JG THE
BOARD PS/AT

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NOTE ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮

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INSTALLING THE
ABOVE™ *BOARD PS/AT*

HOW TO SAVE TIME USING THIS BOOK

If you're in a hurry to use the Above Board PS/AT, reading this preface can save you a lot of time. It tells you what you can skip, so you can focus on the information you need.

For experts

If you're an experienced DOS user who's fluent in hexadecimal jargon, if you understand the difference between conventional, expanded, and extended memory, and if you know your way around the inside of an AT, read the pamphlet entitled *Shortcuts to Installing the Above™ Board PS/AT* instead of this manual.

If you are a software developer and you want to create programs that use expanded memory, call Customer Support and ask for a copy of the *Lotus/Intel/Microsoft Expanded Memory Specification*. This specification explains how programs can use expanded memory. Appendix B lists the Customer Support numbers.

For everyone else

Read this manual for an explanation of Above Board PS/AT features and installation procedures. Here's what you'll find in each chapter:

1 *Product Overview*
A summary of the board's features and the accompanying software. Read this if you're unfamiliar with conventional, expanded, and extended memories, RAM disks, print buffers, or parallel and serial ports.

2 *Installation Overview*
An overview of the six-part installation process.

3 *Adding Memory to the Above Board PS/AT*
How to select memory chips and put them on your Above Board.

4 *Setting the Above Board PS/AT switches*
How to set the switches on the Above Board PS/AT. If you're familiar with the Above Board PS/AT, skip this chapter and go to Appendix A for a quick summary of the switch settings.

5 *Putting the Above Board PS/AT in the computer*
How to put the Above Board PS/AT in your computer.

6 *Running your computer's setup program*
How to run the computer's setup program. Read this chapter if you add conventional or extended memory to your computer.

The appendixes cover specialized technical topics. You don't need to
read them unless one of the chapters advises you to. The Glossary
at the end of the manual defines many of the technical terms.

CONTENTS

9 CHOOSING FROM CONVENTIONAL, EXPANDED, AND EXTENDED MEMORY

10 RAM DISKS

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FIGURES

1 PRODUCT OVERVIEW

This chapter is for readers who are unfamiliar with the Above Board PS/AT. It summarizes the features of the board and the accompanying software.

If you're familiar with the Above Board PS/AT, and you're interested only in installation instructions, turn to Chapter 2.

Above™ Board PS/AT features

The Above Board PS/AT and its software can provide the following:

- three kinds of memory (conventional, expanded, and extended)
- confidence tests
- RAM disks
- a print buffer
- a parallel port
- a serial port

Three kinds of memory

The Above Board PS/AT lets you add three kinds of memory to your computer:

- **Conventional memory**—is memory below 640K bytes. This memory can be used by all DOS application programs. The Above Board PS/AT lets you increase conventional memory from 512K to 640K bytes.

- **Expanded memory**—lets specially-written DOS programs use more than 640K bytes. Symphony Release 1.1, 1-2-3 Release 2.0, Framework II, SuperCalc3 Release 2.1, Ready!, and Javelin are just a few of the specially-written programs that take advantage of expanded memory. Each Above Board PS/AT lets you add as much as 1.5M bytes of expanded memory to your computer.

- **Extended memory**—can be used by programs running under the XENIX operating system or by the VDISK program running under the DOS operating system. DOS application programs can't use extended memory. Each Above Board PS/AT lets you add up to 1.5M bytes of extended memory to your computer.

Refer to Chapter 9 for a full explanation of conventional, extended, and expanded memories.

Confidence test software

The confidence tests pinpoint RAM chips that are defective or improperly installed. Chapter 7 tells how to run the confidence tests.

RAM disk software

RAM disks speed up programs that access disk drives frequently. If you're not familiar with RAM disks, read Chapter 10 before you install your Above Board PS/AT software.

Print buffer software

A print buffer lets you work at your computer while your printer is printing. If you're not familiar with print buffers, read Chapter 11 before you install your Above Board PS/AT software.

Parallel port

The Above Board PS/AT provides your computer with a parallel port (a connector to which you can attach a parallel printer or other parallel device). Refer to Chapter 12 for more about parallel ports.

Serial port

The Above Board PS/AT provides your computer with a serial port (a connector to which you can attach a serial printer, modem, mouse, plotter, or other serial device). Refer to Chapter 13 for more about serial ports.

Which computers can use the Above™ Board PS/AT?

The Above Board PS/AT is designed to work in the IBM AT, the COMPAQ 286 Deskpro, the COMPAQ 286 Portable and Portable II, and any 100% AT-compatible computer.

Which operating systems can use expanded memory?

You can use expanded memory with DOS versions 2.0 and greater. You *can't* use expanded memory with XENIX.

Which programs can use expanded memory?

Framework II, 1-2-3, Symphony, Ready!, and Javelin are just some of the programs that can use the expanded memory on your Above Board PS/AT. The list is growing fast. For details, read the supplement *Recent news about the Above Board PS/AT.*

What about programs that don't use expanded memory?

Even programs that don't use expanded memory directly can benefit from it. Most programs can run faster by using large expanded memory RAM disks. In addition, most programs benefit from an expanded memory print buffer. An expanded memory print buffer lets you use programs even while the printer is printing huge data files.

Special note for software developers

If you're interested in creating programs that use expanded memory, call Customer Support and ask for a copy of the *Lotus/Intel/Microsoft Expanded Memory Specification.* This specification explains how programs can use memory above 640K. Refer to Appendix B for Customer Support numbers.
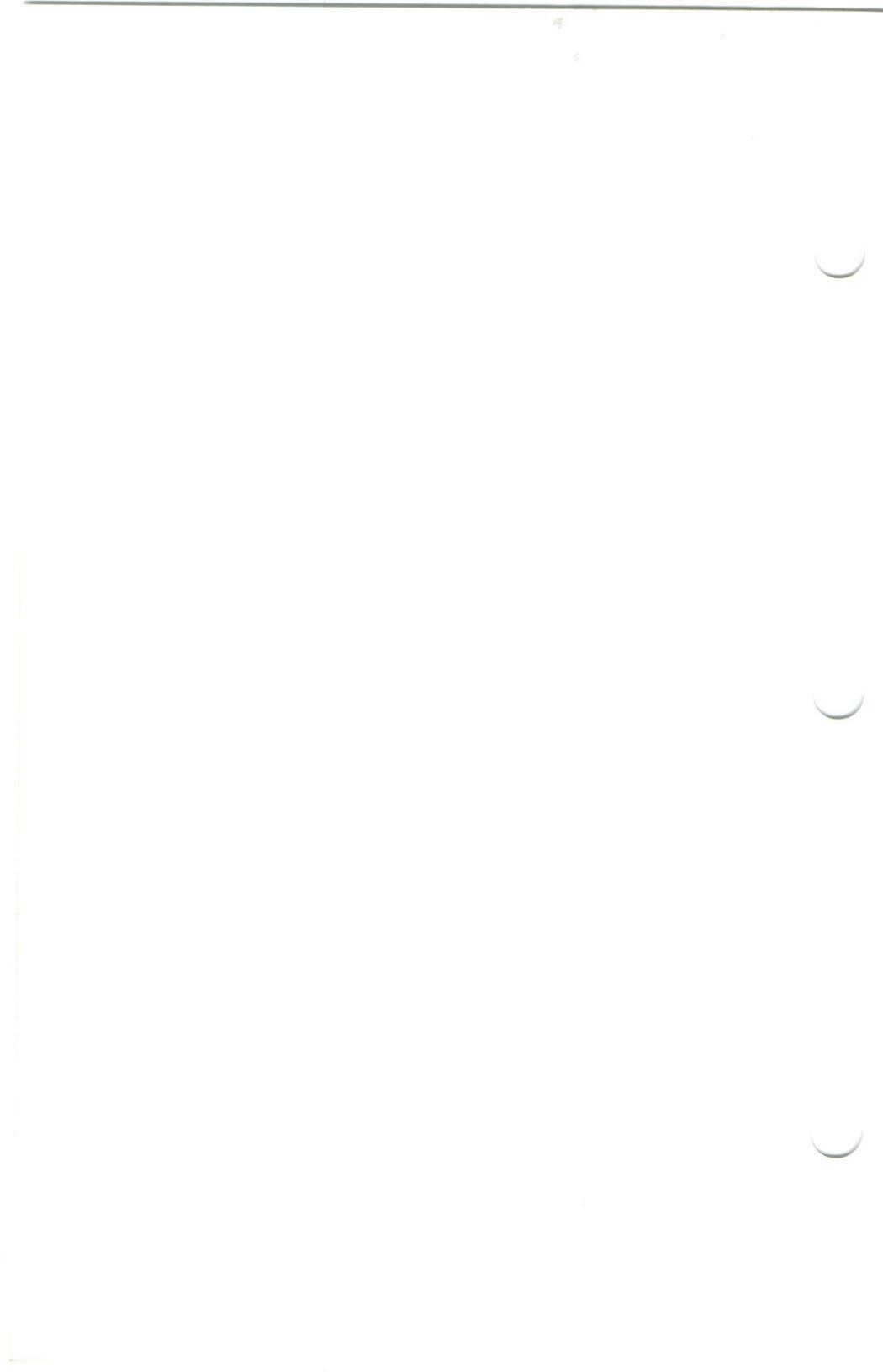
2 INSTALLATION OVERVIEW

This chapter is an overview of the installation instructions for readers who aren't intimate with DOS. DOS experts can skip this chapter and turn to the pamphlet entitled *Shortcuts to Installing the Above™ Board PS/AT.*

Installing the Above Board PS/AT is a six-part process:

1 **Putting memory on the board.** You can put as much as 1.5M bytes (1536K bytes) on the board. If you need more memory, you can add another 2M bytes by attaching the optional Above Board/AT Piggyback Memory. Chapter 3 discusses putting memory on the board.

2 **Setting the board's switches.** The Above Board PS/AT has 20 switches. The switches determine how much memory is conventional, extended, or expanded. They also control the naming of the parallel and serial ports. If you understand the Above Board PS/AT switches, turn to Appendix A to see how to set the switches. If you want more explanation, read Chapter 4.

3 **Putting the board in the computer.** Read Chapter 5 for directions.

4 **Running the computer's setup program.** Both the IBM AT and the COMPAQ 286 computers come with a setup program that helps the computer recognize new options you've added. You *must* run your computer's setup program after you've installed the Above Board PS/AT. Chapter 6 explains how to run the computer's setup program.

5 **Running the confidence tests.** The confidence tests pinpoint any non-functioning or improperly installed RAM chips on the Above Board. Although the confidence tests aren't required, Intel recommends that you invest the time required to run them. Chapter 7 explains how to run these tests.

6 **Running the Intel SETUPAT program.** If you are adding expanded memory, RAM disks, or print buffers to your computer, you *must* run the SETUPAT program that comes with the Above Board PS/AT. Chapter 8 explains how.

After you've performed all six parts of the installation process, your Above Board will be ready to use. To get started, turn to the next chapter.
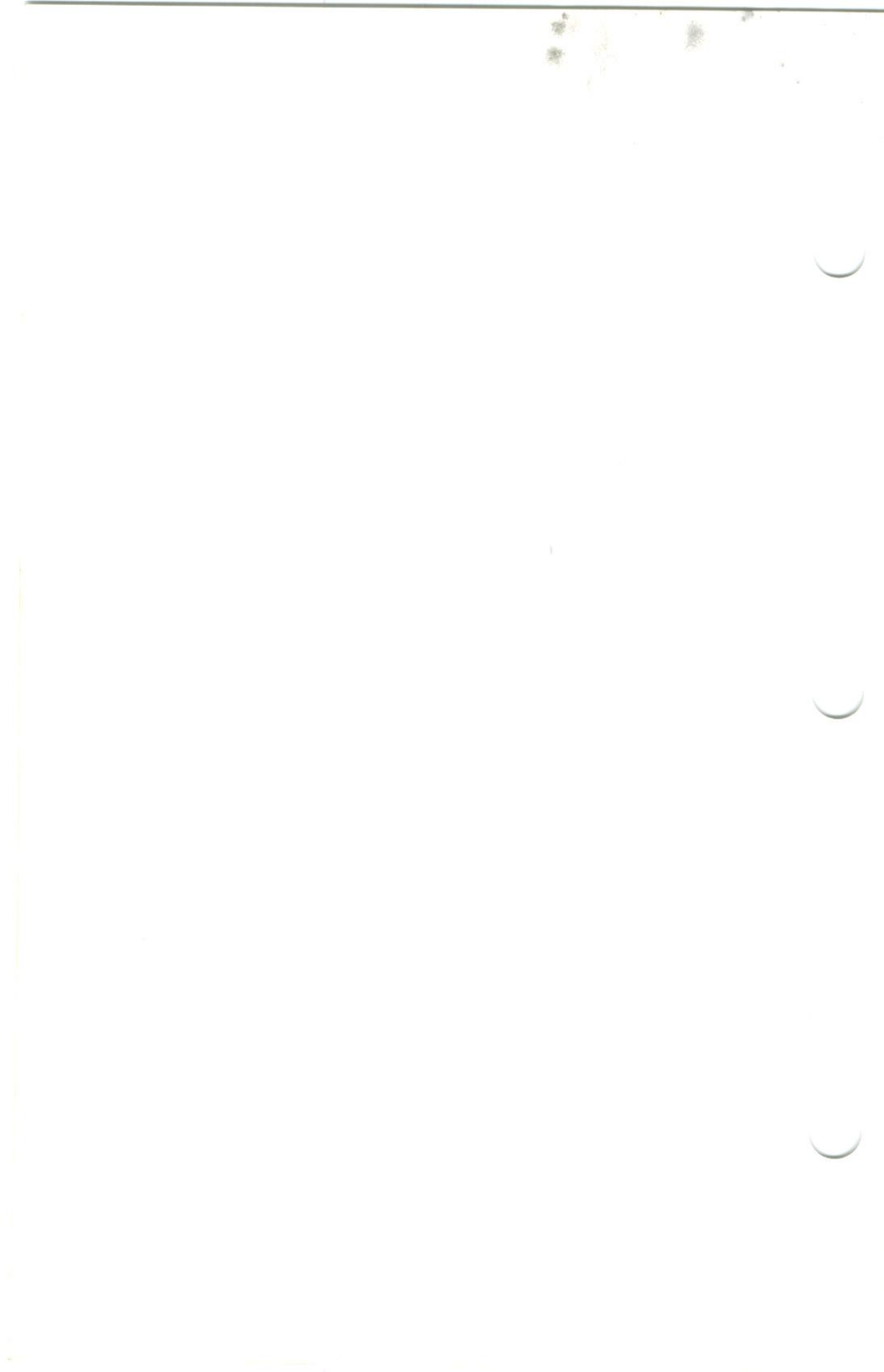
3 ADDING MEMORY TO THE ABOVE™ BOARD PS/AT

If your Above Board PS/AT contains less than 1.5M (1536K) bytes, you can add more memory. This chapter explains how.

This chapter assumes that the Above Board is out of your computer. If it's inside, follow the directions in your IBM AT's *Installation and Setup* manual, your COMPAQ 286's *Operations Guide,* or the comparable manual for your compatible computer to remove the cover of your system unit. Then take the Above Board out and place it on a clean, dry surface with the chips facing up.

Is your board already full?

Before you buy memory chips, see whether your Above Board PS/AT is already full. Figure 3-1 shows where the memory chips fit. The enlarged view shows an empty socket.

PC-0155
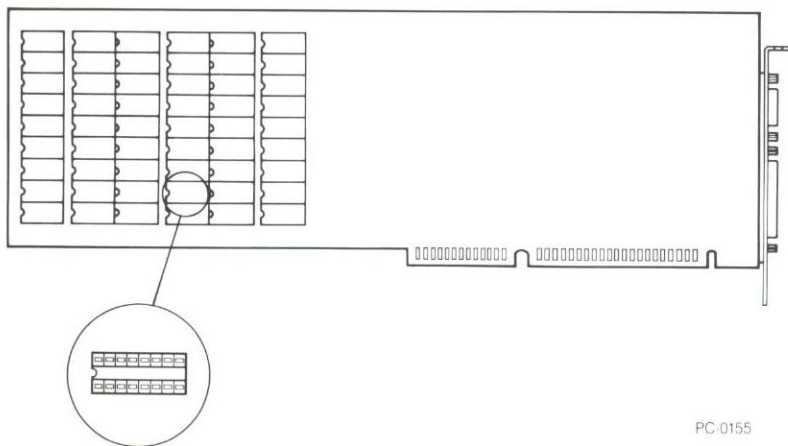
Figure 3-1 *Location of memory chips*

If any of the sockets on your Above Board PS/AT are empty, you can add more memory. The next section, "Rules for adding chips," tells how.

If all the sockets are full, you still may be able to add more memory. Check the memory chips. Are they 64K-bit or 256K-bit chips?

You can tell by reading the labels. If all chips have a "256" in the label (such as M5M4256-15), the board contains 1.5M bytes, all the memory it can hold unless you purchase the optional Above Board/AT Piggyback Memory.

If the chips have a "64" in the label (such as M5K4164-15), you can increase the amount of memory on the board by replacing all the memory chips with 256K-bit chips. The 256K-bit chips are more expensive than the 64K-bit chips, but they provide four times as much memory per column of chips.

Rules for adding chips

The memory chips you add to your Above Board PS/AT are subject to the following rules:

1   You must add chips to one pair of columns at a time. That means one set of 18 chips for two columns of sockets. As shown in Figure 3-2, Columns 1 and 2 are a pair, Columns 3 and 4 are a pair, and so on.

2   The chips must be inserted in the order shown in Figure 3-2. Fill Pair 1 before filling Pair 2, and so on.

3   Each pair of columns must be entirely empty or entirely full. Each must have 18 chips or none at all.

4   The chips must be all 64K-bit chips or all 256K-bit chips. The board won't accept a combination of 256K-bit and 64K-bit chips.

5   The chips must operate at 150 nanoseconds or faster. (For example, 120-nanosecond chips are fine.) You can mix chips of different speeds.
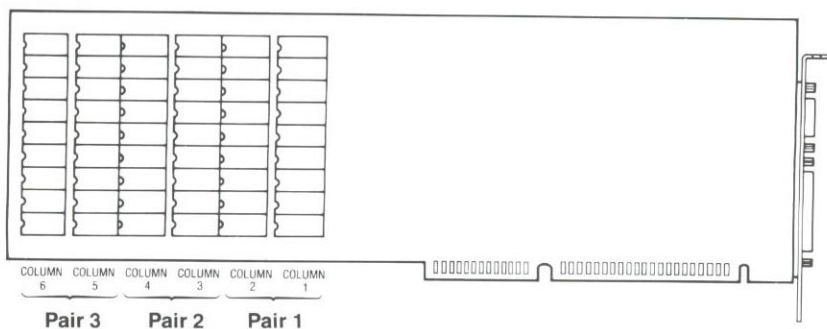
PC-0156

Figure 3-2 *Order for inserting chips*

Adding the chips

1 Decide how much memory you want to add to your Above Board PS/AT. For two columns of empty sockets, you can add:

- 128K bytes with eighteen 64K-bit chips

- 512K bytes with eighteen 256K-bit chips

2 Buy the chips in multiples of 18. (See "Rules for adding chips" 4 and 5 for the type and speed.) Intel has verified that the chips listed in Table 3-1 work correctly in the Above Board PS/AT. Other chips may work, but they haven't been verified.

Table 3-1 *Chips that work on the Above™ Board PS/AT*

Manufacturer	64K-bit chips	256K-bit chips
Fujitsu	MB8264-15	MB81256-12
	MB8264A-15	MB81256-15
Hitachi	HM4864-2	HM50256-12
	HM4864-3	HM50256-15
Mitsubishi	M5K4164-15	M5M4256-12
	—	M5M4256-15
NEC	D4164-3	—
	D4164-2	—
Texas Instruments	TMS4164-15NL	—

3 Gather the materials you'll need—your computer, manual, board, and chips—and arrange them on a clean, dry work surface.

4 Remove the static electricity from your hands by touching the metal back panel of your computer's system unit.

CAUTION ■■■■■■■

Memory chips can be damaged by static discharge. You're less likely to discharge static electricity if you ground yourself by touching the metal back panel of your computer's system unit before you touch the chips. Moving around increases the possibility of static discharge, so limit your movements while installing the memory chips.

5 If you're changing from 64K-bit chips to 256K-bit chips, remove the 64K-bit chips now. When you're ready to add new chips to the board, go to Step 6.

NOTE ■■■■■■■■■■■■■

If you've never put a chip in a socket, read Appendix E for instructions.

6 Insert the chips according to "Rules for adding chips" 2 and 3. When the board and chips are oriented as in Figure 3-3, the notched or dotted edge of each chip should point to the left.

Metal Board Retainer

Notched Chip

Dotted Chip
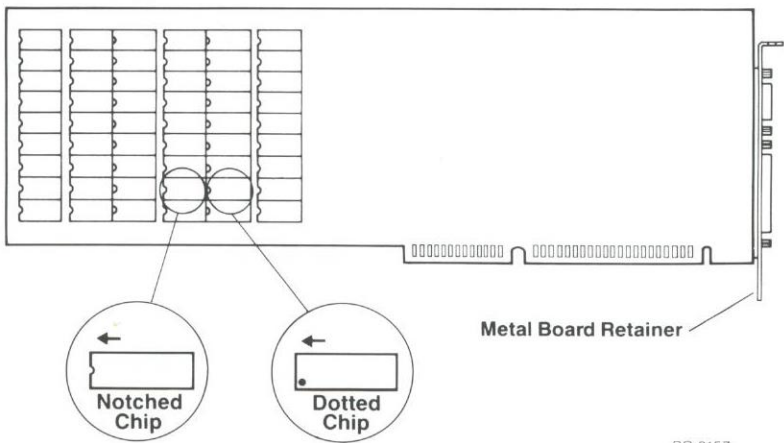
PC-0157

Figure 3-3 *Orienting chips correctly*

7 If you've changed chip types, you'll need to change switch 1 on the *middle* switch block. (Chapter 4 describes the switches.)

CAUTION ■■■■■■■■

Use a ballpoint pen to change the switch. Don't use a pencil, because the graphite in the lead could short-circuit the switch.

For 64K-bit chips, switch 1 must be OFF. For 256K-bit chips, it must be ON. Don't change any other switches until you read Chapter 4.

Once the chips are inserted, turn to Chapter 4. It tells how to set all the switches on the Above Board PS/AT.

4 SETTING THE ABOVE™ BOARD PS/AT SWITCHES

This chapter contains a detailed description of how to set the Above Board switches. If you want a quick summary of the switch settings, turn to Appendix A instead.

CAUTION ■■■■■■■

Use a ballpoint pen to set these switches. Don't use a pencil—the graphite in the lead could short-circuit the switch.

CAUTION ■■■■■■■

Memory chips can be damaged by static discharge. You're less likely to discharge static electricity if you ground yourself by touching the metal back panel of your computer's system unit before you set the switches. Moving around increases the possibility of static discharge, so limit your movements while setting the switches.

Location of the Above™ Board PS/AT switches

The Above Board contains three switch blocks, with eight switches on each of the left and middle blocks and four switches on the right block. Figure 4-1 shows the location of the switch blocks and gives an enlarged view of each.

Orient the Above Board as shown in the figure, and find the three switch blocks on your board.
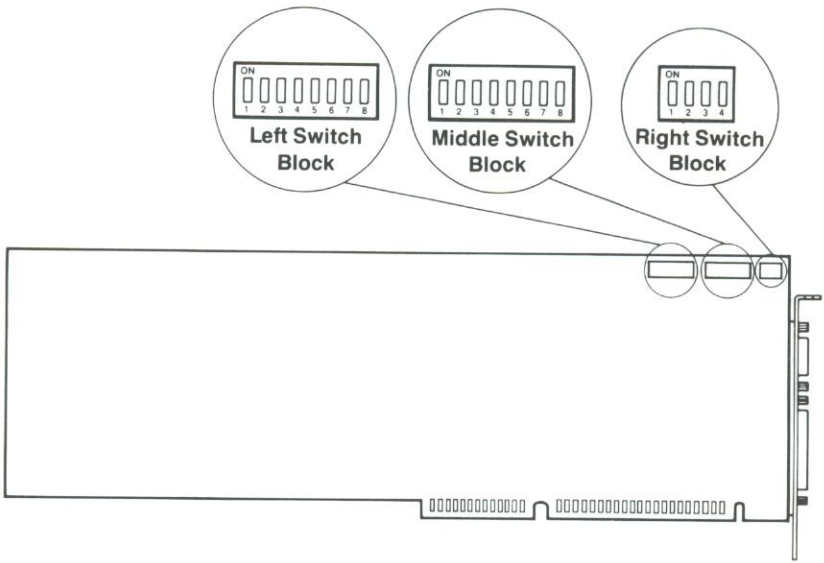
PC-0158

Figure 4-1 *Above™ Board PS/AT switch blocks*

Features that the switches control

Figure 4-2 shows the three Above Board switch blocks and the features that the switches control. It also identifies the tables within this chapter that explain how to set the individual switches.
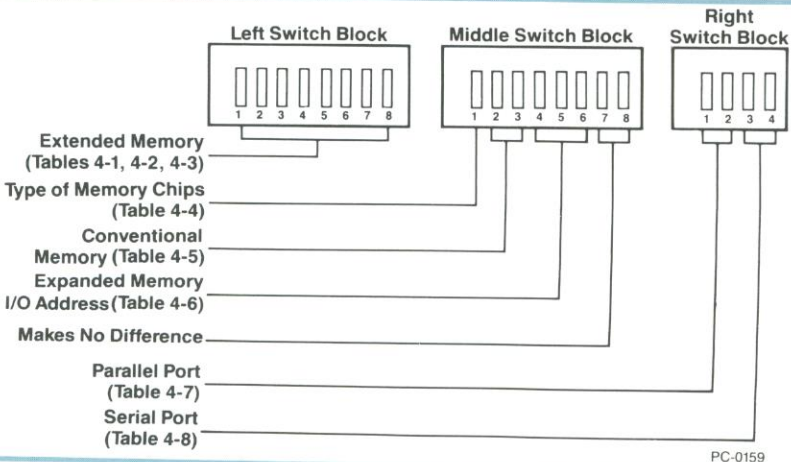
PC-0159

Figure 4-2 *Where to find Above™ Board PS/AT switch information*

The rest of this chapter presents the steps for setting the switches. Follow the steps in order—if you don't, you could miss an important step.

Switches for extended memory

Switches 1 through 8 on the *left* switch block control the starting and ending addresses for extended memory (for XENIX and VDISK). (Refer to Chapter 9 for a definition of extended memory.) You can also set them to indicate you don't want extended memory.
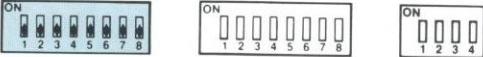
1 If you're using this Above Board to add extended memory, skip this step and go to step 2.

If you don't want the Above Board to supply any extended memory (only expanded or conventional memory), set the left switch block as shown in Table 4-1. After you set the switches, go to step 4.

NOTE ▮▮▮▮▮▮▮▮▮▮▮▮

Few DOS users need extended memory. You need extended memory only if you use a VDISK RAM disk. If you use DOS but not VDISK RAM disks, skip to step 4 after performing step 1.

Table 4-1 Above™ Board PS/AT switches for no extended memory

Does this Above Board supply extended memory?	Switches 1 through 8 on the left switch block
No	
Yes	See Tables 4-2 and 4-3.

2 If you're using this Above Board to add extended memory, select a starting address from Table 4-2 and set the switches as shown.

Table 4-2 Above™ Board PS/AT switches for extended memory starting address

Extended memory starting address for this Above Board	Switches 1 through 4 on the left switch block		
No extended memory (all expanded memory)			
1.0M byte			
1.5M bytes			
2.0M bytes			
2.5M bytes			
3.0M bytes			
3.5M bytes			
4.0M bytes			
4.5M bytes			
5.0M bytes			
5.5M bytes			
6.0M bytes			
6.5M bytes			
7.0M bytes			
7.5M bytes			

NOTE: Extended memory must be supplied in multiples of 512K bytes.

3 Select an extended memory ending address from Table 4-3. If you run SETUPAT (described in Chapter 8), any memory you didn't explicitly assign to extended memory or conventional memory automatically becomes expanded memory.

Table 4-3 Above™ Board PS/AT switches for extended memory ending address

Extended memory ending address for this Above Board	Switches 5 through 8 on the left switch block		
No extended memory (all expanded memory)			
1.5M byte			
2.0M bytes			
2.5M bytes			
3.0M bytes			
3.5M bytes			
4.0M bytes			
4.5M bytes			
5.0M bytes			
5.5M bytes			
6.0M bytes			
6.5M bytes			
7.0M bytes			
7.5M bytes			
8.0M bytes			

NOTE: Extended memory must be supplied in multiples of 512K bytes.

Switch for the type of memory chip

The Above Board can use 64K-bit memory chips or 256K-bit memory chips. You *can't* mix 64K-bit and 256K-bit chips.

4   Identify the type of memory chip on this Above Board. Memory chips with a "64" in the label (such as MB8264-15) are 64K-bit chips. Memory chips with a "256" in the label (such as HM50256-15) are 256K-bit chips.

5   Select the entry in Table 4-4 that matches the type of chips on this Above Board, and set switch 1 on the middle switch block.

Table 4-4 *Above™ Board PS/AT switch for the type of memory chip*

Type of memory chip	Switch 1 on the middle switch block		
64K-bit	ON ▯▯▯▯▯▯▯▯ 1 2 3 4 5 6 7 8	ON ▮▯▯▯▯▯▯▯ 1 2 3 4 5 6 7 8	ON ▯▯▯▯ 1 2 3 4
256K-bit	ON ▯▯▯▯▯▯▯▯ 1 2 3 4 5 6 7 8	ON ▮▯▯▯▯▯▯▯ 1 2 3 4 5 6 7 8	ON ▯▯▯▯ 1 2 3 4

Switches for conventional memory

If your computer contains 512K bytes of conventional memory, you can use the Above Board to add 128K bytes of conventional memory. This brings your computer's conventional memory to 640K, the maximum amount it can use.

6   If you're using the Above Board to add conventional memory to your computer, set switches 2 and 3 on the middle switch block as shown in the first entry of Table 4-5. If you're not adding conventional memory, set the switches as shown in the second entry.

Table 4-5 *Above™ Board PS/AT switches for conventional memory*

Conventional memory on this Above Board	Switches 2 and 3 on the middle switch block		
128K bytes (512K through 640K)	ON [⬜⬜⬜⬜⬜⬜⬜⬜] 1 2 3 4 5 6 7 8	ON [⬜⬛⬛⬜⬜⬜⬜⬜] 1 2 3 4 5 6 7 8	ON [⬜⬜⬜⬜] 1 2 3 4
None	ON [⬜⬜⬜⬜⬜⬜⬜⬜] 1 2 3 4 5 6 7 8	ON [⬜⬛⬜⬛⬜⬜⬜⬜] 1 2 3 4 5 6 7 8	ON [⬜⬜⬜⬜] 1 2 3 4

Switches for the expanded memory I/O address
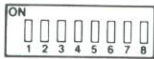
Switches 4 through 6 on the middle switch block control the expanded memory's I/O address locations for the Above Board. Your computer's processor uses I/O addresses to communicate with the boards in the system. (You don't need to understand I/O addresses, but if you want more information about them, refer to the Glossary.)

Most likely you can use the setting shown in Table 4-6 for the middle switch block's switches 4 through 6. But if this is your second, third, or fourth Above Board or if you got Intel Setup message 403 when you ran SETUPAT, you must choose a different setting.

The setting you choose depends on the boards in your computer. If you don't know the I/O addresses used by the other boards, try settings in the order they appear in Figure A-2 (in Appendix A). You'll know if the setting is correct because you won't receive Intel Setup message 403 when you run SETUPAT.

7 If you're using this Above Board to add expanded memory, set switches 4 through 6 on the middle switch block as shown in the first entry of Table 4-6. If you're not adding expanded memory, set the switches as shown in the second entry.

Table 4-6 *Above*™ *Board PS/AT switches for expanded memory I/O address*

Expanded memory I/O address	Switches 4 through 6 on the middle switch block		
258–25F*	ON □□□□□□□□ 1 2 3 4 5 6 7 8	ON □□□■■■□□ 1 2 3 4 5 6 7 8	ON □□□□ 1 2 3 4
No expanded memory	ON □□□□□□□□ 1 2 3 4 5 6 7 8	ON □□□■■■□□ 1 2 3 4 5 6 7 8	ON □□□□ 1 2 3 4
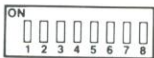
*If this is your second, third, or fourth Above Board, or if you receive Intel Setup message 403 while running SETUPAT, you must choose a different setting. Refer to Figure A-2 in Appendix A for alternate settings.

Switches for the parallel port

This section describes how to set the Above Board parallel port switches. Read Chapter 12 if you need more information about the parallel port.

8   Select a parallel port name from Table 4-7, and set switches 1 and 2 on the right switch block as shown.

Table 4-7 *Above*™ *Board PS/AT switch settings for the parallel port*

Parallel port name	Switches 1 and 2 on the right switch block		
LPT1*	ON □□□□□□□□ 1 2 3 4 5 6 7 8	ON □□□□□□□□ 1 2 3 4 5 6 7 8	ON ■■□□ 1 2 3 4
LPT2**	ON □□□□□□□□ 1 2 3 4 5 6 7 8	ON □□□□□□□□ 1 2 3 4 5 6 7 8	ON □■□□ 1 2 3 4
Shut off parallel port	ON □□□□□□□□ 1 2 3 4 5 6 7 8	ON □□□□□□□□ 1 2 3 4 5 6 7 8	ON ■□□□ 1 2 3 4

*If your computer contains an IBM Monochrome Display Adapter or an equivalent board, DOS refers to this port on the Above Board as LPT2.
**If your computer contains an IBM Monochrome Display Adapter or an equivalent board, DOS refers to this port on the Above Board as LPT3.

Switches for the serial port

This section describes how to set the Above Board serial port switches. Read Chapter 13 if you need more information about the serial port.

9 Select a serial port name from Table 4-8, and set switches 3 and 4 on the right switch block as shown.

Table 4-8 Above™ Board PS/AT switch settings for the serial port

Serial port name	Switches 3 and 4 on the right switch block		
COM1	⬛ ON ⬜⬜⬜⬜⬜⬜⬜⬜ 1 2 3 4 5 6 7 8	⬛ ON ⬜⬜⬜⬜⬜⬜⬜⬜ 1 2 3 4 5 6 7 8	⬛ ON ⬜⬜⬛⬛ 1 2 3 4
COM2	⬛ ON ⬜⬜⬜⬜⬜⬜⬜⬜ 1 2 3 4 5 6 7 8	⬛ ON ⬜⬜⬜⬜⬜⬜⬜⬜ 1 2 3 4 5 6 7 8	⬛ ON ⬜⬜⬛⬜ 1 2 3 4
Shut off serial port	⬜ ON ⬜⬜⬜⬜⬜⬜⬜⬜ 1 2 3 4 5 6 7 8	⬜ ON ⬜⬜⬜⬜⬜⬜⬜⬜ 1 2 3 4 5 6 7 8	⬛ ON ⬜⬜⬜⬜ 1 2 3 4

Check your switch settings

Now that you've set your switches, check that you set them correctly before you install the Above Board in your computer. The next chapter describes installing the Above Board.

HINT ||||||||||||||||||||||||||

You'll need to know your Above Board switch settings before you run the confidence tests. To save time, fill out the worksheet in Chapter 7 before you install the Above Board.

Sample switch settings

This section shows the Above Board switch settings for two specific situations. Do not duplicate these settings unless they are exactly how you want to set up your board.

Sample 1

Suppose you have a computer with 512K bytes of conventional memory. You've bought an Above Board PS/AT. The board is filled with 64K-bit chips, so it contains 384K bytes. You want to add 128K bytes of conventional memory and use the rest of the Above Board's memory as expanded memory for 1-2-3. You won't be using the parallel port, so turn it off. You will use the serial port (for a mouse) which you will name COM1. Given this information, set the Above Board's switches as shown in Figure 4-3.

PC-0160
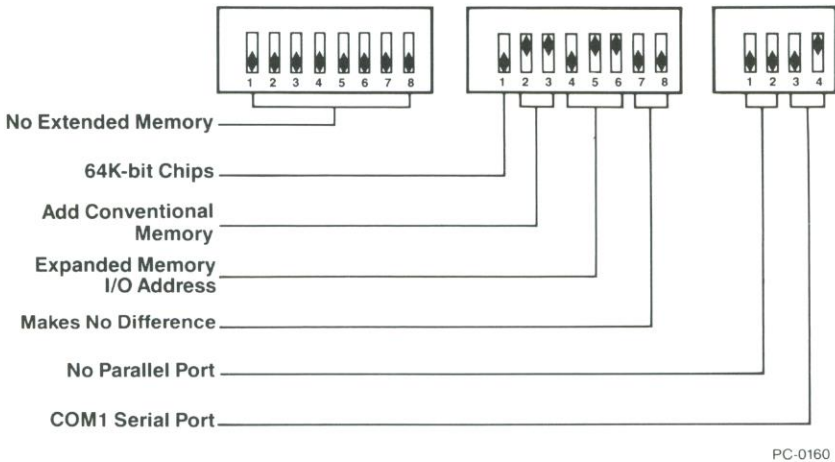
Figure 4-3 *Sample 1, Above™ Board PS/AT switch settings*

Sample 2

Suppose that your computer has 640K bytes of conventional memory so that you won't be adding conventional memory. Your Above Board PS/AT is filled with 256K-bit chips, so it contains 1.5M bytes. You want to make all the memory on the Above Board extended memory, starting at address 1.0M and ending at address 2.5M. You want to specify your parallel port to be LPT1 and name your serial port COM2 (because you already have a serial port named COM1). Given this information, set the switches as shown in Figure 4-4.

Add Extended
Memory From
1.0M to 2.5M

256K-bit Chips

No Conventional
Memory

No Expanded
Memory

Makes No Difference

LPT1 Parallel Port

COM2 Serial Port

PC-0161
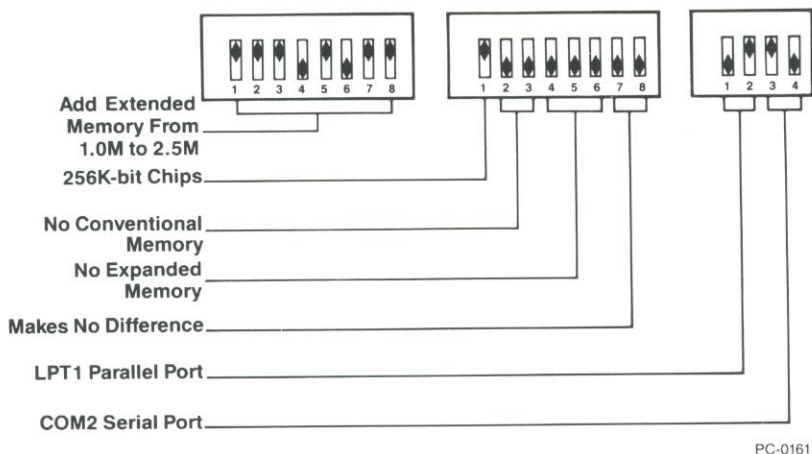
Figure 4-4 *Sample 2, Above™ Board PS/AT switch settings*
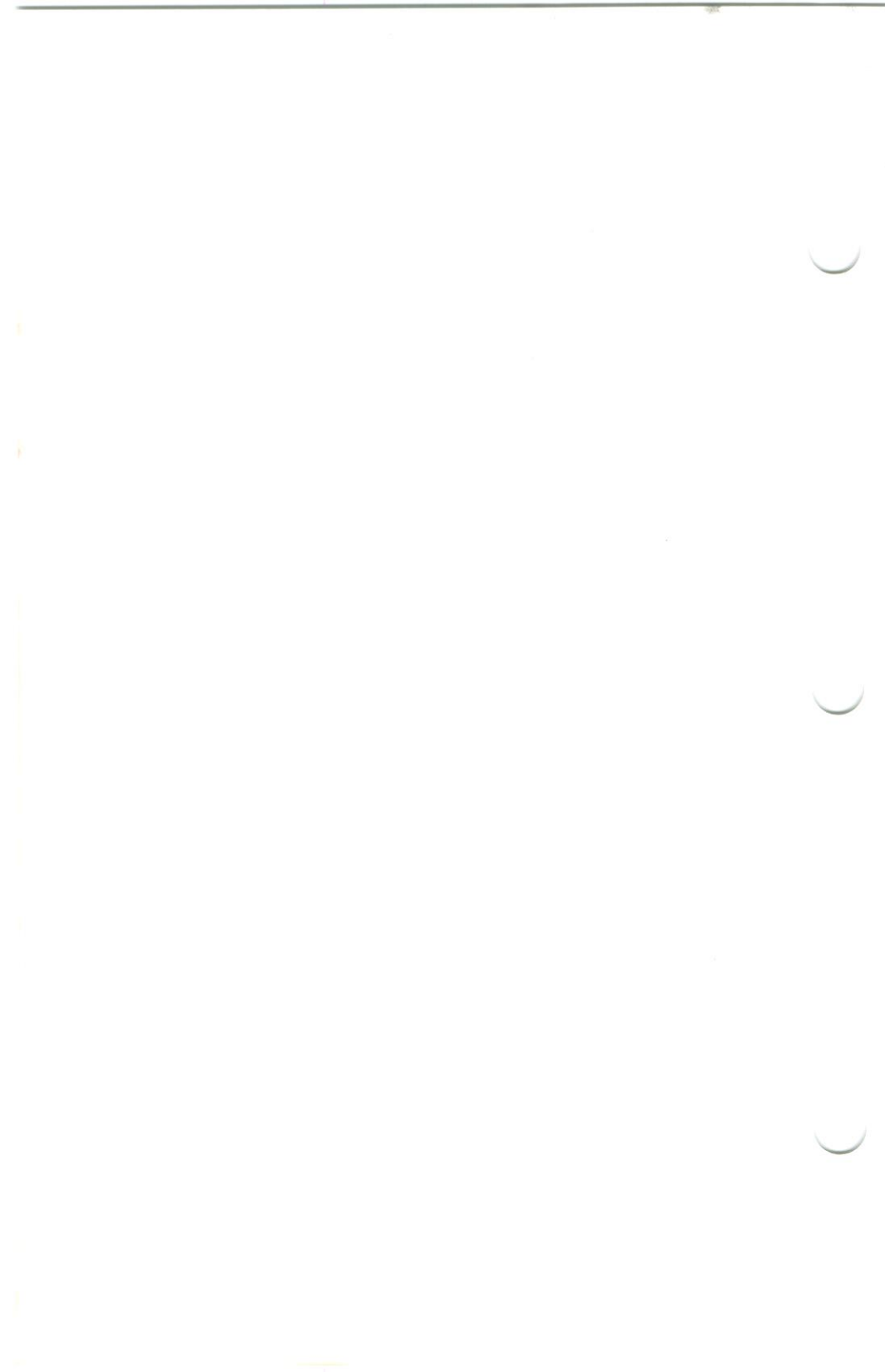
5 PUTTING THE ABOVE™ BOARD PS/AT IN THE COMPUTER

This chapter explains how to install the Above Board in your computer. If you've installed boards before, install the Above Board the same way, but be sure to insert it in a 16-bit expansion slot (refer to step 2).

CAUTION ■■■■■■■

Memory chips can be damaged by static discharge. You're less likely to discharge static electricity if you ground yourself by touching the metal back panel of your computer's system unit before you install the Above Board. Moving around increases the possibility of static discharge, so limit your movements while installing the Above Board.

1 Unplug your computer from the outlet, disconnect the cables, and remove the cover. If you don't know how to remove the cover, refer to IBM's *Installation and Setup* manual, COMPAQ's *Operations Guide,* or the equivalent manual for your compatible computer.

2 Locate an empty 16-bit expansion slot in the computer. A 16-bit slot has two connectors where the gold fingers at the bottom of the Above Board fit. An 8-bit slot has only one connector.

Figure 5-1 shows the difference between a 16-bit and an 8-bit expansion slot. Figure 5-2 shows boards inserted into 16-bit and 8-bit expansion slots.

Rear Panel

16-Bit Expansion Slot

8-Bit Expansion Slot
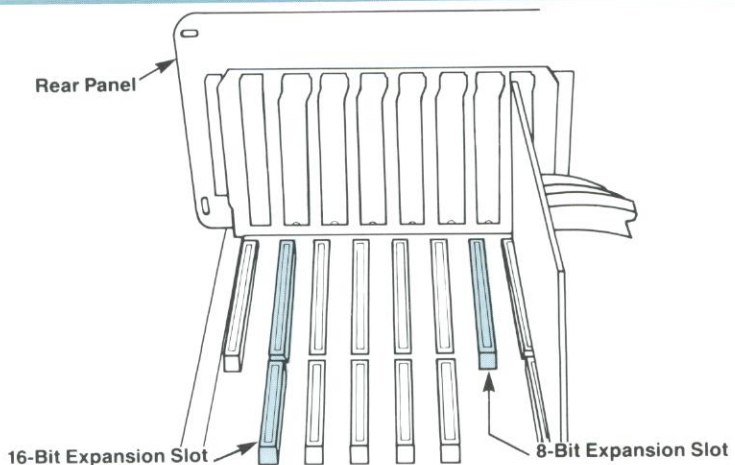
PC-0141

Figure 5-1 *Difference between a 16-bit and an 8-bit expansion slot*

Incorrect Installation

Correct Installation
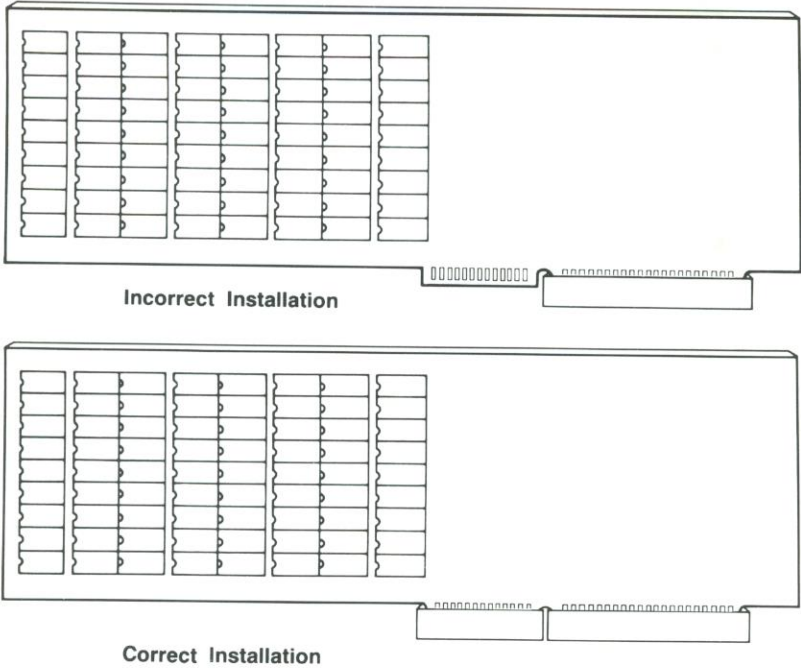
PC-0150

Figure 5-2 *An Above™ Board PS/AT installed in a 16-bit slot*

3 Use a flat-blade screwdriver to remove the screw holding the cover of one of the unused 16-bit expansion slots. Save the screw to use later. Remove the expansion slot cover. Figure 5-3 shows the location of the screw and the expansion slot cover.
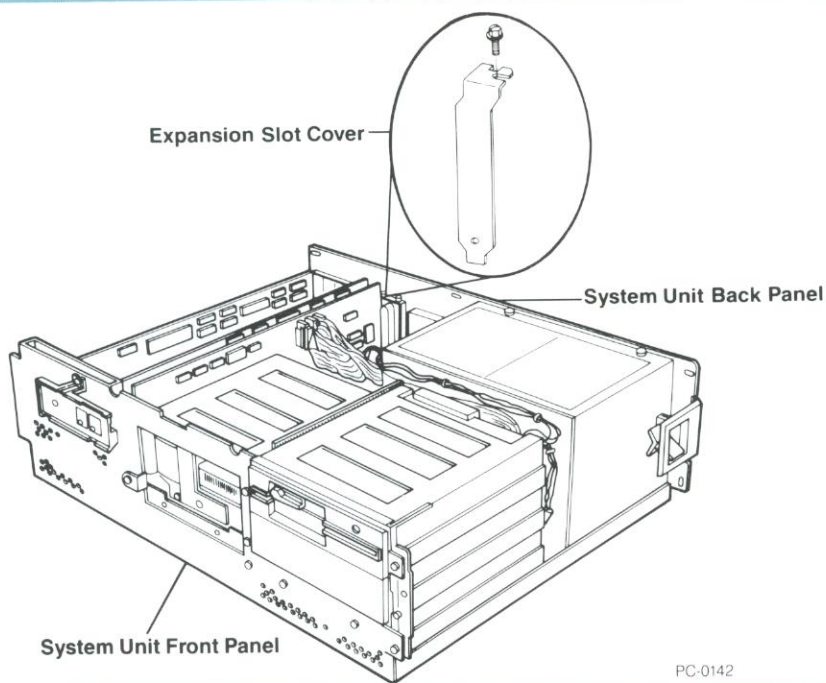
Figure 5-3 *Location of the expansion slot cover on your computer*

4 Line up the edge of the Above Board so that it fits into the top of the support bracket (inside the front panel of your computer) that corresponds to the empty 16-bit expansion slot whose cover you removed in step 3. The support bracket is shown in Figure 5-4.

Support Brackets

Front Panel
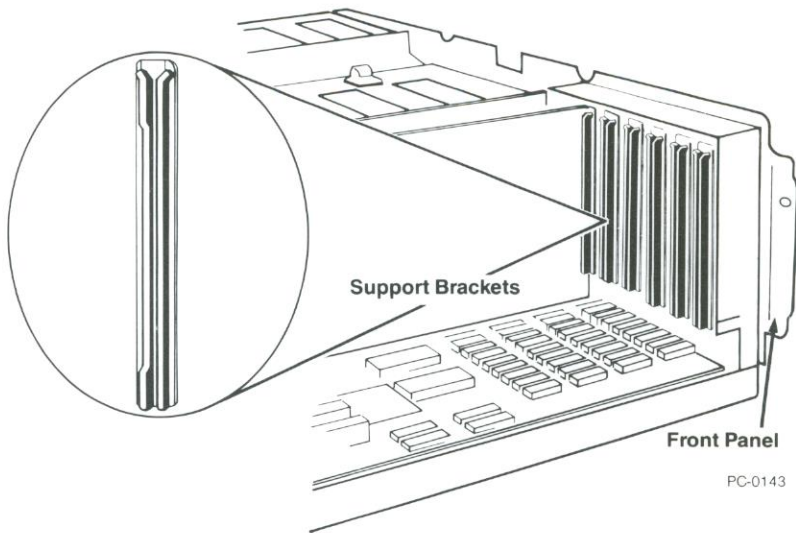
PC-0143

Figure 5-4 *The support bracket*

5 Hold the board at each corner of the top and push down as shown
in Figure 5-5. The board should slide easily most of the way into the
unused expansion slot. When you feel some resistance, check the
alignment. Then push down firmly to seat the board in the expansion
slot connector.
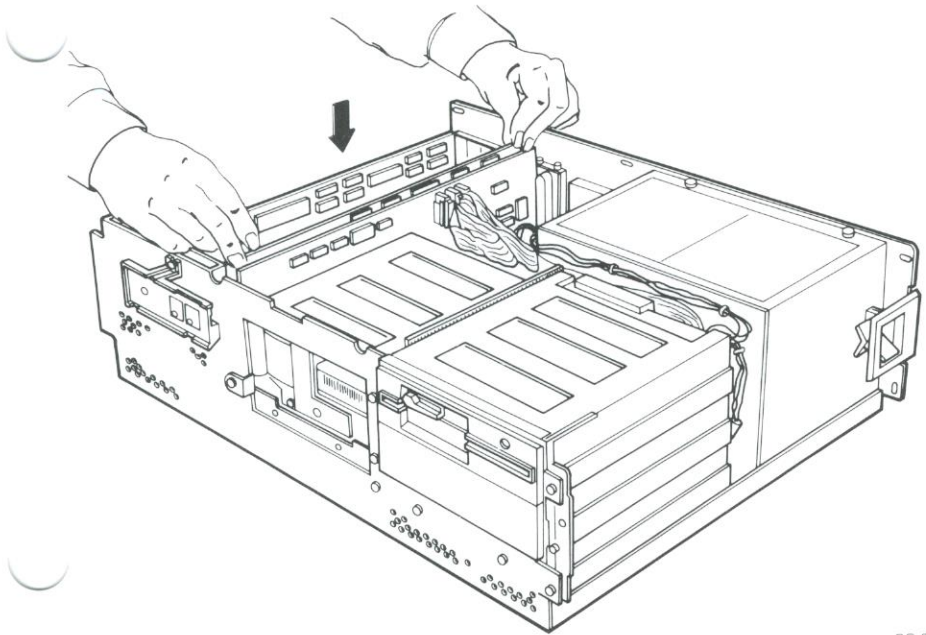
PC-0088

Figure 5-5 *Inserting the Above™ Board PS/AT in an expansion slot*

6 Align the opening in the top of the Above Board's metal retaining bracket with the hole in the top edge of the system unit's rear panel as shown in Figure 5-6. Fasten the metal retaining bracket to the panel with the screw you removed in step 3.

Top of Metal Retaining Bracket

Hole
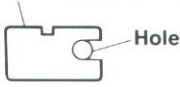
Metal Retaining Bracket
Correctly Aligned

Metal Retaining Bracket
Not Aligned
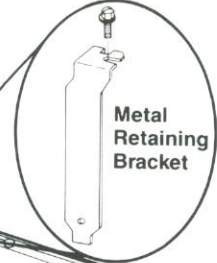
Metal
Retaining
Bracket
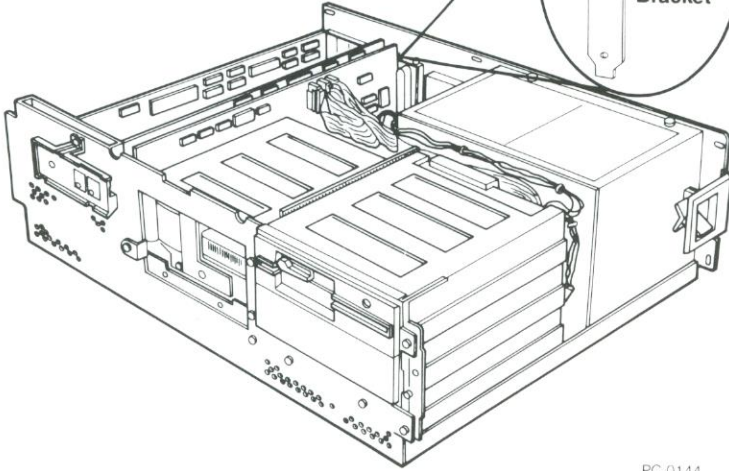
PC-0144

Figure 5-6 *Aligning and fastening the metal retaining bracket to the
back panel*

7 Replace the cover of your system unit, reconnect the cables, and
plug the power cord into the outlet. If you don't know how to replace
the cover, refer to IBM's *Installation and Setup* manual, COMPAQ's
Operations Guide, or the equivalent manual for your compatible
computer.

Now that you've installed the Above Board, turn to the next chapter for
information on running your computer's setup program.

6 RUNNING YOUR COMPUTER'S SETUP PROGRAM

If you use the Above Board to add conventional or extended memory to your computer, you *must* run your computer's setup program. This chapter explains how and provides several examples.

If you've added only expanded memory, you *needn't* run the computer's setup program. Skip this chapter and turn to Chapter 7 to learn about running the confidence tests.

What's the setup program?

Both the IBM AT and the COMPAQ 286 come with a setup program that lets you tell the computer how much conventional and extended memory you have in your computer.

Although the setup programs for an IBM AT and a COMPAQ 286 are similar, the instructions for starting them differ. This chapter provides instructions for both the IBM AT and COMPAQ computers.

When to run setup

Run the computer's setup program after you put the Above Board into the computer, but before you install the Above Board software.

Starting setup for an IBM AT

To start the setup program for an IBM AT, put your Diagnostics diskette in drive A, and restart your computer (by pressing Ctrl-Alt-Del). When the diagnostics menu appears, choose the setup option.

Starting setup for a COMPAQ 286

To start the setup program for a COMPAQ 286, put your User Programs diskette in drive A, and restart your computer (by pressing Ctrl-Alt-Del). Then type

TEST

and press Enter. When the diagnostics menu appears, choose the setup option.

What to tell setup

When the setup program asks how much *base memory* is in your computer, it's asking for the amount of *conventional memory*. When the setup program asks how much *expansion memory* is in your computer, it's asking for the amount of *extended memory*.

Remember—conventional memory is the memory between 0 and 640K. Extended memory is the XENIX or VDISK memory above 1.0M.

The following three examples should help you understand these terms.

Example 1—for DOS users who don't use VDISK

Your computer. Before adding an Above Board, your computer contained 512K bytes of conventional memory and no extended or expanded memory.

Background information. Most DOS users should fill their conventional memory to 640K and use the rest of the Above Board's memory as expanded memory. (The only exception is those who use the VDISK RAM disk. The VDISK software is slower than the RAM disk software that comes with the Above Board. However, if you still want to use VDISK, go to example 2.)

Your Above Board. Your Above Board contains 1.5M bytes. Set your switches to provide conventional memory from 512K to 640K and to provide no extended memory. (Chapter 4 contains switch setting information.) This assigns 128K bytes of Above Board memory to conventional memory, leaving the rest (1408K bytes) for expanded memory.

What to tell setup. When setup asks about base memory, type 640. When it asks about expansion memory (remember that "expansion memory" is extended memory), type 0. Don't worry about the 1408K bytes of expanded memory. The computer's setup program doesn't care about the expanded memory on your Above Board.

Example 2—for DOS users who use VDISK

Your computer. Before adding an Above Board, your computer contained 640K bytes of conventional memory and no extended or expanded memory.

Background information. Because your computer already contains 640K bytes of conventional memory, you can add only expanded memory or extended memory. Suppose that you want to use VDISK for your RAM disks even though the Intel RAM disk software is faster. VDISK can't set up RAM disks in expanded memory, but it can set them up in extended memory. For this example, assume you want 512K bytes of extended memory and 1.0M bytes of expanded memory.

Your Above Board. Your Above Board contains 1.5M bytes. Set your switches to provide extended memory from 1.0M bytes to 1.5M bytes, and to provide no conventional memory. This assigns 512K bytes of Above Board memory to extended memory, leaving 1.0M byte for expanded memory.

What to tell setup. When setup asks about base memory, type 640. When it asks about expansion memory (remember that "expansion memory" is extended memory), type 512. Don't worry about the 1.0M bytes of expanded memory. The computer's setup program doesn't care about the expanded memory on your Above Board.

Example 3—for XENIX users

Your computer. Before adding an Above Board, your computer contained 512K bytes of conventional memory and no extended memory.

Background information. XENIX can't use expanded memory, but it does use conventional and extended memory. Set your Above Board to fill conventional memory to 640K bytes and to use the rest as extended memory. Extended memory can be provided only in blocks of 512K bytes.

Your Above Board. Your Above Board contains 1.5M bytes. Set your switches to provide conventional memory from 512K to 640K and to provide extended memory from 1.0M byte to 2.0M bytes. (Chapter 4 contains switch setting information.) This assigns 128K bytes of Above Board memory to conventional memory and 1.0M byte to extended memory, leaving 384K bytes assigned to expanded memory (which XENIX users can't access.)

What to tell SETUP. When SETUP asks about base memory, type 640. When it asks about expansion memory, type 1024 (for 1M byte).

Where to go from here

Answer the questions asked by the setup program. When setup is finished, you have three alternatives:

- If you're a XENIX user, you're finished installing the Above Board. You can skip the rest of this manual.

- If you're a DOS user, consider running the confidence tests described in Chapter 7. (They can pinpoint any non-functioning RAM chips.) Then run the Intel SETUPAT program described in Chapter 8.

- If you're a DOS user in a hurry to use expanded memory, turn to Chapter 8. It tells how to run the Intel SETUPAT program. SETUPAT prepares your system disk to let your programs use expanded memory.
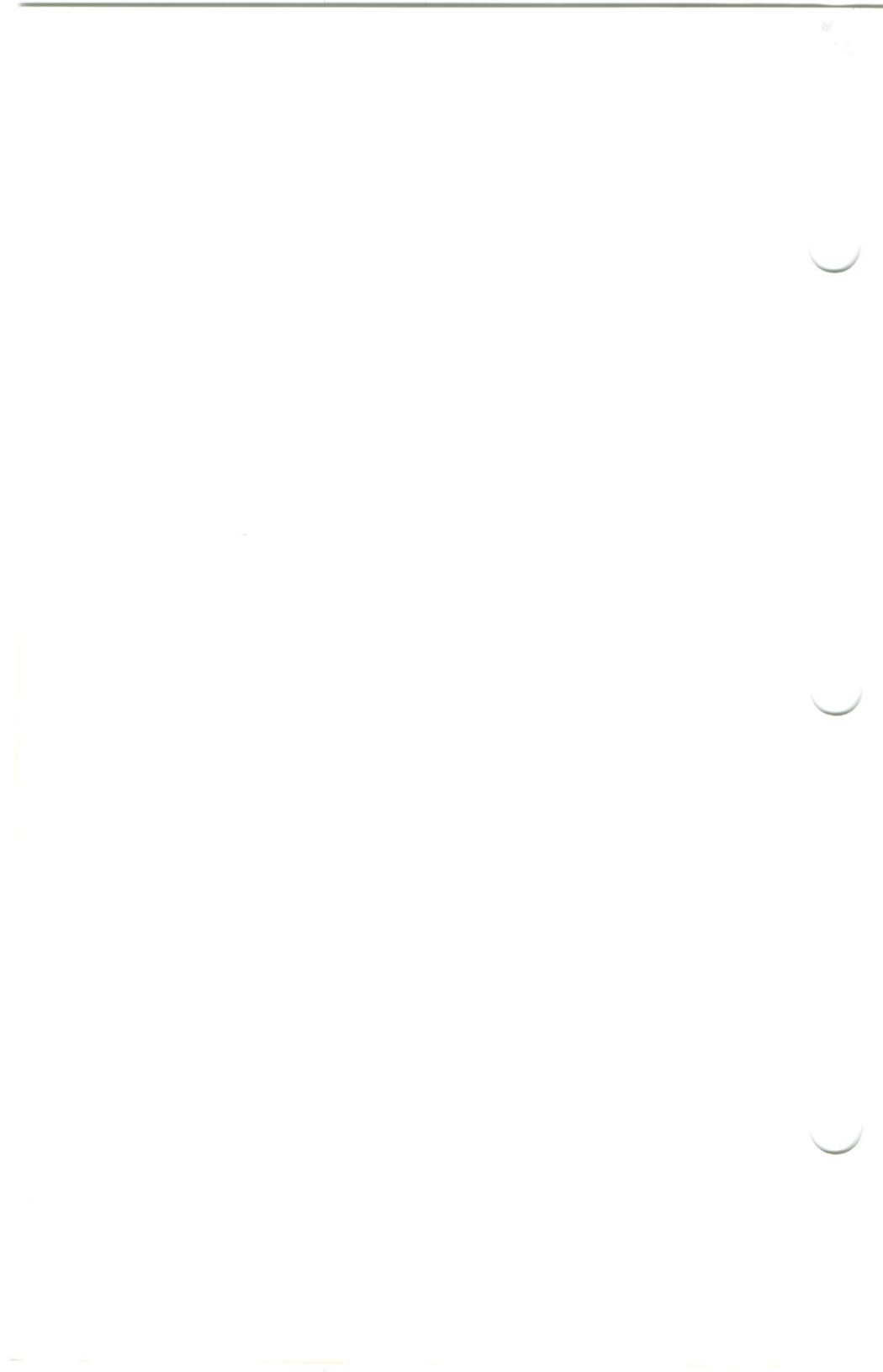
7 RUNNING THE CONFIDENCE TESTS

The confidence tests help ensure that all the Above Boards you've installed in your computer—both Above Board/ATs and Above Board PS/ATs—are ready to operate the way you expect them to. The tests check whether the RAM (memory) chips are working.

During the tests, your screen displays pictures of the boards, the switches, and the columns of chips on each board. When a problem chip is located, it's highlighted. Easy-to-follow summaries tell why the problem turned up and how you can fix it.

NOTE ■■■■■■■■■■■■■

The confidence tests run only under DOS. If you normally use XENIX, you'll need to temporarily switch to DOS if you want to run the confidence tests.

Before you begin...

Before you begin, keep these facts in mind:

- **These confidence tests are different from the memory tests SETUPAT (Intel's setup program) runs.** Some of the SETUPAT tests check for bad memory. They can't pinpoint bad chips; these confidence tests can.

- **These confidence tests use all the RAM in your computer.** If you have important data stored in your computer's RAM (in a print buffer or RAM disk, for example), make sure you save the data before starting the tests.

- **The system unit cover must remain in place during the tests.** If you need to look at a board in order to remedy a problem, wait until the tests are complete. Then, be sure you turn off your computer and unplug it before removing the cover.

Worksheet

Throughout the confidence tests, the TESTAB program, which runs the tests, will ask you for facts about your computer and your Above Boards.

Take a few minutes now to answer the questions in this worksheet. It will save you the trouble of looking them up during the tests. By jotting your notes here, in the manual, you'll be able to find them easily whenever you need them.

• What's the total number of Above board PS/AT's and Above Board/AT's in the computer?   1

FILL IN

FILL IN

Assigned by
TESTAB

	Above Board				Above Board/AT Piggyback Memory Board		
Left Switch Block	Middle Switch Block (PS/AT only)	Right Switch Block	Number of Columns Filled	Type of RAM Chip (64K-bit, 256K-bit, or both)	Number of Columns Filled	Type of RAM Chip (64K-bit or 256K-bit)	Board Number
(tally marks)	*(tally/arrows)*	*(arrows)*	all	256K	—	—	BN0011823J6A

RUNNING THE CONFIDENCE TESTS

Starting the confidence tests

Start the confidence tests by following these steps:

1. Restart your computer using a DOS disk which has no application programs on it.

2. Insert a copy of the Above Board Installation and Utility Software diskette in drive A. Then type:

   A:TESTAB

   and press the Enter key.

The confidence tests will begin running. They're self-explanatory —just follow the instructions.

Be sure to keep your worksheet handy. That way, you'll have answers ready when the TESTAB program asks for them.

When you complete the confidence tests, go to the next chapter for information on running Intel's SETUPAT program.
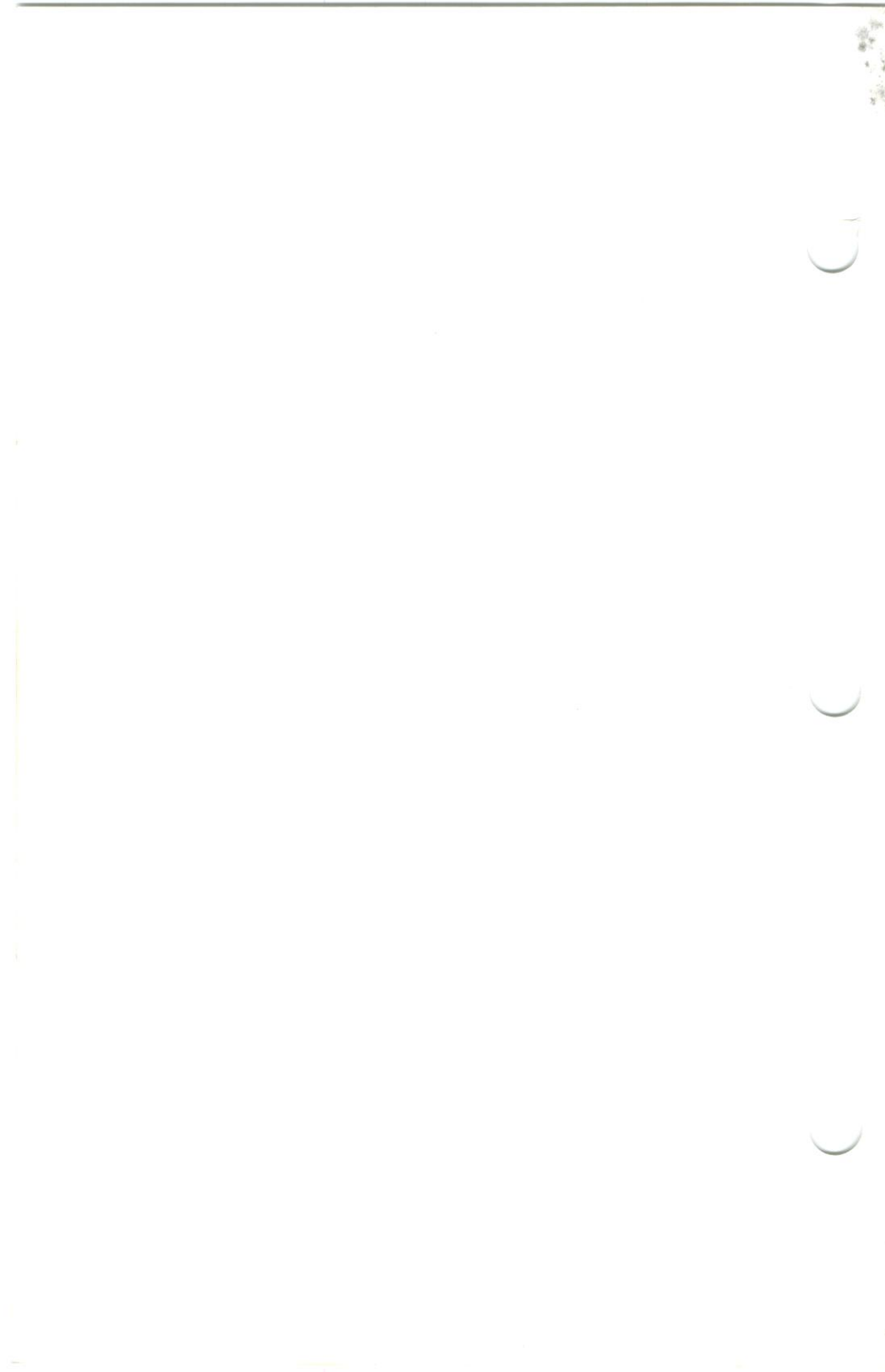
8 RUNNING THE ABOVE™ BOARD PS/AT SETUPAT PROGRAM

SETUPAT is an interactive installation program that helps you set up the Above Board PS/AT software on a diskette or a hard disk. The Above Board software is made up of:

- The Expanded Memory Manager (EMM). The EMM lets programs that conform to the *Lotus/Intel/Microsoft Expanded Memory Specification* use expanded memory.

- RAM disk software. RAM disks let you use some of the computer's random access memory (RAM) as though it were a disk drive. Chapter 10 contains more information about RAM disks.

- Print buffer software. A print buffer lets you use your computer for other tasks while a file is printing. Chapter 11 contains more information about print buffers.

If you're an expert DOS user and want to set up the Above Board software yourself, read the pamphlet entitled *Shortcuts to Installing the Above™ Board PS/AT* instead of this chapter.

NOTE ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮

Set the Above Board switches (Chapter 4), insert the board in your computer (Chapter 5), and run your computer's setup program (Chapter 6) before you follow the instructions in this chapter.

If you're using the Above Board to add only conventional or extended memory (no expanded memory) to your computer, and you're not installing RAM disks or a print buffer, skip this chapter.

What's SETUPAT going to do?

SETUPAT creates or adds to the AUTOEXEC.BAT and CONFIG.SYS files on your system disk (the disk from which you start your computer). This allows the Above Board software to run automatically when you turn on or restart your computer.

SETUPAT differs from most application programs in that you use it less often. Typically, you use it only once to install the Above Board software on your system diskette or your hard disk, so don't bother copying SETUPAT to your hard disk. However, you'll need to run SETUPAT again if you change the Above Board switch settings.

The SETUPAT program:

- Installs the Expanded Memory Manager (EMM) if you have expanded memory.

- Recommends print buffer and RAM disk sizes for popular application programs.

- Displays messages.

- Restarts your computer.

The following subsections describe each of these topics.

SETUPAT installs the EMM

SETUPAT installs the Expanded Memory Manager (EMM) on your system disks so your programs can use expanded memory. If you want to use expanded memory, the EMM must be installed. (Read Chapter 9 for more information about expanded memory.)

A number of specially-written, popular application programs (1-2-3 Release 2.0, Symphony Release 1.1, Ready!, and SuperCalc3 Release 2.1, for example) can use the Above Board's expanded memory. Other application programs may benefit from RAM disks or a print buffer in expanded memory. (Chapter 10 discusses RAM disks, and Chapter 11 discusses the print buffer.)

SETUPAT recommends sizes

To help you, SETUPAT recommends print buffer and RAM disk sizes for popular application programs. These sizes are suggestions only. SETUPAT lets you change them. If you tell SETUPAT that you want RAM disks and a print buffer, it installs them.

SETUPAT displays messages

To help you set up the Above Board software, SETUPAT displays messages in the bottom area of each menu (the message area). Figure 8-1 shows the message area of the screen.

In addition, if you make a mistake, SETUPAT uses this area to let you know what's wrong. These error messages are numbered, and SETUPAT beeps when they appear. Appendix C describes each numbered message in detail.
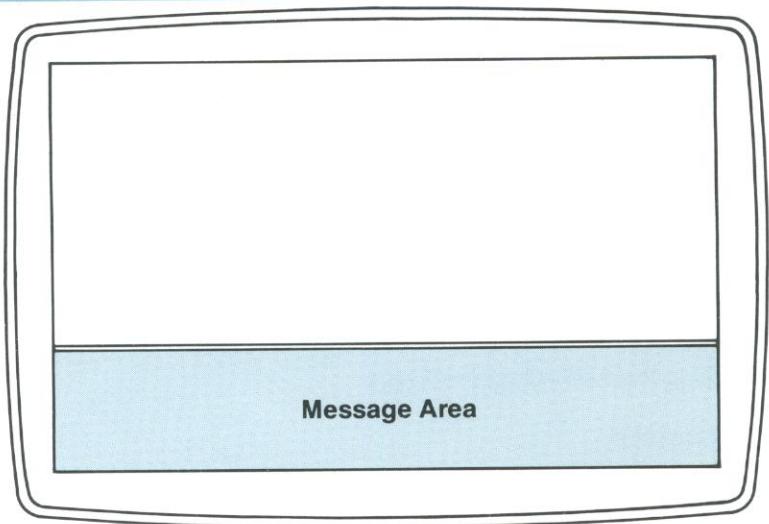
PC-0122

Figure 8-1 *Message area of the SETUPAT screens*

SETUPAT restarts the computer

When SETUPAT is finished installing the Above Board software, it restarts your computer. (This causes the computer to reload DOS.) Restarting is necessary to erase the effects of the tests that SETUPAT performs.

CAUTION ■ ■ ■ ■ ■ ■ ■

Don't start SETUPAT while you have data in a print buffer or RAM disk. When SETUPAT exits, it restarts your computer, which erases the contents of your print buffer and RAM disk.

To avoid losing data from a print buffer or RAM disk, follow these two rules:

● If you have data in a print buffer, first let the printer finish printing the data. Then start SETUPAT.

● If you have data in a RAM disk, first copy the data to a diskette or hard disk. Then start SETUPAT.

Before you begin...

The following subsections describe what you should do before you start the SETUPAT program. Before running SETUPAT, you should:

- Be sure your computer meets the requirements to run SETUPAT.

- Decide where to install the Above Board software—on a diskette or on a hard disk.

- Be sure you're using the most current version of the Above Board software.

- Back up the Above Board software.

Requirements

To use SETUPAT, your computer must contain the following hardware and software:

- Either two diskette drives or one diskette drive and a hard disk.

- DOS version 3.00 or more recent.

- At least 512K bytes of conventional memory.

- At least one Above Board PS/AT. (Chapters 4, 5, and 6 describe how to install an Above Board.)

Where to install the Above™ Board PS/AT software

You must install the Above Board software on a system disk (*a system disk contains DOS and is the one you use to start or restart your computer*). If you start your computer from a diskette, install the Above Board software on that diskette. If you start your computer from a hard disk, install the Above Board software on it.

Installing the Above™ Board PS/AT software on a diskette

If you start your computer from a system *diskette,* install the Above Board software on this diskette. Then, when you use the diskette to start or restart your computer, the Above Board software will be ready to use.

If your system diskette is too full to add the Above Board software (SETUPAT will let you know in a message), create a new system diskette and restart your computer from this diskette before running application programs. If you don't know how to create a system diskette, look up the FORMAT /S command in your DOS manual.

Installing the Above™ Board PS/AT software on a hard disk

You can run SETUPAT as many times as you wish, but you can have only one version of the Above Board software on a hard disk at a time. So, make this version a combination that works well with all your application programs.

To create a good combination version, select the largest sizes for RAM disks and a print buffer required for the programs you use most. If you need guidelines, run SETUPAT once for each of your application programs and jot down the sizes it recommends. Then select the largest of the RAM disk and print buffer sizes SETUPAT displays and do a final setup of your hard disk using those sizes.

Check the version number of the Above™ Board PS/AT software

You must run the Above Board software whenever you add an Above Board with expanded memory or if you add RAM disks or a print buffer. If your computer contains *more than one Above Board,* make sure you use the diskette with the highest version number. The version number is on the label of the Intel diskette.

Back up the Above™ Board PS/AT software

Before you run SETUPAT, make a copy of the Intel diskette. Always use this copy whenever you run SETUPAT.

First turn on or restart your computer using a DOS system disk. Then, format a new diskette and make a copy of the Above Board diskette. Store the original in a safe place. If you don't know how to format and copy diskettes, look up the FORMAT and COPY commands in your DOS manual.

NOTE ■■■■■■■■■■■■■■

If you receive a DOS error message when you turn on or restart your computer, turn it off, insert the diskette that contains your computer's setup program in drive A, and run the computer's setup program (described in Chapter 6).

Starting SETUPAT

This section describes how to start the SETUPAT program. Follow the steps in order.

1 With your screen displaying the DOS prompt, insert a copy of your Above Board diskette into drive A.

2 Type:

A:SETUPAT

and press Enter. You'll see a title screen and a "welcome" screen followed by the first of three installation menus. Follow SETUPAT's directions and answer the questions. SETUPAT does the rest!

NOTE ■■■■■■■■■■■■■

Before you set up a print buffer with SETUPAT, remove non-Intel print buffer commands from the AUTOEXEC.BAT file.

9 CHOOSING FROM CONVENTIONAL, EXPANDED, AND EXTENDED MEMORY

Each Above Board PS/AT lets you add up to 1.5M bytes of memory to your computer. For maximum flexibility, you can define this memory to be conventional, expanded, extended, or a combination of the three. This chapter explains all three types and helps you decide which types are right for you.

If you don't care how memory works, turn to the end of the chapter for a summary of choosing memory.

Conventional memory

DOS manages conventional memory. Application programs that run under DOS use conventional memory.

Conventional memory is limited to 640K bytes. If your computer already has 640K of conventional memory, you can't add more. But if your computer has 512K, the Above Board lets you add 128K bytes for a full 640K bytes. Because almost all business application programs can use the full 640K bytes, filling out your conventional memory should be the first priority.

If you have more than one Above Board in your computer, only one can supply conventional memory.

Beyond conventional memory

Both expanded and extended memory provide memory beyond 640K. The following sections explain the differences between expanded memory and extended memory.

Expanded memory

Expanded memory provides usable memory beyond DOS's 640K conventional memory limit. DOS application programs which conform to the *Lotus/Intel/Microsoft Expanded Memory Specification* (such as 1-2-3 Release 2, Symphony Release 1.1, Framework II, SuperCalc3 Release 2.1, Ready!, and Javelin) can use expanded memory. If you use DOS application programs, you'll probably want to add expanded memory (rather than extended) to your computer.

Extended memory

Extended memory is memory from 1M byte (1024K bytes) to 16M bytes (16,384K bytes).

Only the XENIX operating system and VDISK can use extended memory. Just as DOS manages conventional memory, XENIX manages extended memory.

You can't use extended memory to run DOS application programs because extended memory is outside the range that DOS manages. For example, you can't store 1-2-3 spreadsheets in extended memory. If you use DOS application programs, you'll want to add expanded memory rather than extended memory.

How does expanded memory work?

This section describes how expanded memory works. You don't need this information to set up and use expanded memory. It's provided for your information. Read this section if you're curious about how expanded memory works; otherwise, you can skip it.

Even 640K bytes of conventional memory is sometimes not enough for large application programs. Expanded memory lets you use large programs by accessing memory beyond 640K—memory that DOS can't reach.

Your computer accesses expanded memory through 64K bytes of memory located between 768K and 896K. This 64K-byte block is called the page frame. Just as your computer screen is a window into a large spreadsheet, so the page frame is a window into expanded memory.

Expanded memory is divided into 16K-byte segments called pages. Each 1.5M of expanded memory provides 96 pages. The page frame can contain up to four pages at one time.

Figure 9-1 shows your computer's conventional, expanded, and extended memory.

OK

Conventional Memory

Usable by All DOS Applications

640K

Reserved by IBM

768K

64K Page Frame

896K

Reserved by IBM

1M Byte

Extended Memory

Usable by XENIX™ and VDISK

16M Bytes

Expanded Memory

Usable by DOS Applications Adhering to the Lotus/Intel/Microsoft Expanded Memory Specification

PC-0145
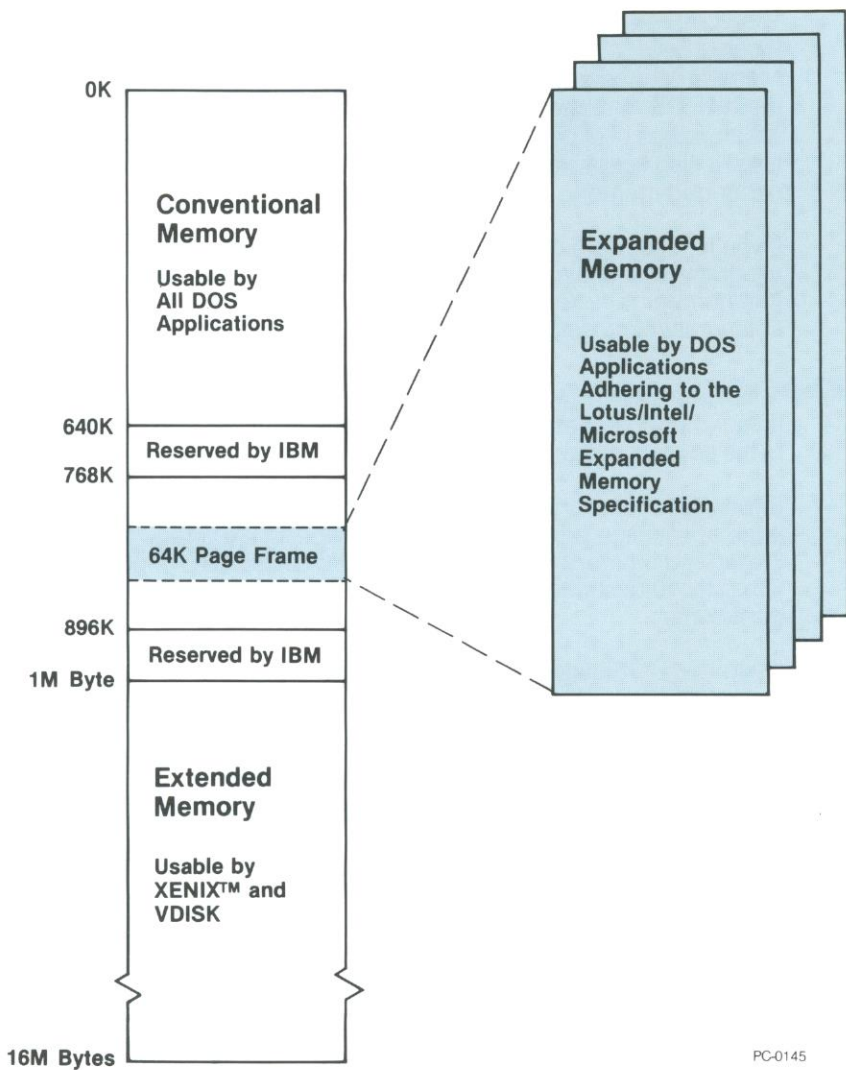
Figure 9-1 *Above™ Board PS/AT expanded memory*

SETUPAT (Intel's setup program) searches the address space between 768K and 896K for an unused 64K-byte segment and automatically sets up a page frame for you.

DOS can't manage expanded memory because the page frame is located beyond 640K. So Intel provides you with the Expanded Memory Manager (EMM). The EMM manages expanded memory just as DOS manages conventional memory. The EMM controls which pages of expanded memory are in the page frame at one time. It also keeps track of which programs own which pages of expanded memory.

If you're a software developer interested in learning how to create programs that use expanded memory, contact Customer Support (the number is in Appendix B) and ask for a copy of the *Lotus/Intel/Microsoft Expanded Memory Specification*.

Choosing memory

If your computer has 512K bytes of conventional memory, add 128K bytes so you have a full 640K bytes of conventional memory.

Expanded memory improves your computer's efficiency if you use large application programs specially written for expanded memory. Expanded memory is also useful for RAM disks and a print buffer. (Chapter 10 describes RAM disks, and Chapter 11 describes the print buffer.)

If you're a DOS user, don't choose extended memory unless you're using VDISK. If you're a XENIX user, extended memory is for you.

Table 9-1 summarizes the uses for conventional, extended, and expanded memory. It shows what memory is useful for the type of software you use and the auxiliary software programs (such as RAM disks) you're using.

Table 9-1 *Choosing memory based on your operating system and auxiliary programs*

Software	Conventional memory	Expanded memory	Extended memory
DOS	X	X	
XENIX	X		X
VDISK RAM disk	X		X
Intel RAM disk	X	X	
Intel print buffer	X	X	
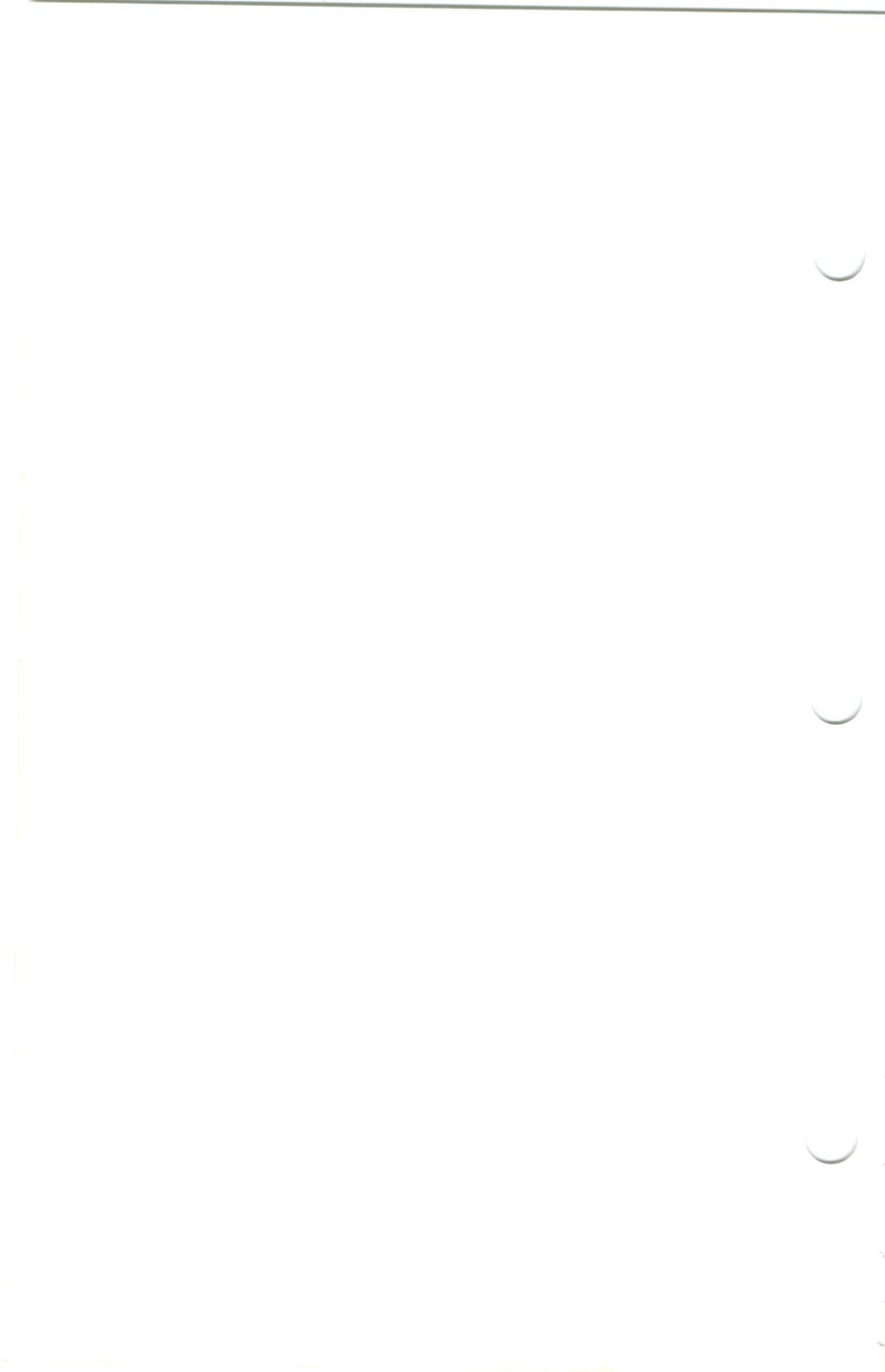
10 *RAM DISKS*

This chapter explains how a RAM disk can help you use your computer more efficiently. To set up a RAM disk, you'll need to run the SETUPAT program, which is described in Chapter 8.

If you're unfamiliar with RAM disks, read this chapter. If you've used RAM disks before, skip it.

What is a RAM disk?

The RAM disk software that comes with the Above Board lets you use some of the computer's random access memory (RAM) as though it were a disk drive. In fact, to your software, the RAM disk appears to be an ordinary drive.

Unlike an ordinary disk drive, a RAM disk has no mechanical parts, so it works much faster—up to 10 times faster than a diskette drive and twice as fast as a hard disk.

Differences between ordinary disks and RAM disks

In a nutshell, here are the differences between ordinary diskettes and RAM disks.

Speed

RAM disks are up to 10 times faster than diskettes and twice as fast as hard disks.

Duration

A RAM disk stores files temporarily. When you store a file on a RAM disk, the file remains there only until you turn off the power or restart your computer (by pressing Ctrl-Alt-Del). If you want to save the file, you must copy it from the RAM disk to a diskette or hard disk.

Size

Although hard disks and diskettes are available only in fixed sizes, a RAM disk can be as large or small as you like.

The size of a RAM disk is limited only by the amount of RAM you're willing to dedicate to it. For RAM disks in conventional memory, practical considerations limit the size to 400K bytes or less. But a RAM disk in expanded memory can be as large as 8M bytes.

When you create your RAM disks, remember that a typical diskette can contain 360K bytes of data. A RAM disk needs the same amount of room for the same amount of data. For example, if you want a RAM disk to hold up to two floppy diskettes' worth of data, make the RAM disk at least 720K bytes.

Format

A RAM disk is formatted automatically—you don't have to format it before putting data on it. In contrast, if you're using a new diskette in an ordinary disk drive, you must invoke the DOS FORMAT command to prepare the diskette before storing data on it.

When is a RAM disk useful?

A RAM disk is especially useful with application programs that frequently read from and write to disk. You can tell how often a program accesses a disk drive by keeping track of how frequently the disk drive's light comes on. (When the light comes on, the computer is reading from or writing to the disk.)

If a disk drive is often busy while a particular program is running, a RAM disk can speed up the program. The next few sections describe situations in which you may want to take advantage of a RAM disk.

Storing an application program on a RAM disk

Many application programs work faster if you store them on a RAM disk.

How can you tell whether your program will run faster from a RAM disk? Look for both these characteristics: (1) The program requires the program diskette to be in a drive (or on a hard disk) the *entire* time the program is running, and (2) the drive containing the program is often busy. If your program has *both* these characteristics, try running it from a RAM disk.

Microsoft Word, for example, runs faster if you store it on a RAM disk. Without a RAM disk, the Word program diskette is normally kept in drive A. Word often accesses drive A to read parts of the word processor into memory or to store information in temporary files.

If you copy Word to a RAM disk before running it, you can eliminate these disk accesses. As a result, Word runs faster, and you can keep a data-storage diskette (instead of the program diskette) in drive A.

Microsoft Word's manual gives specific instructions for using Word with a RAM disk. Some other application programs' manuals also contain this information.

The following popular programs, along with many others, run faster when the program is on a RAM disk:

dBase II
DisplayWrite 2
MultiMate
Volkswriter Deluxe
Word
WordStar

Storing data on a RAM disk

Some programs run faster when you store the data, rather than the program, on a RAM disk. To identify such programs, look for both these characteristics: (1) The program requires that a data disk be kept in one of the drives the *entire* time the program is running, and (2) the drive containing the data disk is often busy. If your program has *both* these characteristics, try storing its data on a RAM disk.

The following popular programs, along with many others, will run faster when their data is stored on a RAM disk:

dBase II
dBase III
pfs:file
WordStar

NOTE ▮▮▮▮▮▮▮▮▮▮▮▮▮

Before you store data files on a RAM disk, realize that the files will be destroyed if a power failure occurs or when you turn off your computer. Unless you have a battery-backup power supply, you should frequently copy your data files from the RAM disk to an ordinary disk.

Creating one RAM disk for programs and one for data

If your application accesses two disk drives heavily, you may want to set up two RAM disks—one for the application program and one for data files.

Storing several frequently used application programs on a RAM disk

Because the Above Board software lets you create huge RAM disks in expanded memory, a RAM disk is an ideal place to store application programs you run frequently.

For example, if you work with both dBase II and DisplayWrite 2, you may want to copy them to large RAM disks in expanded memory when you first turn on your computer. With both programs on RAM disks, you can switch from one to the other rapidly, without changing diskettes.

When is a RAM disk not useful?

In some situations a RAM disk doesn't help. Here are two examples.

Programs that seldom access the disk

A RAM disk can't speed up a program that seldom reads from or writes to disk. For instance, both the program and data files for 1-2-3 reside in RAM, so the program rarely accesses a disk. A RAM disk won't speed up 1-2-3.

Some copy-protected programs

Some copy-protected programs check the diskette to make sure it's the original program diskette. Most of these programs can't be run from a RAM disk.

Not all copy-protected programs work this way. For example, Microsoft Word is copy-protected but will work if you copy it to a RAM disk. If you're unsure about the program you're using, check your program's manual or call the manufacturer.

How many RAM disks can be created?

The SETUPAT program (described in Chapter 8) lets you create up to two RAM disks. If you need more, *Shortcuts to Installing the Above™ Board PS/AT,* (included with your Above Board) explains how to create more.

Can Intel's RAM disks be used with VDISK RAM disks?

Intel's RAM disks work just fine with VDISK RAM disks. VDISK RAM disks run out of *extended* or conventional memory whereas Intel's RAM disks run out of *expanded* or conventional memory. Refer to Chapter 9 for a definition of extended and expanded memory.

You may want to consider using Intel RAM disks rather than VDISK RAM disks because the Intel RAM disks are faster—up to 20% faster, depending upon the operation your computer is performing.

Assigning a drive letter to a RAM disk

RAM disks are created when you start or restart the computer from a disk prepared by the SETUPAT program. During the creation process, DOS finds out how many drives your computer has and automatically assigns the next available letter to your RAM disk.

Here are two examples. In a computer with two diskette drives (A and B) and no hard disk, the first RAM disk is drive C. In a computer with one hard disk (drive C), the first two RAM disks are drives D and E.

The next two paragraphs are a bit technical but you'll want to read them if you're using a device driver, such as a Local Area Network (LAN) or a Bernoulli Box, that adds disk drives to your system.

If you're using a device driver that provides additional "disk drives" to your computer, the Intel RAM disks will be assigned the next available letters after these drives. For example, if your computer has one hard disk (C), and two LAN drives (D and E), the Intel drives would be drives F and G.

The position of the DEVICE = QUIKMEM commands in the system disk's CONFIG.SYS file determines the drive letters that are assigned to each RAM disk. SETUPAT inserts the DEVICE = QUIKMEM commands at the end of the CONFIG.SYS file. If you put the DEVICE = QUIKMEM commands before the LAN (or other device driver) commands, the RAM disks will be assigned drive letters preceding those assigned to the other devices. The pamphlet titled *Shortcuts to Installing the Above™ Board PS/AT* describes the QUIKMEM commands.

Copying files to a RAM disk

A RAM disk can't save you time unless it contains files. If the RAM disk is large enough, you can copy data or almost any application program to it. You can copy files to a RAM disk in one of two ways.

Typing COPY commands

Explicitly copy each file to the RAM disk. This involves typing the DOS COPY command before you invoke the application program. For instance, to copy a file called SAMPLE.DOC from drive A to a RAM disk called drive D, use this command:

COPY A:SAMPLE.DOC D:

Typing COPY commands works well for data files because you may not know what data file you need until just before you start working.

Putting COPY commands in a batch file

Putting the DOS COPY commands in a batch file saves time because you don't need to type all the commands each time you run the program. The batch file automatically copies the files to your RAM disk whenever you run the batch file.

Refer to the DOS manual for more information about batch files.

Batch files work well for running programs from a RAM disk. Generally, you know what files the program needs in order to run, so you can create a batch file to copy them.

For example, suppose you want to run Microsoft Word from a RAM disk. If your RAM disk is drive D, your batch file should contain these commands to copy Word from your default drive to drive D:

```
COPY MW.PGM D:              Copy Word files to drive D.
COPY MW.INI D:
COPY MW.HLP D:
COPY WORD.COM D:
D:                          Make drive D the default.
WORD                        Start Word running.
```

If your batch file is named RUNWORD.BAT, you can invoke Word by typing

RUNWORD

and pressing Enter. The batch file copies the necessary files to drive D and starts Word.

By the way, Word is copy-protected. Even if you run it from a RAM disk, Word requires that you keep the program disk in drive A until Word starts running. Then you can remove the program disk from drive A.

11 THE PRINT BUFFER

This chapter explains how the print buffer works and how you can use it to control printing. To set up a print buffer, you'll need to run the SETUPAT program, which is described in Chapter 8.

What is a print buffer?

The print buffer is Above Board software that lets you print a document without tying up your computer. While your printer is printing, you can continue working—and making effective use of your time.

When is a print buffer useful?

When you're working at your computer, it can be annoying to send a document to the printer, then wait for the printer to finish so you can go back to what you were doing. Although some programs are capable of sending documents at high speed, most printers receive data slowly.

A print buffer solves this problem by turning some of your computer's memory into a data reservoir. Data pours in from the application program to memory, remains in memory until the printer is ready, then flows to the printer.

Your program works faster when it sends data to memory because the memory, unlike the printer, can accept data rapidly. With a print buffer, your computer is free for other chores as soon as your program finishes sending a document to the print buffer.

While you go on working, the data is temporarily stored in memory, until the printer is ready for it. The print buffer sends the data to the printer automatically, even though you're doing other work with the computer.

CAUTION ■■■■■■■

If you turn off or restart your computer before your document is printed, you'll lose any portion remaining in the print buffer.

Although using a print buffer is usually a good idea, it involves one tradeoff: The memory set aside for the print buffer can't be used for other purposes.

To make the most of your computer, you need to decide:

- How much memory you want to devote to the print buffer. (As a rule of thumb, allow 4K bytes of memory for each page of text and 256K bytes for each page of graphics.)

- Whether a print buffer will work to your advantage. (Refer to the next section.)

Should you use a print buffer?

In some situations, a print buffer won't make your computer available for other work more quickly.

Programs that already have a print buffer

If a program has a built-in print buffer, adding a second print buffer won't free up your computer any faster. Framework and DisplayWrite 2 are examples of programs that provide their own print buffers.

Printers with large built-in buffers

If your printer has a built-in buffer large enough to hold your documents, the Above Board print buffer won't help free up your computer any sooner. For example, the Hewlett-Packard LaserJet has a very large print buffer. Unless you're printing graphics or long documents, you'll see little benefit from adding another buffer.

Computers with limited memory

If you routinely send big documents to the printer, you should set aside a proportionately large print buffer. Otherwise, you'll see some delay when your print buffer becomes full.

A print buffer of 16K bytes, for example, can hold only about four pages of text. With a buffer this size, the first half of an eight-page document would fill the print buffer. Then you and your screen would be tied up, just as though you had no print buffer, while you waited for the print buffer to accept the second half.

Computers attached to a local area network (LAN)

At times, LAN software actually slows down the print buffer. At other times, the two pieces of software may interfere with each other and with the operation of your computer's diskette drive(s). In any case, you run the risk of losing data if you use the print buffer with a LAN.

Controlling the printer

If you use the print buffer software, you control the printer's activities through the print buffer command menu shown in Figure 11-1.

You can't use the DOS PRINT command with the Above Board print buffer. If you want to send a file to the printer from DOS, use the COPY *filename* PRN command.

```
Press the number of the option desired, and then press the Enter key.
1-Cancel 2-PrintScreen 3-Pause 4-Resume 5-FormFeed 6-Reset Printer 7-Exit
```
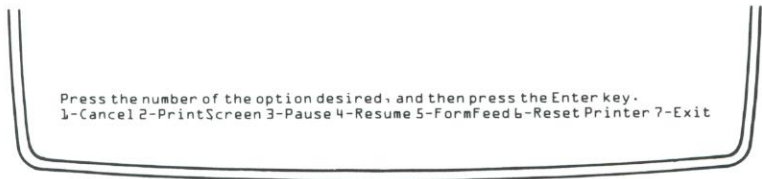
PC-0146

Figure 11-1 *Print buffer command menu*

Calling up the command menu

After the print buffer is installed, you can call up the print buffer command menu by pressing the Shift-PrtSc key combination. The menu will appear on the bottom two lines of your screen.

Any program that disables the Shift-PrtSc key combination will keep you from accessing the print buffer command menu. The print buffer still works, but you won't be able to use the commands in the menu to control the printer.

Compatible display adapters

Intel has verified that the following three types of display adapters work with the print buffer command menu:

- IBM Monochrome Display Adapter.

- Standard IBM Color/Graphics Adapter. (This includes compatible products from other manufacturers, such as the Zenith, AT&T, and COMPAQ Color Graphics Adapters.)

- Hercules Monochrome Graphics Adapter.

NOTE ■■■■■■■■■■■■■■

The print buffer will work with other adapters, but the print buffer command menu may not function as described unless those boards are 100%-compatible with one of the three listed here.

If you have an adapter that's not compatible with one of those listed, you can prevent the print buffer command menu from appearing. When you set up your print buffer by running the SETUPAT program, you'll be asked to identify your display adapter. One option you'll be offered is "other." Choosing this option prevents the menu from appearing, allowing your Shift-PrtSc key to operate as it always has.

NOTE ■■■■■■■■■■■■■■

Select "other" if you're using an Enhanced Graphics Adapter.

CAUTION ■■■■■■■

If you use the print buffer command menu with a non-standard display adapter board (one not on the list of verified display adapters) or if you choose the wrong type of adapter from the SETUPAT's menu, your monitor could be damaged.

Using print buffer commands

Once you've set up a print buffer, your program will send documents to the printer automatically. Most of the time, that's exactly what you'll want it to do.

But occasionally, after sending a document to the printer, you may change your mind. You may want to cancel the document that's printing or stop to put a fresh ribbon on the printer.

To make this easy, the print buffer comes with a set of commands similar to the function buttons on a printer. You can use these commands at any point in your work. Just press the Shift-PrtSc key combination, and the menu in Figure 11-1 will appear in the bottom two lines of your screen.

With the exception of PrintScreen, these commands affect only the buffered printer. (If your computer is attached to more than one printer, refer to the section "Assigning the print buffer to a printer" to find out which printer is buffered.)

When the command menu appears, it suspends the flow of data from your application program to the print buffer and gives you a way to act on the data residing in the buffer. However, any data already in the print buffer continues to flow to the printer.

To select a command, type the number of the command listed in the menu, then press the Enter key. Once a command is completed, you can either choose another command or exit the menu (by choosing option 7).

The menu offers these seven commands:

1 **Cancel**—erases the entire contents of the print buffer. Cancel removes only what's in your computer's print buffer. Data that has already passed from the buffer to the printer (or to the printer's built-in buffer) is printed. Data waiting to be passed from the application program to the print buffer will be sent as soon as you exit the command menu.

HINT ▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐

Cancel *does not stop the entire print job. It erases only data already in your print buffer. To cancel a print job, first tell the application program to stop printing. Then use the* Cancel *option from the print buffer's command menu.*

2 **PrintScreen**—prints whatever was displayed on your screen before you called up the menu. (PrintScreen never prints the menu.) PrintScreen prints the screen, just as the Shift-PrtSc key combination did before you installed the print buffer. PrintScreen also starts your printer if you used Pause to stop it.

If the print buffer is associated with a printer other than LPT1, PrintScreen bypasses the print buffer and sends the screen contents to LPT1. (For details, refer to the section "Assigning the print buffer to a printer.")

HINT ▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐▐

If LPT1 is the buffered printer, and an application program is sending a document to the buffer, PrintScreen *will interrupt it and place the screen contents in the midst of the document. If you want the screen contents on a separate page, either wait until the application finishes sending the document to the buffer, or use the* FormFeed *command before and after you use* PrintScreen.

3 **Pause**—temporarily stops the print buffer from sending data to the printer. To continue printing, use Exit or Resume. PrintScreen and FormFeed also cause printing to continue.

HINT ||||||||||||||||||||||||||

Pause *offers an easy way to eliminate printer noise (when you're on the phone, for example). It's also a handy way to stop the printer so you can change ribbons or take care of paper jams.*

4 **Resume**—continues printing the document exactly where it left off when you used Pause. Resume has no effect unless you've already used Pause.

5 **FormFeed**—tells the printer to put the next line at the top of a new page. It also starts your printer again if you used Pause to stop it.

If the print buffer is empty, the Form Feed occurs immediately. If the buffer contains data, the Form Feed occurs after the data in the buffer is printed.

HINT ||||||||||||||||||||||||||||

FormFeed *is a handy way to separate documents. To avoid putting blank space in the midst of your document, make sure the application program has finished sending a document to the print buffer before you issue the* FormFeed *command.*

6 **ResetPrinter**—empties the Above Board print buffer.

For parallel printers, ResetPrinter does the equivalent of turning your printer off and immediately back on. It returns your parallel printer to its original state. It clears all special settings (such as boldface, different character pitch, or unusual character sets), empties the printer's built-in buffer, and the Above Board's print buffer, and resets the top-of-form.

You can't reset a serial printer with software. For serial printers, ResetPrinter empties the Above Board print buffer, leaves the printer alone, and displays an error message.

HINT ||||||||||||||||||||||||||

If a control character causes your parallel printer to print strange characters, run off the end of the page, or stall, ResetPrinter *will take it back to normal. Just remember to check the top-of-form and other settings before you resume printing.*

7 **Exit**—returns you to the program you were using when you pressed the Shift-PrtSc keys. It also removes the print buffer command menu from your screen. Using Exit after Pause will causes printing to resume.

Handling messages

When a print buffer command fails to execute properly, the print buffer command menu changes to display a message. When a message appears, check Appendix C to find the cause of the problem. Then press any key to return to the print buffer command menu. Once back at the menu, you can reissue the command that failed, or you can exit the menu by choosing option 7.

Assigning the print buffer to a printer

The print buffer is always devoted to one printer.

For a serial printer, you explicitly assign the buffer to a printer when you run the SETUPAT program (refer to Chapter 8).

For a parallel printer, you implicitly assign the buffer to the printer. Each time you start your computer or restart it (by pressing Ctrl-Alt-Del), the first thing you print on a parallel printer determines the assignment. The print buffer is assigned to the first parallel printer you use. (For example, sending your first document to LPT3 assigns the buffer to LPT3.) However, if you issue one of these three print buffer commands *before* printing a document, the print buffer is assigned to LPT1:

2	**PrintScreen**
5	**FormFeed**
6	**ResetPrinter**

Only the documents sent to the buffer's assigned printer go through the print buffer. Any documents sent to another printer go to that printer directly without using the print buffer. To reassign the print buffer for parallel printers, restart your computer by pressing Ctrl-Alt-Del.

If you've decided to set up a print buffer, you'll need to run the SETUPAT program. (Refer to Chapter 8 for details.) It's easy to do, and your efforts will be paid back in the increased use of your computer.

Buffering serial printers

If you intend to buffer a serial printer, use the DOS MODE command to set up your serial port before you print anything. Refer to Chapter 13 for more information.
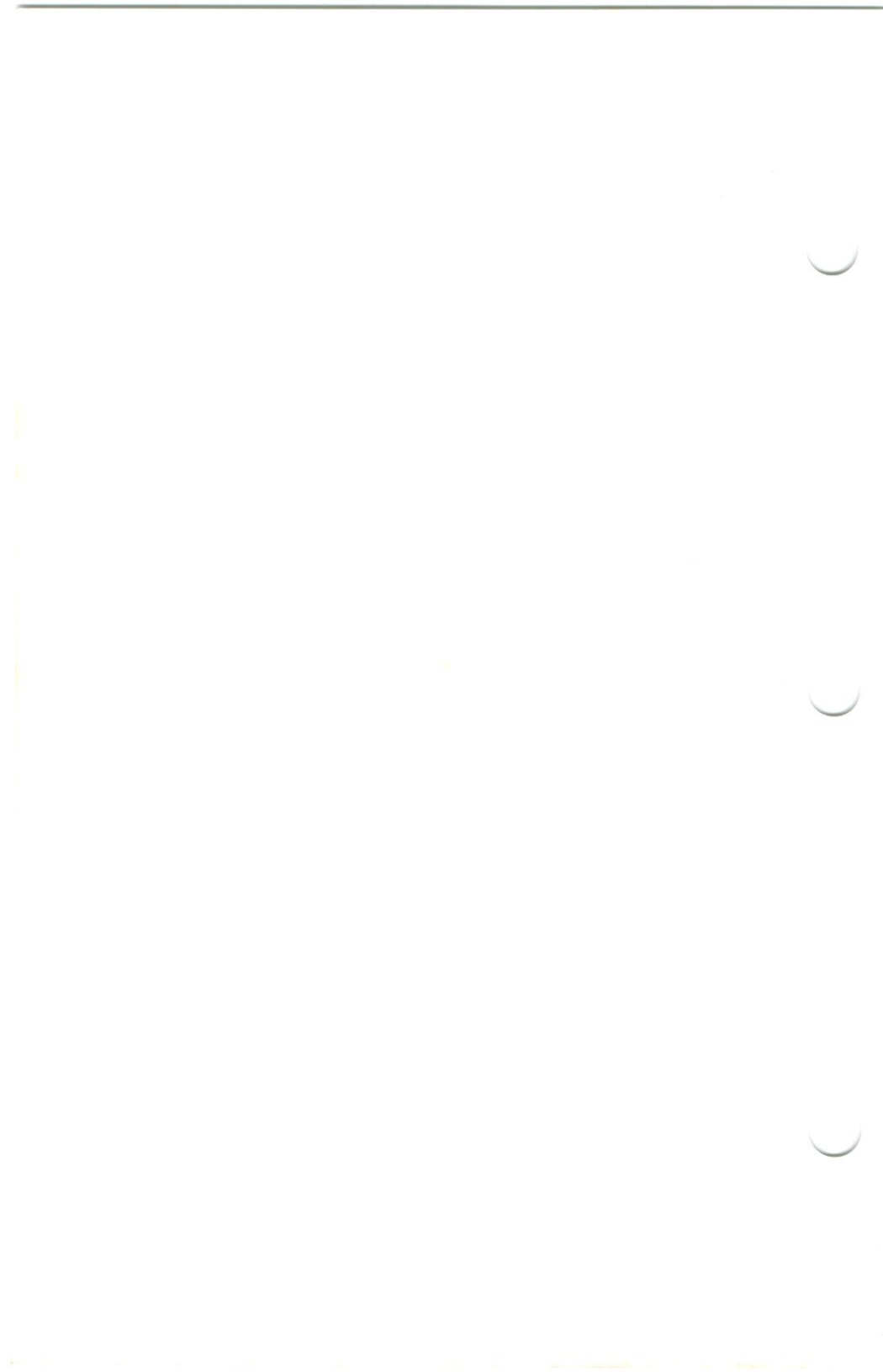
12 *PARALLEL PORTS*

This chapter explains the capabilities of a parallel port. If you're already familiar with parallel ports on your computer, don't read this chapter.

What is a parallel port?

A parallel port is a connector to which you can attach an IBM-compatible parallel printer or other parallel device. Figure 12-1 shows the parallel port provided by the Above Board PS/AT.
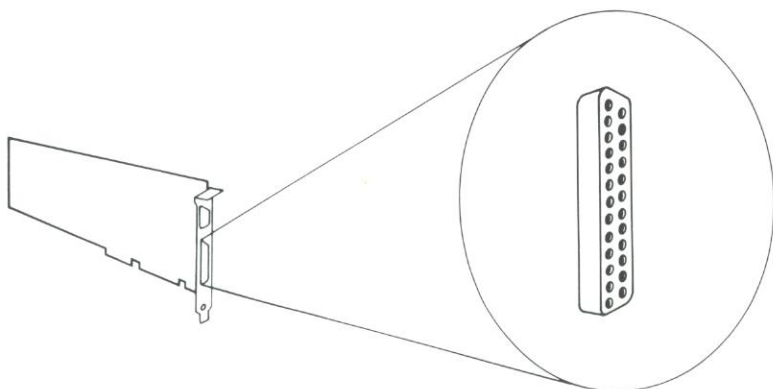
PC-0162

Figure 12-1 Above™ Board's PS/AT parallel port

Is your printer parallel?

Before you connect a printer to the parallel port, make sure that the printer is parallel. Check the printer's manual if you aren't sure. If the printer is serial, turn to Chapter 13.

Examples of parallel printers include the IBM Graphics Printer, Epson FX-80, and most other dot-matrix printers. Many letter-quality printers are also parallel—the NEC 3550 Spinwriter, for example.

Buying a cable

If you don't already have a cable, ask for the standard IBM Parallel Printer Cable or another manufacturer's equivalent. Your dealer can tell you which cables work.

Connecting the printer

Once the Above Board is in the computer, attach the cable's 25-pin male connector to the parallel port. The larger of the Above Board's two connectors is the parallel port.

Figure 12-2 shows how to plug the two connectors together. They're D- shaped, so you can't attach them incorrectly.
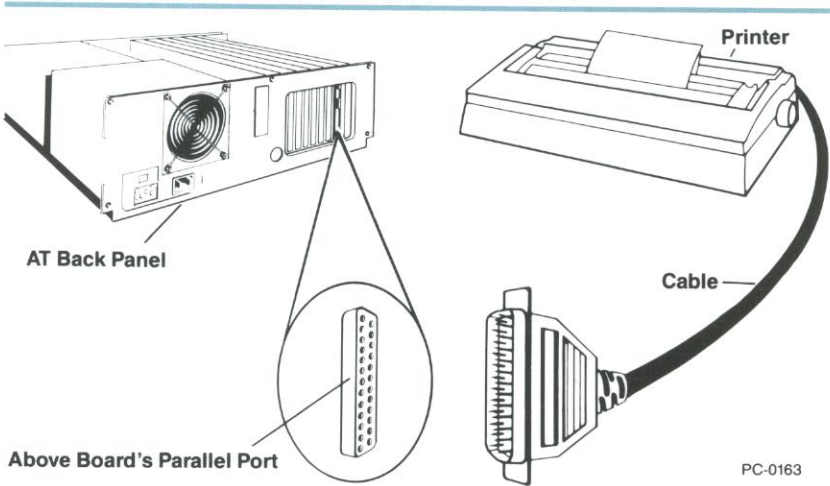
Figure 12-2 *Attaching a printer to a parallel port*

Be sure to secure the cable to the parallel port with its attached screws. If you don't, bumping the cable could loosen the connection, causing your printer to suddenly stop working properly.

Naming or disabling the parallel port

DOS lets you connect up to three parallel printers to the computer at one time. To distinguish among these printers, you must name the ports to which they're connected.

DOS reserves three names (LPT1, LPT2, and LPT3) for parallel ports. Before installing the Above Board, you must set switches to choose the name of the Above Board's parallel port.

If you're adding the computer's first parallel port, name it LPT1. Name the second LPT2. Name the third LPT3.

NOTE ■■■■■■■■■■■■■

If your computer contains an IBM Monochrome Display Adapter or another manufacturer's equivalent, DOS names the display adapter's parallel port LPT1. You can then add up to two more parallel ports (LPT2 and LPT3).

In contrast, if your computer contains no IBM Monochrome Display Adapter (or equivalent), DOS limits you to two parallel ports (LPT1 and LPT2).

If your computer can't contain any additional parallel ports because of this DOS limit, set the switches to disable (shut off) the Above Board's parallel port. This will let you install the Above Board without exceeding DOS's limit. The switches are discussed in Chapter 4.

Using your printer

Once the Above Board is installed and the printer is connected, you can print information in several ways. Here are two examples.

Printing from an application program

Most application programs can send information to your printer. Before you tell your program to start printing, be sure to identify the printer (LPT1, LPT2, or LPT3). If you don't tell the program which printer to use, most programs assume LPT1.

Printing an ASCII file

To print the contents of an ASCII file, use the DOS COPY command. For example:

COPY A:LETTER.TXT LPT1:

prints the contents of a file called LETTER.TXT to the printer attached to LPT1.
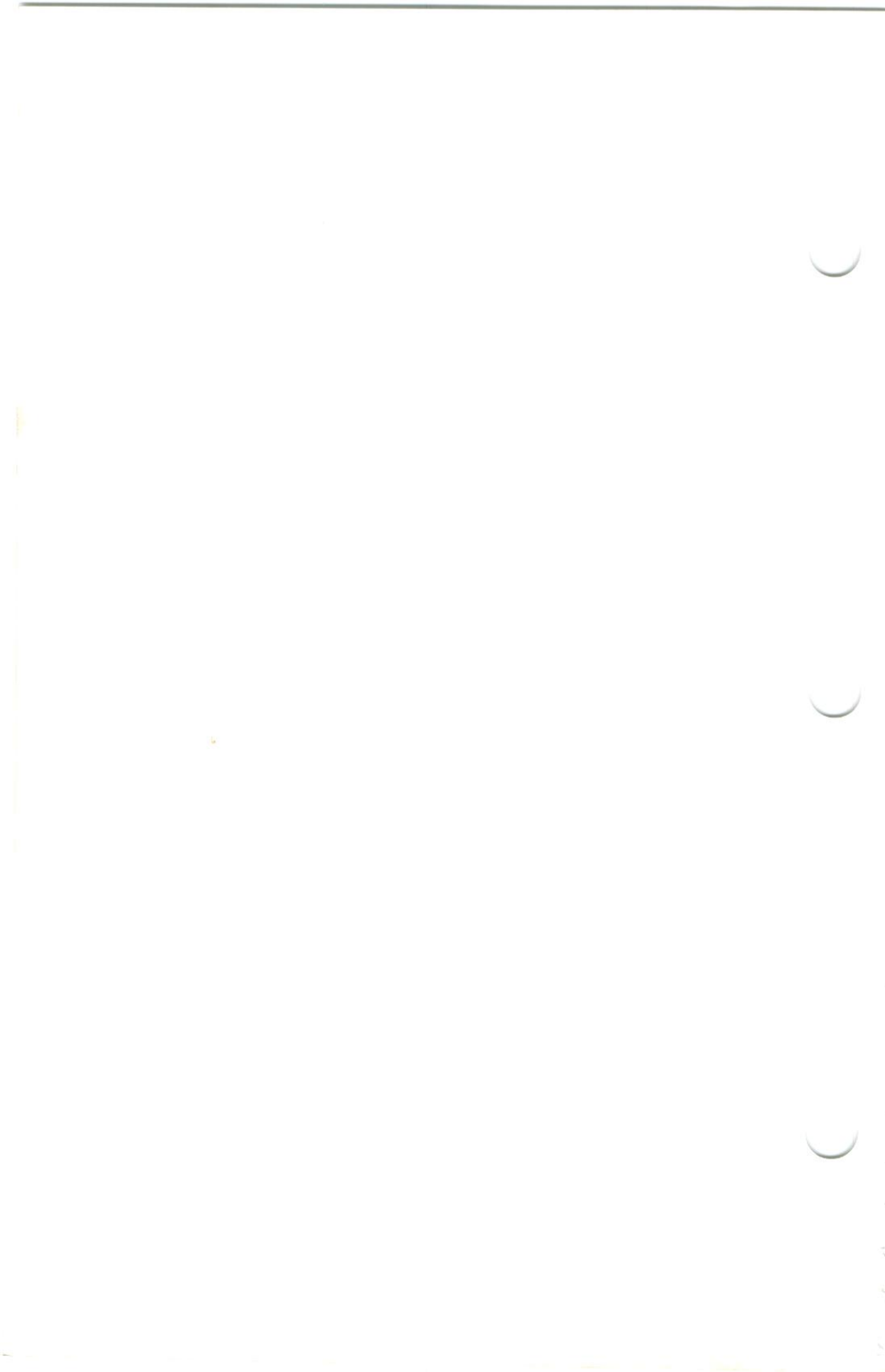
13 *SERIAL PORTS*

This chapter explains the capabilities of the Above Board's serial port. If you're familiar with serial ports on your computer, don't read this chapter.

NOTE ███████████████

The Above Boards' serial port connector is the new 9-pin style rather than the old 25-pin style. If your serial device has a 25-pin cable, your dealer can sell you an adapter that converts it from 25 pins to 9.

What is a serial port?

A serial port is a connector that lets your computer communicate with serial printers, other computers (across phone lines), and serial devices such as plotters, mice, and custom laboratory equipment. Figure 13-1 shows the serial port provided by the Above Board PS/AT.
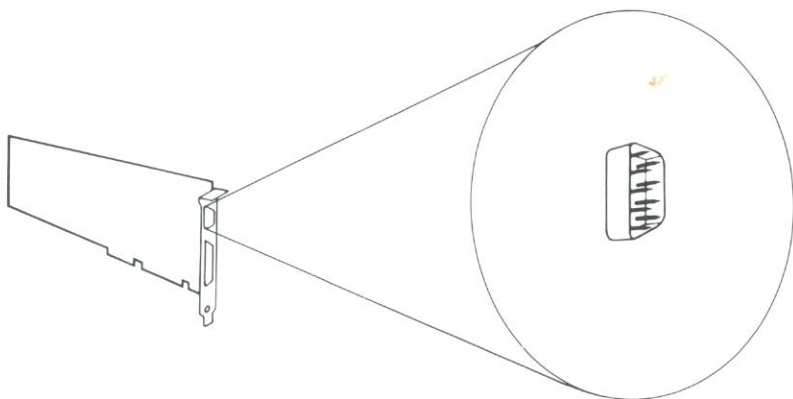
PC-0164

Figure 13-1 *Above™ Board's PS/AT serial port*

Naming or disabling your serial port

DOS lets you put up to two serial ports in your computer. To distinguish between them, you must name them.

DOS reserves two names (COM1 and COM2) for the serial ports. Before installing the Above Board, you must set switches to choose the name of the serial port. (Switch settings are described in Chapter 4.) If you're adding your computer's first serial port, name it COM1. If you're adding the second, name it COM2.

If your computer already has two serial ports before you install this Above Board, set the switches to disable (shut off) the Above Board's serial port. This lets you use the Above Board without violating DOS's limit of two serial ports.

Using a serial printer

Before you connect a printer to a serial port, make sure that the printer is indeed serial. If you're not sure, refer to your printer's manual. If the printer is parallel, turn to Chapter 12.

This section explains how to use a serial printer with the Above Board print buffer.

CAUTION ■■■■■■■

Be sure to run SETUPAT (described in Chapter 8) before you follow these instructions.

Letting your application program set up the serial port

Some applications (most often, word processors) can automatically set up the serial port to match the needs of your printer. (Refer to your application program's manual to see if the serial port is set up automatically.) If you use the serial printer only with these programs, don't set up the port yourself. Otherwise, read the next section.

Setting up the serial port yourself

If your programs don't automatically set up the serial port, you'll need to do it yourself.

Before you set up the port, do a little research. DOS needs to know the protocol parameters for your device. The protocol parameters are:

- port name (COM1 or COM2)

- baud rate (110, 150, 300, 600, 1200, 2400, 4800, or 9600)

- parity (even, odd, or none)

- databits (7 or 8)

- stopbits (1 or 2)

You can generally find the values for these parameters in the manual that came with your device.

Example

This example shows how to set up COM1 for a Hewlett-Packard LaserJet printer.

Use the DOS MODE command to set the printer's protocol parameters. For the Hewlett-Packard LaserJet, the command looks like this:

MODE COM1:9600,N,8,1,P

"COM1" tells DOS which of the two serial ports you're setting up. The LaserJet communicates at 9600 baud, with no parity, 8 databits, and 1 stopbit.

The P tells DOS that you're connecting a printer or plotter to the serial port. (If you're connecting a modem, drop the last comma and the P.)

See your DOS manual for a complete description of the MODE command.

HINT ||||||||||||||||||||||||||||

If you set up the serial port yourself, consider adding the MODE command to your AUTOEXEC.BAT file. If you add it, DOS will automatically set up the serial port whenever you turn on or restart the computer using the disk containing the AUTOEXEC.BAT file. To add the command to the AUTOEXEC.BAT file, use DOS's EDLIN or any other editor that can modify ASCII files.

CAUTION ■■■■■■■

If you're setting up the port for a serial printer, and you plan to use the Above Board print buffer, the order of events is important. First run SETUPAT (Intel's setup program) to prepare your system disk. Then add the MODE command to the AUTOEXEC.BAT file. Put the MODE command ahead of the QUIKBUF command (the print buffer command installed by SETUPAT).

Fooling some application programs

A few application programs cannot send information directly to COM1 or COM2. Here's how to get around such application programs.

You can fool the application into thinking it's communicating with a parallel printer. Use the DOS MODE command to redirect the parallel port to a serial port. For example, MODE LPT1: = COM2 redirects the parallel port LPT1 to the serial port COM2. Then instruct the application to send information to LPT1. The application will send information to LPT1, and DOS will then route the information to COM2 and your serial device.

Redirection requires a second MODE command. Use it in conjunction with (not instead of) the MODE command that sets up the serial port. Be sure that both MODE commands come before the QUIKBUF command.

CAUTION ■■■■■■■

Redirection slows down your serial device (and your print buffer, if you have one). So use redirection only when your application requires it.

Communicating with other computers

If you plan to send data over phone lines to other computers, you'll need a modem. A modem translates data from the computer into a form that can be transmitted over phone lines. It also translates data from phone lines back into the form needed by computers.

Although some modems are boards that can be put inside your computer, others are designed to work outside the computer. These external modems can be attached to the Above Board's serial port.

To find out how to attach a modem to the serial port, refer to the modem's manual. It should also discuss the software required to use the modem.

A SWITCHES AT A GLANCE

Figure A-1 shows the location of the switch blocks on the Above Board PS/AT. Figure A-2 summarizes the Above Board switch settings.

Read Chapter 4 for step-by-step instructions that explain setting these switches.

CAUTION ■■■■■■■

Use a ballpoint pen to change the switch. Don't use a pencil, because the graphite in the lead could short-circuit the switch.

PC-0158
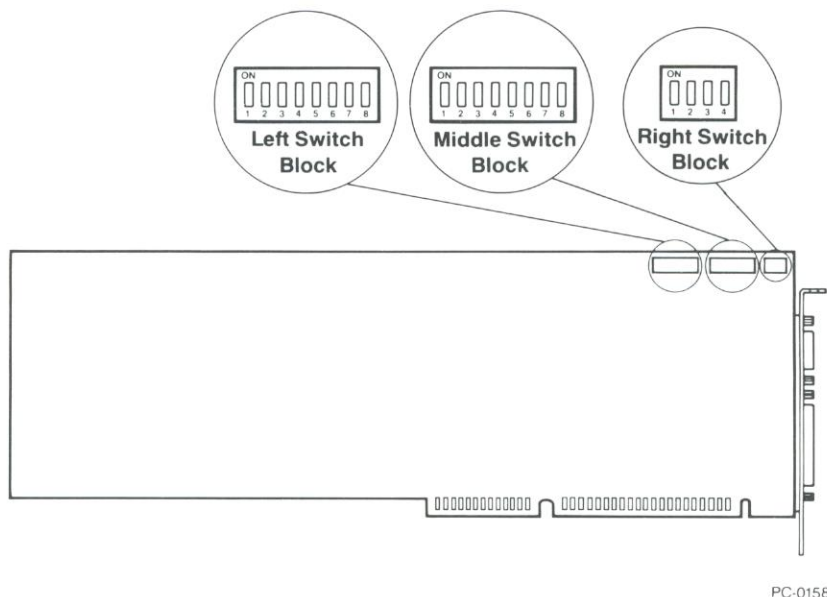
Figure A-1 *Location of Above™ Board PS/AT switch blocks*
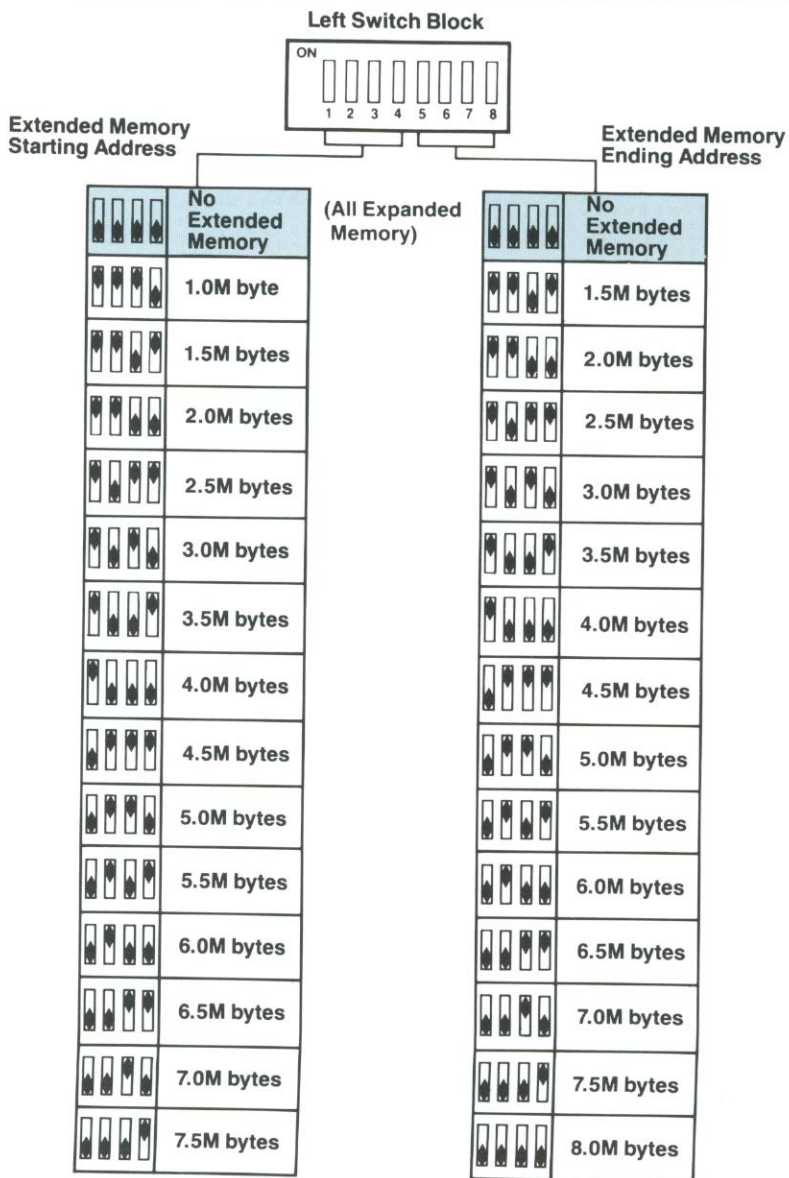
Figure A-2 Settings for the Above™ Board PS/AT switch blocks

Middle Switch Block

Memory Chips

	256K-bit Chips
	64K-bit Chips

Add Conventional Memory From 512K to 640K

	Yes
	No

Makes No Difference

Expanded Memory I/O Address

	208-20Fh
	218-21Fh
	258-25Fh
	268-26Fh
	2A8-2AFh
	2B8-2BFh
	2E8-2EFh
	No Expanded Memory

Right Switch Block

Parallel Port

	LPT1[a]
	LPT2[b]
	Shut Off Parallel Port

Serial Port

	COM1
	COM2
	Shut Off Serial Port
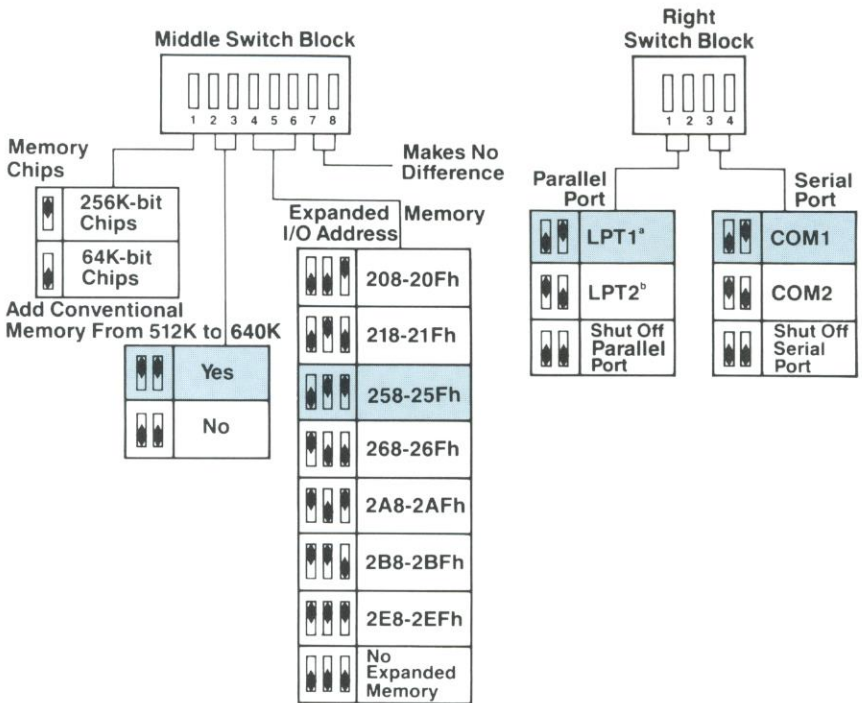
[a] If your computer contains an IBM Monochrome Display Adapter or equivalent board, LPT1 is located on the display board. DOS refers to the Above Board's port as LPT2.

[b] If your computer contains an IBM Monochrome Display Adapter or equivalent board, LPT1 is located on the display board. DOS refers to the Above Board's port as LPT3.
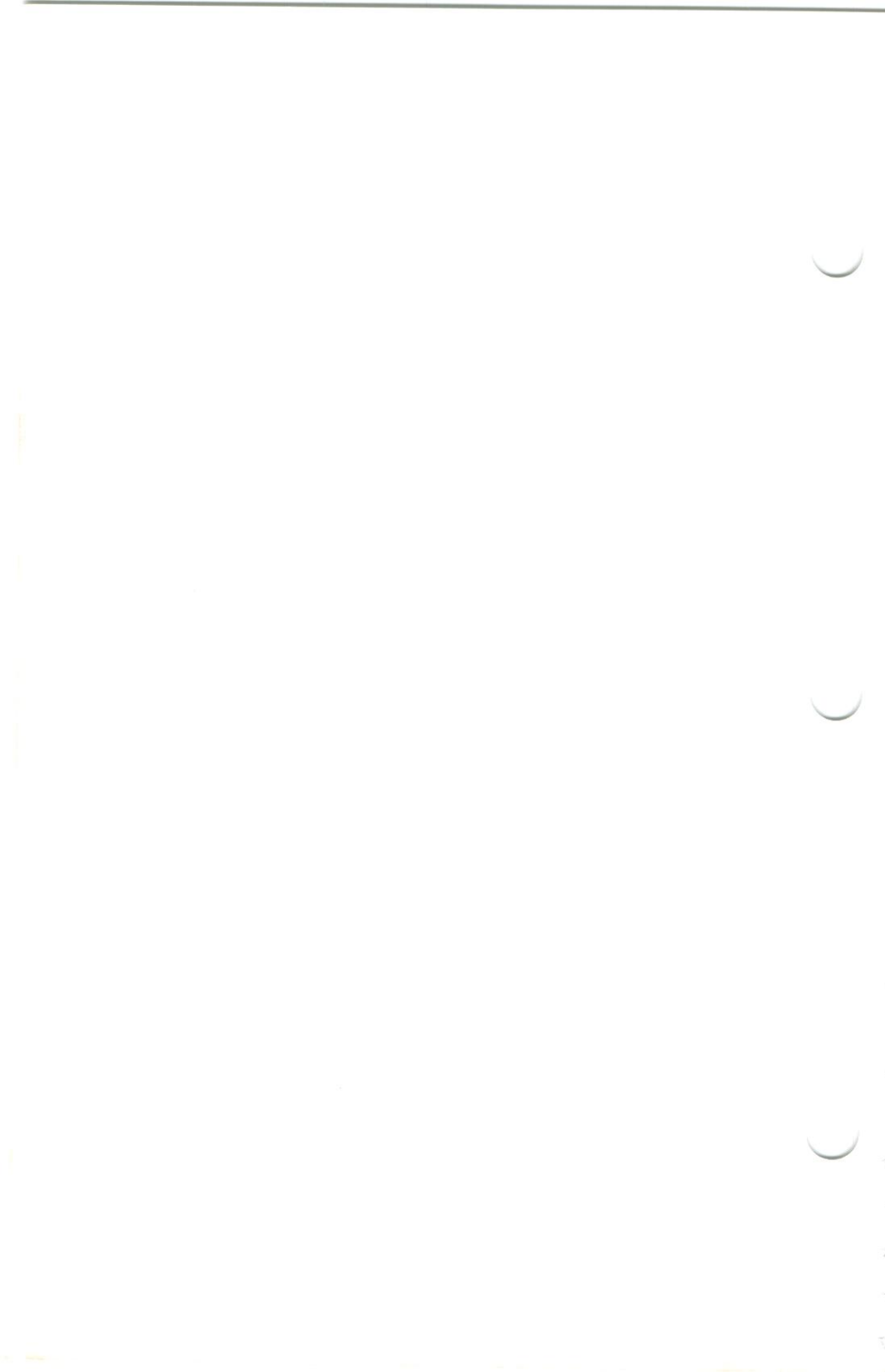
B CUSTOMER SUPPORT INFORMATION

After reading this manual, you may have opinions or questions about the Above Board PS/AT. If so, please contact us at one of our Customer Support numbers.

- If you live in the continental United States but outside Oregon, call (800) 538-3373.

- If you live in Oregon, Alaska, Hawaii, or outside the United States (except Canada), call (503) 629-7354.

- If you live in Canada, call (800) 235-0444.

  Customer Support representatives are ready to answer your call Monday through Friday, from 7 a.m. to 5 p.m. Pacific time.

  If your computer has a modem and you subscribe to CompuServe or The Source, you can reach Customer Support through:

- CompuServe mailbox 70307,461

- The Source mailbox BCG630
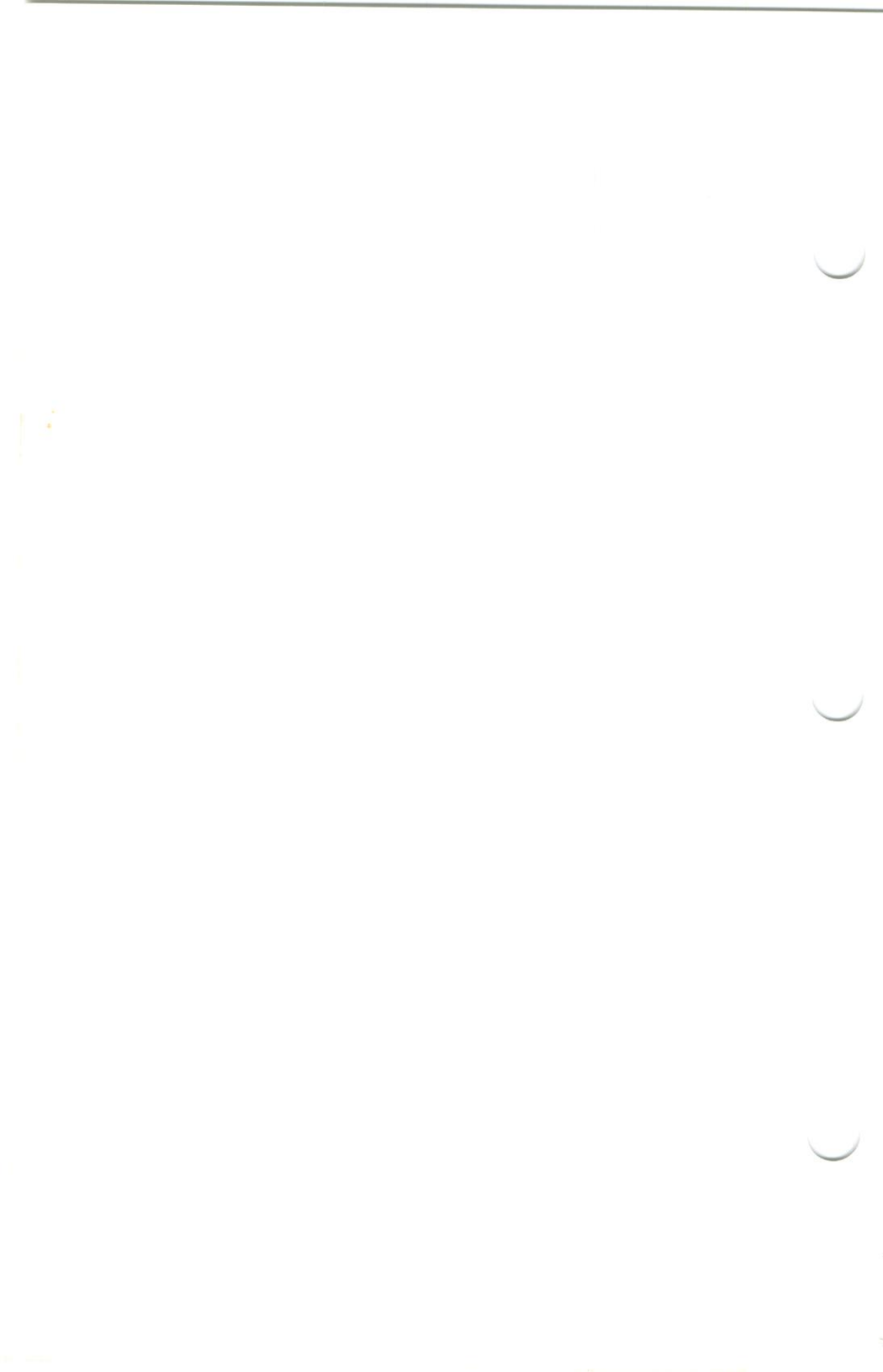
C MESSAGES

As you use your Above Board software, numbered messages may appear on your screen. They tell you the status of your computer and indicate problems you'll need to address.

This appendix lists all the messages in numerical order. Each entry explains why the message appeared and describes how you should respond.

Sometimes, when several messages appear at the same time, they'll scroll up your screen. To make finding them in this appendix easier, jot down the message numbers as they're displayed.

If you have trouble correcting a problem, contact your dealer or contact Intel's Customer Support. Appendix B explains how to reach Customer Support.

Above™ Board Msg 1

Your CONFIG.SYS file contains more than one DEVICE = EMM.SYS command. The first one is used. The others are ignored.

Cause: You have more than one DEVICE = EMM.SYS command in your CONFIG.SYS file. Only the first DEVICE = EMM.SYS command is used.

Action: To prevent this message from appearing each time you restart your computer with this system disk, run SETUPAT (Intel's setup program). SETUPAT will ensure that your CONFIG.SYS file contains only one EMM.SYS command.

Above™ Board Msg 2

Some of the parameters in the DEVICE = EMM.SYS command are incorrect. The Expanded Memory Manager hasn't been installed.

Cause: The DEVICE = EMM.SYS command in your CONFIG.SYS file has been incorrectly edited. It contains some incorrect parameters.

Action: Your screen will display the DOS prompt. When it does, run SETUPAT (Intel's setup program) to set up your system disk. This will save you the trouble of supplying the parameters yourself and will ensure that the syntax of the parameters is correct.

Above™ Board Msg 3

The Expanded Memory Manager can't find one or more of your Above Boards. The Expanded Memory Manager hasn't been installed.

Cause: Since you ran SETUPAT (Intel's setup program), one of several things has happened:

• An Above Board has been removed or its switches have been changed.

• The DEVICE = EMM.SYS command in the CONFIG.SYS file has been edited and now includes incorrect parameters.

• An Above Board has stopped working.

Action: The DOS prompt will appear on your screen. When it does, follow these steps:

• Make sure the computer contains the Above Board(s) you bought. Check to be sure that each one is properly inserted and that the switches are correctly set. (Chapter 4 discusses the switch settings.)

• Run the SETUPAT program to set up the DEVICE = EMM.SYS command on your system disk (the disk you use to start the computer). Then restart the computer. This will ensure that the parameters in the DEVICE = EMM.SYS command are correct.

Above™ Board Msg 4

You've added a non-Above Board to your computer since you last ran SETUPAT. This board contains RAM or ROM that conflicts with memory needed by the Expanded Memory Manager. The Expanded Memory Manager hasn't been installed.

Cause: There are two possibilities. Since you last ran Intel's setup program (SETUPAT):

• The CONFIG.SYS file on your system disk has been edited, and an incorrect parameter has been inserted in the DEVICE = EMM.SYS command. This incorrect parameter makes it appear that you've added a board with conflicting memory.

• You've added a board other than an Above Board, and it's tying up some of the memory the Expanded Memory Manager needs. (The memory locations SETUPAT checked previously are no longer vacant.) This problem is not the result of a malfunctioning Above Board.

Action: The DOS prompt will appear on your screen. When it does, try these solutions in the order listed:

- Use the SETUPAT program again to set up your Above Board software on your system disk. Then restart the computer and see if the message appears again.

- If the message recurs, you'll need to free up memory for the Expanded Memory Manager. The Expanded Memory Manager needs a vacant block of 64K bytes in the computer's higher memory—one of five blocks available. (See Table C-1.) Most likely, these memory locations are being occupied by some newly added board(s).

Table C-1 *Memory blocks the Expanded Memory Manager can use*

Starting Address (in hexadecimal)	Ending Address (in hexadecimal)
C0000	CFFFF
C4000	D3FFF
C8000	D7FFF
CC000	DBFFF
D0000	DFFFF

You'll need to clear one of these memory blocks for the Expanded Memory Manager. Currently, all the blocks are either occupied or overlapped by:

—RAM—if you're using nonconventional memory boards (such as the Tall Tree Systems JRAM-2) or

—ROM—if you're using peripheral adapter boards (hard disk adapter, local area network boards such as the IBM PC Network Adapter board, or the IBM Enhanced Display Adapter)

To clear one of these blocks:

—Find the board causing the conflict. To do this, you'll need to examine the documentation that came with the nonconventional memory or peripheral adapter board. You may need the technical advice of your dealer.

—Change the switches on the conflicting board, if there are any. If not, you'll need to remove the conflicting board.

Above™ Board Msg 5

More than one Above Board contains conventional memory.
The Expanded Memory Manager hasn't been installed.

Cause: You can use only one Above Board to "fill out" a computer's conventional memory to a full 640K. Your computer contains two or more Above Boards that have their switches set to add conventional memory.

Action: Check the switches on each of your Above Boards. Only one can have its switches set to supplement conventional memory. Any other boards should have their switches set to add expanded memory only. (Chapter 4 and Appendix A show how the switches should be set.)

Once the switch settings are correct, run SETUPAT (Intel's setup program) to install the Expanded Memory Manager again. If the message reappears, one of your Above Boards may not be working.

Above™ Board Msg 6

There is no expanded memory to manage. The Expanded Memory Manager hasn't been installed.

Cause: Since you last installed the Above Board software on the system disk (the disk from which you started your computer) one or more of these things has happened:

- Memory chips have been removed from an Above Board.

- Above Board switch settings have been altered.

- The switches indicate the presence of 256K-bit chips even though the board contains only 64K-bit chips.

- The CONFIG.SYS file has been edited, and the DEVICE = EMM.SYS command has been added even though the computer has no expanded memory.

Action: Follow these steps:

- Check the Above Board to make sure it contains all the memory chips it's supposed to.

- Verify that the switches on your Above Board are set correctly. (See Appendix A.)

- Once all chips are present and all switches are set correctly, run SETUPAT to prepare the system disk. This will prevent the message from appearing each time you restart your computer with the disk you're currently using.

Above™ Board Msg 7

Some of the expanded memory on at least one Above Board isn't working correctly. The Expanded Memory Manager has been installed, but your computer has less expanded memory than it would if all memory were working correctly.

Cause: The Expanded Memory Manager found one or more defective memory chips on one or more of the Above Boards in the computer.

Action: You can continue to use the computer, but you'll have less expanded memory than you would if all chips were working. Once you decide to fix the problem, load DOS and run the confidence tests described in Chapter 7. These tests can show you which chips failed. Then you or your dealer can replace the bad chips.

Above™ Board Msg 28

Your RAM disk hasn't been set up because the Expanded Memory Manager hasn't been loaded.

Cause: Setting up a RAM disk in expanded memory requires the Expanded Memory Manager. However, the Expanded Memory Manager hasn't been installed. As a result, neither has the RAM disk. This happened for one of two reasons:

- The DEVICE = EMM.SYS command in your system disk's CONFIG.SYS file has been edited incorrectly.

- SETUPAT (Intel's setup program) wasn't used to set up the system disk.

Action: Your screen will display the DOS prompt. After it does, follow these steps in the order listed:

- Run the SETUPAT program. It will set up your DEVICE = EMM.SYS command correctly.

- If the problem persists, watch for Above Board messages 2, 3, 4, 5, and 6 when you restart the computer. If one of these messages appears, follow the directions listed for that message.

Above™ Board Msg 31

Some of the parameters in the DEVICE = QUIKMEM1.SYS or DEVICE = QUIKMEM2.SYS command are incorrect. The RAM disk hasn't been installed.

Cause: The QUIKMEMx.SYS command in your CONFIG.SYS file has been edited. The command now contains some incorrect parameters.

Action: Your screen will display the DOS prompt. Once it does, run SETUPAT (Intel's setup program) to set up the Above Board software on your system disk. This will save you the trouble of supplying the parameters yourself and will ensure that the syntax of the parameters is correct.

Above™ Board Msg 32

A RAM disk of this size can't be set up. Not enough memory is available. The RAM disk hasn't been installed.

Cause: The RAM disk program senses that the computer contains too little memory to set up the RAM disk you requested. This can be caused by any of the following circumstances:

- The DEVICE = QUIKMEMx.SYS command in the CONFIG.SYS file has been incorrectly edited.

- The computer contains insufficient memory for the RAM disk you requested.

Action: When the screen displays the DOS prompt, try one of these solutions:

- If you're setting up a RAM disk in conventional memory, move it to expanded memory.

- Run SETUPAT (Intel's setup program) to prepare your system disk. SETUPAT will let you know how large a RAM disk will fit. Then restart the computer by pressing Ctrl-Alt-Del.

- If the computer has insufficient memory, you can: (1) Reduce the size of the RAM disk, or (2) add more memory.

Above™ Board Msg 36

The Expanded Memory Manager isn't working. The RAM disk hasn't been installed.

Cause: Something—either in software or in hardware—has affected the internal logic of the Expanded Memory Manager. The Expanded Memory Manager isn't working correctly, so your expanded RAM disk can't be installed.

Action: Restart the computer (by pressing Ctrl-Alt-Del). If the problem recurs, run SETUPAT (Intel's setup program) again to set up your system disk. If the problem persists, contact your dealer or Intel's Customer Support. (See Appendix B.)

Above™ Board Msg 38

There is insufficient memory remaining in your computer system. The Expanded Memory Manager has not been installed.

Cause: Device drivers are consuming all your conventional memory. By the time the Expanded Memory Manager is loaded, there's no room left for it in conventional memory.

Action: You have two choices. Either add more conventional memory, or reduce the conventional memory requirements of some device drivers.

If you choose to reduce the memory requirements of some device drivers, here are two alternatives. If you have a RAM disk in conventional memory, make it smaller or move it to expanded memory. If that doesn't work, delete some of the device drivers from the CONFIG.SYS file.

Above™ Board Msg 39

Too many programs are currently using the Expanded Memory Manager. The RAM disk hasn't been installed.

Cause: The Expanded Memory Manager needs to know what program it's communicating with, so it assigns each program, including the RAM disk, one or more EMM handles (something like an ID number). The programs you're currently using require so many EMM handles that none are left for the RAM disk.

Action: Decide whether to address this problem now or later. If you choose to address it later, continue to use the computer—but without the RAM disk. To really fix the problem, you have two choices:

- Either reduce the number of programs that simultaneously use expanded memory, or

- Run SETUPAT (Intel's setup program) again, and move the RAM disk to conventional memory.

Above™ Board Msg 40

Your computer is not completely compatible with the IBM AT. The Expanded Memory Manager has not been installed.

Cause: You're attempting to install the Above Board in a "compatible" computer that contains a ROM BIOS (basic I/O system) different from the ROM BIOS in an IBM AT.

Action: Contact Intel's Customer Support. The number is in Appendix B.

Intel Setup Msg 403

Intel's setup program can't find expanded memory in your system.

Cause: There are four possibilities:

- Your Above Board is set to supply only conventional and extended memory.

- There are no Above Boards in your computer. You must have an Above Board in the computer *before* you run the SETUPAT program.

- The switches on an Above Board are telling the Above Board to use an I/O port already used by another board.

- None of your Above Boards is working.

Action: If you want your board to supply only conventional memory, press Enter to continue. If you want it to supply expanded memory follow these steps:

- Make sure each Above Board is present and is installed correctly. If you install or reinstall any boards as a result of this message, run SETUPAT again to see whether the problem is fixed. If not, go on to the next step.

- Set the expanded memory I/O address switches for each Above Board to ensure that the board doesn't share I/O ports with any other board—not even with another Above Board. (Refer to Appendix A for switch settings.)

   Remember that different kinds of Above Boards have different switch settings. To find out how to set the expanded memory I/O address switches for the Above Board PS/AT, turn to Appendix A of this manual. For other Above Boards, turn to Appendix A in their manuals. When you finish changing switches, run SETUPAT again.

Intel Setup Msg 406

All your expanded memory is being used. A print buffer can't be set up in expanded memory.

Cause: The expanded memory in the computer has been reserved for other uses. None remains for a print buffer.

Action: You have several choices:

- Set the print buffer's size to zero, and get by without a print buffer.

- Reduce the size of any RAM disks in expanded memory, or move them to conventional memory.

- Put the print buffer in conventional memory instead of expanded memory.

- Add more expanded memory by installing more memory chips or Above Boards. Then run SETUPAT again. Chapter 3 describes how to add memory to the Above Board.

Intel Setup Msg 407

All conventional memory is being used. A print buffer can't be set up.

Cause: Almost all conventional memory has been reserved for other uses. None remains for a print buffer.

• If you're trying to set up a print buffer in conventional memory, there's not enough room for both the print buffer and the print buffer software.

• If you're trying to set up a print buffer in expanded memory, there's not enough room in conventional memory for the print buffer software.

Action: If you still want to install a print buffer, do one of these three things:

• Reduce the size of any RAM disks in conventional memory, or move them to expanded memory.

• Put the print buffer in expanded memory instead of in conventional memory.

• If you have less than 640K bytes in the computer, add more conventional memory and run SETUPAT again. Chapter 3 describes how to add memory to the Above Board.

Intel Setup Msg 408

All your expanded memory is being used. This RAM disk can't be set up in expanded memory.

Cause: All the expanded memory in your computer has been reserved for other uses. None remains for this RAM disk.

Action: If you still want to install this RAM disk, you have two choices:

• Reduce the size of any print buffer or RAM disks in expanded memory, or move them to conventional memory.

• Add more expanded memory by installing more memory chips or Above Boards. (Chapter 3 describes how to add memory to the Above Board.) Then run SETUPAT again.

Intel Setup Msg 409

All conventional memory is being used. This RAM disk can't be set up.

Cause: Almost all conventional memory has been reserved for other uses.

- If you're trying to set up a RAM disk in conventional memory, there's not enough room for both the RAM disk and the RAM disk software.

- If you're trying to set up a RAM disk in expanded memory, there's not enough room in conventional memory for the RAM disk software.

Action: If you still want to install a RAM disk, you have two choices:

- Reduce the size of any print buffer or RAM disks located in conventional memory, or move them to expanded memory.

- If the computer contains less than 640K bytes, add more conventional memory and run SETUPAT again. (Chapter 3 describes how to add memory to the Above Board.)

Intel Setup Msg 410

The diskette you chose is write-protected. Remove the write-protect tab, choose another drive letter, or change diskettes.

Cause: The SETUPAT program is unable to write data to the diskette because the diskette has a write-protect tab.

Action: Check your screen, and verify that you chose the correct drive. If you chose the wrong drive, correct the drive letter. If you chose the correct drive, remove the write-protect tab, reinsert the diskette, and press Enter to continue.

Intel Setup Msg 411

The drive you chose isn't ready. Check to see that the drive contains a diskette and that the drive door is closed.

Cause: The SETUPAT program is unable to read or write data to the diskette in the drive you selected. The drive you chose doesn't exist or contains no diskette, or its door is open.

Action: Check your screen and note the drive you chose. If it's not the one you want, change the drive letter.

If the drive letter is correct, make sure the drive contains a formatted system diskette and that the door is closed.

After you fix the problem, press Enter to continue.

Intel Setup Msg 412

The drive or diskette you chose isn't working correctly. Either choose a new drive letter or change diskettes.

Cause: The SETUPAT program is unable to read or write data to the drive you selected. The drive contains an unformatted or defective diskette, or the drive isn't working correctly.

Action: If the drive is a diskette drive, make sure it contains a formatted system diskette. If it does contain a formatted system diskette, try a different diskette.

After you fix the problem, press Enter to continue. If the message reappears, the drive isn't working. Contact your dealer.

Intel Setup Msg 413

The disk you chose isn't a system disk. Either choose a new drive letter or change diskettes.

Cause: The SETUPAT program can install software only on a system disk. (A system disk is a disk from which you can start or restart the computer.) There are two possible causes. The first is far more likely than the second.

- The drive you specified does not contain a system disk.

- You're using an unusual IBM compatible, and its operating system is not as compatible as it should be. So, SETUPAT doesn't recognize the system disk.

Action: Follow these steps in order:

- First, make sure that the disk is really a system disk. If you start the computer with one disk and then switch to another to run your application software, remember this: the system disk is the one you use to start the computer. Install the Above Board software only on the system disk.

- Second, check your screen and note the drive you chose. If it's not the one that contains your system disk, correct the drive letter. If the drive letter is correct, replace the diskette in that drive with a system diskette.

- If you are using a computer other than an IBM, COMPAQ, or AT&T, contact Intel's Customer Support (refer to Appendix B) and tell them you received Intel Setup Msg 413.

Intel Setup Msg 414

The disk you chose doesn't have enough room for the files from the Intel diskette. For the options you chose, you need K bytes. Remove some files from the disk, choose a new drive letter, or create a new system disk.

Cause: The SETUPAT program finds the files you'll need to use and copies them to the system diskette. The system diskette you chose doesn't have enough room for the files.

Action: Try either of these solutions:

- Remove the overcrowded system diskette from the drive and insert a system diskette that has enough room. Then press Enter and continue running SETUPAT.

- Restart the computer by pressing Ctrl-Alt-Del. Then try either of these two remedies:

  —Make more room on the system diskette by deleting files you don't use. This includes the Above Board files because SETUPAT will add new copies of the files it needs.

  —Format a new system diskette.

  When you're finished, run SETUPAT again.

Intel Setup Msg 415

The drive or the disk on which you are setting up the software isn't working correctly. Check the drive and disk.

Cause: This message appears when the computer can't read or write data to your system diskette. There are several possible causes:

- The drive was empty, or its door was opened when SETUPAT was running.

- Diskettes were changed after SETUPAT started running.

- The diskette is write-protected or it isn't a system diskette.

SETUPAT checked your drive and diskette before the setup process began, so the problem occurred after you pressed S to set up the system disk.

Action: Begin by noting the drive letter on your screen. Next, check the diskette. Once you've put a system diskette with no write-protect tab in the drive indicated, press S again, then press Enter. To confirm your choice, press Y and then press Enter. Do not open the drive door or remove the diskette until the setup process is complete.

If the message reappears, you may have a defective system diskette. Try setting up a new system diskette. If the message persists, it's likely that the drive is defective. Contact your dealer.

Intel Setup Msg 416

The drive or disk that contains the Intel setup files isn't working correctly. Check the drive and disk.

Cause: In general, this message appears when the computer has trouble reading from the drive that contains the necessary Intel files. The message could appear for several reasons:

- The diskette was pulled from the drive when SETUPAT was running.

- The drive door was opened when SETUPAT was running.

- The copy of the Intel diskette is defective.

SETUPAT checked your diskette for defects before the setup process began, so the problem has occurred since you pressed S to set up your system disk.

Action: Try these solutions:

- Make sure your copy of the Intel diskette is properly inserted in the drive. Press S again, then press Enter. Do not open the drive door or remove the diskette until the setup process is complete. Press Y to confirm your choice and then press Enter.

- If the message reappears, your copy of the Intel diskette may be defective. Exit the SETUPAT program and make a new copy of the Intel diskette.

Intel Setup Msg 417

The @@@@@@@@.TMP file already exists on the system disk. Delete or rename this file, choose a new drive letter, or change diskettes.

Cause: When setting up your system disk, the SETUPAT program creates a temporary file called @@@@@@@@.TMP on the system disk. SETUPAT has discovered that a file with this name already exists on your disk.

Action: Try these solutions:

- Check to see whether you specified the correct drive. If you didn't, correct the drive letter.

- Set up the Above Board software on a different system disk.

- Restart the computer by pressing Ctrl-Alt-Del. Then use the DOS RENAME command to change the name of the @@@@@@@@.TMP file on your system disk.

Intel Setup Msg 418

You have only one diskette drive in your system. Refer to it as drive A.

Cause: You've referred to your only diskette drive by some letter other than A.

Action: Change the name of the drive by pressing the A key. Then press Enter.

Intel Setup Msg 420

Your system disk has loaded too many programs into the computer's conventional memory.

Cause: SETUPAT needs to run in memory below 256K bytes. Your system disk has loaded so many programs into the computer's conventional memory that there's insufficient room below 256K left for SETUPAT.

Action: When the screen displays the DOS prompt, follow these steps to fix the problem:

• Remove the Intel diskette from drive A.

• Insert the IBM DOS diskette in drive A, and restart the computer by pressing Ctrl-Alt-Del.

• Remove the IBM DOS diskette from drive A.

• Insert the Intel diskette in drive A, and run SETUPAT again.

Intel Setup Msg 422

Some of the expanded memory on at least one Above Board isn't working correctly. Intel's setup program can finish setting up the Above Board software, but your computer has less expanded memory than it would if all memory were working correctly.

Cause: SETUPAT found one or more defective memory chips on one or more of the Above Boards in the computer.

Action: To fix the problem now, first press Enter, then exit SETUPAT by pressing E and then pressing Enter again. Then, run the confidence tests described in Chapter 7. If you replace any memory chips, run the SETUPAT program again, before you resume using the computer. Running SETUPAT again lets you set up a larger print buffer or RAM disks because you've increased the amount of expanded memory.

To fix the problem later, press Enter to continue. You can set up the Above Board software, but it will use less expanded memory than it would if all the chips were working.

Intel Setup Msg 423

You are using an old version of DOS. The Intel software requires DOS version 3.00 or more recent.

Cause: SETUPAT found that you were using an incorrect version of DOS.

Action: When the screen displays the DOS prompt, put DOS version 3.00 or more recent on your system disk, and run the SETUPAT program under this version of DOS.

Intel Setup Msg 424

The diskette from which you invoked Intel's setup program is missing files.

Cause: The diskette you received from Intel or the copy you're using is missing one or more of these five files: EMM.SYS, QUIKBUF1.COM, QUIKBUF2.COM, QUIKMEM1.SYS, QUIKMEM2.SYS. Either the original diskette is defective, or the copy is incomplete.

Action: When the screen displays the DOS prompt, use the DIR command to check the contents of the Intel diskette and the copy you made. Verify that all six files listed in the "Cause" section are present.

If your copy is defective, make a new copy. If the Intel diskette is defective, see your dealer or contact Intel's Customer Support. (The Customer Support number is in Appendix B.)

Intel Setup Msg 425

More than one Above Board contains conventional memory.

Cause: You can use only one Above Board to add conventional memory (memory below 640K bytes). In the computer, at least two Above Boards have their switches set to add conventional memory.

Action: Check the switches on each of the Above Boards. Only one can have its switches set to add conventional memory. Any other boards should have their switches set to add expanded, extended, or both. (Chapter 4 and Appendix A show the Above Board PS/AT switch settings.)

Once the switch settings are correct, run the SETUPAT program again. If the message reappears, one of the Above Boards may not be working. Contact Intel's Customer Support. (The Customer Support number is in Appendix B.)

Intel Setup Msg 426

Intel's setup program can't set up the Expanded Memory Manager because some of the memory it needs is being used.

Cause: The Expanded Memory Manager needs a vacant block of 64K bytes in the computer's higher memory—one of five blocks available. (Refer to Table C-1 earlier in this appendix.) SETUPAT (Intel's setup program) has checked the five blocks and found none of them vacant. Most likely, these memory locations are taken up by another board(s) in the computer.

Action: When the screen displays the DOS prompt, clear a memory block for the Expanded Memory Manager. Refer to the action section of Above Board Msg 4 to find out how to clear one of these blocks.

Print Buffer Msg 500

[Option] failed—check printer. To go on press any key.

Cause: The print buffer was unable to execute either the PrintScreen (2) or FormFeed (5) option because the printer wasn't ready.

Action: Check the printer. Make sure that it has enough paper, that it's turned on and on-line, and that all cables are plugged in tightly.

If the error was triggered by a PrintScreen command, make sure the printer is LPT1. Pressing any key returns you to the print buffer command menu, where you can either retry the command or exit the menu.

Print Buffer Msg 501

You're trying to set up a second Intel print buffer, but you can have only one. The one you initially set up still works, but the request for a second one is ignored.

Cause: This message appeared because you:

• Typed the QUIKBUF command, or typed the name of a batch file that contains the QUIKBUF command, or

• Edited your AUTOEXEC.BAT file to contain more than one QUIKBUF command.

Action: The screen will display the DOS prompt. After it does, run SETUPAT (Intel's setup program) to install the print buffer. It will make sure that only one Intel print buffer is set up.

Print Buffer Msg 502

Some of the parameters in the QUIKBUF command are incorrect. The print buffer hasn't been installed.

Cause: An incorrect or out-of-sequence parameter has been inserted in the QUIKBUF1 or QUIKBUF2 command in your AUTOEXEC.BAT file.

Action: Press any key, and the screen will display the DOS prompt. Then run SETUPAT to install the print buffer. This will ensure that the parameters are correct.

Print Buffer Msg 503

A print buffer of this size can't be set up. Not enough memory is available.

Cause: The print buffer program senses that the computer contains too little memory to set up the print buffer you requested. This can be caused by any of these circumstances:

• The QUIKBUF command, which sets up the print buffer, has been incorrectly edited.

• A previous exit from an application program was made improperly (by pressing Ctrl-C or Ctrl-Break). This can cause some of the computer's expanded memory to become unavailable for the print buffer.

• The computer has insufficient expanded memory for the print buffer you requested.

• The computer has insufficient conventional memory for the print buffer you requested.

Action: Press any key, and the screen will display the DOS prompt. After it does, try one of these solutions:

- Run SETUPAT (Intel's setup program) to prepare your system disk. SETUPAT will let you know how large a print buffer will fit.

- If the print buffer is in expanded memory and you've improperly exited from your application program, restart the computer. (Make sure your system disk is inserted. Then press Ctrl-Alt-Del.)

- If you're trying to set up a print buffer in expanded memory and you have insufficient expanded memory, you can: (1) Run SETUPAT again and choose a smaller value for the print buffer size. (2) Add more expanded memory to the computer.

- If you're trying to set up a print buffer in conventional memory and you have insufficient conventional memory, you can: (1) Run SETUPAT again and choose a smaller value for the print buffer size. (2) Add more conventional memory to the computer (unless it's at its maximum of 640K bytes). (3) Run SETUPAT again, but put the print buffer in expanded memory instead of conventional.

Print Buffer Msg 504

Your print buffer can't be set up because the Expanded Memory Manager hasn't been loaded.

Cause: Setting up an Intel print buffer in expanded memory requires the Expanded Memory Manager. However, the Expanded Memory Manager hasn't been installed in the computer. As a result, neither has the print buffer. This happened because:

- The CONFIG.SYS file, which sets up the Expanded Memory Manager, has been incorrectly edited, or

- The SETUPAT program wasn't used to set up the system disk (the disk from which you start the computer).

Action: Press any key, and the screen will display the DOS prompt. Once it does, follow these steps in the order listed:

- Run the SETUPAT program. It will set up the Expanded Memory Manager correctly.

- If the problem persists, watch for Above Board messages 2, 3, 4, 5, and 6 when you restart the computer. If one of these messages appears, follow the directions listed for that message.

Print Buffer Msg 505

The Expanded Memory Manager isn't working. The print buffer hasn't been installed.

Cause: Something—either in software or in hardware—has affected the internal logic of the Expanded Memory Manager. The Expanded Memory Manager isn't working correctly, so the expanded print buffer can't be installed.

Action: If you don't care that a print buffer won't be created, and if your software doesn't use expanded memory, press any key. You can then continue using the computer—but without the print buffer.

To fix the problem, restart the computer (by pressing Ctrl-Alt-Del). If the problem recurs, run the SETUPAT program again to set up your system disk. If the problem persists, contact your dealer or Intel's Customer Support.
(See Appendix B.)

Print Buffer Msg 506

Too many programs are currently using the Expanded Memory Manager. The print buffer hasn't been installed.

Cause: The Expanded Memory Manager needs to know what program it's communicating with, so it assigns each program, including the print buffer, one or more EMM handles (something like an ID number). The programs you're currently using require so many EMM handles that none are left for the print buffer.

Action: Decide whether to address this problem now or later. If you choose to address it later, press any key, and you can continue to use the computer now—but without the print buffer.

To fix the problem, you have two choices:

- Either reduce the number of programs that simultaneously use expanded memory, or

- Run SETUPAT (Intel's setup program) again, and move the print buffer to conventional memory.

Print Buffer Msg 507

Can't reset serial printer. To go on, press any key.

Cause: You chose the ResetPrinter option from the print buffer command menu. However, your printer is serial (as opposed to parallel), and serial printers can't be reset.

Action: This is an advisory message rather than an error message. You aren't required to *do* anything. The contents of your print buffer have been erased.

D MULTIPLE ABOVE™ BOARDS IN ONE COMPUTER

At the time this manual was written, Intel offered IBM AT and AT-compatible owners two varieties of Above Board:

- **Above Board PS/AT**—A board that provides two popular features—a parallel port and a serial port—plus a healthy amount of memory (up to 1.5M bytes with 256K-bit chips or up to 384K bytes with 64K-bit chips).

- **Above Board/AT**—A memory-only board that supplies up to 2M bytes of memory with 256K-bit chips or up to 512K bytes of memory with 64K-bit chips.

Combining varieties and features

The two varieties of Above Board complement each other. If you already have an Above Board/AT and want multifunction features, add the Above Board PS/AT. If you're an Above Board PS/AT owner who needs more memory—and memory only—the Above Board/AT does the job.

The choice is up to you. With the option of putting as many as nine Above Boards in your computer, you can select whichever combination works best. Two serial ports, two parallel ports, up to 8M bytes of expanded memory, up to 7M bytes of extended memory — the choice of features varies with the number and type of Above Boards you select.

Chances are, you won't install more than two Above Board PS/ATs. Just two of these boards can supply as many as four ports (two parallel and two serial) and up to 3M of memory. For most people, that's enough to handle printers, a modem, and a mouse. After these basic needs are met, Above Board/ATs can supplement the memory.

This appendix list guidelines you'll need to consider in selecting combinations of Above Boards and Above Board features.

Parallel ports

Your computer can have up to three parallel ports (LPT1, LPT2, and LPT3), provided one of them (LPT1) is on the IBM Monochrome Display Adapter or some other manufacturer's equivalent. Otherwise, DOS limits your computer to two parallel ports.

Each Above Board PS/AT can supply one parallel port.

If your computer already has all the parallel ports it can support, disable the parallel port on your Above Board PS/AT. Read Chapter 12 for more information about the parallel port.

Serial ports

Your computer can have up to two serial ports, COM1 and COM2.

Each Above Board PS/AT can supply one serial port.

If your computer already has all the serial ports it can support, disable the serial port on your Above Board PS/AT. Read Chapter 13 for more information about the serial port.

Conventional memory

Each Above Board can supply 128K bytes of conventional memory beginning at 512K. This is enough memory to fill out conventional memory to 640K bytes. You can set up only one Above Board— either an Above Board/AT or an Above Board PS/AT—to supply conventional memory.

To add conventional memory, refer to Appendix A in the *Installing the Above™ Board/AT or Installing the Above™ Board PS/AT* manual.

Expanded memory

Each Above Board PS/AT can supply up to 1.5M (1536K) bytes of expanded memory when filled with 256K-bit chips and up to 384K bytes when filled with 64K-bit chips. Each Above Board/AT can supply up to 2M bytes of expanded memory when filled with 256K-bit chips and up to .5M (512K) bytes when filled with 64K-bit chips.

Four Above Board/ATs can provide a maximum of 8M bytes of expanded memory all the expanded memory available. However, the number of vacant slots may limit the number of Above Boards you can install.

If you have room in your computer, you can add a Piggyback Memory for each Above Board. Each Piggyback Memory adds 2M.

Extended memory

An Above Board PS/AT can supply up to 1.5M (1536) bytes of extended memory when filled with 256K-bit chips. An Above Board/AT can supply up to 2M bytes of extended memory when filled with 265K-bit chips and up to .5M (512K) bytes when filled with 64K-bit chips. Because extended memory is filled in 512K-byte chunks, an Above Board with 384K bytes (filled with 64K-bit chips) can't provide extended memory.

Four Above Board/ATs can provide a maximum of 6.5M bytes of extended memory. However, the number of vacant slots may limit the number of Above Boards you can install.

If you have room in your computer, you can add a Piggyback Memory for each Above Board. Each piggyback memory adds 2M.

To add extended memory, refer to Appendix A in the *Installing the Above™ Board PS/AT* manual.
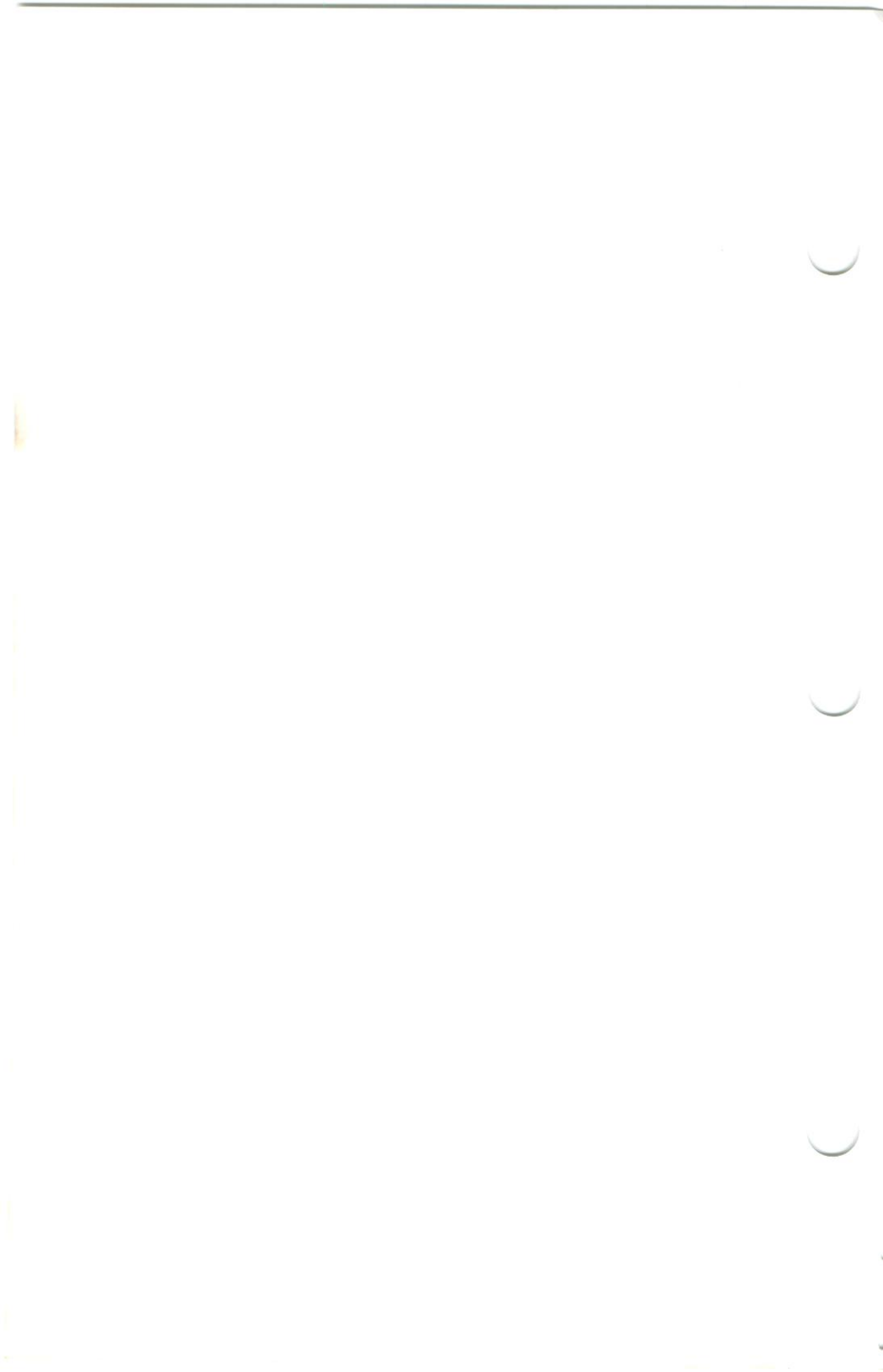
E PUTTING A CHIP IN A SOCKET

This appendix explains how to insert a chip into a socket. If you've successfully put chips in sockets before, you can skip this appendix.

CAUTION ■ ■ ■ ■ ■ ■ ■

Unless you follow step 1, you can ruin your chips.

1 Before touching any chips, remove the static electricity from your hands by touching the back panel of your computer. See Figure E-1.
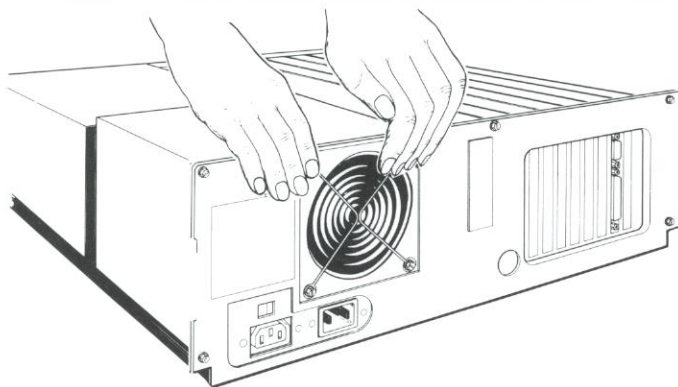
Figure E-1 *Removing static electricity from your hands*

2 Orient your board as shown in Figure E-2, with the metal retaining bracket on the right. Before you put a chip in a socket, make sure the notched edge of the chip points to the left. If the chip has a dot instead of a notch, make sure the edge with the dot faces left.
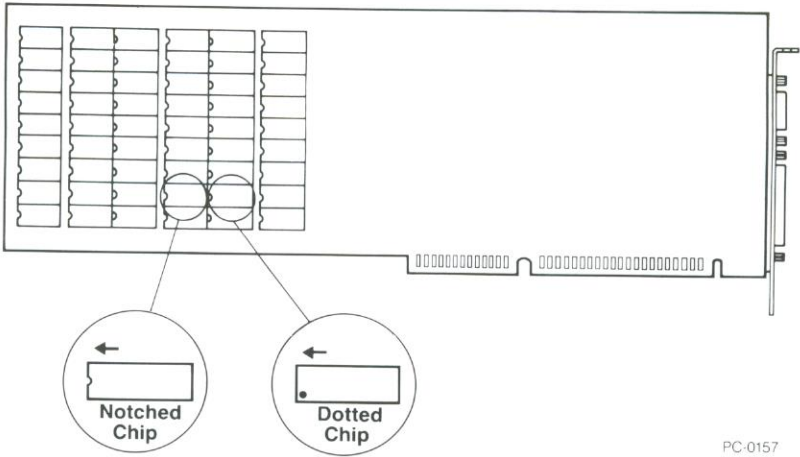
PC-0157

Figure E-2 *Orienting the chip correctly*

3 Carefully insert the pins on one side of the chip halfway into the holes on the same side of the socket. See Figure E-3.
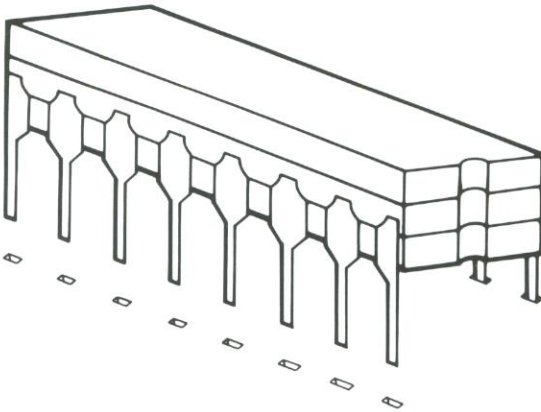
PC-0060

Figure E-3 *Inserting pins halfway in one side of the socket*

4 Insert the pins from the other side of the chip halfway into the holes on that side of the socket. See Figure E-4.

If the pins don't line up with the holes, remove the chip from the socket, gently straighten the pins, and go back to step 2.
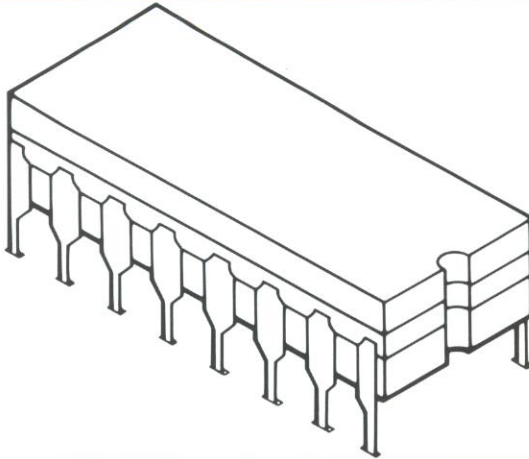
PC-0061

Figure E-4 *Inserting the remaining pins halfway in the socket*

5 Carefully examine the chip's pins. Look for any pins that are bent under or out. (See Figure E-5.) If you find bent pins, remove the chip, gently straighten them, and go back to step 2.
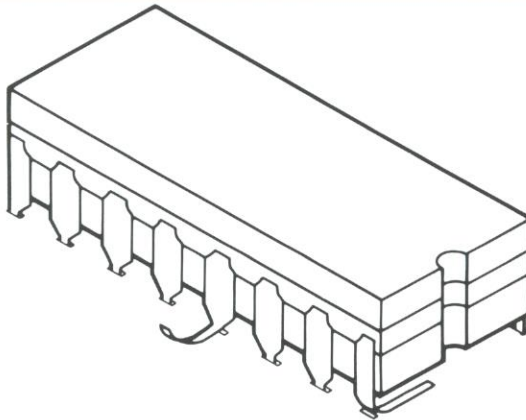
PC-0062

Figure E-5 *Bent pins*

6   When all pins are in the socket holes, apply gentle, even pressure with two fingers until the chip settles into the socket. Then apply firm pressure with both fingers until the chip will go no farther. See Figure E-6.
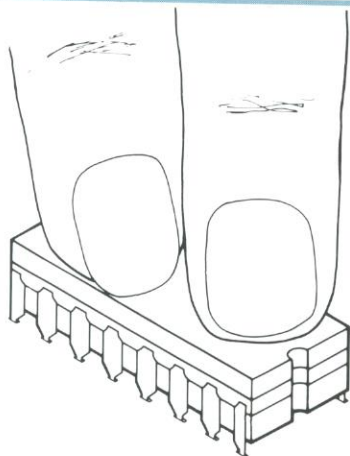
PC-0136

Figure E-6 *Pressing the chip into the socket*

F TECHNICAL INFORMATION

This appendix contains technical information about the Above Board PS/AT.

Power consumption

Each Above Board PS/AT consumes *no more than* 2.0 amps at + 5.0 volts. This assumes that the board is fully populated with either 64K-bit or 256K-bit chips.

Refer to Appendix G if your computer is a compatible.

Number of slots

An Above Board without the Piggyback Memory board fits in one slot.

An Above Board combined with the Piggyback Memory board requires two slots. However, the Piggyback Memory board occupies only half of the second slot. You can put another short board (for example, the IBM AT Serial/Parallel Adapter) in the same slot. Refer to *Installing the Above™ Board/AT Piggyback Memory* for more information about installing the Piggyback Memory board.

Memory capacity

Each Above Board PS/AT can provide your computer with as much as 1.5M bytes (1536K bytes) of memory. When the Piggyback Memory board is attached, the combination can provide as much as 3.5M bytes (3584K bytes).

The maximum amount of memory on an Above Board PS/AT depends upon the type of memory chips you put on the board:

* Equipped with 256K-bit chips, an Above Board PS/AT can contain as much as 1.5M bytes.

* Equipped with 64K-bit chips, an Above Board PS/AT can contain as much as 384K bytes.

If you add a Piggyback Memory board, you more than double the capacity of the Above Board PS/AT.

Acceptable memory chips

Intel has verified that the chips listed in Table 3-1 (in Chapter 3) work correctly with the Above Board PS/AT. Others may work, but they haven't been verified.

You cannot mix 64K-bit and 256K-bit chips on the Above Board.

You can, however, mix chips of different speeds, as long as all chips have access times of 150 nanoseconds or faster. For example, 120-nanosecond chips work fine.

Maximum number of boards per computer

If you use only DOS, you may use as many as four Above Boards (or two Above Boards and two Piggybacks) to provide expanded memory.

If you use DOS *and* XENIX or VDISK you can add up to nine Above Boards in one computer:

- One Above Board for conventional memory.

- Four Above Boards (or two Above Boards and two Piggybacks) to provide expanded memory.

- Four Above Boards (or two Above Boards and two Piggybacks) to provide extended memory.

G ADVICE FOR USERS OF COMPATIBLE COMPUTERS

If your computer is a compatible rather than an IBM AT, your power supply may not provide enough power for all the hardware options you want.

The AT's power supply provides 20 amps of +5 volts. The system board, disk drive adapter, and disk drives consume some of this, as do the 80287 math coprocessor and each board plugged into an expansion slot.

The AT's 20-amp power supply is strong enough to support all the boards you can put in an AT. But, if you have a compatible, your computer's power supply might not be as strong as the IBM AT's.

If you plug in options that require (altogether) more power than your power supply generates, the power supply may shut itself off to prevent damage to the computer. If your power supply shuts off, the data in your memory is destroyed.

To prevent loss of data, Intel suggests you have your dealer calculate the power requirements of all the options in your compatible computer. If these options require more power than your computer's power supply can provide, you have several choices:

- Remove some of the options.

- Buy an expansion unit, and move some of the options from your system unit to the expansion unit.

- Have your dealer install a more robust power supply.

Although some users take a chance and get away with it, Intel recommends a more conservative approach. Before you install your Above Board (or any other board from any manufacturer), ask your dealer whether you're overloading your power supply.
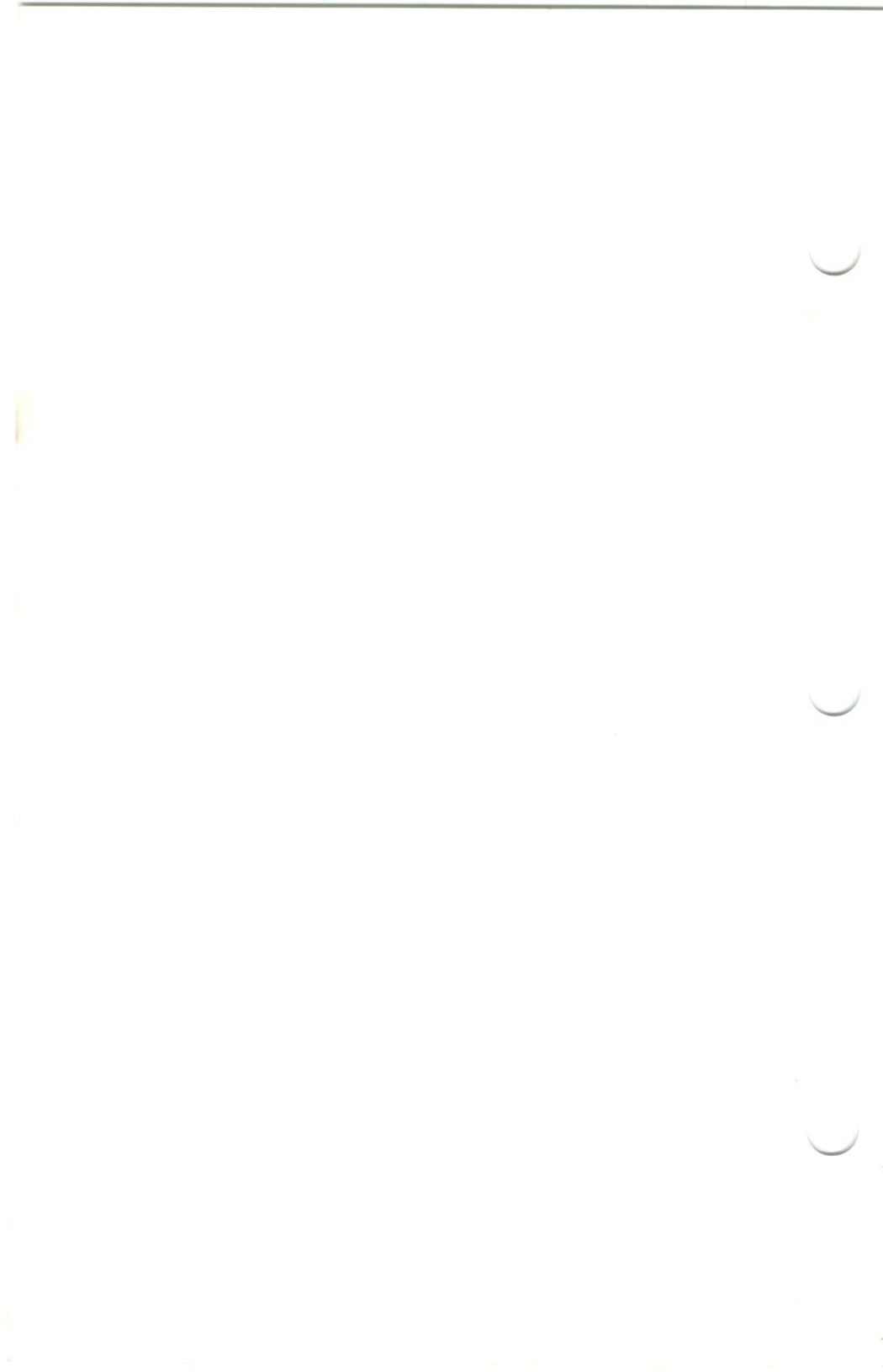
GLOSSARY

This glossary defines some of the technical terms used in this
manual. It will help you understand unfamiliar words you run across.
If you understand the terms used in the manual, you can skip this
glossary.

The terms are defined in alphabetical order.

Above™ Board

Intel calls this board the Above Board because it lets you add usable
memory above the limits that DOS sets. For ATs, DOS allows
application programs to use a maximum of 640K bytes of memory.

By installing Above Boards (as many as nine in one computer) you
can add up to 8M bytes of expanded memory for DOS application
programs and up to 6.5M bytes of extended memory for XENIX and
VDISK. (Expanded and extended memory are defined elsewhere in
this glossary.)

The Above Board comes in four varieties. Two, the Above Board/AT
and Above Board PS/AT, work with IBM ATs and compatibles. The
third and fourth, the Above Board/PC and the Above Board PS/PC,
work with PCs, XTs, and compatibles. Except for Appendix D, the
information in this manual is about the Above Board PS/AT only.

Address

An address is a number that your computer uses to identify a byte of
memory. Each byte in your computer has an address different from
that of any other byte.

Application program

An application program is the software you use to do your work on
the computer. Some categories of application programs are word
processors, database managers, spreadsheet managers, and
project managers. Specific examples of application programs are
MultiMate, dBase II, 1-2-3, Framework, and Symphony.

AUTOEXEC.BAT file

An AUTOEXEC.BAT file is a special-purpose batch file. ("Batch file" is defined elsewhere in this glossary.) When you turn on your computer or restart it by pressing the Ctrl-Alt-Del key combination, DOS searches your system disk for the AUTOEXEC.BAT file. If DOS finds one, it runs the commands in the file.

Batch file

A batch file is a special kind of file that saves time and effort. You can recognize batch files by the ".BAT" extension that follows the file name.

If you use a sequence of DOS commands frequently, you can create a batch file containing the commands, and then run the entire sequence by typing the name of the file. This reduces the number of keystrokes needed to run a sequence of commands.

COM1 and COM2

DOS lets you attach up to two serial devices (usually serial printers) to your computer. To keep track of which device you want to use, DOS assigns them names. COM1 and COM2 are the names. For more information about using serial printers with the Above Board's print buffer, refer to Chapter 13.

Compatible

Some manufacturers make computers similar to IBM ATs. These computers run most—but sometimes not all—the software that the IBM AT runs. These similar computers are called "IBM compatibles."

Some of these computers are less similar to the IBM AT than others. This leads to the confusing question, "How compatible is a specific compatible?"

This manual uses the following definition. If a computer can run ALL the software that an IBM AT can run and can use ALL the hardware that an IBM AT can use, the computer is an IBM compatible.

CONFIG.SYS file

CONFIG.SYS is a special-purpose file. Among other things, it provides DOS with information about the kinds of hardware attached to your computer. Whenever you turn on your computer or restart it by pressing Ctrl-Alt-Del, DOS searches your system disk for the CONFIG.SYS file. If DOS finds one, it reads the commands from the file and uses them to prepare your computer's hardware.

Conventional memory

Conventional memory is the memory that DOS recognizes and uses. This is limited to 640K bytes.

In addition to conventional memory, the Above Board lets you add two more kinds of memory to your computer. This additional memory is called expanded memory and extended memory. Expanded memory and extended memory are defined elsewhere in this glossary.

Chapter 9 discusses all three kinds of memory in detail.

Disk

In this manual, "disk" is a generic term meaning either hard disk or diskette.

DOS

The letters D-O-S stand for Disk Operating System. DOS manages your computer's basic functions, such as conventional memory, disk drives, printers, and the screen. This allows DOS-based application programs to focus on their tasks.

For more information about DOS, read the DOS manual that came with your computer. If you are new to computers, read RUNNING MS-DOS, written by Van Wolverton and published by Microsoft Press. It's an unusually clear book designed for new computer users.

Expanded memory

If you use DOS and DOS application programs, you'll want to use the Above Board to add expanded memory to your computer.

Expanded memory is memory above 1024K that specially-written DOS application programs (such as 1-2-3 Release 2, Symphony Release 1.1, Framework II, SuperCalc3 Release 2.1, Ready!, and Javelin) can use.

Four Above Board PS/ATs can provide up to 6M bytes (1.5M bytes each) of expanded memory for your programs to use.

Chapter 9 discusses Above Board expanded memory in detail.

Expansion slot

An expansion slot is a space in your AT into which you can plug a board. IBM ATs have eight expansion slots, but two are restricted to boards designed for the IBM PCs and XTs. This leaves six slots that can contain boards designed explicitly for the AT—boards such as the Above Board PS/AT. Figure 5-1 (in Chapter 5) shows the difference between the two types of expansion slots.

Extended memory

If you use XENIX or VDISK, you'll want to use the Above Board to add extended memory to your computer.

Extended memory is memory above 1024K bytes (1M byte) that only XENIX (defined elsewhere in this glossary) and VDISK can use. You can't use extended memory to run DOS application programs (such as Symphony).

If you use DOS and DOS application programs, you'll want to add expanded memory rather than extended memory.

Chapter 9 discusses Above Board extended memory.

I/O

I/O is an abbreviation for input/output. Input is the data flowing into your computer. Output is the data flowing out.

I/O addresses

An I/O address is an electrical connection that the boards in your computer use to communicate with the processor or brain of the computer. Although it permits data to flow between board and processor, the I/O address has no relationship to the expansion slot where the board resides.

Keep the following points about I/O addresses in mind:

• An I/O address can't be shared. If one board uses a specific I/O address, the other boards in your computer can't use it.

• There are a limited number (64K) of I/O addresses in each IBM AT.

• Many different kinds of boards are available for the AT, and most of them must use a specific I/O address.

These factors sometimes lead to conflicts. For example, two of the boards in your computer might want to use the same I/O address.

To understand this conflict, think of telephones in two different houses having the same number. When someone calls the number, both phones ring, and both households answer. The ensuing conversation would be difficult to understand.

To prevent this conflict in your AT, three of the switches on the Above Board PS/AT let you select an I/O address. Appendix A shows the I/O address switches.

LPT1, LPT2, and LPT3

DOS lets you attach up to three parallel printers to your computer. To keep track of which printer you want to use, DOS assigns them the names LPT1, LPT2, and LPT3.

M bytes

In publications relating to computers, M (for mega) means 1,048,576 or 1024K. So, 1M byte is 1,048,576 bytes, and 4M bytes is 4,194,304 bytes.

Page frame

The page frame is the 64K-byte segment of your computer's memory that makes expanded memory possible. This segment, which is located somewhere between 768K and 896K, lies within the 80286 processor's "real" address space (0 to 1024K) but beyond the memory that DOS manages for application programs (0 to 640K).

The page frame acts as a gateway through which four 16K-byte blocks of memory, or pages, can be brought into the real address range of the 80286 processor. For a more detailed explanation and an illustration of how the page frame works, read Chapter 9.

Parallel printer

Two kinds of printers work with the IBM AT—parallel and serial. Although most printers for IBM ATs are parallel, serial printers are not rare.

The difference between the two is the way the computer sends the information to be printed. Put simply, parallel printers accept information one byte at a time, and serial printers accept information one bit at a time.

The difference is important because the Above Board print buffer works differently with serial and parallel printers. See Chapter 11 for more information about the print buffer (in general) and Chapter 12 for information about using a parallel printer.

Parity checking

Parity checking is a technique used by many computers (including ATs) to verify the integrity of memory chips while the computer is running.

Print buffer

A print buffer is software that lets your computer do two things at once. Generally, when your computer is sending information to the printer, the computer can't do anything else. But with a print buffer, you can use the computer for productive work even while printing. Read Chapter 11 for more information about print buffers.

RAM

The letters R-A-M stand for Random Access Memory. RAM is the kind of memory your application programs use to store data inside your computer.

RAM has the following characteristics:

- RAM is much faster than disk. Programs can read information from or write information to RAM in much less time than they could using a disk.

- RAM is volatile. When you shut off the power, the information stored in RAM vanishes.

RAM disk

A RAM disk is software that lets you use part of your computer's RAM as a very fast disk. If your programs frequently read from or write to disk, a RAM disk will speed them up substantially. For more information about RAM disks, read Chapter 10.

Restart

Restarting your computer is a technique for starting another program running without turning your computer off.

If you don't have a hard disk, you can restart the computer by inserting a DOS system diskette in drive A, and pressing the Ctrl-Alt-Del key combination.

If you have a hard disk, you can leave drive A empty and press the Ctrl-Alt-Del key combination. This will restart your computer from your hard disk.

ROM

The letters R-O-M stand for Read-Only Memory. ROM is the kind of memory your computer uses to store information that's needed all the time.

ROM has the following characteristics:

• Programs can read information from ROM, but they can't write any to ROM.

• When you shut off the power, the information stored in ROM is retained.

Serial printer

Serial printers are best defined by contrasting them with parallel printers. Read the definition of a parallel printer in this glossary. See Chapter 13 for more information about using a serial printer with the print buffer.

System disk

A system disk is a disk from which you can start or restart your computer. It loads DOS into the computer and (optionally) starts running an application program.

Some application programs include diskettes labeled "system disk" that don't contain DOS and are, therefore, not really system diskettes. Newer versions of 1-2-3, Symphony, and Framework are examples of this type of application programs. In these situations, start or restart your computer from a DOS system disk first. Then run the application program from a separate diskette.

XENIX

XENIX is an operating system that manages extended memory, disk drives, printers, and the screen.

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PCEO