Cheetah Combo™

Installation and Operation Manual

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Cheetah Combo™

Installation and Operation Manual

CHEETAH COMBO

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Inventory Checklist

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

—Cheetah Combo printed circuit board
—Cheetah Combo Installation and Operation Manual
—Cheetah Code provided on a 5¼" floppy diskette
—Limited Warranty

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CHEETAH COMBO

FCC Required Instructions

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

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

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

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

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

In order to meet FCC limits, shielded cables are required to connect the device to a personal computer or other Class B certified devices.

Cheetah Combo
Installation and Operation Manual

1.1 FEATURES

The Cheetah Combo has the following features:

- Through split addressing modes, provides 128K to 384K bytes of expansion memory to first megabyte with 64K or 256K dynamic RAMs.
- Maps excess memory leftover to be available above the first megabyte when 256K dynamic RAMs are used within the first megabyte.
- Provides up to 1.5M bytes of expansion memory.
- Allows each memory bank to be individually set within address space. (Memory banks can be "hidden" from DOS for custom 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.
- Provides for one serial and one parallel I/O port.
- Serial port is switch settable as COM1, COM2, COM3 or COM4.
- Parallel printer port is switch settable as LPT1 or LPT2.

1.2 ORGANIZATION OF THIS MANUAL

SECTION ONE — INTRODUCTION
Overview of the Cheetah Combo adapter.

SECTION TWO — PREINSTALLATION REQUIREMENTS
Tools necessary for installation of the Cheetah Combo adapter as well as instructions for removing the system unit cover on the PC-AT.

SECTION ONE INTRODUCTION

Your Cheetah Combo is the most advanced multifunction add-on adapter for the IBM PC-AT. Unique capabilities of the Cheetah Combo include the ability of 256K dynamic RAMs to "round-out" low memory (640K) and to apply the remaining "leftover" memory above the first megabyte. In addition, the Cheetah Combo can operate with faster memory devices, thereby eliminating the need for a wait state during memory access cycles. Also, the flexibity of the Cheetah Combo allows 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. The Cheetah Combo also provides a versatile serial and parallel port. All of the features mentioned above permit performance and economy previously unavailable on conventional multifunction add-on adapters.

This manual provides step-by-step instructions for configuring and installing the Cheetah Combo adapter in an IBM PC-AT. Included are instructions for configuring the memory switches, serial port switches and parallel port switches on the Cheetah Combo adapter, as well as instructions for configuring the IBM PC-AT to accept and recognize the added memory and I/O ports.

The Cheetah Combo provides from 128K bytes to 1.5M bytes of dynamic Random Access Memory (RAM), a serial port and a parallel port. The Cheetah Combo adapter 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.

CHEETAH COMBO

SECTION THREE	**INSTALLATION—MEMORY** Information required for setting the switches which configure the memory portion of the Cheetah Combo. Also included is information on configuring the jumpers on the PC-AT, and instructions for the physical installation of the Cheetah Combo in the PC-AT chassis.
SECTION FOUR	**INSTALLATION—PARALLEL PORT** Instructions and information for configuring the parallel printer port on the Cheetah Combo adapter.
SECTION FIVE	**INSTALLATION—SERIAL PORT** Information for configuring the serial port on the Cheetah Combo adapter.
SECTION SIX	**TECHNICAL REFERENCE—MEMORY** Technical information pertaining to the memory portion of the Cheetah Combo.
SECTION SEVEN	**TECHNICAL REFERENCE—PARALLEL PORT** Technical information pertaining to the parallel printer port portion of the Cheetah Combo.
SECTION EIGHT	**TECHNICAL REFERENCE—SERIAL PORT** Technical information pertaining to the serial I/O portion of the Cheetah Combo.
APPENDIX A	**MEMORY ADDRESS SELECTION SWITCH CHART** Table of address selection switch positions for configuring the Cheetah Combo memory.
APPENDIX B	**MEMORY SWITCH SETTING EXAMPLES** Examples of typical installation memory switch settings.

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 so that you have easy access to the rear panel.
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 in the top center of the rear panel. After removing the screws, set them aside in a safe place.
10. Carefully slide the system unit cover forward (away from the rear). When the cover will not go any further, tilt the cover upward and remove it from the base. Set the cover aside in a safe place.

SECTION TWO PREINSTALLATION REQUIREMENTS

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

2.1 TOOLS REQUIRED

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

- Flat-blade or Phillips screwdriver
- 3/16-inch nutdriver or 3/16-inch wrench
- Small needlenose pliers or tweezers
- Ballpoint pen or toothpick (helpful in setting the DIP switches)

2.2 ACCESS INSIDE SYSTEM UNIT

In order to install the Cheetah Combo, you must first 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.

Before removing the system unit's cover, it is suggested that you run the program CHSETUP provided on the Cheetah Code diskette supplied with your Cheetah Combo adapter. This program examines the system's current memory configuration and asks you questions regarding the Cheetah Combo adapter to be installed. As you answer each question, the program provides illustrations on the proper switch settings for the Cheetah Combo adapter. If a printer is available on the system, obtain a printout of the settings; otherwise, write the settings down on a piece of paper for future reference.

SECTION THREE INSTALLATION–MEMORY

Before installing the Cheetah Combo, the three factors listed below should be considered:

1. Is Cheetah Combo going to be providing any of the base memory (below one megabyte)?

2. What is the amount of memory to be installed on the Cheetah Combo.

3. Are other memory expansion adapters present within the system?

Cheetah Combo adapters which contain fast, no wait state memories can enhance system performance when used as a substitute for the system unit's slower base memory (these incur one wait state per access cycle).

NOTE: A wait state is one clock period (167 nanoseconds for a PC-AT running at 6 Mhz). It is automatically added to each memory access unless the selected memory asserts a signal that cancels the wait state. The Cheetah Combo adapter was designed to cancel this wait state. This is what is meant by "no wait state" or "zero wait state".

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). The location of pin 1 on jumper J18 is the front pin of the three.

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 Combo provide the memory above 256K bytes, you must ensure that the shorting block for jumper J18 is between pins 2 and 3.

If you own an enhanced model of the PC-AT, and have purchased the fast, no wait state version of the Cheetah Combo with the intention of having the fast memory replace the slower, system unit memory, you must have the shorting block for jumper J18 betweens 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 above. If it is visible and properly set, proceed to the next section (SECTION 3.2). If J18 is not visible, or not set as desired, follow the instructions below to change or view the position of jumper J18.

1. In order to gain access to jumper J18, it is necessary to remove the disk controller card. To remove the disk controller card, first remove the mounting screw located on the back panel bracket.

2. Next, it is necessary to remove cable J6 (a red and black cable located at the top front of the controller). The other cables do not have to be removed. However, it is advised that you make note of them should they become detached and require reconnection.

3. 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 being set.

4. 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).

5. Once the jumper is properly set, replace the disk controller back in its slot, reconnect all cables, and replace the mounting screw.

3.2 SETTING CHEETAH COMBO MEMORY SWITCHES

Before describing the switches on the Cheetah Combo adapter, a certain amount of understanding of the PC-AT memory organization is useful. In the PC-AT, random access 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 and 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 Combo adapter.
- The range between 15.875M and 16M bytes is reserved for system use.

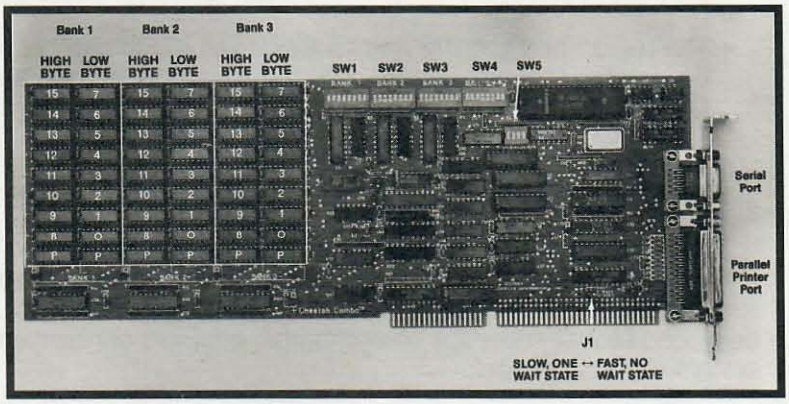
The Cheetah Combo adapter has such flexibility that its memory can be placed on any 128K byte boundary anywhere within the entire PC-AT memory space. It should not, of course, be placed so that it overlaps other memory adapters or reserved system memory space!

Due to the many possible combinations of memory devices and their placement within the system, it is recommended that the program CHSETUP be used for setting the Cheetah Combo 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 asks questions about the system, providing illustrations on how to set the switches.

On the Cheetah Combo adapter, there are five groups of DIP switches. Refer to the following photograph for the location of the switches on the adapter. Of the five groups of DIP switches, the four-position switch located at SW5 is used for setting the I/O ports. This switch is discussed in SECTIONS

4 and 5. The remaining four eight-position DIP switches (labeled SW1 through SW4) are used to assign the address space that each of the three memory banks are to be enabled. Switch 1 (SW1) is used to enable memory Bank 1, switch 2 (SW2) is used to enable memory Bank 2, and switch 3 (SW3) is used to enable memory Bank 3.

Because each of these three switches are similar, the following description of the positions within a switch apply to SW1 through SW3.



SWITCHES SW1 THROUGH SW3

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 RAMs)

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

The fourth eight-position DIP switch (SW4) configures the memory mode for the Cheetah Combo adapter. Specifically, it identifies whether or not the split-mode memory addressing is requested. Also, it identifies the memory device (64K or 256K DRAMs) installed within a given bank.

SWITCH 4 (SW4)

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 (SW1) position 1 should be set to "OFF".

Position 2 Split mode addressing

Position 3 Split mode addressing

Position 4 Memory device size, Bank 1 (ON = 256K, OFF = 64K)

Position 5 Memory device size, Bank 2 (ON = 256K, OFF = 64K)

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

Position 7 Not used

Position 8 Printer port assignment (ON = LPT2, OFF = LPT1)

The following table shows the proper setting of switch #4 (SW4). This is the proper setting when 256K dynamic RAMs are used for Bank 1 and when that bank's memory is to become selected within the first megabyte of system memory.

SWITCH #4 TABLE

Selected Memory Range	Switch Positions 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 Combo adapter contains only 64K dynamic RAMs, the DIP switch labeled SW4 on the card should be set as follows:

Switch 4 (SW4)	POSITION 1	2	3	4	5	6	7	8
	ON	ON	ON	OFF	OFF	OFF	X	printer

Switches SW1 through SW3 are set to indicate which of the three banks, respectively, are to respond to a particular address range. Examples 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 (SW1, SW2, and SW3) identifies a section of memory space occupying 128K bytes. Each bank can be assigned any of all possible 128K-byte boundaries identified in Appendix A.

3.2.2 USE WITH ALL 256K DYNAMIC RAMS

When the Cheetah Combo adapter contains only 256K dynamic RAMs, positions 4 through 6 of the DIP switch labeled SW4 on the adapter should be set as follows:

Switch 4 (SW4)	POSITION							
	1	2	3	4	5	6	7	8
	—see text—			ON	ON	ON	X	printer

Switches SW1, SW2 and SW3 are set to indicate which of the three banks, respectively, are to respond to a particular address range. Examples 1, 2, 3, and 4 of Appendix B provide the switch settings which are most likely to be used. Each bank can be assigned any of all possible 512K byte boundaries identified in Appendix A.

The setting of SW4 positions 1, 2 and 3 is used to identify whether or not "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 the first megabyte of address space). These switches also permit the offset of the entire board so that any 128K byte boundary can be achieved.

Because the examples in Appendix B represent the typical installations of the Cheetah Combo adapter, 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 6.1, "Address Decoding").

3.2.3 USE WITH BOTH 64K AND 256K DYNAMIC RAMS

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

- All devices within a given bank consist of the same type of device (i.e., either all 64K dynamic RAMs or all 256K dynamic RAMs populate a given bank.
- The 256K dynamic memories should be placed in the low banks; then the remaining banks should be filled with 64K dynamic memories.

Due to the many possible combinations of both memory devices and placement of memory within a system, the CHSETUP program described above is recommended for use in setting the switches.

3.3 FAST, NO WAIT STATE OPERATION

The Cheetah Combo adapter is capable of using ultra high-speed dynamic RAMs. Ultra high-speed dynamic RAMs are those RAMs having access speeds of 100-nanoseconds or faster. The Cheetah Combo adapter is designed to use both conventional, 150-nanosecond dynamic memories, as well as the newer, ultra high-speed, 100-nanosecond dynamic memories. For systems operating at 6 MHz, 100-nanosecond memories are required in order to operate without wait states; for systems operating at 8 MHz, 70-nanosecond dynamic RAMs are necessary in order to operate without wait states. Otherwise, use of conventional speed memories requires a wait state. A shorting block at jumper position J1 controls whether or not the Cheetah Combo adapter operates with a wait state. When the shorting block connects the two pins toward the rear of the board (closest to the printer port connector—[see photo]), the board is instructed to operate faster (i.e., without a wait state). When the shorting block connects the two pins away from the rear of the board (farthest from the printer port connector) or is entirely absent, the board is instructed to operate more slowly (i.e., with a single wait state).

NOTE:

***** FOR 6 MHZ SYSTEMS *****

IT IS REQUIRED THAT ALL MEMORIES CONTAINED ON THE CHEETAH COMBO ADAPTER HAVE A SPECIFICATION INDICATING A 100-NANOSECOND ACCESS CAPABILITY SHOULD THE SHORTING BLOCK ON J1 BE INSTALLED IN THE NO WAIT STATE POSITION (SEE PHOTO). IF ANY MEMORY IS INSTALLED ON THE ADAPTER THAT DOES NOT HAVE AT LEAST A 100-NANOSECOND ACCESS CAPABILITY, THE SHORTING BLOCK ON JUMPER J1 SHOULD BE ABSENT OR IN THE 1 WAIT STATE POSITION.

***** FOR 8 MHZ SYSTEMS *****

IT IS REQUIRED THAT ALL MEMORIES CONTAINED ON THE CHEETAH COMBO ADAPTER HAVE A SPECIFICATION INDICATING A 70-NANOSECOND ACCESS CAPABILITY OR LESS SHOULD THE SHORTING BLOCK ON J1 BE INSTALLED IN THE NO WAIT STATE POSITION (SEE PHOTO). IF ANY MEMORY IS INSTALLED ON THE ADAPTER THAT DOES NOT HAVE AT LEAST A 70-NANOSECOND ACCESS CAPABILITY, THE SHORTING BLOCK ON JUMPER J1 SHOULD BE ABSENT OR IN THE 1 WAIT STATE POSITION.

3.4 INSTALLING THE CHEETAH COMBO

Installation of the Cheetah Combo adapter consists of placing the board in any 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 Combo adapter installation procedure:

1. In system units with the disk drives oriented toward the front, the five 16-bit expansion slots are located at the inside left rear of your system unit. The Cheetah Combo adapter 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 Combo adapter into the PC-AT system board connector, ensuring that the rear bracket of the card seats over the system unit's rear panel. Press down on the Cheetah Combo adapter to make certain that the adapter is securely seated into the connector.

4. Using the screw that was removed in step 2, fasten the rear bracket of the Cheetah Combo adapter 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.

3.5 RUNNING THE IBM SETUP PROGRAM

After the Cheetah Combo adapter switches have been set and the adapter has been installed, it is necessary to reconfigure the system to recognize the added memory. This is accomplished by running the set-up program provided on the "Diagnostics for IBM Personal Computer AT" diskette. The procedure to execute the PC-AT set-up 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 returns a memory size error, then prompts you to press the [F1] key.

3. The diagnostic program then loads the set-up program and you are given a series of questions to answer. Answer each question until you are asked for the base memory size.

4. When the base memory prompt "Base memory size is XXXKB Is this correct (Y/N)?" appears, answer NO if you have just used the Cheetah Combo adapter to add to base memory. If you have not added any base memory, answer YES and proceed to the next step.
   If you have added to base memory, the program asks for the new base memory size. The value to enter is either 512 or 640, depending on how you have configured your Cheetah Combo adapter.

5. The next screen prompt states "Expansion memory size is XXXXKB Is this correct (Y/N)?" If you have not used the Cheetah Combo adapter to add any expansion memory (memory above one megabyte), answer YES and proceed to the next screen. If the newly installed Cheetah Combo adapter is providing expansion memory, answer NO. The program then prompts for the new expansion memory size.

The value you enter can be obtained from the Examples in Appendix B, from the value given after running the Cheetah Code set-up program (CHSETUP), or from the table in Appendix A.

6. After the amount of expansion memory has been entered, you are prompted 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; the set-up program automatically repeats.

3.6 PROBLEM TROUBLESHOOTING

Your Cheetah Combo adapter has been thoroughly tested before shipping. Every measure possible has been pursued to ensure that your Cheetah Combo provides years of trouble-free operation.

If you receive an error message during the AT's power-on self-test, the most likely causes are outlined below:

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

2. At least one of the memory devices within the Cheetah Combo adapter is not properly inserted. Common problems associated with inserting an integrated circuit into 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 mishandled memory device, or

   d. a device which is installed "backwards" (the pin 1 notch of the memory is oriented toward the I/O port connectors). The proper orientation is to have the notch away from the I/O port connectors.

If you are confident that none of the causes listed are present, there are two possibilities; either the Cheetah Combo adapter you received is defective (Refer to the Limited Warranty at the beginning of this manual for the procedure to follow), or a problem exists within your system.

SECTION FOUR INSTALLATION—PARALLEL PORT

The parallel printer port on the Cheetah Combo adapter is controlled by position 1 on the four-position DIP switch (SW5) and position 8 of switch SW4. The parallel printer port has three possible configurations: disabled, LPT1, or LPT2. If the system unit already has a parallel printer port installed, you must assign the parallel port on the Cheetah Combo adapter as LPT2 or as disabled.

4.1 PARALLEL PORT DISABLED

To disable the parallel printer port on the Cheetah Combo adapter, move position 1 of switch #5 (the four-position switch) to the OFF (down) direction. The parallel printer port is now disabled.

SW5 position 1 = OFF for port disabled

4.2 PARALLEL PORT AS LPT1

To configure the parallel printer port as LPT1 for the Cheetah Combo adapter, move position 1 of switch #5 (the four-position DIP switch) to the ON (UP) direction. This switch enables the parallel printer port. The address assignment for the parallel port is controlled by position 8 of switch #4. The proper setting of this switch is OFF (DOWN) for use as LPT1.

SW5 position 1 = ON for port enabled
SW4 position 8 = OFF for LPT1

4.3 PARALLEL PORT AS LPT2

To configure the parallel printer port as LPT2 for the Cheetah Combo adapter, move position 1 of switch #5 (the four-position DIP switch) to the ON (UP) direction. This switch enables the parallel printer port. The address assignment for the parallel port is controlled by position 8 of switch #4. The proper setting of this switch is ON (UP) for use as LPT2.

SW5 position 1 = ON for port enabled
SW4 position 8 = ON for LPT2

CHEETAH COMBO

SECTION FIVE INSTALLATION – SERIAL PORT

The serial port on the Cheetah Combo adapter is controlled by position 2, 3 and 4 on the four-position DIP switch (SW5). The serial port has five possible configurations: disabled, COM1, COM2, COM3 or COM4. Select the desired configuration and set the switches as outlined within this section.

5.1 SERIAL PORT DISABLED

The serial port is enabled or disabled by position 2 of switch #5 (the four-position DIP switch – SW5). To enable the serial port, move position 2 of SW5 to the OFF (DOWN) direction. The serial port is now disabled.

SW5 position 2 = OFF for port disabled

5.2 SERIAL PORT AS COM1

The serial port is enabled or disabled by position 2 of switch #5 (the four-position DIP switch – SW5). To enable the serial port, move position 2 of SW5 to the ON (UP) direction. To configure the port as COM1, positions 3 and 4 of SW5 should be moved to the OFF (DOWN) direction.

SW5 position 2 = ON for port enabled
SW5 position 3 = OFF for COM1
SW5 position 4 = OFF for COM1

5.3 SERIAL PORT AS COM2

The serial port is enabled or disabled by position 2 of switch #5 (the four-position DIP switch – SW5). To enable the serial port, move position 2 of SW5 to the ON (UP) direction. To configure the port as COM2, positions 3 of SW5 should be moved to the OFF (DOWN) direction and position 4 of SW5 should be moved to the ON (UP) direction.

SW5 position 2 = ON for port enabled
SW5 position 3 = OFF for COM2
SW5 position 4 = ON for COM2

5.4 SERIAL PORT AS COM3

The serial port is enabled or disabled by position 2 of switch #5 the four-position DIP switch—SW5). To enable the serial port, move position 2 of SW5 to the ON (UP) direction. To configure the port as COM3, positions 3 and 4 of SW5 should be moved to the ON (UP) direction.

SW5 position 2 = ON for port enabled
SW5 position 3 = ON for COM3
SW5 position 4 = ON for COM3

5.5 SERIAL PORT AS COM4

The serial port is enabled or disabled by position 2 of switch #5 (the four-position DIP switch—SW5). To enable the serial port, move position 2 of SW5 to the ON (UP) direction. To configure the port as COM4, position 3 of SW5 should be moved to the ON (UP) direction and position 4 of SW5 should be moved to the OFF (DOWN) direction.

SW5 position 2 = ON for port enabled
SW5 position 3 = ON for COM4
SW5 position 4 = OFF for COM4

SECTION SIX TECHNICAL REFERENCE – MEMORY

This section is optional reading. The first five sections are necessary reading for standard use of the Cheetah Combo adapter. The intent of this section is to explain the memory portion of the adapter so that custom uses by hardware and software developers can be supported.

6.1 ADDRESS DECODING

The address decoding and individual bank selection are accomplished by an identity compare. The modified high order address lines provided on the PC-AT's system bus are compared with the binary values represented by DIP switches SW1, SW2, and SW3. The term "modified," means that the Cheetah Combo 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 SW4, positions 1, 2 and 3 as defined below:

SWITCH #4

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: Setting switch #4 in position 1 to OFF, "hardwires" Bank 1 to become enabled and assumes that Bank 1 is populated with 256K dynamic RAMs. The memory space to which Bank 1 responds is divided between the regions 256K−640K and 1024K−1408K.

6.2 FAST, NO WAIT STATE OPERATION

The Cheetah Combo adapter was designed to operate either with one wait state (when populated with 150-nanosecond access memories), or without wait states (when populated with fast, 100-nanosecond access time dynamic memories [6 MHz processor speed].

Systems operating with an 8 MHz system clock (70-nanosecond access time dynamic memories), are required to operate without a wait state. A shorting block at location J1 on the adapter enables or disables the fast, no wait state 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 ADAPTER, AND SHOULD NOT BE CHANGED!

The jumper posts at J2 and J3 must always have one shorting block each for the memory to operate. There are four possible positions for a shorting block to be placed within each jumper post group. These four positions involve the placement of a shorting block between the center post and one of the adjacent pins (termed North, South, East, and West corresponding to Top, Bottom, Right and Left when board is viewed from component side and I/O connectors are at right). Jumper group J3 selects the timing for the multiplexing of the memory addresses. Jumper group J2 selects the timing for the generation of the column address strobe (/CAS) control signal. Both of these timings are referenced from the generation of the row address strobe (/RAS) and represent a percentage of the tapped delay line (U17) full value.

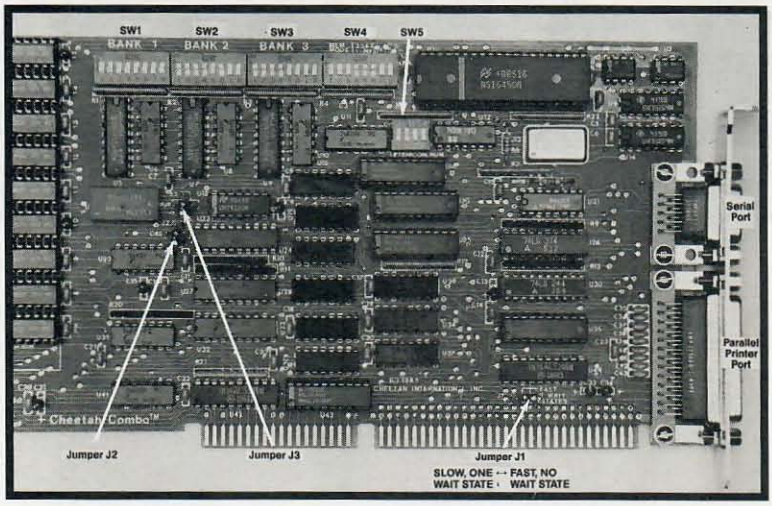
The following table defines the position significance of the shorting block within each jumper group:

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

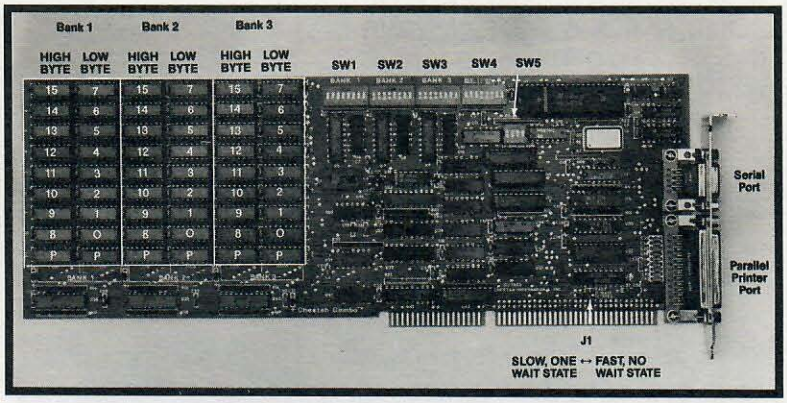
J3 ADDRESS MULTIPLEX CONTROL w.r.t. ROW ADDRESS STROBE

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



6.3 DATA BIT LOCATIONS

The location of specific data bits within each memory bank can easily be determined through use of the component legend printed on the adapter. Each bank consists of two rows, each row with nine memory devices. Within a given bank, the low order byte is located at the right column; the high order byte represents the left column. At the bottom of each column is the parity bit for that column. Numeric bit significance increases from bottom to top; bit 0 is located above the parity low bit; bit 1 is located above bit 0, and so on.



SECTION SEVEN TECHNICAL REFERENCE – PARALLEL PORT

The Cheetah Combo adapter's printer port is completely hardware- and software-compatible with the IBM parallel printer adapter interface. The information provided within this section may be considered optional reading as section 4 covers the configuration of the port as LPT1 or LPT2.

7.1 CONNECTOR SIGNAL ASSIGNMENT

The parallel printer port is the larger (25 pin) female DB type connector located at the back of the Cheetah Combo adapter. The signal assignments on the pins of the connector are identical to that of IBM's parallel printer port and are listed below:

PIN NO.	SIGNAL NAME
1	/STROBE
2	DATA BIT 0
3	DATA BIT 1
4	DATA BIT 2
5	DATA BIT 3
6	DATA BIT 4
7	DATA BIT 5
8	DATA BIT 6
9	DATA BIT 7
10	/ACK
11	+ BUSY
12	+PAPER EMPTY
13	+SELECT
14	/AUTO FEED
15	/ERROR
16	/INITIALIZE
17	/SELECT INPUT
18–25	GROUND

SIGNAL DESCRIPTION:

/STROBE — A 0.5 microsecond minimum, low active pulse which clocks data into the printer. Data setup prior to strobe and hold after strobe are 0.5 microseconds each.

DATA BIT 0–7	Positive polarity, TTL level data. Valid in conjunction with strobe.
/ACK	Printer acknowledge signal. A logic low-level indicates that the printer has received the last character and is ready to accept another.
+BUSY	High active signal which indicates that the printer is busy and cannot accept data.
+PAPER EMPTY	High active signal from the printer indicates that there is no paper in printer.
+SELECT	High active status line from printer which indicates that the printer is in the select mode.
/AUTO FEED	Low active signal to the printer which instructs the printer to line-feed after a line is printed.
/ERROR	Low active status line from the printer which indicates an error condition.
/INITIALIZE	Low active signal to printer (50-microsecond minimum) which causes printer initialization.
/SELECT INPUT	Low active signal to printer which selects the printer.

7.2 ADDRESS AND INTERRUPT ASSIGNMENT

There are two configurations of the parallel printer port: LPT1 or LPT2.

PRINTER AS LPT1

When configured as LPT1, the following port address assignments are made.

ADDRESS	IN/OUT	FUNCTION
378 Hex	OUT	PRINTER DATA
37A Hex	OUT	PRINTER CONTROL
378 Hex	IN	PRINTER DATA
379 Hex	IN	PRINTER STATUS
37A Hex	IN	PRINTER CONTROL

The interrupt signal for LPT1 is IRQ7.

PRINTER AS LPT2

When configured as LPT2, the following port address assignments are made.

ADDRESS	IN/OUT	FUNCTION
278 Hex	OUT	PRINTER DATA
27A Hex	OUT	PRINTER CONTROL
278 Hex	IN	PRINTER DATA
279 Hex	IN	PRINTER STATUS
27A Hex	IN	PRINTER CONTROL

The interrupt signal for LPT2 is IRQ5.

DATA LATCH (Hex 378, 278)

Writing to this address loads the 8 bits of data in the adapter's printer buffer. Reading this address returns the last written contents of the adapter's printer buffer.

PRINTER CONTROLS (Hex 37A, 27A)

Printer control signals are issued by writing to this port. Additionally, the current state of these control signals may be read. The following are the bit definitions for this byte.

Bits 7, 6, and 5 are not used.

Bit 4 +IRQEN. A "1" for this bit enables printer interrupts. A printer interrupt occurs when the "−ACK" signal changes from the active to inactive state. A "0" for this bit disables printer interrupts.

Bit 3 +SLCT IN. A "1" for this position selects the printer.

Bit 2 −INIT. A "0" initializes the printer. A 50-microsecond minimum pulse is required.

Bit 1 +AUTO FD. A "1" will cause the printer to line-feed after a line is printed.

Bit 0 +STROBE. A "1" (0.5-microsecond minimum) will clock the data stored in the data latch port to the printer.

PRINTER STATUS (Hex 379, 279)

Printer status may be accessed by reading this port of the adapter. The following are the bit definitions for this byte.

Bit 7 −BUSY. A "0" indicates that the printer is busy, A "1" indicates that the printer is ready.

Bit 6 −ACK. A "0" indicates that the printer has accepted the last character and is ready to accept another. A "1" indicates that the printer is not ready.

Bit 5 +PE. A "1" on this bit indicates that the printer is out of paper. A "0" indicates that the printer has paper.

Bit 4 +SLCT. A "1" signifies that the printer is selected. A "0" indicates that the printer is not selected.

Bit 3 −ERROR. A "0" indicates that the printer has encountered an error. A "1" indicates no error.

Bits 2, 1, and 0 are not used.

CHEETAH COMBO

SECTION EIGHT TECHNICAL REFERENCE – SERIAL PORT

The Cheetah Combo adapter's serial port is fully hardware- and software-compatible with the IBM PC-AT serial adapter interface. The information provided within this section may be considered optional reading as section 5 covers the configuration of the port as COM1, COM2, COM3, or COM4.

8.1 CONNECTOR SIGNAL ASSIGNMENT

The serial port is the smaller (9-pin) female DB type connector located at the back of the Cheetah Combo adapter. The signal assignments on the pins of the connector are identical to that of IBM's serial port adapter and are listed below:

PIN NO.	SIGNAL NAME
1	CARRIER DETECT
2	RECEIVE DATA
3	TRANSMIT DATA
4	DATA TERMINAL READY
5	SIGNAL GROUND
6	DATA SET READY
7	REQUEST TO SEND
8	CLEAR TO SEND
9	RING INDICATOR

8.2 ADDRESS AND INTERRUPT ASSIGNMENT

There are four configurations of the serial port: COM1, COM2, COM3 or COM4.

SERIAL PORT AS COM1

When configured as COM1, the following port address assignments are made.

ADDR.	DLAB	DIRECTION	FUNCTION
3F8 Hex	0	WRITE	TRANSMITTER HOLDING REGISTER
3F8 Hex	0	READ	RECEIVER BUFFER REGISTER
3F8 Hex	1*	WRITE	DIVISOR LATCH LSB
3F9 Hex	1*	WRITE	DIVISOR LATCH MSB
3F9 Hex	0	WRITE	INTERRUPT ENABLE REGISTER
3FA Hex		READ	INTERRUPT IDENTIFICATION REGISTER
3FB Hex		WRITE	LINE-CONTROL REGISTER
3FC Hex		WRITE	MODEM CONTROL REGISTER
3FD Hex		READ	LINE STATUS REGISTER
3FE Hex		READ	MODEM STATUS REGISTER
3FF Hex		READ/ WRITE	SCRATCHPAD REGISTER

* Indicates that the DLAB (Divisor Latch Access Byte) is set. To set DLAB, write a "1" to bit D7 of the LINE CONTROL REGISTER (address 3FB Hex).

The interrupt signal for COM1 is IRQ4.

SERIAL PORT AS COM2

When configured as COM2, the following port address assignments are made.

ADDR.	DLAB	DIRECTION	FUNCTION
2F8 Hex	0	WRITE	TRANSMITTER HOLDING REGISTER
2F8 Hex	0	READ	RECEIVER BUFFER REGISTER
2F8 Hex	1*	WRITE	DIVISOR LATCH LSB
2F9 Hex	1*	WRITE	DIVISOR LATCH MSB
2F9 Hex	0	WRITE	INTERRUPT ENABLE REGISTER
2FA Hex		READ	INTERRUPT IDENTIFICATION REGISTER
2FB Hex		WRITE	LINE-CONTROL REGISTER
2FC Hex		WRITE	MODEM CONTROL REGISTER
2FD Hex		READ	LINE STATUS REGISTER
2FE Hex		READ	MODEM STATUS REGISTER
2FF Hex		READ/ WRITE	SCRATCHPAD REGISTER

* Indicates that the DLAB (Divisor Latch Access Byte) is set. To set DLAB, write a "1" to bit D7 of the LINE CONTROL REGISTER (address 2FB Hex).

The interrupt signal for COM2 is IRQ3.

SERIAL PORT AS COM3

When configured as COM3, the following port address assignments are made.

ADDR.	DLAB	DIRECTION	FUNCTION
2E8 Hex	0	WRITE	TRANSMITTER HOLDING REGISTER
2E8 Hex	0	READ	RECEIVER BUFFER REGISTER
2E8 Hex	1*	WRITE	DIVISOR LATCH LSB
2E9 Hex	1*	WRITE	DIVISOR LATCH MSB
2E9 Hex	0	WRITE	INTERRUPT ENABLE REGISTER
2EA Hex		READ	INTERRUPT IDENTIFICATION REGISTER
2EB Hex		WRITE	LINE-CONTROL REGISTER
2EC Hex		WRITE	MODEM CONTROL REGISTER
2ED Hex		READ	LINE STATUS REGISTER
2EE Hex		READ	MODEM STATUS REGISTER
2EF Hex		READ/ WRITE	SCRATCHPAD REGISTER

* Indicates that the DLAB (Divisor Latch Access Byte) is set. To set DLAB, write a "1" to bit D7 of the LINE CONTROL REGISTER (address 2EB Hex).

The interrupt signal for COM3 is IRQ3.

SERIAL PORT AS COM4

When configured as COM4, the following port address assignments are made.

ADDR.	DLAB	DIRECTION	FUNCTION
3E8 Hex	0	WRITE	TRANSMITTER HOLDING REGISTER
3E8 Hex	0	READ	RECEIVER BUFFER REGISTER
3E8 Hex	1*	WRITE	DIVISOR LATCH LSB
3E9 Hex	1*	WRITE	DIVISOR LATCH MSB
3E9 Hex	0	WRITE	INTERRUPT ENABLE REGISTER
3EA Hex		READ	INTERRUPT IDENTIFICATION REGISTER
3EB Hex		WRITE	LINE-CONTROL REGISTER
3EC Hex		WRITE	MODEM CONTROL REGISTER
3ED Hex		READ	LINE STATUS REGISTER
3EE Hex		READ	MODEM STATUS REGISTER
3EF Hex		READ/ WRITE	SCRATCHPAD REGISTER

* Indicates that the DLAB (Divisor Latch Access Byte) is set. To set DLAB, write a "1" to bit D7 of the LINE CONTROL REGISTER (address 3EB Hex).

The interrupt signal for COM4 is IRQ4.

TRANSMITTER HOLDING REGISTER WRITE
(3F8, 2F8, 2E8,3E8) DLAB = 0

The transmitter holding register contains the character to be sent. Bit position 0 is the least significant bit and the first bit sent in the serial transmission.

RECEIVER BUFFER REGISTER READ
(3F8, 2F8, 2E8, 3E8) DLAB = 0

The receiver buffer register contains the received character. Bit position 0 is the least significant bit and the first bit to be received during a serial transmission.

DIVISOR LATCH LSB WRITE (3F8, 2F8, 2E8, 3E8) DLAB = 1

Low order 8 bits for the 16-bit programmable baud rate divider.

DIVISOR LATCH MSB WRITE (3F9, 2F9, 2E9, 3E9) DLAB = 1

High order 8 bits for the 16-bit programmable baud rate divider.

BAUD RATE TO DIVISOR VALUE TABLE

DESIRED BAUD RATE	DIVISOR VALUE (decimal)	REQ. (hex)	PERCENT ERROR DIFFERENCE BETWEEN DESIRED & ACTUAL
50	2304	900	–
75	1536	600	–
110	1047	417	0.026
134.5	857	359	0.058
150	768	300	–
300	384	180	–
600	192	0C0	–
1200	96	060	–
1800	64	040	–
2000	58	03A	0.69
2400	48	030	–
3600	32	020	–
4800	24	018	–
7200	16	010	–
9600	12	00C	–

INTERRUPT ENABLE REGISTER WRITE
(3F9, 2F9, 2E9, 3E9) DLAB = 0

The interrupt enable register allows the activation of the interrupt signal to occur on four, individually controllable events: receiver data available, transmit data buffer empty, receiver line status, and modem status. The bit significance is described below:

Bit 0 When set (logical 1), allows the received data available interrupt.

Bit 1 When set (logical 1), allows the transmitter holding register empty interrupt to occur.

Bit 2 When set (logical 1), allows receiver line status interrupts to occur.

Bit 3 When set (logical 1), allows modem status interrupts to occur.

Bits 4-7 Not used, should always be a logical 0.

INTERRUPT IDENTIFICATION REGISTER READ
(3FA, 2FA, 2EA, 3EA)

The interrupt identification register identifies whether an interrupt is pending and, if so, the source of the pending interrupt. Interrupts are prioritized into four levels: receiver line status (priority 1), receiver data available (priority 2), transmitter holding register empty (priority 3), and modem status (priority 4).

Bit 0 Interrupt pending bit. When at a logical "0", this bit signifies that one of the four possible interrupt conditions, identified by bits 1 and 2, has occurred.

Bits 1-2 These two bits provide the encoded, prioritized identification of the pending interrupt.

Bits 3-7 These five bits are always a logical "0".

INTERRUPT IDENTIFICATION CHART

INTERRUPT ID REG BITS 2	1	0	PRIORITY	TYPE	SOURCE	RESET
0	0	1	none	none	none	—
1	1	0	Highest	RCVR LINE STATUS	OVERRUN ERROR or PARITY ERROR or FRAMING ERROR or BREAK INTERRUPT	READING THE LINE STATUS REGISTER
1	0	0	Second	RCVR DATA AVAIL	RECEIVER DATA AVAILABLE	READING THE RECEIVER BUFFER REG
0	1	0	Third	TRANS HOLD REG EMPTY	TRANSMITTER HOLDING REGISTER EMPTY	READING THE INTERRUPT ID REGISTER or WRITING TRANS HOLDING REG
0	0	0	Fourth	MODEM STATUS	CLEAR TO SEND or DATA SET READY or RING INDICATOR or RECEIVED LINE SIGNAL DETECT	READING THE MODEM STATUS REGISTER

LINE CONTROL REGISTER W/R (3FB, 2FB, 2EB, 3EB)

The line control register specifies the format for the asynchronous data communication. Word length, number of stop bits, parity enable, parity type, set-break, and the control of the divisor latch access bit (DLAB) use this register. The line control register contents can be read to facilitate the modification of a single bit without maintaining an image of the register in system memory.

Bits 0-1 These two bits specify the word length of the characters to be transmitted or received. The bits are encoded to produce the four combinations as follows:

Bit 1	Bit 0	Word Length in Bits
0	0	5 bits
0	1	6 bits
1	0	7 bits
1	1	8 bits

Bit 2 This bit selects the number of stop bits. When at a logical "0", one stop bit is generated or checked in a data transmission or reception. For word lengths of 6, 7 or 8 bits, two stop bits are generated or checked when this bit is at a logical "1". A word length of 5 bits having this bit set to a logical "1" will cause 1½ stop bits to be generated or checked.

Bit 3 This bit enables or disables parity generation and checking. A logical "1" enables the parity circuit.

Bit 4 This bit is the even parity select control. Valid only when bit 3 is set, a logical "1" causes even parity; a logial "0" selects odd parity for serial data transfers.

Bit 5 This bit is the stuck-parity bit. It is used to force the parity bit to be the same value for each character transmitted or received. The forced value is always the opposite of the value specified by bit 4 (even parity select bit).

Bit 6 This bit is the set-break control bit. When set to a logical "1", the serial output is forced to the spacing (logical "0") state; it remains there regardless of other transmitter activity. A logical "0" for bit 6 disables the set-break mode.

Bit 7 The divisor latch access bit (DLAB) must be set to a logical "1" in order to access the divisor latches of the baud rate generator. Otherwise, this bit should be a logical "0" to access the data registers and interrupt enable register.

MODEM CONTROL REGISTER WRITE (3FC, 2FC, 2EC, 3EC)

The modem control register permits the exchange of control signals to the modem or data set (device acting as a modem).

Bit 0 This bit controls the data-terminal-ready (−DTR) output. A logical "1" produces the active state; a logical "0" produces the inactive state.

Bit 1 This bit controls the request-to-send (−RTS) output. A logical "1" produces the active state; a logical "0" produces the inactive state.

Bit 2 This bit controls the output−1 (−OUT 1) signal. A logical "1" produces the active state; a logical "0" produces the inactive state.

Bit 3 This bit controls the output−2 (−OUT 2) signal. A logical "1" produces the active state; a logical "0" produces the inactive state.

Bit 4 This bit is for loopback mode control, a useful feature for diagnostic testing of the controller. When set to the logical "1" state, the serial input, as well as the four modem control input signals (−CTS, −DSR, −RLSD [DCD], and −RI), are electrically disconnected and replaced by the transmitter serial output (SOUT), and the four modem control outputs (−DTR, −RTS, −OUT 1, −OUT 2).

This feature allows the verification of the transmit and receive paths of the controller. It also allows the operation of the interrupts.

Bits 5-7 Not used, should always be a logical"0".

LINE STATUS REGISTER R/W (3FD, 2FD, 2ED, 3ED)

This register provides information regarding the status of a data transfer.

Bit 0 This bit signifies receiver data ready. When at a logical "1", it indicates that a complete character has been received and transferred into the receive buffer register. The bit is reset to the "0" state whenever the receive buffer register is read or a "0" is written to this bit.

Bit 1 This bit signifies an overrun error. When a new character is being loaded into a full receive register, an overrun occurs. This bit is reset when the line status register is read.

Bit 2 This bit, when set to a logical "1", signifies that a receive character parity error has occured. This bit is cleared upon reading the line status register.

Bit 3 This bit, when set to a logical "1", signifies that a framing error has occurred. When the received character does not have a valid stop bit (i.e., the stop bit following the data or parity bit is detected as a zero bit [spacing level]), a framing error occurs. This bit is cleared upon reading the line status register.

Bit 4 This bit is the break interrupt indicator. A logical "1" occurs whenever the received data input maintains the spacing state (logical "0") for longer than a full word transmission time. A full word transmission time is the total time of the start bit + data bits + parity bit + stop bit(s). This bit is cleared upon reading the line status register.

NOTE: Bits 1 through 4 indicate error conditions and, as such, will produce a receiver line status interrupt when detected.

Bit 5 This bit indicates that the transmitter holding register is empty when at a logical "1".

Bit 6 This bit indicates that both the transmitter holding register and the internal transmitting shift register are empty when at a logical "1". It assumes the logical "0" state whenever either contains a data character.

Bits 7 This bit is always a logical 0.

MODEM STATUS REGISTER READ (3FE, 2FE, 2EE, 3EE)

The modem status register provides a means to examine the current state of the control lines from the modem. Additionally, four bits of this register indicate a change in the state of the four modem signals; clear to send, data set ready, ring indicator and data carrier detect.

Bit 0 This bit, when a logical "1", signifies that the clear-to-send (−CTS) input to the NS16450 chip has changed state since the last time the modem control register has been read.

Bit 1 This bit, when a logical "1", signifies the data-set-ready (−DSR) input to the NS16450 chip has changed state since the last time the modem control register has been read.

Bit 2 This bit is the trailing edge ring-indicator detector. When this bit is a logical "1", it signifies that the ring-indicator (−RI) input to the NS16450 chip has changed from the active to inactive state since the last time the modem control register has been read.

Bit 3 This bit, when a logical "1", signifies that the data-carrier-detect (−DCD) input to the NS16450 chip has changed state since the last time the modem control register has been read.

NOTE: Whenever bits 0, 1, 2, or 3 have been set to a logical "1", a modem status interrupt is generated.

Bit 4 This bit is the complement of the clear-to-send (−CTS) input. If bit 4 (loop mode) of the modem control register (MCR) is set to a logical "1", this bit is equivalent to RTS in the MCR.

Bit 5 This bit is the complement of the data-set-ready (−DSR) input. If bit 4 (loop mode) of the modem control register (MCR) is set to a logical "1", this bit is equivalent to DTR in the MCR.

Bit 6 This bit is the complement of the ring-indicator (−RI) input. If bit 4 (loop mode) of the modem control register (MCR) is set to a logical "1", this bit is equivalent to OUT 1 in the MCR.

Bit 7 This bit is the complement of the data-carrier-detect (−DCD) input. If bit 4 (loop mode) of the modem control register (MCR) is set to a logical "1", this bit is equivalent to OUT 2 in the MCR.

SCRATCHPAD REGISTER R/W (3FF, 2FF, 2EF, 3EF)

This 8-bit register does not control the adapter in any way. Because it can be read and written, it can be used by the programmer as a scratchpad register.

8.4 CONVERSION FROM 9 PIN CONNECTOR TO 25 PIN CABLE INTERFACE

DB9 CONN.	SIGNAL NAME	DB25 (SEE NOTE) CONN.
1	CARRIER DETECT	8
2	RECEIVE DATA	3
3	TRANSMIT DATA	2
4	DATA TERMINAL READY	20
5	SIGNAL GROUND	7
6	DATA SET READY	6
7	REQUEST TO SEND	4
8	CLEAR TO SEND	5
9	RING INDICATOR	22

NOTE: Configured as RS-232C DCE (Data Communications Equipment).

CHEETAH COMBO

TABLE I

GUIDE FOR SETTING ADDRESS DIP SWITCHES (SW1 - SW3)

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 - SW3)

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

CHEETAH COMBO

TABLE I (continued)

GUIDE FOR SETTING ADDRESS DIP SWITCHES (SW1 - SW3)

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

CHEETAH COMBO

APPENDIX B
MEMORY SWITCH SETTING EXAMPLES

****

Example 1.

Cheetah Combo adapter filled with 54 (18 x 3) 256K dynamic RAMs. Adapter is to provide low order memory (within first megabyte) from 256K through 640K (384K byte total) as well as 1152K bytes of expansion memory.

Set switches as below. Install card in system. Run the set-up program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the number 640 followed by a carriage return. When prompted to enter the amount of extended memory, enter the number1152 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 #4 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	OFF	OFF	OFF	ON	ON	ON	X	LPT#	256K—640K 1.0M—1.125M

APPENDIX B
MEMORY SWITCH SETTING EXAMPLES (cont.)

****

Example 2.

Cheetah Combo adapter filled with 54 (18 x 3) 256K dynamic RAMs. Adapter is to provide low order memory (within first megabyte) from 256K through 512K (256K byte total) as well as 1280K bytes of expansion memory.

Set switches as below. Install card in system. Run the set-up program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the number 512 followed by a carriage return. When prompted to enter the amount of extended memory, enter the number 1280 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 #4 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	OFF	OFF	ON	ON	ON	ON	X	LPT#	256K—512K 1.0M—1.250M

APPENDIX B
MEMORY SWITCH SETTING EXAMPLES (cont.)

****

Example 3.

Cheetah Combo adapter filled with 54 (18 x 3) 256K dynamic RAMs. Adapter is to provide low order memory (within first megabyte) from 512K through 640K (128K byte total) as well as 1408K bytes of expansion memory.

Set switches as below. Install card in system. Run the set-up program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the number 640 followed by a carriage return. When prompted to enter the amount of extended memory, enter the number 1408 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 #4 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	OFF	ON	OFF	ON	ON	ON	X	LPT#	512K—640K 1.0M—1.375M

APPENDIX B
MEMORY SWITCH SETTING EXAMPLES (cont.)

****

Example 4.

Cheetah Combo adapter filled with 54 (18 x 3) 256K dynamic RAMs. Adapter is to provide 1.5M bytes of expansion memory (all above first megabyte).

Set switches as below. Install card in system. Run the set-up program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of extended memory, enter the number 1536 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	OFF	ON	X	X	2.0M—2.5M
4	ON	ON	ON	ON	ON	ON	X	LPT#	

****

Example 5.

Cheetah Combo adapter filled with 54 (18 x 3) 64K dynamic RAMs. Adapter is to provide low order memory (within first megabyte) from 256K through 640K (384K byte total).

Set switches as below. Install card in system. Run the set-up program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the number 640 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	OFF	OFF	OFF	X	LPT#	

APPENDIX B
MEMORY SWITCH SETTING EXAMPLES (cont.)

****

Example 6.

Cheetah Combo adapter filled with 54 (18 x 3) 64K dynamic RAMs. Adapter is to provide low order memory (within first megabyte) from 256K through 512K (256K byte total) as well as 128K bytes of expansion memory.

Set switches as below. Install card in system. Run the set-up program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the number 512 followed by a carriage return. When prompted to enter the amount of extended memory, enter the number 128 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	1.00M—1.128M
4	ON	ON	ON	OFF	OFF	OFF	X	LPT#	

APPENDIX B
MEMORY SWITCH SETTING EXAMPLES (cont.)

****

Example 7.

Cheetah Combo adapter filled with 54 (18 x 3) 64K dynamic RAMs. Adapter is to provide low order memory (within first megabyte) from 512K through 640K (128K byte total) as well as 256K bytes of expansion memory.

Set switches as below. Install card in system. Run the set-up program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the number 640 followed by a carriage return. When prompted to enter the amount of extended memory, enter the number 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	OFF	ON	ON	512K—640K
2	ON	ON	ON	ON	OFF	ON	ON	ON	1.00M—1.128M
3	ON	ON	ON	ON	OFF	ON	ON	OFF	1.128M—1.256M
4	ON	ON	ON	OFF	OFF	OFF	X	LPT#	

APPENDIX B
MEMORY SWITCH SETTING EXAMPLES (cont.)

****

Example 8.

Cheetah Combo adapter filled with 54 (18 x 3) 64K dynamic RAMs. Adapter is to provide expansion memory (all above first megabyte) of 384K bytes.

Set switches as below. Install card in system. Run the set-up program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of extended memory, enter the number 384 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	OFF	OFF	OFF	X	LPT#	

APPENDIX B
MEMORY SWITCH SETTING EXAMPLES (cont.)

****

Example 9.

Cheetah Combo adapter filled with 18 (18 x 1) 256K dynamic RAMs. Adapter is to provide low order memory (within first megabyte) from 256K through 640K (384K byte total) as well as 128K bytes of expansion memory.

Set switches as below. Install card in system. Run the set-up program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the number 640 followed by a carriage return. When prompted to enter the amount of extended memory, enter the number 128 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 #4 controls Bank 1
2	OFF	X	X	X	X	X	X	X	disabled
3	OFF	X	X	X	X	X	X	X	disabled
4	OFF	OFF	OFF	ON	ON	ON	X	LPT#	256K—640K 1.0M—1.125M

APPENDIX B
MEMORY SWITCH SETTING EXAMPLES (cont.)

****

Example 10.

Cheetah Combo adapter filled with 18 (18 x 1) 256K dynamic RAMs. Adapter is to provide low order memory (within first megabyte) from 256K through 512K (256K byte total) as well as 256K bytes of expansion memory.

Set switches as below. Install card in system. Run the set-up program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the number 512 followed by a carriage return. When prompted to enter the amount of extended memory, enter the number 256 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 #4 controls Bank 1
2	OFF	X	X	X	X	X	X	X	disabled
3	OFF	X	X	X	X	X	X	X	disabled
4	OFF	OFF	ON	ON	ON	ON	X	LPT#	256K—512K 1.0M—1.250M

APPENDIX B
MEMORY SWITCH SETTING EXAMPLES (cont.)

****

Example 11.

Cheetah Combo adapter filled with 18 (18 x 1) 256K dynamic RAMs. Adapter is to provide low order memory (within first megabyte) from 512K through 640K (128K byte total) as well as 384K bytes of expansion memory.

Set switches as below. Install card in system. Run the set-up program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of base memory, enter the number 640 followed by a carriage return. When prompted to enter the amount of extended memory, enter the number 384 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 #4 controls Bank 1
2	OFF	X	X	X	X	X	X	X	disabled
3	OFF	X	X	X	X	X	X	X	disabled
4	OFF	ON	OFF	ON	ON	ON	X	LPT#	512K—640K 1.0M—1.375M

APPENDIX B
MEMORY SWITCH SETTING EXAMPLES (cont.)

****

Example 12.

Cheetah Combo adapter filled with 18 (18 x 1) 256K dynamic RAMs. Adapter is to provide 512K bytes of expansion memory (all above first megabyte).

Set switches as below. Install card in system. Run the set-up program on the "Diagnostics for IBM Personal Computer AT" diskette. When prompted to enter the amount of extended memory, enter the number 512 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	OFF	X	X	X	X	X	X	X	disabled
3	OFF	X	X	X	X	X	X	X	disabled
4	ON	ON	ON	ON	ON	ON	X	LPT#	

SW 1 2 3 all ↓

SW 4 ↑ ↑ ↑

SW 5 ↑ ↑ ↑

LPT 2 COM 2 or Clear

Short-cut for installing the 1st Cheetah Memory board in an IBM PC-AT.

1. Remove the PC-AT cover per the IBM "Installation and Setup" manual.

2. Please unplug the small front-most cable connector on top of the disk controller card -it connects to the disk ready light. Remove the retaining bracket screw from the rear of the disk controller card, then gently remove the disk controller card -laying it on top of the power supply. No need to remove the other disk drive cables. You now have access to jumper J18 on the motherboard - which is located directly beneath the front of the disk controller card. (It's the small jumper nearest the memory.) Please insure that it is connected to pins 2&3, which are nearest the back of the AT - the pin nearest the keyboard must be exposed. Replace disk controller card, small cable connector (with smooth side up), and screw.

3. Remove all memory boards from the AT. Replace cover. Place the IBM diagnostic disk in drive A. Turn on power. Press the F1 key if you get a "164- Memory Size Error". Configure the AT with 256K of base memory and zero extended memory. System/memory diagnostics must run without error.

4. Remove diagnostic disk. Return to DOS. Run "CHSETUP" which is on the Cheetah Code disk. Set/verify Cheetah switches - log memory settings.

5. Power down. Remove cover. Insert the Cheetah board in any of the double slots - with dip switches set using the data from step 4 above. Replace screw. Replace cover. Place the IBM diagnostic disk in drive A. Turn on power. Use the base and extended memory numbers that were provided by "CHSETUP" in step 4 to configure the AT. (Also see APPENDIX B, Example 1.) Run system and memory diagnostics. Other memory boards may now be installed above the Cheetah Memory.

Please run the program "FORCE" which is on the Cheetah Code disk. This program forces your programs to load into fast Cheetah Memory - which is above 256k. "FORCE" should be executed before any user programs are loaded - otherwise, they may load into the slower IBM motherboard memory from 0k to 256k. A disk caching program (and buffer) located below 256k offers an even better solution. Should your programs require more than 384k - then you should not run force. Those programs which require more than 384k should be examined to see if seldom used instructions and tables may be placed below 256k. Process above 256k whenever possible!

When you are ready to install additional Cheetah Memory, simply run "CHSETUP" to determine the switch settings.

To set-up a CDISK (our VDISK) in extended memory , use your favorite line editor, (or EDLIN) to build (or add to) the CONFIG.SYS file. The following example uses all of extended memory as one large ram disk.

(256K IBM PC AT with one 2.5Mb Cheetah Card installed.)

Enter: DEVICE=CDISK.SYS 2176 512 256/E into your CONFIG.SYS file.

Please note that this example has room for 256 directory entries - the maximum CDISK allows. CDISK will permit the use of all of extended memory - regardless of the size. See your DOS manual for VDISK specifications.

If you have any questions or problems, please call 1-800-243-3824, or 1-214-757-3001 in Texas.

ORIGINAL BOARD Settings