EPC-2000 Series

Fanless Embedded Computer with Intel® Atom™ D525 Platform

User's Manual

Version 1.0

P/N: 4012200000100P

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Contents

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Declaration of Conformity

CE

The CE symbol on your product indicates that it is in compliance with the directives of the Union European (EU). A Certificate of Compliance is available by contacting Technical Support.

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. This kind of cable is available from ARBOR. Please contact your local supplier for ordering information.

> Warning
> This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Class A

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1)This device may not cause harmful interference, and

(2)This device must accept any interference received, including interference that may cause undesired operation.

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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ARBOR Technology Corp. certifies that all components in its products are in compliance and conform to the European Union's Restriction of Use of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive 2002/95/EC.

The above mentioned directive was published on 2/13/2003. The main purpose of the directive is to prohibit the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) in electrical and electronic products. Member states of the EU are to enforce by 7/1/2006.

ARBOR Technology Corp. hereby states that the listed products do not contain unintentional additions of lead, mercury, hex chrome, PBB or PBDB that exceed a maximum concentration value of 0.1% by weight or for cadmium exceed 0.01% by weight, per homogenous material. Homogenous material is defined as a substance or mixture of substances with uniform composition (such as solders, resins, plating, etc.). Lead-free solder is used for all terminations (Sn(96-96.5%), Ag(3.0-3.5%) and Cu(0.5%)).

SVHC / REACH

To minimize the environmental impact and take more responsibility to the earth we live, Arbor hereby confirms all products comply with the restriction of SVHC (Substances of Very High Concern) in (EC) 1907/2006 (REACH --Registration, Evaluation, Authorization, and Restriction of Chemicals) regulated by the European Union.

All substances listed in SVHC < 0.1 % by weight (1000 ppm)

Important Safety Instructions

Read these safety instructions carefully.

1. Read all cautions and warnings on the equipment.
2. Place this equipment on a reliable surface when installing. Dropping it or letting it fall may cause damage
3. Make sure the correct voltage is connected to the equipment.
4. For pluggable equipment, the socket outlet should be near the equipment and should be easily accessible.
5. Keep this equipment away from humidity.
6. Disconnect this equipment from the A/C outlet before cleaning it. Use a moist cloth. Do not use liquid or sprayed detergent for cleaning.
7. The openings on the enclosure are for air convection and protect the equipment from overheating. DO NOT COVER THE OPENINGS.
8. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
9. If the equipment will not be used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.
10. Never pour any liquid into opening. This may cause fire or electrical shock.
11. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
12. If one of the following situations arises, get the equipment checked by service personnel:
    a. The power cord or plug is damaged.
    b. Liquid has penetrated into the equipment.
    c. The equipment has been exposed to moisture.
    d. The equipment does not work well, or you cannot get it to work according to the user's manual.
    e. The equipment has been dropped or damaged.
    f. The equipment has obvious signs of breakage.
13. The sound pressure level at the operator's position, according to IEC 704-1:1982, is no more than 70dB(A).
14. Keep this User’s Manual for later reference.

About This User's Manual

This User's Manual is intended for experienced users and integrators with hardware knowledge of personal computers. If you are not sure about any description in this User's Manual, please consult your vendor before further handling.

Warning

The Box PC and its components contain very delicately Integrated Circuits (IC). To protect the Box PC and its components against damage caused by static electricity, you should always follow the precautions below when handling it:

1. Disconnect your Box PC from the power source when you want to work on the inside.
2. Use a grounded wrist strap when handling computer components.
3. Place components on a grounded antistatic pad or on the bag that comes with the Box PC, whenever components are separated from the system.

Replacing the Lithium Battery

Incorrect replacement of the lithium battery may lead to a risk of explosion.
The lithium battery must be replaced with an identical battery or a battery type recommended by the manufacturer.
Do not throw lithium batteries into the trash can. It must be disposed of in accordance with local regulations concerning special waste.

Technical Support

If you have technical difficulties, please consult the user's manual first at:

ftp://ftp.arbor.com.tw/pub/manual

Please do not hesitate to call or e-mail our customer service when you still cannot find out the answer.

http://www.arbor.com.tw E-mail:info@arbor.com.tw

Warranty

This product is warranted to be in good working order for a period of one year from the date of purchase. Should this product fail to be in good working order at any time during this period, we will, at our option, replace or repair it at no additional charge except as set forth in the following terms. This warranty does not apply to products damaged by misuse, modifications, accident or disaster.

Vendor assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, or inability to use this product. Vendor will not be liable for any claim made by any other related party.

Vendors disclaim all other warranties, either expressed or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose, with respect to the hardware, the accompanying product's manual(s) and written materials, and any accompanying hardware. This limited warranty gives you specific legal rights.

Return authorization must be obtained from the vendor before returned merchandise will be accepted. Authorization can be obtained by calling or faxing the vendor and requesting a Return Merchandise Authorization (RMA) number. Returned goods should always be accompanied by a clear problem description.

Ordering Information

EPC-2020	EPC-2000 with 1 x PCIe slot & 1 x PCI slot
EPC-2030	EPC-2000 with 2 x PCIe slot & 1 x PCI slot
PAC-P065W	65W AC/DC adapter kit
SSD-25080	Intel® 2.5" 80GB SATAII SSD kit
WMK-2000	Wall mount kit for EPC-2000 series
DRK-2000	Din rail mounting kit for EPC-2000 series
DIO-16/16L(PCI)H	16-CH Input / 16-CH Output isolated digital I/O
DIO-32/32L(PCI)H	32-CH Input / 32-CH Output Isolated digital I/O
COMM-2PD(PCI)H	2-CH isolated RS-422A/485 communication
TML-96	96-pin DIN-rail mountable screw terminal
TML-37	37-pin DIN-rail mountable screw terminal
CBL-96-1.5P	1.5M length shielding cable with 96-pin half-pitch connector at each end
CBL-37-1.5P	1.5M length shielding cable with 37-pin D-type (M) connector at each end

Chapter 1

General Information

1.1 Introduction

EPC-2000 Series is targeted at many different application fields. By adopting it, you can pinpoint specific markets, such as Automatic Optical Inspection, SMT/PCB Industry, In-Vehicle, environment-critical and space-critical applications.

- **All-In-One Platform**
  The CPU, DRAM and even software are integrated to provide a plug-and-play machine.
- **Compact-sized**
  The kernel of EPC-2000 Series is EmETXe-i2903, which is a multi-function COM (Computer-on-Module) embedded board. The whole system consumes only a few space.
- **Fanless, Cable-less and Modular Design**
  By using a low power processor, the system does not have to rely on fans, which are often unreliable and cause dust to circulate inside the equipment. The modular design facilitates maintenance or possible upgrades on the CPU board. Modular Box PC can be easily modified to fit many different applications according to customers' requests.
- **Powerful Communication Capability**
  The EPC-2000 Series provides COM, Ethernet, USB, PCI slot, and PCIe slot.
- **Numerous Display/Video Output**
  Integrated with Intel® HD Graphics core, EPC-2000 Series improves graphics and 3D rendering performance and supports numerous display/video output options includes VGA and LVDS.
- **Advanced Storage Solution**
  EPC-2000 Series comes with CFast slot, which offers a better, faster and more cost-effective expansibility for various applications.
- **Trustworthy**
  The onboard Watchdog Timer can invoke an NMI or system RESET when your application loses control over the system.

1.2 Packing List

After opening the package, carefully inspect the contents. If any of the items is missing or appears damaged, please contact with your local dealer or distributor. The package should contain the following items:

Standard:

1 x EPC-2000 Series Box PC

1 x Accessory Box
(Driver CD/User's Manual/Screws/
Cable/Terminal Block)

1 x Wall-mount kit for EPC-2000 Series

Options:
The following items are normally optional, but some vendors may include them as a standard package, or some vendors may not to carry all the items.

Optional Accessories

PAC-P065W
65W AC/DC adapter kit

SSD-25080
Intel® 2.5" 80GB SATAII SSD kit

WMK-2000
Wall-mount kit for EPC-2000 Series

DRK-2000
Din rail mounting kit for EPC-2000 Series

Optional I/O Expansion

DIO-16/16L(PCI)H
16-CH Input / 16-CH Output Isolated
Digital I/O Board for PCI

DIO-32/32L(PCI)H
32-CH Input / 32-CH Output Isolated
Digital I/O Board for PCI

COMM-2PD(PCI)H
2-CH Isolated RS-422A/485 Communication I/O Board with Isolation for PCI

TML-96
96-pin Din Rail Mountable Screw Terminal

TML-37
37-pin Din Rail Mountable Screw Terminal

CBL-96-1.5P
1.5M length Shielding Cable with 96-pin Half-pitch Connector at Each End

CBL-37-1.5P
1.5M length Shielding Cable with 37-pin D-type (M) Connector at Each End

1.3 The Installation Paths of CD Driver

Windows 2000 & XP

Driver	Path
CHIPSET	\CHIPSET\INF 9.11
LAN	\ETHERNET\INTEL\82574L\WINXP_32_155 \ETHERNET\INTEL\82574L\WINXP_64_155
VGA	\GRAPHICS\INTEL_2K_XP_32\5182
AUDIO	\AUDIO\REALTEK_HD\WIN2K_XP_x86x64_R252

Windows 7

Driver	Path
CHIPSET	\CHIPSET\INF 9.11
LAN	\ETHERNET\INTEL\82574L\WIN7_32 \ETHERNET\INTEL\82574L\WIN7_64
VGA	\GRAPHICS\INTEL_WIN7_32\2230 \GRAPHICS\INTEL_WIN7_64\2214
AUDIO	\AUDIO\REALTEK_HD\Win7_R252

1.4 Specifications

System Kernel	
Processor	Soldered onboard Intel® Atom™ D525 processor
BIOS	AMI Flash BIOS
Chipset	Intel® ICH8M
Graphics	Integrated with Intel® GMA 3150
System Memory	Soldered onboard DDR3 2GB SDRAM
Serial ATA	1 x 2.5" drive bay for SATA interface HDD/SSD, supporting 300MB/s HDD transfer rate 1 x CFast socket
Expansion Bus	Max. 2 x PCIex1 slots 1 x PCI slot
Ethernet Controller	2 x Intel® 82574L PCIe controllers
Watchdog Timer	1 ~ 255 levels reset

I/O Ports	
Serial Port	• 4 x COM ports with DB-9 male connectors • COM1~2: RS-232 • COM3~4: RS-232/422/485 selectable
USB Port	4 x USB type A connectors for USB 2.0 ports
LAN Port	2 x RJ-45 GbE ports
Video Port	1 x DB-15 female connector for Analog RGB 1 x DB-26 male connector for dual channel 24-bit LVDS port
KB/MS	PS/2 interface Keyboard/ Mouse via Y-cable
Audio	Mic-in/Line-out with Realtek ALC886 HD Audio CODEC
Storage	
HDD/SSD	1 x 2.5" drive bay for HDD or SSD
CF	1 x CFAST socket
Safety	
FCC	Class A certified
CE	Certified
Environment	
Operating Temp.	-20 ~ 60ºC (-4 ~ 140ºF), ambient w/ air flow
Storage Temp.	-40 ~ 85ºC (-40 ~ 185ºF)
Relative Humidity	10 ~ 95% @ 40ºC (non-condensing)
Vibration	$3G_{RMS}$/5 to 500Hz/random operation, with SSD
Shock & Crash	Operating 20G, 11ms; Non-operating 40G with HDD, 11ms Operating 40G, 11ms; Non-operating 60G with CFAST/SSD, 11ms Crash 80G, 11ms
Mechanical	
Construction	Aluminum alloy
Mounting	Support wall-mount/Din rail mounting
Weight	3 kg (8.6 lb)
Dimensions (W x D x H)	EPC-2020: 164 x 192 x 120 mm (6.46" x 7.56" x 4.72") EPC-2030: 164 x 192 x 140 mm (6.46" x 7.56" x 5.51")

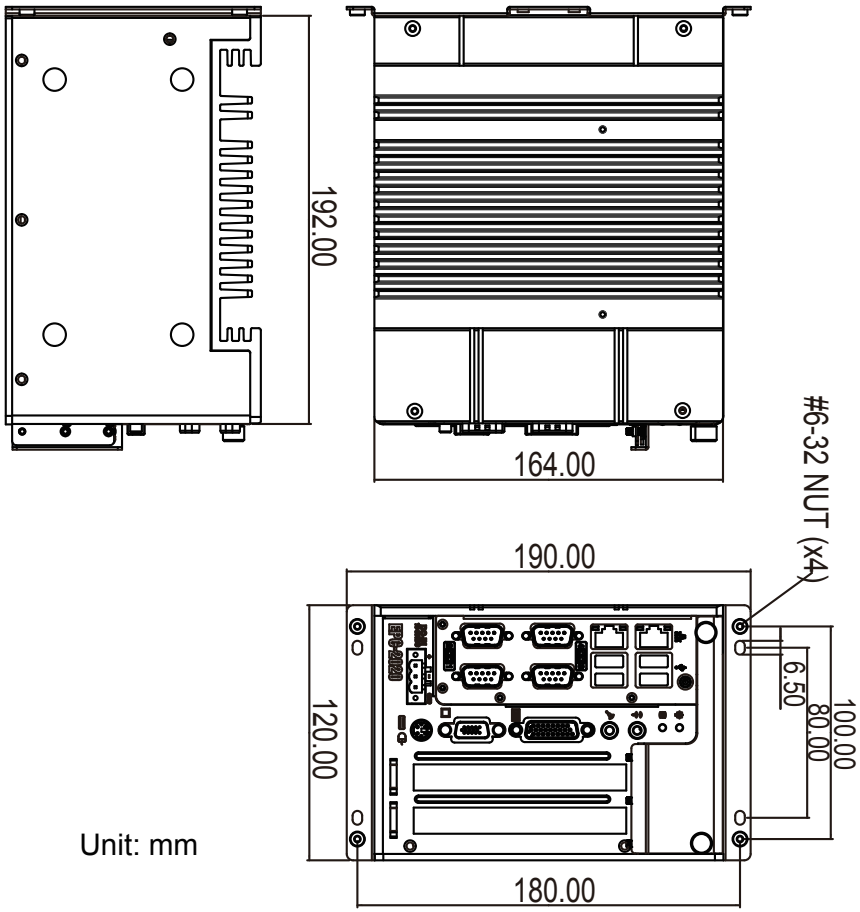
1.5 Power Information

Input Voltage	DC 10V~30V input (w/ 3-pin terminal block)
Power Consumption	60W (Max.)

1.6 Dimensions

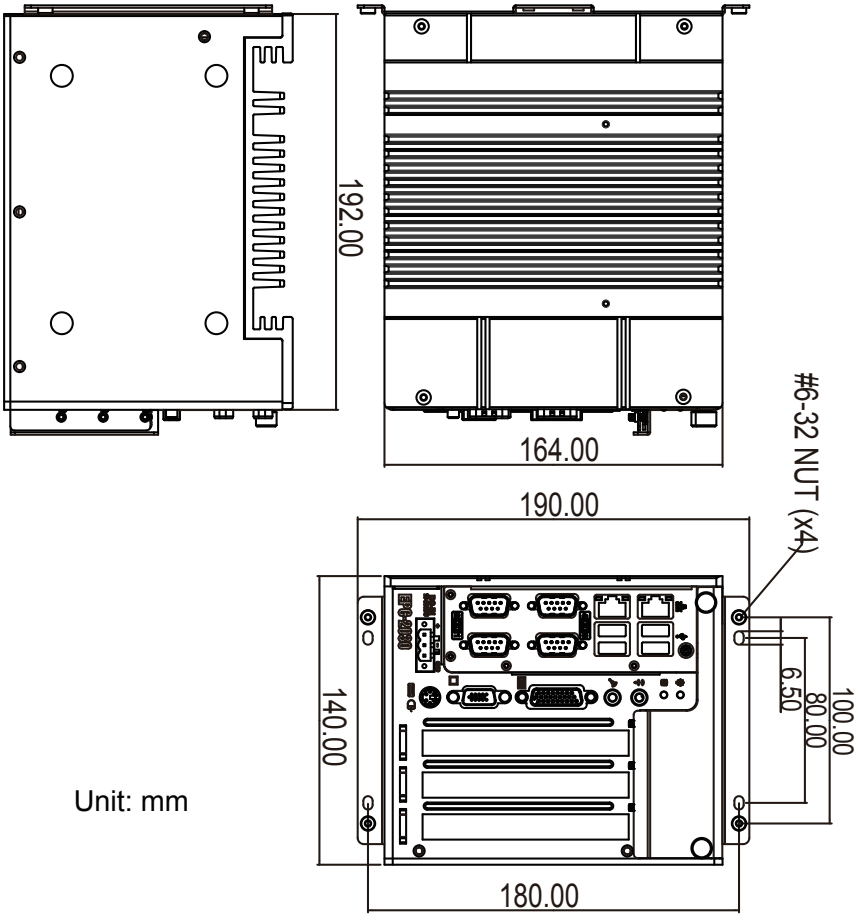
EPC-2020

- Dimension (W x D x H): 164 x 192 x 120 mm (6.46" x 7.56" x 4.72")



EPC-2030

- Dimension (W x D x H): 164 x 192 x 140 mm (6.46" x 7.56" x 5.51")



Unit: mm

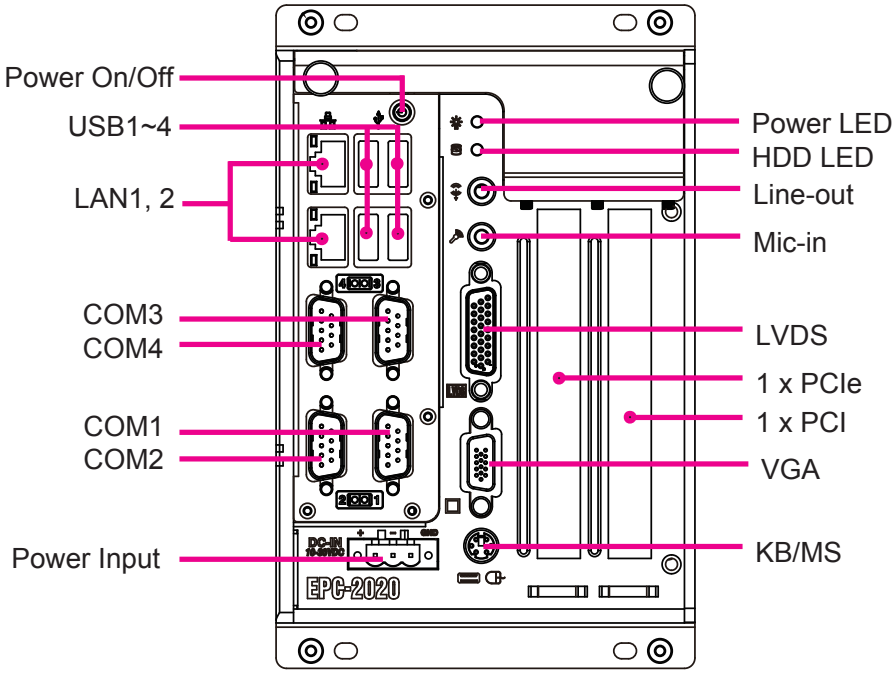
1.7 Locating Controls and Connectors

Both EPC-2020 and EPC-2030 have the same I/O ports and connectors at the front panel.

Please take a moment to identify those controls and connectors shown in the following figures.

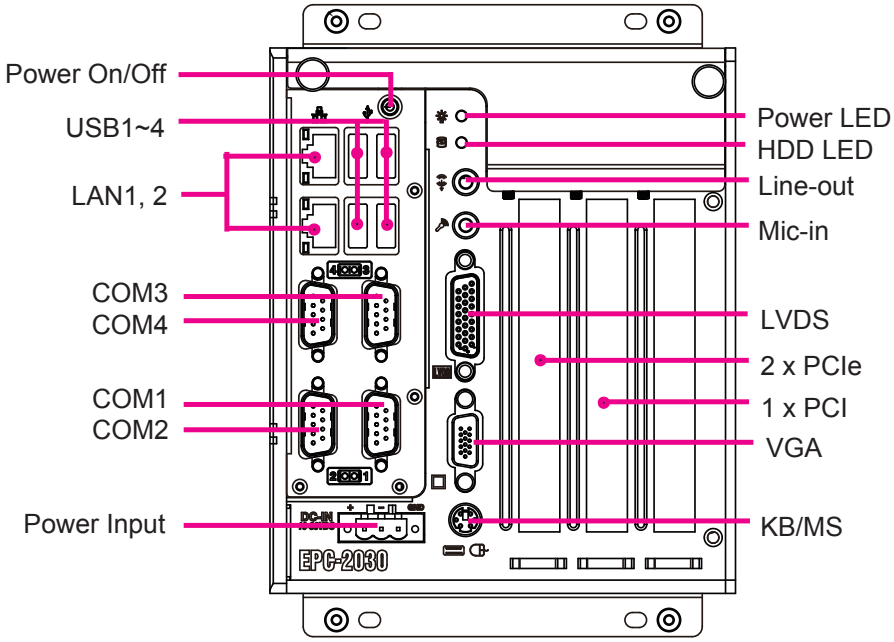
Front Panel

EPC-2020



Front Panel

EPC-2030

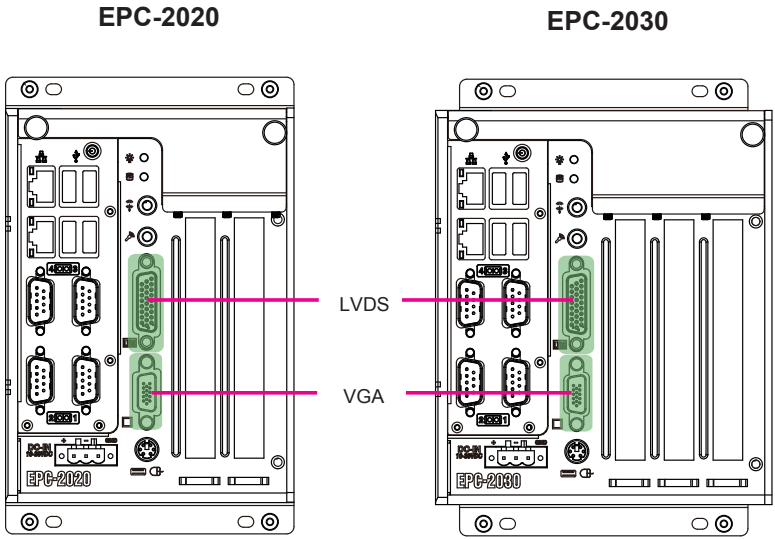


1.8 Connecting Peripherals

The user can use the I/O interfaces located at the front side of the chassis to connect to external peripheral devices, such as a mouse, a keyboard, a monitor, serial devices or parallel printer, etc. Before connection, make sure that the computer and the peripheral devices are turned off.

1.8.1 VGA/LVDS Video Outputs

Both EPC-2020 and EPC-2030 are equipped with two video outputs—one 15-pin VGA and one LVDS at the front side of the chassis for multiple display connections.

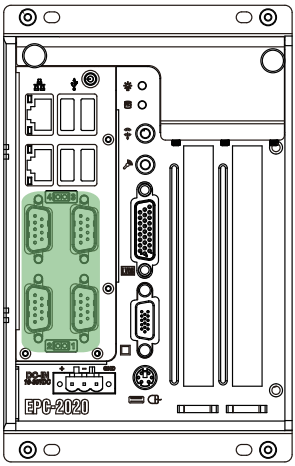


1.8.2 Serial Ports (COM1 ~4)

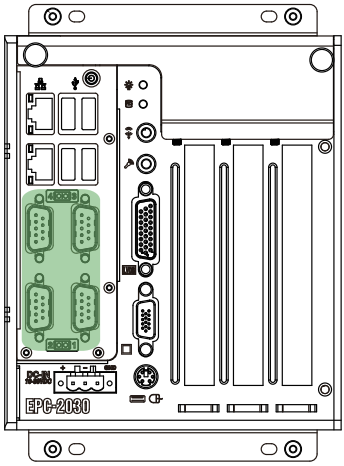
Both EPC-2020 and EPC-2030 support four onboard serial ports. The external COM1~4 connectors are D-SUB 9-pin male connectors. Each port supports RS-232; in addition, COM3, 4 support RS-232/422/485 selectable.

To connect to any serial device, follow the steps below:
1. Turn off the BOX PC system and the serial devices.
2. Attach the interface cable of the serial device to the serial connector. Be sure to fasten the retaining screws.
3. Turn on the computer and the attached serial devices.
4. Refer to the serial device's manual for instructions to configure the operation environment to recognize the new attached devices.
5. If the serial device needs specified IRQ or address, you may need to run the CMOS setup to change the hardware device setup.

EPC-2020



EPC-2030

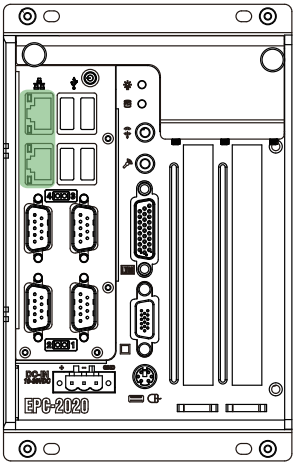


1.8.3 LAN Ports

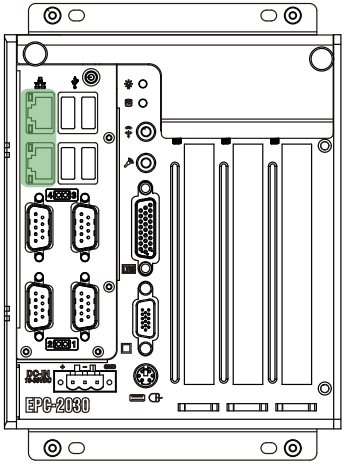
Both EPC-2020 & EPC-2030 provide two Intel® WG82574L 10/100/1000 Base-T Ethernet (RJ-45) interface. For network connection, follow the instructions below:

1. Turn off the BOX PC system and the Ethernet hubs.
2. Plug in one end of cable of a 10/100/1000Base-T hub to the system's RJ-45 jack.

EPC-2020



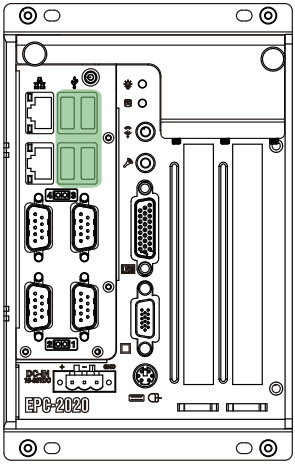
EPC-2030



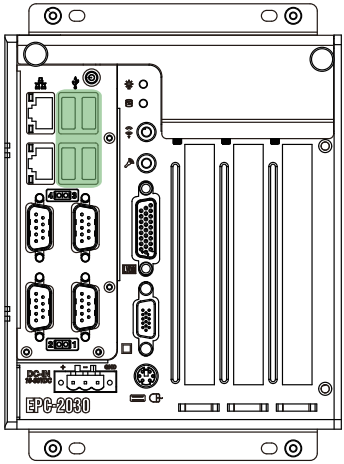
1.8.4 USB Ports

Both EPC-2020 & EPC-2030 have four USB ports on the front panel to connect to external USB devices. USB ports and devices are hot-pluggable. Therefore, any USB device can be connected at all time without turning off your system.

EPC-2020



EPC-2030

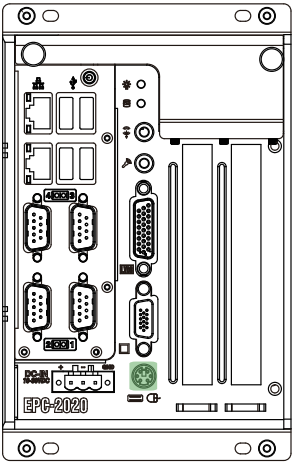


Note that for many of these devices, you will first have to install proper device drivers before they can be recognized by the system.

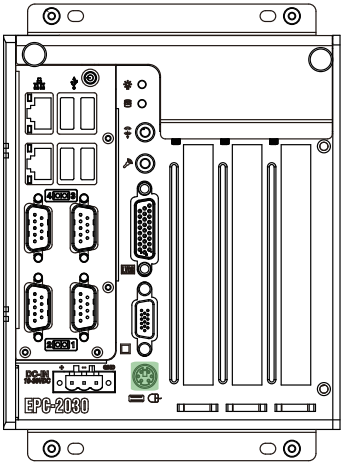
1.8.5 Keyboard and Mouse

Both EPC-2020 & EPC-2030 have one PS/2 keyboard/mouse connector located at the front panel.

EPC-2020



EPC-2030

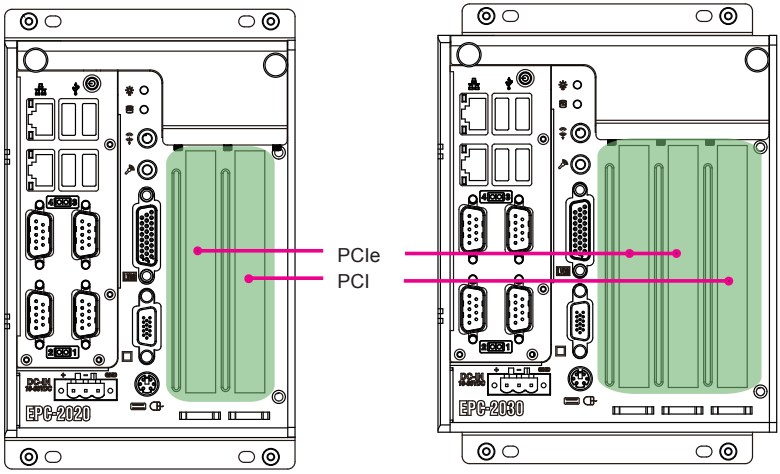


To connect an AT keyboard, an adapter between the PS/2 interface and the AT Keyboard is needed.

1.8.6 Expansion PCI/PCIe Slots

EPC-2020 has one PCIe slot and one PCI slot while EPC-2030 provides two PCIe slots and one PCI slot.

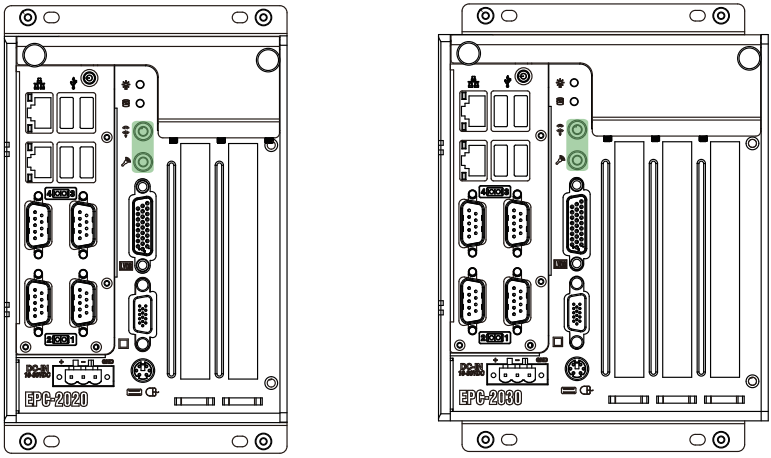
EPC-2020 **EPC-2030**



1.8.7 Audio Line-out/Mic-in

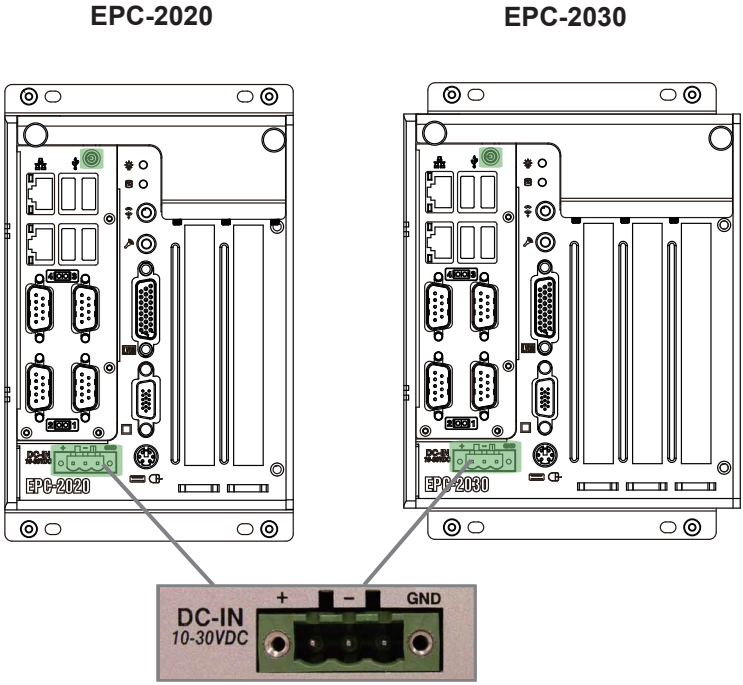
Two audio jacks for Line-out and Mic-in located at the front panel.

EPC-2020 **EPC-2030**



1.8.8 DC Power Input and Power ON/OFF Button

For DC power input, the computer is equipped with a 3-pin terminal block receptacle on the front panel. The “S/W” button located on the front panel is used to power ON/OFF the computer.



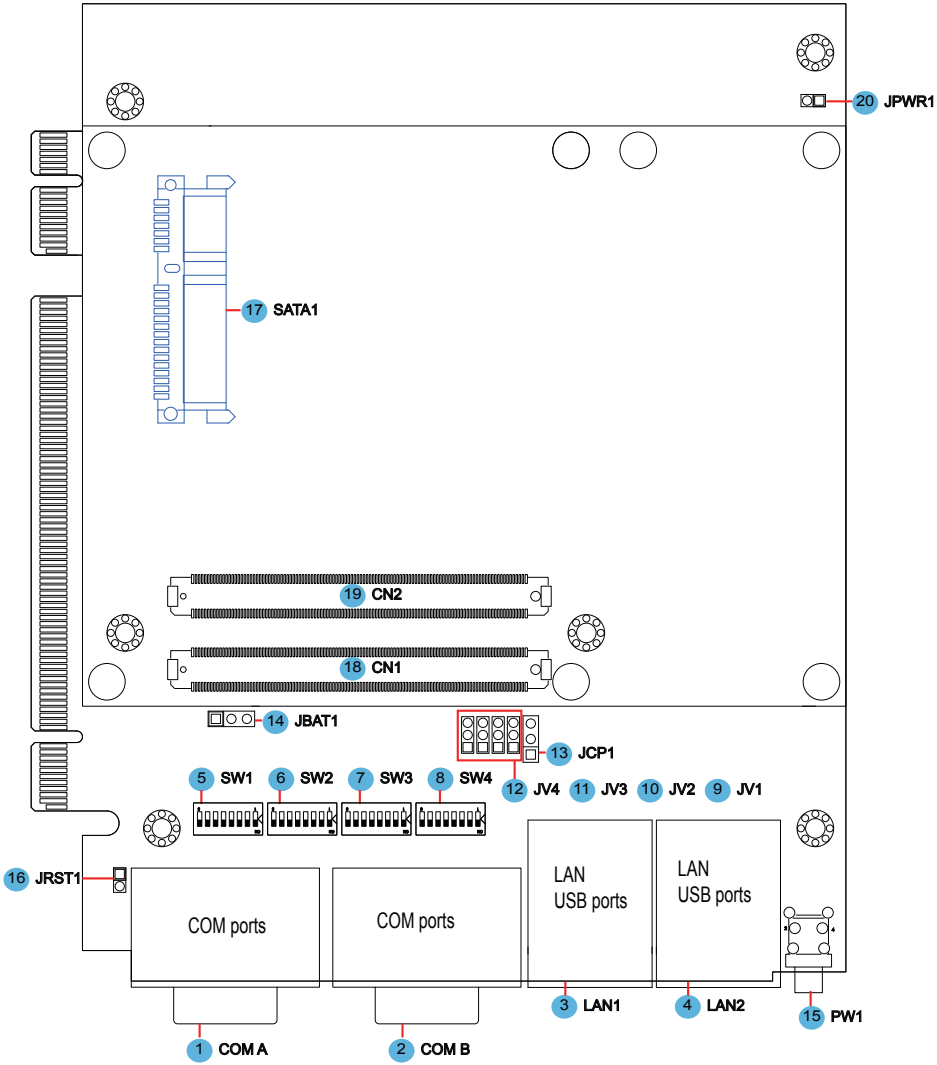
Chapter 2

The Engine of EPC-2000 Series

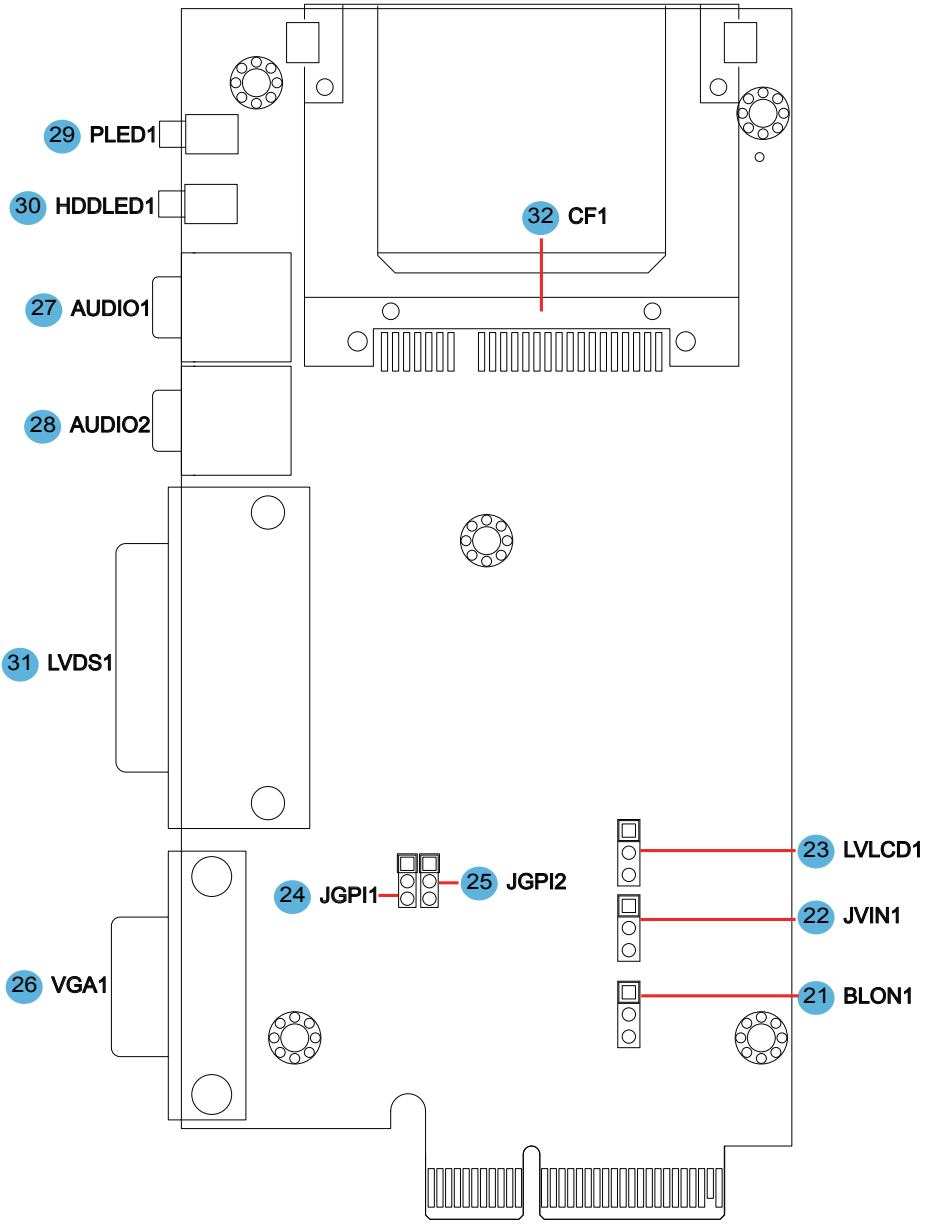
2.1 Board Layout

The engine of EPC-2020 / EPC-2030 is constructed by the combination of PCBA boards. To be specific, EmETXe-i2903, PBE-1902, SCDB-1283, PBR-3SA and PBR-4SA mainly. Such a combination makes system customization feasible. Therefore, this and next sections will introduce these two main boards in detail.

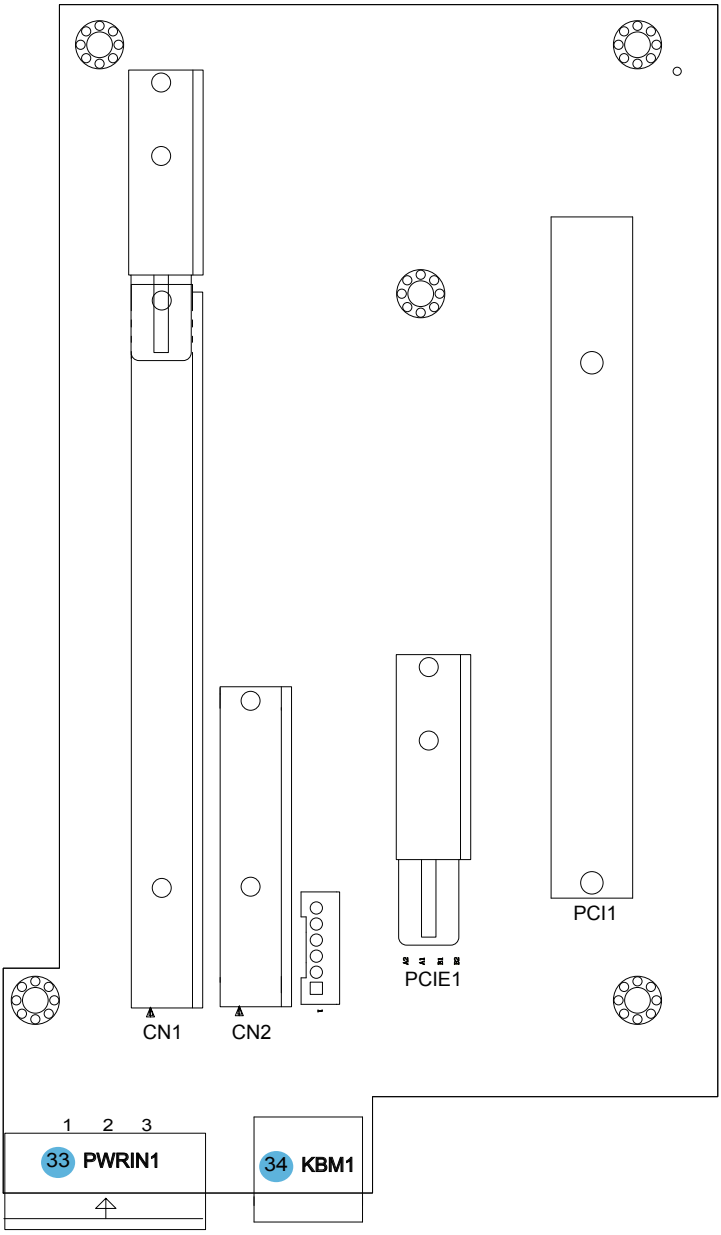
PBE-1902



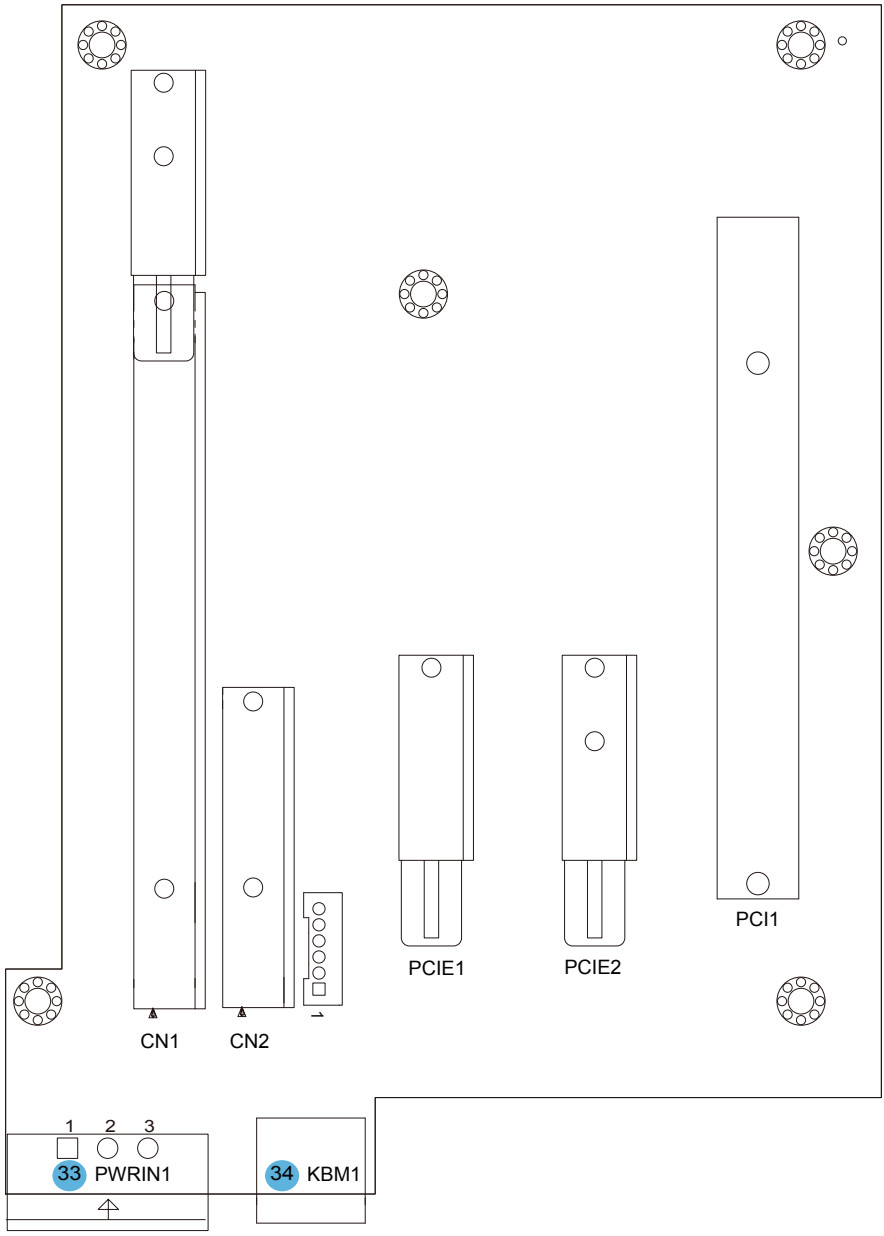
SCDB-1283


29 PLED1
30 HDDLED1
32 CF1
27 AUDIO1
28 AUDIO2
31 LVDS1
24 JGPI1
25 JGPI2
23 LVLCD1
22 JVIN1
21 BLON1
26 VGA1

PBR-3SA (for EPC-2020)



PBR-4SA (for EPC-2030)



2.2 Jumpers and Connectors

2.2.1 Jumpers & Connectors List

Jumpers

Label	Function
SW1~4	COM 3/4 RS-232/RS-422/RS-485 Function Select Jumpers
JV1~4	RI/5V/12V Selection For COM Ports
JCP1	COM Port Power Selection
JBAT1	Clear CMOS Setup
JRST1	Reset Pin Header
JPWR1	AT/ATX Power Mode Selection
BLON1	Backlight Enable Power Selection
JVIN1	Inverter Power Selection
LVLCD1	LCD Power Selection
JGPI1~2	LVDS Panel Type Select Jumpers

Connectors

Label	Function
COM A	RS-232 Serial Port Connector
COM B	RS-232/RS-422/RS-485 Serial Port Connector
LAN1~2	Ethernet Connectors (includes USB Connectors)
PW1	Power On/Off Switch
SATA1	Serial ATA and Power Connectors
CN1~2	COM Express Signal Slots
VGA1	Analog RGB Display Connector
AUDIO1	Audio Jack Connector (Line-out)
AUDIO2	Audio Jack Connector (Mic-in)
PLED1	Power Status LED
HDDLED1	HDD Status LED
LVDS1	LVDS Display Connector
CF1	CFast Slot
KBM1	PS/2 Keyboard and Mouse
PWRIN1	DC Adapter Power Input
PCIE1	PCIex1 Interface Slot
PCIE2	PCIex1 Interface Slot
PCI1	PCI Interface Slot

2.2.2 Jumper Setting

JCP1: COM Port Power Selection (13)

Pin	Description	
1-2	+5V (default)	
2-3	+12V	

JV1~4: RI/5V/12V D-sub Pin 9 Selection for COM Ports (9, 10, 11, 12)

Pin	Description	
1-2	RI (default)	
2-3	5V or 12V (depends on JCP1)	

JBAT1: Clear CMOS Setting (14)

Pin	Description	
1-2	Keep CMOS (default)	
2-3	Clear CMOS	

JPWR1: AT/ATX Power Mode Selection (20)

AT mode	ATX Mode (default)
	

BLON1: Backlight Enable Power Selection (21)

Pin	Description	
1-2	Backlight Enable = +5V (default)	
2-3	Backlight Enable = +3.3V	

JVIN1: Inverter Power Selection (22)

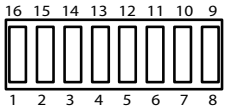
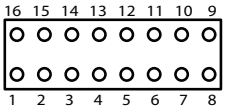
Pin	Description	
1-2	INV_VDD = +5V	
2-3	INV_VDD = +12V (default)	

LVLCD1: LCD Power Selection (23)

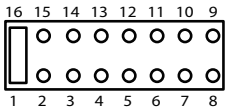
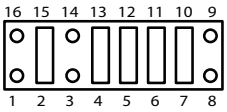
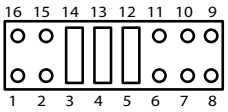
Pin	Description	
1-2	LCD_VDD = +5V	
2-3	LCD_VDD = +3.3V (default)	

SW1~2: COM3 RS-232/RS-422/RS-485 Function Selection (5, 6)

SW1 Setting

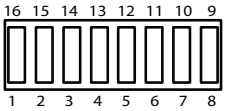
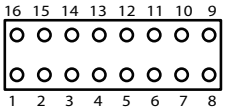
COM3	RS-232 (default)	RS-422&485
1-16	ON	OFF
2-15	ON	OFF
3-14	ON	OFF
4-13	ON	OFF
5-12	ON	OFF
6-11	ON	OFF
7-10	ON	OFF
8-9	ON	OFF
		

SW2 Setting

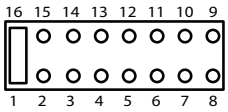
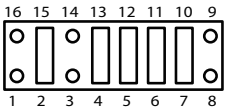
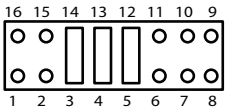
COM3	RS-232 (default)	RS-422	RS-485
1-16	ON	OFF	OFF
2-15	OFF	ON	OFF
3-14	OFF	OFF	ON
4-13	OFF	ON	ON
5-12	OFF	ON	ON
6-11	OFF	ON	OFF
7-10	OFF	ON	OFF
8-9	×	×	×
			

SW3~4: COM4 RS-232/RS-422/RS-485 Function Selection (7, 8)

SW3 Setting

COM4	RS-232 (default)	RS-422&485
1-16	ON	OFF
2-15	ON	OFF
3-14	ON	OFF
4-13	ON	OFF
5-12	ON	OFF
6-11	ON	OFF
7-10	ON	OFF
8-9	ON	OFF
		

SW4 Setting

COM4	RS-232 (default)	RS-422	RS-485
1-16	ON	OFF	OFF
2-15	OFF	ON	OFF
3-14	OFF	OFF	ON
4-13	OFF	ON	ON
5-12	OFF	ON	ON
6-11	OFF	ON	OFF
7-10	OFF	ON	OFF
8-9	×	×	×
			

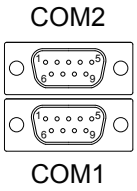
JGPI1~2: LVDS Panel Type Select Jumpers (24, 25)

Channel	JGPI1	JGPI2
18 to 18 (S) (default)	(2-3) 	(2-3) 
18 to 24 (S)	(2-3) 	(1-2) 
18 to 18 (D)	(1-2) 	(2-3) 
18 to 24 (D)	(1-2) 	(1-2) 

2.2.3 Pin Assignments for Connectors

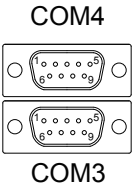
COM A: RS-232 Serial Port Connector (1)
Connector type: Double stacked D-Sub 9-pin male.

Pin	Description	Pin	Description
6	DSR#	1	DCD#
7	RTS#	2	RXD
8	CTS#	3	TXD
9	RI#	4	DTR#
		5	GND



COM B: RS-232/RS-422/RS-485 Serial Port Connectors (2)
Connector type: Double stacked D-Sub 9-pin male.

Pin	Description	Pin	Description
6	DSR#	1	DCD#
7	RTS#	2	RXD
8	CTS#	3	TXD
9	RI#	4	DTR#
		5	GND

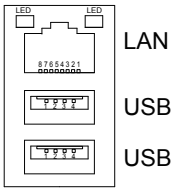


COM B (RS-422/485) PIN OUT

Pin	Description (RS-422)	Pin	Description (RS-485)
1	TXD-	1	DATA-
2	TXD+	2	DATA+
3	RXD+	3	NC
4	RXD-	4	NC
5	GND	5	GND
6	NC	6	NC
7	NC	7	NC
8	NC	8	NC
9	NC	9	NC

LAN1, 2: Ethernet Connectors (includes USB Connectors) (3, 4)
Connector type: RJ-45 + double stacked USB type A connector.

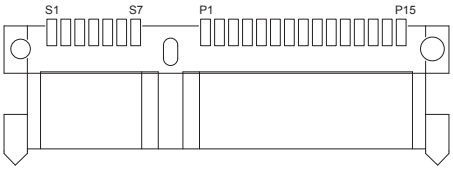
LAN (RJ-45)	
Pin	**Description**
1	MDI0+
2	MDI0-
3	MDI1+
4	MDI1-
5	MDI2+
6	MDI2-
7	MDI3+
8	MDI3-



USB (USB type A connector)	
Pin	**Description**
1	+5V
2	USB-
3	USB+
4	GND

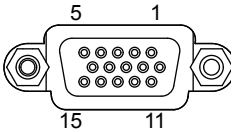
SATA1: Serial ATA and Power Connectors (17)

Pin	Description	Pin	Description	Pin	Description
S1	GND	P1	+3.3VDC	P9	+5VDC
S2	TX+	P2	+3.3VDC	P10	GND
S3	TX-	P3	+3.3VDC	P11	N/C
S4	GND	P4	GND	P12	GND
S5	RX-	P5	GND	P13	+12VDC
S6	RX+	P6	GND	P14	+12VDC
S7	GND	P7	+5VDC	P15	+12VDC
		P8	+5VDC		



VGA1: Analog RGB Display Connector (26)

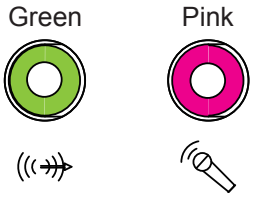
Three-row/15-pin VGA Connector



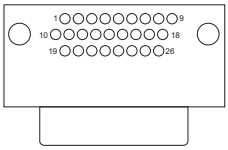
Pin	Description	Pin	Description	Pin	Description
1	RED	6	GND	11	N/C
2	GREEN	7	GND	12	VDDAT
3	BLUE	8	GND	13	HSYNC
4	N/C	9	VCC	14	VSYNC
5	GND	10	GND	15	VDCLK

AUDIO1: Audio Jack Connectors (27, 28)

Jack	Description
Green	Line-out
Pink	Mic-in



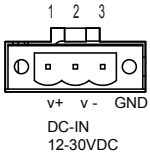
LVDS1: LVDS Display Connector (31)
Connector type: D-Sub 26-pin male.



Pin	Description	Pin	Description	Pin	Description
1	VDD	10	VDD	19	TX1_2+
2	TX0_CLK+	11	TX0_3+	20	TX1_2-
3	TX0_CLK-	12	TX0_3-	21	TX1_3+
4	TX0_0+	13	TX1_CLK+	22	TX1_3-
5	TX0_0-	14	TX1_CLK-	23	INV_VDD
6	TX0_1+	15	TX1_0+	24	BLON
7	TX0_1-	16	TX1_0-	25	BKLTCTL
8	TX0_2+	17	TX1_1+	26	GND
9	TX0_2-	18	TX1_1-		

PWRIN (DC Adapter Power Input) (33)

Pin	Description
1	VCC
2	GND
3	IO GND

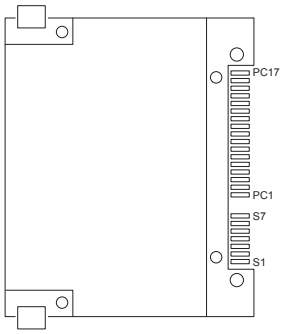


CF1: CFast Slot (32)

CFast Card Type I/II slot

Connector type: 7+17-pin CFast Card connector consisting of a SATA compatible 7-pin signal connector and a 17-pin power and control connector.

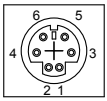
Pin	Description	Pin	Description
S1	GND	PC1	CDI
S2	TX+	PC2	GND
S3	TX-	PC3	TBD
S4	GND	PC4	TBD
S5	RX-	PC5	TBD
S6	RX+	PC6	TBD
S7	GND	PC7	GND
		PC8	LED1
		PC9	LED2
		PC10	IO1
		PC11	IO2
		PC12	IO3
		PC13	PWR
		PC14	PWR
		PC15	PGND
		PC16	PGND
		PC17	CDO



KBM1: Keyboard & Mouse Connector (34)

Connector type: 6-pin mini DIN.

Pin	Description
1	KB Data
2	MS Data
3	GND
4	+5V
5	KB Clock
6	MS Clock



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Chapter 3

Installation and Maintenance

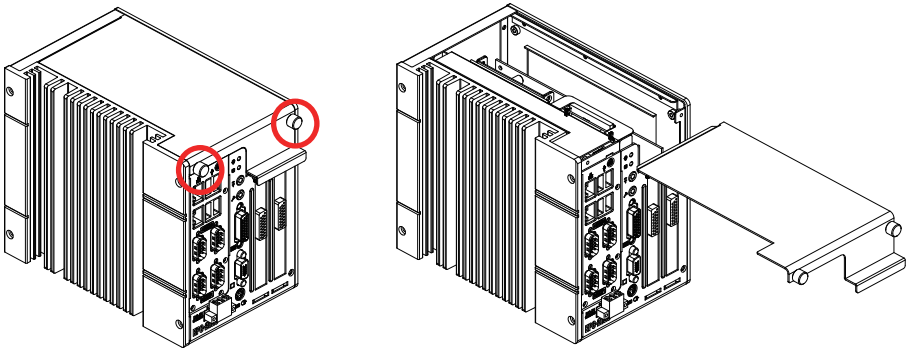
3.1 How to Install HDD, CFast, PCI/PCIe Card

EPC-2020 / EPC-2030 is designed to be modular, slim and lightweight for easier maintenance. The following sections describe simple hardware installations.

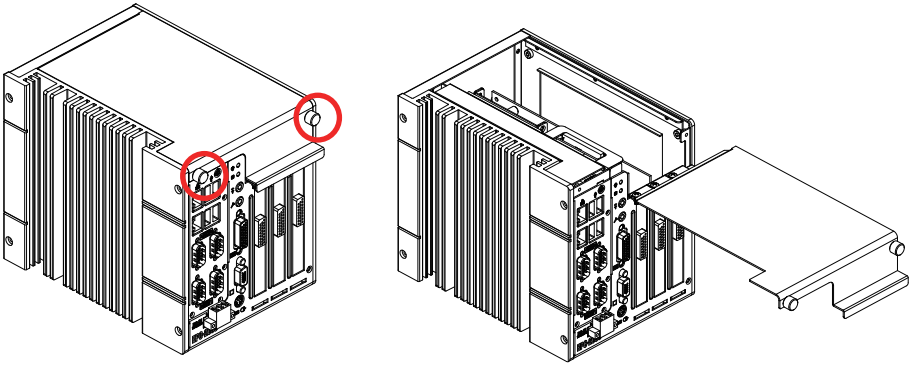
3.1.1 Removing Top Cover

1. Locate the two screws on front panel which secure the top cover.
2. Unscrew the two screws by hand or a screwdriver and slightly take the top cover off the unit.

EPC-2020



EPC-2030



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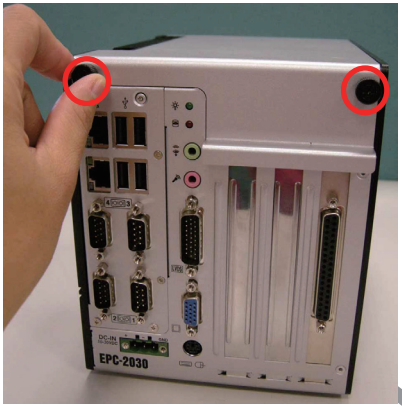

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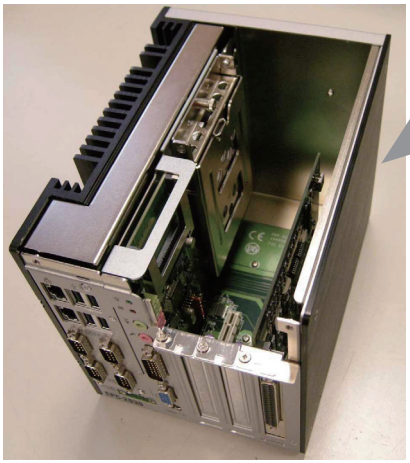
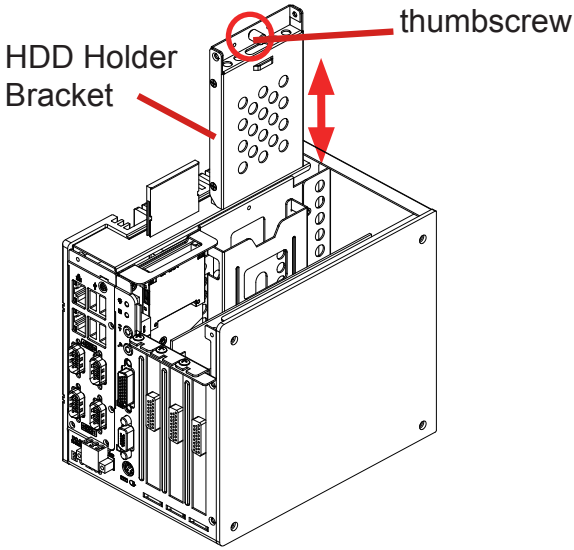
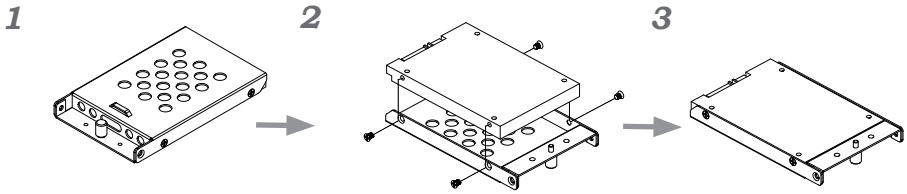
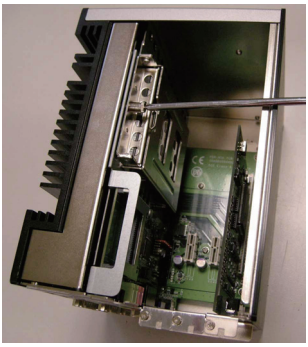


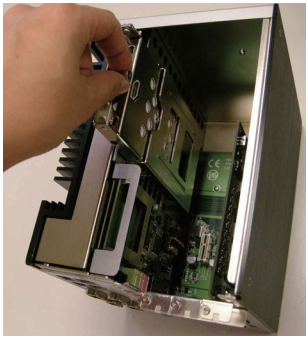
3.1.2 HDD/SSD Installation

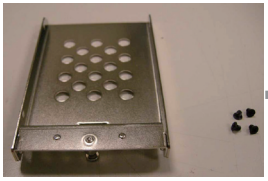
1. Before installing a CFast card, you should follow steps 1-2 in section 3.1.1 to remove the top cover of chassis.
2. Locate the thumbscrew securing the HDD holder bracket to the main unit.
3. Unscrew the screw by hand or a screwdriver and take the HDD holder bracket off the unit.
4. Put the HDD/SSD into the holder bracket included in the accessory package and secure them with the included screws.



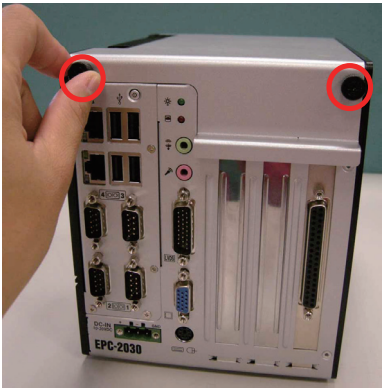








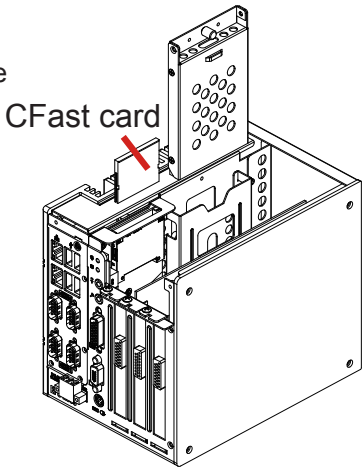
5. Press the HDD holder bracket back to the SATA connector and then fasten the thumbscrew.
6. Fasten the two screws that secure the top cover.



3.1.3 Install CFast Card

Make sure you have turned off the power before inserting or ejecting the CFast card (if OS is installed on CFast card).

1. Before installing a CFast card, you should follow steps 1-2 in section 3.1.1 to remove the top cover of chassis.
2. Insert your CFast card into the slot.
3. Fasten the two screws that secure the top cover.



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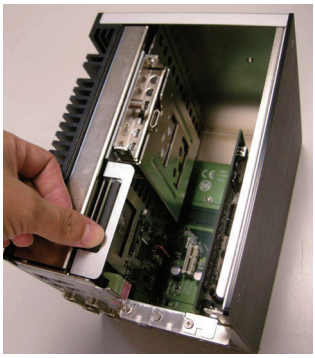

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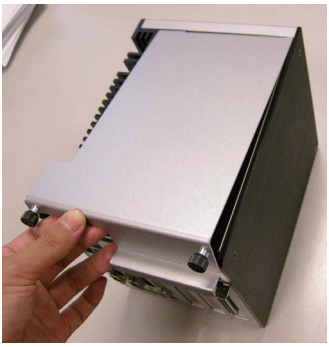

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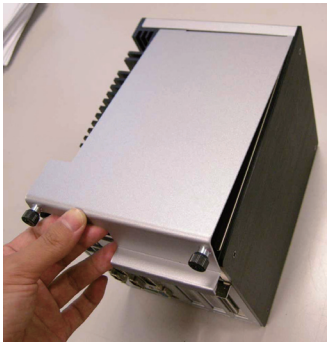
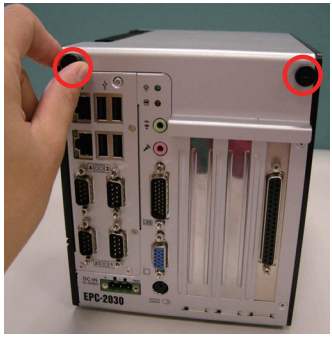
4. To remove the CFast card, follow the steps to remove the top cover and then push card inward to pop-out it from the slot.
5. Fasten the two screws that secure the top cover.





3.1.4 Install PCI/PCIe Card

1. Before installing a PCI/PCIe card, you should remove the top cover of chassis first.
2. Use a screwdriver to loose the screw that secures the expansion slot bracket. After removing the bracket, you can install a PCIe card to this expansion slot.
3. Insert PCI/PCIe card to the PCI/PCIe slot.
4. Secure the PCIe slot to the main unit with the accompanying screws.
5. Fasten the two screws that secure the top cover.

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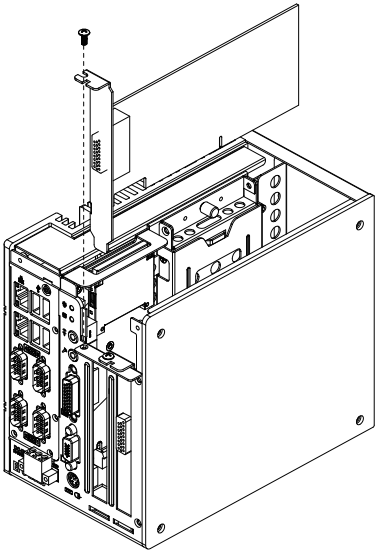
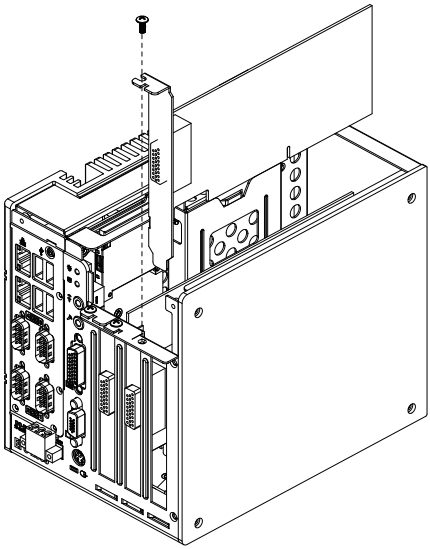


EPC-2030



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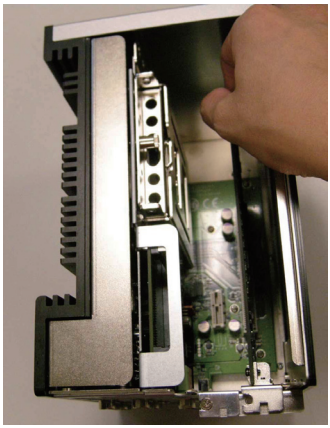

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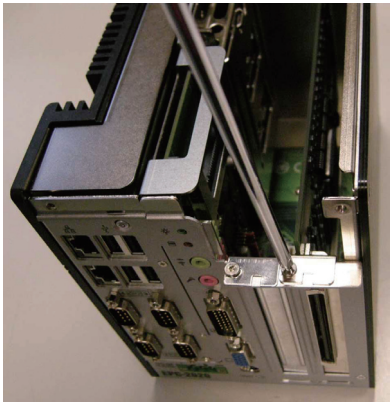
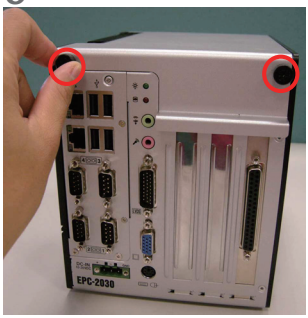


4

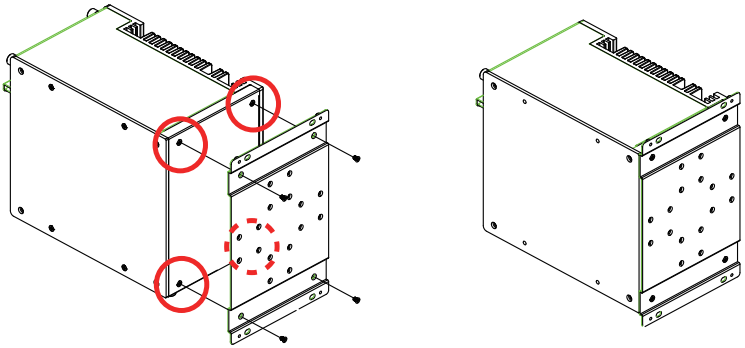
5



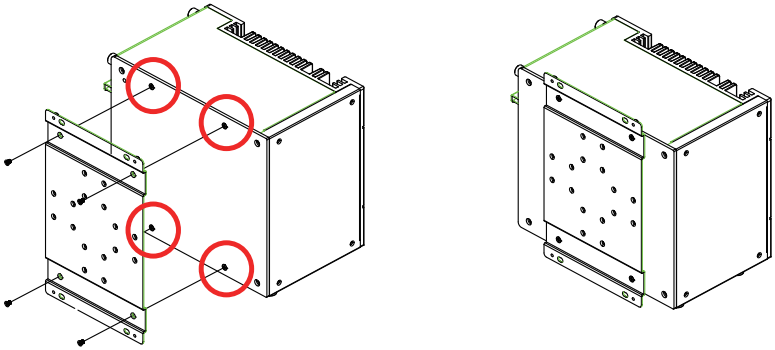
3.2 Wall Mounting

1. Find the wall-mount bracket and screws included in the accessory kit.
2. Select either the rear side or the right side to secure the wall-mouting bracket.
3. Locate the 4 screw holes on the rear side or the right side.
3. Match the screws on the wall-mount kit and secure them to the main unit.

On the Rear Side



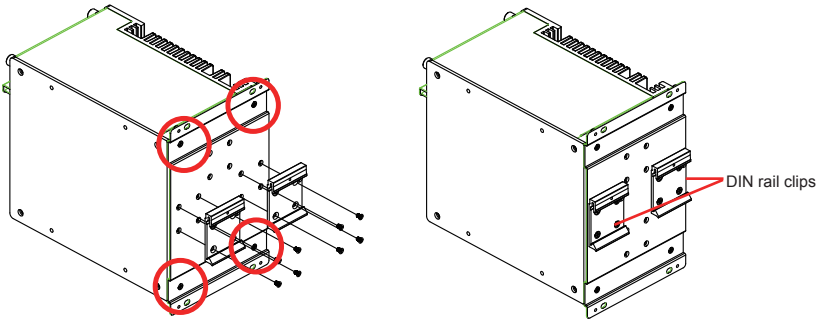
On the Right Side



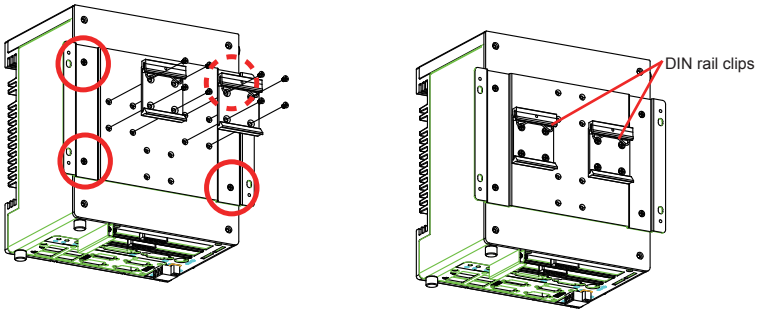
3.3 Din-rail Mounting

1. Please use the accompanying DIN rail kit to mount your computer to a standard DIN rail.
2. Select either the rear side or the right side to secure the bracket.
3. Locate the 4 screw holes on the rear side or the right side.
4. As the figure shown below, align the screw holes of the bracket with the ones of the main unit. Use the screwdriver to secure the bracket to the main unit with the accompanying screws.
5. You can mount the BOX PC on a DIN rail in the horizontal or vertical direction.
6. Fasten a pair of DIN rail clips to the DIN rail bracket which was attached to the main unit.

On the Rear Side

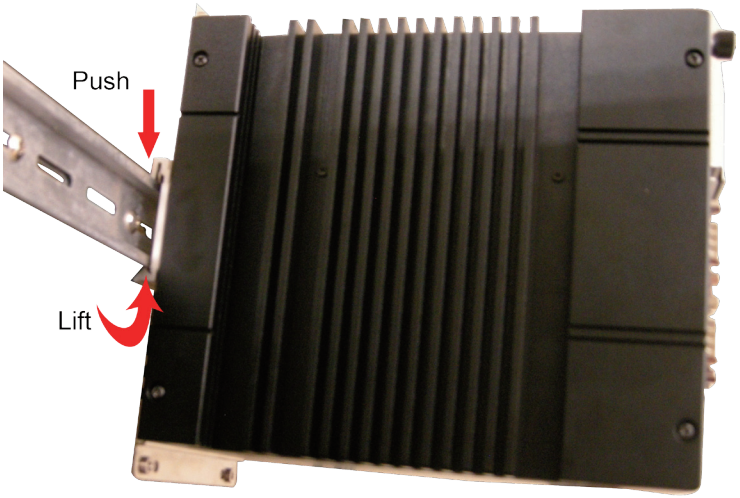


On the Right Side



Removing the Box PC from the DIN Rail

1. Make sure that power is removed from the computer, and disconnect all cables from the computer.
2. Hold the Box PC in both hands and push downwards. As the clip releases, lift the bottom of Box PC slightly.

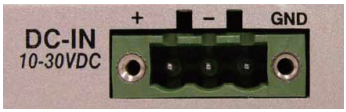


3.4 Wiring the DC-Input Power Source

Warning Only trained and qualified personnel are allowed to install or replace this equipment.

Follow the instructions below for connecting the box PC to a DC-input power source.

1. Before wiring up, make sure the power source is disconnected.
2. Locate the terminal block packaged in the accessory box with your computer.
3. Using the wire-stripping tool to strip a short piece of insulation from the output wires of the DC power source. The wire gauge must be in the range between 14-22 AWG.
4. Identify the positive and negative feed positions for the terminal block connection. Read the symbols printed on the rear panel indicating the polarities and DC-input power range in voltage.
5. Insert the stripped wires into the terminal block plugs. Only wires with insulation part can be exposed in air. Note that the polarities between the wires and the terminal block plugs must be positive to positive and negative to negative.
6. Use a slotted screwdriver to tighten the captive screws. Plug the terminal block, which is wired, into the receptacle on the rear panel firmly.



Chapter 4

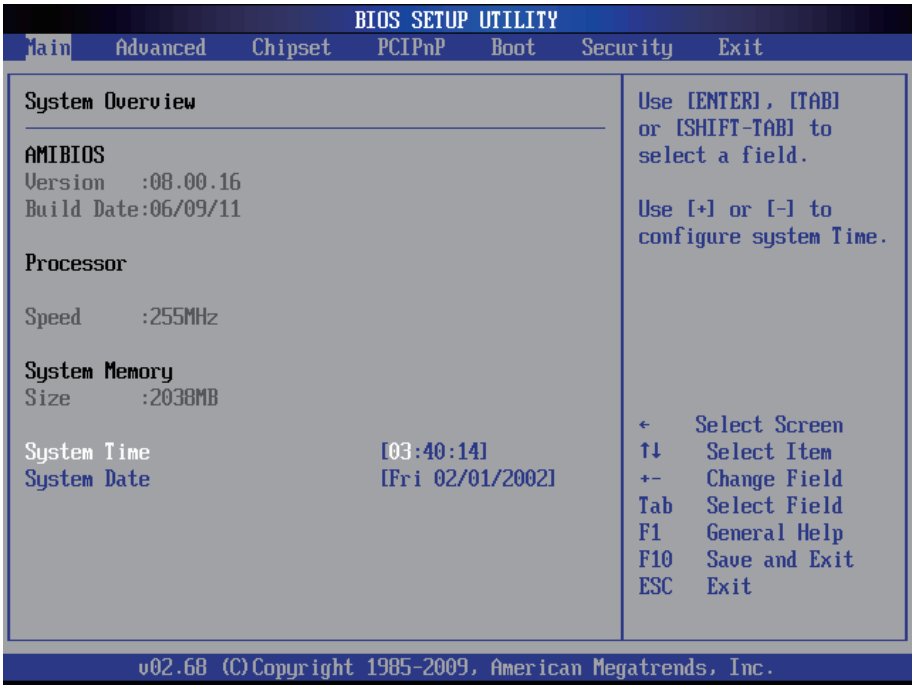
BIOS

4.1 BIOS Main Setup

The AMI BIOS provides a setup utility program for specifying the system configurations and settings. The BIOS RAM of the system stores the setup utility and configurations.

When you turn on the computer, the AMI BIOS is immediately activated. To enter the BIOS SETUP UTILILTY, press **"Delete"** once the power is turned on.
When the computer is shut down, the battery on the motherboard supplies the power for BIOS RAM.

The **Main Setup** screen lists the following information
System Overview
BIOS Version: displays the current version information of the BIOS
Build Date: the date that the BIOS version was made/updated
Processor (auto-detected if installed)
Speed: displays the processor speed
System Memory (auto-detected if installed)
Size: lists the memory size information



System Time

Set the system time.

The time format is: **Hour :** 00 to 23
Minute : 00 to 59
Second : 00 to 59

System Date

Set the system date. Note that the 'Day' automatically changes when you set the date.

The date format is: **Day :** Sun to Sat
Month : 1 to 12
Date : 1 to 31
Year : 1999 to 2099

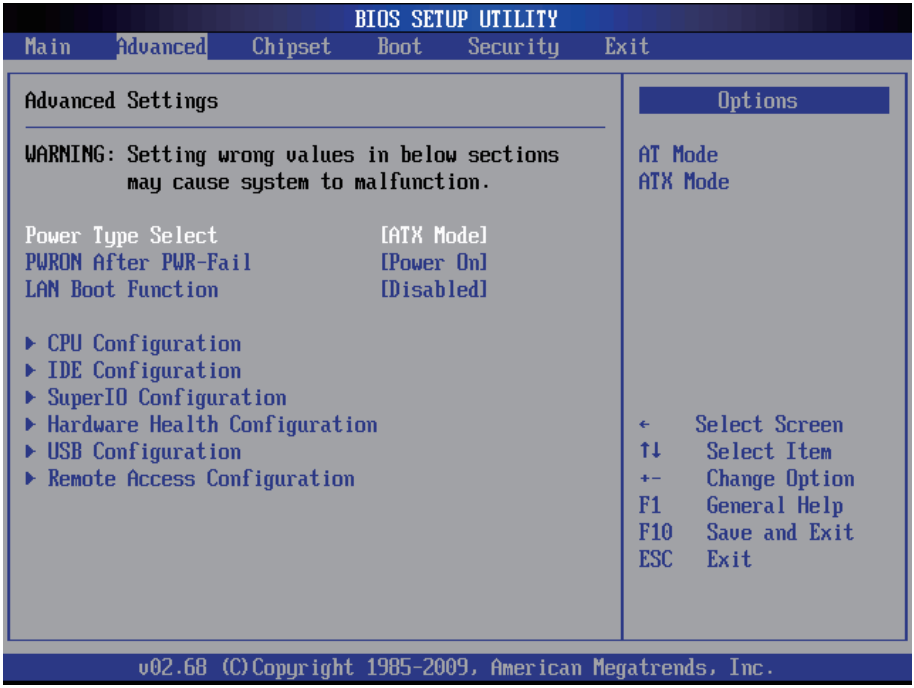
Key Commands

BIOS Setup Utility is mainly a key-based navigation interface. Please refer to the following key command instructions for navigation process.

← →	Move to highlight a particular configuration screen from the top menu bar / Move to highlight items on the screen
↓ ↑	Move to highlight previous/next item
Enter	Select and access a setup item/field
Esc	On the Main Menu – Quit the setup and not save changes into CMOS (a message screen will display and ask you to select "OK" or "Cancel" for exiting and discarding changes. Use "←" and "→" to select and press "Enter" to confirm) On the Sub Menu – Exit current page and return to main menu
Page Up / +	Increase the numeric value on a selected setup item / make change
Page Down / -	Decrease the numeric value on a selected setup item / make change
F1	Activate "General Help" screen
F10	Save the changes that have been made in the setup and exit. (a message screen will display and ask you to select "OK" or "Cancel" for exiting and saving changes. Use "←" and "→" to select and press "Enter" to confirm)

4.2 Advanced Settings

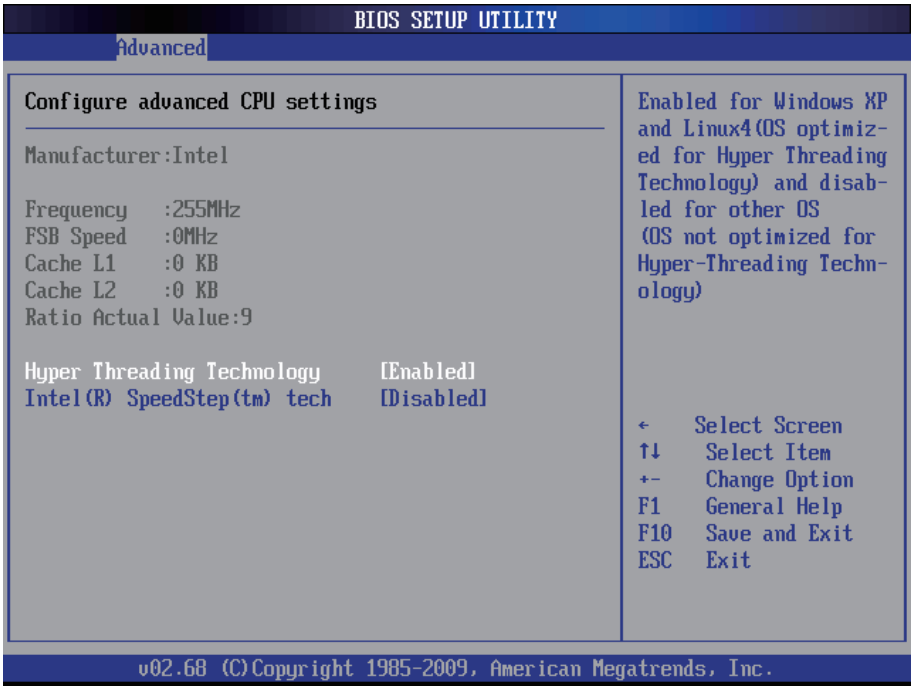
The “Advanced” screen provides the setting options to configure CPU, IDE, Floppy, SuperIO, Hardware Health and USB. You can use “←” and “→” keys to select “Advanced” and use the “↓” and “↑” to select a setup item.



Note: *please pay attention to the “WARNING” part at the left frame before you decide to configure any setting of an item.*

4.2.1 CPU Configuration

The CPU Configuration setup screen varies depending on the installed processor.



Hyper Threading Technology

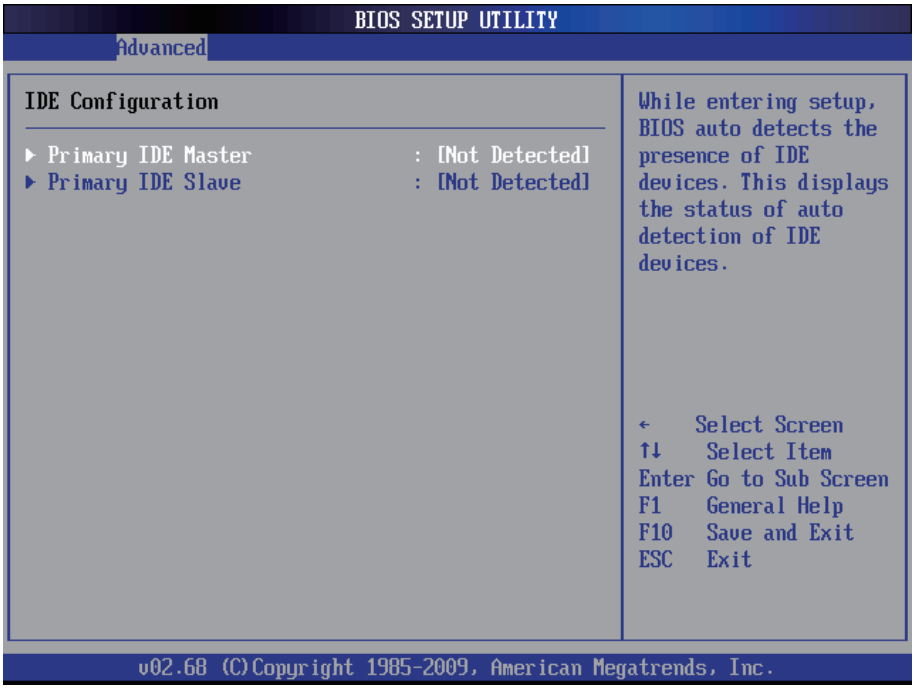
If enabled, your processor supports Hyper-Threading Technology.
The choice: Disabled, Enabled (Default).

Intel® SpeedStep™ tech

Maximum: CPU speed is set to maximum.
Minimum: CPU speed is set to minimum.
Automatic: CPU speed controlled by Operating system.
Disabled: Default CPU speed.

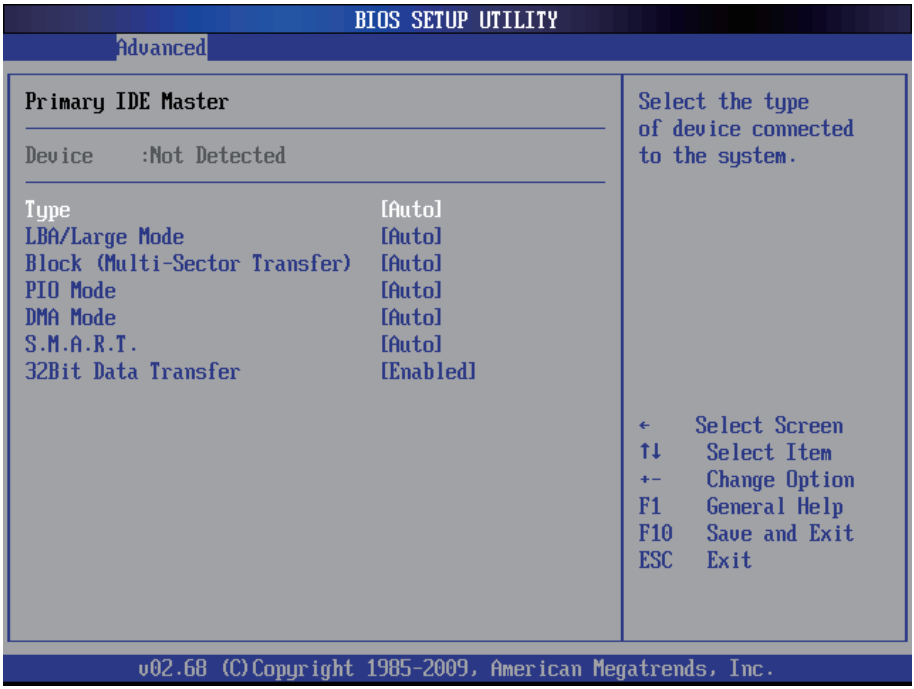
4.2.2 IDE Configuration

Select the “IDE Configuration” to configure the IDE settings. When an item is selected, there is a status description appearing at the right. You can use “Page Up/+” and “Page Down/-” keys to change the value of a selected item.



Primary IDE Master/Slave

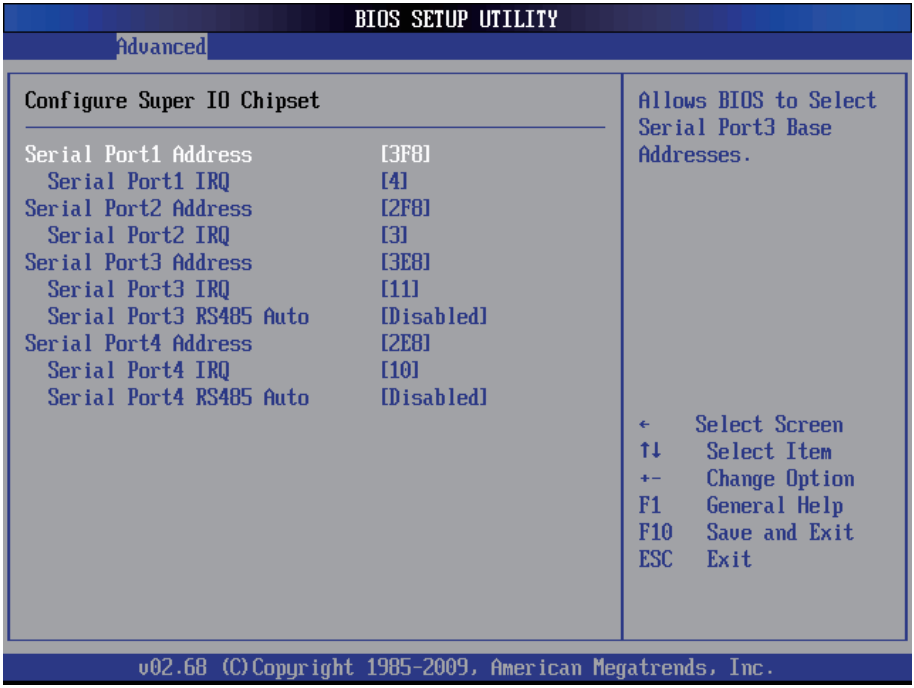
Select one of the IDE devices to configure it. Press <Enter> to access its the sub menu.



Type: the type of devices.
LBA / Large Mode: LBA (Logical Block Addressing) is a method of addressing data on a disk drive. The maximum is 137 GB. You can set “Auto” (auto-detect or) or “Disabled.”
Block (Multi-Sector Transfer): sets block sector transfer timing options.
PIO Mode: sets the IDE PIO (Programmable I/O) timing options.
DMA: configures the DMA options.
S.M.A.R.T.: sets “Auto,” “Enable” or “Disable” for Self-Monitoring Analysis and Reporting Technology (S.M.A.R.T.) to predict impending drive failure.
32Bit Data Transfer: enables or disables 32-bit data transfer. The default is “Enabled.”

4.2.3 Super IO Configuration

Use “Super IO Configuration” to specify address and modes for Serial Port and Parallel Port.



Serial Port1 / Port2 Address

Select an address and corresponding interrupt for the first and second serial ports.

The choice:

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

Serial Port1 IRQ

Select an interrupt for the serial port.

Serial Port2 Address

Select an address and corresponding interrupt for the first and second serial ports.

Serial Port2 IRQ

Select an interrupt for the serial port.

Serial Port2 Address

Select an address and corresponding interrupt for the first and second serial ports.

Serial Port2 IRQ

Select an interrupt for the serial port.

Serial Port3 Address

Select an address and corresponding interrupt for the first and second serial ports.

Serial Port3 IRQ

Select an interrupt for the serial port.

Serial Port3 RS485 Auto

This item allows you to enable serial port 3 auto flow control function. Auto flow control is used in RS-485 to control the signal transmitter automatically. When RS-485 auto flow is disabled, the RS-485 auto flow will not work. The choice: Enabled, Disabled (default)

Serial Port4 Address

Select an address and corresponding interrupt for the first and second serial ports.

Serial Port4 IRQ

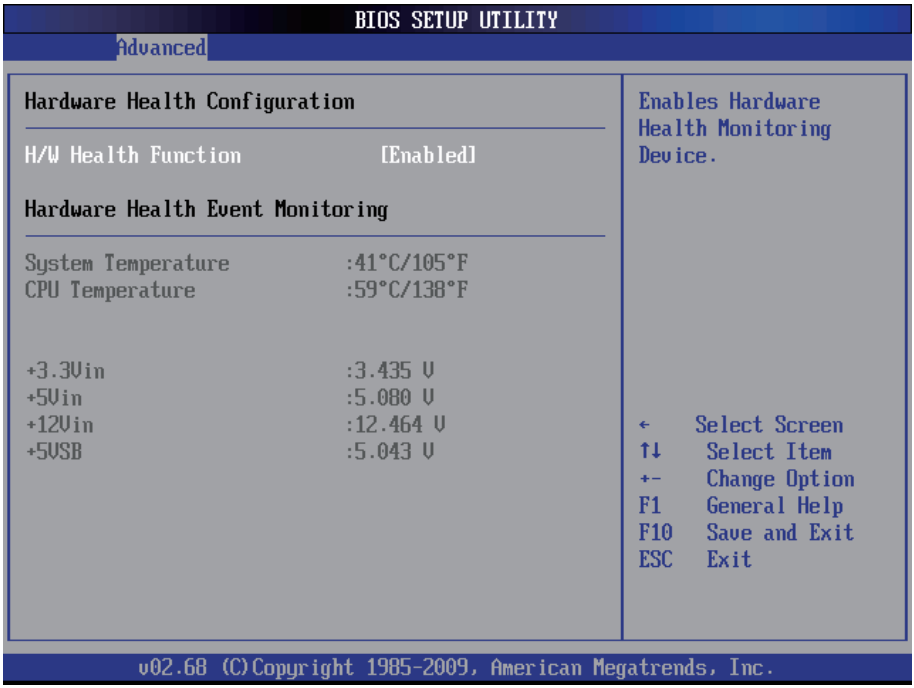
Select an interrupt for the serial port.

Serial Port4 RS485 Auto

This item allows you to enable serial port 4 auto flow control function. Auto flow control is used in RS-485 to control the signal transmitter automatically. When RS-485 auto flow is disabled, the RS-485 auto flow will not work. The choice: Enabled, Disabled (default)

4.2.4 Hardware Health Configuration

The “Hardware Health Configuration” lists out the temperature and voltage information that is being monitored. The default for “H/W Health Function” is “Enabled.”



System Temperature

Displays the currently monitored system temperature.

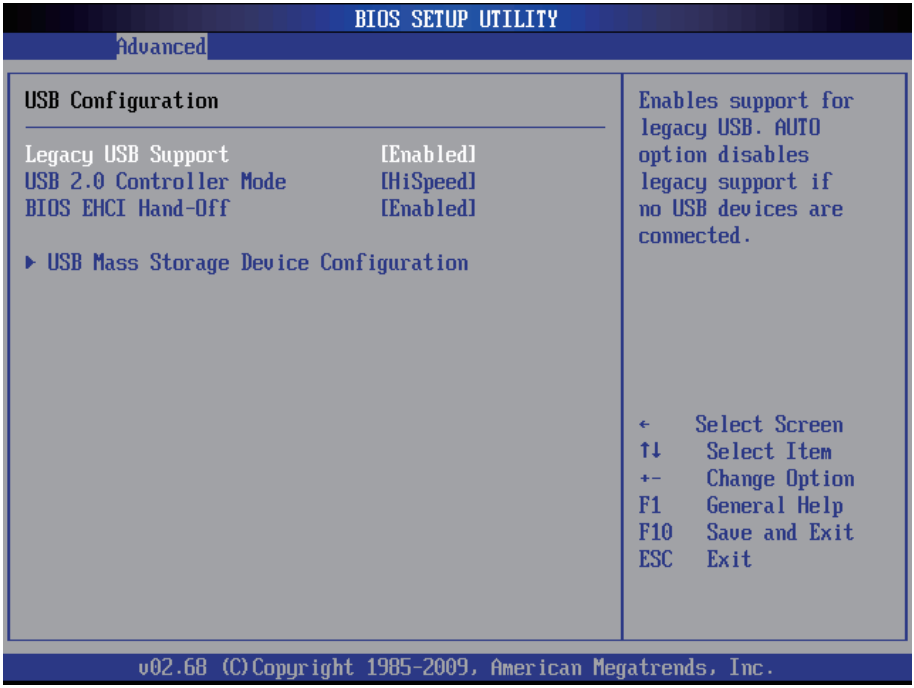
CPU Temperature

Displays the currently monitored CPU temperature.

+3.3Vin / +5Vin / +12Vin

Shows you the voltage level of the +3.3V, +5.0V, +12.0V, +5V standby and battery.

4.2.5 USB Configuration



Legacy USB Support

Enables support for legacy USB. AUTO option disables legacy support if no USB devices are connected.

USB 2.0 Controller Mode

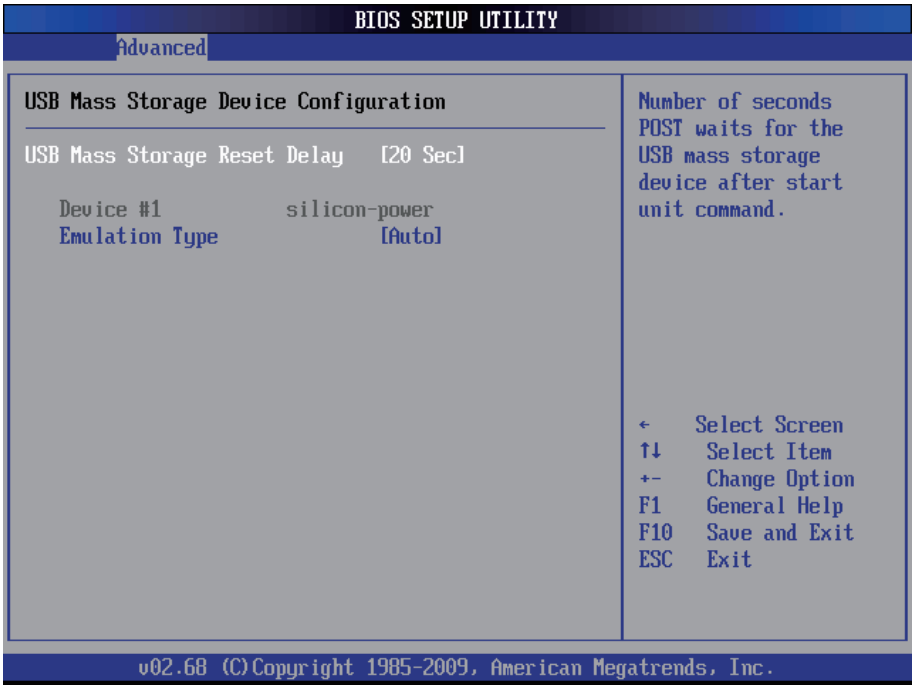
Configures the USB 2.0 controller in High Speed (480Mbps) or Full Speed (12MBPS).

BIOS EHCI Hand-Off

Enabled: enables the EHCI Hand-Off function by BIOS
Disabled: disables the EHCI Hand-Off function by BIOS
Note: *this setting option allows you to enable EHCI Hand Off if your computer operating system does not support it.*
EHCI is the abbreviation for Enhanced Host Controller Interface which is necessary for high speed USB operation.

USB Mass Storage Device Configuration

USB Mass Storage Reset Delay:
Number of seconds POST (Power-On Self-Test) waits for the USB mass storage device after starting unit command.



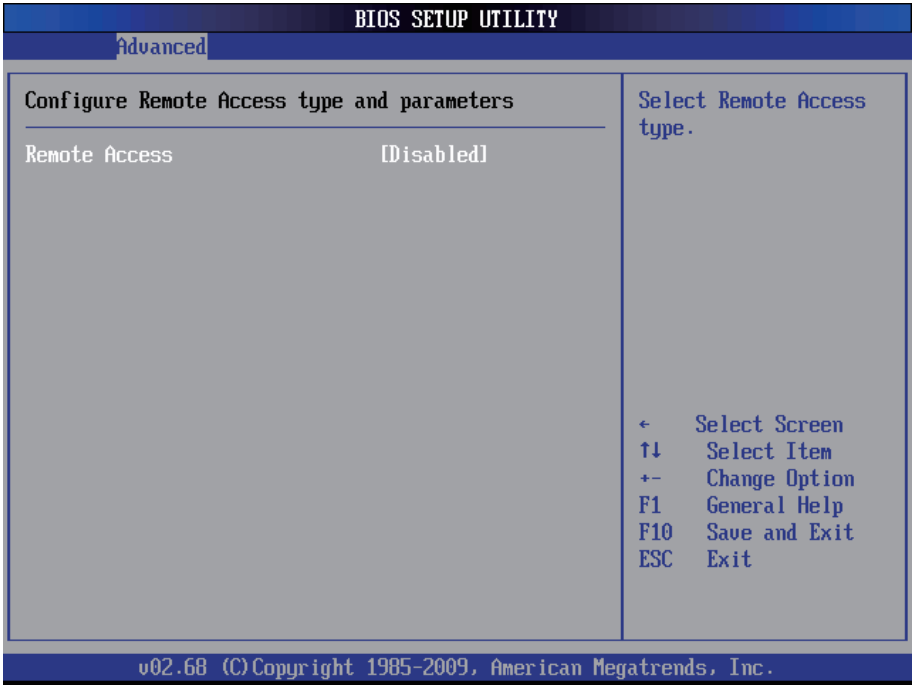
Emulation Type

Sets the value for the system to select the emulation type for USB devices. In general, options include “Auto,” “FDD” and “HDD” (HDD stands for Hard Disk Drive, while FDD is also known as 3 1/2 floppy).
Please keep in mind that options such as “FDD” might not always be available as some computers are not built with this type of connectors.

Note:

If “Auto” is selected, USB device with storage less than 530MB will be emulated as Floppy and remain as hard drive. Forced FDD option can be used to force a HDD formatted drive to “BOOT” as FDD (for example, ZIP drive)

4.2.6 Remote Access Configuration

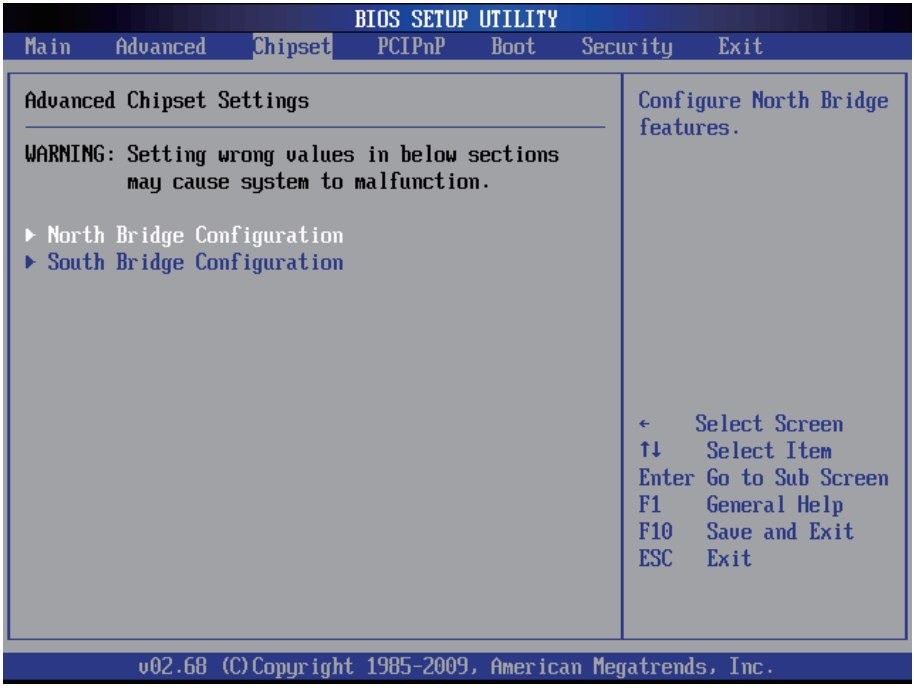


Remote Access

This item allows you to select Remote Access type.

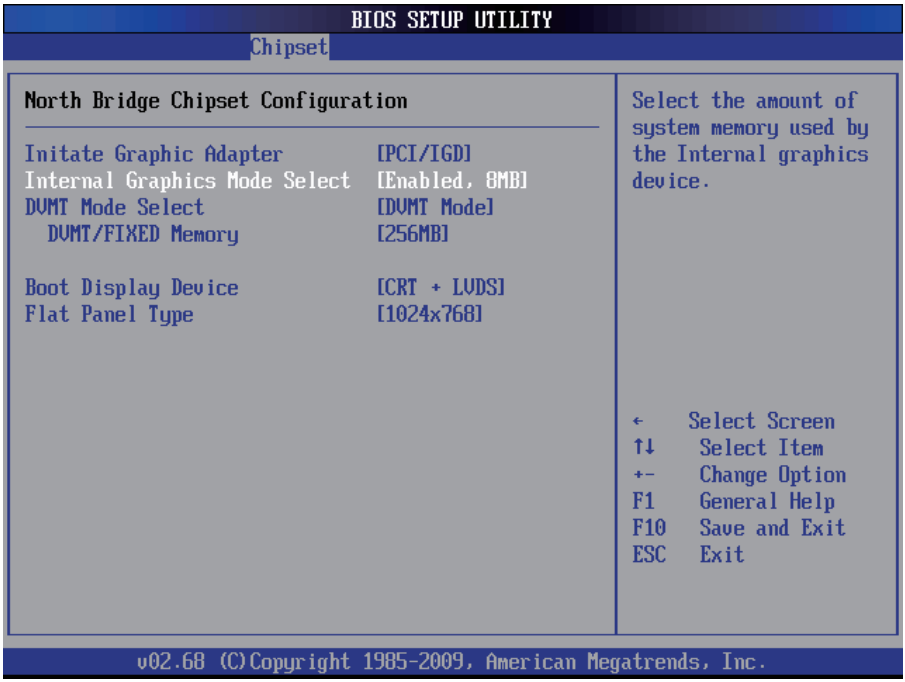
4.3 Chipset Setting

Select “Chipset” to access to “North Bridge Configuration” and “South Bridge Configuration.” You can enter the sub menu of the two configuration options.



Note: *please pay attention to the “WARNING” part at the left frame before you decide to configure any setting of an item.*

4.3.1 North Bridge Chipset Configuration



Initate Graphic Adapter
Select which graphics controller to use as the primary boot device.

Integrated Graphics Mode Select
When set as “Enabled,” you can select the size of system memory that can be used for the integrated graphic device.

DVMT Mode Select
This item allows you to select the DVMT mode.
The choice: FIXED, DVMT, BOTH.

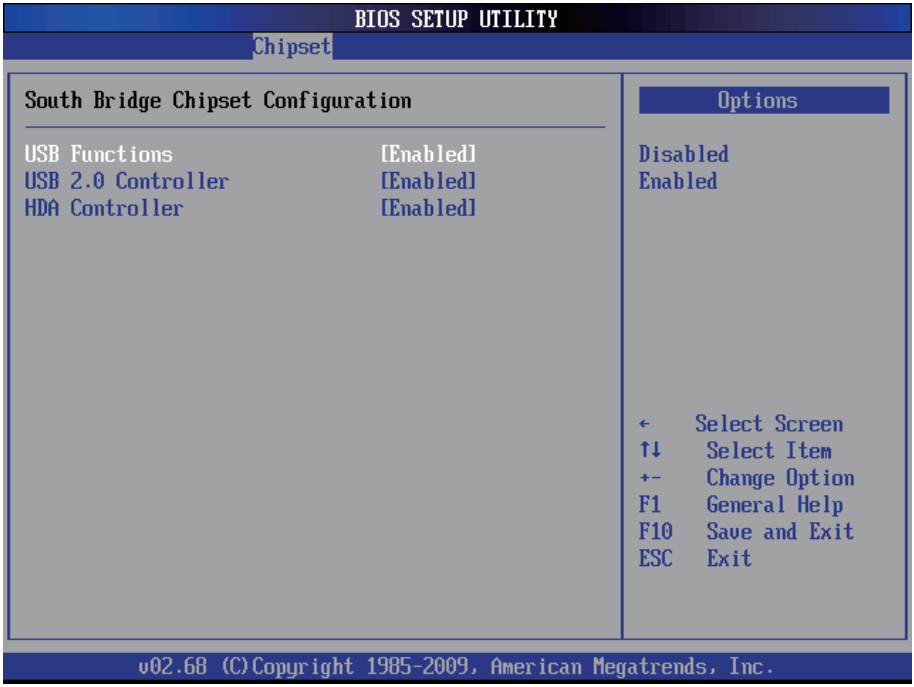
DVMT/FIXED Memory
This item allows you to select the DVMT or FIXED memory size.

Boot Display Device
Boot setting for the display device connected to the computer, such as “External CRT” monitor.

Flat Panel Type
The resolution types of the connected flat panel display device.

4.3.2 South Bridge Chipset Configuration

Normally, the south bridge controls the basic I/O functions, such as USB. This screen allows you to access to the configurations of the IOs.



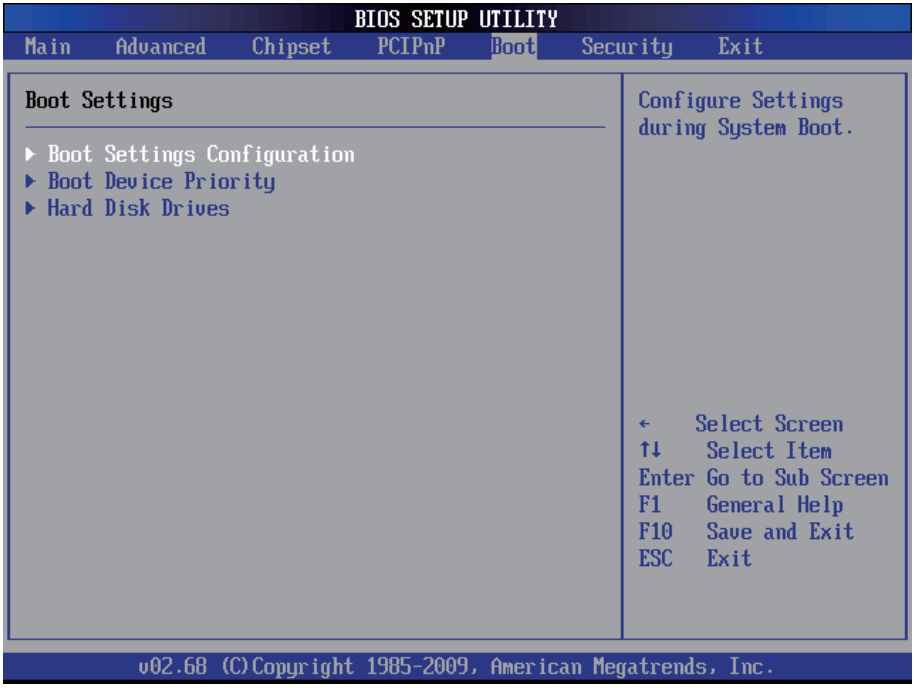
USB Functions
Enable or disable USB functions.

USB 2.0 Controller
If your computer has USB 2.0 ports, please choose “Enabled” to activate the USB 2.0 ports. The default is “Enabled.”

HDA Controller
This item allows you to select the chipset family to support High Definition Audio Controller.
The choice: Enabled, Disabled.

4.4 Boot Setting

The “Boot” screen provides the access to configure the settings for system boot.

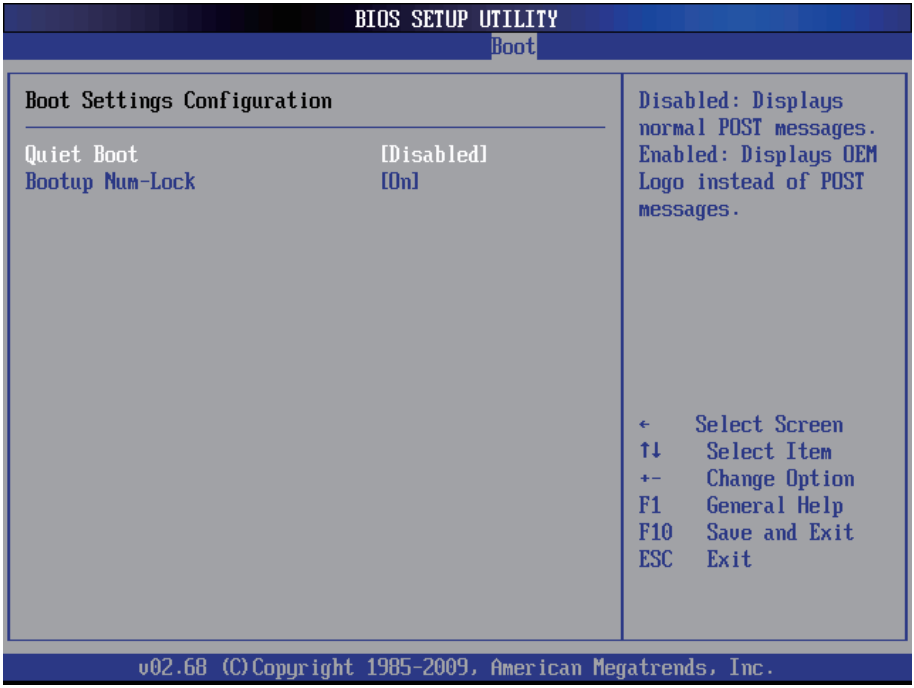


Boot Setting Configuration
Enter the sub menu for boot setting.

Boot Device Priority
Access to the sub menu for boot device priority.

Hard Disk Drives
Press Enter and it shows Bootable and Hard Disk drives.

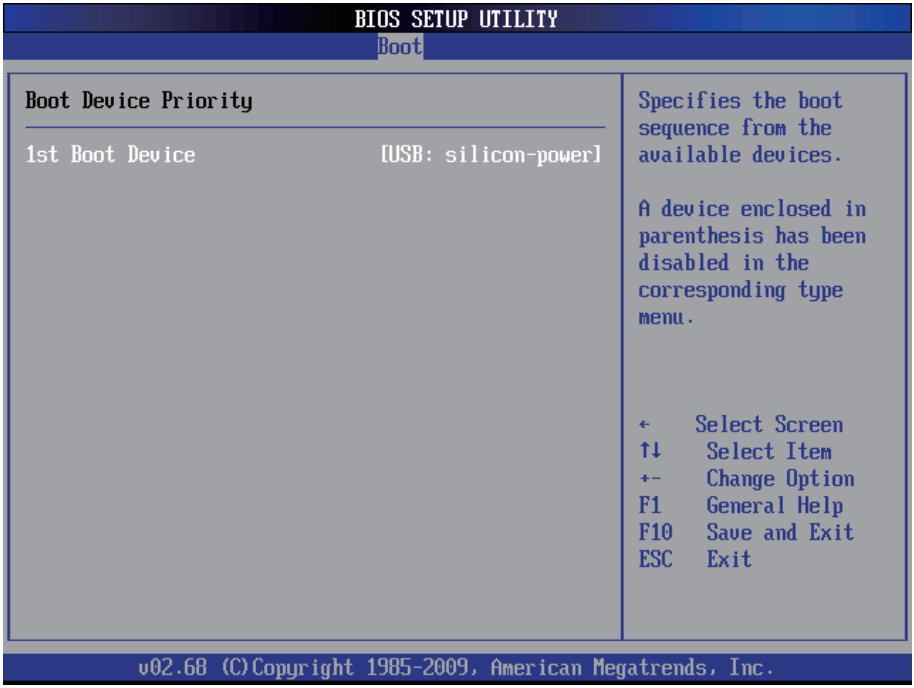
4.4.1 Boot Setting Configuration



Quiet Boot
Display normal POST messages when it's selected as "Disabled." When it is set as "Enabled," OEM messages will be displayed instead of POST messages. The default is "Disabled."

Bootup Num-Lock
Modify Number Lock setting when the system boots up. Select "On" to automatically enable the Number Lock on keyboard when the system is booting up.

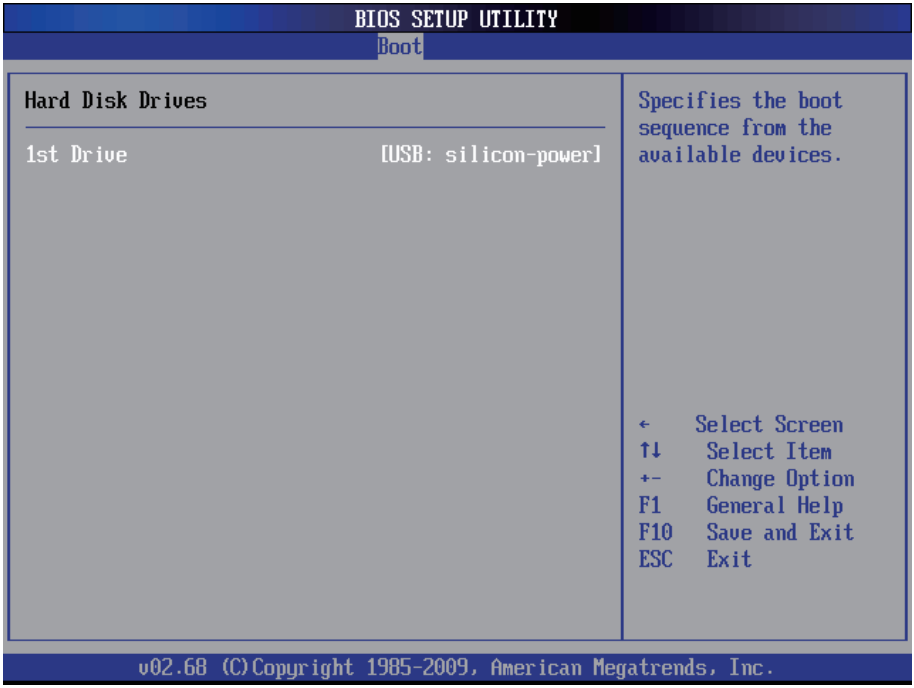
4.4.2 Boot Device Priority



1st Boot Device

Select which devices to be booted according to the priority order of available devices.

4.4.3 Hard Disk Drives

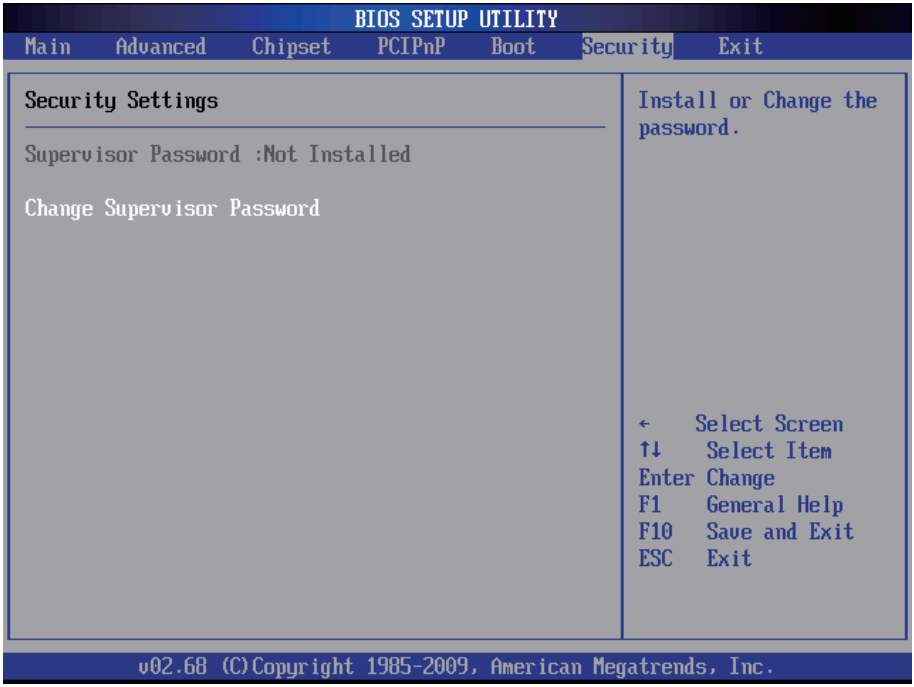


1st Drive

Select which drives to be booted according to the priority order of available drives.

4.5 Security Setting

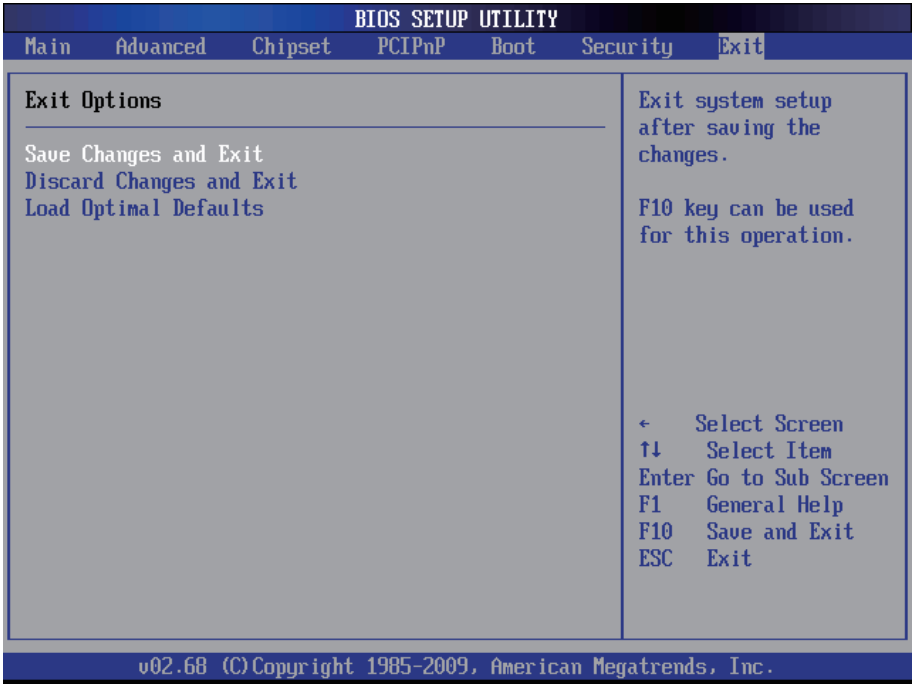
The “Security Settings” screen allows you to set password.



Change Supervisor Password: the default is “Not Installed,” but you can change the Supervisor Password and then it will appear “Installed.” Please always remember your password or else you will have to reset the whole system.

4.6 Exit Setting

Select “Exit” to set exit options, save changes or load default values.



Save Changes and Exit

When you press “Enter” on this option, a message described as the one below will appear:

“Save configuration changes and exit setup?”

Pressing <OK> stores the configuration changes made in BIOS in CMOS menu - a special section of memory that stays on after you turn your system off, and then exit. The next time you boot your system up, the new configured system values will take place.

Note: *you can also press <F10> to enable this operation.*

Discard Changes and Exit

Exit system setup without saving any changes.
You can also press <ESC> to activate this function.

Load Optimal Defaults

When you press <Enter> on this option, a message dialog box will appear asking for your confirmation:

Load Optimal Defaults?
[OK] [Cancel]

Press [OK] to load the BIOS Optimal Default values for all the setup options.

You can also press <F9> key to enable this operation.

4.7 Beep Sound codes list

4.7.1 Boot Block Beep Codes

Number of Beeps	Description
1	Insert diskette in floppy drive A:
2	'AMIBOOT.ROM' file not found in root directory of diskette in A:
4	Flash Programming successful
5	Floppy read error
6	Keyboard controller BAT command failed
7	No Flash EPROM detected
8	Floppy controller failure
9	Boot Block BIOS checksum error
10	Flash Erase error
11	Flash Program error
12	'AMIBOOT.ROM' file size error
13	BIOS ROM image mismatch (file layout does not match image present in flash device)

4.7.2 POST BIOS Beep Codes

Number of Beeps	Description
1	Memory refresh timer error.
2	Parity error in base memory (first 64KB block)
4	Motherboard timer not operational
5	Processor error
6	8042 Gate A20 test error (cannot switch to protected mode)
7	General exception error (processor exception interrupt error)
8	Display memory error (system video adapter)
9	AMIBIOS ROM checksum error
10	CMOS shutdown register read/write error
11	Cache memory test failed

4.7.3 Troubleshooting POST BIOS Beep Codes

Number of Beeps	Description
1, 2 or 3	Reseat the memory, or replace with known good modules.
4-7, 9-11	Fatal error indicating a serious problem with the system. Consult your system manufacturer. Before declaring the motherboard beyond all hope, eliminate the possibility of interference by a malfunctioning add-in card. Remove all expansion cards except the video adapter. • If beep codes are generated when all other expansion cards are absent, consult your system manufacturer's technical support. • If beep codes are not generated when all other expansion cards are absent, one of the add-in cards is causing the malfunction. Insert the cards back into the system one at a time until the problem
8	If the system video adapter is an add-in card, replace or reset the video adapter. If the video adapter is an integrated part of the system board, the board may be faulty.

4.8 AMI BIOS Checkpoints

4.8.1 Bootblock Initialization Code Checkpoints

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

Checkpoint	Description
Before D0	If boot block debugger is enabled, CPU cache-as-RAM functionality is enabled at this point. Stack will be enabled from this point.
D0	Early Boot Strap Processor (BSP) initialization like microcode update, frequency and other CPU critical initialization. Early chipset initialization is done.
D1	Early super I/O initialization is done including RTC and keyboard controller. Serial port is enabled at this point if needed for debugging. NMI is disabled. Perform keyboard controller BAT test. Save power-on CPUID value in scratch CMOS. Go to flat mode with 4GB limit and GA20 enabled.
D2	Verify the boot block checksum. System will hang here if checksum is bad.
D3	Disable CACHE before memory detection. Execute full memory sizing module. If memory sizing module not executed, start memory refresh and do memory sizing in Boot block code. Do additional chipset initialization. Re-enable CACHE. Verify that flat mode is enabled.
D4	Test base 512KB memory. Adjust policies and cache first 8MB. Set stack.
D5	Bootblock code is copied from ROM to lower system memory and control is given to it. BIOS now executes out of RAM. Copies compressed boot block code to memory in right segments. Copies BIOS from ROM to RAM for faster access. Performs main BIOS checksum and updates recovery status accordingly.

D6	Both key sequence and OEM specific method is checked to determine if BIOS recovery is forced. If BIOS recovery is necessary, control flows to checkpoint E0. See Bootblock Recovery Code Checkpoints section of document for more information.
D7	Restore CPUID value back into register. The Bootblock-Runtime interface module is moved to system memory and control is given to it. Determine whether to execute serial flash.
D8	The Runtime module is uncompressed into memory. CPUID information is stored in memory.
D9	Store the Uncompressed pointer for future use in PMM. Copying Main BIOS into memory. Leaves all RAM below 1MB Read-Write including E000 and F000 shadow areas but closing SMRAM.
DA	Restore CPUID value back into register. Give control to BIOS POST (ExecutePOSTKernel). See POST Code Checkpoints section of document for more information.
DC	System is waking from ACPI S3 state
E1-E8 EC-EE	OEM memory detection/configuration error. This range is reserved for chipset vendors & system manufacturers. The error associated with this value may be different from one platform to the next.

4.8.2 Bootblock Recovery Code Checkpoints

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

Checkpoint	Description
E0	Initialize the floppy controller in the super I/O. Some interrupt vectors are initialized. DMA controller is initialized. 8259 interrupt controller is initialized. L1 cache is enabled.
E9	Set up floppy controller and data. Attempt to read from floppy.
EA	Enable ATAPI hardware. Attempt to read from ARMD and ATAPI CDROM.
EB	Disable ATAPI hardware. Jump back to checkpoint E9.
EF	Read error occurred on media. Jump back to checkpoint EB.
F0	Search for pre-defined recovery file name in root directory.
F1	Recovery file not found.
F2	Start reading FAT table and analyze FAT to find the clusters occupied by the recovery file.
F3	Start reading the recovery file cluster by cluster.
F5	Disable L1 cache.
FA	Check the validity of the recovery file configuration to the current configuration of the flash part.
FB	Make flash write enabled through chipset and OEM specific method. Detect proper flash part. Verify that the found flash part size equals the recovery file size.
F4	The recovery file size does not equal the found flash part size.

FC	Erase the flash part.
FD	Program the flash part.
FF	The flash has been updated successfully. Make flash write disabled. Disable ATAPI hardware. Restore CPUID value back into register. Give control to F000 ROM at F000:FFF0h.

4.8.3 POST Code Checkpoints

The POST code checkpoints are the largest set of checkpoints during the BIOS pre-boot process. The following table describes the type of checkpoints that may occur during the POST portion of the BIOS *(Note)*:

Checkpoint	Description
03	Disable NMI, Parity, video for EGA, and DMA controllers. Initialize BIOS, POST, Runtime data area. Also initialize BIOS modules on POST entry and GPNV area. Initialized CMOS as mentioned in the Kernel Variable "wCMOSFlags."
04	Check CMOS diagnostic byte to determine if battery power is OK and CMOS checksum is OK. Verify CMOS checksum manually by reading storage area. If the CMOS checksum is bad, update CMOS with power-on default values and clear passwords. Initialize status register A. Initializes data variables that are based on CMOS setup questions. Initializes both the 8259 compatible PICs in the system
05	Initializes the interrupt controlling hardware (generally PIC) and interrupt vector table.
06	Do R/W test to CH-2 count reg. Initialize CH-0 as system timer.Install the POSTINT1Ch handler. Enable IRQ-0 in PIC for system timer interrupt. Traps INT1Ch vector to "POSTINT1ChHandlerBlock."
07	Fixes CPU POST interface calling pointer.
08	Initializes the CPU. The BAT test is being done on KBC. Program the keyboard controller command byte is being done after Auto detection of KB/MS using AMI KB-5.
C0	Early CPU Init Start -- Disable Cache – Init Local APIC
C1	Set up boot strap processor Information
C2	Set up boot strap processor for POST
C5	Enumerate and set up application processors
C6	Re-enable cache for boot strap processor

C7	Early CPU Init Exit
0A	Initializes the 8042 compatible Key Board Controller.
0B	Detects the presence of PS/2 mouse.
0C	Detects the presence of Keyboard in KBC port.
0E	Testing and initialization of different Input Devices. Also, update the Kernel Variables. Traps the INT09h vector, so that the POST INT09h handler gets control for IRQ1. Uncompress all available language, BIOS logo, and Silent logo modules.
13	Early POST initialization of chipset registers.
20	Relocate System Management Interrupt vector for all CPU in the system.
24	Uncompress and initialize any platform specific BIOS modules. GPNV is initialized at this checkpoint.
2A	Initializes different devices through DIM. See DIM Code Checkpoints section of document for more information.
2C	Initializes different devices. Detects and initializes the video adapter installed in the system that have optional ROMs.
2E	Initializes all the output devices.
31	Allocate memory for ADM module and uncompress it. Give control to ADM module for initialization. Initialize language and font modules for ADM. Activate ADM module.
33	Initializes the silent boot module. Set the window for displaying text information.
37	Displaying sign-on message, CPU information, setup key message, and any OEM specific information.

38	Initializes different devices through DIM. See DIM Code Checkpoints section of document for more information. USB controllers are initialized at this point.
39	Initializes DMAC-1 & DMAC-2.
3A	Initialize RTC date/time.
3B	Test for total memory installed in the system. Also, Check for DEL or ESC keys to limit memory test. Display total memory in the system.
3C	Mid POST initialization of chipset registers.
40	Detect different devices (Parallel ports, serial ports, and coprocessor in CPU, … etc.) successfully installed in the system and update the BDA, EBDA…etc.
52	Updates CMOS memory size from memory found in memory test. Allocates memory for Extended BIOS Data Area from base memory. Programming the memory hole or any kind of implementation that needs an adjustment in system RAM size if needed.
60	Initializes NUM-LOCK status and programs the KBD typematic rate.
75	Initialize Int-13 and prepare for IPL detection.
78	Initializes IPL devices controlled by BIOS and option ROMs.
7C	Generate and write contents of ESCD in NVRam.
84	Log errors encountered during POST.
85	Display errors to the user and gets the user response for error.
87	Execute BIOS setup if needed / requested. Check boot password if installed.
8C	Late POST initialization of chipset registers.
8D	Build ACPI tables (if ACPI is supported)
8E	Program the peripheral parameters. Enable/Disable NMI as selected
90	Initialization of system management interrupt by invoking all handlers. Please note this checkpoint comes right after checkpoint 20h
A1	Clean-up work needed before booting to OS.

A2	Takes care of runtime image preparation for different BIOS modules. Fill the free area in F000h segment with 0FFh. Initializes the Microsoft IRQ Routing Table. Prepares the runtime language module. Disables the system configuration display if needed.
A4	Initialize runtime language module. Display boot option popup menu.
A7	Displays the system configuration screen if enabled. Initialize the CPU's before boot, which includes the programming of the MTRR's.
A9	Wait for user input at config display if needed.
AA	Uninstall POST INT1Ch vector and INT09h vector.
AB	Prepare BBS for Int 19 boot. Init MP tables.
AC	End of POST initialization of chipset registers. De-initializes the ADM module.
B1	Save system context for ACPI. Prepare CPU for OS boot including final MTRR values.
00	Passes control to OS Loader (typically INT19h).

4.8.4 DIM Code Checkpoints

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

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

0 = func#0, disable all devices on the BUS concerned.
1 = func#1, static devices initialization on the BUS concerned.
2 = func#2, output device initialization on the BUS concerned.
3 = func#3, input device initialization on the BUS concerned.
4 = func#4, IPL device initialization on the BUS concerned.
5 = func#5, general device initialization on the BUS concerned.
6 = func#6, error reporting for the BUS concerned.
7 = func#7, add-on ROM initialization for all BUSes.
8 = func#8, BBS ROM initialization for all BUSes.

The lower nibble 'Y' indicates the BUS on which the different routines are being executed. 'Y' can be from 0 to 5.
0 = Generic DIM (Device Initialization Manager).
1 = On-board System devices.
2 = ISA devices.
3 = EISA devices.
4 = ISA PnP devices.
5 = PCI devices.

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Appendix

Appendix A: I/O Port Address Map

Each peripheral device in the system is assigned a set of I/O port addresses which also becomes the identity of the device.
The following table lists the I/O port addresses used.

Address	Device Description
00000000 - 0000000F	Direct memory access controller
00000000 - 00000CF7	PCI bus
00000010 - 0000001F	Motherboard resources
00000020 - 00000021	Programmable interrupt controller
00000022 - 0000003F	Motherboard resources
00000040 - 00000043	System Timer
00000044 - 0000005F	Motherboard resources
00000060 - 00000060	Motherboard resources
00000061 - 00000061	System speaker
00000062 - 00000063	Motherboard resources
00000064 - 00000064	Motherboard resources
00000065 - 0000006F	Motherboard resources
00000070 - 00000071	System CMOS/real time clock
00000072 - 0000007F	Motherboard resources
00000080 - 00000080	Motherboard resources
00000081 - 00000083	Direct memory access controller
00000084 - 00000086	Motherboard resources
00000087 - 00000087	Direct memory access controller
00000088 - 00000088	Motherboard resources
00000089 - 0000008B	Direct memory access controller
0000008C - 0000008E	Motherboard resources
0000008F - 0000008F	Direct memory access controller
00000090 - 0000009F	Motherboard resources
000000A0 - 000000A1	Programmable interrupt controller
000000A2 - 000000BF	Motherboard resources
000000C0 - 000000DF	Direct memory access controller

000000E0 - 000000EF	Motherboard resources
000000F0 - 000000FF	Numeric data processor
000001F0 - 000001F7	ATA Channel 0
000002E8 - 000002EF	Communications Port (COM4)
000002F8 - 000002FF	Communications Port (COM2)
000003B0 - 000003BB	Intel(R) Graphics Media Accelerator 3150
000003C0 - 000003DF	Intel(R) Graphics Media Accelerator 3150
000003E8 - 000003EF	Communications Port (COM3)
000003F6 - 000003F6	ATA Channel 0
000003F8 - 000003FF	Communications Port (COM1)
00000400 - 0000041F	Intel(R) ICH8 Family SMBus Controller-283E
000004D0 - 000004D1	Motherboard resources
00000500 - 0000053F	Motherboard resources
00000800 - 0000087F	Motherboard resources
00000A00 - 00000A0F	Motherboard resources
00000A60 - 00000A6F	Motherboard resources
00000D00 - 0000FFFF	PCI bus
0000A400 - 0000A407	Intel(R) Graphics Media Accelerator 3150
0000A480 - 0000A49F	Standard Universal PCI to USB Host Contoller
0000A800 - 0000A81F	Intel(R) ICH8 Family USB Universal Host Controller-2832
0000A880 - 0000A89F	Intel(R) ICH8 Family USB Universal Host Controller-2831
0000AC00 - 0000AC1F	Intel(R) ICH8 Family USB Universal Host Controller-2830
0000B080 - 0000B08F	Intel(R) ICH8M 3 port Serial ATA Storage Controller-2828
0000B400 - 0000B40F	Intel(R) ICH8M 3 port Serial ATA Storage Controller-2828
0000B480 - 0000B483	Intel(R) ICH8M 3 port Serial ATA Storage Controller-2828
0000B800 - 0000B807	Intel(R) ICH8M 3 port Serial ATA Storage Controller-2828

0000B880 - 0000B883	Intel(R) ICH8M 3 port Serial ATA Storage Controller-2828
0000BC00 - 0000BC07	Intel(R) ICH8M 3 port Serial ATA Storage Controller-2828
0000C000 - 0000CFFF	Intel(R) 82801 PCI Bridge-2448
0000CC00 - 0000CC1F	Multimedia Controller
0000D000 - 0000DFFF	Intel(R) ICH8 Family PCI Express Root Port 3 - 2843
0000E000 - 0000EFFF	Intel(R) ICH8 Family PCI Express Root Port 6 - 2849
0000FFA0 - 0000FFAF	Intel(R) ICH8M Ultra ATA Storage Controller - 2850

Appendix B: Interrupt Request Lines (IRQ)

Peripheral devices use interrupt request lines to notify CPU for the service required. The following table shows the IRQ used by the devices on board.

Level	Function
IRQ 0	System Timer
IRQ -2	Intel(R) ICH8 Family PCI Express Root Port 3-2843
IRQ 3	Communications Port (COM2)
IRQ -3	Intel(R) ICH8 Family PCI Express Root Port 6-2849
IRQ 4	Communications Port (COM1)
IRQ -4	Intel(R) ICH8 Family PCI Express Root Port 1-283F
IRQ 5	Intel(R) ICH8 Family SMBus Controller-283E
IRQ -5	Intel(R) 82574L Gigabit Network Connnection #5
IRQ 6	Multimedia Controller
IRQ -6	Intel(R) 82574L Gigabit Network Connnection #5
IRQ -7	Intel(R) 82574L Gigabit Network Connnection #5
IRQ 8	System CMOS/Real Time Clock
IRQ -8	Intel(R) 82574L Gigabit Network Connnection #5
IRQ -9	Intel(R) 82574L Gigabit Network Connnection #2
IRQ 10	Communications Port (COM4)
IRQ -10	Intel(R) 82574L Gigabit Network Connnection #2

IRQ 11	Communications Port (COM3)
IRQ -11	Intel(R) 82574L Gigabit Network Connnection #2
IRQ -12	Intel(R) 82574L Gigabit Network Connnection #2
IRQ 13	Numeric Data Processor
IRQ 14	ATA Channel 0
IRQ 16	Intel(R) Graphics Media Accelerator 3150
	Standard Universal PCI to USB Host Controller
IRQ 18	Intel(R) ICH8 Family USB Universal Host Controller-2832
	Intel(R) ICH8M 3 port Serial ATA Storage Controller -2828
IRQ 19	Intel(R) ICH8 Family USB Universal Host Controller-2831
IRQ 21	High Definition Audio Controller
IRQ 23	Intel(R) ICH8 Family USB Universal Host Controller-2830
	Intel(R) ICH8 Family USB2 Enhanced Host Controller-2836
IRQ 81 ~ IRQ190	Microsoft ACPI-compliant System

Appendix C: Memory Mapping

Address	Device Description
00000000 - 0009FFFF	System board
000A0000 - 000BFFFF	Intel(R) Graphics Media Accelerator 3150
000A0000 - 000BFFFF	PCI bus
000C0000 - 000CFFFF	System board
000D0000 - 000DFFFF	PCI bus
000E0000 - 000FFFFF	System board
00100000 - 7F6FFFFF	System board
7F700000 - DFFFFFFF	PCI bus
D0000000 - DFFFFFFF	Intel(R) Graphics Media Accelerator 3150
E0000000 - EFFFFFFF	Motherboard resources
F0000000 - FED8FFFF	PCI bus
FE580000 - FE5FFFFF	Intel(R) Graphics Media Accelerator 3150
FE600000 - FE6FFFFF	Intel(R) Graphics Media Accelerator 3150
FE700000 - FE77FFFF	Intel(R) Graphics Media Accelerator 3150
FE7F8000 - FE7FBFFF	High Definition Audio Controller
FE7FF800 - FE7FFBFF	Intel(R) ICH8 Family USB2 Enhanced Host Controller-2836
FE7FFC00 - FE7FFCFF	Intel(R) ICH8 Family SMBus Controller-283E
FE800000 - FE9FFFFF	Intel(R) ICH8 Family PCI Express Root Port 3 -2843
FE8DC000 - FE8DFFFF	Intel(R) 82574L Gigabit Network Connection #2
FE8E0000 - FE8FFFFF	Intel(R) 82574L Gigabit Network Connection #2
FE900000 - FE9FFFFF	Intel(R) 82574L Gigabit Network Connection #2
FEA00000 - FEBFFFFF	Intel(R) ICH8 Family PCI Express Root Port 6 -2849
FEADC000 - FEADFFFF	Intel(R) 82574L Gigabit Network Connnection #5
FEAE0000 - FEAFFFFF	Intel(R) 82574L Gigabit Network Connnection #5
FEB00000 - FEBFFFFF	Intel(R) 82574L Gigabit Network Connnection #5
FEC00000 - FEC00FFF	Motherboard resources
FED00000 - FED003FF	High Precision Event Timer

FED14000 - FED19FFF	System board
FED1C000 - FED1FFFF	Motherboard resources
FED20000 - FED3FFFF	Motherboard resources
FED40000 - FED8FFFF	Motherboard resources
FED90000 - FED93FFF	System board
FED90000 - FFFFFFFF	System board
FEE00000 - FEE00FFF	Motherboard resources
FFB00000 - FFBFFFFF	Intel(R) 82802 Firmware Hub Device
FFC00000 - FFEFFFFF	Motherboard resources
FFF000000 - FFFFFFFF	Intel(R) 82802 Firmware Hub Device

Appendix D: Watchdog Timer (WDT) Setting

WDT is widely applied to industry computers to monitor activities of CPU. The programmed application triggers WDT with adequate timer setting depending on its requirement. Before WDT counts down to zero, the functional system will reset the counter. In case the WDT counter is not reset by an abnormal system, it will counts down to zero and then reset the system automatically.

This computer supports the watchdog timer up to 255 levels for users for software programming. Below please take the source code written in C for a WDT application example.

```
/*-----    Include Header Area -----*/
#include "math.h"
#include "stdio.h"
#include "dos.h"

/**-------- index port 0x2e ---------*/
void main()
{
        outportb(0x2e, 0x87);          /* initial IO port */
        outportb(0x2e, 0x87);          /* twice,  */

        outportb(0x2e, 0x07);          /* point to logical device */
        outportb(0x2e+1, 0x07);        /* select logical device 7 */
        outportb(0x2e, 0xf5);          /* select offset f5h */
        outportb(0x2e+1, 0x40);        /* set bit5 = 1 to clear bit5 */
        outportb(0x2e, 0xf0);          /* select offset f0h */
        outportb(0x2e+1, 0x81);        /* set bit7 =1 to enable WDTRST# */
        outportb(0x2e, 0xf6);          /* select offset f6h */
        outportb(0x2e+1, 0x05);        /* update offset f6h to 0ah :10sec */
        outportb(0x2e, 0xF5);          /* select offset f5h */
        outportb(0x2e+1, 0x20);        /* set bit5 = 1 enable watch dog time */

        outportb(0x2e, 0xAA);          /* stop program F71869E, Exit */
}
```

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