Apex™ 100 & 100\20
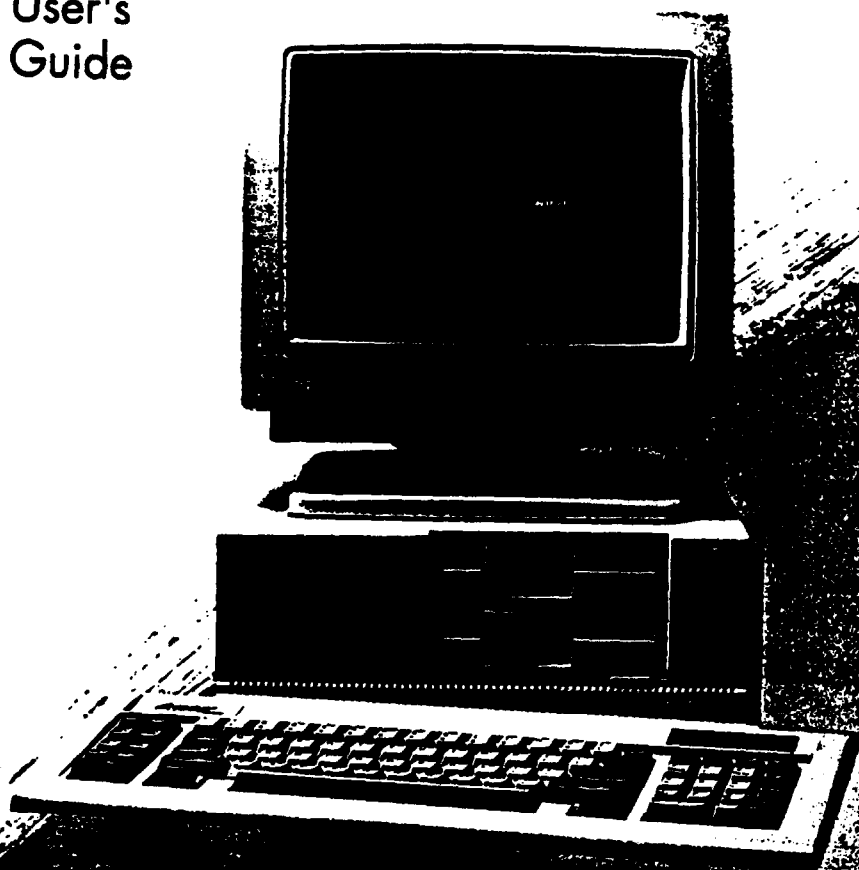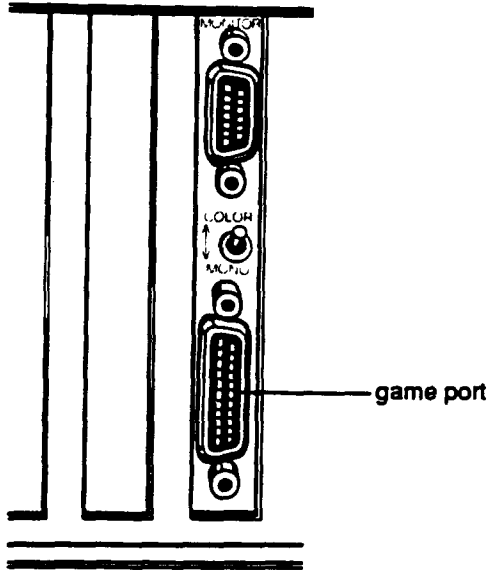## by EPSON®

User's
Guide

Attention Apex™ Owners

The MGA card in your computer includes a game port, such as the one shown below. You can easily connect a joystick, track ball, or other pointing device to this port.

IMPORTANT SAFETY INSTRUCTIONS

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

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

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

4. Do not use this product near water.

5. Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.

6. Slots and openings in the cabinet and the back or bottom are provided for ventilation; to ensure reliable operation of the product and to protect it from overheating, these openings must not be blocked or covered. The openings should never be blocked by placing the product on a bed, sofa, rug, or other similar surface. This product should never he placed near or over a radiator or heat register. This product should not be placed in a built in installation unless proper ventilation is provided

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

8. This product is equipped with a 3-wire grounding-type plug, a plug having a third (grounding) pin. This plug will only fit into a grounding type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the purpose of the grounding type plug.

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

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

11. Never push objects of any kind into this product through cabinet slots, as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electric shock. Never spill liquid of any kind on the product.

12. Except as specifically explained in the User's Manual, do not attempt to service this product yourself. Opening or removing those covers that are marked "Do Not Remove" may expose you to dangerous voltage points **or** other risks. Refer all servicing in those compartments to service personnel.

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

    A. When the power cord or plug is damaged or frayed.

    B. If liquid has ken spilled into the product.

    C. If the product has ken exposed to rain or water.

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

    E. If the product has ken dropped or the cabinet has been damaged.

    F. If the product exhibits a distinct change in performance, indicating a need for service.

Apex 100 & 100\20
by EPSON®

User's Guide
for the
Apex 100 and Apex 100\20

FCC COMPLIANCE STATEMENT FOR AMERICAN USERS

This equipment generates and uses radio frequency energy and if not installed and used properly, hat is, in strict accordance with the manufacturer's instructions, may cause interference co radio and television reception. It has been type **tested** and found co 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 co 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 co try co 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 chat 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 co 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 présent appareil numérique n'émet pas de bruits radioélectriques dépassant la limites applicables aux appareils numériques de Classe A/de Classe B (selon le cas) prescrites dans le règlement sur le brouillage radioélectriques 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 computer is available in these configurations:

❑ The Apex 100 provides two 360KB (kilobyte) diskette **drives**

❑ The Apex 100\20 provides one 20MB (megabyte) hard disk drive and one 360KB diskette drive.

Both models come with 640KB of internal memory, five 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®—an operating system by Microsoft.® In addition to the introduction to MS-DOS provided in this manual, you'll find a comprehensive reference manual for the operating system pack4 in the box with your 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 8087-1, 10 MHz 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 models of the Apex computer except where indicated otherwise.

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

Chapter 3 provides basic instructions for using MS-DOS with your computer.

Chapter 4 describes how to install option cards in your computer.

Chapter 5 contains troubleshooting tips in case you encounter any problems while using your computer.

Appendix A explains how to change the DIP switch settings and run the Setup program if you modify your computer's configuration.

Appendix B gives the technical specifications for the computer.

Appendix C provides information on the power-on diagnostics.

Appendix D 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 E describes how to perform a hardware-level format on the hard disk. You need to do this only if you are having serious problems with the hard disk in your Apex 100\20 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 F 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.

At the back of the manual you'll find a glossary of computer terms 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 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 instruction 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.)

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. Please have the computer's serial number ready when you call.
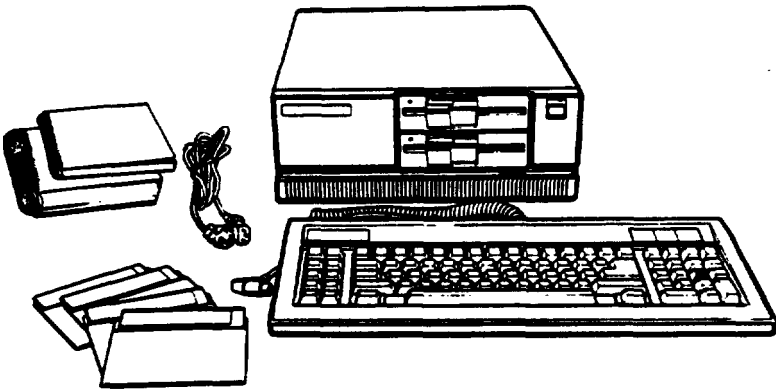
Besides this manual, you should have the following:

❏ 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 video 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.

> **Note**
> If you chose a monitor that is not compatible with the MGA card, you'll also need the appropriate display adapter card to use with that monitor.

You'll find a warranty card and a registration card with the computer. Fill out the registration card and mail it to Epson. With this card on file, Epson can send you update information.

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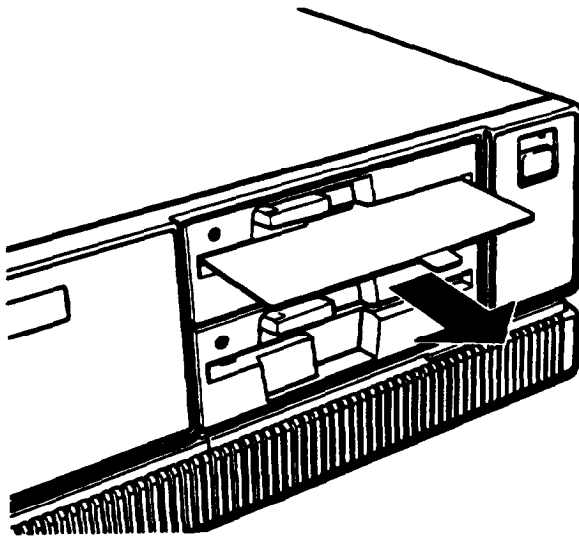
Save the protector **card** and reinsert it whenever you **move** the computer. If you don't plan to use your computer for a week or **more, reinsert** the card to help prevent dust from entering the disk drive.

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 its components. Make sure the surface is hard and flat. Soft surfaces like beds and carpeted floors **attract static** electricity, which **can 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 grounded outlets. You need one outlet for the computer, one for the monitor, and additional outlets for a printer and any other peripherals. You can plug one peripheral 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.)

❑ 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 to attach the monitor to the computer. You can connect a monochrome or color graphics monitor to this card.

Note
If you are using another type of monitor with your computer—such as an EGA (enhanced grapics adapter) or VGA (video graphics array)—you need a compatible display adapter card to control if. If the optional card is not already installed in the computer, you need to do this before you can connect the monitor. See Chapter 4 Fox instructions on installing an option card (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 the backs of the monitor and the computer are facing you.

2. If necessary, connect the monitor cable to the monitor. (Some monitors-such as the Apex-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 by hand or with a screwdriver, depending on the screw type.

retaining screws
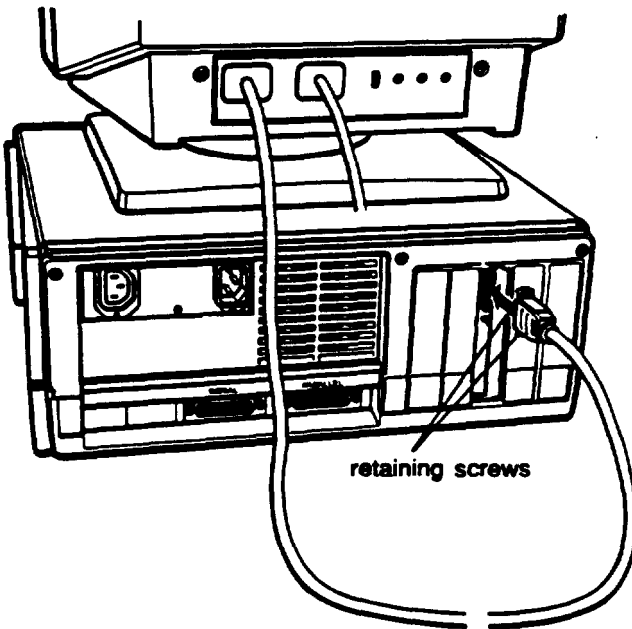
4. If necessary, plug the monitor's power cord into the monitor's power inlet.

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

    Note
    If the monitor has the proper type of plug, you can plug at into the auxiliary power outlet next to the AC power 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 to match the type of monitor you are using, either color or monochrome.
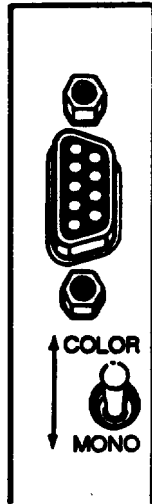
7. The Apex computer is set up to use an 80-column, color monitor. If you are connecting any other type of monitor, you need to change two of the DIP switches (1-5 and 1-6) on the computer's front panel to match the monitor and display adapter you are using. See Appendix A for instructions on changing the DIP switches.

4 Connecting a Peripheral Device

The computer has a parallel interface and a serial interface on the back panel; so you can easily connect a printer or other 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 the 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, check with the store where you purchased the computer.

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 in the following illustration. If the plug has retaining screws, tighten them by hand or with a screwdriver, depending on the screw type.

retaining
screws

3. Connect the other end of the cable to the printer as shown below. If the printer has retaining clips on each side of the printer port, squeeze them 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 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. The Apex uses a 25-pin male connector, so be sure you have the proper cable. If you are not sure, check with the store where you bought the computer and printer.

To connect a serial device, follow the same steps outlined above for a parallel device, but connect the cable to the serial port.
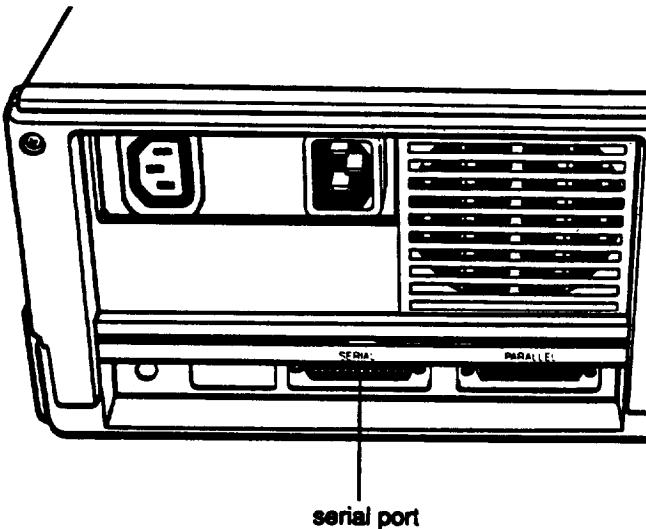
serial port

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 use the serial printer:

❑ Set up the data transmission parameters for the port

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

The Setup program on your Reference diskette lets you define the baud rate, parity, data length, and number of stop bits for a primary and a secondary serial port. See "Running the Setup Program" in Appendix A for instructions.

To redirect the printer data you can use either the MS-DOS MODE command or the Epson MENU utility. (MENU provides 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 power inlet on the 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.
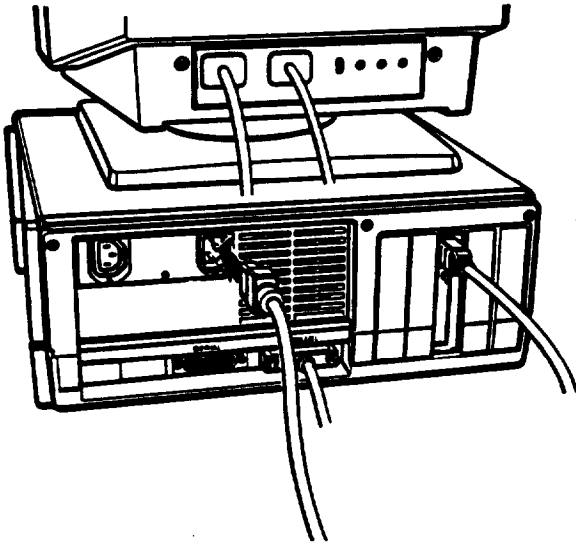
2. Plug the other end of the power cord into a three-prong, 120-volt, grounded electrical outlet.

6 **Connecting the Keyboard**

Follow these steps to connect the keyboard:

1. Facing the front of the computer, open the cover on the lower right comer; use the tip of your finger to pull it open from the right side.
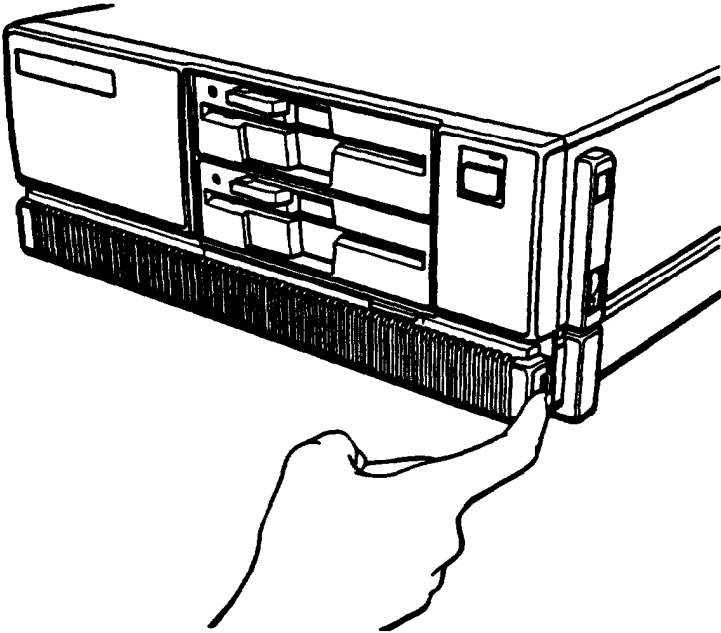
2. Plug the keyboard cable into the socket, as shown below. Do not force the connector, but be sure to insert it all the way.
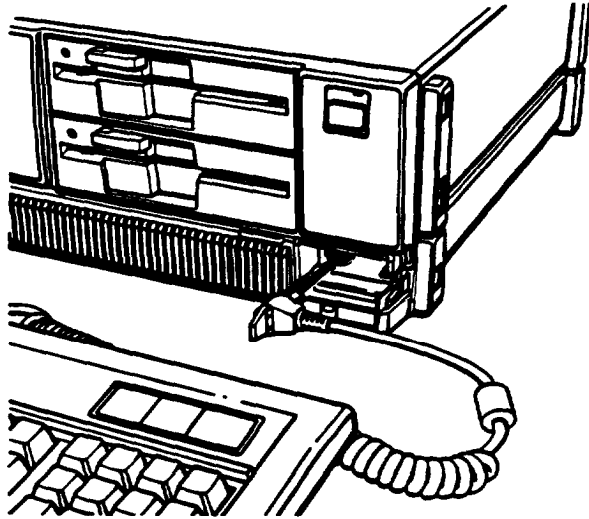
3. Push the cable into the notch at the right side of the computer, as shown below, so the cable leads away to the right side of the computer.

notch
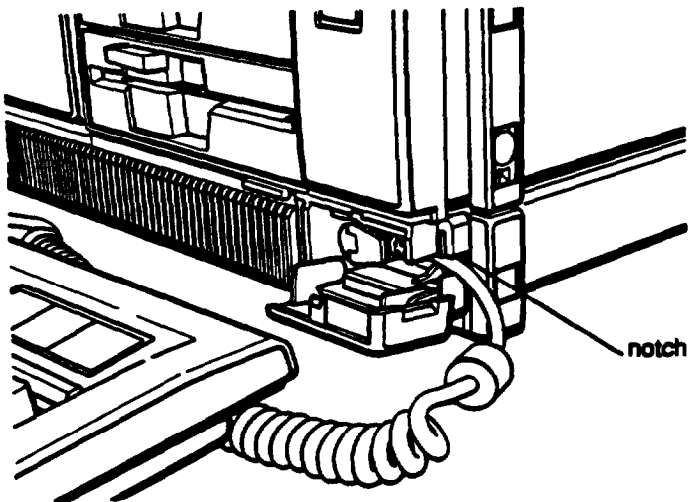
4. Close the keyboard cable cover.

Adjusting the Keyboard Angle

You can change the angle of the keyboard by adjusting the legs on the bottom. Follow these steps:

1. Turn the keyboard over.

2. Press down on the front part of each leg, as shown below, and then use your thumbs to lift up the legs until they lock into place.
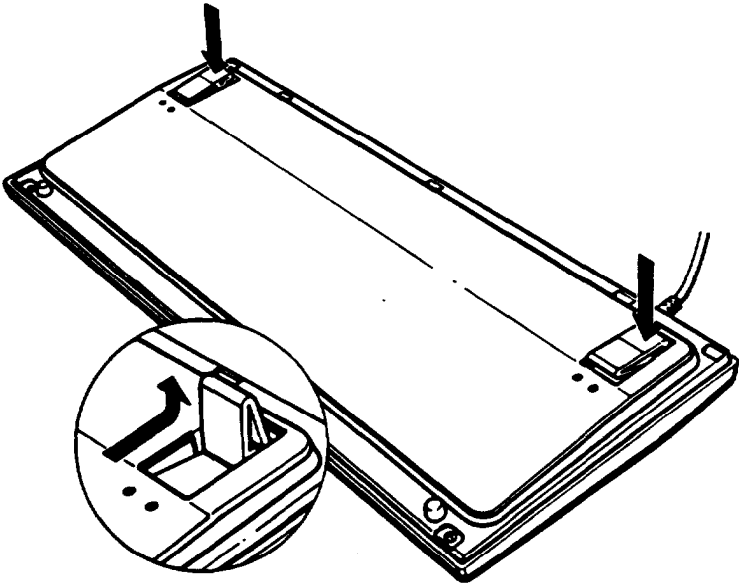
3. Turn the keyboard right-side up.

7 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 a whole disk unusable.

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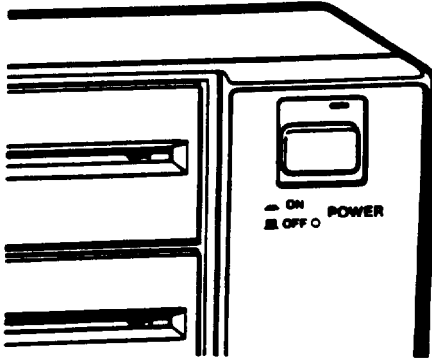
The power indicator on the front panel lights up. After a few seconds, the computer starts to perform an internal self test. This is a series of checks the computer completes each time you turn it on to make sure everything is working correctly. If anything is wrong, an error message appears on the screen.

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.

8 Loading MS-DOS

Once the computer completes its self test, it tries to load MS-DOS, the operating system, into the computer's 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.

If you have the Apex 100\20, the computer automatically loads MS-DOS from the hard disk and you see the MS-DOS command prompt on the screen:

C : \ >

Go on to the section below called "The Command Prompt."

If you have the Apex 100 (no hard disk), the computer does not load MS-DOS, but instead displays the following:

```
Non-system disk or disk error
Insert system diskette in drive A
and strike any key when ready
```

These messages tell you that you need to insert the MS-DOS Startup (system) diskette in the top drive, drive A, so the computer can load the operating system. Follow the instructions below.

Note
You can turn on the computer with Startup diskette in the drive. If you do this, the computer loading MS-DOS form the diskette and you do not see the error message.

Loading MS-DOS On the Apex 100

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

1. Insert the Startup diskette into drive A (the top diskette drive), as shown below. Hold the diskette with the label facing up and the read/write slot leading into the drive.
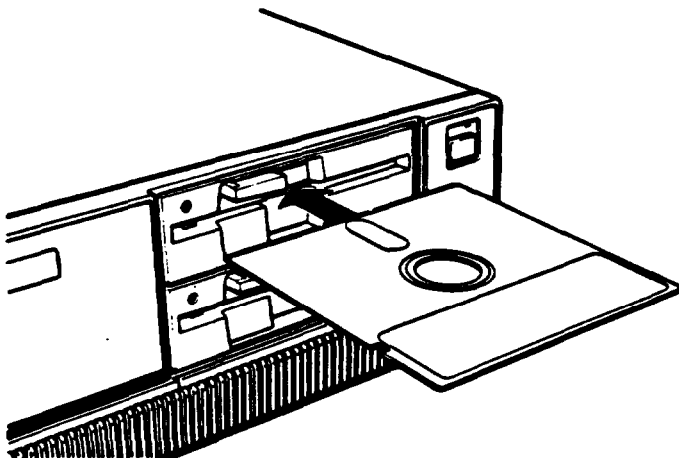
2. When the diskette is in all the way, turn the latch down (clockwise) to lock the diskette in place. (For detailed instructions on inserting diskettes, see Chapter 2.)

3. Press any key. 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  7-24-1989
Enter new date (mm-dd-yy):
```

4. If the date is correct, press Enter to leave it unchanged. To correct the date, enter it in the order shown, using one or two digits for the month, day, and year, separated by dashes. For example, to set the date for August 30, 1989, you would type the following:

```
8-30-89
```

5. Next the screen displays the time prompt, such as this:

```
Current  time is 09:32:21.77
Enter new time:
```

If the time is correct, press Enter to leave it unchanged. To correct the time, use a 24-hour clock to enter the time in the format shown, using one or two digits for each part (you can omit the seconds, if desired). For example, to change the time to 1:30 p.m., you would type the following:

```
13:30
```

The screen displays the MS-DOS command prompt:

```
A>
```

You need to set the date and time this way only once; the computer's real-time clock keeps track of the date and time even when the computer is off. The next time you load MS-DOS, you can **just** press Enter when you see each of these prompts to accept the displayed date and time.

MS-DOS updates months and years correctly-whether the month has 31, 30, 29, or 28 days—and even accounts for leap years. You may **need** to change the time later, however, to accommodate a change **such** as daylight savings time.

> **Note**
> **You can also change the date and time with the Setup program or with the MS-DOS DATE and TIME commands. The Setup program is described in Appendix A. The DATE and TIME commands are described below for the Apex 100\20 and in the MS-DOS manual.**

The Command Prompt

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

On the Apex 100, the top diskette drive **is** drive A and the bottom diskette drive is B. On the Apex 100\20, the diskette drive is A and the hard disk is drive C. MS-DOS reserves the label B for a second diskette drive, whether or not it is installed.

If you load MS-DOS from a diskette in drive A, the command prompt looks like this:

    A>

If you load MS-DOS from the hard disk, the command prompt looks like this:

```
C:\>
```

The hard disk prompt is different because the Apex 100\20 has been set up with a special command that changes the command prompt to show the current directory. (A directory consists of a group of files stored together under an identifying name. See Chapter 3 for a complete description of directories.)

The command that changes the command prompt is called PROMPT and it is stored in a file called AUTOEXEC.BAT. The AUTOEXEC.BAT file contains a series of commands that your computer performs each time it loads MS-DOS. You can add commands to this file to automate a set of procedures you normally perform each time you turn on the computer. See Chapter 3 for more information about using the AUTOEXEC.BAT file.

Note
For consistency, this manual uses the same format for the command prompt for both drive A and drive C, that is: A> and C>.

Setting the Time and Date on the Apex 100\20

The first time you use your Apex 100\20, you need to set the correct date and time for the computer's real-time clock. Follow these steps:

1. At the C> prompt, type DATE and press Enter. The screen displays the following:

```
Current date is Mon 7-24-89
Enter new date (mm-dd-yy):
```

2. If the date is correct, press Enter to leave it unchanged. To change the date, type the appropriate numbers for the month, day, and year, as shown. For example, to set the date for August 30, 1989, type the following and press Enter:

        8-30-89

3. Next type TIME and press Enter. The screen displays the following:

        Current time is 09:32:21.0
        Enter new time:

    If the time is correct, press Enter to leave it unchanged. To change it, enter the time in the format shown using a 24-hour clock. You can omit the seconds, if desired. For example, to change the time to 1:30 p.m., type the following and press Enter:

        13:30

You need to set the date and time this way only once; the computer's real-time clock keeps track of the date and time even when the computer is off. it updates months and years correctly-whether the month has 31, 30, 29, or 28 days-and accounts for leap years. You may need to change the time later, however, to accommodate a change such as daylight savings time.

Note
You can also change the date and time with the Setup program, described in Appendix A.

9 Copying System Diskettes

Now that you have set up your system and loaded MS-DOS, it is important that you make copies of your MS-DOS and Reference diskettes right away. Use only the copies (usually called "working copies") for daily use and store the originals in a safe place.

The procedure for copying diskettes depends on the number of diskette drives you have. Follow the instructions below for your model. You'll need four blank, 360KB, double-sided, double-density, 5 1/4-inch diskettes.

> Note
> If your computer has only one diskette drive and no hard disk, follow the instructions in Chapter 3 for copying diskettes with only one drive.

Be sure to label each diskette as you copy it. Write on the label before you attach it to the diskette to prevent damaging the diskette.

Copying Diskettes on the Apex 100

1. The A> prompt should be on the screen; if it is not, follow the steps in the previous section, "Loading MS-DOS on the Apex 100."

2. Remove the Startup diskette from the cop drive by turning the latch up and pulling out the diskette. Then insert the diskette labelled "Operating 1" and turn the latch down to secure the diskette. The Operating 1 diskette contains the DISKCOPY program which you will use to make the copies.

3. Insert a blank 5 1/4-inch 360KB diskette in drive B (the bottom drive) and turn the latch down to secure the diskette.

4. Type the following and press Enter.

```
DISKCOPY A: B:
```

The screen displays these prompts:

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

5. Drive A (the top drive) already contains a diskette you want to copy (the source diskette) and drive B contains the blank target diskette, so just press any key. The DISKCOPY program begins the copy process.

   If the diskette in drive B is not formatted, the DISKCOPY program formats it. (Formatting prepares a diskette to store data and is described in Chapter 3.) Then the program copies the contents of the diskette in drive A to the formatted diskette in drive B. 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 2 diskette. Again, you see these prompts:

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

7. Remove the original Operating 1 diskette from drive A and the copy from drive B. Insert the Operating 2 diskette in drive A and another blank diskette in drive B. Then follow the instructions above and the prompts on the screen to make a copy of this diskette.

8. Repeat the procedure for the Startup diskette and the Reference diskette.

9. When you finish copying the last system diskette and the Copy another diskette (Y/N)? prompt appears, press N to return to the MS-DOS command prompt.

Copying Diskettes on the Apex l00\20

1. The C> prompt should be on the screen; if it is not, type C : and press Enter.

2. Type the following and press Enter:

   DISKCOPY A: A:

   The screen displays these messages:

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

3. insert the Startup diskette in drive A (the diskette drive), as shown below, with the label facing up and the read/write slot leading into the drive.
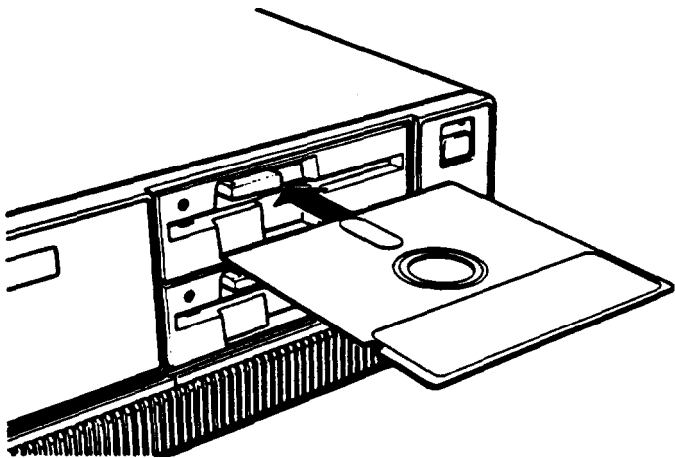
Then `press` any key. The DISKCOPY program copies the contents of the Startup diskette to the computer's memory, and then you see the following:

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

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

   If the diskette is not formatted, the DISKCOPY program formats it. (Formatting prepares a diskette to store data and is described in Chapter 3.) 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)?
   ```

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

6. Remove the copy of the Startup diskette, which you just made, and insert the Operating 1 diskette in the drive. Then press any key. Continue following the prompts on the **screen** to make a copy of this diskette, as you did the Startup diskette.

7. Repeat the procedure to copy the Operating 2 diskette and then the Reference diskette.

8. 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.

Chapter 2
Using Your Computer

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

❑ Changing the operating speed

❑ Using special keys on the keyboard

❑ Interrupting 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: 4.77 MHz or 10 MHz. At 10 MHz, the computer performs all tasks faster, and you will probably use this speed for almost everything you do. Certain application programs, however, have specific timing requirements for diskette access and can run only at the slower speed. See the manual for your application program to determine if this is the case.

Use the CPU switch on the front panel to change the speed. To access the switch, open the cover below the disk drives; press down slightly on the tab to open the cover. Move the switch left for 4.77 MHz or right for 10 MHz.
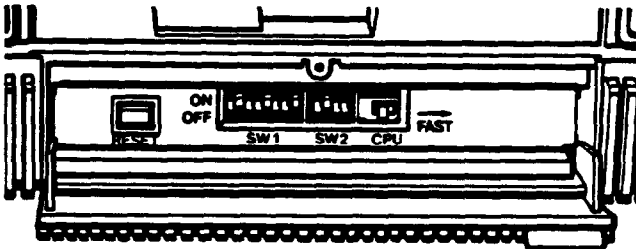
WARNING
You can change the speed while the computer is on, but do
not change it while you are running a program. Complete
your current operation, exit the program to the MS-DOS
command prompt, and then change the speed.

Using Special Keys

Certain keys on your keyboard serve special functions when
your computer is running application programs. The following
illustration shows the keyboard, and the table that follows
describes the special keys.
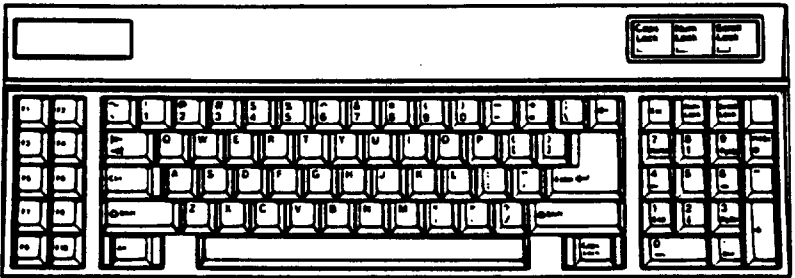
Key	Purpose
F1-F10	Perform special functions within application programs.
Tab	Moves the cursor one tab to the right in normal mode (and one tab to the left in shift mode when using some application programs).
Ctrl	Works with other keys to perform special (control) functions, such as editing operations.
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.
Alt	Works with other keys to enter alternate character codes or functions.

Key	Purpose
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.
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 applications.
Break	When pressed with the Ctrl key, sends a break signal to the computer to terminate the current operation.
PrtSc	When pressed with Shift. prints the screen display on a dot-matrix printer.
Home, End PgUp. PgDn ↑, ↓, →, ←	Control cursor location.
Ins	Turns the insert function on and off.
Del	Deletes the character marked by the cursor.

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 comer of the keyboard is on. When the function is disabled, the light is off.
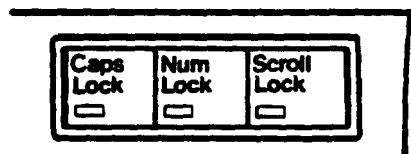
Stopping a Command or Program

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

❏ Hold down the Ctrl key and press C

❏ Hold down the Ctrl key and press Break.

These methods may also work in your application program. If you cannot stop a particular operation, however, you may need to reset the computer, as described in the following section.

Cation

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. The Apex stores your 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 clear the computer's current settings or its memory without turning it off. This is called resetting the computer.

You can reset the computer to reload the operating system. You may need to do this if an error occurs and the computer does not respond to anything you enter on the keyboard; you can reset the computer and try again. However, resetting erases any 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 extra Do not the program unless you have to Same application progress classify and store new data when you exit the program. If you reset the computer without properly exiting the program, you may lose data

To reset the computer, MS-DOS must be either on the hard disk or on a diskette in drive A; so if you have the Apex 100, insert the Startup diskette in drive A.

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 goes blank for a moment and then the computer should reload MS-DOS. If it doesn't, 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 diskette from the diskette drive(s). Turn off the computer and wait five seconds. If you have the Apex 100, insert the Startup diskette in drive A. Then turn the power back on.

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 disk drives.

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 then retrieve and use it when you like. The Apex 100 has two 360KB diskette drives and the Apex 100\20 has one 360KB diskette drive and one 20MB 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. There are concentric rings, called tracks, on the disk in which data is

stored. Double-density diskettes have either 40 or 80 tracks, and high-density diskettes have 80 tracks. The double-density, 360KB diskettes you use in your Apex have 40 tracks.

A hard disk consists of two or more platters stacked on top of one another; so it has four or more sides with many more tracks per side 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.) The diskettes you use on the Apex have 9 sectors per track; other types of diskettes can have 8, 15, or 18 sectors. The number of sectors on a hard disk depends on the type of hard disk.
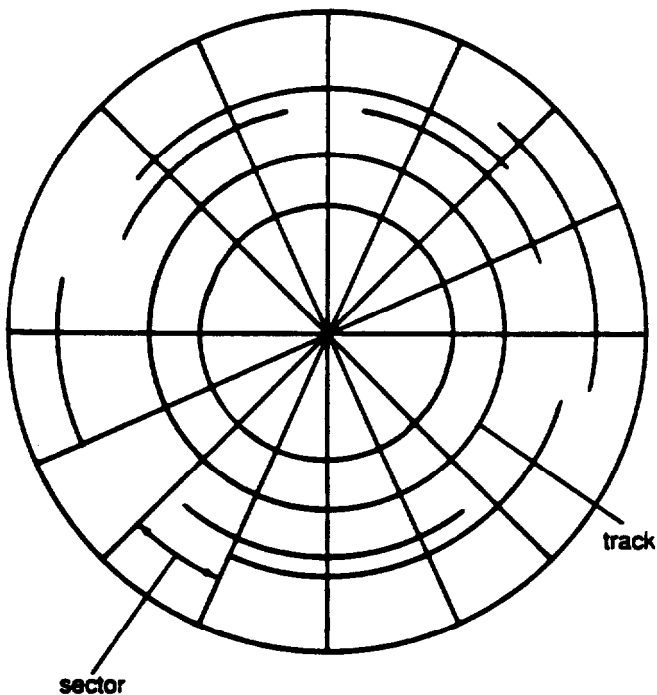
Your computer uses the read/write heads in a disk drive to store and retrieve data on a disk. There is one head above the diskette and one below, so the drive can write to both sides of the diskette. To write to a disk, the computer spins it in the drive to a position where one of the read/write heads 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.

Choosing Diskettes

Your computer uses diskettes that are 5 1/4-inch, double-sided, double-density, 48 TPI (tracks per inch) and have a capacity of 360KB. The diskette boxes are usually marked DS-DD or 2S-2D, soft sector, 48 TPI. Each. 360KB diskette can hold approximately 150 pages of text. For best results, choose only high-quality diskettes with reinforced hub **rings.**

These diskettes are the same type used on IBM-compatible computers with 5 1/4-inch drives; so you can use diskettes in your computer that were prepared and used on another IBM-compatible computer.

Note
Some computers have 5 1/4-inch diskette drives that have a capacity of 1.2MB. You cannot use 5 1/4-inch diskettes that have been formatted for 1.2MB in your 360KB drive. Additionally, if you are using a 360KB diskette that has been formatted in a 1.2MB drive, your computer may have trouble reading that diskette,

If you have an optional 720KB drive, use 3 l/2-inch, double-sided, double-density, 135 TPI, 720KB diskettes with this drive. These diskettes contain 80 tracks per side, 9 sectors per track, and hold up to 720KB of information-approximately 300 pages of text.

> **Note**
> You cannot use 3 1/2-inch diskettes that have been formed for 1.44MB in a 720KB diskette drive.

You need to format new diskettes before you can use them with MS-DOS. The process of formatting erases all data on a diskette and prepares it to receive new data; so be sure to format only new, blank diskettes or diskettes that contain data you want to erase. See Chapter 3 for instructions on formatting diskettes.

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 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. Don't 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 3 1/2-u& 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 and remove the diskette in 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.

If you have the Apex 100\20, 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 need to move the computer, be sure to run the HDSIT program before you turn it off. See "Preparing the Hard Disk for Moving," later in 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.
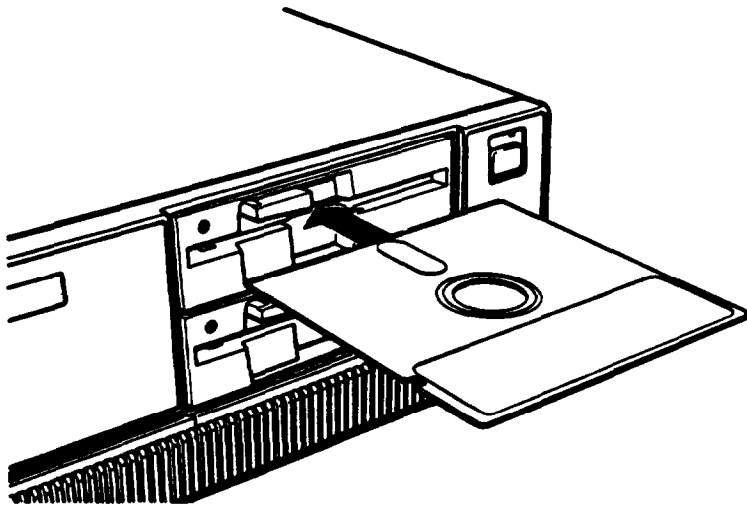
Slide the diskette into the slot until it is in all the way. Then turn the latch down to lock it in a vertical position. This keeps the diskette in place and enables the read/write heads in the disk drive to access the diskette.

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 this:

```
Drive A: not ready
Make sure a diskette is inserted into
the drive and the door is closed
Press any key when ready . . .
```

Close the latch and press any key to continue.

To remove a diskette, turn the 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.

Inserting a 3 1/2-inch diskette

If you have an optional 3 1/2-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.
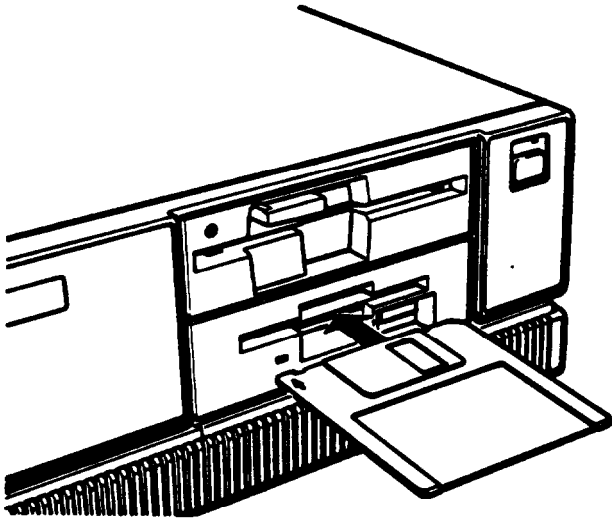
To remove a 3 1/2-inch diskette, press the release button to release it. When the edge pops out of the drive, pull out the diskette and store it properly.

WARNING
Never remove a diskette or num 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 on a **write-protected** diskette, MS-DOS displays an error message.

To write-protect a 5 1/4-inch diskette, cover the small, rectangular notch (shown below) with an adhesive write-protect tab. Write-protect tabs usually come with new 5 1/4-inch diskettes when you buy them.
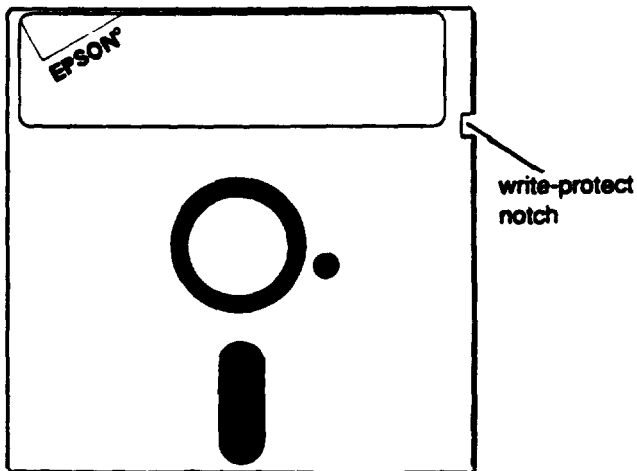
To remove the write protection, peel off the write-protect tab.

On a 3 1/2-inch diskette, the write-protect device is a small
switch on the lower right comer on the back, shown below. To
write-protect a 3 1/2-inch diskette, slide the switch toward the
edge of the diskette **until it** clicks into position, exposing a hole
in the comer.

write-protect switch
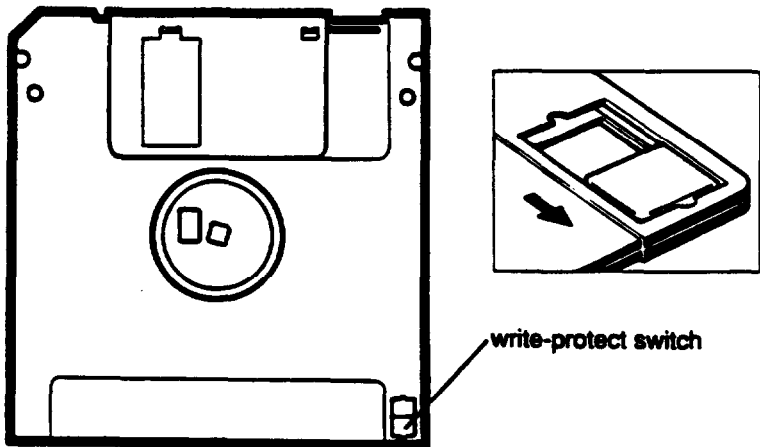
To remove the write protection, slide the switch toward the
center of the diskette so the hole is covered.

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 3 for more instructions on using DISKCOPY and MENU.

If you have the Apex 100\20, 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 3 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 your system has only one diskette drive, MS-DOS treats your 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 a second diskette drive as 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 first diskette you place in the drive (A) to the computer's memory. Then MS-DOS prompts you to insert another diskette (for drive B) and copies the data from memory to the new diskette. When the copying is complete, you see a prompt to insert the original diskette (for drive A).

Because you may often swap diskettes this way, it is important to remember which diskette is which. One way to avoid accidentally losing data is to hold the diskette for one drive in your left hand and the diskette for the other in your right. It is also a good idea to write-protect your original diskette.

On the Apex 100\20, you can load the operating system and application programs from the hard disk, create and store your data there, and use the diskette drive **just** for copying data to or from diskettes.

> Note
> If you have only one diskette drive and no hard disk, you need to use that drive to load the operating system as well as the application programs you are using. First load the operating system; this copies if to the computer's memory (RAM) so you do not need to leave the system 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 do on a diskette. The hard disk, however, provides several advantages:

❏ The 20MB hard disk can store as much data as 55 360KB diskettes-approximately 10,000 pages of text

❏ 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 3 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. This program is especially useful on the hard disk drive because of the large number of files the disk can hold. See Chapter 3 for an introduction to XTREE or see your MS-DOS Reference Manual for complete instructions.

The hard disk in your Apex 100\20 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 to prepare it for use. If you think this may be the case, see Appendix F for instructions.

Backing up hard disk files

While the hard disk is very reliable, it is essential to back up your hard disk files onto 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. Be sure to copy your data files 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 application program diskettes. For instructions on using these programs, see Chapter 3 (or see your MS-DOS manual).

Preparing the hard disk for moving

If you need to move your Apex 100\20 to a new location-
whether it is across the **country** or just across the room-there
is a program you should run to protect the hard disk before you
turn off the computer.

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

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 3
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 plan to use **advanced** features **or** create your own programs, 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. Chapter 1 describes how to load MS-DOS on your computer.

If you have the Apex 100\20, the computer loads MS-DOS from the hard disk automatically when you turn on the computer. If you do not have a hard disk, you need to insert your working copy of the MS-DOS Startup diskette in drive A and then turn on the computer to load MS-DOS. (Alternatively, you can turn on the computer and then insert the Startup diskette to load MS-DOS.)

If the date and time prompts appear, press Enter to accept the date and time shown. The screen then displays the MS-DOS command prompt, A> or C>. This tells you that MS-DOS is loaded and identifies the current drive.

Before you turn off the computer, make sure the A> or C> prompt is displayed. Then remove your diskettes, turn off your computer, and turn off any peripherals.

Starting An Application Program

Once you have loaded MS-DOS, you can start using your application program. If you have the Apex 100, remove the Startup diskette from drive A and insert the program diskette in that drive. If you have the Apex 100\20 and you already copied the application program to the hard disk, log onto drive C (and the appropriate directory, if necessary). If the program is not on the hard disk, insert the diskette in drive A.

Then 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's manual for any instructions on using the program.

Using Drive Designators

MS-DOS uses letters to identify the disk drives in your system.
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.

If you have a hard disk drive, MS-DOS identifies it 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 drive A for a file called WP and executes
the instructions in that file.

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 C>
displayed on your screen, you **know that the default** drive is C.
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 B, you would type the following:

    B:PROGRAM

MS-DOS loads and executes the file named PROGRAM from drive B, 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** he used at any time once **MS-DOS is loaded into memory.** External commands are stored on your system diskettes as program files.

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

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

Reference diskette

ALTPTST.DIG	FDDTST.DIG	MONOTST.DIG
ALTSTST.DIG	FORMAT.COM	MPRTTST.DIG
AUTOEXEC.BAT	HDFMTALL.COM	PARATST.DIG
COLRTST.DIG	HDSIT.EXE	ROMBIOS.COM
COMMAND.COM	HDTST.DIG	SERITST.DIG
CO87TST.DIG	KEYST.DIG	SETUP.EXE
DIAG.COM	MAINTST.DIG	SYSTAT.COM
DIAGSYS.COM	MEMTST.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 the Apex 100\20, all the external files are on your hard disk (drive C) in a directory named \DOS; so MS-DOS can find any external command you need.

If you have the Apex 100 (with 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 the Startup diskette is in drive A and you are logged onto that drive, and you want to format a diskette that is in drive B, you could enter the command as follows:

```
FORMAT B:
```

In this case, MS-DOS looks on drive A, the default drive, for the file named FORMAT.COM and 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-LXX 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 co 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
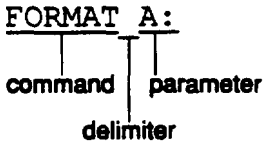
FORMAT is the command name to execute the file FORMAT.COM. The A: is a parameter that tells the command what to format-in this case, the diskette in drive A. The apace between FORMAT and A: is the delimiter that lets MS-DOS distinguish the command name (FORMAT) from the parameter (A:).

Some commands also have optional switches you can use. A switch is a type of parameter that alters the effects 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:  B:/1
```

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

See your MS-DOS Reference Manual for a more detailed explanation of 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:

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

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 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 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 a file named REPORT from the diskette in drive A to the diskette in drive B (using the same name for the copy as for the original file), type the following and press Enter:

    COPY A:REPORT B:

You now have two files named REPORT, *one* **on the** diskette in drive A and one on the diskette in drive B.

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

    COPY A:REPORT B:FACTS

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

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 current 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
the diskette in drive B, type the following and press Enter:

```
COPY A:*.* B:
```

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? B:
```

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.

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

```
COPY A:REPORT + A:FACTS + A:MEMO B: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; so be careful that you do not accidentally erase a file you want to keep.

❑ If you are copying to another 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
```

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 B with the extension .NEW to .OLD, type the following and press Enter:

```
REN B:*.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 MEMO1 and MEMO2 to MEMO1.OLD and MEMO2.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 B, type the following and press Enter:

```
DEL B:REPORT.AUG
```

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

```
DEL B: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), you could 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 could 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. Of course, 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 on 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 LPT1.)

3. Type the name of the device, such as LPT1, 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 360KB
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
```
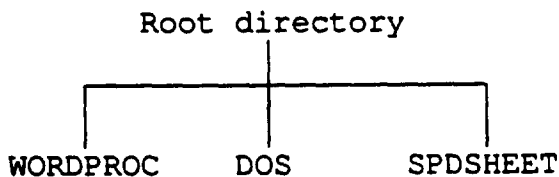
This arrangement would enable you to keep your word
processing programs and data files in a directory called
WORDPROC, **your** spreadsheet program and data files in a
directory called SPDSHEET, and the MS-DOS files in a
directory called DOS. The few files that MS-DOS needs to find
as soon as you boot 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
```
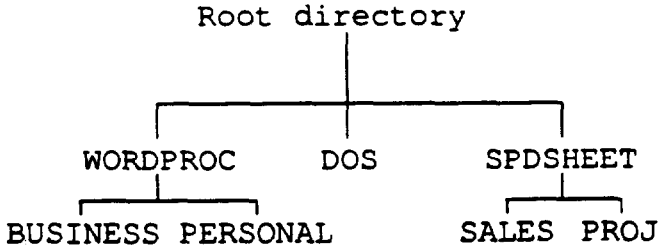
This structure would let you segregate your business word
processing files from your personal word processing files, and
your sales spreadsheets from spreadsheet files used for financial
projections.

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 the hard disk and
    112 on a 360KB diskette.

❑   All directories other than the root directory can have any
    number of files and subdirectories.

❑   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 **&fault** 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 (malting 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) or you can use an absolute pathname. (The . . symbol always designates the parent directory, which is the level above the current directory.) In other words, you can type:

```
CD . .
```
or
```
CD \WORDPROC
```

Using Pathnames

A pathname tells MS-DOS how to find its way to the directory you want to access. There are two 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 its search 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 . . (two periods) 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\JEAN1204.DOC
```

This command tells MS-DOS to list on screen (TYPE) the contents of the file JEAN 1204.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\JEAN1204.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 JEAN 1204.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 which is the default directory on another drive, 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 B:\WORDPROC\PERSONAL

Note
MS-DOS provides several commands that make using
pathnames easy:

APPEND lets you set a search path for date files and
executable files so MS-DOS known where to find them
even if you don' specify the drive and directory.

PATH lets you specify a search path for commands and
programs 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 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>       S-23-89   3:24p
LETTERS        <DIR>       7-13-89   1:48p
RESUME.713      8293 7-29-89   9:07a
BOOKRPRT       10866 6-18-89 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.)

The formatting procedure you use depends on whether you have the Apex 100 or the Apex 100\20. Follow the instructions below for your configuration.

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.**

Formatting Diskettes on the Apex 100

1. Make sure you are logged onto drive A, with your working
   copy of the MS-DOS Startup diskette in the drive.

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

   ```
   FORMAT B:
   ```

   You see this prompt:

   ```
    Insert new diskette for drive B:
    and strike ENTER when ready
   ```

3. Insert the diskette you want to format into drive B and
   press Enter to start formatting.

4. When the diskette is formatted, you see a message similar
   to this:

   ```
   Format complete
   362496 bytes total disk space
   362496 bytes available on disk
   Format another (Y/N)?
   ```

   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. See the MS-DOS Reference Manual for information **about** options you can use with the FORMAT command.

Formatting Diskettes on the Apex 100\20

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.

4. When the diskette is formatted, you see a message similar to this:

    ```
    Format complete
    362496 bytes total disk space
    362496 bytes available on disk
    Format another (Y/N)?
    ```

    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. 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 from the diskette drive. insert the diskette you want to format into drive A and press Enter.

4. When the diskette is formatted, you see a message similar to this:

        Format complete
        362496 bytes total disk space
        362496 bytes available on disk
        Format another (Y/N)?

    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.

Backing Up Data

It is 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
The MENU and XTREE programs provide alternative ways to perform the functions listed above. 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 5 1/4-inch, 360KB diskette to a 3 1/2-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 procedure for copying diskettes depends on whether you have one or two diskette drives. Follow the instructions below for your model.

Using DISKCOPY with the Apex 100

1. Make sure the diskette you want to copy is write-protected. (See Chapter 2 for instructions.)

2. Insert the Operating 1 diskette in drive A.

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

   ```
   DISKCOPY A: B:
   ```

   MS-DOS prompts you to insert your diskettes:

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

4. Remove the Operating 1 diskette from drive A. Then insert the diskette you want to copy from (the source) into drive A and the diskette you want to copy to (the target) into drive B. Then press any key. If the target diskette is not formatted, DISKCOPY formats it and then begins copying.

   When the copy is complete, you see this message:

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

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

Using DISKCOPY with the Apex 100\20

1. Make sure the diskette you want to copy is write-protected.
    (See Chapter 2 for instructions.)

2. If necessary, type C : 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) 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 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 Chapter 2 for instructions.)

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

3. At 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 **chat** 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 57 360KB diskettes to copy a 20MB hard disk that is completely full.

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

Special Epson Utilities

Epson has included several time-saving utilities to make MS-DOS easier for you to use:

❑ HELP 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, and it is especially useful for managing data on a hard disk.

Each of these programs is described below.

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.

Note
The HELP program requires two files, HELP.COM and HELP.TXT, which are on the Operating 2 diskette. If you have the Apex 100, be sure the Operating 2 diskette is in one of your diskette drives and you are logged onto that drive.

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

The MENU program lets you display a menu of MS-DOS commands and select the one you need. MENU is easy to use because you can execute commands without having to remember the exact syntax for each command.

Follow these steps to access the MENU program:

1. Log onto drive C (if you have a hard disk) or insert the Operating 2 diskette into drive A and log onto that drive.

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.

Because MENU works by calling other external commands, you
may occassionally see an error message similar to this when you
select an option:

```
  SETPRINT.EXE not on the current disk.
  Press any key to continue...
```

This message appears if you try to run MENU from a diskette
that does not contain the command called by MENU-in this
case, SETPRINT. (This does not happen on the Apex 100\20
because the hard disk is set up with a PATH command so
MS-DOS can find the appropriate command.)

If you see this message, insert the diskette that has the
command in the diskette drive and try again. (See "Types of
MS-DOS Commands" at the beginning of this chapter to
determine which commands are on which MS-DOS diskettes.)

Note
If you find that you frequently have to swap diskettes
while using MENU, see the description of MENU in your
MS-DOS Reference Manual for some recommended
solutions.

MENU program options

Following is a description of each option. For step-by-step instructions on using each MENU option, see your MS-DOS Reference Manual.

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. This option also lets you 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 Epson HELP program.

Enter DOS Command
Lets you run other MS-DOS commands without leaving the MENU program.

See your MS-DOS Reference Manual for a complete description of the MENU program.

Using XTREE

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 disk

❑ 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.

Follow these steps to run XTREE:

1. Log onto drive C (if you have the Apex 100\20) or insert
the Operating 1 diskette in drive A.

2. Type XTREE at the command prompt and press Enter.
When XTREE is loaded, you see a menu similar to the one
on the following page.

```
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.

\
└─DOS   The directory structure illustrated under
                   this backslash reflects the organization of
                   the directories on the disk. In this case,
                   there is one subdirectory called DOS. If
                   there are no directories listed under the
                   backslash, the disk contains no
                   subdirectories under the root directory.

PILE   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.

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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 cursor 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.

The hard disk on the Apex 100\20 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 on 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:

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

The first line tells MS-DOS to look for programs or batch files
in the root directory and the DOS directory. This way you can
run programs in those directories without having to specify
pathnames in the commands.

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

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 the
    working copy of your MS-DOS Startup disk, insert the
    diskette into drive A. if you are creating an
    AUTOEXEC.BAT file on your hard disk, log onto the root
    directory of your hard disk. (Type CD C : \ and press
    Enter.)

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 more information.

Using HDCACHE for the Hard Disk

If you have the Apex 100\20, 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 4
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.

You can install up to five 8-bit option cards in the computer at one time, but one slot is occupied by the video card that operates your monitor. If you have the Apex 100\20, another slot contains the hard disk drive controller card.

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

If you add an optional disk drive controller card, you also need to change a jumper setting.

This chapter describes how to:

❏ Remove and replace the computer's cover

❏ Install and remove an option card

❏ Change a jumper setting.

Removing the Cover

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

WARNING
Never open the case of the computer while it is plugged into an electrical outlet. Turn off the power switch of 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. The back panel is secured with three screws, as shown below. Remove the screws and put them aside. Take the back panel off the computer.
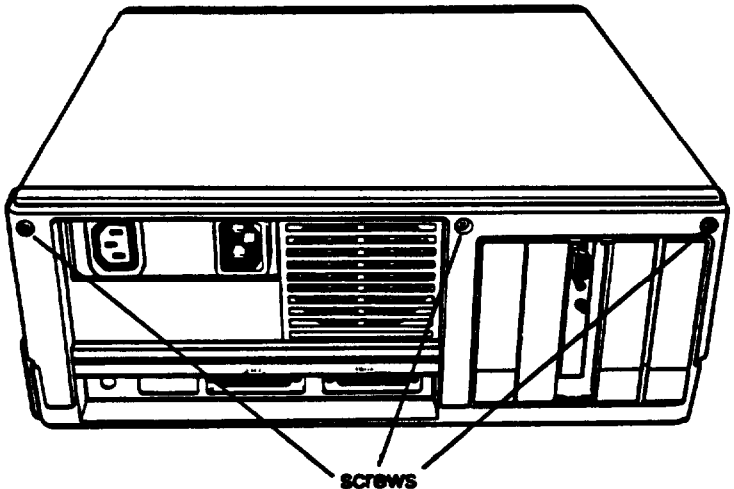
screws

3. The top cover is secured by two screws on each side of the computer. The two screws on the left side of the unit **are** covered by small plastic inserts, as shown below. Gently remove the inserts with a small screwdriver; then remove the screws on both sides of the computer. Put the screws and inserts safely aside.

screws
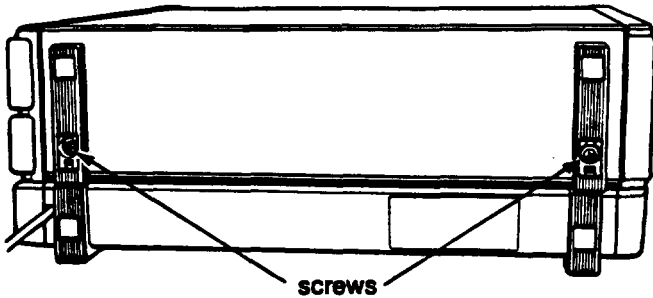
4. Tilt the cover up slightly from the back and pull it toward you and away from the computer, as shown below. Set the cover aside for now.
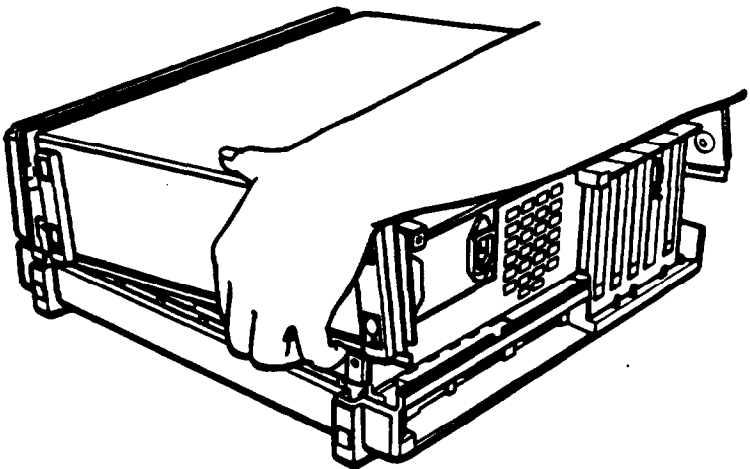
Inserting an Option Card

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 must remove the
MGA card that comes installed in your computer.

Even though option cards are designed to fit only one way, it is
a good idea to examine the card first and follow the
instructions closely.

1. Decide which option slot you want to use; then remove the
    retaining screw and washer from the metal cover plate at
    the back of the slot. (Hold onto the screw and washer as
    you remove them so that they don't fall into the
    computer.) Lift out the metal cover, as shown below.
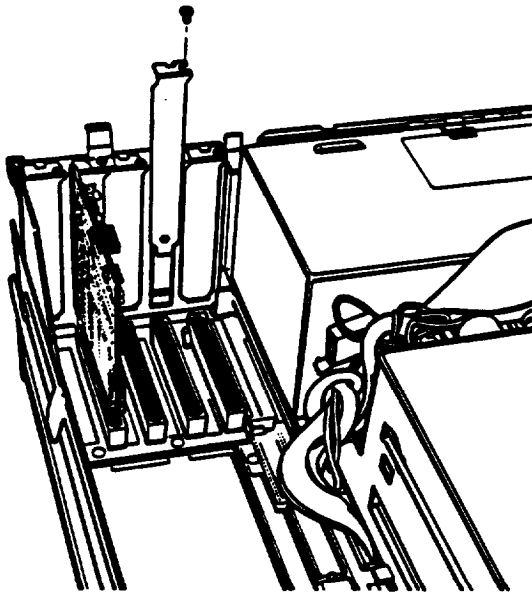
2. Put the option slot cover in a safe place in case you later remove the option card. Keep the screw and washer. You will use them to secure the option card to the computer. If you select one of the two slots that has a grounding tab attached, be sure to replace it in step 6.

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

   If you are installing an optional disk drive controller, see "Optional Disk Drive Controllers" later in this chapter.

   Note
   Pay specific attention to the warnings in your option card instructions. Some devices have delicate CMOS chips 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 it with 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.

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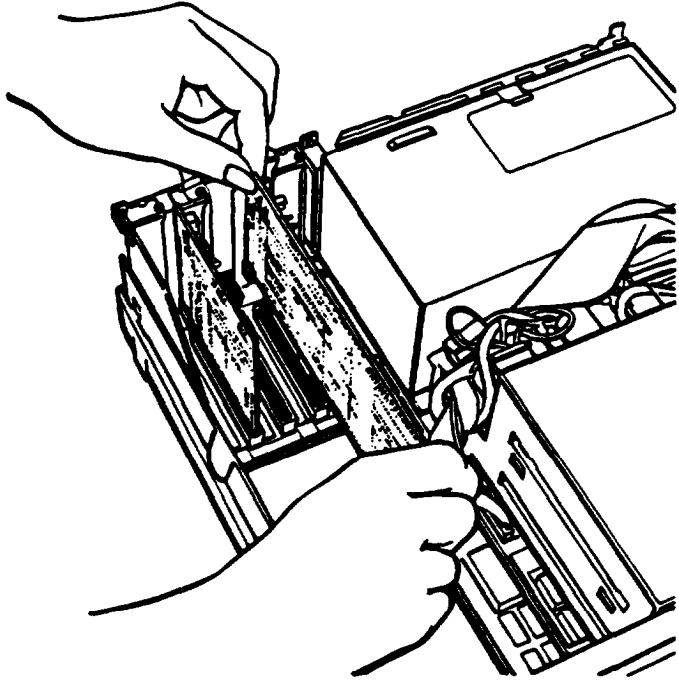
5. Insert the card straight down into the slot. Once the connector pins are in the connector slot, push down firmly (but carefully) to fully insert the card. If the connector pins do not seem to be going in smoothly, do not force the card; pull it all the way out and try again. Be sure to keep the card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

6. Secure the retaining bracket to the frame of the computer with the small screw and washer. Also replace the grounding tab if there is one.

Removing an Access Slot Cover

Some option cards, such as the video card, have an outlet for connecting an external device. If you install an option card that has an external connector for other equipment (such as a monitor), you need to remove the plastic **access** slot cover on the computer's back panel that corresponds to the option card slot. Follow these steps:

1. Lay the back panel down as shown below. Each individual access slot cover is held in position by a tab at the bottom and a clip at the top.
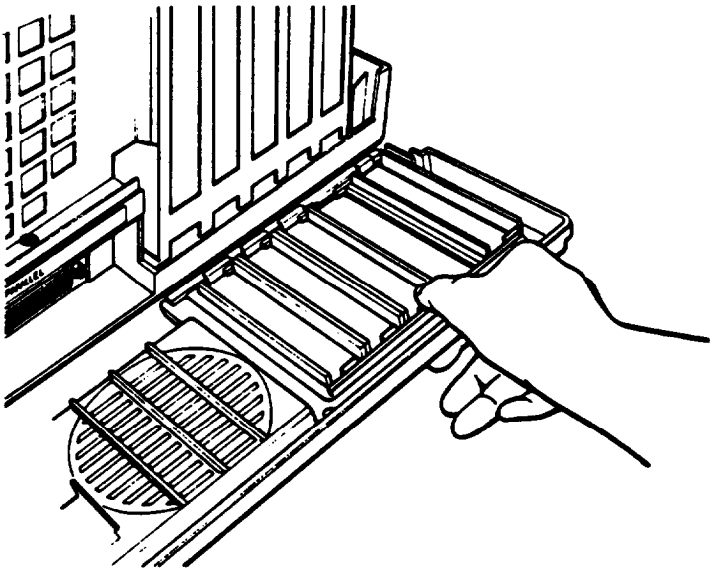
2. Remove the appropriate cover by pushing down on the clip, as shown above. Save the cover in case you need to remove the option card later.

Removing an Option Card

If you later 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

After you have installed or removed an option card (and have changed any necessary jumpers or DIP switch settings on the option card or on the main system board), the last step is to replace the cover of the computer:

1. With the back of the computer facing you, hold the cover over the computer with the side feet to the left of the computer and the front edge pointing slightly downward.

2. Lower the cover onto the bottom half of the case, as shown below, making sure that the bottom edges fit inside the case. At the same time, slide the front edge beneath the top edge of the front panel. Finally, lower the back of the cover so that it is in position.
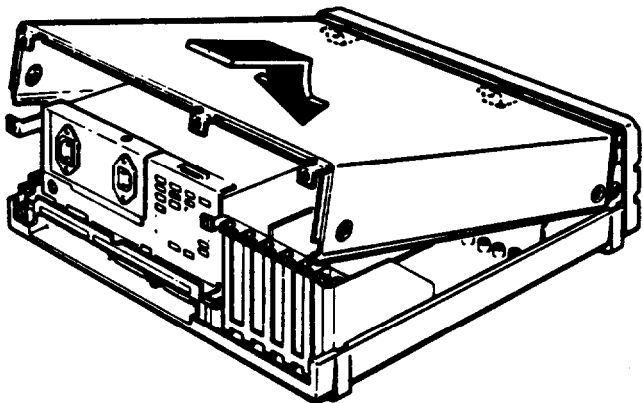
3. Secure the cover by replacing the screws on both sides of the computer. Snap the plastic inserts into the side feet.

4. Replace the back panel and the three screws along the top edge.

5. Return the computer to its original position and reconnect it to the monitor, the keyboard, and any 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 an option card, you may need to change the computer's DIP switches to update the configuration information. For example, if you install an EGA card, you need to change switches 1-5 and 1-6 so the computer knows what type of display adapter you are using. See Appendix A for information about the DIP switches.

If you add a second serial port, you may want to run the Setup program to define the data transmission parameters for that port. See Appendix A for instructions on using 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 option 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 Reference diskette include the following:

❑   Expansion memory

❑   8087-1 math coprocessor

❑   Serial and parallel ports

❑   Monitors and display adapters

❑   Disk drives.

See Appendix D for instructions.

Optional Disk Drive Controllers

The built-in disk drive controller in your computer can control two 360KB (5 1/4") or 720KB (3 1/2") diskette drives. If you install an optional disk drive controller card in your computer to control the diskette drives, you must connect the drives to the option card, and disable the computer's built-in controller by changing a jumper setting.

Installing the Optional Controller

First remove the cover of the computer as described earlier in this chapter. Then see the documentation supplied with the optional disk drive controller card for detailed instructions on how to connect the drives to the option card.

The drive cables for drives A and B are normally connected to connector CN5 on the system board (shown in the following illustration). If a different cable is supplied to connect the drives to the optional controller card, make a careful note of how the original drive cable was connected and remove it from the computer. Keep it in a safe place in case you need to remove the optional controller for any reason.
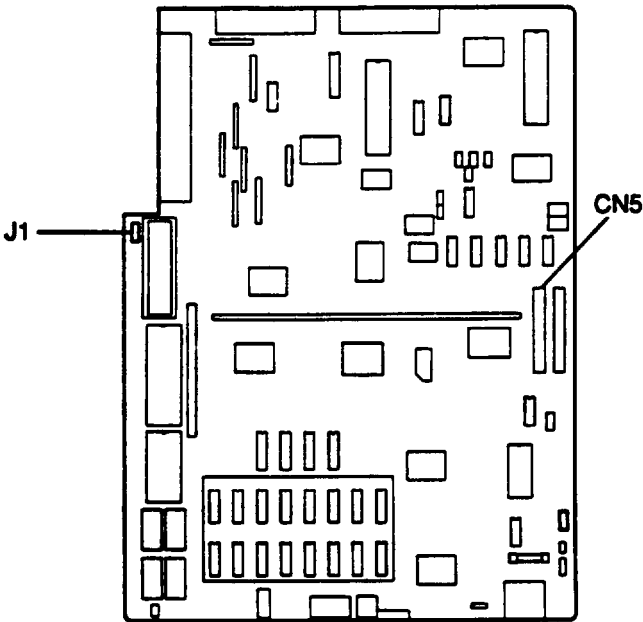
Changing the Jumper Setting

To disable the built-in diskette drive controller, you need to change the setting of Jumper J1 on the main system board. See the illustration above for the location of this jumper, near the option slots. If an option card is installed in slot number five, you may need to remove the card to reach the jumper.

A jumper is a small electrical connector that controls one of the computer's functions. A jumper's setting is determined by where the jumper is placed: either between pin A and the middle pin (position A) or between pin B and the middle pin (position B), as shown below.
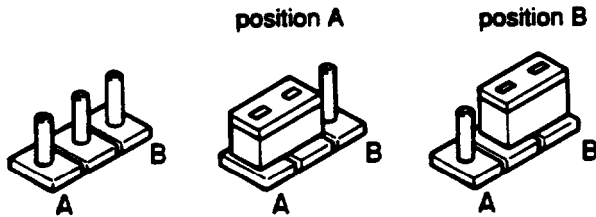
The factory setting for Jumper J1 is position A. To disable the internal diskette drive controller, move the jumper to position B. Use needle-nose pliers or tweezers to lift it off the board and gently move it to the other position. Be careful not to lose it or leave it out of the computer.

If you have also installed an additional disk drive, remember to adjust the appropriate DIP switches on the front panel to match the number of drives installed.

Chapter 5
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 solution recommended here, consult your Epson Customer Care Center. (For the location of the center nearest you, call the Epson Consumer Information Center number: 1-800-922-89 11.)

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 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 the 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 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 Locks Up

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 takes longer 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 2 for more information on stopping a command or program.

4. If your computer still does not respond, you can reset it with the RESET button. Follow the instructions in Chapter 2.

5. If resetting the computer does not work, turn off the computer, wait at least five seconds, and turn it on again. If you have the Apex 100, insert the Startup diskette in drive A. The computer should load MS-DOS and display the MS-DOS command prompt on the screen.

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 Locks Up").

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

Monitor Problems

If the monitor is causing problems, check the following:

1. If there is no display on the screen, check that the monitor's **power** switch is on and that the power light on the monitor is lit. If the power light on the monitor is lit 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 color/mono switch on the back of the card is set correctly for your monitor. See "Connecting the Monitor" in Chapter 1 for instructions. Also check DIP switches 1-5 and 1-6 on the front panel of the computer to make sure they are set correctly. See Appendix A for instructions on setting the DIP switches.

   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. Occasionally, 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 D 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. Is the diskette inserted properly? You may have inserted it upside-down or it may not be inserted all the way. Remove the diskette from the diskette drive and reinsert it with the label facing up and the read/write slot leading into the drive. (See Chapter 2 for detailed instructions on inserting and removing diskettes.)

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 drive and repeat the operation. If you can successfully repeat 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. The 360KB drive in your computer uses 5 1/4-inch double-sided, double-density diskettes. You cannot use diskettes formatted for 1.2MB in this drive.

If you have the optional 720KB drive, use 3 1/2-inch double-sided, double-density diskettes. You cannot use 3 1/2-inch diskettes that were formatted for 1.44MB in this drive.

4. If your diskette is the right type for your drive, check to see if the diskette is write-protected. There may be a write-protect tab over the notch on the side of the diskette (5 1/4-inch) or the write-protect switch may be set (on a 3 1/2-inch diskette). You cannot store or revise data on a write-protected diskette. See Chapter 2 for information on write-protecting diskettes.

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

   Is the diskette formatted? A new diskette must be formatted before you can store data on it. See Chapter 3 for instructions on formatting diskettes.

   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 Diskettes" in Chapter 3 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 that may be defective. Consult your MS-DOS Reference Manual for instructions on using RECOVER.

Note
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 the storage information on the diskette incorrectly. This is probably the case if you have one of these problems:

❑ Part of a file is missing

❑ A file includes parts of other files

❑ An expected output file is missing.

To make the necessary repairs, use the MS-DOS program CHKDSK (described in your MS-DOS Reference Manual).

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, Fparameter 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 drive head
    cleaning kit, 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 D 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 the hard disk in your Apex 100\20, try the following steps:

1. 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:

2. 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:

3. 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 FDlSK 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 F, "Preparing a Hard Disk for Use," for instructions.

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

4. 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 D 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.

5. If you have been using your hard disk for a long time and begin to see numerous read/write errors, the magnetic signals on the disk may be getting weak. If this is the case, 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 E to perform a low-level (Conditional) format.

❑ Follow the instructions in Appendix F to prepare the hard disk for use.

6. 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 F for instructions. If it needs a low-level (physical) format, do that before you partition the disk. (See Appendix E 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 program diskette in the top drive (drive A).

2. Your computer can run at either 4.77 or 10 MHz. While almost all programs work properly at the faster speed, some must run slower. 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 Chapter 2 for instructions on changing the operating speed.

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 the Ctrl key and press C

❑ Hold down the Ctrl key and press Break.

4. An application program can occasionally lock the computer, making it unresponsive to the keyboard. If your computer does not respond when you type on the keyboard, you can reset it. Follow the instructions in Chapter 2.

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 see 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 you are using more than one parallel port or more than one serial port, the DIP switches on the computer must he set properly so MS-DOS knows which one is the primary port and which is the secondary port. See Appendix A for instructions.

4. 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 A> or C>) is showing on the screen, press Shift 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 details.

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

6. 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 D 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 properly, check the following:

1. Is the option card installed correctly? Check the installation procedure described in Chapter 4 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 set the necessary DIP switches or jumpers on the option card? See your option card manual for instructions.

3. 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 the necessary DIP switches on the computer? See Appendix A for more information.

4. 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?

5. 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.

Appendix A
Changing DIP Switches and Using Setup

This Appendix describes how to change the DIP switches on the front panel of your computer and how to run the Setup program on your Reference diskette. You may need this information if you have changed the physical configuration of your computer or you want to set the parameters for a serial port.

Changing the DIP Switches

The DIP switches on your computer are set to provide the computer with information about its configuration. Each time you turn on your computer, it checks the DIP switch settings to verify the physical setup of your system.

The DIP switches are located underneath the cover on the front panel, below the disk drives, as shown below:
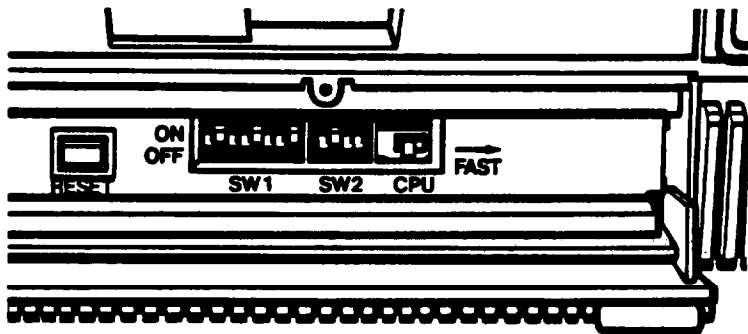
These switches are set at the factory for **your** particular configuration. If you change anything, however—such as the amount of memory, type of monitor, or number of parallel ports-you may need to change a setting.

Note
Set the DIP switches only while your computer is off.
Because software programs check the settings each time you
cum on the system, do not change the settings while a
program is running.

Your computer has two sets of DIP switches; set 1 contains
eight switches which control the computer's internal
operations, and set 2 contains four switches which control the
parallel and serial ports. The label inside the DIP switch cover
shows the function and factory setting of each DIP switch.

A switch is ON when it is up and OFF when it is down. To
change the setting, use a hard, thin object, such as a small
screwdriver or a pencil.

DIP Switch Set 1 (Internal Operations)

The following table lists the system functions controlled by
each switch in set 1.

DIP switch set I

		1	2	3	4	5	6	7	8
Keyboard type	Standard	ON							
	Enhanced	OFF							
Coprocessor	Not installed	ON							
	Installed		Off						
RAM size	640KB			OFF	OFF				
	512KB			Off	ON				
	256KB			ON	ON				
Monitor and adapter type	Color (40x25)					OFF	ON		
	Color (80x25)					ON	OFF		
	Monochrome					OFF	OFF		
	Enhanced					ON	ON		
Number of diskette drives	1							ON	ON
	2							OFF	ON

Switch 1 (keyboard type)—tells your computer what kind of keyboard you are using. If you are using the keyboard chat came with your computer, this switch should be ON to select the standard keyboard. If you have purchased an enhanced (101 - key) keyboard co use with the computer, set this switch OFF.

Switch 2 (coprocessor&cells your computer whether or not an optional math coprocessor is installed. The factory setting is ON to tell the system chat this option has not been installed. If you have installed a math coprocessor, set this switch OFF.

Switches 3 and 4 (RAM size)—indicate how much built-in memory is co be used. Do not change these switches unless you install a memory card and you want to use part of the optional memory co "backfill" the computer's main memory. See the instructions that came with the memory card to see if this is recommended.

Switches 5 and 6 (monitor and adapter type)—define what type of monitor and video card you are using. Set these switches as follows:

❏ If you have a monochrome monitor and video card, set both switches OFF.

❏ If you have an EGA or VGA card, set both switches ON (no matter what type of monitor you have).

❏ If you have a color graphics adapter and an RGB monitor, set switch 5 ON and switch 6 OFF.

❏ If you are using a composite video monitor, and its resolution is poor, you may want to set switch 5 OFF and switch 6 ON. This selects 40-column text mode for your screen and improves the resolution.

Switches 7 and 8 (number of diskette drives)—indicate how many diskette drives your computer has. If you have one drive, set both switches ON so that the operating system knows it must prompt you when you access the drive B diskette. If you have two diskette drives, set switch 7 OFF and 8 ON.

DIP Switch Set 2 (Parallel and Serial Port Operations)

The following cable lists the parallel and serial port functions controlled by DIP switch set 2.

DIP switch set 2.

		1	2	3	4
Parallel	Primary	OFF	ON		
	Secondary	Off	OFF		
	Disable	ON	ON		
Serial	Primary			OFF	OFF
	Secondary			ON	OFF
	Disable				ON

These switches cell the computer how to access the built-in parallel and serial ports. You do not need co change the factory settings unless you install an option card with an additional parallel or serial port. If you do install such a card, read the following information carefully.

Stitches 1 and 2 (paralle port)—tell the computer how co access the built-in parallel port.

The built-in parallel port functions as either the primacy or secondary parallel port. If you install an option card with its own parallel port, you must set these two DIP switches so there is no conflict between the built-in port and the additional port. Here are some examples:

❏ If you install an option card chat has only a parallel port, you must designate it as the secondary port and leave the built-in port as the primary port

❏ If you install an option card chat has both a video port and a parallel port, you must designate this port as primary and make the built-in parallel port secondary.

❑ If you install two option cards with parallel ports, designate one as the primary port and the other as the secondary port. In this ease, you need co set switches 1 and 2 ON to disable the built-in port.

Note
If MS-DOS searches the system for a parallel port and finds only one, it names it LPT1. If there are two parallel ports, it names the primary port LPT1 and the secondary LPT2.

Switches 3 and 4 (serial port)—tell the computer how co access the built-in serial port.

The built-in serial port functions as either the primary or secondary serial port. If you install an option card with its own serial port, you must set these two DIP switches so there is no conflict between the built-in port and the additional port. Here are some examples:

❑ If you install an option card with a serial port pre-set as primary by the manufacturer, you must designate it as the primary port and make the built-in port the secondary port.

❑ If you install an option card or peripheral with a serial port not pre-set, you must designate it as the secondary serial port and the built-in port as the primary serial port.

❑ If you install two option cards with serial ports, designate one as the primary port and the other as the secondary port. In this ease, you need to set switch 4 on to disable the built-in port; it doesn't matter whether switch 3 is ON or OFF.

Note
If MS-DOS searches the system for a serial port and finds only one, it names it COM1. If there are two serial ports, it names the primary port COM1 and the secondary COM2.

Running the Setup Program

You can use the Setup program on your Reference diskette to set (or change) the following for your computer:

❑ Time and date stored in the real-time clock

❑ Primary serial port settings

❑ Secondary serial port settings.

The information you define with the Setup program is scored in the computer's CMOS RAM, which is a permanent area of the computer's memory because it is backed up by a battery. Whenever you cum on the computer, it searches the CMOS RAM for the setup information.

You probably already set the time and date when you first set up your computer; but the Setup program provides another way to verify or change these values.

Similarly, you could use the MS-DOS MODE command instead of Setup to define the serial port parameters. However, unlike MODE, Setup stores your settings permanently so you do not have to redefine them every time you load MS-DOS.

> Note
> If you have already set the date and time and if you are not using a serial port, You do not need to use the Setup program.

Starting Setup

Follow these steps co start the Setup program:

1. Insert the Reference diskette in drive A.

2. Turn on or reset the computer. You see the following Operation menu:

```
OPERATIONMENU

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

0 - Exit to DOS for more utilities

Enter selection number:_
```

This is the menu for the setup and diagnostics programs on the Reference diskette.

3. Press 1 and Enter to select the set up option. The screen then displays the main Setup menu:

```
        Exit
   Real-time clock
  Primary serial port
Secondary serial port
```

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.

Note
Make sure the Num Lock function is off when your are using the Setup program; otherwise the arrow keys do not work. The Num Lock indicator on the top right corner of the keyboard is illuminated when Num Lock is on.

If you do not want to change anything in the Setup menu or if you have finished making changes, press ↑ to highlight the E x i t option. See "Leaving the Setup Program," below, for instructions.

See the appropriate section below for the Setup option you want to use.

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.

Follow these steps to set the real-time clock:

1. Highlight the Real-time clock option 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:

    ```
    1330
    ```

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 keeps 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 Date and press Enter. You see this box:

mm - d d - y y

S. 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:

    08301989

    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 keeps 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.

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.

Changing Serial Port Settings

The primary and secondary serial port settings let you change
the default values for the serial port(s) in your computer. If you
are using the built-in serial port or an additional serial port you
have installed in the computer, use these options to set or
change the parameters required by the port to send and receive
data.

For example, if you have a serial printer attached to the built-in
serial port, you can use the Primary serial port option to match
the computer's parameters to the printer's settings. This
eliminates the need for you to use the MS-DOS MODE
command to set up the serial port when it is needed. (See the
MS-DOS Reference Manual for more information on the
MODE command.)

The primary serial port is the one that MS-DOS recognizes as
COM1 and is usually the built-in serial port. The secondary
serial port is COM2 and this is usually an additional **serial port**
provided by an option card.

Note
You can reverse the assignments so the built-in port is
secondary and the optional port is primary by changing the
DIP switches on the computer and on the optional port. See
"Setting the DIP switches," above, for more information.

To verify or change the primary serial port parameters, highlight `Primary serial port` and press Enter. To change the secondary serial port parameters, highlight `Secondary serial port` and press Enter. For either option, you see a menu similar to this:

```
Baud rate      1200 bps
Parity         None
Data length    7 bits
Stop bits      1 bit(s)
*** SAVE SETTINGS ***
```

The procedure for changing the default settings is identical for the primary and secondary serial ports. Just follow the instructions below to set the parameters as needed. (See the manual for your serial device to determine which parameter settings it requires.)

When you finish changing the settings, highlight `*** SAVE SETTINGS ***` and press Enter to return to the Setup menu.

Baud rate

To set the speed of communication, highlight `Baud rate` and press Enter. The screen displays the following options:

```
  110 bps
  150 bps
  300 bps
  600 bps
 1200 bps
 2400 bps
 4800 bps
 9600 bps
19200 bps
38400 bps
```

Use the arrow keys to highlight the desired communication speed and then press Enter.

Parity

To set the type of parity check, highlight Parity and press Enter. You see the following choices:

```
None
Odd
Even
```

Highlight the desired type of parity check and press Enter.

Data length

To change the data length value, highlight Data length and press Enter. The number changes from 8 to 7, or from 7 to 8. Press Enter again if you want to change back to the other number.

Stop bits

To change the number of stop bits, highlight Stop bits and press Enter. The number changes from 1 to 2, or from 2 to 1. Press Enter again if you want to change back to the other number.

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:

```
Real-timeclock          Time               13:35:31
                        Date               08-30-1989

Primary  serial  port   Baud rate 1200 bps  Parity None
                        Data length 7 bits  Stop bits 1 bit(s)

Secondary  serial  port Baud rate 1200 bps  Parity None
                        Data length 7 bits  Stop bits 1 bit(s)



                   ┌────────────────────────┐
                   │    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 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. If you have the Apex 100, insert the Startup diskette in drive A. If you have the Apex 100\20, leave the diskette drive empty.

3. Highlight `** EXIT AND SAVE **` and press Enter. The program stores the new settings and resets the computer using the new configuration.

4. If you have the Apex 100\20, the C> prompt appears on the screen. If you have the Apex 100, the computer loads MS-DOS from the Startup diskette and displays the date prompt. Press Enter once to accept the displayed date and a second time to accept the time. The A> 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.

Note
If you leave the Reference diskette in the drive and then select ** EXIT AND SAVE ** the computer loads the operating system from the Reference diskette and displays the OPERATION MENU on the screen. Press O and Enter to exit to the MS-DOS command prompt.

Appendix B
Specifications

Main Unit

16-bit CPU	8088-1 microprocessor; 4.77 or 10 MHz clockrate; switch selectable
Main memory	640KB
Coprocessor	8087-1, 10 MHz microprocessor (optional)
Read Only Memory (ROM)	16KB (ROM BIOS)
Direct Memory Access (DMA)	Programmable DMA controller with four channels-two on the motherboard (one for refreshing and one for diskette controller), two available for user peripherals including a hard disk controller
Interrupt (8259)	Programmable interrupt controllers, 8 interrupt levels
Timer/counter (8253-S)	Three programmable timer/counters
Clock/calendar/RAM	Real-time clock, calendar, and **SO-byte** CMOS RAM for configuration, battery back-up
Parallel interface	Standard 8-bit parallel, DB-25 female connector; programmable
Serial interface	RS-232C, asynchronous, DB-25 male connector; programmable

Speaker interface	Internal, controlled by timer/counter
Option slots	Five, B-bit IBM-compatible input-**output** expansion slots; one slot is occupied by a display adapter card and on the Apex 100\20, another contains the hard disk drive controller card

Keyboard

	Detachable, three positions, 84 sculpted keys
Layout	56-key QWERTY main keyboard, l&key numeric pad, 10 function keys (user-definable)
Function keys	Three levels (normal/shift/alternate) user-definable

Mass Storage

	Two internal drives maximum
Standard diskette drive	5 1/4-inch; half-height diskette drive; double-sided, double-density, 36OKB storage capacity
Standard hard disk drive	5 1/4-inch or 3 1/2-inch (5 1/4-inch frame), half-height internal hard disk drive; 20MB storage capacity
Optional	3 1/2-inch (5 1/4-inch frame), half-height diskette drive; double-sided, double-density, 720KB storage **capacity**

Power Supply

Switching type,
fan-cooled

Output voltage:-5 VDC, +5 VDC,
-12 VDC, +12 VDC
Auxiliary AC

Power Requirements: 115/230 VAC
(switch selectable)

Power Rating: 83W average,
102W peak

Environmental Requirements

Temperature

Operating range: 40° to 95°F
(5" to 35°C)

Non-operating range: 5° to 140°F
(-15" to 60°C)

Humidity

Operating range: 20% to 80%,
non-condensing

Non-operating range: 10% to 90%,
non-condensing

Physical Characteristics

Width   14.4" (365 mm)

Depth   14.8" (377 mm)

Height   5.7" (145 mm)

Weight   Apex 100: 21.8 lbs. (9.9 kg)
Apex 100/20: 20.9 lbs. (9.5 kg)

Video and Display Options

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

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

Supports Epson- and IBM-compatible color monitor: color graphics, 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   RGB, 13-inch, color monitor with tilt swivel stand. High-contrast screen; 16 colors; etched surface to **reduce glare**; 18 MHz video bandwidth (AP1020B)

TTL, 12-inch, monochrome monitor with tilt swivel stand. High persistence, P-39 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 (CO1 8011)
	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 (C020011)
	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 (C019011)
	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
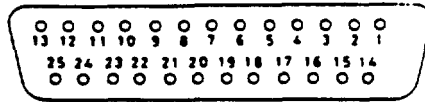
Pin no.	Signal name	Direction	Description
1	-STROBE	O	-STROBE
2	DATA0	O	Data Bit 0
3	DATA 1	O	Data Bit 1
4	DATA 2	O	Data Bit 2
5	DATA 3	O	Data Bit 3
6	DATA 4	O	Data Bit 4
7	DATA 5	O	Data Bit 5
8	DATA 6	O	Data Bit 6
9	DATA 7	O	Data Bit 7
10	-ACK	I	-Acknowledge
11	BUSY	I	Busy
12	PE	I	Paper empty
13	SLCT	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

Serial Port Pin Assignments
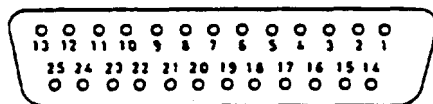
Pin no.	Signal name	Direction	Description
1	NC	–	No connection
2	TX	O	Transmitted data
3	RX	I	Received data
4	RTS	O	Request to send
5	CTS	I	Clear to send
6	DSR	I	Data set ready
7	GND	–	Signal ground
8	DCD	I	Data carrier detect
9-19	NC	–	No connection
20	DTR	O	Data transmit ready
21	NC	–	No connection
22	RI	I	Ring indicator
23-25	NC	–	No connection

Note: The following current loop functions are not supported:

Pin 9: +Transmit current loop data

Pin 11: -Transmit current loop data

Pin 18: +Receive current loop data

Pin 25: -Receive current loop data

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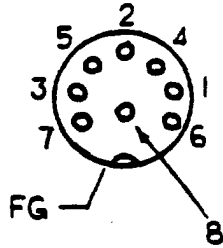
Pin no.	Signal name	Direction	Description
1	KBD CLK	I/O	Keyboard clock
2	KBD DATA	I/O	Keyboard data
3	-KBD RESET	O	-Keyboard reset
4	GND	—	Ground
5	+5V	—	Power
6-8	NC	—	No connection

Parallel Port Loop-back Connector Pin Assignments

Signal name	Pin no.		Pin no.	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
(Output signal)				(Input signal)

Serial Port Loop-back Connector Pin Assignments

Signal name	Pin no.		Pin no.	Signal name
Transmit data	2	—	3	Receive data
Request to send	4	—	5	Clear to send
Data terminal ready	20	—	6	Data set ready
(Output signal)				(Input signal)

Appendix C
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 drives.

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 you can no longer operate the computer. 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:

```
Fl key to resume
```

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 "Running the Setup Program" in Appendix A 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.

Floppy Disk Drive Seek Check

Finally, the computer checks its diskette drive(s) by searching the read/write heads for any malfunction. If it finds any seek errors, you see this message:

```
601-Diskette error
```

If this error occurs, make sure you have inserted the system diskette into drive A. If this message still appears after you insert the diskette, run the System diagnostics (described in Appendix D) and select option 6 from the DEVICE LIST. If the error persists, consult your Customer Care Center about having the drive repaired.

Appendix D
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 to select `Systemdiagnostics` and then press Enter.

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

❏ The setting of the DIP switches on the front panel

❏ 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 resting. 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.

> **Note**
> If your system uses an EGA or VGA with a color monitor,
> your device list should include item 5, "Color graphics
> adapter and CRT." If your system uses an EGA or VGA with
> a monocrhome display, your device list should include
> item 4, "Monochrome display adapter and CRT."

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 (8087)
12 - Alternate serial port

 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 months that is currently selected by DIP switches 1-5 and 1-6 on the front panel.

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

Prom 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 end of this chapter.

System Board Check

Use this option to check the operation of each major component on the system board, including:

❏   The 8088 CPU chip

❏   **The system** ROM

❏ The real-time clock, CMOS RAM, and battery

❏ The main integrated circuits,

The checks made on the 8088 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 the DIP switches to determine the amount of main memory. If any settings are incorrect, check the DIP switches to make sure they match the installed memory.

Note
This option does not check expanded memory above the 640KB memory limit imposed by MS-DOS.

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 this 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, DIP switches 1-5 and 1-6 on the front panel 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:

After checking the characters, respond to the prompt:

```
Is the display correct  (Y/N) ?
```
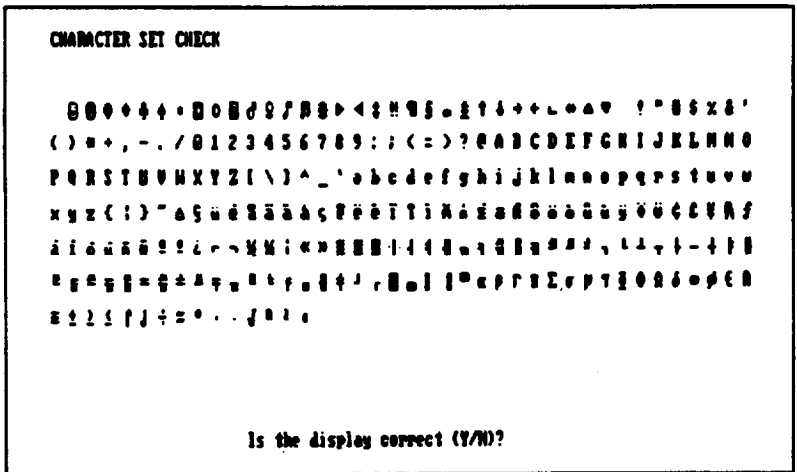
If the characters displayed match the illustration, press Y and
Enter. If they do not match the illustration, press N and then
Enter to display the error message.

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, DIP switches 1-5 and 1-6 must be set correctly for a color monitor.

You can select the individual checks from this 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 number:
```

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) ?
```
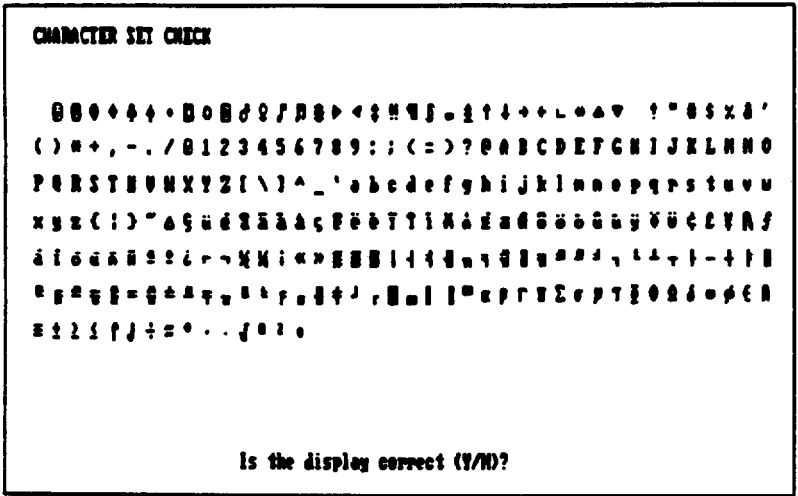
If the characters displayed match the illustration, press Y and
then Enter. If they do not match, press N and Enter to
display the error message.

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:
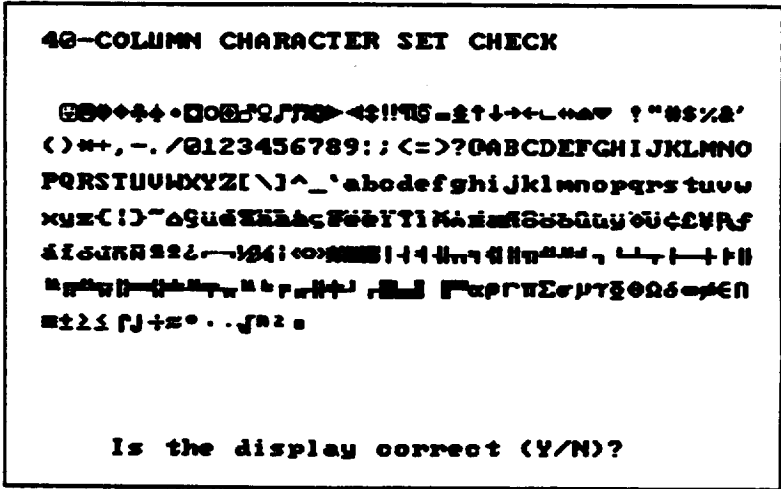
```
40-COLUMN CHARACTER SET CHECK

 ☺☻♥♦♣♠•◘○◙♂♀♪♫☼►◄↕‼¶§▬↨↑↓→←∟↔▲▼ ! "#$%&'
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≡±≥≤⌠⌡÷≈°∙·√ⁿ²■


        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 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.
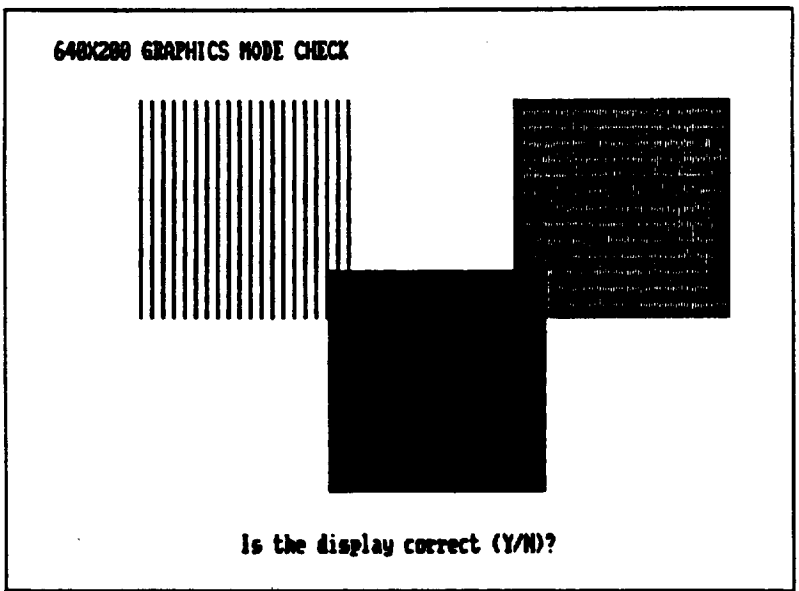

If the patterns on your screen are clear and distinct, press Y and then Enter.

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 rum. You see this pattern for screen 0:
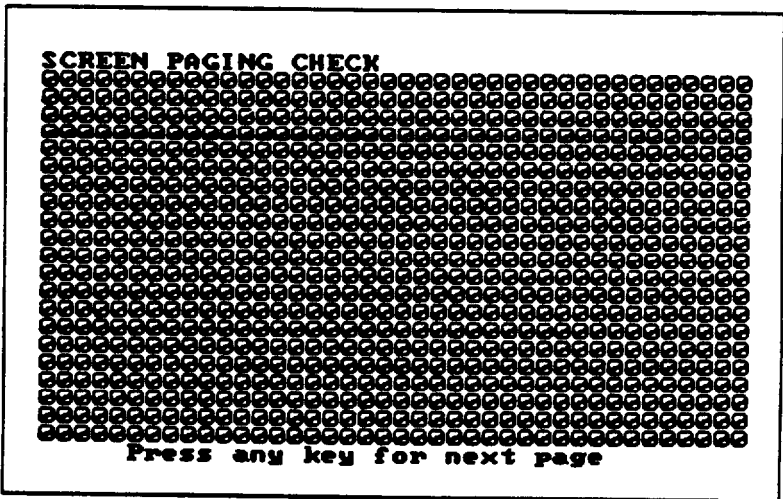
When you have examined this screen, press any key to display the next page. The eight display pages, numbered 0 to 7, are displayed sequentially.

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 co display the error message.

Light Pen Check

To check the function of a light pen connected to the 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 teat. 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 - C y a n	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 (floppy disk) drives inside or connected to your computer. This test includes several checks that allow you to identify particular problems related to your diskette drives.

To run these tests, you need a formatted diskette so the tests can write data on the disk in the drive. In a 360KB drive, you can use only a 360KB diskette. In a 720KB drive, use only a 720KB diskette. If you need to format a diskette, you can do it without leaving the diagnostics program; see "Formatting a Diskette," below. If you already have a formatted diskette, go on to "Starting the Floppy Disk Drive Check."

Formatting a Diskette

To format a diskette without leaving diagnostics, follow these steps:

1. From the DEVICE LIST menu, press 0 to exit. The OPERATION MENU appears on the screen.

2. Press 2 and **Enter** to select Format diskette. If you have two diskette drives, you see this message and prompt:

   ```
   Format Diskette
   Format in which drive (A/B)?
   ```

   Press **A** or B and **Enter**. If you select A, this prompt is displayed:

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

3. If you have only one diskette drive, remove the Reference diskette **from drive** A.

4. Insert the diskette to be formatted in the drive you selected and press Enter. The screen displays the head and cylinder numbers as the diskette is formatted.

    When the format is complete, you see these messages (for a 360KB diskette):

    ```
    Format complete
       362496 bytes total disk space
       362496 bytes available on disk
    Format another (Y/N)?
    ```

You can format another diskette or return co the OPER4TION MENU. Then press 3 and Enter to select Systemdiagnostics.

Starting the Floppy Disk Drive Check

To run the floppy disk drive check, select option 6 from the DEVICE LIST. After you choose the number of times to run the test, the screen displays this menu:

```
FLOPPY DISK DRIVE(S) AND CONTROLLER CHECK MENU

l - Sequential seek check
2 - Randomseek check
3 - Write, read check
4 - Speed check
5 - Run all above checks

0 - Exit

Enter selection number:
```

Before it performs any checks, 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 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 360KB diskettes and track 79 for 720KB 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 track number counts down (from 39 or 79) 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.

Select option 3 from the menu to start this test.

If you have only one diskette drive, you are prompted to exchange the Diagnostics (Reference) Disk for 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, formatted 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 360KB diskette, the first message you see is:

```
Current track is 39
```

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 294.0 rpm and less than 306.0 rpm.
```

The computer spins the diskette for a few seconds then displays a message like this:

```
The disk rotation speed is now 300.0 rpm.
```

Note
The speed for a 360KB or 720KB drive should be 300 rpm. This check permits a tolerance of ±2%.

The diskette continues to spin, and the display 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.
```

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 diskette in drive d and the 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 (8087-1)

Use this option to check the operation of the 8087-1, 10 *MHz* math coprocessor if you have installed one in your computer. To check the math coprocessor, select option 7 from the DEVICE LIST.

Before running any tests, the computer checks DIP switch 1-Z on the front panel to ensure that a coprocessor is installed. If the coprocessor is missing, or if you have not set DIP switch 1-2 correctly, an error occurs and the test ends.

The program then runs a series of checks to test the precision with which the coprocessor performs calculations and to detect whether it correctly handles exceptions. The program reports any errors that occur.

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 have 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 B for signal/pin assignments to make your own loop-back connector). Note that a different connector is required co 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 data 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 B 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 display informs you of the progress of the test. 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{|}~ÇüéâäàåçêëèïîìÄÅ      ‖┤╡╢╖╕╣║╗╝╜╛┐└┴┬├─┼╞╟╚╔╩╦╠═╬╧ ▄ ▐
ßΓπΣσµτΦΘΩδ∞φε∩≡±≥≤⌠⌡÷≈°∙·√ⁿ²■
```

```
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 - Error detection and correction check
4 - Read, verify check
5 - 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 mad/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 this test. 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. Rack 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 E for instructions.

3. Prepare the hard disk for use with FDISK and SELECT. See Appendix F for instructions.

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 ............. 2460

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 E

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	8088 CPU ERROR
102	27128 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
108	8048 SELF DIAGNOSTIC ERROR
109	8259 INTERRUPT CONTROLLER ERROR
111	146818 CMOS BATTERY ERROR
112	146818 CMOS CHECKSUM ERROR
113	8088 INSTRUCTION ERROR
Memory	
201	MEMORY/PARITY ERROR
Keyboard	
301	8048 ERROR
302	NON-STANDARD OR DEFECTIVE KEYBOARD
Monochrome display adapter and CRT	
401	V-RAM ERROR
402	VIDEO SIGNAL ALWAYS HIGH/LOW
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	320x200 GRAPHICS MODE ERROR
507	640x200 GRAPHICS MODE ERROR
508	SCREEN PAGING ERROR
509	LIGHT PEN ERROR
510	COLOR VIDEO ERROR

Error code	Message

Floppy disk drives and controller

601	FLOPPY DISK CONTROLLER ERROR
602	SEOUENTIAL SEEK ERROR
603	RANDOM SEEK ERROR
604	WRITE ERROR
605	READ ERROR

Math coprocessor (8087-1)

701	COPROCESSOR 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

Parallel port

901	ERROR PIN p

Parallel port on video adapter

8101	ERROR PIN p

Serial port (RS-232C)

1101	ERROR DTR DSR, DSR ALWAYS HIGH/LOW
1101	ERROR RTS CTS. CTS ALWAYS HIGH/LOW
1102	TIMEOUT ERROR
1103	VERIFY ERROR

Alternate serial port

1201	ERROR DTR DSR, DSR ALWAYS HIGH/LOW
1201	ERROR RTS CTS, CTS ALWAYS HIGH/LOW
1202	TIMEOUT ERROR
1203	VERIFY ERROR

Dot-matrix printer

1401	status: error-type

Error code Message

Hard disk drives and controller	
1701	SEEK ERROR
1702	WRITE ERROR
1703	READ ERROR
1705	ERROR DETECTION ERROR
1706	ERROR CORRECTION ERROR

Appendix E
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.

If you have the Apex 100/20, the hard disk 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 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 F.

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 000000000000Non-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.

A p p e n d i x   F
Preparing a Hard Disk for Use

If you have the Apex 100\20, your hard disk has already been
physically formatted, partitioned, and formatted for MS-DOS;
so 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 here.

This appendix explains how to do the following:

❑ Use FDISK to create an MS-DOS partition on the hard disk

❑ Use SELECT to format the partition for MS-DOS and
   install MS-DOS on the disk

❑ Use COPY to copy the remaining MS-DOS file to the hard
   disk

❑ Create an AUTOEXEC.BAT file on the hard disk.

> **Note**
> These instructions describe how to prepare the entire hard
> disk for use by MS-DOS. If you are using a different
> operating system, use it to prepare the hard disk.

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 hard disk you are using has been producing numerous read/write errors.

See Appendix E 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.

Creating the MS-DOS Partition

You need to partition the hard disk so it can run MS-DOS. Follow the steps below to create a primary partition on your hard disk for MS-DOS.

Note
These instructions describe how to create a single (primary) partition of 20MB. You can, however, use FDISK to create an extended partition in addition to the primary partition, dividing the 20MB of storage between the two partitions. If you want to create to more than one partition on your hard disk, see the description of FDISK in your MS-DOS Reference Manual.

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

2. Turn on the computer (if it is not on already).

3. Type A : and press **Enter** to log onto drive A.

4. At the A> prompt, type FD I SK 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).........?
    ```

7. Press Y to use the entire hard disk 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 appears on the screen, you see the date prompt.

9. **Press Enter** twice to accept the displayed date and then the time.

The system now recognizes the MS-DOS partition and the A> prompt reappears.

Formatting the MS-DOS Partition

Once you have created the MS-DOS partition, you must
format it for MS-DOS. Use the MS-DOS SELECT command
to format the new 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 new 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.
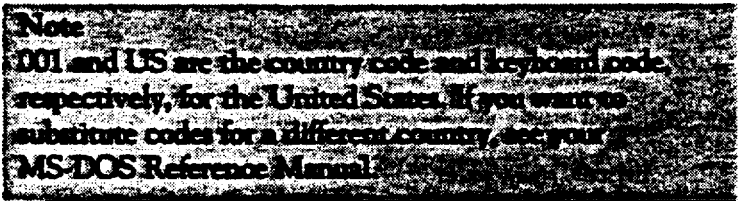
The screen displays this message and prompt:

```
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. Formatting does not begin immediately. The screen displays the following message:

```
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.

Resides 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 name the partition, 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 in the following section.

Copying the Remaining Files to the Hard Disk

Follow the instructions below to copy the files on your ocher
MS-DOS diskettes and the Reference diskette to drive C, the
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.

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 automatically executes 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.

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 = SPSG
PATH = C:\DOS
```

4. Then hold down the Ctrl key and press Z. Then press Enter.

Booting From the Hard Disk

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.

release latch

diskette drive
indicator light

power
switch

power
light

diskette drive

RESET button

CPU speed
switch

keyboard
cable socket

DIP switches

diskette or
hard disk drive

power inlet

option card access slots

power outlet

serial port

MGA port

parallel port

color/mono
switch
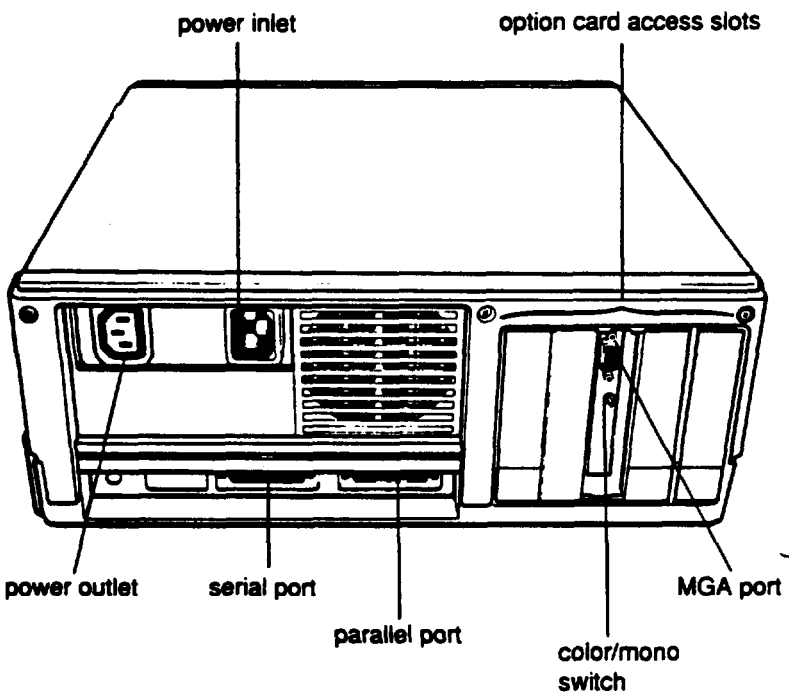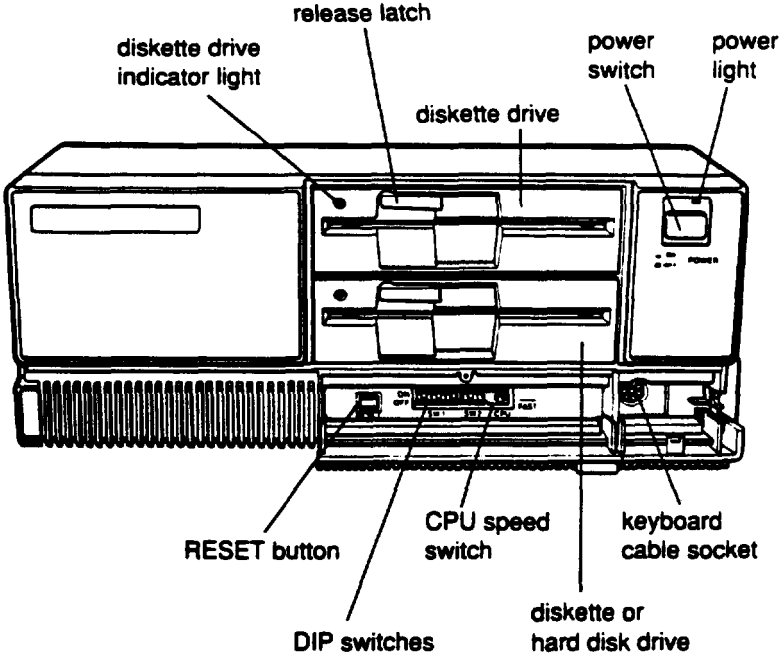
Glossary

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 A, the command prompt looks like this: A>. 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 Operating system.

Double-density

A type of diskette format that allows you to store twice as much data as the standard-density format. A 5 1/4-inch double-density diskette can store 360KB of data. A 3 1/2-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 **4.77** MHz or 10 MHz.

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.

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.

Math coprocessor

>An optional device that enables the computer to process
>certain mathematical calculations faster.

Megabyte Text

>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 4.77 MHz or 10 MHz.

M e m o r y

> 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 **4.77** MHz or 10 MHz.

operating system

> A collection of programs (such as MS-DOS) that manages a computer's operations. The operating system determines how programs run on the computer and supervises all input and output.

Option card

> A circuit board you install inside the computer to provide additional capabilities, such as a modem, 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 rime 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 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 720KB diskette. The 20MB hard disk in the Apex 100\20 has 2460 data tracks.

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 1/4-inch diskette or by setting the write-protect switch on a 3 1/2-inch diskette. When a diskette is write-protected, you cannot erase, change, or record over its contents.

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