

MIC-3328

**3U CompactPCI Intel Ivy bridge
Dual/Quad Core Processor
Blade**

ADVANTECH

Enabling an Intelligent Planet

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CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables.

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Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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 - Description of your software (operating system, version, application software, etc.)
 - A complete description of the problem
 - The exact wording of any error messages

Warnings, Cautions and Notes

Warning! Warnings indicate conditions, which if not observed, can cause personal injury!



Caution! Cautions are included to help you avoid damaging hardware or losing data. e.g. There is a danger of a new battery exploding if it is incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.



Note! Notes provide optional additional information.



Document Feedback

To assist us in making improvements to this manual, we would welcome comments and constructive criticism. Please send all such - in writing to: support@advan-tech.com

Packing List

Before setting up the system, check that the items listed below are included and in good condition. If any item does not accord with the table, please contact your dealer immediately.

- MIC-3328 single board computer (CPU and PCH heatsink included) x1
- Daughter board for SATA HDD, HDD tray (Assembled with SBC dual slot 8HP-1 version) x 1
- Warranty certificate document x 1
- M2.5*8L screw x1 and plastic SPACER SUPPORT x1 in accessory bag for CFast fixing when you plugged in a CFast card
- M3*5L screw x4 in accessory bag for HDD/SSD fixing when you installed HDD/SSD
- 2PIN Jumper in accessory bag for CMOS Clear

Safety Instructions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a reliable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. **DO NOT COVER THE OPENINGS.**
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated into the equipment.
 - The equipment has been exposed to moisture.
 - The equipment does not work well, or you cannot get it to work according to the user's manual.
 - The equipment has been dropped and damaged.
 - The equipment has obvious signs of breakage.
15. **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT WHERE THE STORAGE TEMPERATURE MAY GO BELOW -20° C (-4° F) OR ABOVE 60° C (140° F). THIS COULD DAMAGE THE EQUIPMENT. THE EQUIPMENT SHOULD BE IN A CONTROLLED ENVIRONMENT.**
16. **CAUTION: DANGER OF EXPLOSION IF BATTERY IS INCORRECTLY REPLACED. REPLACE ONLY WITH THE SAME OR EQUIVALENT TYPE RECOMMENDED BY THE MANUFACTURER, DISCARD USED BATTERIES ACCORDING TO THE MANUFACTURER'S INSTRUCTIONS.**

The sound pressure level at the operator's position according to IEC 704-1:1982 is no more than 70 dB (A).

DISCLAIMER: This set of instructions is given according to IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Safety Precaution - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from your PC chassis before you work on it. Don't touch any components on the CPU card or other cards while the PC is on.
- Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a card may damage sensitive electronic components.

We Appreciate Your Input

Please let us know of any aspect of this product, including the manual, which could use improvement or correction. We appreciate your valuable input in helping make our products better.

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Chapter 1

Hardware Configuration

This chapter describes how to configure MIC-3328 hardware.

1.1 Introduction

Advantech's MIC-3328 is a 3U CompactPCI PlusIO CPU blade based on the Intel® 3rd generation Core™ processor family. Based on latest 22 nm process technology these processors support up to four cores / eight threads at up to 2.5 GHz and up to 6M last level cache. With Intel HD Graphics (Gen7, DX11, OCL1.1) integrated into the CPU, the MIC-3328 can serve applications demanding high performance, high resolution video output on up to three independent display interfaces. Latest DDR3 DRAM up to 8 GB running at 1600MT/s complement the powerful processor with high performance, ECC protected onboard memory.

MIC-3328's design for reliability like using soldered processor, DRAM and flash storage for enhanced shock and vibration tolerance make it an ideal choice for workstation workloads in harsh environments and mission/business-critical applications such as military, transportation, test & measurement and traffic control. The enhanced fixed point and floating point performance offered by the intel Core™ processor, improvements in the vector processing instruction set (AVX) along with the possibility to utilize the integrated GPU via standard interfaces such as OpenCL make the MIC-3328 also a great fit for signal processing applications such as radar, beam forming or image processing.

For best in class IO performance, MIC-3328 uses the Intel QM77 PCH, which provides extensive I/O support such as USB3.0, PCI Express gen.2 and SATA-III ports.

For dense applications the MIC-3328 is available with a 4HP front panel, occupying a single slot, only. For applications requiring additional IO and/or peripheral support, the MIC-3328 can be extended to 8HP (2 slots) via specific extension modules (XTMs). For industrial display or workstation applications, a graphics-centric XTM routes two Display Ports from the PCH for triple display support, adds 2 COM ports for data acquisition and control plus a PS/2 and 2.5" SSD. A second XTM provides a XMC mezzanine slot for industry standard extension modules like Advantech's MIC-3666 dual 10GE adapter card. The XMC slot supports a PCI Express x8 interface directly into the Intel Core™ processor with speeds up to 64Gbps according to PCI Express 3.0.

While support for legacy CompactPCI is provided on J1 via an onboard PI7C9X110 bridge, the MIC-3328 supports an UHM J2 connector according to PCIMG2.30 (PlusIO). While this connector maintains backwards compatibility and interoperability with legacy systems, it makes state of the art serial interfaces such as Gigabit Ethernet, PCI express, USB and SATA available for use on a Rear transition Module (RTM) or on a hybrid backplane supporting legacy IO cards as well as CompactPCI Serial peripheral cards as defined in PICMG2.30. Thus, MIC-3328 provides a smooth, risk free and future proof migration path from legacy parallel PCI bussed CompactPCI system to latest serial interface standard predominant in the computer industry. With full backwards compatibility to CompactPCI, customers investments stay protected while the door is opened for platform enhancements and innovations via the new serial interfaces. The MIC-3328 PlusIO J2 supports interfaces such as 4 PCI Express x1 gen. 2 links for IO extension, one GbE for computer to computer multiprocessing, three SATA for Hard drives and RAID systems as well as 4 USB ports for wireless interfaces and legacy interface replacement.

Table 1.1: MIC-3328 Variants

Model number	MIC-3328X*1-S1E	MIC-3328X*1-D1E	MIC-3328X*1-D2E
Slot Width	Single Slot (4HP)	Dual Slots (8HP-1)	Dual Slots (8HP-2)
2 nd Layer XTM	-	1	1
Storage	Optional NAND Flash	CFAST/SATA SSD	CFAST/ Optional NAND Flash

X*= A/B/C

- A mean CPU is 3517UE, 17W
- B mean CPU is 3555LE, 25W
- C mean CPU is 3612QE, 35W

1.2 Specifications

1.2.1 CompactPCI Bus Interface

The MIC-3328 is compliant with PICMG 2.0 Rev. 3.0 and PICMG 3.0 CPCI PlusIO specification. It supports a 32-bit / 33 MHz PCI bus for up to 8 CompactPCI slots at 3.3 V or 5 V VIO. The MIC-3328 is hot-swap compliant (PICMG 2.1).

1.2.2 CPU

The MIC-3328 supports the 22nm technology Intel® IvyBridge™ 3612QE / 355LE / 3517UE processors with clock frequencies up to 2.5GHz and DMI 5GB/s. Supported processors are listed in the table below. The forced airflow cooling is required.

Table 1.2: CPU Variants

Intel CPU Model	Cores	Freq.	Package	Cache	CPU TDP	Board Power Consumption	Required Airflow
3517UE(8HP)	2	1.7 GHz	BGA	4MB	17 W	23.42 W	5CFM
3555LE(8HP)	2	2.5 GHz	BGA	4MB	25 W	33.12 W	10CFM
3612QE(8HP)	4	2.1 GHz	BGA	6MB	35 W	43.91 W	20CFM

1.2.3 BIOS

A 8-MByte SPI flash contain a board-specific UEFI BIOS (from AMI) designed to meet industrial and embedded system requirements.

1.2.4 Chipset

MIC-3328 uses the Intel QM77 PCH, which provides extensive I/O support such as USB3.0, PCI Express gen.2 and SATA-III ports. Three i210 Gigabit Ethernet Controllers provide front panel as well as rear panel network connectivity.

Table 1.3: MIC-3328 with 8HP-1 I/O Features

System Board	Front Panel-4HP			Front Panel-8HP			Main On-Board Features				
	VGA	USB3.0	Ethernet (RJ45)	COM* ①	Display port	PS/2	Onboard Memory	CFast	SATA SSD	COM* ②	on board SATA flash
											Mini-PCle
MIC-3328A1-D1E	1	2	2	2	2	1	4GB	1	1	2	optional
MIC-3328B1-D1E	1	2	2	2	2	1	8GB	1	1	2	optional
MIC-3328C1-D1E	1	2	2	2	2	1	8GB	1	1	2	optional

Note! COM* ①, RJ45 COM with RS232.



COM* ②, PIN Header with RS232/422/485, these COM PIN Headers, SATA SSD and XMC are mutually exclusive.

Table 1.4: MIC-3328 with 8HP-2 I/O Features

System Board	Front Panel-4HP			Front Panel-8HP		Main On-Board Features		
	VGA	USB3.0	Ethernet (RJ45)	XMC	USB2.0* (type A)	Onboard CPU	Onboard Memory	CFast
MIC-3328A1-D2E	1	2	2	1	2	I7-3517UE	4GB	1
MIC-3328B1-D2E	1	2	2	1	2	I7-3555LE	8GB	1
MIC-3328C1-D2E	1	2	2	1	2	I7-3612QE	8GB	1

1.2.5 Memory

The MIC-3328 has 4GB of on-board DDR3-1600 SDRAM on 17W 3517UE version. The MIC-3328 has 8GB of on-board DDR3-1600 SDRAM on 25W 3555LE and 35 W 3612QE version.

1.2.6 Ethernet

There are three I/O LAN ports on the MIC-3328, which are implemented using three Intel i210AT LAN controllers to provide 10/100/1000 Base-T Ethernet connectivity. Three i210 Gigabit Ethernet Controllers provide front panel as well as rear panel network connectivity. The i210 provides higher performance over previous Gigabit Ethernet controllers, better support for virtualization, Energy Efficient Ethernet and ECC protected packet buffers for enhanced reliability. Support for time stamping and synchronization is accomplished via IEEE1588 (PTP). Support for industrial Ethernet protocols such as ProfiNet, EtherCAT and Powerlink is available via third party software partners.

1.2.7 Storage Interface

The MIC-3328 supports three SATA channels. Three SATA on front 4HP and 8HP. Three SATA interfaces are routed to the RIO via the J2 3M UHM connector for PlusIO application.

Table 1.5: Storage

Storage	on board SATA NAND Flash	CFast	SATA SSD/HDD	3 SATA
Location	4HP	8HP-1	8HP-1	to J2

1.2.8 Serial Interface

Four UARTs (serial ports) are on the second layer, and 2 RS232 ports to 8HP front ,2 RS232/422/485 ports are on board PIN header or to 8HP RIO.

1.2.9 USB Port

Two USB3.0 and Six USB 2.0 compliant ports are provided. Two USB3.0 ports are routed to front panel connectors; Two USB2.0 routed to second layer (could be designed on 8HP-2 front panel). The other four USB2.0 ports are routed to J2 UHM connector for PlusIO application.

1.2.10 LEDs

Three LEDs are provided on the front panel as follows:

Table 1.6: LED Indicator for the MIC-3328

LED	Color	Indicator
Hot swap	Blue	The board could be safely removed
Power	Green	Power is provided to the board
HDD	Green	HDD power is on
	Blinking	HDD is accessed

1.2.11 Watchdog Timer

An onboard watchdog timer provides system reset capabilities via software control. The programmable time interval is from 1 to 255 seconds.

1.2.12 Optional Rear I/O Modules

The MIC-3526R1-S1E is the optional 4HP RTM (also known as rear I/O module) for the MIC-3328. It offers a wide variety of I/O panel features, such as one RJ45 LAN ports, and four USB2.0 ports. It also comes with on-board features such as three SATA (one SATA socket for mSATA, two SATA PIN header) and one miniPCle (for wireless LAN card).

Table 1.7: RIO Configurations

RTM Model Number	Rear Panel 4HP		Rear Panel 8HP			All Onboard Socket are on 4HP		
	USB	LAN	DP	COM*	PS/2	SATA	PCle	Slot
MIC-3526R1-D1E	4	1	2	2	1	3	1	2
MIC-3526R1-S1E	4	1	-	-	-	3	1	1

Note!



1. PS/2 is mutually exclusive with PS/2 on 8HP front panel by BOM control. It required a special 8HP board to work. The special 8HP board is on request by customer.
2. 2 x COM default setting is RS232, RS422/485 could be set by the switch on 8HP board. (Total 4 COM ports on 8HP and it's RIO)
3. 2 x DisplayPort is switchable from front panel by switch on 8HP board.

1.2.13 Optional Extension Modules

The MIC-3328 has two kinds of second layer XTM. One XTM 8HP-1 is used for multi-display dual-slot platform, and rich I/O feature set such as COM, PS/2, SATA SSD...etc. Another XTM 8HP-2 is used for XMC PCIe x8 based dual-slot platform. The XTM pin assignment and connectivity is described in detail in the Appendix. For a customized extension module demand, please contact Advantech local representative.

Table 1.8: The Second Layer XTM (8HP) Configurations

XTM	IO Panel				On-board Header/Socket/Connector			
	Display port	COM* ①	PS/2	USB	XMC	SATA HDD	Cfast	COM* ②
8HP-1	2	2	2	-	-	1	1	2
8HP-2	-	-	-	2-optional	1	-	1	2

Note! COM* ①: RJ45 COM with RS232.



COM* ②: PIN Header with RS232/422/485 (switchable to RIO), these COM PIN Headers, SATA SSD and XMC are mutually exclusive.

1.2.14 Mechanical and Environmental Specifications

- **Operating temperature:** 0 ~ 60°C (32 ~ 140°F)

Note! The operating temperature range of the MIC-3328 depends on the installed processor and the airflow through the chassis. Detail airflow



information please refer to Table 1.2. For extended temperature products please contact your ADVANTECH representative.

- **Storage Temperature:** -40 ~ 85°C (-40 ~ 185°F)
- **Humidity (operating):** 95% @ 60°C (non-condensing)
- **Humidity (Non-operating):** 95% @ 60°C (non-condensing)
- **Vibration (Random operating):** 5 ~ 500 Hz, 2 Grms (without on-board 2.5" HDD)
- **Vibration (Sine Non-operating):** 5 ~ 500 Hz, 2 Grms (without on-board 2.5" HDD)
- **Shock (operating):** 10 G each face operating three times
- **Shock (Non-operating):** 30 G each face Non-operating three times
- **Board size:**
 - 3U/1 slot width (4HP): 100 x 160 x 20 mm (3.9" x 6.3" x 0.8")
 - 3U/2 slot width (8HP): 100 x 160 x 40 mm (3.9" x 6.3" x 1.6")
- **Net Weight:**
 - 3U/1 slot width (4HP): 0.62 kg
 - 3U/2 slot width (8HP): 0.90 kg

1.2.15 Compact Mechanical Design

MIC-3328 series has a specially designed heat sink for the processor. MIC-3328 17w and 25w series is installed with aluminum heatsink, MIC-3328 35w series is installed with cuprum heatsink. However, forced air cooling in the chassis is still needed for operational stability and reliability to MIC-3328 all series.

1.2.16 Compact PCI Bridge

The MIC-3328 uses a Pericom PCIe to PCI bridge as a gateway to an intelligent subsystem. The PI7C9X110 bridge offers the following features:

- Compliant with PCI Local Bus Specification, Revision 3.0
- Compliant with PCI-to-PCI Bridge Architecture Specification, Revision 1.2
- Compliant with PCI Bus PM Interface Specification, Revision 1.1
- Compliant with PCI Hot-Plug Specification, Revision 1.1
- Compliant with PCI Mobile Design Guide, Version 1.1
- Compliant with PCI-X Protocol Addendum to the PCI Local Bus Specification, Revision 2.0a
- PME support
- 3.3 V PCI signaling with 5V I/O tolerance
- Provides two level arbitration support for eight PCI Bus masters
- 16-bit address decode for VGA
- Subsystem Vendor and Subsystem Device IDs support

- PCI INT interrupt or MSI Function support

Please consult the PI7C9X110 data sheet for more details.

1.2.17 Hardware Monitor

One Hardware Monitor (NCT7904D) is available to monitor critical hardware parameters, such as system temperature and core voltage.

1.2.18 Super I/O

The MIC-3328 Super I/O (SCH3106) device provides the following legacy PC devices:

- Two UART ports are connected to the XTM as RS232 COM1 and COM2 on front panel. Two UART ports are connected to RIO via J2 as two on board RS-232/422/485
- The PS2 (keyboard/mouse) is routed to the XTM as PS/2 IO on the front panel.

1.2.19 RTC and Battery

The RTC module keeps the date and time. On the MIC-3328 model the RTC circuitry is connected to battery sources (CR2032M1S8-LF, 3 V, 210 mAh).

1.2.20 Drone Mode

The Drone mode will be automatically implemented when the CPU blade is plugged in the peripheral slot on the backplane.

1.3 Functional Block Diagram

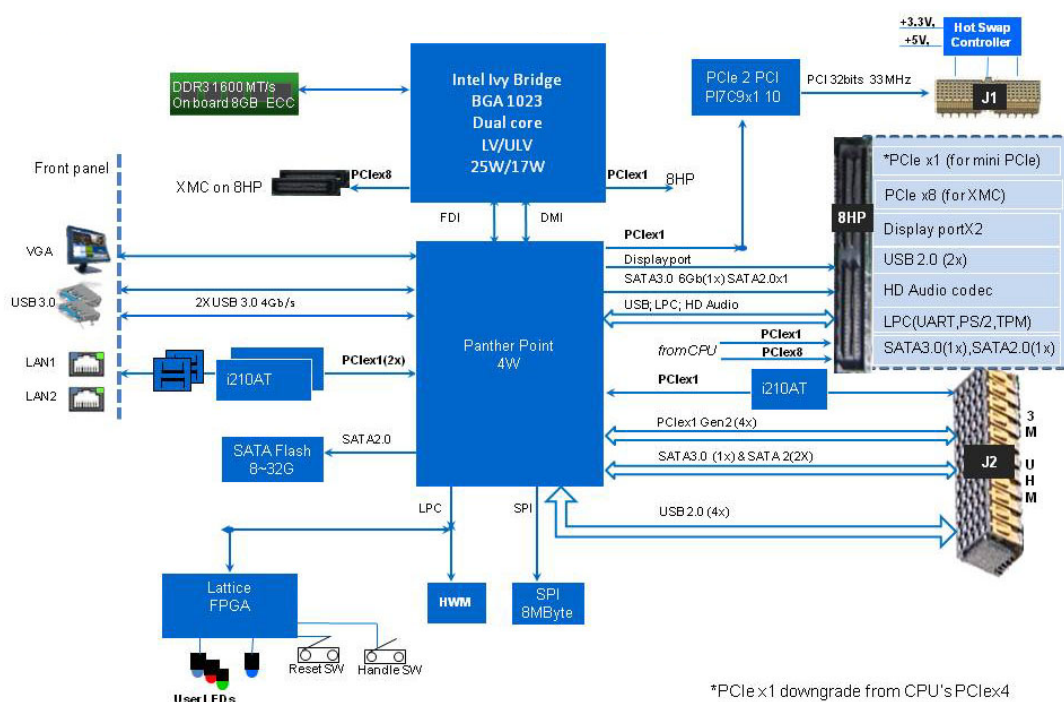


Figure 1.1 MIC-3328 functional block diagram.

1.4 Jumpers and Switches

Table 1.9 and Table 1.10 list the jumper and switch functions. Figure 1.2 illustrates the jumper and switch locations.

The MIC-3328 provides a system reset button (RST near to USB connector) located on the front panel. The system reset button resets all payload and application-related circuitry.

Please read this section carefully before changing the jumper and switch settings on MIC-3328.

Note! You should use a two PIN jumper to short the CN2 PIN1 and PIN2 when you want clear CMOS.



Table 1.9: MIC-3328 jumper descriptions

Number	Function	PIN NO.	PIN Definition
CN2	for Clear CMOS	PIN1	RTCRST
CN2	for Clear CMOS	PIN2	GND
CN5	for CPLD programming	PIN1	PWR
CN5	for CPLD programming	PIN2	TDO
CN5	for CPLD programming	PIN3	TDI
CN5	for CPLD programming	PIN4	EN
CN5	for CPLD programming	PIN5	N/A
CN5	for CPLD programming	PIN6	TMS
CN5	for CPLD programming	PIN7	GND
CN5	for CPLD programming	PIN8	TCK

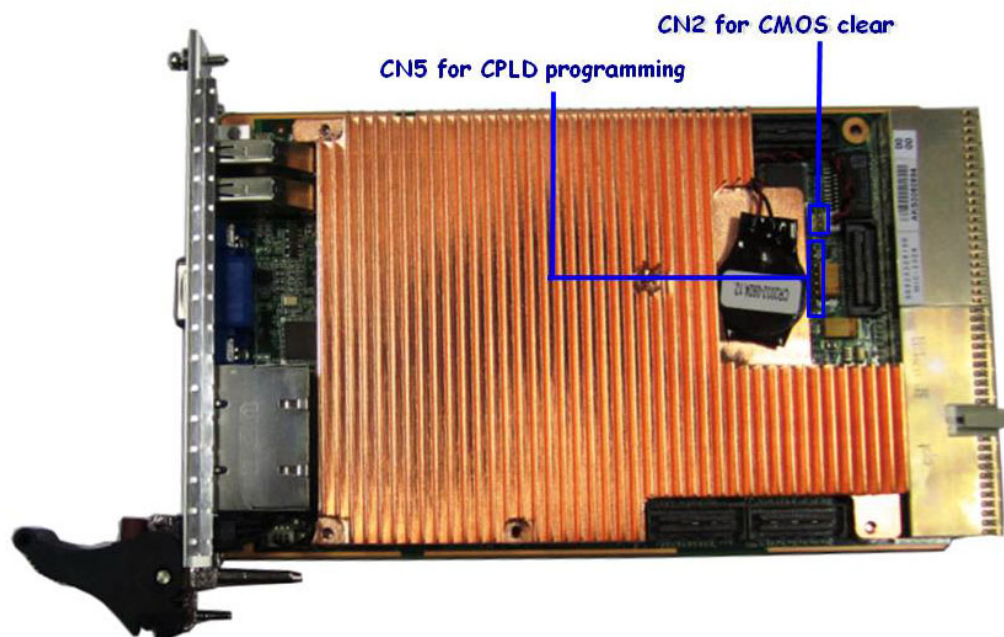


Figure 1.2 MIC-3328 jumper locations

Table 1.10: MIC-3328 8HP Jumper Descriptions

Number	Function
SW1,SW2	For on board/8HP RIO COM3 setting
SW3,SW4	For on board/8HP RIO COM4 setting
SW5,SW6,SW7	For display setting

SW1 & SW2: (For on board/8HP RIO COM3 setting)







	COM setting ■ : key	
RS232 (Default)	SW1 	SW2 
RS422	SW1 	SW2 
RS485	SW1 	SW2 

Figure 1.3 MIC-3328 COM3 switch setting**SW3 & SW4: (For on board/8HP RIO COM4 setting)**







	COM setting ■ : key	
RS232 (Default)	SW3 	SW4 
RS422	SW3 	SW4 
RS485	SW3 	SW4 

Figure 1.4 MIC-3328 COM4 switch setting

SW5 & SW6 & SW7: (For Display Port setting)







	Display setting ■ : key		
Front (Default)	SW5	SW6	SW7
			
REAR	SW5	SW6	SW7
			

Figure 1.5 MIC-3328 8HP Display Port switch setting

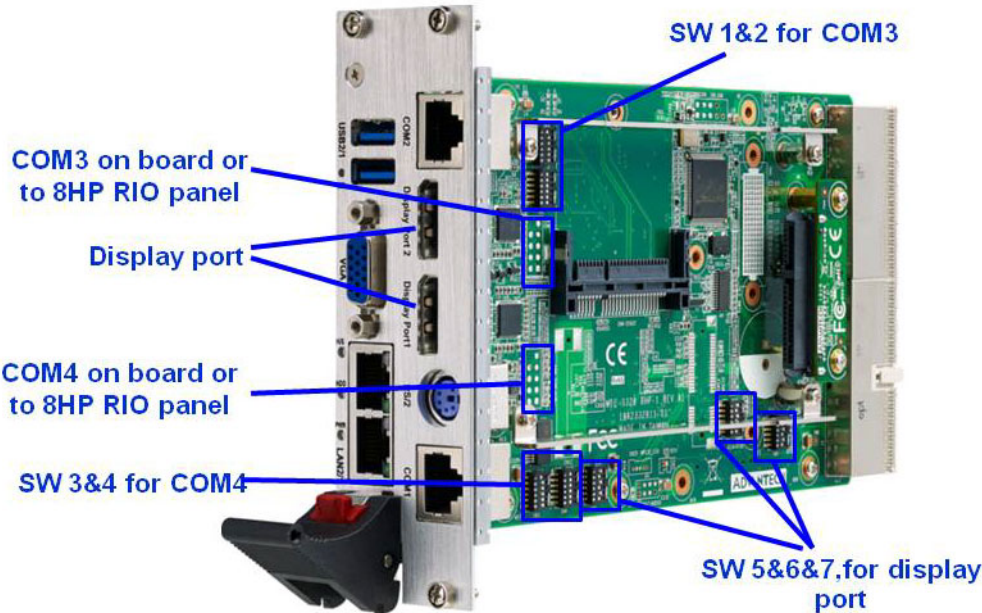


Figure 1.6 MIC-3328 switch locations

1.5 Connector Definitions

Table 1.11 lists the function of each connector and Figure 1.3 and 1.4 illustrate each connector location.

Table 1.11: MIC-3328 4HP Connector Descriptions

Number	Function
USB3CN1	USB3.0 connector
USB3CN2	USB3.0 connector
CN3	Battery connector
CN4	XTM connector (8HP)
CN6	VGA(DB-15)
CN7	RJ45 LAN existing
CN8	XTM connector (8HP)
CN9	XTM connector (8HP)
CN10	Handle connecting
J1	Primary CompactPCI bus
J2	PlusIO or Rear I/O transition

Table 1.12: MIC-3328 8HP Connector Descriptions

Number	Function
CN1	USB connector
CN2	USB connector
CN3	RJ45 COM connector
CN4	Cfast connector
CN5	display port connector
CN6	COM port pin header
CN7	SATA Flash connector
CN8	display port connector
CN9	COM port pin header
CN10	KB/MS connector
CN11	MINIPCIEXPRESS LATCH
CN12	MINIPCIEXPRESS connector
CN15	Enable/disable radio operation on add-in cards that implement radio frequency applications
CN16	USB connector
CN17	HD Audio connector
CN18	XTM connector (4HP)
CN19	XTM connector (4HP)
CN20	XTM connector (4HP)
CN21	XTM connector (4HP)
CN22	MPCIE LED connector
XMC	XMC connector



Figure 1.7 MIC-3328 8HP-1 Front Panel Ports, Indicators and Buttons



Figure 1.8 MIC-3328 8HP-2 Front Panel Ports, Indicators and Buttons

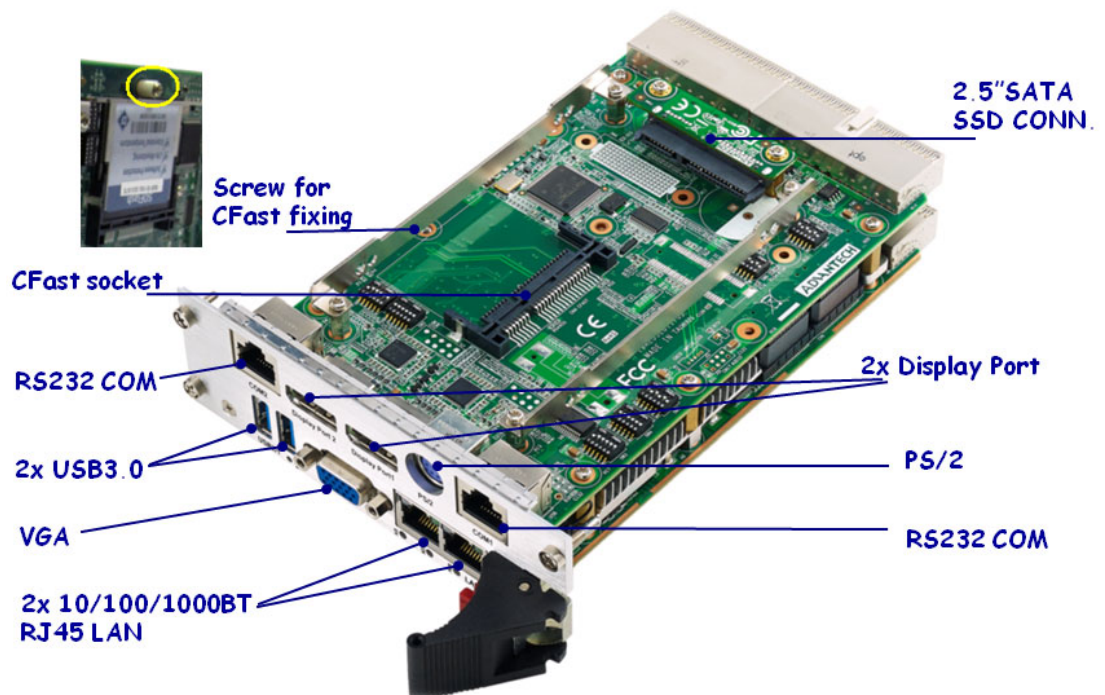


Figure 1.9 MIC-3328 8HP-1 side view

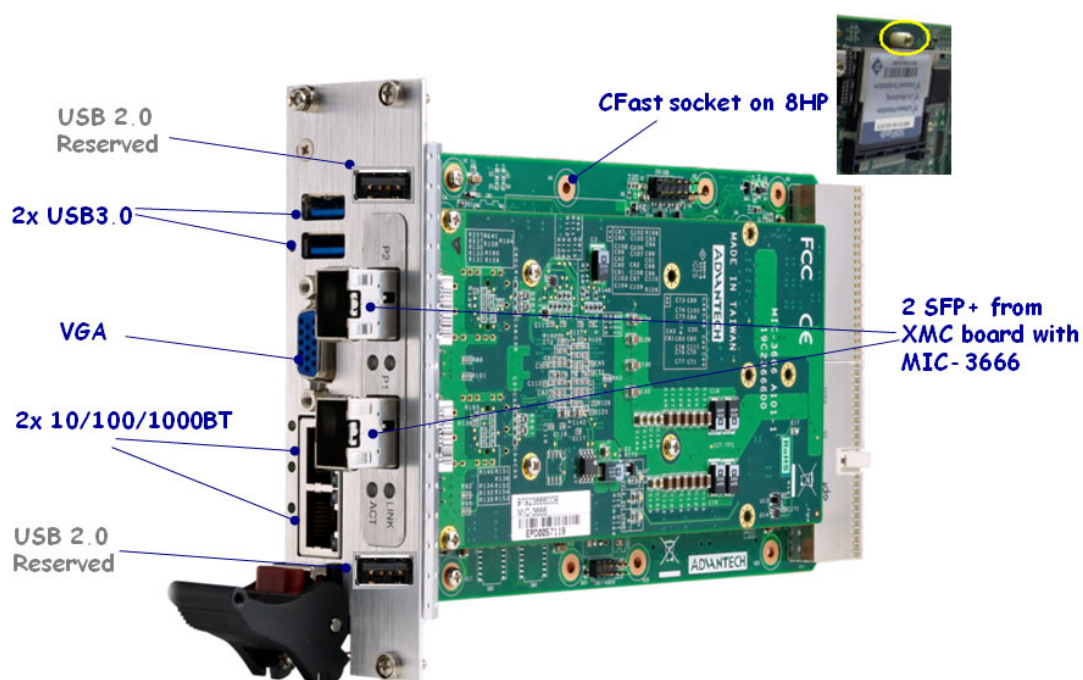


Figure 1.10 MIC-3328 8HP-2 side view



Figure 1.11 RIO Panel Ports

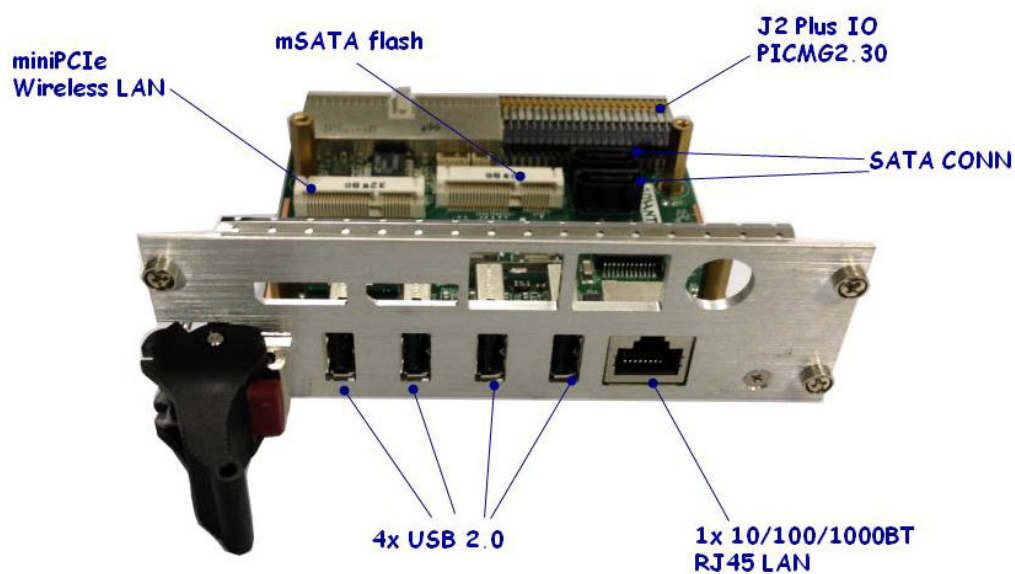


Figure 1.12 RIO 4HP side view

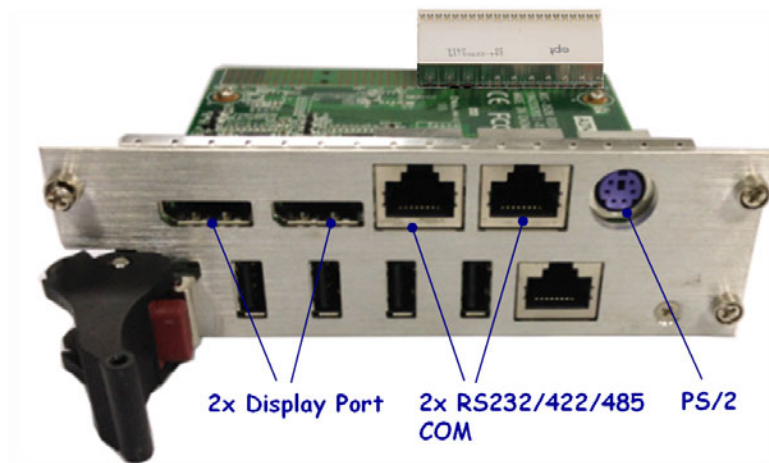


Figure 1.13 RIO 8HP side view

Table 1.13: MIC-3328 4HP Rear I/O Connector Descriptions

Number	Function
CN1	MiniSATA connector
CN2	SATA connector
CN3	RJ45 LAN connector
CN4	USB connector
CN5	SATA connector
CN6	USB connector
CN7	MiniSATA Latch
CN8	USB connector
CN9	enable/disable radio operation on add-in cards that implement radio frequency applications
CN10	Mini PCIE slot
CN11	Mini PCIE Latch
CN12	USB connector
CN22	Mini PCIE LED connector

Table 1.14: MIC-3328 8HP Rear I/O Connector Descriptions

Number	Function
CN1	KB/MS connector
CN2	RJ45 COM connector
CN3	RJ45 COM connector
CN4	Display port connector
CN5	Display port connector

1.6 Safety Precautions

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electric shock, always disconnect the power from your CompactPCI chassis before you work on it. Don't touch any components on the CPU board or other boards while the CompactPCI chassis is powered.
- Disconnect power before making any configuration changes. The sudden rush of power as you connect a jumper or install a board may damage sensitive electronic components.
- Always ground yourself to remove any static charge before you touch your CPU board. Be particularly careful not to touch the chip connectors.
- Modern integrated electronic devices, especially CPUs and memory chips, are extremely sensitive to static electric discharges and fields. Keep the board in its antistatic packaging when it is not installed in the chassis, and place it on a static dissipative mat when you are working with it. Wear a grounding wrist strap for continuous protection.

1.7 Installation Steps

The MIC-3328 contains electro-statically sensitive devices. Please discharge your clothing before touching the assembly. Do not touch components or connector pins. We recommend that you perform assembly at an anti-static workbench.

1.7.1 MIC-3328 Installation Steps

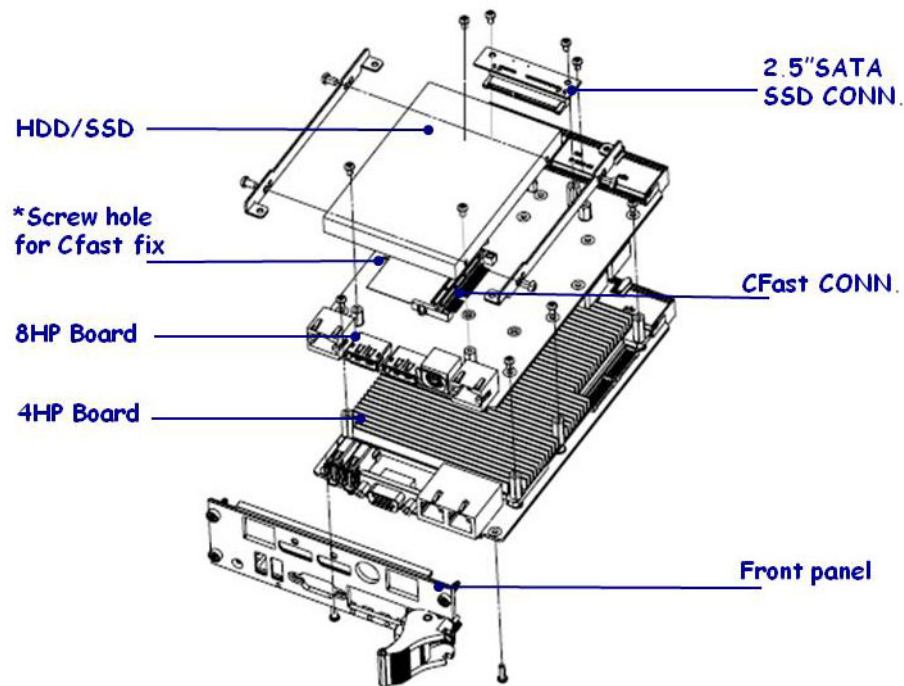


Figure 1.14 MIC-3328 8HP-1 assembly

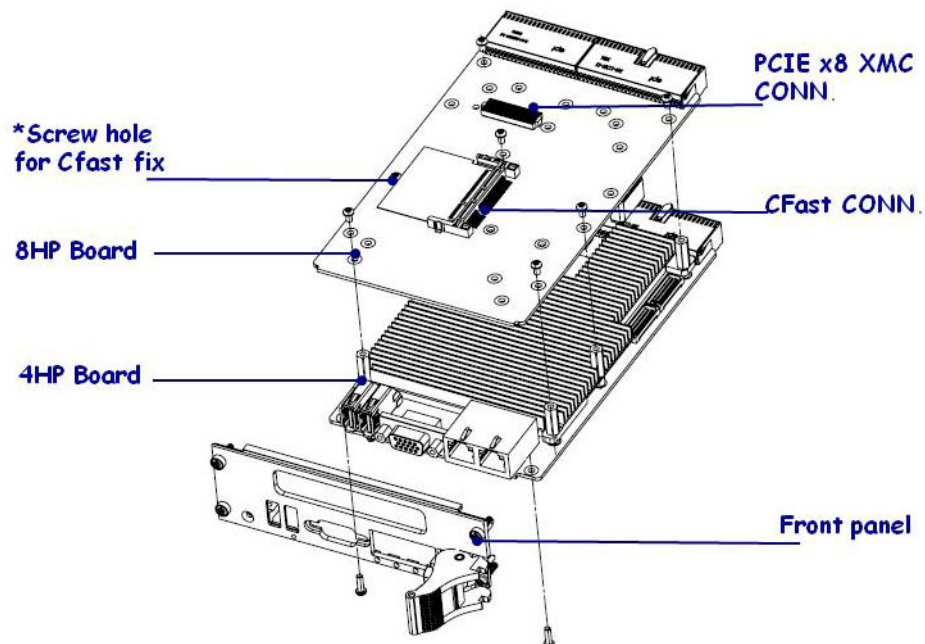


Figure 1.15 MIC-3328 8HP-2 assembly

Note! The Screw and space support part was in accessory bag.



1.7.2 MIC-3328 Rear I/O Board Installation Steps

The MIC-3328 supports either rear I/O board. Following picture shows the installation of the rear I/O board.

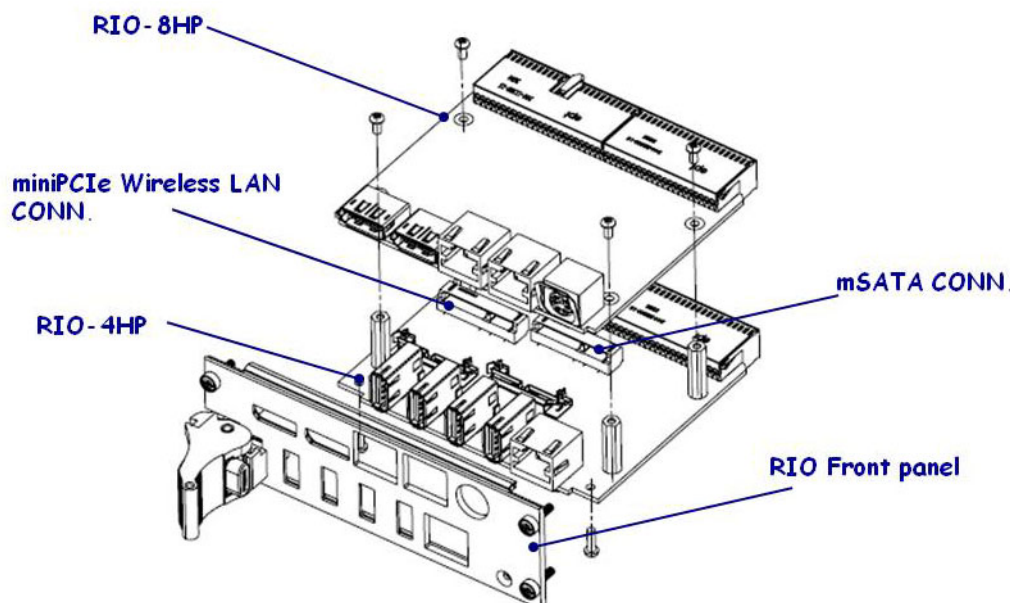


Figure 1.16 MIC-3526 RIO for MIC-3328 8HP assembly

1.7.3 MIC-3328 Board Installation in PlusIO System

The MIC-3328 supports as PlusIO system mother board. Following picture shows the installation.

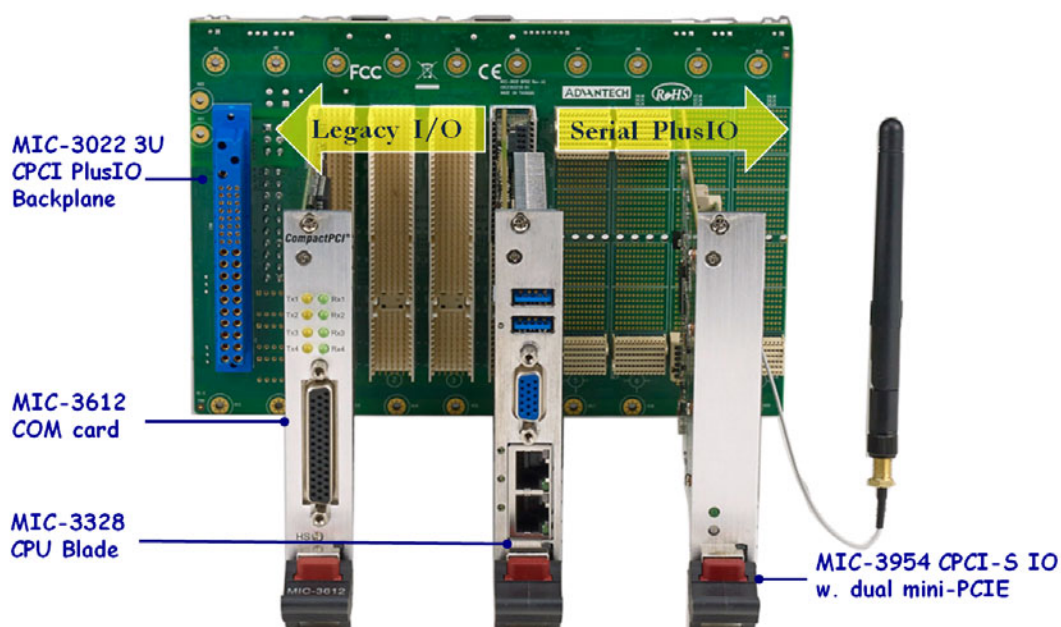


Figure 1.17 MIC-3328 Application in PlusIO system

1.8 Battery Replacement

The Battery model number is CR2032M1S8-LF, a 3V, 210 mAh battery. Replacement batteries may be purchased from Advantech. When ordering the battery, please contact with your local Sales to check the availability.

PN: 1750129010 – BATTERY 3V/210 mAh with WIRE ASS'Y CR2032M1S8-LF

Batteries, battery packs, and accumulators should not be disposed of as unsorted household waste. Please use the public collection system to return, recycle, or treat them in compliance with the local regulations.

1.9 Software Support

Windows XP(Limited to IDE mode set under BIOS SATA Configuration,AHCI mode is not supported under Windows XP.), Windows 7, Windows 8, Windows server2008,Vxworks,UEFI OS and Red Hat Enterprise Linux 6.1 have been fully tested on the MIC-3328. Please contact your local sales representative for details on support for other operating systems.

Chapter 2

AMI BIOS Setup

This chapter describes how to configure the AMI BIOS.

2.1 Introduction

The AMI BIOS has been customized and integrated into many industrial and embedded motherboards for over a decade. This section describes the BIOS which has been specifically adapted to the MIC-3328. With the AMI UEFI BIOS Setup Utility, you can modify BIOS settings and control the special features of the MIC-3328. The Setup program uses a number of menus for making changes and turning the special features on or off. This chapter describes the basic navigation of the MIC-3328 setup screens.

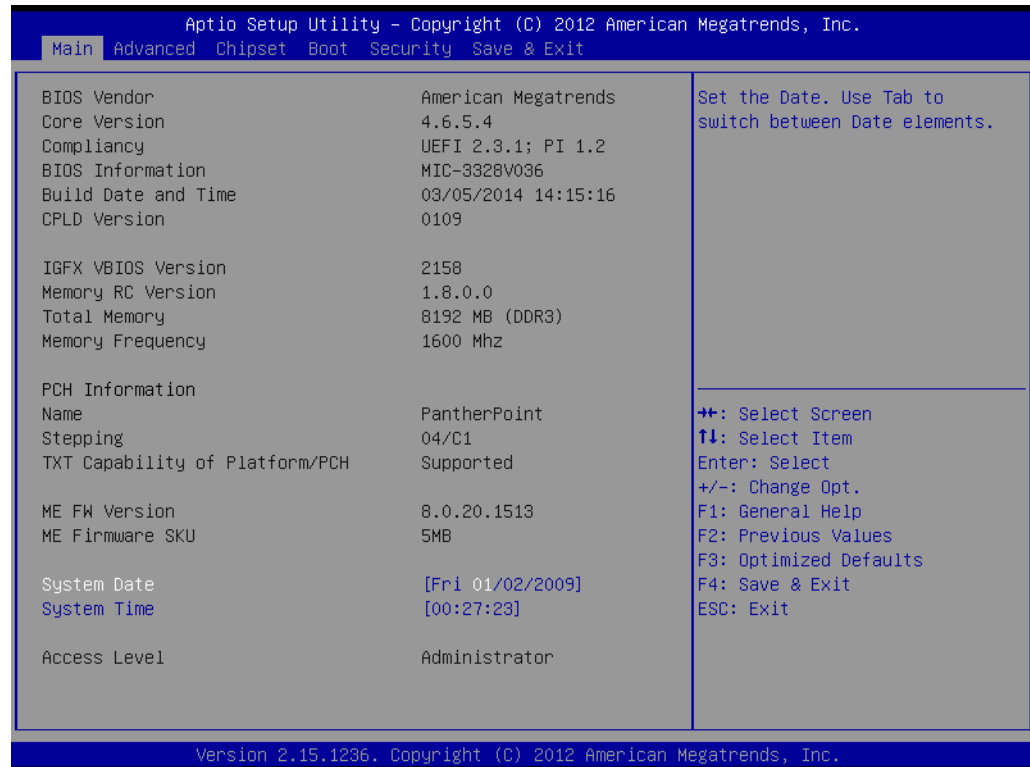


Figure 2.1 Setup program initial screen

The BIOS ROM has a built-in Setup program that allows users to modify the basic system configuration. This type of information is stored in battery-backed up CMOS so it retains the Setup information when the power is turned off.

2.2 Entering Setup

Turn on the computer, and there should be a POST (Power-On Self Test) screen that shows the BIOS supporting the CPU. If there is no number assigned to the patch code, please contact an Advantech application engineer to obtain an up-to-date patch code file. This will ensure that the CPU's system status is valid. After ensuring that you have a number assigned to the patch code, press and you will immediately be allowed to enter Setup.



Figure 2.2 Press or <F2> to run setup

2.2.1 Main Setup

When you first enter the BIOS Setup Utility, you will enter the Main setup screen. You can always return to the Main setup screen by selecting the Main tab. Two main setup options are described in this section. The main BIOS setup screen is shown below.

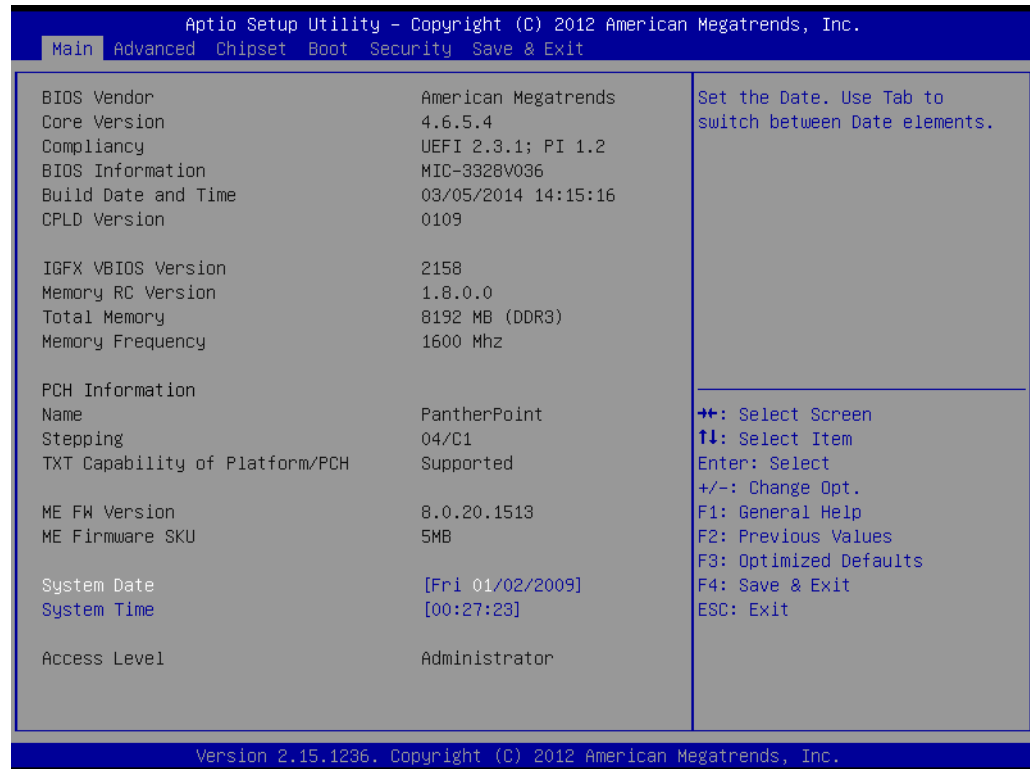


Figure 2.3 Main setup screen

The main BIOS setup menu screen has two main frames. The left frame displays all the options that can be configured. “Grayed-out” options cannot be configured while options in blue can. The right frame displays the key legend. Above the key legend is an area reserved for a text message. When an option is selected in the left frame, it is highlighted in white. Often a text message will accompany it.

■ System Time/System Date

Use this option to change the system time and date. Highlight System Time or System Date using the <Arrow> keys. Enter new values through the keyboard. Press the <Tab> key or the <Arrow> keys to move between fields. The date must be entered in MM/DD/YY format. The time is entered in HH:MM:SS format.

2.2.2 Advanced BIOS Features Setup

Select the Advanced tab from the MIC-3328 setup screen to enter the Advanced BIOS Setup screen. You can select any of the items in the left frame of the screen, such as CPU Configuration, to go to the sub menu for that item. You can display an Advanced BIOS Setup option by highlighting it using the <Arrow> keys. All Advanced BIOS Setup options are described in this section. The Advanced BIOS Setup screen is shown below. The sub menus are described on the following pages.

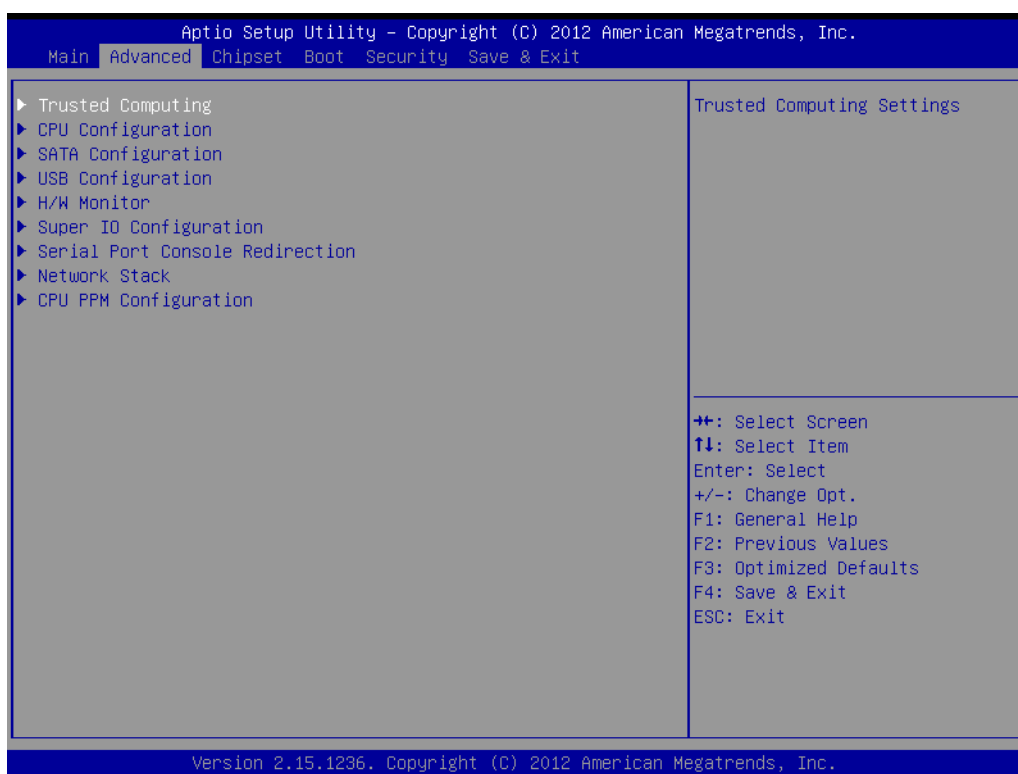


Figure 2.4 Advanced BIOS features setup screen

2.2.2.1 Trusted Computing

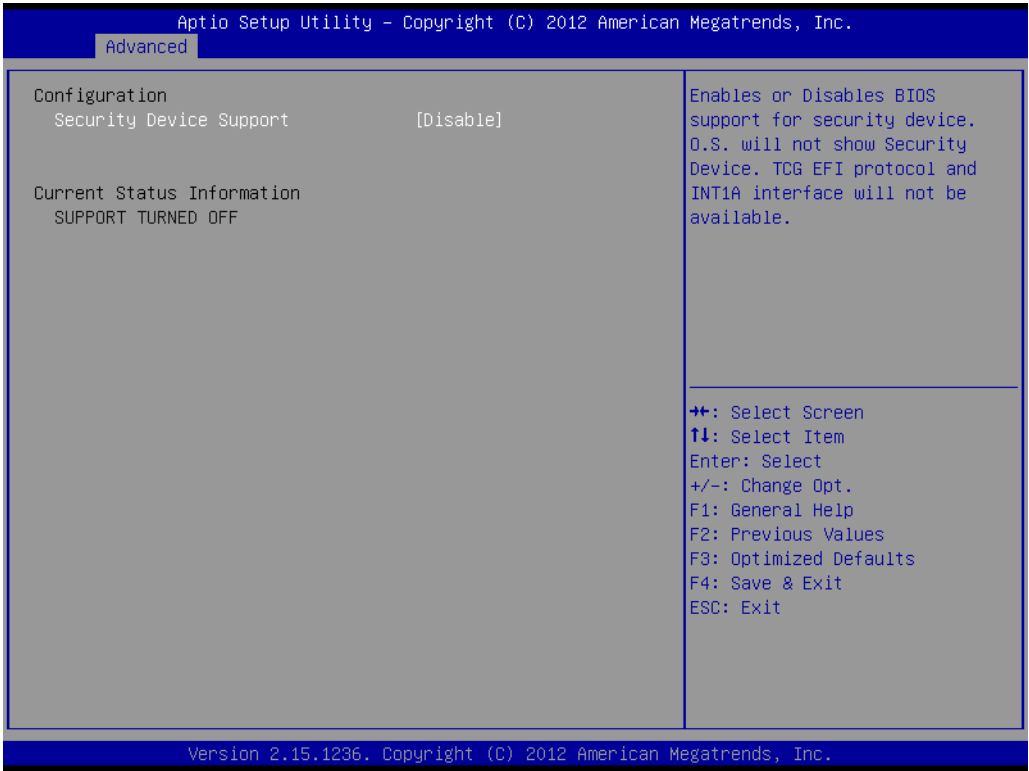


Figure 2.5 Trusted Computing

This item allows you to enable or disable Security Device Support; the default setting is “Disable”.

2.2.2.2 CPU Configuration

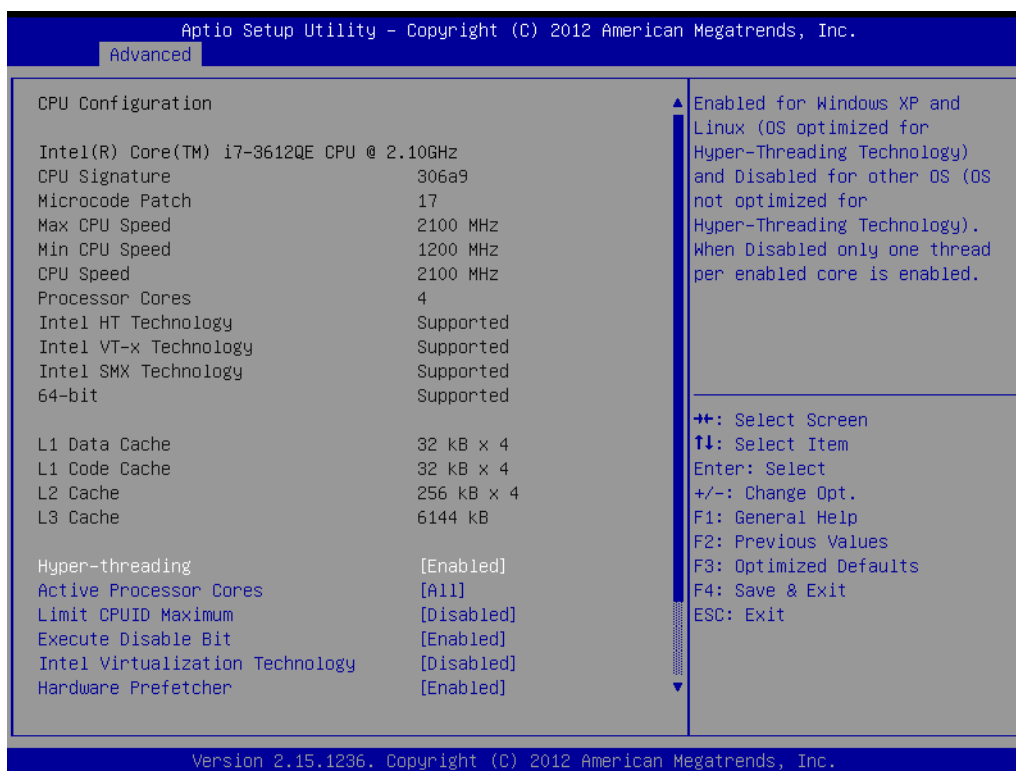


Figure 2.6 CPU configuration

- **Hyper-Threading**
This item allows you to enable or disable Intel? Hyper Threading technology. The default setting is “Enabled”.
- **Active Processor Cores**
This item allows you to configure the Processor Cores quantity from “1” to “All”. The default setting for this item is set to “All”.
- **Limit CPUID Maximum**
This item allows you to enable or disable Limit CPUID Maximum. The default setting is “Disabled”.
- **Execute Disable Bit**
This item allows you to enable or disable the No-Execution page protection technology. The default setting for this item is set to “Enabled”.
- **Intel virtualization technology**
This item allows multiple operating systems to simultaneously share processor resources in a safe and efficient manner when this item is set to “Enabled”. The default setting is “Disabled”.
- **Hardware Prefetcher**
This item allows CPU to prefetch the instruction and data from memory to L2 Cache before CPU processing it. This will help system working more efficiently. The default setting for this item is set to “Enabled”.

2.2.2.3 SATA Configuration

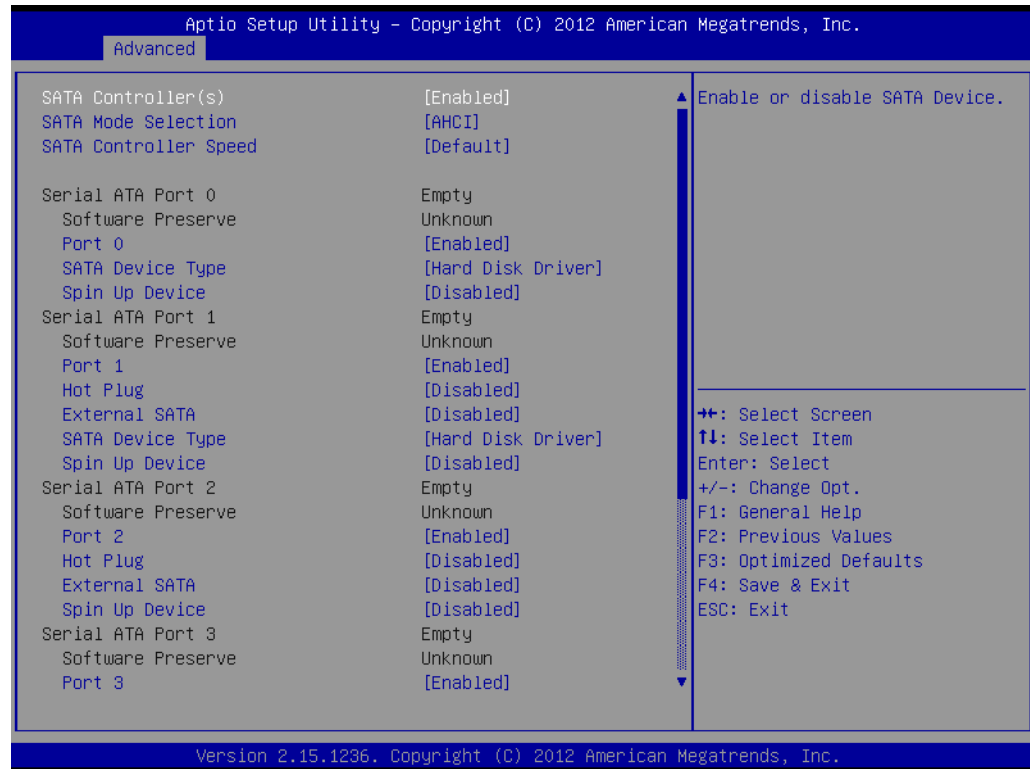


Figure 2.7 SATA configuration

This option allows you to change the serial ATA port status. The port 5 is fixed for the optional on board SATA NAND Flash SSD. The default setting for each of this item is set to “Enabled”.

- **SATA controller(s)**

This option allows you to Enable or Disable the serial ATA device.

- **SATA Mode Selection**

This option allows you to choose AHCI Mode or IDE Mode. The default setting is AHCI Mode. Windows XP OS is limited to IDE Mode, AHCI Mode is not supported under Windows XP.

- **SATA Controller Speed**

This option allows you to choose the speed the SATA controller can support. "Default" means the the maximum speed the SATA controller can support.

- **Serial ATA Port 0~4**

This option allows you to change the serial ATA port status. The "Serial ATA port 5" is fixed for the optional on board SATA NAND Flash SSD. The default setting for each of this item is set to “Enabled”.

2.2.2.4 USB Configuration

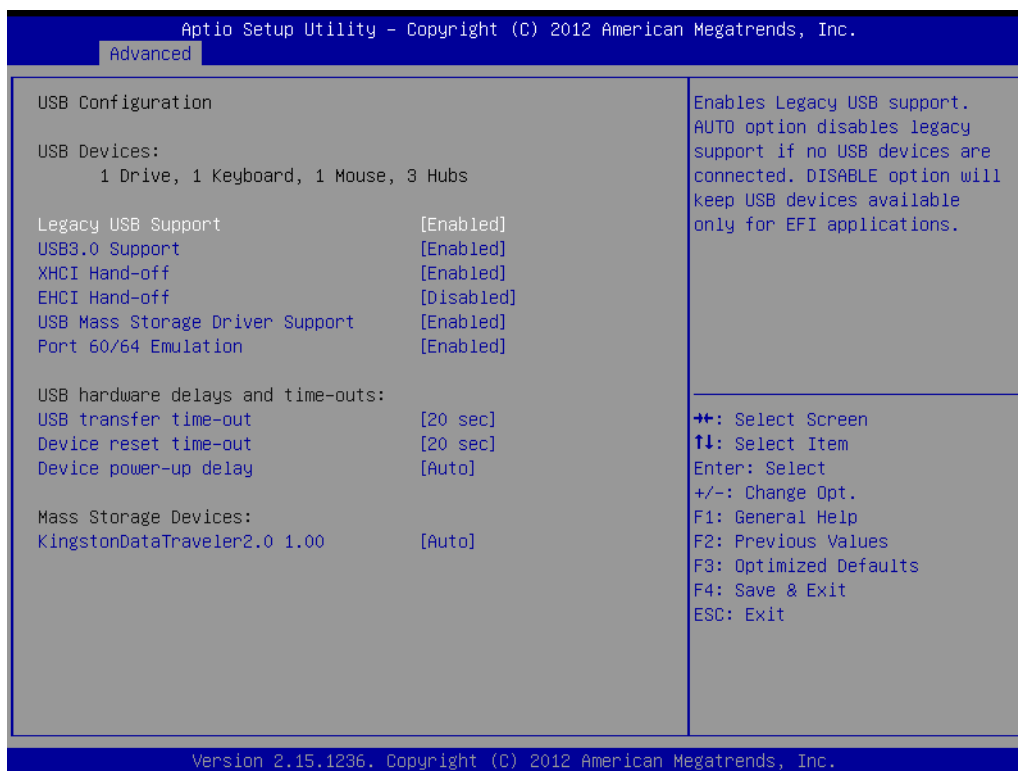


Figure 2.8 USB configuration

- **USB Devices**
This option allows you to check and change the USB device status.
- **USB hardware delays and time-outs**
The recommended setting is as the picture above.
- **Mass Storage Devices**
This option shows you the USB device which is connected.

2.2.2.5 H/W Monitor Configuration

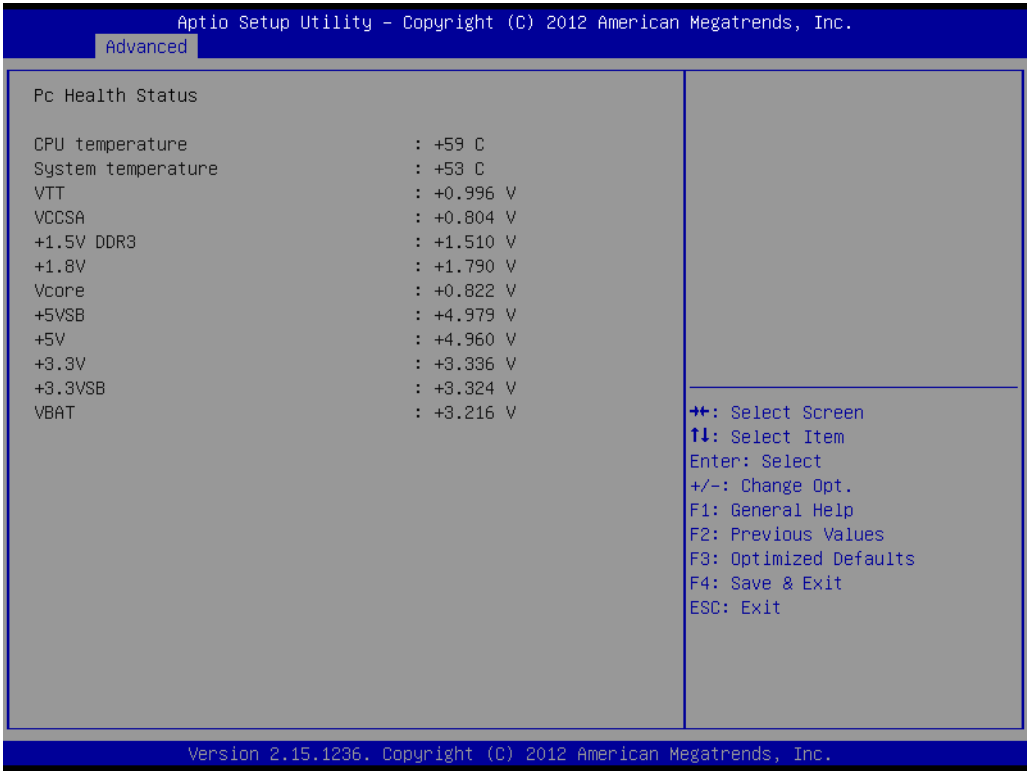


Figure 2.9 H/W Monitor configuration

System temperature, CPU temperature and Voltage status can be checked on Hardware monitor Configuration.

2.2.2.6 Super IO Configuration



Figure 2.10 Super IO configuration

This option allows you to set parameters of each serial port.

2.2.2.7 Serial Port Console Redirection

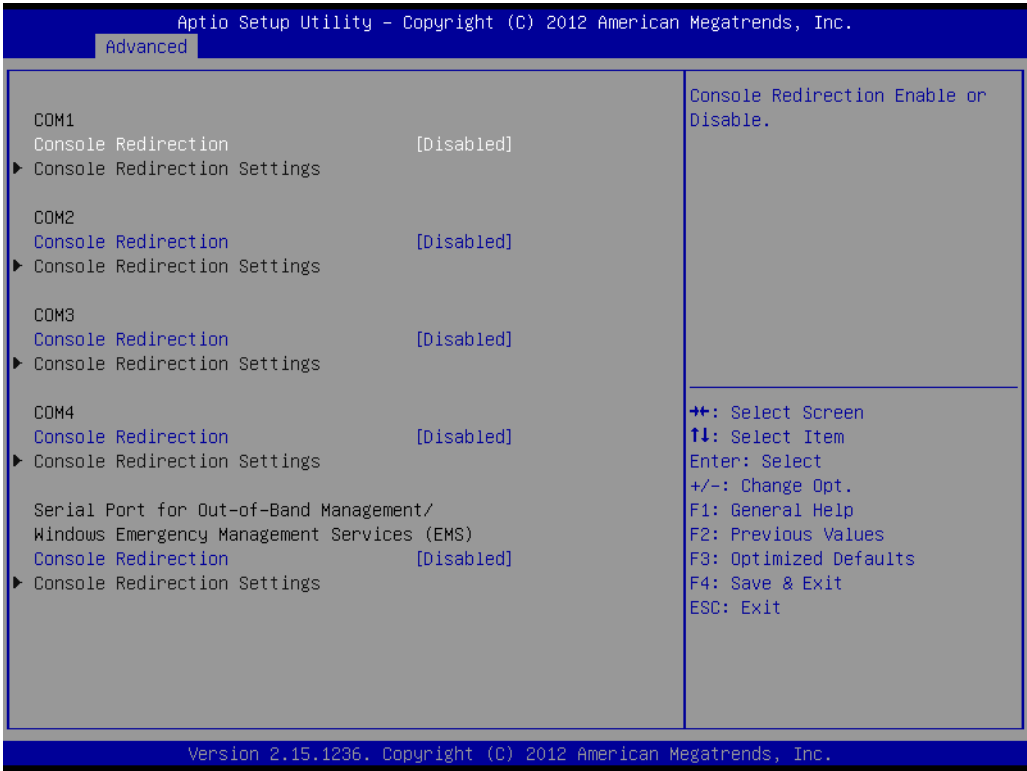


Figure 2.11 Serial Port Console Redirection configuration

This option allows you to enable or disable the Console Redirection function. The default setting is “Disabled”

2.2.2.8 Network Stack



Figure 2.12 Network Stack configuration

This option allows you to enable or disable the Network Stack function. The default setting is “Disabled”.

2.2.2.9 CPU PPM Configuration

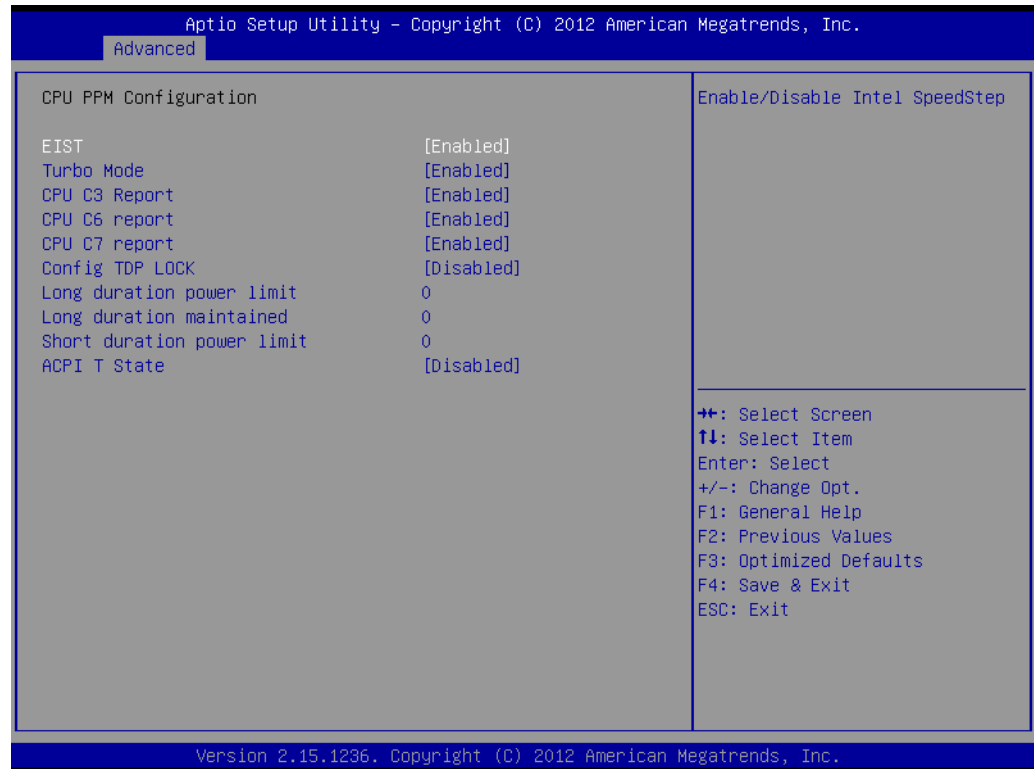


Figure 2.13 CPU PPM configuration

This page shows the CPU status. Different CPU may show different information.

- **EIST**
This option allows you to set the CPU SpeedStep function.
- **Turbo Mode**
This option allows you to set the Turbo Mode function.
- **CPU C3 ~ C7 Report**
The option C3, C6, C7 allows you to set the power management function to save power.

2.2.3 Chipset Setup

2.2.3.1 Chipset Configuration



Figure 2.14 Chipset setup

2.2.3.2 PCH-IO Configuration

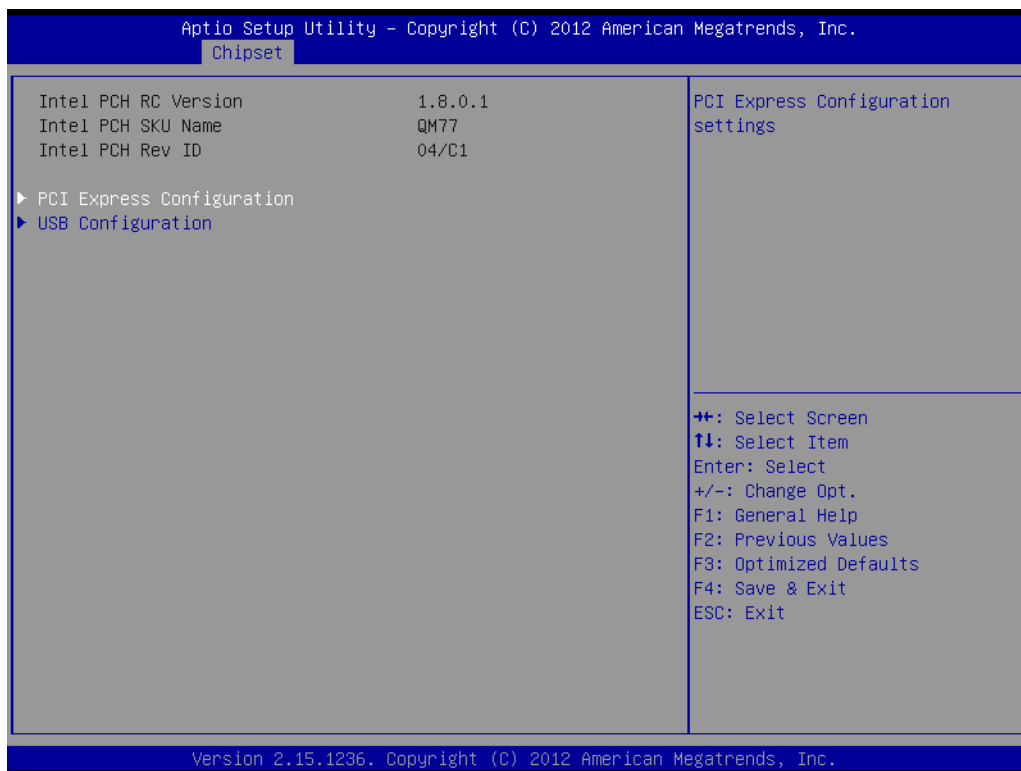


Figure 2.15 PCH-IO Configuration

2.2.3.3 PCI Express Configuration

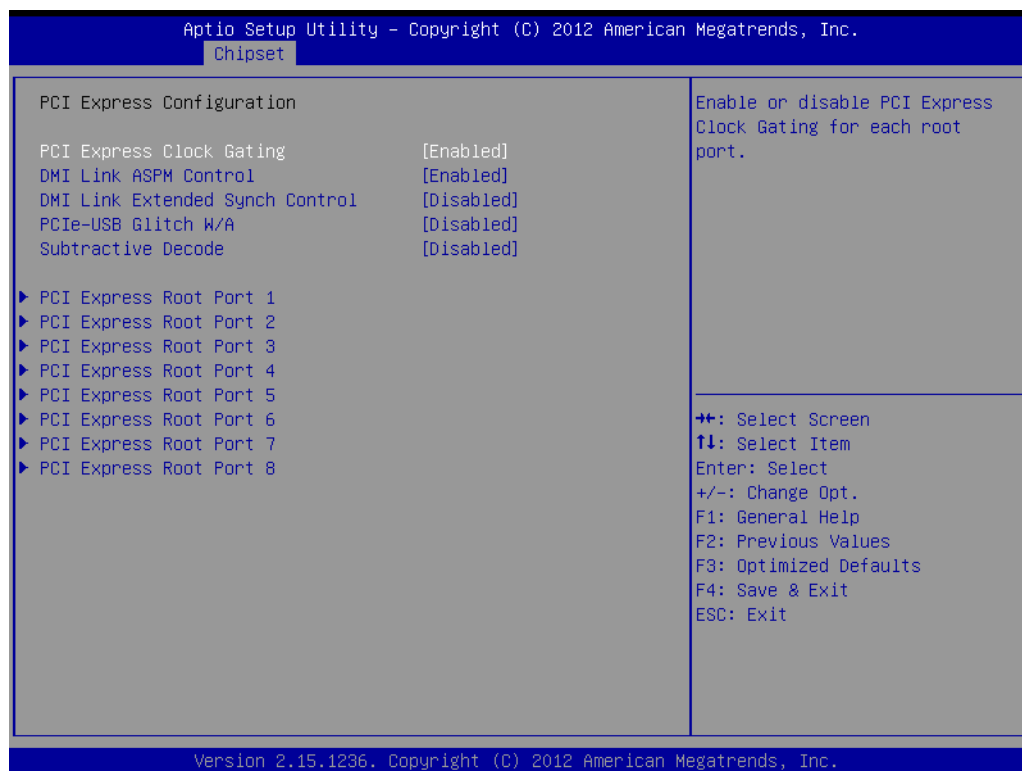


Figure 2.16 PCI Express configuration

This option allows you to Enable or Disable the PCIe clock gating for each root port.

2.2.3.4 USB Configuration

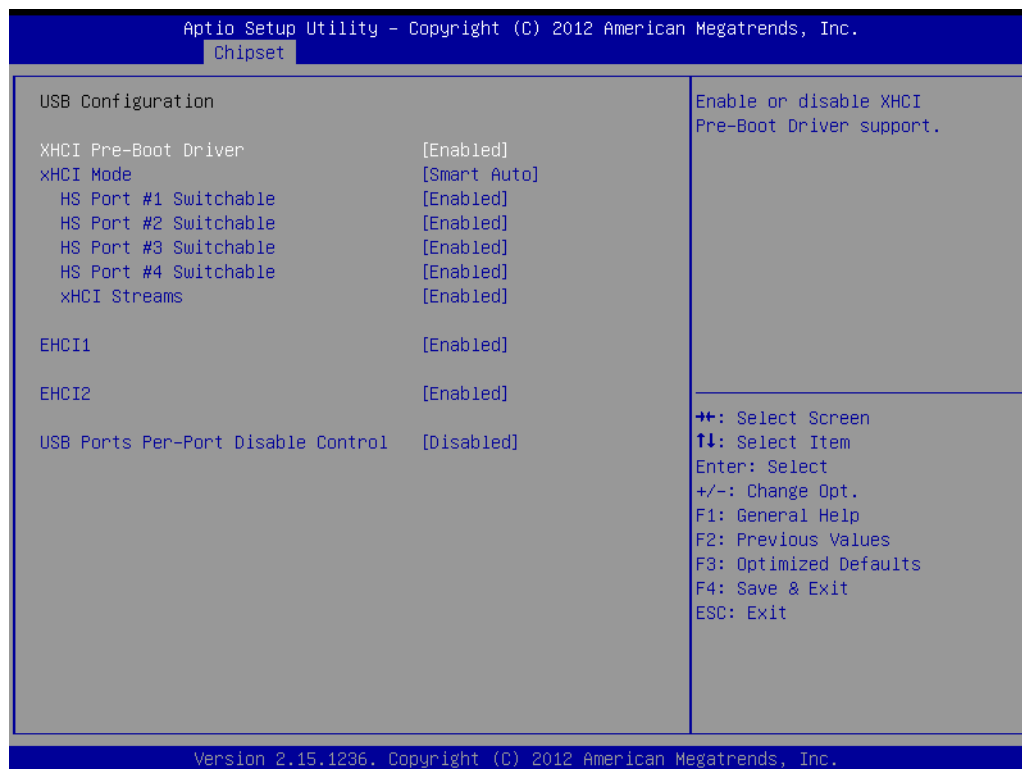


Figure 2.17 USB configuration

- **XHCI Pre-Boot Driver**
This option allows you to Enable or Disable the XHCI Pre-Boot Driver.
- **xHCI Mode**
This option allows you to Enable or Disable the xHCI mode.
- **HS Port #1~4 Switchable**
This option allows you to Enable switch function between xhci and ehci.
- **xHCI Streams**
This option allows you to Enable or Disable the xHCI Streams.
- **EHCI 1~2**
This option allows you to Enable or Disable the switch for EHCI controller 1~2.
- **USB Ports Per-Port Disable Control**
This option allows you to Enable or Disable the general control switch for USB Port.

2.2.3.5 System Agent Configuration

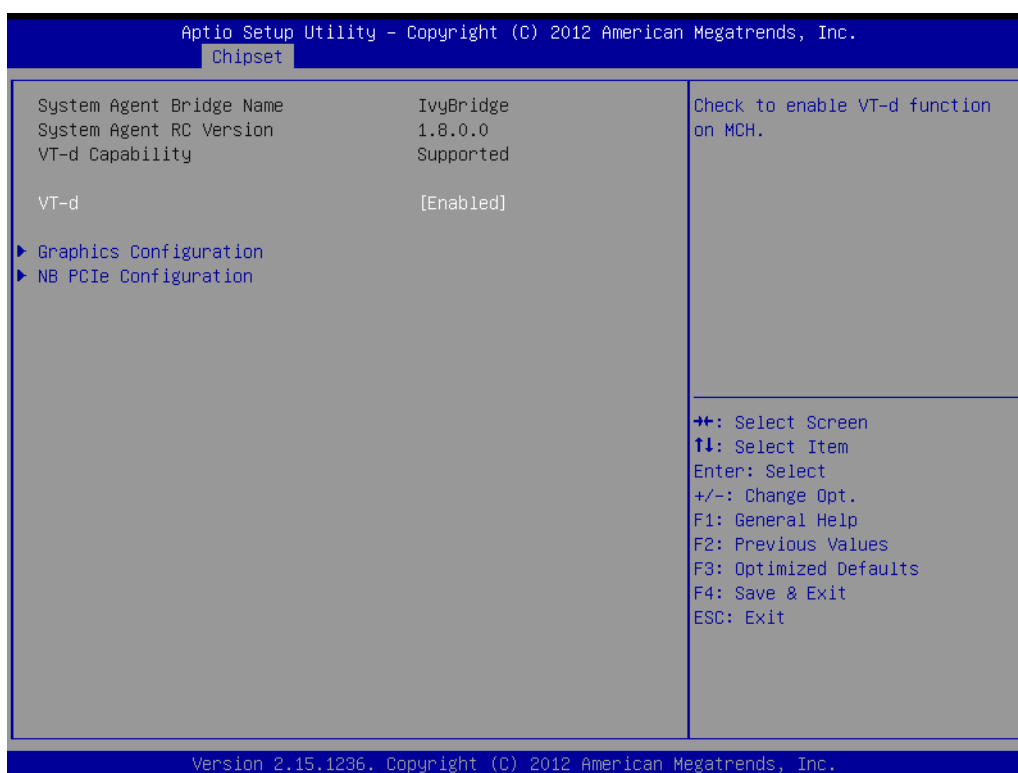


Figure 2.18 System Agent configuration

The option “VT-d” allows you to Enable or Disable the Intel virtualization for directed I/O function.

2.2.3.6 Graphics configuration

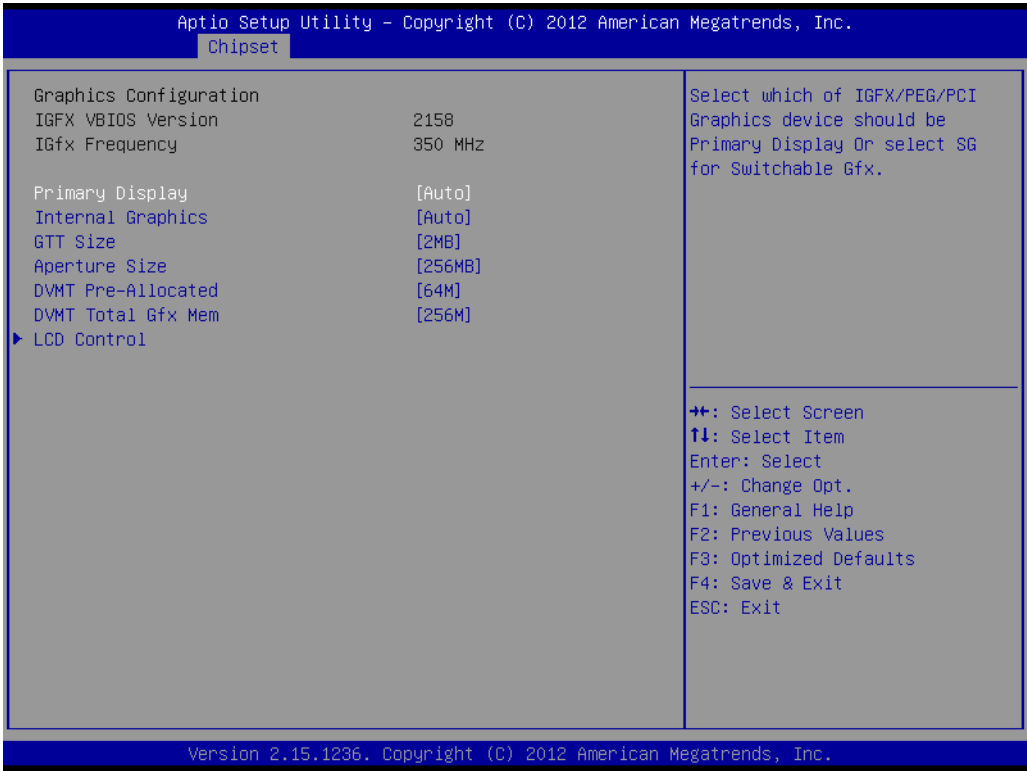


Figure 2.19 Graphics configuration

This page shows the Graphic status and allows you to set the features.

2.2.3.7 NB PCIe configuration

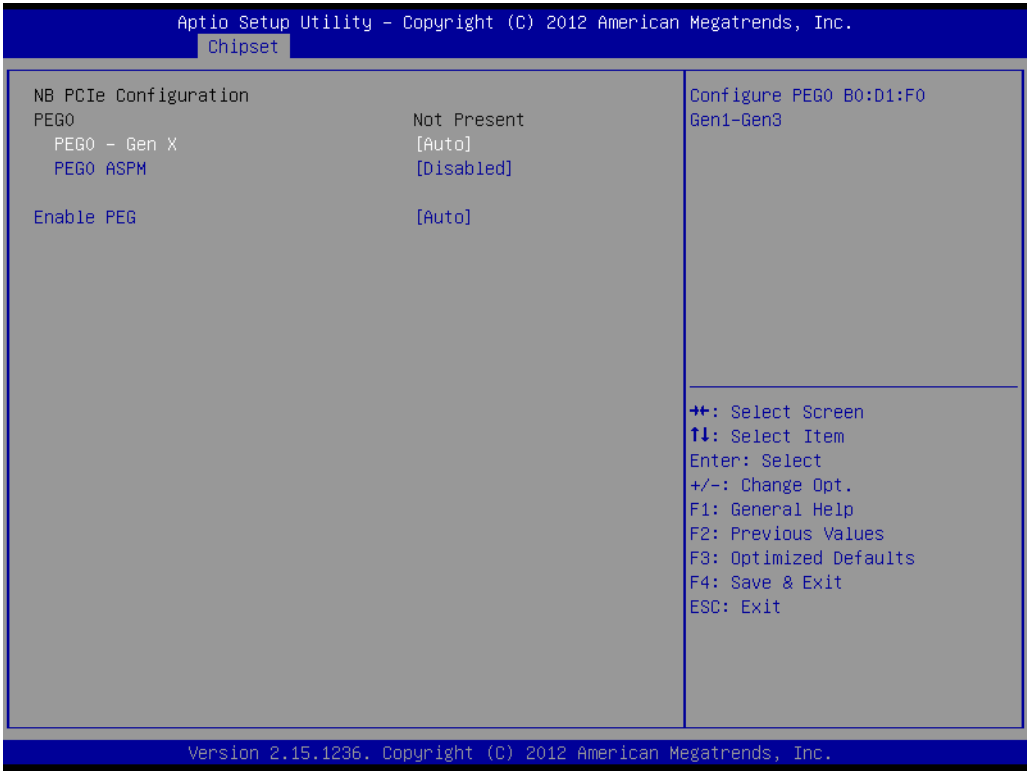


Figure 2.20 NB PCIe configuration

This option allows system automatically detect PCIe device generation.

2.2.4 Boot Setup

2.2.4.1 Boot Configuration

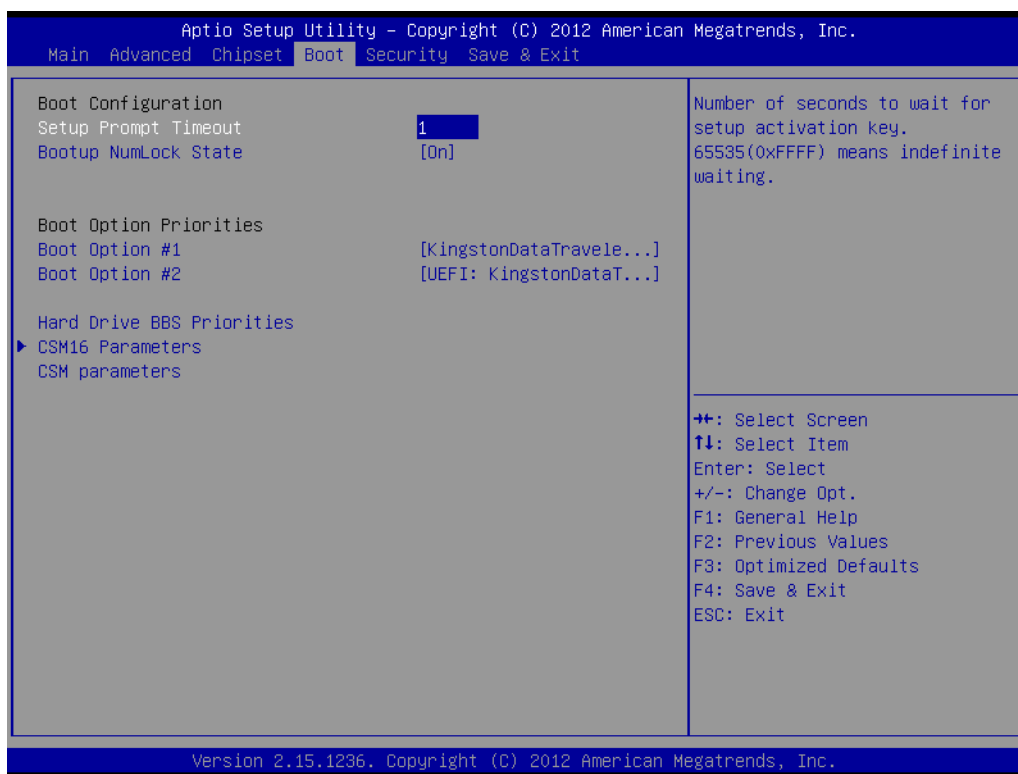


Figure 2.21 Boot setup

- **Setup Prompt Timeout**
This option allows you to set the time before setup hotkey working.
- **Bootup NumLock State**
This setting allows system automatically turns on your NumLock key when the system is booted. The default setting is “on”.
- **Boot Option Priorities**
The option shows you the boot priority of device.”Boot Option #1” has the first priority and then” Boot Option #2”.
- **Hard Drive BBS Priorities**
This option allows you to set the priority of device to boot.

2.2.4.2 CSM16 Parameters Settings Configuration



Figure 2.22 CSM16 Parameters setting

- **GateA20 Active**
This option is useful when RT code is executed 1MB. GateA20 can be disabled using BIOS service in "Upon Request" setting. Do not allow disabling GateA20 in "Always" setting.
- **Option ROM Messages**
This option allows you to set the display mode for Option ROM with "Force BIOS" or "Keep Current". The default setting is "Force BIOS".
- **INT19 Trap Response**
This option allows you to choose "Immediate" execute the trap right away or choose "Postponed" to execute the trap during legacy boot.

2.2.5 Security Setup

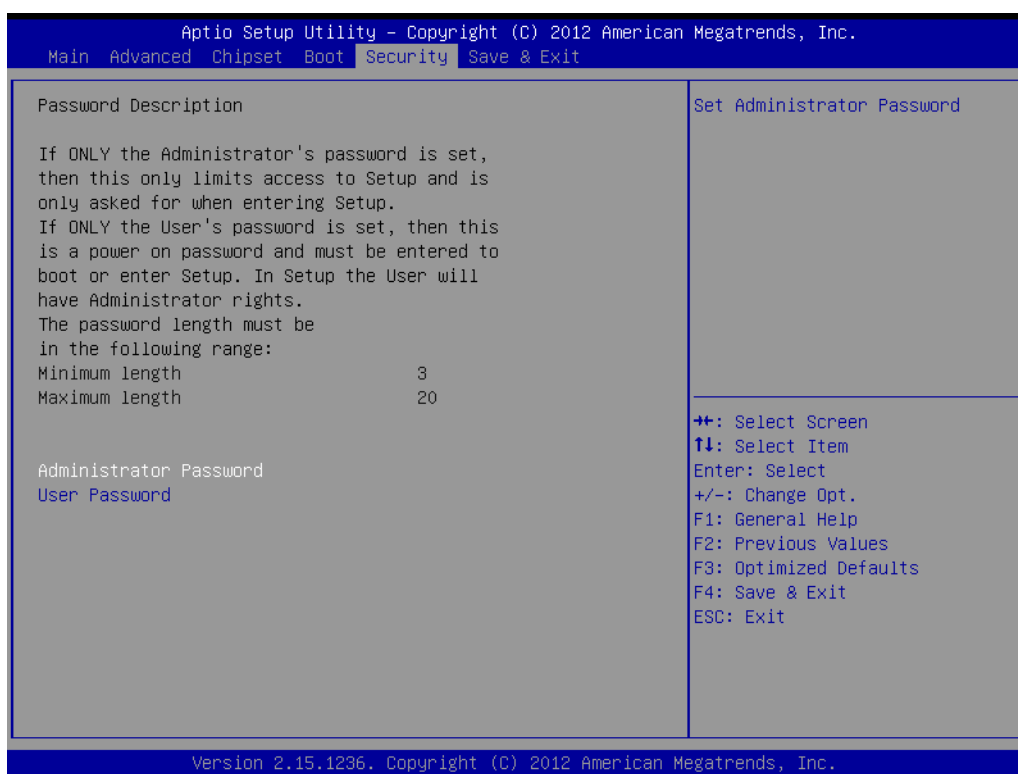


Figure 2.23 Password configuration

Select Security Setup from the MIC-3328 Setup main BIOS setup menu. Password protection is described in this section. To access the sub menu for the following items, select the item and press <Enter>:

- **Administrator Password**
 Select this option and press <ENTER> to access the sub menu, and then type in the password. Set the Administrator password.
- **User Password**
 Select this option and press <ENTER> to access the sub menu, and then type in the password. Set the User Password.

2.2.6 Save & Exit Option



Figure 2.24 Save and Exit configuration

2.2.6.1 Save Changes and Exit

When users have completed system configuration, select this option to save changes, exit BIOS setup menu and when reboot the computer to take effect all system configuration parameters.

1. Select “Save Changes and Exit” and press <Enter>. The following message appears: Save Configuration and Exit? [Yes] [No]
2. Select Yes or No.

2.2.6.2 Discard Changes and Exit

Select this option to quit Setup without making any permanent changes to the system configuration.

1. Select “Discard Changes and Exit” and press <Enter>. The following message appears: Quit without saving? [Yes] [No]
2. Select Yes to discard changes and exit.

2.2.6.3 Save Changes and Reset

1. Select this option to save the changes and reboot the computer to take effect all system configuration parameters. Select this option the following message appears: Save Configuration and Reset? [Yes] [No]
2. Select Yes or No.

2.2.6.4 Discard Changes and Reset

1. Select “Discard Changes and Reset” and press <Enter>. The following message appears: Reset without saving? [Yes] [No]
2. Select Yes to discard changes and reset.

2.2.6.5 Save Options

Select this option to save or discard the changes

2.2.6.6 Restore Defaults

The BIOS automatically configures all setup items to optimal settings when users select this option. Defaults are designed for maximum system performance, but may not work best for all computer applications. In particular, do not use the Defaults if the user's computer is experiencing system configuration problems. Select Restore Defaults from the Save&Exit menu and press <Enter>.

2.2.6.7 Save as User Default

Save the all current settings as a user default.

2.2.6.8 Restore User Default

Restore all settings to user default values.

2.2.6.9 Boot Override

This option shows the boot device for you to choose.

Appendix **A**

Pin Assignments

This appendix describes pin assignments.

A.1 J1 Connector

Table A.1: J1 CompactPCI I/O

PIN	A	B	C	D	E	F
25	5V	REQ64#	ENUM#	3.3V	5V	GND
24	AD1	5V	V(I/O)	AD0	ACK64#	GND
23	3.3V	AD4	AD3	5V	AD2	GND
22	AD7	GND	3.3V	AD6	AD5	GND
21	3.3V	AD9	AD8	M66EN	CBE0	GND
20	AD12	GND	V(I/O)	AD11	AD10	GND
19	3.3V	AD15	AD14	GND	AD13	GND
18	SERR#	GND	3.3V	PAR	CBE1#	GND
17	3.3V	IPMB SCL	IPMB SDA	GND	PERR#	GND
16	DEVSEL#	PCIX_CAP	V(I/O)	STOP#	LOCK#	GND
15	3.3V	FRAME#	IRDY#	BD_SEL#	TRDY#	GND
12-14	KEY AREA					
11	AD18	AD17	AD16	GND	CBE2#	GND
10	AD21	GND	3.3V	AD20	AD19	GND
9	CBE3#	IDSEL	AD23	GND	AD22	GND
8	AD26	GND	V(I/O)	AD25	AD24	GND
7	AD30	AD29	AD28	GND	AD27	GND
6	REQ0#	GND	3.3V	CLK0	AD31	GND
5	NC	NC	RST#	GND	GNT0#	GND
4	NC	Healthy#	V(I/O)	INTP	INTS	GND
3	INTA#	INTB#	INTC#	5V	INTD#	GND
2	TCK	5V	TMS	TDO	TDI	GND
1	5V	NC	TRST#	NC	5V	GND

Note! NC: No Connect



#: Active Low

A.2 J2 Connector

Table A.2: J2 CompactPCI I/O

PIN	A	B	C	D	E	F
22	GA4	GA3	GA2	GA1	GA0	GND
21	CLK6	GND	NC	LAN1_MDIA 3+	LAN1_MDIA 1+	GND
20	CLK5	GND	NC	LAN1_MDIA 3-	LAN1_MDIA 1-	GND
19	GND	GND	NC	LAN1_MDIA 2+	LAN1_MDIA 0+	GND
18	NC	NC	NC	LAN1_MDIA 2-	LAN1_MDIA 0-	GND
17	RIO_PLTRST#	NC	PRST#	REQ6#	GNT6#	GND
16	PCIE_CLK_4-	PCIE_CLK_2+	DEG#	GND	5V	GND
15	PCIE_CLK_4+	PCIE_CLK_2-	FAL#	REQ5#	GNT5#	GND
14	PCIE_CLK_3-	PCIE_CLK_1+	PCIE_CLKRQ 4#	NC	5V	GND
13	PCIE_CLK_3+	PCIE_CLK_1-	PCIE_CLKRQ 3#	NC	NC	GND
12	PCIE1X4_RX+	PCIE_CLKRQ1 #	PCIE_CLKRQ 2#	NC	SATA3_Rx+	GND
11	PCIE1X4_RX-	PCIE1X4_TX+	USB4_P+	SATA3_Tx+	SATA3_Rx-	GND
10	PCIE1X3_RX+	PCIE1X4_TX-	USB4_P-	SATA3_Tx-	SATA2_Rx+	GND
9	PCIE1X3_RX-	PCIE1X3_TX+	USB3_P+	SATA2_Tx+	SATA2_Rx-	GND
8	PCIE1X2_RX+	PCIE1X3_TX-	USB3_P-	SATA2_Tx-	SATA1_Rx+	GND
7	PCIE1X2_RX-	PCIE1X2_TX+	USB2_P+	SATA1_Tx+	SATA1_Rx-	GND
6	PCIE1X1_RX+	PCIE1X2_TX-	USB2_P-	SATA1_Tx-	NC	GND
5	PCIE1X1_RX-	PCIE1X1_TX+	USB1_P+	NC	NC	GND
4	CPCI_VIO	PCIE1X1_TX-	USB1_P-	NC	GPIO	GND
3	CLK4	GND	GNT3#	REQ4#	GNT4#	GND
2	CLK2	CLK3	SYSEN#	GNT2#	REQ3#	GND
1	CLK1	GND	REQ1#	GNT1#	REQ2#	GND

Note! NC: No Connect



#: Active Low

A.3 Other Connectors

Table A.3: XTM Board Connector (CN1, CN4, CN8, CN9)

CN1

PIN	Description	PIN	Description
1	PCIE16X_TX7+	2	PCIE16X_RX7+
3	PCIE16X_TX7-	4	PCIE16X_RX7-
5	GND	6	GND
7	CLK_XMC_GND+	8	PCIE16X_RX8+
9	CLK_XMC_GND-	10	PCIE16X_RX8-
11	GND	12	GND
13	PCIE16X_TX8+	14	PCIE_WAKE#
15	PCIE16X_TX8-	16	XMC_MPRESENT#
17	GND	18	XMC_SDA_SFP0
19	CLK_PEG_B+	20	XMC_SCL_SFP0
21	CLK_PEG_B-	22	SML1_CLK
23	GND	24	SML1_DATA
25	USB9_P-	26	USB_OC#1
27	USB9_P+	28	USB_OC#4
29	GND	30	SUS_CLK
31	USB8_P-	32	+VBAT
33	USB8_P+	34	+1.05V
35	GND	36	GPIO_8HP
37	VCC5	38	VCC3
39	VCC5	40	VCC3

CN4

PIN	Description	PIN	Description
1	SATA0_RX+	2	AZ_BITCLK
3	SATA0_RX-	4	AZ_SYNC
5	GND	6	SPKR
7	SATA0_TX+	8	AZ_RST#
9	SATA0_RX-	10	AZ_SDIN0
11	GND	12	AZ_SDOUT
13	SATA4_RX+	14	XTM RESET
15	SATA4_RX-	16	LAD0
17	GND	18	LAD1
19	SATA4_TX+	20	LAD2
21	SATA4_TX-	22	LAD3
23	GND	24	LFRAME#
25	USB2_P-	26	LDRQ#0
27	USB2_P+	28	SERIRQ
29	GND	30	CLK33M_LPC
31	USB3_P-	32	BUF_PLTRST#
33	USB3_P+	34	KB_A20GATE

35	GND	36	KB_RST#
37	VCC5	38	VCC3
39	VCC5	40	VCC3

CN8

PIN	Description	PIN	Description
1	VCC5	2	VCC3
3	DDI3_HPD	4	DDI2_HPD
5	GND	6	GND
7	XTM_DPD_CTRL_DATA	8	XTM_DPC_CTRL_DATA
9	XTM_DPD_CTRL_CLK	10	XTM_DPC_CTRL_DATA
11	GND	12	GND
13	DDI2_PAIR0-	14	DDI2_PAIR1+
15	DDI2_PAIR0+	16	DDI2_PAIR1-
17	GND	18	GND
19	DDI2_AUX+	20	DDI3_PAIR1+
21	DDI2_AUX-	22	DDI3_PAIR1-
23	GND	24	GND
25	DDI2_PAIR2+	26	DDI3_PAIR2+
27	DDI2_PAIR2-	28	DDI3_PAIR2-
29	GND	30	GND
31	DDI2_PAIR3-	32	DDI3_PAIR0+
33	DDI2_PAIR3+	34	DDI3_PAIR0-
35	GND	36	GND
37	DDI3_AUX+	38	DDI3_PAIR3+
39	DDI3_AUX-	40	DDI3_PAIR3-

CN9

PIN	Description	PIN	Description
1	PCIE16X_TX0-	2	PCIE16X_RX1-
3	PCIE16X_TX0+	4	PCIE16X_RX1+
5	GND	6	GND
7	PCIE16X_TX2+	8	PCIE16X_RX4-
9	PCIE16X_TX2-	10	PCIE16X_RX4+
11	GND	12	GND
13	PCIE16X_TX1+	14	PCIE16X_RX6-
15	PCIE16X_TX1-	16	PCIE16X_RX6+
17	GND	18	GND
19	PCIE16X_TX3-	20	PCIE16X_RX5+
21	PCIE16X_TX3+	22	PCIE16X_RX5-
23	GND	24	GND
25	PCIE16X_TX5+	26	PCIE16X_RX3+
27	PCIE16X_TX5-	28	PCIE16X_RX3-
29	GND	30	GND
31	PCIE16X_TX4-	32	PCIE16X_RX2-

33	PCIE16X_TX4+	34	PCIE16X_RX2+
35	GND	36	GND
37	PCIE16X_TX6-	38	PCIE16X_RX0+
39	PCIE16X_TX6+	40	PCIE16X_RX0-

Table A.4: XMC Connector

PIN	A	B	C	D	E	F
1	PCIE16X_RX0+	PCIE16X_RX0-	VCC3	PCIE16X_RX1+	PCIE16X_RX1-	VCC5
2	GND	GND	NC	GND	GND	XMC_RST#
3	PCIE16X_RX2+	PCIE16X_RX2-	VCC3	PCIE16X_RX3+	PCIE16X_RX3-	VCC5
4	GND	GND	NC	GND	GND	NC
5	PCIE16X_RX4+	PCIE16X_RX4-	VCC3	PCIE16X_RX5+	PCIE16X_RX5-	VCC5
6	GND	GND	NC	GND	GND	12V
7	PCIE16X_RX6+	PCIE16X_RX6-	VCC3	PCIE16X_RX7+	PCIE16X_RX7-	VCC5
8	GND	GND	NC	GND	GND	12V
9	NC	NC	NC	NC	NC	VCC5
10	GND	GND	NC	GND	GND	XMC_GA0
11	PCIE16X_TX0+	PCIE16X_TX0-	NC	PCIE16X_TX1+	PCIE16X_TX1-	VCC5
12	GND	GND	XMC_GA1	GND	GND	XMC_MPRES ENT#
13	PCIE16X_TX2+	PCIE16X_TX2-	NC	PCIE16X_TX3+	PCIE16X_TX3-	VCC5
14	GND	GND	XMC_GA2	GND	GND	XMC_SDA_S FP0
15	PCIE16X_TX4+	PCIE16X_TX4-	NC	PCIE16X_TX5+	PCIE16X_TX5-	VCC5
16	GND	GND	NC	GND	GND	XMC_SCL_SF P0
17	PCIE16X_TX6+	PCIE16X_TX6-	NC	PCIE16X_TX7+	PCIE16X_TX7-	NC
18	GND	GND	NC	GND	GND	NC
19	CLK_XMC_ GND+	CLK_XMC_ GND-	NC	XMC_WAKE #	XMC_ROO T0#	NC

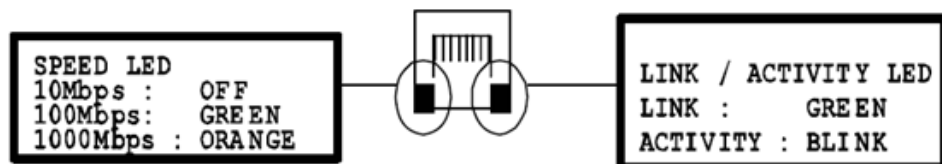


Figure A.1 RJ45 LAN Indicator

Appendix **B**

CPLD

This appendix describes CPLD configuration.

B.1 Features

- **Hot-Swap:** Hot insertion and removal control
- **CompactPCI Backplane:** CompactPCI slot Addressing
- **LPC Bus:** Provide LPC Bus access
- **Watchdog:** Generates a reset signal or interrupt signal when timer overflows
- **Debug Message:** Boot time POST message

B.2 CPLD Introduction

Advantech MIC-3328 CPLD incorporates a LPC Unit to interconnect with a controller hub of an Intel south bridge (QM77). The LPC Unit translates the LPC interface signals to MIC-3328 CPLD internal local bus. The CPLD Internal Local Bus is used to control and communicate with I/O space. The I/O space includes a Watch Dog unit, a debug port unit, and a cPCI slot addressing unit. In addition, there is a Hot-Swap Out-Of-Service LED control unit.

B.3 Watchdog Timer

To program the watchdog timer, you must write a program which writes a value to I/O port address 443 (hex). Any non-zero value in I/O port 443h enables the watchdog function. The watchdog reset time is 1 ~ 255 seconds (1 second per step). Reading I/O port 444h will disable the watchdog. The return value is meaningless.

Appendix C

Glossary

C.1 Glossary

CPU	Central Processing Unit
CPCI	CompactPCI
CPLD	Complex Programmable Logic Device
EMC	Electro Magnetic Compatibiltiy
ESD	Electro Static Discharge
HDD	Hard Disk Drive
HW	HardWare
I/O	Input/Output
IC	Integrated Circuit
LED	Light Emitting Diode
LPC	Low Pin Count
LV	Low Voltage
MAC	Medium Access Control
OS	Operating System
PCB	Printed Circuit Board
PCI	Peripheral Component Interconnect
PCle	Peripheral Component Interconnect Express
PHY	Physical layer Interface
PMC	PCI interface mezzanine card
RIO	Rear Input/Output
RS-232	An Interface specified by Electronic Industries Alliance
RTC	Real Time Clock
RTM	Rear Transition Module
SBC	Single Board Computer
SDRAM	Synchronous DRAM
SPI	Serial Peripheral Interface
SSD	Solid State Disk
SW	SoftWare
XMC	PCle interface mezzanine card
XTM	Extension Module



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