Burroughs

User's Guide

B 20 Systems

MS™-DOS Operating System

(Relative to Release Level 2.0)

Priced Item
Printed in U.S.A.
March 1984

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Correspondence regarding this document should be forwarded directly to Burroughs Corporation, Burroughs Place, Detroit, Michigan 48232.

MS-DOS Version 2.0 Package Contents

1 disk with the following files:

CHKDSK.COM
COMMAND.COM
CREF.EXE
DEBUG.COM
DISKCOPY.COM
EDLIN.COM
FIND.EXE
FC.COM
FORMAT.COM
IO.SYS (hidden file)
LIB.EXE
LINK.EXE
EXE2BIN.EXE
MASM.EXE
MORE.COM
MSDOS.SYS (hidden file)
PRINT.COM
RECOVER.COM
SORT.COM
SYS.COM

3 manuals:

The MS-DOS User's Guide
The MS-DOS Programmer's Reference Manual
Macro Assembler Manual

System Requirements

The MS-DOS operating system requires an 8086 or 8088 microcomputer system. The operating system itself runs in and requires 32K bytes of memory.

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CHAPTER 1

INTRODUCTION

What Is MS-DOS?

What Is An Operating System?

Why Is MS-DOS So Important?

About This Manual

Syntax Notation

MS-DOS Files

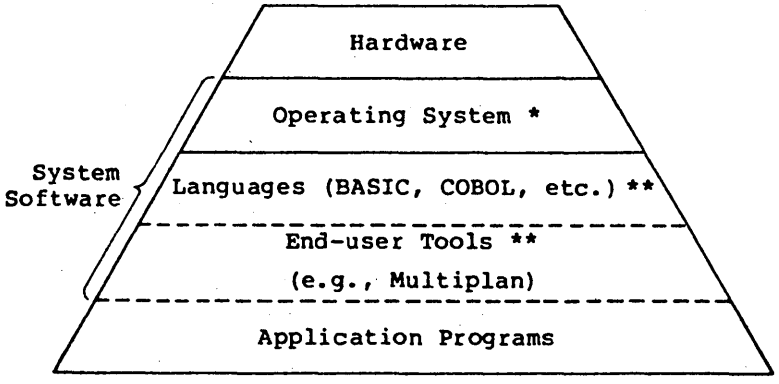
1.1 WHAT IS MS-DOS?

Microsoft(R) MS(tm)-DOS is a disk operating system for 8086/8088-based computers. Through MS-DOS, you communicate with the computer, disk drives, and printer, managing these resources to your advantage.

1.2 WHAT IS AN OPERATING SYSTEM?

An operating system is your "silent partner" when you are using the computer. It provides the interface between the hardware and both you (the user) and the other system software. An operating system can be compared to the electricity in a house--you need it for the toaster and the blender to work, but you are not always aware that it's there.

An operating system (OS) is the piece of system software most closely associated with the hardware. The OS is unique to the microprocessor (computer). For example, MS-DOS runs on the 8086/8088 microprocessor family and will not run on another microprocessor (like the Z8000) unless major parts of the OS are rewritten. Figure 1 illustrates how the hardware, the system software and the application software are related.



* Must adapt to new hardware

** If adapted to operating system, these don't change

Figure 1. Hardware/Software Relationships

MS-DOS is a disk operating system that enables you to create and keep track of files, run and link programs, and access peripheral devices (for example, printers and disk drives) that are attached to your computer. MS-DOS is an important advance in microprocessor operating systems.

1.3 WHY IS MS-DOS SO IMPORTANT?

All Microsoft languages (BASIC Interpreter, BASIC Compiler, FORTRAN, COBOL, Pascal) are available under MS-DOS. Users of MS-DOS are assured that their operating system will be the first that Microsoft will support when any new products or major releases are announced.

1.4 ABOUT THIS MANUAL

This manual describes MS-DOS and how to use it. This chapter introduces some basic MS-DOS concepts; Chapter 2 discusses how to start using MS-DOS and how to format and back up your disks.

Chapter 3 tells you about files--what they are and how to use them. Chapters 4 through 6 introduce MS-DOS commands and Chapter 7 describes the line editor, EDLIN. Read these chapters carefully--they contain information on protecting your data, system commands, and the MS-DOS editing commands.

Chapter 8 explains how to use the MS-DOS File Comparison utility, FC. This utility is helpful when you need to compare the contents of two source or binary files.

If you are writing programs and want to link separately-produced object modules and create relocatable modules, Chapter 9 describes a useful MS-DOS utility, MS-LINK.

Appendices to this manual include instructions for users with one-disk-drive systems and disk error messages.

If you want to know more, a companion manual, the Macro Assembler Manual, contains information of the technical aspects of MS-DOS. A third manual, the MS-DOS Programmer's Reference Manual, describes system architecture, how to install device drivers, and system calls and interrupts.

1.5 SYNTAX NOTATION

The following syntax notation is used throughout this manual in descriptions of command and statement syntax:

[ ] Square brackets indicate that the enclosed entry is optional.

< > Angle brackets indicate data you must enter. When the angle brackets enclose lower case text, you must type in an entry defined by the text; for example, <filename>. When the angle brackets enclose upper case text, you must press the key named by the text; for example, <RETURN>.

{ } Braces indicate that you have a choice between two or more entries. At least one of the entries enclosed in braces must be chosen unless the entries are also enclosed in square brackets.

... Ellipses indicate that an entry may be repeated as many times as needed or desired.

| A bar indicates an OR statement in a command. When used with an MS-DOS filter, the bar indicates a pipe.

CAPS Capital letters indicate portions of statements or commands that must be entered, exactly as shown.

All other punctuation, such as commas, colons, slash marks, and equal signs, must be entered exactly as shown.

1.6 MS-DOS FILES

The MS-DOS disk contains the following files:

	File Name	Function of File
	COMMAND.COM	MS-DOS command processor
*	MSDOS.SYS	MS-DOS operating system
*	IO.SYS	Hardware-operating system interface
	EDLIN.COM	Line editor
	DEBUG.COM	Debugger
	LINK.EXE	Linker
	CHKDSK.COM	Checks disks
	FORMAT.COM	Formats disks
	SYS.COM	Transfers system
	DISKCOPY.COM	Backup utility
	RECOVER.COM	Recovers disks
	PRINT.COM	Print spooler
	MORE.COM	Reviews text

SORT.EXE	Sorts text
FIND.EXE	Finds a string in a list of files or standard input
EXE2BIN.EXE	Converts .EXE files
CONFIG.SYS	System configuration file
FC.EXE	Compares files

You will recognize this list of files when you have learned the DIR (Show Directory) command described in the next chapter. The two files preceded by an asterisk (*) are "hidden" files and will not appear when you enter a DIR command.

In the next chapter, you will learn how to start your MS-DOS system and how to format and back up your disks.

CHAPTER 2

GETTING STARTED

2.1 WHAT HAPPENS WHEN YOU FIRST LOAD MS-DOS?

Follow your computer manufacturer's instructions to insert and load the MS-DOS disk into your system. Loading MS-DOS takes from 3 to 45 seconds, depending on the size of memory in your computer.

Once MS-DOS has been loaded, the system searches the MS-DOS disk for the COMMAND.COM file and loads it into memory. The COMMAND.COM file is a program that processes the commands you enter and then runs the appropriate programs. It is also called the command processor.

When the command processor is loaded, you will see the following display on your screen (the underscore represents the cursor):

```
MS-DOS Version 2.00
Copyright 1981, 1982 Microsoft Corp.

Command V. 2.02
Current date is Wed 1-02-1981
Enter new date:_
```

You must now enter today's date and time at your terminal.

2.2 HOW TO ENTER THE DATE AND TIME

Type today's date in an mm-dd-yy format, where:

mm is a one- or two-digit number from 1-12 (representing month)

dd is a one- or two-digit number from 1-31 (representing day of month)

yy is a two-digit number from 80-99 (the 19 is assumed), or a four-digit number from 1980-2099 (representing year)

Any date is acceptable in answer to the new date prompt as long as it follows the above format. Separators between the numbers can be hyphens (-) or slashes (/). For example:

6-1-82 or 06/01/82

are both acceptable answers to the Enter new date: prompt.

If you enter an invalid date or form of date, the system will prompt you again with Enter new date:.

After you respond to the new date prompt and enter your

answer by pressing the <RETURN> key (or <ENTER> key on some terminals), you will see a prompt similar to this:

```
Current time is 8.30:14.32
Enter new time:_
```

Enter the current time in the hh:mm format, where:

hh is a one- or two-digit number from 0-23 (representing hours)

mm is a one- or two-digit number from 0-59 (representing minutes)

MS-DOS uses this time value to keep track of when you last updated and/or created files on the system. Notice that MS-DOS uses military time; for instance, 1:30 p.m. is written 13:30.

Example:

```
Current time is 0:00:14.32
Enter new time: 9:05
```

You should only use the colon (:) to separate hours and minutes. If you enter an invalid number separator, MS-DOS will repeat the prompt.

NOTE

If you make a mistake while typing, press the control key on your keyboard, hold it down, and then press the C key. This <CONTROL-C> function will abort your current entry. You can then re-answer the prompt or type another command. To correct a line before you press <RETURN>, use the <BACKSPACE> key to erase one letter at a time.

You have now completed the steps for starting MS-DOS.

2.3 HOW TO CHANGE THE DEFAULT DRIVE

After you have answered the new time prompt, a message is displayed that looks like this:

```
A>_
```

The A> is the MS-DOS prompt from the command processor. It tells you that MS-DOS is ready to accept commands. If you have inserted the MS-DOS disk into a drive other than A:, the command processor prompt will reflect that drive (for example, B>). However, usually you will load MS-DOS in drive A:.

The A in the previous prompt represents the default disk drive. This means that MS-DOS will search only the disk in drive A: for any filenames you may enter and will write files to that disk unless you specify a different drive. You can ask MS-DOS to search the disk in drive B: by changing the drive designation or by specifying B: in a command. To change the disk drive designation, enter the new drive letter followed by a colon. For example:

```
A>      (MS-DOS prompt)
A>B:    (you have typed B: in response to
        the prompt)
B>      (system responds with B: and drive B:
        is now the default drive)
```

The system prompt B> will appear and MS-DOS will search only the disk in drive B: until you specify a different default drive.

If you have only one disk drive attached to your computer, turn to Appendix A, Instructions for Users with Single-Drive Systems, for important information. Your computer may have more than 2 disk drives; refer to your computer manufacturer's instructions on the use of these drives.

2.4 HOW TO FORMAT YOUR DISKS

You must "format" all new disks before they can be used by MS-DOS.

A blank disk must be formatted with the MS-DOS FORMAT command. The FORMAT command changes the disk to a format that MS-DOS can use; it also analyzes the disk for defective tracks. If the disk is not already blank, formatting it will destroy any data that exists on the disk. Although this can be a convenient way to make a blank disk, it is recommended that the MS-DOS DELETE command be used for

this purpose. Refer to Chapter 5, "MS-DOS Commands," for more information on the DELETE command.

2.4.1 The FORMAT Command

The syntax of the FORMAT command is:

```
FORMAT [d:]
```

where:

d: is the drive designation (the drive that contains the disk to be formatted)

Note that the brackets identify optional information. If you do not specify a disk drive (for example, A: or B:), MS-DOS will format the disk in the default drive.

With the MS-DOS disk already in drive A:, you are ready to format your new blank disk. The following command will format the new disk in drive B:.

```
FORMAT B:
```

MS-DOS issues the following message:

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

After you insert the new disk in drive B: and press any key on the keyboard, the system responds:

```
Formatting...
```

while MS-DOS is formatting your disk. If you add the /V switch to the FORMAT command, MS-DOS will ask for the volume label of the disk. (See below.) The /S switch tells MS-DOS to copy its system files onto the new disk.

(Note: this message may not appear on your screen.)

When the formatting is finished, MS-DOS will issue a message similar to this:

```
Formatting...Format complete
System transferred

Volume label (11 characters. RETURN for none)?
```

Volume labels are useful to identify disks--they are like a name tag for each disk. When you assign a unique volume

label to a disk, you can always be sure that you know which disk you are using. The volume label you assign to a disk is displayed by issuing the MS-DOS VOL command (refer to Chapter 5, "MS-DOS Commands," for more information on the VOL command). Type a volume label in response to the above prompt if you want to identify this disk, and press <RETURN>. An example of a volume label is PROGRAMS. If you do not want to attach a label to this disk, simply press the <RETURN> key. You will see on your screen a message similar to this:

```
160256 bytes total disk space
12800 bytes used by system
143360 bytes available on disk

Format another (Y/N)?_
```

Type Y to format another disk. Type N to end the FORMAT program.

2.5 HOW TO BACK UP YOUR DISKS

It is strongly recommended that you make backup copies of all your disks. If a disk becomes damaged or if files are accidentally erased, you will still have all of the information on your backup disk. You should make a backup copy of your MS-DOS disk also. You can back up disks by using the MS-DOS DISKCOPY command. This command is described below.

2.5.1 The DISKCOPY Command

The DISKCOPY command copies the contents of a disk onto another disk. You can use this command to duplicate both the MS-DOS disk and a disk that contains your own files. DISKCOPY is the fastest way of copying a disk because it copies the entire disk in one operation, including MS-DOS system files if they exist.

The format of the DISKCOPY command is:

```
DISKCOPY [drive1:] [drive2:]
```

Drive1 is the disk drive that contains the disk that you want to copy; drive2 is the disk drive that contains the blank or "destination" disk. The blank disk must be formatted prior to running DISKCOPY.

For example, if you want to make a copy of your MS-DOS disk which is in drive A:, type

```
DISKCOPY A: B:
```

MS-DOS responds:

```
Insert source diskette into drive A:
Insert formatted target diskette into drive B:
Press any key when ready
```

Make sure the MS-DOS disk is in drive A: and insert a blank, formatted disk in drive B:. Press any character key after you have done this and MS-DOS will begin copying the MS-DOS disk. After MS-DOS has copied the disk, MS-DOS displays:

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

Type Y (for Yes) if you wish to copy another disk with DISKCOPY. If you type N (for No), the default drive prompt is displayed.

You now have a duplicate copy of your MS-DOS disk in drive B:. This duplicate copy can be saved as your backup copy of the MS-DOS disk.

Figure 2 illustrates the DISKCOPY command:

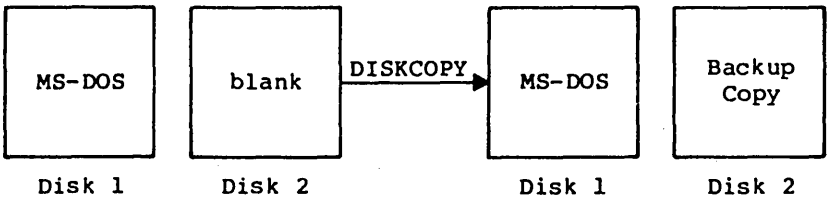


Figure 2. The DISKCOPY Command

Disks must be the same size and density to be copied with the DISKCOPY command. Refer to Chapter 5, "MS-DOS Commands," for more information on the DISKCOPY command.

NOTE

If either of the disks that you are using has defective tracks, DISKCOPY will not work. Use the COPY command to back up your disks in these cases. (COPY will skip over defective tracks.) Refer to Chapter 5, "MS-DOS Commands," for information on how to use COPY to back up your disks.

2.6 AUTOMATIC PROGRAM EXECUTION

If you want to run a specific program automatically each time you start MS-DOS, you can do so with Automatic Program Execution. For example, you may want to have MS-DOS display the names of your files each time you load MS-DOS.

When you start MS-DOS, the command processor searches for a file named AUTOEXEC.BAT on the MS-DOS disk. This file is a program that MS-DOS will run each time MS-DOS is started. Chapter 4, "Learning About Commands," tells you how to create an AUTOEXEC.BAT file.

2.7 FILES

2.7.1 What Is A File?

A file is a collection of related information. A file on your disk can be compared to a file folder in a desk drawer. For example, one file folder might contain the names and addresses of the employees who work in the office. You might name this file the Employee Master File. A file on your disk could also contain the names and addresses of employees in the office and could be named Employee Master File.

All programs, text, and data on your disk reside in files and each file has a unique name. You refer to files by their names. Chapter 3, "More About Files," tells you how to name your files.

You create a file each time you enter and save data or text at your terminal. Files are also created when you write and name programs and save them on your disks.

2.7.2 How MS-DOS Keeps Track Of Your Files

The names of files are kept in directories on a disk. These directories also contain information on the size of the files, their location on the disk, and the dates that they were created and updated. The directory you are working in is called your current or working directory.

An additional system area is called the File Allocation Table. It keeps track of the location of your files on the disk. It also allocates the free space on your disks so that you can create new files.

These two system areas, the directories and the File Allocation Table, enable MS-DOS to recognize and organize the files on your disks. The File Allocation Table is copied onto a new disk when you format it with the MS-DOS FORMAT command and one empty directory is created, called the root directory.

2.7.3 The DIR (Show Directory) Command

If you want to know what files are on your disk, you can use the DIR command. This command tells MS-DOS to display all the files in the current directory on the disk that is named. For example, if your MS-DOS disk is in drive A: and you want to see the listing for the current directory on that disk, type:

DIR A:

MS-DOS will respond with a directory listing of all the files in the current directory on your MS-DOS disk. The display should look similar to this:

```
Volume in drive A is DOS 2-0
Directory of A:

COMMAND    COM   16276    10-29-81   11:48a
DEBUG      COM   11534    10-28-82    9:21a
CHKDSK     COM    6272    10-26-82   12:12p
SYS        COM    1400    10-29-82    6:30p
EDLIN      COM    4419     1-01-80   12:41a
RECOVER    COM    2281    10-29-82    5:37p
PRINT      COM    3899    10-27-82   12:19p
LINK       EXE   41856     8-31-82    1:14p
FORMAT     COM    5605    10-28-82    9:55a
EXEFIX     COM    1350    10-06-82    2:57p
SORT       EXE    1280    10-27-82    3:18p
MORE       COM     291    10-27-82    3:20p
FIND       EXE    5888    01-01-80   12:57a
CONFIG     SYS      33    10-18-82    5:02p
LOCATE     EXE    5888    10-27-82   12:53p
FC         EXE   10624    10-27-82    7:00p
LOGIN      COM     299    10-18-82    6:30p

      20 File(s)        23040 bytes free
```

NOTE

Two MS-DOS system files, IO.SYS and MSDOS.SYS, are "hidden" files and will not appear when you issue the DIR command.

You can also get information about any file on your disk by typing DIR and a filename. For example, if you have created a file named MYFILE.TXT, the command

DIR MYFILE.TXT

will give you a display of all the directory information (name of file, size of file, date last edited) for the file MYFILE.TXT.

For more information on the DIR command, refer to Chapter 5, "MS-DOS Commands."

2.7.4 The CHKDSK (Check Disk) Command

The MS-DOS command CHKDSK is used to check your disks for consistency and errors, much like a secretary proofreading a letter. CHKDSK analyzes the directories and the File Allocation Table on the disk that you specify. It then produces a status report of any inconsistencies, such as files which have a non-zero size in their directory but really have no data in them.

To check the disk in drive A:, type:

```
CHKDSK A:
```

MS-DOS will display a status report and any errors that it has found. An example of this display and more information on CHKDSK can be found in the description of the CHKDSK command in Chapter 5. You should run CHKDSK occasionally for each disk to ensure the integrity of your files.

2.8 HOW TO TURN THE SYSTEM OFF

There is no "logoff" command in MS-DOS. To end your terminal session, open the disk drive doors and remove the disks. Then, simply turn your terminal off in response to a default drive prompt. Refer to your hardware manufacturer's instructions for information on how to do this.

NOTE

Always remove your disks from the disk drives before you turn off your terminal and disk drives.

Summary of Commands in This Chapter

COMMAND	PURPOSE	SYNTAX
FORMAT	Formats disks for MS-DOS	FORMAT [d:]
DISKCOPY	Copies disks	DISKCOPY [drive1:][drive2:]
DIR	Lists directory information	DIR [d:][filename]
CHKDSK	Checks for errors on disk	CHKDSK [d:]

In the next chapter, you will learn more about MS-DOS files.

CHAPTER 3

MORE ABOUT FILES

In Chapter 2, you learned that directories contain the names of your files. In this chapter, you will learn how to name and copy your files. You will also learn more about the MS-DOS hierarchical directory structure which makes it easy for you to organize and locate your files.

3.1 HOW TO NAME YOUR FILES

The name of a typical MS-DOS file will look like this:

```
NEWFILE.EXE
```

The name of a file consists of two parts. The filename is NEWFILE and the filename extension is .EXE.

A filename can be from 1 to 8 characters long. The filename extension can be three or fewer characters. You can type any filename in small or capital letters and MS-DOS will translate these letters into uppercase characters.

In addition to the filename and the filename extension, the name of your file may include a drive designation. A drive designation tells MS-DOS to look on the disk in the designated drive to find the filename typed. For example, to find directory information about the file NEWFILE.EXE which is located on the disk in drive A: (and drive A: is NOT the default drive), type the following command:

```
DIR A:NEWFILE.EXE
```

Directory information about the file NEWFILE.EXE is now displayed on your screen.

If drive A: is the default drive, MS-DOS will search only the disk in drive A: for the filename NEWFILE and so the drive designation is not necessary. A drive designation is needed if you want to tell MS-DOS to look on the other drive to find a file.

Your filenames will probably be made up of letters and numbers, but other characters are allowed, too. Legal characters for filename extensions are the same as those for filenames. Here is a complete list of the characters you can use in filenames and extensions:

```
A-Z   0-9   $   &   #
%   '   (   )   -   @
^   {   }   ~   `   !
```

All of the parts of a filename comprise a file specification. The term file specification (or filespec) will be used in this manual to indicate the following filename format:

[<drive designation:>]<filename>[<.filename extension>]

Remember that brackets indicate optional items. Angle brackets (<>) mean that you supply the text for the item. Note that the drive designation is not required unless you need to indicate to MS-DOS on which disk to search for a specific file. You do not have to give your filename a filename extension.

Examples of file specifications are:

```
B:MYPROG.COB
A:YOURPROG.EXT
A:NEWFILE.
TEXT
```

3.2 WILD CARDS

Two special characters (called wild cards) can be used in filenames and extensions: the asterisk (*) and the question mark (?). These special characters give you greater flexibility when using filenames in MS-DOS commands.

3.2.1 The ? Wild Card

A question mark (?) in a filename or filename extension indicates that any character can occupy that position. For example, the MS-DOS command

```
DIR TEST?RUN.EXE
```

will list all directory entries on the default drive that have 8 characters, begin with TEST, have any next character, end with the letters RUN, and have a filename extension of .EXE. Here are some examples of files that might be listed by the above DIR command:

```
TEST1RUN.EXE
TEST2RUN.EXE
TEST6RUN.EXE
```

3.2.2 The * Wild Card

An asterisk (*) in a filename or filename extension indicates that any character can occupy that position or any of the remaining positions in the filename or extension. For example:

```
DIR TEST*.EXE
```

will list all directory entries on the default drive with filenames that begin with the characters TEST and have an extension of .EXE. Here are some examples of files that might be listed by the above DIR command:

```
TEST1RUN.EXE
TEST2RUN.EXE
TEST6RUN.EXE
TESTALL.EXE
```

The wild card designation *.* refers to all files on the disk. Note that this can be very powerful and destructive when used in MS-DOS commands. For example, the command DEL *.* deletes all files on the default drive, regardless of filename or extension.

Examples:

To list the directory entries for all files named NEWFILE on drive A: (regardless of their filename extensions), simply type:

```
DIR A:NEWFILE.*
```

To list the directory entries for all files with filename extensions of .TXT (regardless of their filenames) on the disk in drive B:, type:

```
DIR B:????????.TXT
```

This command is useful if, for example, you have given all your text programs a filename extension of .TXT. By using the DIR command with the wild card characters, you can obtain a listing of all your text files even if you do not remember all of their filenames.

3.3 ILLEGAL FILENAMES

MS-DOS treats some device names specially, and certain 3-letter names are reserved for the names of these devices. These 3-letter names cannot be used as filenames or extensions. You must not name your files any of the following:

AUX Used when referring to input from or output to an auxiliary device (such as a printer or disk drive).

CON Used when referring to keyboard input or to output to the terminal console (screen).

LST or
PRN Used when referring to the printer device.

NUL Used when you do not want to create a particular file, but the command requires an input or output filename.

Even if you add device designations or filename extensions to these filenames, they remain associated with the devices listed above. For example, A:CON.XXX still refers to the console and is not the name of a disk file.

3.4 HOW TO COPY YOUR FILES

Just as with paper files, you often need more than one copy of a disk file. The COPY command allows you to copy one or more files to another disk. You can also give the copy a different name if you specify the new name in the COPY command.

The COPY command can also make copies of files on the same disk. In this case, you must supply MS-DOS with a different filename or you will overwrite the file. You cannot make a copy of a file on the same disk unless you specify a different filename for the new copy.

The format of the COPY command is:

```
COPY filespec [filespec]
```

For example,

```
COPY A:MYFILE.TXT B:MYFILE.TXT
```

will copy the file MYFILE.TXT on the disk in drive A: to a file named MYFILE.TXT on the disk in drive B:. A duplicate copy of MYFILE.TXT now exists.

Figure 3 illustrates how to copy files to another disk:

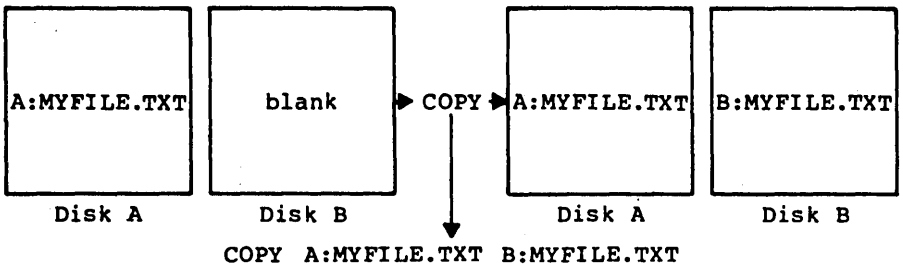


Figure 3. Copying Files to Another Disk

If you want to duplicate the file named MYFILE.TXT on the same disk, type:

```
COPY A:MYFILE.TXT A:NEWNAME.TXT
```

You now have two copies of your file on disk A--one named MYFILE.TXT and the other named NEWNAME.TXT. The following figure illustrates this example.

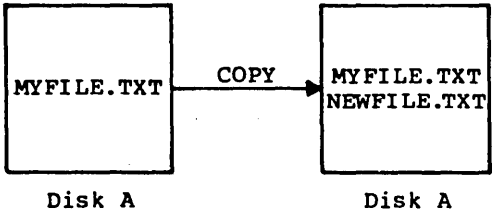


Figure 4. Copying Files on the Same Disk

You can also copy all files on a disk to another disk (i.e., make a backup copy) with the COPY command. Refer to Chapter 5, "MS-DOS Commands," for more information on this process.

3.5 HOW TO PROTECT YOUR FILES

MS-DOS is a powerful and useful tool in processing your personal and business information. As with any information system, inadvertent errors may occur and information may be misused. If you are processing information that cannot be replaced or requires a high level of security, you should take steps to ensure that your data and programs are protected from accidental or unauthorized use, modification, or destruction. Simple measures you can take--such as removing your disks when they are not in use, keeping backup copies of valuable information, and installing your equipment in a secure facility--can help you maintain the integrity of the information in your files.

3.6 DIRECTORIES

As you learned in Chapter 2, the names of your files are kept in a directory on each disk. The directory also contains information on the size of the files, their locations on the disk, and the dates that they were created and updated.

When there are multiple users on your computer, or when you are working on several different projects, the number of files in the directory can become large and unwieldy. You may want your own files kept separate from a co-worker's; or, you may want to organize your programs into categories that are convenient for you.

In an office, you can separate files by putting them in different filing cabinets; in effect, creating different directories of information. MS-DOS allows you to organize the files on your disks into directories. Directories are a way of dividing your files into convenient groups of files. For example, you may want all of your accounting programs in one directory and text files in another. Any one directory can contain any reasonable number of files, and it may also contain other directories (referred to as subdirectories). This method of organizing your files is called a hierarchical directory structure.

A hierarchical directory structure can be thought of as a "tree" structure: directories are branches of the tree and files are the leaves, except that the "tree" grows downward; that is, the "root" is at the top. The root is the first level in the directory structure. It is the directory that

is automatically created when you format a disk and start putting files in it. You can create additional directories and subdirectories by following the instructions in Chapter 4, "Learning About Commands."

The tree or file structure grows as you create new directories for groups of files or for other people on the system. Within each new directory, files can be added, or new subdirectories can be created.

It is possible for you to "travel" around this tree; for instance, it is possible to find any file in the system by starting at the root and traveling down any of the branches to the desired file. Conversely, you can start where you are within the file system and travel towards the root.

The filenames discussed earlier in this chapter are relative to your current directory and do not apply system-wide. Thus, when you turn on your computer, you are "in" your directory. Unless you take special action when you create a file, the new file is created in the directory in which you are now working. Users can have files of the same name that are unrelated because each is in a different directory.

Figure 5 illustrates a typical hierarchical directory structure.

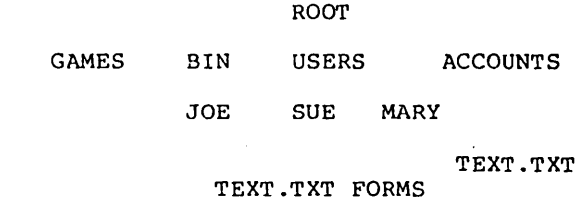


Figure 5. A Sample Hierarchical Directory Structure

The ROOT directory is the first level in the directory structure. You can create subdirectories from the ROOT by using the MKDIR command (refer to Chapter 5, "MS-DOS Commands," for information on MKDIR). In this example, five subdirectories of ROOT have been created. These include:

1. A directory of games, named GAMES
2. A directory of all external commands, named BIN (refer to Chapter 4, "Learning About Commands," for more information on the BIN directory)
3. A USER directory containing separate subdirectories for all users of the system
4. A directory containing accounting information, named ACCOUNTS
5. A directory of programs, named PROGRAMS

Joe, Sue, and Mary each have their own directories which are subdirectories of the USER directory. Sue has a subdirectory under the \USER\SUE directory named FORMS. Sue and Mary have files in their directories, each named TEXT.TXT. Notice that Mary's text file is unrelated to Sue's.

This organization of files and directories is not important if you only work with files in your own directory; but if you work with someone else or on several projects at one time, the hierarchical directory structure becomes extremely useful. For example, you could get a list of the files in Sue's FORMS directory by typing:

```
DIR \USER\SUE\FORMS
```

Note that the backward slash mark (\) is used to separate directories from other directories and files.

To find out what files Mary has in her directory, you could type:

```
DIR \USER\MARY
```

3.7 FILENAMES AND PATHS

When you use hierarchical directories, you must tell MS-DOS where the files are located in the directory structure. Both Mary and Sue, for example, have files named TEXT.TXT. Each will have to tell MS-DOS in which directory her file resides if she wants to access it. This is done by giving MS-DOS a pathname to the file.

3.7.1 Pathnames

A simple filename is a sequence of characters that can optionally be preceded by a drive designation and followed by an extension. A pathname is a sequence of directory names followed by a simple filename, each separated from the previous one by a slash (\).

The syntax of pathnames is:

```
[<d>:][<directory>]\[<directory...>]\[<filename>]
```

If a pathname begins with a slash, MS-DOS searches for the file beginning at the root (or top) of the tree. Otherwise, MS-DOS begins at the user's current directory, known as the working directory, and searches downward from there. The pathname of Sue's TEXT.TXT file is \USER\SUE\TEXT.TXT.

When you are in your working directory, a filename and its corresponding pathname may be used interchangeably. Some sample names are:

\	Indicates the root directory.
\PROGRAMS	Sample directory under the root directory containing program files.
\USER\MARY\FORMS\1A	A typical full pathname. This one happens to be a file named 1A in the directory named FORMS belonging to the USER named MARY.

USER\SUE	A relative pathname; it names the file or directory SUE in subdirectory USER of the working directory. If the working directory is the root (\), (\), it names \USER\SUE.
TEXT.TXT	Name of a file or directory in the working directory.

MS-DOS provides special shorthand notations for the working directory and the parent directory (one level up) of the working directory:

. MS-DOS uses this shorthand notation to indicate the name of the working directory in all hierarchical directory listings. MS-DOS automatically creates this entry when a directory is made.

.. The shorthand name of the working directory's parent directory. If you type:

```
DIR ..
```

then MS-DOS will list the files in the parent directory of your working directory.

If you type:

```
DIR ..\..
```

then MS-DOS will list the files in the parent's PARENT directory.

3.7.2 Pathing And External Commands

External commands reside on disks as program files. They must be read from the disk before they execute. (For more information on external commands, refer to Chapter 4, "Learning About Commands.")

When you are working with more than one directory, it is convenient to put all MS-DOS external commands into a separate directory so they do not clutter your other directories. When you issue an external command to MS-DOS, MS-DOS immediately checks your working directory to find that command. You must tell MS-DOS in which directory these external commands reside. This is done with the PATH command.

For example, if you are in a working directory named

\BIN\PROG, and all MS-DOS external commands are in \BIN, you must tell MS-DOS to choose the \BIN path to find the FORMAT command. The command

```
PATH \BIN
```

tells MS-DOS to search in your working directory and the \BIN directory for all commands. You only have to specify this path once to MS-DOS during your terminal session. MS-DOS will now search in \BIN for the external commands. If you want to know what the current path is, type the word PATH and the current value of PATH will be printed.

For more information on the MS-DOS command PATH, refer to Chapter 5, "MS-DOS Commands."

3.7.3 Pathing And Internal Commands

Internal commands are the simplest, most commonly used commands. They execute immediately because they are incorporated into the command processor. (For more information on internal commands, refer to Chapter 4, "Learning About Commands.")

Some internal commands can use paths. The following four commands, COPY, DIR, DEL, and TYPE have greater flexibility when you specify a pathname after the command.

The syntax of these four commands is shown below.

COPY <pathname pathname>
: If the second pathname to COPY is a directory, all files are copied into that directory. The first pathname may only specify files in the working directory.

DEL <pathname>
: If the pathname is a directory, all the files in that directory are deleted. Note: The prompt "Are you sure (Y/N)?" will be displayed if you try to delete a path. Type Y to complete the command, or type N for the command to abort.

DIR <pathname>
: Displays the directory for a specific path.

TYPE <pathname>
: You must specify a file in a path for this command. MS-DOS will display the file on your screen in response to the TYPE pathname command.

3.7.4 Displaying Your Working Directory

All commands are executed while you are in your working directory. You can find out the name of the directory you are in by issuing the MS-DOS command CHDIR (Change Directory) with no options. For example, if your current directory is \USER\JOE, when you type:

```
CHDIR<RETURN>
```

you will see:

```
A:\USER\JOE
```

This is your current drive designation plus the working directory (\USER\JOE).

If you now want to see what is in the \USER\JOE directory, you can issue the MS-DOS command DIR. The following is an example of the display you might receive from the DIR command for a subdirectory:

```
 Volume in drive A has no ID
 Directory of A:\USER\JOE

.              <DIR>          8-09-82    10:09a
..             <DIR>          8-09-82    10:09a
TEXT           <DIR>          8-09-82    10:09a
FILE1   COM        5243       8-04-82     9:30a
       4 File(s)    8376320 bytes free
```

A volume ID for this disk was not assigned when the disk was formatted. Note that MS-DOS lists both files and directories in this output. As you can see, Joe has another directory in this tree structure named TEXT. The '.' indicates the working directory \USER\JOE, and the '..' is the shorthand notation for the parent directory \USER. FILE1.COM is a file in the \USER\JOE directory. All of these directories and files reside on the disk in drive A:.

Because files and directories are listed together (see previous display), MS-DOS does not allow you to give a subdirectory the same name as a file in that directory. For example, if you have a path \BIN\USER\JOE where JOE is a subdirectory, you cannot create a file in the USER directory named JOE.

3.7.5 Creating A Directory

To create a subdirectory in your working directory, use the MKDIR (Make Directory) command. For example, to create a new directory named NEWDIR under your working directory, simply type:

```
MKDIR NEWDIR
```

After this command has been executed by MS-DOS, a new directory will exist in your tree structure under your working directory. You can also make directories anywhere in the tree structure by specifying MKDIR and then a pathname. MS-DOS will automatically create the . and .. entries in the new directory.

To put files in the new directory, use the MS-DOS line editor, EDLIN. Chapter 7, "The Line Editor (EDLIN)," describes how to use EDLIN to create and save files.

3.7.6 How To Change Your Working Directory

Changing from your working directory to another directory is very easy in MS-DOS. Simply issue the CHDIR (Change Directory) command and supply a pathname. For example:

```
A>CHDIR \USER
```

changes the working directory from \USER\JOE to \USER. You can specify any pathname after the command to "travel" to different branches and leaves of the directory tree. The command "CHDIR .." will always put you in the parent directory of your working directory.

3.7.7 How To Remove A Directory

To delete a directory in the tree structure, use the MS-DOS RMDIR (Remove Directory) command. For example, to remove the directory NEWDIR from the working directory, type:

```
RMDIR NEWDIR
```

Note that the directory NEWDIR must be empty except for the . and .. entries before it can be removed; this will prevent you from accidentally deleting files and directories. You can remove any directory by specifying its pathname. To remove the \BIN\USER\JOE directory, make sure that it has only the . and .. entries, then type:

```
RMDIR \BIN\USER\JOE
```

To remove all the files in a directory (except for the . and .. entries), type DEL and then the pathname of the directory. For example, to delete all files in the \BIN\USER\SUE directory, type:

```
DEL \BIN\USER\SUE
```

You cannot delete the . and .. entries. They are created by MS-DOS as part of the hierarchical directory structure.

Summary of Commands in This Chapter

COMMAND	PURPOSE	SYNTAX
COPY	Copies files	COPY filespec [filespec]
PATH	Sets MS-DOS search path	PATH [pathname]
CHDIR	Displays working directory; changes directories	CHDIR [pathname]
MKDIR	Makes a new directory	MKDIR [pathname]
RMDIR	Removes a directory	RMDIR [pathname]

In the next chapter, you will learn about MS-DOS commands.

CHAPTER 4

LEARNING ABOUT COMMANDS

4.1 INTRODUCTION

Commands are a way of communicating with the computer. By entering MS-DOS commands at your terminal, you can ask the system to perform useful tasks. There are MS-DOS commands that:

Compare, copy, display, delete, and rename files

Copy and format disks

Execute system programs such as EDLIN, as well as your own programs

Analyze and list directories

Enter date, time, and remarks

Set various printer and screen options

Copy MS-DOS system files to another disk

Request MS-DOS to wait for a specific period of time

4.2 TYPES OF MS-DOS COMMANDS

There are two types of MS-DOS commands:

Internal commands

External commands

Internal commands are the simplest, most commonly used commands. You cannot see these commands when you do a directory listing on your MS-DOS disk; they are part of the command processor. When you type these commands, they execute immediately. The following internal commands are described in Chapter 5:

BREAK	DEL (ERASE)	MKDIR (MD)	SET
CHDIR (CD)	DIR	PATH	SHIFT
CLS	ECHO	PAUSE	TIME
COPY	EXIT	PROMPT	TYPE
CTTY	FOR	REM	VER
DATE	GOTO	REN (RENAME)	VERIFY
	IF	RMDIR (RD)	VOL

External commands reside on disks as program files. They must be read from disk before they can execute. If the disk containing the command is not in the drive, MS-DOS will not be able to find and execute the command.

Any filename with a filename extension of .COM, .EXE or .BAT is considered an external command. For example, programs such as FORMAT.COM and COMP.COM are external commands. Because all external commands reside on disk, you can create commands and add them to the system. Programs that you create with most languages (including assembly language) will be .EXE (executable) files.

When you enter an external command, do not include its filename extension. The following external commands are described in Chapter 5:

CHKDSK	MORE
DISKCOPY	PRINT
FIND	RECOVER
FORMAT	SORT
EXE2BIN	SYS

4.3 COMMAND OPTIONS

Options can be included in your MS-DOS commands to specify additional information to the system. If you do not include some options, MS-DOS provides a default value. Refer to individual command descriptions in Chapter 5 for the default values.

The following is the format of all MS-DOS commands:

```
Command [options...]
```

where:

d:	Refers to disk drive designation.
filename	Refers to any valid name for a disk file, including an optional filename extension. The filename option does not refer to a device or to a disk drive designation.
.ext	Refers to an optional filename extension consisting of a period and 1-3 characters. When used, filename extensions immediately follow filenames.

filespec — Refers to an optional drive designation, a filename, and an optional three letter filename extension in the following format:

[<d:>]<filename>[<.ext>]

pathname — Refers to a pathname or filename in the following format:

[<directory>]/[<directory...>]/[<filename>]

switches — Switches are options that control MS-DOS commands. They are preceded by a forward slash (for example, /P).

arguments — Provide more information to MS-DOS commands. You usually choose between arguments; for example, ON or OFF.

4.4 INFORMATION COMMON TO ALL MS-DOS COMMANDS

The following information applies to all MS-DOS commands:

1. Commands are usually followed by one or more options.

2. Commands and options may be entered in uppercase or lowercase, or a combination of keys.

3. Commands and options must be separated by delimiters. Because they are easiest, you will usually use the space and comma as delimiters. For example:

```
DEL MYFILE.OLD NEWFILE.TXT
RENAME,THISFILE THATFILE
```

   You can also use the semicolon (;), the equal sign (=), or the tab key as delimiters in MS-DOS commands.

   In this manual, we will use a space as the delimiter in commands.

4. Do not separate a file specification with delimiters, since the colon and the period already serve as delimiters.

5. When instructions say "Press any key," you can press any alpha (A-Z) or numeric (0-9) key.

6. You must include the filename extension when referring to a file that already has a filename extension.

7. You can abort commands when they are running by pressing <CONTROL-C>.

8. Commands take effect only after you have pressed the <RETURN> key.

9. Wild cards (global filename characters) and device names (for example, PRN or CON) are not allowed in the names of any commands.

10. When commands produce a large amount of output on the screen, the display will automatically scroll to the next screen. You can press <CONTROL-S> to suspend the display. Press any key to resume the display on the screen.

11. MS-DOS editing and function keys can be used when entering commands. Refer to Chapter 6, "MS-DOS Editing and Function Keys," for a complete description of these keys.

12. The prompt from the command processor is the default drive designation plus a greater-than sign; for example, A>.

13. Disk drives will be referred to as source drives and destination drives. A source drive is the drive you will be transferring information from. A destination drive is the drive you will be transferring information to.

4.5 BATCH PROCESSING

Often you may find yourself typing the same sequence of commands over and over to perform some commonly used task. With MS-DOS, you can put the command sequence into a special file called a batch file, and execute the entire sequence simply by typing the name of the batch file. "Batches" of your commands in such files are processed as if they were typed at a terminal. Each batch file must be named with the .BAT extension, and is executed by typing the filename withcut its extension.

You can create a batch file by using the Line Editor (EDLIN) or by typing the COPY command. Refer to the "How to Create an AUTOEXEC.BAT File" section later in this chapter for more information on using the COPY command to create a batch file.

Two MS-DOS commands are available for use expressly in batch files: REM and PAUSE. REM permits you to include remarks and comments in your batch files without these remarks being executed as commands. PAUSE prompts you with an optional message and permits you to either continue or abort the batch process at a given point. REM and PAUSE are described in detail in Chapter 5.

Batch processing is useful if you want to execute several MS-DOS commands with one batch command, such as when you format and check a new disk. For example, a batch file for this purpose might look like this:

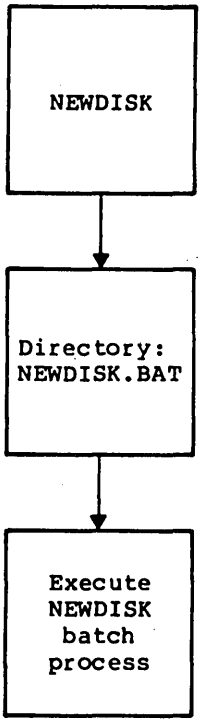
```
1: REM  This is a file to check new disks
2: REM  It is named NEWDISK.BAT
3: PAUSE  Insert new disk in drive B:
4: FORMAT B:
5: DIR B:
6: CHKDSK B:
```

To execute this .BAT file, simply type the filename without the .BAT extension:

```
NEWDISK
```

The result is the same as if each of the lines in the .BAT file was entered at the terminal as individual commands.

Figure 6 illustrates the three steps used to write, save, and execute an MS-DOS batch file.



1. Write a program.
2. Assign a filename extension of .BAT and save on your directory.
3. Enter NEWDISK as a command to MS-DOS.

Figure 6. MS-DOS Batch File Steps

The following list contains information that you should read before you execute a batch process with MS-DOS:

1. Do not enter the filename BATCH (unless the name of the file you want to execute is BATCH.BAT).

2. Only the filename should be entered to execute the batch file. Do not enter the filename extension.

3. The commands in the file named <filename>.BAT are executed.

4. If you press <CONTROL-C> while in batch mode, this prompt appears:

   Terminate batch job (Y/N)?

   If you press Y, the remainder of the commands in the batch file are ignored and the system prompt appears.

   If you press N, only the current command ends and batch processing continues with the next command in the file.

5. If you remove the disk containing a batch file being executed, MS-DOS prompts you to insert it again before the next command can be read.

6. The last command in a batch file may be the name of another batch file. This allows you to call one batch file from another when the first is finished.

4.6 THE AUTOEXEC.BAT FILE

As discussed in Chapter 2, an AUTOEXEC.BAT file allows you to automatically execute programs when you start MS-DOS. Automatic Program Execution is useful when you want to run a specific package (for example, Microsoft Multiplan) under MS-DOS, and when you want MS-DOS to execute a batch program automatically each time you start the system. You can avoid loading two separate disks to perform either of these tasks by using an AUTOEXEC.BAT file.

When you start MS-DOS, the command processor searches the MS-DOS disk for a file named AUTOEXEC.BAT. The AUTOEXEC.BAT file is a batch file that is automatically executed each time you start the system.

If MS-DOS finds the AUTOEXEC.BAT file, the file is immediately executed by the command processor and the date

and time prompts are bypassed.

If MS-DOS does not find an AUTOEXEC.BAT file when you first load the MS-DOS disk, then the date and time prompts will be issued. Figure 7 illustrates how MS-DOS uses the AUTOEXEC.BAT file.

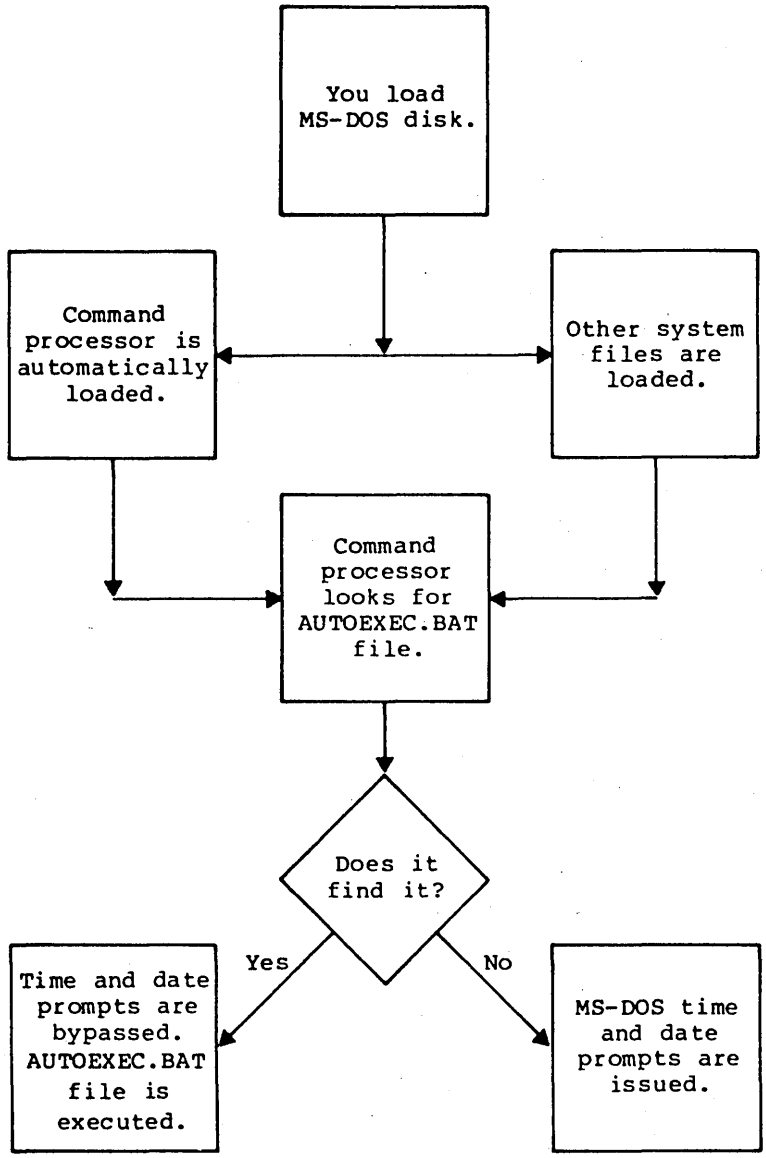


Figure 7. How MS-DOS Uses the AUTOEXEC.BAT File

4.6.1 How To Create An AUTOEXEC.BAT File

If, for example, you wanted to automatically load BASIC and run a program called MENU each time you started MS-DOS, you could create an AUTOEXEC.BAT file as follows:

1. Type:

   COPY CON: AUTOEXEC.BAT

   This statement tells MS-DOS to copy the information from the console (keyboard) into the AUTOEXEC.BAT file. Note that the AUTOEXEC.BAT file must be created in the root directory of your MS-DOS disk.

2. Now type:

   BASIC MENU

   This statement goes into the AUTOEXEC.BAT file. It tells MS-DOS to load BASIC and run the MENU program whenever MS-DOS is started.

3. Press the <CONTROL-Z> key; then press the <RETURN> key to put the command BASIC MENU in the AUTOEXEC.BAT file.

4. The MENU program will now run automatically whenever you start MS-DOS.

To run your own BASIC program, enter the name of your program in place of MENU in the second line of the example. You can enter any MS-DOS command or series of commands in the AUTOEXEC.BAT file.

NOTE

Remember that if you use an AUTOEXEC.BAT file, MS-DOS will not prompt you for a current date and time unless you include the DATE and TIME commands in the AUTOEXEC.BAT file. It is strongly recommended that you include these two commands in your AUTOEXEC.BAT file, since MS-DOS uses this information to keep your directory current.

4.7 CREATING A .BAT FILE WITH REPLACEABLE PARAMETERS

There may be times when you want to create an application program and run it with different sets of data. These data may be stored in various MS-DOS files.

When used in MS-DOS commands, a parameter is an option that you define. With MS-DOS, you can create a batch (.BAT) file with dummy (replaceable) parameters. These parameters, named %0-%9, can be replaced by values supplied when the batch file executes.

For example, when you type the command line COPY CON MYFILE.BAT, the next lines you type are copied from the console to a file named MYFILE.BAT on the default drive:

```
A>COPY CON MYFILE.BAT
COPY %1.MAC %2.MAC
TYPE %2.PRN
TYPE %0.BAT
```

Now, press <CONTROL-Z> and then press <RETURN>. MS-DOS responds with this message:

```
1 File(s) copied
A>_
```

The file MYFILE.BAT, which consists of three commands, now resides on the disk in the default drive.

The dummy parameters %1 and %2 are replaced sequentially by the parameters you supply when you execute the file. The dummy parameter %0 is always replaced by the drive designator, if specified, and the filename of the batch file (for example, MYFILE).

NOTES:

1. Up to 10 dummy parameters (%0-%9) can be specified. Refer to the MS-DOS command SHIFT in Chapter 5 if you wish to specify more than 10 parameters.

2. If you use the percent sign as part of a filename within a batch file, you must type it twice. For example, to specify the file ABC%.EXE, you must type it as ABC%%.EXE in the batch file.

4.7.1 Executing A .BAT File

To execute the batch file MYFILE.BAT and to specify the parameters that will replace the dummy parameters, you must enter the batch filename (without its extension) followed by the parameters you want MS-DOS to substitute for %1, %2, etc.

Remember that the file MYFILE.BAT consists of 3 lines:

```
COPY %1.MAC %2.MAC
TYPE %2.PRN
TYPE %0.BAT
```

To execute the MYFILE batch process, type:

```
MYFILE A:PROG1 B:PROG2
```

MYFILE is substituted for %0, A:PROG1 for %1, and B:PROG2 for %2.

The result is the same as if you had typed each of the commands in MYFILE with their parameters, as follows:

```
COPY A:PROG1.MAC B:PROG2.MAC
TYPE B:PROG2.PRN
TYPE MYFILE.BAT
```

The following table illustrates how MS-DOS replaces each of the above parameters:

BATCH FILENAME	PARAMETER1 (%0) (MYFILE)	PARAMETER2 (%1) (PROG1)	PARAMETER3 (%2) (PROG2)
MYFILE	MYFILE.BAT	PROG1.MAC	PROG2.MAC PROG2.PRN

Remember that the dummy parameter %0 is always replaced by the drive designator (if specified) and the filename of the batch file.

4.8 INPUT AND OUTPUT

MS-DOS always assumes that input comes from the keyboard and output goes to the terminal screen. However, the flow of command input and output can be redirected. Input can come from a file rather than a terminal keyboard, and output can go to a file or to a line printer instead of to the terminal. In addition, "pipes" can be created that allow output from one command to become the input to another. Redirection and pipes are discussed in the next sections.

4.8.1 Redirecting Your Output

Most commands produce output that is sent to your terminal. You can send this information to a file by using a greater-than sign (>) in your command. For example, the command

```
DIR
```

displays a directory listing of the disk in the default drive on the terminal screen. The same command can send this output to a file named MYFILES by designating the output file on the command line:

```
DIR >MYFILES
```

If the file MYFILES does not already exist, MS-DOS creates it and stores your directory listing in it. If MYFILES already exists, MS-DOS overwrites what is in the file with the new data.

If you want to append your directory or a file to another file (instead of replacing the entire file), two greater-than signs (>>) can be used to tell MS-DOS to append the output of the command (such as a directory listing) to the end of a specified file. The command

```
DIR >>MYFILES
```

appends your directory listing to a currently existing file named MYFILES. If MYFILES does not exist, it is created.

If is often useful to have input for a command come from a file rather than from a terminal. This is possible in MS-DOS by using a less-than sign (<) in your command. For example, the command

```
SORT <NAMES >LIST1
```

sorts the file NAMES and sends the sorted output to a file named LIST1.

4.8.2 Filters

A filter is a command that reads your input, transforms it in some way, and then outputs it, usually to your terminal or to a file. In this way, the data is said to have been "filtered" by the program. Since filters can be put together in many different ways, a few filters can take the place of a large number of specific commands.

MS-DOS filters include FIND, MORE, and SORT. Their

functions are described below:

FIND	Searches for a constant string of text in a file
MORE	Takes standard terminal output and displays it, one screen at a time
SORT	Sorts text

You can see how these filters are used in the next section.

4.8.3 Command Piping

If you want to give more than one command to the system at a time, you can "pipe" commands to MS-DOS. For example, you may occasionally need to have the output of one program sent as the input to another program. A typical case would be a program that produces output in columns. It could be desirable to have this columnar output sorted.

Piping is done by separating commands with the pipe separator, which is the vertical bar symbol (|). For example, the command

```
DIR | SORT
```

will give you an alphabetically sorted listing of your directory. The vertical bar causes all output generated by the left side of the bar to be sent to the right side of the bar for processing.

Piping can also be used when you want to output to a file. If you want your directory sorted and sent to a new file (for example, DIREC.FIL), you could type:

```
DIR | SORT >DIREC.FIL
```

MS-DOS will create a file named DIREC.FIL on your default drive. DIREC.FIL contains a sorted listing of the directory on the default drive, since no other drive was specified in the command. To specify a drive other than the default drive, type:

```
DIR | SORT >B:DIREC.FIL
```

This sends the sorted data to a file named DIREC.FIL on drive B:.

A pipeline may consist of more than two commands. For example,

```
DIR | SORT | MORE
```

will sort your directory, show it to you one screen at a time, and put --MORE-- at the bottom of your screen when there is more output to be seen.

You will find many uses for piping commands and filters.

Summary of Commands in This Chapter

COMMAND	PURPOSE	SYNTAX
REM	Adds comment line for batch files	REM [remark]
PAUSE	Suspends execution of a batch file	PAUSE [comment]
FIND	Searches for string of text	FIND string [filename]
MORE	Pages through a file 23 lines at a time	MORE
SORT	Sorts text	SORT

You will find more information on using these filters in the next chapter, MS-DOS Commands.

CHAPTER 5

MS-DOS COMMANDS

Command Formats

MS-DOS Commands

Batch Processing Commands

5.1 COMMAND FORMATS

The following notation indicates how you should format MS-DOS commands:

1. You must enter any words shown in capital letters. These words are called keywords and must be entered exactly as shown. You can enter these keywords in any combination of upper/lowercase; MS-DOS will convert all keywords to uppercase.

2. You supply the text for any items enclosed in angle brackets (< >). For example, you should enter the name of your file when <filename> is shown in the format.

3. Items in square brackets ([ ]) are optional. If you wish to include optional information, do not include the square brackets, only the information within the brackets.

4. An ellipsis (...) indicates that you may repeat an item as many times as you want.

5. You must include all punctuation where shown (with the exception of square brackets), such as commas, equal signs, question marks, colons, or slashes.

5.2 MS-DOS COMMANDS

NOTE

Users of single-drive systems should refer to Appendix A for the additional procedures required when executing many of the following commands.

The following MS-DOS commands are described in this chapter. Note that synonyms for commands are enclosed in parentheses.

BREAK	Sets CONTROL-C check
CHDIR	Changes directories; prints working directory (CD)
CHKDSK	Scans the directory of the default or designated drive and checks for consistency
CLS	Clears screen
COPY	Copies file(s) specified
CTTY	Changes console TTY
DATE	Displays and sets date
DEL	Deletes file(s) specified (ERASE)
DIR	Lists requested directory entries
DISKCOPY	Copies disks
EXE2BIN	Converts executable files to binary format
EXIT	Exits command and returns to lower level
FIND	Searches for a constant string of text
FORMAT	Formats a disk to receive MS-DOS files
MKDIR	Makes a directory (MD)
MORE	Displays output one screen at a time
PATH	Sets a command search path
PRINT	Background print feature
PROMPT	Designates command prompt
RECOVER	Recovers a bad disk
REM	Displays a comment in a batch file
REN	Renames first file as second file (RENAME)
RMDIR	Removes a directory (RD)
SET	Sets one string value to another
SORT	Sorts data alphabetically, forward or backward
SYS	Transfers MS-DOS system files from drive A: to the drive specified
TIME	Displays and sets time

TYPE	Displays the contents of file specified
VER	Prints MS-DOS version number
VERIFY	Verifies writes to disk
VOL	Prints volume identification number

Batch Commands (Command extensions)

ECHO	Turns batch file echo feature on/off
FOR	Batch command extension
GOTO	Batch command extension
IF	Batch command extension
PAUSE	Pauses for input in a batch file
SHIFT	Increases number of replaceable parameters in batch process

NAME TYPE

BREAK Internal

PURPOSE

Sets CONTROL-C check.

SYNTAX

BREAK ON|OFF

COMMENTS

If you are running an application program that uses CONTROL-C function keys, you will want to turn off the MS-DOS CONTROL-C function so that when you press <CONTROL-C> you affect your program and not the operating system. Specify BREAK OFF to turn off CONTROL-C and BREAK ON when you have finished running your application program and are using MS-DOS.

NAME TYPE

CHDIR (CHANGE DIRECTORY) Internal

SYNONYM

CD

PURPOSE

Changes directory to a different path; displays current (working) directory.

SYNTAX

CHDIR [pathname]

COMMENTS

If your working directory is \BIN\USER\JOE and you want to change your path to another directory (such as \BIN\USER\JOE\FORMS), type:

```
CHDIR \BIN\USER\JOE\FORMS
```

and MS-DOS will put you in the new directory. A shorthand notation is also available with this command:

```
CHDIR ..
```

This command will always put you in the parent directory of your working directory.

CHDIR used without a pathname displays your working directory. If your working directory is \BIN\USER\JOE on drive B:, and you type CHDIR <RETURN>, MS-DOS will display:

```
B: \BIN\USER\JOE
```

This command is useful if you forget the name of your working directory.

NAME TYPE

CHKDSK (CHECK DISK) External

PURPOSE

Scans the directory of the specified disk drive and checks it for consistency.

SYNTAX

CHKDSK [d:] <filespec> [/F] [/V]

COMMENTS

CHKDSK should be run occasionally on each disk to check for errors in the directory. If any errors are found, CHKDSK will display error messages, if any, and then a status report.

A sample status report follows:

```
160256  bytes total disk space
  8192  bytes in 2 hidden files
   512  bytes in 2 directories
 30720  bytes in 8 user files
121344  bytes available on disk

 65536  bytes total memory
 53152  bytes free
```

CHKDSK will not correct the errors found in your directory unless you specify the /F (fix) switch. Typing /V causes CHKDSK to display messages while it is running.

You can redirect the output from CHKDSK to a file. Simply type:

```
CHKDSK A:>filename
```

The errors will be sent to the filename specified. Do not use the /F switch if you redirect CHKDSK output.

The following errors will be corrected automatically if you specify the /F switch:

Invalid drive specification

Invalid parameter

Invalid sub-directory entry

Cannot CHDIR to <filename>
Tree past this point not processed

First cluster number is invalid
entry truncated

Allocation error, size adjusted

Has invalid cluster, file truncated

Disk error reading FAT

Disk error writing FAT

<filename> contains
non-contiguous blocks

All specified file(s) are contiguous

You must correct the following errors returned by CHKDSK, even if you specified the /F switch:

Incorrect DOS version
    You cannot run CHKDSK on versions of MS-DOS that are not 2.0 or higher.

Insufficient memory
Processing cannot continue
    There is not enough memory in your machine to process CHKDSK for this disk. You must obtain more memory to run CHKDSK.

Errors found, F parameter not specified
Corrections will not be written to disk
    You must specify the /F switch if you want the errors corrected by CHKDSK.

Invalid current directory
Processing cannot continue
    Restart the system and re-run CHKDSK.

Cannot CHDIR to root
Processing cannot continue
    The disk you are checking is bad. Try restarting MS-DOS and RECOVER the disk.

<filename> is cross linked on cluster
    Make a copy of the file you want to keep, and then delete both files that are cross linked.

X lost clusters found in y chains
Convert lost chains to files (Y/N)?
    If you respond Y to this prompt, CHKDSK will create a directory entry and a file for you to resolve this problem (files created by CHKDSK are named FILEnnnnnnnn).

CHKDSK will then display:

X bytes disk space freed

If you respond N to this prompt and have not specified the /F switch, CHKDSK frees the clusters and displays:

X bytes disk space would be freed

Probable non-DOS disk
Continue (Y/N)?

The disk you are using is a non-DOS disk. You must indicate whether or not you want CHKDSK to continue processing.

Insufficient room in root directory
Erase files in root and repeat CHKDSK

CHKDSK cannot process until you delete files in the root directory.

Unrecoverable error in directory
Convert directory to file (Y/N)?

If you respond Y to this prompt, CHKDSK will convert the bad directory into a file. You can then fix the directory yourself or delete it.

NAME TYPE

CLS Internal

PURPOSE

Clears the terminal screen.

SYNTAX

CLS

COMMENTS

The CLS command causes MS-DOS to send the ANSI escape sequence ESC[2J (which clears your screen) to your console.

NAME

COPY

TYPE

Internal

PURPOSE

Copies one or more files to another disk. If you prefer, you can give the copies different names. This command can also copy files on the same disk.

SYNTAX

COPY <filespec> [filespec] [pathname] [pathname] [/V]

COMMENTS

If the second filespec option is not given, the copy will be on the default drive and will have the same name as the original file (first filespec option). If the first filespec is on the default drive and the second filespec is not specified, the COPY will be aborted. (Copying files to themselves is not allowed.) MS-DOS will display the error message:

```
File cannot be copied onto itself
0 File(s) copied
```

The second option may take three forms:

1. If the second option is a drive designation (d:) only, the original file is copied with the original filename to the designated drive.

2. If the second option is a filename only, the original file is copied to a file on the default drive with the filename specified.

3. If the second option is a full filespec, the original file is copied to a file on the default drive with the filename specified.

The /V switch causes MS-DOS to verify that the sectors written on the destination disk are recorded properly. Although there are rarely recording errors when you run COPY, you can verify that critical data has been correctly recorded. This option causes the COPY command to run more slowly because MS-DOS must check each entry recorded on the disk.

The COPY command also allows file concatenation (joining) while copying. Concatenation is accomplished by simply listing any number of files as options to COPY, separated by +.

For example,

```
COPY  A.XYZ + B.COM + B:C.TXT BIGFILE.CRP
```

This command concatenates files named A.XYZ, B.COM, and B:C.TXT and places them in the file on the default drive called BIGFILE.CRP.

To combine several files using wild cards into one file, you could type:

```
COPY *.LST COMBIN.PRN
```

This command would take all files with a filename extension of .LST and combine them into a file named COMBIN.PRN.

In the following example, for each file found matching *.LST, that file is combined with the corresponding .REF file. The result is a file with the same filename but with the extension .PRN. Thus, FILE1.LST will be combined with FILE1.REF to form FILE1.PRN; then XYZ.LST with XYZ.REF to form XYZ.PRN; and so on.

```
COPY *.LST + *.REF *.PRN
```

The following COPY command combines all files matching *.LST, then all files matching *.REF, into one file named COMBIN.PRN:

```
COPY *.LST + *.REF COMBIN.PRN
```

Do not enter a concatenation COPY command where one of the source filenames has the same extension as the destination. For example, the following command is an error if ALL.LST already exists:

```
COPY  *.LST  ALL.LST
```

The error would not be detected, however, until ALL.LST is appended. At this point it could have already been destroyed.

COPY compares the filename of the input file with the filename of the destination. If they are the same, that one input file is skipped, and the error message "Content of destination lost before copy" is printed. Further concatenation proceeds normally. This allows "summing" files, as in this example:

```
COPY  ALL.LST + *.LST
```

This command appends all *.LST files, except ALL.LST itself, to ALL.LST. This command will not produce an error message and is the correct way to append files using the COPY command.

NAME TYPE

CTTY Internal

PURPOSE

Allows you to change the device from which you issue commands (TTY represents the console).

SYNTAX

CTTY /<device>

COMMENTS

The <device> is the device from which you are giving commands to MS-DOS. This command is useful if you want to change the device on which you are working. The command

```
CTTY /AUX
```

moves all command I/O (input/output) from the current device (the console) to the AUX port, such as a printer. The command

```
CTTY /CON
```

moves I/O back to the original device (here, the console). Refer to the "Illegal Filenames" section of Chapter 3, "More About Files," for a list of valid device names to use with the CTTY command.

NAME TYPE

DATE Internal

PURPOSE

Enter or change the date known to the system. This date will be recorded in the directory for any files you create or alter.

You can change the date from your terminal or from a batch file. (MS-DOS does not display a prompt for the date if you use an AUTOEXEC.BAT file, so you may want to include a DATE command in that file.)

SYNTAX

DATE [<mm>-<dd>-<yy>]

COMMENTS

If you type DATE, DATE will respond with the message:

```
Current date is <mm>-<dd>-<yy>
Enter new date:_
```

Press <RETURN> if you do not want to change the date shown.

You can also type a particular date after the DATE command, as in:

```
DATE 3-9-81
```

In this case, you do not have to answer the Enter new date: prompt.

The new date must be entered using numerals only; letters are not permitted. The allowed options are:

```
<mm> = 1-12
<dd> = 1-31
<yy> = 80-99 or 1980-2099
```

The date, month, and year entries may be separated by hyphens (-) or slashes (/). MS-DOS is programmed to change months and years correctly, whether the month has 31, 30, 29, or 28 days. MS-DOS handles leap years, too.

If the options or separators are not valid, DATE displays the message:

```
Invalid date
Enter new date:_
```

DATE then waits for you to enter a valid date.

NAME
DEL (DELETE)

TYPE
Internal

SYNONYM
ERASE

PURPOSE
Deletes all files with the designated filespec.

SYNTAX
DEL [filespec][pathname]

COMMENTS
If the filespec is *.*, the prompt Are you sure? appears. If a Y or y is typed as a response, then all files are deleted as requested. You can also type ERASE for the DELETE command.

NAME TYPE

DIR (DIRECTORY) Internal

SYNTAX

DIR [filespec] [pathname] [/P] [/W]

PURPOSE

Lists the files in a directory.

COMMENTS

If you just type DIR, all directory entries on the default drive are listed. If only the drive specification is given (DIR d:), all entries on the disk in the specified drive are listed. If only a filename is entered with no extension (DIR filename), then all files with the designated filename on the disk in the default drive are listed. If you designate a file specification (for example, DIR d:filename.ext), all files with the filename specified on the disk in the drive specified are listed. In all cases, files are listed with their size in bytes and with the time and date of their last modification.

The wild card characters ? and * (question mark and asterisk) may be used in the filename option. Note that for your convenience, the following DIR commands are equivalent:

COMMAND	EQUIVALENT
DIR	DIR *.*
DIR FILENAME	DIR FILENAME.*
DIR .EXT	DIR *.EXT
DIR .	DIR *.

Two switches may be specified with DIR. The /P switch selects Page Mode. With /P, display of the directory pauses after the screen is filled. To resume display of output, press any key.

The /W switch selects Wide Display. With /W, only filenames are displayed, without other file information. Files are displayed five per line.

NAME TYPE

DISKCOPY External

PURPOSE

Copies the contents of the disk in the source drive to the disk in the destination drive.

SYNTAX

DISKCOPY [d:] [d:]

COMMENTS

The first option you specify is the source drive. The second option is the destination drive.

The disk in the destination drive must be formatted prior to using DISKCOPY.

You can specify the same drives or you may specify different drives. If the drives designated are the same, a single-drive copy operation is performed. You are prompted to insert the disks at the appropriate times. DISKCOPY waits for you to press any key before continuing.

After copying, DISKCOPY prompts:

```
Copy complete
Copy another (Y/N)?_
```

If you press Y, the next copy is performed on the same drives that you originally specified, after you have been prompted to insert the proper disks.

To end the COPY, press N.

Notes:

1. If you omit both options, a single-drive copy operation will be performed on the default drive.

2. If you omit the second option, the default drive will be used as the destination drive.

3. Both disks must have the same number of physical sectors and those sectors must be the same size.

4. Disks that have had a lot of file creation and deletion activity become fragmented, because disk space is not allocated sequentially. The first free sector found is the next sector allocated, regardless of its location on the disk.

   A fragmented disk can cause poor performance due to delays involved in finding, reading, or writing a file. If this is the case, you must use the COPY command, instead of DISKCOPY, to copy your disk and eliminate the fragmentation.

   For example:

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

   copies all files from the disk in drive A: to the disk in drive B:.

5. DISKCOPY automatically determines the number of sides to copy, based on the source drive and disk.

6. If disk errors are encountered during a DISKCOPY, MS-DOS displays:

   ```
   DISK error while reading drive A
   Abort, Ignore, Retry?
   ```

   Refer to Appendix B, Disk Errors, for information on this error message.

NAME

EXE2BIN

TYPE

External

PURPOSE

Converts .EXE (executable) files to binary format. This results in a saving of disk space and faster program loading.

SYNTAX

EXE2BIN <filespec> [d:][<filename>[<.ext>]]

COMMENTS

This command is useful only if you want to convert .EXE files to binary format. The file named by filespec is the input file. If no extension is specified, it defaults to .EXE. The input file is converted to .COM file format (memory image of the program) and placed in the output file. If you do not specify a drive, the drive of the input file will be used. If you do not specify an output filename, the input filename will be used. If you do not specify a filename extension in the output filename, the new file will be given an extension of .BIN.

The input file must be in valid .EXE format produced by the linker. The resident, or actual code and data part of the file must be less than 64K. There must be no STACK segment.

Two kinds of conversions are possible, depending on whether the initial CS:IP (Code Segment:Instruction Pointer)is specified in the .EXE file:

1. If CS:IP is not specified in the .EXE file, a pure binary conversion is assumed. If segment fixups are necessary (i.e., the program contains instructions requiring segment relocation), you will be prompted for the fixup value. This value is the absolute segment at which the program is to be loaded. The resulting program will be usable only when loaded at the absolute memory address specified by a user application. The command processor will not be capable of properly loading the program.

2. If CS:IP is specified as 0000:100H, it is assumed that the file is to be run as a .COM file with the location pointer set at 100H by the assembler statement ORG; the first 100H bytes of the file are deleted. No segment fixups are allowed, as .COM files must be segment relocatable; that is, they must assume the entry conditions explained in the Macro Assembler Manual. Once the conversion is complete, you may rename the resulting file with a .COM extension. Then the command processor will be able to load and execute the program in the same way as the .COM programs supplied on your MS-DOS disk.

If CS:IP does not meet either of these criteria, or if it meets the .COM file criterion but has segment fixups, the following message will be displayed:

File cannot be converted

This message is also displayed if the file is not a valid executable file.

If EXE2BIN finds an error, one or more of the following error messages will be displayed:

File not found
The file is not on the disk specified.

Insufficient memory
There is not enough memory to run EXE2BIN.

File creation error
EXE2BIN cannot create the output file. Run CHKDSK to determine if the directory is full, or if some other condition caused the error.

Insufficient disk space
There is not enough disk space to create a new file.

Fixups needed - base segment (hex):
The source (.EXE) file contained information indicating that a load segment is required for the file. Specify the

absolute segment address at which the finished module is to be located.

File cannot be converted
The input file is not in the correct format.

WARNING -Read error on EXE file.
Amount read less than size in header
This is a warning message only.

NAME

EXIT

TYPE

Internal

PURPOSE

Exits the program COMMAND.COM (the command processor) and returns to a previous level, if one exists.

SYNTAX

EXIT

COMMENTS

This command can be used when you are running an application program and want to start the MS-DOS command processor, then return to your program. For example, to look at a directory on drive B: while running an application program, you must start the command processor by typing COMMAND in response to the default drive prompt:

```
A>COMMAND
```

You can now type the DIR command and MS-DOS will display the directory for the default disk. When you type EXIT, you return to the previous level (your application program).

NAME TYPE

FIND External

PURPOSE

Searches for a specific string of text in a file or files.

SYNTAX

FIND [/V /C /N] <string> [<filename...>]

COMMENTS

FIND is a filter that takes as options a string and a series of filenames. It will display all lines that contain a specified string from the files specified in the command line.

If no files are specified, FIND will take the input on the screen and display all lines that contain the specified string.

Switches for FIND are:

/V causes FIND to display all lines not containing the specified string.

/C causes FIND to print only the count of lines that contained a match in each of the files.

/N causes each line to be preceded by its relative line number in the file.

The string should be enclosed in quotes. Example:

```
FIND "Fool's Paradise" BOOK1.TXT BOOK2.TXT
```

displays all lines from BOOK1.TXT and BOOK2.TXT (in that order) that contain the string "Fool's Paradise." The command

```
DIR B: | FIND /V "DAT"
```

causes MS-DOS to display all names of the files on the disk in drive B: which do not contain the string DAT. Type double quotes around a string that already has quotes in it.

When an error is detected, FIND responds with one of the following error messages:

Incorrect DOS version
: FIND will only run on versions of MS-DOS that are 2.0 or higher.

FIND: Invalid number of parameters
: You did not specify a string when issuing the FIND command.

FIND: Syntax error
: You typed an illegal string when issuing the FIND command.

FIND: File not found <filename>
: The filename you have specified does not exist or FIND cannot find it.

FIND: Read error in <filename>
: An error occurred when FIND tried to read the file specified in the command.

FIND: Invalid parameter <option-name>
: You specified an option that does not exist.

NAME

FORMAT

TYPE

External

PURPOSE

Formats the disk in the specified drive to accept MS-DOS files.

SYNTAX

FORMAT [d]:[/O][/V][/S]

COMMENTS

This command initializes the directory and file allocation tables. If no drive is specified, the disk in the default drive is formatted.

NOTE

The following switches must be specified in the order in which they appear above.

The /O switch causes FORMAT to produce an IBM personal Computer DOS version 1.X compatible disk. The /O switch causes FORMAT to reconfigure the directory with an OE5 hex byte at the start of each entry so that the disk may be used with 1.X versions of IBM PC DOS, as well as MS-DOS 1.25/2.00 and IBM PC DOS 2.00. This switch should only be given when needed because it takes a fair amount of time for FORMAT to perform the conversion, and it noticably decreases 1.25 and 2.00 performance on disks with few directory entries.

The /V switch causes FORMAT to prompt for a volume label after the disk is formatted.

If the /S switch is specified, it must be the last switch typed; then FORMAT copies operating system files from the disk in the default drive to the newly formatted disk. The files are copied in the following order:

IO.SYS
MSDOS.SYS
COMMAND.COM

NAME TYPE

MKDIR Internal

SYNONYM

MD

PURPOSE

Makes a new directory.

SYNTAX

MKDIR <pathname>

COMMENTS

This command is used to create a hierarchical directory structure. When you are in your root directory, you can create subdirectories by using the MKDIR command. The command

```
MKDIR \USER
```

will create a subdirectory \USER in your root directory. To create a directory named JOE under \USER, type:

```
MKDIR \USER\JOE
```

NAME TYPE

MORE External

PURPOSE

Sends output to console one screen at a time.

SYNTAX

MORE

COMMENTS

MORE is a filter that reads from standard input (such as a command from your terminal) and displays one screen of information at a time. The MORE command then pauses and displays the --MORE-- message at the bottom of your screen.

Pressing the <RETURN> key will display another screen of information. This process continues until all the input data has been read.

The MORE command is useful for viewing a long file one screen at a time. If you type

```
TYPE MYFILES.COM | MORE
```

MS-DOS will display the file MYFILES.COM (on the default drive) one screen at a time.

NAME TYPE

PATH Internal

PURPOSE

Sets a command path.

SYNTAX

PATH [<pathname>[;<pathname>]...]

COMMENTS

This command allows you to tell MS-DOS which directories should be searched for external commands after MS-DOS searches your working directory. The default value is no path.

To tell MS-DOS to search your \BIN\USER\JOE directory for external commands, type:

```
PATH \BIN\USER\JOE
```

MS-DOS will now search the \BIN\USER\JOE directory for external commands until you set another path or shut down MS-DOS.

You can tell MS-DOS to search more than one path by specifying several pathnames separated by semicolons. For example,

```
PATH \BIN\USER\JOE;\BIN\USER\SUE;\BIN\DEV
```

tells MS-DOS to search the directories specified by the above pathnames to find external commands. MS-DOS searches the pathnames in the order specified in the PATH command.

The command PATH with no options will print the current path. If you specify PATH ;, MS-DOS will set the NUL path, meaning that only the working directory will be searched for external commands.

NAME TYPE

PRINT External

PURPOSE

Prints a text file on a line printer while you are processing other MS-DOS commands (usually called "background printing").

SYNTAX

PRINT [[filespec] [/T] [/C] [/S]]...

COMMENTS

You will use the PRINT command only if you have a line printer attached to your computer. The following switches are provided with this command:

/T TERMINATE: this switch deletes all files in the print queue (those waiting to be printed). A message to this effect will be printed.

/C CANCEL: This switch turns on cancel mode. The preceding filespec and all following filespecs will be suspended in the print queue until you type a /P switch.

/P PRINT: This switch turns on print mode. The preceding filespec and all following filespecs will be added to the print queue until you issue a /C switch.

PRINT with no options displays the contents of the print queue on your screen without affecting the queue.

Examples:

PRINT /T empties the print queue.

PRINT /T *.ASM empties the print queue and queues all .ASM files on the default drive.

PRINT A:TEMP1.TST/C A:TEMP2.TST A:TEMP3.TST
removes the three files indicated from the print queue.

PRINT TEMP1.TST /C TEMP2.TST /P TEMP3.TST
removes TEMP1.TST from the queue, and adds TEMP2.TST and TEMP3.TST to the queue.

If an error is detected, PRINT will display one of the following error messages:

Name of list device [PRN:]
This prompt appears when PRINT is run the first time. Any current device may be specified and that device then becomes the PRINT output device. As indicated in the brackets, simply pressing <RETURN> results in the device PRN being used.

List output is not assigned to a device
This message will be displayed if the "Name of list device" specified to the above prompt is invalid. Subsequent attempts will return the same message until a valid device is specified.

PRINT queue is full
There is room for 10 files in the queue. If you attempt to put more than 10 files in the queue, this message will appear on the console.

PRINT queue is empty
There are no files in the print queue.

No files match d:XXXXXXXX.XXX
A filespec was given for files to add to the queue, but no files match a specification. NOTE: if there are no files in the queue to match the canceled filespec, no error message will appear.

Drive not ready
If this message occurs when PRINT attempts a disk access, PRINT will keep trying until the drive is ready. Any other error causes the current file to be canceled. An error message would be output on your printer in such a case.

All files canceled
If the /T (TERMINATE) switch is issued, the message "All files canceled by operator" will be output on your printer. If the current file being printed is canceled by a /C, the message "File canceled by operator" will be printed.

NAME TYPE

PROMPT Internal

PURPOSE

Changes the MS-DOS command prompt.

SYNTAX

PROMPT [<prompt-text>]

COMMENTS

This command allows you to change the MS-DOS system prompt (for example, A>). If no text is typed, the prompt will be set to the default prompt, which is the default drive designation. You can set the prompt to a special prompt, such as the current time, by using the characters indicated below.

The following characters can be used in the prompt command to specify special prompts. They must all be preceded by a dollar sign ($) in the prompt command:

Specify This Character	To Get This Prompt:
$	The '$' character
t	The current time
d	The current date
p	The current directory of the default drive
v	The version number
n	The default drive
g	The '>' character
l	The '<' character
b	The '|' character
_	A CR LF sequence
s	A space (leading only)
h	A backspace
e	ASCII code X'1B' (escape)

Examples:

```
PROMPT $n
        Sets the normal MS-DOS
        prompt (>).
PROMPT Time = $t$_Date = $d
        Sets a two-line prompt which
        prints:
        Time = (current time)
        Date = (current date)
```

If your terminal has an ANSI escape sequence driver, then you can use escape sequences in your prompts. For example:

```
PROMPT  $e[7m$n:$e[m
        Sets the prompts in inverse
        video mode and returns to
        video mode for other
        text.
```

NAME TYPE

RECOVER External

PURPOSE

Recovers a file or an entire disk containing bad sectors.

SYNTAX

RECOVER <filename | d:>

COMMENTS

If a sector on a disk is bad, you can recover either the file containing that sector (without the bad sector) or the entire disk (if the bad sector was in the directory).

To recover a particular file, type:

RECOVER <filename>

This will cause MS-DOS to read the file sector by sector and to skip the bad sector(s). When MS-DOS finds the bad sector(s), the sector(s) are marked and MS-DOS will no longer allocate your data to that sector.

To recover a disk, type:

RECOVER <d:>

where d: is the letter of the drive containing the disk to be recovered.

If there is not enough room in the root directory, RECOVER will print a message and store information about the extra files in the File Allocation Table. You can run RECOVER again to regain these files when there is more room in the root directory.

NAME

REM (REMARK)

TYPE

Internal

PURPOSE

Displays remarks which are on the same line as the REM command in a batch file during execution of that batch file.

SYNTAX

REM [comment]

COMMENTS

The only separators allowed in the comment are the space, tab, and comma.

Example:

```
1: REM  This file checks new disks
2: REM  It is named NEWDISK.BAT
3: PAUSE  Insert new disk in drive B:
4: FORMAT B:/S
5: DIR B:
6: CHKDSK B:
```

NAME
REN (RENAME)

TYPE
Internal

SYNONYM
RENAME

PURPOSE
Changes the name of the first option (filespec) to the second option (filename).

SYNTAX
REN <filespec> <filename>

COMMENTS
The first option (filespec) must be given a drive designation if the disk resides in a drive other than the default drive. Any drive designation for the second option (filename) is ignored. The file will remain on the disk where it currently resides.

The wild card characters may be used in either option. All files matching the first filespec are renamed. If wild card characters appear in the second filename, corresponding character positions will not be changed.

For example, the following command changes the names of all files with the .LST extension to similar names with the .PRN extension:

```
REN *.LST *.PRN
```

In the next example, REN renames the file ABODE on drive B: to ADOBE:

```
REN B:ABODE ?D?B?
```

The file remains on drive B:.

An attempt to rename a filespec to a name already present in the directory will result in the error message "File not found."

NAME **TYPE**

RMDIR (REMOVE DIRECTORY) Internal

SYNONYM

RD

PURPOSE

Removes a directory from a hierarchical directory structure.

SYNTAX

RMDIR <pathname>

COMMENTS

This command removes a directory that is empty except for the . and .. shorthand symbols.

To remove the \BIN\USER\JOE directory, first issue a DIR command for that path to ensure that the directory does not contain any important files that you do not want deleted. Then type:

```
RMDIR \BIN\USER\JOE
```

The directory has been deleted from the directory structure.

NAME **TYPE**

SET Internal

PURPOSE

Sets one string value equivalent to another string for use in later programs.

SYNTAX

SET [<string=string>]

COMMENTS

This command is meaningful only if you want to set values that will be used by programs you have written. An application program can check all values that have been set with the SET command by issuing SET with no options. For example, SET TTY=VT52 sets your TTY value to VT52 until you change it with another SET command.

The SET command can also be used in batch processing. In this way, you can define your replaceable parameters with names instead of numbers. If your batch file contains the statement "LINK %FILE%", you can set the name that MS-DOS will use for that variable with the SET command. The command SET FILE=DOMORE replaces the %FILE% parameter with the filename DOMORE. Therefore, you do not need to edit each batch file to change the replaceable parameter names. Note that when you use text (instead of numbers) as replaceable parameters, the name must be ended by a percent sign.

NAME TYPE

SORT External

PURPOSE

SORT reads input from your terminal, sorts the data, then writes it to your terminal screen or files.

SYNTAX

SORT [/R] [/+n]

COMMENTS

SORT can be used, for example, to alphabetize a file by a certain column. There are two switches which allow you to select options:

/R reverse the sort; that is, sort from Z to A.

/+n sort starting with column n where n is some number. If you do not specify this switch, SORT will begin sorting from column 1.

Examples:

This command will read the file UNSORT.TXT, reverse the sort, and then write the output to a file named SORT.TXT:

```
SORT /R <UNSORT.TXT >SORT.TXT
```

The following command will pipe the output of the directory command to the SORT filter. The SORT filter will sort the directory listing starting with column 14 (this is the column in the directory listing that contains the file size), then send the output to the console. Thus, the result of this command is a directory sorted by file size:

```
DIR | SORT /+14
```

The command

```
DIR | SORT /+14 | MORE
```

will do the same thing as the command in the previous example, except that the MORE filter will give you a chance to read the sorted directory one screen at a time.

NAME

SYS (SYSTEM)

TYPE

External

PURPOSE

Transfers the MS-DOS system files from the disk in the default drive to the disk in the drive specified by d:.

SYNTAX

SYS <d>:

COMMENTS

SYS is normally used to update the system or to place the system on a formatted disk which contains no files. An entry for d: is required.

If IO.SYS and MSDOS.SYS are on the destination disk, they must take up the same amount of space on the disk as the new system will need. This means that you cannot transfer system files from an MS-DOS 2.0 disk to an MS-DOS 1.1 disk. You must reformat the MS-DOS 1.1 disk with the MS-DOS FORMAT command before the SYS command will work.

The destination disk must be completely blank or already have the system files IO.SYS and MSDOS.SYS.

The transferred files are copied in the following order:

IO.SYS
MSDOS.SYS

IO.SYS and MSDOS.SYS are both hidden files that do not appear when the DIR command is executed. COMMAND.COM (the command processor) is not transferred. You must use the COPY command to transfer COMMAND.COM.

If SYS detects an error, one of the following messages will be displayed:

No room for system on destination disk
There is not enough room on the destination disk for the IO.SYS and MSDOS.SYS files.

Incompatible system size
The system files IO.SYS and MSDOS.SYS do not take up the same amount of space on the destination disk as the new system will need.

NAME TYPE

TIME Internal

PURPOSE

Displays and sets the time.

SYNTAX

TIME [<hh>[:<mm>]]

COMMENTS

If the TIME command is entered without any arguments, the following message is displayed:

```
Current time is <hh>:<mm>:<ss>.<cc>
Enter new time:_
```

Press the <RETURN> key if you do not want to change the time shown. A new time may be given as an option to the TIME command as in:

```
TIME 8:20
```

The new time must be entered using numerals only; letters are not allowed. The allowed options are:

```
<hh> = 00-24
<mm> = 00-59
```

The hour and minute entries must be separated by colons. You do not have to type the <ss> (seconds) or <cc> (hundredths of seconds) options.

MS-DOS uses the time entered as the new time if the options and separators are valid. If the options or separators are not valid, MS-DOS displays the message:

```
Invalid time
Enter new time:_
```

MS-DOS then waits for you to type a valid time.

NAME

TYPE

TYPE Internal

PURPOSE

Displays the contents of the file on the console screen.

SYNTAX

TYPE <filespec>

COMMENTS

Use this command to examine a file without modifying it. (Use DIR to find the name of a file and EDLIN to alter the contents of a file.) The only formatting performed by TYPE is that tabs are expanded to spaces consistent with tab stops every eighth column. Note that a display of binary files causes control characters (such as CONTROL-Z) to be sent to your computer, including bells, form feeds, and escape sequences.

NAME TYPE

VER Internal

PURPOSE

Prints MS-DOS version number.

SYNTAX

VER

COMMENTS

If you want to know what version of MS-DOS you are using, type VER. The version number will be displayed on your screen.

NAME TYPE

VERIFY Internal

PURPOSE

Turns the verify switch on or off when writing to disk.

SYNTAX

VERIFY [ON|OFF]

COMMENTS

This command has the same purpose as the /V switch in the COPY command. If you want to verify that all files are written correctly to disk, you can use the VERIFY command to tell MS-DOS to verify that your files are intact (no bad sectors, for example). MS-DOS will perform a VERIFY each time you write data to a disk. You will receive an error message only if MS-DOS was unable to successfully write your data to disk.

VERIFY ON remains in effect until you change it in a program (by a SET VERIFY system call), or until you issue a VERIFY OFF command to MS-DOS.

If you want to know what the current setting of VERIFY is, type VERIFY with no options.

NAME

VOL (VOLUME)

TYPE

Internal

PURPOSE

Displays disk volume label, if it exists.

SYNTAX

VOL [d:]

COMMENTS

This command prints the volume label of the disk in drive d:. If no drive is specified, MS-DOS prints the volume label of the disk in the default drive.

If the disk does not have a volume label, VOL displays:

Volume in drive x has no label

5.3 BATCH PROCESSING COMMANDS

The following commands are called batch processing commands. They can add flexibility and power to your batch programs. The commands discussed are ECHO, FOR, GOTO, IF, and SHIFT.

If you are not writing batch programs, you do not need to read this section.

NAME TYPE
ECHO Internal

PURPOSE
Turns batch echo feature on and off.

SYNTAX
ECHO [ON |OFF| message]

COMMENTS
Normally, commands in a batch file are displayed ("echoed") on the console when they are seen by the command processor. ECHO OFF turns off this feature. ECHO ON turns the echo back on.

If ON or OFF are not specified, the current setting is displayed.

NAME TYPE

FOR Internal

PURPOSE

Command extension used in batch and interactive file processing.

SYNTAX

FOR %%<c> IN <set> DO <command> - for batch processing
FOR %<c> IN <set> DO <command> - for interactive processing

COMMENTS

<c> can be any character except 0,1,2,3,..,9 to avoid confusion with the %0-%9 batch parameters.

<set> is (#<item>*#)

The %%<c> variable is set sequentially to each member of <set>, and then <command> is evaluated. If a member of <set> is an expression involving * and/or ?, then the variable is set to each matching pattern from disk. In this case, only one such <item> may be in the set, and any <item> besides the first is ignored.

NOTE: The words IN, FOR, and DO must be in uppercase.

Examples:

```
FOR %%f IN ( *.ASM ) DO MASM %%f;

FOR %%f IN (FOO BAR BLECH) DO REM %%f
```

The '%%' is needed so that after batch parameter (%0-%9) processing is done, there is one '%' left. If only '%f' were there, the batch parameter processor would see the '%', look at 'f', decide that '%f' was an error (bad parameter reference) and throw out the '%f', so that the command FOR would never see it. If the FOR is not in a batch file, then only one '%' should be used.

NAME TYPE

GOTO Internal

PURPOSE

Command extension used in batch file processing.

SYNTAX

GOTO <label>

COMMENTS

GOTO causes commands to be taken from the batch file beginning with the line after the <label> definition. If no label has been defined, the current batch file will terminate.

Example:

```
:foo
REM looping...
GOTO foo
```

will produce an infinite sequence of messages: REM looping....

Starting a line in a batch file with ':' causes the line to be ignored by batch processing. The characters following GOTO define a label, but this procedure may also be used to put in comment lines.

NAME TYPE

IF Internal

PURPOSE

Command extension used in batch file processing.

SYNTAX

IF <condition> <command>

COMMENTS

The parameter <condition> is one of the following:

ERRORLEVEL <number>
True if and only if the previous program executed by COMMAND had an exit code of <number> or higher.

<string1> == <string2>
True if and only if <string1> and <string2> are identical after parameter substitution. Strings may not have embedded separators.

EXIST <filename>
True if and only if <filename> exists.

NOT <condition>
True if and only if <condition> is false.

The IF statement allows conditional execution of commands. When the <condition> is true, then the <command> is executed. Otherwise, the <command> is ignored.

NOTE: The words ERRORLEVEL, EXIST, and NOT must be uppercase.

Examples:

```
IF NOT EXIST \TMP\FOO ECHO Can't find file

IF NOT ERRORLEVEL 3 LINK $1,,;
```

NAME TYPE

PAUSE Internal

PURPOSE

Suspends execution of the batch file.

SYNTAX

PAUSE [comment]

COMMENTS

During the execution of a batch file, you may need to change disks or perform some other action. PAUSE suspends execution until you press any key, except <CONTROL-C>.

When the command processor encounters PAUSE, it prints:

Strike a key when ready . . .

If you press <CONTROL-C>, another prompt will be displayed:

Abort batch job (Y/N)?

If you type Y in response to this prompt, execution of the remainder of the batch command file will be aborted and control will be returned to the operating system command level. Therefore, PAUSE can be used to break a batch file into pieces, allowing you to end the batch command file at an intermediate point.

The comment is optional and may be entered on the same line as PAUSE. You may also want to prompt the user of the batch file with some meaningful message when the batch file pauses. For example, you may want to change disks in one of the drives. An optional prompt message may be given in such cases. The comment prompt will be displayed before the "Strike a key" message.

NAME TYPE

SHIFT Internal

PURPOSE

Allows access to more than 10 replaceable parameters in batch file processing.

SYNTAX

SHIFT

COMMENTS

Usually, command files are limited to handling 10 parameters, %0 through %9. To allow access to more than ten parameters, use SHIFT to change the command line parameters. For example:

```
if      %0 = "foo"
        %1 = "bar"
        %2 = "name"
        %3...%9 are empty
```

then a SHIFT will result in the following:

```
        %0 = "bar"
        %1 = "name"
        %2...%9 are empty
```

If there are more than 10 parameters given on a command line, those that appear after the 10th (%9) will be shifted one at a time into %9 by successive shifts.

CHAPTER 6

MS-DOS EDITING AND FUNCTION KEYS

Special MS-DOS Editing Keys

Control Character Functions

6.1 SPECIAL MS-DOS EDITING KEYS

The special editing keys deserve particular emphasis because they depart from the way in which most operating systems handle command input. You do not have to type the same sequences of keys repeatedly, because the last command line is automatically placed in a special storage area called a template.

By using the template and the special editing keys, you can take advantage of the following MS-DOS features:

1. A command line can be instantly repeated by pressing two keys.
2. If you make a mistake in the command line, you can edit it and retry without having to retype the entire command line.
3. A command line that is similar to a preceding command line can be edited and executed with a minimum of typing by pressing a special editing key.

The relationship between the command line and the template is shown in Figure 8.

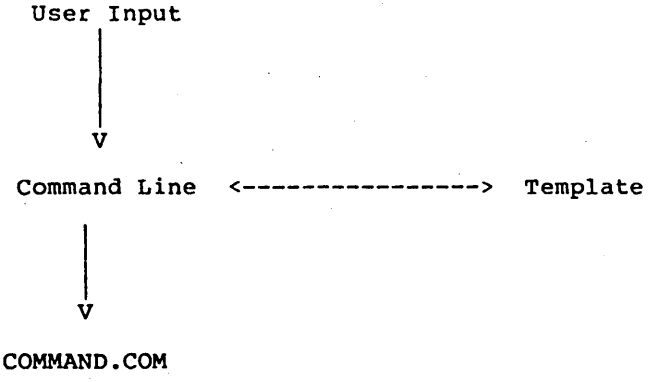


Figure 8. Command Line and Template

As seen in Figure 8, the user (you) types a command to MS-DOS on the command line. When you press the <RETURN> key, the command is automatically sent to the command processor (COMMAND.COM) for execution. At the same time, a copy of this command is sent to the template. You can now recall the command or modify it with MS-DOS special editing keys.

Table 6.1 contains a complete list of the special editing keys. Each of these keys is more fully described in Chapter 7, The Line Editor (EDLIN), where they can be used to edit your text files.

NOTE

The keys on your keyboard may not correspond to the specific keys in the following examples. Therefore, these MS-DOS editing keys will be referred to by FUNCTION rather than by name. When an example says to press the <SKIP1> key, find the key on your keyboard that corresponds to the "skip one character" editing function and press it. Some functions will require you to press two keys. Consult the operating manual for your terminal to determine which keys correspond to the MS-DOS editing functions described here.

You may wish to write in the keys on your keyboard that correspond to the editing keys described below. Space is provided in the following table to do this.

Table 6.1 Special Editing Functions

Key	Editing Function	Your Keyboard
<COPY1>	Copies one character from the template to the command line	
<COPYUP>	Copies characters up to the character specified in the template and puts these characters on the command line	
<COPYALL>	Copies all remaining characters in the template to the command line	
<SKIP1>	Skips over (does not copy) a character in the template	
<SKIPUP>	Skips over (does not copy) the characters in the template up to the character specified	
<VOID>	Voids the current input; leaves the template unchanged	
<INSERT>	Enters/exits insert mode	
<NEWLINE>	Makes the new line the new template	
<CONTROL-Z>	Puts a CONTROL-Z (1AH) end-of-file character in the new template	

Examples:

If you type the following command

```
DIR PROG.COM
```

MS-DOS displays information about the file PROG.COM on your screen. The command line is also saved in the template. To repeat the command, just press two keys: <COPYALL> and <RETURN>.

The repeated command is displayed on the screen as you type, as shown below:

```
<COPYALL>DIR PROG.COM<RETURN>
```

Notice that pressing the <COPYALL> key causes the contents

of the template to be copied to the command line; pressing <RETURN> causes the command line to be sent to the command processor for execution.

If you want to display information about a file named PROG.ASM, you can use the contents of the template and type:

```
<COPYUP>C
```

Typing <COPYALL>C copies all characters from the template to the command line, up to but not including C. MS-DOS displays:

```
DIR PROG._
```

Note that the underline is your cursor. Now type:

```
.ASM
```

The result is:

```
DIR PROG.ASM_
```

The command line DIR PROG.ASM is now in the template and ready to be sent to the command processor for execution. To do this, press <RETURN>.

Now assume that you want to execute the following command:

```
TYPE PROG.ASM
```

To do this, type:

```
TYPE<INSERT> <COPYALL><RETURN>
```

Notice that when you are typing, the characters are entered directly into the command line and overwrite corresponding characters in the template. This automatic replacement feature is turned off when you press the insert key. Thus, the characters "TYPE" replace the characters "DIR " in the template. To insert a space between "TYPE" and "PROG.ASM", you pressed <INSERT> and then the space bar. Finally, to copy the rest of the template to the command line, you pressed <COPYALL> and then <RETURN>. The command TYPE PROG.ASM has been processed by MS-DOS, and the template becomes TYPE PROG.ASM.

If you had misspelled TYPE as BYTE, a command error would have occurred. Still, instead of throwing away the whole command, you could save the misspelled line before you press <RETURN> by creating a new template with the <NEWLINE> key:

```
BYTE PROG.ASM<NEWLINE>
```

You could then edit this erroneous command by typing:

```
T<COPY1>P<COPYALL>
```

The <COPY1> key copies a single character from the template to the command line. The resulting command line is then the command that you want:

```
TYPE PROG.ASM
```

As an alternative, you can use the same template containing BYTE PROG.ASM and then use the <SKIP1> and <INSERT> keys to achieve the same result:

```
<SKIP1><SKIP1><COPY1><INSERT>YP<COPYALL>
```

To illustrate how the command line is affected as you type, examine the keys typed on the left; their effect on the command line is shown on the right:

<SKIP1>	_	Skips over 1st template character
<SKIP1>	_	Skips over 2nd template character
<COPY1>	T	Copies 3rd template character
<INSERT>YP	TYP	Inserts two characters
<COPYALL>	TYPE PROG.ASM	Copies rest of template

Notice that <SKIP1> does not affect the command line. It affects the template by deleting the first character. Similarly, <SKIPUP> deletes characters in the template, up to but not including a given character.

These special editing keys can add to your effectiveness at the keyboard. The next section describes control character functions that can also help when you are typing commands.

6.2 CONTROL CHARACTER FUNCTIONS

A control character function is a function that affects the command line. You have already learned about <CONTROL-C> and <CONTROL-S>. Other control character functions are described below.

Remember that when you type a control character, such as <CONTROL-C>, you must hold down the control key and then press the C key.

Table 6.2 Control Character Functions

Control Character	Function
<CONTROL-N>	Toggles echoing of output to line printer.
<CONTROL-C>	Aborts current command.
<CONTROL-H>	Removes last character from command line, and erases character from terminal screen.
<CONTROL-J>	Inserts physical end-of-line, but does not empty command line. Use the <LINE FEED> key to extend the current logical line beyond the physical limits of one terminal screen.
<CONTROL-P>	Toggles terminal output to line printer.
<CONTROL-S>	Suspends output display on terminal screen. Press any key to resume.
<CONTROL-X>	Cancels the current line; empties the command line; and then outputs a back slash (\), carriage return, and line feed. The template used by the special editing commands is not affected.

CHAPTER 7

THE LINE EDITOR (EDLIN)

7.1 INTRODUCTION

In this chapter, you will learn how to use EDLIN, the line editor program. You can use EDLIN to create, change, and display files, whether they are source program or text files.

You can use EDLIN to:

1. Create new source files and save them.
2. Update existing files and save both the updated and original files.
3. Delete, edit, insert, and display lines.
4. Search for, delete, or replace text within one or more lines.

The text in files created or edited by EDLIN is divided into lines, each up to 253 characters long. Line numbers are generated and displayed by EDLIN during the editing process, but are not actually present in the saved file.

When you insert lines, all line numbers following the inserted text advance automatically by the number of lines being inserted. When you delete lines in a file, all line numbers following the deleted text decrease automatically by the number of lines deleted. As a result, lines are always numbered consecutively in your file.

7.2 HOW TO START EDLIN

To start EDLIN, type:

```
EDLIN <filespec>
```

If you are creating a new file, the <filespec> should be the name of the file you wish to create. If EDLIN does not find this file on a drive, EDLIN will create a new file with the name you specify. The following message and prompt will be displayed:

```
New file
*_
```

Notice that the prompt for EDLIN is an asterisk (*).

You can now type lines of text into your new file. To begin entering text, you must enter an I (Insert) command to insert lines. The I command is discussed later in this chapter.

If you want to edit an existing file, <filespec> should be the name of the file you want to edit. When EDLIN finds the file you specify on the designated or default drive, the file will be loaded into memory. If the entire file can be loaded, EDLIN will display the following message on your screen:

```
End of input file
*
```

You can then edit the file using EDLIN editing commands.

If the file is too large to be loaded into memory, EDLIN will load lines until memory is 3/4 full, then display the * prompt. You can then edit the portion of the file that is in memory.

To edit the remainder of the file, you must save some of the edited lines on disk to free memory; then EDLIN can load the unedited lines from disk into memory. Refer to the Write and Append commands in this chapter for the procedure.

When you complete the editing session, you can save the original and the updated (new) files by using the End command. The End command is discussed in this chapter in the section "EDLIN Commands". The original file is renamed with an extension of .BAK, and the new file has the filename and extension you specify in the EDLIN command. The original .BAK file will not be erased until the end of the editing session, or until disk space is needed by the editor (EDLIN).

Do not try to edit a file with a filename extension of .BAK because EDLIN assumes that any .BAK file is a backup file. If you find it necessary to edit such a file, rename the file with another extension (using the MS-DOS RENAME command discussed in Chapter 5), then start EDLIN and specify the new <filespec>.

7.3 SPECIAL EDITING KEYS

The special editing keys and template discussed in Chapter 6 can be used to edit your text files. These keys are discussed in detail in this section.

Table 7.1 summarizes the commands, codes, and functions. Descriptions of the special editing keys follow the table.

NOTE

The keys on your keyboard may not correspond to the specific keys in the following examples. Therefore, these MS-DOS editing keys will be referred to by FUNCTION rather than by name. When an example says to press the <SKIP1> key, find the key on your keyboard that corresponds to the "skip one character" editing function and press it. Some functions may require you to press two keys. Consult the operating manual for your terminal to determine which keys correspond to the MS-DOS editing functions described here.

Table 7.1 Special Editing Keys

Function	Key	Description
Copy one character	<COPY1>	Copies one character from the template to the new line.
Copy up to character	<COPYUP>	Copies all characters from the template to the new line, up to the character specified.
Copy template	<COPYALL>	Copies all remaining characters in the template to the screen.
Skip one character	<SKIP1>	Does not copy (skips over) a character.
Skip up to character	<SKIPUP>	Does not copy (skips over) the characters in the template, up to the character specified.
Quit input	<VOID>	Voids the current input; leaves the template unchanged.
Insert mode	<INSERT>	Enters/exits insert mode.
Replace mode	<REPLACE>	Turns insert mode off; this is the default.
New template	<NEWLINE>	Makes the new line the new template.

KEY

<COPY1>

PURPOSE

Copies one character from the template to the command line.

COMMENTS

Pressing the <COPY1> key copies one character from the template to the command line. When the <COPY1> key is pressed, one character is inserted in the command line and insert mode is automatically turned off.

Example:

Assume that the screen shows:

```
1:*This is a sample file.
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Pressing the <COPY1> key copies the first character (T) to the second of the two lines displayed:

```
          1:*This is a sample file
<COPY1> 1:*T_
```

Each time the <COPY1> key is pressed, one more character appears:

```
<COPY1> 1:*Th_
<COPY1> 1:*Thi_
<COPY1> 1:*This_
```

KEY

<COPYUP>

PURPOSE

Copies multiple characters up to a given character.

COMMENTS

Pressing the <COPYUP> key copies all characters up to a given character from the template to the command line. The given character is the next character typed after <COPYUP>; it is not copied or displayed on the screen. Pressing the <COPYUP> key causes the cursor to move to the single character that is specified in the command. If the template does not contain the specified character, nothing is copied. Pressing <COPYUP> also automatically turns off insert mode.

Example:

Assume that the screen shows:

```
1:*This is a sample file.
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Pressing the <COPYUP> key copies all characters up to the character specified immediately after the <COPYUP> key.

```
                1:*This is a sample file
<COPYUP>p       1:*This is a sam_
```

KEY

<COPYALL>

PURPOSE

Copies template to command line.

COMMENTS

Pressing the <COPYALL> key copies all remaining characters from the template to the command line. Regardless of the cursor position at the time the <COPYALL> key is pressed, the rest of the line appears, and the cursor is positioned after the last character on the line.

Example:

Assume that the screen shows:

```
1:*This is a sample file.
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Pressing the <COPYALL> key copies all characters from the template (shown in the upper line displayed) to the line with the cursor (the lower line displayed):

```
          1:*This is a sample file    (template)
<COPYALL> 1:*This is a sample file._  (command
                                       line)
```

Also, insert mode is automatically turned off.

KEY

<SKIP1>

PURPOSE

Skips over one character in the template.

COMMENTS

Pressing the <SKIP1> key skips over one character in the template. Each time you press the <SKIP1> key, one character is not copied from the template. The action of the <SKIP1> key is similar to the <COPY1> key, except that <SKIP1> skips a character in the template rather than copying it to the command line.

Example:

Assume that the screen shows:

```
1:*This is a sample file.
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Pressing the <SKIP1> key skips over the first character (T).

```
          1:*This is a sample file
<SKIP1>   1:*_
```

The cursor position does not change and only the template is affected. To see how much of the line has been skipped over, press the <COPYALL> key, which moves the cursor beyond the last character of the line.

```
          1:*This is a sample file.
<SKIP1>   1:*
<COPYALL> 1:*his is a sample file._
```

KEY

<SKIPUP>

PURPOSE

Skips multiple characters in the te up to the specified character.

COMMENTS

Pressing the <SKIPUP> key skips over all characters up to a given character in the template. This character is not copied and is not shown on the screen. If the template does not contain the specified character, nothing is skipped over. The action of the <SKIPUP> key is similar to the <COPYUP> key, except that <SKIPUP> skips over characters in the template rather than copying them to the command line.

Example:

Assume that the screen shows:

```
1:*This is a sample file.
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Pressing the <SKIPUP> key skips over all the characters in the template up to the character pressed after the <SKIPUP> key:

```
                1:*This is a sample file
<SKIPUP>p 1:*_
```

The cursor position does not change. To see how much of the line has been skipped over, press the <COPYALL> key to copy the template. This moves the cursor beyond the last character of the line:

```
          1:*This is a sample file:
 <SKIPUP>p 1:*_
<COPYALL>  1:*ple file._
```

KEY

<VOID>

PURPOSE

Quits input and empties the command line.

COMMENTS

Pressing the <VOID> key empties the command line, but it leaves the template unchanged. <VOID> also prints a back slash (\), carriage return, and line feed, and turns insert mode off. The cursor (indicated by the underline) is positioned at the beginning of the line. Pressing the <COPYALL> key copies the template to the command line and the command line appears as it was before <VOID> was pressed.

Example:

Assume that the screen shows:

```
1:*This is a sample file.
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Assume that you want to replace the line with "Sample File:"

```
1:*This is a sample file.
1:*Sample File_
```

To cancel the line you just entered (Sample File), and to keep "This is a sample file.", press <VOID>. Notice that a backslash appears on the Sample File line to tell you it has been cancelled.

```
        1:*This is a sample file.
<VOID>  1:*Sample File\
        1:_
```

Press <RETURN> to keep the original line, or to perform any other editing functions. If <COPYALL> is pressed, the original template is copied to the command line:

```
<COPYALL> 1: This is a sample file._
```

KEY

<INSERT>

PURPOSE

Enters/exits insert mode.

COMMENTS

Pressing the <INSERT> key causes EDLIN to enter and exit insert mode. The current cursor position in the template is not changed. The cursor does move as each character is inserted. However, when you have finished inserting characters, the cursor will be positioned at the same character as it was before the insertion began. Thus, characters are inserted in front of the character to which the cursor points.

Example:

Assume that the screen shows:

```
1:*This is a sample file.
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Assume that you press the <COPYUP> and f keys:

```
                1:*This is a sample file
<COPYUP>f       1:*This is a sample _
```

Now press the <INSERT> key and insert the characters "edit" and a space:

```
                      1:*This is a sample file.
<COPYUP>f             1:*This is a sample _
<INSERT>edit          1:*This is a sample edit _
```

If you now press the <COPYALL> key, the rest of the template is copied to the line:

```
                      1:*This is a sample edit _
<COPYALL>             1:*This is a sample edit file._
```

If you pressed the <RETURN> key, the remainder of the template would be truncated, and the command line would end at the end of the insert:

```
<INSERT>edit <RETURN> 1:*This is a sample edit _
```

To exit insert mode, simply press the <INSERT> key again.

KEY

<REPLACE>

PURPOSE

Enters replace mode.

COMMENTS

Pressing the <REPLACE> key causes EDLIN to exit insert mode and to enter replace mode. All the characters you type will overstrike and replace characters in the template. When you start to edit a line, replace mode is in effect. If the <RETURN> key is pressed, the remainder of the template will be deleted.

Example:

Assume that the screen shows:

```
1:*This is a sample file.
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Assume that you then press <COPYUP>m, <INSERT>lary, <REPLACE> tax, and then <COPYALL>:

```
                1:*This is a sample file.
<COPYUP>m       1:*This is a sa_
<INSERT>lary    1:*This is a salary_
<REPLACE> tax   1:*This is a salary tax_
<COPYALL>       1:*This is a salary tax file._
```

Notice that you inserted lary and replaced mple with tax. If you type characters that extend beyond the length of the template, the remaining characters in the template will be automatically appended when you press <COPYALL>.

KEY

<NEWLINE>

PURPOSE

Creates a new template.

COMMENTS

Pressing the <NEWLINE> key copies the current command line to the template. The contents of the old template are deleted. Pressing <NEWLINE> outputs an @ ("at sign" character), a carriage return, and a line feed. The command line is also emptied and insert mode is turned off.

NOTE

<NEWLINE> performs the same function as the <VOID> key, except that the template is changed and an @ ("at sign" character) is printed instead of a \ (backslash).

Example:

Assume that the screen shows:

```
1:*This is a sample file.
1:*_
```

At the beginning of the editing session, the cursor (indicated by the underline) is positioned at the beginning of the line. Assume that you enter <COPYUP>m, <INSERT>lary, <REPLACE> tax, and then <COPYALL>:

```
                1:*This is a sample file.
<COPYUP>m       1:*This is a sa_
<INSERT>lary    1:*This is a salary_
<REPLACE> tax   1:*This is a salary tax_
<COPYALL>       1:*This is a salary tax file._
```

At this point, assume that you want this line to be the new template, so you press the <NEWLINE>key:

```
<NEWLINE>1:*This is a salary tax file.@
```

The @ indicates that this new line is now the new template. Additional editing can be done using the new template.

7.4 COMMAND INFORMATION

EDLIN commands perform editing functions on lines of text. The following list contains information you should read before you use EDLIN commands.

1. Pathnames are acceptable as options to commands. For example, typing EDLIN bINuSERjOE/TEXT.TXT will allow you to edit the TEXT.TXT file in the subdirectory JOE.

2. You can reference line numbers relative to the current line (the line with the asterisk). Use a minus sign with a number to indicate lines before the current line. Use a plus sign with a number to indicate lines after the current line.

   Example:

   ```
   -10,+10L
   ```

   This command lists 10 lines before the current line, the current line, and 10 lines after the current line.

3. Multiple commands may be issued on one command line. When you issue a command to edit a single line using a line number (<line>), a semicolon must separate commands on the line. Otherwise, one command may follow another without any special separators. In the case of a Search or Replace command, the <string> may be ended by a <CONTROL-Z> instead of a <RETURN>.

   Examples:

   The following command line edits line 15 and then displays lines 10 through 20 on the screen.

   ```
   15;-5,+5L
   ```

   The command line in the next example searches for "This string" and then displays 5 lines before and 5 lines after the line containing the matched string. If the search fails, then the displayed lines are those line numbers relative to the current line.

   ```
   SThis string<CONTROL-Z>-5,+L
   ```

4. You can type EDLIN commands with or without a space between the line number and command. For example, to delete line 6, the command 6D is the same as 6 D.

5. It is possible to insert a control character (such as CONTROL-C) into text by using the quote character CONTROL-V before it while in insert mode. CONTROL-V tells MS-DOS to recognize the next capital letter typed as a control character. It is also possible to use a control character in any of the string arguments of Search or Replace by using the special quote character. For example:

```
S<CONTROL-V>Z
will find the first occurrence
of CONTROL-Z in a file

R<CONTROL-V>Z<CONTROL-Z>foo
will replace all occurrences
of CONTROL-Z in a file by foo

S<CONTROL-V>C<CONTROL-Z>bar
will replace all occurrences
of CONTROL-C by bar
```

   It is possible to insert CONTROL-V into the text by typing CONTROL-V-V.

6. The CONTROL-Z character ordinarily tells EDLIN, "This is the end of the file." If you have CONTROL-Z characters elsewhere in your file, you must tell EDLIN that these other control characters do not mean end-of-file. Use the /B switch to tell EDLIN to ignore any CONTROL-Z characters in the file and to show you the entire file.

The EDLIN commands are summarized in the following table. They are also described in further detail following the description of command options.

Table 7.2 EDLIN Commands

Command	Purpose
<line>	Edits line no.
A	Appends lines
C	Copies lines
D	Deletes lines
E	Ends editing
I	Inserts lines
L	Lists text
M	Moves lines
P	Pages text
Q	Quits editing
R	Replaces lines
S	Searches text
T	Transfers text
W	Writes lines

7.4.1 Command Options

Several EDLIN commands accept one or more options. The effect of a command option varies, depending on with which command it is used. The following list describes each option.

<line> <line> indicates a line number that you type. Line numbers must be separated by a comma or a space from other line numbers, other options, and from the command.

<line> may be specified one of three ways:

Number Any number less than 65534. If a number larger than the largest existing line number is specified, then <line> means the line after the last line number.

Period (.) If a period is specified for <line>, then <line> means the current line number. The current line is the last line edited, and is not necessarily the last line displayed. The current line is marked on your screen by an asterisk (*) between the line number and the first character.

Pound (#) The pound sign indicates the line after the last line number. If you specify # for <line>, this has the same effect as specifying a number larger than the last line number.

<RETURN> A carriage return entered without any of the <line> specifiers listed above directs EDLIN to use a default value appropriate to the command.

The question mark option directs EDLIN to ask you if the correct string has been found. The question mark is used only with the Replace and Search commands. Before continuing, EDLIN waits for either a Y or <RETURN> for a yes response, or for any other key for a no response.

<string> <string> represents text to be found, to be replaced, or to replace other text. The <string> option is used only with the Search and Replace commands. Each <string> must be ended by a <CONTROL-Z> or a <RETURN> (see the Replace command for details). No spaces should be left between strings or between a string and its command letter, unless you want those spaces to be part of the string.

7.5 EDLIN COMMANDS

The following pages describe EDLIN editing commands.

NAME

Append

PURPOSE

Adds the specified number of lines from disk to the file being edited in memory. The lines are added at the end of lines that are currently in memory.

SYNTAX

[<n>]A

COMMENTS

This command is meaningful only if the file being edited is too large to fit into memory. As many lines as possible are read into memory for editing when you start EDLIN.

To edit the remainder of the file that will not fit into memory, lines that have already been edited must be written to disk. Then you can load unedited lines from disk into memory with the Append command. Refer to the Write command in this chapter for information on how to write edited lines to disk.

NOTES

1. If you do not specify the number of lines to append, lines will be appended to memory until available memory is 3/4 full. No action will be taken if available memory is already 3/4 full.

2. The message "End of input file" is displayed when the Append command has read the last line of the file into memory.

NAME

Copy

PURPOSE

Copies a range of lines to a specified line number. The lines can be copied as many times as you want by using the <count> option.

SYNTAX

[<line>],[<line>],<line>,[<count>]C

COMMENTS

If you do not specify a number in <count>, EDLIN copies the lines one time. If the first or the second <line> are omitted, the default is the current line. The file is renumbered automatically after the copy.

The line numbers must not overlap or you will get an "Entry error" message. For example, 3,20,15C would result in an error message.

Examples:

Assume that the following file exists and is ready to edit:

```
1: This is a sample file
2: used to show copying lines.
3: See what happens when you use
4: the Copy command
5: (the C command)
6: to copy text in your file.
```

You can copy this entire block of text by issuing the following command:

```
1,6,7C
```

The result is:

```
1: This is a sample file
2: used to show copying lines.
3: See what happens when you use
4: the Copy command
5: (the C command)
6: to copy text in your file.
7: This is a sample file
8: used to show copying lines.
9: See what happens when you use
```

```
10: the Copy command
11: (the C command)
12: to copy text in your file.
```

If you want to place the text within other text, the third <line> option should specify the line before which you want the copied text to appear. For example, assume that you want to copy lines and insert them within the following file:

```
 1: This is a sample file
 2: used to show copying lines.
 3: See what happens when you use
 4: the Copy command
 5: (the C command)
 6: to copy text in your file.
 7: You can also use COPY
 8: to copy lines of text
 9: to the middle of your file.
10: End of sample file.
```

The command 3,6,9C results in the following file:

```
 1: This is a sample file
 2: used to show copying lines.
 3: See what happens when you use
 4: the Copy command
 5: (the C command)
 6: to copy text in your file.
 7: You can also use COPY
 8: to copy lines of text
 9: to the middle of your file.
10: See what happens when you use
11: the Copy command
12: (the C command)
13: to copy text in your file.
14: End of sample file.
```

NAME

Delete

PURPOSE

Deletes a specified range of lines in a file.

SYNTAX

[<line>][,<line>]D

COMMENTS

If the first <line> is omitted, that option will default to the current line (the line with the asterisk next to the line number). If the second <line> is omitted, then just the first <line> will be deleted. When lines have been deleted, the line immediately after the deleted section becomes the current line and has the same line number as the first deleted <line> had before the deletion occurred.

Examples:

Assume that the following file exists and is ready to edit:

```
 1: This is a sample file
 2: used to show dynamic line numbers.
 3: See what happens when you use
 4: Delete and Insert
  .
  .
  .
25: (the D and I commands)
26: to edit the text
27:*in your file.
```

To delete multiple lines, type <line>,<line>D:

```
5,24D
```

The result is:

```
1: This is a sample file
2: used to show dynamic line numbers.
3: See what happens when you use
4: Delete and Insert
5: (the D and I commands)
6: to edit text
7:*in your file.
```

To delete a single line, type:

```
6D
```

The result is:

```
1: This is a sample file
2: used to show dynamic line numbers.
3: See what happens when you use
4: Delete and Insert
5: (the D and I commands)
6:*in your file.
```

Next, delete a range of lines from the following file:

```
1: This is a sample file
2: used to show dynamic line numbers.
3:*See what happens when you use
4: Delete and Insert
5: (the D and I commands)
6: to edit text
7: in your file.
```

To delete a range of lines beginning with the current line, type:

```
,6D
```

The result is:

```
1: This is a sample file
2: used to show dynamic line numbers.
3:*in your file.
```

Notice that the lines are automatically renumbered.

NAME

Edit

PURPOSE

Edits line of text.

SYNTAX

[<line>]

COMMENTS

When a line number is typed, EDLIN displays the line number and text; then, on the line below, EDLIN reprints the line number. The line is now ready for editing. You may use any of the EDLIN editing commands to edit the line. The existing text of the line serves as the template until the <RETURN> key is pressed.

If no line number is typed (that is, if only the <RETURN> key is pressed), the line after the current line (marked with an asterisk (*)) is edited. If no changes to the current line are needed and the cursor is at the beginning or end of the line, press the <RETURN> key to accept the line as is.

WARNING

If the <RETURN> key is pressed while the cursor is in the middle of the line, the remainder of the line is deleted.

Example:

Assume that the following file exists and is ready to edit:

```
1: This is a sample file.
2: used to show
3: the editing of line
4:*four.
```

To edit line 4, type:

```
4
```

The contents of the line are displayed with a

cursor below the line:

```
4:* four.
4:*_
```

Now, using the <COPYALL> special editing key, type:

```
<INSERT>number      4: number_
<COPYALL><RETURN>   4: number four.
                    5:*_
```

NAME

End

PURPOSE

Ends the editing session.

SYNTAX

E

COMMENTS

This command saves the edited file on disk, renames the original input file <filename>.BAK, and then exits EDLIN. If the file was created during the editing session, no .BAK file is created.

The E command takes no options. Therefore, you cannot tell EDLIN on which drive to save the file. The drive you want to save the file on must be selected when the editing session is started. If the drive is not selected when EDLIN is started, the file will be saved on the disk in the default drive. It will still be possible to COPY the file to a different drive using the MS-DOS COPY command.

You must be sure that the disk contains enough free space for the entire file. If the disk does not contain enough free space, the write will be aborted and the edited file lost, although part of the file might be written out to the disk.

Example:

E<RETURN>

After execution of the E command, the MS-DOS default drive prompt (for example, A>) is displayed.

NAME

Insert

PURPOSE

Inserts text immediately before the specified <line>.

SYNTAX

[<line>]I

COMMENTS

If you are creating a new file, the I command must be given before text can be typed (inserted). Text begins with line number 1. Successive line numbers appear automatically each time <RETURN> is pressed.

EDLIN remains in insert mode until <CONTROL-C> is typed. When the insert is completed and insert mode has been exited, the line immediately following the inserted lines becomes the current line. All line numbers following the inserted section are incremented by the number of lines inserted.

If <line> is not specified, the default will be the current line number and the lines will be inserted immediately before the current line. If <line> is any number larger than the last line number, or if a pound sign (#) is specified as <line>, the inserted lines will be appended to the end of the file. In this case, the last line inserted will become the current line.

Examples:

Assume that the following file exists and is ready to edit:

```
1: This is a sample file
2: used to show dynamic line numbers.
3: See what happens when you use
4: Delete and Insert
5: (the D and I commands)
6: to edit text
7:*in your file.
```

To insert text before a specific line that is not the current line, type <line>I:

```
7I
```

The result is:

```
7:_
```

Now, type the new text for line 7:

```
7: and renumber lines
```

Then to end the insertion, press <CONTROL-Z> on the next line:

```
8: <CONTROL-Z>
```

Now type L to list the file. The result is:

```
1: This is a sample file
2: used to show dynamic line numbers.
3: See what happens when you use
4: Delete and Insert
5: (the D and I commands)
6: to edit text
7. and renumber lines
8:*in your file.
```

To insert lines immediately before the current line, type:

```
I
```

The result is:

```
8: _
```

Now, insert the following text and terminate with a <CONTROL-Z> on the next line:

```
8: so they are consecutive
9: <CONTROL-Z>
```

Now to list the file and see the result, type L:

The result is:

```
 1: This is a sample file
 2: used to show dynamic line numbers.
 3: See what happens when you use
 4: Delete and Insert
 5: (the D and I commands)
 6: to edit text
 7: and renumber lines
 8: so they are consecutive
 9:*in your file.
```

To append new lines to the end of the file, type:

```
10I
```

This produces the following:

```
10: _
```

Now, type the following new lines:

```
10: The insert command can place new lines
11: in the file; there's no problem
12: because the line numbers are dynamic;
13: they'll go all the way to 65533.
```

End the insertion by pressing <CONTROL-Z> on line 14. The new lines will appear at the end of all previous lines in the file. Now type the List command, L:

The result is:

```
 1: This is a sample file
 2: used to show dynamic line numbers.
 3: See what happens when you use
 4: Delete and Insert
 5: (the D and I commands)
 6: to edit text
 7: and renumber lines
 8: so they are consecutive
 9: in your file.
10: The insert command can place new lines
11: in the file; there's no problem
12: because the line numbers are dynamic;
13: they'll go all the way to 65533.
```

NAME

List

PURPOSE

Lists a range of lines, including the two lines specified.

SYNTAX

[<line>][,<line>]L

COMMENTS

Default values are provided if either one or both of the options are omitted. If you omit the first option, as in:

,<line>L

the display will start 11 lines before the current line and end with the specified <line>. The beginning comma is required to indicate the omitted first option.

NOTE

If the specified <line> is more than 11 lines before the current line, the display will be the same as if you omitted both options.

If you omit the second option, as in

<line>L

23 lines will be displayed, starting with the specified <line>.

If you omit both parameters, as in

L

23 lines will be displayed--the 11 lines before the current line, the current line, and the 11 lines after the current line. If there are less than 11 lines before the current line, more than 11 lines after the current line will be displayed to make a total of 23 lines.

Examples:

Assume that the following file exists and is ready to edit:

```
 1: This is a sample file
 2: used to show dynamic line numbers.
 3: See what happens when you use
 4: Delete and Insert
 5: (the D and I commands)
  .
  .
  .
15:*The current line contains an asterisk.
  .
  .
  .
26: to edit text
27: in your file.
```

To list a range of lines without reference to the current line, type <line>,<line>L:

```
2,5L
```

The result is:

```
 2: used to show dynamic line numbers.
 3: See what happens when you use
 4: Delete and Insert
 5: (the D and I commands)
```

To list a range of lines beginning with the current line, type ,<line> L:

```
,26L
```

The result is:

```
15:*The current line contains an asterisk.
   .
   .
   .
26: to edit text
```

To list a range of 23 lines centered around the current line, type only L:

```
L
```

The result is:

```
 4: Delete and Insert
 5: (the D and I commands)
  .
  .
  .
13: The current line is listed in the middle.
14: The current line remains unchanged.
15:*The current line contains an asterisk.
  .
  .
  .
26: to edit text.
```

NAME

Move

PURPOSE

Moves a range of text to the line specified.

SYNTAX

[<line>],[<line>],<line>M

COMMENTS

Use the Move command to move a block of text (from the first <line> to the second <line>) to another location in the file. The lines are renumbered according to the direction of the move. For example,

```
,+25,100M
```

moves the text from the current line plus 25 lines to line 100. If the line numbers overlap, EDLIN will display an "Entry error" message.

To move lines 20-30 to line 100, type:

```
20,30,100M
```

NAME

Page

PURPOSE

Pages through a file 23 lines at a time.

SYNTAX

[<line>][,<line>]P

COMMENTS

If the first <line> is omitted, that number will default to the current line plus one. If the second <line> is omitted, 23 lines will be listed. The new current line becomes the last line displayed and is marked with an asterisk.

NAME

Quit

PURPOSE

Quits the editing session, does not save any editing changes, and exits to the MS-DOS operating system.

SYNTAX

Q

COMMENTS

EDLIN prompts you to make sure you don't want to save the changes.

Type Y if you want to quit the editing session. No editing changes are saved and no .BAK file is created. Refer to the End command in this chapter for information about the .BAK file.

Type N or any other character except Y if you want to continue the editing session.

NOTE

When started, EDLIN erases any previous copy of the file with an extension of .BAK to make room to save the new copy. If you reply Y to the Abort edit (Y/N)? message, your previous backup copy will no longer exist.

Example:

```
Q
Abort edit (Y/N)?Y<RETURN>
A>_
```

NAME

Replace

PURPOSE

Replaces all occurrences of a string of text in the specified range with a different string of text or blanks.

SYNTAX

[<line>][,<line>][?]R<string1><CONTROL-Z>
<string2>

COMMENTS

As each occurrence of <string1> is found, it is replaced by <string2>. Each line in which a replacement occurs will be displayed. If a line contains two or more replacements of <string1> with <string2>, then the line will be displayed once for each occurrence. When all occurrences of <string1> in the specified range are replaced by <string2>, the R command terminates and the asterisk prompt reappears.

If a second string is to be given as a replacement, then <string1> must be separated from <string2> with a <CONTROL-Z>. <String2> must also be ended with a <CONTROL-Z><RETURN> combination or with a simple <RETURN>.

If <string1> is omitted, then Replace will take the old <string1> as its value. If there is no old <string1>, i.e., this is the first replace done, then the replacement process will be terminated immediately. If <string2> is omitted, then <string1> may be ended with a <RETURN>. If the first <line> is omitted in the range argument (as in ,<line>) then the first <line> will default to the line after the current line. If the second <line> is omitted (as in <line> or <line>,), the second <line> will default to #. Therefore, this is the same as <line>,#. Remember that # indicates the line after the last line of the file.

If <string1> is ended with a <CONTROL-Z> and there is no <string2>, <string2> will be taken as an empty string and will become the new replace string. For example,

R<string2><CONTROL-Z><RETURN>

will delete occurrences of <string1>, but

R<string1><return> and
R<RETURN>

will replace <string1> by the old <string2> and the old <string1> with the old <string2>, respectively. Note that "old" here refers to a previous string specified either in a Search or a Replace command.

If the question mark (?) option is given, the Replace command will stop at each line with a string that matches <string1>, display the line with <string2> in place, and then display the prompt O.K.?. If you press Y or the <RETURN> key, then <string2> will replace <string1>, and the next occurrence of <string1> will be found. Again, the O.K.? prompt will be displayed. This process will continue until the end of the range or until the end of the file. After the last occurrence of <string1> is found, EDLIN displays the asterisk prompt.

If you press any key besides Y or <RETURN> after the O.K.? prompt, the <string1> will be left as it was in the line, and Replace will go to the next occurrence of <string1>. If <string1> occurs more than once in a line, each occurrence of <string1> will be replaced individually, and the O.K.? prompt will be displayed after each replacement. In this way, only the desired <string1> will be replaced, and you can prevent unwanted substitutions.

Examples:

Assume that the following file exists and is ready for editing:

```
 1: This is a sample file
 2: used to show dynamic line numbers.
 3: See what happens when you use
 4: Delete and Insert
 5: (the D and I commands)
 6: to edit text
 7: in your file.
 8: The insert command can place new lines
 9: in the file; there's no problem
10: because the line numbers are dynamic;
11: they'll go all the way to 65533.
```

To replace all occurrences of <string1> with <string2> in a specified range, type:

```
2,12 Rand<CONTROL-Z>or<RETURN>
```

The result is:

```
4: Delete or Insert
5: (the D or I commors)
8: The insert commor can place new lines
```

Note that in the above replacement, some unwanted substitutions have occurred. To avoid these and to confirm each replacement, the same original file can be used with a slightly different command.

In the next example, to replace only certain occurrences of the first <string> with the second <string>, type:

```
2? Rand<CONTROL-Z>or<RETURN>
```

The result is:

```
4: Delete or Insert
O.K.? Y
5: (The D or I commands)
O.K.? Y
5: (The D or I commors)
O.K.? N
8: The insert commor can place new lines
O.K.? N
*_
```

Now, type the List command (L) to see the result of all these changes:

```
   .
   .
4: Delete or Insert
5: (The D or I commands)
   .
8: The insert command can place new lines
   .
   .
```

NAME

Search

PURPOSE

Searches the specified range of lines for a specified string of text.

SYNTAX

[<line>][,<line>][?]S<string><RETURN>

COMMENTS

The <string> must be ended with a <RETURN>. The first line that matches <string> is displayed and becomes the current line. If the question mark option is not specified, the Search command will terminate when a match is found. If no line contains a match for <string>, the message "Not found" will be displayed.

If the question mark option (?) is included in the command, EDLIN will display the first line with a matching string; it will then prompt you with the message O.K.?. If you press either the Y or <RETURN> key, the line will become the current line and the search will terminate. If you press any other key, the search will continue until another match is found, or until all lines have been searched (and the Not found message is displayed).

If the first <line> is omitted (as in ,<line> S<string>), the first <line> will default to the line after the current line. If the second <line> is omitted (as in <line> S<string> or <line>, S<string>), the second <line> will default to # (line after last line of file), which is the same as <line>,# S<string>. If <string> is omitted, Search will take the old string if there is one. (Note that "old" here refers to a string specified in a previous Search or Replace command.) If there is not an old string (i.e., no previous search or replace has been done), the command will terminate immediately.

Examples:

Assume that the following file exists and is ready for editing:

```
 1: This is a sample file
 2: used to show dynamic line numbers.
 3: See what happens when you use
 4: Delete and Insert
 5: (the D and I commands)
 6: to edit text
 7: in your file.
 8: The insert command can place new lines
 9: in the file; there's no problem
10: because the line numbers are dynamic;
11:*they'll go all the way to 65533.
```

To search for the first occurrence of the string "and", type

```
2,12 Sand<RETURN>
```

The following line is displayed:

```
4: Delete and Insert
```

To get the "and" in line 5, modify the search command by typing:

```
<SKIP1><COPYALL>,12 Sand<RETURN>
```

The search then continues from the line after the current line (line 4), since no first line was given. The result is:

```
5: (the D and I commands)
```

To search through several occurrences of a string until the correct string is found, type:

```
1, ? Sand
```

The result is:

```
4: Delete and Insert
O.K.?_
```

If you press any key (except Y or <RETURN>), the search continues, so type N here:

```
O.K.? N
```

Continue:

```
5: (the D and I commands)
O.K.?_
```

Now press Y to terminate the search:

```
O.K.? Y
*_
```

To search for string XYZ without the verification (O.K.?), type:

```
SXYZ
```

EDLIN will report a match and will continue to search for the same string when you issue the S command:

```
S
```

EDLIN reports another match.

```
S
```

EDLIN reports the string is not found.

Note that <string> defaults to any string specified by a previous Replace or Search command.

NAME

Transfer

PURPOSE

Inserts (merges) the contents of <filename> into the file currently being edited at <line>. If <line> is omitted, then the current line will be used.

SYNTAX

[<line>]T<filename>

COMMENTS

This command is useful if you want to put the contents of a file into another file or into the text you are typing. The transferred text is inserted at the line number specified by <line> and the lines are renumbered.

NAME

Write

PURPOSE

Writes a specified number of lines to disk from the lines that are being edited in memory. Lines are written to disk beginning with line number 1.

SYNTAX

[<n>]W

COMMENTS

This command is meaningful only if the file you are editing is too large to fit into memory. When you start EDLIN, EDLIN reads lines into memory until memory is 3/4 full.

To edit the remainder of your file, you must write edited lines in memory to disk. Then you can load additional unedited lines from disk into memory by using the Append command.

NOTE

If you do not specify the number of lines, lines will be written until memory is 3/4 full. No action will be taken if available memory is already more than 3/4 full. All lines are renumbered, so that the first remaining line becomes line number 1.

7.6 ERROR MESSAGES

When EDLIN finds an error, one of the following error messages is displayed:

Cannot edit .BAK file--rename file

Cause: You attempted to edit a file with a filename extension of .BAK. .BAK files cannot be edited because this extension is reserved for backup copies.

Cure: If you need the .BAK file for editing purposes, you must either RENAME the file with a different extension; or COPY the .BAK file and give it a different filename extension.

No room in directory for file

Cause: When you attempted to create a new file, either the file directory was full or you specified an illegal disk drive or an illegal filename.

Cure: Check the command line that started EDLIN for illegal filename and illegal disk drive entries. If the command is no longer on the screen and if you have not yet typed a new command, the EDLIN start command can be recovered by pressing the <COPYALL> key.

If this command line contains no illegal entries, run the CHKDSK program for the specified disk drive. If the status report shows that the disk directory is full, remove the disk. Insert and format a new disk.

Entry Error

Cause: The last command typed contained a syntax error.

Cure: Retype the command with the correct syntax and press <RETURN>.

Line too long

Cause: During a Replace command, the string given as the replacement caused the line to expand beyond the limit of 253 characters. EDLIN aborted the Replace command.

Cure: Divide the long line into two lines, then try the Replace command twice.

Disk Full--file write not completed

Cause: You gave the End command, but the disk did not contain enough free space for the whole file. EDLIN aborted the E command and returned you to the operating system. Some of the file may have been written to the disk.

Cure: Only a portion (if any) of the file has been saved. You should probably delete that portion of the file and restart the editing session. The file will not be available after this error. Always be sure that the disk has sufficient free space for the file to be written to disk before you begin your editing session.

Incorrect DOS version

Cause: You attempted to run EDLIN under a version of MS-DOS that was not 2.0 or higher.

Cure: You must make sure that the version of MS-DOS that you are using is 2.0 or higher.

Invalid drive name or file

Cause: You have not specified a valid drive or filename when starting EDLIN.

Cure: Specify the correct drive or filename.

Filename must be specified

Cause: You did not specify a filename when you started EDLIN.

Cure: Specify a filename.

Invalid Parameter

Cause: You specified a switch other than /B when starting EDLIN.

Cure: Specify the /B switch when you start EDLIN.

Insufficient memory

Cause: There is not enough memory to run EDLIN.

Cure: You must free some memory by writing files to disk or by deleting files before restarting EDLIN.

File not found

Cause: The filename specified during a Transfer command was not found.

Cure: Specify a valid filename when issuing a Transfer command.

Must specify destination number

Cause: A destination line number was not specified for a Copy or Move command.

Cure: Reissue the command with a destination line number.

Not enough room to merge the entire file

Cause: There was not enough room in memory to hold the file during a Transfer command.

Cure: You must free some memory by writing some files to disk or by deleting some files before you can transfer this file.

File creation error

Cause: The EDLIN temporary file cannot be created.

Cure: Check to make sure that the directory has enough space to create the temporary file. Also, make sure that the file does not have the same name as a subdirectory in the directory where the file to be edited is located.

CHAPTER 8

FILE COMPARISON UTILITY (FC)

8.1 INTRODUCTION

It is sometimes useful to compare files on your disk. If you have copied a file and later want to compare copies to see which one is current, you can use the MS-DOS File Comparison Utility (FC).

The File Comparison Utility compares the contents of two files. The differences between the two files can be output to the console or to a third file. The files being compared may be either source files (files containing source statements of a programming language); or binary (files output by the MACRO-86 assembler, the MS-LINK Linker utility, or by a Microsoft high-level language compiler).

The comparisons are made in one of two ways: on a line-by-line or a byte-by-byte basis. The line-by-line comparison isolates blocks of lines that are different between the two files and prints those blocks of lines. The byte-by-byte comparison displays the bytes that are different between the two files.

8.1.1 Limitations On Source Comparisons

FC uses a large amount of memory as buffer (storage) space to hold the source files. If the source files are larger than available memory, FC will compare what can be loaded into the buffer space. If no lines match in the portions of the files in the buffer space, FC will display only the message:

```
*** Files are different ***
```

For binary files larger than available memory, FC compares both files completely, overlaying the portion in memory with the next portion from disk. All differences are output in the same manner as those files that fit completely in memory.

8.2 FILE SPECIFICATIONS

All file specifications use the following syntax:

```
[d:]<filename>[<.ext>]
```

where: d: is the letter designating a disk drive. If the drive designation is omitted, FC defaults to the operating system's (current) default drive.

filename is a one- to eight-character name of the file.

.ext is a one- to three-character extension to the filename.

8.3 HOW TO USE FC

The syntax of FC is as follows:

```
FC [/# /B /W /C] <filename1> <filename2>
```

FC matches the first file (filename1) against the second (filename2) and reports any differences between them. Both filenames can be pathnames. For example,

```
FC B:\FOO\BAR\FILE1.TXT \BAR\FILE2.TXT
```

FC takes FILE1.TXT in the \FOO\BAR directory of disk drive B: and compares it with FILE2.TXT in the \BAR directory. Since no drive is specified for filename2, FC assumes that the \BAR directory is on the disk in the default drive.

8.4 FC SWITCHES

There are four switches that you can use with the File Comparison Utility:

/B Forces a binary comparison of both files. The two files are compared byte-to-byte, with no attempt to re-synchronize after a mismatch. The mismatches are printed as follows:

```
--ADDRS----F1----F2-
xxxxxxxx   yy    zz
```

(where xxxxxxxx is the relative address of the pair of bytes from the beginning of the file). Addresses start at 00000000; yy and zz are the mismatched bytes from file1 and file2, respectively. If one of the files contains less data than the other, then a message is printed out. For example, if file1 ends before file2, then FC displays:

Data left in F2

/# # stands for a number from 1 to 9. This switch specifies the number of lines required to match for the files to be considered as matching again after a difference has been found. If this switch is not specified, it defaults to 3. This switch is used only in source comparisons.

/W Causes FC to compress whites (tabs and spaces) during the comparison. Thus, multiple contiguous whites in any line will be considered as a single white space. Note that although FC compresses whites, it does not ignore them. The two exceptions are beginning and ending whites in a line, which are ignored. For example (note that an underscore represents a white)

___More__data_to_be_found____

will match with

More_data_to_be_found

and with

_____More_____data_to_be_____found_____

but will not match with

____Moredata_to_be_found

This switch is used only in source comparisons.

/C Causes the matching process to ignore the case of letters. All letters in the files are considered uppercase letters. For example,

Much_MORE_data_IS_NOT_FOUND

will match

much_more_data_is_not_found

If both the /W and /C options are specified, then FC will compress whites and ignore case. For example,

___DATA_was_found____

will match:

data_was_found

This switch is used only in source comparisons.

8.5 DIFFERENCE REPORTING

The File Comparison Utility reports the differences between the two files you specify by displaying the first filename, followed by the lines that differ between the files, followed by the first line to match in both files. FC then displays the name of the second file followed by the lines that are different, followed by the first line that matches. The default for the number of lines to match between the files is 3. (If you want to change this default, specify the number of lines with the /# switch.) For example,

```
        ...
        ...

----------<filename1>
<difference>
<1st line to match file2 in file1>

----------<filename2>
<difference>
<1st line to match file1 in file2>

-----------------------------------------------

        ...
        ...
```

FC will continue to list each difference.

If there are too many differences (involving too many lines), the program will simply report that the files are different and stop.

If no matches are found after the first difference is found, FC will display:

```
*** Files are different ***
```

and will return to the MS-DOS default drive prompt (for example, A>).

8.6 REDIRECTING FC OUTPUT TO A FILE

The differences and matches between the two files you specify will be displayed on your screen unless you redirect the output to a file. This is accomplished in the same way as MS-DOS command redirection (refer to Chapter 4, "Learning About Commands").

To compare File1 and File2 and then send the FC output to DIFFER.TXT, type:

```
FC File1 File2 >DIFFER.TXT
```

The differences and matches between File1 and File2 will be put into DIFFER.TXT on the default drive.

8.7 EXAMPLES

Example 1:

Assume these two ASCII files are on disk:

ALPHA.ASM BETA.ASM

FILE A	FILE B
A	A
B	B
C	C
D	G
E	H
F	I
G	J
H	1
I	2
M	P
N	Q
O	R
P	S
Q	T
R	U
S	V
T	4
U	5
V	W
W	X
X	Y
Y	Z
Z	

To compare the two files and display the differences on the terminal screen, type:

```
FC ALPHA.ASM BETA.ASM
```

FC compares ALPHA.ASM with BETA.ASM and displays the differences on the terminal screen. All other defaults remain intact. (The defaults are: do not use tabs, spaces, or comments for matches, and do a source comparison on the two files.)

The output will appear as follows on the terminal screen (the Notes do not appear):

```
----------ALPHA.ASM
D                       NOTE: ALPHA file
E                       contains defg,
F                       BETA contains g.
G

----------BETA.ASM
G

--------------------------------

----------ALPHA.ASM
M                       NOTE: ALPHA file
N                       contains mno where
O                       BETA contains jl2.
P

----------BETA.ASM
J
l
2
P

--------------------------------

----------ALPHA.ASM
W                       NOTE: ALPHA file
                        contains w where
----------BETA.ASM      BETA contains 45w.
4
5
W
```

Example 2:

You can print the differences on the line printer using the same two source files. In this example, four successive lines must be the same to constitute a match.

Type:

```
FC /4 ALPHA.ASM BETA.ASM >PRN
```

The following output will appear on the line printer:

```
----------ALPHA.ASM
D
E
F
G
H
I
M
N           NOTE: p is the lst of
O           a string of 4 matches.
P

----------BETA.ASM
G
H
I
J
1
2
P

------------------------------

----------ALPHA.ASM
W
                      NOTE: w is the lst of a
----------BETA.ASM     string of 4 matches.
4
5
W
```

Example 3:

This example forces a binary comparison and then displays the differences on the terminal screen using the same two source files as were used in the previous examples.

Type:

```
FC /B ALPHA.ASM BETA.ASM
```

The /B switch in this example forces binary comparison. This switch and any others must be typed before the filenames in the FC command line. The following display should appear:

```
--ADDRS----F1---F2--
 00000009    44   47
 0000000C    45   48
 0000000F    46   49
 00000012    47   4A
 00000015    48   31
 00000018    49   32
 0000001B    4D   50
 0000001E    4E   51
 00000021    4F   52
 00000024    50   53
 00000027    51   54
 0000002A    52   55
 0000002D    53   56
 00000030    54   34
 00000033    55   35
 00000036    56   57
 00000039    57   58
 0000003C    58   59
 0000003F    59   5A
 00000042    5A   1A
```

8.8 ERROR MESSAGES

When the File Comparison Utility detects an error, one or more of the following error messages will be displayed:

Incorrect DOS version
: You are running FC under a version of MS-DOS that is not 2.0 or higher.

Invalid parameter:<option>
: One of the switches that you have specified is invalid.

File not found:<filename>
: FC could not find the filename you specified.

Read error in:<filename>
: FC could not read the entire file.

Invalid number of parameters
: You have specified the wrong number of options on the FC command line.

CHAPTER 9

THE LINKER PROGRAM (MS-LINK)

9.1 INTRODUCTION

In this chapter you will learn about MS-LINK. It is recommended that you read the entire chapter before you use MS-LINK.

NOTE

If you are not going to compile and link programs, you do not need to read this chapter.

The MS-DOS linker (called MS-LINK) is a program that:

Combines separately produced object modules into one relocatable load module--a program you can run

Searches library files for definitions of unresolved external references

Resolves external cross-references

Produces a listing that shows both the resolution of external references and error messages

9.2 OVERVIEW OF MS-LINK

When you write a program, you write it in source code. This source code is passed through a compiler which produces object modules. The object modules must be passed through the link process to produce machine language that the computer can understand directly. This machine language is in the form required for running programs.

You may wish to link (combine) several programs and run them together. Each of your programs may refer to a symbol that is defined in another object module. This reference is called an external reference.

MS-LINK combines several object modules into one relocatable load module, or Run file (called an .EXE or Executable file). As it combines modules, MS-LINK makes sure that all external references between object modules are defined. MS-LINK can search several library files for definitions of any external references that are not defined in the object modules.

MS-LINK also produces a List file that shows external references resolved, and it also displays any error messages.

MS-LINK uses available memory as much as possible. When available memory is exhausted, MS-LINK creates a temporary disk file named VM.TMP.

Figure 9 illustrates the various parts of the MS-LINK operation.

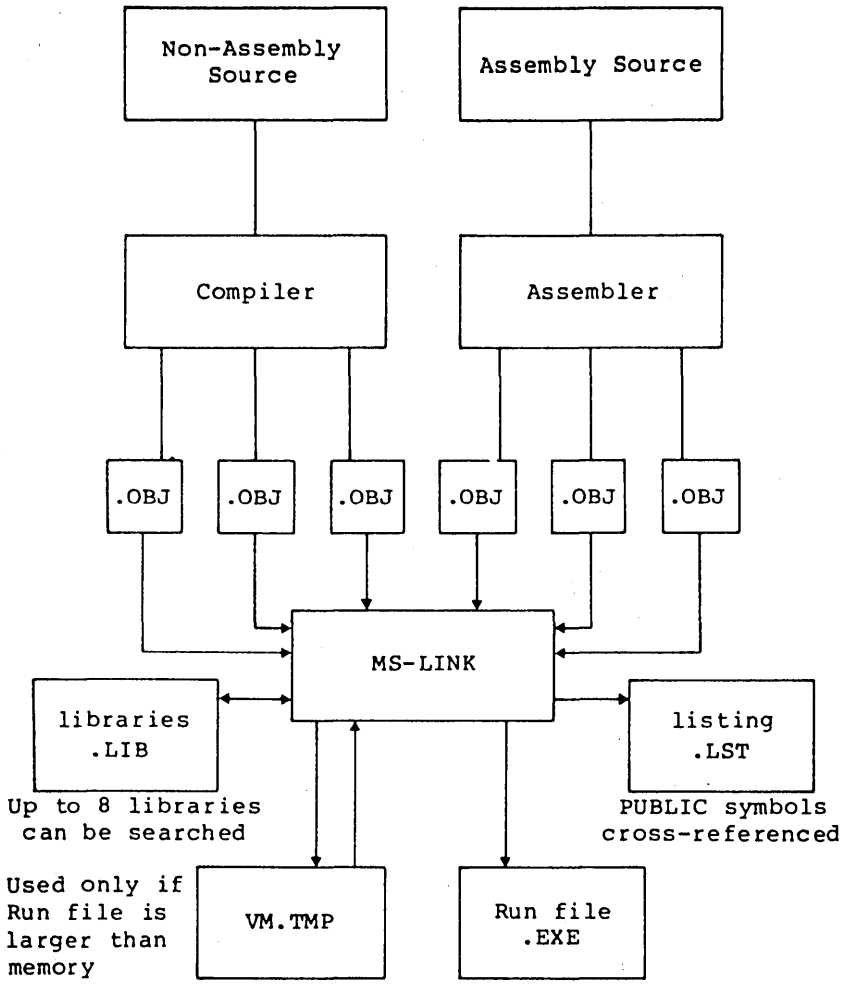
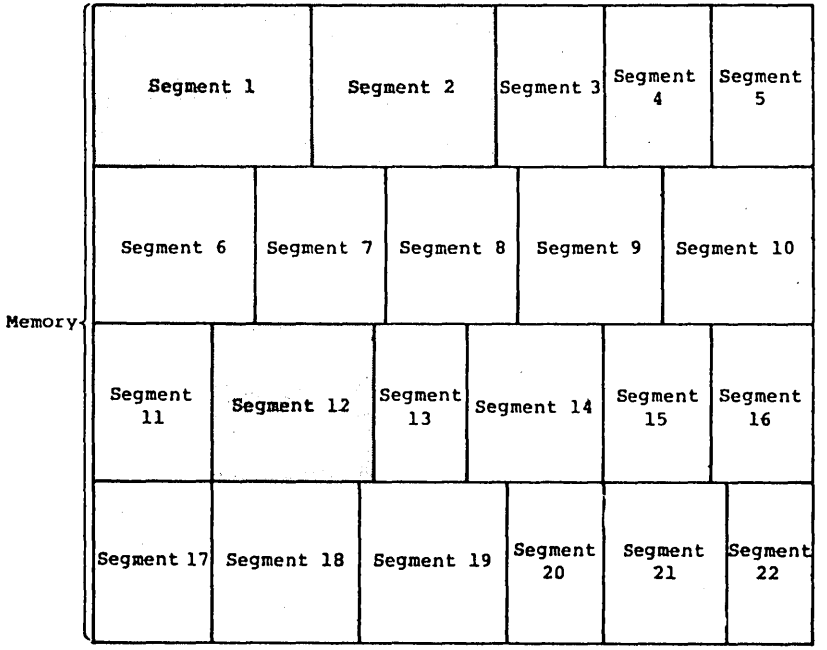


Figure 9. The MS-LINK Operation

9.3 DEFINITIONS YOU'LL NEED TO KNOW

Some of the terms used in this chapter are explained below to help you understand how MS-LINK works. Generally, if you are linking object modules compiled from BASIC, Pascal, or a high-level language, you will not need to know these terms. If you are writing and compiling programs in assembly language, however, you will need to understand MS-LINK and the the definitions described below. The section MS-LINK in the Macro Assembler Manual also contains useful information on how MS-LINK works.

In MS-DOS, memory can be divided into segments, classes, and groups. Figure 10 illustrates these concepts.



shaded area = a group (64K bytes addressable)

Figure 10. How Memory Is Divided

Example:

	Segment Name	Segment Class Name
Segment 1	PROG.1	CODE
Segment 2	PROG.2	CODE
Segment 12	PROG.3	DATA

Note that segments 1, 2, and 12 have different segment names but may or may not have the same segment class name. Segments 1, 2, and 12 form a group with a group address of the lowest address of segment 1 (i.e., the lowest address in memory).

Each segment has a segment name and a class name. MS-LINK loads all segments into memory by class name from the first segment encountered to the last. All segments assigned to the same class are loaded into memory contiguously.

During processing, MS-LINK references segments by their addresses in memory (where they are located). MS-LINK does this by finding groups of segments.

A group is a collection of segments that fit within a 64K byte area of memory. The segments do not need to be contiguous to form a group (see illustration). The address of any group is the lowest address of the segments in that group. At link time, MS-LINK analyzes the groups, then references the segments by the address in memory of that group. A program may consist of one or more groups.

If you are writing in assembly language, you may assign the group and class names in your program. In high-level languages (BASIC, COBOL, FORTRAN, Pascal), the naming is done automatically by the compiler.

Refer to the Macro Assembler Manual for information on how to assign group and class names and on how MS-LINK combines and arranges segments in memory.

9.4 FILES THAT MS-LINK USES

MS-LINK:

Works with one or more input files

Produces two output files

May create a temporary disk file

May be directed to search up to eight library files

For each type of file, the user may give a three-part file specification. The format for MS-LINK file specifications is the same as that of a disk file:

[d:]<filename>[<.ext>]

where: d: is the drive designation. Permissible drive designations for MS-LINK are A: through O:. The colon is always required as part of the drive designation.

filename is any legal filename of one to eight characters.

.ext is a one- to three-character extension to the filename. The period is always required as part of the extension.

9.4.1 Input File Extensions

If no filename extensions are given in the input (object) file specifications, MS-LINK will recognize the following extensions by default:

.OBJ	Object
.LIB	Library

9.4.2 Output File Extensions

MS-LINK appends the following default extensions to the output (Run and List) files:

.EXE	Run (may not be overridden)
.MAP	List (may be overridden)

9.4.3 VM.TMP (Temporary) File

MS-LINK uses available memory for the link session. If the files to be linked create an output file that exceeds available memory, MS-LINK will create a temporary file, name it VM.TMP, and put it on the disk in the default drive. If MS-LINK creates VM.TMP, it will display the message:

```
VM.TMP has been created.
Do not change diskette in drive, <d:>
```

Once this message has been displayed, you must not remove the disk from the default drive until the link session ends. If the disk is removed, the operation of MS-LINK will be unpredictable, and MS-LINK might display the error message:

```
Unexpected end of file on VM.TMP
```

The contents of VM.TMP are written to the file named following the Run File: prompt. VM.TMP is a working file only and is deleted at the end of the linking session.

WARNING

Do not use VM.TMP as a filename for any file. If you have a file named VM.TMP on the default drive and MS-LINK requires the VM.TMP file, MS-LINK will delete the VM.TMP already on disk and create a new VM.TMP. Thus, the contents of the previous VM.TMP file will be lost.

9.5 HOW TO START MS-LINK

MS-LINK requires two types of input: a command to start MS-LINK and responses to command prompts. In addition, seven switches control MS-LINK features. Usually, you will type all the commands to MS-LINK on the terminal keyboard. As an option, answers to the command prompts and any switches may be contained in a response file. Command characters can be used to assist you while giving commands to MS-LINK.

MS-LINK may be started in any of three ways. The first method is to type the commands in response to individual prompts. In the second method, you type all commands on the line used to start MS-LINK. To start MS-LINK by the third method, you must create a response file that contains all the necessary commands and tell MS-LINK where that file is when you start MS-LINK.

Summary of Methods to Start MS-LINK

Method 1	LINK
Method 2	LINK <filenames>[/switches]
Method 3	LINK @<filespec>

9.5.1 Method 1: Prompts

To start MS-LINK with Method 1, type:

```
LINK
```

MS-LINK will be loaded into memory. MS-LINK will then display four text prompts that appear one at a time. You answer the prompts to command MS-LINK to perform specific tasks.

At the end of each line, you may type one or more switches, preceded by the switch character, a forward slash.

The command prompts are summarized below and described in more detail in the "Command Prompts" section.

PROMPT	RESPONSES
Object Modules [.OBJ]:	List .OBJ files to be linked. They must be separated by blank spaces or plus signs (+). If a plus sign is the last character typed, the prompt will reappear. There is no default; a response is required.
Run File [Object-file.EXE]:	Give filename for executable object code. The default is first-object-filename.EXE. (You cannot change the output extension.)
List File [Run-file.MAP]:	Give filename for listing. The default is RUN filename.
Libraries [ ]:	List filenames to be searched, separated by blank spaces or plus signs (+). If a plus sign is the last character typed, the prompt will reappear. The default is to search for default libraries in the object moducles. (Extensions will be changed to .LIB.)

9.5.2 Method 2: Command Line

To start MS-LINK using Method 2, type all commands on one line. The entries following LINK are responses to the command prompts. The entry fields for the different prompts must be separated by commas. Use the following syntax:

```
LINK (object-list>,<runfile>,<listfile>,<lib-list>[/switch...]
```

The entries following LINK are responses to the command prompts. The entry fields for the different prompts must be separated by commas.

where: object-list is a list of object modules, separated by plus signs.

runfile is the name of the file to receive the executable output.

listfile is the name of the file to receive the listing.

lib-list is a list of library modules to be searched.

/switch refers to optional switches, which may be placed following any of the response entries (just before any of the commas or after the <lib-list>, as shown).

To select the default for a field, simply type a second comma with no spaces between the two commas.

Example:

```
LINK
FUN+TEXT+TABLE+CARE/P/M,,FUNLIST,COBLIB.LIB
```

This command causes MS-LINK to be loaded, then the object modules FUN.OBJ, TEXT.OBJ, TABLE.OBJ, and CARE.OBJ are loaded. MS-LINK then pauses (as a result of using the /P switch). MS-LINK links the object modules when you press any key, and produces a global symbol map (the /M switch); defaults to FUN.EXE Run file; creates a List file named FUNLIST.MAP; and searches the Library file COBLIB.LIB.

9.5.3 Method 3: Response File

To start MS-LINK with Method 3, type:

```
LINK @<filespec>
```

where: filespec is the name of a response file. A response file contains answers to the MS-LINK prompts (shown in Method 1) and may also contain any of the switches. When naming a response file, the use of filename extensions is optional. Method 3 permits the command that starts MS-LINK to be entered from the keyboard or within a batch file without requiring you to take any further action.

To use this option, you must create a response file containing several lines of text, each of which is the response to an MS-LINK prompt. The responses must be in the same order as the MS-LINK prompts discussed in Method 1. If desired, a long response to the Object Modules: or Libraries: prompt may be typed on several lines by using a plus sign (+) to continue the same response onto the next line.

Use switches and command characters in the response file the same way as they are used for responses typed on the terminal keyboard.

When the MS-LINK session begins, each prompt will be displayed in order with the responses from the response file. If the response file does not contain answers for all the prompts, (in the form of filenames, the semicolon command character or carriage returns), MS-LINK will display the prompt which does not have a response, then wait for you to type a legal response. When a legal response has been typed, MS-LINK continues the link session.

Example:

```
FUN TEXT TABLE CARE
/PAUSE/MAP
FUNLIST
COBLIB.LIB
```

This response file tells MS-LINK to load the four object modules named FUN, TEXT, TABLE, and CARE. MS-LINK pauses before producing a public symbol map to permit you to swap disks (see discussion under /PAUSE in the "Switches" section before using this feature). When you press any key, the output files will be named FUN.EXE and FUNLIST.MAP. MS-LINK will search the library file COBLIB.LIB, and will use the default settings for the switches.

9.6 COMMAND CHARACTERS

MS-LINK provides three command characters.

Plus sign — Use the plus sign (+) to separate entries and to extend the current line in response to the Object Modules: and Libraries: prompts. (A blank space may be used to separate object modules.) To type a large number of responses (each may be very long), type a plus sign/<RETURN> at the end of the line to extend it. If the plus sign/<RETURN> is the last entry following these two prompts, MS-LINK will prompt you for more module names. When the Object Modules: or Libraries: prompt appears again, continue to type responses. When all the modules to be linked and libraries to be searched have been listed, be sure the response line ends with a module name and a <RETURN> and not a plus sign/<RETURN>.

Example:

```
Object Modules [.OBJ]: FUN TEXT
TABLE CARE+<RETURN>
Object Modules [.OBJ]:
FOO+FLIPFLOP+JUNQUE+<RETURN>
Object Modules [.OBJ]:
CORSAIR<RETURN>
```

Semicolon To select default responses to the remaining prompts, use a single semicolon (;) followed immediately by a carriage return at any time after the first prompt (Run File:). This feature saves time and overrides the need to press a series of <RETURN> keys.

NOTE

Once the semicolon has been typed and entered (by pressing the <RETURN> key), you can no longer respond to any of the prompts for that link session. Therefore, do not use the semicolon to skip some prompts. To skip prompts, use the <RETURN> key.

Example:

```
Object Modules
[.OBJ]: FUN TEXT TABLE CARE<RETURN>
Run Module [FUN.EXE]: ;<RETURN>
```

No other prompts will appear, and MS-LINK will use the default values (including FUN.MAP for the List file).

<CONTROL-C> Use the <CONTROL-C> key to abort the link session at any time. If you type an erroneous response, such as the wrong filename or an incorrectly spelled filename, you must press <CONTROL-C> to exit MS-LINK then restart MS-LINK. If the error has been typed but you have not pressed the <RETURN> key, you may delete the erroneous characters with the backspace key, but for that line only.

9.7 COMMAND PROMPTS

MS-LINK asks you for responses to four text prompts. When you have typed a response to a prompt and pressed <RETURN>, the next prompt appears. When the last prompt has been answered, MS-LINK begins linking automatically without further command. When the link session is finished, MS-LINK exits to the operating system. When the operating system prompt appears, MS-LINK has finished successfully. If the link session is unsuccessful, MS-LINK will display the appropriate error message.

MS-LINK prompts you for the names of Object, Run, and List files, and for Libraries. The prompts are listed in order of appearance. The default response is shown in square brackets ([ ]) following the prompt, for prompts which can default to preset responses. The Object Modules: prompt has no preset filename response and requires you to type a filename.

Object Modules [.OBJ]:

Type a list of the object modules to be linked. MS-LINK assumes by default that the filename extension is .OBJ. If an object module has any other filename extension, the extension must be given. Otherwise, the extension may be omitted.

Modules must be separated by plus signs (+).

Remember that MS-LINK loads segments into classes in the order encountered. You can use this information to set the order in which the object modules will be read by MS-LINK. Refer to the Macro Assembler Manual for more information on this process.

Run File [First-Object-filename.EXE]:

Typing a filename will create a file for storing the Run (executable) file that results from the link session. All Run files receive the filename extension .EXE, even if you specify an extension other than .EXE.

If no response is typed to the Run File: prompt, MS-LINK uses the first filename typed in response to the Object Modules: prompt as the RUN filename.

Example:

```
Run File [FUN.EXE]:  B:PAYROLL/P
```

This response directs MS-LINK to create the Run file PAYROLL.EXE on drive B:. Also, MS-LINK will pause, which allows you to insert a new disk to receive the Run file.

List File [Run-Filename.MAP]:

The List file contains an entry for each segment in the input (object) modules. Each entry also shows the addressing in the Run file.

The default response is the Run filename with the default filename extension .MAP.

Libraries [ ]:

The valid responses are up to eight library filenames or simply a carriage return. (A carriage return means default library search.) Library files must have been created by a library utility. (Consult the MS-LIB section of the Macro Assembler Manual for information on library files.) MS-LINK assumes by default that the filename extension is .LIB for library files.

Library filenames must be separated by blank spaces or plus signs (+).

MS-LINK searches library files in the order listed to resolve external references. When it finds the module that defines the external symbol, MS-LINK processes that module as another object module.

If MS-LINK cannot find a library file on the disks in the disk drives, it will display the message:

```
Cannot find library <library-name>
Type new drive letter:
```

Press the letter for the drive designation (for example, B).

9.8 MS-LINK SWITCHES

The seven MS-LINK switches control various MS-LINK functions. Switches must be typed at the end of a prompt response, regardless of which method is used to start MS-LINK. Switches may be grouped at the end of any response, or may be scattered at the end of several. If more than one switch is typed at the end of one response, each switch must be preceded by a forward slash (/).

All switches may be abbreviated. The only restriction is that an abbreviation must be sequential from the first letter through the last typed; no gaps or transpositions are allowed. For example:

Legal	Illegal
/D	/DSL
/DS	/DAL
/DSA	/DLC
/DSALLOCA	/DSALLOCT

/DSALLOCATE

Using the /DSALLOCATE switch tells MS-LINK to load all data at the high end of the Data Segment. Otherwise, MS-LINK loads all data at the low end of the Data Segment. At runtime, the DS pointer is set to the lowest possible address to allow the entire DS segment to be used. Use of the /DSALLOCATE switch in combination with the default load low (that is, the /HIGH switch is not used) permits the user application to dynamically allocate any available memory below the area specifically allocated within DGroup, yet to remain addressable by the same DS pointer. This dynamic allocation is needed for Pascal and FORTRAN programs.

NOTE

Your application program may dynamically allocate up to 64K bytes (or the actual amount of memory available) less the amount allocated within DGroup.

/HIGH

Use of the /HIGH switch causes MS-LINK to place the Run file as high as possible in memory. Otherwise, MS-LINK places the Run file as low as possible.

IMPORTANT

Do not use the /HIGH switch with Pascal or FORTRAN programs.

/LINENUMBERS

The /LINENUMBERS switch tells MS-LINK to include in the List file the line numbers and addresses of the source statements in the input modules. Otherwise, line numbers are not included in the List file.

NOTE

Not all compilers produce object modules that contain line number information. In these cases, of course, MS-LINK cannot include line numbers.

/MAP

/MAP directs MS-LINK to list all public (global) symbols defined in the input modules. If /MAP is not given, MS-LINK will list only errors (including undefined globals).

The symbols are listed alphabetically. For each symbol, MS-LINK lists its value and its segment:offset location in the Run file. The symbols are listed at the end of the List file.

/PAUSE

The /PAUSE switch causes MS-LINK to pause in the link session when the switch is encountered. Normally, MS-LINK performs the linking session from beginning to end without stopping. This switch allows the user to swap the disks before MS-LINK outputs the Run (.EXE) file.

When MS-LINK encounters the /PAUSE switch, it displays the message:

```
About to generate .EXE file
Change disks <hit any key>
```

MS-LINK resumes processing when the user presses any key.

CAUTION

Do not remove the disk which will receive the List file, or the disk used for the VM.TMP file, if one has been created.

/STACK:<number>

number represents any positive numeric value (in hexadecimal radix) up to 65536 bytes. If a value from 1 to 511 is typed, MS-LINK will use 512. If the /STACK switch is not used for a link session, MS-LINK will calculate the necessary stack size automatically.

All compilers and assemblers should provide information in the object modules that allow the linker to compute the required stack size.

At least one object (input) module must contain a stack allocation statement. If not, MS-LINK will display the following error message:

```
WARNING: NO STACK STATEMENT
```

```
Start     Stop      Length     Name
00000H    009ECH    09EDH      CODE
009F0H    01166H    0777H      SYSINITSEG
```

The information in the Start and Stop columns shows the 20-bit hex address of each segment relative to location zero. Location zero is the beginning of the load module.

The addresses displayed are not the absolute addresses where these segments are loaded. Consult the Macro Assembler and Utilities Manual for information on how to determine where relative zero is actually located, and also on how to determine the absolute address of a segment.

Because the /MAP switch was used, MS-LINK displays the public symbols by name and value. For example:

```
ADDRESS          PUBLICS_BY_NAME
009F:0012        BUFFERS
009F:0005        CURRENT_DOS_LOCATION
009F:0011        DEFAULT_DRIVE
009F:000B        DEVICE_LIST
009F:0013        FILES
009F:0009        FINAL_DOS_LOCATION
009F:000F        MEMORY_SIZE
009F:0000        SYSINIT

ADDRESS          PUBLICS BY VALUE
009F:0000        SYSINIT
009F:0005        CURRENT_DOS_LOCATION
009F:0009        FINAL_DOS_LOCATION
009F:000B        DEVICE_LIST
009F:000F        MEMORY_SIZE
009F:0011        DEFAULT_DRIVE
009F:0012        BUFFERS
009F:0013        FILES
```

For more information on MS-LINK, refer to the Macro Assembler Manual.

9.10 ERROR MESSAGES

All errors cause the link session to abort. After the cause has been found and corrected, MS-LINK must be rerun. The following error messages are displayed by MS-LINK:

ATTEMPT TO ACCESS DATA OUTSIDE OF SEGMENT BOUNDS, POSSIBLY BAD OBJECT MODULE
: There is probably a bad Object file.

BAD NUMERIC PARAMETER
: Numeric value is not in digits.

CANNOT OPEN TEMPORARY FILE
: MS-LINK is unable to create the file VM.TMP because the disk directory is full. Insert a new disk. Do not remove the disk that will receive the List.MAP file.

ERROR: DUP RECORD TOO COMPLEX
: DUP record in assembly language module is too complex. Simplify DUP record in assembly language program.

ERROR: FIXUP OFFSET EXCEEDS FIELD WIDTH
: An assembly language instruction refers to an address with a short instruction instead of a long instruction. Edit assembly language source and reassemble.

INPUT FILE READ ERROR
: There is probably a bad Object file.

INVALID OBJECT MODULE
: An object module(s) is incorrectly formed or incomplete (as when assembly is stopped in the middle).

SYMBOL DEFINED MORE THAN ONCE
: MS-LINK found two or more modules that define a single symbol name.

PROGRAM SIZE OR NUMBER OF SEGMENTS EXCEEDS CAPACITY OF LINKER
: The total size may not exceed 384K bytes and the number of segments may not exceed 255.

REQUESTED STACK SIZE EXCEEDS 64K
Specify a size greater than or equal to 64K bytes with the /STACK switch.

SEGMENT SIZE EXCEEDS 64K
64K bytes is the addressing system limit.

SYMBOL TABLE CAPACITY EXCEEDED
Very many and/or very long names were typed, exceeding the limit of approximately 25K bytes.

TOO MANY EXTERNAL SYMBOLS IN ONE MODULE
The limit is 256 external symbols per module.

TOO MANY GROUPS
The limit is 10 groups.

TOO MANY LIBRARIES SPECIFIED
The limit is 8 libraries.

TOO MANY PUBLIC SYMBOLS
The limit is 1024 public symbols.

TOO MANY SEGMENTS OR CLASSES
The limit is 256 (segments and classes taken together).

UNRESOLVED EXTERNALS: <list>
The external symbols listed have no defining module among the modules or library files specified.

VM READ ERROR
This is a disk error; it is not caused by MS-LINK.

WARNING: NO STACK SEGMENT
None of the object modules specified contains a statement allocating stack space, but you typed the /STACK switch.

WARNING: SEGMENT OF ABSOLUTE OR UNKNOWN TYPE
There is a bad object module or an attempt has been made to link modules that MS-LINK cannot handle (e.g., an absolute object module).

WRITE ERROR IN TMP FILE
No more disk space remains to expand the VM.TMP file.

WRITE ERROR ON RUN FILE
Usually, there is not enough disk space for the Run file.

APPENDIX A

INSTRUCTIONS FOR USERS WITH SINGLE-DRIVE SYSTEMS

NOTE

Information in this appendix is installation-dependent and may not be implemented on every manufacturer's machine.

On a single-drive system, you enter the commands as you would on a multi-drive system.

You should think of the single-drive system as having two drives (drive A: and drive B:). But instead of A: and B: representing two physical drives as on the multi-drive system, the A: and B: represent disks.

If you specify drive B: when the "drive A: disk" was last used, you are prompted to insert the disk for drive B:. For example:

```
A> COPY COMMAND.COM B:
Insert diskette for drive B:
and strike any key when ready
  1 File(s) copied
A>_
```

If you specify drive A: when the "drive B: disk" was last used, you are prompted again to change disks. This time, MS-DOS prompts you to insert the "drive A: disk."

The same procedure is used if a command is executed from a batch file. MS-DOS waits for you to insert the appropriate disk and press any key before it continues. You will be prompted to do this.

NOTE

The letter displayed in the system prompt represents the default drive where MS-DOS looks to find a file whose name is entered without a drive specifier. The letter in the system prompt does not represent the last disk used.

For example, assume that A: is the default drive. If the last operation performed was DIR B:, MS-DOS believes the "drive B: disk" is still in the drive. However, the system prompt is still A:, because A: is still the default drive. If you type DIR, MS-DOS prompts you for the "drive A: disk" because drive A: is the default drive, and you did not specify another drive in the DIR command.

APPENDIX B

DISK ERRORS

If a disk or device error occurs at any time during a command or program, MS-DOS returns an error message in the following format:

```
<yyy> ERROR WHILE <I/O action> ON DRIVE x
Abort,Ignore,Retry:_
```

In this message,<yyy> may be one of the following:

```
WRITE PROTECT
BAD UNIT
NOT READY
BAD COMMAND
DATA
BAD CALL FORMAT
SEEK
NON-DOS DISK
SECTOR NOT FOUND
NO PAPER
WRITE FAULT
READ FAULT
DISK
```

The <I/O-action> may be either of the following:

```
READING
WRITING
```

The drive <x> indicates the drive in which the error has occurred.

MS-DOS waits for you to enter one of the following responses:

A Abort. Terminate the program requesting the disk read or write.

I Ignore. Ignore the bad sector and pretend the

error did not occur.

R Retry. Repeat the operation. This response is to be used when the operator has corrected the error (such as with NOT READY or WRITE PROTECT errors).

Usually, you will want to attempt recovery by entering responses in this order:

R (to try again)
A (to terminate program and try a new disk)

One other error message might be related to faulty disk read or write:

FILE ALLOCATION TABLE BAD FOR DRIVE x

This message means that the copy in memory of one of the allocation tables has pointers to nonexistent blocks. Possibly the disk was incorrectly formatted or not formatted before use. If this error persists, the disk is currently unusable and must be formatted prior to use.

APPENDIX C

ANSI ESCAPE SEQUENCES

NOTE

Information in this appendix is installation-dependent and may not be implemented on every manufacturer's machine.

An ANSI escape sequence is a series of characters (beginning with an escape character or keystroke) that you can use to define functions to MS-DOS. Specifically, you can reassign keys, change graphics functions, and affect cursor movement.

This appendix explains how the ANSI escape sequences are defined for MS-DOS version 2.0. Examples on how to use ANSI escape sequences are included at the end of this appendix.

Notes:

1. The default value is used when no explicit value or a value of zero is specified.

2. Pn represents "numeric parameter." This is a decimal number specified with ASCII digits.

3. Ps represents "selective parameter." This is any decimal number that is used to select a subfunction. Multiple subfunctions may be selected by separating the parameters with semicolons.

C.1 CURSOR FUNCTIONS

The following escape sequences affect the cursor position on the screen.

CUP - Cursor Postion

ESC [Pl ; Pc H

HVP - Horizontal & Vertical Postion

ESC [Pl ; Pc f

CUP and HVP move the cursor to the position specified by the parameters. The first parameter specifies the line number, and the second parameter specifies the column number. The default value is 1. When no parameters are specified, the cursor is moved to the home postion.

CUU - Cursor Up

ESC [Pn A

This sequence moves the cursor up one line without changing columns. The value of Pn determines the number of lines moved. The default value for Pn is 1. The CUU sequence is ignored if the cursor is already on the top line.

CUD - Cursor Down

ESC [Pn B

This sequence moves the cursor down one line without changing columns. The value of Pn determines the number of lines moved. The default value for Pn is 1. The CUD sequence is ignored if the cursor is already on the bottom line.

CUF - Cursor Forward

ESC [Pn C

The CUF sequence moves the cursor forward one column without changing lines. The value of Pn determines the number of columns moved. The default value for Pn is 1. The CUF sequence is ignored if the cursor is already in the far right column.

CUB - Cursor Backward

ESC [Pn D

This escape sequence moves the cursor back one column without changing lines. The value of Pn determines the number of columns moved. The default value for Pn is 1. The CUB sequence is ignored if the cursor is already in the far left column.

DSR - Device Status Report

ESC [6 n

The console driver will output a CPR sequence (see below) on receipt of the DSR escape sequence.

CPR - Cursor Position Report (from console driver to system)

ESC [Pn ; Pn R

The CPR sequence reports current cursor position via standard input. The first parameter specifies the current line and the second parameter specifies the current column.

SCP - Save Cursor Postion

ESC [s

The current cursor position is saved. This cursor position can be restored with the RCP sequence (see below).

RCP - Restore Cursor Position

ESC [u

This sequence restores the cursor position to the value it had when the console driver received the SCP sequence.

C.2 ERASING

The following escape sequences affect erase functions.

ED - Erase Display

ESC [2 J

The ED sequence erases the screen, and the cursor goes to the home position.

EL - Erase Line

ESC [K

This sequence erases from the cursor to the end of the line (including the cursor position).

C.3 MODES OF OPERATION

The following escape sequences affect screen graphics.

SGR - Set Graphics Rendition

ESC [Ps ; ... ; Ps m

The SGR escape sequence invokes the graphic functions specified by the parameter(s) described below. The graphic functions remain until the next occurrence of an SGR escape sequence.

Parameter	Parameter Function	
0	All Attributes off	
1	Bold on	
4	Underscore on	(monochrome displays only)
5	Blink on	
7	Reverse Video on	
8	Concealed on	(ISO 6429 standard)
30	Black foreground	(ISO 6429 standard)
31	Red foreground	(ISO 6429 standard)
32	Green foreground	(ISO 6429 standard)
33	Yellow foreground	(ISO 6429 standard)
34	Blue foreground	(ISO 6429 standard)
35	Magenta foreground	(ISO 6429 standard)
36	Cyan foreground	(ISO 6429 standard)
37	White foregound	(ISO 6429 standard)
40	Black background	(ISO 6429 standard)
41	Red background	(ISO 6429 standard)
42	Green background	(ISO 6429 standard)
43	Yellow background	(ISO 6429 standard)

44	Blue background	(ISO 6429 standard)
45	Magenta background	(ISO 6429 standard)
46	Cyan background	(ISO 6429 standard)
47	White backgound	(ISO 6429 standard)

SM - Set Mode

```
      ESC [ = Ps h
or    ESC [ = h
or    ESC [ = 0 h
or    ESC [ ? 7 h
```

The SM escape sequence changes the screen width or type to one of the following parameters:

Parameter	Parameter Function
0	40 x 25 black and white
1	40 x 25 color
2	80 x 25 black and white
3	80 x 25 color
4	320 x 200 color
5	320 x 200 black and white
6	640 x 200 black and white
7	wrap at end of line

RM - Reset Mode

```
      ESC [ = Ps l
or    ESC [ = l
or    ESC [ = 0 l
or    ESC [ ? 7 l
```

Parameters for RM are the same as for SM (Set Mode), except that parameter 7 will reset the wrap at the end of line mode.

C.4 KEYBOARD REASSIGNMENT

Although not part of the ANSI 3.64-1979 or ISO 6429 standard, the following keyboard reassignments are compatible with these standards.

The control sequence is:

```
     ESC [ Pn ; Pn ; ... Pn p
or   ESC [ "string" ; p
or   ESC [ Pn ; "string" ; Pn ; Pn ; "string" ; Pn p
or   any other combination of strings and decimal numbers
```

The final code in the control sequence (p) is one reserved for private use by the ANSI 3.64-1979 standard.

The first ASCII code in the control sequence defines which code is being mapped. The remaining numbers define the sequence of ASCII codes generated when this key is intercepted. Note that there is one exception: if the first code in the sequence is zero (NUL), then the first and second code make up an extended ASCII redefinition.

Examples:

1. Reassign the Q and q key to the A and a key (and vice versa):

```
ESC [ 6 5 ; 8 1 p          A becomes Q
ESC [ 9 7 ; 1 1 3 p        a becomes q
ESC [ 8 1 ; 6 5 p          Q becomes A
ESC [ 1 1 3 ; 9 7 p        q becomes a
```

2. Reassign the F10 key to to a DIR command followed by a carriage return:

```
ESC [ 0 ; 6 8 ; " d i r " ; 1 3 p
```

The 0;68 is the extended ASCII code for the F10 key; 13 decimal is a carriage return.

APPENDIX D

HOW TO CONFIGURE YOUR SYSTEM

In many cases, there are installation-specific settings for MS-DOS that need to be configured at system startup. An example of this is a standard device driver, such as an online printer.

The MS-DOS configuration file (CONFIG.SYS) allows you to configure your system with a minimum of effort. With this file, you can add device drivers to your system at startup. The configuration file is simply an ASCII file that has certain commands for MS-DOS startup (boot). The boot process is as follows:

1. The disk boot sector is read. This contains enough code to read MS-DOS code and the installation's BIOS (machine-dependent code).

2. The MS-DOS code and BIOS are read.

3. A variety of BIOS initializations are done.

4. A system initialization routine reads the configuration file (CONFIG.SYS), if it exists, to perform device installation and other user options. Its final task is to execute the command interpreter, which finishes the MS-DOS boot process.

D.1 CHANGING THE CONFIG.SYS FILE

If there is not a CONFIG.SYS file on the MS-DOS disk, you can use the MS-DOS editor, EDLIN, to create a file; then save it on the MS-DOS disk in your root directory.

The following is a list of commands for the configuration file CONFIG.SYS:

BUFFERS = <number>
This is the number of sector buffers that will comprise the system list. It is installation-dependent. If not set, 10 is a reasonable number.

FILES = <number>
This is the number of open files that the XENIX system calls can access. It is installation-dependent. If not set, 10 is a reasonable number.

DEVICE = <filename>
This installs the device driver in <filename> into the system list. (See below.)

BREAK = <ON or OFF>
If ON is specified (the default is OFF), a check for CONTROL-C as input will be made every time the system is called. ON improves the ability to abort programs over previous versions of the MS-DOS.

SHELL = <filename>
This begins execution of the shell (top-level command processor) from <filename>.

A typical configuration file might look like this:

```
Buffers =  10
Files   =  10
Device  =  \BIN\NETWORK\SYS
Break   =  ON
Shell   =  A:\BIN\COMMAND.COM A:\BIN /P
```

Note here that the Buffers and Files parameters are set to 10x The system initialization routine will search for the filename \BIN\NETWORK.SYS to find the device that is being added to the system. This file is usually supplied on disk with your device. Make sure that you save the device file in the pathname that you specify in the Device parameter.

This configuration file also sets the MS-DOS command EXEC to the COMMAND.COM file located on disk A: in the \BIN directory. The A:\BIN tells COMMAND.COM where to look for itself when it needs to re-read from disk. The /P tells COMMAND.COM that it is the first program running on the system so that it can process the MS-DOS EXIT command.

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