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ZENITH data systems

HEATH

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Preface

CP/M* is an acronym for the Control Program for Microcomputers, the operating system that has quickly become the industry standard because of its convenience and wide range of practical applications.

This manual is designed to help you to make CP/M productive in your microcomputer environment. To provide instruction for CP/M users with various levels of microcomputer experience, this manual is divided into two guides:

- "The CP/M Introductory Guide", explains beginning concepts necessary to use CP/M with Heath/Zenith hardware, and provides step-by-step procedures for starting up and preparing CP/M software.

- "The CP/M Reference Guide" is a comprehensive description of each command included in your CP/M software package.

If you are not familiar with CP/M practices and conventions, you will probably find it useful to read the overview and concept sections of the first guide. Even individuals with no experience in computers will be able to understand and use CP/M by reading this portion of the manual.

All users should perform the procedures in the CP/M Introductory Guide upon receipt of CP/M Distribution Disks.

*CP/M is a registered trademark of Digital Research Corp.

When you finish performing the procedures in the first guide, you will be ready to use CP/M with the application programs of your choice. But we urge you to make the most of your CP/M software package by exploring the reference guide to CP/M resident commands and transient commands.

This manual will be more effective throughout if you read it while you are using your microcomputer. Test each concept through your terminal to reinforce your learning.

A second, separate volume contains a system interface guide, an alteration guide, and appropriate appendices. These reprints from Digital Research are general in nature and references to CP/M-85 and specific computers may not be accurate. Since the source code listed in these reprints was not used to create CP/M-85, refer to Distribution Disk II for the actual source code.

Essential Requirements

Use of CP/M-85 Version 2.2.100 is limited to the following specifications:

1. Distribution Media — Two, soft-sectored, 5.25 inch, 48-TPI floppy disks at double density.

2. Disk Format — Soft-sectored, 5.25-inch, 48-TPI floppy disks at double density; or soft-sectored, 8-inch, 48-TPI floppy disks.

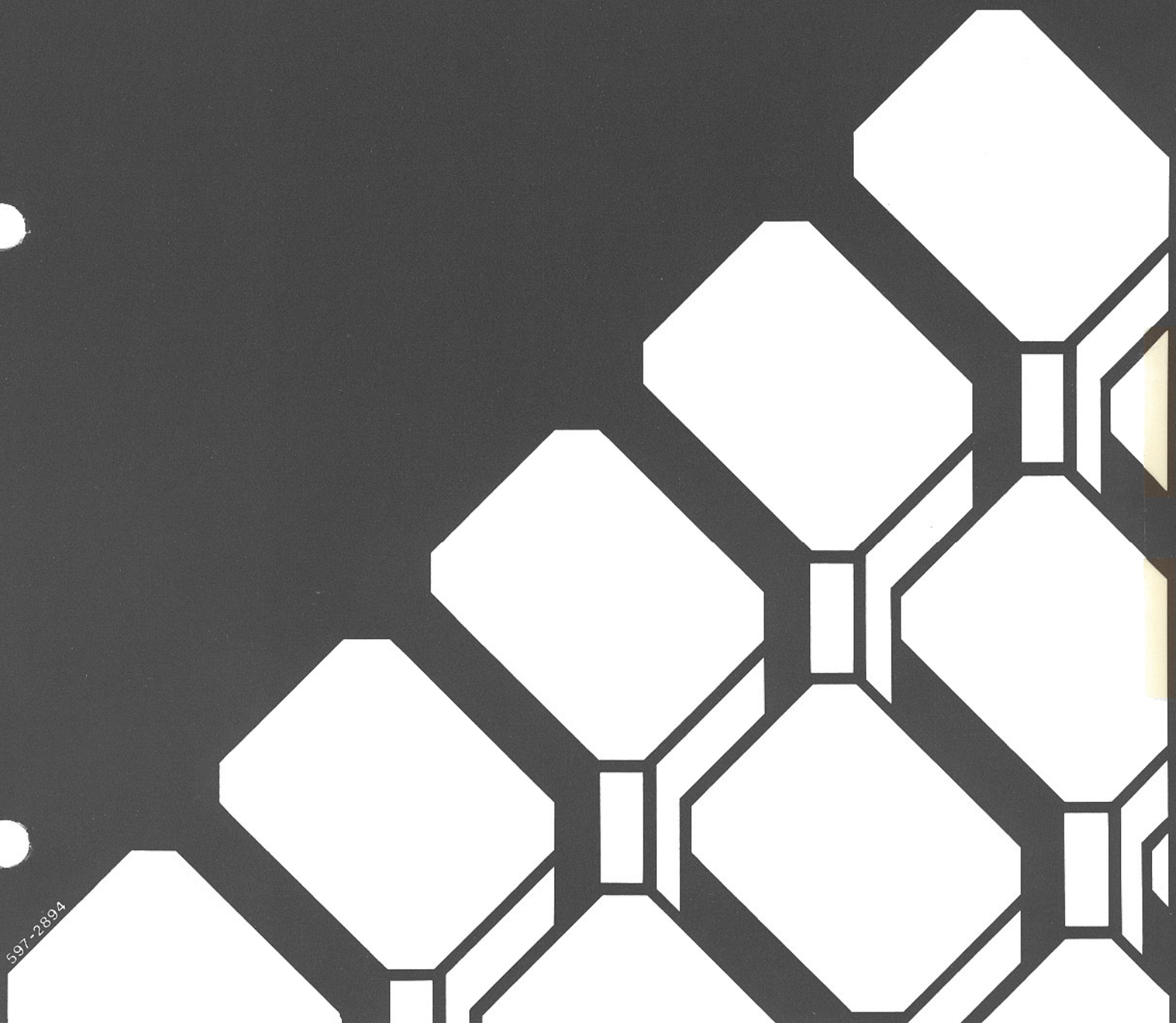
3. Minimum Hardware — Z-100 or H-100 microcomputer with attached or separate video screen.

Introductory Guide

Table of Contents

THE CP/M-85 INTRODUCTORY GUIDE

THE CP/M-85 REFERENCE GUIDE



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Section One

Beginning Concepts

This part of the manual explains concepts that are important when you are using the CP/M Operating System within your Heath/Zenith microcomputer environment.

The concepts explained here are grouped under the headings:

- "Microcomputer Concepts:" Provided for individuals who have never before used microcomputers, and for individuals with limited microcomputer experience who wish to review.

- "CP/M Concepts:" Provided for individuals who are unfamiliar with the CP/M Operating System.

Individuals who are proficient at using both microcomputers and CP/M can skip this section of the manual, and proceed directly to "Software Preparation Procedures" on Page 1-27.

Examples of User/Computer Dialog

This text contains examples of user interaction with a microcomputer. In these examples, displays presented on the microcomputer terminal will be represented by the following typestyle:

```
THIS TYPESTYLE represents terminal displays

0123456789#$*?:=.A>()
```

User input (the characters that you type through the terminal) will be represented by boldface type, as shown:

BOLDFACE TYPE represents the things you type

0123456789#$*?:=[.]()

When you should enter a carriage return by pressing the key marked "RETURN," the example will show the symbol ⓒ.

In many instances, the exact text of a display will vary by a few characters. This manual often substitutes a few letters in place of exact characters where variations are likely to occur. For instance, this manual will illustrate a program's serial number as "Serial number sss-sssss," while your terminal might actually display it as "Serial number 357-81469."

In cases where the exact characters you type will vary, this manual presents a description of the necessary characters within curved braces, { }.

Hence, this manual might explain that an entry should be made in the following form: **B:=A:{file name.ext}** ⓒ, when you actually type the characters **B:=A:CONFIGUR.COM** ⓒ.

Hardware device model numbers beginning with the "H/Z" prefix are references to either a Heath device, a Zenith device, or both. For example "H/Z-100" in this manual refers to hardware devices that are labeled either "H-100" or "Z-100."

MICROCOMPUTER CONCEPTS

Your microcomputer is a sophisticated piece of equipment that reflects the latest technical advances in the computer field. But this machine is practically useless without the programs (instructions) that tell it what to do.

These programs are stored on disks, and used by your microcomputer when they are required to perform a task. This section explains how the programs are stored on disks, shows you how to handle your disks, and defines two important types of programs: the operating system and the application program.

Disks

Stored information, or data, is arranged in concentric rings on the surface of a disk. These rings are called *tracks*. Each track is divided into areas called *sectors*. Each sector contains data measured in units called *bytes*. A byte of data could be one letter typed at the terminal keyboard or one instruction in a program. But since a byte is such a small unit, you will more often see data measured in *kilobytes*. A kilobyte (abbreviated as *K*) is equal to 1024 bytes.

Data is transferred to disks in the form of magnetic impulses generated by an electromagnet called the *read-write head*. As the name implies, the read-write head can read data from the disk or write data on the disk — similar to the way in which the head in a tape recorder transfers magnetic impulses to and from a cassette tape.

But unlike a tape recorder, a disk drive unit can transfer data at any location on the disk surface almost instantly, because the drive is usually spinning the disk at a high rate of speed. Whenever the read-write head is instructed to read or write data at a particular location on the disk, it positions itself along the appropriate track and skims across the surface of the disk as the appropriate sector spins by. Each disk has a directory that tells the read-write head which track and sector it should access to transfer the necessary information in the proper sequence.

There are two different kinds of tracks on every disk: system tracks and file tracks. System tracks are reserved for part of your operating system, and they are usually the two or three outermost tracks on the disk. File tracks are reserved for files, and they are the inner tracks on the disk. (Upcoming text will explain the concepts behind operating systems and files.)

NOTE: Before data can be written on a disk, the surface of the disk must be prepared. Disk preparation is performed by a program called "FORMAT," which is stored on your Distribution Disk. FORMAT prepares the disk surface by dividing it into tracks and sectors. The procedures for constructing backups and customizing the operating system will show you how to prepare disks using FORMAT.

DISKETTES

A *diskette* is a circular sheet of mylar plastic with a magnetic oxide on its surface and a square plastic cover.

Diskettes, and the data stored on them, are fragile. Therefore, you should adhere to the following precautions to ensure that disks and stored data are not damaged.

Diskette Handling Precautions

- When you are holding the diskette, touch only the protective square diskette cover. Do not touch the brownish disk surface that shows through the read-write access slots in the diskette.

- Keep the diskette in the protective paper envelope whenever it is not within a disk drive.

- Do not allow dust, ashes, liquid, or any other foreign material to contact the disk surface.

- Keep the diskette away from electric motors, appliances, telephones, etc., as these devices contain magnets that could alter the magnetic impressions on the disk.

- Never put a diskette into a drive unit before turning on hardware equipment; and never leave a diskette in a drive unit while the power is being turned off. Sudden fluctuations in the power supply to your hardware environment could cause the read-write head to write on the disk surface and destroy stored information.

- Do not expose diskettes to temperatures above 125 degrees Fahrenheit (52 Centigrade), or temperatures below 40 degrees Fahrenheit (10 Centigrade).

- Never press a ball-point pen or a pencil directly against the diskette. Instead, mark diskette labels before adhering them to the diskette, or mark them using a felt-tip pen while they are on the diskette.

- Do not allow the diskette to be bent, creased, or torn.

- Do not attach paper clips to the diskette.

Write-Protecting and Write-Enabling Diskettes

You can mechanically prevent or allow the writing or erasing of information to or from your disks by covering or uncovering the notch in the diskette with specially-provided tabs. The way that you use these tabs depends on the size of the diskette.

5.25-inch Diskettes

With 5.25-inch diskettes, the notch is covered to **prevent** you from writing to or erasing from the disk. Therefore, by putting the tab on a 5.25-inch diskette, you are "write-protecting" the disk. A 5.25-inch diskette with a notch that is not covered can be written to or erased from. Therefore, a 5.25-inch diskette with an uncovered notch is "write-enabled." Figure 1-1 illustrates this distinction.

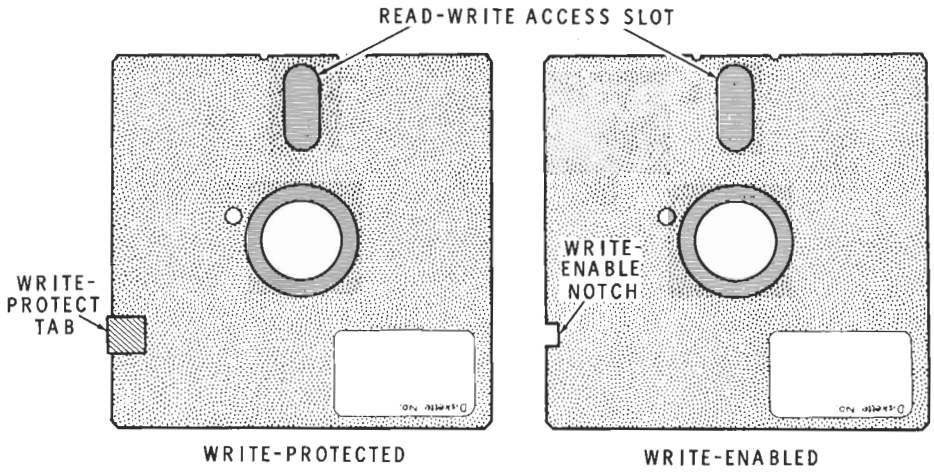


Figure 1-1
5.25-inch Diskettes

8-inch Diskettes

With 8-inch diskettes, the notch is covered to **allow** you to write to or erase from the disk. Therefore, by putting the tab on an 8-inch diskette, you are "write-enabling" the disk. An 8-inch diskette with a notch that is not covered can not be written to or erased from. Therefore, an 8-inch diskette with an uncovered notch is "write-protected." Figure 1-2 illustrates this distinction.

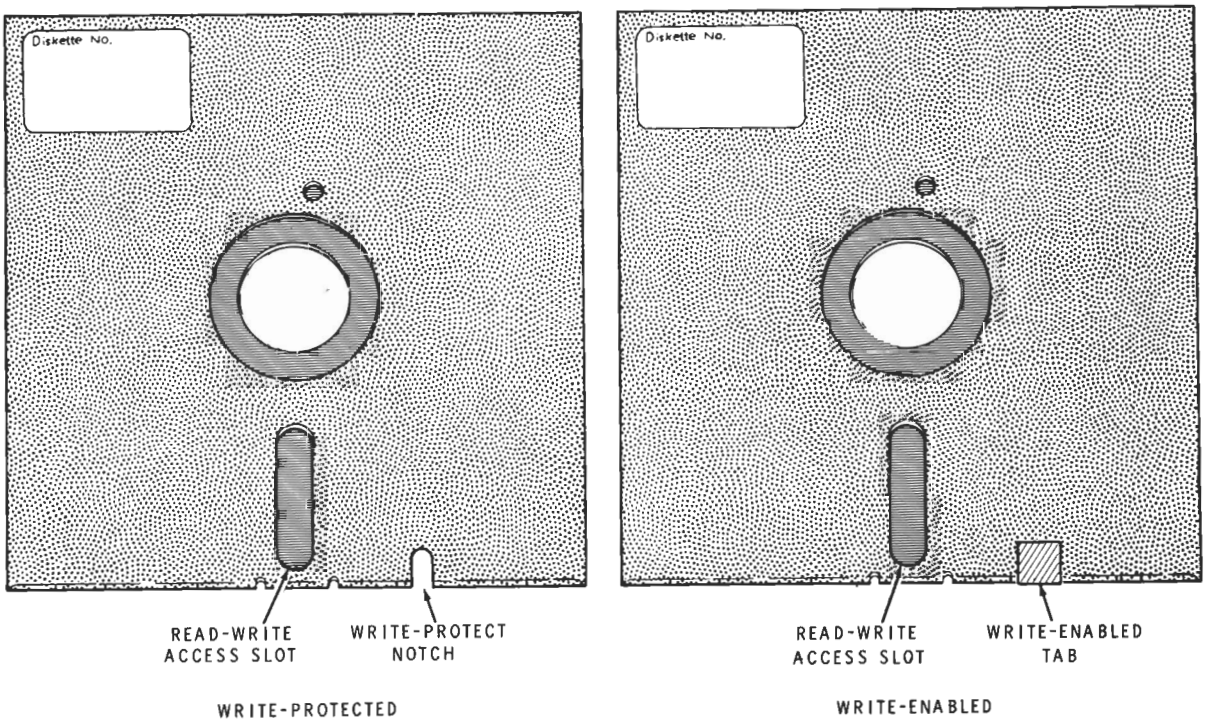


Figure 1-2
8-inch Diskettes

NOTE: Whether a diskette is write-protected or write-enabled, you can usually read or copy data from it.

Inserting Diskettes

To insure that data stored on your diskettes can be safely and efficiently accessed, the diskettes must be inserted into drives carefully and correctly.

When you insert a diskette into a disk drive, point the oblong holes in the diskette towards the back of the drive. A label is usually affixed to one side of the diskette, and this label should face upward on the right side as the diskette is inserted into the drive. When the diskette is fully inserted in the drive slot, close the drive latch.

Figure 1-3 illustrates the proper technique for inserting diskettes into some of the many drives that Heath/Zenith offers.

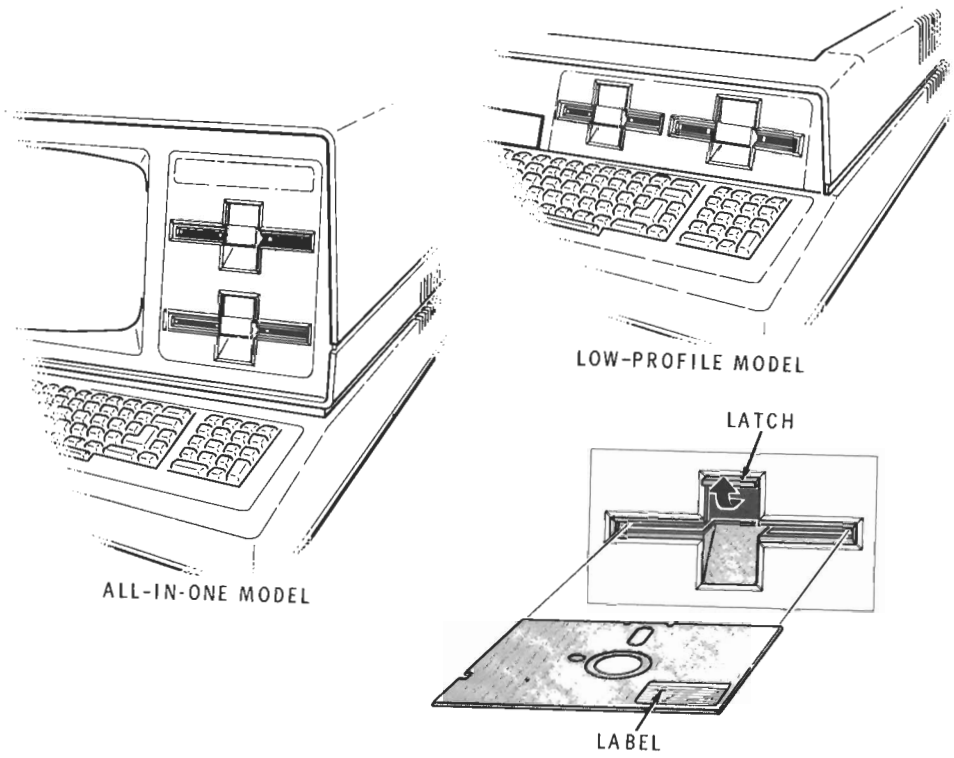


Figure 1-3
Inserting Diskettes

The Operating System

An operating system is a computer program that controls both the components of your hardware environment and subordinate programs ("application programs") that perform specific tasks.

It provides a vital link between your keyboard and your application programs, and between your application programs and your peripheral hardware. Thus it is essential that you use an operating system whenever you use an application program in your microcomputer environment.

The way that you use the CP/M Operating System is to copy an image of the system from a disk, and put it inside the memory of your microcomputer. This activity (called "bootstrapping," "booting up," or "cold booting") occurs automatically when you power up the computer and insert a disk containing the CP/M Operating System.

CP/M can perform several useful functions when it is alone in your computer's memory, but it also has "hollow" areas into which you can load application programs as you need them.

OPERATING SYSTEM COMPONENTS

The Heath/Zenith CP/M operating system is divided into two software components: the "system kernel" and the "BIOS files." A disk that contains both of these components is said to contain the CP/M Operating System. Such a disk can also be said to be "bootable," which means that it contains an image of the operating system that can be inserted into the computer and used.

The System Kernel

The *system kernel* is a set of programs that reside on the reserved system tracks of a disk. Special data transfer utilities (usually SYSGEN and/or MVCPM207) are used to copy the system kernel from one disk to another. The system kernel manages files, translates the commands you enter at the keyboard, and performs other functions that do not depend upon specific hardware characteristics.

The BIOS Files

BIOS stands for Basic Input/Output System, which is the part of the operating system that enables CP/M to work in a Heath/Zenith hardware environment. The BIOS used with this CP/M release consists of the files BIOS85.SYS and BIOS88.SYS, which reside on the file tracks of the disk. The BIOS files can be manipulated by the same methods used to manipulate other files that are stored on the disk. The portion of the BIOS stored in the file BIOS85.SYS uses the 8085 processor of the Z-100. The portion stored in BIOS88.SYS uses the 8088 processor of the Z-100.

OPERATING SYSTEM REQUIREMENTS

To use the operating system, you must transfer a copy of it from a disk to the computer by performing an activity called "bootstrapping," "booting-up," or "cold booting." Both the system kernel and the BIOS files **must** be together on a disk for that disk to be usable for bootstrapping (the activity that puts CP/M in the computer).

To protect your software investment, we strongly suggest that you make backup copies of your CP/M distribution software before using it for any practical applications. Once you have made backup copies, your CP/M software will be ready for use in a Heath/Zenith hardware environment. "Section Two: Software Preparation Procedures" (on Page 1-27) shows you how to start up and back up your CP/M software.

The CP/M Operating System on your distribution software is ready to accommodate a standard configuration of hardware devices. If your hardware configuration differs from these standards, you must adjust the system before it will accommodate all of your devices. Your distribution software includes utilities to help you adjust the system for your devices.

Your CP/M-85 distribution software contains a serial number to prevent the mixing of this software with software from other CP/M distribution packages. Therefore, do not try to use this CP/M system with other CP/M systems or utilities, and do not try to use these utilities with other CP/M systems.

Application Programs

An application program is a set of instructions that tells your microcomputer how to perform a specific function.

Application programs are stored on the file tracks of a disk in units of data called files (as explained in "Files," Page 1-13). An application program might consist of several files that automatically access each other under certain circumstances. Whenever an application program file is needed to perform a specific task, an image of this file is copied from the disk and inserted into computer memory, where the CP/M Operating System has a reserved "hollow" area for it.

After the application program files have served their purpose, CP/M moves them aside and either reserves its hollow memory areas for new application programs or executes some of the programs within the operating system itself.

EXAMPLES OF APPLICATION PROGRAMS

Your Distribution Disk contains several application programs, which are often referred to as "transient commands" or "utilities." These programs, stored on the Distribution Disk, are identified by names that end with the file extension "COM." This extension indicates that these files are valid COMmands that can execute under CP/M.

The following list shows just some of the types of application programs, languages, and utilities which are or shortly will become available from Heath/Zenith. Refer to your User's Manual for a list of existing CP/M software which may be converted to run under CP/M-85 on the Z-100.

BUSINESS:

- Electronic Spread Sheet
- Inventory Management
- General Ledger
- Accounts Receivable
- Accounts Payable
- Sales Invoicing
- Payroll
- Client Posting & Accounting
- Property Management
- Word Processing
- Electronic Dictionary
- Mail List Management
- Data-based Manager
- Automatic Letter Generator

PROGRAMMING LANGUAGES:

- BASIC-80 Interpreter
- BASIC-80 Compiler
- C-BASIC
- FORTRAN-80
- COBOL-80

SYSTEM UTILITIES:

- Macro Assembler
- Printerspooling operation
- Symbolic Debugger

APPLICATION PROGRAM REQUIREMENTS

It is important to remember that an application program cannot produce the results you desire without the presence of an operating system. Therefore, you must always load the CP/M operating system into your microcomputer before you can use any application program. ("Start-Up Procedure" will show you how to put CP/M in your computer.)

Furthermore, the CP/M Operating System must be capable of controlling all of your hardware devices before any application program can use these devices. Sometimes you must adjust the system (as described in "Backup Procedures," Page 1-32) so it can control your hardware devices.

Each application program consists of at least one file with a .COM file name extension. Some application programs also consist of additional files. All of the files included in an application program must be present on a disk within a drive whenever you wish to use the application program.

CP/M CONCEPTS

CP/M Concepts explains some of the basic properties of the CP/M Operating System and some of the conventions you must follow when using the system. After reading "Microcomputer Concepts" and "CP/M Concepts" you should be ready to perform the Software Preparation Procedures.

Specifically, this text shows you how CP/M stores data in units called files, how CP/M accesses these files through disk drives, and how you should issue commands to the CP/M Operating System.

Files

The CP/M Operating System enables you to create, analyze, and manipulate data by storing this data in units called *files*. These files are stored on the surface of a disk and given names that conform to CP/M file naming conventions.

When you issue a command that refers to a particular file by name, CP/M goes to the appropriate disk, makes a copy of the file, and puts the copy into one of its hollow areas inside the computer.

CP/M FILE NAMING CONVENTIONS

A file name consists of two parts: the primary name and the extension. The primary name has between one and eight characters, and is essential in all file names. The extension can have between one and three characters, or it can be omitted entirely. The primary name and the extension are separated by a period (.), in the following form:

{**primary name**}.{**extension**}

The characters used in the primary name and extension can be any character on the console keyboard except the following special characters:

<>.,;: =?*[]

The following example file names all conform to these conventions:

memo.doc BIOS85.SYS PROGRAM.ASM 4/27/81.TXT

FORMAT.COM FILE#1 33%-RATE.DAT WSMSGS.OVR

Although the extension is optional, you'll probably find it useful to give your files extensions that somehow describe the type or purpose of the file you are naming. The following list shows several extensions that are applied to files used for a specific purpose:

EXTENSION	FILE PURPOSE
COM	Command file (executable under CP/M)
ASM	Assembler source file
HEX	Intel HEX object file
PRN	Print file of program listing
BAS	BASIC source file
INT	Intermediate BASIC file (for BASIC-E, CBASIC)
BAK	Backup file
LIB	Library source file
SUB	A list of commands to be executed with SUBMIT
$$$	Temporary work file
FOR	FORTRAN source file
DAT	ASCII data file
DOC	ASCII document file

REFERENCING SEVERAL FILES AT ONCE (WILDCARD FILE NAMES)

Many of the commands that you will issue refer to files by name. But when you want to issue the same command for several files with similar names, it is often more convenient to enter a "wildcard file name" with the command.

A "wildcard file name" represents several file names — much like a "joker" in a deck of cards can stand for any card in the deck. (Wildcard file names are sometimes called "ambiguous file names.") A wildcard file name contains either asterisks (*), or question marks (?), or both.

An asterisk (*) is entered in place of the entire primary name and/or extension of a file, as shown in the following example:

16MAY82.*

In this example, the asterisk replaces the extension so that this wildcard refers to files on the disk with the primary name "16MAY82" and **any** extension.

In the following example, the wildcard asterisk takes the place of the primary name:

*.COM

Therefore, all files with the extension "COM" and **any** primary name would be referenced.

The wildcard "*.*" stands for **any** file on the disk. (Actually, there are exceptional circumstances under which all of the files on a disk cannot be referenced at one time, but these circumstances will be explained in later text.)

Question marks (?) can be used in a wildcard file name to take the place of single characters at fixed file name positions. For instance, the wildcard

JOB?.HEX

would refer to any file that has the extention "HEX," a primary name with the characters "J," "O," "B," and one or fewer additional characters. Hence the files "JOB0.HEX," "JOB1.HEX," and "JOBY.HEX" are just a few of the files that could be referenced by such a wildcard (if these files existed on the disk).

You can use any number of question marks in a wildcard (up to 11) and the actual file names referenced will be those with the same characters as those that are explicitly stated in the wildcard and any characters in the place of the question mark characters.

Thus the wildcard "????????.COM" will reference any file on the disk with the "COM" extension — just like the "*.COM" wildcard.

Disk Drives

A disk drive is a device that transfers data to and from disk storage media.

DRIVE NAMES

To allow you to refer to disks and files within your disk drives, the CP/M Operating System recognizes each drive in your hardware environment by a distinct "drive name." A *drive name* consists of a letter of the alphabet in the range A through D and a colon (:).

Possible drive names are A: B: C: and D:

DEFAULT DRIVE

The *default drive* is the drive to which the system will refer unless you specifically tell the system to refer to a different drive. The default drive is also the drive named in the system prompt, which is displayed when the CP/M system is in control. (Drive A is always the default drive when you boot up, as shown by the "A>" system prompt.)

You can execute an application program that is stored as a file in the default drive by typing the primary file name of the application program file (the part without the "COM"extension) in response to the system prompt, as shown:

A>**{primary name}** CR

Where "A>" is the system prompt; and

where **{primary name}** is the primary name of the file that you want to execute. For this command to be valid, the file must reside on a disk in default drive A:, and have a "COM" extension.

If the file represented by **{primary name}** does not reside on default drive A:, then the system will display a message repeating your unfound entry with a question mark, as shown:

```
A>{primary name} CR
{primary name}?
```

This kind of error message will also occur if you use improper syntax in your entry or misspell your entry.

Changing the Default Drive

You can change the default drive by typing the name of another drive and a carriage return at the "A>" prompt, as shown:

```
A>B: ↵
```

Such an entry will produce a new system prompt, indicating that drive B: is now the default drive, as shown:

```
A>B: ↵
B>
```

NOTE: Any drive that is changed to the default drive in this fashion must be a valid drive within your hardware environment, and it must contain a floppy disk prepared by the FORMAT program. When you switch default drives in this fashion, the CP/M system will assume that any Application Program you wish to execute should be found on a disk in the new default drive.

Accessing a Non-Default Drive

A *non-default drive* is a disk drive whose name is not displayed in the system prompt. For instance, if the "A>" system prompt is displayed (meaning A: is the default drive), then your non-default drives are any valid drives with names "B:" through "D:."

When you want to execute an application program that resides on a disk in a non-default drive, type the name of the appropriate non-default drive immediately before the program's primary name and a carriage return:

```
A>B:{primary name} ↵
```

Where "A>" is the system prompt;

where **B:** is the name of the desired non-default drive; and

where {**primary name**} is the primary name of the file that you want to execute. The file must reside on a disk in non-default drive B: and have a "COM" extension.

The CP/M system would respond to such an entry by "logging in" disk B: to get the Application Program indicated by {**primary name**}, inserting an image of this program into computer memory, and executing the program.

SWITCHING DISKETTES BETWEEN DRIVES

When you reference a disk drive (by entering a command at a default drive, by changing default drives, or by logging in a non-default drive with a command), the CP/M system remembers some of the characteristics of the disk in the referenced drives. Switching diskettes between drives can cause problems unless you tell the system to forget the old characteristics.

You can make the system forget about old disk characteristics by performing a *warm boot* (by holding down the "CTRL" key and pressing the "C"). This entry is often abbreviated as **CTRL-C,** and it is usually entered in response to the "A>" system prompt. It tells the operating system to forget what it knew about the disks that used to be in the drives. Then it redisplays the system prompt.

We suggest that you perform a warm boot whenever you remove a diskette from a drive and replace it with another diskette (unless the system prompts you to insert a different diskette).

USING CP/M WITH ONE DRIVE

This release of the CP/M Operating System enables you to access disks in four drives: two 5.25-inch soft-sectored drives and two 8-inch drives. However, you do not need this many drive slots to perform multi-drive operations, because CP/M can treat your single drive as if it were two drives.

CP/M actually believes that there are two of each size drive you have. The drives that CP/M believes you have are called *logical* drives. The drives that you actually have are called *physical* drives. CP/M enables you to access information from either kind of drive by allowing the single drive to access information from different disks at different times during the same operation.

When you enter a valid command that requires more disks than you have physical drives, CP/M displays prompts that instruct you to insert the required diskettes into the physical drive at the appropriate time. The prompts appear in the form:

```
PUT DISK x IN DRIVE y: AND PRESS RETURN
```

Where `x` is the logical name that is assigned to a particular disk for the duration of the operation; and
where `y:` is the physical name given to the single drive, which is temporarily set to read data from or write data to a particular disk.

When such a prompt appears, you should remove the diskette that is already in the drive, insert the diskette that the prompt indicates, and enter a carriage return. Execution of the program will resume until the drive needs to write data to or read data from a different disk. Then a similar prompt will appear, requesting that you insert a different disk into the drive.

When switching diskettes between a drive in this manner, you do not have to perform a warm boot after a diskette switch. However, you must keep track of which diskette is which. If you insert the wrong diskette, the required data will not be found and you might have to start the operation over.

The text on "Backup Procedures One" and "Working Disk Procedures One" (intended solely for users with a single-drive Z-100 or H-100) contains instructions for putting this "logical/physical drive" concept to work.

Commands

In general, a command is a program that can help you to create, change, analyze, or move data. Commands are entered in response to a "system prompt."

A *system prompt* consists of the letter for the default drive and the greater-than (>) character. When you start up CP/M, the system prompt is displayed on your console, as shown:

```
A>
```

The system prompt tells you that CP/M is ready to receive a command in the form of a "command line."

COMMAND LINES

A command line is the form of response you make to the system prompt to bring up, or "invoke," a command. A command line usually consists of three components: the "function," the "argument(s)," and the "carriage return." The function is entered first, and it indicates the activity that will be performed. The first argument is entered one space after the function. The argument indicates what data (files, systems, disks, drives, etc.) the function's activity should be performed upon. Each following argument is separated by one space from the preceding one. After entering the function and argument, you must enter a carriage return to tell CP/M that the entire command line is ready for execution.

You will enter command lines in the following form:

A>**{function}** **{argument}** **{argument}...**CR

Where "A>" is the system prompt;

where **{function}** is mandatory for all commands;

where **{argument}** **{argument}...** is optional for some commands; and

where CR is mandatory for all commands.

Always separate the command line function and the command line argument with one space. Furthermore, any command entered at a prompt that includes the ">" character must end with a carriage return. However, commands themselves often display prompts as well. And when such a prompt ends with a colon (:), a carriage return is usually not required for CP/M commands and utilities.

NOTE: In this text, the entry of a carriage return will be illustrated with the symbol "CR."

There are two kinds of commands that can be executed in a CP/M operating environment: Resident Commands and Transient Commands.

RESIDENT COMMANDS

Resident commands reside within the CP/M operating system. Therefore, CP/M doesn't have to refer to a disk to know how to execute these commands — although the commands themselves might affect data that **is** on a disk.

The CP/M Operating System contains the following resident commands:

DIR Displays the names of files that reside on a disk.

ERA Erases specified files from a disk.

REN Renames a specified file on a disk.

SAVE Saves the contents of computer memory space by creating a file on a disk.

TYPE Displays the contents of a file on the terminal.

USER Enables you to divide the space on a disk into separate areas for different users.

This list shows only the command line function of the resident commands. See "The CP/M-85 Reference Guide" for a comprehensive explanation of the arguments used when these commands are entered.

TRANSIENT COMMANDS

Transient commands are application programs that are supplied with the CP/M Operating System on your CP/M distribution software. These application programs help you to manipulate the operating system and to perform several other useful microcomputer activities.

These commands (also known as "utilities") are stored on the disk as files with the "COM" extension. When you issue a command that makes reference to one of these files, CP/M copies an image of this file from the appropriate disk, puts this image into one of CP/M's hollow areas inside the computer, and begins execution of the transient command.

The following list shows the files containing all of the transient commands offered by Heath/Zenith for CP/M Version 2.2.100.

ASM.COM	LOAD.COM
BSYSGEN.COM	MVCPM207.COM
CONFIGUR.COM	PIP.COM
DDT.COM	PREL.COM
DUMP.COM	STAT.COM
DUP.COM	SUBMIT.COM
ED.COM	SYSGEN.COM
FORMAT.COM	XSUB.COM
LIST.COM	

To use a transient command in a command line, you type the primary file name of the file that contains this command. This primary name is the command line function.

"Section Two: Software Preparation Procedures" provides step-by-step instructions for entering transient command lines. "The CP/M Reference Guide" provides further details on all aspects of these commands.

BIOS SOURCE FILES

Distribution Disk II contains the source code files used to produce BIOS85.SYS and BIOS88.SYS. These files are supplied for the benefit of assembly language system programmers, and they will not be needed by most users. Many of the files on Disk II are written in 8086 assembly language and require the Digital Research 8086 assembler (not included, available from Digital Research as part of CP/M-86) for re-assembly.

COMMAND LINE ENTRY

The CP/M Operating System is very precise in the way it accepts command lines. You must spell all components of a command line correctly and include the names of non-default disk drives whenever a referenced file is not on the default disk. If you don't, CP/M will not be able to execute your command and will respond by redisplaying the invalid command line with a question mark (?). However, CP/M does allow some flexibility in the way you may respond to the system prompt, as the following special entry explanations show.

NOTE: In this text, "CTRL" followed by a hyphen and a letter (CTRL-S, CTRL-C, CTRL-P for example) indicates that you should hold down the key marked CTRL (control key) while pressing the key marked with the letter.

The following list explains the single keys and combinations of keys that you can press to edit a command line before submitting it to CP/M for execution.

DELETE — Removes the previous character typed from the command line. Depending on how your Operating System is adjusted, the removed characters might be echoed (repeated in reverse) on the video console display, or erased from the display.

BACK SPACE — Removes the character typed previously. Also removes any "DELETED" characters that were echoed in the line immediately to the left of the cursor.

CTRL-H — Same as "BACK SPACE."

CTRL-X — Removes all characters typed in the command line, as if you used "BACK SPACE" all the way to the beginning of the line.

CTRL-U — Effectively removes all characters typed in the command line, and allows you to try again on the line beneath the old line. It leaves the display of the old command line on the console, and displays the "#" character at the end of this old line to label it as a nullified entry.

CTRL-R — Redisplays the edited version of a command line below the "scratch pad" version of the line without any of the "DELETED" characters that might have been echoed in the line. Also displays the "#" character at the end of the "scratch pad" version.

The following list explains the single keys and combinations of keys that you can press to end a command line and submit it to CP/M for execution.

RETURN Ends the command line, sends the command to the system for execution, displays nothing on the console. After execution of the command, CP/M redisplays system prompt. In this manual, the symbol ⏎ will often be used in examples and instructions to remind you to make this entry at the end of a command line.

CTRL-J Same as "RETURN."

CTRL-M Same as "RETURN."

The following list explains the single keys and combinations of keys that you can press to change the way in which CP/M executes your command line:

CTRL-S When these keys are pressed once the display of data to the console is interrupted, pressing the keys a second time allows CP/M to resume data display. This entry is useful when data scrolls by on a console too quickly for you to read it. "The CP/M Reference Guide" explains the commands during which it is safe and useful to make this entry.

CTRL-P Causes CP/M to send everything it displays on the console device to the list device (LST:) at the same time. (The list device is usually a printer.) Making this entry a second time will stop the display to the list device. This entry is useful when you want to record the displays that appear during the execution of a command on paper.

The routing of console displays to the list device will continue during and after the execution of any resident command or transient commands STAT and DUMP. This data routing will remain in effect during (not after) the execution of any other transient command except SUBMIT and XSUB. This entry will not cause data routing to the list device during the execution of most other application programs either.

If you type a CTRL-P entry while your list device is disconnected, turned off, in a local mode, or off line, the system will not be able to send data to the device. Also neither the ^P entry nor CTRL-P will work if your system is not adjusted to operate your printer.

The following entry enables you to enter an unusually long command line:

CTRL-E Enables you to see the entire display of a command line that is longer than your screen is wide. When you type this entry, the remaining portion of your command line will be displayed at the lefthand end of the next screen line.

This entry will not send your command line to the system for execution (as a "RETURN" entry would). It is not essential that you enter CTRL-E when typing a command line that exceeds console display range because CP/M will process your command line even if it does not fit on one screen line.

Even if you type CTRL-E entries, a command line cannot exceed 127 characters in length. If you type a 127th character in a command line, CP/M will automatically append a carriage return and try to execute your command line based upon the first 127 characters.

The following entries enable you to enter comments that CP/M will ignore:

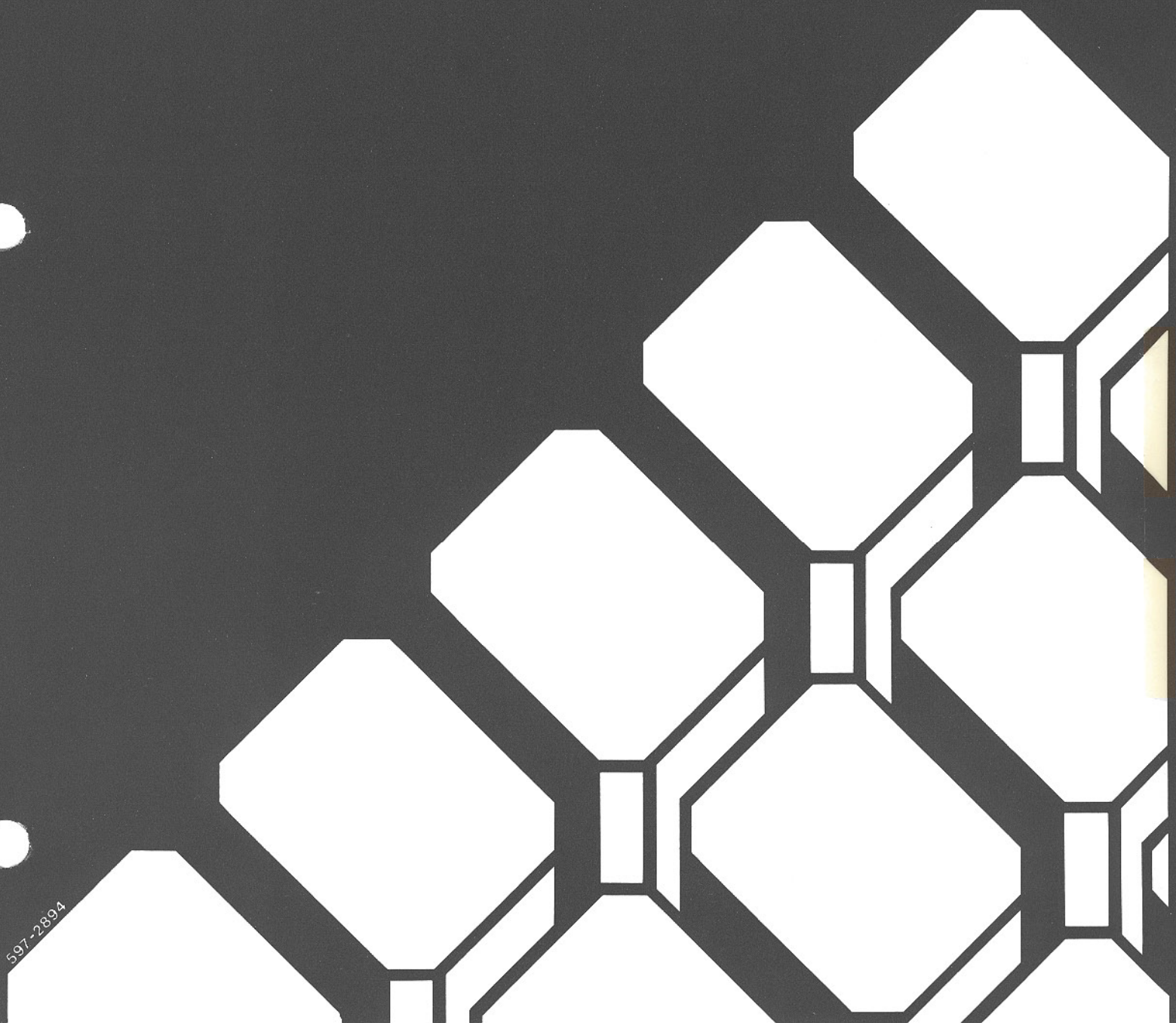
; (The semicolon.) Enables you to enter comments not intended for execution without receiving error feedback from CP/M. To cause CP/M to ignore a comment, you must make the ";" the first character entered at the system prompt. Comments can consist of any characters you wish, typed after the ";" entry, and followed by a ⓒⓡ or CTRL-U or CTRL-X.

: (The colon) Same as ";" (semicolon), except that you should not begin a comment line with two consecutive colons.

The following entries enable you to rapidly skip several spaces in a command line or comment:

TAB As with a regular typewriter, this key enables you to advance several spaces without pressing the space bar several times. It skips to the eighth column of the console display range or to some column numbered by a multiple of eight. Hence if you enter a TAB at the beginning of a command line, you will skip six columns (because the system prompt takes up two columns). If you immediately enter another TAB, you will skip an additional eight columns, and so forth.

CTRL-I Same as "TAB."



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Section Two

Software Preparation Procedures

This part of the manual provides the following three procedures for preparing your CP/M software so that it works efficiently with your hardware.

- **Start-Up Procedure:** Helps you to prepare your microcomputer hardware for use, and to load the CP/M Operating System into your micrcomputer.

- **Backup Procedures:** Help you to copy and customize your CP/M distribution software onto backup disks, to protect your software investment.

- **Working Disk Procedures:** Help you to combine useful application programs on a customized bootable disk.

Every user should perform one start-up procedure, one backup procedure, and one working disk procedure after receiving CP/M distribution software.

These procedures contain several examples of user interaction with a microcomputer. In these examples, displays presented on the microcomputer console will be represented by the following typestyle:

```
THIS TYPESTYLE represents console displays

        (0123456789#$*?:=.A>)
```

User input (the characters that you type through the console) will be represented by boldface type, as shown:

BOLDFACE TYPE represents the things you type

(0123456789#$*?:=[.])

When you should enter a carriage return by pressing the key marked "RETURN," the example will show the symbol ⓒⓡ .

In many instances, the exact text of a display will vary by a few characters. This manual often substitutes a few letters in place of exact characters where variations are likely to occur. For instance, this manual will illustrate a program's serial number as "Serial number sss-sssss," while your terminal might actually display it as "Serial number 357-81469."

In cases where the exact characters you type will vary, this manual presents a description of the necessary characters within curved braces, { }. Hence, this manual might instruct you to make an entry in the form "**B:=A:{file name.ext}** ⓒⓡ ," when your entry might actually be "**B:=A:CONFIGUR.COM** ⓒⓡ ."

If you have trouble performing a procedure or if you obtain an error message, then refer to "The CP/M-85 Reference Guide." The reference guide contains comprehensive explanations of each utility. If you encounter an error message that is not explained in the reference guide, then consult "Appendix A: Operating System Error Messages."

START-UP PROCEDURE

This procedure will explain the sequence of steps necessary for starting up a session of CP/M use. This sequence includes the preparation of your hardware devices, the insertion of a bootable disk into the appropriate drive, and the movement of a copy of the CP/M operating system from a disk into your microcomputer's memory.

The most significant step in this sequence is the movement of CP/M from a disk into the microcomputer. This step is known as "bootstrapping" or "cold booting." You will perform this step at least once each time you use CP/M in your microcomputer. Once inside your microcomputer, CP/M can control an application program or perform one of the many tasks within its own repertoire.

This procedure consists of several steps to help you start up the CP/M Operating System in your Z-100 microcomputer. After you have unpacked your computer and connected any peripheral device to it according to the procedures given in the Z-100 Series User's Manual, proceed with the following steps.

NOTE: Your Z-100 computer is equipped with an automatic bootstrap feature. When your Z-100 is shipped, this feature is set to boot up immediately when the computer is powered up or reset. Therefore, a manual bootstrap command is not necessary during the start-up procedure. For more information about booting up with the Z-100, see "Appendix B: Bootstrap."

1. Make certain that the power cords and transmission cables to all of your hardware devices are securely plugged into the proper receptacles. (Refer to the manual of each hardware device for assistance.)

2. Turn on the power switches to all of your hardware devices. Within a few seconds, the red light on your drive will glow.

3. Place CP/M Distribution Disk I into the lefthand drive (if you have a Low-Profile Z-100) or into the upper drive (if you have an All-in-One Z-100), and close the drive door.

   Within a few more seconds, a CP/M-85 identification message and system prompt will be displayed in the following form:

```
CP/M-85 VERSION 2.2.100 07/07/82

A>
```

You have successfully booted the CP/M-85 Operating System. The "A>" system prompt indicates that the system is waiting for you to enter a command. Proceed to "Backup Procedures," Page 1-32.

NOTE: If a message and prompt in this form do not appear, take one of the following steps:

- If nothing appears on the screen, hold down the **CTRL** key while pressing the **RESET** key to reset the computer. The bootstrapping procedure should resume automatically and cause display of the message and prompt.

- If a pointed finger prompt appears on the upper lefthand corner of the screen, then the automatic bootstrapping attempt was aborted. You must now enter a manual bootstrap command, as explained in "Appendix B: Bootstrap." (In general, manual bootstrapping can be performed by pressing the **B** key and then ⏎.)

- If these steps continually fail to produce any screen display, refer to the section entitled "In Case of Difficulty" in the Z-100 Series User's Manual.

BACKUP PROCEDURES

A CP/M backup disk is a disk that contains all of the data that is stored on a CP/M distribution disk.

We strongly recommend that you make backup disks the first time you boot up with CP/M distribution software. A backup disk will help you to protect your software investment, because it is subjected to daily use while your distribution disks are stored safely away.

Because Heath/Zenith offers such a wide range of hardware, this manual contains two different backup procedures:

Backup Procedure One is for users with a single-drive Z-100 or H-100.

Backup Procedure Two is for users with a double-drive Z-100 or H-100.

Turn to and follow the backup procedure specified for your computer. Use only one backup procedure.

If you feel that you can perform the procedure without step-by-step instructions, then you can use the "Procedure Synopsis" at the beginning of the procedure for an overview of the activities involved.

Backup Procedure One

For users with a single-drive Z-100 or H-100

To perform this procedure, you must have the following:

- A Z-100 or H-100 microcomputer with only one inboard drive
- Two CP/M-85 Distribution Disks (version 2.2.100)
- Two blank, 5.25-inch, soft-sectored, double-sided, double-density, disks

During this procedure you will prepare the blank disks for data storage, copy the CP/M Operating System and files to the blank disks, and customize the system. Thus the blank disks will become replicas of the CP/M Distribution Disks.

The single-drive backup procedure requires a large number of disk exchanges. To avoid confusion, clearly label your destination (backup) disks prior to starting this process.

To prepare for this procedure, label one blank disk "CP/M-85 Backup Disk I" and the other "CP/M-85 Backup Disk II".

NOTE: The blank disks that you will convert into CP/M Backup Disks should be write-enabled during this entire procedure. Therefore, do not cover the notches of these blank disks with write-protect tabs. However, the CP/M Distribution Disks should be write-protected; so leave the notches of these disks covered by tabs, as shipped.

PROCEDURE SYNOPSIS

This procedure requires you to perform the following activities in sequence:

booting up
FORMAT
DUP
CONFIGUR

To begin Procedure One, boot up with Distribution Disk I in the computer's inboard disk drive. Proceed to the FORMAT activity.

FORMAT

This FORMAT activity helps you prepare blank disks for data storage.

1. At the A> system prompt, type **FORMAT** and press ⏎. This entry invokes FORMAT, which displays the following:

```
CP/M-85 Format Version 2.2.100

This program is used to initialize a disk.
All information currently on the disk will be destroyed.
Is that what you want? (y/n):
```

2. Type **Y**. FORMAT will display:

```
Which drive do you wish to use for this operation?
```

3. Type **B**. FORMAT will display:

```
Number of sides? (1=single, 2=double):
```

4. Type **2**. FORMAT will display the following message:

```
Put the disk you wish to be formatted in drive B.
Press RETURN to begin, anything else to abort.
```

5. Remove Distribution Disk I, and replace it with Backup Disk I. Then close the disk drive, and press ⏎. Then FORMAT will display:

```
PUT DISK B IN DRIVE A: AND PRESS RETURN
```

6. Leave Backup Disk I in the drive, and press ⏎. The light on the disk drive will glow for more than one minute while the disk is being formatted.

```
Do you have more disks to format? (y/n):
```

7. Type **Y** at this prompt. FORMAT will display:

```
Which drive do you wish to use for this operation?:
```

8. Type **B**. FORMAT will display:

```
Number of sides? (1=Single, 2=Double):
```

9. Type **2**. FORMAT will display the following message:

```
Put the disk you wish to be formatted in drive B.
Press RETURN to begin, anything else to abort.
```

10. Remove Backup Disk I and replace it with Backup Disk II. Then close the disk drive, and press ⏎. The light on the disk drive will glow for several seconds. Then FORMAT will display:

```
Do you have more disks to format? (y/n):
```

11. Type **N** at this prompt. FORMAT will display:

```
PUT DISK A IN DRIVE A: AND PRESS RETURN
```

12. Remove Backup Disk II and insert Distribution Disk I. Then press ⏎. CP/M will display the system prompt:

```
A>
```

With Distribution Disk I in the drive, proceed to DUP.

DUP

NOTE: Creating a backup copy of your Distribution Disk on a system having only one drive is an extremely lengthy process taking 15 to 20 minutes during which time you will be instructed to replace the disks more than 320 times. Should you mix up the source and destination disk during this procedure, DUP will continue with displaying an error message.

The DUP utility copies all of the data from one disk to another disk of the exact same type.

1. At the A> prompt, type **DUP** and press ⓒⓡ. DUP will display the following:

```
Disk Utility Program
Version 2.2.100

Do you want to:

   A  copy and verify
   B  copy only
   C  verify only

   Z  exit to operating system

Selection:
```

2. Type **A**. DUP will display:

```
Source unit:
```

3. Type **A**. DUP will display:

```
Destination unit:
```

4. Type **B**. DUP will display:

```
Put source disk in drive A.
Put destination disk in drive B.

Press RETURN to begin:
```

5. Ignore the "Put destination disk" prompt (since there is no physical drive B). Since Distribution Disk I is the "source disk" for this operation (and since it already resides in the drive), press ⓒⓡ. The following prompt will appear:

```
PUT DISK B IN DRIVE A: AND PRESS RETURN
```

6. Remove Distribution Disk I from the drive, insert Backup Disk I, close the drive latch, and press ⓒⓡ. Soon a similar prompt will appear:

```
PUT DISK A IN DRIVE A: AND PRESS RETURN
```

7. Temporarily assign the following identities to your disks:

   Distribution Disk I is "DISK A" and
   Backup Disk I is "DISK B."

   Insert these disks alternately, as specified in the prompts.

   When the copy operation is finished, DUP will display:

   ```
   Copy finished.
   ```

   After copying, DUP will automatically start to verify the accuracy of the copy operation. Continue to insert the appropriate disks as prompted. When the verification operation is finished, DUP will display:

   ```
   Verification finished.
   ```

   Then DUP will redisplay the selection menu.

8. Type **A**. DUP will display:

   ```
   Source unit:
   ```

9. Type **A**. DUP will display:

   ```
   Destination unit:
   ```

10. Type **B**. DUP will display:

    ```
    Put source disk in drive A.
    Put destination disk in drive B.

    Press RETURN to begin:
    ```

11. Ignore the "Put destination disk" prompt (since there is no physical drive B). Insert Distribution Disk II as the "source disk" for this duplication operation and press CR. Soon the following prompt will appear:

    ```
    PUT DISK B IN DRIVE A: AND PRESS RETURN
    ```

12. Remove Distribution Disk II from the drive, insert Backup Disk II, close the drive latch, and press CR. Soon a similar prompt will appear:

    ```
    PUT DISK A IN DRIVE A: AND PRESS RETURN
    ```

13. Temporarily assign the following identities to your disks:

    Distribution Disk II is "DISK A"; and
    Backup Disk II is "DISK B."

    Insert these disks alternately, as specified in the prompts.

    When the copy operation is finished, DUP will display:

    ```
    Copy finished.
    ```

    After copying, DUP will automatically start to verify the accuracy of the copy operation. Continue to insert the appropriate disks as prompted. When the verification operation is finished, DUP will display:

    ```
    Verification finished.
    ```

    Then DUP will redisplay the selection menu.

14. Type **Z** at the DUP selection menu. DUP will display the following prompt:

    ```
    Place a bootable disk in drive A and type any character:
    ```

15. Insert Backup Disk I in the drive, and type any keyboard character. The following prompt will be displayed:

    ```
    PUT DISK A IN DRIVE A: AND PRESS RETURN
    ```

16. Leave Backup Disk I in the drive, and press ⓒⓡ. CP/M will display the system prompt, as shown:

    ```
    A>
    ```

17. Store your distribution software away in a safe place. Use your backup software for all future activities.

Proceed to CONFIGUR.

CONFIGUR

The CONFIGUR utility adjusts the CP/M Operating System on Backup Disk I for your hardware.

NOTE: You should skip the CONFIGUR activity and proceed to "Working Disk Procedure One" on Page 1-51 if you do not have a printer or modem, or if you have one of the following:

- A serial printer (such as the Z-25 or the H-25) that runs at 4800 baud, accepts 8 bits per character with no parity bit, handshakes with RTS pin number 4, is ready when handshaking signal is High, and has no protocol.

- A modem (such as the WH-13, the Lexicon WH-23, the UDS WH-33, or the Hayes WH-43) that runs at 300 baud, accepts 8 bits per character with no parity bit, and uses no handshaking.

If you have a printer and/or modem that is **not** listed in these descriptions, then begin this activity at Step 1.

1. Type **CONFIGUR** ⏎. CONFIGUR will display the following menu:

```
CP/M-85 System Configuration Utility version 2.2.100
      Copyright© 1982 by Zenith Data Systems

                *** MAIN MENU ***

          P - Printer Configuration
          M - Modem Configuration
          C - Command Configuration
          I - I/O Map Configuration
          ? - Brief Help Message

          X - Exit

     Selection [P,M,C,I,X or ?] :
```

Type **P** and ⏎. CONFIGUR will display the following menu:

```
                    *** Printer Configuration ***

  1 - MX-80 or other PARALLEL Centronics-interface printer
  2 - H/Z-25
  3 - H-14 or TI-810(WH-24)
  4 - Dec LA-34 or LA-36
  5 - Diablo 620
  6 - Diablo 630,1610,1620,1630 or 1640(WH-44)
  7 - MX-80 Serial
  8 - Votrax Type 'n Talk
  9 - User-defined SERIAL Printer

Please choose the number that corresponds to your printer :
```

3. Enter the number to the left of your printer's name and ⏎. CONFIGUR will display a message listing some characteristics of your printer. If these characteristics do not match those of your printer, either change your printer settings (see printer manual) or specify characteristics of a user-defined printer (see CONFIGUR section in "Reference Guide").

   NOTE: If your printer is not listed by name in the "Printer Selection" menu, press **9** and ⏎, and refer to the Reference Guide for instructions.

4. When the message listing the characteristics of your printer is displayed, press ⏎ at the "Press RETURN to see Main Menu:" prompt. CONFIGUR will redisplay the "MAIN MENU."

NOTE: If you have a modem that is **not** set with standard Heath/Zenith characteristics, refer to the CONFIGUR text in "The CP/M Reference Guide" Page 2-43 and Page 2-51.

5. Type **X** and ⏎ at the "MAIN MENU." CONFIGUR will display the following menu:

```
                    *** EXIT OPTIONS ***

T - Make changes temporary (to memory only)
P - Make changes permanent (to memory and disk)
Q - Make no changes

? - Brief Help Message

Choice [T,P,Q or ?]:
```

6. Type **P** and ⏎ to apply the specified changes to the system, and to record this system on the disk in drive A. CONFIGUR will either display one or two graphics depicting the rear panel of your Z-100 computer, or relinquish control to the CP/M system.

7. If CONFIGUR displays the "Z-100 Rear Panel" graphic, then attach your printer and/or modem cables as shown in the graphic.

   If CP/M immediately displays the system prompt, proceed to Step 8.

8. If you have a printer, test it by holding down the **CTRL** and pressing the **P** key. Then press ⏎ a few times. Your printer (if properly configured and connected) should print system prompts just as they are displayed to the video screen. Then enter **CTRL-P** again to discontinue this printer test.

You have just finished your backup procedure, in which you duplicated the information from your distribution software and configured the system on one of the backup disks.

Proceed to "Working Disk Procedure One" on Page 1-51.

Backup Procedure Two

FOR USERS WITH A DOUBLE-DRIVE Z-100 OR H-100

To perform this procedure, you must have the following:

- A Z-100 or H-100 microcomputer with two inboard drives
- Two CP/M-85 Distribution Disks (version 2.2.100)
- Two blank, 5.25-inch, soft-sectored, double-sided, double-density, disks

During this procedure you will prepare the blank disks for data storage, copy the CP/M Operating System and files to the blank disks, and customize the system. Thus the blank disks will eventually become usable replicas of the CP/M Distribution Disks.

To prepare for this procedure, label one blank disk "CP/M-85 Backup Disk I", and the other "CP/M-85 Backup Disk II."

NOTE: The blank disks that you will convert into CP/M Backup disks should be write-enabled during this entire procedure. Therefore, do not cover the notches of these blank disks with write-protect tabs. However, the CP/M Distribution Disks should be write-protected, so leave the notches of these disks covered by tabs, as shipped.

PROCEDURE SYNOPSIS

This procedure requires you to perform the following activities in sequence:

booting up
FORMAT
DUP
CONFIGUR

To begin Procedure Two, insert Distribution Disk I in the left or upper disk drive of the computer (drive A), and insert Backup Disk I in the computer's remaining drive (drive B). Boot up the system.

Proceed to the FORMAT activity.

FORMAT

This FORMAT activity helps you prepare blank disks for data storage.

1. At the A> System Prompt, type **FORMAT** and press ㊞ . This entry invokes FORMAT, which displays the following:

```
CP/M-85 Format Version 2.2.100

This program is used to initialize a disk.
All information currently on the disk will be destroyed.
Is that what you want? (y/n):
```

2. Type **Y**. FORMAT will display:

```
Which drive do you wish to use for this operation?
```

3. Type **B**. FORMAT will display:

```
Number of sides? (1=single, 2=double):
```

4. Type **2**. FORMAT will display the following message:

```
Put the disk you wish to be formatted in drive B.
Press RETURN to begin, anything else to abort.
```

5. Check to make certain that Backup Disk I is in drive B, and press ㊞. The light on the disk drive will glow for more than a minute, as the disk is being formatted. Then FORMAT will display:

```
Do you have more disks to format? (y/n):
```

6. Type **Y** at this prompt. FORMAT will display:

```
Which drive do you wish to use for this operation?
```

7. Type **B**. FORMAT will display:

```
Number of sides? (1=Single, 2=Double):
```

8. Type **2**. FORMAT will display the following message:

```
Put the disk you wish to be formatted in drive B.
Press RETURN to begin, anything else to abort.
```

9. Remove Backup Disk I, from drive B, and replace it with Backup Disk II. Then close the disk drive, and press ⏎. The light on the disk drive will glow for more than a minute while the disk is being formatted. Then FORMAT will display:

```
Do you have more disks to format? (y/n):
```

10. Type **N** at this prompt. CP/M will display:

```
A>
```

Leave Distribution Disk I in drive A, insert Backup Disk I into drive B, and proceed to DUP.

DUP

The DUP utility copies all of the data from one disk to another disk of the exact same type.

1. At the A> prompt, type **DUP** and press ⏎. DUP will display the following:

```
Disk Utility Program
Version 2.2.100

Do you want to:

   A  copy and verify
   B  copy only
   C  verify only

   Z  exit to operating system

Selection:
```

2. Type **A**. DUP will display:

```
Source unit:
```

3. Type **A**. DUP will display:

```
Destination unit:
```

4. Type **B**. DUP will display:

```
Put source disk in drive A.
Put destination disk in drive B.

Press RETURN to begin:
```

5. Check to make certain that Distribution Disk I is in drive A, and that Backup Disk I is in drive B. Then press ⏎. When the copy operation is finished, DUP will display:

```
Copy finished.
```

   After copying, DUP will automatically start to verify the accuracy of the copy operation. When the verification operation is finished, DUP will display:

```
Verification finished.
```

   Then DUP will redisplay the selection menu.

6. Type **A**. DUP will display:

```
Source unit:
```

7. Type **A**. DUP will display:

```
Destination unit:
```

8. Type **B**. DUP will display:

```
Put source disk in drive A.
Put destination disk in drive B.

Press RETURN to begin:
```

9. Insert Distribution Disk II into drive A, insert Backup Disk II into drive B, and press ⓒⓡ. When the copy operation is finished, DUP will display:

```
Copy finished.
```

   After copying, DUP will automatically start to verify the accuracy of the copy operation. When the verification operation is finished, DUP will display:

```
Verification finished.
```

   Then DUP will redisplay the selection menu.

10. Type **Z** at the DUP selection menu. CP/M will display the system prompt, as shown:

```
A>
```

11. Store your distribution software in a safe place, and insert Backup Disk I in drive A.

Proceed to CONFIGUR.

CONFIGUR

The CONFIGUR utility adjusts the CP/M Operating System on Backup Disk I for your hardware.

NOTE: You should skip the CONFIGUR activity and proceed to "Working Disk Procedure Two" on Page 1-56 if you do not have a printer or modem, or if you have one of the following:

- A serial printer (such as the Z-25 or the H-25) that runs at 4800 baud, accepts 8 bits per character with no parity bit, handshakes with RTS pin number 4, is ready when handshaking signal is High, and has no protocol.

- A modem (such as the WH-13, the Lexicon WH-23, UDS WH-33, or the Hayes WH-43) that runs at 300 baud, accepts 8 bits per character with no parity bit, and uses no handshaking.

If you have a printer and/or modem that is **not** listed in these descriptions, then begin this activity at Step 1.

1. Type **CONFIGUR** ㊞. CONFIGUR will display the following menu:

```
CP/M-85 System Configuration Utility version 2.2.100
     Copyright(c) 1982 by Zenith Data Systems

              *** MAIN MENU ***

        P - Printer Configuration
        M - Modem Configuration
        C - Command Configuration
        I - I/O map Configuration
        ? - Brief Help Message

        X - Exit

    Selection [P,M,C,I,X or ?]:
```

2. Type **P** and ㊐. CONFIGUR will display the following menu:

```
                *** Printer Configuration ***

    1 - MX-80 or other PARALLEL Centronics-interface printer
    2 - H/Z-25
    3 - H-14 or TI-810(WH-24)
    4 - Dec LA-34 or LA-36
    5 - Diablo 620
    6 - Diablo 630,1610,1620,1630 or 1640(WH-44)
    7 - MX-80 Serial
    8 - Votrax Type 'n Talk
    9 - User-defined SERIAL Printer

  Choose the number that corresponds to your printer :
```

3. Enter the number to the left of your printer's name and ㊐. CONFIGUR will display a message listing some characteristics of your printer. If these characteristics do not match those of your printer, either change your printer settings (see printer manual) or specify characteristics of a user-defined printer (see CONFIGUR section in the "Reference Guide").

   NOTE: If your printer is not listed by name in the "Printer Configuration" menu, press **9** and ㊐, and refer to the "Reference Guide" for instructions.

4. When the message listing the characteristics of your printer is displayed, press ㊐ at the "Press RETURN to access Main Menu:" prompt. CONFIGUR will redisplay the "Configur Main Menu."

NOTE: If you have a modem that is **not** set with standard Heath/Zenith characteristics, refer to the CONFIGUR text in "The CP/M Reference Guide" on Page 2-43 and Page 2-51.

5. Type **X** and ⏎ at the "Configur Main Menu". CONFIGUR will display the following prompt:

```
                    *** EXIT OPTIONS ***

T - Make changes temporary (to memory only)
P - Make changes permanent (to memory and disk)
Q - Make no changes

? - Brief Help Message

Choice [T,P,Q or ?]:
```

6. Type **P** and ⏎ to apply the specified changes to the system, and to record this system on the disk in drive A. CONFIGUR will either display a graphic depicting the rear panel of your Z-100 computer, or relinquish control to the CP/M system.

7. If CONFIGUR displays any "Z-100 Rear Panel" graphics, then attach your printer and/or modem cables as shown in the graphic.

   If CONFIGUR immediately relinquishes control to the CP/M system, CP/M will display the system prompt.

8. If you have a printer, test it out by holding down the **CTRL** key and pressing the **P** key. Then press ⏎ a few times. Your printer (if properly configured and connected) should print system prompts just as they are displayed to the video screen. Then enter **CTRL-P** again to discontinue this printer test.

You have just finished your backup procedure, in which you duplicated the information from your distribution software and configured the system on one of the backup disks.

Proceed to "Working Disk Procedure Two" on Page 1-56.

WORKING DISK PROCEDURES

A *working disk* is a disk that contains both a customized CP/M Operating System and useful application programs.

Most users find working disks to be convenient, if not essential, because combining the operating system and application programs on the same disk makes it quicker and easier to access vital programs and/or data.

Because Heath/Zenith CP/M-85 supports such a wide range of hardware items, this manual contains two procedures for making a Working Disk:

Working Disk Procedure One is for users with a single-drive Z-100 or H-100.

Working Disk Procedure Two is for users with a double-drive Z-100 or H-100.

Turn to and follow the working disk procedure specified for your hardware environment. Use only one procedure.

If you feel you can perform the procedure without step-by-step instructions, then you can use the "Procedure Synopsis" at the beginning of the procedure for an overview of the activities involved.

Working Disk Procedure One

FOR USERS WITH A SINGLE-DRIVE Z-100 OR H-100

To perform this procedure, you must have the following:

- A Z-100 or H-100 microcomputer with only one inboard drive.
- CP/M-85 Backup Disk I (version 2.2.100).
- A blank, 5.25-inch, soft-sectored, double-sided, double-density, disk.
- Any number of Application Program Disks containing software designed for use under Heath/Zenith CP/M-85.

During this procedure, you will prepare the blank disk for data storage, copy the CP/M Operating System to it, and copy application program files to it from an Application Program Disk.

To prepare for this procedure, label the blank disk with the name(s) of the application program(s) you plan to copy, and with the words "Working Disk."

NOTE: The blank disk that you will convert into a working disk should be write-enabled during this entire procedure. Therefore, do not cover the notch of this blank disk with a write-protect tab.

PROCEDURE SYNOPSIS

This procedure requires you to perform the following activities in sequence:

booting up
FORMAT
SYSGEN
PIP

To begin Procedure One, boot up with CP/M Backup Disk I in the computer's left or upper disk drive. Proceed to the FORMAT activity.

FORMAT

This FORMAT activity helps you prepare blank disks for data storage.

1. At the A> system prompt, type **FORMAT** and press ⏎. This entry invokes FORMAT, which displays following:

```
CP/M-85 Format Version 2.2.100

This program is used to initialize a disk.
All information currently on the disk will be destroyed.
Is that what you want? (y/n):
```

2. Type **Y**. FORMAT will display:

```
Which drive do you wish to use for this operation?
```

3. Type **B**. FORMAT will display:

```
Number of sides? (1=single, 2=double):
```

4. Type **2**. FORMAT will display the following message:

```
Put the disk you wish to be formatted in drive B.
Press RETURN to begin, anything else to abort.
```

5. Remove Backup Disk I and replace it with the working disk. Then close the disk drive door, and press ⏎. Then FORMAT will display:

```
PUT DISK B IN DRIVE A: AND PRESS RETURN
```

6. Leave the working disk in the drive, and press ⏎. The light on the disk drive will glow for more than one minute while the disk is being formatted. Then FORMAT will display:

```
Do you have more disks to format? (y/n):
```

7. Type **N** at this prompt. FORMAT will display:

```
PUT DISK A IN DRIVE A: AND PRESS RETURN
```

8. Remove the working disk, and insert Backup Disk I. Then press ⏎. Then CP/M will display the system prompt.

```
A>
```

With Backup Disk I in the drive, proceed to SYSGEN.

SYSGEN

Use the SYSGEN utility to copy the CP/M Operating System to the working disk from the Backup Disk.

1. At the A> prompt, type **SYSGEN** and press ⏎. The SYSGEN utility will display the message:

```
CP/M-85 SYSGEN VER 2.2.100
SOURCE DRIVE NAME (OR RETURN TO SKIP):
```

2. At this prompt type **A**. SYSGEN will display:

```
SOURCE ON A, THEN TYPE RETURN
```

3. Press ⏎. SYSGEN will display:

```
FUNCTION COMPLETE.
COPY BIOS88.SYS & BIOS85.SYS (Y/N):
```

4. Type **Y**. SYSGEN will display:

```
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

5. Type **B**. SYSGEN will display:

```
DESTINATION ON B, THEN TYPE RETURN
```

6. Press ⏎. SYSGEN will display the following prompt:

```
PUT DISK B IN DRIVE A: AND PRESS RETURN
```

7. Remove Backup Disk I, insert the working disk, and press ⏎. SYSGEN will display:

```
FUNCTION COMPLETE.
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

8. Press ⏎. SYSGEN will display the following prompt:

```
PUT DISK A IN DRIVE A: AND PRESS RETURN
```

9. Remove the working disk, and insert Backup Disk I. Then press ⏎. CP/M will display:

```
A>
```

With Backup I in the drive, proceed to PIP.

PIP

The PIP activity will help you to copy application program files from Application Program Disks to your working disk.

1. Type **PIP B:=A:PIP.COM[V]** ⏎.

2. Insert "Disk A" (Backup Disk I) and "Disk B" (working disk) as prompted, until the system prompt appears.

3. Reset the computer by holding down the **CTRL** key while pressing the **RESET** key.

4. Boot up with the working disk.

5. Type **PIP** ⏎ at the "A>" system prompt. This entry invokes PIP, which will display the "*" prompt.

6. Type **A:=B: {file name.ext}[V]** ⏎ at the "*" prompt; where {filename.ext} is the name of a file you wish to copy from the Application Program Disk to the working disk.

7. Insert "DISK A" (working disk) and "DISK B" (Application Program Disk) as prompted. When finished copying the file, PIP will redisplay the "*" prompt.

8. For each application program you wish to copy from the **same** Application Program Disk, repeat Steps 6 and 7.

   For each application program you wish to copy from a **different** Application Program Disk, press ⏎ at the "*" prompt and repeat Steps 5, 6, and 7.

9. Hold down the **CTRL** key and press the **C** key to return to the CP/M Operating System.

You now have a working disk, containing a fully customized CP/M Operating System and some useful application programs.

Working Disk Procedure Two

FOR USERS WITH A DOUBLE-DRIVE Z-100 OR H-100.

To perform this procedure, you must have the following:

- A Z-100 or H-100 microcomputer with two inboard drives
- CP/M-85 Backup Disk I (version 2.2.100)
- A blank, 5.25-inch, soft-sectored, double-sided, double-density, disk
- Any number of Application Program Disks containing software designed to run under Heath/Zenith CP/M-85.

During this procedure you will prepare the blank disk for data storage, copy the CP/M Operating System to it, and copy application program files to it from an Application Program Disk.

To prepare for this procedure, label the blank disk with the names of the application program(s) you plan to copy and with the words "Working Disk".

NOTE: The blank disk that you will convert into a working disk should be write-enabled during this entire procedure. Therefore, do not cover the notch of this blank disk with a write-protect tab.

PROCEDURE SYNOPSIS

This procedure requires you to perform the following activities in sequence:

booting up
FORMAT
SYSGEN
PIP

To begin Procedure Two, boot up with CP/M Backup Disk I in the left or upper disk drive of the computer (drive A). Then insert the working disk into the computer's remaining drive (drive B).

Proceed to the FORMAT activity.

FORMAT

This FORMAT activity helps you prepare blank disks for data storage.

1. At the A> System Prompt, type **FORMAT** and press ⏎. This entry invokes FORMAT, which displays the following:

```
CP/M-85 Format Version 2.2.100

This program is used to initialize a disk.
All information currently on the disk will be destroyed.
Is that what you want? (y/n):
```

2. Type **Y**. FORMAT will display:

```
Which drive do you wish to use for this operation?:
```

3. Type **B**. FORMAT will display:

```
Number of sides? (1=single, 2=double):
```

4. Type **2**. FORMAT will display the following message:

```
Put the disk you wish to be formatted in drive B.
Press RETURN to begin, anything else to abort.
```

5. Press ⏎. The light on the disk drive will glow for more than one minute while the disk is being formatted. Then FORMAT will display:

```
Do you have any more disks to format? (y/n):
```

6. Type **N** at this prompt. CP/M will display:

```
A>
```

With Backup Disk I in drive A and the working disk in drive B, proceed to SYSGEN.

SYSGEN

Use the SYSGEN utility to copy the CP/M Operating System to the working disk from the Backup Disk.

1. At the A> prompt, type **SYSGEN** and press ⏎. This entry invokes SYSGEN, which will display the following message:

```
CP/M-85 SYSGEN VER 2.2.100
SOURCE DRIVE NAME (OR RETURN TO SKIP):
```

2. Type **A.** SYSGEN will display:

```
SOURCE ON A, THEN TYPE RETURN
```

3. Press ⏎. SYSGEN will display:

```
FUNCTION COMPLETE
COPY BIOS88.SYS & BIOS85.SYS (Y/N):
```

4. Type **Y.** SYSGEN will display:

```
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

5. Type **B.** SYSGEN will display:

```
DESTINATION ON B, THEN TYPE RETURN
```

6. Press ⏎. SYSGEN will display:

```
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

7. Press ⏎. CP/M will display:

```
A>
```

With Backup Disk I in drive A and the working disk in drive B, proceed to PIP.

PIP

This PIP activity will help you to copy application program files from Application Program Disks to your working disk.

1. Type **PIP B:=A:PIP.COM[V]** ㊐.

2. When the system prompt appears, reset the computer holding down the **CTRL** key while pressing the **RESET** key.

3. Remove both disks. Then insert the working disk in the left or upper drive, and the Application Program Disk in the remaining drive.

4. Boot up with the working disk.

5. Type **PIP** ㊐ at the "A>" system prompt. This entry form causes PIP to display the "*" prompt.

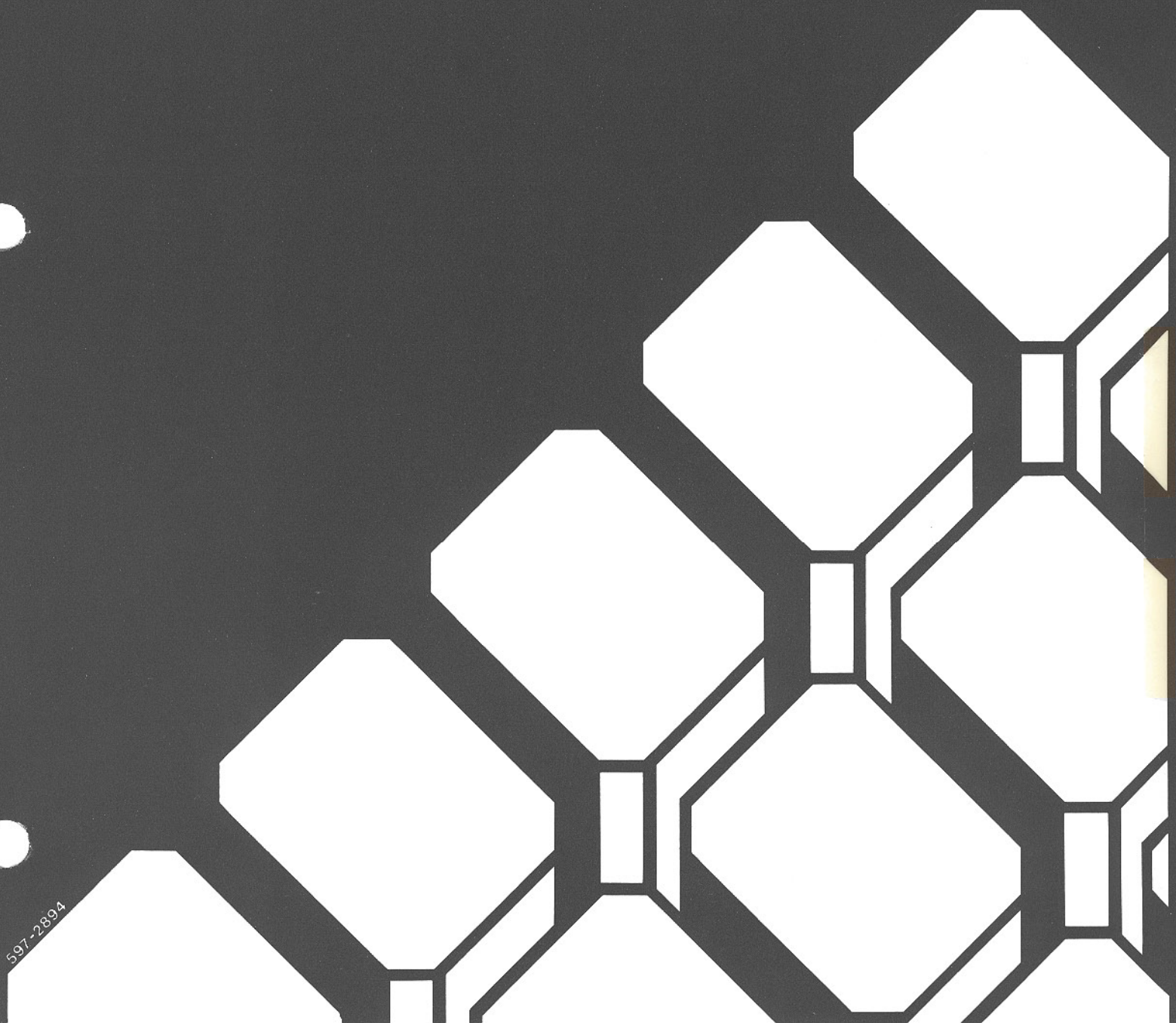
6. Type **A:=B:{file name.ext}[V]** ㊐ at the "*" prompt; where {filename.ext} is the name of a file you wish to copy from the Application Program Disk to the working disk. When finished copying the file, PIP will redisplay the "*" prompt.

7. For each application program you wish to copy from the **same** Application Program Disk, repeat Step 6.

   For each application program you wish to copy from a **different** Application Program Disk, press ㊐ at the "*" prompt, and repeat Steps 5 and 6.

8. Hold down the **CTRL** key and press the **C** key to return to the CP/M Operating System.

You now have a working disk that contains a fully customized CP/M Operating System and some useful programs.



597-2894

CP/M-85

REFERENCE GUIDE

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First Printing
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About This Guide

This Reference Guide contains detailed descriptions of each of the commands accompanying Heath/Zenith CP/M-85. The guide deals with all 23 resident commands and transient commands, presenting each command in alphabetical order. The text explains the following aspects of commands (where applicable):

- Function
- Invocation
- Options or Parameters
- Common applications
- Error message explanations

The text on each command is divided into numbered sections and subsections concerning specific aspects of the command. The numbers heading important sections are often indicated within a summary paragraph at the beginning of the text.

The Reference Guide features several examples of user interaction with the microcomputer. In these examples, displays presented by the microcomputer console will be represented by the following typestyle:

```
THIS TYPESTYLE represents console displays

(0123456789#$*?:=.A>)
```

User input will be represented by boldfaced type, as shown:

BOLDFACED TYPE represents the things the user types

(0123456789#$*?:=[.])

When you should enter a carriage return by pressing the key marked "RETURN", the example will show the symbol ⓒⓡ.

An example of user interaction with the terminal might appear as follows:

A>**STAT {drive}:{file name}** ⓒⓡ

Where "A>" is a console display (displayed by CP/M);

where **STAT** is a command entry typed through the console by the user;

where **{drive}**, **{file name}**, or any other description enclosed in curved braces is an entry that the user should supply; and

where ⓒⓡ is a user-entered carriage return.

The "where" statements that immediately follow a sample screen display or sample entry describe the important components of the display or entry.

ASM

The Utility that Creates an Intel Hexadecimal File and a Print-Out File from an Assembly Language Program File

The ASM assembler is designed to use the 8080 instruction set. The Z-100 and H-100 microcomputers contain an 8085 central processing unit, which accommodates 8080 instructions. This section of the Reference Guide assumes that the user is familiar with assembly language programming, and with the use of 8080 instructions. A brief synopsis of the function of 8080 op-codes is provided in "Appendix D: Assembler Operation Codes." For individuals with no background related to assembly language programming, the Heathkit Continuing Education Course in Assembly Language Programming is recommended.

The ASM utility reads assembly language source files (files with the "ASM" extension) from a disk and translates them into two output files (1):

- An output file with the "HEX" extension, containing 8080 machine code in Intel hexadecimal form (2). This file can be loaded into the computer (using the LOAD utility) and executed under the CP/M Operating System.

- An output file with the "PRN" extension, containing ASCII characters. This file can be printed out, displayed on a console screen, or not produced (1.1). It includes the same mnemonics as the "ASM" file (3, 4, and 5), plus the hexadecimal address of each source line and signal characters for errors that occurred during the assembly (6.2).

1. ASM INVOCATION

The ASM utility is invoked in response to the system prompt by entering a command in the following form:

A>**ASM {file name}.{asm}{hex}{prn}** ⏎

Where **{file name}** is the primary name of an assembly language source file whose extension is assumed to be "ASM". This file will be translated into the two output files by ASM;

where **{asm}** represents a one-letter parameter entered to specify the drive in which the assembly language source file is located;

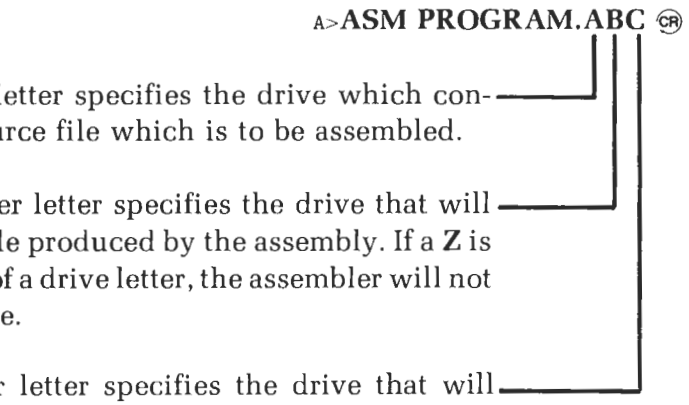
where **{hex}** represents a one-letter parameter entered to specify the drive to which the "HEX" output file will be written; and

where **{prn}** represents a one-letter parameter entered to specify the drive to which the "PRN" output file will be written.

CP/M assumes that the source file has the extension "ASM." Therefore, the "ASM" extension does not have to be entered in the invocation command.

1.1 Assembler Parameters

Three single-letter parameters can be entered immediately after the period (.) in the invocation command line, as if they were a file extension. The following example gives a detailed explanation of each parameter:



If you omit any of these parameter letters from the invocation command line, the ASM utility will try to read from, or write to, the default drive.

1.2 Example ASM Command Lines

The following examples and explanations illustrate the different forms of the ASM command line and the results they produce.

A>ASM PROGRAM↵

Source file PROGRAM.ASM is read from the default drive and assembled. Hex file PROGRAM.HEX and print file PROGRAM.PRN are written to the default drive.

A>ASM PROGRAM.ABB↵

Source file PROGRAM.ASM is read from drive A and assembled. Output files PROGRAM.HEX and PROGRAM.PRN are both written to drive B.

A>ASM PROGRAM.BAX↵

Source file PROGRAM.ASM is read from drive B and assembled. Hex file PROGRAM.HEX is written to disk A, and print file PROGRAM.PRN is displayed on the console.

A>ASM PROGRAM.BZZ↵

Source file PROGRAM.ASM is read from drive B and assembled. Neither output file is created. Such an entry is used to check for source file errors.

2. ASM EXECUTION

When invoked, ASM identifies itself with the following display:

```
CP/M ASSEMBLER - VER 2.0
```

Where "2.0" indicates the version number of the ASM utility.

If you specified (in a parameter) that the PRN file be displayed rather than stored, then this display will now appear on the console. This display (and the assembly operation) can be suspended by entering a **CTRL-S**, and resumed by entering any character. However, if you enter a character other than CTRL-S before entering CTRL-S, the CTRL-S entry will not suspend the display.

The display and assembly operation can be aborted by resetting the computer.

After an assembly operation is completed, ASM displays a message in the form of the following example:

```
0FD4
02AH USE FACTOR
END OF ASSEMBLY

A>
```

Where "0FD4" (or any number appearing in this position) is the last address (in hexadecimal) of the HEX file produced in the assembly; and

where "02AH" represents the percentage of free system memory used for ASM's symbol table. This percentage is expressed in hexadecimal values, with 000H being 0 percent, and 0FFH being 100 percent.

3. FORM FOR SOURCE FILE STATEMENTS

Assembly language source files must be composed of program statements in the following form:

line# label operator operand ;comment

Where the **line#** field is an optional integer value representing the source program line number. These numbers are only for the convenience of the user and are ignored by the assembler when present;

where the **label** field is optional, except when required by particular statement types. It consists of a maximum of 16 alphanumeric characters (letters and numbers). The first character must be a letter. Labels can be freely used by the programmer to identify elements such as program steps.

A single label should not contain any spaces, because ASM interprets a space as the end of the label field. However, the dollar sign ($) can be used to improve the readability of labels that contain more than one word. ASM will ignore the dollar sign and consider the other characteristics in the label as if they were in a continuous string. The label "DATESOFBIRTH" is somewhat easier to read than the label "DATESOFBIRTH". ASM will treat the two labels as being identical.

Labels may also be followed by a colon (:) to maintain compatibility with some other assemblers. The colon will not become part of the label and will be ignored by ASM.

Where **operator** is either a pseudo operation, or an assembler directive (see 5, Page 2-15), or an assembler opcode;

where the **operand**, in general, contains an expression formed from constants and labels together with arithmetic and logical operations on these elements (see 4, Page 2-9); and

where a **comment** consists of any characters following a semicolon (;) until an end-of-line is encountered. An asterisk (*) used as the first character on a line will also indicate a comment. All comments are read and listed in the print file but are otherwise ignored by ASM.

Any or all of these fields may be present in a statement, each separated by a space or a tab. Each assembly language statement is terminated by a carriage return and a line feed (both of which are inserted when the RETURN key is pressed with many text editors), or with the exclamation point character (which is recognized by the ASM utility as an "end-of-line" character). If the exclamation point (!) is used to signify the end of an assembly language statement, other statements can be entered on the same physical line.

4. FORMING THE OPERAND

In order to completely describe the operation codes and pseudo operation, it is first necessary to present the form of the operand since it is used in nearly all statements.

Expressions consist of simple operands (labels, constants, and reserved words) combined in properly formed subexpressions by arithmetic and logical operators. Expression computation is carried out by the assembler as the assembly proceeds. Each expression must produce a 16-bit value during the assembly.

The number of significant digits in the result must not exceed the intended use. If an expression is to be used in a byte move-immediate instruction, then the most significant 8 bits of the expression must be zero. The restrictions on the expression significance are given with the individual instructions.

4.1 Labels

A label is an identifier which occurs on a particular statement. Generally, the label is given a value determined by the type of statement which it precedes.

If the label occurs on a statement which generates machine code or reserves memory space (such as a MOV instruction or a DS pseudo operation), the label is given the value of the program address that it labels. If the label precedes an EQU or SET instruction, the label is given the value resulting from evaluating the operand. Except for the SET statement, an identifier can only label one statement. Unless a SET instruction follows a particular label, this label can occur only once in a program.

When a label appears in the operand, its value is substituted by the assembler. This value can then be combined with other operands and operators to form an operand for a particular instruction.

4.2 Numeric Constants

A numeric constant is a 16-bit value in one of several bases. The base, or radix, of the constant is denoted by a trailing radix indicator. The radix indicators are:

B. Binary constant (base 2)
O Octal constant (base 8)
Q Octal constant (base 8)
D Decimal constant (base 10)
H Hexadecimal constant (base 16)

"Q" is an alternate radix indicator for octal numbers since, the letter O is easily confused with the digit zero (0).

A numeric constant which does not terminate with a radix indicator is assumed to be a decimal constant.

A constant is composed of a sequence of digits, sometimes followed by a radix indicator. The digits are in the appropriate range for the radix. Binary constants must be composed of the digits 0 and 1, octal constants can contain digits in the range 0-7, while decimal constants contain decimal digits 0-9. Hexadecimal constants contain decimal digits and hexadecimal digits A (10D), B (11D), C (12D), D (13D), E (14D), and F (15D). The leading digit of a hexadecimal constant must be a decimal digit in order to avoid confusing a hexadecimal constant with an identifier. (Preceding the hexadecimal number with a zero will always suffice).

A constant composed in this manner must correspond to a binary number that can be contained within a 16-bit counter, otherwise it is truncated on the right by the assembler. As with labels, dollar signs ($) can be embedded in constants to improve readability. Finally, the radix indicator is translated to upper case if a lower case letter is encountered. The following are valid examples of numeric constants.

```
1234     1234D    1100B    1111$0000$1111$0000B
1234H    0FFEH    33770    33$77$22Q
3377o    0fe3h    1234d    0ffffh
```

4.3 Reserved Words

There are several reserved character sequences with pre-defined meanings in the operand field of a statement. Names of 8080 registers are given below. When ASM encounters one of these register names, the numeric value shown in the following table is produced:

REGISTER NAME	REGISTER VALUE
A	7
B	0
C	1
D	2
E	3
H	4
L	5
M	6
SP	6
PSW	6

Lowercase names have the same value as their upper case equivalents.

When the symbol "$" occurs in the operand field (not embedded within identifiers and numeric constants) its value becomes the address of the next instruction to generate, not including the instruction contained within the current logical line.

4.4 String Constants

String constants, which are sequences of ASCII characters, are represented by enclosing the characters within apostrophe symbols ('). All strings must be fully contained within the current physical line (thus allowing "!" symbols within strings) and may not exceed 64 characters in length. The apostrophe character can be included within a string by representing it as a double apostrophe (press the apostrophe key two consecutive times), which ASM interprets as a single apostrophe.

In most cases, the string length is restricted to either one or two characters (the DB pseudo operation is an exception). If the string consists of one character, it becomes an 8-bit value. If the string consists of two characters, it becomes a 16-bit value. A two character string becomes a 16-bit constant, with the second character as the low order byte, and the first character as the high order byte.

The value of a character is its corresponding ASCII code. There is no case translation within strings. Therefore, both upper and lower case characters can be represented. Only ASCII characters that print are allowed within strings. Valid strings are:

'A' 'AB' 'ab' 'c'
'She said "Hello" to me.'
'I said "Hello" to her.'

4.5 Arithmetic and Logical Operators

The operands described previously can be combined in normal algebraic notation using any combination of properly formed operands, operators, and parenthesized expressions. The operators recognized in the operand field are shown by the following list:

a + b	Unsigned arithmetic sum of a and b
a − b	Unsigned arithmetic difference between a and b
+ b	Unary plus (produces b)
− b	Unary minus (identical to 0 − b)
a * b	Unsigned magnitude multiplication of a and b
a / b	Unsigned magnitude division of a by b
a MOD b	Remainder after a / b
NOT b	Logical inverse of b (0's become 1's, 1's become 0's), where b is considered a 16-bit value
a AND b	Bit-by-bit logical and of a and b
a OR b	Bit-by-bit logical or of a and b
a XOR b	Bit-by-bit logical exclusive or of a and b
a SHL b	The value which results from shifting a to the left by an amount b, with zero fill
a SHR b	The value which results from shifting a to the right by an amount b, with zero fill

In each case, a and b represent simple operands (labels, numeric constants, reserved words, and one or two character strings), or fully enclosed parenthesized subexpressions such as:

```
10+20      10h+37Q      L1/3      (L2+4)      SHR 3
('a' and 5fh) + '0'          ('B' +B) OR (PSW+M)
(1+(2+c)) shr (A-(B+1))
```

All computations are performed at assembly time as 16-bit unsigned operations. Thus, −1 is computed as 0−1 which results in the value 0ffffh (i.e., all 1s). The resulting expression must fit the operation code in which it is used. If the expression is used in an ADI (add immediate) instruction, then the high order eight bits of the expression must be zero. As a result, the operation "ADI −1" produces an error message (−1 becomes 0ffffh, which cannot be represented as an 8-bit value), while ADI (−1) AND 0FFH" is accepted by the assembler since the "AND" operation zeroes the high order bits of the expression.

4.6 Precedence of Operators

ASM assumes that operators have a relative precedence of application which allows the programmer to write expressions without nested levels of parentheses. The resulting expression has assumed parentheses which are defined by the relative precedence.

The order of application of operators in unparenthesized expressions is listed below. Operators listed first have highest precedence (they are applied first in an unparenthesized expression), while operators listed last have lowest precedence. Operators listed on the same line have equal precedence, and are applied from left to right as they are encountered in an expression.

```
* / MOD SHL SHR
- +
NOT
AND
OR XOR
```

In the following examples, the expressions shown to the left are interpreted by ASM as the fully parenthesized expressions shown to the right:

APPEARANCE IN PROGRAM	AS INTERPRETED BY ASM UTILITY
a * b + c	(a * b) + c
a + b * c	a + (b * c)
a MOD b * c SHL d	((a MOD b) * c) SHL d
a OR b AND NOT c + d SHL e	a OR (b AND (NOT(c + (d SHL e))))

Balanced parenthesized subexpressions always can be used to override the assumed parentheses. The last expression in the preceding example could be rewritten to force application of operators in a different order, as shown:

```
(a OR b) AND (NOT c) + d SHL e
```

This expression is interpreted by ASM as the following expression with assumed parentheses:

```
(a OR b) AND ((NOT c) + (d SHL e))
```

An unparenthesized expression is well-formed only if the expression resulting from inserting the assumed parentheses is well-formed.

5. ASSEMBLER DIRECTIVES

Assembler directives are used to set labels to specific values during the assembly, perform conditional assembly, define storage areas, and specify starting addresses in the program. Each assembler directive is denoted by a "pseudo operation" that appears in the operation field of the line. These pseudo operations are acceptable to ASM:

Pseudo Operation	Function	Text Subsection
ORG	Set the program or data origin	(5.1)
END	End program, optional start address	(5.2)
EQU	Numeric "equate"	(5.3)
SET	Numeric "set"	(5.4)
IF	Begin conditional assembly	(5.5)
ENDIF	End of conditional assembly	(5.6)
DB	Define data bytes	(5.7)
DW	Define data words	(5.8)
DS	Define data storage area	(5.9)

5.1 The ORG Directive

The ORG Directive takes the following form:

Label ORG expression

Where "label" is an optional program label; and

where "expression" is a 16-bit expression, consisting of operands which are defined previous to the ORG statement.

The assembler begins machine code generation at the location specified in the expression. There can be any number of ORG statements within a particular program. There are no checks to ensure that the programmer is not defining overlapping memory areas. Most programs written for the CP/M operating system begin with an ORG statement of:

ORG 100H

Machine code generation begins at the base of the CP/M transient program area (hexadecimal address 100H). If a label is specified in the ORG statement, then the label is given the value of the expression. (This label can then be used in the operand field of other statements to represent this expression.)

5.2 The END Directive

The END Directive is optional in an assembly language program. If it is present, it should be the last statement. All subsequent statements will be ignored by ASM.

The two forms of the END directive are:

label END

label END expression

Where the "label" field is optional; and

where the "expression" field is the program starting address.

If the first form is used, the assembly process stops and the default starting address of the program is taken as 0000.

If the second form is used, the expression in the statement becomes the program starting address. (This starting address is included in the last record of the Intel formatted machine code "HEX" file that results from the assembly.)

Most CP/M assembly language programs should end with the statement:

END 100H

resulting in the default starting address of 100H (which is the beginning of the Transient Program Area).

NOTE: When an assembled .HEX file is loaded using the CP/M LOAD utility (included with your CP/M-85 distribution software), use of this directive is not necessary. LOAD produces .COM files that automatically execute from address 100H regardless of any END directive that might exist at the end of a program.

5.3 The EQU Directive

The EQU Directive is used to set up synonyms for particular numeric values. It takes the following form:

label EQU expression

Where the "label" field must be present, and must not label any other statement; and

where the "expression" field is assigned to an identifier given in the label field. The identifier is usually a name which describes the value in a more human-oriented manner. This name is used throughout the program to "parameterize" certain functions.

Suppose, for example, that data received from a Teletype appears on a particular input port, and that data is sent to the Teletype through the next output port in sequence. The following series of equate statements could be used to define these ports for a particular hardware environment:

```
TTYBASE  EQU  10H          ;BASE PORT NUMBER FOR TTY
TTYIN    EQU  TTYBASE      ;TTY DATA IN
TTYOUT   EQU  TTYBASE+1    ;TTY DATA OUT
```

At a later point in the program, the statements which access the Teletype could appear as shown:

```
IN       TTYIN      ;READ TTY DATA TO REG-A
. . .
OUT      TTYOUT     ;WRITE DATA TO TTY FROM REG-A
```

This directive makes the program more readable than if the absolute I/O ports had been used.

If the hardware environment is redefined to start the Teletype communications ports at 7FH instead of 10H, the first statement need only be changed to:

```
TTYBASE    EQU  7FH   ;BASE PORT NUMBER FOR TTY
```

Then, the program can be reassembled without changing any other statements.

5.4 The SET Directive

The SET Directive takes the following form:

label SET expression

Where the "label" field must be present, and may appear in other SET statements throughout the program; and

where the "expression" field is evaluated by ASM, and becomes the current value associated with the label.

The EQU Directive defines a label with a single value while the SET Directive defines a value which is valid from the current SET statement to the point where the label appears in the next SET statement. The use of the SET is similar to the EQU statement, but SET is most often used in controlling conditional assembly.

5.5 The IF Directive

5.6 The ENDIF Directive

The IF and ENDIF Directives define a range of assembly language statements which are included or excluded during the assembly process. The form is:

```
If expression
statement#1
statement#2
. . .
statement#n
ENDIF
```

When ASM encounters the IF statement; it evaluates the expression following the IF. (All operands in the expression must be defined ahead of the IF statement). If the expression evaluates to a value where the low order bit (bit 0) is one, then statement #1 through statement #n are assembled. If the expression evaluates to a value where the low order bit (bit 0) of the expression is zero, then the statements are listed but not assembled.

Conditional assembly is used to write a single "generic" program that includes a number of possible run-time environments, with only a few specific portions of the program selected for any particular assembly. The following program segments, might be part of the program that communices with either a Teletype console or CRT console by selecting a particular value for TTY before the assembly begins:

```
TRUE    EQU  0FFFFH          ;DEFINE VALUE OF TRUE
FALSE   EQU  NOT TRUE        ;DEFINE VALUE OF FALSE
;
TTY     EQU  TRUE            ;TRUE IF TTY, FALSE IF CRT
;
TTYBASE EQU  10H             ;BASE OF TTY I/O PORTS
CRTBASE EQU  20H             ;BASE OF CRT I/O PORTS
        IF   TTY             ;ASSEMBLE RELATIVE TO TTYBASE
CONTIN  EQU  TTYBASE         ;CONSOLE INPUT
CONOUT  EQU  TTYBASE+1       ;CONSOLE OUTPUT
        ENDIF
;
        IF   NOT TTY         ;ASSEMBLE RELATIVE TO CRTBASE
CONTIN  EQU  CRTBASE         ;CONSOLE INPUT
CONOUT  EQU  CRTBASE+1       ;CONSOLE OUTPUT
        ENDIF
        . . .
        IN   CONTIN          ;READ CONSOLE DATA
        . . .
        OUT  CONOUT          ;WRITE CONSOLE DATA
```

In this case, the program would assemble for an environment where a Teletype is connected, based at port 10H. The statement defining TTY could be changed to:

```
TTY     EQU  FALSE
```

and, in this case, the program would assemble for a CRT based at port 20H.

5.7 The DB Directive

The DB Directive allows the programmer to define initial storage areas in single-byte format. The statement appears in the form:

label DB e#1,e#2, ...,e#n

Where "e#1" through "e#n" are either:

- Expressions which evaluate to 8-bit values (the high order eight bits must be zero), or
- ASCII strings of fewer than 65 characters.

There is no practical restriction on the number of expressions that can be included on a single source line. The expressions are evaluated and placed sequentially into the machine code file following the last program address generated by ASM. String characters are similarly placed into memory, starting with the first character and ending with the last character.

Strings containing more than two characters cannot be used as operands in more complicated expressions. They must stand alone between the commas. ASCII characters are always placed in memory with the parity bit reset (to 0). There is no translation from lower to uppercase with strings. The optional label can be used to reference the data area throughout the remainder of the program. Examples of valid DB statements are:

```
data:   DB    0,1,2,3,4,5
        DB    data and 0ffh,5,377Q,1+2+3+4
signon: DB    'please type your name',CR,1f,0
        DB    'AB' SHR 8, 'C', 'DE' and 7FH
```

5.8 The DW Directive

The DW Directive lets you define initial storage areas in double-byte words. The statement appears in the form:

```
label    DW    e#1,  e#2,  ..., e#n
```

Where "e#1" through "e#n" are expressions which ASM evaluates in 16-bit results.

ASCII strings are limited to one or two characters. Data storage is consistent with the 8080 processor. The least significant byte of the expression is stored first in memory, followed by the most significant byte. The following are examples of DW usage:

```
doub:   DW      Offefh,doub+4,signon-$,255+255
        DW      'a', 5,  'ab',  'CD',  6 sh1  8 or 11b
```

5.9 The DS Directive

The DS Directive is used to reserve an area of uninitialized memory. This directive takes the following form:

```
label    DS  expression
```

Where the label is optional.

The assembler begins subsequent code generation after the area reserved by the DS. The DS statement given previously has exactly the same effect as the following statement:

```
label:  EQU   $  ;LABEL VALUE IS CURRENT CODE LOCATION
        ORG   $+expression   ;MOVE PAST RESERVED AREA
```

6. ASM ERROR MESSAGES

The ASM utility has two kinds of error messages. One signals problems that occur during ASM file manipulation (6.1), and another signals errors in the assembly language source file (6.2).

6.1 File Manipulation Error Messages

The following error messages are displayed when ASM encounters difficulty in manipulating the source and/or output files involved in operation of the ASM utility:

```
NO SOURCE FILE PRESENT
```

The file specified in the ASM command does not exist on the accessed disk.

```
NO DIRECTORY SPACE
```

The disk directory is full. Unnecessary files should be erased, and the operation attempted again.

```
SOURCE FILE NAME ERROR
```

Improperly formed ASM file name (such as a name specified with "?" fields) was entered.

```
SOURCE FILE READ ERROR
```

The source file cannot be read properly by the assembler. The TYPE command, a text editor, or DDT can be used to determine the location of the unreadable code.

```
OUTPUT FILE WRITE ERROR
```

Output files cannot be written properly. The most likely cause is a full disk. Unnecessary files should be erased, and the operation attempted again.

```
CANNOT CLOSE FILE
```

Output file cannot be closed. Disk should be checked for write protection.

```
SYMBOL TABLE OVERFLOW
```

The symbol table has exceeded memory capacity.

6.2 Assembly Program Error Messages

When errors occur within the assembly language program, they are listed as single character flags in the left-most position of the source listing. The line in error is also echoed in a terminal display so that the source listing need not be examined to determine if errors are present. The error codes are:

D Data error: Element in data statement cannot be placed in the specified data area.

E Expression error: Expression is ill-formed and cannot be computed at assembly time.

L Label error: Label cannot appear in this context (may be duplicated label).

N Not implemented: Features which will appear in future ASM versions (e.g., macros) are recognized, but flagged in this version.

O Overflow: Expression is too complicated (i.e., too many pending operators) to compute, simplify it.

P Phase error: Label does not have the same value on two subquent passes through the program.

R Register error: The value specified as a register is not compatible with the operation code.

V Value error: Operand encountered in expression is improperly formed.

BSYSGEN

The Utility that Copies CP/M Between Disks

The BSYSGEN utility is used to transfer either part or all of the CP/M operating system to a disk, depending on the circumstances. Unlike the SYSGEN utility (see Page 2-193) the BSYSGEN utility can **not** be used to copy the system kernel directly from memory to a disk after running the MVCPM207 utility, although it can copy a file that was recorded on a disk by the SAVE command after a run of MVCPM207.

NOTE: This release of the CP/M Operating System consists of a system kernel and the BIOS files (BIOS85.SYS and BIOS88.SYS). To make a disk bootable, you must put the system kernel on the disk's system tracks **and** the BIOS85.SYS and BIOS88.SYS files on the disk's file area.

BSYSGEN can be used by two methods: the Utility Prompt Method or the System Prompt Method.

1. UTILITY PROMPT METHOD

Under the Utility Prompt Method, you first load the BSYSGEN utility into computer memory, and then respond to BSYSGEN prompts that define the operation.

1.1 Utility Prompt Command Entry

To begin under the Utility Prompt Method, type the following command at the system prompt:

```
A>BSYSGEN <CR>
```

The following display will appear:

```
CP/M-85 BSYSGEN VER 2.2.100
SOURCE DRIVE NAME :
```

1.2 Specifying the Source

At the "SOURCE DRIVE NAME:" prompt, you can specify the drive containing the disk from which the system will be copied. Enter the letter that stands for that drive.

The following example shows how you would answer this prompt if the source of the system was to be the disk in drive A:

```
SOURCE DRIVE NAME: A
```

NOTE: BSYSGEN can only copy the system between disks of the same type. Therefore, you can **not** enter a carriage return at this BSYSGEN prompt to copy a system that has been moved into computer memory by the MVCPM207 utility. (If you do wish to copy the system from memory immediately after a MVCPM207 activity, use the SYSGEN utility.)

BSYSGEN will now prompt you to confirm your selection of the source drive, with a prompt in the following form:

```
SOURCE ON A, THEN TYPE RETURN:
```

You can confirm your specification of the source drive name by entering a carriage return at this prompt. (You can also abort the BSYSGEN operation and return control to the operating system by simultaneously pressing the **CTRL** and **C** keys at this prompt.)

If you confirm the "SOURCE ON" prompt with a carriage return, BSYSGEN will then display the message:

```
COPY BIOS88.SYS & BIOS85.SYS (Y/N):
```

1.3 Copying BIOS88.SYS and BIOS85.SYS with BSYSGEN

To instruct BSYSGEN to copy the files BIOS88.SYS and BIOS85.SYS from the source disk to the destination disk, press **Y** at the "COPY BIOS88.SYS & BIOS85.SYS (Y/N):" prompt. If you do **not** wish to copy BIOS88.SYS and BIOS85.SYS, press **N**.

NOTE: If you decline to copy the BIOS files using the BSYSGEN utility, you can copy them using the PIP utility.

If you pressed Y to copy the BIOS files, BSYSGEN will display the message "FUNCTION COMPLETE," and then prompt for destination. If you pressed N to forgo the copying of the BIOS files, BSYSGEN will immediately prompt for destination.

1.4 Specifying the Destination

A few seconds after you have made an entry at the "COPY BIOS88.SYS & BIOS85.SYS" prompt, BSYSGEN will prompt for destination as shown:

```
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

The first time this prompt appears, you should type the drive letter for the disk that you wish to receive the system. For instance, type **B**. BSYSGEN would then display a prompt in the following form:

```
DESTINATION ON B, THEN TYPE RETURN
```

Confirm your destination specification by entering a carriage return at such a prompt.

BSYSGEN will again display the "DESTINATION DRIVE NAME (OR RETURN TO REBOOT):" prompt. This time, you can specify a different drive name, insert a new disk into the former destination drive and specify this drive again as the destination, or enter a carriage return to cause a warm boot. (A warm boot will exit you from the BSYSGEN utility to the CP/M Operating System. Then a system prompt will be displayed.)

2. SYSTEM PROMPT METHOD

The System Prompt Method enables you to enter all of the specifications necessary for a BSYSGEN operation in a single command line entered at the CP/M system prompt.

2.1 System Prompt Command Entry

System Prompt Method BSYSGEN commands are entered in the following form:

A>**BSYSGEN {destination}={source}{[option,option]}**CR

Where **BSYSGEN** is the command line function, stored in the file BSYSGEN.COM on the logged disk;

where {**destination**} is the name of the drive (A:, B:, C:, or D:) containing the formatted disk that you wish to receive the copy of the system;

where {**source**} can be either a drive name, a file name, or both; and

where {**[option,option]**} represents letters enclosed in square brackets [ ] and separated by a comma "," to specify how the BSYSGEN operation should be conducted.

NOTE: In a CP/M command line "equation," the data source is always on the right and the data destination is always on the left.

2.2 BSYSGEN Data Sources

The source of the transferred data in a System Prompt Method command can be one of the following four types:

- Drive Name, including a letter for a drive within your hardware environment and a colon, as with **A:**, **B:**, **C:**, or **D:**;
- File Name, which specifies a file that was created and stored by consecutive MVCPM207 and SAVE commands, as with **CPM48.SYS** or **CPM64.SYS**; or
- Drive Name and File Name, where the file desired for the system kernel source resides on a disk in a non-default drive and the drive name must specify that drive, as with **B:CPM48.SYS** or **C:CPM64.SYS**.

2.3 BSYSGEN Options and Defaults

BSYSGEN command lines entered by the System Prompt Method can include the following options (enclosed in square brackets [ ]):

B BIOS88.SYS and BIOS85.SYS files will be copied from the specified source to the specified destination. If files named BIOS88.SYS and BIOS85.SYS already exist on the destination disk, they will be overwritten.

N No prompts will be displayed during this operation.

When you enter a BSYSGEN command line with source and destination specifications and neglect to specify options, BSYSGEN will perform the operation according to these default criteria:

- BIOS88.SYS and BIOS85.SYS files will **not** be copied (as if the B option was not specified);
- Prompt **will** be displayed to confirm which drive will receive the copy of the system (as if option N was not entered). The BSYSGEN prompt displays in the following form:

```
CP/M-85 BSYSGEN VER 2.2.100

DESTINATION ON B, THEN TYPE RETURN
```

2.4 System Prompt Method Examples

A>**BSYSGEN B:=A:** ⏎ BSYSGEN will copy the system core from the disk in drive A to the disk in drive B. The BIOS files from A will **not** be copied and a prompt **will** appear before the copying, by default.

A>**BSYSGEN B:=D:[N]** ⏎ BSYSGEN will copy the system core from the disk in drive D to the system tracks of the disk in drive B. The BIOS files will **not** be copied, by default. A prompt will **not** appear before the copying, as specified by the N option.

A>**D:BSYSGEN B:=C:CPM48.SYS[B,N]** ⏎ The BSYSGEN utility in this case is stored on the disk in non-default drive D. It will copy the system core from the file named "CPM48.SYS" (recorded onto the disk in drive C by the SAVE command after creation in memory by the MVCPM207 command), and put it on the system tracks of the disk in drive B. It will also copy the BIOS files from drive C to drive B, and display no prompts during the operation, as specified by options.

3. BSYSGEN ERROR MESSAGES

```
INVALID DRIVE NAME
```

You must specify drive names using the names of drives that exist in the hardware environment, and are recognized by the operating system that was loaded at bootstrap.

```
NO SOURCE FILE ON DISK
```

The drive specified as "SOURCE DRIVE" did not contain one of the BIOS files (BIOS88.SYS or BIOS85.SYS). Use a different disk in the source drive, or copy working BIOS files to the source disk, or rename existing BIOS files to "BIOS88.SYS" and "BIOS85.SYS."

```
SOURCE FILE INCOMPLETE
```

BSYSGEN failed in an attempt to copy the BIOS files from the disk in the source drive. This file might have been damaged by disk media flaws or partially overwritten. You should reset, perform bootstrap, and reenter the BSYSGEN command using a different disk in the source drive.

```
WRITE ERROR DURING BIOS.SYS
```

You should try BSYSGEN again with a destination disk that is write-enabled, formatted, and has at least 6 kilobytes of free space.

```
ERROR READING BIOS.SYS
```

BSYSGEN failed in an attempt to copy the file BIOS.SYS from the disk in the source drive. This file might have been damaged by disk media flaws or partially overwritten. You should reset, perform bootstrap, and reenter the BSYSGEN command using a different disk in the source drive or using a different disk to perform bootstrap.

```
PERMANENT ERROR, TYPE RETURN TO IGNORE
```

The system kernel or BIOS files are either incompatible with the destination disk type or otherwise flawed. You should reset, reboot, and reenter the BSYSGEN command using a different disk in the source drive or using a different disk to boot up. Under some circumstances, you must use the MVCPM207 utility before BSYSGEN.

```
UNABLE TO SELECT DRIVE
```

Specify the name of a drive that can be accessed by BSYSGEN. Such a drive must be a valid drive that is recognized by the operating system.

```
COMMAND SYNTAX ERROR
```

System Prompt Method command line was entered without following the entry form explained in "2.1 Command Line Entry." Enter command again after reviewing this entry form.

```
ILLEGAL OPTION
```

System Prompt Method command line was entered with an option other than a B or an N. Reenter command with either, none, or all of the BSYSGEN options B and N. Enclose the option(s) in square brackets and separate them with a comma if both are used.

CONFIGUR

The Utility that Customizes CP/M for Your Hardware and/or Preferences

The CONFIGUR utility helps you to change the CP/M Operating System so that it will accommodate a particular printer (3) or modem (4). CONFIGUR also enables you to set the system to automatically invoke commands (5) upon cold boots and/or warm boots, and to assign physical devices to logical devices (6). After you have specified these changes to the system, CONFIGUR enables you to apply them to the system in memory and/or the system on disk, or to cancel them completely (7).

CONFIGUR is usually run during the first session of CP/M use in a particular hardware environment. But it should also be run whenever a hardware component is added or changed, or whenever you wish to change an automatic command line.

You do **not** need to use the CONFIGUR activity if you do not have a printer or modem, or if you have one of the following:

- A serial printer (such as the Z-25 or the H-25) that runs at 4800 baud, accepts 8 bits per character with no parity bit, handshakes with RTS pin number 4, is ready when handshaking signal is High, and uses no protocol.

- A modem (such as the WH-13, the Lexicon WH-23, the UDS WH-33, or the Hayes WH-43) that runs at 300 baud, accepts 8 bits per character, has no parity bit, and uses no handshaking.

These hardware settings match the default settings of the CP/M-85 system when it is shipped.

Since CONFIGUR adjusts the system for hardware characteristics, you must sometimes answer prompts that ask about these characteristics. Always consult your hardware manuals and check the settings of your hardware devices when answering these prompts.

NOTE: Changes specified through the CONFIGUR utility can only be recorded on a disk if the disk is write-enabled. If you are performing a CONFIGUR operation with a write-protected disk, you can only apply changes to the system in memory.

1. CONFIGUR INVOCATION

You can invoke CONFIGUR by responding to the system prompt with a command line in the following form:

A>**CONFIGUR** ⏎

This entry causes the display of CONFIGUR's identification message, copyright notice, version number, and "MAIN MENU."

2. CONFIGUR MAIN MENU

CONFIGUR is a menu-driven utility. It first displays a main menu, which looks like this:

```
CP/M-85 System Configuration Utility version 2.2.100
      Copyright (C) 1982 by Zenith Data Systems

                *** MAIN MENU ***


           P - Printer Configuration
           M - Modem   Configuration
           C - Command Configuration
           I - I/O map Configuration
           ? - Brief Help message

           X - Exit

Selection [P,M,C,I,X or ?] :
```

This menu enables you to access any of four sub-menus so that you can adjust the CP/M Operating System to accommodate your printer, modem, or automatic command preference. In addition, you can obtain screen displays of helpful comments about the menu and its use. This menu also enables you to exit the CONFIGUR utility, and thus gain access to the CP/M Operating System.

To enter a particular sub-menu or exit selection, type the character listed to the left of that selection and press ⏎.

3. PRINTER SPECIFICATION

In order to adjust the system to accommodate your printer, you must select "Printer Configuration" at the main menu, and specify your printer either by its name or by its characteristics.

When you enter **P** and ⓒⓡ at the main menu, CONFIGUR displays the following sub-menu:

```
                *** Printer Configuration ***

 1-   MX-80 or other PARALLEL Centronics-interface printer
 2-   H/Z-25
 3-   H-14 or TI-810(WH-24)
 4-   Dec LA-34 or LA-36
 5-   Diablo 620
 6-   Diablo 630,1610,1620,1630 or 1640(WH-44)
 7-   MX-80 Serial
 8-   Votrax Type 'n Talk
 9-   User-defined SERIAL Printer

Choose the number that corresponds to your printer :
```

- If your printer is listed by name in this menu, and you have not changed the switch settings since it was shipped, then see "3.1 Specifying Printer Name."
- If you have a printer that is not listed by name on this menu or a listed printer on which the switch settings have been changed since shipping, then see "3.2 Specifying Printer Characteristics."

3.1 Specifying Printer Name

If your printer is listed by name on the "Printer Configuration" menu, and you have not changed the switch settings since it was shipped, then type the number listed to the left of the printer name and a carriage return.

This entry will adjust the CP/M Operating System to accommodate the characteristics that usually apply to your type of printer when it is shipped.

CONFIGUR then displays a message describing the characteristics of the printer you selected. The printer characteristics descriptions for each menu-listed printer are shown beginning on the following page.

NOTE: If you have a printer that is not listed by name on this menu, or a listed printer on which the switch settings have been changed since shipping, then type **9** and carriage return, and see "3.2 Specifying Printer Characteristics."

Each printer you select in response to the "Printer Configuration" menu has different characteristics, which are described in the message CONFIGUR displays after your selection.

MX-80 or Centronics

```
You have selected an MX-80 Parallel, and Centronics

  Assure Centronics style parallel operation
Press RETURN to access Main menu:
```

H/Z-25

```
You have selected an H/Z-25


Standard settings:

   4800   baud
  Handshake on RTS
  Printer ready on high

Press RETURN to access Main menu:
```

H-14 or TI-810

```
You have selected an H-14 or a TI-810(WH-24)


Standard settings:

   4800   baud
  Handshake on RTS
  Printer ready on low

Press RETURN to access Main menu:
```

Dec LA-34 or LA-36

```
You have selected a DEC LA-34 or an LA-36


Standard settings:

    300   baud

Press RETURN to access Main menu:
```

Diablo 620

```
You have selected a Diablo 620


Standard settings:

    300   baud
  ETX/ACK protocol

Press RETURN to access Main menu:
```

Diablo 630 or 1640

```
You have selected a Diablo 630,1610,1620,1640 or a 1650


Standard settings:

   1200   baud
  ETX/ACK protocol

Press RETURN to access Main menu:
```

MX-80 Serial

```
You have selected an MX-80 with serial interface


Standard settings:

   4800   baud
  Handshake on DTR
  Printer ready on low

Press RETURN to access Main menu:
```

Votrax Type 'n Talk

```
You have selected a Votrax Type 'n Talk


Standard settings:

   4800   baud
  Handshake on RTS
  Printer ready on high

Press RETURN to access Main menu:
```

After viewing the message that lists your printer's characteristics, press ⓒⓡ. The "MAIN MENU" will be redisplayed.

- If the settings of your printer match those listed in the message for your printer, then enter the letter for another selection.
- If you specified your printer by name at the "Printer Configuration" menu, but want this printer set with characteristics that differ from those listed for your printer by CONFIGUR, type **P** and ⓒⓡ again at the "MAIN MENU." Then type **9** and ⓒⓡ at the "Printer Configuration" menu and see "3.2 Specifying Printer Characteristics."

NOTE: Printers selected by name at the "Printer Configuration" menu have their appropriate physical device assigned automatically to the LST: logical device.

3.2 Specifying Printer Characteristics

To adjust the system for a printer that is not listed by name on this menu, or a listed printer on which the switch settings have been changed since shipping, type **9** and ⓒⓡ at the "Printer Configuration" menu.

CONFIGUR will then prompt you to specify characteristics of your printer such as: baud rate, bits per character, parity, handshaking pin, handshake polarity and protocol.

NOTE: If you respond to one of these prompts by pressing ⓒⓡ without first typing one of the values listed in the prompt, the prompt will be redisplayed.

BAUD RATE

When you enter **9** and ⓒⓡ at the "Printer Configuration" menu, CONFIGUR will first display the following message:

```
                User Defined Printer

 Baud rate selection
(Space=next possibility,
 BACK SPACE=last possibility,
 RETURN=select this one)
Baud Rate :    45.5
```

Explanation

Baud rate is the speed at which data is transmitted to and from your printer, roughly corresponding to the number of bits per second transmitted. Since the CP/M Operating System coordinates the transmission of data to and from your printer, CP/M must know how fast your printer is set to send and receive data.

Specification Technique

To the right of the words "Baud Rate :" in this prompt, you will see a number that corresponds to one of the 16 baud rates possible on the Z-100 computer (45.5, 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 9600, 19200, 38400).

Each of these baud rate values is stored in sequence by CONFIGUR, although only one value is visible at one time. You can view a different value by pressing the **space bar** for a greater value, or by pressing the **BACK SPACE** key for a lesser value.

When the correct baud rate value is displayed in the "Baud Rate :" prompt, press ⏎ to specify this value. CONFIGUR will get ready to set the CP/M Operating System to accommodate this baud rate value for printer data transmission.

BITS PER CHARACTER

After you have specified a baud rate, CONFIGUR will display the following prompt:

```
Bits per character [5,6,7 or 8] :
```

Explanation

Bits per character is the number of significant data bits your printer expects to receive in order to decipher one character (byte) from the stream of bits that are transmitted. Start bits, stop bits, and parity bits are not included in this number. (Most printers accept 7 or 8 bits per character.)

Specification Technique

To specify the number of bits per character your printer accepts, type **5, 6, 7,** or **8** at the "Bits per character" prompt. Then press ⏎. CONFIGUR will get ready to set the CP/M Operating System to transmit this many bits within every character of data it sends.

PARITY

After you have specified bits per character, CONFIGUR will display the following prompt:

```
Parity [O(dd),E(ven),N(one)] :
```

Explanation

Parity is a method by which data is checked to make sure it hasn't changed during transmission.

When odd parity is used, a parity bit is sent along with each character that is sent to the printer. Before transmission, this bit is set to either one or zero to ensure that the sum of all of the transmitted bits is an odd number. If the printer receives a byte of data bits and a parity bit that do not all add up to an odd number, then an error must have occurred during transmission.

Even parity works the same way, except that the parity bit is set to either one or zero to ensure that the sum of the transmitted bits is an even number.

When no parity is used, no parity bit accompanies each transmitted character.

Specification Technique

To specify the kind of parity (if any) that is used to check errors in the data sent to your printer, type **O** for odd parity, **E** for even parity, and **N** for no parity. After typing one of these specifications, press ⓒR. CONFIGUR will get ready to set the CP/M Operating System so that it transmits parity bits as required by your printer.

HANDSHAKE PIN

After you have specified the nature of your printer's parity, CONFIGUR will display the following prompt:

```
Handshake Pin [N(one), D(tr/pin 20), R(ts/pin 4)] :
```

Explanation

The *handshake pin* is the circuit through which the printer and the computer signal each other to determine when data should be transmitted. This circuit is one of many bundled together in the RS-232C cable that connects the computer with the printer. The printer uses this cable circuit to signal that the printer is ready to receive more data.

The DTR (Data Terminal Ready) handshake pin is labelled with the number 20 on the receptacle ends of the cable; and the RTS (Request To Send) handshake pin is labelled with the number 4 on the receptacle ends of the cable.

Specification Technique

To specify the particular handshake pin (if any) that is used to signal the printer's readiness to receive data, type **N** for no pin, type **D** for the DTR (number 20) pin, or type **R** for the RTS (number 4) pin. After typing one of these specifications, press ⏎. CONFIGUR will get ready to set the CP/M Operating System so that it signals the printer's readiness as required by your printer.

POLARITY

If you specified a handshake pin (by typing D or R at the previous prompt), then a prompt will appear in the following form:

```
Polarity [N(one),H(ready when High),L(ready when Low( ] :
```

NOTE: If you specified no handshake pin (by typing N at the previous prompt), then the "Polarity" prompt will not appear. Instead, the handshake pin prompt will be followed by a protocol prompt.

Explanation

Polarity is the voltage level at which the printer signals the computer that the printer is ready to receive more data. This signal can be sent at either a high voltage level or a low voltage level. It travels through the handshake pin that was specified at the previous prompt.

Specification Technique

To specify a polarity, type **H** if the printer signals its readiness with a high voltage signal, and type **L** if the printer signals its readiness with a low voltage signal. To specify no polarity, type **N**.

PROTOCOL

After you have answered the handshake pin prompt (and possibly the polarity prompt), CONFIGUR will display the following prompt:

```
Protocol [X(on/Xoff),E(tx/Ack),N(one)] :
```

Explanation

Protocol is a method of coordinating the transmission of data between your computer and your printer by assigning one device or both devices to transmit specific characters as a signal to the other device.

With XON/XOFF protocol, the printer transmits the DC3 character (Device Control 3: turns transmitter off) when the printer must momentarily stop receiving data, either because the buffer is full or because the printer is off line. The printer sends the DC1 character (Device Control 1: turns transmitter on) when the printer is ready to receive more data, as when the buffer has empty space and the printer is on line.

With ETX/ACK protocol, the computer transmits the ETX character at the end of the transmission of a unit of data (to signify the End of TeXt). When the printer processes the unit of data (buffer size) with the ETX character, the printer transmits the ACK character back to the computer (to ACKnowledge that the data unit was received). If this option is selected, you will be asked to enter the device buffer size. Enter a number between 10 and 255 to reflect the largest amount of data that your printer can handle.

Specification Technique

To specify the particular protocol characters (if any) that are transmitted to signal the printer's readiness to receive more data, type **X** for XON/XOFF protocol, type **E** for ETX/ACK protocol, and type **N** for no protocol. After typing one of these letters, press ㊏. CONFIGUR will get ready to set the CP/M Operating System so that it allows transmission of the proper signal characters, if any.

After you have specified a protocol, CONFIGUR will display:

```
Press RETURN to access Main Menu:
```

Press ㊏ and CONFIGUR will redisplay the "MAIN MENU," at which time you can enter another selection.

4. MODEM SPECIFICATION

In order to adjust the system to accommodate your modem, enter **M** and ⓒ at the "Configur Main Menu." Then CONFIGUR will display one or more prompts that help you to specify either the model number or characteristics of your modem. The first modem prompt looks like this:

```
*** Modem Configuration ***

Standard Heath/Zenith Modem? (WH-13,WH-23,WH-33,WH-43) [Y/N] :
```

Your response to this prompt depends on whether your modem is listed in the prompt by its model number. If not, you must specify individual characteristics of your modem.

4.1 Specifying Modem Model Number

If the model number of your modem (as shown in the Heath/Zenith catalog) is listed in this prompt, and you have not changed the switch settings since it was shipped, then type **Y** and press ⓒ. This entry gets CONFIGUR ready to adjust the CP/M Operating System to accommodate the characteristics that usually apply to these modems when they are shipped. After this entry, CONFIGUR will redisplay the "MAIN MENU." Then you can enter the letter for another selection.

4.2 Specifying Modem Characteristics

If you have a modem that is not listed in this prompt, or if you have a listed modem on which the switch settings have been changed since shipping, then type **N** and ⓒ at this prompt. CONFIGUR will then enable you to specify characteristics of your modem such as: baud rate, bits per character, parity, and handshaking pin. First CONFIGUR displays a prompt for baud rate selection.

NOTE: If you respond to one of these prompts by pressing ⓒ without first typing one of the values listed in the prompt, the prompt will be redisplayed.

BAUD RATE

When you enter the letter **N** at the "Modem Port Selection" menu, CONFIGUR will first display the following message:

```
  Baud rate selection
(Space=next possibility,
BACKSPACE=last possibility,
RETURN=select this one)
   Baud Rate :    45.5
```

Explanation

Baud rate is the speed with which data is transmitted to and from your modem, roughly corresponding to the number of bits per second transmitted. Since the CP/M Operating System coordinates the transmission of data to and from your modem, CP/M must know how fast your modem is set to send and receive data.

Specification Technique

This prompt enables you to specify the baud rate of your modem. To the right of the words "Baud Rate :", you will see a number that corresponds to one of the 16 baud rates possible on the Z-100 computer (45.5, 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 4800, 9600, 19200, 38400).

CONFIGUR displays these values, one-at-a-time, in sequence. You can view a different value by pressing the **space bar** for a greater value, or by pressing the **BACK SPACE** key for a lesser value.

When the correct baud rate value is displayed in the "Baud Rate :" prompt, press ⏎ to specify this value. CONFIGUR will get ready to set the CP/M Operating System to accommodate this baud rate value for modem data transmission.

BITS PER CHARACTER

After you have specified a baud rate, CONFIGUR will display the following prompt:

```
Bits per character: [5,6,7 or 8] :
```

Explanation

Bits per character is the number of significant data bits your modem expects to receive in order to decipher one character (byte) from the stream of bits that are transmitted. Start bits, stop bits, and parity bits (if used) are not included in this number.

Specification Technique

To specify the number of bits per character your modem accepts, type **5**, **6**, **7**, or **8** at the "Bits per character" prompt. Then press ⓒR. CONFIGUR will get ready to set the CP/M Operating System to transmit this many bits within every character of data it sends.

PARITY

After you have specified bits per character, CONFIGUR will display the following prompt:

```
Parity [O(dd),E(ven),N(one)] :
```

Explanation

Parity is a method by which data is checked to make sure it hasn't changed during transmission.

When odd parity is used, a parity bit is transmitted along with each character that is transmitted to the modem. Before transmission, this bit is set to either one or zero to ensure that the sum of all of the transmitted bits is an odd number. If the modem receives a byte of data bits and a parity bit that do not all add up to an odd number, then an error must have occurred during transmission.

Even parity works the same way, except that the parity bit is set to either one or zero to ensure that the sum of all of the transmitted bits is an even number.

When no parity is used, no parity bit accompanies each transmitted character.

Specification Technique

To specify the kind of parity (if any) that is used to check errors in the data sent to your modem, type **O** for odd parity, **E** for even parity, and **N** for no parity. After typing one of these specifications, press ⓒⓡ. CONFIGUR will get ready to set the CP/M Operating System so that it transmits parity bits as required by your modem.

HANDSHAKE PIN

After you have specified the nature of your modem's parity, CONFIGUR will display the following prompt:

```
Handshake Pin [N(one), D(tr/pin 20), R(ts/pin 4(] :
```

Explanation

The *handshake pin* is the circuit through which modem and the computer signal each other to determine when data should be transmitted. This circuit is one of many bundled together in the RS-232C cable that connects the computer with the modem. The modem uses this circuit to signal the computer that it is ready to receive more data.

The DTR (Data Terminal Ready) handshake pin is labelled with the number 20 on the receptacle ends of the cable; and the RTS (Request To Send) handshake pin is labelled with the number 4 on the receptacle ends of the cable.

Specification Technique

To specify the particular handshake pin (if any) that is used to signal the modem's readiness to receive data, type **N** for no pin, type **D** for the DTR (number 20) pin, or type **R** for the RTS (number 4) pin. After typing one of these specifications, press ⏎. CONFIGUR will get ready to set the CP/M Operating System so that it signals the modem's readiness as required by your modem.

Then CONFIGUR will redisplay the "MAIN MENU", at which you can enter the letter for another selection.

POLARITY

If you specified a handshake pin (by typing D or R at the previous prompt), then a prompt will appear in the following form:

```
Polarity [N(one),H(ready when High),L(ready when Low) ] :
```

NOTE: If you specified no handshake pin (by typing N at the previous prompt), then the "Polarity" prompt will not appear.

Explanation

Polarity is the voltage level at which the modem signals the computer that the modem is ready to receive more data. This signal can be sent at either a high voltage level or a low voltage level. It travels through the handshake pin that was specified at the previous prompt.

Specification Technique

To specify a polarity, type **H** if the modem signals it readiness with a high voltage signal, and type **L** if the modem signals its readiness with a low voltage signal. To specify no polarity, type **N**.

5. AUTOMATIC COMMAND SPECIFICATION

In order to adjust the system to accommodate your preference in automatic commands, you must type **C** and ⏎ to select "Command Configuration" at the main menu. CONFIGUR will display the following menu:

```
                *** Command Line Configuration ***

      C - Cold Boot Command Line =
      W - Warm Boot Command Line =
      ? - Brief Help Message

      X - Exit

    Selection [C,W, ? or X]:
```

This menu enables you to specify that a command be automatically invoked upon a cold boot or that a command be automatically invoked upon a warm boot. You can specify up to two different commands: one for execution on cold boot, and one for execution on warm boot. In addition, this menu enables you to display a screen of helpful comments about this menu and its use, if you enter a ?.

5.1 Cold Boot Command Line

To specify a command for automatic cold boot invocation, type **C** and ⏎ at the "Command Line Menu." CONFIGUR will display the prompt:

```
Cold Boot Command Line :
```

At this prompt type a valid CP/M command line, just as you would type it at a CP/M system prompt. When you enter the ⏎ to end the command line, CONFIGUR will display the command line on the "Command Line Menu" and get ready to set the CP/M Operating System to invoke this command immediately after every cold boot.

If the menu already shows a cold boot command line and you wish to remove it, type **C** at the "Command Line Menu" and immediately press ⏎.

NOTE: Your Z-100 is capable of performing an automatic cold boot when powered up or reset, if a switch within the Z-100 is set properly. If this automatic booting feature is not switched on, you must power up or reset the computer and then enter a bootstrap command to perform a cold boot. In either case, the cold boot will be immediately followed by invocation of a command specified through CONFIGUR.

5.2 Warm Boot Command Line

To specify a command for automatic warm boot invocation, type **W** and ⓒⓡ at the "Command Line Menu." CONFIGUR will display the prompt:

```
Warm Boot Command Line :
```

At this prompt, type a valid CP/M command line, just as you would type it at a CP/M system prompt. When you enter the ⓒⓡ to end the command line, CONFIGUR will display the command line on the "Command Line Menu" and get ready to set the CP/M Operating System to invoke this command immediately after every warm boot.

If the menu already shows a warm boot command line and you wish to remove it, type **W** at the "Command Line Menu" and immediately enter a carriage return.

NOTE: A warm boot can occur when you press the **CTRL** and **C** keys simultaneously, or when some application programs exit to the operating system. In either case, the warm boot will be immediately followed by invocation of a command specified through CONFIGUR.

5.3 Acceptable Commands

Any valid resident command, transient command (utility), or application program is acceptable in the automatic command line. However, any file that the command line refers to must reside on the disk specified in the command line. For example, if the line reads:

```
C - Cold Boot Command Line = B:SC
```

Then the file "SC.COM" (part of the SuperCalc application program) must reside on the disk in drive "B:" for the command to work. If any data referenced in the command line cannot be found in the specified drives, then command execution will be aborted and an error message will be displayed.

NOTE: Some transient commands (utilities) and application programs finish their execution by performing a warm boot. Therefore we recommend that you do not enter both an automatic cold and warm boot command line for a program that performs a warm boot after execution, because endless execution of the same program might result.

5.4 Returning to the Main Menu

To finish your command line menu activities and regain access to the "Configur Main Menu," type **X** at the "Command Line Menu." CONFIGUR will redisplay the "MAIN MENU," which enables you to enter the letter for another selection.

6. I/O DEVICE SPECIFICATION

In order to adjust the system to send certain types of data through different physical devices, enter **I** and ⓒⓡ at the "Configur Main Menu." Then CONFIGUR will display a menu in the following form:

```
            ***I/O Map Configuration***

    C - Console     Currently: CRT
    R - Reader      Currently: PTR
    P - Punch       Currently: PTP
    L - List        Currently: TTY
    ? - Brief Help Message

    X    Exit

  Selection [C,R,P,L,? or X] :
```

(The current assignments of your physical devices may differ from those in this sample menu.)

This menu shows the physical device names that are currently assigned to each logical device category.

NOTE: If you have already chosen a printer (by name or by characteristics) during this CONFIGUR run, then List device will have been automatically assigned to the proper physical device. Therefore, the letter "L" will not **not** be listed in the I/O map selection prompt. Furthermore, you will not be able to select the List device during this CONFIGUR run.

EXPLANATION

Data can be sent to or from a wide variety of peripheral hardware devices. CP/M groups these devices under the logical device categories "Console," "Reader," "Punch," and "List" (as shown on the left side of the menu).

However, these categories provide CP/M with only a general reference to the actual device being used. CP/M is capable of controlling data transfer through many different devices that are included in these categories. Therefore, a more specific name must be assigned to each logical device category to inform CP/M of the kind of devices it must control. The specific name assigned to each logical device category is the "physical device name." Each physical device name helps CP/M to recognize and control a particular kind of peripheral hardware.

The physical device name currently assigned to each logical device category is listed on the right side of the menu.

Table 2-1 will help you determine which physical device names can be matched with which logical device names.

NOTE: By entering a ? at this menu, you will cause a screen display of helpful comments about this menu and its use.

This table names and describes the physical devices that can be assigned to each logical device category.

Table 2-1

Physical Device Names

SELECTION LETTER	LOGICAL DEVICE CATEGORY	PHYSICAL DEVICE NAME	DESCRIPTION AND/OR CATALOG NAME OF THE ACTUAL HARDWARE DEVICE USED
C	Console	TTY:	A printing terminal attached to serial port outlet A on the Z-100 (e.g. Decwriter).
		CRT:	A video display terminal and keyboard.
		BAT:	A batch pseudo-device using RDR: for input and LST: for output.
		UC1:	A modem attached to serial port B on the Z-100.
R	Reader	TTY:	A printing terminal attached to serial port outlet A on the Z-100 (e.g. Decwriter).
		PTR:	Not implemented.
		UR1:	A modem attached to serial port B on the Z-100.
		UR2:	A video display terminal and keyboard.
P	Punch	TTY:	A serial printer attached to serial port outlet A on the Z-100.
		PTP:	Not implemented.
		UP1:	A modem attached to serial port B on the Z-100.
		UP2:	A video display terminal and keyboard.
L	List	TTY:	A serial printer attached to serial port outlet A on the Z-100 (e.g. H/Z-25, H-14, TI-810, Diablo, Epson MX-80 serial, Decwriter).
		LPT:	A parallel printer attached to the parallel port on the Z-100 (e.g. Epson MX-80 parallel).
		CRT:	A video display terminal and keyboard.
		UL1:	A modem attached to serial port B on the Z-100.

Specification Technique

To select a logical device category to be changed, you must first type the letter (**C, R, P,** or **L**) listed to the left of the category in the menu and ⓒ. CONFIGUR will display one of the following prompts:

```
    Console:  [T(ty), C(rt), B(at) or 1(UC1)]:
```
or
```
    Reader:   [T(ty),P(tr),1(UR1),2(UR2)] :
```
or
```
    Punch:    [T(ty),P(tp),1(UP1),2(UP2)] :
```
or
```
    List:     [ T(ty),C(rt),L(pt),1(UL1)] :
```

Each of these prompts show the logical device category on the left, and all of the physical device names that could be assigned to this category on the right.

To assign a physical device name to a logical device category, type the single character of the name that is displayed outside the parentheses.

CONFIGUR will respond by instantly displaying the name of the specified physical device in the "I/O Map Configuration" menu.

You can access the CONFIGUR MAIN MENU by entering **X** and ⓒ at the "Selection" prompt beneath the "I/O Map Configuration."

NOTE: These logical/physical device assignments can be temporarily changed outside of CONFIGUR by using the STAT utility (see Page 2-174).

Specification Examples

For instance, if you want to change the assignment of physical device name "TTY" to "LPT" in the "List" category, type **L** (for "List") and ⓒ at the menu's selection prompt. Then type **L** (for "LPT") and ⓒ at the "List" category prompt. CONFIGUR will redisplay the "I/O Map Configuration" menu with the "LPT" named as "Currently" the physical device assigned to "List."

As a further example, if you wish to assign the physical device name "UR1" in place of the name "PTR" for the "Reader" category, type **R** (for "Reader") and ⓒ at the menu's selection prompt. Then type **1** (for "UR1") and ⓒ at the "Reader" category prompt. CONFIGUR will redisplay the "I/O Map Configuration" menu with the "UR1" named as "Currently" the physical device assigned to "Reader."

7. EXITING FROM CONFIGUR

The "MAIN MENU" enables you to exit from the CONFIGUR utility, and eventually gain access to the CP/M Operating System.

```
CP/M-85 System Configuration Utility version 2.2.100
      Copyright (C) 1982 by Zenith Data Systems

                  *** MAIN MENU ***


            P - Printer Configuration
            M - Modem   Configuration
            C - Command Configuration
            I - I/O map Configuration
            ? - Brief Help message

            X - Exit

Selection [P,M,C,I X or ?]:
```

7.1 The Exit Selection

To begin to exit from CONFIGUR to CP/M, press **X** and ⏎.

If you have **not** specified any changes to the system during this CONFIGUR activity, CONFIGUR will immediately relinquish control to CP/M, which will display the system prompt.

If you **have** specified any changes to the system during this CONFIGUR activity, CONFIGUR will display the following menu:

```
        *** EXIT OPTIONS ***


T - Make changes temporary (to memory only)
P - Make changes permanent (to memory and disk)
Q - Make no changes

? - Brief Help Message

Choice [T,P,Q or ?]:
```

- If you wish to cancel all of the changes that you have specified without having them applied to the system, then press **Q** or ⏎. The unchanged CP/M Operating System will then display the system prompt.

- If you wish to have CONFIGUR apply all of the changes you have specified only to the CP/M system now in active computer memory, then press **T** (for Temporary) at this prompt. These changes will remain in effect until the computer is reset. If you had specified changes pertaining to printers and/or modems, CONFIGUR will now display a diagram to assist you in connecting your hardware devices.

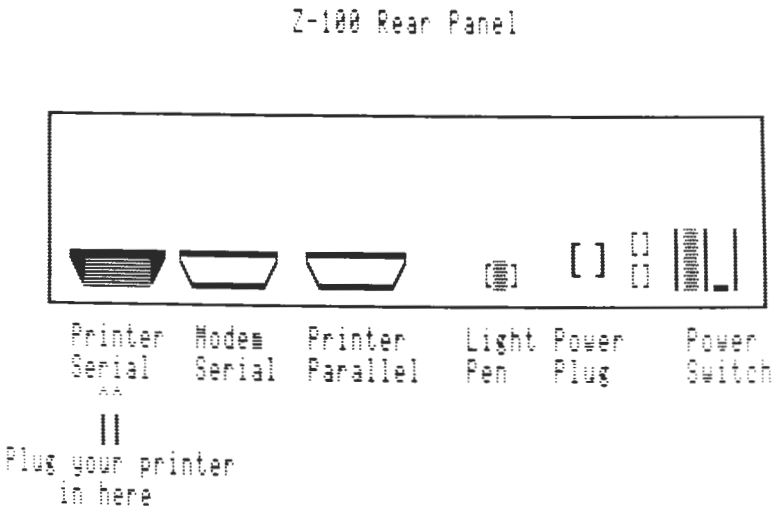
(See "7.2 Connecting Your Hardware".) However if you had specified no printer or modem changes, CONFIGUR will now relinquish control to CP/M, which will display the system prompt.

- If you wish to have CONFIGUR apply all of the changes you have specified both to the CP/M system in active computer memory and the system on the disk, then press **P** (for Permanent) at this prompt. These changes will go in effect as soon as CP/M regains control. These changes will be recorded on the disk in drive A until the next CONFIGUR session conducted with the same disk in drive A. If you specified changes pertaining to printers and/or modems, CONFIGUR will now display a diagram to assist you in connecting your hardware devices. (See "7.2 Connecting Your Hardware.") However if you specified no printer or modem changes, CONFIGUR will now relinquish control to CP/M, which will display a system prompt.

NOTE: If the disk in drive A was write-protected when you invoked CONFIGUR, the "P- Make changes permanent" choice will not appear in the exit menu, and entering the letter P at this menu will have no effect.

7.2 Connecting Your Hardware

Before returning control to the CP/M Operating System, CONFIGUR will display a diagram in the following form:



This diagram shows the location of the outlet on your Z-100 rear panel, onto which you should attach the RS232 cable that leads to your printer and/or modem. Attach the applicable cable(s) to the indicated outlet(s) before trying to use the printer and/or modem.

NOTE: This example diagram shows the message that will appear beneath the diagram if you had specified a serial printer during this CONFIGUR activity. The message appears beneath a different peripheral outlet if you had specified a parallel printer or a modem.

8. CONFIGUR ERROR MESSAGES

```
Incompatible Configur & CPM-85
```

Explanation

You are running a CONFIGUR utility under a CP/M Operating System of a different version. The version number of your CONFIGUR and your CP/M must match. Copy CP/M (using SYSGEN) and CONFIGUR (using PIP) from CP/M-85 Distribution Disk I, boot up, and invoke CONFIGUR again.

```
Bad choice.   Choice [1..9]:
```

Explanation

Your entry at the "Printer Selection" menu was not a number between 1 and 9. Enter the number between 1 and 9 that corresponds to your printer.

DDT

The Dynamic Debugging Utility

> This text assumes that the user is familiar with assembly language programming, the hexadecimal number system, and 8080 CPU registers. Caution is advised during DDT use, because DDT has the ability to alter executable programs.

The Dynamic Debugging Tool (DDT) utility enables you to debug machine language programs (files with the extension "HEX" or "COM"). DDT loads a program into the Transient Program Area of the computer's memory (1). During a debugging session, the utility exposes and manipulates the hexadecimal, assembly language, and ASCII forms of the loaded program when you implement the special DDT commands (3). You can copy the results of the debugging session to a disk file by exiting from DDT and implementing the SAVE resident command (2).

1. DDT INVOCATION

The DDT utility can be invoked using two methods: the System Prompt Method or the Utility Prompt Method.

1.1 System Prompt Invocation Method

You respond to the system prompt with a command line in the form:

A>**DDT {file name}**CR

Where **{file name}** is the complete name of a program file residing on the default disk with a "HEX" or "COM" extension. This file is automatically loaded into the computer's memory beginning at address 100H (the Transient Program Area start.)

DDT will identify itself with the message:

```
DDT VERS 2.2
NEXT   PC
aaaa  pppp
-
```

Where "2.2" is the utility's version number;

where "aaaa" is the next available memory address after the program is loaded (or the address after the last address occupied by the loaded program);

where "pppp" is the current position of the program counter within the Transient Program Area (this value is usually 0100 when the program is first loaded into memory); and

where "-" (the hyphen character) is the DDT prompt, at which you can enter special DDT commands.

Because DDT loads programs into the Transient Program Area, usually beginning at address 0100, you can approximate a program's size by subtracting 0100 from the "aaaa" value in the display.

1.2 Utility Prompt Invocation Method

You respond to the system prompt with the following command:

```
A>DDT<CR>
```

The DDT utility will identify itself with the following display:

```
DDT VERS 2.2
-
```

Where "2.2" is the version number; and

where "-" (the hyphen character) is the DDT prompt, at which you can enter special DDT commands.

To load a file from the default disk into memory under this invocation method, you must now make the following entries, in order: the letter **I,** (no space), the complete file name of the program to be loaded, a carriage return, the letter **R,** and another carriage return.

The DDT utility will **I**nsert the name of the program into memory, **R**ead the named program into memory, and display values for both the "NEXT" available address and the "PC" program counter. For example, if you desire to debug the program file named "PROGRAM.HEX", the console display of these transactions might appear as follows:

```
A>DDT<CR>
DDT VERS 2.2
-IPROGRAM.HEX<CR>
-R<CR>
NEXT  PC
3E80 0100
-
```

Where "3E80" is the next available memory address after the end of the program (or the address after the last address occupied by the loaded program); and

where "0100" is the current value of the program counter (or the first memory address occupied by the program); and

where "-" (the hyphen character) is the DDT prompt, at which you can enter special DDT commands.

LOADING A PROGRAM FROM A NON-DEFAULT DRIVE

Using the second DDT invocation method, you can access a file from a non-default disk by doing the following, in order:

- Enter the letter **I,** the complete file name of the program to be loaded, and a carriage return; and
- Enter the character string **S5C** and a carriage return. This entry will produce a six-digit hexadecimal display.
- Enter the two-digit drive number for the drive containing the program that is to be debugged, and a carriage return. (See the table below to find the drive number that corresponds to the appropriate drive letter. This table will not be displayed on the console.)

Drive Number	Drive Letter
00	DEFAULT
01	A
02	B
03	C
04	D

NOTE: "DEFAULT" is the drive logged before DDT invocation.

The drive number you entered will be displayed on the right of the six-digit display, and a second six-digit display will appear beneath;

- Enter a . (period) and a carriage return. This entry will be displayed on the right of the second six-digit display; and finally
- Enter the letter **R** and a carriage return. DDT will read the program file into memory, and display values for both the "NEXT" available address and the "PC" program counter.

For instance, to access the file named "PROGRAM.HEX" from the disk within non-default drive B (02), you must interact with DDT as shown in the following display:

```
A>DDT<CR>
DDT VERS 2.2
-IPROGRAM.HEX<CR>
-S5C<CR>
005c 00 02<CR>
005D 57 .<CR>
-R<CR>
NEXT  PC
3880 0100
-
```

2. SAVING A DEBUGGED PROGRAM

You can preserve the results of a debugging session by copying a block of data from the Transient Program Area (TPA) to a disk file. The SAVE resident command will assist in this task. SAVE copies the number of pages you specify (256-byte blocks) from the TPA to the file name you specify on a disk.

To SAVE a program that has been loaded into memory and debugged by DDT, first exit from the DDT utility to the operating system. If the exit is performed properly, the image of the program in the TPA will remain undisturbed as SAVE copies from it to a disk file.

You can exit from the DDT utility by either of the following two methods:

- **Performing a Warm Boot** — Any time the DDT hyphen (-) prompt is displayed, enter a **CTRL-C** (by pressing the **C** key while holding down the **CTRL** key). The operating system will display a system prompt (A>).
- **Jumping to the Operating System's Entry Address** — Any time the DDT hyphen (-) prompt is displayed, you can trigger execution of the operating system by entering the DDT command **G0** (where "**0**" is zero). This command sends the program counter to computer memory location 0000H (zero), where the system parameters area begins. The operating system responds by displaying a system prompt (A>).

You must next enter the SAVE command. The SAVE command is entered in the form:

A>**SAVE {pages} {file name.ext}**CR

Where {pages} are 256-byte units of data that are expressed in decimal (not hexadecimal) numerals, and

where {**file name.ext**} specifies the file name under which you wish to store the results of the debugging session.

You can SAVE the entire program by determining the (decimal) number of pages between the "pppp" value and the "aaaa" value displayed when DDT initially loads the program into the TPA, as shown:

```
NEXT  PC
aaaa pppp
```

Unless the program has been moved from the beginning of the TPA, the two lefthand digits in the "aaaa" value will be the hexadecimal number of pages the program occupies, as long as the two righthand digits are not zeros. If the two righthand digits are zeros, one should be subtracted from this total to determine the number of hexadecimal pages. In either case, the hexadecimal number of pages should be converted to a decimal number suitable for the SAVE command.

3. DDT COMMANDS

The DDT utility has its own assortment of commands. They are entered in response to the DDT hyphen (-) prompt. DDT command lines begin with a single command letter. These letters are listed on the left side of the following list:

- **A** Assembly: Assembly language mnemonics are inserted
- **D** Display: Display memory contents in hexadecimal and ASCII form
- **F** Fill: Fill a block of memory with a specified data constant
- **G** Go: Go to specified address to run a program
- **H** Hex: Hexadecimal computation of sums and differences
- **I** Insert: Insert file name into file control block
- **L** List: List assembler mnemonics of a program
- **M** Move: Move a data block to a different memory area
- **R** Read: Read a program file into memory from disk
- **S** Substitute: Substitute hexadecimal values at an address
- **T** Trace: Trace program execution
- **U** Untrace: Untrace program execution
- **X** eXamine: Examine or change registers or flags

Most of these command letters can be followed by parameters such as hexadecimal values or a file name. All DDT command lines must end with a carriage return.

When hexadecimal parameters are used, these values consist of one to four digits. (Longer numbers are automatically truncated on the right.) One, two, or three such values can be entered in some command lines. Values are separated by commas or single blank spaces.

Only one DDT command can be entered in response to a single DDT hyphen (-) prompt. Each DDT command line, however, can be composed using most of the same line editing keys and techniques as are used for commands entered at the CP/M system prompt.

No DDT command line can exceed 32 characters in length. If a thirty-second character is entered, a carriage return is appended and execution begins based on the first 32 characters in the command line.

Many DDT commands operate under a "CPU state" which corresponds to the program being tested. The CPU state holds the program's registers. Initially, all registers and flags contain zeroes — except for the program counter (P) and the stack pointer (S), which default to the value 100H.

The program counter is a CPU register that is used as a movable reference point for DDT commands. It keeps track of the last hexadecimal address that was displayed and/or altered by a DDT command. The address immediately after this last address will be the starting address for the next DDT command the user enters (unless the next command specifies a different starting address).

3.1 A — Assembly Language Mnemonics are Inserted

The A (assemble) command enables you to insert assembly language instructions into the program being tested. The command is entered in the form:

As

Where "s" is the memory address at which you desire to start inserting assembly language instruction statements.

DDT responds to such an entry by echoing the value ("s") entered. You can then enter an assembly language statement to the right of the echoed "s" value. The statement must end with a carriage return.

DDT will display the next available memory address after the new statement is appended to the program. You can enter another statement to the right of the displayed address, or enter a carriage return alone to end A command operations and retrieve the DDT prompt.

For example, if you want to insert a "MOVE IMMEDIATE to register C" statement into a program at memory address 0104H, the following entry should be made in response to the DDT prompt:

A104CR

DDT will echo the address with the display:

```
0104
```

To the right of the address display, you can insert the statement:

MVI C,{data}CR

Where {data} is the data to be moved into register C.

DDT will then display the value for the next available memory location. Since the "MVI" statement took up two locations, DDT displays:

```
0106
```

You can enter another statement at location 0106H or end the operations of the A command by entering a carriage return alone.

NOTE: When the A command inserts a statement at a particular memory address, the statement(s) that formerly occupied that part of memory will be overwritten, and therefore destroyed. If you insert a statement that does not occupy the same number of locations as the statement(s) being replaced, the meaning of subsequent statements might be changed. You should use the "L" command immediately after finishing A command operations, to verify that the desired results were achieved during use of the A command. The following example demonstrates this problem.

Suppose you want to replace a "jump" instruction (JMP) with a "return from subroutine" statement (RET). The JMP statement occupies three locations, and the RET instruction will occupy one. Inserting the one-byte RET into the first location of the three-byte JMP will leave the last two-thirds of the JMP statement in the program. This partial statement could cause problems when the program is run.

3.2 D — Display Memory Contents in Hexadecimal and ASCII Form

The D (display) command allows the user to view the contents of memory in both hexadecimal and ASCII formats. The display appears in the following form:

```
aaaa bb bb bb bb bb bb bb bb bb bb bb bb bb bb bb bb ccccccccccccccc
```

Where "aaaa" is the address of the first memory location displayed in this line;

where "bb" represents the hexadecimal contents of a memory location; and

where "ccccccccccccccc" represents the ASCII translation of the contents of each memory location.

If the contents of a memory location cannot be displayed as an ASCII character, a period (.) will be displayed instead.

The display address acts as a pointer in memory which is initially set to 100H. As each memory location is displayed, the pointer is incremented by one so that at the end of a D command, the pointer is positioned ready to display the next 256 memory locations.

The three forms of the command are:

D Display memory from the current display address. DDT will display 12 lines, each representing 16 bytes of data.

Ds Change the starting display address to "s." Then display memory beginning with address "s" and continuing for 192 more bytes.

Ds,f Change the starting display address to "s." Then display memory beginning with address "s" and continuing until memory address "f" is reached.

D,f Display memory from the current display address until address "f" is reached.

Displays triggered by any of these commands can be suspended if a **CTRL-S** is entered during the display. The display will resume if any character is entered.

A display will be aborted if any character other than CTRL-S is entered. However, it is recommended that the display be intentionally aborted by pressing the DELETE key, because other characters will appear at the next DDT hyphen (-) prompt if they are used to abort the display.

EXAMPLE DISPLAY

For example, if you want to see a hexadecimal and ASCII display of the file "SYSGEN.COM," **D** should be entered at the DDT prompt. This entry would produce a display like the following:

```
0100 C3 87 02 43 4F 50 59 52 49 47 48 54 20 28 43 29 ...COPYRIGHT (C)
0110 20 31 39 37 38 2C 20 44 49 47 49 54 41 4C 20 52  1978, DIGITAL R
0120 45 53 45 41 52 43 48 20 6F 26 00 29 29 29 29 29 ESEARCH o&.)))))
0130 29 29 C9 0E 01 CD 05 00 FE 61 D8 FE 7B D0 E6 5F ))........a..{..._
0140 C9 5F 0E 02 CD 05 00 C9 3E 0D CD 41 01 3E 0A CD ._.......>..A.>..
0150 41 01 C9 E5 CD 48 01 E1 7E B7 C8 E5 CD 41 01 E1 A....H..~....A..
0160 23 C3 58 01 D5 4F 2A 01 00 11 18 00 19 D1 E9 2A #.X..O*........*
0170 01 00 11 1B 00 19 E9 2A 01 00 11 1E 00 19 E9 2A .......*........*
0180 01 00 11 21 00 19 E9 2A 01 00 11 24 00 19 E9 2A ...!...*...$...*
0190 01 00 11 27 00 19 E5 21 9A 07 3A 98 07 BE F5 35 ...'...!..:.....5
01A0 CA AE 01 F1 0E 00 C2 B7 01 0E 02 C3 B7 01 F1 3A ...............:
01B0 98 07 32 9A 07 0E 01 E1 E9 0E 14 C3 05 00 0E 0F ..2.............
```

NOTE: To use this example, you must first load SYSGEN.COM into memory.

3.3 F — Fill A Block of Memory with a Specified Data Constant

The F (fill) command allows you to fill a block of memory with a specific constant. The form of the command is:

Fs,f,c

Where "s" is the address at which the filling should begin;

where "f" is the address at which the filling should end; and

where "c" is the data constant that should occupy each memory address in between.

Any data that resided between addresses "s" and "f" prior to the entry of the command will be overwritten by the constant, and therefore destroyed.

Only hexadecimal values should be entered in such a command, and value "f" must be greater than value "s." If "s" is greater than "f," the operation will not be executed and the DDT prompt will reappear.

For example, the following command:

- **F9200,9400,E5**CR

would fill every memory location from address 9200H through address 9400H with the hexadecimal value "E5."

3.4 G — Go to Specified Address to Run a Program

The G (Go to) command enables you to begin execution of the program from any address, and to specify one or two execution breakpoints if desired. (A *breakpoint* is the address of an instruction which, when reached, will stop the execution of the program and redisplay the DDT prompt.) Execution begins with the instruction at the memory address immediately following the one specified in the command. The instruction at the specified address is not executed.

If no breakpoint is entered, the only other way in which the control of the program may be returned to you is if an "RST 7" instruction is encountered within the program. This instruction will immediately stop program execution and redisplay the DDT prompt to allow further DDT commands from you.

The G command can be entered in the following forms:

G Begins execution of the program at the current value of the program counter, with no breakpoints set. The program will run to completion.

Gs Sets the program counter to address "s" and begins execution of the program from that address, with no breakpoints set. The program will run to completion.

G,b Begins execution of the program at the current value of the program counter and continues until the instruction at address "b" (the breakpoint) is reached. Then program execution stops.

Gs,b Sets the program counter to "s" and begins execution of the program at address "s." When the instruction at address "b" (the breakpoint) is reached, program execution stops.

G,b,c Begins execution of the program at the current value of the program counter and continues until either address "b" or address "c" is reached. When either of these breakpoint addresses is reached, program execution stops.

Gs,b,c Sets the program counter to address "s" and begins execution of the program at this point. When either address "b" or address "c" is reached, program execution stops.

At a breakpoint, program execution stops and DDT displays:

```
*bbbb
-
```

Where "bbbb" is the address at which program execution stopped; and

where "-" is the DDT prompt.

For example, you could "go to" the very beginning of computer memory (address 0000H) and trigger execution of the program that is situated there. This program is, of course, the CP/M operating system. Its execution can be triggered by entry of a G and a zero, as shown:

```
-G0<CR>
```

The operating system would respond by displaying the system prompt, as shown:

```
A>
```

This command has the same effect as a warm boot.

3.5 H — Hexadecimal Computation of Sums and Differences

The H (hexadecimal value) command simultaneously adds and subtracts two hexadecimal values. This command is entered in the following form:

Ha,b

Where "a" is a hexadecimal value; and

where "b" is another hexadecimal value.

The resulting display appears in the form:

```
ssss  dddd
```

Where "ssss" represents the sum of two values; and

where "dddd" represents the difference between the two values.

This command is helpful in determining addresses to which programs will be relocated with DDT command "M."

For example, if you have a program that begins at address 0311H, and wish to move this program 0126H bytes higher in memory, then the H command could be used to calculate the new starting address, as shown:

```
-H311,126<CR>
0437 01EB
```

0437H would be the new starting address for the program.

However, if you enter an "a" value that is smaller than the "b" value, the sum ("ssss") will be the same, but the difference ("dddd") will be equal to 10000H minus the amount that "b" is greater than "a."

Such a case is demonstrated by the following entry:

```
-H1,2<CR>
```

which will produce this displayed solution:

```
0003 FFFF
```

3.6 I — Insert File Name into File Control Block

The I (input) command allows you to insert a file name into the area of memory that is used to store the names of files to be read from the disk. This area of memory begins at address 5CH. This is one of the memory areas from which the Console Command Processor (a functioning part of the CP/M operating system) distributes control to utilities and resident commands. This DDT command is entered in one of the following forms:

-I{**primary file name**}CR

-I{**primary file name**}.{**extension**}CR

If the second form of the command is used and the {**extension**} entered is either "HEX" or "COM," then subsequent R commands can be used to read the pure binary or hexadecimal machine code.

The I command will not read the file from the disk and store it into memory. It will only insert the file name into the File Control Block portion of the Console Command Processor, so that a subsequent R command can read the named file into memory.

3.7 L — List Assembly Language Mnemonics of a Program

The L (list) DDT command enables you to disassemble the instructions within a span of memory, and to display the assembly language mnemonics of the disassembled code on the console. The command can be entered in any of the following three forms:

L Lists 11 lines of disassembled machine code, beginning at the current list address. The list address acts as a pointer in memory which is initially set to 100H. As each memory location is disassembled, the pointer is incremented by one.

Ls Changes the list address to "s" and then lists 11 lines of disassembled machine code beginning at address "s."

Ls,f Lists disassembled code from starting address "s" to the final address "f."

The list appears in the form:

```
aaaa  mmmm  oooo
```

Where "aaaa" is the address of the instruction,

where "mmmm" is the mnemonic of the operator, and

where "oooo" is the operand.

Listings triggered by any of these commands can be suspended if a **CTRL-S** is entered during the listing. The listing will resume if any character is entered.

A listing will be aborted if any character other than CTRL-S is entered. It is recommended that the listing be intentionally aborted by pressing the DELETE key, because other characters will appear at the next DDT hyphen (-) prompt if they are used to abort the listing.

If an invalid mnemonic is encountered in a statement of a disassembled program, question marks ("??") will be used to represent it in the listing.

The disassembled mnemonics between address 0919 and address 091C of the program in memory can be listed with the entry of the following command:

-L0919,091CCR

Such a listing might appear as:

```
0919 OUT  F2
091A INX  H
091B MOV  A,M
091C ORA  A
```

3.8 M — Move a Data Block

The M (move) command allows you to move a block of data from one area of memory to another. This command is entered as:

Ms,f,d

Where "s" is the starting address;

where "f" is the final address of the block of data to be moved; and

where "d" is the starting point of the memory area to which the data is moved.

The data is moved to the area of memory beginning at the address "d." An example of the command is:

M100,200,1000CR

This command would take the contents of the block of memory starting at address 0100H and running through address 0200H, and move these contents to the area of memory beginning with the address 1000H.

3.9 R — Read a Program File Into Memory From Disk

The R (read) command is used after the I command to read COM and HEX files from the diskette into the transient program area in preparation for a debug operation. The R command requires a previous I command, specifying the name of the HEX or COM file to be read. The command can be entered in either of two forms:

R Reads the file whose name is in the file control block at address 5CH from disk and places it in the Transient Program Area. (The file name was placed in this location with the I command.)

Rb Reads the file whose name is in the file control block at address 5CH from disk and places it in the Transient Program Area with the addition of a bias factor, "b," which is a hexadecimal number added to each program instruction address or data address as it is read. This factor allows you to locate the program at any location in memory. When the bias is omitted, then b=0000 is assumed.

The read operation must not place the file in the first page of memory (0-0FFH) because this would write over the system parameters stored in this area. If the file specified in the preceding I command is a HEX file, the load address is derived from each individual HEX record. If the file to be loaded is a COM file, a load address of 100H is assumed. Any number of R commands may be issued following an I command to reread the program under test.

The Read command reads the file from the default drive. If another drive is desired, enter the command "S5C" to substitute the desired number, such that the number of the drive is specified by a number in the following table:

Drive Number	Drive Letter
00	DEFAULT
01	A
02	B
03	C
04	D

This substitution should be performed between the I command and the R command.

When the R command loads a named file into the Transient Program Area, a message in this form is displayed:

```
NEXT   PC
nnnn  pppp
```

Where "nnnn" is the address immediately following the loaded program; and

where "pppp" is the current value of the program counter (100H for COM files, or is taken from the last record if a HEX file is specified.)

The next address "nnnn" can be used to determine the size of the file which was loaded. If the beginning address is 100H, then subtracting 100H from "nnnn" will give the user the size of the program in bytes. The size derived in this manner is in hexadecimal units, and may have to be converted to decimal units before it is used.

3.10 S — Substitute Hexadecimal Values

The S (set) command enables you to examine — and optionally alter — the contents of specified memory locations. This command is entered as:

Sb

Where "b" is the hexadecimal address of the first memory location to examine.

DDT responds with a display of addresses and bytes:

```
aaaa  cc
```

Where "aaaa" is the hexadecimal address, and

where "cc" is the hexadecimal contents of the memory location.

You may substitute a new value for "cc" by entering the new value (in one or two hexadecimal digits) and a carriage return when DDT displays "aaaa" and "cc." Your entry will appear on the right side of this display, and replace "cc" in the memory image of the program.

The next address "aaaa" and its contents "cc" are displayed, inviting you to substitute a new value for this "cc." When you are finished altering address contents in this sequence of addresses, a period (.) and a carriage return should be entered, rather than a new value. Your alterations will be retained in memory, and the DDT hyphen (-) prompt will reappear.

If you wish to skip an address without changing it, a carriage return (without a period) should be entered in response to one of the "aaaa" "cc" displays.

For example, if you enter the following command:

-S100CR

then memory addresses and their contents will be displayed on the screen, starting with address 0100H, as shown. Your substituted values for the address contents are in bold-faced print on the right side of the following example display:

```
0100 C3 3CCR
0101 C0 CCR
0102 01 10CR
0103 20 CR
0104 43 CR
0105 4F F4CR
0106 50 .CR
-
```

3.11 T — Trace Program Execution

The T (trace) command allows the user to trace the execution of one to 65,535 (0FFFFH) program steps. During the trace, the contents of all registers and the status of all flags within the central processing unit (CPU) are displayed. This command can be entered in either of these forms:

T Displays the contents of the CPU registers and the status of the flags; then executes one program instruction. The DDT hyphen prompt (-) reappears.

Tn Displays the contents of the CPU registers and the status of the flags; then executes "n" program instructions, and stops. The DDT hyphen prompt (-) reappears.

Displays caused by the T command take this form:

```
CfZfMfEfIf  A=bb B=dddd D=dddd H=dddd S=dddd P=dddd inst *hhhh
```

Where "f" is a 0 or 1 flag value;

where "bb" is a byte value;

where "dddd" is a double byte quantity corresponding to a register pair;

where the "inst" field contains the dissassembled instruction which occurs at the location addressed by the program counter; and

where "hhhh" is the next address available for execution.

The display address (used in the D command) is set to the value of the H and L registers. The list address (used in the L command) is set to the value of "hhhh" so it will be ready to list the next program steps to be executed if desired. Since the state of the flags and registers of the CPU displayed by the T command occur before each instruction is executed, it may be helpful to use an X command to view the state of the CPU after the trace command.

The second form of the T command will trace the execution for n steps (n is a hexadecimal value) before a program breakpoint occurs. A breakpoint can be forced during long trace displays by using the DELETE key. The state of the CPU is displayed before each program step is executed in the trace mode.

If the program being tested must access the disk or Input/Output (I/O) devices through the CP/M system, the program tracing is discontinued at the interface to CP/M, and resumes after return from CP/M to the program being tested. CP/M functions which access I/O devices, such as the disk drive, operate at the proper speed (real-time), avoiding I/O timing problems. Programs running in the trace mode execute approximately 500 times slower than real-time because DDT takes control after each instruction you enter is executed. In programs which use interrupt instructions, the interrupts are always enabled during the trace mode.

3.12 U — Untrace Program Execution

The U (untrace) command allows you to trace the execution of one to 65,535 (0FFFH) program steps. During the untrace, the contents of all registers and the status of all flags within the central processing unit (CPU) are displayed. Intermediate program steps are not displayed. You can enter this command in either of these forms:

U Displays the contents of the CPU registers and the status of the flags; then executes one program instruction. The DDT hyphen prompt (-) reappears.

Un Displays the contents of the CPU registers and the status of the flags; then executes "n" program instructions, and stops. The DDT hyphen prompt (-) reappears.

Displays caused by the U command take this form:

```
CfZfMfEfIf  A=bb B=dddd D=dddd H=dddd S=dddd P=dddd inst=*hhhh
```

Where "f" is a 0 or 1 flag value;

where "bb" is a byte value;

where "dddd" is a double byte quantity corresponding to a register pair;

where the "inst" field contains the dissassembled instruction which occurs at the location addressed by the program counter; and

where "hhhh" is the next address available for execution.

The display address (used in the D command) is set to the value of the H and L registers. The list address (used in the L command) is set to the value of "hhhh" so it will be ready to list the next program steps to be executed if desired. Since the state of the flags and registers of the CPU is displayed by the U command before each instruction is executed, it may be helpful to use an X command to view the state of the CPU after the untrace command.

The second form of the U command will untrace the execution for n steps (n is a hexadecimal value) before a program breakpoint occurs. A breakpoint can be forced during long untrace displays by using the DELETE key. The state of the CPU is displayed before each program step is executed in the untrace mode.

If the program being tested must access the disk or Input/Output (I/O) devices through the CP/M system, the program untracing discontinues at the interface to CP/M, and resumes after return from CP/M to the program being tested. CP/M functions which access I/O devices operate at the proper speed (real-time), avoiding I/O timing problems. Programs running in the untrace mode execute approximately 500 times slower than real-time because DDT takes control after each user instruction is executed. In programs which use interrupt instructions, the interrupts are always enabled during the untrace mode.

3.13 X — eXamine or Change Registers or Flags

The X (examine) command enables you to display and alter the state of the registers and flags of the CPU at any time during the debugging process. You can enter this command in either of these forms:

X

Xr

Where "r" is one of the 8080 CPU registers in the following table:

8080 CPU REGISTER SYMBOL	REGISTER NAME	RANGE OF REGISTER CONTENTS
C	Carry Flag	(0/1)
Z	Zero Flag	(0/1)
M	Minus Flag	(0/1)
E	Even Parity Flag	(0/1)
I	Interdigit Carry	(0/1)
A	Accumulator	(0-FF)
B	BC Register Pair	(0-FFFF)
D	DE Register Pair	(0-FFFF)
H	HL Register Pair	(0-FFFF)
S	Stack Pointer	(0-FFFF)
P	Program Counter	(0-FFFF)

The first form of the command displays the state of the CPU in this form:

```
CfZfMfEfIf  A=bb B=dddd D=dddd H=dddd S=dddd P=dddd inst
```

Where "f" is a 0 or 1 flag value,

where "bb" is a byte value,

where "dddd" is a double byte quantity corresponding to a register pair, and

where the "inst" field contains the dissassembled instruction which occurs at the location addressed by the program counter.

The second form of the command displays the flag or register value of the specified register, and allows alteration of the hexadecimal value within this flag or register. You can substitute a new value for the value held in the register. You make this substitution by entering the new value and a carriage return to the right of the existing value.

This example demonstrates how the value in a register can be altered. Your entries are in boldfaced type:

```
-XS
S=00FE EF00<CR>
-
```

When you substitute a value into a flag or register, ending the substitution with a carriage return, the DDT hyphen prompt (-) reappears. If you wish to make no changes to the values, a carriage return alone should be entered.

BC, DE, and HL are displayed as register pairs. You must enter the entire register pair when either B or C or the BC pair is altered.

4. DDT ERROR SIGNALS

DDT does not display entire messages when you make an erroneous entry. However, DDT will display a question mark (?) if your entry does not conform to valid entry syntax restrictions.

Additionally, DDT will display question marks (??) in place of invalid mnemonics that it encounters when dealing with the assembly language form of a program.

DIR

The Resident Command that Displays Disk File Directories

The DIR resident command is issued to determine the presence of: (1) all of the files on a disk; (2) a specified file; or (3) a group of specified files. After command entry, DIR displays file names to the console (4). Some file names cannot be accessed by DIR (5).

1. DIRECTORY OF ALL FILES ON A DISK

DIR can be used to determine the names of all files on a disk by answering the system prompt with this entry:

A>**DIR** CR

If you desire a DIRectory of the files on a disk that does not reside in the default drive (drive B for instance) the DIR command should be entered with a drive specification, as:

A>**DIR B:** CR

NOTE: Because DIR is a resident command, it is automatically loaded into the computer with the rest of the operating system. It is never necessary (or valid) to specify a drive at the **beginning** of a DIR command line. For example, the command A>**B:DIR** CR is invalid.

2. DIRECTORY OF SPECIFIED FILE

To find out if one particular file resides on a disk, the complete name of that file is entered one space after the resident command specification "DIR." For example, the entry of the following command line will check the disk in default drive A for the file named "THISFILE.DOC":

A>**DIR THISFILE.DOC**↵

The presence of a specific file on a disk in a non-default drive can be determined by entering the appropriate drive name and a colon immediately before the name of the specified file.

3. DIRECTORY OF A GROUP OF FILES

To inquire about several files belonging to a group with similar names, you can enter an ambiguous file name (a file name with wildcard characters "*" and "?"). For example, to check the default drive disk for all of the files with the extension "BAK," you would enter this command line:

A>**DIR *.BAK**↵

As another example, the command line:

A>**DIR PROGRAM?.HEX**↵

will check the disk for files such as "PROGRAM1.HEX," "PROGRAM2.HEX," "PROGRAM3.HEX," etc. In addition, the command:

A>**DIR S*.COM**↵

will check the disk for files such as "SC.COM," "STAT.COM," and "SYSGEN.COM."

4. CONSOLE DISPLAY OF FILE DIRECTORY

Entering a DIR command line will produce a console display showing up to four file names in a horizontal line, with the name of the logged drive preceding each line. This example shows a DIRectory display of all of the files on some disk in drive A:

```
A: MVCPM207 COM : LIST     COM : PIP      COM : SUBMIT   COM
A: STAT     COM : XSUB     COM : ED       COM : ASM      COM
A: DDT      COM : LOAD     COM : CONFIGUR COM : SYSGEN   COM
A: DUMP     COM : DUMP     ASM : DUP      COM : FORMAT   COM
A: CPM48    COM : BSYSGEN  COM : DUMP     PRN : DUMP     HEX
```

If a specified file or group of files is not found on the disk being investigated, the console displays the message:

```
NO FILE
```

This message will also appear if a DIR command line references files on an empty disk.

5. FILES NOT ACCESSIBLE BY DIR

DIR commands will not produce a display indicating the presence of files that maintain the "SYS" status. (See "Changing a File's System Status" on Page 2-181.)

Files assigned to an unlogged user area are also inaccessible to a DIR command unless a USER command is issued before the DIR command. (See "USER" on Page 2-201.)

DUMP

The Utility that Displays a File in Hexadecimal Form

The DUMP utility is invoked with the name of a file (1) to display the hexadecimal contents of each address in a file (2). The file contents appear in lines containing 16 bytes of data each. To the left of each line is the address of the first byte in each line. This display will continue to the end of the program, unless suspended or aborted (3).

1. DUMP INVOCATION

The hexadecimal contents of a file can be displayed on the console by responding to the system prompt with the command of:

A>**DUMP {file name.ext}**CR

Where **{file name.ext}** is the complete file name of the disk file that you wish to examine in a hexadecimal display.

2. EXAMPLE DUMP DISPLAY

The command **DUMP THISFILE.HEX** ⏎ might produce this display:

```
0000 C3 C0 01 20 43 4F 50 59 52 49 47 48 54 20 28 43
0010 29 20 31 39 37 39 2C 20 44 49 47 49 54 41 4C 20
0020 52 45 53 45 41 52 43 48 20 44 49 53 4B 20 4F 52
0030 20 44 49 52 45 43 54 4F 52 59 20 46 55 4C 4C 24
0040 46 49 4C 45 20 45 58 49 53 54 53 2C 20 45 52 41
0050 53 45 20 49 54 24 4E 45 57 20 46 49 4C 45 24 2A
0060 2A 20 46 49 4C 45 20 49 53 20 52 45 41 44 2F 4F
etc. . .
```

3. SUSPENDING LONG SCROLLING DISPLAYS

The displays produced by the DUMP utility often scroll by quickly on the console. They can be halted temporarily by entering **CTRL-S** at any time during the scroll. The display can be resumed by entering any keyboard character except CTRL-C (which executes a warm boot and aborts the program). A run of the DUMP utility can be aborted altogether by entering any keyboard character (other than CTRL-S) during the display.

4. DUMP ERROR MESSAGE

```
NO INPUT FILE PRESENT ON DISK
```

The file specified to be DUMPed does not exist on that disk. Command should be reentered by specifying the proper file name or drive name, or by inserting the proper disk.

DUP

The Utility that Duplicates and/or Verifies Entire Disks

The DUP utility can be used to duplicate **all** of the data from one disk to another disk. It can also compare the two disks to verify whether the data recorded on one disk correspond exactly to the data recorded on another disk. If desired, DUP will even perform both operations consecutively, to ensure accurate duplication of a disk.

NOTE: Both of the disks involved in a DUP operation must be prepared in the exact same fashion by the FORMAT utility. The density and number of sides used for data storage on each disk must be identical. You cannot duplicate disks that were initialized through the Z-DOS Operating System when using the CP/M DUP utility.

You can use the DUP utility through either of two methods: the Utility Prompt Method or the System Prompt Method.

1. UTILITY PROMPT METHOD

With this DUP method, you invoke the DUP utility from a disk by entering a command at the system prompt. Then you answer a series of DUP prompts to define the duplication operation.

1.1 Utility Prompt Command Entry

Invoke DUP by typing a command at the system prompt in the following form:

```
A>DUP ↵
```

The DUP utility will present this display:

```
Disk Utility Program
Version 2.2.100

Do you want to:

     A  copy and verify
     B  copy only
     C  verify only

     Z  exit to operating system

Selection:
```

This display includes a menu listing the four operations DUP offers. You can begin execution of an operation by typing the letter listed to the left of that operation. Each operation is explained in the following sections.

1.2 A — copy and verify

The "copy and verify" operation makes an exact duplicate of a disk and verifies that the operation was performed flawlessly by comparing the two disks.

To begin this operation, type **A** at the "Selection:" prompt. (No carriage return is necessary.)

DUP will ask, in a series of consecutive prompts, for the letter of the drive that contains the disk to be copied **from** ("Source unit:") and for the letter of the drive that contains the disk to be copied **to** ("Destination unit:"). Enter the appropriate drive letter for each prompt. (No carriage return is necessary.)

When you have specified both a source and destination, DUP will instruct you to put the appropriate disks in the specified drives (even if you have already done so). Then the screen display will look something like:

```
Source unit:C
Destination unit:D

Put source disk in drive C.
Put destination disk in drive D.

Press RETURN to begin:
```

The last three lines in this display give you a final opportunity to make certain that you have specified the proper drives and inserted the proper disks. (It is important to make sure of these factors, to avoid accidentally duplicating the contents of a blank disk to a disk that has useful data.)

When both disks are seated in the proper drives, enter a carriage return to start the copying process or anything else to abort the operation. The lights on the specified drives will glow alternately to signify DUP activity. (The duration of the copy and verify operation varies depending on the density and number of sides used on the disks.) When finished, DUP will display:

```
Copy finished.
```

The verification process will begin automatically. DUP will compare the source and destination disks to verify the accuracy of the copy. Then DUP will display:

```
Verification finished.
```

and redisplay the DUP selection menu.

1.3 B — copy only

The "copy only" operation makes an exact duplicate of a disk.

To begin this operation, type **B** at the "Selection:" prompt. (No carriage return is necessary.)

DUP will ask, in a series of consecutive prompts, for the letter of the drive that contains the disk to be copied **from** ("Source unit:") and for the letter of the drive that contains the disk to be copied **to** ("Destination unit:"). The screen display for this operation may appear as:

```
Source unit:C
Destination unit:D

Put source disk in drive C.
Put destination disk in drive D.

Press RETURN to begin:
```

The last three lines in this display give you a final opportunity to make certain that you have specified the proper drives and inserted the proper disks. (It is important to make certain of these factors, to avoid accidentally duplicating the contents of a blank disk to a disk that has useful data stored on it.)

When both disks are seated in the proper drives, enter a carriage return to start the copying process or anything else to abort the operation. The lights on the specified drives will glow alternately to signify DUP activity. (The duration of the copy operation varies depending on the density and number of sides used on the disks.) When finished, DUP will display:

```
Copy finished.
```

Then DUP will redisplay the selection menu.

1.4 C — Verify Only

The "verify only" operation helps you determine whether two disks are identical in media and data contents.

To begin this operation, type **C** at the DUP selection menu. (No carriage return is necessary.)

DUP will ask, in two consecutive prompts, for the letter of the drives that contain the disks to be compared. (These prompts will ask you to specify "Source unit:" and "Destination unit:", although "source" and "destination" are not pertinent for this operation.)

Answer each prompt with the name of one of the drives containing a disk to be compared. The screen display for this operation might appear as:

```
Source unit:C
Destination unit:D

Put source disk in drive C.
Put destination disk in drive D.

Press RETURN to begin:
```

Enter a carriage return to start the verification process. The lights on the specified drives will glow alternately to signify DUP activity. (The duration of the verification operation varies depending on the density and number of sides used by the disks.)

If DUP finishes comparing the two disks and finds that they are absolutely identical, DUP will display:

```
Verification finished
```

Then DUP will redisplay the selection menu.

If the two disks do not correspond exactly, in data content and data position, then DUP displays:

```
Verification error
```

Then DUP will redisplay the selection menu.

NOTE: Conceivably, two disks could contain the exact same data, but in different positions on the disk surface. DUP verification regards such disks as **different**.

1.5 Z — Exit to Operating System

When the DUP selection menu is redisplayed, you should insert a bootable disk in drive A. Then you can end the program and return to the operating system by typing the **Z** alternative at the "Selection:" prompt. Such an entry produces the system prompt:

```
A>
```

1.6 Invalid Entries During a DUP Prompt Operation

If you answer a DUP prompt with an invalid character, either the prompt or the menu will be repeated in most cases. If you specify a drive that does not exist in the hardware environment (when responding to the "source unit:" prompt or the "Destination unit:" prompt) the terminal may "hang up," freezing the keyboard. In such a case, reset the computer and perform bootstrap to proceed with any CP/M operation.

2. SYSTEM PROMPT METHOD

The System Prompt Method enables you to include all of the specifications necessary for the DUP operation in a single command line entered at the CP/M system prompt.

2.1 Command Line Entry

System Prompt Method DUP commands are entered in this form:

A>**DUP {destination}:={source}:{[option]}**↵

Where **DUP** is the command line function, stored in the file DUP.COM on the logged disk;

where {**destination**} is the letter of the drive containing the blank disk that you wish to receive the copied data;

where {**source**} is the letter of the drive containing the data disk that you wish to duplicate; and

where {**[option]**} represents letters enclosed in square brackets [ ] and separated by a comma "," to specify how the DUP operation should be conducted. One or two of the letters **C, V,** or **N** can be used, although none of these options are mandatory.

NOTE: In a CP/M command line "equation," the data source is always on the right and the data destination is always on the left.

2.2 DUP Options

Through the System Prompt Method, you can enter the following options to perform the DUP operation as indicated. These option letters should always be enclosed in square brackets. If two option letters are used, they should be separated by a comma.

C — Copy only: DUP will copy all of the data from the source disk to the destination disk, without comparing them to verify the accuracy of the copy.

V — Verify only: DUP will compare the source and destination disks to verify that they contain the exact same data in the exact same locations on the disk surface. When this option is specified, **either** disk can be the "source" or "destination."

N — No inquiry prompt: DUP will perform the operation you have specified without displaying a prompt to confirm whether the disks are in the appropriate drives.

Without the C or V Options — Copy and Verify: DUP will copy all of the data from the source disk to the destination disk, and then automatically compare the two disks to verify that the copying was accurate. This operation will be performed by default if you enter a DUP command with source drive and destination drive specifications but without specifying a C or V option.

2.3 DUP Defaults

If you enter a System Prompt Method DUP command line (specifying destination and source drives) and abstain from specifying certain options, the following default conditions will be in effect during the DUP operation:

- Copy and Verify operation will be performed. The entire contents of the source disk will be copied to the destination disk and then the two disks will be compared to verify whether they are exact duplicates. This operation occurs if neither the C option nor the V option is specified.
- Prompts are displayed to encourage you to insert the source and destination disks in the specified drives, and to trigger the start of the DUP operation with a carriage return. These prompts appear as:

```
Disk Utility Program
Version 2.2.100


Put source disk in drive A.
Put destination disk in drive B.

Press RETURN to begin:
```

2.4 System Prompt Examples

A>DUP B:=A: ⏎

DUP will prompt you to insert the proper disks into drives B and A, then copy all of the data from drive A to drive B, and then verify whether the copy was performed accurately.

A>B:DUP C:=D:[C,N] ⏎

The DUP utility, in this case, is stored on the disk in non-default drive B. It will copy all of the data from the disk in drive D to the disk in drive C. As specified in the options, DUP will **not** prompt you to insert the disks in the appropriate drive and DUP will **not** verify the accuracy of the copy.

A>DUP D:=C:[V,C] ⏎

If your command line options are contradictory (both V and C used in same line), DUP will acknowledge only the last one. In this case, DUP will prompt you to insert the proper disks into drives D and C, and then **copy** all of the data from drive C to drive D. DUP will **not** verify that the copy was performed accurately.

A>dup c:=d:[v,n] ⏎

DUP will verify that the data stored on the disks in drives C and D is exactly the same and arranged in the same locations on the surfaces of these disks. As specified in the options, DUP will **not** copy any data and it will **not** prompt you to insert your disks. Notice that the letters in a DUP command line do not have to be in uppercase (capitalized).

NOTE: Conceivably, two disks could contain the exact same data, but in different positions on the disk surface. A DUP verification operation would regard such disks as **different**, and display a "Verification Error" message.

3. DUP ERROR MESSAGES

```
Media incompatible on diskettes.
```

Disks used for DUPping must be identical in size, density, number of sides, and tracks per inch.

```
Drives incompatible for copy operation.
```

DUP operations can only be performed between two drives that write the same type of disk media. Specify drives that write to identical disk types for your "Source unit" and "Destination unit."

```
Invalid Source Unit or Invalid Destination Unit.
```

Drives specified as source or destination must be drives that are connected in the hardware environment, turned on and recognized by the operating system. Specify such drives.

```
Hard read error on source disk. Copy/Verify aborted.
```

DUP failed in an attempt to read data from a source disk. Try the operation again. If DUP failures persist, use the PIP utility to copy files from the source disk, and the SYSGEN utility to copy the operating system from the source disk.

```
Hard read error on destination disk. Copy/Verify aborted.
```

DUP failed in an attempt to write data to the destination disk. Use the FORMAT utility to prepare the destination disk before using DUP. If DUP failures persist, use a different disk as the data destination. Make certain that the destination disk media is the same as the source disk media.

```
Verification error.
```

DUP's comparison of two disks found them to be different. Determine which disk contains the most desirable data. Call this disk the "source disk," use the FORMAT utility to erase and prepare the inferior disk. Perform DUP's "copy and verify" operation. If a second verification of these two disks produces this error, use a new disk of the same media type for the destination. Repeat the "copy and verify" operation.

```
Source and Destination cannot be the same drive.
```

Different drive units must be specified as source and destination unit.

```
Destination diskette is write protected.
```

Disk should be write-enabled by removing the adhesive tab from the write-enable notch on a 5.25-inch disk jacket, or by attaching an adhesive tab to the write-protect on an 8-inch disk.

```
Command line syntax error
```

System Prompt Method command line was entered incorrectly. Reenter using the entry form explained in "2.1 Command Line Entry."

```
Unknown command line option
```

System Prompt Method command line was entered with invalid characters used as options. Reenter using only the options listed in "2.2 DUP Options."

```
Error encountered during copy operation
```

DUP was unable to copy one disk's data to another disk. Retry the copy operation. If the error occurs again, use a different destination disk.

```
Operation aborted.
```

This message occurs when you press a character other than carriage return at the "Press RETURN to begin" prompt. Below it, the DUP menu will be redisplayed.

ED

The Line Editing Utility that Creates and Edits Text Files

The ED utility allows you to compose, alter, and manipulate files containing ASCII characters. The files composed by ED are often referenced or manipulated by other system utilities and commands.

When invoking ED, you either create a new file or summon an old file into the computer (1). ED works on files using an area of computer memory known as the memory buffer (2). Files being EDited can be moved, altered, or displayed when you enter various ED commands (3).

1. ED INVOCATION

The ED utility is invoked by the entry of a command line in the following form:

A>**ED {file name}**CR

Where {**file name**} is the complete name of a file that you wish to compose or edit. You must specify the name of the text file here.

If the file resides in a non-default drive, this drive should be specified immediately before the file name in the command line. If the file does not yet exist, ED will create it on the disk in the default drive, or on a disk in a specified drive.

The following entry, for example, would cause ED to open the file named "THISFILE.TXT" that resides on the disk in non-default drive B:

A>**ED B:THISFILE.TXT**CR

When ED "opens" a file, it checks the disk directory for the name of the file. Then, ED reserves the computer's Transient Program Area (TPA) as a memory buffer to be used for text editing and file manipulation.

If the name of the file is not in the disk directory, ED creates the empty file and displays both the "NEW FILE" message and the ": *" prompt. You can begin inserting text into the empty file by using the "I" command at the prompt.

If the name of the file does exist in the disk directory, then ED locates it, and displays the ": *" prompt on the console. You can then move the existing file into the memory buffer by using the "A" command at the prompt.

2. ED STRUCTURE AND FEATURES

Text sections 2.1, 2.2, and 2.3 explain the structure and features of the ED utility. It is recommended that you fully understand these concepts before you try to implement ED commands.

2.1 Text Files in the CP/M Environment

To be properly read from, written to, and transferred, CP/M text files must be composed entirely of American Standard Code for Information Interchange (ASCII) characters. Text files must end with the entry of the CTRL-Z "end-of-file" character. Text can be moved to and from the disk in units of "lines". A line is defined as a string of ASCII characters that ends with the carriage return and line feed characters. (The "carriage return and line feed" combination can be entered by pressing the RETURN key.)

2.2 The Memory Buffer

The memory buffer is an area in the computer's memory that the ED utility uses as a "scratch pad" on which to compose and edit text before it is transferred to a disk for storage.

You can send a specified number of lines of text to the buffer from the disk or send text characters into the buffer by entering them directly through the keyboard. The memory buffer in your computer can hold more than 36,000 text characters at one time. When it is full, you can purge the buffer of text by writing a specified number of text lines from the full buffer to the disk.

2.3 The Character Pointer

Text in the buffer is usually arranged on numbered lines. To help you access locations within the text, the buffer contains an invisible character pointer, that can be moved to specific locations within the text by various user commands.

The character pointer resides either before the first character in the text, after the last character, or between any two text characters. When it is moved to a position in the text, a specified number of characters or lines can be inserted or deleted starting at the pointer's current position. Text is inserted through the use of special commands, sometimes followed by direct keyboard typing.

The character pointer is positioned by the commands you enter that move it up or down to different lines, left or right along a line, or to the top or bottom of the file.The character pointer can also search through the text to locate a text string you specify.

All ED commands are executed starting at the current position of the character pointer.

3. ED COMMANDS

Commands used within the CP/M EDitor are entered in response to the ":*" prompt, or to a prompt in the form "n:*" where "n" is the number of the text line upon which the character pointer resides. All ED commands (except those which end an ED session) can be entered in a series on the same command line. The last command entered on any line must be followed by a carriage return to initiate command processing.

The ED utility uses four commands (A, W, X, and R) to transfer text lines between the disk and the memory buffer (3.1).

When a file is in the memory buffer, four commands (B, C, L, and n) can be used to move the character pointer to a specified line or character (3.2).

Once the character pointer is in position, three commands (I, D, and K) are used to insert text into or delete text from the buffer (3.3)

Whenever text is within the memory buffer, two commands (T and P) can be used to display it to the screen. Three other commands (Z, V, and U) are used to alter characteristics of screen display (3.4).

When a file is in the memory buffer, four commands (F, S, N, and J) can be used to move the character pointer to an occurrence of a specified text string (3.5).

To remove an entire file from the memory buffer, four commands (E, Q, H, and O) can be used to send it from the buffer to the disk, or to dispose of it in some manner. These commands must be entered alone and followed immediately by a carriage return (3.6).

One command (M) is used to trigger multiple execution of other ED commands (3.7).

3.1 Moving Text to or from Memory Buffer

nA **Append lines from disk to buffer**

This command will copy "n" lines of text from the disk file specified in the invocation command to the memory buffer, where the text image can be edited.

The nA command must be implemented when you wish to edit text from an existing file. This command is entered in response to the ": *" prompt, and causes the "1: *" prompt to be displayed. The counterpart of the nA command, the nW command, transfers edited text lines back to the disk.

If you do not specify the number (n) of lines to be appended, ED will append one line from the disk. If the "#" character is entered in place of "n" (#A), then all of the text lines in the disk file (up to the capacity of the memory buffer) will be copied to the buffer.

nW **Write lines from buffer to disk**

This command transfers "n" lines of edited text from the memory buffer to the disk. Text that is written to the disk in this manner will no longer exist in the memory buffer.

The W command is implemented when the memory buffer becomes full during text editing. It is entered in response to the ": *" or "n: *" prompt, and causes the ": *" prompt to be displayed.

The W command always starts at the top of the buffer, transferring the first line in the buffer through the "nth" line in the buffer. The buffer text line that occurs after the "nth" line then becomes the first line, moving up to the top of the buffer.

If you do not specify the number of lines to be transferred to the disk, one line will be transferred. If the "#" character is entered in place of "n" (#W), then all of the text lines in the memory buffer will be transferred to the disk, and the buffer will be empty.

As the edited text is written back to the disk, a few lines at a time, it accumulates in a temporary file that has a "$$$" extension.

nX **eXtradite text block from buffer to temporary library file**

This command transfers a block of text from the memory buffer to a temporary disk file, so that it can be transferred back to the buffer (by the R command) at a desired location.

The block of text begins with the line containing the character pointer, and ends "n" lines later. The block is stored on the disk in a temporary file which is automatically named $$$.LIB (CP/M's standard name for a temporary library file). After this file is created on the disk, you should implement other ED commands to move the character pointer to the text location at which the temporary file should be inserted.

When the character pointer is at the desired location, the R command is used to transfer the $$$.LIB file back to the buffer at the desired location. The letter "R" and a carriage return should be entered to insert the text at the current location. The same text can then be inserted at another text location by moving the character pointer and, again, entering "R" and a carriage return.

Before a different block of text is transferred to the $$$.LIB file, the "0X" (a zero followed by an X) command should be entered to clear the old text from the file.

If no number is specified in the space preceding the "X", then one line of text (starting from the current character pointer location) is transferred to the temporary file. If the "#" symbol is specified, then all of the text lines within the buffer which follow the character pointer are transferred.

Rf **Read library file f from disk to buffer**

This command copies the text from a disk library file to the memory buffer, inserting this text at the current location of the character pointer.

The file being read into the buffer should usually be specified in place of the "f" in the command "Rf". However, these files are always assumed to have the "LIB" extension. Therefore, you only need to enter the primary file name in such a command. For example, the text from library file "ROUTINEX.LIB" could be read into the buffer with the entry of the following command:

RROUTINEX

If you wish to read a temporary library file into the buffer text, then no part of the file name need be entered with the R command. CP/M's standard temporary library file name "$$$.LIB" will be assumed.

3.2 Positioning the Character Pointer

+/−B **Beginning/Bottom of text character pointer movement**
This command will move the character pointer to the beginning of the first line of the text in the buffer (if entered in the form **B**), or to the end of the last line in the buffer (if entered in the form **−B**).

+/−nL **Line down/up character pointer movement**
This command will move the character pointer from its current line within the memory buffer text to another line a specified number (**n**) of lines away.

When the command is entered in the form **nL**, the character pointer will move ahead (down) the specified number of lines to the beginning of a text line.

When the command is entered in the form **−nL**, the character pointer will move backward (up) the specified number of lines to the beginning of a text line.

If the number of lines to move is not specified when the **L** command is entered, the pointer will move one line ahead (down).

In order to move the pointer to the beginning of the line upon which it currently resides, enter the "0L" command (with a zero preceding the "L").

+/−n **Move to nth line and display it**
This command moves the character pointer from its current line a specified number of lines (**n**) and displays the text of the line on which it lands. This command produces the same results as the simultaneous entry of both the "L" and "T" commands. If no number is entered before the carriage return, ED assumes the number one.

+/−nC Character pointer movement to right/left

This command moves the character pointer a specified number (**n**) of character spaces, usually toward the right or left edge of a text line. (When a command-driven character pointer reaches the edge of a text line, the carriage return and line feed characters will cause it to change its direction momentarily.)

When entered with a plus sign ("+") or with no sign, this command will move the pointer the specified number of spaces to the right, and/or down to successive lines. When entered with a minus sign ("−"), this command will move the pointer the specified number of spaces to the left, and/or up to preceding lines. If you wish to move the character pointer past the edge of a text line using the "C" command, the number specified in the command will have to include two character spaces to get past the carriage return and line feed characters at the end of the line.

3.3 Inserting and Deleting Text

I Insert characters from keyboard to buffer

The "I" command enables you to insert characters directly into the text at the current position of the character pointer. This command is entered in response to the ": *" or "n: *" prompt.

If you enter a carriage return immediately after the "I" command, then the "n:" prompt appears on the next line and text characters can be inserted on successive lines until you enter a CTRL-Z "end-of-file" character. The entry of a CTRL-Z causes the ": *" prompt to be displayed. After this insertion operation, the character pointer will be positioned at the end of the last inserted text line.

If text is inserted on the same line as the "I" command, then the insertion operation will end when the next carriage return is entered, and a "*"command prompt will appear at the left edge of the screen. After this insertion operation, the character pointer will be positioned at the beginning of the line following the line of inserted text.

If upper and lowercase insertion text is desired, enter the "I" command with a lowercase "i." Entering the command with an uppercase "I" will automatically translate all inserted text to uppercase.

+/−nD Delete characters from buffer text

This command will delete a specified number (**n**) of characters from memory buffer text, starting at the location of the character pointer.

Deletions will take effect to the left of the pointer if the specified number of deletions is preceded by a "−" sign. If the specified number of deletions is preceded by a "+" sign or by nothing, characters to the right of the pointer will be deleted.

If no number of characters is specified for the deletion operation, one character will be deleted. If "#" is specified as the number of characters to be deleted, all text characters before or after the pointer (depending on the sign preceding the number) will be deleted.

The carriage return and line feed characters at the end of each text line count as two separate characters, even though they are produced by pressing only the RETURN key.

+/−nK Kill lines from buffer text

This command will delete a specified number (**n**) of lines from the memory buffer text, starting at the position of the character pointer.

If a "+" (plus sign) precedes the number of lines to be killed, the number of lines occurring **after** the character pointer will be killed. If a "−" (minus sign) precedes the number, the number of lines occurring **before** the pointer will be killed.

If the character pointer is positioned in the middle of a line during a "K" command, the portion of the text line to the left or right of the pointer will be deleted as if it were one entire line.

If no number (**n**) is specified for the deletion operation, then **one** line will be deleted. If "#" is specified as the number of lines to be deleted, then **all** text lines before or after the pointer (depending on the sign preceding the number) will be deleted.

3.4 Displaying Text to Console

+/−nT **Type text lines on console**

This command will cause a console display of a specified number (**n**) of text lines, starting at the position of the character pointer.

If the character pointer is in the middle of a line, the portion of the line between the pointer and the end of the line will be counted as an entire line. If this command begins with a minus sign ("−"), the specified number of lines before the line containing the character pointer and the line containing the pointer are displayed. If the pointer is positioned in the middle of a line and a zero is specified in the command, only the portion of the line from its beginning to the pointer will be displayed.

If no number (**n**) of lines is specified, **one** line will be displayed. If the "#" symbol is specified, **all** of the lines in one direction will be displayed.

You can interrupt a console display which scrolls too quickly by entering a CTRL-S character. The scroll will resume when another CTRL-S is entered. You can abort a long scrolling screen display by entering any other keyboard character while the display is in progress.

The "T" command will not affect the position of the character pointer. At the end of a "T" operation, the pointer marks the position at which the operation began. This position will be indicated by the number in the "n: *" prompt.

The "T" command can be entered in response to an "n: *" or ": *" prompt.

nP **Page display on console**

This command causes text to be displayed on the video screen in units of one page (23 lines), and deposits the character pointer at the end of the display.

If a display of the first page (23 lines) beginning at the character pointer is desired, a zero should precede the **P** in such a command. Hence, a **0P** command has the same effect as a **23T** command.

If the number one or no number is specified before the "P", then one page (23 lines) of text, starting 23 lines past the character pointer, will be displayed. The command **2P** will cause the display of two pages starting 23 lines past the pointer. The command **3P** will cause the display of three pages starting 23 lines past the character pointer, and so on. Hence, a **2P** command has the same effect as a **23L46T-23L.**

nZ **Zone interruption of text display scroll**

This command can be entered into a command line in front of the "T" or "P" display commands to interrupt a long console display scroll at time-regulated intervals so you can view the text one zone at a time.

When "T" and/or "P" commands are entered in a series within the same command line, "Z" commands can be placed in between to interrupt their execution for time periods determined by the number preceding the "Z."

The number (**n**) preceding the **Z** in the command stands for the number of half-seconds that the display scroll will be interrupted. If a command line contains a **10Z** between two display commands, the scrolling caused by the display commands will be interrupted for five seconds.

+/−V **aVert or replace line numbers in console displays**

If you prefer not to use the line numbers, the **−V** command will eliminate them from the console display.

The command **V** will restore line numbers to the console display.

A special form of this command, in which a zero precedes the V (**0V**), will produce a display showing how many locations remain unused in the memory buffer (r), and the total number of buffer locations that are accessible through the ED utility (t). The display appears in the form: "r/t".

+/−U **Uppercase/lowercase text translation**

If you prefer all characters entered into text through the ED utility to be uppercase, enter the "U" command.

The "−U" command can be entered to allow the inserted text to be displayed in both lower and uppercase.

3.5 Searching for Text Strings

nFt **Find text string t within buffer text**

This command is used to locate the specified number of occurrences (n) of a particular string of characters (t) within the text.

The string of characters (**t**) being sought is specified immediately after the **F** in the command and end when you enter a **CTRL-Z** character and a carriage return.

If you do not specify the number of occurrences (n) of the string to be found within the text, only the first occurrence is found.

If you desire to locate a string of characters (t) that contains the carriage return and line feed characters, these two characters can be specified in the command line with the **CTRL-L** character.

The string specified in the command (t) must match the actual text in spelling, spacing, capitalization, etc.

The specification of a string of characters that is not found in the text produces the error message:

```
BREAK "#" AT STRING
```

where "string" is an unfound text string, and where the character pointer goes back to its position before the search operation failed.

nSdt **Search and replace text string**

This command performs the operations of the "F", "D", and "I" commands simultaneously, finding a specified string (d) within the buffer text, deleting it, and inserting a second specified string (t) at the same location.

The number (n) in the command represents the number of text string substitutions desired by the user throughout the text. The omission of this number will cause a substitution to be made only at the first occurrence of the sought-after string (d). The entry of the "#" symbol in place of this number will cause the substitution to be made at every occurrence of the specified string throughout the text.

The string of characters to be found and deleted in the buffer text (d) is specified immediately after the "S" in the command and is ended by a CTRL-Z character. Immediately after this CTRL-Z, the text string to be inserted (t) is entered, with a second CTRL-Z and a carriage return.

The specification of a string of characters that is not found in the text produces the error message:

```
BREAK "#" AT STRING
```

Where "string" is an unfound text string, and where the character pointer goes back to its position before the search and replace operation failed.

nNt **fiNd text string on disk**

This command performs the same search operation as the "F" command except that it can search an entire file for a text string (t).

If the specified string (t) is not found in the memory buffer, this command will automatically write the contents of the buffer to the disk (into a temporary file, as the "W" command does) and append an image of another portion of the disk file's text to the buffer (as the "A" command does) until the entire file has been searched for the string the specified number of times (n).

nJftd **Juxtaposition substitution and deletion**

This command finds a first string (f), inserts a second string (t) after the first, and then deletes all of the text between the end of the inserted string (t) and the beginning of the third string (d).

The "J" in the command is immediately followed by the first text string (f), a CTRL-Z, the text string to be inserted (t), a CTRL-Z, the third text string (d), a CTRL-Z, and a carriage return.

The third string (d) serves as the restraining boundary for the text deletion.

This multifaceted operation is performed a specified number of times (n), or once, if no number is specified. If the "#" is specified, the operation will be performed for all occurrences of the first text string (f).

If the third command line string cannot be found in the buffer text, no text is deleted.

3.6 Closing a Text File

E **End session while buffer text becomes permanent disk file**
All text in memory buffer is copied to the disk, where it is combined with any text that has accumulated in a temporary file and is assigned the original file name.

At the same time, the version of the file that was copied to perform the edit is assigned the extension ".BAK" in place of its old extension.

The operating system regains control and displays the system prompt.

Q **Quit session by deleting edited copy of file**
All text in the memory buffer and/or any temporary file created during the session is deleted. Any existing versions of the file on the disk maintain the status and names they held prior to the editing session.

If the file being edited existed on disk before the session, then the original version remains intact, as if the editing session never took place.

Since the accidental use of this command may delete important text composed or edited during the session, its entry will produce the "Q-(Y/N)?" confirmation message. The **Y** character must be entered before the deletion will be executed. If the **N** is entered, the current editing session will continue.

H **Halt session temporarily to save alterations**
All alterations made to text (or any text composed) will be saved under the active file name, and the editing session will continue with an image of the currently edited file automatically appended to the memory buffer. This command has the same effect as entering a combination of both the "E" and "A" commands.

O **Omit recent alterations and re-start edit session**

Any text in the memory buffer or in a temporary disk file is deleted, and the editing session continues, using the same text with which it began.

In effect, this command nullifies any text alterations or composition performed in the most recent ED session and starts the session over, as if the "Q" and "A" commands had been entered consecutively.

3.7 Causing Multiple Command Execution

nM **Multiple command execution**

This command permits you to execute one or more commands a specified number of times (n) without additional command entries. Commands are entered on the same line, following the **nM** command in a string terminated by either a carriage return or a CTRL-Z.

All commands following the **nM** will be executed the number of times specified at the beginning of the entire command line (n) or until an error condition is encountered. If no number (n) is specified, then the operations invoked by the command line will be implemented from the position of the character pointer through the end of the text, or until an error condition is encountered.

This command is commonly used with the search and replace command ("nS"), to facilitate text string substitution throughout a large text area. When such a search reaches the end of the text in the memory buffer, an error condition indicates that the substitution can no longer be executed.

Multiple commands are executed from the position of the character pointer toward the end of the text. The pointer should be positioned at the beginning of the buffer text if multiple commands are to be executed throughout the text.

4. THE FILE EDITING CYCLE

The following sequence of diagrams shows the file named "REPORT.DOC" as it undergoes ED's file editing cycle. The left side of the diagrams represents the memory buffer, and the right side of the diagrams represents the logged disk.

In Figure 2-1, the new file "REPORT.DOC" has been opened by entering **ED REPORT.DOC** at the "A>" system prompt. You then enter ED's **I** command, and begin typing text into the memory buffer file. No text has yet been recorded on the disk.

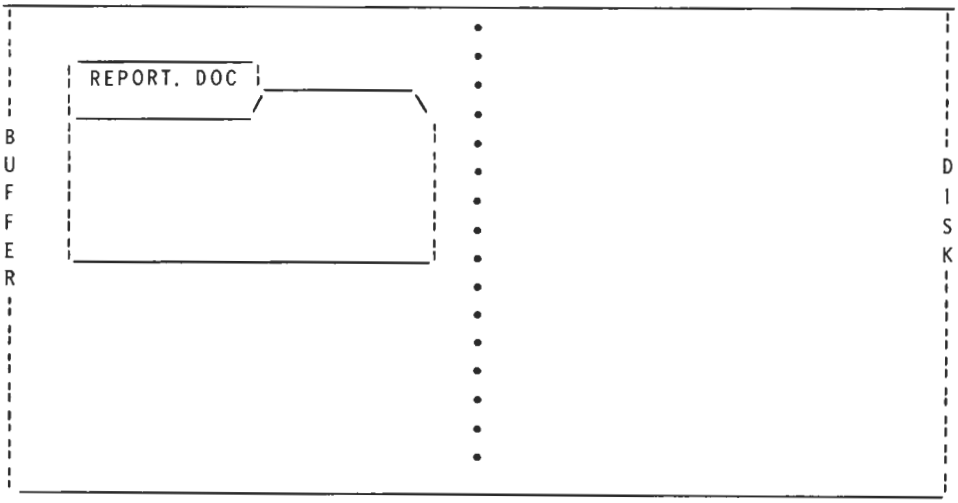


Figure 2-1

In Figure 2-2, you inserted text into the file, and want to save some number of text lines. First end the insert by entering a CTRL-Z. Then to save the text, enter ED's **W** command to send a specified number of text lines from the buffer to a temporary file on the disk. ED gives this temporary file the name "REPORT.$$$". The buffer file remains.

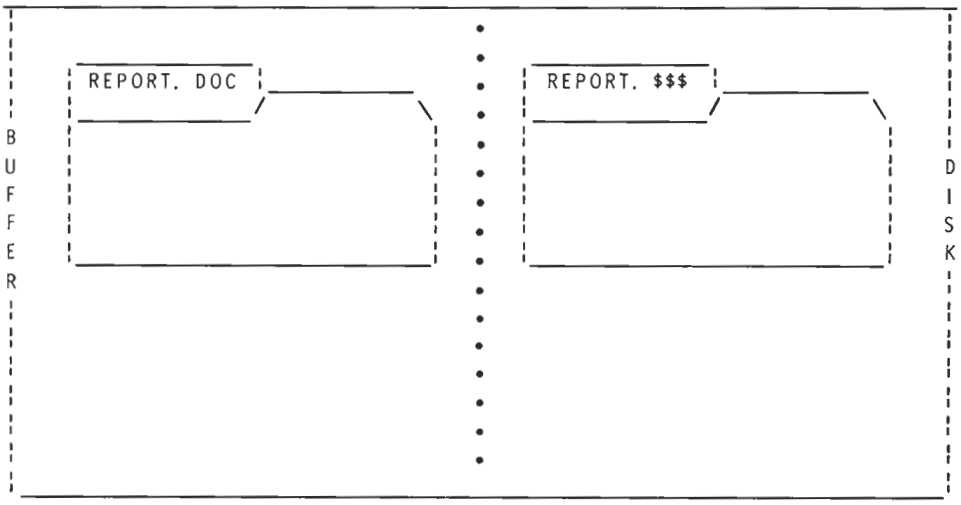


Figure 2-2

In Figure 2-3 you end the editing session and save all of the text composed for "REPORT.DOC," by entering ED's **E** command. This saved text is recorded on the disk under the file name "REPORT.DOC." Both the buffer file "REPORT.DOC" and the temporary disk file "REPORT.$$$" have disappeared.

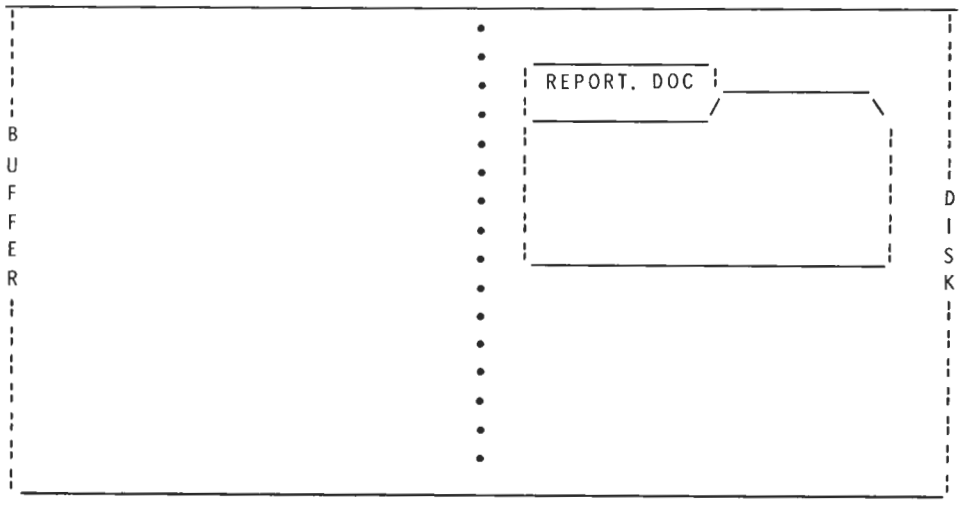


Figure 2-3

In Figure 2-4, you are reopening the file "REPORT.DOC" to edit it. First enter **ED REPORT.DOC** to invoke ED. Then enter ED's **A** command to bring a copy of a specified number of text lines from the disk into the buffer. The disk copy of "REPORT.DOC" remains on the disk.

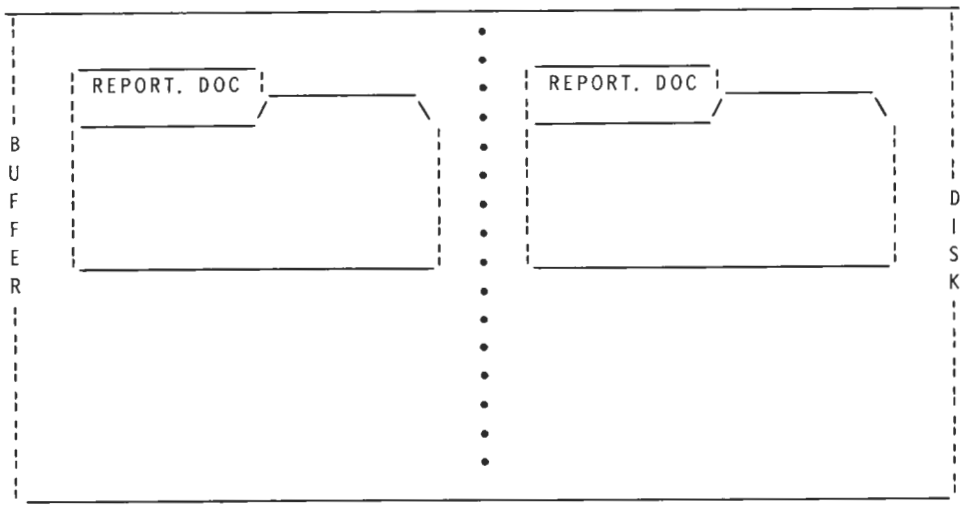


Figure 2-4

You changed and/or added to the text lines that were brought into the buffer. To save these changes and/or additons, again enter a CTRL-Z and ED's **W** command. Figure 2-5 reflects the state of the files after these activities. The original disk copy of "REPORT.DOC" remains on the disk, a copy of some of the files text remains in the buffer under the name "REPORT.DOC," and some number of edited text lines from the file have been sent to the temporary disk file named "REPORT.$$$."

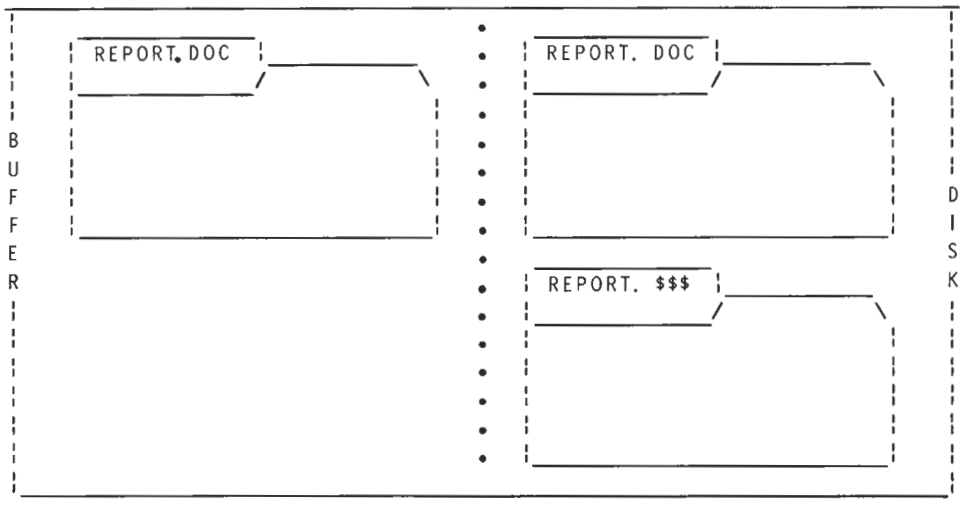


Figure 2-5

In Figure 2-6 you closed the file editing session and saved the changes and/or additions made to the text, by entering ED's **E** command. ED reacts to this entry by combining all text from buffer file "REPORT.DOC," all text from temporary disk file "REPORT.$$$," and any unchanged text from the original disk file "REPORT.DOC" into a new disk file named "REPORT.DOC." Then ED renames the original "REPORT.DOC" disk file to "REPORT.BAK." The buffer file and the temporary disk file disappear.

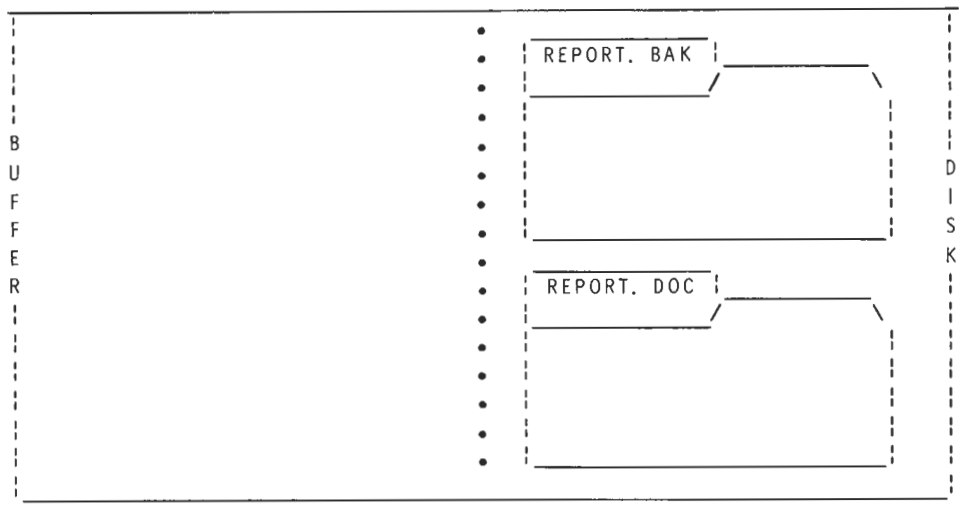


Figure 2-6

Thus a file with a file name extension assigned by you is usually the latest version of the file, whereas a file with the extension "BAK" is usually an old copy of the file.

If you reedit the disk file "REPORT.DOC" and save the newly-edited version, the current disk file "REPORT.DOC" will become the new disk file "REPORT.BAK," as the memory file "REPORT.DOC" and the disk file "REPORT.$$$" combine to become the new disk file "REPORT.DOC." The old disk file "REPORT.BAK" will be automatically deleted after the third ED session with the file.

NOTE: These diagrams only illustrate a few of the basic options for file manipulation. The text on ED commands explains other options.

5. ED ERROR MESSAGES

```
BREAK "?" AT x
       *
```

("x" is an invalid character that you entered.) You entered an ED command under inappropriate circumstances, at the wrong kind of prompt, or with improper syntax. The command should be reentered.

```
DISK OR DIRECTORY FULL
```

You either entered **ED** without a file name argument at the CP/M system prompt, or composed more text than the disk could hold. For the former, you should invoke the ED utility by typing a command line with a file name argument. For the latter, you cannot save the overflow of text. When composing future documents, use ED's "W" command or CP/M's STAT utility more often.

```
** FILE IS READ/ONLY **
```

You tried to save newly-edited text to a file that cannot be written to because it has read/only status. You should abandon the text in the buffer with ED's "Q" exit command, and use CP/M's STAT command to assign read/write status to the file before the next edit.

```
"SYSTEM" FILE NOT ACCESSIBLE
```

You tried to edit a file that had been given the "system" status by the STAT command. This status hides a file from commands such as ED and DIR. Assign the "directory" status to the file, using the STAT command, before trying to edit the file again.

```
NO MEMORY
```

You filled the memory buffer, and must use the "W" command to send some of the buffer text to the disk.

ERA

The Resident Command for Erasing Files

The ERA resident command frees the space once occupied by disk files, permitting the storage of new files. ERA will erase a single file (1) or a group of files (2). ERA also displays a message when it cannot erase a file (3). Caution should be exercised when using ERA because erased files cannot be rescued.

1. ERASING A DISK FILE

To erase a file from a disk, enter a command line in the following form:

A>**ERA {file name.ext}**CR

Where {**file name.ext**} is the complete name of the file you wish to delete.

Files that do not reside on a disk in the default drive can only be erased when their file name is preceded in the command line by the appropriate drive specification.

2. ERASING GROUPS OF FILES

A group of files with similar names can be deleted by a single ERA command line when ambiguous file names (names with the "*" or "?" characters) are used, as:

```
A>ERA B:PROGRAM?.PRN ↵
```

which would delete files with names such as PROGRAM1.PRN, PROGRAM2.PRN, PROGRAMX.PRN, and PROGRAM/.PRN from the disk in drive B.

This command example shows how to delete even more files at once:

```
A>ERA B:*.* ↵
```

This entry would erase every file from a disk. Because of the destructive potential of this form of the command, ERA will ask you for confirmation with this message:

```
ALL (Y/N)?
```

The command will not be executed until you confirm it by pressing the **Y** key. If the **N** key is pressed, no files will be erased and the system prompt will be displayed.

3. CONSOLE RESPONSE TO ERA COMMANDS

When ERA finds the specified file and erases it, the system prompt returns.

If the specified file does not reside on a disk in the specified drive, then the console will display:

```
NO FILE
```

If the file you desire to erase is write-protected by the "R/O" (read only) status, or if you switched disks between drives without performing a warm boot, this message will be displayed:

```
Bdos Err On X: File R/O
```

or

```
Bdos Err On X: R/O
```

Where X is the letter of the drive containing the write-protected file.

If the disk containing the file to be erased is mechanically write-protected (with adhesive tabs for 5.25-inch, or without adhesive tabs for 8-inch), then this message will be displayed:

```
Bdos Err on X: Bad Sector
```

Where X is the drive from which you tried to erase a file.

If you specify a 5.25-inch drive in an ERA command, and that drive contains no disk, ERA will search the drive for the disk indefinitely. Reset the computer and reboot the system to end this search.

Where X is the drive from which the user tried to erase a file.

FORMAT

The Utility that Prepares the Disk Surface

FORMAT prepares a floppy disk for storing data by establishing storage areas on the disk surface. At the same time, FORMAT erases any data that remains on the disk from prior use, and sometimes inspects the recording surface for imperfections that could impair data storage or transmisison. FORMAT also enables you to determine how much data you will be able to store on the disk.

CAUTION: Because FORMAT erases all existing data on a disk, make certain that you only format blank disks or disks containing expendable data. You can use the DIR (Page 2-83) or STAT (Page 2-174) commands to check a disk for valuable data files before FORMATting it. However, DIR and STAT cannot always find all of the files on a disk.

You can use the FORMAT utility through either of two methods: the Utility Prompt Method or the System Prompt Method.

1. UTILITY PROMPT METHOD

With this FORMAT method, you load the FORMAT utility into memory by entering a command at the system prompt. Then you answer a series of FORMAT prompts to define the formatting operation.

1.1 Utility Prompt Command Entry

Answer the system prompt with a command in the following form:

A>**FORMAT** ⏎

When invoked through the FORMAT prompt method, FORMAT first identifies itself with name, version number, and a caution about its capabilities. It also asks you if you wish to continue the operation, as shown:

```
CP/M-85 Format Version 2.100

This program is used to initialize a disk.
All information currently on the disk will be destroyed.
Is that what you want? (y/n):
```

Respond to this question by entering **Y**.

1.2. Specifying the Disk to be Formatted

After you have confirmed your intention to format a disk, FORMAT asks:

```
Which drive do you wish to use for this operation?
```

Answer this prompt by entering the letter of the drive containing the disk you wish to format. The drive you specify must be a valid disk drive in your hardware environment containing a write-enabled floppy disk of the proper disk size and sector type.

NOTE: This drive does not necessarily have to be a physical drive. For instance if you have only one physical 5.25-inch drive slot, then you can specify drive B at this prompt. You will later be prompted to put the appropriate disk in the drive.

1.3 Defining the FORMAT Operation

After you specify the drive containing the disk you want to format, FORMAT will enable you to define the manner in which you want the disk to be formatted. If you are formatting a 5.25-inch disk, the FORMAT utility enables you to specify the **number of sides** you want prepared for data storage. If you are formatting an 8-inch disk, the FORMAT utility enables you to specify the **density level** at which data will be stored on the disk.

SPECIFYING NUMBER OF SIDES FOR A 5.25-INCH DISK

If you are formatting a 5.25-inch disk, the FORMAT utility enables you to specify the number of sides you want formatted by displaying the following prompt:

```
Number of Sides? (1=single, 2=double):
```

Entering the number **1** at this prompt will give the formatted disk a file capacity of 148 kilobytes. Entering the number **2** will give the formatted disk a file capacity of 304 kilobytes.

NOTE: All 5.25-inch disks formatted with this CP/M release are automatically formatted at double-density. Therefore, the FORMAT utility will not prompt you to specify the density (level of data concentration) at which you want a 5.25-inch disk formatted.

SPECIFYING DATA DENSITY FOR AN 8-INCH DISK

If you are formatting an 8-inch disk, the FORMAT utility enables you to specify the level of density at which you wish to store data by displaying the following prompt:

```
Which density? (S=single, D=double):
```

The "density" of a disk refers to the level of concentration of the data stored on its surface. Higher density levels sometimes decrease data access reliability.

- If the disk in the specified drive is single-sided, then entering the letter **S** (for single-density) at this prompt will give the formatted disk a file capacity of 241 kilobytes. Entering the letter **D** (for double-density) will give the formatted disk a file capacity of 482 kilobytes.
- If the disk in the specified drive is double-sided, then entering the letter **S** (for single-density) at this prompt will give the formatted disk a file capacity of 490 kilobytes. Entering the letter **D** (for double-density) will give the formatted disk a file capacity of 980 kilobytes.

NOTE: Some 8-inch disks allow you to format only one side and others allow you to format both sides. These two types of disk are distinguished by the position of a small hole in the disk near the center spindle hole. Therefore, the number of sides that can be formatted on a particular 8-inch disk is an unchangeable feature of that particular disk. The FORMAT utility detects the position of this hole and automatically prepares to format the disk on the appropriate number of sides.

1.4 Beginning the FORMAT Operation

After you have defined the manner in which your disk will be formatted, FORMAT will display the following prompt to enable you to begin or cancel the operation:

```
Put the disk you wish to be formatted in drive x.
Press RETURN to begin, anything else to abort.
```

(The character "x" stands for the letter of the disk drive you specified.) Entering a carriage return at this prompt will begin the actual formatting operation, while entering any other keyboard character will cause all FORMAT activities to end as CP/M displays the system prompt.

NOTE: It takes at least a minute for FORMAT to format most disks. During this time the light on the specified disk drive will glow.

1.5 Ending a FORMAT Operation

When FORMAT finishes preparing a disk's surface, it will display the following prompt:

```
Do you have more disks to format? (y/n):
```

If you wish to FORMAT another disk without reinvoking FORMAT, press **Y** at this prompt. FORMAT will again prompt to specify the drive containing the disk you wish to format.

If you have no other disks to format, press **N**. CP/M will display the A> system prompt, at which you can enter any CP/M command.

2. SYSTEM PROMPT METHOD

The System Prompt Method enables you to include all of the specifications necessary for the FORMAT operation in a single command line. Enter this command line at the CP/M system prompt.

2.1 Command Line Entry

System Prompt Method FORMAT commands are entered in the following form:

A>**FORMAT {drive}:{[option,option]}**CR

Where **FORMAT** is the command line function, stored in the file FORMAT.COM on the logged disk;

where {**drive**} is the letter of the drive that contains the disk you wish to format (this letter must represent a valid drive in your hardware environment, such as **A**, **B**, **C**, or **D**); and

where {**[option,option]**} represents letters and/or numbers enclosed in square brackets [ ] and separated by commas "," to specify how the formatting operation should be conducted.

2.2 FORMAT Options

FORMAT command lines entered by the System Prompt Method can include the following options:

SD 8-inch disk formatted to Single Density;

DD 8-inch disk formatted to Double Density;

1S 5.25-inch disk formatted on only one side;

2S 5.25-inch disk formatted on both sides;

F Fast formatting, because the routine test of disk surface media is not performed;

N No prompt displayed between FORMAT command entry and FORMAT execution;

Options should be enclosed in square brackets, and separated by commas (when more than one is used). Options are the last item in a FORMAT command line before the carriage return.

NOTE: All 5.25-inch disks are automatically formatted at double density by this version of FORMAT. 8-inch disks are automatically formatted on the number of sides for which the disk has been certified by the manufacturer. (FORMAT detects this certification by checking the position of the small hole in the disk cover next to the center spindle hole.)

2.3 System Prompt Method Defaults

When you enter a FORMAT command line with a drive specification and decline to specify some or all of the possible options, FORMAT will prepare the disk according to the following default criteria:

- 5.25-inch, disk formatted to Double Density (regardless of any options you might specify);
- 8-inch disk formatted to Double Density (as if you specified the DD option);
- 5.25-inch disk formatted on both sides (as if you specified the 2S option);
- 8-inch, single-sided disk formatted on one side (regardless of any options you might specify);
- 8-inch, double-sided disk formatted on both sides (regardless of any options you might specify);
- Disk surface will be tested for data retention (as if you did not specify the F option); and
- Prompts will be displayed between FORMAT command entry and FORMAT execution (as if you did not specify the N option). Therefore, whenever you enter a System Prompt Method command without the N option, the following prompt will appear:

```
CP/M-85 Format Version 2.2.100

This program is used to initialize a disk.
All information currently on the disk will be destroyed.
Is that what you want? (y/n):
```

- To confirm your intention to run a FORMAT operation, enter a **Y** at this prompt. Then FORMAT will display the prompt:

```
Put the disk you wish to be formatted in drive x.
Press RETURN to begin, anything else to abort.
```

To begin execution of the formatting process, insert the appropriate disk in drive x (where x is the drive you specified in the command line) and enter a carriage return.

NOTE: You can abort the FORMAT operation by pressing any key other than Y at the first FORMAT prompt, or by pressing any key other than the RETURN key at the second FORMAT prompt. When you abort a FORMAT operation in either fashion, CP/M displays the system prompt.

2.4 System Prompt Method Examples

A>FORMAT B:[2S]↵

FORMAT will prepare the surface of the disk in drive B (a 5.25-inch disk) to double density and on both sides, as specified by options. FORMAT will display prompts before formatting and test the disk surface while formatting, by default.

A>FORMAT B:↵

FORMAT will prepare the surface of the disk in drive B (a double-sided 8-inch disk). Due to the disk manufacturer's recommendation, this disk will be formatted on both sides. By default, this disk will be formatted to double density. Also by default, FORMAT will display prompts before formatting and test the disk surface while formatting.

A>FORMAT B:[2S,1S]↵

If your command line contains contradictory options, FORMAT will acknowledge the last one. Hence, in this case, FORMAT will format the surface of the disk in drive B (a 5.25-inch disk) on only one side, as specified by the last side quantity option. FORMAT will also display prompts before formatting and test the disk surface while formatting, by default.

A>**C:format B:[Sd,f,N]**↵

The FORMAT utility, in this case, is stored on the disk in non-default drive C. It will prepare the surface of the disk in drive B (a single-sided 8-inch disk) to single density, as specified by the "Sd" option. Since the disk was manufactured for single-sided data storage, only one side will be formatted. The "f" option specifies that this formatting operation will be performed without a disk media test. The "N" option specifies that FORMAT will not prompt you to confirm your intentions before the formatting operation begins.

NOTE: As with any other command entered at a CP/M system prompt, you can edit a FORMAT command line with the **DELETE** key, or erase the entire command line by holding down the **CTRL** key while pressing the **X** key.

3. DISK CAPACITIES

The following three tables show the amount of file space remaining on various kinds of disk after they are formatted under various kinds of conditions. (The FORMAT utility also prepares areas of the disk for the recording of the CP/M system core and the disk file directory, although the space reserved for such software items is not included in these tables.)

The following table shows the file capacities of 5.25-inch, soft-sectored disks formatted in 48 TPI drives:

	Single-sided	Double-sided
Double density	148 kilobytes	304 kilobytes

This table shows the file capacities of single-sided 8-inch disks:

	Single density	Double density
Single-sided	241 kilobytes	482 kilobytes

This table shows the file capacities of double-sided 8-inch disks:

	Single density	Double density
Double-sided	490 kilobytes	980 kilobytes

NOTE: The FORMAT utility supplied with this CP/M version cannot format any disk to extended double density. However, this CP/M version can be used to read data from (but not write data to) most disks that have been formatted at any density by earlier CP/M versions.

4. FORMAT ERROR MESSAGES

```
Drive x: not available in current configuration
```

If you entered a drive name (x:) that does not exist in the hardware environment, enter a different drive name.

```
Unable to format this disk.  It is write protected.
Do you have any more disks to format? (y/n):
```

Disks must be write-enabled before they can be formatted. Write-enable a 5.25-inch disk by removing the adhesive tab from its write-enable notch, and write-enable an 8-inch disk by attaching a write-enable tab to its write-protect notch.

```
Unable to format this disk. Place a different disk in the drive and press any key to begin...
```

The disk to be FORMATted is damaged or improperly inserted in the drive. Try again or replace the disk.

```
Media error
```

The disk to be FORMATted is damaged or improperly inserted in the drive. The user should try the operation again and replace the disk if the message appears again.

```
Wrong type of media, or media inserted improperly,
or media damaged.
```

You may have tried to FORMAT a hard-sectored disk in a soft-sectored drive. Check that the proper type of disk is being used. If the proper disk type is being used, then it may be damaged. Use a different disk and try again.

```
ILLEGAL FORMAT OPTION
```

System Prompt Method command line was entered with undefined characters in place of options.

```
ILLEGAL COMMAND SYNTAX
```

System Prompt Method command line was entered with undefined characters in place of options.

```
DISK IS NOT OF TYPE SPECIFIED
```

A System Prompt Method command line specified a drive that contained a disk which did not match the specified disk type.

```
OPTION NOT AVAILABLE
```

A System Prompt Method command line included option characters which were not possible under the circumstances. Reenter command with pertinent options.

LIST

The Utility that Prints Text File Contents on Paper

The LIST utility enables you to obtain paper copies of files by entering a command (1) for one or more files (2) to be printed. Special printout characteristics can be set when you enter the command with LIST parameters (3). You can stop a LIST printout in progress (4). LIST is used to print out only certain types of files (5).

1. METHODS OF ENTERING LIST COMMANDS

Two different methods can be used to enter LIST commands: the Utility Prompt Method and the System Prompt Method.

1.1 Utility Prompt Method

With the Utility Prompt Method, you enter **LIST** in response to the system prompt. This entry is sufficient to invoke LIST, which displays its own prompt — the asterisk (*). You can now enter the argument portion of the command line in response to the "*" prompt supplied by LIST. LIST prompt entries are made in the following form:

A>**LIST**CR

*{**argument**}CR

Where {argument} is the name of the file(s) to be LISTed.

After the LIST operation is finished, LIST again displays the "*" prompt. You can enter another argument or return to the operating system by entering a carriage return.

1.2 System Prompt Method

To invoke a LIST operation with a single command line, you must include the argument in the response to the system prompt, as in the following example:

A>**LIST {argument}**CR

Where {**argument**} is the name of the file(s) to be LISTed.

After LIST finishes the latter printing operation, it automatically returns you to the operating system, and the system prompt is displayed.

For example, the following command, entered using the Utility Prompt Method:

A>**LIST**CR

***REPORT.DOC**CR

and this command, entered using the System Prompt Method:

A>**LIST REPORT.DOC**CR

will produce the same results. Both commands will produce a paper copy of the file named "REPORT.DOC."

2. PRINTING CONTENTS OF MORE THAN ONE FILE

Several files can be specified in a single LIST command. To initiate a LISTing of several files, enter the names of the files in the argument, separated by single spaces.

If the files to be LISTed reside on different disks, their names should be preceded by a drive specification (drive letter and colon).

Both of the following examples demonstrate how to LIST the contents of the specified files:

A>**LIST**<CR>

***PRINTOUT.DOC B:PROGRAM.PRN B:REPORT.DOC C:SYSTEMX.PRN**<CR>

or

A>**LIST PRINTOUT.DOC B:PROGRAM.PRN B:REPORT.DOC C:SYSTEMX.PRN**<CR>

3. LIST PARAMETERS

You can specify parameters in a LIST argument to alter the characteristics of a standard print-out. These parameters allow you to select print-out characteristics such as the date, the number of copies desired, the width of tabs, etc. If no parameters are specified, LIST will print a document with default value characteristics.

The parameters used to specify print-out characteristics are shown in Table 2-2.

Table 2-2

List Parameters

PARAMETER NAME	KEYBOARD ENTRY	DESCRIPTION OF PRINT-OUT CHARACTERISTIC	DEFAULT VALUE
Date	**[D xxx...x]**	First 10 characters of specified date printed on upper right corner of each document page.	no date
Heading	**[H xxx...x]**	First 60 characters of specified heading printed on at left of top line of each document page.	file name (first copy only)
No Heading	**[N]**	No heading or date printed on any document page.	file name
Lines per Page	**[L nn]**	Each document page has the specified number of lines. Specification of zero lines /page causes printing without page breaks.	60 lines per page
Tab Stop Width	**[T nn]**	Each tab stop within text is expanded or contracted to specified number of spaces.	8 spaces
Page Number	**[P nn]**	Page numbering sequence begins with specified number on first file page.	page 1
Upper Case	**[U]**	All letters in document printed in upper case	upper and lower case
Copies Desired	**[C nn]**	Specified number of copies are printed.	1 copy
Erase	**[E]**	File is erased from disk after LIST operation is completed.	file retained on disk

USE OF LIST COMMAND LINE PARAMETERS

Parameters are entered, enclosed in square brackets, after the last file name in the LIST command. If more than one parameter is entered, each should be enclosed in a set of brackets.

A LIST command entered with parameters using the LIST Prompt Method might appear as follows:

```
A>LIST<CR>
*PRINTOUT.DOC PROGRAM.PRN [H Today's Work] [D 31-Feb-81] [P 9]<CR>
```

This command will cause the contents of the files PRINTOUT.DOC and PROGRAM.PRN to be printed, with the following heading across the top of the first page of each file:

```
Today's Work                                31-Feb-81 Page 9
```

The parameters will take effect on all of the files specified in that command line.

When the command is entered using the Utility Prompt Method, any parameters entered (except for the starting Page number parameter and Erase parameter) will remain in effect with any files specified at a successive asterisk (*) prompt, until new values are entered for the parameters, or until control is returned to the operating system.

When a LIST command line is entered using the System Prompt Method, letters in the heading, date, and page number line will be automatically translated into UPPERCASE. The following System Prompt command demonstrates this character translation:

```
A>LIST PRINTOUT.DOC PROGRAM.PRN [H Today's Work] [D 31-Feb-81] [P 9]<CR>
```

This command will cause the contents of the files PRINTOUT.DOC and PROGRAM.PRN to be printed with the following heading across the top of the first page of each file:

```
TODAY'S WORK                                31-FEB-81 PAGE 9
```

4. ABORTING A LIST OPERATION

After a LIST command has been entered, the printout can be aborted by pressing any keyboard character while the printout is in progress. (If more than one copy has been requested, you must abort each copy.) LIST will then redisplay the asterisk prompt (under the Utility Prompt Method); or CP/M will display the system prompt (under the System Prompt Method).

5. FILES THAT SHOULD BE LISTED

Only files containing ASCII characters should be LISTed. ASCII character files include files composed using a text editor (such as ED), or file with the "PRN" extension created by an assembler (such as ASM).

Files not composed of ASCII characters will produce meaningless printouts if LISTed.

Files composed in a word processor will LIST, but they might possess features (such as bold face characters or page breaks) that LIST will not print in the same way as the word processor's printout command.

6. LIST ERROR MESSAGES

```
File not found
```

A file specified in the LIST command argument does not exist on the disk in the logged drive. If the file does exist on a disk, that disk should be inserted in a drive and the appropriate drive should be specified before the file name in the argument.

```
Syntax error in command line
```

The LIST command was improperly entered. Often occurs if a space is not entered between file names, or when an invalid parameter is specified.

LOAD

The Utility that Loads a Hexadecimal File for Execution

The LOAD utility puts an assembled hexadecimal file in the Transient Program Area (1), and translates the file into a "COM" file, which is executable under the CP/M operating system (2). Only certain types of files can be LOADed (3).

1. LOAD INVOCATION

To LOAD a hexadecimal file into the TPA, you should respond to the system prompt with this entry:

A>**LOAD {hex file}**CR

Where **{hex file}** is the primary file name of an Intel hexadecimal file. The file extension is omitted from this entry because LOAD always assumes the extension to be "HEX."

This command translates the hex file into machine code that can be executed under CP/M, gives it a "COM" extension, and writes it back to the disk.

2. EXECUTING A LOADED PROGRAM

The user can start execution of the program by entering the primary name of the file (and a carriage return) in response to the system prompt. Thus the file is executed as if it were a regular CP/M utility.

It is only necessary to LOAD a hex file once. The "COM" version of the file will be stored on the disk from which the "HEX" version came. Thereafter, CP/M treats it like another "COM" file.

The operation can take place on a non-default drive if the file name is prefixed by a drive name. The entry of the following command:

A>**LOAD B:BETA**CR

brings the LOAD program into the TPA from the default disk and then operates on the file "BETA.HEX," which resides in drive B. The file named "BETA.COM" is written to the disk in drive B. (The file "BETA.HEX" will also remain on the disk.) Now you can execute BETA.COM by responding to the system prompt as shown:

A>**B:BETA**CR

Thus, you can develop new CP/M commands by using LOAD to translate a "HEX" file produced with the ASM utility (see Page 2-3) into a CP/M-executable "COM" file.

3. LOAD REQUIREMENTS FOR HEXFILES

To be LOADed, a file must contain valid Intel hexadecimal format records. The ASM utility can be used to produce such a file from a file with the "ASM" extension. The hex file must begin at address 100H, which is the memory location at which the Transient Program Area (TPA) begins. In addition, the addresses in the hex records must be in ascending order. Gaps in memory regions are filled with zeros by the LOAD command, as the hex records are read. Thus, LOAD must be used only for creating CP/M command files, which operate in the TPA. Program files that occupy memory locations other than the beginning of the TPA (address 100H) can be loaded using the DDT utility. After a program is LOADed, LOAD displays a list of hexadecimal numbers in the following form:

```
FIRST ADDRESS nnnn
LAST  ADDRESS nnnn
BYTES READ    nnnn
RECORDS WRITTEN nn
```

4. LOAD ERROR MESSAGES

```
INVALID HEX DIGIT
```

The hexadecimal file you tried to LOAD contains upper bits set in ASCII words.

```
ERROR ADDRESS nnnn
```

An error occurred at address "nnnn."

```
CHECK SUM ERROR
```

The hexadecimal file did not produce the correct check sum during LOAD execution.

```
CANNOT OPEN SOURCE
```

The hexadecimal source file specified in the LOAD command line is not present on the specified disk.

```
NO MORE DIRECTORY SPACE
```

The directory on the disk is full.

```
CANNOT CLOSE FILES
```

The LOADed file is not present when LOAD tries to close the "COM"file.

```
INVERTED LOAD ADDRESS, LOAD ADDRESS nnnn
```

The LOADed hexadecimal file did not start at the beginning of the TPA (0100H) as it should have.

MVCPM207

The Utility that Customizes a CP/M System Kernel for Memory Size

The MVCPM207 utility will adjust the CP/M system kernel so that it has the proper memory size for your purposes. It can change the system's size within a range of 48 through 64 kilobytes of Random Access Memory (RAM). This utility should be followed immediately with another utility or command, such as SYSGEN or SAVE.

1. FUNCTION OF MVCPM207

MVCPM207 loads the kernel of a CP/M Operating System (the part exclusive of BIOS files BIOS85.SYS and BIOS88.SYS) into a special location in computer memory. At this location, it adjusts the system kernel to either a specified memory size or the total available memory size of the computer.

MVCPM207 must also find and measure the BIOS85.SYS file that will eventually be used with the system kernel, to allow sufficient space for this BIOS file. MVCPM207, however, always relies upon a SYSGEN or SAVE command to copy the system kernel that MVCPM207 loaded into memory.

2. MVCPM207 COMMAND LINE ENTRY

The MVCPM207 command line is entered in the following form, with two optional specifications separated by a space, as shown:

A>**MVCPM207 {nn} {d}:{biosfile.ext}** ⏎

Where the {**nn**} variable represents the memory size that the transferred system kernel will occupy, in multiples of 1024 bytes (kilobytes). This is an optional value. If the "*" character or no value is entered, the system kernel will be set to occupy the entire memory capacity of the computer being used, by default. (Your Z-100 computer, as used with this version of CP/M, has a memory range of 48K through 64K.) This value can be less than or equal to the actual memory capacity of the computer. If it is larger than the computer's capacity, then the CP/M system created will be useless in the computer;

where the {**d**} variable represents the letter of the disk drive containing the BIOS files that are to be matched up with the system kernel being moved. This variable is optional. If omitted, MVCPM207 will assume that the created system kernel should be modified to be compatible with the BIOS files that are currently active in computer memory; and

where the {**biosfile.ext**} variable represents the name of the file containing the system components normally stored in the file BIOS85.SYS. This variable is optional. If omitted, MVCPM207 will assume the file name "BIOS85.SYS."

NOTE: The "*" character must be entered when you specify **no** value for the memory {"nn"} variable, and **do** specify a value for the drive name {d} and/or BIOS file name {biosfile.ext}. In this sort of command line, the "*" character acts as a "place holder" so that your drive name and/or file name parameters are not interpreted as a memory value because it was entered in the memory value space.

During execution, the MVCPM207 utility will respond with a message in the following form:

```
MVCPM207 VERSION 2.2.100

CONSTRUCTING nnk CP/M vers 2.2.100
READY FOR "SYSGEN" OR
"SAVE 38 CPMnn.COM"

A>
```

3. MVCPM207 EXAMPLES

The following command lines and explanations are specific examples of MVCPM207 command entry.

A>**MVCPM207 48** ⏎	The system kernel created by this command will operate with 48K of RAM. The kernel will be adjusted using the BIOS that was loaded into computer memory at bootstrap for reference.
A>**MVCPM207 * C:**⏎	The system kernel created by this command will probe computer memory and operate at computer's memory capacity (64K). This kernel will be adjusted using the BIOS files stored in drive C: for reference.

4. AFTER RUNNING MVCPM207 . . .

MVCPM207 should be immediately followed by either:

- The SYSGEN utility, which will transfer the adjusted CP/M system kernel to the system tracks of a specified disk; or by
- The SAVE resident command, which will transfer the adjusted CP/M system kernel to a file on a specified disk.

If you perform any **other** CP/M activity immediately after running MVCPM207, the work of MVCPM207 will probably be destroyed.

5. MVCPM207 ERROR MESSAGES

```
INVALID MEMORY SIZE
```

Valid memory sizes are between 48K and 64K.

```
SYNCHRONIZATION ERROR
```

The serial number of the MVCPM207 utility used must match that of the CP/M Operating System used. Reset, cold boot the system and try again with a matching system and utility.

```
READ ERROR
```

MVCPM207 cannot read data from the file you specified because the file and/or disk surface is flawed.

```
NO FILE
```

MVCPM207 cannot read data from the file you specified because it cannot find the file on the specified drive.

```
NO SPACE
```

The BIOS files you specified will not fit in memory.

```
BAD LOAD
```

The file you specified did not load properly. You should try the MVCPM207 command again or specify a different file.

```
CAN'T OPEN BIOS85.SYS & BIOS88.SYS
```

MVCPM207 is unable to use the specified BIOS because it is not stored in files specifically named "BIOS85.SYS" and "BIOS88.SYS," because it is not stored on the drive A disk, or because it is stored in a defective file.

```
FATAL ERR F25: NOT ENUF MEMORY
```

MVCPM207 execution was aborted. Reset, cold boot the system and try again.

```
File not found.
```

MVCPM207 could not find the file that you specified as the BIOS on the specified disk.

```
UNABLE TO READ BIOS FILE
```

An inaccessible BIOS file was specified at the end of a MVCPM207 command line. Copy the specified file to an accessible disk and reenter the same command, or enter another MVCPM207 command specifying a different BIOS file.

PIP

The Utility that Copies Data between Files, Disks, and/or Hardware Devices.

PIP stands for Peripheral Interchange Program, the CP/M utility that can be invoked (1, 2, 3) to copy (4) and link (5) files or parts of files (6), and to direct input and output between logical devices (8). PIP also allows files to be transferred between different disks when using a one-drive hardware environment (9). PIP operations can be regulated by parameters (11).

1. METHODS OF ENTERING PIP COMMANDS

Two different methods can be deployed to enter PIP commands: the Utility Prompt Method and the System Prompt Method.

1.1 Utility Prompt Method

With the Utility Prompt Method, you enter "PIP" in response to the system prompt. This entry is sufficient to invoke PIP, which displays its own prompt — the asterisk (*). You now enter the argument half of the command line in response to the "*" prompt supplied by PIP, as shown in the following example:

```
A>PIP<CR>
*{argument}<CR>
*
```

After this PIP operation is finished, PIP again displays the "*" prompt. In reply, enter another argument to command PIP to perform another operation, or enter a carriage return alone to return to the operating system and obtain a system prompt.

1.2 System Prompt Method

To use PIP with a single command line, the system prompt mode of command entry can be used. With this mode, you must include the argument in the response to the system prompt, as shown in the following example:

```
A>PIP {argument}<CR>
A>
```

After PIP finishes this operation, it automatically returns to the operating system, and the system prompt is displayed.

NOTE: PIP sends data to a destination from a source, but it does not remove the data from the source. It merely copies an image of the data, and then sends it. Therefore, any data that is PIPped will remain intact at the source after the PIP operation.

2. THE ARGUMENT IN A PIP COMMAND LINE

PIP commands require an argument regardless of which invocation method is used. PIP arguments must specify a "data source" (which can be either a file or a logical input device), and a "data destination" (which can be either a file, a disk, or a logical output device). The "data destination" is entered first and followed by an "=" sign, which is followed by the "data source," as shown in these examples:

```
A>PIP<CR>
*{data destination}={data source}<CR>
```

or

```
A>PIP {data destination}={data source}<CR>
```

In all cases, PIPped data is transferred in a right-to-left direction, with respect to the command line components. The file, disk, or logical output device to receive the data is always specified on the left hand side of the "=" sign; and the file or logical input device to submit the data is always specified on the right hand side of the "=" sign.

3. CHARACTERISTICS OF DATA DESTINATION AND SOURCE SPECIFICATIONS

A data destination can be a file, a disk, or a logical device. A data source can be a file or a logical device. Each must be specified in the command line as shown:

DATA SPECIFICATION CHARACTERISTICS	EXAMPLES
Data can be transferred to a disk by specifying the letter of the drive in which the disk resides, and a colon.	B:=C:SENDOVER.DOC B:=C:*.*
Files on non-default disks are identified by specifying the drive in which they reside immediately before the file name.	B:NEW.DOC=C:SEND.DOC B:CREATED.DOC=CON: CON:=B:SENDOVER.DOC
Logical devices are specified by entering the three-letter code for that particular device and a colon.	LST:=CON: LST:=SENDOVER.DOC CREATED.DOC=CON:

4. FILE COPYING EXAMPLES

The following argument will cause PIP to transfer a copy of the file SENDOVER.DOC from drive B to the same disk, and give it the file name CREATED.DOC. In effect, this operation creates a file backup with a different name on the same disk.

B:CREATED.DOC=B:SENDOVER.DOCCR

The following argument will cause PIP to transfer a copy of the file SENDOVER.DOC from drive C to the disk in drive B, and give it the file name CREATED.DOC.

B:CREATED.DOC=C:SENDOVER.DOCCR

The following argument will cause PIP to transfer a copy of the file SENDOVER.DOC from the currently logged drive to the disk in drive B, and give it the same file name.

B:=SENDOVER.DOCCR

The following argument will cause PIP to transfer a copy of the file SENDOVER.DOC from drive C to the disk in drive B, and give it the same file name.

B:=C:SENDOVER.DOCCR

Each of the following arguments will cause PIP to transfer a copy of the file SENDOVER.DOC from the disk in drive B to the disk in the currently logged drive, and give it the file name SENDOVER.DOC. Note that the data source in this argument is **not** the disk in drive B, but the file SENDOVER.DOC which resides on the disk in drive B. Because the source file is not specified in the typical data source location, PIP assumes that the source file is the same as the destination file, which is specified in its typical location.

SENDOVER.DOC=B:CR

or

SENDOVER.DOC=B:SENDOVER.DOCCR

5. DATA SOURCE CONCATENATION

While only one data destination can be specified in a single PIP command line, several data sources can be specified. Thus you can merge data from several locations to one location.

When more than one data source is specified, each data source specification is separated by a comma.

The length of a PIP command line cannot exceed 255 characters. (If you try to enter a 256th character into the command line, PIP will begin execution based on the first 255 characters entered.)

PIP will concatenate data sources in the order in which their specifications are entered in the command line.

The following PIP argument will cause PIP to get a copy of the files THISFILE.DOC and THATFILE.DOC from the disk in drive C and the file YOURFILE.DOC from the disk in the default drive. PIP will then combine all three files into one file (in the order they are specified), place this file on the disk in drive B, and assign the name COMBINED.DOC to the transferred combination of the three source files.

***B:COMBINED.DOC=C:THISFILE.DOC,C:THATFILE.DOC,YOURFILE.DOC**CR

NOTE: Both files and devices can be specified as data sources in the same command line.

6. COPYING A BLOCK OF DATA

Blocks of files, as well as whole files, can be copied to another file. To do this, you enter a PIP command that specifies the source file name and the beginning and end of the block being transferred. Such an entry requires the use of PIP parameters as in the following example:

***BLOCKFIL.TXT=WHOLEFIL.TXT[Sbeginning^ZQend^Z]**CR

In this example, "BLOCKFIL.TXT" is the name of the destination file to receive a block of text from the source file named "WHOLEFIL.TXT." The block is specified by entering a bracket, the parameter "S," a unique string of text from the "beginning" of the block, a CTRL-Z character, the parameter "Q," a unique string of text from the "end" of the block, a CTRL-Z character, and another bracket.

The following example demonstrates how you can concatenate blocks from several files by using the "S" and "Q" parameters to specify the beginning and end of each block:

***USBLOCK.TXT=GETADD.TXT[SFour↑ZQearth↑Z],CONSTIT.TXT[SWhen↑ZQAmerica↑Z]**CR

With the entry of this command line, PIP would combine the specified block from the file "GETADD.TXT" with the specified block from "CONSTIT.TXT." With this data, PIP would create the file "USBLOCK.TXT."

NOTE: The strings following the S and Q parameters will be translated to UPPERCASE if you are using PIP by the System Prompt Method. They will **not** be translated to upper case if you are using the Utility Prompt Method.

7. COPYING DATA TO AN INTEL HEXADECIMAL FILE

PIP performs a special function if the data destination is a file with the "HEX" extension (an Intel hex formatted machine code file) and the data source (or one of several data sources) is an input/output device, such as a paper tape reader.

In such a case, PIP checks to ensure that the source is a properly formed Intel hexadecimal file, with legal hexadecimal values and checksum records. If an invalid input record is found, PIP reports an error message at the console and waits for corrective action.

It is usually sufficient to open the reader and rerun a section of the tape (by pulling the tape back about 20 inches). When the tape is ready for the second reading, you should enter a carriage return at the console, and PIP will attempt another read. If the tape position cannot be properly read, you should continue the read (by entering a carriage return after the error message), and enter the record manually, using the ED utility after the disk file is constructed from the other data source components.

For convenience, PIP allows a CTRL-Z ("end-of-file"character) to be entered from the console if the source file is a RDR: device. In such a case, PIP reads the specified device and monitors the keyboard. If a CTRL-Z is entered at the keyboard, then the read operation is terminated normally.

For instance, the following PIP argument could be entered to create a "HEX" file:

***CREATED.HEX=CON:,B:SENDOVER.HEX,PTR:**↵

The preceding argument will cause PIP to create the data destination file CREATED.HEX by reading the data from source device CON: (as you enter hexadecimal values at the keyboard and eventually enter a CTRL-Z "end-of-file" character), the data from source file SENDOVER.HEX (which includes a CTRL-Z), and finally the data from source device PTR: (until a CTRL-Z is read from the paper tape).

NOTE: Hexadecimal data can be checked for valid format by specifying the "H" or "I" format in the PIP argument (see Page 2-162).

8. COPYING DATA TO OR FROM LOGICAL DEVICES

The following examples, and explanations, demonstrate PIP commands that transfer data to and/or from computer-recognized logical devices:

***LST:=SENDOVER.PRN**CR

The preceding argument causes PIP to copy the source file SENDOVER.PRN to the LST:device.

***CON:=B:THISFILE.ASM,C:THATFILE.ASM,YOURFILE.ASM**CR

The preceding argument causes PIP to concatenate three ASM source files: one from the disk in drive B, one from the disk in drive C, and one from the default disk. PIP will send a concatenation of data from these sources to the CON: device. Thus the contents of the files will be displayed on your console.

***LST:=B:PROMPT.DAT,CON:** CR

The preceding argument causes PIP to send data from a drive B file to the list device until the end of the file, then from the console keyboard to the list device until you enter the CTRL-Z end-of-file character.

8.1 Input/Output Devices Accessible Through PIP

The PIP utility allows you to transfer data directly to or from the logical and physical devices being used. PIP supports data transfer with respect to the devices indicated in Table 2-3.

Table 2-3

Logical/Physical Devices

LOGICAL DEVICE NAME	PHYSICAL DEVICE NAME	DESCRIPTION AND/OR CATALOG NAME OF RECOMMENDED INPUT/OUTPUT MACHINE
CON:	TTY:	A printing terminal attached to serial port outlet A on the Z-100 (e.g. Decwriter).
	CRT:	A video display terminal and keyboard.
	BAT:	A batch pseudo-device using RDR: for input and LST: for output.
	UC1:	A modem attached to serial port B on the Z-100.
RDR:	TTY:	A printing terminal attached to serial port outlet A on the Z-100 (e.g. Decwriter).
	PTR:	Not implemented.
	UR1:	A modem attached to serial port B on the Z-100.
	UR2:	A video display terminal and keyboard.
PUN:	TTY:	A serial printer attached to serial port outlet A on the Z-100.
	PTP:	Not implemented.
	UP1:	A modem attached to serial port B on the Z-100.
	UP2:	A video display terminal and keyboard.
LST:	TTY:	A serial printer attached to serial port outlet A on the Z-100 (H/Z-25, H-14, TI-810, Diablo, Epson MX-80 serial, Decwriter).
	CRT:	A video display terminal and keyboard.
	LPT:	A parallel printer attached to the parallel printer port outlet on the Z-100 (Epson MX-80 parallel, Centronics).
	UL1:	A modem attached to serial port B on the Z-100.

You must be certain that the destination device specified is capable of receiving data, and that the specified source device is capable of sending data.

ADDITIONAL LOGICAL DEVICES USED WITH PIP

All devices in the preceding table can also be referenced using the STAT utility, which assigns physical devices to logical devices on a temporary basis. (CONFIGUR can match the devices in Table 2-3 on a permanent basis.)

The PIP utility can also gain access to five additional devices, which are defined below:

NUL: Sends 40 "nulls" (ASCII zeroes) to the destination device. (The NUL: device is usually accessed at the beginning and/or end of the output when a paper tape punch device is used.)

EOF: Sends an "end-of-file" character (ASCII CTRL-Z) to the destination device. (A CTRL-Z is sent automatically when PIPping a file composed with ASCII characters.)

INP: Special input source which can be "patched" into the PIP program itself. Through this source, PIP accepts data input character-by-character using a system call to memory location 103H. The data returns from location 109H. The parity bit must be preset at zero.

OUT: Special output destination which can be "patched" into the PIP program. PIP transmits data from register C to this destination using a system call to memory location 106H. Note that locations 109H through 1FFH of the PIP memory image are not used, and can be replaced by special purpose drivers using DDT.

PRN: This device is accessed for the same purposes as the LPT: device. In its operation, however, tabs are expanded at every eighth character position, lines are numbered, and page breaks occur every 60 lines. Output directed to the LPT: device will be treated identically if the [TNP] or [T8NP60] parameter is used in a LIST command (see Page 2-138).

8.2 Suspending PIP Operations

When PIPing to the CON: logical device, the copy operation can be suspended by entering the CTRL-S character at the keyboard and resumed by entering any character other than CTRL-C. The operation can be aborted by entering any keyboard character other than CTRL-S while data is being transferred. PIP will respond to such an entry with the following message mentioning the name of the file being displayed:

```
ABORTED : {filename.ext}
```

9. USING PIP WITH A ONE-DRIVE HARDWARE ENVIRONMENT

When performing a PIP operation in a one-drive hardware environment, the "PIP" command should be entered alone at the system prompt (using invocation method 1.1) to produce the "*" prompt.

When using the PIP utility to copy a file to a file on another disk, the disks involved must be inserted in the drive alternately to allow PIP to read from one file and then write to another. The command line argument should be entered as follows:

***B:{destination file name}=A:{source file name}**CR

Where **B:** specifies logical drive device B;

where **A:** specifies logical drive device A; and

where both A and B are referred to as physical drive device 0 (the only physical drive device in the hardware environment).

This entry causes PIP to display the message:

```
PUT DISK B IN DRIVE A: AND PRESS RETURN
```

The disk designated to receive the file copy should be placed in the drive, and a carriage return entered. PIP will display the following message:

```
PUT DISK A IN DRIVE A: AND PRESS RETURN
```

The disk containing the data source file should be placed in the drive, and a carriage return entered. You should repeat these two steps alternately, as the PIP prompts indicate, until the entire source file has been copied to the destination file. This process will vary in length, depending on the size of the file being copied. You should keep track of which disk is A and which is B to avoid errors.

10. PIP'S METHOD OF OPERATION

File names and device names can both be used in a single data source argument, with PIP reading each name entered (starting with the name entered on the left-hand side of the source argument) until it reaches "end-of-file." "End-of-file" is indicated by a CTRL-Z character in ASCII files, and by the actual end of the file in non-ASCII files. Each of the data source names entered is read and then concatenated to the preceding name (to its left) until the last name has been read.

The data destination device or file receives a copy of the data from the source files and/or devices. When data from an ASCII file is written, the CTRL-Z "end-of-file" character is appended to the result.

As the PIP operation begins, a temporary file is established in the directory of the destination disk. This file has a name that consists of the primary name specified in the data destination, and a "$$$" extension. This temporary file is not changed to the actual file (with the extension specified in the command line argument) until successful completion of the PIP operation.

Files with a "COM" extension are always assumed to be non-ASCII files.

11. PIP PARAMETERS

The PIP utility performs enhanced data transfer operations when command line parameters are used. All PIP parameters used are to be entered after the data source and enclosed between a single set of square brackets. A carriage return must follow the closing bracket. Parameters are entered in the following form:

*{**data destination**}={**data source**}{[**parameters**]}<CR>

Where {**data destination**} is a specification of the file, disk, or device to receive the transferred data;

where {**data source**} is one or more specifications of the file(s) or device(s) from which the transferred data will be copied; and

where {[**parameters**]} is the specification of PIP parameters used to regulate the transfer operation.

NOTE: Several parameters can be enclosed between a set of brackets in a single PIP command line.

The parameters used to regulate transfer operations are as follows:

B Block mode transfer: PIP transfers data from a source device to a buffer (data reservoir in computer memory), which retains bits of a continuous flow of data before writing it on a disk. The buffer is emptied to a disk when the CTRL-S character is transmitted to the buffer from the source device. PIP then resumes transmitting the continuous flow of data from the source device. If the buffer overflows with data, PIP will display an error message.

Dn Delete characters: Causes PIP to transfer all of the characters within the source file or source device — except for the characters to the right of the nth column, which are truncated so that the file can be sent to a narrow printer or console.

E Echo transfers: Causes display indicating what units of data are being transferred, as they are being transferred.

F Filter Form Feeds From File: Removes form feeds that are embedded in a file. The "P" parameter can be entered in the same command line to insert new form feeds.

Gn Get file from user area "n": Enables you to access files through a different user area number "n" (in the range 0-15). Can only be implemented if the file "PIP.COM" is in the current user number.

H Hex data transfer: Transferred data is checked for proper Intel hexadecimal file format, and unnecessary characters between hex records are removed during the transfer operation. If errors occur, PIP will display prompts for corrective action.

I Ignore records: Transferred Intel hex files will not include ":00" records. The I parameter automatically sets the H parameter.

L Lowercase letters: Translates all PIPped alphabetic characters to lowercase.

N Number lines: Applies line numbers to the beginning of each transferred line of data. The numbers begin at one and increase sequentially by ones. The numbers are separated from data lines by a colon. If "N2" is specified, then each number is preceded by up to five zeros and followed by a tab space. This tab space is expanded if the "T" parameter is also set.

O Object file transfer: The normal CP/M end of file will be ignored in any data transferred with this parameter. This parameter is useful in transferring files with non-ASCII characters.

Pn Page ejects: Transferred data is interrupted at the beginning of the file and every "n" lines thereafter. If "n" is omitted from the parameter, the value "1" is assumed. If the value "1" is entered or assumed with the parameter, page ejects will occur every 60 lines. If the "F" parameter is entered in the same command line, then form feed suppression takes place before the new page ejects are inserted.

Qstring^Z Quit copying block: the text "string" between the "Q" and the "^Z" (CTRL-Z) in this parameter marks the end of a block of text to be transferred. (Block begins with text "string" in the "Sstring^Z" parameter.)

R Read system files: Enables transferral of files with the "SYS" status.

Sstring^Z Start copying block: the text "string" between the "S" and the "^Z" in this parameter marks the start of a block of text to be transferred. (Block ends with text "string" in the "Qstring^Z" parameter.)

NOTE: The strings following the S and Q parameters are translated to UPPERCASE by the system if PIP is invoked using the System Prompt Method (entire command on one line):

A>**PIP B:THIS.DOC=C:THAT.DOC[STHE BEGINNING^ZQTHE END.^Z]**

Therefore, the file's actual text must be in uppercase to match the string. However, if PIP is invoked using the Utility Prompt Method (with the command line argument entered in response to PIP an "*" prompt):

A>**PIP**
***B:THIS.DOC=C:THAT.DOC[SThe beginning^ZQthe end.^Z]**

Then the string text will **not** be automatically translated into uppercase.

Tn Tab expansion: Expands each occurrence of tab character to every "n"th column in transferred text.

U Uppercase: Translates lowercase alphabetic characters to uppercase during text transferral.

V Verify operation: compares copy of transferred data with original to ensure exact correspondence. Might increase command execution time by as much as two times. This parameter only works if the data destination is a disk file.

W Write over files: Writes newly transferred data file over old data file, even if old file has been given R/O (read only) status. PIP will not prompt you before deleting the old file.

Z Zero parity bit: Sets parity bit on input to 0 for each ASCII character in transferred data.

12. PIP ERROR MESSAGES

```
DISK READ ERROR
```

Source of data is flawed. Repeat PIP command or replace data source.

```
DISK WRITE ERROR
```

Destination disk did not have enough space for PIPped data. Clear some space on the destination and repeat PIP command.

```
VERIFY ERROR
```

Destination disk has flawed media. Replace destination disk and repeat PIP command.

```
ABORTED: {filename.ext}
```

A keyboard entry during a PIP data transfer caused this message and an end to PIP execution while {filename.ext} was being copied to the CON: device. Reenter the same command.

```
BAD PARAMETER
```

You entered an invalid parameter or an invalid bracket in a PIP command line.

```
INVALID USER NUMBER
```

You specified a user number out of the 0 - 15 range.

```
INVALID DIGIT
```

You entered an invalid digit for a PIP parameter. Reenter the entire command line.

```
CHECKSUM ERROR
```

PIP verification found a discrepancy between a data source and data destination file. The PIP operation should be repeated.

```
INVALID FORMAT
```

You entered PIP command line in improper form, and should repeat entry of command.

```
NO DIRECTORY SPACE
```

The directory of the destination disk is full.

```
NO FILE: =x:filename.ext
```

PIP could find no source file by the name "filename.ext" on the disk in drive "x."

```
START NOT FOUND:={filename.ext}{[param]}
```

PIP could not find the beginning of a string specified with the "S" and "Q" parameters. Reenter command specifying a string beginning that exists in the data source.

```
QUIT NOT FOUND:={filename.ext}{[param]}
```

PIP could not find the end of a string specified with the "S" and "Q" parameters. Reenter command specifying a string end that exists in the data source.

```
DESTINATION IS R/O, DELETE (Y/N)?
```

This message prompts you that the destination already has a file by that name which has been given R/O status (see Page 2-180). You can have the old file overwritten by answering Y to this prompt.

```
NOT FOUND
```

Reenter PIP command with the name of an accessible data source.

```
UNRECOGNIZED DESTINATION
CANNOT WRITE
```

Reenter a PIP command with a valid data destination.

```
INVALID PIP FORMAT
CANNOT READ
```

You made a syntax error in command line, and PIP could not read the source file. Reenter the command after checking the invalid command for syntax errors.

```
INVALID SEPARATORS
```

Reenter PIP command with the proper square brackets around a parameter.

PREL

The Utility that Creates a Relocatable File from Two Hexadecimal Output Files

The PREL utility is invoked (1) to take the hex output files of two assemblies and generates a relocatable file from them (2). The first of the assemblies should have an initial origin of 000H and the second assembly should be one page higher, or 0100H. The hex output of the first assembly should be given a file name extension of "HX0", and the hex output of the second should have "HX1" for its extension. PREL can be effectively implemented as one of the batched commands in a SUB file (3).

1. PREL INVOCATION

A PREL command line is entered in this form:

A>**PREL {hex file name} {relocatable file name}**CR

Where {**hex file name**} is the primary name of the two assembled hex files (These files are given the extensions HX0 and HX1); and

where {**relocatable file name**} is the primary name of the output page relocatable file. (The output file will have the extension PRE.)

For example, the command line:

A>**PREL MYPROG TESTBIOS**CR

would create the file TESTBIOS.PRE from the two hex files MYPROG.HX0 and MYPROG.HX1.

2. PREL FUNCTION

PREL will compare the two hex files and perform two separate functions:

- PREL converts the hex file to a binary file (similar to the function of the LOAD utility).

- PREL appends a relocation table to the end of the file which includes a bit for each byte in the module. If a particular bit has a value of one, then the associated byte must be offset when the program is loaded into memory. An error message will result if the hex values for a given byte differ by more than 0 or 1. An error message will also result if the addresses in the hex files do not increase sequentially.

3. PREL OPERATION

All addresses that need to be relocated should be expressed relative to the base of the module, and not defined absolutely. A convenient way to do this is to omit "ORG" statements from the program and use the SUBMIT utility to enter batched commands from a SUB file. The commands in the SUB file should perform the required assemblies and the conversion to a relocatable format. An example of this type of batched command might be:

```
PIP TEMP0.ASM=ORG0.ASM,$1.ASM
ASM TEMP0.AAZ
REN $1.HX0=TEMP0.HEX
ERA TEMP0.ASM
PIP TEMP1.ASM=ORG1.ASM,$1.ASM
ASM TEMP1.AAZ
ERA TEMP1.ASM
REN $1.HX1=TEMP1.HEX
PREL $1 $1
ERA $1.HX0
ERA $1.HX1
```

where the files ORG0.ASM and ORG1.ASM contain nothing but "org 0000H" and "org 0100H" statements respectively. This command script could be invoked with the entry:

A>**SUBMIT MAKEPRE MYPROG**CR

Where the command sequence is contained in a file called MAKEPRE.SUB, the original assembly file is called MYPROG.ASM and the final result is a page relocatable file called MYPROG.PRE.

4. PREL ERROR MESSAGES

```
Phase error
```

Hexadecimal files do not contain correct starting addresses.

```
Cannot open input file
```

The file with the extension "HX0" or "HX1" was not found.

```
Cannot create output file
```

The directory on the destination disk is full.

```
Hex files not monotonic
```

The hexadecimal addresses are not increasing sequentially.

```
rite error
```

The destination disk is full.

REN

The Resident command that Renames Files

The REN command allows you to assign a new name to any disk file (1). If it cannot RENname a file, it displays the reason (2).

1. RENAMING A FILE

To RENname a file, you respond to the system prompt with a command line in the following form:

A>**REN {new name}={old name}**↵

Where {**new name**} is the name you wish to assign to the file; and

where {**old name**} is the name of the file before it is RENamed.

For instance, the name of the file "MYFILE.DAT" can be assigned to a file currently named "YOURFILE.DAT" by entering the following command:

A>**REN MYFILE.DAT=YOURFILE.DAT**↵

If the file receiving the new name does not reside on a disk in the default drive, then the REN command line must include a drive specification which precedes the new file name, as shown:

A>**REN C:MYFILE.DAT=YOURFILE.DAT**↵

2. CONSOLE RESPONSE TO RENAMING COMMANDS

If a file is successfully RENamed, the system prompt will appear.

```
A>
```

If the file being renamed does not exist on the default drive and no drive is specified (or if an incorrect drive is specified), then REN cannot find the file you want to rename and will display the error message:

```
NO FILE
```

If you try to assign a file a name that is actually the current name of an existing file, REN will not perform the change and displays the error message:

```
FILE EXISTS
```

SAVE

The Resident Command that Copies Data from Memory to a Disk File

The SAVE command is used to copy the contents of a span of memory locations to a disk file (1). The amount of data that SAVE will copy is measured in pages (2). The data that SAVE copies from the computer's memory space can come from a variety of sources (3).

1. SAVE COMMAND LINE

To SAVE a program onto a disk and create a file for it, you respond to the system prompt with a command in the form:

A>**SAVE {pages} {file name}**CR

Where {**pages**} is the **decimal** number of pages of memory contents that SAVE should copy to the disk, and

where {**file name**} is the name of the file created to store the data.

NOTE: A page of memory in CP/M is 256 (decimal) bytes, or a span of 0100H (hexadecimal) memory locations.

For example, to copy three pages (the memory contents between address 100H and address 3FFH) of data from main memory to the disk in non-default drive B and give this block of data the file name "PROGRAM.ASM," you enter the following command line:

A>**SAVE 3 B:PROGRAM.ASM**CR

2. SAVE DESCRIPTION

Data in the computer's Transient Program Area (TPA) memory space can be blocked off by specifying the first and last memory locations that it occupies. Programs loaded into the TPA always begin at memory location 0100H (hexadecimal). This is also the location from which SAVE starts copying blocks of data. Therefore, if you specify one page (100H bytes) in the SAVE command line, SAVE will start copying data from memory location 100H and continue through memory location 1FFH.

Only whole pages can be transferred; and SAVE recognizes only decimal integers for pages.

3. COMMON APPLICATIONS FOR SAVE

SAVE will copy the binary values for data that resides in memory locations 100H through FFFFH (in a 64K computer). This area of memory is known as the Transient Program Area, and it is used to accommodate data manipulated by utilities and application programs. Data often remains in these locations after being manipulated by CP/M utilities.

One useful application is to SAVE a program that has been placed in memory by the DDT utility. To produce the system prompt (A>) and allow entry of the SAVE command, you must exit from the DDT utility with a warm boot (performed by pressing CTRL-C).

Another common application is to SAVE a copy of the operating system onto a file. Part of the system always occupies the area of memory between locations 0H and 100H. However, if the system kernel is loaded into the Transient Program Area by the MVCPM207 utility, it can be SAVED onto a file. To do this, you must follow a MVCPM207 command with a command in the following form:

A>**SAVE 38 CPMkk.COM**CR

Where **kk** is the number of kilobytes of memory to which the system has been adjusted by the MVCPM207 utility.

4. COMPUTING PAGES TO BE SAVED

To SAVE a program from memory, you first determine how many pages this program occupies. This requires a conversion of the program's hexadecimal size to decimal pages.

The hexadecimal size of a program is displayed when the program is loaded into the TPA under DDT. This display indicates that the program begins at address 0100H and ends at an address identified as "NEXT." You should take the two left-hand digits from the "NEXT" value and convert them into a decimal number. This decimal number is the number of pages to be SAVEd.

For example, if you are debugging a program that occupies memory locations 0100H through 28FFH, the results of this debugging activity can be recorded by taking the hexadecimal value "28," converting them into the decimal value "40," and entering the following command:

```
A>SAVE 40 PROGRAMX.HEX<CR>
```

If the disk to which you try to SAVE a data block does not have enough space to record a file of the specified size, then the following error message will be displayed:

```
NO SPACE
```

STAT

The Utility that Reports Disk Statistics and Assigns Status

The STAT utility has two functions: to provide statistical information about disk space or file size (1), and to allow you to change the assignment of various types of status (2) to files and devices.

1. REPORTING STATISTICS CONCERNING DISKS AND FILES

The STAT utility enables you to determine the amount of disk space that specific files occupy and/or the amount of disk space not yet occupied by files. STAT reports these statistics in a variety of units.

1.1 Available Disk Space

The amount of unoccupied space on the disk in the default drive that is available for use can be determined by entering the command "STAT" and a carriage return at the default drive prompt, as in the following example:

A>**STAT**↵

If drive A is the only drive that has been logged since the system was booted, then STAT will respond with a display like the following:

A: R/W, Space: 3k

Where "A:" indicates that the disk in drive A was investigated by STAT;

where "R/W," stands for Read/Write, meaning that data and files can be written to or read from the disk. If STAT encounters a disk that has been write-protected, it will report that the disk is "R/O" or read/only. Data and files cannot be recorded to or erased from a read/only diskette; and

where "3k" indicates the amount of space that is unoccupied on the disk, and thus available to record files. Memory space is expressed in units of 1024 bytes, or kilobytes (k). One byte holds one character. The disk that was investigated for the preceding example has enough remaining memory space to store 3072 characters.

If you logged other drives since the system was last booted, the preceding response to the simple "STAT" command line will also produce a listing for the disks in each of the drives that have been logged, as shown:

```
A: R/W, Space: 3k
B: R/W, Space:18k
C: R/W, Space:65k
```

Even if a non-default drive has not yet been logged, you can still ascertain the space remaining on the disk within it by specifying the drive in the STAT command line:

A>**STAT B:**↵

The entry of this command line might produce the response:

```
Bytes Remaining on B: 24k
```

1.2 Disk Space Consumed by a File

To find out how much space one particular file occupies, you are required to specify the file name and the drive in which the file resides. An appropriate entry for such a command would be:

A>**STAT C:PRINTOUT.DOC**CR

Such an entry might produce the STAT message:

```
 Recs  Bytes  Ext Acc
  140    18k    2 R/W C:PRINTOUT.DOC
Bytes Remaining on C: 72k
```

Where "Recs" stands for the number of records within the file. The file PRINTOUT.DOC contains 140 data records. A record is the amount of data it takes to fill up 128 bytes (one-eighth of a kilobyte) of memory space. Thus, one record consists of 128 data characters. However, STAT cannot report fractions of records; and if a file contains anywhere from 1 to 128 characters, STAT will still report that the file contains one record;

where "Bytes" stands for the amount of memory space the file occupies, expressed in kilobytes (1024 bytes). In this display, STAT reports that the file PRINTOUT.DOC occupies 18 kilobytes of memory space. One kilobyte of space will hold 8 records. However, STAT cannot report fractions of kilobytes; and if a file contains anywhere from 1 to 8 records, STAT will still report that it occupies one kilobyte of space;

where "Ext" stands for the number of extents that the file occupies. In this display, STAT reports that the file PRINTOUT.DOC occupies two extents. One extent will process 16 kilobytes of data. However, STAT cannot report fractions of extents; and if a file occupies anywhere from 0 to 16 kilobytes, STAT will still report that it requires one extent to be processed;

where "Acc" indicates the file's access status. The "R/W" access status (read/write) enables you to run commands to freely erase data from the file or to add data to the file. The "R/O" access status imposes limitations on the commands you can run to change the data in a file. (See Page 2-180.); and

where "PRINTOUT.DOC" is the name of the file that is being statistically analyzed. Since this file name is **not** enclosed in parentheses, it has directory status. If a file name in this kind of display is enclosed in parentheses, it has system status. (See Page 2-181.)

1.3 Disk Space Consumed by Groups of Files

To obtain the status of all of the files on a disk without entering a command line specifying each file on the disk, the drive letter and the ambiguous filename "*.*" can be entered, as in the following command line:

A>**STAT B:*.***CR

Such an entry will produce a display like this:

```
 Recs  Bytes  Ext Acc
  175    22k    2 R/W B:DATE0927.DOC
  160    20K    2 R/W B:DATE1003.DOC
   15     2k    1 R/W B:REPORT1.TXT
    9     1K    1 R/W B:REPORT2.FIL
  119    15k    1 R/O B:THATFILE.COM
  201    25k    2 R/O B:THISFILE.COM
Bytes Remaining On B: 26k
```

(Such an operation will only reveal the files within the currently logged user area.) STAT can also convey the status of groups of files on a disk when ambiguous file names are entered with the asterisk and/or question mark representing only part of the file names, as in the following sample command lines:

A>**STAT B:*.COM**CR

A>**STAT B:DATE????.DOC**CR

A>**STAT B:REPORT?.***CR

1.4 Measuring the Size of a File

In addition to determining the actual amount of disk space occupied by a file, STAT can also report on the outermost boundaries of the disk space occupied by a file, or the difference between the first and last sectors occupied by the file.

In the case of sequential files, the size of the file is the same as the number of records because records are recorded on adjacent sectors. The records of random files are often scattered over a wider disk area than they actually occupy. To determine the size of a file, the normal command line for status of a particular file is entered, followed by a space and the characters "$" and "S," as shown:

A>**STAT C:PRINTOUT.DOC $S**CR

The preceding entry might produce the response:

```
 Size  Recs  Bytes  Ext Acc
  140   140    18k    1 R/W C:PRINTOUT.DOC
Bytes Remaining On C: 72k
```

NOTE: If disks are switched from one drive to another between STAT runs, the individual file statistics will be accurate, but the "Bytes Remaining on X: nnk" message will bear a kilobyte count that reflects the remaining disk space on the disk that was first logged within that particular drive since boot-up. To ensure a correct listing of remaining disk capacity, you should perform a warm boot (enter **CTRL-C**) if disks are switched between STAT runs.

In this example, the value listed for "Size" and for "Recs" are equal because the file being statistically analyzed is a sequential file.

2. ASSIGNING STATUS

The STAT utility also performs functions which allow disk protection, manipulation of file indicators, disk parameter statistics, user number display, and Input/Output device assignment. A list of these special STAT functions can be invoked by entering the following command:

```
A>STAT VAL:
```

In response, STAT will display the following list:

```
Temp R/O Disk: d:=R/O                                        (2.1)
Set Indicator: d:filename.typ $R/O $R/W $SYS $DIR  (2.2, 2.3)
Disk Status  : DSK: d:DSK:                                   (2.4)
User Status  : USR:                                          (2.5)
Iobyte Assign:                                               (2.6)
CON: = TTY: CRT: BAT: UC1:
RDR: = TTY: PTR: UR1: UR2:
PUN: = TTY: PTP: UP1: UP2:
LST: = TTY: CRT: LPT: UL1:
```

2.1 Temporarily Changing a Disk's Access Mode

The category title "Acc" in a STAT display stands for the access mode of a file. A file's access mode can be either R/W or R/O. The R/W (Read/Write) mode allows you to write data to the file or erase data from it. The R/O (Read/Only) mode prevents insertion or deletion of data within the file.

To change the access mode of all files on a disk from R/W to R/O, requires the entry of "STAT," a space, the name of the drive containing the disk to be protected, a colon, an "=" sign, the new access mode "R/O," and a carriage return. The following example illustrates such a command line:

```
A>STAT B:=R/O
```

After the entry of this command line, the data files on disk B cannot be erased or over-written. The protection furnished by the R/O access mode will remain in effect until a warm or cold boot is performed.

If you protect files in this manner and try to write to or delete from a file on the disk, the following error message is displayed:

```
Bdos Err On B: R/O
```

CP/M will not allow alteration to file contents, and will perform a warm boot with the next key pressed after this message is displayed. After this warm boot is performed, the disk's files are reset to the R/W access mode.

2.2 Changing a File's Access Mode

The R/W (Read/Write) mode allows you to write data to the file or erase data from it. The R/O (Read/Only) mode prevents insertion or deletion of file data, and it can be applied to files by the set indicator commands "$R/O" and "$R/W."

Individual files, or groups of files, can be given the R/O status with the entry of "STAT," a space, the drive specification, the file name, a space, the characters "$R/O," and a carriage return. For instance, the file named "ARCHIVAL.DOC" on the disk in drive B can be protected from alteration by the following entry:

```
A>STAT B:ARCHIVAL.DOC $R/O<CR>
```

After this command has been given, the following message is displayed:

```
ARCHIVAL.DOC set to R/O
```

Attempts to write to or erase from this file using any command will produce the message:

```
Bdos Err On B: File R/O
```

If this error message occurs, you can access the system by pressing any key.

The R/O attribute is recorded in the directory and will not change if the system is re-booted. The file can be made Read/Write again by entering a similar command with the characters "$R/W" in place of "$R/O," as in the following example:

```
A>STAT B:ARCHIVAL.DOC $R/W<CR>
```

2.3 Changing a File's System Status

Individual files, or groups of files, can be given the system status, which prevents their mention in DIRectory listings, prevents access by the EDitor, and prevents copying by PIP (except with the "[R]" parameter). This status is applied to a file when the entry of "STAT," the drive specification, and the file name is followed by the characters "$SYS." For instance, the file "HIDEFILE.COM" on drive B becomes ineligible for PIPing (except with [R], DIRectory mention or EDiting, when the following command is entered:

```
A>STAT B:HIDEFILE.COM $SYS<CR>
```

After this command has been given, the message:

```
HIDEFILE.COM set to SYS
```

is displayed.

To illustrate how this status protects a file, efforts to edit the file using the ED utility will produce the message:

```
"SYSTEM" FILE NOT ACCESSIBLE
```

In addition, a check of this file using a different form of the STAT command will also produce noteworthy results, as shown. If you enter the command:

```
A>STAT B:HIDEFILE.COM<CR>
```

The following display will appear:

```
 Recs  Bytes  Ext  Acc
   38     5k    1  R/W B:(HIDEFILE.COM)
Bytes Remaining On B: 19k
```

When a file bears the SYS status, it will have parentheses around its listing in a STAT file report.

The system attribute can be removed from this file by the following entry:

```
A>STAT B:HIDEFILE.COM $DIR<CR>
```

The **$DIR** argument in a STAT command line lifts all of the restrictions imposed by the $SYS argument in a previous STAT command.

2.4 Listing Disk Characteristics

Characteristics of a disk can be obtained by entering "STAT," a drive specification, "DSK:," and a carriage return, as shown:

```
A>STAT B:DSK:<CR>
```

STAT will list a display similar to the following:

```
   B: Drive Characteristics
2496: 128 Byte Record Capacity
 312: Kilobyte Drive Capacity
 256: 32 Byte Directory Entries
 256: Checked Directory Entries
 128: Records/ Extent
  16: Records/ Block
  32: Sectors/ Track
   2: Reserved Tracks

A>
```

Where the letter "B" to the left of "Drive Characteristics" indicates the selected drive, which contains the disk being analyzed (a 5.25-inch soft-sectored disk in this example);

where the second and third lines indicate the disk's total "Record Capacity" and "Kilobyte Drive Capacity," respectively. These totals include file, directory, and system capacity. The amount of space accessible for storing files is a few kilobytes smaller.

where the directory can hold a maximum of "256" entries;

where the number of "Checked Directory Entries" is usually identical to the directory size for floppy disks, since this mechanism is used to detect changed disk media during CP/M operation without an intervening warm boot;

where the number of "Records/ Extent" indicates the addressing capacity of each directory entry;

where the number of "Records/ Block" indicates the basic size of a block. By knowing that a record contains 128 bytes, you can calculate the number of bytes in a block;

where the number of "Sectors/ Track" can help you determine the number of sectors on the disk (the 5.25-inch soft-sectored disk has 40 tracks on each formatted side); and

where the "Reserved Tracks" are reserved for the operating system and the disk file directory.

If no drive is specified in the command line, then a listing in the above form will be displayed for the disk in each drive that has been logged since the last warm boot.

2.5 Examining User Areas

User access to certain files can be controlled by assigning user areas to the files. (See text on USER resident command.) The following form of the STAT utility will display a list of the numbered user areas which have files on the currently logged disk.

```
A>STAT USR:↵
```

This entry might produce the response:

```
Active User : 0
Active Files: 0 1 3
```

The first line in the response lists the currently logged user area, or "Active User," which was set at zero either by the last USER command, or by a cold boot.

The second line lists the other user area numbers that have been established for files on the disk. This list is displayed as "Active Files," and indicates that additional files can be accessed by logging user area one or three.

2.6 Temporarily Matching Logical and Physical Devices

The STAT utility also enables you to monitor and temporarily control the assignment of physical Input/Output devices to the appropriate logical device names. In general, there are four logical peripheral devices which, at any particular instant, are each assigned to one of several physical peripheral devices. The four logical devices, and the physical devices that can be assigned to each of them, are shown in the display invoked by the **STAT VAL:** command, and in the following table:

Table 2-4

Possible Device Assignments

LOGICAL DEVICE NAME	PHYSICAL DEVICE NAME	DESCRIPTION AND/OR CATALOG NAME OF RECOMMENDED INPUT/OUTPUT MACHINE
CON:	TTY:	A printing terminal attached to serial port outlet A on the Z-100 (e.g. Decwriter).
	CRT:	A video display terminal and keyboard.
	BAT:	A batch pseudo-device using RDR: for input and LST: for output
	UC1:	A modem attached to serial port B on the Z-100.
RDR:	TTY:	A printing terminal attached to serial port outlet A on the Z-100 (e.g. Decwriter).
	PTR:	Not implemented.
	UR1:	A modem attached to serial port B on the Z-100.
	UR2:	A video display terminal and keyboard.
PUN:	TTY:	A serial printer attached to serial port outlet A on the Z-100.
	PTP:	Not implemented.
	UP1:	A modem attached to serial port B on the Z-100.
	UP2:	A video display terminal and keyboard.
LST:	TTY:	A serial printer attached to serial port outlet A on the Z-100 (H/Z-25, H-14, TI-810, Diablo, Epson MX-80 serial, Decwriter).
	CRT:	A video display terminal and keyboard.
	LPT:	A parallel printer attached to the parallel printer port outlet on the Z-100 (Epson MX-80 parallel, Centronics).
	UL1:	A modem attached to serial port B on the Z-100.

EXAMINATION OF CURRENT DEVICE ASSIGNMENTS

The current assignments of the physical devices to logical devices are shown in the display invoked by the following command entry:

A>**STAT DEV:**↵

This command produces a display similar in form to:

```
CON: is CRT:
RDR: is UR1:
PUN: is UP1:
LST: is UL1:
```

CHANGING DEVICE ASSIGNMENTS

The current logical to physical device assignment can be changed by entering this STAT command:

A>**STAT {logical device}:={physical device}:**↵

Where both the {**logical device**} and the {**physical device**} are specified by their four-character names.

For example, the following entry will change the physical device assigned to the list logical device (LST:) to a parallel printer (LPT:):

A>**STAT LST:=LPT:**↵

Several device assignments can be affected in one command by entering equations in series, separated by commas.

Physical to logical device pairings assigned by the STAT utility will survive a warm boot, but are replaced by default assignments when a cold boot is performed. Default assignments, that will survive a cold boot, may be changed through the CONFIGUR utility.

3. STAT ERROR MESSAGES

```
Bad Delimiter
```

You entered a command line with improper syntax while assigning some type of status (2). Command should be reentered in the proper form.

```
Invalid Assignment
```

You tried to make a device assignment with a device name that is not listed in Table 2-4. Reenter assignment using valid device names.

```
Invalid File Indicator
```

You tried to assign a particular indicator ($R/O, $R/W, $SYS, or $DIR) to a file but did not type the proper characters after the dollar sign. Check the invalid command for improper characters (see Page 2-179) and reenter the command.

```
File Not Found
```

STAT found none of the files you specified on the logged disk. Reenter command specifying different file names, or perform a warm boot and insert a disk that has the specified file(s).

```
Invalid Disk Assignment
```

You entered a disk status assignment command that included a status other than "R/O" or "R/W." See Page 2-179 for the correct syntax of disk status command lines, and reenter the command.

```
** Aborted **
```

When you assign status ($R/O, $R/W, $SYS, or $DIR) to a file, you must wait for the system prompt to be displayed before you type the next command. If you try to enter a command while a STAT status command is executing (utilizing CP/M's "type-ahead" keyboard entry buffer), you will abort the status command.

SUBMIT

The Utility that Triggers Automatic Execution of CP/M Commands

The SUBMIT utility enables you to initiate automatic execution of several sequential commands (3) by issuing only one SUBMIT command (2). The SUBMIT command accesses a file containing a pre-composed sequence of commands (1). You can also vary the execution of this command sequence with each invocation, by substituting command line parameters such as file names, drive names, or device names for variables inserted into the command file.

1. SUB FILES

A SUB file is a file with the "SUB" extension, which is comprised of a sequence of command lines composed using a text editor (e.g. ED). The SUB file is the source of the command sequence referenced by the SUBMIT command. The command lines within a SUB file can contain prototype parameters to represent command line fields. These prototype parameters appear in the SUB file in the form:

```
$n
```

Where each numeral ("n") preceded by a dollar sign ("$") takes the place of a file name, drive name, or device name which you will substitute into the SUB file with an actual parameter entered in the SUBMIT command line.

The following example shows the text of the SUB file with the name "MULTIJOB.SUB," which contains two prototype parameters:

```
ASM $1
DIR $1
ERA *.BAK
PIP $2:=$1.PRN
ERA $1.PRN
```

2. SUBMIT COMMAND LINES

The SUBMIT utility can be used as in the following example:

A>**SUBMIT MULTIJOB PROGRAMX LST**<CR>

Where {**MULTIJOB**} is the name of the SUB file filled with batch commands,

where {**PROGRAMX**} and {**LST**} are parameters which will be substituted into one or more locations in the batch file.

An actual SUBMIT parameter is the explicit specification of a command, file, drive, or device which you want to substitute for a prototype parameter within the SUB file. The number of parameters specified in a SUBMIT command line must correspond to the number of different prototype parameters that appear within the SUB file in the form "$n."

3. SUBMIT EXECUTION

After the entry of a SUBMIT command line, SUBMIT will create a file named $$$.SUB, and send it to the Console Command Processor (CCP) portion of the operating system. The CCP recognizes the commands in the SUB file and executes them in sequence. The $$$.SUB file contains the actual parameters expressed in the SUBMIT command substituted for the corresponding prototype parameters which are embedded in the original SUB file. If created in response to the preceding example command line, the $$$.SUB file would contain the following commands:

```
ASM PROGRAMX
DIR PROGRAMX.*
ERA *.BAK
PIP LST:=PROGRAMX.PRN
ERA PROGRAMX.PRN
```

4. SUBMITTING A SUB FILE FROM A DRIVE OTHER THAN A

The $$$.SUB file must exist on a disk in drive A for the commands to be executed. However, the SUB file used by SUBMIT to create the $$$.SUB file can reside on a disk in **any** existing drive; and the $$$.SUB file can be created on a disk in **any** existing drive.

If $$$.SUB is located on a disk in a drive other than drive A, you must adhere to one of the following sets of stipulations to initiate command execution:

- The drive location of the disk containing the SUB file must be specified in the SUBMIT command line. $$$.SUB is created on a bootable disk, the disk is placed in drive A, and the system must be re-booted with drive A as the default drive.

- The drive location of the disk containing the SUB file must be specified in the SUBMIT command line. $$$.SUB is created on any disk and the PIP utility is used to transfer it to a disk that resides in drive A with sufficient space available to receive $$$.SUB.

5. ABORTING SUBMIT COMMAND EXECUTION

Execution of SUBMITted commands can be aborted by typing a DELETE, RETURN, or CTRL-C immediately after the command is displayed. In this case, the $$$.SUB file is removed, and the subsequent commands come from the console. Command processing is also aborted if the CCP detects an error in any of the commands. Programs which execute under CP/M can abort processing of command files when error conditions occur by simply erasing any existing $$$.SUB file.

6. UNCONVENTIONAL TEXT IN A SUB FILE

You can insert comments into a SUB file so that they will be displayed on the console with the SUB file commands during the processing of these commands. To ensure that the CCP ignores the comments and does not interpret them as commands, they must be entered on a line which begins with a semicolon (;).

To introduce literal dollar signs into a SUB file, you may enter "$$," which translates to a single "$" within the SUB file. Furthermore, a caret symbol (^) can precede the alphabetic character X, which produces a single CTRL-X character within the file.

7. CHAINED BATCH COMMANDS

The last command in a SUB file can be a SUBMIT command, which could either initiate execution of the commands within another SUB file, or repeat execution of the commands within the same file. You can include different parameters to be substituted for SUB file prototypes to cause varied repetition of the same set of commands.

8. SUBMIT ERROR MESSAGES

```
No 'SUB' File Present
```

SUBMIT command can only be issued if a file with the "SUB" extension exists on a logged disk, and if that file is specified in the SUBMIT command line. You should reenter the command with a different argument, or log the disk with the appropriate SUB file.

```
Disk Write Error
```

SUBMIT found insufficient disk space while trying to create $$$.SUB file on the disk. You should clear off some space on the disk or use another disk.

```
Error On Line n

Parameter Error
```

You entered an invalid parameter in the SUB file. Edit SUB file, with only decimal integers following the "$" sign for a parameter.

```
Directory Full
```

SUBMIT tried to create SUB file on a disk that didn't have enough directory space to accommodate the SUB file name. You should clear off some space on the disk or use another disk.

```
Cannot Close, Read/Only?
```

SUBMIT is trying to write data to a disk (as one of the activities prescribed in a SUB file command line), but the file being written to has the R/O (read/only) status. You must use the STAT utility to change the file's status to "R/W" (read/write); or change the SUB file command line that is trying to write to the file; or enter different SUBMIT parameters.

SYSGEN

The Utility that Puts the Operating System on a Disk

The SYSGEN utility is used to transfer the operating system to a disk. Under some circumstances, SYSGEN does this task without the aid of other utilities. Sometimes SYSGEN needs the help of other utilities to put an entire, usable system on the disk.

1. SYSGEN INVOCATION

No matter which SYSGEN method is to be performed, the SYSGEN utility is invoked by entering the following command at the system prompt:

```
A>SYSGEN<CR>
```

A display in the following form will appear:

```
CP/M-85 SYSGEN VER 2.2.100
SOURCE DRIVE NAME (OR RETURN TO SKIP):
```

Your next entry depends on the SYSGEN method you are using.

2. SYSGEN METHODS

You must consider the circumstances before running SYSGEN, so that you use the appropriate SYSGEN method. Use of the MVCPM207 utility will often influence your choice of a SYSGEN method. Thus, you have a choice of the following two SYSGEN methods:

- If the MVCPM207 utility was **not** used immediately before SYSGEN to customize the system for memory capacity, then use the "Disk-to-Disk Method" (2.1). (The BSYSGEN utility could also be used under these circumstances.)
- If the MVCPM207 utility (which moves a system kernel into computer memory) was used immediately before SYSGEN, use the "Computer-to-Disk Method" (2.2).

NOTE: When the CP/M Operating System is copied to a disk, it is moved in two parts: the system kernel and the BIOS files. The "Computer-to-Disk System Copying" method does not copy the BIOS files. If this method is used, then the PIP utility must be used to copy the BIOS files.

2.1 Disk-to-Disk Method

If the operating system is being copied between two disks of the same type, you can copy both the system kernel and the BIOS files to the destination disk using this SYSGEN method. (This method is used when a MVCPM207 activity does **not** precede the SYSGEN activity.)

Under these circumstances, you should answer the "SOURCE DRIVE NAME" prompt by typing the letter for a drive name, as shown:

```
SOURCE DRIVE NAME (OR RETURN TO SKIP): X
```

Where **x** is the letter of the source drive.

SYSGEN will respond with a prompt in the following form:

```
SOURCE ON x, THEN TYPE RETURN
```

Answer this prompt with a carriage return. SYSGEN will read the system kernel from the source disk and signal that it has done so with the following message:

```
FUNCTION COMPLETE
```

Then SYSGEN will offer the option of copying the BIOS files (BIOS88.SYS and BIOS85.SYS) from the source disk with the prompt:

```
COPY BIOS88.SYS & BIOS85.SYS (Y/N):
```

If you wish to copy the BIOS files from the source disk, then **Y** should be pressed, and SYSGEN will again display the message:

```
FUNCTION COMPLETE
```

If you do **not** wish to copy the BIOS files ("BIOS85.SYS" and "BIOS88.SYS") with SYSGEN, press **N** at this prompt.

After either entry, SYSGEN will prompt for the drive that contains the destination disk. The user should answer the prompt as shown:

```
DESTINATION DRIVE NAME (OR RETURN TO REBOOT): y
```

Where **y** is the letter of a valid, working drive.

Then SYSGEN will display the prompt:

```
DESTINATION ON y, THEN TYPE RETURN
```

Enter a carriage return at this prompt, to confirm the destination drive choice. SYSGEN will put the system kernel, and in some cases the BIOS file, onto the destination disk. (The disk in drive "y".)

Then SYSGEN will display the prompt:

```
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

If you wish to copy the same system components to a different destination disk, then type the letter of the drive containing this disk.

If you do not wish to SYSGEN other disks, then enter a carriage return. The SYSGEN activity will end, and CP/M will display the system prompt.

2.2 Computer-to-Disk-Method

If you have just run the MVCPM207 utility to customize the operating system for memory capacity, then a system kernel still resides in a special location of computer memory. You can copy this system kernel from the computer to the disk by using this SYSGEN method.

When SYSGEN prompts for "SOURCE DRIVE NAME," you must enter a carriage return — **not** a drive name.

```
SOURCE DRIVE NAME (OR RETURN TO SKIP) ↵
```

SYSGEN will now prompt you for the drive that contains the destination disk. Answer the prompt as shown:

```
DESTINATION DRIVE NAME (OR RETURN TO REBOOT) y
```

Where **y** is the letter of the drive containing the disk that is to receive the system kernel. (The BIOS files cannot be copied through this SYSGEN method.)

SYSGEN will request confirmation with the prompt:

```
DESTINATION ON y, THEN TYPE RETURN
```

Enter a carriage return at this prompt. SYSGEN will put the system core onto the destination disk (the disk in drive y).

Then SYSGEN will again display the prompt:

```
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

If you wish to copy the same system components to a different destination disk, then the letter of the drive containing this disk should be entered.

If you do not wish to SYSGEN other disks, and you have **not** specified drive A at a previous "DESTINATION DRIVE" prompt, enter a carriage return at this "DESTINATION DRIVE" prompt. The SYSGEN activity will end, and CP/M will display the system prompt.

If you do not wish to SYSGEN other disks, and you specified drive A at a previous "DESTINATION DRIVE" prompt, then you must reset the computer at the second "DESTINATION DRIVE" prompt rather than entering a carriage return. Resetting the computer at this prompt is necessary because entry of a carriage return at this prompt induces a warm boot, which would cause the new system kernel (recently recorded on the disk in drive A) to be loaded into computer memory. It is undesirable to load any part of this new system kernel into memory on a warm boot because it might have just been changed by the MVCPM207 utility. Therefore, it might be of a different size than the system kernel that was loaded into memory at bootstrap.

If you are copying the CP/M system from memory to a destination disk (as you would after using MVCPM207), SYSGEN will not be able to copy the BIOS files for you. Since the BIOS files ("BIOS85.SYS" and BIOS88.SYS") are essential to make a disk bootable, you must copy them using the PIP utility.

The PIP utility can be used to transfer the BIOS files, as shown:

A>**PIP y:=x:BIOS8?.SYS[RV]**CR

Where **y** is the destination disk receiving copies of the BIOS files;

where **x** is the source disk from which the BIOS files are copies;

where **BIOS8?.SYS** is a wild card file name that stands for both BIOS85.SYS and BIOS88.SYS; and

where **[RV]** are PIP parameters used to help you copy a file that has system status, and to help you verify the accuracy of the copy operation.

3. SYSGEN ERROR MESSAGES

```
INVALID DRIVE NAME
```

When you specify drive names you must use the names of drives that exist in the hardware environment and are recognized by the operating system that was loaded at bootstrap.

```
NO SOURCE FILE ON DISK
```

The drive specified as "SOURCE DRIVE" did not contain the BIOS files. Use a different disk in the source drive, or rename BIOS files that had been given names other than "BIOS85.SYS" and "BIOS88.SYS."

```
SOURCE FILE INCOMPLETE
```

SYSGEN failed in an attempt to copy the BIOS files from the disk in the source drive. This file might have been damaged by disk media flaws or partially overwritten. Reset, perform bootstrap, and reenter the SYSGEN command using a different disk in the source drive.

```
WRITE ERROR DURING BIOSxx.SYS
```

Run SYSGEN again with a destination disk that is write-enabled, is formatted, and has at least 6 kilobytes of free space.

```
ERROR READING BIOSxx.SYS
```

SYSGEN failed in an attempt to copy the BIOS85.SYS file and/or the BIOS88.SYS file from the disk in the source drive. These files might have been damaged by disk media flaws or partially overwritten. Reset, perform bootstrap, and reenter the SYSGEN command using a different disk in the source drive or using a different disk to perform bootstrap.

```
PERMANENT ERROR, TYPE RETURN TO IGNORE
```

The system kernel or BIOS files are either incompatible with the destination disk type or otherwise flawed. Reset, perform bootstrap, and reenter the SYSGEN command using a different disk in the source drive or using a different disk to perform bootstrap. Under some circumstances, you must use the MVCPM207 utility before SYSGEN.

```
UNABLE TO SELECT DRIVE
```

You entered the name of a drive that is not accessible. Rerun the utility entering valid drive names at the prompts.

TYPE

The Resident Command that Displays File Contents on the Console

The TYPE command displays the contents of specified files on the console (1). Fast scrolling displays can be controlled to make them readable (2). TYPE is best used on ASCII files (3).

1. DISPLAYING A FILE

To produce a console display of the contents of a disk file, respond to the system prompt with a command line in the following form:

A>**TYPE {file name}**<CR>

Where {**file name**} is the complete, explicit name of a file.

If you must examine a file that resides on a disk in a non-default drive, this drive must be specified immediately before the file name specification. For example, if the file "LOGDRIVE.TXT" resides on a disk in drive B, its contents will be displayed on the screen when the following command is entered:

A>**TYPE B:LOGDRIVE.TXT**<CR>

You cannot specify wildcard file names in a TYPE command.

2. SCREEN DISPLAY CHARACTERISTICS

The display produced by TYPE will scroll by on the console until the entire contents of the file have been displayed. You can terminate the display during its execution and return to the operating system by pressing any character other than "CTRL-S." The display scroll can be halted temporarily by pressing the "CTRL-S" character, and re-started by pressing "CTRL-S" (or any other character) again.

Some of the special features (boldfaced type, underlining, etc.) inserted into text files by some word processing systems might not be indicated in screen displays produced by the TYPE command.

3. PRACTICAL USAGE OF TYPE

The most desirable usage of the TYPE command is to display text files composed of ASCII characters (printable letters and numbers). If the TYPE command is issued for a file with a "COM" extension (or for any file stored on the disk in binary form) the resulting screen display will contain a meaningless series of characters.

To obtain a listing of the file, enter a **CTRL-P** before entering the TYPE command line. Listings will not exhibit special features (boldfaced type, underlining, etc.) that are inserted into some text files by word processing systems. Enter CTRL-P a second time to end the listing.

USER

The Resident Command that Controls User Access to Disk Areas

The USER command enables you to access only files in a specified area of the disk directory (1). You can log into USER areas by invoking a single USER command line (2). You must implement a sequence of commands to put files into a non-zero USER area (3).

1. USER INVOCATION

File directories supported by the CP/M system are divided into 16 user areas. When a user is logged into a particular USER area, then only the files within that area are accessible (except by implementing the PIP utility with the "G" parameter).

The USER command is useful when several users have files stored on the same disk. File directory (DIR) and status checks (STAT) invoked by a particular user will list only the files in the user's specified area.

Whenever a cold boot is performed, the user is automatically logged-in to USER area number 0. When in this area, only files in USER area 0 of the directory are accessible.

2. INVOKING USER

To make a user area other than number 0 accessible, you should respond to the system prompt by entering a command line in this form:

A>**USER {area number}**↵

Where {area number} indicates the number, from 0 to 15, of an area that contains files that you wish to access.

The USER command can be issued whenever the system prompt appears. The currently-logged USER area will be in effect for all of the disks in the hardware environment, until a different USER area is logged or a cold boot is performed.

3. PULLING FILES INTO USER AREAS

Files can be pulled into a USER area that contains the file PIP.COM, but to put the file PIP.COM into that USER area in the first place requires a special process.

To put the file PIP.COM into a USER area (other than area zero), you should follow these steps, in sequence:

3.1 Insert disks that have the PIP.COM utility and at least 8 kilobytes of space available.

3.2 Log USER area zero (or whatever USER area contains PIP.COM) by entering the command **USER 0** ↵.

3.3 Invoke the PIP utility by entering the command **PIP** ↵. (Specify the name of the drive that contains PIP.COM if it is not the default drive.)

3.4 Press ↵ at the asterisk (*) prompt.

3.5 Log USER area by entering the command **USER n** ↵, where **n** is the number (0-15) of the USER area you wish to establish.

3.6 Save the portion of computer memory that now contains the file PIP.COM by entering the command **SAVE 29 PIP.COM**↵. (Specify the name of the drive on which you wish to establish the USER area if it is not the default drive.)

These six steps will place the file "PIP.COM" into the desired USER area (n). Once PIP.COM resides within a USER area, it can help you pull other files into that USER area. The following example display demonstrates how this procedure might appear on the console:

(3.2) A>**USER 0**CR
(3.3) A>**PIP**CR
(3.4) * CR
(3.5) A>**USER 5**CR
(3.6) A>**SAVE 29 PIP.COM**CR

If you have followed the preceding example procedure, additional file copies can now be pulled into USER area 5 by the entry of commands in the form:

A>**PIP A:={drive}:{file name.ext}[G{source area}]**CR

Where {**drive**} is the name of the drive from which file copies are being pulled;

where {**file name.ext**} is the name of the file being pulled into the new USER area from the {**source area**}; and

where {**source area**} is the number of the USER area from which files are being pulled. This area must contain {**file name.ext**}.

XSUB

The Utility that Batches Commands Within Utility Programs for Automatic Processing

The XSUB utility extends the power of the SUBMIT utility to enable you to invoke utility programs, and then execute commands within these programs, while making only one entry at the terminal.

1. XSUB OPERATION

The XSUB command line is entered as the first line in a SUB file. A SUB file is a text file composed of command lines that are executed in sequence when a SUBMIT command line is entered at the system prompt.

When the XSUB command is executed, it moves beneath the component of the operating system known as the Console Command Processor (CCP). All command lines after the XSUB command line are processed by XSUB, so that programs which usually prompt you to make entries on the keyboard will accept entries directly from the SUB file.

The XSUB program remains in memory after execution, and displays the message `(xsub active)` each time a warm boot is performed during the execution of the $$$.SUB file. Thus the initial XSUB command in a SUB file can remain in effect throughout the execution of every command in the SUB file.

XSUB will display the message `Xsub Already Present` as you enter the command **XSUB** at the system prompt (through the console). However, this remnant of the XSUB program will not go into effect when subsequent SUB files are submitted. Therefore, you must make "XSUB" the first line of any SUB file in which XSUB execution is desired.

NOTE: XSUB will not support the submission of input for programs which, when run, prompt for single character input. The only programs that can effectively be used in a SUB file under XSUB are programs that accept input lines ended with a carriage return, such as DDT, PIP, LIST, and ED.

2. XSUB EXAMPLE

The file "MEGAJOB.SUB" contains the following command lines:

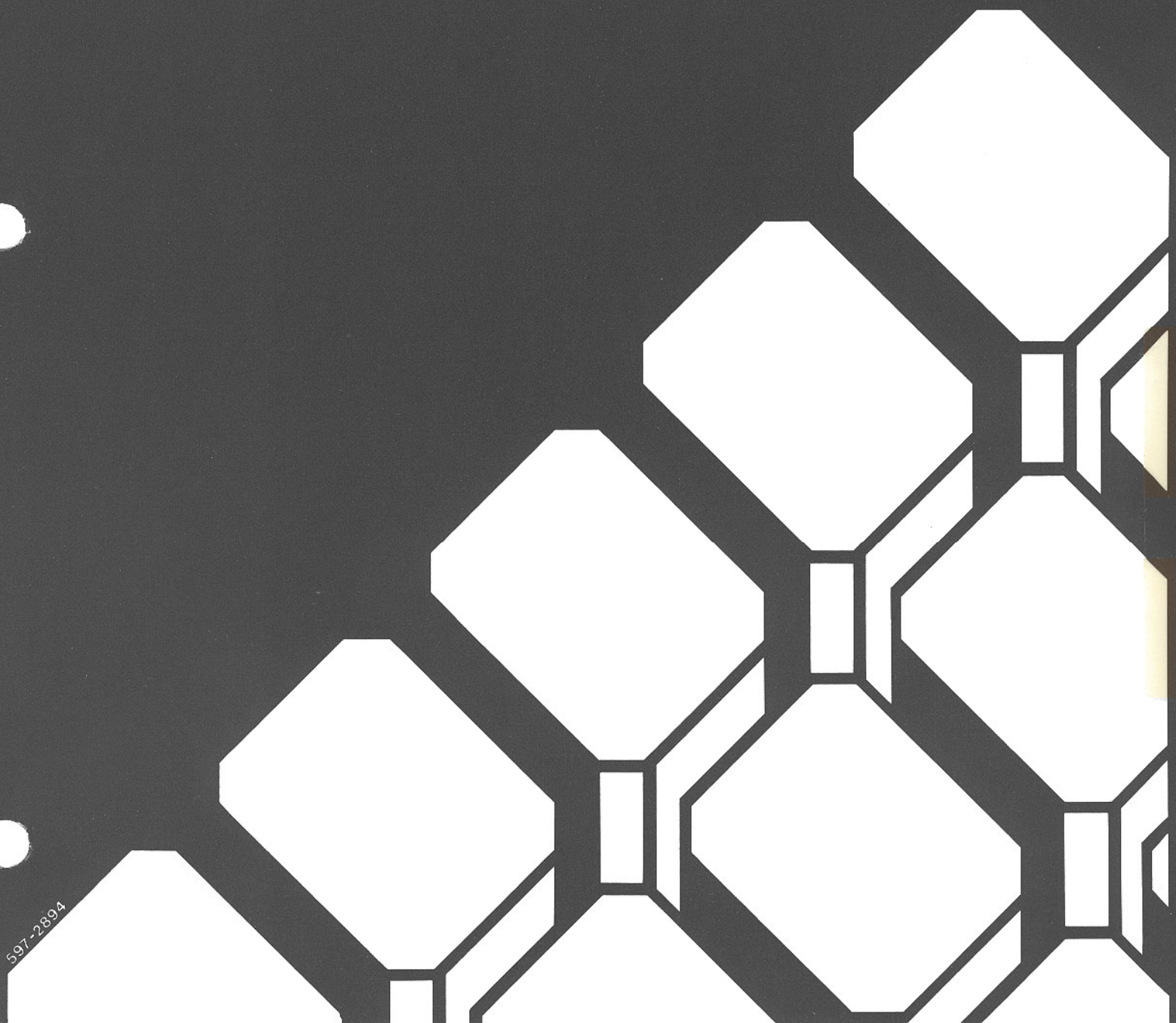
```
XSUB
DDT
I$1.HEX
R
G0
SAVE 4 $2.COM
```

Processing of this SUB file could be initiated by entering the following command line:

```
A>SUBMIT MEGAJOB PRGRMY PRGRMZ<CR>
```

The preceding entry creates a $$$.SUB file in which the primary file name "PRGRMY" is substituted for the prototype name "$1" of the SUB file, and "PRGRMZ" is substituted for the "$2" prototype parameter.

As commands are read from the $$$.SUB file, the XSUB utility enters computer memory. Then DDT enters and executes the DDT commands "IPRGRMY.HEX," "R," and "G0," which are also included in the $$$.SUB file. The DDT command "G0" has the same effect as a warm boot, which enables the operating system to process the final command in the $$$.SUB file, "SAVE 4 PRGRMZ.COM."



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Appendix A

Operating System Error Messages

This appendix explains error messages produced by the CP/M Operating System.

```
HARD (operation) ERROR ON DRIVE (d): STATUS (w) TRACK (x) SIDE (y) SECTOR (z)
```

where `operation` is either "READ" or "WRITE," depending on which operation was being performed through CP/M when the error occurred;

where `d` is the letter of the drive that contains the disk on which the error occurred (A, B, C, or D);

where `w` is the number of the status of the error. Status numbers are explained in your Z-100 hardware manual (see Page A-4 for a list of these numbers and their explanations);

where `x` is the number of the disk track on which the error occurred;

where `y` is the side of the disk on which the error occurred; and

where `z` is the number of the disk sector on which the error occurred;

If it is possible to skip over the disk location that could not be read from or written to, CP/M will follow the "HARD" error message with the following prompt:

```
PRESS <CTL-C> TO ABORT, <RETURN> TO IGNORE:
```

Causes: If the message says "READ," the CP/M system (or some operation conducted through CP/M) tried to read from a disk and failed. If the message says "WRITE," the CP/M system (or some operation conducted through CP/M) tried to write to a disk and failed. This failure might have occurred because: (1) Disk used for a data transfer operation is damaged or extremely worn. (2) Disk drive controller is malfunctioning. (3) Disk being accessed was FORMATted by a disk drive controller other than the Z207 controller. (4) Disk being accessed has not been FORMATted at all. (5) Drive being accessed contains no disk. (6) Accessed disk is write-protected.

Remedies: If no prompt is displayed (as during an attempted FORMAT activity), the system will automatically abort the operation after briefly displaying the "HARD" error message. If the prompt is displayed, you can either abort the operation by entering a **CTRL-C** (performs a warm boot), or ignore the error by entering a ⓒⓡ (skips over the sector where the error occurred). However, after making one of these two entries, you should (1) Inspect or replace disk. (2) Inspect or replace controller card. (3) & (4) FORMAT disks in your own hardware environment. (5) Access a drive with a disk. (6) Write-enable disk and perform warm boot before trying to write data to disk.

```
Bdos Err On x: Select
```

Cause: The variable "x:" is the name of a drive which you referred to in a command, but which CP/M cannot access or does not recognize.

Remedy: Press any keyboard character after such an error message, and the operation will be aborted as if you entered a warm boot. CP/M will then display a system prompt.

```
Bdos Err On x: R/O
```

Causes: Where "x:" is the name of a drive at which CP/M refuses to read or write data. (1) You tried to write to a file that had been given "Read/Only" status by the STAT utility. (2) You tried to write to a disk that had been given temporary "Read/Only" status by the STAT utility. (3) You tried to switch disks in a drive and then write to the new disk.

Remedies: In all cases, pressing any keyboard character after such an error message will cause a warm boot. (1) Change file status to "Read/Write" using the STAT utility. (2) Perform a warm boot in any fashion (such as the **CTRL-C** entry) before trying to write data to the disk. (3) Perform a warm boot (with a **CTRL-C**) after switching disks, but before accessing a switched disk.

```
NO FILE
```

Causes: (1) You invoked DIR Resident Command for a directory of disk files, and the file(s) specified were not on the disk in the logged user area. (2) You invoked TYPE Resident Command to display contents of a file that was not on the disk in the logged user area. (3) You invoked ERA Resident Command to erase a file that was not on the disk in the logged user area. (4) You invoked REN Resident Command to try to rename a file that was not on the disk in the logged user area.

Remedies: (1) Unless such a message gives you adequate information, log to a different user area with the USER Resident Command before trying DIR command. (2), (3), & (4) Check disk directory using DIR Resident Command or STAT utility to obtain correct file name.

```
FILE EXISTS
```

Cause: You tried to rename a file (with REN Resident Command) using a name that another file on the same disk already has.

Remedy: Give a different name to the file you are renaming, or move the file that already has the name to a different disk or user area.

```
NO SPACE
```

Cause: You invoked the SAVE Resident Command to store memory contents on a disk that didn't have enough room for the data from memory.

Remedy: Reenter SAVE command either by specifying the name of a drive containing a disk that has sufficient room for the file, or by specifying fewer pages of data.

```
SYNCHRONIZATION ERROR
```

Cause: You tried to invoke a copy of the MVCPM207 utility that did not bear the same serial number identification as the Operating System.

Remedy: Only use a MVCPM207 utility and system that reside on the same CP/M Distribution Disk (or on a backup copy of this disk).

```
LOAD ERROR
```

Cause: You tried to perform bootstrap with a disk that does not contain a usable copy of the BIOS85.SYS, BIOS88.SYS, and/or ALTCHAR.SYS files.

Remedy: You should copy properly customized BIOS files to the disk, rename current BIOS files to the names "BIOS85.SYS" and "BIOS88.SYS," and/or copy an alternate character font file to ALTCHAR.SYS.

STATUS ERRORS

The following is a list of error status numbers generated by the Z-100 hardware in floppy disk systems (see Page A-1). For detailed explanations consult the appropriate technical manual.

Number	Explanation
80	Not ready.
40	Write protect violation.
20	Head is loaded.
20	Record type.
10	Seek error.
10	Record not found.
8	CRC error.
4	Found track 0
4	Lost data.
2	Index hole.
1	Busy.

Note that where more than one explanation is offered, the number generated is operation-dependent.

Appendix B

Bootstrap

The Start-Up Procedure in Volume I: CP/M Introductory Guide provides instructions on performing automatic bootstrap with one of your drives.

However, the Z-100 microcomputer enables you to vary start-up procedures by switching the automatic bootstrap feature off, and entering manual bootstrap commands that can reference any of your disk drives. This appendix explains the start-up variations that are possible with the Z-100.

THE AUTOMATIC/MANUAL BOOTSTRAP FEATURE

The method you use to boot your Z-100 computer is determined by the setting of a switch inside the computer. This switch is labelled "SW-101," and it is illustrated in Figure B-1 of this appendix. (See your Z-100 hardware manual for further details on this switch.) When your Z-100 is shipped from the factory, it is preset to automatically perform bootstrap with your Z-100's lefthand drive (if your Z-100 is a Low Profile) or with your Z-100's upper drive (if your Z-100 is an All-in-One) as soon as you turn on your computer.

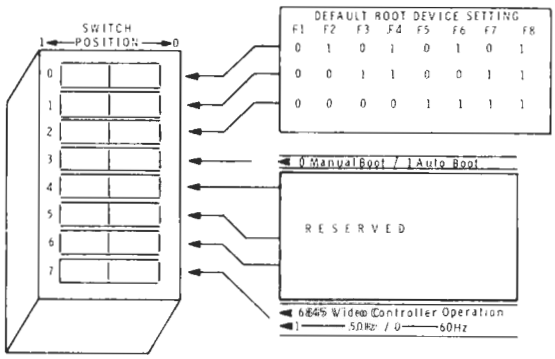


Figure B-1
Automatic/Manual Bootstrap Setting (Switch SW-101)

Entering Manual Bootstrap Commands

When the SW-101 switch is set for automatic bootstrap, your Computer automatically boot up with your Z-100's lefthand drive (if your Z-100 is a Low Profile) or with your Z-100's upper drive (if your Z-100 is an All-in-One). If you wish to boot up with a different drive, you must first set the SW-101 for manual bootstrap. Refer to your Z-100 hardware manual for instructions on setting this switch.

When the SW-101 switch is set for manual bootstrap, the console should display the pointed finger prompt and a flashing cursor when you turn on the Z-100 and enter **CTRL-RESET**, as shown:

You can enter your manual bootstrap command from the keyboard in response to the "pointing finger" prompt. There are several options that are available so that you can perform bootstrap from any of the drives in your hardware environment.

The bootstrap command syntax is:

<B>OOT **[<dev>][<#>][:<boot string>]**CR

Where **<B>** is required input that the computer completes with "OOT";

where **<dev>** is an optionl function key (F1 or F2) that determines which device the controller is to use;

where **<#>** is the optional unit number (0 or 1) of the device type connected to the device controller that is to be used;

where **<boot string>** (not presently supported) is an optional string of up to 79 characters that is preceded by a colon; and

where CR is a required carriage return.

Table B-1 shows how you can boot up with any of the drives in your hardware environment. This table lists the drive accessed, the actions or commands used to access this drive, and the setting of the SW-101 switch that is necessary.

Table B-1
Bootstrap Alternatives

Drive	User Actions to Cause Bootstrap	SW-101 Settings (3, 2, 1, 0)
A:	Power On (Auto-Boot)	1, 0, 0, 0
	<B>CR	0, 0, 0, 0
	<B><F1>CR	0, x, x, x
	<B><F1><0>CR	0, x, x, x
B:	<B><F1><1>CR	0, x, x, x
C:	Power On (Auto-Boot)	1, 0, 0, 1
	<B>CR	0, 0, 0, 1
	<B><F2>CR	0, x, x, x
	<B><F2><0>CR	0, x, x, x
D:	<B><F2><1>CR	0, x, x, x

NOTE: "x" is SW-101 switch setting indicating that position may be set to anything.

To make the manual bootstrap command easier to work with, it uses "logical devices" to make the distinction between the different drive types connected to your system. The difference between the actual drive controller board and the device type used by the bootstrap command is illustrated in Figures B-2 and B-3.

Because the Z-207 controller card is designed to control both 5.25-inch and 8-inch disks, a method must be used that makes a distinction between these two. This method must also allow for future expansion where one controller card might control only one type of device, or it might control several devices. (See Figure B-4, which illustrates the theory of such expansions.)

NOTE: Figures B-2 through B-4 illustrate features of the Z-100 Computer. These features are not all necessarily used by this CP/M system.

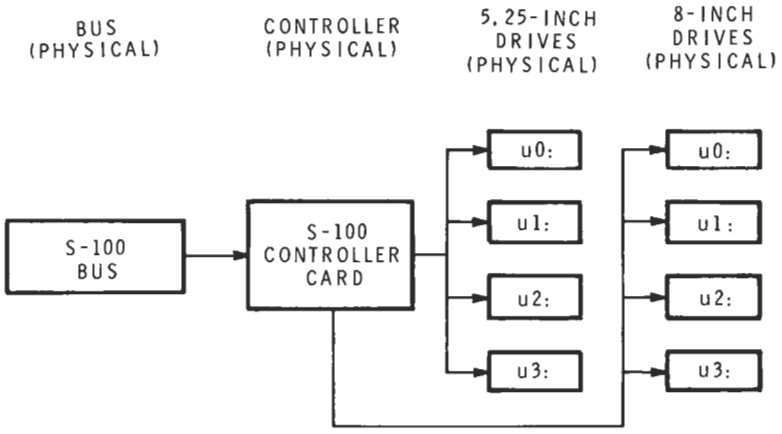


Figure B-2

Physical Connections from the Hardware Viewpoint

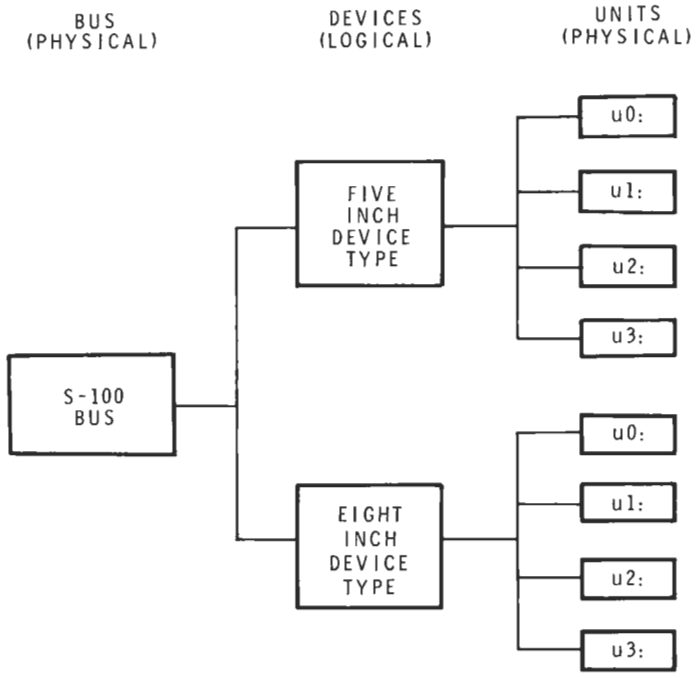


Figure B-3

Logical connections from the Bootstrap Command Viewpoint

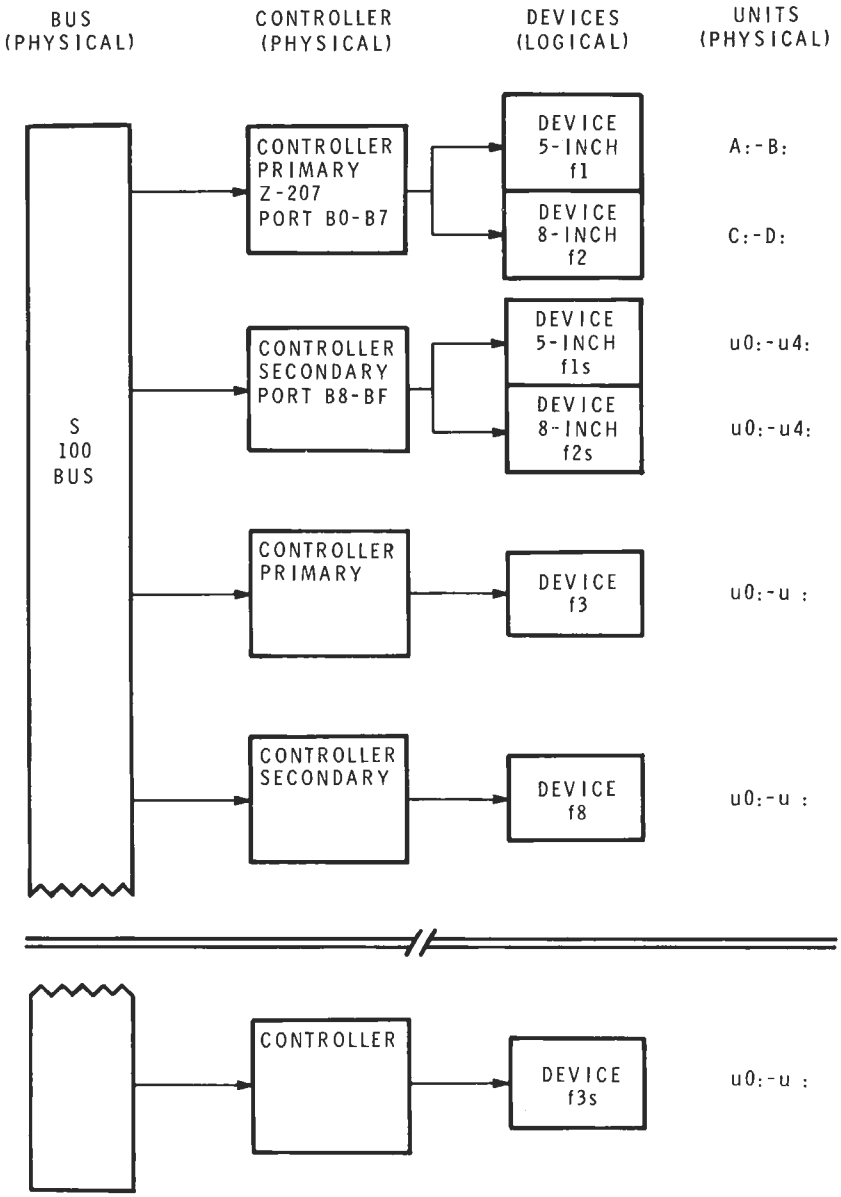


Figure B-4

Logical Device Extensions With SW-101 DIP Switch

The controller shown at the top of Figure B-4 shows the Z-100's standard controller card (Z-207), the other controllers that are shown are just theoretical for this diagram, which illustrates how the manual bootstrap command syntax works for possible device expansion.

Manual Bootstrap Examples

Example 1: To manually boot up from one of the 5.25-inch disks, you type **B** and the computer completes the command with "oot," spelling "Boot."

NOTE: With no other options entered, **B**<CR> defaults to the 0 unit of the switch selected device. If you pressed <CR> before selecting any of the other bootstrap command line options, the system would boot up from the Z-207 controller on the 0 unit of the device selected with your SW-101 DIP switch (5.25-inch device if the setting for positions 0, 1, and 2 are set to 0, 0 and 0, respectively).

Next, you press the **<f1>** function key, which selects the 5.25-inch device on the controller at port B0. In your system, the Z-207 (shown as the top device in Figure B-4) is the one selected.

NOTE: With no other options entered, **B <f1>** <CR> defaults to the 0 unit of the device specified by **<f1>**. If you pressed <CR> before selecting any of the other bootstrap command line options, the system would boot up from the A: drive.

Then, to select a particular 5.25-inch drive that is connected to the Z-207 controller, you would press **0** or **1** (the unit number), which applies to drives "A:" or "B:" respectively.

Example 2: To boot up from an 8-inch disk, you type **B** and the computer completes the command with "oot," displaying "Boot."

NOTE: With no other options entered, **B** ⓒ defaults to the 0 unit of the switch selected device. If you pressed ⓒ before selecting any of the other bootstrap command line options, the system would boot up from the Z-207 controller on the 0 unit of the device selected with your SW-101 DIP switch (8-inch device if the setting for positions 0, 1 and 2 are set to 1, 0 and 0, respectively).

Next, you press the <**f2**> function key and this selects the 8-inch device from the controller at port B0. In your system the Z-207, shown as the topmost controller in Figure B-4, is the one selected.

NOTE: With no other options entered, **B** <**f1**> ⓒ defaults to the 0 unit of the device specified by <**f1**>. If you pressed ⓒ before selecting any of the other bootstrap command line options, the system would boot up from the C: drive.

Then, to select a particular 8-inch drive that is connected to the Z-207 controller, you would press **0** or **1** (the unit number), which applies to the "C:" or "D:" drives respectively that are software supported in the current system.

Or, if you wanted to select from the secondary controller (at port B8) you would type <**B**> <**S**> to boot from the 0 unit of the 0 device on that controller.

Manual Bootstrap Procedure

In general, the Manual Bootstrap Procedure requires you to:

- Secure correct power and peripheral connections.
- Turn power on.
- Secure System Distribution disk in drive A:.
- Wait for "pointing finger" monitor prompt.
- Enter the boot up command.
- Await system prompt.

After you have unpacked your Computer and connected any peripheral device to it according to the procedures given in the Z-100 Series User's Manual, proceed with the following steps.

Specifically, the Manual Bootstrap Procedure requires you to:

1. Make certain that the power switch, which is located on the back panel of your Computer, is in the OFF position.

2. Make certain that the power switches on any peripheral devices (printer, modem, video terminal, disk drives) that are connected to your Computer, are in their respective OFF positions.

3. Make certain that the power outlets used for your Computer and peripheral devices are properly grounded in accordance with the appropriate electrical codes. (If you are not certain, have a qualified electrician check!)

4. Double check all cables and cords to make certain that they are securely connected.

5. Turn the power switch on each of your peripheral devices to the ON position.

6. Turn the power switch on your Computer to the ON position.

7. Within a few seconds, you should see a "pointing finger" (the Monitor Prompt) in the upper lefthand corner of your video terminal's screen.

NOTE: If you do not see the pointed finger prompt, then you should:

- Turn the Computer's power switch to the OFF position.
- Turn off the power switches to any connected peripheral devices.
- Refer to the "In Case of Difficulty" section in your Z-100 Series User's Manual.

8. Place CP/M Distribution Disk I into the lefthand drive (for Low-Profile) or upper drive (for All-in-One) of your Z-100 and close the drive latch.

9. Type the letter **B**. The word "Boot" appears to the right of the finger.

10. Type ⓒⓡ to boot from 5.25-inch drives.

11. A message in the following form should appear after several seconds:

```
CP/M-85 VERSION 2.2.100  07/07/82

A>
```

NOTE: If the CP/M identification message and system prompt have not appeared after a minute, press **CTRL-RESET** (both the CTRL and RESET keys are located on the left side of the keyboard). The pointing finger prompt should appear in the upper lefthand corner of your screen.

- If the pointing finger appears, try the manual bootstrap procedure again, beginning from Step 9.
- If no pointing finger appears, press **CTRL-RESET** and repeat this procedure, beginning from Step 9. However, if the pointing finger prompt still does not appear, refer to the section entitled "In Case of Difficulty" in the Z-100 Series User's Manual.

Appendix C

Alternate Character Fonts

The CP/M-85 Operating System is equipped with extra character fonts that enable your Z-100 or H-100 Computer to display characters from one of seven different foreign languages or an assortment of graphic characters.

The characters for each font are stored in files with the .CHR file name extension. The primary file name of each file identifies the type of characters it contains. The character font files reside on Distribution Disk I under the following names:

DANISH.CHR
ENGLISH.CHR
FRENCH.CHR
GERMAN.CHR
ITALIAN.CHR
SPANISH.CHR
SWEDISH.CHR
GRAPHICS.CHR

When stored in files by these names, the fonts are inactive. However, when any of these files is copied to the file named ALTCHAR.SYS, the font becomes active.

ACTIVATING ALTERNATE FONTS

To activate one of these alternate character fonts (cause its characters to display) copy this file to the file name ALTCHAR.SYS. Use a command in the following form:

A>**PIP ALTCHAR.SYS={fontname}.CHR[V]**CR

Where **PIP** is the file copying command, explained on Page 2-148;
where **ALTCHAR.SYS** is a file name that will be loaded into memory during a cold boot if it exists on the disk in drive A;
where {**fontname**} is the primary name of an alternate character font file; and
where **[V]** is a command parameter that causes PIP to verify the accuracy of the copy operation.

After entering such a command, reset and cold boot the system.

For example, you can obtain screen displays with Italian characters by entering the following command:

A>**PIP ALTCHAR.SYS=ITALIAN.CHR[V]**CR

and then resetting and cold booting the system.

ALTERNATE FONT OPERATION

When you cold boot the system, CP/M-85 checks the disk in drive A for the file ALTCHAR.SYS. If this file is on the disk, it is loaded into memory with the system kernel and the BIOS files. When in memory, the ALTCHAR.SYS file will cause screen displays of the characters it contains. NOTE: Use of an alternate font may change system or utility prompts.

These characters will have been copied from a foreign language file or the graphics file; or they may be the characters stored in the default ALTCHAR.SYS file supplied with your distribution software. (The default ALTCHAR.SYS file is identical to the GRAPHICS.CHR file.)

ALTERNATE FONT FILE FORMAT

The format of an alternate font file consists of three parts: the keyboard mapper, the font plotter, and the display mapper.

The keyboard mapper is in the following form:

Keyboard {code}	Map {swap}
•	•
•	•
•	•
FF	FF

Where {**code**} is the value generated by the keyboard processor;
where {**swap**} is the value that {code} is to be mapped to; and
where **FF** (in hexadecimal) is the terminating byte for both the {code} and {swap} data.

The font plotter follows the FF terminator of the keyboard map. For each mapped character, the plotter includes a one byte value representing the character and a nine byte description of the character. Each of the description bytes indicates the state of the eight pixels in a single line within the eight-by-nine pixel matrix. The font information for all of the mapped characters terminates with FFH or an End-Of-File (1AH) value.

For example, Figure C-1 illustrates the eight-by-nine pixel matrix used to plot the "bullet" graphics character (•). The value for this character is 5EH, and the nine description bytes of the pixels turned on and off for this character are listed to the right of each pixel line in Figure C-1.

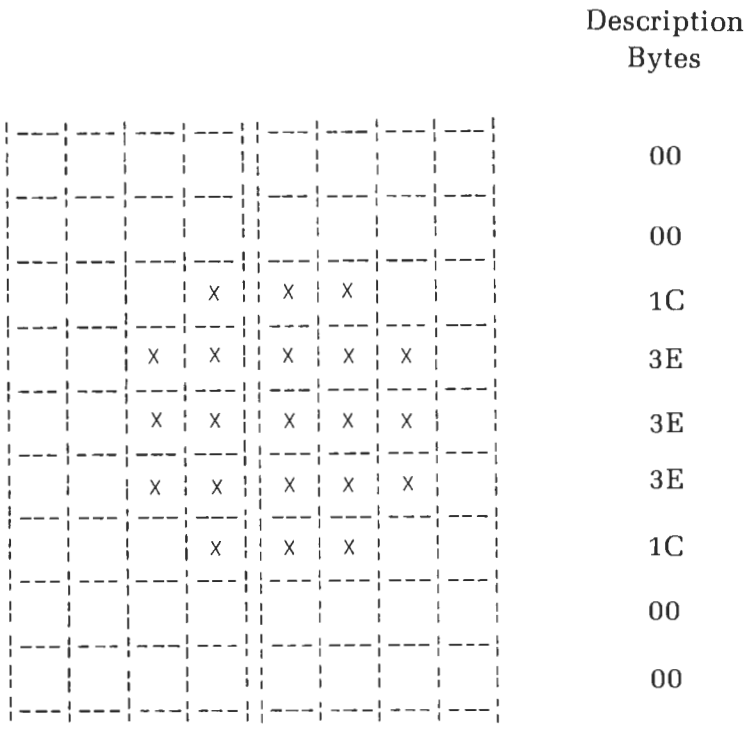


Figure C-1
Plotting of the "Bullet" (•) character in ALTCHAR.SYS

NOTE: Each box in Figure C-1 represents one pixel. If the box is empty, the pixel is off. If the box is filled in, the pixel is on. The first nibble of each description byte applies to the first four pixels in a line. The second nibble of each description byte applies to the second four pixels in a line.

Hence, the font plotter bytes for the "bullet" character would be "5E 00 00 1C 3E 3E 3E 1C 00 00".

The display mapper is formatted similarly to the keyboard mapper. However, display mapper values have had 20H (ASCII space) subtracted from them.

Appendix D

Assembler Operation Codes

Assembly language operation codes form the principal part of assembly language programs, and form the operation field of the instruction. In general, ASM accepts all the standard mnemonics for the Intel 8080 microcomputer, which are given in detail in the Intel manual "8080 Assembly Language Programming Manual." Labels are optional on each input line and, if included, take the value of the instruction address immediately before the instruction is issued. The individual operators are listed briefly in the following sections for completeness, although it is understood that the Intel manuals should be referenced for exact operator details. In each case,

e3	represents a 3-bit value in the range 0-7 which can be one of the predefined registers A, B, C, D, E, H, L, M, SP, or PSW
e8	represents an 8-bit value in the range 0-255
e16	represents a 16-bit value in the range 0-65535

which can themselves be formed from an arbitrary combination of operands and operators. In some cases, the operands are restricted to particular values within the allowable range, such as the PUSH instruction. These cases will be noted as they are encountered.

In the sections which follow, each operation code is listed in its most general form, along with a specific example, with a short explanation and special restrictions.

JUMPS, CALLS, AND RETURNS

The Jump, Call, and Return instructions allow several different forms which test the condition flags set in the 8080 microcomputer CPU. The forms are:

JMP	e16	JMP	L1	Jump unconditionally to label
JNZ	e16	JMP	L2	Jump on non zero condition to label
JZ	e16	JMP	100H	Jump on zero condition to label
JNC	e16	JNC	L1+4	Jump on no carry to label
JC	e16	JC	L3	Jump on carry to label
JP0	e16	JPO	$+8	Jump on parity odd to label
JPE	e16	JPE	L4	Jump on even parity to label
JP	e16	JP	GAMMA	Jump on positive result to label
JM	e16	JM	a1	Jump on minus to label
CALL	e16	CALL	S1	Call subroutine unconditionally
CNZ	e16	CNZ	S2	Call subroutine if non zero flag
CZ	e16	CZ	100H	Call subroutine on zero flag
CNC	e16	CNC	S1+4	Call subroutine if no carry set.
CC	e16	CC	S3	Call subroutine if carry set
CPO	e16	CPO	$+8	Call subroutine if parity odd
CPE	e16	CPE	S4	Call subroutine if parity even
CP	e16	CP	GAMMA	Call subroutine if positive result
CM	e16	CM	b1$c2	Call subroutine if minus flag
RST	e3	RST	0	Programmed "restart", equivalent to CALL 8*e3, except one byte call
RET				Return from subroutine
RNZ				Return if non zero flag set
RZ				Return if zero flag set
RNC				Return if no carry
RC				Return if carry flag set
RPO				Return if parity is odd
RPE				Return if parity is even
RP				Return if positive result
RM				Return if minus flag is set

IMMEDIATE OPERAND INSTRUCTIONS

Several instructions are available which load single or double precision registers, or single precision memory cells, with constant values, along with instructions which perform immediate arithmetic or logical operations on the accumulator (register A).

MVI	e3,e8	MVI	B,255	Move immediate data to register A, B, C, D, E, H, L, or M (memory)
ADI	e8	ADI	1	Add immediate operand to A without carry
ACI	e8	ACI	0FFH	Add immediate operand to A with carry
SUI	e8	SUI	L + 3	Subtract from A without borrow (carry)
SBI	e8	SBI	L AND 11B	Subtract from A with borrow (carry)
ANI	e8	ANI	$ AND 7FH	Logical "and" A with immediate data
XRI	e8	XRI	1111$0000B	"Exclusive or" A with immediate data
ORI	e8	ORI	L AND 1+1	Logical "or" A with immediate data
CPI	e8	CPI	'a'	Compare A with immediate data (same as SUI except register A not changed)
LXI	e3,e16	LXI	B,100H	Load extended immediate to register pair (e3 must be equivalent to B, D, H, or SP)

INCREMENT AND DECREMENT INSTRUCTIONS

Instructions are provided in the 8080 repetoire for incrementing or decrementing single and double precision registers. The instructions are:

INR	e3	INR	E	Single precision increment register (e3 produces one of A, B, C, D, E, H, L, M)
DCR	e3	DCR	A	Single precision decrement register (e3 produces one of A, B, C, D, E, H, L, M)
INX	e3	INX	SP	Double precision increment register pair (e3 must be equivalent to B, D, H, or SP)
DCX	e3	DCX	B	Double precision decrement register pair (e3 must be equivalent to B, D, H, or SP)

DATA MOVEMENT INSTRUCTIONS

Instructions which move data from memory to the CPU and from CPU to memory are given below:

MOV	e3,e3	MOV	A,B	Move data to leftmost element from rightmost element (e3 produces one of A, B, C, D, E, H, L, or M). MOV M,M is disallowed
LDAX	e3	LDAX	B	Load register A from computed address (e3 must produce either B or D)
STAX	e3	STAX	D	Store register A to computed address (e3 must produce either B or D)
LHLD	e16	LHLD	L1	Load HL direct from location e16 (double precision load to H and L)
SHLD	e16	SHLD	L5+x	Store HL direct to location e16 (double precision store from H and L to memory)
LDA	e16	LDA	GAMMA	Load register A from address e16
STA	e16	STA	X3-5	Store register A into memory at e16
POP	e3	POP	PSW	Load register pair from stack, set SP (e3 must produce one of B, D, H, or PSW)
PUSH	e3	PUSH	B	Store register pair into stack, set SP (e3 must produce one of B, D, H, or PSW)
IN	e8	IN	0	Load register A with data from port e8
OUT	e8	OUT	255	Send data from register A to port e8
XTHL				Exchange data from top of stack with HL
PCHL				Fill program counter with data from HL
SPHL				Fill stack pointer with data from HL
XCHG				Exchange DE pair with HL pair

ARITHMETIC LOGIC UNIT OPERATIONS

Instructions which act upon the single precision accumulator to perform arithmetic and logic operations are:

ADD	e3	ADD	B	Add register given by e3 to accumulator without carry (e3 must produce one of A, B, C, D, E, H, or L)
ADC	e3	ADC	L	Add register to A with carry, e3 as above
SUB	e3	SUB	H	Subtract reg e3 from A without carry, e3 is defined as above
SBB	e3	SBB	2	Subtract register e3 from A with carry, e3 defined as above
ANA	e3	ANA	1+1	Logical "and" reg with A, e3 as above
XRA	e3	XRA	A	"Exclusive or" with A, e3 as above
ORA	e3	ORA	B	Logical "or" with A,e3 defined as above
CMP	e3	CMP	H	Compare register with A, e3 as above
DAA				Decimal adjust register A based upon last arithmetic logic unit operation
CMA				Complement the bits in register A
STC				Set the carry flag to 1
CMC				Complement the carry flag
RLC				Rotate bits left, (re)set carry as a side effect (high order A bit becomes carry)
RRC				Rotate bits right, (re)set carry as side effect (low order A bit becomes carry)
RAL				Rotate carry/A register to left (carry is involved in the rotate)
RAR				Rotate carry/A register to right (carry is involved in the rotate)
DAD	e3	DAD	B	Double precision add register pair e3 to HL (e3 must produce B, D, H, or SP)

CONTROL INSTRUCTIONS

The four remaining instructions are categorized as control instructions, and are listed below:

HLT	Halt the 8080 processor
DI	Disable the interrupt system
EI	Enable the interrupt system
NOP	No operation

Appendix E

Memory Checking

Modern personal computers are extremely reliable. Your Z-100 operates at a speed of 5 million clock cycles per second and will typically operate for several thousand hours between service calls. However, computers are machines, and machines do, on occasion, develop problems. Among the problems which may occur in all computers are memory failures.

Memory failures may be classified as either "hard" or "soft." Soft memory errors occur randomly at an average frequency of roughly once every several thousand hours of operation and do not indicate the presence of a hardware problem. Hard memory failures are due to defective components within the computer, and will occur frequently until the defective component is replaced.

Your Z-100 computer has special circuitry and additional memory to automatically detect any memory failures (hard or soft) which do occur, through a technique known as "parity checking." When a "parity error" occurs, a display similar to the one below will appear on the screen:

```
ERROR - MEMORY OR BUSS

F =XXXX  IP=XXXX  CS=XXXX  DS=XXXX  ES=XXXX  SS=XXXX  SP=XXXX
AX=XXXX  BX=XXXX  CX=XXXX  DX=XXXX  DI=XXXX  SI=XXXX  BP=XXXXXX

SYSTEM HALT
```

The purpose of providing the parity error message is to let you know that you may have a problem which may not be readily apparent and which may require the attention of service personnel. Parity checking is an advanced feature found in only a few microcomputer systems. In systems without parity checking, the memory error usually goes unnoticed for a period of days or weeks until the amount of data destroyed becomes so large that it can no longer be ignored.

When an error occurs, the system will display the parity error message described above and halt. The system must then be reset and rebooted, with the consequence that all work in the computer's memory and any unclosed files on the disk will be permanently lost. It is generally best not to use the system any further until the memory test (supplied with your

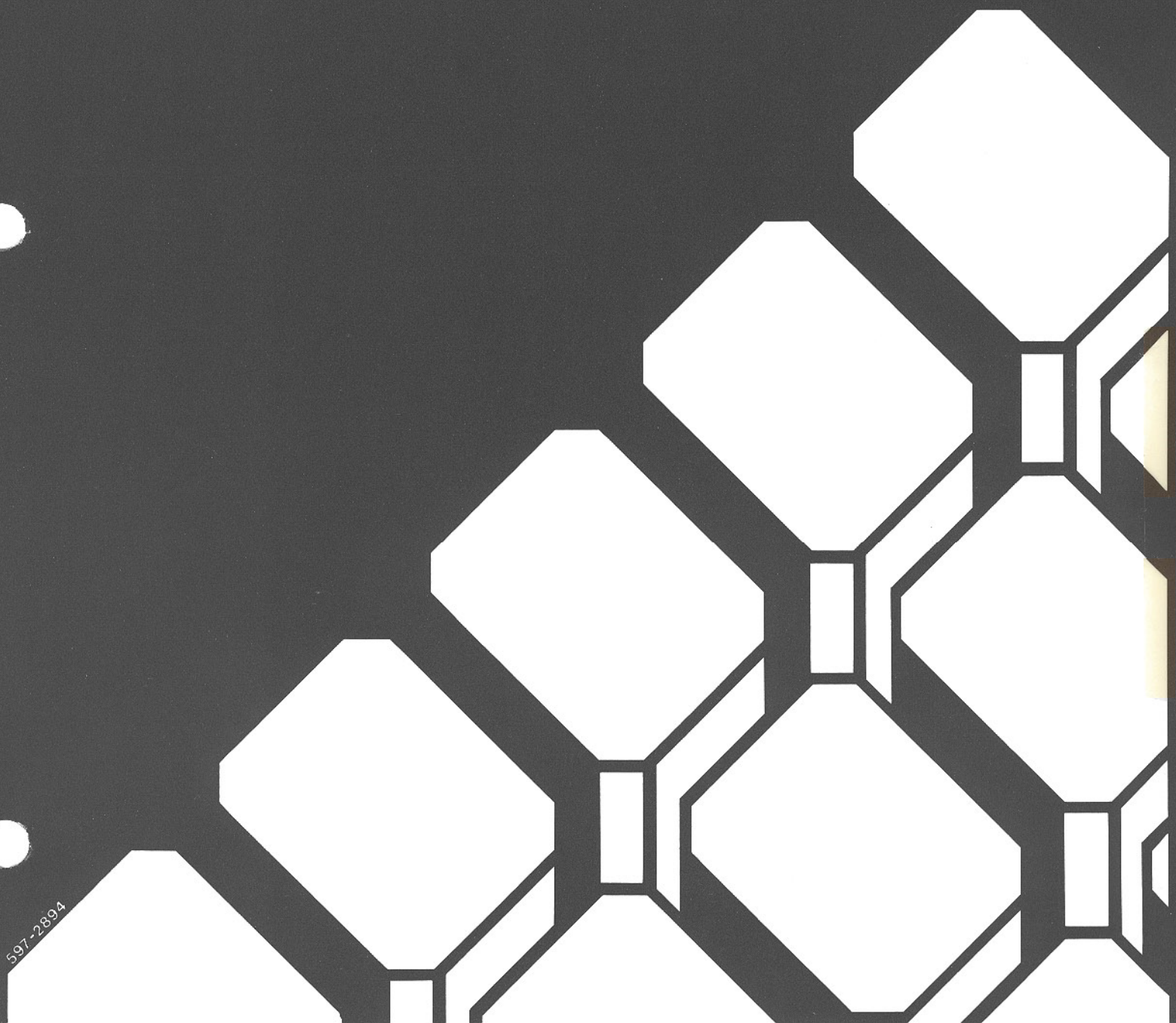
Z-DOS operating system) has been run (preferably from a write-protected disk!). If the memory test does not turn up problems after several hours of operation, you should resume normal operation. If subsequent memory failures occur, you should copy down all of the data presented on the screen by the parity error routine and retain it for use by service personnel. Also, record which program and operating system you were using at the time. If multiple errors occur within 30 days, a serviceman should be called, even if the memory test does not indicate the presence of problems.

8-INCH DISKETTE STEP RATE

Zenith Data Systems is providing 8-inch drivers installed in the CP/M-85 disk systems for development purposes and to support future products. Zenith Data Systems does not guarantee proper operation of the 8-inch drivers with disk systems obtained from other vendors. However, for the benefit of customers who wish to experiment with non-Zenith hardware at their own risk, the track-to-track stepping rate, which is set at 3 milliseconds, may be changed by using DDT and the SAVE command. In the example shown below, the rate is changed from 3 milliseconds to 15 milliseconds. User input is shown in bold:

```
A>STAT BIOS85.SYS $R/W

BIOS85 SYS set to R/W
A>REN BIOS85.OLD=BIOS85.SYS
A>DDT BIOS85.OLD
DDT VERS 2.2
NEXT PC
0600 0100
-S381
0381 00 03          {00 = 3 mS, 01 = 6 mS, 02 = 10 mS, 03 = 15 mS}
0382 04
-S399               {00 = 3 mS, 01 = 6 mS, 02 = 10 mS, 03 = 15 mS}
0399 00 03
039A 04
-G0

A>SAVE 5 BIOS85.SYS
A>STAT BIOS85.SYS $SYS

BIOS85 SYS set to SYS
A>STAT BIOS85.SYS $R/O

BIOS85.SYS set to R/O
A>
```

INDEX



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ZENITH data systems

HEATH

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Zenith Data Systems Corporation
Software Consultation
Hilltop Road
St. Joseph, Michigan 49085

or call:

(616) 982-3884 Application Software/SoftStuff Products
(616) 982-3860 Operating Systems/Languages/Utilities

Consultation is available from 8:00 AM to 7:30 PM (Eastern Time Zone) on regular business days.

ESSENTIAL REQUIREMENTS for using:
CP/M-85 (Winchester Utilities)

a. Distribution Media: Two 5.25-inch soft-sectored 48-tpi disks
b. Machine Configuration (minimum): Z-100, 128K memory, one floppy disk drive, one Winchester drive, and CRT
c. Operating System: Not applicable
d. Microcomputer Language: Not applicable

HEATH COMPANY
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Table of Contents

Introduction

This supplement to the CP/M®-85 manual contains instructions for using the features of your software package that are related to the Winchester disk.

Use this supplement with your CP/M-85 manual. Both will be necessary for efficient use of CP/M-85 in your Zenith Data Systems and/or Heath hardware. Many features of the software are explained in the CP/M-85 manual and not in this supplement.

Section One: Winchester Disk Concepts — explains the important concepts you will need to master before you can use your Winchester disk hardware and software. You should read this section after reading the "Beginning Concepts" text of the CP/M-85 manual.

Section Two: Winchester Disk Procedures — instructs you on preparing your Winchester disk for everyday use. You should read these procedures instead of the "Software Preparation Procedures" in the CP/M-85 manual.

Section Three: Bootup with a Winchester Disk — instructs you on the many bootup options afforded you. You should read this section instead of "Appendix B: Bootup" in the CP/M-85 manual.

Section Four: Winchester Disk Software — explains in detail how several of your system support utilities work. Some of these utilities are totally different from the utilities explained in the "Reference Guide" of the CP/M-85 manual. Others are similar to utilities that are explained in the "Reference Guide" of the CP/M-85 manual. In cases where this supplement and the CP/M-85 manual contain similar text on utilities, rely on the text in this supplement.

NOTE: This supplement presents several examples of prompts and messages that are displayed on your video screen. The version numbers and/or dates presented in these examples might differ slightly from the version numbers and dates displayed on your screen.

User input (the entries you type through the keyboard) will be represented by **boldface type**. In command lines that include keys labeled by more than one character (such as RETURN and CTRL), the key labels will be represented by the key label in ***italic boldfaced type***, as shown in the following example:

PIP E:=A:*.*[RV] ***RETURN***

The term "Z-100" is often presented in this supplement to refer to computers in the Z-100 series. The Z-100 series of computers includes the ZF-110-22, ZF-120-22, H-110-1, H-120-1, ZW-110-32, and ZW-120-32.

Section One

Winchester Disk Concepts

A Winchester Disk (or disks) is a round metal platter coated with a magnetic oxide. This disk is permanently enclosed in a chamber within the cabinet of your Z-100 or H-100 computer.

The Winchester disk's storage capacity is far greater than that of your floppy disks. Because the Winchester Disk has such a great capacity for storing data, it is divided into separate storage areas called "partitions".

The software and data on a partition can be accessed similarly to the software and data stored on a floppy disk in a drive. In fact, for most CP/M operations, a Winchester partition behaves just like a floppy disk. Therefore, when explanations in the CP/M-85 manual refer to a "floppy disk", the same explanation is often applicable to a partition as well.

WINCHESTER DISK ADVANTAGES

Z-100 Winchester hardware and software were designed to provide you with a more convenient, flexible, and secure microcomputer environment.

These products solve three of the most crucial problems involved in any microcomputer application: storage space, organization of data, and protection from media failure.

Convenience

To make your microcomputer work more convenient, Z-100 Winchester disk products help you to store far more data than you can store on a floppy disk. The Z-217 Winchester disk controller card and this version of CP/M-85 enable you to use a Winchester disk with a storage capacity of up to 32 megabytes. (Your Winchester disk might have a different storage capacity.)

Two complimentary utilities provided with your CP/M-85 software (BACKUP and RESTORE) provide you with a convenient method for backing up large quantities of Winchester disk files to floppy disks, and then restoring these files to the Winchester disk when necessary.

Flexibility

Because your Z-100 hardware and software can perform so many microcomputer tasks, you have been provided with Winchester utility software to make your Winchester disk a more flexible work tool. The Winchester utility software (provided with your Winchester disk hardware) enables you to separate the programs and data of different applications into different areas of the Winchester disk.

The PART utility is provided for this purpose. It enables you to divide your Winchester disk into as many as 16 separate work areas or partitions.

Integrity

One of the most common fears of computer users is the loss of valuable data due to failure of the storage media. The Winchester utility software offers you three utilities for protecting your data.

One utility (PREP) initializes and tests the entire disk surface. PREP then helps prevent access of any faulty disk media as you work with the Winchester disk.

Another utility (VERIFY) enables you to find any disk media that has become faulty since you began using the disk. VERIFY then helps prevent access of this faulty media.

An additional utility (SHIP) enables you to protect the data on your Winchester disk from damage due to physical shock.

WINCHESTER PARTITIONS VERSUS FLOPPY DISKS

Winchester disk partitions and floppy disks are similar in the following ways:

- Software and data can be accessed on each by entering commands that refer to them by drive names.
- Each can contain an operating system, so that you can boot up using only this partition or disk.
- Different floppy disks and different Winchester partitions can contain different operating systems and still be used in the same disk drive.
- The storage capacities of each can be varied by using special programs (FORMAT for floppy disks and PART for Winchester partitions) before recording data.

Winchester disk partitions and floppy disks are different in the following ways:

- The storage capacity of a Winchester partition is potentially much larger than the storage capacity of a floppy disk.
- Floppy disks can be removed from the floppy disk drive and transported freely. Winchester partitions cannot be removed from the Winchester disk drive, although partitions can be created, eliminated, enlarged, or contracted by special programs (PREP and PART).

- A customized operating system will be able to access all floppy disks immediately upon bootup. A customized system can access a maximum of only one Winchester partition immediately upon bootup. Users with more than one Winchester partition must use a special program (ASSIGN) to "introduce" these partitions to the system before the system will be able to access them.

ACCESSING WINCHESTER PARTITIONS

For most CP/M operations, you can think of a Winchester partition as if it were a floppy disk. However, just as a floppy disk needs to be inserted into a drive, a Winchester partition needs to be assigned to a drive.

You must **insert** a floppy disk into a drive before its data can be accessed. Likewise, you must usually **assign** a partition to a drive before its data can be accessed.

Your Winchester disk drive can contain as many as 16 partitions accessible through CP/M, but only two of these partitions can be assigned to drive names at any one time.

Since your Winchester partitions are permanently sealed in the Winchester disk drive, you can not manually remove a partition or insert a new one. Therefore, you must use the ASSIGN utility to assign partitions to drives. "ASSIGN" in "Section Four: Winchester Disk Software" contains detailed instructions on assigning partitions.

NOTE: The only time when you can access a partition without assigning it is when you boot up to that partition. Booting up to a partition is explained in detail in "Section Three: Bootup with a Winchester Disk".

DEFAULT BOOT PARTITION

You can create as many as 16 bootable CP/M partitions on your Winchester disk and boot up with any of them. However, booting up with a partition requires different circumstances than booting up with a floppy disk.

You must either type special bootup commands or establish one partition as your "default boot partition" using the PART utility.

Each partition on your Winchester disk is identified by a partition name and (optionally) a system name.

Therefore, you can specify which partition you want to boot up with each time you boot up by typing the partition name and (when necessary) the system name at the end of your bootup command. "Section Three: Bootup with a Winchester Disk" contains detailed instructions on booting up to a partition in this manner.

However, some users find it more convenient to establish one partition as the one that will be used for booting up most of the time. Once this partition is established as the default boot partition, the user will not need to enter its partition name and system name in order to boot up with it. "PART" in "Section Four: Winchester Disk Software" contains detailed instructions on establishing a default boot partition.

NOTE: Even when you have selected a default boot partition, you can still boot up to any established partition by entering an explicit bootup command (see Section Three: Bootup with a Winchester Disk).

WINCHESTER DISK PRECAUTIONS

The Winchester Disk stores so much information within such small surface areas, you should adhere to the following precautions to ensure that the disk and stored data are not damaged.

- Your computer and Winchester drive must not be subjected to any kind of a drop or other physical shock. Should the computer be accidentally dropped, even from only two to three inches, the Winchester drive may fail to operate. If this occurs you should contact your local ZDS representative for service.

- The built-in disk of your Winchester drive cannot be physically removed from the drive. However, information can be removed, stored, and replaced with other data. You will learn how to do this later in this supplement and in the Winchester section of your operating system manuals.

- Do not use or store electric motors, appliances, telephones near the Winchester drive, as these devices contain magnets that could alter the magnetic impressions on the disk.

- Do not expose the Winchester drive to temperatures below 15 degrees Celsius (60 degrees Fahrenheit) or temperatures above 32 degrees Celsius (90 degrees Fahrenheit).

- Do not expose the Winchester disk to smoke or excessively dusty conditions.

NOTE: You should also adhere strictly to any precautions specified in your hardware documentation.

Section Two

Winchester Disk Procedures

Before you begin using your Winchester disk for everyday microcomputer tasks, you should perform one or both of the following two procedures in sequence:

- Winchester Utility Procedure — Necessary only for users with a damaged copy of the Winchester Utility Disk and/or users who wish to repartition their Winchester disk or change the default boot partition.

- Software Transfer Procedure — Necessary for all users.

These procedures can help you to make backup copies of your Winchester Utility Disk and CP/M Distribution Disks, to divide your Winchester disk into partitions, and to transfer customized CP/M software to one or more partitions.

The instructions within each procedure will inform you when it is possible for some users to skip an activity.

WINCHESTER UTILITY PROCEDURE

This procedure can help you to back up the Winchester Utility Disk (using the DSKCOPY utility), and to repartition your Winchester disk (using the PART utility).

None of these activities are essential to all users because all users are shipped two copies of the Winchester Utility Disk, and because Winchester disks supplied by Zenith Data Systems or Heath contain a CP/M partition when they are shipped. Therefore some users can skip activities within this procedure or proceed directly to the Software Transfer Procedure.

Procedure Synopsis

If either copy of your Winchester Utility Disk is damaged, then you should perform the following activities in sequence:

Z-DOS Bootup
DSKCOPY

If you wish to change the arrangement of partitions on your Winchester disk or the default boot partition, then you should perform the following activities in sequence:

Z-DOS Bootup
PART

If your Winchester Utility Disk is damaged **and** you wish to change partitions or the default boot partition, then you should perform the following activities in sequence:

Z-DOS Bootup
DSKCOPY
PART

NOTE: This procedure will require you to use the Z-DOS Operating System (rather than the CP/M-85 Operating System). The differences between the Z-DOS and CP/M-85 systems will have no noticeable effect on the operation of the PART utility.

Z-DOS Bootup

This bootup activity helps you to load the Z-DOS Operating System into the computer from a floppy disk (the Winchester Utility Disk), so that it can control Z-DOS utilities.

1. Insert the Winchester Utility Disk into the 5.25-inch floppy disk drive slot of the Z-100, and close the drive latch.

2. Reset the system by entering ***CTRL-RESET*** (if you have not already done so).

3. If the light on the 5.25-inch floppy disk drive glows after you reset the system, then skip ahead to step 5.

   If the light on the Winchester disk drive glows after you reset the system, then wait several seconds until the pointing finger prompt is displayed on the screen. Then proceed to step 4.

   If no drive light glows after you reset the system, then the pointing finger prompt should be displayed on the screen. Then proceed to step 4.

4. At the pointing hand prompt, press the **B** key, the ***F1*** key, and a ***RETURN***.

5. Wait for the display of a series of messages in the following form:

```
Z-DOS/MS-DOS BIOS Release 1.00, version 1.10

Z-DOS/MS-DOS release 1.00, version 1.25
(c) Copyright 1982 Zenith Data Systems

Z-DOS/MS-DOS release 1.00, version 1.20S
Current date is Mon  1-31-83
Enter new date:
```

6. At the "Enter new date" prompt, type the current date in the following form:

```
Current date is Mon 1-31-83
Enter new date {mm}-{dd}-{yy} RETURN
```

Where **{mm}** is a number in the range 1-12, representing a month;
where **{dd}** is a number in the range 1-28, 1-29, 1-30, or 1-31 (depending on the month and year) representing a day; and
where **{yy}** is a number in the range 80-99 or 1980-2099 representing a year.

Then Z-DOS will display a message in the following form:

```
Current time is 8:35:12.50
Enter new time:
```

7. At the "Enter new time" prompt, type the current time in the following form:

```
Current time is 8:35:12.50
Enter new time {hh}:{mm}:{ss} RETURN
```

Where **{hh}** is a number in the range 1-24 representing the hours;
where **{mm}** is a number in the range 0-59 representing the minutes. This entry is optional. If omitted, 00 is assumed; and
where **{ss}** is a number in the range 0-59 representing the seconds. This entry is optional. If omitted, 00 is assumed.

The A: system prompt will now appear on your screen, to show that Z-DOS is in control and ready to accept commands.

If either copy of your Winchester Utility Disk is damaged, then you should proceed to the DSKCOPY activity.

If you wish to change the arrangement of partitions on your Winchester disk or the default boot partition and you have two usable copies of the Winchester Utility Disk, then you should proced to the PART activity.

DSKCOPY

The DSKCOPY activity will help you to copy all of the software from your Winchester Utility Disk to a backup disk.

NOTE: We recommend that you use this activity only if a copy of the Winchester Utility Disk has become unusable.

1. Type the command **DSKCOPY/V *RETURN*** at the A: system prompt. This entry invokes DSKCOPY, which will display a message and prompt in the following form:

```
            DSKCOPY version 1.01
Copyright(C) 1982 Zenith Data Systems

Source drive name? (A-F)  _:
```

2. Type **A**. Then DSKCOPY will display the following prompt:

```
Destination drive name? (A-F)  _:
```

3. Type **B**. Then DSKCOPY will display the following prompt:

```
Place source diskette in A: and destination diskette in B:
Hit RETURN when ready.
```

4. Leave the Winchester Utility Disk in the drive, and press ***RETURN***. Then DSKCOPY will display the following prompt:

```
Formatting destination... Place disk B in drive A:.
Hit any key when ready.
```

5. Remove the Winchester Utility Disk from the drive.

6. Label a blank, 5.25-inch, double-sided, double density, 48-tpi, floppy disk with the words "Winchester Utility Backup Disk".

7. Insert the Winchester Utility Backup Disk in the 5.25-inch floppy disk drive slot, close the drive latch, and press a gray key. (Do not press any of the brown keys in the top row.) The floppy disk drive light will glow for several seconds. Then DSKCOPY will display the following prompt:

```
Copying... Place disk A in drive A:.
Hit any key when ready.
```

8. Remove the Winchester Utility Backup Disk from the drive, insert the Winchester Utility Disk, and press a gray key. DSKCOPY will continue to display prompts in the following form:

```
Place disk X in drive A:.
Hit any key when ready.
```

9. When a prompt in this form reads "Place disk B", insert the Winchester Utility Backup Disk and carefully press a key.

   When a prompt in this form reads "Place disk A", insert the Winchester Utility Disk and carefully press a key.

10. Continue switching the two disks as DSKCOPY displays a prompt in the following form:

```
Verifying... Place disk A in drive A:.
Hit any key when ready.
```

11. Continue switching the two disks until DSKCOPY displays the following prompt:

```
Copy another? (Y/N) <N>
```

12. Type **N** and press ***RETURN***. The system prompt should be displayed again, as shown:

```
A:
```

13. Store your Winchester Utility Disk away in a safe place, and leave your Winchester Utility Backup Disk in the 5.25-inch floppy disk drive for the remainder of this procedure.

14. Type **DIR** ***RETURN*** at the system prompt. The following prompt will appear on the screen:

```
Place disk A in drive A:
Hit RETURN when ready.
```

15. Press ***RETURN*** at the Place disk A prompt. (Leave your Winchester Utility Backup Disk in the drive.) Directory characteristics of the Winchester utility files will be displayed.

If you wish to change the partition arrangement or the default boot partition, proceed to the PART activity.

If you do not wish to change the partition arrangement or the default boot partition, proceed to the "Software Transfer Procedure".

PART

The PART activity helps you to change the quantity, size, and names of Winchester disk partitions. It also enables you to specify which partition should be accessed when you boot up.

A partition is much like a floppy disk in most operations, because you can access a partition's data and/or software by entering commands that refer to the drive name that has been designated for that particular partition.

CAUTION: Performance of this procedure can irrevocably destroy any software or data that now resides on your Winchester disk. Therefore, you should **not** perform this procedure unless you are certain that you have floppy disk copies of any valuable software or data that might reside on the Winchester disk. This procedure is **not** absolutely necessary for use of Winchester disks supplied by Zenith Data Systems or Heath. ZDS and Heath Winchester disks already contain a CP/M partition when they are shipped to you. This CP/M partition occupies one half of the total Winchester disk space, while a Z-DOS partition occupies the other half.

NOTE: These steps provide you with the minimum information necessary to use the PART utility. If you obtain an error message or desire more detailed information about PART, refer to "PART" in "Section Four: Winchester Disk Software".

1. Type the command **PART *RETURN*** at the A: system prompt. This entry invokes PART. PART first displays an identification message, an explanation of the program's function, a caution, and the following prompt:

```
Proceed (Y/N)?
```

2. Read the initial PART display, paying particular attention to the caution.

   If you wish to proceed with PART, press **Y**. PART will display a table showing the (default) status of several features related to partitions. The cursor will appear at the bottom of the display, at the end of the following menu and prompt:

```
        B - Modify default boot partition
        P - Partition maintenance
        E - Exit
    Choose desired option. <B, P or E>_
```

   At this display, you have the choice of changing the arrangement of your Winchester disk partitions, changing the setting of the default boot partition, or exiting from PART. Proceed to step 3.

   If you do not wish to proceed past the initial display with PART, press **N**. The system prompt will appear. Now back up your Winchester disk, or do whatever is necessary to get ready to use PART.

3. If you wish to change the arrangement of partitions on your Winchester disk, then type **P** at this prompt and proceed to step 4. The cursor will move to the partition name of the first partition, at the top of the table.

   If you wish to change the setting of the default boot partition, then type **B** at this prompt and skip ahead to step 7. The cursor will move to the current default boot partition, near the bottom of the table.

4. If you wish to change or add a partition name at the cursor position, type a string of **1-16 ASCII characters** (excluding the semicolon or non-printing characters such as the space or the tab). You can use the BACK SPACE key to edit this entry. Then press ***RETURN***. The name you typed will be displayed and the cursor will move to the system name of the same partition. Proceed to step 5.

If you do not wish to change the partition name of this partition, press ***RETURN*** only. The cursor will move to the system name of the same partition. Proceed to step 4. (If no partition existed in the partition name position when you pressed RETURN, the cursor will move down to the default boot partition. Under these circumstances, you should skip ahead to step 7.)

If you wish to remove all features (partition name, system name, percentage, and kilobytes) of a partition from the table, press the **space bar** once. The cursor will remain in the same position, as the features of the next partition in the table move up to the cursor position. Then repeat step 4. (If no partition was featured below the cursor when you pressed the space bar, the cursor will move down to the default boot partition. Under these circumstances, you should skip ahead to step 7.)

5. If you wish to change the system name at the cursor position, type a string of **1-10 ASCII characters** (excluding the semicolon or non-printing characters such as the space or the tab). You can use the BACK SPACE key to edit this entry. Then press ***RETURN***. We recommend that you use the system name "CP/M" for your CP/M-85 partitions. To create a Z-DOS partition, you must use the system name, "Z-DOS". The system name you type will be displayed and the cursor will move to the allocation percentage of the same partition. Proceed to step 6.

   If you do not wish to change the system name of this partition, press ***RETURN*** only. The cursor will move to the allocation percentage of the same partition. Proceed to step 6.

6. If you wish to change the percentage of Winchester disk space that is allocated to a partition, type a non-fraction **number** in the range n-100 (where n is the number displayed at the bottom of the screen on the right side of the Minimum allocation message) when the cursor appears in a percentage position. Then press ***RETURN***. The percentage

you entered will (usually) be displayed, and the allocation in kilobytes will be automatically calculated and displayed. The cursor will move down to the next partition name position. Return now to step 4. (If you have just allocated the percentage for the 16th partition on the table, the cursor will move down to the default boot partition number. Under these circumstances, you should proceed to step 7.)

NOTE: If you enter a percentage that would cause a total allocation of more than 100 percent, PART will allocate only the difference between 100 percent and the total percent of allocation to all other partitions on the table. In this manner, PART prevents you from over-allocating your Winchester disk space. Furthermore, you should not allocate more than 8 megabytes (8192 kilobytes) to any single partition.

If you do not wish to change the allocation percentage of this partition, then press ***RETURN*** only. The cursor will move down to the next partition name position. Return now to step 4. (If the positions for partition name, system name, and percentage on one line of the table are all blank, then pressing RETURN at the blank percentage position will cause the cursor to move down to the default boot partition number. Under these circumstances, you should proceed to step 7.)

7. If you wish to change or establish a default boot partition, type the number of a partition that is featured in the table. You can use the BACK SPACE key to edit this entry. Then press ***RETURN***. The cursor will move to a prompt beneath a menu of PART options. Proceed to step 8.

   If the default boot partition identifies a partition that is featured on the table and if you do not wish to change this partition's default booting status, then press ***RETURN*** only.

The cursor will move to a prompt beneath a menu of PART options. Proceed to step 8.

If you prefer that none of your partitions have the default booting status, press the **space bar** only. The cursor will move to a prompt beneath a menu of PART options. Proceed to step 8.

8. After you have typed an entry for the default boot partition, PART displays a menu and a prompt in the following form:

```
B - Modify default boot partition
P - Partition Maintenance
R - Restore to original partitions
E - Exit
Choose desired option. <D, P, R or E>
```

If you are satisfied with the partition arrangement and wish to exit from the PART utility, type **E**. Then proceed to step 9. The cursor will remain at the end of a prompt, but a different menu will appear at the bottom of the screen.

If you wish again to change partition arrangement features that you have just entered, type **P**. Then return to step 4. The cursor will move up to the partition name of the first partition, at the top of the table.

If you wish to change partition arrangement features again, but prefer to have the table appear as it did at the beginning of this PART session, type **R**. Then return to step 4. The cursor will move up to the partition name of the first partition, at the top of the table.

If you wish again to change the default boot partition, type **B**. Then return to step 7. The cursor will move up to the default boot partition.

9. When you enter E for "Exit" at the previous prompt, the following menu and prompt appear:

```
M - Make changes and exit
A - Abort, make no changes and exit

Choose desired option. <M or A>
```

If you want to exit from the PART utility and change the status of Winchester disk partition features to reflect the changes that you entered during this PART session, type **M**. This entry has the potential to destroy any data that might exist on the Winchester disk. The A: system prompt will be displayed.

If you want to end this PART session without any changes to the Winchester disk, type **A**. Each partition feature will revert to the status it maintained before you invoked the PART utility. Any and all changes you may have entered during this PART session will be nullified, as if you had not even invoked PART. The A: system prompt will be displayed.

You have just completed the Winchester Utility Procedure. Remove the Winchester Utility Backup Disk for Winchester Utility Backup Disk from the floppy disk drive, and store it safely away.

NOTE: You must reset your computer and boot up again after completing a PART session.

SOFTWARE TRANSFER PROCEDURE

This procedure will help you to move and (where necessary) customize the following software items to one or more Winchester disk partitions:

- The CP/M-85 Operating System
- CP/M-85 support utility files
- Application program files
- Data files used with application programs

You should perform this procedure after using the PART utility, after backing up your Winchester Utility Disk, or after using the PREP utility.

Procedure Synopsis

This procedure requires you to perform the following activities in sequence:

Floppy Disk Bootup
ASSIGN
FORMAT
MVCPM217
SYSGEN
PIP
Winchester Partition Bootup
PIP
CONFIGUR

If you wish to transfer software to more than one CP/M partition, you must also perform the following activities in sequence for each of your additional partitions:

ASSIGN
FORMAT
SYSGEN
PIP

Floppy Disk Bootup

This bootup activity helps you to load the CP/M Operating System into the computer from a floppy disk (Distribution Disk I), so that it can control CP/M utilities.

1. Insert CP/M-85 Distribution Disk I into the 5.25-inch floppy disk drive slot of the Z-100, close the drive latch.

2. Reset the system by entering ***CTRL-RESET*** (if you have not already done so).

3. If the light on the 5.25-inch floppy disk drive glows after you reset the system, then skip ahead to step 5.

   If the light on the Winchester disk drive glows after you reset the system, then wait several seconds until the pointing finger prompt is displayed on the screen. Then proceed to step 4.

   If no drive light glows after you reset the system, then the pointing finger prompt should be displayed on the screen. Then proceed to step 4.

4. At the pointing finger prompt, press the **B** key, the ***F1*** key, and a ***RETURN***.

5. Wait for a message and prompt to appear in the following form:

```
CP/M-85 VERSION 2.2.101  01/28/83

A>
```

When the A> system prompt appears, leave Distribution Disk I in the floppy disk drive slot and proceed to the ASSIGN activity.

ASSIGN

The ASSIGN utility assigns CP/M partitions to drive names, so that you can move software and data to and from these partitions.

CP/M will allow you to have as many as two partitions assigned to drive names at one time. But during this activity, you will assign only one partition to a drive name.

1. Type **ASSIGN ?** and press ***RETURN***. ASSIGN will display a list of the partition names that were set up with the PART program. Such a display might look something like this:

```
PARTITION NAME      OS NAME       SIZE
----------------    -----------   -------
DATABASE            ;Z-DOS        1200k
SPREAD-SHEET        ;CP/M         1000k
WORD/PROCESSING     ;CP/M         1000k
ACCOUNTING          ;CP/M         1800k
```

Your partitions will probably have different names, though they will be displayed in this form.

2. Select the partition that you want to become your Backup Partition.

3. Type the command **ASSIGN X:={partition}** ***RETURN*** at the system prompt.

   Where **X:** is the name of the drive to which you are assigning the partition. If you do not have 8-inch disk drives connected, enter **C:** for the drive name. If you have 8-inch disk drives connected, enter **E:** for the drive name.

   where **{partition}** identifies the partition you wish to select. A partition is identified by a partition name, and optionally by a system name. (It is not necessary to include the system name if the Winchester disk contains only one partition with the specified partition name.

A sample entry could be

ASSIGN C:=SPREAD-SHEET;CP/M *RETURN*.

4. If you wish to confirm the assignment, type **ASSIGN** and press ***RETURN***. The ASSIGN utility will display the drive assignment you just entered. A sample display might appear in the following form:

```
C: = SPREAD-SHEET;CP/M
```

Leave Distribution Disk I in drive A and proceed to the FORMAT activity.

FORMAT

The FORMAT utility will prepare the newly assigned partition for data storage.

1. At the CP/M prompt A>, type **FORMAT** and press ***RETURN***. This entry invokes FORMAT, which will display the following message:

```
CP/M-85 Format Version 2.2.101

This program is used to initialize a disk.
All information currently on the disk will be destroyed.
Is that what you want? (y/n):
```

2. Type **Y**. FORMAT will display:

```
Which drive do you wish to use for this operation?
```

3. If you do not have any 8-inch disk drives connected, type **C**.

   If you have any 8-inch disk drives connected, type **E**.

   FORMAT will display:

   ```
   Will format partition assigned to drive X:

   Press RETURN to begin, anything else to abort.
   ```

4. Press ***RETURN***. FORMAT will begin preparing the surface of the partition. When finished preparing the partition, FORMAT displays the message:

   ```
   Do you have any more disks to format? (y/n):
   ```

5. Type **N**. FORMAT will now display:

   ```
   A>
   ```

Leave the Distribution Disk in the floppy disk drive slot and proceed to the MVCPM217 activity.

MVCPM217

The MVCPM217 activity helps you to move the CP/M system kernel (the portion of the operating system exclusive from the BIOS files) from a floppy disk to the Winchester disk partition.

The MVCPM217 utility is necessary because floppy disks and Winchester partitions are controlled by different controller cards. MVCPM217 adjusts the system kernel to match the controller card that it is being moved to.

1. Type the command **MVCPM217** ***RETURN*** at the system prompt.

2. Wait for a display in the following form to appear:

```
MVCPM217 VERSION 2.2.101

CONSTRUCTING nnk CP/M vers 2.2
READY FOR "SYSGEN" OR
"SAVE 38 CPMnn.COM"

A>
```

Leave the Distribution Disk in the floppy disk drive slot and proceed immediately to the SYSGEN activity.

NOTE: The MVCPM217 activity moves the CP/M system kernel to a special location within computer memory. You must perform the SYSGEN activity immediately after the MVCPM217 activity, or else the result of the MVCPM217 activity will be lost.

SYSGEN

The SYSGEN utility puts the CP/M system that was just moved into memory by MVCPM217 on the newly assigned Winchester partition.

1. Type the command **SYSGEN *RETURN*** at the A> system prompt. This entry invokes SYSGEN, which will display a message in the following form:

```
CP/M-85 SYSGEN VER 2.2.101
SOURCE DRIVE NAME (OR RETURN TO SKIP):
```

2. Press ***RETURN***. (This entry signifies that the source of the system kernel is computer memory, rather than a disk drive.) SYSGEN will display:

```
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

3. If you do not have any 8-inch disk drives connected, type **C**.

   If you have any 8-inch disk drives connected, type **E**.

   SYSGEN will display a prompt in the following form:

```
DESTINATION ON C, THEN TYPE RETURN
```

4. Press ***RETURN***. SYSGEN will display:

```
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

5. Press ***RETURN***. Now CP/M will display the system prompt:

```
A>
```

Leave Distribution Disk I in the floppy disk drive slot and proceed to the PIP utility.

PIP

You will use the PIP utility to copy all of the files from Distribution Disk I to the partition.

1. If you do not have any 8-inch disk drives connected, type the command **PIP C:=A:*.*[RV]** ***RETURN*** at the system prompt.

   If you have any 8-inch disk drives connected, type the command **PIP E:=A:*.*[RV]** ***RETURN*** at the system prompt. PIP will display the names of all the files from Distribution Disk I as they are copied, in the following form:

   ```
   COPYING -
   ALTCHAR.SYS
   .
   .
   .
   XSUB.COM
   ```

2. Wait for PIP to display the entire list of files. Then CP/M will again display the system prompt:

   ```
   A>
   ```

When you have completed the PIP activity, remove CP/M-85 Distribution Disk I from the floppy disk drive slot and store it in a safe place. Then proceed to the Winchester Partition Bootup activity.

Winchester Partition Bootup

This bootup activity helps you to load the CP/M Operating System into the computer from the partition, so that it can control CP/M utilities.

1. Reset the system by entering ***CTRL-RESET*** (if you have not already done so).

2. If the light on the 5.25-inch floppy disk drive glows after you reset the system, then press the ***DELETE*** key. The pointing finger prompt should then be displayed on the screen. (Do not be alarmed if the "Boot Abort" or "Device Error" message also appears.) Proceed to step 3.

   If the light on the Winchester disk drive glows after you reset the system, then wait several seconds until the pointing finger prompt is displayed on the screen. Then proceed to step 3.

   If no drive light glows after you reset the system, then the pointing finger prompt should be displayed on the screen. Proceed to step 3.

3. At the pointing finger prompt, type a bootup command in the following form:

   B ***F3*** **:{bootstring}** ***RETURN.***

   Where **B** tells the computer that you wish to boot up. The computer will automatically display the remaining letters in the word "Boot".

   where **F3** is one of the brown function keys located in the top row of your keyboard. This entry tells the computer what type of disk you wish to boot up from. The computer will display "f3" in reverse video.

   where :{**bootstring**} tells the computer which partition you wish to use to boot up. The colon must be the first character in this entry. The remaining characters must be the partition name, and optionally the system name, of a bootable partition that exists on your Winchester disk.

where ***RETURN*** tells the computer to begin processing your bootup entry.

NOTE: You can omit the :{**bootstring**} specification from your bootup command if you have already set the desired partition as your "Default Boot Partition" through the PART utility.

For example, you could type the following entry to boot up to a Winchester disk CP/M partition named "SPREAD-SHEET":

B *F3* : SPREAD-SHEET;CP/M *RETURN*

If your Winchester disk contained only one partition with the "SPREAD-SHEET" partition name, then it would be unnecessary to include the system name (;CP/M) in the bootstring.

NOTE: Do not press the space bar while typing your bootup entry. Spaces appear in this example for clarity.

4. Wait several seconds, until a message and prompt appear in the following form:

```
CP/M-85 VERSION 2.2.101  01/28/83
A>
```

When the A> system prompt appears, proceed to the PIP activity.

PIP

This activity will help you to copy files to your partition from the following three sources:

- CP/M-85 Distribution Disk II
- 5.25-inch or 8-inch soft-sectored, 48-tpi application program disks (distribution disks or transfer disks)
- Data files used for application programs

1. Insert CP/M Distribution Disk II into the floppy disk drive slot of the Z-100. This slot will be called drive C during this activity.

2. Type the command **PIP A:=C:*.*[V]** ***RETURN*** at the system prompt. PIP will display the names of all the files from Distribution Disk II as they are copied, in the following form:

```
COPYING -
ASCII.LIB
.
.
.
Z217DRVR.LIB
```

3. Wait for PIP to display the entire list of files. Then CP/M will again display the system prompt:

```
A>
```

4. Remove CP/M Distribution Disk II from the floppy disk drive, and store it in a safe place.

5. Insert an application program disk into a floppy disk drive slot (5.25-inch or 8-inch).

6. Type a command in the form **PIP A:=X:{filename.ext}[V]** ***RETURN*** at the system prompt.

   Where **X:** is the name of the drive from which you are copying files. If you are copying from a 5.25-inch drive, enter **C:** for the drive name. If you are copying from an 8-inch drive, enter **E:** for the drive name.

   where **{filename.ext}** is the primary name and extension of a file you wish to copy from the application program disk. If you wish to copy all of the files from this disk, enter ***.***. The *.* entry is a wild card file name that represents all of the files on the application program disk.

   where **[V]** is an option that causes PIP to verify the accuracy of the copy operation.

   PIP will display the names of the specified files on the application program disk as they are copied, in the following form:

   ```
   COPYING -
   SC.COM
   SC.OVL
   ```

   NOTE: The names of the files copied will depend on the contents of your source disk.

7. Wait for PIP to display the entire list of files. Then CP/M will again display the system prompt:

   ```
   A>
   ```

8. Repeat step 5, step 6, and step 7 for each application program disk or data disk from which you wish to copy files to the partition.

   NOTE: If you wish to copy some application program files and/or data files to different partitions, repeat the ASSIGN, FORMAT, MVCPM217, SYSGEN, and PIP activities.

When you have finished copying files to the partition, proceed to the CONFIGUR activity.

CONFIGUR

The CONFIGUR utility adjusts the CP/M Operating System on your partition for your hardware and preferences.

You do **not** need to perform this CONFIGUR activity if you have the following:

- A serial printer (such as the Z-25 or the H-25) that is set at 4800 baud, accepts 8 bits per character with no parity bit, handshakes with RTS pin number 4, is ready when handshaking signal is high, and has no software protocol.

  and/or

- A modem (such as the WH-13, the Lexicon WH-23, UDS WH-33, or the Hayes WH-43) that is set at 300 baud, accepts 8 bits per character with no parity bit, and uses no handshaking.

If you have a printer and/or modem that is **not** listed in these descriptions, then begin this activity at step 1.

1. Type **CONFIGUR** ***RETURN***. CONFIGUR will display the following menu:

```
CP/M-85 System Configuration Utility version 2.2.101
     Copyright (c) 1982 by Zenith Data Systems

              *** MAIN MENU ***

        P - Printer Configuration
        M - Modem Configuration
        C - Command Configuration
        I - I/O Map Configuration
        ? - Brief Help message

        X - Exit

        Selection [P,M,C,I,X or ?] :
```

2. Type **P** and ***RETURN***. CONFIGUR will display the following menu:

```
*** Printer Configuration ***

1- MX-80 or other PARALLEL Centronics-interface printer
2- H/Z-25
3- H-14 or TI-810(WH-24)
4- Dec LA-34 or LA-36
5- Diablo 620
6- Diablo 630,1610,1620,1630 or 1640(WH-44)
7- MX-80 Serial
8- Votrax Type 'n Talk
9- User-defined SERIAL Printer

Please choose the number that corresponds to your printer :
```

3. Enter the number to the left of your printer's name and ***RETURN***. CONFIGUR will display a message listing some characteristics of your printer. If these characteristics do not match those of your printer, either change your printer settings (see printer manual) or specify characteristics for a "User-defined" printer (see CONFIGUR section in "Reference Guide" of the CP/M-85 manual).

   NOTE: If your printer is not listed by name in the "Printer Configuration" menu, press **9** and ***RETURN***, and refer to the "Reference Guide" of the CP/M-85 manual for instructions.

4. When the message listing the characteristics of your printer is displayed, press ***RETURN*** at the "Press RETURN to access Main menu:" prompt. CONFIGUR will redisplay the "Configur Main Menu".

NOTE: If you have a modem that is **not** set with standard Heath/Zenith characteristics, refer now to the CONFIGUR text in the "Reference Guide" of the CP/M-85 manual.

5. Type **X** and ***RETURN*** at the "Configur Main Menu". CONFIGUR will display the following menu and prompt:

```
*** EXIT OPTIONS ***

T - Make changes temporary (to memory only)
P - Make changes permanent (to memory and disk)
Q - Make no changes

? - Brief Help Message

Choice [T,P,Q or ?]:
```

6. Type **P** and ***RETURN*** to apply the specified changes to the system, and to record this system on the partition. CONFIGUR will either display a graphic depicting the rear panel of your Z-100 computer, or relinquish control to the CP/M system.

7. If CONFIGUR displays the "Z-100 Rear Panel" graphic, then attach your printer and/or modem cables as shown in the graphic. Then proceed to step 8.

   If CP/M immediately displays the system prompt, skip to step 9.

8. After you have attached your printer and/or modem cables, press ***RETURN***. CP/M will then display the system prompt.

9. If you have a printer, test it out by entering ***CTRL-P***. Then press ***RETURN***. Your printer (if properly configured and connected) should print system prompts as they are displayed to the video screen. Enter ***CTRL-P*** again to discontinue this printer test.

If you wish to transfer the CP/M Operating System and other software to other partitions, proceed to the ASSIGN activity. If not, you have completed the Software Transfer Procedure.

ASSIGN

The ASSIGN utility assigns CP/M partitions to drive names, so that you can move software and data to and from these partitions.

You will now use ASSIGN to assign a second partition to a drive name, so that you can transfer the customized CP/M system and/or application programs and data to this second partition. You can repeat this activity for each of your CP/M partitions.

1. Type **ASSIGN** and press ***RETURN***. The ASSIGN utility will display the current assignment(s) of partition(s) to drive(s). A sample display will appear in one of the following two forms:

```
A: = SPREAD-SHEET;CP/M
```

or

```
A: = SPREAD-SHEET;CP/M
B: = WORD/PROCESSING;CP/M
```

2. Type **ASSIGN ?** and press ***RETURN***. ASSIGN will display a list of the names and sizes of all partitions on the Winchester disk. Such a display might look something like this:

```
PARTITION NAME          OS NAME       SIZE
--------------          -------       ----
DATABASE                ;Z-DOS        1200k
SPREAD-SHEET            ;CP/M         1000k
WORD/PROCESSING         ;CP/M         1000k
ACCOUNTING              ;CP/M         1800k
```

Your partitions will probably have different names, though they will be displayed in this form.

3. Select a partition other than the one currently assigned to drive A. (Type **ASSIGN *RETURN*** again if you have forgotten which partition is assigned to drive A.)

4. Type the command **ASSIGN B:={partition}** ***RETURN*** at the system prompt.

   Where **B:** is the name of the drive to which you are assigning the second partition.
   where **{partition}** identifies the partition you wish to select. A partition is identified by a partition name, and optionally by a system name. (It is not necessary to include the system name if the Winchester disk contains only one partition with the specified partition name.)

   A sample entry could be:

   ASSIGN B:=ACCOUNTING;CP/M *RETURN*.

5. If you wish to confirm the assignment, type **ASSIGN** and press ***RETURN***. The ASSIGN utility will display the drive assignment you just entered (along with the automatic assignment of the booted partition to drive A). A sample display might appear in the following form:

```
A:  =  SPREAD-SHEET;CP/M
B:  =  ACCOUNTING;CP/M
```

Proceed to the FORMAT activity.

FORMAT

The FORMAT utility will prepare the newly assigned partition for data storage.

1. At the CP/M prompt A>, type **FORMAT** and press ***RETURN***. This entry invokes FORMAT, which will display the following message:

```
CP/M-85 Format Version 2.2.101

This program is used to initialize a disk.
All information currently on the disk will be destroyed.
Is that what you want? (y/n):
```

2. Type **Y**. FORMAT will display:

```
Which drive do you wish to use for this operation?
```

3. Type **B**. FORMAT will display:

```
Will format partition assigned to drive x:

Press RETURN to begin, anything else to abort.
```

4. Press ***RETURN***. FORMAT will begin preparing the surface of the partition. When finished preparing the partition, FORMAT displays the message:

```
Do you have any more disks to format? (y/n):
```

5. Type **N**. FORMAT will now display:

```
A>
```

Proceed to the SYSGEN activity.

SYSGEN

The SYSGEN utility transfers the customized CP/M Operating System from the drive A partition to the newly assigned drive B partition.

1. Type the command **SYSGEN *RETURN*** at the A> system prompt. This entry invokes SYSGEN, which will display a message in the following form:

```
CP/M-85 SYSGEN VER 2.2.101
SOURCE DRIVE NAME (OR RETURN TO SKIP):
```

2. Type **A**. SYSGEN will display:

```
SOURCE ON A, THEN TYPE RETURN
```

3. Press ***RETURN***. SYSGEN will display:

```
FUNCTION COMPLETE
COPY SYSTEM FILES (Y/N):
```

4. Type **Y**. SYSGEN will display:

```
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

5. Type **B**. SYSGEN will display:

```
DESTINATION ON B, THEN TYPE RETURN
```

6. Press ***RETURN***. SYSGEN will display:

```
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

7. Press ***RETURN***. Now CP/M will display the system prompt:

```
A>
```

Proceed to the PIP utility.

PIP

This activity will help you to copy files to your second partition from the following two sources:

- 5.25-inch or 8-inch soft-sectored, 48-tpi application program disks (distribution disks or transfer disks)
- Data disks used with application programs

1. Insert an application program or data disk into a floppy disk drive slot (5.25-inch or 8-inch).

2. Type a command in the form **PIP B:=X:{filename.ext}[V]** ***RETURN*** at the system prompt.

   Where **B:** is the name of the drive to which you have assigned the second partition.

   where **X:** is the name of the drive from which you are copying files. If you are copying from a 5.25-inch drive, enter **C:** for the drive name. If you are copying from an 8-inch drive, enter **E:** for the drive name.

   where **{filename.ext}** is the primary name and extension of a file you wish to copy from the application program or data disk. If you wish to copy all of the files from this disk, enter ***.***. The *.* entry is a wild card file name that can be used to represent all of the files on the application program or data disk.

   where **[V]** is an option that causes PIP to verify the accuracy of the copy operation.

PIP will display the names of the specified files on the application program disk as they are copied, in the following form:

```
COPYING -
GLMST001.DAT
GLMST002.DAT
GLMST003.DAT
      .
      .
      .
GLMST037.DAT
```

NOTE: The names of the files copied will depend on the contents of your source disk.

3. Wait for PIP to display the entire list of files. Then CP/M will again display the system prompt:

```
A>
```

4. Repeat this PIP activity for each application program disk or data disk from which you wish to copy files to the second partition.

When you have finished copying files to the second partition, return to Page 2-29 and repeat this procedure's sequence of the following activities:

ASSIGN
FORMAT
SYSGEN
PIP

Steps in these activities that refer to the "second partition" can also be used for the third, fourth, or fifth CP/M partition — or any other established CP/M partition through the 16th partition.

When you have finished preparing each of your CP/M partitions, you have completed this procedure.

Section Three

Bootup with a Winchester Disk

The bootup activities in "Section Two: Winchester Disk Procedures" provide simplified instructions on booting up with your floppy disk drives and Winchester disk partitions.

However, CP/M-85 enables you to boot up in a wide variety of ways. This section shows you can boot up to any floppy disk drive or Winchester disk partition in your hardware environment.

NOTE: When the ZF-110 (Low-Profile with two floppy drives) and the ZF-120 (All-in-One with two floppy drives) are shipped, they are set to boot up to the left-hand or upper floppy drive automatically upon power up. When the ZW-110-32 (Low-Profile with a Winchester drive) and the ZW-120-32 (All-in-One with a Winchester drive) are shipped, they are set to boot up to a preset, non-bootable partition on the Winchester disk automatically upon power up.

WINCHESTER DISK BOOTING ALTERNATIVES

The method you must use to boot up can depend on the following factors:

- The setting of switches 0, 1, and 2 on the SW-101 dip switch component, which determine the default boot drive device
- The setting of switch 3 on the SW-101 dip switch component, which determines whether booting will be manual or automatic
- The setting of a default boot partition, which can be changed or eliminated by using the PART utility

The combined affect of all of these factors usually influences whether you need to type an explicitly detailed bootup command, whether you need to type a short ambiguous bootup command, or whether you need to type any bootup command at all.

Table 3-1 shows how you can bootup with any of the drives in your hardware environment. This table lists the drive accessed, the actions or commands used to access this drive, and the settings of the SW-101 switch that are necessary.

Drive	User Actions to Cause Bootup	SW-101 Settings (3, 2, 1, 0)
5.25-inch floppy disk drive 0	Power On (Auto-Boot) {**B**} ***RETURN*** {**B**} {***F1***} ***RETURN*** {**B**} {***F1***} {**0**} ***RETURN***	1, 0, 0, 0 0, 0, 0, 0 0, x, x, x 0, x, x, x
8-inch drive 0	Power On (Auto-Boot) {**B**} ***RETURN*** {**B**} {***F2***} ***RETURN*** {**B**} {***F2***} {**0**} ***RETURN***	1, 0, 0, 1 0, 0, 0, 1 0, x, x, x 0, x, x, x
8-inch drive 1	{**B**} {***F2***} {**1**} **RETURN**	0, x, x, x
Winchester partition	Power On (Auto-Boot)* {**B**} {**bootstring**} ***RETURN*** {**B**} {***F3***} {**bootstring**} ***RETURN*** {**B**} {***F3***} {**0**} {**bootstring**} ***RETURN***	1, 0, 1, 0 0, 0, 1, 0 0, x, x, x 0, x, x, x

An "x" in a SW-101 setting is used where a dip switch may be set to either 0 or 1 without affecting the bootup action.

* A default boot partition must have been selected for automatic bootup to occur upon powering up the computer.

Table 3-1
Bootup Alternatives

Refer to Figure 3-1 for an illustration of the switch settings specified in Table 3-1.

NOTE: Zenith Data Systems and Heath do not currently support Z-100 hardware environments that include a Winchester disk and more than one 5.25-inch floppy disk drive.

Each line in Table 3-1 shows a different method you can use to boot up to a particular drive. Some methods require you to press extra keys as you enter the bootup command. Others require you to change the setting of SW-101 switches.

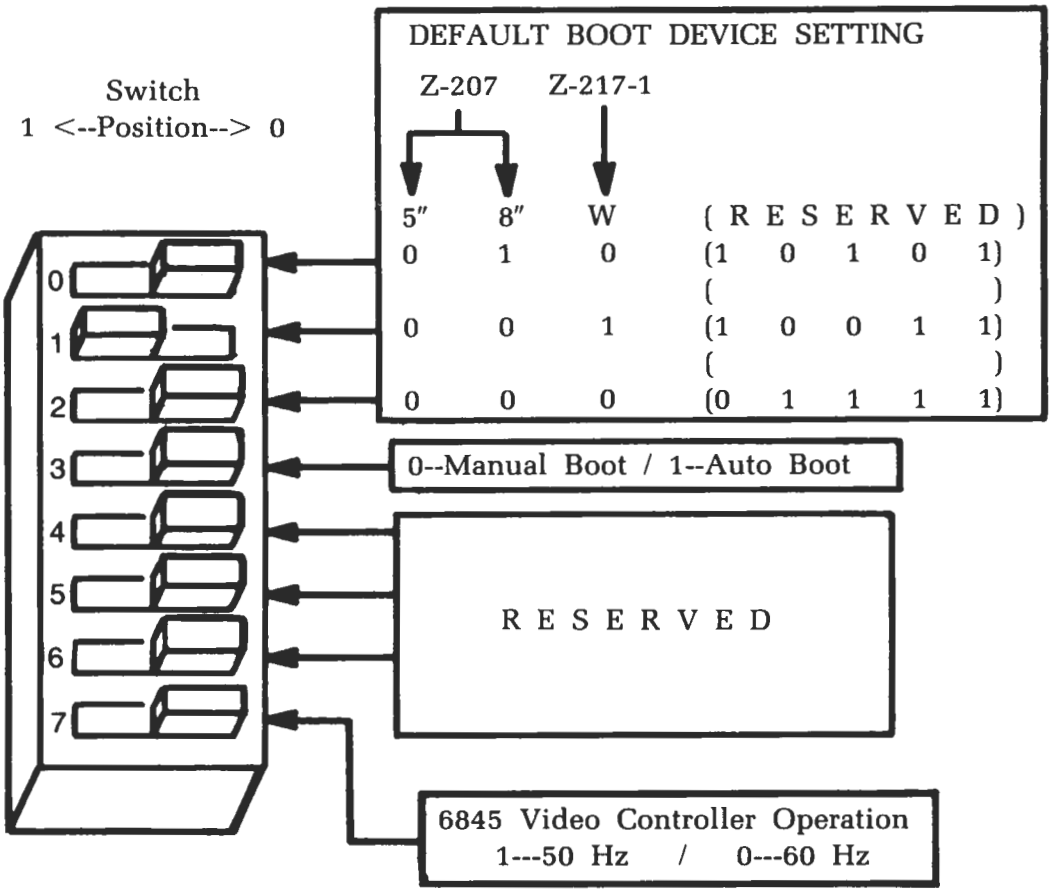

Figure 3-1
Automatic/Manual Bootup Setting (Switch SW-101)

EXPLICIT WINCHESTER BOOTUP COMMANDS

You can enter an explicit bootup command whenever the pointing finger prompt is displayed in the upper left-hand corner of your screen.

Whenever the pointing finger prompt is displayed as the lowest item on the screen, the MTR-100 program within the Z-100 is ready to accept commands such as bootup commands.

If the pointing finger prompt is not displayed, enter ***CTRL-RESET*** and then press the ***DELETE*** key. The pointed hand prompt should appear, possibly beneath an error message.

You can enter your explicit bootup command from the keyboard in response to the pointing finger prompt. There are several options that are available so that you can bootup from any of the drives or bootable partitions in your hardware environment.

Explicit bootup commands for any Z-100 drive device are entered in the following form:

Boot {**dev**} {**#**} {**S**} {**:bootstring**} ***RETURN***

Where **B** is a required input that the computer responds to by displaying oot;
where {**dev**} is an optional function key (F1 through F8) that determines which device will be accessed. (Only the function keys F1, F2, and F3 are valid {dev} entries with Z-207 floppy disk hardware and Z-217 Winchester hardware.);
where {**#**} is the optional unit number (0 or 1) that indicates which of the two possible drive slots of a particular floppy drive device will be accessed;
where {**S**} is optional and specifies that the secondary device controller is to be used;
where {**bootstring**} is an optional string that identifies the particular partition that you wish to boot. If specified, the bootstring must be preceded by a colon (:); and
where ***RETURN*** is a required carriage return.

NOTE: The bootstring in the manual bootup command can be up to 80 characters long, with the last character being a zero (30H). However if you are booting up to a partition that was established by PART or PREP, then you should include a maximum of 27 characters in this string. The 27 characters usually used in the bootstring include up to 16 for partition name, one for a semicolon, and up to 10 for system name. More details about the bootstring are provided under "Ambiguous Winchester Bootup Commands".

If a device unit is requested that is not connected or is otherwise inaccessible, the "Device Error" message is displayed.

Explicit bootup commands specifically for the Z-100 Winchester disk drive are entered in the following form:

Boot ***F3*** **{partition name};{system name}** ***RETURN***

Where **B** is a required input that the computer completes with "oot";
where **F3** is the required brown F3 function key, located in the top row of your Z-100 keyboard. This entry determines that the Z-217 controller card (rather than the Z-207) will be accessed;
where {**partition name**} is the partition name of the established partition you wish to boot. Partition names contain 1-16 ASCII characters excluding the semicolon, space, tab. This entry is mandatory unless a default boot partition has been selected;
where ; is a semicolon that must used as a separation character only when you also specify a system name; and
where {**system name**} is the operating system name of the established partition you wish to boot. Operating system names contain 1-10 ASCII characters excluding the semicolon, space, tab. The operating system name is an optional entry. You only need to specify it if the specified partition name matches that of another partition on the disk. The operating system names of all established partitions are displayed on the menu.
where ***RETURN*** is a required carriage return entry.

NOTE: The {**partition name**} and {**system name**} are both components of the bootstring.

For example, if you have a partition with the partition name "WORD/PROCESSING", and the system name "CPM", then you can boot up to this partition with the following explicit bootup command:

Boot *F3* WORD/PROCESSING;CPM *RETURN*

If you have a partition with the partition name "DATABASE", and the system name "Z-DOS", then you can boot up to this partition with the following explicit bootup command:

Boot *F3* DATABASE;Z-DOS *RETURN*

Furthermore, if you have only one partition on the disk that has the partition name "DATABASE" (rather than having several with the partition name "DATABASE" and different operating system names), then you could also boot up to this partition with the following command:

Boot *F3* DATABASE *RETURN*

AMBIGUOUS WINCHESTER BOOTUP COMMANDS

Since the Winchester disk contains separate partitions, you must specify which partition you wish to access whenever you enter a bootup command. Partitions are accessed by bootup commands that include a bootstring.

A bootstring is a string of characters that positively identifies a Winchester disk partition. This string usually includes the partition name and the system name of the partition you are trying to identify.

However if you enter an ambiguous bootup command (a bootup command without a bootstring specification), and if no "default boot partition" has been established on the Winchester disk, then the following error message will be displayed:

```
Error - Partition not found.  Type RETURN to continue.
```

This error message will also appear if you have selected a default boot partition, and then try to explicitly specify a bootstring, but accidentally type an entry for the bootstring that does not match the names of any of the established partitions.

In response to this error message, press the ***RETURN*** key. Then a menu and prompt in the following form will appear:

```
Partition          Operating System
---------          ----------------

Z-DOS              Z-DOS
CPM                CPM

Boot String? . . . . . >
```

This menu enables you to specify a bootstring. Enter the bootstring of the partition you wish to boot.

NOTE: The partition names and operating system names that appear when you enter an ambiguous bootup command may differ from those shown here. Your display might show names for as many as 16 different partitions.

Type a bootstring at the prompt, in the following form:

BootString?.....>{**partition name**};{**system name**} ***RETURN***

Where {**partition name**} is the partition name of the established partition you wish to boot. Partition names contain 1-16 ASCII characters excluding the semicolon, space, tab. The partition name is a mandatory part of the bootstring. All established partition names are displayed on the menu;

where ; is a semicolon that must used as a separation character only when you also specify a system name;

where {**system name**} is the operating system name of the established partition you wish to boot. Operating system names contain 1-10 ASCII characters excluding the semicolon, space, tab. The operating system name is an optional part of the bootstring. You only need to specify it if the specified partition name matches that of another partition on the disk. The operating system names of all established partitions are displayed on the menu; and

where ***RETURN*** is a required carriage return entry.

If you have more than one partition with the same partition name, and if you do not specify a system name, then the first partition on the menu that bears the common partition name will be booted.

After you enter a valid bootstring for an established partition, the computer will load in the operating system contained on the specified partition. Then this system will display its own messages, menus, and/or prompts.

If you specify a bootstring for a CP/M partition, you will obtain a message and prompt in the following form:

```
CP/M-85 VERSION 2.2.101 01/28/83

A>
```

To avoid obtaining the "partition not found" error message, you can take either or both of the following actions:

- Carefully type an explicit bootup command whenever you boot up to the Winchester disk. This explicit bootup command should include the bootstring for an established partition.

- Use the PART utility to select an established partition as your "default boot partition", so that this partition will be accessed when you enter ambiguous bootup commands to your Winchester disk.

AUTOMATIC BOOTUP FEATURE

The method you use to boot your Z-100 computer is determined by the setting of a switch inside the computer. This switch is labeled "SW-101", and it is illustrated in Figure 3-2 of this section, with the automatic bootup feature switched on. (See your Z-100 hardware manual for further details on this switch.)

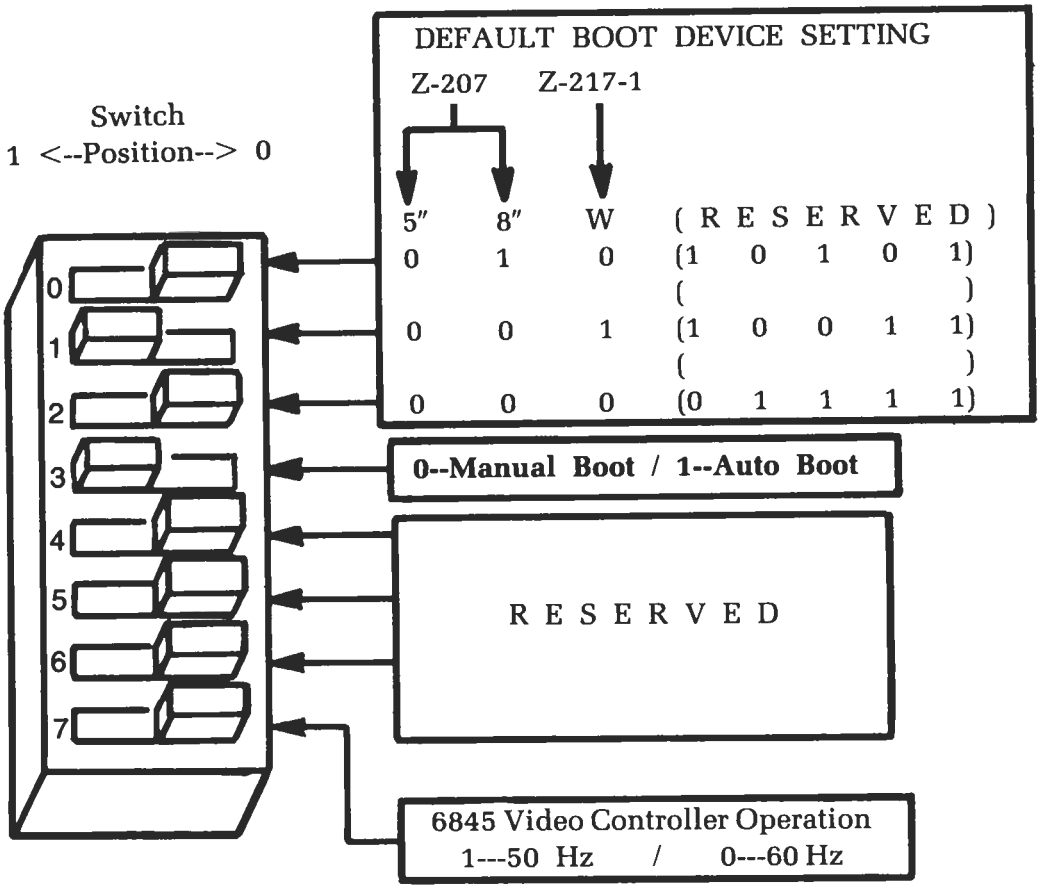

Figure 3-2
Automatic/Manual Bootup Setting (Switch SW-101)

When the 3 switch on the SW-101 is switched to the 1 setting, your Z-100 will attempt to boot up from a drive immediately after being turned on, or whenever ***CTRL-RESET*** is entered. The drive accessed during this bootup process is determined by other switches.

BOOTUP CONCEPTS

To make the manual bootup command easier to work with, it uses "logical devices" to make the distinction between the different drive types connected to your system. The difference between the actual drive controller board and the device type used by the bootup command is illustrated in Figures 3-3 and 3-4.

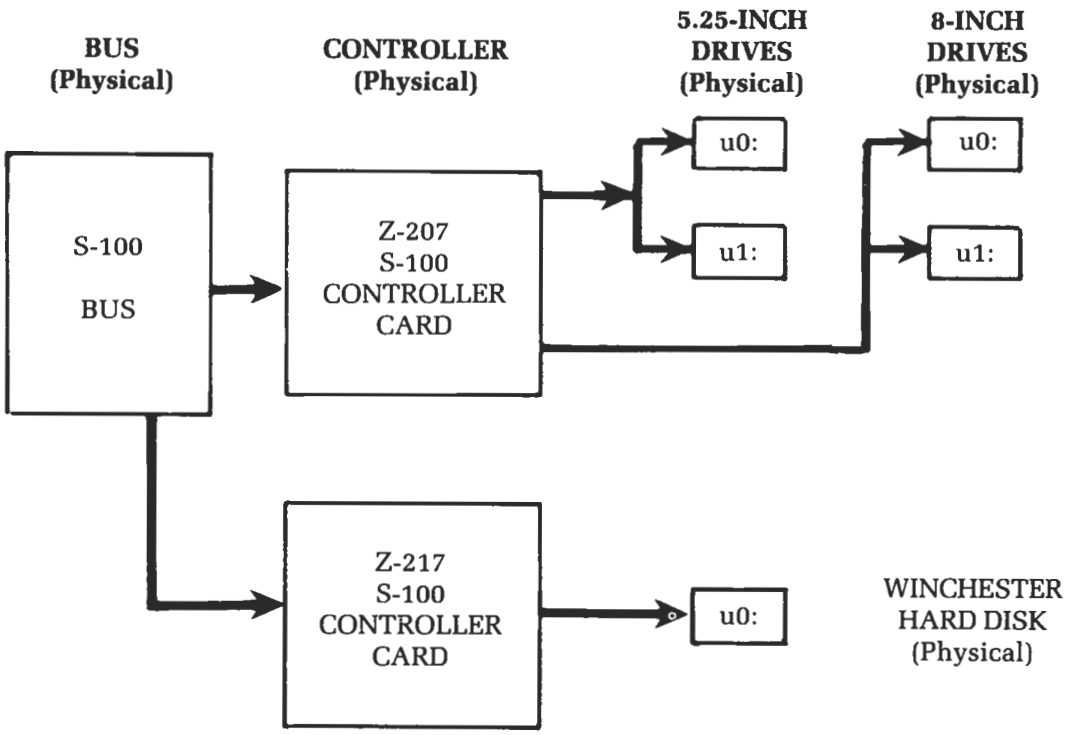

Figure 3-3
Physical Connections from the Hardware Viewpoint

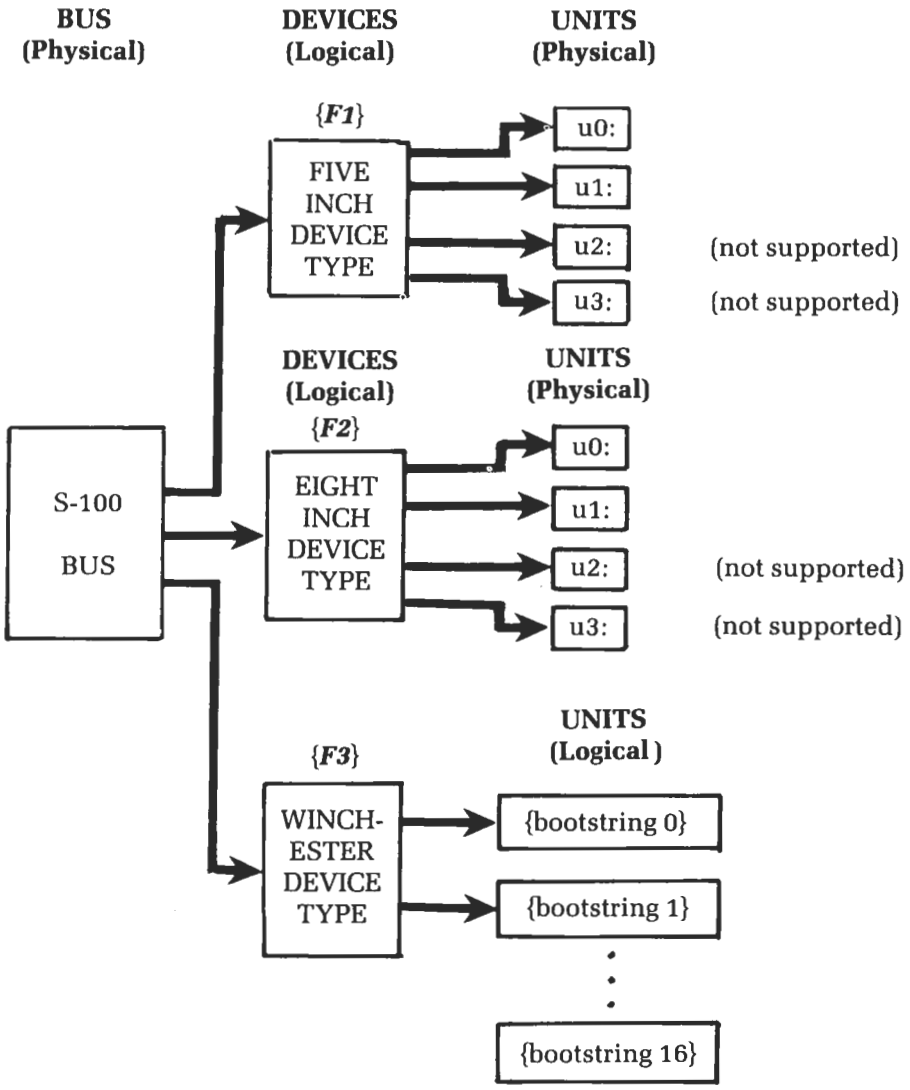

Figure 3-4
Logical Connections from the Bootup Command Viewpoint

The Z-207 controller card is designed to control both 5.25-inch and 8-inch disks. The Z-217-1 controller card is designed to control only Winchester disks. But since 5.25-inch drives, 8-inch drives, and Winchesters are each different device types, you must use different com-

mand entries and/or different switch settings in order to boot up to any particular one of these devices. Your hardware environment could be expanded even further, as shown in Figure 3-5.

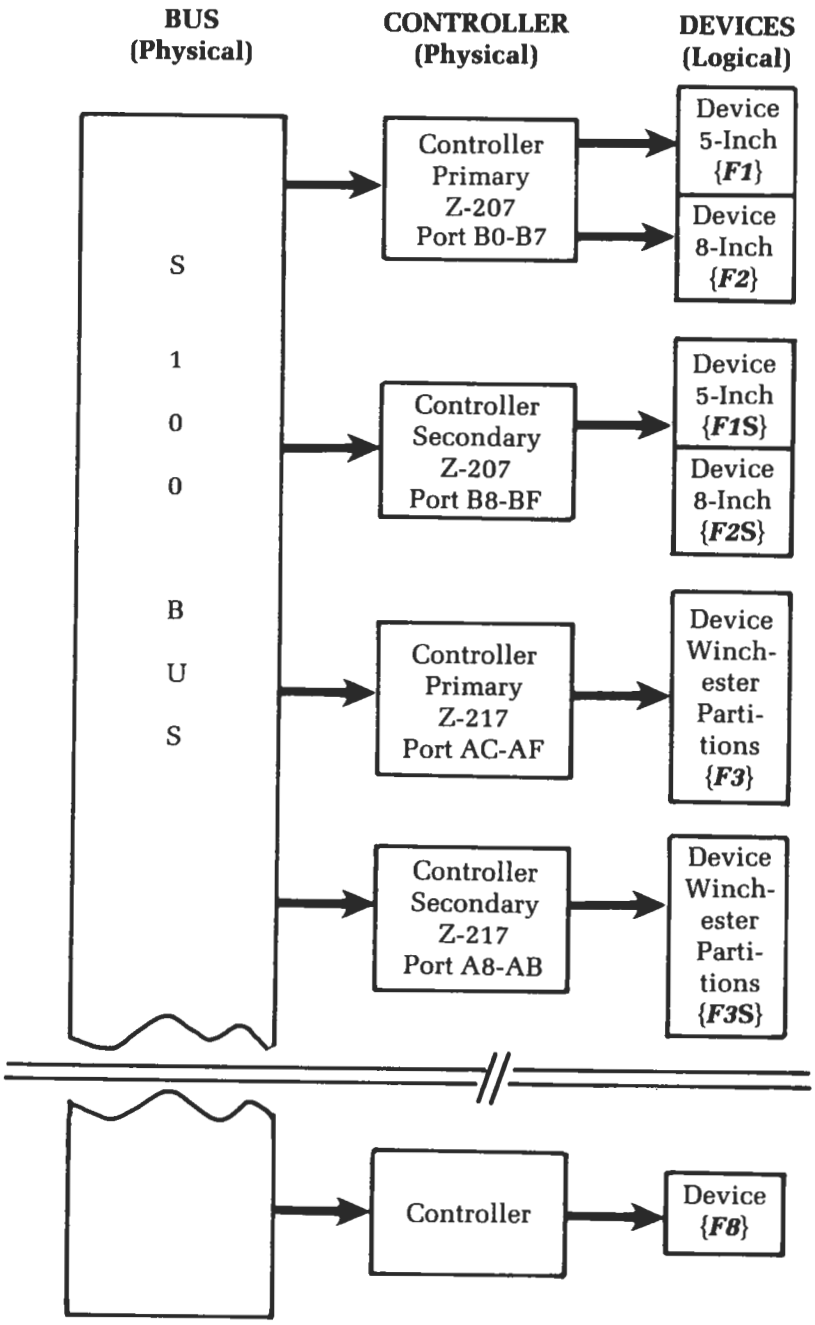

Figure 3-5
Logical Device Extensions With SW-101 DIP Switch

WINCHESTER BOOTUP ERROR MESSAGES

You might encounter the following error messages when trying to boot up to the Winchester disk.

```
Error - Partition not found.  Type RETURN to continue
```

Cause: Either you entered a bootup command without including a bootstring while no default bootstring was established, or you entered a bootup command that included an invalid bootstring.

Cure: Type ***RETURN***. A table listing all valid partitions (by partition name and operating system name) will be displayed. See the explanation in Ambiguous Bootup Command for a complete recovery from this error message.

```
Error -- Unable to read boot code from partition
```

Cause: The boot code on the specified partition is either not present, or it has developed a bad sector.

Cure: Boot up from another drive. Then back up and format the partition from which you were trying to boot up when the error message appeared. If this partition is totally inaccessible, back up all partitions and run PREP again. If this error message occurs after using PREP, contact Zenith Data Systems Technical Consultation for assistance.

```
Error -- Can not read superblock A.
```

Cause: Either the initial checksum of Superblock A does not match the most recent checksum, or the disk has a bad sector where Superblock A is recorded.

Cure: Superblock B will be used automatically, and the bootup operation will resume. However, this error message indicates that only one usable copy of the superblock remains on the disk. Although you could use the disk in this condition, all Winchester disk data will become inaccessible if Superblock B is ever damaged. Therefore, we recommend that you back up all of the files from all partitions and then run PREP if this error message appears.

```
Fatal Error -- Can not read superblock B.
```

Cause: Either the initial checksum of Superblock B does not match the most recent checksum, or the disk has a bad sector where Superblock B is recorded.

Cure: Run PREP again. If this error message occurs after repeating PREP, contact Zenith Data Systems Technical Consultation for assistance.

Section Four

Winchester Disk Software

To enhance the capabilities of your Winchester disk, this version of the CP/M-85 software package includes some new utilities and some modified utilities. These utilities are featured in alphabetical order in this section.

This section contains detailed reference text on the following aspects of these utilities (where applicable):

- Function
- Invocation
- Options
- Common applications
- Error message explanations

The text on each command is divided into numbered sub-sections concerning specific aspects of the utility.

ASSIGN

The Utility that Assigns Winchester Partitions to Drives

The ASSIGN utility enables you to access data from Winchester disk partitions by assigning the partitions to drives, or by changing partition drive assignments. ASSIGN can also identify all of the partitions on a Winchester disk, and identify which of these partitions are currently assigned to a drive name.

1 Winchester Disk Partitions

A partition is an area on the surface of a Winchester disk that performs as though it were a floppy disk drive during most CP/M operations.

The Winchester disk can be divided into as many as 16 partitions to accommodate separate groups of operating systems and files. Two of these partitions can be made accessible at one time, if they contain the same operating system.

Partitions are identified by a partition name that consists of one to 16 characters, and optionally an operation system name that consists of 10 characters.

Although one partition is accessible as soon as you boot up to the Winchester disk, no other partition can be accessed to you until you run the ASSIGN utility to assign the second partition to a drive name.

NOTE: Partitions are established on a Winchester disk by the PREP or PART utilities. Partitions are already established on your Winchester disk when it is shipped from the factory. Therefore, it is only necessary for you to use PREP and/or PART if you wish to change the partitions on your Winchester disk. See the "PART" and "PREP" sections of this supplement for more information.

2 Assigning Partition = Inserting Disk

For most CP/M operations, you can think of a Winchester partition as if it were a floppy disk. However, you must also realize that the ASSIGN activity is similar to the fundamental activity of inserting a floppy disk into a drive.

You must **insert** a floppy disk into a drive before its data can be accessed. Likewise, you must **assign** a partition to a drive before its data can be accessed (unless you booted up to the partition).

3 Inquiry of Available Partitions

To find out the names of **all** of the partitions on the Winchester disk, enter the following command:

A>**ASSIGN ?** ***RETURN***

ASSIGN will respond with a display in the following form:

```
PARTITION NAME          OS NAME        SIZE
--------------          ----------     ------
CPM-BUSINESS            ;CPM           3200k
CPM-WORDPROC            ;CPM           2860k
CPM-PROGRAMS            ;CPM           2020k
Z-DOS1                  ;Z-DOS         1600k
```

Where the characters listed beneath "PARTITION NAME" are the partition names that were designated for each partition when the PART or PREP utility was run;

where the characters listed beneath "OS NAME" are the operating system names that were designated for each partition when the PART or PREP utility was run; and

where the numbers listed beneath "SIZE" show the total capacity (in kilobytes) of the partition named to the left. This capacity includes usable file space and space that might be occupied by an operating system or by bad sectors. (To determine the amount of usable file space that is free on a partition for future files, use ASSIGN to assign that partition to a drive and run the STAT utility.)

NOTE: The partitions listed in this display may or may not be assigned.

4 Inquiry of Current Assignments

To find out the names of the partitions on the Winchester disk that are currently accessible through a drive name, enter the following command:

A>**ASSIGN** ***RETURN***

The ASSIGN utility will display equations to indicate which drive names can be used to access which partition names, as in the following example:

```
A: = CPM-WORDPROC;CPM
B: = Z-DOS1;Z-DOS
```

When you boot up to a Winchester Disk partition, that partition is automatically assigned to drive A, and a different partition can be assigned to drive B using the ASSIGN utility.

5 Assigning Partitions to Drive Names

To assign a partition to a drive, enter a command in the following form:

A>**ASSIGN {d}:={partition name};{system name}** ***RETURN***

Where **{d}** is the letter for the drive to which you wish to assign the partition;

where **{partition name}** is the partition name of the established partition you wish to assign. Partition names contain 1-16 ASCII characters excluding the semicolon, space, tab. This entry is mandatory in a drive partition assignment command;

where ; is a semicolon that must used as a separation character only when you also specify a system name; and

where **{system name}** is the operating system name of the established partition you wish to assign. Operating system names contain 1-10 ASCII characters excluding the semicolon, space, tab. The operating system name is an optional entry. You only need to specify

it if the specified {partition name} matches that of another partition on the disk.

NOTE: The {**partition name**} and {**system name**} are both components of the "bootstring", which must sometimes be specified in bootup commands.

For example, you can assign the partition named "CPM-PROGRAMS;CPM" to drive B with the following command:

A>**ASSIGN B:=CPM-PROGRAMS;CPM** ***RETURN***

Furthermore, if you have only one partition on the disk with the partition name "CPM-PROGRAMS", you can omit specification of the operating system name in the command, as shown:

A>**ASSIGN B:=CPM-PROGRAMS** ***RETURN***

6 Valid Assignment Commands

A maximum of two Winchester disk partitions can be assigned to drive names at one time, regardless of how many partitions have been established on the disk.

The drives to which you can assign a partition vary, depending upon the type of media you used to boot up and the types of drives you have in your hardware environment. The following table shows which forms of partition assignment commands you can enter depending upon your bootup media and upon any other kind of disk drive you might have. (The command forms indicated in this table use the variable {**partition name**};{**system name**} to represent the partition you wish to assign.)

Bootup Media	Additional Drives	Valid Assignment Commands
5.25-inch floppy disk	with any 8-inch floppy drives	A>**ASSIGN E:={partition name};{system name}** ***RETURN*** A>**ASSIGN F:={partition name};{system name}** ***RETURN***
5.25-inch floppy disk	with no 8-inch floppy drives	A>**ASSIGN C:={partition name};{system name}** ***RETURN*** A>**ASSIGN D:={partition name};{system name}** ***RETURN***
8-inch floppy disk	with any 5.25-inch floppy drives	A>**ASSIGN E:={partition name};{system name}** ***RETURN*** A>**ASSIGN F:={partition name};{system name}** ***RETURN***
8-inch floppy disk	with no 5.25-inch floppy drives	A>**ASSIGN C:={partition name};{system name}** ***RETURN*** A>**ASSIGN D:={partition name};{system name}** ***RETURN***
Winchester partition	not applicable	* A>**ASSIGN A:={partition name};{system name}** ***RETURN*** A>**ASSIGN B:={partition name};{system name}** ***RETURN***

* When you boot up with a Winchester partition that contains the CP/M-85 Operating System, this partition is automatically assigned to drive A.

7 ASSIGN Error Messages

BAD PARTITION NAME

EXPLANATION: User tried to assign a valid drive name to an invalid partition name, or user made syntax error during command entry. User must perform cold boot, and re-enter any assignments made.

BAD DRIVE NAME

EXPLANATION: User tried to assign a drive name other than A or B to a Winchester disk partition. Assignment commands must be re-entered.

PARTITION ALREADY IN USE

EXPLANATION: User tried to assign a new drive name to a partition name that already has an assigned drive name. The assignment of the partition's currently assigned partition must be removed before a new drive name can be assigned to the partition.

BAD OS NAME

EXPLANATION: User tried to assign a partition name with an invalid operating system name to a valid drive name. This assignment should be attempted again with an operating system name that helps to identify an existing partition.

INCORRECT VERSION OF BIOS

EXPLANATION: The operating system being used will not accommodate Winchester disk partitions, or the system's version number does not match ASSIGN's version number.

DISK READ ERROR

EXPLANATION: The operating system failed in an attempt to read from the Reserved Winchester Area (see text on PREP). Use the VERIFY utility. If this error message occurs again, contact Zenith Data Systems Technical Consultation for assistance.

BACKUP

The Utility that Facilitates File Copying from Working Disks and/or Partitions to Backup Storage Media

The BACKUP utility makes it more convenient for you to copy files from a disk or partition, because it makes more efficient use of disk space when transferring copies, and because it allows options not available through other file copying utilities.

BACKUP is especially beneficial to Winchester disk users, because so many files are involved in daily backup procedures from Winchester disk partitions. However it is possible to BACKUP files to or from either partitions or floppy disks. Therefore, this text refers to source or destination recording media as "partition/disk" or "disk/partition" wherever it would be practical for you to use either type of media.

BACKUP's function is complementary to the function of the RESTORE utility, which can return backed up files to their original media.

NOTE: The disks that receive backed up files in a BACKUP operation must be formatted. Therefore, before using BACKUP, you should determine how many disks will be necessary to receive the backed up files. (The STAT utility can be useful in determining the size of the files you wish to back up.) Then you must use the FORMAT utility to prepare each of the necessary disks.

1 BACKUP Operation

When the BACKUP utility copies files from a source partition/disk, it temporarily concatenates them to be stored as a single "backup file" on the destination media. Thus the backup file is a long, continuous string of data including individual files that are joined by BACKUP and separated by RESTORE. The backup file also contains a directory that lists all of the individual files in the exact sequence they were copied.

However, the backup file might be much larger than the capacity of your destination media. For instance, if the source in a BACKUP operation is a large Winchester disk partition and the destination is a 5.25-inch floppy disk drive, then the backup file will likely overflow the capacity of a single floppy disk.

Therefore BACKUP is capable of storing parts of the backup file on more than one disk. BACKUP accomplishes this multi-disk storage feat by recording up to the absolute capacity of the distribution media, prompting you to insert another disk, and then continuing to copy from where it left off. With this capability, BACKUP can even divide an individual file within the backup file between two or more disks.

The backup file's directory keeps track of the number of disks that were necessary to receive the entire backup file. In this directory, each of the disks used is numbered as a "volume".

The disk volumes used to receive the backup file are collectively called the "backup disk set".

The BACKUP and RESTORE utilities also enable you to view several statistics, such as the names of the files within a backup file, by entering special command line options.

NOTE: If you are performing a BACKUP operation from a floppy disk to a Winchester disk, the "backup disk set" can consist of only one partition. You will not be able to back up files to more than one partition during this operation — even if more than one formatted CP/M partition is already assigned to a drive name. Therefore, if you wish to back up files to a Winchester disk partition, you should make certain that this partition has enough free space to accommodate all of the backup files. Use the STAT utility to determine the size of the files to be backed up and the amount of free space on the partition.

2 Invoking BACKUP

You can use the BACKUP utility through either of the following methods: the Utility Prompt Method and the System Prompt Method. Both methods enable you to use optional switches that provide more control of what is backed up.

2.1 UTILITY PROMPT METHOD

With this BACKUP method, you invoke the BACKUP utility from a disk by entering the command function at the system prompt, and then entering the command argument at a prompt displayed by the BACKUP utility. The first entry under this method is in the following form:

A>**BACKUP** ***RETURN***

After an entry in this form, BACKUP will display a message and prompt in the following form:

```
          BACKUP Version x.xx
Copyright (C) 1982 Zenith Data Systems
>>
```

NOTE: The version number of the BACKUP utility (shown in this example as "x.xx") might vary.

At the >> BACKUP prompt, you should enter a command line argument in the following form:

>>**{d}:{destfile}={s}:{sorcfile},{s}:{sorcfile},... [{x};{x};...]** ***RETURN***

Where >> is the BACKUP utility prompt;
where **{d}** is the optional name of the drive that is to receive the copies being transferred. This specification is necessary only if this destination drive is not also the default drive;
where **{destfile}** is the primary name of the backup file, which you wish to contain all of the individual files copied in this operation;
where **{s}** is the optional name of the drive from which files are being copied. This specification is necessary only if this source drive is not also the default drive;
where **{sorcfile}** is the complete name of each file, separated by commas, that you wish to back up from the source partition/disk. You can enter wild card file names (using the * and ? characters); and
where **{x}** is any of the optional single letter options, separated by semicolons, that structure the BACKUP operation.

NOTE: A space is allowed, but not necessary, between the source file specifications and the options.

When BACKUP has completed the specified operation, it will redisplay the >> BACKUP prompt. You can continue entering command line arguments at BACKUP prompts indefinitely.

The BACKUP utility will display the names of each file that it copies in a vertical list, during the BACKUP operation.

When you wish to exit from the BACKUP utility to the CP/M system, press the RETURN at a BACKUP prompt. Then CP/M will display the A> system prompt.

NOTE: Like all command lines entered through the CP/M system, the BACKUP command line can contain only 127 characters. If your command line is between 78 and 127 characters in length, you can keep the entire line visible on your video screen by entering ***CTRL-E*** after the 79th character.

2.2 SYSTEM PROMPT METHOD

With this BACKUP method, you enter the command line function and the command line argument both at the system prompt, in the following form:

A>**BACKUP {d}:{destfile}={s}:{sorcfile},{s}:{sorcfile},... [{x};{x};...]** ***RETURN***

Where **BACKUP** is the command line function, stored in the file BACKUP.COM on the default or logged partition/drive;

where {**d**} is the optional name of the drive that is to receive the copies being transferred. This specification is necessary only if this destination drive is not also the default drive;

where {**destfile**} is the primary name of the backup file, which you wish to contain all of the individual files copied in this operation;

where {**s**} is the optional name of the drive from which files are being copied. This specification is necessary only if this source drive is not also the default drive;

where {**sorcfile**} is the complete name of each file, separated by commas, that you wish to back up from the source partition/disk. You can enter wild card file names (using the * and ? characters); and
where {**x**} is any of the optional single letter options, separated by semicolons, that structure the BACKUP operation.

NOTE: A space must be entered between the BACKUP command line function and the drive and/or file name specifications. A space is allowed, but not necessary, between the source file specifications and the options.

The BACKUP utility will display the names of each file that it copies in a vertical list, during the BACKUP operation.

After BACKUP has completed the specified operation, CP/M will display the A> system prompt.

NOTE: Like all command lines entered through the CP/M system, the BACKUP command line can contain only 127 characters. If your command line is between 78 and 127 characters in length, you can keep the entire line visible on your video screen by entering ***CTRL-E*** after the 78th character.

2.3 HELP DISPLAY METHOD

With this BACKUP method, you enter the command line function and a ? (question mark) at the system prompt, as shown:

A>**BACKUP ?** ***RETURN***

This command will cause the display of messages that summarize the purpose, command line, and options of the BACKUP utility. The system prompt will appear below the BACKUP display.

This invocation method does not back up files. It is designed to provide you with a convenient quick reference to a few aspects of the BACKUP utility.

3 BACKUP Sources

A BACKUP command line can include one or more sources. When specifying sources, you must always specify a file, and sometimes a drive.

The source files specified in a BACKUP command line should be identified by complete file names, including the primary name (1-8 characters) and the extension (1-3 characters if used).

Whenever a specified source file does not reside on the default drive, a drive name should be specified in front of it. You can back up files from any valid drive during a BACKUP operation.

Wild card, or ambiguous, file names can be specified, using the * or ? wild card characters. (Wild card file names can be particularly useful when you have many files to copy, because a command line can contain a maximum of only 127 characters.)

Any number of source file names can be specified in a command line (as long as the limit of 127 characters per command is not exceeded). However if two or more source file names are specified, they must be separated by commas.

NOTE: The number of source files that can be backed up in a single BACKUP operation is limited by the amount of space on the first disk/partition used to receive the backup volumes. This disk/partition must have enough free space to accommodate the entire backup file directory. The backup file directory is described in "8 Structure of Backup Files".

Source file specification is required in all BACKUP command lines except those entered with the [B] option, for the sole purpose of displaying characteristics of all of the master backup files on disk; or in those entered with the [L] option, for the sole purpose of displaying a list of the individual files within a backup file.

The following source file specification:

.ASC,TEST?,C:*.

would cause copies to be made of all files on the default drive with an .ASC extension; all files on the default drive that are five characters long beginning with TEST and have no extension (such as TEST0, TEST1, TESTS, TESTY, etc.); and all files on drive C.

To further demonstrate the characteristics of source file specifications:

A:DEMO.*,B:SYSTEM.COM,E:82*.DOC,????.DAT

would cause copies to be made of all files on drive A with DEMO as primary name and any extension; the file SYSTEM.COM on drive B; all files on drive E that have a primary name beginning with 82 and that have a .DOC extension; and all files on the default drive that have a four letter (or less) primary name with a .DAT extension.

NOTE: If any of the source files you specify are random files (as opposed to sequential files), these files might contain more records when restored with the RESTORE utility.

4 BACKUP Destination

A BACKUP command line can include only one destination. When specifying this destination, you must always specify the primary name of a file, and sometimes a drive.

The file specified as the destination will ultimately become the backup file that will contain all of the individual files that are copied.

The destination file specified in a BACKUP command line should be identified by a primary file name only (1-8 characters). The extension should not be specified, because BACKUP applied extensions to the backup file automatically. (BACKUP will apply the extension "000" to the first backup file volume, "001" to the second, "002" to the third, etc.)

Wild card file name characters (* or ?) cannot be used to specify a destination file.

Whenever a specified destination file does not reside on the default drive, a drive name should be specified in front of it. You can back up files to any valid drive during a BACKUP operation.

NOTE: However if your destination drive is assigned a partition, you will only be able to create one backup file volume. If the files you wished to backup will not fit on this volume, then you will have to abort the BACKUP operation.

A destination file specification is required in all BACKUP command lines except those entered with the [B] option, for the sole purpose of displaying characteristics of all of the master backup files on the default disk.

Consider an example where the primary file name "C:QUITTIME" is entered as destination in a command line. The ensuing BACKUP operation required that five disks (backup file volumes) be inserted into drive C to accomodate all of the source files.

The resulting set of destination disks (backup file volumes) would contain the following backup files:

QUITTIME.000
QUITTIME.001
QUITTIME.002
QUITTIME.003
QUITTIME.004

The file "QUITTIME.000" would be the master backup file volume, which contains the backup file directory.

5 BACKUP Options

The BACKUP utility enables you to structure any backup operation by specifying the following options in a command line:

B Backup directory — displays a directory listing statistics about all master backup files.

D Date stamping — applies today's date to the directory of individual files within a backup file.

E Exception files — exclude exception files from backup operation

L List directory — list the directory of the backup files

Q Query each — query yes or no on each file before backing up

S System files — include system files in the backup

U User number — backup files from specified user area(s) in addition to the current user area

V Verify — verify the file after backup operation

Switches are always the last items specified in a BACKUP command line. They must be enclosed within square brackets, and separated by semicolons when more than one is used.

If a switch requires specification of files, then the option letter should be separated from these file specifications by a colon. When more than one file specification is necessary within a single option, then the file specifications should be separated by commas.

Options are entered in the following form:

[{x};{x}:{details},{details},{details};{x};...]

Where {**x**} is an option letter;
where {**details**} are additional character strings (such as the date, file names, or user numbers) that must be specified with some options;
where the **[ ]** square brackets must enclose the options;
where the **;** (semicolon) must separate multiple options;
where the **,** (comma) must separate the file names and/or user numbers used with some options; and
where the **:** (colon) must separate some option letters from accompanying {details}.

5.1 B BACKUP DIRECTORY

The B option causes a directory display listing statistics about all of the master backup files (those backup files with the "000" extension) on a specified disk.

This directory lists the primary name of each master backup file, the number of volumes in the backup set that begins with each master, the number of files in each set of backup files, and the date of each backup operation.

Only the drive containing the master backup file(s) needs to be known in command lines entered for the sole purpose of producing a B option directory. Therefore, specify this drive in the command line unless it is the default drive.

You can use the B option in commands of the following form:

A>**BACKUP {d}: [B]** ***RETURN***

Where **BACKUP** is the command line function, stored in the file BACKUP.COM on the default or logged partition/drive;
where {**d**} is the optional name of the drive that has received the copied files, and stored them within backup file volumes. This specification is necessary only if this destination drive is not also the default drive; and
where **[B]** is the single letter option that causes the display of master backup file features.

The B option may be used with both methods of invoking backup. For example, from the CP/M system prompt:

A>**BACKUP C: [B]** ***RETURN***

or the same operation from the BACKUP utility prompt:

>>**C: [B]** ***RETURN***

The B directory listing would appear in the following form:

Name	Volumes	Files	Date
QUITTIME	3	117	4-27-83
SAVEME	1	48	10-24-82
STORAGE	5	231	2-30-84

5.2 D DATE STAMPING

The date option enables you to specify the date for this BACKUP operation within the command line, without having to answer a date prompt. This date will appear in the displays caused by the B option. Specify the date option and date string in either of the following forms:

[D:{mm}-{dd}-{yy}]

[D:{mm}/{dd}/{yy}]

Where {**mm**} is a one- or two-digit entry for the month, within the range 1-12;
where {**dd**} is a one- or two-digit entry for the day of the month, within the range 1-31;
where {**yy**} is a one- to four-digit entry for the year, within the range 0-9999; and
where either - (hyphens) or / (slashes) can be used to separate month from day and day from year, although - (hyphen) will always appear in the dates of the display produced by the [B] option.

If you do not specify the D option, then BACKUP will prompt you to specify the date during each BACKUP session in which you specify both source and destination.

If you do specify the D option in a command in which both source and destination are specified, BACKUP should begin to copy individual files, displaying the drive name, file name, and user area number of each individual file as it is copied, in the following form:

```
E:FILENAM1.EXT from user 9
E:FILENAM2.EXT from user 9
E:FILENAM3.EXT from user 9
          .
          .
          .
E:FILENAMn.EXT from user 9
```

5.3 E EXCEPTION FILES

The backup operation takes place for all of the files except that file given as an exception file. The file listed with the E option is then ignored during the operation. The E option is entered in the following form:

[E:{filespec},{filespec}]

Where **E** is the option;
where **{filespec}** represents files that are to be excluded from the operation. If a file being excluded does not reside on the default drive, then you must also specify the name of the drive that contains it. Ambiguous file names (with * or ? wild card characters) can be specified; and
where the , (comma) and : (colon) are required separation characters.

For example:

A>BACKUP BACK1=*.DAT [E:TEMPFILE.DAT] ***RETURN***

would backup all files from the default drive that have a .DAT extension — except the file named TEMPFILE.DAT, which would be omitted.

5.4 L LIST DIRECTORY

The L option causes BACKUP to give the internal directory of files that are contained within a specified backup file. The directory information would list the volume number at which each individual file starts and ends, the user from which each individual file came, and the amount of disk space occupied by each file.

The L option is used for commands in the following form:

A>**BACKUP {d}:{destfile} [L]** ***RETURN***

Where **BACKUP** is the command line function, stored in the file BACKUP.COM on the default or logged partition/drive;
where {**d**} is the optional name of the drive that has received the copies being transferred. This specification is necessary only if the destination drive is not also the default drive;
where {**destfile**} is the primary name of the backup file, which you wish to contain all of the individual files copied in this opeation; and
where **[L]** is the single letter option that causes the display of backup file directory features.

The L option may be used with both methods of invoking backup. For example, from the CP/M system prompt:

A>**BACKUP BACK9 [L]** ***RETURN***

or the same operation from the BACKUP utilty prompt:

>>**BACK9 [L]** ***RETURN***

The L directory listing will appear in the following form:

Filename	User	Start Volume	End Volume	Size in Kilobytes
INDIVID1.DAT	0	1	1	3264
INDIVID2.DAT	0	1	1	19582
INDIVID1.DOC	15	2	3	7236
INDIVID2.DOC	15	3	3	22230

4 file(s) on 3 volume(s)

5.5 Q QUERY EACH

When the Q option is used, you are queried before each file is backed up, by a prompt in the following form:

```
Backup {x}:{sorcfile} from user {n} (Y/N) ?
```

Where "{x}" is the drive containing a source file that you specified for this operation; and
where "{sorcfile}" is a source file that you specified for this operation.
where "{n}" is the number (0–15) of the user area from which the source file could be backed up.

A prompt in this form is displayed for each file BACKUP encounters that matches the source specifications you entered.

For example, if the current user area is 0 and three .DOC files exist on source disk B in user area 0, and if the command to BACKUP was:

```
A>BACKUP C:BACK1=B:*.DOC [Q] RETURN
```

then BACKUP would ask:

```
Backup B:FILE1.DOC from user 0 (Y/N) ?
```

After you respond it would ask,

```
Backup B:FILE2.DOC from user 0 (Y/N) ?
```

and finally,

```
Backup B:FILE3.DOC from user 0 (Y/N) ?
```

In response to such a prompt, press **Y** or **y** to cause the file to be backed up. Press **N** or **n** to prevent the file from being backed up.

5.6 S SYSTEM FILES

The S option allows BACKUP to backup files that have been set in the directory (by the STAT utility) as system files. System files will not be backed up merely because of this option, but only if this option is used in a command line where system files are specified as sources.

When the S option is not included in the command line, system files are ignored during the BACKUP operation — even if these files are specified in the command line.

5.7 U USER NUMBER

The U option causes BACKUP to back up only the individual files within the specified user area(s). If you do not include a U option in the BACKUP command, then BACKUP will back up only the individual files from the current user area.

NOTE: CP/M enables you to divide each of your disks and partitions into 16 separate user access areas, numbered 0-15. When you boot up a partition or disk, you are working within user area 0 until you enter a USER command. See the "USER" text in the "Reference Guide" of your CP/M-85 manual for more information on user areas.

Specify the user option in the following form:

[U:n1,n2,...]

Where **U** is the option letter;
where : (colon) must separate the option letter from the user number(s); and
where **n1** stands for the number (0–15) of one of the user areas from which BACKUP will copy individual files. If you specify more than one user area number, separate each with a comma.

You can specify as many as 16 user areas with a single U option. You can specify any user area(s) regardless of the user area currently being used.

5.8 V VERIFY

The V option causes BACKUP to verify all files copied. With V, BACKUP reads each source file after it is copied to make sure that the source and destination copies are identical.

During the operation, BACKUP displays messages in the following form:

```
E:FILENAM1.EXT from user 12
Verifying E:FILENAM1.EXT
E:FILENAM2.EXT from user 12
Verifying E:FILENAM2.EXT
E:FILENAM3.EXT from user 12
Verifying E:FILENAM3.EXT
          .
          .
          .
E:FILENAMn.EXT from user 12
Verifying E:FILENAMn.ext
```

6 Runtime Prompting

After you invoke BACKUP and enter a command to perform some operations, you will be prompted to enter the date and/or to insert various disks.

6.1 DATE PROMPT

Whenever you enter a BACKUP command in which both source and destination are specified and the D option is not specified, BACKUP will prompt you to enter today's date, so that the backup file directory can show the date on which the operation took place. (If you do not specify both destination and source in the command line, or if you do specify the D option, then no date prompt will appear.)

This date will appear after you have entered a command line, and it will appear in the following form:

```
Enter today's date:
```

You should respond to this prompt with an entry in the following form:

```
Enter today's date: {mm}-{dd}-{yy} RETURN
```

Where {**mm**} is a one- or two-digit entry for the month, within the range 1-12;
where {**dd**} is a one- or two-digit entry for the day of the month, within the range 1-31;
where {**yy**} is a one- to four-digit entry for the year, within the range 0-9999; and
where either - (hyphens) or / (slashes) can be used to separate month from day and day from year, although - (hyphen) will always appear in the dates of the display produced by the [B] option.

NOTE: If you enter BACKUP commands through the utility prompt method, you will be prompted to enter the date only once during the BACKUP session. The date that you enter at the prompt (displayed after the first command you enter with both source and destination) will be applied to any backup file copied until you exit from BACKUP.

After you have specified a date, BACKUP should begin to copy individual files, displaying the drive name and file name of each individual file as it is copied, in the following form:

```
E:FILENAM1.EXT from user 9
E:FILENAM2.EXT from user 9
E:FILENAM3.EXT from user 9
```

6.2 DISK INSERTION PROMPT

If a BACKUP operation requires more than one backup disk to accommodate all of the source files, then you will be prompted to insert formatted disks each time a previously inserted disk becomes full. BACKUP will keep track of the number and sequence of the disks you insert, and designate a "Volume" number for each disk in the set.

NOTE: If you are performing a BACKUP operation from a floppy disk to a Winchester disk partition, the Backup Disk Set can consist of only one partition. You will not be able to back up files to any other partition during this operation — even if another assigned formatted CP/M partition exists on the Winchester disk. Therefore, if you wish to back up files to a Winchester disk partition, you should make certain that this partition has enough free space to accommodate all of the backup files. Use the ASSIGN and STAT utilities beforehand to determine file size and free partition space.

When BACKUP has filled a backup disk to capacity, it will display a message in the following form:

```
Insert another disk in drive x for backup,
and hit RETURN when ready,
or hit any other key to abort.
```

Where "drive x" identifies the destination drive you specified in the BACKUP command.

If you are ready to continue the operation, insert a disk that has been formatted by the CP/M-85 FORMAT utility. This disk can also contain other files. Then you should close the drive latch and press the ***RETURN*** key.

If you do not wish to continue the operation, or if your destination media is a Winchester disk partition, then press some key other than the ***RETURN*** key. The BACKUP operation will end, and a prompt will appear. (The BACKUP utility prompt will appear if you had invoked BACKUP by the utility prompt method. The CP/M system prompt will appear if you had invoked BACKUP by the system prompt method.)

NOTE: If you are backing up to one or more floppy disks, then you can use disks that have been formatted with either Version 2.2.100 FORMAT or Version 2.2.101 FORMAT.

6.3 MASTER DISK INSERTION PROMPT

The first disk in the backup set is known as "volume one", or the "master volume" of the backup file. This disk contains a file with the primary name that was specified in the command line as the destination, and with the extension "000".

As the specified source files for a BACKUP operation are being backed up, BACKUP accumulates a list of statistics, such as the names of the individual files it backs up and the number of volumes required.

After all of the files have been copied, BACKUP will try to record this list in the directory at the beginning of the master disk. If the operation required more than one backup volume, then BACKUP will prompt you to reinsert the master disk of the backup set.

The prompt that requests reinsertion of the master disk volume appears in the following form:

```
Insert backup master volume 1,  {destfile}.000,  in drive {x},
hit RETURN when ready.
```

Where "{destfile}" is the primary file name you specified for the destination file; and

where "{x}" identifies the destination drive you specified in the BACKUP command.

In response to a prompt in this form, you should insert the master volume disk (the disk that was first inserted in the destination drive during this BACKUP operation). Then you should close the drive latch and press the ***RETURN*** key.

BACKUP will then try to record statistics about the BACKUP operation in the master backup file directory.

If BACKUP finds the master backup file on the disk you just inserted, it will record the statistics in the directory, and a prompt (utility prompt or system prompt) will appear to signal the end of this BACKUP operation.

If BACKUP cannot find the master backup file on the disk you just inserted, it will display a message in the following form:

```
Can not open master backup file, {destfile}.000,
insert another disk in drive {x},
and hit RETURN when ready,
or hit any other key to abort.
```

Where "{destfile}" is the primary file name you specified for the destination file. (The copy of this file with the "000" extension is called the master backup file.); and

where "{x}" identifies the destination drive you specified in the BACKUP command.

If you wish to complete the operation and can obtain the disk that contains the master backup file (which has the primary name displayed as {destfile} and the "000" extension), then insert this disk in the specified drive, close the drive latch, and press ***RETURN***.

If you do not wish to continue the operation or cannot obtain the disk that contains the master backup file, then press any key other than ***RETURN***. The BACKUP operation will end and a prompt (utility or system prompt) will appear.

7 Preparing BACKUP Routines

If you create backups on a regular basis, BACKUP can come in very handy. BACKUP was designed specially so that you would be able to store the BACKUP command lines that you enter on a regular basis, so that they can be entered automatically, with far less typing.

To store BACKUP commands for automatic execution, you will need a text editor or word processor and the SUBMIT utility.

The text editor or word processor will enable you to prefabricate and store commonly entered BACKUP command lines in a disk file. The SUBMIT utility will enable you to type a short, simple command line that causes automatic execution of all the stored BACKUP commands.

This text explains a few BACKUP routines geared toward users of some popular application software products supplied by Zenith Data Systems. The text on each routine shows you how to prepare the routine by explaining the following essential facts:

- The type of user who would probably benefit from using the routine
- The names of the drives in which you should store particular files during the routine
- The form of the file you should create (with your text editor or word processor) to store commonly entered BACKUP command lines
- The form of the SUBMIT command you should type each time you wish to use the routine

NOTE: To successfully prepare a BACKUP routine, you should understand the operation of the SUBMIT utility. For information on SUBMIT, refer to the "SUBMIT" text in the "Reference Guide" of your CP/M-85 manual.

GENERAL PURPOSE BACKUP ROUTINE

This routine can be helpful for anyone who wants to backup an entire partition regularly. Steps 1 through 3 can be considered preparation steps, that you need to perform only once. Steps 4 through 6 should be performed every time you conduct the routine.

1. Using a text editor or word processor, open a text file under the name **GNBACKUP.SUB**.

2. Into this file, enter the following command line:

   BACKUP $1:GENBACK=$2:*.* [D:$3-$4-$5;V] ***RETURN***

3. Close the text file GNBACKUP.SUB

4. Use the PIP utility to copy the text file GNBACKUP.SUB and the utility file SUBMIT.COM to drive A, if they are not there already.

5. When you are ready to perform the BACKUP routine, type **A:** ***RETURN*** to make drive A the default drive.

6. Type a command in the following form:

A>**SUBMIT GNBACKUP {floppy} {partition} {mm} {dd} {yy}** ***RETURN***

Where {**floppy**} is the drive letter of the floppy disk drive to which you wish to back up your files;
where {**partition**} is the drive letter of the Winchester disk partition from which you wish to backup your files;
where {**mm**} is a one- or two-digit entry for the current month, within the range 1-12;
where {**dd**} is a one- or two-digit entry for today's date, within the range 1-31; and
where {**yy**} is a one- to four-digit entry for the current year, within the range 0-9999.

For example, if today is February 30, 1984, and you wish to back-up files from the drive A partition to the drive C floppy disk, then you should type the following command:

A>**SUBMIT GNBACKUP C A 2 30 84** ***RETURN***

BACKUP will back up all files from the partition into a backup file with the primary name "GENBACK".

SUPERCALC™ BACKUP ROUTINE

This routine can be helpful to users of the SuperCalc spread sheet program who wish to regularly backup all SuperCalc data files from a Winchester disk partition. Steps 1 through 3 can be considered preparation steps, that you need to perform only once. Steps 4 through 6 should be performed every time you conduct the routine.

1. Using a text editor or word processor, open a text file under the name **SCBACKUP.SUB**.

2. Into this file, enter the following command line:

   BACKUP $1:SCBACK=$2:*.CAL [D:$3-$4-$5;V] ***RETURN***

3. Close the text file SCBACKUP.SUB

4. Use the PIP utility to copy the text file SCBACKUP.SUB and the utility file SUBMIT.COM to drive A, if they are not there already.

5. When you are ready to perform the BACKUP routine, type **A:** ***RETURN*** to make drive A the default drive.

™ SuperCalc is a trademark of Sorcim Corporation.

6. Type a command in the following form:

A>**SUBMIT SCBACKUP {floppy} {partition} {mm} {dd} {yy}** ***RETURN***

Where {**floppy**} is the drive letter of the floppy disk drive to which you wish to back up your files;
where {**partition**} is the drive letter of the Winchester disk partition from which you wish to backup your files;
where {**mm**} is a one- or two-digit entry for the current month, within the range 1-12;
where {**dd**} is a one- or two-digit entry for today's date, within the range 1-31; and
where {**yy**} is a one- to four-digit entry for the current year, within the range 0-9999.

For example, if today is February 30, 1984, and you wish to back-up files from the drive A partition to the drive C floppy disk, then you should type the following command:

A>**SUBMIT SCBACKUP C A 2 30 84** ***RETURN***

BACKUP will back up all SuperCalc data files from the partition into a backup file with the primary name "SCBACK".

WORDSTAR™ BACKUP ROUTINE

This routine can be helpful to users of the WordStar word processor who wish to regularly backup all WordStar text files that have the same file name extension. Steps 1 through 3 can be considered preparation steps, that you need to perform only once. Steps 4 through 6 should be performed every time you conduct the routine.

1. Using WordStar's non-document editing mode, open a text file under the name **WSBACKUP.SUB**.

2. Into this file, enter the following command line:

BACKUP $1:WSBACK=$2:*.$3 [D:$4-$5-$6;V] ***RETURN***

™ WordStar is a trademark of MicroPro International Corporation.

3. Save the text file WSBACKUP.SUB.

4. Use the PIP utility to copy the text file WSBACKUP.SUB and the utility file SUBMIT.COM to drive A, if they are not there already.

5. When you are ready to perform the BACKUP routine, type **A:** ***RETURN*** to make drive A the default drive.

6. Type a command in the following form:

A>**SUBMIT WSBACKUP {floppy} {partition} {ext} {mm} {dd} {yy}** ***RETURN***

Where {**floppy**} is the drive letter of the floppy disk drive to which you wish to back up your files;
where {**partition**} is the drive letter of the Winchester disk partition from which you wish to backup your files;
where {**ext**} is the one- to three-letter file name extension of the text files you wish to back up;
where {**mm**} is a one- or two-digit entry for the current month, within the range 1-12;
where {**dd**} is a one- or two-digit entry for today's date, within the range 1-31; and
where {**yy**} is a one- to four-digit entry for the current year, within the range 0-9999.

For example, if today is February 30, 1984, and you wish to back-up files with the "DOC" extension from the drive A partition to the drive C floppy disk, then you should type the following command:

A>**SUBMIT WSBACKUP C A DOC 2 30 84** ***RETURN***

BACKUP will back up all WordStar text files with the specified file name extension from the partition into a backup file with the primary name "WSBACK".

8 Structure of Backup Files

The BACKUP utility backs up several source files into a single backup file. This backup file contains all of the files that were copied, in the order they were specified. At the beginning of the backup file is a directory of the copied files. The BACKUP utility maintains this directory to show the names of the files within the backup file, so that the RESTORE utility, when used, will be able to copy the files to other media.

At the beginning of the backup file directory is an entry for the backup file itself. This backup file directory entry is a sequence of bytes that are stored in the following form:

Purpose of bytes	ID	File Control Block (FCB)	R	quantity of copied files	date of backup	R	release number	version number	R
Quantity of bytes	1	32	4	2	2	7	1	1	14 = 64 bytes

Where "ID" is a byte that is set to one to distinguish this master backup directory entry from normal file directory entries;

where "File Control Block (FCB)" is a set of bytes that describe the drive name, primary file name, file name extension, and other characteristics used by CP/M to store files;

where "R" stands for reserved bytes that are not used for any particular purpose in this version of the software;

where "quantity of copied files" is the number of individual files stored within the backup file;

where "date of backup" is the date that the user entered in response to a prompt during the BACKUP operation; and

where "release number" and "version number" are included to insure that this software will be used only with compatible releases and versions of BACKUP and RESTORE.

NOTE: The file name extension in the "File Control Block (FCB)" of the backup file directory entry is the file name extension of the last volume of the backup disk set — and not necessarily the extension of the volume that contains the directory. Thus you can determine how many volumes were used to accommodate all of the backed up files by looking at the directory in the first volume. (The first volume is the volume given the extension "000" during the BACKUP operation.)

Immediately following the backup file entry in the backup file directory are several sequences of bytes, each describing attributes of one of the individual files that was copied into the backup file during the BACKUP operation. The bytes of the individual file directory entry are stored in the following form:

Purpose of bytes	ID	File Control Block (FCB)	R	start volume	end volume	start position	end position	file length	U	R	
Quantity of bytes	1	32	4	1	1	2	2	2	1	18	= 64 bytes

Where "ID" indicates the location of this individual file entry amongst the other individual file entries in the directory. If the value of this byte is 2, then the entry describes an individual file within the backup file. If the value of this byte is FF, then the entry is a "dummy" entry that merely signals the end of the backup file, and does not describe an individual file;

where "File Control Block (FCB)" is a set of bytes that describe the drive name, primary file name, file name extension, and other characteristics used by CP/M to store files;

where "R" stands for reserved bytes that are not used for any particular purpose in this version of the software;

where "start volume" indicates the number of the first backup file volume used to accommodate this individual file;

where "end volume" indicates the number of the last backup file volume used to accommodate this individual file;

where "start position" is the number of 128-byte records between the beginning of the backup file volume and the beginning of this individual file;

where "end position" is the number of 128-byte records between the beginning of the backup file volume and the record following the end of this individual file;
where "file length" is the length of this individual file, as measured in 128-byte records; and
where "U" is the number of the user area from which the file came.

The number of individual source files that can be backed up in a single BACKUP operation is limited by the amount of space on the first disk/partition used to receive the backup volumes. This disk/partition must have enough free space to accommodate the entire backup file directory.

NOTE: If any of the source files you specify are random files (as opposed to sequential files), these files might become larger when restored with the RESTORE utility.

9 BACKUP Error Messages

```
Verify error, try BACKUP again (Y/N)?
```

BACKUP has detected that the copy of a backed up file on destination media is different from the original copy of the file on the source media. This message usually indicates a surface imperfection on the destination media.

Press **Y** if you wish to have BACKUP try to recopy and verify the same individual file, overwriting the bad copy of this file. Then BACKUP will resume displaying the names of the individual files as they are copied and verified, beginning with the file in which the verification error occurred.

Press **N** if you wish BACKUP to skip the file that it just failed to verify, and try to copy and verify the next of the specified source files.

```
Backup filename can not be ambiguous.
```

You specified * or ? wild card characters in the destination file name for the BACKUP operation. Repeat the command specifying the destination with an explicit file name.

```
Cannot open master backup file {filename}.000,
not enough space on disk.
```

The disk/partition specified as the destination media for the backup file {filename} did not have enough free disk space to accommodate the entire backup file directory. Repeat the BACKUP operation specifying a larger partition for the destination (if you are backing up files to the Winchester disk) or inserting a formatted floppy disk with more free space (if you are backing up files to a floppy disk drive).

```
Extension on backup file specified, will be ignored.
```

This occurs whenever you try to assign a backup file an extension, by specifying a full file name for a destination file. If this occurs, BACKUP ignores the extension you specified and uses its standard, sequentially numbered extensions. Program operation will not be disturbed.

```
Can not find master backup file {filename}.000.
```

This message occurs when the /L option is requested for a file from a disk where the master backup {filename}.000, is not present.

```
File {filename}.{ext} is not found.
```

This message occurs whenever a file is specified for BACKUP or RESTORE and that file is not on the disk.

```
Insert another disk in drive {x} for backup,
and hit RETURN when ready,
or hit any other key to abort.
```

The disk just used to receive some of the copied files is now full. Remove this disk from the drive, label it, insert another formatted disk into the destination drive, close the drive latch, and press the ***RETURN*** key.

```
Invalid backup file
```

This message occurs if the backup file specified in a command does not contain valid information. This may occur if the file specified was not a backup file, but had a "000" extension, or if the data in a backup file had degraded (possible due to a bad sector, or inadvertent exposure for the media to an electromagnetic field).

```
Invalid date in option
```

This message occurs if the date given with the D option was not entered in the proper form. If any of the numbers in the date are out of range, if any numbers are separated by invalid characters, or if the D option letter is omitted, then this message will appear.

```
Invalid date
```

This message occurs if the date entered in response to the date prompt does not conform to the proper form for entering dates. If any of the numbers in the date are out of range, or if any numbers are separated by invalid characters, then this message will appear.

```
Invalid drive designation on BACKUP file.
```

This message occurs when a drive name is used that is not in the range of supported drive names (A through F).

```
Invalid exception file specifications.
```

This message will occur if the exception file specified has a syntax error in the specification.

```
Invalid filename.
```

This message appears when a file name is specified that does not conform to CP/M file naming conventions.

```
Invalid selection file specifications.
```

This message is generally caused by a typographical error in the command line. The message results when parameters in the command line appear garbled or incorrectly punctuated.

```
Invalid option [x] specified.
```

This message occurs if BACKUP is unable to recognize the option [x] that was specified in the command.

```
Not enough parameters specified.
```

This message results when the command to BACKUP is not complete enough for BACKUP to carry out the intended operation.

```
Can not open master backup file {filename}.000,
insert another disk in drive x:
and hit RETURN when ready,
or hit any other key to abort.
```

This message occurs if the disk that has been inserted is not volume 1. Insert the correct disk.

```
Can not open backup file {filename}.{nnn},
insert another disk in drive x
and hit RETURN when ready,
or hit any other key to abort.
```

This message occurs when you are asked to insert volume nnn + 1 (which would contain {filename}.{nnn}) and the wrong disk is inserted. Insert the correct disk.

```
Invalid user option
```

This message occurs if the user number specified with the U option is not in the range 0–15 or if a user number was specified with improper syntax.

```
Invalid version of BACKUP for {filename.000}.
```

This message occurs if you have used different versions of the BACKUP, for instance in a command that included the [L] option. When producing a directory of a backup file, use the same version of BACKUP as you used to create the backup file.

```
No files selected.
```

This message occurs if none of the source files you specified in the BACKUP command exist on the default or specified source media.

BSYSGEN

The Utility that Copies the Operating System Between Disks

The BSYSGEN utility is used to transfer either part or all of the CP/M operating system to a disk, depending on the circumstances. Unlike the SYSGEN utility the BSYSGEN utility can **not** be used to copy the system kernel directly from memory to a disk after running a MVCPM2x7 utility, although it can copy a file that was recorded on a disk by the SAVE command after a run of a MVCPM2x7 utility. ("MVCPM2x7" stands for either the MVCPM207 utility or the MVCPM217 utility.)

NOTE: This release of the CP/M Operating System consists of a system kernel and two or three system files. The system files are BIOS85.SYS and BIOS88.SYS, and sometimes ALTCHAR.SYS. To make a disk bootable, you must put the system kernel on the disk's system tracks **and** the BIOS85.SYS and BIOS88.SYS files in the disk's file area. The ALTCHAR.SYS system file will be used by CP/M if it is present on the bootable disk, although it is not necessary to make a disk bootable.

BSYSGEN can be used by two methods: the Utility Prompt Method or the System Prompt Method.

1 Utility Prompt Method

Under the Utility Prompt Method, you first load the BSYSGEN utility into computer memory, and then respond to BSYSGEN prompts that define the operation.

1.1 UTILITY PROMPT COMMAND ENTRY

To begin under the Utility Prompt Method, type the following command at the system prompt:

A>**BSYSGEN** ***RETURN***

The following display will appear:

```
BSYSGEN VER 2.2.101
SOURCE DRIVE NAME :
```

1.2 SPECIFYING THE SOURCE

At the "SOURCE DRIVE NAME :" prompt, you can specify the drive containing the disk from which the system will be copied. Enter the letter that stands for that drive.

The following example shows how you would answer this prompt if the source of the system was to be the disk in drive A:

```
SOURCE DRIVE NAME (OR RETURN TO SKIP): A
```

NOTE: BSYSGEN can only copy the system between disks of the same type. Therefore, you can **not** enter a carriage return at this BSYSGEN prompt to copy a system that has been moved into computer memory by a MVCPM2x7 utility. (If you do wish to copy the system from memory immediately after a MVCPM2x7 activity, use the SYSGEN utility.)

BSYSGEN will now prompt you to confirm your selection of the source drive, with a prompt in the following form:

```
SOURCE ON A, THEN TYPE RETURN:
```

You can confirm your specification of the source drive name by entering a carriage return at this prompt. (You can also abort the BSYSGEN operation and return control to the operating system by entering ***CTRL-C*** at this prompt.)

If you confirm the "SOURCE ON" prompt with a carriage return, BSYSGEN will then display the message:

```
FUNCTION COMPLETE
COPY SYSTEM FILES (Y/N):
```

1.3 COPYING SYSTEM FILES WITH BSYSGEN

To instruct BSYSGEN to copy the files BIOS85.SYS and BIOS88.SYS (and ALTCHAR.SYS if it exists on the source disk) from the source disk to the destination disk, press **Y** at the "COPY SYSTEM FILES (Y/N):" prompt. If you do **not** wish to copy system files, press **N**.

NOTE: If you decline to copy the system files using the BSYSGEN utility, you can copy them using the PIP utility.

If you pressed Y to copy the system files, BSYSGEN will display the "DESTINATION DRIVE NAME (OR RETURN TO REBOOT):" prompt. If you pressed N to forgo the copying of system files, BSYSGEN will also prompt for destination.

1.4 SPECIFYING THE DESTINATION

After you have made an entry at the "COPY SYSTEM FILES" prompt, BSYSGEN will prompt for destination as shown:

```
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

The first time this prompt appears, you should type the drive letter for the disk that you wish to receive the system. For instance, type **B**. BSYSGEN would then display a prompt in the following form:

```
DESTINATION ON B, THEN TYPE RETURN
```

Confirm your destination specification by entering a carriage return at such a prompt.

BSYSGEN will again display the "DESTINATION DRIVE NAME (OR RETURN TO REBOOT):" prompt. This time, you can specify a different drive name, insert a new disk into the former destination drive and specify this drive again as the destination, or enter a carriage return to cause a warm boot. (A warm boot will exit you from the BSYSGEN utility to the CP/M Operating System. Then a system prompt will be displayed.)

2 System Prompt Method

The System Prompt Method, enables you to enter all of the specifications necessary for a BSYSGEN operation in a single command line.

2.1 SYSTEM PROMPT COMMAND ENTRY

System Prompt Method BSYSGEN commands are entered in the following form:

A>**BSYSGEN {destination}={source}{[option,option]}** ***RETURN***

Where **BSYSGEN** is the command line function, stored in the file BSYSGEN.COM on the logged disk;
where {**destination**} is the name of the drive (A, B, C, D, E, or F) containing the formatted disk that you wish to receive the copy of the system;
where {**source**} can be either a drive name, a file name, or both; and
where {**[option,option]**} represents letters enclosed in square brackets **[ ]** and separated by a comma , to specify how the BSYSGEN operation should be conducted.

NOTE: In a CP/M command line "equation", the source is always on the right and the destination is always on the left.

2.2 BSYSGEN DATA SOURCES

The source of the transferred data in a System Prompt Method command can be one of the following types:

- Drive Name, including a letter for a drive within your hardware environment and a colon, as with **A:**, **B:**, **C:**, **D:**, **E:**, and **F:**;

- File Name, which specifies a file that was created and stored by consecutive MVCPM2x7 and SAVE commands, as with **CPM48.SYS** or **CPM64.SYS**; or

- Drive Name and File Name, where the file desired for the system resides on a disk in other than the default drive and the drive name must specify that drive, as with **B:CPM48.SYS** or **C:CPM64.SYS**.

2.3 BSYSGEN OPTIONS AND DEFAULTS

BSYSGEN command lines entered by the System Prompt Method can include the following options (enclosed in square brackets [ ]):

B The BIOS88.SYS and BIOS85.SYS files (and ALTCHAR.SYS if it exists on the source) will be copied from the specified source to the specified destination. If files named BIOS88.SYS, BIOS85.SYS, and ALTCHAR.SYS already exist on the destination disk, they will be overwritten.

N No prompts will be displayed during this operation.

When you enter a BSYSGEN command line with source and destination specifications, and neglect to specify options, BSYSGEN will perform the operation according to these default criteria:

- BIOS88.SYS, BIOS85.SYS, and ALTCHAR.SYS files will **not** be copied (as if the B option was not specified);
- Prompt **will** be displayed to confirm which drive will receive the copy of the system (as if option N was not entered). The BSYSGEN prompt displays in the following form:

```
BSYSGEN VER 2.2.101

DESTINATION ON B, THEN TYPE RETURN
```

2.4 SYSTEM PROMPT METHOD EXAMPLES

A>BSYSGEN B:=A: ***RETURN*** BSYSGEN will copy the system kernel from the disk in drive A to the disk in drive B. The system files from A will **not** be copied and a prompt **will** appear before the copying, by default.

A>**BSYSGEN B:=D:[N]** ***RETURN*** BSYSGEN will copy the system kernel from the disk in drive D to the system tracks of the disk in drive B. The system files will **not** be copied, by default. A prompt will **not** appear before the copying, as specified by the N option.

A>**D:BSYSGEN B:=C:CPM48.SYS[B,N]** ***RETURN*** The BSYSGEN utility, in this case, is stored on the disk in drive D. It will copy the system kernel from the file named "CPM48.SYS" (recorded onto the disk in drive C by the SAVE command after creation in memory by a MVCPM2x7 command), and put it on the system tracks of the disk in drive B. It will also copy the system files from drive C to drive B, and display no prompts during the operation, as specified by options.

3 BSYSGEN Error Messages

```
INVALID DRIVE NAME
```

EXPLANATION: User must specify drive names using the names of drives that exist in the hardware environment, and are recognized by the operating system that was loaded at bootstrap.

```
NO SOURCE FILE ON DISK
```

EXPLANATION: The drive specified as "SOURCE DRIVE" did not contain one of the BIOS files (BIOS85.SYS or BIOS88.SYS). Use a different disk in the source drive, or copy working BIOS files to the source disk, or rename existing BIOS files to "BIOS85.SYS" and "BIOS88.SYS".

SOURCE FILE INCOMPLETE

EXPLANATION: BSYSGEN failed in an attempt to copy the system files from the disk in the source drive. This file might have been damaged by disk media flaws or partially overwritten. The user should reset, bootup, and re-enter the BSYSGEN command using a different disk in the source drive.

WRITE ERROR DURING SYSTEM FILES

EXPLANATION: The user should try BSYSGEN again with a destination disk that is write-enabled, formatted, and has at least 12 kilobytes of free space to accommodate the system files.

ERROR READING SYSTEM FILES

EXPLANATION: BSYSGEN failed in an attempt to copy the system files from the disk in the source drive. This file might have been damaged by disk media flaws or partially overwritten. The user should reset, bootup, and re-enter the BSYSGEN command using a different disk in the source drive or using a different disk to bootup.

PERMANENT ERROR, TYPE RETURN TO IGNORE

EXPLANATION: The system kernel or system files are either incompatible with the destination disk type or otherwise flawed. The user should reset, bootup, and re-enter the BSYSGEN command using a different disk in the source drive or using a different disk to bootup. Under some circumstances, the user must use a MVCPM2x7 utility before BSYSGEN.

UNABLE TO SELECT DRIVE

EXPLANATION: Specify the name of a drive that can be accessed by BSYSGEN. Such a drive must be a valid drive that is recognized by the operating system.

COMMAND SYNTAX ERROR

EXPLANATION: System Prompt Method command line was entered without following the entry form explained in "2.1 System Prompt Command Entry". Enter command again after reviewing this entry form.

ILLEGAL OPTION

EXPLANATION: System Prompt Method command line was entered with an option other than a B or an N. Re-enter command with either, none, or all of the BYSYSGEN options B and N. Enclose the option(s) in square brackets and spearate them with a comma if both are used.

FORMAT

The Utility that Prepares Disk or Partition Surface

The FORMAT utility prepares a floppy disk or Winchester partition for the storage of data by establishing storage areas on the disk surface. At the same time, FORMAT erases any data that remains on the disk or partition from prior use, and sometimes inspects the recording surface for imperfections that could impair data storage or transmission. FORMAT also enables you to determine how much data you will be able to store on a floppy disk.

CAUTION: Because FORMAT erases all existing data on a disk or partition, make certain that you only format disks or partitions containing expendable data or no data. You can use the DIR or STAT commands (see the "Reference Guide" of the CP/M-85 manual) to check for valuable data files before formatting. However, the DIR and STAT commands do not always display all of the files on a disk or partition.

You can use the FORMAT utility through either of two methods: the Utility Prompt Method or the System Prompt Method.

1 Utility Prompt Method

With this FORMAT method, you load the FORMAT utility into memory by entering a command at the system prompt. Then you answer a series of FORMAT prompts to define the formatting operation.

1.1 UTILITY PROMPT COMMAND ENTRY

Answer the system prompt with a command in the following form:

A>**FORMAT** ***RETURN***

When invoked through the FORMAT prompt method, FORMAT first identifies itself with name, version number, and a caution about its capabilities. It also asks you if you wish to continue the operation, as shown:

```
Format Version 2.2.101

This program is used to initialize a disk.
All information currently on the disk will be destroyed.
Is that what you want? (y/n):
```

Respond to this question by entering **Y** if you wish to format a disk or partition. Enter **N** if you do not.

1.2 SPECIFYING THE DISK OR PARTITION TO BE FORMATTED

After you have confirmed your intention to format a disk or partition, FORMAT asks:

```
Which drive do you wish to use for this operation?:
```

Answer this prompt by entering the letter of the drive containing the disk (or assigned the partition) you wish to format. The drive you specify must be a valid disk drive in your hardware environment.

The drive you specify does not necessarily have to be a physical drive. For instance if you have only one physical 5.25-inch drive slot, then you can specify drive B at this prompt. You will later be prompted to put the appropriate 5.25-inch disk in the drive.

However if you specify a Winchester partition, this partition must have already been assigned a drive name. If the partition you wish to format is not currently assigned to the specified drive name, you must exit from the FORMAT utility and use the ASSIGN utility to assign this partition to the drive. You can exit from FORMAT at the "Which drive" prompt by entering ***CTRL-C***.

1.3 DEFINING THE FORMAT OPERATION

After you specify the drive containing the disk or partition you wish to format, FORMAT will display a message another prompt. The kind of prompt FORMAT displays depends upon whether you are trying to format a 5.25-inch floppy disk, an 8-inch floppy disk, or a Winchester partition.

Formatting a 5.25-Inch Disk

If you specified a drive that contains a 5.25-inch disk, the FORMAT utility enables you to specify the number of sides you want formatted by displaying the following prompt:

```
Number of Sides? (1=single, 2=double):
```

Entering the number **1** at this prompt will give the formatted disk a file capacity of 148 kilobytes. Entering the number **2** will give the formatted disk a file capacity of 304 kilobytes.

NOTE: All 5.25-inch disks formatted with this CP/M release are automatically formatted at double density. Therefore, the FORMAT utility will not prompt you to specify the density (level of data concentration) at which you want a 5.25-inch disk formatted.

After you respond to the "Number of Sides?" prompt, FORMAT will display a prompt in the following form to enable you to begin or cancel the FORMAT operation:

```
Put the disk you wish to be formatted in drive x.
Press RETURN to begin, anything else to abort.
```

(The character "x" stands for the letter of the disk drive you specified.) Entering a carriage return at this prompt will begin the actual formatting operation, while entering any other keyboard character will help you to end the FORMAT operation.

NOTE: It takes at least a minute for FORMAT to format a disk. During this time the light on the specified disk drive will glow.

Formatting an 8-Inch Disk

If you are formatting an 8-inch disk, the FORMAT utility enables you to specify the level of density at which you wish to store data by displaying the following prompt:

```
Which density? (S=single, D=double):
```

The "density" of a disk refers to the level of concentration of the data stored on its surface. Higher density levels sometimes decrease data access reliability.

- If the disk in the specified drive is single-sided, then entering the letter **S** (for single density) at this prompt will give the formatted disk a file capacity of 241 kilobytes. Entering the letter **D** (for double density) will give the formatted disk a file capacity of 482 kilobytes.

- If the disk in the specified drive is double-sided, then entering the letter **S** (for single density) at this prompt will give the formatted disk a file capacity of 490 kilobytes. Entering the letter **D** (for double density) will give the formatted disk a file capacity of 980 kilobytes.

NOTE: Some 8-inch disks allow you to format only one side and others allow you to format both sides. These two types of disk are distinguished by the position of a small hole in the disk jacket, near the center spindle hole. The number of sides that can be formatted on a particular 8-inch disk is an unchangeable feature of that particular disk. The FORMAT utility automatically detects the position of this hole and prepares to format the disk on the appropriate number of sides.

After you respond to the "Which density?" prompt, FORMAT will display a prompt in the following form to enable you to begin or cancel the FORMAT operation:

```
Put the disk you wish to be formatted in drive x.
Press RETURN to begin, anything else to abort.
```

(The character "x" stands for the letter of the disk drive you specified.) Entering a carriage return at this prompt will begin the actual formatting operation, while entering any other keyboard character will help you to end the FORMAT operation.

NOTE: It takes at least a minute for FORMAT to format a disk. During this time the light on the specified disk drive will glow.

Formatting a Winchester Disk Partition

If you specified a drive that has been assigned a Winchester partition, FORMAT will display a prompt in the following form to enable you to begin or cancel the FORMAT operation:

```
Will format partition assigned to drive x:

Press RETURN to begin, anything else to abort.
```

(The character "x" stands for the letter of the partition you specified.) Entering a carriage return at this prompt will begin the actual formatting operation, while entering any other keyboard character will help you to end the FORMAT operation.

The file capacity of the partition you are formatting is determined before you invoke the FORMAT utility, by the PREP utility (which automatically allocates half of the Winchester disk space to a single CP/M partition), or by the PART utility (which enables you to determine the size of your partitions). See text sections on "PREP" and "PART" for more information.

NOTE: As FORMAT formats a partition, the light on the Winchester disk drive will glow.

1.4 ENDING A FORMAT OPERATION

When FORMAT finishes preparing a disk's surface, or when you press "anything else to abort" the FORMAT utility, FORMAT will display the following prompt:

```
Do you have more disks to format? (y/n):
```

If you wish to format another disk or partition without reinvoking FORMAT, press **Y** at this prompt. FORMAT will again prompt to specify the drive containing the disk or partition you wish to format.

If you do not wish to format another disk or partition, press **N**. FORMAT will display the system prompt, at which you can enter any CP/M command.

NOTE: You can also end a FORMAT operation by entering ***CTRL-C*** at the "Which drive" prompt.

2 System Prompt Method

The System Prompt Method enables you to include all of the specifications necessary for the FORMAT operation in a single command line. Enter this command line at the CP/M system prompt.

2.1 COMMAND LINE ENTRY

System Prompt Method FORMAT commands are entered in the following form:

A>**FORMAT {drive}:{[option,option]}** ***RETURN***

Where **FORMAT** is the command line function, stored in the file FORMAT.COM on the logged disk;

where **{drive}** is the letter of the drive that contains the disk or partition you wish to format (this letter must represent a valid drive in your hardware environment, such as **A**, **B**, **C**, **D**, **E**, or **F**); and

where {**[option,option]**} represents letters and/or numbers enclosed in square brackets **[ ]** and separated by commas **,** to specify how the formatting operation should be conducted.

NOTE: You can specify logical (imaginary) drive names in FORMAT commands, as well as physical (visible) drive names. Then you will be prompted to insert two different disks alternately into a single physical drive slot.

2.2 FORMAT OPTIONS

FORMAT command lines entered by the System Prompt Method can include the following options:

SD 8-inch disk formatted to Single Density;

DD 8-inch disk formatted to Double Density;

1S 5.25-inch disk formatted on only one side;

2S 5.25-inch disk formatted on both sides;

F Fast formatting, because the routine test of disk surface media is not performed;

N No prompt displayed between FORMAT command entry and FORMAT execution;

Options should be enclosed in square brackets, and separated by commas when more than one is used. Options are the last item in a System Prompt Method FORMAT command line before the carriage return.

NOTE: All 5.25-inch disks are automatically formatted at double density by this version of FORMAT. 8-inch disks are automatically formatted on the number of sides for which the disk has been certified by the manufacturer. (FORMAT detects this certification by checking the position of the small hole in the disk cover next to the center spindle hole.)

2.3 SYSTEM PROMPT METHOD DEFAULTS

When you enter a FORMAT command line with a drive specification, and decline to specify some or all of the possible options, FORMAT will prepare the disk according to the following default criteria:

- 5.25-inch, disk formatted to Double Density (regardless of any options you might specify);
- 8-inch disk formatted to Double Density (as if you specified the DD option);
- 5.25-inch disk formatted on both sides (as if you specified the 2S option);
- 8-inch, single-sided disk formatted on one side (regardless of any options you might specify);
- 8-inch, double-sided disk formatted on both sides (regardless of any options you might specify);
- Disk surface will be tested for data retention (as if you did not specify the F option); and
- Prompts will be displayed between FORMAT command entry and FORMAT execution (as if you did not specify the N option). Therefore, whenever you enter a System Prompt Method command without the N option, the following prompt will appear:

```
CP/M-85 Format Version 2.2.101

This program is used to initialize a disk.
All information currently on the disk will be destroyed.
Is that what you want? (y/n):
```

To confirm your intention to run a FORMAT operation, enter a **Y** at this prompt. Then FORMAT will display a prompt in the following form if you specified a floppy disk:

```
Put the disk you wish to be formatted in drive x.
Press RETURN to begin, anything else to abort.
```

or the following prompt if you specified a Winchester partition:

```
Will format partition assigned to drive x:

Press RETURN to begin, anything else to abort.
```

To begin execution of the FORMAT operation for a floppy disk, insert the appropriate disk in drive x (where drive x is the drive you specified in the command line) and enter a carriage return. To begin execution of the FORMAT operation for a Winchester partition, simply enter a carriage return.

To abort the FORMAT utility, enter any keyboard character other than Y or y at the "Is that what you want?" prompt, or press anything other than RETURN at the "Press RETURN to begin, anything else to abort." prompt. In either case, the FORMAT operation will end and CP/M will display the system prompt.

2.4 SYSTEM PROMPT METHOD EXAMPLES

A>**FORMAT B:[2S]** ***RETURN*** FORMAT will prepare the surface of the disk in drive B (a 5.25-inch disk) to double density and on both sides, as specified by options. FORMAT will display prompts before formatting and test the disk surface while formatting, by default.

A>**FORMAT B:** ***RETURN*** FORMAT will prepare the surface of the disk in drive B (a double-sided 8-inch disk). Due to manufacturer's certification, this disk will be formatted on both sides. By default, this disk will be formatted to double density. Also by default, FORMAT will display prompts before formatting and test the disk surface while formatting.

A>**FORMAT B:[2S,1S]** ***RETURN*** If your command line contains contradictory options, FORMAT will acknowledge the last one. Hence, in this case, FORMAT will format the surface of the disk in drive B (a 5.25-inch disk) on only one side, as specified by the last side quantity option. FORMAT will also display prompts before formatting and test the disk surface while formatting, by default.

A>**C:format B:[Sd,f,N]** ***RETURN*** The FORMAT utility, in this case, is stored on the disk in drive C. It will prepare the surface of the disk in drive B (a single-sided 8-inch disk) to single density, as specified by the "Sd" option. Since the disk was manufactured for single-sided data storage, only one side will be formatted. The "f" option specifies that this formatting operation will be performed without a disk media test. The "N" option specifies that FORMAT will not prompt you to confirm your intentions before the formatting operation begins.

NOTE: As with any other command entered at a CP/M system prompt, you can edit a FORMAT command line with the ***DELETE*** key, or erase the entire command line by entering ***CTRL-X***.

3 Disk Capacities

The following three tables show the amount of file space remaining on various kinds of disks after they are formatted under various kinds of conditions. (The FORMAT utility also prepares areas of the disk for the recording of the CP/M system kernel and the disk file directory, although the space reserved for such software items is not included in these tables.)

The following table shows the file capacities of 5.25-inch, soft-sectored disks formatted in 48-tpi drives:

	Single-sided	Double-sided
Double density	148 kilobytes	304 kilobytes

This table shows the file capacities of single-sided 8-inch disks:

	Single density	Double density
Single-sided	241 kilobytes	482 kilobytes

This table shows the file capacities of double-sided 8-inch disks:

	Single density	Double density
Double-sided	490 kilobytes	980 kilobytes

The file capacity of a formatted Winchester disk partition is determined before you invoke the FORMAT utility, by the PREP utility (which automatically allocates half of the Winchester disk space to a single CP/M partition), or by the PART utility (which enables you to determine the size of your partitions). See the sections on "PREP" and "PART" for more information.

NOTE: The FORMAT utility supplied with this CP/M version cannot format any disk to extended double density. However this CP/M version can write to or read from a disk that was formatted at extended double density by the FORMAT utility of some other CP/M versions.

4 FORMAT Error Messages

```
Drive not available in current configuration
```

EXPLANATION: If you entered a drive name that has not been assigned a partition, or does not exist in your hardware, enter a different drive name.

```
Disk is write protected.
Unable to format this disk.
Do you have any more disks to format? (y/n):
```

EXPLANATION: Remove any adhesive tab that might be attached to the write-enable notch on a 5.25-inch disk cover, or cover the write-protect notch on an 8-inch disk. The "Do you have" prompt appears with this message only when you enter a Utility Prompt Method command.

```
Unable to format this disk. Place a different disk in the drive
and press any key to begin...
```

EXPLANATION: The disk to be formatted is damaged or improperly inserted in the drive. Try again or replace the disk.

```
ILLEGAL FORMAT OPTION
```

EXPLANATION: System Prompt Method command line was entered with undefined characters in place of options.

```
ILLEGAL COMMAND SYNTAX
```

EXPLANATION: System Prompt Method command line was entered with undefined characters in place of options.

```
DISK IS NOT OF TYPE SPECIFIED
```

EXPLANATION: A System Prompt Method command line specified a drive that contained a disk which did not match the specified disk type.

```
OPTION NOT AVAILABLE
```

EXPLANATION: A Utility Prompt Method prompt was answered with characters which were not possible under the circumstances. Enter a pertinent option at this prompt.

```
PARTITION IS SMALLER THAN MINIMUM ALLOWABLE SIZE
```

EXPLANATION: Winchester disk partitions under CP/M can be as small as 64 kilobytes. Back up any valuable software and/or data stored on other partitions and use the PART utility to create CP/M partitions that are at least 64 kilobytes in size. Then try the FORMAT utility again.

```
PARTITION IS LARGER THAN CP/M MAXIMUM SIZE -- ONLY 8 MEG USABLE
```

EXPLANATION: The partition being formatted has been allocated 8 megabytes (8192 kilobytes) or more Winchester disk space. You will only be able to access the first 8192 kilobytes on the partition. To make the rest of the partition's space accessible, Back up any valuable software and/or data stored on other partitions and use the PART utility to make the partition smaller and to allocate the remaining space to another partition. Then try the FORMAT utility again.

```
Incorrect version of BIOS
```

EXPLANATION: The CP/M-85 system and FORMAT being used are not of the same version. Use a CP/M-85 system and FORMAT utility that were both copied from the same CP/M-85 distribution disk. Then try to FORMAT utility again.

MVCPM2x7
(MVCPM207 and MVCPM217)

The Utility that Customizes a CP/M System Kernel for Memory Size and Disk Type

The MVCPM2x7 utilities will adjust the CP/M system kernel so that it has the proper memory size for your purposes, and so that it recognizes the type of disk (floppy or Winchester partition) it will be recorded on. It can change the system's size within a range of 48 through 64 kilobytes of Random Access Memory (RAM). This utility should be followed immediately with another utility or command, such as SYSGEN or SAVE.

NOTE: The two MVCPM2x7 utilities are provided in separate files because each one is intended for use with a specific disk controller card. MVCPM207 is intended for the Z-207 controller card, and MVCPM217 is intended for the Z-217-1 controller card.

If you have a Z-207 card and wish to create a CP/M-85 system for a floppy disk (floppy disks are controlled by the Z-207 card), then use MVCPM207.

If you have a Z-217-1 card and wish to create a CP/M-85 system for a Winchester disk partition (Winchester disks are controlled by the Z-217-1 card), then use MVCPM217.

1 Function of MVCPM2x7

MVCPM2x7 loads the kernel of a CP/M Operating System (the part exclusive of system files BIOS85.SYS, BIOS88.SYS, and ALTCHAR.SYS) into a special location in computer memory. At this location, it adjusts the system kernel to either a specified memory size or the total available memory size of the computer. It also adjusts the system for the type of disk (floppy or Winchester partition) that it will eventually be recorded (when SYSGEN is run).

MVCPM2x7 must also observe and measure the BIOS85.SYS file that will eventually be used with the system kernel, to allow sufficient space for this BIOS file. MVCPM2x7 always relies upon a SYSGEN or SAVE command to copy the system kernel that MVCPM2x7 loaded into memory.

2 MVCPM2x7 Command Line Entry

The MVCPM2x7 command line is entered in the following form, with three specifications separated by a space, as shown:

A>**MVCPM{xxx} {nn} {d}:{biosfile.ext}** ***RETURN***

Where **{xxx}** is the number that matches the model number of disk controller card that controls the disk that will eventually receive the system being moved. If xxx is 207, the system will be prepared for a floppy disk. If xxx is 217, the system will be prepared for a Winchester partition;

where the **{nn}** variable represents the memory size that the transferred system kernel will occupy, in multiples of 1024 bytes (kilobytes). This is an optional value. If the "*" character or no value is entered, the system kernel will be set to occupy the entire memory capacity of the computer being used, by default. (Your Z-100 computer, as used with this version of CP/M, has a memory range of 48K through 64K.) This value can be less than or equal to the actual memory capacity of the computer. If it is larger than the computer's capacity, then the CP/M system created will be useless in the computer;

where the **{d}** variable represents the letter of the disk drive containing the system files that are to be matched up with the system kernel being moved. This variable is optional. If omitted, MVCPM2x7 will assume that the created system kernel should be modified to be compatible with the system files that are currently active in computer memory; and

where the **{biosname.ext}** variable represents the name of the file containing the system components normally stored in the file BIOS85.SYS. This variable is optional. If omitted, MVCPM2x7 will assume the file name "BIOS85.SYS".

NOTE: The "*" character must be entered when you specify **no** value for the memory {**nn**} variable, and **do** specify a value for the drive name {**d**} and/or BIOS file name {**biosname.ext**}. In this sort of command line, the "*" character acts as a "place holder" so that your drive name and/or file name parameters are not interpreted as a memory value because it was entered in the memory value space.

During execution, the MVCPM2x7 utility will respond with a message in the following form:

```
MVCPM2x7 VERSION 2.2.101

CONSTRUCTING nnk CP/M vers 2.2
READY FOR "SYSGEN" OR
"SAVE 38 CPMnn.COM"
```

3 MVCPM2x7 Examples

The following command lines and explanations are specific examples of MVCPM2x7 command entry.

A>**MVCPM207 48** ***RETURN*** The system kernel created by this command will operate with 48K of RAM. The kernel will be adjusted for memory size and for a floppy disk, using the BIOS that was loaded into computer memory at bootup for reference.

A>**MVCPM217 * C:** ***RETURN*** The system kernel created by this command will probe computer memory and operate at computer's memory capacity (64K). This kernel will be adjusted for memory size and for a Winchester partition, using the BIOS files stored in drive C for reference.

4 After Running MVCPM2x7 . . .

MVCPM2x7 should be immediately followed by either:

- The SYSGEN utility, which will transfer the adjusted CP/M system kernel to the system tracks of a specified disk; or by
- The SAVE resident command, which will transfer the adjusted CP/M system kernel to a file on a specified disk.

If the user performs any **other** activity immediately after running MVCPM2x7, the work of MVCPM2x7 will probably be destroyed.

5 MVCPM2x7 Error Messages

```
INVALID MEMORY SIZE
```

EXPLANATION: Valid memory sizes are between 48K and 64K.

```
SYNCHRONIZATION ERROR
```

EXPLANATION: The serial number of the MVCPM2x7 utility used must match that of the CP/M-85 Operating System used.

```
READ ERROR
```

EXPLANATION: MVCPM2x7 cannot read data from a file the user specified because the file and/or disk surface is flawed.

```
NO FILE
```

EXPLANATION: MVCPM2x7 cannot read data from a file the user specified because it cannot find the file on the specified drive.

```
NO SPACE
```

EXPLANATION: The system files the user specified will not fit in memory.

```
BAD LOAD
```

EXPLANATION: A file specified by the user did not load properly. The user should try the MVCPM2x7 command again or specify a different file.

```
File not found.
```

EXPLANATION: MVCPM2x7 could not find the file the user specified as the BIOS on the specified disk.

```
UNABLE TO READ BIOS FILE
```

EXPLANATION: MVCPM2x7 was unable to read system file software from the disk. Copy the files BIOS85.SYS and BIOS88.SYS to this disk or a new disk and try MVCPM2x7 again.

PART

The Utility that Rearranges Winchester Disk Partitions and/or Changes the Partition Used for Default Bootup

The PART utility enables you to change the quantity, size, and names of Winchester disk partitions. It also enables you to specify which partition should be accessed when you boot up. You do not need to run PART in order to use your Winchester disk, because a CP/M partition was prepared on the disk before it was shipped.

The PART utility is recorded on the Winchester Utility Disk, which is shipped with your Winchester disk hardware documentation. The PREP utility is also recorded on this disk. Although this disk runs under the Z-DOS Operating System, you can boot up with it — just as you would a CP/M disk.

CAUTION: Any changes you make to the quantity or size of partitions through PART can destroy all existing data on your Winchester disk. Therefore, you should back up all necessary data from all partitions before you use PART.

NOTE: After using the PART utility, you must enter ***CTRL-RESET*** and reboot the system with a floppy disk containing the CP/M-85 Operating System.

1 Partition Features

Winchester disks distributed by Zenith Data Systems or Heath have large storage capacities. To make practical use of all this storage space, it is divided into partitions. You can establish up to 16 CP/M partitions on your Winchester disk. You can also have partitions with other operating systems on the disk.

A partition behaves like a floppy disk in most operations, because you can access a partition's data and/or software by entering commands that refer to the drive name that has been designated for that particular partition. However, you can only access a CP/M partition through a drive name either by booting up to that particular partition, or by first running the ASSIGN utility.

NOTE: The exact capacity of your Winchester disk drive is determined by the drive's manufacturer and by the amount of usable disk space remaining after unusable space has been made inaccessible by software such as the PREP utility. Examples in this text show disk space totals for a Winchester disk that accommodates 10,000 kilobytes. However it is possible that your disk will accommodate a different amount.

When your Winchester disk is shipped from the factory, it has already been prepared with two partitions. Each of these partitions occupies approximately one half of your total Winchester disk space. Each is also given a distinct name. One of these partitions is intended for used with the CP/M-85 Operating System and software that runs under CP/M-85. The other is intended for use of with the Z-DOS Operating System (sold separately) and software that runs under Z-DOS.

The PART utility enables you to view and change the status of the following partition features:

- Name of each partition
- Name of the operating system to be placed on each partition
- Approximate percentage of disk space allocated to each partition
- Precise capacity of each partition in kilobytes (1024-byte units)
- Total (approximate) percentage of Winchester disk space that is and is not allocated to partitions
- Total (precise) number of kilobytes of Winchester disk space that are and are not allocated to partitions
- Name of the one partition that is accessed when you boot up without specifying a partition

2 PART Operation

The PART utility enables you to change the status of partition features by typing different kinds of entries in response to prompts. During different phases of PART operation, features of the screen display will change and the cursor will move to the appropriate screen location after your entries. PART operation usually prompts you to make the following kinds of entries in sequence:

1) PART Invocation
2) PART Ratification
3) Choice of Operation
4) Partition Names
5) System Names
6) Allocation Percentages
7) Default Boot Partition Number
8) Choice of Operation
9) Choice of Exit Method

NOTE: If you wish to rearrange partitions, then you will probably repeat steps 4), 5), and 6) several times (once for each partition) before you perform step 7). If you merely wish to set a new default boot partition, then you will skip steps 4), 5), and 6).

2.1 PART INVOCATION

PART is recorded on the Winchester Utility Disk (supplied with your Winchester disk hardware and documentation) as an executable .COM file.

Entry Rules

To invoke the PART utility, enter the following command at the system prompt:

A:**PART** ***RETURN***

NOTE: Enter the PART command at the Z-DOS system prompt just as you would at a CP/M system prompt.

Resulting Display

After it is invoked, the PART utility displays identification messages, a caution, and a prompt, as shown:

```
                PART version x.xx
Copyright (C) 1982, Zenith Data Systems Corporation


The PART utility helps you to:

* change the arrangement of your Winchester disk partitions and/or
* select a partition (default boot partition) to which you can
  boot up without specifying the partition's name

PART displays a table showing the names of each partition (a
partition name and a system name) and the amount of disk space
allocated to each partition (in percentages and in kilobytes). PART
also dynamically calculates and totals the kilobyte size of all
partitions as you specify each partition's allocation percentage.

CAUTION: Using PART can destroy all files on your Winchester disk.
Do  not use PART until you  have transferred backup copies of your
Winchester disk files to floppy disks.

Proceed (Y/N)?
```

NOTE: The version number of the PART utility (shown in this example as "x.xx") might vary.

Error Conditions

If the PART.COM file is not on the disk you are using to run PART, you will receive the following "Bad command or file name" error message. Try the command again after inserting a disk containing the PART.COM file into the drive. Use the **DIR *RETURN*** command at the "A:" system prompt to determine whether a disk has this file.

If the disk has been removed from drive A since bootup, you will receive a "Seek error reading drive A Abort, Retry, Ignore" error message. Insert a disk containing PART.COM in drive A, close the drive latch, and press **R**.

If you try to run PART after booting up with a disk containing the CP/M-85 Operating System, then you will receive an error message in the form: "Bdos Err On X: Select". Reset the computer, boot up to the disk containing the Z-DOS Operating System and the PART.COM file. (We recommend that you use the Winchester Utility Backup Disk.) Then repeat the PART command at the A: system prompt.

2.2 PART RATIFICATION

At the initial PART display, you have the choice of ratifying your intentions to use the PART utility as it is described in the displayed messages (and subject to the displayed caution), or exiting from the PART utility.

2.2.1 CONTINUING TO USE PART

An affirmative answer to this prompt verifies your intentions to continue using PART.

Entry Rules

Type **Y** at this prompt if you fully understand the consequences of using PART and still wish to continue.

CAUTION: Rearrangement of Winchester disk partitions can destroy any software or data now stored on the disk. Therefore we recommend that you make backup copies of any valuable software and/or data now stored on the Winchester disk before verifying your intentions to use PART.

NOTE: You can use PART to select a different "default boot partition" without destroying software or data, as long as you make no entries to change the arrangement of partitions.

Resulting Display

When you have ratified your intentions to use PART, the current status of several partition features is visible on a screen display of the following form:

```
    Partition Name    Operating System Name    Percentage    Kilobytes
    --------------    ---------------------    ----------    ---------
 1. Z-DOS              Z-DOS                   50%           5000
 2. CPM                CPM                     50%           5000
 3.
 4.
 5.
 6.
 7.
 8.
 9.
10.
11.
12.
13.
14.
15.
16.
Total Utilization (Allocated/unallocated)      100/0         10000/0
Default boot partition number: 1   <Z-DOS;Z-DOS                 >

     B - Modify default boot partition
     P - Partition maintenance
     E - Exit
Choose desired option. <B, P or E> _
```

The PART display shown above is the display that will appear the first time you run PART after shipment of a Zenith Data Systems (or Heath) Winchester disk, or after you have run the PREP utility. If you have already used PART since shipment or since running PREP, then some features of this display might appear differently.

2.2.2 Declining to Use PART

Type any character other than Y or y if you do not wish to use PART at this time. The A: system prompt will be displayed.

2.3 CHOICE OF OPERATION

After ratifying your intentions to use the PART utility, you have the choice of selecting a different default boot partition, changing the arrangement of your Winchester disk partitions, or exiting from PART.

A three-line menu enables you to select a PART operation by typing B, P, or E as the cursor flashes at the end of the prompt on the bottom of the screen.

2.3.1 Choosing to Modify Default Boot Partition

The default boot partition is usually the partition that you intend to use most often for booting up. Any established bootable partition that is selected as the default boot partition is the partition that will be automatically accessed when you type a bootup command without specifying a partition name. (In order to boot up to any other partition, you must specify the partition name, and sometimes the system name, in your bootup command.)

Entry Rules

Type **B** at this prompt to select an default boot partition. This operation will not prompt you to change the arrangement of any partitions. If you choose this activity, skip the next three steps and refer to "2.7 Default Boot Partition Number" for further instructions.

Resulting Display

After typing the B entry to "Modify default boot partition", the activities menu and prompt will be replaced by the "Enter number of new default boot partition" prompt. Additionally, the number and names of the current default boot partition will be replaced by the cursor on the display line beneath the table, as shown:

```
/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\
15.
16.
Total Utilization (Allocated/unallocated)          100/0            10000/0
Default boot partition number: 1    <Z-DOS;Z-DOS                 >
```

Enter number of new default boot partition.

When a display in this form appears, proceed to "2.7 Default Boot Partition Number".

2.3.2 Choosing Partition Maintenance

The "Partition Maintenance" operation leads you to add partitions, remove partitions, change the names of partitions, and/or change the percentage of space allocated to partitions. Then this activity also prompts you to select a default boot partition.

Entry Rules

Type **P** at this prompt to begin changing the arrangement of partitions. (At the end of this operation, you will also be prompted to change the setting of the default boot partition.)

Resulting Display

When you choose the "Partition maintenance" operation, the cursor moves to the beginning of the first partition name in the table and the operations menu is replaced by a "Minimum allocation" message at the bottom of the display, as shown:

```
   Partition Name      Operating System Name     Percentage     Kilobytes
   --------------      ---------------------     ----------     ---------
1. Z-DOS                Z-DOS                     50%            5000
2. CPM                  CPM                       50%            5000
3.
/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\
15.
16.
Total Utilization (Allocated/unallocated)   100/0          10000/0
Default boot partition number: 1   <Z-DOS;Z-DOS             >

Minimum allocation = 2%
```

When a display in this form appears, proceed to "2.4 Partition Name."

2.3.3 Choosing to Exit

Type **E** at this prompt to exit from the PART utility completely. The A: system prompt will be displayed immediately.

2.4 PARTITION NAME

After you have chosen the "Partition maintenance" operation, the cursor moves to the first character of a "Partition Name".

2.4.1 Changing or Adding a Partition Name

When the cursor moves to a position beneath the "Partition Name" column on the table, you can change the name of an existing partition or add a new partition to the table by entering the partition name as the first feature of this partition.

Entry Rules

A partition name is any string of **1-16 ASCII characters**, with the exception of the semicolon (;) and non-printing characters such as a space or tab. After entering this string, press the ***RETURN*** key. Then the cursor will move to the operating system name position for this partition.

PART will always display partition name letters (if any) in upper case, although you can enter them in either lower or upper case.

When the cursor arrives at the first character of a partition name, you will immediately erase the old partition name by pressing any key other than ***RETURN*** or the space bar.

While entering a partition name, you can press the ***BACK SPACE*** key to erase one character to left. If, when changing an old name, you press BACK SPACE until you have erased your entire new name, the old name will be redisplayed.

Partitions that you intend to give the same operating system name should be given different partition names.

Examples

The following examples are valid partition names:

```
CP/M _ ACCOUNTING     DATABASE     WORD/PROCESSING     George

Spread _ sheet     Z-DOS _ ACCOUNTING          Thelma          BASIC
```

Resulting Display

After you have entered 1-16 characters and pressed the RETURN key for a partition name, the new partition name will be displayed and the cursor moves to the operating system name position for this partition, as shown in the following partial display:

```
   Partition Name      System Name         Percentage    Kilobytes
   --------------      -----------         ----------    ---------
1. DATABASE            Z-DOS                  50%          5000
2. CPM                 CPM                    50%          5000
3.
4.
/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\
```

Error Conditions

If you press the semicolon key or the TAB key and then press the RETURN key, the partition name will appear to vanish while the other features for the partition remain. However when you have finished making an entry for this partition's allocation percentage, the old partition name for this partition will reappear.

You cannot finish PART operation after giving two partitions the same partition names unless they are given different system names. However, it will wait until you make an entry for the default boot partition before displaying the "duplicate name error" message in reverse video. If this message appears, you will have to correct the duplicate names before exiting from PART.

2.4.2 Bypassing a Partition Name

When the cursor moves to a position beneath the "Partition Name" column on the table, you can retain an old partition name and advance to the system name or stop rearranging the partitions completely.

Entry Rules

To refrain from changing a partition name, press only the RETURN key.

Resulting Displays

If the cursor was at a partition where a partition name already existed, then the RETURN entry causes the cursor to move ahead to the system name of the same partition, as shown in the following partial display:

```
   Partition Name      System Name              Percentage    Kilobytes
   --------------      -----------              ----------    ---------
1. Z-DOS               Z-DOS                      50%           5000
2. CPM                 CPM                        50%           5000
3.
4.
\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\
```

If the cursor was at a position beneath the "Partition Name" category where no partition name has yet been established, a RETURN entry will move the cursor ahead to the "Default boot partition number" feature, as shown in the following partial display:

```
   Partition Name      Operating System Name     Percentage    Kilobytes
   --------------      ---------------------     ----------    ---------
1. Z-DOS               Z-DOS                      50%           5000
2. CPM                 CPM                        50%           5000
3.
4.
\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\
15.
16.
Total Utilization (Allocated/unallocated)        100/0         10000/0
Default boot partition number: _
```

Enter the number of the default boot partition.

2.4.3 Removing a Partition

When the cursor moves to a position beneath the "Partition Name" column on the table, you can remove all features of this partition from the table.

Entry Rules

To remove a partition from the table without inserting a new partition in its place, simply press the **space bar**.

Resulting Display

The partition name, system name, allocation percentage, and allocation kilobytes for this partition will disappear. Then the features for all of the partitions below will move up one number. The cursor remains in the same position, although it now blinks at the partition name of a different partition.

If the partition you have removed was the default boot partition, then the "is undefined" message will be displayed.

Additionally, the "Total Utilization" (in both percentage and kilobytes) will show a different amount of "unallocated" space in reverse video (unless the removed partition was allocated zero percent of the disk).

The following partial display shows how the screen might appear after you remove a partition:

```
   Partition Name     Operating System Name    Percentage    Kilobytes
   --------------     ---------------------    ----------    ---------
1. CPM                CPM                      50%           5000
2.
3.
4.
\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\
15.
16.
Total Utilization (Allocated/unallocated)      50/50       5000/5000
Default boot partition number: is undefined


  Minimum allocation = 2%
```

Error Condition

If you remove a partition that was the default boot partition, then the "is undefined" message will be displayed until you make an entry for the default boot partition. If you then press RETURN to bypass setting the default boot partition feature, PART will display the "boot partition error" message in reverse video and prevent you from exiting from PART.

2.5 OPERATING SYSTEM NAME

After you have pressed the RETURN key during a partition name entry, the cursor moves to the first character of an "Operating System Name".

System names are not mandatory for partitions, although they must be used when the same partition names are used for different partitions.

2.5.1 Changing a System Name

When the cursor moves beneath the "Operating System Name" column on the table, you can change the system name of a partition.

Entry Rules

A system name is a string of **1-10 ASCII characters**, with the exception of the semicolon (;) and non-printing characters such as a space or tab. After entering this string, press the ***RETURN*** key.

PART will display system name letters in upper case, although you can enter them in either lower or upper case.

When the cursor arrives at the first character of a system name, you can immediately erase the old system name by pressing any key other than RETURN.

While entering a system name, you can press the ***BACK SPACE*** key to erase one character to left. If, when changing an old name, you press BACK SPACE until you have erased your entire new name, the old name will be redisplayed.

The same system name can be used for several partitions, as long as the partition names are different.

Example Entries

The following examples are valid operating system names:

CPM Z-DOS UNDER-DOS Acronym-DOS

NOTE: The Z-DOS operating system requires that you use the operating system name "Z-DOS" (as it is spelled here) for the partition(s) you plan to use for Z-DOS programs. We recommend that you use the operating system name "CPM" for the partitions you plan to use for CP/M programs, although CP/M does not require any particular system name.

Resulting Display

After you have entered 1-10 characters and pressed the RETURN key for a system name, the new system name will be displayed and the cursor moves to the allocation percentage position for this partition, as shown in the following partial display:

```
   Partition Name      System Name          Percentage    Kilobytes
   --------------      -----------          ----------    ---------
1. DATABASE            CPM                  50%           5000
2. CPM                 CPM                  50%           5000
3.
4.
```

Error Conditions

If you try to enter the same system name for two partitions that also have the same partition name, PART will wait until you make an entry for the default boot partition display the "duplicate name error" message in reverse video. If this message appears, you will have to correct the duplicate names before exiting from PART.

If the names you have entered duplicate the names of a partition that has a greater number on the left side of the table, and if this partition with the greater number is the default boot partition, then the number of the default boot partition will automatically change to the smallest number of the two partitions that have the same names. This change in the number of the default boot partition occurs after you have made an entry for the allocation percentage of the duplicate partition with the smallest number.

If you press the semicolon key or the TAB key or the space bar and then press the RETURN key, the operating system name will appear to vanish while the other features for the partition remain. However when you have finished making an entry for the default boot partition, the old system name for this partition will reappear.

2.5.2 Bypassing the System Name

When the cursor moves beneath the "Operating System Name" column on the table, you can retain the old system name (or leave this feature blank) and skip ahead to the same partition's allocation percentage.

Entry Rules

To refrain from changing a system name, press only the RETURN key.

Resulting Display

The RETURN only entry causes the cursor to move ahead to the percentage feature of the same partition, without making any change to the system name, as shown in the following partial display:

	Partition Name	System Name	Percentage	Kilobytes
1.	DATABASE	Z-DOS	50%	5000
2.	CPM	CPM	50%	5000
3.				
4.				

/\

2.6 ALLOCATION PERCENTAGE

After you have made an entry at an "Operating System Name" position, the cursor moves to the "Percentage" position for the same partition.

2.6.1 Setting a Percentage

When the cursor moves to the first digit of a "Percentage" (of Winchester disk space allocation), you can set an allocation percentage.

Entry Rules

You must enter percentages by typing a whole **number in the range n-100**, where **n** is the number displayed at the bottom of the screen on the right side of the "Minimum allocation" message.

The percentage you enter for a CP/M partition must be low enough so that this partition will not be larger than 8 megabytes (8192 kilobytes). (If you allocate more than 8 megabytes to a partition, CP/M-85 will not be able to access part of this partition.)

NOTE: Different brands and models of Winchester disk require different minimum allocations.

Resulting Displays

For every allocation percentage you enter, PART automatically calculates the exact number of kilobytes that should be allocated to a partition according to the percentage you entered. PART also automatically calculates the total quantity of percentage points and kilobytes that are allocated and unallocated.

If you set an allocation percentage that brings the total allocation of disk space to 100 percent, and if you are entering it for one of the first 15 partitions on the table, then the cursor will move down to the partition name position of the next partition (whether this partition has been established yet or not) and the screen will appear in the form of the following partial display:

```
    Partition Name   Operating System Name   Percentage   Kilobytes
    --------------   ---------------------   ----------   ---------
 1. DATABASE         CPM                     30%          3000
 2. CPM              CPM                     70%          7000
 3. _
 4.
/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/
15.
16.
Total Utilization (Allocated/unallocated)    100/0        10000/0
Default boot partition number: is undefined

    Minimum allocation = 4%.
```

If you set an allocation percentage that brings the total allocation of disk space to 100 percent, and if you are entering it for the 16th partition on the table, then the cursor will move down to the default boot partition position and the screen will appear in the form of the following partial display:

```
    Partition Name    Operating System Name   Percentage   Kilobytes
    --------------    ---------------------   ----------   ---------
 1. DATABASE          CPM                     6%           600
 2. SPREAD-SHEET      CPM                     6%           600
/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\

15. COBOL             UNDER-DOS               6%           600
16. FUN&GAMES         ACRONYM-DOS             10%          1000
Total Utilization (Allocated/unallocated)     100/0        10000/0
Default boot partition number: _
```

Enter number for the default boot partition.

NOTE: If you establish 16 partitions on your disk, and have not allocated all of the disk space with your percentage entry for the 16th partition, PART will automatically allocate all of the remaining disk space to the 16th partition — no matter how much space you try to allocate to this partition.

If you set an allocation percentage that brings the total allocation of disk space to less than 100 percent, and if you are entering it for one of the first 15 partitions on the table, then the cursor will move down to the partition name position of the next partition (whether this partition has been established yet or not). Additionally, the "Total Allocation" figures will display the amount of "unallocated" space (in both

percentages and kilobytes) in reverse video. The screen will appear in the form of the following partial display:

```
   PartitionName     Operating System Name    Percentage    Kilobytes
   --------------    ---------------------     ----------    ---------
1. DATABASE          CPM                       50%           5000
2. CPM               CPM                       20%           2000
3. _
4.
\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/
15.
16.
Total Utilization (Allocated/unallocated)      70/30    7000/3000
Default boot partition number: _


     Minimum allocation = 2%
```

NOTE: You can exit from PART with part of your disk unallocated.

Error Conditions

PART will monitor the percentages you enter for each partition, and dynamically lower any percentage you enter if it would have brought the total allocation to more than 100 percent of disk space. Thus PART will never allow you to allocate more than 100 percent of your Winchester disk space, and the displayed percentages will never total more than 100.

PART keeps the total allocation percentages at or below 100 percent by subtracting percentage points from partitions, starting with the partitions at the bottom of the table. In cases of extreme over allocation, PART might even reduce the allocation percentages of some partitions to zero percent.

The minimum possible allocation percentage, which differs depending on the kind of Winchester disk you have purchased, is displayed at the bottom of the screen whenever you are in position to enter an allocation percentage. If you enter an allocation percentage lower than the minimum limit for your Winchester disk, PART will automatically convert this percentage to zero percent.

Whenever the percentage of a partition is zero percent, PART will prevent you from exiting until you have changed this percentage to a value at or above the minimum percentage allowed for your own particular Winchester disk.

If you try to enter a non-numeric character, a fractional or decimal point number, or a number greater than 100, then the terminal will beep and the cursor will remain at the percentage position. Then you can enter a valid number.

You can exit from PART after allocating less than 100 percent of the disk space to partitions. The unallocated space on your Winchester disk will be inaccessible until you use either the PART utility or the PREP utility.

2.6.2 Bypassing the Percentage

When the cursor moves to the first digit of an existing "Percentage" (of Winchester disk space allocation), you can skip ahead to the partition name of the next partition, or skip ahead to the default boot partition number.

Entry Rules

To retain the percentage that is currently displayed for a partition and skip ahead to another partition feature, press the RETURN key only.

Resulting Displays

The displays that result after you have bypassed a percentage entry are similar in form to those that appear when you enter a number, although the percentage of the partition for which you just made the entry will not change.

The cursor will move to the partition name position for the next partition, unless you have just bypassed the percentage for the 16th partition in the table, in which case the cursor will move down to the default boot partition position.

Error Conditions

If you bypass the percentage feature for a newly established partition (by specifying no number and pressing the RETURN key), then PART will display "0%" for this partition. Additionally, the "allocation error" message will appear in reverse video when the operations menu reappears. Furthermore, you will be prevented from exiting from PART until you correct the partition table so that no partitions are allocated "0%" of the disk space.

2.7 DEFAULT BOOT PARTITION NUMBER

After you have either chosen the "Modify default boot partition" operation or finished a "Partition maintenance" operation, the cursor will move to the default boot partition position. The current default boot partition number and names will vanish from the display.

2.7.1 Selecting a Default Boot Partition

When the cursor moves to the default boot partition position, you can select a different partition to be accessed during bootup.

The default boot partition position is at the right side of the "Default boot partition number:" message. When the cursor moves to this position, the number and names of the current default boot partition vanish from the display, and the "Enter the number of the new default boot partition." message appears at the bottom of the screen.

Entry Rules

To establish a default boot partition, you must enter the **number of an established partition** and press RETURN.

This number must be in the range 1-16. It must be listed in the table to the left of an established partition name. The number, partition name, and system name of the partition you specified by number will be displayed between angle brackets.

Resulting Display

If you enter **3** as your default boot partition number, and if line 3 on your partition table looks like the following:

```
3. WORD/PROCESSING    CPM                    15%          1500
```

then part of the display showing your new default boot partition number will appear as follows:

```
   Partition Name     Operating System Name    Percentage    Kilobytes
   --------------     ---------------------    ----------    ---------
1. DATABASE           CPM                      30%           3000
2. SPREAD-SHEET       CPM                      30%           3000
3. WORD/PROCESSING    CPM                      15%           1500
4. BASIC              Z-DOS                    25%           2500
5.
/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\
15.
16.
Total Utilization (Allocated/unallocated)      100/0         10000/0
Default boot partition number: 3 <WORD/PROCESSING;CPM          >
     B - Modify default boot partition
     P - Partition maintenance
     R - Restore to original partitions
     E - Exit
Choose desired option. <B, P, R or E>
```

NOTE: The operations menu is displayed beneath the default boot partition number as soon as you make an entry for this feature. Refer to "2.8 Entering Choice of Operation" for instructions on using this menu at this stage of the program.

Error Conditions

If you try to enter a number (in the 1-16 range) for which there is no established partition on the table, the invalid number will vanish and the cursor will remain at the number position until you enter a valid number and press RETURN.

If you try to enter a number that is out of the 1-16 range, the computer beeps and the cursor remains at the number position until you enter a valid number and press RETURN.

2.7.2 Bypassing the Default Boot Partition

When the cursor moves to the default boot partition number, you can retain the current default boot partition, and advance to the PART operations menu.

Entry Rules

To bypass changing the default boot partition feature, press only the ***RETURN*** key at this position.

Resulting Display

The number and names of the current default boot partition will be redisplayed, and the cursor will move to the "Choose desired option" prompt beneath the operations menu, as shown:

```
\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\
15.
16.
Total Utilization (Allocated/unallocated)       100/0          10000/0
Default boot partition number: 1 <DATABASE;CPM                    >
     B - Modify default boot partition
     P - Partition maintenance
     R - Restore to original partitions
     E - Exit
Choose desired option. <B, P, R or E> _
```

Refer to "2.8 Entering Choice of Operation" for instructions on using the operations menu at this stage of the PART utility.

Error Condition

If you have caused the default boot partition feature to become undefined by removing a partition from the table (as explained in "2.4.3 Removing a Partition"), and then bypass the default boot partition, you will still encounter the "boot partition error" message, as shown in the following partial display:

```
/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/
15.
16.
Total Utilization (Allocated/unallocated)      100/0        10000/0
Default boot partition number: is undefined
boot partition error
     B - Modify default boot partition
     P - Partition maintenance
     R - Restore to original partitions
Choose desired option. <B, P or R>_
```

Furthermore, you will not be able to exit from PART until you either enter the number of an existing partition or remove the default boot partition.

2.7.3 Removing the Default Boot Partition

When the cursor moves to the default boot partition number, you can remove this feature altogether and advance to a PART operations menu.

Entry Rules

To remove the default boot partition, press the **space bar** only.

Resulting Display

The "is undefined" message will be displayed at the default boot partition position. However, you will not encounter the "boot partition error" message. Additionally, the operations menu and prompt appear, as shown in the following partial display:

```
/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\
15.
16.
Total Utilization (Allocated/unallocated)      100/0         10000/0
Default boot partition number: is undefined
     B - Modify default boot partition
     P - Partition maintenance
     R - Restore to original partitions
     E - Exit
Choose desired option. <B, P, R or E> _
```

Refer to "2.8 Entering Choice of Operation" for instructions on using the operations menu at this stage of the PART utility.

NOTE: If you remove the default boot partition, you will have to enter bootup commands that specify partition names (and possibly also operating system names) in order to boot up with any partition.

2.3 ENTERING CHOICE OF OPERATION

After you completed a PART operation (such as "Modify default boot partition" or "Partition maintenance"), the operations menu will appear.

This menu is the same as the menu explained in "2.3 Choice of Operation", with the addition of the "R – Restore to original partitions" operation.

NOTE: If you have encountered an error condition, the "E – Exit" operation might not be displayed. Therefore you must choose one of the operations that enables you to change partition features, and correct the error condition before PART will allow the "E – Exit" operation.

2.8.1 Choosing to Modify Default Boot Partition

The partition that is selected as the default boot partition is the partition that will be automatically accessed when you type a bootup command without specifying a partition name.

Entry Rules

Type **B** at this prompt to select a default boot partition.

Resulting Display

After typing the B entry to "Modify default boot partition", the activities menu and prompt will be replaced by the "Enter number of new default boot partition" prompt. Additionally, the number and names of the current default boot partition will be replaced by the cursor on the display line beneath the table.

When a display in this form appears, refer back to "2.7 Default Boot Partition Number" for further instructions.

2.8.2 Choosing Partition Maintenance

The "Partition Maintenance" operation leads you to add partitions, and/or change the percentage of space allocated to partitions. Then this activity also prompts you to select a default boot partition.

Entry Rules

Type **P** at this prompt to begin changing the arrangement of partitions.

Resulting Display

When you choose the "Partition maintenance" operation, the cursor moves to the beginning of the first partition name in the table and the operations menu is replaced by a "Minimum allocation" message at the bottom of the display.

When a display in this form appears, refer back to "2.4 Partition Name".

2.8.3 Restoring Partition Features

When the cursor moves to the "Choose desired option." prompt, you can end the PART session, rearrange your partitions starting either with your most recent entries or with the partition features set as they appeared when you invoked PART, or reselect a default boot partition starting either with your most recent entries or with the default boot partition that was set when you invoked PART.

Entry Rules

Type **R** if you want each partition feature to revert to its status at the time you invoked the PART utility.

Resulting Display

When you choose the "R – Restore to original partitions" operation, PART will redisplay the operations menu without the "R – Restore to original partitions" option. The partition table will show the names, allocations, and default boot partitions that were already established when you invoked PART, as shown in the following display:

```
   Partition Name     Operating System Name    Percentage    Kilobytes
   --------------     --------------------     ----------    ---------
 1. Z-DOS             Z-DOS                     50%           5000
 2. CPM               CPM                       50%           5000
 3.
 4.
 5.
 6.
 7.
 8.
 9.
10.
11.
12.
13.
14.
15.
16.
Total Utilization (Allocated/unallocated)      100/0         10000/0
Default boot partition number: 1   <Z-DOS;Z-DOS                 >

     B – Modify default boot partition
     P – Partition maintenance
     E – Exit
Choose desired option. <B, P or E> _
```

NOTE: This display is identical to the display presented in "2.3 Choice of Operation".

Error Conditions

If you enter a character other than B, P, R, or E, PART will cause the computer to beep and the cursor to remain at the end of the prompt until you enter a valid letter.

2.8.4 Beginning the Exit Operation

When you exit from the PART operation after changing any partition features (through the "Modify default boot partition" or "Partition maintenance" operations), you will have to choose this operation and then make an entry at another menu.

Entry Rules

Type **E** if you wish to exit from the PART utility.

Resulting Display

When you choose the "E – Exit" operation, the following exit menu and prompt will be displayed at the bottom of the screen:

```
M - Make changes and exit
A - Abort, make no changes and exit

Choose desired option. <M or A> _
```

Error Conditions

If you enter a character other than B, P, R, or E, PART will cause the computer to beep and the cursor to remain at the end of the prompt until you enter a valid letter.

2.9 CHOICE OF EXIT METHODS

When you choose the "E – Exit" operation after changing partition features, the final exiting menu appears.

CAUTION: Before typing an entry at this menu, review the partition table carefully to be certain that your partitions are allocated as you want them. Remember that any rearrangement of partitions can destroy data on the Winchester disk, and that no changes are actually made to the Winchester disk until you enter the M option.

NOTE: Regardless of the exit method you choose, you will have to enter ***CTRL-RESET*** and reboot the system after exiting from PART.

2.9.1 Making Changes to the Winchester Disk

When the cursor moves to the prompt beneath the final exit menu, you can change the partition features according to your entries while exiting from PART.

Entry Rules

Type **M** if you want to exit from the PART utility and change the status of Winchester disk partition features to reflect the changes that you entered during this PART session.

CAUTION: This entry has the potential to destroy any data that might exist on the Winchester disk.

Resulting Display

After you choose and enter the "Make changes" option the Z-DOS system prompt will appear, as shown:

```
A:
```

Error Conditions

If you enter a character other than M or A, PART will cause the computer to beep and the cursor to remain at the end of the prompt until you enter a valid letter.

2.9.2 Aborting Changes to the Winchester Disk

When the cursor moves to the prompt beneath the final exit menu, you can nullify all of the changes you have entered while exiting from PART.

Entry Rules

Type **A** if you want to end this PART session without any changes to the Winchester disk.

Resulting Display

After you choose and enter the "Abort" option, the Z-DOS system prompt will appear, as shown:

```
A:
```

NOTE: Each partition feature will revert to the status it maintained before you invoked the PART utility. Any and all changes you may have entered during this PART session will be nullified, as if you had not even invoked PART.

Error Conditions

If you enter a character other than M or A, PART will cause the computer to beep and the cursor to remain at the end of the prompt until you enter a valid letter.

3 The Superblock

NOTE: Information concerning the superblock is not essential for use of the PART utility or the Winchester disk. This information is provided for users who wish to obtain a deeper understanding of some of the activities that PART performs in order to partition a Winchester disk.

Winchester disk space is allocated according to information contained within a unit of software that is stored on a reserved area of the Winchester disk. This unit of software is called the "superblock".

The superblock is a unit of Winchester support software that enables you to access specific partitions. The superblock is initially recorded on your disk when you use the PREP utility.

The superblock is also recorded on Winchester disks obtained from Zenith Data Systems or Heath — whether or not you use the PREP utility.

To insure the integrity of the superblock information, two copies of the superblock are recorded on the disk. These copies are named "Superblock A" (the copy used in most cases) and "Superblock B" (a backup copy used only when Superblock A is unusable).

After you use PART to change partitioning features (such as partition name, system name, allocation percentage, and default boot partition), PART updates both copies of the superblock and other Winchester support software units. Other Winchester support software units are explained in the text entitled "5 The Reserved Winchester Area" under "PREP".

The information within each copy of the superblock resembles the information shown on the partition table that is displayed when you use the PART utility. The superblock is structured as shown in Table 4-1.

	16 bytes	10 bytes	1 byte	3 bytes
1.	Partition Name	System Name	flag	Start Sector
2.	Partition Name	System Name	flag	Start Sector
3.	Partition Name	System Name	flag	Start Sector
4.	Partition Name	System Name	flag	Start Sector
5.	Partition Name	System Name	flag	Start Sector
6.	Partition Name	System Name	flag	Start Sector
7.	Partition Name	System Name	flag	Start Sector
8.	Partition Name	System Name	flag	Start Sector
9.	Partition Name	System Name	flag	Start Sector
10.	Partition Name	System Name	flag	Start Sector
11.	Partition Name	System Name	flag	Start Sector
12.	Partition Name	System Name	flag	Start Sector
13.	Partition Name	System Name	flag	Start Sector
14.	Partition Name	System Name	flag	Start Sector
15.	Partition Name	System Name	flag	Start Sector
16.	Partition Name	System Name	flag	Start Sector
17.	blanks	blanks	blanks	Start Sector
	16 bytes	10 bytes	1 byte	3 bytes

Table 4-1
Superblock Structure

NOTE: The superblock does not include all of the software necessary to facilitate Winchester disk access. Other Winchester support software, used for Winchester bootup and isolation of unusable disk media, are explained in the text entitled "5 The Reserved Winchester Area" under "PREP".

3.1 THE START SECTOR

The structure of the superblock is similar to the layout of the partition table that is displayed while you are using PART. For each partition, it contains a partition name (1–16 characters) and an operating system name (1–10 characters).

However, in undating the superblock, PART converts the allocation percentages that you entered into a different kind of statistic that can be used during partition access to determine where a partition begins and ends. PART converts the percentage value into the number of the start sector number of each partition.

Although you can establish only 16 partitions on the Winchester disk, there are 17 partition entries defined in the superblock. The size of each partition is determined by the difference between the "Start Sector" values of adjacent partitions.

It is necessary to define a 17th partition so that the size of the 16th partition (if established by the user) can be calculated by subtracting the start sector value of the 16th partition from the start sector value of the 17th partition.

The partition preceding the first partition that has spaces (20H) entered for its partition name will be considered to be the last usable partition defined in the table. The start sector of this partition will be one greater than the last sector allocated. The partition name entry for the 17th partition is always spaces.

3.2 THE FLAG BYTE

Partitions are also labeled with a flag byte.

The flag byte contains special information about the partition. For this version of the PART utility, only the high order bit is defined. This bit is set to one whenever PREP is run, or whenever PART is run with PART changes being made. The operating system that is eventually recorded on the disk can reset this byte when the system's formatting utility is run on the partition.

The FORMAT utility supplied with this version of CP/M-85 does not use or set this flag byte.

3.3 DISK SPACE CALCULATION

The PART utility allocates portions of Winchester disk space using 512-byte sectors as the primary unit of measure, and converts the quantities of sectors (512-byte units) into kilobytes (1024-byte units) for the totals displayed on the screen. PART determines how much space to allocate by performing the following internal operations in sequence:

1. observing the total size of the Winchester disk being used,
2. monitoring the percentages you enter,
3. calculating the number of sectors that is closest to this percentage,
4. converting sectors to kilobytes, and
5. displaying this kilobyte quantity on the screen.

Thus the amount of disk space that is actually allocated will not always be exactly equal to the percentage you entered, but rounded to the nearest kilobyte.

If you enter an allocation percentage that is greater than the remaining space percentage on the disk, then PART will calculate the number of kilobytes of space remaining on the disk, calculate this amount to the nearest one percent, and display this remaining percentage instead of the percentage that you tried to enter.

Because of PART's rounding of space portions to the nearest percentage, the percentages allocated to your partitions might not always add up to exactly 100 percent when the disk is full. Furthermore, this rounding can also cause partitions that were divided into equal percentages to have slightly unequal kilobyte capacities.

3.4 VERIFYING THE SUPERBLOCK

PART updates information in Superblock A and Superblock B at the locations where these superblock copies were initially recorded (by the PREP utility). By spacing these two copies of the superblock several sectors apart, PART decreases the chance that both copies could be damaged simultaneously.

A checking code called a "checksum" is calculated by PART for each of the copies of the superblock before PART records these superblock copies on the Winchester disk. The results of these checksums are recorded in a data structure known as the Software Boot Code (see text entitled "5 The Reserved Winchester Area" under "PREP").

Then, when execution of either PART or PREP is repeated on the same Winchester disk, the utility first performs checksums to verify that the superblocks have not changed since the original checksums were performed.

If the PART utility encounters difficulty in reading Superblock A, or if the results of the second checksum of Superblock A differ from the results of the original checksum, then PART tries to read Superblock B.

If the PART utility encounters difficulty in reading Superblock B, or if the results of the second checksum of Superblock B differ from the results of the original checksum, then PART will display an error message.

4 PART Error Messages

```
Allocation error
```

You have established one or more partitions that are presently allocated zero percent of the disk. (PART might have subtracted from the original amount of space you allocated to these partitions when you allocated too much space to other partitions.) You must repeat the "Partition maintenance" operation and change allocation percentages of one or more partitions to conform with percentage entry rules (see "2.6 Allocation Percentage").

```
Boot Partition error
```

You have removed the default boot partition from the table during a "Partition maintenance" operation. You can either replace this partition through the "Partition maintenance" operation, or select valid default boot partition through the "Modify default boot partition" or "Partition maintenance" operation.

```
Duplicate Names error
```

You have established more than one partition with both the same partition name or the same operating system name. You must change at least one of the names of one of these partitions through the "Partition maintenance" operation.

NOTE: The above three error messages can appear in a series if more than one error condition exists at the same time. The form of these series error messages can be:

```
Allocation and Boot Partition error
Allocation and Duplicate Names error
Boot Partition and Duplicate Names error
Allocation and Boot Partition and Duplicate Names error
```

All such error messages are displayed in reverse video, between the default boot partition position and the operations menu.

The conditions that produce any of these error messages will also prevent you from exiting from the PART utility until you have corrected the errant condition(s).

```
Unable to communicate with the Z-217 controller
```

The PART utility was unsuccessful in an attempt to access the Z-217 controller, which controls the Winchester disk. This problem could indicate that the Z-217 controller is not firmly plugged into the S-100 bus, the drive cable connectors are not securely fastened, or that the controller has a hardware malfunction. Check to see that the controller card and all cable connectors are secure. Then run PREP and PART in sequence. If this error occurs after repeated attempts to run PREP and PART, contact Zenith Data Systems Technical Consultation for assistance.

```
Z-217 controller error on Set Drive Parameters command
```

One or more responses to the five drive characteristic questions were not valid for the particular drive connected. A malfunction of the Z-217 controller is also possible. Recheck the characteristics of your drive. Then run PREP and PART in sequence. If this error occurs after repeated attempts to run PREP and PART, contact Zenith Data Systems Technical Consultation for assistance.

```
Error - unable to re-write tables
```

PART is unable to record changes to the superblock after you have specified changes to the partition table and exited from PART. PART might succeed in recording some of the changed superblock information over the old superblock before this error message occurs, leaving portions of new and old superblocks on your Winchester disk. Therefore, you should use the PREP utility and then repeat the PART utility.

```
Unable to read superblock/SBC, disk unusable
```

PART either unsuccessful in reading information stored in the existing software boot code, or successfully read the software boot code and detected a checksum error. Use the PREP utility and then repeat the PART utility.

```
Fatal Error -- Can not read superblock B.
```

A bad sector error has occurred in the backup copy of the superblock (Superblock B). Try to run the PREP utilities on the disk in sequence. If repeated attempts to use PREP and PART fail, then contact Zenith Data Systems Technical Consultation for assistance.

PREP

The Utility that Initializes a Winchester Disk

The PREP utility prepares the magnetic surface of many different types of Winchester disk for use as mass storage devices in a Z-100 environment. The PREP utility is seldom (if ever) needed by most users.

The PREP utility is recorded on the Winchester Utility Disk, which is shipped with your Winchester disk hardware documentation. Although this disk runs under the Z-DOS Operating System, you can boot up with it — just as you would with a bootable CP/M-85 disk.

CAUTION: Using PREP will destroy all software and/or data stored on your Winchester disk. Do not use PREP until you have transferred your Winchester disk files to floppy disks. Winchester disks supplied by Zenith Data Systems or Heath have already been prepared by PREP before they are shipped. Therefore, users of these disks will need to use PREP only if they are consistently encountering an unreasonable number of disk access errors, and cannot correct this problem with the VERIFY utility.

NOTE: Before you use the PREP utility, a hardware component called a "jumper" must be installed at the "format enable" location on your Z-217 Winchester disk drive controller card. This jumper is already installed (although unused) at a different location on your Z-217 controller card when the card is shipped. Therefore, before you can use the PREP utility, you must move the jumper to the "format enable" location. This procedure is explained under the heading "PREP Hardware Adjustments" of the text on PREP.

After you use the PREP utility, you will have to reset and reboot the system with a bootable floppy disk.

Additionally, you should remove the jumper from the format enable location on the Z-217 controller card between the time you finish using PREP and the time you perform routine activities that involve data storage on the Winchester disk.

WARNING: Unplug your computer from its power source before touching any hardware component within the computer's cabinet.

1 Winchester Disk Features

"Winchester disks" come in a variety of sizes and configurations, but they all have common features. The central feature and core of a Winchester disk device is a rigid platter. The typical platter consists of a non-magnetic metal (generally aluminum) disk, coated with a thin plating of ferric oxide or cobalt. This platter itself is the Winchester disk, as opposed to the floppy disk, which has a plastic (usually mylar) core with a thin coating of a similar magnetic substrate.

1.1 PLATTERS

Winchester disk platters are generally sealed to prevent particulate matter from the environment (such as dust, smoke, dirt, or hair) from contaminating a platter's surface or read/write head. Winchester disks are available in a variety of sizes and with one or more platters. Winchester disks can be either "fixed" or "removable". The fixed disk is permanently mounted inside the device, but removable Winchester disks come in disk packs or cartridges and may be removed or interchanged.

1.2 READ/WRITE HEADS

The read/write heads are electromagnets that slide back and forth a fraction of an inch above the surface of Winchester disk platters. The movement of a Winchester disk drive's read/write heads between the hub of the platters and the edge of the platters is called "stepping". Therefore, this movement is measured by an amount known as the "step rate".

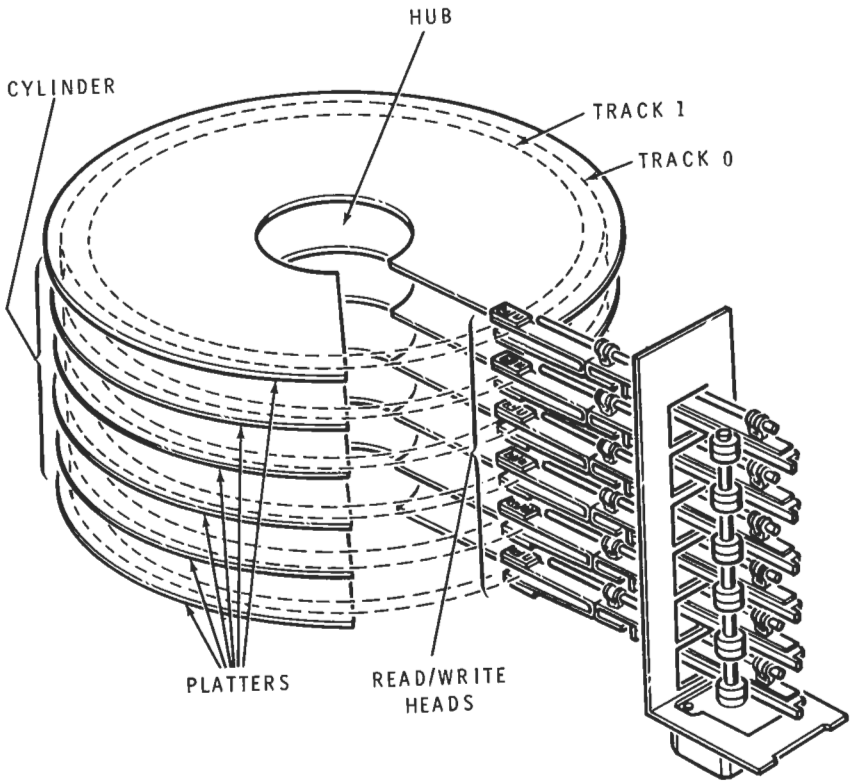

Figure 4-1
Winchester Disk Components

1.3 LOGICAL WINCHESTER DISK DIVISIONS

Winchester disks that are supplied by Zenith Data Systems and Heath can be divided into several logical subunits called "partitions". This is partly because large quantities of storage locations are easier to deal with if they are subdivided. The various subdivisions help speed storage and retrieval of data.

1.4 SECTORS

A "sector" is the basic unit of data organization for disk drive devices. Like floppy disks, Winchester disks are divided into sectors. Winchester disk sectors under CP/M-85 are 512 bytes long.

1.5 TRACKS AND CYLINDERS

Each recording surface of a Winchester disk platter is also divided into concentric rings called "tracks", which are similar to the tracks of a floppy disk. The Winchester disks initialized by PREP are formatted with 18 sectors per track. A further division of a Winchester disks storage area is the cylinder (see Figure 4-1). A "cylinder" is a collection of all tracks that are located the same distance from the outer edge of each recording surface. Winchester disk read/write heads can access all of the data stored on a particular cylinder without any stepping movement.

For example, if a Winchester disk drive has four read/write heads, the drive can access a cylinder of 72 sectors (4 tracks times 18 sectors) without stepping (moving the heads). This amounts to a total of 36864 bytes (36 kilobytes) being read or written.

2 Invoking PREP

Invoke PREP by entering the following command at the Z-DOS system prompt:

A: **PREP *RETURN***

When you invoke PREP, the following display appears:

```
                    PREP version 1.00
          Copyright (C) 1982, Zenith Data Systems

The PREP utility helps you to:

  * initialize surface of Winchester disk
  * test data retention capabilities of Winchester disk media
  * isolate questionable disk sectors
  * divide the surface of Winchester disk into two partitions
    of equal size (one Z-DOS partition and one CP/M partition)

PREP may prompt you to specify five Winchester disk characteristics in
order to identify the type of Winchester disk you have installed.
Then PREP displays messages as it operates on the disk.

Caution:  Using PREP can destroy all files on your Winchester disk.
Winchester disks supplied by Zenith or Heath are prepared by PREP
before they are shipped. Users of these disks will use PREP only
after consistently encountering an unreasonable number of disk access
errors. Do not use PREP until you have transferred backup copies of
your Winchester disk files to floppy disks.

Do you wish to proceed with PREP (Y/N)?
```

Typing an **N** at this prompt ends the PREP utility and returns you to the system prompt.

Typing a **Y** causes PREP to display the following prompt:

```
Please type P to proceed
```

Typing any response other than P ends the PREP utility and returns you to the system prompt.

3 Responding to Disk Characteristic Prompts

Typing **P** at the "Please type P to proceed" prompt causes PREP to continue operation.

If the disk has been previously prepared by PREP and no errors are found in the first sector of the boot code (see the text entitled "5 The Reserved Winchester Area"), PREP skips these disk characteristic prompts, assumes the disk surface has been previously initialized, and proceeds immediately to disk initialization (see the text entitled "4.1 Initializing the Disk").

If the disk has not been prepared with PREP, or if there is an error found in the first sector of the boot code (see "5 The Reserved Winchester Area"), then the following five disk characteristic prompts will appear in sequence:

```
Enter number of heads in hex:
Enter number of cylinders in hex:
Enter reduced write current cylinder in hex:
Enter pre-comp cylinder in hex:
Enter step rate code in hex:
```

The significance of each of these disk characteristic prompts is explained here.

```
Enter number of heads in hex:
```

At this prompt, type a hexadecimal value for the number of read/write heads contained in the drive you are preparing. Then press ***RETURN***.

```
Enter number of cylinders in hex:
```

At this prompt, type the hexadecimal value of the number of cylinders contained in the drive you are preparing. Then press ***RETURN***.

For disks with floating read/write heads, this number would be equal to the total number of tracks divided by the total number of read/write heads. For disks with fixed read/write heads, this number would be equal to the total number of tracks divided by the total number of usable platter surfaces.

```
Enter reduced write current cylinder in hex:
```

At this prompt, type the hexadecimal value for the location of the first cylinder at which read/write head current must be reduced. Then press ***RETURN***.

Toward the hub of the platters, where the circumference of each cylinder is smaller, data storage sectors are recorded closer together than the sectors on cylinders near the edge of the platters. Therefore, some Winchester disk drives reduce the electrical current sent to the read/write head when they write data on cylinders that are close to the hub of the disk platters. This reduction of current helps to prevent magnetic interference between the data sectors that are recorded extremely close together.

```
Enter pre-comp cylinder in hex:
```

At this prompt, enter the hexadecimal value for the number of the first cylinder at which write precompensation must take place. Then press ***RETURN***.

On the cylinders located close to the hub of a Winchester disk, where data is recorded at extremely high density, bit shift can occur. "Bit shift" is a phenomenon where the data bits written at a particular location spread apart slightly on the media after they have been written. Bit shift is most likely to occur when similar bits are written close together. The "pre-comp" (write precompensation) characteristic compensates for bit shift by writing some bits earlier or later that the normal rate of data writing. Precompensation for Winchester disks causes a slight deviation (about 12 nanoseconds for every 100 nanoseconds) from the normal rate of data writing during the writing of bits that are apt to shift.

```
Enter step rate code in hex:
```

At this prompt, you should enter the hexadecimal value code that indicates the rate at which the read/write heads step between tracks. Then press ***RETURN***.

After you respond to the "step rate code" prompt, PREP will automatically begin to perform its three operations (see "4 PREP Operations") in sequence.

The PREP utility is capable of preparing a wide variety of Winchester disks for data storage. Table 4-2 lists several different Winchester disks available in the microcomputer market and indicates the hexadecimal values you should enter to prepare each disk when prompted by PART for a specific disk characteristic.

The labels for the columns of numbers in Table 4-2 correspond to PREP characteristic prompts. If the model number of your Winchester disk is listed in the left-hand column of the table, then enter the numbers listed in the right-hand columns in sequence as the characteristic prompts are displayed.

According to Table 4-2, if you have a Miniscribe Mod II 2012 Winchester disk drive, you should respond to the drive characteristic prompts as follows:

```
Enter number of heads in hex: 4 RETURN
Enter number of cylinders in hex: 132 RETURN
Enter reduced write current cylinder in hex: 200 RETURN
Enter pre-comp cylinder in hex: 80 RETURN
Enter step rate code in hex: 1 RETURN
```

Drive Model	Total Heads	Total Cylinders	Reduced Current Cylinder	Write Pre-comp Cylinder	Step Rate Code
Seagate					
ST-406	2	132	200	80	1
ST-412	4	132	200	80	1
ST-419	6	132	200	80	1
ST-506	4	99	80	40	96
ST-706	2	132	200	80	1
Miniscribe					
Mod II 2012	4	132	200	80	1
Mod III 3012	2	264	300	80	1
Mod IV 4020	4	1E0	200	80	1
IMI					
5006H	2	132	200	D6	1
5012H	4	132	200	D6	1
5018H	6	132	200	D6	1
Tandon					
TM 602S	4	99	80	40	96
TM 603S	6	99	80	40	96

Table 4-2
Responses to PREP Characteristic Prompts

4 PREP Operations

PREP begins to prepare the surface of your Winchester disk either after displaying the initial screen messages or after you respond to the five disk characteristic prompts. PREP prepares the disk by performing three operations in sequence: Initializing the Disk, Testing the Disk Media, and Initializing the Reserved Winchester Area.

4.1 INITIALIZING THE DISK

After you have responded to the disk characteristic prompts, PREP initializes the surface of the disk for the test that will follow. While this occurs, you will see the message:

```
Initializing the disk...
```

This initialization is similar to FORMAT in that it magnetically records a map of all sectors on the disk surface. When the surface has been initialized, the message shows:

```
Initializing the disk...completed
```

and then PREP begins testing the disk media.

NOTE: If your Winchester disk hardware has not been properly adjusted, the following message will be displayed instead of the "Initializing the disk..." message:

```
Error during formatting of the drive.
```

If this message appears, you must now perform a hardware adjustment as explained in the text entitled "6 PREP Hardware Adjustments".

4.2 TESTING THE DISK MEDIA

PREP performs seven test passes to check the integrity of the disk's storage capability. During each pass, PREP writes a predetermined code to each sector (the drive light will flicker) and then reads back that code to verify that it remained correct (the drive light will appear as constantly on). PREP keeps you informed of its progress by displaying the message:

```
Media test in progress, pass n
```

Where `n` is the number (in the range 1-7) of the pass that it is currently conducting.

Be patient. This PREP operation can take from 45 to 90 minutes because of the large number of sectors that PREP must test.

PREP uses a different code on each pass it makes through the test. If PREP finds sectors containing unusable media, it stores the address of these sectors, and later places these sector addresses into a bad sector table.

4.3 INITIALIZING THE RESERVED WINCHESTER AREA

After completing the media tests, PREP records and verifies the Reserved Winchester Area (see "5 The Reserved Winchester Area") on the first several sectors of the Winchester disk. During this operation, PREP displays the following message:

```
Initializing the disk...
```

If PREP adds the word completed to the end of this display, and displays the system prompt, then all PREP operations are complete. The display should appear as follows:

```
Initializing the disk...completed

A:
```

Then you should reset the system and boot up with a bootable floppy disk. If you wish to use the PART utility immediately, then boot up with a copy of the Winchester Utility Disk. If you wish to perform any other operation, then boot up with a floppy disk.

NOTE: You will not be able to access any partition after using PREP until you reset the system and boot up with a bootable floppy disk.

CAUTION: After using PREP, you should remove a hardware component called a jumper from the "format enable" location on the Z-217 Winchester Disk Controller Board. Refer to the text entitled "6 PREP Hardware Adjustments" for instructions on removing this component. This procedure will help to protect the data on your Winchester disk from being destroyed accidentally.

5 The Reserved Winchester Area

NOTE: Information concerning the Reserved Winchester Area is not essential for use of the PREP utility or the Winchester disk. This information is provided for users who wish to obtain a deeper understanding of the operations that PREP performs in order to prepare a Winchester disk.

When the PREP utility is run, it records units of Winchester support software on the first 36 usable sectors of the Winchester disk. These software units are collectively known as the Reserved Winchester Area. They are recorded on the Winchester disk during PREP's reserved area initialization operation (see 4.3 Initializing the Reserved Winchester Area). These software units are arranged as shown in Table 4-3.

SECTORS USED	WINCHESTER SUPPORT SOFTWARE UNITS
5	Software Boot Code (SBC)
1	Superblock A
1	Bad Sector Table A
11	blank
1	Superblock B
1	Bad Sector Table B
16	blank
36	TOTAL RESERVED WINCHESTER AREA

Table 4-3
Winchester Support Software Units
within Reserved Winchester Area

The most important Winchester support software units listed in Table 4-3 are the software boot code, the superblocks, and the bad sector tables.

These units are vital to you during Winchester bootup because they help you to access a particular partition after you access the Winchester disk itself. Users of CP/M-85 with the Winchester disk also use these data structures to make unusable media (bad sectors) inaccessible before FORMAT is run.

The blanks inserted between the "A" copies of the superblock and bad sector table and the "B" copies of these units help to decrease the chance that all important Winchester support software units could be damaged simultaneously.

If you must access any part of the reserved Winchester area, you can determine the location of the Winchester support software units by examining the pointers in the software boot code. The software boot code will begin at sector zero regardless of the location of the other software units.

5.1 THE SOFTWARE BOOT CODE (SBC)

The "software boot code" (SBC) is a Winchester support unit that helps locate the partition to be booted after entry of a Winchester disk bootup command. The SBC also helps you to avoid bad sectors during disk access by referring to a bad sector table.

PREP records the SBC on the first 5 sectors of the Winchester disk during initialization of the reserved Winchester area (see "4.3 Initializing the Reserved Winchester Area").

5.1.1 Role of SBC During Bootup

When you enter a Winchester disk bootup command (see "Bootup with a Winchester Disk"), the computer will load the SBC into Random Access Memory (RAM).

Once within RAM, the SBC begins to access a partition. The partition that is accessed is determined either by a bootstring or a default boot partition. A bootstring can be specified by the user during bootup. A default boot partition is stored in a fixed location within the SBC (see the text entitled "5.1.2 SBC Entries").

In order to access a partition, the SBC must match the specified bootstring or default boot partition with a partition that exists in the superblock's table of partitions (see the text entitled "5.2 The Superblock").

When the SBC finds a partition that matches the specified bootstring or default boot partition, the SBC loads the first 32 sectors of that partition into RAM. If the accessed partition contains CP/M-85, then the CP/M-85 boot loader program will begin to execute the remainder of the bootup operation.

5.1.2 SBC Entries

The entries included in the first 128 bytes of the SBC are described in Table 4-4.

BYTES	SBC ENTRIES
3	System bytes
1	PART/SBC version number (Used to synchronize different releases of software)
1	PART/SBC revision number (Used to synchronize different releases of software)
27	Default bootstring (16 bytes define the partition name, one byte defines the semicolon, and 10 bytes define the operating system name)
3	Beginning sector address of bad sector table A
3	Beginning sector address of bad sector table B
3	Beginning sector address of superblock A
3	Beginning sector address of superblock B
2	Sector size (512 bytes per sector)
2	Sectors per track (18)
6	Reserved for future expansion
3	Number of sectors on entire Winchester disk
1	Reserved for future expansion
2	Checksum for superblock copy A
2	Checksum for superblock copy B
2	Checksum for bad sector table copy A
2	Checksum for bad sector table copy B
12	Set drive for Z-217 controller
3	Address of first user sector (first sector beyond Reserved Winchester Area)
6	Date partitioned, or default date, when PART is run (When PREP is run, the value 00 is used for each byte.)
2	Checksum of SBC (assuming initial value is zero)
39	Reserved for future expansion
128	FIRST QUARTER-SECTOR OF SBC

Table 4-4
Software Boot Code Entries

The format for each three-byte sector number is low, middle, high byte.

NOTE: Table 4-4 describes one quarter-sector of the five-sector SBC. The rest of the SBC consists of the assembly instructions that lead to the actual access of the specified partition.

5.1.3 SBC Verification

A checking code called a "checksum" is calculated by PREP for the SBC before PREP records the SBC on the disk. The results of these checksums are recorded in entries within the SBC.

Then, when execution of either PART or PREP is repeated on the same Winchester disk, verification checksums are performed to verify that the SBC has not changed since the original checksums were performed.

If the SBC has changed, or if it cannot be read, then an error message will be displayed.

The SBC also contains the checksums used to verify the other Winchester support units (the superblocks and bad sector tables).

5.2 THE SUPERBLOCK

The "superblock" is a Winchester support unit that contains information about each partition on the disk. It contains the following items for each of 17 defined partitions:

- partition name
- operating system name
- flag byte (to show whether PREP or PART has been run on the disk since the last time the partition was formatted)
- address of the starting sector

5.2.1 Superblock Entries

These items occupy 30 bytes per entry. The 17 superblock entries are structured as shown in Table 4-5.

BYTES	SUPERBLOCK ENTRY
30	Entry for 1st partition (including 16-bytes partition name, 10-byte system name, 1-byte flag, and 3-byte starting sector)
30	Entry for 2nd partition (including 16-bytes partition name, 10-byte system name, 1-byte flag, and 3-byte starting sector)
30	Entry for 3rd partition (including 16-bytes partition name, 10-byte system name, 1-byte flag, and 3-byte starting sector)
.	.
.	.
.	.
30	Entry for 16th partition (including 16-bytes partition name, 10-byte system name, 1-byte flag, and 3-byte starting sector)
30	Entry for 17th partition (including 16-bytes partition name, 10-byte system name, 1-byte flag, and 3-byte starting sector)
2	Reserved for future expansion
512	TOTAL FOR EACH SUPERBLOCK

Table 4-5
Superblock Entries

NOTE: Refer to the text entitled "5.2 The Superblock" in the text on PART for a detailed explanation of the components of each superblock entry and other information concerning the superblock.

5.2.2 Superblock Verification

During initialization of the reserved Winchester area (see the text entitled "4.3 Initializing the Reserved Winchester Area"), PREP records superblock entries twice on the Winchester disk. The primary copy of the superblock, called Superblock A, is used unless some of its contents have been damaged since it was recorded. The backup copy of the superblock, called Superblock B, is used if Superblock A is damaged. Each copy is recorded several sectors apart to decrease the chance that both could be damaged simultaneously.

A checking code called a "checksum" is calculated by PREP for each superblock copy before PREP records these superblock copies on the Winchester disk. The results of these checksums are recorded in the software boot code (see "5.1 The Software Boot Code (SBC)").

Then, when execution of either PART or PREP is repeated, verification checksums are performed to verify that the superblocks have not changed since the original checksums were performed.

If Superblock A cannot be read, or if the results of the second checksum of Superblock A differ from the results of the original checksum, then the utility tries to read Superblock B.

If Superblock B cannot be read, or if the results of the second checksum of Superblock B differ from the results of the original checksum, then all partitions will be inaccessible.

5.3 THE BAD SECTOR TABLE

The "bad sector table" is an ordered list of the addresses of each sector on the disk that contains unusable media. The information in the bad sector table enables CP/M-85 to avoid bad sectors (unusable media) when it accesses a partition during your everyday activities.

The bad sector table can include the addresses of as many as 169 bad sectors. Each bad sector address is recorded in a three-byte entry. Entries that do not contain the address of a bad sector are filled with three zeroes.

5.3.1 Bad Sector Table Entries

The structure of the bad sector table is explained in Table 4-6.

During media testing (see "4.2 Testing the Disk Media"), PREP maintains a record of the location of all the bad sectors (sectors containing unusable media) that it finds on the disk. Then, during initialization of the reserved Winchester area (see "4.3 Initializing the Reserved Winchester Area"), PREP creates a table of all bad sectors and records two copies of this table on the disk.

BYTES	BAD SECTOR TABLE ENTRY
3	Address of 1st bad sector found by PREP
3	Address of 2nd bad sector found by PREP
3	Address of 3rd bad sector found by PREP
3	Address of 4th bad sector found by PREP
.	.
.	.
.	.
3	Address of 168th bad sector found by PREP
3	Address of 169th bad sector found by PREP
3	Last entry in table (always contains 000)
2	Reserved for future expansion
512	TOTAL FOR EACH BAD SECTOR TABLE

Table 4-6
Bad Sector Table Entries

5.3.2 Bad Sector Table Verification

The primary copy of the bad sector table, called Bad Sector Table A, is used unless some of its contents have been damaged since it was recorded. The backup copy of the bad sector table, called Bad Sector Table B, is used if Bad Sector Table A is damaged. Each copy is recorded several sectors apart, to decrease the chance that both could be damaged simultaneously.

A checking code called a "checksum" is calculated by PREP for each of the copies of the bad sector table before PREP records these bad sector table copies on the Winchester disk. The results of these checksums are recorded in the software boot code (see "5.1 The Software Boot Code (SBC)").

Then, when execution of PREP or PART is repeated on the same Winchester disk, verification checksums are performed to verify that the bad sector tables have not changed since the original checksums were performed.

If Bad Sector Table A cannot be read, or if the results of the second checksum of Bad Sector Table A differ from the results of the original checksum, then Bad Sector Table B is read.

If Bad Sector Table B cannot be read, or if the results of the second checksum of Bad Sector Table B differ from the results of the original checksum, then no bad sector table information will be available in the Reserved Winchester Area. If the FORMAT utility is then used on a partition of this disk, it will assume that the disk has no bad sectors and format without avoiding any bad sectors. If the VERIFY utility is used on this disk, it will find no bad sector table to which it can append new bad sectors. Therefore, it will search the disk for all bad sectors and create a new bad sector table.

6 PREP Hardware Adjustments

Before you can use the PREP utility, a hardware component within your Z-100 computer must be moved from one location to another. This text section explains the procedure you must perform in order to properly move this component.

This component must be moved because its position during use of PREP is different from its position during all other Winchester disk activities.

6.1 JUMPER DESCRIPTION

This hardware component is called a "jumper". A jumper is an insulated metal clip or wire used to connect different locations on a circuit board.

In this case, the jumper used is a small conductive metal clip covered with a box-like plastic case. This kind of jumper is known as a Berg jumper.

This jumper is designed to fit over two metal pins protruding from the circuit board known as the Z-217 Winchester Disk Controller Board (or controller card).

When you use PREP, the jumper must cover two of the pins on the Z-217 to allow PREP to initialize the Winchester disk. When you perform any activity other than PREP, the jumper must be stored at a different location on the Z-217.

6.2 JUMPER MOVEMENT PROCEDURE

This procedure explains the sequence of steps you should perform to adjust your hardware both before and after using PREP.

WARNING: The internal components of your computer can cause severe electric shock if touched while the computer is running. Therefore, you should turn off your computer and unplug it from its power source before touching any hardware component within the computer's cabinet.

1. Remove any disk that may be in the floppy disk drive.

2. Turn off your computer's power and unplug it from the power source.

3. Remove the cabinet top from your computer. (Refer to Appendix I of the Z-100 Series User's Manual for detailed information on removing this top.)

4. Locate the Z-217 Winchester Disk Controller Board in the "Card Cage" illustrated in Figure 4-2.

   NOTE: Your computer also contains a disk controller board for floppy disks (called the Z-207). The Z-217 Winchester Disk Controller Board is the board that is connected to the Winchester disk drive (rather than the floppy disk drive) by a flat, ribbon-like cable.

5. Gently slide the Z-217 controller board upward until the area shown in Inset #1 of Figure 4-2 is above the top of the card cage. Do not remove the Z-217 board completely from the card cage. As you slide the board upward, be certain that some of the board is still anchored between the card cage's vertical tracks.

   NOTE: In order to slide the Z-217 controller board upward, you might first have to temporarily unplug Z-217 cables or a cable that lies above the Z-217 board.

6. Locate the jumper covering the pins shown in Inset #1 of Figure 4-2. Remove this jumper by carefully sliding it away from the board. Be careful not to bend the pins.

   NOTE: The pins shown in Inset #1 are known as the Z-217 interrupt pins. These pins need not be connected by the jumper while you are using PREP.

7. Locate the two pins shown in Inset #2 of Figure 4-2. Carefully slide the jumper over these pins. Be careful not to bend the pins.

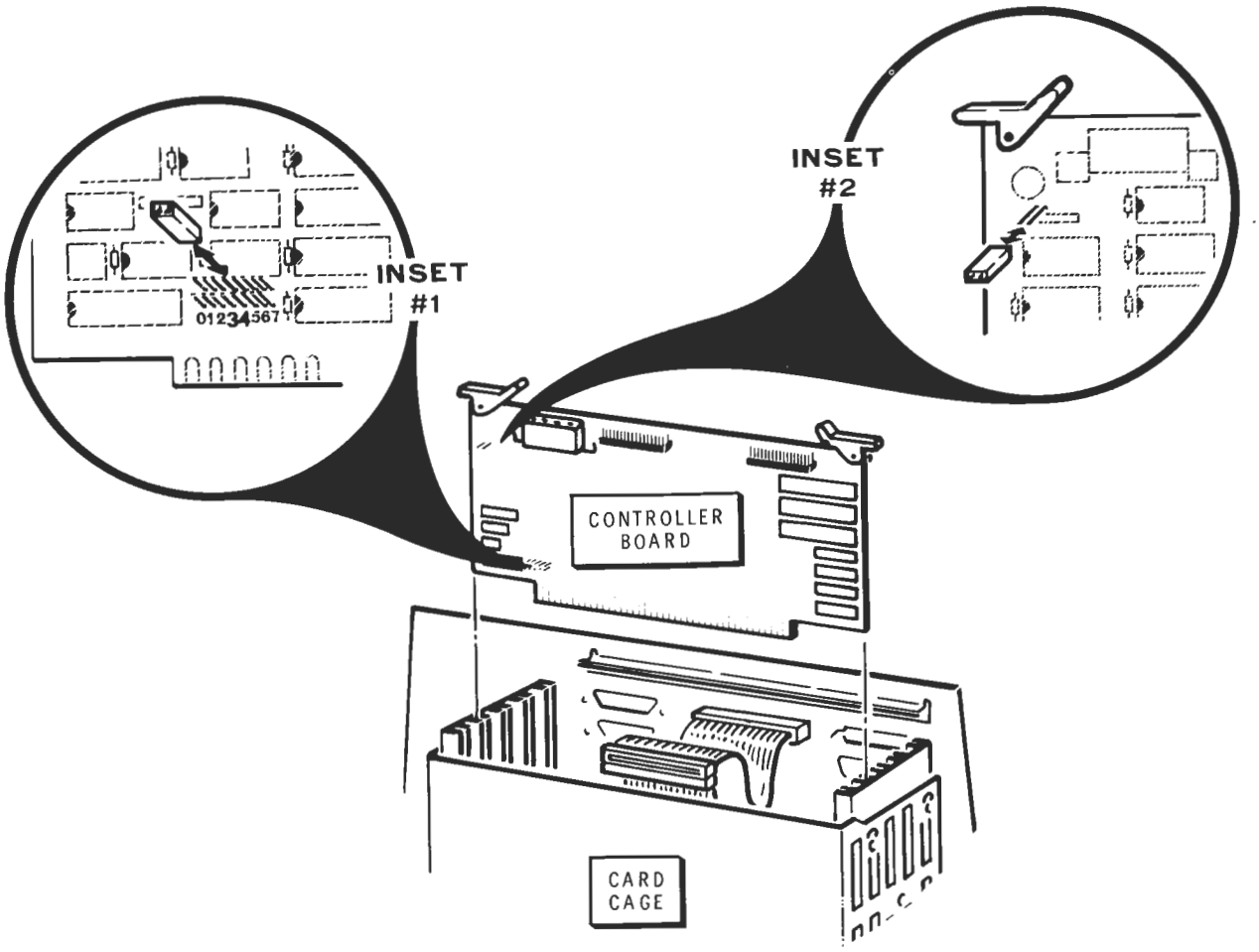

Figure 4-2
Z-217 Controller Board Adjustment

NOTE: The pins shown in Inset #2 are known as the "format enable" pins. When connected by the jumper, your Winchester disk can be initialized by PREP.

8. Gently slide the Z-217 board downward until the bottom edge of the board is securely engaged to the horizontal connector at the bottom of the card cage.

   NOTE: Be careful that the Z-217 remains between the same pair of vertical card cage tracks as you slide it downward.

9. If you have unplugged any internal cables, plug them back into the apropriate sockets on the controller boards. Make sure that all cables are firmly connected.

10. Replace the top cover of your computer and make sure that it is completely latched into position.

11. Plug the computer back into the power source and turn on the computer.

Proceed to use the PREP utility as explained in the text entitled "2 Invoking PREP".

When you have finihsed using the PREP utility, perform the steps of this procedure in reverse sequence to remove the jumper from the Z-217 format enable pins and replace it on the Z-217 interrupt pins.

CAUTION: You must remove the jumper from the format enable pins before performing any other activity. If this jumper remains on the format enable pins, irregularities in the power supply can cause the Winchester disk to be automatically initialized during normal use of the disk. This initialization will destroy any data recorded on the disk.

7 PREP Error Messages

```
Bad sector count exceeded for this drive.
```

Cause: The upper bound limit for bad sectors has been exceeded. This could indicate a hardware malfunction.

Cure: Run PREP again. If this error message reappears after repeated use of PREP, then contact Zenith Data Systems Technical Consultation for assistance.

```
Error -- Can not read superblock A.
```

Cause: A bad sector error has occurred in the primary superblock (Superblock A).

Cure: PREP will automatically use the backup copy of the superblock (Superblock B) and resume the operation it was conducting when the error message was displayed. However, this message indicates that only one usable copy of the superblock remains on the disk. Although you could use the disk in this condition, all Winchester disk data will become inaccessible if Superblock B is ever damaged. Therefore, we recommend that you run PREP again if this error message appears.

```
Error -- Drive capacity > 32 megabytes!
```

Cause: PREP has calculated that the Winchester disk drive connected to the Z-217 controller is larger than the maximum allowable size of 32 megabytes.

Cure: Run PREP, being careful to respond with the correct values to the drive characteristic prompts.

```
Error during formatting of the drive.
```

Cause: This could mean that you responded incorrectly to the five prompts about the drive's characteristics. This message could also indicate either a hardware malfunction or improper positioning of the format enable jumper on the Z-217 controller board.

Cure: Refer to the text entitled "6 PREP Hardware Adjustment". If you have not already done so, move the jumper to the "format enable" position on the Z-217 controller board. Then invoke PREP again, and double check your responses to the five drive characteristic prompts if they appear. After using PREP, remove the jumper from the "format enable" position.

```
Invalid HEX value, Try again:
```

Cause: Value entered was not a valid hexadecimal number, or the value entered was outside of the possible range.

Cure: Double check the appropriate hexadecimal value against the disk manufacturer's documentation or Table 4.2 in this supplement. Then attempt to enter the correct value at the prompt again.

```
Track 0 contains bad sector(s).
```

Cause: A bad sector error has occurred in the reserved area of the Winchester disk. This could indicate a hardware malfunction.

Cure: Run PREP again. If this error message reappears after repeated use of PREP, then contact Zenith Data Systems Technical Consultation for assistance.

```
Unable to communicate with the Z217 controller
```

Cause: PREP can not locate the Z-217 controller. This could mean that the Z-217 is not firmly plugged into the S-100 bus, that the drive cable connectors are not securely fastened, or that the controller has a hardware malfunction.

Cure: Check to see that the controller card and all cable connectors are secure, and run PREP again.

```
Unable to write default PART values
```

Cause: An error was encountered as PREP attempted to write the superblocks. This error condition can be caused by media imperfections at the sectors where PREP is trying to write a copy of the superblock.

Cure: Run PREP again. If this error message reappears after repeated use of PREP, then contact Zenith Data Systems Technical Consultation for assistance.

```
Z-217 controller error on Set Drive parameters command
```

Cause: One or more responses to the five drive characteristic prompts were not valid for the particular drive connected. A malfunction of the Z-217 controller is also possible.

Cure: Recheck the drive characteristics and run PREP again. If this error occurs after repeated attempts to run PREP, consult Zenith Technical Consultation or your service representative.

RESTORE

The Utility that Facilitates File Copying to Disks and/or Partitions for Active Use

The RESTORE utility makes it possible for you to access working files from the backup files produced by the BACKUP utility, and copy them back to the media you use for your daily microcomputer tasks.

RESTORE is especially beneficial to Winchester disk users, because so many files are involved in daily backup procedures from Winchester disk partitions. However it is possible to RESTORE files to or from either partitions or floppy disks. Therefore, this text refers to source or destination recording media as "partition/disk" or "disk/partition" wherever it would be practical for you to use either type of media.

RESTORE's function is complementary to the function of the BACKUP utility, which makes optimum use of disk space by storing working files inside of a special backup file.

1 RESTORE Operation

When the BACKUP utility copies individual files from a source partition/disk, it temporarily concatenates them to be stored as a single "backup file" on the destination media. Thus the backup file is a long, continuous string of data including individual files that are joined by BACKUP and separated by RESTORE. The backup file also contains a directory that lists all of the files in the exact sequence they were copied.

Often BACKUP stores parts of the backup file on more than one disk. BACKUP accomplishes this multi-disk storage feat by recording up to the absolute capacity of the distribution media, prompting you to insert another disk, and then continuing to copy from where it left off. With this capability, BACKUP can even divide a file within the backup file between two disks. Each of the disks necessary to accommodate the entire backup file is called a "volume" of the backup file, and given a volume number.

The RESTORE and BACKUP utilities also enable you to view several statistics, such as the names of the files within a backup file, by entering special command line options.

The BACKUP utility informs RESTORE of the sequence used to store backed up files by listing this sequence in the directory of the special backup file. Thus when RESTORE begins to restore files from the Back-up Disk Set, it reads the list of files from the backup file directory and restores them to the original media in the listed sequence.

2 Invoking RESTORE

You can use the RESTORE utility through either of the following three methods: the Utility Prompt Method, the System Prompt Method, or the Help Display Method.

2.1 UTILITY PROMPT METHOD

With this RESTORE method, you invoke the RESTORE utility from a disk by entering the command function at the system prompt, and then entering the command argument at a prompt displayed by the RESTORE utility. The first entry under this method is in the following form:

A>**RESTORE** ***RETURN***

After an entry in this form, RESTORE will display a message and prompt in the following form:

```
          RESTORE Version x.xx
Copyright (C) 1982 Zenith Data Systems

>>
```

NOTE: The version number of the RESTORE utility (shown in this example as "x.xx") might vary.

At the >> RESTORE prompt, you should enter a command line argument in the following form:

>>{**d**}:{**destfile**},{**d**}:{**destfile**},... = {**s**}:{**sorcfile**} [{**x**};{**x**};...] ***RETURN***

where >> is the RESTORE utility prompt;
where {**d**} is the optional name of the drive that is to receive the copies being transferred. This specification is necessary only if this destination drive is not also the default drive;
where {**destfile**} is one of the individual file names that is being extracted from within the backup file and copied to the destination media, where it will (once again) be accessible by its own file name;
where {**s**} is the optional name of the drive from which the backup file is being copied. This specification is necessary only if this source drive is not also the default drive;
where {**sorcfile**} is the primary name of the backup file. Wild card file name characters (* and ?) are not allowed; and
where {**x**} is any of the optional single letter options, separated by semicolons, that structure the RESTORE operation.

When RESTORE has completed the specified operation, it will redisplay the >> RESTORE prompt. You can continue entering command line arguments at RESTORE prompts indefinitely.

The RESTORE utility will display the names of each file that it copies in a vertical list, during the RESTORE operation.

When you wish to exit from the RESTORE utility to the CP/M system, press the RETURN at a RESTORE prompt. Then CP/M will display the A> system prompt.

NOTE: Like all command lines entered through the CP/M system, the RESTORE command line can contain only 127 characters. If your command line is between 78 and 127 characters in length, you can keep the entire line visible on your video screen by entering ***CTRL-E*** after the 79th character.

2.2 SYSTEM PROMPT METHOD

With this RESTORE method, you enter the command line function and the command line argument both at the system prompt, in the following form:

A>**RESTORE {d}:{destfile},{d}:{destfile},... = {s}:{sorcfile} [{x};{x};...]** ***RETURN***

Where **RESTORE** is the command line function, stored in the file RESTORE.COM on the default or logged partition/drive;
where {**d**} is the optional name of the drive that is to receive the copies being transferred. This specification is necessary only if this destination drive is not also the default drive;
where {**destfile**} is one of the individual file names that is being extracted from within the backup file and copied to the destination media, where it will (once again) be accessible by its own file name;
where {**s**} is the optional name of the drive from which the backup file is being copied. This specification is necessary only if this source drive is not also the default drive;
where {**sorcfile**} is the primary name of the backup file. Wild card file name characters (* and ?) are not allowed; and
where {**x**} is any of the optional single letter options, separated by semicolons, that structure the RESTORE operation.

The RESTORE utility will display the names of each file that it copies in a vertical list, during the RESTORE operation.

After RESTORE has completed the specified operation, CP/M will display the A> system prompt.

NOTE: Like all command lines entered through the CP/M system, the RESTORE command line can contain only 127 characters. If your command line is between 78 and 127 characters in length, you can keep the entire line visible on your video screen by entering ***CTRL-E*** after the 78th character.

2.3 HELP DISPLAY METHOD

With this RESTORE method, you enter the command line function and a ? (question mark) at the system prompt, as shown:

A>**RESTORE ?** ***RETURN***

This command will cause the display of messages that summarize the purpose, command line, and options of the RESTORE utility. The system prompt will reappear below the RESTORE display.

This invocation method does not cause restoration of backed up files. It is designed to provide you with a convenient quick reference to a few aspects of the RESTORE utility.

3 RESTORE Source

A RESTORE command line can include only one source. When specifying this source, you must always specify the primary name of a file, and sometimes a drive.

The file specified as the source is the backup file into which all of the individual files were copied.

The source file specified in a RESTORE command line should be identified by a primary file name only (1-8 characters). The extension should not be specified, because the BACKUP utility has already applied extensions to each backup file volume. (BACKUP applies the extension "000" to the first backup file volume, "001" to the second, "002" to the third, etc.) During the RESTORE operation, you will be prompted to insert backup file disk volumes at appropriate times.

Wild card file name characters (* or ?) cannot be used to specify a source file.

Whenever a specified source (backup file) does not reside in the default drive, a drive name should be specified in front of it. You can restore files to any valid drive during a RESTORE operation.

A source file specification is required in all RESTORE command lines except those entered with the [B] option, for the sole purpose of displaying characteristics of all of the master backup files on the default disk.

Consider an example where the primary file name "C:QUITTIME" is entered as source in a command line. The ensuing RESTORE operation required that five disks (backup file volumes) be inserted into drive C to completely disperse all of the individual files that had been stored within QUITTIME.

The source disks contained the following backup files volumes:

QUITTIME.000
QUITTIME.001
QUITTIME.002
QUITTIME.003
QUITTIME.004

The file "QUITTIME.000" was the master backup file volume, which contained the backup file directory.

4 RESTORE Destinations

A RESTORE command line can include one or more destinations. When specifying destinations, you must always specify a file, and sometimes a drive.

The destination files specified in a RESTORE command line should be identified by complete file names, including the primary name (1-8 characters) and the extension (1-3 characters if used).

Whenever a specified destination file does not reside on the default drive, a drive name should be specified in front of it. You can restore files to any valid drive during a RESTORE operation.

Wild card, or ambiguous, file names can be specified, using the * or ? wild card characters. (Wild card file names can be particularly useful when you have many files to copy, because a command line can contain a maximum of only 127 characters.)

Any number of destination files can be specified in a command line (as long as the limit of 127 characters per command is not exceeded). However if two or more destination files are specified, they must be separated by commas.

A destination file specification is required in all RESTORE command lines except those entered with the [B] option, for the sole purpose of displaying characteristics of all of the master backup files on a disk; or in those entered with the [L] option, for the sole purpose of displaying a list of the individual files within a backup file.

The following destination file specification:

.ASC,TEST?,C:*.

would cause the release (from within the backup file) of all files with an .ASC extension to the default drive; all files (from the backup file) that are five characters long beginning with TEST and have no extension (such as TEST0, TEST1, TESTS, TESTY, etc.) to the default drive; and all files (from the backup file) to drive C.

To further demonstrate the characteristics of destination file specifications:

A:DEMO.*,B:SYSTEM.COM,E:82*.DOC,????.DAT

would cause the release (from within the backup file) of all files with DEMO as primary name and any extension to the disk/partition in drive A; the file SYSTEM.COM to drive B; all files (from the backup file) that have a primary name beginning with 82 and that have a .DOC extension to drive E; and all files (from the backup file) that have a four letter (or less) primary name with a .DAT extension to the default drive.

NOTE: Many of the individual files stored within the backup file may be identified by both the name of the file and the name of the drive from which they were originally copied. However, the drive name stored with the file name in the backup file does not affect the RESTORE operation in any way. In a restore command line, the drive names you specify for destination files identify the drives to which you want the individual files to go, as they are released from the backup file.

5 RESTORE Options

The RESTORE utility enables you to structure any backup operation by specifying the following options in the command line:

B Backup directory — displays a directory listing statistics about all master backup files.

E Exception files — exclude exception files from restore operation

L List directory — list the directory of the backup files

O Overwrite files — overwrite any existing files with the same name

Q Query each — query yes or no on each file before restoring

R Read only — overwirte read/only (R/O) files without prompt

S System files — restore system files if specified

U User number — restore files that were backed up from specified user area(s) in addition to the current user area

V Verify — verify the file after restoring it.

Options are always the last items specified in a RESTORE command line. They must be enclosed within square brackets, and separated by semicolons when more than one is used.

If a switch requires specification of files, then the option letter should be separated from these file specifications by a colon. When more than one file specification is necessary with a single option, then the file specifications should be separated by commas.

Options are entered in the following form:

[{x};{x}:{details},{details},{details};{x};...]

Where {**x**} is an option letter;
where {**details**} are additional character strings (such as the date, file names, or user numbers) that must be specified with some options;
where the **[ ]** square brackets must enclose the options;
where the **;** (semicolon) must separate multiple options;
where the **,** (comma) must separate the file names and/or user numbers used with some options; and
where the **:** (colon) must separate some option letters from accompanying {details}.

5.1 B BACKUP DIRECTORY

The B option causes a directory display listing statistics about all of the master backup files (those backup files with the "000" extension) on a specified disk.

This directory lists the primary name of each master backup file, the number of volumes in the backup set that begins with each master, the number of files in each set of backup files, and the date of each backup operation.

Only the drive containing the master backup file(s) needs to be known in command lines entered for the sole purpose of producing a B option directory. Therefore, specify this drive in the command line unless it is the default drive.

You can use the B option in commands of the following form:

A>**RESTORE {d}: [B]** ***RETURN***

Where **RESTORE** is the command line function, stored in the file RESTORE.COM on the default or logged partition/drive;
where {**d**} is the optional name of the drive that has received the copied files, and stored them within backup file volumes. This specification is necessary only if this destination drive is not also the default drive; and
where **[B]** is the single letter option that causes the display of master backup file features.

The B option may be used with both methods of invoking RESTORE. For example, from the CP/M system prompt:

A>**RESTORE C: [B]** ***RETURN***

or the same operation from the RESTORE utility prompt:

>>**C: [B]** ***RETURN***

The B directory listing would appear in the following form:

Name	Volumes	Files	Date
QUITTIME	3	117	4-27-83
SAVEME	1	48	10-24-82
STORAGE	5	231	2-30-84

5.2 E EXCEPTION FILES

The restore operation takes place for all of the files except that file given as an exception file. The file listed with the E option is then ignored during the operation. The E option is entered in the following form:

[E:{filespec},{filespec}]

Where **E** is the option;
where {**filespec**} represents files that are to be excluded from the operation. If a file being excluded does not reside on the default drive, then you must also specify the name of the drive that contains it. Amgibuous file names (with * or ? wild card characters) can be specified; and
where the , (comma) and : (colon) are required separators.

For example:

A>**RESTORE BACK1 = *.DAT [E:TEMPFILE.DAT]** ***RETURN***

would restore all files from the default drive that have a .DAT extension except the file named TEMPFILE.DAT, which would be omitted.

5.3 L LIST DIRECTORY

The L option causes RESTORE to give the internal directory of files that are contained within a specified backup file. The directory information would list the volume number where the files start and end, and the size of the file.

The L option is used for commands in the following form:

A>**RESTORE {d}:{ sorcfile} [L]** ***RETURN***

Where **RESTORE** is the command line function, stored in the file RESTORE.COM on the default or logged partition/drive;
where {**d**} is the optional name of the drive that has received the copies being transferred. This specification is necessary only if this drive is not also the default drive;
where {**sorcfile**} is the primary name of the backup file, which you wish to contain all of the individual files copied in this operation; and
where {**L**} is the single letter option that causes the display of backup file directory features.

The L option may be used with both methods of invoking RESTORE. For example, from the CP/M system prompt:

A>**RESTORE BACK9 [L]** ***RETURN***

or the same operation from the RESTORE utility prompt:

>>**BACK9 [L]** ***RETURN***

The L directory listing will appear in the following form:

Filename	User	Start Volume	End Volume	Size in Kilobytes
TESTFIL1.DAT	0	1	1	3264
TESTFIL2.DAT	0	1	2	19582
TESTFIL1.DOC	11	2	3	7236
TESTFIL2.DOC	11	3	3	22230

4 file(s) on 3 volume(s)

5.4 O OVERWRITE FILES

During operation, if RESTORE encounters a file with the same filename as the backup file, RESTORE asks if the file should be deleted with a message in the following form:

```
File {filename} already exists, do you wish to delete it (Y/N)?
```

When the O option is used, RESTORE overwrites the original copy of the file on the destination media (the copy that "already exists") without the query.

5.5 Q QUERY EACH

When the Q option is used, you are queried before each file is restored, by a prompt in the following form:

```
Restore {x}:{destfile} to user {n} (Y/N) ?
```

Where "{x}" is the drive containing an individual file that you specified for this operation. The drive name is only displayed if it is not the default drive;
where "{destfile}" is an individual file from within the backup file that you specified for restoration; and
where "{n}" represents the number (0–15) of the user area to which the {destfile} will be restored.

A prompt in this form is displayed for each file RESTORE encounters that is contained within the backup file you specified as the source.

For example, if the current user area is 0 and you wanted to restore two .DOC files from the "BACK1" backup file on drive C to their individual file names in user area 0, and if the command to RESTORE was:

A>**RESTORE B:*.DOC=C:BACK1 [Q]** ***RETURN***

then RESTORE would ask:

```
Restore B:FILE1.DOC to user 0 (Y/N) ?
```

After you respond it would ask,

```
Restore B:FILE2.DOC to user 0 (Y/N) ?
```

In response to such a prompt, press **Y** or **y** to cause the file to be restored. Press **N** or **n** to prevent the file from being restored.

5.6 R READ/ONLY FILES

The R option enables RESTORE to overwrite individual files that have read/only (R/O) status on the destination media without displaying a prompt.

As a default (in the absence of the R option), the following prompt is displayed if you are restoring individual files to destination media where files by the same name exist with the read/only (R/O) status:

```
File {filename.ext} read only (R/O), do you wish to delete it (Y/N) ?
```

Where "{filename.ext}" is the complete file name of the file you are trying to restore.

NOTE: The STAT utility is used to apply read/only (R/O) or read/write (R/W) status to a file, as explained in the "STAT" text in the CP/M-85 manual.

5.7 S SYSTEM FILES

The S option allows RESTORE to restore files that are set in the directory (by the STAT utility) as system files. System files will not be restored merely because of this option, but only if this option is used in a command line where system files are specified as destinations.

When the S option is not included in the command line, system files are ignored during the RESTORE operation — even if these files are specified in the command line.

5.8 U USER NUMBER

The U option causes RESTORE to restore only the individual files within the specified user area(s). If you do not include a U option in the RESTORE command, then RESTORE will restore only the individual files from the current user area.

NOTE: CP/M enables you to divide each of your disks and partitions into 16 separate user access areas, numbered 0-15. When you boot up a partition or disk, you are working within user area 0 until you enter a USER command. See the "USER" text in the "Reference Guide" of your CP/M-85 manual for more information on user areas.

Specify the user option in the following form:

[U:n1,n2,...]

Where **U** is the option letter;
where : (colon) must separate the option letter from the user number(s); and
where **n1** stands for the number of one of the user areas to which RESTORE will restore individual files. If you specify more than one user area number, separate each with a comma.

You can specify as many as 16 user areas with a single U option. You can specify any user area(s) regardless of the user area currently being used.

5.9 V VERIFY

The V option causes RESTORE to verify all files copied. With the V option, RESTORE reads each source file after it is copied to make sure that the source and destination copies are identical.

During a verified RESTORE operation, the names of the copied and verified files will be displayed in the following form:

```
E:FILENAM1.EXT to user 12
Verifying E:FILENAM1.EXT
E:FILENAM2.EXT to user 12
Verifying E:FILENAM2.EXT
E:FILENAM3.EXT to user 12
Verifying E:FILENAM3.EXT
E:FILENAM4.EXT to user 12
Verifying E:FILENAM4.EXT
          .
          .
          .
E:FILENAMn.EXT to user 12
Verifying E:FILENAMn.EXT
```

6 Runtime Prompting

After you invoke RESTORE and enter a command, RESTORE should begin to restore files, displaying the drive name and file name of each individual file as it is copied, in the following form:

```
E:FILENAM1.EXT to user 9
E:FILENAM2.EXT to user 9
E:FILENAM3.EXT to user 9
E:FILENAM4.EXT to user 9
          .
          .
          .
E:FILENAMn.EXT to user 9
```

However, during an extensive RESTORE operation, you might be prompted to insert other specifically named disks.

If the BACKUP operation that created a backup disk set required more than one backup disk to accommodate all of the individual files, then a subsequent RESTORE operation will probably have to require that more than one disk be inserted to allow dispersal of the individual files.

The BACKUP utility kept track of the number and sequence of the disks used to accommodate the files and designated a "Volume" number for each disk that it prompted you to insert when creating the backup disk set.

Thus the subsequent RESTORE operation must echo the prompts displayed by BACKUP to instruct you to reinsert the same disks in the proper sequence.

The RESTORE prompts that request reinsertion of the backup disk set volumes appear in the following form:

```
Insert backup volume {nnn}, {sorcfile}.{nnn-1}, in drive {x},
and hit RETURN when ready.
```

Where "{nnn}" is the number of the volume number of the disk RESTORE needs now in order to continue restoring individual files from the backup disk set;
where "{sorcfile}" is the primary file name that was applied to all of the backup files during the BACKUP operation;
where "{nnn-1}" is the file name extension of the particular disk that RESTORE needs now in order to continue restoring individual files from the backup disk set. (This extension number is always one less than the corresponding volume number.); and
where "{x}" identifies the source drive you specified in the RESTORE command line.

"Volume nnn" corresponds to the backup file with extension nnn-1. The volume number is always one more than the number of the volume's file name extension.

In response to a prompt in this form, you should insert the specified volume (disk) in the specified drive. Then you should close the drive latch and press RETURN.

If RESTORE finds the backup file volume that it needed on the disk you just inserted, it will continue to restore individual files in sequence, displaying the drive and file names as they are restored.

If RESTORE cannot find the master backup file on the disk you just inserted, it will display a message in the following form:

```
Can not open backup file, {sorcfile}.{nnn-1},
insert another disk in drive {x},
and hit RETURN when ready,
or hit any other key to abort.
```

Where "{sorcfile}" is the primary file name that was applied to all of the backup files during the BACKUP operation;
where "{nnn-1}" is the file name extension of the particular disk that RESTORE needs now in order to continue restoring individual files from the backup disk set. (This extension number is always one less than the corresponding volume number.); and
where "{x}" identifies the source drive you specified in the RESTORE command line.

If you wish to complete the operation and can obtain the disk that contains the specified backup file, then insert this disk in the specified drive, close the drive latch, and press ***RETURN***.

If you do not wish to continue the operation or cannot obtain the disk that contains the specified backup file, then press any key other than RETURN. The RESTORE operation will end and a prompt (utility or system prompt) will appear.

The first disk in the backup set is known as "volume 1", or the "master volume" of the backup file. This disk contains a file with the primary name that was specified in the command line as the destination, and with the extension "000".

Sometimes during the RESTORE operation, RESTORE will need to access the contents of the backup master volume. RESTORE displays a slightly different prompt when it needs to access this particular volume, as shown:

```
Insert backup master volume 001, {sorcfile}.000, in drive {x},
and hit RETURN when ready.
```

Where the word "master" is added;
where the volume number is always "001" for a master volume; and
where the file name extension is always "000" for a master volume.

If RESTORE is prompting the master volume in particular, and you insert a disk that does not contain the master volume, then the error message displayed is also slightly different from that which is displayed when other volumes are needed, as shown:

```
Can not open master backup file, {sorcfile}.000,
insert another disk in drive {x},
and hit RETURN when ready,
or hit any other key to abort.
```

Where the word "master" is added; and
where the file name extension is always "000" for a master volume.

7 Preparing RESTORE Routines

If you restore backups on a regular basis, RESTORE can come in very handy. RESTORE was designed specially so that you would be able to store the RESTORE command lines that you enter on a regular basis, so that they can be entered automatically, with far less typing.

To store RESTORE commands for automatic execution, you will need a text editor or word processor and the SUBMIT utility.

The text editor or word processor will enable you to prefabricate and store commonly entered RESTORE command lines in a disk file. The SUBMIT utility will enable you to type a short, simple command line that causes automatic execution of all the stored RESTORE commands.

This text explains a few RESTORE routines geared toward users of some popular application software products supplied by Zenith Data Systems. The text on each routine shows you how to prepare the routine by explaining the following essential facts:

- The type of user who would probably benefit from using the routine
- The names of the drives in which you should store particular files during the routine
- The form of the file you should create (with your text editor or word processor) to store commonly entered RESTORE command lines
- The form of the SUBMIT command you should type each time you wish to use the routine

NOTE: To successfully prepare a RESTORE routine, you should understand the operation of the SUBMIT utility. For information on SUBMIT, refer to the "SUBMIT" text in the "Reference Guide" of your CP/M-85 manual.

GENERAL PURPOSE RESTORE ROUTINE

This routine can be helpful for anyone who wants to restore an entire backup disk set regularly. Steps 1 through 3 can be considered preparation steps, that you need to perform only once. Steps 4 through 6 should be performed every time you conduct the routine.

1. Using a text editor or word processor, open a text file under the name **GNRESTOR.SUB**.

2. Into this file, enter the following command line:

   RESTORE $1:*.* = $2:GENBACK [V] ***RETURN***

3. Close the text file GNRESTOR.SUB

4. Use the PIP utility to copy the text file GNRESTOR.SUB and the utility file SUBMIT.COM to drive A, if they are not there already.

5. When you are ready to perform this restore routine, type **A:** ***RETURN*** to make drive A the default drive.

6. Type a command in the following form:

   A>**SUBMIT GNRESTOR {partition} {floppy}** ***RETURN***

   Where {**partition**} is the drive letter of the Winchester disk partition to which you wish to restore your files; and
   where {**floppy**} is the drive letter of the floppy disk drive from which you wish to restore your files;

   For example, if you wish to restore files from the backup file with the primary name "GENBACK" in the drive A floppy disk to the drive C Winchester partition, then you should type the following command:

   A>**SUBMIT GNRESTOR C A** ***RETURN***

RESTORE will restore all files from the backup file with the primary name "GENBACK" back to the partition under their individual file names.

SUPERCALC RESTORE ROUTINE

This routine can be helpful for anyone who wants to restore Supercalc data files from an entire backup disk set regularly. Steps 1 through 3 can be considered preparation steps, that you need to perform only once. Steps 4 through 6 should be performed every time you conduct the routine.

1. Using a text editor or word processor, open a text file under the name **SCRESTOR.SUB**.

2. Into this file, enter the following command line:

   RESTORE $1:*.* = $2:SCBACK [V] ***RETURN***

3. Close the text file SCRESTOR.SUB

4. Use the PIP utility to copy the text file SCRESTOR.SUB and the utility file SUBMIT.COM to drive A, if they are not there already.

5. When you are ready to perform this restore routine, type **A:** ***RETURN*** to make drive A the default drive.

6. Type a command in the following form:

   A>**SUBMIT SCRESTOR {partition} {floppy}** ***RETURN***

   Where {**partition**} is the drive letter of the Winchester disk partition to which you wish to restore your files; and
   where {**floppy**} is the drive letter of the floppy disk drive from which you wish to restore your files;

   For example, if you wish to restore SuperCalc data files from the backup file with the primary name "SCBACK" in the drive A floppy disk to the drive C Winchester partition, then you should type the following command:

   A>**SUBMIT SCRESTOR C A** ***RETURN***

RESTORE will restore all files from the backup file with the primary name "SCBACK" back to the partition under their individual file names.

WORDSTAR RESTORE ROUTINE

This routine can be helpful to users of the WordStar word processor who wish to regularly restore all WordStar text files that have the same file name extension. Steps 1 through 3 can be considered preparation steps, that you need to perform only once. Steps 4 through 6 should be performed every time you conduct the routine.

1. Using WordStar's non-document editing mode, open a text file under the name **WSRESTOR.SUB**.

2. Into this file, enter the following command line:

   RESTORE $1:*.$2=$3:WSBACK [V] ***RETURN***

3. Close the text file WSRESTOR.SUB

4. Use the PIP utility to copy the text file WSRESTOR.SUB and the utility file SUBMIT.COM to drive A, if they are not there already.

5. When you are ready to perform this restore routine, type **A:** ***RETURN*** to make drive A the default drive.

6. Type a command in the following form:

A>**SUBMIT WSRESTOR {partition} {ext} {floppy}** ***RETURN***

Where **{partition}** is the drive letter of the Winchester disk partition to which you wish to restore your files;
where **{ext}** is the one- to three-letter file name extension of the text files you wish to back up; and
where **{floppy}** is the drive letter of the floppy disk drive from which you wish to restore your files;

For example, if you wish to restore WordStar text files that have the file name extension "DOC", and if these files are now within the backup file with the primary name "WSBACK" in the drive A floppy disk, and if you wish to restore to the drive C Winchester partition, then you should type the following command:

A>**SUBMIT WSRESTORE C DOC A** ***RETURN***

RESTORE will restore all files from the backup file with the primary name "WSBACK" back to the partition under their individual file names.

8 Structure of Backup Files

The BACKUP utility backs up several source files into a single backup file. This backup file contains all of the files that were copied, in the order they were specified. At the beginning of the backup file is a directory of the copied files. The BACKUP utility maintains this directory to show the names of the files within the backup file, so that the RESTORE utility, when used, will be able to copy the files to other media.

At the beginning of the backup file directory is an entry for the backup file itself. This backup file directory entry is a sequence of bytes that are stored in the following form:

Purpose of bytes	ID	File Control Block (FCB)	R	quantity of copied files	date of backup	R	release number	version number	R
Quantity of bytes	1	32	4	2	2	7	1	1	14

= 64 bytes

Where "ID" is a byte that is set to one to distinguish this master backup directory entry from normal file directory entries;
where "File Control Block (FCB)" is a set of bytes that describe the drive name, primary file name, file name extension, and other characteristics used by CP/M to store files;
where "R" stands for reserved bytes that are not used for any particular purpose in this version of the software;
where "quantity of copied files" is the number of individual files stored within the backup file;
where "date of backup" is the date that the user entered in response to a prompt during the BACKUP operation; and
where "release number" and "version number" are included to insure that this software will be used only with compatible releases and versions of BACKUP and RESTORE.

NOTE: The file name extension in the "File Control Block (FCB)" of the backup file directory entry is the file name extension of the last volume of the backup disk set — and not necessarily the extension of the volume that contains the directory. Thus you can determine how many volumes were used to accommodate all of the backed up files by looking at the directory in the first volume. (The first volume is the volume given the extension "000" during the BACKUP operation.)

Immediately following the backup file entry in the backup file directory are several sequences of bytes, each describing attributes of one of the individual files that was copied into the backup file during the BACKUP operation. The bytes of the individual file directory entry are stored in the following form:

Purpose of bytes	ID	File Control Block (FCB)	R	start volume	end volume	start position	end position	file length	U	R
Quantity of bytes	1	32	4	1	1	2	2	2	1	18 = 64 bytes

Where "ID" indicates the location of this individual file entry amongst the other individual file entries in the directory. If the value of this byte is 2, then the entry describes an individual file within the backup file. If the value of this byte is FF, then the entry is a "dummy" entry that merely signals the end of the backup file, and does not describe an individual file;

where "File Control Block (FCB)" is a set of bytes that describe the drive name, primary file name, file name extension, and other characteristics

where "R" stands for reserved bytes that are not used for any particular purpose in this version of the software;

where "start volume" indicates the number of the first backup file volume used to accommodate this individual file;

where "end volume" indicates the number of the last backup file volume used to accommodate this individual file;

where "start position" is the number of 128-byte records between the beginning of the backup file volume and the beginning of this individual file;

where "end position" is the number of 128-byte records between the beginning of the backup file volume and the record following the end of this individual file;

where "file length" is the length of this individual file, as measured in 128-byte records; and

where "U" is the number of the user area from which the individual file came.

The number of individual source files that can be backed up in a single BACKUP operation is limited by the amount of space on the first disk/partition used to receive the backup volumes. This disk/partition must have enough free space to accommodate the entire backup file directory.

NOTE: If any of the source files you specify are random files (as opposed to sequential files), these files might become larger when restored with the RESTORE utility.

9 RESTORE Error Messages

```
Verify error, try RESTORE again (Y/N)?
```

RESTORE has detected that the copy of a backed up file on destination media is different from the original copy of the file on the source media.

Press **Y** if you wish to have RESTORE try to recopy and verify the file that could not be verified. RESTORE will try to overwrite the copy of the file that could not be verified. Then RESTORE will resume displaying the names of the individual files as they are copied and verified, beginning with the file in which the verification error occurred.

Press **N** if you wish to skip the file that could not be verified. Then RESTORE will try to copy and verify the next individual file that is listed in the backup file.

```
Backup filename can not be ambiguous.
```

You specified * or ? wild card characters in the source file name for the RESTORE operation. Repeat the command specifying the source with an explicit file name.

```
Extension on backup file specified, will be ignored.
```

This occurs whenever you try to assign a backup file an extension, by specifying a full file name for a destination file. If this occurs, RESTORE ignores the extension you specified and uses its standard, sequentially numbered extensions. Program operation will not be disturbed.

```
Cannot find master backup file {filename}.000.
```

This message occurs when the /L option is requested for a file from a disk where the master backup {filename}.000, is not present.

```
File {filename}.{ext} is not found.
```

This message occurs whenever a file is specified for BACKUP or RESTORE and that file is not on the disk.

```
Invalid backup file
```

This message occurs if the backup file specified in a command does not contain valid information. This may occur if the file specified was not a backup file, but had a "000" extension, or if the data in a backup file had degraded (possibly due to a bad sector, or inadvertent exposure of the media to an electromagnetic field).

```
Invalid drive designation on RESTORE file.
```

This message occurs when a drive name is used that is not in the range of supported drive names (A through F).

```
Invalid exception file specifications.
```

This message will occur if the exception file specified has a syntax error in the specification.

```
Invalid filename.
```

This message appears when a file name is specified that does not conform to CP/M file naming conventions.

```
Invalid selection file specifications.
```

This message is generally caused by a typographical error in the command line. The message results when parameters in the command line appear garbled or incorrectly punctuated.

```
Invalid option [x] specified.
```

This message occurs if RESTORE is unable to recognize the option that was specified in the command.

```
Not enough parameters specified.
```

This message results when the command to RESTORE is not complete enough for RESTORE to carry out the intended operation. Enter the command again specifying additional options or file specifications.

```
Cannot open master backup file {filename}.000,
insert another disk in drive x
hit RETURN when ready,
or hit any other key to abort.
```

This message occurs if the disk that has been inserted is not volume 1. Insert the correct disk.

```
Cannot open backup file {filename}.{nnn},
insert another disk in drive x
hit RETURN when ready,
or hit any other key to abort.
```

This message occurs when you are asked to insert volume nnn+1 (which would contain {filename}.{nnn}) and the wrong disk is inserted. Insert the correct disk.

```
Invalid user option
```

This message occurs if the user number specified with the U option is not in the range 0–15 or if a user number was specified with improper syntax.

```
Invalid version of RESTORE for {filename.000}.
```

This message occurs if you have used different versions of RESTORE and BACKUP. Always use a copy of the RESTORE utility that bears the same version number as the BACKUP utility that you used to create backup file {filename.000}.

```
No files selected.
```

This message occurs if none of the source files you specified in the RESTORE command exist on the default or specified source media.

```
Out of disk space on restoration of {filename.ext}.
insert another disk and hit RETURN
or hit any other key to abort
```

The disk to which you are trying to restore files does not contain enough blank space to accommodate an individual file. You should insert a disk that has enough space into the destination drive and press the RETURN key, or press a key other than the RETURN key and enter a RESTORE command with different destination file specifications.

SHIP

The Utility that Moves Read/Write Heads to a Safe Position

The SHIP utility moves the read/write heads of a Winchester disk to a position where they can not contact and destroy stored data on a disk platter in case of physical shock.

The SHIP utility is recorded on the Winchester Utility Disk, which is supplied with your Winchester disk hardware documentation. Although the Winchester Utility Disk runs under the Z-DOS Operating System, you can boot up with it — just as you would with a bootable CP/M-85 disk.

1 Winchester Disk Safety

Winchester disks are sensitive precision instruments that can be easily affected by physical shock or impact. The data stored on a Winchester disk is also vulnerable. Because of this vulnerability, you should take special precautions by running SHIP before shipping your Winchester disk, or even before moving the disk across the room.

The SHIP command enables you to protect your Winchester disk, and the data on the disk. SHIP affords this protection by moving the disk's read/write heads towards the hub of the Winchester disk platters. When in this position, the heads and platters will not be damaged by platter vibration that can be caused by physical shock.

Although platters can be caused to vibrate at their outside edges, the platter area near the hub is rigid enough to inhibit vibration. Therefore, the heads and platters are safer when the heads are near the hub.

Run SHIP whenever you intend to physically move the unit containing your Winchester disk.

To use SHIP, invoke the utility at the system prompt and enter a cylinder address value at the prompt, as explained below.

NOTE: The Z-217 controller card causes the read/write heads to move to cylinder zero the first time you access the Winchester disk after power up. Therefore, the head positioning caused by SHIP will remain in effect only until you turn the disk on again and access it.

2 Invoking SHIP

To invoke SHIP by this method, type the following command:

A:**SHIP** ***RETURN***

When invoked, SHIP displays a message in the following form:

```
          SHIP version 1.00
Copyright(C) 1983, Zenith Data Systems

The SHIP utility helps you to:

  * Position the read/write heads of the Winchester disk
    At a safe location for subsequent transportation
    of the Winchester disk unit.

SHIP will prompt you to specify a cylinder address to
identify where the read/write heads should be moved.

Enter shipping cylinder address in hex:
```

3 Entering the Shipping Cylinder

At the "Enter shipping cylinder address in hex:" prompt you should enter a hexadecimal value for the address of the cylinder at which the read/write heads should be positioned when the Winchester disk is physically moved. Refer to Table 4-7 or to your Winchester disk hardware documentation if you are uncertain of this number. Then press ***RETURN***.

NOTE: If you do not wish to move the heads at this time, then enter ***CTRL-C*** at the prompt.

After you have responded to the SHIP prompt, SHIP will move the read/write heads to the specified cylinder. Then Z-DOS will display the system prompt:

```
A:
```

NOTE: After using the SHIP utility, you will have to reset and reboot the system with a bootable floppy disk.

Table 4-7 shows the values you should enter in response to the SHIP prompt if you own any of the list Winchester disks.

Drive Model	Cylinder Position for Shipping
Seagate	
ST-406	131
ST-412	131
ST-419	131
ST-506	9A
ST-706	131
Miniscribe	
Mod II 2012	14F
Mod III 3012	28D
Mod IV 4020	209
IMI	
5006H	148
5012H	148
5018H	148
Tandon	
TM 602S	9A
TM 603S	9A

Table 4-7
Responses to SHIP Prompts

NOTE: If Table 4-7 and your Winchester disk hardware documentation do not explain how the read/write heads should be positioned, then respond to the SHIP prompt by entering the hexadecimal value for the last cylinder on your disk. For instance if your disk has 132 cylinders, enter **132** and ***RETURN*** at this prompt.

4 SHIP Error Messages

```
Invalid HEX value, Try again:
```

Cause: Value entered was not a valid hexadecimal number, or the value entered was outside of the possible range.

Cure: Double check the appropriate hexadecimal value against the disk manufacturer's documentation or Table 4-7. Then enter the correct value at the question again, and press ***RETURN***.

```
Unable to communicate with the Z-217 controller
```

Cause: SHIP can not locate the Z-217 controller. This could mean that the Z-217 is not firmly plugged into the S-100 bus, that the drive cable connectors are not securely fastened, or that the controller has a hardware malfunction.

Cure: Check to see that the controller card and all cable connectors are secure, and run SHIP again.

```
Z-217 controller error on Set Drive Parameters command
```

Cause: Your response to the Enter shipping cylinder address in hex prompt was not valid for the particular drive connected. A malfunction of the Z-217 controller is also possible.

Cure: Recheck the drive parameters and run SHIP again. If this error occurs after repeated attempts to run SHIP, consult Zenith Technical Consultation or your service representative.

SYSGEN

The Utility that Puts the Operating System on a Disk

The SYSGEN utility is used to transfer the operating system to a disk. Under some circumstances, SYSGEN does this task by itself. Sometimes SYSGEN needs the help of other utilities before an entire, usable system can be put on the disk.

1 SYSGEN Invocation

No matter which SYSGEN method is to be performed, the SYSGEN utility is invoked by entering the following command at the system prompt:

A>**SYSGEN** ***RETURN***

A display in the following form will appear:

```
SYSGEN VER 2.2.101
SOURCE DRIVE NAME (OR RETURN TO SKIP):
```

Your next entry depends on the SYSGEN method you are using.

2 SYSGEN Methods

You must consider the circumstances before running SYSGEN, so that you use the appropriate SYSGEN method. Use of a MVCPM2x7 utility will often influence your choice of a SYSGEN method. Thus you have a choice of the following two SYSGEN methods:

- If a MVCPM2x7 utility was **not** used to customize the system for memory capacity, then use the "2.1 Disk to Disk Method". (The BSYSGEN utility could also be used under these circumstances.)

- If a MVCPM2x7 utility (which moves a system kernel into computer memory) was used before SYSGEN, use the "2.2 Computer to Disk Method".

NOTE: When the CP/M Operating System is copied to a disk, it is moved in two parts: the system kernel and the system files. The "2.2 Computer to Disk Method" method does not copy the system files. If this method is used, then the PIP utility must be used to copy the system files.

2.1 DISK TO DISK METHOD

If the operating system is being copied between two disks of the same type, you can copy both the system kernel and the system files to the destination disk using this SYSGEN method. (This method is used when a MVCPM2x7 activity does **not** precede the SYSGEN activity.)

Under these circumstances, you should answer the "SOURCE DRIVE NAME" prompt by typing the letter for a drive name, as shown:

```
SOURCE DRIVE NAME (OR RETURN TO SKIP): x
```

Where x is the letter of the source drive.

SYSGEN will respond with a prompt in the following form:

```
SOURCE ON x, THEN TYPE RETURN
```

Answer this prompt with a carriage return. SYSGEN will read the system kernel from the source disk, and signal that it has done so with the following message:

```
FUNCTION COMPLETE
```

Then SYSGEN will offer the option of copying the system files (BIOS88.SYS, BIOS85.SYS, and ALTCHAR.SYS) from the source disk with the prompt:

```
COPY SYSTEM FILES (Y/N):
```

If you wish to copy the system files from the source disk, then **Y** should be pressed, and SYSGEN will again display the message:

```
FUNCTION COMPLETE
```

If you do **not** wish to copy the system files (BIOS85.SYS, BIOS88.SYS, and ALTCHAR.SYS) with SYSGEN, press **N** at this prompt.

After either entry, SYSGEN will prompt for the drive that contains the destination disk. The user should answer the prompt as shown:

```
DESTINATION DRIVE NAME (OR RETURN TO REBOOT): y
```

Where y is the letter of a valid, working drive.

Then SYSGEN will display the prompt:

```
DESTINATION ON y, THEN TYPE RETURN
```

Enter a carriage return at this prompt, to confirm the destination drive choice. SYSGEN will put the system kernel and in some cases the system file, onto the destination disk. (The disk in drive "y").

Then SYSGEN will again display the prompt:

```
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

If you wish to copy the same system components to a different destination disk, then type the letter of the drive containing this disk.

If you do not wish to SYSGEN other disks, then enter a carriage return. The SYSGEN activity will end, and CP/M will display the system prompt.

2.2 COMPUTER TO DISK METHOD

If you have just run a MVCPM2x7 utility to customize the operating system for memory capacity, then a system kernel still resides in a special location of computer memory. You can copy this system kernel from the computer to the disk by using this SYSGEN method.

When SYSGEN prompts for "SOURCE DRIVE NAME", you must enter ***RETURN*** — **not** a drive name.

```
SOURCE DRIVE NAME (OR RETURN TO SKIP) RETURN
```

SYSGEN will now prompt you for the drive that contains the destination disk. Answer the prompt as shown:

```
DESTINATION DRIVE NAME (OR RETURN TO REBOOT) y
```

Where y is the letter of the drive containing the disk that is to receive the system kernel. (The system files cannot be copied through this SYSGEN method.)

SYSGEN will request confirmation with the prompt:

```
DESTINATION ON y, THEN TYPE RETURN
```

Enter a carriage return at this prompt. SYSGEN will put the system kernel onto the destination disk (the disk in drive y).

Then SYSGEN will again display the prompt:

```
DESTINATION DRIVE NAME (OR RETURN TO REBOOT):
```

If you wish to copy the same system components to a different destination disk, then the letter of drive containing this disk should be entered.

If you do not wish to SYSGEN other disks, and you have **not** specified drive A at a previous "DESTINATION DRIVE" prompt, enter a carriage return at this "DESTINATION DRIVE" prompt. The SYSGEN activity will end, and CP/M will display the system prompt.

If you do not wish to SYSGEN other disks, and you specified drive A at a previous "DESTINATION DRIVE" prompt, then you must reset the computer at the second "DESTINATION DRIVE" prompt rather than entering a carriage return. Resetting the computer at this prompt is necessary because entry of a carriage return at this prompt induces a warm boot, which would cause the new system kernel (recently recorded on the disk in drive A) to be loaded into computer memory. It is undesirable to load any part of this new system kernel into memory on a warm boot because it might have just been changed by a MVCPM2x7 utility. Therefore, it might be of a different size than the system kernel that was loaded into memory at bootup.

If you are copying the CP/M system from memory to a destination disk (as you would after using MVCPM2x7), SYSGEN will not be able to copy the system files for you. Since the system files (BIOS85.SYS, BIOS88.SYS, and ALTCHAR.SYS) are essential to make a disk bootable, you must copy them using the PIP utility. If ALTCHAR.SYS can be copied also

The PIP utility can be used to transfer the system files, as shown:

A>**PIP y:=x:*SYS[RV]** ***RETURN***

Where **y** is the destination disk receiving copies of the system files;
where **x** is the source disk from which the system files are copied;
where ***.SYS** is a wild card file name that stands for BIOS85.SYS, BIOS88.SYS, and ALTCHAR.SYS (if present on source); and
where**[RV]** are PIP parameters used to help you copy a file that has system status, and to help you verify the accuracy of the copy operation.

3 SYSGEN Error Messages

INVALID DRIVE NAME

EXPLANATION: User must specify drive names using the names of drives that exist in the hardware environment, and are recognized by the operating system that was loaded at bootup.

NO SOURCE FILE ON DISK

EXPLANATION: The drive specified as "SOURCE DRIVE" did not contain the system files. Use a different disk in the source drive, or rename BIOS files that had been given names other than "BIOS85.SYS" and "BIOS88.SYS".

SOURCE FILE INCOMPLETE

EXPLANATION: SYSGEN failed in an attempt to copy the system files from the disk in the source drive. This file might have been damaged by disk media flaws or partially overwritten. Reset, bootup, and re-enter the SYSGEN command using a different disk in the source drive.

WRITE ERROR DURING SYSTEM FILES

EXPLANATION: Run SYSGEN again with a destination disk that is write-enabled, formatted, and has at least 12 kilobytes of free space.

ERROR READING SYSTEM FILES

EXPLANATION: SYSGEN failed in an attempt to copy system file software from the disk in the source drive. These files might have been damaged by disk media flaws or partially overwritten. Reset, bootup, and re-enter the SYSGEN command using a different disk in the source drive or using a different disk to perform bootstrap.

```
PERMANENT ERROR, TYPE RETURN TO IGNORE
```

EXPLANATION: The system kernel or system files are either incompatible with the destination disk type or otherwise flawed. Reset, bootup, and re-enter the SYSGEN command using a different disk in the source drive or using a different disk to bootup. Under some circumstances, the user must use a MVCPM2x7 utility before SYSGEN.

```
UNABLE TO SELECT DRIVE
```

EXPLANATION: SYSGEN could not read to or write from a disk in a particular drive. Make certain that a formatted disk is properly inserted in the drive and try SYSGEN again.

VERIFY

The Utility that Isolates Recent Bad Sectors on Your Winchester Disk

The VERIFY utility examines your Winchester disk for any bad sectors (media imperfections) that have occurred since the disk was shipped or since the PREP utility was last used. Then VERIFY adds the addresses of these bad sectors to a list of bad sectors that was recorded on the Winchester disk when PREP was run. This list is called the bad sector table.

The VERIFY utility is shipped on the Winchester Utility Disk.

The PREP utility has already been run on all Winchester disks supplied by Zenith Data Systems or Heath. (Refer to the text entitled "The Bad Sector Table" under "PREP" for information on the bad sector table.)

NOTE: After using the VERIFY utility, you must reset and reboot the system. Use bootable media other than the Winchester Utility Disk to reboot after using VERIFY.

1 Bad Sectors

Bad sectors are media imperfections that can cause hard errors during Winchester disk access operations. Hard errors are conditions in which an operation failed after a number of repeated attempts. Recovery from a hard error usually brings an abrupt end to the operation being attempted.

However, the VERIFY utility enables you to prevent hard errors from occurring in the future if these errors were caused by bad sectors. If VERIFY finds a reasonable number of new bad sectors (between 1 and 169), it adds them to the bad sector table that was originally created by the PREP utility.

The PREP utility (which is used before shipping on Winchester disks supplied by Zenith Data Systems or Heath) initializes the Winchester disk. PREP also helps you to make bad sectors inaccessible by creating a table of all the bad sectors, and storing this table on the Winchester disk.

Then, the next time you format a partition, FORMAT will take into consideration the newly acknowledged bad sectors. FORMAT will set up sector boundaries that will prevent usage of the bad sectors during all operations that occur after the formatting operation.

However, you might also obtain hard errors during Winchester disk access due to the following other problems:

- Excessive physical shock
- Entry of foreign material (such as smoke) into the Winchester disk chamber
- Malfunction of the Z-217 controller card
- Temporary loss of power to the disk

If one of these problems causes a hard error, then the disk might not have any new bad sectors for VERIFY to find. In such a case, you should back up the files from your Winchester disk. Then you should use the PREP utility. If you still encounter hard errors after using PREP, contact Zenith Data Systems Technical Consultation for assistance.

2 VERIFY Entries

VERIFY does not destroy any of the data on the Winchester disk. However, if you use VERIFY to isolate bad sectors, then we recommend that after VERIFY, you use BACKUP to copy all files from the partition on which the bad sectors occurred. Then you should use FORMAT on the partition on which the bad sectors occurred. Finally you should use RESTORE to replace the backed up files on this partition.

2.1 INVOKING VERIFY

To invoke VERIFY, type the following command at the system prompt:

A: **VERIFY** ***RETURN***

VERIFY will display the following message and prompt:

```
            VERIFY version 1.00
Copyright(C) 1982, Zenith Data Systems

The VERIFY utility helps you to:

  *  Locate sectors that have failed since you last ran PREP

Do you wish to proceed with VERIFY (Y/N)?
```

2.2 CONFIRMING INTENTIONS TO USE VERIFY

At the "Do you wish to proceed with VERIFY (Y/N)?" prompt, you can press **Y** to continue with the utility, or press any other key to exit to the system.

If you press Y to continue, VERIFY displays the following prompt:

```
Enter bad sector address, or zero to end:
```

2.3 ENTERING BAD SECTOR ADDRESSES

When error conditions are encountered during Winchester disk access operations, CP/M-85 displays a hard error message that is slightly different from the floppy disk hard error message explained in "Appendix A: Operating System Error Messages" in the CP/M-85 manual.

This Winchester disk error message appears in the following form:

```
HARD {operation} ERROR ON DRIVE {d:} STATUS {nn} SECTOR {ssss}
```

Where "{operation}" identifies the operation that was being performed when the error occurred. This operation could be worded as:

READ

or

WRITE

where "{d:}" is the name of the drive to which the partition was assigned when an error was encountered on the partition;

where "{nn}" is a code for the status of the error. These status codes are explained in the Z-217 Technical Manual; and

where "{ssss} is the logical hexadecimal address of the sector on which the hard error occurred. (Logical sector addresses begin with the first sector on the entire Winchester disk, which is sector 0000.)

An error message in this form does not always indicate that your Winchester disk has bad sectors. When you receive such an error message, record the status code, and refer to the Z-217 Technical Manual to determine the meaining of this code. If the error message includes a status code with the number 80 or 81 or a number from 00 through 05 or from 20 through 40, then the error message probably does **not** indicate a bad sector or a reason for using the VERIFY utility.

However, if the error message includes a status code with a number from 10 through 17, then it is likely that your Winchester disk has developed a bad sector. Therefore, you should record the sector address that is also displayed in the error message, and use this sector address to respond to the "Enter bad sector address, or zero to end:" prompt.

We recommend that you also record the partition name and system name of the partition on which the error(s) occurred.

At the "Enter bad sector address, or zero to end:" prompt, enter the address of the logical sector at which the error(s) occurred, or type the digit zero (0) to begin media verification.

If you enter the address of a logical secotr, then VERIFY will continue to display the

```
Enter bad sector address, or zero to end:
```

until you enter a zero.

3 VERIFY Operation

When VERIFY begins to search for bad sectors (after you have typed a zero at the bad sector address prompt) VERIFY displays the message:

```
Beginning verification...
```

3.1 VERIFICATION COMPLETION

When VERIFY is finished verifying the disk, it will display the following message:

```
Beginning verification...Completed
```

3.2 VERIFICATION REPORT

If VERIFY found no bad sectors during the operation, it will also display the following message:

```
No bad sectors located.
```

If VERIFY found a reasonable number (1–169) of bad sectors during its search, it will display the following message:

```
Bad sectors located. Tables modified
```

NOTE: The words Tables modified will not appear in this message if VERIFY is unsuccessful in recording the new bad sector information at the end of the bad sector table.

If VERIFY finds more than 169 bad sectors on the Winchester disk, it will display the following message:

```
Bad sector count exceeded for this drive.
```

4 VERIFY Followup Activities

After you use the VERIFY utility, the data stored on your Winchester disk will still be intact (except the data that was recorded over bad sectors). However, the addition to the bad sector table that VERIFY provides will not be put to use until you use the FORMAT utility on the newly verified media.

The bad sectors that VERIFY found will not become inaccessible until FORMAT is used on the partition that contained the bad sectors. FORMAT will redefine the sector boundaries of the partition so that the bad sectors cannot be accessed.

Reset Reset the computer after using VERIFY, (No partition will be accessible until you do.)

Boot up If you have not already done so, boot up to a floppy disk or partition (other than the partition just verified) that contains the CP/M-85 Operating System.

ASSIGN If necessary, assign the partition on which the error occurred to a drive.

BACKUP Use the BACKUP utility to copy all of the files from the partition to floppy disks.

FORMAT When all of the Winchester disk files have been safely backed up to floppy disk media, use the FORMAT utility. Specify the drive that has been assigned the partition on which the bad sector(s) occurred.

MVCPM217 If you have booted up with a floppy disk, use the MVCPM217 utility to create a CP/M system in memory that can later be transferred to the newly formatted partition. If you have booted up with another partition, then skip using the MVCPM217 utility.

SYSGEN Invoke the SYSGEN utility. If you have booted up with a floppy disk and used the MVCPM217 utility, then press ***RETURN*** at the "SOURCE DRIVE NAME (OR RETURN TO SKIP):" prompt. If you have booted up with another partition and not used the MVCPM217 utility, then enter the drive name for the booted partition at the "SOURCE DRIVE NAME (OR RETURN TO SKIP):" prompt.

RESTORE After formatting this partition, use the RESTORE utility to copy the backed up files back to the Winchester disk partition.

You should take the earliest possible opportunity after verifying to perform these activities to insure the safety of your stored software and data.

5 VERIFY Error Messages

```
Bad sector count exceeded for this drive.
```

Cause: The upper bound limit of 169 bad sectors has been exceeded. This could indicate a hardware malfunction.

Cure: Run VERIFY again. If this error message appears after repeating VERIFY, then run PREP. If this error message appears after running PREP, then contact Zenith Data Systems Technical Consultation for assistance.

```
Error -- Can not read superblock A.
```

Cause: A bad sector error has occurred in the primary superblock (Superblock A).

Cure: This condition is self correcting. The backup or secondary superblock (Superblock B) will now be used. However, we advise that you now back up all of your files and then run PREP and PART again. If superblock B ever becomes unreadable, all data on the Winchester disk will become inaccessible.

```
Error -- Drive capacity > 32 megabytes!
```

Cause: VERIFY has calculated that the Winchester drive connected to the Z-217 controller card is larger than the maximum allowable size of 32 megabytes.

Cure: Run VERIFY being careful to respond with the correct values to the drive parameter questions.

```
Error -- Unable to read boot code from partition
```

Cause: The boot code on the spedified partition is either not present, or it has developed a bad sector.

Cure: Boot from another drive. Then run VERIFY, reset, reboot, and run ASSIGN, BACKUP, FORMAT and RESTORE on the partition where the error occurred. If that partition is totally unavailable, you may need to run the PREP utility.

```
Fatal Error -- Can not read superblock B.
```

Cause: A bad sector error has occurred in the backup copy of the superblock.

Cure: Run VERIFY again.

```
Invalid HEX value, Try again:
```

Cause: Value entered was not a valid hexadecimal number, or the value entered was outside of the possible range.

Cure: Double check the appropriate hex value, and re-enter.

```
Track 0 contains bad sector(s).
```

Cause: A bad sector error has occurred in the reserved area of the hard disk. This could indicate a hardware malfunction.

Cure: Run VERIFY again. If this error message appears after repeating VERIFY, then run PREP. If this error message appears after running PREP, then contact Zenith Data Systems Technical Consultation for assistance.

```
Unable to communicate with the Z217 controller
```

Cause: VERIFY can not locate the Z-217 controller. This could mean that the Z-217 is not firmly plugged into the S-100 bus, all of the drive cable connectors are not securely fastened, or that the controller has a hardware malfunction.

Cure: Check to see that the controller card and all cable connectors are secure, and run VERIFY again. If this error message appears after repeating VERIFY, then run PREP. If this error message appears after running PREP, then contact Zenith Data Systems Technical Consultation for assistance.

```
Unable to re-write tables, disk unusable!
```

Cause: VERIFY is unable to record data in the reserved Winchester area of your Winchester disk.

Cure: Run PREP. If this error message appears after running PREP, then contact Zenith Data Systems Technical Consultation for assistance:

```
Z-217 controller error on Set Drive Parameters command
```

Cause: One or more of the drive characteristics specified in the reserved Winchester area is not valid for your Winchester disk drive.

Cure: Run PREP, making certain that you enter the proper drive characteristics for your Winchester disk drive. If this error message appears after running PREP, then contact Zenith Data Systems Technical Consultation for assistance.

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