PANTHER
386SX

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

VERSION : 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 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.   During first time start up or when memory size is altered, you might need to clear the previous setup before the BIOS can recognize the current system configuration. If system failed to initialize during first time power up, please refer to 'RESET CMOS SETUP INFORMATION' on page 3-10 for necessary remedies.

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.   After power is on, please wait for a minute. The system BIOS are going through a self-test during this period and nothing is shown on the screen. After the self-test, the system BIOS will initialize the display adaptor and show messages.

5.   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-386SX 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. There are also technical information provided for hardware and software engineers.

The manual compose of 4 chapters, Chapter 1 contains a brief introduction of Panther-386SX motherboard. In Chapter 2, specifications and functions of Panther-386SX 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 the Chapter 4.

System BIOS and the system setup are further described in the appendix A. All setup procedures are explained.

Note :
   Panther 386SX is available in two versions, one in 16Mhz and the other in 20Mhz. Features and functions described in the manual is identical for both versions except for their operating frequencies.

CONTENT

Chapter 1
Introduction

The Panther-386SX 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 20 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-386SX 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-386SX system to run 386 software in essentially a 286 hardware environment.

For the memory system, It supports up to 32 MByte of DRAMs on the system board. Full EEMS support is provided in hardware for the complete LIM EMS 4.0 standard. 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 DRAM capacity for their applications. This flexibility in configuration allows you to select an ideal cost/performance combination.

The Panther-386SX 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-386SX 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-386SX system. It supports MS-DOS, Xenix, Unix and all PC/AT application programs. Users can run applications designed for the PC/AT on Panther-386SX without any modification. Multi-tasking and multi-user capabilities are fully functional on this system board.

In addition, the Panther-386SX 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-386SX 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. Affordability and 32-bit processing power are the two ingredients meant to poise Panther-386SX's users for success.

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Chapter 2
General Features

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SPECIFICATION

Processor Subsystem :

Intel 80386SX CPU
Optional 80387SX Co-processor

Speed :

Turbo/normal speed
Software/hardware selectable

Memory Subsystem :

32MB maximum using 4M SIMMs
2MB using 256Kbx4 DRAM chips or 256K SIMMs
Support memory mixing of 256K, 1M and 4M
Page/Interleave memory:
-   Page mode memory
-   2-way and 4-way interleave mode
System BIOS shadow
Video BIOS shadow
Hardware LIM/EMS 4.0 implementation
Parity can either be enabled or disabled
128K, 256K or 512K Eprom BIOS
Pipeline Mode operation

GENERAL FEATURES

I/O Subsystem :

Compatible to standard AT bus
Six 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.

On the other hand, the 80286's limitations become obvious when more powerful applications are being developed. This microprocessor is limited by its 16-bit architecture. The 64KB segment size also becomes an obstacle to complicated software. Software developers have to partition their software into multiple code and data segments, which means larger program size and less efficiency. 80286 lacks a complete facility to switch between real and protected mode. So operating systems need to handle the mode switching and the performance is greatly downgraded.

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, 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.

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-386SX has a very sophisticated and advanced memory system, it supports up to 32 Megabytes of local DRAM. When more than 640KB of memory are installed, the 384K of memory between 1M and 1.384M can be allocated for EMS and shadow RAM purposes; there is no memory wasted here as opposed to the conventional design.

In order to raise performance and decrease system cost, both page mode and interleave operation are available 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 technology that loads system BIOS and/or video 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. This process of shadowing and address "roll-over" has programmable 16K byte granularity across the range of A0000-FFFFF.

LIM EMS 4.0

Full hardware LIM EMS 4.0 support using 72 register sets for high performance of software applications which require expansion memory. It provides superior performance to a software only EMS driver; hardware EMS page mapping is orders of magnitude greater than software EMS. Also, hardware EMS does not suffer from the problems of EMS emulators, for example, there are no aliasing affects with a hardware EMS. However if so desired, hardware EMS can also be disabled allowing the use of software "Limulators" for maximum flexibility.

Expanded memory provides usable memory beyond DOS's 640K limit. DOS application programs that conform to the Expanded Memory Specification (such as the latest versions of 1-2-3, Symphony, Framework II, SuperCalc3) can use expanded memory. If you use DOS application programs, it will be most desirable to use EMS.

Panther-386SX EMS system consists of seventy-two mapping registers. They are split into a standard and an alternate set of 36 registers each. The alternate register set allows rapid hardware context switching. It can support the full LIM EMS 4.0 specification with any of the valid memory maps of 1 MByte and higher. The system allows backfill down to 256K for EEMS support and provides 24 mapping registers covering this space. Twelve of the 36 registers cover the EMS space from C0000h to E0000h. All registers are capable of translating over the complete 32 Mbyte range of on-board DRAM. Users preferring an alternate plug-in EMS solution, can disable the on-board EMS system as well as system board DRAM, as required, down to 256K.

I/O SUBSYSTEM

It is very important that a high speed system should be compatible with existing peripherals without downgrading the performance. The Panther-386SX 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. (See EASY SETUP PROGRAM on Appendix A for detail) If for example, the peripheral card is not capable of operating at high speed, user can define a moderate or 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-386SX is designed to be compatible with standard AT bus. All the expansion cards conformed to the standard AT bus can be used in Panther-386SX 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 U30 at the centre 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-386SX	Math Coprocessor
20 Mhz System	80387SX-20
16 Mhz System	80387SX-16

Check whether the system BIOS can detect the coprocessor upon power up. The system BIOS will display a list of devices on the motherboard after self-test. If the coprocessor is installed, it should show the type of coprocessor.

SYSTEM MEMORY CONFIGURATION

Panther-386SX offers a very flexible and sophisticated memory configuration. There are 4 memory banks available, these memory banks are defined 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 use DIP and SIMM type memory at the same time. 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 SIMM socket referenced as 'BANK 0'.

One bank of memory refers to as 2 SIMMs modules or 6 DIP memory chips (4x44256 + 2x41256). For the SIMM memory, user can install 256K, 1M and/or 4M SIMM; therefore it has a maximum memory capacity of 32 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	U1, U2, U3, U4	44256
	U5, U6 (parity)	41256
BANK 1	U8, U9, U10, U11	44256
	U12, U13 (parity)	41256
BANK 2	U15, U16, U17, U18	44256
	U19, U20 (parity)	41256
BANK 3	U21, U22, U23, U24	44256
	U25, U26 (parity)	41256

U5,U6, U12,U13, U19,U20 & U25,U26 are the parity bits for BANK 0 to BANK 3 respect-ively. In normal situation, those bits are not needed and the parity checking logic can be disabled. Hence, the user can left those sockets blank and thus allowing you to minimize the system cost. (See discussions on Jumper setting JP2)

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 installed when upgrading the system. As a typical case, a basic system can be equipped with 1 Megabyte memory using 256K DIP DRAM and then memory size is later increased to 5 Megabytes by putting another 2 banks of 1M SIMM. The memory size is detected automatically by system BIOS and indicated during memory test 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.

Whenever the memory configuration is altered in your system, you have to reset the CMOS Setup for the BIOS to determine the correct memory size. For information on resetting the CMOS Setup, refer to the sections on "RESET CMOS SETUP INFORMATION" and Appendix A - "Key Conventions".

Memory Configuration Table

	16-Bit	DRAM	Banks	Page/Int	erleave	Total
Bank 0	Bank 1	Bank 2	Bank 3	A	B	Memory
256K				Page		0.5MB
256K	256K			2/P		1.0MB *
256K	256K	256K		2/P	Page	1.5MB
256K	256K	256K	256K	4/P	4/P	2.0MB
256K	256K	1M		2/P	Page	3.0MB
256K	256K	1M	1M	2/P	2/P	5.0MB
256K	256K	4M		2/P	Page	9.0MB
256K	256K	4M	4M	2/P	2/P	17.0MB
1M				Page		2.0MB
1M	1M			2/P		4.0MB
1M	1M	256K		2/P	Page	4.5MB
1M	1M	1M		2/P	Page	6.0MB
1M	1M	1M	1M	4/P	4/P	8.0MB
1M	1M	4M		2/P	Page	12.0MB
1M	1M	4M	4M	2/P	2/P	20.0MB
4M				Page		8.0MB
4M	4M			2/P		16.0MB
4M	4M	256K		2/P	Page	16.5MB
4M	4M	1M		2/P	Page	18.0MB
4M	4M	4M		2/P	Page	24.0MB
4M	4M	4M	4M	4/P	4/P	32.0MB
1M	4M			Page		10.0MB

*   *The 1M memory map is a special case where the 384K of memory above 640K can be allocated for 2 options:*

> *(1)   remapped between 1M and 1.384M as extended memory*
> *(2)   for EMS and shadow RAM purpose*

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 chips on the modules should be facing the 386SX CPU. 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 P3 is connected to the turbo switch of the case panel.   This controls the operation mode between turbo and normal mode, it will toggle between the 2 modes 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.

RESET CMOS SETUP INFORMATION

Sometimes, improperly setting the system BIOS setup may cause the system malfunction and you might no longer be able to enter SETUP to correct such problem; specially if the Extended Setup is incorrectly done. If such case happen, the following steps should be taken:

a) Turn off the computer.
b) Hold <INS> key down.
c) Turn on the computer.
d) When memory test begins, release <INS> key.

This should clear the Extended CMOS registers hence allowing the BIOS to bring up the system with BIOS default values, you then may proceed as usual.

Alternatively, you can clear the entire setup by hardware means. In such case <u>turn off the power</u>, use a conducting material such a jumper plug or screw driver to short jumper located at JW6 for about a second and then remove it.   This will clear internal CMOS status register.   Turn the power on again, the BIOS now finds the CMOS status register is reset and will regard the setup information as invalid. The Extended SETUP will be loaded with default values, the CMOS SETUP however is cleared. You have to provide information in CMOS SETUP and proceed as usual.

SYSTEM BOARD JUMPER SETTING

There are several 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.

Parity Enable/Disable

JP2	Parity Check
1-2	Enable *
2-3	Disable

ROM Size

JP3	JP4	ROM Size
1-2	1-2	27128
2-3	1-2	27256 *
2-3	2-3	27512

Display Selection

JP6	Display Type
1-2	Monochrome display *
2-3	CGA, EGA, VGA

Pipeline Mode Operation

JP1	Operating Mode
1-2	Non-Pipeline Mode
2-3	Pipeline Mode *

* *Default setting*

Note :

Earlier version of Panther 386SX does not support Pipeline operation and therefore jumper JP1 is not available in that version. If the motherboard supports pipeline operation which is indicated by the present of jumper header JP1, do select pipeline mode; this will improve system performance.

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-386SX and is intended for advanced users interested in the basic design and operation of Panther-386SX.

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-386SX 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-386SX. 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*
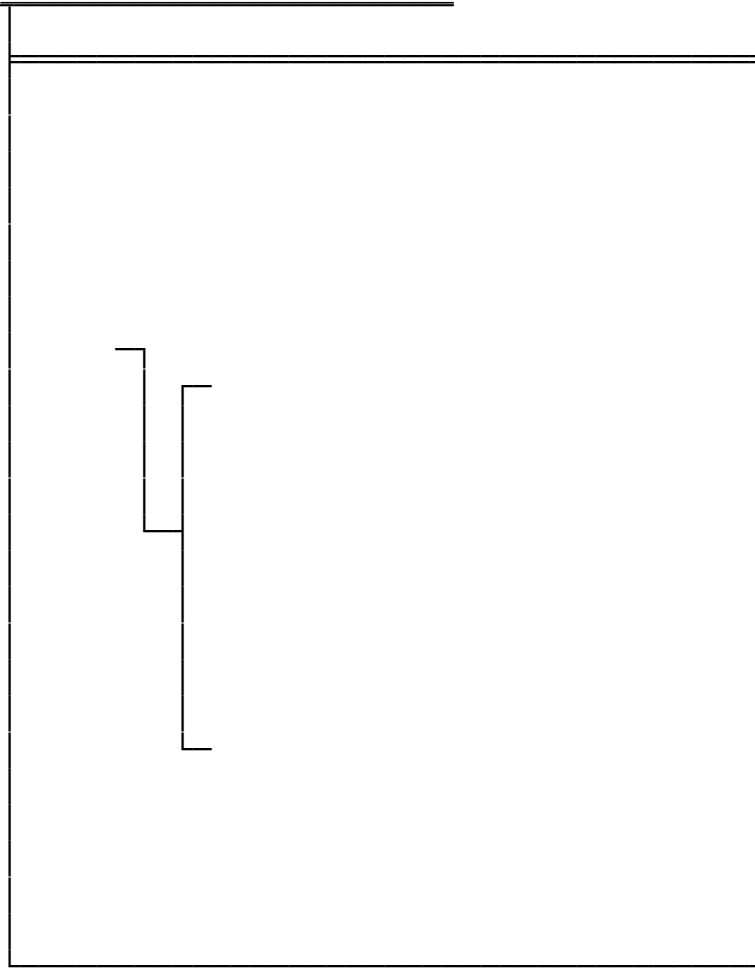
DIRECT MEMORY ACCESS (DMA)

Panther-386SX 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 and CMOS RAM are build-ing in the chipset which is 100% compatible with the 146818. An additional 64 bytes of standby RAM have been added in order to support non-volatile configuration register storage. It keeps configuration information when power is 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-386SX provides eight expansion slots, six 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 JA8.

The following figure shows the pin numbering for I/O channel connectors JB1-JB6.

TECHNICAL INFORMATION

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 your turning 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).

MEMORY TEST BYPASS

After the system is powered on or after a reset, the BIOS performs diagnostics of the system and displays the size of the memory being tested.

Note that you can bypass the memory test by pressing the <ESC> key. This option would be useful when the memory on the system is quite large. You may hit the <ESC> key when the message following message appears on the screen:

Press <ESC> Key to bypass MEMORY test

It is recommended to complete the memory test. The total memory size is displayed after the memory test.

In case of serious errors, the BIOS will suspend the test. If the display is not initialized, the BIOS will report the error through a sequence of beep sounds. Otherwise, error message will be shown on the screen.

There are two types of errors reported by beep sounds. One is conveyed as one long beep followed by a number of short beeps. The meanings of the errors are shown in next page :-

Short Beep Count	Meaning
3	Memory Failure
8	Display Adapter Failure

The other type of errors are serious failure and are conveyed as a number of beep and repeated infinitely.

Beep Count	Meaning
1	DRAM Refresh Failure
3	Base 64K Byte Memory Failure
4	System Timer Failure
5	Processor Failure
6	Keyboard Controller - Gate A20 Failure
7	Virtual Mode Exception Error
9	ROM-BIOS Checksum Failure

If no error is found during self-test, the system BIOS will proceed to boot from floppy disk or hard disk. The system BIOS will list the system configuration on the screen as shown in next page.

System Configuration (C) Copyright 1985-1990, American Megatrends Inc.,

Main Processor	*: 80386*	*Base Memory Size*	*:*	*640 KB*
Numeric Processor	*: None*	*Ext. Memory Size*	*:*	*7168 KB*
Floppy Drive A:	*: 1.2 MB, 5¼"*	*Hard Disk C: Type*	*:*	*2*
Floppy Drive B:	*: 1.44MB, 3½"*	*Hard Disk D: Type*	*:*	*None*
Display Type	*: VGA or EGA*	*Serial Port(s)*	*:*	*None*
ROM-BIOS Date	*: 04/30/90*	*Parallel Port(s)*	*:*	*3BC*

Do check the list to make sure that the configuration is correct. Sometimes, problems arise because of the incorrect information of the configuration. For example, if you forget to modify the setup after changing the floppy disk drive from one type to another, it can not boot from floppy disk or may not work properly. If you check the list, you can find the cause of the problem.

SYSTEM SETUP

The SETUP program lets you specify your system's configuration of diskette drives, hard disk drives, video display, memory, and date and time. The AMI BIOS provides a one-screen interactive equipment and machine configuration setup. The SETUP can be run after the system has been turned on and the memory test is finished or has been escaped. This program is built-in, you do not need a diskette to use it.

If your Panther-386SX is already installed in a working system, you will not need to use the SETUP program unless the configuration already recorded in the on-board CMOS RAM is lost or a change is made in your system hardware configuration. If the information is lost due to loss of battery power, you will need to reenter the configuration. If the configuration is altered, the changes must be recorded.

If it is the first time that the computer is started up, you will need to configure the system by telling the SETUP program what hardware configuration your system contains.

Setup Procedure

Note : The BIOS may be updated from time to time, the one you got may not be exactly as discussed; this section will also be updated as necessary.

The Setup incorporates two sections:

(1) CMOS SETUP
(2) XCMOS SETUP

In CMOS SETUP section, you can enter system configuration information which will be stored in CMOS RAM on the motherboard. The information includes the devices of the system as well as memory size. User may update this portion as necessary such as in the case of change of system configuration and devices.

XCMOS SETUP (EXTENDED SETUP PROGRAM) is used to define and store user configuration for the chipset components. Features such as page, interleave and the I/O speed options are defined in this portion. Please note that improperly setting these registers may cause the system to fail in normal operation. Consult your dealer if you have any doubt.

Follow the instructions as they come up on the screen to complete the initial procedure. The initial prompt tells you to press the <DEL> key if you want to use the setup program. It is displayed briefly just after the RAM test is run when you first turn on the system. If it disappears before you have a chance to respond turn the system off and on again or reset the system and the message will reappear. The initial screen prompt will be similar to :

Press <DEL> key if you want to run SETUP/EXTD-SET

Hit <DEL> key to get into the Setup Mode. (Note that <DEL> key will get you into the setup mode, only when the above message is displayed on the screen.)

Upon your pressing of the <DEL> key, the following message will appear on the screen :

EXIT FOR BOOT

RUN CMOS SETUP

RUN XCMOS SETUP

Use <Up> and <Down> keys to highlight the selected item. Highlight RUN CMOS SETUP for the SETUP program and press the <Return> key to enter this option.

Key Conventions

The field shown in reverse video is the current field, which is the one the user may changes.

Use the arrow keys to move the options.
Use <PgUp> or <PgDn> to move bar inside settings menu.
Use <ENTER> to select the options.
Use <ESC> key to abort and return to previous menu.

Note that if user settings do not allow system to startup, which happens if incorrect settings were made; the following steps should be taken:

a) *Turn off the computer.*
b) *Hold <INS> key down.*
c) *Turn on the computer.*
d) *When memory test begins, release <INS> key.*

The above procedure will clear the Extended CMOS register hence allowing the BIOS to bring up the system with BIOS default values.

If this still couldn't correct such problem, you should do it by clearing the SETUP through manual procedure. For details of it, please refer to the section on RESET CMOS SETUP INFORMATION.

CMOS SETUP

Depending on the BIOS version, a SETUP menu similar to below will appear :

CMOS SETUP (C) Copyright 1985-1990, American Megatrends Inc.,

Date (mn/date/year) : Sun, Jul 01, 1990	*Base memory size : 640 KB*
Time (hour/min/sec) : 12 : 05 : 30	*Ext. memory size : 7424 KB*
Floppy Drive A: : 1.2 MB, 5¼"	*Numeric Processor: None*
Floppy Drive B: : 1.44 MB, 3½"	

Cyln Head WPcom LZone Sect Size

Hard Disk C: type : Not Installed	
Hard Disk D: type : Not Installed	
Primary Display : VGA or EGA	
Keyboard : Installed	*Sun Mon Tue Wed ThuFri Sat*
Video BIOS Shadow : Disabled	
Scratch RAM Option : 1	*1 2 3 4 5 6 7*
Main BIOS Shadow : Disabled	

8   9   10   11   12   13   14

15   16   17   18   19   20   21

Month : Jan, Feb, ... Dec	*31 22 23 24 25 26 27 28*
Date : 01, 02, 03, ...	*2099*
Year : 1901, 1902, ...	*29 30 31 1 2 3 4*

ESC=Exit,↓→↑←=Select,PgUp/PgDn=Modify   5   6   7   8   9   10   11

CMOS Setup Options

Once you have entered the SETUP menu, enter the date, time, the primary display type, the floppy drive installed and the hard disk drive type (if installed). The SETUP program will automatically determines your computer's memory configuration and displays it on the SETUP menu.

OPTION 1   TIME AND DATE

Use PgUp and PgDn keys to change the value. The date and time cannot be entered directly. A calender is displayed on the lower right corner of the screen for your reference.

OPTION 2   FLOPPY DISK DRIVE

Four types of floppy disk drives are supported :

1. 5-¼ inch standard drive (360K)
2. 5-¼ inch high-density drive (1.2M)
3. 3-½ inch standard drive (720K)
4. 3-½ inch high-density drive (1.44M)

The system BIOS supports two floppy disk drives and they are recognized as drive A and B. Select the correct types. Otherwise the drives cannot work properly. If one of them is not installed, select 'Not Installed' for that drive.

The BIOS is able to detect the type of the drives automatically. But remember to check the settings before exit.

OPTION 3   FIXED DISK DRIVE

There are 47 types of fixed disks supported by the BIOS. Consult your fixed disk manual to determine its correct type. The parameters such as cylinder number, head number, sector number and pre-compensation must match your fixed disk's parameters.

Use PgUp and PgDn keys to change the fixed disk type. If the type of your fixed disk is not included in the hard disk list, define a new type as type 47. Use left and right arrow keys to move between the parameter fields and enter the parameters. The parameters will be stored in the CMOS RAM and your fixed disk can be used afterwards. Each hard disk can be assigned a different type 47 hard disk. So two hard disks which are not included in the list can be used together in your system.

If the type of fixed disk is wrong, it takes a while before the BIOS can identify the error. After setting the fixed disk type, if the system halts after reboot, please wait for a while. It is most likely that the setting of fixed disk type is incorrect.

When you install a new hard disk, make sure whether it is already formatted. If not, the BIOS has to check for a while before reporting the hard disk error. In fact, the error arises only because the hard disk is not formatted. If the hard disk is formatted, you can run DOS FDISK and DOS FORMAT.

Some fixed disks are specially handled and must be set to 'Not Installed'. Consult the fixed disk manual for details.

OPTION 4   DISPLAY

Four types of display are supported:

1. *CGA 80 column mode*
2. *CGA 40 column mode*
3. *EGA and VGA*
4. *Monochrome*

If the type of display is incorrect, the BIOS will prompt you and ask you to set up again. But the BIOS is still able to display messages on the display attached to the system. Thus you can enter the setup program.

The jumper JP6 must be set to reflect this setting. Otherwise, the BIOS will report error after self-test.

OPTION 5   KEYBOARD

If a keyboard is attached to the system, select 'Installed'. The BIOS will test the keyboard during self-test.

OPTION 6   VIDEO BIOS SHADOW

The Video BIOS Shadow can be enabled / disabled in this particular option. The Video card should be checked to see whether it has 16K or 32K of ROM. If it has no ROM (in the case of monochrome), there is no need to shadow the Video BIOS.

OPTION 7   SCRATCH RAM

The BIOS may require memory storage for certain functions and the storage can be allocated in two ways. One way is to use the BIOS stack and another is to allocate a 1K bytes memory in the base memory. Generally, the former option is appropriate. If the hard disk type 47 is defined or if you run program like OS/2 which will use 80386 instruction, select the option '2'.

OPTION 8   MAIN BIOS SHADOW

The Main BIOS Shadow can also be shadowed using this menu. If you have more than 1 MByte of memory, enable this option for a more efficient system. The Main BIOS would be shadow at F0000h.

EXTENDED SETUP PROGRAM

All the registers of the chipsets are initialized with default optimal values by the system BIOS. Thus, there is absolutely no need to modify these registers unless the system configuration is changed. Since improperly setting these registers may cause the system to malfunction, check your settings carefully before altering the XCMOS SETUP.

In EXTENDED SETUP PROGRAM, the main menu is shown as below :

EASY SETUP - SYSTEM/BUS CONTROLLER
ADVANCED SETUP - SYSTEM/BUS CONTROLLER
WRITE CMOS REGISTERS AND EXIT
DO NOT WRITE CMOS REGISTERS AND EXIT

There are two ways to program the registers: easy setup and advanced setup. In easy setup, the system BIOS allows you to modify some registers which are more likely to be changed if system configuration is modified. Advanced setup on the other hand, is much more complicated and you have to program the registers bit by bit. Unless you are an expert in the chipset; otherwise, do not alter anything in the advanced setup.

After changing the registers' settings, select 'WRITE CMOS REGISTER AND EXIT' to save the new settings in the CMOS RAM. The BIOS will then reboot the system and the new settings are in effect thereafter. Test your system first to make sure that the settings are correct. Unreliable performance may result if these registers are improperly set. It which case you have to run setup and enter the correct register values again.

EASY SETUP

In most cases, the easy setup is adequate and is also relatively simple to use compared with the advance setup. But before making any changes take note on how it is originally set, so in case you commit any error in making changes you can always correct it.   The Extended Setup Main Menu has four options:

(1) CLOCK SELECTION
(2) WAIT STATE SETTING
(3) MEMORY OPTIONS
(4) EXPAND MEMORY SUPPORT

(1)   CLOCK SELECTION

The user can define the following clocks as necessary :

DMA Clock Selection

The Direct Memory Access (DMA) clock has two settings.

a) SYSCLK/2 *
b) SYSCLK

* BIOS defaults

Non-TURBO Clock Speed

Non-turbo speed is the speed at which the system will run when you switch to normal mode of operation. This provide means to slow operation of older, speed sensitive software. This is specially true for graphics intensive entertainment software which may otherwise operate much too fast.

You have the following options :

	Non-Turbo System	Speed
Options	20 Mhz	16 Mhz
Clk2/1	20	16
Clk2/2	10 *	8 *
Clk2/3	6.67	5.33
Clk2/4	5	4

* BIOS defaults

BUS Mode Selection

Do not alter this option, use 'Synchronous' mode only.

Synchronous BUS Clock Speed

The is the frequency at which the I/O peripherals will operate. The system performance can be improved by selecting a higher bus clock, however care should be exercised in setting it.   Make sure that the peripheral cards are capable of operating at higher speed before making changes, otherwise problem could arise.

Under this, you have the choices of Div by 1, 2, 3 or 4. These all derived from the base frequency of 16/20 Mhz depending which system you are using. It is strongly recommended that the BUS clock speed is under 8 Mhz to be compatible with all existing peripheral cards.

	BUS	*Speed*
BUS CLOCK	*20 Mhz*	*16 Mhz*
Div by 1	*20*	*16*
Div by 2	*10*	*8 **
Div by 3	*6.67 **	*5.33*
Div by 4	*5*	*4*

*   BIOS defaults

(2)   WAIT STATE SETTING

ROM Wait States

The default is 3 WS. If Main BIOS Shadow is enable in the CMOS Setup, changing this would have negligible effect.

8-Bit DMA Wait States

For the 8-bit DMA wait state, the following settings are possible:

0 WS
1 WS
2 WS *

16-Bit DMA Wait States

The following settings are also possible for the 16-bit DMA wait state:

0 WS
1 WS
2 WS *

*   BIOS defaults

8-Bit I/O Wait States & 16-Bit I/O Wait States

Possible settings :

*0 WS ***
1 WS

This option will provide an alternative solution to some peripheral cards that are critical in I/O timing. Try set to 1 WS if problem occurs in peripheral cards.

* BIOS defaults

(3) MEMORY OPTIONS

Page Mode for Bank A & Page Mode for Bank B

Page mode -> Disable
*Page mode -> Enable **

User has the option of either enable or disable the page mode feature, it is recommended that this feature be enable for a more cost/effective system.

Interleave for Bank A & Interleave for Bank B

Word Interleave
*Block Interleave **

Interleave can be done in two ways - word or block interleave. The default is block interleave and is automatically enable.

* BIOS defaults

---

(4)   EXPANDED MEMORY SUPPORT

Global EMS

*Global EMS Disabled **

Global EMS Enabled

EMS translation registers form C0000h to EC000h can either be enabled or disabled here.

EMS Backfill Register Set

*EMS Backfill Registers Disabled **

EMS Backfill Registers Enabled

Backfill is an EMS feature provided to allow operating system software to use some of the more advanced features of LIM 4.0.   Essentially, the memory from 4000H-9FFFH (256K-640K Bytes) become part of the EMS memory.   Normally, this memory is used as conventional memory.

This option provides the means to remap this conventional memory as EMS memory.   Select the option to global enable or disable for the EMS backfill translation registers from 40000 to 9C000h.

* * BIOS defaults*

ADVANCED SETUP

Warning : This section is intended for advance user only. Do not alter the ADVANCED SETUP unless you are an expert in this field. Improper use of advanced setup may cause the system to fail normal operations!!!

Panther-386SX is a very advanced, sophisticated and timing-efficient system. Most of the functions are highly programmable via a set of internal configuration registers. The ADVANCED SETUP provides the means to define and store these configuration parameters.

The ADVANCED SETUP is specifically designed and intended for manufacturer's setup and for future update purposes, the manufacturer will initialize these parameters with the optimal values that will reflect the user's configurations and thereby maintaining the system at the optimum performance. This means that the BIOS will come up with optimized default values upon power up, there is no need for the user to bother in setting these parameters. Please note that improperly setting these registers may cause the system to fail in normal operation.

Since this section is not intended for general users, it would only be discussed briefly. User can have the definition and function of each bit in the advanced setup menu once the bit is highlighted. In advanced setup, you directly modify each bit of the registers in the chipset instead of a whole set. Some of the internal registers of the chipset that is not accessible in EASY SETUP may be modified here in the ADVANCED SETUP.

Use arrow keys to move the cursor between each field, you can see the corresponding function of each bit and explanation is given on the right side of the screen whenever the bit is highlighted. Use PgUp and PgDn keys to change the bit value. Related bits are grouped together.

'0' represents the bit is 0 and '1' represents the bit is 1. 'R' means reserved bit which is not allowed to be changed.

In this setup section, a setup menu is shown and the defaults are as follows:

Legend :

R   -   reserved bit
X   -   don't care, BIOS autodetect
*   -   depends on memory size, BIOS autodetect
+   -   = 0 1 for 16 Mhz system
*   = 1 0 for 20 Mhz system*

```
BUS          81H -> 11   11   11   0  0         Go to Prev/Next Register - ↑ ↓
CONTRLR      82H -> 0 0 R R R R 0       Go to Prev/Next Entry    -
             84H -> 1 0 1  R 1 1  0  0          Scroll Bit Value     - PgUp/PgDn
                                                Return to MAIN MENU   - <ESC>
SYSTEM       02H ->       01 01 0000*
CONTRLR      03H -> R R R    010 01*
             04H -> R R R R  0 0 00            ROM  WAIT  STATES
             05H -> 0 1   0111XX
             06H -> 0   0 00   0  0 00          01        -> 1 WS
             07H -> 01  R 00     0 11         10    -> 2 WS
             08H -> 00    0  01   R0 1       11 or 00     -> 3 WS
             09H -> 01  R 00     0 11
             0AH -> 00    0  01   R 0 1
             0BH -> 00000000
             0CH -> 00000000
             0DH -> 0 0   0 0   0 0   0 0
             0EH -> 0 0   0 0   0 0   0 0
             0FH -> 0 0   0 0   0 0   0 0
             10H -> 0 0   0 0   0 0   0 0
             11H -> 0 0   0 0   0 0   0 0
             12H -> 0 0   0 0   0 0   0 0
             14H -> 0010 1   0 1+ 0
```
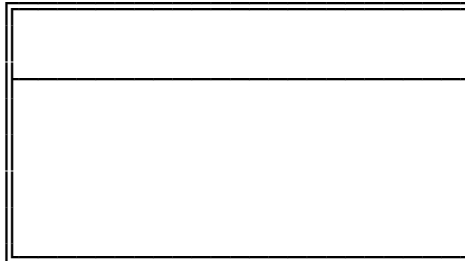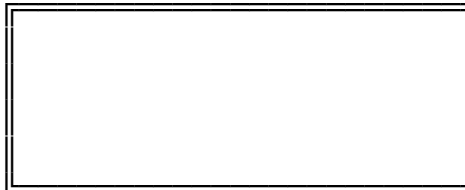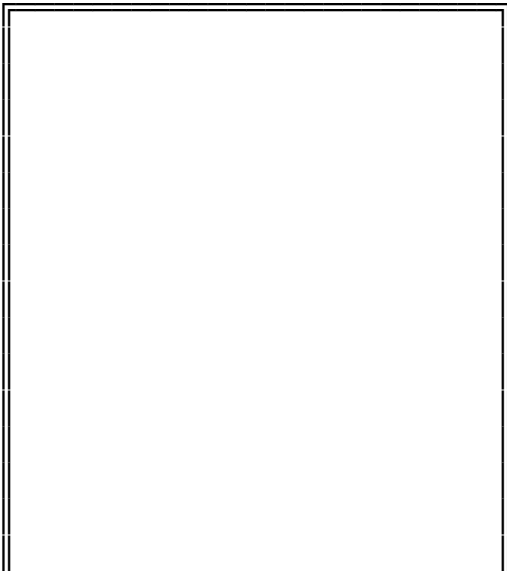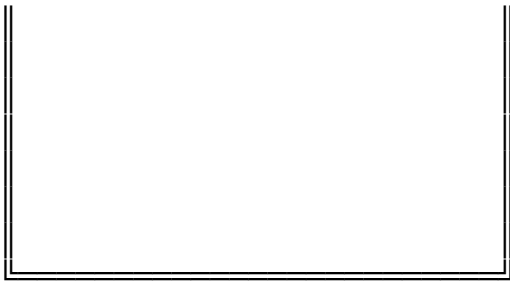
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Appendix B
Operation and Maintenance

Some components of the Panther-386SX 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