Cheetah Card™

Installation and Operation Manual

CHEETAH™

INTERNATIONAL, INC.

Cheetah Card™

Installation and Operation Manual

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Cheetah Card
Cheetah Code

Inventory Checklist

Your Cheetah Card add-on memory adapter for the IBM PC-AT is packaged to include the following:

—Cheetah Card printed circuit board

—Cheetah Card Installation and Operation Manual

—Cheetah Code provided on a 5¼" floppy diskette

—Limited Warranty

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Cheetah Card
Installation and Operation Manual

SECTION ONE INTRODUCTION

Your Cheetah Card is the most advanced add-on memory adapter available for the IBM PC-AT. Unique capabilities of the Cheetah Card include the ability to employ 256K dynamic RAMs to "round-out" low memory (640K) and apply the remaining "leftover" memory above the first megabyte. Moreover, the Cheetah Card can operate with faster memory devices, thereby eliminating the need for a wait state during memory access cycles. Further, the flexibility of the Cheetah Card allows for banks of memory to be individually mapped anywhere within the 16 megabyte address space. This feature can be used to provide memory for other system hardware or software features without the awareness of the PC-DOS operating system. These features permit performance and economy previously unavailable on conventional memory add-on adapters.

This manual provides step-by-step instructions for configuring and installing the Cheetah Card in an IBM PC-AT. Included are instructions for configuring the switches on the Cheetah Card as well as instructions for configuring the IBM PC-AT to accept and recognize the added memory.

The Cheetah Card provides from 128K bytes to 2.5M bytes of dynamic Random Access Memory (RAM). The Cheetah Card is a printed circuit board (roughly 4.5 inches by 13.3 inches) that may be installed in any full-length, 16 bit slot in an IBM PC-AT or PC-AT compatible system.

1.1 FEATURES

The Cheetah Card has the following features:

- Split addressing modes provide 128K to 384K bytes of expansion memory to first megabyte with 64K or 256K dynamic RAMs.
- Maps excess memory leftover when 256K dynamic RAMs are used within the first megabyte to be available above first megabyte.
- Provides up to 2.5M bytes of expansion memory.
- Each memory bank individually settable within address space. (Memory banks can be "hidden" from DOS for specific hardware or software use).

- Fast access option eliminates wait state cycles and boosts system performance.
- Provides byte parity.
- Allows both 8 bit and 16 bit data transfers.
- Accepts both 64K and 256K dynamic RAMs.

1.2 ORGANIZATION OF THIS MANUAL

The paragraphs below briefly outline the organization of this manual:

SECTION ONE — **INTRODUCTION**
Provides an overview of the Cheetah Card.

SECTION TWO — **PREINSTALLATION REQUIREMENTS**
Identifies the tools necessary for installation of the Cheetah Card as well as instructions for removing the system unit cover on the PC-AT.

SECTION THREE — **INSTALLATION**
This section contains the information required for setting the switches on the Cheetah Card, configuring the jumpers on the PC-AT, and the physical installation of the Cheetah Card in the PC-AT chassis.

SECTION FOUR — **TECHNICAL REFERENCE**
Technical information of the Cheetah Card is provided within this section.

APPENDIX A — **ADDRESS SELECTION SWITCH CHART**
This portion of the manual contains a table of address selection switch positions.

APPENDIX B — **EXAMPLES**
Typical installation switch settings are outlined in this portion of the manual in the form of examples.

SECTION TWO PREINSTALLATION REQUIREMENTS

The Cheetah Card is intended for use in any IBM PC-AT or PC-AT compatible computer.

2.1 TOOLS REQUIRED

The tools you will need to install the Cheetah Card are listed below:

- Flat-blade or Phillips head screwdriver
- 3/16 inch nutdriver or 3/16 inch wrench
- Small needlenose pliers or tweezers
- Ballpoint pen

2.2 ACCESS INSIDE SYSTEM UNIT

In order to install the Cheetah Card you will have to remove the cover on the system unit of the IBM PC-AT. To install the Cheetah Card on compatible systems from other manufacturers you must refer to the appropriate manual for instructions on removing the system cover for that particular non-IBM unit.

The following procedure outlines the cover removal for an IBM PC-AT:

1. Turn the system unit power switch OFF.
2. Turn the power switches for all external equipment (monitors, printers, modems, etc.) OFF.
3. Unplug the system unit and all external equipment from the wall outlet.
4. Disconnect all cables connected to the rear panel of the system unit.
5. Place the front panel key in its extreme counter-clockwise position and remove the key.

6. Remove the keyboard and any other equipment from the immediate work area.

7. Position the system unit such that easy access to the rear panel is achieved.

8. A plastic cover is usually attached to the rear of the system unit with strips of Velcro. If the cover is present, carefully remove it to gain access to the cover mounting screws.

9. Using a flat blade screwdriver, remove the five mounting screws located on the rear panel of the system unit. The location of the cover mounting screws are as follows: one in each corner and one near the top center of the rear panel.

   Save the screws in a safe place after removal.

10. Carefully slide the system unit cover forward (away from the rear). When the cover will go no further, tilt the cover upward and remove from the base. Set the cover aside in a safe place.

SECTION THREE INSTALLATION

Before installing the Cheetah Card several options must be taken into consideration. These options include whether the Cheetah Card is to provide any base memory (below one megabyte), the amount of memory installed on the Cheetah Card, and the presence of other memory expansion boards within the system. Cheetah Cards which are configured to contain fast, no wait state, memories can enhance system performance when used as a substitute for the slower base system memory (those incur one wait state per access cycle).

3.1 SETTING SYSTEM UNIT MEMORY SIZE

This section describes how to verify and, if necessary, change the system unit memory size jumper for the IBM PC-AT. For PC-AT compatible units a different procedure may be required. Owners of non-IBM units should refer to the appropriate installation guide provided with their unit for configuration instructions.

Located on the IBM PC-AT motherboard is a three post jumper labeled J18. This jumper has two positions; either a shorting block between pins 1 and 2, or a shorting block between pins 2 and 3. Jumper J18 is located near the front of the system unit directly beneath the disk controller board. This jumper signifies whether the memory for addresses 256K through 512K are located on the system unit (jumper pins 1 to 2) or provided on an external card (jumper pins 2 to 3). Note: The location of pin 1 on jumper J18 is the frontmost of the three pins.

The PC-AT comes in two versions: one called the "base" model containing 256K bytes of system memory, and one termed the "enhanced" model containing 512K bytes of system memory. If you own a "base" model and plan to have the Cheetah Card provide the memory above 256K bytes, you will have to insure that the shorting block for jumper J18 is between pins 2 and 3. If you own an "enhanced" model and have purchased the fast, no wait state version of the Cheetah Card and wish the fast memory to replace the slower, system memory, you will want the shorting block for jumper J18 between pins 2 and 3. Otherwise, the proper position for the shorting block on jumper J18 is between pins 1 and 2.

Verify that the RAM jumper, J18, is clearly visible and set as outlined for the conditions described above. If visible and properly set, proceed to the next section. If not visible or not set as desired, follow the instructions below to change the position of jumper J18.

In order to gain access to jumper J18 it will be necessary to remove the disk controller card. To remove the disk controller card, first remove the mounting screw located on the back panel. Next, it will be necessary to remove cable J6 (a red and black cable located at the top front of the controller). The other cables connecting to the disk controller do not have to be removed. However, it is advised that you make note of them should they become detached and require reconnection.

Remove the disk controller card by pulling upward. Position the controller (with cables still attached) out of the way by placing it over the power supply and fixed disk while jumper J18 is set.

The shorting block on jumper J18 is most easily removed with a pair of needlenose pliers or tweezers. Remove the shorting block on jumper J18 and place in the desired position (as outlined above). Once the jumper is properly set, replace the disk controller back into its slot, reconnect all cables, and replace the mounting screw.

3.2 SETTING CHEETAH CARD MEMORY SWITCHES

Before describing the switches on the Cheetah Card a certain amount of understanding of the PC-AT memory organization is useful. In the PC-AT, memory is organized as follows:

- Up to 640K bytes can be installed in low order memory (called base memory)

- A gap is left between 640K to 1M bytes for system purposes (display memory, BASIC Read-Only-Memory, etc.)

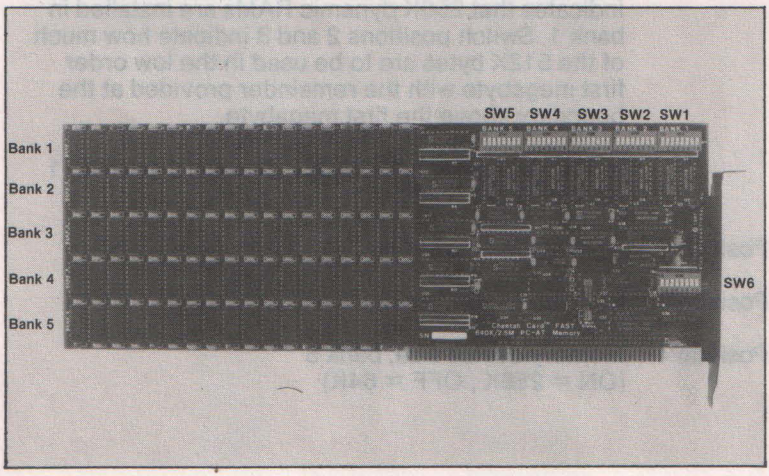
- The region between 1M and 15.875M (14.875M total) can be installed (termed extended memory) using the Cheetah Card.

– Between 15.875M and 16M bytes is reserved for system use.

The Cheetah Card has such flexibility that its memory can be placed anywhere within the entire PC-AT memory space. Naturally, it should not be placed such that it overlaps other memory cards or reserved system memory space!

Due to the many possible combinations of both memory devices and placement of memory within a system it is recommended that the program CHSETUP be used for setting the Cheetah Card switches. This program is provided on your Cheetah Code diskette and is the executable file CHSETUP.EXE. Simply type CHSETUP and carriage return and the CHSETUP program will ask questions about the system and provide pictorials on how to set the switches.

On the Cheetah Card, there are six, eight position DIP switches. Of these, the first 5 switches (SW1 through SW5) are used to enable each of the 5 banks. Switch 1 (SW1) is used to enable bank 1, Switch 2 is used to enable bank 2 and so on. Because each of these 5 switches are similar, the following description of the positions within a switch apply to each.



SWITCHES SW1 THROUGH SW5

Position 1 Bank enable (ON = ON), (OFF = OFF)

Positions 2 through 8 Starting bank address

2 Address bit 23 (ON = 0, OFF = 1)

3 Address bit 22 (ON = 0, OFF = 1)

4 Address bit 21 (ON = 0, OFF = 1)

5 Address bit 20 (ON = 0, OFF = 1)

6 Address bit 19 (ON = 0, OFF = 1)

7 Address bit 18 (ON = 0, OFF = 1)
(ignored if bank is configured for 256K dynamic RAMs)

8 Address bit 17 (ON = 0, OFF = 1)
(ignored if bank is configured for 256K dynamic RAMs)

The sixth eight position DIP switch configures the mode of operation for the adapter. Specifically, it identifies whether split-mode addressing is requested as well as identifying the memory device (64K or 256K DRAMs) within a given bank.

SWITCH 6 (SW6)

Position 1 Split mode addressing enabled. This switch position, when "OFF" indicates that bank 1 is to be used in the lower first megabyte of system memory. It also indicates that 256K dynamic RAMs are installed in bank 1. Switch positions 2 and 3 indicate how much of the 512K bytes are to be used in the low order first megabyte with the remainder provided at the boundary above the first megabyte.

NOTE: If this position is "OFF," switch 1 position 1 should be set "OFF."

Position 2 Split mode addressing.

Position 3 Split mode addressing.

Position 4 Memory device size, bank 5
(ON = 256K , OFF = 64K)

Position 5 Memory device size, bank 4
(ON = 256K , OFF = 64K)

Position 6 Memory device size, bank 3
(ON = 256K , OFF = 64K)

Position 7 Memory device size, bank 2
(ON = 256K , OFF = 64K)

Position 8 Memory device size, bank 1
(ON = 256K , OFF = 64K)

****

The following table shows the proper setting of switch #6 when 256K dynamic RAMs are used for bank 1 and that bank's memory is to become selected within the first megabyte of system memory.

SWITCH #6 TABLE POSITIONS

Selected Memory Range	1	2	3
256K - 640K + 1.0M - 1.128M	OFF	OFF	OFF
512K - 640K + 1.0M - 1.384M	OFF	ON	OFF
256K - 512K + 1.0M - 1.256M	OFF	OFF	ON

3.2.1 USE WITH ALL 64K DYNAMIC RAMS

When the Cheetah Card contains only 64K dynamic RAMs, the DIP switch labeled SW6 on the card should be set as follows:

Switch 6 (SW6):	POSITION							
	1	2	3	4	5	6	7	8
	ON	ON	ON	OFF	OFF	OFF	OFF	OFF

Switches SW1 through SW5 are set to indicate which of the five banks respectively are to respond to a particular address range. Examples number 5, 6, 7, and 8 of appendix B outline the switch settings which are most likely to be used. When

using 64K dynamic RAMs, each switch identifies a section of memory space occupying 128K bytes. Each bank can be assigned any of all the possible 128K byte boundaries identified in Appendix A.

3.2.2 USE WITH ALL 256K DYNAMIC RAMS

When the Cheetah Card contains only 256K dynamic RAMs, positions 4 though 8 of the DIP switch labeled SW6 on the card should be set as follows:

Switch 6 (SW6):	POSITION							
	1	2	3	4	5	6	7	8
	—see text—			ON	ON	ON	ON	ON

Switches SW1 through SW5 are set to indicate which of the five banks respectively are to respond to a particular address range. Examples numbered 1, 2, 3, and 4 of appendix B provides the switch settings which are most likely to be used. Each bank can be assigned any of all the possible 512K byte boundaries identified in Appendix A.

The setting of SW6 positions 1, 2 and 3 is used to identify if "split" address mode is desired. Split address mode permits Bank 1 to be shared between Base (within the first megabyte of address space) and Extended memory (above first address space). These switches also permit the offset of the entire board such that any 128K byte boundary can be achieved.

As the examples in Appendix B represent the typical installations of the Cheetah Card, further understanding of these switches is usually not necessary. For those requiring special configurations, please refer to the technical reference portion of this manual (section 4.1, titled—"Address decoding").

3.2.3 USE WITH BOTH 64K AND 256K DYNAMIC RAMS

The Cheetah Card is capable of using both 64K and 256K dynamic memories in any combination with the following constraints:

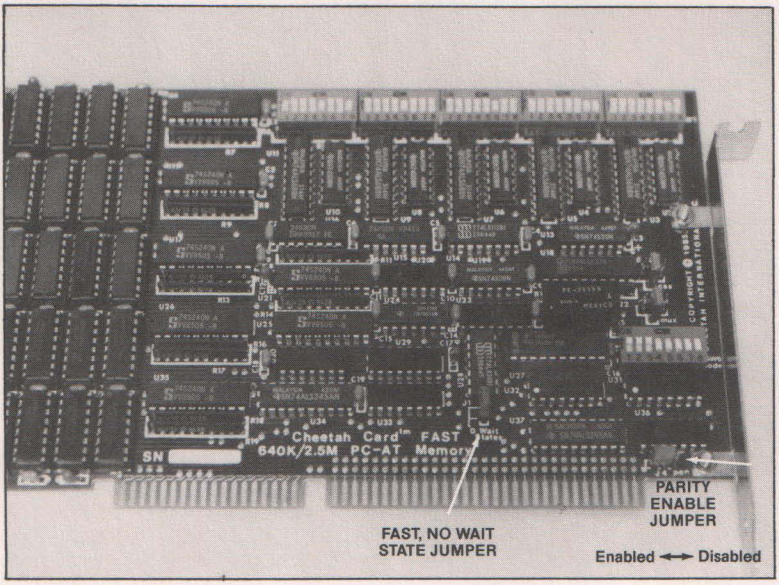
1) All devices within a given bank consist of the same type of device, that is, either all 64K dynamic RAMs or all 256K dynamic RAMs populate a given bank.

2) The 256K dynamic memories should be placed in the low banks first, then the remaining banks filled with 64K dynamic memories.

Due to the many possible combinations of both memory devices and placement of memory within a system it is recommended that the program CHSETUP be used for setting the Cheetah Card switches. This program is provided on your Cheetah Code diskette and is the executable file CHSETUP.EXE. Simply type CHSETUP and carriage return and the CHSETUP program will ask questions about the system and provide pictorials on how to set the switches.

3.3 PARITY ENABLE JUMPER

The jumper labeled J4 on the Cheetah Card controls the enabling or disabling of byte parity on the board. Your Cheetah Card is shipped with parity enabled and it is recommended that parity be enabled during normal operation of the memory. There are times when it may be desirable to disable the parity circuitry (usually in the diagnosis of memory problems). To disable the parity circuitry remove the shorting block and replace in the parity disabled position (see photo for location of J4).



3.4 FAST, NO WAIT STATE OPERATION

The Cheetah Card is capable of using ultra high speed dynamic RAMs. Ultra high speed dynamic RAMs are those having access speeds below 100 nanoseconds. The Cheetah Card was designed to use both conventional, 150 nanosecond dynamic memories as well as the newer, ultra high speed, 100 nanosecond dynamic memories. The 100 nanosecond memories are required to achieve system memory access cycles in two PC-AT system clocks (333 nanoseconds). Otherwise, use of conventional memories will perform their data retrieval in three system clock cycles (500 nanoseconds). The presence of a shorting block on jumper J1 of the Cheetah Card indicates that the entire board will operate in the fast mode (NO WAIT STATES). The absence of a shorting block on J1 indicates that the entire board will incur one wait state during memory accesses.

NOTE: IT IS REQUIRED THAT ALL MEMORIES CONTAINED ON THE CHEETAH CARD HAVE A SPECIFICATION INDICATING A 100 NANOSECOND ACCESS CAPABILITY SHOULD THE SHORTING BLOCK ON J1 BE INSTALLED. IF ANY MEMORY IS INSTALLED THAT DOES NOT HAVE A 100 NANOSECOND ACCESS CAPABILITY, THERE SHOULD BE NO SHORTING BLOCK ON JUMPER J1.

3.5 INSTALLING THE CHEETAH CARD

Installation of the Cheetah Card consists of placing the board in any one of the 16 bit PC-AT expansion slots. The 16 bit expansion slots are those having two connectors, a large 62-pin connector with an adjacent, smaller, 36-pin connector. Non-IBM, PC-AT compatible units should refer to the appropriate manual for proper placement of additional memory boards within those systems.

The following steps outline the Cheetah Card installation procedure:

1. With the system unit oriented such that the disk drives are towards the front, the five 16 bit expansion slots will be located at the inside left rear of your system unit. The Cheetah Card can be installed in any one of the unused 16 bit slots.

2. Using a flat blade screwdriver or a 3/16 inch nutdriver, remove the screw that holds the system expansion slot cover in place.

3. Place the Cheetah Card into the PC-AT system board connector, insuring that the rear bracket of the card seats over the system unit's rear panel. Press down on the Cheetah Card to make certain that the board is securely seated into the connector.

4. Using the screw that was removed in step 2, fasten the rear bracket of the Cheetah Card to the rear panel of the system unit.

5. Replace the system unit cover by performing the steps for removing the cover (section 2.2) in reverse order.

3.6 RUNNING THE PC-AT SETUP PROGRAM

After the Cheetah Card switches have been set and the card installed it will be necessary to reconfigure the system to recognize the added memory. This is accomplished by running the setup program provided on the "Diagnostics for IBM Personal Computer AT" diskette. The procedure to execute the PC-AT setup program is as follows:

1. Insert the "Diagnostics for IBM Personal Computer AT" diskette in drive "A." Turn the AT's power switch "ON."

2. After the power-up self test is finished the system will return a memory size error and then prompt for you to press the [F1] key.

3. The diagnostic program will then load the setup program and you will be given a series of questions to answer. Answer each question until you are asked for the base memory size.

4. When the base memory question is asked "Base memory size is XXXKB Is this correct (Y/N) ?" Answer NO if you have just used the Cheetah Card to add to base memory. If you have not added any base memory hit the Y key and carriage return and proceed to the next step.

   If you have added to base memory the program will then ask for the new base memory size. The value you should enter will be either 512 or 640 depending on how you have configured your Cheetah Card.

5. The next screen will then state "Expansion memory size is XXXXKB Is this correct (Y/N) ?" If you have not used the Cheetah Card to add any expansion memory (memory above one megabyte) answer yes and proceed to the next screen. If the newly installed Cheetah Card is providing expansion memory you will answer NO and the program will prompt for the new expansion memory size. The value you will enter can be obtained from either the Examples of Appendix B, the value given after running the Cheetah Code setup program, CHSETUP, or can be obtained from the table of Appendix A.

6. After the amount of expansion memory has been entered you will be presented with a screen listing the options "set." Pay particular attention to the amount listed for Base memory size and Expansion memory size. If the numbers are correct answer YES; if you have made a mistake, answer NO and the setup program will be automatically repeat.

3.7 PROBLEM TROUBLESHOOTING

Your Cheetah Card has been throughly tested before shipping. Every measure possible was pursued to insure that your Cheetah Card would provide years of trouble-free operation.

In the event that an error message is given during the AT's power-on self test, the most likely causes are outlined below:

1) The switches on the Cheetah Card have not been properly set. Review the switch setting section of this manual or re-run the switch setting progam, CHSETUP, and verify that the Cheetah Card switches are set as desired.

2) One or more memory devices within the Cheetah Card is not properly inserted. Common problems associated with inserting an integrated circuit in a socket are:

   a) a pin sticking out adjacent to the socket,

   b) one or more pins bent and tucked under the body of the memory device,

   c) a defective or mis-handled memory device, or,

   d) a device which is installed "backwards" (the pin 1 notch of the memory oriented toward the system board rather than upward).

Should you be confident that none of the causes listed above are present there are two possiblities: either the Cheetah Card you received is defective (Refer to the Limited Warranty at the begining of this manual for the procedure to follow), or a possible problem exists within your system.

SECTION FOUR TECHNICAL REFERENCE

This section is optional reading. The first three sections are all that are necessary for standard usage of the Cheetah Card. The intent of this section is to explain the architecture of the board in order that custom usages by hardware and software developers can be supported.

4.1 ADDRESS DECODING

The address decoding and individual bank selection is accomplished by means of an identity compare of the "modified" high order address lines provided on the PC-AT's system bus with that of the binary value represented by DIP switches SW1 through SW5. By the term "modified" it is meant here that the Cheetah Card can ADD or SUBTRACT the values 0, 1, 2, or 3 from the high order 7 bits of the PC-AT address bus (A23-A17). The value of the modification is set by DIP switch SW6, positions 1, 2 and 3 as defined below:

Switch 6:

MODIFICATION TO SYSTEM ADDRESS LINES A23-A17	Position 1	2	3
BEFORE IDENTITY COMPARE			
+0	ON	ON	ON
+1 (128K OFFSET)	ON	ON	OFF
+2 (256K OFFSET)	ON	OFF	ON
+3 (384K OFFSET)	ON	OFF	OFF
−4 (−512K OFFSET) * SEE NOTE	OFF	ON	ON
−3 (−384K OFFSET) * SEE NOTE	OFF	ON	OFF
−2 (−256K OFFSET) * SEE NOTE	OFF	OFF	ON
−1 (−128K OFFSET) * SEE NOTE	OFF	OFF	OFF

NOTE: Settings of switch #6 having position 1 in the OFF state "hardwires" BANK 1 to become enabled and assumes that BANK 1 is populated with 256K dynamic RAMs. The memory space BANK 1 responds to is divided between the region 256K - 640K and 1024K - 1408K.

4.2 FAST OPERATION

The Cheetah Card was designed to operate either without wait states when populated with fast, 100 nanosecond access time dynamic memories or with one wait state when populated with 150 nanosecond access memories. A shorting block at location J1 on the board enables the fast mode of operation. Two other jumper blocks, J2 and J3, in conjunction with a tapped delay line arrange the timing sequence necessary to achieve the fast performance mode.

NOTE! THE SHORTING BLOCKS AT J2 AND J3 HAVE BEEN SET AT THE FACTORY FOR OPTIMUM RELIABILITY AND PERFORMANCE. THE INFORMATION PROVIDED BELOW IS FOR TECHNICAL REFERENCE OR REPAIR ONLY. THE PROPER PLACEMENT OF THESE SHORTING BLOCKS INVOLVES SEVERAL ASPECTS OF THE OTHER COMPONENTS ON THE BOARD, AND AS SUCH, SHOULD NOT BE CHANGED!

The jumper blocks at J2 and J3 must always have a shorting block each for the board to operate. There are four possible positions for a shorting block to be placed within each jumper group. These four positions involve the placement of a jumper block between the center pin and one of the adjacent pins (termed North, South, East, and West corresponding to Top, Bottom, Right, and Left when board is positioned with the row of DIP switches at top). Jumper block J3 selects the timing for the multiplexing of the memory address and jumper block J2 selects the timing for the generation of the column address strobe (CAS) control signal. Both timings are referenced from the generation of the row address strobe (RAS) and are a percentage of the tapped delay line (U22) full value.

The following table defines the position significance of the shorting block within each jumper group:

J2 Column Address Strobe w.r.t Row Address Strobe

NORTH 60% of delay line value
SOUTH 80% of delay line value
EAST 40% of delay line value
WEST 100% of delay line value

J3 Address mutiplex control w.r.t Row Address Strobe

NORTH 60% of delay line value
SOUTH 40% of delay line value
EAST no delay
WEST 20% of delay line value

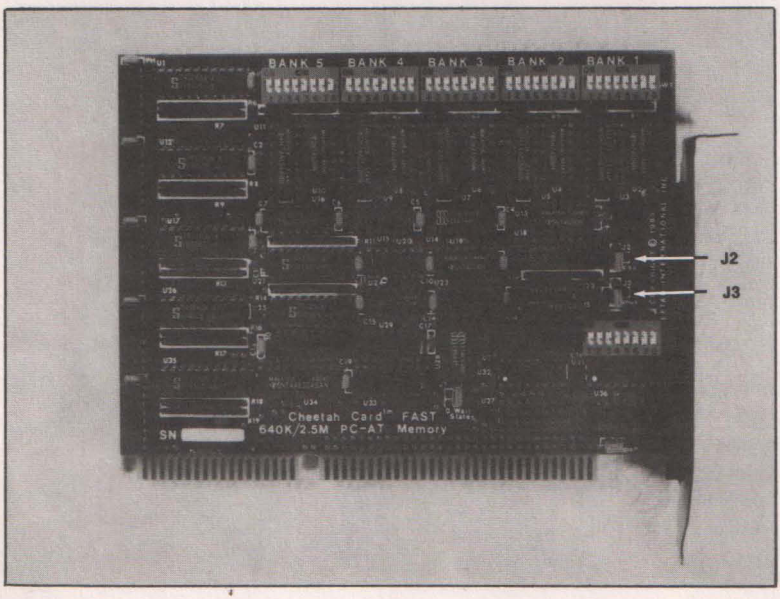


TABLE I

GUIDE FOR SETTING ADDRESS DIP SWITCHES (SW1 - SW5)

ADDRESS RANGE (HEX)	ADDRESS RANGE (DECIMAL)	SWITCH SETTING 2	3	4	5	6	7	8	EXPANSION MEMORY (K bytes)	NOTES
000000 - 01FFFF	0K - 128K	ON	ON	ON	ON	ON	ON	ON	0	System Memory—DO NOT USE
020000 - 03FFFF	128K - 256K	ON	ON	ON	ON	ON	ON	OFF	0	System Memory—DO NOT USE
040000 - 05FFFF	256K - 384K	ON	ON	ON	ON	ON	OFF	ON	0	NOTE 1
060000 - 07FFFF	384K - 512K	ON	ON	ON	ON	ON	OFF	OFF	0	NOTE 1
080000 - 09FFFF	512K - 640K	ON	ON	ON	ON	OFF	ON	ON	0	
0A0000 - 0BFFFF	640K - 768K	ON	ON	ON	ON	OFF	ON	OFF	0	System Memory—DO NOT USE
0C0000 - 0DFFFF	768K - 896K	ON	ON	ON	ON	OFF	OFF	ON	0	System Memory—DO NOT USE
0E0000 - 0FFFFF	896K - 1.0M	ON	ON	ON	ON	OFF	OFF	OFF	0	System Memory—DO NOT USE
100000 - 11FFFF	1.0M - 1.125M	ON	ON	ON	OFF	ON	ON	ON	128	Expansion Memory
120000 - 13FFFF	1.125M - 1.250M	ON	ON	ON	OFF	ON	ON	OFF	256	
140000 - 15FFFF	1.250M - 1.375M	ON	ON	ON	OFF	ON	OFF	ON	384	
160000 - 17FFFF	1.375M - 1.5M	ON	ON	ON	OFF	ON	OFF	OFF	512	
180000 - 19FFFF	1.5M - 1.625M	ON	ON	ON	OFF	OFF	ON	ON	640	
1A0000 - 1BFFFF	1.625M - 1.750M	ON	ON	ON	OFF	OFF	ON	OFF	768	
1C0000 - 1DFFFF	1.750M - 1.875M	ON	ON	ON	OFF	OFF	OFF	ON	896	
1E0000 - 1FFFFF	1.875M - 2.0M	ON	ON	ON	OFF	OFF	OFF	OFF	1024	
200000 - 21FFFF	2.0M - 2.125M	ON	ON	OFF	ON	ON	ON	ON	1152	
220000 - 23FFFF	2.125M - 2.250M	ON	ON	OFF	ON	ON	ON	OFF	1280	
240000 - 25FFFF	2.250M - 2.375M	ON	ON	OFF	ON	ON	OFF	ON	1408	
260000 - 27FFFF	2.375M - 2.5M	ON	ON	OFF	ON	ON	OFF	OFF	1536	

NOTE 1 This position requires the proper setting of jumper 18 on the PC-AT motherboard. Refer to the installation section within this manual for verification of proper configuration.

TABLE I (continued)

GUIDE FOR SETTING ADDRESS DIP SWITCHES (SW1 - SW5)

ADDRESS RANGE (HEX)	ADDRESS RANGE (DECIMAL)	SWITCH SETTING 2	3	4	5	6	7	8	EXPANSION MEMORY (K bytes)	NOTES
280000 - 29FFFF	2.5M - 2.625M	ON	ON	OFF	ON	OFF	ON	ON	1664	
2A0000 - 2BFFFF	2.625M - 2.750M	ON	ON	OFF	ON	OFF	ON	OFF	1792	
2C0000 - 2DFFFF	2.750M - 2.875M	ON	ON	OFF	ON	OFF	OFF	ON	1920	
2E0000 - 2FFFFF	2.875M - 3.0M	ON	ON	OFF	ON	OFF	OFF	OFF	2048	
300000 - 31FFFF	3.0M - 3.125M	ON	ON	OFF	OFF	ON	ON	ON	2176	
320000 - 33FFFF	3.125M - 3.250M	ON	ON	OFF	OFF	ON	ON	OFF	2304	
340000 - 35FFFF	3.250M - 3.375M	ON	ON	OFF	OFF	ON	OFF	ON	2432	
360000 - 37FFFF	3.375M - 3.5M	ON	ON	OFF	OFF	ON	OFF	OFF	2560	
380000 - 39FFFF	3.5M - 3.625M	ON	ON	OFF	OFF	OFF	ON	ON	2688	
3A0000 - 3BFFFF	3.625M - 3.750M	ON	ON	OFF	OFF	OFF	ON	OFF	2816	
3C0000 - 3DFFFF	3.750M - 3.875M	ON	ON	OFF	OFF	OFF	OFF	ON	2944	
3E0000 - 3FFFFF	3.875M - 4.0M	ON	ON	OFF	OFF	OFF	OFF	OFF	3072	
400000 - 41FFFF	4.0M - 4.125M	ON	OFF	ON	ON	ON	ON	ON	3200	
420000 - 43FFFF	4.125M - 4.250M	ON	OFF	ON	ON	ON	ON	OFF	3328	
440000 - 45FFFF	4.250M - 4.375M	ON	OFF	ON	ON	ON	OFF	ON	3456	
460000 - 47FFFF	4.375M - 4.5M	ON	OFF	ON	ON	ON	OFF	OFF	3584	
480000 - 49FFFF	4.5M - 4.625M	ON	OFF	ON	ON	OFF	ON	ON	3712	
4A0000 - 4BFFFF	4.625M - 4.750M	ON	OFF	ON	ON	OFF	ON	OFF	3840	
4C0000 - 4DFFFF	4.750M - 4.875M	ON	OFF	ON	ON	OFF	OFF	ON	3968	
4E0000 - 4FFFFF	4.875M - 5.0M	ON	OFF	ON	ON	OFF	OFF	OFF	4096	
500000 - 51FFFF	5.0M - 5.125M	ON	OFF	ON	OFF	ON	ON	ON	4224	
520000 - 53FFFF	5.125M - 5.250M	ON	OFF	ON	OFF	ON	ON	OFF	4352	
540000 - 55FFFF	5.250M - 5.375M	ON	OFF	ON	OFF	ON	OFF	ON	4480	
560000 - 57FFFF	5.375M - 5.5M	ON	OFF	ON	OFF	ON	OFF	OFF	4608	

580000 - 59FFFF	5.5M -	5.625M	ON	OFF	ON	OFF	OFF	ON	ON	4736
5A0000 - 5BFFFF	5.625M -	5.750M	ON	OFF	ON	OFF	OFF	ON	OFF	4864
5C0000 - 5DFFFF	5.750M -	5.875M	ON	OFF	ON	OFF	OFF	OFF	ON	4992
5E0000 - 5FFFFF	5.875M -	6.0M	ON	OFF	ON	OFF	OFF	OFF	OFF	5120
600000 - 61FFFF	6.0M -	6.125M	ON	OFF	OFF	ON	ON	ON	ON	5248
620000 - 63FFFF	6.125M -	6.250M	ON	OFF	OFF	ON	ON	ON	OFF	5376
640000 - 65FFFF	6.250M -	6.375M	ON	OFF	OFF	ON	ON	OFF	ON	5504
660000 - 67FFFF	6.375M -	6.5M	ON	OFF	OFF	ON	ON	OFF	OFF	5632
680000 - 69FFFF	6.5M -	6.625M	ON	OFF	OFF	ON	OFF	ON	ON	5760
6A0000 - 6BFFFF	6.625M -	6.750M	ON	OFF	OFF	ON	OFF	ON	OFF	5888
6C0000 - 6DFFFF	6.750M -	6.875M	ON	OFF	OFF	ON	OFF	OFF	ON	6016
6E0000 - 6FFFFF	6.875M -	7.0M	ON	OFF	OFF	ON	OFF	OFF	OFF	6144
700000 - 71FFFF	7.0M -	7.125M	ON	OFF	OFF	OFF	ON	ON	ON	6272
720000 - 73FFFF	7.125M -	7.250M	ON	OFF	OFF	OFF	ON	ON	OFF	6400
740000 - 75FFFF	7.250M -	7.375M	ON	OFF	OFF	OFF	ON	OFF	ON	6528
760000 - 77FFFF	7.375M -	7.5M	ON	OFF	OFF	OFF	ON	OFF	OFF	6656
780000 - 79FFFF	7.5M -	7.625M	ON	OFF	OFF	OFF	OFF	ON	ON	6784
7A0000 - 7BFFFF	7.625M -	7.750M	ON	OFF	OFF	OFF	OFF	ON	OFF	6912
7C0000 - 7DFFFF	7.750M -	7.875M	ON	OFF	OFF	OFF	OFF	OFF	ON	7040
7E0000 - 7FFFFF	7.875M -	8.0M	ON	OFF	OFF	OFF	OFF	OFF	OFF	7168
800000 - 81FFFF	8.0M -	8.125M	OFF	ON	ON	ON	ON	ON	ON	7296
820000 - 83FFFF	8.125M -	8.250M	OFF	ON	ON	ON	ON	ON	OFF	7424
840000 - 85FFFF	8.250M -	8.375M	OFF	ON	ON	ON	ON	OFF	ON	7552
860000 - 87FFFF	8.375M -	8.5M	OFF	ON	ON	ON	ON	OFF	OFF	7680
880000 - 89FFFF	8.5M -	8.625M	OFF	ON	ON	ON	OFF	ON	ON	7808
8A0000 - 8BFFFF	8.625M -	8.750M	OFF	ON	ON	ON	OFF	ON	OFF	7936
8C0000 - 8DFFFF	8.750M -	8.875M	OFF	ON	ON	ON	OFF	OFF	ON	8064
8E0000 - 8FFFFF	8.875M -	9.0M	OFF	ON	ON	ON	OFF	OFF	OFF	8192
900000 - 91FFFF	9.0M -	9.125M	OFF	ON	ON	OFF	ON	ON	ON	8320
920000 - 93FFFF	9.125M -	9.250M	OFF	ON	ON	OFF	ON	ON	OFF	8448
940000 - 95FFFF	9.250M -	9.375M	OFF	ON	ON	OFF	ON	OFF	ON	8576
960000 - 97FFFF	9.375M -	9.5M	OFF	ON	ON	OFF	ON	OFF	OFF	8704

TABLE I (continued)

GUIDE FOR SETTING ADDRESS DIP SWITCHES (SW1 - SW5)

ADDRESS RANGE (HEX)	ADDRESS RANGE (DECIMAL)	SWITCH SETTING 2	3	4	5	6	7	8	EXPANSION MEMORY (K bytes)	NOTES
980000 - 99FFFF	9.5M - 9.625M	OFF	ON	ON	OFF	OFF	ON	ON	8832	
9A0000 - 9BFFFF	9.625M - 9.750M	OFF	ON	ON	OFF	OFF	ON	OFF	8960	
9C0000 - 9DFFFF	9.750M - 9.875M	OFF	ON	ON	OFF	OFF	OFF	ON	9088	
9E0000 - 9FFFFF	9.875M - 10.0M	OFF	ON	ON	OFF	OFF	OFF	OFF	9216	
A00000 - A1FFFF	10.0M - 10.125M	OFF	ON	OFF	ON	ON	ON	ON	9344	
A20000 - A3FFFF	10.125M - 10.250M	OFF	ON	OFF	ON	ON	ON	OFF	9472	
A40000 - A5FFFF	10.250M - 10.375M	OFF	ON	OFF	ON	ON	OFF	ON	9600	
A60000 - A7FFFF	10.375M - 10.5M	OFF	ON	OFF	ON	ON	OFF	OFF	9728	
A80000 - A9FFFF	10.5M - 10.625M	OFF	ON	OFF	ON	OFF	ON	ON	9856	
AA0000 - ABFFFF	10.625M - 10.750M	OFF	ON	OFF	ON	OFF	ON	OFF	9984	
AC0000 - ADFFFF	10.750M - 10.875M	OFF	ON	OFF	ON	OFF	OFF	ON	10112	
AE0000 - AFFFFF	10.875M - 11.0M	OFF	ON	OFF	ON	OFF	OFF	OFF	10240	
B00000 - B1FFFF	11.0M - 11.125M	OFF	ON	OFF	OFF	ON	ON	ON	10368	
B20000 - B3FFFF	11.125M - 11.250M	OFF	ON	OFF	OFF	ON	ON	OFF	10496	
B40000 - B5FFFF	11.250M - 11.375M	OFF	ON	OFF	OFF	ON	OFF	ON	10624	
B60000 - B7FFFF	11.375M - 11.5M	OFF	ON	OFF	OFF	ON	OFF	OFF	10752	
B80000 - B9FFFF	11.5M - 11.625M	OFF	ON	OFF	OFF	OFF	ON	ON	10880	
BA0000 - BBFFFF	11.625M - 11.750M	OFF	ON	OFF	OFF	OFF	ON	OFF	11008	
BC0000 - BDFFFF	11.750M - 11.875M	OFF	ON	OFF	OFF	OFF	OFF	ON	11136	
BE0000 - BFFFFF	11.875M - 12.0M	OFF	ON	OFF	OFF	OFF	OFF	OFF	11264	
C00000 - C1FFFF	12.0M - 12.125M	OFF	OFF	ON	ON	ON	ON	ON	11392	
C20000 - C3FFFF	12.125M - 12.250M	OFF	OFF	ON	ON	ON	ON	OFF	11520	
C40000 - C5FFFF	12.250M - 12.375M	OFF	OFF	ON	ON	ON	OFF	ON	11648	
C60000 - C7FFFF	12.375M - 12.5M	OFF	OFF	ON	ON	ON	OFF	OFF	11776	

C80000 - C9FFFF	12.5M - 12.625M	OFF	OFF	ON	ON	OFF	ON	ON	11904
CA0000 - CBFFFF	12.625M - 12.750M	OFF	OFF	ON	ON	OFF	ON	OFF	12032
CC0000 - CDFFFF	12.750M - 12.875M	OFF	OFF	ON	ON	OFF	OFF	ON	12160
CE0000 - CFFFFF	12.875M - 13.0M	OFF	OFF	ON	ON	OFF	OFF	OFF	12288
D00000 - D1FFFF	13.0M - 13.125M	OFF	OFF	ON	OFF	ON	ON	ON	12416
D20000 - D3FFFF	13.125M - 13.250M	OFF	OFF	ON	OFF	ON	ON	OFF	12544
D40000 - D5FFFF	13.250M - 13.375M	OFF	OFF	ON	OFF	ON	OFF	ON	12672
D60000 - D7FFFF	13.375M - 13.5M	OFF	OFF	ON	OFF	ON	OFF	OFF	12800
D80000 - D9FFFF	13.5M - 13.625M	OFF	OFF	ON	OFF	OFF	ON	ON	12928
DA0000 - DBFFFF	13.625M - 13.750M	OFF	OFF	ON	OFF	OFF	ON	OFF	13056
DC0000 - DDFFFF	13.750M - 13.875M	OFF	OFF	ON	OFF	OFF	OFF	ON	13184
DE0000 - DFFFFF	13.875M - 14.0M	OFF	OFF	ON	OFF	OFF	OFF	OFF	13312
E00000 - E1FFFF	14.0M - 14.125M	OFF	OFF	OFF	ON	ON	ON	ON	13440
E20000 - E3FFFF	14.125M - 14.250M	OFF	OFF	OFF	ON	ON	ON	OFF	13568
E40000 - E5FFFF	14.250M - 14.375M	OFF	OFF	OFF	ON	ON	OFF	ON	13696
E60000 - E7FFFF	14.375M - 14.5M	OFF	OFF	OFF	ON	ON	OFF	OFF	13824
E80000 - E9FFFF	14.5M - 14.625M	OFF	OFF	OFF	ON	OFF	ON	ON	13952
EA0000 - EBFFFF	14.625M - 14.750M	OFF	OFF	OFF	ON	OFF	ON	OFF	14080
EC0000 - EDFFFF	14.750M - 14.875M	OFF	OFF	OFF	ON	OFF	OFF	ON	14208
EE0000 - EFFFFF	14.875M - 15.0M	OFF	OFF	OFF	ON	OFF	OFF	OFF	14336
F00000 - F1FFFF	15.0M - 15.125M	OFF	OFF	OFF	OFF	ON	ON	ON	14464
F20000 - F3FFFF	15.125M - 15.250M	OFF	OFF	OFF	OFF	ON	ON	OFF	14592
F40000 - F5FFFF	15.250M - 15.375M	OFF	OFF	OFF	OFF	ON	OFF	ON	14720
F60000 - F7FFFF	15.375M - 15.5M	OFF	OFF	OFF	OFF	ON	OFF	OFF	14848
F80000 - F9FFFF	15.5M - 15.625M	OFF	OFF	OFF	OFF	OFF	ON	ON	14976
FA0000 - FBFFFF	15.625M - 15.750M	OFF	OFF	OFF	OFF	OFF	ON	OFF	15104
FC0000 - FDFFFF	15.750M - 15.875M	OFF	OFF	OFF	OFF	OFF	OFF	ON	15232
FE0000 - FFFFFF	15.875M - 16.0M	OFF	OFF	OFF	OFF	OFF	OFF	OFF	15360

RESERVED—DO NOT USE

APPENDIX B
SWITCH SETTING EXAMPLES (cont.)

****

Example 1.

Board filled with 90 (all 5 rows) 256K dynamic RAMs. Cheetah Card to provide low order memory (within first megabyte) from 256K through 640K (384K bytes) as well as 2176K bytes of expansion memory.

Set switches as below. Install card in system. Run the setup program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the numbers 640 followed by a carriage return. When prompted to enter the amount of extended memory, enter the numbers 2176 followed by a carriage return.

SWITCH NUMBER	POSITION 1	2	3	4	5	6	7	8	ACTIVE ADDRESS
1	OFF	X	X	X	X	X	X	X	Switch #6 controls bank 1
2	ON	ON	ON	ON	OFF	ON	X	X	1.125M - 1.625M
3	ON	ON	ON	ON	OFF	OFF	X	X	1.625M - 2.125M
4	ON	ON	ON	OFF	ON	ON	X	X	2.125M - 2.625M
5	ON	ON	ON	OFF	ON	OFF	X	X	2.625M - 3.125M
6	OFF	OFF	OFF	ON	ON	ON	ON	ON	256K - 640K, 1.0M - 1.125M

APPENDIX B
SWITCH SETTING EXAMPLES (cont.)

****

Example 2.

Board filled with 90 (all 5 rows) 256K dynamic RAMs. Cheetah Card to provide low order memory (within first megabyte) from 256K through 512K (256K bytes) as well as 2304K bytes of expansion memory.

Set switches as below. Install card in system. Run the setup program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the numbers 512 followed by a carriage return. When prompted to enter the amount of extended memory, enter the numbers 2304 followed by a carriage return.

SWITCH NUMBER	POSITION 1	2	3	4	5	6	7	8	ACTIVE ADDRESS
1	OFF	X	X	X	X	X	X	X	Switch #6 controls bank 1
2	ON	ON	ON	ON	OFF	ON	X	X	1.250M - 1.750M
3	ON	ON	ON	ON	OFF	OFF	X	X	1.750M - 2.250M
4	ON	ON	ON	OFF	ON	ON	X	X	2.250M - 2.750M
5	ON	ON	ON	OFF	ON	OFF	X	X	2.750M - 3.250M
6	OFF	OFF	ON	ON	ON	ON	ON	ON	256K - 512K, 1.0M - 1.250M

APPENDIX B
SWITCH SETTING EXAMPLES (cont.)

****

Example 3.

Board filled with 90 (all 5 rows) 256K dynamic RAMs. Cheetah Card to provide low order memory (within first megabyte) from 512K through 640K (128K bytes) as well as 2432K bytes of expansion memory.

Set switches as below. Install card in system. Run the setup program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the numbers 640 followed by a carriage return. When prompted to enter the amount of extended memory, enter the numbers 2432 followed by a carriage return.

SWITCH NUMBER	POSITION 1	2	3	4	5	6	7	8	ACTIVE ADDRESS
1	OFF	X	X	X	X	X	X	X	Switch #6 controls bank 1
2	ON	ON	ON	ON	OFF	ON	X	X	1.375M - 1.875M
3	ON	ON	ON	ON	OFF	OFF	X	X	1.875M - 2.375M
4	ON	ON	ON	OFF	ON	ON	X	X	2.375M - 2.875M
5	ON	ON	ON	OFF	ON	OFF	X	X	2.875M - 3.375M
6	OFF	ON	OFF	ON	ON	ON	ON	ON	512K - 640K, 1.0M - 1.375M

APPENDIX B
SWITCH SETTING EXAMPLES (cont.)

****

Example 4.

Board filled with 90 (all 5 rows) 256K dynamic RAMs. Cheetah Card to provide 2.5M bytes of expansion memory (all above first megabyte).

Set switches as below. Install card in system. Run the setup program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of extended memory, enter the numbers 2560 followed by a carriage return.

SWITCH NUMBER	POSITION 1	2	3	4	5	6	7	8	ACTIVE ADDRESS
1	ON	ON	ON	ON	OFF	ON	X	X	1.0M - 1.5M
2	ON	ON	ON	ON	OFF	OFF	X	X	1.5M - 2.0M
3	ON	ON	ON	OFF	ON	ON	X	X	2.0M - 2.5M
4	ON	ON	ON	OFF	ON	OFF	X	X	2.5M - 3.0M
5	ON	ON	ON	OFF	OFF	ON	X	X	3.0M - 3.5M
6	ON	ON	ON	ON	ON	ON	ON	ON	

APPENDIX B
SWITCH SETTING EXAMPLES (cont.)

****

Example 5.

Board filled with 90 (all 5 rows) 64K dynamic RAMs. Cheetah Card to provide low order memory (within first megabyte) from 256K through 640K (384K bytes) as well as 256K bytes of expansion memory.

Set switches as below. Install card in system. Run the setup program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the numbers 640 followed by a carriage return. When prompted to enter the amount of extended memory, enter the numbers 256 followed by a carriage return.

SWITCH NUMBER	POSITION 1	2	3	4	5	6	7	8	ACTIVE ADDRESS
1	ON	ON	ON	ON	ON	ON	OFF	ON	256K - 384K
2	ON	ON	ON	ON	ON	ON	OFF	OFF	384K - 512K
3	ON	ON	ON	ON	ON	OFF	ON	ON	512K - 640K
4	ON	ON	ON	ON	OFF	ON	ON	ON	1.0M - 1.125M
5	ON	ON	ON	ON	OFF	ON	ON	OFF	1.125M - 1.256M
6	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	

APPENDIX B
SWITCH SETTING EXAMPLES (cont.)

****

Example 6.

Board filled with 90 (all 5 rows) 64K dynamic RAMs. Cheetah Card to provide low order memory (within first megabyte) from 256K through 512K (256K bytes) as well as 384K bytes of expansion memory.

Set switches as below. Install card in system. Run the setup program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the numbers 512 followed by a carriage return. When prompted to enter the amount of extended memory, enter the numbers 384 followed by a carriage return.

SWITCH NUMBER	POSITION 1	2	3	4	5	6	7	8	ACTIVE ADDRESS
1	ON	ON	ON	ON	ON	ON	OFF	ON	256K - 384K
2	ON	ON	ON	ON	ON	ON	OFF	OFF	384K - 512K
3	ON	ON	ON	ON	OFF	ON	ON	ON	1.0M - 1.128M
4	ON	ON	ON	ON	OFF	ON	ON	OFF	1.128M - 1.256M
5	ON	ON	ON	ON	OFF	ON	OFF	ON	1.256M - 1.384M
6	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	

APPENDIX B
SWITCH SETTING EXAMPLES (cont.)

****

Example 7.

Board filled with 90 (all 5 rows) 64K dynamic RAMs. Cheetah Card to provide low order memory (within first megabyte) from 512K through 640K (128K bytes) as well as 512K bytes of expansion memory.

Set switches as below. Install card in system. Run the setup program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the numbers 640 followed by a carriage return. When prompted to enter the amount of extended memory, enter the numbers 512 followed by a carriage return.

SWITCH NUMBER	POSITION 1	2	3	4	5	6	7	8	ACTIVE ADDRESS
1	ON	ON	ON	ON	ON	OFF	ON	ON	512K - 640K
2	ON	ON	ON	ON	OFF	ON	ON	ON	1.0M - 1.128M
3	ON	ON	ON	ON	OFF	ON	ON	OFF	1.128M - 1.256M
4	ON	ON	ON	ON	OFF	ON	OFF	ON	1.256M - 1.384M
5	ON	ON	ON	ON	OFF	ON	OFF	OFF	1.384M - 1.512M
6	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	

APPENDIX B
SWITCH SETTING EXAMPLES (cont.)

****

Example 8.

Board filled with 90 (all 5 rows) 64K dynamic RAMs. Cheetah Card to provide expansion memory (all above first megabyte) 640K bytes total expansion memory.

Set switches as below. Install card in system. Run the setup program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of extended memory, enter the numbers 640 followed by a carriage return.

SWITCH NUMBER	POSITION 1	2	3	4	5	6	7	8	ACTIVE ADDRESS
1	ON	ON	ON	ON	OFF	ON	ON	ON	1.0M - 1.128M
2	ON	ON	ON	ON	OFF	ON	ON	OFF	1.128M - 1.256M
3	ON	ON	ON	ON	OFF	ON	OFF	ON	1.256M - 1.384M
4	ON	ON	ON	ON	OFF	ON	OFF	OFF	1.384M - 1.512M
5	ON	ON	ON	ON	OFF	OFF	ON	ON	1.512M - 1.640M
6	ON	ON	ON	OFF	OFF	OFF	OFF