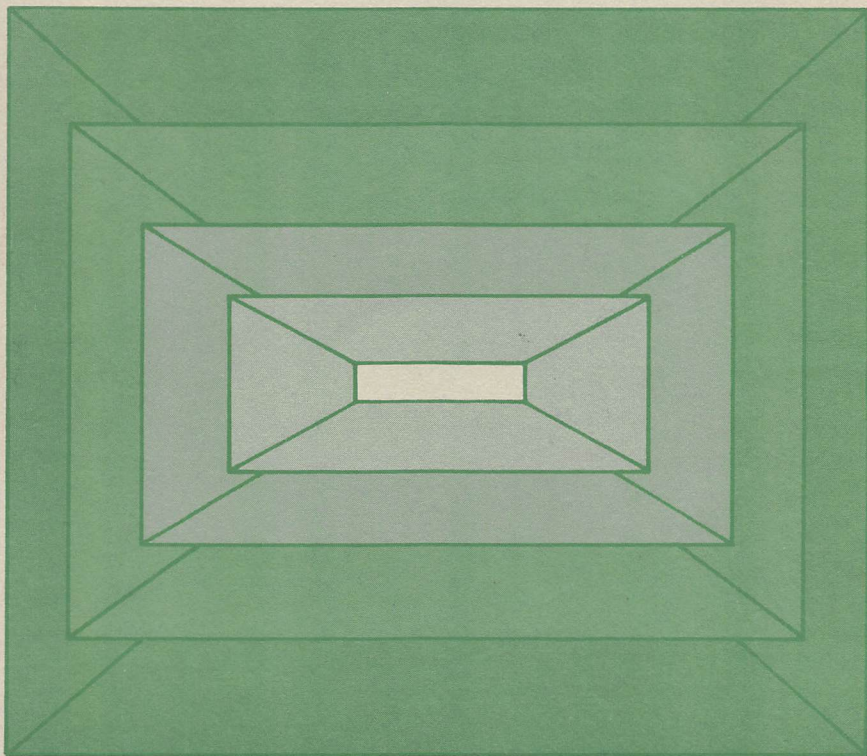


STANDARD[™] 286/10

Installation and Operations



*Standard 286/10 Installation and Operations
Version PC.610.04, March 18, 1988
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WARRANTY INFORMATION

SPECIFICATIONS

We reserve the right to substitute or change materials, product specifications, and functional attributes without notice, at any time.

CLAIMS AND DAMAGES

All goods and packages are inspected before shipment. Claims for goods damaged or incomplete shipments **must be filed within five days** of receipt of merchandise.

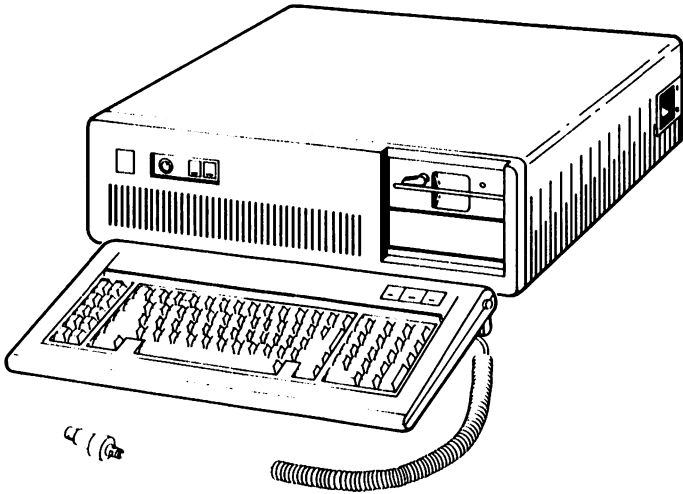
RETURN MERCHANDISE

Merchandise may not be returned for credit without a **return authorization number** and only if returned within **thirty (30) days** of original shipment. Returned merchandise must be unused, packed in the original packing material, any warranty cards must be present and blank, and shipped to us freight and insurance prepaid with proof-of-purchase. (Leave warranty cards blank until the end of the thirty-day period.) You assume all liability for products you ship with insufficient insurance coverage. Merchandise returned may be subject to a 15% restocking and handling charge. Credit will not be issued for merchandise that is not in resalable condition or that is beyond the thirty day period.

(Continued on inside back cover)

286/10

Installation and Operations



FEDERAL COMMUNICATIONS COMMISSION RADIO FREQUENCY INTERFERENCE STATEMENT

WARNING: This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with noncertified peripherals is likely to result in interference to radio and TV reception. Using nonshielded interface cables with this product is prohibited. The manufacturer is not responsible for any interference caused by unauthorized modifications of this product.

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. The Class B limits are designed to provide reasonable protection against such interference in a residential situation. However, this does not guarantee that interference will not occur in a particular installation. If interference problems occur, try one or more of these measures:

- Reorient the receiving antenna
- Relocate the computer system with respect to the receiver
- Move the computer away from the receiver
- Place the computer AC power connection on another circuit or outlet

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the FCC helpful:

"How to Identify and Resolve Radio-TV Interference Problems"

This booklet is available from the U.S. Government Printing Office, Washington, DC, 20402, Stock No. 004-000-00345-4

PREFACE

ABOUT THIS MANUAL

This manual is designed to help you set up and use your computer. It includes the following:

- An overview of the computer
- Instructions on how to set up the computer
- Instructions on how to add components to the computer
- A guide to help you solve problems with the computer.
- A technical summary.

TERMINOLOGY

Many computer components have several names. For consistency and to avoid confusion, one name is used throughout this manual to refer to each component. These names are listed below with their commonly-known synonyms and a short definition.

- **system board.** (system unit board, motherboard) The main board on the system that houses the CPU and the main memory.
- **fixed disk or fixed disk drive.** (hard disk, Winchester) A mass-storage device that stores large amounts of data on a disk that is entirely enclosed and mounted in the system unit.
- **diskette drive.** (floppy drive) A data storage device that records data on 5 1/4-inch diskettes and is mounted in the system unit.
- **drive or disk.** Generic terms used when referring to any storage device.
- **system unit.** (system enclosure) The plastic and metal case that houses all of the computer components with the exception of the monitor, the keyboard, and the printer(s).
- **video display.** (display, screen, monitor, CRT) The television-like device that the computer displays information on.

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1-2 General Description

STANDARD FEATURES

Congratulations! You just purchased a reliable and versatile microcomputer. This computer will provide computing support to your home or office for many years to come.

Your computer is a high-performance, 16-bit microcomputer based on the industry-standard 80286 microprocessor. It is compatible with the major software and hardware products that run on the IBM PC AT*.

This personal computer provides the following features:

- **High-speed clock system.** The computer can run at either the standard 6MHz speed or the turbo 10MHz speed. You select the processing speed using a switch on the back panel of the system unit.
- **Random-access memory (RAM).** The computer comes to you with 512KB of memory; this can be expanded to 1MB on the system board. With option boards, the computer can support up to 16MB of directly accessible RAM.
- **200-watt power supply.** This power supply, with a single ON/OFF switch, provides DC power for the system and internal expansion boards, an external AC outlet for a video monitor, and four DC outlets for diskette, tape, and fixed disk drives. It can be switched between 110 and 220 volts power sources at either 50 or 60 Hz.

* IBM and PC AT are trademarks of International Business Machines Corporation.

General Description 1-3

- **Diskette Drive/Fixed Disk Drive Controller.** The diskette drive/fixed disk drive controller can control up to two diskette drives and two fixed disk drives.
- **One 1.2MB diskette drive.** This diskette drive will read, write, and format high-capacity, 1.2MB and standard 360KB diskettes.
- **Eight expansion slots.** Your computer has two eight-bit slots and six sixteen-bit slots. One sixteen-bit slot is used by the disk controller and one slot is used by your video adapter. This leaves six slots available for expansion.
- **Keyboard.** The standard 84-key keyboard with tactile feedback has ten function keys and a combined numeric and cursor-control keypad. The enhanced 101-key keyboard has twelve function keys and separate numeric and cursor-control keypads.
- **Internal clock with battery backup.** The clock keeps track of the current date and time, even when the system is turned off.
- **Hardware reset circuit.** The reset button on the back panel of the system unit provides a smooth way to reset the system and prevents excess stress on the power start/stop circuitry.
- **80287 math coprocessor socket.** Allows you to easily add an 80287 math coprocessor to the system for faster calculations.

1-4 General Description

System Unit

The system unit contains the heart of the computer. All external devices (such as video displays, printers, and keyboards) connect to the rear of the system unit. The system board, video adapter board, diskette/fixed disk controller board, power supply, and any expansion boards are installed inside of the system unit.

Processing Speeds and Wait States

The system runs at either the standard 6MHz speed or the turbo 10MHz speed. A toggle switch on the back of the system unit allows you to switch between the lower and the higher processing speeds. You can switch between processor speeds with the system power on or off.

The processor in your system can run with either zero or one wait states. A wait state is built into most 80286 processor based computers (including the IBM PC AT) because the microprocessor is faster than the RAM chips and peripheral support chips. In effect, the wait state cycle looks like this: ... work ... WAIT ... work ... WAIT ... work ...

Special no-wait-state logic allows your computer to run with no wait state at 6MHz. With faster (100ns) RAM chips, the system can run with no wait states at 10MHz. Running your computer at 10MHz with no wait state gives you a 50% increase in processing speed over the enhanced IBM AT. You can switch your computer to zero wait state by setting a jumper inside the system unit.

Power Supply

The power supply has a switched AC power outlet on the back panel for an external device. This outlet is normally used for a video display. The power supply also has four power connectors for internal devices like diskette, fixed disk, or tape drives. The power ON/OFF switch is on the right-hand side of the system unit, and the 110/220 Volt selector switch is above the AC power outlet.

Internal Drive Capacity

There is enough space inside the system unit for you to install three additional half-height diskette, tape, or fixed disk drives. For example, you can easily add another half-height diskette drive and two half-height fixed disk drives to your system. Alternatively, you can install a full-height drive in place of two half-height drives.

Expansion Slots

The system board has eight slots. Six of the slots are on a sixteen-bit data bus and two are on an eight-bit data bus. The diskette/fixed disk drive controller board must be installed in one of the sixteen-bit slots. The eight-bit slot farthest from the disk drives is normally used for a video adapter board. The remaining six slots are available for adding expansion boards such as I/O, internal modem, or multifunction boards.

NOTE: An enhanced graphics adapter (EGA) board is usually installed closer to the power supply.

Clock-Calendar Battery Backup

The clock built into the computer uses a battery pack to keep the time while the system is turned off. This battery pack consists of four AA-size, 1.5 volt batteries mounted on the power supply inside the system unit. These batteries are user-replaceable and available at most convenience stores. On some systems, two 3 volt lithium batteries may be used.

1-6 General Description

Status Indicators

The indicator lights on the front panel provide you with status information. The power light indicates when the system is turned on. If your system has a fixed disk, the disk access light indicates when the system accesses the fixed disk.

System Reset Button

The reset button is on the back panel of the system unit. Pressing this button will reboot the system even if the system does not accept the reboot key sequence (Ctrl, Alt, Del). Rebooting the system with this button is much easier on your system than turning the power off and then on again.

Keyboard Lock

Turning your system key in the lock on the console locks or unlocks your keyboard. Once you lock the keyboard, the computer does not accept keyboard input until the keyboard is unlocked. This can increase system security and prevent accidental keyboard input.

Keyboard

The standard keyboard for your computer is an 84-key typewriter-style keyboard. This keyboard has ten function keys and a combined numeric/cursor-control keypad. The enhanced keyboard has a 101-key keyboard with twelve function keys and separate numeric and cursor-control keypads. Levers on the bottom of the keyboard allow you to adjust the tilt of the keyboard for your comfort.

Diskette Drive/Fixed Disk Drive Controller

The diskette drive/fixed disk drive controller can control up to two diskette drives and two fixed disk drives. This means that if you want to add another diskette drive or a fixed disk drive to your system, you do not need to install another controller board.

The diskette portion of the controller supports four types of diskette drives:

- 5.25-inch, double-sided/double-density diskette drives that are compatible with the IBM PC and PC/XT and can hold up to 360KB
- 3.5-inch, double-sided/double-density diskette drives that are compatible with the IBM Convertible PC and Personal System 2 Model 30 and can hold up to 720KB
- 5.25-inch, double-sided/high-density diskette drives that are compatible with the IBM PC AT and can hold up to 1.2MB
- 3.5-inch, double-sided/high-density diskette drives that are compatible with most IBM Personal System 2 models and can hold up to 1.44MB

High-Density Diskette Drive

Your computer comes with one diskette drive designed for use with 5.25-inch, double-sided/high-density diskettes. These high-density diskettes can hold up to 1.2MB of data. While this drive is designed for 1.2MB diskettes, you can also use it with double-density diskettes, which can hold up to 360KB of data. However, it is recommended that you install a 360KB diskette drive for use with double-density diskettes to provide compatibility with other PC-compatible systems.

1-8 General Description

OPTIONS

Software

You must use an operating system with your computer. It is compatible with the standard, PC-compatible operating systems such as, Microsoft DOS or XENIX™. A recent version of MS-DOS is available from your dealer.

Your computer can run most IBM-compatible software on the market today, including such well-known packages as Lotus 1-2-3, Symphony, dBASE III, Flight Simulator and WordStar. In those rare cases where a product designed to run on IBM systems will not run on your system, substitutes are available.

For example, your system cannot run IBM BASIC. In this case, you can run GW BASIC. This programming language from MicroSoft Corporation is designed to run on PC-compatible computers and is available from your dealer.

Video Displays

Your computer runs with the following types of video displays:

- Monochrome video display with a 9-pin D-connector (TTL input signal).
- Red-green-blue (RGB) color video display with a 9-pin D-connector (RGB input signal).
- Composite monochrome monitor with an RCA phono jack.

You must add a video display and a video adapter board to your computer.

Fixed Disk Drives

Fixed disk drives provide much greater storage capacity and access speed than diskette drives. Most fixed disk drives for this class of computer can store 20MB or 30MB of data. This compares to your diskette drive, which stores 1.2MB on high-density diskettes. You can also obtain high-capacity fixed disk drives with even greater storage capacity.

Diskette Drives

Diskettes provide a fast, reliable, and portable storage media for your data and programs. You can easily install an additional internal diskette drive in your system (for a maximum of two connected to your controller board). This second diskette drive can be either a 360KB, 720KB, 1.2MB, or 1.44MB drive.

However, if you add another diskette drive, it is a good idea for it to be a 360KB diskette drive. There are three reasons for adding a 360KB drive:

- Most personal computers have 360KB diskette drives.
- 360KB diskette drives cannot read 1.2MB diskettes.
- 1.2MB drives are not guaranteed to write reliably to 360KB diskettes.

Therefore, by adding a 360KB drive, you can use 360KB diskettes and ensure that other personal computers can read them without problems.

1-10 General Description

Printers, Plotters, and Modems

Most PC-compatible printers are parallel printers. That is, they connect to the computer through a high-speed, eight-bit, parallel port. Some PC-compatible plotters also use a parallel port. These parallel printers and plotters usually connect to a parallel port on your video display adapter board.

Most serial printers, serial plotters, and external modems use a serial, RS-232 interface. These devices must connect to a serial port on your computer. So, unless you are using a video adapter that has a serial port, you must install an I/O board with a serial port in the computer.

CHAPTER 2 INITIAL SYSTEM SETUP

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2-2 Initial System Setup

INTRODUCTION

This chapter provides detailed instructions on how to set up the computer for the first time. This process involves:

- Unpacking, checking, and preparing the computer and options.
- Connecting the interface and power cables.
- Running the SETUP program to set the system clock.

If the instructions in this chapter are not followed, any resulting damage to the system and peripherals may not be covered by the warranty.

UNPACKING AND PREPARING THE SYSTEM

Complete the steps in the following sections before starting to set up *any* parts of the system.

Unpacking the System

To unpack the system, complete the following steps:

1. Carefully remove all of the components from their shipping containers.

NOTE: Be sure to keep all shipping containers in case you need to transport the system.

2. Check to make sure that the following items are included:

- System unit
- Power cord
- Keyboard
- Keys for the keylock
- SETUP diskette
- Any other components you ordered with your system.

If your order has not been processed correctly, contact your dealer immediately.

NOTE: The video display, video display adapter, I/O board, printer, and plotter shown in this manual are system options. They are not part of the basic system. Instructions for installing these options are included here only for completeness.

3. Check each item to ensure that it is not damaged. If any parts are damaged, contact your dealer or UPS.*

* Make sure that you contact your dealer within the time limits set by the Warranty.

2-4 Initial System Setup

Preparing to Set Up the System

To prepare the area and the computer, complete these steps:

1. Make sure that a grounded outlet is located near where you plan to install the computer.

WARNING

The system and peripherals have grounded power cords for your safety. You must plug them into grounded power outlets to avoid electrical shock.

2. Set the power switches on the system unit, video display, printer, and other peripherals to OFF.

CAUTION

Setting up your system while the power is on may cause permanent damage to the computer and/or peripherals.

3. Situate the system unit so that you can comfortably reach the rear panel.
4. Familiarize yourself with which connectors are in which slots on the rear panel. As shown in Figure 2-1, some boards have similar connectors.

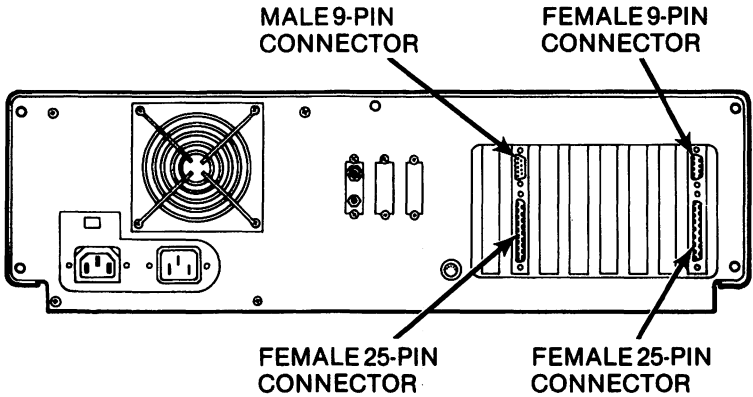


Figure 2-1
Connectors on the Rear of the System Unit

For example, the monochrome or monographics adapter boards (on the right in Figure 2-1) and the I/O board (on the left) are similar but identifiably different. While both of these boards have parallel printer ports with identical female, 25-pin connectors, the monographics board has a video port with a female, 9-pin connector and the I/O board has a serial port with a male, 9-pin connector.

SETTING UP THE SYSTEM

The following sections provide details on connecting cables to a video display, a keyboard, parallel printer(s), a serial printer, plotter, or modem, and the system power cables.

Note: The exact locations of the boards in your system may be different than the locations shown in the illustrations. If so, pay attention to how the connectors look, and attach each cable to its matching receptacle.

2-6 Initial System Setup

Connecting the Video Display

Complete the following steps to connect the video display:

1. Connect the video display to the video port at the rear of the system. If your video data cable has the connector shown in Figure 2-2, plug it into the female, 9-pin video port on the video adapter and secure the connector with the attached screws. If you have a composite video display, connect the RCA phono plug (which looks like a radio headphone plug) to the female RCA phono jack on your video adapter board.

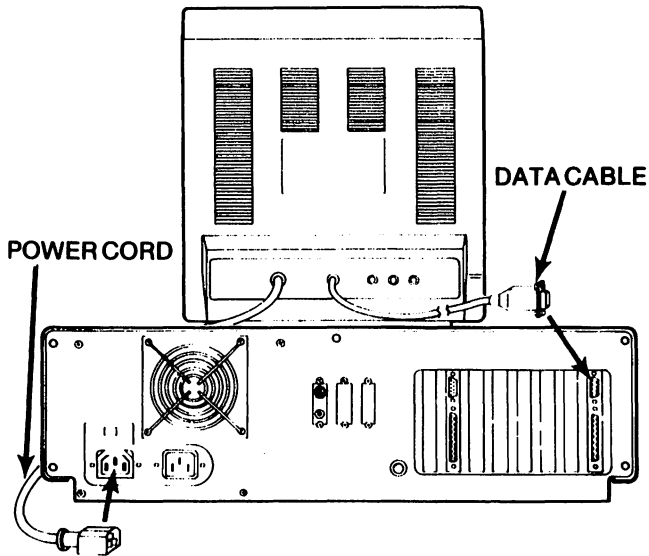


Figure 2-2
Video Display Cable Connections

2. After you connect the data cable, connect the video display power cable to a power outlet. If your video power cord has the connector shown in Figure 2-2, plug it into the power outlet at the rear of the system unit. Otherwise, plug it into a grounded wall outlet.

Connecting the Keyboard

Complete the following steps to configure and connect the keyboard:

1. Connect the keyboard data cable to the round connector at the rear of the system unit as shown in Figure 2-3.

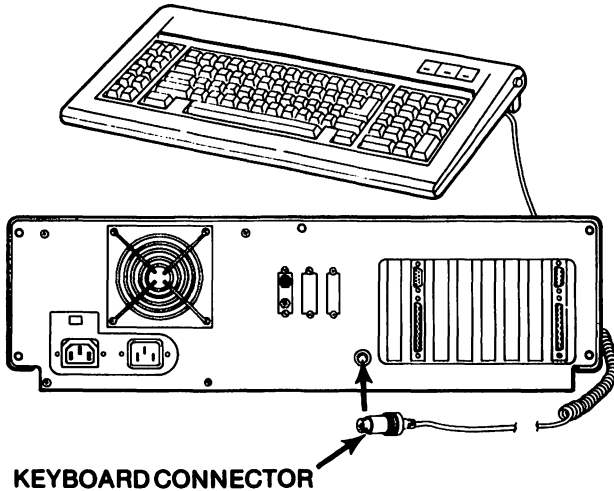


Figure 2-3
Keyboard Cable Connection

2-8 Initial System Setup

2. Check beneath your keyboard for a PC/XT vs. AT switch. If your keyboard has this switch, make sure that it is switched to the AT setting.

Connecting Parallel Printer(s)

Read your printer manual to determine whether your printer uses parallel or serial (RS-232) data transmission. If you have a parallel printer, complete the following steps.

1. Connect the printer data cable to the parallel port on the video adapter board (labeled A in Figure 2-4). If you have an Enhanced Graphics Adapter (EGA) board, which does not have a parallel port, you need an I/O board, which has both a parallel and a serial port.
2. If you have a second parallel printer, connect its data cable to the parallel port on the I/O board (labeled B in Figure 2-4).
3. Plug the printer power cord(s) into grounded wall socket(s).

NOTE: If your system was set up at the factory, the parallel port on the video adapter is configured as LPT1, and the parallel port on the I/O board is configured as LPT2. If you have additional parallel ports -- more than two, refer to your I/O board manual or run a print test to determine which port is which.

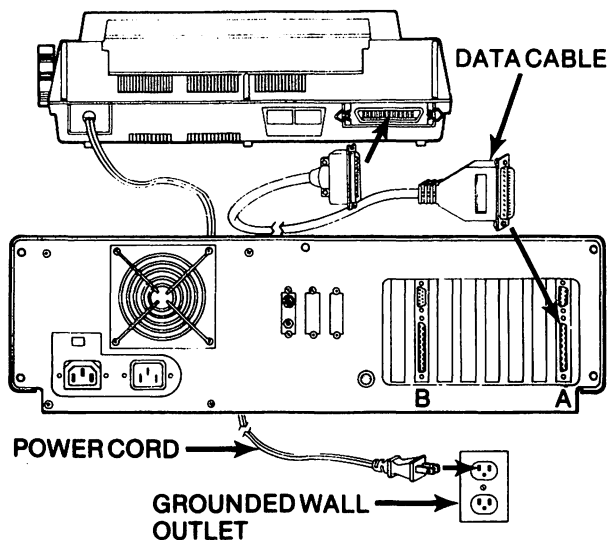


Figure 2-4
Parallel Printer Cable Connections

Connecting a Serial Printer, Plotter, or Modem

Refer to your option manual to determine the type of interface on your option. Some printers, most plotters, and most external modems use a serial (RS-232) interface. If you have a serial option, complete the following steps.

1. Connect the option's serial data cable to the pigtail cable supplied with your I/O card as shown in Figure 2-5.
2. Connect the pigtail to the serial port on the I/O card.
3. Secure the cables with the attached screws.
4. Connect the option's power cord to a grounded power outlet.

2-10 Initial System Setup

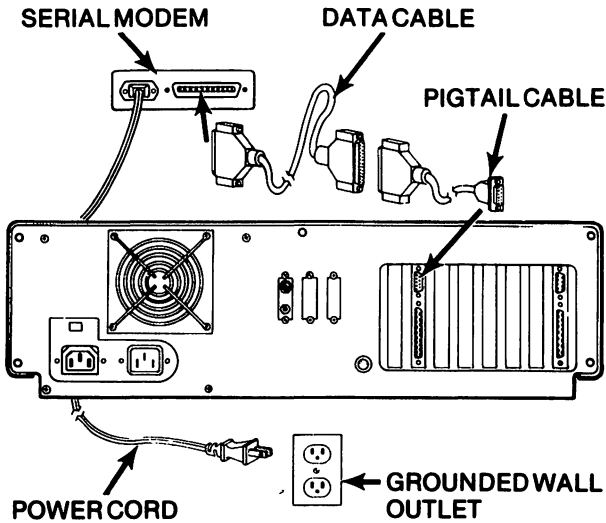


Figure 2-5
Serial Cable Connections

Connecting the System Power Cables

Connect the power cord to the rear of the system unit and to the grounded wall outlet, as shown in Figure 2-6.

NOTE: It is highly recommended that you protect your system by using a U.L. Approved surge and spike protector. This protector connects to the grounded wall outlet and your system power cord connects to this protector.

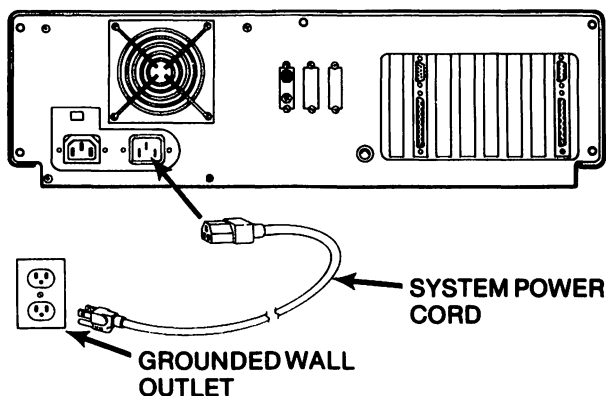


Figure 2-6
System Power Connection

STARTING THE SYSTEM

Once you have finished setting up the system, arrange the system so that you can use the keyboard, diskette drive(s) and video display, and then proceed to the next section.

Starting the System

Follow these instructions to start the system for the first time.

1. If the video display has a power switch, turn the switch to ON.
2. Turn the video display brightness and contrast up.
3. Turn the system power switch to ON.

NOTE: This switch is located on the right side of the system unit, toward the rear.

2-12 Initial System Setup

4. Insert your DOS diskette into Drive A and close the drive door.

NOTE: The side of the diskette with the label should be up and nearest you. If your system has one diskette drive, it is Drive A. If your system has two diskette drives, the top drive is Drive A.

What Happens Next

When you turn on the system, the system immediately displays the following message.

PHOENIX 80286 ROM BIOS Version 3.07
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After the system displays this message, the system beeps and performs a self-test to check the central processing unit (CPU), random access memory (RAM), read-only memory (ROM), keyboard, and disk drives. If an error occurs, the system beeps again and displays an error message. If this occurs, refer to Appendix A for help.

When the self-tests complete, the system reads operating instructions from the diskette in Drive A. This process is called *booting the system*. During the boot process, an introductory message from the operating system is displayed.

The exact message displayed on your system will vary. After the introductory messages, DOS takes over, and displays its messages. The exact format and wording of the messages vary depending upon which DOS version you are using. The examples in this book are from DOS Version 3.10.

Date and Time Prompts

Following the initial DOS message, the system displays the current battery-maintained date and prompts you for the correct date. Press the **Enter** key to accept the date displayed. If the date is wrong, you can correct it later.

The system next displays the current battery-maintained time and prompts you for the correct time. Again, Press the **Enter** key to accept the time displays. Again, if the time is wrong, you can correct it later.

Is the System Ready?

After the date and time prompts, the DOS prompt appears:

A>

This prompt indicates that DOS is ready to accept commands.

If the time was not correct when you were prompted for the current date and time, run the **SETUP** program, as described in the paragraph entitled *Running SETUP* in Chapter 4, to set the battery-maintained clock.

Once the clock is correct, the next thing you need to do is to make working copies of your **SETUP** and **DOS** disks. Refer to the paragraph entitled *Important! Making Backups* in Chapter 4 for instructions on how to make these copies.

2-14 Initial System Setup

Where To Go From Here

If your system is operating properly, you are ready to learn how to use DOS. The DOS software is vital to the operation of your computer. Your DOS manual provides information about how to use DOS. After you learn the fundamentals of DOS, you can install and start using your application programs. Refer to the manuals for your application programs for information on installing and running them.

If you follow the instructions in this chapter and the computer does not work, run the **SETUP** program and check the switches on the system board. Instructions on using the **SETUP** program are in Chapter 4. For troubleshooting information, refer to Appendix A.

CHAPTER 3 EXPANDING THE SYSTEM

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3-2 Expanding the System

INTRODUCTION

This chapter contains instructions for physically changing your system. The operations covered include:

- **Opening the system unit**
- **Installing adapter boards**
- **Changing the amount of memory on the system board**
- **Changing the type of video adapter used with the system**
- **Closing the system unit**

Many of these operations also require that you run the **SETUP** program after they are complete. Instructions on running **SETUP** are provided in Chapter 4.

REMOVING THE SYSTEM UNIT COVER

To remove the system unit cover, follow these steps:

1. **Turn the power off.**
2. **Remove all of the power cords and cables from the rear of the system unit.**
3. **Unscrew the five screws at the rear of the system unit. (See Figure 3-1.)**
4. **With the front of the unit facing you, lift the cover slightly and pull it toward you. When you feel resistance to the forward motion, tilt the front of the cover up, then lift it off. (See Figure 3-2.) Set the cover aside.**

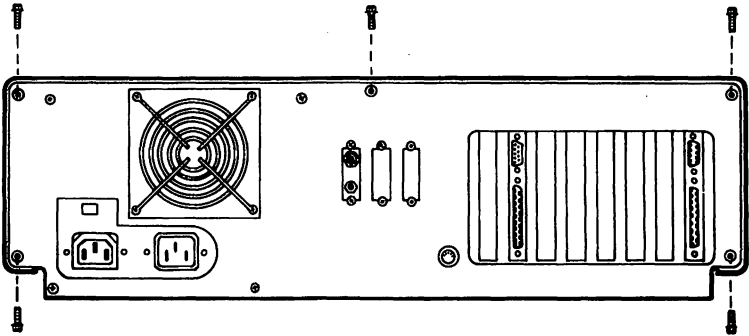


Figure 3-1
Removing the System Unit Cover Screws

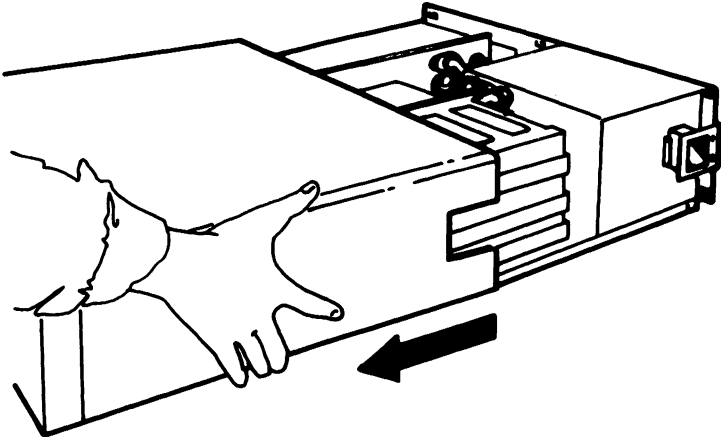


Figure 3-2
Removing the System Unit Cover

3-4 Expanding the System

INSTALLING AN ADAPTER BOARD

Some examples of adapter boards include video, multifunction, memory expansion, I/O, and internal modem boards. The following instructions explain how to install these boards in your system, and in some cases provide additional things you should consider when install them.

However, most boards require some type of configuration. That is, you must set switches or jumpers on each individual board to make it work properly on your computer. Refer to your adapter board installation manual for instructions on how to configure the board.

About Boards and Slots

The system board has eight-bit and sixteen-bit bus slots for expansion boards. The eight-bit slots have a single connector on the system board; the sixteen-bit slots have two, end-to-end connectors with a small amount of space between them.

Examine the lower edge of your adapter board. If it has one card-edge connector, you can insert it into any slot in the system board. However, if the board has two card-edge connectors, *you must insert it in one of the sixteen-bit slots.*

Installing Parallel or Serial Ports

You can have up to three parallel ports and four serial ports on your system. The parallel ports are referred to as LPT1, LPT2, and LPT3 and the serial ports are referred to as COM1, COM2, COM3, and COM4.

If you are installing a board that has a parallel or serial port, you must either configure the port properly or disable it. An enabled, but improperly configured port will interfere with proper operation of the other ports in the computer.

Most video adapter boards have a parallel port, which is usually pre-configured as LPT1. If you add another board with a parallel port, make sure that your parallel ports are configured properly. The adapter board controlling the first parallel printer must be configured as LPT1. The adapter board controlling the second parallel printer must be configured to control LPT2, and so on.

By convention, most video adapter boards are pre-configured to use LPT1 and most other boards with parallel ports are pre-configured to use LPT2. However, you should confirm this before installing either board.

If you have more than one serial port, you must configure one as COM1, the second as COM2, and so on. Additionally, each port must be assigned an interrupt request address. The industry standard is that IRQ4 is assigned to COM1 and IRQ3 is assigned to COM2.

Most serial ports are pre-configured as COM1 and to use IRQ4. However, *you should verify and adjust the port configurations of any enabled serial ports on your system.* Conflicting interrupt requests can seriously effect the operation of your computer.

Refer to your adapter board installation manuals for more information.

Installing an Adapter Board

To install an adapter board, follow these steps:

1. Remove the cover from the unit.
2. Remove a blank slot cover from the rear of the system unit. Keep the screw.
3. Gently press the adapter board into the slot. When installing a full length card, make sure that the front edge of the board is inserted in the card-edge guide. See Figure 3-3.

3-6 Expanding the System

4. Use the screw that held the blank slot cover to secure the board to the back panel.
5. Run the SETUP program if you changed the amount of memory or your primary video board.

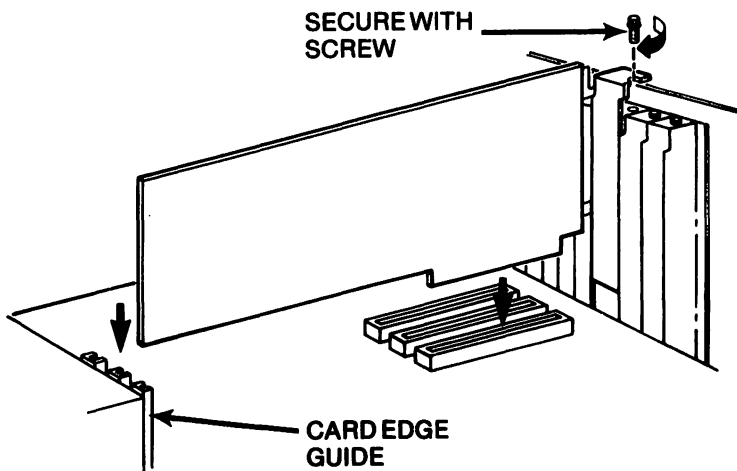


Figure 3-3
Installing an Adapter Board

INSTALLING RAM OR A NEW VIDEO DISPLAY

If you are adding or removing random-access memory (RAM) or are changing the type of video display, you must change jumper settings on the system board. The system board is located at the bottom of the system unit, as shown in Figure 3-4.

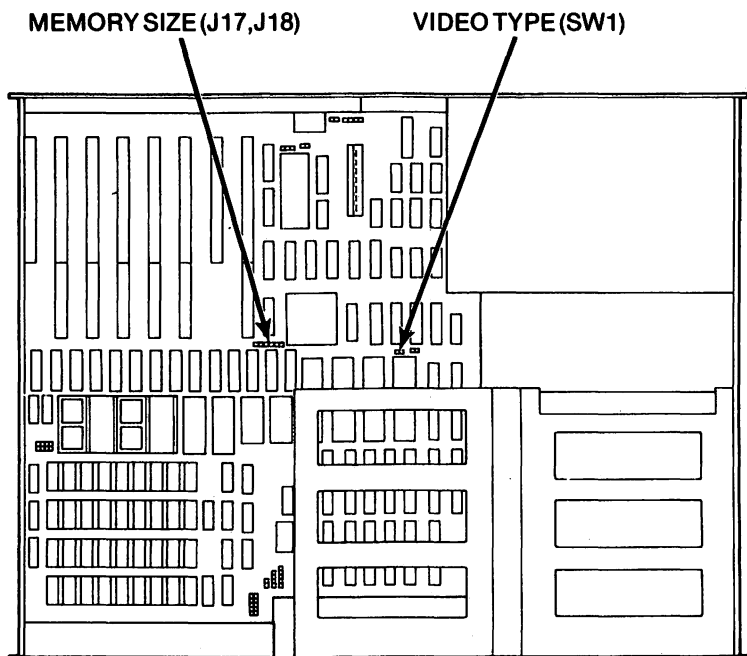


Figure 3-4
System Board

Changing the Amount of RAM on the System Board

The system comes with 512KB of RAM. You can install 512KB, 640KB, or 1,024KB on the system board of your system. No other amounts of RAM are allowed on the system board.

3-8 Expanding the System

Since DOS can directly access only the first 640KB of memory, any memory over 640KB must be treated as extended memory. (Extended memory can be set up as an electronic disk by the DOS VDISK program or other RAM disk software.) However, the system can also be configured so that any memory over 512KB is treated as extended memory.

Therefore, if you have 1,024KB installed on the system board, there are two possible configurations of this memory; either 512KB is base memory and 512KB is extended memory or 640KB is base memory and 384KB is extended memory.

To change the amount or configuration of memory on the system board, first install the correct number and type of RAM chips, then reset the jumpers on the J17 and J18 memory jumper pins for your configuration. Table 3-1 shows the possible configurations for your system.

Table 3-1
Memory Configurations:

Amount of Memory (KB)	Jumper Settings		RAM Chips	
	J17	J18	Bank 0	Bank 1
512	2-3	2-3	18-256K	none
640	2-3	1-2	18-256K	18-64K
512/512	1-2	2-3	18-256K	18-256K
640/384	1-2	1-2	18-256K	18-256K

Changing the Video Display Type

1. Install the new video adapter board in the system unit. (See **Installing an Adapter Board** in this chapter.)
2. Locate the jumper pins labeled SW1 on the system board (see Figure 3-4). If you have a monochrome (TTL) video display, place the jumper block on only one pin. If you have a color, EGA, CGA (RGB) or black and white (composite) video display, place the jumper block across both pins.

NOTE: If you are using both types of video adapters on the same system, configure SW1 for the type you will use as the power-up display.

3. Connect the video display data cable to the video adapter at the rear of the system unit. (See Chapter 2.) Connect the video display power cord to the power outlet on the rear of the system unit or to the grounded wall outlet.

REPLACING THE SYSTEM UNIT COVER

1. Move the system unit so that its front is facing you. Hold the system unit cover so it is facing you, and tilt the front of the cover up. Place the metal tabs at the top rear of the cover behind the front panel of the system unit. (Refer to Figure 3-2.)
2. Lower the cover until it is horizontal with the system unit, and slide it into position.
3. Replace the five cover screws on the back panel. (Refer to Figure 3-1.)
4. Replace all of the cables. (Refer to Chapter 2 of this manual if necessary.)

3-10 Expanding the System

RUNNING THE SETUP PROGRAM

After you install a new video board or memory board or change the amount of memory on the system board, you must run the **SETUP** program to reconfigure the system. Refer to Chapter 4 for instructions on running the **SETUP** program.

CHAPTER 4 THE SYSTEM AND SOFTWARE

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4-2 The System and Software

DISK OPERATING SYSTEMS AND APPLICATION SOFTWARE

To use your system, you must have a disk operating system (DOS). DOS is not provided with your system but can be purchased separately. Some DOS programs commonly used with your system and other compatibles are PC-DOS and MS-DOS*. For maximum flexibility and capacity, use DOS version 3.1 or later.

DOS programs manage the system. They control how memory (RAM and ROM) is used, and how data on files is accessed. They also provide utilities that allow you to prepare diskettes or fixed disks, make backup copies of your data or programs, and display or print copies of programs or files.

If you are not going to write programs in BASIC, you will also need application software. Application software (application programs) are programs that help you do your work on the computer. Application software includes spreadsheets, word processors, data base programs, inventory control programs, and more.

IMPORTANT! MAKING BACKUPS

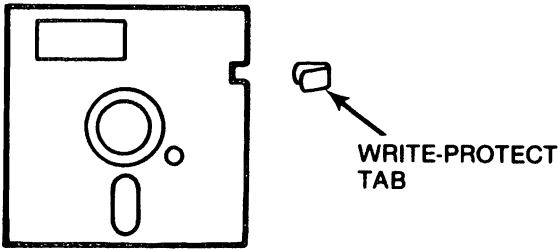
Backups are copies of data and programs. You should always keep a current backup copy of your work in case your diskette is somehow damaged.

Before you use any application software, including DOS or a BASIC programming language, or the system Utilities diskette, make a copy of the original diskette. Use the copy to do your work, and keep the original in a safe place.

* PC-DOS is a trademark of International Business Machines Corporation and MS-DOS is a trademark of MicroSoft Corporation.

This section describes how to use the DISKCOPY command to copy your DOS diskette. You can also use the BACKUP command or the COPY command to make backup copies. Each method has its benefits; refer to your DOS manual for more information.

NOTE: In copying and formatting, the terms source and target are frequently used. The *source* diskette is the diskette you are copying *from*. The *target* diskette is the diskette you are copying *to*.



Before you try to format or copy a diskette, make sure that the target diskette is write enabled. The diskette is write enabled if the notch on the side of the diskette is uncovered. The diskette is write protected (no data can be written on the diskette) if the notch is covered. For safety, you should write protect the source diskette.

Formatting a Diskette

The target diskette (the diskette you are transferring information to) must be formatted. Formatting divides the diskette into sectors that DOS uses to organize the information on the diskette.

4-4 The System and Software

CAUTION

*Do not format a diskette that contains important information. The **FORMAT** command destroys all previous data on the diskette.*

To format a diskette, follow these steps:

1. Put the DOS diskette into Drive A.
2. Make sure that the target diskette is not write protected.
3. Make sure that the current directory is the root directory of Drive A.

You can do this by entering the following commands:

```
A:  
CD \
```

*You must enter the backslash character in the second command line to move to the root directory. You can enter the **CHDIR** command instead of the **CD** command; they are synonyms.*

4. Enter the following command:

```
FORMAT A:
```

This command formats a diskette in the same format as the diskette drive. That is, if Drive A is a 1.2MB diskette drive. you insert a high-capacity, 1.2MB diskette in the drive, and DOS will format it to 1.2MB.

High-capacity diskettes cannot be read by 360KB diskette drives. To format a 360KB diskette to the 360KB format in a 1.2MB drive, insert the 360KB diskette in the 1.2MB drive and enter the following command instead of the one above:

FORMAT A: /4

5. When the system prompts for you to insert the new diskette, remove the DOS diskette from Drive A.
6. Insert the new diskette into Drive A.
7. Press the **Enter** key to begin formatting the new diskette.

Formatting takes about a minute. When complete, DOS asks if you want to format another disk.

8. Press the **Y** and **Enter** keys to format another; press the **N** and **Enter** keys to return to DOS.

During **FORMAT** operations, you can transfer DOS to the diskette you are formatting, and you can give the diskette a name, or *volume label*. If your system has more than one drive, you can use the **FORMAT** command to format the diskette in another drive, or to format a fixed disk drive.

Copying a Diskette

The procedure for copying diskettes is slightly different, depending upon whether you have one or two diskette drives. Follow the procedure below that applies to your system.

NOTE: You cannot use the **DISKCOPY** command to copy information from a 1.2MB diskette to a 360KB diskette. However, **DISKCOPY** can copy a 360KB diskette in a 1.2MB drive to a 360KB diskette in a 360KB drive.

4-6 The System and Software

Copying a Diskette With One Diskette Drive

1. Insert the DOS diskette in the drive.
2. Enter the following command:

DISKCOPY A: B:

The following messages appear:

**Insert source diskette in drive A:
Strike any key when ready**

3. Make sure that the target diskette is not write protected.
4. Remove the DOS diskette from Drive A and replace it with the source diskette. (If you are copying the DOS diskette, leave it in Drive A.)
5. Press any key.
6. Follow the instructions in the prompts.

Remember, the source diskette is the diskette you are copying from. The target diskette is the diskette you are copying to. When the copy is complete, DOS displays a message:

Copy complete

Copy another (Y/N)?_

7. Press the Y key to copy another. Press the N key to return to DOS.

Copying a Diskette With Two Diskette Drives

1. Insert the DOS diskette in Drive A.
2. Enter the following command:

DISKCOPY A: B:

The following messages appear:

**Insert source diskette in drive A:
Insert formatted target diskette in drive B:
Strike any key when ready**

3. Remove the DOS diskette from Drive A and insert the source diskette. (If you are copying the DOS diskette, leave it in Drive A.)
4. Make sure that the target diskette is not write protected.
5. Insert the target diskette in Drive B and press any key.

The following message appears:

Copying...

Copying takes about 30 seconds. When finished, DOS displays a message:

...Copy complete

Copy another (Y/N)?_

6. Press the Y key to copy another. Press the N key to return to DOS.

4-8 The System and Software

THE SETUP PROGRAM

About Setup

The SETUP program is a DOS utility that stores system configuration information in the battery-backed up memory on the system.

System configuration information is data that defines the optional equipment on your computer, such as disk drive types and memory size. Without this information, the system boots with a minimum default configuration.

You should run SETUP under all of the following conditions:

- You set up the computer for the first time.
- You added or removed memory.
- You replaced the battery.
- You want to reset the system clock.
- You added or removed a diskette drive.
- You added or removed a fixed disk drive.
- You changed your primary video display.

This section provides step-by-step instructions on how to run the SETUP program.

Determining Your System Configuration

SETUP requests information about the options installed on the computer. Before you begin, you should fill out the following chart.

Chart of Option Settings

Drive A type: _____
(360KB, 720KB, 1.2MB, or 1.44MB)

Drive B type: _____
(360KB, 720KB, 1.2MB, 1.44MB or none)

Fixed Disk Drive C type: _____
(1 - 47 or none)

Fixed Disk Drive D type: _____
(1 - 47 or none)

Amount of system base memory: _____
(512KB, or 640KB)

Amount of extended memory: _____
(384KB - 16.25MB)

Type of video adapter _____
(EGA, 40- or 80-column color graphic, or monochrome)

This section will help you determine each of these specifications.

Diskette Drive Type

Refer to your diskette drive users manuals to determine what type of diskette drive(s) are installed on your computer. The four possible types are: 360KB, 720KB, 1.2MB, or 1.44MB capacity.

4-10 The System and Software

Fixed Disk Drive Type

There are three ways to determine what type of fixed disk is installed on your computer:

- 1. Refer to your fixed disk drive manual. Often it will indicate the drive type number for use on the IBM PC/AT or compatible computers.**
- 2. Refer to the table entitled **Fixed Disk Drive Type Specifications** in Appendix D of this manual. If your fixed disk drive is listed, enter the indicated drive type.**
- 3. Locate the following information in your fixed disk drive manual:**
 - Number of cylinders**
 - Number of drive heads**
 - Write precompensation cylinder**
 - Landing zone**
 - Number of sectors**
 - Drive capacity (in megabytes)**

You do not have to understand the function of each of these specifications. Simply locate the specifications for your fixed disk drive and then match them to the appropriate drive type on the list in Appendix D.

System Base Memory

Base memory is also referred to as *conventional memory*. Base memory is the memory that DOS can directly access. It can be either 512KB or 640KB. If you change the amount of memory, make sure that you install the correct type of RAM chips and change the jumper selections as shown in Chapter 3 and Appendix C.

Amount of Extended Memory

Extended memory is the memory above your base memory up to 16MB. Some examples follow:

<i>System Board Memory</i>	<i>Base System Memory</i>	<i>Extended System Memory</i>	<i>Extended Memory Card</i>	<i>Total Extended Memory*</i>
512KB	512	0	0	0
640KB	640	0	0	0
1024KB	512	512	0	512
1024KB	640	384	0	384
1024KB	512	512	1.5MB	2MB

You enter the extended memory value in kilobytes (KB). One megabyte (MB) is equal to 1024KB; 1.5MB is equal to 1536KB.

IMPORTANT: The memory on the system board is divided into base memory and extended memory. The amount of base and extended memory you enter when you run SETUP *must* correspond to the way you set the jumpers inside of the system unit. Refer to Chapter 3 for the correct jumper settings.

* This is the number you enter in SETUP for the expansion memory.

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Video Adapter

SETUP requests the type of video adapter on the computer. If you have two video adapters, enter the one that is the prime video adapter.

NOTE: If your system has an EGA video display, answer with 0 (EGA) even if another adapter is primary.

If you are not sure what type of video display is installed on the computer, refer to your video display and video display adapter manuals.

Running SETUP

Running SETUP involves several steps:

1. Starting the computer with DOS.
2. Running the SETUP program.
3. Rebooting the computer to make the configuration changes take effect.

To run SETUP, first start the computer from Drive A as described in Chapter 2. When the A> prompt appears, insert the SETUP diskette in Drive A, and enter the following command:

SETUP

The following messages appear:

Phoenix Software Asc. Ltd
Configuration Setup Program Ver 3.3
(C) Copyright 1986

This program is used to store system configuration information into battery backed memory in your computer. It is necessary to run this program when any memory, disk drives, or monitors, are added or removed from you system, or to set the battery maintained time or date.

Press <enter> to continue ... _

Press the Enter key; the following messages appear:

The battery maintained date is:

08/04/1987

The battery maintained time is:

09:03:04

Are these correct ?

[Y or N <enter>]_

Check the date and time displayed on your computer screen. If they are correct, press the Y key then the Enter key; the next menu is displayed.

4-14 The System and Software

If the date or the time is incorrect, press the N key then the Enter key; the following messages are displayed:

The battery maintained date is:

06/29/1987

**If this is not correct type
the correct date using numbers
separated by slashes.**

**For example type 05/21/1985 <enter>
meaning May 21, 1985**

? _

As indicated in the message, you should enter the correct date now, then press Enter. You must indicate all of the digits in the year; for example, enter 1986 for the year, not just 86. If the date already is correct, press the Enter key. After you press Enter, the following messages appear:

The battery maintained time is:

09:03:04

**If this time is not correct type
the correct time using military
(24 hour) time separated by colons.**

**For example type 13:05:00 <enter>
meaning exactly 1:05 pm.**

? _

If the time is correct, press Enter.

If the time is not correct, enter the new time. Separate each digit of the time with colons, as shown in the example on the screen. The computer records military time, that is, the hours are recorded from zero to 24. Minutes are counted from zero to 59 as in standard time. For example, midnight is 00:00:00, 6:00AM is 06:00:00, and 6PM is 18:00:00. (Refer to the glossary for more examples of military time.)

NOTE: The settings shown in the following menus are provided as examples only; it is likely that one or more of the settings will not match the setting on your computer. As you run **SETUP**, carefully examine the settings on your computer video display to ensure their accuracy.

After you press **Enter**, **SETUP** displays a screen that lists current settings of the computer, as shown in the following example:

**The following information is required
for correct operation of your computer.**

the current settings of your options:

Diskette Drive A: is 1.2M
Diskette Drive B: is NONE
Fixed Disk Drive C: is TYPE 3
Fixed Disk Drive D: is NOT INSTALLED
System Base Memory is 512K
Extended Memory is 0
Prime Video Adapter is MONOCHROME

Are these options correct
(Reply Y or N then <enter>)

? _

4-16 *The System and Software*

Carefully examine the list of options on the menu shown on your computer screen to ensure that all of the specifications are correct.

NOTE: If you just set up your computer for the first time, the specifications are already set by the team at the factory.

Respond to the prompt as follows:

If all of the options are correct, press the Y key and then the Enter key.

The following message appears:

**Your system must now be rebooted.
Insert DOS disk and Press <enter>**

Insert the DOS diskette in Drive A and press Enter. The computer will reboot. When the A> prompt appears, you can use the computer.

If any of the options are incorrect, press the Y key then the Enter key.

The SETUP program will now ask you to verify each of the settings that were listed in the menu. After each option, SETUP asks, "Is this correct (Y or N)." To change any setting, press the N key then the Enter key; SETUP prompts you for the correct information. To retain the current setting, press Y then Enter; SETUP displays the next setting.

The first option you can change is the number and type of diskette drives:

Your diskette drive types are set to

Diskette Drive A: is 1.2M

Diskette Drive B: is NONE

Are these drive types correct (Y or N)

?_

Respond as follows:

- Type Y to accept the current information.
- Type N to correct the information.

When you type N, SETUP displays the following questions:

What type is diskette drive A:

- 0 if this drive is not installed
 - 1 if capacity is 360 kilobytes
 - 2 if capacity is 1.2 megabytes
 - 3 if capacity is 720 kilobytes
 - 4 if capacity is 1.44 megabytes
- (0,1,2,3 or 4) ?
-

Enter the number that corresponds to the correct information for Drive A. For example, if Drive A is a 1.2MB diskette drive, type the number 2, then press Enter.

4-18 *The System and Software*

SETUP then repeats the prompt for Drive B. After you enter the correct information for Drive B, SETUP displays information about your fixed disk drives. For example, if you have one fixed disk drive, your screen may appear as follows:

Your fixed disk types are set to

Fixed Disk Drive C: is TYPE 3

Fixed Disk Drive D: is NOT INSTALLED

Are these drive types correct (Y or N)

?_

Respond as follows:

- Type **Y** to accept the current information.
- Type **N** to change the current information.

When you type N, SETUP displays the following messages:

**How many fixed disk drives are installed
in your system ?**

(0, 1, or 2) ? _

Enter the number of fixed disk drives on your system, then press **Enter**. **SETUP** then asks you about fixed disk drive C:

What type is fixed drive C:

**(Enter drive type indicated by label
affixed to drive)**

**For a list of disk types supported by
your computer enter a ? at the prompts**

(1 to 47 or ?)?_

If you press the ? key, **SETUP** displays the specifications of the drive types that you can install on your system. For your convenience, these specifications are listed in Appendix D.

After you determine the drive type, enter the appropriate number in response to the prompt.

If you have another fixed disk drive, **SETUP** asks for the drive type for it. After you enter the correct information, **SETUP** asks for information about the system base memory:

**Base memory is that memory positioned
so as to be available to MSDOS programs.**

System Base Memory is 512K

Is this correct (Y or N)?_

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Respond as follows:

- Type **Y** to accept the current information.
- Type **N** to correct the amount of memory.

When you type **N**, **SETUP** displays the following messages:

**What is the total size of the base
memory installed on your system in K
(Standard configurations are
256, 512, or 640)**

?_

Type the appropriate amount of base memory (either **512** or **640**) then press **Enter**.

Next, **SETUP** asks you to confirm the amount of extended memory:

**Extended memory is positioned at
a high address and available to MSDOS
only for special functions.**

Extended memory is 0K

Is this correct?_

After you enter the amount of extended memory, SETUP asks about the video display:

The primary display is used by the system following boot. If more than one video adapter is installed in your system you must select one as primary. If you have an EGA installed the EGA option must be selected even if another adapter is to be used as primary. See your installation manual for details of option switch settings that might also be needed.

Prime Video Adapter is MONOCHROME

Is this correct (Y or N) ?_

Respond as follows:

- Type Y if the correct type of video display is shown.
- Type N if an incorrect type of video display is shown.

When you type N, SETUP displays the following message:

Use the number code to indicate the primary display adapter

0	EGA
1	Color graphic (40 columns)
2	Color graphic (80 columns)
3	Monochrome

?_

4-22 *The System and Software*

Enter the number that corresponds to the type of video display on your computer.

NOTE: If your system has an EGA video display, answer with 0 (EGA) even if another adapter is primary.

After you enter the correct prime video adapter, SETUP displays the settings you have entered for all of the options, and asks if these options are correct.

Respond to the prompt as follows:

- Type **N** if there are any errors. SETUP takes you through each screen again.
- Type **Y** if the options are correct.

When you type **Y**, SETUP prompts you as follows:

**Your system must now be rebooted.
Insert DOS disk and Press <enter>**

Insert your DOS diskette into Drive A and press the Enter key. Your system reboots and the configuration changes take effect. The configuration process is now complete.

SETUP Error Messages

The following messages can appear when you run SETUP or when the computer tries to reboot:

Invalid configuration information - please rerun SETUP program.

The system boot process found that the configuration information does not agree with the system options that are actually installed on the system. This is a normal message if you just installed a new option and have not yet run SETUP. Run SETUP and ensure that you enter the correct configuration for each of your system options.

ERRORS FOUND

DISK X: FAILED INITIALIZATION

SETUP found that the fixed disk configuration information is incorrect. Run SETUP again and make sure that you enter the correct fixed disk drive type(s). Refer to Appendix D in this manual and to your fixed disk drive installation manual to determine your correct drive type(s). If you are using two fixed disk drives with two types of configuration, make sure that you assign the correct configuration to each drive.

ERRORS FOUND

**INCORRECT CONFIGURATION INFORMATION
MEMORY SIZE MISCOMPARE**

SETUP found that the size of the base or extended memory does not agree with the configuration information. Make sure that the correct RAM chips are installed on the system board. (See Chapter 3.) Make sure that bits 3 and 4 on SW1 on the system board are configured properly. (See Chapter 3.) Run SETUP again and make sure that the base RAM and expansion RAM information is correct.

**Hard disk failure
strike the F1 key to continue**

The system boot process found a fixed disk error. Run SETUP again and make sure that you enter the correct drive type.

4-24 The System and Software

Invalid configuration information - please run SETUP program.

The system boot process found that the configuration information does not agree with the system options that are actually installed on the system. This is a normal message if you just installed a new option and have not yet run SETUP. Run SETUP and ensure that you enter the correct configuration for each of your system options.

Time-of-day not set - please run SETUP program

The boot process found that the configuration information is not set. Run SETUP and configure your system.

INVALID RESPONSE - RETRY

You entered an inappropriate response to a prompt. Check the prompt and reenter your response.

INCORRECT FORMAT FOR DATE - RETRY

This message appears after you enter the date in the following instances:

- You entered letters instead of numbers.
- You did not enter all of the digits in the year.
- You separated the digits of the date with any character other than slashes or dashes.

Enter the date in the following format:

mm/dd/yyyy

Where:

mm is the month (1 - 12)

dd is the day of the month (1 - 31)

yyyy is all four digits of the year

INCORRECT FORMAT FOR TIME

Enter the time in the following format:

hh:mm:ss

Where:

hh is the hour

mm is the minute

ss is the seconds

REBOOTING THE SYSTEM

You can reboot the system in any of the following three ways:

1. Press the **CTRL**, **ALT**, and **DEL** keys simultaneously, then release them.
2. Press the reset button (if one is installed).
3. Turn the computer off, wait a few seconds, then turn it on again.

The DOS diskette must be in Drive A, or your fixed disk drive must contain the DOS files, for the computer to restart.

4-26 *The System and Software*

When you reboot, the system performs self-tests, loads DOS again, and you lose access to all of the data in memory. Methods 1 and 2 are preferred because they cause the least stress on the computer. In methods 1 and 2, the computer runs system self-tests, but does not run a random-access memory (RAM) test. Method 3 causes the RAM tests to run, so takes slightly longer to complete and physically erases all data and programs in memory.

SWITCHING BETWEEN PROCESSING SPEEDS

Flip the toggle switch on the back panel of the system unit to switch between processing speeds. This switch is shown in Figure 4-1.

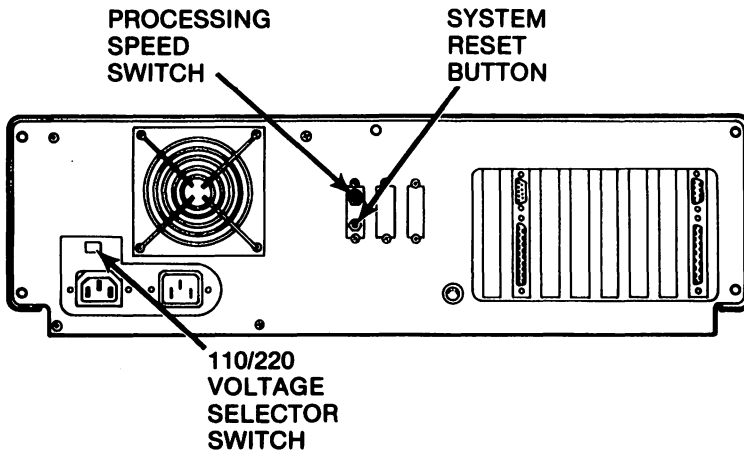


Figure 4-1
System Unit External Switches

USING THE ON-BOARD CLOCK

There are two timekeepers on your computer. The first one is the DOS clock-calendar, and the second is the battery-operated clock-calendar on the system board.

The date and time are important to DOS, because DOS records the date and time when each file is created or updated. When you enter the DIR command in DOS, these dates are displayed.

The DOS clock-calendar starts up when you turn the computer on and when you restart the computer. The major drawback of the DOS clock-calendar is that when power is removed from the computer, the clock stops. Therefore, each time you restart or reboot the system, the DOS date and time are reset to predetermined values.

The date on the DOS clock-calendar usually restarts at the date when the DOS version was created or when the diskette was made. The time restarts at 00:00. Therefore, each time you reset the computer you must reenter the current date and time.

The clock-calendar on the system is battery-operated, so it keeps time whether or not the computer is on. You set the clock-calendar once, then the time and date are set until the batteries wear out or a leap-year occurs. (During a leap year the system loses one day.)

You set and retrieve the date and time from the Clock-Calendar with the SETUP program on the SETUP diskette. When you set the time with SETUP, the correct date and time is automatically transferred to DOS every time you start the computer. The SETUP program is described elsewhere in this chapter.

PARTITIONING A FIXED DISK DRIVE

To use DOS with a fixed disk drive, you must run the **FDISK** program to create partitions on the disk. **FDISK** allows you to use up to four operating systems on a fixed disk, but even if you are using only one operating system, it must have a partition.

Partitioning is necessary when you use more than one operating system because each operating system has its own way of performing the operating system functions. The partitions divide the disk; each operating system runs within its own boundaries and does not interfere with the others. Each operating system treats its partition as an entire disk.

The **FDISK** program in DOS creates a partition for DOS and a drive. This DOS partition cannot be any larger than 32MB. To create a larger DOS partition or multiple DOS partitions on a drive, you need special partitioning software. To create a partition for another operating system, use the disk partitioning program in that operating system.

Starting the FDISK Program

To start the program, insert a diskette that contains the **FDISK** program in the A: drive and enter the following commands:

```
A:  
FDISK
```

*Since **FDISK** is an external command, the **FDISK.COM** file must be in the current directory or the current path defined by the **PATH** command.*

The Hard Disk Setup Utility menu appears:

Hard Disk Setup Utility

Type "X" to exit any function

Drive C has **xxx** total cylinders

No.	System	Boot	Start	Length
1	DOS Y	0	YYY	

1. Assign ALL hard disk space to DOS
2. Create/change DOS partition
3. Change bootable partition
4. Exit to DOS

Enter number of your choice [1]:_

Where:

xxx is the total number of cylinders on the disk.

yyy is the length of the partition.

The No., System, Boot, Start, and Length columns may be empty. If you have more than one fixed disk installed, information about each one is displayed. When you select an option, FDISK allows you to select the desired drive.

4-30 *The System and Software*

Using Only DOS on the Disk

If you are only using DOS on the disk, press **Enter** from the Hard Disk Setup Utility menu. The following message appears:

```
WARNING! Data on Drive X will be destroyed!  
Do you wish to continue (Y/N)? _
```

Ensure that the correct drive name is listed in the message. Press **Y** to partition the disk. The following message appears:

```
System will now restart  
Insert system disk in drive A and strike any key  
when ready _
```

Press any key (the **Enter** key works fine). The system reboots, and your partition is created. Before you use the disk, you must format the disk using the **FORMAT** command (See your DOS manual for details.) If you want to start the computer using the fixed disk drive, make sure you use the **/S** option when you format the disk, to transfer the DOS files to the fixed disk drive.

Using More Than One Operating System on the Disk

Should You Create More Than One Partition?

DOS, IBM PC-DOS, AT&T DOS, and other DOS programs are not considered different operating systems for purposes of partitioning a disk. Therefore, they can use the same partition. In fact, the DOS and PC-DOS **FDISK** programs will not allow you to create additional partitions if a partition for one is already present. In this section, the term **DOS** applies to any DOS compatible operating system.

Some operating systems that are considered different than DOS are XENIX, UNIX, and CP/M. If you create DOS partitions, enter the disk partitioning program for the other DOS, and the other DOS indicates that a DOS partition already exists, that DOS probably is compatible with DOS.

Creating More Than One Partition

If you will be using more than one operating system on the disk, make note of the total number of cylinders available on the disk as shown in the Hard Disk Setup Utility menu.

Select option 2 on the Hard Disk Setup Utility menu. The following prompt appears:

Size of DOS partition in cylinders [xxx]: _

Where xxx is the number of cylinders on the entire disk.

Enter a number to indicate the amount of space you wish to allot to DOS. For example, if your disk has 611 available cylinders and you want to divide the disk equally between DOS and another operating system, you can enter 300. This is about half of the available disk space and leaves some room for system information.

Press Enter. The following prompt appears:

Starting cylinder of DOS partition [0] _

Since this is the first partition, you should start it at 0. Press Enter. The following message appears:

**WARNING! Data on Drive X will be destroyed!
Do you wish to continue (Y/N)? _**

4-32 *The System and Software*

Ensure that the correct drive specifier is indicated. If correct, press **Enter**. The following message appears:

```
System will now restart
Insert system disk in drive A and strike any key
when ready _
```

Press **Enter**.

The next step is for you to create a partition for your other operating system(s). Load the other operating system(s) and use their disk partitioning program(s) to create the other partition(s). Make sure that you do not put the partition at the same location as the DOS partition. (The partition program should not allow you to do this.) The partition program displays where each partition is located.

NOTE: If you want to boot from the fixed disk with a particular operating system, use option 3 in the Hard Disk Setup Utility menu, and change the active (bootable) partition. This tells the computer where to look for boot instructions.

Separating Your Disk into Partitions After Using the Disk

Make backup copies of all the files on your fixed disk, then follow the instructions for using more than one operating system on the disk.

STOPPING A RUNAWAY PROGRAM

To stop a runaway program, try these escape sequences until you find one that works:

- Press **Esc**.
- Press **Ctrl-C**.
- Press **Ctrl-Break**. (The **Break** key is the same as the **Scroll Lock** key on some keyboards.)
- Press the **CTRL**, **ALT**, and **DEL** keys simultaneously, then release them.
- Turn the system off.



APPENDIX A TROUBLESHOOTING

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A-2 Troubleshooting

GENERAL TROUBLESHOOTING

This appendix is designed to help you isolate, and if possible, to correct system malfunctions. Most malfunctions are created when the computer or options are set up incorrectly; you can fix this type of problem by following the instructions in this appendix. If the corrective actions in this section do not correct the problem, refer to your option installation manual(s).

Use the following checklist to determine whether or not there is a problem with the equipment.

1. If the system does not respond when you turn on the power switch, check to see if the wall outlet is good. To do this, switch the system off and unplug its power cord. Connect an electrical device which is known to work (such as a lamp) in to the same outlet. If it works, the problem is in the system unit or options. If not, the problem is in the wall outlet or its circuit. Try connecting the system to another wall outlet.
2. Check that the 110/220 Volt selector switch on the back panel is in the correct position.
3. Check to be sure that all external devices (such as the video display and printer) are correctly connected to the system unit. Be sure all cables are firmly seated on their connectors.
4. Check to be sure that all power cords are connected to the equipment and to the AC wall outlet.
5. Make sure the system unit's power switch is in the on position.
6. Make sure that the video display is turned on and that the contrast and/or brightness is turned up.
7. Run the SETUP program to ensure that the system is configured properly. (See Chapter 2.)

If the problem persists, use the procedures in the following paragraphs to identify and correct the problem.

The remainder of this appendix is organized by general types of problems (such as power supply problems and display problems). Problems are shown in *italic* type; corrective actions follow.

WARNING

When removing the system cover, first turn off the power and disconnect the power cord. If you turn on the system with its cover removed, observe the following safety precautions:

1. **Remove any metal jewelry that could come in contact with the system unit.**
2. **Do not reach into the system unit or touch any of the internal hardware while the system's power is on.**
3. **Do not leave any loose components, boards, or other objects in the system unit.**

A-4 Troubleshooting

POWER SUPPLY SOLUTIONS

If the system does not respond when you turn it on (fan does not turn, no display, no beep), or the power supply fan starts then abruptly stops, perform the following steps:

1. Make sure that the power supply cable is installed properly into the wall outlet and the rear of the system unit.
2. Check that the 110/220 Volt selector switch on the back panel is in the correct position.
3. Make sure that the boards in the system unit are properly seated in their slots on the system board.
4. Make sure that the cable running from the power supply to the system board is properly seated in its slot.
5. Make sure that the cables from the power supply to the disk drives are seated properly.

If the problem still occurs, perform the steps in the flowchart to isolate the source of the problem.

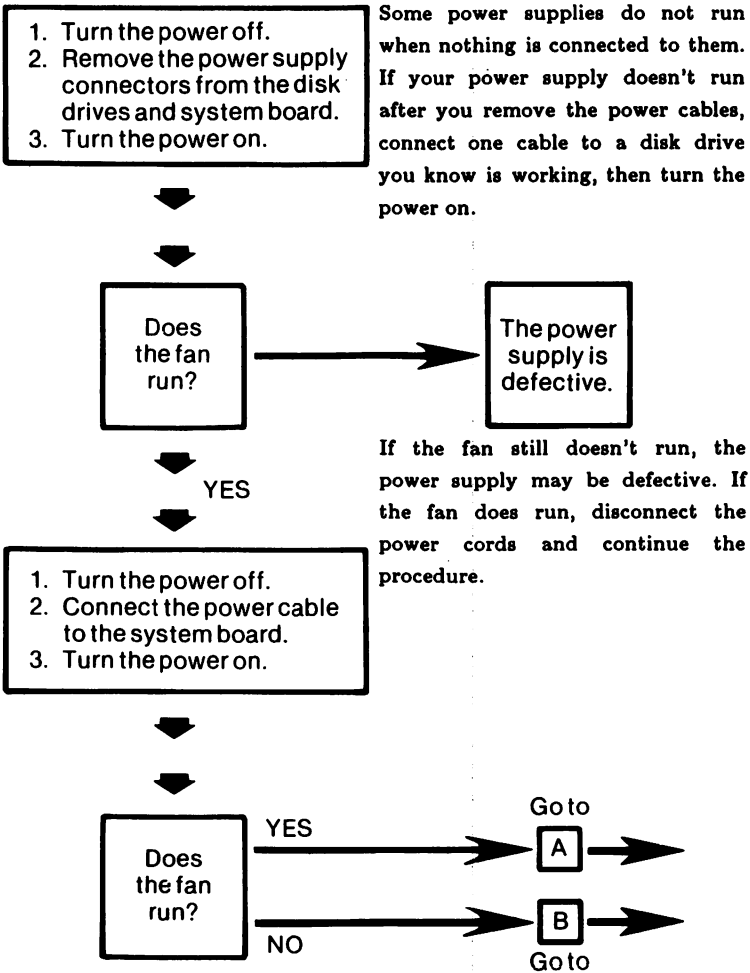


Figure A-1
Power Supply Troubleshooting Flowchart page 1

A-6 Troubleshooting

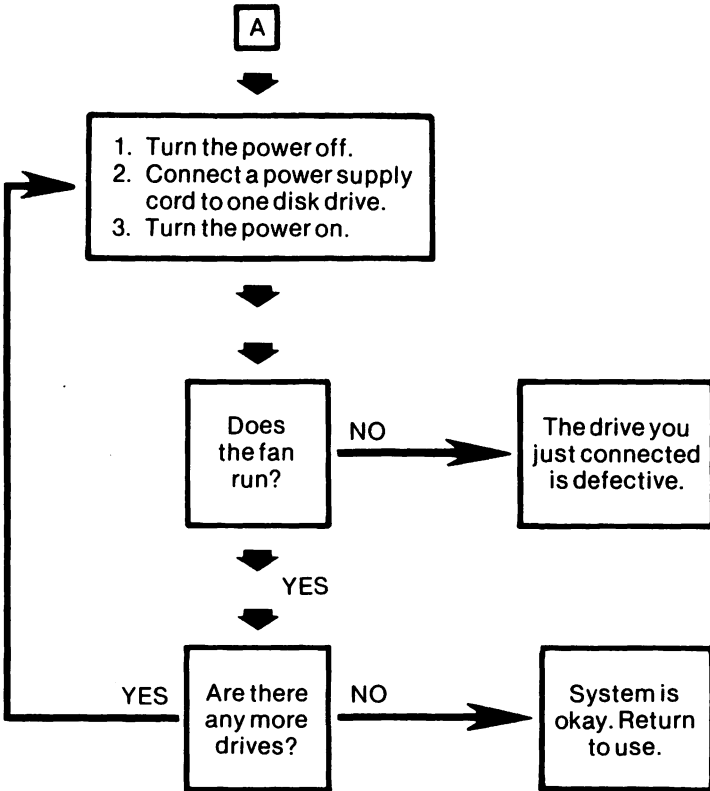


Figure A-1 page 2

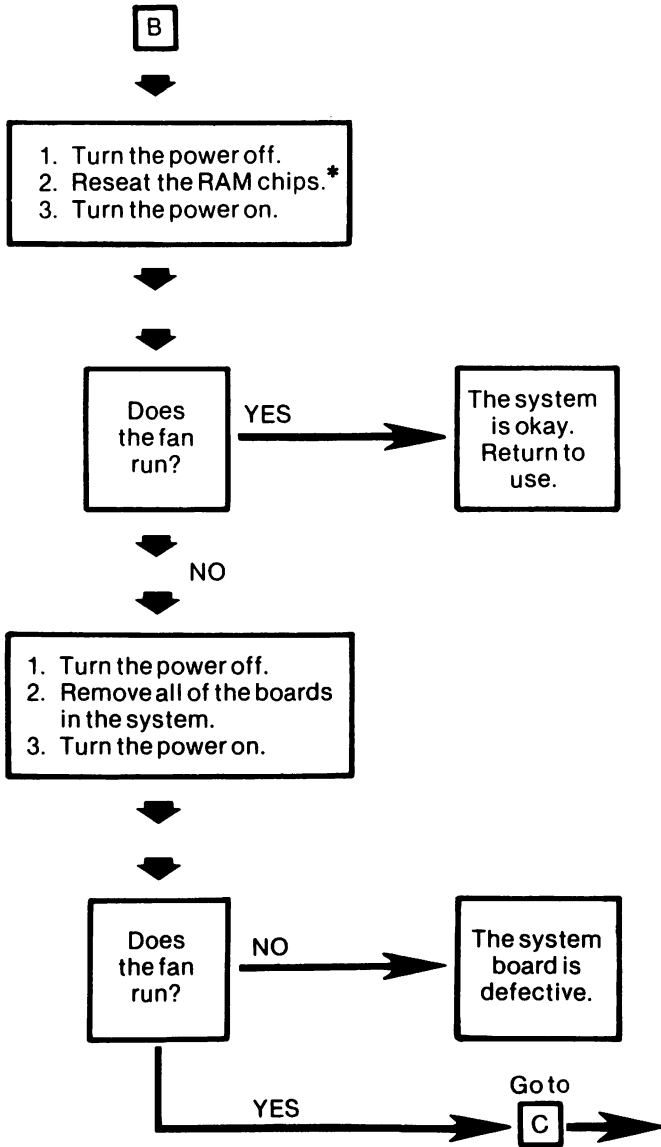


Figure A-1 page 3

*To reseal the RAM chips, gently remove the chips from their sockets and then replace them.

A-8 Troubleshooting

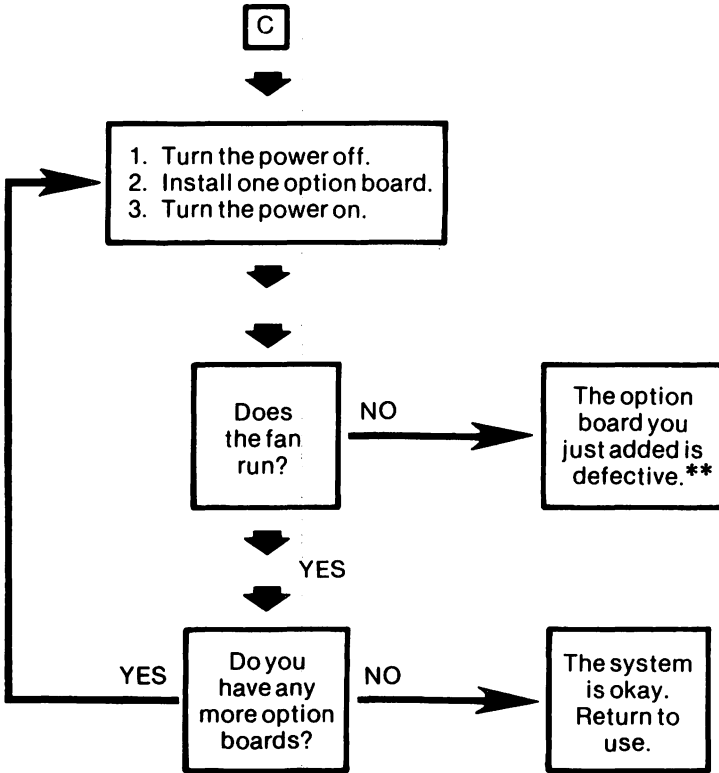


Figure A-1 page 4

**You may be able to use your computer while the option board is missing. For example, the computer can run without a serial adapter.

VIDEO DISPLAY SOLUTIONS

If the video display remains blank but you hear the system's fan running, perform the following corrective actions:

1. Make sure that the video display is plugged in and turned on and that the brightness and contrast are turned up.
2. Make sure that the video display data cable is properly connected to its port at the rear of the system unit. (Refer to the video adapter board installation manual.)
3. If there is still a problem, turn off the system, unplug its power cord, and remove the system cover to make sure that the video adapter board is properly seated in its slot.
4. Make sure that the SW1 jumper pins are set correctly for the type of video display you are using. If you are using a monochrome video display, set set the jumper on only one pin. If you are using any other type of video display, set the jumper on both pins.
5. Make sure that the video display you are using is compatible with the video adapter board. Refer to your video display and video adapter board manuals for more information.
6. Replace the system cover, reconnect the power cord, and turn on the system.

If the problem persists, refer to **Random-Access Memory Solutions** in this Appendix.

A-10 Troubleshooting

If the video display screen displays the message

CRT Error

try these corrective actions:

1. Run SETUP so that it indicates the correct type of video display.
2. Turn off the system, disconnect its power cord, and remove the system cover to make sure that the video display and controller board are compatible and that any switches on the video controller board are set correctly. Some adapter boards can run both monochrome and color video displays. Others can run either monochrome or color but not both. Refer to the video display and video adapter manuals for more information.
3. Check the SW1 jumper on the system board to ensure that it indicates the correct type of video display adapter on the system. (See Chapter 3.) If the jumper is incorrectly set, power off the computer and change it to the correct setting.
4. Replace the system cover, reconnect the power cord, and turn on the system.

KEYBOARD SOLUTIONS

If the keyboard does not work, try these corrective actions:

1. Ensure that the keyboard cable is fully inserted into the correct port. If your keyboard has a PC/AT switch, make sure that it is set properly.
2. If another computer is available, try the keyboard on it. If the keyboard does not work on the second computer, the keyboard is probably defective. If the keyboard works on the second computer, the keyboard is good; the keyboard interface to the first computer is probably defective.

If the computer beeps continuously and displays the following message,

Keyboard stuck key failure

it indicates that a key on the keyboard is stuck. If you find that no keys are actually stuck, refer to the next paragraph, Random-Access Memory Solutions.

RANDOM-ACCESS MEMORY SOLUTIONS

When you start the computer, it runs a short test of all the random-access memory (RAM) on the system board. As the computer performs the RAM test, it displays a message that indicates the RAM addresses being tested. If there is a problem with RAM, the computer may display any of a wide range of symptoms. The following paragraphs list the symptoms and the corrective actions for each symptom.

WARNING

Disconnect power from the computer before you remove the system's cover, change any switch setting, or reposition any item inside the system cover.

If the system does not respond when you turn on the power or if the fan turns but the display remains blank:

1. Turn off the power, disconnect the power cord, and remove the system cover. Refer to Figure A-2 and check the RAM chips in RAM bank 0. Press down gently on each chip to make sure that all of the chips are fully seated in their sockets.

A-12 Troubleshooting

CAUTION

Make sure that each chip is installed with the notched edge or printed dot toward the front of the computer.

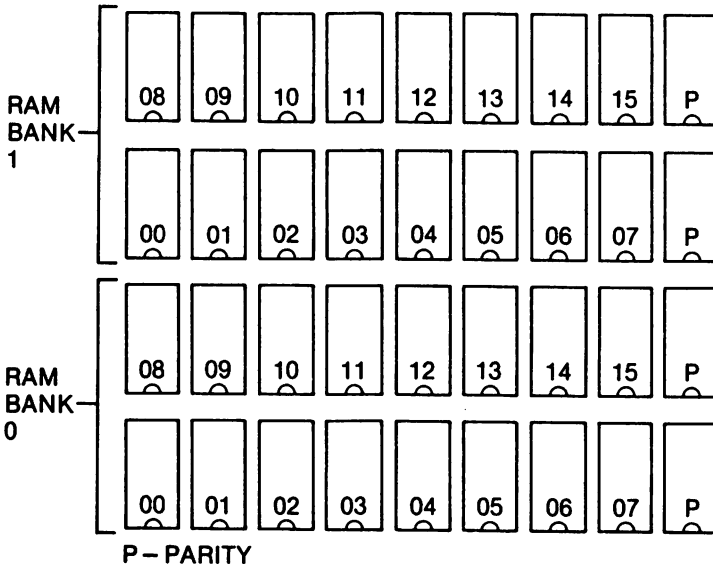


Figure A-2
Memory Bank Chart

2. If this does not correct the problem, use a small screwdriver to lift each chip out of its socket. Reinstall each chip. If the error recurs, one of the RAM chips in bank 0 is probably defective.

Troubleshooting A-13

If the system beeps continuously when you turn it on, check the keyboard for stuck keys. If no keys are stuck, one or more of the RAM chips may be defective.

If the system beeps four times (beep beep -- beep beep) or seven times (beep beep beep -- beep beep beep -- beep) and the video display does not work:

1. Turn off the power, disconnect the power cord, and remove the system cover. Refer to Figure A-2 and check the RAM chips in RAM bank 0. Press down gently on each chip to make sure that all of the chips are fully seated in their sockets.

CAUTION

Make sure that each chip is installed with the notched edge or printed dot toward the front of the computer.

2. If this does not correct the problem, use a small screwdriver to lift each chip out of its socket. Reinstall each chip. If the error recurs, one of the RAM chips in bank 0 is probably defective.

If the amount of base memory and expansion memory displayed when the system starts up is incorrect or if the computer displays the message

**Invalid configuration information - please run
SETUP**

1. Run SETUP. Make sure that the amount of base memory and the amount of expansion memory defined by SETUP are correct.
2. Turn off the system, disconnect the power cord, and remove the system cover. Locate the J17 and J18 jumper pins on the system board.

A-14 Troubleshooting

3. Configure the J17 and J18 jumpers correctly according to Table 3-1. If you have 1024KB on the system board, you must decide how much of the memory is base memory (directly available to DOS) and how much is extended memory (available for special functions). The choices are 512/512 or 640/384.
4. After you set the memory jumpers, replace the system cover, reconnect the power cord, and turn on the system. Run SETUP and specify the correct amount of base memory and expansion memory. The amounts you enter in SETUP *must* agree with the way you set the J17 and J18 jumpers.
5. If the problem persists, turn off the power, disconnect the power cord, and remove the system cover. Refer to Figure A-2 and check the RAM chips in RAM bank 1. Press down gently on each chip to make sure that all of the chips are fully seated in their sockets.

CAUTION

Make sure that each chip is installed with the notched edge or printed dot toward the front of the computer.

6. If this does not correct the problem, use a small screwdriver to lift each chip out of its socket. Reinstall each chip. If the error recurs, one of the RAM chips in bank 1 is probably defective.

Refer to Chapter 3, **Changing the Amount of RAM on the System Board**, for detailed information about the settings required for the amount of memory on the computer.

PARALLEL PORT AND DEVICE SOLUTIONS

If your printer or other parallel device does not respond to incoming data from the system, try the following corrective actions. After you try a corrective action, try again to send data to the device (for example, try printing a short file).

CAUTION

Before you disconnect any cables, always turn off the parallel device and the system, in that order. When you turn the system back on, always turn it on before turning on the parallel device.

1. Make sure that the parallel device is turned on.
2. Ensure that the I/O cable connecting the parallel device to the parallel port is installed correctly and seated properly. Refer to Chapter 2 in this manual and to the device and adapter board installation manuals.
3. Try another I/O cable.
4. If you have more than one parallel adapter, make sure that they are set as separate ports. (The first must be LPT1, the next LPT2, and so on.) Refer to your parallel adapter board installation manual for instructions.

NOTE: If you have a parallel port on the video display adapter board, it is usually set as LPT1 and cannot be configured as another parallel port. Therefore, any additional parallel port must be configured as LPT2 or LPT3.

5. Make sure that the software is sending data to the correct port .

A-16 Troubleshooting

If the corrective actions are not successful and you have more than one parallel device, install each device individually, starting with LPT1. Carefully check all of the settings on your adapter boards and parallel devices. (Refer to the installation manual for the devices.)

If you can make both parallel devices run on one port but not the other, the other port may be incorrectly configured for its device or may be defective.

If you can make one parallel device run on both ports, the other parallel device is probably defective.

If both devices work using one I/O cable but not the other, the other cable is defective.

SERIAL PORT AND DEVICE SOLUTIONS

If the serial printer or other device does not respond to incoming data and your system has only one serial port (or your system has more than one serial port but the problem is confined to a single port), try these corrective actions:

CAUTION

Before you disconnect any cables, always turn off the serial device and the system, in that order. When you turn the system back on, always turn it on before turning on the serial device.

- 1. Make sure that the serial device is turned on.**
- 2. Make sure that the proper I/O cable is correctly installed and fully seated on the connectors.**
- 3. Try another I/O cable.**

4. Turn off the serial device and the system, then remove the system cover. Ensure that the proper Interrupt Request line (IRQ) is set for the communication port being used. Refer to Appendix C and the serial adapter reference manual.

NOTE: The industry standard is that COM1 uses IRQ4 and COM2 uses IRQ3. Set the IRQ line using the jumpers or switches on serial adapter board. Refer to Appendix C and your serial adapter board installation manual for information.

5. Make sure that the baud rate, parity, and stop bits are set identically on the adapter board and the serial device. (Refer to the board and device installation manuals.) You can use the MODE command to change this protocol.

If you have two serial ports, and output will go to neither port, disable or remove one port and try the following corrective actions. When the port is working, disable or remove it, enable or reinstall the other port, and repeat these corrective actions.

To disable adapter boards that have jumpers, remove the jumpers. Adapter boards with switches have a port enable/disable switch.

1. Make sure that the proper cables are fully installed in their sockets.
2. Make sure that the serial ports are all set as separate ports. (The first must be COM1, the next COM2, and so on.) Refer to your serial adapter board installation manual for instructions.
3. Ensure that the proper Interrupt Request line (IRQ) is set for each communication port. This is especially important when you are driving more than one serial device, because if this is set incorrectly, both ports can be disabled.

A-18 Troubleshooting

NOTE: The industry standard is that COM1 uses IRQ4 and COM2 uses IRQ3. Set the IRQ line using the jumpers or switches on the serial adapter board. Refer to the adapter board reference manual for information.

DISK DRIVE SOLUTIONS

If an error condition occurs with any of your disk drives, perform the following steps. Refer to your disk drive and controller installation manuals for information on cable installation and switch settings. If the trouble persists after you perform all of the steps, the disk drive(s) and/or controller may be defective.

Diskette Drive Troubleshooting

If the system reports a problem with a diskette drive, perform the following steps:

1. Make sure the diskette is inserted properly. (The seamed side goes down, and the edge with two small notches goes toward the rear of the unit.)
2. Make sure the drive door is closed. (The system will not start from a diskette drive when the door is open.)
3. Make sure the correct number and type of diskette drives are selected by the SETUP program. (See Chapter 4 in this manual for more information.)
4. Turn off the system, disconnect the power cord, and remove the system cover. Check to see that the power cable is connected to the drive.

5. Make sure the cables are not reversed or installed upside down and that the cable connectors are fully seated in the sockets on the drive and controller. The colored edge of each cable should be connected to the pin 1 side of the connector on the disk drive. Pin 1 is labeled on the connector.
6. Make sure the controller board is fully seated in its slot on the system board.
7. If your system is equipped with more than one diskette drive, make sure the drives are configured properly. Both Drive A and Drive B are set as Drive B. One end of the data cable connected to the drives has a twist in it--this end should be connected to Drive A to distinguish it from Drive B.
8. Refer to your disk drive installation manual for further corrective actions.

Fixed Disk Drive Troubleshooting

On Power-Up, the following message appears:

**Hard disk failure
Strike the F1 key to continue**

If you are attempting to boot from the fixed disk drive, and the following message appears after you press F1:

No boot device available - strike F1 to retry boot

format the fixed disk drive. Refer to the FORMAT command in your DOS manual for instructions. You can boot the system from a DOS diskette in Drive A.

CAUTION

Formatting destroys all data on the disk.

If formatting the disk does not solve the problem, perform the following steps:

1. Turn off the system, disconnect the power cord, and remove the system cover. Make sure that each drive has its power and data cables connected securely.
2. Check to be sure the fixed disk drive control cable is installed correctly. If you have one fixed disk drive, the part of the control cable that has the twist in it connects to the drive. If you have two fixed disk drives, both Drive C and Drive D should be set as Drive D. One part of the control cable (the wider ribbon cable) connected to the drives has a twist in it -- this end should be connected to Drive C to distinguish it from Drive D.

If the system reports a fixed disk error, perform the following steps:

1. Make sure the correct drive type is selected in the SETUP program. See Chapter 4 for information on SETUP and drive types.
2. Turn off the system, disconnect the power cord, and remove the system cover. Make sure that each drive has its power and data cables connected securely.
3. Make sure the controller board is fully seated in its slot on the system board.
4. Make sure the drives are configured properly. If you have one fixed disk drive, it should be configured as Drive C, and the part of the control cable that has the twist in it connects to the drive.

If you have two fixed disk drives, both Drive C and Drive D should be set as Drive D. One part of the control cable (the wider ribbon cable) connected to the drives has a twist in it -- this end should be connected to Drive C to distinguish it from Drive D.

5. If you have two fixed disk drives, remove the terminating resistor from the drive that is in the *middle* of the daisy-chain control cable. The fixed disk drive connected to the end of the control cable must have a terminating resistor pack installed. This applies to both one and two fixed disk drive configurations. The last drive is the only one to have the terminating resistor pack installed. See your drive manual for details.
6. Refer to your disk drive and controller installation manual(s) for further corrective actions.

SOLUTIONS FOR OTHER PROBLEMS

If error messages appear, refer to the DOS error messages section in this appendix, your disk drive installation manual, or your DOS manual.

If an unrecoverable disk error occurs after you have been using the system for an extended period, turn the power off and allow the system to cool. If this solves the problem this time, but the problem recurs, ensure that the computer has adequate air flow around it. Check inside the system unit for any cable that may impede the interior air flow.

If after operating with no problems, the system reports a parity error and the program stops running, turn off the system, disconnect its power cable, and remove the system cover. Gently press down on each of the two leftmost RAM chips in bank 1 (the two rows nearest the back of the system). If this does not correct the problem, try removing and reinstalling the two chips, being sure to orient them with the notch or dot facing the front of the system.

A-22 Troubleshooting

GENERAL SOLUTIONS TO PROBLEMS WITH DOS

When you encounter error messages or other problems while using DOS, try these corrective actions.

1. Check your spelling. (Press F3 to display the line you typed last.)
2. Enter the backslash character (\), not the forward slash character (/) to separate names in a pathname.
3. Check the command syntax. (See your DOS manual.)

DOS ERROR MESSAGES

This section lists some of the most common error messages.

Bad command or file name

- Check your spelling.
- Ensure that the program or file is on the specified drive. Type DIR to check.
- Ensure that your file specification is correct; some commands do not allow operations between disk drives, between different directories, or between a fixed disk and a diskette drive.

**Disk Error Reading Drive X
Abort, Retry, Ignore?**

- Make sure the drive door is closed.
- Make sure the diskette is inserted properly. (Seamed-side down, with the side with two small semi-circle-shaped notches farthest from you.)
- Try another diskette. (If the second diskette works, the first diskette is probably defective.)
- Make sure that the diskette is formatted.
- Make sure that the diskette is formatted with the same format as your diskette drive. Regular, 360KB diskette drives cannot read high-capacity (1.2MB) diskettes.

File not found

- Check your spelling.
- Make sure that you included the extension in the filename.
- Ensure that the command allows operations between directories or files.
- Check the command syntax.
- Make sure that the file is on the drive.
- Use the full pathname if the file you seek is not in the current directory.

A-24 Troubleshooting

Invalid date

Enter the date in the following form:

mm-dd-yyyy

Each entry must be a *number* and separated by a *hyphen*.

**Write protect error writing drive x
Abort, Retry, Ignore? _**

- Write-enable the disk. (Remove the write-protect tab from the side of the diskette.)
- Close the drive door.

PLACING A SERVICE CALL

If you have followed the troubleshooting procedures in this appendix and still have problems, and if the equipment is still under warranty, place a service call before taking any further action. It may be possible to solve the problem without returning the equipment. Do not remove the equipment from the system before you have placed a service call. The following paragraphs give the procedure for placing the service call, and packing the equipment for shipment if it needs to be returned.

Before You Place the Service Call

When you place the service call, the service technician will need some information in order to help you identify and solve the problem. You must have the following items and information ready before you place the service call:

- **Your invoice. The first information the technician will need is your invoice number.**
- **What you were trying to do when the error occurred. For example, did the error occur while you were booting the system? Did it happen when you tried to print a file?**
- **How the system responded to the error. Did the computer beep, display some messages, and then stop? Was the red light on the diskette drive on? Exactly what happened? This information will help the technicians find a solution to the problem.**
- **A screwdriver and any other tools necessary to disassemble the computer. In some cases, the technician will ask you to open the computer to help troubleshoot the problem.**

A-26 Troubleshooting

Placing the Service Call

To place a service call, dial the customer service number listed on the inside back cover of the manual. When you place the call, use a telephone near the computer. The technician who takes your call may ask you to do some of the following things to help isolate the cause of the problem:

- Run some DOS commands.
- Check cable connections.
- Open the computer and check some of the parts inside.
- Try equipment on another computer. (This is a common method of troubleshooting.)

In most cases, the problem can be identified and solved using troubleshooting procedures over the phone.

If the technician cannot solve the problem over the telephone, he or she will ask you to return the equipment and will give you a Return Merchandise Authorization (RMA) Number. Write down this number immediately. When you pack the equipment for shipment, the RMA number must be written on the outside of the box.

When you return equipment, it must include all items which you originally received with the equipment -- hardware, cables, manuals, software and anything else which you may have received. This is important because if there is a problem, it may not be caused by the equipment which appears to be at fault. All products returned for credit or replacement with a different item must be complete, like new, as when you received it from us. Incomplete products will not be processed and will be returned to you as received by us.

Troubleshooting A-27

Be sure to include a piece of paper with your RMA number, name, address, daytime phone number, and a short description of the problem inside the shipping container in case a technician needs to call you regarding the equipment. Sometimes, after talking to customer service, you may remember some aspect of the problem that was not discussed. This information may help our technical department re-create your problem more exactly and therefore help to ensure a timely solution.

Also include the method of shipment if you send it overnight or 2 day service. The equipment will be returned to you in a like manner, overnight or 2 day service.

Once you have packed the equipment for shipment, write your RMA number on the outside of the shipping container. No packages will be accepted at our facility without RMA numbers.



**APPENDIX B:
GLOSSARY**

CONTENTS:

List of Glossary Terms B-2

B-2 Glossary

backup A spare copy of your data or program. It is a good idea to keep a backup copy of all your data and programs in case the original diskette is damaged.

board A long, flat piece of hardware consisting of many electronic components on a metal or plastic foundation. Each board fits into a slot inside the system unit and controls the use of a peripheral device. *Synonym:* card.

boot To restart the system by pressing the CTRL, ALT, and DEL keys simultaneously and then releasing them. When you boot or reboot, the system transfers instructions from **read-only memory** to **random-access memory** and loads DOS. You must have DOS or another startup program on the diskette in Drive A or on the fixed disk when you reboot the system; if you don't, an error message is displayed. *Synonyms:* IPL (initial program load), restart.

character Any number, letter, punctuation mark, or space.

current directory The directory where DOS is operating. The current directory is the **default** directory. You can change the current directory with the CHDIR (CD) command.

current drive The disk drive where DOS is operating. The current drive is the **default** drive.

daisy-chain cable A cable that has more than one connector. For example, a daisy-chain cable is used to connect more than one diskette drive to a diskette drive controller. One connector runs to the controller, the middle connector runs to one diskette drive, and the other end connector runs to the other diskette drive.

data All of the information that you process with your computer. It includes calculations, numbers, lists, reports, programs, documents, letters, etc.

default A predetermined or recommended choice in a program. The default value is applied unless you supply an alternative.

destination The drive or file you transfer information *to*. (*See also source.*)

directory A special file; its content is a list of file names. Directories can contain files and sub-directories. All files are listed under a directory.

disk operating system A program that controls the way programs are loaded into memory, how information is stored on the disk, and how the computer communicates with the printer and other peripheral devices.

DOS *See* disk operating system.

electronic disk An extension of memory that is used like a diskette drive. Electronic disks provide faster access times than real disk drives, but because the electronic disk is part of random-access memory, all the data stored on it is lost when you remove power from the system. *Synonym:* RAM-disk.

file A collection of data. You can think of a computer file as you do a file that you store in a filing cabinet. In a computer, all data is kept in a file, and every file has a name.

firmware A program that is permanently recorded on a programmable read-only memory (PROM) chip. It is installed on the computer's system board, and thus is essentially a piece of **hardware** that performs **software** functions.

hardware Physical equipment used in the computer.

LED (Light-emitting diode) Indicator light.

load To transfer a program from a disk to **random-access memory**.

B-4 Glossary

military time In military time, the hours are counted from zero to 23. Minutes are counted from one to 59 as in standard time.

Examples:

<i>Standard</i>	<i>Military</i>
Midnight:	00:00
1:00am	01:00
noon	12:00
1:00pm	13:00
1:30pm	13:30
6:00pm	18:00
6:30pm	18:30

overwrite Replace new information with old information. This term usually occurs in error messages.

peripheral A device used with the computer. Peripherals connect to the rear of the system unit and provide additional functions. Some examples of peripherals are the video display, printers, and modems.

port A connector on the outside rear of the system unit. You connect peripheral equipment to the computer via the ports.

prompt A question or request posed by a program. You enter a response to the question to continue operation of the program. The A> or B> symbols provided by MS-DOS are a form of prompt.

RAM *See* random-access memory.

RAM-disk *See* electronic disk.

random-access memory Temporary memory that stores data and programs while the computer is in use.

read-only memory Permanent memory where the computer start-up instructions are stored. You can add special ROMs to your system; these ROMs can store DOS or instructions for interpreting computer programs.

restart To load DOS again. This is achieved by **rebooting**, by pressing the system restart button, or by turning the system off and then on again. (The definition of this term varies from book to book.)

ROM See read-only memory.

slot Long, narrow connectors inside the system unit that allow you to insert hardware boards.

software Computer programs. Software (programs) are instructions that direct the computer to do tasks.

source The drive or file that you transfer information *from*.

synonym In DOS, a command having the same meaning as another command. For example, CD is a synonym for CHDIR. Both execute exactly the same command.

syntax Rules for forming statements in DOS (or a computing language). In DOS, the syntax includes the order of filenames, pathnames, and/or punctuation for each command. For example, in the COPY command, the source file must be named first, and the target file must be named second.

target The drive or file that you transfer information *to*.



APPENDIX C TECHNICAL DESCRIPTION

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Processing Speeds - J25	C-7
Battery Type - J31	C-7
ROM Type - ROM SEL	C-7
Video Display Type - SW1	C-7

C-2 Technical Summary

SYSTEM BOARD LOCATIONS AND FUNCTIONS

The following table describes the locations shown in Figure C-1.

<i>Location</i>	<i>Function</i>
E1	Selects the number of wait states.
J17,J18	Select the system board RAM configuration.
J19	Connector for the system speaker.
J20	Connector for the keylock and power LED.
J21	External keyboard connector (5-pin DIN).
J22	Connector for the external battery pack.
J24	Connector for the reset button.
J25	Selects the processor speed..
J27	Connector for the turbo LED.
J29	Selects the speed on the coprocessor.
J31	Selects the type of battery installed.
ROM SEL	Selects the type of ROM chips on the system.
SW1	Selects the type of display used as the primary display.

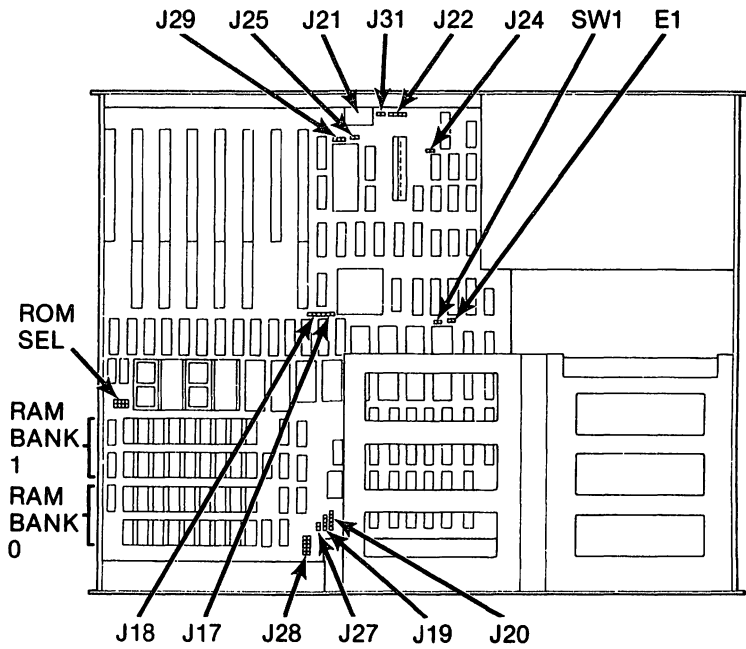


Figure C-1
System Board Locations

CPU AND SUPPORT

CPU: 80286
Bus slots: two eight-bit and six 16-bit

C-4 Technical Summary

640/384 Memory Map

Address Space	Function
000000 - 07FFFF	512KB RAM on system board
080000 - 09FFFF	128KB RAM on system board
0A0000 - 0BFFFF	128KB Video memory
0C0000 - 0DFFFF	128KB I/O expansion ROM
0E0000 - 0EFFFF	64KB System ROM expansion
0F0000 - 0FFFFFFF	64KB Reserved for BIOS
100000 - 15FFFF	384KB Extended memory
160000 - FDFFFF	14.85MB I/O Extended memory
FE0000 - FEFFFF	64KB System ROM expansion
FF0000 - FFFFFFFF	64KB Reserved for BIOS

512/512 Memory Map

Address Space	Function
000000 - 07FFFF	512KB RAM on system board
080000 - 09FFFF	128KB I/O extended RAM
0A0000 - 0BFFFF	128KB Video memory
0C0000 - 0DFFFF	128KB I/O extended ROM
0E0000 - 0EFFFF	64KB System ROM expansion
0F0000 - 0FFFFFFF	64KB Reserved for BIOS
100000 - 17FFFF	512KB Extended memory
180000 - FDFFFF	15MB I/O Extended memory
FE0000 - FEFFFF	64KB System ROM expansion
FF0000 - FFFFFFFF	64KB Reserved for BIOS

MEMORY MAPS

Your 80286 microprocessor can use two addressing modes. In 8088-compatible real-addressing mode, it can command 1MB of address space. In protected virtual-addressing mode, it can command 16MB of address space.

RAM CONFIGURATION - J17,J18

The system comes with 512KB of RAM installed on the system board. The system supports 512KB, 640KB, and 1,024KB (1MB) of RAM. No other RAM amounts are supported. To change the amount of RAM on the system board, install the appropriate RAM chips, as shown in Table C-1.

DOS can use a maximum of 640KB of memory. When you install 1,024KB of memory on the system board, part of this memory must be treated as extended RAM. (Extended RAM can be used as an electronic disk by most RAM disk programs.) When your system has 1,024KB of memory, either 512KB is base memory and 512KB is extended memory or 640KB is base memory and 384KB is extended memory.

Set jumpers J17 and J18 to indicate your preferred configuration, as shown in Table C-1.

C-6 Technical Summary

Table C-1
Memory Configurations:

Amount of Memory (KB)	Jumper Settings		RAM Chips	
	J17	J18	Bank 0	Bank 1
512	2-3	2-3	18-256K	none
640	2-3	1-2	18-256K	18-64K
512/512	1-2	2-3	18-256K	18-256K
640/384	1-2	1-2	18-256K	18-256K

SPEAKER - J19

The system speaker is mounted within the system unit and connects to the main board at location J19.

KEYLOCK/INDICATOR LIGHT CONSOLE - J20

The keylock and power indicator lamps connect to the system board at location J20. This connector is keyed so that you can only connect it the correct way. The wires on the fixed disk drive access indicator lamp connect to the diskette drive/fixed disk controller.

CLOCK-CALENDAR BATTERY - J22

This connector is used to connect a battery pack that contains four size AA 1.5-volt batteries to the system board. To connect the battery pack to, connect the red wire on the battery pack to the positive pin (labeled +) on the board. You can install one 6-volt or two 3-volt lithium batteries in the battery socket (no wiring is required), but the standard AA batteries provide longer life.

RESET BUTTON - J24

The reset button connects to the main board at location J24.

PROCESSING SPEEDS - J25

The toggle switch for selecting processor speeds connects to the main board at location J25. To permanently select the 10MHz speed, place a jumper plug on J25.

BATTERY TYPE - J31

If you use rechargeable batteries, place a jumper across these pins.

ROM TYPE - ROM SEL

Two types of ROMs can be used on your system. Each type takes two of the ROM sockets on the system board. Socket U59 is the low order (0) socket and U61 is the high order (1) socket. The following table shows how the ROM SEL pins must be jumpered to select the type of ROM chips installed.

Type	KB/Chip	Jumpers
27256	32KB	5-6,7-8
27128	16KB	1-2,3-4

VIDEO DISPLAY TYPE - SW1

For a monochrome (TTL) display, set bit 2 on SW1 to OFF. For a color, EGA, CGA (RGB) or black and white (composite) display, set bit 2 on SW1 to ON.



**APPENDIX D:
DISKETTE DRIVE/FIXED DISK CONTROLLER
SPECIFICATIONS**

CONTENTS:

Introduction	D-2
Fixed Disk Drive Types	D-5
Technical Specifications	D-8

D-2 Diskette Drive/Fixed Disk Controller

INTRODUCTION

This appendix provides functional and technical specifications for the Western Digital WD1003-WA2 diskette drive/fixed disk controller and the NCL America NDC-5125 diskette drive/fixed disk drive controller. These controllers are functionally equivalent.

The drive/fixed disk controller boards have the following features:

- Compatibility with the IBM PC/AT.
- Can control a total of two diskette drives. These diskette drives can be 360KB, 720KB, 1.2MB, or 1.44MB drives.

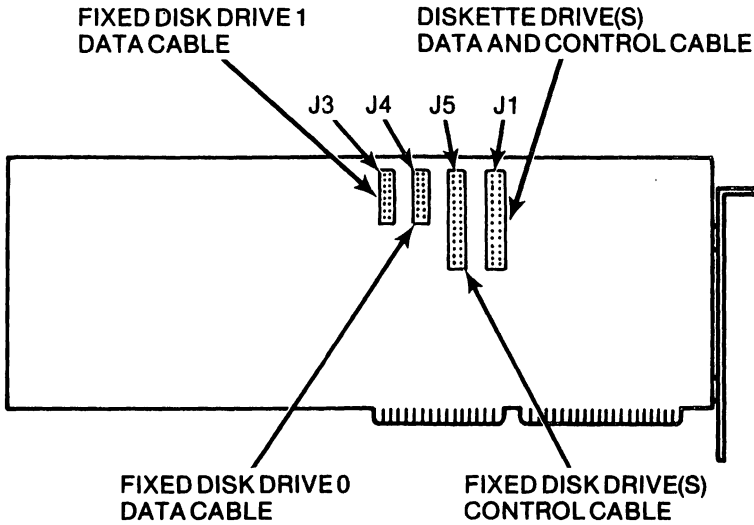


Figure D-1
Drive Connectors on the Western Digital Controller

Diskette Drive/Fixed Disk Controller D-3

- Can control a total of two fixed disk drives in addition to the diskette drives. These drives can have different capacities or configurations.
- 16-bit high-speed parallel I/O data transfers.
- Multiple sector read/write commands which may cross head and cylinder boundaries.
- Implied and buffered seek commands.
- Programmable format and error recovery algorithms.

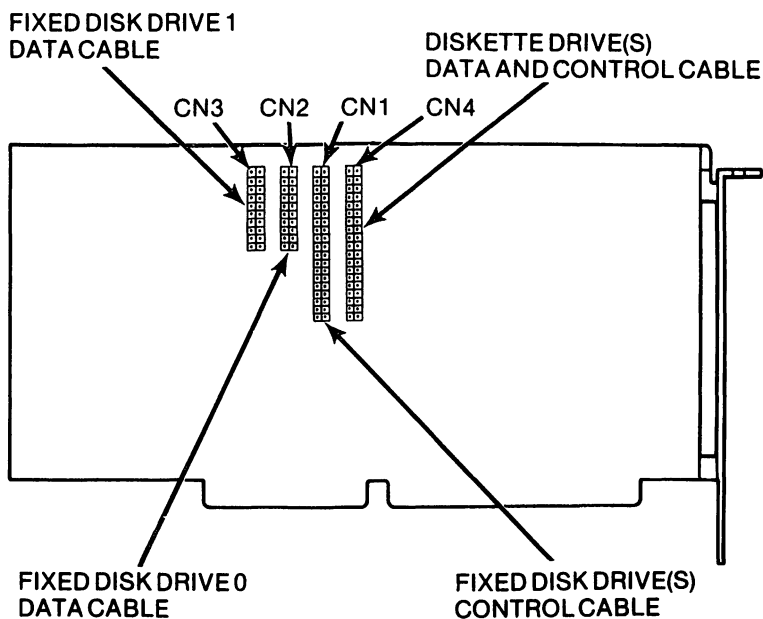


Figure D-2
Drive Connectors on the NCL Controller

D-4 Diskette Drive/Fixed Disk Controller

JUMPER PINS ON THE NCL CONTROLLER

JP0 This set of pins controls the host-controller I/O address for the fixed disk drive(s). If no jumper block is installed (the standard setting), the address is set to 1F0 - 1F7. Installing a jumper block sets the address to 170 - 177.

JP1 This set of pins controls the host-controller I/O address for the the diskette drive(s). If no jumper block is installed (the standard setting), the address is set to 3F2 - 3F7. Installing a jumper block sets the address to 372 - 377.

JP2 - JP5 These are factory test jumpers

JP6 A jumper block is necessary for normal operation and should not be removed.

FIXED DISK DRIVE TYPES

The following table lists many of the fixed disk drives available for your computer, their capacities, and their disk types. Enter the indicated disk type when you run SETUP. This list is reproduced from the list that is available when you run SETUP.

Fixed Disk Drive Type Specifications

TYPE	CYLIN- DERS	HEADS	PRE- COMP	LAND ZONE	SEC- TORS	SIZE MEGS*
1	306	4	128	305	17	10.1
2	615	4	300	615	17	20.4
3	615	6	300	615	17	30.6
4	940	8	512	940	17	62.4
5	940	6	512	940	17	46.8
6	615	4	no	615	17	20.4
7	462	8	256	511	17	30.6
8	733	5	no	733	17	36.4
9	900	15	no	901	17	112.0
10	820	3	no	820	17	20.4
11	855	5	no	855	17	35.4
12	855	7	no	855	17	49.6
13	306	8	128	319	17	20.3
14	733	7	no	733	17	42.5
16	612	4	0	633	17	20.3
17	977	5	300	977	17	40.5
18	977	7	no	977	17	56.7
19	1024	7	512	1023	17	59.5
20	733	5	300	732	17	30.4
21	733	7	300	933	17	42.5
22	733	5	300	733	17	30.4
23	306	4	0	336	17	10.1

* All sizes are approximate.

D-6 Diskette Drive/Fixed Disk Controller

TYPE	CYLIN- DERS	HEADS	PRE- COMP	LAND ZONE	SEC- TORS	SIZE MEGS*
25	615	4	0	615	17	20.4
26	1024	4	-1	1023	17	34.0
27	1024	5	-1	1023	17	34.0
28	1024	8	-1	1023	17	42.5
29	512	8	256	512	17	34.0
30	615	2	615	615	17	20.4
31	989	5	0	989	17	41.0
35	1024	9	1024	1024	17	76.5
36	1024	5	512	1024	17	42.5
37	830	10	no	830	17	68.8
38	823	10	256	824	17	68.3
39	615	4	128	664	17	20.4
40	615	8	128	664	17	40.8
41	917	15	no	918	17	114.1
42	1023	15	no	1024	17	127.3
43	823	10	512	823	17	68.3
44	820	6	-1	820	17	40.8
45	1024	8	-1	1024	17	68.0
46	925	9	-1	925	17	69.1
47	699	7	256	700	17	40.6

* All sizes are approximate.

Examples of Fixed Disk Drive Types

<i>Disk Type</i>	<i>Drive Capacity</i>	<i>Examples of Drive Type</i>
1	10MB	Cogito CGF912; MMI M212 and M312; Seagate ST412, ST212, ST112; Rodime RO202; Tandon TM252 and TM502; Fujitsu M2233; Shugart 7121; MiniScribe 2012 and 3412
2	21MB	Tulin TL226 ¹ ; CMI 6426; Qume R2001; Shugart 7241; Seagate 225
3	31MB	Tulin TL240 ¹ ; CMI 6640 Qume R3001; Rodime RO206
4	64MB	Atasi 3080 ¹
5	48MB	--
6	21MB	Seagate ST4026; Microscience 725; Tandon 262
7	31MB	Quantum Q540 ¹
8	31MB	Seagate ST4038
9	115MB	Maxtor XT-1140 ¹
10	21MB	Micropolis 1302 ¹ ; Vertex V1301,2

1 Not all of the cylinders are used.

D-8 Diskette Drive/Fixed Disk Controller

<i>Disk Type</i>	<i>Drive Capacity</i>	<i>Examples of Drive Type</i>
11	36MB	Vertex V150 ^{1,2} ; Seagate 4051 MiniScribe 6053
12	51MB	Vertex V170 ^{1,2}
13	21MB	Seagate ST425; MMI M225 and M312; Rodime RO204; Fujitsu M2235
14	44MB	--

TECHNICAL SPECIFICATIONS

Physical Attributes

Western Digital Controller

Length:	33.3cm (13.1 inches)
Width:	12.2cm (4.8 inches)
Height:	1.27cm (1.27 inches)

NCL Controller

Length	20.6 centimeters (8.1 inches)
Width	10.7 centimeters (4.2 inches)
Height	1.27 centimeters (0.5 inches)

Power Requirement

Western Digital Controller

+5V +/- 5% 1.5A +12 +/- 10% 0.5mA

NCL Controller

+5VDC @ 1.4 A (max) -5VDC @ 60 mA (max)

-
- 2 The Vertex drives actually have 987 cylinders, so only 83 percent of the V130 and 87 percent of the V150 and V170 are used.

Diskette Drive/Fixed Disk Controller D-9

Temperature

Western Digital Controller

Operating	0-50 C (32-131 F)
Nonoperating	-40-60 C (-40-140 F)

NCL Controller

Operating	0-50 C (32-131 F)
Nonoperating	-40 C - +85 C

Humidity

Western Digital Controller

Operating	8% to 85% non-condensing
Nonoperating	5% to 95% non-condensing

NCL Controller

Operating	10-80%
Nonoperating	10-80%

Shock and Vibration

Shock	35G/20MS square wave maximum
-------	------------------------------

Vibration	1G/0-600Hz, dwell not to exceed 30 seconds at any resonance
-----------	---

Altitude

Operating	0-3000 meters maximum
Nonoperating	0-5000 meters maximum

D-10 Diskette Drive/Fixed Disk Controller

Fixed Disk Recording Specifications

Encoding method	MFM
Data rate	5.0Mbs (Western Digital); 8Mbs (NCL)
Sector format	512 bytes/sector 17 sectors/track Sectors numbered 01 through 17 Track soft sectored format.
Interleave	2:1
Drives Supported	2 maximum
Heads supported	16 maximum
Tracks supported	1024 maximum
Hard error rate	less than 1 per 10 ¹² bits read
Soft error rate	less than 1 per 10 ¹⁰ bits read
Seek error rate	less than 1 per 10 ⁶ seeks

Read/Write Control Specifications

Maximum acquisition time	12.8 us @ 5.0Mbs
Capture range	> +/- 2.2%
Drive margin	+/- 16ns (with precompensation off)
Asymmetry tolerance	30nsec

Error Correction

Method	Polynomial division
Degree	32
Record length	516 by 8 bits maximum
Correction span	5 bits

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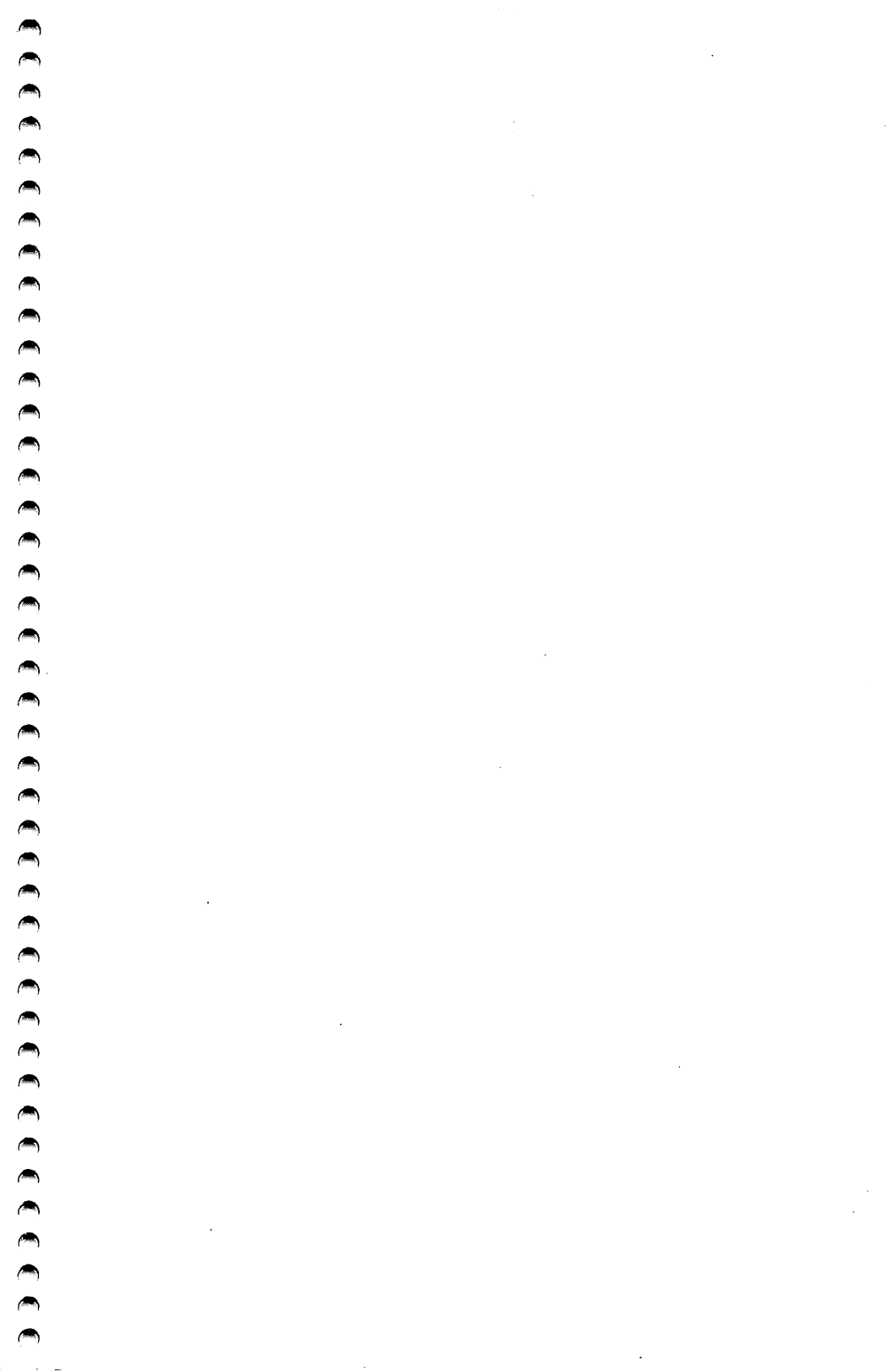
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Standard Brand Products warrants its hardware products against defects in materials and workmanship to the original purchaser for a period of one (1) year from the date of shipment. Warranty service, whether it be repair, adjustment or replacement (at our option) may be obtained by delivering the product and proof-of-purchase to:

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Obtain a **return authorization number** from **Standard Brand Products** prior to returning products to the factory. Merchandise received without a **return authorization number** shall be refused. Purchaser shall prepay shipping charges for products returned to **Standard Brand Products** and shall insure and accept all liability for loss of or damage to the product. **Standard Brand Products** will pay for the return of the product to the purchaser.

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