NTM6900 / WTM7026

6900-xxx / 7026-xxx

No. 87-006903-000 / No. 87-007029-000 Revision C

TECHNICAL REFERENCE

Intel® Xeon® E5500-series / Intel® Xeon® E5600-series

Quad Core

PROCESSOR-BASED

Extended ATX Motherboards

WARRANTY

The following is an abbreviated version of Trenton Technology's warranty policy for Extended ATX motherboards. For a complete warranty statement, contact Trenton or visit our website at www.TrentonTechnology.com.

Trenton Extended ATX motherboards products are warranted against material and manufacturing defects for five years from date of delivery to the original purchaser. Buyer agrees that if this product proves defective Trenton Technology Inc. is only obligated to repair, replace or refund the purchase price of this product at Trenton Technology's discretion. The warranty is void if the product has been subjected to alteration, neglect, misuse or abuse; if any repairs have been attempted by anyone other than Trenton Technology Inc.; or if failure is caused by accident, acts of God, or other causes beyond the control of Trenton Technology Inc. Trenton Technology Inc. reserves the right to make changes or improvements in any product without incurring any obligation to similarly alter products previously purchased.

In no event shall Trenton Technology Inc. be liable for any defect in hardware or software or loss or inadequacy of data of any kind, or for any direct, indirect, incidental or consequential damages arising out of or in connection with the performance or use of the product or information provided. Trenton Technology Inc.'s liability shall in no event exceed the purchase price of the product purchased hereunder. The foregoing limitation of liability shall be equally applicable to any service provided by Trenton Technology Inc.

RETURN POLICY

Products returned for repair must be accompanied by a Return Material Authorization (RMA) number, obtained from Trenton Technology prior to return. Freight on all returned items must be prepaid by the customer, and the customer is responsible for any loss or damage caused by common carrier in transit. Items will be returned from Trenton Technology via Ground, unless prior arrangements are made by the customer for an alternative shipping method

To obtain an RMA number, call us at (800) 875-6031 or (770) 287-3100. We will need the following information:

Return company address and contact
Model name and model # from the label on the back of the product
Serial number from the label on the back of the product
Description of the failure

An RMA number will be issued. Mark the RMA number clearly on the outside of each box, include a failure report for each board and return the product(s) to our Utica, NY facility:

TRENTON Technology Inc.
1001 Broad Street
Utica, NY 13501
Attn: Repair Department

Contact Trenton for our complete service and repair policy.

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This manual is as complete and factual as possible at the time of printing; however, the information in this manual may have been updated since that time. Trenton Technology Inc. reserves the right to change the functions, features or specifications of their products at any time, without notice.

E-mail: Support@TrentonTechnology.com
Web: www.TrentonTechnology.com

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HANDLING PRECAUTIONS

WARNING: This product has components that may be damaged by electrostatic discharge.

To protect your motherboard from electrostatic damage, be sure to observe the following precautions when handling or storing the board:

- Keep the motherboard in its static-shielded bag until you are ready to perform your installation.
- Handle the motherboard by its edges.
- Do not touch the I/O connector pins.
- Do not apply pressure or attach labels to the motherboard.
- Use a grounded wrist strap at your workstation or ground yourself frequently by touching the metal chassis of the system before handling any components. The system must be plugged into an outlet that is connected to an earth ground.
- Use antistatic padding on all work surfaces.
- Avoid static-inducing carpeted areas.

RECOMMENDED BOARD HANDLING PRECAUTIONS

This motherboard has components on both sides of the PCB. Some of these components are extremely small and subject to damage if the board is not handled properly. It is important for you to observe the following precautions when handling or storing the board to prevent components from being damaged or broken off:

- Handle the board only by its edges.
- Store the board in padded shipping material or in an anti-static board rack.
- Do not place an unprotected board on a flat surface.

Before You Begin

INTRODUCTION

It is important to be aware of the system considerations listed below before installing your NTM6900 (6900-xxx) or WTM7026 (7026-xxx) embedded motherboard. The NTM6900 motherboard supports the Intel® Xeon® 5500 series of Nehalem-EP processors, while the WTM7026 features the Intel® Xeon® 5600 series of Westmere-EP CPUs. System performance may be affected by incorrect usage of the features listed below.

MECHANICAL LAYOUT AND CHASSIS INSTALLATION

Trenton's NTM6900 /WTM7026 Extended ATX motherboards comply with the SSI-EEB Enterprise Bay Specification 2008, Revision 1.0. This specification defines the Extended ATX motherboard form factor including the board's mechanical dimensions, mounting hole locations, option card slot locations, I/O connector placements, maximum component heights and the motherboard's I/O plate dimensions.

Note: The I/O plate for the motherboard is packed with the motherboard inside its own separate bag. The I/O plate needs to be installed into the standard chassis opening to cover the gaps between the motherboard's I/O connectors and ensure ESD protection.

Chassis that adhere to the SSI-EEB industry standard should be used with the NTM6900 motherboard. See the NTM6900/WTM7026 dimension diagram in the *Chapter 1 - Specifications* for more details.

12V AUX POWER REQUIREMENTS

Both 12V AUX motherboard connectors (P15 and P16) must be connected to the system power supply to ensure proper board operation.

DDR3 MEMORY

The DDR3 memory modules used in the NTM6900 must be ECC registered (72-bit) DDR3 DIMMs and must be PC3-10600, PC3-8500 or PC3-6400 compliant.

NOTES:

- All memory modules must have gold contacts.
- Low voltage (DDR3L) DIMMs are not supported.
- To maximize memory interface speed, populate each memory channel with DDR3 DIMMs having the same interface speed.
- Populate the memory channels starting with the DIMM socket farthest from the CPU. Work you way toward the processor populating the DIMM sockets labeled with an "A" first followed by the "B" labeled sockets.
- If populating a memory channel with a Quad-rank and a Single- or Dual-rank DIMM place the Quad-rank DIMM farthest from the processor.

The motherboard will support DIMMs with different speeds, but the memory channel interface will operate at the speed of the slowest DIMM.

SATA RAID OPERATION

The ICH10R I/O Controller Hub used on the NTM6900 and WTM7026 features Intel® Matrix Storage Technology, which allows the ICH10R's SATA controller to be configured as a RAID controller supporting RAID 0, 1, 5 and 10 implementations. To configure the SATA ports as RAID drives or to use advanced features of the ICH10R, you must install the Intel® Matrix Storage Manager. A link to the software is available under the **Downloads** tab on either the NTM6900 or the WTM7026 product detail web pages located on Trenton's website.

CPU FAN CONNECTION OPTIONS

The motherboard uses a 4-wire fan mounted on each CPU heat sink to ensure proper system operation. These CPU fans connect to P28 for CPU1 and P31 for CPU2. Like the system fan connectors, these fans make use of the ACPI soft control lines via jumpers W2 and W4. Jumper W4 is associated with P28 and W2 works with P31. The factory default settings for W2 and W4 is CLOSED which enables speed control for the CPU fans. If jumpers W2 and W4 are removed, the speed of the CPU fans will not be accurately controlled. Today's processors have internal logic to prevent excessive temperatures from damaging the CPUs should a failure occur with the system's ACPI control signals. The *Advanced Setup* chapter in the manual contains information on the motherboard's ACPI BIOS settings. Motherboards that have BIOS revision TTIRYF27 or later support the speed control functionality for the CPU fans.

SYSTEM FAN CONNECTION OPTIONS

The four chassis fan connections on the NTM6900 and WTM7026 motherboards are labeled: P25, P26, P27 and P30. A system fan speed control jumper (W7, W6, W5 and W3) is associated with each system fan connector and the position of this jumper determines speed control operation. Speed control operation is a function of the fan type used in the chassis design. Three-wire fans and four-wire fans with a PWM control line will behave differently depending on the jumper settings. These jumper settings are shown in the system fan speed control table. The *Advanced Setup* chapter in the manual contains information on the motherboard's ACPI BIOS settings.

System Fan Speed Control Operation	P25 –> W7	P26 –> W6	P27 –> W5	P30 –> W3
4-Wire-System Fans				
System fan speed controlled via ACPI soft control commands * = Factory default W# jumper setting	Closed* - No effect, system fan speed max.	Closed* - No effect, system fan speed max.	Closed* - System fan under ACPI control	Closed* - System fan under ACPI control
System fan speed runs at max speed all of the time	Open – No effect, system fan speed max	Open – No effect, system fan speed max	Open – System fan speed range limited – Not Recommended	Open – System fan speed range limited – Not Recommended
3-Wire System Fans				
System fan speed controlled via ACPI soft control commands * = Factory default W# jumper setting	Closed* - No effect, system fan speed max.	Closed* - No effect, system fan speed max.	Closed* - System fan runs at max. speed	Closed* - System fan runs at max. speed
System fan speed runs at max speed all of the time	Open – No effect, system fan speed max	Open – No effect, system fan speed max	Open – System fan has some limited speed control	Open – System fan has some limited speed control

System fans connected to connectors P25 and P26 will always run at full speed because the W7 and W6 control jumpers have no effect regardless of position. Alternatively, system fans connected to P27 or P30 may vary in speed based on the temperature sensor readings and the associated ACPI soft control signal commands. The *Advanced Setup* chapter in the manual contains information on the motherboard's ACPI BIOS settings. Motherboards that have BIOS revision TTIRYF27 or later support the speed control functionality for the system fans.

PCI EXPRESS OPTION CARD SLOT CONFIGURATIONS

There are six PCI Express® option card slots supported on Trenton's Extended ATX motherboards. Five of these slots (PCIe7, PCIe6, PCIe5, PCIe4 and PCIe2) support either PCI Express 2.0 or 1.1 option cards. PCIe3 is a PCI Express slot dedicated to supporting PCIe 1.1 option cards. Slots 2, 4 and 6 are x16 mechanical slots driven with x8 PCIe electrical links. Slots 3, 5, and 7 are x8 mechanical slots driven with x4 PCIe electrical links.

PCI CARD SLOT CONFIGURATION

There is an additional PCI slot supported on the motherboard to enable a mix of option card bus technologies. The PCI card slot is labeled PCI-1 and the slot is configured with a 32-bit/33MHz parallel PCI bus interface. The motherboard's PCI slot supports 5V or Universal PCI cards.

ENVIRONMENTAL AND SYSTEM AIRFLOW CONSIDERATIONS

Trenton has performed many hours of thermal testing on the motherboard under a variety of simulated system conditions using different processor options. The system design using the NTM6900 or WTM7026 should provide a chassis airflow of 350LFM over the motherboard. The steady state operating temperature range specification for the Trenton NTM6900 motherboard is 0° C to 50° C (32° F to 122° F).

Trenton's thermal testing methodology is engineering driven, verifiable and conservative in order to ensure long-lasting and reliable system operations under varying environmental conditions. We have validated proper board operation with typical temperature excursions 10% above the motherboard's stated maximum operating temperature. Operating temperature excursions below 0° C have also been verified in Trenton's labs. The amount and duration of these extended temperature excursions are application dependent. Contact Trenton to discuss your specific system's environmental parameters should you need to exceed our published operating temperature range specification.

FOR MORE INFORMATION

For more information on any of these features, refer to the appropriate sections *NTM6900 / WTM2026 Technical Reference Manual* (#87-006903-000 / #87-007029-000). The latest manual revision may be found on Trenton's website - www.TrentonTechnology.com.

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Chapter 1 Specifications

Introduction

The NTM6900 and WTM7026 are long-life, Extended ATX motherboards that support one or two, dual/quad-core, Intel® Xeon® 5500 Series and quad/six-core Intel® Xeon® 5600 Series processors respectively. The series 5500 CPUs used on the NTM6900 are based on the Nehalem-EP micro-architecture while the series 5600 processors utilized on the WTM7026 use the Westmere-EP micro-architecture. The Westmere-EP processors feature Intel® TXT support and Intel® Hyper-Threading. Both processor types feature three dual-channel DDR3 direct memory interfaces into each processor. All twelve (12) DDR3 DIMM slots are available for use in a dual-processor board configuration and can theoretically support up to 144GB of total system memory. However, the market realities for PC3-10600, PC3-8500 or PC3-6400 memory modules limit this maximum capacity to 96GB. The maximum amount of system memory supported is cut in half with a single processor motherboard configuration. The NTM6900/WTM7026 motherboard architecture is based upon the proven Intel® 5520 (i.e. Tylersburgh) chipset with the Intel® ICH10R I/O Controller Hub. Trusted Computing applications are supported by the motherboard's built-in TPM 1.2 component and the TPM header. A Graphic Processing Unit (GPU) provides an additional 8MB of dedicated video memory that enables a system to support WUXGA video resolutions (i.e. 1920 x 1200 pixels) at a 64k color depth on the board's built-in video port. Standard audio ports are available on the motherboard's I/O plate along with four 10/100/1000Base-T Ethernet interfaces and eight USB 2.0 ports. Additional PS/2 mouse and keyboard ports for legacy input devices are also available for use on the I/O plate. On-board headers support two RS-232 serial ports, two additional USB 2.0 interfaces and six SATA/300 ports. These SATA/300 ports support either independent SATA drives or RAID 0, 1, 5 and 10 drive arrays.

Here is a listing of all the possible Intel® processors supported on Trenton's NTM6900 and WTM7026 embedded motherboards. The Trenton model number for your motherboard indicates the processors that were installed on the motherboard at our factory. This information may prove useful for any component driver support questions that may arise regarding your final system configuration.

Dual-Processor NTM6900 Models

Model #	Model Name	Speed	Intel® CPU Brand Number
Two Intel Xeon 5500 Series Processors – Dual Core, 4.8GT/s, 4MB cache			
6900-005	NTM/1.86DM	1.86GHz	E5502
6900-007	NTM/2.20DM	2.20GHz	E5503
Two Intel Xeon 5500 Series LV Processors – Dual Core + Hyper-Threading, 5.86GT/s, 8MB cache			
6900-030	NTM/2.0DLN	2.0GHz	L5508 (embedded)
Two Intel Xeon 5500 Series Processors – Quad Core, 4.8GT/s, 4MB cache			
6900-106	NTM/2.0QM	2.0GHz	E5504 (embedded)
6900-107	NTM/2.13QM	2.13GHz	E5506
6900-108	NTM/2.26QM	2.26GHz	E5507
Two Intel Xeon 5500 Series Processors – Quad Core + Hyper-Threading, 5.86GT/s, 8MB cache			
6900-208	NTM/2.26QN	2.26GHz	E5520
6900-210	NTM/2.40QN	2.40GHz	E5530
6900-211	NTM/2.53QN	2.53GHz	E5540 (embedded)
Two Intel Xeon 5500 Series LV Processors – Quad Core, 4.8GT/s, 4MB cache			
6900-307	NTM/2.13QLM	2.13GHz	L5506
Two Intel Xeon 5500 Series LV Processors – Quad Core + Hyper-Threading, 5.86GT/s, 8MB cache			
6900-407	NTM/2.13QLN	2.13GHz	L5518 (embedded)
6900-408	NTM/2.26QLN	2.26GHz	L5520
6900-410	NTM/2.40QLN	2.40GHz	L5530

Dual-Processor WTM7026 Models

Model #	Model Name	Speed	Intel® CPU Brand Number
Two Intel Xeon 5600 Series Processors – Six Core, 5.86GT/s, 12MB cache			
7026-610	WTM/2.4MN	2.4GHz	E5645 (embedded)
Two Intel Xeon 5600 Series LV Processors – Six Core, 5.86GT/s, 12MB cache			
7026-631	WTM/2.0MLN	2.0GHz	L5638 (embedded)
7026-633	WTM/2.26MLN	2.26GHz	L5640
Two Intel Xeon 5600 Series Processors – Quad Core, 5.86GT/s, 12MB cache			
7026-710	WTM/2.4QN	2.4GHz	E5620 (embedded)
7026-711	WTM/2.53QN	2.53GHz	E5630
7026-712	WTM/2.66QN	2.66GHz	E5640
Two Intel Xeon 5600 Series Processors – Quad Core, LV, 5.86GT/s, 12MB cache			
7026-730	WTM/1.87QLN	1.87GHz	L5618 (embedded)
7026-732	WTM/2.13QLN	2.13GHz	L5630

NOTE: The term “embedded” in the Intel® CPU Brand Number column indicates a processor speed targeted by Intel® for long-life availability and support. The length of support ranges from five years to over seven years. Contact Trenton for additional details.

Single-Processor NTM6900 Models

Model #	Model Name	Speed	Intel® CPU Brand Number
One Intel Xeon 5500 Series Processor – Dual Core, 4.8GT/s, 4MB cache			
6900-045	NTMS/1.86DM	1.86GHz	E5502
6900-047	NTMS/2.20DM	2.20GHz	E5503
One Intel Xeon 5500 Series LV Processor – Dual Core + Hyper-Threading, 5.86GT/s, 8MB cache			
6900-070	NTMS/2.0DLN	2.0GHz	L5508 (embedded)
One Intel Xeon 5500 Series Processor – Quad Core, 4.8GT/s, 4MB cache			
6900-146	NTMS/2.0QM	2.0GHz	E5504 (embedded)
6900-147	NTMS/2.13QM	2.13GHz	E5506
6900-148	NTMS/2.26QM	2.26GHz	E5507
One Intel Xeon 5500 Series Processor – Quad Core + Hyper-Threading, 5.86GT/s, 8MB cache			
6900-248	NTMS/2.26QN	2.26GHz	E5520
6900-250	NTMS/2.40QN	2.40GHz	E5530
6900-251	NTMS/2.53QN	2.53GHz	E5540 (embedded)
One Intel Xeon 5500 Series LV Processor – Quad Core, 4.8GT/s, 4MB cache			
6900-347	NTMS/2.13QLM	2.13GHz	L5506
One Intel Xeon 5500 Series LV Processor – Quad Core + Hyper-Threading, 5.86GT/s, 8MB cache			
6900-447	NTMS/2.13QLN	2.13GHz	L5518 (embedded)
6900-448	NTMS/2.26QLN	2.26GHz	L5520
6900-450	NTMS/2.40QLN	2.40GHz	L5530

Single-Processor WTM7026 Models

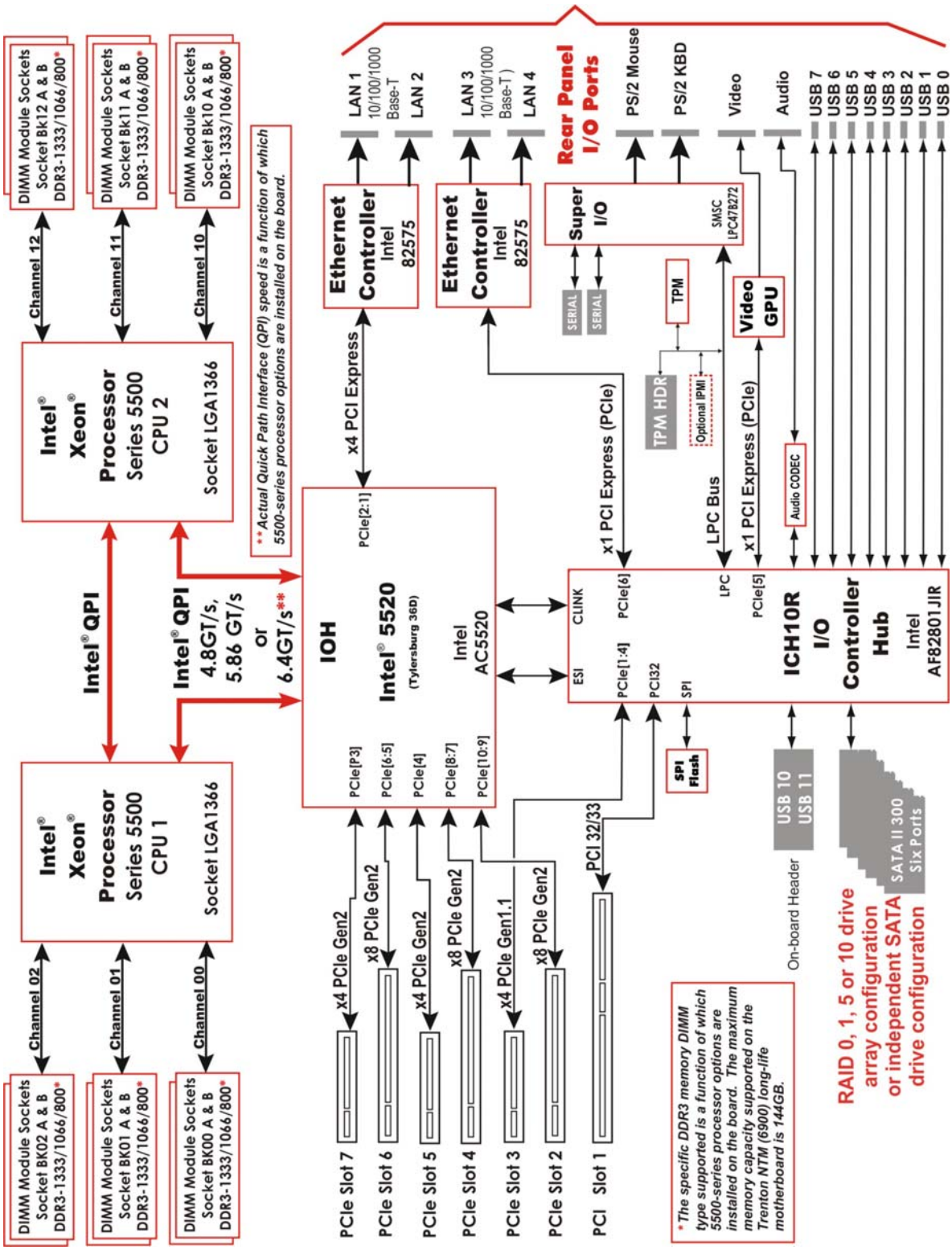
Model #	Model Name	Speed	Intel® CPU Brand Number
One Intel Xeon 5600 Series Processor – Six Core, 5.86GT/s, 12MB cache			
7026-650	WTMS/2.4MN	2.4GHz	E5645 (embedded)
One Intel Xeon 5600 Series LV Processor – Six Core, 5.86GT/s, 12MB cache			
7026-671	WTMS/2.0MLN	2.0GHz	L5638 (embedded)
7026-673	WTMS/2.26MLN	2.26GHz	L5640
One Intel Xeon 5600 Series Processor – Quad Core, 5.86GT/s, 12MB cache			
7026-750	WTMS/2.4QN	2.4GHz	E5620 (embedded)
7026-751	WTMS/2.53QN	2.53GHz	E5630
7026-752	WTMS/2.66QN	2.66GHz	E5640
One Intel Xeon 5600 Series Processor – Quad Core, LV, 5.86GT/s, 12MB cache			
7026-770	WTMS/1.87QLN	1.87GHz	L5618 (embedded)
7026-772	WTMS/2.13QLN	2.13GHz	L5630

NOTE: The term “embedded” in the Intel® CPU Brand Number column indicates a processor speed targeted by Intel® for long-life availability and support. The length of support ranges from five years to over seven years. Contact Trenton for additional details.

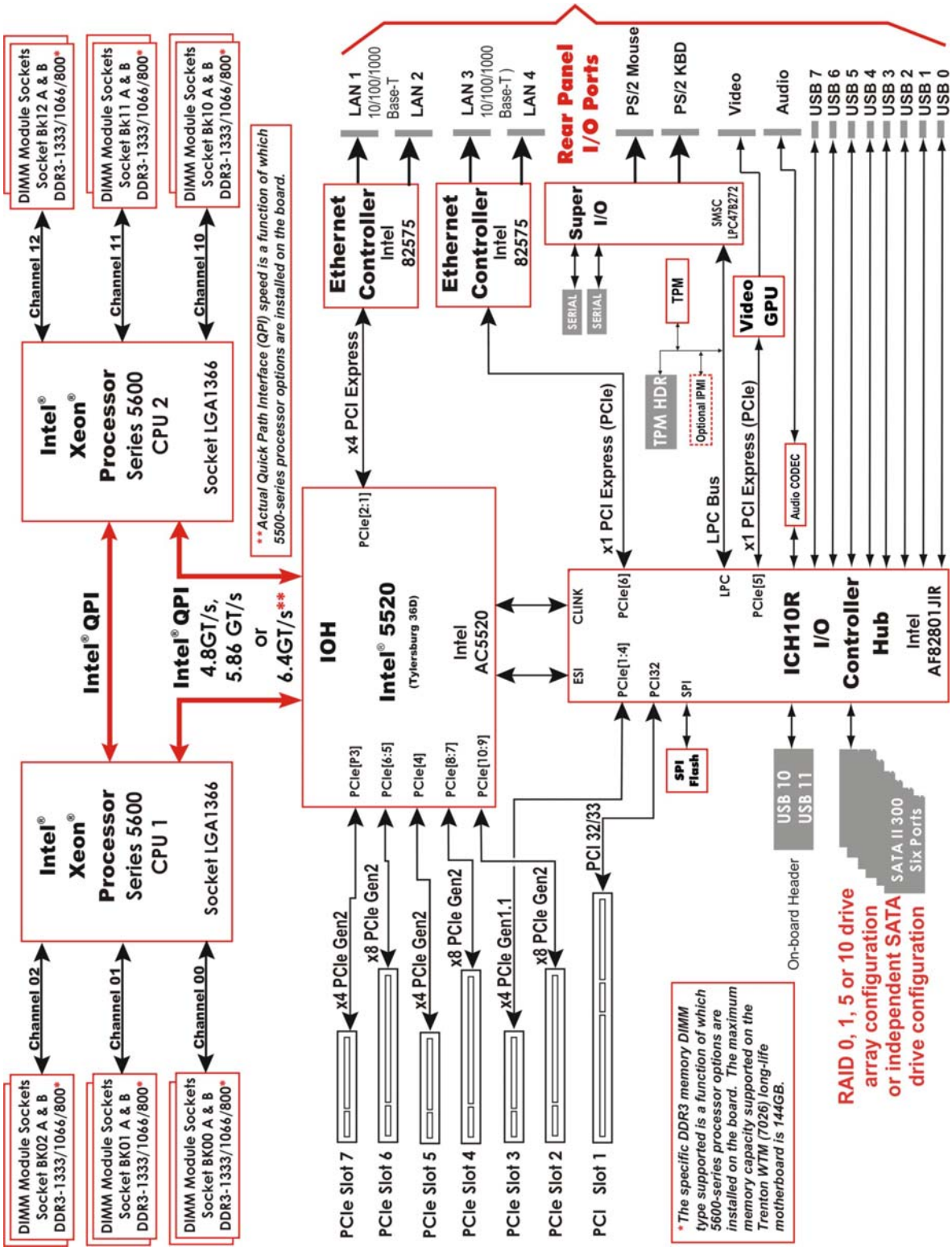
Features

- Extended ATX motherboard form factor complies with the SSI-EEB Enterprise Electronics Bay Specification 2008, Revision 1.1
- NTM6900 - Two, Intel® Xeon® Series 5500 (Nehalem-EP), Quad Core Processors
  - Intel® Virtualization and Intel® VT-D on all CPUs
  - Intel® Hyper-Threading available on selected CPUs
- WTM7026 - Two, Intel® Xeon® Series 5600 (Westmere-EP), Six Core Processors
  - Intel® Trusted Execution Technology (Intel® TXT) on all CPUs
  - Intel® Virtualization and Intel® VT-D on all CPUs
  - Intel® Hyper-Threading available most CPUs
- Intel® 5520 chipset (Tylersburg) with 4.8GT/s, 5.86GT/s or 6.4GT/s Intel® Quick Path Interconnect (Intel® QPI) support
  - I/O Controller Hub - Intel® ICH10R with built-in SATA/300 RAID support
- Six, dual-channel, DDR3-1333 memory interfaces
- Twelve, DIMM slots with a maximum capacity of 144GB of Double Data Rate (DDR3) system memory
- Seven option card slots
  - Five PCI Express® 2.0 or 1.1 slots
  - One PCI Express 1.1 slot
  - One 32-bit/33MHz PCI slot
- Four, 10/100/1000Base-T Ethernet interfaces
- Six, SATA/300 ports support independent SATA storage devices or may be configured to support RAID 0, 1, 5 or 10 implementations
- Trusted Computing support via an on-board TPM 1.2
- Ten, Universal Serial Bus (USB 2.0) interfaces
  - Eight USB ports are located on the motherboard's I/O plate
  - Two, USB ports are available via an on-board header
- Two, RS-232 serial communication ports available via on-board headers
- Video port driven with Graphics Processing Unit (GPU) with 8MB of video memory to support WUXGA resolutions (i.e. 1920 x 1200 pixels) at a 64k color depth
- Standard audio ports located on the motherboard's I/O plate
- PS/2 keyboard and mouse ports located on the motherboard's I/O plate
- Four, fan power headers simplify the integration of the system cooling solution
- Full PC compatibility

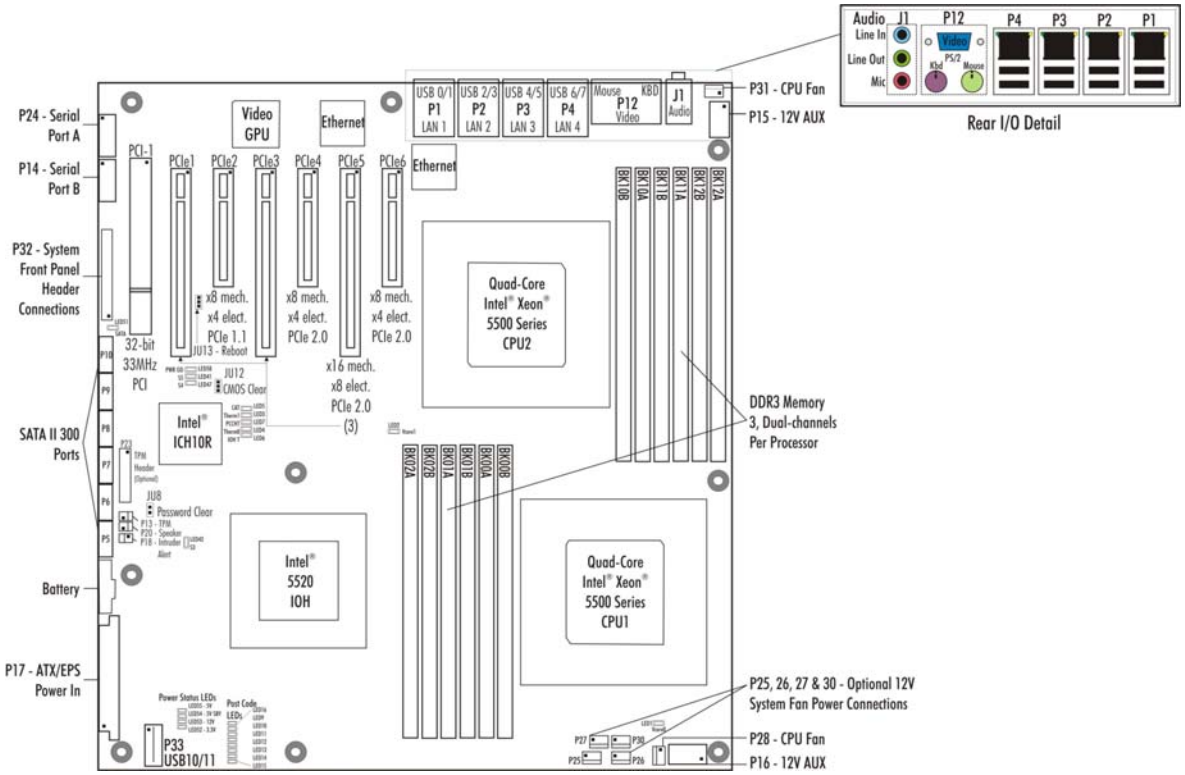
NTM6900 (6900-xxx) – Extended ATX Motherboard Block Diagram



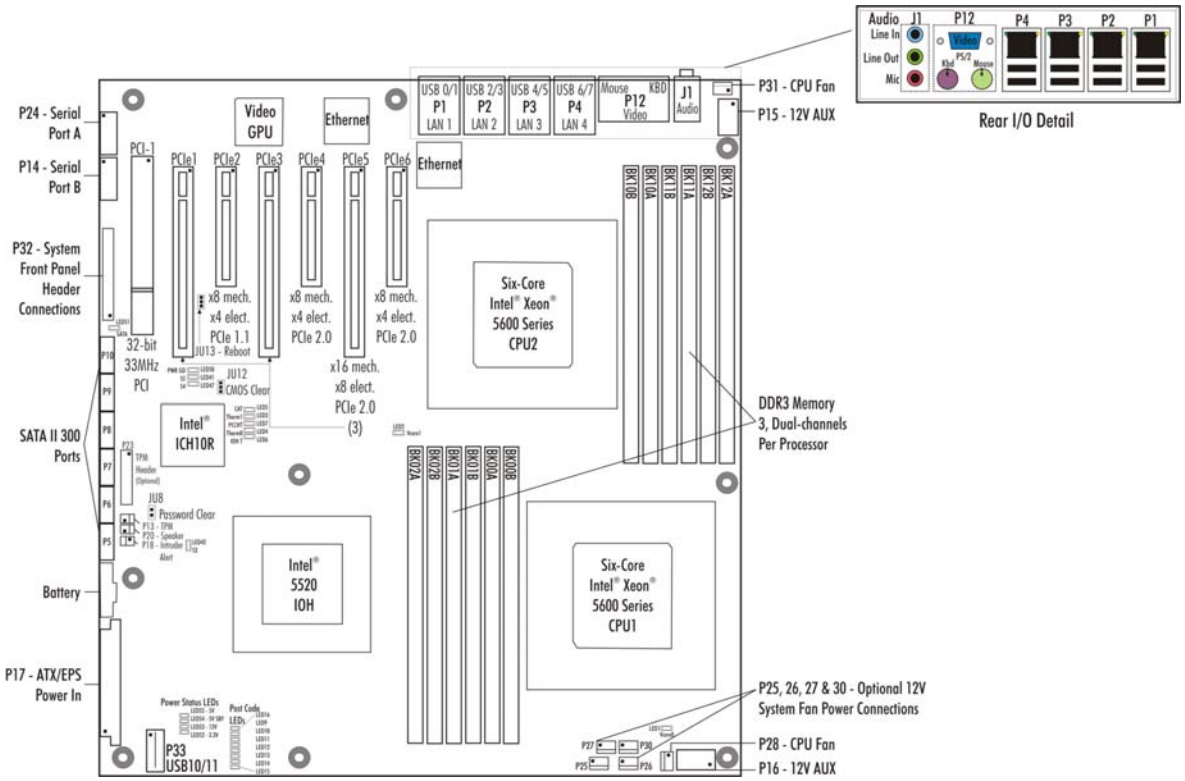
WTM7026 (7026-xxx) – Extended ATX Motherboard Block Diagram



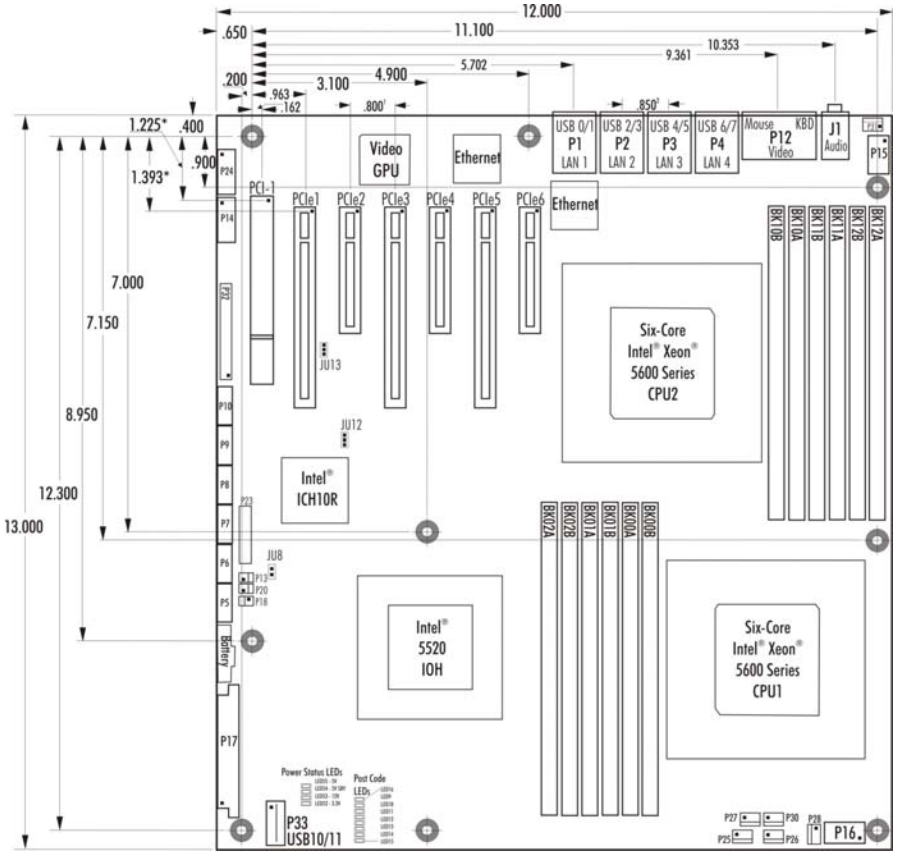
NTM6900 (6900-xxx) – Extended ATX Motherboard Layout



WTM7026 (7026-xxx) – Extended ATX Motherboard Layout



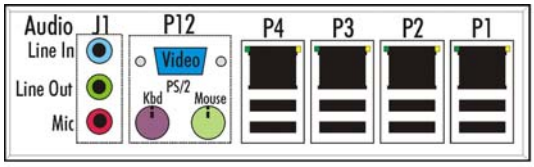
NTM6900 (6900-xxx) / WTM7026 (7026-xxx) – Extended ATX Motherboard Dimension Drawing



Notes:

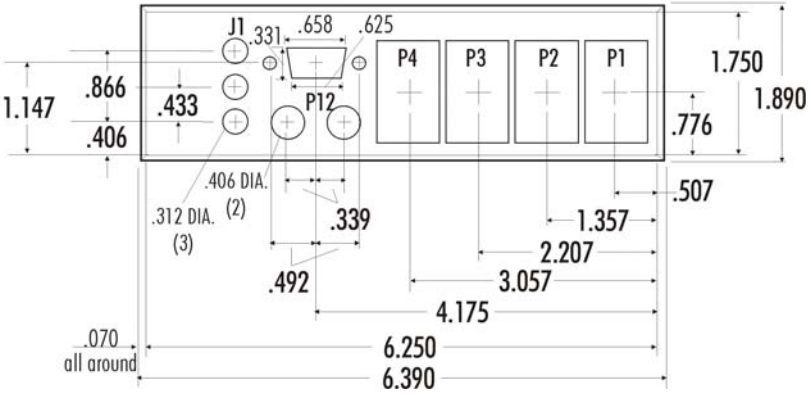
- All dimensions are inches
- Typical PCIe pin 1 location is 0.049” from connector center
- Typical PCI pin 1 location is 0.150” from connector center
- Mounting holes have a nominal 0.156” diameter
- Italic text indicates the center dimension of a card slot or I/O connector
- Superscript 1 indicates card slot center spacing
- Superscript 2 indicated I/O connector center spacing
- The system power supply must provide +12V power to both 12V AUX power connectors (P15 and P16) for proper motherboard operation

NTM6900 (6900-xxx) / WTM7026 (7026-xxx) – Rear I/O Plate Dimension Drawing



Rear I/O Layout

Rear I/O Plate Dimensions



Processor

- Intel® Xeon® Processor, 5500 Series, Quad or Dual-Core (NTM6900)
- Intel® Xeon® Processor, 5600 Series, Six or Quad-Core (WTM7026)
- Processor plugs into an LGA1336 socket

Bus Interface
PCI Express® 2.0 compatible and supports a PCI Local Bus

Data Path
DDR3-1333 Memory - 72-bit
PCI Express 2.0 & 1.1, x4 and x8 electrical links
PCI Bus - 32-bit

Serial Interconnect & Bus Speeds
PCI Express 2.0 – 5.0GHz per lane
PCI Express 1.1 – 2.5GHz per lane
PCI – 33MHz

Quick Path Interconnect Speeds
The Intel® 5520 chipset supports 4.8GT/s, 5.86GT/s or 6.4GT/s data transfer speeds between processors and between the processors and the motherboard's IOH. The speed of the Intel® QPI depends on the type of CPU installed. The Quick Path Interconnect enables both processor-to-processor resource sharing and fast data transfers between CPUs and the Intel® 5520 IOH.

Memory Interfaces
Three, dual-channel, Double Data Rate (DDR3) memory channels support PC3-10600, PC3-8500 or PC3-6400 DIMMS connected directly to the processors. These memory interfaces may operated at speeds up to 1333MHz depending on the type of DDR3 DIMMs installed.

DMA Channels
The motherboard is fully PC compatible with seven DMA channels, each supporting type F transfers.

Interrupts
The motherboard is fully PC compatible with interrupt steering for PCI plug and play compatibility.

BIOS (Flash)
The BIOS is an AMIBIOS8® with built-in advanced CMOS setup for system parameters, peripheral management for configuring on-board peripherals and other system parameters. The BIOS resides in the Atmel® AT25128 SPI Serial EEPROM (SPI Flash). The BIOS may be upgraded from a USB thumb drive storage device by pressing **<Ctrl> + <Home>** immediately after reset or power-up with the USB device installed in drive A:. Custom BIOSs are available.

Cache Memory
The processors include either a 4MB, 8MB or 12MB last-level cache (LLC) memory capacity that is equally shared between all of the processor cores on the die. Each individual processor core also has 256k mid-level cache (MLC), a 32k L1 instruction cache and a 32k L1 data cache.

DDR3 Memory

Each processor on the motherboard supports three, dual-channel, DDR3-1333 memory interfaces. There are twelve DIMM sockets on the board and each one can support up to 12GB DIMMs for a total possible DDR3 system memory capacity of 144GB. DDR3 memory capacities of 2GB, 4GB and 8GB are more common in today's market; thereby, making the maximum practical limit of system memory supported 96GB. The memory channel transfer rates is 1333MHz when using PC3-10600 (i.e. DDR3-1333) DIMMs. Each of the channels (BK##A and BK##B) terminates with two dual in-line memory module (DIMM) sockets. The System BIOS automatically detects memory type, size and speed.

The motherboard uses industry standard gold finger memory modules, which must be PC3-10600, PC3-8500 or PC3-6400 compliant and have the following features:

- Gold-plated contacts
- ECC registered (72-bit) DDR3 memory
- 240-pin

The following DIMM sizes are supported:

MT/s	DIMM Type	Rank	Component Density
1333	PC3-10600	Single, Dual, Quad	1GB, 2GB, 4GB, 8GB, 12GB
1066	PC3-8500	Single, Dual, Quad	1GB, 2GB, 4GB, 8GB, 12GB
800	PC3-6400	Single, Dual, Quad	256MB, 512MB, 1GB, 2GB

NOTE 1: To maximize memory interface speed, populate each memory channel with DDR3 DIMMs having the same interface speed. The motherboard will support DIMMs with different speeds, but the memory channel interface will operate speed of the slowest DIMM.

NOTE 2: Low voltage (DDR3L) DIMMs are not supported.

NOTE 3: PC3-10600 DIMMs (DDR3-1333) are supported when one DIMM per channel is populated. If two PC3-10600 DIMMs are installed in the same channel then the BIOS will log an error and operate the memory channel at 1066 MT/s.

NOTE 4: Populating the memory channels with DIMMs having different speeds is supported on the motherboard; however, the overall memory interface speed will run at the speed of the slowest DIMM.

NOTE 5: If populating a memory channel with a Quad-rank and a Single- or Dual-rank DIMM place the Quad-rank DIMM farthest from the processor.

NOTE 6: Populate the memory channels starting with the DIMM socket farthest from the CPU and work you way toward the processor as illustrated in the chart below:

Population order	CPU1	CPU2
1	BK02A	BK12A
2	BK01A	BK11A
3	BK00A	BK10A
4	BK02B	BK12B
5	BK01B	BK11B
6	BK00B	BK10B

If populating a memory channel with a Quad-rank and a Single- or Dual-rank DIMM place the Quad-rank DIMM farthest from the processor.

PCI Express Option Card Slots
There are six PCI Express® option card slots supported on the motherboard. Five of these slots (PCIe7, PCIe6, PCIe5, PCIe4 and PCIe2) support either PCI Express 2.0 or 1.1 option cards. PCIe3 is a PCI Express slot dedicated to supporting PCIe 1.1 option cards. Slots 2, 4 and 6 are x16 mechanical slots driven with x8 PCIe electrical links. Slots 3, 5, and 7 are x8 mechanical slots driven with x4 PCIe electrical links. PCI Express 2.0 bas a base frequency per lane of 5.0GHz while PCIe 1.1 runs at half of this speed or 2.5GHz per lane. The PCI Express auto-negotiation capability built-in to the motherboards' PCIe interface controllers enable support for PCI Express option cards with x16, x8, x4 and x1 PCIe 2.0 or 1.1 electrical links. The PCIe interfaces on the option cards must also support PCI Express auto-negotiation as per the PCI Express Base Specification. Refer to the PCI Express chapter of this manual for more information.

PCI Option Card Slot
A 32-bit/33MHz option card slot is available on the motherboard to enable system support for an option card with a parallel bus interface. This card slot accepts either 5V or universal voltage PCI cards

Universal Serial Bus (USB)
The motherboard supports up to ten on-board high-speed USB 2.0 ports. Connectors for eight of the USB interfaces (0 and 7) are rear panel I/O port, while the remaining two interfaces are available via an on-board header.

Video Interface
The motherboard supports a standard VGA video connector located at the rear of the motherboard. The video port is driven with a Graphics Processing Unit (GPU) with 8MB of video memory. This enables video support for WUXGA resolutions (i.e. 1920 x 1200 pixels) at a 64k color depth.

Ethernet Interfaces
Four 10/100/1000Base-T Ethernet ports are located at the rear of the motherboard. Two Intel® 82575 Ethernet controllers with dual-channel outputs are driven with PCI Express communication links on the motherboard. This motherboard design feature ensures that the final system solution supports fastest Ethernet network communications possible. The Ethernet interfaces are compliant with the IEEE 802.3 Specification.

The main components of the Ethernet interfaces are:

- Intel® 82575 for dual 10/100/1000-Mb/s media access control (MAC) with SYM, a serial ROM port and a PCIe interface
- Serial ROM for storing the Ethernet address and the interface configuration and control data
- Integrated RJ-45/Magnetics module connectors on the motherboards require category 5 (CAT5) unshielded twisted-pair (UTP) 2-pair cables for a 100-Mb/s network connection or category3 (CAT3) or higher UTP 2-pair cables for a 10-Mb/s network connection. Category 5e (CAT5e) or higher UTP 2-pair cables are recommended for a 1000-Mb/s (Gigabit) network connection.
- Link status and activity LEDs on the I/O bracket for status indication (See *Ethernet LEDs and Connectors* later in this chapter.)

Software drivers are supplied for most popular operating systems.

Serial ATA/300 Ports
The motherboard's six Serial ATA 300 (SATA/300) ports comply with the SATA II specification and support six independent SATA storage devices such as hard disks and CD-RW devices. SATA produces higher performance interfacing by providing data transfer rates up to 300MB per second on each port. The ICH10R I/O Controller Hub features Intel® Matrix Storage Technology, which allows the ICH10R's SATA controller to be configured as a RAID controller supporting RAID 0, 1, 5 and 10 implementations.

Audio Interface
Standard audio ports located at the rear of the motherboard support the Line In, Line Out and MIC audio functions.

Trusted Platform Module (TPM 1.2)
The motherboard is compliant with version 1.2 of the Trusted Computing Group specification for Trusted Platform Modules via the us of the Atmel® ATC97SC3203 TPM.

Battery
A built-in lithium battery is provided, for ten years of data retention for CMOS memory.

CAUTION: There is a danger of explosion if the battery is incorrectly replaced. Replace it only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

System BIOS Setup Utility
The System BIOS is an AMIBIOS8® with a ROM-resident setup utility. The BIOS Setup Utility allows you to select to the following categories of options:

- Main Menu
- Advanced Setup
- PCIPnP Setup
- Boot Setup
- Security Setup
- Chipset Setup
- Exit

Each of these options allows you to review and/or change various setup features of your system. Additional BIOS utility details are provided in the BIOS chapters of this manual.

Power Requirements
The following are typical values:

Processor Type	Processor Speed	+5V	+12V	+3.3V
CPU Idle State with 12GB of system memory:				
Intel® Xeon® E5645	2.40GHz	4.59A	7.77A	1.98A
Intel® Xeon® L5638	2.00GHz (LV)	4.60A	7.60A	2.06A
Intel® Xeon® E5540	2.53GHz	4.59A	7.87A	1.87A
Intel® Xeon® E5504	2.00GHz	4.41A	8.04A	1.93A
100% CPU Stress State with 12GB of system memory:				
Intel® Xeon® E5645	2.40GHz	4.61A	13.70A	2.15A
Intel® Xeon® L5638	2.00GHz (LV)	4.61A	11.21A	2.04A
Intel® Xeon® E5540	2.53GHz	4.60A	12.79A	1.92A
Intel® Xeon® E5504	2.00GHz	4.42A	11.67A	1.91A

Tolerance for all voltages is +/- 5%

CAUTION: Trenton recommends an EPS type of power supply for systems using high-performance processors. Dual +12V power connectors are provided on the motherboard and must be used when using dual Intel® Xeon® Series 5500 processors.

Temperature/Environment
Operating Temperature: 0º C. to 50º C.

Air Flow Requirement: 350LFM continuous airflow

Storage Temperature: - 40º C. to 70º C.

Humidity: 5% to 90% non-condensing

Mechanical
The Extended ATX form factor of the motherboard complies with the SSI-EEB 2008 – Rev. 1.0 industry standard for overall board dimensions [12.0" (30.5cm) x 13.0" (33.1cm)] and mounting-hole placements. The motherboard's standard height cooling solution is designed for 2U and greater chassis heights.

UL Recognition
This motherboard is designed to meet UL60950 and CAN/CSA C22.22 No. 60950-00.

Configuration Jumpers
The setup of the configuration jumpers on the motherboard is described below. An asterisk (*) indicates the default value of each jumper.
NOTE: For the three-position jumper, "TOP" is toward the bracket end of the board; "BOTTOM" is toward the Post Code LEDs.

JU8 **Password Clear** (two position jumper)
Install for one power-up cycle to reset the password to the default (null password).
Remove for normal operation. *

JU12 **CMOS Clear** (three position jumper)
Install on the TOP to clear.
Install on the BOTTOM to operate. *
NOTE: To clear the CMOS, power down the system and install the jumper on the TOP. Wait for at least two seconds, move the jumper back to the BOTTOM and turn the power on. When AMIBIOS displays the "CMOS Settings Wrong" message, press F1 to go into the BIOS Setup Utility, where you may reenter your desired BIOS settings, load optimal defaults or load failsafe defaults.

W2, W4 **CPU Fan Speed Control** (two position jumper)
Install to run CPU fan at full speed*
Remove to enable ACPI soft control of the CPU cooling fan
Note: W2 jumper is connected to CPU1 fan header P28 and W4 is for CPU2 fan header P31

W3, W5, W6, W7 **System Fan Speed Control** (two position jumper)
4-Wire-System Fans
W7 – Closed* = No effect, system fan runs at maximum speed
W6 – Closed* = No effect, system fan runs at maximum speed
W5 – Closed* = System fan under ACPI control
W3 – Closed* = System fan under ACPI control

W7 – Open = No effect, system fan runs at maximum speed
W6 – Open = No effect, system fan runs at maximum speed
W5 – Open = System fan speed range limited, NOT RECOMMENDED
W3 – Open = System fan speed range limited, NOT RECOMMENDED

3-Wire System Fans
W7 – Closed* = System fan speed runs at max speed all of the time
W6 – Closed* = System fan speed runs at max speed all of the time
W5 – Closed* = System fan speed runs at max speed all of the time
W3 – Closed* = System fan speed runs at max speed all of the time
---
W7 – Open = No effect, system fan runs at maximum speed
W6 – Open = No effect, system fan runs at maximum speed
W5 – Open = System fan has some limited speed control
W3 – Open = System fan has some limited speed control

Note: The following jumpers provide the speed control capability to the system fan headers listed below; W3 – P30, W5 – P27, W6 – P26 and W7 – P25.

W8 **PSON Soft Control** (two position jumper)
Install to enable ACPI soft control of the PSON signal line*
Remove to disable PSON control

Ethernet LEDs and Ethernet Connectors

P1, P2, P3 and P4 Ethernet LEDs

The I/O bracket houses the four RJ-45 network connectors for Ethernet LAN1, LAN2, LAN3 and LAN2. Each LAN interface connector has two LEDs that indicate activity status and Ethernet connection speed. Listed below are the possible LED conditions and status indications for each LAN connector:

LED/Connector	Description
Activity LED	This green LED indicates network activity. This is the LED closest to connector P12 on the LAN connector.
Off	No current network transmit or receive activity
On (flashing)	Indicates network transmit or receive activity.
Link Speed LED	This green/yellow LED identifies the connection speed. This is the LED farthest from connector P12 on the LAN connector.
Off	Indicates a valid link at 1000-Mb/s
On	Indicates a valid link at 100-Mb/s.
RJ-45 Network Connectors	The RJ-45 network connector requires a Connectors category 5 (CAT5) unshielded twisted-pair (UTP) 2-pair cable for a 100-Mb/s network connection or a category 3 (CAT3) or higher UTP 2-pair cable for a 10-Mb/s network connection. A category 5e (CAT5e) or higher UTP 2-pair cable is recommended for a 1000-Mb/s (Gigabit) network connection.

Motherboard Status LEDs

LED1 and LED2 – Processor Power LEDs

LED1 is located just above the P28 CPU Fan1 connector in the lower right corner of the motherboard. LED2 is located near the center of the board and just above and to the left of memory DIMM socket BK02A. These red LEDs are off during normal motherboard operations. If the LEDs are on, this indicates that the processor's VCC voltage levels are below the required levels to maintain proper CPU operations.

LED3 and LED4 – Processor Thermal Throttling LEDs

The processor throttling LEDs for each CPU are labeled LED3 and LED4, and located to the right on the Intel ICH10 Southbridge. LED3 indicates the thermal shutdown status of CPU2 and likewise LED4 monitors the thermal of CPU1 as illustrated below:

LED Status	Description
Off	Indicates the processor is operating within acceptable thermal levels.
On (flashing)	Indicates the processor is throttling down to a lower operating speed due to rising CPU temperature.
On (solid orange)	Indicates the processor has reached the thermal shutdown threshold limit. The motherboard is still operating, but a thermal shutdown may soon occur.

NOTE: When a thermal shutdown occurs, the LED will stay on in systems using non-ATX/EPS power supplies. The processor will cease functioning, but power will still be applied to the motherboard. In systems with ATX/EPS power supplies the LED will turn off when a thermal shutdown occurs because system power is removed via the ACPI soft control power signal S5. In this case, all motherboard LEDs will turn off; however, stand-by power will still be on.

LED5 – CAT

When LED5 is illuminated this indicates that a catastrophic error has occurred in the system and the motherboard's processor(s) cannot continue to operate. The processor(s) will turn this LED on for non-recoverable machine check errors and other internal unrecoverable errors.

LED6 - IOH Thermal Throttling LED

The IOH throttling LED is located to the right on the Intel ICH10 Southbridge. LED6 indicates the thermal shutdown status of the IOH as illustrated below:

LED Status	Description
Off	Indicates the IOH is operating within acceptable thermal levels.
On (flashing)	Indicates the IOH is throttling down to a lower operating speed due to rising IOH temperature.
On (solid orange)	Indicates the IOH has reached the thermal shutdown threshold limit. The motherboard is still operating, but a thermal shutdown may soon occur.

NOTE: When a thermal shutdown occurs, the LED will stay on in systems using non- ATX/EPS power supplies. The IOH will cease functioning, but power will still be applied to the motherboard. In systems with ATX/EPS power supplies, the LED will turn off when a thermal shutdown occurs because system power is removed via the ACPI soft control power signal S5. In this case, all motherboard LEDs will turn off; however, stand-by power will still be present.

LED7 – PRCHT

This is the "Processor Hot" LED and it will turn on when a processor's temperature monitoring sensor detects that the CPU has reached its maximum safe operating temperature. This indicates that the processor's Thermal Control Circuit has been activated, if enabled.

POST Code LEDs

As the POST (Power On Self Test) routines are performed during boot-up, test codes are displayed on Port 80 POST Code LEDs 16, 9, 10,11,12,13,14 and 15. These LED are located in the lower left corner of the motherboard to the right of the power status LEDs. The POST Code LEDs and are numbered from top (position 1 = LED16) to bottom (position 8 – LED15). Refer to the board layout diagram for the exact location of the POST code LEDs.

These POST codes may be helpful as a diagnostic tool. Specific error codes are listed in Appendix A - BIOS Messages section of the NTM6900 Technical Reference Manual, along with a chart to interpret the LEDs into hexadecimal format.

LED41 – S5 State

This is a green LED that when it is it on indicates that the motherboard has entered the S5 or OFF state. In the S5, state the system is in a complete shutdown mode. The system/motherboard must be rebooted in order to recover from the S5 state.

LED42 – S3 State

When this green LED is on it indicates that the motherboard has entered the S3 SLEEP state. Any processor instructions, cache contents or chipset instructions that were pending when the motherboard entered the S3 state are lost. System memory is retained during the S3 sleep state.

LED47 – S4 State

If this green LED is on it indicates that the motherboard has entered the S4 or HIBERNATE state. This sleep state consumes less power than the S3 state. A small amount of power is used to support writing any pending data to the system's hard drive. System memory contents are not retained in the S4 sleep state.

LED52 – 3.3V Level
LED52 is at the bottom of a group of power status LEDs located in the lower left corner of the motherboard near USB header connector P33. When this green LED is on the 3.3V level is in the proper range for the board.

LED53 – 12V Level
LED53 is just above LED52 and this green LED indicates that the 12V level is in the proper range for the board.

LED54 – 5V Standby
LED54 is just above LED53 and this green LED represents what amounts to a caution indicator. When this LED is on the 5V stand by voltage is present on the motherboard. Option cards and any other motherboard components must not be removed or installed when the LED 54 is illuminated.

CAUTION: Never remove or install option cards or any other system components while LED54 is illuminated.

LED55 – 5V Level
LED55 is just above LED54 and this green LED indicates that the 5V level is in the proper range for the board.

LED58 – Power Good
Located just below the PCIe1 card slot, when this green LED is turned on it indicates that each system power level is at the proper operating level required by the motherboard.

Motherboard Connectors

NOTE:
A connectors square solder pad located on the bottom side of the PCB indicates pin 1.

P1, P2, P3, P4 - 10/100/1000Base-T Ethernet and Dual USB Combo Connectors - LAN1 + USB0/USB1, LAN2 + USB2/USB3, LAN3 + USB4/USB5, LAN4 + USB6/USB7

RJ-45/Dual USB combo connector,
Pulse #JG0-0006NL
Each individual RJ-45 connector is defined as follows:

PIN	SIGNAL	PIN	SIGNAL
1	MX0+	5	MX2-
2	MX0-	6	MX1-
3	MX1+	7	MX3+
4	MX2+	8	MX3-

Each individual USB connector is defined as follows:

PIN	SIGNAL	PIN	SIGNAL
1	+5V – USB#	3	USB#+
2	USB#-	4	GND – USB#

Notes:
1 – P1 = LAN1 + USB0/USB1, P2 = LAN2 + USB2/USB3,
P3 = LAN3 + USB4/USB5, P4 = LAN4 + USB6/USB7
2 – LAN ports support standard CAT5 Ethernet cables
3 – USB ports support standard USB cables and devices
4 - # indicates USB port number

P5, P6, P7, P8, P9, P10 - SATA PORT II 300 Ports

7 pin vertical connector, Molex #67491-0031

PIN	SIGNAL	PIN	SIGNAL
1	Gnd	5	RX-
2	TX+	6	RX+
3	TX-	7	Gnd
4	Gnd		

Notes:
1 – P5 = SATA0 interface, P6 = SATA1 interface,
P7 = SATA2 interface, P8 = SATA3 interface,
P9 = SATA4 interface, P10 = SATA5 interface,
2 – SATA connectors support standard SATA II interface cables

P14, P24 – RS-232 Serial Port

10 pin vertical connector, Amp #1761602-3

PIN	SIGNAL	PIN	SIGNAL
1	Carrier Detect	6	Clear To Send
2	Data Set Ready	7	Data Terminal Ready
3	Receive Data	8	Ring Indicator
4	Request To Send	9	Signal Gnd
5	Transmit Data	10	NC

P15, P16 – +12V AUX Input Power Connector

8 pin vertical connector, Molex #39-29-3086

PIN	SIGNAL	PIN	SIGNAL
1	Gnd	5	+12V Aux Input
2	Gnd	6	+12V Aux Input
3	Gnd	7	+12V Aux Input
4	Gnd	8	+12V Aux Input

Caution: Both P15 and P16 must be connected to the system power supply to ensure proper board operation.

P17 – ATX/EPS Power Connector

24 pin vertical dual row, Molex #44206-0007

PIN	SIGNAL	PIN	SIGNAL
1	+3.3V	13	+5V
2	+3.3V	14	-12V
3	Gnd	15	Gnd
4	+5V	16	PSON
5	Gnd	17	Gnd
6	+5V	18	Gnd
7	Gnd	19	Gnd
8	PWRGD	20	-5V
9	+5V AUX	21	+5V
10	+12V	22	+5V
11	+12V	23	+5V
12	+3.3V	24	Gnd

Connectors (continued)

P12 –Video and PS/2 Mouse & Keyboard Connector

VGA/Dual PS/2 combo connector,
NORCOMP #999-H15-PS2L571
15-pin Video connector (blue):

PIN	SIGNAL	PIN	SIGNAL
1	Red	9	+5V
2	Green	10	Gnd
3	Blue	11	NC
4	NC	12	EEDI
5	Gnd	13	HSYNC
6	Gnd	14	VSYNC
7	Gnd	15	EECS
8	Gnd		

PS/2 Keyboard connector (purple):

PIN	SIGNAL	PIN	SIGNAL
1	Kbd Data	4	5V AUX
2	NC	5	Kbd CLK
3	Gnd	6	NC

PS/2 Mouse connector (green):

PIN	SIGNAL	PIN	SIGNAL
1	Mouse Data	4	5V AUX
2	NC	5	Mouse CLK
3	Gnd	6	NC

Notes:
1 – Video connector supports standard video cables
2 – PS/2 keyboard connector supports standard PS/2 keyboards
3 – PS/2 mouse connector supports standard PS/2 pointing devices

P25, P26, P27, P28, P30, P31 – System Fan & CPU Fan Power Connectors

4 pin single row header, FOXCONN #HF2704E-M1

PIN	SIGNAL	
1	Speed Control Line	P28 = CPU1 fan connector
2	+12V	P31 = CPU2 fan connector
3	Fan Tach	P25, P26, P27, P28 = optional
4	Fan PWM Sys	System fan connectors

P13 - TPM GPIO Signal Connector

2 pin single row header, Amp #640456-2

PIN	SIGNAL	PIN	SIGNAL
1	Gnd	2	Future Use

P18 – Intruder Alert Connector

2 pin single row header, Amp #640456-2

PIN	SIGNAL	PIN	SIGNAL
1	Gnd	2	Alert Signal

P20– Speaker Header

2 pin single row header, Amp #640456-2

PIN	SIGNAL	PIN	SIGNAL
1	Speaker Out	2	+5V

P23 – IPMI Header

20 pin dual row header, Molex #10-89-7202

PIN	SIGNAL	PIN	SIGNAL
1	+3.3V SBY	2	LPC_LFRAME#
3	+5V	4	LPC_LAD3
5	SYS RST#	6	LPC_LAD2
7	CLK_33_TPM	8	LPC_LAD1
9	LPC_LDRQ1#	10	LPC_LAD0
11	RST_LPC#	12	SERIRQ
13	Gnd	14	Gnd
15	SMBALRT#	16	LAN_ SMBALRT#
17	SMBDATA	18	LAN_ SMBDATA
19	SMBCLK	20	LAN_ SMBCLK

Connectors (continued)

P32 – Front Panel Header Connector

34 pin dual row header, Molex #10-89-7342

PIN	SIGNAL	PIN	SIGNAL
1	+3.3V	2	+5V Stand By
3	NC	4	+5V Stand By
5	Gnd	6	NC
7	+3.3V	8	NC
9	LED HDD Activity	10	NC
11	PWRBTN	12	L1 ACTV#
13	Gnd	14	L1 LINK#
15	System RESET	16	SMB DATA
17	Gnd	18	SMB CLK
19	NC	20	ICH Intruder#
21	NC	22	L2 ACTV#
23	NC	24	L2 LINK#
25	NC	26	NC
27	NC	28	NC
29	NC	30	NC
31	L4 ACTV#	32	L3 ACTV#
33	L4 LINK#	34	L3 LINK#

J1 – Audio Connector

3 position audio, FOXCONN #JA33331-H119-4F

Socket Color	SIGNAL
Light Blue	Line In
Lime	Line Out
Pink	Mic

J1 audio jacks support standard audio cables

P33 – Dual Universal Serial Bus (USB) Connector

10 pin dual row header, Amp #1761610-3
(+5V fused with self-resetting fuse)

PIN	P33A SIGNAL	PIN	P33B SIGNAL
1	+5V-USB10	2	+5V-USB11
3	USB10-	4	USB11-
5	USB10+	6	USB11+
7	Gnd-USB10	8	Gnd-USB11
9	NC	10	NC

Note:
1 – P33 odd pins are for USB10 and the even pins are USB11

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Chapter 2 PCI Express® and PCI Option Card Slots

Introduction

PCI Express® is a high-speed, high-bandwidth interface with multiple channels (lanes) bundled together with each lane using full-duplex, serial data transfers with high clock frequencies.

The PCI Express architecture is based on the conventional PCI addressing model, but improves upon it by providing a high-performance physical interface and enhanced capabilities. Whereas the PCI bus architecture provided parallel communication between a processor board and backplane, the PCI Express protocol provides high-speed serial data transfer, which allows for higher clock speeds. The same data rate is available in both directions simultaneously, effectively reducing bottlenecks between the motherboard's logic components and PCI Express option card slots.

PCI Express option cards may require updated device drivers. Most operating systems that support legacy PCI cards will also support PCI Express cards without modification. Because of this interface design, a single PCI card and multiple PCI Express option cards can co-exist in the same system.

PCI Express serial interface connectors have lower pin counts than PCI parallel bus connectors. The PCIe connectors are physically different, based on the number of lanes in the connector.

PCI Express Links

Several PCI Express channels (lanes) are bundled together for each PCIe option card slot. A link is a collection of one or more PCIe lanes. A basic full-duplex link consists of two dedicated lanes for receiving data and two dedicated lanes for transmitting data. PCI Express supports scalable link widths in 1-, 4-, 8- and 16-lane configurations, generally referred to as x1, x4, x8 and x16 slots. A PCI Express x4 slot with a PCIe 1.1 interface implementation indicates that the slot has four PCIe lanes, which gives the slot a bandwidth of 250MB/s in each direction per lane. Unlike PCI parallel buses, there are no additional devices sharing a serial PCI Express interface. Since there are no additional devices competing for bandwidth; the effective bandwidth is counted in both directions and results in 500MB/s (full-duplex) per lane or 2GB/s for the x4 PCIe 1.1 card slot. If an option card with a PCI Express 2.0 interface is installed into the x4 PCIe5 or PCIe7 motherboard slots, then this effective full-duplex bandwidth doubles to 4GB/s.

The link configuration of the motherboard's PCI Express links is determined by specific interface specification of the PCI Express option card. In PCI Express Gen 1.1 and Gen 2.0 bandwidths for the PCIe links are deter-mined by the link width multiplied by 250MB/s and 500MB/s, as follows:

Card Slot Size	PCIe 1.1 Bandwidth	PCIe 1.1 Full-Duplex Bandwidth	PCIe 2.0 Bandwidth	PCIe 2.0 Full-Duplex Bandwidth
x1	250MB/s	500MB/s	500MB/s	1GB/s
x4	1GB/s	2GB/s	2GB/s	4GB/s
x8	2GB/s	4GB/s	4GB/s	8GB/s

Scalability is a core feature of PCI Express. An option card with a higher number of PCIe lanes will not function in a mechanical slot set-up with a lower number of lanes available (e.g., a x8 board in a x4 mechanical slot) because the connectors are mechanically incompatible. However, the reverse configuration will function on the motherboard without any electrical issues. A board with a lower number of lanes can be placed into a slot with a higher number of lanes (e.g., a x4 board into a x8 slot).

A PCI Express link auto-negotiates between the PCI Express devices to establish communication at the lowest common interface link between the device and the card slot. The motherboard can reconfigure the PCIe links for optimum system performance. This allows a x16 PCIe card to operate in a x16 PCIe mechanical slot even though the slot is driven with a x8 PCI Express electrical link.

For more information, refer to the PCI-SIG's *PCI Express® Base Specification 2.0*.

Motherboard PCIe Card Slot Configurations

The motherboard supports PCI Express option cards with either PCIe revision 1.0 or 2.0 interfaces. The mechanical slots and their associated PCIe electrical link configurations enable the motherboard to support PCI Express option cards that implement industry standard x16, x8, x4 and x1 PCIe electrical links. Like the PCI Express interface implementation on the motherboard, the PCIe option cards must also support the PCI Express auto-negotiation or link training feature specified in the PCI Express interface specification. Link training enables a PCIe option card with a x16 electrical link to function in motherboard slot PCIe5. The interface controller inside the motherboard's Intel 5520 IOH will auto-negotiate with the option card's PCIe controller to establish communications at the lowest common link, which in this example would be the x8 PCIe electrical link. This same capability exists on all of the motherboard's PCIe option card slots. Option cards with PCI Express 2.0 interface implementations should be installed in motherboard slots PCIe1, PCIe3, PCIe4, PCIe5 or PCIe6 to take full advantage of the speed benefits of the PCIe 2.0 interface. A PCIe 2.0 card installed in PCIe2 slot will function, but will operate at the PCIe 1.1 interface data rate. The table below will help explain the motherboard's PCIe slot configurations:

PCIe Card Slot	Mechanical Size	Electrical Link	PCIe Interface Implementation Supported
PCIe1	x16	x8	PCIe 2.0 or PCIe 1.1
PCIe2	x8	x4	PCIe 1.1
PCIe3	x16	x8	PCIe 2.0 or PCIe 1.1
PCIe4	x8	x4	PCIe 2.0 or PCIe 1.1
PCIe5	x16	x8	PCIe 2.0 or PCIe 1.1
PCIe6	x8	x4	PCIe 2.0 or PCIe 1.1

Motherboard PCI Card Slot Configuration

The slot labeled PCI-1 is a 32-bit/33MHz PCI slot. Unlike PCI Express the PCI slot is driven with a parallel bus. However, unlike many passive PCI backplane designs there are no additional devices attached to this particular bus to slow down PCI option card communications to the motherboard's I/O controller hub. The PCI-1 slot supports either 5V or universal 32-bit/33MHz PCI option cards.

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Chapter 3 Motherboard Installation

Introduction
For a successful installation, it is essential that you follow the recommendations for handling static devices. There are many small and static-sensitive components on the motherboard. Care must be used when handling the motherboard to ensure that none of the small components are damaged. As you begin the motherboard installation, review the following board handling cautions that you saw previously in front of this manual.

Handling Precautions

WARNING: This product has components that may be damaged by electrostatic discharge.

To protect your motherboard from electrostatic damage, be sure to observe the following precautions when handling or storing the board:

- Keep the motherboard in its static-shielded bag until you are ready to perform your installation.
- Handle the motherboard by its edges.
- Do not touch the I/O connector pins.
- Do not apply pressure or attach labels to the motherboard.
- Use a grounded wrist strap at your workstation or ground yourself frequently by touching the metal chassis of the system before handling any components. The system must be plugged into an outlet that is connected to an earth ground.
- Use antistatic padding on all work surfaces.
- Avoid static-inducing carpeted areas.

Recommended Board Handling Precautions
This motherboard has components on both sides of the PCB. Some of these components are extremely small and subject to damage if the board is not handled properly. It is important for you to observe the following precautions when handling or storing the board to prevent components from being damaged or broken off:

- Handle the board only by its edges.
- Store the board in padded shipping material or in an anti-static board rack.
- Do not place an unprotected board on a flat surface.

Chassis Mounting
The motherboard uses the standard hole-pattern defined in the SSI-EEB 2008 – Rev. 1.0 industry specification. This spec is commonly referred to as the Extended ATX form factor. The chassis you intend to use for your motherboard needs to support this motherboard form factor and standard Extended ATX mounting hole pattern. Most standard industrial chassis support multiple mounting-hole patterns.

Computer chassis typically have either plastic or metal mounting standoffs or fasteners. Metal mounting standoffs are preferable because they provide the necessary chassis ground for the motherboard and threaded standoffs will provide better motherboard mounting security compared to clip-in fasteners.

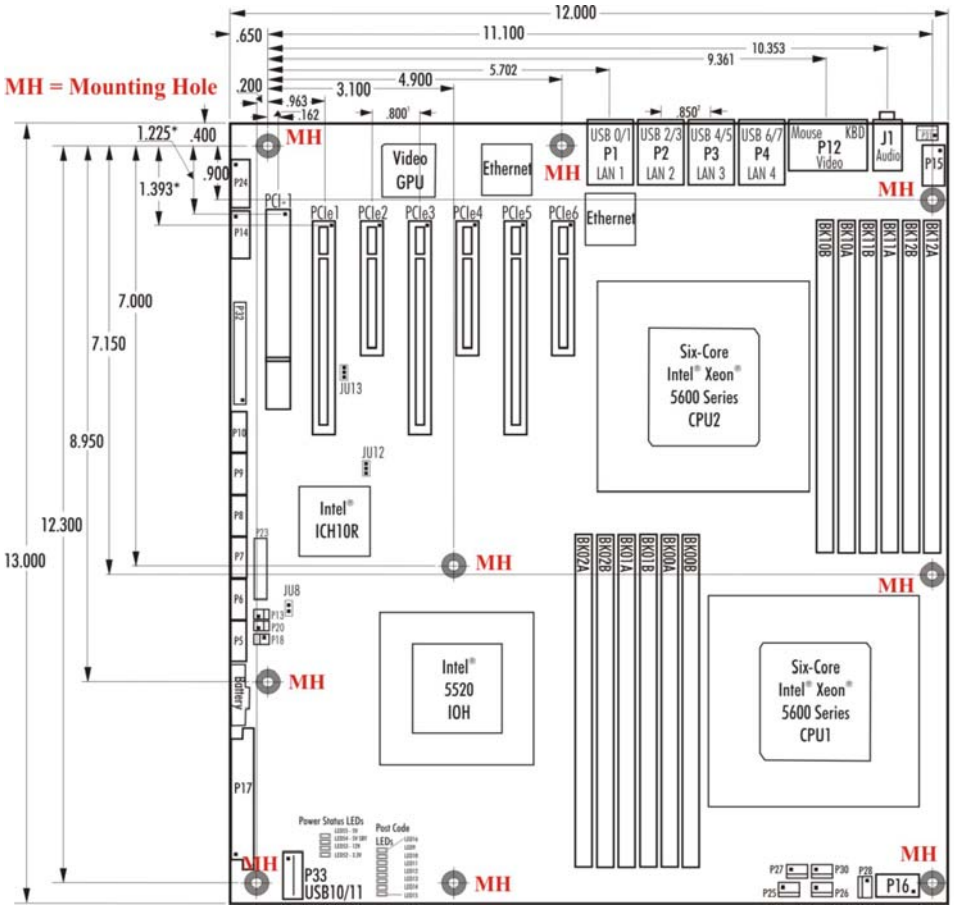
Carefully align the motherboard mounting holes up with the chassis mounting standoffs. The motherboard mounting holes have a nominal diameter of 0.156” or 3.96mm. The thread size and style of the chassis’

mounting standoffs will determine the type of the mounting screw hardware necessary to install the motherboard into the chassis. Typically, #6-32 pan head screws are used to secure a motherboard to the chassis standoffs, but you must use the mounting hardware recommended by the chassis manufacturer.

CAUTION: Motherboard damage will occur if using mounting screws or fasteners with diameters larger than 0.150".

CAUTION: Do not press down on the motherboard when installing the mounting hardware or clicking the motherboard onto a chassis fastener. Do not exceed a force over 8lbs/square inch when installing a motherboard mounting screw. Failure to adhere to these two caution messages will result in motherboard damage.

Secure the motherboard to the chassis using **all of the available motherboard mounting holes**.



Notes:

- All dimensions are inches
- Typical PCIe pin 1 location is 0.049" from connector center
- Typical PCI pin 1 location is 0.150" from connector center
- Mounting holes have a nominal 0.156" diameter
- *Italic text indicates the center dimension of a card slot or I/O connector*
- Superscript 1 indicates card slot center spacing
- Superscript 2 indicated I/O connector center spacing
- The system power supply must provide +12V power to both 12V AUX power connectors (P15 and P16) for proper motherboard operation

Memory Installation

Refer to the DDR3 memory section in Chapter 1 of this manual for detailed information on the proper memory modules to be used on the motherboard.

There are a number of PC3-10600, PC3-8500 and PC3-6400 DDR3 DIMMs available for use on the motherboard from a number of different sources. Available memory capacity and module construction varies, but the same basic DDR3 DIMM characteristics must be present on the modules you select. These characteristics are:

- ECC-registered (72-bit) DDR3 memory
- Gold-plated DIMM contacts
- 240-pin DDR3 DIMMs

Trenton has validated the performance of a number of different PC3-10600, DDR3 DIMMs for use on the motherboard:

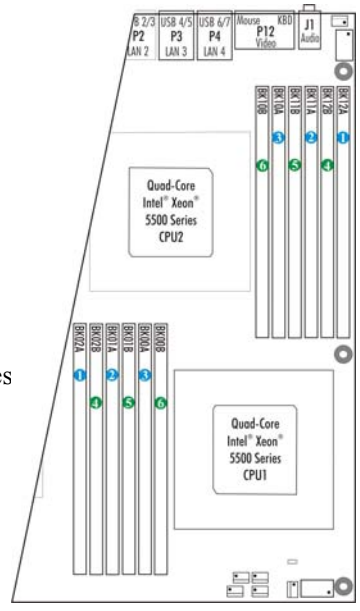
Trenton Memory Part Number	DDR3 DIMM Description	Validated DDR3 DIMM vendor	Vendor's Part Number
504520-000	1GB, DDR3 PC3-10600, 1333MHz, Buffered, 72-bit, 240 pin-DIMM	Transcend	TS128MKR72V3U
504520-001	2GB, DDR3 PC3-10600, 1333MHz, Buffered, 72-bit, 240 pin-DIMM	Transcend	TS256MKR72V3U
504520-002	4GB, DDR3 PC3-10600, 1333MHz, Buffered, 72-bit, 240 pin-DIMM	Transcend	TS512MKR72V3U

The memory market is constantly changing. Check with Trenton to learn the latest in validated memory availability for the motherboard.

The same basic memory installation procedure listed below should be followed regardless of the memory type used on the motherboard.

1. Populate the memory channels starting with the DIMM socket farthest from the CPU. Work you way toward the processor populating the DIMM sockets labeled with an "A" first followed by the "B" labeled sockets.
2. The chart and diagram below will help guide your memory installation:

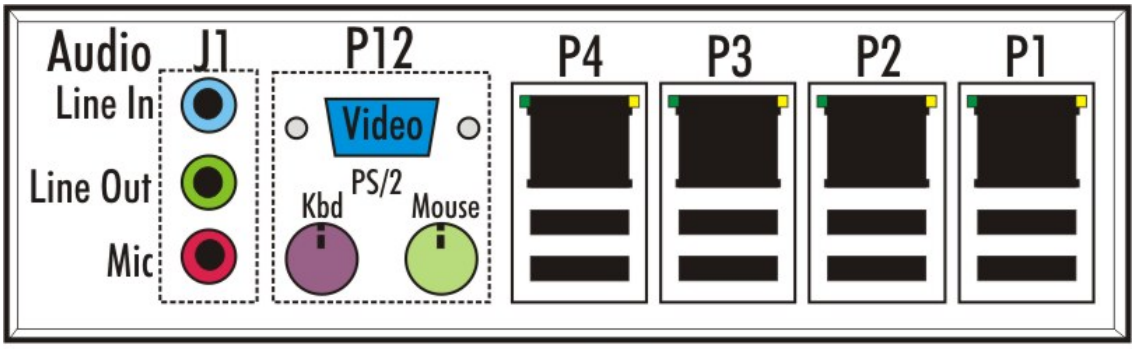
Population Order	CPU1	CPU2
1	BK02A	BK12A
2	BK01A	BK11A
3	BK00A	BK10A
4	BK02B	BK12B
5	BK01B	BK11B
6	BK00B	BK10B



3. Ensure the DIMM release tabs of the sockets are open before inserting a memory module.
4. Insert each DIMM into each socket observing that the modules registration notch is oriented correctly.
5. Press down on the DIMM until the module release tabs snap into place.
6. Repeat this process for all remaining DIMMs.
7. Pushing open the socket's release tabs enables a module to be easily removed from its DIMM socket.

Rear I/O Connectors

The I/O plate of the motherboard provides rear chassis I/O connections for a variety of devices and communication networks. The diagram below illustrates these available connections:



Rear I/O Detail

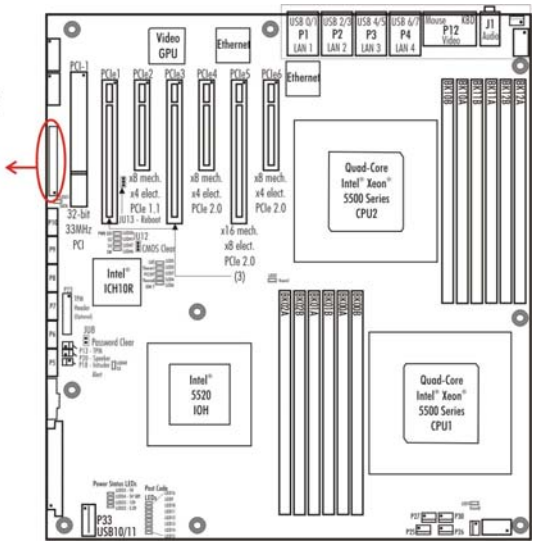
Connectors P1 through P4 provide 10/100/1000Base-T Ethernet connections as well as multiple USB 2.0 ports. Each connector features one Ethernet network connection and two USB 2.0 ports. Refer to the motherboard connector section in Chapter 1of this manual for detailed pin-out information for all of the motherboard's rear I/O connectors.

Front I/O Header

The motherboard connector P32 contains several header pins for connecting various front panel system elements to the motherboard. These elements are items such as function LEDs and switches. Additional system control signals and voltages are made available on P32 to support specific system functions that you may wish to implement in your industrial computer design. The use of these elements depends the chassis type. The following illustration lists the functions available on this header and detailed signal connection data for P32 is located in the motherboard connector section of Chapter 1.

P32 - System Front Panel Header Connections

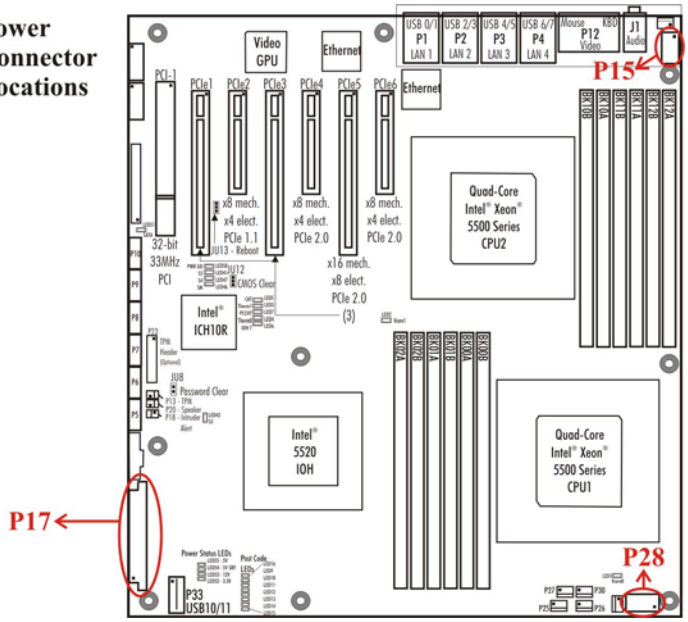
	34	33	
To LAN3 ← 34	L3 LINK	L4 ACTV	33 → To LAN4
Activity LED ← 32	L3 ACTV	L4 LINK	31 → Activity LED
	NC	NC	
	NC	NC	
	NC	NC	
To LAN2 ← 24	L2 LINK	NC	
Activity LED ← 22	L2 ACTV	NC	
	ICH Intruder#	NC	
	SMB CLK	Gnd	17 → To switch
	SMB DATA	Sys Reset	15 →
To LAN1 ← 14	L1 LINK	Gnd	13 → To switch
Activity LED ← 12	L1 ACTV	PwrBtn	11 →
	NC	HDD Act	9 → To LED
	NC	+3.3V	7 →
	NC	Gnd	
	+5V Std By	NC	
	+5V Std By	+3.3V	
	2	1	



Connecting Power

There are three system power connections required for the motherboard. Connector P17 accepts a 24-pin standard ATX/EPS power supply connection, while P15 and P28 are 8-pin, +12V AUX input power connectors. Single and dual-processor motherboard configurations require both auxiliary power connections. The figure below illustrates the power connector locations on the motherboard. See Chapter 1 for detailed pin-out information on the power connectors.

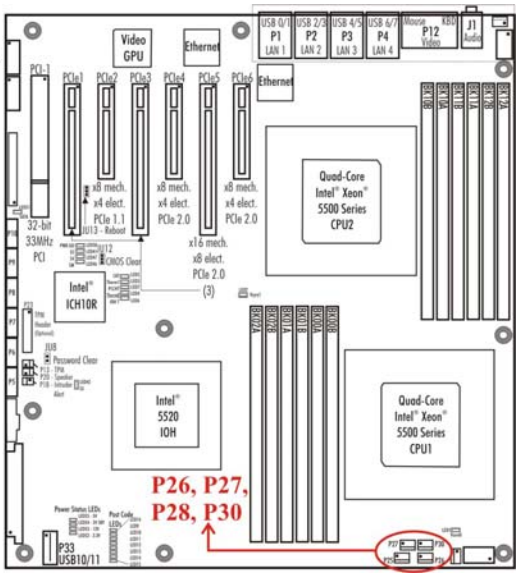
P15, P17 and P28 - Power Connector Locations



Fan Headers

Four fan headers are available for connecting system fans. These four-pin headers support a fan speed control line. Four-pin fans feature the speed control line; however, the motherboard's fan header design also accommodates 3-pin fans without speed control. The figure below shows the system fan header locations on the motherboard. See the Motherboard Connectors section in Chapter 1 for detailed fan header pin-out information.

P25, P26, P27 and P30 - System Fan Header Locations



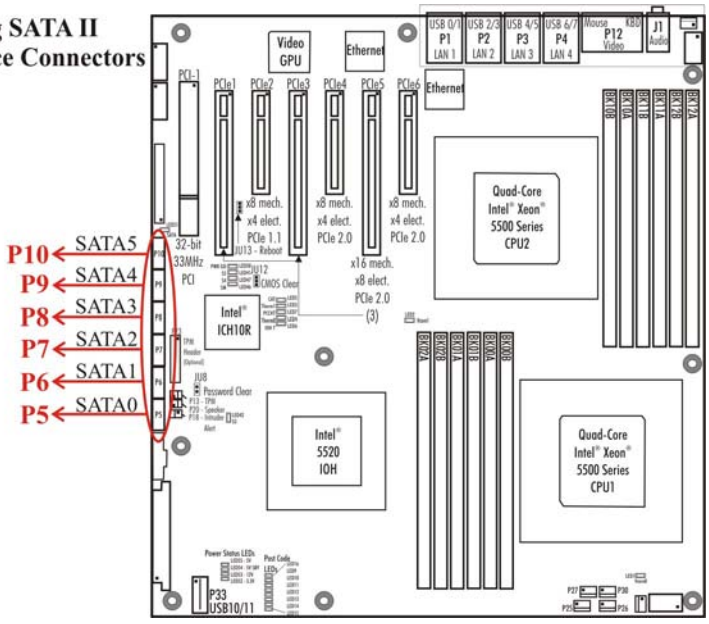
SATA II 300 Connectors

There are six, locking SATA connectors on the motherboard to ensure secure hard drive connections in a variety of system mounting locations. The system's SATA HDDs may operate as independent storage drives or as part of a RAID 0, 1, 5 or 10 drive array using the internal RAID controller of the Intel® ICH10R. The SATA connectors are labeled P5 through P10 with the logical addressing for use with the system software listed below:

Motherboard Connector	Logical SATA Interface	Motherboard Connector	Logical SATA Interface
P5	SATA0	P6	SATA1
P7	SATA2	P8	SATA3
P9	SATA4	P10	SATA5

The figure below shows the locations of the motherboard's SATA connectors. See the Motherboard Connectors section in Chapter 1 for detailed pin-out information.

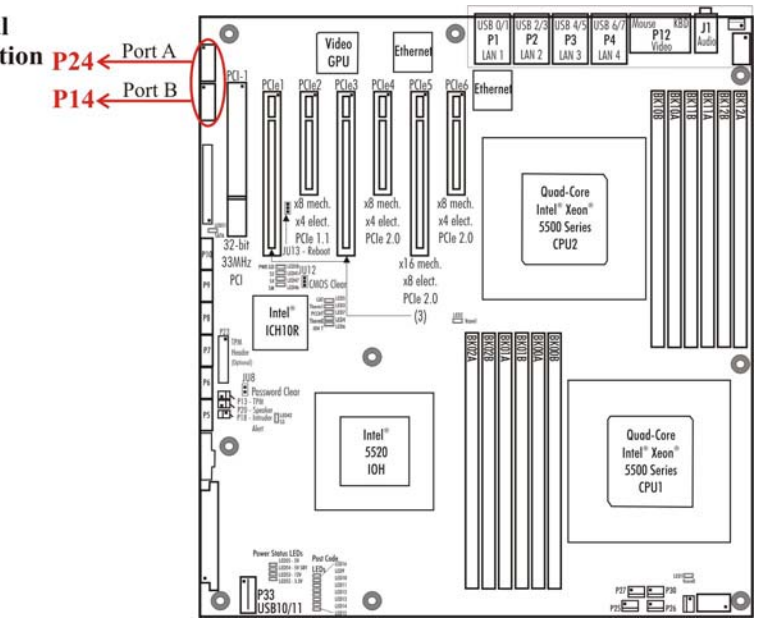
P5, P6, P7, P8 - Locking SATA II P9, and P10 Interface Connectors



RS-232 Serial Port Headers

Two serial port headers are available for RS-232 communications to and from the motherboard. Typically, headers P14 and P24 would be wired over to DB9 serial port connectors located on the chassis. The drawing below shows the location of the P14 and P24 headers and detailed header pin-out information can be found in the Motherboard Connectors section of Chapter 1.

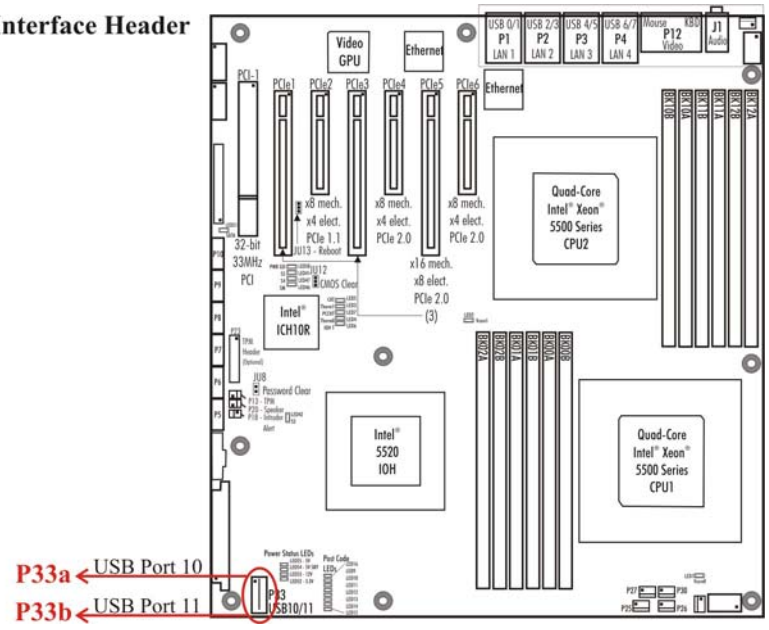
P14 - RS232 Serial and Communication P24 Headers



On-board USB Header

P33 is a ten-pin header that supplies two additional USB interfaces for use on the front or rear panel of the system chassis. The header provides logical USB interfaces 10 and 11 and is shown in the drawing below. See the Motherboard Connectors section of Chapter 1 for additional information.

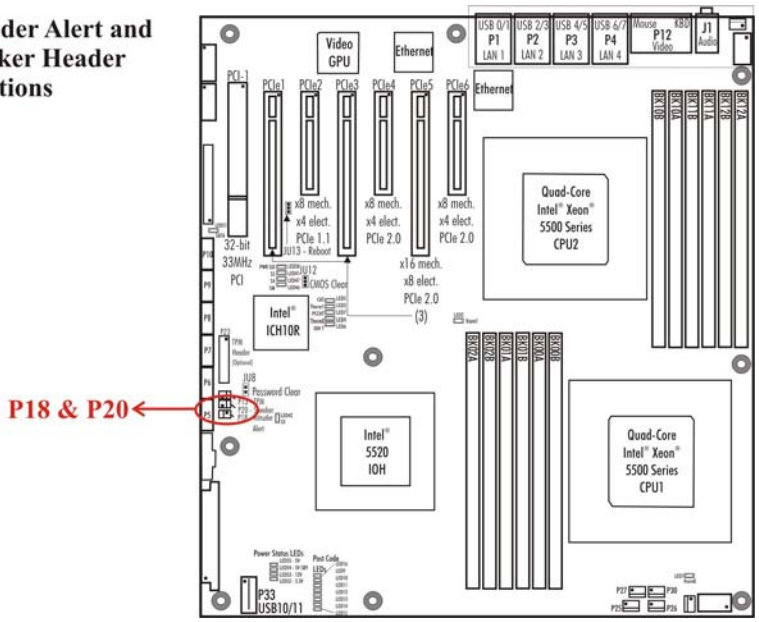
P33 - Dual USB Interface Header



Intruder Alert and Speaker Headers

Both of the 2-pin headers illustrated below carry signals that are made available to the system designer to help with integrating system security. For example, the intruder alert signal on P18 can be routed to the user-supplied system monitoring software via an internal chassis cover switch. If the cover is removed, the switch opens and the user-supplied monitoring software registers a change in state of the intruder alert signal. The monitoring software can send a signal to header P20 to sound the internal speaker alarm. See Chapter 1 for the P18 and P20 pin-out details.

P18 and P20 - Intruder Alert and Speaker Header Locations



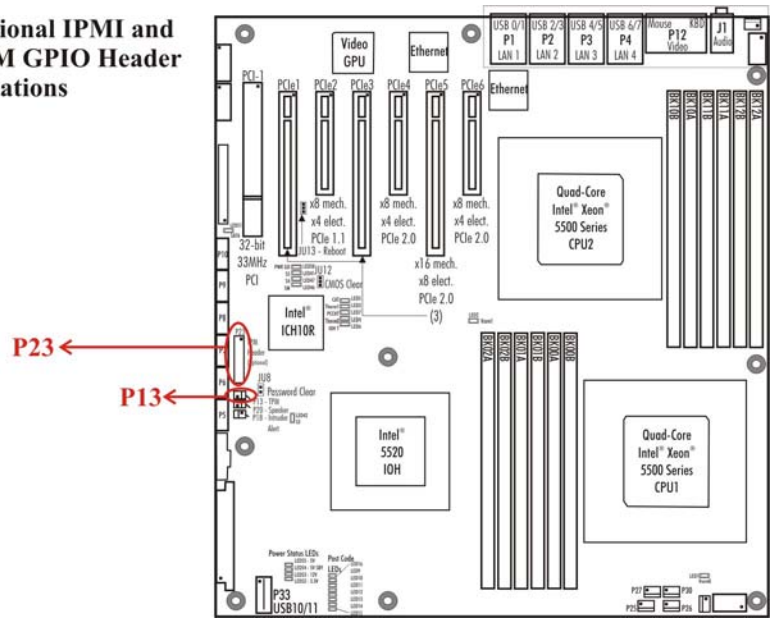
Optional IPMI and TPM 1.2 Headers

P23 is a 20-pin header that provides various IPMI signal connections for optional IPMI system implementations. The hardware hooks to support IPMI are available on the motherboard; however, user-supplied application software and an operating system that is IPMI aware must be available.

Header P13 is a two-pin header that will provide access to a future-use TPM General Purpose I/O (GPIO) signal. Contact Trenton if your system requires this optional GPIO signal for your trusted computing application.

The illustration below shows the location of headers P23 and P13. See Chapter 1 for the pin-out details of P23 and P13.

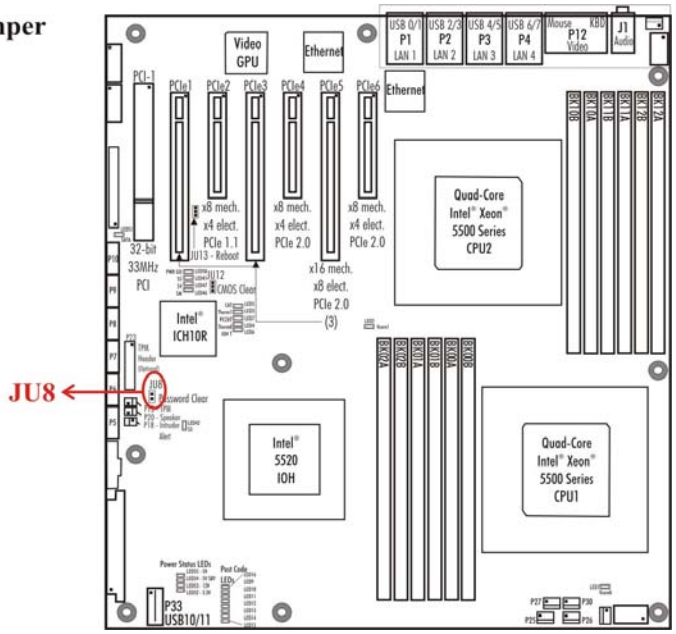
P23 and P13 - Optional IPMI and TPM GPIO Header Locations



Password Clear Jumper

The password clear jumper (JU8) is a two-position jumper as shown in the figure below. The jumper is disconnected for normal system operation. To reset the password to default, i.e. the null password, connect the two pins by installing the password clear jumper for one power-up cycle. The BIOS will read the new jumper position upon system power-up and reset the password to NULL.

JU8 - Password Clear Jumper



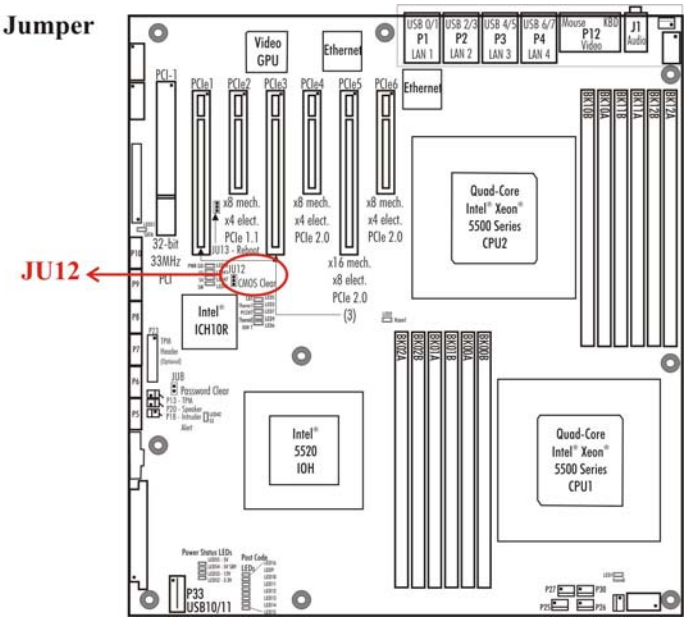
CMOS Clear Jumper

The CMOS clear jumper (JU12) is the three-position shown in the figure below. To clear the motherboard's CMOS, power down the system and install the jumper on the TOP.

NOTE: If your system has an ATX power supply, you may need to remove the incoming AC power cord to ensure that the system shuts down completely. All power must be removed from the motherboard in order to allow JU12 to clear the CMOS.

The TOP of the motherboard is toward the rear I/O connectors and the BOTTOM of the board is toward the Post Code LEDs. Wait for at least two seconds, move the jumper back to the BOTTOM and turn the power on. When AMIBIOS displays the "CMOS Settings Wrong" message, press F1 to go into the BIOS Setup Utility, where you may reenter your desired BIOS settings, load optimal defaults or load failsafe defaults.

JU12 - CMOS Clear Jumper



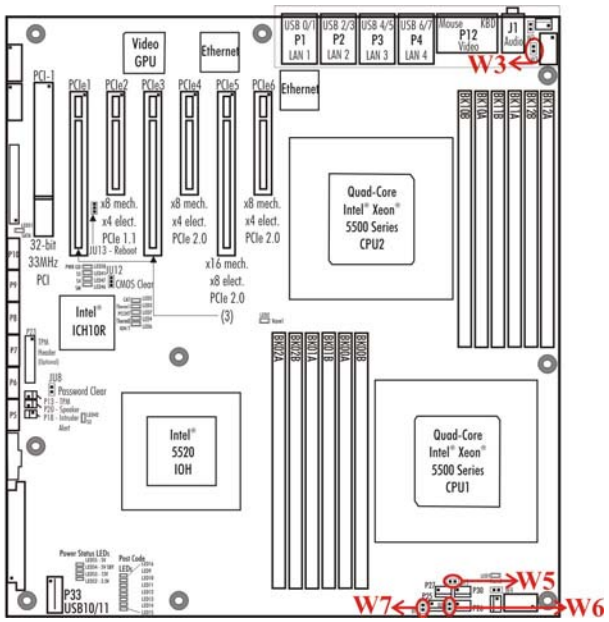
System Fan Speed Control Jumpers

There are four system fan connectors available for use on the motherboard. The system fan speed control jumpers allow the speed of each fan to be controlled by ACPI soft control signals. The factory default jumper settings are in the open positions thereby allowing the system fans to run at maximum speed.

NOTE: Jumper W3 connects to system fan connector P30 to control the speed of a fan equipped with a speed control line that is plugged into P30. Likewise, jumpers W5, W6 and W7 are associated with system fan connectors P27, P26 and P25 respectively.

The following illustration shows the locations of the system fan speed control jumpers.

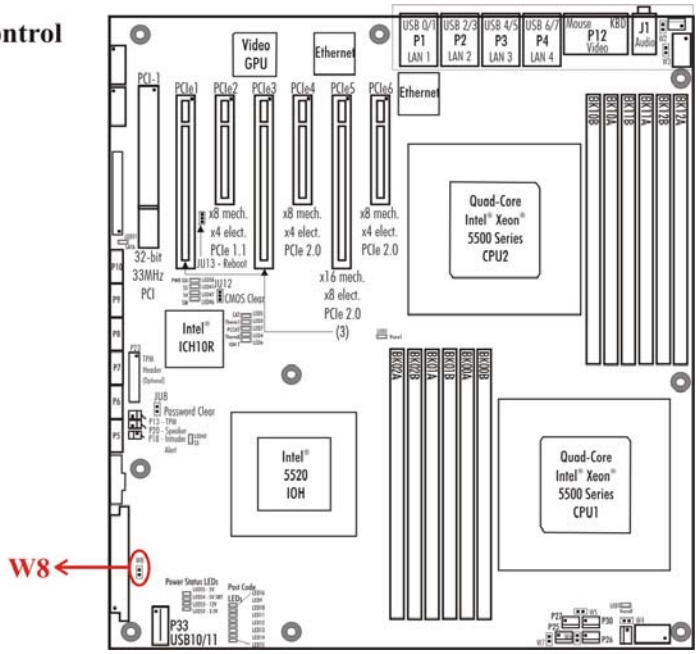
W3, W5 - System Fan Speed
W6, W7 Control Jumpers



PSON Soft Control Jumper

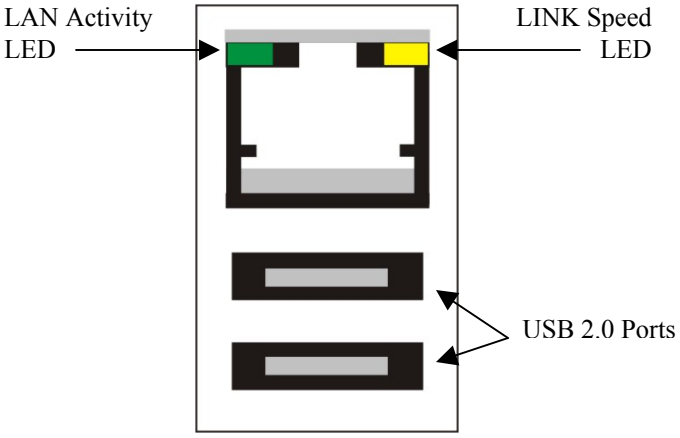
Installing the PSON soft control jumper (W8) enables the motherboard to take advantage of the ACPI soft control signal lines common on ATX and EPS system power supplies. The factory default setting for this jumper is in the installed position. See the figure below for the location of the PSON jumper.

W8 - PSON Soft Control Jumper



Ethernet LAN LEDs

There are four rear LAN ports on the motherboard and each LAN port supports a LAN Activity and Link Speed LED as shown in the diagram below.

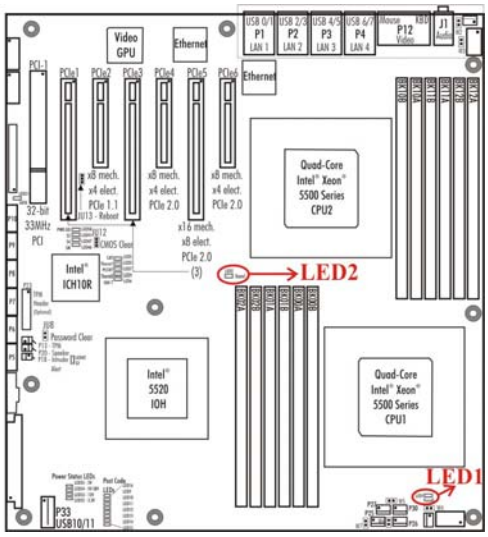


LED/Connector	Description
Activity LED	This green LED indicates network activity. This is the LED closest to connector P12 on the LAN connector.
Off	No current network transmit or receive activity
On (flashing)	Indicates network transmit or receive activity.
Link Speed LED	This green/yellow LED identifies the connection speed. This is the LED farthest from connector P12 on the LAN connector.
Off	Indicates a valid link at 1000-Mb/s
On	Indicates a valid link at 100-Mb/s.

Processor Power LEDs

When LED1 or LED2 turn on, this indicates that the processor's Vcore voltage level has fallen below the required level to maintain proper CPU operations. The LED locations are illustrated below.

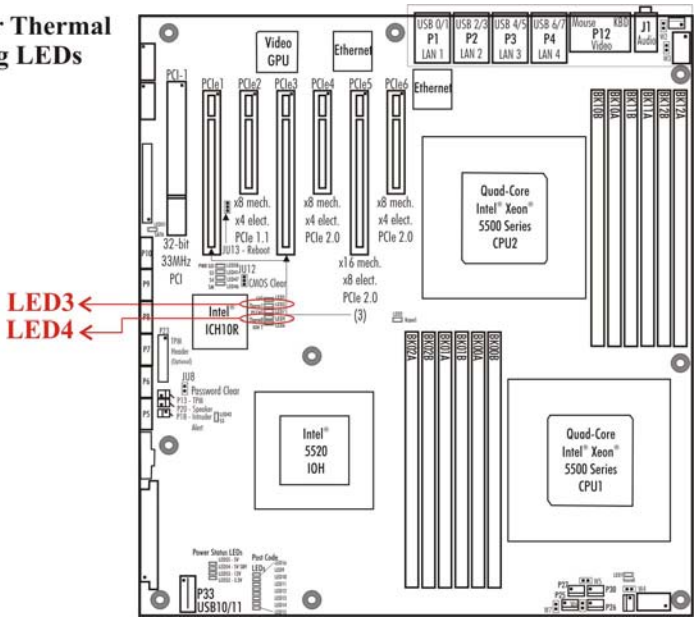
LED1, - Processor Power
LED2 LEDs



Processor Thermal Throttling LEDs

When LED3 and LED4 are off, both processors are functioning within the proper thermal conditions. If either LED is flashing, this indicates that the associated processor is operating at a lower operating speed because the CPU core has reached a temperature above the processor's thermal throttling level. A solid orange LED condition indicates that the processor has reached a CPU threshold limit. Processor thermal shutdown may occur if the condition causing the elevated temperature state is not corrected. Refer to the motherboard status LED section of chapter 1 for more detail. The locations of LED3 and LED 4 are shown in the diagram below.

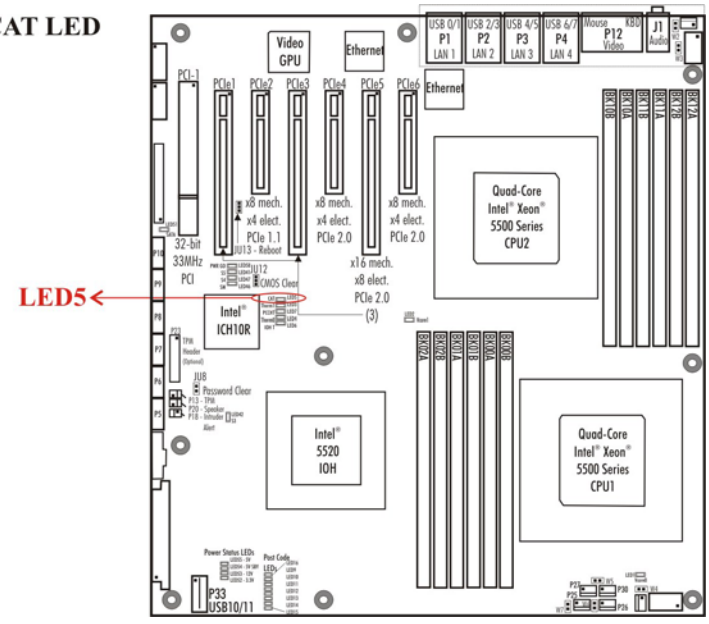
LED3, - Processor Thermal
LED4 Throttling LEDs



CAT LED

LED5 is the catastrophic (CAT) LED located on the motherboard as shown below. This LED comes on of the processor's cannot continue to operate due to non-recoverable machine check or other internal unrecoverable errors.

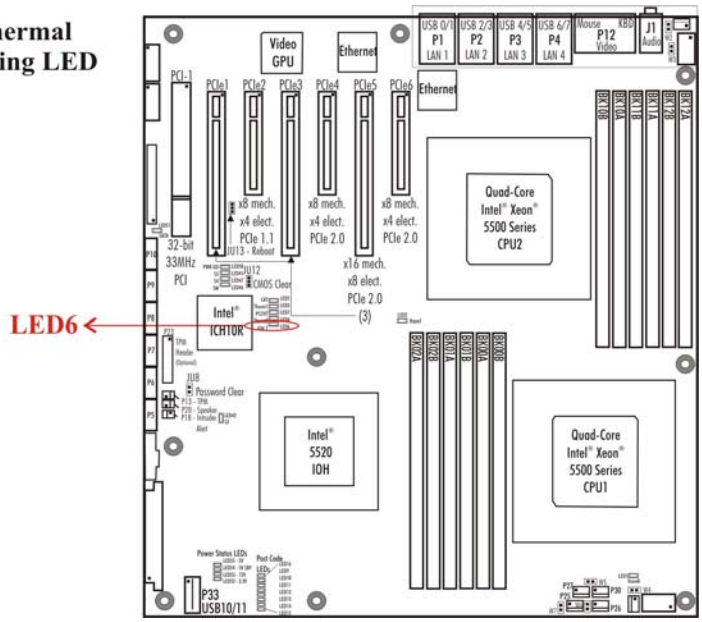
LED5 - CAT LED



IOH Thermal Throttling LED

Like the CPUs, the motherboard's Input/Output Hub or IOH is equipped with an internal temperature sensor for thermal throttling purposes. The IOH thermal throttling LED (LED6) will begin flashing if the IOH senses a temperature above the throttling limit but below the thermal shutdown threshold. The IOH continues to operate whileLED6 is flashing, but the device operates at a reduced speed. At the threshold limit the LED will become solid orange, which indicates that a thermal shutdown condition may soon occur. The location of LED6 is illustrated in the diagram below.

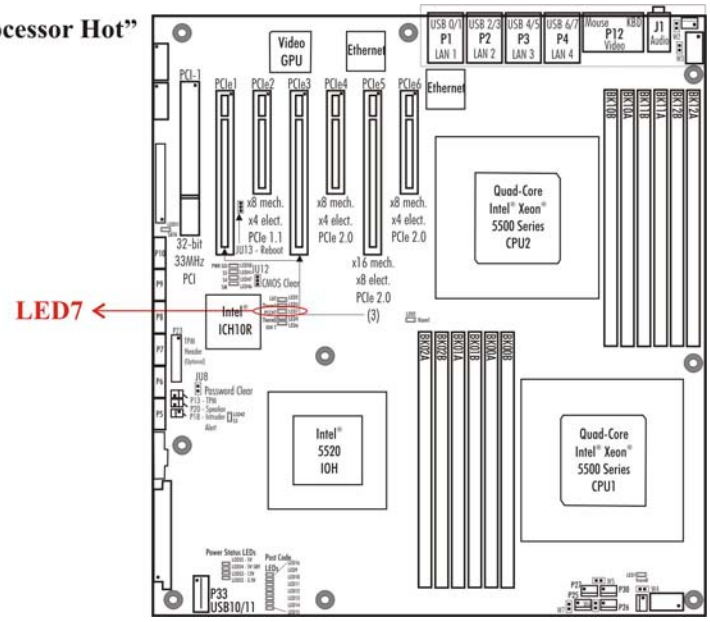
LED6 - IOH Thermal Throttling LED



PRCHT "Processor Hot" LED

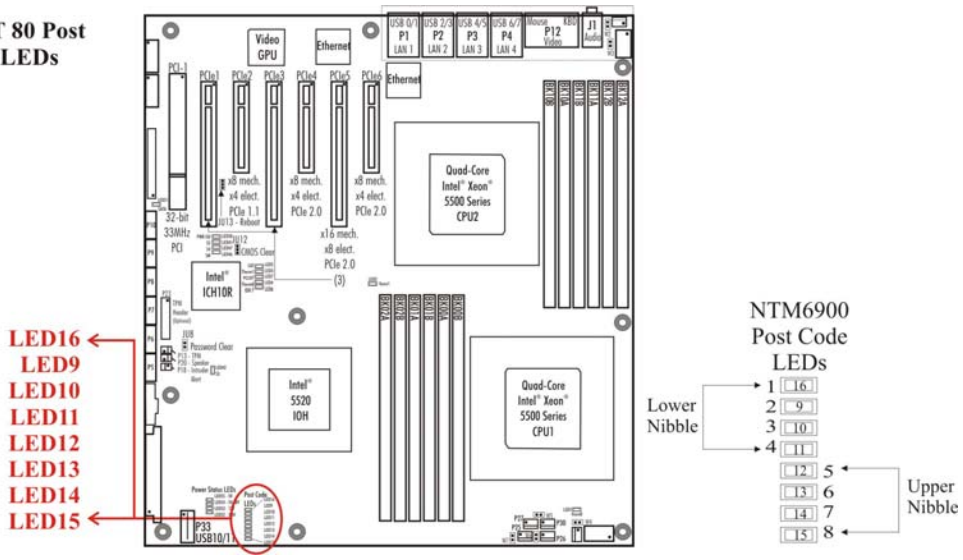
This LED is labeled LED7 on the motherboard as shown below. If this LED is on, a processor has reached its maximum safe operating temperature. Refer to the motherboard status LED section of chapter 1 for more detail.

LED7 - PRCHT "Processor Hot" LED



Port 80 Post Code LEDs

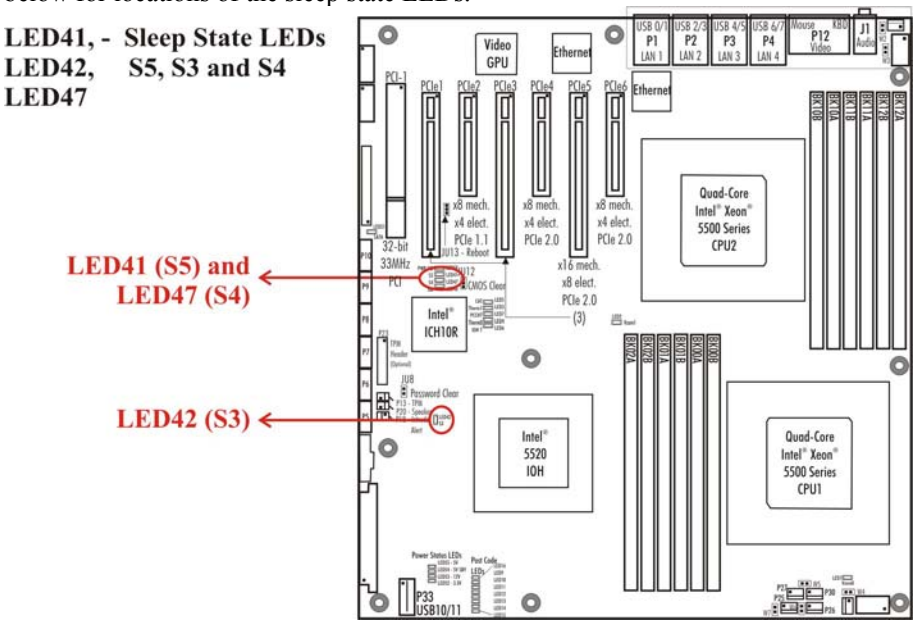
The Power On Self Test or POST Code LEDs are shown in the diagram below. These diagnostic LEDs monitor the results of the various routines performed by the BIOS during the motherboard's boot-up process. If the motherboard fails a particular boot-up routine during POST, the resultant LEDs that remain on are associated with the hexadecimal number for the specific error code. These specific error codes and their associated hexadecimal values are listed in Appendix A – BIOS Messages.



S3, S4 and S5 Sleep State LEDs

LEDs 41, 42 and 47, indicate the three sleep states supported on the motherboard. When LED41 is on the motherboard has entered the S5 sleep state, LED42 indicated S3 and LED47 turns on for the S4 sleep state.

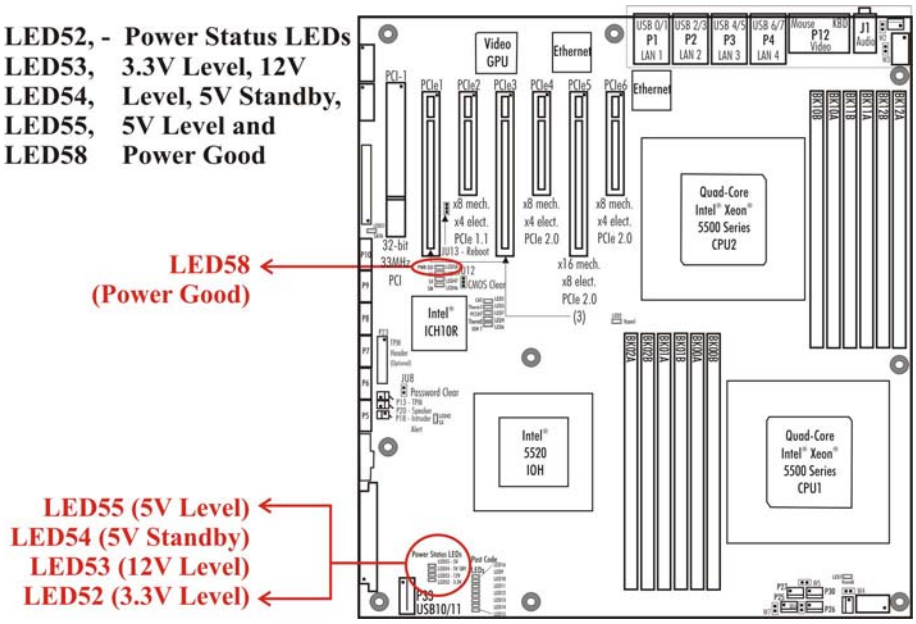
In the S5 sleep state, the system shuts down complete and must be re-booted in order to recover. In S3, any pending processor or chipset instructions as well as cache contents are lost, but system memory is retained. The S4 state consumes less power than the S3 state to support writing any pending data to the system's hard drive. However, system memory contents are not retained in the S4 sleep state. Refer to the drawing below for locations of the sleep state LEDs.



Power Status LEDs

The five power status LEDs on the motherboard indicate that the proper voltage levels are being delivered to the motherboard. The conditions of the LEDS must be observed before installing or removing option cards and system components. These devices should **never** be installed or removed while LED54 is illuminated. LED54 indicated that the 5V Standby voltage is present on the motherboard. Pulling the incoming AC power to the system power supply is usually required to turn off the 5V Standby voltage. The table and drawing below indicated the function and location of each power status LED.

LED Number	LED Function
LED52	**3.3V Level** – When turned ON this LED indicates that +3.3V is in the proper range for the motherboard.
LED53	**12V Level** - When turned ON this LED indicates that +12V is in the proper range for the motherboard.
LED54	**5V Standby** - When turned ON this LED indicates that the 5V stand by voltage is present on the motherboard. Removing or installing system cards and device while LED 54 is illuminated may result in damage to the motherboard and/or the system device.
LED55	**5V Level** - When turned ON this LED indicates that +5V is in the proper range for the motherboard.
LED58	**Power Good** - When turned ON this LED indicates that each system power level is within the proper operating range for the motherboard.



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Chapter 4 System BIOS

BIOS Operation
Chapters 3 through 8 of this manual describe the operation of the American Megatrends AMIBIOS and the BIOS Setup Utility. Refer to *Running AMIBIOS Setup* later in this chapter for standard Setup screens, options and defaults. The available Setup screens, options and defaults may vary if you have a custom BIOS.

When the system is powered on, AMIBIOS performs the Power-On Self Test (POST) routines. These routines are divided into two phases:

1) **System Test and Initialization**. Test and initialize system boards for normal operations.

2) **System Configuration Verification**. Compare defined configuration with hardware actually installed.

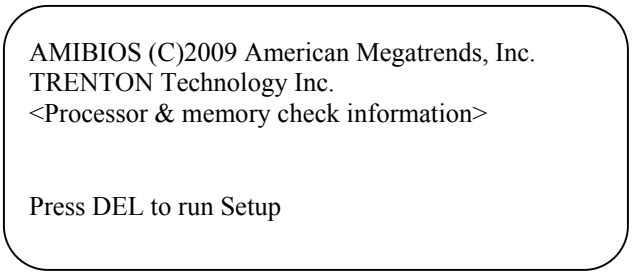
If an error is encountered during the diagnostic tests, the error is reported in one of two different ways. If the error occurs before the display device is initialized, a series of beeps is transmitted. If the error occurs after the display device is initialized, the error message is displayed on the screen. See *BIOS Errors* later in this section for more information on error handling.

The following are some of the Power-On Self Tests (POSTs) which are performed when the system is powered on:

- CMOS Checksum Calculation
- Keyboard Controller Test
- CMOS Shutdown Register Test
- 8254 Timer Test
- Memory Refresh Test
- Display Memory Read/Write Test
- Display Type Verification
- Entering Protected Mode
- Memory Size Calculation
- Conventional and Extended Memory Test
- DMA Controller Tests
- Keyboard Test
- System Configuration Verification and Setup

AMIBIOS checks system memory and reports it on both the initial AMIBIOS screen and the AMIBIOS System Configuration screen which appears after POST is completed. AMIBIOS attempts to initialize the peripheral devices and if it detects a fault, the screen displays the error condition(s) which has/have been detected. If no errors are detected, AMIBIOS attempts to load the system from a bootable device, such as a hard disk. Boot order may be specified by the **Boot Device Priority** option on the Boot Setup Menu as described in the *Boot Setup* chapter later in this manual.

Normally, the only POST routine visible on the screen is the memory test. The following screen displays when the system is powered on:



Initial Power-On Screen

You have two options:

- Press **<Del>** to access the BIOS Setup Utility.

  This option allows you to change various system parameters such as date and time, disk drives, etc. The *Running AMIBIOS Setup* section of this manual describes the options available.

  You may be requested to enter a password before gaining access to the BIOS Setup Utility. (See *Password Entry* later in this section.)

  If you enter the correct password or no password is required, the BIOS Setup Utility Main Menu displays. (See *Running AMIBIOS Setup* later in this section.)

- Allow the bootup process to continue without invoking the BIOS Setup Utility.

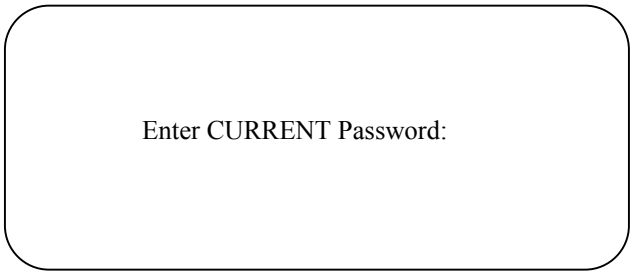
  In this case, after AMIBIOS loads the system, you may be requested to enter a password. (See *Password Entry* later in this section.)

Once the POST routines complete successfully, a screen displays showing the current configuration of your system, including processor type, base and extended memory amounts, hard drive types, display type and peripheral ports.

Password Entry
The system may be configured so that the user is required to enter a password each time the system boots or whenever an attempt is made to enter the BIOS Setup Utility. The password function may also be disabled so that the password prompt does not appear under any circumstances.

The **Password Check** option in the Security Menu allows you to specify when the password prompt displays: **Always** or only when **Setup** is attempted. This option is available only if the supervisor and/or user password(s) have been established. The supervisor and user passwords may be changed using the **Change Supervisor Password** and **Change User Password** options on the Security Menu. If the passwords are null, the password prompt does not display at any time. See the *Security Setup* section of this chapter for details on setting up passwords.

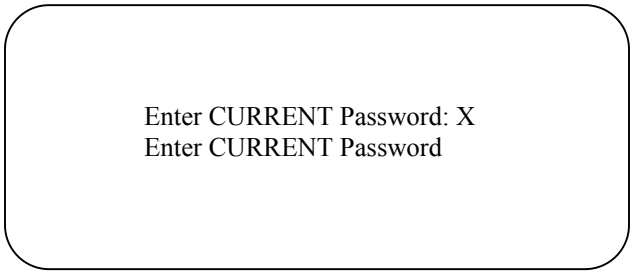
When password checking is enabled, the following password prompt displays:



Type the password and press **<Enter>**.

NOTE: The null password is the system default and is in effect if a password has not been assigned or if the CMOS has been corrupted. In this case, the password prompt does not display. To set up passwords, you may use the **Change Supervisor Password** and **Change User Password** options on the Security Menu of the BIOS Setup Utility. (See the *Security Setup* section later in this chapter.)

If an incorrect password is entered, the following screen displays:



You may try again to enter the correct password. If you enter the password incorrectly three times, the system responds in one of two different ways, depending on the value specified in the **Password Check** option on the *Security* Menu:

1) If the **Password Check** option is set to **Setup**, the system does not let you enter Setup, but does continue the booting process. You must reboot the system manually to retry entering the password.

2) If the **Password Check** option is set to **Always**, the system locks and you must reboot.

After rebooting, you will be requested to enter the password. Once the password has been entered correctly, you are allowed to continue.

BIOS ERRORS

If an error is encountered during the diagnostic checks performed when the system is powered on, the error is reported in one of two different ways:

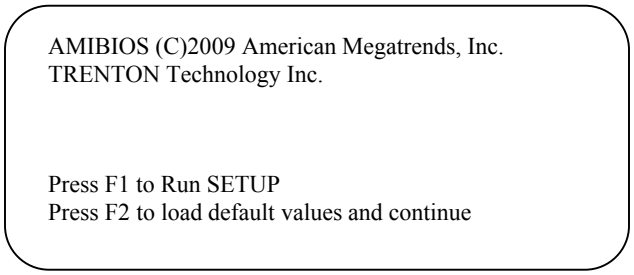
1) If the error occurs before the display device is initialized, a series of beeps is transmitted.

2) If the error occurs after the display device is initialized, the screen displays the error message. In the case of a non-fatal error, a prompt to press the **<F1>** key may also appear on the screen.

Explanations of the beep codes and BIOS error messages may be found in *Appendix A - BIOS Messages*.

As the POST routines are performed, test codes are presented on Port 80H. These codes may be helpful as a diagnostic tool and are listed in *Appendix A - BIOS Messages*.

If certain non-fatal error conditions occur, you are requested to run the BIOS Setup Utility. The error messages are followed by this screen:



Running AMIBIOS Setup

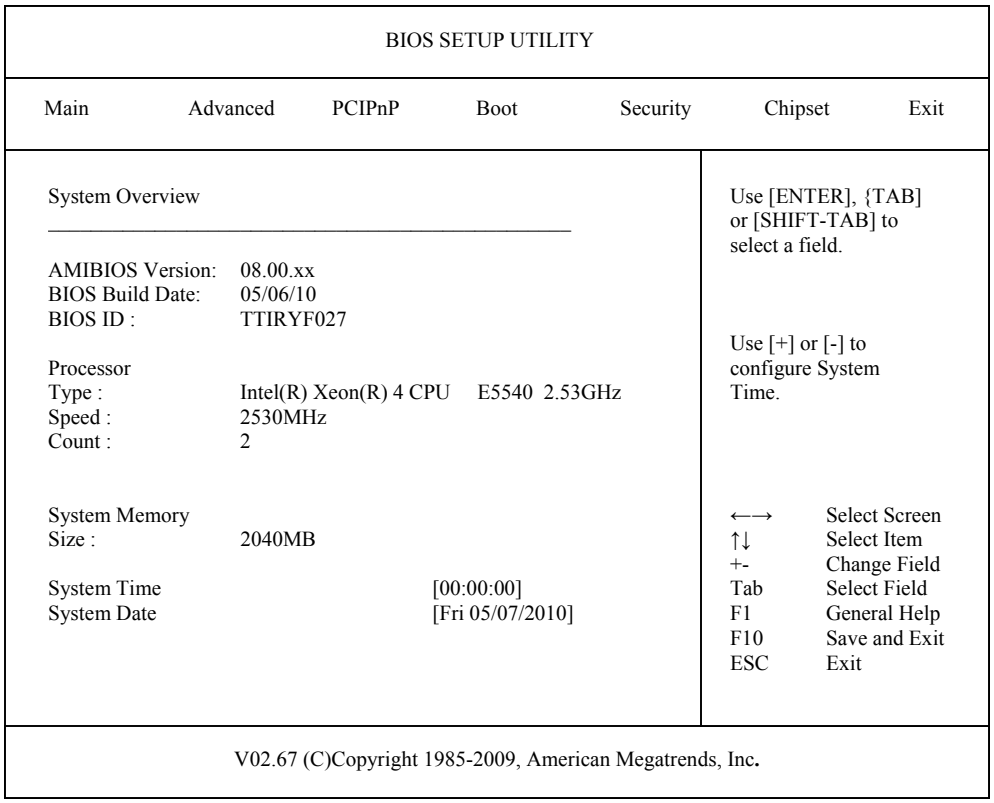
AMIBIOS Setup keeps a record of system parameters, such as date and time, disk drives and other user-defined parameters. The Setup parameters reside in the Read Only Memory Basic Input/Output System (ROM BIOS) so that they are available each time the system is turned on. The BIOS Setup Utility stores the information in the complementary metal oxide semiconductor (CMOS) memory. When the system is turned off, a backup battery retains system parameters in the CMOS memory.

Each time the system is powered on, it is configured with these values, unless the CMOS has been corrupted or is faulty. The BIOS Setup Utility is resident in the ROM BIOS so that it is available each time the computer is turned on. If, for some reason, the CMOS becomes corrupted, the system is configured with the default values stored in this ROM file.

As soon as the system is turned on, the power-on diagnostic routines check memory, attempt to prepare peripheral devices for action, and offer you the option of pressing **<Del>** to run the BIOS Setup Utility.

If certain non-fatal errors occur during the Power-On Self Test (POST) routines which are run when the system is turned on, you may be prompted to run the BIOS Setup Utility by pressing **<F1>**.

BIOS Setup Utility Main Menu
When you press **<F1>** in response to an error message received during the POST routines or when you press the **<Del>** key to enter the BIOS Setup Utility, the following screen displays:



BIOS Setup Utility Main Menu

When you display the BIOS Setup Utility Main Menu, the format is similar to the sample shown above. The data displayed on the top portion of the screen details parameters detected by AMIBIOS for your processor board and may not be modified. The system time and date displayed on the bottom portion of the screen may be modified.

BIOS SETUP UTILITY MAIN MENU OPTIONS

The descriptions for the system options listed below show the values as they appear if you have not changed them yet. Once values have been defined, they display each time the BIOS Setup Utility is run.

System Time/System Date
These options allow you to set the correct system time and date. If you do not set these parameters the first time you enter the BIOS Setup Utility, you will receive a "Run SETUP" error message when you boot the system until you set the correct parameters.

The Setup screen displays the system options:

System Time	**[00:00:00]**
System Date	**[Mon 01/01/2001]**

There are three fields for entering the time or date. Use the **<Tab>** key or the **<Enter>** key to move from one field to another and type in the correct value for the field.

If you enter an invalid value in any field, the screen will revert to the previous value when you move to the next field. When you change the value for the month, day or year field, the day of the week changes automatically when you move to the next field.

BIOS SETUP UTILITY OPTIONS

The BIOS Setup Utility allows you to change system parameters to tailor your system to your requirements. Various options which may be changed are listed below. Further explanations of these options and available values may be found in later chapters of this manual, as noted below.

NOTE: Do *not* change the values for any option unless you understand the impact on system operation. Depending on your system configuration, selection of other values may cause unreliable system operation.

NOTE: Menu items listed below in *italics* are only available when and IOB module is installed.

Use the **Right Arrow** key to display the desired menu. The following menus are available:

- Select **Advanced** to make changes to Advanced Setup parameters as described in the *Advanced Setup* chapter of this manual. The following options may be modified:
    - CPU Configuration
        - Hardware Prefetcher
        - Adjacent Cache Line Prefetch
        - MPS and ACPI MADT Ordering
        - Max CPUID Value Limit
        - Intel (R) Virtualization Tech
        - Execute-Disable Bit Capability
        - Intel (R) HT Technology
        - Active Processor Cores
        - A2OM
        - Intel (R) SpeedStep(tm) Tech
        - Intel (R) C-State Tech
        - ACPI T State
    - IDE Configuration
        - SATA#1 Configuration
            - Configure SATA#1 as
        - SATA#2 Configuration
        - Primary IDE Master/Primary IDE Slave
        - Secondary IDE Master/Secondary IDE Slave
        - Third IDE Master
        - Fourth IDE Master
            - LBA/Large Mode
            - Block (Multi-Sector Transfer)
            - PIO Mode

- DMA Mode
- S.M.A.R.T.
- 32Bit Data Transfer

- Hard Disk Write Protect
- IDE Detect Time Out (Sec)
- ATA(PI) 80Pin Cable Detection

- SuperIO Configuration
  - Serial Port1 Address/Serial Port2 Address
    - Serial Port2 Mode
- USB Configuration
  - Legacy USB Support
  - USB 2.0 Controller Mode
  - BIOS EHCI Hand-Off
  - Legacy USB1.1 HC Support
  - Hot Plug USB FDD Support
- ACPI Configuration
  - Advanced ACPI Configuration
    - ACPI Version Features
    - ACPI APIC Support
    - AMI OEMB Table
    - Headless Mode
  - Chipset ACPI Configuration
    - Energy Lake Feature
    - APIC ACPI SCI IRQ
    - USB Device Wakeup From S3/S4
    - High Precision Event Timer
    - HPET Memory Address
- AHCI Configuration
  - AHCI BIOS Support
  - AHCI Port 0
  - AHCI Port 1
  - AHCI Port 2
  - AHCI Port 3
  - AHCI Port 4
  - AHCI Port 5
    - SATA Port(x)
    - S.M.A.R.T.
- I/O Virtualization
  - SR-IOV Supported

- Intel TXT Initialization (Valid with Intel Xeon E5600-series processors only)
    - BIOS AC [SCLEAN]
    - BIOS AC [SCHECK]
    - Lock DPR
    - Reset TPM Establishment Flag
- Intel (R) VT-d Configuration
    - Intel VT-d
    - Coherency Support
- MPS Configuration
    - MPS Revision
- PCI Express Configuration
    - Relaxed Ordering
        - Auto/Enabled/Disabled
    - Maximum Payload Size
        - 128/256/512/1024/2048/4096 Bytes
    - Extended Tag Field
    - No Snoop
    - Maximum Read Request Size
    - Active State Power Management
    - Extended Synch
- Trusted Computing
    - TCG/TPM Support
        - No/Yes

- Select **PCIPnP** to make changes to PCI Plug and Play Setup parameters as described in the *PCI Plug and Play Setup* chapter of this manual. The following options may be modified:
    - Clear NVRAM
    - Plug & Play O/S
    - PCI Latency Timer
    - Allocate IRQ to PCI VGA
    - Palette Snooping
    - PCI IDE BusMaster
    - OffBoard PCI/ISA IDE Card
    - IRQs 3, 4, 5, 7, 9, 10, 11, 14 and 15
    - DMA Channels 0, 1, 3 5, 6 and 7
    - Reserved Memory Size

- Select **Boot** to make changes to Boot Setup parameters as described in the *Boot Setup* chapter of this manual. The following options may be modified:
    - Boot Settings Configuration
        - Quick Boot
        - Quiet Boot
        - AddOn ROM Display Mode
        - Bootup Num-Lock
        - PS/2 Mouse Support
        - Wait For 'F1' If Error
        - Hit 'DEL' Message Display
        - Interrupt 19 Capture
        - Boots Graphic Adapter Priority
    - Boot Device Priority
    - Hard Disk Drives
    - Removable Drives
    - CD/DVD Drives

- Select **Security** to establish or change the supervisor or user password or to enable boot sector virus protection. These functions are described later in this chapter. The following options may be modified:
    - Change Supervisor Password
        - User Access Level
        - Password Check
    - Change User Password
        - Password Check
    - Clear User Password
    - Boot Sector Virus Protection

- Select **Chipset** to make changes to Chipset Setup parameters as described in the *Chipset Setup* chapter of this manual. The following options may be modified:
    - CPU Bridge Configuration
        - QPI Links
            - Slow Speed/Full Speed
        - QPI Frequency
            - Auto/4.800GT/5.866GT/6.400GT
        - QPI L0s and L1
            - Enabled/Disabled
        - Memory Frequency
            - Auto/Force DDR-800/Force DDR-1066/Force DDR-1333
        - Memory Mode
            - Independent/Channel Mirroring/Lockstep
        - Demand Scrubbing
        - Patrol Scrubbing

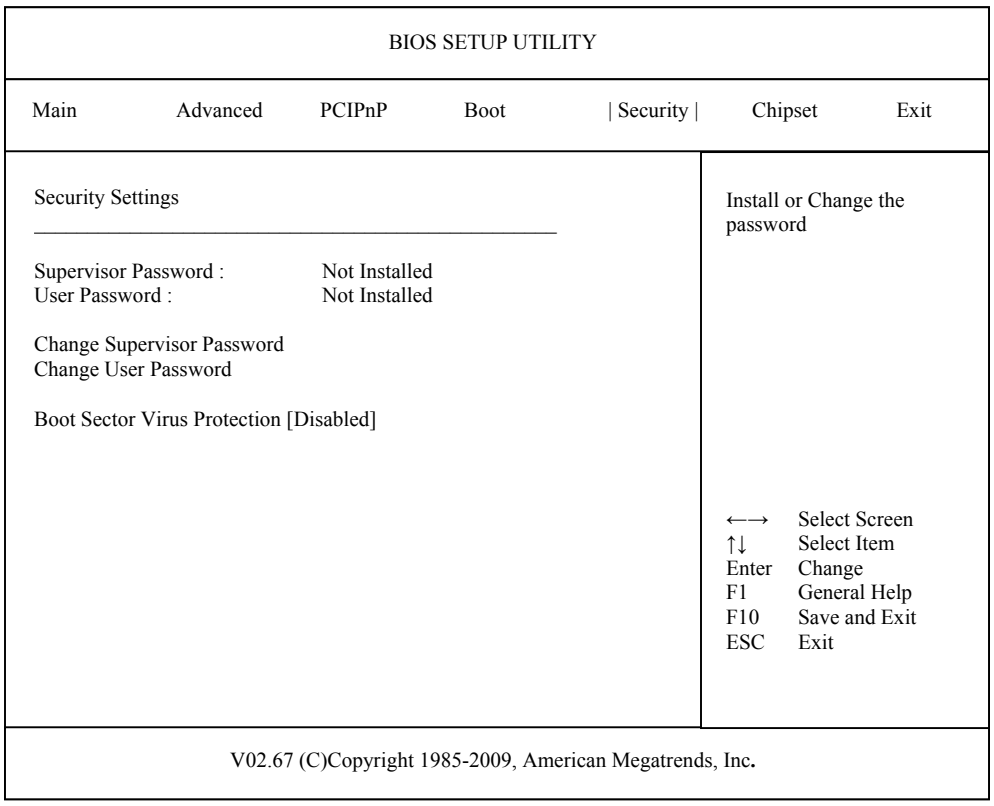
- Throttling – Closed Loop
  - Hyster Temp
    - Disabled/1.5° C/3.0° C/ 6.0° C
  - Guardband Temp
  - Inlet Temp
  - Temp Rise
  - Airflow
  - Altitude
    - Sea Level or Below/1-300/301-600/601-900/901-1200/1201-1500/1501-1800/1801-2100/2101-2400/2401-2700/2701-3000
  - DIMM Pitch
- Throttling – Open Loop

- North Bridge Chipset Configuration
  - Crystal Beach / DMA
  - Crystal Beach / DCA
  - Coarse-Grained Clock Gating
- South Bridge Configuration
  - USB Functions
    - Disabled/2 USB Ports/4 USB Ports/6 USB Ports/8 USB Ports/10 USB Ports/12 USB Ports
  - USB Port Configure
    - 6x6 USB Ports/8x4 USB Ports
  - USB 2.0 Controller
  - HDA Controller
  - SMBUS Controller
  - SLP_S4# Min Assertion Width (4 to 5/3 to 4/2 to 3/1 to 2 seconds)
  - Restore on AC Power Loss
    - Power Off/Power On/Last State
  - SMA Master Break Event
- PCI Express Ports Configuration
    - PCIe Port 0
      - Auto/Enabled/Disabled
    - PCIe Port 1
    - PCIe Port 2
    - PCIe Port 3
    - PCIe Port 4
    - PCIe Port 5
    - PCIe High Priority Port
      - Disabled/Port 0/Port 1/Port 2/Port 3/Port 4/Port 5
    - PCIe Port 0 IOxAPIC Enable
      - Disabled/Enabled
    - PCIe Port 1 IOxAPIC Enable
    - PCIe Port 2 IOxAPIC Enable

- PCIe Port 3 IOxAPIC Enable
- PCIe Port 4 IOxAPIC Enable
- PCIe Port 5 IOxAPIC Enable

- Select **Exit** to save or discard changes you have made to AMIBIOS parameters or to load the Optimal or Failsafe default settings. These functions are described later in this chapter. The following options are available:
  - Save Changes and Exit
  - Discard Changes and Exit
  - Discard Changes
  - Load Optimal Defaults
  - Load Failsafe Defaults

Security Setup
When you select **Security** from the BIOS Setup Utility Main Menu, the following Setup screen displays:



Security Setup Screen

When you display the Security Setup screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>**.

NOTE: The values on this screen do not necessarily reflect the values appropriate for your SHB. Refer to the explanations below for specific instructions about entering correct information.

SECURITY SETUP OPTIONS

The Security Setup options allow you to establish, change or clear the supervisor or user password and to enable boot sector virus protection.

The descriptions for the system options listed below show the values as they appear if you have not changed them yet. Once values have been defined, they display each time the BIOS Setup Utility is run.

CHANGE SUPERVISOR PASSWORD

This option allows you to establish a supervisor password, change the current password or disable the password prompt by entering a null password. The password is stored in CMOS RAM.

If you have signed on under the user password, this option is *not* available.

The **Change Supervisor Password** feature can be configured so that a password must be entered each time the system boots or just when a user attempts to enter the BIOS Setup Utility.

NOTE: The null password is the system default and is in effect if a password has not been assigned or if the CMOS has been corrupted. In this case, the "Enter CURRENT Password" prompt is bypassed when you boot the system, and you must establish a new password.

If you select the **Change Supervisor Password** option, the following window displays:

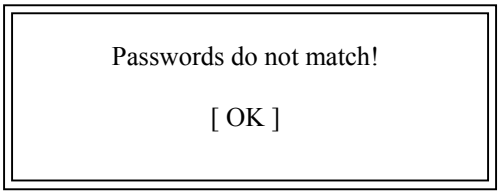
This is the message which displays before you have established a password, or if the last password entered was the null password. If a password has already been established, you are asked to enter the *current* password before being prompted to enter the *new* password.

Type the new password and press **<Enter>**. The password cannot exceed six (6) characters in length. The screen displays an asterisk (*) for each character you type.

After you have entered the new password, the following window displays:

Re-key the new password as described above.

If the password confirmation is miskeyed, AMIBIOS Setup displays the following message:



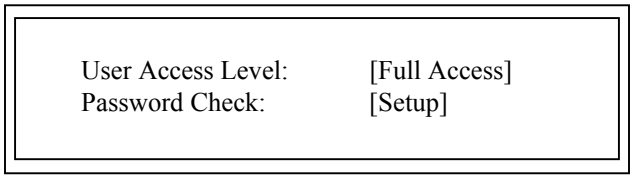
No retries are permitted; you must restart the procedure.

If the password confirmation is entered correctly, the following message displays:

Press the **<Enter>** key to return to the Security screen. **Installed** displays on the screen next to the **Supervisor Password** option, indicating the password has been accepted. This setting will remain in effect until the supervisor password is either disabled or discarded upon exiting the BIOS Setup Utility. If you have created a new password, be sure to select **Exit**, then **Save Changes and Exit** to save the password. The password is then stored in CMOS RAM. The next time the system boots, you are prompted for the password.

NOTE: Be sure to keep a record of the new password each time it is changed. If you forget it, use the Password Clear jumper to reset it to the default (null password). See the *Specifications* chapter of this manual for details.

If a password has been established, the following options and their default values are added to the screen:



User Access Level

This option allows you to define the level of access the user will have to the system.

The Setup screen displays the system option:

User Access Level [Full Access]

Four options are available:

- Select **No Access** to prevent user access to the BIOS Setup Utility.
- Select **View Only** to allow access to the BIOS Setup Utility for viewing, but to prevent the user from changing any of the fields.
- Select **Limited** to allow the user to change only a limited number of options, such as Date and Time.
- Select **Full Access** to allow the user full access to change any option in the BIOS Setup Utility.

Password Check

This option determines when a password is required for access to the system.

The Setup screen displays the system option:

Password Check [Setup]

Two options are available:

- Select **Setup** to have the password prompt appear only when an attempt is made to enter the BIOS Setup Utility program.
- Select **Always** to have the password prompt appear each time the system is powered on.

DISABLING THE SUPERVISOR PASSWORD

To *disable* password checking so that the password prompt does not appear, you may create a null password by selecting the **Change Supervisor Password** function and pressing **<Enter>** without typing in a new password. You will be asked to enter the current password before being allowed to enter the null password. After you press **<Enter>** at the **Enter New Password** prompt, the following message displays:

CHANGE USER PASSWORD

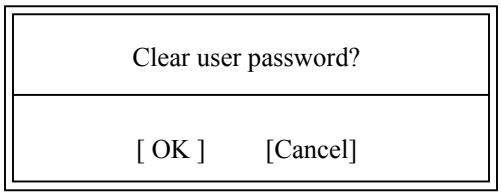
The **Change User Password** option is similar in functionality to the **Change Supervisor Password** and displays the same messages. If you have signed on under the user password, the **Change Supervisor Password** function is not available for modification.

If a user password has been established, the **Password Check** option and its default value is added to the screen. This option determines when a user password is required for access to the system. For details, refer to the description for **Password Check** under the **Change Supervisor Password** heading earlier in this section.

CLEAR USER PASSWORD

This option allows you to clear the user password. It disables the user password by entering a null password.

If you select the **Clear User Password** option, the following window displays:



You have two options:

- Select **Ok** to clear the user password.
- Select **Cancel** to leave the current user password in effect.

Boot Sector Virus Protection

This option allows you to request AMIBIOS to issue a warning when any program or virus issues a Disk Format command or attempts to write to the boot sector of the hard disk drive.
The Setup screen displays the system option:

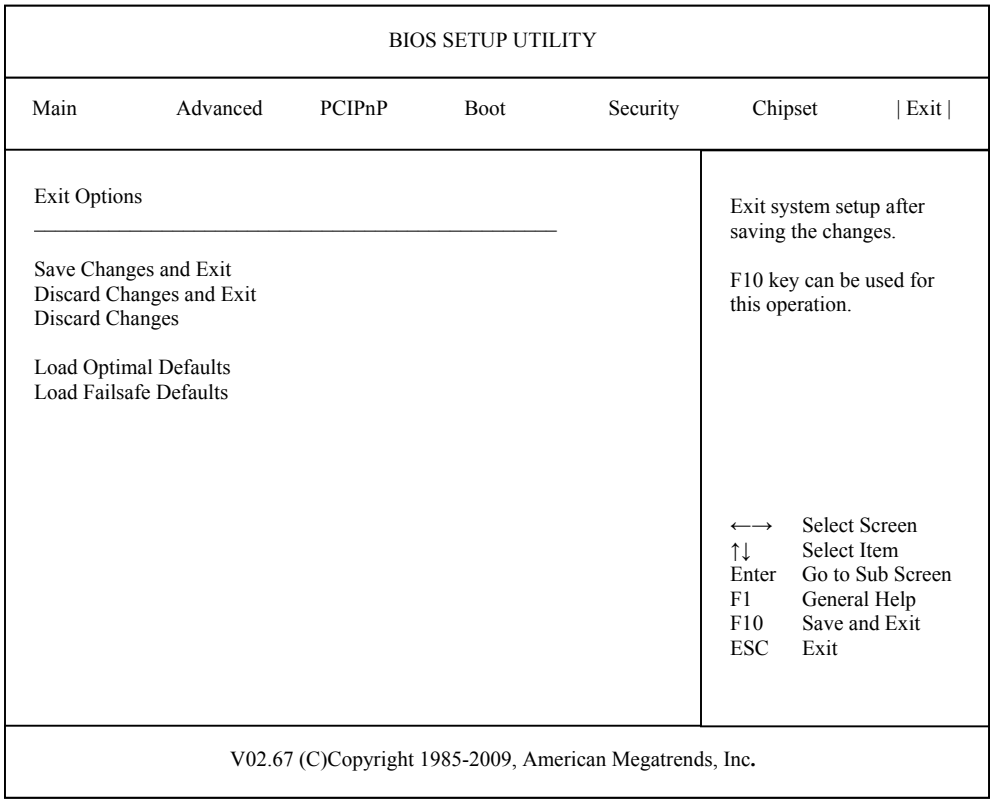
Boot Sector Virus Protection [Disabled]

Available options are:

Disabled
Enabled

NOTE: You should *not* enable boot sector virus protection when formatting a hard drive.

Exit Menu
When you select Exit from the BIOS Setup Utility Main Menu, the following screen displays:



Exit Menu Screen

When you display the Exit Menu screen, the format is similar to the sample shown above. Highlight the option you wish to select and press **<Enter>**.

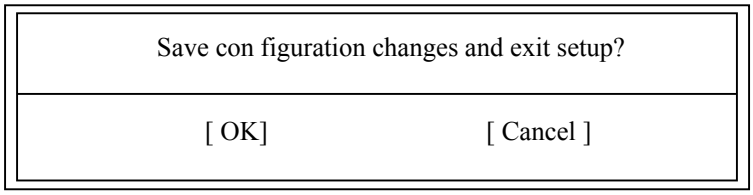
EXIT MENU OPTIONS

When you are running the BIOS Setup Utility program, you may either save or discard changes you have made to AMIBIOS parameters, or you may load the Optimal or Failsafe default settings.

Save Changes and Exit

The features selected and configured in the Setup screens are stored in the CMOS when this option is selected. The CMOS checksum is calculated and written to the CMOS. Control is then passed back to the AMIBIOS and the booting process continues, using the new CMOS values.

If you select the **Save Changes and Exit** option, the following window displays:

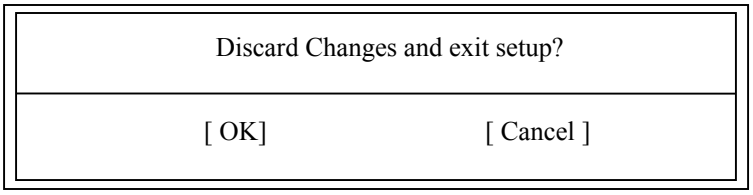


You have two options:

- Select **Ok** to save the system parameters and continue with the booting process.
- Select **Cancel** to return to the BIOS Setup Utility screen.

Discard Changes and Exit
When the **Discard Changes and Exit** option is selected, the BIOS Setup Utility exits *without* saving the changes in the CMOS. Control is then passed back to AMIBIOS and the booting process continues, using the previous CMOS values.

If you select the **Discard Changes and Exit** option, the following window displays:

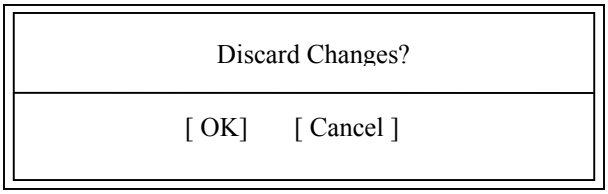


You have two options:

- Select **Ok** to continue the booting process *without* writing any changes to the CMOS.
- Select **Cancel** to return to the BIOS Setup Utility screen.

Discard Changes
When the Discard Changes option is selected, the BIOS Setup Utility resets any parameters you have changed back to the values at which they were set when you entered the Setup Utility. Control is then passed back to the BIOS Setup Utility screen.

If you select the Discard Changes option, the following window displays:



You have two options:

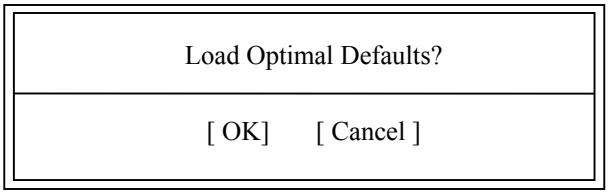
- Select Ok to reset any parameters you have changed back to the values at which they were set when you entered the BIOS Setup Utility. This option then returns you to the BIOS Setup Utility screen.
- Select Cancel to return to the BIOS Setup Utility screen without discarding any changes you have made.

Load Optimal or Failsafe Defaults
Each AMIBIOS Setup option has two default settings (Optimal and Failsafe). These settings can be applied to all AMIBIOS Setup options when you select the appropriate configuration option from the BIOS Setup Utility Main Menu.

You can use these configuration options to quickly set the system configuration parameters which should provide the best performance characteristics, or you can select a group of settings which have a better chance of working when the system is having configuration-related problems.

Load Optimal Defaults
This option allows you to load the Optimal default settings. These settings are best-case values which should provide the best performance characteristics. If CMOS RAM is corrupted, the Optimal settings are loaded automatically.

If you select the **Load Optimal Defaults** option, the following window displays:

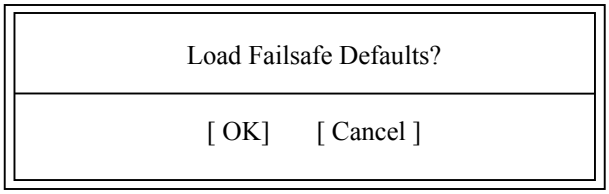


You have two options:

- Select Ok to load the Optimal default settings.
- Select Cancel to leave the current values in effect.

Load Failsafe Defaults This option allows you to load the Failsafe default settings when you cannot boot your computer successfully. These settings are more likely to configure a workable computer. They may not provide optimal performance, but are the most stable settings. You may use this option as a diagnostic aid if your system is behaving erratically. Select the Failsafe settings and then try to diagnose the problem after the computer boots.

If you select the **Load Failsafe Defaults** option, the following window displays:



You have two options:

- Select **Ok** to load the Failsafe default settings.
- Select **Cancel** to leave the current values in effect.

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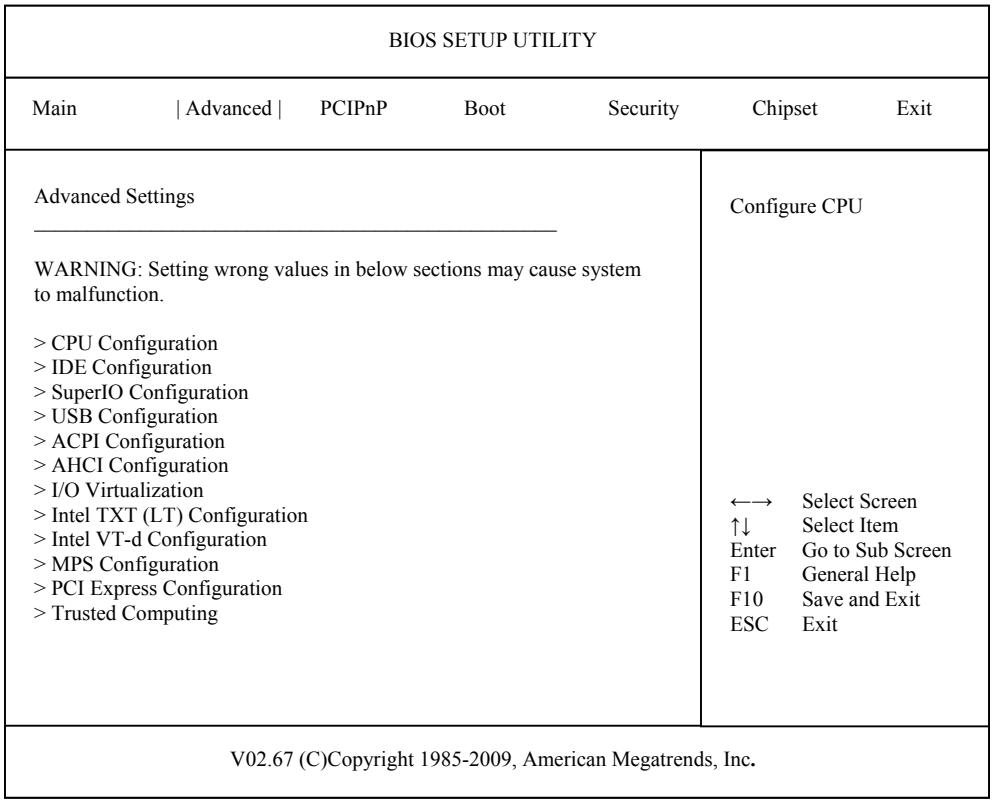
Chapter 5 Advanced Setup

Advanced Setup
When you select **Advanced** from the BIOS Setup Utility Main Menu, the following Setup screen displays:



When you display the Advanced Setup screen, the format is similar to the sample shown above, allowing you to continue to subscreens designed to change parameters for each of the Advanced Setup options. Highlight the option you wish to change and press **<Enter>** to proceed to the appropriate subscreen.

ADVANCED SETUP OPTIONS

NOTE: Do *not* change the values for any Advanced Setup option unless you understand the impact on system operation. Depending on your system configuration, selection of other values may cause unreliable system operation.

CPU Configuration
The **CPU Configuration** subscreen provides you with information about the processor in your system. The following options may be modified:

- CPU Configuration
    - Hardware Prefetcher
    - Adjacent Cache Line Prefetch
    - MPS and ACPI MADT Ordering
    - Max CPUID Value Limit
    - Intel (R) Virtualization Tech
    - Execute-Disable Bit Capability
    - Intel (R) HT Technology
    - Active Processor Cores
    - A2OM
    - Intel (R) SpeedStep(tm) Tech
    - Intel (R) C-State Tech
    - ACPI T State

IDE Configuration
The options on the **IDE Configuration** subscreens allow you to set up or modify parameters for your IDE controller and hard disk drive(s). The following options may be modified:

- IDE Configuration
    - SATA#1 Configuration
        - Configure SATA#1 as
        - Max Ports on SATA#1
    - SATA#2 Configuration
    - Primary IDE Master/Primary IDE Slave
    - Secondary IDE Master/Secondary IDE Slave
    - Third IDE Master
    - Fourth IDE Master
        - Type
        - LBA/Large Mode
        - Block (Multi-Sector Transfer)
        - PIO Mode
        - DMA Mode
        - S.M.A.R.T.
        - 32Bit Data Transfer
    - Hard Disk Write Protect
    - IDE Detect Time Out (Sec)
    - ATA(PI) 80Pin Cable Detection

SuperIO Configuration
The options on the **SuperIO Configuration** subscreen allow you to set up or modify parameters for your on-board peripherals. The following options may be modified:

- Serial Port1 Address/Serial Port2 Address

USB Configuration
The options on the **USB Configuration** subscreen allow you to set up or modify parameters for your on-board USB ports. The following options may be modified:

- Legacy USB Support
- USB 2.0 Controller Mode
- BIOS EHCI Hand-Off
- Legacy USB1.1 HC Support
- Hotplug USB FDD Support

ACPI Configuration
The **ACPI Configuration** subscreen allows you to set up or modify the following options:

- ACPI Configuration
    - Advanced ACPI Configuration
        - ACPI Version Features
        - ACPI APIC Support
        - AMI OEMB Table
        - Headless Mode
    - Chipset ACPI Configuration
        - Energy Lake Feature
        - APIC ACPI SCI IRQ
        - USB Device Wakeup From S3/S4
        - High Precision Event Timer
        - HPET Memory Address

AHCI Configuration
The **ACPI Configuration** subscreen allows you to set up or modify the following options:

- AHCI
    - AHCI BIOS Support
    - AHCI Port 0
      AHCI Port 1
      AHCI Port 2
      AHCI Port 3
      AHCI Port 4
      AHCI Port 5

- SATA Port(x)
- S.M.A.R.T.

I/O Virtualization
The **I/O Configuration** subscreen allows you to modify the following option:

- SR-IOV Supported

Intel TXT Configuration
When using Intel® Xeon® Series 5600 CPUs (i.e. Westmere-EP) on the Trenton WTM7026 motherboard the **Intel TXT Configuration** subscreen allows you to modify the following option:

- Intel TXT Initialization

Intel VT-d Configuration
The **Intel VT-d Configuration** subscreen allows you to modify the following options:

- Intel VT-d Initialization
- Coherency Support

MPS Configuration
The **MPS Configuration** subscreen allows you to modify the following option:

- MPS Revision

PCI Express Configuration
The options on the **PCI Express Configuration** subscreen allow you to set up or modify parameters for configuring the motherboard's PCI Express interface parameters. The following options may be modified:

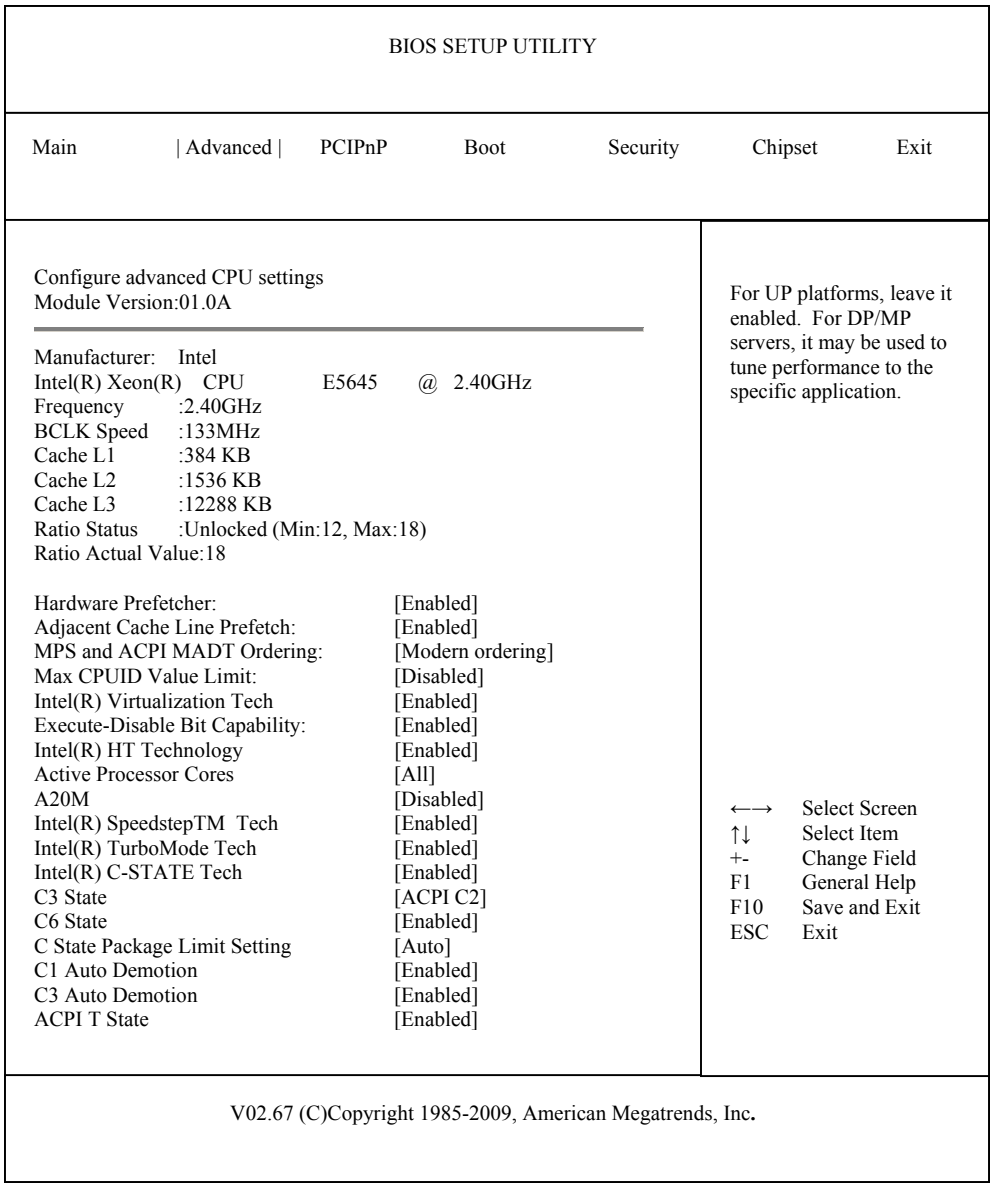
- Relaxed Ordering
- Maximum Payload Size
- Extended Tag Field
- No Snoop
- Maximum Read Request Size
- Active State Power Management
- Extended Synch

Trusted Computing
The **Trusted Computing** subscreen allows you to modify the following option:

- TCG/TPM Support

Saving and Exiting
When you have made all desired changes to **Advanced** Setup, you may make changes to other Setup options by using the right and left arrow keys to access other menus. When you have made all of your changes, you may save them by selecting the **Exit** menu, or you may press **<Esc>** at any time to exit the BIOS Setup Utility without saving the changes.

CPU Configuration Setup
When you select **CPU Configuration** from the Advanced Setup Screen, the following Setup screen displays:



CPU Configuration Screen

When you display the CPU Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

CPU CONFIGURATION SETUP OPTIONS

The descriptions for the system options listed below show the values as they appear if you have not yet run Advanced Setup. Once you change the settings, the new settings display each time Advanced Setup is run.

Hardware Prefetcher

The Setup screen displays the system option:

Hardware Prefetcher: [Enabled]

Available options are:
Disabled
Enabled

Adjacent Cache Line Prefetch

The Setup screen displays the system option:

Adjacent Cache Line Prefetch: [Enabled]

Available options are:
Disabled
Enabled

MPS and ACPI MADT Ordering

The Setup screen displays the system option:

MPS and ACPI MADT ordering: [Modern ordering]

Available options are:
Modern ordering
Legacy ordering

Max CPUID Value Limit

The Setup screen displays the system option:

Max CPUID Value Limit: [Disabled]

Available options are:
Disabled
Enabled

Intel(R) Virtualization Tech

The Setup screen displays the system option:

Intel(R) Virtualization Tech: [Enabled]

Available options are:
Disabled
Enabled

Execute-Disable Bit Capability

The Setup screen displays the system option:

Execute-Disable Bit Capability [Enabled]

Available options are:
Disabled
Enabled

Intel(R) HT Technology

HT means Hyper-Threading and the Setup screen displays the system option:

Intel(R) HT Technology [Enabled]

Available options are:
Enabled
Disabled

Active Processor Cores

The Setup screen displays the system option:

Active Processor Cores [ALL]

Available options are:
All
1, 2, 3, 4 or 5

A20M

The Setup screen displays the system option:

A20M [Disabled]

Available options are:
Disabled
Enabled

Intel(R) SpeedStep ™ Tech

The Setup screen displays the system option:

Intel(R) SpeedStep™ Tech [Disabled]

Available options are:
Disabled
Enabled

Intel(R) C-STATE Tech

The Setup screen displays the system option:

Intel(R) C-STATE Tech [Disabled]

Available options are:
Disabled
Enabled

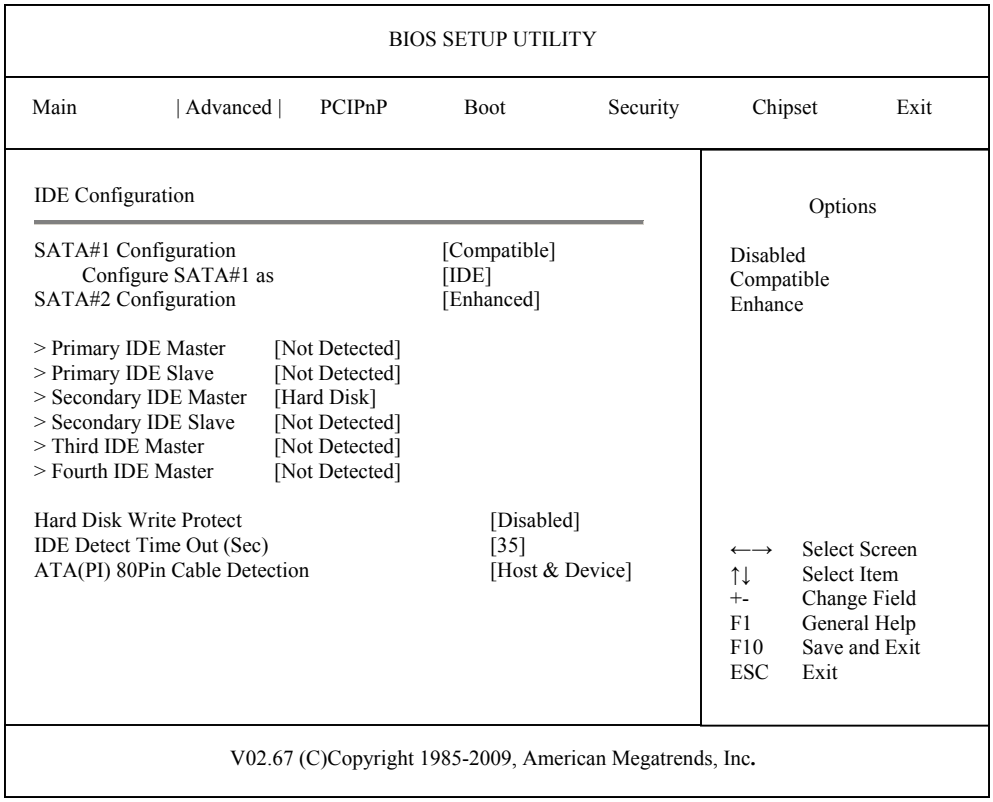
ACPI T Technology

The Setup screen displays the system option:

ACPI T State [Enabled]

Available options are:
Disabled
Enabled

IDE Configuration
When you select **IDE Configuration** from the Advanced Setup Menu, a Setup screen similar to the following displays:



IDE Configuration Screen

When you display the IDE Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

Some of the options on this screen allow you to continue to subscreens designed to change parameters for that particular option. Highlight the option you wish to change and press **<Enter>** to proceed to the appropriate subscreen.

IDE CONFIGURATION OPTIONS

The descriptions for the system options listed below show the values as they appear if you have not run the BIOS Setup Utility program yet. Once values have been defined, they display each time the BIOS Setup Utility is run.

SATA#1 Configuration

The Setup screen displays the system option:

SATA#1 Configuration [Compatible]

Three options are available:

- Select **Disabled** to disable all ports. No drives are displayed on the screen.
- Select **Compatible** to allow up to four serial devices.
- Select **Enhanced** to allow up to six serial devices.

Configure SATA As

This option allows you specify how to configure the available SATA devices. It is only available if the SATA#1 Configuration option is set to Compatible or Enhanced.

The Setup screen displays the system option:

Configure SATA as [IDE]

Three options are available:

- Select IDE to enable the SATA devices as IDE devices.
- Select RAID to enable the SATA devices as a RAID device. When RAID is selected:
    - The SATA#2 Configuration screens disappear.
    - The Configure SATA#1 Device ID line appears with a default value of 2822 with an optional device ID setting of 3A25 available.
    - The Hot Plug Menu Displays below the Fourth IDE Master displays with a default value of Disabled.
- Select AHCI to enable Native Command Queuing (NCQ) and SATA hot plug capability. When AHCI is selected:
    - The SATA#1 Configuration and SATA#2 Configuration screens disappear.
    - The Hot Plug Menu Displays below the Fourth IDE Master displays with a default value of Disabled.

SATA#2 Configuration

The Setup screen displays the system option:

SATA#2 Configuration [Enhanced]

Two options are available:

- Select **Disabled** to disable all ports.
- Select **Enhanced** to allow up to the maximum available drives.

Primary IDE Master/Primary IDE Slave
Secondary IDE Master/Secondary IDE Slave
Third IDE Master
Fourth IDE Master

The line items displayed are determined by the SATA settings described previously. The values for the line items depend on the devices detected by AMIBIOS.

The Setup screen displays the system options:

Primary IDE Master : [Not Detected]
Primary IDE Slave : [Not Detected]
Secondary IDE Master: [Hard Disk]
Secondary IDE Slave : [Not Detected]
Third IDE Master : [Not Detected]
Fourth IDE Master : [Not Detected]

This is an example of the screen. To view and/or change parameters for any of the devices, press **<Enter>** to proceed to the IDE Device Setup screen, which is described later in this section.

Hard Disk Write Protect
This option allows you to disable or enable device write protection. Write protection will be effective only if the device is accessed through the BIOS.

The Setup screen displays the system option:

Hard Disk Write Protect [Disabled]

Available options are:

Disabled
Enabled

IDE Detect Time Out (Sec)

This option allows you to select the time-out value (in seconds) for detecting an ATA/ ATAPI device.

The Setup screen displays the system option:

IDE Detect Time Out (Sec) [35]

Available options are:
0
5
10
15
20
25
30
35

ATA(PI) 80Pin Cable Detection

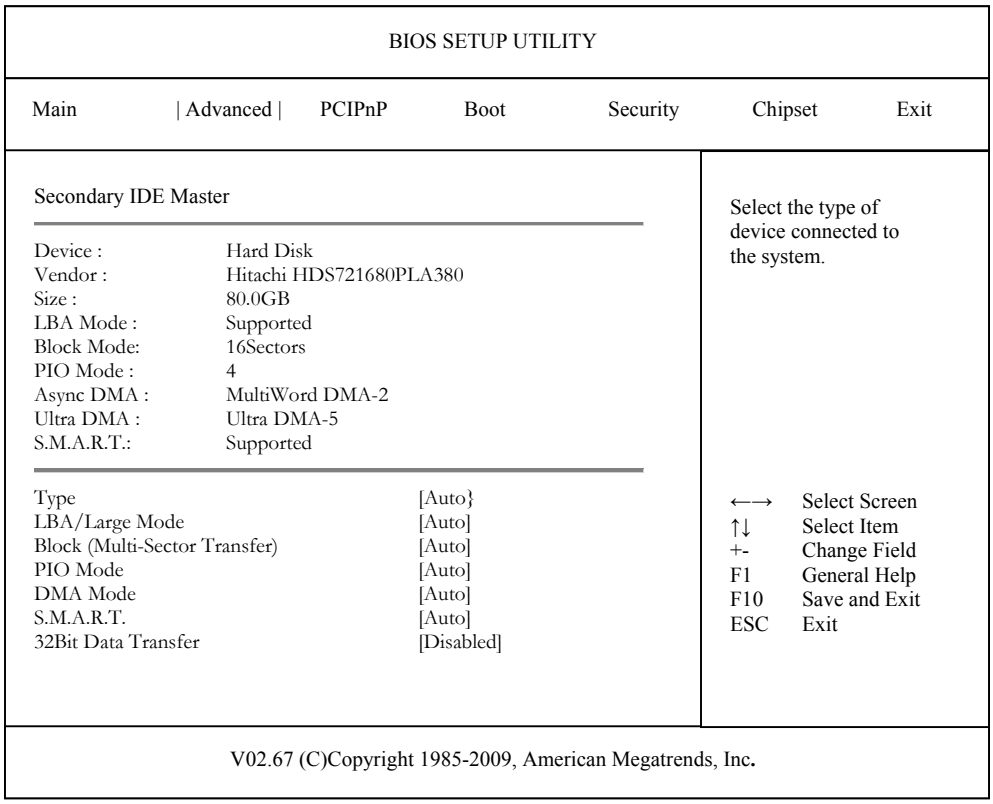
This option allows you to select the mechanism for detecting an 80-pin ATA(PI) cable.

The Setup screen displays the system option:

ATA(PI) 80Pin Cable Detection [Host & Device]

Available options are:
Host & Device
Host
Device

IDE Device Setup
When you select one of the IDE devices from the **IDE Configuration** screen, a Setup screen similar to the following displays:



IDE Device Screen

When you display the IDE Device subscreen, the format is similar to the sample shown above. The data displayed on the top portion of the screen details the parameters detected by AMIBIOS for the specified device and may not be modified. The data displayed on the bottom portion of the screen may be modified.

The drive information; which displays the first time the BIOS Setup Utility is run, indicates the drive(s) on your system which AMIBIOS detected upon initial bootup.

IDE DEVICE SETUP OPTIONS

The following options are available for each of the IDE devices on the primary and secondary IDE controllers:

Type

This option allows you to specify what type of device is on the IDE controller.

The Setup screen displays the system option:

Type [Auto]

Available options are:

Not Installed
Auto
CD/DVD
ARMD

If **Not Installed** is selected, the other options on the bottom portion of this screen do not display.

LBA/Large Mode

This option allows you to enable IDE LBA (Logical Block Addressing) Mode for the specified IDE drive. Data is accessed by block addresses rather than by the traditional cylinder-head-sector format. This allows you to use drives larger than 528MB.

The Setup screen displays the system option:

LBA/Large Mode [Auto]

Two options are available:

- Select **Disabled** to have AMIBIOS use the physical parameters of the hard disk and do no translation to logical parameters. The operating system which uses the parameter table will then see only 528MB of hard disk space even if the drive contains more than 528MB.
- Select **Auto** to enable LBA mode and translate the physical parameters of the drive to logical parameters. LBA Mode must be supported by the drive and the drive must have been formatted with LBA Mode enabled.

Block (Multi-Sector Transfer) Mode

This option supports transfer of multiple sectors to and from the specified IDE drive. Block mode boosts IDE drive performance by increasing the amount of data transferred during an interrupt.

If **Block Mode** is set to **Disabled**, data transfers to and from the device occur one sector at a time.

The Setup screen displays the system option:

Block (Multi-Sector Transfer) [Auto]

Available options are:
Disabled
Auto

PIO Mode

IDE Programmed I/O (PIO) Mode programs timing cycles between the IDE drive and the programmable IDE controller. As the PIO mode increases, the cycle time decreases.

Set the **PIO Mode** option to **Auto** to have AMIBIOS select the PIO mode used by the IDE drive being configured. If you select a specific value for the PIO mode, you must make *absolutely* certain that you are selecting the PIO mode supported by the IDE drive being configured.

The Setup screen displays the system option:

PIO Mode [Auto]

Available options are:

Auto
0
1
2
3
4

DMA Mode

This option allows you to select DMA Mode for the device.

The Setup screen displays the system option:

DMA Mode [Auto]

Available options are:

Auto	
SWDMA0	(SingleWord DMA 0 - 2)
SWDMA1	
SWDMA2	
MWDMA0	(MultiWord DMA 0 - 2)
MWDMA1	
MWDMA2	
UDMA0	(UltraDMA 0 - 6)
UDMA1	
UDMA2	
UDMA3	
UDMA4	
UDMA5	
UDMA6	

S.M.A.R.T.

This option allows AMIBIOS to use the SMART (Self-Monitoring Analysis and Reporting Technology) protocol for reporting server system information over a network.

The Setup screen displays the system option:

S.M.A.R.T. [Auto]

Available options are:

Auto
Disabled
Enabled

32Bit Data Transfer
If the **32Bit Data Transfer** parameter is set to **Enabled**, AMIBIOS enables 32-bit data transfers. If the host controller does not support 32-bit transfer, this feature *must* be set to **Disabled**.

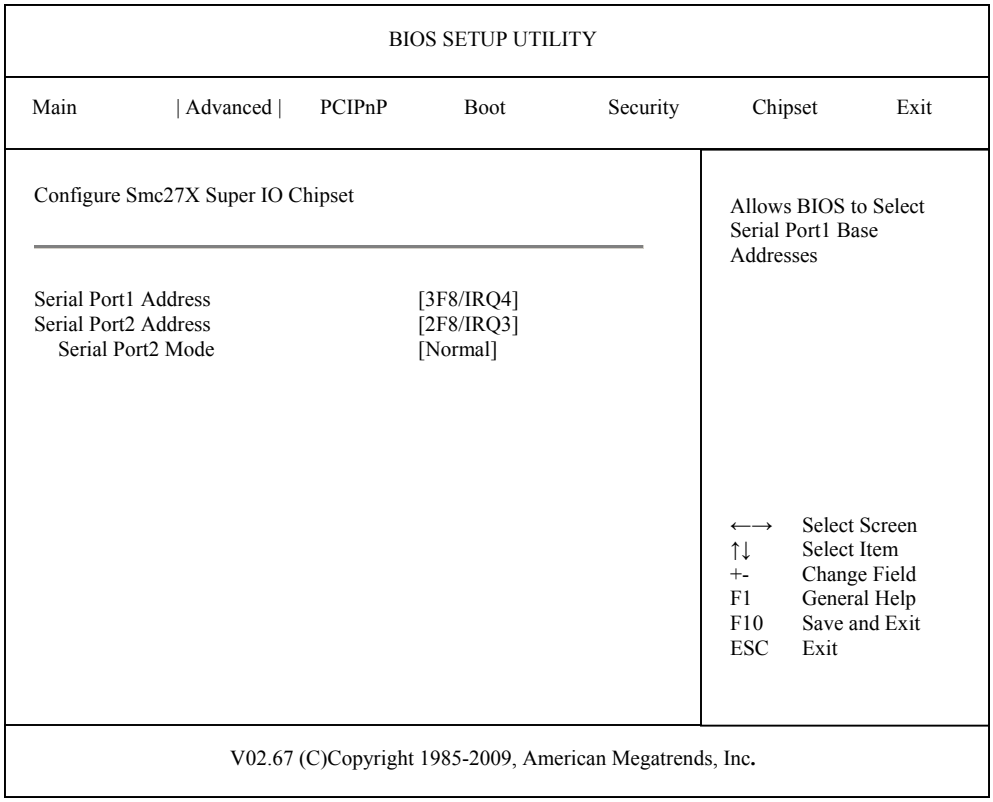
The Setup screen displays the system option:

32Bit Data Transfer [Disabled]

Available options are:

Disabled
Enabled

SuperIO Configuration
When you select **SuperIO Configuration** from the Advanced Setup Menu, the following Setup screen displays. This menu is only available if an IOB module is installed.



SuperIO Configuration Screen

When you display the SuperIO Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

SUPERIO CONFIGURATION OPTIONS

The descriptions for the system options listed below show the values as they appear if you have not run the BIOS Setup Utility program yet. Once values have been defined, they display each time the BIOS Setup Utility is run.

Serial Port1 Address/Serial Port2 Address

Each of these options enables the specified serial port on the motherboard and establishes the base I/O address and the number of the interrupt request for the port.

The Setup screen displays the system option:

Serial Port1 Address [3F8/IRQ4]
Serial Port2 Address [2F8/IRQ3]
Serial Port2 Mode [Normal]

Available options are:

Disabled
3F8/IRQ4
3E8/IRQ4
2F8/IRQ3
2E8/IRQ3

NOTE: The values available for each on-board serial port may vary, depending on the setting previously selected for the other on-board serial port and any off-board serial ports. If an I/O address is assigned to another serial port, AMIBIOS automatically omits that address from the values available.

If the system has off-board serial ports which are configured to specific starting I/O ports via jumper settings, AMIBIOS configures the on-board serial ports to avoid conflicts.

When AMIBIOS checks serial ports, any off-board serial ports found are left at their assigned addresses. Serial Port1, the first on-board serial port, is configured with the first available address and Serial Port2, the second on-board serial port, is configured with the next available address. The default address assignment order is 3F8H, 2F8H, 3E8H, 2E8H. Note that this same assignment order is used by AMIBIOS to place the active serial port addresses in lower memory (BIOS data area) for configuration as logical COM devices.

For example, if there is one off-board serial port and its address is set to 2F8H, Serial Port1 is assigned address 3F8H and Serial Port2 is assigned address 3E8H. Configuration is then as follows:

COM1 - Serial Port1 (at 3F8H)
COM2 - off-board serial port (at 2F8H)
COM3 - Serial Port2 (at 3E8H)

Serial Port2 Mode

This option allows the BIOS to select the mode for Serial Port2.

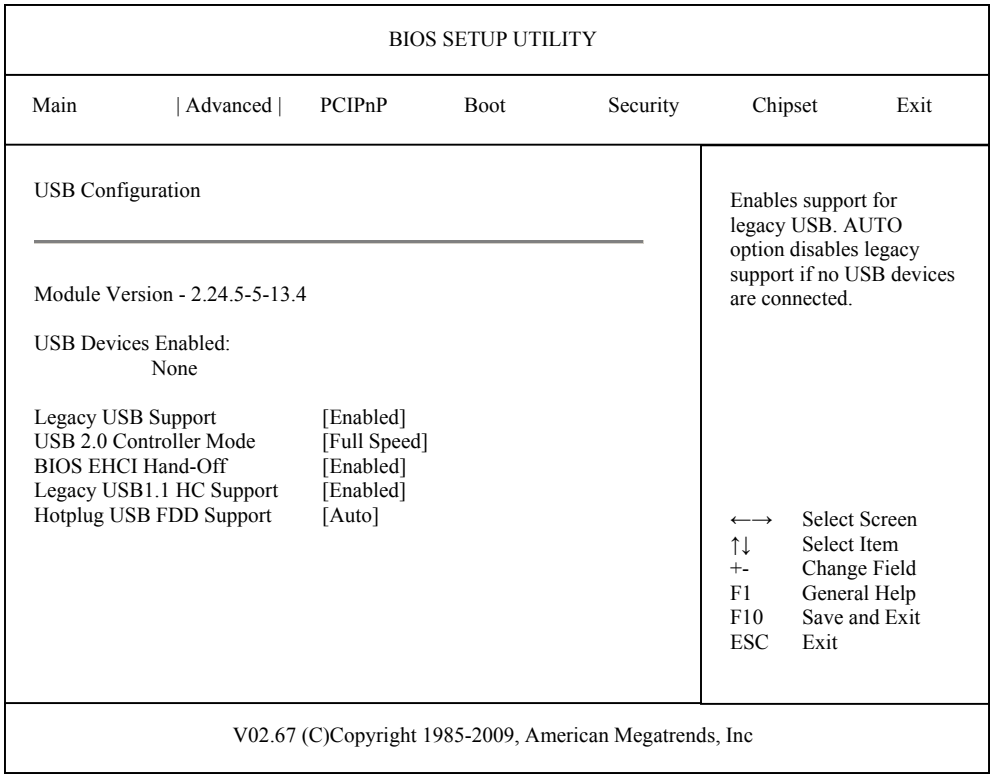
The Setup screen displays the system option:

Serial Port2 Mode [Normal]

Four options are available:

- Select **Normal** to use normal serial port mode.
- Select **IrDA** to communicate to an infrared data device connected to serial port 2.
- Select **ASK IR** to communicate to an infrared data device using the Sharp ASK protocol connected to serial port 2.

USB Configuration
When you select **USB Configuration** from the Advanced Setup Menu, the following Setup screen displays:



USB Configuration Screen

When you display the USB Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

USB CONFIGURATION OPTIONS
The descriptions for the system options listed below show the values as they appear if you have not run the BIOS Setup Utility program yet. Once values have been defined, they display each time the BIOS Setup Utility is run.

Legacy USB Support

This option allows you to enable support for older USB devices. The **Auto** option disables legacy support if no USB devices are connected. If this option is set to **Disabled**, the remaining three options are not available.

The Setup screen displays the system option:

Legacy USB Support [Enabled]

Available options are:
Disabled
Enabled
Auto

USB 2.0 Controller Mode

This option configures the USB 2.0 controller to high-speed (480Mbps) or full-speed (12Mbps) mode. If the **Legacy USB Support** option is set to **Disabled**, this option is not available.

The Setup screen displays the system option:

USB 2.0 Controller Mode [FullSpeed]

Available options are:

FullSpeed
HiSpeed

BIOS EHCI Hand-Off

This option is a work-around for operating systems without EHCI hand-off support. If the **Legacy USB Support** option is set to **Disabled**, this option is not available.

The Setup screen displays the system option:

BIOS EHCI Hand-Off [Enabled]

Available options are:

Disabled
Enabled

Legacy USB1.1 HC Support

This option allows you to alert the motherboard's USB hardware controller that there may be older USB 1.1 devices used in the system. Some of these legacy devices may have issues functioning on a faster USB 2.0 interface.

The Setup screen displays the system option:

Legacy USB1.1 HC Support [Enabled]

Available options are:

Disabled
Enabled

Hotplug USB FDD Support

Some older USB floppy disk drives may create issues when they are installed or removed from a system under power. When this option is set to **Auto** the BIOS creates a dummy FDD device that will be associated with any hotplug USB floppy drive that may be used later by the system. The Auto option will only perform this dummy device creation when there is no USB FDD present.

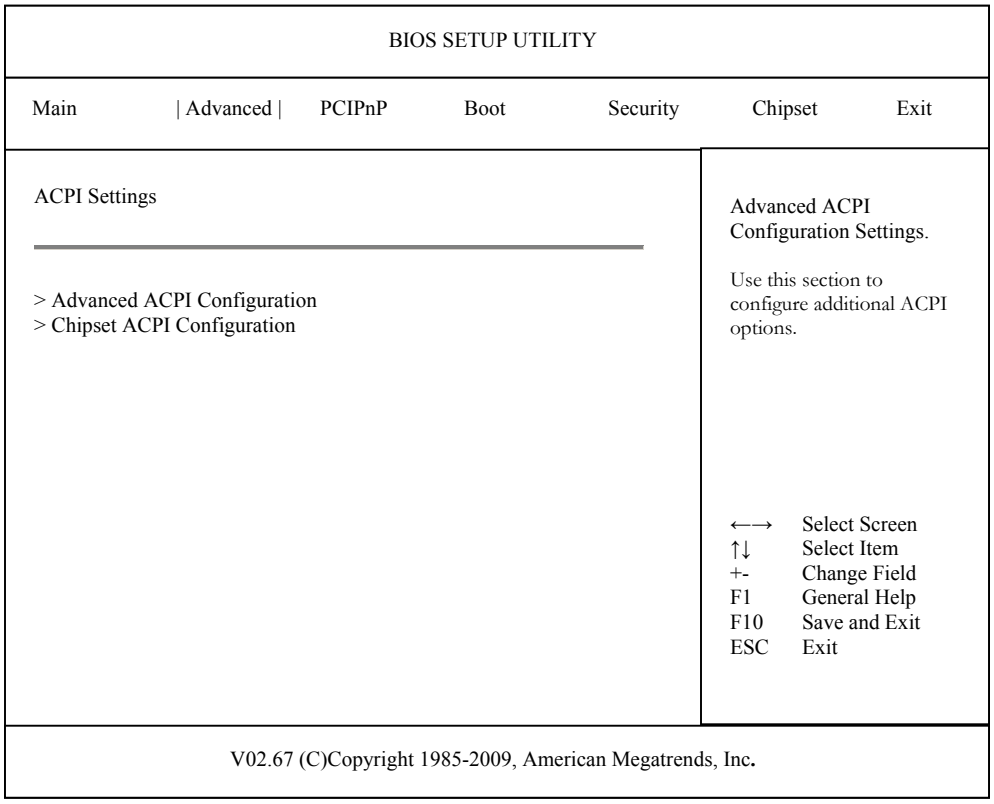
The Setup screen displays the system option:

Hotplug USB FDD Support [Auto]

Available options are:

Disabled
Enabled
Auto

ACPI Configuration
When you select **ACPI Configuration** from the Advanced Setup Menu, the following Setup screen displays:



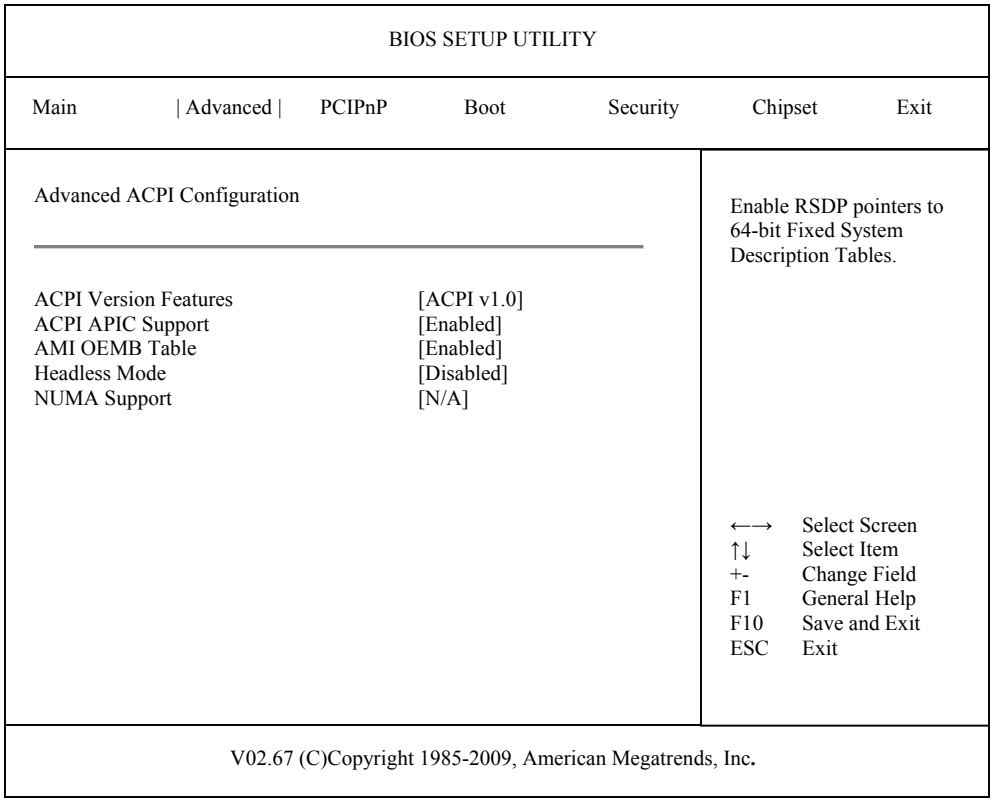
ACPI Configuration Screen

The Advanced Configuration and Power Interface or ACPI is and open communication standard that among other things enables a unified approach for the motherboard's BIOS to discover hardware elements, establish device configuration and set-up power management and monitoring. When you display the ACPI Configuration screen, the format is similar to the sample shown above, allowing you to continue to subscreens designed to change parameters for each of the ACPI Configuration options. Highlight the option you wish to change and press **<Enter>** to proceed to the appropriate subscreen.

The subscreens allow you to set up or modify the following options:

- Advanced ACPI Configuration
  - ACPI Version Features
  - ACPI APIC Support
  - AMI OEMB Table
  - Headless Mode
- Chipset ACPI Configuration
  - Energy Lake Feature
  - APIC ACPI SCI IRQ
  - USB Device Wakeup From S3/S4
  - High Precision Event Timer
  - HPET Memory Address

Advanced ACPI Configuration
When you select **Advanced ACPI Configuration** from the ACPI Configuration Menu, the following Setup screen displays:



Advanced ACPI Configuration Screen

When you display the Advanced ACPI Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

ADVANCED ACPI CONFIGURATION OPTIONS

The descriptions for the system options listed below show the values as they appear if you have not run the BIOS Setup Utility program yet. Once values have been defined, they display each time the BIOS Setup Utility is run.

ACPI Version Features

The Setup screen displays the system option:

ACPI Version Features [ACPI v1.0]

Available options are:
ACPI v1.0
ACPI v2.0
ACPI v3.0

ACPI APIC Support

The Setup screen displays the system option:

ACPI APIC Support [Enabled]

Available options are:
Disabled
Enabled

AMI OEMB Table

The Setup screen displays the system option:

AMI OEMB Table [Enabled]

Available options are:
Disabled
Enabled

Headless Mode

The Setup screen displays the system option:

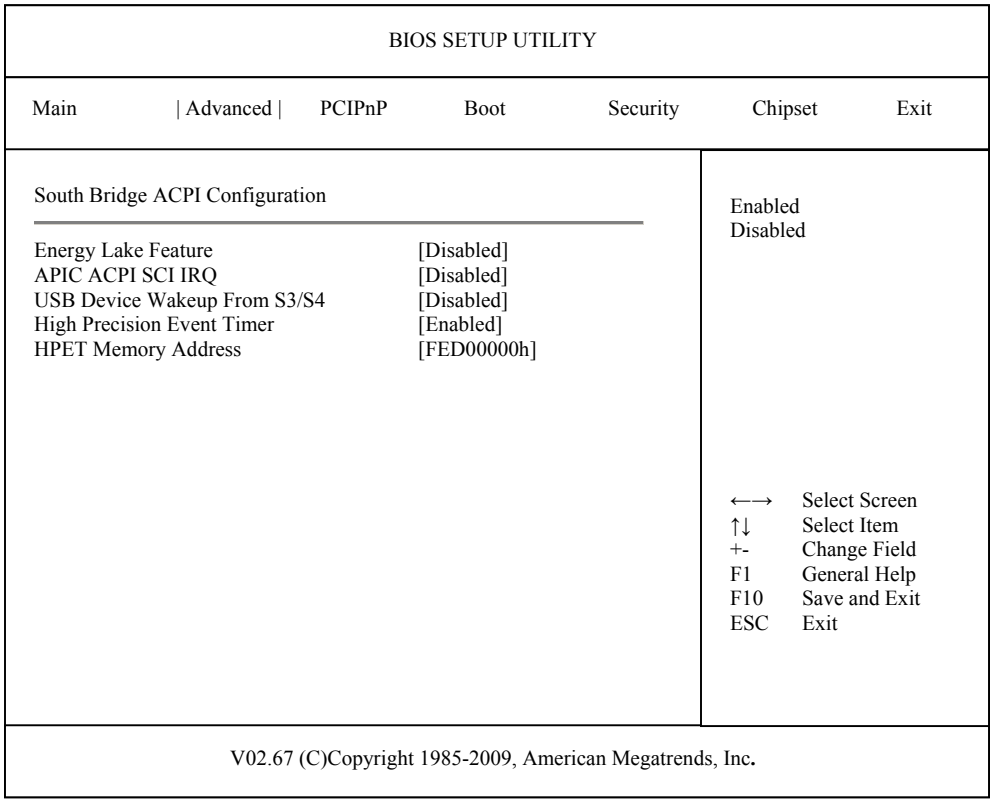
Headless Mode [Disabled]

Available options are:
Disabled
Enabled

NUMA Support

This is a fixed BIOS setting and not available (N/A) for user configuration.

Chipset ACPI Configuration
When you select **Chipset ACPI Configuration** from the ACPI Configuration Menu, the following Setup screen displays:



Chipset ACPI Configuration Screen

When you display the Chipset ACPI Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

CHIPSET ACPI CONFIGURATION OPTIONS

The descriptions for the system options listed below show the values as they appear if you have not run the BIOS Setup Utility program yet. Once values have been defined, they display each time the BIOS Setup Utility is run.

Energy Lake Feature

Energy Lake is an Intel processor technology that enables system support for consumer electronics or (CE)-like device power behavior. Energy Lake is also a key CPU technology for maintaining system state and data integrity during power loss events. The Setup screen displays the system option:

Energy Lake Feature [Disabled]

Available options are:

Enabled
Disabled

APIC ACPI SCI IRQ

The Setup screen displays the system option:

APIC ACPI SCI IRQ [Disabled]

Available options are:

Disabled
Enabled

USB Device Wakeup From S3/S4

The Setup screen displays the system option:

USB Device Wakeup From S3/S4 [Disabled]

Available options are:

Disabled
Enabled

High Precision Event Timer

The Setup screen displays the system option:

High Precision Event Timer [Enabled]

Available options are:

Disabled
Enabled

HPET (High Precision Event Timer) **Memory Address**

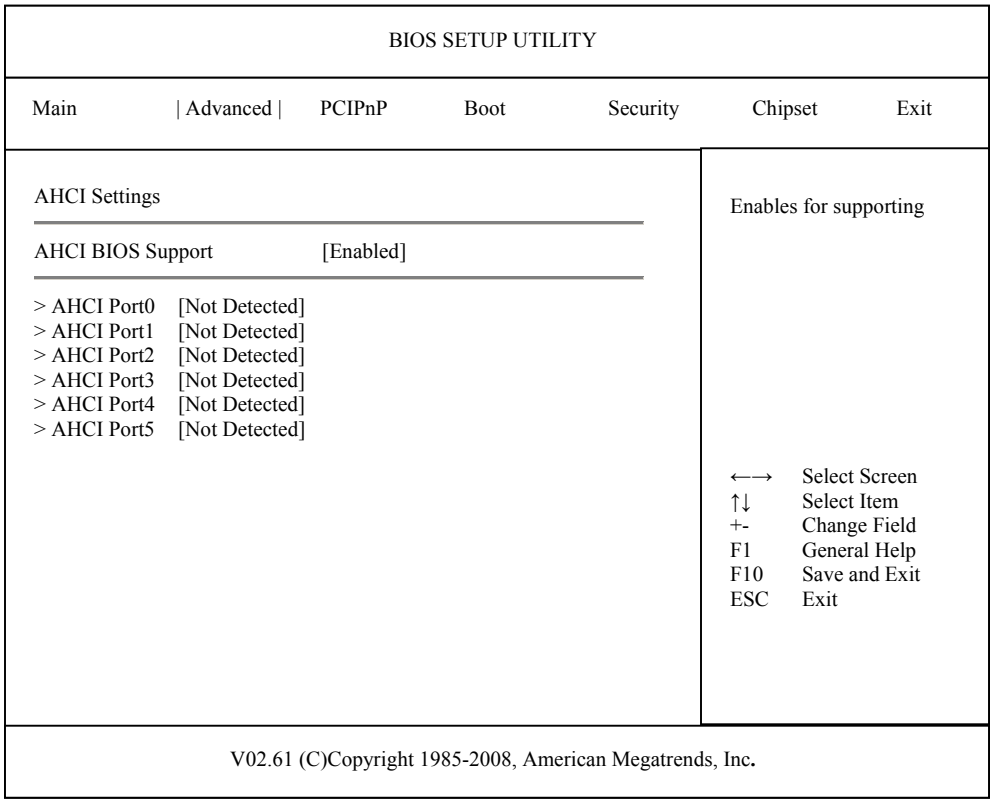
The Setup screen displays the system option:

HPET Memory Address [FED00000h]

Available options are:

FED00000h
FED01000h
FED02000h
FED03000h

AHCI Configuration
When you select **AHCI Configuration** from the Advanced Setup Menu, the following Setup screen displays:



AHCI Configuration Screen

When you display the AHCI Configuration screen, the format is similar to the sample shown above. You may highlight the option you wish to change, press enter to display the available options and then press **<Enter>** again to accept the highlighted value you chose.

Other options on this screen allow you to continue to subscreens designed to change parameters for that particular option. Highlight the option you wish to change and press **<Enter>** to proceed to the appropriate subscreen.

AHCI CONFIGURATION OPTIONS

The Advanced Host Controller Interface or AHCI defines the operation of the motherboard's SATA host bus adapters. ACHI is an industry standard that enables the motherboard's BIOS to set-up communications to the system's SATA drives regardless of the specific system implementation. The descriptions for the system options listed below show the values as they appear if you have not run the BIOS Setup Utility program yet. Once values have been defined, they display each time the BIOS Setup Utility is run.

AHCI BIOS Support

The Setup screen displays the system option:

AHCI BIOS Support [Enabled]

Available Options are:

Enabled

Disabled

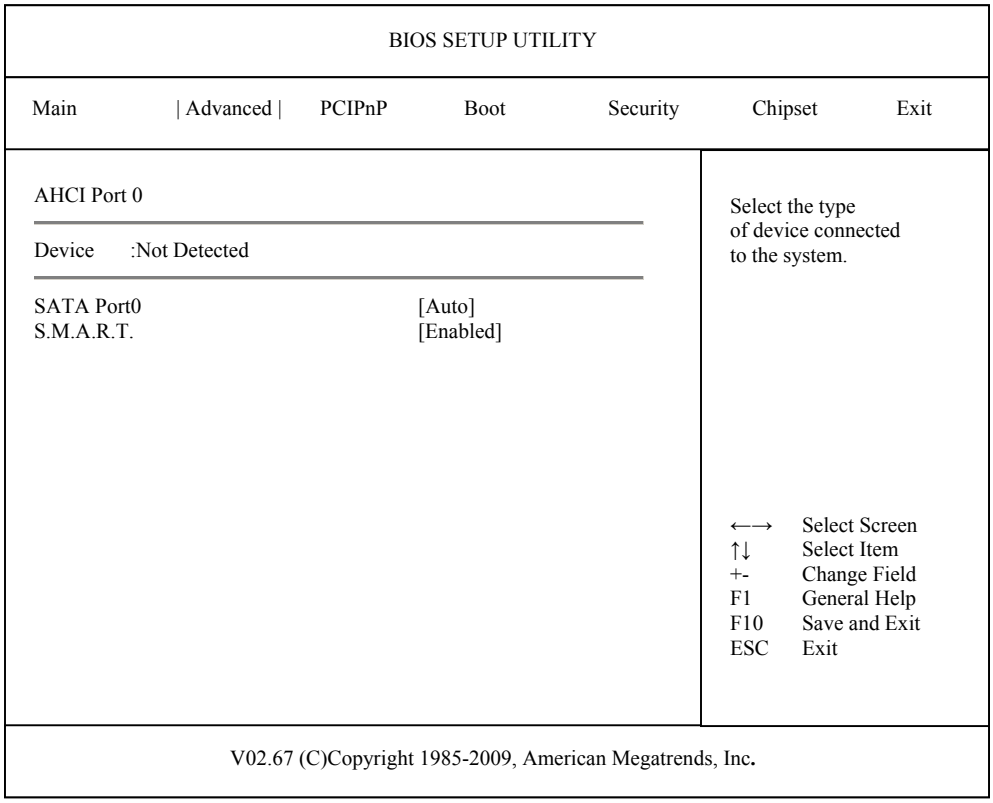
AHCI PORT 0, 1, 2, 3, 4, 5, 6

The Setup screen displays the system options:

AHCI Port 0 [Not Detected]
AHCI Port 1 [Not Detected]
AHCI Port 2 [Not Detected]
AHCI Port 3 [Not Detected]
AHCI Port 4 [Not Detected]
AHCI Port 5 [Not Detected]

This is an example of the screen. To view and/or change parameters for any of the devices, press <ENTER> to proceed to the IDE Device Setup screen.

AHCI Port Configuration
When you select an **AHCI Port x** option from the **AHCI Configuration Menu**, the following Setup screen will display for each **AHCI Port x** option:



AHCI Port Configuration Screen

When you display the AHCI Port Configuration screen **for any of the 6 AHCI Ports listed on the AHCI Configuration screen**, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

AHCI PORT CONFIGURATION OPTIONS
The descriptions for the system options listed below show the values as they appear if you have not run the BIOS Setup Utility program yet. Once values have been defined, they display each time the BIOS Setup Utility is run. The AHCI Port screen is the same for all 6 AHCI Ports listed on the AHCI Configuration screen.

SATA Port0

The Setup screen displays the system option:

SATA Port0 [Disabled]

Available options are:

Auto
Not Installed

S.M.A.R.T.

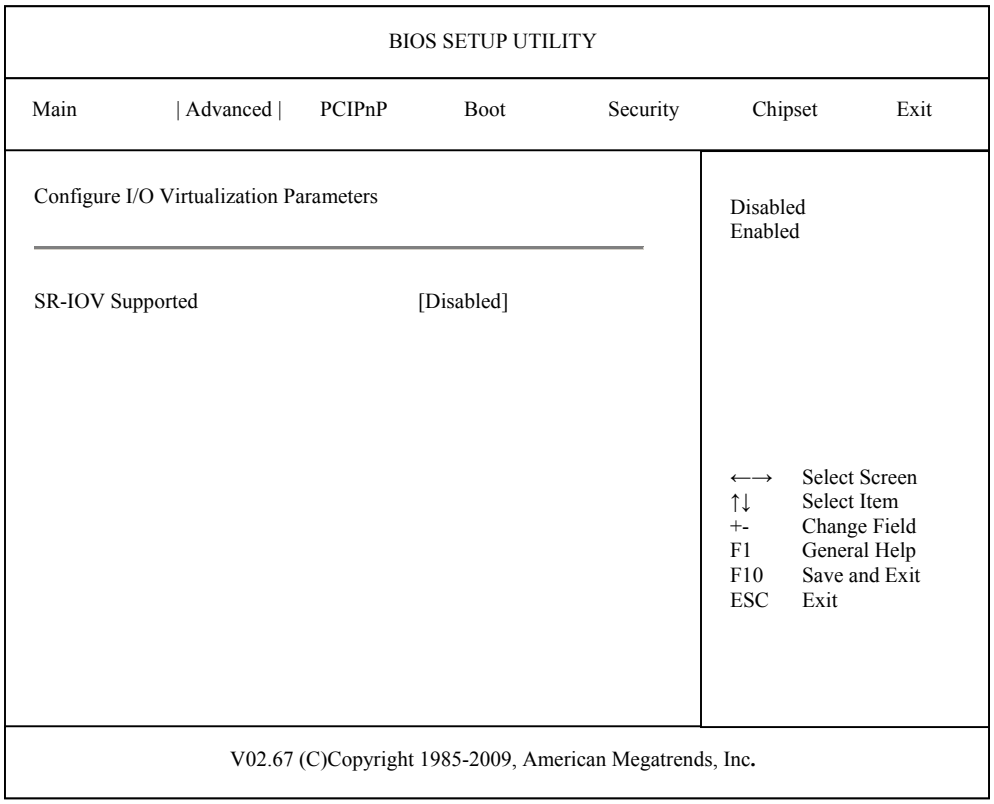
The Setup screen displays the system option:

S.M.A.R.T. [Enabled]

Available options are:

Disabled
Enabled

I/O Virtualization
When you select **I/O Virtualization** from the Advanced Setup Screen, the following Setup screen displays:



I/O Virtualization Screen

I/O virtualization technology enables one physical adapter card to appear as multiple virtual network interface cards (NICs). Virtual NICs function as conventional NICs and are designed to be compatible with existing operating systems, Hypervisors, and applications. Single Root I/O Virtualization (SR-IOV) is a sub-specification that allows a PCI Express device to appear to be multiple separate physical PCIe devices.

When you display the I/O Virtualization screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

I/O VIRTUALIZATION SETUP OPTION

The description for the system option listed below shows the value as it appears if you have not yet run Advanced Setup. Once you change the setting, the new setting displays each time Advanced Setup is run.

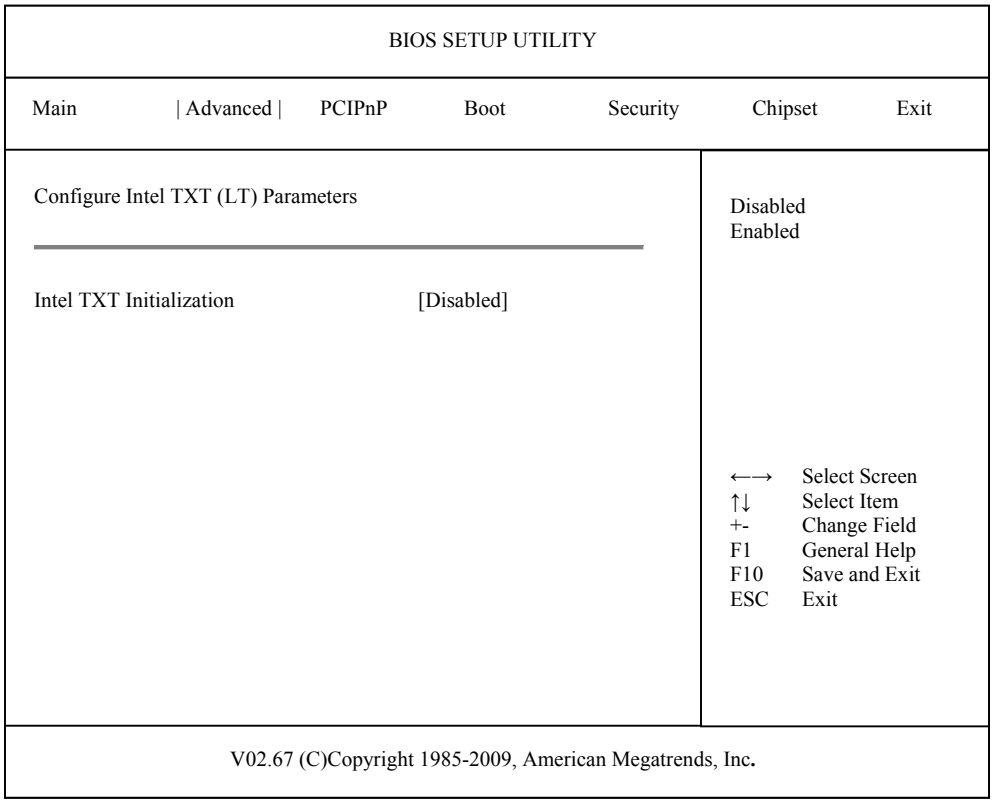
I/O Virtualization

The Setup screen displays the system option:

SR-IOV Supported [Disabled]

Available options are:
Disabled
Enabled

Intel TXT(LT) Configuration
Intel® Trusted Execution Technology (Intel® TXT) is only supported on motherboard versions with the Intel® Xeon® Series 5600 Processors, i.e. Intel codename Westmere-EP. When you select **Intel TXT(LT) Configuration** from the Advanced Setup Screen, the following Setup screen displays:



Intel TXT (LT) Configuration Screen

The Intel® Xeon® Series 5600 processors used on the Trenton WTM7026 motherboard support the Intel® TXT feature to enable system designers to develop an enhanced computer platform. The platform can utilize a set of CPU extensions designed to provide a measured and controlled launch of system software that will then establish a protected environment for itself and any additional software that the system may execute. The Intel TXT extensions and the motherboard's on-board TPM provide a Trusted Computer Group platform environment that guards against malicious software attacks and protects the platform's Measured Launch Environment (MLE) from corruption.

When you display the Intel TXT (LT) Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

INTEL TXT(LT) CONFIGURATION SETUP OPTION

The description for the system option listed below shows the value as it appears if you have not yet run Advanced Setup. Once you change the setting, the new setting displays each time Advanced Setup is run.

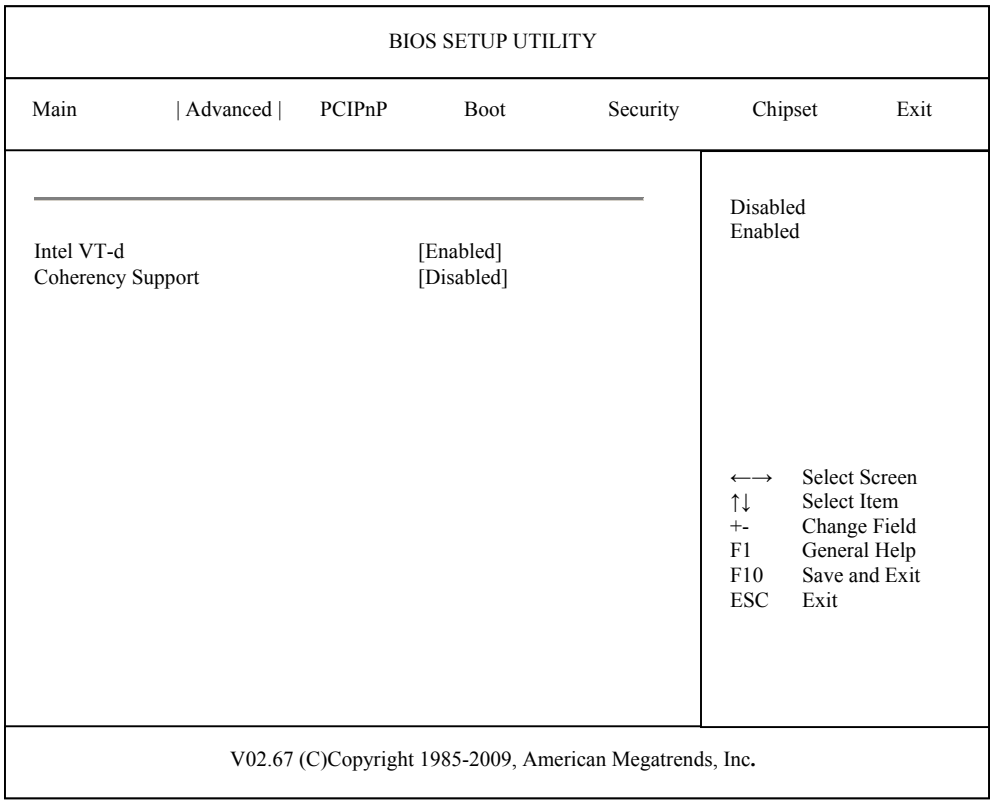
Intel TXT(L/T) Configuration

The Setup screen displays the system option:

Intel TXT Initialization [Disabled]

Available options are:
Disabled
Enabled

Intel VT-d Configuration
When you select **Intel VT-d Configuration** from the Advanced Setup Screen, the following Setup screen displays:



Intel VT-d Configuration Screen

The basic idea virtualization is to allow the computer platform to run multiple operating systems and/or software applications on the same motherboard. Intel® VT-d or Intel® Virtualization for Directed I/O extends this basic concept to I/O devices while enhancing platform security by restricting **direct memory access (DMA)** of the devices to pre-assigned domains or physical memory regions..

When you display the Intel VT-d Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

INTEL VT-D CONFIGURATION SETUP OPTIONS

The description for the system option listed below shows the value as it appears if you have not yet run Advanced Setup. Once you change the setting, the new setting displays each time Advanced Setup is run.

Intel VT-d Configuration

The Setup screen displays the system options:

Intel VT-d **[Enabled**]

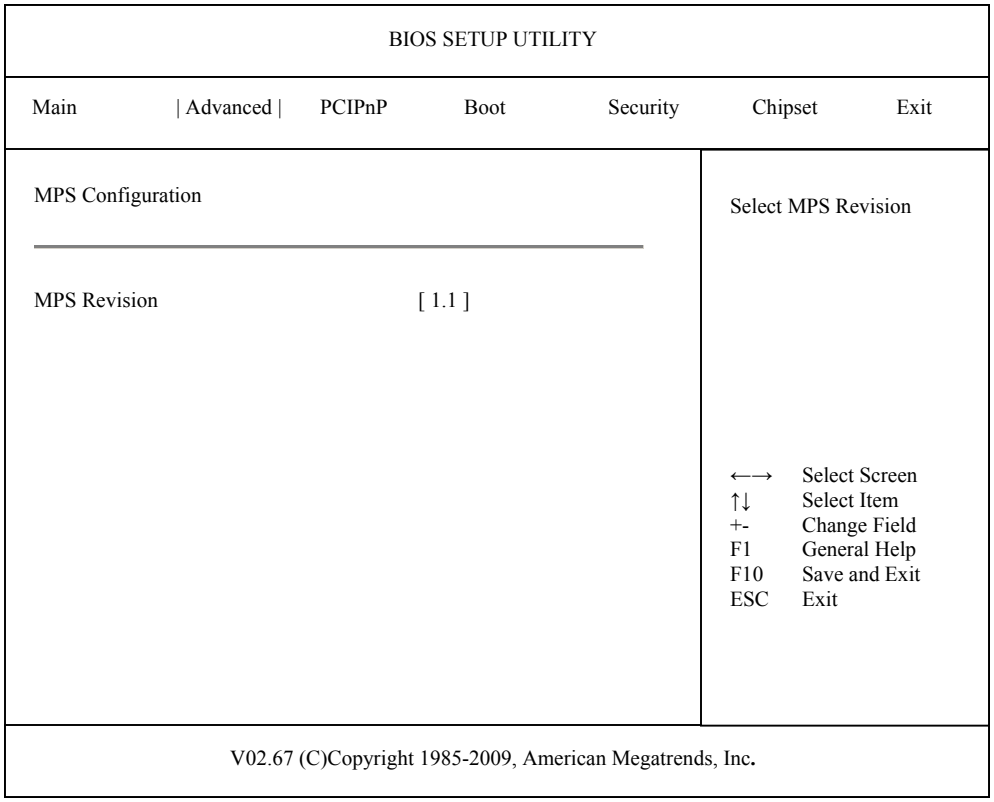
Available options are:
Disabled
Enabled

The Setup screen displays the system options:

Coherency Support **[Disabled**]

Available options are:
Disabled
Enabled

MPS Configuration
When you select **MPS Configuration** from the Advanced Setup Screen, the following Setup screen displays:



MPS Configuration Screen

When you display the MPS Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

MPS CONFIGURATION SETUP OPTIONS

The description for the system option listed below shows the value as it appears if you have not yet run Advanced Setup. Once you change the setting, the new setting displays each time Advanced Setup is run.

MPS Revision

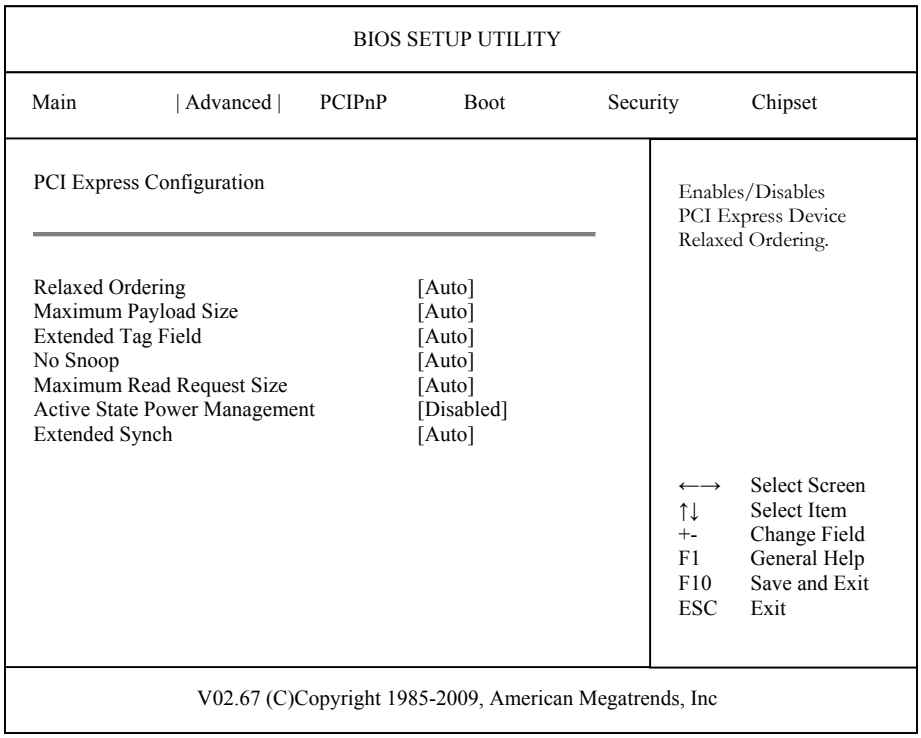
The Setup screen displays the system option:

MPS Revision [1.1]

Available options are:

1.1
1.4

PCI Express Configuration
The following Setup screen displays when selecting **PCI Express Configuration** from the Advanced Setup Menu.



PCI Express Configuration Screen

When you display the PCI Express Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

PCI EXPRESS CONFIGURATION OPTIONS

These options allow you to determine how the motherboard's PCI Express interface shall process PCIe interface data packets from the PCIe option card slots. The **Auto** option instructs the motherboard BIOS to use the automatic interface configuration features inherent in the PCI Express protocol. Once the values have been defined, they display each time Advanced Setup is run.

Relaxed Ordering

Relaxed Ordering is a configuration option that allows PCIe data packets to be processed ahead of data packets already in the execution queue. The PCIe Transaction Layer Protocol header has a relaxed ordering parameter that an option card may take advantage of in setting-up high priority message transactions. This option enables, disables or allows the automatic relaxed ordering of PCIe data packets.

The Setup screen displays the system option:

Relaxed Ordering [Auto]

Available options are:
Auto
Disabled
Enabled

Maximum Payload Size

This option sets up the maximum payload size of a PCI Express device that the motherboard will accept. The **Auto** option allows the motherboard's BIOS to select the maximum value.

The Setup screen displays the system option:

Maximum Payload Size [Auto]

Available options are:
Auto
128, 256, 512, 1024, 2048 or 4096 Bytes

Extended Tag Field

If this option is **Enabled** it will allow a PCIe device to use an 8-bit TAG field as a requester.

The Setup screen displays the system option:

Extended Tag Field [Auto]

Available options are:
Auto
Disabled
Enabled

No Snoop

This option enables or disables the PCI Express devices' No Snoop option.

The Setup screen displays the system option:

So Snoop [Auto]

Available options are:
Auto
Disabled
Enabled

Maximum Read Request Size

This option allows you to set the maximum read request size of the PCI Express data packet or allow the BIOS to select the value automatically.

The Setup screen displays the system option:

Maximum Read Request Size [Auto]

Available options are:

Auto
128, 256, 512, 1024, 2048 or 4096 Bytes

Active State Power Management

This option specifies if you want to manage the power consumption of the PCI Express links via the interface's L0s an L1 link power states.

The Setup screen displays the system option:

Active State Power Management [Disabled]

Available options are:

Disabled
Enabled

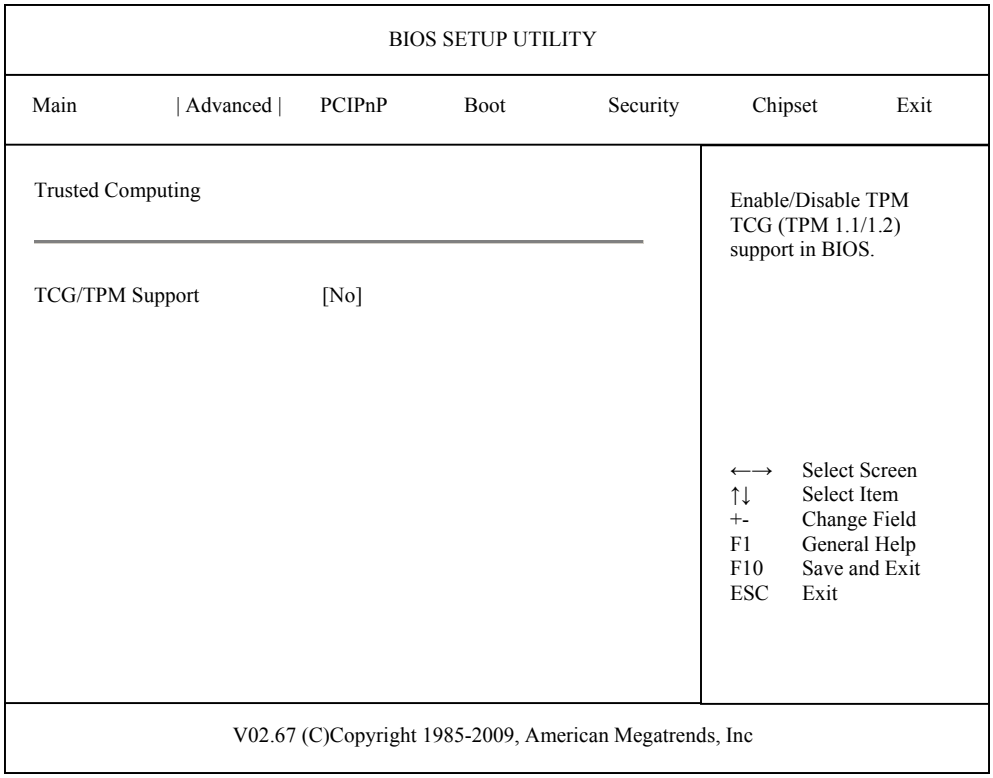
Extended Synch

This option allows the generation of extended synchronization patterns.

The Setup screen displays the system option:

Extended Synch [Auto]

Trusted Computing
When you select **Trusted Computing** from the Advanced Setup Menu, the following Setup screen displays:



Trusted Computing Screen

This screen allows you to enable or disable BIOS support for the motherboard's on-board TPM 1.2 module. Configuration screen format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

TRUSTED COMPUTING OPTION

TCG/TPM Support

Use caution when enabling your system for Trusted Computing support. You must have a complete understanding of TCG/TPM activation keys and encrypted passwords to ensure that you do not cause the system to enter into an un-recoverable mode of platform security.

The Setup screen displays the system option:

TCG/TPM Support [No]

Available options are:
No
Yes

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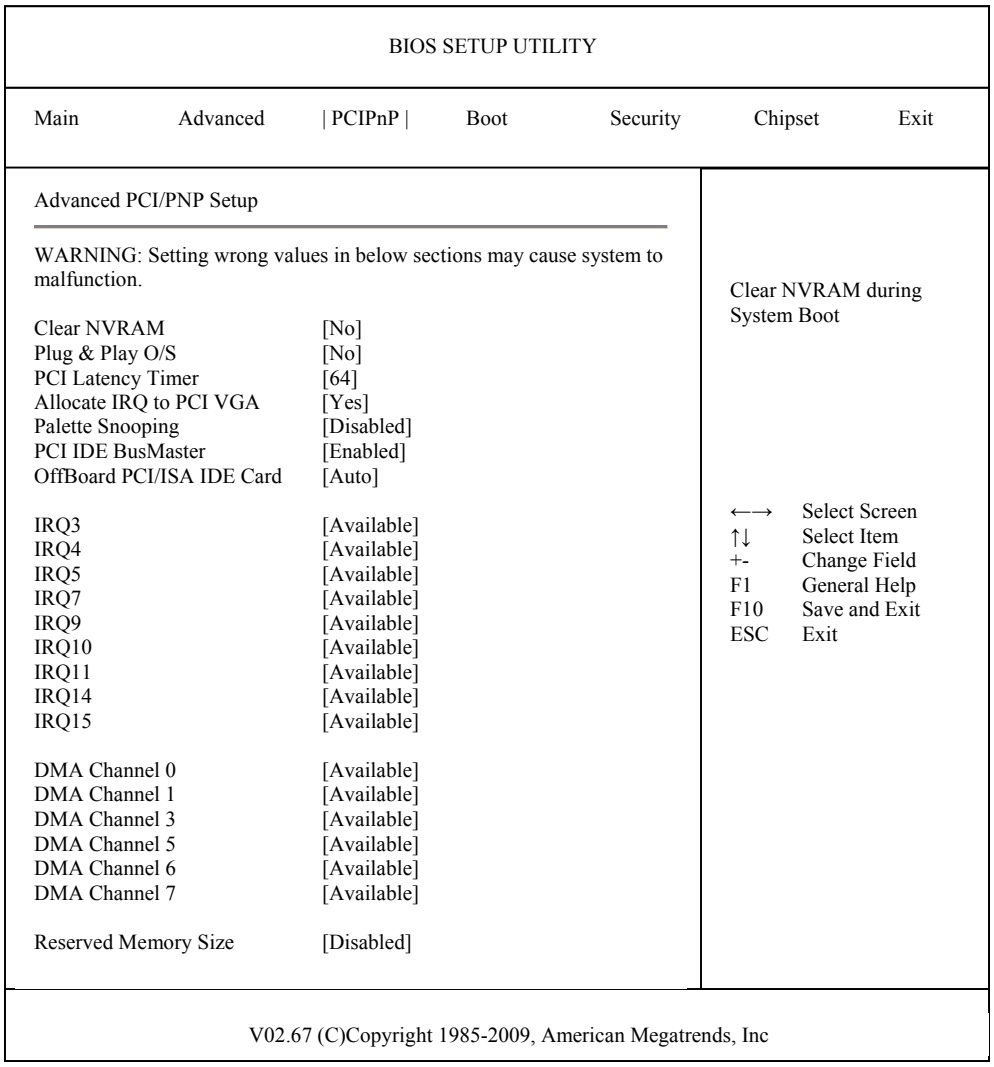
Chapter 6 Plug and Play Setup

Plug and Play Setup

When you select **PCIPnP** from the BIOS Setup Utility Main Menu, the following Setup screen displays:



PCIPnP Setup Screen

When you display the PCIPnP Setup screen, the format is similar to the sample shown above, except the screen does not display all of the options at one time. If you need to change other options, use the down arrow key to locate the appropriate option. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

NOTE: The values on the PCIPnP Setup screen do not necessarily reflect the values appropriate for your motherboard. Refer to the explanations below for specific instructions about entering correct information.

PCIPNP SETUP OPTIONS

The descriptions for the system options listed below show the values as they appear if you have not yet run PCIPnP Setup. Once values have been defined, they display each time PCIPnP Setup is run.

NOTE: Do not change the values for any PCIPnP Setup option unless you understand the impact on system operation. Depending on your system configuration, selection of other values may cause unreliable system operation.

Clear NVRAM

This option allows you to clear NVRAM during system boot.

The Setup screen displays the system option:

Clear NVRAM [No]

Available options are:
No
Yes

Plug & Play O/S

This option indicates whether or not the operating system installed in the computer is Plug and Play-aware. AMIBIOS only detects and enables PnP adapter cards which are required for system boot. An operating system which is PnP-aware detects and enables all other PnP-aware adapter cards. Set this option to **No** if the operating system (such as DOS or OS/2) does *not* use PnP.

NOTE: You *must* set this option correctly or PnP-aware adapter cards installed in your computer will not be configured properly.

The Setup screen displays the system option:

Plug & Play O/S [No]

Two options are available:

- Select **No** to allow AMIBIOS to configure the devices in the system.
- Select **Yes** if your system has a Plug and Play operating system and you want to allow the operating system to configure all Plug and Play (PnP) devices which are not required for bootup.

PCI Latency Timer

This option specifies the latency of all PCI devices on the PCI Local Bus. The settings are in units equal to PCI clocks.

The Setup screen displays the system option:

PCI Latency Timer [64]

Available options are:

32, 64, 96, 128, 160, 192, 224, 248

Allocate IRQ to PCI VGA

This option allows you to assign an IRQ to a PCI VGA card if the card requests an IRQ.

The Setup screen displays the system option:

Allocate IRQ to PCI VGA [Yes]

Available options are:

Yes
No

Palette Snooping

This option, when set to **Enabled**, indicates to the PCI devices that a graphics device is installed in the system so the card will function correctly.

The Setup screen displays the system option:

Palette Snooping [Disabled]

Available options are:

Disabled
Enabled

PCI IDE BusMaster

This option specifies whether the IDE controller on the PCI Local Bus has bus mastering capability for reading and writing to IDE drives. The IDE drive(s) must support PCI bus mastering.

The Setup screen displays the system option:

PCI IDE BusMaster [Disabled]

Available options are:

Disabled
Enabled

OffBoard PCI/ISA IDE Card

This option specifies the PCI expansion slot on the motherboard where the off-board PCI IDE controller is installed, if any.

The Setup screen displays the system option:

OffBoard PCI/ISA IDE Card [Auto]

Available options are:

Auto
PCI Slot1
PCI Slot2
PCI Slot3
PCI Slot4
PCI Slot5
PCI Slot6

If you select any value other than **Auto**, the following options and their default values are added to the screen:

OffBoard PCI IDE Primary IRQ/OffBoard PCI IDE Secondary

These options specify the PCI interrupts used by the primary and secondary IDE channels on the off-board PCI IDE controller. You may use the **INTA**, **INTB**, **INTC** and **INTD** options to assign IRQs to the Int Pin used by the specified channel. If the **OffBoard PCI/ISA IDE Card** option is set to **Auto**, these options are not available.

The Setup screen displays the system options:

OffBoard PCI IDE Primary IRQ [Disabled]
OffBoard PCI IDE Secondary [Disabled]

Available options are:

Disabled
INTA
INTB
INTC
INTD
Hardwired

IRQ3/IRQ4/IRQ5/IRQ7/IRQ9/IRQ10/IRQ11/IRQ14/IRQ15

These options indicate whether the specified interrupt request (IRQ) is available for use by the system for PCI/Plug and Play devices or is reserved for use by legacy devices. This allows you to specify IRQs for use by legacy adapter cards.

The IRQ setup options indicate whether AMIBIOS should remove an IRQ from the pool of available IRQs passed to BIOS configurable devices.

The Setup screen displays the system option:

IRQ# [Available]

where # is the number of the interrupt request (IRQ)

Two options are available:

- Select **Available** to make the specified IRQ available for use by PCI/PnP devices.
- Select **Reserved** to reserve the specified IRQ for use by legacy devices.

DMA Channels 0, 1, 3, 5, 6 and 7

These options indicate whether the specified DMA channel is available for use by the system for PCI/Plug and Play devices or is reserved for use by legacy devices.

The Setup screen displays the system option:

DMA Channel # [Available]

where # is the DMA Channel number

Two options are available:

- **Available** indicates that the specified DMA channel is available for use by PCI/PnP devices.
- **Reserved** indicates the specified DMA channel is reserved for use by legacy devices.

Reserved Memory Size

This option specifies the size of the memory area reserved for legacy devices. If this option is set to **Disabled**, the **Reserved Memory Address** option is not available.

The Setup screen displays the system option:

Reserved Memory Size [Disabled]

Available options are:

Disabled
16k
32k
64k

Saving and Exiting

When you have made all desired changes to **PCIPnP** Setup, you may make changes to other Setup options by using the right and left arrow keys to access other menus. When you have made all of your changes, you may save them by selecting the **Exit** menu, or you may press **<Esc>** at any time to exit the BIOS Setup Utility without saving the changes.

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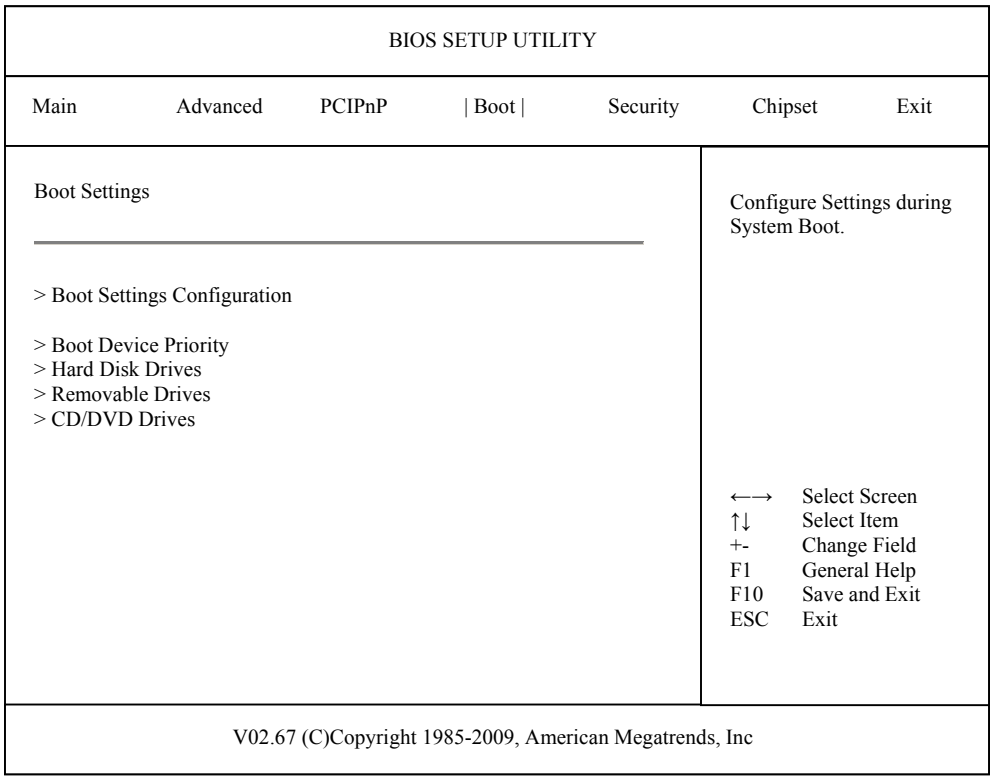
Chapter 7 Boot Setup

Boot Setup



Boot Setup Screen

When you display the Boot Setup screen, the format is similar to the sample shown above, allowing you to continue to subscreens designed to change parameters for each of the Boot Setup options. Highlight the option you wish to change and press **<Enter>** to proceed to the appropriate subscreen.

NOTE: If no device is found for one of the device types, the line item for that device type does not display.

BOOT SETUP OPTIONS

The descriptions for the system option listed below show the values as they appear if you have not yet run Boot Setup. Once values have been changed, they display each time Boot Setup is run. You may also continue to subscreens to specify boot parameters and the boot sequence of bootable devices in your system.

Boot Settings Configuration

The options on the **Boot Settings Configuration** subscreen allow you to set up or modify parameters for boot procedures.

The following options may be modified:

- Quick Boot
- Quiet Boot
- AddOn ROM Display Mode
- Bootup Num-Lock
- PS/2 Mouse Support
- Wait For 'F1' If Error
- Hit 'DEL' Message Display
- Interrupt 19 Capture
- Boots Graphic Adapter Priority

Boot Device Priority

The options on the **Boot Device Priority** subscreen specify the order in which AMIBIOS attempts to boot devices available in the system. It allows you to select the drive which will be booted first, second, third, etc.

Hard Disk Drives

The **Hard Disk Drives** subscreen specifies the boot sequence of the hard drives available in the system.

Removable Drives

The **Removable Drives** subscreen specifies the boot sequence of the removable devices available in the system.

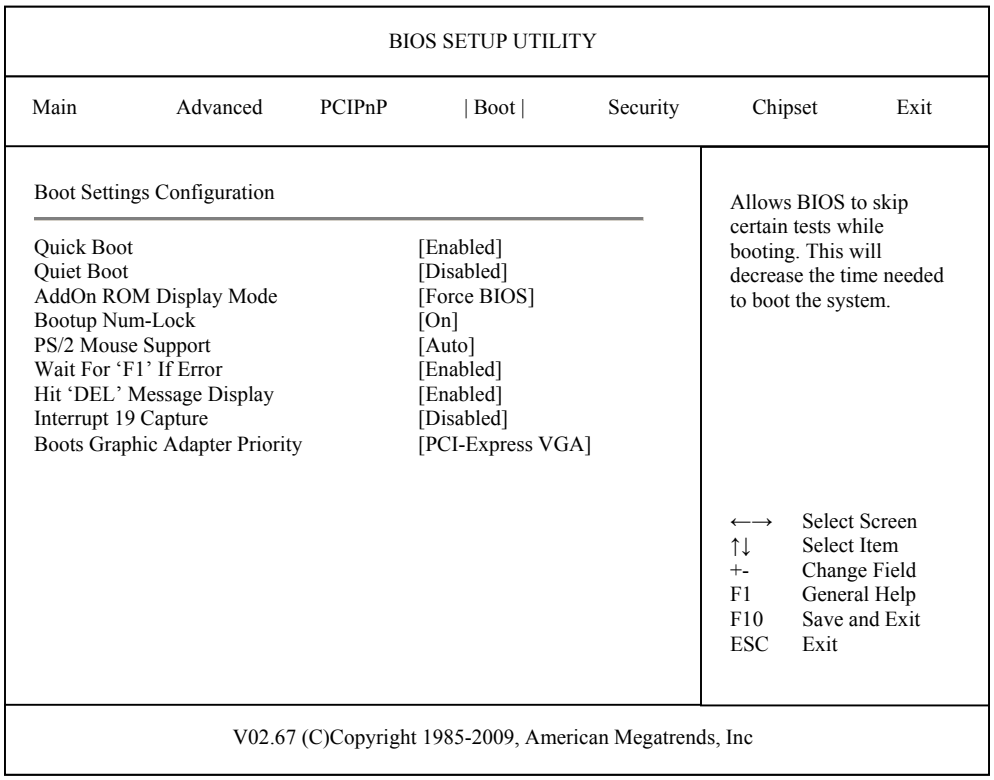
CD/DVD Drives

The **CD/DVD Drives** subscreen specifies the boot sequence of the CDROM and DVD devices available in the system.

Saving and Exiting

When you have made all desired changes to **Boot** Setup, you may make changes to other Setup options by using the right and left arrow keys to access other menus. When you have made all of your changes, you may save them by selecting the **Exit** menu, or you may press **<Esc>** at any time to exit the BIOS Setup Utility without saving the changes.

Boot Setting Configuration
When you select **Boot Settings Configuration** from the Boot Setup Menu, the following Setup screen displays:



Boot Settings Configuration Screen

When you display the Boot Settings Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

BOOT SETTINGS CONFIGURATION OPTIONS

The descriptions for the system options listed below show the values as they appear if you have not run the BIOS Setup Utility program yet. Once values have been defined, they display each time the BIOS Setup Utility is run.

Quick Boot

This option allows you to have the AMIBIOS boot quickly when the computer is powered on or go through more complete testing. If you set the **Quick Boot** option to **Enabled**, the BIOS skips certain tests while booting and decreases the time needed to boot the system.

The Setup screen displays the system option:

Quick Boot [Disabled]

Available options are:
Disabled
Enabled

Quiet Boot

This option specifies what will be displayed on the screen while the system is performing the POST routines when the computer is powered on or a soft reboot is performed.

The Setup screen displays the system option:

Quiet Boot [Disabled]

Two options are available:

Select **Disabled** to display normal POST messages.

Select **Enabled** to display the OEM logo instead of the POST messages.

AddOn ROM Display Mode

This option specifies the system display mode which is set at the time the AMIBIOS post routines initialize an optional option ROM.

The Setup screen displays the system option:

AddOn ROM Display Mode [Force BIOS]

Two options are available:

Select **Force BIOS** to use the display mode currently being used by AMIBIOS.

Select **Keep Current** to use the current display mode.

BootUp Num-Lock

This option enables you to turn off the Num-Lock option on the enhanced keyboard when the system is powered on. If Num-Lock is turned off, the arrow keys on the numeric keypad can be used, as well as the other set of arrow keys on the enhanced keyboard.

The Setup screen displays the system option:

BootUp Num-Lock [On]

Available options are:

Off
On

PS/2 Mouse Support

This option indicates whether or not a PS/2-type mouse is supported.

The Setup screen displays the system option:

PS/2 Mouse Support [Auto]

Available options are:

Disabled
Enabled
Auto

Wait For ’F1’ If Error

Before the system boots up, the AMIBIOS executes the Power-On Self Test (POST) routines, a series of system diagnostic routines. If any of these tests fail but the system can still function, a non-fatal error has occurred. The AMIBIOS responds with an appropriate error message followed by:

Press F1 to RESUME

If this option is set to **Disabled**, a non-fatal error does not generate the “Press F1 to RESUME” message. The AMIBIOS still displays the appropriate message, but continues the booting process without waiting for the **<F1>** key to be pressed. This eliminates the need for any user response to a non-fatal error condition message. Non-fatal error messages are listed in *Appendix A - BIOS Messages*.

The Setup screen displays the system option:

Wait For ’F1’ If Error [Enabled]

Available options are:
Disabled
Enabled

Hit ’DEL’ Message Display

The “Hit DEL to run Setup” message displays when the system boots up. Disabling this option prevents the message from displaying.

The Setup screen displays the system option:

Hit ’DEL’ Message Display [Enabled]

Available options are:
Disabled
Enabled

Interrupt 19 Capture

This option allows option ROMs to trap Interrupt 19.

The Setup screen displays the system option:

Interrupt 19 Capture [Disabled]

Available options are:
Disabled
Enabled

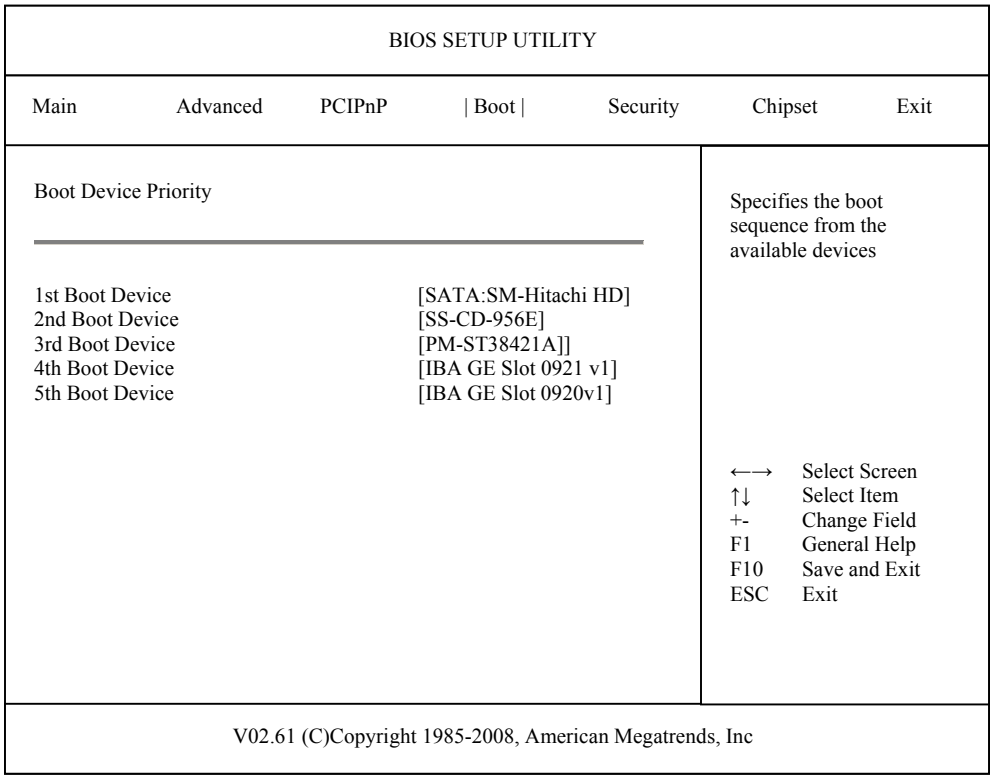
Boots Graphic Adapter Priority

This option selects the graphics controller to be used as the primary boot device.

The Setup screen displays the system option:

Boots Graphic Adapter Priority [PCI-Express VGA]
Available options are:
PCI-Express VGA
PCI VGA

Boot Device Priority
When you select **Boot Device Priority** from the Boot Setup Menu, a Setup screen similar to the following displays:



Boot Device Priority Screen

When you display the Boot Device Priority screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

NOTE: The number of line items on this screen may vary depending on the number of bootable devices available on your system.

BOOT DEVICE PRIORITY OPTIONS

1st Boot Device through 5th Boot Device

These options specify the order in which AMIBIOS attempts to boot the devices after the POST routines complete. The setting for each boot device line item is the description of the bootable device. The number of line items on this screen is dynamic. If new system devices are added, the new devices are displayed at the end of the list as additional line items.

The motherboard supports bootup from a LAN device. In the sample screen above, the 4th Boot Device and 5th Boot Device line items are boot from LAN options.

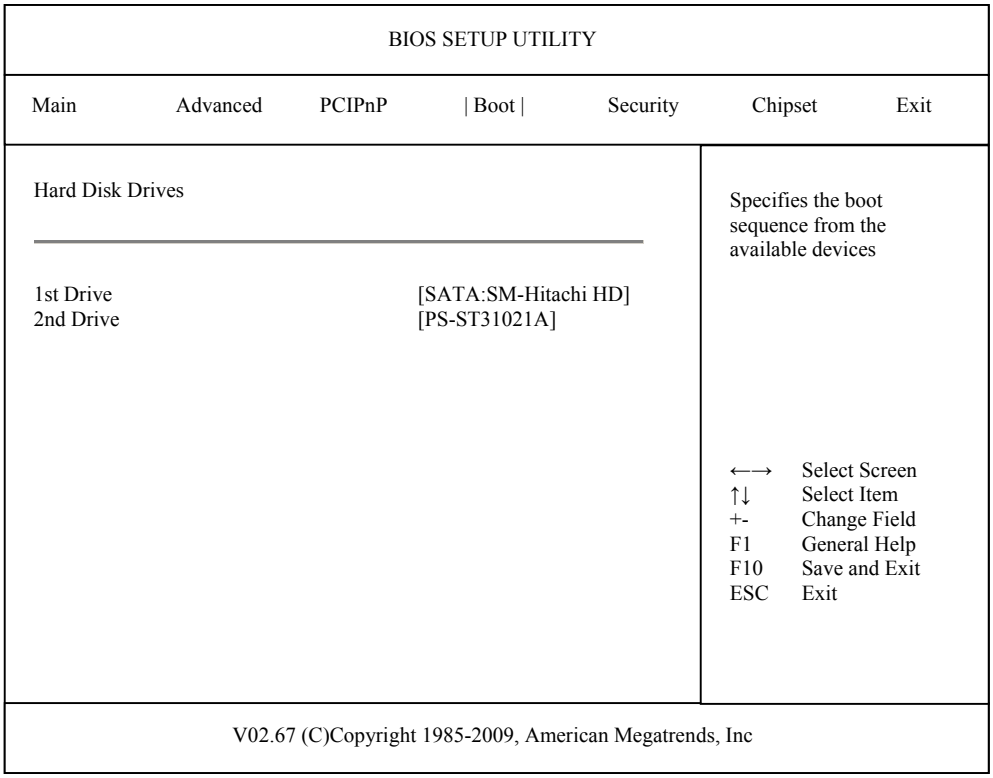
The Setup screen displays the system option(s):

Boot Device [xxxxxxxxx]

where ### is the boot order and xxxxxxxxx is the description of the device.

NOTE: Disabled is also available as an option if you do not want a particular device to be included in the boot sequence. Setting a device to **Disabled** will eliminate unnecessary delays during the bootup process.

Hard Disk Drives
When you select **Hard Disk Drives** from the Boot Setup Menu, a Setup screen similar to the following displays:



Hard Disk Drives Screen

When you display the Hard Disk Drives screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

NOTE: The number of line items on this screen is determined by the number of hard disk drives available.

HARD DISK DRIVES OPTIONS

The motherboard supports up to six hard disk drives through a primary and secondary SATA controller in a master/slave configuration.

1st Drive/2nd Drive

When the system boots up, it searches for all hard drives and displays the description of each disk drive it has detected.

If you have more than one hard disk drive, you may change the order in which the system will attempt to boot the available hard drives by changing these line items. The number of options displayed for each line item depends on the number of hard disk drives in your system.

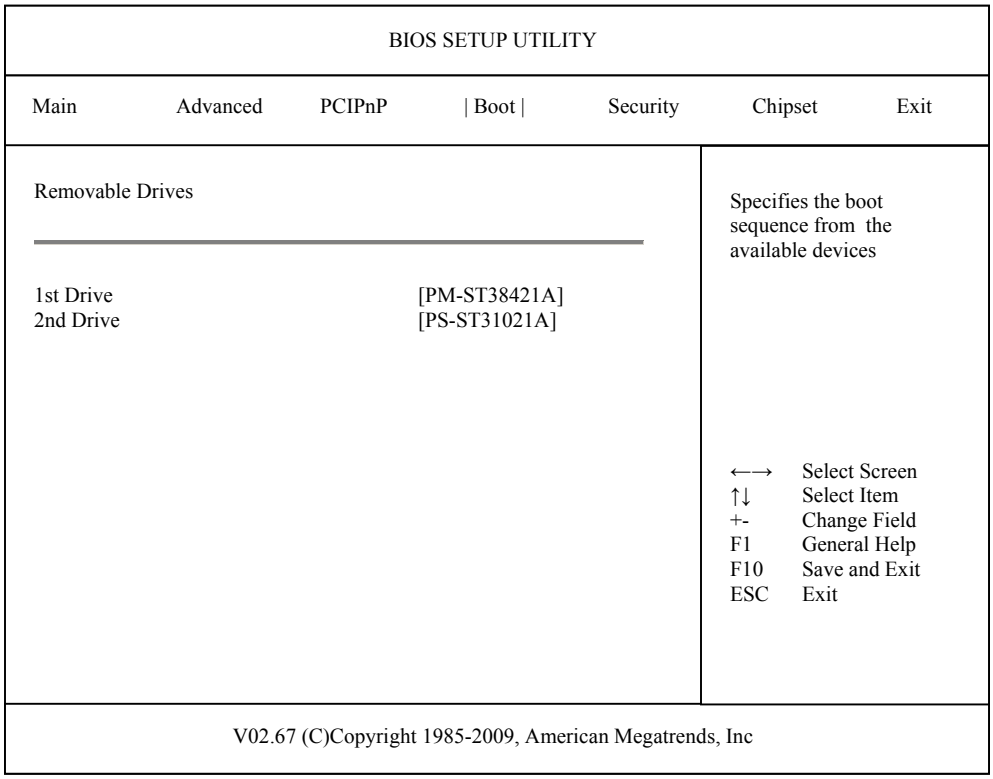
Disabled is also available as an option if you do not want a particular drive to be included in the boot sequence.

The Setup screen displays the system option(s):

Drive [xxxxxxxxx]

where ### is the boot order and xxxxxxxxx is the description of the hard disk drive.

Removable Drives
When you select **Removable Drives** from the Boot Setup Menu, a Setup screen similar to the following displays:



Removable Drives Screen

When you display the Removable Drives screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

NOTE: The number of line items on this screen is determined by the number of removable devices available.

REMOVABLE DRIVE OPTIONS

The motherboard supports multiple removable drives and allows you to change the boot sequence of these devices.

1st Drive/2nd Drive

When the system boots up, it searches for all removable devices and displays the description of each device it has detected.

If you have more than one removable device, you may change the order in which the system will attempt to boot the available devices by changing these line items. The number of options displayed for each line item depends on the number of removable devices in your system.

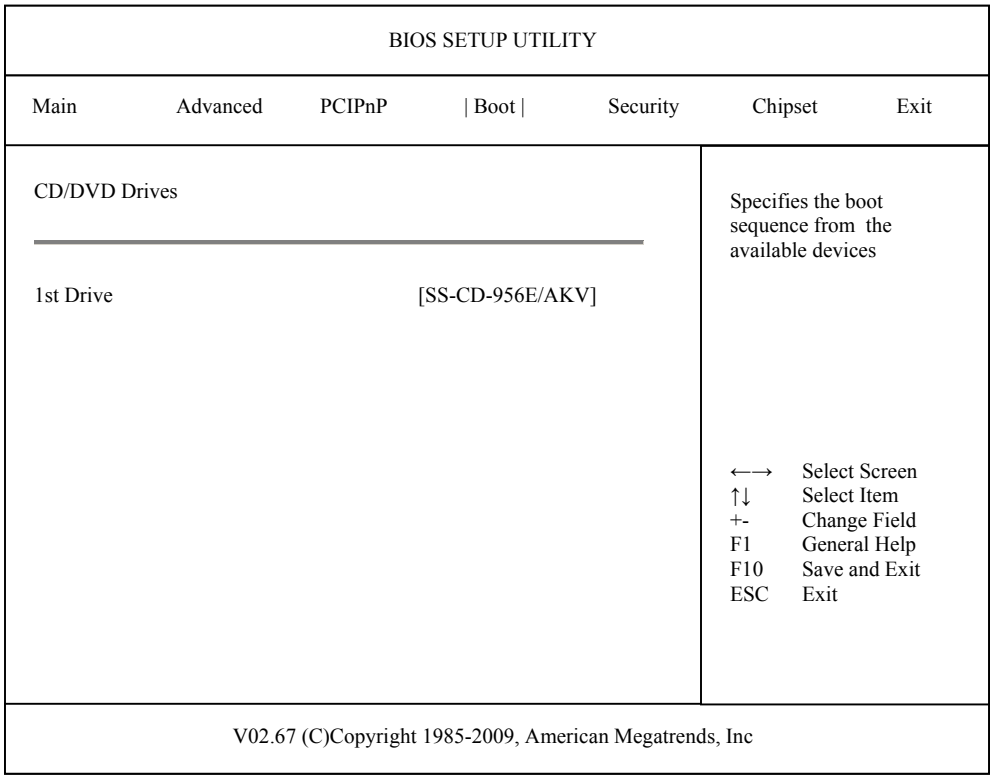
Disabled is also available as an option if you do not want a particular device to be included in the boot sequence.

The Setup screen displays the system option(s):

Drive [xxxxxxxxx]

where ### is the boot order and xxxxxxxxx is the description of the removable drive.

CD/DVD Drives
When you select **CD/DVD Drives** from the Boot Setup Menu, a Setup screen similar to the following displays:



CD/DVD Drives Screen

When you display the CD/DVD Drives screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

NOTE: The number of line items on this screen is determined by the number of CDROM and DVD drives available.

CD/DVD DRIVE OPTIONS
The motherboard supports multiple CDROM and DVD devices and allows you to change the boot sequence of these devices.

1st Drive/2nd Drive

When the system boots up, it searches for all CDROM and DVD drives and displays the description of each drive it has detected.

If you have more than one ATAPI CDROM drive, you may change the order in which the system will attempt to boot the available drives by changing these line items. The number of options displayed for each line item depends on the number of CDROM and DVD devices in your system.

Disabled is also available as an option if you do not want a particular drive to be included in the boot sequence.

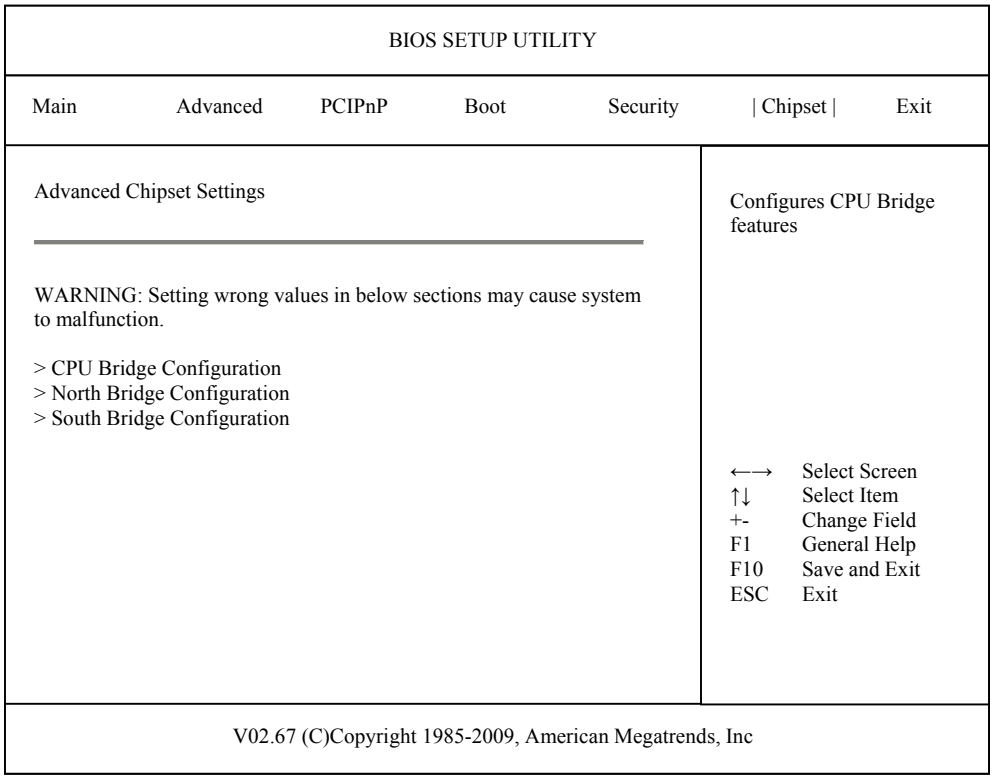
The Setup screen displays the system option:

Drive [xxxxxxxxx]

where ### is the boot order and xxxxxxxxx is the description of the CDROM or DVD drive.

Chapter 8 Chipset Setup

Chipset Setup
When you select **Chipset** from the BIOS Setup Utility Main Menu, the following Setup screen displays:



Chipset Setup Screen

When you display the Chipset Setup screen, the format is similar to the sample shown above, allowing you to continue to subscreens designed to change parameters for each of the Chipset Setup options. Highlight the option you wish to change and press **<Enter>** to proceed to the appropriate subscreen.

NOTE: The values on the Chipset Setup subscreens do not necessarily reflect the values appropriate for your motherboard. Refer to the explanations following the screens for specific instructions about entering correct information.

CHIPSET SETUP OPTIONS

NOTE: Do *not* change the values for any Chipset Setup option unless you understand the impact on system operation. Depending on your system configuration, selection of other values may cause unreliable system operation.

CPU Bridge Configuration

The options of the CPU Bridge Configuration subscreen will allow you to set up or modify parameters to configure the Intel® Quick Path Interconnect (Intel® QPI) between the CPUs and the Intel® 5520 Input Output Hub or IOH. Other memory interface parameters are also accessible via this subscreen.

The following options may be modified:

- QPI Links Speed
- QPI Frequency
- QPI L0s and L1
- Memory Frequency
- Memory Mode
- Demand Scrubbing
- Patrol Scrubbing
- Throttling – Closed Loop
    - Hyster temp
    - Guardband temp
    - Inlet temp
    - Temp Rise
    - Air Flow
    - Altitude
    - DIMM Pitch
- Throttling – Open Loop

North Bridge Configuration

The options on the **North Bridge Configuration** subscreen allow you to set up or modify parameters to configure the Intel® 5520 IOH.

The following options may be modified:

- Crystal Beach / DMA
- Crystal Beach / DCA
- Coarse-Grained Clock Gating

South Bridge Configuration

The options on the **South Bridge Configuration** subscreen allow you to set up or modify parameters to configure the Intel® ICH10R I/O Controller Hub.

The following options may be modified:

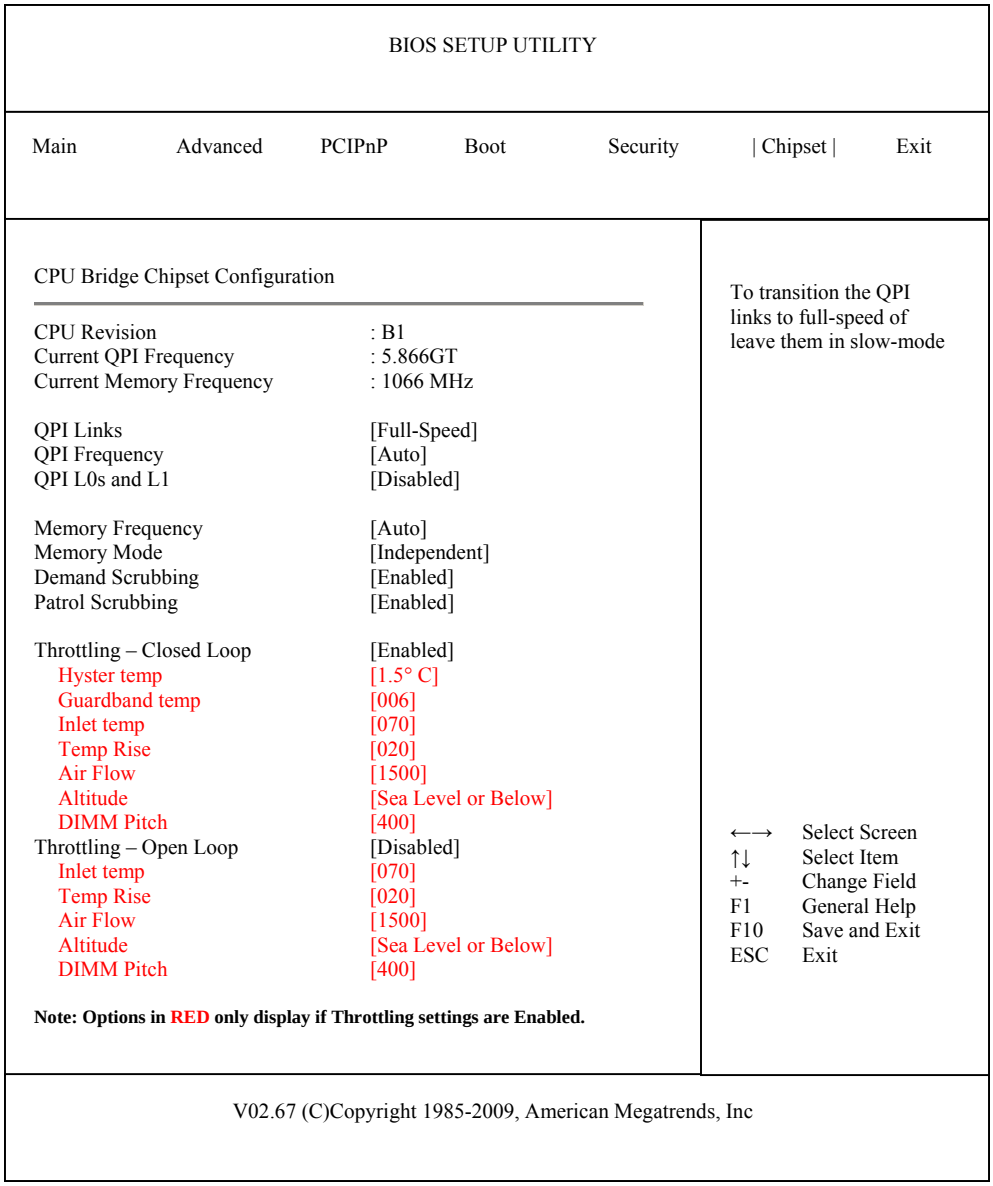
- USB Functions
- USB Port Configure
- USB 2.0 Controller
- HAD Controller
- SMBUS Controller
- SLP_S4# Min. Assertion Width

- Restore on AC Power Loss
- SATA Master Break Event
- PCI Express Ports Configuration
    - PCIe Port 0
    - PCIe Port 1
    - PCIe Port 2
    - PCIe Port 3
    - PCIe Port 4
    - PCIe Port 5
    - PCIe High Priority Port
    - PCIe Port 0 I/OxAPIC Enable
    - PCIe Port 1 I/OxAPIC Enable
    - PCIe Port 2 I/OxAPIC Enable
    - PCIe Port 3 I/OxAPIC Enable
    - PCIe Port 4 I/OxAPIC Enable
    - PCIe Port 5 I/OxAPIC Enable

Saving and Exiting When you have made all desired changes to **Chipset** Setup, you may make changes to other Setup options by using the right and left arrow keys to access other menus. When you have made all of your changes, you may save them by selecting the **Exit** menu, or you may press **<Esc>** at any time to exit the BIOS Setup Utility without saving the changes.

CPU Bridge Configuration

When you select **CPU Bridge Configuration** from the Chipset Setup Screen, the following Setup screen displays:



CPU Bridge Configuration Screen

When you display the CPU Bridge Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

CPU BRIDGE CONFIGURATION OPTIONS

The descriptions for the system options listed below show the values as they appear if you have not yet run Chipset Setup. Once values have been defined, they display each time Chipset Setup is run.

QPI Links Speed

The Setup screen displays the system option:

QPI Links Speed [Full-Speed]

Available options are:

Slow-Mode
Full-Speed

QPI Frequency

The Setup screen displays the system option:

QPI Frequency [Auto]

Available options are:

Auto
4.800GT
5.866GT
6.400GT

QPI L0s and L1

The Setup screen displays the system option:

QPI L0s and L1 [Disabled]

Available options are:

Disabled
Enabled

Memory Frequency

The Setup screen displays the system option:

Memory Frequency [Auto]

Available options are:

Auto
Force DDR-800
Force DDR-1066
Force DDR-1333

Memory Mode

The Setup screen displays the system option:

Memory Mode

Available options are:

Independent
Channel Mirroring
Lockstep

Demand Scrubbing

The Setup screen displays the system option:

Demand Scrubbing [Enabled]

Available options are:

Disabled
Enabled

Patrol Scrubbing

The Setup screen displays the system option:

Patrol Scrubbing [Enabled]

Available options are:

Disabled
Enabled

Throttling – Closed Loop

The Setup screen displays the system option:

Throttling – Closed Loop [Enabled]
Available options are:
Disabled
Enabled

If Throttling – Closed Loop option is enabled, the available sub-options are:

Hyster Temp	[Disabled, 1.5° C, 3.0° C, 6.0° C]
Guardband Temp	[006] (fixed setting)
Inlet temp	[070] (fixed setting)
Temp Rise	[020] (fixed setting)
Air Flow	[1500] (fixed setting)
Altitude	[Sea Level or Below, 1-300, 301-600, 601-900, 901-1200, 1201-] [1500, 1501-1800, 1801-2100, 2101-2400, 2401-2700, 2701-3000]
DIMM Pitch	[400] (fixed setting)

Throttling – Open Loop

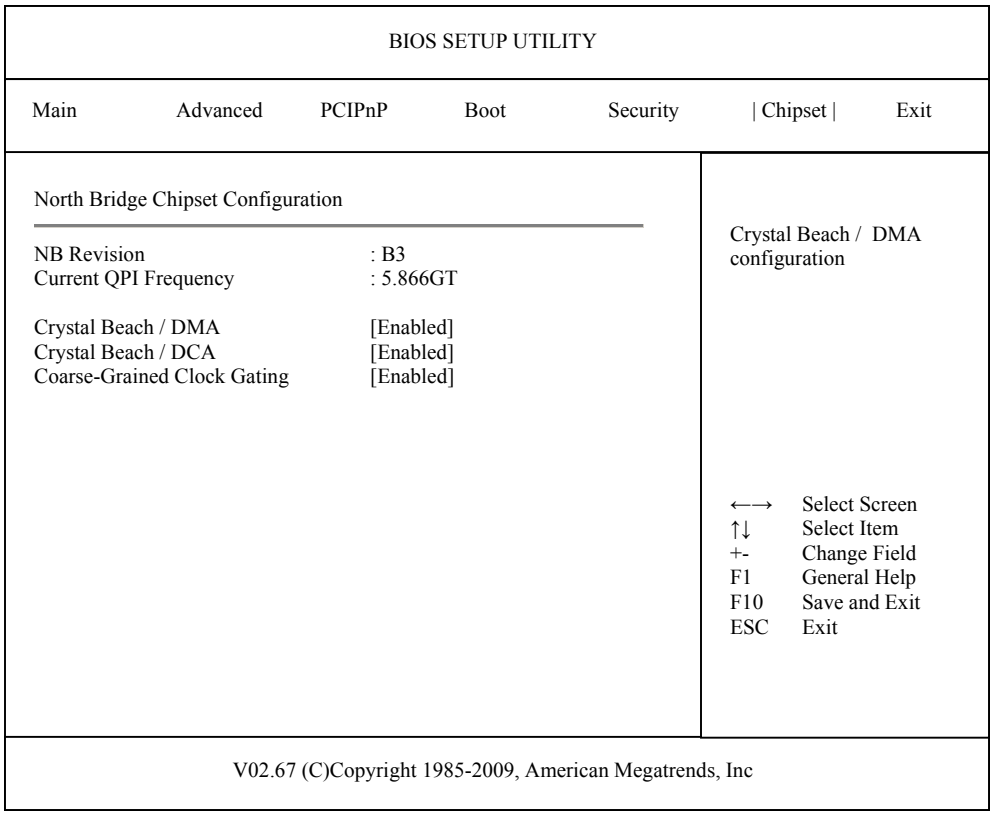
The Setup screen displays the system option:

Throttling – Open Loop [Disabled]
Available options are:
Disabled
Enabled

If Throttling – Open Loop option is enabled, the available options are:

Inlet temp	[070] (fixed setting)
Temp Rise	[020] (fixed setting)
Air Flow	[1500] (fixed setting)
Altitude	[Sea Level or Below, 1-300, 301-600, 601-900, 901-1200, 1201-] [1500, 1501-1800, 1801-2100, 2101-2400, 2401-2700, 2701-3000]
DIMM Pitch	[400] (fixed setting)

North Bridge Configuration
When you select **North Bridge Configuration** from the Chipset Setup Screen, the following Setup screen displays:



North Bridge Configuration Screen

When you display the North Bridge Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

NORTH BRIDGE CONFIGURATION OPTIONS
Some recent operating systems require the chipset's Crystal Beach DMA implementation for proper recovery from system shutdowns. Enabling the Crystal Beach DMA option allows the motherboard to receive the various stop codes and then restart the system automatically. The descriptions for the system options listed below show the values as they appear if you have not yet run Chipset Setup. Once values have been defined, they display each time Chipset Setup is run.

Crystal Beach / DMA

The Setup screen displays the system option:

Crystal Beach / DMA [Enabled]

Available options are:

Disabled
Enabled

Crystal Beach / DCA

The Setup screen displays the system option:

Crystal Beach / DCA [Enabled]

Available options are:

Disabled
Enabled

Coarse-Grained Clock Gating

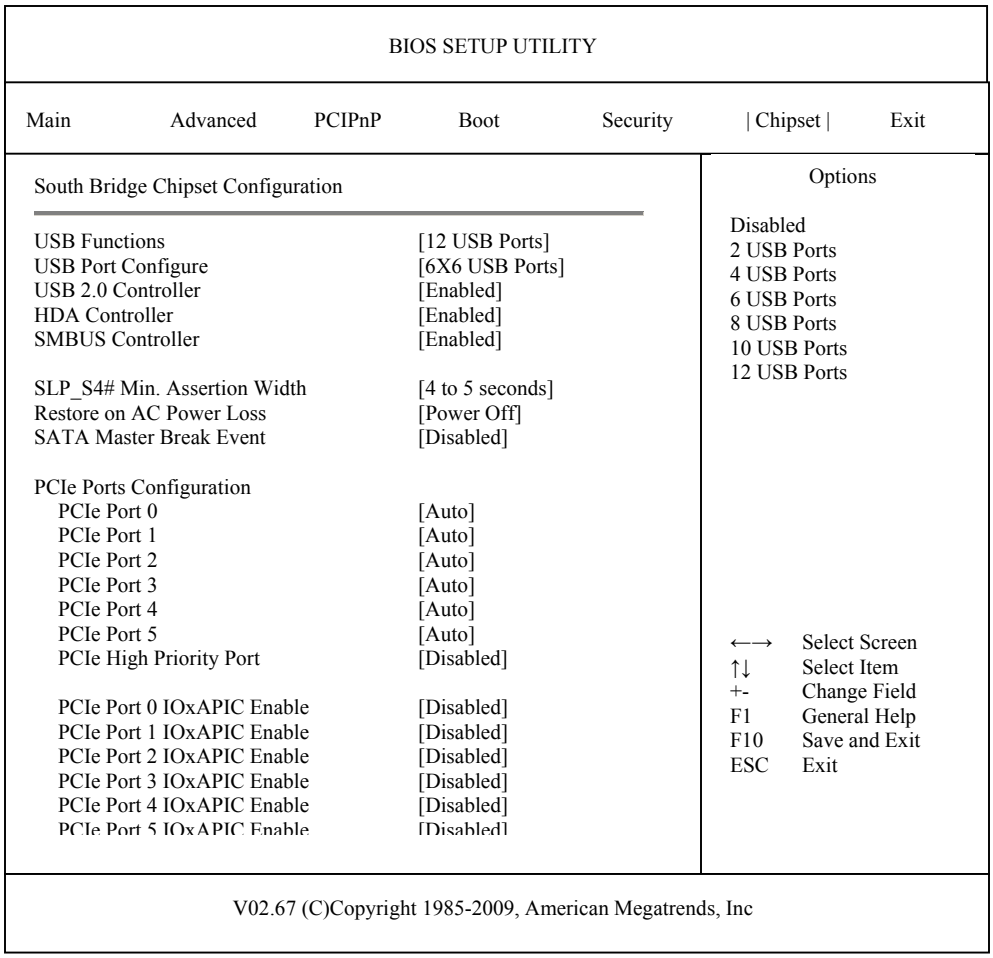
The Setup screen displays the system option:

Coarse-Grained Clock Gating [Enabled]

Available options are:

Disabled
Enabled

South Bridge Configuration
When you select **South Bridge Configuration** from the Chipset Setup Screen, the following Setup screen displays:



South Bridge Configuration Screen

When you display the South Bridge Configuration screen, the format is similar to the sample shown above. Highlight the option you wish to change and press **<Enter>** to display the available settings. Select the appropriate setting and press **<Enter>** again to accept the highlighted value.

SOUTH BRIDGE CONFIGURATION OPTIONS

The descriptions for the system options listed below show the values as they appear if you have not yet run Chipset Setup. Once values have been defined, they display each time Chipset Setup is run.

USB Functions

This option specifies the number of Universal Serial Bus (USB) ports to be used.

The Setup screen displays the system option:

USB Functions [12 USB Ports]

Available options are:

Disabled
2 USB Ports
4 USB Ports
6 USB Ports
8 USB Ports
10 USB Ports
12 USB Ports

USB Port Configure

This Option is not visible if USB Functions is set to Disabled.

The Setup screen displays the system option:

USB Port Configure [6X6 USB Ports]

Available options are:
6X6 USB Ports
8X4 USB Ports

USB 2.0 Controller

This Option can only be changed from its default if USB Functions is set to Disabled.
The Setup screen displays the system option:

USB 2.0 Controller [Enabled]

Available options are:
Disabled
Enabled

HDA Controller

The Setup screen displays the system option:

HDA Controller [Enabled]

Available options are:

Disabled
Enabled

SMBUS Controller

The Setup screen displays the system option:

SMBUS Controller [Enabled]

Available options are:

Disabled
Enabled

SL_S4# Min. Assertion Width

The Setup screen displays the system option:

SL_S4# Min. Assertion Width [4 to 5 seconds]

Available options are:

4 to 5 seconds
3 to 4 seconds
2 to 3 seconds
1 to 2 seconds

Restore on AC Power Loss

This option specifies the state the system should return to when power is restored after AC power is lost.

The Setup screen displays the system option:

Restore on AC Power Loss [Last State]

Three options are available:

- Select **Power Off** to have the system remain off until it is powered back on via a soft power-on, i.e., by pressing and releasing the power button.
- Select **Power On** to have the system turn the power back on automatically if AC power becomes active again.
- Select **Last State** to return the system to the state it was in (power on or off) when AC power was lost.

SATA Master Break Event

The Setup screen displays the system option:

SATA Master Break Event [Disabled]

Available options are:

Disabled
Enabled

PCIe Ports Configuration

The Setup screen displays the following options for configuring the PCIe ports:

PCIE Port 0 through 5 [Auto, Enabled and Disabled]
PCIE High Priority Port [Disabled, Port 0, Port1, Port 2, Port 3, Port 4 or Port 5]
PCIE Port 0 thoughh 5 IOxAPIC Enable [Disabled or Enabled]

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Appendix A BIOS Messages

BIOS Beep Codes
Errors may occur during the POST (Power-On Self Test) routines which are performed each time the system is powered on.

Non-fatal errors are those which, in most cases, allow the system to continue the bootup process. The error message normally appears on the screen. See *BIOS Error Messages* later in this section for descriptions of these messages.

Fatal errors are those which will not allow the system to continue the bootup procedure.

These fatal errors are usually communicated through a series of audible beeps. Each error message has its own specific beep code, defined by the number of beeps following the error detection. The following table lists the errors which are communicated audibly.

Beep Codes	Description
1	Memory refresh timer error
2	Parity Error
3	Main memory read/write test error
4	Timer not operational
5	Processor error
6	Keyboard controller BAT test error
7	General exception error
8	Display memory error
9	ROM checksum error
10	CMOS shutdown register read/write error
11	Cache memory bad

BIOS Beep Code Troubleshooting

Beep Counts	Description
1, 2 or 3	Reseat the memory or replace with known good modules.
4-7, 9-11	Fatal error. Perform the following steps before calling Technical Support. Remove all expansion cards and try to reboot. If the beep code is still generated, call Technical Support. If the beep code is not generated, one of the add-in cards is causing the malfunction. Insert the cards back into the system one at a time until the problem recurs. This will indicate the malfunctioning card.
8	The board may be faulty. Call Technical Support.

BIOS Error Messages

If a non-fatal error occurs during the POST routines performed each time the system is powered on, the error message will appear on the screen in the following format:

ERROR Message Line 1
ERROR Message Line 2
Press F1 to Resume

Note the error message and press the **<F1>** key to continue with the bootup procedure.

NOTE: If the **Wait for 'F1' If Any Error** option in the Advanced Setup portion of the BIOS Setup Program has been set to **Disabled**, the "Press F1 to Resume" prompt will not appear on the last line. The bootup procedure will continue without waiting for operator response.

For most of the error messages, there is no ERROR Message Line 2. Generally, for those messages containing an ERROR Message Line 2, the text will be "RUN SETUP UTILITY." Pressing the **<F1>** key will invoke the BIOS Setup Utility.

A description of each error message appears below.

Memory Errors

Message	Description
Gate20 Error	The BIOS is unable to properly control the SBC's Gate A20 function, which controls access to memory over 1MB. This may indicate a problem with the board.
Multi-Bit ECC Error	This message only occurs on systems using ECC enabled memory modules. ECC memory has the ability to correct singlebit errors that may occur from faulty memory modules. A multiple bit corruption of memory has occurred, and the ECC memory algorithm cannot correct it. This may indicate a defective memory module.
Parity Error	Fatal memory parity error. System halts after displaying this message.

Boot Errors

Message	Description
Boot Failure	This is a generic message indicating the BIOS could not boot from a particular device. This message is usually followed by other information concerning the device.
Invalid Boot Diskette	A diskette was found in the drive, but it is not configured as a bootable diskette.
Drive Not Ready	The BIOS was unable to access the drive because it indicated it was not ready for data transfer. This is often reported by drives when no media is present.

BIOS ERROR MESSAGES (CONTINUED)

Boot Errors (Continued)

Message	Description
A: Drive Error	The BIOS attempted to configure the A: drive during POST, but was unable to properly configure the device. This may be due to a bad cable or faulty diskette drive.
B: Drive Error	The BIOS attempted to configure the B: drive during POST, but was unable to properly configure the device. This may be due to a bad cable or faulty diskette drive.
Insert BOOT diskette in A:	The BIOS attempted to boot from the A: drive, but could not find a proper boot diskette.
Reboot and Select proper Boot device or Insert Boot Media in selected Boot device	BIOS could not find a bootable device in the system and/or removable media drive does not contain media.
NO ROM BASIC	This message occurs on some systems when no bootable device can be detected.

Storage Device Errors

Message	Description
The following errors are typically displayed when the BIOS is trying to detect and configure IDE/ ATAPI devices in POST.	
XXXXXX Hard Disk Error XXXXXX - ATAPI Incompatible	Messages in this format indicate that the specified device could not be properly initialized by the BIOS. Possible message are: Primary Master Hard Disk Error Primary Slave Hard Disk Error Secondary Master Hard Disk Error Secondary Slave Hard Disk Error Primary Master Drive - ATAPI Incompatible Primary Slave Drive - ATAPI Incompatible Secondary Master Drive - ATAPI Incompatible Secondary Slave Drive - ATAPI Incompatible
The following messages can be reported by an ATAPI device using the S.M.A.R.T. error reporting standard. The S.M.A.R.T. failure message may indicate the need to replace the hard disk.	
S.M.A.R.T. Capable but Command Failed	The BIOS tried to send a S.M.A.R.T. message to a hard disk, but the command transaction failed.
S.M.A.R.T. Command Failed	The BIOS tried to send a S.M.A.R.T. message to a hard disk, but the command transaction failed.
S.M.A.R.T. Status BAD, Backup and Replace	A S.M.A.R.T. capable hard disk sends this message when it detects an imminent failure.
S.M.A.R.T. Capable and Status BAD	A S.M.A.R.T. capable hard disk sends this message when it detects an imminent failure.

BIOS ERROR MESSAGES (CONTINUED)

Virus Related Errors

Message	Description
The following messages only display if Virus Detection is enabled in the BIOS Setup Utility.	
BootSector Write !!	The BIOS has detected software attempting to write to a drive's boot sector. This is flagged as possible virus activity.
VIRUS: Continue (Y/N)?	The BIOS has detected possible virus activity.

System Configuration Errors

Message	Description
DMA-2 Error	Error initializing secondary DMA controller. This is a fatal error, often indicating a problem with system hardware.
DMA Controller Error	POST error while trying to initialize the DMA controller. This is a fatal error, often indicating a problem with system hardware.
Checking NVRAM..Update Failed	BIOS could not write to the NVRAM block. This message appears when the FLASH part is write-protected or if there is no FLASH part (system uses a PROM or EPROM).
Microcode Error	BIOS could not find or load the CPU Microcode Update to the processor. This message only applies to Intel processors. The message is most likely to appear when a brand new processor is installed in an SBC with an outdated BIOS. In this case, the BIOS must be updated to include the Microcode Update for the new processor.
NVRAM Checksum Bad, NVRAM Cleared	There was an error while validating the NVRAM data. This causes POST to clear the NVRAM data..
Resource Conflict	More than one system device is trying to use the same non-shareable resources (memory or I/O).
NVRAM Ignored	The NVRAM data used to store Plug and Play (PnP) data was not used for system configuration in POST.
NVRAM Bad	The NVRAM data used to store Plug and Play (PnP) data was not used for system configuration in POST due to a data error.
Static Resource Conflict	Two or more static devices are trying to use the same resource space (usually memory or I/O).
PCI I/O Conflict	A PCI adapter generated an I/O resource conflict when configured by BIOS POST.
PCI ROM Conflict	A PCI adapter generated an I/O resource conflict when configured by BIOS POST.
PCI IRQ Conflict	A PCI adapter generated an I/O resource conflict when configured by BIOS POST.
PCI IRQ Routing Table Error	BIOS POST (DIM code) found a PCI device in the system but was unable to figure out how to route an IRQ to the device. Usually this error is caused by an incomplete description of the PCI Interrupt Routine of the system.

BIOS ERROR MESSAGES (CONTINUED)

System Configuration Errors

Message	Description
Timer Error	Indicates an error while programming the count register of channel 2 of the 8254 timer. This may indicate a problem with system hardware.
Interrupt Controller-1 Error	BIOS POST could not initialize the Master Interrupt Controller. This may indicate a problem with system hardware.
Interrupt Controller-2 Error	BIOS POST could not initialize the Slave Interrupt Controller. This may indicate a problem with system hardware.

CMOS Errors

Message	Description
CMOS Date/Time Not Set	The CMOS Date and/or Time are invalid. This error can be resolved by readjusting the system time in the BIOS Setup Utility.
CMOS Battery Low	CMOS Battery is low. This message usually indicates that the CMOS battery needs to be replaced. It could also appear when the user intentionally discharges the CMOS battery.
CMOS Settings Wrong	CMOS settings are invalid. This error can be resolved by using the BIOS Setup Utility.
CMOS Checksum Bad	CMOS contents failed the Checksum check. Indicates that the CMOS data has been changed by a program other than the BIOS or that the CMOS is not retaining its data due to malfunction. This error can typically be resolved by using the BIOS Setup Utility.

Miscellaneous Errors

Message	Description
Keyboard Error	Keyboard is not present or the hardware is not responding when the keyboard controller is initialized.
Keyboard/Interface Error	Keyboard Controller failure. This may indicate a problem with system hardware.
System Halted	The system has been halted. A reset or power cycle is required to reboot the machine. This message appears after a fatal error has been detected.

Bootblock Initialization Code Checkpoints

The Bootblock initialization code sets up the chipset, memory and other components before system memory is available. The following table describes the type of checkpoints that may occur during the Bootblock initialization portion of the BIOS:

Checkpoint	Description
Before D1	Early chipset initialization is done. Early super I/O initialization is done including RTC and keyboard controller. NMI is disabled.
D1	Perform keyboard controller BAT test. Check if waking up from power management suspend state. Save power-on CPUID value in scratch CMOS.
D0	Go to flat mode with 4GB limit and GA20 enabled. Verify the bootblock checksum.
D2	Disable cache before memory detection. Execute full memory sizing module. Verify that flat mode is enabled.
D3	If memory sizing module not executed, start memory refresh and do memory sizing in Bootblock code. Do additional chipset initialization. Reenable cache. Verify that flat mode is enabled.
D4	Test base 512K memory. Adjust policies and cache first 8MB. Set stack.
D5	Bootblock code is copied from ROM to lower system memory and control is given to it. BIOS now executes out of RAM.
D6	Both key sequence and OEM specific method is checked to determine if BIOS recovery is forced. Main BIOS checksum is tested. If BIOS recovery is necessary, control flows to checkpoint E0. See the Bootblock Recovery Code Checkpoints section of this appendix for more information.
D7	Restore CPUID value back into register. The Bootblock-Runtime interface module is moved to system memory and control is given to it. Determine whether to execute serial flash.
D8	The Runtime module is uncompressed into memory. CPUID information is stored in memory.
D9	Store the Uncompressed pointer for future use in PMM. Copy Main BIOS into memory. Leave all RAM below 1MB Read/Write including E000 and F000 shadow areas but closing SMRAM.
DA	Restore CPUID value back into register. Give control to BIOS POST (Execute POSTKernel). See the POST Code Checkpoints section of this appendix for more information.

Bootblock Recovery Code Checkpoints

The Bootblock recovery code gets control when the BIOS determines that a BIOS recovery needs to occur because the user has forced the update or the BIOS checksum is corrupt. The following table describes the type of checkpoints that may occur during the Bootblock recovery portion of the BIOS:

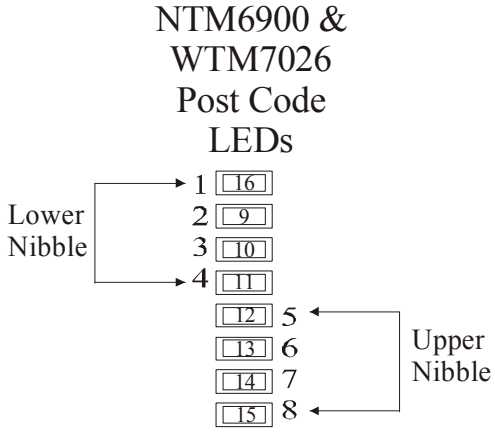
Checkpoint	Description
E0	Initialize the floppy controller in the super I/O. Some interrupt vectors are initialized. DMA controller is initialized. 8259 interrupt controller is initialized. L1 cache is enabled.
E9	Set up floppy controller and data. Attempt to read from floppy.
EA	Enable ATAPI hardware. Attempt to read from ARMD and ATAPI CDROM.
EB	Disable ATAPI hardware. Jump back to checkpoint E9.
EF	Read error occurred on media. Jump back to checkpoint EB.
E9 or Ea	Determine information about root directory of recovery media.
F0	Search for pre-defined recovery file name in root directory.
F1	Recovery file not found.
F2	Start reading FAT table and analyze FAT to find the clusters occupied by the recovery file.
F3	Start reading the recovery file cluster by cluster.
F5	Disable L1 cache.
FA	Check the validity of the recovery file configuration to the current configuration of the flash part.
FB	Make flash write enabled through chipset and OEM specific method. Detect proper flash part. Verify that the found flash part size equals the recovery file size.
F4	The recovery file size does not equal the found flash part size.
FC	Erase the flash part.
FD	Program the flash part.
FF	The flash has been updated successfully. Make flash write disabled. Disable ATAPI hardware. Restore CPUID value back into register. Give control to F000 ROM at F000:FFF0h.

POST Code LEDs

The POST code checkpoints are the largest set of checkpoints during the BIOS pre-boot process. The following chart is a key to interpreting the POST codes displayed on LEDs 1 through 8 on the TQ9 SHB. The LEDs are located in the center of the board to the right of the processor and are numbered from top (1) to bottom (8). Refer to the board layout in the *Specifications* chapter for the exact location of the POST code LEDs.

Upper Nibble (UN)				
Hex. Value	LED8	LED7	LED6	LED5
0	Off	Off	Off	Off
1	Off	Off	Off	On
2	Off	Off	On	Off
3	Off	Off	On	On
4	Off	On	Off	Off
5	Off	On	Off	On
6	Off	On	On	Off
7	Off	On	On	On
8	On	Off	Off	Off
9	On	Off	Off	On
A	On	Off	On	Off
B	On	Off	On	On
C	On	On	Off	Off
D	On	On	Off	On
E	On	On	On	Off
F	On	On	On	On

Lower Nibble (LN)				
Hex. Value	LED4	LED3	LED2	LED1
0	Off	Off	Off	Off
1	Off	Off	Off	On
2	Off	Off	On	Off
3	Off	Off	On	On
4	Off	On	Off	Off
5	Off	On	Off	On
6	Off	On	On	Off
7	Off	On	On	On
8	On	Off	Off	Off
9	On	Off	Off	On
A	On	Off	On	Off
B	On	Off	On	On
C	On	On	Off	Off
D	On	On	Off	On
E	On	On	On	Off
F	On	On	On	On



POST CODE CHECKPOINTS

The POST code checkpoints are the largest set of checkpoints during the BIOS pre-boot process. The table below describes the type of checkpoints that may occur during the POST portion of the BIOS. Refer to the chart in the previous section to interpret the hexadecimal values of POST code LEDs 1 through 8.

Checkpoint	Description
03	Disable NMI, parity, video for EGA and DMA controllers. Initialize BIOS, POST, Runtime data area. Also initialize BIOS modules on POST entry and GPNV area. Initialize CMOS as mentioned in the Kernel Variable “wCMOSFlags.”
04	Check CMOS diagnostic byte to determine if battery power is OK and CMOS checksum is OK. Verify CMOS checksum manually by reading storage area. If the CMOS checksum is bad, update CMOS with power-on default values and clear passwords. Initialize status register A. Initialize data variables that are based on CMOS setup questions. Initialize both the 8259 compatible PICs in the system.
05	Initialize the interrupt controlling hardware (generally OPIC) and interrupt vector table.
06	Do read/write test to CH-2 count register. Initialize CH-0 as system timer. Install the POSTINT1Ch handler. Enable IRQ-0 in PIC for system timer interrupt. Traps INT1Ch vector to “POSTINT1ChHandlerBlock.”
08	Initialize the processor. The BAT test is being done on KBC. Program the keyboard controller command byte is being done after auto detection of keyboard/mouse using AMI KB-5.
0A	Initialize the 8042 compatible keyboard controller.
0B	Detect the presence of PS/2 mouse.
0C	Detect the presence of keyboard in KBC port.
0E	Testing and initialization of different input devices. Also, update the Kernel variables. Traps the INT09h vector, so that the POST INT09h handler gets control for IRQ1. Uncompress all available language, BIOS logo and silent logo modules.
13	Early POST initialization of chipset registers
24	Uncompress and initialize any platform specific BIOS modules.
30	Initialize System Management Interrupt.
2A	Initialize different devices through DIM. See *DIM Code Checkpoints* section of this appendix for more information.
2C	Initialize different devices. Detects and initializes the video adapter installed in the system.
2E	Initialize all the output devices.
31	Allocate memory for ADM module and uncompress it. Give control to ADM module for initialization. Initialize language and font modules for ADM. Activate ADM module.
33	Initialize the silent boot module. Set the window for displaying text information.
37	Display sign-on message, processor information, setup key message and any OEM specific information.

POST CODE CHECKPOINTS (CONTINUED)

Checkpoint	Description
38	Initialize different devices through DIM. See DIM Code Checkpoints section of this appendix for more information.
39	Initialize DMAC-1 and DMAC-2.
3A	Initialize RTC date/time.
3B	Test for total memory installed in the system. Also, check for DEL or ESC keys to limit memory test. Display total memory in the system.
3C	Mid POST initialization of chipset registers.
40	Detect different devices (parallel ports, serial ports and coprocessor in CPU, etc.) successfully installed in the system and update the BDA, EBDA, etc.
50	Program the memory hole or any kind of implementation that needs an adjustment in system RAM size if needed.
52	Updates CMOS memory size from memory found in memory test. Allocates memory for Extended BIOS Data Area from base memory.
60	Initialize NUM-LOCK status and program the keyboard Typematic rate.
75	Initialize INT13 and prepare for IPL detection.
78	Initialize IPL devices controlled by BIOS and option ROMs.
7A	Initialize remaining option ROMs.
7C	Generate and write contents of ESCD in NVRAM.
84	Log errors encountered during POST.
85	Display errors to the user and get the user response for error.
87	Execute BIOS setup if needed/requested.
8C	Late POST initialization of chipset registers.
8E	Program the peripheral parameters. Enable/disable NMI as selected.
90	Late POST initialization of system management interrupt.
A0	Check boot password if installed.
A1	Clean-up work needed before booting to OS.
A2	Take care of runtime image preparation for different BIOS modules. Fill the free area in F000h segment with 0FFh. Initialize the Microsoft IRQ Routing Table. Prepare the runtime language module. Disable the system configuration display if needed.
A4	Initialize runtime language module.

POST CODE CHECKPOINTS (CONTINUED)

Checkpoint	Description
A7	Display system configuration screen if enabled. Initialize the processor before boot, which includes the programming of the MTRRs.
A8	Prepare processor for OS boot, including final MTRR values.
A9	Wait for user input at configuration display if needed.
AA	Uninstall POST INT1Ch vector and INT09h vector. Deinitialize the ADM module.
AB	Prepare BBS for INT19 boot.
AC	End of POST initialization of chipset registers.
B1	Save system context for ACPI.
00	Pass control to OS Loader (typically INT19h)

DIM Code Checkpoints

The Device Initialization Manager module gets control at various times during BIOS POST to initialize different buses. The following table describes the main checkpoints where the DIM module is accessed:

Checkpoint	Description
2A	Initialize different buses and perform the following functions: Reset, Detect and Disable (function 0); Static Device Initialization (function 1); Boot Output Device Initialization (function 2). Function 0 disables all device nodes, PCI devices and PnP ISA cards. It also assigns PCI Bus numbers. Function 1 initializes all static devices, which include manually configured on-board peripherals, memory and I/O decode windows in PCI-to-PCI bridges and non-compliant PCI devices. Static resources are also reserved. Function 2 searches for and initializes any PnP, PCI or AGP video drivers.
38	Initialize different buses and perform the following functions: Boot Input Device Initialization (function 3); IPL Device Initialization (function 4); General Device Initialization (function 5). Function 3 searches for and configures PCI input devices and detects if system has standard keyboard controller. Function 4 searches for and configures all PnP and PCI boot devices. Function 5 configures all on-board peripherals that are set to an automatic configuration and configures all remaining PnP and PCI devices.

Additional Checkpoints
While control is in the different functions, additional checkpoints are output to Port 80H as word values to identify the routines being executed.

The low byte value indicates the main POST Code Checkpoint. The high byte is divided into two nibbles and contains two sets of information. The details of the high byte of these checkpoints are detailed in the following table:

High Byte XY

The upper nibble 'X' indicates the function number that is being executed. 'X' can be from 0 to 8.

0	Function 0. Disable all devices on the bus.
1	Function 1. Initialize static devices on the bus.
2	Function 2. Initialize output devices on the bus.
3	Function 3. Initialize input devices on the bus.
4	Function 4. Initialize IPL devices on the bus.
5	Function 5. Initialize general devices on the bus.
6	Function 6. Error reporting for the bus.
7	Function 7. Initialize add-on ROMs for all buses.
8	Function 8. Initialize BBS ROMs for all buses.

The lower nibble 'Y' indicates the bus on which the different routines are being executed. 'Y' can be from 0 to 5.

0	Generic DIM (Device Initialization Manager)
1	On-board system devices
2	ISA devices
3	EISA devices
4	ISA PnP devices
5	PCI devices

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