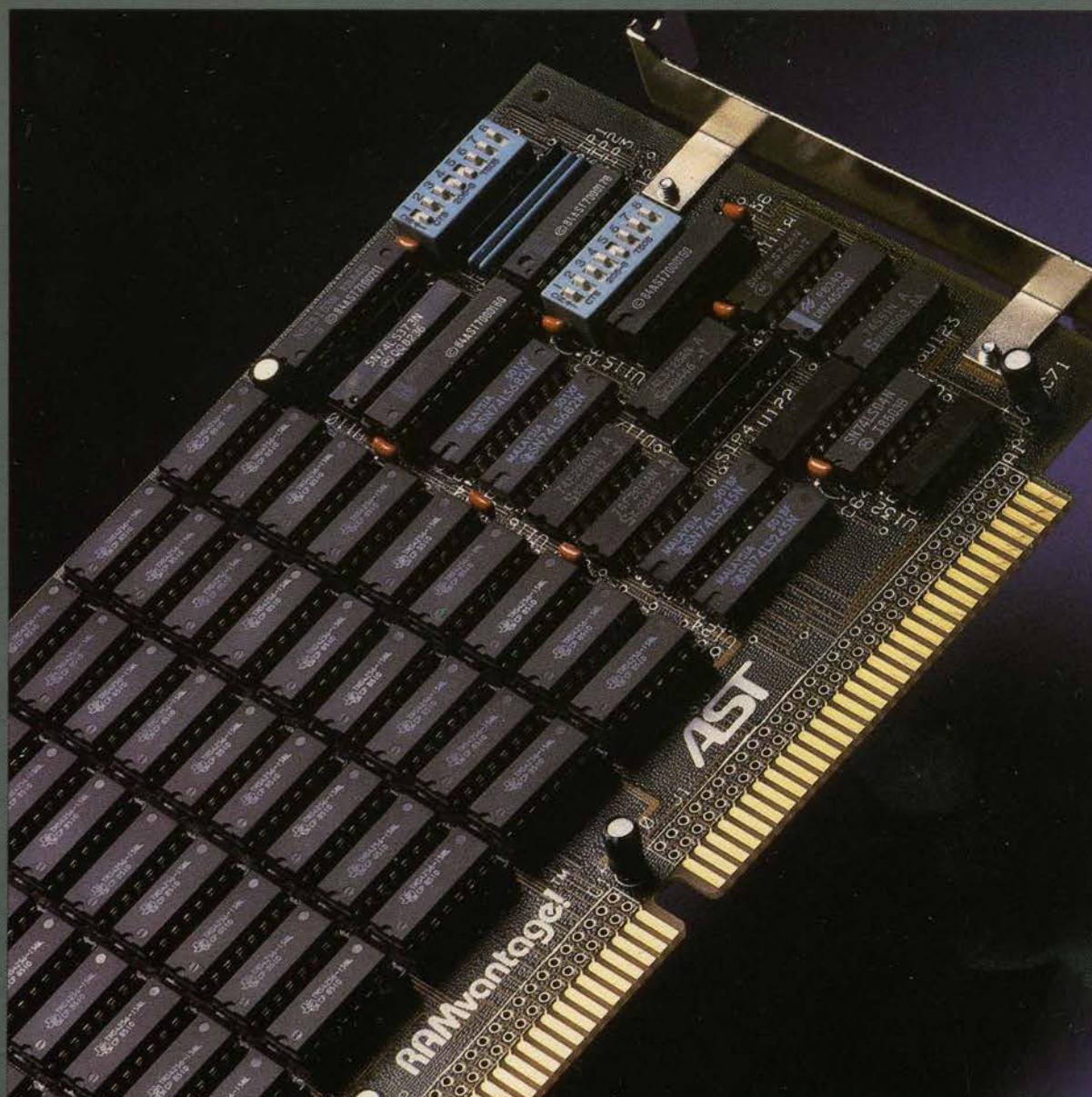


RAMvantage!™

AST
RESEARCH INC.

*Memory Expansion Board
For the IBM® PC-AT and
Compatibles Offering Up
To 3 Megabytes of Memory*



User's Manual

AST Product

RAMvantage!

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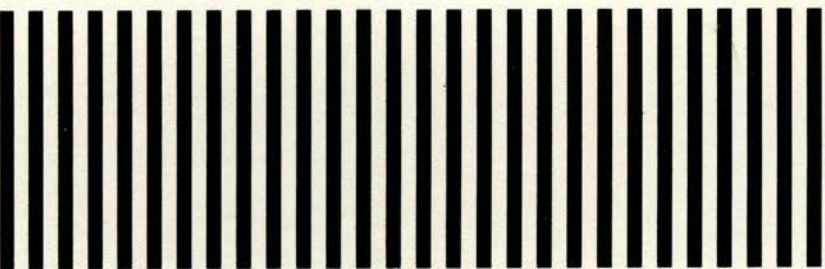
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RAMvantage!

Memory Expansion Board

for the

IBM PC-AT

User's Manual
000212-001 B
September 1985

AST RESEARCH, INC.
Irvine, California
(714) 863-1333

Second Edition (September 1985)

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Table of Contents

SECTION 1. INTRODUCING <i>RAMvantage!</i>	1-1
1.1 Inventory Checklist	1-1
1.2 Additional Memory	1-2
1.3 PC-AT System Requirements	1-3
1.4 How to Use this Manual	1-3
1.4.1 Related Reading	1-3
1.4.2 Manual Outline	1-4
SECTION 2. CONFIGURATION AND INSTALLATION	2-1
2.1 Before You Begin	2-1
2.2 Factory Configuration	2-2
2.3 Configuring <i>RAMvantage!</i>	2-4
2.4 Installing <i>RAMvantage!</i> in the PC-AT	2-13
2.5 Running the PC-AT SETUP and Diagnostic Program	2-17
SECTION 3. MEMORY CONFIGURATION	3-1
3.1 PC-AT Memory Addressing	3-1
3.1.1 The 640-KB Base Memory Area — Split Memory Addressing	3-3
3.1.2 The 15-MB Extended Memory Area	3-5
3.1.3 PC-AT System Board Memory Configuration	3-5
3.2 Setting the <i>RAMvantage!</i> Starting Memory Address	3-6
3.3 If You Have Other Memory Boards	3-6
3.3.1 Installing a Board "Below" <i>RAMvantage!</i>	3-7
3.3.2 Installing a Board "Above" <i>RAMvantage!</i>	3-8
3.4 Installing Additional Memory on <i>RAMvantage!</i>	3-9
3.4.1 Memory Chip Specifications	3-9
3.4.2 Populating the Memory Banks with Memory Chips	3-10
3.4.3 Mixing 64- and 256-KB Memory Chips	3-11
3.5 Setting the Memory Size of <i>RAMvantage!</i>	3-12

TABLE OF CONTENTS

(Continued)

APPENDIXES

Appendix A: Memory Configuration Information	A-1
Appendix B: Configuring PC-AT System Board Memory	B-1

FIGURES

Figure 2-1. <i>RAMvantage!</i> Board Layout	2-3
Figure 2-2. Setting <i>RAMvantage!</i> Memory Size	2-5
Figure 2-3. Memory Size (Example 1)	2-6
Figure 2-4. Memory Size (Example 2)	2-6
Figure 2-5. Split Memory Addressing in a 256-KB PC-AT	2-8
Figure 2-6. Split Memory Addressing in a 512-KB PC-AT	2-10
Figure 2-7. Contiguous Memory Addressing in a 512-KB or 640-KB PC-AT	2-11
Figure 2-8. Enabling/Disabling Parity	2-12
Figure 2-9. PC-AT System Board Memory Configuration Jumper J18	2-14
Figure 2-10. Lifting the Disk Controller Board	2-15
Figure 3-1. PC-AT System Memory Map	3-2
Figure 3-2. Split Memory Addressing (512-KB PC-AT and 3-MB <i>RAMvantage!</i> Board)	3-4
Figure 3-3. Memory Bank Configuration	3-10
Figure 3-4. SW1 and Memory Banks	3-12
Figure 3-5. Memory Size (Example #1)	3-13
Figure 3-6. Memory Size (Example #2)	3-13
Figure B-1. PC-AT System Board Memory Configuration	B-2

Tables

Table A-1. Split Memory Addressing Memory Allocation ..	A-2
Table A-2. Switch Block #2 Settings (Starting Address) ...	A-3

SECTION 1

INTRODUCING RAMvantage!

The AST Research *RAMvantage!*[™] is a multifunction enhancement product for the IBM® Personal Computer (PC) AT®. *RAMvantage!* includes these features:

- Memory extension upgradable to 3 megabytes (MB) of Random Access Memory (RAM).
- "Split Memory Addressing"[™] which allows *RAMvantage!* to round out your PC-AT base memory to 640 kilobytes (KB) while also providing extended memory at 1 MB and above. This provides the greatest possible efficiency in PC-AT memory usage.
- Compatibility with both 64-KB and 256-KB RAM chips for maximum flexibility in upgrading *RAMvantage!* memory. Total memory capacity of *RAMvantage!* is 768 KB using 64-KB chips, or 3 MB using 256-KB chips.
- AST offers 128-KB memory upgrade kits for *RAMvantage!*, consisting of 18 64-KB chips (order AST part number MPAD-128). AST also offers 512-KB memory upgrade kits consisting of 18 256-KB chips (order AST part number MPAD-512).

1.1 Inventory Checklist

Before you get started, check that your *RAMvantage!* package includes the following:

- *RAMvantage!* circuit board.
- *User's Manual*.

Introduction

Your *RAMvantage!* package may also include other materials; if so, they are documented separately.

NOTE

Be sure to fill out your warranty card (located at the front of this manual) and mail it in.

1.2 Additional Memory

Your *RAMvantage!* board comes standard with a minimum of 128 KB of RAM.

Extended memory for your *RAMvantage!* is available in increments of either 128 KB (using 64-KB RAM chips) or 512 KB (using 256-KB RAM chips) for a total of up to 3 MB on the *RAMvantage!* circuit board.

Additional memory can be factory-installed, or you can install it yourself at a later date. Upgrade kits are available from your dealer.

NOTE

Although the AST Research *RAMvantage!* board is designed for easy user upgrade, the warranty coverage applies only to the configuration of the board as originally shipped from the factory. Components added on at a later date are not warranted.

1.3 PC-AT System Requirements

The *RAMvantage!* board is designed to be completely compatible with the IBM PC-AT. There are no special requirements for installing the *RAMvantage!* in the PC-AT except those noted during the installation instructions.

1.4 How to Use this Manual

This manual assumes some familiarity with PC-DOS® (version 3.0 or later) and the IBM PC-AT hardware. All references to operating system commands and I/O port designations in this manual assume operation under a single-user, single-tasking version of the PC-DOS operating system.

This section provides a list of related documentation and an outline of this manual.

1.4.1 Related Reading

You can find additional information in the following manuals for your IBM PC-AT:

Installation and Setup

Guide to Operations

Technical Reference

Disk Operating System (version 3.0 or later)

BASIC

1.4.2 Manual Outline

The following outline describes this manual.

SECTION 1: INTRODUCTION

Introduces the *RAMvantage!* and related topics.

SECTION 2: CONFIGURATION AND INSTALLATION

Describes how to configure *RAMvantage!* and install it in your PC-AT.

SECTION 3: MEMORY CONFIGURATION

Describes *RAMvantage!* memory configuration in detail, and includes a PC-AT system memory map.

APPENDIX A: MEMORY CONFIGURATION INFORMATION

Lists all possible settings for *RAMvantage!* Switch Block #2 (starting memory address).

APPENDIX B: CONFIGURING THE PC-AT SYSTEM BOARD MEMORY

Describes how to properly configure the PC-AT system board for either 256 or 512 KB of system board memory.

SECTION 2

CONFIGURATION AND INSTALLATION

This section contains instructions for installing your *RAMvantage!* in most PC-AT configurations. There are five basic steps to follow when installing *RAMvantage!*:

1. Configure the memory size.
2. Configure the starting address.
3. Select error checking.
4. Install *RAMvantage!* in the PC-AT.
5. Run the PC-AT SETUP and diagnostic program.

If you have more detailed questions about memory configuration, please refer to Section 3 for further information.

2.1 Before You Begin

- If your PC-AT is equipped with a 256-kilobyte (KB) system board, or if you are changing the PC-AT system board memory configuration at this time, you must configure the system board according to the instructions contained in Installation STEP 4 (and Appendix B) of this manual. Failing to do this will cause errors during the PC-AT's power-on self test.
- "Base Memory" refers to the PC-AT's 640-KB standard memory area.

"Extended Memory" refers to the PC-AT's 15-megabyte (MB) extended memory area.

“Split Memory Addressing” means part of *RAMvantage!* memory is rounding out the 640-KB base area, while the remaining memory provides extended memory in the 15-MB area.

“Contiguous Memory Addressing” means that all *RAMvantage!* memory is being used as extended memory.

Section 3 provides further information on configuring *RAMvantage!* memory, including a diagram of the PC-AT system memory map and configuration examples.

2.2 Factory Configuration

RAMvantage! (shown in Figure 2-1) is shipped from the factory in this configuration:

- Split Memory Addressing enabled (factory setting may be for either 256 or 512 KB PC-AT system board: check before installing).
- Memory size switches set as appropriate for the factory-installed Random Access Memory (RAM) on your *RAMvantage!*.

Your *RAMvantage!* board comes standard with a minimum of 128 KB of RAM.

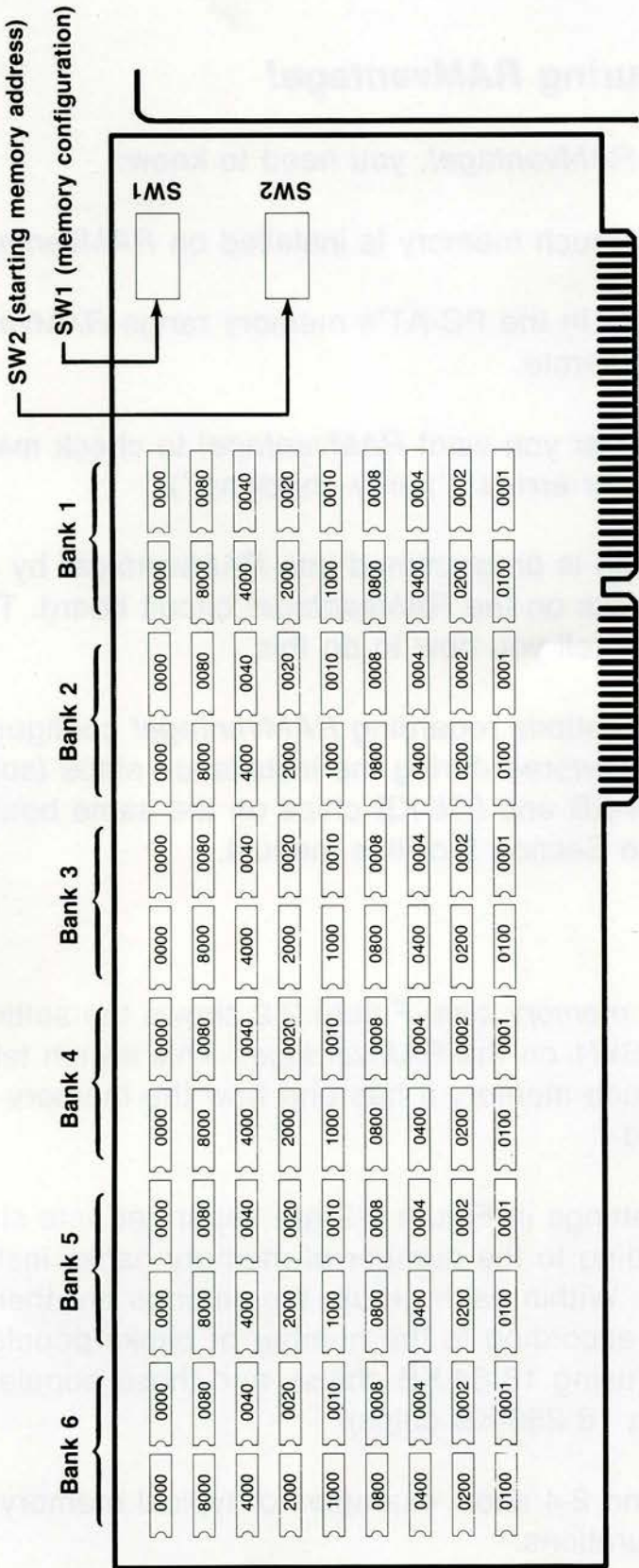


Figure 2-1. RAMvantage! Board Layout.

2.3 Configuring *RAMvantage!*

To configure *RAMvantage!*, you need to know:

- How much memory is installed on *RAMvantage!*.
- Where in the PC-AT's memory range *RAMvantage!* will operate.
- Whether you want *RAMvantage!* to check memory data for errors ("parity checking").

This information is programmed into *RAMvantage!* by setting the switch blocks on the *RAMvantage!* circuit board. The following steps tell you how to do this.

If you have questions regarding *RAMvantage!* configuration that are not answered during the installation steps (such as how to mix 64-KB and 256-KB chips on the same board), please refer to Section 3 of this manual.

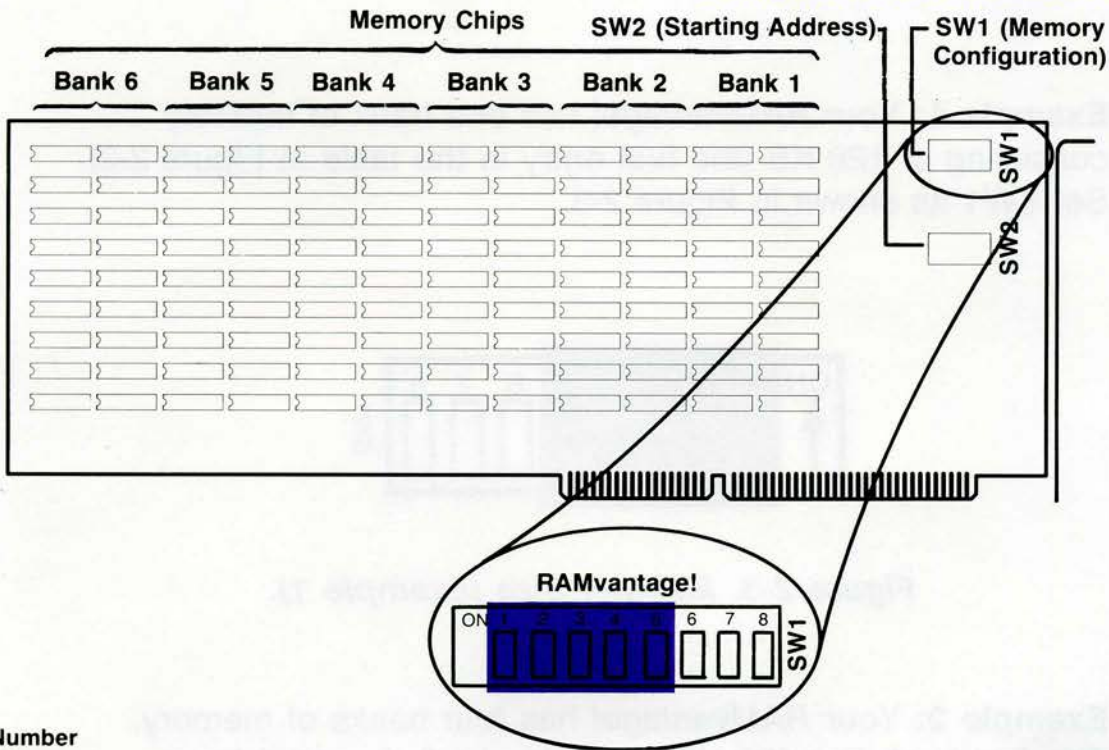
STEP 1

Configure the memory size: Figure 2-2 shows the settings for switch block SW1 on the *RAMvantage!*. This switch tells the board how much memory it has and how the memory chips are configured.

The switch settings in Figure 2-2 are separated into six groups according to the number of memory banks installed on *RAMvantage!*. Within each group, the settings are then broken down according to the number of banks populated with 128 KB (using 18 64-KB chips), and those populated with 512 KB (using 18 256-KB chips).

Figures 2-3 and 2-4 show examples of typical memory size switch configurations.

Configuration and Installation



Number of Rows Installed	Bank 1	Bank 2	Bank 3	Bank 4	Bank 5	Bank 6	SW1-1	SW1-2	SW1-3	SW1-4	SW1-5
1	128 KB						OFF	OFF	OFF	OFF	ON
1	512 KB						OFF	OFF	ON	ON	ON
2	128 KB	128 KB					OFF	OFF	OFF	ON	OFF
2	128 KB	512 KB					ON	OFF	OFF	OFF	OFF
2	512 KB	512 KB					OFF	ON	OFF	OFF	OFF
3	128 KB	128 KB	128 KB				OFF	OFF	OFF	ON	ON
3	128 KB	128 KB	512 KB				ON	OFF	ON	OFF	ON
3	128 KB	512 KB	512 KB				ON	OFF	OFF	OFF	ON
3	512 KB	512 KB	512 KB				OFF	ON	OFF	OFF	ON
4	128 KB	128 KB	128 KB	128 KB			OFF	OFF	ON	OFF	OFF
4	128 KB	128 KB	128 KB	512 KB			ON	ON	OFF	OFF	ON
4	128 KB	128 KB	512 KB	512 KB			ON	OFF	ON	ON	OFF
4	128 KB	512 KB	512 KB	512 KB			ON	OFF	OFF	ON	OFF
4	512 KB	512 KB	512 KB	512 KB			OFF	ON	OFF	ON	OFF
5	128 KB	128 KB	128 KB	128 KB	128 KB		OFF	OFF	ON	OFF	ON
5	128 KB	128 KB	128 KB	128 KB	512 KB		ON	ON	ON	OFF	OFF
5	128 KB	128 KB	128 KB	512 KB	512 KB		ON	ON	OFF	ON	OFF
5	128 KB	128 KB	512 KB	512 KB	512 KB		ON	OFF	ON	ON	ON
5	128 KB	512 KB	512 KB	512 KB	512 KB		ON	OFF	OFF	ON	ON
5	512 KB	512 KB	512 KB	512 KB	512 KB		OFF	ON	OFF	ON	ON
6	128 KB	128 KB	128 KB	128 KB	128 KB	128 KB	OFF	OFF	ON	ON	OFF
6	128 KB	128 KB	128 KB	128 KB	128 KB	512 KB	ON	ON	ON	ON	OFF
6	128 KB	128 KB	128 KB	128 KB	512 KB	512 KB	ON	ON	ON	OFF	ON
6	128 KB	128 KB	128 KB	512 KB	512 KB	512 KB	ON	ON	OFF	ON	ON
6	128 KB	128 KB	512 KB	512 KB	512 KB	512 KB	ON	ON	OFF	OFF	OFF
6	128 KB	512 KB	512 KB	512 KB	512 KB	512 KB	ON	OFF	ON	OFF	OFF
6	512 KB	512 KB	512 KB	512 KB	512 KB	512 KB	OFF	ON	ON	OFF	OFF

Figure 2-2. Setting RAMvantage! Memory Size.

Example 1: Your *RAMvantage!* has one bank of memory consisting of 128 KB (the first entry in the table in Figure 2-2). Set SW1 as shown in Figure 2-3.



Figure 2-3. Memory Size (Example 1).

Example 2: Your *RAMvantage!* has four banks of memory. The first bank has 128 KB, while banks 2, 3, and 4 have 512 KB. Set SW1 as shown in Figure 2-4.

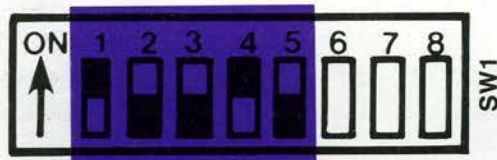


Figure 2-4. Memory Size (Example 2).

Set the switches to match the amount and configuration of memory on your *RAMvantage!*.

STEP 2

Configure the starting memory address: The next thing you need to tell *RAMvantage!* is where its memory will be located in the PC-AT's memory addressing range. You do this by setting SW2 on *RAMvantage!*.

When configuring SW2, please note:

- If you are using no other memory boards in your PC-AT, or if you are using the IBM 128-KB memory board, follow the instructions in this section.
- If you are using any other memory boards in your PC-AT (excluding the IBM 128-KB board), or if you are using more than one *RAMvantage!*, follow the instructions in Section 3.3, "If You Have Other Memory Boards".
- If you have 256 KB on your PC-AT system board, you must use Option #1 below to configure SW2. (You must also configure your PC-AT system board as instructed in Section 2.4 — or Appendix B — of this manual.)
- If you have 512 KB on your PC-AT system board, you can use Option #2 or #3 to configure SW2.
- Appendix A lists all possible starting address switch settings for *RAMvantage!*.

Select the starting memory address of *RAMvantage!* from one of the following three options, depending on the configuration of your PC-AT:

- *Option #1: Split Memory Addressing in a 256-KB PC-AT. This RAMvantage! configuration is mandatory in all 256-KB PC-ATs (Figure 2-5).*
- *Option #2: Split Memory Addressing in a 512-KB PC-AT (Figure 2-6).*
- *Option #3: Contiguous memory addressing in a 512-KB or 640-KB PC-AT (Figure 2-7).*

If the configuration you want does not fall into one of the above three categories, see Section 3.

Option #1: Split Memory Addressing in a 256-KB PC-AT. If your PC-AT has 256 KB on its system board, you must set SW2 as shown in Figure 2-5.

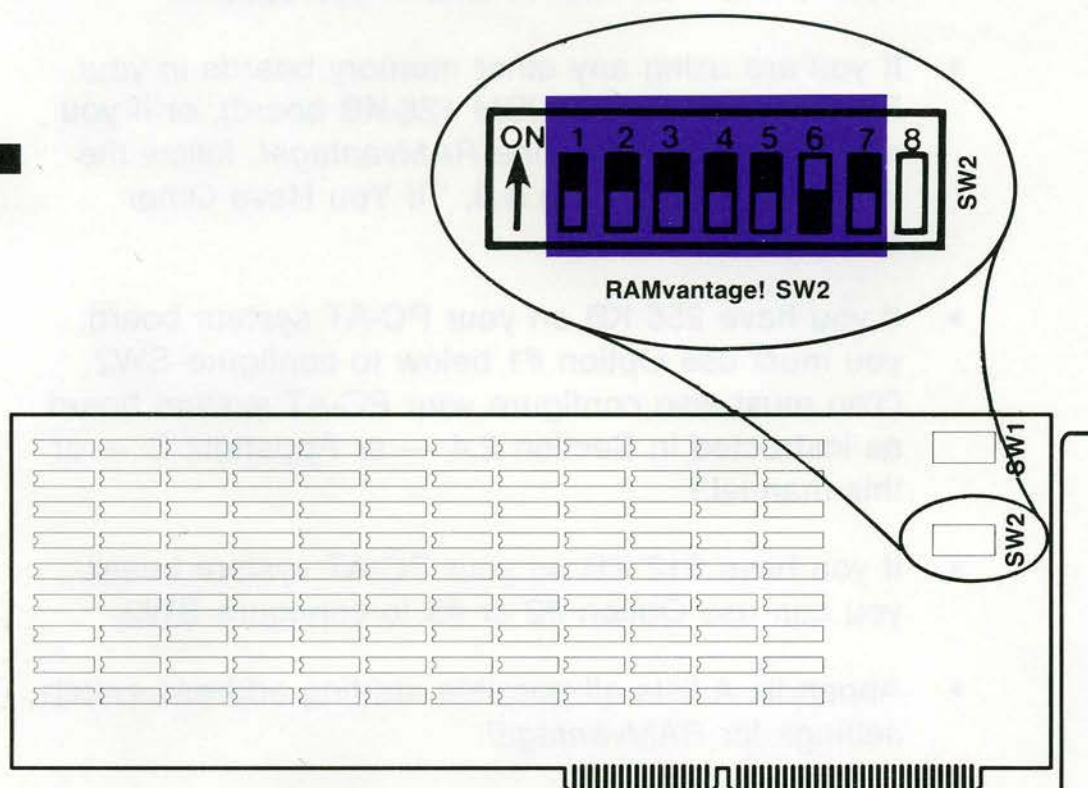


Figure 2-5. Split Memory Addressing in a 256-KB PC-AT.

In this configuration, the first 384 KB of memory on *RAMvantage!* is dedicated to rounding out the base memory area to its 640-KB maximum.

Please note the following facts regarding *RAMvantage!* installation in a 256-KB PC-AT:

- If *RAMvantage!* has more than 384 KB, the first 384 KB is used to round out the PC-AT's base memory to 640 KB. The remaining *RAMvantage!* memory is addressed as extended memory (not system board memory).
- If *RAMvantage!* has 384 KB or less on it, this memory is added to the PC-AT's 256-KB system board memory, for total base memory of 384, 512, or 640 KB. There would be no extended memory.
- If *RAMvantage!* has 384 KB or less on it, this memory is added to the PC-AT's 256-KB system board memory, for total base memory of 384, 512, or 640 KB. There would be no extended memory.
- If you are installing *RAMvantage!* in a 256-KB PC-AT, or if you are changing the PC-AT system board memory configuration at this time, *you must properly configure your PC-AT system board*. Step 4 (and Appendix B) tells you how to configure your PC-AT system board.

Option #2 : Split Memory Addressing in a 512-KB PC-AT.

If your PC-AT has 512 KB on its system board, you can use the first 128 KB of memory on *RAMvantage!* to round out the PC-AT's base memory area to its 640-KB maximum. Set SW2 as shown in Figure 2-6.

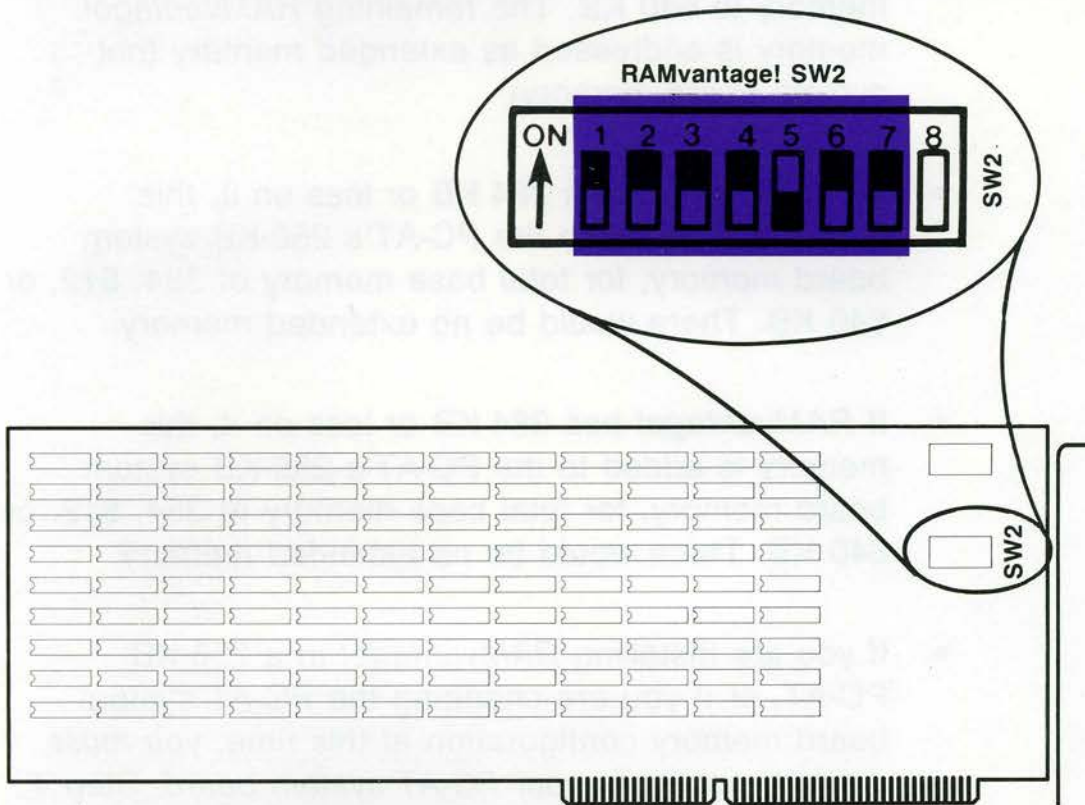


Figure 2-6. Split Memory Addressing in a 512-KB PC-AT.

In this configuration, the first 128 KB of memory on *RAMvantage!* rounds out the PC-AT base memory area to 640 KB.

- If *RAMvantage!* has exactly 128 KB on it, this memory is added to the 512-KB system board memory for total base memory of 640 KB. There would be no extended memory.

- If *RAMvantage!* has more than 128 KB, the first 128 KB is used to round out the base memory to 640 KB, with the remaining *RAMvantage!* memory addressed as extended memory.

Option #2 is useful if you are using applications software that can take advantage of a full 640 KB of base memory.

Option #3: Contiguous memory addressing in a 512-KB or 640-KB PC-AT. If your PC-AT has 512 KB on its system board, you can address all *RAMvantage!* memory as extended memory (see Figure 2-7). Use this option if you have the IBM 128-KB board in your PC-AT.

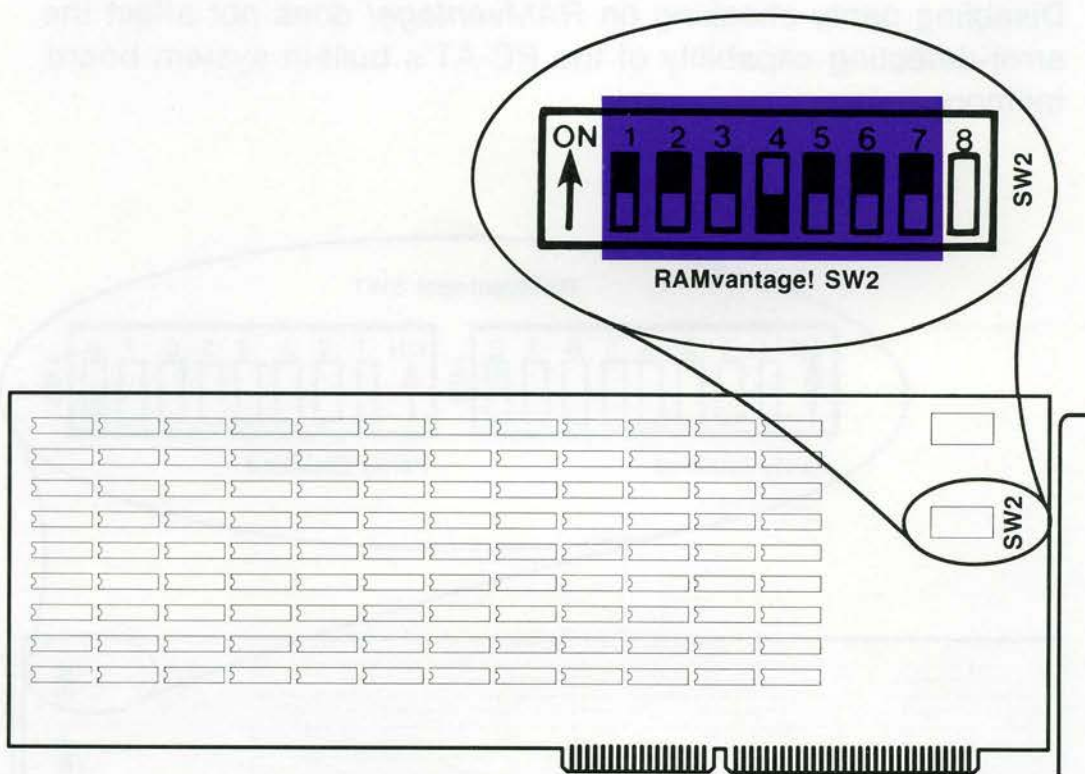


Figure 2-7. Contiguous Memory Addressing in a 512- or 640-KB PC-AT.

In this configuration, all *RAMvantage!* memory is used as extended memory. The 640-KB base area is not affected by the *RAMvantage!*.

STEP 3

Select error checking: *RAMvantage!* supports the PC-AT's memory error checking feature (called *parity checking*). When parity checking is enabled (SW1-8 ON), any memory error that occurs on *RAMvantage!* causes a parity error to be generated and an error message to appear on the screen. If an error occurs while parity checking is disabled (SW1-8 OFF), no message is generated and there is no way of knowing when an error occurs. You should leave this switch on (see Figure 2-8) so that memory errors will not go undetected. *RAMvantage!* is factory-configured with parity enabled.

Disabling parity checking on *RAMvantage!* does not affect the error-detecting capability of the PC-AT's built-in system board memory.

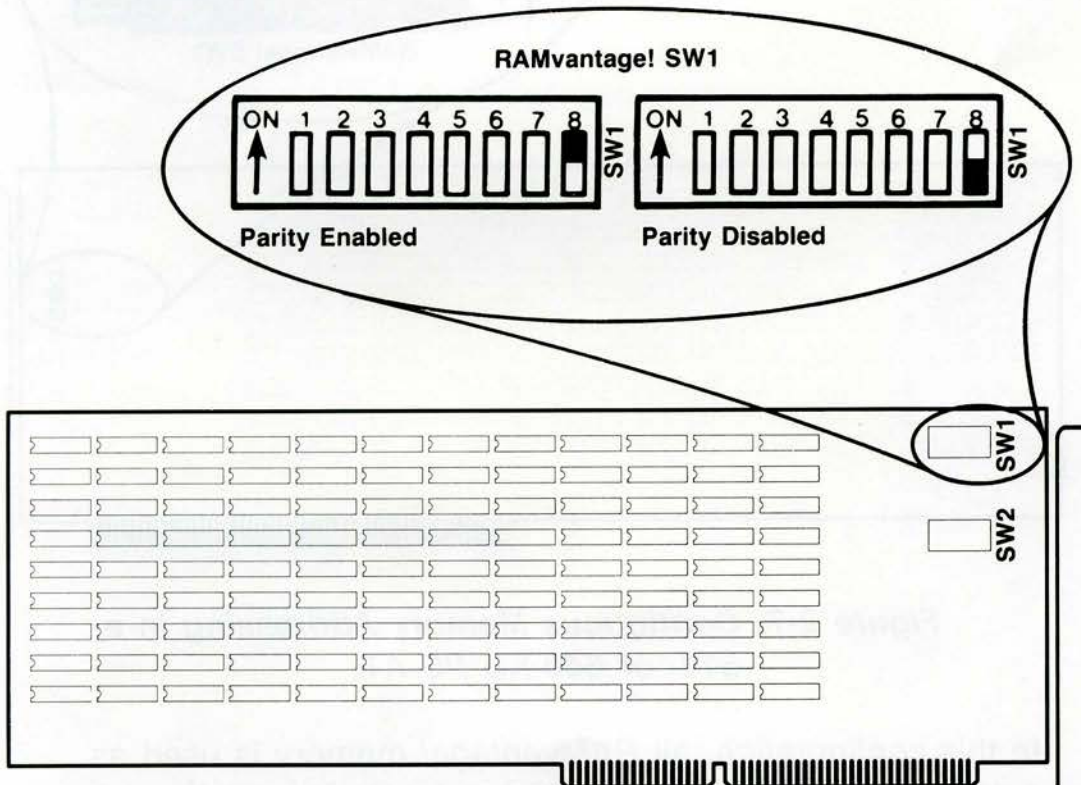


Figure 2-8. Enabling/Disabling Parity.

2.4 Installing *RAMvantage!* in the PC-AT

You can install the *RAMvantage!* board in any two-connector expansion slots on the PC-AT system board.

CAUTION

Be sure that the power is off and that the power cord is removed from the PC-AT before installing or removing any equipment.

STEP 1

Remove the PC-AT system cover: Refer to Section 2 of the IBM PC-AT *Installation and Setup* manual if you need instructions on removing the PC-AT system cover.

STEP 2

Verify PC-AT system board configuration:

NOTE

If your PC-AT is equipped with a 512-KB system board, it is not necessary to perform this step; proceed to STEP 3.

A jumper on the PC-AT system board (J18) determines the maximum amount of memory the system board will accept (see Figure 2-9). The J18 jumper is located underneath the disk controller board at the very front of the PC-AT chassis.

With the jumper in the 256-KB position, the system board will accept a maximum of 256 KB. With the jumper in the 512-KB position, the system board will accept a maximum of 512 KB.

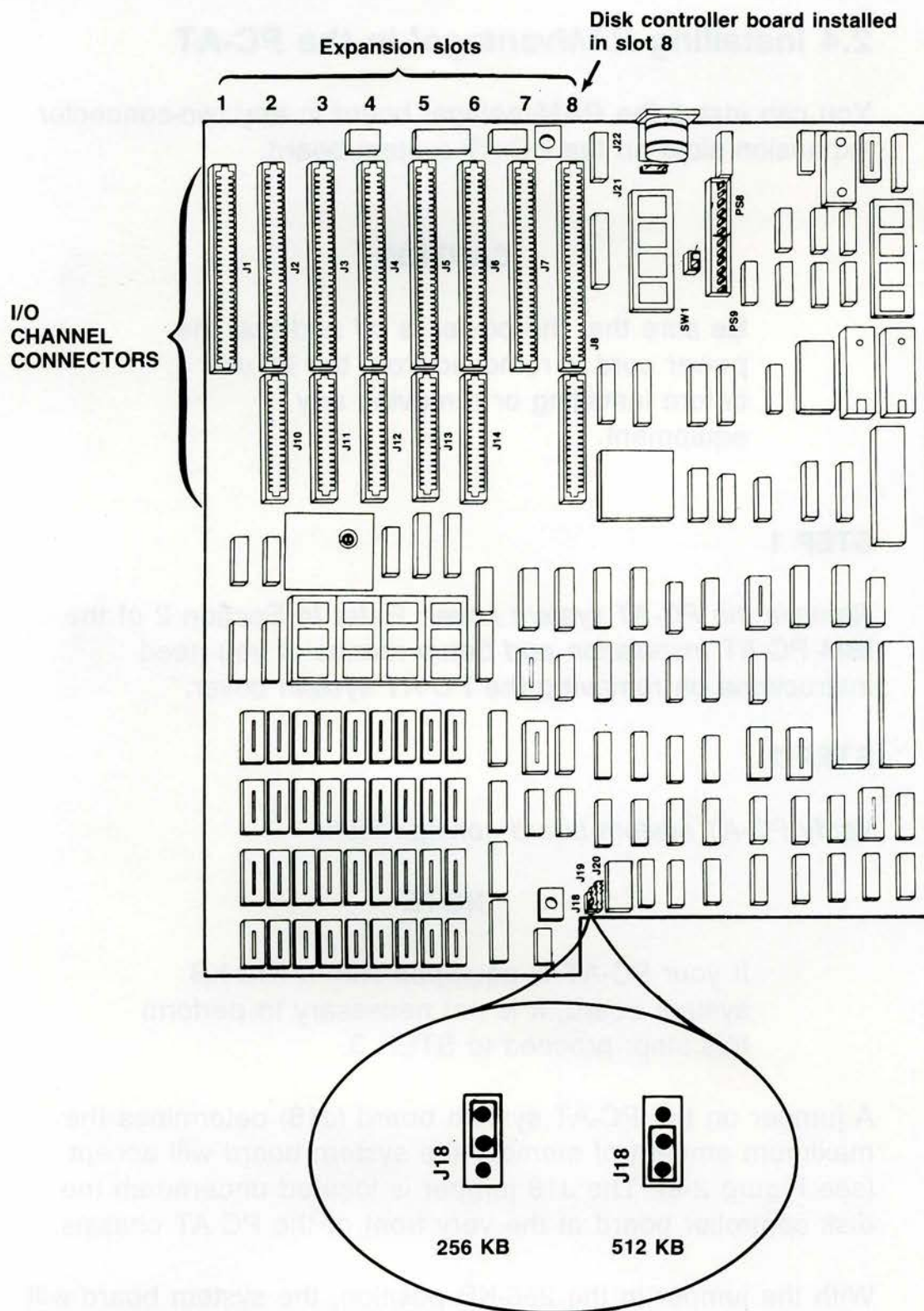


Figure 2-9. PC-AT System Board Memory Configuration Jumper J18.

Jumper J18 *must* be in the correct position to ensure reliable PC-AT operation:

- *If you have 256 KB on your system board and you are installing a memory board like RAMvantage!, the jumper must be in the 256-KB position.*
- *If you have 512 KB on your system board, the jumper must be in the 512-KB position.*

You might have to lift the disk controller board (installed in slot 8 — slot numbers are visible at the PC-AT back panel) to access jumper J18 (see Figure 2-10). To lift the controller board, remove the disk controller bracket screw and *carefully* lift up the board about 2 inches. Be careful not to put too much stress on the ribbon cables attached to the top of the disk controller board.

When you have the jumper correctly configured, reseal the disk controller board and secure its bracket to the PC-AT chassis with the screw.

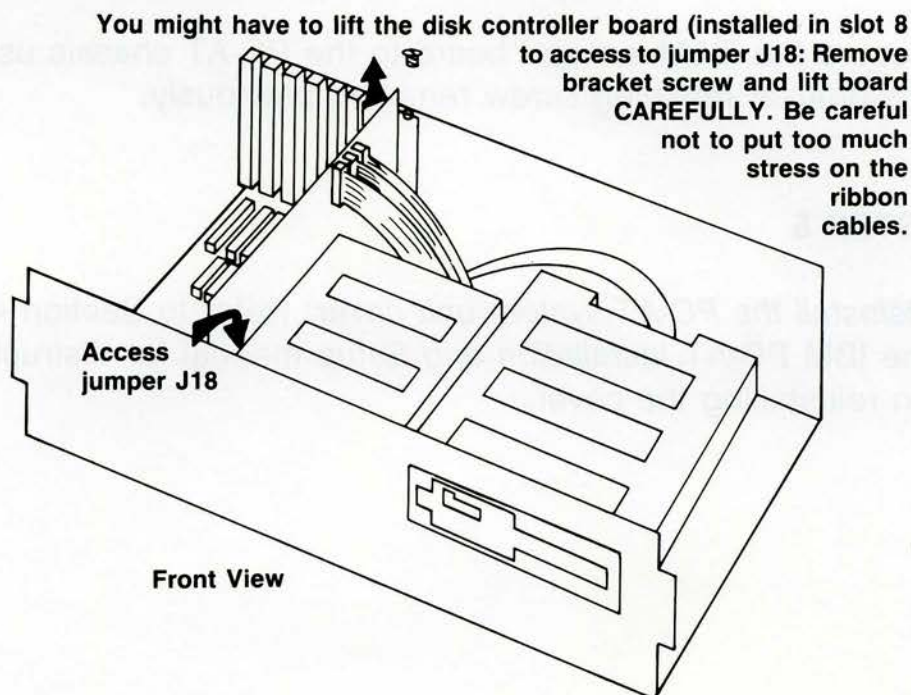


Figure 2-10. Lifting the Disk Controller Board.

STEP 3

Select an open expansion slot: You can install *RAMvantage!* into any of the two-connector PC-AT expansion slots.

Locate the metal bracket that covers the cutout in the back panel of the PC-AT chassis for the slot that you have selected. Remove and save the bracket-retaining screw using a small flathead screwdriver. Remove the bracket.

STEP 4

Install the RAMvantage! board: Line up your *RAMvantage!* board in the selected slot and position its front bottom corner in the plastic card guide channel at the front of the PC-AT chassis. Keeping the top of the *RAMvantage!* board level, lower the board until its gold edge connectors are aligned with the system board expansion slot connectors. Use an evenly distributed pressure to press the *RAMvantage!* board straight down until it seats in the expansion slot.

Secure the *RAMvantage!* board to the PC-AT chassis using the bracket retaining screw removed previously.

STEP 5

Reinstall the PC-AT system unit cover: Refer to Section 4 of the IBM PC-AT *Installation and Setup* manual for instructions on reinstalling the cover.

2.5 Running the PC-AT SETUP and Diagnostic Program

You must run the SETUP program whenever you change your PC-AT's system configuration by adding or removing memory:

STEP 1

Diagnostic program boot up: Boot the PC-AT with the IBM "Diagnostics for IBM Personal Computer AT" diskette. You can find this diskette at the back of the PC-AT *Guide to Operations* manual.

STEP 2

Run SETUP: The diagnostic should automatically detect that the memory configuration has changed, and begin the SETUP program (if not, select Option 4 — "SETUP" — from the menu). Answer the SETUP questions as appropriate for the new amount of system memory and extended memory in your PC-AT.

Some notes about the SETUP program:

- SETUP will ask you a number of questions about your PC-AT configuration that are unrelated to the *RAMvantage!* installation (for example, it verifies the type of floppy drive, monitor type, time and date, and so forth). There is no need to change any of these parameters unless one is in error. SETUP will ask you to verify correct memory configuration following these other questions.
- To change the amount of extended memory, you must first tell SETUP that you want to change the amount of base memory: re-enter the correct amount of base memory, then enter the new amount of extended memory.

- Appendix A includes two tables that can help you to compute the amount of extended memory in your PC-AT in KB (SETUP wants all information in KB):

Use Table A-1 to compute the amount of base and extended memory (as well as the net total memory) in either a 256- or 512-KB PC-AT, for all possible *RAMvantage!* configurations.

Table A-2 gives all the possible SW2 switch settings, and can also be used to convert memory size values between MB and KB (for example, 3 MB equals 3072 KB).

- When you enter the amount of base memory, 256, 384, 512, and 640 are all valid configurations (the screen display implies that 384 KB is not permitted).
- When you enter the amount of extended memory, the value you enter must be a multiple of 128 KB, beginning at zero (0, 128, 256, 384, and so forth) up to a maximum of 15360 (15 MB).
- Remember that if you have 256 KB on your PC-AT system board, *RAMvantage!* should be configured for Split Memory Addressing. Unless you have more than 256 KB of base memory (either by filling the system board with chips or by using Split Memory Addressing on *RAMvantage!*), SETUP will not recognize any extended memory.

After the system completes the Setup procedure, it will reboot and re-enter the diagnostics.

STEP 3

Test the new configuration: Referring to Section 2 of the IBM *Guide to Operations* manual for instructions, run the IBM PC-AT system diagnostics to test your new configuration.

This completes *RAMvantage!* installation.

SECTION 3

MEMORY CONFIGURATION

The advanced memory design characteristics of *RAMvantage!* make it very flexible. Besides adding up to 3 megabytes (MB) to your PC-AT, you can usually install *RAMvantage!* alongside other PC-AT-compatible memory boards (including other *RAMvantage!* boards) to increase memory capacity beyond 3 MB. The *RAMvantage!* also has a unique feature called *Split Memory Addressing*. This allows *RAMvantage!* to round out the PC-AT's base memory to its 640-kilobyte (KB) maximum, while also giving you additional memory in the PC-AT's 15-MB extended memory area.

This section describes the PC-AT's memory addressing capabilities and how you can use *RAMvantage!* to make the most of these features. This section also tells you how to extend *RAMvantage!* memory yourself, and how to use *RAMvantage!* along with other memory boards in your PC-AT.

3.1 PC-AT Memory Addressing

Figure 3-1 illustrates a simplified system memory map for the PC-AT.

If you are familiar with the standard IBM PC memory map, you will note that the first 1 MB of the PC-AT is organized the same as the PC: 640 KB of user memory, followed by 384 KB reserved for internal use by the computer. This adds up to 1 MB of memory, the maximum a standard PC can address at one time.

Memory Configuration

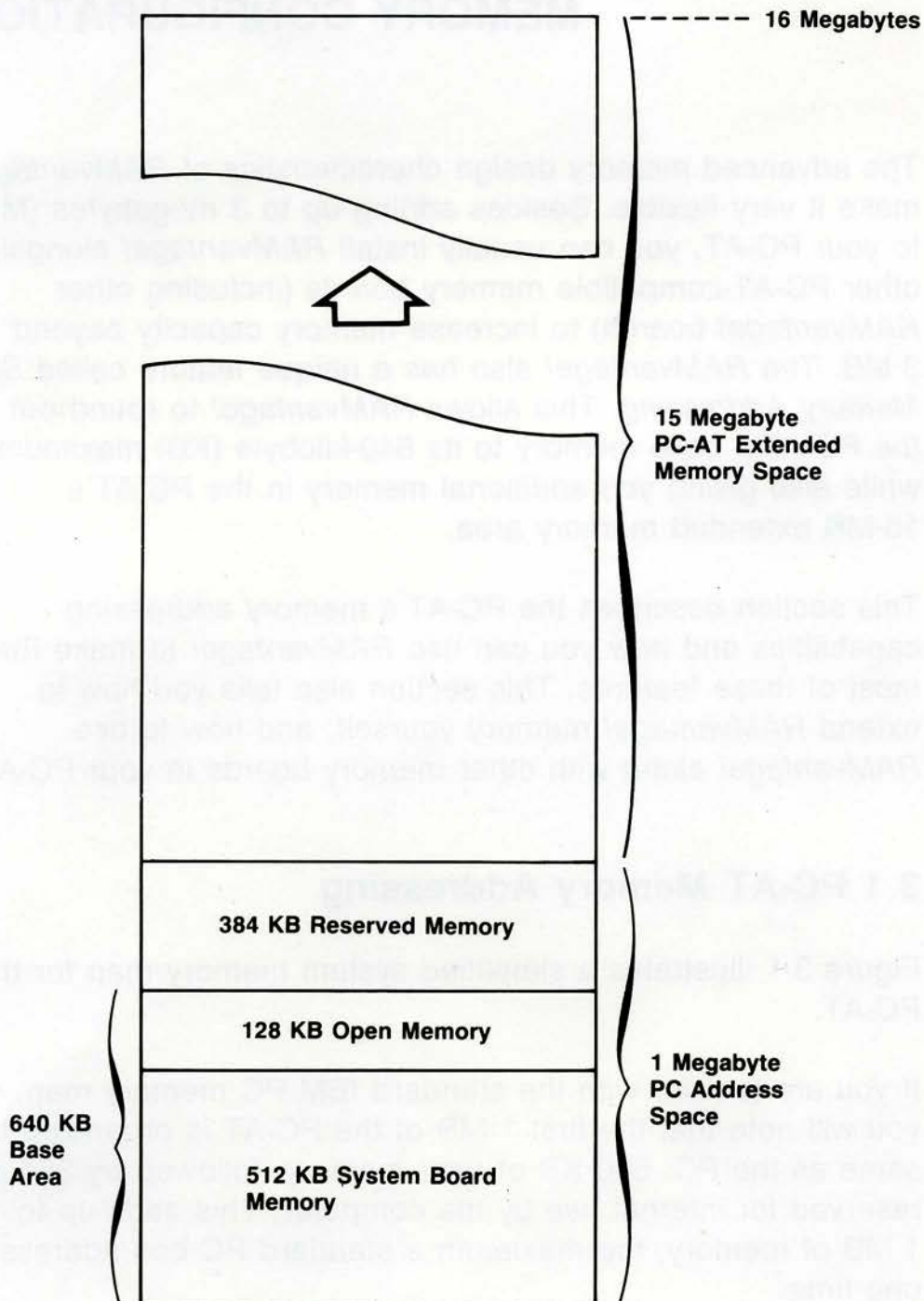


Figure 3-1. PC-AT System Memory Map.

The PC-AT, on the other hand, is capable of using memory above the 1-MB limit of the PC, up to a total of 16 MB. This additional 15-MB space in the PC-AT is called *extended memory*. The 640-KB space is called *base memory*.

3.1.1 The 640-KB Base Memory Area — Split Memory Addressing

The PC-AT system board comes populated with either 256 or 512 KB of memory. In either case, the PC-AT is short of its maximum 640-KB base memory. When your PC-AT has 512 KB on its system board, you can use a separate 128-KB board to bring the PC-AT's base memory up to its maximum of 640 KB. However, using the separate 128-KB board uses up an extra slot. Any additional extended memory boards also require further slots.

RAMvantage!, on the other hand, can be used to round out the base memory to a full 640 KB *and* provide extended memory. This feature is called *Split Memory Addressing*.

If your PC-AT has 256 KB on its system board, you *must* use the Split Memory Addressing feature on the *RAMvantage!*. In this case, *RAMvantage!* contributes up to 384 KB to the 640-KB base memory, depending on how much memory is available on *RAMvantage!*. If you have other than 256 or 512 KB in your PC-AT base memory (384 KB, for example), *RAMvantage!* must be used as extended memory only.

If your PC-AT has 512 KB on its system board, you have two options for configuring *RAMvantage!*:

- You can use Split Memory Addressing to round out the PC-AT's 640-KB base memory. Operating *RAMvantage!* in the split mode adds 128 KB to the PC-AT's 640-KB base memory.
- You can use all *RAMvantage!* memory as extended memory.

Memory Configuration

For example, let's say you have a 512-KB PC-AT and a 3-MB RAMVantage!, and you want to use Split Memory Addressing to round out the base memory of the AT to 640 KB. This results in 640 KB of base memory and 2.875 MB (3 MB minus 128 KB) of extended memory. Figure 3-2 shows this configuration.

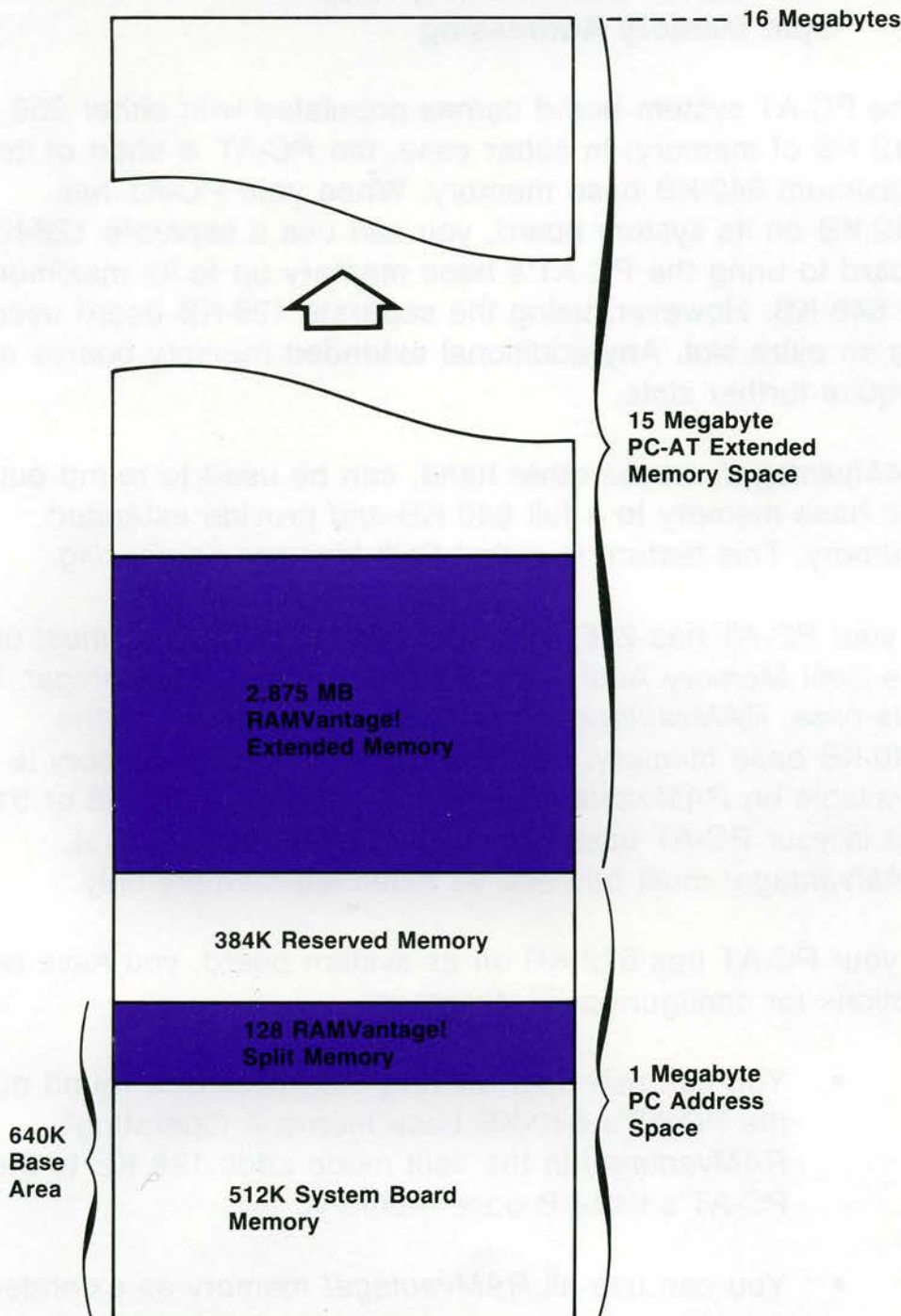


Figure 3-2. Split Memory Addressing (512-KB PC-AT and 3-MB RAMVantage! Board).

Of course, if you already have another 128-KB memory board, you can still use *RAMvantage!*; all of its memory will be located in the PC-AT's 15-MB extended memory area.

The *RAMvantage!* Split Memory Addressing feature is enabled or disabled when you set the board's starting address with Switch SW2. This topic is discussed in detail in Section 3.2.

You can use Split Memory Addressing even if you have insufficient memory on *RAMvantage!* to round out the PC-AT's base area to a full 640 KB. In this case, whatever is available on *RAMvantage!* is added to the existing PC-AT system board memory, and none of the *RAMvantage!* memory will be addressed as extended memory.

As your memory needs grow, you can add more memory chips to *RAMvantage!* to round out the 640-KB base memory and provide extended memory.

3.1.2 The 15-MB Extended Memory Area

Beginning at the 1-MB address, there is 15 MB of extended memory space in the PC-AT. This space can be used for Random Access Memory (RAM) disks such as IBM's VDISK.SYS utility, or for multiuser operating systems such as XENIX™. In addition, application software designed to run in the PC-AT's "protected mode" can also use this memory. Figure 3-1 illustrates this 15-MB area.

Memory installed in the 15-MB extended memory area must be contiguous, and must start at the 1-MB address boundary. No gaps are allowed.

3.1.3 PC-AT System Board Memory Configuraton

You can set jumper J18 on the PC-AT system board to configure it for a maximum of 256 or 512 KB of system memory. Whenever you add or remove chips on the system board, or when you install a *RAMvantage!* board, you should verify correct configuration of this jumper. Appendix B tells you how to configure this jumper.

3.2 Setting the *RAMvantage!* Starting Memory Address

You must set the *RAMvantage!* starting memory address so that it fits into the PC-AT system memory map without conflicting with other memory. *RAMvantage!* (along with any other memory boards) must also fit into the memory map in such a way that there are no gaps.

Switch Block SW2 on *RAMvantage!* is used to set its starting address. If you are using no other memory boards or if you have only the IBM 128-KB board, the instructions in Section 2.3, Step 2, tell you how to set SW2 on *RAMvantage!*.

Appendix A illustrates all the possible combinations of settings for SW2 on *RAMvantage!*.

3.3 If You Have Other Memory Boards

RAMvantage! can usually be installed along with other PC-AT memory boards, including IBM's, without causing any problems. However, you must be careful to set the starting addresses for each board so they do not conflict with each other.

NOTE

If the only other memory board in your PC-AT is the IBM 128-KB board, use the recommended settings in Figure 2-5 (Section 2) for SW2 on *RAMvantage!*.

3.3.1 Installing a Board “Below” *RAMvantage!*

To address another memory board “below” *RAMvantage!*, follow this procedure:

STEP 1

Using the instructions supplied with the other board, configure the other board so its starting address is at 1 MB. If you are using more than one board below *RAMvantage!*, ensure that they do not conflict with each other and that they occupy contiguous memory starting at 1 MB.

STEP 2

If necessary, disable any unused memory sockets on the other boards so they won't conflict with each other or with *RAMvantage!*. If you cannot disable unused sockets on a board, the other board should be addressed “above” *RAMvantage!* (refer to Section 3.3.2). If the other board has switch settings for the amount of memory on it, then it will probably automatically disable any unused memory sockets.

STEP 3

Set the *RAMvantage!* starting address to 1 MB plus the size of the other board(s).

For example, if the other board has 512 KB of memory, set the *RAMvantage!* starting address to 1.5 MB (hexadecimal address :180000 — see Appendix A).

STEP 4

Install the cards and run the PC-AT's SETUP program to tell it the new amounts of: (1) base memory and (2) extended memory. You can use the tables in Appendix A to convert MB to KB (SETUP requires information in KB).

3.3.2 Installing a Board “Above” *RAMvantage!*

To address another board above *RAMvantage!*, follow this procedure:

STEP 1

Set the *RAMvantage!* starting address to one of the first three entries in the tables in Appendix A. Use the first entry if your PC-AT has 256 KB on the system board. Use the second entry if your PC-AT has 512 KB on the system board and you want to use Split Memory Addressing. Use the third entry if you do not want Split Memory Addressing or if you have the IBM 128-KB board.

STEP 2

Referring to the instructions supplied with the other board, set the other board's starting address to 1 MB plus the amount of *extended* memory on *RAMvantage!*.

For example, if *RAMvantage!* has 1.5 MB of extended memory on it, you would set the other board's starting address at 2.5 MB (hexadecimal address :280000).

If you use Split Memory Addressing on *RAMvantage!*, remember that the amount of extended memory is the total *RAMvantage!* memory minus the amount it contributes to the 640-KB user memory area.

Using the above example, a 1.5 MB *RAMvantage!* with Split Memory Addressing enabled in a 512-KB PC-AT would have 1.375 MB of extended memory (1.5 MB minus 128 KB), so you would set the other board's starting address at 2.375 megabytes (1 MB + 1.375 MB), which is hexadecimal address :260000.

STEP 3

Run the PC-AT's SETUP program and configure it for the new amounts of (1) base memory and (2) extended memory. You can use the tables in Appendix A to convert MB to KB (SETUP requires information in KB).

3.4 Installing Additional Memory on *RAMvantage!*

On *RAMvantage!*, a memory bank which is populated with 18 64-KB memory chips contains 128 KB of memory, while a bank populated with 18 256-KB memory chips contains 512 KB of memory:

18 64-KB chips = 128 KB (64 K 16-bit words)

18 256-KB chips = 512 KB (256 K 16-bit words)

You can upgrade a *RAMvantage!* that is not fully populated simply by plugging in additional memory chips. You can also upgrade from 64-KB chips to 256-KB chips.

AST Research offers 128-KB memory upgrade kits for *RAMvantage!*, consisting of 18 64-KB chips (order AST part number MPAD-128).

AST also offers 512-KB memory upgrade kits consisting of 18 256-KB chips (order AST part number MPAD-512).

3.4.1 Memory Chip Specifications

If you purchase memory chips from another source, be sure they meet the following specifications.

64-KB Chip Specifications: Use 64-KB Dynamic Random Access Memory (DRAM) with these characteristics:

150 nanosecond (ns) access time

Pin 1 not used

+ 5 Volt Only

Memory Configuration

The following 64-KB memory chips are compatible:

Micron Technology MT4264N-2 or MT4264N-15
Hitachi HM4864P-2
NEC UPD4164C-3 or UPD4164C-15
Motorola MCM6665AP-15 or MCM6665BP-15 or
MCM4164BP15
Fujitsu MB8264-15P
Texas Instruments TMS4164-15NL

256-KB Chip Specifications: Use 256-KB Dynamic Random Access Memory (DRAM) with these characteristics:

150 nanosecond (ns) access time

The following 256-KB memory chips are compatible:

AT&T WCM41256FX-15
Fujitsu MB81256-15P
NEC UPD41256C-15
Hitachi HM50256P-15
Mitsubishi M5M4256P-15
Texas Instruments TMS4256-15NL
Toshiba TMM41256P-15

3.4.2 Populating the Memory Banks with Memory Chips

Figure 3-3 illustrates the arrangement of the banks of memory chips on *RAMvantage!*.

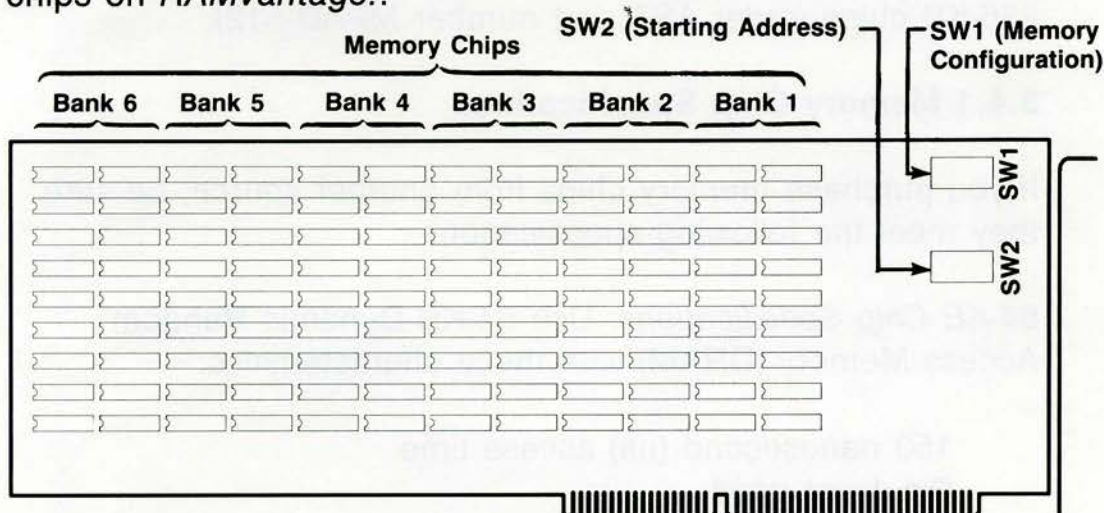


Figure 3-3. Memory Bank Configuration.

The *RAMvantage!* board can have up to six banks of memory on it, numbered 1 through 6. This provides up to 3 MB in the space of a single PC-AT expansion slot.

When adding memory to *RAMvantage!*, remember:

- The memory banks on *RAMvantage!* must be populated in sequential order. You cannot have an empty bank of sockets in between two populated banks.
- Whenever you add or remove memory on *RAMvantage!*, be sure to reset SW1 to reflect the new memory configuration on the board (see Section 3.5).
- You must run the PC-AT's SETUP program whenever you add or remove memory from the PC-AT.

3.4.3 Mixing 64- and 256-KB Memory Chips

When mixing 64- and 256-KB chips on the same board, remember:

- Each bank of 18 chips must be populated entirely, using one type of chip. You cannot intermix 64- and 256-KB chips in the same bank.
- Once a bank of 256-KB chips is installed, all the following banks must use only 256-KB chips. For example, if you have 64-KB chips in banks 1 and 2, and you install 256-KB chips in banks 3 through 6.

3.5 Setting the Memory Size of *RAMvantage!*

SW1 on *RAMvantage!* tells the board how much memory is installed on it. The diagram in Figure 3-4 shows you the location and settings of SW1 and the memory banks on *RAMvantage!*.

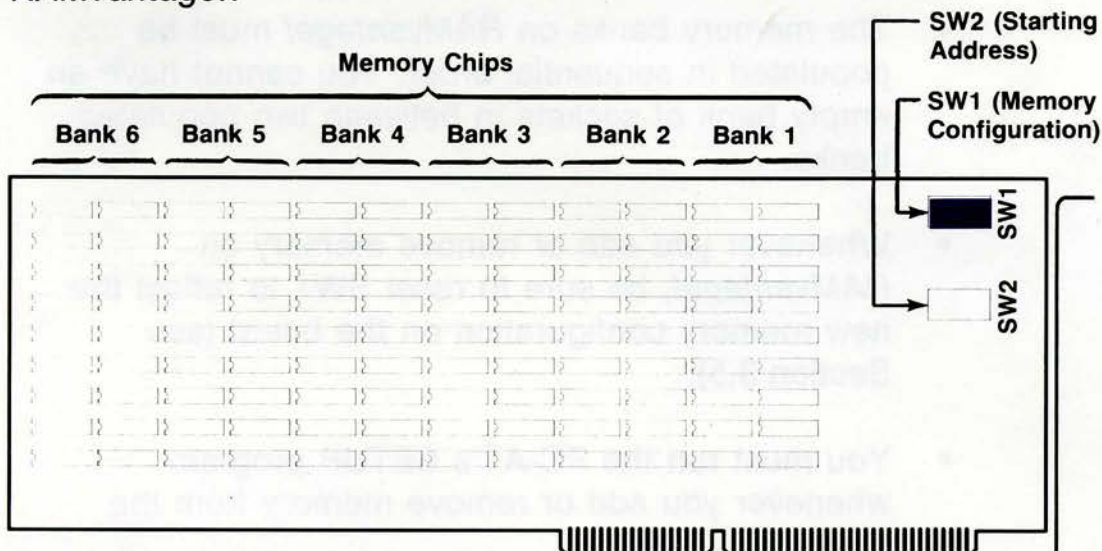


Figure 3-4. SW1 and Memory Banks.

The switch settings in Figure 3-4 are separated into six groups according to the number of memory banks installed on *RAMvantage!*; one bank of memory, two banks of memory, and so forth. Within each group, the settings are then broken down according to the number of banks populated with 128 KB (using 64-KB chips), and the number of banks populated with 512 KB (using 256-KB chips).

Figures 3-5 and 3-6 show examples of typical memory size switch configurations.

Example 1:

Your *RAMvantage!* has one bank of memory consisting of 128 KB. Use the first entry in the table to set SW1 as shown in Figure 3-5.



Figure 3-5. Memory Size (Example #1).

Example 2:

Your *RAMvantage!* has four banks of memory and the first bank has 128 KB while banks 2, 3, and 4 have 512 KB. Set SW1 as shown in Figure 3-6.

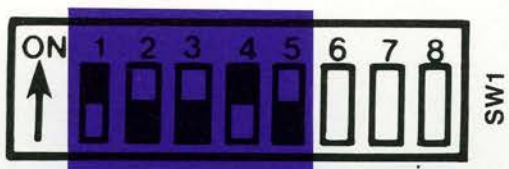


Figure 3-6. Memory Size (Example #2).

Set the switches to match the amount of memory on your *RAMvantage!*.

Example 1:

Your RAS/Manager has one bank of memory consisting of 128 KB. Use the first entry in the table to set 256 KB as shown in Figure 3-5.



Figure 3-5. Memory Size (Example 1)

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Example 2:

Your RAS/Manager has four banks of memory and the first bank has 128 KB, while banks 2, 3, and 4 have 256 KB. Set 256 KB as shown in Figure 3-6.



Figure 3-6. Memory Size (Example 2)

Set the switches to match the amount of memory on your RAS/Manager.

APPENDIX A

MEMORY CONFIGURATION INFORMATION

This appendix contains information relating to *RAMvantage!* memory configuration:

- Table A-1 tells you how to compute the amount of base and extended memory in the PC-AT, based on the configuration of *RAMvantage!*.
- Table A-2 lists all possible starting addresses of *RAMvantage!* and the corresponding settings for SW2 on the board.

In Table A-2, the first two table entries are for Split Memory Addressing in an PC-AT with 256 or 512 kilobytes (KB). All other switch settings put *RAMvantage!* into the contiguous addressing mode.

Table A-1. Split Memory Addressing Memory Allocation.

TOTAL MEMORY ROWS POPULATED	NUMBER ROWS 64 KB CHIPS	NUMBER ROWS 256 KB CHIPS	TOTAL RAMVANTAGE! MEM. (KB)	256 KB PC-AT			512 KB PC-AT		
				BASE MEM.	EXTENDED MEM.	TOTAL MEM.	BASE MEM.	EXTENDED MEM.	TOTAL MEM.
1	1	0	128	384	0	384	640	0	640
1	0	1	512	640	128	768	640	384	1024
2	2	0	256	512	0	512	640	128	768
2	1	1	640	640	256	896	640	512	1152
2	0	2	1024	640	640	1280	640	896	1536
3	3	0	384	640	0	640	640	256	896
3	2	1	768	640	384	1024	640	640	1280
3	1	2	1152	640	768	1408	640	1024	1664
3	0	3	1536	640	1152	1792	640	1408	2048
4	4	0	512	640	128	768	640	384	1024
4	3	1	896	640	512	1152	640	768	1408
4	2	2	1280	640	896	1536	640	1152	1792
4	1	3	1664	640	1280	1920	640	1536	2176
4	0	4	2048	640	1664	2304	640	1920	2560
5	5	0	640	640	256	896	640	512	1152
5	4	1	896	640	512	1152	640	768	1408
5	3	2	1408	640	1024	1664	640	1280	1920
5	2	3	1792	640	1408	2048	640	1664	2304
5	1	4	2176	640	1792	2432	640	2048	2688
5	0	5	2560	640	2176	2816	640	2432	3072
6	6	0	768	640	384	1024	640	640	1280
6	5	1	1152	640	768	1408	640	1024	1664
6	4	2	1536	640	1152	1792	640	1408	2048
6	3	3	1920	640	1536	2176	640	1792	2432
6	2	4	2304	640	1920	2560	640	2176	2816
6	1	5	2688	640	2304	2944	640	2560	3200
6	0	6	3072	640	2688	3328	640	2944	3584

Conversion Chart for calculating the amount of base memory and expansion memory in the PC-AT when using split memory addressing on the RAMvantage!

RAMvantage and PC-AT Memory Configuration Information

Table A-2. Switch Block #2 Settings (Starting Address).

RAMVANTAGE! START ADDRESS (MEGABYTES)	RAMVANTAGE! START ADDRESS (K-BYTES)	RAMVANTAGE! START ADDRESS (HEXADECIMAL)	RAMVANTAGE! SWITCH BLOCK #2						
			SW1	SW2	SW3	SW4	SW5	SW6	SW7
0.250	256	040000	ON	ON	ON	ON	ON	OFF	ON
0.500	512	080000	ON	ON	ON	ON	OFF	ON	ON
1.000	1024	100000	ON	ON	ON	OFF	ON	ON	ON
1.125	1152	120000	ON	ON	ON	OFF	ON	ON	OFF
1.250	1280	140000	ON	ON	ON	OFF	ON	OFF	ON
1.375	1408	160000	ON	ON	ON	OFF	ON	OFF	OFF
1.500	1536	180000	ON	ON	ON	OFF	OFF	ON	ON
1.625	1664	1A0000	ON	ON	ON	OFF	OFF	ON	OFF
1.750	1792	1C0000	ON	ON	ON	OFF	OFF	OFF	ON
1.875	1920	1E0000	ON	ON	ON	OFF	OFF	OFF	OFF
2.000	2048	200000	ON	ON	OFF	ON	ON	ON	ON
2.125	2176	220000	ON	ON	OFF	ON	ON	ON	OFF
2.250	2304	240000	ON	ON	OFF	ON	ON	OFF	ON
2.375	2432	260000	ON	ON	OFF	ON	ON	OFF	OFF
2.500	2560	280000	ON	ON	OFF	ON	OFF	ON	ON
2.625	2688	2A0000	ON	ON	OFF	ON	OFF	ON	OFF
2.750	2816	2C0000	ON	ON	OFF	ON	OFF	OFF	ON
2.875	2944	2E0000	ON	ON	OFF	ON	OFF	OFF	OFF
3.000	3072	300000	ON	ON	OFF	OFF	ON	ON	ON
3.125	3200	320000	ON	ON	OFF	OFF	ON	ON	OFF
3.250	3328	340000	ON	ON	OFF	OFF	ON	OFF	ON
3.375	3456	360000	ON	ON	OFF	OFF	ON	OFF	OFF
3.500	3584	380000	ON	ON	OFF	OFF	OFF	ON	ON
3.625	3712	3A0000	ON	ON	OFF	OFF	OFF	ON	OFF
3.750	3840	3C0000	ON	ON	OFF	OFF	OFF	OFF	ON
3.875	3968	3E0000	ON	ON	OFF	OFF	OFF	OFF	OFF
4.000	4096	400000	ON	OFF	ON	ON	ON	ON	ON
4.125	4224	420000	ON	OFF	ON	ON	ON	ON	OFF
4.250	4352	440000	ON	OFF	ON	ON	ON	OFF	ON
4.375	4480	460000	ON	OFF	ON	ON	ON	OFF	OFF
4.500	4608	480000	ON	OFF	ON	ON	OFF	ON	ON
4.625	4736	4A0000	ON	OFF	ON	ON	OFF	ON	OFF
4.750	4864	4C0000	ON	OFF	ON	ON	OFF	OFF	ON
4.875	4992	4E0000	ON	OFF	ON	ON	OFF	OFF	OFF
5.000	5120	500000	ON	OFF	ON	OFF	ON	ON	ON
5.125	5248	520000	ON	OFF	ON	OFF	ON	ON	OFF
5.250	5376	540000	ON	OFF	ON	OFF	ON	OFF	ON
5.375	5504	560000	ON	OFF	ON	OFF	ON	OFF	OFF
5.500	5632	580000	ON	OFF	ON	OFF	OFF	ON	ON
5.625	5760	5A0000	ON	OFF	ON	OFF	OFF	ON	OFF
5.750	5888	5C0000	ON	OFF	ON	OFF	OFF	OFF	ON
5.875	6016	5E0000	ON	OFF	ON	OFF	OFF	OFF	OFF
6.000	6144	600000	ON	OFF	OFF	ON	ON	ON	ON

Table A-2. Switch Block #2 Settings (Starting Address) Continued

RAMVANTAGE! START ADDRESS (MEGABYTES)	RAMVANTAGE! START ADDRESS (K-BYTES)	RAMVANTAGE! START ADDRESS (HEXADECIMAL)	RAMVANTAGE! SWITCH BLOCK #2						
			SW1	SW2	SW3	SW4	SW5	SW6	SW7
6.125	6272	620000	ON	OFF	OFF	ON	ON	ON	OFF
6.250	6400	640000	ON	OFF	OFF	ON	ON	OFF	ON
6.375	6528	660000	ON	OFF	OFF	ON	ON	OFF	OFF
6.500	6656	680000	ON	OFF	OFF	ON	OFF	ON	ON
6.625	6784	6A0000	ON	OFF	OFF	ON	OFF	ON	OFF
6.750	6912	6C0000	ON	OFF	OFF	ON	OFF	OFF	ON
6.875	7040	6E0000	ON	OFF	OFF	ON	OFF	OFF	OFF
7.000	7168	700000	ON	OFF	OFF	OFF	ON	ON	ON
7.125	7296	720000	ON	OFF	OFF	OFF	ON	ON	OFF
7.250	7424	740000	ON	OFF	OFF	OFF	ON	OFF	ON
7.375	7552	760000	ON	OFF	OFF	OFF	ON	OFF	OFF
7.500	7680	780000	ON	OFF	OFF	OFF	OFF	ON	ON
7.625	7808	7A0000	ON	OFF	OFF	OFF	OFF	ON	OFF
7.750	7936	7C0000	ON	OFF	OFF	OFF	OFF	OFF	ON
7.875	8064	7E0000	ON	OFF	OFF	OFF	OFF	OFF	OFF
8.000	8192	800000	OFF	ON	ON	ON	ON	ON	ON
8.125	8320	820000	OFF	ON	ON	ON	ON	ON	OFF
8.250	8448	840000	OFF	ON	ON	ON	ON	OFF	ON
8.375	8576	860000	OFF	ON	ON	ON	ON	OFF	OFF
8.500	8704	880000	OFF	ON	ON	ON	OFF	ON	ON
8.625	8832	8A0000	OFF	ON	ON	ON	OFF	ON	OFF
8.750	8960	8C0000	OFF	ON	ON	ON	OFF	OFF	ON
8.875	9088	8E0000	OFF	ON	ON	ON	OFF	OFF	OFF
9.000	9216	900000	OFF	ON	ON	OFF	ON	ON	ON
9.125	9344	920000	OFF	ON	ON	OFF	ON	ON	OFF
9.250	9472	940000	OFF	ON	ON	OFF	ON	OFF	ON
9.375	9600	960000	OFF	ON	ON	OFF	ON	OFF	OFF
9.500	9728	980000	OFF	ON	ON	OFF	OFF	ON	ON
9.625	9856	9A0000	OFF	ON	ON	OFF	OFF	ON	OFF
9.750	9984	9C0000	OFF	ON	ON	OFF	OFF	OFF	ON
9.875	10112	9E0000	OFF	ON	ON	OFF	OFF	OFF	OFF
10.000	10240	A00000	OFF	ON	OFF	ON	ON	ON	ON
10.125	10368	A20000	OFF	ON	OFF	ON	ON	ON	OFF
10.250	10496	A40000	OFF	ON	OFF	ON	ON	OFF	ON
10.375	10624	A60000	OFF	ON	OFF	ON	ON	OFF	OFF
10.500	10752	A80000	OFF	ON	OFF	ON	OFF	ON	ON
10.625	10880	AA0000	OFF	ON	OFF	ON	OFF	ON	OFF
10.750	11008	AC0000	OFF	ON	OFF	ON	OFF	OFF	ON
10.875	11136	AE0000	OFF	ON	OFF	ON	OFF	OFF	OFF
11.000	11264	B00000	OFF	ON	OFF	OFF	ON	ON	ON
11.125	11392	B20000	OFF	ON	OFF	OFF	ON	ON	OFF
11.250	11520	B40000	OFF	ON	OFF	OFF	ON	OFF	ON
11.375	11648	B60000	OFF	ON	OFF	OFF	ON	OFF	OFF
11.500	11776	B80000	OFF	ON	OFF	OFF	OFF	ON	ON

Table A-2. Switch Block #2 Settings (Starting Address) Continued

RAMVANTAGE! START ADDRESS (MEGABYTES)	RAMVANTAGE! START ADDRESS (K-BYTES)	RAMVANTAGE! START ADDRESS (HEXADECIMAL)	RAMVANTAGE! SWITCH BLOCK #2						
			SW1	SW2	SW3	SW4	SW5	SW6	SW7
11.625	11904	BA0000	OFF	ON	OFF	OFF	OFF	ON	OFF
11.750	12032	BC0000	OFF	ON	OFF	OFF	OFF	OFF	ON
11.875	12160	BE0000	OFF	ON	OFF	OFF	OFF	OFF	OFF
12.000	12288	C00000	OFF	OFF	ON	ON	ON	ON	ON
12.125	12416	C20000	OFF	OFF	ON	ON	ON	ON	OFF
12.250	12544	C40000	OFF	OFF	ON	ON	ON	OFF	ON
12.375	12672	C60000	OFF	OFF	ON	ON	ON	OFF	OFF
12.500	12800	C80000	OFF	OFF	ON	ON	OFF	ON	ON
12.625	12928	CA0000	OFF	OFF	ON	ON	OFF	ON	OFF
12.750	13056	CC0000	OFF	OFF	ON	ON	OFF	OFF	ON
12.875	13184	CE0000	OFF	OFF	ON	ON	OFF	OFF	OFF
13.000	13312	D00000	OFF	OFF	ON	OFF	ON	ON	ON
13.125	13440	D20000	OFF	OFF	ON	OFF	ON	ON	OFF
13.250	13568	D40000	OFF	OFF	ON	OFF	ON	OFF	ON
13.375	13696	D60000	OFF	OFF	ON	OFF	ON	OFF	OFF
13.500	13824	D80000	OFF	OFF	ON	OFF	OFF	ON	ON
13.625	13952	DA0000	OFF	OFF	ON	OFF	OFF	ON	OFF
13.750	14080	DC0000	OFF	OFF	ON	OFF	OFF	OFF	ON
13.875	14208	DE0000	OFF	OFF	ON	OFF	OFF	OFF	OFF
14.000	14336	E00000	OFF	OFF	OFF	ON	ON	ON	ON
14.125	14464	E20000	OFF	OFF	OFF	ON	ON	ON	OFF
14.250	14592	E40000	OFF	OFF	OFF	ON	ON	OFF	ON
14.375	14720	E60000	OFF	OFF	OFF	ON	ON	OFF	OFF
14.500	14848	E80000	OFF	OFF	OFF	ON	OFF	ON	ON
14.625	14976	EA0000	OFF	OFF	OFF	ON	OFF	ON	OFF
14.750	15104	EC0000	OFF	OFF	OFF	ON	OFF	OFF	ON
14.875	15232	EE0000	OFF	OFF	OFF	ON	OFF	OFF	OFF
15.000	15360	F00000	OFF	OFF	OFF	OFF	ON	ON	ON
15.125	15488	F20000	OFF	OFF	OFF	OFF	ON	ON	OFF
15.250	15616	F40000	OFF	OFF	OFF	OFF	ON	OFF	ON
15.375	15744	F60000	OFF	OFF	OFF	OFF	ON	OFF	OFF
15.500	15872	F80000	OFF	OFF	OFF	OFF	OFF	ON	ON
15.625	16000	FA0000	OFF	OFF	OFF	OFF	OFF	ON	OFF
15.750	16128	FC0000	OFF	OFF	OFF	OFF	OFF	OFF	ON
15.875	16256	FE0000	OFF	OFF	OFF	OFF	OFF	OFF	OFF

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APPENDIX B

CONFIGURING PC-AT SYSTEM BOARD MEMORY

You only need to reconfigure PC-AT system board memory if:

- You are installing *RAMvantage!* in a 256-kilobyte (KB) PC-AT.
- You are expanding a 256-KB PC-AT system board to 512 KB by plugging in additional memory chips.
- You are depopulating a 512-KB PC-AT system board to 256 KB.
- You are not sure if the PC-AT system board is properly configured.

A jumper on the PC-AT system board (J18) determines the maximum amount of memory the system board will accept. With the jumper in the 256-KB position, the system board will accept a maximum of 256 KB. With the jumper in the 512-KB position, the system board will accept a maximum of 512 KB.

This jumper *must* be in the correct position to ensure reliable PC-AT operation:

- If you have 256 KB on your system board and you are installing a memory board like *RAMvantage!*, the jumper must be in the 256-KB position.
- If you have 512 KB on your system board, the jumper must be in the 512-KB position.

Configuring PC-AT System Board Memory

Jumper J18 is located underneath the disk controller board at the very front of the PC-AT chassis. Figure B-1 shows the location of this jumper and its two configuration positions.

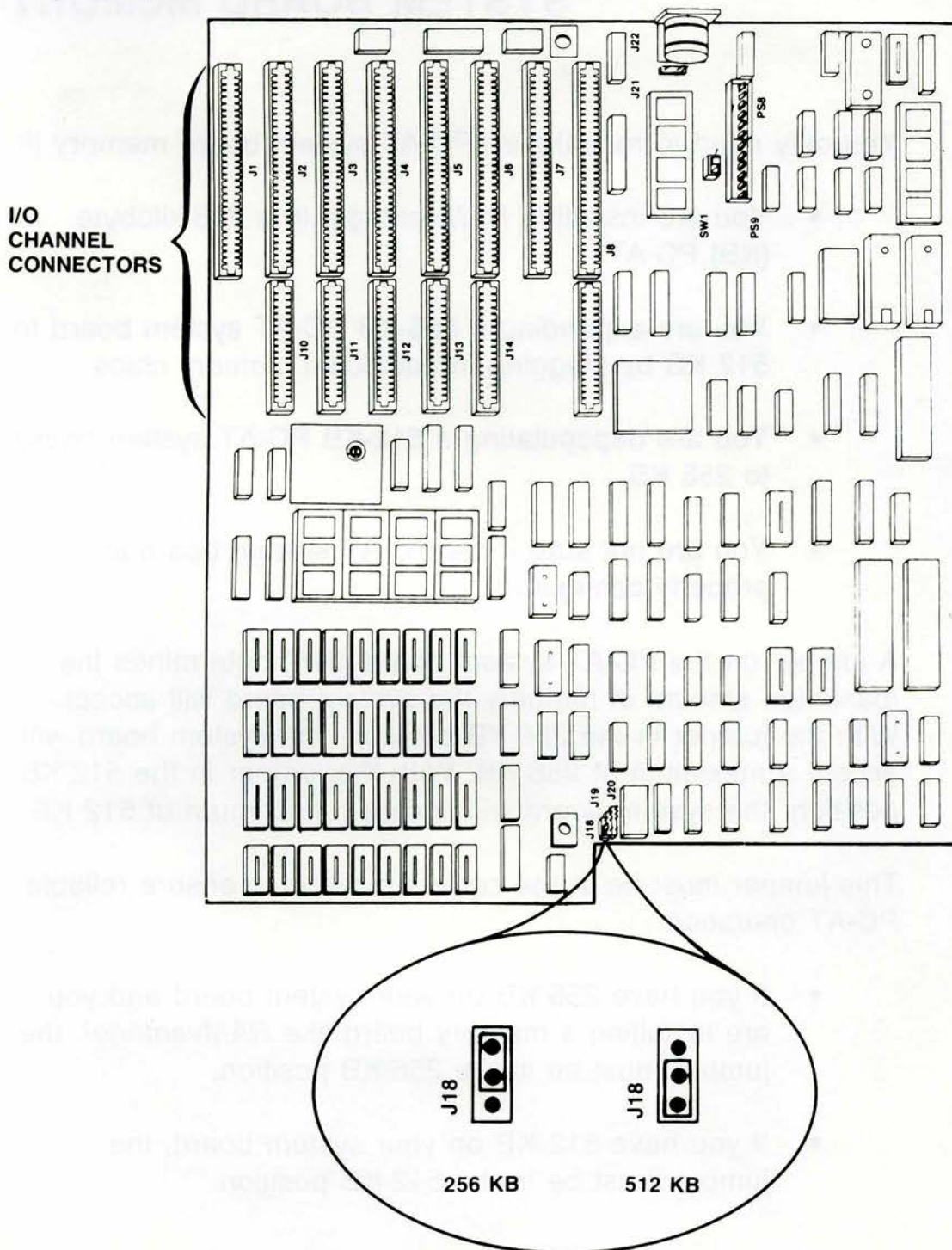


Figure B-1. PC-AT System Board Memory Configuration.

You might have to lift the disk controller board up to access the jumper. To do this, remove the screw securing the disk controller board bracket to the PC-AT chassis and *carefully* lift up the board about 2 inches.

When you have the jumper correctly configured, be sure to reinstall the disk controller board and secure the bracket to the PC-AT chassis with the screw.

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FCC WARNING

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to a computer that complies with Class B limits. Operation with non-certified peripherals is likely to result in interference to radio and TV reception. When connecting to a peripheral device, a shielded I/O cable is required to ensure compliance with FCC Rules.

Instructions to User

This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the computer with respect to the receiver.
- Move the computer away from the receiver.
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits.
- Ensure that board slot covers are in place when no board is installed.
- Ensure that all brackets are fastened securely to the PC chassis.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission (FCC) helpful: "How to Identify and Resolve Radio-TV Interference Problems". This booklet is available from the U.S. Government Printing Office, Washington, DC 20402. Stock No. 004-000-00345-4.

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The limited warranty applies to hardware products only.

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Product Comment Form

***RAMvantage!* User's Manual**
000212-001 B

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Address:

Product/Manual Comments and Suggestions

Please mail this form to:

AST Research, Inc.
Attn: Product Marketing
2121 Alton Ave.
Irvine, CA 92714

Product Comment Form

AST RESEARCH, INC.

Attachment: User's Manual

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Addendum
to
RAMvantage!™
User's Manual

000212-006 A
July, 1986

AST Research, Inc.
Irvine, California
(714) 863-1333

ADDENDUM TO THE

RAMVANTAGE!™ USER'S MANUAL

This addendum adds necessary changes in the memory chip specification resulting from the use of 8 MHz PC-ATs.

Please replace the original pages with updated pages from this addendum as follows:

Original Pages

3-9 through 3-10

Updated Pages

3-9 through 3-10

A 800-515000
July 1986

AST Research, Inc.
Irvine, California
(714) 853-1333

STEP 3

Run the PC-AT's SETUP program and configure it for the new amounts of (1) base memory and (2) extended memory. You can use the tables in Appendix A to convert MB to KB (SETUP requires information in KB).

3.4 Installing Additional Memory on *RAMvantage!*

On *RAMvantage!*, a memory bank which is populated with 18 64-KB memory chips contains 128 KB of memory, while a bank populated with 18 256-KB memory chips contains 512 KB of memory:

18 64-KB chips = 128 KB (64 K 16-bit words)

18 256-KB chips = 512 KB (256 K 16-bit words)

You can upgrade a *RAMvantage!* that is not fully populated simply by plugging in additional memory chips. You can also upgrade from 64-KB chips to 256-KB chips.

AST Research offers 128-KB memory upgrade kits for *RAMvantage!*, consisting of 18 64-KB chips (order AST part number MPAD-128).

AST also offers 512-KB memory upgrade kits consisting of 18 256-KB chips (order AST part number MPAD-512).

3.4.1 Memory Chip Specifications

If you purchase memory chips from another source, be sure they meet the following specifications, for use with either 6-MHz or 8-MHz PC-ATs.

64-KB Chip Specifications: Use 64-KB Dynamic Random Access Memory (DRAM) with these characteristics:

120 nanosecond (ns) access time

Pin 1 not used

+5 Volt Only

The following 64-KB memory chips are compatible:

Fujitsu MB81464-12PZ
Micron MT4067Z-12

256-KB Chip Specifications: Use 256-KB Dynamic Random Access Memory (DRAM) with these characteristics:

120 nanosecond (ns) access time

The following 256-KB memory chips are compatible:

Fujitsu MB81256-12P
Hitachi HM50256P-12
Micron MT1257-12
Motorola MCM6256P-12
NEC UPD41256C-12
Samsung KM41256-12
Texas Instruments TMS4256-12NL
Toshiba TMM41256P-12

3.4.2 Populating the Memory Banks with Memory Chips

Figure 3-3 illustrates the arrangement of the banks of memory chips on *RAMvantage!*.

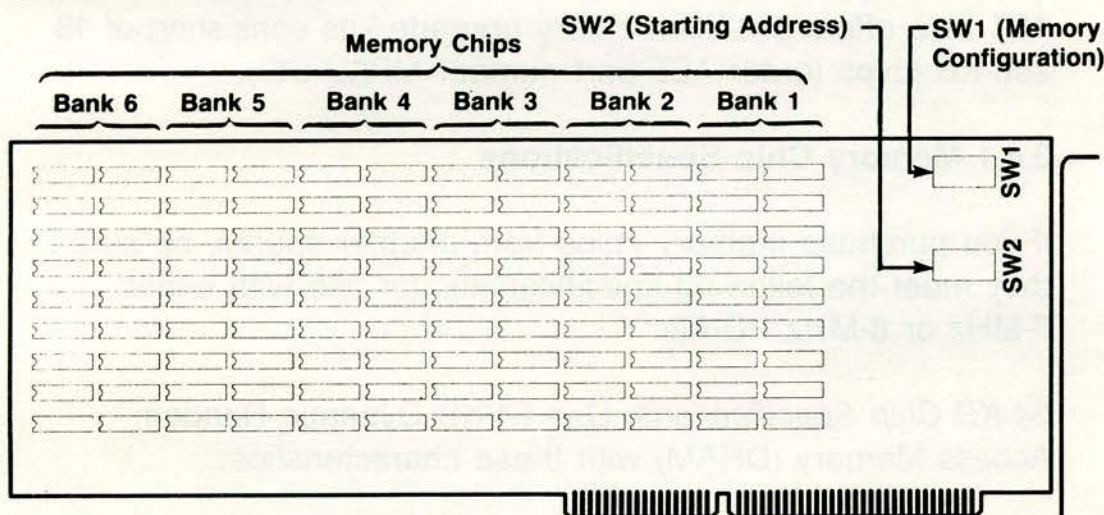


Figure 3-3. Memory Bank Configuration.