

# Desktop Computer

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# Z-100 Series

# User's Manual

889-0037-0  
CONSISTS OF

MANUAL  
889-2860-03

FLYSHEET  
887-2807-00

TAB SET  
887-2790

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**data**  
**systems**

## OPERATION

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### Your Computer System

#### SETTING UP

The following paragraphs will describe setting up each plug, connector, and control on your Computer. While examining the back panel and the connectors be sure that the Computer is turned off and unplugged. Rotate your Desktop Computer so you are looking at its back.

Refer to Pictorial 1-2 for the all-in-one model Desktop Computer, and to Pictorial 1-3 for the low-profile model.

#### Back Panel

- Fan — Used to provide ventilation to the power supply. Never block the fan openings or restrict air movement while you have your Computer turned on.

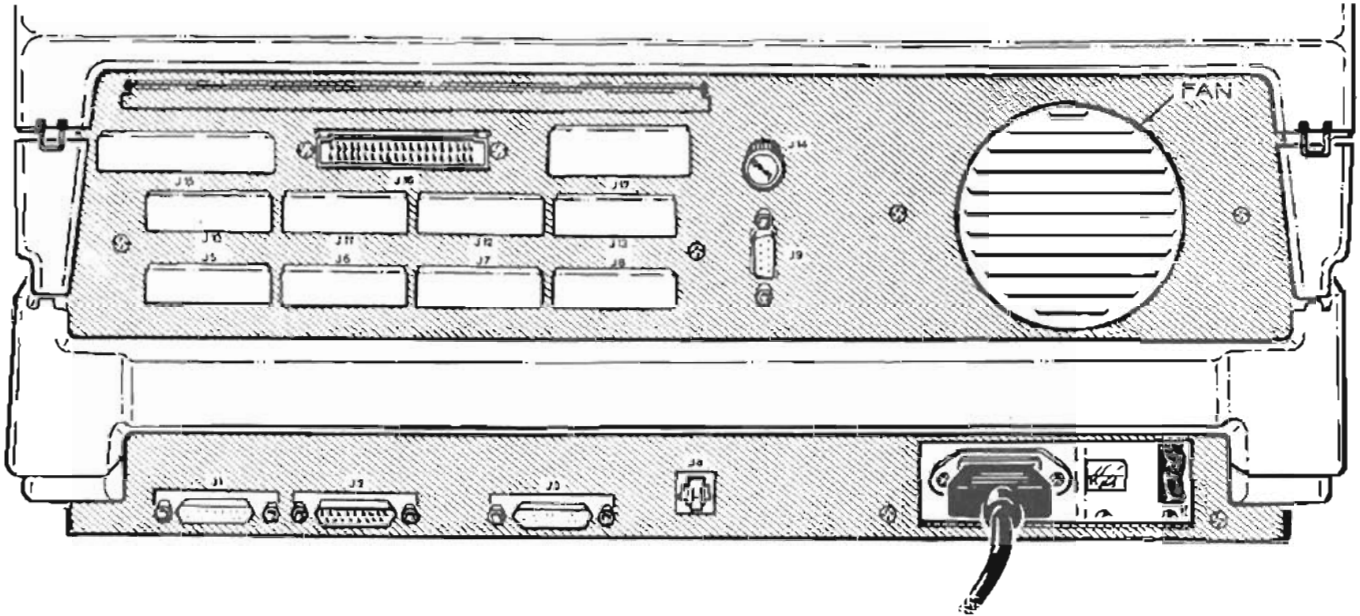
The following connector(s) and control are located next to the fan openings on the upper back panel.

- J14 — Brightness Control - (All-in-one model only) Used to adjust the brightness of the video display. Adjust it to obtain the brightness most suitable to you.
- J14 — Composite Video Out - (Low-profile model only) Provides the proper video signal for a separate black and white video monitor. The low profile model requires a separate video monitor; you cannot use a standard television receiver for this purpose as it is not designed to display all of the information needed for word processing or accounting applications.
- J9 — RGB Video Out - Provides the necessary signals for a high-resolution color monitor that uses RGB (Red-Green-Blue color) signals. Appendix I contains the necessary information that you need to configure this connector.
- J16 — 8" Floppy Disk Connector - Provides the proper signals to read and write diskettes in 8" Shugart-compatible disk drives.

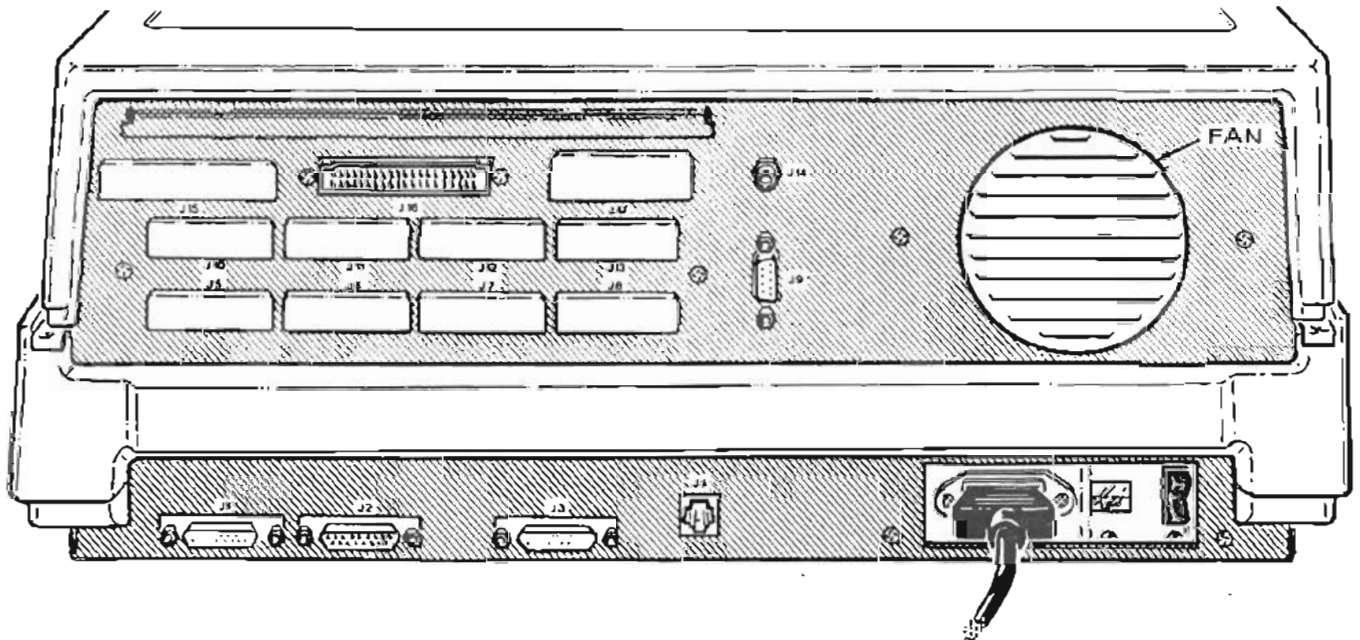
In addition to the above control and connectors, there are a number of unfilled positions on the upper back panel for future expansion (J5-J8, J10-J13, J15, and J17). The necessary connectors will be provided with the expansion units.

# OPERATION

## Your Computer System



**Pictorial 1-2**  
All-in-One model



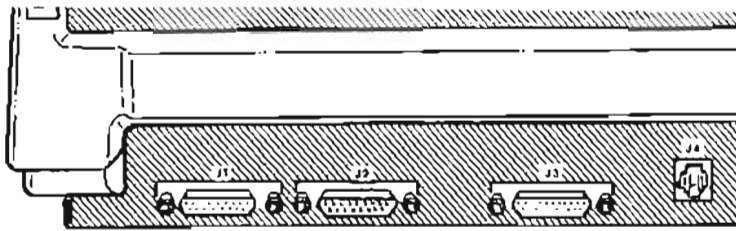
**Pictorial 1-3**  
Low profile model

## OPERATION

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### Your Computer System

Refer to Pictorial 1-4. These connectors are on the lower left portion of the back of your Computer.



**Pictorial 1-4**  
Peripheral connectors

- J1 — Serial Connector - Provides the necessary EIA-standard RS-232 DCE signals for connection to a serial printer.
- J2 — Serial Connector - Provides the necessary EIA-standard RS-232 DTE signals for use with a telephone modem.
- J3 — Parallel Printer Connector - Provides the necessary Centronics-type parallel signals for connection to a parallel printer.
- J4 — Light Pen Connector - Provides the necessary signals for connection to a light pen for on-screen graphics work.

## OPERATION

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### Your Computer System

Magnets and magnetized objects can erase some of the information stored on your diskettes. Also, X-rays may destroy the data on a diskette. By keeping your diskettes away from these sources of trouble, you can help to insure trouble-free operation of your Computer.

You are now ready to see your new Computer in operation. The following directions will power-up your Computer and prepare it for the Demonstration Diskette.

- Turn the POWER SWITCH on. You should see the power-on indicator (in the RESET key) light and disk drive A's disk access indicator glow. **NOTE:** The disk access indicator may not glow if certain features are not enabled on your Desktop Computer. However, if you do not see the power-on indicator light up, turn the power off and refer to the "In Case of Difficulty" section, Page 1.25.

#### Power-up



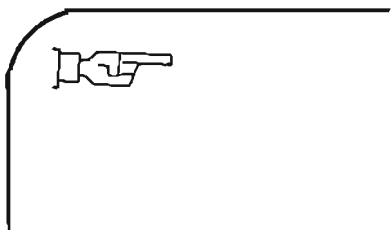
## OPERATION

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**Your Computer System**

- After about 30 seconds the following message should appear on the screen:

Device Error



and a small hand (called the “hand prompt”) pointing to a cursor will appear in the upper left hand corner of the screen. If they do not appear, press both the **CTRL** and **RESET** keys at the same time. If the message, small hand, and cursor still does not appear after another 30 seconds, refer to the “In Case of Difficulty” section.

NOTE: If the disk access light does not glow when you turn on your Computer, the hand prompt should appear very shortly. If it does not, press both the **CTRL** and **RESET** keys at the same time. If the hand prompt does not immediately appear, refer to the “In Case of Difficulty” section.

Also, you may override the 30 second wait by pressing the **DELETE** key while the disk access light is glowing. The screen will then display the message:

Boot Abort

and the hand prompt.

# DISK OPERATING SYSTEM

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## Introduction

A Disk Operating System, or DOS, is a program that lets you do certain tasks, such as organize the diskette (with the FORMAT command), copy information from one diskette to another (with the COPY command), enter the date and time (DATE and TIME commands), and load other programs.

NOTE: Two Disk Operating Systems that work with your Computer are Z-DOS<sup>®</sup> and CP/M<sup>®</sup>. There are also two versions of BASIC: BASIC-80 for use with CP/M<sup>®</sup>-85 and existing 8-bit software, and Z-BASIC for use with Z-DOS and 16-bit software.

Z-DOS was prepared for the Zenith Data Systems Z-100 Series Desktop Computers by Microsoft. It is compatible with MS-DOS, the operating system of the IBM Personal Computer. Z-DOS stands for Zenith Disk Operating System. It is supplied on a diskette and must be loaded into your Computer.

To "load" Z-DOS, you will use a program called a "monitor," which is built into your Computer. The monitor program is always there, ready to help you get started, to check out certain features, and to serve as a system supervisor. You will learn how to load Z-DOS into your Computer later in this section. Then we will show you how to use some of the features of Z-DOS to organize diskettes and duplicate them.

CP/M-85 is briefly compared to Z-DOS in Appendix G. Complete information concerning this operating system is contained in the CP/M-85 Manuals.

If you are using your Desktop Computer for the first time, be sure you have read the "Operation" section of this Manual; it contains important information for new users. Even if you have used other computers before, we suggest that you read the discussion on controls before you attempt to use your Computer.

NOTE: The following information assumes you have two drives. If your system has only one drive, refer to Appendix C for proper use of one-drive commands.

## DISK OPERATING SYSTEM

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### The Monitor Program

Your Computer contains a special program, called a monitor, that is designed to help you get started. One of its functions is to "load" (or "boot") the disk operating system ("DOS") from diskette into memory. The Desktop Computer is set at the factory to automatically boot the DOS when it is turned on. By setting a switch (see Appendix I) you can disable this feature (called "autoboot").

If autoboot is disabled, after power-up you will see a small hand pointing to an underline or a solid video block in the upper left-hand corner of the screen. This "prompt" is the Computer's way of telling you that it is ready and waiting for your command. To execute any monitor program command, the "hand prompt" must be present. It occurs automatically after the system is turned on and may be restored at any time. To do so, simultaneously press both the **CTRL** and **RESET** keys if you ever find that you need to start over. However, do not "reset" your Computer unless you are sure that no important programs are being executed.

#### Autoboot

If autoboot is enabled (set as the Computer comes from the factory), then there will be no display until a certain amount of time passes, or you press the **DELETE** key, or you insert a diskette with the DOS on it into drive A.

If you press the **DELETE** key, the screen will show:

```
Boot Abort
```

and the hand prompt. The system is now in a manual mode and you can use the commands described later in this section.



# DISK OPERATING SYSTEM

## The Monitor Program

If you wait for the system and do not put a diskette into drive A, the screen will show:

Device Error

and the hand prompt. This message will also appear if you put the diskette into the disk drive wrong. The system is now in a manual mode and you can use the commands described later in this section.

If you want to restart the Computer at any time, press both the **CTRL** and **RESET** keys at the same time. The Computer will attempt to boot in a DOS, as it did when you first turned it on. If you have a diskette properly inserted in drive A, the DOS will be booted.

### THE COMMANDS

#### V—Version

NOTE: Professional software is released in versions. Updates and enhancements to these programs are made as they are developed. Each time a revision of this type occurs, it is called a new "version" and given a number (Version 1.0, Version 1.1, etc.).

You can use the Version command whenever you want to find out what version of the monitor program you have in your Computer. To use this command:

- Make sure the Computer is on and the hand prompt is showing.
- Press the **V** key. The Computer will display:

Version 1.0

and return to the hand prompt.

The display tells you that the monitor version (in the example) is 1.0. There is no relationship between the monitor version number and the operating system version number shown later in this section.

## DISK OPERATING SYSTEM

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### The Monitor Program

This is the monitor command you will use if your system is not set up to boot automatically, if a diskette is not autobooted after power up, or if you want to manually boot the system. The boot process reads the operating system (DOS) from the diskette and loads it into the Computer. To use this command:

#### **B — Boot**

- Make sure the Computer is on and the hand prompt is showing.
- Insert the Z-DOS diskette (or any diskette with a Z-100 disk operating system on it) into Drive A (see Pictorials 1-12A or 1-12B on Page 1.13).
- Close the disk drive door.
- Press the **B** key. The Computer will display:

Boot

- Press the **RETURN** key.

The Computer will now execute the boot routine and load the operating system from the disk into the Computer's memory.

# DISK OPERATING SYSTEM

## Loading Z-DOS

With the Z-DOS Manual, you will receive two Z-DOS diskettes titled: Distribution Disk I and Distribution Disk II. The following steps will show you how to "load" the disk operating system the first time and then create "backups", or "working copies", of the distribution diskettes.

To load Z-DOS:

- Turn on the Computer or press the **CTRL** and **RESET** keys at the same time if the Computer is already on.
- Insert the Z-DOS Distribution Disk I into Drive A.
- Close the disk drive door.
- If you are booting the Computer manually, press the **Q** key. The Computer will display:

Boot

and then press the **RETURN** key.

The LED disk access indicator will come on, indicating that the diskette is being "read" by the Computer. You may hear a low whirring noise, which is the normal sound of the disk drive motors.

As Z-DOS is read into the Computer, your display will show a message similar to:

```
Z-DOS/MS-DOS BIOS Release 1.00, version 1.00
```

```
Z-DOS/MS-DOS release 1.00, version 1.25  
(C)Copyright 1982 Zenith Data Systems
```

```
Z-DOS/MS-DOS Command release 1.00 version 1.19
```

```
A:Date
```

```
Current date is Fri 8-27-1982
```

```
Enter new date:
```

## DISK OPERATING SYSTEM

## Z-DOS Commands

**Other Internal  
Commands**

You will find more complete instructions and how to use the options of the internal Z-DOS commands in the Z-DOS Manual. The internal commands not covered here (.BAT, PAUSE, and REM) are also discussed in that Manual.

**EXTERNAL COMMANDS**

External Z-DOS commands are actually separate programs. They are called commands, because you can execute them from Z-DOS in the same manner as an internal command. Because they are separate programs, you can (selectively) remove them from your diskette with the ERASE command (see Page 2.25).

All external commands will appear on the directory listing of a diskette. These programs are known as "utilities;" they are used for some common task, such as the FORMAT command (see "FORMAT", Appendix K.)

The external commands included with Z-DOS are summarized in the following chart:

The Command:	Tells the Computer to:
CHKDSK	Check the directory and report free space.
CONFIGUR	Configure the system for a specific printer.
CREF	A cross reference utility used with assembly language code.
DEBUG	Load, change, or display the contents of any file.

# DISK OPERATING SYSTEM

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## Z-DOS Commands

The Command:	Tells the Computer to:
DSKCOMP	Compare the contents of two diskettes to see if they are identical.
DSKCOPY	Duplicate the contents of one diskette onto another diskette.
EDLIN	Create, edit, display, or delete text on ASCII files.
EXE2BIN	Convert executable files (.EXE) to binary files (.COM).
FILCOM	Compare the contents of two files to see if they are identical.
FORMAT	Format diskette.
LIB	A library manager used with object code files.
LINK	Creates an executable file (.EXE) from object code files.
MAKE	An extended batch processor with built-in backup capabilities.
MAP	Assign logical names to physical drives.
MASM	Z-DOS's Assembler used for 8086 and 8088 assembly language files.
SYS	Transfer the operating system.

# APPENDIX E

## System Specifications

<b>Introduction</b>	This Appendix lists the specifications for the Z-100 and its integral peripheral products.	
<b>CPU</b>	8-Bit processor	8085.
	Clock	5 MHz.
	Type	8 Bit CPU.
	Wait state	Memory, 1; I/O, 2.
	16-Bit processor	8088.
	Clock	5 MHz.
	Type	16 Bit CPU.
	Wait state	Memory, 0; I/O, 1.
	On-board memory	64K to 192k bytes in 64K increments, 128K or 192K standard, parity checked.
	Memory Space	1 Megabyte.
	Monitor Space	One 64K page (8K used).
	Video RAM Space	Three 64K pages.
	User Memory Space	3/4 Megabyte (768K).
	<b>Interrupts</b>	
	Controller	Dual 8259A.
	System	15 level priority vector interrupt.
<b>Video Display</b>	CRT (all-in-one)	12" diagonal, green nonglare.
	Display Format	25 rows of 80 characters.
	Display Size	6.5" high × 8.5" wide.
	Character Size	0.2" high × 0.1" wide approximate.
	Character Type	5 × 9 dot matrix.
	Character Set	"Soft", dynamically redefinable.
	Dot Resolution	640 horizontal by 225 vertical.
	Colors (optional)	Eight: Red, green, blue, white, black, cyan, magenta, and yellow.
	Grey Scale:	Eight levels when you are using a monochrome display and the color option is installed in the Computer.

## APPENDIX E

## System Specifications

## Options

Interlace mode	640 × 512 pixels.
Pages	Second page of display.
Light Pen	One pixel resolution.

## Outputs

Red, green, blue, composite video, composite sync, separated horizontal and vertical sync.

## Type

Proposed IEEE-696 (S-100).

**Bus structure**

## Number of slots

Five.

## Data Bus Width

Eight bits.

## Address Bus Width

Twenty-four bits.

## I/O Addressing

Eight bits.

## Type

Programmable.

**Timer**

## Type

95 keys (61-key alphanumeric and 16-key function & control section, plus an 18-key numeric & control section).

**Keyboard**

## Maximum Debounce

5 milliseconds.

## Modes

Two: ASCII and Event driven.

## Processor

8041A Universal Peripheral Interface.

## Buffer

FIFO buffer (17 character).

## Key Click

May be disabled.

## Auto Repeat

11 keys/second. May be disabled.

## Fast Repeat

28 keys/second.

(on S-100 card—may be omitted)

**Disk Controller**

## Type

WD 1797.

## Drives supported

Up to four each.

5-1/4"

Single/double sided, 48/96 tracks per inch, single/double density.

8"

Single/double sided, single/double density.

## Data Separator

Phase-locked loop.

Pre-compensation

Variable independently for both 5-1/4" and 8" sizes.

## Data Transfer

Programmed using wait states.

Type

Interrupt or polling.

## APPENDIX E

## System Specifications

	<b>Internal Disk Drive</b>	
	Size	5-1/4"
	Sides	Single or Double
	Track Per Inch	48 or 96
	Capacity (formatted)	160K, 320K or 640K, depending upon the number of sides and tracks per inch.
	Track format	4K, 8 sectors of 512 bytes each (recommended).
	Stepping speed	6 milliseconds per track or faster.
	<b>External Disk Drive</b>	
	Type	8" single- or double-sided, Shugart compatible.
	<b>Winchester Disk Drive</b>	(optional)
	Type	One internal 5" replacing one internal floppy disk drive, Seagate or Seagate compatible.
	Capacity (formatted)	5.3 megabytes.
<b>Input/Output</b>	<b>Serial I/O</b>	Dual RS 232 ports, one DTE and one DCE.
	Baud Rate	110 to 38,400.
	Operation	Asynchronous RS-232 or synchronous.
	Stop Bits	One, one and one half, or two bits.
	Word length	Five, six, seven, or eight bits.
	Parity	Even, odd, none.
	Break Capability	Detection and generation.
	<b>Parallel</b>	Eight bit output only.
	Type	Centronics.



## APPENDIX E

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### System Specifications

Input, volts	115 volts or 230 volts.	<b>Power Supply</b>
Input, hertz	50Hz or 60Hz.	
Operating Temperature	15.6 to 32.2 degrees Celsius, (60 to 90 degrees Fahrenheit).	
Storage Temperature	10 to 43 degrees Celsius, (50 to 110 degrees Fahrenheit).	
Operating Humidity	8 to 80% non-condensing.	

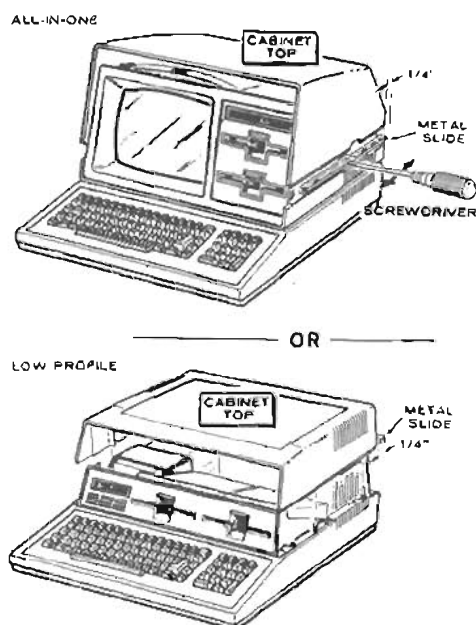
Zenith Data Systems reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

## APPENDIX I

## User Configurations

## Introduction

The Z-100 Series of Desktop Computers may be configured a number of ways through dip switches and jumpers located on circuit boards inside the Computer. The information presented in this appendix will allow you to custom configure your Computer to your needs. Also included are instructions to remove the cabinet top.



Pictorial I-1

Top case removal

## CABINET TOP REMOVAL

To remove the cabinet top of your Desktop Computer, refer to Pictorial I-1 and complete the appropriate steps:

- All-in-one model — Use a small flat-blade screwdriver and move the metal slides 1/4" to the back as shown.
- Low profile model — Move the two metal slides 1/4" to the back as shown.

Carefully lift the cabinet top straight up and set it to one side.

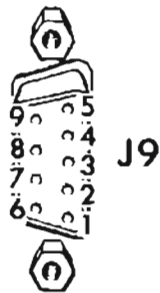
# APPENDIX I

## User Configurations

### RGB PINOUTS

Refer to Pictorial I-2, J9 Pinout. The following illustrates the different signals you can get through the J9 connector for RGB color monitors. Also see "Video Board Jumpers."

<u>Pin</u>	<u>Signal</u>
1	Ground
2	Ground
3	Red
4	Green
5	Blue
6	Not connected <i>INTENSITY</i>
7	Not connected <i>MONOCHROME</i>
8	Horizontal Sync
9	Vertical or Composite Sync



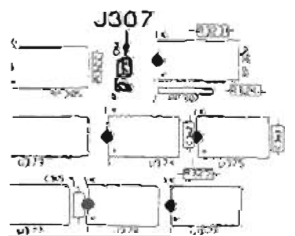
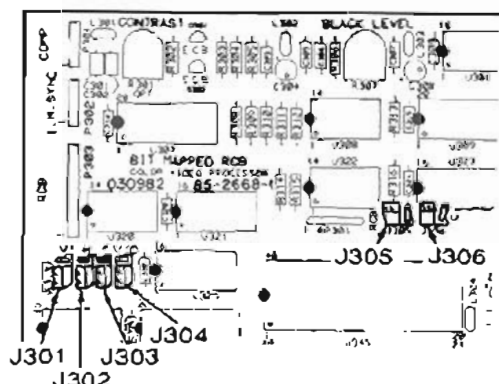
**Pictorial I-2**  
J9 pinout

# APPENDIX I

## User Configurations

### VIDEO BOARD JUMPERS

The following Jumpers are located on the video board. Refer to Pictorial I-3.



**Pictorial I-3**  
Video board jumpers

Jumper	Description
J301	Selects vertical sync polarity for use by the internal monitor. The "-" position will produce a negative going sync.
J302	Selects the horizontal sync polarity at pin 8 of the DB-9 connector. The "-" position will produce a negative going sync.
J303	Selects the signal fed to pin 9 of the DB-9 Connector. If the jumper is in the "C" position, then pin 9 will have a composite sync. If the jumper is in the "V" position, pin 9 will carry the vertical sync signal.
J304	Selects the polarity of either the composite or vertical sync signal on pin 9 of the DB-9 connector.
J305	Selects RGB (color option if full video RAM is present) or the Green video RAM bank for a monochrome display. Used in conjunction with J306. If the jumper is in the "RGB" position, then the color option is selected. If the jumper is in the "G" position, a monochrome display will be used.
J306	Selects RGB or monochrome. Set the same as J305.
J307	Selects the memory addressing options and type for the video memory. If no jumper is present, then the chips are 32K and located in high memory. If the jumper is in the 32 position, the chips are 32K and located in the low end of the video memory. If the jumper is in the 64 position, the chips are 64K and cover both memory locations.

# APPENDIX I

## User Configurations

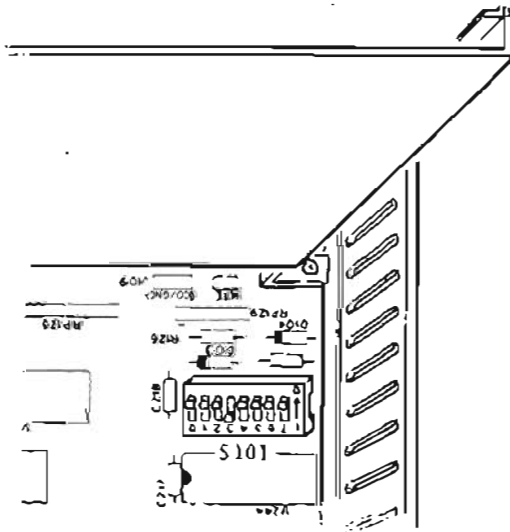
### DIP SWITCH SETTINGS (CPU MOTHER BOARD)

Refer to Pictorial I-4 for the location of switch S101 found on the CPU Mother Board next to the S-100 card cage.

<u>Section</u>	<u>Description</u>
0	} Default boot device *
1	
2	
3	1 = Auto boot, 0 = Manual boot
4	not used
5	not used
6	not used
7	0 = 60 Hz, 1 = 50 Hz operation

\* Sections 0, 1, and 2 should be set to reflect the type of drive that the system is to be booted from:

<u>Section:</u>	<u>Device</u>			<u>Type:</u>
0	1	2		
0	0	0	5-1/4" Floppy Disk Drive (Internal)	
1	0	0	8" Floppy Disk Drive (External)	
0	1	0	5" Winchester Disk (Internal)	



**Pictorial I-4**  
CPU board Dip switch settings

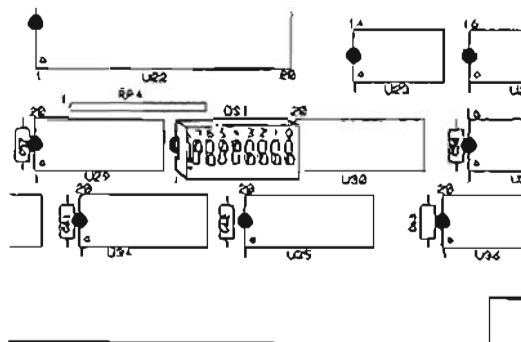
# APPENDIX I

## User Configurations

### DIP SWITCH SETTINGS (DISK CONTROLLER BOARD)

Refer to Pictorial I-5 for the location of switch DS1 found on the Z-207 Disk Controller Board.

<u>Section</u>	<u>Description</u>
7	} Set port (modulo 8)
6	
5	
4	
3	
2	not used
1	Precomp select for 5-1/4" disk drives
0	0 = 48 tpi, 1 = 96 tpi (5-1/4" drives)



**Pictorial I-5**  
Z-207 Disk Controller  
switch settings

## APPENDIX L

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**Monitor 100 Commands****THE MONITOR PROGRAM**

Your Computer contains a special program called the monitor. This program can perform several functions. One of its primary uses is to "load" (or "boot") the disk operating system (DOS) from a diskette or the Winchester disk into memory.

To use the monitor commands other than boot, the system must be in the manual-boot mode, or have the boot sequence aborted if it is in the autoboot mode. Either way, a hand prompt "⌘" will appear along the left side of the screen.

Most Z-100 Computers are set at the factory to automatically boot from the default drive when power is first turned on ("auto-boot"). If you press the **DELETE** key during the boot sequence, you will abort the auto-boot process and obtain the hand prompt. By resetting a switch (see Appendix I), you can permanently disable this "autoboot" feature if you desire. In this case, you must boot the Computer manually using the "boot" command described below.

If you want to reset the Computer to the hand prompt condition, press both the **CTRL** and **RESET** keys simultaneously. If the Computer is in the autoboot mode, the Computer will again attempt to boot and you will have to press the **DELETE** key to abort the boot sequence.

**MONITOR SYNTAX**

"Monitor Syntax" is the rules of punctuation and positioning of characters that you must follow. If you do not follow these rules, the Computer's monitor commands will not respond as you want them to.

If you try to delete a displayed command name or characters that you did not type in, the command will be aborted and the system will return to the hand prompt.

## APPENDIX L

### Monitor 100 Commands

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The monitor commands use the following syntax. If you type an incorrect key, the Computer will beep and wait for you to type a correct key.

- "nnnn" – Start segment value in hex (up to 4 hex values).
- "mmmm" – Start offset value in hex (up to 4 hex values).
- "oooo" – End offset value in hex (up to 4 hex values).
- "nn" – Byte value in hex (up to 2 hex values).
- "pp" – Byte value in hex (up to 2 hex values).
- [ ] – Anything enclosed in square brackets is optional and the brackets must not be typed.
- x | y – The "|" indicates that either character (x or y) can be input, but not both.

#### THE COMMANDS

The monitor contains 12 commands. One of these commands is called "Help." It provides a list of all the commands.

#### Help

- Make sure the Computer is on and the hand prompt is showing.



## APPENDIX L

## Monitor 100 Commands

- Press either the **HELP** or **H** key. The Computer will display:

```
Boot
Color Bar
Dump
Examine
Fill
Help
<HELP Key>
Input
Output
System
Test
Version
Xecute
```

and return to the hand prompt.

The display shows you the list of commands. Some commands; such as Boot, Color Bar, Help, System, Test, and Version; can be used by anyone. The other commands; Dump, Examine, Fill, Input, Output, and Xecute; should only be used by experienced computer programmers.

### B — Boot

This command will boot (or "load") the disk operating system from a diskette or Winchester drive into memory.

**Autoboot** — If autoboot is disabled, after power-up you will see a small hand pointing to an underline or a solid video block in the upper left-hand corner of the screen. This "prompt" indicates that the Computer is ready and waiting for your command. To execute a monitor command, the hand prompt must be present. It occurs automatically after the system is turned on, and you may restore it at any time by resetting the Computer. However, do not reset your Computer unless you are sure that the drives are not performing file operations.

## APPENDIX L

### Monitor 100 Commands

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If autoboot is enabled (the Computer normally comes from the factory this way), then there will be no display until a certain amount of time passes, or you press the **DELETE** key, or you insert a diskette with an operating system on it into drive A.

If you press the **DELETE** key, the screen will show:

Boot Abort

and the hand prompt. The system is now in the manual mode until you reset the Computer or turn it on again, and you can use the commands described in this appendix.

If you wait for the system and do not put a diskette into drive A, the screen will show:

Device Error

and the hand prompt. This message will also appear if you put the diskette into the disk drive incorrectly. The system is now temporarily in the manual mode and you can use the commands described in this appendix.

**Boot** — The Boot command syntax is:

Boot [F1 | F2 | F3][0 | 1 | 2 | 3 ][S][:boot\_string]

- Make sure the Computer is on and the hand prompt is showing.
- Press the **F3** key. the Computer will display:

Boot

and wait for you to type on the keyboard to give it more information.

## APPENDIX L

## Monitor 100 Commands

- If you press the **RETURN** key, the Computer will begin to boot the operating system from the default device, drive zero. The default device is determined by the setting of switch S101 on the Computer's main board (see Appendix I of your User's Manual). This device can be 5-1/4" floppy disk drive zero, 8" floppy disk drive zero, or the first 5-1/4" Winchester drive.
- If you press the **F1**, **F2**, or **F3** key followed by the **RETURN** key, the Computer will boot from a specific device without regard to the settings of main board switch S101. "F1" specifies 5-1/4" floppy disk drive zero, "F2" specifies 8" floppy disk drive zero, and "F3" specifies the first 5-1/4" Winchester drive.

The monitor can support up to four drives of each type. Therefore, you can boot from any drive by typing 0, 1, 2, or 3, after the "F1, F2, or F3." For example, to boot from 8" drive number one (which is the second drive; drive zero is the first drive), press **F2 1 RETURN**. If the drive is not present or is faulty, after about 30 seconds a "Device Error" message will appear on the screen.

- You can boot the Computer from any partition on the Winchester drive if there is a system on it. To do this, press **B F3**, the name of the partition, and then press the **RETURN** key. The screen display will be:

Boot f3: (and the partition name that you entered)

- You can enter **Bboot S**. It is a proper entry. However, it is reserved for future expansion and will not cause the Computer to perform any function. You can only exit from it by resetting the Computer (by simultaneously pressing the **CTRL** and **RESET** keys) or by waiting for 30 seconds for a Device Error message to be displayed.

## APPENDIX L

---

### Monitor 100 Commands

#### C — Color Bar

The Color Bar command will display color bars that consist of the eight colors that are supported by the Z-100 Family of Computers – black, blue, red, magenta, green, cyan, yellow, and white.

Press the **C** key. The color bars will be displayed.

NOTE: If you are using a monochrome display instead of a color monitor, the display will appear as a gray scale. Also, if your Computer does not have the color option (Video Memory Expansion Accessory IC's, Model Z-219-1) installed, the display will be vertical bars as, there are no levels of intensity.

#### D — Dump

This command displays the values in the memory addresses that you specify. You must enter both the starting address and the ending address. If you do not enter the starting and ending addresses, the command will display 256 bytes, starting from the address next to the address of the last byte displayed in the previous dump command. At power-up or reset, the starting address is 0:0.

The Dump command syntax is:

Dump [nnnn:mmmm-oooo]

Press the **D** key. The Computer will display:

Dump

and then wait for you to enter the memory addresses.

## APPENDIX L

# Monitor 100 Commands

### EXAMPLE:

Press the **D** key, enter **1 0 0 0 : 0 F F** and press the **RETURN** key. The Computer will display the contents of the selected range of memory.

### E — Examine

This command displays the memory address that you select, and the value stored at that address, and then waits for you to change the value or indicate that it should not be changed.

If you type a valid hex number, this value is stored at the displayed location. If you press the RETURN key, the value at the displayed location is unaffected and the next address and its value are displayed. To exit from the Examine command, press the DELETE key.

If you do not enter an address after you type "E", the last address displayed will be displayed again unless the Computer was just turned on or reset. In this case, the address will be 0:0.

The Examine command syntax is:

Examine [nnnn:mmmm]

Press the **⌘** key. The Computer will display:

Examine

and then wait for you to enter the memory address that you want to examine.

## APPENDIX L

### Monitor 100 Commands

---

#### EXAMPLE:

Press the **⏏** key, enter **1 0 0 0 : 0** and press the **RETURN** key. The screen will display:

```
1000:0000 5A =
```

and wait for you to respond. (For this example, the value at this location is 5A.) To change the value, enter the new value (example: **4 A**) and press the **RETURN** key. Then the Computer will display the next address and wait for your input as follows:

```
1000:0000 5A = 4A
1000:0001 A5 =
```

Press the **RETURN** key and the display will increment to the next address without changing the value in the present address. Press the **DELETE** key to exit the Examine command and obtain the hand prompt again.

#### F — Fill

This command fills sections of memory with a byte value "pp" that you select. All values are in hex and you must enter an address range each time a Fill command is used, since this command can modify large sections of memory. Once you enter the comma, any attempt to delete the comma will cause an abort.

The Fill command syntax is:

```
Fill nnnn:mmmm-oooo,pp
```

Press the **F** key. The Computer will display:

```
Fill
```

and then wait for you to enter the address range.

## APPENDIX L

## Monitor 100 Commands

## EXAMPLE:

Press the **F** key, enter **1 0 0 0 : 0 : F F : 4 C** and press the **RETURN** key. The Computer will beep and fill the selected block of memory with 4C hex ("L"). To check the memory block, perform the Dump command.

**I — Input**

This command produces an input from the port you specify by "nn". The obtained value will be displayed in hex. This command has no default.

The Input command syntax is:

Input nn

Press the **I** key. The Computer will display:

Input c

and then wait for you to enter the port number. After you enter the port number, the hex value obtained from the port will be displayed.

## EXAMPLE:

Press the **I** key, enter **F 5** and press the **RETURN** key. The Computer will beep and display the contents of the keyboard port (F5).

**O — Output**

This command causes hex value "pp" to be output to the port that you specify with hex value "nn".

## APPENDIX L

---

### Monitor 100 Commands

The Output command syntax is:

Output nn,pp

- Press the **O** key. The Computer will display:

Output

and then wait for you to enter output value "pp" and the port number "nn". No further display occurs.

EXAMPLE:

Press the **O** key, enter **F5I4C**, and press the **RETURN** key. The Computer will beep and display the hand prompt.

### S — System

This command provides memory information about your Computer. It displays the amount of contiguous RAM in the system, the size of the video RAM parts (32K or 64K chips), and tells whether the system supports monochrome or color.

The System command syntax is:

System

- Press the **S** key. The Computer will display the system information as shown in the following example.

```
System
128Kb of contiguous RAM
32Kb Video memory
Monochrome
```



## APPENDIX L

---

Monitor 100 Commands**T — Test**

This command allows you to perform several tests on your Computer system. These tests can help you isolate a problem or just make sure that the various sections are operating properly. You can select the disk read test (that makes sure that data on diskettes can be read into the system), keyboard test (that makes sure that the keys all work and produce the correct character), memory test (that insures there are no bad cells in memory), or power-up test (that makes sure the power-up tests are happening properly, except that the RAM test is not performed during this test).

**Disk Read Test** — This test does a repetitive disk read on the default device (drive 0). It continuously reads the boot tracks into memory and increments the counter on the screen after each successful read. If an error occurs, the test will stop.

**Keyboard Test** — This test fills the screen with the character that you type. If you type a nondisplayable character, such as the ESC key, the screen will display the message "NON-DISPLAYABLE CHARACTER."

**Memory Test** — This test does the "Moving Inversion Test" on the first two banks of on-board memory (through 128K bytes). The Moving Inversion test is also performed on the green plane of video RAM if 64K byte parts are installed. If 32K byte parts are installed in video RAM, another test is used. If an error occurs, the test will stop.

**Power-Up Test** — This test recycles through the power-up tests, except for the RAM test, until you stop the testing or an error occurs.

## APPENDIX L

### Monitor 100 Commands

---

You can stop the tests by pressing the **DELETE** key. During the Memory Test, the system may take up to five minutes to respond to the **DELETE** key. In that case, you may want to reset the Computer.

The Test syntax is:

Test

Press the **F1** key. The Computer will display:

CHOOSE ONE OF THE FOLLOWING:

1. DISK READ TEST
2. KEYBOARD TEST
3. MEMORY TEST
4. POWER-UP TEST
5. EXIT

ENTER YOUR CHOICE:

Then choose the test you want by pressing the **1**, **2**, **3**, or **4** key. Press the **5** key if you want to exit to the hand prompt.

#### **V** — Version

This command displays the version of the Monitor ROM in your Computer.

The Version command syntax is:

Version

Press the **V** key. The Computer will display the version number. Example:

Version 2.2

---

## Monitor 100 Commands

### X — Xecute

This command is intended for programmers. It sets the CS:IP to the address that you select and then causes a jump to that address. There is no default address, and you must enter a valid hex address or abort the command by pressing the DELETE key one or more times. Once you execute a jump, you can only return to the monitor by resetting the Computer.

The Xecute command syntax is:

Xecute nnnn:mmmm

Press the **X** key. The Computer will display:

Xecute

and then wait for you to enter a valid hex address.



# USING MS-DOS ON THE Z-100 — AN INTRODUCTION

Z-DOS, the primary operating system for the Z-100 Series Computers, has been replaced with MS-DOS Version 2 (Microsoft Corporation).

There are differences between the two operating systems that affect the files on the disks, the instructions in the *Z-100 Series User's Manual*, and the backup utilities. This insert has been prepared to show you the differences between Z-DOS and MS-DOS Version 2 and help you make the first backups of your system disks.

If you are not familiar with computers, you should first read the "Operation" section of the *Z-100 Series User's Manual* and the first four pages of the "Disk Operating System" section.

## MS-DOS

MS-DOS is very similar to Z-DOS, which is described in your *User's Manual*. It loads the same way and the opening messages are very similar. When you first boot MS-DOS Version 2, you will be asked for the date and time; enter them as instructed in the manual.

Instead of going into an automatic backup procedure, MS-DOS will display:

```
A> path=\bin  
A>
```

The last line is the prompt for the operating system and serves the same purpose as the A. prompt that is explained in the *User's Manual*.

### YOUR FIRST BACKUPS

Starting on page 2.8 of the *User's Manual*, there is a discussion on making backups. We strongly recommend that you make backups of the two MS-DOS distribution disks before proceeding any further. Use the following procedure to do so.

- Turn on your computer, insert Disk #1 of MS-DOS in drive A, close the door, and boot the system as described in the *User's Manual*.

- Type the following on the keyboard:

```
DISKCOPY/V
```

and press the RETURN key. You will see a display similar to the following on your screen:

```
DISKCOPY version 2.15  
Copyright(C) 1984 Zenith Data Systems Corporation
```

```
Source drive name? (A-H) :
```

The program, DISKCOPY, is requesting the drive name that has the source diskette in it (in this case, drive A).

- Press the A key. The next line will be displayed:

```
Destination drive name? (A-H) :
```

This request is for the name of the disk drive in which you will place a blank diskette.

**NOTE:** The system does not check to see if your diskette has data on it. Any information previously recorded on the diskette will be erased and blank (empty) tracks will be placed on the diskette to receive new data. Be sure you are using a blank diskette (or one that you wish to erase).

- Press the B key, *even if you only have one floppy disk drive* (the system will prompt you to swap diskettes when needed — see "Z-DOS for Single Drive Systems" in Appendix C of your *User's Manual*). The screen will display the following message:

```
Place the source disk in A and the destination disk in B.  
Press RETURN when ready.
```

The system is now ready to start making a backup of your MS-DOS Version 2 Disk #1.

- Insert a blank diskette in drive B and close the door.

## MS-DOS

- Press the RETURN key. The computer will display the following as it formats, copies, and checks the information being recorded on the diskette.

```

Formatting destination...
Copying...
Verifying...

```

When the diskette has been copied, the following will be displayed:

```
Do you wish to copy another disk (Y/N)? <N>
```

- Remove the diskette from drive B and prepare a label for it. There is a discussion concerning diskette labels on page 2.11 of your *User's Manual*.
- Since you have two diskettes to duplicate, press the Y key.
- Press the RETURN key. You will be prompted to enter the drive name for the source and destination diskettes.
- Remove MS-DOS Disk #1 from drive A and replace it with Disk #2; then answer the prompts as you did before.
- When the Do you wish to copy another disk message appears the second time, press the N key and then the RETURN key.

You have now completed the first backup of the distribution diskettes. When convenient, you will want to make at least one more working copy of these diskettes. The easiest way to do this is to follow the same instructions. However, label your diskettes as copy 2 (or 3) instead of copy 1 (see the discussion in your *User's Manual*).

Your *User's Manual* mentions three ways to make manual backups. You have just used the diskcopy program to duplicate (make backups of) your MS-DOS distribution diskettes. The second method, the format and copy procedure, remains unchanged from the way it is described in your *User's Manual*. MS-DOS Version 2 does not contain the third method, the MAKE utility.

MS-DOS CONTROL KEY FUNCTIONS

MS-DOS has a number of features not incorporated into Z-DOS. These are fully described in the MS-DOS Version 2 documentation. However, for the purpose of using the *Z-100 Series User's Manual*, the description on page 2.14 through page 2.16 is no different.

MS-DOS COMMANDS

MS-DOS is very similar to Z-DOS in many ways. The discussion on Z-DOS commands applies equally to MS-DOS, except that the MS-DOS prompt is terminated by the greater-than (>) sign instead of the colon (:). The description of files, programs, and file names is likewise valid for both operating systems.

INTERNAL COMMAND DIFFERENCES

Table 1 lists the internal commands for MS-DOS Version 2. A dash (—) indicates Z-DOS does not contain an equivalent command.

Table 1  
*MS-DOS Version 2 Internal Commands*

COMMAND		DESCRIPTION
Z-DOS	MS-DOS	
—	BREAK	Enable or disable CTRL-C
—	CD	Display (or change) the current directory path
—	CHDIR	Same as CD
—	CLS	Clear the screen
COPY	COPY	Copy file(s)
—	CTTY	Change device from which MS-DOS receives commands
DATE	DATE	Display and/or change the current system date
DEL	DEL	Delete file(s) from the diskette
DIR	DIR	List directory entries
—	ECHO	Enable or disable echo feature
ERASE	ERASE	Same as DEL
—	EXIT	Exit command and return to next lower level of command structure

Table 1 (continued)  
MS-DOS Version 2 Internal Commands

COMMAND		DESCRIPTION
Z-DOS	MS-DOS	
—	FOR	Command extension (for batch files)
—	GOTO	Branch instruction (for batch files)
—	IF	Conditional branch instruction (for batch files)
—	MD	Create a new directory
—	MKDIR	Same as MD
—	PATH	Specify directory path(s)
PAUSE	PAUSE	Temporarily halt batch file execution
—	PROMPT	Designate MS-DOS system prompt
REM	REM	Insert a comment in a batch file
REN	REN	Rename a file
RENAME	RENAME	Same as REN
—	RD	Remove a directory
—	RMDIR	Same as RD
—	SET	Make one string equivalent to another
—	SHIFT	Allow over 10 batch parameters
TIME	TIME	Display and/or change current system time
TYPE	TYPE	Display the contents of a file
—	VER	Display MS-DOS.SYS and IO.SYS version numbers
—	VERIFY	Enable or disable read after write (data verification) feature
—	VOL	Display diskette volume label

For the most part, MS-DOS commands respond the same as Z-DOS. The minor differences in the DIR command are largely in the header (the volume name and directory path is displayed) and the footer (the remaining free bytes on the diskette are displayed).

If you display the directory for Disk #1, you will see something similar to the following:

Volume in drive A is 890-434-05  
Directory of A:\

COMMAND	COM	16421	9-06-84	3:09p
ALTCHAR	SYS	431	4-04-84	10:03a
AUTOEXEC	BAT	23	4-04-84	9:30a
CONFIG	SYS	12	9-06-84	8:58a
BIN	<DIR>		9-06-84	3:16p
5 File(s)		38912 bytes free		

In order to view the directory entries in the subdirectory, BIN, you would have to enter the following command:

CD BIN

and press the RETURN key. Then the directory entry will be similar to:

Volume in drive A is 890-434-05  
Directory of A:\bin

..	<DIR>		9-06-84	3:16p
..	<DIR>		9-06-84	3:16p
EDLIN	COM	8080	4-04-84	9:19a
CHKDSK	COM	8468	4-04-84	9:19a
SYS	COM	922	4-04-84	9:20a
FORMAT	COM	13658	9-06-84	2:57p
CONFIGUR	COM	11992	9-06-84	3:02p
DISKCOPY	COM	15722	9-06-84	2:51p
DISKCOMP	COM	1917	9-06-84	2:55p
PRINT	COM	6288	9-06-84	12:00p
ASSIGN	COM	5214	9-06-84	2:53p
RECOVER	COM	2295	4-04-84	9:20a
SEARCH	COM	4338	9-06-84	2:58p
APPLY	COM	1945	8-16-84	5:04p
MORE	COM	4364	4-04-84	9:20a
CIPHER	COM	153	4-04-84	9:07a
FC	EXE	2585	4-04-84	9:20a
SORT	EXE	1632	4-04-84	9:18a
FIND	EXE	6331	4-04-84	9:19a
FONT	EXE	31396	9-06-84	2:48p
BACKUP	EXE	65320	9-06-84	2:39p
RESTORE	EXE	24830	9-06-84	2:43p
RDCPM	COM	3818	9-06-84	2:49p
ZDIR	COM	3372	6-01-84	9:43a
MAP	COM	3737	7-13-84	10:02a

25 File(s) 38912 bytes free

In order to return to the original directory, you would have to type:

CD ..

and press the RETURN key.

You will find complete instructions for using these internal MS-DOS commands in the MS-DOS documentation.

### EXTERNAL COMMAND DIFFERENCES

MS-DOS contains a number of new utility programs which are listed alphabetically (along with the Z-DOS utilities) in Table 2. A dash (—) indicates which version of the operating system (Z-DOS or MS-DOS) does not contain an equivalent command or utility. Note that many of the Z-DOS commands were not documented in the *Z-100 Series User's Manual*.

Table 2  
MS-DOS Version 2 External Commands

COMMAND		DESCRIPTION
Z-DOS	MS-DOS	
—	APPLY	Execute a command with substitution
—	ASSIGN	Assign logical drive name to a Winchester partition
BACKUP	BACKUP	File archiver used to back up Winchester files
CHKDSK	CHKDSK	Check the directory and report free space
—	CIPHER	Encrypt or decrypt files
COMMAND	COMMAND	Call resident commands
CONFIGUR	CONFIGUR	Configure the system for specific hardware
CREF	—	A cross reference utility used with assembly language code*
DEBUG	DEBUG	Load, change, or display the contents of any file (or memory area)
DSKCOMP	DISKCOMP	Compare the contents of two diskettes to see if they are identical
DSKCOPY	DISKCOPY	Duplicate the contents of one diskette onto another diskette
EDLIN	EDLIN	Create, edit, display, or delete text on ASCII files
EXE2BIN	EXE2BIN	Convert executable files (.EXE) to binary files (.COM)
FILCOM	FC	Compare the contents of two files and list differences
—	FIND	Search a file for a string of text
—	FONT	Create or alter customized character sets and keyboard maps
FORMAT	FORMAT	Format diskettes (according to the operating system format)
LIB	LIB	A library manager used with object code files
LINK	LINK	Creates an executable file (.EXE) from object code files and libraries (.LIB)
MAKE	—	An extended batch processor with built-in backup capabilities (not available for MS-DOS Version 2)
MAP	MAP	Assign logical names to physical drives
MASM	—	A macro assembler for 8086 and 8088 assembly language files*
MEMTEST	—	Test system memory
—	MORE	Display screen output one line at a time
PRINT	PRINT	Send ASCII files to device (usually a printer)
PSC	PSC	Send screen image to device (usually a printer)
RDCPM	RDCPM	Transfer CP/M-disk-based files to MS-DOS (Z-DOS)
—	RECOVER	Restore directory entries for erased file(s)

\* This program is part of the MS-DOS Version 2 Programmer's Utility Pack, available separately from Zenith Data Systems dealers or Heath Company.

Table 2 (continued)  
MS-DOS Version 2 External Commands

COMMAND		DESCRIPTION
Z-DOS	MS-DOS	
RESTORE	RESTORE	Restore archived file(s)
—	SEARCH	Locate file(s) with directory structure
—	SORT	Sort ASCII file
SYS	SYS	Transfer IO.SYS and MS-DOS.SYS (Z-DOS.SYS) to specified drive
—	ZDIR	List sorted directory entries

Most of the utilities (external commands) that are common between the two versions of the operating system remain the same. However, there are some differences:

- CONFIGUR now allows you to specify track-to-track stepping speeds for the floppy disk drives.
- CHKDSK has the capability to recover files that have been messed up by a program and also reports directory information.
- FORMAT can be used to clear only the directory, instead of reformatting the entire diskette surface.
- PRINT has the capability of working in a background environment while you execute other MS-DOS commands.
- PSC has a number of variations to support several different dot-addressable printers.

## Winchester Systems

It is important to note that the Winchester Utilities diskette now contains one additional file: DETECT. This utility works the same way that VERIFY works, except that it has a new name and new screens. The reason for the new filename is to prevent a conflict between trying to execute the VERIFY utility and the VERIFY resident (internal) command. If you transfer your Winchester utilities to bootable MS-DOS Version 2 diskettes, be sure to *exclude* the VERIFY utility. Use DETECT instead.





data  
systems

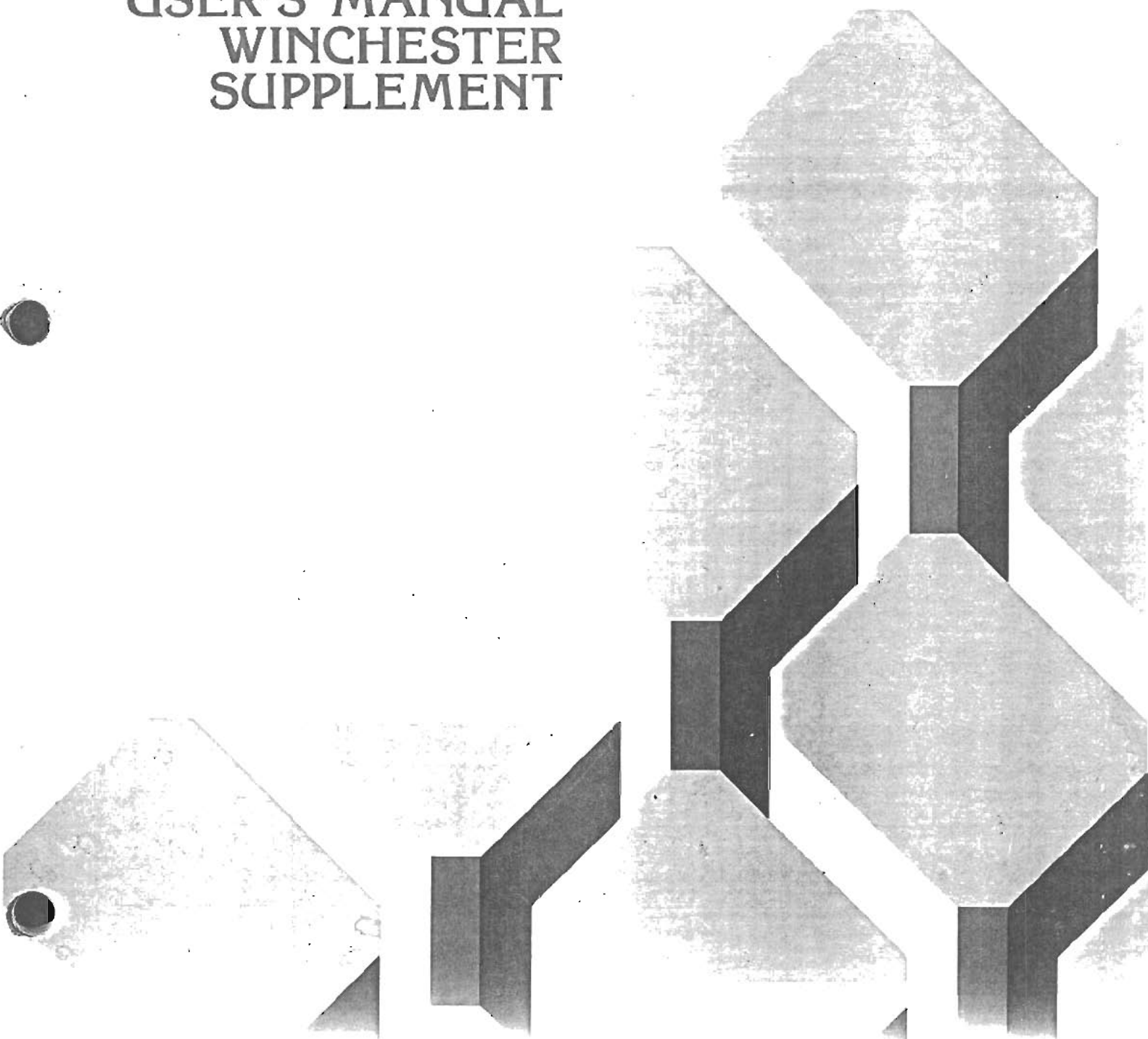
THE QUALITY GOES IN BEFORE THE NAME GOES ON

---

DESKTOP COMPUTER SYSTEMS

---

Z-100  
USER'S MANUAL  
WINCHESTER  
SUPPLEMENT



# WINCHESTER SUPPLEMENT

## Hardware Features

drive is shipped from the factory. Use the following procedure to start your system for the first time or whenever you do not want to "boot" from your Winchester drive.

If your Computer is set for auto boot and your do not see the hand prompt when you reset or turn on the system, disable the normal power-up sequence by pressing the **DELETE** key immediately. Once the screen warms up, it will display the message:

Boot Abort

and you will see the "hand prompt." You will also see the power-on indicator (in the RESET key) light.

You may now boot from the floppy disk drive and run the programs on either the Customer Demonstration Disk or the Utilities disk.

To use either diskette, follow these general instructions:

- Make sure your Computer is turned on and the hand prompt is showing. If your system is set for auto boot, remember to press the **DELETE** key to disable the power-up sequence from trying to access the Winchester disk. If your system does not display the hand prompt, refer to the "In Case of Difficulty" section on page 1.25 of the User's Manual.
- Refer to page 1.13 of the User's Manual and insert either the Customer Demonstration diskette or the Winchester Utilities diskette (with the label closest to you and facing up) into the floppy disk drive in your system. NOTE: Remove the tab that is covering the write protect notch if one is present on the Customer Demonstration diskette.

## WINCHESTER SUPPLEMENT

---

### Hardware Features

- Close the disk drive door and press the **B** key and then the **F1** key. You will see the following on the screen:

Boot f1

Press the **RETURN** key. The disk access indicator for the floppy disk drive will glow. After a moment, the first messages will appear on the screen.

- If you are using the Customer Demonstration diskette, turn to page 1.20 in your User's Manual for the messages and instructions.
- If you are going to use the Winchester Utilities diskette, read the next section, a discussion of how to use these four utilities.

# WINCHESTER SUPPLEMENT

---

## The Utilities

Four utility programs — PART, PREP, SHIP, and VERIFY — are supplied on a minimum system Z-DOS diskette. Two copies of the diskette are supplied, so you need not worry about “backing up” your diskette before you use it. Note, however, that the system on this diskette *is not* designed for normal Z-DOS use, and should be used only for these utilities.

The PREP utility is supplied so that you may initialize the surface of your Winchester disk should the need ever arise. It will also allow you to check for bad sectors and “lock out” any that are found. In addition, PREP will pre-allocate two “standard” partitions (described later) for immediate use.

The VERIFY utility is supplied so that you may check the surface of your Winchester disk for bad sectors and “lock out” any that are found. Where PREP destroys the data you have stored on your disk, VERIFY does not.

The PART utility is supplied so that you can redefine the partitions of your Winchester disk if those that are preset do not meet your needs.

The SHIP utility is supplied so you can place the heads in your system over an unused portion of the Winchester disk. This utility should be used whenever you move your Desktop Computer, even a short distance.

You should read pages 2.5 to 2.7 of the Z-100 Series User's Manual and then boot your Winchester Utilities disk as described in the “Power Up” section of this supplement. When you see the Z-DOS prompt on your screen, you are ready to run PREP, PART, SHIP or VERIFY.

## WINCHESTER SUPPLEMENT

---

### The PREP Utility

The surface of the Winchester disk must be initialized before you can use it in a system. This is similar to the FORMAT command and procedure discussed in the Z-100 Series User's Manual, except that typical operating system information (headers, labels, boot code and directories) for a specific system is not written onto the disk. In addition, PREP will test the surface and set up standard partitions. Two are set up — approximately equal in size — so it is not necessary to run the PART utility unless you want to use some other partitioning arrangement. Also, the disk will normally have been prepared at the factory as part of the final testing procedure, so you should not need to use PREP.

You need to be aware that while PREP does test the surface of the disk for retention of data, it will also destroy any data that you have recorded on the Winchester disk system. If you do not want to destroy the data on your disk, but still want to test the disk for data retention capabilities, you may run the VERIFY utility. This utility does not destroy the current data and partitions that are set up on your Winchester disk, but it does test for and flag those sectors that are bad so that they can be "locked out" later. See "The VERIFY Utility" for a discussion of this process.

Before you can run the PREP utility, you must install a jumper on the Winchester disk controller card in your Desktop Computer. If the jumper is not installed, your Winchester disk cannot be accidentally initialized. Therefore, the jumper (not installed) acts as a safety feature for any files that may be on the disk. If you wish to run PREP, refer to Appendix B (at the back of this Supplement) to install or remove the jumper.

# WINCHESTER SUPPLEMENT

---

## The PREP Utility

### FEATURES OF PREP

The PREP utility enables you to:

- Initialize the surface of your Winchester disk.
- Test the data retention capabilities of your Winchester disk.
- Isolate questionable disk sectors.
- Divide the surface of the Winchester disk into two equal partitions (normally with one used for Z-DOS and one for CP/M).

### PREP OPERATION

If your Winchester disk does not contain initialization information (for instance, the disk may not have been initialized or the information may be incorrect or damaged), PREP will prompt you to enter characteristics in order to identify the type of Winchester disk you have in your Desktop Computer. Then PREP will display messages that tell you what is happening as it "prepares" and tests your disk. A chart of typical Winchester disk parameters is supplied in Appendix A along with the specific answers that you should enter for each of the five prompts.

**CAUTION:** Using PREP will destroy all the files that may exist on your Winchester disk. Winchester disks supplied by Zenith Data Systems or Heath Company will normally have been prepared with PREP at the factory. If your disk has been prepared, you will need to use PREP only if you consistently encounter an unreasonable number of disk access errors. Do not use PREP until you have backed up the information on your Winchester disk to floppy disks.

- To start the PREP utility, type:

PREP

and press the **RETURN** key. You will see a display similar to the one illustrated in Figure 2.

# WINCHESTER SUPPLEMENT

---

## The PREP Utility

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 drive you have installed. Then PREP displays messages as it operates on the disk.

**CAUTION:** Using PREP will destroy all files on your Winchester disk. Winchester disks supplied by Zenith or Heath are normally prepared by PREP before they are shipped. Users of these disks will need to use PREP only if they are consistently encountering an unreasonable number of disk access errors. Do not use PREP until you have transferred your Winchester disk files to floppy disks.

Do you wish to proceed with PREP (Y/N)?

**Figure 2**  
The Introductory Display for PREP

At the bottom of the display, you will see:

Do you wish to proceed with PREP (Y/N)?

## WINCHESTER SUPPLEMENT

## The PREP Utility

If you press the **N** key, the program will be halted and control of the Computer will be returned to Z-DOS. If you press the **Y** key, PREP will continue operation.

- To exit PREP, press the **N** key. The Z-DOS system prompt will be displayed.
- To continue with PREP, press the **Y** key. You will see:

Please type P to proceed

This display gives you one last chance to change your mind. The reason for this second prompt is the nature of PREP. *PREP will destroy any and all information that has previously been recorded on the Winchester disk.*

- To continue with PREP, press the **P** key. If you press *any other* key, PREP will be stopped and you will see the Z-DOS system prompt.

If the disk has been previously prepared and PREP detects no errors in the boot code or "superblock" (explained later), then the following five disk parameter questions will be skipped and the tests will be run. However, if the disk has not been previously prepared or if an error is detected in the boot code or superblock, then you will be asked to enter five disk parameters. Your answers will depend upon the type of Winchester drive installed in your Desktop Computer. You will find a list of possible drives and the appropriate responses for each question listed in a table in Appendix A of this supplement.

In the examples that follow, the responses supplied are for the Miniscribe 2012 (the standard 10 megabyte drive supplied in Winchester versions of the Desktop Computer).

The screen will display:

Enter number of heads in hex:



## WINCHESTER SUPPLEMENT

---

### The PREP Utility

- Enter 4 (the hexadecimal equivalent of the number of read/write heads) and press the **RETURN** key. Next, the screen will display:

Enter number of cylinders in hex:

- This number is equal to the total number of tracks divided by the total number of read/write heads. Enter 132 (the hexadecimal equivalent of the number of cylinders) and press the **RETURN** key. The screen will now display:

Enter reduced write current cylinder in hex:

- Toward the hub of a hard disk, where the circumference of each track is smaller, some Winchester systems require that less electrical current be applied to the write head to avoid having magnetic pulses overlap adjacent tracks. The Miniscribe Mod II 2012 does not require reduced write current. Therefore, a value greater than the largest cylinder number will be entered. Enter 200 (the number in hexadecimal of the cylinder where the current applied to the write head is reduced to avoid overwriting track bounds) and press the **RETURN** key. Next, the screen will display:

Enter pre-comp cylinder in hex:

- Disk storage devices operate by creating magnetically polarized areas on the disk surface that correspond to the presence or absence of "bits" (the smallest unit of measure in computer data and memory) in the information being stored. Since "like" charges repel and "unlike" charges attract, it is possible for the charged areas on the disk surface, which represent the data, to "shift" slightly if they are closely spaced after being recorded. If such a shift occurs, reduced reliability will result.

Precompensation refers to the intentional shifting of data during the recording process so the combined result of precompensation and the natural shift (which cannot be prevented) places the data in the desired position. On

# WINCHESTER SUPPLEMENT

## The PREP Utility

the outer tracks of the disk, the spacing between bits is great enough so no significant shifting occurs and pre-compensation is not required. However, since the inner tracks have a smaller circumference, the bits are closer together and precompensation is required to maintain acceptable reliability. Enter 80 (the cylinder number where precompensation must start) and press the **RETURN** key. Next, the screen will display:

Enter step rate code in hex:

- Enter 1 (the rate code in hexadecimal at which the read/write heads "step" between tracks) and press the **RETURN** key.

Now that you have supplied the necessary information for your hard disk, the program will initialize the surface of the disk for the tests that follow. The initialization process is similar to that used by the Z-DOS and CP/M-85 FORMAT utility in that the surface of each disk is organized into tracks and sectors. In addition, a "map" is also prepared for keeping track of any sectors that are found to be bad.

During the initialization process, you will see the following display on the screen:

```
Initializing the disk...
```

If you have not installed the jumper on the controller board, the system will immediately display:

```
Error during formatting of the drive.
```

and return to the Z-DOS prompt; the disk will not be affected. Remember, to run the PREP utility, you must install the jumper on the controller board as explained in Appendix B.

When the disk has been fully initialized, you will see:

```
...completed
```

## WINCHESTER SUPPLEMENT

---

### The PREP Utility

Now the disk will be tested seven times. Each test is known as a "pass." The seven passes of the test that are now performed are conducted to check the integrity of the disk's storage capacity. During each pass, PREP will "write" a predetermined code in each sector (the LED drive access light will flicker) and then will "read" back that code to verify that it remained correct (the LED drive access light will appear to be constantly on). PREP will keep you informed of its progress by displaying the message:

```
Media test in progress. Pass n
```

where *n* represents the current pass number. This phase of PREP takes about an hour and a half because of the large number of sectors on the Winchester disk system.

PREP uses a different code on each pass it makes through the test. If PREP finds questionable areas on the disk, it stores the address where the error occurred, and later places these addresses into a bad sector table.

When PREP has finished the seven passes, two "superblocks" and two bad sector tables are recorded on the disk. While it is doing this, you will see:

```
Initializing the disk...completed
```

A "superblock" is a portion of the disk surface (on cylinder 0) that is used to keep track of the disk "partition" names, the operating system name assigned to each partition, a flag that is used to show whether the partition has been formatted or not, and a pointer (or number) for the first sector of that partition. The superblock is recorded twice on the Winchester disk. Each copy is written with a different disk head so that the copies are physically isolated from each other. If something occurs to damage one copy of the superblock, the other may remain usable.

## WINCHESTER SUPPLEMENT

---

### The PREP Utility

During the test passes, PREP kept a record of any bad sectors. After the tests are finished and the superblocks have been written, PREP will write the bad sector table. As with the superblock, the table is recorded twice, each with a separate read/write head. The bad sector tables are used to “flag” all known bad sectors and “lock them out,” or prevent them from being used by the system for data storage. It is normal to have a small number of bad sectors out of the five to twenty *thousand* located on the typical Winchester disk.

When the tests are completed, PREP will return control to the minimum Z-DOS system and you will see the Z-DOS prompt. Remember, since this is a minimum operating system, do not use it for normal operation.

- Remove the Format Enable jumper as explained in Appendix B of this Supplement. *Do not* proceed with any other operations until you have removed the jumper and replaced it in its proper place on the board.

## WINCHESTER SUPPLEMENT

---

### The VERIFY Utility

The VERIFY utility enables you to verify the integrity of your Winchester disk. However, the tests performed by the system are not "destructive." That is, they will not destroy the data that is recorded on your disk.

Several things could cause a sector to "go bad" during normal operation of your system. They include subjecting the Computer system to a physical shock (most common cause of sector failure), power failure during the middle of a disk operation (unlikely), or electronic component failure (very rare). When a power failure causes a sector to go bad, you may be able to recover the use of that sector by reformatting the partition, just as you would reformat a floppy disk. However, you will want to use the BACKUP utility before you do this. See the discussion on BACKUP and RESTORE found later in this supplement.

When a bad sector is located by the VERIFY utility, its location will be stored in memory. At the end of the test, those sectors that are found to be bad are added to the bad sector table that was established by the PREP utility. However, the bad sector(s) located by VERIFY will *not be* "locked out" until you run your Z-DOS or CP/M-85 FORMAT program and reformat the partition.

One advantage of VERIFY is that you can use the utility to check your disk if you *suspect* that you have one or more bad sectors. If none are found, the system will let you know, and you can continue to use your programs without having to go through the BACKUP and RESTORE processes described later in this supplement.

## WINCHESTER SUPPLEMENT

---

### The PART Utility

To start the PART utility, type:

PART

and press the **RETURN** key. The screen illustrated in Figure 4 will be displayed.

```
PART version 1.00
Copyright(C) 1982, Zenith Data Systems
```

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 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 size of all partitions as you specify each partitions allocation percentage

CAUTION: Using PART can destroy all files on your Winchester disk. Do not use PART until you have transferred copies of your Winchester disk files to floppy disks.

Proceed (Y/N)?

#### Figure 4

The Introductory Display for PART

At the bottom of the display, you will see:

```
Proceed (Y/N)?
```

If you press the **N** key, the program will be halted and control of the Computer will be returned to Z-DOS. If you press the **Y** key, PART will continue operation.

## WINCHESTER SUPPLEMENT

---

### The PART Utility

The display illustrated in Figure 5 shows the partition name, operating system name, percentage of disk space, and size in kilobytes for each partition. The total percentage, and the number of kilobytes currently allocated and not allocated on the disk, are shown at the bottom of the table.

You will also see the number of the partition that is assigned to be the default boot partition (if one is assigned), its name and operating system. Below that there is a short "menu" that will allow you to select a different default boot partition, change the arrangement of your Winchester disk partitions, or exit from the PART utility. Your choice is entered by pressing the **B**, **P**, or **E** key.

The display is similar to the one that will appear the first time you run PART on a new Heath/Zenith Data Systems Z-217 Winchester disk, or immediately after you have run the PREP utility. If you have already used PART, then portions of your display may vary from the one illustrated in Figure 5.

#### Modifying the Default Boot Partition

The "default boot partition" is the one that will be selected when you boot your system without specifying a partition name (as with an auto boot operation). (In order to select any other partition during the boot process, you must specify the partition name, and sometimes the system name, in the boot command.)

- Press the **B** key to modify the default boot partition. The menu that was displayed at the bottom of the screen as shown in Figure 5 will disappear. The cursor will move to the current default boot partition number as shown in Figure 6.

# WINCHESTER SUPPLEMENT

---

## The PART Utility

```
.  
. .  
. .  
Total Utilization (Allocated/unallocated)      100/0      10000/0  
Default boot partition number: _  
  
    B - Modify default boot partition  
    P - Partition maintenance  
    E - Exit  
Enter the number of the default boot partition.
```

**Figure 6**

**Entering a Default Boot Partition**

When the cursor moves to the default boot partition number, you will see the current partition number and name disappear. You may now enter the number of the partition that you want to be selected by the boot process. You will also see a prompt to, "Enter the number of the default boot partition," at the bottom of the screen.

- Enter the number of the partition that you want to establish as the default boot partition, and press the **RETURN** key. The number must be in the range 1 to 16 and have a partition name established in the table. Once you enter the number and press **RETURN**, the partition and system names will be displayed between the angle brackets.

A disk that has just been prepared with the PREP utility will be set up with two partitions. The default boot partition will be set to 1 (Z-DOS). To change the default boot partition to partition 2 (CPM), enter:



## WINCHESTER SUPPLEMENT

## The PART Utility

and press the **RETURN** key. Your screen will be similar to that illustrated in Figure 7.

```
.  
. .  
. .  
Default boot partition number: 2 <CPM:CPM >  
  B - Modify default boot partition  
  P - Partition maintenance  
  R - Restore to original partitions  
  E - Exit  
Choose desired option. <B, P, R or E>
```

**Figure 7**

**Display After Selecting a Default Boot Partition**

If you try to enter a number for which there is no established partition on the table, the Computer will simply not accept your entry and the cursor will remain at the number position until you enter a valid number and press **RETURN**.

To retain the current default boot partition number press the **RETURN** key. The number and names of the current default boot partition will be redisplayed, and the cursor will move to the "Choose desired option" prompt at the bottom of the display as shown in Figure 7.

## WINCHESTER SUPPLEMENT

---

### The PART Utility

The cursor will be positioned over the first character of the first partition's partition name in the table. The partition name may be up to 16 characters in length and may contain any printing character except the semicolon (;). The following are all valid partition names:

#### The Partition Name

CP/M\_ACCOUNTING  
DATABASE  
WORD/PROCESSING  
George  
Spread-sheet  
Z-DOS\_ACCOUNTING  
Thelma  
BASIC

At this time, you may choose to change the partition name, delete the partition, or leave it alone.

To change the partition's name, type the new name. If you use lower case letters, they will be converted to upper case. While entering the new name, you will see several things happen.

- The old partition name will be erased when you press the first letter of the new name.
- The **BACK SPACE** key will operate normally, moving one character to the left and erasing the character under the cursor. When you use the **BACK SPACE** key to erase the first letter of the new name that you have typed, the letter will be removed and the old partition name will reappear.

# WINCHESTER SUPPLEMENT

## The PART Utility

- If you press only the **RETURN** key, the partition name will remain unchanged while the cursor moves to the next column, the operating system name.
- If you press the semicolon key or the **TAB** key and then press the **RETURN** key, the partition name will disappear while the other features of that partition remain the same. However, after you have finished making all the entries for this partition, the old partition name will reappear.

NOTE: Avoid giving two partitions the same partition names unless you plan to give them different operating system names. Even though PART will not flag the error immediately, you will see the "duplicate name error" message after you make the default boot partition entry.

- If you want to delete all the entries for this partition, press the **SPACE BAR**. The remaining information in the table will move up one row. If you remove a partition that was assigned as the default boot partition, then the "is undefined" message will be displayed for the default boot partition until a new default boot partition is selected. If you then attempt to bypass setting the default boot partition, the "boot partition error" message will be displayed until you properly specify a default boot partition.
- If you do not want to make a change to the partition name, do not make any entries; press the **RETURN** key.
- If you wish to alter the partition name, type the new name and press the **RETURN** key.

Once you press the **RETURN** key, the cursor will move to the next column, the operating system name.

# WINCHESTER SUPPLEMENT

---

## The PART Utility

An operating system name may be up to 10 characters in length and may contain any printing character except the semicolon (;). NOTE: Z-DOS requires that you use "Z-DOS" (as it is spelled here) as the operating system name for those partition(s) that you plan to use with Z-DOS. At the present time, you may use any name you choose for the CP/M operating system, or you may optionally choose to use no name. Operating system names are not mandatory except in the case of Z-DOS. However, if you use the same partition name for more than one partition, each partition must then have a different operating system name. The following are typical examples of operating system names:

CPM  
Z-DOS  
USER-DOS  
OTHER-DOS

### The Operating System Name

At this time, you may choose to change the operating system name or leave it alone.

To change the operating system name, type the new name. If you use lower case letters, they will be converted to upper case. While entering the new name, you will see several things happen.

- The old operating system name will be erased when you press the first letter of the new name.
- The **BACK SPACE** key will operate normally, moving one character to the left and erasing the character under the cursor. When you use the **BACK SPACE** key to erase the first letter of the new operating system name that you have typed, the letter will be removed and the old operating system name will reappear.
- If you press only the **RETURN** key, the operating system name will remain unchanged while the cursor moves to the percentage column.

## WINCHESTER SUPPLEMENT

## The PART Utility

- If you press the semicolon key or the **TAB** key and then press the **RETURN** key, the operating system name will disappear while the other features of that partition remain the same. However, after you have finished making all the entries for this partition, the old operating system name will reappear.

NOTE: Avoid giving two partitions the same operating system names unless you give them different partition names. Even though PART will not flag the error immediately, you will see the “duplicate name error” message after you make the default boot partition entry.

- If you do not want to make a change to the partition name, do not make any entries; press the **RETURN** key.
- If you wish to alter the operating system name, type the new name and press the **RETURN** key.

Once you press the **RETURN** key, the cursor will move to the percentage column.

#### The Percentage Column

The amount in the percentage column indicates the percent of the total available disk space that has been allocated for that partition. It is expressed as a whole number in the range from the minimum allocation figure displayed at the bottom of the screen (see Figure 9) to 100. With the cursor in the percentage column, you may enter a new figure or leave it alone.

PART will automatically calculate the number of kilobytes that are represented by the figure that you enter, and record that quantity in the next column. The total disk space that is allocated (to be used) and not allocated (not to be used) in percent and kilobytes will also be calculated and displayed at the bottom of the table.

## WINCHESTER SUPPLEMENT

---

### The PART Utility

previously selected). For example, if you have two Z-DOS partitions, one in partition number 2 and one in partition number 5, PART will always select partition number 2 as the default boot partition even you attempt to select partition number 5.

You may continue to modify, delete or leave unchanged the remaining partitions, and when you have finished with all the previously allocated partitions, you may enter new partitions. When all partitions have been selected, then enter your choice of the default boot partition (or leave it undefined).

If you find the cursor in the partition name column of an unused partition (one for which there is no information) and you do not want to establish any more partitions, press the **RETURN** key. The cursor will advance directly to the default boot partition area where you can establish the default boot partition of your choosing.

### Finishing PART

After you complete any PART operation (such as "Modify default boot partition" or "Partition maintenance"), the menu at the bottom of the screen will display four options as illustrated in Figure 8. The first two options, B and P, have already been discussed.

**NOTE:** If you have created an error condition, the E option may not be displayed. Therefore, you must select an operation and correct the error.

Now is a good time to review your choices. If you do not like what you see on your display, you may restore the partition table to its original condition upon starting PART or, if everything meets your satisfaction, you may exit PART and record your choices permanently.

## WINCHESTER SUPPLEMENT

## The PART Utility

- To restore the partition table to its original condition, press the **R** key. The screen will redisplay the original table. You may now reenter your choices. NOTE: The menu will no longer display the "R - Restore original partitions" option.
- To begin the exit process, press the **E** key. The screen will show you two choices:

M - Make changes and exit

A - Abort, make no changes and exit

Choose desired option. (M or A)

If you press the **M** key to make the changes (you have selected) to the Winchester disk, you need to be aware that any data you have on the disk could be lost. Make sure that you have backups of your files before you select this option.

- Press the **M** key to complete the changes and record them on the Winchester disk.
- Press the **A** key to exit PART without making any changes to the current partitioning arrangement on the Winchester disk.

After either operation, the Z-DOS prompt will be displayed. Remember this is not a complete version of Z-DOS; do not use it for normal operation.

## WINCHESTER SUPPLEMENT

---

### Installing Operating Systems

The operating systems currently available for the Z-100 from Zenith Data Systems are Z-DOS (Zenith Disk Operating System) and CP/M-85 (Control Program for Microcomputers). This section of the Winchester Supplement will let you initially install either operating system on your Winchester and prepare it so that you may boot directly from the Winchester disk.

For the moment, assume that you are going to use the Winchester disk as it is shipped from the factory. There are two partitions: one called Z-DOS and one called CPM. First you will use PART to establish the default boot partition for one of the two operating systems. Then you will install Z-DOS and CP/M.

#### ESTABLISHING THE DEFAULT BOOT PARTITION

- Use your Utilities disk and run PART as previously described.
- Press the **B** key to select option B of the menu to establish the default boot partition.

You may press the **1** key to select the Z-DOS operating system or the **2** key to select the CP/M operating system as the default system to be used when booting from the Winchester disk.

- Press the **Q** key to quit PART and press the **M** key to make the changes and exit to the operating system.

**NOTE:** Before you attempt to install *any* operating system on your Winchester disk system, you must remove the Winchester Utilities disk and reboot your system using the operating system that you wish to install. For instance, if you wish to install CP/M, you will have to boot your system with CP/M Distribution Disk I. If you wish to install Z-DOS, you will have to boot your system with Z-DOS Distribution Disk I.



# WINCHESTER SUPPLEMENT

---

## Installing Operating Systems

### Z-DOS

NOTE: Unless you have previously duplicated your Z-DOS Distribution Disks with the MAKE utility, your Desktop Computer will start a duplication process when you boot from your Z-DOS Distribution Disk I. Use the following instructions to install Z-DOS on your Winchester system.

- Turn on your Computer (if it is not already on), place your Z-DOS Distribution Disk I (you must have Z-DOS BIOS version 1.10 or later) in the floppy disk drive, and close the door.
- If your Computer is not set up to boot from the floppy disk, press the **DELETE** key to stop any auto boot process. Then press the **B** key and then the **F1** key, followed by the **RETURN** key.

In a moment, the Z-DOS initial messages will appear and you will be asked to enter the date. If your disks have not been previously duplicated using the automatic MAKE utility installed on your distribution disks, you must press the **CTRL** and **C** key simultaneously. You will be asked if you want to discontinue the batch process. Press the **Y** key and then the **RETURN** key. The Z-DOS prompt will appear.

- Type

```
FORMAT E: /S/V
```

and press the **RETURN** key. The E represents the first Z-DOS Winchester partition (under Z-DOS, drives A and B are assigned to the built-in floppy disk, drives C and D are assigned to the external 8" drives if present, and drives E and F are assigned to the two Winchester partitions). The **V** switch will locate any bad sectors and lock them out of the system. The **/S** switch will establish the operating system on the disk. You will see:

# WINCHESTER SUPPLEMENT

---

## Installing Operating Systems

Format version 1.6

Will format partition assigned drive E:  
Strike any key when ready

- Press any key. You will see the Winchester disk access light come on while the disk is being formatted. When it has completed the operation, you will have created a minimum operating system on the Winchester disk. A message will be displayed informing you of the total number of bytes on the partition, the number of bytes used by the system, and the number of free bytes for your files. If any sectors were locked out, that information will also be displayed.

- Type the following:

COPY A: \*.\* E:

The E: in the command represents the first Winchester drive partition.

- Press the **RETURN** key. You will see each file displayed as it is transferred and the total number of files copied. Repeat the COPY command for each Z-DOS distribution diskette.

NOTE: If you copied the Z-DOS Distribution Disks directly to your Winchester disk system, you need to delete one file to prevent the automatic duplication process from taking place every time you boot your Winchester disk.

- Type:

ERASE E: AUTOEXEC.BAT

- and press the **RETURN** key.

# WINCHESTER SUPPLEMENT

---

## Installing Operating Systems

### Booting from the Winchester

NOTE: This boot procedure assumes that you have assigned a Z-DOS partition as the default boot partition. If you have not assigned any partition as the default boot partition, read the section entitled, "Booting from the Winchester — No Default Boot Partition."

At this point, you may boot your Computer from the Winchester disk. Use the same procedure to boot your Computer as you would if you were using a floppy disk. The only difference is that the Winchester cannot be removed from the system, and so it is ready to go when you turn on or reset your Computer.

If your Computer is not set up to boot from the Winchester disk, you will have to press the **DELETE** key to stop any auto boot process and then press the **B** key and then the **F3** key, followed by the **RETURN** key. The Winchester LED disk access indicator will light and in a moment, the Z-DOS initial messages will appear, along with the Z-DOS prompt. You have booted your system from the Winchester. You may now use any Z-DOS program or utility you want.

### CP/M-85

You should become somewhat familiar with various CP/M utilities and options by reading about them in your CP/M-85 documentation. To prepare the Winchester CP/M partition and use it to boot up CP/M, proceed with the following instructions.

- Turn on your Computer (if it is not already on), place your CP/M-85 Distribution Disk 1 (you must have CP/M version 2.2.101 or later) in the floppy disk drive, and close the door.

## WINCHESTER SUPPLEMENT

---

### Installing Operating Systems

- Reset your Computer by pressing the **CTRL** and **RESET** keys at the same time and then releasing them. If your Computer is set up for auto boot, press the **DELETE** key to disable this feature. You should see the hand prompt in the upper right-hand corner of the screen.
- Press the **B** and **F1** keys. Your screen will display:

```
Boot f1
```

Press the **RETURN** key. The floppy disk drive LED access indicator will come on and in a moment your screen will display a message similar to:

```
CP/M-85 VERSION 2.2.101 01/28/83
```

```
A>
```

The A> is the CP/M system prompt. You must now "assign" your system to work with the CP/M partition.

- If you *do not* have 8" diskettes connected or turned on, type the following:

```
ASSIGN C: =CPM
```

- If you *do* have 8" disk drives connected to your system and turned on, type:

```
ASSIGN E. =CPM
```

ASSIGN is a CP/M command that will let you access a partition by name. In this case, you want to be able to set up the partition that has been named CPM by the PREP utility. If you are going to work with a different CP/M partition at this time, you would use that partition's name in place of CPM as illustrated. The reason two different disk names (C: or E:) are shown is that CP/M is a dynamic

# WINCHESTER SUPPLEMENT

---

## Installing Operating Systems

operating system and assigns disk designators at the time of bootup. Two names are assigned by CP/M to each of the floppy disk systems that are connected to the system. The names A: and B: are always assigned to the built in drive (even if only one is present as is the case with the Winchester system). If external 8" drives are present, then C: and D: are assigned to those drives and E: and F: are assigned to the Winchester disk. If no 8" system is present, then C: and D: are assigned to the Winchester disk.

- Press the **RETURN** key. The CP/M prompt will reappear. You are now ready to format the partition.

- Type:

```
FORMAT
```

and press the **RETURN** key. The following will be displayed:

```
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)
```

- Press the **Y** key. The display will show:

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

- You will enter either C or E as you did in when you selected the CP/M partition with the ASSIGN command. Your display will show:

```
Formatting partition
```

```
Press RETURN to begin, anything else to abort.
```

## WINCHESTER SUPPLEMENT

---

### Installing Operating Systems

- Press the **RETURN** key. The Winchester disk access indicator will light while the partition is being formatted. When the process is finished, you will see:

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

- Press the **N** key. The CP/M prompt will reappear. Now you will place the CP/M BIOS on the disk.
- Type the following:

```
MVCPM217
```

and press the **RETURN** key. You will see the following:

```
MVCPM217 VERSION 2.2.101
```

```
CONSTRUCTING 64k CP/M vers 2.2
```

```
READY FOR "SYSGEN" OR
```

```
"SAVE 38 CPM64.COM"
```

```
A>
```

You must now perform the SYSGEN operation before you attempt *any* other command.

- Type the following:

```
SYSGEN
```

and press the **RETURN** key. You will see displayed:

```
CP/M-85 SYSGEN VER 2.2.101
```

```
SOURCE DRIVE NAME (OR RETURN TO SKIP):
```

- Press the **RETURN** key. The information is stored in memory as a result of the MVCPM217 operation. The display will now show:

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

## WINCHESTER SUPPLEMENT

## Installing Operating Systems

- Press the **C** or **E** key as you have done for the FORMAT command. You will see a display similar to:

DESTINATION ON C, THEN TYPE RETURN

The C will be replaced with an E if you had pressed the E key. Since the disk is permanently mounted, press the **RETURN** key.

CP/M will place the operating system on your Winchester disk. You will see:

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

- Press the **RETURN** key. The CP/M-85 prompt will appear on your screen.
- Type the following for non-8" systems:

PIP C: =A: \*. \* [RV]

or the following for 8" systems:

PIP E: =A: \*. \* [RV]

and press the **RETURN** key. The PIP utility is similar to the COPY utility in Z-DOS. With CP/M you will see the name of each CP/M file as it is copied. When it is finished, you will see the CP/M prompt appear once again. You have completed the preparation of the CP/M partition for booting.

## WINCHESTER SUPPLEMENT

---

### Installing Operating Systems

#### Booting from the Winchester

NOTE: This boot procedure assumes that you have assigned a CP/M partition as the default boot partition. If you have not assigned any partition as the default boot partition, read the section entitled, "Booting from the Winchester — No Default Boot Partition."

At this point, you may boot your Computer from the Winchester disk. Use the same procedure to boot your Computer as you would if you were using a floppy disk. The only difference is that the Winchester cannot be removed from the system and so it is ready to go when you turn on or reset your Computer.

If your Computer is not set up to boot from the Winchester disk, you will have to press the **DELETE** key to stop any auto boot process and then press the **B** key and then the **F8** key, followed by the **RETURN** key. The Winchester LED disk access indicator will light and in a moment, the CP/M-85 initial messages will appear, along with the CP/M prompt. You have booted your system from the Winchester and may now use any CP/M-85 compatible program or utility of your choosing.

#### Booting from the Winchester — No Default Boot Partition

If you attempt to boot from your Winchester disk when no default boot partition has been established, an error condition will be created and you will see on your screen:

Error - Partition not found. Type RETURN to continue.

- Press the **RETURN** key. Now the system will display all of the valid partition names and operating system labels that were assigned by PREP or when you used the PART utility.



## WINCHESTER SUPPLEMENT

---

### Installing Operating Systems

You may boot your system from any partition that contains an operating system by typing the partition name (for instance, Z-DOS) and pressing the **RETURN** key.

If you have selected a partition that has not been formatted, the hand prompt will reappear on your screen. The system may be booted as previously described.

If you have selected a partition that has been formatted, but did not contain an operating system, the operation of your Desktop Computer will be the same as if you had attempted to boot your system from a formatted disk that had no operating system on it. Consult your respective operating system manual for more information.

#### **OTHER OPERATING SYSTEMS**

From time to time, Zenith Data Systems will release additional operating systems that you may want to use with your Winchester drive. Documentation will be included with those systems that will tell you how to install them on your Winchester drive.

## WINCHESTER SUPPLEMENT

---

### The SHIP Utility

The SHIP Utility is provided so that you may place the heads of your Winchester system over a non-vital area of the disks. Then if the system is accidentally jarred during movement, damage will be limited to an area that is not used by your Computer. The floating head design of Winchester drives makes them very sensitive to physical shocks, which can damage the surface of the disks. Therefore, you should use this utility whenever you move your Winchester disk system, even from one table to another.

To operate the SHIP utility, boot your Winchester Utilities disk and type:

```
SHIP
```

and press the **RETURN** key. You will see a display similar to the one illustrated in Figure 10.

```
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:

**Figure 10**  
The Display for SHIP

## WINCHESTER SUPPLEMENT

## Appendix A

This appendix lists some of the models of Winchester disk systems that can be used with the Z-217 controller installed in your system. The model normally supplied in 10 megabyte Winchester configurations is the Miniscribe Mod II 2012 (indicated by the asterisk in the chart). If you have a different drive, use the corresponding figures to answer the prompts presented by the PREP and SHIP utilities. If you have any questions concerning which system is installed in your Desktop Computer, consult your dealer. All amounts are listed in hexadecimal.

Manufacturer and Model	No. of Cylinders	No. of Heads	Write Current Cylinder	Precomp Cylinder	Step code	SHIP Cylinder Address
<b>Seagate</b>						
ST-506	99	4	80	40	96	9A
ST-706	132	2	200	80	1	131
ST-406	132	2	200	80	1	131
ST-412	132	4	200	80	1	131
ST-419	132	6	200	80	1	131
<b>Miniscribe</b>						
Mod II 2012*	132	4	200	80	1	14F
Mod IV 4020	1E0	4	200	80	1	209
Mod III 3012	264	2	300	80	1	28D
<b>IMI</b>						
5006H	132	2	200	D6	1	148
4012H	132	4	200	D6	1	148
5018H	132	6	200	D6	1	148
<b>Tandon</b>						
TM 602S	99	4	80	40	96	9A
TM 603S	99	6	80	40	96	9A

This information is provided from Manufacturer's specifications and is subject to change without notice.

## WINCHESTER SUPPLEMENT

## Appendix B

The information in this appendix will provide you with the necessary information to enable your system for proper PREP operation. Please note that you normally will never have to perform this operation; VERIFY and PART should be sufficient in most instances. However, if you must run PREP, proceed with the following instructions.

- Remove any disk that may be in the floppy disk drive and turn off the power.
- Using instructions provided in Appendix I of the Z-100 Series User's Manual, remove the cabinet top.
- Carefully remove any cable(s) that may prevent you from removing the Z-217 Winchester Controller card from the card cage. One such cable may be the external 8-inch floppy disk cable leading from the Z-207 Controller card to the back panel of your Computer. Note any cables you remove and how they are positioned on their respective boards so that you can replace them later.

NOTE: In the next step, you may have to carefully remove the two flat ribbon cables that go from the Z-217 Winchester Controller card to the Winchester drive. You will have to do this if the cables are not long enough to prevent strain on them when you remove the controller card from the card cage. If you do remove the cables, note the position of each cable and the position of the colored edge of the cable with respect to the connector and card. You will need to reconnect these cables when you re-install the card.

- Refer to Figure 11 and gently lift the Z-217 controller board free of the S-100 bus and straight up until it almost clears the card cage.

## WINCHESTER SUPPLEMENT

---

### Appendix B

- Remove the jumper from the interrupt plugs (see inset 1 of the Figure).
- Place the jumper over the Format Enable plugs on the upper left corner of the board (see inset 2 of the Figure).
- Replace the board by gently pushing it straight down into the card cage. Make sure that it slides down the guides provided and is completely pushed down into its socket.
- Replace any cables that you have disconnected and make sure that all cards are fully seated into their connectors on the main board of the Computer.
- Replace the top cover of your Computer and make sure that it is completely latched into position.
- Replace the power cord. Your system is now ready to use with the PREP utility.

**CAUTION:** Do *not* leave the jumper in place for normal operation. If you do, it is possible that the Winchester disk can automatically initialize itself if it receives a "glitch" from some obscure source. To remove the jumper reverse the above procedure.

## WINCHESTER SUPPLEMENT

## Appendix B

note: install controller in  
FIRST slot (closest to front  
of 2100 )

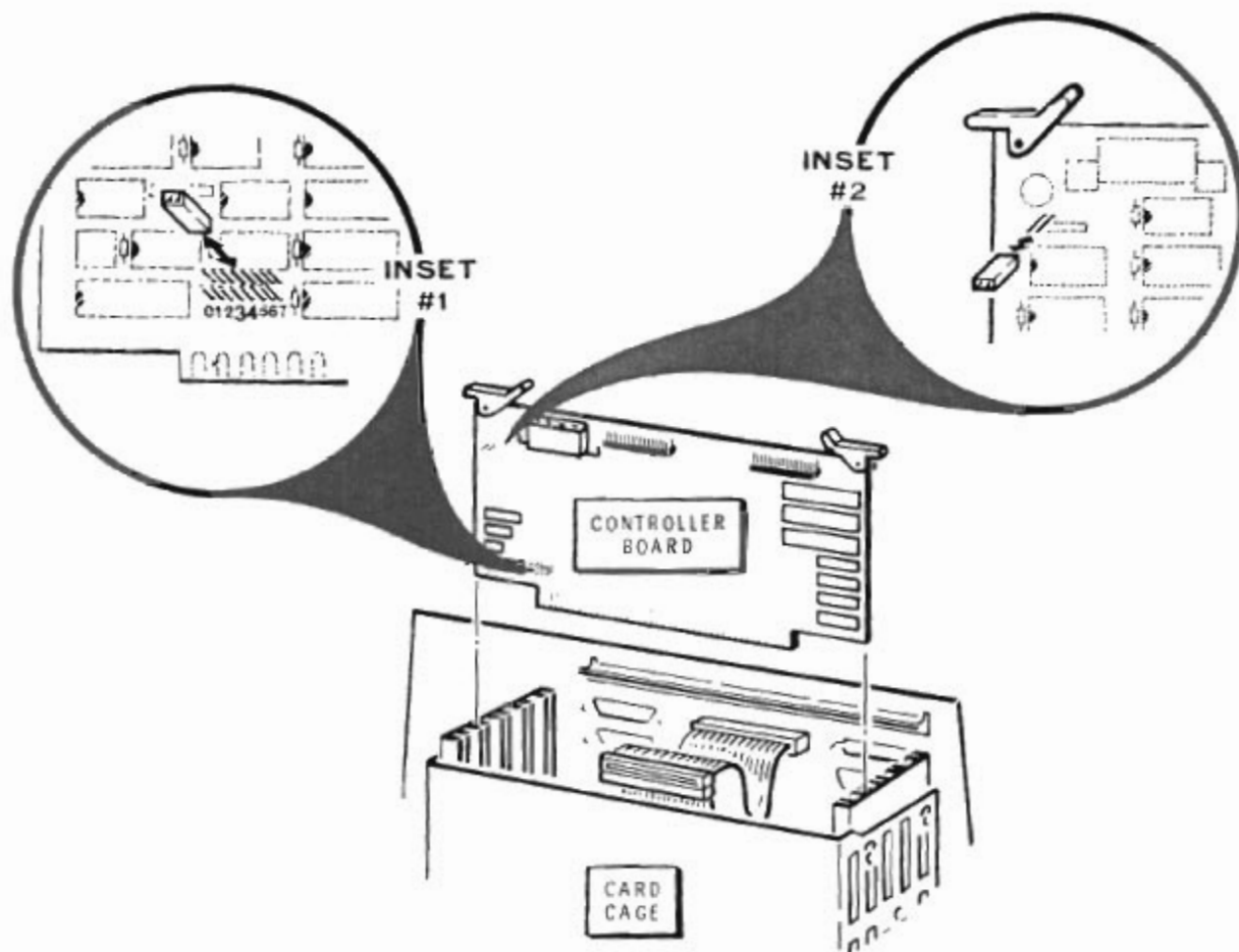


Figure 11

The Winchester disk controller board

## SEAGATE TECHNOLOGY

... continued from last page

MODEL	MEGB	HDS	CYL	SPT	SEEK	FF	HDT	INTERFACE	ENCODE	LZ	WP	RW/C	MTBF
ST157H-1	48.96	6	615	26	28	3.50	HH	SCSI	RLI 2.7	AUTO	N/A	N/A	150K
ST157H	49.12	6	615	26	40	3.50	HH	ST-506/412	RLI 2.7	AUTO			150K
ST157R-1	49.12	6	615	26	28	3.50	HH	ST-506/412	RLI 2.7	AUTO			150K
ST1581N	625.00	9	1,478	*	14	3.50	HH	SCSI-2	RLI	AUTO	N/A	N/A	150K
ST177N	61.30	5	921	26	24	3.50	HH	SCSI	RLI 2.7	AUTO	N/A	N/A	150K
ST1980H	660.00	13	1,730	*	11.4	3.50	HH	SCSI-2	RLI 1.7	AUTO	N/A	N/A	200K
ST1980ND	660.00	13	1,730	*	9	3.50	HH	SCSI-2/DIFF	RLI 1.7	AUTO	N/A	N/A	200K
ST206	5.32	2	306	17		5.25	HH	ST-506/412	MFM		128	307	
ST2106E	94.37	5	1,024	36	18	5.25	HH	ESDI	RLI 2.7	AUTO	N/A	N/A	100K
ST2106N	94.18	5	1,022	36	18	5.25	HH	SCSI	RLI 2.7	AUTO	N/A	N/A	100K
ST2106PM	94.18	5	1,022	36	18	5.25	HH	SCSI	RLI 2.7	AUTO	N/A	N/A	100K
ST212	10.85	4	306	17		5.25	HH	ST-506/412	MFM	319	128	307	11K
ST2125N	107.00	3	1,544	*	18	5.25	HH	SCSI	RLI	AUTO	N/A	N/A	100K
ST2125NM	107.00	3	1,544	*	18	5.25	HH	SCSI	RLI	AUTO	N/A	N/A	100K
ST2125NV	107.00	3	1,544	*	18	5.25	HH	SCSI	RLI	AUTO	N/A	N/A	100K
ST213	10.70	2	615	17	65	5.25	HH	ST-506/412	MFM	670	300	N/A	20K
ST2132E	160.68	4	1,453	54	16	5.25	HH	ESDI	RLI 2.7	AUTO	N/A	N/A	100K
ST2208N	183.00	5	1,544	*	18	5.25	HH	SCSI	RLI	AUTO	N/A	N/A	100K
ST2208NM	183.00	5	1,544	*	18	5.25	HH	SCSI	RLI	AUTO	N/A	N/A	100K
ST2208NV	183.00	5	1,544	*	18	5.25	HH	SCSI	RLI	AUTO	N/A	N/A	100K
ST2248	21.41	4	615	17	70	5.25	HH	SCSI	RLI 2.7	AUTO	N/A	N/A	100K
ST225	21.41	4	615	17	65	5.25	HH	ST-506/412	MFM	670	300		100K
ST225N	21.41	4	615	17	65	5.25	HH	SCSI	MFM	670	N/A	N/A	100K
ST225R	21.17	2	667	31	70	5.25	HH	ST-506/412	RLI 2.7		667		100K
ST2274A	241.50	5	1,747	54	16	5.25	HH	IDE (AT)	RLI 2.7	AUTO	N/A	N/A	100K
ST238	32.74	4	615	26	65	5.25	HH	ST-506/412	RLI 2.7		615		100K
ST2383A	338.10	7	1,747	54	16	5.25	HH	IDE (AT)	RLI 2.7	AUTO	N/A	N/A	100K
ST238E	338.10	7	1,747	54	16	5.25	HH	ESDI	RLI 2.7	AUTO	N/A	N/A	100K
ST238N	332.00	7	1,261	*	14	5.25	HH	SCSI	RLI	AUTO	N/A	N/A	100K
ST2383NM	332.00	7	1,261	*	14	5.25	HH	SCSI	RLI	AUTO	N/A	N/A	100K
ST238R	32.74	4	615	26	65	5.25	HH	ST-506/412	RLI 2.7		615		100K
ST2500N	442.00	7	1,755	*	16	5.25	HH	SCSI	RLI	AUTO	N/A	N/A	100K
ST2500NM	442.00	7	1,755	*	16	5.25	HH	SCSI	RLI	AUTO	N/A	N/A	100K
ST2500NV	442.00	7	1,755	*	16	5.25	HH	SCSI	RLI	AUTO	N/A	N/A	100K
ST2508	42.34	4	967	31	70	5.25	HH	SCSI	RLI 2.7	AUTO	N/A	N/A	100K
ST250R	42.34	4	967	31	70	5.25	HH	ST-506/412	RLI 2.7		670		100K
ST251	42.82	6	820	17	40	5.25	HH	ST-506/412	MFM	AUTO			100K
ST251-1	42.82	6	820	17	38	5.25	HH	ST-506/412	MFM	AUTO	B21	B21	100K
ST251H	43.16	4	820	26	40	5.25	HH	SCSI	RLI 2.7	AUTO	N/A	N/A	70K
ST251H-1	43.16	4	820	26	28	5.25	HH	SCSI	RLI 2.7	AUTO	N/A	N/A	70K
ST251R	43.66	4	820	26	40	5.25	HH	ST-506/412	RLI 2.7				100K
ST252	42.82	6	820	17	40	3.50	HH	ST-506/412	MFM	AUTO			100K

... continued on next page

\* - Variable

65 = 267

## SEAGATE TECHNOLOGY

... continued from last page

MODEL	MEGB	HDS
ST250	43.04	5
ST274A	63.09	5
ST277N	65.49	5
ST277N-1	65.59	6
ST277R	65.49	6
ST277R-1	65.49	6
ST278R	65.49	6
ST279R	65.82	5
ST280A	66.68	5
ST296N	85.44	8
ST3025A	21.51	1
ST3025N	21.51	1
ST3051A	43.10	
ST3057N	49.09	3
ST3066A	89.12	10
ST3066N	89.12	10
ST31200N	1050.00	9
ST31200ND	1050.00	9
ST3120A	106.00	3
ST3144A	120.68	3
ST325AIX	21.41	2
ST325H	21.41	2
ST3283A	245.36	5
ST3283N	245.36	5
ST351AIX	42.82	6
ST3600A	140.00	7
ST3600N	135.00	7
ST3600ND	625.00	7
ST3610N	535.00	7
ST3610ND	535.00	7
ST4026	21.41	4
ST4038	31.99	5
ST4051	42.51	5
ST4053	44.34	5
ST406	5.32	2
ST4077N	68.15	5
ST4077R	68.15	5
ST4085	71.30	8
ST4086	72.48	9
ST4096	80.21	9
ST4096N	80.21	9

\* - Variable





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**ZENITH**

**data  
systems**

**HEATH**

# Introductory Guide

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NOTE: In this text, the entry of a carriage return will be illustrated with the symbol “␣.”

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.

# 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 Ⓢ
```

The following display will appear:

```
CP/M-85 BSYSGEN VER 2.2 100  
SOURCE DRIVE NAME .
```

# 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.

# 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.



## 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.

## 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.

<u>Number</u>	<u>Explanation</u>
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.

 DIGITAL RESEARCH™

# CP/M®-86

## Part I Z-100 Utilities



data  
systems

HEATH

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## UTILITIES

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### LDCOPY

#### *The Utility that Copies the CP/M-86 Operating System between Disks*

Use the LDCOPY utility to create a bootable CP/M-86 disk. You may copy CP/M-86 from the system tracks of any bootable disk/partition if you are transferring the system between like devices (from floppy to floppy or from disk partition to disk partition). If you are transferring the system between unlike devices (from floppy to disk partition or from disk partition to floppy), you may copy CP/M-86 by using the .CMD file(s) named BOOT207 and BOOT217. Both of these copy operations are detailed below.

The CP/M-86 BIOS file, CPM.SYS, must also be present on a bootable disk. LDCOPY has no effect on CPM.SYS. To transfer it you must use the PIP utility with the R option (see PIP in the "User's Guide").

You may execute LDCOPY by either of two methods: the Utility Prompt method or the System Prompt method. With the Utility Prompt method, LDCOPY is first loaded into memory. You then enter additional parameters in response to specific prompts. This method must be used if you intend to transfer the system to more than one disk. With the System Prompt method, LDCOPY is loaded and all necessary parameters are supplied from a single command line. A detailed description of each method follows.

#### Utility Prompt Method

Place a disk containing LDCOPY.CMD in a disk drive (A is assumed in this example) and enter:

```
A>LDCOPY
```

and press **RETURN**.

When loading is complete you will see this sign-on message:

```
LDCOPY rel x.xx  
Copyright (c) 1983 Zenith Data Systems Corp.
```

Below the sign-on message the "Source:" prompt will appear:

```
Source:
```

The entry for this response depends upon whether you are transferring the system between like devices (floppy to floppy or disk partition to disk partition) or unlike devices (floppy to disk partition or disk partition to

## UTILITIES

## RDDOS

where <e:> specifies the source drive. The source drive should contain the Z-DOS formatted disk with the file(s) you wish to copy. This entry is required since the system must be told where to find the Z-DOS formatted disk.

where <filespec> is any legal filename and extension which represents the Z-DOS formatted file(s) you wish to copy to CP/M format. You may also use any valid combination of wild cards for the filespec.

When you have completed this entry by pressing **RETURN**, RDDOS will display its banner while it completes the copying function. When copying is complete, RDDOS will automatically return to the system prompt A>.

## Help Screen

To invoke the help screen, type the following:

```
A>RDDOS ?
```

and press **RETURN**. The question mark entry tells the system that you want it to display the detailed version of Help. The following message appears on your screen:

```
                RDDOS Rel. x.xx  
        Copyright (c) 1983 Zenith Data Systems Corp.
```

RDDOS reads a file, file group, or directory from a disk that has been formatted using a Z-DOS compatible system and will copy the file(s) to a disk having been formatted with CP/M.

The RDDOS command is similar to the PIP command except that the source file(s) are expected to be on a Z-DOS disk.

```
Usage: RDDOS [destination] source  
      --or-- RDDOS DIR drive
```

Where

"destination" a CP/M filespec or drive name, and "source" is a Z-DOS filespec.

When you have finished reviewing the detailed help message, the system prompt is displayed.

The Z-BASIC Compiler package contains the following software on disk:

BASCOM.COM – (The Z-BASIC Compiler)  
BASRUN.EXE – (The Runtime Module)  
BASRUN.LIB – (The Runtime Library)  
BASCOM.LIB – (The Old Runtime Library)  
DEMO.BAS – (A Demonstration Program)

The functions of these files are described on page 1.3, "Software Descriptions."

This manual assumes that you have a working knowledge of the Z-BASIC language, but may be unfamiliar with using the compiler as a programming tool.

The Z-BASIC Compiler requires a minimum of 128K of memory and one disk drive. We recommend two drives, however, for easier operation. The compiler operates under Z-DOS<sup>™</sup>, which is required. The Z-BASIC Compiler also requires the linker, LINK, to assist in creating executable compiled programs. LINK is a standard Z-DOS utility.

Language and operational differences exist between the Z-BASIC Compiler and the Z-BASIC Interpreter. Consult Chapter 10 of this manual before you try to compile a BASIC program.

The syntax notation used in this manual is consistent with the syntax used for the Z-BASIC Interpreter. Syntax notation is described in detail on page 1.5.

---

## Details

The Z-BASIC Compiler is an optimizing compiler designed to complement the Z-BASIC Interpreter. The Z-BASIC Compiler allows you to create programs that in most cases:

1. Execute faster than the same interpreted programs,
2. Require less memory than the same interpreted programs,
3. Are source-code secure.

<sup>™</sup>Z-DOS is a trademark of Zenith Data Systems Corporation.

# INTRODUCTION

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## Details

These benefits can be critical in:

- Graphics applications, where execution speed can often make or break an application
- Business applications, where several chained programs can be supported by a main menu
- Commercial applications, where software is being sold in a competitive marketplace and source-code security is essential.

Another major benefit is that the compiler has been created to support most of the interpreted BASIC language. Thus, the interpreter and the compiler complement each other and provide you with an extremely powerful BASIC programming environment. In this environment, you can quickly RUN and debug a program with the BASIC Interpreter, and then later compile the same program to increase its speed of execution and to decrease its space in memory.

An outstanding BASIC Compiler feature is a runtime module named BASRUN.EXE, which contains the majority of the runtime environment. The runtime module is loaded when program execution begins; later execution of chained programs do not require reloading. This allows you to develop a system of related programs that can all be run using the same runtime environment: the environment required by your program need not be saved on disk as part of your executable .EXE file. For a system of four programs, this can save at least 48K of disk space—a substantial savings.

Note that although the language supported by the BASIC Compiler is not completely identical to that supported by the interpreter, the compiler has been designed so that compatibility is maintained wherever possible.

The Z-BASIC Compiler supports, in some form, all of the statements and commands described in the Z-BASIC Reference manual except:

AUTO	CONT	DELETE	EDIT	ERASE
LIST	LLIST	LOAD	MERGE	NEW
RENUM	SAVE			



# INTRODUCTION

---

## Details

### IMPORTANT

Language, operational, and other differences between the BASIC Compiler and the BASIC Interpreter are described in Chapter 10, "A Basic Compiler/Interpreter Language Comparison." You should review the information in that chapter before compiling any of your programs that already run without problem when interpreted by BASIC. Only then make any necessary changes.

### Software Descriptions

A description of the function of the software on disk follows:

1. **BASCOM.COM** (the BASIC Compiler)—Compiles BASIC source files into relocatable and linkable .OBJ files.
2. **BASRUN.EXE** (The Runtime Module)—A single module containing all of the routines called from your compiled .OBJ file.
3. **BASRUN.LIB** (The Runtime Library)—A library module used to interface the calls in your program to the proper routines in the BASRUN.EXE runtime module.
4. **BASCOM.LIB** (An Alternate Runtime Library)—A collection of modules containing routines that are similar to the routines found in the BASRUN.EXE runtime module. This library should be used for applications that you want to execute as single .EXE files without the runtime module. This library does not support CHAIN with COMMON. Additional differences are described in Chapter 7, "Linking."
5. **DEMO.BAS** (A Demonstration Program)—Used in Chapter 3 to demonstrate program development with the Z-BASIC Compiler.

The documentation package includes the *Z-BASIC Compiler* manual and the *Z-BASIC Interpreter* manual.

# INTRODUCTION TO COMPILATION

---

## Details

*Runtime Support*—The body of routines that may be linked to your compiled .OBJ file. These routines implement various features of the BASIC language. The BASCOM.LIB, BASRUN.LIB, and the runtime module all contain runtime support routines. See Chapter 7, “Linking,” for more information on runtime support.

*The BASRUN.EXE Runtime Module*—A module containing most of the routines needed to implement the BASIC language.

Use of the runtime module gives you the following advantages:

1. True chaining is allowed.
2. COMMON can be used to communicate between chained programs.
3. Linktime is reduced, since unbound globals do not have to be searched for in multiple library modules.

Note, however, that the runtime module must be accessible on disk when you execute your final .EXE file.

*The BASRUN.LIB Runtime Library*—A few modules used to load in BASRUN.EXE at runtime and to move segments around in memory to permit chaining.

*The BASCOM.LIB Runtime Library*—A collection of modules containing routines almost identical in function to similar routines contained in the runtime module. However, this library does not support COMMON between chained subprograms. It does support a version of CHAIN that is equivalent to the simple RUN <filename> command.

*Linking*—The process in which the linker computes absolute addresses for labels and variables in relocatable modules, and then resolves all global references by searching the BASRUN.LIB runtime library. After loading and linking, the linker saves the modules that it has loaded into memory as a single .EXE file on your disk. This entire process is called *linking*.

Complete understanding of all the above terms is not essential for continued reading. You may want to refer back to these terms later, as you become familiar with the compiler and with the linker. We will now discuss the program development process.

## INTRODUCTION TO COMPILATION

## Details

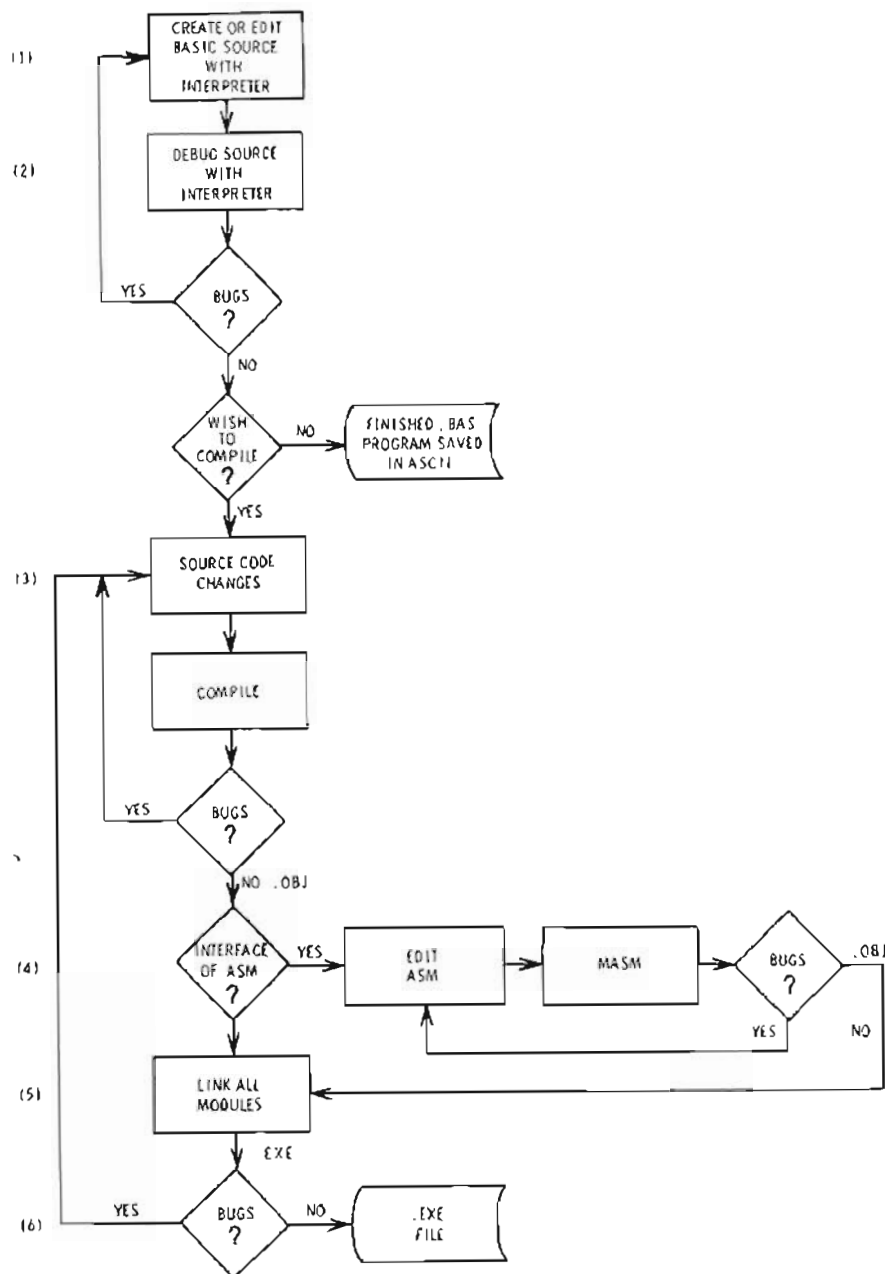


Figure 2.1. The Program Development Process

## DEMONSTRATION RUN

---

### Details

#### 3. Create a BASIC source file.

BASIC programs can be created with any text editor available to you. For the purpose of this demonstration run, we will use the program provided on disk named DEMO.BAS. Because the compiler assumes a .BAS extension, BASIC source files should always be given the .BAS extension.

#### 4. Invoke the compiler.

As a response to the operating system prompt (which is B since you are currently logged on B), type:

```
B: A: BASCOM
```

The above command invokes the BASIC Compiler.

#### 5. Input filenames.

The compiler then prints an informative header and prompts you for the name of your BASIC source program. Enter:

```
Source filename [.BAS]: A: DEMO
```

The default extension .BAS is assumed. After you have entered the name of a legal filename for the source file, you are prompted to enter the name of the relocatable object file that you want to create. Type:

```
Object Filename [DEMO.OBJ]: DEMO
```

Note that the default name is enclosed in brackets in the prompt. This default name can be selected by simply entering **RETURN**. It can also be selected by entering DEMO as shown here.

Remember that all files created in this demonstration run are written to drive B.

The final prompt is for the name of the source listing file. The source listing file is created during compilation; it lists your BASIC source and any compilation errors or warnings as they occur. By default, the listing

## DEMONSTRATION RUN

---

### Details

file is sent to the null file, NUL, and no file is created. Writing to the NUL file is equivalent to not writing a file at all. However, error messages are always displayed on the screen. To specify this default, you need only type **RETURN**.

However, if any part of a file specification is entered after the prompt, the default extension is .LST and the default device is the currently logged drive. For this demonstration, send this file to the console screen.

Therefore, enter:

```
Source listing [NUL.LST]: CON
```

After you have completed your input, compilation begins and the source listing file is sent to the console screen as the source file is read.

6. Look for error messages.

As your program is compiled, error messages are displayed on the terminal screen. For the demonstration program, there should be no error messages displayed. When the compiler has finished, it displays the message:

```
23533 Bytes Available  
17003 Bytes Free
```

```
0 Warning Error(s)  
0 Severe Error(s)
```

(The number of bytes available and free is dependent on your particular system.) Program control is then returned to the operating system.

At this point, you should see one new file listed in drive B's directory, DEMO.OBJ.

7. Link routines in the runtime library to your .OBJ file.

After compilation, you are ready to link your program. Your .OBJ file must be processed by the linker so that it contains absolute addresses and not code-relative addresses.

# DEMONSTRATION RUN

## Details

To begin linking, type:

```
B: A:LINK
```

The linker prompts you for the name of your relocatable object file, which in this case is DEMO:

```
Object Modules [.OBJ] : DEMO
```

The .OBJ extension is assumed for the file DEMO. You are next prompted for the names of the run file and the linker list file. Simply type **RETURN** after each prompt to specify the default files given in brackets:

```
Run File [DEMO.EXE] : RETURN
```

```
Map File [NUL.MAP] : RETURN
```

The next prompt allows you to specify any additional libraries you wish to search other than BASRUN.LIB or BASCOM.LIB. Do not specify BASRUN.LIB or BASCOM.LIB because the compiler has instructed the linker to automatically search the proper BASIC library. However, if your program calls for routines that are found in an assembly language library, specify the name of that library in response to this prompt.

Therefore, when the Libraries prompt appears, type:

```
Libraries [.LIB] : ; RETURN
```

The linker automatically knows which of the two libraries to search by default. Thus, the semicolon (;) is used to indicate default values for all remaining parameters.

These parameters, and how to use the linker, are discussed in Chapter 7 and in Volume 2 of the Z-DOS manual. However, the default configuration for these parameters is all that you need here. The executable file named B:DEMO.EXE is created as a result of this linking process.

8. Run your program.

To run your final program, simply type:

```
DEMO
```

## DEMONSTRATION RUN

---

### Details

This searches for the BASRUN.EXE runtime module on the default drive. Since it is not there, the system looks for it in drive A, where it is found. Once the runtime module is loaded, execution of the file named B:DEMO.EXE begins.

If you would like to compile the Demo program using the BASCOM.LIB library, you must append a /O to the command line used to invoke the compiler, as shown in the following example:

```
A: BASCOM DEMO /O; RETURN
```

The BASCOM.LIB runtime library is most often used for applications that you want to execute as single .EXE files without the runtime module. The advantages and disadvantages to using the BASCOM.LIB are described on pages 7.4 and 7.5.

Remember, spaces between the filename and the compiler switch are ignored and the semicolon is used to indicate default values for all remaining parameters.

This completes the demonstration run. For more information regarding compilation, see Chapter 6, "Compiling." For additional information regarding the linking of libraries, see Chapter 7, "Linking," in this manual.

## COMPILING

## Details

**Table 6.2. Compiler Switches**

SWITCH	ACTION	CATEGORY
/A	Include listing of disassembled object code in the source listing.	Special Code
/D	Generate debug code for runtime error checking.	Special Code
/E	Program has ON ERROR GOTO with RESUME <line number>.	Error Trapping
/N	Numbers for lines not needed for all lines.	Special Code
/O	Substitute the BASCOM.LIB runtime library for BASRUN.LIB as the default runtime library searched by the linker.	Special Code
/R	Store arrays in row major order.	Special Code
/S	Write quoted strings to .OBJ file on disk and not to compiler symbol table in RAM.	Special Code
/T	Use version 4.51 execution conventions.*	Conventions
/V	Program has KEY(n) ON, ON KEY(n) GOSUB, COM(1) ON or ON COM(1) GOSUB as used for "event trapping".	Special Code
/W	Program has KEY(n) ON, ON KEY(n) GOSUB, COM(1) ON or ON COM(1) GOSUB as used for "event trapping".	Special Code
/X	Program has ON ERROR GOTO with RESUME, RESUME 0, or RESUME NEXT.	Error Trapping
/4	Use Microsoft 4.51 lexical conventions (not allowed with /N).*	Conventions

\*Use /4 and /T together for version 4.51 lexical and execution conventions.

Each of the switches shown in Table 6.2 are explained in detail on the following pages.



The purpose of the linker as it relates to the Z-BASIC Compiler is to combine object modules and link those modules to a library, to produce an executable file which can be run.

You may link compiler-produced .OBJ files to either the BASRUN.LIB library or the BASCOM.LIB library.

The linker will automatically search the BASRUN.LIB library unless you specified the /O switch when the compiler was invoked, which will force the linker to search the BASCOM.LIB library instead.

There are distinct advantages and disadvantages to using either library, depending on the contents and size of the program being linked.

To invoke the linker, type:

```
A:LINK
```

**NOTE:** There is no need to specify which library you want to use at linktime as this may cause serious linktime errors.

---

## Details

The purpose of the linker is to combine several object modules into one relocatable load module to produce an executable .EXE file that may be subsequently run.

As the linker combines the modules, it searches through libraries for the definitions needed to resolve any external references that are unresolved.

There are two distinct libraries that may be used to link a compiler-produced .OBJ file.

1. Linking to the *BASRUN.LIB* runtime library
2. Linking to the *BASCOM.LIB* runtime library

With BASRUN.LIB, a runtime module is used at runtime. With BASCOM.LIB, selected routines are linked to the .OBJ file to create a single .EXE file that does not need a runtime module.

Metacommands are compiler directives that provide source file control and listing file control. See Table 9.1 for brief descriptions of each metacommand.

More than one metacommand may be given at the start of a comment; however, multiple metacommands must be separated by a space character.

A metacommand, when followed by a plus (+), turns on a feature. When a metacommand is followed by a minus (-), the feature is turned off.

---

## Details

Metacommands are compiler directives that provide two capabilities: source file control and listing file control. The available metacommands are listed in Table 9.1.

**Table 9.1. The Metacommands**

NAME	DESCRIPTION
\$INCLUDE:'filename'	Switches compilation from current source file to source given by 'filename'.
\$LIST<+   ->	Turns on or off source listing. Errors are always listed. Default is on.
\$OCODE<+   ->	Turns on or off disassembled object code listing. Default is off.
\$TITLE:'text'	Sets page title.
\$\$SUBTITLE:'text'	Sets page subtitle.
\$LINESIZE:n	Sets width of listing. Default is 80.
\$PAGESIZE:n	Sets length of listing in lines. Default is 66; 60 are printable.
\$PAGE	Skips to next page. Line number is reset.
\$PAGEIF:n	Skips to next page if less than (n) lines left.
\$\$SKIP:n	Skips (n) lines or to end of page.

Some commands that are operational commands in the Z-BASIC interpreter are not acceptable input to the compiler. These include:

AUTO	CONT	LIST	MERGE	RENUM
BLOAD	DELETE	LLIST	NEW	SAVE
BSAVE	EDIT	LOAD		

In addition, there are commands that function differently under the interpreter than under the compiler. They include:

CALL	FOR/NEXT	STOP
CALLS	FRE	TRON/TROFF
CHAIN	LOF	USRn
CLEAR	OPEN	WHILE/WEND
COMMON	ON ERROR GOTO	WIDTH
DEFxxx	REM	
DRAW	RESUME	
DIM	RETURN	
END	RUN	

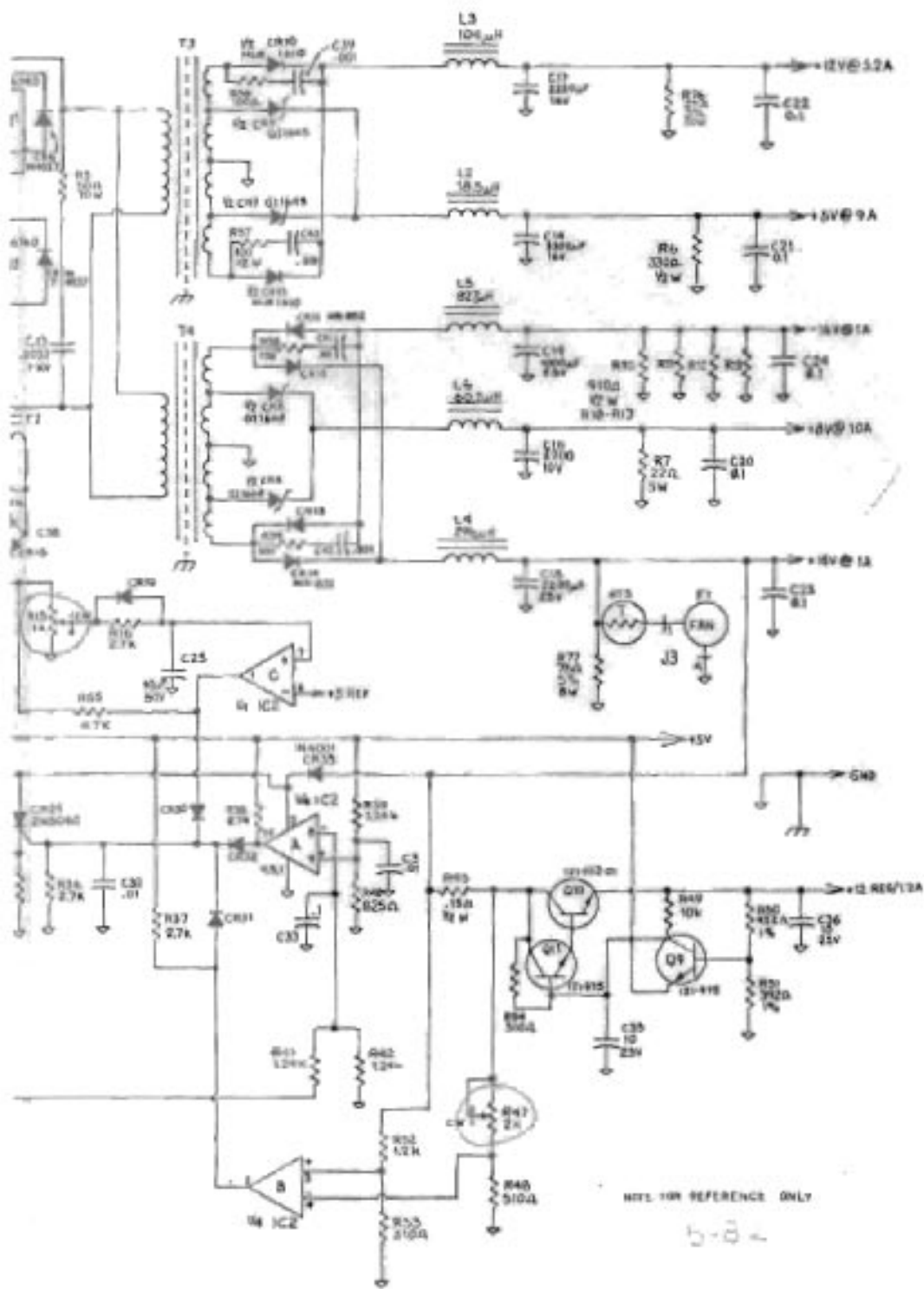
The compiler has other differences that distinguish it from the interpreter. These include:

1. Expression evaluation
2. Use of integer variables
3. Double precision arithmetic functions
4. Double precision loop variables
5. Increased string size
6. Efficient string space implementation.

## Language Comparison

There are differences between the languages supported by the Z-BASIC Compiler and the Z-BASIC Interpreter that must be taken into account when you compile existing or new BASIC programs. This is why we





R23- Adj, all but  
+12v for video

R15 - Current limiting

R47 - +12v for CRT  
over cut. Adj.