboard error

When a number precedes this message, the number represents the key (in hexadecimal) that is causing the error. This message may occur after you have used Ctrl Alt Del to reset the computer, and does not necessarily indicate a problem.

Display Card Check

The computer checks the color or monochrome display card that is installed in the system. An error number and message appear if any faults are found in the display adapter card. Number 401 represents an error in the monochrome display card, and 501 represents an error in the color display card. The messages are:

```
401-CRT   error
501-CRT error
```

Optional RAM Check

If any additional memory (expansion RAM) is installed, the computer then checks that RAM for any malfunction.

Diskette Drive Seek Check

The computer checks its diskette drives by searching the read/write heads for any malfunction.

If any seek errors are found, you see this message:

```
601-Diskette error
```

If this message appears, run the System diagnostics (described in Appendix C) and select the Floppy disk drives and controller test, option 6, from the DEVICE LIST. If the error persists, consult your Customer Care Center about having the drive repaired.

Hard Disk Controller and Hard Disk Check

The computer next checks the hard disk controller and drive
unit. If a malfunction is found in the hard disk controller card,
you see this error number and message:

```
1782-Disk controller failure
```

If an error is found in the hard disk drive unit, the screen
displays one of these error messages:

```
178n-Disk n error
179n-Disk n error
```

where n is 0 or 1, and represents the drive number of the hard
disk. Drive C is number 0, and drive D is number 1.

Appendix C
Performing System Diagnostics

This appendix describes how to check the operation of the main unit and peripheral devices of your computer. You check these devices using the diagnostics program on your Reference diskette.

Run the diagnostics program if you are not sure whether a device is performing correctly. The table at the end of this appendix lists the error messages you may see during testing.

If these instructions tell you to contact your Epson Customer Care Center, call 1-800-922-8911 for the location of the nearest Customer Care Center.

You can test the following devices, each of which is identified by a specific reference number:

     1 — System
     2 — Memory
     3 — Keyboard
     4 — Monochrome display adapter and CRT
     5 — Color graphics adapter and CRT
     6 — Floppy disk drives and controller
     7 — Math coprocessor
     9 — Parallel port (printer interface)
    11 — Serial port (RS-232C port)
    12 — Alternate serial port
    14 — Dot-matrix printer
    17 — Hard disk drives and controller
    81 — Parallel port (on video adapter)

Starting System Diagnostics

To run the system diagnostics, you must boot your computer with the Reference diskette in drive A. If you start this program in any other way, some tests may produce strange results.

To start the system diagnostics program, follow these steps:

1. **Insert the Reference diskette in drive A.**

2. **Turn on or reset the computer. The OPERATION MENU**
    appears.

3. Press 4 reset System diagnostics and then
    press Enter.

**When you start the system diagnostics, the computer checks
the following:**

❑ **The positions of the internal jumpers**

❑ **Any peripheral devices that are connected to the system.**

**After these items are checked, you see a list of the devices
available for testing. This list includes only the devices that are
installed in your system and looks something like this:**

```
The following devices have been installed

DEVICE LIST

 1 - System board
 2 - Memory
 3 - Keyboard
 5 - Color graphics adapter and CRT
 6 - Floppy disk drives and controller
 9 - Parallel port (printer interface)
11 - Serial port (RS-232C port)
14 - Dot-matrix printer
17 - Hard disk drives and controller
81 - Parallel port (on video adapter)

Is the DEVICE LIST correct (Y/N)?
```

If the list correctly describes your system, press Y and then
Enter. **If a device is missing from this list, or if you wish to
change the list, press** N **and Enter.**

Once you confirm the DEVICE LIST, you can test only those items. If you decide later that you need to add a device, you must return to the OPERATION MENU and re-select System diagnostics.

Modifying the DEVICE LIST

If an installed device is missing from the DEVICE LIST, it is important that you add it to the list and test it carefully. In response to this prompt:

```
Is the DEVICE LIST correct (Y/N)?
```

press N followed by Enter. You then see a new menu:

```
Modify DEVICE LIST

1 - Add devices
2 - Delete devices

0 - Exit

Enter selection number:
```

To add a device to the list, press 1 and then Enter. The program displays a list of other devices that are not currently included in the DEVICE LIST. You see a menu similar to this:

```
Additional  DEVICE  LIST

4 - Monochrome display adapter and CRT
7 - Math coprocessor (80287)

0 - Exit

Enter the number of the item to add:
```

**Type the number of the item you wish to add and press Enter.
That item then disappears from the Additional DEVICE LIST
on the screen. You can add as many devices as necessary.
When you finish adding devices, press 0 followed by Enter to
return to the Modify DEVICE LIST menu.**

Note
Even if you have both monochrome and color display
adapter cards installed, you can test only the monitor that is
currently selected by the color/mono switches on the front
and back panels.

To remove a device from the list, press 2 and Enter. **The
screen displays the current DEVICE LIST and the prompt:**

```
Enter the number of the item to delete:
```

Type the number of the item you wish to delete and press
Enter. **That item then disappears from the DEVICE LIST on
the screen. You can delete as many devices as necessary.**

When the DEVICE LIST is correct, press 0 and then Enter.
The program returns to the Modify DEVICE LIST menu.

**When you have finished adding or deleting devices and are
back to the Modify DEVICE LIST menu, press 0 and then**
Enter **again. The screen displays the modified DEVICE LIST
for a final check. If the list is correct, press** Y **and** Enter. Do
not press 0 to exit to the OPERATION MENU.

You are now ready to select a test.

Selecting a Test

From the DEVICE LIST, select the device you wish to test. Type the number of the device; then press Enter. Before the test begins, you are asked how many times to perform the test. You see this menu:

```
Number of times to test device

1 - Run test one time
2 - Run test multiple times

0 - Exit

Enter selection number:
```

You can specify that the test be performed one time only or any number of times in the range from 1 to 9999. In almost all cases, running a test only once is sufficient. Running a test multiple times is for reliability testing of specialized functions only.

To perform the test once, press 1 and Enter. The program then may display a submenu of more detailed tests for the device you are checking.

To perform the test multiple times, press 2 and Enter. You see this prompt:

```
Terminate checking if an error
detected (Y/N)?
```

Press Y and Enter to terminate checking if the device produces an error, or press N and Enter to repeat the test regardless of an error. You see this prompt:

```
How many times (1-9999):
```

Type the number of times you wish to repeat the test, then press Enter. The test for the device now starts.

Resuming From an Error

If an error occurs during a test, the test stops at that point, and
an error code and error message appear. If you want to record
the problem, you can print out the message on your printer.
You see this prompt:

```
Do you want a printout of the error
message(s) (Y/N) ?
```

To continue without printing the error message, press N and
Enter.

Before you request a printout, be sure your printer is turned on
and online, and the paper is installed correctly. Then press Y
and Enter. If the printer is not ready, the following message
and prompt appear:

```
Printer is not installed correctly.
Install, correctly and enter Y, or
Enter N to cancel printing.
```

Correct the problem and press Y and Enter to continue
printing, or press N and Enter to cancel printing.

After printing the error message, the program displays this
prompt:

```
Printout is finished. Press ENTER to
return to the menu.
```

The program continues after an error in one of the following
ways:

❏ It returns to the DEVICE LIST, or

❏ If you are running multiple tests and are not terminating on
an error, the program repeats the test that caused the error.

The remainder of this appendix describes the tests you can run on the system's internal devices and on the optional devices installed on your computer. The program displays the title of each check on the screen.

> **Note**
> **For a complete list of the error codes and messages these tests may display, see the table at the end of this chapter.**

System Board Check

Use this option to check the operation of each major component on the system board, including:

❏ The 80286 CPU chip

❏ The system ROM

❏ The rea1-time clock, CMOS RAM, and battery

❏ The main integrated circuits.

The checks made on the 80286 CPU chip are extremely comprehensive. They ensure that the CPU instruction set is functioning correctly.

If an error is reported, write down the error code and message, or print them out, and contact your Customer Care Center. Attempting to correct system board errors yourself may violate your warranty agreement.

Memory Check

Use this option to check the computer's built-in memory. The program checks only the amount of memory that you have indicated as present in the Setup program.

For this check, the program writes specific data into memory and then reads it back. The data is written and read in blocks of 64KB. A parity check is also made on each block. A count of memory is displayed after each block that is tested without an error. The final message is usually:

   640 KB OK

If an error is reported, write down the error code and message, or print them out, and contact your Customer Care Center. Attempting to correct memory errors yourself may violate your warranty agreement.

Keyboard Check

Use this option to check the operation of the keyboard. The program first checks the keyboard controller; during this check, you see the green indicator lights on the keyboard flash. If no errors are detected, you can then choose the correct keyboard layout.

If you run the keyboard check multiple times, the KEYBOARD SELECT MENU does not appear.

Before checking the operation of the keys, you must select the appropriate keyboard layout so that the test display matches the keys on your keyboard. You see the following menu.

```
KEYBOARD SELECT MENU

1 - US ASCII
2 - United Kingdom
3 - French
4 - German
5 - Italian
6 - Spanish

0 - Exit

Enter selection number:
```

Type the number of your keyboard layout, then press Enter.
You can exit the keyboard test by pressing 0 and Enter.

After you select a keyboard layout, the program displays the
layout on the screen. Press each key on the keyboard to make
sure the corresponding character is displayed on the screen. If
the character displayed on the screen does not match the key
you pressed, there is a problem with your keyboard. Test each
key.

The status of the Num Lock, Caps Lock, and Scroll Lock
indicators is shown on the upper right side of the keyboard
layout.

These messages appear on the screen:

```
KEYBOARD CHECK
Press Y followed by ENTER to exit.
Press N followed by ENTER if screen
and keyboard do not match.
```

If all the keys function correctly and match the characters
displayed, press Y and then Enter.

If all the keys function, but the characters displayed do not match the keys, press Y and then Enter. Then re-select the keyboard test from the DEVICE LIST, and check that you selected the correct keyboard layout. You can find diagrams of all the international keyboard layouts in the MS-DOS Reference Manual.

If any key is incorrect, press N and Enter. Make a copy of the error code and message, or print them out, and contact your Customer Care Center.

Monochrome Display Adapter and CRT Check

Use this option to check the operation of a monochrome display adapter and monitor. This test includes several checks that allow you to identify particular problems related to the monochrome display. To run this check, the color/mono switches on the front and back panels must be set correctly for a monochrome monitor.

You can select the individual checks from this menu:

```
MONOCHROME ADAPTER AND CRT CHECK MENU

1 - Monochrome adapter check
2 - Attribute check
3 - Character set check
4 - Video check
5 - Sync check
6 - Run all above checks

0 - Exit

Enter selection number:
```

If you run the monochrome adapter check multiple times, this menu of-checks does not appear and only the first test (option 1) is performed.

If an error occurs during any of these tests, record the error code and message, or print them out. Then contact your Customer Care Center.

When you finish running the monochrome adapter check, press 0 and Enter to return to the DEVICE LIST.

Monochrome Adapter Check

To check the monochrome adapter, press 1 and then Enter. The computer checks the video RAM (display memory) on the display adapter by writing certain data to memory, then reading it back and comparing it to the written data. It also tests the video enable signal of the display controller chip.

Attribute Check

To check the display attributes of the adapter card, press 2 and then Enter. A series of messages are displayed showing examples of all the possible display attributes (normal intensity, high intensity, blinking, reversed characters, and underlining). Check the information displayed on your screen, and then respond to the prompt:

```
Is the display correct (Y/N)?
```

Press Y and then Enter if the display is correct.

If the display attributes are not correct, adjust the brightness and contrast on your display monitor. If they are still incorrect, press N and Enter. Contact your Customer Care Center to make sure that your monitor is able to display all the attributes available and to ensure that your monitor cable is not damaged.

Character Set Check

To check your character set, press 3 and then Enter. The characters that are included in the internal character generator are displayed. Check the characters displayed on your screen against this illustration:

```
CHARACTER SET CHECK


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                    Is the display correct (Y/N)?
```

After checking the characters, respond to the prompt:

```
Is the display correct (Y/N)?
```

If the characters displayed match the illustration, press Y and Enter. If they do not match the illustration, press N and then Enter to display the error message.

Video Check

To check the video output of your monochrome adapter, press 4 followed by Enter. This check displays two different screens, black and intensified white. First you see the black screen; press any key to display the intensified white screen. Then press any key to end this check.

You can use this display to adjust the size of the display on the screen. The vertical and horizontal adjustments are located on your monitor.

Sync Check

This test is provided for service purposes only. If you accidentally select this option, press any key to end the test.

Run All Above Checks

To run all the tests on the menu in sequence, press 6 and Enter. When you choose this option, all checks for the monochrome adapter and CRT are performed automatically in sequential order. Although you do not start each test, you must still supply the appropriate responses to progress from one test to the next.

Color Graphics Adapter and CRT Check

Use this option to check the operation of a color graphics display adapter and monitor. This test includes several checks that allow you to identify particular problems related to the color display. To run this check, the color/mono switches on the front and back panels of the computer must be set correctly for a color monitor.

You can select the individual checks from the following menu.

```
COLOR GRAPHICS ADAPTER AND CRT CHECK MENU

 1 - Color graphics adapter check
 2 - Attribute check
 3 - Character set check
 4 - 40-column character set check
 5 - 320x200 graphics mode check
 6 - 640x200 graphics mode check
 7 - Screen paging check
 8 - Light pen check
 9 - Color video check
10 - Sync check
11 - Run all above checks

 0 - Exit

Enter selection numb&:
```

If you specified to run the color adapter **check multiple times,
this menu does not appear and only the first test (Color
graphics adapter check) is performed.**

**If an error occurs during any of these tests, record the error
code and message, or print them out. Then contact your
Customer Care Center.**

When you finish running the color adapter check, press **0 and**
Enter **to return to the DEVICE LIST.**

Color Graphics Adapter Check

To check the color graphics adapter, press 1 and **then** Enter.
**The computer checks the video RAM (display memory) on the
display adapter by writing test data to memory, and then
reading it back and comparing it to the written data. It also
tests the video enable signal of the display controller chip.**

Attribute Check

To check the display attributes of the color graphics adapter card, press 2 and Enter. Several messages are displayed showing examples of all the possible display attributes and colors. Check the information displayed on your screen, and respond to the prompt:

```
Is the display correct (Y/N)?
```

Press Y and then Enter if the display is correct. If the colors are not correct, adjust the controls on your display monitor. If they are still incorrect, press *N* and Enter.

Contact your Customer Care Center if you have any monitor problems.

Character Set Check

To check your 80-column character set, press 3 and Enter. *The* characters that are included in the internal character generator are displayed. Check the characters displayed on your screen against this illustration:

After checking the characters, respond to the prompt:

```
Is the display correct  (Y/N) ?
```

If the characters displayed match the illustration, press Y and then Enter. **If they do not match, press** N **and** Enter **to display the error message.**

40-column Character Set Check

To check your 40-column character set, press 4 and then Enter. **The character fonts that are included in the internal character generator are displayed. Check the characters displayed on your screen against this illustration:**

After checking the characters, respond to the prompt:

```
Is the display correct (Y/N)?
```

If the characters displayed match the illustration, press Y and Enter. **If they do not match the illustration, press** N **and** Enter **to display the error message.**

320x200 Graphics Mode Check

To check your 320x200 graphics mode, press 5 and then Enter. The screen displays three colored squares-light green, brown, and red-against a cyan background. These four colors are Color Set 0. If they are correct, press Y and then Enter.

The same pattern is displayed again; this time the squares are cyan, white, and magenta, and the background is red. These colors are called Color Set 1. If these are also correct, press Y and then Enter to end the test.

If any colors are displayed incorrectly, check the adjustment of your monitor and make sure that both ends of the cable are plugged in firmly. If a problem still exists, press *N* and Enter to display the error message.

640x200 Graphics Mode Check

To check your 640x200 graphics mode, press 6 and Enter. *The* screen displays three patterned squares against a black background, as shown below.
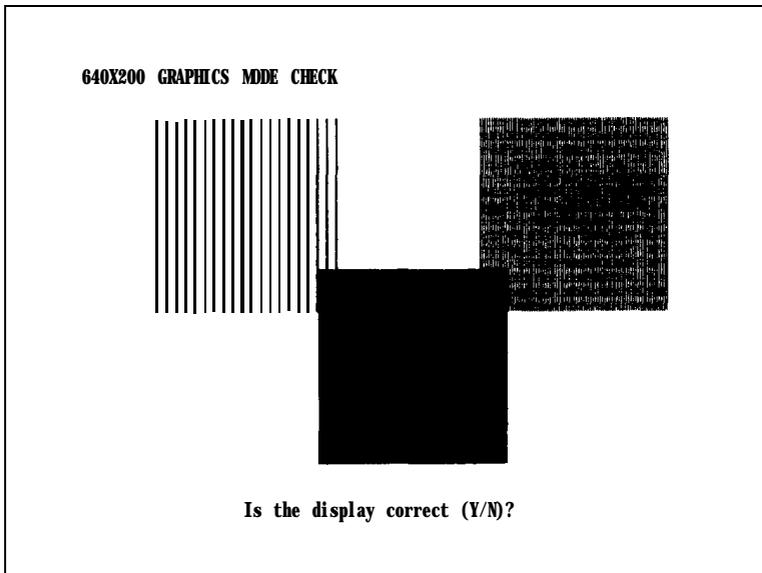
If the patterns on your screen are clear and distinct, press Y and then Enter.

If any pattern is not displayed clearly, check the adjustment of your monitor and make sure it is connected properly. If a problem still exists, press N **and** Enter **to display the error message.**

Screen Paging Check

To check the screen paging of your monitor, press 7 **and** Enter. **The video RAM on the color graphics adapter is divided into eight independent display pages. This test checks the eight pages by first filling all eight with a number corresponding to the page and then displaying each page in turn. You see this pattern for screen 0:**
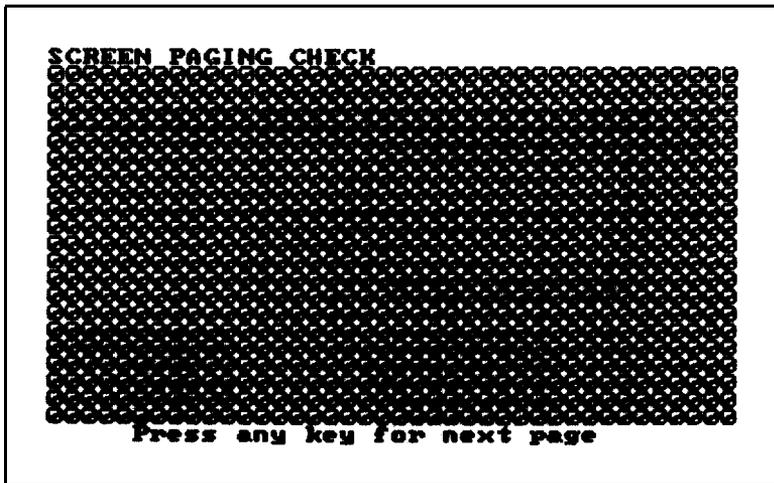
When you have examined this screen, press any key to display the next page. The eight display pages, numbered 0 to 7, are displayed sequentially.

After the eighth page is displayed, you see the prompt:

```
Is the display correct (Y/N)?
```

If all eight pages are correct, press Y and Enter. If any page is filled with an incorrect number, press N and Enter to display the error message.

Light Pen Check

To check the function of a light pen connected to a color graphics adapter card, press 8 and then Enter. This test checks that a light pen connected to the color graphics adapter is performing accurately. When you select this check, you see these prompts:

```
Enter Y to start light pen check.
Enter N to return to the menu.
```

If you do not have a light pen attached, press N and Enter. To begin the test, press Y and Enter. You see this prompt:

```
PLACE LIGHT PEN ON CENTER OF WHITE BLOCK
```

Touch the center of the white block on the screen with the light pen. When the light pen is correctly positioned, the block moves to another part of the screen for a second test. After three successful tests, the check ends.

An error occurs if:

❏ The light pen is not connected properly

❏ You touch the screen at the wrong point

❏ The light pen is malfunctioning

❏ You do not touch the square within a certain amount of time (which is dependent on the current CPU speed).

Color Video Check

Option 9, Color video check, displays 16 different screens, each a different color, and a message indicating the color. The screens show the following colors in the order specified below:

1 -	Black	9 -	Gray
2 -	Blue	10 -	Light blue
3 -	Green	11 -	Light green
4 -	Cyan	12 -	Light cyan
5 -	Red	13 -	Light red
6 -	Magenta	14 -	Light magenta
7 -	Brown	15 -	Yellow
8 -	White	16 -	White (high intensity)

To start this test, select option 9 from the menu; the first screen appears. Press any key to display the next screen. On the last screen, you see this prompt:

```
Is the display correct (Y/N)?
```

If all the colors are correct, press Y and Enter to end the test. If any color is displayed incorrectly, check the adjustment of your monitor and make sure that both ends of the cable are plugged in firmly. If a problem still exists, press N and Enter to display the error message.

Sync Check

This test is provided for service purposes only. If you accidentally select this option, press any key to end the test.

Run All Above Checks

To run all the tests on the menu in sequence, press 11 and Enter. When you choose this option, all checks for the color adapter and CRT are performed automatically in sequential order. Although you do not start each test, you must still supply the appropriate responses to progress from one test to the next.

Floppy Disk Drives and Controller Check

Use this option to test the performance of the diskette drives installed in your computer. This test includes several checks that allow you to identify particular problems related to your diskette drives.

Before running these tests, format a diskette to use for the tests that write data on the disk in the drive. To test a 1.2MB drive, you can use a 1.2MB or a 360KB diskette. However, to test the full capacity of the drive, use only a 1.2MB disk.

Likewise, in a 1.44MB drive you can use a 1.44MB or a 720KB diskette, but a 1.44MB diskette is best to test the full capacity of the drive. In a 360KB drive, you can use only a 360KB diskette, and in a 720KB drive, you can use only a 720KB disk.

> **Note**
> The Format diskette option on the OPERATION MENU cannot format a 1.2MB disk. Therefore, to test a 1.2MB drive, use the MS-DOS FORMAT command to format a high-density diskette.

You can select the individual tests from this menu:

```
FLOPPY DISK DRIVE(S) AND CONTROLLER CHECK MENU

1 - Sequential seek check
2 - Random seek check
3 - Write, read check
4 - Speed check
5 - Disk change check
6 - Run all above checks

0 - Exit

Enter  selection  number:
```

Before any checks are performed, the program determines the number of diskette drives installed in your computer. If you have more than one drive, you see this prompt each time you select a test:

```
Check which drive (A/B)?
```

Press A or B and then Enter.

If any errors occur, record the error code and message and contact your Epson Customer Care Center.

Sequential Seek Check

This test checks the ability of the read/write heads to locate any part of the diskette. This action by a read/write head is called a seek. During this test, each head seeks sequentially from the innermost track to the outermost track. The innermost track is track 39 for 36OKB diskettes and track 79 for 720KB, 1.2MB, and 1.44MB diskettes.

Select option 1 from the menu to start this test. The program displays the number of each track it finds. For example, with a 360KB diskette, the first message you see is:

```
Current track is 39
```

The program counts the track numbers from 79 or 39 to 0. The seek is performed by each head, so you see the count twice. If no errors occur, the menu reappears.

Random Seek Check

This test is identical to the sequential seek check, except that the seek operation is performed on each track in random order instead of sequential order. Select option 2 from the menu to start this test.

Write, Read Check

This test checks the ability of the selected disk drive to read
and write data from a diskette. The test writes to and reads
from each cylinder on the diskette, starting at the center.

Note
This test destroys all data on the diskette in the selected
drive.

Select option 3 from the menu to start this test. If you have
only one diskette drive, you see a prompt to remove the
diagnostics (Reference) diskette and insert a blank diskette
before running the test. You see these messages:

```
Use only a formatted blank diskette for this
test.
Any data present may be erased.

If using drive A, remove your Diagnostics Disk.

Enter Y to start this check.
Enter N to return to the menu.
```

Make sure the blank diskette you prepared is in drive A, then
press Y and Enter.

The program displays the current track number as each cylinder
is tested. For example, with a 1.2MB diskette, the first message
you see is:

```
Current track is 79
```

Speed Check

This test checks the revolution speed of the specified disk
drive. Select option 4 from the menu to start this test. You see
a message similar to this:

```
The disk rotation speed should be more than
352.8 rpm and less than 367.2 rpm.
```

The computer spins the diskette for a few seconds and then
displays a message like this:

```
The disk rotation, speed is now 360.5 rpm.
```

The diskette continues to spin and the message listing the
rotation speed is updated every few seconds. To stop the test,
press any key; the program returns to the menu.

If you try to perform a speed test without inserting a diskette, or
if a read error occurs, you see this message and prompt:

```
Disk is defective or not installed properly.
Press ENTER to return to the menu.
```

Disk Change Check

This check tests the ability of a drive to detect that a diskette
has been inserted or removed. Disk changes cannot be detected
by a 360KB diskette drive.

Select option 5 from the menu to start this test. First the
program checks the selected drive type; if the drive is a 360KB
drive, you see these messages:

```
Drive d is a 360KB drive.
DISK CHANGE is not allowed with this type of
drive.
Press ENTER to return to the menu.
```

When you run the test for a 1.2MB, 720KB, or 1.44MB drive,
you see this prompt:

```
Remove the disk from drive d.
```

Release the disk drive latch, and remove the diskette. You see:

```
Re-insert the disk into drive d.
```

Re-insert the diskette and secure the lock. If no errors occur, the menu reappears. An error occurs if the drive is malfunctioning, or if you do not remove or replace the diskette within a certain time.

Run All Above Checks

To run all the tests on the menu in sequence, press 6 and then Enter. When you choose this option, all checks for the diskette drive(s) and controller are performed automatically in sequential order. Although you do not start each test, you must still supply the appropriate responses to progress from one test to the next.

Math Coprocessor Check (80287)

Use this option to check the operation of the 80287 math coprocessor if you have one installed in your computer. To check the math coprocessor, select option 7 from the DEVICE LIST.

Before running any tests, the computer checks the settings in CMOS RAM to ensure that a coprocessor is installed. If the coprocessor is missing, or if you have not changed the setting in CMOS RAM with the Setup option, an error occurs and the test ends.

If the coprocessor is installed, the program then runs a series of checks on the precision with which the coprocessor performs calculations and handles exceptions.

Parallel Port (Printer Interface) Check

Use this option to test the operation of the secondary parallel printer port. For example, you would select this option to test the built-in port if you have assigned it as the secondary port, or if you installed an option card that provides a parallel port.

To perform the test, you must insert a special loop-back connector into the parallel port so that the computer can check the individual pins of the port. Contact your Customer Care Center if you need a loop-back connector (or see Appendix A for signal/pin assignments to make your own loop-back connector). Note that a different connector is required to test the serial port.

When you select option 9 from the DEVICE LIST, you see these prompts:

```
Attach loop-back connector to parallel port.
Enter Y to start this check when connector
is attached, or Enter N to return to the
menu.
```

Insert the loop-back connector. Then press Y and Enter to start the check.

The computer checks the port by writing and reading dam and control information, and reports errors for any pins that are faulty. Note that if you connect a printer cable instead of a loop-back connector, you get errors.

Parallel Port (on Video Adapter) Check

Use the Parallel port (on video adapter) check to test the functions of the primary port. This tests either the built-in port, if it is set up to act as the primary port, or the parallel port on a monochrome adapter (such as the IBM monochrome display and printer adapter) if you have one installed in your computer.

To perform the test, you must insert the special loop-back connector into the parallel port so that the computer can check the individual pins of the port. This test is identical to the Parallel port check. For more details, see the description of the Parallel port (printer interface) check above.

Serial Port (RS-232C) Check

Use this option to test the functions of the primary serial communications (RS-232C) port. To perform the test, you must insert a special loop-back connector into the RS-232C port so that the computer can check the individual pins of the port. Contact your Customer Care Center if you need a loop-back connector (or see Appendix A for the signal/pin assignments if you want to make your own loop-back connector). Note that a different connector is required to test the parallel port.

When you select option 11 from the DEVICE LIST, you see these prompts:

```
Attach loop-back connector to serial port.
Enter Y to start this check when connector
is attached, or Enter N to return to the
menu.
```

Insert the loop-back connector. Then press Y and Enter to start the check.

First, the computer checks the serial port control lines to see that they are able to change from high to low and vice versa. No messages are displayed during this part of the test unless an error occurs.

The second test is an echo back check during which the port sends data to itself in a fixed data format, at all the possible baud rates. When this test begins, you see these messages:

```
RS232C echo back check - at various baud rates
Current baud rate is 75
Current test data is 00
```

Each baud rate is tested in turn, and the progress is displayed. If the port does not become ready correctly, a timeout error occurs. If any data received does not match the data sent, a verify error occurs, and the computer reports the transmitted and received data at the time of the error.

The final test is an echo back check during which the port
sends data to itself at 9600 baud, using various data formats.
At the start of the test, you see these messages:

```
RS232C echo back check - with various data
formats
Current data format:      5 data bits, 1 stop bits,
                    parity - NONE
Current test data is 00
```

Once again, if any data received does not match the data sent,
a verify error occurs, and the computer reports the transmitted
and received data at the time of the error.

Alternate Serial Port Check

Use this option to test the functions of an additional serial
communications (RS-232C) port. To perform the test you must
insert a special loop-back connector into the alternate serial
port so that the computer can check the individual pins of the
port.

This test is identical to the check for the primary serial port.
For more details, see the description of the Serial port
(RS-232C) check above.

Dot-matrix Printer Check

Use this option to check:

❏ The operation of your printer in IBM-compatibility mode

❏ The compatibility of your printer with the extended
character set used by the computer

❏ The ability of your printer to produce bit-image graphics
and print images of the graphics screen.

When you select option 14 from the DEVICE LIST, you see this prompt:

   Is dot-matrix printer on-line (Y / N) ?

Check that your printer is connected to the computer, and that it is turned on, loaded with paper, and on-line. Press Y and then **Enter** to continue, or press **N** and **Enter** to return to the menu.

When you continue the test, the computer checks that the printer is responding correctly. This test detects whether the printer is off-line or whether an interface error exists. If no errors occur, the computer sends a repeating sequence of characters and bit-image data to the printer until you press any key. The pattern looks like this:

```
Text data (20H-7FH,A0H-FFH)
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmno
pqrstuvwxyz{|}~ !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'
abcdefghijklmnopqrstuvwxyz{|}~

Bit-image data (00H-FFH)
```

The text data includes all the characters commonly used by programs that require foreign languages or graphic characters. If your printer prints different characters than you see in the illustration, some printed characters may not be what you expect with certain software.

The bit-image data is sent to the printer using a command (ESC K) compatible with Epson and IBM printers. If this pattern is printed correctly, you can use the MS-DOS GRAPHICS program to print out copies of graphics screens.

   Note
   Even if the test runs only for a short time, your printer may store many characters in its buffer. To stop printing, ,set the printer off-line.

Hard Disk Drives and Controller Check

Use this option to test the performance of the hard disk drive installed in your computer. If any errors occur, have the drive checked and serviced by your Customer Care Center.

When you select option 17 from the DEVICE LIST, you see this menu:

```
HARD DISK DRIVE(S) AND CONTROLLER CHECK MENU

1 - Seek check
2 - Write, read check
3 - Head select check
4 - Error detection and correction check
5 - Read, verify check
6 - Run all above checks

0 - Exit

Enter selection number:
```

If you specify to run the hard disk drive check multiple times, this menu does not appear and only the first three tests are performed.

When you select a check from this menu, the program determines the number of hard disk drives installed in your computer. If you have more than one drive, each time you select a test you see this prompt:

```
Check which drive (C/D)?
```

Press C **or** D **and then** Enter.

Seek Check

This test checks the ability of the read/write heads to locate any part of the hard disk. This action by a read/write head is called a seek. During this test, each head seeks each cylinder of the disk in sequence, starting from the center.

Select option 1 from the menu to start thistest. The program displays the number of each cylinder it finds, counting down from 614 (for a 20MB hard disk) to 0. The seek is performed by the read/write heads simultaneously, so you see the cylinder numbers only once. If no errors occur, the menu reappears.

Write, Read Check

This check tests the ability of the hard disk drive to read and write data. The test writes to and reads from each sector of the innermost cylinder of the disk, using each head.

Note
This test destroys all data on the innermost cylinder of the selected hard disk drive. This cylinder is reserved for diagnostics, and is never used for storage by MS-DOS. Therefore, data created by MS-DOS is not destroyed.

Select option 2 from the menu to start this test. You see these messages:

```
The data on the highest physical cylinder
may be destroyed by this check.
Enter Y to start this check.
Enter N to return to the menu.
```

Press Y and then Enter to continue with the test. You do not see a cylinder count during the test. If no errors occur, the program returns to the menu.

If an error is reported, make a note of the code and message. Then use the Non-destructive surface analysis (option 4 on the HARD DISK FORMAT MENU) to check the condition of the hard disk. If this analysis shows no other problems with the disk, follow these steps:

1. Back up all the files on your hard disk with the BACKUP command, described in your MS-DOS Reference Manual.

2. **Re-format the disk using option 2, Format hard disk, on the OPERATION MENU. See Appendix D for instructions.**

3. **Prepare the hard disk for use with FDISK and SELECT. See Appendix E for instructions.**

Head Select Check

This test checks whether each head of the hard disk can be selected correctly. If both heads are checked without error, the program returns to the main menu. Select option 3 from the menu to start this test.

Error Detection and Correction Check

This test checks the ability of the hard disk drive to detect a read/write error and to correct the data accordingly.

Note:
This test destroys some data on the innermost cylinder of the selected hard disk drive. This cylinder is reserved for diagnostics, and is never used for storage by MS-DOS. Therefore, data created by MS-DOS is not destroyed.

Select option 3 from the menu to start this test. You see these messages:

```
The data on the highest physical cylinder
may be destroyed by this check.
Enter Y to start this check.
Enter N to return to the menu.
```

Press Y **and then** Enter to **continue with the test. If no errors occur, the program returns to the menu.**

An error occurs only if the drive is malfunctioning. In this case, back up all your files, and have the drive serviced immediately. (The drive may be corrupting your data.)

Read, Verify Check

This test reads and verifies data from all tracks of the disk, checking each cylinder and using both heads.

Select option 4 from the menu to start this test. The program displays the number of each cylinder it finds. For example, with a 20MB hard disk, the first message you see is:

```
Current  cylinder  is  614
```

The cylinder number counts down to 0.

At the end of the test, you see a table of the results of the test. For example, for a 20MB hard disk with no bad tracks, you see:

```
BAD  TRACKS  ..............      0
READ  ERROR  TRACKS  .......      0
GOOD  TRACKS  .............    2 4 6 0

Press  ENTER  to  return  to  the  menu
```

Press Enter when you have viewed the table.

If the results show BAD TRACKS on your disk, it is all right because those tracks will not be used. If, however, the results show any READ ERROR TRACKS, run the Destructive surface analysis described in Appendix D.

Run All Above Checks

To run all the tests on the menu in sequence, press 5 and then Enter. When you choose this option, all checks for the hard disk drives and controller are performed automatically in sequential order. Although you do not start each test, you must still supply the appropriate responses to progress from one test to the next.

The first prompt you see is:

```
The data on the highest physical cylinder
may be destroyed by this check.
Enter Y to start this check.
Enter N to return to the menu.
```

Press Y and then Enter **to continue with the test.**

Error Codes and Messages

This table lists all the error codes and messages that may appear during diagnostics checks.

Error code	Message
System board	
101	80286 CPU ERROR
102	27256 ROM CHECKSUM ERROR
103	8254 TIMER COUNTER REGISTER ERROR
104	8254 TIMER COUNTER ERROR
105	8237 DMA CONTROLLER REGISTER ERROR
105	8237 DMA REFRESH ERROR
106	612 DMA PAGE REGISTER ERROR
107	8042 TIMEOUT ERROR
108	8042 SELF DIAGNOSTIC ERROR
108	8042 WRITE COMMAND ERROR
109	8259 INTERRUPT CONTROLLER ERROR
110	146818 CMOS SHUTDOWN BYTE ERROR
111	146818 CMOS BATTERY ERROR
112	146818 CMOS CHECKSUM ERROR
113	80286 INSTRUCTION ERROR
114	80286 PROTECT MODE ERROR 1
115	80286 PROTECT MODE ERROR 2

Memory

201	MEMORY/PARITY ERROR

Error code	Message

Keyboard

301	8042 ERROR
301	KEYBOARD ERROR
302	KEYBOARD IS NON-STANDARD OR DEFECTIVE
303	KEYBOARD LOCKING ERROR

Monochrome display adapter and CRT

401	V-RAM ERROR
402	VIDEO SIGNAL ERROR
403	ATTRIBUTE ERROR
404	CHARACTER SET ERROR

Color graphics adapter and CRT

501	V-RAM ERROR
503	ATTRIBUTE ERROR
504	CHARACTER SET ERROR
505	40-COLUMN CHARACTER SET ERROR
506	COLOR GRAPHICS ERROR
507	640X200 GRAPHICS MODE ERROR
508	SCREEN PAGING ERROR
509	LIGHT PEN ERROR
510	COLOR VIDEO ERROR

Floppy disk drives and controller

601	FLOPPY DISK CONTROLLER ERROR
602	SEQUENTIAL SEEK ERROR
603	RANDOM SEEK ERROR
604	WRITE ERROR
605	READ ERROR
606	DISK CHANGE CHECK REMOVE ERROR
607	DISK CHANGE CHECK INSERT ERROR

Math coprocessor (80287)

701	NOT INSTALLED
702	COPROCESSOR INITIALIZE ERROR
703	COPROCESSOR INVALID OPERATION MASK ERROR
704	COPROCESSOR ST FIELD ERROR
705	COPROCESSOR COMPARISON ERROR
706	COPROCESSOR ZERO DIVIDE MASK ERROR
707	COPROCESSOR ADDITION ERROR
708	COPROCESSOR SUBTRACTION ERROR
709	COPROCESSOR MULTIPLICATION ERROR
710	COPROCESSOR PRECISION ERROR

Error code	Message
Parallel port	
901	ERROR PIN p
Serial port (RS-232C)	
1101	control signal ALWAYS LOW
1101	control signal ALWAYS HIGH
1102	TIMEOUT ERROR
1103	VERIFY ERROR
Alternate serial port	
1201	control signal ALWAYS LOW
1201	control signal ALWAYS HIGH
1202	TIMEOUT ERROR
1203	VERIFY ERROR
Dot-matrix printer	
1401	status
Hard disk drives and controller	
1701	SEEK ERROR
1702	WRITE ERROR
1703	READ ERROR
1704	HEAD ERROR
1705	ERROR DETECTION ERROR
1706	ERROR CORRECTION ERROR
Alternate parallel port	
2101	ERROR PIN p

Appendix D
Physically Formatting a Hard Disk

This appendix describes how to *physically* format a hard disk. Sometimes called a low-level or hard format, this procedure should not be confused with the logical format performed by the MS-DOS FORMAT command. The physical formatting of a hard disk is a separate step that is usually done at the factory by the disk manufacturer.

The hard disk in your computer has already been physically formatted, partitioned, and formatted for MS-DOS; so you should not need to do anything to prepare it for use. You need to format the hard disk only if one of the following is true:

❑ The hard disk is producing numerous read/write errors or you are having other serious problems with the disk. Sometimes, after a hard disk has been used for a long time, the magnetic signals on the surface of the disk begin to weaken and this causes the disk to frequently produce errors. You may need to reformat the disk in this case.

❑ You have installed a different hard disk in your computer that has never received the low-level format.

WARNING
Physically formatting the hard disk erases any data it contains. If **you have any data** on **the disk or you are unsure** if **formatting is necessary, contact your** Epson **Customer** Care Center **first. Someone there can advise you on the best procedure to follow.**

In addition to destroying all the data on the disk, formatting also removes any partitions defined on the disk by FDISK as well as the logical formatting performed by the SELECT (or **FORMAT)** command. Therefore, whether you are formatting a

new disk or reformatting a used disk, after physically formatting it, you need to run FDISK and SELECT to prepare the hard disk for use. Follow the instructions in Appendix E.

Formatting and Checking Options

To perform a physical format or to determine if a hard disk needs to be physically reformatted, follow these steps:

1. **Insert the Reference diskette in drive A.**

2. **Turn on or reset the computer. The OPERATION MENU appears.**

3. **Press 2 to select Format hard disk, and then press** Enter. **The following menu of formatting and checking options appears:**

```
HARD DISK FORMAT MENU
1 - Conditional format (Normal)
2 - Unconditional format
3 - Destructive surface analysis
4 - Non-destructive surface analysis
0 - Exit
Enter selection number:
```

These options work as follows:

❑ **Conditional format (Normal) scans the disk for bad tracks that have been flagged, formats the disk, and then reflags the bad tracks so they are never used to store data. You cannot perform a Conditional format on a disk that has not already received an Unconditional format.**

❑ **Unconditional format requires you to enter the tracks to be flagged as bad, and then allows you to edit the list of bad tracks. You can run an Unconditional format on any hard disk.**

❏ Destructive surface analysis tests a formatted hard disk for bad tracks and updates the bad track table. Because this option writes and reads data on the disk, it destroys all data on any track that produces an error. You cannot run the Destructive surface analysis on a disk that has never been formatted.

❏ Non-destructive surface analysis checks a formatted hard disk for unflagged bad tracks without destroying data. You cannot run the Non-destructive surface analysis on a disk that has never been formatted.

The type of format you choose depends on whether you are reformatting a disk that has been used or formatting a new disk for the first time. (See the recommendations below.)

Reformatting a Used Disk

If you are reformatting a disk you have been using that appears to be damaged, follow these steps:

1. Use the Non-destructive surface analysis test to check for unflagged bad tracks.

2. If errors occur during the Non-desctructive analysis, use BACKUP to back up the data on your disk.

3. Run the Conditional format.

4. Run the Destructive surface analysis.

Formatting a New Disk

Many hard disk drives are supplied with a list of bad tracks but
without the bad tracks flagged on the disk. Other hard disks are
supplied with the bad tracks already flagged. If you are
formatting a new hard disk that may not have been formatted,
follow these steps:

1. Run the Conditional format to see if the disk has been
   formatted. If you see the message "This drive has unflagged
   error(s) or is unformatted," you need to run the
   Unconditional format; go on to step 2.

   If these messages do not appear and you see a count of the
   flagged tracks and good tracks, do the following:

   ❏ If the count of flagged bad tracks matches the number
      of bad tracks on the list that came with the disk, the
      disk has been formatted properly and you do not need
      to do anything else. You can cancel formatting at this
      point.

   ❏ If the list of bad tracks provided with the disk contains
      bad tracks but the Conditional format does not detect
      any bad tracks, go on to step 2.

2. Cancel the Conditional format and run the Unconditional
   format to format the disk and flag the bad tracks manually.

Starting the Formatting Process

To begin formatting, type the number of the option you want
and press Enter.

Note
If you have more than one hard disk drive, you see this prompt:

```
Enter drive letter (C/D)?
```

Press C **or** D **and** then Enter.

Conditional Format (Normal)

Use this option to format the hard disk. All flagged tracks are marked so that they are never used.

To start the Conditional format, press 1 and then Enter. The program starts to scan the disk to find all tracks flagged as bad, starting from the innermost cylinder of the disk. During the scan, you see the number of the cylinder the program is currently checking. For example, if you have a hard disk, the first messages you see are:

```
Format Hard Disk
Scanning for flagged bad tracks...
Current cylinder is nnn
```

When the scan is complete, the program displays information about the condition of the disk, like this:

```
Scanning finished.
Count of tracks flagged bad      =    n
Count of tracks with other errors =    n
Count of good tracks             = nnnn
```

The program then displays a warning about the consequences of proceeding with formatting:

```
WARNING! ALL DATA WILL BE DESTROYED IN
ALL PARTITIONS OF HARD DISK, NOT JUST
IN MS-DOS PARTITION!
Do you want to start formatting (Y/N)?
```

If there are no tracks with other errors, and you are absolutely sure that you want to format the hard disk, press Y and Enter. **The program then asks you once more if you want to continue. You see this message and prompt:**

```
DOUBLE CHECK THAT YOU HAVE BACKUP
DISKETTE COPIES OF ALL YOUR FILES.

Do you want to exit and check your
file copies (Y/N)?
```

When you are certain no valuable data will be destroyed, press N **and** Enter.

If you cancel formatting at either stage, you see these messages:

```
Format cancelled.
Press ENTER to return to the menu.
```

If you continue with formatting, you see:

```
Now formatting...
```

When formatting is complete, any bad tracks are flagged, and you see a series of messages like these:

```
Format finished.
Flagging bad tracks...
Cylinder is xxxx, head is yy
Format completed.
Press ENTER to return to the menu.
```

Flagged tracks are identified by xxxx and yy. At this point, press Enter to return to the HARD DISK FORMAT MENU.

If there are any tracks with other errors, scanning stops and you see this message:

```
Scanning cancelled.
Warning: This drive has an unflagged
error(s), or is unformatted.
Press ENTER to return to the menu.
```

Press Enter. This may mean that the drive has never been formatted or that an error was not flagged. If you want to format the disk after receiving this message, do the following:

1. If the drive is not formatted, perform the Unconditional format (Option 2) and enter any tracks you know are bad in the Bad Track Table. (See "Unconditional Format" below.)

2. Run the Destructive surface analysis (Option 3) to flag any remaining bad tracks. (See "Destructive Surface Analysis," which appears later in this appendix.)

3. Run the Conditional format again. No errors should occur; if one does, contact the dealer who sold you the disk.

Unconditional Format

Use this option to format your hard disk when you want to enter the list of bad tracks before formatting begins. The main difference between unconditional and conditional formatting is the way in which bad tracks are identified. With the unconditional format, you must enter the list of bad tracks before formatting begins.

The Unconditional format can format a hard disk that has never been formatted or was not formatted properly; the Conditional format works only on a disk that has already been formatted.

If you are formatting a disk that has never been formatted, check the list of bad tracks that came with the disk. This list identifies each defect by the head and cylinder number, which are required for the Unconditional format.

To start the Unconditional format routine, press 2 and then Enter. **You are first given the option to change the interleave factor for formatting from the default value of three. Only do this if the documentation with your hard disk recommends a different value. You see this prompt:**

```
Do you want default interleave of 3
(Y/N) ?
```

To accept the default, press Y **and** Enter. **To change the value, press** N **and** Enter. **You see this prompt:**

```
Enter interleave factor (1-16):
```

Type the recommended value and press Enter. **The next screen allows you to edit the table of bad tracks:**

Bad Track Table									
Cylinder	Head	Cylinder	Head	Cylinder	Head	Cylinder	Head	Cylinder	Head

Move highlighted area to desired track with cursor keys.
A = Add track, C = Change track, D = Delete track, F = Finish editing

Enter command letter:

Some of the messages change if the table is full or empty. However, the way that you add a bad track or make a correction is the same.

To add a bad track, follow these steps:

1. Press A. You see this prompt:

   ```
   Enter cylinder number (1 - xxxx):
   ```

2. Type the number of the cylinder containing the bad track you want to enter, and press Enter. You see this prompt:

   ```
   Enter head number (0 - yy):
   ```

3. Type the head number for the bad track, and press Enter. The maximum valid cylinder and head numbers (xxxx and yy) vary according to the capacity of the hard disk.

To cancel the operation, press Enter without entering a value. You see this message:

```
Table unchanged.
```

If you enter an invalid cylinder or head number, a reminder of the range of values appears and the program asks you to enter the value again. When you complete a valid entry, it appears in the table and you can select another command.

If you make a mistake, move the cursor block to the incorrect track and press C to alter the track data. Or you can press D to remove the track from the table. Change the track data just like you add a track.

Once you complete editing, check the entries in the table once more. When you are sure the table is correct, press F. The program displays a warning about the consequences of proceeding with formatting, and the remaining steps are exactly the same as for a normal conditional format.

Destructive Surface Analysis

Use this option to accurately locate any bad tracks on a hard disk, and to flag any bad tracks that are not flagged.

WARNING
If any errors occur during this check, all data on the track
that produces the error is destroyed. For this reason, if you
think that an unflagged bad track is causing trouble, first run
option 4, Non-destructive surface analysis, to check the disk
surface.

This test operates by a complex process of writing, reading, and verifying information on every track of the hard disk, except for tracks that are already flagged as bad tracks. To start the test, press 3 **and then** Enter. You see these messages:

```
Analyze Hard Disk
Read/Save/Write/Read/Restore/Read
check for all tracks...
Current cylinder is nnn
```

As each track is checked, the cylinder number (nnn) counts down to zero. When the analysis is complete, the program displays a complete report on the status of the disk, including a table of unflagged tracks that produced write, read errors, such as the following:

```
Analysis finished.
Count of tracks flagged bad              =  n
Count of tracks with write, read errors = n
Count of good tracks                     = nnn
No write, read error was detected.
No data was destroyed.
Press ENTER to return to the menu.
```

If the program finds one bad track that is not flagged, the summary would show one track with a write, read error. The report is then followed by a table like this:

```
                     Write, Read Error Tracks
                    ============================
  Cylinder Head     Cylinder Head     Cylinder Head     Cylinder Head

     237    2

  Confirm to register the tracks in the Write, Read Error
  Track Table as bad tracks.

  Do you want to register the error tracks as bad tracks (Y/N)?
```

To flag the error tracks as bad, press Y and Enter. You then see a list of the tracks as they are flagged and then these messages:

```
Flagging bad  tracks...
Cylinder is 237, head is 2
Press ENTER to return to the menu.
```

Press Enter to return to the HARD DISK FORMAT MENU.

Non-destructive Surface Analysis

The Non-destructive surface analysis does not destroy any data, and can safely be used to check the condition of your hard disk drive. However, this test does not flag any bad tracks it detects.

To start the test, press 4 and then Enter. You see these messages:

```
Analyze Hard Disk
Read/Verify check for all tracks...
Current cylinder is xxxx
```

As each track is checked, the current cylinder is displayed. The cylinder number counts down to zero as the disk is checked.

When the analysis is complete, the program displays a summary of the status of the disk. This summary lists the following:

❑   **Flagged bad tracks**

❑   **Tracks with read, verify errors**

❑ **Good tracks.**

If no errors occur, you see this message:

```
No read, verify error was detected.
```

If errors are found, the program displays a table of the tracks that gave errors, similar to the one displayed by the destructive analysis.

After the status reports you see this message:

```
Press ENTER to return to the menu.
```

Check the information displayed, then press Enter.

Appendix E
Preparing a Hard Disk for Use

If your Apex computer came with a hard disk, it has already
been physically formatted, partitioned, and formatted for
MS-DOS. You should not need to do anything to prepare it for
use. However, if you have installed a new hard disk in your
computer or you need to repartition or reformat the disk you
have been using, you may need to perform part or all of the
procedures described in this appendix.

This appendix explains how to do the following:

❏ Use FDISK to create a primary MS-DOS partition

❏ Use FDISK to create an extended MS-DOS partition on
   the Apex 200\40

❏ Use SELECT to format the partition for MS-DOS and
   install MS-DOS on the disk

❏ Use COPY to copy the remaining MS-DOS files to the
   hard disk

❏ Create an AUTOEXEC.BAT file.

Before you can use FDISK and SELECT, your hard disk must
have received a low-level format. This type of formatting is
usually done by the manufacturer and you should not need to
do this yourself. If you are using an Epson drive, it has already
been formatted. However, you may need to perform a low-level
(also called physical) format if one of the following is true:

❏ The hard disk is new and has never been formatted. Some
   manufacturers do not format their hard disks.

❏ The number of read/write errors on your hard disk is
   increasing with time.

See Appendix D for instructions on performing a low-level format. If you need to format the disk, be sure to do it before completing the steps in this appendix.

WARNING
The procedures described in this appendix destroy any data on the hard disk. If your disk contains data, use the BACKUP command to copy all the data before completing the steps described here. See your MS-DOS Reference Manual for instructions on using BACKUP.

Partitioning the Hard Disk

You need to partition the hard disk so it can run the MS-DOS operating system. The partitioning process divides the single physical disk into one or more logical drives. You can access each logical drive as though it were a separate physical device. The first logical drive is drive C, the second is drive D, and so on.

Note
If you install a second hard disk, MS-DOS refers to that disk automatically as drive D. In this case, the second logical drive on your first disk is referred to as drive E, the third is drive F, and so on.

The first logical drive (drive C) is also called the primary partition. All remaining logical drives together make up what MS-DOS calls the extended partition. Extended partitions are necessary on a hard disk with a capacity greater than 32MB because MS-DOS (version 3.3) cannot manage more than 32MB at a time.

The instructions in this appendix describe how to:

❏ Create a primary partition of 20MB if you have the Apex 200\20, or a primary partition of 32MB if you have the Apex 200\40.

❏ Create an extended partition on the Apex 200\40 of 8MB.

If you prefer to create a primary and extended partition of different sizes, see the instructions for FDISK in your MS-DOS Reference Manual.

Creating the MS-DOS Partition

Follow the steps below to create a primary partition on your hard disk for MS-DOS. On the Apex 200\20, the primary partition created is 20MB. On the Apex 200\40, the primary partition created is 32MB.

1. Insert the working copy of your MS-DOS Startup diskette in drive A.

2. Turn on or reset the computer.

3. After MS-DOS is loaded, press Enter twice to accept the time and date prompts.

4. At the A> prompt, type FDISK and press Enter. The screen displays the FDISK options menu.

5. Press 1 to select the Create DOS partition option and press Enter.

6. Press 1 to select the Create Primary DOS partition option and press Enter. The screen displays the following prompt:

```
Do you wish to use the maximum size
for a DOS partition and make the
DOS partition active (Y/N)....? [Y]
```

7. **Press Y to use the maximum size for MS-DOS and press** Enter. **The screen displays the following message and prompt:**

```
System will now restart
Insert DOS diskette in drive A:
Press any key when ready ...
```

8. **Press any key to restart the system (the Startup diskette is already in drive A). Your computer begins reloading MS-DOS. After the preliminary copyright information displays on the screen, the date prompt appears.**

9. **Press** Enter **twice to accept the displayed date and then the time.**

The system now recognizes the primary MS-DOS partition and you can access it as drive C. You still need to install MS-DOS on this drive with the SELECT command before you can use it. For instructions, see "Formatting the Primary Partition" below.

Creating the Extended Partition

If you have the Apex 200\40, you still have 8MB of disk space left over after creating the primary MS-DOS partition. Follow these steps to create an 8MB extended partition and designate it as drive D:

1. **At the A> prompt, type** FDISK **and press** Enter. **The screen displays the FDISK options menu.**

2. **Press 1 to select the Create DOS partition option and press** Enter.

3. Press 2 to select the Create Extended DOS partition option and press Enter. The screen displays the following prompt:

    ```
    Total disk space is 1021 cylinders.
    Maximum space available for
    partition is 252 cylinders.
    Enter partition size ........ [252]
    ```

4. Press Enter to accept the partition size. The screen displays the following message:

    ```
    Extended Partition Created
    ```

    The screen also displays information about the partitions you have created.

5. Press Esc to return to the FDISK Options menu. FDISK automatically displays the Create Logical DOS Drive(s) option and a message similar to this:

    ```
    No logical drives defined
    Total partition size is 252
    cylinders.
    Maximum space for logical
    drive is 252 cylinders.
    Enter logical drive size .... [252]
    ```

6. Press Enter to accept the logical drive size. FDISK creates a logical drive for the extended partition and designates it as drive D.

7. Press Esc twice. The screen displays the following message and prompts:

    ```
    System will now restart
    Insert DOS diskette in drive A:
    Press any key when ready ...
    ```

8. **Press any key to restart the system (the MS-DOS Startup diskette is already in drive A). Your computer reloads MS-DOS, displaying the preliminary copyright information and the date prompt.**

9. **Press** Enter **twice to accept the date and time shown.**

The system now recognizes the MS-DOS partition as drive C and the extended partition as drive D. To install MS-DOS on your hard disk, you must format these logical drives.

Formatting the Primary Partition

Use the MS-DOS SELECT command to format the primary partition, drive C. SELECT automatically does the following:

❏ **Formats the partition**

❏ **Labels the partition**

❏ **Copies the MS-DOS system files to the hard disk.**

After you have done this, MS-DOS boots automatically from this partition on the hard disk every time you turn on or reset your computer (as long as there is no diskette in drive A).

Follow these steps to format the primary partition:

1. **Insert the working copy of your MS-DOS Startup diskette in drive A (if it is not there already), and turn on the computer if necessary.**

2. **At the A> prompt, type the following and press** Enter:

    ```
    SELECT A: C:\DOS 001 US
    ```

Note
001 and US are the country code and keyboard code,
respectively, for the United States. If you want to
substitute codes for a different country, see your
MS-DOS Reference Manual.

The screen displays this message and prompt:

```
SELECT is used to install DOS the
first time.
SELECT erases everything on the
specified target and then installs
DOS. Do you want to continue (Y/N)?
```

3. Press Y and then Enter. Formatting does not begin
    immediately. The screen displays the following message
    and prompt:

```
WARNING, ALL DATA ON NON-REMOVABLE
DISK DRIVE C: WILL BE LOST!
Proceed with Format (Y/N)?
```

4. Press Y and Enter to begin formatting the partition. The
    screen continuously displays the changing head and
    cylinder numbers.

    Besides formatting the hard disk partition, SELECT copies
    the operating system files to the hard disk. When the
    procedure is complete, the screen displays the following:

```
Format Complete
System Transferred
Volume Label (11 characters, ENTER
for none)
```

5. It is a good idea to enter a name (label) for the partition to
    protect it from being accidentally formatted later. If you
    want to do this, type a name of up to 11 characters and
    press Enter. If you do not want to name it, press Enter.

The screen first displays disk space information and then displays the following message:

```
Reading source file(s)...
```

SELECT copies the rest of the files from the Startup diskette to the hard disk. When all the files are copied, the A> **prompt reappears. The partition on the hard disk is now formatted.**

Note
The SELECT procedure described above copies all the files
from your Startup diskette to a directory it created on drive
C named \DOS. This enables you to start MS-DOS from
the hard disk. However, you should copy all the MS-DOS
files to your hard disk as described below. So Copying the
Remaining Files to the Hard Disk.

Formatting the Extended Partition

Follow this procedure to format the extended partition:

1. **Insert the working copy of your MS-DOS Startup diskette in drive A (if it is not already there).**

2. **At the A> prompt, type the following and press** Enter:

   ```
   FORMAT D:/V
   ```

3. **The screen displays this message and prompt:**

   ```
   WARNING, ALL DATA ON NON-REMOVABLE
   DISK DRIVE D: WILL BE LOST!
   Proceed with Format (Y/N)?
   ```

4. Press Y and Enter to begin formatting the extended partition. The screen continuously displays the changing head and cylinder numbers. When the procedure is complete, you see the following message:

```
Format Complete
Volume Label (11 characters, ENTER
 for none)
```

5. It is a good idea to enter a name (volume label) for drive D, to protect it from being accidentally reformatted later. If you want to do this, type up to 11 characters and press Enter. If you do not want to name it, just press Enter.

   The screen displays.information about the total disk space available on drive D. The A> prompt reappears.

6. If you have created additional logical drives on your hard disk, repeat steps 1 through 5 above for each additional logical drive. Substitute the appropriate drive letter in the FORMAT command. For example, to format drive E, type the following and press Enter:

```
FORMAT E: /V
```

Copying the Remaining Files to the Hard Disk

Follow the instructions below to copy the files on your other MS-DOS diskettes and the Reference diskette to drive C, the primary partition on the hard disk:

1. Remove the MS-DOS Startup diskette from drive A and insert the diskette labelled Operating 1 in the drive.

2. You should still be logged onto drive A. If not, type A: and press Enter.

3. **At the A> prompt, type the following and press** Enter:

   ```
   COPY *.* C:\DOS
   ```

   MS-DOS copies all the files from the diskette to the \DOS subdirectory on the hard disk. The file names appear on the screen as they are copied.

4. **When the A> prompt reappears, remove the Operating 1 diskette and repeat the procedure for the Operating 2 and Reference diskettes. Store all your diskettes in a safe place.**

Note
 The procedure described above copies all the files on the
 MS-DOS and Reference diskettes to the \DOS subdirectory
 on drive C, You may, however, prefer to more time of these
 commands in other subdirectories. For information on
 creating subdirectories, ice Chapter 4 of net year MS-DOS
 Reference Manual. The file COMMAND.COM (which is
 included on the Startup and Operating 1 diskettes) must
 remain in the root directory of drive C.

Creating the AUTOEXEC.BAT File

The following procedure creates an AUTOEXEC.BAT file in the root directory of the hard disk. Once this file exists on the hard disk, your computer can automatically execute several commands every time you turn on or reset the computer. Specifically, it does the following:

❑ **Bypasses the date and time prompts**

❑ **Defines a path to all the MS-DOS commands in the \DOS directory**

❑ **Changes the command prompt to reflect the current directory.**

Note
The AUTOEXEC.BAT file is optional, and you can either not create one at all or create one that is different. For a description of AUTOEXEC.BAT, see Chapter 4; or see your MS-DOS manual for more detailed information.

Follow these steps:

1. Type C : and press **Enter** to log onto the hard disk.

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

        COPY CON AUTOEXEC.BAT

3. Type the following, pressing **Enter** after each line:

        ECHO OFF
        CLS
        PROMPT = PG
        PATH = C:\DOS

4. Hold down the **Ctrl** key and press **Z.** Then press **Enter.**

Now you can load MS-DOS from drive C on your hard disk. Be sure there is no diskette in drive A when you turn on or reset your computer. Otherwise, the computer tries to load MS-DOS from the diskette in drive A. If drive A is empty (or the latch is up), MS-DOS is booted from drive C.

Appendix F
Types of Hard Disk Drives

This appendix lists the numbers you need to identify a hard disk drive. Refer to this table and the documentation supplied with your hard disk to find the correct number for the type of drive you are installing. You use this drive type number when you run the Setup program after installing a hard disk drive.

Drive type	Cylinders	Heads	Write precompensation	Landing zone (cylinder)	Capacity (MB)
1	306	4	128	305	10
2	615	4	300	615	20
3	615	6	300	615	30
4	940	8	512	940	62
5	940	6	512	940	46
6	615	4	– 1	615	20
7	462	8	256	511	30
8	733	5	– 1	733	30
9	900	15	– 1	901	112
10	820	3	– 1	820	20
11	855	5	– 1	855	35
12	855	7	– 1	855	50
13	306	8	128	319	20
14	733	7	– 1	733	42
15	0	0	0	0	0
16	612	4	0	663	20
17	977	5	300	977	40
18	977	7	– 1	977	58
19	1024	7	512	1023	60
20	733	5	300	732	30
21	733	7	300	732	42
22	733	5	300	733	30
23	306	4	0	336	10
24	612	4	305	663	20
25	306	4	– 1	340	10
26	612	4	– 1	670	20
27	698	7	300	732	40
28	976	5	488	977	41
29	306	4	0	340	10
30	611	4	306	663	20
31	732	7	300	732	43
32	1023	5	– 1	1023	43
33-42	0	0	0	0	0
43	1024	8	512	1023	69
44	830	10	512	829	141
45	1024	5	512	1023	43
46	615	8	128	618	40
47	0	0	0	0	0
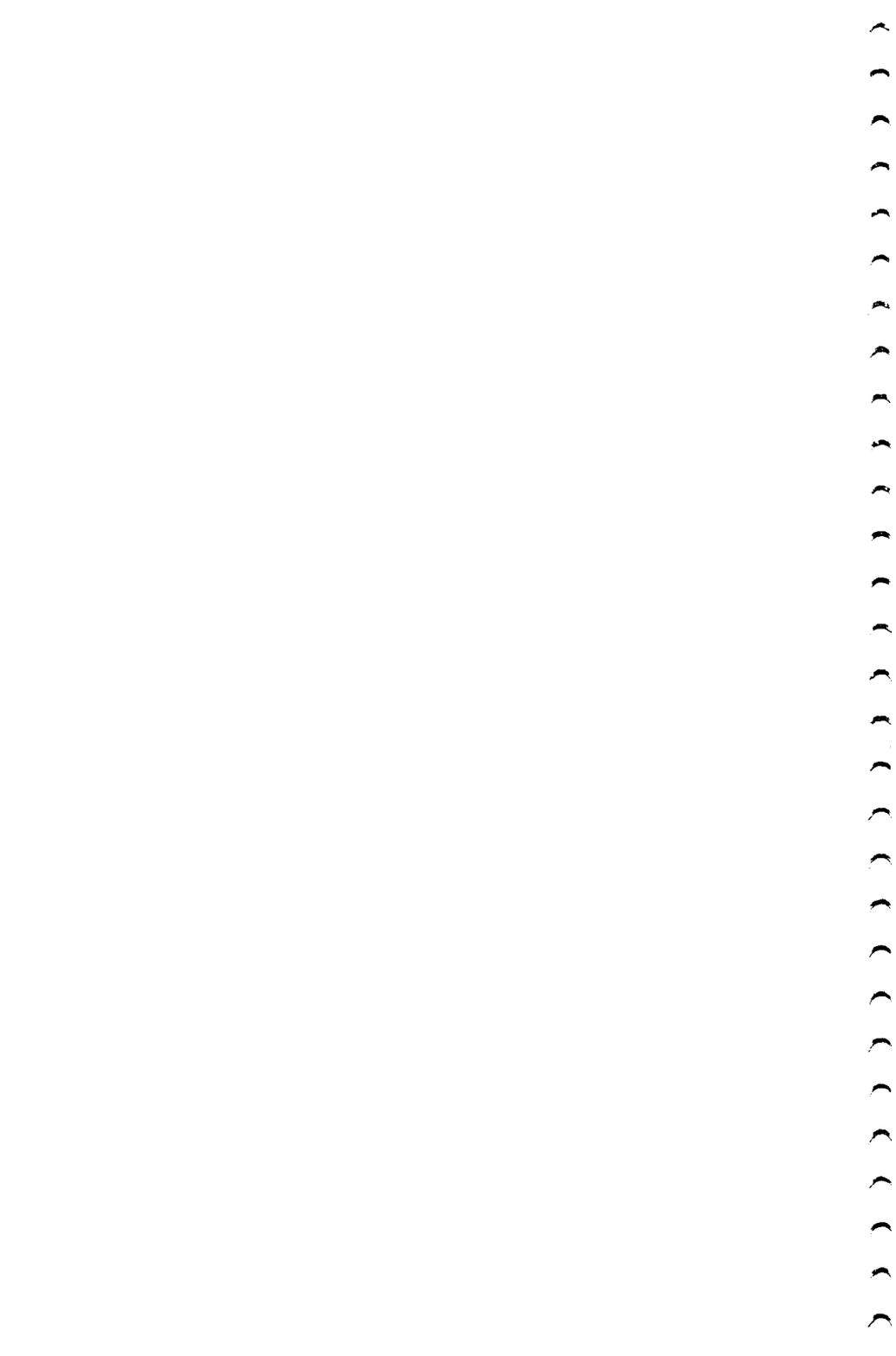
Glossary

Absolute pathname

A pathname that begins with the backslash character. An absolute pathname tells MS-DOS how to find its way to a given directory, starting at the root directory. See also Relative pathname.

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. Files transmitted in ASCII code can be used by many different computers, printers, and programs.

Asynchronous

A method of data transmission in which one machine sends data one character at a time to another, without either machine preparing for the transmission.

AUTOEXEC.BAT file

The batch file that is executed automatically when you load MS-DOS. See also Batch file.

Backup

An extra copy of a program, data file, or disk, kept in case your working copy is damaged or lost.

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. In a batch file, each command is entered on a separate line. When you type the filename, all the commands in that file are executed sequentially.

Baud rate

A measure of the speed of data transmission. Usually equivalent to bits per second.

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 or a program into the computer's memory.

Byte

A sequence or group of eight bits that represents one character.

CGA

Color Graphics Adapter. A type of circuit board that is installed in one of the computer's I/O slots that can generate up to 25 lines of text with 80 characters on each line, or monochrome graphics with a 640 x 200 resolution and four color graphics at 320 x 200 resolution.

Character

Anything that can print in a single space on the page or the screen. Includes numbers, letters, punctuation marks, and graphic symbols.

CMOS

Complementary Metal-Oxide Semiconductor. A method of making low power silicon chips.

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 in MS-DOS also displays the current operating drive; if it is drive C, the command prompt looks like, this: C : \>.
See also Prompt.

Configuration

The particular setup of a group of components. For example, a typical system configuration consists of a computer with one diskette drive and one hard disk drive and a monitor, connected to a printer.

Control code

A command (generated when you hold down Ctrl and press another key on the keyboard) that instructs your computer to perform a specific function.

Coprocessor

An optional device that enables the computer to process certain mathematical calculations faster.

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.

Current directory

> The directory you are logged onto and working in. Also known as the default directory.

Cursor

> The highlighted marker that shows your position on the screen.

Cylinders

> See Tracks.

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).

Data length

> The number of bits per character in serial transmissions.

Default

> Values or settings that take 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.

Default directory

> The directory where MS-DOS executes your next command, unless you tell it to do otherwise (by including a pathname with the command). Also known as the current or working directory.

Default drive

> The disk drive from which MS-DOS executes your next command, unless you tell it to do otherwise (by including a drive designator with the command). Also known as the current drive.

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.

Diagnostics

> The tests and procedures the computer performs to check its internal circuitry and set up its configuration.

DIP switch

> A small switch on a computer, option card, or printer that controls a particular function. DIP stands for Dual In-line Package.

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
   and used to store data permanently. Also called floppy disk.

Display adapter

   The card that is installed in one of the computer's option slots.
   The display adapter provides the interface to which you
   connect the monitor and controls the way the monitor displays
   text and graphics. Also known as video card.

DOS

   The Disk Operating System that controls the computer's input
   and output functions. See Oprating system.

Double-density

   A type of diskette format that allows you to store twice as much
   data as the standard-density format. A 5 ¼-inch double-density
   diskette can store 360KB of data. A 3 ½-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 adapter that allows
   you to display high-resolution graphics on a color 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 up
   to 640 x 350 resolution.

Executable file

A file containing program instructions, as opposed to data created with an application program. An executable file has the extension.BAT, .COM, or .EXE.

Execution speed

The speed at which the central processing unit can execute commands. Also called operating speed. The Apex can run at 8 MHz or 12 MHz.

Extended memory

Memory above 1MB that is not available to MS-DOS application programs. Extended memory can be used for the disk caching program, HDCACHE. See the description of the HDCACHE in your MS-DOS Reference Manual.

Extended partition

An additional MS-DOS partition; you can create one primary MS-DOS partition and one extended partition,

Extension

A suffix of up to three characters that can be added to a file name to better identify it.

External command

An MS-DOS command stored in a program file with the extension .COM or .EXE. MS-DOS must be able to find the program file to execute the command. See also Internal command.

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 of up to eight characters that MS-DOS uses to identify a file.

Floppy disk

See Diskette.

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 data permanently. Unlike a diskette, it is fixed in place. It can process data more rapidly and store many more files than a diskette.

Hardware

Any physical component of a computer system, such as a monitor, printer, keyboard, or CPU.

Hexadecimal

A base 16 numbering system frequently used by programmers. Any decimal number between 0 and 255 can be represented by a two-digit hexadecimal number.

High-density

A type of diskette format that allows you to store more data than normal. A 5 ¼-inch high-density diskette can store 1.2MB of data. A 3 ½-inch high-density, double-sided 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.

Internal command

    An MS-DOS command that is stored in the command processor of the operating system; it is not a separate program file. This means that you can execute an internal command without specifying a pathname. Examples include COPY, DEL, RENAME, and DIR. Unlike external commands, internal commands can be executed from any drive or directory.

Jumper

    A small device that fits over two small pins on a circuit board to activate a particular function.

Keyboard

    A device resembling a typewriter keyboard to enter letters and numbers to the computer.

Kilobyte (KB)

    A unit used to measure storage space in a computer's memory or on a disk. One kilobyte equals 1024 bytes.

Logical disk drive

    A subdivision of a physical disk drive, treated by MS-DOS as though it were a separate physical component of the computer. A physical disk drive may be divided into several logical drives.

Main memory

The amount of memory in the computer up to 1MB that is
available to MS-DOS and application programs. Also called
base memory.

Math coprocessor

An optional device that enables the computer to process
certain mathematical calculations faster.

Megabyte (MB)

A unit used to measure storage space in a computer's memory
or on a disk. One megabyte equals 1,048,576 bytes.

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 Apex operates at 8 MHz or 12 MHz.

Memory

The area where your computer stores data. Memory contents
can be permanent and inalterable (ROM) or temporary
(RAM).

MGA

Multi-graphics Adapter. The type of display adapter that can
display monochrome or color text and 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 that comes with your computer. See Operating system.

Numeric keypad

The number keys grouped to the right of the keyboard.

Operating speed

The speed at which the central processing unit can execute commands. Also called execution speed. The Apex can run at *8* MHz or 12 MHz.

Operating system

A collection of programs (such as MS-DOS) that manages a computer's operations. The operating system determines how programs run and supervises all input and output.

Option card

A circuit board you install inside the computer to provide additional capabilities, such as a modem, a hard disk controller, or a mouse.

Parallel

The type of interface that transmits data in groups of bits. See Interface and Serial.

Parameter

A qualifier added to a command that tells the computer what particular conditions to look for.

Parent directory

The directory immediately above a given directory in the directory tree. In pathnames, the parent directory is represented by the symbol .. (two periods).

Parity

Data signals sent during communications to detect errors in transmitting or receiving data.

Partition

The area defined on a hard disk for use by an operating system; to divide a hard disk into separate sections or logical drives.

Pathname

The list of directories and subdirectories you need to specify to locate a file. For example, the pathname for the file SALES which is located in the subdirectory BUSINESS of the root directory (\) is \BUSINESS\SALES.

Peripheral

A 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 where you can connect a peripheral device.

Power-on diagnostics

The system tests the computer runs to check its internal circuitry and configuration each time you turn it on.

Primary partition

The MS-DOS partition from which the operating system starts.

Program

A disk file that contains coded instructions and tells a computer what to do and how to do it.

Prompt

A message displayed on the screen that tells you what action you need to perform next.

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 the computer; so you must store any data you want to keep on a diskette or hard disk.

Read

To move 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 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.

Relative pathname

A pathname that does not begin with the backslash character. A relative pathname tells MS-DOS how to find its way to a given directory, starting at the current default directory. See also Absolute pathname.

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.

RGB

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 or of other subdirectories.

RS-232C

A widely-used, standard type of serial interface. You can easily connect an RS-232C-compatible device to the computer.

Sector

A contiguous section of a disk track that provides an address at which the computer can access data.

Self test

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 Interface and Parallel.

Software

The programs that enable your computer to perform the tasks and functions you indicate.

Source diskette

The diskette that you are reading or copying data from during a copy or backup operation.

Stop bit

A signal sent in serial communications to mark the end of a character.

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 a diskette as it formats it. See Parameters.

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.

Target diskette

    The diskette to which you are copying data during a copy or backup operation.

Tracks

    Addressable, concentric circles on a disk, resembling the grooves on a record, which help to divide the disk into separate accessible areas. There are 40 tracks on each side of a double-sided 360KB diskette and 80 tracks on each side of a double-sided 1.2MB diskette. The numeber of tracks on a hard disk depends on its capacity.

VGA

    Video Graphics Array. A type of high-resolution color display adapter that can display monochrome text and graphics at up to 720 x 400 resolution, 16-color graphics at up to 640 x 480 resolution, or 256-color graphics at 320 x 200 resolution.

Video card

    The display adapter card that is installed in one of the computer's option slots. The video card provides the interface to which you connect the monitor and it controls the way the monitor displays text and graphics.

Wildcard

    A character that represents any character or group of characters. The wildcard character * (asterisk) represents a group of characters, and the wildcard character ? (question mark) represents a single character.

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 the side of a 5 ¼-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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