Operator's Reference Guide II

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IMPORTANT SOFTWARE DISKETTE INFORMATION

For your own protection, do not use this product until you have made a backup copy of your software diskette(s). The backup procedure is described in the user's guide for your computer.

Please read the DISKID file on your new software diskette. DISKID contains important information including:

- The part number of the diskette assembly.
- The software library disk number (for internal use only).
- The date of the DISKID file.
- A list of files on the diskette, with version number, date, and description for each one.
- Configuration information (when applicable).
- Notes giving special instructions for using the product.
- Information not contained in the current manual, including updates, any known bugs, additions, and deletions.

To read the DISKID file onscreen, follow these steps:

1. Load the operating system.
2. Remove your system diskette and insert your new software diskette.
3. Enter —

   type diskid(cr)

4. The contents of the DISKID file is displayed on the screen. If the file is large (more than 24 lines), the screen display will scroll. Type ALT-S to freeze the screen display; type ALT-S again to continue scrolling.

FIGURES

TABLES

SECTIONS

MANUAL CONVENTIONS

This manual uses the following conventions:

- In the text, names of commands, files, and programs appear in all-uppercase. Examples are COPY, TEXT.DOC, and DISKCOPY.COM.
- When commands are explained for the first time, the command format is set off as a boldfaced single line, such as:

  PRINT myfile(cr)

  — Parts of the command that you type exactly as shown (such as the command name) are all-uppercase.

  — Parts of the command that you vary or omit to fit the situation (such as filenames and drive names) are all-lowercase.

  — When you type a command, you can use any combination of upper- and lowercase for all command elements.
- In examples and command formats, pressing the Return key is shown as (cr), and typing a space is shown as (sp).
- Some examples show the screen, including what you type and the system's response. In these screen examples, what you type is underlined and all-lowercase. For example:

```
A>print myfile(cr)
```

- The ALT (Alternate function) key acts as the Control key on your computer. In text, ALT- represents the ALT key. For example, ALT-C represents typing the Alternate function of key C. In screen examples, however, the ALT key is shown as a caret (^), such as ^C.

PREFACE

Your computer is one of the most flexible, versatile, and powerful desktop computers in the world. From now on, you will get your work done faster and more easily than ever before. And you'll produce accurate, attractive results.

This *Operator's Reference Guide* shows you how to use your computer. Information is presented in the order you need it. Procedures are explained one at a time. Each new term is printed in bold type the first time it's used, and precise definitions for these terms appear in the Glossary.

The first Section—Introduction to Your Computer—includes information you need to begin using your computer for office work. You learn how to set up the computer and how to attach a peripheral device such as a printer. You are introduced to the components of software. You learn how to work with floppy diskettes and disk drives, and how to use the standard keyboard.

The second Section—Using the Operating System—describes the basic operating system functions that you must understand to use your computer efficiently. This Section describes how to load the operating system, how to change disk drives, how to format new diskettes for use with your computer, and how to make backup diskettes (copies).

The third Section—Using the Hard Disk—describes how to work with a hard disk, how to prepare a hard disk for use (configuration), and how to back up files from your hard disk.

The final Section—Software Development Tools—lists and describes software packages (available through your dealer) that can be used to develop your own software for your computer. Some of the products in this Section are the *Programmer's Tool Kits*, the *Graphics Tool Kit*, and various Communications packages.

At the back of this Guide are handy reference tools—a comprehensive Glossary of important terms, and a complete index.

Companions to this Guide include:

- The *MS-DOS User's Guide*, which describes the MS-DOS system structure, including its file and subdirectory system, and its disk- and file-management utilities. You can learn the special MS-DOS editing functions, the internal commands, and EDLIN (the MS-DOS text editor). Also included is a description of the CP/M Emulator, which runs CP/M-86 programs under MS-DOS. The final chapter is a reference list of all the error messages and error codes you can encounter in using the operating system. Error messages are documented for the booting process and for normal operations.

- Appendixes in the *MS-DOS User's Guide* contain information you will find useful while you read any of the manuals. Appendixes A, B, and C illustrate the keyboards available for your computer, and the different character sets that your software may use. Appendix D lists the display driver specifications, including the Escape sequences, Alternate sequences, and the 132-column utility. Appendix E gives detailed instructions for attaching peripheral devices and gives the wiring patterns for cables. Appendix F is a table listing the character or code produced by each key on all the available keyboards. Appendix G describes some differences between MS-DOS 2.1 and PC-DOS. Appendix H shows you how to use the CALC.COM program to operate your keyboard as a calculator. Finally, Appendix I gives hints on how to handle problems you may encounter with your computer.

SECTION I
INTRODUCTION TO YOUR COMPUTER

Section I of this Guide describes:

- How to set up your computer.
- The parts of your computer (collectively called **hardware**).
- The components of **software** (computer programs and the disk file system).
- Basic rules for operating your computer, including how to use:
  - —Disk drives
  - —Floppy diskettes
  - —The hard disk
  - —The keyboard

This section is written for the first-time computer user, but you will benefit from reading it even if you have computer experience. It introduces you to the unique features of your computer. It also contains basic information you need to understand more advanced manuals (such as the *MS-DOS User's Guide*) and to operate your computer with confidence and ease.

1

SETTING UP YOUR COMPUTER

This chapter describes:

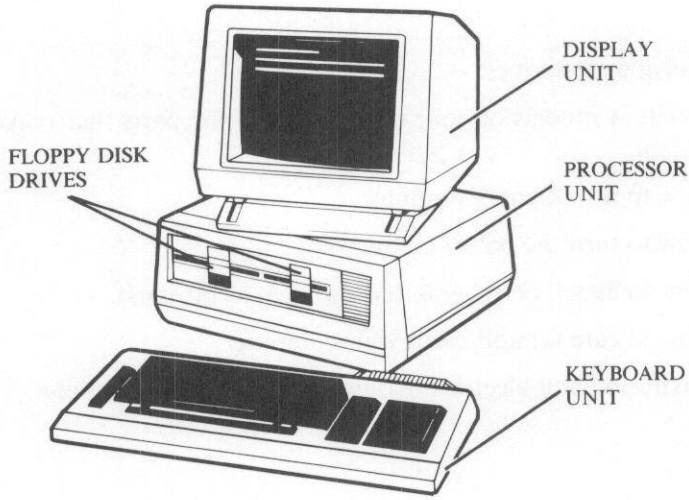
- Different models of your computer and the parts that make up the system.
- How to install your computer.
- How to turn the power on and off.
- How to attach peripheral devices (such as printers).
- How to care for and clean your computer.
- Environmental/electrical requirements for your computer.

MODELS AND PARTS 1.1

Your computer is available in several models. Most models consist of the four parts or components shown in Figure 1-1:

- The **central processing unit (CPU)**—the "brains" of the computer. The CPU is contained on a "chip"—an integrated circuit fabricated on a silicone wafer—and is housed inside the main cabinet. Your computer's CPU is an Intel 8088.
- Disk drives—turntable-like devices for handling floppy diskettes. Most disk drives are housed inside the main cabinet.
- The **CRT (cathode-ray tube)**—the TV-like display unit.
- A detachable **keyboard**.

Figure 1-1: Computer with Two Floppy Disk Drives



Different keyboard models are available for these languages, among others:

- American
- English
- French
- German
- Italian

Appendix A in the *MS-DOS User's Guide* illustrates all the keyboard languages available, while Chapter 4 in this section explains how to use the keyboard.

Some models have two **floppy disk drives**, like the system shown in Figure 1-1. Other models have an **internal hard disk** and only one floppy drive, as shown in Figure 1-2. Any of these models can be connected to an **external hard disk**, shown in Figure 1-3.

If your computer is connected to a network such as the Server Network, you may have a "diskless station," a computer with no disk drives (see the *Server Network User's Guide* for more information).

Chapter 3 describes different **system configurations** (hardware arrangements) and explains how to use floppy drives and diskettes, the hard disk, and diskless stations.

Figure 1-2: Computer with Internal Hard Disk

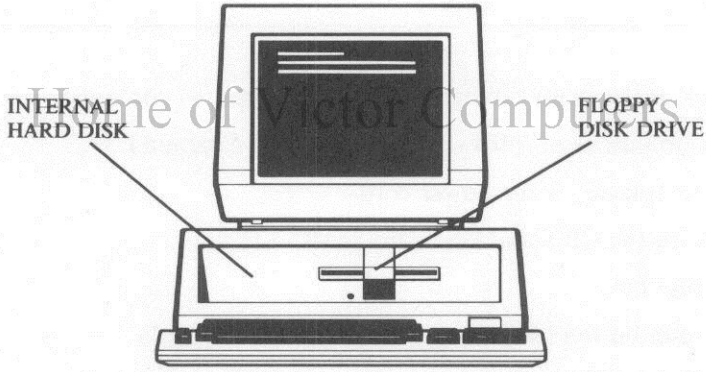
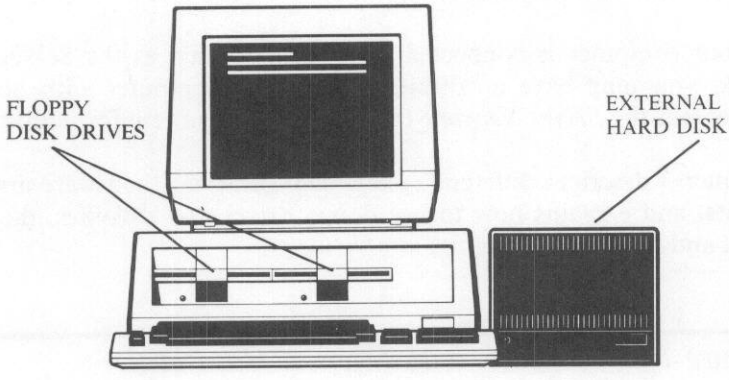


Figure 1-3: Computer with External Hard Disk



The back of the main cabinet (shown in Figure 1-4) contains:

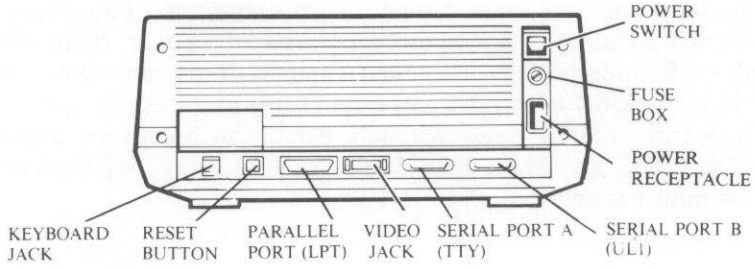
- The computer's on/off switch (described in Chapter 1.3)
- The receptacle for the power cord
- Jacks for the CRT and keyboard cords
- The fuse box
- The reset button (described in Section II, Chapter 1)
- Connectors for **peripheral devices**

Peripheral devices are equipment for "input/output"—they put data into or take data out of the CPU. You are probably familiar with such peripheral devices as keyboards, CRTs, disk drives, and printers.

Your computer has two connectors for serial transmission (RS232C) devices, and one connector for a parallel transmission (Centronics) device (see Figure 1-4). Chapter 1.4 describes how to attach a peripheral device. Appendix E in the *MS-DOS User's Guide* gives complete instructions for attaching devices, and includes details about cable and connector requirements, as well as software adjustments that may be needed.

You can also attach the following optional expansion devices: a MODEM (telephone hookup device), the *Audio Tool Kit* (enabling you to use the built-in CODEC, an audio encoder/decoder), and a Network board (for connecting your computer to the Server Network).

Figure 1-4: Main Cabinet, Rear View



1.1.2 INTERNAL MEMORY (RAM)

A computer performs tasks by following the steps or instructions in a **program**. The **internal memory** is the part of the computer that holds the programs and the **data** the computer is using. In a single second, your computer can do thousands of program steps. This high speed is possible because your computer has fast access to all the program steps in its internal memory.

High-speed internal memory is called **random-access memory (RAM)**. With RAM, the computer can access any location in memory at random with the same speed (access time). The computer can also use data and programs stored on disk, but accessing from disk is much slower than accessing from RAM.

The size of a computer's memory (RAM) is given in **bytes** or in **Kbytes**. The data files and programs that you store on disk are also measured in bytes and in Kbytes. The byte is the smallest complete unit of data; one byte represents one character (a letter or a number). A Kbyte or Kilobyte is approximately a thousand bytes (exactly 1024 bytes). You can see how big your files are with the DIR and CHKDSK commands, described in the *MS-DOS User's Guide.*

If you could open the main cabinet of your computer, you would see its internal memory. The memory consists of one or more **circuit boards** (stiff cards holding integrated circuits). Your computer's standard RAM is 256K bytes; you can expand this memory size with additional boards to 896K bytes. Memory expansion boards are available in 128K, 256K, and 384K byte sizes. (See your marketing representative for information.)

INSTALLING YOUR COMPUTER 1.2

To unpack a new computer, follow the instructions packed inside its shipping carton.

CAUTION

- Whenever you move your computer, make sure the main power switch (shown in Figure 1-5) is off or at the 0 position. If you have an external hard disk, turn the hard disk power switch off (see Figure 1-6).
- Handle your computer with care, especially if it has a hard disk. Excessive vibration can knock floppy disk drives out of alignment and can damage a hard disk.
- Connectors that attach to your computer are asymmetrical; before you attempt to connect any cords or cables, decide which side of the connector should be up and which side down.

Figure 1-5: Power Switch

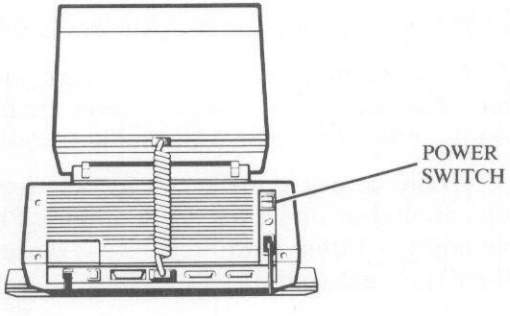
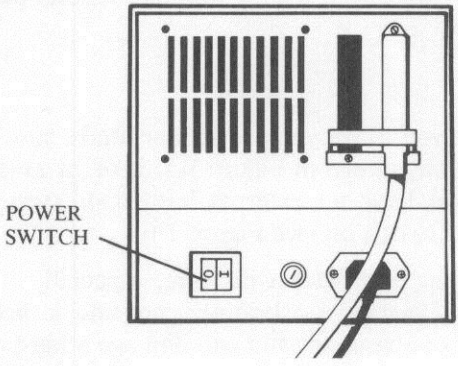


Figure 1-6: External Hard Disk Power Switch



To set up your computer, you need a level, sturdy work surface about two feet square. Follow these steps to assemble and install your computer:

1. Place the platform or carousel for the CRT on top of the main cabinet. A hole in the platform bottom fits over a peg in the top of the cabinet.
2. Place the CRT in the grooves on the platform (see Figure 1-7).
3. Plug the CRT connector into the center jack in the back of the main cabinet (see Figure 1-4). To disconnect the plug later, press in the tabs on the sides of the plug while pulling it out (see Figure 1-8).
4. Plug the keyboard cord into the keyboard jack (see Figure 1-4). The cord can go around or under the main cabinet. Place the keyboard in a stable position within cord range. Your dealer can supply you with a longer keyboard cord if you need one.

Figure 1-7: Positioning Computer Units

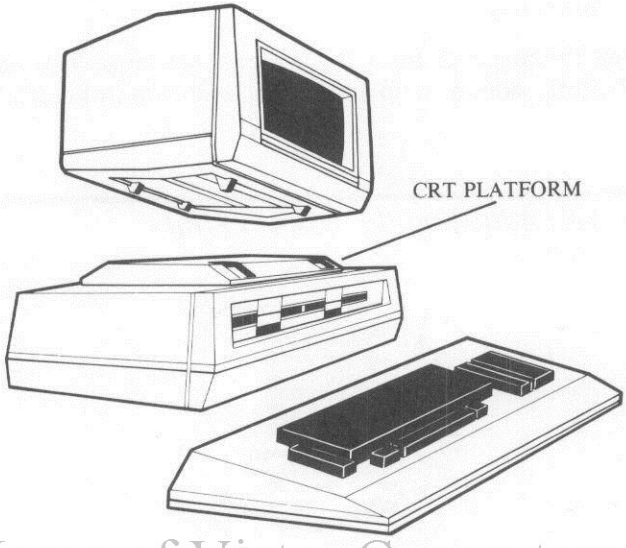
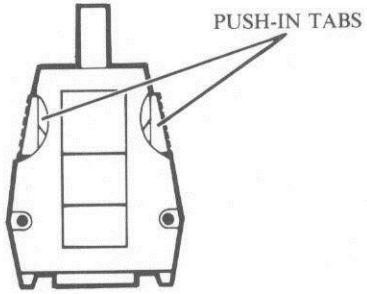


Figure 1-8: CRT Connector



5. Plug the power cord into the power receptacle (see Figure 1-4). The plug on the power cord may have two or three prongs; plug it into an appropriate wall outlet. Do not use any other power cord with your computer.
6. Adjust the angle of the CRT for easy viewing. You can push the CRT gently sideways, up and down, as shown in Figure 1-9.

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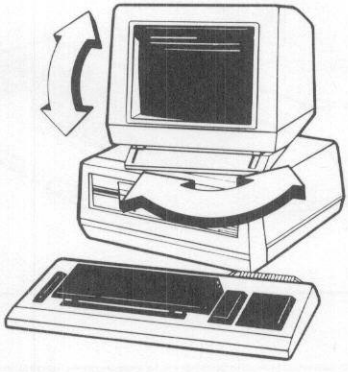
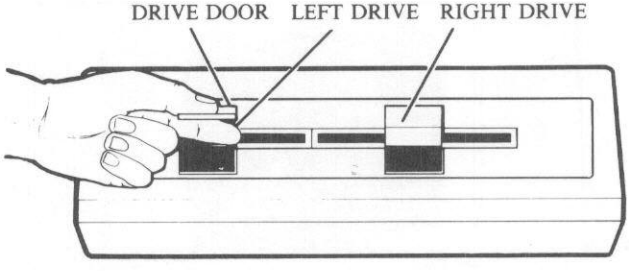
Figure 1-9: Adjusting the Display Unit



Before you turn the power on or off, always make sure the drives are empty and the drive doors are open, as described here. Follow these steps to turn on the power:

1. Open the doors to the floppy disk drive(s):
   - ▶ The door to a floppy disk drive is a slot on the front of the main cabinet (see Figure 1-1).
   - ▶ Each drive has a latched door. Open each drive door by gently lifting the latch as shown in Figure 1-10.

Figure 1-10: Opening a Drive Door



2. Make sure the drives are empty. Remove any floppy diskettes or cardboard disks. (Cardboard head protectors are packed in the drives when the computer is shipped from the factory. Reinsert these head protectors and close the drive doors each time you move your computer.)

3. If you have an external hard disk, turn on its power switch (see Figure 1-6).
4. Turn on the main power switch (see Figure 1-5) by depressing the 1 position of the rocker switch.

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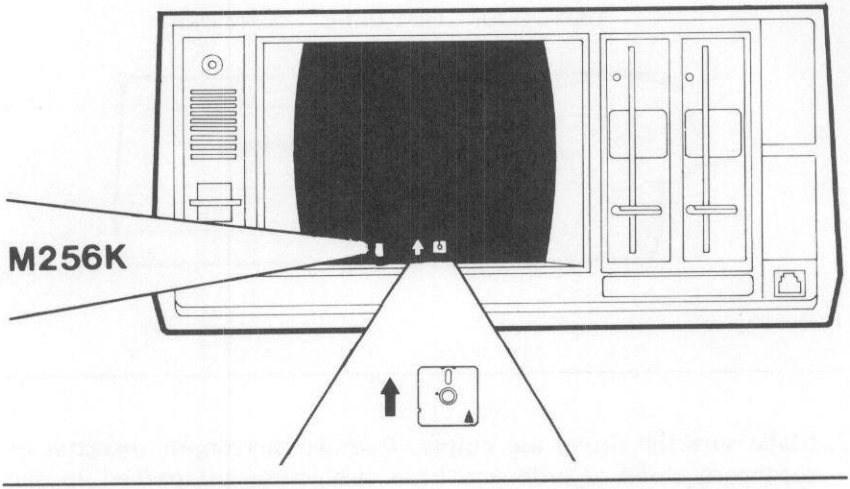
When you turn on the power, you should see the **power-on display** and the **memory-test message**, shown in Figure 1-11. The power-on display is a flashing arrow and a diskette symbol, indicating that you should insert a system diskette in the computer. The memory-test message is an "M" and a number that indicates the size of your computer's internal memory (RAM). At the same time, the red in-use light for one drive lights up, telling you to insert the diskette in that drive. Chapter 2 describes how to insert a diskette, and Section II tells how to load the operating system with a system diskette.

Figure 1-11: Power-On Display



To turn off power to your computer:

1. Remove all diskettes from the drives and store them safely. Before you remove a diskette from any drive, check that the red in-use light for the drive is off. The light must be off before you remove a diskette. You can disregard any light on an empty drive.
2. If you have an external hard disk, turn off its power switch.
3. Turn off the main power switch for the computer.

You do not need to turn off the power unless you are leaving your computer for a long time (several days). To protect your work, however, always remove and store your diskettes when you finish using the computer.

ATTACHING PERIPHERAL DEVICES 1.4

This chapter outlines the general steps for attaching a peripheral device to your computer. For details on this procedure, see Appendix E of the *MS-DOS User's Guide.*

Your computer has three connectors (ports) for peripheral devices, shown in Figure 1-4. The ports accept different types of interfaces:

- The two serial ports (A and B) are for RS232C interfaces, and can also be used for MODEM devices.
- The parallel port is for a Centronics interface, and can also be used for IEEE-488 devices.

To attach a peripheral device such as a printer to your computer:

1. Determine the type of interface your printer uses: serial or parallel. The connector on a parallel printer resembles the parallel port on your computer. A serial printer's connector resembles the serial port.

2. Obtain a cable and connectors that enable your computer to "talk to" the printer. If you bought your computer and the printer at the same time, your dealer should be able to provide you with a cable. If you bought the printer separately, you may still be able to use a cable from your computer dealer. If you do not have a working cable, one must be constructed to match the requirements of the printer and the computer.

3. Adjust the printer settings to match the requirements of your computer.
4. Connect the cable to the printer and to the computer.
5. Make sure the operating system is configured (set up) to send output to that port. To do this, use the MS-DOS CLST command or the CP/M-86 STAT command. See the appropriate user's guide for instructions.

1.5 MAINTAINING YOUR COMPUTER

Your computer requires no regular maintenance on your part. You should, however, protect your computer from dust and dirt, which can damage parts of the system. Keep the parts of your computer clean by following these instructions:

CRT: Clean the screen with the CRT cleaning cloth supplied with your computer. Do not use cleaning solution on the CRT screen; residue from the solution can build up on the mesh covering the screen and obscure screen images.

MAIN CABINET: Clean the computer cabinet with a soft cloth dampened with a mild household cleaner.

KEYBOARD: Dust the keyboard with a feather duster, or wipe it with a soft cloth when the keyboard is disconnected or when the power is off.

CAUTION

- Never spray water or cleaning solution into the drives or onto the back of the cabinet.
- Keep cigarette smoke and ashes away from your computer. Smoke and ash particles can damage diskettes and parts of the disk drives.
- Keep liquids and small items such as paper clips away from the keyboard. Spills can damage the keyboard.
- Never try to open the cabinet, except when following manufacturer's directions.

ENVIRONMENTAL AND ELECTRICAL REQUIREMENTS 1.6

Environmental Requirements

- Floppy drives: 40–95 degrees Fahrenheit (5–35 degrees Centigrade).
- Hard disk: 60–90 degrees Fahrenheit (15–32 degrees Centigrade).
- 5–80% relative humidity (non-condensing).

Keep your computer out of direct sunlight; overheating can damage the components.

Electrical Requirements

	U.S. and Canada	International
▶ Voltage:	95–137 Volts AC at 47–63 Hz	190–270 Volts AC at 47–63 Hz
▶ Current:	1.5 Amp	0.75 Amp

2

INTRODUCTION TO THE SOFTWARE

A working computer system is made up of both hardware and **software**. Software is the programs (instructions) the computer uses to do work for you. Software tells the hardware how to produce the results you want.

There are three types of software:

- Systems software
- Programming/development software
- Applications software

Systems software includes the **operating system** or **OS** (a group of programs that handles basic operations for the entire system), and **utility programs** (individual programs that handle different file operations and system configuration functions). Systems software is packaged with your computer, although you can obtain some systems separately.

Programming/development software is computer languages (such as MS-BASIC and MS-FORTRAN). You can use computer languages to develop your own programs that manage your data for you. Computer languages are available as separate products. Development software also includes programs used by programmers—such as libraries, text editors, and linkers.

Applications software is programs that perform some useful end function, such as accounting or word processing. Application programs are available as separate products.

"Software" is programs written and marketed for your computer. The computer files that you create are not, strictly speaking, software. The

file system, however, is shared by all types of software, and all software (except for some parts of the operating system) is stored on disk as files. The file system is included as part of software in this chapter.

2.1 SOFTWARE COMPONENTS

These components of software are described here:

- The operating system (OS)
- The file system
- Utility programs
- Application programs

2.1.1 THE OPERATING SYSTEM

The operating system (the OS) is a group of programs that controls basic computer functions. Because the computer cannot function or run another program without the OS, you must load the OS before you can do any work with your computer. The OS is a program that, once loaded, is always present, even when you are running another program. The OS manages your files, and controls input/output between the CPU and the peripheral devices in your system.

Like all programs, the OS is a list of instructions stored on disk. A floppy diskette that contains the OS is called a **system diskette**. A hard disk volume that holds and loads the OS is called the **boot volume** (see Section III).

Your computer can use any of several operating systems. The primary operating system supplied with your computer is MS-DOS. In some cases, CP/M-86 is also supplied. The hard disk, however, operates only

under MS-DOS. To use CP/M-86 with the hard disk, you must use the CP/M-86 Emulator, an MS-DOS utility (see the *MS-DOS User's Guide*).

Section II of this manual describes how to load your computer with MS-DOS. Some details differ if you use CP/M-86; the *CP/M-86 User's Guide* describes how to load and use CP/M-86.

THE FILE SYSTEM 2.1.2

When you use your computer to handle business records, to word process documents, or to write programs, you will create **files**. There are two basic types of computer files:

- Data files (such as payroll accounts, or the text of letters and reports).
- Program files (such as word processing programs, database management systems, and OS utilities).

The major difference between the types of files is what they do—data files contain information, and program files control and manipulate data.

While you are creating a file, the file exists only in your computer's internal memory. To keep the data or program files you create, you must store the files on disk (either floppy diskettes or the hard disk). Each application program or OS has commands for saving files. Later, when you want to work with a data or program file, you must place (load) the file in memory (see Chapter 2.2).

Filenames and File Size

When you create a file, you give it a unique name. You can freely choose names for your files, within the rules for naming files. Here are the rules:

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- A filename can be 1 to 8 characters long (letters or numbers).
- You can add an optional filename extension of 1 to 3 characters, preceded by a period. Each OS recognizes types of files by file extensions, listed in the *MS-DOS User's Guide* and the *CP/M-86 User's Guide.*

The name of the drive or hard disk volume (such as A: or C:) where the file is stored is also optional—in most cases. You must include the drive name for files that are not stored on the current drive (known as the default or logged drive, described in Section II, Chapter 2).

Here are two examples of filenames:

- FORMAT.EXE (the name of a utility program).
- B:FORMLTR3.DOC (the name of a form letter document file stored on drive B).

On each disk the OS keeps a **directory**—a list of the names of all the files stored on the disk. You can look at the directory of a diskette or hard disk volume by typing the DIR command as shown in Chapter 2 of Section II.

Computer files, like office files, take up space. Office file sizes are measured in pages; computer files are measured in bytes (a byte is one character) or in Kbytes (one Kbyte is about a thousand bytes). For example, a file of text that averages 3000 characters per page measures about 3K bytes per page. Your OS can tell you the size of each file.

UTILITY PROGRAMS 2.1.3

Utility programs work with the OS to perform basic file operations or configure your system for you. You can use different utility programs to:

- Copy files or diskettes.
- Format diskettes for use with your computer.
- Tell you the size of the files on a disk.
- Tell you the amount of free space on a disk.
- Check or change the peripheral devices in your system.

Each operating system has utilities, and utilities for one OS do not work with another OS. Each utility program is stored in a separate file. MS-DOS utility program files have the extension .COM or .EXE; utility program files for CP/M-86 have the extension .CMD. You must load a utility program into memory before you can use it. This means that the file for that utility must be on your hard disk or on a diskette loaded in your computer (or on a peripheral device, Network server, or hard disk attached to your computer). You can place a utility file on any diskette or hard disk volume with the COPY command (for MS-DOS) or with the PIP command (for CP/M-86).

APPLICATION PROGRAMS 2.1.4

Application programs perform specific tasks such as word processing or inventory control. The word "application" means that the program applies the computer to a particular job.

Before you can use an application program, you must load it into memory, just like any file or OS. (Chapter 2.2 describes loading programs, and Section II gives instructions for loading the OS.) The user's guide for each application program describes how to load the program.

2.2 ABOUT BOOTING UP AND LOADING PROGRAMS

Before you can use the operating system or any application program, you must **load** the operating system. Loading the OS into memory transfers the OS from the system diskette into RAM. Then you can use the OS to communicate with your computer, or you can load a program into memory and use that program.

The process of loading the operating system is also called **booting** the system, or booting up. The term "boot" comes from "bootstrap". In a sense, loading or booting the OS pulls the computer up by its bootstraps. When you power up your computer, its memory is empty—it "knows" nothing. Before the computer can "learn" a program, it needs instructions on how to operate. Loading the operating system places preliminary instructions into RAM—instructions that enable the computer to "learn" and perform other programs.

You load the operating system by inserting your system diskette, as described in Section II, Chapter 1. If you have a hard disk, you can set up the hard disk to load the OS automatically for you. Once you have loaded the OS into your computer's memory, you can remove the system diskette (if necessary) and load the utility or application programs that you want to use.

You load an application program into memory by typing a specific command, such as the filename of the program file itself (see your program user's guide). When an application program is loaded into memory, you must use the commands "known" to that program. When you exit from the application program, you return to the OS and can use OS commands again.

3

USING YOUR SYSTEM

This chapter describes these different system configurations (hardware arrangements):

- Dual floppy disk drive model
- Internal hard disk model
- External hard disk
- Network stations

You will also learn how to work with these parts of your computer system:

- Floppy disk drives
- Floppy diskettes
- The hard disk

SYSTEM CONFIGURATIONS 3.1

The different computer models available are illustrated in Chapter 1 and described here. Most models can be set up in several ways or connected network-fashion to other computers.

Dual Floppy Drive System

The model shown in Figure 1-1 has two floppy drives. This model has a standard internal memory (RAM) of 256K that can be expanded to 896K. Floppy diskettes are used as external memory (storage for programs and files).

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Internal Hard Disk System

The internal hard disk model has a single floppy disk drive (as shown in Figure 1-2). Internal hard disk models have a standard memory (RAM) of 256K. The hard disk has a storage capacity of 10.6M byte (an Mbyte or Megabyte is one million bytes). The hard disk can hold slightly less data than 9 double-sided floppy diskettes can hold. With a hard disk system, you can use both floppy diskettes and the hard disk for storing programs and files. Using the hard disk is described in Chapter 3.4 and in Section III.

External Hard Disk

You can connect an external hard disk to any model computer. Figure 1-3 shows a dual drive system connected to an external hard disk. The external hard disk has the same storage capacity as the internal hard disk (10.6M byte). Using an external hard disk is described in Chapter 3.4 and in Section III.

Network Stations

You can connect any computer model to the Server Network. In the Network, one hard disk model (the server) handles file operations for up to 54 stations. The stations might be floppy-drive models that can work on or off the Network, or diskless stations that can work only on the Network. Using Network stations is described in Chapter 3.5 and in the *Server Network User's Guide.*

FLOPPY DISK DRIVES 3.2

Your computer uses **floppy diskettes** as external memory (storage for programs or files). The CPU uses **floppy disk drives** to store data (**write**) on a diskette and to retrieve data (**read**) from a diskette. Floppy drives are peripheral devices, but they are built into the cabinet with the CPU (see Figures 1-1 and 1-2). Hard disk models also use the hard disk as external storage.

A floppy disk drive is conceptually like a phonograph turntable. Both devices spin a sheet of plastic and pick up a "message"—the phonograph has a needle that picks up sound frequencies, and the disk drive has a **read/write head** that picks up the magnetic pulses signifying binary data.

Floppy disk drives can be **single-sided** or **double-sided**. Although all drives look alike, there are important differences between single- and double-sided drives:

- Double-sided drives can read data from both sides of a double-sided disk; single-sided drives can read data from one side only.
- Computers with double-sided drives are shipped with a "DOUBLE-SIDED" sticker on the CPU. You can also identify double- and single-sided machines by the code (DS or SS) inside the latch to the drive door. You can see the code by holding a mirror level with the drive door.
- Internal hard disk computers always have a double-sided floppy drive.

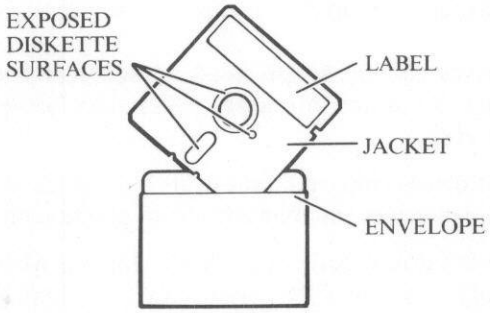
CAUTION

- Do not stick anything other than a diskette into a drive.
- Open and close doors carefully and smoothly. Do not suddenly snap them open or closed.
- Never open a drive door when its in-use light is on or the drive motor is running. The diskette in the drive can be damaged, or the data being processed can be lost.

3.3 FLOPPY DISKETTES

Another important part of a computer system is the **floppy diskette**. Your computer uses 5¼″ floppy diskettes (and the hard disk, if you have one) to store the files you create. Diskettes are called "floppy" because they are flexible—as opposed to a hard disk, which is rigid. Figure 3-1 shows the parts of a floppy diskette.

Figure 3-1: Parts of a Diskette



Data is stored as magnetic pulses on the surface of floppy diskettes or hard disks. The computer reads information from the diskette or from the hard disk, and it writes information on diskette or disk. Reading and writing is done by the read/write head in the disk drive. The read/write head fits into a slot on the diskette jacket through which it reads and writes data as the drive motor spins the disk. While a floppy drive is reading or writing, the in-use light next to the drive lights up.

HANDLING DISKETTES 3.3.1

Handle diskettes carefully. Follow these guidelines:

- Do not bend diskettes. If the surface of the diskette is marred, the computer may be unable to read or write data on the diskette.
- Do not touch any exposed surfaces; hold diskettes by the label (see Figure 3-1). Because data is stored as minute magnetic pulses, tiny particles of dust, smoke, or dirt from your fingers can make your data inaccessible.
- Keep diskettes away from magnetic fields, such as those generated by magnetic paper clip holders or ringing telephones. Interference from magnetic fields can "jumble" your data.
- Write on the diskette label with a soft felt-tip pen. Do not use a ball point pen or pencil. Never write on the diskette envelope when the diskette is inside it.

LABELING YOUR DISKETTES 3.3.2

Writing the contents of a diskette on its label helps you keep your data and programs in order. Here are examples of what you can record on a diskette label:

- The names of the files on the diskette, and/or the general subject of the files.
- The date the diskette was formatted.
- The date(s) you created or updated the files.
- The operating system used (MS-DOS or CP/M-86).
- The name of the program used to create the files.

- Type of diskette: Master, Working, or Backup.
  - **Master diskettes** are original software diskettes from your dealer. Master diskettes should be write-protected and stored in a safe place and should never be edited or changed.
  - **Working diskettes** can be copies of master diskettes for everyday use, or diskettes that contain your working files. A working diskette can contain programs and/or data files.
  - **Backup diskettes** are copies of your working diskettes. Backups should be updated regularly as protection against accidental loss of data. Chapter 4 describes how to make backups.

3.3.3 TYPES OF DISKETTES

You should purchase and use only double-density floppy diskettes. Single-density diskettes may work, but they are not reliable and should not be used with your computer.

You can also purchase and use either single-sided or double-sided diskettes. Here are the important differences between single- and double-sided diskettes:

- Double-sided diskettes store twice as much information as single-sided diskettes.
- Single-sided diskettes can be used with single- or double-sided floppy disk drives.
- Double-sided diskettes can be used with any drive, but only a double-sided drive can read both sides of a diskette.

If you buy double-sided diskettes and have double-sided disk drives, you can use the diskettes as single-sided or as double-sided diskettes. You do this by running the FORMAT utility either for single- or for double-sided format. Also, you can use single-sided diskettes with double-sided drives, but you cannot FORMAT single-sided diskettes to be double-sided.

WRITE-PROTECTING DISKETTES 3.3.4

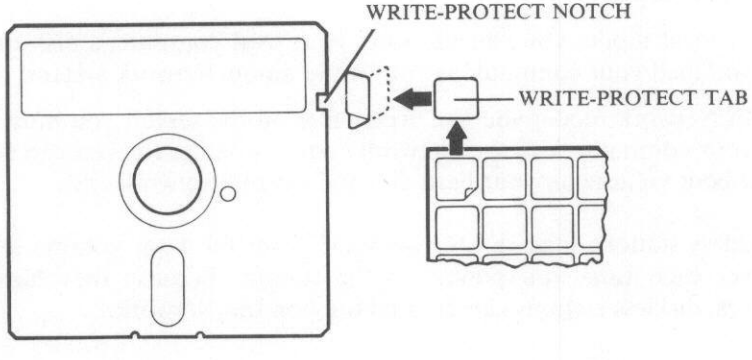
After you store your files on diskette, you can safeguard the information by **write-protecting** the diskette. Your computer cannot write (record) over the information on a write-protected diskette.

Each diskette has a **write-protect notch** (see Figure 3-2). The computer can write on a diskette whose write-protect notch is open. If you cover the notch with an adhesive **write-protect tab**, the read/write head cannot contact the diskette to begin a write operation. Instead, the OS gives you an **error message** indicating that the diskette is write-protected.

You will find sheets of write-protect tabs packed in diskette cartons, along with diskette labels for writing the filenames on the diskette.

To edit a file on a write-protected diskette, remove the adhesive tab and insert the diskette into a disk drive. After you complete your edit, replace the tab (or apply a new tab) for continued write-protection.

Figure 3-2: Write-Protecting a Diskette



3.4 THE HARD DISK

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The hard disk is divided into **volumes**. You can use each volume much like a floppy drive with a diskette in it. Each volume has a letter name, like a floppy drive. The volumes are named when you set up (configure) the hard disk.

When you power up a hard disk model, the computer tries to load the OS from the floppy drive(s) first, and then from the hard disk. You can set up a boot volume on your hard disk to load the OS. (Setting up the hard disk is described in Section III.

3.5 SERVER NETWORK

Computers on the Server Network can use shared files stored on the server (a hard disk model set up to share its disk space). The Network also shares printers that are connected to a server. The *Server Network User's Guide* gives details on using the Network.

Most computers connected to the Server Network can be used in local or Network mode:

- In local mode, you can use only your own computer's disk drives; you load your computer as you would a non-Network system.
- In Network mode, you can access files on the server; you must load your computer with the Network system diskette (or you can set up a boot volume on your hard disk to load the Network OS).

Diskless stations load the Network OS from the boot volume on the server each time you power up the station. Because they have no drives, diskless stations can be used only on the Network.

4

USING THE KEYBOARD

You can communicate with the computer via the keyboard only after you load the operating system or an application program. (Loading the operating system is described in Section II, Chapter 1.) This chapter familiarizes you with the keyboard and some of the keyboard functions you can perform with the OS.

GENERAL KEYBOARD OPERATION 4.1

Several keyboard models are available for your computer. The keyboards (shown in Appendix A in the *MS-DOS User's Guide*) are designed for different languages. Each keyboard has special characters for that language, and may also have different key arrangements.

To use the keyboard, you must first install your computer, plug in the keyboard, and load the operating system. Pressing a key on the keyboard does two things:

- Displays a character on the screen (for most characters).
- Transmits code (**ASCII**) representing the character to the CPU.

Besides a physical keyboard, your computer uses a "soft keyboard"—a part of the OS that tells the computer what character and code to generate for each keystroke. You can rearrange your soft keyboard or assign a new character or function to any key. To do this, you use the KEYGEN program to create a new keyboard file (with .KB or .KBD file extension). (For more on KEYGEN, see the *Graphics Tool Kit* or the *Applications Programmer's Tool Kit*.)

Your computer also has a large **character set**, consisting of up to 256 characters, symbols, and graphics (see Appendix C in the *MS-DOS*

User's Guide). When you print out files, your printer may not reproduce all the characters in the screen display. This happens most often with typewriter-style printers (such as daisy-wheel printers) because they have a limited character set (a daisy-wheel usually has less than a hundred characters). Some dot-matrix printers, on the other hand, have a graphics mode in which they can produce any character by filling in portions of the character matrix.

I

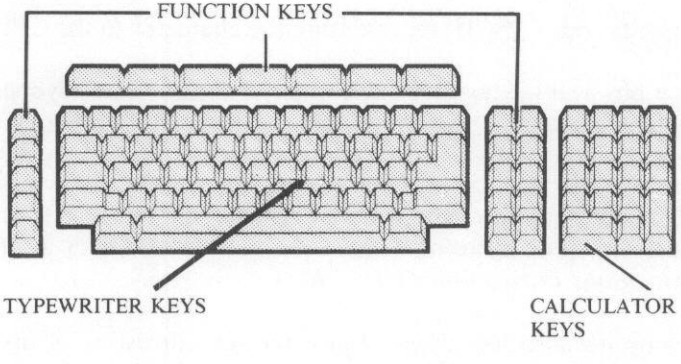
4.2 KEY FUNCTIONS

Most of the time the keys have the functions described here. Some programs, however, use some keys differently (see instructions in your program user's guide).

The keyboard contains five main key groups (shown in Figure 4-1):

- The **typewriter keys.**
- Three groups of **function keys** (described in the following paragraphs).
- The **calculator pad.**

Figure 4-1: Key Groups



You can type on the typewriter keys just as you type on a typewriter. You can correct most mistakes with the Backspace key (labeled with a left-arrow or with BACKSPACE). You can also use the Delete key (labeled DEL or DEL CHAR) located to the right of the Backspace key. The Delete key deletes characters to the right of the cursor, while the Backspace deletes to the left of the cursor.

If you make a mistake in an MS-DOS command, MS-DOS displays an error message telling you that the command is "bad". CP/M-86 responds to an unknown or misspelled command by repeating the command, followed by "?". For both operating systems, you can simply retype the command correctly after this type of error message.

Two keys on either side of the Space bar are not found on a normal typewriter—the ALT (Alternate) key, and the Pause or Pause/CONT key:

- The ALT key is always used with a second key; it performs ALT-key (Alternate) functions. To enter an ALT-key function (such as ALT-C), hold down the ALT key and press the other key (in this case, the letter c or C). Most ALT-key sequences perform functions defined by the OS or by the program in use.
- Use of the Pause key is defined by the current program. It usually stops/restarts scrolling of the screen display. Pause gives you time to read the screen or verify the data.

Each OS also has special ALT-key functions that you can use to edit your commands to the OS (see the user's guide for your operating system). For example, ALT-S freezes the screen in the same way the Pause key does.

The top row of function keys are **general function keys**. Their use is defined by the program you are using (see your program user's guide). Many programs display the functions of these keys on the bottom line of the screen.

Your keyboard may have ten general function keys, or only seven. For keyboards with seven function keys, the functions for keys F8, F9, and F10 are performed by keys in the far left column. F8 is the Alternate function of the SCRL or INT key; F9 is the ALT function of the RVS key; and F10 is the ALT function of the UNDL key.

The remaining function keys are **specific function keys**. They are intended to do what is shown on their labels, although their use may vary with the program you are using.

You can use the calculator pad to type numbers just like the number keys in the typewriter section. You can also use the calculator pad to perform mathematical operations. The use of the calculator pad is described in Appendix H in the *MS-DOS User's Guide.*

4.3 KEY LABELS

A key's label shows the function or character the key produces. Key labels can be on the top and on the front of keys; the position tells whether the label gives the shifted, unshifted, or ALT mode (see Figure 4-2). Remember, however, that the character produced is determined by the soft keyboard, not by the key label.

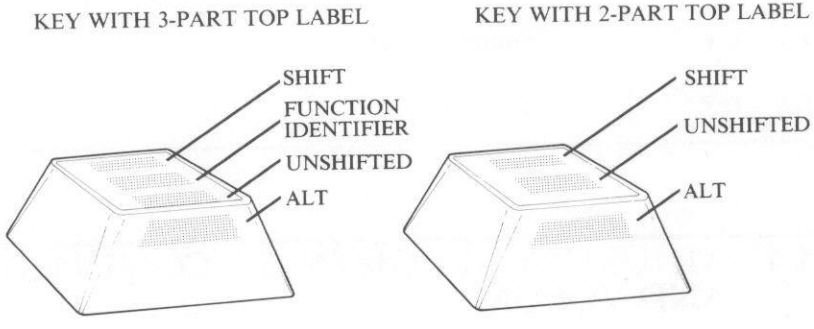
Keytop labels in the typewriter section show the character that the key produces. For alphabetic characters, there is only one key label; pressing the key unshifted produces lowercase, and pressing the key shifted (with the Shift key) produces uppercase. Pressing the key together with the ALT key may produce a different character or an Alternate function defined by the OS or the current program.

A two-part label (such as the labels on the number keys in the typewriter section) indicate that the key has different shifted and unshifted functions. For example, the key that produces the numeral 3 unshifted may produce the pound sign (#) shifted.

Labels on the front of a key give the key's Alternate function (Figure 4-2). For example, the front of the 7 key may have an up-arrow, indicating that ALT-7 produces ^. The cursor movement keys have key-front labels that show their Alternate functions as contrast, brightness, and volume control keys.

The underline key (a specific function key labeled OFF/UNDL/ON) is a key with a three-part label. After you press it unshifted, everything that appears on the screen is underlined. Press it while holding down the Shift key to turn off underline mode. (The underline mode is a temporary mode that affects only what is on the screen. You cannot use it to print underlined words.)

Figure 4-2: Key Label Positions: Unshifted, Shifted, and ALT



Symbols are used as key labels on some keyboards. Table 4-1 defines the symbol labels. (Your keyboard may not use these labels.)

Table 4-1: Symbols on Key Labels

LABEL	FUNCTION
↵	Return or Enter
⇧	Shift
⇧ or 🔒	Shift lock/lock release
←	Backspace
→|	Tab right
↑, ↓, →, ←	Cursor control
☼▲, ☼▼	Brightness control
◐▲, ◐▼	Contrast control
🔊▲, 🔊▼	Audio control

4.4 ADJUSTING BRIGHTNESS, CONTRAST, AND VOLUME

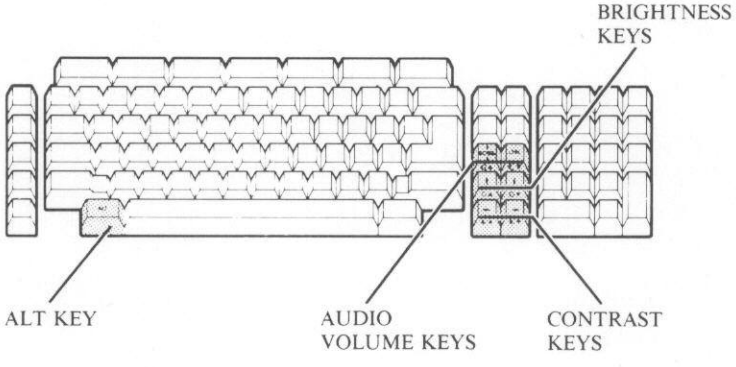
You can adjust screen brightness, contrast, and audio volume after the OS is loaded.

- Brightness—You may want to increase screen brightness when other light sources make it difficult to see the screen.
- Contrast—You can control the onscreen contrast between high- and low-intensity characters when you are using an application program that displays high-intensity characters. (Some programs do not support high-intensity characters; with these programs, each contrast key works like the opposite brightness key to increase or decrease overall screen brightness.)

- Volume—You can adjust the volume for application programs that use sound, such as beeps (or voice prompts, if you have an optional audio expansion board).

You adjust brightness, contrast, or volume by holding down the ALT key and pressing one of the keys shown in Figure 4-3. Each brightness, contrast, or volume key has an appropriate symbol on its keyfront label. The label also shows an up-triangle or a down-triangle. For example, the label on the front of the brightness-up key has a sun symbol (✹) and an up-triangle (▲).

Figure 4-3: Brightness/Contrast/Volume Keys and the ALT Key



To increase screen brightness, hold down the ALT key and press the brightness-up key one or more times.

To decrease brightness, hold down the ALT key and press the brightness-down key one or more times.

The contrast and volume keys work the same way.

SECTION II
USING THE OPERATING SYSTEM

This section describes basic operating system functions—the first steps in operating your computer with MS-DOS. (Most of the functions described here also apply to CP/M-86.) You will learn step by step how to:

- Load the operating system into memory on any system configuration (floppy drive, hard disk, or Network station).
- Use the reset button to reload the OS.
- Use the DIR command to display the directory for a diskette or a hard disk volume.
- Use filename wild-card characters with DIR.
- Use the MS-DOS FORMAT utility to prepare new diskettes for use with your computer.
- Use the MS-DOS DISKCOPY utility to make backup diskettes.
- Use the MS-DOS SDCOPY utility to make backup diskettes on a single drive.
- Use the MS-DOS COPY command to back up individual files.

Once you know how to use commands (like DIR) and utilities (like FORMAT and DISKCOPY), you can change some details in the steps described in this section. For example, you can load a program from any drive if you name the drive in the command to load the program (as described in Chapter 2).

1

LOADING THE OPERATING SYSTEM

This chapter describes how to load the operating system in three different system configurations:

- Floppy drive systems
- Hard disk systems
- Network stations

You will also learn how and when to use the reset button to reload or restart the OS. The OS described in this chapter is MS-DOS; some details differ for CP/M-86.

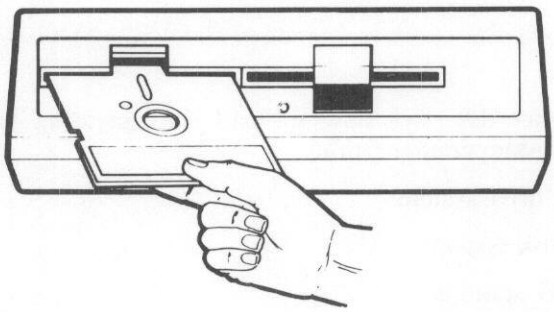
II

PROCEDURE FOR FLOPPY DRIVES 1.1

You use your system diskette to load the OS. Follow these steps:

1. Make sure the screen shows the power-on display (a diskette and a flashing arrow, as shown in Figure 1-11 in Section I). If the display is not on, make sure your system is powered on, and check that the power cord and the cords for the CRT and the keyboard are firmly connected to the main cabinet.
2. Insert the system diskette—with the label side up and the label edge last—into the left drive (Figure 1-1). For a system with one floppy drive, insert the diskette into the single drive (usually on the right side).

Figure 1-1: Inserting a Diskette



II

3. Gently but firmly close the drive door. Do not reopen the drive door until the OS has fully loaded into memory (as described in the following paragraphs).

1.1.1 THE BOOTING PROCESS

Booting is the process of loading the operating system into memory. At the start of the booting process, the computer's internal memory (RAM, described in Section I) is empty. There are no data or programs in RAM to direct the booting process. Instead, your computer uses a type of permanent memory whose only function is to execute its stored program or read its data into RAM. This type of memory is called **read-only memory** or **ROM**.

Your computer has a "boot ROM" that reads the operating system into RAM and performs system tests during the booting process. The boot ROM contains only this predefined routine, and cannot be used for any other function.

The boot ROM performs these functions:

1. Determines the size of RAM.
2. Identifies the device (floppy drive, hard disk, or Network server) from which the operating system can be loaded. Devices are checked in this order: left floppy drive (A), right floppy drive (B), hard disk, Network.
3. Reads the operating system from this device into memory.

The boot ROM begins the booting process when you turn on power to your computer (or when you press the reset button). During the first step of the booting process, the power-on display and memory-test message appear (shown in Figure 1-11 in Section I). This display occurs with all system configurations and remains on the screen until the operating system starts loading into memory. During this first part of the booting process, the boot ROM also tests the floppy disk drives by flashing the in-use lights on and off.

The boot process completes when you insert a system diskette, and the boot ROM loads the OS into RAM.

During the booting process, the boot ROM displays symbols and numbers at the bottom of the screen. The symbols and numbers give you information about your system, such as the memory size, the type of device the boot ROM is testing for the OS, and the code for any error that occurs. The symbols and their meanings are listed in Table 1-1. Error codes are defined in Chapter 8 of the *MS-DOS User's Guide.*

Table 1-1: Boot ROM Display Symbols

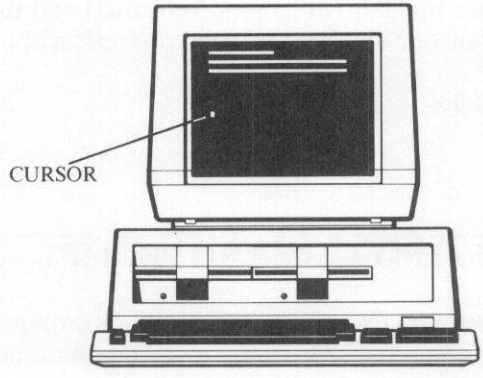
SYMBOL	MEANING
M	MEMORY: Memory test/sizing procedure is being executed.
nnnK	Memory (RAM) size in Kbytes.
	CLOCK: Wait for the process indicated by the accompanying symbol to complete.
	FLASHING ARROW: Appears with the floppy disk symbol, meaning that you should insert a diskette in a disk drive.
	FLOPPY DISK: Boot ROM is trying to read the OS from a floppy disk. When this symbol appears with the clock, the OS is loading from diskette.
0-9	Indicates the floppy drive or Network server from which the OS is loading. For floppy drives, 0 is the left drive, and 1 is the right drive. A Network server number can be 0–9.
	NETWORK: Boot ROM is reading the OS from a Network server's boot volume.
	HARD DISK: Boot ROM is trying to read the OS from the hard disk.
X	ERROR: Appears with a two-digit code to indicate a loading error. The source of the error may be indicated by an accompanying symbol, such as the floppy disk. Error codes are defined in the *MS-DOS User's Guide*.

II

1.1.2 SIGN-ON MESSAGE

After the operating system loads into memory, it displays its **sign-on message** (Figure 1-2). The sign-on message displays your computer's name and gives setup information about the operating system, such as its version number and character set.

Figure 1-2: Sign-On Message



ENTERING THE DATE AND TIME 1.1.3

After the sign-on message, MS-DOS asks you to type the date. Both MS-DOS and CP/M-86 have time-keeping mechanisms, but only MS-DOS requests time and date at bootup and "stamps" the date and time on files. If you type in the date and time, MS-DOS records the correct date and time on files you create or edit during that operating session. If you press Return instead of typing the date and time, MS-DOS uses the system creation date, or the last valid date and time you set. (The *MS-DOS User's Guide* gives detailed instructions on how to enter the date and time.)

For MS-DOS, you type the date using numbers for the month, day, and year, in one of these formats:

mm/dd/yy or **mm-dd-yy** (for American OS)

dd/mm/yy or **dd-mm-yy** (for European OS)

Type the time using numbers for the hour and minutes, as follows:

hh:mm

For example, to enter the date (in American format) and time as April 18, 1984, 2:30 pm, answer the date and time prompts with:

4/18/84 **14:30**

1.1.4 THE SYSTEM COMMAND PROMPT

II

After the booting process completes, the command prompt and cursor appear. Now the system is "booted up," and you can enter OS commands or load an application program into memory.

The command prompt shows the default drive name. For example, the prompt A > shows you that drive A is the default; B > means drive B is the default. Next to the command prompt is the cursor, a highlighted rectangle that shows where your next entry will appear on the screen.

Here is the screen display showing the command prompt and cursor after you load the OS into memory (in this example, drive A is the default):

```
A>_
```

PROCEDURE FOR HARD DISK SYSTEMS 1.2

Internal hard disk systems always try to load from the floppy drive first. External hard disk systems try to load from either drive. You use your system diskette to load the OS like this:

- For an internal hard disk system, insert the diskette in the single floppy drive.
- For an external hard disk system, insert the system diskette in either drive.

Loading the OS from a hard disk volume is faster and easier than loading from a floppy diskette. To do this, you must configure the hard disk and copy the OS onto the boot volume. Then the OS automatically loads from the boot volume if there is no floppy diskette in the floppy drive. (See Section III for instructions.)

PROCEDURE FOR NETWORK STATIONS 1.3

Computers connected to the Server Network can load either a local OS (not operating on the Network) or a Network OS. If you want to load a local OS, follow the instructions for loading the OS in a dual drive system (Chapter 1.1) or for a hard disk system (Chapter 1.2).

To boot up on the Network, you must use a Network system diskette. Follow these steps:

1. Turn on your system. Insert your Network Station system diskette and press the reset button (see the next section).
2. Wait for a message from the Network. You will be logged in automatically or you will be prompted for your user name.

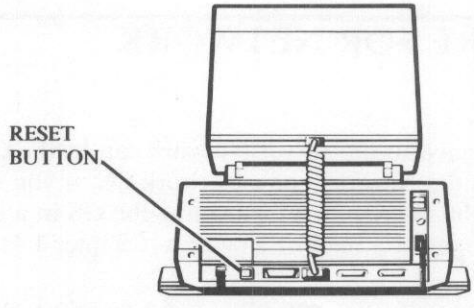
Diskless workstations automatically load the OS from the hard disk of the server when you turn on the power. If a diskless station fails to boot at power-up, make sure that the servers are turned on and that all Network connections are secure.

1.4 USING THE RESET BUTTON

The **reset button** is the square black button on the rear of the main cabinet (see Figure 1-3). The reset button is placed on the back of the cabinet so that it will not accidentally be pressed when you are using the computer. You can easily find the reset button without having to look behind the computer. Reach to the back of the cabinet with your right hand—the reset button is just past the jack for the keyboard cord.

II

Figure 1-3: Reset Button



Pressing the reset button is like turning the computer off and then on again. When you press the reset button, the computer attempts to reload the OS. Several things can happen:

- The system "reboots" (reloads the OS) if your system diskette is inserted correctly.
- The screen displays its power-on display (Figure 1-12 in Section I) if the drives are empty and the drive doors are open.
- The screen displays an error message if the drives are empty but a drive door is closed. To solve this problem, open the drive door. Likewise, if a drive contains a diskette that is not a system diskette, you will get an error message. (Error messages are listed and described in the *MS-DOS User's Guide.*)

CAUTION

- When you press the reset button, the computer "forgets" everything in memory and may destroy the work you were doing. Avoid using the reset button unless you have saved your work.
- Do not reset the system if the in-use light is lit on a drive containing a diskette.
- Be extra careful if you are using your computer on a Network; pressing the reset button can "lock you out" of your own files or cause problems for other users.

Use the reset button to reload the operating system, or to recover from a "lock-up" situation or a program "bug" that you cannot otherwise correct.

2

CHANGING DRIVES AND DISPLAYING DIRECTORIES

This chapter describes how to:

- Change the default drive.
- Use the DIR command to display the directory of a diskette or a hard disk volume.
- Use DIR to verify that a file is in the directory.
- Use filename wild-card characters to refer to more than one file.

THE DEFAULT DRIVE 2.1

The **default drive** or **logged drive** is the floppy disk drive you are using. Similarly, for a hard disk system, the "default drive" is the volume you are using.

By convention, any command or filename you enter refers only to the default drive unless you name another drive, as shown in Chapter 2 of Section I. This means that you can omit the drive name when you want to refer to a file on the currently logged drive. To refer to a file on another drive, however, you must include that drive name.

For example, if you enter a command containing the filename B:MEMO, the OS searches for the file on drive B. If you enter the filename MEMO, the OS searches for the file on the default drive.

2.1.1 CHANGING THE DEFAULT DRIVE

When the OS loads into memory, the default drive is the drive from which the OS loaded. You can change the default drive or "log onto" another drive. This procedure is also known as moving from one drive to another. Type the new drive name, a colon (:), and press Return. After you change the default drive, the command prompt shows the name of the new default drive.

In this example the default drive is changed from A to B:

```
A>b:(cr)
B>_
```

II

2.1.2 LOADING FILES FROM ANY DRIVE OR VOLUME

Suppose you can load an application program by typing the command LOAD, like this:

```
A>load(cr)
```

This command tells the OS to look on the default drive for the LOAD program file. If LOAD is on that diskette or hard disk volume, the program loads into memory, and you can then start using it. If the LOAD program file is not on that diskette or hard disk volume, the OS displays an error message telling you that the file is not on that drive.

If the LOAD program file is on another drive, you can load it by typing the drive name when you type the program name. For example, the following command loads the program from drive B while you are logged on drive A:

```
A>b:load(cr)
```

You could also move to the drive that has the file you want, and then load the program. For example, if you are logged on drive A, you can load the program from drive B like this:

```
A>b:(cr)
B>load(cr)
```


DISPLAYING A DIRECTORY 2.2

On each diskette and hard disk volume, the operating system keeps a **directory**—a list of the files on that diskette or volume. Once you have loaded the OS, you can list the directory of your diskette(s) or hard disk volume(s). You display the directory by entering the DIR command at the system prompt (A >), like this:

```
dir(cr)
```

The preceding command lists the directory for the diskette in the logged drive or for the default volume of the hard disk. If you enter this DIR command when your system diskette is in the logged drive, the screen displays the names of all the utility programs and other files on the system diskette.

The DIR commands for MS-DOS and CP/M-86 display the directory in different formats. Also, MS-DOS keeps subdirectories that you can use as separate work/storage areas; CP/M-86 keeps directories for different User areas. See the appropriate user's guide for more details.

You can look at the directory of a hard disk volume that is not currently logged, or the directory of a diskette in a drive other than the default drive. To do this, you name the other volume or drive in your DIR command. For example, on a hard disk system, this command displays the directory of the volume called D:

```
A>dir d:(cr)
```


Besides listing all the files in a directory, DIR can tell you if the directory contains a particular file (or files). For example, to see if a file named PAYROLL.JAN is on the default drive, enter this command:

```
A>dir payroll.jan(cr)
```

If PAYROLL.JAN is in the directory for the default drive, the OS displays the filename PAYROLL.JAN (and MS-DOS displays its file size and date of creation). If the file is not in the directory, the OS gives you an error message indicating that it cannot find the file.

USING WILD-CARD CHARACTERS 2.3

In some OS commands you can use **wild-card characters** to match filenames in the directory. Wild-card characters "abbreviate" the filename, and allow you to refer to more than one file with a single filename.

Using wild-card characters is similar to using wild cards in a card game. Wild-card characters take on value by matching existing files.

The two wild-card characters are the question mark (?) and the asterisk (*). You can use ? and * with both CP/M-86 and MS-DOS; the user's guide for each OS gives more details about wild-card characters.

The ? matches any character (or none) in that location in the filename or file extension. For example, PAYROLL.O?? matches all these filenames:

PAYROLL.OC PAYROLL.OVR
PAYROLL.OCTPAYROLL.O

The * means "pad with ?s". The * can refer to groups of files with similar names. For example, *.DOC matches all files with the extension .DOC. The filename WS*.* matches all files whose filenames (no matter how long) start with WS, regardless of extension.

Suppose you are logged onto drive A, but you want to know if the file CHKDSK.COM is on drive B. You can use the DIR command with wild-card characters to find out what .COM files are in the directory:

```
A>dir b:c*.com(cr)
```

Now the screen lists all the files that meet these three requirements:

- They are on drive B (or hard disk volume B).
- Their filenames start with C and are 1 to 8 characters long.
- They have file extension .COM.

3

PREPARING NEW DISKETTES FOR USE (FORMAT)

To store the files you create, you need diskettes that are **formatted** (prepared for use with your computer). Here are two ways you can format diskettes:

- Use the FORMAT utility. FORMAT prepares blank diskettes that you can then use for file and program storage. Chapter 3.1 describes how to load FORMAT for both MS-DOS and CP/M-86. Chapters 3.2 and 3.3 describe how to run the MS-DOS FORMAT program. The user's guides for MS-DOS and CP/M-86 give more details.
- Use the DISKCOPY utility. DISKCOPY makes a copy (or backup) of a master or working diskette that contains files you want to keep. The diskette receiving the copy can be formatted or not, or can contain files that you do not want to keep. DISKCOPY copies all the files from the working or master diskette. The use of DISKCOPY for MS-DOS is described in Chapter 4 and in the *MS-DOS User's Guide*. For instructions on using the CP/M-86 DCOPY utility, see the *CP/M-86 User's Guide*.

You can use FORMAT on systems with one or two floppy drives. FORMAT lays out the **tracks** and **sectors** on a diskette. A track is a circular section of a diskette; FORMAT lays out 80 tracks on each side. A sector is a portion of a track; FORMAT sets up sectors of 512 bytes.

FORMAT also makes sure the diskette is reliable for data storage. If a diskette is unreliable, the format process fails. If your FORMAT does not succeed, try to run the program again. If FORMAT fails repeatedly, discard the diskette and use another.

Each operating system has its own version of FORMAT—FORMAT.EXE for MS-DOS, and FORMAT.CMD for CP/M-86. Each version of FORMAT has different screen displays. Also, diskettes

formatted for one OS do not work for the other OS (or programs running under that OS). Both versions of FORMAT, however, can format both single- and double-sided diskettes.

CAUTION

FORMAT erases any information already recorded on the diskette. Be sure the diskette you format does not contain information you need. If the diskette containing the FORMAT utility also contains files you want to keep, write-protect it before you begin the FORMAT procedure.

II

3.1 LOADING THE FORMAT PROGRAM

You can load and run the MS-DOS FORMAT utility using either of these two methods:

- Type the program name followed by a Return:

  format(cr)

  This loads the FORMAT utility into memory from the default drive. FORMAT then displays choices for you to make, as described in Chapters 3.2 and 3.3.

  To load and run FORMAT on a single floppy drive, you must use this method. Then after the FORMAT menu appears, remove the diskette used to load FORMAT and insert the diskette you want to format.

- Enter a complete command line (the program name and the drive side containing the diskette to be formatted). You can also add FORMAT command switches (described in Chapter 7 of the *MS-DOS User's Guide*). For example, this command formats the diskette in the righthand drive (drive B):

  format right(cr)

The FORMAT utility loads into memory and immediately begins formatting. The menu screen is not displayed.

After the diskette in drive B is formatted, the system prompt reappears. To format another diskette, enter another FORMAT command.

SUMMARY OF THE FORMAT PROCEDURE 3.2

These are the basic steps for running the MS-DOS FORMAT program and using its onscreen menu. Chapter 3.3 gives more details about the FORMAT procedure.

1. Load the FORMAT program by typing only the program name.
2. Select the drive you want to format—LEFT or RIGHT. The RIGHT drive is the default. To select the LEFT drive, press the left-cursor key.
3. (Optional) Supply a Volume ID for the formatted diskette—type a name or number that you want to use as an on-disk "label" for the diskette contents.
4. Select double-sided or single-sided format using the cursor keys. (FORMAT offers you this choice only if you have double-sided drives.)
5. Select the process you want by pressing the function keys at the top of your keyboard:
   - ▶ FORMAT (prepare a blank diskette, track by track).
     Press F2 for FORMAT.
   - ▶ CLEAR (clear or empty the directory of a working diskette).
     Press F3 for CLEAR.

6. Wait for the process to complete. Then you can repeat steps 2 through 5 as many times as you want to FORMAT or CLEAR more than one diskette.
7. QUIT (exit) the FORMAT program. Press F1. Then press F2 to confirm your choice to QUIT.

3.3 USING THE FORMAT MENU

This chapter describes how the FORMAT program works onscreen. The description assumes your system has double-sided drives. Some details differ for single-sided drives, but FORMAT prompts you to select options for your system.

1. Load MS-DOS if it is not already loaded. Make sure that the default drive contains the FORMAT utility (the FORMAT.EXE and FORMAT.DAT files).
2. Load the FORMAT utility into memory by typing:

   format(cr)

3. Once FORMAT is loaded, it displays its menu or selection screen. If you want an explanation of the FORMAT program and its onscreen selection process, you can press the HELP key, F7, as shown in the bottom line of the screen display (see step 7). Pressing F7 displays the contents of the help file FORMAT.DAT. (If this file is not on the default drive, FORMAT cannot display the help screen.)
4. The top line in the FORMAT menu or selection screen is a sign-on banner that gives the name of the program and its version number:

```
Format Selection                    FORMAT version x.y
```

Below this banner are the selections you can make:

```
Format Which Disk . . . . . .  LEFT [RIGHT]

Volume ID . . . . . .

Format Double Sided . . . . . .  YES [NO]
```

Below the selection lines is the prompt line. The prompt line changes as you work from step to step; it tells you what to do next:

```
Move the cursor using the arrow keys to
indicate which floppy disk you wish to format.
```


Notice that the first selection (Format Which Disk) is underlined to indicate that this line is your current choice. The default choice (RIGHT) is highlighted.

You can change the selection like this: Press the left-cursor key, and LEFT becomes the highlighted choice for Format Which Disk. Press the right-cursor key, and the choice returns to RIGHT.

Insert the diskette you want to format in the right drive. If you have only one floppy drive, remove any diskette in that drive and insert the diskette to be formatted. Make sure RIGHT is highlighted on the Format Which Disk line.

5. You move to other selection lines by using the up- or down-cursor keys. Move to the next line—Volume ID—by pressing the down-cursor key. This line has no default choice. A Volume ID is an optional 11-character name that you can create to "label" your diskettes. For example, you might use PAYRLRECDS as the Volume ID for a diskette that you will use to store payroll files.

   If you want to give this diskette a Volume ID, type in the name you want. Otherwise, go on to the next step.

6. Move down to the Format Double Sided selection line by pressing the down-cursor key. (If your system has single-sided drives, this selection line does not appear; go on to step 7.) The default choice NO is highlighted, indicating that the FORMAT will be single-sided.

   If you want to format this diskette to be double-sided, change the choice to YES by pressing the left-cursor key.

7. When you are sure that the choices in the selection lines are what you want, start the FORMAT process. To start and quit FORMAT, you use the function keys on the top row of your keyboard; FORMAT displays the value of the function keys on the bottom line of the screen:

```
1 QUIT   2 FORMAT   3 CLEAR                    7 HELP
```

   To start formatting the diskette in the selected drive (the one highlighted in the Format Which Disk selection line), press F2. During the format process, FORMAT tells you the number of the track it is formatting:

```
Now formatting track: nn
```

8. The FORMAT process does not end until the program tells you it is complete, and displays the amount of storage space on the diskette (in bytes). If you select double-sided format, the display is:

```
Format right floppy drive complete:
1216512 bytes available on diskette.
```

9. Now the screen redisplays the original prompt line asking you to indicate which drive you want to format. Remove the diskette you have just formatted. Put it in its envelope and store it, or keep it on hand for immediate use.

10. To format another diskette, insert the diskette, check that the selection lines display the choices you want, and then press F2 to start formatting.

11. To return to the operating system, press F1 (labeled QUIT on the bottom line of the screen). FORMAT asks:

```
ARE YOU SURE THAT YOU WANT TO EXIT FORMAT?
```

12. Now the screen's bottom line displays new values for function keys 1 and 2—NO and YES, respectively. To exit to the operating system, press F2 (YES). To remain in the FORMAT program, press F1 (NO). Instead of using the function keys, you can also type the letter y for YES, or the letter n for NO.

3.4 USING FORMAT WITH ONE FLOPPY DRIVE

If you have only one floppy disk drive (as with an internal hard disk system), you can load FORMAT from your system diskette or from the hard disk.

- To load and run the MS-DOS FORMAT program from a hard disk, follow the steps described in Chapter 3.3. The FORMAT.EXE file must be in the current directory on the default drive (volume).
- To load FORMAT from your system diskette in the single floppy drive, follow the steps described in Chapter 3.3, **except that** you must remove your system diskette and insert the diskette you want to format before you press F2 (FORMAT) in step 7.

4

MAKING BACKUPS (DISKCOPY, SDCOPY, AND COPY)

This chapter tells you how to:

- Back up your MS-DOS system diskette
- Back up your working diskettes
- Back up individual files

Regular backup is very important. First you should back up your system diskette, as described in Chapter 4.1.1. Then, at least once every work session, make a backup (a copy) of the working diskettes you are using. Diskettes can be damaged (by dust, in particular), and they wear out over time. Also, power failures can destroy data on diskettes in use. If you don't keep up-to-date backups, you may lose the information recorded on your working diskettes.

You use the MS-DOS DISKCOPY or SDCOPY utilities to back up MS-DOS diskettes, or the CP/M-86 DCOPY utility to back up CP/M-86 diskettes. DISKCOPY works with a dual drive system; SDCOPY works with a single drive (such as an internal hard disk system). If you are using MS-DOS, the directory of your system diskette should contain DISKCOPY.COM or SDCOPY.COM (or both). If you are using CP/M-86, you should see DCOPY.CMD on your system diskette directory. This chapter describes the MS-DOS DISKCOPY only. See the *CP/M-86 User's Guide* for instructions on using the CP/M-86 DCOPY.

If you have an internal hard disk system, you cannot use DISKCOPY, which requires two floppy drives. Instead, you can back up MS-DOS files and diskettes with SDCOPY, COPY, or SEARCH. SDCOPY and COPY are described in Chapters 4.2 and 4.3. All three commands are described in Section III.

4.1 BACKUP WITH TWO DRIVES (DISKCOPY)

To run DISKCOPY you must use two floppy disk drives. You also need:

- The DISKCOPY program file—DISKCOPY.COM. This file is on your MS-DOS system diskette.
- A master or working diskette (the one you want to copy).
- A backup diskette (the one to be the copy).

For the backup diskette, you can use a blank diskette or one that already contains files. DISKCOPY formats the diskette and erases any existing files as it copies files from the original diskette to the backup. Once you have made a backup diskette, you can re-use (update) it by DISKCOPYing onto it again.

Use a double-sided backup diskette if the diskette you are copying is double-sided. To DISKCOPY a double-sided diskette, your computer must have double-sided drives. If you are using double-sided diskettes on double-sided drives, DISKCOPY automatically copies both sides of the diskette.

4.1.1 BACKING UP YOUR MS-DOS SYSTEM DISKETTE

The first work you should do with your computer is to make a backup of your system diskette. After you copy your system diskette, use the copy in your day-to-day work. Keep the original system diskette (the master) in a safe place such as a locked file cabinet or diskette box. If your system diskette is damaged or lost, you can easily make a new copy of the master.

To back up a system diskette (or any diskette containing the MS-DOS DISKCOPY program):

1. Load MS-DOS if it is not already loaded. For this example, your system diskette should be in the left drive. Insert the backup diskette in the righthand drive.
2. To copy the diskette in the left drive to the diskette in the right drive, type:

   diskcopy left to right(cr)

   Or you can abbreviate the command like this:

   diskcopy l r(cr)

3. DISKCOPY's sign-on message appears at the top of the screen:

```
Diskette COPY Utility - Version x.y
```

4. The DISKCOPY process begins immediately. During the copy, the number of the track being copied appears at the bottom of the screen.
5. When DISKCOPY finishes the copy, the system prompt reappears.
6. Remove the backup diskette from the right drive (drive B). Label it, or update the label, and put the diskette in a safe place, such as a diskette case.
7. To make another backup system diskette, insert another diskette in the right drive and repeat step 2.
8. If you are finished making copies, remove the master system diskette from the left drive, write-protect the master, and store it in a safe place.

4.1.2 BACKING UP OTHER DISKETTES

Backing up diskettes that contain data files or application programs is as important as backing up your system diskette. You can back up a working diskette or any diskette that does not contain DISKCOPY by first loading the DISKCOPY program from a system diskette, and then swapping in the diskette you want to copy.

To back up a working diskette (or a diskette that does not contain DISKCOPY), follow these steps:

1. Load MS-DOS (if it is not already loaded) with your system diskette in the left drive.
2. Type:

   diskcopy(cr)

3. DISKCOPY's sign-on message appears at the top of the screen:

```
Diskette COPY Utility - Version x.y
```

   At the bottom of the screen, DISKCOPY asks you:

```
Copy from FLOPPY drive? (Left or Right; press
RETURN to end.)
```

4. Now that the DISKCOPY utility is loaded into memory, you can remove your system diskette. Insert the diskette you want to copy in the left drive. Type:

   1

   to indicate the left drive.

5. DISKCOPY displays:

```
Copy from Left FLOPPY drive to Right FLOPPY
drive.  Press space bar when ready.
```

6. Insert the backup diskette in the righthand drive.

7. Press the Space bar to start the copy. Pressing Return cancels this copy and returns you to the original DISKCOPY prompt (step 3). Pressing any other key has no effect.

8. DISKCOPY tells you when the copy is complete and asks if you want to repeat the process:

```
Copy from Left FLOPPY drive to Right FLOPPY
drive complete.

Copy from FLOPPY drive? (Left or Right; press
RETURN to end.)
```

9. To return to MS-DOS:

   a. Remove the master/working and backup diskettes from the drives.

   b. Insert your system diskette in the left (default) drive.

   c. Press Return.

4.2 BACKUP WITH ONE DRIVE (SDCOPY)

You can use the MS-DOS SDCOPY utility to back up diskettes on a single floppy disk drive, such as an internal hard disk system. The SDCOPY process takes several minutes, and you must remove and reinsert your diskettes repeatedly. Alternatives are the COPY command or the SEARCH utility (see the *MS-DOS User's Guide*).

Be sure to use a double-sided diskette if the diskette you are copying is double-sided. Copying a single-sided diskette onto a double-sided diskette reformats the diskette as single-sided.

To back up a diskette with SDCOPY:

1. Load MS-DOS if it is not already loaded.
2. At the command prompt, type:

   sdcopy(cr)

3. SDCOPY's sign-on message appears at the top of the screen. At the bottom of the screen, SDCOPY asks you to insert the source diskette (the diskette you want to copy):

```
Insert source diskette, then press space bar
(return key to exit).
```

4. Press the Space bar if the floppy drive contains the diskette you want to copy (the source diskette).
5. If the floppy drive does not contain the diskette you want to copy:
   a. Remove the diskette in the drive.
   b. Insert the source diskette.
   c. Press the Space bar.

6. Now SDCOPY tells you how many times you must reinsert the source and destination diskettes to complete the copy:

```
N insertions of your source and destination
disks will be required.
```

where N represents a number.

Also, SDCOPY starts the copy process by reading a portion of data from the source diskette:

```
Partial read #1 of N
```


7. SDCOPY ask you to insert the destination diskette (the backup diskette):

```
Insert formatted destination disk, then press
space bar (return key to exit).
```

8. Remove the source diskette, insert the backup diskette, and press the Space bar.
9. SDCOPY copies the first section of the source diskette onto the destination diskette:

```
Partial write #1 of N
```

Then SDCOPY asks you to reinsert the source diskette:

```
Insert source disk, then press space bar
(return key to exit).
```

10. Continue to reinsert your source and destination diskettes until the copy is complete. SDCOPY notifies you if the wrong diskette is in the drive when you press the Space bar.
11. SDCOPY notifies you when the copy is complete and prompts you to repeat the process:


```
SDCOPY completed.

Insert source disk, then press space bar
(return key to end).
```

12. To make another copy, repeat steps 1 to 11. To return to the OS command prompt, press the Return key.

4.3 BACKING UP FILES (COPY)

You can use the MS-DOS COPY command to copy files in these ways:

- From one floppy diskette to another
- From one hard disk volume to another
- From a hard disk volume to a floppy diskette, or vice versa

The steps described here tell how to use COPY with an internal hard disk system to back up one floppy diskette onto another. If you are using CP/M-86, you can use the PIP utility to back up files. See the appropriate user's guide for details on both COPY and PIP.

COPY COMMAND SYNTAX 4.3.1

In a COPY command, you name two files. The first file is copied onto the second file. The general form of a COPY command is:

COPY < oldfile > < newfile > (cr)

where:

< oldfile > is the full filename for the file you want to copy (including drive name, filename, and extension, if any).

< newfile > is the full filename for the file to be copied onto. It may be an existing file, or a new one. If you omit the drive name, the copy is made to the default drive. If you give only a drive name, a copy is made (with the original filename and extension) to the drive you name.

For example, to copy the file TEXT.DOC from drive A to drive B, and rename the file NEWTEXT, enter:

```
A>copy text.doc b:newtext(cr)
```

The next command copies all files with .DOC file extension from drive B to drive A. The filenames of the copies on drive A are the same as the original files on drive B.

```
A>copy b:*.doc(cr)
```

4.3.2 USING COPY TO BACK UP A DISKETTE

One way to back up a diskette on an internal hard disk system is to COPY the diskette contents onto a volume of the hard disk. Then COPY the contents of the volume onto the backup diskette.

To do this, you must use a hard disk volume with enough available storage to hold the files you want to copy. For a double-sided floppy diskette you need up to 1217K bytes of data with allocation units of 2K size. For a single-sided diskette, you need 612K storage and 2K allocation units. (To set up a hard disk volume, use AUTOSET, described in Section III.

To copy a diskette:

1. Load MS-DOS or get to the MS-DOS command prompt.
2. Transfer the files you want to copy from the original diskette to the hard disk volume. For example, to copy all the files from drive B (the floppy drive) to hard disk volume C, use this command:

   copy b:*.* c:(cr)

3. Remove the original diskette from the floppy drive. Insert the backup diskette.
4. Transfer the files onto the backup diskette. For example, to copy all the files from hard disk volume C to drive B, use this command:

   copy c:*.* b:(cr)

SECTION III

USING THE HARD DISK

Section III of this Guide describes how to:

- Configure a hard disk with the AUTOSET utility
- Copy the MS-DOS operatings system onto a hard disk (SYS)
- Copy the system utilities and other disk files onto a hard disk (COPY)
- Organize the files on your hard disk for efficient use of storage space
- Display volume-drive assignments for a hard disk (VDIR)
- Back up hard disk files onto floppy diskettes (COPY and SEARCH)
- Restore files from diskette to hard disk (SEARCH)

1

OVERVIEW OF HARD DISK OPERATIONS

This chapter describes hard disk operations and terminology for the first-time user. If you have never used a hard disk, read this chapter carefully before you set up your hard disk. If you are familiar with hard disks, you may want to skim this chapter.

BASIC OPERATIONS 1.1

Working with a hard disk is like working with multiple floppy disk drives. The hard disk is made up of storage areas called **volumes**. Each volume functions like a floppy drive with a diskette in it.

Volumes, like floppy disk drives, have letter names such as A, C, and D. The default drive or volume is displayed in the system command prompt (such as A> for drive/volume A). You can move from one hard disk volume to another just as you would change the default drive on a floppy drive computer (see Section II).

You can access files on the hard disk exactly as you access files on a floppy drive—by including the volume name (like a drive name) with the filename. For example, suppose you can load a program with the command RUNDATA. If the program file is stored on hard disk volume A, the following command loads the program (regardless of which volume is currently logged):

```
a:rundata(cr)
```

You can also set up your hard disk to load the operating system. The volume that loads the OS is called the **boot volume**. The procedure for setting up a boot volume is described in Chapter 2.2.

1.1.1 SIZE LIMITATIONS

The hard disk has a much larger capacity for data (files) and for directory entries than a diskette does. A double-sided floppy diskette can hold about 1200K bytes (1.2M bytes) of data, and a single-sided diskette can hold 612K bytes of data. A small hard disk volume, however, can contain from 20K to 1000K bytes (one Megabyte). Large volumes can contain several thousand Kbytes—a volume the size of the hard disk itself would be over 10,000K or 10 Megabytes.

Directory size is another limitation difference between the hard disk and floppy diskettes. If you try to save a new file when the directory is full, you get an error message, and you may lose your data. A double-sided diskette's root directory can contain 256 file entries. A hard disk's root directory may hold anywhere from 17 entries (for small volumes) up to 321 entries (for 10M byte volumes). The actual directory size for each volume is set during configuration.

III

Keep these size limitations in mind when you move files from the hard disk to diskette. For example, a floppy diskette that can hold all the data from a hard disk volume may not be able to hold all the directory entries.

HARD DISK UTILITIES 1.1.2

Hard disk utilities are MS-DOS programs that perform maintenance functions on a hard disk system. This manual describes the use of two hard disk utilities:

- AUTOSET configures the hard disk.
- VDIR displays the volume-drive assignments in the system.

These other utilities for the hard disk are described in the *Hard Disk Tool Kit*:

- HDSETUP custom configures the hard disk. You can use it to create or delete volumes, and change drive assignments.
- HDTEST runs a confidence test on the hard disk.
- HDFIXUP recovers data from damaged areas on the hard disk.
- HDFORMAT reformats (erases) the hard disk.
- HDPARK places the read/write head in a safe position for transporting a hard disk.
- HDRESTOR replaces a bad hard disk label with the backup label.

HARD DISK CONFIGURATION 1.2

Before you can use your hard disk, you must set up or **configure** it. Configuring means organizing the hard disk so that the OS can use it. To configure a hard disk, run one of the hard disk configuration utilities (AUTOSET or HDSETUP). AUTOSET configures the hard disk with a predefined configuration of your choice (see Chapter 2.1). With HDSETUP you can create your own configuration (see the *Hard Disk Tool Kit*).

Either configuration utility divides the hard disk into volumes. Each volume (and volume directory) is given a specific amount of disk space. Volumes can be any size, up to the capacity of the hard disk. AUTOSET offers you configurations with volume sizes ranging from 1000K to 8000K bytes, and with root directory sizes from 128 to 512 file entries.

Each volume is also given a **Volume ID**—a name or label for that volume. AUTOSET assigns default Volume IDs (such as VOLUME 1) during configuration. HDSETUP allows you to assign unique names to the hard disk volumes. For example, you might put your word processing program and files in a volume called EDITOR.

After you configure your hard disk, you should copy the operating system, the system utilities, and your application programs and data files onto the hard disk (see Chapter 2.2).

1.3 HARD DISK VOLUMES

III

You can configure the hard disk into one volume or several volumes. Each volume is assigned a drive letter (A–O) during configuration with AUTOSET. A hard disk system can have a maximum of fifteen drive assignments (at least one is a floppy drive).

The operating system uses hard disk volumes as if they were physical disk drives. Thus the volumes, represented by drive letters, become "logical drives." You use logical drive names like physical drive names in commands and filenames—to tell the operating system where your files are located.

AUTOSET assigns default Volume IDs (names) to the logical drive letters. For example, if you select an AUTOSET configuration with five volumes, the volumes and the single floppy drive are given the following logical drive names and default names:

Logical Drive	Volume Name
A:	VOLUME 1
B:	RIGHT FLOPPY
C:	VOLUME 2
D:	VOLUME 3
E:	VOLUME 4
F:	VOLUME 5

USING AN EXTERNAL HARD DISK 1.4

To use an external hard disk, follow these guidelines:

- If your external hard disk is attached to a dual floppy drive computer, you can use both floppy drives. You must select an AUTOSET configuration whose name begins with E (for external hard disk). All the E configurations include two floppy drives.
- You can attach an external hard disk to an internal hard disk system. In this case, you must select an AUTOSET configuration whose name starts with IE (for internal/external).
- The external hard disk has its own power source and on/off switch. Turn on power to the external hard disk before you boot up.

2

SETTING UP A HARD DISK (AUTOSET)

This chapter describes the following steps for preparing a hard disk for use:

1. Configure the hard disk with AUTOSET (Chapter 2.1).
2. Copy the operating system onto the boot volume (Chapter 2.2).
3. Copy your application programs and data files onto the hard disk (Chapter 2.3).

Hints for organizing your hard disk are presented in Chapter 2.4. Chapter 2.5 tells how to reconfigure a hard disk.

Chapter 3 contains the fourteen configuration choices that are displayed onscreen during configuration with AUTOSET.

III

CONFIGURING THE HARD DISK WITH AUTOSET 2.1

Configuring the hard disk does the following:

- Organizes the disk space into volumes.
- Divides each volume into **allocation units**, the building blocks of data storage (described in Chapter 3).
- Assigns a Volume ID or label to each volume. By default, AUTOSET assigns a number, such as VOLUME 1.
- Assigns a logical drive letter (A–O) to each volume.

The AUTOSET configuration utility allows you to choose from fourteen predefined configurations. The hard disk operating system diskette contains fourteen .CFG files that contain instructions to MS-DOS for setting up each configuration. Chapter 3 shows all the configuration files and explains more about their specifications. To display the configuration choices during configuration with AUTOSET, the AUTOSET.HLP file must be on the default drive.

Follow these steps to configure your hard disk with the AUTOSET utility:

1. Install and power up your computer as shown in Section II.
2. Insert the MS-DOS hard disk operating system diskette into any floppy drive. The OS loads into memory from the diskette.
3. MS-DOS prompts you for the date and time. Use numbers to enter the date as month/day/year or day-month-year. Enter the time, using 0 to 23 for the hour and 0 to 59 for the minutes. Do not enter the half second. You can press Return if you do not want to record the date and time.
4. The screen displays the system prompt and the cursor. For example:


```
B>_
```

This is the prompt for an internal hard disk system because the operating system was loaded from the floppy drive (drive B). If you are using an external hard disk with a dual drive computer, you can load the OS from either floppy drive. If you use the left drive, the prompt A > appears.

5. Load the AUTOSET utility by typing:

   autoset(cr)

6. The AUTOSET utility displays its sign-on banner:

```
AUTOMATIC SETUP UTILITY vx.y
```

Now you should see the first of the AUTOSET configuration displays. Each display describes the uses for that configuration.

The top line of the display tells you the configuration filename. For example, the top line in the first display is I5AND5.CFG. The I stands for Internal, indicating that this configuration is for an internal hard disk only. "5AND5" means 5 Megabytes and 5 Megabytes—or two volumes of 5 Megabytes each. CFG is the filename extension for a configuration file. The next part of the display, "Specifications", gives the size of each volume, the number of directory entries (Dir), the number of allocation units (the AU is the MS-DOS unit for data storage), and the amount of memory required for that configuration.

Drive letters (A:, B:, C:, and so on) at the upper right of the screen identify the volumes and the floppy drive. In the first display, the hard disk volumes are A and C, and the floppy drive is B. The size of each volume is listed next to the drive letter, and the boot volume for the configuration is labeled. In the first display, volume A is the boot volume.

The rest of the display describes the uses for this type of hard disk configuration.

7. Press any key to see the next hard disk configuration file. All fourteen AUTOSET configurations are shown in Chapter 3.

8. After you have viewed all the configuration types, you are asked to select a type:

```
Please enter the filename of your choice
```

As an example, you could enter:

e5x2.cfg(cr)

E indicates that this configuration is for an external hard disk. 5X2 means 5 volumes, each 2 Megabytes in size. E5X2.CFG is a good general-purpose configuration for an external hard disk.

If you misspell the name of the configuration file, the screen displays:


```
130-Cannot open the specified filename
```

If you get this error message, return to step 5 (reload the AUTOSET utility). Then make sure that you type the name of the configuration file correctly in step 8.

9. AUTOSET configures your disk and displays:

```
Press any key to reboot your system
```

10. Press any key. The operating system reloads from the floppy drive (containing the hard disk operating system diskette).

11. Enter the date and time again. The system prompt appears. You have just configured the hard disk.

A newly configured hard disk is empty, like empty library shelves. To use the hard disk, you should copy onto it all the programs you want to work with—starting with the operating system.

COPYING THE OPERATING SYSTEM 2.2

Each configuration choice has a single boot volume (the volume that contains and loads the operating system). After you copy MS-DOS onto the boot volume, the OS can load into memory each time you turn on the computer or press the reset button. If you do not copy the OS onto the boot volume, you must load the OS from a system diskette each time you turn on the power or press the reset button.

To set up a boot volume, you must use these two commands to copy parts of the operating system onto your hard disk:

- Use SYS to copy the operating system. SYS automatically copies the following files:
  - —MSDOS.SYS, a hidden file containing the part of MS-DOS that loads into memory at bootup.
  - —COMMAND.COM, the command processor file containing all the MS-DOS internal commands.
  - —The configuration files CONFIG.SYS, CONFIG.BAT (if present), and the device drivers named in the CONFIG.SYS file.
- Use COPY to copy the other system files—all the files listed on the system diskette directory, such as .COM, .EXE, .BAT, and .KB files.

Follow these steps to copy the two parts of the operating system onto the hard disk boot volume:

1. Load MS-DOS if it is not already loaded.
2. Enter a SYS command to copy the operating system onto the boot volume. For example, to copy the OS from floppy drive B to hard disk volume A, type:

```
B>sys b: a:(cr)
```

   SYS tells you when copying is finished.

3. Copy the system files onto the hard disk with the COPY command. For example, to copy all the files from the system diskette in drive B to volume A, type:

```
B>copy b:*.* a:(cr)
```


   The screen displays each filename as the file is copied into the specified volume.

4. Remove the system diskette from the floppy drive and store it.

For more information on using SYS and COPY, see the *MS-DOS User's Guide.*

COPYING OTHER DISK FILES 2.3

The final step in setting up a hard disk is to copy your application programs and data files onto the volumes where you want them. Chapter 2.4 gives hints for organizing these files on your hard disk.

Follow these steps to copy an application program file or data files from diskette to the hard disk:

1. Load MS-DOS if it is not already loaded.
2. Insert an application program diskette or a data file diskette into the floppy drive.
3. To copy all the files from the diskette in drive B onto hard disk volume A, enter:

```
B>copy b:*.* a:(cr)
```

   The screen displays the filenames as each file is copied onto the specified volume.

   To copy the single file DBASE.COM from the floppy drive to volume C, type:

```
B>copy b:dbase.com c:(cr)
```

   The COPY command is fully described in the *MS-DOS User's Guide.*

4. Remove the application program or data file diskette from the floppy drive.

2.4 ORGANIZING THE HARD DISK

The key to efficient use of the hard disk is knowing how to organize your data. The goal is to use storage space economically and to store files so that they are easy to locate and access. Here are some hints:

- Use the different hard disk volumes, like separate drawers in a filing cabinet, to store sets or related files. One arrangement is to store files, utilities, and application programs on one volume, and store data files on the other volumes. This arrangement is useful if you update your data files often and want to back up all your files regularly.
- If you use one major application program (such as an accounting program), you can dedicate one large volume to this program's data files. Store your other program files and utilities on another volume.
- If you use many applications, you can keep each program and its data files on a separate volume. When you use an application, log onto the volume that contains the program file.
- If several users share one hard disk, each person might have his or her own volume(s). Subdirectories can also be used to divide storage space among several users.

- Although the DISKCOPY program does not work on an internal hard disk system, you can make disk copies by using one volume or subdirectory exclusively for file transfers. The volume must be at least as large as a floppy diskette (612K for single-sided diskettes, 1200K for double-sided diskettes). Use COPY *.* to copy all files from the diskette to the hard disk volume. Swap diskettes. Then COPY *.* or MV *.* to complete the copy from the hard disk to the diskette. Erase the files from the hard disk with DEL *.* if you use COPY. (You can also use SDCOPY to make a disk copy on your hard disk machine.)

RECONFIGURING THE HARD DISK 2.5

If the configuration you selected is not working for you, you can reconfigure your hard disk with AUTOSET. Reconfiguring the hard disk erases all the files on the hard disk, and assigns new volumes. The procedure described here allows you to save your files before you reconfigure your hard disk.

1. Insert the hard disk system diskette into the floppy drive. Press the reset button to reload the operating system from the diskette. Repeat steps 3, 4, and 5 of Chapter 2.1.
2. The screen displays:

```
AUTOMATIC SETUP UTILITY vx.y

YOUR HARD DISK IS ALREADY INITIALIZED.
ALL OF THE CURRENT DATA WILL BE DESTROYED IF
THIS PROGRAM CONTINUES.
DO YOU WANT TO BACK UP YOUR DATA? (y/n)
```

This prompt gives you an opportunity to save existing hard disk file(s).

3. If you do not want to save the files on the hard disk, go to step 10.

   If you want to save any of the existing files, enter y. The screen displays the system prompt:

```
B>
```

4. Remove the system diskette from the floppy drive.

5. Insert a formatted diskette to be used as the backup diskette.
6. Enter a COPY command or a SEARCH command to back up the files you want to keep. (Both COPY and SEARCH are described in Chapter 5.)

   For example, to copy all the files from hard disk volume C to floppy drive B, enter:

   copy c:*.* b:(cr)

   You must enter a COPY command like this for each volume containing files you want to keep.
7. When you have copied all your files, remove the backup diskette and reinsert the system diskette.
8. Reload the operating system by pressing the reset button.
9. At the system prompt, enter:

   autoset(cr)

10. Enter n in response to the backup data prompt (shown in step 2). Then enter y at the next prompt:


```
ARE YOU SURE YOU WANT TO REINITIALIZE
YOUR DISK?
```

11. Follow steps 6 to 10 of Chapter 2.1. To restore any files you backed up in step 6, use the procedure described in Chapter 2.3.

3

AUTOSET CONFIGURATION CHOICES

This chapter contains descriptions of the configurations available with AUTOSET, listed by their filenames. The same descriptions are displayed onscreen by the AUTOSET help file (AUTOSET.HLP). At the beginning of each description are the specifications for that configuration.

The AUTOSET specifications show:

- **Disk**—0 for an internal hard disk, and 2 for an external hard disk.
- **Capac**—The capacity of each volume in Kbytes (1K byte = 1024 bytes, and 1000K bytes = 1M byte).
- **Dir**—The number of files that can be stored in each volume's directory.

- **Au**—The allocation unit size. Allocation units are the building blocks for file storage. Each MS-DOS file is broken up and stored in blocks that are the size of the AUs assigned to that volume during configuration. Each volume can have different size AUs; the range is from 1K to 64K bytes. The AU size is the minimum amount of disk space that can be allocated to a file. For example, with an AU size of 4K, a 10-byte file uses 4K of disk space, and a 5K-byte file uses 8K.
- **Mem Req**—The amount of operating system memory used by each volume. The total amount of memory required for the configuration is also shown. Memory requirements are given in units of K (Kbytes) or b (bytes).

At the far right of the display are the drive letter assignments. The volume that loads the operating system for that configuration is labeled "(boot)". Floppy disk drive assignments are labeled "Right Floppy" or

"Left Floppy". For each hard disk volume assigned to a drive letter, "0" indicates the internal hard disk, and "2" indicates the external hard disk. The size of each hard disk volume is given in Megabytes; for example, a 2000K volume is shown as "2m".

If you know the configuration you want, you can load AUTOSET and select the configuration file at the same time. For example, if you want to configure your internal hard disk system to match the I2N8X1.CFG file, enter:

```
A>autoset i2n8x1.cfg(cr)
```

I5N5.CFG

Specifications

Disk	Capac	Dir	Au	Mem Req
0	5000K	352	4K	2048b
0	5000 + K	352	4K	2048b

A: 0-5m (boot)
B: Right Floppy
C: 0-5 + m

Total Memory Requirements with double-sided floppy - 5K = 5120b

III

THIS CONFIGURATION IS FOR SYSTEMS WITH AN INTERNAL HARD DISK ONLY. I5N5.CFG is ideal for the user who uses only two (2) applications. You can store a different application and its files on each volume. The volumes are large, making large files easy to handle. Allocation unit size is small enough (4K) that small files will not waste disk space.

This configuration may not be suitable for you if you run numerous applications. You can use subdirectories, however, to divide the two volumes into more storage areas.

I2N8.CFG

Specifications					A: 0-2m (boot)
Disk	Capac	Dir	Au	Mem Req	B: Right Floppy
0	2000K	256	4K	1024b	C: 0-8 + m
0	8000 + K	512	4K	3072b	

Total Memory Requirements with double-sided floppy - 5K = 5120b

THIS CONFIGURATION IS FOR SYSTEMS WITH AN INTERNAL HARD DISK ONLY. I2N8.CFG is appropriate if you use a single application program which produces large files, such as an accounting spreadsheet application. Small files here do not waste much disk space, while large files are easily accommodated.

The single large volume (C) may make this configuration unsuitable if you run numerous applications that you want to store separately. Files and applications, however, can be organized into subdirectories on volume C.

I1N3X3.CFG

Specifications					A: 0-1m (boot)
Disk	Capac	Dir	Au	Mem Req	B: Right Floppy
0	1000K	192	2K	1024b	C: 0-3m
0	3000K	352	4K	1536b	D: 0-3m
0	3000K	352	4K	1536b	E: 0-3 + m
0	3000 + K	352	4K	1536b	

Total Memory Requirements with double-sided floppy - 6.5K = 6656b

THIS CONFIGURATION IS FOR SYSTEMS WITH AN INTERNAL HARD DISK ONLY. I1N3X3.CFG is suitable if you use up to three (3) applications that you want to store separately. A moderate number of large files can be stored on the three large volumes (C, D, and E). Small files will not waste large amounts of disk space because of the 4K AU on these volumes. Extra small files (< 2K) should be stored on the 1 Megabyte volume (A) because of its smaller AU.

A disadvantage of this configuration is that it uses a large amount of memory. Memory-sensitive applications may have problems.

I5X2.CFG

Specifications					A: 0-2m (boot)
Disk	Capac	Dir	Au	Mem Req	B: Right Floppy
0	2000K	256	2K	1536b	C: 0-2m
0	2000K	256	2K	1536b	D: 0-2m
0	2000K	256	2K	1536b	E: 0-2m
0	2000K	256	4K	1024b	F: 0-2 + m
0	2000 + K	256	4K	1024b	

Total Memory Requirements with double-sided floppy - 7.5K = 7680b

THIS CONFIGURATION IS FOR SYSTEMS WITH AN INTERNAL HARD DISK ONLY. I5X2.CFG is a good general purpose configuration. Small files can be efficiently stored on the first three volumes (A, C, and D) because of the small AU (2K). Larger files should be stored on volumes E and F.

A disadvantage of this configuration is the large amount of memory (7.5K) required by the operating system. This should not be a problem, however, if you work primarily with small files.

I2N8X1.CFG

Specifications					A: 0-2m (boot)
Disk	Capac	Dir	Au	MemReq	B: Right Floppy
0	2000K	256	4K	1024b	C: 0-1m
0	1000K	240	2K	1024b	D: 0-1m
0	1000K	240	2K	1024b	E: 0-1m
0	1000K	240	2K	1024b	F: 0-1m
0	1000K	240	2K	1024b	G: 0-1m
0	1000K	240	2K	1024b	H: 0-1m
0	1000K	240	2K	1024b	I: 0-1m
0	1000K	240	2K	1024b	J: 0-1 + m
0	1000 + K	240	2K	1024b	

Total Memory Requirements with double-sided floppy - 10K = 10240b

THIS CONFIGURATION IS FOR SYSTEMS WITH AN INTERNAL HARD DISK ONLY. I2N8X1.CFG was designed with the programmer in mind. It allows you to store different types of files on separate volumes. The small AU size (2K) on volumes C–J minimizes wasted disk space for files of all sizes.

A disadvantage of this configuration is the large amount of memory required (10K). This may be a problem for memory-sensitive applications.

E5N5.CFG

Specifications					
Disk	Capac	Dir	Au	Mem Req	A: Left Floppy B: Right Floppy
2	5000K	352	4K	2048b	C: 2-5m (boot)
2	5000 + K	352	4K	2048b	D: 2-5 + m

Total Memory Requirements with double-sided floppies - 6K = 6144b

THIS CONFIGURATION IS FOR SYSTEMS WITH AN EXTERNAL HARD DISK ONLY. E5N5.CFG is ideal for the user who uses only two (2) applications. You can store a different application and its files on each volume. The volumes are large, making large files easy to handle. Allocation unit size is small enough (4K) that small files will not waste disk space.

This configuration may not be suitable for you if you run numerous applications. You can use subdirectories, however, to divide the two volumes into more storage areas.

E2N8.CFG

Specifications					
Disk	Capac	Dir	Au	Mem Req	A: Left Floppy B: Right Floppy
2	2000K	256	4K	1024b	C: 2-2m (boot)
2	8000 + K	512	4K	3072b	D: 2-8 + m

Total Memory Requirements with double-sided floppies - 6K = 6144b

THIS CONFIGURATION IS FOR SYSTEMS WITH AN EXTERNAL HARD DISK ONLY. E2N8.CFG is appropriate if you use a single application program which produces large files, such as an accounting

spreadsheet application. Small files here do not waste much disk space, while large files are easily accommodated.

The single large volume (D) may make this configuration unsuitable if you run numerous applications that you want to store separately. Files and applications, however, can be organized into subdirectories on volume D.

E1N3X3.CFG

Specifications					A: Left Floppy
Disk	Capac	Dir	Au	Mem Req	B: Right Floppy
2	1000K	192	2K	1024b	C: 2-1m (boot)
2	3000K	352	4K	1536b	D: 2-3m
2	3000K	352	4K	1536b	E: 2-3m
2	3000 + K	352	4K	1536b	F: 2-3 + m

Total Memory Requirements with double-sided floppies - 7.5K = 7680b

THIS CONFIGURATION IS FOR SYSTEMS WITH AN EXTERNAL HARD DISK ONLY. E1N3X3.CFG is suitable if you use up to three (3) applications that you want to store separately. A moderate number of large files can be stored on the three large volumes (D, E, and F). Small files will not waste large amounts of disk space because of the 4K AU on these volumes. Extra small files (< 2K) should be stored on the 1 Megabyte volume (C) because of its smaller AU.

A disadvantage of this configuration is that it uses a large amount of memory. Memory-sensitive applications may have problems.

E5X2.CFG

Specifications					A: Left Floppy
Disk	Capac	Dir	Au	Mem Req	B: Right Floppy
2	2000K	256	2K	1536b	C: 2-2m (boot)
2	2000K	256	2K	1536b	D: 2-2m
2	2000K	256	2K	1536b	E: 2-2m
2	2000K	256	4K	1024b	F: 2-2m
2	2000 + K	256	4K	1024b	G: 2-2 + m

Total Memory Requirements with double-sided floppies - 8.5K = 8704b

THIS CONFIGURATION IS FOR SYSTEMS WITH AN EXTERNAL HARD DISK ONLY. E5X2.CFG is a good general purpose configuration. Small files can be efficiently stored on the first three volumes (C, D, and E) because of the small AU (2K). Larger files should be stored on volumes F and G.

A disadvantage of this configuration is the large amount of memory (8.5K) required by the operating system. This should not be a problem, however, if you work primarily with small files.

E2N8X1.CFG

Specifications					
Disk	Capac	Dir	Au	Mem Req	A: Left Floppy B: Right Floppy
2	2000K	256	4K	1024b	C: 2-2m (boot)
2	1000K	240	2K	1024b	D: 2-1m
2	1000K	240	2K	1024b	E: 2-1m
2	1000K	240	2K	1024b	F: 2-1m
2	1000K	240	2K	1024b	G: 2-1m
2	1000K	240	2K	1024b	H: 2-1m
2	1000K	240	2K	1024b	I: 2-1m
2	1000K	240	2K	1024b	J: 2-1m
2	1000+K	240	2K	1024b	K: 2-1+m

Total Memory Requirements with double-sided floppies - 11K = 11264b

THIS CONFIGURATION IS FOR SYSTEMS WITH AN EXTERNAL HARD DISK ONLY. E2N8X1.CFG was designed with the programmer in mind. It allows you to store different types of files on separate volumes. The small AU size (2K) on volumes D–K minimizes wasted disk space for files of all sizes. A disadvantage of this configuration is the large amount of memory required (11K). This may be a problem for memory-sensitive applications.

IE5N5.CFG

Specifications					A: 0-5m (boot)
Disk	Capac	Dir	Au	Mem Req	B: Right Floppy
0	5000K	352	4K	2048b	C: 0-5 + m
0	5000 + K	352	4K	2048b	D: 2-5m
2	5000K	352	4K	2048b	E: 2-5 + m
2	5000 + K	352	4K	2048b	

Total Memory Requirements with double-sided floppy - 9K = 9216b

THIS CONFIGURATION IS FOR SYSTEMS WITH BOTH AN INTERNAL AND EXTERNAL HARD DISK. IE5N5.CFG is ideal for the user who uses up to four (4) applications. You can store a different application and its files on each volume. The volumes are large, making large files easy to handle. Allocation unit size is small enough (4K) that small files will not waste disk space.

IE2N8.CFG

Specifications					A: 0-2m (boot)
Disk	Capac	Dir	Au	Mem Req	B: Right Floppy
0	2000K	256	4K	1024b	C: 0-8 + m
0	8000 + K	512	4K	3072b	D: 2-2m
2	2000K	256	4K	1026b	E: 2-8 + m
2	8000 + K	256	4K	3072b	

Total Memory Requirements with double-sided floppy - 9K = 9216b

THIS CONFIGURATION IS FOR SYSTEMS WITH BOTH AN INTERNAL AND EXTERNAL HARD DISK. IE2N8.CFG is appropriate if you use applications which produce large files, such as accounting spreadsheet applications. Small files here do not waste much disk space, while large files are easily accommodated.

IE1N3X3.CFG

Specifications					A: 0-1m (boot)
Disk	Capac	Dir	Au	Mem Req	B: Right Floppy
0	1000K	192	2K	1024b	C: 0-3m
0	3000K	352	4K	1536b	D: 0-3m
0	3000K	352	4K	1536b	E: 0-3 + m
0	3000 + K	352	4K	1536b	F: 2-1m
2	1000K	192	2K	1024b	G: 2-3m
2	3000K	352	4K	1536b	H: 2-3m
2	3000K	352	4K	1536b	I: 2-3 + m
2	3000 + K	352	4K	1536b	

Total Memory Requirements with double-sided floppy - 12K = 12288b

THIS CONFIGURATION IS FOR SYSTEMS WITH BOTH AN INTERNAL AND EXTERNAL HARD DISK. IE1N3X3.CFG is suitable if you use numerous applications. A moderate number of large files can be stored on the six large volumes (C, D, E, and G, H, I). On these volumes, small files will not waste large amounts of disk space because of the 4K AU. Extra small files (< 2K) should be stored on the 1 Megabyte volumes (A and F) because of the smaller AU.

A disadvantage of this configuration is the large amount of memory (12K) required. Memory-sensitive applications may have problems.

IE5X2.CFG

Specifications					A: 0-2m (boot)
Disk	Capac	Dir	Au	Mem Req	B: Right Floppy
0	2000K	256	2K	1536b	C: 0-2m
0	2000K	256	2K	1536b	D: 0-2m
0	2000K	256	2K	1536b	E: 0-2m
0	2000K	256	4K	1024b	F: 0-2 + m
0	2000 + K	256	4K	1024b	G: 2-2m
2	2000K	256	2K	1536b	H: 2-2m
2	2000K	256	2K	1536b	I: 2-2m
2	2000K	256	2K	1536b	J: 2-2m
2	2000K	256	4K	1024b	K: 2-2 + m
2	2000 + K	256	4K	1024b	

Total Memory Requirements with double-sided floppy - 14K = 14336b

THIS CONFIGURATION IS FOR SYSTEMS WITH BOTH AN INTERNAL AND EXTERNAL HARD DISK. IE5X2.CFG is a good general purpose configuration. Small files can be efficiently stored on the first three volumes of each hard disk (A, C, D, and G, H, I) because of the small AU (2K). Larger files should be stored on the remaining two volumes of each hard disk (E, F, and J, K).

A disadvantage of this configuration is the large amount of memory (14K) required by the operating system. This should not be a problem, however, if you work primarily with small files.

4

LISTING DRIVE ASSIGNMENTS (VDIR)

You can display the volume-drive assignments on your system with the VDIR.EXE utility. VDIR lists information about each hard disk volume or floppy disk drive assigned to a drive letter in your configuration.

To display the drive assignments on your hard disk system, enter:

vdir(cr)

VDIR lists these headings:

- VOLUME NAME is the logical drive letter and the volume ID or name. If the drive letter is assigned to a floppy disk drive with a diskette in it, the listing is "FLOPPY". If the disk drive is empty, the listing is "NO DISK".
- TYPE is the operating system used for that volume or for the diskette in that floppy disk drive. (Currently, MS-DOS and UNIX are the only operating systems listed.)
- CAPACITY is the storage space on the hard disk volume or on the diskette in the floppy disk drive. Capacity is listed in Kbytes. (1K byte equals 1024 bytes.)
- DIRECTORY SIZE is the number of files you can store in the root directory on that volume or diskette. Subdirectory files are not included in this number.
- AU is the size of the allocation unit for the volume or diskette. (AUs are described in Chapter 3.)

This example shows the VDIR display on an internal hard disk system configured into two volumes. The VDIR.EXE file is on hard disk volume A, and the floppy drive contains a single-sided diskette:

```
A>vdir(cr)

VOLUME DIRECTORY UTILITY Vx.y

   VOLUME NAME    TYPE    CAPACITY  DIRECTORY SIZE    AU

A:   VOLUME 1    MS-DOS    5000K          352          4K

B:   FLOPPY      MS-DOS     612K          128          2K

C:   VOLUME 2    MS-DOS    5327K          352          4K

A>_
```

5

BACKING UP THE HARD DISK (COPY AND SEARCH)

Backup is an important part of working with a hard disk. You should regularly back up (copy) your hard disk files onto diskette. If your hard disk is accidentally erased or damaged, you can use your backup diskettes to replace the lost file(s). Keep your backups in a place where they cannot be damaged, such as in a diskette case or a file cabinet.

Establish a backup routine that matches your needs. This manual describes backup procedures using these two types of routines:

- An informal, straightforward routine in which you pick specific files for backing up. Chapters 5.1 and 5.2 describe how to back up files onto diskettes with the COPY command and with the SEARCH utility.
- A systematic routine in which you always have a backup of the latest version of every file. Chapter 6 shows you how to set up and run a batch-file system for backing up files and for restoring files to the hard disk using SEARCH.

An informal backup routine is simple and takes little time, but it does not guarantee that you will have a backup of every file you need. On the other hand, the systematic routine described in Chapter 6 regularly backs up all files that have been edited since the last backup. Using this backup system offers better protection against accidental loss of valuable files.

5.1 USING THE COPY COMMAND

The MS-DOS COPY command makes a copy of a file with the same or a new filename. COPY can back up hard disk files onto diskettes, as shown in the examples in the following paragraphs.

The following command copies the contents of the default drive (hard disk volume A) to the diskette in drive B:

```
A>copy *.* b:(cr)
```

COPY displays each filename onscreen as it is copied.

To copy the single file MOREBILLS from hard disk volume C to drive B, enter:

```
A>copy c:morebills b:(cr)
```

III

For a complete description of the COPY command syntax, see the *MS-DOS User's Guide.*

SPACE CONSIDERATIONS 5.1.1

When you back up files from the hard disk to a diskette, remember that floppy diskettes cannot hold as much data or as many directory entries as the hard disk (see Chapter 1.1.1). Before you start the backup process with COPY, enter a DIR or CHKDSK command to determine the size of the files you want to copy. If there is more data than can fit on one diskette, you should do one of the following:

- COPY files singly or in small groups. After each COPY command, enter a CHKDSK command to determine the amount of free space left on the diskette.
- Use SEARCH with the /TARC (create tape archive) switch. A tape archive file containing your backup files takes up less space than the same files would if you copied them onto the diskette. SEARCH also allows you to insert another formatted diskette after each diskette is filled. (See instructions for SEARCH in Chapters 5.2 and 6.)

ERROR CONDITIONS 5.1.2

Two possible error conditions can occur when you use COPY to back up a hard disk volume onto diskette. (1) The volume directory can be too large, or (2) the diskette can be filled before all the files have been copied.

1. If the volume directory is larger than the diskette directory, the screen displays:

```
File Creation Error
```

2. If the hard disk volume contains more data than the diskette can hold, MS-DOS copies the hard disk files until the diskette is full. Then the screen displays:

```
Insufficient disk space
```

In either error condition, use the DIR command to list the diskette and the volume directories. Determine which hard disk files have not been copied onto the diskette. Then insert another formatted diskette. (You may want to delete from the hard disk all the files already copied onto the diskette.) Finally, enter a COPY command to copy the remaining file(s) onto the diskette.

5.2 USING THE SEARCH UTILITY

This chapter explains the basic uses for the SEARCH utility in backing up and restoring files. First, important background concepts are discussed, including MS-DOS file attributes, archive status, and tape archive files. Examples of SEARCH commands show how to estimate the number of diskettes needed for file backup, turn archive status ON for selected files, and back up files with archive status ON. This chapter assumes you have some familiarity with SEARCH. If you need more information about SEARCH or if you have other backup needs (such as archiving only named files, only certain directories, or only files of a certain age) refer to the description of SEARCH in the *MS-DOS User's Guide.*

Even if you skim or skip this chapter, you should be able to set up and run the ready-to-use system for backing up files presented in Chapter 6.

Two uses for the SEARCH utility are to copy and to "tape-archive" (back up) selected files. By including appropriate matching constraints and action switches in a SEARCH command, you can:

- Create a "tape archive" file (one continuous file) on a floppy diskette. The tape archive contains copies of selected files from your hard disk.
- Determine how much disk space your hard disk files will occupy when they are tape-archived.
- Turn archive status ON for all your files, and then tape-archive the files with archive status ON.
- Restore all files (or selected files) from a backup diskette to the hard disk.

File Copies vs. Tape Archive Files

With SEARCH you can create two kinds of backup files—a file copy (identical to the original file), and a tape archive file (one continuous file made up of several files). The differences between file copies and tape archive files are:

- File copies: SEARCH with the /CP action switch copies individual files, groups of similar files, or entire subdirectories from one hard disk volume to another, or to a floppy diskette. Each file copy is a duplicate of the original file (just like a copy made with COPY or DISKCOPY). You can give the copy any name you want.
- Tape archive files: SEARCH with the /TARC action switch ("create tape archive") copies individual files, groups of similar files, or entire subdirectories into a single continuous file on another hard disk volume, or on a diskette. Tape archive files require less disk space than individual file copies do. You give the tape archive file a name of your choice; this name is listed in the directory, but the individual files in the tape archive file are not listed. You can display the filenames with SEARCH, as described in Chapter 5.2.5.

This guide describes backing up with tape archive files rather than with file copies. For more information about copying files with SEARCH, see the *MS-DOS User's Guide.*

5.2.2 BACKGROUND CONCEPTS

The SEARCH capabilities used for backing up files involve aspects of the MS-DOS file system. The following paragraphs give background information, and present SEARCH examples about these aspects of the file system: file attributes, archive status, and tape archive files.

File Attributes

Every MS-DOS file has a set of file attributes recorded in its directory entry. Each attribute can be ON or OFF, signaling the status of a file characteristic to the operating system. The file attributes include:

- Archive status ON means that the file is new or has been changed since it was last archived.
- System file status ON means that the file contains the operating system.
- Hidden file status ON means that the file is not listed in the directory.
- Directory status ON means that the file is a subdirectory.
- Read-only status ON means that MS-DOS will not allow writing to the file. Read-only status OFF means that the file has read/write status, and can be written to.

You can change most of these file attributes using SEARCH with the /ATTR+ and /ATTR- switches (turn ON and OFF). For example, suppose you want to prevent edits to the file LATEPAY.MEM in subdirectory FINANCE on drive C. You can set read-only status ON for this file with:

```
search c:\finance\latepay.mem /attr+ r(cr)
```

To display the status of the file attributes, use SEARCH with the /LS switch. For example, to list the files (and their file attributes) in subdirectory FINANCE (and any subdirectories of FINANCE) on drive C, enter:

```
search c:\finance /ls(cr)
```

A file listing displayed by the /LS switch looks like this:

```
a----w   4096   20-Jul-83   10:30 c:\finance\latepay.mem
```

The first column is the attribute column, showing the status of the file attributes for that file. A letter (such as "a" for archive) means this attribute is ON. When read-only status is ON, the letter "r" appears in the last position in the attribute column; when read-only status is OFF, "w" appears (for read/write).

Archive Status

The archive file attribute is always ON unless you turn it OFF. For a newly created file, archive status is ON by default. Each time you write to a file, MS-DOS sets its archive status ON (if it was OFF). You can use the SEARCH utility to turn archive status on and off. With SEARCH you can select files with archive status ON and then tape-archive them (see examples in Chapter 5.2.4).

Because you can control the archive attribute, it can be a signal telling you when a file needs to be archived. If you turn OFF archive status for hard disk files when you archive them, you will know that any files with archive status ON have been created or edited since your last archive. This on/off signal is the basis for the backup procedures described in this chapter and in Chapter 6.

5.2.3 GETTING READY TO TAPE-ARCHIVE FILES

Before you tape-archive all your files for the first time, you should perform two preliminary steps—set archive status ON, and estimate the number of diskettes you need to hold your backup files. These steps are not necessary for every backup, but you should know these procedures and use them whenever you do a backup that involves a major portion of your work.

Setting Archive Status ON

SEARCH can turn the archive attribute ON for all files on any drive(s) or in a particular directory, or for selected files. When you make a tape archive with SEARCH with the /TARC /A switches, files with archive status ON will be archived. You should set archive status ON for all the files you want to back up before you make your first tape archive (as described in Chapter 5.2.4). After that, do not use this procedure unless you want to archive another complete copy of all your files.

To turn archive status ON, enter a SEARCH command listing the drives/volumes or the individual files you want to have archive status, followed by the action switch /ATTR + A (which turns archive status ON).

For example, to set archive status ON for all files on volumes A, C, and D, enter:

```
search a:\ c:\ d:\ /attr + a(cr)
```

To turn archive status ON for all .DOC files on volumes C and D, enter:

```
search c:\ d:\ /name *.doc /attr + a(cr)
```

The /NAME switch in this command selects files that match the following name (*.DOC).

Determining Space Needed for Backup

To determine the amount of space your files will occupy when you tape-archive them, use SEARCH with the /SUM switch. In the SEARCH command, name the volumes and/or files you want to back up. For example, if you are going to tape-archive all files with archive status ON on volumes A, C, D, and E, you can gauge the amount of disk space needed for the tape archive file with:

```
search a:\ c:\ d:\ e:\ /a /sum(cr)
```

This command searches all the files on volumes A, C, D, and E (including any subdirectories) to find files with the archive attribute ON (/A), and then outputs the sum of the file's sizes (/SUM) in bytes. This sum can tell you how many diskettes you need to tape-archive these files. If, for example, the sum is 221251 bytes, you need 221251/1024 Kbytes (216K bytes) of disk storage to back up these hard disk files. Since a single-sided diskette contains 612K bytes, you need only one formatted diskette for the backup.

5.2.4 CREATING TAPE ARCHIVE FILES

SEARCH can make a tape archive file containing any files you select. The examples here show how to tape-archive files with archive status ON.

Tape-Archiving Files with Archive Status ON

To create a tape archive file, use the /TARC (create tape archive) or /TARA (append to tape archive) action switches for SEARCH. Follow this switch with the name you want to give the tape archive file. End the command with any modifiers or secondary actions you want. (Action and constraint modifiers are listed in the SEARCH syntax description in the *MS-DOS User's Guide*.)

To archive files that have archive status ON from volumes A, C, and D, put a formatted diskette in drive B and enter:

```
search a:\ c:\ d:\ /a /tarc b:backup /attr- a(cr)
```

This command finds all files with the archive bit ON (/A), archives them to a single file called BACKUP on drive B (/TARC B:BACKUP), and then resets the archive bit (/ATTR- A) on the original files on the hard disk.

To archive the same files as the previous example, but to omit listings and object files (which can be easily reproduced), use:

```
search a:\ c:\ d:\ /a /tarc b:backup /attr- a /^name *.obj!*.lst(cr)
```

The /^NAME switch means that the SEARCH command will not process files with the names that follow the switch. The two filenames omitted from the tape archive (*.OBJ and *.LST) are separated by an exclamation mark, meaning "or". Although the /^NAME switch appears at the end of this example command, you can also place it after the volume names.

To archive a few files, you can add them to a previous tape archive file by using:

```
search a:\*.doc c:\finance\latepay.mem /tara b:backup(cr)
```

This command does not use archive status to select files. Instead, all the .DOC files on volume A and the LATEPAY.MEM file in the \FINANCE subdirectory are appended (/TARA) to the existing tape archive file B:BACKUP.

Using More than One Diskette

During a tape archive, the diskette may run out of space. SEARCH displays an error message asking if you want to continue. Respond N(cr) and remove the diskette. Insert a blank formatted diskette and re-enter the same SEARCH command. If your command (like the ones here) turns archive status OFF after archiving a file, SEARCH starts where it left off without skipping or duplicating files.

RESTORING FILES FROM A TAPE ARCHIVE 5.2.5

Once you have backed up files to a tape archive, you may want to list the filenames in the tape archive file. To display the contents of a tape archive file, use a SEARCH command such as:

```
search /tarx d:filename /ls(cr)
```

The /TARX switch means "extract from tape archive". D: is the name of the drive or volume containing the tape archive file. FILENAME is the full filename of the tape archive file (including subdirectories if necessary). The /LS switch lists filenames in long format, including file attributes, file size, date and time of creation.

To restore files from a tape archive file named BACKUP in drive B, enter:

```
search /tarx b:backup /cp \ /vt(cr)
```

The /TARX switch means to restore or extract files from the tape archive. The /CP switch copies files from the tape archive. The \ means that the copying begins at the root directory (not at the current working directory, which may not be the root). The /V switch returns files to their original Volumes, and the /T switch puts files in their original Tree structure (subdirectory hierarchy).

If the archive diskette was created when there were too many files to fit on it, you may get an error message on the last file. In this case, tell SEARCH to continue, insert the next archive diskette, and repeat the /TARX command. The file in error on the previous diskette should be intact at the beginning of the next archive diskette.

To restore the single file RESUME.JOB from the tape archive file BACKUP on floppy drive B to the current working directory of hard disk volume C, use:

```
search /tarx b:backup /cp c: /name resume.job(cr)
```

III

Chapter 6.5 gives more details on selective restoring of backup files.

6

AN ARCHIVE/RESTORE SYSTEM USING SEARCH

This chapter presents a ready-made system for archiving or backing up hard disk files. The basis of this system is batch files that you customize to match your hard disk configuration. The backup system uses the archive attribute to select files for backing up. Files with archive status ON are tape-archived onto floppy diskettes. Later you can restore entire archive diskettes or selected files from a tape archive. For an explanation of archive status and tape archive files, see Chapter 5.2.2.

Unless you are confident with your ARCHIVE, RESTORE and SEARCH abilities, always follow the procedures described here exactly.

To begin this backup system, you create the batch files you need and then tape-archive all your hard disk files. Because the initial tape archive file contains every file, it is the baseline on which later backup and restore procedures are based.

PROCEDURE FOR SETTING UP 6.1

You need four batch files, each containing one SEARCH command used in the backup system. The batch files are listed here with the SEARCH command each one should contain. When you create the batch files, change the variable elements in the SEARCH commands to match your system.

For example, the SEARCH commands shown here list only volumes A and C, but your SEARCH commands should list all the volumes that you want to archive on your system. Also, B:BACKUP is used here to represent the tape archive file. You can give your tape archive files any filenames you choose, and the archive diskette can be in drive A (if you have a dual floppy drive computer). Use the form D:\ to indicate volumes and drives. (If you omit the \, only the current working directory of that volume will be archived.) Instructions for using these batch files and for using alternate SEARCH commands are in Chapters 6.2 through 6.5.

To create the batch files, you can use any text editor, or the COPY \DEV\CON command. For example, to create the ALLARCH.BAT batch file for a hard disk with volumes A, C, D, and E, you could use:

```
copy \dev\con allarch.bat(cr)
search a:\ c:\ d:\ e:\ /attr + a(cr)
^Z(cr)
```

To run any of these batch files, enter the filename (without the .BAT extension) at the system prompt. For example, if FILESIZE.BAT is on hard disk volume A, you can run the FILESIZE procedure with:


```
A>filesize(cr)
```

Batch File 1: ALLARCH.BAT

To set all files on the named volumes to be archived (archive status ON):

```
search a:\ c:\ /attr + a(cr)
```

Batch File 2: FILESIZE.BAT

To sum the sizes of the files with archive status ON—this sum is the size of the tape archive file that will be produced in the ARCHIVE procedure:

```
search a:\ c:\ /a /sum(cr)
```

Batch File 3: ARCHIVE.BAT

To tape-archive files with archive status ON:

```
search a:\ c:\ /a /tarc b:backup /attr- a(cr)
```

Batch File 4: RESTORE.BAT To restore all files from the tape archive to their original volumes and subdirectories:

```
search /tarx b:backup /cp \ /vt(cr)
```

INITIAL BACKUP PROCEDURE 6.2

To start your backup system, follow these steps:

1. Run the ALLARCH batch file. It turns archive status ON for all your hard disk files so that they can be correctly processed by the backup system.
2. Run the FILESIZE batch file. It tells you the size of the tape archive file that will contain your hard disk files.
   a. Divide the sum of the file sizes by 1024 to get the number of Kbytes of disk storage needed for the tape archive file.
   b. FORMAT enough floppy diskettes to contain that tape archive file (see Chapter 5.2.3).
   c. Label the diskettes "ARCHIVE—ALL". Add the date and "1 of n", "2 of n", and so on. "ARCHIVE—ALL" indicates that all files you had are on this set of diskettes. The "1 of n" tells you the sequence for restoring these diskettes.

3. Run the ARCHIVE batch file. It tape-archives all files with archive status ON.

   a. If you have more files than can fit on the diskette, an error message occurs asking if you want to continue. Since no more files can fit on the diskette, answer N(cr).

   b. Insert the next "ARCHIVE—ALL" diskette and run ARCHIVE again. It will begin archiving with the file that didn't fit on the first diskette. Continue until ARCHIVE completes.

Running these three batch files sets up the baseline for this archive system. Subsequent ARCHIVEs systematically back up files that have been edited since your last archive.

6.3 REGULAR BACKUP PROCEDURE

The regular backup procedure should be run periodically, ideally once a day. Use this procedure whenever you have made significant changes to files that you would not want to have to re-enter.

III

Follow these steps:

1. Run the FILESIZE batch file. It tells you the amount of disk space you need for the tape archive file. Label your backup diskettes "ARCHIVE" with the date and "1 of n", and so on. The "ARCHIVE" label indicates that this is an update, not a baseline tape archive of all your files. See step 2 in Chapter 6.2 for details on preparing the backup floppy diskette(s).

2. Run the ARCHIVE batch file. It tape-archives all files with archive status ON (all files that have been edited since the last ARCHIVE). See step 3 in Chapter 6.2 for details on using more than one diskette with ARCHIVE.

Occasionally, instead of this regular backup procedure, use the procedure for archiving all files, described in Chapter 6.2. Using that procedure re-establishes a baseline of backup files and reduces the number of backup diskettes you must keep on hand. Having fewer backup diskettes also reduces the chances of losing data in a restore. Because the restore process relies on all the backup diskettes, errors on a single diskette can lose files.

PROCEDURE FOR RESTORING A TAPE ARCHIVE 6.4

This procedure extracts the most recent archived versions of all the files in a tape archive. To restore only a few files, use the procedure described in Chapter 5.2.5 and in Chapter 6.5.

1. In your set of ARCHIVE diskettes, look for one(s) labeled "ARCHIVE—ALL" with the latest date. This is the diskette(s) containing the most recent full image of your files.
2. Put the diskette in drive B and run the RESTORE batch file. It will write the files to your hard disk in their original volumes and directories.
3. If the last file on a diskette labeled "x of y" did not fit, you will get an error message during RESTORE.
   a. Answer Y(cr) (you want to continue). If this was the last file, RESTORE will complete. If not, some I/O error occurred and that file was not restored (you may try the restore process over, or use the selective restore procedure).
   b. Insert the next diskette of this "ARCHIVE—ALL" sequence of diskettes, and run RESTORE again.
4. After you run RESTORE on the "ARCHIVE—ALL" diskette(s), find the next dated "ARCHIVE" diskette sequence.

5. Run RESTORE on each of these diskettes, and all remaining "ARCHIVE" dates—**always in sequence of date, and in sequence of diskette number within a given date.**

6. When the last "ARCHIVE" diskette has been restored, your hard disk has been restored to its condition as of the last date and time of tape-archiving.

6.5 PROCEDURE FOR SELECTIVE RESTORING

Suppose you archived your files last night, worked all day today, and unintentionally deleted one file. If you restore your complete tape archive, the rest of today's work would be lost. The examples here show how to restore particular files or directories rather than an entire tape archive file. For instructions on listing the contents of a tape archive file, see Chapter 5.2.5.

To restore specific files, use this format:

III

```
search /tarx b:backup /cp \ /vt options(cr)
```

where /TARX means extract from tape archive, and B:BACKUP is the drive and filename of the tape archive file. The /CP switch copies files from the tape archive, and the \ starts the copy at the root directory. The /V and /T switches return files to their original volumes and tree structures. OPTIONS are SEARCH command switches that select files or directories from the tape archive.

As options, you can use the /NAME, /^NAME, /FNAME, and /^FNAME switches to select the files you want to restore. For example:

```
search /tarx b:backup /cp \ /vt /name status.mem(cr)
```

restores only files named STATUS.MEM (in any directory or volume) from the archive diskette. To select groups of files with similar names, you can use wild cards with /NAME, such as:

```
search /tarx b:backup /cp \ /vt /name soft*.*(cr)

search /tarx b:backup /cp \ /vt /name ?status.mem(cr)
```

To restore multiple files, you can list several filenames separated by exclamation marks. For example, the following command uses the /NAME switch to restore all files with an extension of ASM or a name of STATUS with any extension:

```
search /tarx b:backup /cp \ /vt /name *.asm!status.*(cr)
```

To restore specific directories, use the /FNAME switch. For example, this command restores only files in the directory A:\PROJECTS:

```
search /tarx b:backup /cp \ /vt /fname a:\projects\*.*(cr)
```

To also restore subdirectories of A:\PROJECTS (and their files), use:

```
search /tarx b:backup /cp \ /vt /fname a:\projects\* /. /\(cr)
```

This command restores all files at and in subdirectories (and their subdirectories) of A:\PROJECTS. The /. switch matches the * with the file extension separator, and the /\ switch matches path separators.

With the /FNAME option you can use both types of wild cards, and more than one path specification can be included using exclamation marks. You can use /FNAME with /NAME to restore only files with specified names in those specified paths.

A

HARD DISK BOOT ROM ERRORS

This appendix lists the error codes that are displayed during bootup or reset if your system cannot boot up (load the operating system) from the boot volume of the hard disk. The boot ROM first attempts to load the operating system from the floppy drive(s), then from the Network (if any), and finally from the hard disk. When the boot ROM tries the hard disk, the symbol or icon shown in Figure A-1 is displayed at the bottom of the screen. If an error occurs during bootup from the hard disk, an X is displayed next to the hard disk symbol, along with one of the error codes listed in Table A-1.

If you get a hard disk error when you try to load the hard disk OS, make sure your hard disk is configured with a boot volume, and that the boot volume contains an operating system. You may have to run SYS to copy an OS to the boot volume, or AUTOSET (or HDSETUP) to set up a hard disk volume that you can boot from.

Figure A-1: Hard Disk Boot ROM Symbol

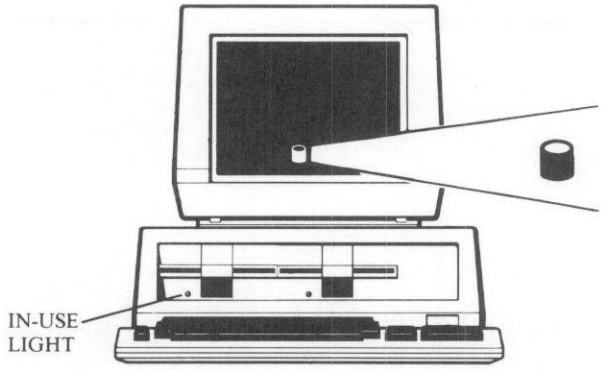


Table A-1: Hard Disk Boot ROM Error Codes

ERROR CODE	MEANING
01	No index detected from disk drive.
02	No seek-complete signal from disk drive.
03	Write fault from disk drive.
04	Drive not ready after it was selected.
06	Track 00 not found.
10	ID field read error.
11	Uncorrectable data error.
12	Address mark not found.
14	Target sector not found.
15	Seek error (incorrect cylinder and/or track).
18	Correctable data error.
19	Bad-track flag detected.
1A	Format error.
20	Invalid command.
21	Illegal disk address.
30	RAM diagnostic failure.
31	Program memory checksum error.
32	ECC diagnostic failure.
3D	Internal error; invalid command.
3F	Time out on disk operation.
40	Internal error; bad operation.
41	Hard disk I/O error; bad region information in label.
4F	Internal error; invalid block count.
98	Bad hard disk label.
99	Label indicates no operating system on disk.

NOTE: Early boot ROMs add 80 hex to the error code (01 – 4F). For example, error 10 will be displayed as 90, and error 4F as CF.

SECTION IV

SOFTWARE DEVELOPMENT TOOLS

This brief section gives you an idea of the range of software development tools available for use with your computer. The contents of the following software packages are listed and described:

- *Applications Programmer's Tool Kit II*
  - —including Data Base Support, System Configuration, and Programming Tools
- *Systems Programmer's Tool Kit II*
  - —including the *MS-DOS 2.1 Reference Manual* and system utility programs
- *Graphics Tool Kit II*
- Communications Packages
  - —IEEE 488
  - —PC COMM
  - —ASYNC
  - —3270 BISYNC
  - —3276 SNA
  - —3278 COAX
  - —TD830
- *Audio Tool Kit*

Contact your dealer for details on these and other options.

1

PROGRAMMER'S TOOL KITS

The two *Programmer's Tool Kits* are each two-volume packages of utilities. One tool kit is designed for applications programmers, and one is designed for systems programmers.

APPLICATIONS—VOLUME I

Data Base Support

- FABS: A module that uses key files for fast data retrieval. FABS organizes the key files in balanced trees (Btrees), eliminating the need to search the entire data file each time you want to retrieve a piece of information.
- AUTOSORT: A sort/merge/select utility that helps you sort very large files that contain fixed-length fields within fixed-length records. AUTOSORT can be used by itself or it can be called as a subroutine from application programs.

System Configuration

- EFONT: A font editor you can use to create or modify the characters that appear on the screen. With EFONT, you can make changes to an existing character set or you can create a new one to use in a special application.
- KEYGEN: A utility that lets you take advantage of your computer's "soft" keyboard. KEYGEN is used to define and change the functions performed by individual keys.
- SYSGEN: A system generation program that lets you create a custom operating system. SYSGEN lets you customize keyboard tables, character sets, default printer types, serial port specifications, logos, and banners.

APPLICATIONS—VOLUME II

Programming Tools

- PMATE: A full-screen, expandable editing system that combines the best features of text editors, word processors, and text output processors. PMATE lets you create and maintain text files, and is very useful for editing programs.
- PLINK: A relocatable linker that links together separately produced modules of 8086/8088 object code. The code can be generated from the Macro Assembler or any of the Microsoft compilers. PLINK is user-friendly: it prompts when you must issue a command; your answers to the prompts are the commands.
- PLIB: Creates and modifies library files used by PLINK. PLIB adds, deletes, or extracts modules from a library. It can create a general library used by many programs or for the structured development of a single program.

SYSTEMS—VOLUME I

- Macro Assembler: An assembler with many features usually found only in large computer assemblers. Macro assembly, conditional assembly, and a variety of assembler directives give you the tools you need to get full use and power from your computer.
- MS-LIB: Creates and modifies library files used by MS-LINK. MS-LIB adds, deletes, or extracts modules from a library. It can create a general library used by many programs or for the structured development of a single program.
- MS-LINK: A relocatable linker that links together separately produced modules of 8086/8088 object code. The code can be generated from Macro Assembler or any of the Microsoft compilers. MS-LINK is user-friendly: it prompts you each time a command needs to be issued; your answers to the prompts are the commands.

- MS-CREF: A cross-reference utility that helps you debug assembly language programs. MS-CREF produces an alphabetical listing of all symbols used in a program, making it easy to locate the program line number where a particular symbol occurs. MS-CREF can be used with the Macro Assembler.
- DEBUG: A debugging program that provides a controlled testing environment for binary and executable object files. DEBUG eliminates the need to reassemble a program to see if you can fix a problem by making a minor change.

SYSTEMS—VOLUME II

- *MS-DOS Reference Manual:* A comprehensive programmer's guide that lists and describes the MS-DOS system calls. This manual also provides technical information about device drivers, disk allocation, file control blocks and work areas, and .EXE file structure and loading.

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GRAPHICS TOOL KIT

The *Graphics Tool Kit* is a package of utilities that help you create screen graphics for special purposes. The tool kit includes:

- BUSIGRAF: A business graphics package that lets you create and edit pie charts, bar graphs, line plots, and organization charts.
- GRAFIX: A powerful programming library that helps you program screen graphics. With GRAFIX, you can draw different types of lines, circles and arcs, fill in areas and bars (and choose the fill-in pattern), and many other functions.
- CHARGRAF: A character graphics system that lets you create and print graphics with characters instead of high-resolution graphics.
- EFONT: A font editor you can use to create or modify the characters that appear on the screen. With EFONT, you can make graphics images with specially designed character fonts.
- KEYGEN: A utility that lets you take advantage of your computer's "soft" keyboard. KEYGEN is used to define and change the functions performed by individual keys, enabling keystrokes to generate graphics characters.
- GW-BASIC: An interactive interpreter that supports the BASIC language with extensions for music and high-resolution graphics.

3

COMMUNICATIONS

With these packages, your computer can communicate with and control external devices and other computers, including the IBM Personal Computer. Current communications packages include:

- IEEE 488: A parallel communications interface used for device communication and control. You can use IEEE 488 to communicate with devices such as data acquisition and control products, measurement devices, plotters, and printers. These devices must conform to ANSI Standard MC1.1 "Digital interface for programmable instrumentation."
- PC COMM: Lets your computer communicate with the IBM Personal Computer (PC). PC COMM lets you transmit source and object files from the IBM PC to your computer with an effective transfer rate of about 1000 bytes per second. PC COMM can be used without purchasing additional hardware for the IBM PC.
- ASYNC: Lets your computer communicate with other computers. ASYNC lets you log on to a remote timesharing computer or transfer files between computers over hard wires or the telephone.
- 3270 BISYNC: Enables your computer to communicate with computers using the IBM Binary Synchronous Communications (BSC) protocol.
- 3276 SNA: Enables your computer to execute the same host applications as with an actual IBM 3270 terminal.
- 3278 COAX: Enables your computer to emulate an IBM 3278 Model 2 or Model 5 display terminal. You can execute the same host applications as with an IBM 3270 terminal.
- TD830: Lets your computer communicate with computers using the Burroughs TD830 communications protocol.

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AUDIO TOOL KIT

The audio package lets you record, edit, store, and play back sounds or voices using the optional CODEC available for your computer. You can use the audio package for voice prompts, error or help messages, voice confirmation of data entered on the keyboard, and electronic voice messaging.

GLOSSARY

Allocation unit: Storage units for MS-DOS files. An allocation unit can contain 1K, 2K, 4K, 8K, 16K, 32K, or 64K bytes. The allocation unit is the smallest unit of space MS-DOS can work with. When you set up a hard disk, you can select the AU size for each hard disk volume.

ALT-key character or **Alternate character:** The letter or number key used with the ALT key to perform an Alternate function.

ALT-key function or **Alternate function:** A function performed by holding down the ALT key and pressing another key. The Alternate function for some keys is shown on the keyfront label.

Ambiguous: Describes a file specifier that contains wild-card characters.

Application program: A program that performs specific tasks, such as word processing or payroll accounting.

ASCII: American Standard Code for Information Interchange. A binary code used for transmitting data between the computer and peripheral devices. ASCII includes letters, numbers, and special command or control characters.

AU: See "allocation unit."

Back up: To create a backup diskette.

Backup or **backup diskette:** A duplicate diskette. You should routinely create backups to ensure against diskette damage and data loss.

Bit: The smallest unit of data; a binary digit (either 0 or 1 in binary notation).

Boot or **boot up:** To load the operating system into the computer's internal memory. See "load."

Boot volume: The hard disk volume that you use to load the OS.

Byte: A group of bits processed as a complete unit. For your computer, one byte is 16 bits.

Calculator pad: The group of keys on the right of the keyboard, arranged like a calculator.

Character: A letter, number, or symbol.

Character set: The full array of possible characters generated by the operating system. The character set is presented as a matrix whose axes are code combinations.

Circuit board: A board or card that holds the circuitry of a computer. One type of circuit board is a memory board; additional memory boards are called expansion boards.

Command: What you type at the keyboard to tell the computer what to do. The program you are using must contain the command in its "vocabulary" for the command to work. Commands may consist of words, parts of words, or codes.

Command line: A command and its parameters.

Command parameter: A word or group of characters that you type with a command to specify what you want the command to do.

Command prompt: A program's signal that requests a command from you. The OS command prompt is a letter followed by > (for example, A >).

Command switch: A type of command line parameter you can use with some utilities. Command switches are different for each utility that uses them.

Configure: To plan or specify the component parts of a computer system to meet the requirements of a particular application.

Configured hard disk: A disk which has been formatted for use and divided into volumes. The AUTOSET and HDSETUP utilities configure the hard disk.

CPU: Central processing unit, the "brains" of the computer, which performs logical operations and input/output. Your computer's CPU is an Intel 8088 processor—a chip mounted on a circuit board. The main unit of your computer contains both the CPU and the disk drives.

CRT: The display screen. CRT stands for cathode-ray tube. The screen displays both what you type and the computer's messages to you.

Cursor: A rectangular highlighted marker on the screen that shows where your next typed entry will appear.

Data: Information sent from one device to another or processed by the computer.

Default drive: The floppy disk drive or hard disk volume you are now using. The default drive is shown in the system command prompt.

Default value: The assumed value. The computer assumes a default value unless you specify another value.

Device: See "peripheral device."

Directory: See "file directory."

Disk operating system: See "operating system."

Diskette: See "floppy diskette."

Display unit: See "CRT."

DOS: See "operating system." Stands for "disk operating system."

Double-sided diskette: A floppy diskette that can store information on both sides.

Double-sided drive: A floppy disk drive that can read data from both sides of a double-sided diskette or from one side of a single-sided diskette.

Drive: (1) A floppy disk drive. (2) In general, a floppy disk drive or a hard disk volume. Both drives and volumes are identified with drive designations such as A: or C:.

Drive designation: A one-letter/colon code that identifies a floppy disk drive or a hard disk volume. A drive designation is an optional part of a file specifier when the file is on the default drive.

Drive door: The latched door guarding a floppy disk drive.

Error code: A two-digit code shown with some error messages. The error code identifies the type of error situation.

Error message: A message that the computer displays to notify you of a problem.

External DOS command: A command which must be loaded from disk before execution. (Same as "utility.")

File: A named collection of letters, numbers, symbols, or programming code recorded on a diskette.

File directory: A list of the files on a diskette or hard disk volume. The operating system maintains a directory for each diskette and updates the directory when files are recorded or erased.

File extension: An optional part of a file specifier that contains up to 3 characters and is preceded by a period.

Filename: A name that you (or another user) give to a computer file. A filename contains up to 8 characters.

File specifier: The full designation for a file, including drive name, filename, and file extension.

Floppy disk drive: A motor-driven component of your computer; used to record data on or retrieve data from diskettes. Can be single- or double-sided.

Floppy diskette: A circular sheet of magnetically coated flexible plastic enclosed in a firm, square jacket. Diskettes are used for storing data.

Format: To prepare a diskette to accept data so that you can record information on it.

Function key: A key that performs a function defined by the OS or by the program you are using.

Hard disk: An optional part of the computer used to store programs and data. Hard disks come in two models: internal and external. An internal hard disk is contained in the processor unit. An external hard disk is attached to the processor unit with its own power cord.

Hardware: The physical parts of the computer.

Internal command: An MS-DOS command that is resident in memory at all times (e.g., DIR) as opposed to a command which must be loaded from disk (such as FORMAT).

In-use light: A red light located by each floppy disk drive. The in-use light lights up each time the computer reads from or writes to the diskette in the drive. The in-use lights are light-emitting diodes.

Kbyte: Kilobyte, or 1024 bytes.

Keyboard: The computer's separate typewriter-style device on which you type commands and data.

Load: To transfer a program from a diskette into the computer's memory so that you can work with the program.

Logged drive: Default drive.

Logical device: A general type of peripheral device used by the operating system for input/output processing. Some MS-DOS logical devices are CON, LST, AUXIN, and AUXOUT. For each logical device, you can assign a physical device to match your system configuration.

Memory: The computer's electronic storage. Internal memory (RAM and ROM) is integrated circuits that hold programs and data ready for immediate use by the computer. External (or auxiliary) memory is floppy diskettes or a hard disk; these hold data and programs that must be placed in the internal memory to be used by the computer.

Memory test message: The display shown while the computer checks the memory before loading the OS. The message is a clock symbol (asking you to wait), the letter M, and a number. The number indicates memory size.

Operating system (OS): A program that manages the basic operations used by all programs. Examples of operating systems are MS-DOS and CP/M-86.

OS: See "operating system."

Peripheral devices: External equipment that the central processing unit uses to communicate with the outside world. Peripheral devices include keyboards, CRTs, printers, card readers, and disk drives (auxiliary memory).

Physical device: A peripheral device used for input/output by the operating system.

Power-on message: The diskette-shaped symbol and flashing arrow shown when you turn on the power. This message tells you the computer is ready for you to insert a diskette.

Processor unit: See "CPU."

Program: A set of instructions for a computer. Programs tell the computer how to do specific tasks.

RAM: Random access memory (see "Memory"). Gives you access to any location with the same access speed. RAM is like "blank paper" on which you write your programs or data. RAM is temporary. To keep your data from one operating session to another, you must store it on diskette.

Read: To retrieve data from a diskette. The computer can read programs and data files.

Read/write head: An electromagnet that picks up (reads) electronic pulses and records (writes) pulses on a diskette or hard disk. Similar in theory to the pickup arm on a phonograph. The magnetic pulses are read by the CPU as binary data.

Reset: To press the reset button.

Reset button: The square button on the rear of the processor unit. When you press the reset button, the computer abandons the current file and/or program and tries to reload the OS.

ROM: Read-only memory. A memory circuit with a stored program that cannot be changed by the user.

Sector: A portion of a diskette track. Your computer can store 512 bytes in each sector.

Sign-on message: Identifying information that the computer displays when a program is loaded.

Single-sided diskette: A diskette that can record information on one side only.

Single-sided drive: A floppy disk drive that can read or write on only a single side of a diskette.

Soft error: An error that may be caused by a worn or flawed section of a diskette. You can check the number of soft errors on a diskette by using a command switch with DISKCOPY. Diskettes that contain more than 20 soft errors are unreliable and should be discarded.

Software: Computer programs, including operating systems, computer languages, utility programs, and application programs.

Storage: Any device or medium (such as tape or disk) that can hold data and programs. External storage is outside the processor, such as floppy diskettes. Internal storage is inside the processor, such as RAM and ROM.

System configuration: A working arrangement of computer components and peripheral devices.

System diskette: A diskette containing an operating system.

Track: A circular section of a diskette. Your computer's diskettes have 80 tracks on a side.

Typewriter keys: The main group of keys on the keyboard, arranged like a typewriter.

Utility: A program provided with the operating system, used to help manage certain basic computer operations. Utilities appear as files on the disk directory (such as FORMAT.EXE) and can be loaded into memory by typing their names (such as FORMAT). MS-DOS utilities have .COM or .EXE file extensions.

Write: To record or store data or programs on a diskette.

Write-protect: To protect a diskette by preventing the computer from writing over data recorded on it.

Write-protect notch: A notch on a diskette that you can cover with an adhesive tab to write-protect the diskette.

Zone: One of eight groups of diskette tracks. The drive motor runs at a different speed in each zone.

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