

Z-2300 Series

Service Guide

585-301-01
860-203

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Record of Service Bulletins

SERVICE BULLETIN NUMBER	DATE OF ISSUE	CHANGED PAGE(S)	PURPOSE OF SERVICE BULLETIN	INITIALS

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St. Joseph, Michigan 49085

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Chapter 1 Introduction

The Z-2300 Series computer is a high-performance, XT- and AT-compatible 80286-based personal computer. The basic Z-2300 Series computer is shown in Figure 1-1.

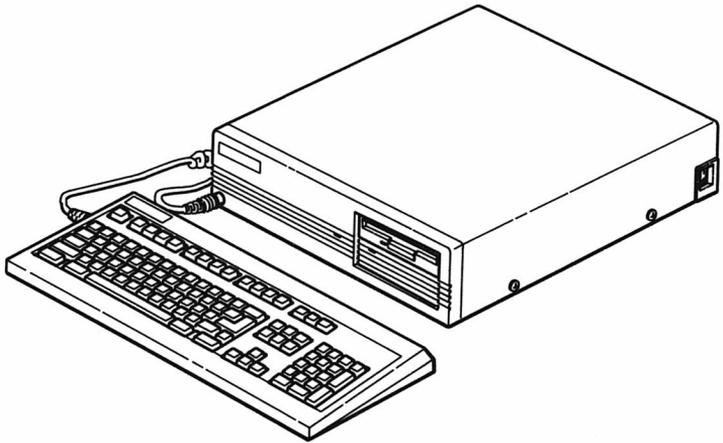


Figure 1-1. Basic Z-2300 Series Computer

This computer uses an 80286 microprocessor operating at 8 MHz. A socket is provided for an optional 80287 numeric coprocessor. A minimum of 1M of RAM is included (expandable to 6M using 1M SIMMs). Available video cards support CGA, EGA, MDA, and Hercules video in their native (TTL) modes and as 31.49 kHz analog video signals. A Zenith 480-line (VGA-type) display is also available. The disk controller supports two floppy disk drives. The hard disk drive installed in the Z-2300 Series contains its own controller circuitry.

Introduction

This Service Guide identifies the Z-2300 Series computer, lists its specifications, and provides a brief description of its major assemblies. Procedures for adding internal options and peripherals are included. The general operation of the computer is described along with specific Monitor program commands including user-selectable self-tests and debugger commands. Complete disassembly procedures, connector pinouts, and configuration information are also included. Finally, a troubleshooting procedure is supplied to assist in diagnosing faults to the circuit card or major assembly level. Related publications include:

- 585-299 *Z-2300 Series Service Manual*
- 595-4074 *Professional Desktop Computer Owner's Manual*

Tools and Equipment

The tools and equipment recommended to service this computer as described in this Service Guide include:

- Flat-blade screwdrivers
- Phillips screwdrivers
- Nutdrivers
- A DVM or VOM
- Disk-based diagnostics (CB-31-2).

Product Features

Figures 1-2 and 1-3 illustrate the controls, features, and connectors of a basic Z-2300 Series computer. More detailed information on connecting and operating the computer is included in later chapters.

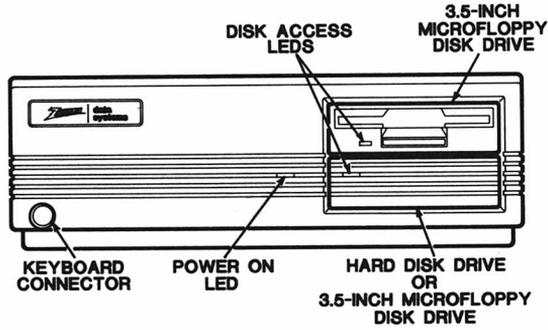


Figure 1-2. Front View

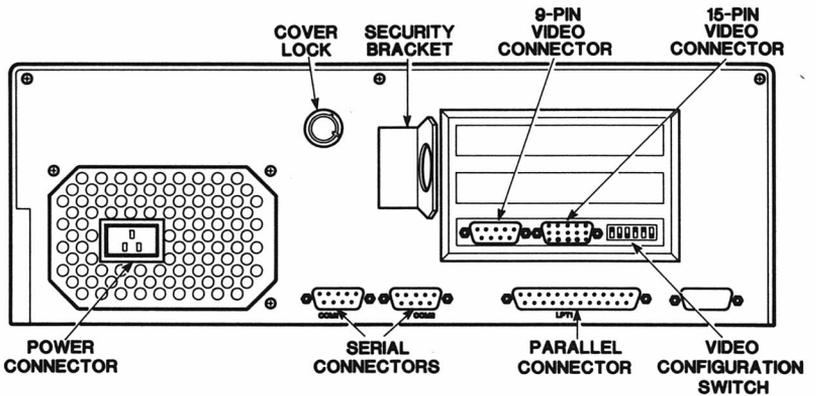


Figure 1-3. Rear View

Specifications

CPU:	80286, 16 bit.
Clock:	8 MHz.
Memory:	1M minimum, expandable to 6M using 1M SIMMs; 640K system memory.
Backplane:	Three PC/AT slots (two available for expansion).
I/O:	Centronics-type parallel port (DB-25 connector). Two RS-232C asynchronous serial ports (DB-9 connectors): one start bit; 7- or 8-bit word length; one or two stop bits; selectable baud rates of 110, 150, 300, 600, 1200, 2400, 4800, or 9600 baud; RD, CTS, DSR, CD signals recognized; TD, RTS, DTR control signals generated; half- or full-duplex operation.

Video

31.49 kHz:	Analog RGB video signals at a constant 31.49 kHz scan available through a 15-pin D-type connector. Generates EGA, CGA, MDA, Hercules, and Zenith 480-line (VGA-type) displays when used with 31.49 kHz analog RGB or multi-sync type monitors.
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Native:	Standard RGBrgb, RGBI, or TTL-compatible monochrome video signals available through a 9-pin D-type connector. Generates EGA, CGA, MDA, and Hercules displays when used with the same monitors.
Disk drives:	One 3.5-inch microfloppy disk drive and one hard disk drive. Support for two floppy disk drives.
Keyboard:	101-key enhanced keyboard with 17-key numeric keypad, 4-key cursor control pad, 6-key editing pad, 3-key function pad, and 12 programmable function keys.
Power supply	
Input:	100-130 VAC at 60 Hz or 200-230 VAC at 50 Hz, auto-switching.
Output:	+5 VDC at 8A, +12 VDC at 3A, -12 VDC at 0.2A.
Audio:	8-ohm, 2-inch speaker.
Battery:	3.6V lithium powers real-time clock.
Size	
Computer:	14 × 15 × 4 inches (35.6 × 38.1 × 10.2 cm)
Keyboard:	18.5 × 8 × 1.5 inches (47 × 20 × 9 cm)

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Introduction

System Overview

This section briefly describes the major components of the Z-2300 Series computer. The computer consists of a main board (containing the CPU, memory, I/O ports, and real-time clock), a backplane board (containing expansion slots and floppy disk controller circuitry), a video card, a power supply, floppy and hard disk drives, and a keyboard.

Main Board

The main board contains the CPU and its support circuits as well as all I/O circuitry. The Z-2500 Series is based on the 80286 CPU and is compatible with the Z-200 Series and other AT-compatible computers. A number of functions are combined into two VLSI (very large scale integration) multifunction controller devices, resulting in a smaller, simpler design using fewer ICs.

Support is available for an 80287 numeric coprocessor. The operating speed can be set for different versions of the coprocessor. Up to 6M of memory, in the form of SIMM (single in-line memory module) devices, is also supported on this board.

Two RS-232C serial ports are available through 9-pin D-type connectors mounted on the main board. One Centronics-type parallel port is available through a 25-pin D-type connector mounted on the main board.

A 3.6-volt lithium battery powers the real-time clock and supplies the voltage needed to retain the configuration information for the computer.

Backplane Board

A vertically-oriented backplane board plugs into a 62-pin connector on the main board. This board contains three AT-compatible expansion slots, the floppy disk controller circuitry, and the hard disk cable connector. The floppy disk controller supports two floppy disk drives. The hard disk controller circuitry is contained in the hard disk drive.

Keyboard Interface Board

The keyboard connector is mounted on a small circuit board in the left front corner of the chassis. This board contains the keyboard connector filtering and fuse.

Video Card

The Z-449 video card can produce an analog RGB video signal at a constant 31.49 kHz horizontal scan frequency. CGA, EGA, MDA, Hercules, and Zenith 480-line (VGA-type) displays can all be produced using a 31.49 kHz analog RGB video monitor. These analog signals are available through a 15-pin D-type connector on the video card.

The video card can also produce CGA, EGA, MDA, and Hercules video signals in their standard (TTL) form. These standard signals are available through a 9-pin D-type connector on the video card.

Power Supply

The switch-mode power supply provides the following voltages at the currents indicated:

- +5 VDC at 8A
- +12 VDC at 3A
- -12 VDC at 0.2A

Introduction

These outputs are electrically isolated from the main voltage and share the cabinet as the common ground.

Keyboard

The computer is supplied with an enhanced 101-key keyboard that can be set for PC- or AT-compatible operation.

Chapter 2

Installation

This chapter explains the installation of a Z-2300 Series computer, including installation of internal options, peripheral interface, and power connection.

Begin by unpacking the computer and peripherals. The keyboard is packaged separately. Have the customer save the shipping cartons in case the computer must be transported.

The options and peripherals to be installed vary from customer to customer. Some items to check for during installation include:

- Amount of installed memory.
- Numeric coprocessor installation.
- Type and location of optional circuit cards.
- Type of video monitor.
- Type and number of disk drives.

Installation of Options

The Z-2300 Series computer supports several options, including additional memory (up to 6M), an 80287 numeric coprocessor, additional circuit cards, additional disk drives, and custom ROMs (for specific customer applications). Use the following sections to install these options.

Installation

Memory

As shipped from the factory, this computer contains at least 1M of memory. This computer uses memory modules called SIMMs rather than the individual memory chips used in other computers. The SIMM is illustrated in Figure 2-1.

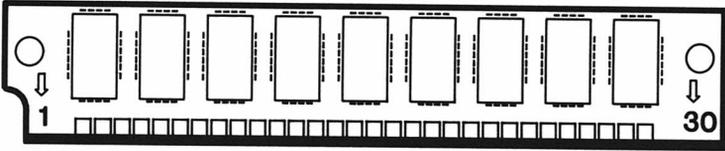


Figure 2-1. SIMM Memory Module

The SIMM consists of nine separate memory chips (one bank) mounted on a small circuit board. The board is then plugged into a socket on the main board of the computer. The factory installed memory consists of four 256K SIMMs. To add memory to the computer, refer to Figure 2-2 and the following procedure:

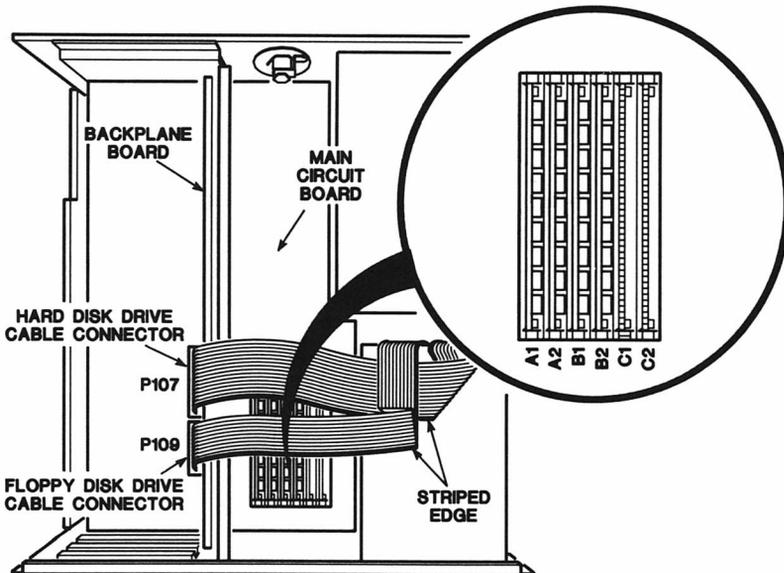


Figure 2-2. Memory Module Socket Locations

1. Remove the computer cover as described in Chapter 4.
2. Refer to Figure 2-2 and locate the memory module sockets. The sockets are designated A1, A2, B1, B2, C1, and C2.

CAUTION

Like other memory devices, SIMMs can be damaged by static electricity. Observe the following precautions when handling and installing SIMMs:

- Do not remove the SIMM from its protective packaging until you are ready to install it.
 - Equalize the static electricity between the work surface, the SIMM, and you by touching the work surface with one hand and then picking up the SIMM with the other hand.
 - Once you remove the SIMM from its protective packaging, do not set it down or let go of it until it is either installed in the computer or returned to its protective packaging.
3. Refer to Figure 2-3 and read the following procedures for installing and removing SIMMs, then continue on to step 4:

To install a SIMM, tip it slightly toward the left (away from the disk drive housing) and guide it into its socket on the main board, as shown. Next, gently push it to the right until it is upright. You should hear a distinct click as the guides at the ends of the module socket snap into the holes at the ends of the SIMM.

To remove a SIMM, use a small flat-blade screwdriver to push the guides at the ends of the module socket away from the holes at the ends of the SIMM. At the same time, gently tip the SIMM toward the left (away from the disk drive housing). Once the SIMM is free, it will lift out easily.

Installation

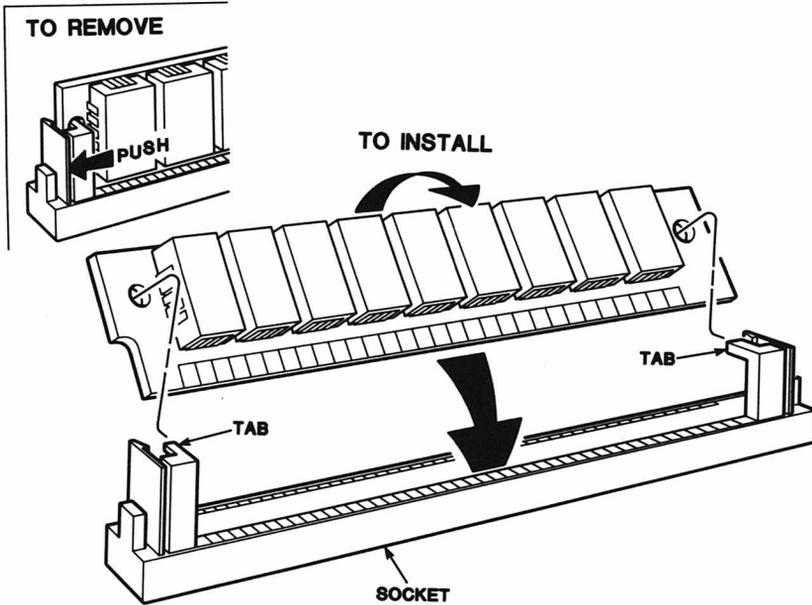


Figure 2-3. Installing and Removing SIMMs

NOTE: Because the SIMM must be tipped at an angle to be inserted, you must remove all installed SIMMs before adding new SIMMs to the computer. Install new SIMMs by inserting the highest bank first. For example, if you are installing four 1M SIMMs, insert the fourth SIMM first in location B2, then fill B1, A2, and A1.

4. To expand the memory to 3M, install a ZCA-2300-MG memory kit (consisting of two 1-megabyte SIMMs) in sockets C1 and C2. Be certain to position the SIMMs so that the flat side faces left and the side containing the memory devices faces the disk drive housing, as shown in Figure 2-3.

To expand the memory to 6M, remove the four factory-installed 256K SIMMs from sockets A1 through B2. Install six 1M SIMMs in sockets A1 through C2. Again, be certain to position the SIMMs so that the flat side faces left and the side containing the memory devices faces the disk drive housing, as shown in Figure 2-3. Finally, move the jumper at J516 on the main board from pins 2 and 3 to pins 1 and 2.

5. Replace the computer cover.
6. Run the Setup/Configuration program described in Chapter 3. This will allow the computer to recognize the added memory.
7. Perform the ROM-based memory test described in Chapter 3. This test will verify that all memory banks are functioning properly.

Numeric Coprocessor

An empty socket (U538) next to the CPU accepts an 80287 numeric coprocessor. Refer to the following procedure to install a numeric coprocessor in the computer.

CAUTION

The 80287 numeric coprocessor can be damaged by static electricity. Observe the following precautions when handling and installing the 80287:

- Do not remove the 80287 from its protective packaging until you are ready to install it.
 - Equalize the static electricity between the work surface, the 80287, and you by touching the work surface with one hand and then picking up the 80287 with the other hand.
 - Once you remove the 80287 from its protective packaging, do not set it down or let go of it until it is either installed in the computer or returned to its protective packaging.
1. Remove the computer cover as described in Chapter 4.

Installation

2. Refer to Figure 2-4 and locate the 80287 numeric coprocessor socket (designated U538).

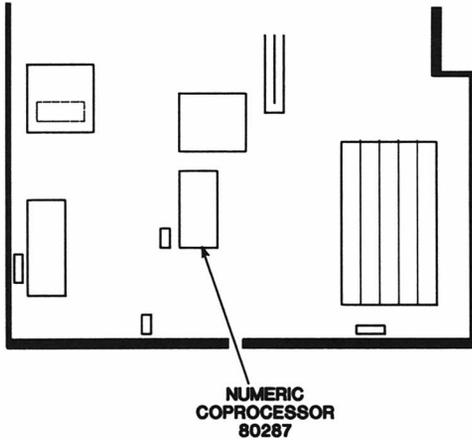


Figure 2-4. 80287 Numeric Coprocessor Socket Location

3. Adjust the pin alignment of the 80287 by laying the IC on its side and carefully rolling it until the pins are aligned as shown in Figure 2-5. This will allow you to properly seat the IC in its socket.

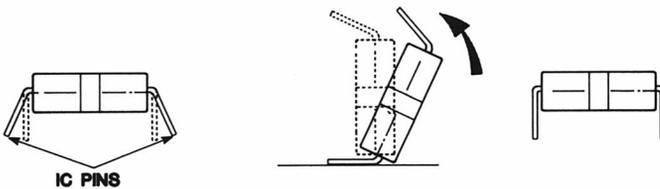


Figure 2-5. IC Pin Alignment

4. Align pin 1 of the 80287 with pin 1 of U538 and carefully press the IC into the socket. Verify that the pins are seated properly and that no pins are bent outside of the socket.
5. Refer to Chapter 5 to configure the main board jumpers for the 80287 version you are installing.
6. Replace the computer cover.

Circuit Cards

Two AT-compatible expansion slots are available for adding circuit cards to the computer. To add a circuit card:

1. Remove the cover as described in Chapter 4.
2. Identify the expansion slot in which you plan to install the new card.
3. Refer to Figure 2-6 and remove the blank panel that corresponds to the slot you plan to use. You will no longer need the blank panel, but save the screw that secures it.
4. Refer to the documentation supplied with the new card and configure it as necessary before installing it in the computer.
5. Position the new card over the slot and then seat it in the slot by pushing down carefully until it slides into place.
6. Secure the card with the screw that secured the blank panel.
7. Replace the computer cover.

Installation

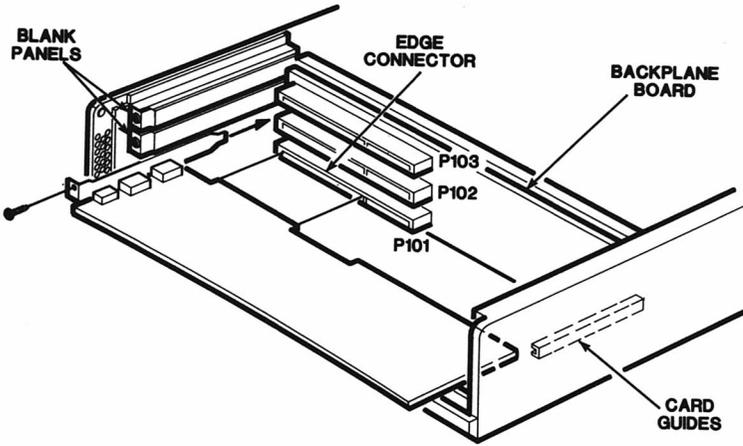


Figure 2-6. Circuit Card Installation

Internal Disk Drives

Up to two disk drives can be installed in the Z-2300 Series computer. If only one disk drive is installed, then either a hard disk drive or an additional floppy disk drive can be installed. All disk drives installed in the computer must be 3.5-inch drives.

To install an additional disk drive, refer to the disassembly information in Chapter 4. Before installing the drive, set the drive select switch or jumper on the drive to the appropriate position; a second disk drive is usually designated drive B. After installing the drive, connect the power and disk drive cable to the drive. Be certain to align pin 1 of the disk drive cable with pin 1 of the disk drive connector. Finally, refer to Chapter 3 and run the Setup/Configuration program to allow the computer to recognize the added drive.

External Disk Drive

If only one floppy disk drive is currently installed in the computer, an external 5.25-inch floppy disk drive can be added by installing a ZCA-2300-EF external drive expansion card. In addition to the expansion card, you will need the following:

- ZA-180-54 external 5.25-inch, 360K floppy disk drive
- ZA-180-60 power supply (for ZA-180-54)
- HCA-76 interface cable.

Detailed installation instructions are included with the drive expansion card documentation (595-4103).

Connections

This section provides information for connecting peripherals to the Z-2300 Series computer. Pinouts are included for the keyboard, video, parallel port, and serial port connectors.

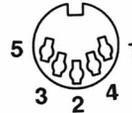
Installation

Keyboard

The 101-key keyboard connects to the computer through a 5-pin DIN connector mounted on the main board. This connector is accessed through a hole in the front panel. Table 2-1 lists the pin assignments of the keyboard connector.

Table 2-1. Keyboard Connector Pin Assignments

PIN	SIGNAL	TYPE
1	Keyboard clock	Output (to keyboard)
2	Keyboard data	Input (from keyboard)
3	—	—
4	Ground	—
5	+5 VDC	Output (to keyboard)



Video

Two video output connectors are available on the rear panel of the computer. These connectors allow the computer to be used with almost any type of video monitor, provided that the video card is properly configured for the monitor to be used. Two jumpers and a 6-section DIP switch configure the video card. Configuration information for this card is included in Chapter 5.

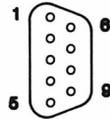
CAUTION

To avoid damage to the video card, the monitor, or both, be certain that the video card is properly configured for the monitor to be used.

The video card can produce CGA, EGA, MDA, and Hercules video signals in their standard (TTL) form. These signals are available at the 9-pin D-type connector. Use this connector with standard EGA (RGBrgb), CGA (RGBI or RGB), MDA (TTL monochrome), and Hercules (TTL monochrome) monitors. Refer to Table 5-4 in Chapter 5 for specific examples of these monitors and the proper configuration. Table 2-2 lists the pin assignments of the 9-pin D-type video connector.

Table 2-2. 9-Pin Video Connector Pin Assignments

PIN	MDA/HGC (mono)	CGA (RGB,RGBI)	EGA (RGBrgb)
1	Ground	Ground	Ground
2	Ground	Ground	red
3	—	Red	Red
4	—	Green	Green
5	—	Blue	Blue
6	Intensity	Intensity	green
7	Video	—	blue
8	H sync	H sync	H sync
9	V sync	V sync	V sync

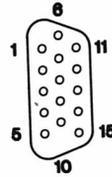


The video card can produce an analog RGB video signal at a constant 31.49 kHz horizontal scan frequency. CGA, EGA, MDA, Hercules, and Zenith 480-line (VGA-type) displays can all be produced using a 31.49 kHz analog RGB video monitor. These analog RGB video signals are available at the 15-pin D-type connector. Refer to Table 5-4 in Chapter 5 for specific examples of these monitors and the proper configuration. Table 2-3 lists the pin assignments for the 15-pin D-type video connector.

Installation

Table 2-3. 15-Pin Video Connector Pin Assignments

PIN	31.49 kHz ANALOG RGB
1	Red video
2	Green video
3	Blue video
4	—
5	Ground
6	Red ground
7	Green ground
8	Blue ground
9	—
10	Sync ground
11	—
12	—
13	H sync
14	V sync
15	—

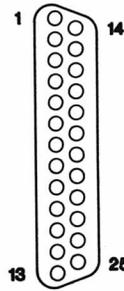


Parallel Port

One Centronics-type parallel port is available on the rear panel of the computer through a 25-pin D-type connector. Table 2-4 lists the pin assignments of the parallel port connector. The rear panel hook-up chart at the end of this chapter shows the location of the parallel port connector.

Table 2-4. Parallel Port Pin Assignments

PIN	SIGNAL
1	<u>Strobe</u>
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	<u>Acknowledge</u>
11	Busy
12	Paper end (out)
13	<u>Select</u>
14	<u>Auto feed</u>
15	<u>Error</u>
16	<u>Initialize printer</u>
17	<u>Select input</u>
18-25	Ground



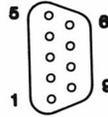
Serial Port

Two RS-232C serial ports are available on the rear panel of the computer through 9-pin D-type connectors. Table 2-5 lists the pin assignments of the serial port connectors. Some serial devices with 25-pin D-type connectors require a special cable to connect to the 9-pin D-type connector on this computer. Table 2-5 includes a cross reference between the 9-pin and 25-pin connectors. The rear panel hook-up chart at the end of this chapter shows the locations of the serial port connectors.

Installation

Table 2-5. Serial Port Pin Assignments

PIN	SIGNAL	25-PIN CROSS REFERENCE
1	Carrier detect	(8)
2	Receive data	(3)
3	Transmit data	(2)
4	Data terminal ready	(20)
5	Signal ground	(7)
6	Data set ready	(6)
7	Request to send	(4)
8	Clear to send	(5)
9	Ring indicate	(22)
Case	Chassis ground	(1)



Power Connections

This section details the power connections for the computer. Before connecting the computer or any peripherals to their AC power source, make sure all power switches are in their OFF position. Figure 2-7 shows a common rear-panel hook-up for this computer.

1. Attach the power cord to the receptacle on the back of the computer and plug the other end into the AC power source.
2. Attach the monitor and peripherals to their AC power sources. Plug the keyboard into the connector on the rear panel of the computer.
3. Remove the shipping insert (if present) from each floppy disk drive. Have the customer save this insert in case the computer must be transported.
4. Proceed to Chapter 3 for power-up and operation instructions.

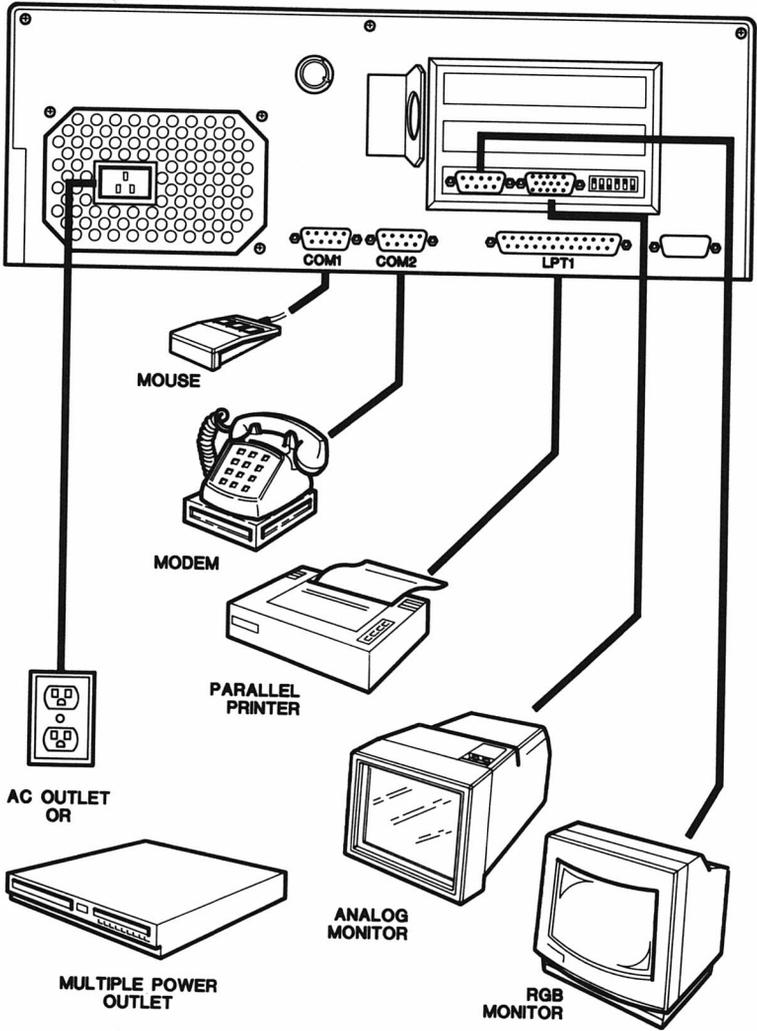


Figure 2-7. Rear Panel Hook-Up Chart



Chapter 3

Operation

This chapter provides basic operating information for the Z-2300 Series computer. Refer to the Owner's Manual (595-4074) for complete operating instructions.

Power Up

Turn on the computer, monitor, and other peripherals. The fan in the computer's power supply will start, the keyboard will reset, the disk drives will initialize, and the power-up self-tests will be performed. You should see the keyboard LEDs blink as the keyboard is reset. The disk access indicator LEDs should also light. You should hear some noise as the read/write heads of the disk drives move. This power-up sequence can be used to diagnose problems in faulty computers.

The computer is factory-set to autoboot the operating system from a disk. Computers supplied with a hard disk drive will boot from the hard disk drive.

If the hard disk has not been PREPped or formatted, this error message will appear shortly after the computer is turned on:

```
+++ DISK ERROR: Drive not ready! +++
```

If the operating system has not been loaded onto the hard disk, one of these messages will appear:

```
No system
```

```
Not a bootable partition
```

These messages are normal and indicate that the CPU recognizes that the operating system is not present. Refer to the operating system documentation for information on loading the operating system.

Operation

Resetting the Computer

Occasionally, you will want to reset the computer to force the power-up sequence to be repeated. The computer can be reset in either of two ways:

Hard reset — Turn the computer off, wait 30 seconds, and then turn it back on.

Soft reset — Press the CTRL, ALT, and DEL keys in sequence, hold them, and then release them.

The Monitor Program

The ROM-based Monitor program permanently stores information vital to the computer's operation. This program contains:

- Power-up tests that can detect problems that would prevent the computer from operating.
- The boot command, which allows the computer to load the operating system from a disk to memory.
- User-selectable tests for the disk drives, keyboard, and memory.
- Commands that allow machine language programs to be entered, changed, examined, and run.

In addition, the Monitor program allows access to the hardware Setup/Configuration menu discussed in a later section.

Entering the Monitor Program

The MFM-200 Monitor program can be used to diagnose problems, change the configuration, and perform ROM-based diagnostics. You can enter the Monitor program in several ways:

CTRL-ALT-INS — Press the CTRL, ALT, and INS keys in sequence, hold them, and then release them. A message similar to this should be displayed:

```
MFM-200 Monitor, Version x.x
Memory size: xxxK
Enter "?" for help
->
```

The arrow (->) on the last line of the message is the Monitor prompt. It indicates that you have entered the Monitor program. You should be able to enter the Monitor program even when software is running.

CTRL-ALT-RETURN — If the CTRL-ALT-INS key combination does not force the computer to enter the Monitor program, press the CTRL, ALT, and RETURN keys in sequence, hold them, and then release them. The CPU register contents will be displayed on the screen followed by the Monitor prompt. Once the Monitor prompt appears, try the CTRL-ALT-INS key combination again. The Monitor message described earlier should appear.

Hard reset — There may be instances when the CPU is locked up and neither the CTRL-ALT-INS nor CTRL-ALT-RETURN combination allows you to enter the Monitor program. If this happens, perform a hard reset by turning the computer off, waiting 30 seconds, and then turning it back on. This procedure should clear the CPU and allow you to use the CTRL-ALT-INS key combination.

Figure 3-1 shows the Monitor command summary you will see if you type a question mark (?) and press RETURN at the Monitor prompt. Monitor commands use the following conventions:

- Items shown in brackets

[like this]

are optional entries and are only entered in certain cases.

Operation

- Items shown in braces and separated by a vertical bar

{like this | and this}

represent a series of choices. Choose only one. In this example, you can choose either *like this* or *and this*.

- Items shown in angle braces

<like this>

must be replaced with a variable, such as a disk drive number.

- 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>][100][200] Where <range> is:
TEST:	Extended diagnostics	TEST
SETUP:	Define hardware Setup	SETUP

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->

Figure 3-1. Monitor Command Summary

Machine Language Debugger Commands

The Monitor program contains a complete set of machine language debugger commands. These commands allow experienced machine level programmers to test procedures and routines, examine memory and register contents, and troubleshoot and correct machine language programs.

Do not attempt to use the machine language debugger commands unless you are familiar with such programming and microprocessor architecture. Table 3-1 lists and describes each command.

Table 3-1. Machine Language Debugger Commands

COMMAND	SYNTAX	DESCRIPTION
Display memory	D<address>	Displays contents of 128 bytes of memory beginning at specified address.
	D<address> L<bytes>	Displays contents of specified number of bytes of memory beginning at specified address.
	D<range>	Displays contents of specified block of memory.
Examine memory	E<address>	Displays and allows user to alter contents of specified memory location.
Fill memory	F<range>,<data byte>	Enters specified data byte into each memory location in specified memory block.
	F<range>,"ASCII string"	Enters specified ASCII string into specified memory block.

Operation

Table 3-1 (continued). Machine Language Debugger Commands

COMMAND	SYNTAX	DESCRIPTION
Execute (Go)	<i>G=<address></i>	Begins execution of program at specified address.
	<i>G=<address>,<breakpoint></i>	Begins execution of program at specified address and halts at breakpoint.
Hex math	<i>H<number1>,<number2></i>	Displays the sum and the difference of the specified hexadecimal numbers.
Input from port	<i>I<port address></i>	Displays contents of specified port.
Move memory block	<i>M<range>,<destination></i>	Copies contents of specified memory block to another specified memory block.
Output to port	<i>O<port address>,<data></i>	Writes specified data to specified port address.
Examine Registers	<i>R<register name></i>	Displays contents of specified CPU register and allows modification of contents.
Search memory	<i>S<address>L<bytes>,<data></i>	Searches specified memory block for specified data byte and displays address data found.
	<i>S<range>L<bytes>,"ASCII"</i>	Searches specified memory block for specified ASCII character and displays address character found.

Table 3-1 (continued). Machine Language Debugger Commands

COMMAND	SYNTAX	DESCRIPTION
Trace program	T<count>	Executes specified number of lines of an assembled program in single-step mode.
Unassemble program	U<range>	Displays mnemonics and hex coding for specified memory block.

Setup/Configuration Program

The Setup/Configuration program sets the time, date, the amount of installed memory, the boot drive, the type of video card, and the number and type of disk drives installed. A special entry can slow down the computer's speed for time-dependent applications. Once entered, this information is stored in non-volatile memory and only needs to be changed if the main board battery is replaced or if the actual hardware configuration is changed. To access the Setup/Configuration program:

1. Enter the Monitor program by pressing the CTRL, ALT, and INS keys in sequence, holding them, and then releasing them.

Operation

- After the Monitor prompt appears, type **SETUP** and press **RETURN**. You will see a display similar to the one in Figure 3-2.

Hardware Setup/Configuration Program			
Time: 09:53:08			
Date: 04/14/1988			
	Base	Extended	EMS
Main RAM:	640K	0K	256K
Add-On RAM:	0K	0K	---
Total:	640K	0K	---
Floppy Drive 0:	3-1/2" 1.4M		
Floppy Drive 1:	-None Present-		
Boot Drive:	Floppy Then Hard Disk		
Serial Port 1 (COM1):	Enable		
Serial Port 2 (COM2):	Enable		
Video Display:	Enhanced Graphics		
Video Refresh Rate:	50 Hz	60 Hz	
Operating Speed: Slow Fast Smart			
Hard Disk Drive 0:			
Media Type:			
Cylinders:	Heads:		
Ship Zone:	Sectors:		
Precomp:	Capacity:		
Hard Disk Drive 1: -Not Present-			
Media Type: N/A			
Cylinders:	Heads:		
Ship Zone:	Sectors:		
Precomp:	Capacity:		
Use Space/Backspace to select values, Arrows to move, Esc when done			

Figure 3-2. Setup/Configuration Menu

- Use the **RETURN** key to move from one field to another. Use the space bar and **BACKSPACE** keys to make a selection in the field. The selection is activated when you move to another field.
- Use the **ESC** key to exit from the program after you have entered the information corresponding to the hardware of the computer. Enter **Y** (yes) to indicate that you are done making changes, and then press **RETURN** to save the changes.

Time — The time field allows you to set or adjust the real-time clock. To set the time, enter the correct time, in 24 hour format, as hours (00-24), minutes (00-59), and seconds (00-59). After you complete the entry, press **RETURN**. If you make a mistake, use the **BACKSPACE** key to erase the incorrect entry.

Date — The date field allows you to set or adjust the date function of the real-time clock. To set the date, enter the correct date using month (01-12), day (01-31), and year entries. After you complete the entry, press RETURN. If you make a mistake, use the BACKSPACE key to erase the incorrect entry.

Main RAM/Add-On RAM — This field allows you to allocate the available memory as base, extended, or EMS memory. Base memory refers to the memory (up to 640K) that MS-DOS® recognizes directly.

EMS memory can be used to address memory beyond 640K under software control. Some applications programs use an EMS software driver to address this memory. EMS memory is located in the address space 0D0000 to 0DFFFF. Refer to the MS-DOS documentation for more information.

Extended memory refers to memory beyond 1M that is outside the memory range that MS-DOS can access. Under software control, this memory can be used for setting up RAM disks and other applications. Refer to the MS-DOS documentation for more information.

Main RAM refers to the available memory installed on the main board of the computer. Add-On RAM refers to memory present on optional memory cards that are plugged into the expansion slots on the main board. Table 3-2 lists the possible entries for this field. Note that for some combinations, a custom PAL is required. For other combinations, additional memory modules (SIMMs) are required. Finally, some combinations are not currently supported, even though they appear as options.

The factory setting is:

BASE	EXTENDED	EMS
640K	0K	256K

Operation

Table 3-2. Main RAM/Add-On RAM Field Combinations

BASE	EXTENDED	EMS	COMMENTS
256K	0K	384K	Requires custom PAL
256K	0K	-OFF-	Requires custom PAL
512K	0K	384K	Standard
512K	0K	-OFF-	Standard
640K	0K	256K	Standard
640K	0K	-OFF-	Standard
640K	0K	2048K	Requires additional memory module
640K	2048K	-OFF-	Requires additional memory module
640K	3072K	2048K	Requires 3 additional memory modules
640K	5120K	-OFF-	Requires 3 additional memory modules
640K	5120K	2048K	Not currently available
640K	7168K	-OFF-	Not currently available
640K	7168K	2048K	Not currently available
640K	9216K	-OFF-	Not currently available
640K	13321K	2048K	Not currently available
640K	15323K	-OFF-	Not currently available

Floppy Drive 0, Floppy Drive 1 — This field specifies the type of floppy disk drive(s) that are installed. This computer can support two floppy disk drives. The following choices can be made for each disk drive in this field:

- 5-1/4" 360K
- 5-1/4" 1.2M
- 3-1/2" 720K
- 3-1/2" 1.4M
- Not Present

The factory settings are:

Floppy Drive 0: 3-1/2" 1.4M
 Floppy Drive 1: Not Present

Boot Drive — This field allows you to select the drive from which the computer will boot upon power-up. The final choice instructs the computer to enter the Monitor mode without loading an operating system. The following choices can be made in this field:

- Floppy Drive 0
- Hard Disk Drive 0
- Floppy then Hard Disk
- Enter MFM-200 Monitor

The factory setting is:

Hard Disk Drive 0.

Serial Port 1, Serial Port 2 — This field allows you to activate up to two serial ports. The computer is equipped with two serial ports (designated COM1 and COM2) as shipped from the factory. The following choices can be made for either port in this field:

- Enable
- Disable

The factory settings are:

Serial Port 1 (COM1): Enable
Serial Port 2 (COM2): Enable

Video Display — This field specifies the type of video card installed in the computer. Refer to Chapter 5 for more detailed information about the standard video card installed in this computer. The following choices are available in this field:

- Color Card: 40×25
- Color Card: 80×25
- Mono Card: 80×25
- Enhanced Graphics

Operation

The factory setting is:

Enhanced Graphics

Video Refresh Rate — This field selects the video display refresh rate and generally reflects the power line frequency in use. The following choices are available:

- 50 Hz
- 60 Hz

The factory setting is:

60 Hz

Operating Speed — The Operating Speed entry allows some control over the computer's speed. The following choices are available:

- Slow
- Fast
- Smart

Choose the Fast mode to take full advantage of the faster operating speed of this 80286-based computer. Choose the Smart mode to slow down the input/output speed. (Some programs may require a slower input/output speed to operate properly.) Choose the Slow mode to slow down the entire computer operation. (Some programs may require a slower overall computer speed to operate properly.)

The factory setting is:

Fast

Hard Disk Drive 0, Hard Disk Drive 1 — This field specifies the type of hard disk drive installed. The computer can support one internal hard disk drive. For the 40M hard disk drive, the factory setting is:

Drive Type 44

Boot Command

The boot command allows you to load an operating system manually from a floppy or hard disk drive.

Booting from floppy disk drives — To boot from floppy disk drive A, enter the Monitor program, insert a disk with an operating system in drive A, type BF0, and press RETURN. The computer will attempt to load an operating system from the disk in drive A. To boot from a second floppy disk drive installed in the computer, type BF1 in place of BF0.

Booting from hard disk drives — To boot from a hard disk drive, enter the Monitor program, type BW, and press RETURN. You can also boot from a particular partition of a hard disk drive if it is divided into multiple partitions. Use this command with the appropriate drive and partition number:

BW<drive number>:<partition number>

Color Bar Command

The color bar command allows you to display an array of colors in the form of a bar graph. On monochrome monitors, the color bars appear as a gray scale. Use this command to adjust the brightness and contrast of the video monitor. To view the color bars, enter the Monitor program, type C, and press RETURN.

User Tests

A number of tests are available at the Monitor prompt. To access these tests, enter the Monitor program, type TEST, and press RETURN. The following menu will appear:

Operation

CHOOSE ONE OF THE FOLLOWING:

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

ENTER YOUR CHOICE:

To run a test, type the number corresponding to that test. Press the ESC key once to pause a test. Press the ESC a second time to return to the test menu. To return to the Monitor prompt, select EXIT.

Disk Drives

The Z-2300 Series computer can support up to two floppy disk drives or one internal floppy disk drive and one hard disk drive. An external 5.25-inch floppy disk drive can be added using the ZCA-2300-EF external floppy drive expansion card. The internal floppy disk drives can be either 3.5-inch standard (720K) or high (1.4M) density. Figure 3-3 illustrates the floppy and hard disk drive locations for this computer.

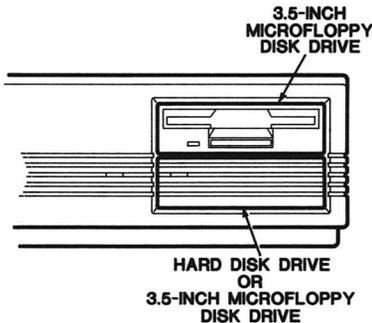


Figure 3-3. Disk Drive Locations

Keyboard

The Z-2300 Series computer is supplied with an enhanced 101-key keyboard. The keyboard is illustrated in Figure 3-4.

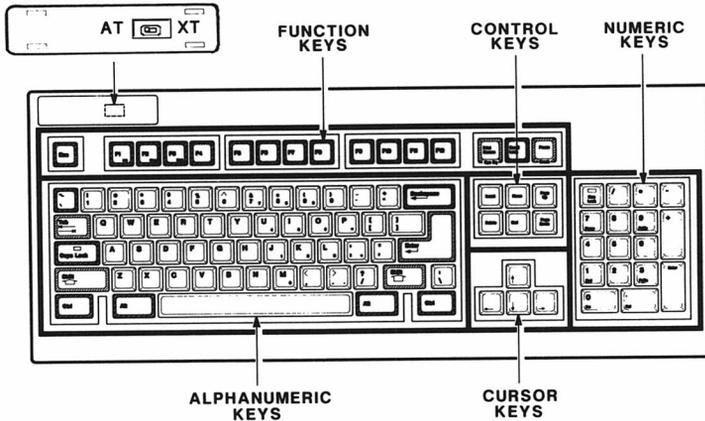


Figure 3-4. Enhanced Keyboard

The keys are divided into five groups. These groups are described briefly in the following paragraphs.

Alphanumeric keys — These are the primary keys used for entering information. They are arranged in QWERTY fashion much like those of a typewriter.

Numeric keys — These keys can be used to speed the entry of numeric data. They are activated by pressing the NUM LOCK key. When NUM LOCK is off, these keys perform cursor and screen movement functions.

Operation

Control keys — These keys are controlled by software. Software packages such as word processors and spreadsheets often assign a function to these control keys to make the program more convenient to use.

Cursor keys — These keys allow movement of the cursor, such as in the Setup/Configuration program discussed earlier.

Function keys — These keys are assigned special functions by software.

With the exception of the SCROLL LOCK, CAPS LOCK, and NUM LOCK keys, all the keys are single-pole, single-throw, push-to-make switches. The SCROLL LOCK, CAPS LOCK, and NUM LOCK keys are single-pole, single-throw, push-to-make, push-to-break switches.

Chapter 4

Disassembly

This chapter contains step-by-step instructions for disassembly. For reassembly, perform the steps in the reverse order unless instructed otherwise. Read each section (and any previous sections referred to) completely before disassembling the computer.

WARNING

To avoid a shock hazard, unplug the computer before beginning disassembly.

Cover Removal

1. Turn off the computer and unplug it.
2. Disconnect the keyboard, video monitor, and all other peripherals from the computer.
3. Turn the rear panel keylock to its fully counterclockwise (unlocked) position.
4. Refer to Figure 4-1 and remove and save the seven screws that secure the cover to the computer.
5. Remove the cover by sliding it toward the front of the computer. Support the cover as you slide it off to avoid contact with circuit cards or cables.
6. If you are replacing the power supply, remove the plastic power switch bezel from the back right corner of the chassis. Replace this panel and the adhesive strip on the new power supply.

Disassembly

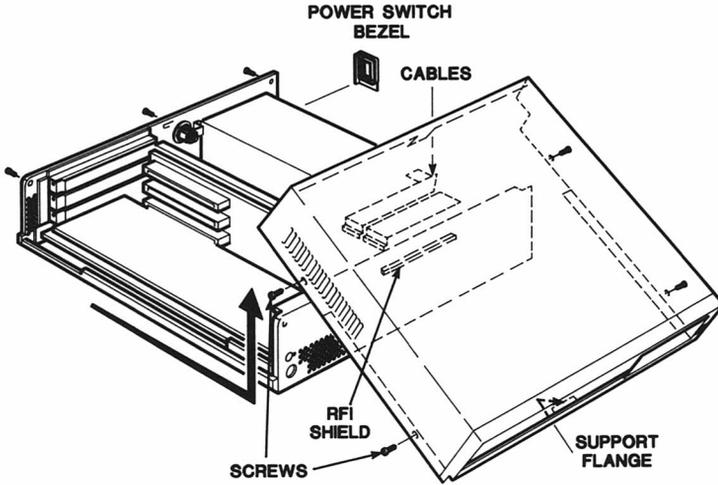


Figure 4-1. Cover Removal

Circuit Card Removal

CAUTION

Components on some circuit cards can be damaged by static electricity. Observe standard precautions when handling circuit cards during removal or installation.

1. Remove the cover as described earlier.
2. Note the location and orientation of any cables connected to the card to be removed. If necessary, mark these cables so they can be properly connected during reassembly.

3. Refer to Figure 4-2 and remove the screw that secures the circuit card to the computer chassis.

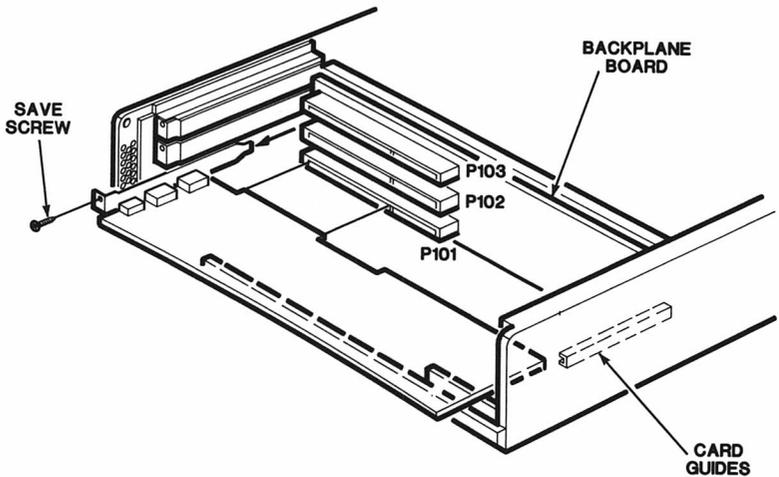


Figure 4-2. Circuit Card Removal

4. Remove the circuit card from the connector on the backplane board by grasping it at both ends and sliding it until it is freed from its connector.
5. Store the circuit card in protective packaging until you are ready to use it again.

Backplane Board Removal

1. Remove the cover as described earlier.
2. Remove all circuit cards as described earlier.

Disassembly

3. Disconnect any floppy and hard disk cables from the connectors on the backplane board, as shown in Figure 4-3. Note the orientation of the cables for reassembly.
4. Remove the two screws that secure the backplane board to the chassis support bracket, as shown in Figure 4-3.

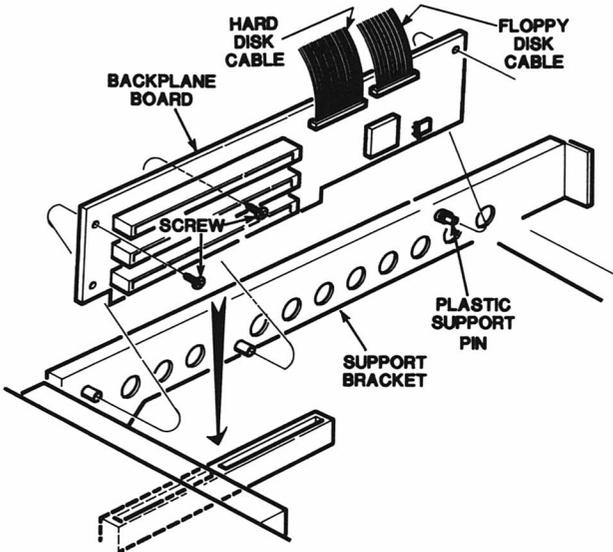


Figure 4-3. Backplane Board Removal

5. Free the backplane board from the plastic support and lift it up and out of the connector on the main board.

Keyboard Interface Board Removal

1. Remove the cover as described earlier.
2. Remove all circuit cards as described earlier.

3. Remove the screw that secures the keyboard interface board to the main board and computer chassis, as shown in Figure 4-4.

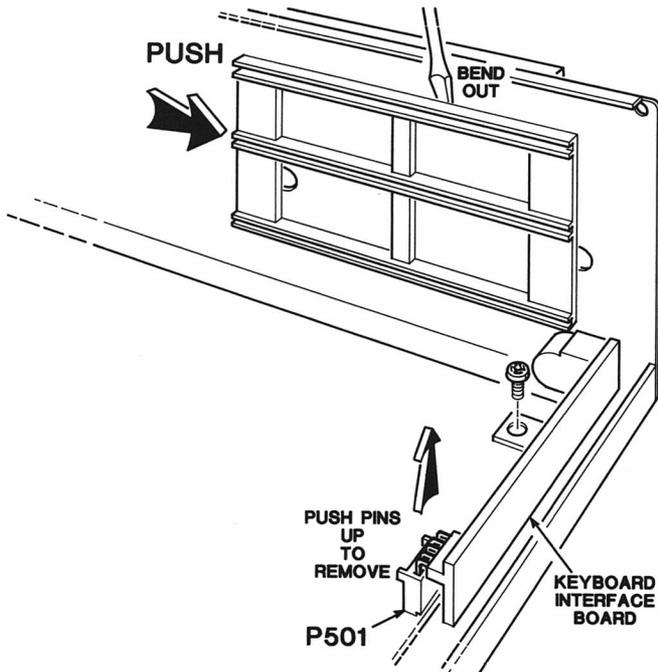


Figure 4-4. Keyboard Interface Board Removal

4. Gently lift the keyboard interface board from connector P501 on the main board, as shown in Figure 4-4. Remove this board at an angle by holding down the front of the board above the keyboard connector and lifting the back of the board above P501.

Disassembly

Speaker/LED Removal

1. Remove the cover as described earlier.
2. Remove all circuit cards as described earlier.
3. Remove the backplane board as described earlier.
4. Remove the screw that secures the speaker mounting bracket to the chassis support bracket.
5. Disconnect the speaker/LED cable leading to connector P506 on the main board.
6. Slide the power LED through the opening in the front of the computer chassis and remove the speaker/LED assembly.

Battery Removal

1. Remove the cover as described earlier.
2. Disconnect the battery cable leading to connector P509 on the main board.

NOTE: All configuration information stored in the Monitor ROM will be lost once P509 is disconnected. If necessary, note the current setup information before removing the battery so you can re-enter the correct information after reassembly.

3. Lift the battery from the Velcro strip that secures it to the side of the disk drive housing.

Main Board Removal

1. Remove the cover as described earlier.
2. Remove all circuit cards as described earlier.

Disassembly

3. Remove the backplane board as described earlier.
4. Remove the keyboard interface board as described earlier.
5. Disconnect the cables leading to connectors P506 (speaker/LED assembly), P507 (power supply), and P509 (battery).
6. Remove the six threaded hex spacers that secure the two 9-pin serial port connectors and the 25-pin parallel port connector to the rear panel of the computer, as shown in Figure 4-5.

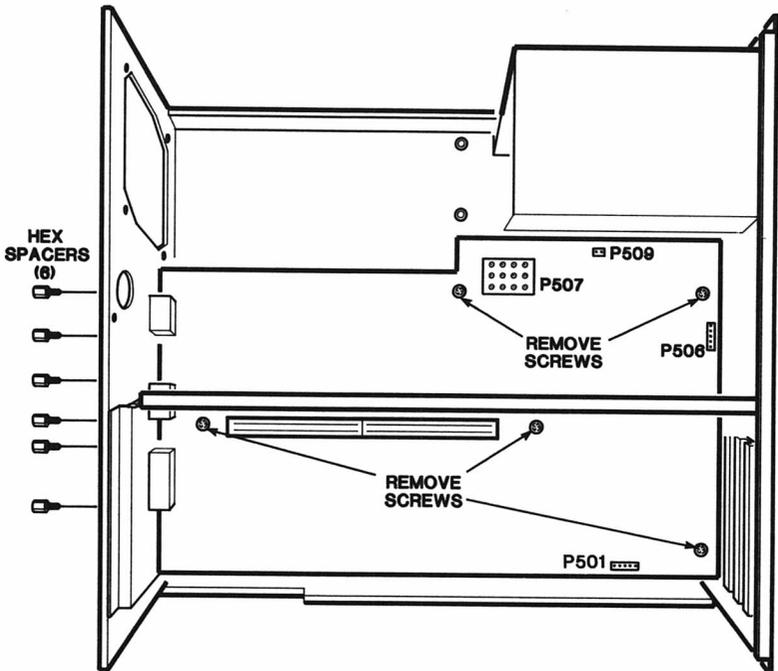


Figure 4-5. Main Board Removal

7. Remove the remaining four screws that secure the main board to the chassis, as shown in Figure 4-5.

Disassembly

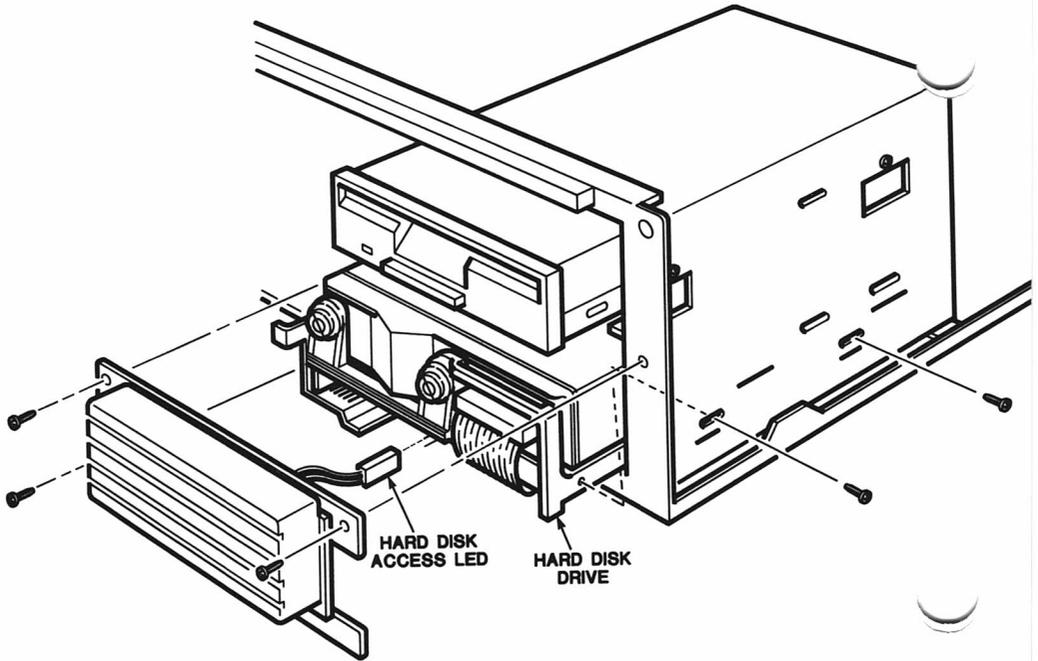


Figure 4-8. Hard Disk Drive Removal

4. Disconnect the hard disk access LED cable from the drive and remove the front panel.
5. Remove the two screws that secure the hard disk drive to the disk drive housing, as shown in Figure 4-8.
6. Slide the hard disk drive out from the front of the disk drive housing. If you are replacing the disk drive, remove the plastic guide track from the old drive and attach it to the new drive in the same way.

Power Supply Removal

1. Remove the cover as described earlier.
2. Disconnect power supply connector P507 from the main board.
3. Disconnect any power supply cables connected to the disk drives.
4. Remove the three screws that secure the power supply to the back panel of the computer, as shown in Figure 4-9.
5. Remove the two screws that secure the power supply to the bottom of the chassis, as shown in Figure 4-9.
6. Lift the power supply from the chassis.

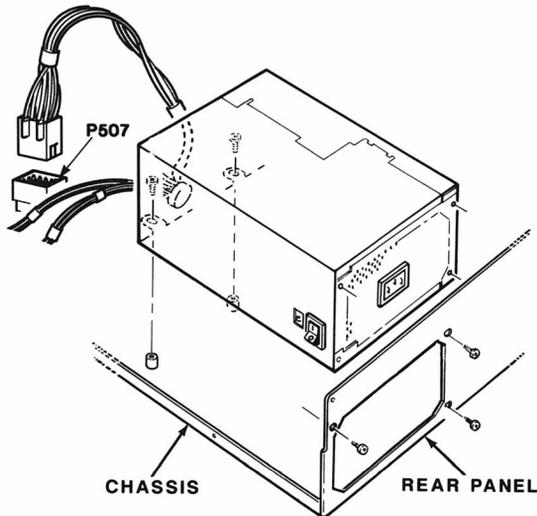


Figure 4-9. Power Supply Removal



Chapter 5 Configuration

This chapter describes the jumper and switch settings for Z-2300 Series computers. For connector pinouts and information about the ROM-based Setup/Configuration program, refer to Chapter 2.

All circuit boards illustrated in this chapter are shown with their jumpers and switches in the factory settings. Figure 5-1 shows the locations of the major assemblies in this computer.

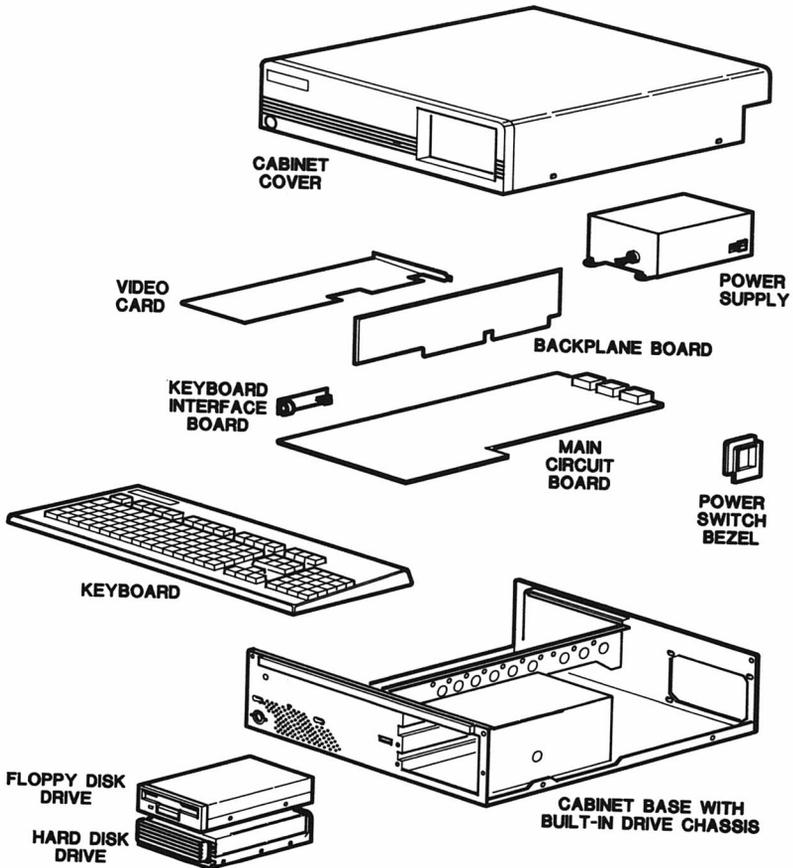


Figure 5-1. Major Assemblies

Main Board

The main board contains ten configurable jumper blocks. Their locations and factory settings are illustrated in Figure 5-2. Table 5-1 describes each jumper briefly. Some of the jumpers are described in more detail following the table.

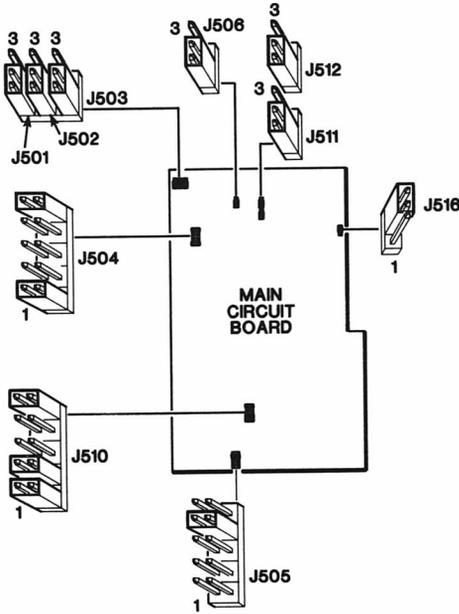


Figure 5-2. Main Board Jumper Locations

Table 5-1. Main Board Jumper Settings

JUMPER	FUNCTION	SETTING
J501	Parallel port use:	
	Printer	1-2*
	Scanner	2-3
J502	Parallel port use:	
	Printer	1-2*
	Scanner	2-3
J503	Parallel port use:	
	Printer	1-2*
	Scanner	2-3
J504	CHIPSpak IC selection:	
	Unit 1	1-2*
	Unit 2	3-4
	Unit 3	5-6
	Unit 4	7-8
	IBM printer compatibility	9-10*
J505	80287 direct clock speed:	
	8MHz (80286 clock divide by two)	1-2
	Optional 80287 oscillator (not used)	3-4
	24MHz oscillator (not used)	5-6
	16MHz oscillator	7-8*
	14MHz oscillator	9-10
J506	Parallel port use:	
	Printer	1-2*
	Scanner	2-3
J510	Miscellaneous functions:	
	Color video card	1-2*
	SCP control	3-4*
	Keyboard type (AT or XT)	5-6, 7-8
	Numeric coprocessor clock mode (CLKM)	9-10*

Configuration

Table 5-1 (continued). Main Board Jumper Settings

JUMPER	FUNCTION	SETTING
J511	Parallel port use: Printer	1-2*
	Scanner	2-3
J512	Parallel port use: Printer	1-2*
	Scanner	2-3
J516	Memory module type: 1M SIMMs installed in banks A1, A2, B1, B2, C1, C2	1-2
	256K SIMMs installed in banks A1, A2, B1, B2	2-3*

* Factory setting

J501-J503, J506, J511, J512 — These jumpers determine whether the parallel port is to be used with a printer or with a scanner. With positions 1-2 jumpered, the port is configured for use with a printer. With positions 2-3 jumpered, the port is configured for use with a scanner. As shipped, the parallel port is configured for operation with a printer designated LPT1.

J504 — This jumper determines the port select address and allows the use of ports on additional installed cards that may contain them. This jumper normally requires no adjustment.

J505 — This jumper determines the direct clock speed for the numeric coprocessor. Set this jumper in combination with J510 according to the coprocessor version you are using as, described in Table 5-2.

Configuration

J510 — The numeric coprocessor clock mode jumper signals the installed coprocessor for direct or divided clock mode operation. With no jumper installed on pins 9-10, the numeric coprocessor is forced into its direct clock mode. This means that the direct clock speed applied to the coprocessor will not be divided internally by the coprocessor. (Jumper block J505 determines the clock speed that is applied to the coprocessor.) When a jumper is installed on pins 9-10, the numeric coprocessor divides the incoming direct clock speed. For an 80287, the incoming clock speed is divided by 3; for an 80C287 (CMOS version), the incoming clock speed is divided by 2. Refer to the description of J505 and to Table 5-2 for more information.

Table 5-2. J505 Numeric Coprocessor Settings

PINS JUMPERED	DIRECT CLOCK SPEED	EFFECTIVE COPROCESSOR SPEED WITH J510, PINS 9-10 INSTALLED	
		80287 (divide by 3)	80C287 (divide by 2)
7-8*	16 MHz	5.3 MHz	8 MHz
9-10	14 MHz	4.7 MHz	7 MHz
1-2	8 MHz	2.7 MHz	4 MHz

* Factory setting; use this setting with the Z-416-C numeric coprocessor.

J516 — This jumper defines the type of memory modules (SIMMs) installed in locations A1, A2, B1, and B2. As set at the factory (jumper installed on pins 2-3), 256K SIMMs must be installed in locations A1, A2, B1, and B2; locations C1 and C2 can contain either 256K or 1M SIMMs for a maximum of 3M of installed memory. When this jumper is installed on pins 1-2, locations A1, A2, B1, B2, C1, and C2 must only contain 1M SIMMs for a maximum of 6M of installed memory.

Configuration

Backplane Board

The backplane board contains five configurable jumper blocks. Their locations and factory settings are illustrated in Figure 5-3. Table 5-3 describes each jumper briefly. Some of the jumpers are described in more detail following the table.

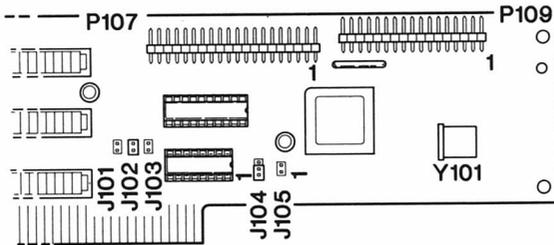


Figure 5-3. Backplane Board Jumper Locations

Table 5-3. Backplane Board Jumper Settings

JUMPER	FUNCTION	SETTING
J101	Floppy controller crystal (Y101)	
	Present	OFF
	Not present	ON
J102	Floppy controller circuitry	
	Enable	ON*
	Disable	OFF
J103	Precompensation:	
	125 nS	OFF*
	187 nS	ON
J104	Hard disk drive manufacturer:	
	Conner 40M hard disk drive	1-2*
	Other	2-3
J105	Not used	

* Factory setting

Configuration

J101 — This jumper should be installed if floppy controller crystal Y101 is not present on the backplane board; if Y101 is present, this jumper should not be installed.

J102 — This jumper activates the floppy controller circuitry on the backplane board. If a separate disk controller card is used to control the floppy disk drives, disable the floppy controller circuitry on the backplane board by removing this jumper.

J103 — This jumper sets the floppy disk drive precompensation value. When the jumper is installed, the precompensation value is 187 nS; when it is not installed, the value is 125 nS.

J104 — This jumper is installed on pins 1-2 when a Conner 40M hard disk drive is present. For other hard disk drives, this jumper should be installed on pins 2-3.

Video Card

CAUTION

To avoid damage to the video card, the monitor, or both, be certain that the video card is properly configured for the monitor to be used.

The Z-449 video card can produce an analog RGB video signal at a constant 31.49 kHz horizontal scan frequency. CGA, EGA, MDA, Hercules, and Zenith 480-line (VGA-type) displays can all be produced using a 31.49 kHz analog RGB video monitor. These analog RGB video signals are available at the 15-pin D-type connector. Use this connector only with video monitors that accept an analog RGB video signal at a constant 31.49 kHz horizontal scan frequency.

Configuration

The video card can also produce CGA, EGA, MDA, and Hercules video signals in their standard (TTL) form. These signals are available at the 9-pin D-type connector. Use this connector with standard EGA (RGBrgb), CGA (RGBI or RGB), MDA (TTL monochrome), and Hercules (TTL monochrome) monitors.

Figure 5-4 shows the video card switch and jumper locations. Table 5-4 lists the switch and jumper combinations for various display types, including certain Zenith Data Systems video monitors.

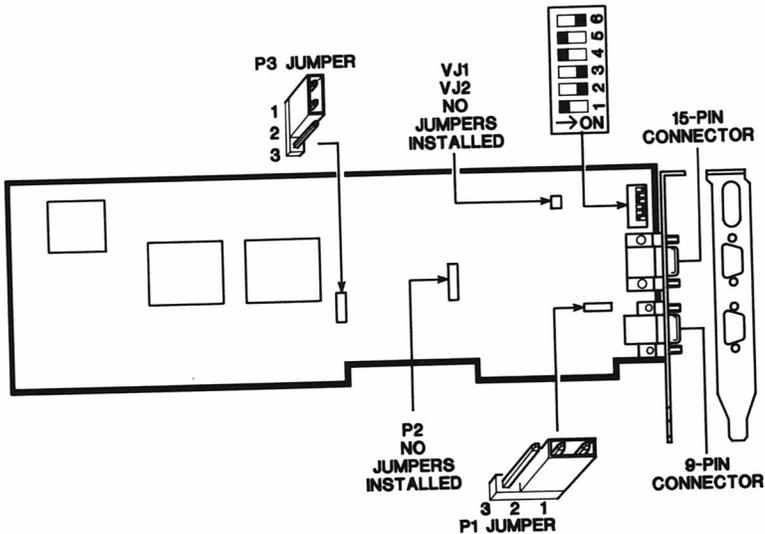


Figure 5-4. Video Card Switch and Jumper Locations

Configuration

Table 5-4. Video Card Configuration

MONITOR TYPE (ZDS MODEL)	SWITCH SECTION ¹						JUMPER	
	1	2	3	4	5 ²	6 ³	P1	P3
CGA (80x25) (ZVM-1330, 1360)	OFF	OFF	OFF	ON	OFF	OFF	2&3	1&2
CGA monochrome (ZMM-1470)	OFF	OFF	OFF	ON	OFF	OFF	2&3	1&2
EGA (350 line) (ZVM-1380-C)	OFF	ON	ON	OFF	OFF	OFF	1&2	1&2
EGA monochrome (ZMM-1470)	OFF	ON	ON	OFF	OFF	OFF	1&2	1&2
MDA monochrome (ZVM-1240)	OFF	OFF	ON	OFF	OFF	OFF	2&3	1&2
Hercules monochrome (ZVM-1240)	OFF	OFF	ON	OFF	OFF	OFF	2&3	1&2
31.49 kHz analog RGB (color) or multi-sync (ZCM-1490, 1390)	OFF	ON	ON	OFF	OFF	ON	1&2	1&2
31.49 kHz analog RGB (monochrome) (ZMM-149)	ON	ON	OFF	OFF	OFF	ON	1&2	1&2

Configuration

Table 5-4 (continued). Video Card Configuration

NOTES

1. Switch sections 1 through 4 define the type of video display to be produced: CGA, EGA, MDA, Hercules, or Zenith 480-line (VGA-type).
 2. Switch section 5 activates the automode feature. Automode automatically switches the display output of the video card between CGA and EGA or between MDA and Hercules under software control. **When the automode feature is enabled, the computer cannot recognize NMI or parity errors; this switch should normally be set to OFF.**
 3. Switch section 6 selects between 31.49 kHz analog RGB signals (available at the 15-pin D-type connector) and standard (TTL) signals (available at the 9-pin D-type connector).
-

Hard Disk Drive

The hard disk drive installed in the computer requires no adjustment. Because the controller circuitry is part of the hard disk drive, a drive select jumper is not used.

Floppy Disk Drives

One or two 1.4M, 3.5-inch microfloppy disk drives can be installed in the computer. The drive select switch on an installed drive is factory-set for DS1. If two floppy disk drives are installed, a twist in the disk drive cable forces one drive to be designated drive A and the other drive B, even though both drives are configured as DS1. Figure 5-5 illustrates the drive select switch location. This switch should normally require no adjustment. When installing another floppy disk drive, refer to its documentation to determine the drive select jumper location and settings.

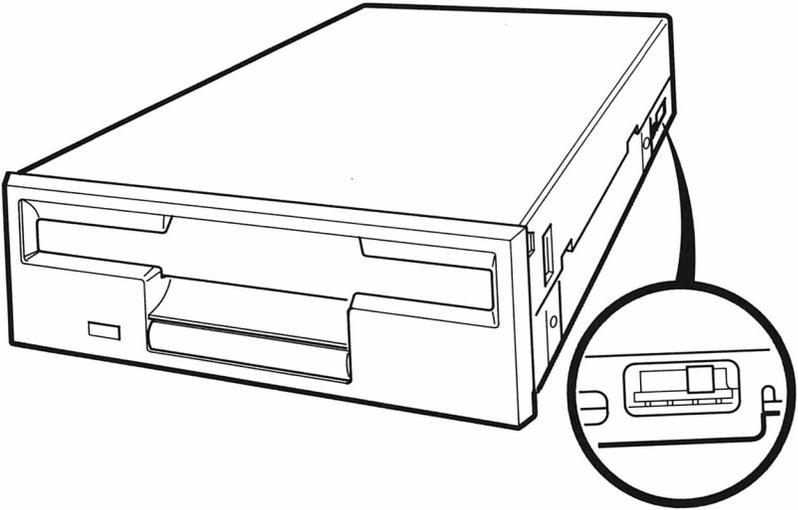


Figure 5-5. 3.5-Inch Disk Drive Select Switch

Keyboard

The enhanced 101-key keyboard can be set for either PC- or AT-compatible operation. A switch is located in a recess under the Zenith Data Systems nameplate on the keyboard. To gain access to the switch, use a small screwdriver to gently pry the nameplate up. The switch positions are labeled AT and XT. For use with the Z-2300 Series computer, this switch is factory-set to the AT position.



Chapter 6

Troubleshooting

This chapter provides information on troubleshooting the Z-2300 Series computer. Enough information is included to assist in diagnosing most faults to the circuit card level. Verify that the hardware setup/configuration information is correct before proceeding (refer to Chapter 3).

The troubleshooting procedure is in a question-and-answer form, with a yes or no answer for most questions. You will be directed to the next logical step by the YES or NO column. If a "—" is shown in either or both columns:

- The fault has been identified and corrected. In this case the step directs you to retest the fault area to verify that the problem is corrected.
- Further action is required. In this case the step directs you to perform a specific test to isolate the problem.

The troubleshooting procedure contains the following steps:

- Step 1: Initial Checks
- Step 2: Power Up
- Step 3: ROM-Based Disk Read Test
- Step 4: Disk-Based Diagnostic Fast Tests
- Step 5: Comprehensive ROM-Based Diagnostic Tests
- Step 6: Comprehensive Disk-Based Diagnostic Tests
- Step 7: Power Supply
- Step 8: Main Board
- Step 9: Floppy Disk Drives
- Step 10: Hard Disk Drives
- Step 11: Video Card and Monitor
- Step 12: Keyboard

Information on configuring the disk-based diagnostics is included at the end of the chapter.

Troubleshooting

Error Messages

Table 6-1 lists the error messages that can be generated by the computer. Some messages isolate specific problems and are self-explanatory. In those cases, no further action is specified in the table. For the remaining messages, refer to the troubleshooting step or steps indicated in the table and perform the procedure as directed. If you cannot perform the procedure, replace the device indicated in the procedure.

Table 6-1. Error Messages

MESSAGE	PROCEED TO STEP:
+++ ERROR: Please replace the back-up battery! +++	—
+++ ERROR: Bad configuration information found in CMOS! +++	—
+++ ERROR: CPU failure! +++	8
+++ ERROR: ROM checksum failure! +++	8
+++ ERROR: Overflow! +++	8
+++ ERROR: RAM failure! Address: XXXX:YYYY, Bit: X, MODULE: XXX	6
+++ ERROR: Parity hardware failure! Address: XXXX:YYYY, Bit: X, MODULE XXX	6, 8
+++ ERROR: Parity failure! +++	6, 8
+++ ERROR: Memory Parity Failure! +++	6, 8
+++ ERROR: Timer interrupt failure! +++	6, 8
+++ ERROR: Base memory size error! SETUP: XXXK ACTUAL: YYYK +++	—
+++ ERROR: Extended memory size error! SETUP: XXXXXK ACTUAL: YYYYYK +++	—
+++ Divide by zero! +++	—
+++ ERROR: Keyboard not responding or not connected! +++	12
+++ ERROR: Invalid/No keyboard code received! +++	12
+++ DISK ERROR: Drive not ready! +++	3, 9, 10
+++ DISK ERROR: Bad disk controller! +++	3, 6, 9, 10
+++ DISK ERROR: DMA overrun! +++	6, 9, 10
+++ DISK ERROR: Disk not bootable! +++	9, 10
+++ DISK ERROR: Sector not found! +++	9, 10
+++ DISK ERROR: CRC error! +++	9, 10
+++ DISK ERROR: Invalid address mark detected! +++	9, 10
+++ DISK ERROR: Seek failure! +++	9, 10
+++ DISK ERROR: Invalid data read! +++	3, 9, 10
No system	3, 9, 10
Not a bootable partition	10
+++ Non-maskable interrupt! +++	6
+++ ERROR: Wild Interrupt! +++	6
+++ ERROR: Wild Hardware Interrupt! +++	6
FATAL: Internal Stack Failure, System Halted	6

Step 1: Initial Checks

STEP	PROCEDURE	YES	NO
1	Is there a specific customer complaint?	1a	1b
1a	Did the computer work and then break?	1c	2
1b	Is the computer plugged into a working outlet?	1c	2
1c	Perform a "sense test" of the computer. Check for physical damage to the cabinet, disk drives, keyboard, and video monitor. Check the floppy disk drives for disks jammed in the drive and for proper mechanical operation. Also, smell the computer for indications of overheated or burned components. Do you detect signs of damage?	1d	2
1d	Locate and replace damaged parts or free any jammed disk. Proceed to step 2.	—	—

Step 2: Power Up

STEP	PROCEDURE	YES	NO
2	Plug the computer into a working outlet and turn it on. The fan in the power supply should start, the keyboard should reset, and the disk drives should initialize. You should see the keyboard LEDs blink as the keyboard is reset, the disk access indicators should light and you should hear some noise as the read/write heads of the disk drives move. Do you detect anything unusual?	2a	2d

Troubleshooting

2a	Do you hear a slow, steady beep? (Such a beep indicates that the "slushware" has not been loaded into the upper half of the first 1M of RAM.)	2b	2d
2b	If 256K SIMMs are installed in locations B1 and B2, replace them. If 1M SIMMS are installed in A1 - C2, replace the 1M SIMM in location A1. (Refer to Chapter 2 for SIMM installation instructions.) Turn the computer on. Does the problem persist?	2c	3
2c	Replace the main board. Repeat step 2.	—	—
2d	Did the computer power up?	2f	2e
2e	Turn off the computer and proceed to step 1c, and then to step 7.	—	—
2f	Is there a readable display on the video monitor?	3	2g
2g	Is there a blinking cursor on the video monitor?	3	8

Step 3: ROM-Based Disk Read Test

STEP	PROCEDURE	YES	NO
3	Reset the computer by pressing the CTRL-ALT-INS key combination. The Monitor prompt should appear in the upper left corner of the screen: MFM-200 Monitor, Version x.x Memory Size: xxxK Enter "?" for help ->		
	Does this message appear?	3b	3a

Troubleshooting

3a	Turn off the computer and proceed to step 8.	—	—
3b	Type TEST and press RETURN. Does the test menu appear?	3c	3a
3c	Insert a disk in drive A (be sure you have a backup copy of this disk). Can the disk be inserted easily and does the drive door close and latch?	3e	3d
3d	Turn the computer off and proceed to Step 9.	—	—
3e	<p>Select the disk read test from the menu by pressing the 1 key. The following message should appear:</p> <pre style="margin-left: 2em;">DISK READ TEST TEST COUNT = x TYPE <ESC> TO ABORT</pre> <p>Allow the disk read test to run for at least 30 seconds. Does a device error message appear on the screen?</p>	3f	4
3f	Turn the computer off and proceed to step 9.	—	—

Step 4: Disk-Based Diagnostics Fast Tests

STEP	PROCEDURE	YES	NO
4	Insert the disk-based diagnostics disk (CB-31-2) into drive A and boot it. Does the diagnostics menu appear on the screen?	4d	4a

Troubleshooting

4a	Insert another bootable disk into drive A and boot the drive. Can you boot the drive?	4b	4c
4b	Use another copy of the disk-based diagnostics and return to step 4.	—	—
4c	Proceed to step 9.	—	—
4d	Use the arrow keys to select the diagnostics for the computer you are servicing. (If that computer model does not appear on the menu, proceed to the "Disk-Based Diagnostics" section at the end of this chapter.) Run the fast test. Does an error or fail message appear on the screen?	4e	4g
4e	Run all automatic tests for the device that showed an error in the fast tests. Does an error or fail message appear?	4f	4g
	NOTE: If you suspect a problem with the serial ports, run the external loopback test included in the disk-based diagnostics. You will need a loopback plug (part number 438-73) for this test.		
4f	Refer to Table 6-1 and proceed to the appropriate step to replace the faulty device.	—	—
4g	Turn the computer off and remove the cover. Have any circuit cards not supplied by Zenith Data Systems been installed?	4h	5
4h	Remove any circuit cards not supplied by Zenith Data Systems. Repeat steps 4 through 4e. Does the problem persist?	5	4i
4i	Repeat steps 2, 3, and 4 to verify that the problem has been corrected.	—	—

Step 5: Comprehensive ROM-Based Tests

STEP	PROCEDURE	YES	NO
5	Does the computer have more than one disk drive?	5a	5c
5a	Boot the additional drives and run the ROM-based disk read test on each drive. Does an error or fail message appear?	5b	5c
5b	Proceed to step 9 (floppy disk drives) or step 10 (hard disk drives).	—	—
5c	Run the ROM-based memory tests. Allow the tests to run for at least two passes. Does an error or fail message appear?	5d	5e
5d	Proceed to step 8.	—	—
5e	Run the ROM-based keyboard test. Test the keyboard by pressing a number of keys and verifying that the correct characters are displayed. Do you detect a problem?	5f	5g
5f	Does an error or fail message appear?	5g	5h
5g	Proceed to step 12.	—	—
5h	Run the ROM-based power-up test. Allow the test to run for at least ten passes. Does an error or fail message appear?	5i	6

Troubleshooting

- 5i Refer to Table 6-1 and proceed to the appropriate step to replace the faulty device. — —

Step 6: Comprehensive Disk-Based Diagnostics

STEP	PROCEDURE	YES	NO
6	Select the normal test for the computer from the disk-based diagnostics menu (enter NO when prompted for fast tests). Run all automatic tests for the computer. Does an error or fail message appear?	6a	6b
6a	Refer to Table 6-1 and proceed to the appropriate step to replace the faulty device.	—	—
6b	Run all manual tests by selecting each test individually (select SINGLE TEST). Run the sections marked M (manual) or C (combination). Does an error or fail message appear?	6a	7

Step 7: Power Supply

STEP	PROCEDURE	YES	NO
7	Is the computer plugged into a working outlet?	7b	7a

Troubleshooting

7a	Plug the computer into a working outlet and return to step 2.	—	—
7b	Turn the computer on. Does the fan start?	7g	7c
7c	Turn the computer off and disconnect the power cord from the outlet and from the computer. Check all three conductors of the cord for continuity. Is there continuity?	7d	7f
7d	The power cord is defective. Replace the power cord and return to step 2.	—	—
7e	Turn the computer off and remove the cover. Perform a sense test (see step 1). Verify that all cables from the power supply are properly connected at the main board and disk drives. Does everything appear normal?	7g	7f
7f	Refer to the appropriate section or replace any damaged parts based on the results of the sense test.	—	—
7g	Disconnect the power cables from the disk drives and turn the computer on. Does the fan start?	7i	7h
7h	Refer to Figure 6-1 and verify that the correct output voltages are present at each disk drive power cable. Are they correct?	7j	7m

Troubleshooting



Figure 6-1. Disk Drive Power Cable Voltages

- | | | | |
|--|---|----|----|
| 7i | Reconnect the disk drives one at a time and turn the computer on after each drive is reconnected. Does the computer fail to start when a particular drive is connected? | 7k | 7j |
| 7j | Turn off the computer. Remove a circuit card and then turn the computer on. Does the fan start? | 7l | 7m |
| (Repeat this process until each board has been removed, including the back-plane board.) | | | |
| 7k | Replace the drive that prevents the power supply from starting. Return to step 2. | — | — |
| 7l | Replace the circuit board that prevents the power supply from starting. Return to step 2. | — | — |
| 7m | Replace the power supply. Turn the computer on. Does the power supply start? | 2 | 7n |

- 7n Replace the main board. Return to step 2 and verify that the problem has been corrected. — —

Step 8: Main Board

STEP	PROCEDURE	YES	NO
8	<p>Attempt to boot the MS-DOS operating system. If a hard disk drive is installed, the computer should automatically attempt to boot from it. If only floppy disk drives are installed, insert the MS-DOS disk into drive A and attempt to boot the operating system. A message similar to the following should appear:</p> <p>Current Date is Tue 1-01-1980 Enter new date (mm-dd-yy):</p> <p>Does the correct message appear?</p>	3	8a
8a	<p>Turn the computer off and remove the cover. Perform a sense test (see step 1). Also, refer to the configuration information in Chapter 5 and verify that the jumpers are set correctly. Do you detect any damage or incorrect jumper settings?</p>	8b	8c
8b	<p>Correct any jumper settings. Replace any parts that appear damaged. Return to step 2 and verify that the problem has been corrected.</p>	—	—
8c	<p>Are any circuit cards not supplied by Zenith Data Systems installed in the computer?</p>	8d	8e

Troubleshooting

8d	Remove any circuit cards not supplied by ZDS. Repeat step 8. Does the problem persist?	8e	3
8e	Is an error message displayed on the screen?	8f	8g
8f	Refer to Table 6-1 and proceed to the step indicated. If the error message indicates a problem with the main board, proceed to step 8m.	—	—
8g	Attempt to boot MS-DOS as described in step 8. Observe the LEDs on the keyboard as you turn the computer on. Do the LEDs light and then extinguish shortly after the computer is turned on?	8h	8j
8h	Attempt to boot MS-DOS as described in step 8. Observe the disk drive LEDs and listen for disk drive head movement after you turn the computer on. Do the LEDs light and then extinguish as the disk drives initialize?	8i	8k
8i	Does a blinking cursor or other readable display appear on the screen?	8k	8l
8j	Turn the computer off. Replace the keyboard. Repeat step 8. Does the problem persist?	8m	3
8k	Turn the computer off. Replace the backplane board. Repeat step 8. Does the problem persist?	8m	3
8l	Turn the computer off. Replace the video card. Repeat step 8. Does the problem persist?	8m	3

8m	If you have a replacement Monitor ROM available (part number 444-463), replace the ROM. Begin by turning the computer off. Locate the Monitor ROM (designated U526). Using a small screwdriver, gently pry the ROM from its socket. Then carefully position the replacement ROM over the socket. Be certain that pin 1 of the ROM is aligned with the pin 1 location on the outline for U526 and press the new ROM into the socket. Make sure that the ROM is properly seated and that no pins are bent under or out of the socket. Repeat step 8. Does the problem persist?	8n	3
8n	Replace the main board. Return to step 2 and verify that the problem has been corrected.	—	—

Step 9: Floppy Disk Drives

STEP	PROCEDURE	YES	NO
NOTE: Be sure you have a backup copy of the disks used in these steps.			
9	Can a floppy disk be inserted into drive A?	9e	9a
9a	Inspect the drive for mechanical problems. Is there a disk in the drive?	9b	9c
9b	Try to remove the disk by pressing the ejection button or by closing and then opening the disk drive latch. Can you remove the disk?	9e	9d

Troubleshooting

9c	Replace the disk drive. Return to step 2 and verify that the problem has been corrected.	—	—
9d	Grasp the disk with a pair of tweezers or small pliers. Attempt to remove it by lifting it up and out. Can you remove the disk?	9e	9c
9e	Insert a disk into the drive. Does the disk latch into place properly?	9f	9c
9f	Does the latch remain engaged?	9g	9c
9g	Release the latch and eject the disk. Did the latch release and can the disk be removed?	9h	9c
9h	Remove the disk from the drive and inspect it for damage. Is the disk damaged?	9c	9i
9i	Insert a copy of the MS-DOS disk in drive A. Turn the computer on. Press the CTRL, ALT, and INS keys in sequence, hold them, and then release them. Boot drive from A by typing BF0 at the Monitor prompt. Does the drive A disk access LED light?	9j	9k
9j	A message similar to the following should appear: <pre>Current Date is Tue 1-01-1980 Enter new date (mm-dd-yy):</pre>		
	Does this message appear?	4	9k

Troubleshooting

9k	Inspect all cables leading to the disk drive. Are they properly seated on both the drive and the backplane board connectors?	9m	9l
9l	Seat the connectors properly and repeat step 9j. Does the correct message appear?	4	9m
9m	Replace the cable leading from the backplane board to the disk drive. Repeat step 9j. Does the correct message appear?	4	9n
9n	Does the computer have two floppy disk drives installed?	9o	9q
9o	Disconnect, but do not remove, drive A. Insert a bootable MS-DOS disk into drive B and attempt to boot from this drive by typing BF1 at the Monitor prompt. Does the correct message appear?	9p	9q
9p	Replace drive A. Return to step 2 and verify that the problem has been corrected.	—	—
9q	Replace the backplane board. Return to step 2 and verify that the problem has been corrected.	—	—

Troubleshooting

Step 10: Hard Disk Drives

STEP	PROCEDURE	YES	NO
10	Inspect the hard disk drive and the cable leading to it. Do you detect any damage?	10a	10b
10a	Replace any damaged parts and return to step 4 to verify that the problem has been corrected.	—	—
10b	Turn the computer on. Does the disk access LED light?	10c	10e
10c	Is the computer configured to autoboot from the hard disk drive?	10d	10e
10d	Did the hard disk drive boot?	4	10f
10e	Attempt to boot from the hard disk by typing BW at the Monitor prompt. A message similar to the following should appear: <pre>Current date is Tue 1-01-1980 Enter new date (mm-dd-yy):</pre>		
	Does the correct message appear?	4	10f
10f	Does the message <pre>No system</pre> appear?	10g	10h

Troubleshooting

- | | | | |
|-----|--|-----|-----|
| 10g | Attempt to install MS-DOS on the hard disk. Insert a copy of MS-DOS in drive A and boot from that drive by typing BF1 at the Monitor prompt. When the operating system prompt appears, type XCOPY A: C: /V and press RETURN. Repeat step 10e. Does the correct message appear? | 4 | 10h |
| 10h | Turn the computer off, remove the cover, and perform a sense test. Check the cables leading to the hard disk drive for signs of damage. Do you detect any damage or improper configuration? | 10i | 10j |
| 10i | Replace any damaged cables. Can you boot from the hard disk drive now? | 4 | 10j |
| 10j | Replace the hard disk drive. Run the PREP utility and return to step 10g to install MS-DOS on the new hard disk. (Refer to the MS-DOS documentation for more detailed information about setting up a hard disk drive for the first time.) Can you boot from the hard disk drive? | 4 | 10k |
| 10k | Replace the backplane board. Can you boot from the hard disk drive? | 4 | 10l |
| 10l | Replace the main board. Return to step 2 and verify that the problem has been corrected. | — | — |

Troubleshooting

Step 11: Video

STEP	PROCEDURE	YES	NO
11	Perform a sense test on both the video monitor and the computer. Do you detect any damage?	11a	11b
11a	Repair or replace any damaged parts and return to step 2.	—	—
11b	Verify that the video cable from the monitor is securely connected to the appropriate D-type connector on the back of the video card. Is the connector seated properly?	11d	11c
11c	Seat the video cable connector properly and proceed to step 11d.	—	—
11d	Refer to the "Video Card" section of Chapter 5 and verify that the video card is configured properly for the type of video monitor being used. Is the video card configured properly?	11e	11d
11e	Turn the computer and video monitor on. Is anything (including an unreadable display) visible on the screen?	11g	11f
11f	Make sure the monitor is plugged into a working outlet. Is the power-on indicator on the monitor lit?	11g	11n
11g	Adjust the brightness and contrast controls on the monitor. Is anything visible on the screen?	11h	11o

Troubleshooting

11h	Is the display readable?	4	11i
11i	Does the monitor produce a readable display when connected to an identical, known good computer?	11k	11j
11j	Does the problem persist when the computer is connected to an identical, known good monitor?	11k	11n
11k	Are any circuit cards not supplied by Zenith Data Systems installed in the computer?	11l	11o
11l	Turn the computer and monitor off. Disconnect and remove any circuit cards not supplied by Zenith Data Systems. Turn the computer and monitor on. Does a display appear?	11m	11o
11m	Return to step 2 and verify that the problem has been corrected.	—	—
11n	Replace the video monitor and return to step 2 to verify that the problem has been corrected.	—	—
11o	Replace the video card. Refer to Chapter 5 and configure the new card properly for the type of video monitor being used. Check the switch and jumper settings carefully. Turn the computer and monitor on. Does a display appear?	2	11p
11p	Replace the backplane board. Does a display appear?	2	11q
11q	Replace the main board. Return to step 2 and verify that the problem has been corrected.	—	—

Troubleshooting

Step 12: Keyboard

STEP	PROCEDURE	YES	NO
12	Inspect the keyboard, keyboard connector, and cable. Make sure the connector is secure at both the keyboard and computer. Do you detect any damage?	12a	12b
12a	Replace the damaged keyboard or cable. Proceed to step 12b.	—	—
12b	Turn the computer on. Press the CTRL, ALT, and INS keys in sequence, hold them, and then release them. You should see a message similar to the following: <pre>MFM-200 Monitor, Version x.x Memory Size: xxxK Enter "?" for help -></pre>		
	Does the correct message appear?	12c	12f
12c	Type TEST at the Monitor prompt. Is the word TEST displayed accurately on the screen?	12d	12f
12d	Type TEST and press RETURN. Select the keyboard test by pressing the 2 key. The keyboard test identification and character code message should appear across the top of the screen. Does the correct display appear?	12e	12f

- | | | | |
|-----|---|-----|---|
| 12e | If there is a specific customer complaint about the keyboard, test the keys in question by pressing them and verifying that the correct character is displayed. If there is no specific problem, press the keys individually and verify that the correct characters are displayed. Do you detect a problem? | 12f | 2 |
| 12f | Replace the keyboard and proceed to step 12. After testing the operation of the replacement keyboard, do you detect the same problems as with the original keyboard? | 12g | 2 |
| 12g | Replace the keyboard interface board. Repeat step 12b. Does the problem persist? | 8 | 2 |

Disk-Based Diagnostics

The ROM-based tests check all functions of the computer required for loading and running the disk-based diagnostics. The disk-based diagnostics contain comprehensive routines to check both the computer's circuitry and the interfaces required to operate peripherals. Use the following procedure to run the disk-based diagnostics:

1. Turn the computer on and correct any faults detected by the power-up tests. If the Monitor prompt (->) appears, or if the computer starts to autoboot from a disk, proceed to the next step.
2. Press the CTRL, ALT, and INS keys in sequence, hold them, and then release them. When the Monitor prompt appears, insert the disk-based diagnostics disk into drive A. Type BF1 and press RETURN to boot the diagnostics disk.

Troubleshooting

3. At the opening menu, select the model number corresponding to the computer you are servicing. If the model number is not shown on this menu, you will have to create a new configuration file for the computer. Refer to the disk-based diagnostics documentation for the procedure.
4. When prompted for the fast test, choose NO. Then select either "all automatic tests" or "manual tests" as necessary and proceed with the diagnostics. Replace any faulty devices indicated by the test results.
5. After you have replaced the faulty device, run the diagnostics again to verify that all problems have been corrected.

Chapter 7

Parts List

Table 7-1 lists only field-replaceable parts. For a complete list of all parts, refer to the Z-2300 Series Service Manual (585-299).

Table 7-1. Z-2300 Series Parts List

PART NUMBER	DESCRIPTION
HE-89-0065	Line cord
HE-90-1395-1	Cabinet (cover), painted
HE-90-1402	Cabinet (cover), vinyl clad
HE-134-1968	34-conductor floppy disk drive cable
134-1981	40-conductor hard disk drive cable
150-0307-3	Z-449 video card
HE-151-1030	1.4M, 3.5-inch microfloppy disk drive
HE-151-1032	40M, 3.5-inch hard disk drive
HE-151-1066-C1	20M 3.5-inch hard disk drive
HE-163-0040-4	101-key keyboard
HE-181-7595-10	Keyboard interface board
HE-181-7600-1F	Main board
HE-181-7601-1C	Backplane board
HE-200-1583	Chassis (bottom)
HE-203-2373	Front panel (attached to cover)
HE-210-0140	Plastic power switch panel
HE-234-0908	Power supply
HE-266-1244	Lock
HE-266-1295	Plastic guide track (hard disk drive)
HE-266-1296	Plastic guide track (floppy disk drive)
HE-418-0060	Battery, 3.6V lithium in molded case
195-4074	<i>Professional Desktop Computer Owner's Manual</i>



