PANTHER-IV
386SX

REVISION : 1.0

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 consult 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 W/S" for DRAM Read & Write Wait State under the "Advanced Chipset Setup" of the BIOS Setup Utility.

b)   Never allow the "I/O-Bus Speed" to exceed 8.33MHz in the "Advanced Chipset Setup" unless you are so sure that the I/ O cards installed are capable of running at such high speed. (Refer to A-16 for details)

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-IV 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 information however, are also provided for hardware and software engineers.

The manual compose of 4 chapters, Chapter 1 contains a brief introduction of Panther-IV motherboard. In Chapter 2, specifications and functions of Panther-IV 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-IV is available in various operating speeds. Features and functions described in the manual is identical for all versions except for their operating frequencies.

CONTENT

Chapter 1
Introduction

The Panther-IV 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 33 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-IV 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-IV 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-IV 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-IV 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-IV system. It supports MS-DOS, Xenix, Unix and all PC/AT application programs. Users can run applications designed for the PC/AT on Panther-IV without any modification. Multi-tasking and multi-user capabilities are fully functional on this system board.

In addition, the Panther-IV 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-IV 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 4MB 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
512K Eprom BIOS

GENERAL FEATURES

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 pipeline, 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-poxt 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, exponential, 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.

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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.

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MEMORY SYSTEM

Panther-IV 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

Ba	nk		Ba	nk	

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-IV 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-IV is designed to be compatible with standard AT bus. All the expansion cards conformed to the standard AT bus can be used in Panther-IV without problem.

Chapter 3
Installing Components

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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-IV	Math Coprocessor
33 Mhz System	80387SX-33
25 Mhz System	80387SX-25
20 Mhz System	80387SX-20
16 Mhz System	80387SX-16

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SYSTEM MEMORY CONFIGURATION

Four DIP memory banks and two SIMM memory banks are available on Panther-IV, 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 4 DIP memory chips (4x44256). 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	U21, U22, U29, U30	256Kx4 bit
BANK 1	U23, U24, U31, U32	256Kx4 bit
BANK 2	U15, U16, U25, U26	256Kx4 bit
BANK 3	U17, U18, U27, U28	256Kx4 bit

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/Int	erleave	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
4M				Page		8.0MB *
1M	4M			Page		10.0MB
4M	4M			2/P		16.0MB

* Available for 33MHz system only.

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.

CONTROL OF SYSTEM SPEED

System speed can be selected by hardware switch and keyboard. Connector P2 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

* Default setting

`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 <u>power is OFF</u> 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 operation *
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	Turbo switch connector
P3	Speaker 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 - Turbo Switch Connector

Pin	Assignment
1	Selection Pin
2	Ground

P 3 - Speaker Connector

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

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

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Chapter 4
Technical Information

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

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-IV 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-IV. 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*
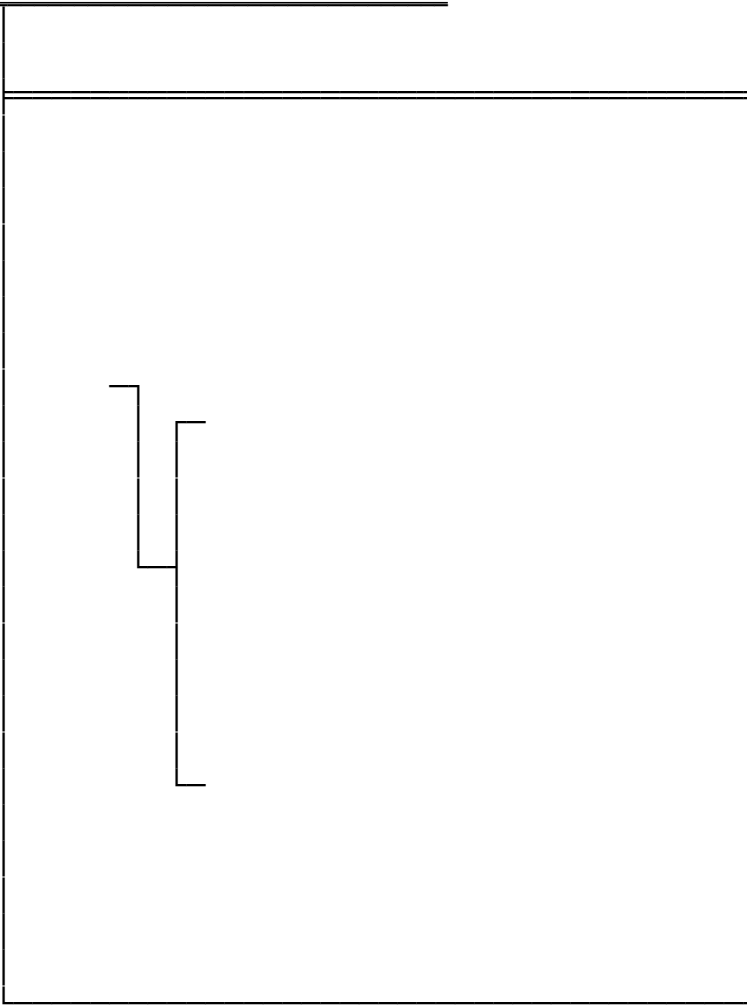
DIRECT MEMORY ACCESS (DMA)

Panther-IV 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-IV 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
MR System BIOS

The system BIOS provides an interface for the software to control the hardware and is recorded in a ROM (Read Only Memory) chip. Upon power-up, it will also carry out a thorough diagnostic test to make sure the system is functional. It will initialize the chipset with setting stored in the CMOS RAM.

Then it proceeds to load the disk operating system and you can start to work with your applications.

In this supplementary, it mainly explains the BIOS Setup Utility, in which you can set up your system to suit your configuration and applications.   In case you have any doubt, consult your dealer. Improper setting may cause reliability problem or system failure.

SETUP UTILITY DESCRIPTION

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

You may enter the Setup Utility in three ways:

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

The Setup Utility is an interactive program for the system setup. You can enter the system configuration, such as clock, hard disk type and floppy disk type. There are many advanced options available to you to improve the system performance. The settings for these options are preset to a proper value, such that the overall performance is optimal. In most case, you only need to setup the clock, hard disk type and floppy disk type.

The main screen format of setup utility consists of these four fields:

Copyright/Version

On the top two lines on the screen, the BIOS version number is shown.

Menu Line

A list of setup section names appears on this line, from which a specific section may be selected. Use 'Left' and 'Right' arrow key to change from one setup section to another and the corresponding Edit-Page (see below) is shown. Press ENTER key to enter the setup section.

Edit Page

In the Edit page, setup options are listed. You can move the cursor to a particular field and change the setting. Press PgUp key to exit.

Prompt Line

The Setup-Utility is designed to be usable without the aid of this manual. In the prompt line, acceptable key-strokes and corresponding explanation are listed. The main Setup Menu is shown as below when the Setup Utility is invoked.

MR BIOS(tm) Copyright(c)1991,Microid Research Ver 1.28 Port OPTI435V

Summary Clock Video Floppy Fixed Boot-Seq Keyboard More --->	
CPU Type 80386-08	Floppy 0 .... 12.M [5¼]
CPU MHz 40.0	Floppy 1 .... None
Boot Speed .... High	Floppy 2 .... None
Math Unit .... n/a	Floppy 3 .... None
	Fixed 80 (C:) .... Type 17
RAM Cache 64K	Fixed 81 (D:) .... None
Shadow RAM .... Enable	Boot Sequence .... C : 1st
Memory-Base 640K	Anti-Virus .... n/a
Memory-Extended 3328K	Security .... Disable
Memory-System 128K	
Memory-Total 4096K	Keyboard .... AT
	Numlock .... On
COM1 .... 3F8	LPT1 378	TypeMatic 30.0
COM2 .... n/a	LPT2 .... n/a	
COM3 .... n/a	LPT3 .... n/a	Video-Primary ...... V/EGA-Color
COM4 .... n/a	LPT4 .... n/a	Video-Secondary .... n/a
F10 to Record and Exit	Home End Moves Cursor

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 Moves Cursor (Left/Right Arrows)

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

Enter - To Select

When the cursor is in Menu Line, you need to press enter key to enter the Edit Page for a particular setup section. The cursor will move from the Menu Line into the Edit Page, on the first field.

ESC - For Menu

When the cursor is currently in the Edit-Page, press ESC (or PgUp) to return to Menu-Line.

Up/Down/Left/Right Arrows - Moves Cursor

The cursor is currently 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 Edit-Page. This particular field can be entered with numbers or letters. Press ENTER to enter the editing mode. The field remains illuminated, and a small blinking underline cursor will appear under the leftmost editable character in that field. In general, Left-Arrow, Right-Arrow, Space, Backspace, and Alpha Numerics are accepted in edit mode. ESC will restore the field to its initial state and the blinking underline will disappear. ENTER will finalize the editing mode 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. Press SpaceBar or <+> to change to 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 specify 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 behaviour 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 if the user simply scroll through available options.

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 to a non-Format column on the screen.   While the format is in progress, ESC will immediately terminate the process.

_____

SETUP SECTION

There are currently 12 sections contained in BIOS Setup. As the cursor is moved across the Menu Line, Page for the respective Setup Section appears in the Edit. A quick summary of the utilities is given below.

(1)　SUMMARY UTILITY PAGE

In the Summary Section, the basic configurations and characteristic of your system can be viewed here. Each of the fields are explained below with an example of how they might appear:

CPU

The type of the CPU is shown.

CPU 80386SX	indicates a 386SX processor chip

Math Unit

Numeric-Coprocessor-Extension type found in the system.

NPX	Description
80387	Co-processor Install

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). Possible range is 64K to 640K.

Memory-Extended

Indicates the amount of extended memory (above 1 Megabyte boundary).

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 un-implemented (0K), 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, COM2, COM3, COM4

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

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

LPT1, LPT2, LPT3 and LPT4

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

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

Floppy 0, Floppy 1, Floppy 2 And Floppy 3

Indicates floppy drive type and step rate. The "type" can be 5¼ 360K, 5¼ 1.2M, 3½ 720K, 3½ 1.4M AND 3¼ 2.8M. The "step rate" is given as two options : fast or slow required for the read/write head to be moved to an adjacent cylinder.

Floppy 0	Description
None 5¼ 1.2M	Card present but no drive 5¼ inch

Fixed 80 (C:), Fixed 81 (D:)

Indicates fixed disk type, step rate encoding and if "Translation Mode" is in effect. If the "Translation Mode" is enabled for this disk a letter "T" will be shown. The step rate will be shown if set to non-zero.

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 Step rate
46T {E}	Drive type "46", Translate+Step rate

Boot Sequence

Specifies the selected order in which the disk 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:

Anti-Virus

The Anti-Virus is provided in two options:

> *Enable*
> *Disable*

Security

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

> *For example,*   *Security ..... Enable*
> *Security ..... Disable*

Keyboard

The keyboard type is shown in this field.

> *For example,*   *Keyboard ... AT*   *PC/AT type keyboard*
> *Keyboard ... XT*   *PC/XT type keyboard*

Num Lock

The programmable powerup Num Lock state is shown in this field.

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

> *For example,*   *Num Lock ..... Off*
> *Num Lock ..... On*

_____

Typematic

The programmable powerup "typematic" repeat rate is shown here.

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

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

Video-Primary

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

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

Video-Secondary

Indicates if a second video card is present in the system. This will be displayed:

Video-Secondary ..... n/a

Otherwise, refer to VIDEO-PRIMARY above.

---

(2)   CLOCK CONFIGURATION

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

Display Format

You may choose the type format of time and date. Both 'United States' and 'International' formats are supported. When the format is changed, the time and date shown below will be adjusted accordingly.

Time

When 'United States' format is chosen, the time field is shown in 12 hour format, followed by a time-of-day indicator "a" or "p" (am/pm). After entering the second, the cursor moves the right most of the field, press `a' for am or `p' for pm. In International format, it is in 24 hour format and type the time directly.

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

Date

The date field is shown in mm/dd/yyyy format (United States format) or dd/mm/yyy (international format).

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 enable, 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 reaches 1:59:59 am, it is rolled-back to 1:00:00 am. This feature is only useful in those countries using this scheme, such as United States. Otherwise, set the field to "Disable".

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

---

(3)   VIDEO CONFIGURATION

The primary video adaptor is declared through this utility.

A "primary" adaptor is defined to be the video card which will be recognized by the operation system. If there are two video cards present, the other one becomes the "secondary" video adaptor. The secondary adaptor is placed into a stand-by state and can only be activated by specialized software.

No jumper setting is required and the BIOS will determine the type of display found in the computer. In systems with a single video card, the choices are limited to that present card, or "none". Setting to "none" is useful in certain specialized monitoring/control applications.

When two video cards are present in the system, one must be color, and the other monochrome. The BIOS will identify these cards, and make both choices available for primary selection. If one of the cards is V/EGA, the BIOS will automatically detect whether the display card is in color or monochrome mode. Although V/EGA cards generally require setting dipswitches, the BIOS will override those settings according to the primary adaptor selected via this utility. Note that some valid dipswitch state must still be set on the V/EGA card so that it may correctly initialize itself.

If a CGA card is found, 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" when accessed too quickly in 80-column text mode. Such cards require synchronization with video signals to prevent this undesirable effect. Most CGA cards do not require this synchronization, and the video access speed will be improved. Try selecting the fast mode. If there is no "snow" problem, select fast mode permanently.

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(4)   FLOPPY DISK CONFIGURATION

This utility setups the floppy drive subsystem, drives A:, B:, C: and D:.

The BIOS supports the following types of floppy disk drives:

a.   5.25 inch, 360K bytes drive;
b.   5.25 inch, 1.2M bytes drive;
c.   3.5 inch, 720k bytes drive;
d.   3.5 inch, 1.4M bytes drive;
e.   3.5 inch, 2.8M bytes drive;

The "step-rate" parameter controls the speed which the drive head moves from track to track. Usually the fast rate is selected. In case that your disk drive cannot work with fast rate or your application depends on the timing of the drive, select the slower speed.

---

(5)   FIXED DISK CONFIGURATION / LOW LEVEL FORMATION

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

The type of fixed disks may be selected from standard fixed disk table or defined as user-defined type 46 and 47. Make sure you choose the correct type. Otherwise, the system will have problem with the fixed disk. 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
(5) Number of Sectors per Track

If you know the type of the hard disk, move cursor to the 'Type' field and enter the type number directly. The type can also be selected by changing the figure in 'size' field to match your fixed disk capacity. It is feasible in IDE Hard Disk.

If the type of your fixed disk is not included in the standard table, define it in type 46 and 47.   Move the cursor to the "Type" field and select 46 or 47. Then move the cursor down to the next field, "Cylinders". Enter the number of cylinders, and press ENTER when done. Continue in this fashion, editing the "Heads", "Precomp", "Landing", and "Sector" fields.

Larger capacity fixed disk drives with higher track density may have more than 1024 cylinders, but the standard BIOS only supports upto 1024 tracks. There is a translation mode to surpass the 1024 cylinders limitation. Up to 16384 (16K) cylinders can be addressed via the translation mode.   The Translation Mode

implementation is designed to be compatible both with programs which exclusively use the BIOS interface, and programs which interpret the fixed disk tables and run the drives directly. If Translate Mode is not selected, only the first 1024 cylinders will be accessible through the BIOS interface.

To support the translate mode, a Low-level-Format utility is supported by the BIOS.   Press CTRL-F to enter Low-level Format utility. Enter the range of cylinders to be formatted.   The sequence may be increasing or decreasing order.   If the final cylinder is greater than the start cylinder, it is in increasing order. Otherwise, it is in deceasing order. Also, the "interleave" is programmable. The default setting is "3". But most of the fixed disks and controllers nowadays, such as IDE hard disk, support interleave factor of "1". Consult the manual of hard disk and hard disk controller for detail.

Many advanced fixed disks are already formatted in the factory and low level format should not be done. Consult your dealer for detail.

Anti-Virus is provided as a user selectable option. It offers a measure of protection against malicious programs by trapping writes to the main boot sector. It also traps attempts to low-level-format any region of the fixed disk. It may be enabled only after the fixed disk has been proper installed.

(6) BOOT SEQUENCE CONFIGURATION

Boot Sequence

In a typical BIOS implementation, whenever CTRL ALT DEL is pressed or cold-boot, an attempt to boot from drive A: always occurs first. If the drive is found to be empty, drive C: is booted. However, hard disk is always used as the boot device in the computer system, and drive A: is only used to transfer files. So booting directly from drive C: is more convenient and takes less time.

The boot sequence is now selectable. In addition to the usual "A: first, then C:" sequence, the order may be reversed so that drive C: is accessed first.

To override the boot sequence established in this utility, a special "hot-key" warm-boot sequence CTRL ALT ENTER is available. The effect is identical to CTRL ALT DEL, except a prompt appears on the screen asking which drive should be booted. For cold-boot, press ENTER during the memory test. A prompt will be shown to ask which drive is the boot device. When "Screen-Prompt" is selected, the BIOS will always ask you to choose which drive to boot.

_____

Memory Priming

Memory test will be carried out after cold-boot. When there is a lot of memory installed, the test will take some time. To speed up the test, you may change from "Full test" to "Quick scan". The BIOS will only perform a simple memory test which will just need a few seconds.

Cold-Boot Delay

Since power-up diagnostics only take a few second, some hard disks may not even complete their setup process and can not be accessed by the BIOS. In this case, the BIOS has to wait before the hard disk is ready. Otherwise, hard disk error will be reported. Maximum cold-boot delay is 30 seconds. Select a proper time delay to suit your hard disk. Set to "none" for no delay. `None' or a short delay is appropriate for most IDE hard disks. 5 second delay is preset in the BIOS.

(7)   KEYBOARD CONFIGURATION

In 84-key AT-style keyboards, it 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. In the original AT system, Numlock is always on after booting and thus the keypad is in numeric mode. You need to press the Numlock key once so as to use the cursor keys.   101/2 key keyboards have a dedicated Cursor Keypad in addition to the Numeric Keypad. The NumLock key is not necessary.

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

Typematic Rate

When a key is pressed on the keyboard for a period of time, the keystroke will begin repeating at a predefined rate. The delay is by default 0.5 seconds and the repeat rate is 10 characters per second.   This typematic repeat rate feature is a function of the keyboard and is not produced by the system BIOS. However, most of AT-style keyboards permit overriding the initial delay and subsequent repeat rate. The BIOS can be configured to issue override typematic parameters to the keyboard at boot-time.   Both the "Delay before repeat" and "typematic Repeat Rate" parameters can be selected.   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.

If the keyboard fails to function properly when overriding the default typematic state, disable the "Typematic Override" field.   The Delay and Rate fields will display "Default" in response to this selection. In this way, no typematic parameters will be issued to the

keyboard.

(8)   FIRST AID

The setup utility "First Aid" provides method to solve problem with network in AT design.

The problem is the keyboard with Novell environment in high speed system. Keyboard may not be respond very well because Novell program is running at very fast speed but the keyboard is a slow speed device. The BIOS allows you to adjust a parameter to make the keyboard work properly. You need to test your selection. Set to the lowest value that can solve the problem.

Note :   On 386 Series, The A20-Gate option is aimed at solving the problem with some applications using protected mode. The A20-Gate signal is Generated from slow speed device.   Sometimes the application crashes when toggling this signal. Setting this signal to "ON" can eliminate the problem.

---

(9)   SPEED

System Speed

This option selects the boot up speed. If you select this option to 'HIGH', the system will boot up in turbo mode.

(10) SHADOW RAM CONFIGURATION

In this section, the BIOS allows you to select "shadow RAM" function for the address in 640K to 1M region. The BIOS will detect which address is occupied by adapter ROM and video ROM. The address range of C0000H to CFFFFH, which is usually used by VGA and EGA BIOS, is divided into four 16K blocks. The memory space from D0000H to DEEEEH is also divided into four 16K blocks. The last memory block is E0000H to EFFFFH. The BIOS ROM is resident at F0000H and is always shadowed.

When no memory block is selected to be shadowed in the range from D0000H to DFFFFH and E0000H to EFFFFH, these memory blocks may be mapped to the top of memory and served as extended memory. In this case, the memory block originally locates at A0000H to BFFFFH where is already occupied by display memory will also be remapped to the top of memory. There is additional 256KB available in the extended memory.

Each adapter ROM and video ROM will be assigned a number. If a ROM occupies more than one block, the BIOS will show the same ROM number for each block.

To set a ROM to be shadowed, move the cursor to a particular block and change to the "WP-Shadow". If the ROM occupies more than one block, just set one block to be shadowed and then other blocks will be set accordingly. It avoids the mistake that you just enable the shadow RAM function for part of a ROM.

The address range that is not used may be available to software by setting to "RW-Shadow". This feature is useful to many memory management utilities and advanced operation systems. These utilities can move the memory resident files and device drivers to these address ranges and hence there are more spaces available in the 640KB range. If a particular memory block in D0000H to DFFFFH and E0000H to EFFFFH are set to "RW-Shadow", 256KB remapped function is not enabled.

(11)CHIPSET

This section provides a means to define some parameters for the system, such as memory wait state and the AT-bus speed. The default settings are proper for normal usage. After changing the setting, make sure your system is still reliable and compatible with the peripherals.

DRAM Timing

The number of wait state for read and write operation depends on the clock speed of CPU and the speed rating of the DRAM. Improper setting can make the system unstable. Since the specification of DRAM for different manufacturers may vary, you would better consult your local dealer for the detailed information. In general, select 0 wait state for read and write operations with 80ns DRAM for 25MHz and 70ns DRAM for 33MHz system.

AT BUS Clock

BUS clock is used by peripherals on the system board and slot, such display and DMA BUS clock is generated from CPU clock-in and the speed of BUS clock is shown below.

System Speed	ATCLK Select(I/O Bus Speed)		
	CLK2/8	CLK2/6	CLK2/4
16MHz	4	5.33	8*
20MHz	5	6.67*	10
25MHz	6.25	8.33*	12.5
33MHz	8*	11	16.5

* Recommended values

      The system performance can be improved by selecting a higher Bus clock speed. To be compatible with general add-on cards, the bus clock must be 8.4MHz or less. There are many old version add-on cards that can only run at the slow speed. So, be careful when you want to set to higher speed.

(12) SECURITY CONFIGURATION

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 when the computer is first being powered up. Three opportunities are given to enter the correct password. If three unsuccessful attempts are made, the system will be halted and an alarm will be sounded. The alarm will persist until the power is turned off. After the correct password is entered, the computer will proceed to boot-up. Security feature is not applied to warm-boot, pressing CTRL-ALT-DEL.

The Setup-Utility is also password protected when Security feature is enabled. When entering the BIOS setup 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".

When you select to enable the Security feature, a second field will appear on the screen for you to enter a password. A password consisting of zero to ten characters must be typed in. Asterisks are echoed to the screen, instead of the character typed, and the only keystroke available for editing is BackSpace. The password cannot be viewed. Press ENTER when you have entered the password. Then a prompt will appear requiring the same password to be entered again. The BIOS will compare the entries and the process will repeat if the latter entry does not match the initial one.

All keystrokes recognized by BIOS can be used in the password. So, function keys such as F1 and combinations of keys, such as ALT F1 and SHIFT F1, are valid and considered different. Also Alphabetic characters are case-sensitive, which means "a" and "A" are different.

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 procedure is identical to initially installing the password.

The password entry feature may also be set to "Disable" and the Security feature is disabled. When disabled, anyone can invoke the BIOS Setup and enable the Security feature with their own password. Afterward, the system can only boot up with his password.

Appendix B
Operation and Maintenance

Some components of the Panther-IV 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 mother-board, 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