Rampage® Plus 286

Expanded Memory Board

for the

IBM® PC AT®

and Compatible Computers

and XT-Compatible Computers with

AST Xformer/286™

Changes are periodically made to the information contained in this manual; these changes will be incorporated into new editions.

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INTRODUCING RAMPAGEPLUS 286

Rampage® Plus 286 is a flexible and powerful memory enhancement board for the AST Premium®/286 and Premium Workstation, IBM® PC AT® and compatible computers, and XT-compatible computers using the AST Xformer/286™ board. It offers complete hardware and software compatibility with Expanded Memory Specification (EMS) 4.0 software.

The RampagePlus 286 Smart Switch™ configuration software eliminates the need to set board switches. The software can make the optimal settings for your computer automatically, or you can select your configuration from easy-to-use menus. The RampagePlus 286 board retains your selected configuration even when the computer is turned off.

You can upgrade your RampagePlus 286 board's memory to a maximum of 8 megabytes (MB) with single inline memory modules (SIMMs) that snap in and out of your board sockets. Optional I/O Pak 286™ piggyback boards add two serial ports or one serial port and one parallel port to your RampagePlus 286 board.

RampagePlus 286 offers a number of options for using memory. Under (DOS), memory up to 640 kilobytes (KB) is directly accessible. This is called *conventional* or *base memory*. RampagePlus 286 can use memory beyond 640 KB in the following ways.

- *Expanded memory:* This allows applications to exceed the 640-KB limit by swapping memory pages in and out of conventional memory. In order to use expanded memory, your computer requires a memory board and software that support memory paging.

  RampagePlus 286 supports Lotus®/Intel®/ Microsoft® (LIM) EMS Version 4.0 software for applications that use

expanded memory. EMS 4.0 offers compatibility with applications currently using EMS 3.2 and the Enhanced Expanded Memory Specification (EEMS). Performance is superior with applications written for EMS 4.0, including Microsoft℞ Windows 2.0 andDESQview™.

● *Extended memory:* This is memory in the 1- to 16-MB range that can be used for creating random access memory (RAM) disks and print spoolers. RampagePlus 286 includes software for creating RAM disks and print spoolers.

Extended memory can be used directly by other operating systems, including IBM Operating System/2™ (OS/2™).

The program can allocate any portion of the RampagePlus 286 board's memory as expanded or extended. By allocating more RampagePlus 286 memory as expanded, you increase the amount of memory the application can use for paging. If you allocate more memory as extended, you can create larger RAM disks and print spoolers.

RampagePlus 286 also comes with these SuperPak utility programs which run under DOS. (See the *SuperPak User's Manual* for more information):

● *fASTdisk*™*:* A program that simulates fixed disks in RAM. A fASTdisk can be as large as total memory, and enables you to store and retrieve data and programs at RAM speeds.

● *SuperSpool*™*:* An intelligent print spooler that enables you to direct files to a printer while freeing your computer for other tasks.

● *SuperDrive*™*:* A program that simulates floppy disks in RAM, enabling you to store and retrieve data and programs at RAM speeds. *SuperDrive* is most useful

with applications that require strict floppy-disk emulation. To use this utility your system must be able to recognize a simulated floppy drive b:.

● *INSTALL.EXE:* A software installation utility that enables you to configure and install fASTdisk, SuperDrive, SuperSpool, and the expanded memory software.

NOTE

Use Version 1.00 or later of the RampagePlus 286 Utility/SuperPak disk. For information on the SuperPak utilities, see your *SuperPak User's Manual.*

Your SuperPak disk may also include other software that pertains to other AST products. The README file on your SuperPak disk describes the programs included in your SuperPak software. To read the file, insert your disk into drive A and type the following:

A:README<Enter>

Format Notation

This manual uses the following format notation:

● *Boldface characters* indicate information you enter.

● *Uppercase characters* indicate items (such as commands) that you enter as shown. You may type either upper- or lowercase letters.

● *Lowercase characters* represent parameters you define. These parameters must satisfy the conditions of the command descriptions.

- *Angle brackets (< >)* tell you to press a key. For example, **<Esc>** means to press the Esc key. Press the Enter key only when you see the instruction **<Enter>**.

- *Hyphens between keys* tell you to press them simultaneously. For example, **<Ctrl>-<Alt>-<Del>** tells you to hold down Ctrl and Alt while pressing the Del key.

- *Square brackets ([ ])* indicate an optional term you may omit. Do not enter the brackets.

- *Color* indicates prompts and messages you see on the screen.

- A *leading zero* and *trailing lowercase "h"* indicate a hexadecimal number (for example, 02C0h).

Related Documentation

This manual assumes you are familiar with your computer's hardware and operating system. If you need more information, refer to the manuals included with your computer.

If you plan to use RampagePlus 286 to develop EMS 4.0 software, detailed programming information is available in *Lotus/Intel/Microsoft Expanded Memory Specification, Version 4.0*, Copyright 1987, Lotus Development Company, Intel Corporation, and Microsoft Corporation (Lotus, Intel, and Microsoft part number 300275-001)

PART I. GETTING STARTED

1. Before You Begin

2. Installing Your RampagePlus 286

3. Configuring RampagePlus 286

4. Running the SETUP Program

NOTES

This section presents information you will need before you install RampagePlus 286. You will follow these steps to install and configure your board:

- Check package contents and system requirements (Section 1).

- Install the RampagePlus 286 board in your computer (Section 2).

- Run the Smart Switch program (Section 3).

- Run your computer's SETUP program (Section 4).

1.1 Checking the Contents

In addition to this manual (AST part number 000743-001), your RampagePlus 286 package includes the following items:

- RampagePlus 286 expanded memory board

- 5.25-inch RampagePlus 286 Utility/SuperPak disk

- *SuperPak User's Manual* (AST part number 000745-001)

- *SuperPak Installation Supplement* (000347-001)

1.2 System Requirements

The minimum hardware requirement for operation with RampagePlus 286 is an AT-compatible computer (including AST Premium/286 and Workstation, and IBM PC AT) or an XT-compatible computer using an AST Xformer/286 system board replacement. Your computer must have an unused dual-connector expansion slot. RampagePlus 286 software is compatible with DOS 2.0 or later and OS/2 (in real mode).

1.3 What You Need to Know

This section tells you the information you need before you begin installing RampagePlus 286. Fill out the accompanying checklist as you answer each question.

1.3.1 About Your Computer

Use the following questions to identify your system.

A. *In which computer are you installing RampagePlus 286?*

   ☐ AST Premium/286
   ☐ AST Premium Workstation
   ☐ IBM PC AT
   ☐ IBM PC XT with Xformer 286
   ☐ Other _____

B. *Which operating system are you using?*
   RampagePlus 286 is compatible with DOS or OS/2. With DOS, you may use expanded memory and SuperPak utilities. With OS/2, use all of the RampagePlus 286 memory as extended.

   ☐ DOS 2.0 or above
   ☐ OS/2

C. *What is your computer's bus speed?*
   RampagePlus 286 can operate with bus speeds from 6 to 12.5 megahertz (MHz). To operate at the higher end of this range, you may need to install faster SIMMs. See your computer user's manual for more information on bus speeds.

   ☐ 6 MHz
   ☐ 8 MHz
   ☐ 10 MHz
   ☐ 12.5 MHz

D. *How many wait states does your computer's bus use?*
   Wait states are intervals between the time data is requested and the time it is actually sent. RampagePlus 286 can operate with zero or one added wait state. To operate at zero wait states, you may need to install faster SIMMs. See your computer user's manual for more information on wait states.

   ☐ Zero wait states
   ☐ One wait state

E. *How much memory does your computer already have?*
   When you turn on your computer, the amount of linear memory (conventional and extended) appears in the upper left corner of the screen. Your computer can have a maximum of 640 KB of conventional memory. Total linear memory cannot exceed 15.5 MB. The 384 KB of reserved high memory is not included.

   Expanded memory is not tested with linear memory. A separate message indicates the amount of expanded memory and any memory errors. Your computer can have up to 32 MB of expanded memory with EMS 4.0.

_____ KB conventional memory (maximum 640 KB)

+ _____ KB extended memory

_____

_____ KB linear memory (maximum 15.5 MB)

_____ KB expanded memory (maximum 32 MB)

F. Do you have any other memory expansion boards in your computer?

RampagePlus 286 can work with other AST, IBM or compatible memory expansion boards. See Section 6 for more information.

Board	Amount of Memory (in KB)	Expanded Memory (Yes/No)

1.3.2 About Your RampagePlus 286 Board

Use the following questions to identify the configuration of your board.

G. How much memory is on the RampagePlus 286 board?

RampagePlus 286 is available in a number of memory configurations from 0 to 8 MB. If you want to install more memory, see Section 6.

_____ KB RampagePlus 286 memory

H. Do you have another RampagePlus 286 board in your computer?

You may install up to four RampagePlus 286 boards in your computer to give your computer a maximum of 32 MB of expanded memory. Be sure not to allocate more than 15.5 MB for linear memory. See Section 6 for more information.

_____ Number of RampagePlus 286 boards already installed

I. What speed SIMMs are on your RampagePlus 286 board?

The speed of your SIMMs determine the bus speed and number of wait states in which RampagePlus 286 can operate.

To check your SIMM speed, look at the part number, which is usually on the chips or the back side. If you need to remove the SIMMs, see Section 5 for instructions.

The last two digits of the part number indicate the speed. The number 10 indicates 100-ns SIMMs. The number 12 indicates 120-ns SIMMs.

Section 6 indicates the type of SIMMs needed to operate at different speeds.

_____ ns SIMMs installed on the RampagePlus 286 board

1.3.3 About Your Memory Allocation

Use the following questions to identify how you will use RampagePlus 286.

J. Do you want to use RampagePlus 286 to backfill conventional memory?

You can improve the performance of expanded memory software by using a portion of RampagePlus 286 memory as conventional. Instead of being limited to reserved high memory, the EMS software can use backfilled conventional memory for paging.

If your computer has less than 640 KB, RampagePlus 286 memory must be used to backfill conventional memory. To improve paging performance, you may disable some or all of the system board to use RampagePlus memory as conventional. For example, setting the system board for 256 KB enables RampagePlus 286 to use 384 KB for paging.

You do not have to disable the memory of a Premium/286 or Premium Workstation.

_____ RampagePlus 286 memory used as conventional (640 KB maximum)

K. How much memory do you want to allocate as expanded and extended?

You can configure RampagePlus 286 memory as any combination of expanded or extended memory. Your configuration depends on the applications you want to use.

If you plan to use EMS 4.0 applications, including Microsoft Windows 2.0 and DESQview 2.0, allocate most of your RampagePlus 286 memory as expanded. If you plan to use large RAM disks and print spoolers, allocate most of your RampagePlus 286 as extended.

Allocate all of the RampagePlus 286 memory as extended if you use OS/2.

_____ KB conventional memory
_____ KB extended memory
+   _____ KB expanded memory
_____
_____ KB total RampagePlus 286 memory

L. Which SuperPak utilities do you want to install?

RampagePlus 286 comes with SuperPak utility software that runs under DOS. You may install the optional fASTdisk RAM disk or SuperSpool print spooler.

If you want to use fASTdisk or SuperSpool, you should allocate enough extended memory for them. Do not install these utilities if you are using OS/2.

For more information on the SuperPak utilities, see the *SuperPak User's Manual,* also included with RampagePlus 286.

fASTdisk
SuperSpool
SuperDrive

NOTES

This section shows you how to install your RampagePlus 286 board by following these steps:

- Check the precautions for installing boards (Section 2.1).

- Remove the cover (Section 2.2).

- Disable system board memory to enable RampagePlus 286 to backfill conventional memory (Section 2.3).

- Install the RampagePlus 286 board (Section 2.4).

- Replace the cover and install cables (Section 2.5).

You will need a flathead screwdriver and nut driver to perform these procedures.

2.1 Precautions for Installing Boards

Before installing RampagePlus 286, follow the rules in this section carefully. Failure to install boards correctly can damage your computer.

- Before handling your computer and RampagePlus 286 boards, discharge any static electricity by touching a grounded surface.

- Before installing the board, turn off your computer and unplug all cables, including the power cord. Do not install or remove components while your computer is on.

- Install the RampagePlus 286 board so it is fully inserted in the slot.

2.2 Removing Your Computer Cover

Use a flathead screwdriver or hex nut driver to remove the
screws from the back panel. Slide the cover past the ON/OFF
switch, then lift it straight off (Figure 2-1). For more information
about removing the cover, see your computer user's manual.

1. Remove hex screws.

2. Slide cover past
on/off switch.

A102-4

3. Lift off cover.
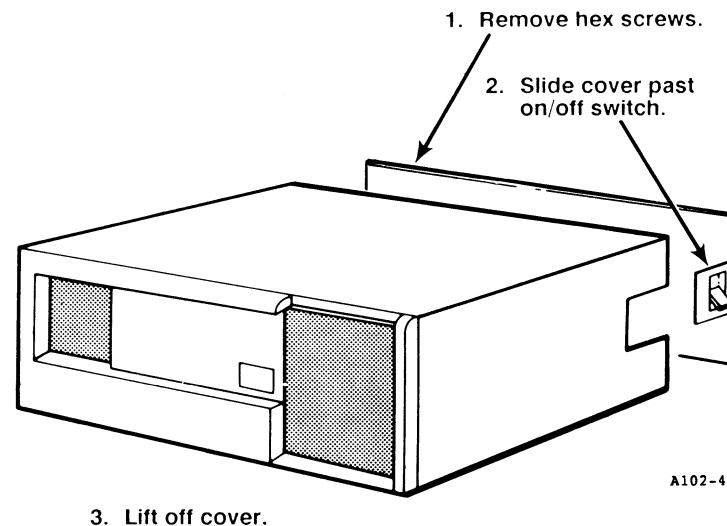
Figure 2-1. Removing the Computer Cover.

2.3 Disabling System Board Memory

If you do not plan to use RampagePlus 286 memory to backfill
conventional memory, skip this section.

The system boards of most AT-compatible computers cannot be
used for paging. By disabling part or all of the computer's
system board memory and backfilling it with RampagePlus 286
memory, you increase the amount of conventional memory
available to swap pages. This can improve the performance of
your EMS 4.0 software.

On most AT-compatible computers, you can change the amount
of recognized system board memory by setting a jumper or
switch. RampagePlus 286 will backfill conventional memory to
640 KB from the amount set on the system board.

The instructions shown here are for the PC AT. See your
computer user's manual for detailed instruction on setting its
configuration.

STEP 1
Lift the disk controller board: You need to remove the disk
controller board to reach the jumper. Remove the disk controller
board's bracket retaining screw and save it. Carefully lift the
board about two inches. Do not pull the ribbon cables attached
to the board.

STEP 2
Set the jumper: Locate jumper J18 near the front of the
computer. Set the jumper for either 256 or 512 KB. Do not set
the system for more memory than is installed on the system
board (Figure 2-2).

(back of computer)

Expansion slots

PC AT System board

A142-2

Up to 256 KB of system
board memory recognized.

Up to 512 KB of system
board memory recognized.
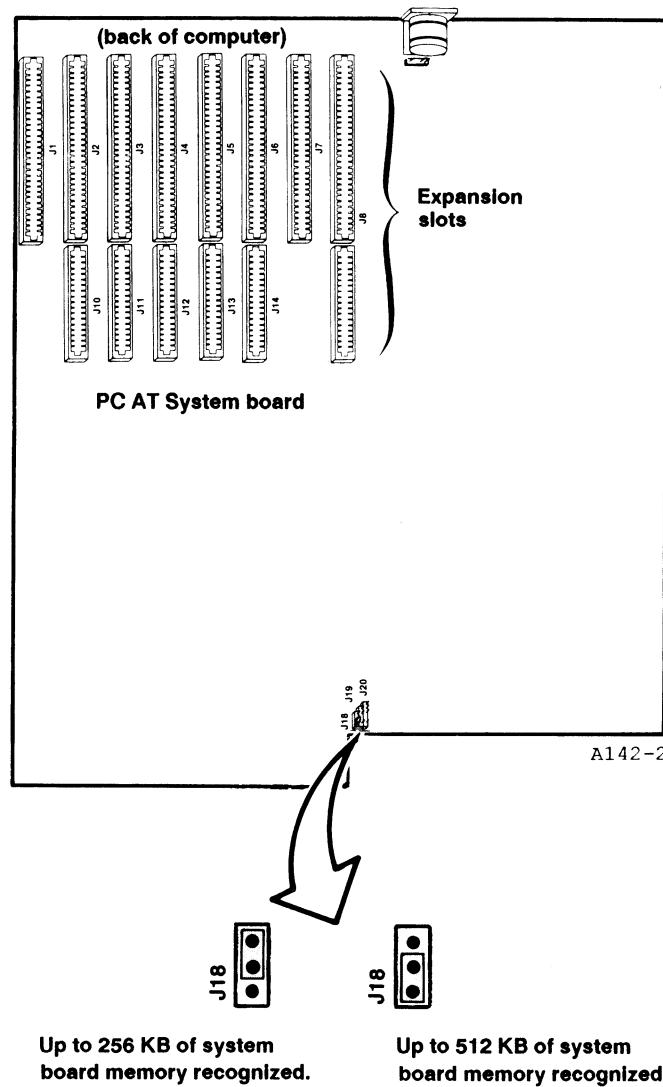
Figure 2-2. Setting the AT System Board Jumper.

CAUTION

Do not remove memory chips from the system board,
regardless of the jumper setting.

STEP 3
Replace the disk controller board: Carefully press down on the
disk controller board until it is completely inserted into the slot.
Be sure all ribbon cables are securely attached. Replace the
bracket retaining screw you removed earlier.

2.4 Installing RampagePlus 286

STEP 1
Select an open expansion slot: RampagePlus 286 requires one
dual-connector slot.

STEP 2
Remove the expansion slot cover: On the back panel, locate the
metal cover for the slot that you have selected. Remove the
bracket retaining screw with a small flathead screwdriver and
save it. Remove the expansion slot cover.

STEP 3
Install the RampagePlus 286 board: Insert the RampagePlus
286 board in your computer. Make sure the end of the card is in
the card guide and any ribbon cables or wires pass safely above
or underneath the board. Line up the board's edge connector
with the slot. Push the board down until it is fully inserted in the
slot (Figure 2-3).

Retaining screw   RampagePlus 286
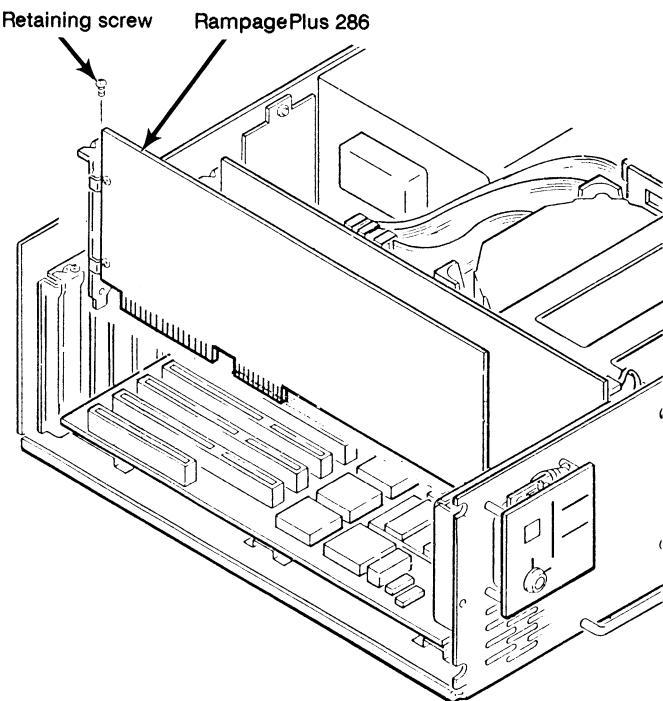
Figure 2-3. Installing the RampagePlus 286 Board.

STEP 4
Secure the board to the rear of the chassis: Replace the bracket
retaining screw you removed in Step 2.

2.5 Replacing the Cover

After you have installed the board, carefully slide the cover from
the front until it stops securely against the rear panel. Reinstall
the screws you removed earlier. Connect the power cord to the
system unit and make sure the keyboard is plugged in.
Reconnect all peripherals.

You are now ready to run the Smart Switch program. Go on to
Section 3.

CONFIGURING RAMPAGEPLUS 286   3

This section gives a step-by-step procedure for using the Smart
Switch software to configure the RampagePlus 286 board. It
provides the information you need to configure your board in
most circumstances.

- Section 3.1 explains how to start the Smart
  Switch program.

- Section 3.2 shows you how to configure
  RampagePlus 286 in Automatic mode. In this mode the
  program configures your board for you, allocating
  RampagePlus 286 memory as linear (extended) or
  paged (expanded). The software looks for the amount of
  memory already installed in your computer and backfills
  it to 640 KB, if needed. Using automatic mode, you can
  install your board quickly and easily.

- Section 3.3 shows how to configure your
  RampagePlus 286 in Manual mode, which gives you
  complete control over the operation of your board. You
  select all the configuration settings yourself. Before
  using manual mode you should be very familiar with your
  system and its components.

- Section 3.4 describes how to change the configuration of
  RampagePlus 286.

3.1 Starting the Smart Switch Program

Before you begin, make sure you have installed your
RampagePlus 286 board as shown in Section 2.

Insert the SuperPak utilities disk in drive A and type **SMART**.
The Identifying System message appears as the program
determines how much memory your system has and how many
RampagePlus 286 boards are installed. When the program
indicates that it is ready to continue, press **<Enter>**.

You see the Smart Switch Main Menu (Figure 3-1).

```
┌─────────────────────────────────────────────────────┐
│   AST RampagePlus 286 Smart Switch Version 1.00      │
│        (C) Copyright 1988, AST Research Inc.         │
│              All Rights Reserved                     │
├─────────────────────────────────────────────────────┤
│                                                      │
│                    MAIN MENU                         │
│                                                      │
│      A. View Current System Configuration            │
│      B. View RampagePlus 286 Configuration           │
│      C. Set RampagePlus 286 Configuration            │
│                                                      │
│                                                      │
│                                                      │
│                 Enter Selection:                     │
├─────────────────────────────────────────────────────┤
│      Valid Keys = A-C, <Esc> = Exit, ? = Help        │
└─────────────────────────────────────────────────────┘
```
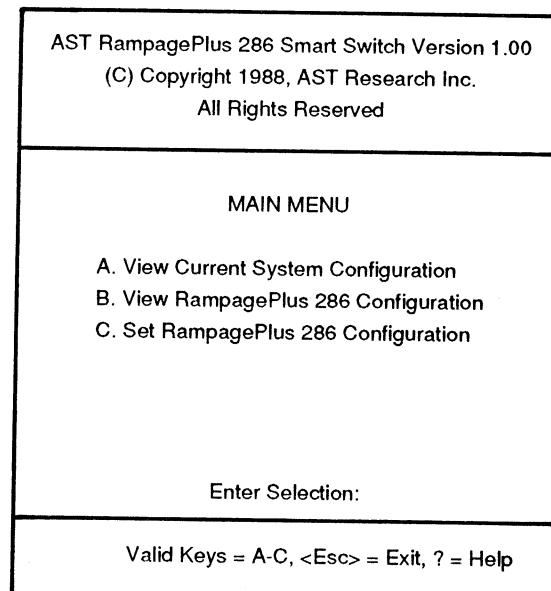
Figure 3-1. Smart Switch Main Menu.

At the bottom of each screen, a list of keystrokes appears:

- *To select a menu option:* Press the letter key for
  that option. Then press **<Enter>**.

- *To return to the previous screen:* Press **<Esc>**.

- *To get help:* Press **<?><Enter>**..

The Main Menu offers you three options:

A. *View Current System Configuration:* Shows your
   computer's current configuration, including amounts of
   conventional, extended, and expanded
   memory installed.

B. *View RampagePlus 286 Configuration:* Shows the
   configuration of your RampagePlus 286 board. Your
   screen should be similar to Figure 3-2.

C. *Set RampagePlus 286 Configuration:* Configures your
   board in Automatic or Manual mode.

```
┌─────────────────────────────────────────────────────────┐
│  RampagePlus 286 Memory Board(s)                          │
│                         Board1   Board2   Board3   Board4 │
│  Memory Configuration..Bank 1   2M      N/A      N/A      N/A. │
│                        Bank 2   0K      N/A      N/A      N/A  │
│                        Bank 3   0K      N/A      N/A      N/A  │
│                        Bank 4   0K      N/A      N/A      N/A  │
│  Total Memory on Board          4096K   N/A      N/A      N/A  │
│  Expanded Memory Size           2048K   N/A      N/A      N/A  │
│  Linear Memory Size.............2048K   N/A      N/A      N/A  │
│  Linear Starting Address.....   1048K   N/A      N/A      N/A  │
│  Base I/O Address.................02A8h  N/A      N/A      N/A  │
│  Wait State.........................1 Wait  N/A   N/A      N/A  │
│  Parity.............................Enable  N/A   N/A      N/A  │
├─────────────────────────────────────────────────────────┤
│  I/O Pak 286-S Board(s)                                   │
│  Serial Port1.......................03F8h  N/A   N/A      N/A  │
│  Serial Port2.......................Disable N/A  N/A      N/A  │
├─────────────────────────────────────────────────────────┤
│  I/O Pak 286-SP Board(s)                                  │
│  Serial Port........................N/A    N/A   N/A      N/A  │
│  Parallel Port......................N/A    N/A   N/A      N/A  │
├─────────────────────────────────────────────────────────┤
│           ESC = Return to Previous Menu                   │
│                                                           │
└─────────────────────────────────────────────────────────┘
```

Figure 3-2. RampagePlus 286 Configuration Screen.

The screen in Figure 3-2 shows the configuration of all the RampagePlus 286 boards in your computer. The board you are currently configuring is highlighted. (The configuration shown is an example, and your actual configuration may be different.) It displays the following information:

Memory Configuration
Indicates the total amount of memory in each bank of your Rampageplus 286 boards. Bank 1 is listed on top, followed by Banks 2, 3, and 4.

Total Memory on Board
Shows the total amount of memory (expanded and extended) on your RampagePlus 286 boards.

Expanded Memory Size
Indicates the amount of paged EMS 4.0 memory on your RampagePlus 286 boards.

Linear Memory Size
Shows the amount of conventional and extended memory allocated on RampagePlus 286 boards.

Linear Memory Starting Address
Shows the lowest address of linear memory installed before the first RampagePlus 286 board.

Base I/O Address
Indicates the base I/O address of RampagePlus 286 and other boards. This setting depends on the speed of the SIMMs you are using.

Wait States
Shows the number of wait states on your computer's bus.

Parity
Displays whether memory checking is enabled. Unless you are performing diagnostic testing, leave this setting enabled.

I/O Pak 286-S Board(s)
Displays the starting address of any I/O Pak SS Boards you are using with RampagePlus 286.

I/O Pak 286-SP Board(s)
Displays the starting address of any I/O Pak SP Boards you are using with RampagePlus 286.

To configure your RampagePlus 286 board, press **C<Enter>** at the Main Menu. The Configuration Menu appears (Figure 3-3).

```
+-----------------------------------------------+
|                                               |
|  AST RampagePlus 286 Smart Switch Version 1.00|
|       (C) Copyright 1988, AST Research Inc.   |
|              All Rights Reserved              |
|                                               |
+-----------------------------------------------+
|                                               |
|                  MAIN MENU                     |
|                                               |
|      A. Automatic Mode -- All Linear          |
|      B. Automatic Mode -- All Expanded        |
|      C. Manual                                |
|                                               |
|                                               |
|                                               |
|                                               |
|              Enter Selection:                  |
|                                               |
+-----------------------------------------------+
|    Valid Keys = A-C, <Esc> = Exit, ? = Help   |
+-----------------------------------------------+
```
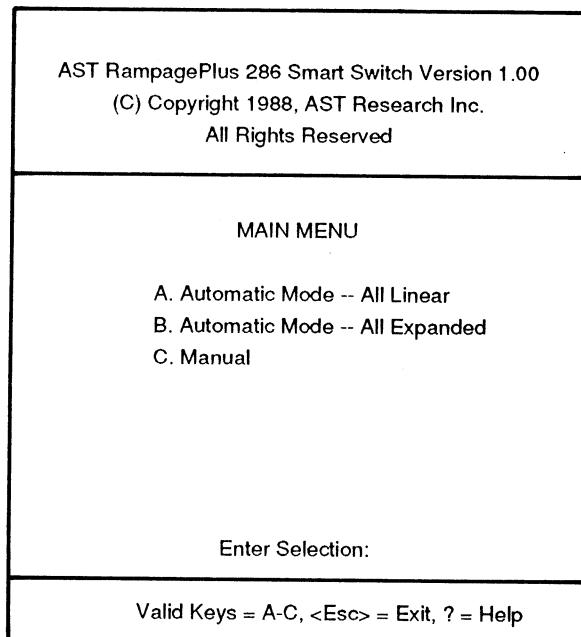
Figure 3-3. Configuration Menu

Now you are ready to start configuring your board. Read the section pertaining to the mode you are using:

● *For Automatic mode (linear or expanded):* See Section 3.2.

● *For Manual mode:* See Section 3.3.

3.2 Automatic Mode

To use Linear Automatic mode, press **A<Enter>** at the Main menu. Press **B<Enter>** for Expanded Automatic Mode.

Your RampagePlus 286 board is automatically configured. A screen shows a summary of your board's memory configuration and I/O port assignments (Figure 3-2).

Press **<Esc>**. The program returns you to the Main menu. If you are satisfied with the results of the automatic configuration, press **<Esc>**. Press Y to activate the new configuration. Turn off the system and go to Section 4 to run SETUP.

If you want to change your configuration, press **C<Enter>** at the Main menu. The program returns you to Manual mode in which you can reconfigure your board. Go to Section 3.3 for more information.

To run Automatic mode again, see Section 3.4.

3.3 Manual Configuration

To start Manual mode from the Main menu, press **C<Enter>**. The Manual Mode menu appears (Figure 3-4).

```
┌─────────────────────────────────────────────┐
│                                             │
│  AST RampagePlus 286 Smart Switch Version 1.00  │
│     (C) Copyright 1988, AST Research Inc.    │
│            All Rights Reserved              │
│                                             │
├─────────────────────────────────────────────┤
│                                             │
│       Board 1: RampagePlus 286 Memory       │
│                                             │
│         Select one of these options:        │
│                                             │
│       A. Linear/Expanded Memory Size        │
│       B. Linear Memory Starting Address     │
│       C. Base I/O Address                   │
│       D. Wait State                         │
│       E. Parity                             │
│       F. Sequence Through All Options       │
│                                             │
│            Enter Selection:                 │
│                                             │
├─────────────────────────────────────────────┤
│  Valid Keys = A-F, ESC = Return to Previous Menu │
└─────────────────────────────────────────────┘
```
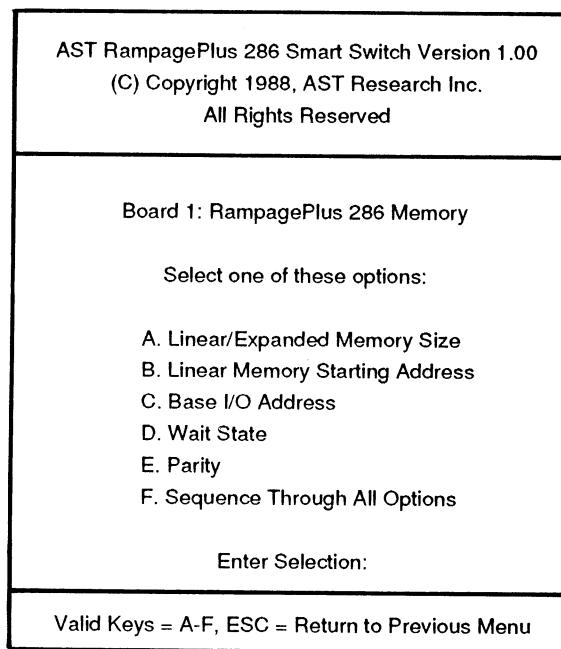
Figure 3-4. Manual Mode Menu.

This menu enables you to change any or all of five settings
(A-E).

A. *Linear/Expanded Memory Size:* Enables you to choose
   how much RampagePlus 286 memory is to be allocated
   as linear (extended) and expanded (paged). Extended
   memory includes conventional (backfilled) memory *and*
   extended memory above 1 MB. Press Q to enter an
   amount not listed on the menu. The amount you enter
   must be an increment of 128. When you enter an
   amount of extended memory, the program automatically

calculates and displays the amount of EMS 4.0 paged
(expanded) memory on your board.

B. *Linear Memory Starting Address:* Asks for the address at
   which RampagePlus 286 linear memory is to begin.

C. *Base I/O Address:* Enables you to set the base I/O
   address of your RampagePlus 286.

D. *Wait State:* Asks you for the number of wait states on
   your computer's bus. Choose 1 wait state if your system
   runs at 12 MHz and does not already have 1 wait state.

E. *Parity:* Enables or disables memory checking. Leave this
   setting enabled unless you are performing diagnostic
   testing.

F. *Sequence Through All Options:* Enables you to view and
   change each configuration setting in order.

Press the letter of the setting you want to change. A screen
appears with a list of available options. Select an option by
pressing the corresponding letter key.

After you make your selection, a screen displaying your board's
overall configuration appears. This screen is similar to that
shown in Figure 3-2.

To make further changes to your configuration, press **Y** to repeat
manual configuration.

To accept your changed configuration, press **N** to save your
settings. The program returns you to the Main menu.

From the Main menu, press **<Esc>** to exit, and press **Y** to save
the new configuration. Turn your computer off and back on
again to re-boot and activate the configuration. Do **not** re-boot
by pressing **<Ctrl>-<Alt>-<Del>**.

Your next step is to run the computer's SETUP program. Go to Section 4.

3.4 Changing Your Board Configuration

Use the Smart Switch program to change your RampagePlus 286 board settings. You may use Manual mode to make minor adjustments to your configuration, such as setting the extended memory allocation or changing the base I/O address to avoid conflicts.

To use Automatic mode again, you need to set a jumper on the RampagePlus 286 board. Pins 1-2 and 2-3 on JP1 enable Automatic mode. To use Automatic mode again, move the jumper on the other set of pins. If the jumper is on pins 1 and 2, move it to pins 2 and 3. If the jumper is on pins 2 and 3, move it to pins 1 and 2 (Figure 3-10).

Each time you want to repeat Automatic mode, move the jumper to the alternate position (1-2 or 2-3).

After you change your configuration, run the computer's SETUP program as shown in Section 4.

JP1

If the jumper is on pin 1 and 2, move it to pins 2 and 3.

If the jumper is on pins 2 and 3, move it to pins 1 and 2.

A142-3
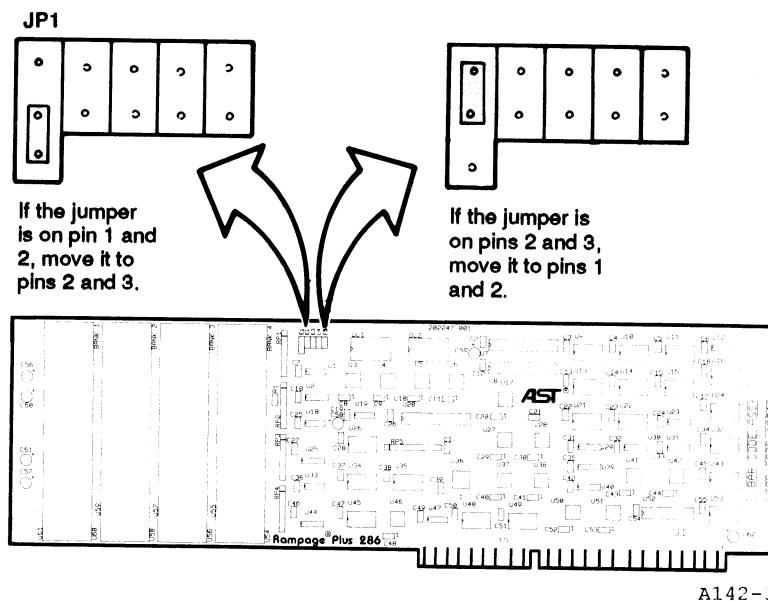
Figure 3-10. Enabling Automatic Mode.

NOTES

After running the Smart Switch program, you need to run your computer's SETUP program to set your system configuration. This section provides general guidelines for using the SETUP program with RampagePlus 286. See your computer user's manual for complete operating instructions.

Before running SETUP, make sure your RampagePlus 286 is properly installed and configured with the Smart Switch program (Sections 2 and 3).

NOTE

Your computer's SETUP program may be different from the example shown here. For more information, see your computer user's manual.

STEP 1

Reboot your computer: After you complete the Smart Switch program, the computer reboots. The total amount of memory appears in the upper left corner of the screen. The computer then beeps and displays an error message similar to the following:

Memory Size Error-(Run SETUP)

Press F1 to resume

This message means there is additional memory in your computer to be configured.

STEP 2

Start the SETUP program: Follow the instructions in your computer user's manual to start the SETUP program. With most computers, insert the diagnostic disk into drive A and press

<F1>. If you have an AST Premium computer with the ASTSETUP program in firmware, press <Ctrl>-<Alt>-<Esc>.

STEP 3
Change the memory configuration: For RampagePlus 286, you will need to change the amount of conventional and extended memory in your computer. Do not change any of the other settings unless you have made other hardware changes.

For conventional memory, indicate the amount of memory on the system board and any RampagePlus 286 memory used for backfilling. For most systems, your total should be 640 KB.

If you have allocated extended memory on RampagePlus 286 and other memory boards, enter the amount where indicated by the SETUP program.

Most SETUP programs do not ask you to enter the amount of expanded memory. The RampagePlus 286 expanded memory drivers will check and count the amount of expanded memory.

STEP 4
Complete the SETUP program: Follow the instructions on the screen to save your configuration changes and quit the SETUP program. After you exit SETUP, the computer reboots. You do not have to run SETUP again until you install another hardware option.

If you see any errors, insert your diagnostics disk in drive A and run the SETUP program again.

To conclude your RampagePlus 286 installation, run the SuperPak INSTALL program as shown in the *SuperPak User's Manual.* This program installs the expanded memory drivers and optional SuperPak utilities.

PART II. USING RAMPAGEPLUS 286

You can easily add memory to your RampagePlus 286 board. RampagePlus 286 uses SIMMs, which are circuit boards fitted with memory chips. SIMMs do not require tools for installation.

This section shows you how to add or remove memory on your RampagePlus 286 board. To ensure that your RampagePlus 286 board works properly, follow these steps:

- Read Section 5.1 for a list of valid memory combinations.

- Read Section 5.2 on which SIMMs to use.

- Read Section 5.3 for instructions on installing and removing SIMMs.

NOTE

Whenever you add or remove memory on your RampagePlus 286 board, you must take two additional steps: (1) Reset the jumper at JP-1 from its current position to the alternate postion. (2) Use the SmartSwitch program to reconfigure your computer.

See Section 3 for more information on the jumper. See Section 3 to run the Smart Switch program and Section 4 to run SETUP. To change your SuperPak and expanded memory driver configuration, see the *SuperPak Installation Supplement*.

5.1 Valid Memory Configurations

The RampagePlus 286 board has four pairs of sockets called *banks*. If you install a SIMM in the first socket of a bank, you must install matching SIMMs in the other one.

RampagePlus 286 can use 256-KB or 1-MB SIMMs in combinations up to 8 MB. By installing matching sets of four SIMMs, you can increase RampagePlus 286 memory in 512-KB (0.5-MB) or 2-MB increments.
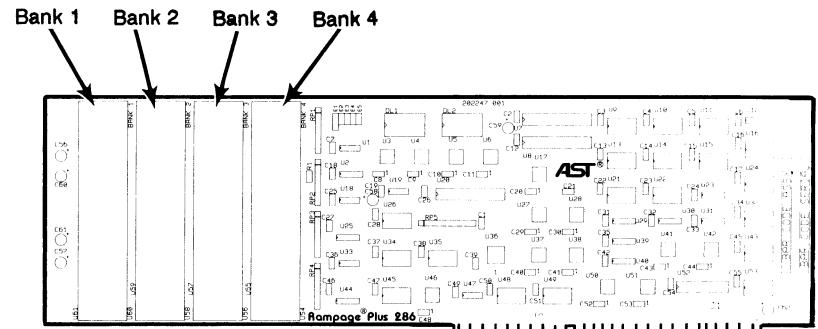
These memory configurations have two important rules:

- *Put matching SIMMs in both sockets of a bank:* If you put a SIMM in one socket, you must put a matching SIMM in the other socket of the bank. Do not put a 256-KB SIMM in the left socket and a 1-MB SIMM in the right.

- *Install memory in the lowest numbered bank first:* Install memory in Bank 1 first, then Bank 2, Bank 3, and Bank 4.

Figure 5-1 shows you the valid memory combinations for RampagePlus 286. To install 0.5 MB in a bank, use matching 256-KB SIMMs in both sockets. To install 2.0 MB in a bank, use a matching pair of 1-MB SIMMs.

Do not use combinations other than those listed here.

Keep in mind that if you fill your board with 256KB SIMMs, you will have to replace some of them if you later increase board memory.

A142-4

Total Memory	Bank 1	Bank 2	Bank 3	Bank 4
0.0 MB	--	--	--	--
0.5 MB	0.5 MB	--	--	--
1.0 MB	0.5 MB	0.5 MB	--	--
1.5 MB	0.5 MB	0.5 MB	0.5 MB	--
2.0 MB	0.5 MB	0.5 MB	0.5 MB	0.5 MB
	2.0 MB	--	--	--
2.5 MB	0.5 MB	2.0 MB	--	--
3.0 MB	0.5 MB	0.5 MB	2.0 MB	--
3.5 MB	0.5 MB	0.5 MB	0.5 MB	2.0 MB
4.0 MB	2.0 MB	2.0 MB	--	--
4.5 MB	0.5 MB	2.0 MB	2.0 MB	--
5.0 MB	0.5 MB	0.5 MB	2.0 MB	2.0 MB
6.0 MB	2.0 MB	2.0 MB	2.0 MB	--
6.5 MB	0.5 MB	2.0 MB	2.0 MB	2.0 MB
8.0 MB	2.0 MB	2.0 MB	2.0 MB	2.0 MB

Figure 5-1. Valid Memory Combinations.

To populate these banks, you need SIMMs that match the specifications in Section 5.2.

5.2 SIMM Specifications

There are two things you need to consider when purchasing SIMMs for RampagePlus 286:

- The type of SIMMs you want to use (256-KB or 1-MB)

- Your computer's bus speed

Keep in mind that you need matching pairs of SIMMs to install in both sockets of each bank.

NOTE

Use SIMMs that meet the specifications listed in the following sections. Otherwise, your computer will fail to run properly.

5.2.1 Specifications for 256-KB SIMMs

Use 256-KB SIMMs with these characteristics:

- 256 KB by 9 bits memory

- 0.050 inch thickness

- +5 Volt only

Depending on your computer's bus speed and the number of wait states you want to use, select SIMMs of speeds shown in Table 5-1.

Table 5-1. 256-KB SIMM Speeds.

Added wait states	Bus Speed		
	6/8 MHz	10 MHz	12.5 MHz
0	120 ns	100 or 120 ns	100 ns*
1	120 ns	100 or 120 ns	100 ns
* Static column			

The 256-KB SIMMs listed in Table 5-2 are compatible with RampagePlus 286.

Table 5-2. Compatible 256-KB SIMMs.

Manufacturer	120 ns	100 ns
Mitsubishi	MH25609J-12	MH25609J-10
NEC	MC41256A9B-12	
NMB		MM2801J9S-10
Okidata	MSC2304-12YS9	MSC2304-10YS9

5.2.2 Specifications for 1-MB SIMMs

Use 1-MB SIMMs with these characteristics:

- 1 MB by 9 bits memory

- 0.050 inch thickness

- +5 Volt only

Depending on your computer's speed and the number of wait states you want to use, select SIMMs of the speeds shown in Table 5-3.

Table 5-3. 1-MB SIMM Speeds.

Added wait states	Bus Speed		
	6/8 MHz	10 MHz	12.5 MHz
0	120 ns	100 or 120 ns	100 ns*
1	120 ns	100 or 120 ns	100 ns
* Static column			

The 1-MB SIMMs listed in Table 5-4 are compatible with RampagePlus 286.

Table 5-4. Compatible 1-MB SIMMs.

Manufacturer	120 ns	100 ns
Hitachi		HB56A19B-10S
Toshiba	THM91000S-12	THM91000S-10

5.3 Installing and Removing SIMMs

This section gives you step-by-step instructions on installing and removing SIMMs on your RampagePlus 286 board:

● Before proceeding, read Section 5.3.1 for rules on handling SIMMs.

● To install SIMMs, see Section 5.3.2.

● To remove SIMMs, see Section 5.3.3.
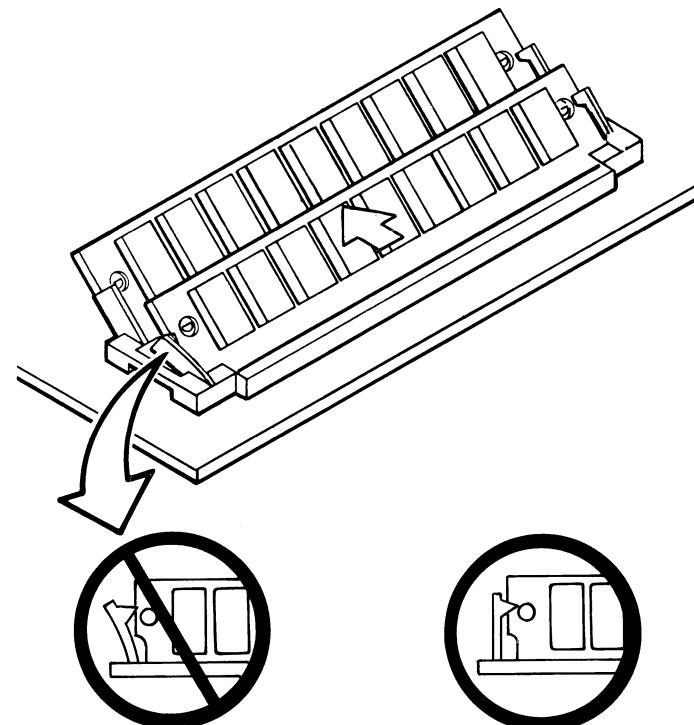
5.3.1 Rules for Handling SIMMs

Before you start installing SIMMs on your RampagePlus 286 board, there are a few rules to remember. Following these rules will prevent damage to your RampagePlus 286 board and computer:

● Use SIMMs that meet the specifications in Section 5.2.

● Both sockets in the bank must have the same type of SIMMs.

● Add or subtract RampagePlus 286 memory in the increments shown in Figure 5-1.

● Install SIMMs in Bank 0 first.

● Before handling any chips, discharge any static electricity by touching a grounded surface.

● After changing your RampagePlus 286 board's memory configuration, run the Smart Switch program (Section 2) and your computer's SETUP program (Section 3).

5.3.2 Installing SIMMs

To install a SIMM, insert its edge connector into the socket with the component side facing you. Carefully push the SIMM back until it snaps into place (Figure 5-2).

A142-7

Figure 5-2. Installing a SIMM.

CAUTION

Make sure the SIMM is securely in the socket. Improper installation of a SIMM can damage the RampagePlus 286 board.
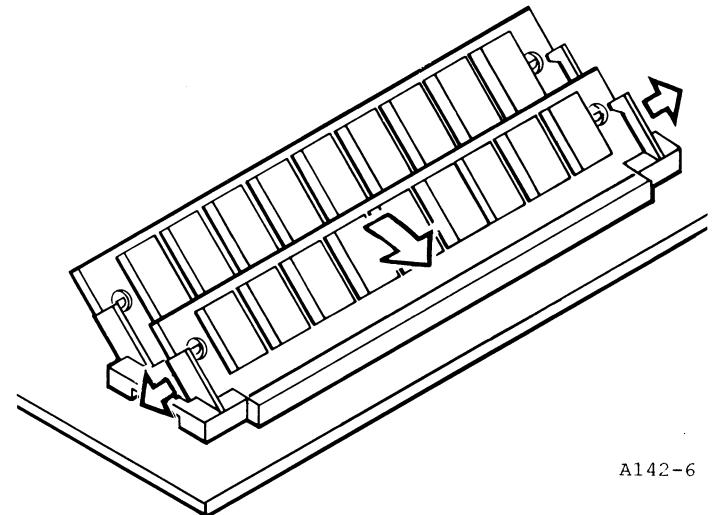
5.3.3 Removing SIMMs

In some cases, you need to remove SIMMs to upgrade memory. For example, to upgrade your RampagePlus 286 board from 1 to 8 MB, remove the set of 256-KB SIMMs in Bank 0 and plug in 1-MB SIMMs. You also need to remove slower SIMMs to upgrade RampagePlus 286 for zero wait state operation.

To remove a SIMM, carefully pull the plastic brackets apart slightly and push the SIMM up, as shown in Figure 5-3.

CAUTION

Remove SIMMs carefully. If you pull too hard on the brackets, you will break them.

A142-6

Figure 5-3. Removing a SIMM.

Be sure to save your SIMMs for future use (such as upgrading another RampagePlus 286 board).

NOTES

USING RAMPAGEPLUS 286 WITH
OTHER MEMORY BOARDS   6

RampagePlus 286 is compatible with most other paged memory boards for AT-compatible computers. Under most circumstances, you may install RampagePlus 286 without changing your other boards' settings. In automatic mode, the RampagePlus 286 configuration software recognizes other boards in your computer and calculates the optimum configuration for RampagePlus 286.

To make sure your boards work properly, follow these rules:

- Make sure each expanded memory board has a different base I/O address.

- Only use the expanded memory drivers provided with RampagePlus 286. Do not use drivers included with your EMS 4.0 application.

  The RampagePlus 286 expanded memory drivers are designed for AST and compatible paged memory boards. They may not be compatible with paged boards from other manufacturers. Use the other manufacturers' boards as extended memory and AST and compatible boards as expanded.

You may have change your configuration under the following circumstances:

- To use RampagePlus 286 memory to backfill conventional memory (Section 6.1)

- To use EMS 4.0 software that requires full hardware compatibility (Section 6.2)

If you need to change the switch settings on your other memory boards, see Section 6.3 for instructions. To install more than one RampagePlus 286 board, see Section 6.4.

6.1 Backfilling Memory with Another Board

If RampagePlus 286 is to backfill conventional memory, the board's starting address must directly follow system board memory. The starting address of other memory boards must be higher than RampagePlus 286 memory.

If you currently use another EMS or EEMS board to backfill conventional memory (like Rampage 286 or Advantage Premium), use RampagePlus 286 to backfill instead, as this improves the performance of applications requiring full EMS 4.0 compatibility. Set your other paged memory board so its starting address is after RampagePlus 286 linear memory. Section 6.2 provides more information on EMS 4.0 compatibility.)

Example

You have a computer with 256 KB configured on the system board, a 2-MB memory board, and a 4-MB RampagePlus 286. You want to use 384 KB from RampagePlus 286 to backfill conventional memory and use the rest of RampagePlus 286 as expanded. The other memory board is used as extended.

You would set up your system this way:

- With the RampagePlus 286 Smart Switch program, set the linear memory starting address at 256 KB, the conventional memory backfill at 384 KB, and the extended memory amount at 0 KB.

- On your other memory board, set the linear memory starting address switches at 640 KB. (Do not count RampagePlus 286 expanded memory.)

See Section 6.3 for a step-by-step procedure for setting the addresses.

6.2 Memory Paging Compatibility

Depending on your applications, you can use other paged memory boards as expanded memory with RampagePlus 286.

If you are using EEMS or earlier versions of EMS, you may use RampagePlus 286 with the paged memory boards you already use.

You may also add other paged memory boards for expanded memory with EMS 4.0 programs that do not require full hardware compatibility. Usually, the software user's manual specifies which boards it can use for paging.

The EMS 4.0 features that RampagePlus 286 supports include direct memory access (DMA) and 32 alternate page registers for multitasking. If your program requires these features, you may use your EEMS and older EMS paged memory boards, but with a considerable loss of performance. For best results, use only the RampagePlus 286 board for expanded memory and older paged memory boards for extended memory.

Example

An application requires full EMS 4.0 hardware compatibility. You have a computer with 256 KB configured on the system board, a 4-MB RampagePlus 286 board and a 2-MB Advantage Premium board.

You would set up your system this way:

- Use the Smart Switch program to configure your RampagePlus 286 board with a 256 KB linear memory starting address, 384 KB conventional memory backfill, and 0 KB extended memory.

- Set the Advantage Premium switches for conventional and extended memory already installed at 640 KB and the conventional/extended memory size to 2048 KB.

6.3 Configuring Other Boards with RampagePlus 286

If you must change the configuration of your other memory boards, follow these steps:

STEP 1
Plan your memory allocation: Using the guidelines in Sections 6.1 and 6.2, calculate the starting linear memory addresses of your other memory boards. This address is the amount of configured system board memory plus backfilled conventional memory and extended memory (if any) on your RampagePlus 286 boards.

STEP 2
Set the switches on the other memory boards: Turn off your computer and remove your other memory boards. Set the switches for starting linear memory address, conventional and extended memory allocated, and base I/O address. These settings should not conflict with RampagePlus 286 or other boards in your computer. See your memory board user's manual for instructions.

STEP 3
Configure the RampagePlus 286 to run in Smart Switch Automatic mode: If you have already used Automatic mode, set jumper E2 on the RampagePlus 286 board. (See Section 3 for instructions.)

STEP 4
Reinstall the boards and assemble your system.

STEP 5
Run Smart Switch: Follow the instructions in Section 3 to use the Smart Switch program. Use Automatic mode to configure your system. If needed, use Manual mode to make changes. Be sure the RampagePlus 286 settings do not conflict with your other memory boards.

STEP 6
Run SETUP: See Section 4 for instructions.

6.4 Using Multiple RampagePlus 286 Boards

You can increase your computer's memory by installing up to four additional RampagePlus 286 boards. A RampagePlus 286 board does not have to be fully populated with 8 MB before you install another one.

Each RampagePlus 286 board has a unique identification code, set with a jumper. To change the identification, locate jumper block JP. On a new board, the ID jumper is installed on pin JP2. Leave the jumper on JP2 for the first board in your computer. Move the ID jumper to JP3 on the second board, JP4 on the third, and JP5 on the fourth (Figure 6-1).

First Rampage Plus 286 board
Second Rampage Plus 286 board
Third Rampage Plus 286 board
Fourth Rampage Plus 286 board

A142-7
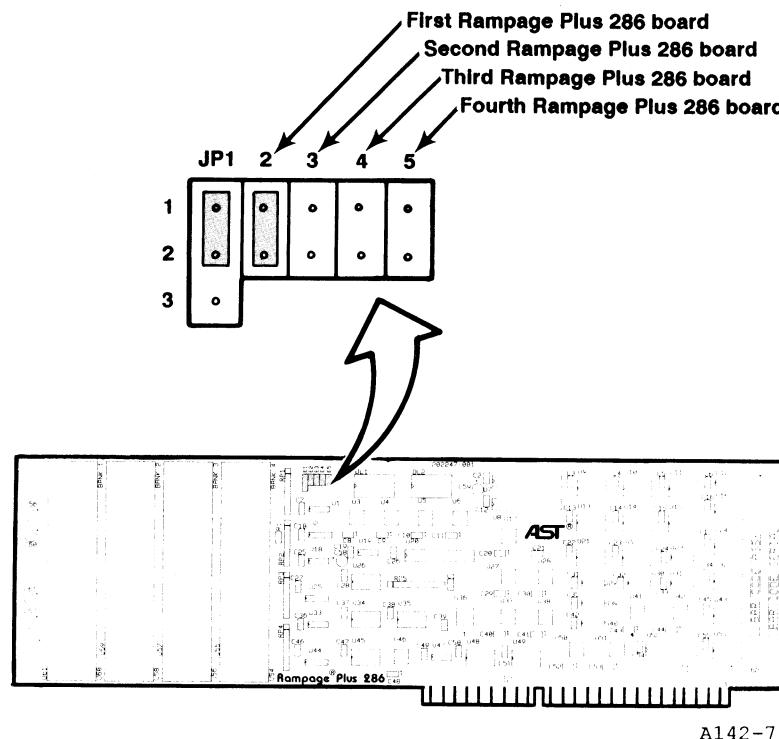
Figure 6-1. Board Identification Jumper.

After you set the jumper, install the board in your computer as shown in Section 2. Run the Smart Switch program, as shown in Section 3. By installing a new RampagePlus 286 board, you can use Automatic mode. If you are using Manual mode, set a different base I/O address for each RampagePlus 286 board. To run Automatic mode for a board again, move the mode jumper from pins 1 and 2 on JP1 to pins 2 and 3 on JP1 on either of the RampagePlus 286 boards.

PART III. APPENDICES

A. Troubleshooting

B. RampagePlus 286 Memory Paging

C. Modifying REMM.SYS and REX.SYS

Although your RampagePlus 286 board is designed for easy installation and reliable operation, problems can sometimes occur. This appendix shows you how to troubleshoot problems with installation, self-test, and memory, and explains how to restore your computer's configuration.

A.1 Troubleshooting Installation Problems

This section offers some suggestions for solving difficulties with RampagePlus 286:

PROBLEM
> The computer indicates a memory size error.

ACTION
> Run the computer's SETUP program.

PROBLEM
> RampagePlus 286 does not work properly after you add or remove memory.

ACTION
> Run the Smart Switch program to change the board configuration, then run the computer's SETUP program. See Sections 3 and 4 for instructions.

PROBLEM
> When you run Automatic mode, the following error appears:
>
> There are no products that require automatic configuration

ACTION
> Run Automatic mode again. Change the jumper on pins 1-2-3 of JP1 on your RampagePlus 286 board. If the jumper is on pins 1-2, move it to pins 2-3. If the jumper is on pins 2-3, move it to pins 1-2.

PROBLEM

The INSTALL program does not run with OS/2.

ACTION

Change to Real (DOS-compatible) mode to run INSTALL.

PROBLEM

SuperSpool and fASTdisk do not work with OS/2.

ACTION

The SuperPak utilities are not compatible with OS/2. Run INSTALL again from Real mode to disable SuperSpool and fASTdisk.

PROBLEM

The computer indicates a memory error.

ACTION

Check the following:

- Run the Smart Switch and SETUP programs after installing the board.

- If your system board is configured for less than 640 KB, make sure to use RampagePlus 286 memory to backfill to 640 KB.

- If you have more than one RampagePlus 286 board, make sure the jumper on JP2-JP5 is in a different location on each board.

- Make sure the RampagePlus 286 base I/O address does not conflict with other devices.

- Make sure the starting linear memory addresses of your memory boards do not overlap.

If none of the above methods solve the problem, you may have a memory chip problem. Note the string of numbers in the upper left corner of the screen and see Appendix A.2 for an explanation.

PROBLEM

The expanded memory software indicates an error upon booting.

ACTION

Check the following:

- Use only the expanded memory drivers provided with RampagePlus 286. Do not use drivers provided by other manufacturers.

- If your system board is configured for less than 640 KB, make sure only one expanded memory board is backfilling conventional memory. This board should be RampagePlus 286.

- If there is a parity error, you may have a bad SIMM or a SIMM that is not properly installed. The expanded memory software indicates which bank the bad SIMM is located. Make sure both SIMMs are correctly installed in the sockets. Replace any defective SIMMs.

If neither of these methods solve the problem, note the error message and see Appendix A.3 for an explanation.

PROBLEM

An EMS 4.0 application fails to start or run properly.

ACTION

Your application may require full EMS 4.0 hardware compatibility. Use your RampagePlus 286 boards for expanded memory and your other paged memory boards as extended memory.

If your system board is configured for less than 640 KB, use RampagePlus 286 to backfill conventional memory. The starting linear memory address of your other paged memory boards should be above RampagePlus 286. See Section 5 for more information.

A.2 Troubleshooting POST Error Codes

When you boot your computer, it runs through a built-in diagnostic program called power-on self-test (POST). This test checks the memory and hardware configuration.

If there is an error, a code appears in the upper-left corner of the screen. Table A-1 lists POST error codes you might encounter.

Table A-1. POST Error Codes.

Error Code	Description
021	Power supply
101	System unit
201	Memory
301	Keyboard
401	Monochrome display adapter
501	Color graphics adapter
601	Disk drive(s)/adapter
701	Math coprocessor
901	Parallel printer adapter
1101	Asynchronous communications adapter (COM1)
1201	Alternate asynchronous communications adapter (COM2)
1301	Game control adapter
1401	IBM matrix printer
1501	Synchronous data link control communications (SDLC)
1701	Fixed disk drive(s) adapter
1801	Expansion unit
2001	Binary synchronous communications (BSC)
2101	Alternate binary synchronous communications (ALT BSC)
2201	IBM cluster adapter
2801	Distributed function communications adapter
2901	IBM color graphics printer
3301	IBM compact printer

If the computer displays POST code 201, your computer has a memory error. Make sure you have run the SETUP program and set the correct amount of linear (conventional and extended) memory.

If you still get a 201 error, remove all the memory expansion boards from the computer, reconfigure the computer with the SETUP program, and reboot. If you see an error code this time, you may have bad memory chips on your system board. Contact the manufacturer or your authorized AST reseller for service.

If you do not get a memory error, you may have configured your memory expansion boards incorrectly. Remove the board and check the following:

- Make sure all switch settings are correct (including starting memory address, parity checking, conventional memory size, and Dual Page mode). See Section 2 for instructions on configuring RampagePlus 286.

- Make sure there are no configuration conflicts between memory boards.

- If you are installing I/O Pak 286, make sure it is securely installed as shown in the *I/O Pak 286 Supplement*.

If you are unable to correct an error, contact your reseller for assistance.

A.3 REMM and REX Error Messages

This appendix lists and explains some error messages you may see if problems are encountered while the Rampage/2 Expanded Memory Manager (REMM) or the Rampage/2 Extended Memory Emulator (REX) are being initialized. Each list is in alphabetical order.

When appropriate, this section offers possible solutions. Only messages generated by RampagePlus 286 software appear here. Other error messages may be generated by DOS. See your DOS Reference Manual.

A.3.1 REMM Initialization Error Messages

REMM:
Illegal or conflicting switch settings.
> **Explanation:** There is more than one RampagePlus 286 board installed, and two or more have a starting address below 640 KB. REMM cannot function if more than one RampagePlus 286 board has a starting address below 640 KB.

> **Action:** Use the Smart Switch program to set the starting address on one or more RampagePlus 286 boards so that only one is below 640 KB.

REMM:
No logical memory pages found.
> **Explanation:** This message indicates that either REMM cannot find any RampagePlus 286 boards or there is no memory available for use in mapping. All memory on the RampagePlus 286 board may be in use filling out the 640 KB of system memory for the PC.

> **Action:** Delete the line DEVICE=REMM.SYS from the CONFIG.SYS file if all of RampagePlus 286's memory is being used to fill out 640 KB of system memory.

REMM:
No valid Page Frame Base Address found.
> **Explanation:** REMM cannot find a free 64-KB block of memory between 640 KB and 1 MB in PC memory, which is needed for memory paging to occur. This may occur because the /X= parameter in the DEVICE statement installing REMM in the CONFIG.SYS file (see

in Appendix B) has excluded too many blocks of memory in this region from use, or because other software modules are installed in the 640-KB to 1-MB region.

> **Action:** Check the CONFIG.SYS file and remove any /X parameters that exclude memory segments needed for completing a 64-KB area between 640 KB and 1 MB.

REMM:
Unavailable Page Frame Base Address (PFBA) specified in /START= parameter.
> **Explanation:** The /START= parameter in the DEVICE statement that installs REMM in the CONFIG.SYS file specifies a segment address that is not the start of an available block of 64 KB of memory in the range from 640 KB to 1 MB.

> **Action:** No action is necessary. REMM will choose its own PFBA (if a valid one exists) after displaying this message and will continue with initialization.

A.3.2 REX Initialization Error Messages

Expanded Memory Manager is not present
> **Explanation:** This message indicates that REX has failed to detect REMM, which is necessary for REX to function. If this message appears, REX will not function.

> **Action:** Make sure the CONFIG.SYS file has the line DEVICE=REX.SYS after the DEVICE=REMM.SYS command, and the file REMM.SYS is in the root directory of the diskette used to initialize your computer.

Extended Memory allocation adjusted

> **Explanation:** The DEVICE=REX.SYS command in the CONFIG.SYS file requested more memory to be used as extended memory than the total available expanded memory. In this situation, REX allocates as much expanded memory as is available.

> **Action:** No action is necessary. While it is initializing, REX issues a message indicating how much memory is reserved for use with REX.

Non-recoverable error in Expanded Memory Manager

> **Explanation:** This message indicates that REMM is present but has returned a non-recoverable error code to REX. If this message appears, REX will not function.

> **Action:** Check which error message was issued for REMM and the suggested action in this appendix.

RAMPAGEPLUS 286 MEMORY PAGING B

This appendix gives you a simplified overview of how RampagePlus 286 memory paging works. This information can help you decide how to configure your RampagePlus 286 board.

AT-compatible computers offer two basic types of memory: *Linear* memory is memory with a continuous sequence of addresses. *Paged* (also called *expanded*) is memory broken into segments (called *pages*) which are swapped in and out of ranges accessible by DOS.

Section B.1 describes linear memory. Section B.2 describes expanded memory.

For a more detailed explanation of EMS 4.0 paging, refer to the *Lotus/Intel/Microsoft Expanded Memory Specification, Version 4.0.*

B.1 Linear Memory

The IBM PC's original 8088 microprocessor could address only 1 MB. The first 640 KB, called *conventional memory*, is reserved for programs and data. The 384 KB between 640 KB and 1 MB, called *reserved high memory*, is reserved for video RAM, the read only memory basic input/output system (ROM BIOS), and other system and peripheral functions. When the PC first came out, 640 KB seemed like more than enough memory. As applications became more complex, more memory was needed.

The PC AT was introduced with an 80286 microprocessor that can address up to 15.5 MB. To maintain compatibility with older applications, DOS still used the 1 MB addressing limit. Memory from 1 to 16 MB could be used for print spoolers and RAM disks, but it was not available to applications limited by the 640 KB limit. This is called *extended memory*.

Like conventional memory, extended memory uses a series of memory addresses. Therefore, both conventional and extended memory are called *linear memory*. Unlike conventional memory, extended memory cannot be addressed directly by DOS. Extended memory can be used by print spoolers, RAM disks, and other operating systems such as OS/2.

Figure B-1 shows a sample linear memory configuration.

Legend:

 Conventional

 Extended

 Reserved high memory
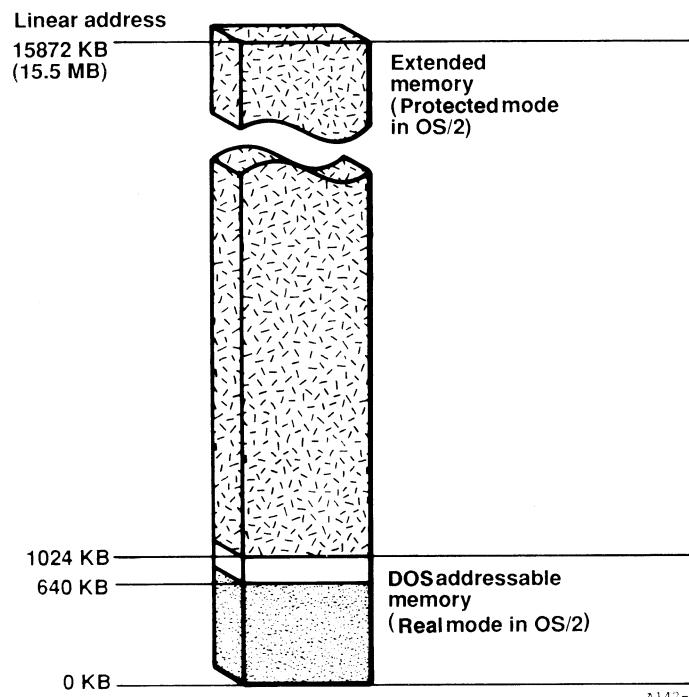
Figure B-1. Linear Memory Configuration.

B.2 Paged Memory

Paging offers you the ability to use memory beyond the DOS 640-KB limit by swapping 16 KB pages in and out of open areas in the 1-MB addressable range (called *frames*). DOS can address the portion of expanded memory in the 1 MB range. By swapping pages from different areas of expanded memory, applications can use up to 32 MB.

Since expanded memory cannot be addressed directly, it is not counted by the computer as part of linear memory and therefore not restricted to the 15.5-MB addressing limit as conventional and extended memory are.

Figure B-2 shows a simplified example of memory paging. This figure shows how expanded memory pages are swapped into a frame of reserved high memory.

Legend:
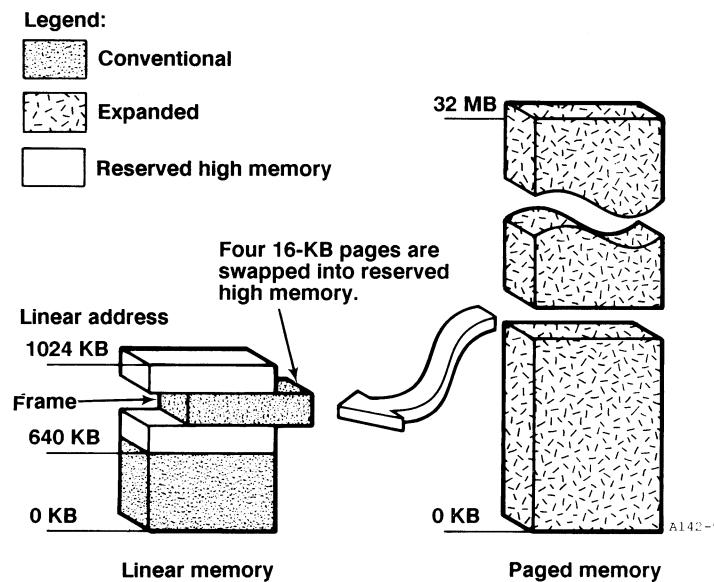
Figure B-2. Memory Paging Example.

B.2.1 Improving Paging Efficiency

The number of pages that can be swapped at one time depends on the frame size. EMS 4.0 needs a minimum 64 KB frame size (four pages). You can configure your system so EMS 4.0 pages an entire 1 MB at a time (64 pages). Naturally, larger frame sizes improve paging efficiency.

Frames are normally located in reserved high memory. Areas unused by video RAM and ROM BIOS are available for paging. Peripheral devices that use reserved high memory (such as secondary display adapters and network boards) also limit frame size. The expanded memory software also uses part of reserved high memory.

When the system board is enabled, conventional memory is unavailable for paging. The system board's linear memory cannot be broken down for paging.

By disabling the system board, RampagePlus 286 memory is used to backfill conventional memory. Any unused portion of conventional memory can serve as a frame. Since more pages can be swapped at once, paging efficiency improves.

Figure B-3 shows the difference between enabling and disabling the system board.

Legend:

Conventional

Reserved high memory

Figure B-3. Enabling and Disabling the System Board.

B.2.2 Expanded Memory Software

The Rampage Expanded Memory Manager driver REMM.SYS performs the memory paging. It supports EMS 4.0 and earlier versions, and EEMS. Only use the REMM.SYS provided with RampagePlus 286 for paging; do not use drivers provided by other applications and memory boards.

For some applications, you may need additional extended memory. The Rampage Extended Memory Emulator driver REX.SYS enables your computer to use more extended memory without reconfiguring your boards. REX.SYS uses expanded memory to emulate extended memory. You may use emulated extended memory for print spoolers and RAM disks.

Once you install these programs with INSTALL, expanded memory applications will automatically use paging. To assure proper operation, only use the expanded memory drivers provided with RampagePlus 286. Do not use expanded memory drivers provided by other boards or applications.

If you need to modify the expanded memory configuration, use the INSTALL program. Some applications require special configurations for REMM.SYS and REX.SYS not provided by INSTALL. For information on modifying the expanded memory configuration, see Appendix C.

NOTES

MODIFYING REMM.SYS AND REX.SYS   C

The INSTALL program on your SuperPak utilities disk configures the REMM.SYS and REX.SYS expanded memory drivers and adds the necessary commands to the CONFIG.SYS file. Under normal circumstances, you do not need to modify the REMM.SYS and REX.SYS commands. For routine configuration changes, use the INSTALL program.

For specialized applications, such as excluding memory for paging, limiting the number of process IDs, or setting the number of contexts, you may modify the expanded memory software. (If you do not know what these applications are, you probably should not modify these commands yourself.)

This section explains the expanded memory software in depth and shows how to enter parameters to change the configuration.

C.1 Expanded Memory Drivers

RampagePlus 286 comes with two drivers: REMM.SYS, which performs memory paging, and REX.SYS, which uses expanded memory to emulate extended memory.

C.1.1 REMM.SYS

The REMM.SYS software driver swaps memory between the RampagePlus 286 board and system boards memory by creating pointers, loading the registers, and mapping computer windows to RampagePlus 286 expanded memory. REMM.SYS also conducts an integrity test on the expanded memory when the computer is turned on. This prevents any memory that is not working properly on RampagePlus 286 or other expanded memory boards from being used.

In order to retrieve a particular element of data, your application program must keep track of the page in which RampagePlus 286 memory holds it. According to parameters supplied by the application program, REMM.SYS links windows in logical memory to pages of RampagePlus 286 physical memory by means of the 64 mapping registers, the map control register, and the page registers.

REMM.SYS also allocates RampagePlus 286 memory to several process IDs, also known as EMM handles. Each process ID is allocated to a particular application program, and has certain pages of memory allocated to it. Process IDs aid in multitasking.

C.1.2 REX.SYS

With REX.SYS, expanded memory can emulate extended memory. You can increase the amount of extended memory for RAM disks and print spoolers without reconfiguring your boards.

REX.SYS works with REMM.SYS to convert expanded memory operations into extended. Calls for ROM BIOS functions designed for extended memory are intercepted by REX.SYS and linked with REMM.SYS so they can use expanded memory.

REMM.SYS must be installed before REX.SYS to use emulated extended memory. Use emulated extended memory for RAM disks and print spoolers only. Other operating systems may not be able to use emulated extended memory.

C.2 Modifying CONFIG.SYS

As installed with the INSTALL program, REMM.SYS and REX.SYS should not require further modification. Use INSTALL to set and change memory configuration. The information in this section is for reference purposes only.

If you need to change REMM.SYS or REX.SYS manually, you will need to change the CONFIG.SYS file. Use a text editor or word processor and save the file in unformatted or non-document mode.

INSTALL adds the following statements to the CONFIG.SYS file to configure REMM.SYS and REX.SYS software drivers.

    DEVICE=REMM.SYS

    DEVICE=REX.SYS

The DEVICE=REMM.SYS statement always comes before DEVICE=REX.SYS. Any devices that require expanded memory or emulated extended memory, such as fASTdisk, are assigned after REMM.SYS and REX.SYS. (See the *SuperPak User's Manual* for more information regarding fASTdisk.)

After the REMM.SYS and REX.SYS statements, you will see a string of additional parameters, which configure the drivers. These parameters invoke special features, most of them for software development.

CAUTION

Enter the parameters shown here carefully. Errors in the REMM.SYS and REX.SYS statements will prevent your computer from working properly.

To make routine changes to your memory configuration, use the INSTALL program instead of modifying CONFIG.SYS yourself.

For information on REMM.SYS and REX.SYS parameters, see the following sections:

● *For REMM.SYS parameters:* See Appendix C.3.

● *For REX.SYS parameters:* See Appendix C.4.

C.3 DEVICE=REMM.SYS Parameters

You can append multiple parameters to the DEVICE=REMM.SYS statement. Separate parameters with one blank space as shown below:

DEVICE=REMM.SYS [/X] [/P] [/S] [/D] [/C] [/N]

With the exception of the "/X" parameter, the following are intended for software developer use.

/X= -- Exclude

The /X parameter enables you to exclude certain ranges of memory from REMM.SYS mapping. REMM.SYS will never map into memory space that is already occupied, but you may have an application for which you would like to reserve certain memory ranges.

NOTE

If you use software designed for EEMS, exclude the area used by video memory from mapping.

The INSTALL program automatically installs the appropriate "/X" parameter. (INSTALL excludes the 0B000-0BFFFh range for an IBM monochrome display adapter, Hercules graphics adapter, or compatible; 0B800-0BFFFh for an IBM color graphics adapter or compatible; 0A000-0BFFFh for an IBM enhanced graphics adapter or compatible, or for other types of video boards.)

Format:	/X=nnnn-nnnn
	n is a hexadecimal digit. The first *nnnn* is the starting address of the range, and the second *nnnn* is the ending address.
	You can specify multiple ranges as long as you separate each address range with one blank.
Default:	No memory is excluded if you use the /X parameter by itself. You must specify a memory range.
Example:	DEVICE=REMM.SYS /X=B000-BFFF
	This is the standard statement for a system that includes a Hercules graphics adapter.
Example:	DEVICE=REMM.SYS /X=C140-CA00 /X=DDDD-DDFF
Notes:	You must leave at least one contiguous 64-KB segment of memory available for mapping by REMM.SYS starting in the range 0C000h through 0E000h. In other words, you may not use the /X parameter to exclude all contiguous 64-KB segments that start in that range.

/PIDS= or /P= -- process IDs

The /P parameter limits the number of process IDs that REMM.SYS will allow. A process ID is the identification assigned to each user or application on the system.

Format:	/PIDS=n or /P=n (short form)
	n is a decimal number from 2 to 256.
Default:	The default value is 32.

Example: DEVICE=REMM.SYS /PIDS=12

Notes: Increasing the number of process IDs increases the amount of memory used by REMM.

/START= or /S= -- Start

The /S parameter tells REMM.SYS to put logical page 0 of the mapping window at the specified segment address. This hexadecimal address must be on a 16-KB boundary, and must be within the 0C000-0E000h range.

Format: /START=nnnn

   n is a hexadecimal digit.

Default: Determined dynamically by REMM.

Example: DEVICE=REMM.SYS /START=C000

/DEPTH= or /D= -- Depth

The /D parameter specifies the maximum number of mapping register contexts per process ID that REMM.SYS can save. Unless you are developing software, use the default value.

Format: /DEPTH=nn

   nn is any decimal number from 1 to 32.

Default: The default value is 5.

Example: DEVICE=REMM.SYS /DEPTH=15

/CONTEXTS= or /C= -- Total Contexts

The /C parameter specifies the total number of mapping register contexts that can be saved for all process IDs combined. Unless you are developing software, use the default value.

Format: /CONTEXTS=nnn

   n is a decimal digit.

Default: The value of DEPTH plus the value of PIDS minus one.

Example: DEVICE=REMM.SYS /CONTEXTS=36

Notes: The value of CONTEXTS cannot be less than the value of PIDS.

/N -- Nomenclature

The /N parameter displays a message similar to the following when you boot your computer:

```
RampagePlus 286 Expanded Memory Manager          Version X.xx
(c) Copyright AST Research, Inc. 1985, 1986          All Rights Reserved
KB ok        Board at Port    Bank Number . . . . . . . . . . . . . . . 0123
1152         0268             0=OK, X=Bad or Empty, P=Parity Err.     0000
1024         0256             0=OK, X=Bad or Empty, P=Parity Err.     00XX
                             Expanded Memory Pages:        136
                             Windows START at:             C000h
                             Process IDs:                  32
                             Contexts:                     36
                             Depth:                        5
                             Mode:                         1F
```

C.4 DEVICE=REX.SYS Parameter

Only one parameter for the REX.SYS statement specifies the amount of emulated extended memory.

Format: DEVICE=REX.SYS [nnnn]

                 nnnn is a decimal value indicating the amount of emulated extended memory to allocate (in KB).

Default: 512

Example: DEVICE=REX.SYS 1024

                 This statement indicates that 1024 KB of expanded memory is to be used to emulate extended.

Notes: This value should be a multiple of 16 KB, otherwise, REX.SYS will round up the amount to the next highest multiple.

GLOSSARY

Following are definitions of some technical terms used in this manual:

Backfill
To use memory on add-in boards as conventional memory.

Base Memory
Memory up to 640 KB that is directly accessible by DOS. Also see *conventional memory*.

Basic input/output system (BIOS)
A set of low-level input and output routines the computer calls to perform its functions.

Bus Speed
The speed at which your computer's bus handles data.

Byte
The basic unit of measure for computer memory. A character -- such as a letter, number or punctuation mark -- uses one byte of memory. Computer memory is often measured in *kilobytes* (approximately one thousand bytes) or *megabytes* (about one million bytes).

Each byte is made up of eight *bits*. For more information on bytes and bits, see an introductory book on computers.

Conventional memory
Memory up to 640 KB that is directly accessible by DOS. Also see *base memory*.

Driver

A file that configures an application to run with specific peripherals. The RAMTYPE.SYS and REMM.SYS drivers are used by EMS and EEMS applications to take advantage of RampagePlus 286 expanded memory.

Dual-connector slot

An expansion slot on AT-compatible computer that has two sockets. A board installed in this slot can transfer 16 bits at once.

Emulated extended memory

Expanded memory that functions like extended memory with the REX.SYS driver. Emulated extended memory can be used for print spoolers or RAM disks.

Enhanced Expanded Memory Specification (EEMS)

An enhanced version of the expanded memory specification that provides a more flexible system for paging expanded memory. EEMS can be used by software that supports it.

Expanded memory

Also called *paged memory*. Memory provided on the RampagePlus 286 board that is not allocated as part of the computer's conventional memory. Expanded memory is swapped in and out of windows in the address space recognizable by DOS, using special software device drivers provided with your RampagePlus 286.

Expanded memory specification (EMS)

A specification for paging expanded memory. EMS can be used by software that supports it. RampagePlus 286 uses EMS 4.0.

Expansion memory

Memory over 640 KB that may be used as expanded or extended.

Extended memory

Memory at addresses of 1 MB or greater. Extended memory is used by OS/2 as Protected mode memory.

fASTdisk

AST's program that uses RAM to emulate a fixed disk.

Frame

An open space in the 1-MB addressable range that can be used for paging memory. A frame must be at least 64 KB.

Hexadecimal

The base-16 numbering system. Numbers are represented by values from 0 to F (15). For example, the hexadecimal number 100000 is equal to the decimal value 1,048,576.

INSTALL

A menu-driven program used for installing the expanded memory and SuperPak software.

Kilobyte (KB)

A unit of measure for memory. One KB is equal to 1024 bytes of memory.

Linear Memory

Memory that is organized in a long series of addresses.

Megabyte (MB)

A unit of measure for memory. One MB is equal to one thousand kilobytes, or approximately one million bytes, of memory.

Megahertz (MHz)

A unit for measuring frequency equal to a million cycles per second. Clock speed is measured in MHz.

Nanosecond (ns)

One billionth of a second. Nanoseconds are used to measure the amount of time needed to process memory.

Operating System/2 (OS/2)

A multitasking operating system that can directly address approximately 15.5 MB of memory. This operating system works in 80286- and 80386-based machines like the AST Premium/286, IBM PS/2™, and PC AT.

Page

A 16-KB section of expanded memory that is swapped in and out of conventional and reserved high memory.

Paged Memory

Also called *expanded memory*. Memory provided on the Rampage/2-286 board that is not allocated as part of the computer's conventional memory. Paged memory is swapped in and out of windows in the address space recognizable by DOS, using special software device drivers provided with your Rampage/2-286.

Parity checking

A method of double-checking the accuracy of information stored in the computer's memory.

Print spooler

A program that allocates a portion of computer RAM as a printer buffer. AST's print spooler program is called *SuperSpool*.

A print spooler sends a file to be printed to a buffer rather than directly to the printer. The spooler then sends the file from the buffer to the printer. Once the file is stored in the buffer, the computer can do other work while the printer is printing.

RAM disk

A program that allows you to use part of the computer's memory as if it were a disk drive. AST's *fASTdisk* program is a fixed disk emulator.

RAM disks are erased when the computer is turned off or rebooted. This means you must save data you want to keep on a floppy or fixed disk.

Rampage Expanded Memory Manager (REMM.SYS)

A driver that enables your computer to use Rampage expanded memory with application programs.

Rampage Extended Memory Emulator (REX.SYS)

A driver that uses expanded memory to emulate extended memory. (Also see *emulated extended memory*.)

Random access memory (RAM)

The computer's memory. Information can be written to and read from RAM. The PS/2's RAM can be expanded to 15.5 MB. One Rampage/2-286 board can provide up to 2 MB of RAM.

Read only memory (ROM)

Computer memory that can be read but not overwritten. ROM is usually dedicated to a particular function, such as the *basic input/output system (BIOS)*.

Reference disk

A floppy disk IBM provides with the PS/2 that you may use to configure Rampage/2-286. If you have an RampagePlus 286 board in your computer, you must use the RampagePlus 286 Configuration disk instead.

Reserved high memory

Memory from 640 to 1024 KB reserved for video display adapters, ROM BIOS, network, and other add-in boards. EMS 4.0 can use open spaces in reserved high memory for paging.

Single Inline Memory Module (SIMM)

A small circuit board which contains memory chips. Rampage/2-286 uses 256-KB SIMMs to increase the amount of memory on the board.

Smart Switch

A program used to select the RampagePlus 286 configuration and save it on the board.

SuperSpool

The AST program that enables you to use part of computer memory as a *print spooler*.

System board

The board built into the computer that contains basic components, such as the microprocessor and ROM. The system boards of most computers contain a small amount of conventional memory, usually 512 KB.

VDISK

An IBM software product that enables you to create simulated fixed disks in RAM.

Wait state

The interval between the time data is requested and when it is actually transmitted.

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NOTES

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User's Manual
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Rampage® Plus 286

Expanded Memory Board

for the

IBM® PC AT®

and Compatible Computers

and XT-Compatible Computers with

AST Xformer/286™

ADDENDUM TO THE RAMPAGEPLUS 286 USER'S MANUAL

This addendum documents an optional parameter not previously described in Appendix C. Please insert the updated pages in place of those originally supplied in your User's Manual:

TABLES

NOTES

If you need to change REMM.SYS or REX.SYS manually, you will need to change the CONFIG.SYS file. Use a text editor or word processor and save the file in unformatted or non-document mode.

INSTALL adds the following statements to the CONFIG.SYS file to configure REMM.SYS and REX.SYS software drivers.

DEVICE=REMM.SYS

DEVICE=REX.SYS

The DEVICE=REMM.SYS statement always comes before DEVICE=REX.SYS. Any devices that require expanded memory or emulated extended memory, such as fASTdisk, are assigned after REMM.SYS and REX.SYS. (See the *SuperPak User's Manual* for more information regarding fASTdisk.)

After the REMM.SYS and REX.SYS statements, you will see a string of additional parameters, which configure the drivers. These parameters invoke special features, most of them for software development.

CAUTION

Enter the parameters shown here carefully. Errors in the REMM.SYS and REX.SYS statements will prevent your computer from working properly.

To make routine changes to your memory configuration, use the INSTALL program instead of modifying CONFIG.SYS yourself.

For information on REMM.SYS and REX.SYS parameters, see the following sections:

- *For REMM.SYS parameters:* See Appendix C.3.

- *For REX.SYS parameters:* See Appendix C.4.

C.3 DEVICE=REMM.SYS Parameters

You can append multiple parameters to the DEVICE=REMM.SYS statement. Separate parameters with one blank space as shown below:

DEVICE=REMM.SYS [/X] [/P] [/S] [/D] [/C] [/N] [/M]

With the exception of the "/X" parameter, the following are intended for software developer use.

/X= -- Exclude

The /X parameter enables you to exclude certain ranges of memory from REMM.SYS mapping. REMM.SYS will never map into memory space that is already occupied, but you may have an application for which you would like to reserve certain memory ranges.

NOTE

If you use software designed for EEMS, exclude the area used by video memory from mapping.

The INSTALL program automatically installs the appropriate "/X" parameter. (INSTALL excludes the 0B000-0BFFFh range for an IBM monochrome display adapter, Hercules graphics adapter, or compatible; 0B800-0BFFFh for an IBM color graphics adapter or compatible; 0A000-0BFFFh for an IBM enhanced graphics adapter or compatible, or for other types of video boards.)

/CONTEXTS= or /C= -- Total Contexts

The /C parameter specifies the total number of mapping register contexts that can be saved for all process IDs combined. Unless you are developing software, use the default value.

Format:	/CONTEXTS=nnn
	n is a decimal digit.
Default:	The value of DEPTH plus the value of PIDS minus one.
Example:	DEVICE=REMM.SYS /CONTEXTS=36
Notes:	The value of CONTEXTS cannot be less than the value of PIDS.

/N -- Nomenclature

The /N parameter displays a message similar to the following when you boot your computer:

RampagePlus 286 Expanded Memory Manager			Version X.xx
(c) Copyright AST Research, Inc. 1985, 1986			All Rights Reserved
KB ok	Board at Port	Bank Number	0123
1152	0268	0=OK, X=Bad or Empty, P=Parity Err.	0000
1024	0256	0=OK, X=Bad or Empty, P=Parity Err.	00XX
	Expanded Memory Pages:	136	
	Windows START at:	C000h	
	Process IDs:	32	
	Contexts:	36	
	Depth:	5	
	Mode:	1F	

/M= -- Mode

The /M parameter designates certain blocks of reserved high memory for 16-bit operation. To use a 16-bit video adapter, for example, you must change the REMM.SYS default (8-bit mode) in blocks of sufficient size.

Format: /M = nn

nn is a mode bit setting.

Table C-2 shows the range of mode bit alternatives.

Table C-2. Mode Bit Alternatives.

Parameter Setting	1st 640 KB	Reserved High Memory
DEVICE = REMM.SYS /M=1F	16-bit	All 8-bit
DEVICE = REMM.SYS /M=3F	16-bit	1st 128 KB at 16-bit, remainder at 8-bit
DEVICE = REMM.SYS /M=5F	16-bit	2nd 128 KB at 16-bit, remainder at 8-bit
DEVICE = REMM.SYS /M=7F	16-bit	1st 256 KB at 16-bit, remainder at 8-bit

Default: 1F (See Table C-2.)

Example: DEVICE=REMM.SYS/M=7F

This sets the first two blocks of 128 KB in reserved high memory to 16-bit operation.

Notes: Assign high memory in 128-KB blocks. Even if you need only 212 KB, for example, you must still assign two blocks (256 KB).

C.4 DEVICE=REX.SYS Parameter

Only one parameter for the REX.SYS statement specifies the amount of emulated extended memory.

Format: **DEVICE=REX.SYS [nnnn]**

nnnn is a decimal value indicating the amount of emulated extended memory to allocate (in KB).

Default: 512

Example: DEVICE=REX.SYS 1024

This statement indicates that 1024 KB of expanded memory is to be used to emulate extended.

Notes: This value should be a multiple of 16 KB, otherwise, REX.SYS will round up the amount to the next highest multiple.

NOTES

R

S

RAMPAGE®PLUS 286 ERRATA SHEET

This information sheet corrects and updates the hardware compatibility requirements of the AST® RampagePlus 286 board and package content information.

Your AST product includes both 3.5- and 5.25-inch disks. The disks' contents and names are the same. You may use either set of disks as instructed in the user's manual.

RampagePlus 286 will operate properly when installed in the following computers:

● IBM® PC AT® and compatible computers with bus speed at 8 megahertz (MHz), including AST Bravo/286

● IBM Personal System/2® Model 30 286 (10 MHz bus) with 1 wait state inserted using the RampagePlus 286 installation program

● AST Premium/286 (10 MHz bus)

● AST Xformer/286 (10 MHz bus)

RampagePlus 286 may not operate properly when used with other computers with bus speeds exceeding 8 MHz. If your computer enables you to do so, change its bus speed to 8 MHz.

For RampagePlus 286 to operate properly at 8 or 10 MHz bus speeds in the computers listed above, and at 8 MHz bus speeds in other computers, use 100 nanosecond (ns) or faster SIMMs. Do not use static column SIMMs.

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