Z-200 PC Series Computers
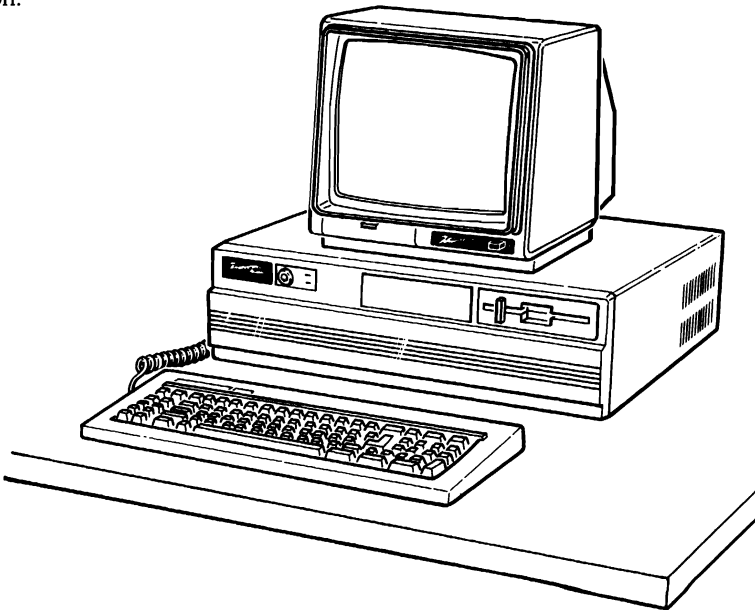
Owner's Manual

ZENITH | data systems

Welcome

Congratulations on your purchase of a new Z-200 PC Series Computer. The Z-200 PC represents a state-of-the-art design capable of satisfying both personal and business needs.

With Zenith, the future is here today. Your new computer can act as a stand-alone tool or function as the center of a powerful and expandable business automation package. Combined with Zenith Data Systems software, your personal computer can easily provide practical and affordable solutions to many of your business problems. It can satisfy a variety of business applications, including data processing, telecommunications, networking, and financial analysis.

This manual has been prepared for you, the new computer owner and user. Welcome to personal computing at its very best, and accept Zenith's pledge and commitment that the quality goes in before the name goes on.

Preface

This Owner's Manual is intended to be used as a reference guide whenever you wish to set up, add to, or understand more about your Z-200 PC Series Computer System.

Chapter 1 — Unpacking and connecting your new computer system are the first things covered in this chapter of the Owner's Manual. After a description of how to power up the system, all the keys on the keyboard are explained individually. The program for setting up the computer with the various options installed is also included in this chapter.

Chapter 2 — This chapter tells how to get software running in your computer from either the floppy disk drive or an optional Winchester drive. Instructions for making backup copies of disks and configuring the system for printers are also covered.

Chapter 3 — In the extreme case where your computer does not seem to work correctly, this chapter covers error messages, cover removal and diagnostic LEDs, as well as information on calling for assistance.

Chapter 4 — Summaries of the commands used in both the MFM-200 program and MS-DOS Version 3 are included in this chapter.

Chapter 5 — Details of the devices associated with the computer are presented in this chapter.

Appendices — The appendices provide general instructions on the addition of options into the computer. These options include cards, integrated circuits, floppy disk drives, and Winchester drives.

A glossary of commonly-used terms and an index are also included at the back of the manual.

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Initial Setup

You will find your computer system easiest to use if all the components are located in the same general area. A good, solid work surface near a power source and a telephone will prove best.

Refer to the instructions on the inside top flap of the shipping carton and unpack the computer. Place it on the work surface selected and position it so you are looking at the back panel.

NOTE: Because of the number of video options available, the computer system does not include a video card. However, you **must have** a video card installed in your computer for proper operation.

If a video card has been installed by your dealer, continue with the initial setup of your system. If no card is installed, Appendix A of this manual includes general installation instructions for ZDS-Manufactured video cards.

LINE SELECT
SWITCH

SERIAL
CONNECTOR

ON/OFF   POWER CORD   KEYBOARD
POWER   CONNECTOR   CONNECTOR
SWITCH

PARALLEL
CONNECTOR
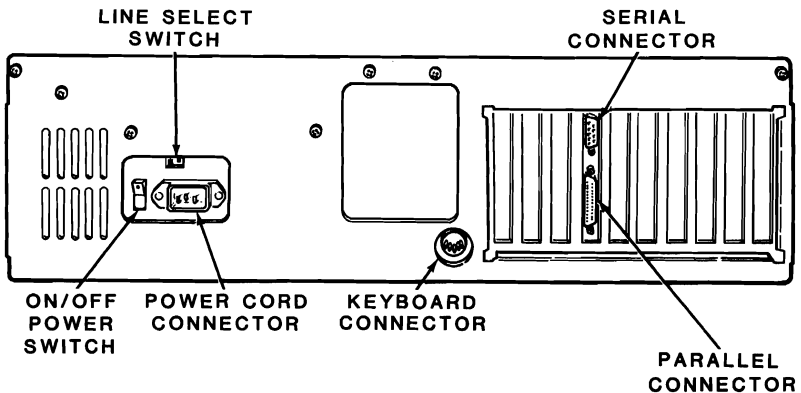
Figure 1.1. The Back Panel

The Back Panel

The following switches and connectors are located on the back panel as shown in Figure 1.1.

Line Select Switch — This switch is used to select between 115 VAC and 230 VAC. You should never use this switch unless, during initial setup, you are in an area serviced by a 230 VAC power source. (Check local electrical codes.) Changing the setting on this switch should be done only by qualified individuals. When the line voltage is changed, for example, 115 VAC to 230 VAC, the line cord plug must be changed to the proper type and voltage rating.

On/Off Power Switch — The power switch is located on the left side of the back panel. Make sure the switch is in the OFF position before you plug your computer into an outlet.

Power Cord Connector — When connected, the power cord supplies power to the computer.

Keyboard Connector — A 5-pin "DIN" connector provides the necessary signals for connection with the computer keyboard.

Serial Connector — The necessary EIA-standard RS-232 signals for connection to a serial printer or other serial device are provided through this 9-pin connector. A special cable is needed to connect a DB-25 output to this connector.

Parallel Connector — This 25-pin connector provides the necessary parallel signals for connection to a Centronics-type parallel printer or other parallel output device.

Connections

Connect the end of the keyboard cable to the keyboard connector on the back of the computer as shown in Figure 1.2.

Refer to the Appendices at the back of this manual for instructions for connecting a monitor.
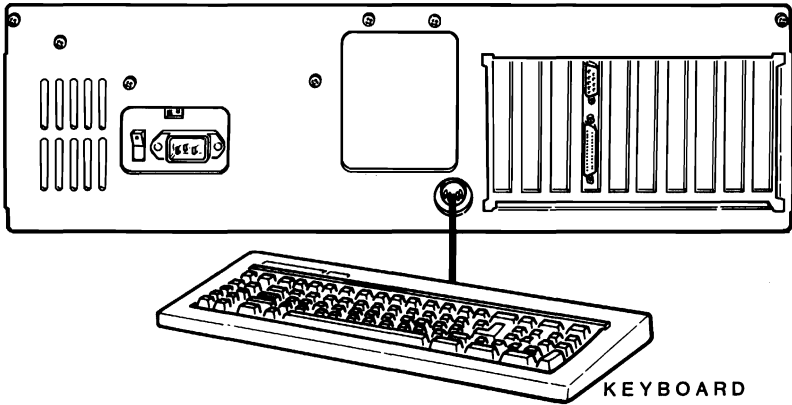
KEYBOARD

Figure 1.2. Keyboard Connection

Initial Setup

If your system components are not in their normal operating positions, move them to their final position now. Reconnect any cables. Up to this point, you should not have made any power connections.

CAUTION: This computer system is designed to operate on either of two different AC line voltages, either 115 VAC at 60 Hz or 230 VAC at 50 Hz. Before connecting the computer, make sure it is rated for the voltage available in your area. The computer is set at the factory for 120 volts, the standard voltage in the United States. To change the voltage rating, contact your authorized repair facility.

● Before you connect any of your computer's components to an AC power source, turn all power on/off switches off.

The computer has a detachable power cord. Refer to Figure 1.3 and plug the appropriate end of the power cord into the computer. Do not attach the other end at this time.

With multiple power cords involved, you may want to use a switched multiple outlet box or power strip to turn on (or off) all system components at the same time. If you do use a switched outlet box or power strip, make sure it is properly rated for your system's power needs (for 115 volt systems, 10 amperes; for 230 volts, 5 amperes).

Do not use an extension cord unless it is a heavy-duty, three-wire type. Smaller cords tend to reduce the amount of voltage available and can cause unsatisfactory performance from your computer.

- Position the computer so the front is clear and you can insert or remove disks as needed. You also should be able to easily reach the power on/off switch on the back panel. Plug the power cord into an AC power source.

- The monitor may be placed on the computer or anywhere convenient. Plug its power cord into an AC power source.

- Place the keyboard where you will normally use it. It receives power directly from the computer and does not have a separate power connection.

- Place any other peripherals you may be using in their operating positions and plug their power cords into an AC power source.

**AC POWER
SOURCE**
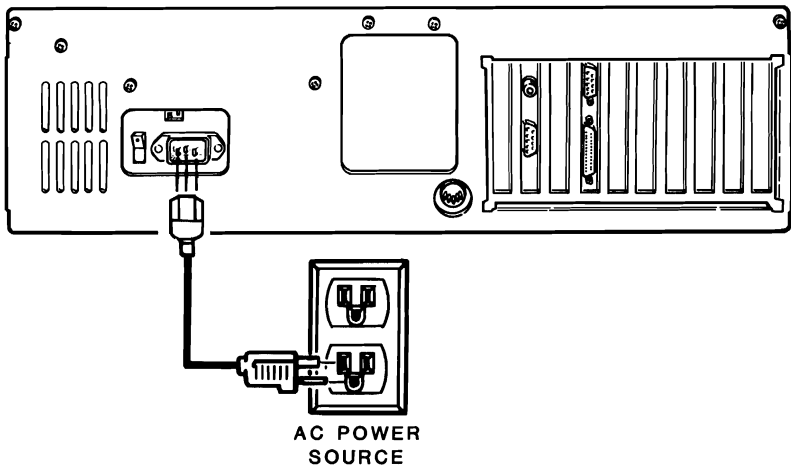
Figure 1.3. Connecting the Power Cord

Powerup and Self-Tests

Normal Powerup

CAUTION: Before you turn on your computer system, be sure the cardboard shipping insert has been removed from the disk drive.

The computer system's power may be turned on in any sequence, however, **never** turn your system's power on or off with a disk in the floppy disk drive; remove the disk first.

There are two suggested sequences for turning on your system:

• One switch operation through a switched multiple outlet power box or strip. The one switch on the box or strip will control the entire computer system simultaneously.

• For most applications, apply power to your monitor first, then the computer. Finally, turn on any other peripherals attached to your computer system.

After the system is turned on, a number of things will happen: a small, quiet fan will start; a light on the disk drive will come on; and the drive will make some sound as the "read/write heads" move back and forth. Factory assembled computers are set to "autoboot" (automatically load a disk operating system from a floppy or Winchester disk) when they are shipped. One of the lights on the disk drives will come on and remain on in a computer set for autoboot. If autoboot is started, a disk must be placed in the drive and the door shut within about 20 seconds.

If you want to reset the system by turning it off and then on again, wait at least five seconds before turning the computer on.

Self-Tests

When you turn on your computer, it executes a series of internal tests to check that everything is working correctly. These tests serve several important functions. First, they verify that all of the circuits are in a starting configuration. Second, the tests check various functions of the computer so it will operate properly.

When the tests are finished, the computer will let you know it is ready to run by displaying the opening message, or starting the automatic boot procedure (autoboot).

If some portion of the equipment fails to operate correctly, the computer will attempt to display an error message. These messages and more information on the initial diagnostics are included in the In Case of Difficulty section in Chapter 3 of this manual.

Keyboard

Keyboard Lock

The left side of the front panel includes a keyboard lock that is independent of the power switch.

When the key is in the unlocked (clockwise) position, the computer is fully operational. In the locked (counterclockwise) position, the key can be removed and the keyboard is disabled. The cover is locked on the chassis — when the keyboard is locked.

An extra key and a card referencing the key number and security code are included in the box with your computer. These materials should be kept in two different places. If a key gets lost, the extra key or the reference card can be taken to a locksmith for a duplicate key.

NOTE: Zenith Data Systems can not duplicate a key according to the serial number of the computer. Keep your extra key and reference card in secure locations.

The keyboard of your computer contains 84 keys that are discussed in the following pages.

Whenever you hold down any key, except the SHIFT, CTRL, ALT, CAPS LOCK, SCROLL LOCK, or NUM LOCK, it will start repeating. The rate at which it repeats will gradually increase as you hold the key down.

Alphabetic Keys

Your personal computer has the standard 26 letters of the alphabet arranged as they are on a typewriter. These keys allow you to enter either upper- or lowercase letters; hold down either SHIFT key or push the CAPS LOCK key to obtain uppercase letters.

The CAPS LOCK key is a push-to-engage, push-to-release key, and affects **only** the alphabetic keys. A light in the key indicates whether the feature is on (lit) or off (unlit).
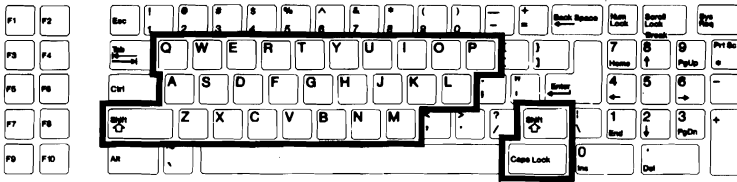
Figure 1.4. Alphabetic Keys

Nonalphabetic Keys

The nonalphabetic keys include: the numbers 0 through 9, punctuation marks, and special characters. The lower marking on each key is generated when neither SHIFT key is pressed, while the upper marking is generated when a SHIFT key is held down. The CAPS LOCK key **will not** shift these keys.
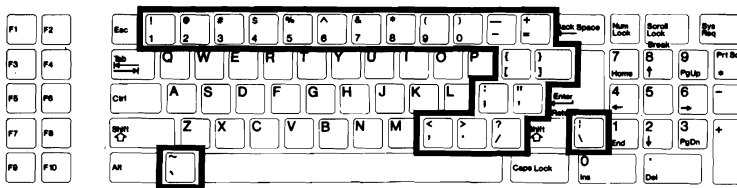
Figure 1.5. Nonalphabetic Keys

Initial Setup

Common Control Keys

Refer to Figure 1.6 for the following discussions which describe the most common function for each key. However, software (a program) may direct any key to cause some other function to take place. Any key that has a special function usually is described in the documentation that accompanies the software.

Space Bar — Enter a blank character (space) by pressing this bar.

BACK SPACE — Moves the cursor one position to the left. The cursor is an indicator on your display that lets you know where the next key entry will appear.

TAB — Causes the position of the cursor to move to the next tab column.

ENTER/RETURN — Returns the cursor to the left side of the display. This key tells the computer that data or instructions have been entered and may be processed.
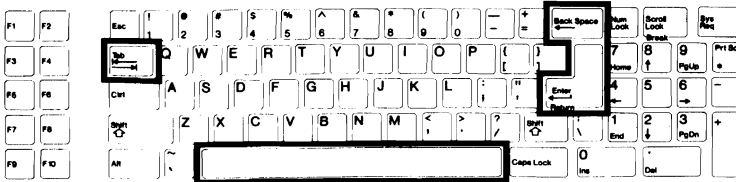
Figure 1.6. Common Control Keys

Special Function Keys

The following keys are used for special purposes by some programs. Instructions describing their use appear with the programs that use their functions.

Special Function Keys (F1 through F10) — Used for special purposes.

1/END, 2/(down arrow), 3/PGDN, 4/(left arrow), 6/(right arrow), 7/HOME, 8/(up arrow), and 9/PGUP — When none of the SHIFT of NUM LOCK keys are pressed, these cursor control keys are used to control cursor movement and screen presentation.

0/INS and ./DEL — When none of the SHIFT or NUM LOCK keys are pressed, these two keys are used in applications that require special insertion and deletion operations. The DEL (delete) key often duplicates the BACK SPACE key, but may be used for other purposes.

SCROLL LOCK/BREAK — Used by application programs to control screen scrolling or interrupt program execution. This key is not always active.

PRT SC/* — Enters the asterisk or, when used with the SHIFT key, sends the contents of the screen to a printer.

SYS REQ — Program defined.
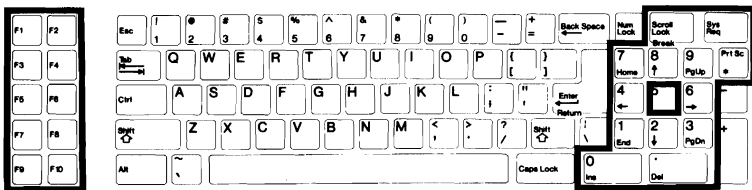
Figure 1.7. Special Function Keys

Control Keys

The control keys are used in combination with other keys to perform certain functions. Combinations using these control keys are explained in Table 1.1.

ESC — The escape key is used to stop the execution of a program/function or to perform special functions when you press it in sequence with another key. For example, if you want to enter ESC-E, press the **ESC** key, release it, and then press the **E** key.

NOTE: When you do not want your computer system to autoboot a disk, press the **ESC** key during autoboot (while the disk light is on). The system prompt and message will appear in the upper-left corner of the monitor's screen.

CTRL — The control key performs special functions by pressing it with another key simultaneously. For example, if you want to enter the CTRL-C combination, press and hold the CTRL key and then press the **C** key.

ALT — The alternate key is used to enter special commands by pressing it and another key at the same time. For example, if you want to enter the ALT-A combination, press and hold the **ALT** key and then press the **A** key.

NOTE: The CTRL, ALT, and DEL combination will reset your computer. All three keys must be pressed at the same time to return the computer to the power-up point.
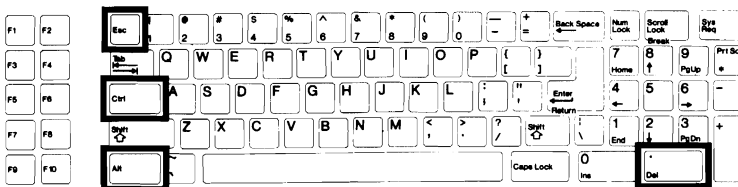
Figure 1.8. Control Keys

Table 1.1. Control Key Combinations

COMBINATION	FUNCTIONS
CTRL-S	When pressed, this key will cause any output to pause on the screen until any key is pressed.
CTRL-NUM LOCK	This key sequence will cause the computer to halt until any other key is typed.
CTRL-SCROLL LOCK	If this key is pressed, any MFM-200 command that is executing will be terminated and control will return to the MFM-200 monitor.
CTRL-C	Same as CTRL-SCROLL LOCK.
CTRL-ALT-DEL	This three-key combination will cause the computer to act as though it was just turned on. Diagnostics will be performed and the system will be initialized.
CTRL-ALT-INS	This sequence acts the same as CTRL-ALT-DEL, except that the machine does not actually reset, but rather, control is forced to the system monitor. Since a reset is not performed, the machine does not autoboot. This permits users to boot from an alternate drive even though the setup menu is set for autoboot.
CTRL-ALT-RETURN	This three-key sequence is used to suspend a program (usually during the debugging process). It saves the contents of the CPU registers, and acts as though a user breakpoint has been executed. The user may then use the MFM-200 facilities to examine/modify the CPU registers, I/O ports, or the contents of memory. To begin execution again where the processor left off, the MFM-200 'G' command is used (without specifying the '= < addr>').
ALT-ESC	When used with a Zenith keyboard, this toggles the key click. This means that pressing the keys will turn the key click on if it is off, and vice versa.

Initial Setup

Initial Setup

Calculator Keyboard Operation

Figure 1.9 shows those keys which are used to speed up the entry of data.

NUM LOCK — This key, when pressed, shifts the normal functions of the cursor keys and the INS and DEL keys to that of a calculator keypad. A small red light in the NUM LOCK key indicates whether the feature is on (lit) or off (unlit).

0-9, . , −, + — This group of keys, located to the right of the main keyboard, includes: the numbers 0 through 9 and a period for entry of decimal points; a plus for entry of positive numbers (optional in most cases); and a minus for entry of negative numbers. Some software may use the plus and minus keys to indicate the type and completion of an entry.
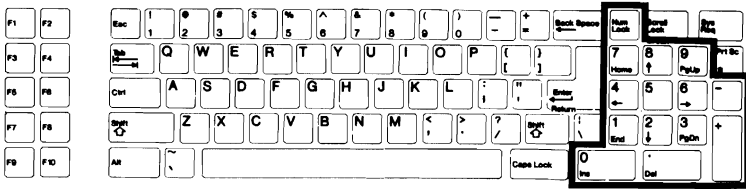
Figure 1.9. Calculator Keyboard

Keyboard Adjustment

The keyboard of your computer has an adjustment that allows you to select one of two positions of tilt. A leg is located under each back corner of the keyboard. Refer to Figure 1.10 and select the position that best fits your needs.

- To increase the tilt of the keyboard, refer to the inset in the figure and press each leg on the spot indicated.

- To select the closed position, move each leg back into its closed position.

Initial Setup
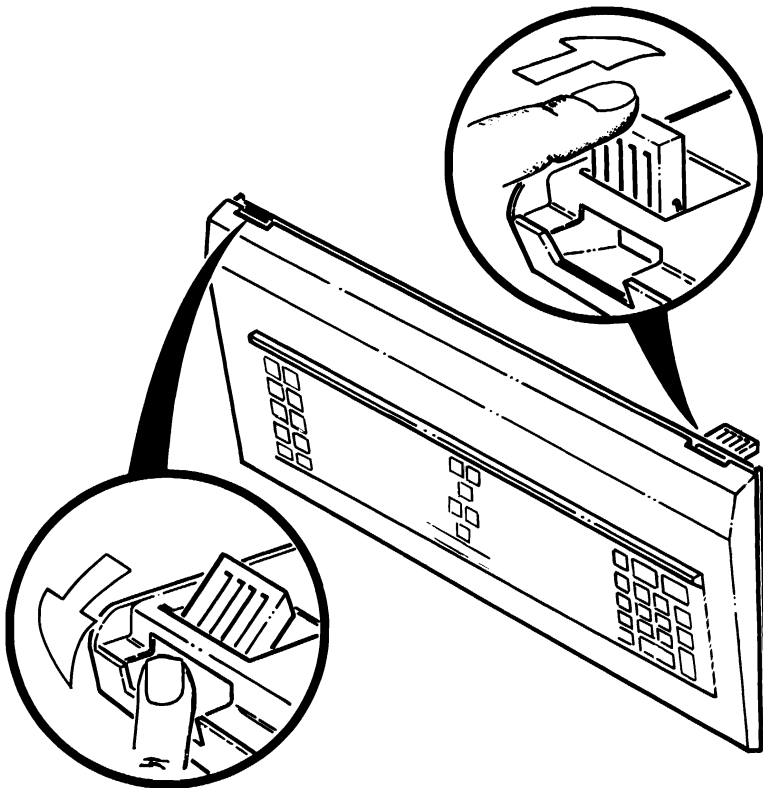
Figure 1.10. Keyboard Legs

The SETUP Program

The SETUP program serves as a reference, giving the computer informa-
tion about your system's configuration. The information you enter about
your system is kept in memory for all future uses and can easily be changed
if you alter your configuration.

Type **SETUP** after the MFM-200 system prompt (− >) and press the
RETURN key to run the program. If your computer is set for autoboot,
press the **CTRL** and **ALT** keys simultaneously and while holding them
down, press the **INS** key to get to the system prompt.

When the setup screen first appears, the standard selection in each field,
or grouping, is already highlighted on the screen with a rectangular-shaped,
reverse-screen image. You can make your own selections by highlighting
the data which matches your system's configuration.

You can move up, down, left, or right between fields using the arrow
keys. Within each field, except the time and date field, use the space
bar and BACKSPACE key to move between entries.

To make a selection, move to the desired field and highlight the entry
that describes your system. This selection will be locked in when you
move to the next field.

The message area at the bottom of the screen will provide help and error
messages.

TIME

The time and date are the only entries that need to be typed in. All
the other data is selected using the highlighted cursor.

The system's clock is battery-operated and will run continuously, even
when the computer is turned off. Therefore, you do not need to enter
a new time and date each time you turn the system on.

Initial Setup

The time clock operates on a 24 hour basis. For example, 2 p.m. is 14:00 and 11 p.m. is 23:00. The format for entering the time is hh:mm:ss, where hh is the hour, mm is the number of minutes past the hour, and ss is the number of seconds into the minute.

The time must be entered in a two-digit format. For example, the hour entry for 9 a.m. is 09. It is not necessary to enter the colons between the hours, minutes, and seconds. They will be entered automatically.

Example: 4:35 a.m. is entered as 043500.

4:35 p.m. is entered as 163500.

If the time is not entered correctly, an error message will appear at the bottom of the screen. The cursor will not move past the entry until a valid time is entered.

If you make a mistake while typing, use the BACKSPACE key to return to the position where you made the mistake and type over it.

After entering the time, press the **RETURN** key to move to the date entry.

DATE

The date entry format is mm/dd/yyyy, where mm represents the month, dd represents the day of the month, and yyyy represents the year. Note that the numbers representing the month and day consist of two digits, while the year is represented by a four-digit number.

Example: March 21, 1986 is entered as 03211986.

It is not necessary to enter the slashes between the month, day, and year. They will be entered automatically. After entering the date, press the **RETURN** key.

The time and date fields are the only ones which are entered using the RETURN key. In the remaining fields, your selection will be locked in when you move from a field using the arrow keys.

DST

The next field, to the right of the date and time, is labeled DST, which stands for Daylight Savings Time. If you are operating the system in an area where Daylight Savings Time is in effect at some time during the year, you will want to enable this feature. The clock will automatically be set backwards or forwards one hour on the correct day.

Base Memory

Select your computer's base memory size by positioning the highlighted cursor over 512K or 640K, using the space bar or the BACKSPACE key.

Expansion Memory

If your computer contains more than the maximum 640K of base memory, then you need to select the number of bytes of expansion memory you have added to the system. The selection ranges from 0 to 15,360 in increments of 64K. Use the space bar to make the number higher and the backspace key to choose a lower number. If you do not have any expansion memory, set the number at 0.

Floppy Drive 0

If you are using one or more floppy disk drives, you need to choose between the 360K low-density drive, or the 1.2M high-density drive for each one that is present. Your first floppy drive is referred to as "FLOPPY DRIVE 0." If you do not have a floppy drive, choose NOT PRESENT.

Floppy Drive 1

If you are using a second floppy disk drive, it is referred to as "FLOPPY DRIVE 1." Choose again between the 360K drive and the 1.2M drive formats. If you do not have a second floppy drive, choose NOT PRESENT.

Boot Drive

The Boot Drive field allows you to set your default drive, which is the drive the computer will autoboot first. Four options are available:

Option #1: The computer attempts to read the first floppy disk.

Option #2: The computer attempts to read the first Winchester disk.

Option #3: The computer attempts to read the first floppy disk and if a bootable disk is not found, continues on to the first Winchester disk.

Option #4: The computer enters the MFM-200 monitor. The system prompt (− >) will appear and you can then boot from any drive using the boot ('B') command.

Video Display

If your system includes an optional color video card, select one of these options:

Option #1: 40 × 25 for 40-character display

Option #2: 80 × 25 for 80-character text display

Option #3: 80 × 25 for monochrome display

Option #4: Enhanced graphics card

If you have an optional high-resolution monochrome text display adapter installed and plan on using it as the default display, select the monochrome card.

Video Refresh Rate

The video refresh rate should be set according to the power line frequency in your area. In the United States, the typical power line frequency is 60 Hz. If your system is not set correctly, the video screen will flicker.

Initial Setup

Winchester Drives

If you are using one or more Winchester disk drives, you need to select a drive type for each of them. Refer to Table 2.1 for the different types. For a factory-installed drive, the type can be determined by the code on the back panel. This code is arranged in 3-digit sets, each representing one drive.

- The first 3-digit set represents the drive identifier code for floppy drive A.

- The second 3-digit set represents the drive type identifier code for either floppy drive B (if present) or Winchester drive 0.

- The third 3-digit set represents the drive type identifier code for either Winchester drive 0 or Winchester drive 1, depending on whether floppy drive B is installed.

- The fourth 3-digit set represents the drive type identifier code for Winchester drive 1. The maximum of 12 digits indicates that four drives are installed in the computer.

Position the highlighted marker over the drive number and, using the space bar and backspace key, scan through the drive types (1 to 15), until you find the one which matches the data for your drive. If you do not have a Winchester drive, select NOT PRESENT.

Initial Setup

Table 1.2. Winchester Drive Types

TYPE	CAPACITY (BYTES)	CYL	HEADS	SHIPPING PRECOMP	ZONE
1	10M	306	4	128	306
2	20M	615	4	300	615
3	30M	699	5	256	710
4	65M	940	8	512	940
5	49M	940	6	512	940
6	20M	615	4	FFFF	615
7	40M	699	7	256	710
8	30M	733	5	FFFF	733
9	117M	900	15	FFFF	901
10	40M	925	5	000	926
11	37M	855	5	FFFF	855
12	52M	855	7	FFFF	855
13	20M	306	8	128	319
14	44M	733	7	FFFF	733
15	0M	000	0	0000	000

NOTE: Winchester drives 1-14 each contain 17 sectors/track.

Refer to Table 1.3 for the drive type that must be entered in the SETUP menu according to the drive type identifier code.

Table 1.3. Winchester ID Codes

DRIVE TYPE ID CODE	DRIVE TYPE	MANUFACTURER	MODEL	CAPACITY
156	1	Miniscribe	2012	10M
164	1	CMI	5412	10M
167	1	Seagate	412	10M
208	2	Seagate	4026	20M
237	2	CDC	225	20M
215	7	Hitachi	DK511-5	40M
239	10	CDC	94155-48	40M

If you are installing an additional drive and need to determine the drive type number, use Table 1.3 to cross-reference the model number of the drive to the correct drive type number. Some drives may have a label that indicates the drive type number.

Floppy Disks

A floppy disk consists of three parts: the plastic disk, the disk liner, and the disk jacket as shown in Figure 2.1. The disk itself is made out of a thin, flexible, plastic material that is coated with a magnetic oxide similar to that used in magnetic recording tape. It can be stretched or bent easily, leaving distortions in its surface that will destroy its usefulness.

WRITE PROTECT
NOTCH

DISK JACKET

PLASTIC DISK

DISK LINER
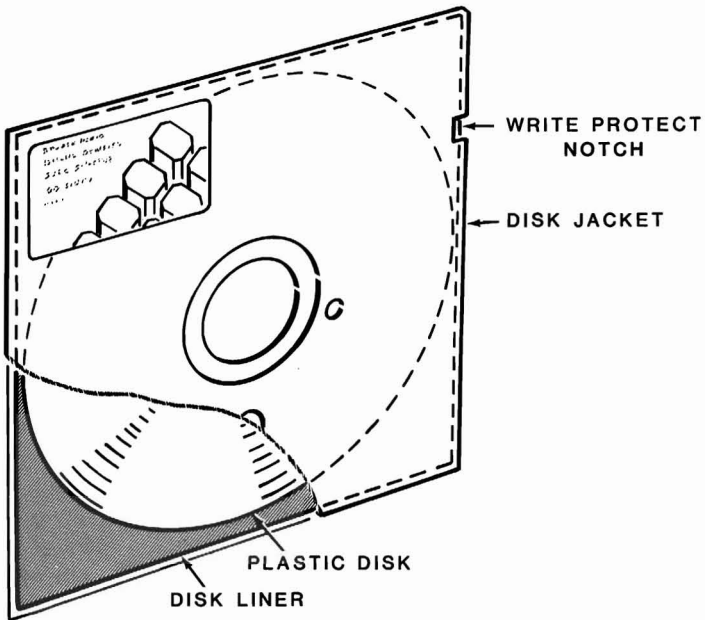
Figure 2.1. The Floppy Disk

Operation

The protective liner, a sleeve of cloth-like material that cleans the disk and traps dust particles, is placed around the disk. The outer jacket (with a label on the upper left-hand corner) adds additional protection and makes the disk somewhat rigid. The protective envelope covers the exposed areas of the disk when it is not in use or is being stored.

The outer jacket of a floppy disk has three openings and a notch along one side. The large center opening is used by the disk drive to grip the disk and rotate it. The small circular hole to one side is used for timing purposes and the long slot is used for access to the disk by the "read/write head."

The read/write head functions like the recording and playback head in a tape recorder. The disk comes in contact with the read/write head, and will either record (write) to, or read magnetic impulses from the disk. If the disk is in any way deformed, this process is interrupted and valuable data can be lost. For example, the oily residue left from a fingerprint may cause the disk to lose contact with the head, interrupting the read/write process.

The notch is called a "write-protect notch" and is located near the label. Whenever you have important information on a disk that you do not want to "write over," place a write-protect tab over this notch. The computer will sense its presence and will not record on this disk. Write-protect tabs usually come with blank disks when you buy them. The only disks you will encounter without the notch are some software master disks. This keeps the masters from being changed in any way.

When you purchase disks for use in your computer, ask for 5.25-inch disks that are soft-sectored, double-sided, double-density or high-density disks. You may use either 40-track, 48-tpi or 80-track, 96-tpi disks.

You always have to format brand new disks before you use them. Formatting is the "organization" of your disk so it can hold your "files" of information. This information may be data, programs, or the Disk Operating System (DOS). A disk that you have previously used can be reformatted, but remember, formatting a disk erases everything on it.

Floppy Disk Care

Floppy disks can be damaged easily. Observe the following precautions when handling them.

DO: Format all new disks.
Store them in their protective envelopes.
Keep them clean and dry.
Make backup copies of valuable disks.
Put write-protect tabs on valuable disks.
Label them with stick-on labels using a felt-tip pen.
Remove disks before turning the computer off.
Keep disks away from heat and direct sunlight.

DON'T: Reformat valuable disks.
Use ballpoint pens or pencils when writing on the labels.
Expose them to magnetism of any sort.
Touch the exposed surface of the disk.
Use paper clips on them.

Operation

Operation

Disk Drives

Next, look at the disk drives shown in Figure 2.2. They are mass storage devices designed to transfer information into and out of computer memory.

- **Disk Drives** — One high-density floppy disk drive is included with your desktop computer. Your computer also may include a Winchester hard disk system.

- **Disk Drive Positions** — If your computer has only one floppy disk drive, it will be known as drive A. The optional Winchester system may be divided in up to four parts, called partitions. These are identified as drive C, drive D, drive E, and drive F. If the Winchester system has a single partition, it is referred to as drive C.

The drive names are arbitrary with the disk operating system. Most systems that run on your desktop computer use the names illustrated here. Other operating systems may refer to the drives by other means. Consult the documentation supplied with your operating system for the names of the drives (drive A will be the first named drive; drive B, the next; and so on).

- **Disk Load Slot** — Insert a floppy disk in this slot with the label up and toward you. If the disk is not oriented as shown, the unit will not operate properly and you may damage the floppy disk and/or the disk drive. If the disk meets resistance while you are inserting it into the drive, check to make sure there is no disk already in the drive. The disk should slide smoothly into the drive, until you hear a click.

- **Disk Drive Latch** — Your floppy disk drive may contain a latch, door, or handle which is used to secure the floppy disk in the proper position in the drive. If the latch closes with difficulty, remove the disk, inspect the rim of the center hole for damage, check for proper orientation and try again.

- **LED Disk Access Indicator** — This light, which may be in one of several different locations on the front of your disk drive, indicates that the computer is attempting to read from or write to the disk. The read/write operation will be successful only if the disk is inserted properly and the disk drive latch is closed.

The left side of the front panel includes a keyboard lock that is independent of the power switch.

When the key is in the unlocked (clockwise) position, the computer is fully operational. In the locked (counterclockwise) position, the key can be removed and the keyboard is disabled. The cover is locked on the chassis when the keyboard is locked.

DISK DRIVES

WINCHESTER DISK ACCESS INDICATOR

WINCHESTER HARD DISK SYSTEM

FLOPPY DISK DRIVE

KEYBOARD LOCK

FLOPPY DISK ACCESS INDICATOR

DISK DRIVE LATCH

DISK LOAD SLOT

INSET

LABEL
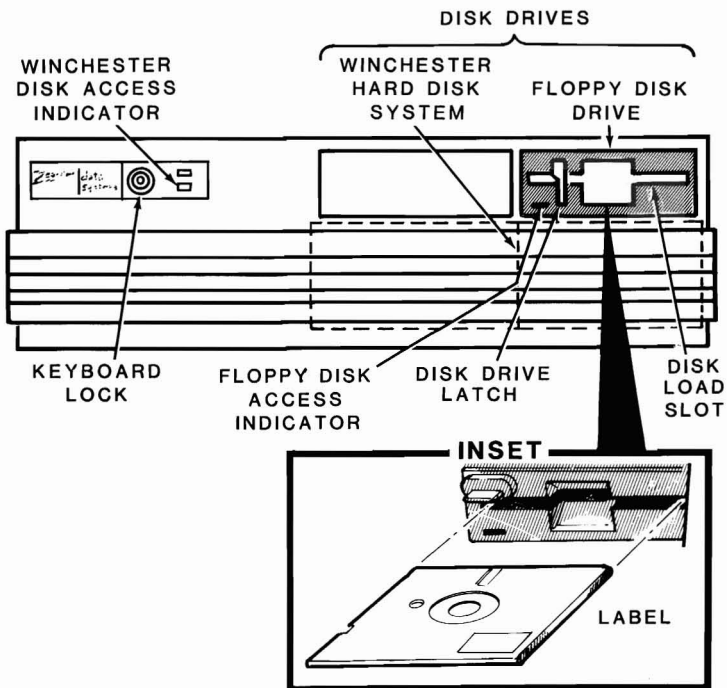
Figure 2.2. Disk Drives

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 from disk into memory. Wired computers are set at the factory to automatically boot the DOS when they are turned on. By changing the SETUP program (see the Setup section in Chapter 1), you can disable this feature called autoboot.

If the autoboot feature is disabled, after powerup, you will see a three-line message in the upper left-hand corner of your monitor's screen. Under this message, you will see a dash and greater than sign (–>), acting as an arrow, pointing to a blinking line. 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 prompt must be present. It occurs automatically after the system is turned on and may be reset at any time by pressing the CTRL, ALT and DEL keys at the same time. However, do not reset your computer unless you are sure that no important programs are being executed.

If the autoboot feature is enabled, then there will be no display until a certain amount of time passes, the ESC key is pressed, or a disk with the DOS on it is inserted into drive A. Some Winchester systems may attempt to boot from the Winchester system. If the DOS has not been placed on the Winchester disk, an error message eventually will be displayed.

If autoboot is on and you press the ESC key, the screen will show something similar to the following message. This message is the same for systems that do not automatically attempt to boot from a disk.

```
MFM-200 Monitor, Version 1.0
Memory Size: 512K
Enter "?" for help.
->
```

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 version and given a number (Version 1.0, Version 1.1, etc.). The version of your monitor program is shown in the first line of the message.

The second line of the message tells you how many thousands (K) of bytes of memory are installed in your computer. In this case, the computer illustrated has the standard 512K (or characters) of memory. Your computer may contain more, typically 640K, for some systems.

Your computer is now in the manual mode and you can use the monitor commands. A complete summary of the monitor commands is included in "Software Summaries," Chapter 4.

The B command is the monitor command you will use most often if your system is not set up to boot automatically, if a disk is not autobooted after powerup, or if you want to manually boot the system. The boot process reads the operating system from the disk and loads it into the computer. To use this command:

* Make sure the computer and the video monitor are on and the prompt is showing.
* Insert the MS-DOS disk (or any disk with a Z-200 PC Series disk operating system on it) into drive A.
* Close the disk door or latch.
* Press in sequence the **B**, **F**, and **0** (zero) keys. The computer will display BF0 (or bf0).
* 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.

The Disk Operating System

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

MS-DOS was prepared for the Zenith Data Systems Z-200 PC Series Computers by Microsoft. It is supplied on disks and must be loaded into your computer.

Loading MS-DOS

With the MS-DOS manual, you will receive two MS-DOS disks titled: Distribution Disk I, and Distribution Disk II. The following steps will show you how to load the DOS for the first time and then create backups, or working copies, of the distribution disks.

To load MS-DOS:

- Turn on the computer, or press the **CTRL, ALT,** and **DEL** keys in sequence while holding down each of the previous keys if the computer is already on.

- Insert MS-DOS Distribution Disk I into drive A.

- Close the disk drive door or latch.

- If you are booting the computer manually, press in sequence, the **B, F,** and **0** (zero) keys. The computer will display:

  bf0

- Press the **RETURN** key.

The disk access light will come on, indicating that the disk is being read by the computer. You may hear a buzz or two from your drive, which is the normal sound of the disk drive motors.

As MS-DOS is read into the computer, your display will show messages similar to the following:

```
MS-DOS Version 3.xx
(C) Copyright Microsoft Corp. 1981, 82, 83
Current date is Tue 1-01-1980
Enter new date (mm-dd-yy):
```

The date actually shown by your computer will probably differ from this display. The format for entering the date is M/D/Y or M-D-Y, where M is the month (1 to 12), D is the day (1 to 31), and Y is the year (80 to 99). Four digits may be used for the year. Any other response will cause the computer to display:

```
Invalid date
Enter new date (mm-dd-yy):
```

● Enter the current date and press the **RETURN** key. The computer will display:

```
Current time is 0:03:20.20
Enter new time:
```

The time actually shown by your computer will probably differ from this display. You will use the format H:M:S.C to enter the time, where H is hours (0 to 23), M is minutes (0 to 59), S is seconds (0 to 59), and C is tenths of a second (0 to 9). Minutes, seconds, and tenths of a second are optional and may be omitted. The separators, colon and period, must be used exactly as shown or else the following error message will be displayed:

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

● Enter the current time and press the **RETURN** key. The display will now show:

```
A>
```

You can see by this sample display that the arrow has been replaced by A> which is the prompt used by MS-DOS. This display also tells you which drive is currently being used by the system, called the default drive.

Operation

Later on, you will find out how to change the drive being used. But first, you need to create a copy, or backup, of MS-DOS and store the original in a safe place.

Backups

By making backups at regular intervals, you can minimize the amount of work that would be necessary to bring your computer records up to date if information is lost through mishandling of a disk or by some other cause.

Backups provide a convenient method of rotating your disks so that one is not in constant use. The backup procedure also gives you a way of verifying that the disk you are using is a good one and not one that may cause a problem.

The following discussion will take you through a step-by-step method of making backups. This procedure involves formatting a new disk and then copying every track from the original (source) disk to the new (destination) disk. DISKCOPY can be used to duplicate and produce identical disks, however, you cannot use it to produce nonidentical disks. We will show you another method to make backups using the FORMAT and COPY commands in Chapter 4 of this manual.

- Make sure your system is on and the MS-DOS prompt, A>, is on the display.

- Insert MS-DOS Distribution Disk I in drive A.

- Type:

  `DISKCOPY/V`

- Press the **RETURN** key. When you pressed the RETURN key, you told the computer to execute the command. The computer will display something similar to:

```
DISKCOPY version 3.xx


Source drive name?  (A-B) __:
```

Diskcopy is a utility; the version number illustrated may not necessarily match yours. There are several operator prompts, the first of which is now on the screen.

● Press the **A** key. This is your source drive, the one that contains MS-DOS Distribution Disk I. The computer will display:

```
Destination drive name?  (A-B) __:
```

● Press the **B** key. This is your destination drive, into which you will place a blank disk. The computer will display:

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

NOTE: With only one floppy disk drive, the computer will simulate two-drive operation; you will be prompted to switch disks when necessary.

● Press the **RETURN** key.

When the computer completes this copy, repeat the same procedure for the other distribution disk.

If the disk you placed in drive B contains flaws on the surface of the disk or in the magnetic coating, an imperfect copy was made and the following error message will be displayed:

```
Read error on destination drive
Disk verify failure
```

While it is possible to use this disk for other purposes, it is not recommended. If it is a brand new disk (never before used), it should be returned for replacement; otherwise, dispose of it.

Operation

Winchester Disks

The Winchester drive is an option that will allow you to store the equivalent of several dozen floppy disks inside your computer, ready for immediate access in your daily business needs. Besides additional on-line capacity of stored records, the speed at which that information may be accessed is increased by a factor of ten to twenty.

A Winchester disk drive system, such as the one in your computer, is only one of a family of disk systems generally called "hard disks."

The organization of an individual hard disk is similar to a floppy disk. However, a hard disk system may have more than one platter (disk), and the system may use each side of each platter. Therefore, each side will have its own read/write head. Each head is in alignment with the heads for the other platters or sides, and all are moved together.

A track is that portion of the disk that passes under a read/write head. If you have four read/write heads on four different platter sides, you will have four tracks that are passing under the heads at one time. These four tracks make up a "cylinder." A cylinder has as many tracks as there are heads in any particular hard disk system.

In addition to being divided into cylinders, tracks, and sectors, a hard disk may be "partitioned." A partition is a group of tracks or cylinders that you use as a "logical" drive for a particular application or operating system.

A logical drive acts like a floppy disk. Because a rigid drive is considered to be a logical drive, it will be treated the same as an individual floppy disk drive. It will be uniquely identified with a drive name, such as C or D. It may contain an operating system such as MS-DOS, or may be used strictly for data storage.

The Winchester in your computer uses a single head per platter side, and is sealed against contamination from the outside. Before you can use it, the disk surfaces must be prepared (formatted like a floppy disk) and partitioned. Your operating system from Zenith Data Systems contains four utility programs: PART, PREP, SHIP, and DETECT that will be used to prepare and partition your system. They are discussed in Chapter 4.

Winchester Operation

A Zenith Data System Personal Computer shipped from the factory is set up to boot from a floppy or the Winchester disk. However, the first time you use your system, the Winchester will not be ready to use because it will not yet contain an operating system. It also is possible that it may not have been prepared or partitioned, although this normally will be done before the Winchester drive is shipped from the factory. Refer to Chapter 4, "Software Summaries" and the MS-DOS documentation for more information.

NOTE: Before turning the power off on a computer with a Winchester drive, run the SHIP Utility to prevent accidental data loss.

Installing Operating Systems

This section explains how to install MS-DOS 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 four partitions: one called DOS and three unallocated. Winchester disks distributed by Zenith Data Systems have a very large storage capacity when compared to floppy disks. To make practical use of all this storage space, partitions divide the disk space into more manageable sizes. You can use up to four partitions on your Winchester disk. Each partition will be treated like an individual disk. Therefore, you may have different operating systems on different partitions. However, you may not have two different operating systems on the same partition.

The first of the four partitions that exists on your Winchester disk as shipped from the factory occupies the total available Winchester disk space. It has been assigned a distinct name: DOS. This can represent any of the popular operating systems that are sold by ZDS for the Z-200 PC Series. Therefore, you do not need to run PART completely before you use your Winchester disk. If the one partition will meet your needs, proceed to Establishing the Default Boot Partition. Note that there is no requirement that you use MS-DOS on this partition, in spite of the name given to it.

First you will use one section of PART to establish the default boot partition for the operating system. Then you will install MS-DOS.

Operation

Establishing the Default Boot Partition

● Use your MS-DOS disk and run PART as described in your MS-DOS manual.

● Press the **F1** key to establish the default boot partition.

● Press the **1** key to select DOS (for the MS-DOS operating system) as the default system to be used when booting from the Winchester disk.

● Press the **E** key to quit PART, and press the **M** 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 reset and reboot your system using the operating system you wish to install. If you wish to install MS-DOS, you will have to boot your system with MS-DOS Distribution Disk I.

● Turn on your computer (if it is not already on), place your MS-DOS Distribution Disk I in the floppy disk drive, and close the drive door.

● If your computer is not set up to boot from the floppy disk, press the **ESC** key to stop any autoboot process. Then press the **B** key and then the **F** and **0** keys, followed by the **RETURN** key.

In a moment, the MS-DOS initial message will appear and you will be asked to enter the date and time. Enter them. The MS-DOS prompt will appear.

● Type:

FORMAT C:/S

● Press the **RETURN** key. The C represents the first MS-DOS Winchester partition (under MS-DOS, drives A and B are assigned to the built-in floppy disk, and drives C through F can be assigned to the four Winchester partitions). The /S switch will establish the operating system on the disk. You will see:

```
FORMAT version 3.xx
```

```
Will FORMAT partition assigned drive C

Press RETURN when ready.
```

- Press the **RETURN** 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 also will be displayed.

- Type:

```
COPY A:*.* C:
```

The C: 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 MS-DOS Distribution Disk II.

Booting from the Winchester

NOTE: This boot procedure assumes that you have assigned the 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.

Operation

Operation

If your computer is not set up to boot from the Winchester disk, you will have to press the **ESC** key to stop any autoboot process (from the floppy disk), and then press the **B** key and then the **W** key, followed by the **RETURN** key. The Winchester disk access light will come on along with the MS-DOS opening message. You may now use any MS-DOS program or utility you want.

Booting from the Winchester —
No Default Boot Partition

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

```
Not a bootable partition
```

If you have selected a partition that has not been formatted, the prompt will reappear on your screen. You may attempt to boot the system as previously described.

If you have selected a partition that has been formatted, but does not contain an operating system, the operation of your personal 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 operating system manual for more information.

Other Operating Systems

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

Backing Up the Winchester Disk

Because it is possible to store the equivalent of several dozen floppy disks on the Winchester disk, two commands, BACKUP and RESTORE, have been added to the MS-DOS operating systems to aid you in backing up your Winchester MS-DOS partitions. You may elect to copy only certain files, files updated recently, or the entire partition.

The operation is further enhanced by providing an automatic FORMAT procedure for the floppy disk, protection against unwanted overwriting of existing files on the Winchester, verification, and so on. For complete details of the features and operation of BACKUP and RESTORE, refer to your MS-DOS manual.

To back up the entire MS-DOS partition, use the following instructions:

● Have a good supply of 5.25-inch floppy disks on hand that may be used for backups.

● Boot the Winchester system and at the MS-DOS prompt, type:

BACKUP C:*.* A:/V

The C designates the first Winchester disk MS-DOS partition.

If you want to back up a different partition, replace the C with D (or the appropriate letter representing the third or fourth partition). The wild card symbols *.* indicate "copy all files." The /V switch is used to verify that the copy is valid, and is identical to the original.

The system will prompt you to put the floppy disks into the disk drives as needed. When the process is finished, the MS-DOS prompt will reappear.

Restoration of the original files to the Winchester disk is also either somewhat selective or automatic. Again, you will find full details in your MS-DOS documentation.

Operation

Operation

● To restore the single file to the Winchester drive from your master backup floppy disks, type:

   RESTORE A: C:*.* V

Use the drive names as described in the BACKUP operation. The system will prompt you to place the floppy disks into the drives as needed. When the operation is complete, the MS-DOS prompt will reappear.

Manual Backups

MS-DOS offers the option of making manual backups of disks. While this process is not as simple as using DISKCOPY, it does permit you to make copies of files on different media (for instance, backup material on the Winchester to a floppy disk). This process also will allow you to create working copies of application software that may be distributed without an operating system.

System Disks

This section will show you how to use the FORMAT command to organize a disk so you can use it to store your files of data or programs, and put the operating system on it. Then you will use the COPY command to make a duplicate of your original files.

You must always use the format procedure with new disks. It also is necessary to format any disk that was used on a different computer, under a different operating system (other than MS-DOS), or that had been partially or completely erased by a magnetic field. Different computers and operating systems may use a different and incompatible format on the disk surface.

FORMAT

● Turn on the computer system and load (boot) MS-DOS. The computer will display:

A>

● Type:

FORMAT B:/S/V

● Press the **RETURN** key. The "B:" portion of the format command tells the computer that you want to use drive B to format your disk. The "/S" portion tells the system to place a copy of the operating system onto the disk in drive B. The "/V" portion tells the system to check and lock out (verify) any bad sectors (areas of the disk surface) that it finds. The computer will display:

FORMAT version 3.xx

Insert new disk in drive B
and press RETURN when ready.

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

● Insert a blank disk in drive B and close the door or latch.

● Press the **RETURN** key. Drive B's disk access indicator will glow, and the drive will make some clicking sounds as the disk is formatted. After approximately one minute the computer will display:

System transferred

Enter desired volume label (11 characters, RETURN for none)?

Operation

Operation

- Enter an appropriate title (limited to 11 characters with no spaces or punctuation), and press the **RETURN** key. The computer will display:

```
1213952 bytes total disk space
60416 bytes used by system
1153536 bytes available on disk

Do you want to format another disk (Y/N)?
```

- Press the **N** key for "no." The display will show the MS-DOS prompt.

The disk has been successfully formatted and the operating system placed on it. Even though you used drive B to format the disk, drive A stayed in control and is still the "default" drive. You know this by the A> prompt which is now on the screen, telling you the computer is ready for the next command.

COPY

- Place the disk you want to copy in drive A. Leave the disk in drive B alone.

- Type the following:

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

Here is what each part of this command tells your computer:

COPY	Copy
A:	from drive A (the source drive)
.	all the files (the asterisks are "wild cards" and mean all)
B:	to drive B (the destination).

- Press the **RETURN** key. You will now see the disk access indicators alternately glow as each disk drive is accessed by the operating system. The name of each file will be displayed as it is copied. You will also see a message that tells you how many files were transferred (copied) to the destination disk (in this case, all of them). Such a message might read:

```
26 File(s) copied
```

Nonsystem Disks

To prepare a disk that does not contain the operating system, the procedure is slightly different.

FORMAT

- Place your MS-DOS disk in drive A.

- Type:

```
FORMAT B:/V
```

- Press the **RETURN** key. The disk will not have the operating system placed on it for the format procedure, but it will be checked for bad sectors. Your computer will display:

```
FORMAT version 3.xx

Insert new disk in drive B
and press RETURN when ready.
```

- Insert a blank disk in drive B and close the door or latch.

- Press the **RETURN** key. Drive B's disk access indicator will glow, and the drive will make some clicking sounds as the disk is formatted. After approximately one minute the computer will display:

```
Enter desired volume label (11 characters, RETURN for none)?
```

Operation

- Enter an appropriate title (limited to 11 characters with no spaces or punctuation), and press the **RETURN** key. The computer will display:

    ```
    1213952 bytes total disk space
    1213952 bytes available on disk

    Do you want to format another disk (Y/N)?
    ```

- Press the **N** key for "no." The display will show the MS-DOS prompt. The disk has been successfully formatted, but the operating system has not been placed on it.

COPY

- Place the disk you want to copy in drive A. Leave the disk in drive B alone.

- Type the following:

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

- Press the **RETURN** key. You will now see the disk access indicators alternately glow as each disk drive is accessed by the operating system. The name of each file will be displayed as it is copied from drive A to drive B. When all the files have been copied, you will see a message that tells you how many files were transferred (copied) to the destination disk (in this case, all of them). Such a message might read:

    ```
    26 File(s) copied
    ```

The COPY command is used to copy one or more files from one disk to another. It is a widely used command and, as you can see, can be used to make backups or system disks from software that is distributed on nonsystem disks. The message displayed at the end of the operation tells you how many files were involved in any particular COPY operation.

CONFIGUR

CONFIGUR is an MS-DOS utility program that allows you to change the communications protocol of your computer to match that of your printer. A protocol is a set of parameters used in the process of exchanging information between computers and/or other devices such as printers. There is no one best protocol; however, in order to communicate successfully, both your computer and printer must use the same protocol.

If you are using only a parallel printer, the port is already configured for LPT1, so you do not need to run the CONFIGUR program.

The following example configures a serial Diablo 1640. If you are configuring a device other than a Diablo 1640, follow the example and substitute your device name in the step where the device type is specified. If your device is not listed, refer to the MS-DOS documentation for User-Defined Serial Configuration.

To begin to configure your system for a particular protocol, enter:

`CONFIGUR`

and press the **RETURN** key, the screen will display:

```
CONFIGUR Version 3.xx


Use one of the following options to configure a device

A. Configure LPT device
B. Configure COM device

C. Exit with no changes

Enter selection (A-C):
```

Operations

At this main menu, press **A** and the LPT menu will appear:

```
Use one of the following options to select the type of configuration

A. Map parallel output to serial output
B. Configure parallel device

C. Exit

Enter selection (A-C):
```

Press **A**

After A is pressed, the following submenu appears:

```
Select the parallel port to be mapped.

A. LPT1
B. LPT2
C. LPT3

D. Exit

Enter selection (A-D):
```

In response to this screen, press **B**

```
Use one of the following options to select the type of configuration

A. Map parallel output to serial output
B. Configure parallel device

C. Exit

Enter selection (A-C):
```

This is the same screen you saw when you started this operation. Since you have already told the computer you will be using a serial device:

Press **C**

```
CONFIGUR Version 3.xx

Use one of the following options to configure a device

A. Configure LPT device
B. Configure COM device

Use one of the following to modify an existing system

C. Exit program
D. Make changes to disk
E. Make changes to memory
F. Make changes to both disk and memory

Enter selection (A-F):
```

Since you have told the computer you are using a serial printer, you now need to tell it which serial printer.

Press **B**

```
Select the serial port to be configured

A. COM1
B. Exit

Enter selection (A-B):
```

Operation

Operation

Press **A** and the following will appear:

```
Use one of the following options to select the appropriate configuration

A. Compatibility mode (2400 baud, DTR and RTS pos.)
B. MS-80 (4800 baud, DTR pos. (pin 20))
C. H/Z-25 (4800 baud, RTS pos. (pin 4))
D. H-14/WH-24 (4800 baud, RTS Neg. (pin 4))
E. Diablo 630/1640 (1200 baud, ETX/ACK)
F. WH-23/WH-33/WH-43 modem (300 baud, No handshake)
G. WH-12 Votrax Type-N-Talk (4800 baud, RTS Pos. (pin 4))
H. User Defined
I. Exit with no changes

Enter selection (A-I):
```

As this example is for a Diablo 1640:

Press **E**

The main menu is displayed again.

```
CONFIGUR Version 3.xx

Use one of the following options to configure a device

A. Configure LPT device
B. Configure COM device

Use one of the following to modify an existing system

C. Exit program
D. Make changes to disk
E. Make changes to memory
F. Make changes to both disk and memory

Enter selection (A-F):
```

If you have completed the necessary configuration for your system, save the changes you have made to either disk, memory, or both.

General Service

This chapter contains general service information for your Zenith Data Systems Personal Computer. Included is information about diagnostic programs that check for errors in your computer hardware. This chapter also contains information about how to remove and replace the cover of your computer, locate the diagnostic LEDs, and what to do in case of difficulty.

Initial Diagnostics

Your personal computer performs a series of self-tests whenever it is turned on. The computer beeps if it encounters any hardware failures during these tests.

If the computer fails any of the tests, it attempts to display an error message. Possible error messages along with their likely causes are listed in Table 3.1.

Table 3.1. Possible Power-Up Diagnostic Messages and Explanations

```
+++ ERROR: CPU failure! +++
+++ ERROR: ROM checksum failure! +++
```

If either of the above two messages appear, the CPU card is not functioning properly. The checksum message is a result of a mismatch between a predetermined value and a value derived from the contents of system ROM. Turn the computer off, wait five seconds, and then turn the computer on again.

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Table 3.1 (continued). Possible Power-Up Diagnostic Messages and Explanations

+++ ERROR: RAM failure! Address: XXXX:YYYY, Bit: N, Chip: UXXX +++
+++ ERROR: Parity hardware failure! Address XXXX:YYYY,Chip:UXXX +++
+++ ERROR: RAM failure! Address: XXXX:YYYY, Chip: UXXX +++

These messages indicate that the CPU is unable to read or write to the RAM or video RAM memory. If the chip number displayed is a 200 number, the failure is on the CPU card. If the chip number is a 400 number, the failure is on the expansion card. Before replacing a card, check that the card is properly seated in the backplane slot.

+++ ERROR: Timer interrupt failure! +++

If this error occurs, the timing logic on the I/O card may have failed. Make sure that the card is properly seated and set up for the options installed. Also, check that all optional cards are set up correctly.

+++ ERROR: Keyboard not responding or not connected! +++

A message of this type indicates that the keyboard did not send the code at powerup to indicate proper functioning. The most likely cause is a disconnected keyboard. Check the cable to make sure it is connected.

+++ ERROR: Divide by zero! +++
+++ Overflow! +++
+++ Wild interrupt! +++
+++ ERROR: Memory parity failure! +++
+++ Non-maskable interrupt! +++

Instructions or interrupts were generated by the computer or a peripheral causing this type of error.

Table 3.1 (continued). Possible Power-Up Diagnostic Messages and Explanations

+ + + ERROR: CMOS Memory Failure! + + +

A memory test of the CMOS memory/clock chip on the I/O card indicates faulty memory within the chip.

+ + + ERROR: System Control Processor failure! + + +

The system control processor on the I/O card is not responding. This will affect the functioning of the keyboard as well as other vital system functions.

+ + + ERROR: Please replace the back-up battery! + + +

Replace the back-up battery that is to keep CMOS memory valid when power is not applied to the system.

+ + + ERROR: Bad configuration information found in CMOS! + + +

The memory in the CMOS chip does not contain valid information. The system will automatically execute the SETUP command so the user may set up the CMOS correctly.

+ + + ERROR: Base memory size error! SETUP: XXXK ACTUAL: XXXK + + +
+ + + ERROR: Expansion memory size error! SETUP: XXXXK ACTUAL: XXXXK! + + +

The amount of memory specified in the SETUP command does not equal the amount of memory actually found by the system. Faulty or non-existent memory, or invalid SETUP information may be the cause.

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Table 3.1 (continued). Possible Power-Up Diagnostic Messages and Explanations

```
+++ DISK ERROR: Drive not ready!  +++
+++ DISK ERROR: Seek failure!  +++
+++ DISK ERROR: Cannot reset drive!  +++
+++ DISK ERROR: Invalid data read!  +++
+++ DISK ERROR: Data corrected!  +++
```

These errors are usually caused when the system attempts to boot the operating system from a disk and no disk has been inserted into the disk drive. Be sure that there is a disk in the drive inserted correctly and the drive latch is closed properly.

```
+++ DISK ERROR: Disk not bootable!  +++
```

This error message indicates that the floppy disk is fine but the boot code read from sector 0 is not a valid executable code.

```
+++ DISK ERROR: Must run SETUP to boot from Winchester!  +++
```

This error message is for Winchester only and indicates that an attempt was made to boot from a Winchester drive for which no SETUP information was specified. Run SETUP and specify a Winchester drive type for that drive.

```
+++ DISK ERROR: Bad disk controller!  +++
+++ DISK ERROR: DMA overrun!  +++
```

Errors of this nature usually indicate a malfunction on the disk controller card, but may also be caused by other defective cards in the system. If any nonstandard cards have been installed, they should be suspected first in an error condition of this nature.

Table 3.1 (continued). Possible Power-Up Diagnostic Messages and Explanations

+++ DISK ERROR: Bad disk controller! +++
+++ DISK ERROR: DMA overrun error! +++

There errors usually indicate a faulty disk controller card but may be caused by other cards in the computer (game cards), remove these additional cards and run the tests again. If the problem no longer occurs, replace the cards one at a time; then run the test after each card has been inserted. When the system no longer functions, the last card placed in the system could be defective.

+++ DISK ERROR: Sector not found! +++
+++ DISK ERROR: CRC error! +++
+++ DISK ERROR: Invalid address mark! +++

These errors happen when booting the operating system from disk. They can result from using a disk that does not have a copy of the operating system on it, or from a faulty disk drive. Most often, this condition can be corrected by using another disk. If these errors occur often, it may be necessary to have a technician align your drives and/or adjust the disk controller card.

No error message — Occasionally, a malfunction may occur that, by its nature, prevents anything, including an error message, from being echoed to the monitor screen. Check to make sure that you are allowing enough time (up to thirty seconds for Winchester systems) for any disk I/O problems to "time out.

Whenever any of these error messages is displayed, be sure to write it down in full. Your service technician will need this information.

If the short suggestions listed in Table 3.1 do not correct the situation, turn to the Troubleshooting table in the In Case of Difficulty section of this chapter for further information.

General Service

Manual Diagnostics

In addition to the tests that run automatically when your computer is turned on, there are diagnostic tests that can be run from the keyboard.

The testing sequence is begun by typing TEST while the monitor prompt (− >) is showing on the screen. The following display will appear:

```
CHOOSE ONE OF THE FOLLOWING

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

ENTER YOUR CHOICE:
```

To run any of the tests, press the corresponding number key. Once the test starts, with the exception of the keyboard test, it will run until it locates an error or you stop it. The keyboard tests operates on a key-by-key basis.

After beginning each test, the computer will display a screen similar to:

```
SAMPLE TEST




                TEST COUNT = 1




        TYPE <ESC> TO ABORT
```

Disk Read Test

The disk read test is used to troubleshoot problems in the disk drive used to load (boot) the operating system. When this test is selected, a system disk must be in drive A. Do not use a distribution disk for this test.

Place a disk with an operating system on it in drive A and press the 1 key. The red disk access LED on the drive will glow and the boot tracks will be read continuously.

Each time the initial code is read from the boot tracks, a counter will be incremented. If an error is detected:

    DEVICE ERROR

will be displayed.

Keyboard Test

For the keyboard test, press any printing (non-escape) key and a screen full of the character will be displayed. The character code of the key will be displayed in the upper right-hand portion of the screen.

Base Memory Test

The base memory test is more extensive than the initial power-on memory test. It displays the same set of error messages as the power-up diagnostics.

While the video RAM is being tested, patterns will appear on the screen.

General Service

Expansion Memory Test

The expansion memory test checks all optional memory cards that have been placed in the computer. If no expansion memory has been installed, the message:

    NO EXPANSION MEMORY INSTALLED

will be displayed on the screen.

Power-Up Test

The power-up test is provided as a means to continuously run the initial tests. A message:

    TEST COUNT = 1

will be displayed in the center of the screen. The number will be increased by one each time the test is successfully passed.

Any error messages generated will be the same as those in the Power-up Diagnostics section.

Stopping the Diagnostic Tests

To stop any of the tests, press the **ESC** key. If you are running the keyboard test, pressing ESC will return you to the diagnostic menu as seen in the Manual Diagnostics section.

To return to the menu from any test other than the keyboard test, you must first stop the test and press **ESC** a second time.

LED Diagnostic Indicators

Your Zenith Data Systems Personal Computer is a reliable machine that will not need much service. However, as with all computers, there is the possibility of a major hardware failure that would prevent the screen display of diagnostic messages.

Because of this, built into your computer are two sets of LEDs which report diagnostics independent of the screen display. The diagnostic LEDs are located on the I/O card and on the backplane board. To see these LEDs, the cover of the computer must be removed.

Cover Removal

Refer to Figure 3.1 for the cover removal procedure.

1.   Turn off the computer and unplug the line cord from the AC outlet.

WARNING: Hazardous voltages may be present inside the computer whenever the line cord is connected to an AC outlet. **Do not** begin disassembly before unplugging the unit.

2.   If a monitor is connected to the computer, disconnect its cable and set the monitor aside. Also disconnect the cables of any other peripherals connected to the computer and set them aside.

3.   Make sure that the keyboard lock is in the fully clockwise position (unlocked).

4.   Remove and save the screws that secure the top cover to the unit.

5.   Remove the cover by sliding the cover to the front while holding it up to avoid catching any wires, cables, or connectors. Set the cover to one side.
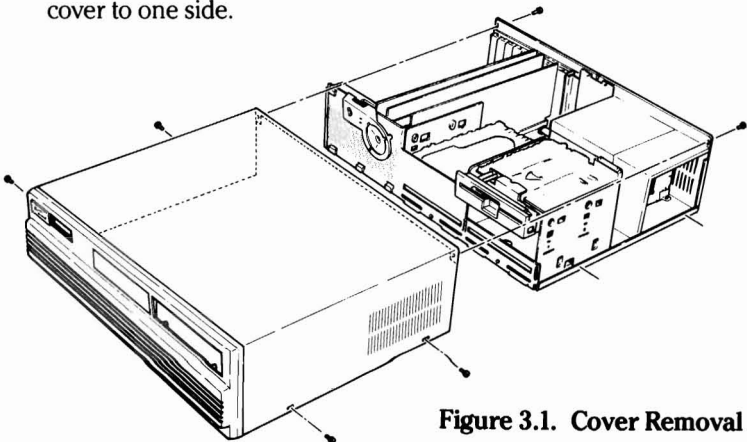
Figure 3.1. Cover Removal

General Service

Locating the Diagnostic LEDs

With the cover removed, you can observe a number of printed circuit cards. Most models have three cards, your model may have more. These standard cards are mounted in the backplane board.

Diagnostic LEDs are located in two places: the I/O card and the backplane board. The LEDs on the I/O card are red; on the backplane board they are green.

Viewed from the front, the I/O card is located the fourth slot from the right. Near the top front of the card are the six red diagnostic LEDs. Viewed from the front, the six green backplane LEDs are at the right rear of the backplane. See Figure 3.2.
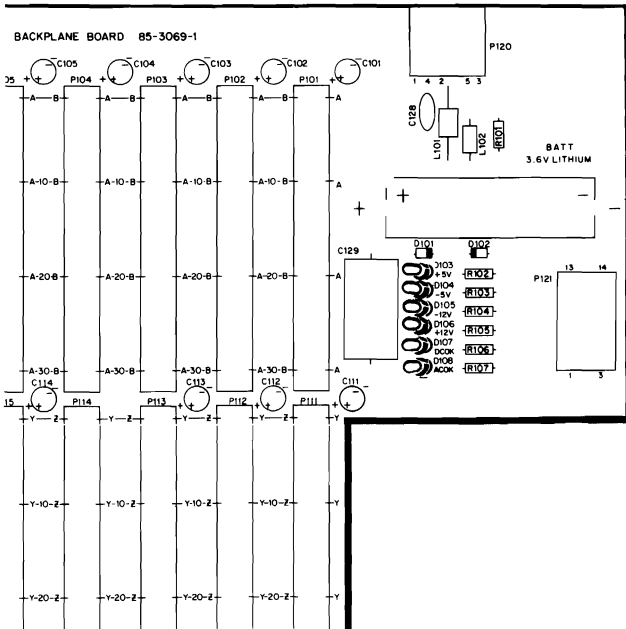
Figure 3.2. Backplane LEDs (Green)

Check to make sure that your machine is still turned off. Reconnect the power cord to the computer and plug it in.

Turn the machine on while observing the LEDs. The functions indicated by each of the I/O card LEDs are shown in Figure 3.3 and Table 3.2.
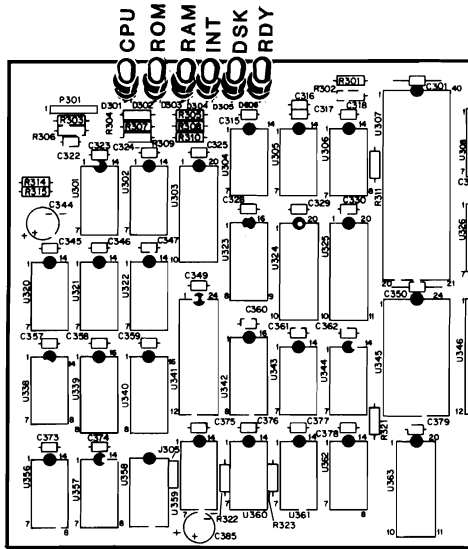
Figure 3.3. I/O Card LEDs (Red)

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All of the LEDs on both the I/O card and backplane board should light when the computer is first turned on.

As the diagnostic tests are successfully completed, the I/O card LEDs, with the exception of the final LED, turn off one-by-one in sequence from the front to the rear. The final LED will turn off after the operating system is read from the disk.

Table 3.2 indicates which hardware functions correspond to each of the I/O card LEDs.

Table 3.2. LED Diagnostic Functions

LED NUMBER	FUNCTION	DIAGNOSIS
1	CPU	The central processing unit is bad.
2	ROM	The program ROM in the computer is invalid.
3	RAM	The random access memory is not storing information correctly.
4	INT	The system clock timer, interrupts, or keyboard is malfunctioning.
5	DSK	The disk controller is not responding correctly.
6	RDY	This light remains lit until after an operating system is read from the disk.

Because only one LED is extinguished at a time, in the event of a major hardware failure several LEDs may remain lit. The LED remaining lit nearest to the front of the machine will be the one indicating the source of failure.

The LEDs on the backplane board should remain lit whenever the computer is turned on. If any of the LEDs are not lit, call your nearest Zenith Data Systems service technician.

Cover Replacement

1.   Push all of the cables down so they are no higher than the cards or power supply.

NOTE: Make sure the cables going to J5 on the disk controller card (slot 1) and P301 on the I/O card (slot 4) are properly connected.

2.   Slide the cover back on the unit and secure it with the screws removed and set aside during cover removal.

3.   Reattach the cables on the rear panel.
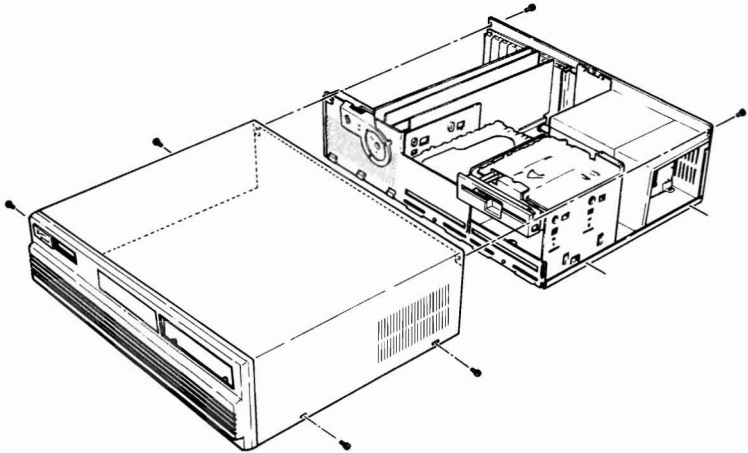
Figure 3.4. Cover Replacement

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In Case of Difficulty

All Zenith Data Systems (ZDS) computer hardware and software products are designed to work together as a complete system. Proper operation can be assured only when your computer is used with ZDS designed or approved accessories. ZDS does not assume the responsibility for improper operation resulting from custom interfacing, custom software, or the use of accessories not approved by Zenith Data Systems.

All the computer components have been wired and tested at the factory. If you encounter any malfunction during the warranty period, call your Zenith Data Systems dealer or authorized repair facility to arrange for service. **Do not** attempt to service this computer during the warranty period; to do so may void the warranty.

You may have out-of-warranty products repaired by your dealer or authorized repair facility. You may wish to obtain a maintenance contract for your computer system, or you can purchase individual replacement parts to do your own service.

The location of the nearest Zenith Data Systems dealer or repair facility can be obtained by calling 1-800-842-9000.

Troubleshooting

Table 3.3 provides troubleshooting information for common problems.

Table 3.3. Troubleshooting Table

CONDITION	POSSIBLE CAUSE
System won't boot automatically (autoboot on).	1. Wrong disk (you must use a system disk). 2. Disk inserted wrong. 3. Disk latch not closed. 4. Autoboot not set internally.

Table 3.3 (continued). Troubleshooting Table

CONDITION	POSSIBLE CAUSE
System won't boot from opening messages (autoboot off).	1. Haven't pressed the RETURN key. 2. Wrong disk (you are trying to boot from an unformatted disk or data disk). 3. Disk inserted wrong. 4. Disk latch not closed. 5. Pressed wrong key.
Nothing happens at poweron, and the green light on the front panel is not lit.	1. Line cord not plugged in (check both ends). If you are using a multiple outlet box, check its plug. 2. Power not on at AC power source (wall outlet). Check with a different appliance. 3. Power switch not on (either the computer or the multiple outlet box). 4. Line select switch incorrect for your area. 5. Cable attaching light and speaker not attached to I/O card.
System resets to power-on point or disk keeps rebooting.	1. Loose line cord. 2. Bad disk.
Error message displayed right after poweron.	1. See the inital diagnostics discussion.

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Table 3.3 (continued). Troubleshooting Table

No video (blank screen) on the monitor.	1. External monitor not turned on.
	2. External monitor not plugged in.
	3. External monitor not properly connected to computer.
	4. Brightness control turned down.
	5. Computer not transmitting a signal (screen was blanked or cleared by a program). **NOTE:** This will not be the case when you first turn on the unit or the computer is waiting for you to do something.
	6. CPU failure during initial tests (see the initial diagnostics discussion).
Insufficient brightness.	1. Brightness control turned down.

Service Information

In the extreme case where you are unable to resolve a difficulty, you may want to contact your Zenith Data Systems dealer or authorized repair facility.

The personal computer has built-in diagnostic routines that may assist the service representative in correcting any difficulties. Refer to the diagnostics sections of this chapter.

When You Call for Help

When you call for service, list the following information about your computer. It will help your dealer to diagnose and repair your unit.

1.   The problem you are having. If you ran the diagnostics, supply the tests you ran and the messages, if any, that were displayed.

2.   The name, model number, and series number of your computer.

3.   System configuration including any peripherals being used.

4.   Any additional information that will help describe your system and the difficulty you are experiencing.

General Service

Cleaning the System

The personal computer is well-designed and does not require a lot of maintenance. Occasionally you may want to wipe dust and fingerprints off the cabinets and monitor screen. Use the following suggestions to clean your equipment:

* Before cleaning the equipment, make sure the power is off.

* Use only a cloth that has been slightly dampened with water or a nondetergent cleaning solution.

* Do not use spray liquids or a soaking-wet cloth.

* After wiping the computer with a damp cloth, make sure everything is dry before turning it back on.

* Do not attempt to clean floppy disks.

* Any other portions of the system that cannot be cleaned in this manner should be left to qualified service individuals.

The most common problem experienced by customers with equipment of any kind is dust that builds up over a long period of time. Keep your computer and keyboard covered when they are not in use.

Software Summaries

This chapter of the Owner's Manual contains a summary of the commands used in the MFM-200 programs as well as the most rudimentary operations performed while using MS-DOS. Complete MS-DOS documentation is included with your operating system software.

MFM-200 Command Summary

Multi-Function Monitor, MFM-200, is the name of the firmware resident in your Z-200 PC Series Computer. This firmware, actually a two-ROM set, contains the basic input/output drivers used by the operating system for communication with the machine. The MFM-200 also contains:

- Power-up diagnostics capable of detecting almost any problem which would prevent the disk-based diagnostics from being run.
- A debugging facility similar to Microsoft's DEBUG, a utility used to monitor, debug, and edit assembly language programs.
- Ability to boot up from any drive attached to the system.
- Menu-selectable diagnostics that run diagnostics more advanced than the power-up tests. Since these diagnostics repeat until ended by the user, this permits long-term testing of the machine.
- The SETUP program that gives the computer information about the system's configuration.

An important element of the MFM-200 firmware is the monitor/debugger. This debugger, similar to the Microsoft DEBUG utility supplied with MS-DOS, contains a number of debugging facilities, including:

- Boot operating system from disk;
- Display a color bar chart.
- Display contents of memory;
- Fill memory with a string;
- Execute a user program;
- Input/Output to/from I/O ports;
- Display/change contents of CPU registers;

Software Summaries

- Search memory for a pattern;
- Single-step a user program;
- Disassemble a user program;
- Change video and scroll modes;

As well as containing a substantial subset of the commands available in the Microsoft DEBUG debugger, the MFM-200 monitor contains additional commands which support the system operation of the Z-200 PC Series Computers. These commands are summarized in Table 4.1. The syntax notation in this table is as follows:

- Items in brackets [like this] are optional, and need to be entered only in certain cases.

- Items in braces, separated by a vertical bar '|', {like this | and this}, represent a series of choices. Only one selection should be made from the alternate choices presented. In the above example, either 'like this' or 'and this' would be entered.

- Items enclosed in angle brackets as in <address> are to be replaced with a user-supplied entry (here, 2000:0 may be an actual entry).

- When a number is called for, a register name may be entered in its place — the contents of the specified register will be used.

- RETURN means to press the RETURN key.

- Ellipses (. . .) indicate you may enter more material similar to what is before the ellipses.

Table 4.1. MFM-200 Command Summary

CMD:	Explanation:	Syntax:
?:	Help	?
B:	Boot from disk	B [{F|W}][{0|1|2|3}][:<partition>]
C:	Color bar	C
D:	Display memory	D [<range>]
E:	Examine memory	E <addr>
F:	Fill memory	F <range>,{<byte>|"<string>"}...
G:	Execute (Go)	G [= <addr>][,<breakpoint>]...
H:	Hex math	H <number1>,<number2>
I:	Input from port	I <port>
M:	Move memory block	M <range>,<dest>
O:	Output to port	O <port>,<value>
R:	Examine Registers	R [<register>]
S:	Search memory	S <range>,{<byte>|"<string>"}...
T:	Trace program	T [<count>]
U:	Unassemble program	U [<range>]
V:	Set Video/Scroll	V [M<mode>][S<scroll>]
	Where <range> is:	<addr>{,<addr>|L<length>}
TEST:	Extended diagnostics	TEST
SETUP:	Define hardware Setup	SETUP

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Help   Syntax: ?

Example: ? *RETURN*

To help command displays a list of the commands available in the MFM-200 monitor, along with a syntax diagram.

Boot from Disk   Syntax: B[{F\|W}][{0\|1\|2\|3}][:<partition>]

Example: BF0 *RETURN*

This command reads the boot code from disk and executes it. If an error is detected, an error message will be displayed. If no drive number is entered, the computer will boot from the last drive or partition from which it was booted.

Software Summaries

Color Bar   Syntax: C

Example: C *RETURN*

Displays a 16-color bar chart that can be used to adjust a color RGB-input monitor.

Display Memory   Syntax: D[<range>]

Example: D1234:5678 L200 *RETURN*   or   D DS:7000 *RETURN*

Displays contents of memory in hexadecimal and ASCII (an ASCII period '.' is used for non-printing characters). If <length> is specified in <range>, the display is done for <length> bytes. If no address is specified, the next 128 bytes will be displayed.

Examine Memory   Syntax: E<addr>

Example: E 0:100 *RETURN* or   E DS:7000 *RETURN*

Displays the contents of a byte of memory, and requests user input. If a dash '–' is entered, the contents of the previous byte is shown, and a space will display the contents of the next byte. Otherwise, entry of a hexadecimal number from 0-FF will modify the contents of the byte currently being examined. RETURN is pressed to finish the E command.

Fill Memory   Syntax: F<range>,{<byte>|"<string>"}...

Example: F 1800:0,3FF,"Testing!",0D,0A *RETURN*

Fills contents of memory starting at <range> with data from the <string>. Data is reused from the list as often as necessary to fill the <range>.

Execute (Go)   Syntax: G[= <addr>][,<breakpoint>]...

Example: G 5000:3ACD *RETURN* or   G246 *RETURN*

Software Summaries

Transfers control to user program, with optional breakpoints. Up to eight breakpoints may be entered. If the processor encounters a breakpoint, MFM-200 saves the processor status for the 'R' and 'G' commands, and displays the processor registers and the currently executing instruction. Entering just G will cause the processor to pick up where it left off.

Hex Math   Syntax: H<number1>,<number2>

Example: H 43C7,99FA *RETURN*

Displays the sum and difference of the two hexadecimal values.

Input from Port   Syntax: I<port>

Example: I 3FE *RETURN*

Displays the contents of the selected input port.

Move Memory Block   Syntax: M<range>,<dest>

Example: M3219:FEDC,FFFF,3905:0 *RETURN*

Moves the block of memory specified by <range> to the destination <dest>. The move is performed so that overlapping moves will not result in overwriting of any data.

Output to Port   Syntax: O<port>, value

Example: O 21,BC *RETURN* or O DX,A *RETURN*

Outputs the specified byte value to an output port.

Examine Registers   Syntax: R[<register>]

Example: R SP *RETURN* or R *RETURN*

With a single register name specified, the contents of that register is shown, and you are prompted for input. If a valid hexadecimal number is entered at the prompt, the register's value is changed to that entered.

Software Summaries

With no register name specified, all registers are displayed.

The flags register (FL) is displayed as a sequence of two letter abbreviations for each of the flag bits. The abbreviations are:

FLAG	ON	OFF
Overflow	OV(overflow)	NV(no overflow)
Direction	DN(down)	UP(up)
Interrupts	EI(enabled)	DI(disabled)
Sign	NG(negative)	PL(plus)
Zero	ZR(zero)	NZ(not zero)
Auxiliary carry	AC(aux. carry)	NA(no aux. carry)
Parity	PE(even)	PO(odd)
Carry	CY(carry)	NC(no carry)

When changing the flags register, any of the listed abbreviations may be entered to set/reset individual flag bits. For instance, entering NV ZR would reset the overflow flag and set the zero flag. In the case of multiple abbreviations for the same flag being entered, the last one entered will take effect.

Search Memory   Syntax: S<range>,{<byte>|"<sting>"}...

Example: S 2400:15,8CD,"Alpha",3,"Beta" *RETURN*

Scan through the <range> of memory for <string>. Each time the search command finds an occurrence of the string, the start address of the string is printed.

Trace Program   Syntax: T[<count>]

Example: T 5 *RETURN*

Trace single-steps through a user program, printing the contents of the CPU registers after every instruction is executed.

If <count> is entered, single-stepping will begin at the new address. The current CPU address is used if no new CPU address is specified.

Software Summaries

The entered value is a repetition count indicating how many instructions should be executed before control is returned to the monitor. If no value is entered, the default is 1 (one) instruction.

Unassemble Program   Syntax: U[<range>]

Example: U *RETURN* or   U 1527 *RETURN*

Unassemble (or disassemble) a memory area into assembly-language form. If the address is not given, it will disassemble following the last unassemble. If <range> is not specified, the next 32 bytes will be disassembled.

Set Video/Scroll   Syntax: V[M<mode>][S<scroll>]

Example: V M3 *RETURN* or V S0 *RETURN* or VM6 S2 *RETURN*

The 'V' command is used to set the current video or scroll mode. The different modes are discussed in the Video Mode section of this manual.

Also set by the 'V' command is the current scroll mode. The scroll mode determines how information is moved off of the screen once it has been filled. The following scroll modes are acceptable:

●   0-Software (compatible) scroll mode. Information is scrolled by actually moving text around on the screen. This mode is the default on the Z-200 PC Series.

●   1-Hardware (jump) scroll mode. This mode, while not compatible with all application packages, is faster than the software scroll mode. This scroll mode may be used only in the 80 × 25 or the graphics video mode.

●   2-Smooth scroll mode. This scroll mode, usable only with high-resolution graphics, generates a dsiplay which is more readable than other scrolling modes. Readability is enhanced by moving characters upward a small piece at a time.

Extended Diagnostics   Syntax: TEST

Example: TEST *RETURN*

This command performs extended diagnostics. When this command is
executed, the user is presented with a menu permitting a number of
tests to be run.

Define Hardware Setup   Syntax: SETUP

Example: SETUP *RETURN*

This command enters the setup program to store the configuration infor-
mation in the system.

Special Function Keys

Several keys have special meanings to the MFM-200 monitor.

BACKSPACE	This key is pressed to correct typing errors prior to beginning execution of a command. Each depression of the BACKSPACE key de-letes a single character.
RETURN	Used to begin processing command which has been entered by the user.
SCROLL LOCK	When pressed, this key will cause any output to pause on the screen until any key is pressed.
CTRL-S	Same as SCROLL LOCK.
CTRL-NUM LOCK	This key sequence will cause the computer to halt until any other key is typed.

CTRL-SCROLL LOCK	If this key is pressed, any MFM-200 command which is executing will be terminated and control will return to the MFM-200 monitor.
CTRL-C	Same as CTRL-SCROLL LOCK.
CTRL-ALT-DEL	This three-key combination will cause the computer to act as though it were just turned on. Diagnostics will be performed and the system will be initialized.
CTRL-ALT-INS	This sequence acts the same as CTRL-ALT-DEL, except that the machine does not actually reset, but rather, control is forced to the system monitor. Since a reset is not performed, the machine does not autoboot. This permits the user to boot from an alternate drive even if SETUP is set for autoboot.
CTRL-ALT-RETURN	This three-key sequence is used to suspend a program (usually during the debugging process). It saves the contents of the CPU registers, and acts as though a user breakpoint had been executed. The user may then use the MFM-200 facilities to examine/modify the CPU registers, I/O ports, or the contents of memory. To begin execution again where the processor left off, the MFM-200 'G' command is used (without specifying the '= <addr>').
ALT-ESC	When used with a Zenith keyboard, this toggles the key click. This means that pressing these keys will turn the key click on if it is off, and vice versa.

MS-DOS Commands

An MS-DOS command is an instruction to the system that is typed on the keyboard. Some of the commands, called internal commands (referred to as resident commands in the MS-DOS manual), are an integral part of the operating system. Other commands, referred to as external commands (called transient commands in the MS-DOS manual), are actually separate programs (which we call utilities) on the disk and must be loaded into the computer before the functions are performed.

The FORMAT command, for example, is external; that is, it is a separate program. The COPY command is internal and, as such, is always a part of MS-DOS. In order to use an external command, the command file must exist on the disk. If the file is not present, the command can not be executed and an error message will appear on the screen.

MS-DOS Prompts

The prompt is a signal that your system is ready to accept a command. While using MS-DOS, you will see the prompt displayed as the letter representing the drive being used. The letter is followed by a symbol, usually a greater than sign (>), and a blinking underline. The underline is called the cursor and it lets you know where the next character will be displayed.

If you select drive A, the normal default drive on powerup, the MS-DOS prompt would look like this:

    A>

If you select drive B, then the MS-DOS prompt would appear as:

    B>

You can change the prompt and the default drive by typing the new drive name, a colon, and pressing the RETURN key. For instance, if drive A is currently the default drive and you want to change the default drive to drive B, type **B**: and press the **RETURN** key.

If drive B is the current default drive and you want to change the default drive to drive A, type **A**: and press the **RETURN** key.

You will notice that the current default drive (in the form of the prompt) is displayed each time you finish an MS-DOS command.

Error Messages

Your system will display an error message when something is wrong. The message itself often will tell you what is wrong so you will be able to correct the problem. An example of this would be:

    Invalid drive specification

This message implies that, in your command, you specified a drive that is not connected to your system. You would then re-enter the command, specifying the correct drive.

For a complete list of MS-DOS error messages and their meanings, refer to your MS-DOS manual.

Files, Programs, and File Names

A file may contain either data or a program. Some programs actually may consist of several different files such as MS-DOS. There are three programs (files) critical to the operation of MS-DOS: MSDOS.SYS, IO.SYS, and COMMAND.COM. The first two are hidden files that are physically present on the disk but do not display as part of the disk directory.

Software Summaries

Each file is identified by a file specification. It has three parts: an optional drive name, a file name, and an extension.

● **Drive name** — The drive name is a letter from A to F and must be followed by a colon. The use of these letters is limited by the configuration of your system. For instance, if your system does not have more than two drives and you try to use any drive name beyond B, an error message may be displayed.

● **File name** — The file name is from one to eight characters in length. These characters can be any letter from A to Z, any number from 0 to 9, or certain punctuation characters. Examples of legal file names are MYFILE, A1PROG, and 333-1.

● **Extension** — The extension is from one to three characters in length. The allowed characters are the same as those that you can use for the file name. A period (.) must be used to separate the extension from the file name. Examples are .BAS, .SYS and .COM. Some extensions, like .SYS, are reserved for certain file types. Consult your MS-DOS manual for further information.

Examples of valid and invalid file names are:

Valid file names:	Invalid file names:
MYPROG.BAS	WE,3.BAS (comma)
COMMAND.COM	B:MYP:2.BAS (second colon)
MSDOS.SYS	MS.OS.SYS (first period)

Internal Commands

Some of the commands that are internal to MS-DOS are listed in the following chart:

The command:	Tells the computer to:
COPY	Copy files.
DATE	Display the current system date and prompt for a new entry.
DEL (ERASE)	Delete a file from the disk.
DIR	List directory entries.
REN (RENAME)	Rename a file.
TIME	Display the current system time and prompt for a new entry.
TYPE	Display the contents of a file.

This is not a complete list of the internal MS-DOS commands. For a full discussion of all the internal commands, consult your MS-DOS manual.

COPY

The COPY command allows you to produce a copy of any file or program. The general form of the command is:

COPY (from) file specification (to) file specification

Remember that the file specification is made up of the drive name, the file name, and the extension. If the default drive is being used, you may omit the drive name.

Here are some examples of the COPY command:

(1) COPY OLDFILE.EXT NEWFILE.EXT
(2) COPY A:OLDFILE.EXT NEWFILE.EXT
(3) COPY B:OLDFILE.EXT A:NEWFILE.EXT
(4) COPY A:OLDFILE.EXT B:NEWFILE.EXT

Software Summaries

In each case, the file OLDFILE.EXT was duplicated under the name of NEWFILE.EXT. The drive name allows you to: (1) use the default drive for both files; (2) use drive A as the source drive and the default drive for the destination; (3) use drive B as the source drive and drive A as the destination; and (4) use drive A as the source drive and drive B as the destination. You will note that in examples (3) and (4) the default drive was not used.

There are several options and limitations in the format of the COPY command. These are fully explained in the MS-DOS manual. However, one very important restriction (for your protection against accidental file destruction) is that you may not copy a file onto itself. If you try it, the following error message will be displayed:

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

DATE

The DATE command allows you to change the date that is currently stored in your system.

- To execute the command, type:

  DATE

- Press the **RETURN** key. The computer will display the current date and prompt you for a new entry. If you press the RETURN key without entering a new date, the computer will not make any changes to the current date.

The format for entering the date is M/D/Y or M-D-Y, where M is the month (1 to 12), D is the day (1 to 31), and Y is the year (80 to 99). Four digits may be used for the year. Any other response will cause the computer to display:

```
Invalid date
Enter new date (mm-dd-yy):
```

Some examples of how valid dates are entered and stored are:

Your entry:	Will be stored as:
6-9-82	Wed 6-09-1982
12-31-2082	Thu 12-31-2082
1-1-80	Tue 1-01-1980
8/12/82	Thu 8-12-1982

DEL (ERASE)

There will be times when you have a file that you want to delete from a disk. For example, if your MS-DOS disk had a file by the name of BADFILE.EXT, you would do the following to delete it.

● Type:

DEL BADFILE.EXT

● Press the **RETURN** key. Or, you could type:

DEL B:BADFILE.EXT

● Press the **RETURN** key. You must use the drive name if the file you want to remove is not on the default drive.

The command ERASE may be used in place of the DEL command. The following are equivalent to the previous examples:

ERASE BADFILE.EXT
ERASE B:BADFILE.EXT

DIR

Each disk, when it has been formatted, is organized to accept files. The names of these files are stored on the disk in an area called the directory. The DIR command allows you to look at these files.

Software Summaries

● To display a directory on the default drive, type:

```
DIR
```

● Press the **RETURN** key. You will see a listing similar to the following partial listing of MS-DOS Distribution Disk I:

```
Volume in drive A has no label
Directory of A:\

COMMAND      COM    18160    12-13-83     11:20a
FORMAT       EXE    12656     1-06-84      2:43p
CONFIGUR     COM    19724    12-13-83      8:14a
CHKDSK       EXE     6468    11-21-83      3:24p
   .
   .
   .
PSCMX80      COM     1456    11-08-83      2:00p
PSCMPI       COM     1394    11-08-83      3:45p
         26 Files(s) 129024 bytes free
```

While your distribution disk will probably differ in the information displayed, you will see the same five columns of information representing, in order: (1) the name of each file, (2) the extension name, (3) the number of bytes used to store the file (a byte is a measure of memory which can be equated to one keystroke of a printable character on the keyboard), (4) the date, and (5) the time a file was created, last edited, or changed.

At the top of the listing you will see the label of the disk and the path name(s) of this directory. At the bottom of the directory list, you will see a total count of the number of displayed files and the number of bytes still free for your use on the disk. Complete information on directories, paths, files, and disk space can be found in the MS-DOS documentation.

You can list the directory of a drive other than the default drive by adding the drive name. For example, to get a directory listing of the disk in drive B:

● Type:

```
DIR B:
```

● Press the **RETURN** key.

If you want to look for a specific file, you may use the name of the file, as in the following examples:

DIR FORMAT.EXE
or,
DIR B:FORMAT.EXE

NOTE: You must use the entire file name. The inclusion of the drive name tells the computer to look on the disk in that disk drive.

Wild Cards

Two additional characters that you may use with a file's name are called wild cards. The term means "anything" and they are represented by the question mark (?) and the asterisk (*).

You can use the question mark whenever you want to match any letter in the position the wild card appears. For instance, if you type:

    DIR AB?DE.EXT

the computer will display any files with five letter names that begin with AB, end with DE, and have the extension of .EXT that appear in the directory of the default drive's disk.

The other wild card is the asterisk (*). This is used as a multiple question mark and will cause the computer to match with all characters found in those positions. For instance, when you type:

    DIR AB*.EXT

the computer will display any files with names that begin with AB and have the extension of .EXT. Likewise, if you type:

    DIR F*

the computer will list all files starting with the letter F, regardless of the rest of the file name or extension. If you type:

Software Summaries

```
DIR C*
```

for the directory sample we showed you earlier, the computer will display
something similar to:

```
Volume in drive A has no label
Directory of A:\

COMMAND COM        18160    12-31-83   11:20a
CONFIGUR COM       19724    12-13-83    8:14a
CHKDSK EXE          6768    11-21-83    3:24p
              4 Files(s) 129024 bytes free
```

To get a feel for how this works, place one or more of your disks in
the computer and experiment with the directory command.

Normally, you would have to also repeat the wild card * (asterisk) after
the period as well, as shown in the following:

> DIR F:*.*
> DIR C:*.*

However, DIR is the one command that will accept a single wild card
for both the file name and the extension.

RENAME (REN)

Occasionally, you will want to rename a file for one reason or another.
To do this, you would type:

RENAME NAMEONE.EXT NAMETWO.EXT
or,
RENAME B:NAMEONE.EXT NAMETWO.EXT

and press the RETURN key. These files don't exist on your MS-DOS disk
as shipped from the factory, but if they did, the computer would take
the file named NAMEONE.EXT and rename it NAMETWO.EXT. Note the
use of the drive name. If the file you want to rename is on a drive other
than the default drive, then the drive name must be used.

An alternative command to RENAME is REN. It does the same thing and may be used interchangeably.

TIME

The TIME command allows you to change the time that is currently stored in your computer. The command will be executed when you type TIME and press the RETURN key. The computer will display the current time and prompt you for a new entry. If you press the RETURN key, the computer will not make any change to the current time.

You will use the format H:M:S.C to enter the time, where H is hours (0 to 23), M is minutes (0 to 59), S is seconds (0 to 59), and C is tenths of a second (0 to 9). Both seconds and tenths of a second are optional and may be omitted. The separators, colon and period, must be used exactly as shown or else the following error message will be displayed:

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

Some examples of valid entries and how they are stored in your computer follow:

Your entry	Will be stored as:
9:15	9:15:00.00
9:15:30	9:15:30.00
9:15:30.5	9:15:30.50
14:2:3	14:02:03.00

TYPE

You can use the TYPE command to display the contents of a file on the screen for a quick view. By using the CTRL-P function (refer to your MS-DOS manual), you also may make a permanent hard copy on your printer.

If you would want to look at the file, TEXTFILE.TXT, you would enter:

```
TYPE TEXTFILE.EXT
```

The computer will now present the contents of the file on the display. If you want to temporarily stop the display, you can use the CTRL-S key as described in your MS-DOS manual.

Other Internal Commands

You will find more complete instructions on how to use the options of the internal MS-DOS commands in your MS-DOS manual. The internal commands that were not covered here also are discussed in that manual.

External Commands

External MS-DOS commands are actually separate programs. They are called commands because you can execute them from MS-DOS in the same manner as an internal command. Because they are separate programs, you can selectively remove them from your disk with the ERASE command.

All external commands will appear on the directory listing of a disk. These programs are known as utilities and are used for common tasks, such as the FORMAT command.

Some of the external commands included with MS-DOS are summarized as follows:

The command:	Tells the computer to:
CHKDSK	Check the directory, report free space, and repair the directory, if necessary.
CONFIGUR	Configure the system for specific hardware.
DISKCOMP	Compare the contents of two disks to see if they are identical.
DISKCOPY	Duplicate the contents of one disk onto another disk.
FORMAT	Format a disk.
SYS	Transfer the operating system.

CHKDSK

This command lets you check your disks to make sure they are still usable and do not contain any bad areas. You should use this command occasionally on all of your disks to verify that they have not been damaged. A number of error messages may be displayed, depending upon the condition of the disk. These error messages are discussed fully in your MS-DOS documentation.

After the error messages are displayed (if any), CHKDSK will display a status report consisting of the number of files on the disk, the total disk space, the amount of unused space remaining on the disk, the internal memory space in the system, and the amount of memory unused by the system.

A typical status report of any empty formatted disk (no label) would read:

```
1213952 bytes total disk space
1213952 bytes available on disk

 524288 bytes total memory
 485552 bytes free
```

This amount of total memory is for a system with 512 kilobytes.

A CHKDSK report for a disk (no label) that contains files on the disk would be similar to:

```
362496 bytes total disk space
 23552 bytes in 3 hidden files
126976 bytes in 27 user files
154624 bytes available on disk

524288 bytes total memory
485552 bytes free
```

The two hidden files are IO.SYS and MSDOS.SYS, which are present but not displayed during a listing of the directory.

DISKCOMP

The DISKCOMP command is a companion to the DISKCOPY command. Disks that have been duplicated with the DISKCOPY command can be checked against the originals with DISKCOMP. Also, if you have two disks and suspect that they are not identical, DISKCOMP is a quick method to check them out.

● To use DISKCOMP, type:

```
DISKCOMP
```

● Press the **RETURN** key. The computer will display:

```
DISKCOMP version 3.xx

Source1 drive name? (A-X) __:
```

● Press the letter that corresponds to the drive that you will use for one of the disks. The computer will now display:

```
Source2 drive name? (A-X) __:
```

● Press the letter that corresponds to the drive that you will use for the other disk. If you used A for one drive and B for the other, the computer will now display:

```
Place the source1 disk in A and the source2 disk in B.
Press RETURN when ready.
```

● After you insert the disks into their respective drives and press the **RETURN** key, the computer will now start comparing the two disks and will display:

```
Verifying...
```

If the two disks are not identical, the display will show:

```
Disk verify failure
Do you want to compare more disks (Y/N)? <N>
```

If the two disks are identical, then the display will ask:

```
Do you want to compare more disks (Y/N)? <N>
```

DISKCOPY

DISKCOPY is a disk duplication program that, once loaded into your system, will allow you to duplicate disks. You used DISKCOPY earlier to back up your MS-DOS distribution disks. **Do not** use DISKCOPY on a network drive.

DISKCOPY contains its own formatting routines, so the destination disks do not have to have been previously formatted. However, no check is made to see if the destination disk contains data, so be sure you know that the disk does not contain vital information before you proceed with DISKCOPY.

*   To use DISKCOPY, type:

    DISKCOPY

*   Press the **RETURN** key. The computer will display a message similar to:

    ```
    DISKCOPY version 3.xx
    ```

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

    X is a variable depending on your system configuration.

*   Press the key that corresponds to the drive which will contain your source disk. The next prompt will show:

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

*   Press the key that corresponds to the drive which will contain your destination disk. For instance, if you pressed the A key for the source and the B key for the destination, your computer would display:

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

Software Summaries

● Now place your source and destination disks in their respective drives and press the **RETURN** key. The display will show:

```
Formatting destination...
```

The destination disk will be formatted. This takes about a minute. After the formatting is completed, the display will show:

```
Copying...
```

Now the drive access indicators will alternately glow as the information is copied from the source disk to the destination disk. When all of the information has been copied, the display will show:

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

● If you have another disk to duplicate, press the **Y** key and then the **RETURN** key. You again will be asked to enter the name of the drives being used.

● If you do not have any other disks to copy, press the **RETURN** key. The computer will return to the MS-DOS prompt.

● An alternate method to use the DISKCOPY command is to type the following:

```
DISKCOPY A: B:
```

Here is what you are telling the computer:

DISKCOPY	Duplicate the disk
A:	in drive A
B:	onto the disk in drive B

● Press the **RETURN** key. The following prompt will be displayed:

```
DISKCOPY version 3.xx

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

● Place your source and destination disks in their respective drives and press the **RETURN** key. After the duplication process is completed, the computer will return to the MS-DOS prompt.

FORMAT

The FORMAT command is used to organize your disk so that it can receive files of data or programs. **Do not** use the FORMAT command on a network drive.

This command also puts information in the area of the disk which normally holds the operating system. If you try to boot your system with a disk which only has been formatted and does not contain an operating system, the following message will appear:

```
No system
```

If you get this message, you will have to reset your system by pressing the CTRL, ALT, and DEL keys at the same time. Then you can place a system disk in drive A and properly boot the system. The term system disk refers to any disk that has the operating system on it.

You can use the FORMAT command during the backup procedure and place the operating system on the new disk with a "switch." The disk also can be checked during the format procedure and verified. Two of the most common switches are: /S (for System) and /V (for Verify). If you want to make a data disk which will not contain the operating system, use the following instructions:

● With the system on and your MS-DOS working disk 1 in drive A, type:

```
FORMAT B: /V
```

● Press the **RETURN** key. The computer will display:

```
FORMAT version 3.xx

Insert new disk in drive B
and press RETURN when ready.
```

Software Summaries

● Place a blank disk in drive B.

● Press the **RETURN** key. The disk in drive B will be formatted. Then the computer will display:

```
Enter desired volume label (11 characters, RETURN for none)?
```

● You may use up to 11 continuous characters (excluding the period) for a name. Most computer users will use the underscore to join words. Press the RETURN key when you have finished typing your label. The computer will display:

```
1213952 bytes total disk space
1213952 bytes available on disk

Do you want to format another disk (Y/N)?
```

If the format program discovered any flawed areas on the disk, it will "lock them out" so that they will not be used. We suggest that disks with bad areas not be used for important data. The computer will display a message similar to the following for a disk with bad areas.

```
1213952 bytes total disk space
 107520 bytes in bad sectors
1106432 bytes available on disk
```

Likewise, CHKDSK will display similar information.

SYS

From time to time, improvements and/or enhancements will be made to the operating system included with your Z-200 PC Series Computer. When this happens, you can use the SYS command to copy the new system onto your existing disks. Refer to your MS-DOS documentation when you need to use SYS.

Other External Commands

You will use the CONFIGUR command to set up your system if you have a printer. This command was explained fully in Chapter 2.

The other external commands are explained in detail in your MS-DOS documentation.

Winchester Utilities

Four utility programs — PREP, PART, SHIP, and DETECT — are supplied with MS-DOS.

- **PREP** — This utility initializes the surface of your Winchester disks. It also will allow you to check for bad sectors and "lock out" any that are found. In addition, PREP will pre-allocate four partitions (described later), one for immediate use.

- **PART** — This utility redefines the partitions of your Winchester disk if those that are preset do not meet your needs.

- **SHIP** — This utility places the heads in your system over an unused portion of the Winchester disk. Use this utility whenever you move your personal computer, even a short distance.

- **DETECT** — This utility checks the surface of your Winchester disk for bad sectors. Where PREP destroys the data you have stored on your disk, DETECT does not.

A brief description of each utility follows. For more detailed explanations refer to the MS-DOS manual.

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 earlier, 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. Four partitions are set up — the entire disk is allocated to the first — so it is not necessary to run the PART utility unless you want to use any of the other partitions. The disk normally will have been prepared at the factory as part of the final testing procedure of your computer, 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 also will 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 DETECT 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 DETECT Utility for a discussion of this process.

Features of PREP

The PREP utility:

- initializes the surface of your Winchester disk,
- tests the data retention capabilities of your Winchester disk,
- isolates questionable disk sectors,
- divides the surface of the Winchester disk into four partitions, and
- sets up one partition with all the disk space allocated to it.

CAUTION: Using PREP will destroy all the files that may exist on your Winchester disk. Winchester disks supplied by Zenith Data Systems normally will be 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.

The PART Utility

The PART utility enables you to change the names, number, and sizes of Winchester disk partitions. It also allows you to specify which partition you want accessed when your computer boots up.

CAUTION: If you make any changes to the number or size of the partitions on your Winchester disk with either PART or PREP, you may destroy existing data on the disk. Therefore, if you have previously used the drive for data storage, you should back up all necessary files from each partition before using the PART program.

Current versions of MS-DOS support up to 32 continuous megabytes. To use a 40M drive completely, partition the Winchester into smaller partitions.

Features of PART

The PART utility establishes and/or changes:

- the name of each partition,
- the name of the operating system to be used with each partition,
- the amount of disk space allocated to each partition, and
- the name of the partition that is selected when you boot your computer from the Winchester system.

The SHIP Utility

The SHIP utility is provided so that you may place the heads of your Winchester system over a nonvital area of the disk. 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, that can damage the surface of the disks. Therefore, use this utility before you move your Winchester disk system, even from one table to another.

NOTE: Before turning the power off on a computer with a Winchester drive, run the SHIP utility to prevent accidental data loss.

Software Summaries

The DETECT Utility

The DETECT 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 chapter.

When a bad sector is located by the DETECT 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 DETECT will not be "locked out" until you run your MS-DOS FORMAT program and reformat the partition.

One advantage of DETECT 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.

Hardware

System Overview

Your Z-200 PC Series System is a flexible, reliable, and powerful personal computer. It is designed to provide you with years of trouble-free performance.

The heart of your system is the Central Processing Unit (CPU). The CPU processes information, performs arithmetic functions, and provides control for the rest of the system.

With a 200-watt power supply distributed through a ten-slot backplane board, the Z-200 PC Series Computer can support many different options. The basic system includes disk storage, memory, and input/output functions.
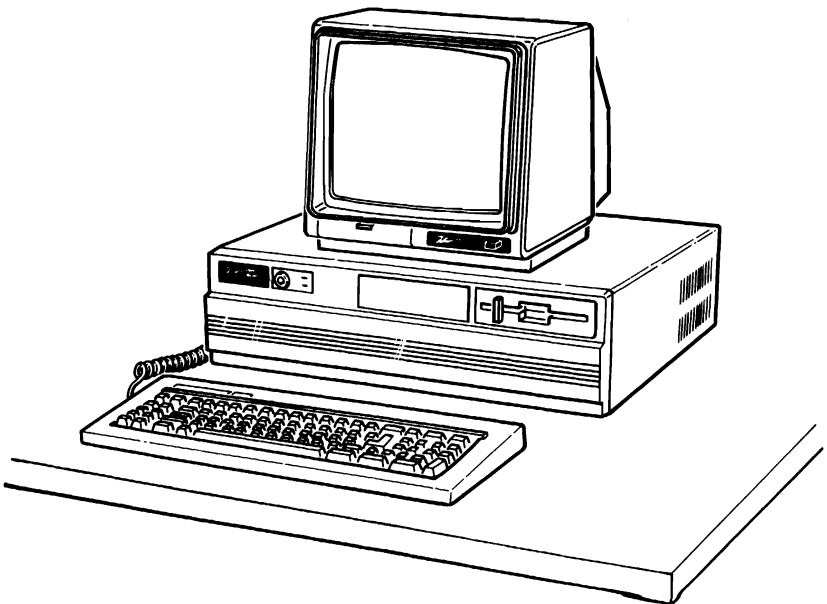
Hardware

Figure 5.1. Z-200 PC Series Computer

Hardware

The various parts of the personal computer are described in the following pages. Refer to Figure 5.2 for the location of each item described.

DISK CONTROLLER CARD
VIDEO CARD
CPU/MEMORY CARD
INPUT/OUTPUT CARD
4 CARDS

POWER
SUPPLY

BACKPLANE
CIRCUIT
BOARD
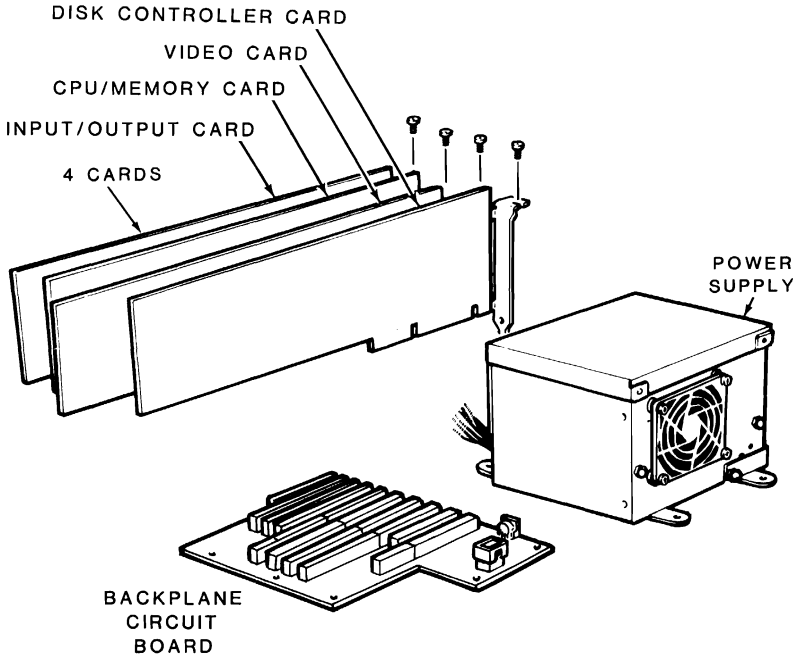
Figure 5.2 Hardware Configuration

Hardware

Power Supply

The switching mode power supply, located at the back right in the computer, provides 200 watts of power in a compact package. It can support many peripherals including the popular Winchester disk system.

Do not attempt to service your power supply. It has no user-replaceable parts.

Backplane

The backplane is a board that acts as the computer's central nervous system. It is securely mounted to the computer chassis and has slots for ten cards. When a card is plugged into the backplane, it becomes part of your computer.

The basic computer includes three cards: a Disk Controller Card, CPU/Memory Card, and Input/Output (I/O) Card. The seven remaining slots on the backplane are for expansion.

There are also six Light-Emitting Diodes (LEDs) for monitoring the power supply. Information about these LEDs is in "General Service," Chapter 3 of this manual.

Disk Controller Card

The disk controller card is capable of supporting up to two high performance Winchester disk drives and two double-sided, high-density (1.2M) floppy disk drives.

CPU/Memory Card

The CPU/memory card contains an Intel 80286 Microprocessor and a socket is provided for an optional 80287 numeric processor extension. This card also contains: logic for generating the 16-bit bus control signals; buffering for address, data, and control buses; 512K bytes plus one parity bit per byte of RAM; parity generation and checking; 60K of ROM; and 4K of special RAM.

Input/Output Card

The input/output card contains the system control processor (Intel 8042), keyboard interface, speaker interface, parallel port, serial port, DMA controller, interval timer, interrupt controller, address decoding and generation of control signals for the expansion bus, and six LED indicators for diagnostic purposes.

The tone generator provides signals from 37 to 32,000 Hz for a speaker that is mounted on the card guide.

The parallel output port provides support for peripherals (usually printers) that require parallel signals.

The serial input/output port is RS-232 compatible and can be used with a number of different serial input/output devices. You could connect a serial printer, plotter, modem for asynchronous communications, graphics tablet, or "mouse" to this port.

Specifications

Keyboard	84 keys with extended function capabilities, 8049 keyboard processor
Power Supply	200 watts DC outputs: + 5V, − 5V, + 12V, − 12V Input volts: switch selectable, 100-130 VAC, or 200-230 VAC Status signals: DC OK, AC OK
Processors	Intel 80286 16-bit Microprocessor Optional Intel 80287 Numeric Processor Extension
Memory	512K RAM standard
Audio	One 8-ohm, 2-inch speaker
Mass Storage	One floppy disk drive Double-sided, double-density, soft-sectored, 1.2M formatted capacity (MS-DOS Version 3)
Input/Output Ports	One parallel printer port One RS-232 serial input/output port
Environmental Range	60-90°F (15-32°C) 15-80% relative humidity

Hardware

Hardware

Disk Controller Card

● Supports up to two high-density (1.2M) or standard density (360K) floppy disks and two Winchester disk systems.

Mass Storage

Disks provide your computer with mass storage capability. Mass storage is important for several reasons which are explained in the following paragraphs.

Mass storage provides a place to store programs, data, and other information that needs to be kept for use some time in the future. Remember, information in RAM disappears each time the computer is turned off.

Mass storage also provides the computer with a place to store information that isn't being used at that very instant. For example, in word processing, long documents can reside on a disk and be moved to RAM as needed, where they can be edited quickly.

Mass storage is a reusable storage space. Once information is no longer needed, it may be erased and the space used for more current information. Floppy disks also provide a convenient method for transporting programs and data between computers.

CPU/Memory Card

● 80286 microprocessor
● Socket for 80287 numeric processor extension
● Contains boot, monitor, and diagnostic programs in ROM.
● System memory contains 512K of RAM.

80286 Microprocessor

The heart of your computer is the Intel 80286 Microprocessor. It consists of three sections — an Arithmetic Logic Unit (ALU), memory, and a control section.

The ALU performs all of the calculations for the computer. The microprocessor's memory holds information which the ALU or the control section may use. This memory, while small, is the quickest in the machine. The control section keeps all of the information coming and going in the proper order, making sure that information arrives at the proper place at the proper time.

80287 Numeric Processor Extension

On your CPU card there is a socket for an Intel 80287 Numeric Processor Extension.

This device can, with the proper software, take over some of the arithmetic processing from the 80286 microprocessor and speed up the calculating of certain kinds of data.

Not all programs will benefit from the numeric processor extension. Only programs that are specifically meant for it will benefit from the 80287.

Hardware

Read-Only Memory

Read-Only Memory (ROM) retains the information stored in it even after the computer is turned off. It contains information which is vital to your computer's operation. The CPU/memory card has one ROM integrated circuit which contains:

● Power-up self-test;

● SETUP program that stores the configuration information in the system.

● Facilities that enable programmers to enter, examine, change, or run machine language programs;

● The boot, or bootstrap loader, program which enables your computer to load the operating system into system memory from disk;

● Extensive menu-selectable diagnostics, covered in "General Service," Chapter 3 of this manual; and

● Video mode and scroll mode set commands, used to select the screen characteristics for the video display.

● Device drivers for the devices that can be connected to the system.

Random Access Memory

The smallest unit of information is called a bit. The next largest unit of information is a byte, which is composed of eight (8) bits. Each keystroke can be stored in one byte.

Random Access Memory (RAM) is used to temporarily store information, programs, and data, and to act as a work space for the CPU. Naturally, the larger the work space the more work that can be done.

The 32-bit processor of your computer can access up to 16 Megabytes of main memory under MS-DOS.

Input/Output Card

Keyboard

The keyboard connector is located on the backplane board and extends through the back of the computer.

The keyboard functions as an I/O device for your computer. See Chapter 1 for information concerning special keys.

Speaker

Your computer has a 2-inch speaker. GW-BASIC supports various tones and durations that enable your computer to play a full range of music. Consult the GW-BASIC manual for specific programming information.

Parallel Printer Output Port

The parallel printer port is located on the I/O card. Its DB-25 connector is accessible through the rear panel of the computer.

The printer port is used to drive Centronics-type print devices (printer or plotters). This standard has been adopted by a large number of manufacturers.

Note that the port is brought out of the machine to a DB-25 connector rather than an edge connector. You must have the proper cable to use the DB-25 connector.

Hardware

The operating system, MS-DOS Version 3, is configured to use this port as a standard printer port as it is supplied by Zenith Data System. Table 5.1 defines the connections for the parallel printer.

Table 5.1. Parallel Port Definitions

PIN NUMBER	SIGNAL NAME
1	Strobe
2	Data bit 0
3	Data bit 1
4	Data bit 2
5	Data bit 3
6	Data bit 4
7	Data bit 5
8	Data bit 6
9	Data bit 7
10	Acknowledge
11	Busy
12	Page end
13	Select
14	Auto feed
15	Error
16	Initialize printer
17	Select input
18-25	Ground

A typical parallel printer will be connected as shown in Figure 5.3. Be sure to use the proper cable.
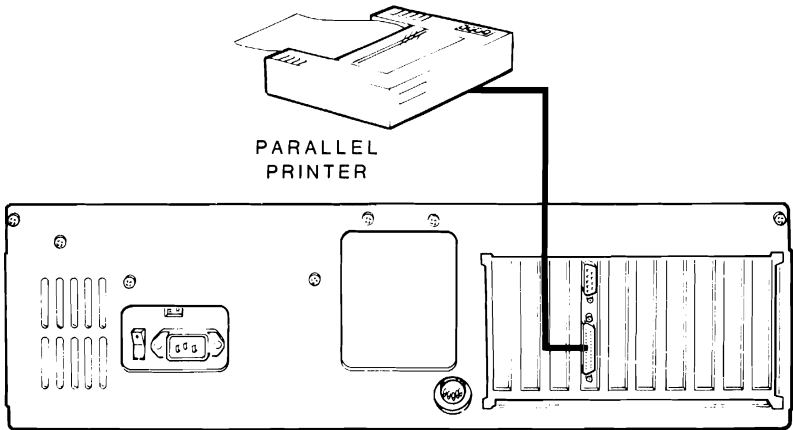
Figure 5.3. Parallel Printer Connection

Serial Printer Input/Output Port

Mounted on the I/O card is an RS-232 serial port that extends through the rear of the cabinet. The input/output port is software controlled and may be used with a wide variety of equipment, including serial printers, asynchronous modems, serial graphics devices, and even a "mouse."

The serial port comes from the factory configured as RS-232 Data Terminal Equipment (DTE). The control signals are listed in Table 5.2.

Table 5.2. RS-232 Pin Definitions

PIN NUMBER	SIGNAL NAME
1	Carrier detect
2	Receive data
3	Transmit data
4	Data terminal ready
5	Ground
6	Data set ready
7	Request to send
8	Clear to send
9	Ring indicate

Connecting a Serial Printer

If you have a serial printer, connect one end of your cable to the serial connector on the back of the computer and the other end to your printer. A special cable is needed to connect a DB-25 output to this connector. Refer to Figure 5.4 and the printer's documentation for specific instructions.

Before you can use the printer, you will have to run the configuration program (CONFIGUR) supplied with your operating system to properly configure the signals going to your printer. Refer to "Operation," Chapter 2, for specific instructions.
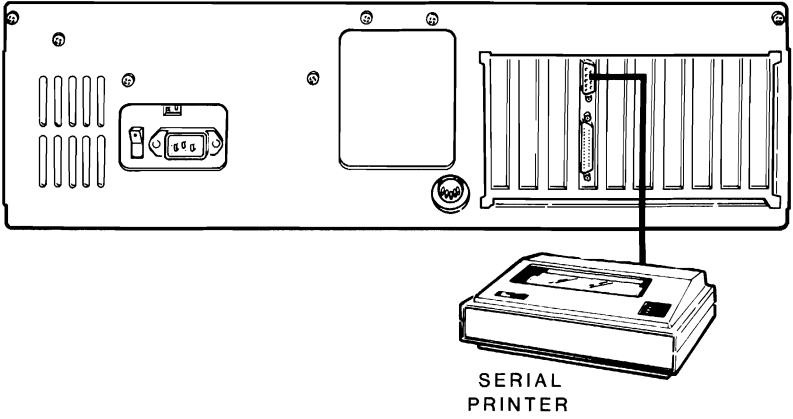
SERIAL
PRINTER

Figure 5.4. Serial Printer Connection

Hardware

Hardware
___

Connecting a Modem

There are two types of modems: acoustic-coupled and direct-connect. Both are attached to your computer the same way. However, the direct-connect also must be directly attached to your telephone line. Refer to Figure 5.6 and your modem's documentation for specific instructions.

To attach your modem to your computer, plug one end of your modem cable into the serial connector on the back of your computer. Secure the other end to your modem. Refer to your modem's documentation for specific instructions.
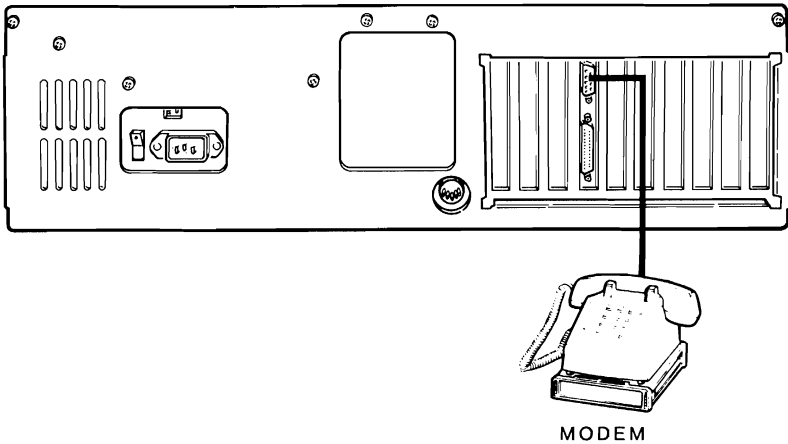
MODEM

Figure 5.5. Modem Connection

Installing Options

Cover Removal

Refer to Figure A.1 for the cover removal procedure.

☐   Turn off the computer and unplug the line cord from the AC outlet.

WARNING: Hazardous voltages may be present inside the computer whenever the line cord is connected to an AC outlet. Do not begin disassembly before unplugging the unit.

☐   If a monitor is connected to the computer, disconnect its cable and set the monitor aside. Also disconnect the cables of any other peripherals connected to the computer and set them aside.

☐   Make sure that the keyboard lock is in the fully clockwise position (unlocked).

☐   Remove and save the six screws that secure the top cover to the unit.

☐   Remove the cover by sliding the cover to the front while holding it up to avoid catching any wires, cables, or connectors. Set the cover to one side.
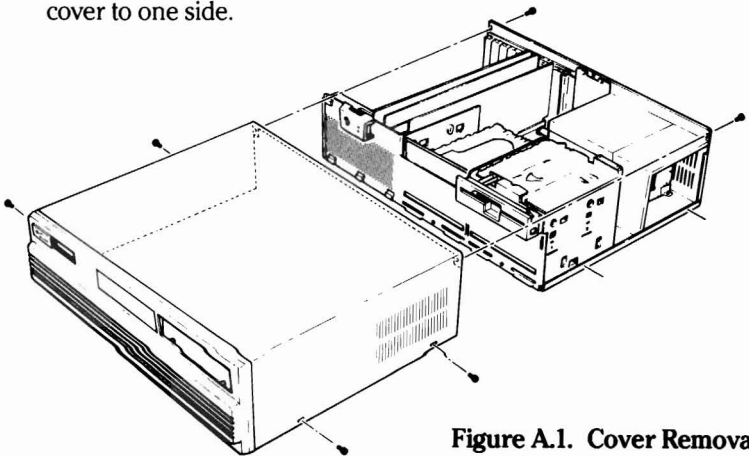
Figure A.1. Cover Removal

Appendices

Cover Replacement

☐   Push all of the cables down so they are no higher than the cards or power supply.

☐   Slide the cover back on the unit and secure it with the six screws removed and set aside during cover removal.

☐   Reattach the cables on the rear panel.

NOTE: Make sure the cables going to J5 on the disk controller card (slot 1) and P301 on the I/O card (slot 4) are properly connected.
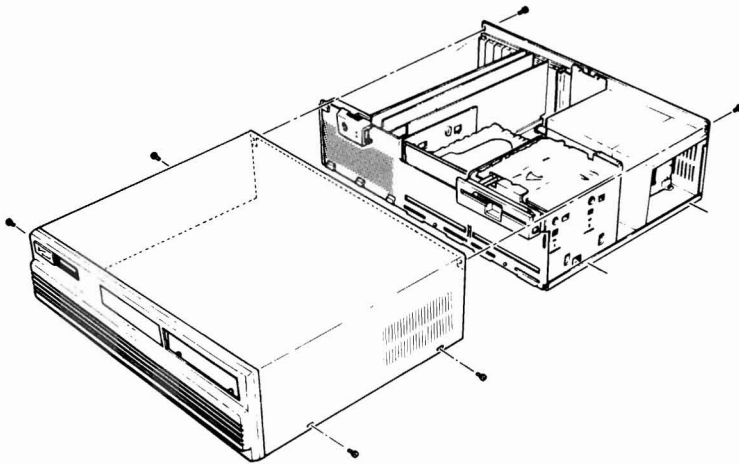
Figure A.2. Cover Replacement

Card Removal

Before any cards may be removed, the cover must be taken off.

☐ Disconnect any cables that may be attached to the card. Double check to make sure that you are removing the proper card.

☐ Remove the support bracket screw securing the card in the computer.

☐ Firmly grasp the card to be removed with one hand toward the front and the other about midway down the card. Lift the card directly up with firm pressure. **Do not** jerk the card.

☐ Place the card on a level, nonconducting surface with the components facing up.
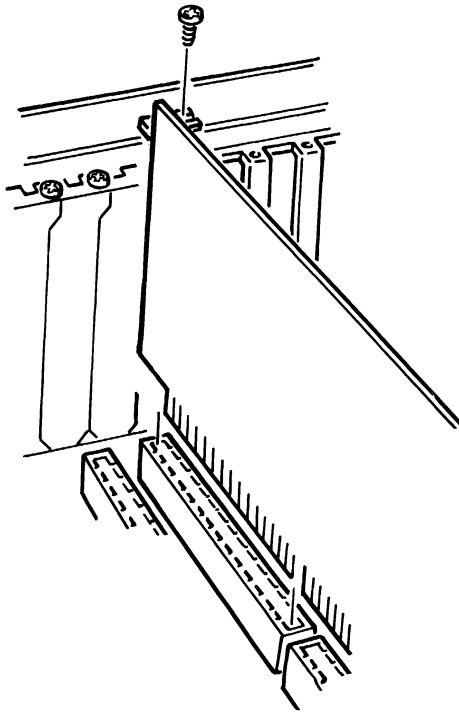
Figure A.3. Card Removal and Installation

Card Installation

See Figure A.3. The following information may be used to install new cards as well as to replace an existing card.

☐ Grasp the card and position it over the backplane.

☐ Make sure that the edge connector faces down and is aligned properly. Slowly and firmly slide the card into the edge connector.

☐ Secure the bracket of the card to the unit with the bracket screw. If necessary, reattach any cables.

☐ Replace the cover.

NOTE: If a card is purchased that is shorter than the chassis of the computer, the card guide adapter packed with the computer must be installed between the card and the chassis as shown in Figure A.4.
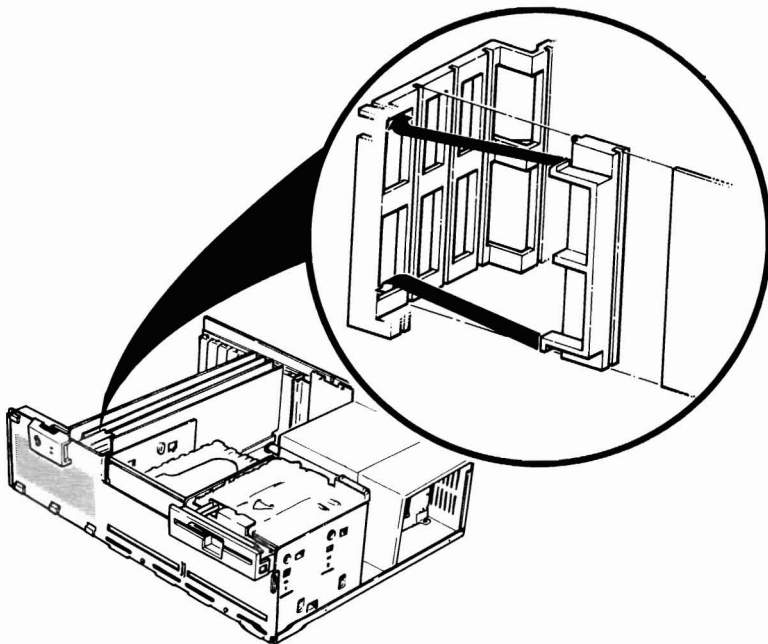
Figure A.4. Card Guide Adapter

Integrated Circuit Installation

To install optional Integrated Circuits (ICs) in your computer, the cover and the correct card must be removed.

CAUTION: ICs are complex electronic devices that perform many complicated functions in a circuit. These devices can be damaged during installation. Read all of the following information before you install any ICs.

Once you remove an IC from its protective foam packing, do not lay the IC down or let go of it until it is installed in its socket. When you bend the leads of an IC, hold the IC in one hand and place your other hand on your work surface before you touch the IC to your work surface. This will equalize the static electricity between the work surface and the IC.

The pins on the ICs may be bent out at an angle so they do not line up with the holes in the IC socket. **Do not** try to install an IC without first bending the pins. Incorrect assembly may damage the IC pins or the socket, causing intermittent and unreliable contact.

Before you install an IC, lay it down on its side, as shown below, and roll it very carefully toward the pins to bend them into line. Then turn the IC over and bend the pins on the other side in the same manner.

IC LEADS

A   B
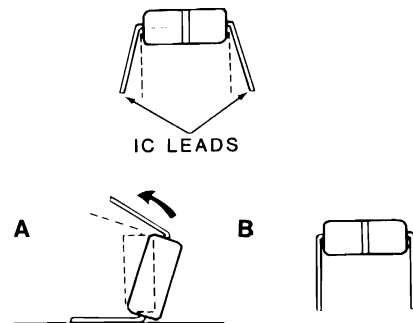
Figure A.5. Rolling to Bend Pins

Appendices

Installing Options

☐   Make sure that the pin 1 end of the IC is positioned over the index mark on the circuit board (not the socket) as shown in Figure A.6.

☐   Press the IC firmly into the socket.

NOTE: A pin can become bent under the IC and will appear to be correctly seated in its socket. If a malfunction occurs while testing, examine the IC (and remove it, if necessary) to be certain that all pins are correctly inserted.

Refer to the insert packed with your IC(s) for the correct location for installing your option.

INDEX
MARK

PIN 1
END

SOCKET

INDEX
MARK
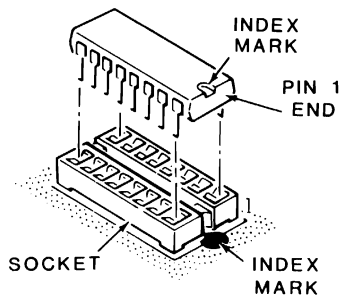
Figure A.6. Orientation and Alignment of an IC

Numeric Processor Extension Installation

To install the 80287 Numeric Processor Extension in your computer, follow the instructions for Cover Removal and Card Removal and remove the CPU/memory card. The CPU/memory card is located in the third slot from the power supply.

NOTE: The numeric processor extension is shipped in protective foam. Do not remove it from the foam until you are ready to install it in its socket on the CPU/memory card.

Using the instructions for Integrated Circuit Installation, install the 80287 in the 40-pin socket at location U219 on the CPU/memory card as shown in Figure A.7.

Replace the cover and card by following the procedure for Card Installation and Cover Replacement.
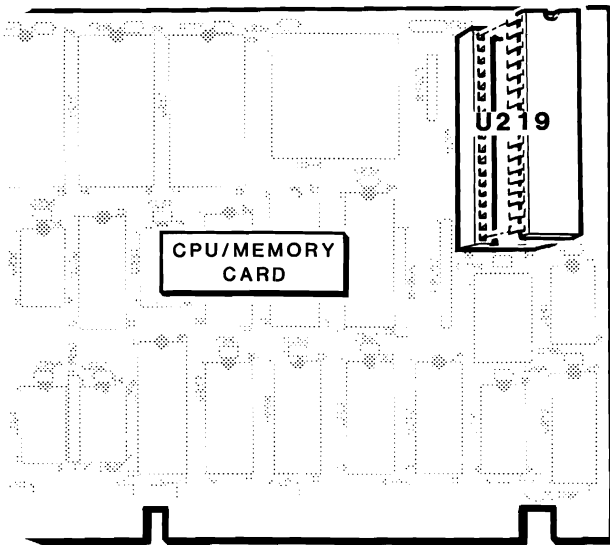
Figure A.7. Installation of Numeric Processor Extension

Connecting the Monitor

Unpack your color or monochrome monitor and place it where you nor-
mally will use it, making sure you have access to all of the controls and
connectors. If you are using a Zenith Data Systems monochrome monitor
with your new computer, you will find the cable packed with your com-
puter.

For RGB monitors — Connect one end of the cable to the RGB DB-9
connector on the back of the computer. Connect the other end to the
appropriate connector on the monitor (refer to your monitor's documenta-
tion for the location).

For monochrome monitors — Connect one end of the cable to the
composite monochrome video out connector on the back of the computer.
Connect the other end to the appropriate connector on the monitor (refer
to your monitor's documentation for the location).
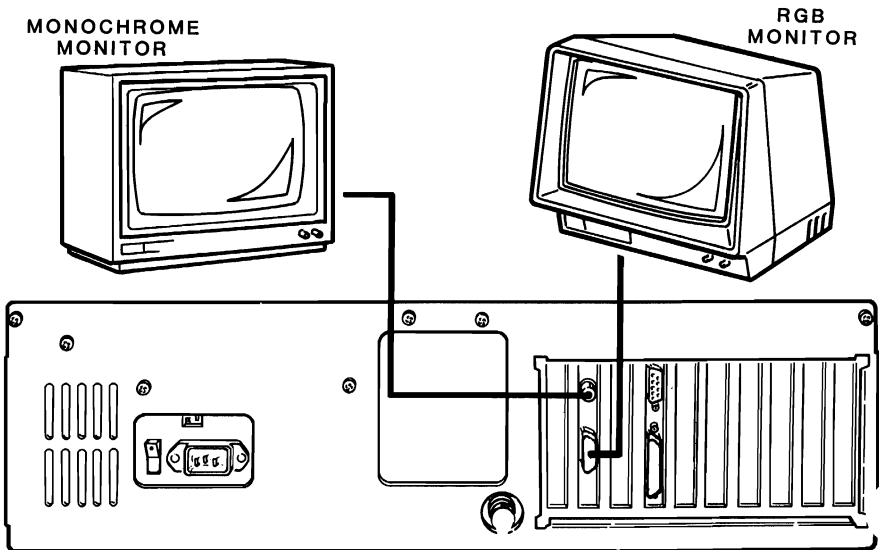
Figure A.8.   Monitor Connections

Installing Drives

Second Floppy Disk Drive Installation

Before a second floppy disk drive may be installed, the cover of the computer must be removed. Follow the instructions under Cover Removal in Appendix A.

Refer to Figure B.1 for the following steps. These instructions are for the installation of all models of floppy disk drives. For configuration of 360K floppy drives, refer to 360K Floppy Drive Configuration later in this appendix.
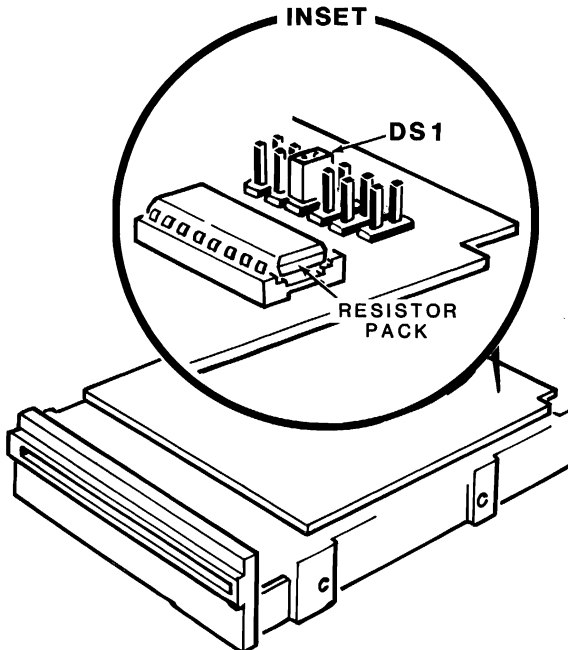
☐   Unpack the new disk drive and mounting hardware that is supplied.

Figure B.1. Programming Jumper

Installing Drives

NOTE: Do not remove the cardboard shipping insert that is in the drive until the installation is complete.

☐   Position the disk drive as shown. Refer to the inset drawing and check the programming jumper. If the jumper is not in position DS1, remove it and install it there. For the configuration of 360K drives, refer to 360K Floppy Drive Configuration later in this appendix.

NOTE: There are other jumpers in various places on the drive. These have been set correctly at the factory and should not be moved.

☐   Remove the resistor pack if installed.

☐   Remove the screw holding the disk drive chassis in the center of the computer as shown in Figure B.2. If a Winchester drive is installed in this chassis, disconnect the cables on the Winchester drive before removing the disk drive chassis.

☐   Slide the disk drive chassis to the rear of the computer until it passes the lip on the bottom of the main chassis.

☐   Lift the disk drive chassis straight up out of the computer.

☐   Refer to Figure B.2 and place the new disk drive on the four supports on the disk drive chassis. Fasten it with the four 6-32 × 3/8″ Phillips hex head screws packed with the disk drive.

☐   Place the disk drive chassis with the newly installed drive back in the computer and slide the chassis to the front. Make sure the drive chassis catches the lip on the main chassis.

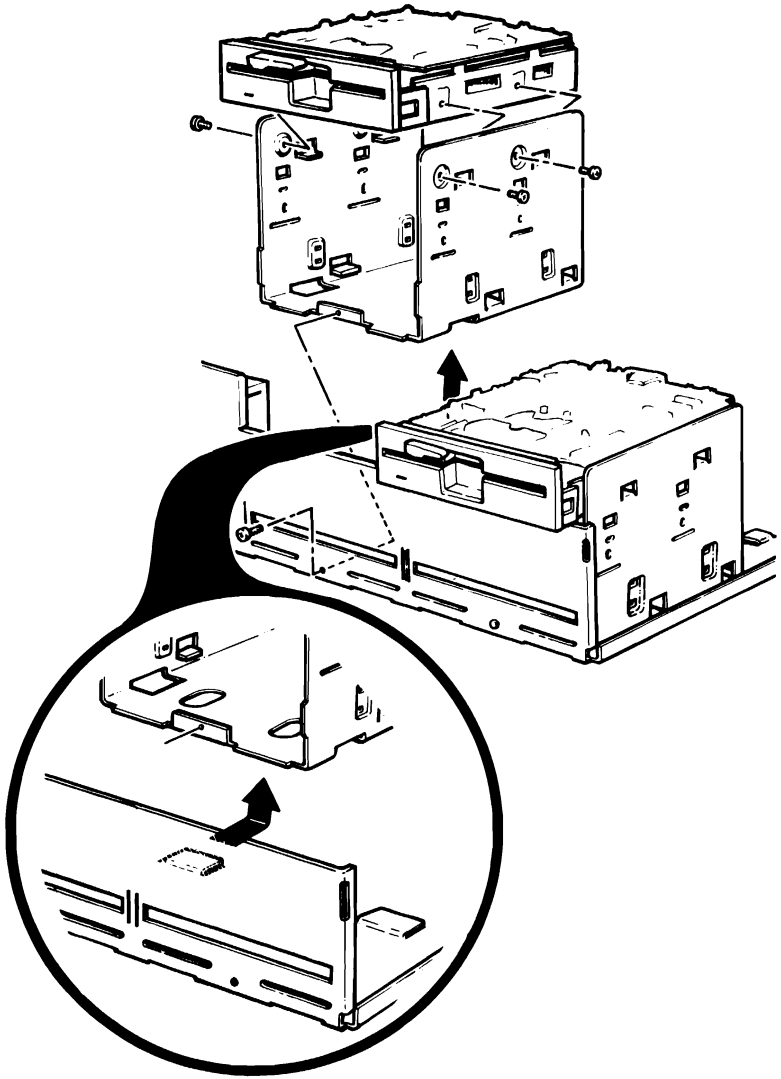☐   Reattach the screw to the front of the computer.

Figure B.2. Drive Installation

Cable Connections

Refer to Figure B.3 for the following steps.

☐   Install one of the four connectors coming from the power supply into the 4-pin plug on the left side of the new drive. This connector can only be installed one way due to the beveled corners.

☐   Position the ribbon cable assembly connected to the first disk drive as shown, and install the connector on the disk drive circuit board of the new drive. If Winchester drive cables are disconnected, re-attach the cables to the Winchester.

☐   Replace the cover following the instructions in Cover Replacement.

☐   Remove the cardboard shipping insert from the drive before turning on the computer.

NOTE: Before using your computer, the SETUP program must be run. Refer to The SETUP Program section in Chapter 1 of this manual.
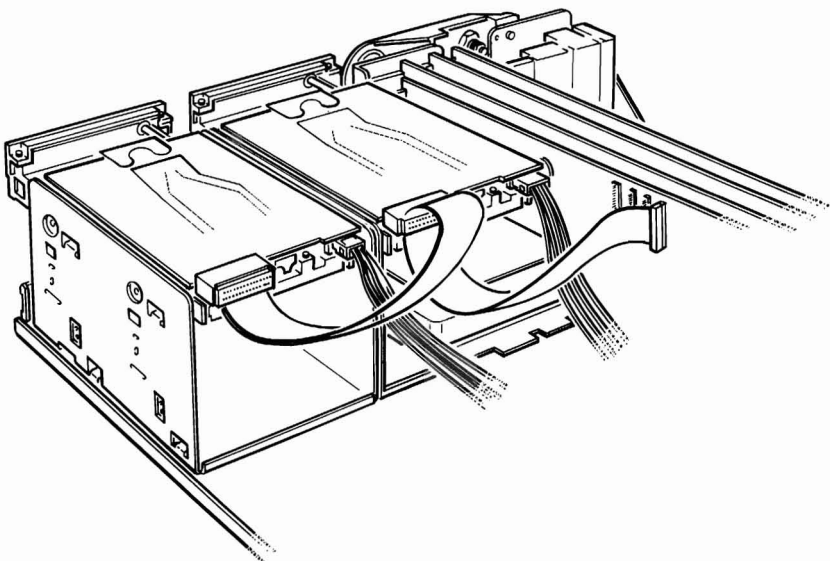
Figure B.3. Cable Connections

Winchester Drive Installation

Before a Winchester drive may be installed, the cover of the computer must be removed. Follow the instructions under Cover Removal in this appendix. Make a note of the type of Winchester drive you are installing according to the information printed on the bottom of the drive. If you are installing a second Winchester drive, proceed to Second Winchester Drive Installation later in this appendix. Before installing the Winchester, verify that the drive select jumper is set at DS1.

Refer to Figure B.4 for the following steps.

NEW
WINCHESTER
DRIVE
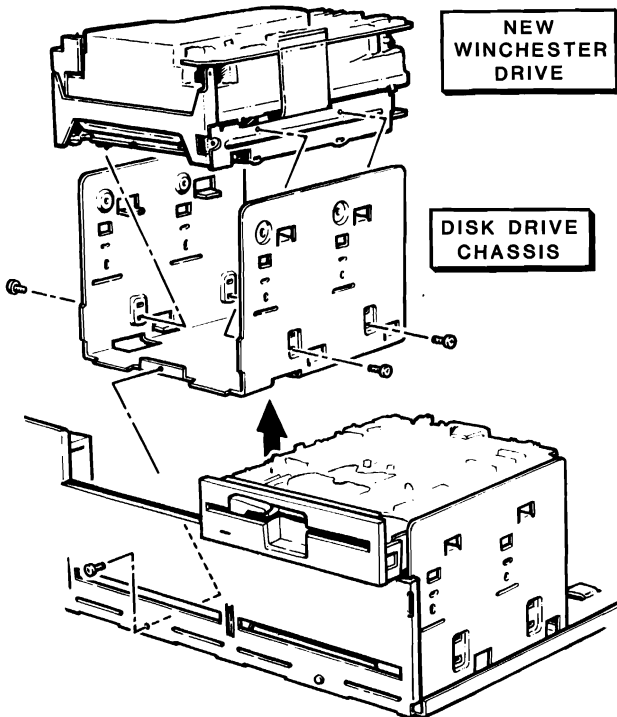
DISK DRIVE
CHASSIS

Figure B.4. Winchester Drive Installation

Installing Drives

☐ Unpack the new Winchester disk drive and mounting hardware that is supplied.

☐ If there are two floppy disk drives in the computer, disconnect the two cables from the floppy disk drive in the center.

☐ Remove the screw holding the center disk drive chassis.

☐ Slide the disk drive chassis to the rear of the computer until it passes the lip on the bottom of the main chassis.

☐ Lift the disk drive chassis straight up out of the computer.

☐ Remove the four screws from the floppy disk drive (if present), lift the drive out of the disk drive chassis, and set it to one side.

☐ Place the new Winchester drive in the bottom of the disk drive chassis and secure it with the four screws packed with the Winchester drive.

☐ Return the floppy disk drive on top of the Winchester drive if necessary and secure it with the four screws.

☐ Place the disk drive chassis with the newly installed Winchester drive back in the computer and slide the chassis to the front. Make sure the drive chassis catches the lip on the main chassis.

☐ Reattach the screw to the front of the computer.

Cable Connections

Refer to Figure B.5 for the following steps.

☐   Install one of the four connectors coming from the power supply into the 4-pin plug on the left side of the Winchester drive.

☐   Position the ribbon cable assembly connected to the floppy drive as shown, with the colored stripe toward the power supply and install the connector on the disk drive circuit board of the new drive.

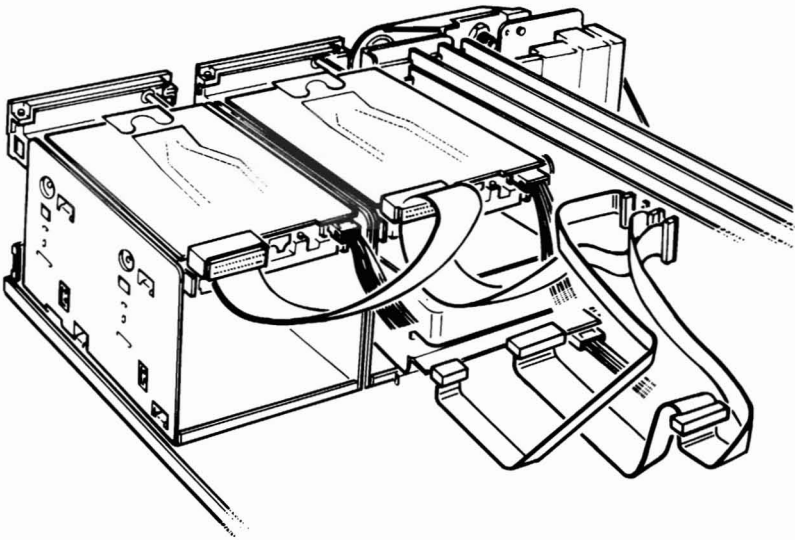☐   Reconnect the cables to the floppy disk drive if present.

Figure B.5. Cable Connections

Appendices

☐ Replace the cover following the instructions in Cover Replacement.

NOTE: Before using your computer, the SETUP program must be run. Refer to The SETUP Program section in Chapter 1 of this manual. It may also be necessary to run the PREP and PART utilities on the Winchester. Refer to Chapter 2 for more information.

Second Winchester Drive Installation

Refer to Figure B.6 for the following steps.

☐ Unpack the new Winchester drive and mounting hardware that is supplied.

☐ Remove the resistor pack if installed.

☐ Disconnect the two cables from the existing floppy disk drive.

☐ Remove the screw holding the disk drive chassis on the rightside of the computer.

☐ Slide the disk drive chassis to the rear of the computer until it passes the lip on the bottom of the main chassis.

☐ Lift the disk drive chassis straight up out of the computer.

☐ Place the new Winchester drive in the bottom of the disk drive chassis and secure it with the four screws packed with the Winchester drive.

☐ Return the floppy disk drive on top of the Winchester drive and secure it with the four screws.

☐ Place the disk drive chassis with the newly installed drive back in the computer and slide the chassis to the front. Make sure the drive chassis catches the lip on the main chassis.
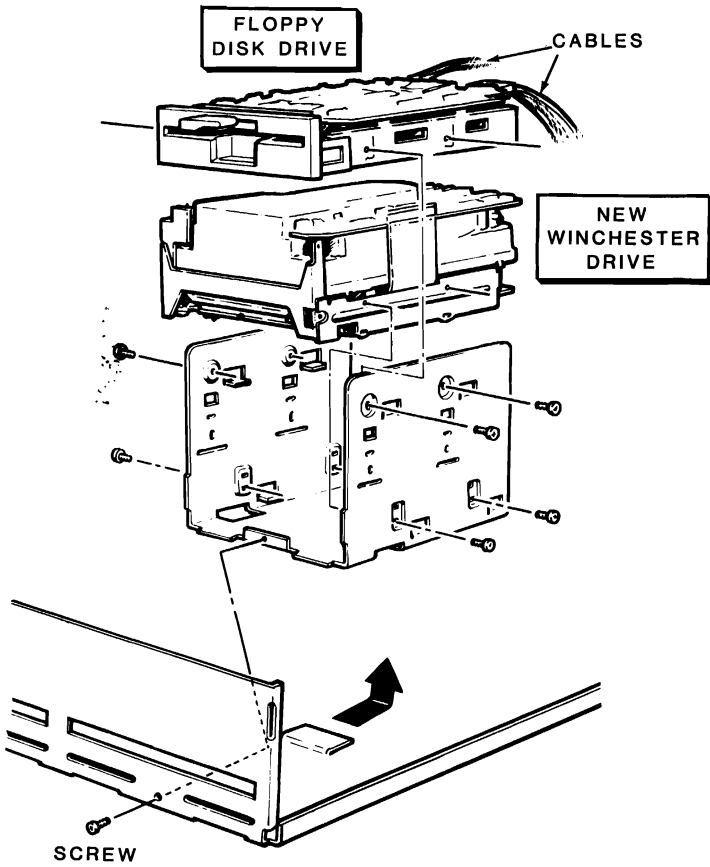
☐ Reattach the screw to the front of the computer.

FLOPPY
DISK DRIVE

CABLES

NEW
WINCHESTER
DRIVE

SCREW

Figure B.6. Second Winchester Drive Installation

Cable Connections

Refer to Figure B.7 for the following steps.

☐   Install one of the four connectors coming from the power supply into the 4-pin plug on the left side of the new Winchester drive.

☐   Position the ribbon cable assembly connected to the first Winchester drive as shown with the colored stripe toward the power supply, and install the connector on the disk drive circuit board of the new drive.

☐   Install one of the four connectors coming from the power supply into the 4-pin plug on the left side of the floppy drive.

☐   Reconnect the ribbon cable assembly to the floppy disk drive circuit board.

☐   Replace the cover following the instructions in Cover Replacement.

NOTE: Before using your computer, the SETUP program must be run. Refer to The SETUP Program section in Chapter 1 of this manual. It may also be necessary to run the PREP and PART utilities on the Winchester. Refer to Chapter 2 for more information.
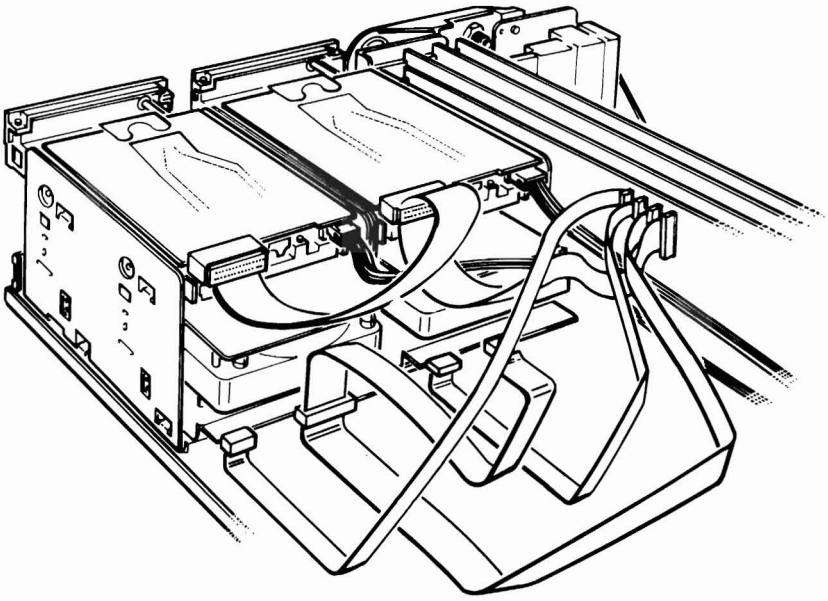
Figure B.7. Cable Connections

360K Floppy Drive Configuration

There are two different models of 360K floppy disk drives available for installation in the Z-200 PC Series Computer. Each of these two have different jumpers to change for proper operation.

Compare your floppy disk drive to those shown in Figure B.8 and do the following:

Drive Type #1 — Cut the tracer leading to pin 34 with a small sharp knife.

Drive Type #2 — Cut the wire labeled RY.

Continue with Second Floppy Disk Drive Installation explained earlier in this appendix.

Installing Drives
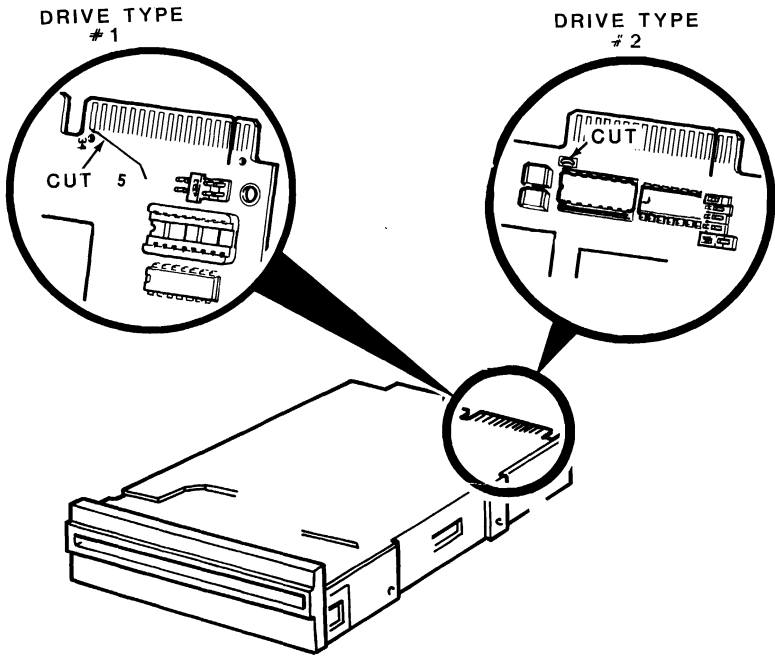
Figure B.8. Jumper Configuration 360K Drives

Appendices

Glossary

Acoustic-coupled modem — A modem that uses any telephone with a standard handset, on a temporary basis, and avoids a permanent connection to the telephone lines. *See also* Direct-connect modem, and Modem.

Acronym — A word formed from letters found in a name, term, or phrase. For example, BASIC is formed from the words **Beginner's All-purpose Symbolic Instruction Code.**

Address — The label, name, or number identifying a register, location, or unit where data is stored. In most cases, address refers to a location in computer memory.

Alphabetic — Relating to the alphabet.

ALU — Arithmetic and Logic Unit. This section of the computer performs the basic mathematical operations such as addition, subtraction, multiplication, and division of numbers.

Application — A system, problem, or task that a computer is assigned.

ASCII — American Standard Code for Information Interchange. It is the industry standard used to transmit information to printers, other computers, and other peripheral devices.

Assemble — To prepare a machine-usable code from a symbolic code.

Assembly Language — A machine-oriented programming language that uses mnemonics for instructions.

Asynchronous — A mode of operation where the next command is started and stopped by special signals. In communication, the signals are referred to as start and stop bits.

Autoboot — Automatically booting an operating system at powerup. *See also* Boot, and DOS.

Automation — The act of making a process partially or fully automatic.

Glossary

Backup — A copy of data and/or programs that is saved in case the original is damaged or destroyed.

BASIC — Beginner's All-purpose Symbolic Instruction Code. An easily-learned programming language consisting largely of English words and terms.

Binary — The numbering system using a base of 2.

Bit — Binary digit. The smallest part of information in binary notation.

Board — A printed-circuit board assembly that mounts onto the physical chassis of a computer or peripheral. Other cards may be plugged into this board. *See also* Card.

Boot — The process of loading an operating system into a computer. *See also* Autoboot, and DOS.

Bootstrap — The program used by the computer to load the operating system.

Break — The process of interrupting and temporarily halting a sequence of operations.

Buffer — An auxiliary storage area for data. Many peripherals have buffers used to temporarily store data that will be used as time permits.

Bug — A term that is widely used to describe the cause of a computer misoperation. A "bug" may be in the hardware design or software used by the computer.

Bus — A circuit or line used to carry data or power between two or more locations.

Byte — A group of eight bits processed together.

Cable — An assembly of one or more conductors used to transmit power or data from a source to a destination and, in some cases, vice versa.

Glossary

Card — A printed-circuit board assembly that plugs into another board. *See also* Board.

Centronics-type interface — A parallel printer interface which has become accepted as "quasi-standard" through common usage by a number of manufacturers. *See also* Interface, Parallel, and Printer.

Character — One of a set of symbols that may be arranged to express information.

Checksum — A method of checking the accuracy of a character transmitted, manipulated, or stored. The checksum is the result of the summation of all the digits involved.

Chip — The term applied to an integrated circuit that contains many electronic circuits. A chip is sometimes called an IC or an IC chip. The name is occasionally applied to the entire integrated circuit package.

Circuit — An electronic path through which current flows.

Class B — One of two classes established for computers by the Federal Communications Commission regulating the allowable amount of Radio Frequency Interference (RFI) radiation. All personal computers must meet class B requirements.

Code — A method of representing data in a form the computer can understand and use.

Command — A code that represents an instruction for the computer.

Communication — The transmission of information from one point to another.

Components — An essential part of a system.

Composite video signal — A signal containing all the elements needed by a video monitor to produce a display. It may be either color or monochrome. *See also* CRT, Monitor, and RGB video.

Glossary

Computer — A machine capable of accepting information, processing it by following a set of instructions, and supplying the results of this process.

Configuration — The arrangement of parts.

Connector — A device that provides an electrical and/or mechanical junction between two cables or a cable and chassis.

CPU — Central Processing Unit. The circuitry which actually processes the information and controls the storage, movement, and manipulation of that data. The CPU contains the ALU and a number of registers for this purpose.

CRT — Cathode-Ray Tube. Used interchangeably with display, screen, and video monitor. CRT refers to the television-like screen in a computer, terminal, or monitor.

Cursor — A character, usually an underline or block used to indicate a position on the screen.

Cylinder — Used to describe the tracks in disk units with multiple read-write heads that can be accessed without mechanical movement of the heads.

Data — The general term used to describe information that can be processed by a computer.

"D" Connector — A connector having the shape of the capital letter D.

DCE — Data Communications Equipment. The DCE connector is a serial connector found on serial communications equipment, generally a modem. *See also* Modem.

Debug — The process of locating and removing any errors in equipment or programs.

Decimal — The numbering system based on ten and consisting of the digits 0 through 9.

Delete — To remove or eliminate.

Glossary

Density — The closeness of space distribution on a storage medium such as a disk.

Device — A mechanical or electronic unit, such as a printer, disk drive, terminal, intended to serve a specific purpose.

Diagnostics — Information on what tests a device failed, used to aid in troubleshooting.

Digit — A single element or sign used to convey the idea of quantity, either by itself or with other numbers of its series.

Direct-connect modem — A modem that is connected directly to the telephone lines. By using a direct-connect modem, you avoid problems associated with high levels of noise. *See also* Acoustic-coupled modem, and Modem.

Directory — A disk file that lists all of the other files on the disk and information about each file.

Disk — *See* Floppy disk.

Disk drive — A device used to read data from and write data onto disks.

Diskette — *See* Floppy disk.

Disk operating system — *See* DOS.

Display — The television-like screen used by the computer to present information to the operator.

DOS — Disk Operating System. A program or programs that provide basic utility operations and control of a disk-based computer system.

Double-density — This term is most often applied to the storage characteristics of disks, and generally refers to the density of the storage of bits on the disk surface on each track.

DTE — Data Terminal Equipment. The DTE connector is found on a terminal device, which also includes printers. *See also* Printer, and Terminal.

Glossary

Edit — To change data, a program, or a program line.

Execute — To perform a command.

Field — A set of related characters that make up a piece of data.

File — A collection of related records that is treated as a unit. A file may contain data or represent a computer program.

Firmware — Programs or instructions that are stored in read-only memories and become a part of the physical makeup of the computer. *See also* Hardware, and Software.

Floppy Disk — A thin, flexible, plastic platter, coated with magnetic material and enclosed in a plastic jacket. It is used to store data and comes in two standard sizes: 5 1/4″ and 8″ diameter. Also called a "floppy disk," "floppy diskette," "flexible disk," or "flexible diskette."

Formatting — The process of organizing the surface of a disk to accept files of data and programs.

Graphics — Generally refers to special characters that may be displayed or printed. It also indicates that the specified device may be able to reproduce any type of display, from photographs to line and bar charts.

Hard copy — A printed copy of a machine output.

Hardware — The physical computer and all of its component parts, as well as any peripherals and interconnecting cables. *See also* Firmware, Peripheral, and Software.

Hexadecimal — A numbering system based on sixteen and represented by the digits 0 through 9 and A (10) through F (15). A single byte of data by be represented by two hexadecimal digits.

Hidden file — A file that may be accessed (read) but will not appear on a disk directory. *See also* Floppy disk, Directory, and File.

Glossary

Home — This term usually refers to the upper left-hand corner of the display screen, and specifically to the first displayable character location.

IC — Integrated Circuit. *See* Chip.

Initialize — To set counters, switches, and addresses at starting values.

Input — 1. Information or data transferred into the computer. 2. The route through which such information passes. 3. The devices which supply a source of input data, such as the keyboard or disk drive.

I/O — Input/Output. 1. The transmission of data into or out of a computer. 2. The equipment used to communicate with a computer. *See also* Input, and Output.

Instruction — A program step that tells the computer what to do for a single operation in a program.

Interface — A device that serves as a common boundary between two other devices, such as two computer systems or a computer and peripheral. *See also* RS-232 interface.

Interference — Any electrical or electromagnetic disturbance that can cause an undesired response.

Interrupt — A temporary suspension of processing by the computer caused by input from another part of the computer or a peripheral.

Jump — A departure from the normal sequential line-by-line flow of a program. A jump may be either conditional, based upon the outcome of a test, or unconditional.

K — The abbreviation of Kilo, which stands for 1,000. However, in computers it is the power of two closest to the number (2 ^ 10); hence the amount of 1,024. As an example, 16K would equal 16 times 1,024 or 16,384. *See also* Kilo.

Glossary

Keyboard — A device used to enter information into a computer, made up of two or more keys, often arranged like a typewriter and/or calculator.

Key click — An audible signal when a key is pressed.

Kilo — A prefix meaning: (1) 1000 when used in a mathematical expression; or (2) 1024 when used as a unit of measurement in computers. *See also* K, and Kilobyte.

Kilobit — A unit of measurement in computers that equals 1024 bits. *See also* Bit, K, and Kilo.

Kilobyte — A unit of measurement in computers that equals 1024 bytes. *See also* Byte, K, and Kilo.

Language — A defined set of characters that when used alone or in combinations, form a meaningful set of words and symbols. In a computer language, it refers to a set of words and operators and the rules governing their usage.

LED — Light-emitting diode.

Load — The process of entering information (data or a program) into a computer, from a keyboard, disk, or other source.

M — Abbreviation for Mega. *See* Mega.

Machine language — A programming language consisting only of numbers or symbols that the computer can understand without translation.

Maintenance — The process of maintaining hardware and software. With hardware, in addition to corrective maintenance, or repair, this also includes preventive maintenance, or cleaning and adjustment. With software, maintenance refers to updating critical tables and routines to maintain accountability with established standards (as in the updating of tax tables for Income and Social Security Tax deductions in a payroll program).

Glossary

Mega — A term meaning one million, abbreviated M. When it is used in computers, it usually means one thousand K. One Megabyte equals 1,048,576 bytes.

Megabyte — 1,048,576 bytes. *See* Mega.

Memory — A portion of a computer that is used to store information. The size of a microcomputer is often determined by the amount of user memory (measured in kilobytes) in the system. *See also* RAM, and ROM.

Microprocessor — The control and processing portion of a computer.

Mnemonic — A term applying to an abbreviation or acronym that is easy to remember.

Mode — Method of operation.

Modem — MOdulator DEModulator. A device that converts the digital signals from a computer into a form compatible with transmission facilities and vice versa. Most commonly used with telephone communications. *See also* Acoustic-coupled modem, and Direct-connect modem.

Monitor — 1. A control program in a computer. 2. A separate peripheral used to display information; a black and white (monochrome) or color display. *See also* CRT.

Monochrome display — A single-color (black and white, black and green, or black and amber) display.

Mouse — A peripheral device with one or more switches that is connected to a computer or terminal and used as an entry device. It can serve as a graphics entry device or as a control for cursor positioning on the screen. *See also* Cursor, and Graphics.

Multiprocessing — Doing two or more processes at the same time. While this usually applies to computers with more than one CPU, it also may apply to time sharing. *See also* Time share.

Multitasking — Doing two or more tasks at the same time; often used synonymously with multiprocessing. Multiprocessing deals with unrelated tasks while multitasking deals with related tasks and often deals with the same disk files.

Glossary

Multiuser — The ability to accommodate two or more operators on one computer system at the same time, usually through two or more terminals. *See also* Multiprocessing, Multitasking, and Network.

Network — The interconnection of a number of points by means of a common interface or communications facility, such as a telephone.

Numeric — Composed of numbers. The value of a number as contrasted to a character representation.

Operating System — *See* DOS.

Operation — A defined action; the action specified by a single computer instruction.

Operator — 1. The person who actually manipulates the computer controls, places the disk into the disk drive, removes printer output, etc. 2. A symbol that designates a mathematical operation such as plus (+), minus (−), and so on. 3. A symbol or keyword that designates a logical comparison or operation such as greater than (>), less than (<), NOT, and so on.

Output — The results of computer operations. This may be in the form of displayed or printed information, data stored on a disk, or data transmitted to another computer.

Parallel — In computers, this refers to information sent as a group, rather than serially. For example, eight bits (or a byte) are transmitted simultaneously over eight channels or wires. *See also* Serial.

Parity — Refers to a method used to check the validity of data that is stored, transmitted, or manipulated.

Partitions — The divisions of a large block.

Peripheral — A device that is connected to the computer for the purpose of supplying input and/or output capability to that computer. A peripheral may or may not be under direct control of the computer.

Port — The path through which data is transferred into and/or out of the computer or CPU.

Glossary

Printer — A device used to produce computer output in the form of typewritten or printed characters and symbols on paper. The output of a printer is called "hard copy," or a "computer printout."

Process — The act of completing or executing an instruction or set of instructions.

Processor — A computer or its CPU. *See also* CPU.

Program — A set of computer instructions which, when followed, will result in the solution to a problem or the completion of a task.

Prompt — A symbol, character, or other sign that the computer is waiting for some form of operator input. The prompt may request data and be made up of text that requests specific data.

RAM — Random Access Memory. Read-write memory that data may be written to (stored) or read from (retrieved) directly. *See also* Random access, and ROM.

Random access — The ability to access locations without regard to sequential position; access may be accomplished by going directly to the location. On occasion, this is called "direct access."

Read — The process of obtaining data from some source, such as a disk.

Read/write head — A magnetic recording/playback head similar to those used by tape recorders. The function of the head is to read (playback) and write (record) information on magnetic material such as a disk surface.

Real time clock — A portion of the computer that maintains the actual time of day and may be used in a computer program.

Refresh rate — The rate at which data is renewed or restored.

Register — A short-term storage circuit that usually has a capacity of one word.

Glossary

Reset — The process of restoring the equipment to its initial state.

RGB video — A high-resolution color monitor which utilizes separate red, green, and blue signals rather than a combination, or "composite," of the same. *See also* CRT, Composite video signal, Display, and Monitor.

ROM — Read-Only Memory. Memory which is similar to RAM except that data cannot be written to it. Data can be read from it directly, as in the case of RAM, but it will retain the information stored in it whether power is applied or not. It is most often used for special programs such as the monitor program in your computer. *See also* RAM.

Routine — A sequence of instructions that carry out a well-defined function. A program may be called a routine, although programs usually contain many routines. If a routing is separated from the main body of the program, it is referred to as a "subroutine."

RS-232 interface — A standardized interface adopted by the Electronic Industries Association (EIA) to ensure uniformity of interfacing signals between computers and peripherals. This capability is built into most computer devices. *See also* Interface.

Search — The systematic examination of data to locate a specific item. Searches are characterized by several different methods including sequential (items are examined in a specific sequence) and binary (ordered data containing the desired item is repeatedly halved until the desired item is found).

Sector — A portion of a disk track. The location of a particular sector on the track is a matter of timing. In a disk, timing is handled by timing holes. Disks containing only one timing hole are said to soft-sectored because the timing is handled by software. Disks containing many timing holes are said to be hard- sectored because the timing is handled by hardware. *See also* Track.

Sequential — The order in which things follow one after the other.

Serial — Refers (as referenced to data in computers) to data that has been broken down into component parts (characters or bits) and handled in a sequential manner. *See also* Parallel.

Glossary

Sign — An indication of whether the value is greater than zero (>0) or less than zero (<0). The dash or hyphen ($-$) is used to indicate a negative (less than zero) value. The absence of the dash or a plus sign ($+$) indicates a value grater than zero (positive).

Soft-sectored — This term applies to disks and indicates a type of disk that has a single timing hole which marks the beginning of a track. Sectoring of the track is controlled by software. *See also* Sector, and Track.

Software — A general term that applies to any program (set of instructions) that can be loaded into a computer from any source. *See also* Firmware, and Hardware.

Sort — To arrange (or place in order) data according to a predefined set of rules.

Switch — A mechanical or electrical device that completes or breaks the path of the current and sends it over a different path.

Syntax — The rules governing the use of a language.

System — An assembly of components into a whole. A computer system is made up of the computer plus one or more peripheral.

Task — A job, usually performed by following a specific set of instructions to solve a problem.

Terminal — An input/output device, usually consisting of a keyboard and a display screen. A terminal also may consist of a printer and a keyboard; this is referred to as a "printing terminal." Either type may include a modem (either the acoustic-coupled or the direct-connect type) for remote operation.

Time share — The process of accomplishing two or more tasks at (apparently) the same time. The computer will process one task at a time, but only a small portion, before switching to the next. Because a computer can process a great amount of data in a very short time, the switching between tasks is usually not apparent to human observation except when many tasks are executed at the same time. *See also* Multiprocessing.

Glossary

Track — The portion of a disk that one read/write head passes over while in a stationary position. Track density is measured in tpi (tracks per inch).

Utility — A program that accomplishes a specific purpose, usually quite commonly needed by a wide range of applications. Most utilities are furnished with a computer system while some, like sort routines, may be sold separately by a different vendor.

Verify — To examine and substantiate the results of a computer operation.

Winchester — A term which has come to be applied to most forms of high-density, fixed-disk storage.

Word processing — An application, widely used in microcomputers for entering, manipulating, correcting, deleting, formatting, and printing various types of text: correspondence, reports, legal documents, articles, manuscripts, and books. These application programs often include a spelling checker and other aids to the writer: punctuation checker, thesaurus, and indexer.

Write — The process of recording data on some object, such as a display, disk, or paper.

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