16MHz/ 20MHz/ 25MHz PANTHER II SYSTEM BOARD

User's Manual

P A N T H E R - I I
3 8 6 S X

The material in this manual is for information only and is subject to change without notice.

REVISION : 1.1

RADIO FREQUENCY INTERFERENCE STATEMENT

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 with radio and television reception.

If this equipment does cause interference to radio or TV 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 away from the receiver.
* Move the computer away from the receiver.
* Plug the power cord of computer into a different outlet so that computer and receiver are on different branch circuits.
* Ensure that card slot covers are in place when no card is installed.
* Ensure that card mounting screws, attachment connector screws, and ground wires are tightly secured.
* If peripherals are used with this system, it is suggested to use shielded, grounded cables, with in-line filters if necessary.

If necessary, the user should cónsult the dealer service representative for additional suggestions.

The manufacturer is not responsible for any radio or TV interferences caused by unauthorized modifications to this equipment. It is the responsibility of the user to correct such interferences.

Note

1. *Be certain that the BIOS setup is properly initialized before actual operation, otherwise performance degrade and/or reliability problem may result.*

   a) *For optimum performance, select "0" for Read & Write Wait State under the Chipset option of the BIOS Setup Utility.*

   b) *Never allow the 'AT-Bus Speed' to exceed 8.3 MHz in the BIOS Setup unless you are so sure that the I/O cards installed are capable of running at such high speed.*

2. *Electronic components are sensitive to dust and dirt. Do inspect and clean the computer system regularly.*

3. *Turn off the power whenever you install or remove any connector, memory module and add-on card. Before turning on the power, make sure that all the connectors, memory modules and add-on cards are well secured.*

4. *The SIMM sockets are fragile device. Do not force the SIMM modules into the sockets. It may break the locking latches.*

Preface

This manual covers the necessary information to operate the Panther-II system board. In-depth explanations of the functions of the motherboard are provided. The table of contents gives detailed information about the arrangement of this manual. The system BIOS setup is further discussed in the appendix.

The content in this manual is only for reference and is intended to provide basic information for the general users. Basic technical informations however, are also provided for hardware and software engineers.

The manual compose of 4 chapters, Chapter 1 contains a brief introduction of Panther-II motherboard. In Chapter 2, specifications and functions of Panther-II are discussed. It also outlines many advanced features of the CPU and the system architecture. Chapter 3 deals with the installation of coprocessor, DRAM modules, jumpers and the memory configurations. Technical information is provided in Chapter 4.

System BIOS and the system setup are further discussed in the appendix A. Detailed setup procedures are explained.

Note :

Panther-II is available in three operating speeds, 16Mhz, 20Mhz and 25Mhz. Features and functions described in the manual is identical for both versions except for their operating frequencies.

CONTENT

Chapter 1
Introduction

The Panther-II system board is a high performance system board that represents a significant technological advance over the conventional 386SX designs. It offers an increased power and flexibility architecture by supporting 80386SX processor speeds up to 25 Mhz *(See NOTE on preface).* The design utilizes advanced main frame techniques such as two or four way interleaving along with high speed page mode capability.

The Panther-II offers an inexpensive entrance to 386-specific applications. It combines the abilities of the 80386 and the 80286 machines. Like an 80386 machine, it processes instructions internally in 32-bit chunks. Like an 80286 machine, it operates with a 16-bit data bus and a 24-bit address bus. This constructions allows the Panther-II system to run 386 software in essentially a 286 hardware environment.

For the memory system, It supports up to 16 MByte of DRAMs on the system board. System and Video shadowing features are supported on all 16K boundaries between 640K and 1M. It is also optimized to allow mixing of DRAM types to give end user the maximum flexibility in choosing the correct memory capacity for their applications. This flexibility in configuration allows you to select an ideal cost/performance combination.

The Panther-II is a fully PC/AT compatible system board implemented with a highly integrated chip sets to provide high performance, reliability and compatibility. It is based on the 386SX CPU which can access the world's largest existing microcomputer software base, including the growing 32-bit software.

To speed up the switching of CPU between protected and real mode, a special feature known as 'OS/2 Optimization' is also incorporated. This provides an unique method to handle the mode switching which will improve the performance for advanced operating system and expanded memory manager applications.

Regarding to the issue of compatibility, Panther-II system is fully hardware and software compatible with associated PC-AT products. This means that virtually all the hardware and software that is available for the PC/AT can also be run on a system you build around the Panther-II system. It supports MS-DOS, Xenix, Unix and all PC/AT application programs. Users can run applications designed for the PC/AT on Panther-II without any modification. Multi-tasking and multi-user capabilities are fully functional on this system board.

In addition, the Panther-II provides standard ISA expansion bus connectors so that add-on cards developed for the PC/AT will be fully functional. On-board power good generator is also implemented to ensure the reliability of the system and is capable of working with any

power supplies.

Panther-II is a perfect choice for CAD/CAM workstation, file server and end user applications. It is designed for the most advanced computer-based applications for today and in the future.

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Chapter 2
General Features

SPECIFICATION

Processor Subsystem :

Intel 80386SX CPU
Optional 80387SX Co-processor

Speed :

Turbo/normal speed
Software/hardware selectable

Memory Subsystem :

16MB maximum using 4M SIMMs
2MB using 256Kbx4 DRAM chips
Page/Interleave memory:
- Page mode memory
- 2-way and 4-way interleave mode

System BIOS shadow
Video BIOS shadow
Parity Check option
512K Eprom BIOS

I/O Subsystem :

Compatible to standard AT bus
Four 16-bit expansion slots
Two 8-bit expansion slots

System Support Functions :

- 8-Channel DMA (Direct Memory Access)
- 16-level interrupt
- 3 programmable timers
- CMOS RAM for system configuration
- Real time clock with battery backup
- OS/2 Optimization (Fast A20 gate and fast reset)

Other Features :

- On board POWERGOOD test circuit
- External battery connector
- Hardware turbo switch

PROCESSOR

The 80386SX Microprocessor is a 32-bit CPU with a 16-bit external data bus and a 24-bit external address bus. The 386SX CPU brings the high-performance software of the Intel386 Architecture to mid-range systems. It provides the performance benefits of a 32-bit programming architecture with the cost saving associated with 16-bit hardware systems.

The 386SX Microprocessor is 100% object code compatible with the 386DX, 286 and 8086 microprocessors. It provide 386DX based systems optimized for performance and 386SX CPU based systems optimized for cost, both sharing the same operating systems and application software. Unlike the 286-based systems against which it competes, the 386SX inherits the 386's protected and virtual 8086 modes and internal 32-bit processing.

Instruction pipeling, high bus bandwidth, and a very high performance ALU ensure short average instruction execution times and high system throughput. The 386SX CPU is capable of execution at sustained rates of 2.5-3.0 million instructions per second.

The integrated memory management unit (MMU) includes an address translation cache, advanced multi-tasking hardware, and a four-level hardware-enforced protection mechanism to support operating systems. The virtual machine

capability of the 386SX CPU allows simultaneous execution of applications from multiple operating systems such as MS-DOS and UNIX.

80386SX is not only an enhanced version of 80286, but designed to overcome the deficiencies of 80286. It allows you to make use of application software that a 286 just can't handle. For example, a very important attribute of any multi-tasking/multi-user operating system is its ability to rapidly switch between tasks or processes. The 386SX Microprocessor directly supports this operation by providing a task switch instruction in hardware.

The 386SX Microprocessor has two modes of operation: Real Address Mode (Real Mode), and Protected Virtual Address Mode (Protected Mode). Real Mode has the same base architecture as the 8086, but allows access to the 32-bit register set of the 386SX Microprocessor.

The complete capabilities of the 386SX Microprocessor are unlocked when the processor operates in Protected Virtual Address Mode. Protected Mode vastly increases the linear address space to four gigabytes and allows the running of virtual memory programs of almost unlimited size. In addition, Protected Mode allows the 386SX Microprocessor to run all of the existing 386DX CPU, 80286 and 8086 CPU's software, while providing a sophisticated memory management and a hardware-assisted protection mechanism. Protected Mode allows the use of additional instructions specially optimized for supporting

multitasking operating system.

The 386SX Microprocessor also offers four levels of protection which are optimized to support a multi-tasking operating system and to isolate and protect user programs from each other and the operating system.

MATH COPROCESSOR

The demand for sophisticated, number-crunching scientific and business applications has rapidly increased in recent years. 80386SX features an integer Arithmetic Logic Unit which only handles simple integer operations such as addition and multiplication. Floating-point operations which are actually utilized by applications must be accomplished through software routines.

To overcome this obstacle, external Math coprocessor is necessary. The Math coprocessor contains complex hardware and large data registers for floating-point numeric operations.

The 387SX Math CoProcessor is an extension to the Intel 386 microprocessor architecture. The combination of the 387SX with the 386SX Microprocessor dramatically increases the processing speed of computer application software which utilizes mathematical operations. This makes an ideal computer workstation platform for applications such as financial modelling and spreadsheet, CAD/CAM, or graphics.

The 387SX Math CoProcessor adds over seventy mnemonics to the 386SX Microprocessor instruction set. Specific 387SX math operations include logarithmic, arithmetic, exponentional, and trigonometric functions. The 387SX supports integer, extended integer, floating point and BCD data formats, and fully conforms to the

ANSI/IEEE floating point standard. The math coprocessor offloads the complicated math functions from the CPU. Therefore, it handles in one instruction what would have required many steps with the CPU. So you can save time on your favourite spreadsheet, database, engineering, scientific and graphics packages.

The 387SX CoProcessor is object code compatible with the 387DX and upward object code compatible from the 80287 and 8087 Math Co-processors.

In real-address mode and virtual-8086 mode, the 386SX Microprocessor and 387SX Math Coprocessor is completely upward compatible with software for the 8086/8087 and 80286/80287 real-address mode systems.

In protected mode, the 386SX Microprocessor and 387SX Math Coprocessor is completely upward compatible with software for the 80286/80287 protected mode system.

In all modes, the 386SX Microprocessor and 387SX Math Coprocessor is completely compatible with software for the 386 Microprocessor/387 Math Coprocessor system.

MEMORY SYSTEM

Panther-II supports the use of 256K, 1M and 4M DRAMs device configurations for up to 16MB of on-board system memory.

Both page mode and interleave operation are incorporated on the system board DRAM. Page mode is enabled or disabled for each pair of DRAM banks independently. When on, it is active on all memory maps for the enabled bank pairs. Interleaving requires pairs of banks. Both page mode and interleave are automatically enabled. One bank of memory refers to as 2 modules of SIMM or 4 pieces of DIP DRAM. Detailed operation of each is given in the following sections.

Interleave Operation

Two-way interleaving is automatically enabled whenever both memory banks of a pair are populated with same DRAM types. If all four banks are populated with same DRAMs, four-way interleaving automatically occurs. If the four memory banks are not populated with same DRAMs, two-way interleaving occurs on pairs that are of the same type.

In a system with three banks populated, the first two banks perform two-way interleave if they are of the same DRAM type. Next table

shows the automatic interleaving options that occur versus the number of populated banks. In the table, Bank 0,1,2 and 3 are the designations for each of the four DRAM banks. In the columns below these designators, "Yes" or "No", indicate whether the bank is populated.

Automatic Interleave vs Memory Map

Bank			Bank		
0	1	A Bank Address Mode	2	3	B Bank Address Mode
Yes	No	Linear	No	No	N/A
Yes	Yes	2-Way Interleave	No	No	N/A
Yes	Yes	2-Way Interleave	Yes	No	Linear
Yes	Yes	2-Way Interleave 0 and 1*	Yes	Yes	2-Way Interleave 2 and 3*

* This is for the case where Banks A and B contain different types of DRAMS. If all four banks contain the same DRAM type then four-way interleaving is automatically activated.

Page Mode Operation

Memory Interleaving operates independently of page mode. Page mode is active whether one bank or both are populated. The page mode operation results in no additional wait state penalty for either reads or writes which immediately follow reads to the same DRAM page.

When pairs of banks are installed interleaving is automatically enabled. The

combination of page mode with interleaving results in the best possible combination of fast system memory operation using the most cost effective DRAMs.

Shadow RAM

To further enhance the system performance, shadow RAM is supported. Shadow RAM is a technique that loads system BIOS ,video and/or adapter BIOS from the low speed EPROM/ROM directly into fast DRAM during boot-up of the computer. The execution of the BIOS then will have significant improvement because access to DRAM is much faster than ROM.

Memory Remapping

If shadow RAM is not used at memory area 0D0000H:0EFFFFH, remapping is possible. Then, local memory areas 0A0000H:0BFFFFH and 0D0000H:0EFFFFH (each 128K bytes) are mapped to the top of total memory for it to be used as extended memory. Memory areas 0F0000H-0FFFFFH (system BIOS) and 0C0000H-0CFFFFH (video BIOS) are reserved for shadow RAM.

I/O SUBSYSTEM

It is very important that a high speed system should be compatible with existing peripherals without downgrading the performance. The Panther-II system is exactly designed with this capability in mind. To be compatible with the existing add-on cards, user has the option of defining the I/O speed. If for example, the peripheral card is not capable of operating at high speed, user can define a slow speed for I/O slot operation while still maintain the rest of the system at very high speed.

SYSTEM FUNCTIONS

System functions include :

- Interrupt
- DMA
- Timer
- Real time clock
- Clock and ready generation
- I/O channel control

All system functions are 100% compatible to AT standard. I/O channel of Panther-II is designed to be compatible with standard AT bus. All the expansion cards conformed to the standard AT bus can be used in Panther-II without problem.

Chapter 3
Installing Components

Warning : Be sure to turn off the computer's power switch before installing or replacing any component.

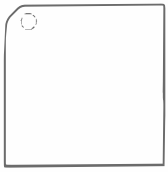
If installation sounds risky, let your dealer install the 80387SX. If you make a mistake, you could damage the 80387SX or your computer.

INSTALLING 80387SX MATH COPROCESSOR

Math coprocessor 80387SX is available in a 68-pin PLCC package. Find the 80387SX socket on the system board, it's located on U16 at the corner of the motherboard. The socket is a 68-pin PLCC socket, align the chip so that its orientation mark matches up with that of the socket. When you are sure the pins are aligned correctly, press firmly and evenly on the 80387SX into the socket. Make sure that the coprocessor is firmly inserted into the socket.

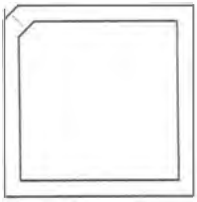
The speed rating of 80387SX should match that of the system speed for a optimum and reliable operation. Refer to the table below to determine the correct speed rating of the 80387SX.

Panther-II	Math Coprocessor
20 Mhz System	80387SX-20
16 Mhz System	80387SX-16



80387SX Coprocessor

Orientation Mark



Numeric Coprocessor Socket

SYSTEM MEMORY CONFIGURATION

Four DIP memory banks and two SIMM memory banks are available on Panther-II, these memory banks are designated as BANK 0 to BANK 3 in the motherboard. User has the option of either using DIP type DRAM or SIMM type memory modules. Still if the user prefers, he could use both types together. That means you could make use of DIP and SIMM type memory simultaneously. Please note that however, you cannot install both memory types marked with the same bank reference. For example if you had already installed DIP memory into 'BANK 0', you can no longer install SIMM into the memory modules referenced as 'BANK 0'.

One bank of memory refers to 2 SIMM modules or 6 DIP memory chips (4x44256 + 2x41256). For the SIMM memory, user can install 256K, 1M or 4M SIMM; therefore it has a maximum memory capacity of 16 Megabytes. On the other hand; if purely DIP DRAM are used, it will allow up to 2 Megabytes of memory. The DIP DRAM are organized in 4 banks as shown in next page :

DIP DRAM Memory Organization

Memory Bank	DIP Memory Location	DRAM Size
BANK 0	U39, U40, U41, U42	44256
	U38, U37 (parity)	41256
BANK 1	U33, U34, U35, U36	44256
	U32, U30 (parity)	41256
BANK 2	U26, U27, U28, U29	44256
	U31, U24 (parity)	41256
BANK 3	U20, U21, U22, U23	44256
	U25, U19 (parity)	41256

U38,U37, U32,U30, U31,U24 & U25,U19 are the parity bits for BANK 0 to BANK 3 respectively. In normal situation, those bits are not needed and the parity checking logic can be disabled. Hence, the user can left those sockets unpopulated and thus allowing you to minimize the system cost.

There are several combinations of DRAM types you may consider. So, a basic system can be equipped with fewer memory and later more memory can be added when upgrading the system. As a typical case, a basic system can be equipped with 2 Megabyte memory using 1MB SIMM and then memory size is later expanded to 10 Megabytes by putting another banks of 4M SIMM.

The memory size is detected automatically by system BIOS and indicated after power up. No switches or jumpers are required to be set for the memory size and DRAM type.

The different configurations of memory is illustrated in the next table. It shows the page mode, interleave options and the DRAM combinations available for each possible memory map. Since interleaving requires pairs of banks, various controls described act on memory in bank pairs. The short hand notation Bank A is used when describing something that affects memory banks 0 and 1 as a set. Similarly, Bank B is used to describe memory banks 2 and 3 as a set.

Memory Configuration Table

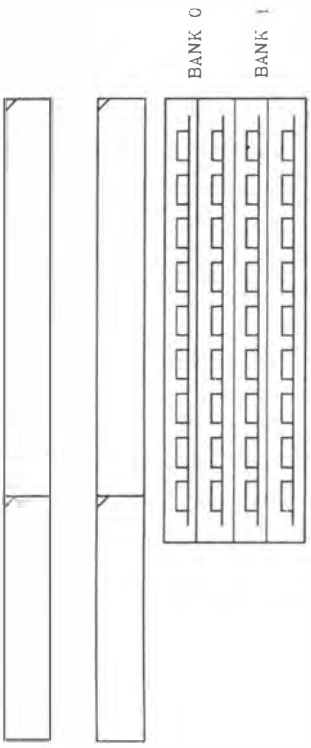
16-Bit DRAM Banks				Page/Interleave		Total
Bank 0	Bank 1	Bank 2	Bank 3	A	B	Memory
256K	256K			2/P		1.0MB
256K	256K	256K	256K	4/P	4/P	2.0MB
1M				Page		2.0MB
1M	1M			2/P		4.0MB
1M	4M			Page		10.0MB
4M	4M			2/P		16.0MB

Installing SIMM Modules

Whenever adding memory modules to the motherboard, install 2 modules at a time. Also make sure that the SIMM is installed in the correct orientation, the RAM chips on the modules should be facing the I/O slot. See the figure on next page for illustration.

To install a module, the module edge should angled into the socket's contact and then the module is pivoted into position, where the locking latches will secure it. If the module edge is not completely inserted into the socket, it cannot be pivoted to be in vertical position and should be dragged out and inserted again. Do not force the module into the SIMM socket. It will damage the locking latches.

The modules should be locked by the locking latches of the sockets firmly. Please check carefully before turning on the power. Otherwise, the system will not work properly.



RAM Module Orientation

CONTROL OF SYSTEM SPEED

System speed can be selected by hardware switch and keyboard. Connector P3 should be connected to the turbo switch of the case panel, this toggles the operation mode between turbo and normal mode when pressed.

In addition to the front-panel switch, you can also change the system speed via keyboard. Press 'Ctrl', 'Alt' and '+' for turbo mode and 'Ctrl', 'Alt' and '-' for normal mode.

In either case, the turbo LED will light up to indicate whether the system is now running in turbo mode or normal mode. In turbo mode, the turbo LED will turned on. In normal mode, the turbo LED is off.

It should be note that turbo switch setting will override the keyboard switching mode, but not vice versa.

SYSTEM BOARD JUMPER SETTING

There are a few jumpers in the motherboard that allow the user to select the desired system configuration. The following tables show the function and default settings of these jumpers.

Password Security Jumper

This jumper serves as a master de-select for the Powerup and Setup Password entry. The user can program the system to prompt for a password during powerup and during entry to the Setup Utility. When security is enabled, the computer will deny powerup access until the correct password is presented. An alarm will sound if three incorrect passwords are presented. This feature can be disabled, or the password changed, via the BIOS Setup Utility. Please refer to the section on 'Security Configuration Utility' of Setup Utility under Appendix A for details.

JP1	Password Security
1-2	Disabled *
2-3	Enabled

'CMOS Setup' Reset Jumper

Sometimes, improper setup may cause the system to malfunction and you might not be able to correct such problem without clearing the entire CMOS Setup. The purpose of this jumper is for the user to reset the CMOS Setup in case of critical error occurred in the Setup. Make sure that the power is OFF before you do this operation. Also be certain that this jumper is re-installed to its normal position after resetting the CMOS Setup.

After the CMOS Setup is cleared, the Setup will be loaded with the BIOS default value upon power-up and you may continue to define the system configuration as usual.

JP2	Function
1-2	Normal opertaion *
2-3	Reset CMOS Setup

* Default setting

SYSTEM BOARD CONNECTORS

Under typical conditions, these connectors should be connected to the indicators and switches of the system unit.

Connector	Function
P1	Hardware reset connector
P2	Speaker connector
P3	Turbo switch connector
P4	Turbo LED connector
P5	Power LED & Ext-Lock connector
P6-P7	Power supply connector
P8	External battery connector
KB1	Keyboard connector

Pin assignments of the connectors are illustrated as follows :

P 1 - Hardware Reset Connector

Pin	Assignment
1	Selection Pin
2	Ground

P 2 - Speaker Connector

Pin	Assignment
1	Data out
2	+5 Vdc
3	Ground
4	+5 Vdc

P 3 - Turbo Switch Connector

Pin	Assignment
1	Selection Pin
2	Ground

P 4 - Turbo LED Connector

Pin	Assignment
1	+5 Vdc
2	LED signal

P 5 - Power LED & Ext-Lock Connector

Pin	Assignment
1	+5 Vdc
2	Key
3	Ground
4	Keyboard inhibit
5	Ground

P6-P7 - Power Supply Connector

Pin	Assignment
1	POWERGOOD
2	+5 Vdc
3	+12 Vdc
4	-12 Vdc
5	Ground
6	Ground

Pin	Assignment
1	Ground
2	Ground
3	-5 Vdc
4	+5 Vdc
5	+5 Vdc
6	+5 Vdc

P 8 - External Battery Connector

Pin	Assignment
1	+ Vdc
2	not used
3	Ground
4	Ground

KB 1 - Keyboard Connector

Pin	Assignment
1	Keyboard clock
2	Keyboard data
3	Spare
4	Ground
5	+5 Vdc

Chapter 4
Technical Information

This section provides technical information about Panther-II and is intended for advanced users interested in the basic design and operation of Panther-II.

MEMORY MAPPING

Address	Range	Function
000000-7FFFFF	000K-512K	System Board Memory (512K)
080000-09FFFF	512K-640K	System Board Memory (128K)
0A0000-0BFFFF	640K-768K	Display Buffer (128K)
0C0000-0DFFFF	768K-896K	Adaptor ROM / Shadow RAM (128K)
0E0000-0EFFFF	896K-960K	System ROM / Shadow RAM (64K)
0F0000-0FFFFF	960K-1024K	System BIOS ROM / Shadow RAM (64K)
100000-7FFFFF	1024K-8192K	System Memory
800000-FFFFFF	8192K-16318K	System Memory

I/O ADDRESS MAP

I/O Address Map on System Board

I/O address hex 000 to 0FF are reserved for the system board I/O.

ADDRESS (HEX)	DEVICE
000-01F	DMA Controller 1, 8237
020-03F	Interrupt Controller 1, 8259, Master
040-05F	Timer, 8254
060-06F	Keyboard Controller
070-07F	Real Time Clock, NMI (non-maskable interrupt) mask
080-09F	DMA Page Register, 74LS612
0A0-0BF	Interrupt Controller 2, 8259
0C0-0DF	DMA Controller 2, 8237
0F0	Clear Math Coprocessor Busy
0F1	Reset Math Coprocessor
0F8-0FF	Math Coprocessor Port

I/O address hex 100 to 3FF are available on the I/O channel.

ADDRESS (HEX)	DEVICE
1F0-1F8	Fixed Disk
200-207	Game I/O
278-27F	Parallel Printer Port 2
2F8-2FF	Serial Port 2
300-31F	Prototype Card
360-36F	Reserved
378-37F	Parallel Printer Port 1
380-38F	SDLC, bisynchronous 2
3A0-3AF	Bisynchronous 1
3B0-3BF	Monochrome Display and Printer Adapter
3C0-3CF	Reserved
3D0-3DF	Color Graphics Monitor Adapter
3F0-3F7	Diskette Controller
3F8-3FF	Serial Port 1

SYSTEM TIMERS

Panther-II has three build-in programmable timer/counters defined as channels 0 through 2 :

Channel 0	System Timer
Gate 0	Tied on
Clk in 0	1.190 Mhz OSC
Clk out 0	8259 IRQ 0

Channel 1	Refresh Request Generator
Gate 1	Tied on
Clk in 1	1.190 Mhz OSC
Clk out 1	Request Refresh Cycle

Channel 2	Tone Generation of Speaker
Gate 2	Controlled by bit 0 of port hex 61 PPI bit
Clk in 2	1.190 Mhz OSC
Clk out 2	Used to drive the speaker

Note : Channel 1 is programmed to generate a 15-micro-second period signal.

The 8254 Timer/Counters are treated by system programs as an arrangement of four programmable external I/O ports. Three are treated as counters and the fourth is a control register for mode programming.

SYSTEM INTERRUPTS

Sixteen levels of system interrupts are provided on Panther-II. The following shows the interrupt-level assignments in decreasing priority.

Level	Function
Microprocessor NMI	Parity or I/O Channel Check
Interrupt Controllers	
CTLR 1 CTLR 2	
IRQ0	Timer Output 0
IRQ1	Keyboard (Output Buffer Full)
IRQ2	Interrupt from CTLR 2
IRQ8	Real-time Clock Interrupt
IRQ9	Software Redirected to INT 0AH (IRQ2)
IRQ10	Reserved
IRQ11	Reserved
IRQ12	Reserved
IRQ13	Coprocessor
IRQ14	Fixed Disk Controller
IRQ15	Reserved
IRQ3	Serial Port 2
IRQ4	Serial Port 1
IRQ5	Parallel Port 2
IRQ6	Diskette Controller
IRQ7	Parallel Port 1

DIRECT MEMORY ACCESS (DMA)

Panther-II supports seven DMA channels.

Channel	Function
0	Spare (8 bit transfer)
1	SDLC (8 bit transfer)
2	Floppy Disk (8 bit transfer)
3	Spare (8 bit transfer)
4	Cascade for DMA Controller 1
5	Spare (16 bit transfer)
6	Spare (16 bit transfer)
7	Spare (16 bit transfer)

The following shows the addresses for the page register.

Page Register	I/O Address (HEX)
DMA Channel 0	0087
DMA Channel 1	0083
DMA Channel 2	0081
DMA Channel 3	0082
DMA Channel 5	008B
DMA Channel 6	0089
DMA Channel 7	008A
Refresh	008F

REAL TIME CLOCK AND CMOS RAM

Real time clock is build-in for maintaining the time and date. This subsystem also contains 114 bytes of RAM in addition to the Clock/Calender. The Clock/Calendar information and RAM are kept active by connecting the device to an external battery when system power is turned off. Upon you turn the system power on, CMOS will load the recorded configuration into the system so that the system can function in the right track with the equipped devices. However, if you have not configured the CMOS, or the battery which supports the power to the CMOS is weaken, you need to redefine the necessary parameters whenever the system is boot up. The following page shows the CMOS RAM addresses.

CMOS RAM ADDRESS MAP

Addresses	Description
00-0D	* Real-time clock information
0E	* Diagnostic status byte
0F	* Shutdown status byte
10	Diskette drive type byte - drives A and B
11	Reserved
12	Fixed disk type byte - drives C and D
13	Reserved
14	Equipment byte
15	Low base memory byte
16	High base memory byte
17	Low expansion memory byte
18	High expansion memory byte
19-2D	Reserved
2E-2F	2-byte CMOS checksum
30	* Low expansion memory byte
31	* High expansion memory byte
32	* Date century byte
33	* Information flags (set during power on)
34-7F	User RAM (Standby)

* These bytes are not included in the checksum calculation and are not part of the configuration record.

REAL TIME CLOCK INFORMATION

The following table describes real-time clock bytes and specifies their addresses.

Byte	Function	Address
0	Seconds	00
1	Second alarm	01
2	Minutes	02
3	Minute alarm	03
4	Hours	04
5	Hour alarm	05
6	Day of week	06
7	Date of month	07
8	Month	08
9	Year	09
10	Status Register A	0A
11	Status Register B	0B
12	Status Register C	0C
13	Status Register D	0D

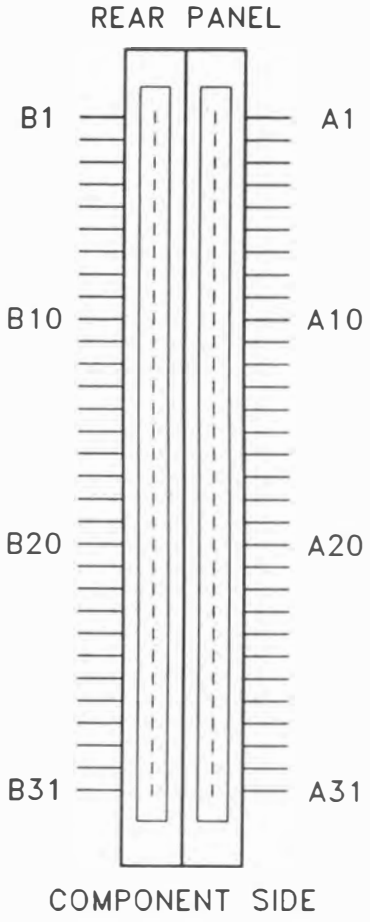
SYSTEM EXPANSION BUS

Panther-II provides six expansion slots, four of which are 16-bit and two are 8-bit expansion slot.

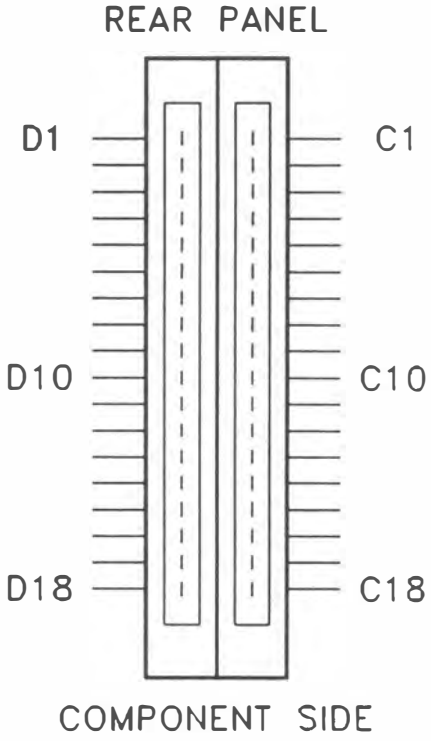
The I/O channel supports:

* I/O address space from hex 100 to hex 3FF
* Selection of data access (either 8 or 16 bit)
* 24 bit memory addresses (16MB)
* Interrupts
* DMA channels
* Memory refresh signal

The following figure shows the pin numbering for I/O channel connectors JA1 to JA6.



The following figure shows the pin numbering for I/O channel connectors JB1-JB4.



The following tables summarize pin assignments for the I/O channel connectors.

I/O Channel (A-Side)

I/O Pin	Signal Name	I/O
A1	-I/O CH CK	I
A2	SD7	I/O
A3	SD6	I/O
A4	SD5	I/O
A5	SD4	I/O
A6	SD3	I/O
A7	SD2	I/O
A8	SD1	I/O
A9	SD0	I/O
A10	-I/O CH RDY	I
A11	AEN	O
A12	SA19	I/O
A13	SA18	I/O
A14	SA17	I/O
A15	SA16	I/O
A16	SA15	I/O
A17	SA14	I/O
A18	SA13	I/O
A19	SA12	I/O
A20	SA11	I/O
A21	SA10	I/O
A22	SA9	I/O
A23	SA8	I/O
A24	SA7	I/O
A25	SA6	I/O
A26	SA5	I/O
A27	SA4	I/O
A28	SA3	I/O
A29	SA2	I/O
A30	SA1	I/O
A31	SA0	I/O

I/O Channel (B-Side)

I/O Pin	Signal Name	I/O
B1	GND	Ground
B2	RESET DRV	I
B3	+5 Vdc	Power
B4	IRQ9	I
B5	-5 Vdc	Power
B6	DRQ2	I
B7	-12 Vdc	Power
B8	0WS	I
B9	+12 Vdc	Power
B10	GND	Ground
B11	-SMEMW	O
B12	-SMEMR	O
B13	-IOW	I/O
B14	-IOR	I/O
B15	-DACK3	I
B16	DRQ3	O
B17	-DACK1	I
B18	DRQ1	O
B19	-Refresh	I/O
B20	CLK	O
B21	IRQ7	I
B22	IRQ6	I
B23	IRQ5	I
B24	IRQ4	I
B25	IRQ3	I
B26	-DACK2	O
B27	T/C	O
B28	BALE	O
B29	+5 Vdc	Power
B30	OSC	O
B31	GND	Ground

I/O Channel (C-Side)

I/O Pin	Signal Name	I/O
C1	SBHE	I/O
C2	LA23	I/O
C3	LA22	I/O
C4	LA21	I/O
C5	LA20	I/O
C6	LA19	I/O
C7	LA18	I/O
C8	LA17	I/O
C9	-MEMR	I/O
C10	-MEMW	I/O
C11	SD8	I/O
C12	SD9	I/O
C13	SD10	I/O
C14	SD11	I/O
C15	SD12	I/O
C16	SD13	I/O
C17	SD14	I/O
C18	SD15	I/O

I/O Channel (D-Side)

I/O Pin	Signal Name	I/O
D1	-MEM CS16	I
D2	-I/O CS16	I
D3	IRQ10	I
D4	IRQ11	I
D5	IRQ12	I
D6	IRQ15	I
D7	IRQ14	I
D8	-DACK0	O
D9	DRQ0	I
D10	-DACK5	O
D11	DRQ5	I
D12	-DACK6	O
D13	DRQ6	I
D14	-DACK7	O
D15	DRQ7	I
D16	+5 Vdc	Power
D17	-MASTER	I
D18	GND	Ground

Appendix A
System BIOS

All microcomputer systems use a Basic Input Output System. This is software that has been permanently recorded in a ROM (Read Only Memory) chip and functions as the basic point of communication between the system board and the rest of the computer.

The BIOS provides an operational interface to the system and relieve the programmer from worrying about the characteristics of hardware devices. Thus, hardware modifications and enhancements become transparent to user's programs, access to BIOS is through the program interrupts of the microprocessor. Each BIOS entry point is available through its own interrupt.

Upon you turn on the power of your system, it will go through a self-test routine which checks all of its internal devices. Complete testings will be carried out on the CPU, base 640K RAM, extended RAM, ROM, system board, CMOS memory, video controllers, parallel and serial subsystems, floppy and fixed disk subsystems and the keyboard.

When the self-test is completed, the system will search for the DOS (disk operating system) system file in drive A. If no system diskette is put in drive A, it will check the fixed disk (if installed).

SETUP UTILITY DESCRIPTION

A Setup Utility is incorporated into the BIOS which allows the user to view the system configuration, and to select a variety of powerup/runtime options.

Entrance to Setup can occur in three ways:

(1) A configuration change detected during POST forces entrance, or
(2) ESC is pressed during cold-boot, or
(3) CTRL+ALT+ESC is pressed to warm-boot into Setup.

With the exception of a few special features (eg, low level format), the Setup Utility is nothing more than an interactive, menu-driven editor for the system CMOS. After an initial CMOS configuration session in Setup, the system will be able to powerup and warm boot without any further assistance from Setup. The typical end user will rarely (if ever) access Setup again, unless hardware is changed or CMOS is corrupted by a runaway program.

The Setup utility gives the appearance of being a single application program, but is actually comprised of a group of separate, dedicated utilities ("screens"). A different utility exists for each of the subsystems which require configuration. Each such utility is designed to look and operate in a fashion consistent with the

rest, yielding an integrated result which is coherent and easily understood. Access to the individual utilities is accomplished through Menu selection. It is this Menu which bonds the otherwise disjoint configuration screens into a single utility.

The Setup screen is broadcast simultaneously to both CRTs regardless of CMOS settings, so it will never happen that the user will bc without video when (re) configuration is necessary. The screen format consists of these four fields:

(1) Copyright/OEM Banner

on the top two lines. The BIOS version number and OEM Porting description also appear in this field.

Directly below the Copyright/OEM banner, a three-segment graphic window is displayed which consumes thc remaining 23 lines of the screen. A Menu resides on the top line, a dynamic keystroke Prompt is found on the bottom line, and the remaining region is referred to as the Edit Page:

(2) Menu Line

A list of utility names appears on this line, from which a specific selection may bc madc. (Eg, Video, Floppy, etc.) A reverse-video cursor is present which can bc moved leftward

or rightward to highlight a desired entry. As the cursor is moved from entry to entry, the Edit-Page (see #3 below) is simultaneously updated to show the corresponding configuration utility. When ENTER is pressed, that utility will be invoked within the Edit-Page window. The cursor leaves the Menu-Line, and reappears upon the first editable field within the utility. Because there are more utility names than can be fit onto the Menu Line, only a subset of the entire menu is displayed. The rightmost entry displays "More-->", and an attempt to move the cursor onto it causes a new portion of the menu to be revealed. This new section begins with "<--More", allowing leftward cursor movement back to the original menu.

(3) Edit Page

This "window" displays the utility whose title is illuminated on the Menu Line (#2 above). As already explained, the utility becomes activated by pressing ENTER (or PgDn), and the cursor appears on an editable field within this Edit-Page. To further distinguish that this utility is active, the Menu-Line is erased with only this utility's title remaining. Until exited (back to the Menu), all fields within this Edit-Page are accessible for editing. Deactivation of the utility occurs when PgUp is pressed. The Menu-Line is redisplayed and the cursor leaves the Edit-Page, reappearing on the Menu-Line.

While the utility is activated, all keystrokes required to accomplish thc edit are indicated on the PROMPT-LINE, discussed next.

(4) Prompt Line

The Setup-Utility is designed to be usable without the aid of this manual. To this end, alist of acceptable key-strokes and effects is provided on this line, and that list is updated on a keystroke by eystroke basis. Even an unfamiliar user should be able to maneuver around and successfully configure the system, upon realization that this PROMPT LINE line updates dynamically per keystroke.

Depending on BIOS version, a menu similar to next page will be shown upon the SETUP is invoked.

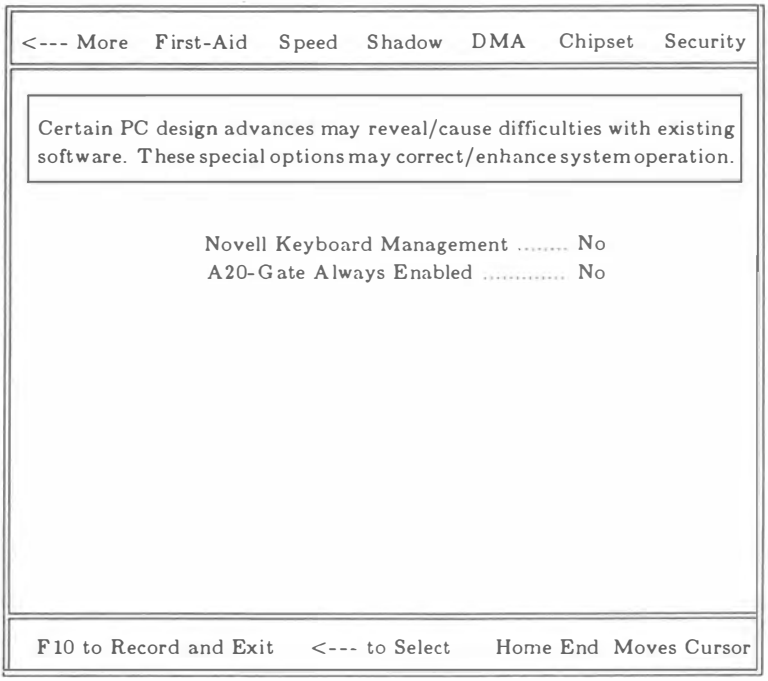
MR BIOS (tm) Copyright (c) 1991, Microid Research Ver 1.0F Port OPTI317

Summary	Clock	Video	Floppy	Fixed	Boot-Seq	Keyboard	More-->

CPU Type 386SX-08	Floppy 0 (A:) 1.2M 3mS
CPU MHz 20.0	Floppy 1 (B:) 360K 4mS
Boot Speed ..... High	Fixed 80 (C:) ..... Type 17
Coprocessor 387SX	Fixed 81 (D:) ..... Type 17
RAM Cache ..... n/a	Boot Sequence ..... C: 1st
Shadow RAM ..... Enable	Cold-Boot Delay ..... 0 Sec
Memory-Base 640K	
Memory-Extended 1280K	Keyboard ..... AT
Memory-System 128K	NumLock ..... On
Memory-Total 2048K	Typematic 30.0
COM1 ..... 3F8 | LPT1 378	Video-Primary ..... V/EGA-Color
COM2 ..... n/a | LPT2 ..... n/a	Video-Secondary ..... n/a
COM3 ..... n/a | LPT3 ..... n/a	
COM4 ..... n/a | LPT4 ..... n/a	Security ..... Disable

F10 to Record and Exit	Home End Moves Cursor

MR BIOS (tm) Copyright (c) 1991, Microid Research Ver 1.0F Port OPTI317



Prompt-Line Text

The purpose of this section is to further explain the meanings of the keystroke prompts. They are somewhat abbreviated due to screen space limitations:

F10 TO RECORD AND EXIT

Press F10 to record the new configuration to CMOS, and terminate the Setup session. The system will proceed to boot-up.

HOME END (LEFT/RIGHT ARROWS) MOVES CURSOR

The Menu-cursor can be moved respectively to the first entry, last entry, or next leftward/rightward entry.

(ENTER) TO SELECT

The Menu-cursor currently illuminates an entry, such as CLOCK, VIDEO, FLOPPY, etc., and the Edit-Window currently shows the configuration related to that Menu entry. Press ENTER to commence editing that Edit Page. The cursor will move from the Menu-Line into the Edit-Page, upon the first editable field. Note:PgDn key can be used instead of ENTER in this context.

ESC FOR MENU

The cursor is currently in the Edit-Window. ESC (or PgUp) returns it to the Menu-Line. Note:the newly edited configuration is not yet recorded to CMOS. See F10 key description above.

(UP/DOWN/LEFT/RIGHT ARROWS) MOVES CURSOR

The cursor is currenly illuminating a field within an Edit-Page. It may be moved to another field via these cursor keys.

(ENTER) TO EDIT

The cursor is currently illuminating a field within and Edit-Page. This particular field can be edited keying-in numbers or letters. To invoke the editor, press ENTER. The field remains illuminated, and a small blinking underline (hardware cursor) will appear under the leftmost editable character in that field. In general, Left-Arrow, Right-Arrow, Space, Backspace, and AlphaNumerics are accepted in edit mode. ESC will restore the field to its pre-edit state and the blinking underline will disappear. ENTER will finalize the edit and the blinking underline will disappear. All "edit-mode" keystrokes are prompted.

+-SCROLLS CHOICES
SPACEBAR +- TO CHANGE
SPACEBAR +- SCROLLS CHOICES

The cursor is currently illuminating a field within the Edit-Page which may be changed. SpaceBar and "+" make visible (select) other available options. The options are rolled through a list in the forward direction. BackSpace and "-" roll the options in reverse order.

Esoteric Prompts

A few special-case prompts also exist. Generally, they specifty a range of numbers or a particular set of AlphaNumeric characters that will be accepted in the field. For example, the CLOCK Time-Of-Day subfield accepts Alphabetic "a" and "p" to indicate am and pm.

The SECURITY utility requires pressing ENTER after selecting a new configuration. This additional step is not consistent with behavior of the other utilities, but is necessary so that a new password can be prompted when appropriate, and so the current password is not dismissed should the user simply scroll through available options.

Duc to thc scvcrity of consequences, the LOW-LEVEL-FORMAT field column within the FIXED disk configuration utility cannot be accessed until CTRL-F is pressed. Pressing ESC while the cursor is in that column will move it safely to a non-Format column on the screen. While the format is in progress, ESC will immediately terminate (abort) the process.

EDIT-PAGE / UTILITIES

There are currently 12 utilities contained in Setup, each accessible in a separate, dedicated Edit Page. As the cursor is moved horizontally across the Menu Line, new Edit Pages appear in the Edit Window which correspond to that menu entry. A quick summary of the utilities is given here, and full descriptions are given in the remainder of this section.

Utility	Description
Summary	The entire hardware/feature config is summarized
Clock	Time, Date, and daylight Savings config utility
Video	Video configuration Utility
Floppy	Floppy Disk subsystem configuration utility
Fixed	Fixed Disk subsystem config and format utility
Boot-Seq	Boot sequence configuration utility
Keyboard	Powerup NumLock and Typematic configuration utility
Speed	CPU speed configuration utility
Shadow	Shadow RAM config and adaptor ROM display utility
DMA	DMA timing parameters
Chipset	Memory Wait States and Bus Speed Selection
Security	Password Security configuration utility

(1) SUMMARY UTILITY PAGE

This Page serves as both a summary utility and as the signon screen of the Setup-Utility. Most every characteristic of the Computer can be viewed here, but editing the fields is not permitted from this Page. (Should a configuration change be desired, select the desired utility by moving the Menu cursor). Each of the fields are discussed below, and an example given of how they might appear:

CPU

The type and "stepping" (revision) number of the CPU is shown.

CPU 80386SX-08	indicates a '386SX, rev 08 processor chip

MHz

The oscillator frequency driving the CPU (max speed if multi-speed).

Mhz 20.0	indicates 20 MegaHertz speed

NPX

Numeric-Coprocessor-Extension type found in the system.

NPX	Description
n/a	if none found
80387SX	if '387SX

CPU SPEED

The programmable boot-time CPU speed is indicated by this field.

CPU Speed	Description
Low	if slow speed
High	if fast speed

SHADOW RAM

Indicates if any part of the (384K) ROM space is mapped to shadow RAM.

For example, Shadow RAM ..... n/a
Shadow RAM ..... Enable
Shadow RAM ..... Disable

MEMORY-BASE

Indicates the amount of base memory (below 1 Megabyte boundary) confirmed to be in working order. Possible range is 64K to 640K.

MEMORY-EXTENDED

Indicates the amount of extended memory (above 1 Megabyte boundary) found to be in working order. Possible range is OK to 15360K.

For example, Memory-Extended 1024K

MEMORY-SYSTEM

Indicates the amount of special OEM memory found to be in working order. Typically, this field will be unimplemented (OK), or will represent the 384K available for shadow RAM or relocation to the Extended Memory pool.

For example, Memory-System 384K

MEMORY-TOTAL

This is simply a sum of the three preceding quantities.

For example, Memory-Total 2048K

COM1

Indicates if RS232 serial port COM1 is present, and its I/O address.

For example, COM1 ..... n/a
COM1 ..... 3F8
COM1 ..... 2F8

COM2

See COM1 description above.

LPT1

Indicates if parallel (printer) port LPT1 is presest, and its I/O address.

For example, LPT1 ..... n/a
LPT1 ..... 3BC
LPT1 378
LPT1 278

LPT2

LPT3

See LPT1 description above.

FLOPPY 0 (A:)

Indicates floppy drive A: type and step rate. The "type" can be 360K, 1.2M, 720K, or 1.4M. The "step rate" is given as an amount of time (in milliseconds) required for the read/write head to be moved to an adjacent cylinder. There are two step-rate settings possible for each drive type, a slow and a fast rate. (The lower number is the faster rate, and provides improved performance).

Floppy 0 (A:)	Description
N/A	No controller card found
None	Card present but no drive
1.4M 3mS	3.5 inch hi-cap, fast step

FLOPPY 1 (B:)

See description of drive A: field, above.

FIXED 80 (C:)

Indicates fixed disk C: type, step rate encoding if nonstandard, and if "Translation Mode" is in effect. The drive "type" may be any value from 1 to 47, and is dependent on the fixed disk present in the system. If this drive has more than 1024 cylinders, a special feature "Translation Mode" may be selected (via FIXED menu entry) to make use of the cylinders in excess of 1023. If selected, then "T" will be appended to the drive type number as a reminder. Another special feature allows the selection of non-standard step rates to gain higher performance. Selection of a non-zero steprate encoding is non-standard, and as a reminder, is shown between braces.

Fixed 80 (C:)	Description
N/A	Fixed controller card not present
None	Drive type "0", no drive present
2	Drive type "2", no special features
47T	Drive type "47T", Translation Mode
8 {F}	Drive type "8", special Steprate
46T {E}	Drive type "46", Translate+Steprate

FIXED 81 (D:)

See description of drive C: field, above.

BOOT SEQUENCE

Specifies the selected order in which the disk(s) will be booted.

Boot-Sequence	Description
A: 1st	Try A:first, if failure, try C:
C: 1st	Try C:first, if failure, try A:
Prompt	Screen prompt for drive A: - D:

KEYBOARD

The keyboard type/protocol is shown in this field.

Eg, Keyboard ... AT PC/AT type keyboard
Keyboard ..... XT PC/XT type keyboard

NUMLOCK

The programmable powerup NumLock state is shown in this field.

Note: This is only meaningful for AT-type keyboards.

For example, NumLock ..... Off
NumLock ..... On

TYPEMATIC

The programmable powerup "typematic" repeat rate is shown here. Many values are possible, up to 30.0 characters per second.

Note: This is only meaningful for AT-type keyboards.

Typematic	Description
Default	No rate programmed, speed approx 10 cps
30.0	30 cps rate is programmed

VIDEO-PRIMARY

Indicates the video adaptor which will be in use when the system boots (DOS).

Video-Primary	Description
None	Speical Support, see VIDEO menu
Monochrome	B/W card
CGA - Snow	CGA, slow access due to "snow"
CGA - Fast	CGA, "snow" isn't problem
V/EGA-Mono	Advanced Graphics, B/W monitor
V/EGA-Color	Advanced Graphics, Color monitor

VIDEO-SECONDARY

Indicates if a second video card is present in the system. (Typically, two CRT systems are used in CAD applictions). If present, this monitor will only be supported by special software aware of its presence. In particular, it will not be seen by DOS. Most systems will NOT have dual monitor configurations, and this will be displayed:

Video-Secondary ..... n/a

Otherwise, refer to VIDEO-PRIMARY above.

SECURITY

The state of password-Security is shown in this field.

For example, Security ..... Enable
Security ..... Disable

(2) CLOCK CONFIGURATION UTILITY

The battery backed Real-Time-Clock (RTC) time, date, and daylight savings feature are programmed through this utility.

NOTE: Changing the setting of any one field at 11:59:59 pm may permit unexpected roll-over of another field, and especially unintended results may occur during daylight-savings transistion periods (*).

TIME

The time field is shown in USA 12 hour format, followed by a time-of-day indicator "a" or "p" (am/pm). When chaging the time setting, all values are checked. if necessary, Setup will enforce (impose) legal limits.

Time hh/mm/ss t	Military
12:00:00 a	00:00:00
09:10:11 p	21:10:11

DATE

The date field is shown in USA mm/dd/yyyy format. When editing the date setting, all values are checked (include leap years). If necessary, Setup will enforce (impose) legal limits.

Date (mm/dd/yyyy)	
01/23/1990	January 23, 1990

DAYLIGHT SAVINGS

The RTC has a built-in capability to automatically adjust the time on the two daylight savings days of the year (*). If this is desired, set the field to "Enable". Otherwise, set the field to "Disable". Note that in general, nothing will be immediately observable by setting the field to either state.

For example, Daylight Savings ..... Enable
Daylight Savings ..... Disable

(*) On the last Sunday in April, the time increments from 1:59:59 am to 3:00:00 am. On the last Sunday in October, when the time first reaches 1:59:59 am, it is rolled-bak to 1:00:00 am.

(3) VIDEO CONFIGURATION UTILITY

The primary video adaptor is declared through this utility.

A "primary" adaptor is defined to be the video card which will be recognized by an operation system (such as DOS) when it receives control of the system after a powerup or warm-boot. If there are two video cards present, the "other" one becomes (by default) the "secondary" video adaptor. The secondary adaptor is placed into a standby state, waiting to be activated by specialized software which knows of its existence. Ordinarily, there will be one and only one video card in the system, and it is (trivially) assigned "primary".

No jumper setting is required, all that need be done is to select an adaptor from those available in this utility, and the only choices made available will be consistent with the equipment found in the computer. In systems with only a single video card (the usual case), the choices are limited to that present card, or "none".

As suggested, a video-less system may be configured. This is useful in certain specialized monitoring/control applications. These steps should be taken to configure a video-less system: First, while some video card is present in the system, enter the Setup utility and select the VIDEO configuration utility (here). Select the "none" option, and exit this

screen (press PgUp). Then press F10, which records the new configuration and boots the computer. Turn the system off, and remove the video card. The computer is now ready to be run without video.

When two video cards are present in the system, one must be color, and the other B/W. MR BIOS ™ will identify these cards, and make both choices available for primary selection. If one of the cards is V/EGA, its operation in the capacity of monochrome or color will automatically be detected and reported. Although V/EGA cards generally require setting dipswitches, MR BIOS ™ will override those settings according to the primary adaptor selected via this utility. Note well that "some" valid dipswithc state must still be set on the V/EGA card so that it may correctly initialize itself.

If a CGA card is present in the system, a second field will appear on the screen. Its purpose is to allow selection of video access speed. Some CGA cards will produce screen "snow" (also called "hash") when accessed too quickly in 80-column AlphaNumeric mode (the usual mode). Such cards require synchronization with video retrace/sync signals to prevent this undesirable effect. Most CGA cards do not require this synchronization, and dramatic speed improvement (and a lack of scroll "flicker") is realized through unrestrained access. Try selecting the fast mode - either the "snow" problem won't exist, or it will be intolerably obvious.

(4) FLOPPY DISK CONFIGURATION UTILITY

This utility configures the floppy drive subsystem, drives A: and B:.

The BIOS must be informed of the types of floppy drives in the system, their step rates, and in the case of 720K drives, whether or not a "media-change-line" is present.

If the drive controlle card is absent, no choices will be available, and there is nothing to do here. that is rarely the case, but is supported configuration. usually, a controller card is present along with at least one diskette drive. In this more usual case, one of four drive types can be specified for each, drive A: and drive B:. The choices include two 5.25 inch drive types: 360K and 1.2M drives, and two 3.5 inch drives types: 720K and 1.4M drives. If a drive is not connected to either the A: or B: card connector, then "none" should be selected for that drive. Otherwise, an error message will be generated each time the computer is booted.

A "media-change-line" field is also displayed with each drive type, but is only programmable in the 720K case. This "media-change-line" is an electrical signal produced by a mechanical switch in the disk drive. It is activated when a disk is inserted. (You can feel the spring-loaded switch actuate when inserting a disk in a 1.2M drive). Operating systems like DOS check this signal each time the

disk is accessed, saving the time required to re-read the disk directory into memory if the swithc is not tripped. There were difficulties during the transition period from PC-XTs to PC-ATs regarding this, because the swithc was NOT present on the XT-720K drive, but WAS present on the AT-720K drive. This BIOS supports either kind of 720K drive, by allowing (requiring) the change-line to be specified.

Follow these steps to determine which type of 720K drive you have: Configure the system for Change-Line present (ie, select "Yes"), and exit the Setup Utility. Insert a (non-blank) disk into the drive, and type DIR to see that directory. Remove the disk, and insert a different one known to have a different directory. Type DIR again, and examine the new directory. If this drive lacks the Change-Line, then the latter directory display will (incorrectly) be identical to the original disk's. In such a case, invoke the Setup-Utility again and correct the Change-Line field to "No". NOTE: If a 720K drive is improperly configured to indicate "No" Change-Line when it is in fact present, the drive will operate correctly, but with diminished performance.

(5) FIXED DISK CONFIGURATION / LOW LEVEL FORMAT UTILITY

This utility configures the fixed disk subsystem, dirves C: and D:

DRIVE TYPES

If one or two fixed disks are present in the system (and connected to a controller card), then the drive(s) must be configured via this utility. The main purpose is to assign a drive "type" to the drive(s). The "type" in turn is used to select a table of parameters which completely describe the drive characteristics. The drive parameter tables are comprised of these entries:

(1) Number of Cylinders
(2) Number of Heads
(3) Starting Precompensation Cylinder
(4) Landing Zone Cylinder (Park)
(5) Number of Sectors per Track

Up to 47 drive tables/types can be defined within the BIOS in a compatible fashion, and the first 23 drive types (1-23) are standardized throughout the industry. The remaining 24 drive types/tables are BIOS implementation dependent, of course chosen in an attempt to service the widest variety of drive types.

However, there are many hundreds of drives being marketed, and it is thus impossible to explicitly support all of them.

PROGRAMMABLE TYPES 46 & 47

This BIOS provides tables for types 1-45, reserving types 46 and 47 as "user programmable" drive types. The parameters for each drive type can be viewed by scrolling they "Type" field through the entire sequence 1-47. (See the bottom "Prompt" line on the screen. Pressing + or - while the cursor is on the "Type" field will cause the fields to scroll). If it happens that your particular drive parameter table is not among the 45 explicitly defined in this BIOS, then the option exists to program them "by hand" into either drive table 46 or 47.

To create a "user programmed" drive parameter table, first move the cursor to the "Type" field and select 46 or 47. Then move the cursor down to the next field, "Cylinders", and press ENTER. Key in the number of cylinders, and press ENTER when done. Continue in this fashion, editing the "Heads", "Precomp", "Landing", and "Sector" fields. It's as simple as that.

TRANSLATION MODE

Larger capacity drives with higher track density are becoming increasingly available, but the standard BIOS interface limits support to 1024 tracks. The standard BIOS interface cannot take advantage of these new technologies. It is possible through translation schemes, however, to support drives with capacity in excess of a GigaByte.

MR BIOS ™ provides such a Translation Mode to surpass this 1024 (1K) cylinder limitation. up to 16384 (16K) cylinders can be addressed via the Translation Mode... but MOST STATE OF THE ART DRIVE CONTROLLER CARDS SUPPORT ONLY 4K CYLINDERS to date. Many older cards only support 2K cylinders. The Translation Mode implementation is designed to be compatible both with programs which exclusively use the BIOS interface, and programs which interpret the drive tables and run the drives directly. If Translate Mode is not selected (ie, the field is set to "No"), then ony the first 1024 cylinders will be accessible through the BIOS interface.

LOW LEVEL FORMAT

The large drive support is complemented by a built-in Low-level-Format utility. Be very careful when using this utility. As with all fromat programs, the data currently on the

drive will be forever lost. Most typical uses of the format utility will involve formatting the entire disk, but it is not required here. A range of cylinders may be specified as the target of the operation, and the sequence may be increasing or decreasing order. Also, the "interleave" (also called "skew factor") is selectable. In general, select an interleave of "3" (default) unless your drive card has 8K or more RAM on board, or specifically claims to be a "1:1" card. In that case, select an interleave of "1".

Note: Be wary of products which calculate the "best" interleave factor for a drive/card combination. Multi-sector reads can often be (optimally) accomplished with a tight interleave, but programs employing sequential single-sector reads (including DOS 3.3 and earlier) will suffer greatly from such an "optimization".

(6) BOOT SEQUENCE CONFIGURATION UTILITY

The order in which the disks are searched for a "boot sector" is configurable via this utility.

In a typical BIOS implementation, whenever CTRL ALT DEL is pressed, an attempt to boot drive A: always occurs first, and if the drive is found to be empty, then drive C: is booted. If an unbootable disk is present in drive A:, the system pauses and a message is displayed to that effect.

In most installations, drive A: is used simply to transfer files, and C: is the general purpose storage and boot device. If a disk is present in drive A: when the computer is booted, it is usually there by mistake.

For convenience, MR BIOS ™ supports a programmable boot order. In addition to the usual "A: first, then C:" sequence, the order may be reversed so that drive C: is accessed first. This promotes a swifter boot process, and eliminates the annoyance of having to remove a floppy from drive A: prior to booting.

A special "hot-key" warm-boot sequence CTRL ALT ENTER is available to override the default sequence established here in this utility. The effect is identical to CTRL ALT DEL, except a prompt appears on the screen asking

which drive should be booted. In most circumstances, we suggest setting the default boot sequence to "C: 1st", and when the rare occasion arises requiring a floppy boot, use CTRL ALT ENTER to override to drive A:. Note that drives B: and D: may also be specified at the prompt, but this is incompatible with current DOS revisions.

During cold-boot (powerup or pushbutton reset), the Screen-Prompted boot can be invoked by pressing ENTER during the memory test.

The default boot sequence may also be set to Screen-Prompt, in which case booting always requires explicit selection of the boot drive.

(7) KEYBOARD CONFIGURATION UTILITY

This utility is used to configure the boot-time NumLock state and the keyboard Typematic rate.

NUMLOCK

Many users have become accustomed to the 84-key AT-style keyboard, which lacks a dedicated cursor-control keypad. The NumLock control key is used on these keyboards to toggle the Numeric Keypad from numeric operation to cursor functions. The standard powerup default state of NumLock is "off", so the Numeric Keypad is in the cursor mode of operation after booting.

The newer generation 101/2 key keyboards have a dedicated Cursor Keypad (in addition to the Numeric Keypad). Although the NumLock key is present on this keyboard, it is only there for downward compatibility with the earlier 84 key keyboards. The standard powerup default state of NumLock is "on", so the Numeric Keypad is in the intuitively correct numeric mode.

Through this utility, the boot-time default state of NumLock can be set to individual preference. Select "Disable" or "Enable" accordingly.

TYPEMATIC RATE

When a key is held pressed on the keyboard for some period of time, that keystroke will begin repeating at a predefined rate. The initial delay is by default 0.5 seconds, and the repeat rate defaults to 10 characters per second. This "typematic" feature is a function of the keyboard, and is not produced by the system BIOS. However, (most) AT-style keyboards permit overriding the initial delay and subsequent repeat rate.

MR BIOS ™ can be configured to issue override typematic parameters to the keyboard at boot-time. Both the Delay and Rate parameters can be selected, per personal preference. To accomplish this, "Enable" the "Typematic Override" field, and select the Delay and Rate in the other fields. We suggest a Delay of 0.5 seconds, and a Repeat Rate of 30.0 cps.

Should it happen that the keyboard fails to function properly when overriding the default typematic state, then "Disable" the "Typematic Override" field. The Delay and Rate fields will display "Default" in response to this selection. When configured this way, no typematic parameters will be issued to the keyboard at boot-time.

(8) SPEED CONFIGURATION UTILITY

This utility allows the boot-time speed of the system to be selected, either high-speed or low-speed.

It is very unusual to configure the system to boot the computer into the slow-speed state, since the only effect is degraded performance. Two instances where it may be necessary are: An add-on card or other hardware device malfunctions when running at full speed, or, a software program that is always used fails at full speed. In general, set the default system speed to "High".

A convenient method is available to change system speed "on the fly", without affecting the boot-time default speed. The hot-key sequences CTRL ALT + and CTRL ALT - set the speed to high and low, respectively.

(9) SHADOW RAM CONFIGURATION UTILITY

This utility performs two functions. Its main purpose is to allow the boot-time state of the shadow RAM to be configured. It also provides a means to view the ROMs found in the 640K - 1Meg region, which is useful for users of EMS drivers and Virtual-86 programs.

Explanation of the term "shadwo RAM": The system BIOS, V/EGA ROM, and a variety of other programming is stored in one-time programmable devices called ROMs (Read-Only-Memory). Two important properties of ROMs which lend them to this use are:

(1) The data is protected, it cannot be changed by mistake, and
(2) the data is retained when the power is shut off

A notable deficiency in ROM technology is its speed - ROM access time is typically two to three times slower than normal memory (RAM) access. to further exaggerate this difference, ROM data is generally accessible only in 8-bit quantities, whereas general purpose memory can be read in 16-bit or 32-bit quantities (286/386 respectively). A simple-minded scheme to improve the access speed is to copy data from slow ROMs to fast RAM, and thereafter using the RAM image instead of the

ROM. When RAM is dedicated to this purpose, it is called "shadow RAM".

In nearly all cases, the shadowed regions should be configured as "Write-Protected". This will prevent the shadowed data from becoming corrupted should a programming error write data into that region. Although very unusual, several board products are known to possess Read/Write memory embedded in the same region as the ROM. Such "ROMs", if shadowed, must be configured "Read/Write" to function correctly.

The entire 384K ROM space is subdivided into ten regions, depicted by the ten fields shown on the screen. The Video and Adaptor ROM region is comprised of eight equal 16K segments, and the System and BIOS ROM region is divided into two 64K segments. This breakdown is generic, and may suggest a finer granularity of shdow capability than is actually available in a particular computer. When this is the case, enabing shadow in one region will automatically cause other regions to become shadowed. The screen will be updated accordingly. A similar situation exists with the "Read/Write" vs "Write-Protect" attribute assignment.

ROMs of varying capacities may be present in the computer, and a single one may (and often does) extend beyond a 16K segment boundary. Also, a single ROM might not be aligned on a 16K boundary, and consequently

resides in two adjacent segments even though it is smaller than 16K. This utility scans the entire 384K ROM space, and assigns a number to each ROM found (beginning with ROM #1). Each of the ten fields on the screen show the ROM #n found in the respective segment. If a single ROM spans two or more (adjacent) 16K segments, each associated field will display the identical ROM #n.

It would be bizarre and most likely troublesome to shadow anything less than an entire ROM. Therefore, this utility automatically extends the shadow state set in a field to all other fields possessing the same ROM #n. For example, if two adjacent fiels show ROM #1 present, and then one of the fields is set to "WP-Shadow", the other field will simultaneously be updated to display the identical state (WP-Shadow).

Note that when all fields are set to non-shadowed, they will either display "Vacant" (no ROM present there), or they will show the "ROM #n" residing at that location.

(10) DMA PARAMETER UTILITY

DMA timings may be adjusted to increase the performance of EtherNet, SCSI and other Bus-Master peripherals. However care should be taken when altering these parameters so that it won't violate the specification, otherwise problem may arise. The default values are recommended for reliable operation.

DMA CLOCK

ATCLK/2 *
ATCLK/1

8-BIT WAITS / 16-BIT WAITS

1 WS *
2 WS
3 WS
4 WS

COMMAND WIDTH

Normal *
Compress

MEMR# SIGNAL / MEMW# SIGNAL

Normal *
Early

* Default

(11) CHIPSET PARAMETER UTILITY

This utility identifies the chipset revision and provides a means to define the system memory wait state and the AT-bus speed. BIOS defaults are conservative settings, these allow the system to boot at the CPU's rated speed. Operational capability may be temporarily reduced until these configuration parameters are set to mirror the true system configuration.

Reg10: Wait States - Write
Reg10: Wait States - Read

I
0 *

A setting of '0' will allow the system to performance zero wait state memory access under the page/interleave scheme.

Reg 14: AT-Bus Speed

16MHz System	20MHz System	25MHz System
5.3 *	6.7 *	8.3 *
8	10	12.5

It is strongly recommended that the AT-Bus speed should be kept at or below 8.3 MHz so as to comply with ISA AT-Bus specification.

* Default

(12) SECURITY CONFIGURATION UTILITY

This utility is used to enable or disable Password Security.

This Security feature offers a measure of protection against unauthorized use of the computer, by requiring a password be entered when the computer is first being powered up. Three opportunities are given to key-in the correct-password (ie, two mistakes are allowed). If three unsuccessful attempts are made to guess the password, the system will be halted and an alarm will be sounded. The alarm will persist until the power is cycled off.

After the correct password is provided, the computer will boot-up and operate in the normal fashion. CTRL ALT DEL will not re-invoke the Security Clearance procedure encountered at powerup.

The Setup-Utility is also password protected when Security is active. When entering the Setup-Utility via CTRL ALT ESC, the SUMMARY page will be displayed as usual, but the user will be prompted to press "F10 to Exit", or "ENTER for Security Clearance". Ie, the user must leave, or enter the correct password. The configurations cannot be modified until the password is correctly typed. As is the case during powerup, three failed attempts to supply the correct password results in an alarm being sounded and the system halting.

When enabling the Security feature (ie, a transition from "Disable" to "Enable"), a second field will apear on the screen prompting entry of a password. A password consisting of zero to ten characters, followed by ENTER, must be typed in. Asterisks are echoed to the screen (instead of the character typed), and the only keystroke available for editing is BackSpace. Thus, the password cannot be viewed. Not even by the person who creates it. Upon completing the password (ie, after ENTER is pressed), a prompt will appear requiring the same password again be entered. This step ensures that no typographical errors exist in the original password. The entire process will reloop if the latter entry does not match the initial password.

All keystrokes normally recognized by BIOS are availbale for use in the password. Ie, F1, ALT F1, SHIFT F1 are all valid and considered different. Also Alphabetic characters are case-sensitive, which means for example that "a" and "A" are distinguished from one another.

Once the password has been defined, it may subsequently be changed using this utility. To accomplish this, toggle the "Security" field entry from "Enable" to "Change Code", and press ENTER. The resulting steps are identical to initially installing the password.

The password entry feature may also be set to "Disable", which turns off Security. Be aware that this configuration allows anyone who

invokes the Setup-Utility to re-Enable the Security feature with their own pasword. It could happen for example, that a curious but outherwise unfamiliar user accidentally sets a new password. The situation may not be discovered until too late, when the computer cannot be powered up because the correct password is unknown. It is therefore STRONGLY ADVISED that if this Security feature is going to be left disabled, then the Master-Override Password Security Jumper 'JP1' be set to position '1-2' (Master-Disable).

Appendix B
Operation and Maintenance

Some components of the Panther-II or computer components are static-sensitive devices and can be damaged by static discharges. To prevent such damage, the device may be wrapped in a conductive, anti-static bag; certain precautions should be taken before removing the device from its bags.

When installing or removing any add-on card, DRAM module or coprocessor, care should be taken when handling these devices. Touch an unpaint metal part of your system unit (for example, the screws on the rear of the system unit) with one hand, then hold the component you are installing on the other hand. This will place your body, the component, and the system unit at the same ground potential, preventing an accidental static discharge. Be sure to handle circuit boards by the edges only and do not touch the component pins or solder joints. Grasp diskette drives or fixed disk drives by their frames to avoid touching the circuit board. Memory chips or co-processor should be held by their bodies only, not by their pins.

Preventing a problem is better than having to fix it after it has happened. This is where cleanliness and proper operating procedures come into play.

KEEPING THE SYSTEM COOL

Airflow is critical for proper operation. The motherboard contains many high-speed components and they will generate heat during operation. Other add-on cards and hard disk drive can also produce a lot of heat. As a result, the temperature inside the computer system may be very high. These boards require cool air to prevent a deadly heat build-up. Be sure that all cooling vents in the front or sides of the computer are open and that air circulation is good. Check the clearance at the back of the computer; the power supply contains a fan to blow air out of the case, make sure the fan is not blocked by cables or papers. Don't push your computer flush against the wall; leave it some breathing space. Heat can destroy computer chips.

CLEANING THE "GOLDEN FINGER"

Whenever inserting an add-on card to the motherboard, make sure that there is no dirt on the "golden finger" of the add-on card. If not, the contact between the "golden finger" and the slot may be poor and thus causing the add-on cards to work improperly. Use a pencil eraser to clean the "golden finger" if dirt is found.

CLEANING THE MOTHERBOARD

Because the system is air-cooled, dust can enter your system through the ventilation slots. At least once a year, take the cover off your computer and vacuum the interior to remove accumulated dust. Use a brush attachment on the vacuum and carefully go over all exposed parts. To prevent dust from accumulating on the motherboard, installing all mounting plates on the rear of the case. Regularly examine your system, and if necessary, vacuum the interior of the system with a miniature vacuum.

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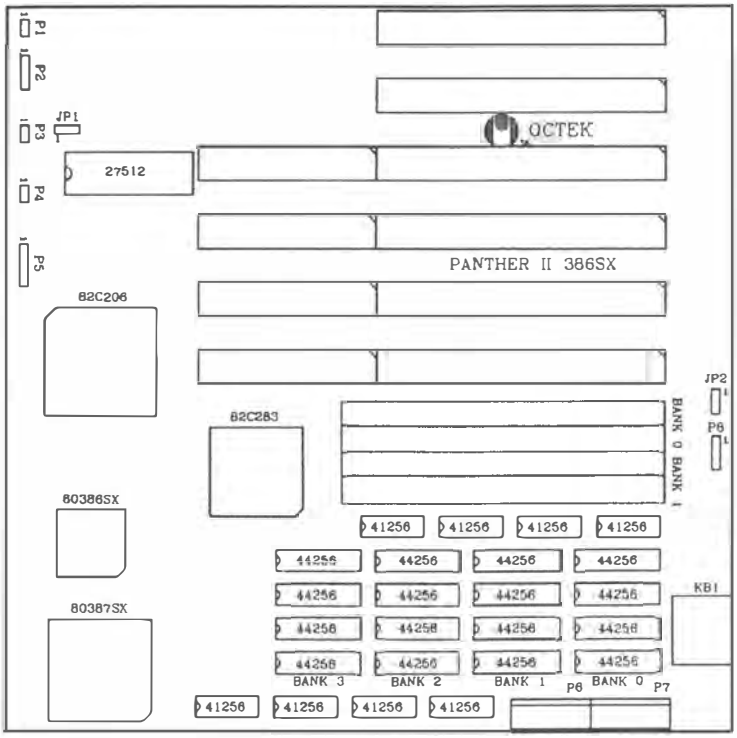
Appendix C
System Board Layout



Panther II 386SX Motherboard

Supplement

for Panther II Ver. 1.01 Motherboard

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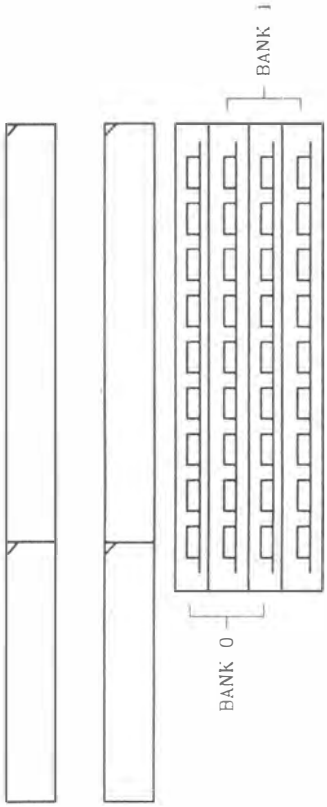
Panther II motherboard version 1.01 has SIMM memory organization differed from that described in the manual, revision 1.0. Please refer to the figure below for the proper SIMM memory configuration.



PM 13000008-01
Printed in Hong Kong