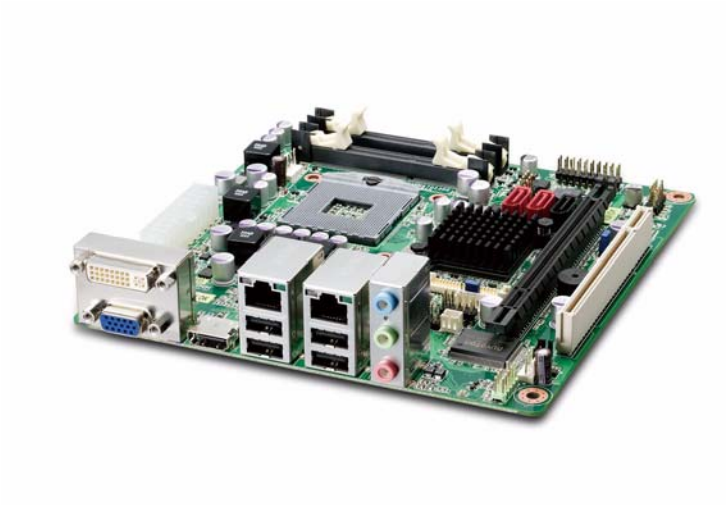
MI-220

Mini-ITX Embedded Motherboard with Intel® Core™ i7/i5/i3 CPU and QM67 PCH

User's Manual



Manual Rev.: 2.02

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Revision History

Revision	Release Date	Description of Change(s)
2.00	2011/11/11	Initial release
2.01	2011/12/19	Correct F_PANEL1 pin definition
2.02	2013/08/29	Update memory capacity to 16 GB; correct ATXPWR1 pinout; add HDMI connector note

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Preface

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Using this Manual

Audience and Scope

The MI-220 User's Manual is intended for hardware technicians and systems operators with knowledge of installing, configuring and operating industrial grade computers.

Manual Organization

This manual is organized as follows:

Preface: Presents copyright notifications, disclaimers, trademarks, and associated information on the proper usage of this document and its associated product(s).

Chapter 1, Introduction: Introduces the MI-220, its features, applications, and specifications, including functional descriptions and board layout.

Chapter 2, Connectors & Jumpers: Provides technical information on connectors, jumpers and pin assignments for configuring the MI-220.

Chapter 3, Getting Started: Describes how to install components and drivers on the MI-220.

Chapter 4, BIOS Setup: Presents information and illustrations to help understand and configure the system BIOS.

Appendix A, Watchdog Timer: Presents information on understanding and configuring the watchdog timer.

Appendix B, System Resources: Presents information on I/O mapping, IRQ routing, and resource allocation.

Important Safety Instructions: Presents safety instructions all users must follow for the proper setup, installation and usage of equipment and/or software.

Getting Service: Contact information for ADLINK's worldwide offices.

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Conventions

Take note of the following conventions used throughout this manual to make sure that users perform certain tasks and instructions properly.



NOTE: Additional information, aids, and tips that help users perform tasks.



CAUTION: Information to prevent ***minor*** physical injury, component damage, data loss, and/or program corruption when trying to complete a task.



WARNING: Information to prevent ***serious*** physical injury, component damage, data loss, and/or program corruption when trying to complete a specific task.

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1 Introduction

This chapter will introduce the MI-220, its features, specifications, functional description, and mechanical layout.

1.1 Package Contents

Please check that your package contains the items below. If you discover damaged or missing items, please contact your vendor.

- MI-220 Mini-ITX Embedded Motherboard
- I/O shield
- 2x SATA cable
- Driver CD
- User's Manual



DO NOT install or apply power to equipment that is damaged or if there is missing/incomplete equipment. Retain the shipping carton and packing materials for inspection. Please contact your ADLINK dealer/vendor immediately for assistance. Obtain authorization from your dealer before returning any product to ADLINK.

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1.2 Overview

The ADLINK MI-220 is a Mini-ITX embedded motherboard based on the Intel® Core™ i7/i5/i3 Processor built on 32-nm process technology in rPGA988B package and the Mobile Intel® QM67 Express Chipset. The MI-220 is ideal for embedded applications requiring low power consumption in a standard small form factor motherboard with a complete set of I/O functions and high-bandwidth network connectivity. These features, combined with two SO-DIMM sockets supporting DDR3 1066/1333MHz SDRAM up to 16 GB, SATA 6 Gb/s ports, PCIe x16, PCI, and Mini PCIe expansion slots, HDMI, DVI-D, VGA, dual-channel 24-bit LVDS, and audio interfaces make the MI-220 suitable for medical, transportation, industrial automation, and other applications requiring a low noise/power, space-saving, multiple display platform.

1.3 Features

- Mini-ITX form factor (170 mm x 170 mm)
- Intel® Core™ i7/i5/i3 Processor:
  - Quad/dual cores with Hyper-Threading
  - DMI 5 GT/s
  - 6MB/3MB last level cache
  - rPGA988B package in Socket G2
- DDR3-1066/1333 up to 16 GB max. (2x SODIMM sockets)
- Intel® HD Graphics integrated in processor
  - VGA supporting 2048 x 1536 @ 60 Hz (QXGA)
  - DVI-D, HDMI Type A, Dual Channel 24-bit LVDS
- Mobile Intel® QM67 Express Chipset
- 1x PCIe x16 slot, 1x PCI slot, Mini PCIe expansion slot
- 2x SATA 6Gb/s ports, 1x SATA 3 Gb/s port
- 3x RS-232 + 1x RS-232/422/485 serial ports
- 2x GbE
- 6x USB 2.0 ports (4x faceplate, 2x onboard pin headers)
- PS/2 keyboard/mouse by internal pin header
- Line-in, Line-out, Mic-in
- RoHS compliant

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1.4 Specifications

System	
CPU	Intel® Core™ Processor, rPGA988B package, Socket G2 • Core™ i7-2710QE, 2.1GHz, 6M LLC, 32nm, 45W TDP • Core™ i5-2510E, 2.5GHz, 3M LLC, 32nm, 35W TDP • Core™ i3-2330E, 2.2GHz, 3M LLC, 32nm, 35W TDP Intel® Celeron® B810, 1.6GHz, 2M LLC, 32nm, 35W TDP
Chipset	• Intel® QM67 Platform Controller Hub
Memory	• Dual-Channel DDR3 1066/1333MHz, up to 16 GB • 2x 204-pin SO-DIMM sockets, vertical type
BIOS	• AMI 32 Mb SPI BIOS
Audio	• Realtek ALC892 HD Audio • Line-in, line-out and mic-in
Watchdog Timer	• 1-255 second/minute programmable
Hardware Monitor	• CPU/System temperature, fan speed and onboard DC voltage
Operating System	• Windows XP/7 32/64-bit, Fedora 14, Redhat Enterprise Linux 5
I/O Interfaces	
Serial ATA	• 2x SATA 6Gb/s ports, 1x SATA 3 Gb/s port
Onboard I/O	• 6x USB 2.0 (4x external, 2x by pin header) • 3x RS-232 + 1x RS-232/422/485 serial ports • PS/2 keyboard/mouse by internal pin header
Rear I/O	• 2x RJ-45 LAN ports • 4x USB 2.0 ports • 1x D-Sub VGA connector • 1x DVI-D connector • 1x HDMI type A connector • 3x audio jacks (line-in, line-out and mic-in)
Expansion Slots	• 1x PCIe x16 slot, 1x PCI slot, 1x Mini PCIe slot
Display	
Processor	• Intel® HD Graphics 3000
VGA	• Dsub-15 connector up to 2048x1536 @ 60Hz (QXGA)
DVI	• DVI-D connector, up to 1920x 1200 @ 60 Hz (connector has DVI-I pinout; no VGA signals supported)
HDMI	• HDMI type A connector, up to 1920x 1200 @ 60 Hz
LVDS	• Dual-channel 24-bit LVDS up to 1600x1200 (UXGA)

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Ethernet	
Controller	• Intel® 82579LM + 82574L controllers • Supports Wake-on-LAN
Ports	• 2x RJ-45 Ethernet port
Mechanical and Environment	
Form Factor	• Mini-ITX Embedded Motherboard
Dimensions	• 170 mm x 170 mm (L x W)
Operating Temp.	• 0°C to 60°C
Storage Temp.	• -20ºC to 80ºC
Rel. Humidity	• 10 - 90% RH non-condensing
Safety	• CE, FCC Class A

Table 1-1: MI-220 General Specifications

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1.5 Block Diagram

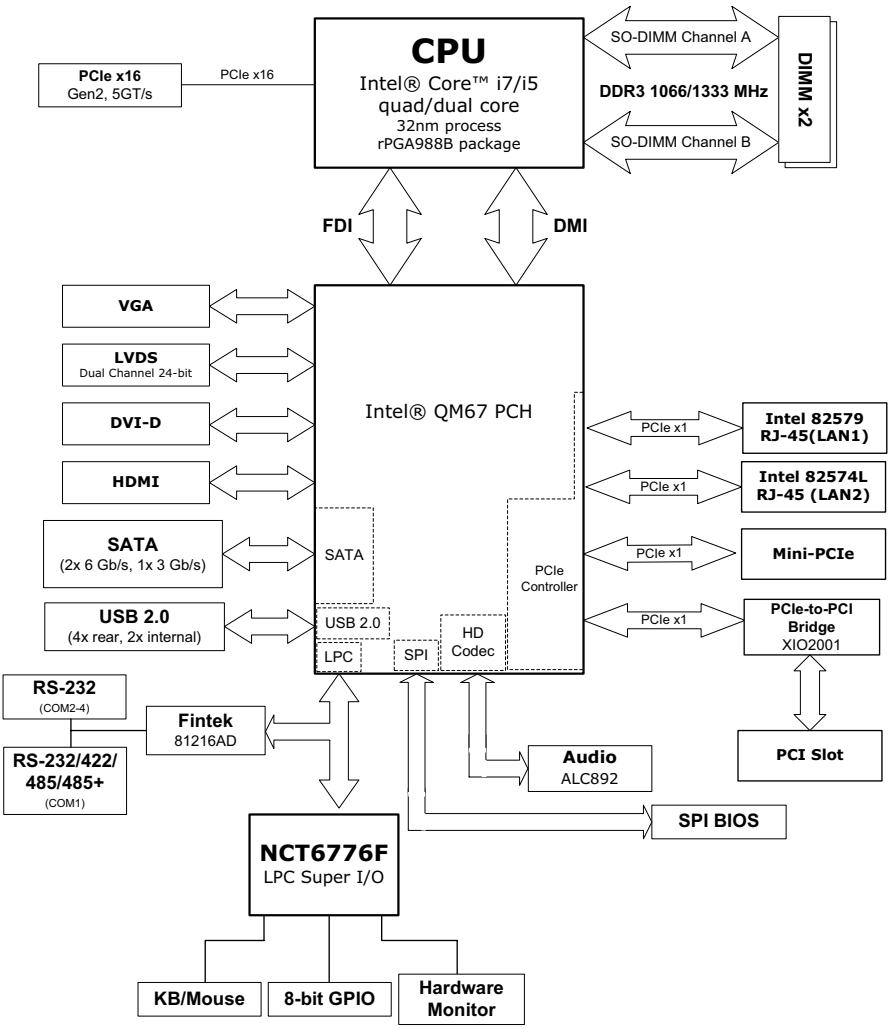


Figure 1-1: MI-220 Block Diagram

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1.6 Functional Description

Processor Support

The MI-220 is a Mini-ITX embedded board featuring the 2nd generation Intel® Core™ processor family (Intel® Core™i7/i5/i3) in rPGA988B package. An integrated memory controller supports dual channel 1066/1333 MHz DDR3 and Intel® HD Graphics is integrated onboard the CPU. The CPU provides a PCI Express x16 slot for external graphics or expansion. Direct Media Interface (DMI) and Flexible Display Interface (FDI) provide connectivity to the Mobile Intel® QM67 Express Chipset.

Mobile Intel® QM67 Express Chipset

The Intel® BD82QM67 Platform Controller Hub (PCH) combine with the processor to provide a compact yet powerful 2-chip solution. Direct Media Interface (DMI) is the chip-to-chip connection between the processor and PCH. Intel® Flexible Display Interface carries display traffic from the integrated graphics on the processor to the legacy display interfaces on the PCH. The PCH supports all other required interfaces including PCI Express, SATA 6 Gb/s, USB 2.0, LPC, and SPI.

Dual-Channel DDR3 Memory

To meet the requirements of memory-intensive applications, the MI-220 has a dual-channel memory architecture supporting DDR3 1066/1333 MHz SO-DIMMs. The key advantages of DDR3 are higher bandwidth and increased performance at lower power than DDR2. DDR3 memory technology meets the requirements of the latest 3D graphics, multimedia and network applications, and boosts system performance by eliminating bottlenecks.

Gigabit Ethernet

The MI-220 utilizes an Intel® 82579LM Gigabit Ethernet PHY and Intel® 82574L Gigabit Ethernet Controller connected to the PCIe bus of the QM67 PCH. Intel® AMT 7.0 (82579LM on LAN1), Wake-on-LAN and PXE are supported.

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Serial ATA

The MI-220 provides three SATA ports with data transfer rates of up to 6.0 GB/s on 2 ports and up to 3.0 GB/s on 1 port. Intel® Rapid Storage Technology supports AHCI and RAID 0/1/5/10 functionality.

USB 2.0

The MI-220 provides 6 USB 2.0 ports supporting transfer rates up to 480 Mb/s. All ports are USB 1.1 compatible.

Hardware Monitoring

A built-in, proactive hardware monitoring system in the Super I/O monitors the CPU temperature, system fan speed, and voltage levels to prevent overheating and/or component damage, effect timely failure detection, and ensure stable supply of current for critical components.

Watchdog Timer

The watchdog timer (WDT) monitors system operations based on user-defined settings. The WDT can be programmed for different time-out periods, such as from 1 to 255 seconds or from 1 to 255 minutes. The WDT generates a reset signal, then a reset request, after failure to strobe it within the programmed time period. A register bit may be enabled to indicate if the watchdog timer caused the reset event. The WDT register is cleared during the power-on sequence to enable the operating system to take appropriate action when the watchdog generates a reboot.

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1.7 Power Consumption

Intel® Core™ i7-2710QE, 2.1GHz, 6M LLC, 32nm, 45W TDP

Test Configuration	
Memory	Innodisk DDR3-1333 4GB M3SN-4GHJDC09-B (2x)
Graphics	Intel® HD Graphics 3000
Storage	Seagate ST9160412AS Momentus 7200.4 160G.
Power Supply	SPI FSP350-60PLN 350W

DOS (idle)				
Power Req.	+12V	+5VSB	+3.3V	Total
Current (A)	2.20	0.86	0.87	–
Watts (W)	26.4	4.30	2.34	33.0
Windows XP, Idle				
Power Req.	+12V	+5V	+3.3V	Total
Current (A)	0.98	0.85	0.71	–
Watts (W)	11.8	4.25	2.34	18.4
Windows XP, CPU Stress (Kpower)				
Power Req.	+12V	+5V	+3.3V	Total
Current (A)	4.00	0.93	0.76	–
Watts (W)	48.0	4.65	2.51	55.2
Windows XP, Total System Stress (Burnin)				
Power Req.	+12V	+5V	+3.3V	Total
Current (A)	4.60	1.54	0.77	–
Watts (W)	55.2	7.70	2.54	65.4
S1 Mode				
Power Req.	+12V	+5V	+3.3V	Total
Current (A)	0.57	0.59	0.73	–
Watts (W)	6.89	2.95	2.41	12.3
S5 Mode				
Power Req.	–	+5VSB	–	Total
Current (A)	–	0.94	–	–
Watts (W)	–	4.70	–	4.70

Table 1-2: Intel® Core™ i7-2710QE Power Consumption

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1.8 Board Layout

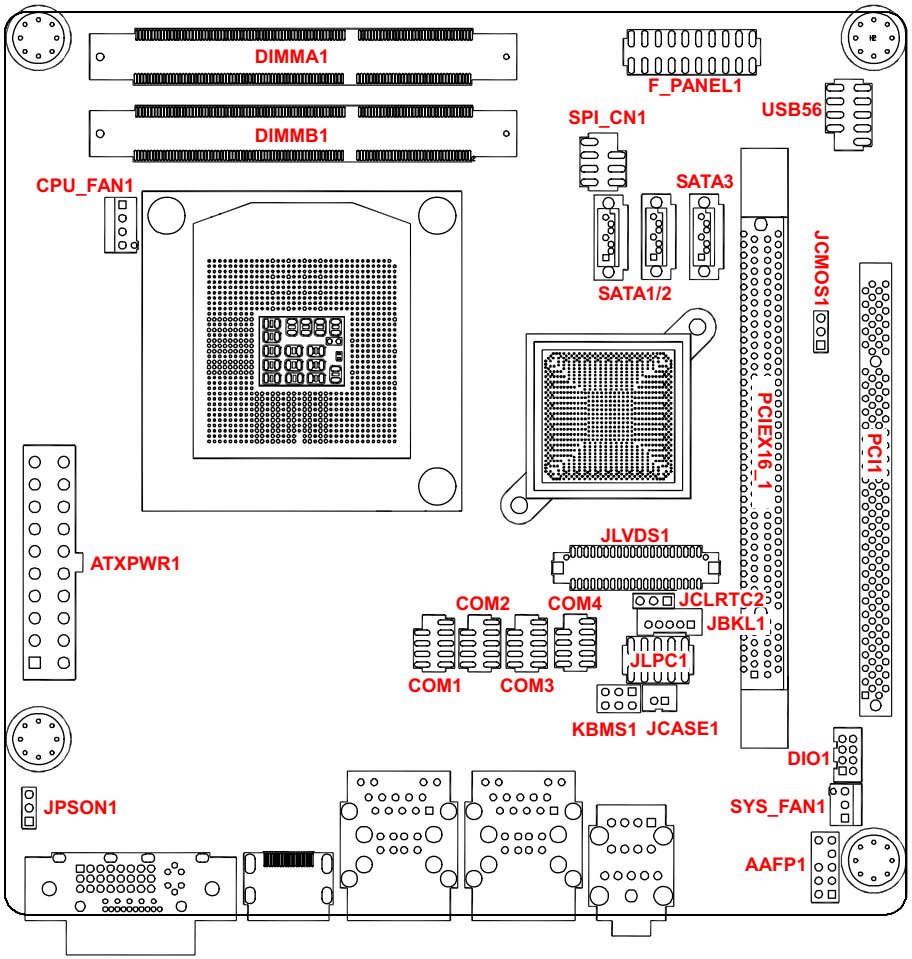


Figure 1-2: MI-220 Board Layout

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AAFP1	Front Panel Audio pin header	**JLPC1**	LPC pin header
ATXPWR1	ATX Power connector	**JLVDS1**	LVDS Flat Panel connector
COM1~4	Serial Port connectors	**JPSON1**	AT Mode jumper
CPU_FAN1	CPU Fan connector	**KBMS1**	PS/2 KB/MS pin header
DIMMA1	SO-DIMM Channel A	**PCI1**	PCI slot
DIMMB1	SO-DIMM Channel B	**PCIEX16_1**	PCIe x16 slot
DIO1	Digital IO pin header	**SATA1/2**	SATA 6 Gb/s connectors
F_PANEL1	System Panel pin header	**SATA3**	SATA 3 Gb/s connector
JBKL1	LCD Inverter connector	**SPDIF_OUT**	S/PDIF pin header
JCASE1	Chassis Intrusion connector	**SPI_CN1**	SPI pin header
JCLRT_C2	LCD Backlight Voltage jumper	**SYS_FAN1**	System Fan connector
JCMOS1	Clear CMOS jumper	**USB45**	USB4/5 pin header

Table 1-3: MI-220 Board Layout Legend

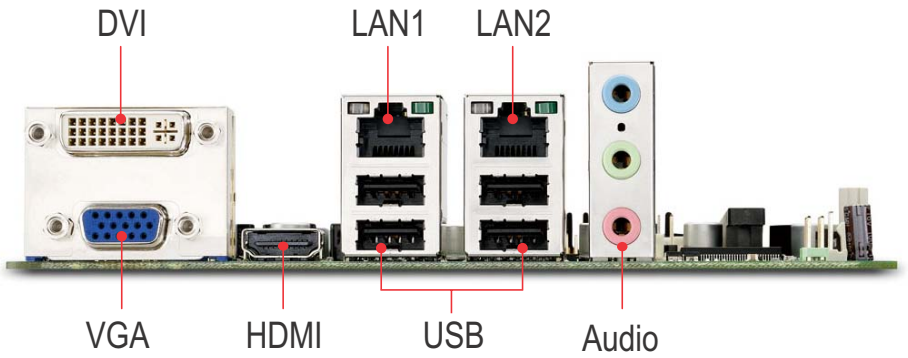


Figure 1-3: MI-220 Rear I/O Layout

NOTE:

The HDMI port has limited clearance with the rear I/O shield. Use an HDMI cable with a low-profile molding.

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1.9 Mechanical Dimensions

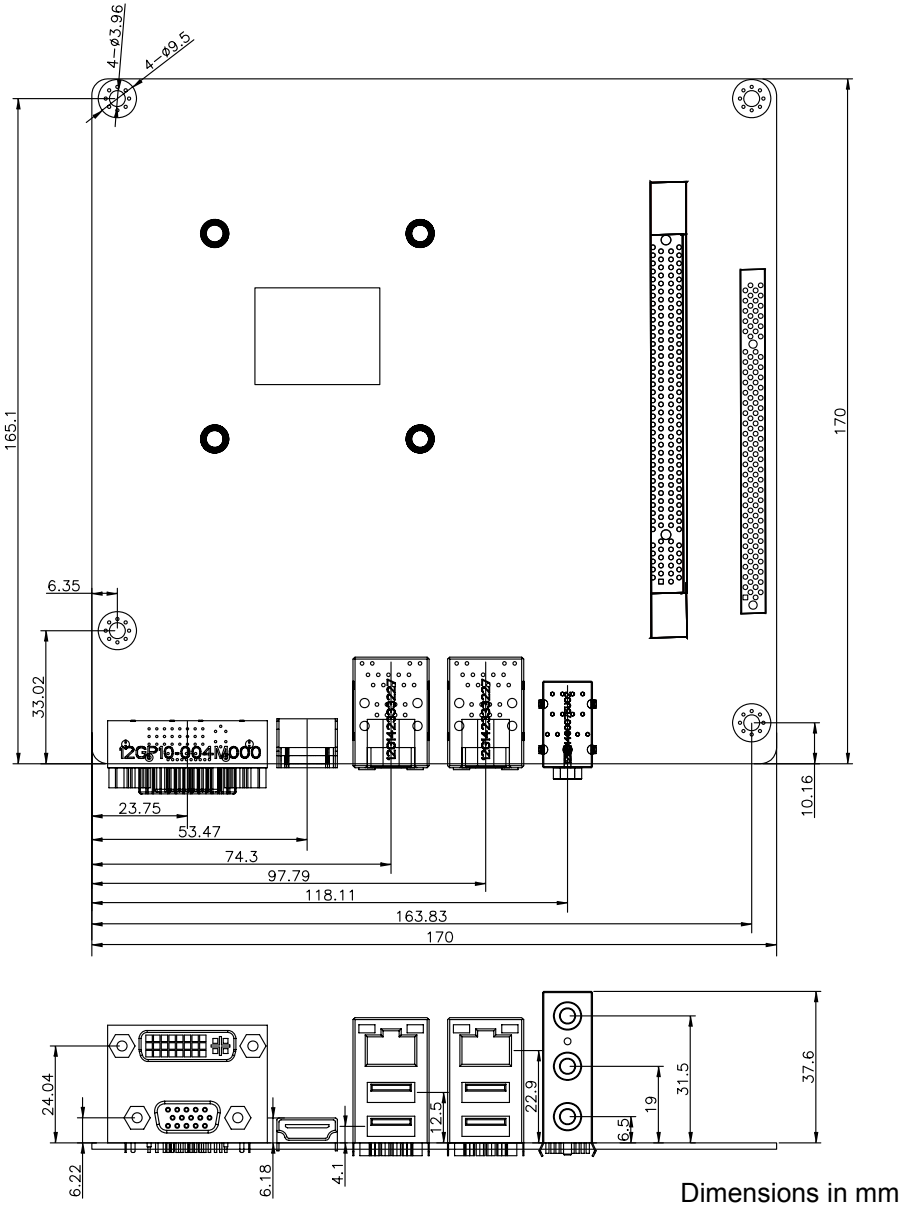


Figure 1-4: MI-220 Board Dimensions

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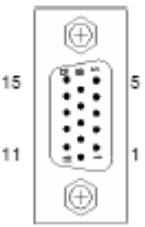
2 Connectors & Jumpers

Refer to **Figure 1-2: MI-220 Board Layout** and **Figure 1-3: MI-220 Rear I/O Layout** for connector and jumper locations.

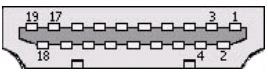
2.1 Rear I/O Connectors

VGA Connector.

Signal Name	Pin #	Pin #	Signal Name
Red	1	2	Green
Blue	3	4	VCC pull-up
GND	5	6	GND
GND	7	8	GND
VCC	9	10	GND
VCC pull-up	11	12	DDC2B DATA
HSYNC	13	14	VSYNC
DDC2B CLK	15		



HDMI Connector

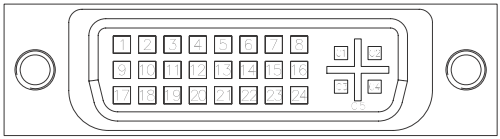


Pin #	Signal	Pin #	Signal
1	TMDS Data2+	2	TMDS Data2 Shield
3	TMDS Data2–	4	TMDS Data1+
5	TMDS Data1 Shield	6	TMDS Data1–
7	TMDS Data0+	8	TMDS Data0 Shield
9	TMDS Data0–	10	TMDS Clock+
11	TMDS Clock Shield	12	TMDS Clock–
13	CEC	14	Reserved
15	SCL	16	SDA
17	DDC/CEC Ground	18	+5 V Power
19	Hot Plug Detect		

NOTE: The HDMI port has limited clearance with the rear I/O shield. Use an HDMI cable with a low-profile molding.

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DVI-D Connector



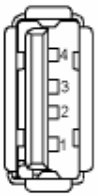
Pin #	Signal	Pin #	Signal
1	TMDS Data2-	16	Hot Plug Detect
2	TMDS Data2+	17	TMDS Data0-
3	TMDS Data2/4 Shield	18	TMDS Data0+
4	TMDS Data4-	19	TMDS Data0/5 Shield
5	TMDS Data4+	20	TMDS Data5-
6	DDC Clock	21	TMDS Data5+
7	DDC Data	22	TMDS Clock Shield
8	Analog Vertical Sync	23	TMDS Clock +
9	TMDS Data1-	24	TMDS Clock -
10	TMDS Data1+	C1	NC
11	TMDS Data1/3 Shield	C2	NC
12	TMDS Data3-	C3	NC
13	TMDS Data3+	C4	NC
14	+5 V Power	C5	NC
15	GND		

NOTE:

Although the connector has a DVI-I type pinout, pins C1 through C5 are not connected and no VGA signals are supported.

USB Connectors

Pin #	Signal Name
1	Vcc
2	USB-
3	USB+
4	GND

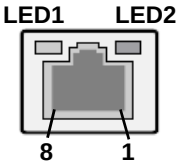


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LAN Port (RJ-45)

This port allows gigabit connection to a Local Area Network (LAN) using a network hub. The LAN port comes with two LEDs to indicate link, activity and speed. Refer to the tables below for the LAN port pin and LED definitions.

Pin #	10BASE-T/100BASE-TX	1000BASE-T
1	TX+	BI_DA+
2	TX-	BI_DA-
3	RX+	BI_DB+
4	--	BI_DC+
5	--	BI_DC-
6	RX-	BI_DB-
7	--	BI_DD+
8	--	BI_DD-



LED1 (Activity/Link)		LED2 (Speed)	
Status	**Description**	**Status**	**Description**
Off	No Link	Off	10 Mb connection
Orange	Linked	Orange	100 Mb connection
Blinking	Data Activity	Green	1 Gb connection

Audio I/O port

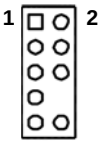
The three-jack audio I/O supports Line-In, Line-Out, and Mic-In functions. The blue Line-In jack onnects to an audio source such as a CD player. The green Line-Out port connects to a speaker or headphone, while the pink Mic-In jack connects to a microphone.

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2.2 Onboard Connectors and Jumpers

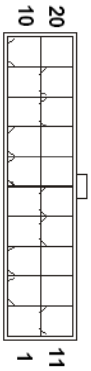
Front Panel Audio Pin Header (AAFP1)

Pin #	Signal	Pin #	Signal
1	MIC2_L	2	GND
3	MIC2_R	4	3.3V
5	LIN2_R	6	SRTN1
7	SENSE A	8	NC
9	LIN2_L	10	SRTN2



ATX Power Connector (ATXPWR1)

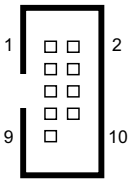
Pin #	Signal	Pin #	Signal
1	+3.3V	11	+3.3V
2	+3.3V	12	-12V
3	GND	13	GND
4	+5V	14	PS-ON#
5	GND	15	GND
6	+5V	16	GND
7	GND	17	GND
8	PWRGD	18	NC
9	+5VSB	19	+5V
10	+12V	20	+5V



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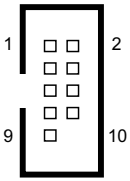
Serial Port Connectors - RS-232 (COM1~4)

Pin #	Signal	Function
1	DCD	Data Carrier Detect
2	DSR	Data Set Ready
3	RXD	Receive Data
4	RTS	Request to Send
5	TXD	Transmit Data
6	CTS	Clear to Send
7	DTR	Data Terminal Ready
8	RI	Ring Indicate
9	GND	Ground
10	NC	Key



Serial Port Connector - RS-422/485/485+ (COM1)

Pin #	RS-422/485+	RS-485
1	TX-	DATA-
2	N/A	N/A
3	TX+	DATA+
4	N/A	N/A
5	RX+	N/A
6	N/A	N/A
7	RX-	N/A
8	N/A	N/A
9	GND	GND
10	Key	Key

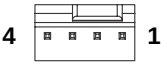


To set COM1 to RS-422/485/485+, go the following BIOS setup screen: Advanced > Super IO Configuration > Serial Port 1 Configuration > Device mode.

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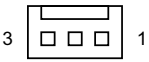
CPU Fan Connector (CPU__FAN1)

Pin #	Signal
1	GND
2	Fan power (+12V)
3	Fan Tachometer
4	Fan Speed Control



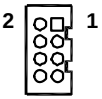
System Fan Connector (SYS_FAN1)

Pin #	Signal
1	GND
2	Fan Power (+12V)
3	Fan Tachometer



Digital I/O Connector (DIO1)

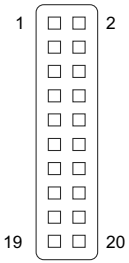
Pin #	Signal	Pin #	Signal
2	DIO_4	1	DIO_0
4	DIO_5	3	DIO_1
6	DIO_6	5	DIO_2
8	DIO_7	7	DIO_3



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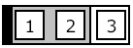
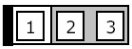
System Panel Connector (F_PANEL1)

Pin #	Signal	Function	Pin Group
1	WDSPK	Speaker signal	Chassis Speaker
3	NC		
5	NC		
7	P5V	Power	
9	NC		
11	GND	Ground	Key Lock
13	KEYLOCK	Keyboard lock	
15	PLED	Power LED signal	Power LED
17	NC		
19	P5V	Power LED pull-up	
2	GND	Ground	RESET Button
4	RESETBT	RESET signal	
6	NC		
8	GND	Ground	Power On Button
10	POWERBT	Power-on signal	
12	NC		
14	NC		
16	HDDLED	Hard Disk LED signal	Hard Disk LED
18	P3V3	Hard Disk LED pull-up	
20	NC		



Clear CMOS (JCMOS1)

The CMOS RAM data contains the date / time and BIOS setting information. CMOS is powered by the onboard button cell battery. To erase the CMOS RAM data: (1) Unplug the MI-220; (2) short the JP1 pin 2-3; (3) turn the power on. After power on, remove the jumper cap from pin 2-3 and reinstall it to pin 1-2.

RTC status	Connection	JP5
Normal	1 – 2	
Clear CMOS	2 – 3	

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Chassis Intrusion Connector (JCASE1)

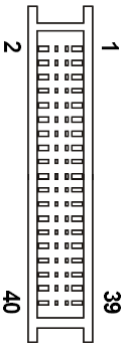
This header is connected to the chassis intrusion sensor to detect if the case is opened.

Pin #	Signal
1	SIO_CASEOP#
2	GND



LVDS Flat Panel Connector (JLVDS1)

Pin #	Signal	Pin #	Signal
2	+5V	1	+3.3V
4	+5V	3	+3.3V
6	SD_DDC	5	SC_DDC
8	GND	7	GND
10	LVDS0_P0	9	LVDS0_P1
12	LVDS0_N0	11	LVDS0_N1
14	GND	13	GND
16	LVDS0_P2	15	LVDS0_P3
18	LVDS0_N2	17	LVDS0_N3
20	GND	19	GND
22	LVDS1_P0	21	LVDS1_P1
24	LVDS1_N0	23	LVDS1_N1
26	GND	25	GND
28	LVDS1_P2	27	LVDS1_P3
30	LVDS1_N2	29	LVDS1_N3
32	GND	31	GND
34	LVDS0_CLKP	33	LVDS1_CLKP
36	LVDS0_CLKN	35	LVDS1_CLKN
38	GND	37	GND
40	+12V	39	+12V



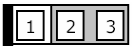
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LCD Inverter Connector (JBLK1)

Pin #	Signal
1	+12V
2	GND
3	LVDS_BKL
4	Bright
5	+5V

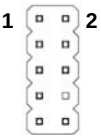


LCD Backlight Voltage Jumper (JCLRT_C2)

Status	Connection	JCLRT_C2
+5V (default)	1 – 2	
+3V	2 – 3	

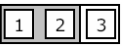
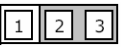
LPC Pin Header (JLPC1)

Pin #	Signal	Pin #	Signal
1	V3.3	2	GND
3	BIOS_DISABLE#	4	LPC_AD3
5	PRST_SIO	6	LPC_AD2
7	CLK33M_LPC	8	LPC_AD1
9	LPC_FRAME#	10	LPC_AD0



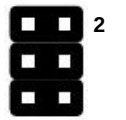
AT Mode Jumper (JPSON1)

Pin #	Signal
1	PSON_AT
2	FRP_PANSWUN
3	NC

Status	Connection	JCLRT_C2
AT Mode	1 – 2	
ATX Mode	2 – 3 (default)	

PS/2 Keyboard/Mouse Pin Header (KBMS1)

Pin #	Signal	Function
1	KDAT	Keyboard data
2	KCLK	Keyboard clock
3	MDAT	Mouse data
4	MCLK	Mouse data
5	P5V_KM	+5 V
6	GND	Ground



SATA Connectors (SATA1-3)

Pin #	Signal
1	GND
2	TXP
3	TXN
4	GND
5	RXN
6	RXP
7	GND

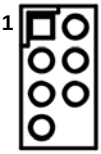


NOTE: SATA1/2 are 6 Gb/s ports, SATA3 is a 3 Gb/s port.

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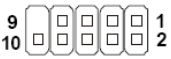
SPI Pin Header (SPI_CN1)

Pin #	Signal	Pin #	Signal
1	+3V ROM	2	GND
3	F_SPI_CS#	4	F_SPI_CLK
5	F_SPI_MISO	6	F_SPI_MOSI
7	SPI_HOLD#	8	NC



USB 2.0 Connector (USB45)

Pin #	Signal	Pin #	Signal
1	+5V	2	+5V
3	USB4-	4	USB5-
5	USB4+	6	USB5+
7	GND	8	GND
9	Key	10	NC



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3 Getting Started

This chapter provides information on how to install components to the MI-220 SBC.

3.1 System Memory

The MI-220 supports modules up to 8GB of DDR3 1066/1333MHz in each of two 204-pin SO-DIMM sockets (total 16 GB). See Figure 1-2 on page 9 for SO-DIMM socket locations.

Memory Module Installation

The DDR3 memory modules are notched to facilitate correct installation in the DIMM sockets.



Disconnect all power supply to the board before installing a memory module to prevent damaging the board and memory module.

To install a memory module:

1. Locate the SO-DIMM slot on the motherboard.
2. Align the memory module on the socket, making sure that the notch matches the break on the socket.
3. Insert the module firmly into the slot until the retaining clips snap back inwards and the module is securely seated.

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3.2 Driver Installation

The MI-220 drivers for **Windows XP 32-bit** are located in the following directories on the Driver CD, or can be downloaded from the ADLINK website (**http://www.adlinktech.com**):

Chipset	X:\Driver\Step 1_CHIP\
Display	X:\Driver\Step 2_VGA\winxp32
LAN	X:\Driver\Step 3_LAN\XP_32
Audio	X:\Driver\Step 4_AUDIO\XP 32_64
RAID	X:\Driver\Step 5_RAID\
Mgmt. Engine	X:\Driver\Step 6_ME\

Follow the instructions below to install the required MI-220 drivers:

1. Install the Windows operating system before installing any driver. Most standard I/O device drivers are installed during Windows installation.


NOTE:

In order to enable AHCI mode, you must pre-install the Intel® Rapid Storage Technology driver using the F6 installation method described in **X:\Driver\Step 5_RAID\F6Readme.txt**.

2. Install the **Chipset driver** by running the program **X:\Driver\Step 1_CHIP\\infinst_autol.exe**. Follow the instructions given and reboot when instructed.
3. Install the **Display driver** and utilities by running the program **X:\Driver\Step 2_VGA\winxp32\winxp_14464.exe**. Follow the instructions given and reboot when instructed.
4. Install the **LAN driver** by running the program **X:\Driver\Step 3_LAN\XP_32\PROWin32.exe**. Follow the instructions given and reboot if required.
5. Install the **Audio driver** by running the program **X:\Driver\Step 4_AUDIO\XP 32_64\WDM_R261.exe**. Follow the instructions given and reboot if required.

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6. Install the **Intel Rapid Storage Technology Utility** by extracting and running the program **iata_cd_10.6.0.1022.exe** in **X:\Driver\Step 5_RAID\Intel_Rapid_Storage_Technology_10.6.0.1022.zip**.



The Intel Rapid Storage Technology Utility file may not be included on the Driver CD. Please download it from the ADLINK website if necessary.

7. Install the **Management Engine driver** by running the program **X:\Driver\Step 6_ME\setup.exe**. Follow the instructions given and reboot if required.

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4 BIOS Setup

The following chapter describes basic navigation for the AMIBIOS® EFI BIOS setup utility.

4.1 Starting the BIOS

To enter the setup screen, follow these steps:

1. Power on the motherboard
2. Press the < Delete > key on your keyboard when you see the following text prompt:
   < Press DEL to run Setup >
3. After you press the < Delete > key, the main BIOS setup menu displays. You can access the other setup screens from the main BIOS setup menu, such as Chipset and Power menus.



Note: In most cases, the < Delete > key is used to invoke the setup screen. There are several cases that use other keys, such as < F1 >, < F2 >, and so on.

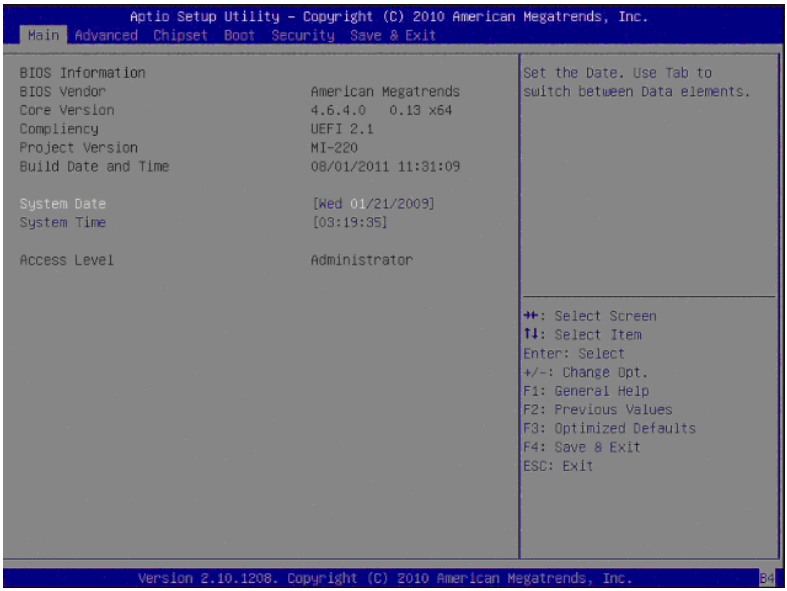
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Setup Menu

The main BIOS setup menu is the first screen that you can navigate. Each main BIOS setup menu option is described in this user's guide.

The Main BIOS setup menu screen has two main frames. The left frame displays all the options that can be configured. "Grayed" options cannot be configured, "Blue" options can be.

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.

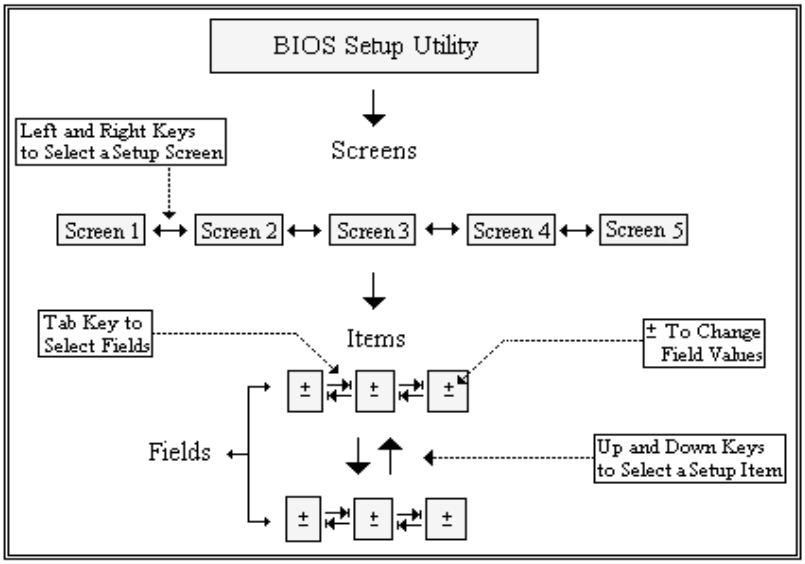


Navigation

The BIOS setup/utility uses a key-based navigation system called hot keys. Most of the BIOS setup utility hot keys can be used at any time during the setup navigation process.

These keys include < F1 >, < F10 >, < Enter >, < ESC >, < Arrow > keys, and so on. .

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Note: There is a hot key legend located in the right frame on most setup screens.

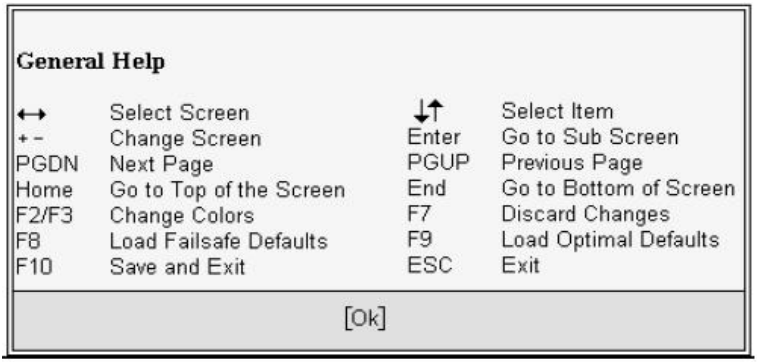
The < F8 > key on your keyboard is the Fail-Safe key. It is not displayed on the key legend by default. To set the Fail-Safe settings of the BIOS, press the < F8 > key on your keyboard. It is located on the upper row of a standard 101 keyboard. The Fail-Safe settings allow the motherboard to boot up with the least amount of options set. This can lessen the probability of conflicting settings.

Hotkey Descriptions

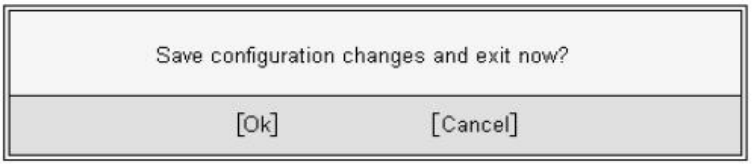
F1 The < F1 > key allows you to display the General Help screen.

Press the < F1 > key to open the General Help screen.

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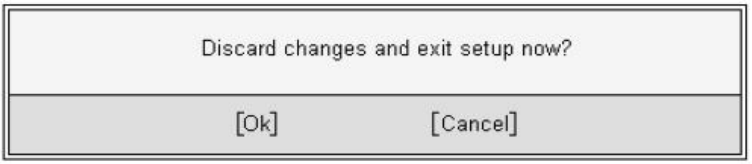


F10 The < F10 > key allows you to save any changes you have made and exit Setup. Press the < F10 > key to save your changes. The following screen will appear:



Press the < Enter > key to save the configuration and exit. You can also use the < Arrow > key to select Cancel and then press the < Enter > key to abort this function and return to the previous screen.

ESC The < Esc > key allows you to discard any changes you have made and exit the Setup. Press the < Esc > key to exit the setup without saving your changes. The following screen will appear:



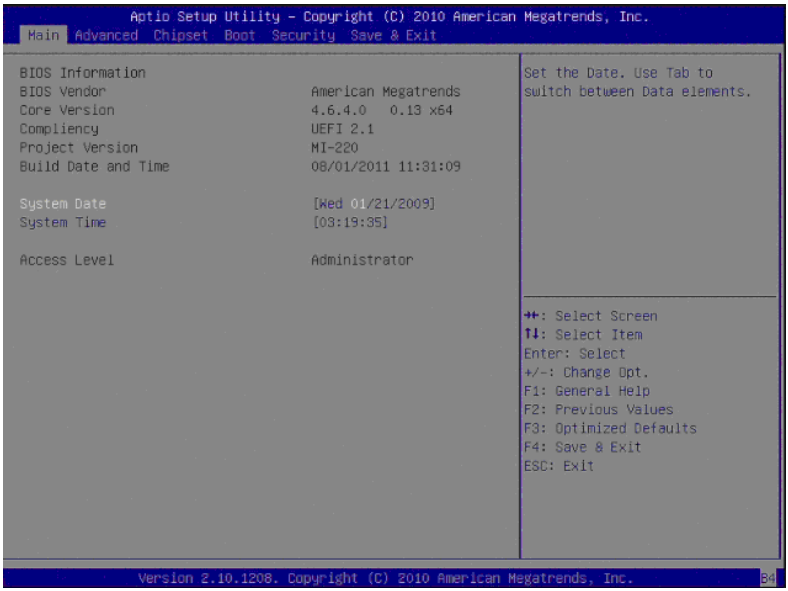
Press the < Enter > key to discard changes and exit. You can also use the < Arrow > key to select Cancel and then press the < Enter > key to abort this function and return to the previous screen.

Enter The < Enter > key allows you to display or change the setup option listed for a particular setup item. The < Enter > key can also allow you to display the setup sub-screens.

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4.2 Main Setup

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



System & Board Info

BIOS Vendor

Displays the BIOS vendor.

Core Version

Displays the BIOS core version.

Compliancy

Displays the current BIOS compliancy.

Project Version

Displays the current BIOS revision.

Build Date and Time

Displays the BIOS build data.

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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 using 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.

Note: The time is in 24-hour format. For example, 5:30 A.M. appears as 05:30:00, and 5:30 P.M. as 17:30:00.

Access Level

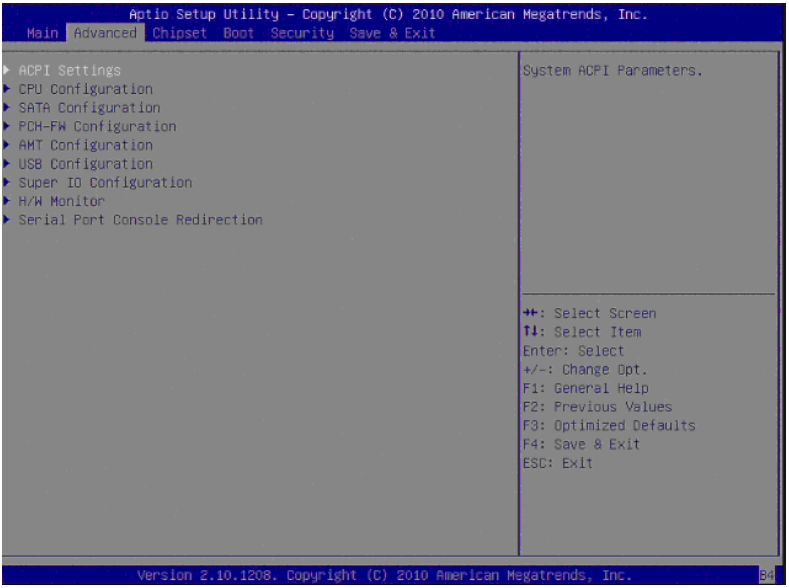
Displays the current system access level.

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4.3 Advanced BIOS Setup

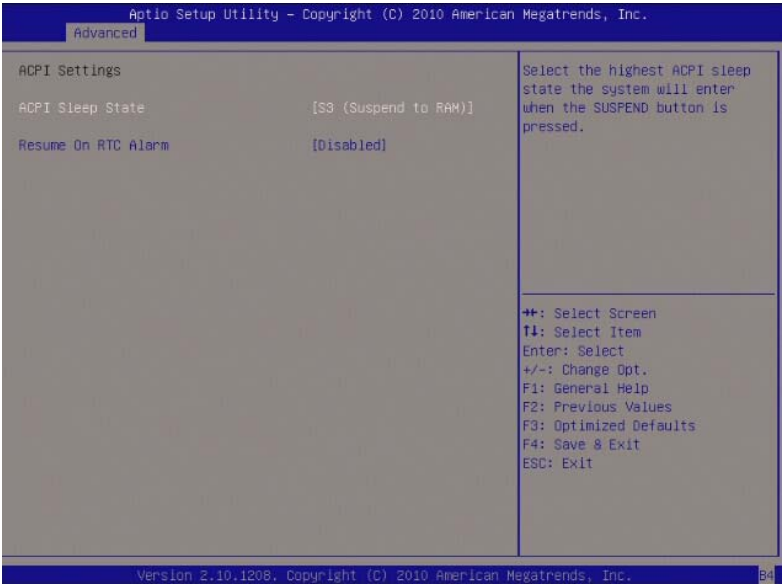
Select the Advanced tab from the setup screen to enter the Advanced BIOS Setup screen. You can select any of the items in the left frame of the screen, such as SuperIO Configuration, to go to the sub menu for that item. You can display an Advanced BIOS Setup option by highlighting it using the < Arrow > keys. The Advanced BIOS Setup screen is shown below.

The sub menus are described on the following pages.



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4.3.1 ACPI Settings



ACPI Sleep State

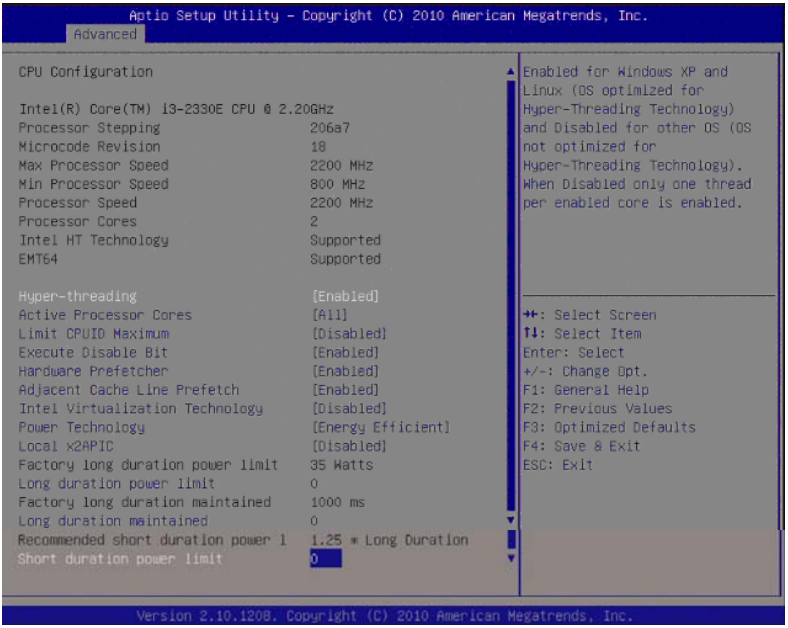
Select the highest ACPI sleep state the system will enter, when the SUSPEND button is pressed. Options: S1, S3, Suspend Disable.

Resume On RTC Alarm

Enable or disable system wake on alarm event. When enabled, the system will wake at the hr/min/sec specified.

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4.3.2 CPU Configuration



Hyper-Threading

Enables/disables Intel® Hyper-Threading Technology.

Active Processor Cores

Number of cores to enable in processor. Options: All, 1.

Limit CPUID Value Maximum

When Enabled, the processor will limit the maximum CPUID input value to 03h when queried, even if the processor supports a higher CPUID input value. When Disabled, the processor will return the actual maximum CPUID input value of the processor when queried. Enable this option to allow compatibility with older operating systems.

Execute Disable Bit

Allows you to enable or disable the No-Execution Page Protection Technology. Setting this item to [Disabled] forces the XD

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feature flag to always return a zero (0). Options: Enabled, Disabled.

Hardware Prefetcher

Enables/disables the Mid Level Cache (L2) streamer prefetcher.

Adjacent Cache Line Prefetch

Enables/disables the prefetching of adjacent cache lines.

Intel® Virtualization Tech

When enabled, Intel® Virtualization Technology (Intel® VT) makes a single system appear as multiple independent systems to software. This allows for multiple, independent operating systems to be running simultaneously on a single system.

Power Technology

Sets the power management features. Options: Disabled, Energy Efficient, Custom.

Local x2APIC

Enables/disables Local x2APIC. Some OSes do not support this.

Long Duration Power Limit

Sets the Long Duration Power Limit in watts.

Long Duration Maintained

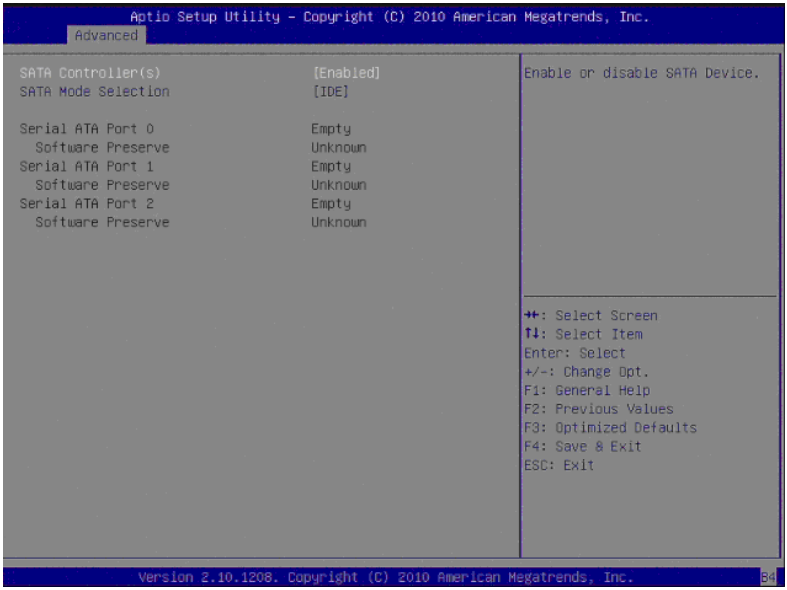
Sets the time window for which the Long Duration Power Limit is maintained in miliseconds.

Short Duration Power Limit

Sets the short duration power limit in watts.

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4.3.3 SATA Configuration



SATA Controller(s)

Enable or disable the SATA controller(s).

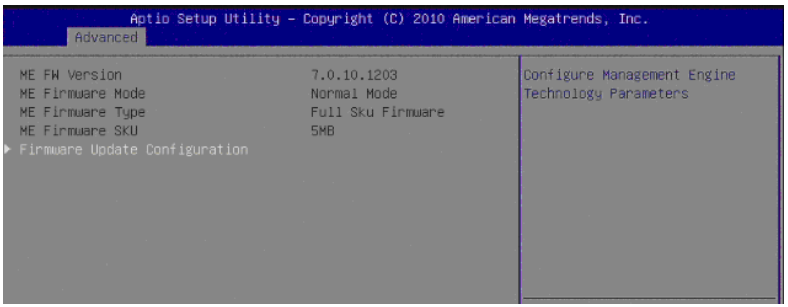
SATA Mode

Options: IDE, RAID, AHCI.

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4.3.4 PCH-FW Configuration

You can use this screen to enter the options for the Firmware Update Configuration Settings. The Firmware Update Configuration screen is shown below.



Firmware Update Configuration



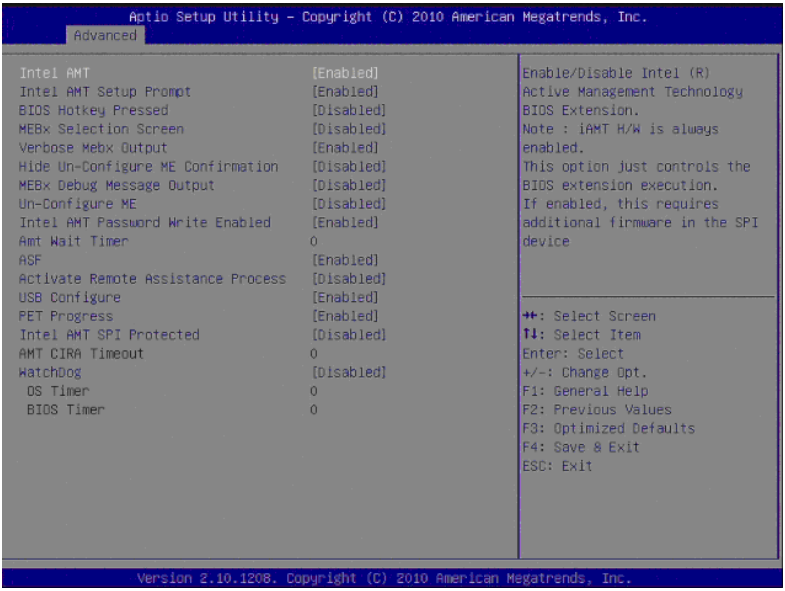
ME FW Image Re-Flash

Enable or disable eanagement Engine Firmware Image Re-Flash function.

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4.3.5 AMT Configuration

You can use this screen to select options for the Intel Active Management Technology settings.



Intel AMT

This item allows the user to Enable/Disable the Intel AMT function.

Intel AMT Setup Prompt

Set the Intel AMT Setup Prompt to wait for hotkey to enter setup. Options: Enabled, Disabled.

BIOS Hotkey Pressed

Enable or disable BIOS hotkey pressed.

MEBx Selection Screen

Enable or disable the MEBx selection screen.

Verbose MEBx Output

Enable or disable Verbose MEBx output.

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Hide Un-Configure ME Confirmation

Hide the Un-Configure ME prompt without password confirmation.

MEBx Debug Message Output

Enable or disable MEBx debug message output.

Un-Configure ME

This item allows the user to unprovision the ME function without a password. Options: Enabled, Disabled.

Intel AMT Password Write Enable

Enable or disable Intel AMT Password Write. Password is writeable when set to Enabled.

AMT Wait Timer

Set the number of seconds to wait before sending ASF_GET_BOOT_OPTIONS.

ASF

Enable or disable Alert Specification Format.

Activate Remote Assistance Process

Trigger CIRA boot. Options: Enabled, Disabled.

USB Configure

Enable or disable the USB Configure function.

PET Progress

User can set PET Events progress to enable or disable receipt of PET events. Options: Enabled, Disabled.

Intel AMT SPI Protected

Enable or disable Intel AMT SPI write protect.

WatchDog

Enable or disable the WatchDog Timer.

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OS Timer

Sets the OS WatchDog Timer (seconds).

BIOS Timer

Sets the BIOS WatchDog Timer (seconds).

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4.3.6 USB Configuration



Legacy USB Support

Legacy USB Support refers to USB mouse and keyboard support. Normally if this option is not enabled, any attached USB mouse or USB keyboard will not become available until a USB compatible operating system is fully booted with all USB drivers loaded. When this option is enabled, any attached USB mouse or USB keyboard can control the system even when there are no USB drivers loaded on the system. Set this value to enable or disable the Legacy USB Support.

- **Disabled:** Set this value to prevent the use of any USB device in DOS or during system boot.
- **Enabled:** Set this value to allow the use of USB devices during boot and while using DOS.
- **Auto:** This option auto detects USB Keyboards or Mice and if found, allows them to be utilized during boot and while using DOS.

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EHCI Hand-Off

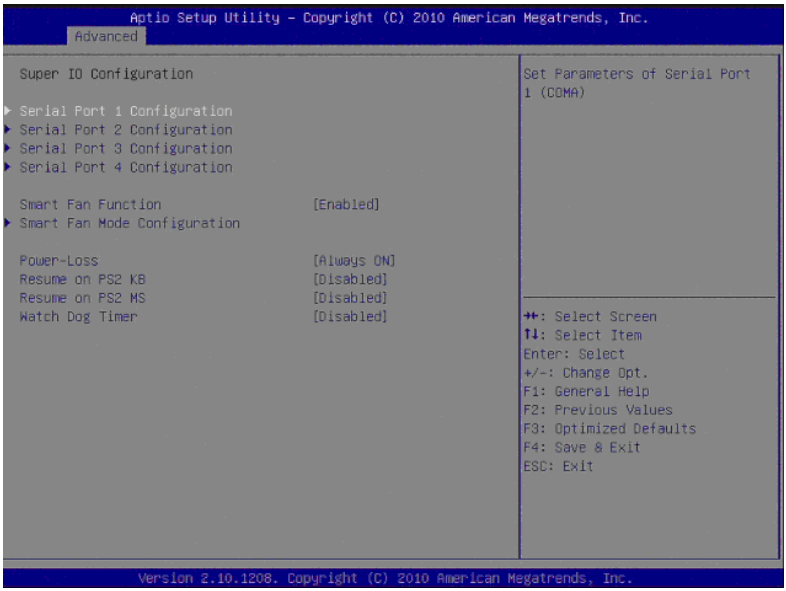
This is a workaround for OSes without EHCI hand-off support. The EHCI ownership change should be claimed by EHCI driver. Options: Enable, Disable.

Mass Storage Devices:

Mass storage device emulation type. 'AUTO' enumerates devices according to their media format. Optical drives are emulated as 'CDROM', drives with no media will be emulated according to a drive type. Options: Auto, Floppy, Forced FDD, Hard Disk, CD-ROM.

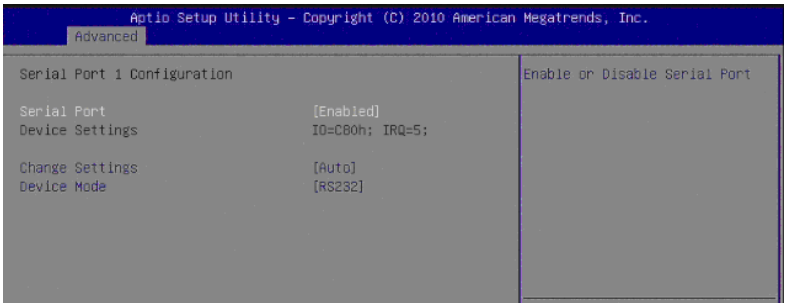
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4.3.7 Super IO Configuration



Serial Port1-4 Configuration

Enter the submenu for each serial port to enable/disable and view the I/O port and IRQ settings.



Serial Port

Enable or disable Serial Port 1~4.

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Device Settings

Set the serial port address and IRQ. Options: Auto, IO=3F8h; IRQ=4, IO=3F8h; IRQ=3, 4, 5, 6, 7, 9. 10, 11, 12, IO=2F8h; IRQ=3, 4, 5, 6, 7, 9. 10, 11, 12, IO=3E8h; IRQ=3, 4, 5, 6, 7, 9. 10, 11, 12, IO=2E8h; IRQ=3, 4, 5, 6, 7, 9. 10, 11, 12

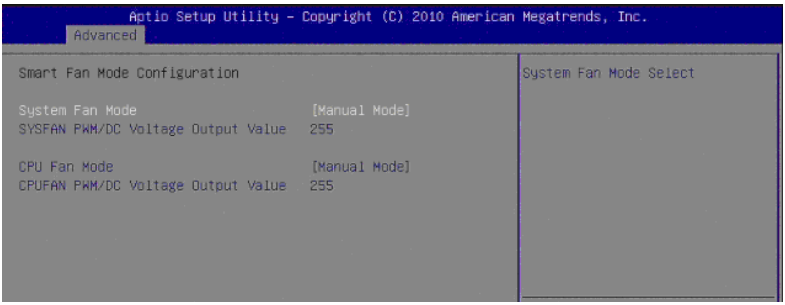
Device Mode

Change the Serial Port mode of COM1. Options: RS232, RS422, RS485 Half, RS485 Full

Smart Fan Function

Enable or disable the Smart Fan function.

Smart Fan Mode Configuration



System Fan Mode

System Smart Fan mode select. Options: Manual Mode, Thermal Cruise Mode, SMART FAN IV Mode

SYSFAN PWM/DC Voltage Output Value

Range of setting: 0-255.

CPU Fan Mode

CPU Smart Fan mode select. Options: Manual Mode, Thermal Cruise Mode, SMART FAN IV Mode

CPUFAN PWM/DC Voltage Output Value

Range of setting: 0-255.

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Power Loss

Determines what state the computer enters when AC power is restored after a power loss. The options for this value are Always Off, Always On and Auto.

- **Always Off:** Set this value to always power off the system while AC power is restored.
- **Always On:** Set this value to always power on the system while AC power is restored.
- **Auto:** Set this value to power off/on the system depending on the last system power state while AC power is restored.

Resume on PS2 KB

Enable or disable Resume on PS/2 Keyboard function.

Resume on PS2 MS

Enable or disable Resume on PS2 Mouse function.

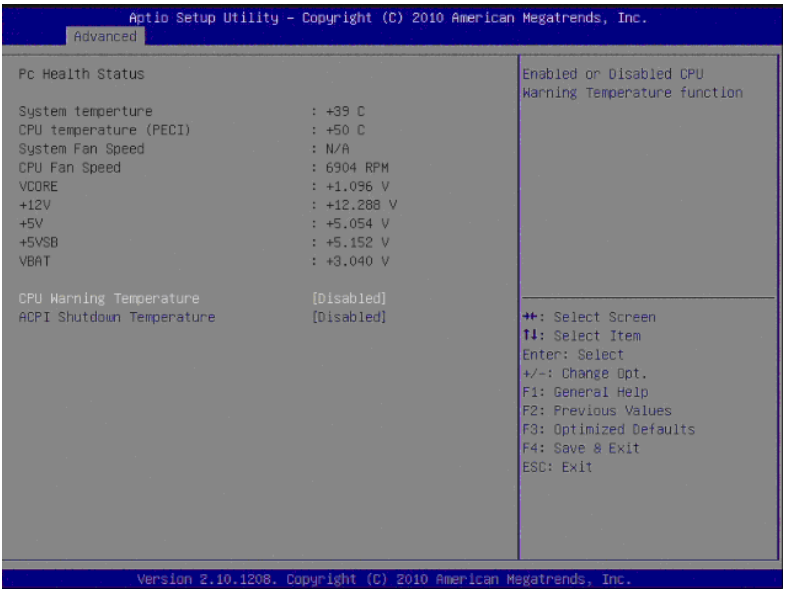
Watch Dog Timer

Enable or disable Watchdog Timer Function.

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4.3.8 H/W Monitor

This screen displays the current status of all of the monitored hardware devices/components such as voltages and temperatures.



CPU Warning Temperature

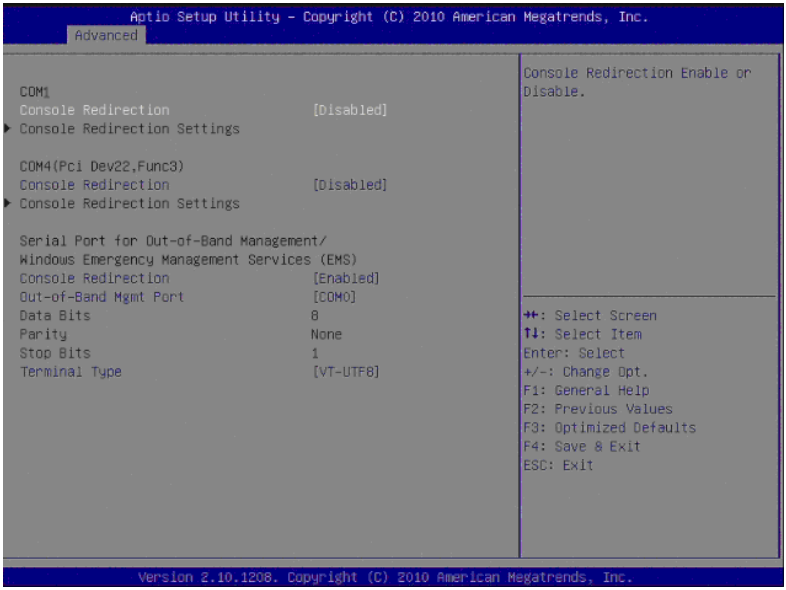
Enables or disables the CPU warning temperature function. Options: Disable, 50 C/122 F, 55 C/131, 60 C/140 F, 65 C/149 F, 70 C/158 F, 75 C/167 F.

ACPI Shutdown Temperature

Enables or disables the ACPI shutdown temperature function. Options: Disable, 70 C/158 F, 75 C/167 F, 80 C/176 F, 85 C/185 F, 90 C/194 F, 95 C/205 F.

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4.3.9 Serial Port Console Redirection



COM1/4 Console Redirection

Options: Enabled/Disabled.

Console Redirection Settings

The settings specify how the host computer and the remote computer exchange data. Both computers should have the same or compatible settings.

Terminal Type

This option is used to select either VT100/VT-UTF8 or ANSI terminal type. Options: VT100, VT100+, VT-UTF8, ASNI.

Bits per second

Select the bits per second you want the serial port to use for console redirection. The options are 115200, 57600, 38400, 19200, 9600.

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Data Bits

Select the data bits you want the serial port to use for console redirection. Set this value to 7 and 8.

Parity

Set this option to select Parity for console redirection. The settings for this value are None, Even, Odd, Mark and Space.

Stop Bits

Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning). The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit. Set this value to 1 and 2.

Flow Control

Set this option to select Flow Control for console redirection. The settings for this value are None, Hardware RTS/CTS.

Record Mode

With this mode enabled only text will be sent., allowing capture of Terminal data. Set this value to Enabled or Disabled.

Resolution 100x31

Enable or disable extended terminal resolution. Set this value to Enabled or Disabled.

Legacy OS Redirection Resolution

On a legacy OS, the number of Rows and Columns supported by redirection. Set this value to 80x24 and 80x25.

Serial Port for Out-of-Band Management

These settings control the ACPI serial port redirection table (SPCR) which is used by Windows servers to provide Windows Emergency Management Services (EMS) and is independent from console redirection output. OoB Management or EMS allows the remote management of selected components of Windows servers, even when a server is not connected to the network or the network is not available

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Console Redirection

Options: Enabled/Disabled.

Out-of-Band Mgmt Port

Options: COM0, COM4 (PCI Dev22, Func3), Disabled.

Data Bits

Displays the frame width for Out-of-Band Management.

Parity

Displays the parity for Out-of-Band Management.

Stop Bits

Displays the number of stop bits for Out-of-Band Management.

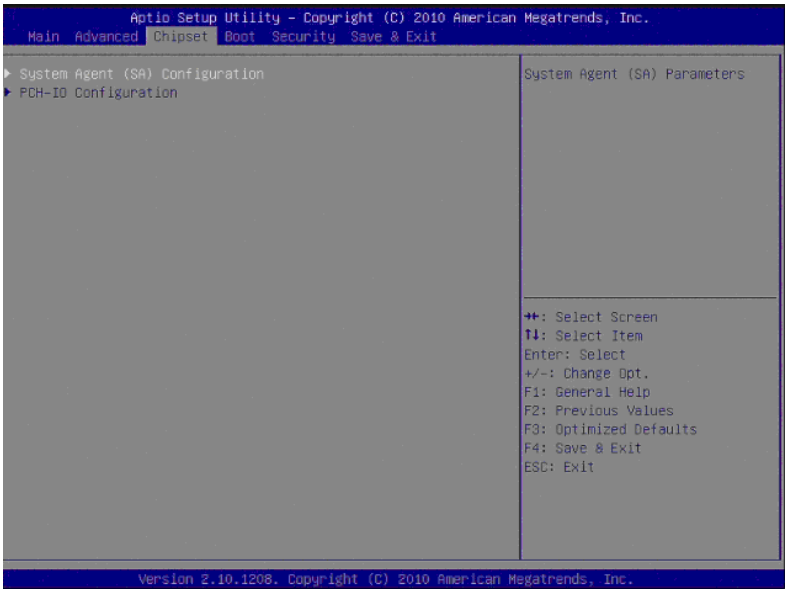
Terminal Type

VT-UTF8 is the preferred terminal type for out-of-band management. The next best choice is VT100+ and then VT100. See above, in Console Redirection Settings page, for more Help with Terminal Type/Emulation. Options: VT100, VT100+, VT-UTF8, ANSI.

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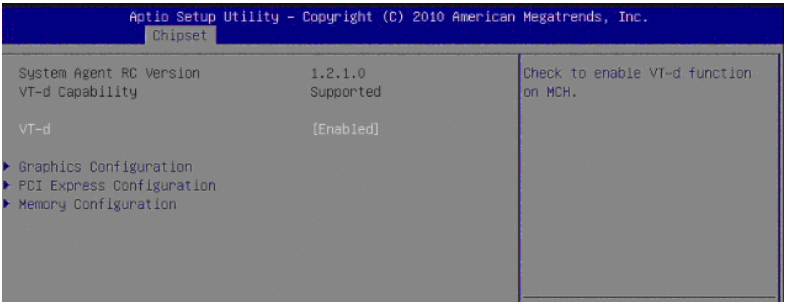
4.4 Chipset Setup

Select the Chipset tab from the setup screen to enter the Chipset BIOS Setup screen. You can select any of the items in the left frame of the screen to go to the sub menu for that item. The Chipset BIOS Setup screen is shown below.



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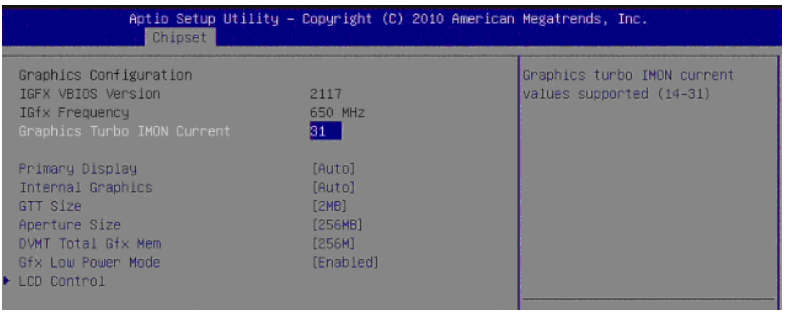
4.4.1 System Agent (SA) Configuration



VT-d

Intel Virtualization Technology for Directed I/O. Options: Enabled/ Disabled.

Graphics Configuration



Graphic Turbo IMON Current

Graphic Turbo IMON Current values supported: 14-31 µA.

Primary Display

Allows you to select which graphics controller to use as the primary boot device. Options: Auto, IGFX, PEG, PCI.

Internal Graphics

Keep IGD enabled based on the setup options. Options:Auto, Disabled, Enabled

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GTT Size

Set GTT (Graphics Memory Manager) size. Options:1MB, 2MB

Aperture Size

Options: 128MB, 256MB, 512MB

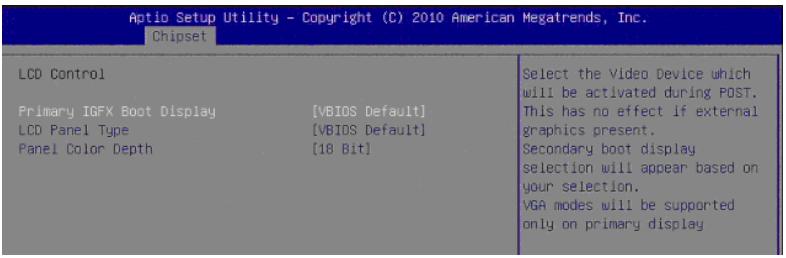
DVMT Total Gfx Mem

Select DVMT/Fixed memory size used by the Integrated Graphics Device. Options: 128MB, 256MB, Maximum.

Gfx Low Power Mode

Options: Enabled, Disabled

LCD Control



Primary IGFX Boot Display

Select the display port active during POST. This has no effect on any external graphics present. Options: VBIOS Default, CRT (VGA), DVI, LFP (LVDS), HDMI. See table below for *VBIOS Default* display output settings.

Connected Display(s)	BIOS Mode	DOS Mode
VGA	VGA	VGA
DVI	DVI	DVI
HDMI	HDMI	HDMI
LVDS	N/A	N/A
VGA + DVI	VGA + DVI	VGA
VGA + HDMI	VGA + HDMI	VGA
VGA + LVDS	VGA	VGA

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LCD Panel Type

Select the LCD panel used by the internal graphic device. Options: VBIOS Default, 640x480 LVDS, 800x600 LVDS, 1024x768 LVDS, 1280x1024 LVDS, 1400x1050 LVDS1, 1400x1050 LVDS2, 1600x1200 LVDS, 1366x768 LVDS, 1680x1050 LVDS, 1920x1200 LVDS 1440x900 LVDS, 1600x900 LVDS, 1280x800 LVDS, 1920x1080 LVDS, 2048x1536 LVDS.

Panel Color Depth

Select the LFP panel color depth. Options:18 Bit, 24 Bit.

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4.4.2 PCI Express Configuration



PEG0 - Gen X

Configure PEG B0:D1:F0 Gen1-Gen2. Options: Auto, Gen1, Gen2.

Always Enable PEG

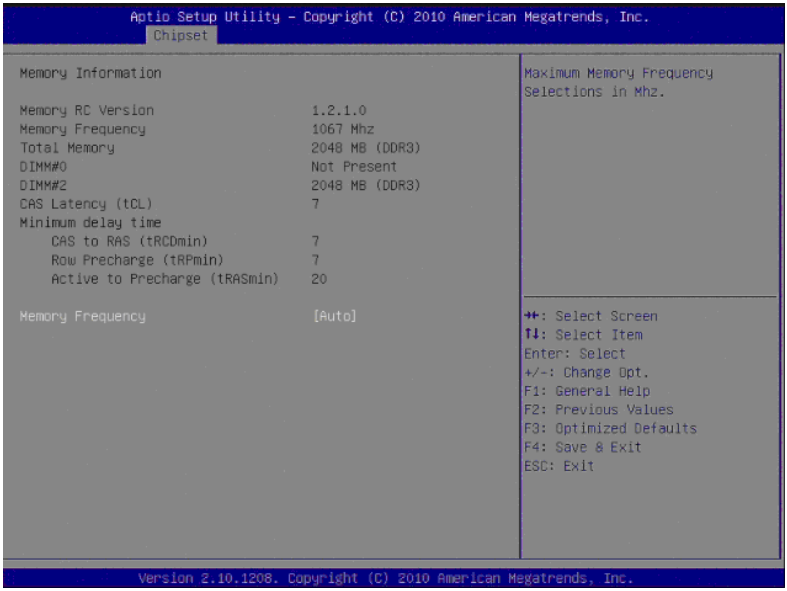
Options: Enabled, Disabled

PEG ASPM

Control ASPM support for the PEG device. Options: Disabled, Auto, ASPM L0s, ASPM L1, ASPM L0sL1

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4.4.3 Memory Configuration

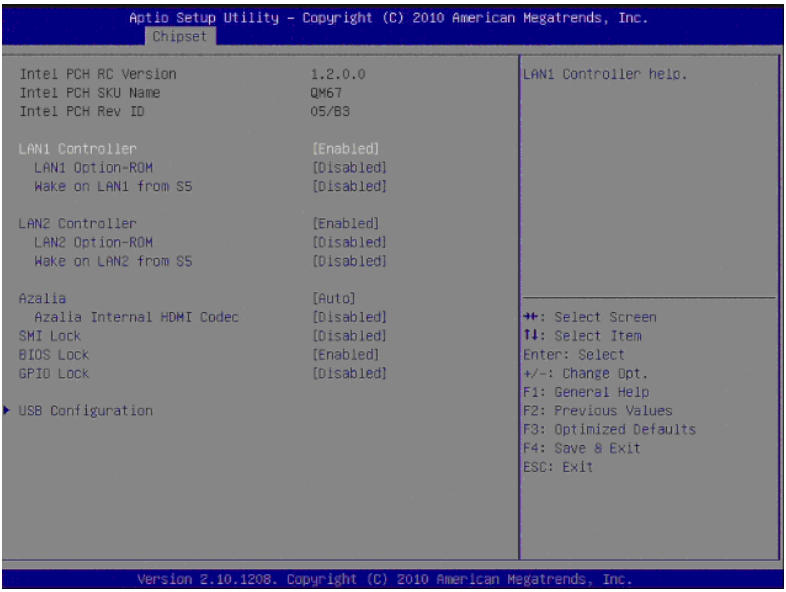


Memory Frequency

Maximum memory frequency in MHz. Options: Auto, 1067, 1333.

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4.4.4 PCH-IO Configuration



LAN1/2 Controller

Controls the onboard LAN1/2 controller. Options: Enabled/Disabled.

LAN1/2 Option-ROM

Enable or disable LAN1/2 Boot Option for legacy network devices.

Wake on LAN1/2 from S5

Enable or disable wake on LAN1/2 from S5.

Azalia Internal HDMI Codec

- **Disabled:** Azalia will be unconditionally Disabled.
- **Enabled:** Azalia will be unconditionally Enabled.
- **Auto:** Azalia will be enabled if present, disabled otherwise.

SMI Lock

Enable or disable SMI lockdown.

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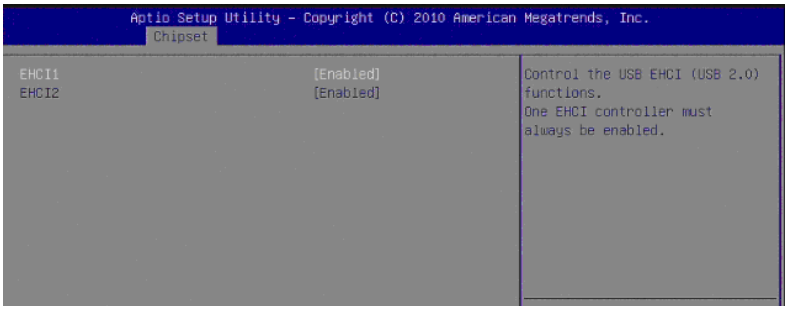
BIOS Lock

Enable or disable BIOS interface lockdown.

GPIO Lock

Enable or disable GPIO lockdown.

USB Configuration



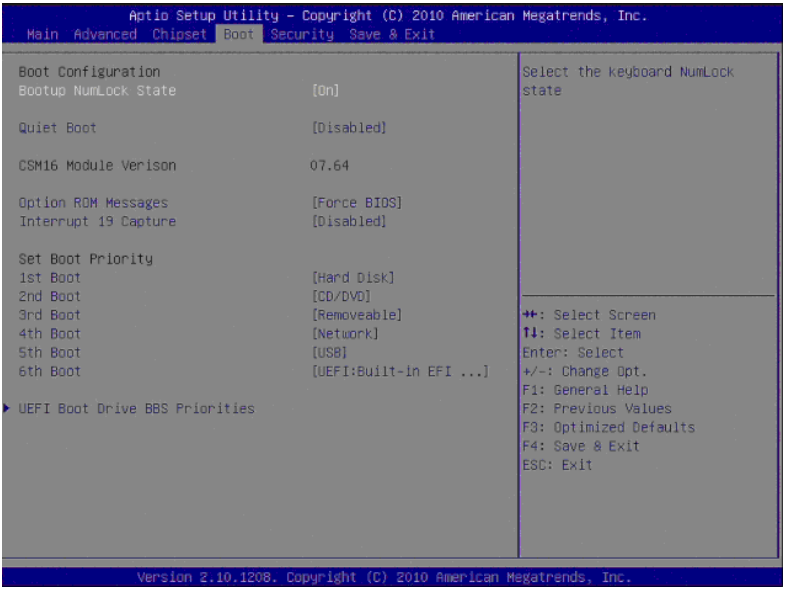
EHCI1/2

Enable or disable the USB EHCI1/2 (USB 2.0) functions.

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4.5 Boot Configuration

Select the Boot tab from the setup screen to enter the Boot BIOS Setup screen. You can select any of the items in the left frame of the screen, such as Boot Device Priority, to go to the sub menu for that item. You can display a Boot BIOS setup option by highlighting it using the < Arrow > keys. The Boot Configuration screen is shown below:



Bootup NumLock State

This setting determines the state of the NumLock function on bootup. Options: On, Off.

Quiet Boot

When this feature is enabled, the BIOS will display the full-screen logo during the boot-up sequence, hiding normal POST messages.

When it is disabled, the BIOS will display the normal POST messages, instead of the full-screen logo.

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Option ROM Messages

Set the display mode for Option ROM messages. Options: Force BIOS, Keep Current.

Interrupt 19 Capture

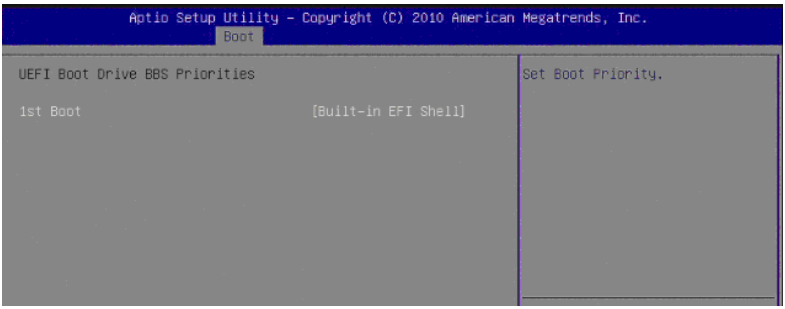
Allows Option ROMs to trap INT 19. Options: Disabled, Enabled.

Set Boot Priorities

The Boot devices are listed in groups by device type. First press <Enter> to enter the sub-menu. Then you may use the arrow keys to select the desired device, then press <+>, <-> or <PageUp>, <PageDown> key to move it up/down in the priority list. For example, USB storage disks will be listed as "USB Drives" in the sub-menu as below. Only the first device in each device group will be available for selection in the Boot Device Priority option.

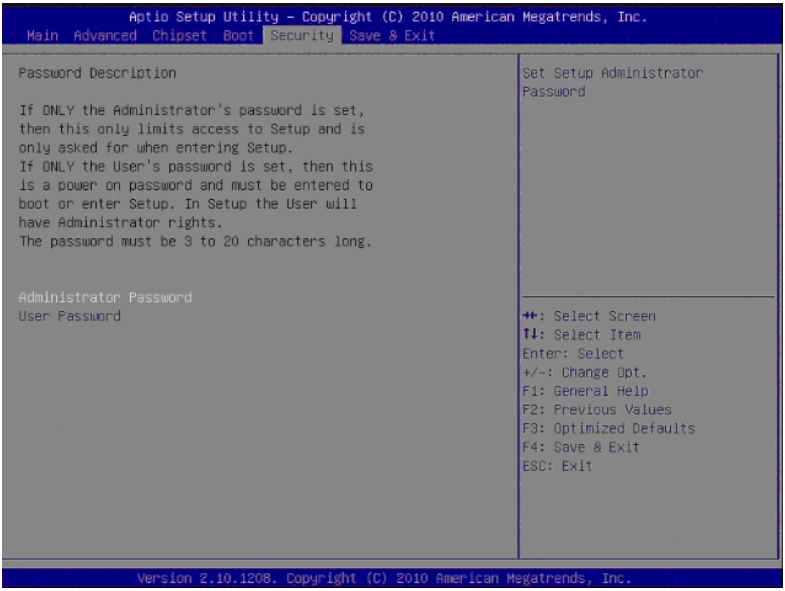
UEFI Boot Drive BBS Priorities

Specifies the Boot Device priority sequence of UEFI Boot drives.



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4.6 Security Setup



▶

Administrator Password

Select this option and press < Enter > to access the sub menu. You can use the sub menu to change the Administrator password.

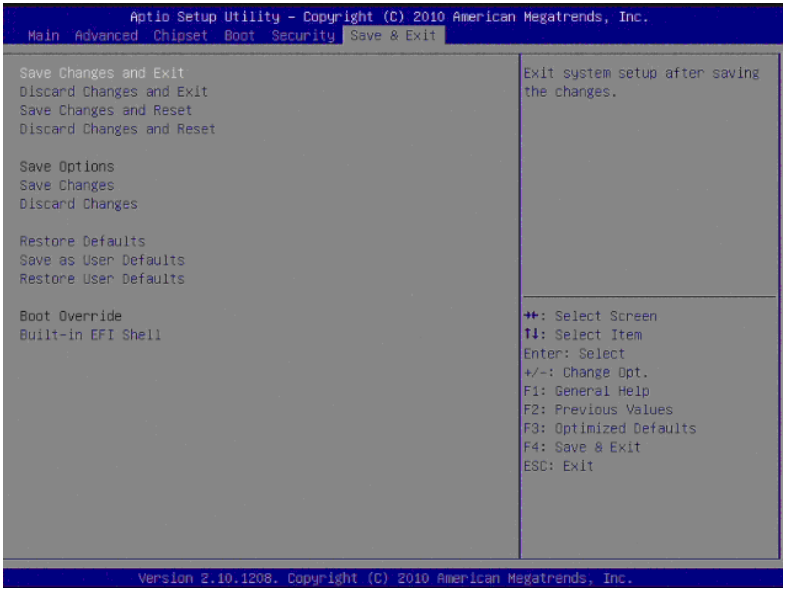
User Password

Select this option and press < Enter > to access the sub menu. You can use the sub menu to change the User password.

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4.7 Exit Menu

Select the Exit tab from the setup screen to enter the Exit BIOS Setup screen. You can display an Exit BIOS Setup option by highlighting it using the < Arrow > keys. The Exit BIOS Setup screen is shown below.



Save Changes and Exit

When you have completed the system configuration changes, select this option to leave Setup and reboot the computer so the new system configuration parameters can take effect.

Save Configuration Changes and Exit Now?

[Yes] [No]

appears in the window. Select [Yes] to save changes and exit.

Discard Changes and Exit

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

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Discard Changes and Exit Setup Now?

[Yes] [No]

appears in the window. Select [Yes] to discard changes and exit.

Save Changes and Reset

Reset the system after saving the changes.

Discard Changes and Reset

Reset system setup without saving any changes.

Save Changes

Save changes made so far to any of the setup options.

Discard Changes

Select Discard Changes from the Exit menu and press < Enter >.

Select [Yes] to discard changes.

Restore Defaults

Restore/Load Default values for all the setup options.

Save as User Defaults

Save the changes made so far as User Defaults.

Restore User Defaults

Restore the User Defaults to all the setup options.

Boot Override

This group of functions includes a list of devices within the boot order. Select a drive to immediately boot that device regardless of the current boot order. If you are booting to the EFI Shell, an exit from the shell returns to Setup.

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Appendix A - Watchdog Timer

Watchdog Timer sample code for the MI-220 is as follows.

WDT Sample Code

```
void SIOConfigEnter ()
{
    IoWrite8 (NCT6776F_CONFIG_INDEX ,
     NCT6776F_CONFIG_MODE_ENTER_VALUE);
    IoWrite8 (NCT6776F_CONFIG_INDEX ,
     NCT6776F_CONFIG_MODE_ENTER_VALUE);
}

void SIOConfigExit ()
{
    IoWrite8 (NCT6776F_CONFIG_INDEX ,
     NCT6776F_CONFIG_MODE_EXIT_VALUE);
}

void Oem_WDT_Init (
  IN SETUP_DATA                *SetupData
)
{
    UINT8                       Data8;

    SIOConfigEnter();

    IoWrite8 (NCT6776F_CONFIG_INDEX , 0x2C);       //
     Pin113 function selection to TSIC
    Data8 = IoRead8(NCT6776F_CONFIG_DATA) | 0x01;
    IoWrite8 (NCT6776F_CONFIG_DATA , Data8);

    IoWrite8 (NCT6776F_CONFIG_INDEX ,
     NCT6776F_LDN_SEL_REGISTER);
    IoWrite8 (NCT6776F_CONFIG_DATA , NCT6776F_LDN_GPIO2);

    IoWrite8 (NCT6776F_CONFIG_INDEX ,
     NCT6776F_ACTIVATE_REGISTER);
    Data8 = IoRead8(NCT6776F_CONFIG_DATA) | 0x04;
    IoWrite8 (NCT6776F_CONFIG_DATA , Data8);

    IoWrite8 (NCT6776F_CONFIG_INDEX ,
     NCT6776F_LDN_SEL_REGISTER);
```

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```
    IoWrite8 (NCT6776F_CONFIG_DATA , NCT6776F_LDN_GPIOA);

    IoWrite8 (NCT6776F_CONFIG_INDEX , 0xE0);       //
     selection Pin113 to GPO High
    IoWrite8 (NCT6776F_CONFIG_DATA , 0x00);
    IoWrite8 (NCT6776F_CONFIG_INDEX , 0xE1);
    IoWrite8 (NCT6776F_CONFIG_DATA , 0x01);
    IoWrite8 (NCT6776F_CONFIG_INDEX , 0xE5);       //
     selection Pin113 to WDTO
    IoWrite8 (NCT6776F_CONFIG_DATA , 0x01);

    IoWrite8 (NCT6776F_CONFIG_INDEX , 0x2C);       //
     Pin113 function selection to GPIOA0
    Data8 = IoRead8(NCT6776F_CONFIG_DATA) & 0xFE;
    IoWrite8 (NCT6776F_CONFIG_DATA , Data8);

    IoWrite8 (NCT6776F_CONFIG_INDEX ,
     NCT6776F_LDN_SEL_REGISTER);
    IoWrite8 (NCT6776F_CONFIG_DATA , NCT6776F_LDN_GPIO2);

    IoWrite8 (NCT6776F_CONFIG_INDEX ,
     NCT6776F_ACTIVATE_REGISTER);
    Data8 = IoRead8(NCT6776F_CONFIG_DATA) | SetupData-
     >WDT_Control ;
    IoWrite8 (NCT6776F_CONFIG_DATA , Data8);

    IoWrite8(NCT6776F_CONFIG_INDEX, 0xF5);
    Data8 = IoRead8(NCT6776F_CONFIG_DATA) | SetupData-
     >WDT_CountMode;
    IoWrite8 (NCT6776F_CONFIG_DATA , Data8);

    IoWrite8(NCT6776F_CONFIG_INDEX, 0xF6);
    IoWrite8(NCT6776F_CONFIG_DATA, SetupData-
     >WDT_TimeOut);

    SIOConfigExit();
}
```

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Appendix B - System Resources

B.1 System Memory Map

Address Range (decimal)	Address Range (hex)	Size	Description
(4GB-8MB)	FFE00000 – FFFFFFFF	8 MB	High BIOS Area
(4GB-18MB) – (4GB-17MB-1)	FEE00000 – FEEFFFFF	1 MB	FSB Interrupt Memory Space
(4GB-20MB) – (4GB-19MB-1)	FEC00000 – FECFFFFF	1 MB	APIC Configuration Space
960 K – 1024 K	F0000 – FFFFF	64 KB	System BIOS Area
896 K – 960 K	E0000 – EFFFF	64 KB	Extended System BIOS Area
768 K – 896 K	C0000 – DFFFF	128 KB	PCI expansion ROM area C0000 – C7FFF: Onboard VGA BIOS CB800 – CC7FFF: Intel 82578DM PXE option ROM when onboard LAN boot ROM is enabled.
640 K – 768 K	A0000 – BFFFF	128 KB	Video Buffer & SMM space
0 K – 640 K	00000 – 9FFFF	640 KB	DOS Area

Table B-1: System Memory Map

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B.2 Direct Memory Access Channels

Channel Number	Data Width	System Resource
0		Open
1		Open
2		Open
3		Open
4		Direct Memory Access Controller
5		Open
6		Open
7		Open

Table B-2: Direct Memory Access Channels

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B.3 Fixed I/O Map

Hex Range	Device
000-00F	Direct memory access controller
010-01F	Motherboard resources
020-021	Programmable interrupt controller
022-03F	Motherboard resources
040-043	System timer
044-04F	Motherboard resources
050-053	System timer
054-05F	Motherboard resources
060-060	Standard 101/102-Key or Microsoft Natural PS/2
061-061	Motherboard resources
063-063	Motherboard resources
064-064	Standard 101/102-Key or Microsoft Natural PS/2
065-065	Motherboard resources
067-067	Motherboard resources
070-070	Motherboard resources
071-07F	System CMOS/real time clock
072-07F	Motherboard resources
080-080	Motherboard resources
081-083	Direct memory access controller
084-086	Motherboard resources
087-087	Direct memory access controller
088-088	Motherboard resources
089-08B	Direct memory access controller
08C-08E	Motherboard resources
08F-08F	Direct memory access controller
090-092	Motherboard resources
093-09F	Direct memory access controller
0A0-0A1	Programmable interrupt controller
0A2-0BF	Motherboard resources
0C0-ODF	Direct memory access controller
0E0-0EF	Motherboard resources

Table B-3: Fixed I/O Map

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Hex Range	Device
0F0-0FF	Numeric data processor
274-277	ISAPNP Read Data Port
279-279	ISAPNP Read Data Port
290-29F	Motherboard resources
3B0-3BB	Intel HD Graphics Family
3C0-3DF	Intel HD Graphics Family
400-453	Motherboard resources
454-457	Motherboard resources
458-47F	Motherboard resources
4D0-4D1	Motherboard resources
500-57F	Motherboard resources
680-69F	Motherboard resources
A20-A2F	Motherboard resources
A79-A79	ISAPNP Read Data Port
C80-C87	Communications Port (COM1)
C88-C8F	Communications Port (COM2)
C90-C97	Communications Port (COM3)
C98-C9F	Communications Port (COM4)
1000-100F	Motherboard resources
164E-164F	Motherboard resources
E000-E01F	Intel 82574L Gigabit Network Connection
E020-EFFF	Intel 6 Series/C220 Series Chipset Family PCI Express
F000-F03F	Intel HD Graphics Family
F040-F05F	Intel 6 Series/C220 Series Chipset Family SMBus
F060-F07F	Intel 82579LM Gigabit Network Connection
F080-F08F	Intel 6 Series/C220 Series Chipset Family 2 port Serial
F090-F09F	Intel 6 Series/C220 Series Chipset Family 2 port Serial
F0A0-F0A3	Intel 6 Series/C220 Series Chipset Family 2 port Serial
F080-F087	Intel 6 Series/C220 Series Chipset Family 2 port Serial
F0C0-F0C3	Intel 6 Series/C220 Series Chipset Family 2 port Serial
F0D0-F0D7	Intel 6 Series/C220 Series Chipset Family 2 port Serial
F0E0-F0EF	Intel 6 Series/C220 Series Chipset Family 4 port Serial

Table B-3: Fixed I/O Map

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Hex Range	Device
F0F0-F0FF	Intel 6 Series/C220 Series Chipset Family 4 port Serial
F100-F103	Intel 6 Series/C220 Series Chipset Family 4 port Serial
F110-F117	Intel 6 Series/C220 Series Chipset Family 4 port Serial
F120-F123	Intel 6 Series/C220 Series Chipset Family 4 port Serial
F130-F137	Intel 6 Series/C220 Series Chipset Family 4 port Serial
FFFF-FFFF	Motherboard resources

Table B-3: Fixed I/O Map

B.4 Variable I/O Map

Hex Range	Device
400	ACPI
Anywhere in 64KB I/O Space	USB UHCI Controller #1
Anywhere in 64KB I/O Space	USB UHCI Controller #2
580	SMBUS
460	TCO
500	GPIO
C80/C88/C90/C98	Serial Port 1, Serial Port 2, Serial Port 3,
290	Hardware Monitor

Table B-4: Variable I/O Map

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B.5 Interrupt Request (IRQ) Lines

IRQ Lines APIC Mode

IRQ#	Typical Interrupt Resource
0	System timer
1	Standard 101/102-Key or Microsoft Natural PS/2 Keyboard
2	N/A
3	N/A
4	N/A
5	Communications Port (COM1)
6	N/A
7	Communications Port (COM2)
8	System CMOS/real time clock
9	Microsoft ACPI-Compliant System
10	Communications Port (COM3)
11	Communications Port (COM4)
12	Microsoft PS/2 Mouse
13	Numeric data Processor
3	Intel 6 Series/C220 Series Chipset Family SMBus Controller-
16	Intel 6 Series/C220 Series Chipset Family PCI Express Root
16	Intel 6 Series/C220 Series Chipset Family USB Enhanced
16	Intel HD Graphics Family
16	Intel Management Engine Interface
17	Intel 6 Series/C220 Series Chipset Family PCI Express Root
19	Intel 6 Series/C220 Series Chipset Family 2 port Serial ATA
19	Intel 6 Series/C220 Series Chipset Family 4 port Serial ATA
19	Intel 6 Series/C220 Series Chipset Family PCI Express Root
19	Intel 82574L Gigabit Network Connection
20	Intel 82579LM Gigabit Network Connection
22	Microsoft UAA Bus Driver for High definition Audio
23	Intel 6 Series/C220 Series Chipset Family USB Enhanced

Table B-5: IRQ Lines APIC Mode

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B.6 PCI Configuration Space Map

Bus #	Device #	Function #	Routing	Description
00h	00h	00h	N/A	Intel QM67 Host Processor Bridge
00h	02h	00h	Internal	Intel Integrated Graphics Device
00h	16h	00h	Internal	Intel Management Engine Interface
00h	16h	03h	Internal	KT Controller
00h	19h	00h	Internal	GbE Controller
00h	1Ah	00h	Internal	Intel USB EHCI Controller #2
00h	1Bh	00h	Internal	High Definition Audio controller
00h	1Ch	00h	Internal	Intel ICH Express Root port #1
00h	1Ch	01h	Internal	Intel ICH Express Root port #2
00h	1Ch	07h	Internal	Intel ICH Express Root port #8
00h	1Dh	00h	Internal	Intel USB EHCI Controller #1
00h	1Fh	00h	Internal	LPC Controller
00h	1Fh	02h	Internal	SATA Controller #1
00h	1Fh	03h	Internal	SMBus Controller
00h	1Fh	05h	Internal	SATA Controller #2
02h	00h	00h	External	Texas Instruments PCI Bridge
04h	00h	00h	External	Intel Ethernet

Table B-6: PCI Configuration Space Map

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B.7 PCI Interrupt Routing Map

PIR	A	B	C	D	E	F	G	H
IGD	X							
Intel ME	INTA	INTD	INTC	INTB				
GbE Controller					X			
EHCI Controller #1	X							
EHCI Controller #0								X
HDA Controller							X	
PCIE port 0	INTA	INTB	INTC	INTD				
LPC Controller	INTF	NTD	INTC	INTA				
SATA Controller0			X	X				
SATA Controller1				X				
SMBus Controller			X					

Table B-7: PCI Interrupt Routing Map

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Important Safety Instructions

For user safety, please read and follow all **instructions**, **WARNINGS**, **CAUTIONS,** and **NOTES** marked in this manual and on the associated equipment before handling/operating the equipment.

- Read these safety instructions carefully.
- Keep this user's manual for future reference.
- Read the specifications section of this manual for detailed information on the operating environment of this equipment.
- When installing/mounting or uninstalling/removing equipment:
  - Turn off power and unplug any power cords/cables.
- To avoid electrical shock and/or damage to equipment:
  - Keep equipment away from water or liquid sources;
  - Keep equipment away from high heat or high humidity;
  - Keep equipment properly ventilated (do not block or cover ventilation openings);
  - Make sure to use recommended voltage and power source settings;
  - Always install and operate equipment near an easily accessible electrical socket-outlet;
  - Secure the power cord (do not place any object on/over the power cord);
  - Only install/attach and operate equipment on stable surfaces and/or recommended mountings; and,
  - If the equipment will not be used for long periods of time, turn off and unplug the equipment from its power source.

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- Never attempt to fix the equipment. Equipment should only be serviced by qualified personnel.

A Lithium-type battery may be provided for uninterrupted, backup or emergency power.



Risk of explosion if battery is replaced with one of an incorrect type. Dispose of used batteries appropriately.

- Equipment must be serviced by authorized technicians when:
  - The power cord or plug is damaged;
  - Liquid has penetrated the equipment;
  - It has been exposed to high humidity/moisture;
  - It is not functioning or does not function according to the user's manual;
  - It has been dropped and/or damaged; and/or,
  - It has an obvious sign of breakage.

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