**IEI Technology Corp.**

MODEL:
WAFER-945GSE3

Intel® Atom™ based 3.5" CPU Module
Up to 2.0 GB DDR2, VGA, LVDS, Mini PCIe, RS-232/422/485,
IDE, CompactFlash®, 6 x USB, RoHS

User Manual

Rev. 1.03 – 26 January, 2011

RoHS Lead Free

Revision

Date	Version	Changes
26 January, 2011	1.03	Minor update
4 November, 2010	1.02	Minor update
22 July, 2010	1.01	Minor update
25 November, 2009	1.00	Initial release

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Chapter

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Introduction

1.1 Introduction

Figure 1-1: WAFER-945GSE3

The WAFER-945GSE3 is a 3.5" SBC with a 1.6 GHz Intel® Atom™ N270 CPU.

The WAFER-945GSE3 is designed for fanless operation. The low power CPU does not require active cooling and stays within the specified heat range using the included cooling solution.

Storage on the board is handled by two SATA ports for connecting a hard drives, optical drives or SSDs. The CompactFlash® slot on the underside allows a Type I/II CompactFlash® card to be installed.

The board has two graphics outputs. A VGA output connects to a traditional VGA monitor and the LVDS connector is for an LCD panel.

Other slots and connectors include a PCIe Mini card slot, RS-232, RS-232/422/485, Gigabit Ethernet, audio input and output, digital I/O and PC/104.

1.2 Benefits

Some of the WAFER-945GSE3 motherboard benefits include,

- Low power consumption

- Wide range of I/O interfaces
- Standard API software interface for embedded features

1.3 Features

Some of the WAFER-945GSE3 motherboard features are listed below:

- 3.5" form factor
- RoHS compliant
- PC/104 expansion card slot
- SATA and CompactFlash®
- Gigabit Ethernet

1.4 Connectors

The connectors on the WAFER-945GSE3 are shown in the figure below.
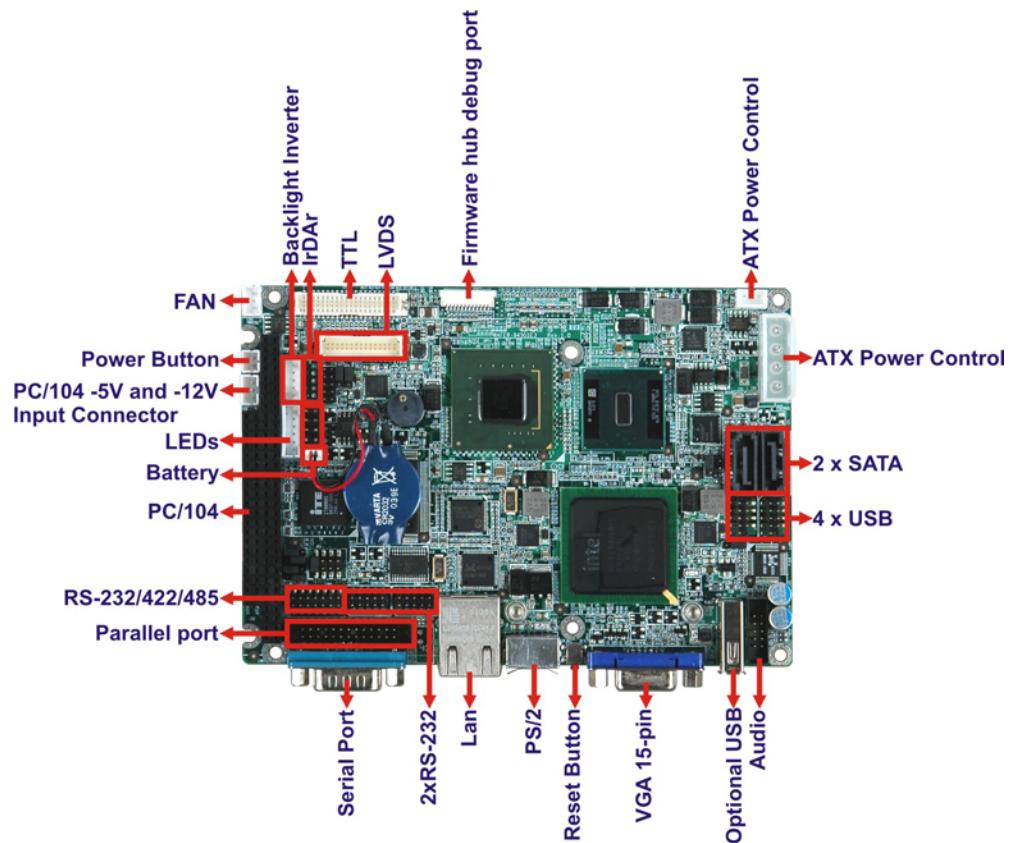
Figure 1-2: Connectors
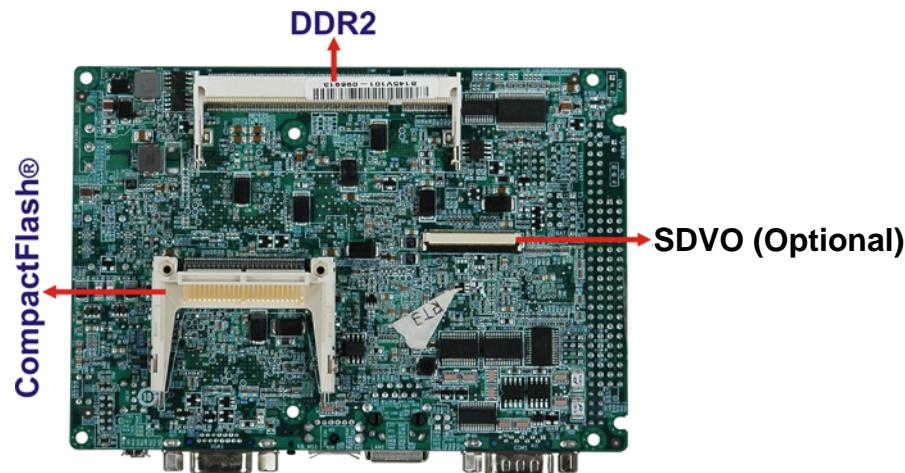
Figure 1-3: Connectors

1.5 Dimensions

The main dimensions of the WAFER-945GSE3 are shown in the diagram below.

- Length: 102 mm
- Width: 146 mm
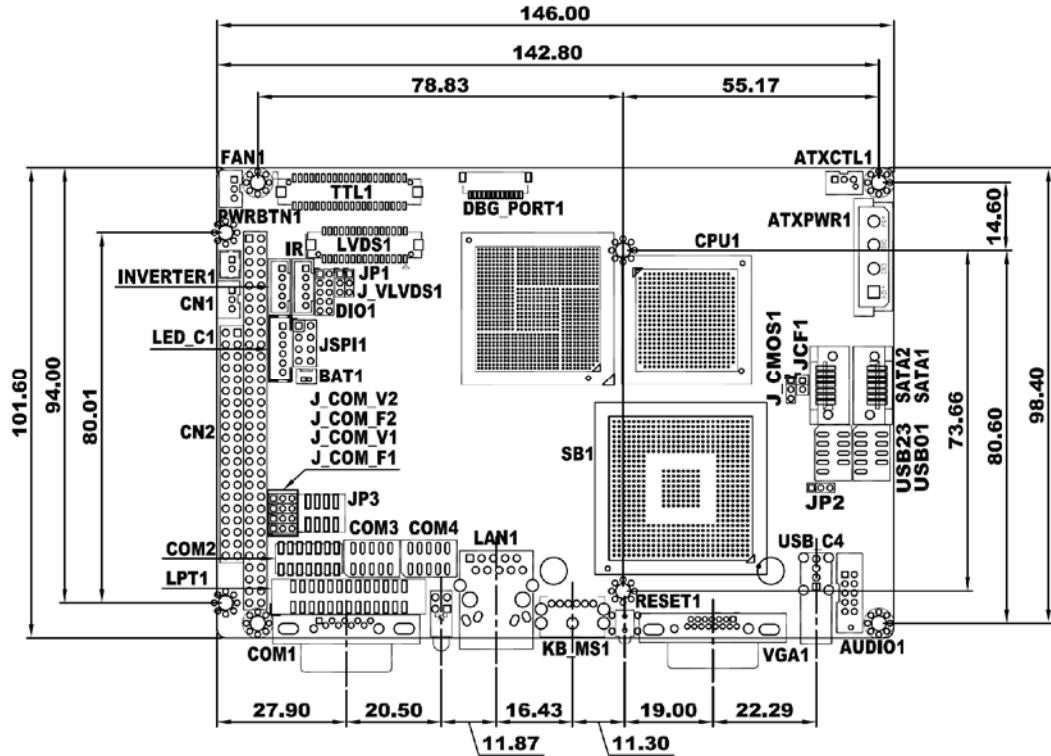
Figure 1-4: Top Dimensions
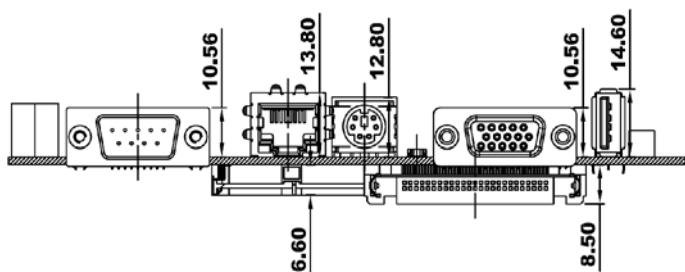
Figure 1-5: I/O Panel Dimensions
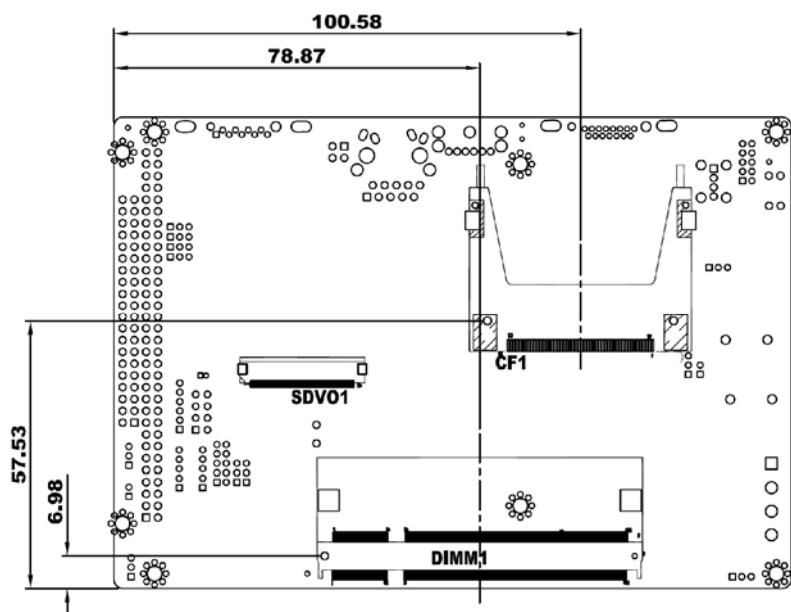
Figure 1-6: Bottom Dimensions

1.6 Data Flow

Figure 1-7 shows the data flow between the system chipset, the CPU and other components installed on the motherboard.
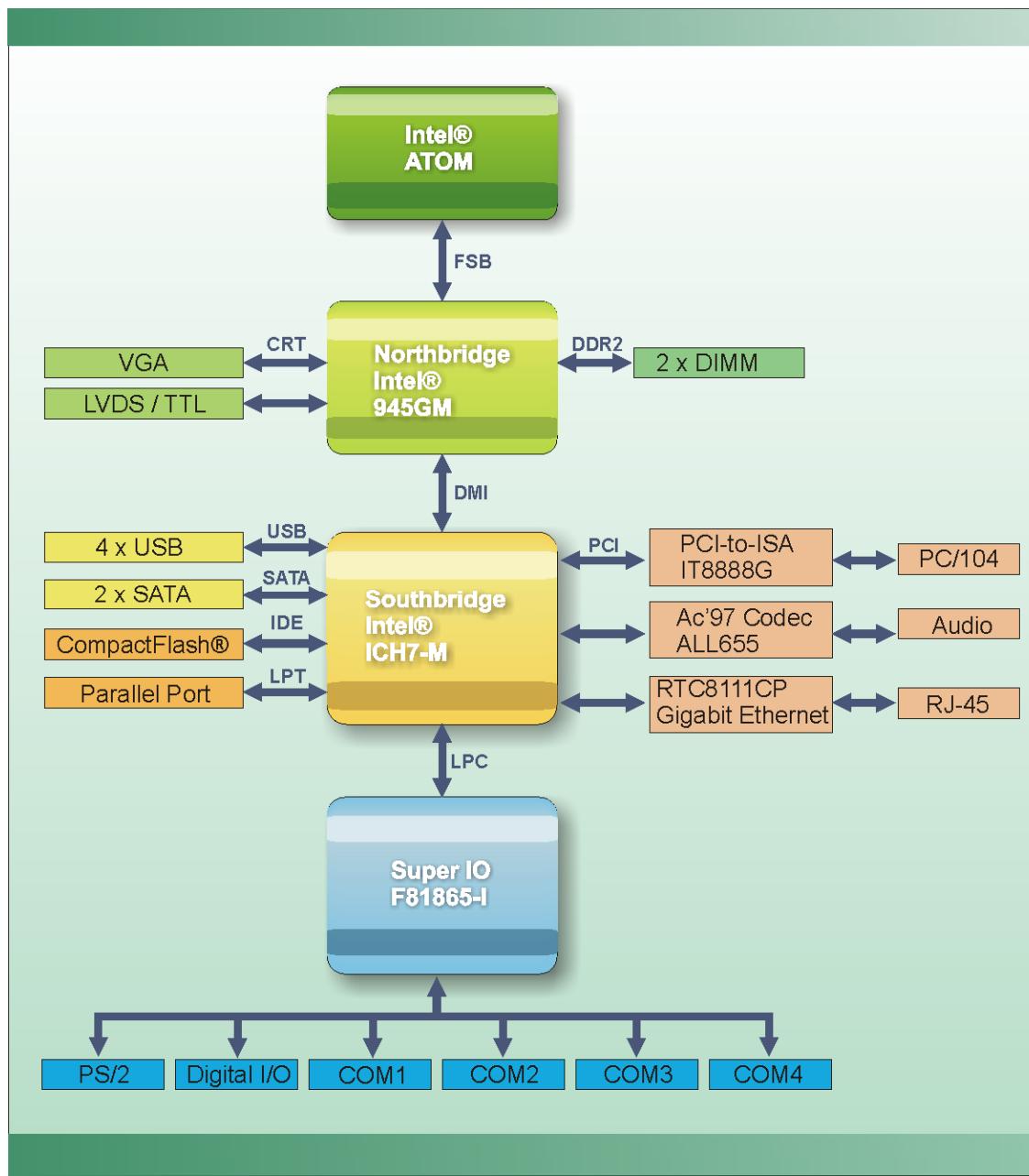
Figure 1-7: Data Flow Diagram

1.7 Technical Specifications

WAFER-945GSE3 technical specifications are listed in Table 1-1.

Specification	WAFER-945GSE3
Form Factor	3.5"
Socket	Embedded
CPU Supported	1.6 GHz Intel® Atom™ N270
Front Side Bus (FSB)	533 MHz
Northbridge	Intel® 945GSE
Southbridge	Intel® ICH7M
Super I/O	Fintek F81865
Memory	200-pin 533 MHz DDR2 SDRAM SO-DIMM up to 2.0 GB
Audio	Line in Line out Mic in
BIOS	SPI bios
Watchdog Timer	Software programmable supports 1~255 sec. system reset
Expansion	
PCI	PC/104 expansion slot
I/O Interface Connectors	
Display port	VGA Dual channel 18-bit LVDS 18-bit TTL (LVDS to TTL)
USB	4 x USB 2.0
Storage	
IDE	2 x SATA CompactFlash® card slot
Environmental and Power Specifications	
Power Supply	AT or ATX, 5 V only

Specification	WAFER-945GSE3
Power Consumption	2.54 A @ 5 V (1.6 GHz Intel® Atom™ N270, 2 GB DDR2)
Operating temperature	0ºC ~ 60ºC (requires cooler and silicone heat sink paste)
Humidity	0% ~ 95% (non-condensing)
Physical Specifications	
Dimensions	102 mm x 146 mm
Weight GW/NW	650 g/250 g

Table 1-1: Technical Specifications

Chapter

2

Packing List

2.1 Anti-static Precautions

WARNING!

Static electricity can destroy certain electronics. Make sure to follow the ESD precautions to prevent damage to the product, and injury to the user.

Make sure to adhere to the following guidelines:

- **Wear an anti-static wristband**: Wearing an anti-static wristband can prevent electrostatic discharge.
- **Self-grounding**: Touch a grounded conductor every few minutes to discharge any excess static buildup.
- **Use an anti-static pad**: When configuring any circuit board, place it on an anti-static mat.
- **Only handle the edges of the PCB**: Don't touch the surface of the motherboard. Hold the motherboard by the edges when handling.

2.2 Unpacking Precautions

When the WAFER-945GSE3 is unpacked, please do the following:

- Follow the antistatic guidelines above.
- Make sure the packing box is facing upwards when opening.
- Make sure all the packing list items are present.

2.3 Packing List

  NOTE:

If any of the components listed in the checklist below are missing, do not proceed with the installation. Contact the IEI reseller or vendor the WAFER-945GSE3 was purchased from or contact an IEI sales representative directly by sending an email to sales@iei.com.tw.

The WAFER-945GSE3 is shipped with the following components:

Quantity	Item and Part Number	Image
1	WAFER-945GSE3	
2	SATA cable (**P/N**: 32000-062800-RS)	
1	KB/MS PS/2 Y-cable (**P/N**: 32000-133200-RS)	
1	Audio cable (**P/N:** 32000-072100-RS)	
1	Dual USB cable (wo bracket) (**P/N**: 32000-073400-RS)	
2	Serial port cable (**P/N**: 32200-000049-RS)	
1	Mini jumper pack (2.0mm) (**P/N**:33100-000033-RS)	

Quantity	Item and Part Number	Image
1	Utility CD	
1	Quick installation guide	

Table 2-1: Packing List

2.4 Optional Items

These optional items are available.

Item and Part Number	Image
RS-232/422/485 cable (**P/N**: 32200-026500-RS)	
SATA power cable (**P/N**: 32100-088600-RS)	
AT to ATX cable (**P/N**: 32100-052100-RS)	
LPT cable (wo bracket) (**P/N**: 32200-015100-RS)	

Table 2-2: Optional Items

Chapter

3

Connector Pinouts

3.1 Peripheral Interface Connectors

Section **3.1.2** shows peripheral interface connector locations. **Section 3.1.2** lists all the peripheral interface connectors seen in **Section 3.1.2**.

3.1.1 Layout

The figure below shows the on-board peripheral connectors, rear panel peripheral connectors and on-board jumpers.
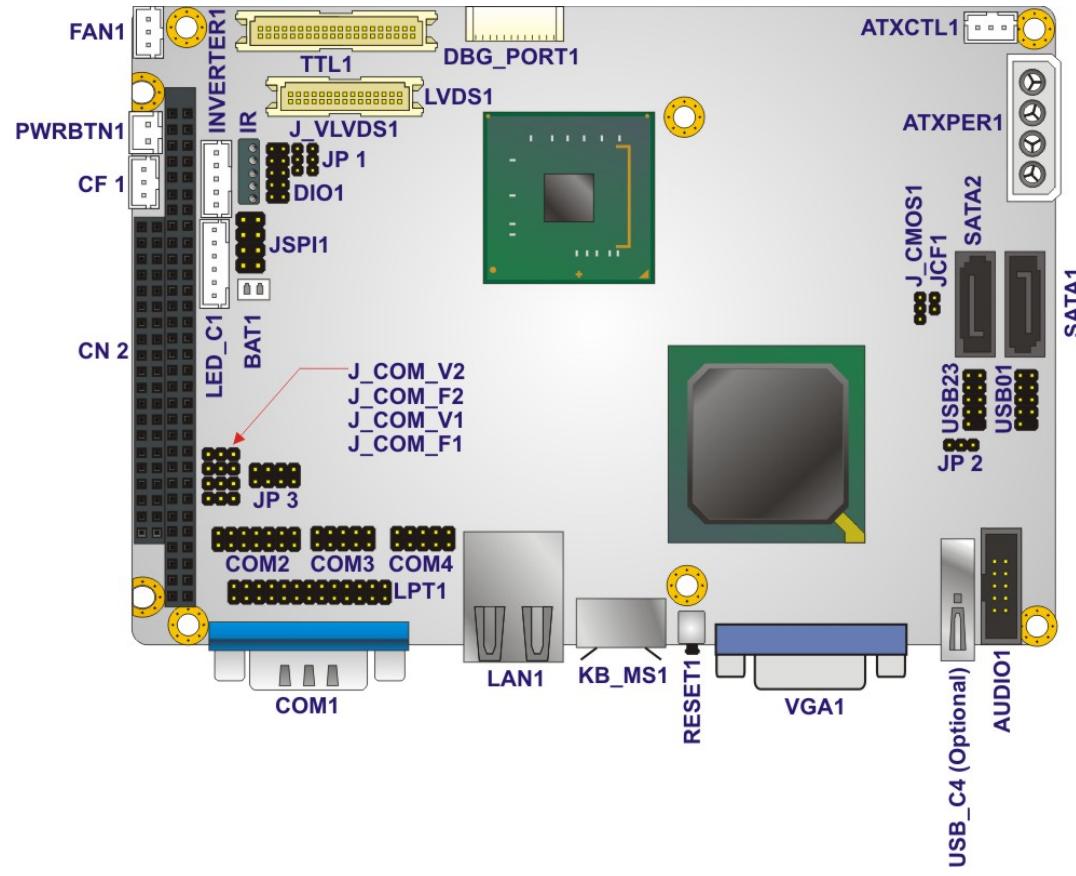
Figure 3-1: Connector and Jumper Locations

3.1.2 Peripheral Interface Connectors

The table below shows a list of the peripheral interface connectors on the WAFER-945GSE3. Detailed descriptions of these connectors can be found below.

Connector	Type	Label
ATX power connector	Molex	ATXPWR1
ATX power control connector	3-pin wafer	ATXCTL1
Audio connector	10-pin header	AUDIO1
Backlight inverter connector	6-pin box header	INVERTER1
Battery connector	2-pin box header	BT1
CompactFlash® card slot	CF card slot	CF1
Debug port connector	12-pin box	DBG_PORT1
Digital I/O connector	10-pin header	DIO1
DIMM connector	DIMM slot	DIMM1
Fan connector	3-pin wafer	FAN1
Infrared interface connector	5-pin header	IR1
LED connector	6-pin header	LED_C1
LVDS connector	30-pin crimp	LVDS1
Parallel port connector	26-pin header	LPT1
PC/104 connector	PC/104 connector	CN2
PC/104 power input connector	3-pin header	CN1
Power button connector	2-pin box header	PWRBTN1
Reset button connector	2-pin box header	RESET1
SATA drive connector	SATA connector	SATA1, SATA2
SDVO connector	Flat cable connector	SDVO1
Serial port connector	14-pin header	COM2
Serial port connectors	10-pin header	COM3, COM4
SPI flash connector	8-pin header	JSPI1
TTL LCD connector	40-pin crimp	TTL1
USB connectors	8-pin header	USB01, USB23

Table 3-1: Peripheral Interface Connectors

3.1.3 External Interface Panel Connectors

The table below lists the rear panel connectors on the WAFER-945GSE3. Detailed descriptions of these connectors can be found in a later section.

Connector	Type	Label
Ethernet connector	RJ-45	LAN1
Keyboard/mouse connector	PS/2	KB_MS1
Serial port connector	DB-9	COM1
USB connector (optional)	USB	USB_C4
VGA connector	15-pin female VGA	VGA1

Table 3-2: Rear Panel Connectors

3.2 Internal Peripheral Connectors

Internal peripheral connectors are found on the motherboard and are only accessible when the motherboard is outside of the chassis. This section has complete descriptions of all the internal, peripheral connectors on the WAFER-945GSE3.

3.2.1 ATX Power Connector

CN Label:	ATXPWR1
CN Type:	4-pin Molex
CN Location:	See Figure 3-2
CN Pinouts:	See Table 3-3

The ATX connector is connected to an external ATX power supply. Power is provided to the system, from the power supply through this connector.
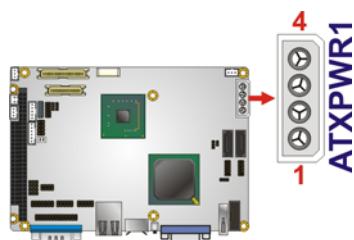
Figure 3-2: ATX Power Connector Location

Pin	Description
1	12 V
2	GND
3	GND
4	5 V

Table 3-3: ATX Power Connector Pinouts

3.2.2 ATX Power Control Connector

CN Label:	**ATXCTL1**
CN Type:	3-pin wafer
CN Location:	See Figure 3-3
CN Pinouts:	See Table 3-4

Provides standby power to the system when the system is turned off.
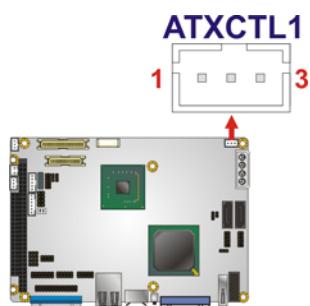
Figure 3-3: ATX Power Control Connector Location

Pin	Description
1	5VSB
2	GND
3	PS_ON#

Table 3-4: ATX Power Control Connector Pinouts

3.2.3 Audio Connector

CN Label:	**AUDIO1**
CN Type:	10-pin header
CN Location:	See Figure 3-4
CN Pinouts:	See Table 3-5

This header provides a line output and microphone input.
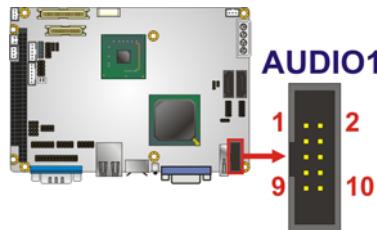
Figure 3-4: Audio Connector Location

Pin	Description	Pin	Description
1	Speaker_R	2	Line_In_R
3	GND	4	GND
5	Speaker_L	6	Line_In_L
7	GND	8	GND
9	MIC_IN	10	MIC_IN

Table 3-5: Audio Connector Pinouts

3.2.4 Backlight Inverter Connector

CN Label:	**INVERTER1**
CN Type:	5-pin box header (1x5)
CN Location:	See Figure 3-5
CN Pinouts:	See Table 3-6

Provides power for the LCD backlight.
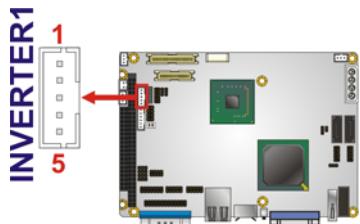
Figure 3-5: Backlight Inverter Connector Location

Pin	Description
1	LCD_BKLTCTL
2	GND
3	+12 V
4	GND
6	Backlight enable

Table 3-6: Backlight Inverter Connector Pinouts

3.2.5 Battery Connector

CN Label:	**BAT1**
CN Type:	2-pin wafer (1x2)
CN Location:	See Figure 3-6
CN Pinouts:	See Table 3-7

This is connected to the system battery. The battery provides power to the system clock to retain the time when power is turned off.
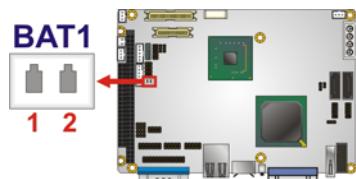
Figure 3-6: Battery Connector Location

Pin	Description
1	Battery+
2	Ground

Table 3-7: Battery Connector Pinouts

3.2.6 CompactFlash® Slot

CN Label: **CF1**

CN Type: CompactFlash® card slot

CN Location: See Figure 3-7

A CompactFlash® Type I/II card can be used in this slot.
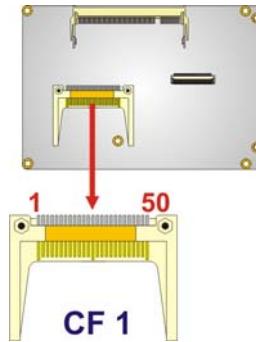
Figure 3-7: CompactFlash® Slot Location

3.2.7 Debug Port Connector

CN Label: **DBG_PORT1**

CN Type: 12-pin connector

CN Location: See **Figure 3-8**

CN Pinouts: See **Table 3-8**

Debug port for the firmware hub.
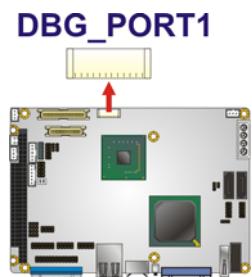
Figure 3-8: Debug Port Connector Location

Pin	Description	Pin	Description
1	GND	7	LAD2
2	FWHPCLK	8	LAD3
3	PCIRST#	9	INT_SERIRQ
4	LFRAME	10	GND
5	LAD0	11	+3.3 v
6	LAD1	12	+5 v

Table 3-8: Debug Port Connector Pinouts

3.2.8 Digital I/O Connector

CN Label:	**DIO1**
CN Type:	10-pin header (2x5)
CN Location:	See Figure 3-9
CN Pinouts:	See Table 3-9

The digital I/O connector provides programmable input and output for external devices. The digital I/O provides 4-bit output and 4-bit input.
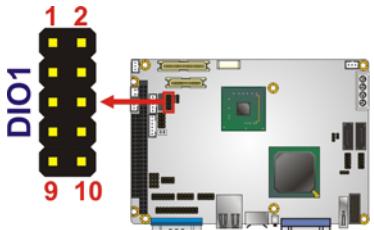
Figure 3-9: Digital I/O Connector Locations

Pin	Description	Pin	Description
1	GND	2	VCC (+5 V)
3	Output 3	4	Output 2
5	Output 1	6	Output 0
7	Input 3	8	Input 2
9	Input 1	10	Input 0

Table 3-9: Digital I/O Connector Pinouts

3.2.9 DIMM Connector

CN Label: **DIMM1**

CN Type: DIMM connector

CN Location: See **Figure 3-10**

For installing one SO-DIMM on the system.
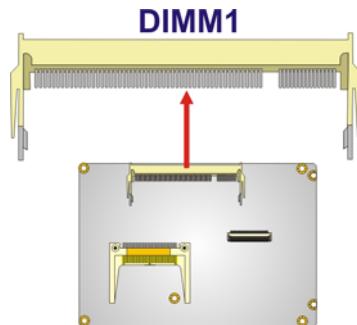
Figure 3-10: DVI Connector Location

3.2.10 Fan Connector

CN Label: **FAN1**

CN Type: 3-pin header

CN Location: See Figure 3-11

CN Pinouts: See Table 3-10

Connects to a system cooling fan.
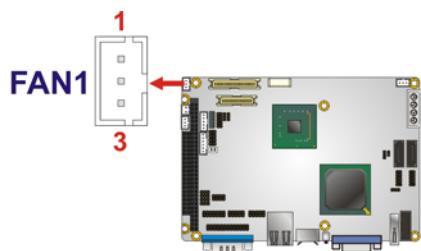
Figure 3-11: Fan Connector Location

Pin	Description
1	FANIO1
2	+12 V
3	GND

Table 3-10: Fan Connector Pinouts

3.2.11 Infrared Interface Connector

CN Label:	**IR1**
CN Type:	5-pin header (1x5)
CN Location:	See **Figure 3-12**
CN Pinouts:	See **Table 3-11**

The infrared connector attaches to an infrared receiver for use with remote controls.
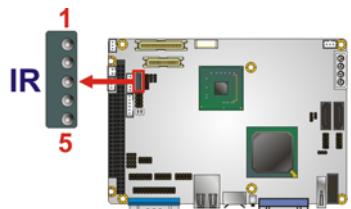
Figure 3-12: Infrared Connector Location

Pin	Description
1	VCC
2	NC
3	IR-RX
4	GND

Pin	Description
5	IR-TX

Table 3-11: Infrared Connector Pinouts

3.2.12 LED Connector

CN Label:	**LED_C1**
CN Type:	6-pin header
CN Location:	See **Figure 3-13**
CN Pinouts:	See **Table 3-12**

Connects to the hard drive and power LEDs on the front panel, also provides 5 V power output.
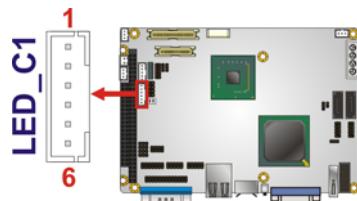
Figure 3-13: LED Connector Location

Pin	Description
1	5 V power output (+5 V)
2	5 V power output (GND)
3	Power LED+
4	Power LED-
5	Hard drive LED+
6	Hard drive LED-

Table 3-12: LED Connector Pinouts

3.2.13 LVDS Connector

CN Label:	**LVDS1**
CN Type:	30-pin crimp (2x15)
CN Location:	See Figure 3-14
CN Pinouts:	See Table 3-13

The LVDS connector is for an LCD panel connected to the board.
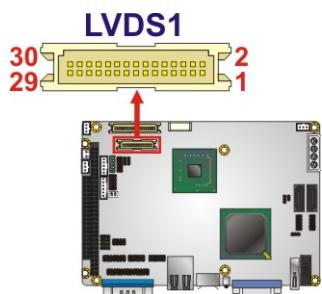
Figure 3-14: LVDS Connector Location

Pin	Description	Pin	Description
1	GND	2	GND
3	A_Y0	4	A_Y0#
5	A_Y1	6	A_Y1#
7	A_Y2	8	A_Y2#
9	A_CK	10	A_CK#
11	NC	12	NC
13	GND	14	GND
15	B_Y0	16	B_Y0#
17	B_Y1	18	B_Y1#
19	B_Y2	20	B_Y2#
21	B_CK	22	B_CK#
23	NC	24	NC
25	GND	26	GND
27	VCC_LCD	28	VCC_LCD
29	VCC_LCD	30	VCC_LCD

Table 3-13: LVDS Connector Pinouts

3.2.14 Parallel Port Connector

CN Label:	**LPT1**
CN Type:	26-pin box header
CN Location:	See **Figure 3-15**
CN Pinouts:	See **Table 3-14**

Connects to devices with a parallel port interface, most typically printers.
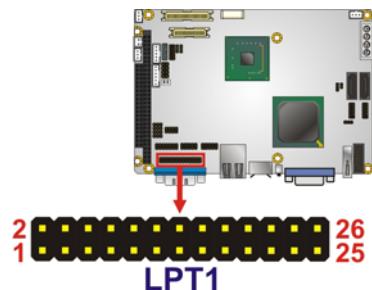
Figure 3-15: Parallel Port Connector Location

Pin	Description	Pin	Description
1	STB#	2	AFD#
3	PD0	4	ERR#
5	PD1	6	INIT#
7	PD2	8	SLIN#
9	PD3	10	GND
11	PD4	12	GND
13	PD5	14	GND
15	PD6	16	GND
17	PD7	18	GND
19	ACK#	20	GND
21	BUSY	22	GND
23	PE	24	GND
25	SCLT	26	NC

Table 3-14: Parallel Port Connector Pinouts

3.2.15 PC/104 Connector

CN Label:	CN2
CN Type:	PC/104 Connector
CN Location:	See **Figure 3-16**
CN Pinouts:	See **Table 3-15**

Used for connecting PC/104 expansion cards.
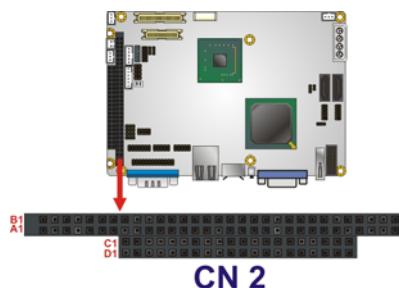
Figure 3-16: PC/104 Slot Location

Pin	Row A	Row B	Row C	Row D
1	IOCHK-	GROUND	GROUND	GROUND
2	SD7	RSTDRV	SBHE-	MCS16-
3	SD6	+5 V	SA23	IOCS16-
4	SD5	IRQ9	SA22	IRQ10
5	SD4	-5 V	SA21	IRQ11
6	SD3	DREQ2	SA20	IRQ12
7	SD2	-12 V	SA19	IRQ15
8	SD1	ZWS-	SA18	IRQ14
9	SD0	+12 V	SA17	DACK0-
10	IOCHRDY	GROUND	MEMR-	DREQ0
11	AEN	SMEMW-	MEMW-	DACK5-
12	SA19	SMEMR-	SD8	DRREQ5
13	SA18	IOW-	SD9	DACK6-
14	SA17	IOR-	SD10	DREQ6
15	SA16	DACK3-	SD11	DACK7-
16	SA15	DREQ3	SD12	DREQ7

Pin	Row A	Row B	Row C	Row D
17	SA14	DACK1-	SD13	+5 V
18	SA13	DREQ1	SD14	MASTER-
19	SA12	REFRESH-	SD15	GROUND
20	SA11	ISACLK	NC	GROUND
21	SA10	IRQ7		
22	SA9	IRQ6		
23	SA8	IRQ5		
24	SA7	IRQ4		
25	SA6	IRQ3		
26	SA5	DACK2-		
27	SA4	TC		
28	SA3	BALE		
29	SA2	+5 V		
30	SA1	ISA_OSC		
31	SA0	GROUND		
32	GROUND	GROUND		

Table 3-15: PC/104 Slot Connector Pinouts

3.2.16 PC/104 Power Input Connector

CN Label:	CN1
CN Type:	3-pin wafer (1x3)
CN Location:	See **Figure 3-17**
CN Pinouts:	See **Table 3-16**

Certain PC/104 cards require a -5 V or -12 V power supply. The onboard power from the board does not provide -5 V or -12 V power. To power expansion cards that require -5 V or -12 V a capable power supply must be connected to this connector.
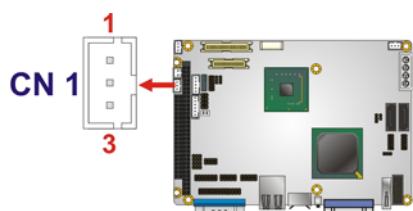
Figure 3-17: PC/104 Power Input Connector Pinouts

Pin	Description
1	-5 V
2	GND
3	-12 V

Table 3-16: PC/104 Power Input Connector Pinouts

3.2.17 Power Button Connector

CN Label:	**PWRBTN1**
CN Type:	2-pin wafer (1x2)
CN Location:	See **Figure 3-18**
CN Pinouts:	See **Table 3-17**

Connects to the power switch on the system chassis.
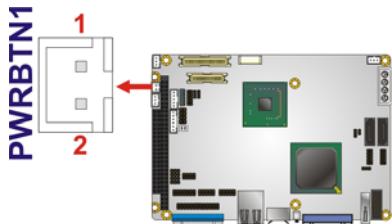
Figure 3-18: Power Button Connector Location

Pin	Description
1	PWRBTSW-
2	GND

Table 3-17: Power Button Connector Pinouts

3.2.18 Reset Button Connector

CN Label: **RESET1**

CN Type: 2-pin wafer (1x2)

CN Location: See **Figure 3-19**

CN Pinouts: See **Table 3-18**

Connects to the reset button on the system chassis.
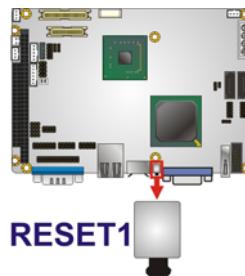
Figure 3-19: Reset Button Connector Location

Pin	Description
1	GND
2	PM_RESET
3	GND
4	PM_RESET

Table 3-18: Reset Button Connector Pinouts

3.2.19 SATA Drive Connectors

CN Label: **SATA1, SATA2**

CN Type: 7-pin SATA drive connectors

CN Location: See **Figure 3-20**

CN Pinouts: See **Table 3-19**

Connects to SATA hard drives or optical drives.
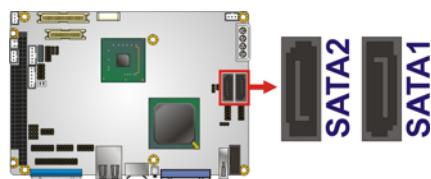
Figure 3-20: SATA Drive Connector Location

Pin	Description
1	GND
2	TX+
3	TX-
4	GND
5	RX-
6	RX+
7	GND

Table 3-19: SATA Drive Connector Pinouts

3.2.20 SDVO Connector

CN Label: SDVO1

CN Type: Flat cable connector

CN Location: See **Figure 3-21**

CN Pinouts: See **Table 3-20**

Connects to an external video codec.
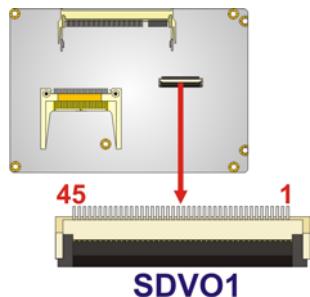
Figure 3-21: SDVO Connector Location

Pin	Description	Pin	Description
1	GND	25	GND
2	NC	26	SDVOB_BLUE-
3	NC	27	SDVOB_BLUE+
4	GND	28	GND
5	NC	29	SDVOB_RED-
6	NC	30	SDVOB_RED+
7	GND	31	GND
8	SDVOB_CLK-	32	SDVO_STALL-
9	SDVOB_CLK+	33	SDVO_STALL+
10	GND	34	GND
11	SDVO_GREEN-	35	SDVO_TVCLKIN-
12	SDVO_GREEN+	36	SDVO_TVCKLIN+
13	GND	37	GND
14	NC	38	SDVO_CLK
15	NC	39	SDVO_DATA
16	GND	40	PCIRST-
17	SDVOB_INT-	41	VCC
18	SDVOB_INT+	42	VCC
19	GND	43	VCC
20	NC	44	NC
21	NC	45	NC
22	GND		
23	NC		
24	NC		

Table 3-20: SDVO Connector Pinouts

3.2.21 Serial Port Connector

CN Label: COM2

CN Type: 14-pin header

CN Location: See Figure 3-22

CN Pinouts: See Table 3-21

Provides RS-232, RS-422 or RS-485 network capabilities.
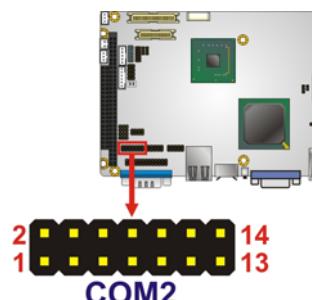
Figure 3-22: Serial Port Connector Locations

Pin	Description	Pin	Description
1	DCD#	2	DSR#
3	RXD	4	RTS#
5	TXD	6	CTS#
7	DTR#	8	RI#
9	GND	10	NC
11	TXD485+	12	TXD485#
13	RXD485+	14	RXD485#

Table 3-21: Serial Port Connector Pinouts

3.2.22 Serial Port Connectors

CN Label: **COM3, COM4**

CN Type: 10-pin header (2x5)

CN Location: See **Figure 3-23**

CN Pinouts: See **Table 3-22**

These connectors provide RS-232 communications.
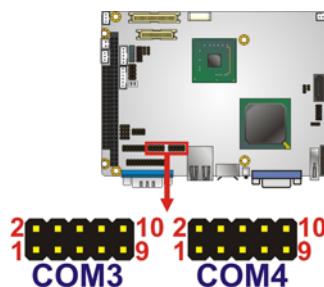
Figure 3-23: Serial Port Connector Location

Pin	Description	Pin	Description
1	Data Carrier Direct (DCD#)	2	Data Set Ready (DSR#)
3	Receive Data (RXD)	4	Request To Send (RTS#)
5	Transmit Data (TXD)	6	Clear To Send (CTS#)
7	Data Terminal Ready (DTR#)	8	Ring Indicator (RI#)
9	Ground (GND)	10	Ground (GND)

Table 3-22: Serial Port Connector Pinouts

3.2.23 SPI Flash Connector

CN Label:	JSPI1
CN Type:	8-pin header (2x4)
CN Location:	See **Figure 3-24**
CN Pinouts:	See **Table 3-23**

The 8-pin SPI Flash connector is used to flash the BIOS.
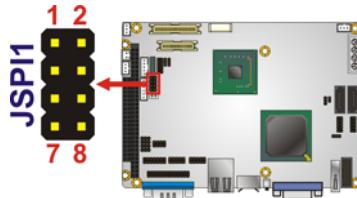
Figure 3-24: SPI Flash Connector

Pin	Description	Pin	Description
1	VCC	2	GND
3	CS#	4	CLOCK
5	SO	6	SI
7	NC	8	NC

Table 3-23: SPI Flash Connector

3.2.24 TTL LCD Connector

CN Label: TTL1

CN Type: 40-pin crimp (2x20)

CN Location: See **Figure 3-25**

CN Pinouts: See **Table 3-24**

Connects directly to an LCD panel.
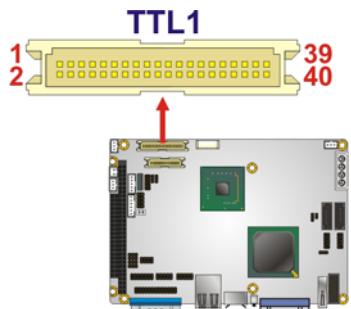
Figure 3-25: TTL LCD Connector Location

Pin	Description	Pin	Description
2	LCD_VCC	1	LCD-VCC
4	GND	3	GND
6	LCD_VCC	5	LCD_VCC
8	GND	7	SDA
10	NC	9	NC
12	B1	11	B0
14	B3	13	B2
16	B5	15	B4

Pin	Description	Pin	Description
18	NC	17	NC
20	G1	19	G0
22	G3	21	G2
24	G5	23	G4
26	NC	25	NC
28	R1	27	R0
30	R3	29	R2
32	R5	31	R4
34	GND	33	GND
36	VSYNC	35	CLK
38	HSYNC	37	LCD_EN
40	NC	39	NC

Table 3-24: TTL LCD Connector Pinouts

3.2.25 USB Connector

CN Label:	**USB01, USB23**
CN Type:	8-pin header (2x4)
CN Location:	See Figure 3-26
CN Pinouts:	See Table 3-25

The USB header can connect to two USB devices.
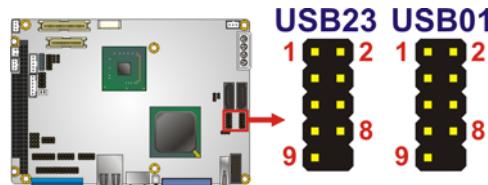
Figure 3-26: USB Connector Location

Pin	Description	Pin	Description
1	VCC	2	VCC
3	DATA-	4	DATA-
5	DATA+	6	DATA+

Pin	Description	Pin	Description
7	GND	8	GND

Table 3-25: USB Port Connector Pinouts

3.3 External Interface Connectors

Figure 3-27 shows the WAFER-945GSE3 motherboard external interface connectors. The WAFER-945GSE3 on-board external interface connectors are shown in Figure 3-27.
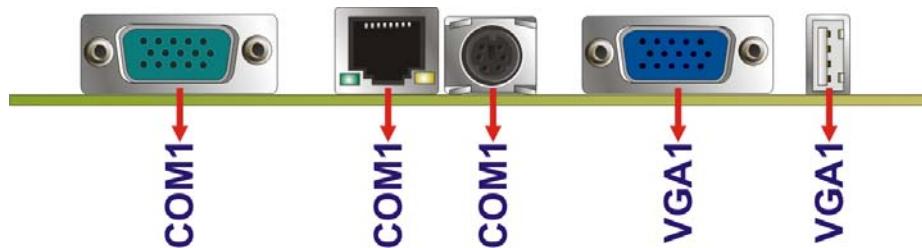
Figure 3-27: External Interface Connectors

3.3.1 Ethernet Connector

CN Label: **LAN1**

CN Type: RJ-45

CN Location: See Figure 3-27

CN Pinouts: See Table 3-26

A 10/100/1000 Mb/s connection can be made to a Local Area Network.

Pin	Description	Pin	Description
1	MDIA3-	5	MDIA1+
2	MDIA3+	6	MDIA2+
3	MDIA2-	7	MDIA0-
4	MDIA1-	8	MDIA0+

Table 3-26: Ethernet Connector Pinouts
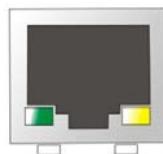
Figure 3-28: Ethernet Connector

The RJ-45 Ethernet connector has two status LEDs, one green and one yellow. The green LED indicates activity on the port and the yellow LED indicates the port is linked.

SPEED LED		LINK LED	
Status	**Description**	**Status**	**Description**
GREEN	ON: 100 MB OFF: 10 MB	YELLOW	ON: Linked Flashing: Activity

Table 3-27: Connector LEDs

3.3.2 Keyboard/Mouse Connector

CN Label:	**KB_MS1**
CN Type:	PS/2
CN Location:	See Figure 3-27
CN Pinouts:	See **Table 3-28**

The keyboard and mouse connector is a standard PS/2 connector.
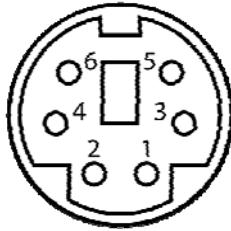
Figure 3-29: PS/2 Pinout and Configuration

Pin	Description
1	KB DATA
2	MS DATA
3	GND
4	VCC
5	KB CLOCK
6	MS CLOCK

Table 3-28: Keyboard Connector Pinouts

3.3.3 Serial Port Connector

CN Label:	**COM1**
CN Type:	DB-9 connector
CN Location:	See Figure 3-27
CN Pinouts:	See Table 3-29 and Figure 3-30

The RS-232 serial connector provides serial connection in the RS-232 mode.

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

Table 3-29: Serial Port Pinouts
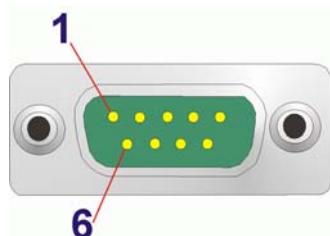
Figure 3-30: Serial Port Pinout Locations

3.3.4 USB Port (optional)

CN Label: **USB_C4**

CN Type: USB Combo ports

CN Location: See Figure 3-27

CN Pinouts: See Table 3-30

The USB ports attach to standard USB devices.

Pin	Description	Pin	Description
1	VCC	5	VCC
2	Data4-	6	Data5-
3	Data4+	7	Data5+
4	Ground	8	Ground

Table 3-30: USB Connector Pinouts

3.3.5 VGA Connector

CN Label: **VGA1**

CN Type: D-sub 15-pin female connector

CN Location: See Figure 3-27

CN Pinouts: See Figure 3-31 an Table 3-31

The standard 15-pin female VGA connector connects to a CRT or LCD monitor.

Pin	Description	Pin	Description	Pin	Description
1	RED	6	CRT_PLUG#	11	NC
2	GREEN	7	GROUND	12	DDCDAT
3	BLUE	8	GROUND	13	HSYNC
4	NC	9	NC	14	VSYNC
5	GROUND	10	GROUND	15	DDCCLK

Table 3-31: VGA Connector Pinouts
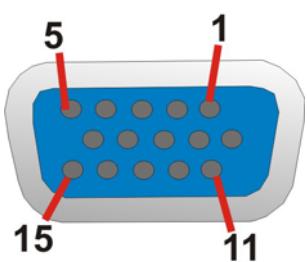
Figure 3-31: VGA Connector

Chapter

4

Installation

4.1 Anti-static Precautions

 WARNING:

Failure to take ESD precautions during installation may result in permanent damage to the product and severe injury to the user.

Electrostatic discharge (ESD) can cause serious damage to electronic components, including the WAFER-945GSE3. Dry climates are especially susceptible to ESD. It is therefore critical to strictly adhere to the following anti-static precautions whenever the WAFER-945GSE3, or any other electrical component, is handled.

- **Wear an anti-static wristband**: - Wearing a simple anti-static wristband can help to prevent ESD from damaging the board.
- **Self-grounding**:- Before handling the board touch any grounded conducting material. During the time the board is handled, frequently touch any conducting materials that are connected to the ground.
- **Use an anti-static pad**: When configuring the WAFER-945GSE3, place it on an antic-static pad. This reduces the possibility of ESD damaging the WAFER-945GSE3.
- **Only handle the edges of the PCB**:-: When handling the PCB, hold it by the edges.

4.2 Installation Considerations

 NOTE:

The following installation notices and installation considerations should be read and understood before the WAFER-945GSE3 is installed. All installation notices pertaining to the installation of WAFER-945GSE3 should be strictly adhered to. Failing to adhere to these precautions may lead to severe damage of the WAFER-945GSE3 and injury to the person installing the motherboard.

⚠ **WARNING:**

The installation instructions described in this manual should be carefully followed in order to prevent damage to the WAFER-945GSE3, WAFER-945GSE3 components and injury to the user.

Before and during the installation please **DO** the following:

- **Read the user manual**:
  - ○ The user manual provides a complete description of the installation instructions and configuration options.
- **Wear an electrostatic discharge cuff (ESD)**:
  - ○ Electronic components are easily damaged by ESD. Wearing an ESD cuff removes ESD from the body and helps prevent ESD damage.
- **Place on an antistatic pad**:
  - ○ When installing or configuring the motherboard, place it on an antistatic pad. This helps to prevent potential ESD damage.
- **Turn all power off**:
  - ○ Make sure the product is disconnected from all power supplies and that no electricity is being fed into the system.

Before and during the installation of the WAFER-945GSE3 **DO NOT:**

- **DO NOT** remove any of the stickers on the PCB board. These stickers are required for warranty validation.
- **DO NOT** use the product before verifying all the cables and power connectors are properly connected.
- **DO NOT** allow screws to come in contact with the PCB circuit, connector pins, or its components.

4.3 SO-DIMM Installation

To install an SO-DIMM, please follow the steps below and refer to Figure 4-1.
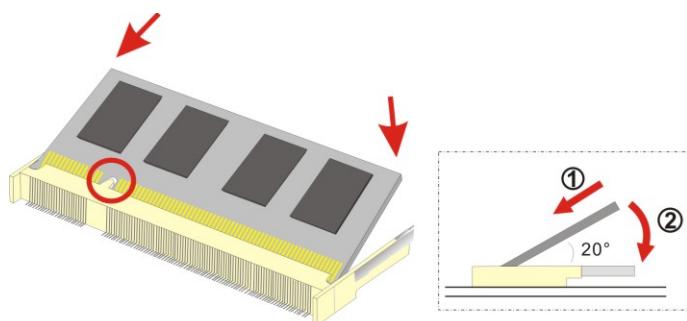
Figure 4-1: SO-DIMM Installation

Step 1:   Locate the SO-DIMM socket. Place the board on an anti-static mat.

Step 2:   Align the SO-DIMM with the socket. Align the notch on the memory with the notch on the memory socket.

Step 3:   Insert the SO-DIMM. Push the memory in at a 20º angle. (See Figure 4-1)

Step 4:   Seat the SO-DIMM. Gently push downwards and the arms clip into place. (See Figure 4-1)

4.4 Jumper Settings

NOTE:

A jumper is a metal bridge that is used to close an electrical circuit.   It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To CLOSE/SHORT a jumper means connecting the pins of the jumper with the plastic clip and to OPEN a jumper means removing the plastic clip from a jumper.
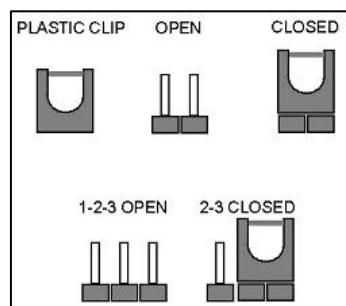
Before the WAFER-945GSE3 is installed in the system, the jumpers must be set in accordance with the desired configuration. The jumpers on the WAFER-945GSE3 are listed in Table 4-1.

Description	Label	Type
Audio Power Input selection	JP2	3-pin header
AT/ATX mode selection	ATXCTL1	3-pin header
Clear CMOS	J_CMOS1	3-pin header
COM1 RI/voltage selection	J_COM_F1	3-pin header
COM1 voltage selection	J_COM_V1	3-pin header
COM2 RI/voltage selection	J_COM_F2	3-pin header
COM2 voltage selection	J_COM_V2	3-pin header
COM2 RS-232/422/485 selection	JP3	8-pin header
CompactFlash® master/slave selection	JCF1	2-pin header
LVDS voltage selection	J_VLVDS1	3-pin header
LVDS/TTL selection	JP1	3-pin header

Table 4-1: Jumpers

4.4.1 Audio Power Input Selection

Jumper Label: **JP2**

Jumper Type: 3-pin header

Jumper Settings: See **Table 4-2**

Jumper Location: See **Figure 4-2**

Selects the voltage of the Audio Power Input.

Pin	Description
1-2	+5 V
2-3	+12 V

Table 4-2: Audio Power Input Selection
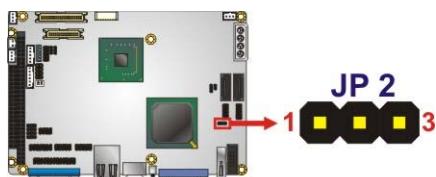
Figure 4-2: Audio Input Jumper Location

4.4.2 Clear CMOS Jumper

Jumper Label:	**J_CMOS1**
Jumper Type:	3-pin header
Jumper Settings:	See Table 4-3
Jumper Location:	See **Figure 4-3**

If the WAFER-945GSE3 fails to boot due to improper BIOS settings, the clear CMOS jumper clears the CMOS data and resets the system BIOS information. To do this, use the jumper cap to close pins 2 and 3 for a few seconds then reinstall the jumper clip back to pins 1 and 2.

If the "CMOS Settings Wrong" message is displayed during the boot up process, the fault may be corrected by pressing the F1 to enter the CMOS Setup menu. Do one of the following:

- Enter the correct CMOS setting
- Load Optimal Defaults
- Load Failsafe Defaults.

After having done one of the above, save the changes and exit the CMOS Setup menu.

The clear CMOS jumper settings are shown in Table 4-3.

Pin	Description
1-2	Keep CMOS Setup
2-3	Clear CMOS Setup

Table 4-3: Clear CMOS Jumper Settings
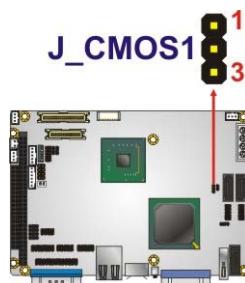
Figure 4-3: Clear CMOS Jumper Location

4.4.3 AT/ATX Mode Selection

Jumper Label:	**ATXCTL1**
Jumper Type:	3-pin header
Jumper Settings:	See Table 4-4
Jumper Location:	See **Figure 4-4**

Set both of the jumpers select AT or ATX power mode for the WAFER-945GSE3. AT power mode limits the system to on/off. ATX allows the system to use various power saving states and enter a standby state, so the system can be turned on remotely over a network. The settings on both jumpers should be the same.

Pin	Description
2-3	AT mode
Open	ATX mode

Table 4-4: AT/ATX Mode Selection
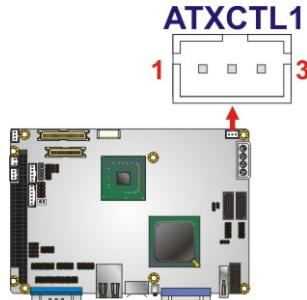
Figure 4-4: AT/ATX Mode Jumper Location

4.4.4 LVDS Voltage Selection

Jumper Label:	**J_VLVDS1**
Jumper Type:	3-pin header
Jumper Settings:	See Table 4-5
Jumper Location:	See **Figure 4-5**

Selects the voltage of the LVDS connector.

Pin	Description
1-2	3.3 V
2-3	5.0 V

Table 4-5: LVDS Voltage Selection
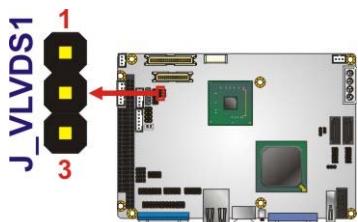
Figure 4-5: LVDS Voltage Jumper Location

4.4.5 CompactFlash® Master/Slave Selection

Jumper Label:	**JCF1**
Jumper Type:	2-pin header
Jumper Settings:	See Table 4-6
Jumper Location:	See **Figure 4-6**

Sets the CompactFlash® slot as the IDE primary master or primary slave.

Pin	Description
Open	Slave
Closed	Master

Table 4-6: CompactFlash® Master/Slave Selection
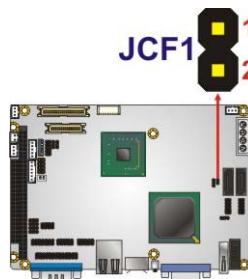
Figure 4-6: CompactFlash® Master/Slave Jumper Location

4.4.6 COM2 RS-232/422/485 Selection

Jumper Label:	JP3
Jumper Type:	8-pin header
Jumper Settings:	See Table 4-7
Jumper Location:	See **Figure 4-7**

Selects the communication method of COM2 serial port.

Pin	Description
1-2	RS-232
3-4	RS-422
5-6	RS-485
7-8	RS-485 with RTS control

Table 4-7: COM2 RS-232/422/485 Selection
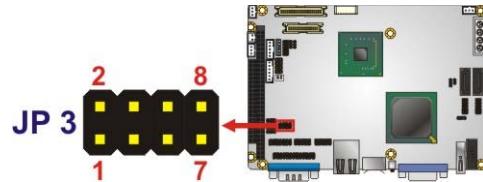
Figure 4-7: COM2 RS-232/422/485 Jumper Location

4.4.7 LVDS/TTL Selection

Jumper Label:	**JP1**
Jumper Type:	3-pin header
Jumper Settings:	See **Table 4-8**
Jumper Location:	See **Figure 4-8**

Selects LVDS video output, or both.

Pin	Description
1-2	LVDS only
2-3	LVDS + TTL

Table 4-8: LVDS/TTL Selection
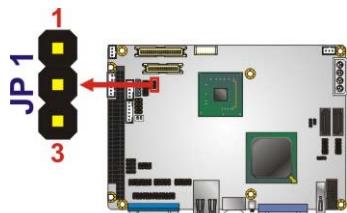
Figure 4-8: LVDS/TTL Jumper Location

4.4.8 COM1 RI/Voltage Selection

Jumper Label:	**J_COM_F1**
Jumper Type:	3-pin header
Jumper Settings:	See **Table 4-9**
Jumper Location:	See **Figure 4-9**

Sets pin 9 as the Ring Indicator or for supplying power.

Pin	Description
1-2	Voltage
2-3	Ring Indicator

Table 4-9: COM1 RI/Voltage Selection
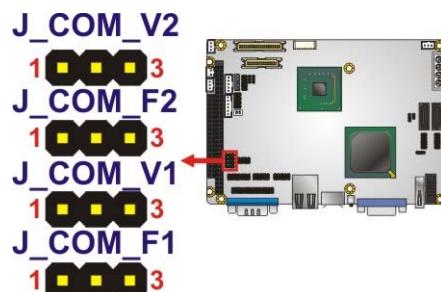
Figure 4-9: COM1 RI/Voltage Jumper Location

4.4.9 COM1 Voltage Selection

Jumper Label:	**J_COM_V1**
Jumper Type:	3-pin header
Jumper Settings:	See **Table 4-10**
Jumper Location:	See **Figure 4-10**

Sets the voltage supplied by pin 9.

Pin	Description
1-2	+5 V
2-3	+12 V

Table 4-10: COM1 Voltage Selection
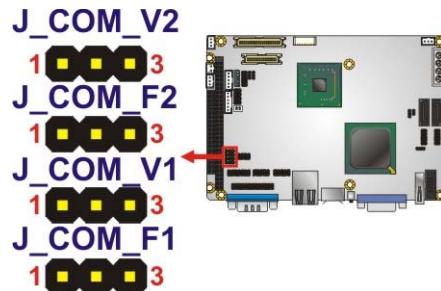
Figure 4-10: COM1 Voltage Jumper Location

4.4.10 COM2 RI/Voltage Selection

Jumper Label:	J_COM_F2
Jumper Type:	3-pin header
Jumper Settings:	See Table 4-11
Jumper Location:	See Figure 4-11

Sets pin 8 as the Ring Indicator or for supplying power.

Pin	Description
1-2	Voltage
2-3	Ring Indicator

Table 4-11: COM2 RI/Voltage Selection
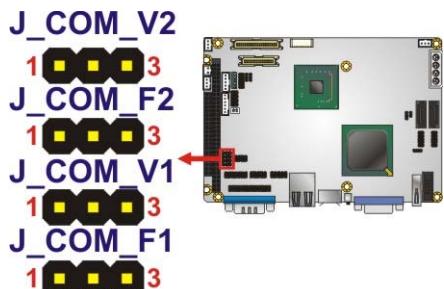
Figure 4-11: COM2 RI/Voltage Jumper Location

4.4.11 COM2 Voltage Selection

Jumper Label:	J_COM_V2
Jumper Type:	3-pin header
Jumper Settings:	See Table 4-12
Jumper Location:	See Figure 4-12

Sets the voltage supplied by pin 8.

Pin	Description
1-2	+5 V
2-3	+12 V

Table 4-12: COM2 Voltage Selection
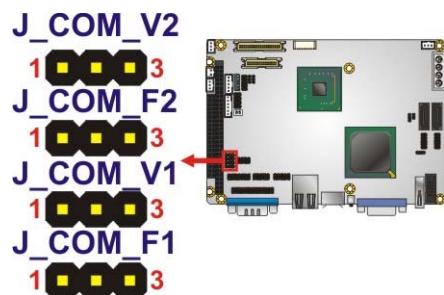
Figure 4-12: COM2 Jumper Location

4.5 Power Connection

To connect the power cables to the WAFER-945GSE3 follow the steps in the relevant section below.

4.5.1 AT Power Setup

AT power is controlled directly from the power supply. The system power is turned on and of by turning off the power supply. This method is best suited for always-on applications, where all the terminals need to be turned on from a central power switch.
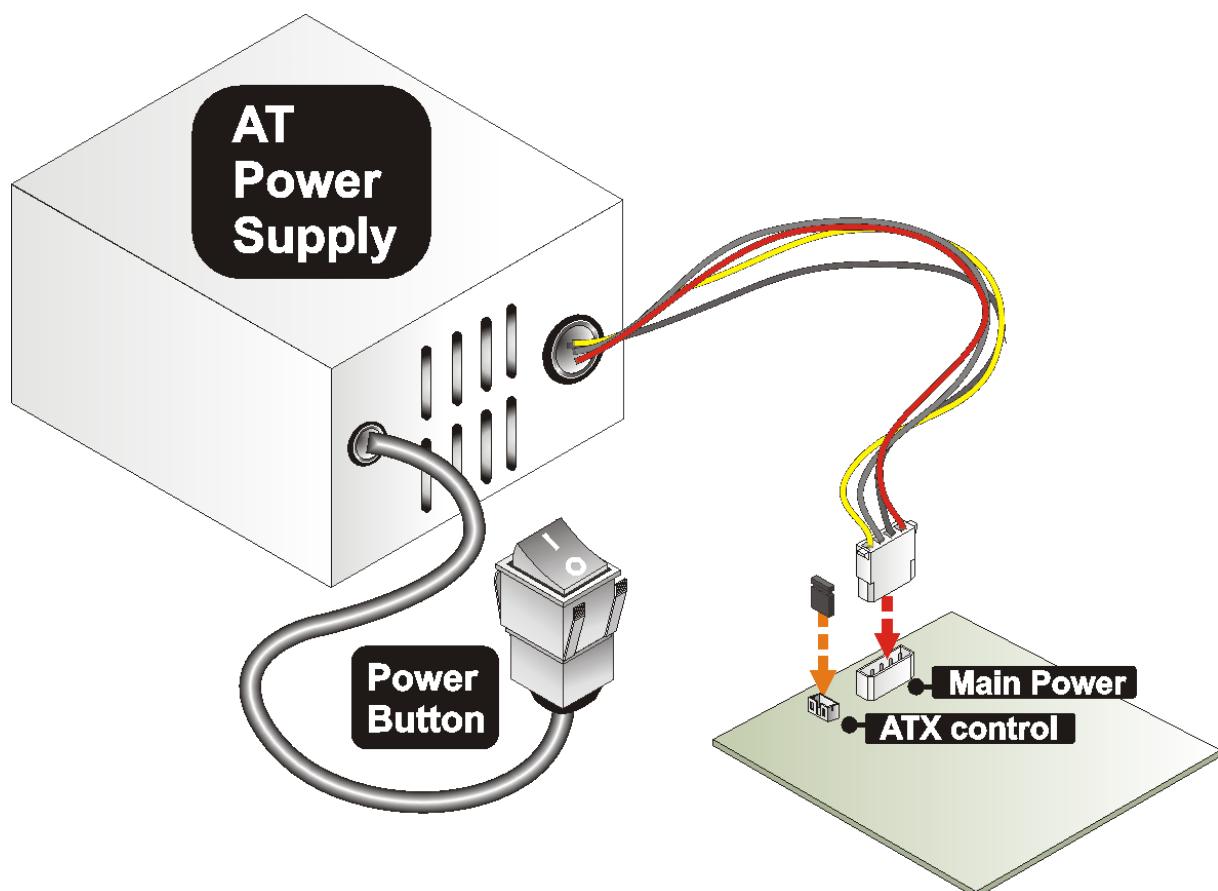
Figure 4–13: AT Power Setup

4.5.2 ATX Power Setup

ATX power can be turned on and off from the power supply. In addition to this basic capability ATX power can be shut off from the system, through software, or over a network.
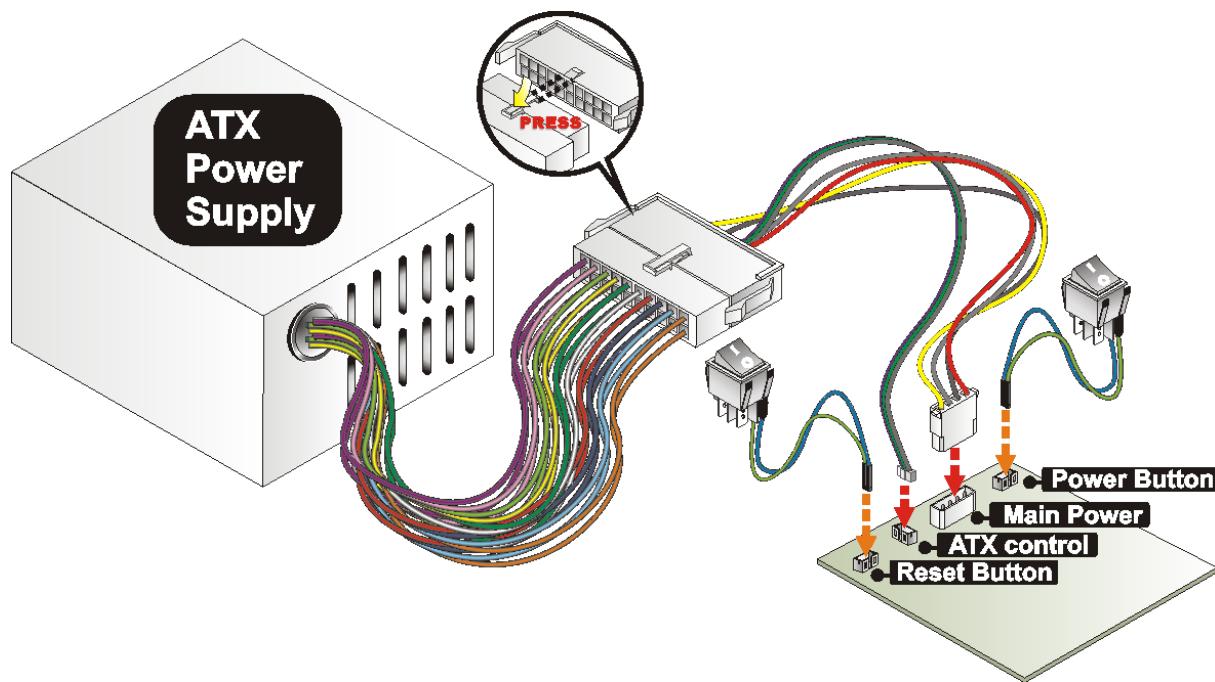
Figure 4–14: ATX Power Setup

4.6 Chassis Installation

4.6.1 Airflow

![warning icon] **WARNING:**

Airflow is critical to the cooling of the CPU and other onboard components. The chassis in which the WAFER-945GSE3 must have air vents to allow cool air to move into the system and hot air to move out.

The WAFER-945GSE3 must be installed in a chassis with ventilation holes on the sides allowing airflow to travel through the heat sink surface. In a system with an individual power supply unit, the cooling fan of a power supply can also help generate airflow through the board surface.

4.6.2 Motherboard Installation

To install the WAFER-945GSE3 motherboard into the chassis please refer to the reference material that came with the chassis.

4.7 Internal Peripheral Device Connections

This section outlines the installation of external components to the motherboard. Cables included in the package are listed in the unpacking section.

4.7.1 Audio Kit Installation

The Audio Kit that came with the WAFER-945GSE3 connects to the audio connector on the WAFER-945GSE3. The audio kit consists of three audio jacks. Mic-in connects to a microphone. Line-in provides a stereo line-level input to connect to the output of an audio device.   Line-out, a stereo line-level output, connects to two amplified speakers. To install the audio kit, please refer to the steps below:

Step 1:   Locate the audio connector. The location of the 10-pin audio connector is shown in **Chapter 3**.

Step 2:   Align pin 1. Align pin 1 on the on-board connector with pin 1 on the audio kit connector. Pin 1 on the audio kit connector is indicated with a white dot. See Figure 4-15.
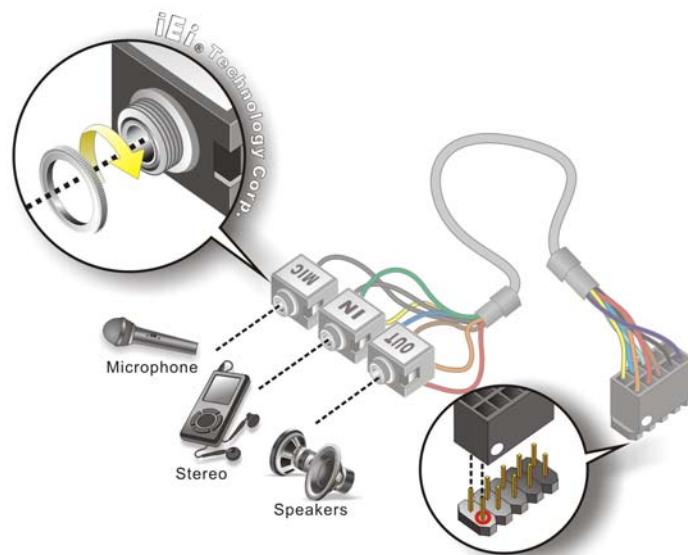
Figure 4-15: Audio Kit Cable Connection

Step 3: **Connect the audio devices**. Connect speakers to the line-out audio jack. Connect the output of an audio device to the line-in audio jack. Connect a microphone to the mic-in audio jack.

4.7.2 CompactFlash® Installation

 NOTE:

Both CompactFlash® Type I and Type II cards are supported.

To install the CompactFlash® card, please follow the steps below.

Step 1: **Locate the CF card socket**. Locate the CompactFlash® slot.

Step 2: **Align the CF card**. Align the CompactFlash® card. The label side should be facing away from the board. The grooves on the CompactFlash® slot ensure that the card cannot be inserted the wrong way.

Step 3: **Insert the CF card**. Push until the CompactFlash® card is firmly seated in the

slot. See Figure 4-16.
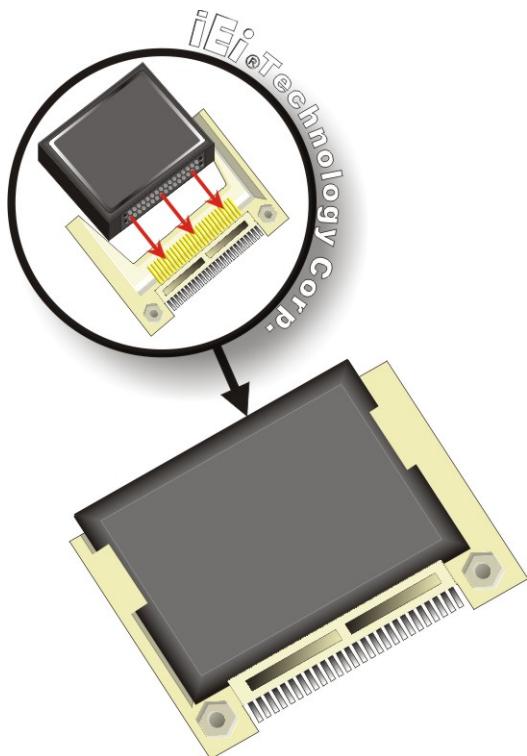
Figure 4-16: CompactFlash® Card Installation

4.7.3 LVDS LCD Installation

The WAFER-945GSE3 can be connected to a TFT LCD screen through the 30-pin LVDS crimp connector on the board. To connect a TFT LCD to the WAFER-945GSE3, please follow the steps below.

Step 1: **Locate the connector**. The location of the LVDS connector is shown in

Chapter 3.

Step 2: **Insert the cable connector**. Insert the connector from the LVDS PCB driving

board to the LVDS connector as shown in Figure 4-25. When connecting the

connectors, make sure the pins are properly aligned.

![Warning icon] **WARNING:**

The diagram below is merely for illustration. The configuration and connection of the cables from the TFT LCD screen being installed may be different. Please refer to the installation manual that came with the TFT LCD screen.
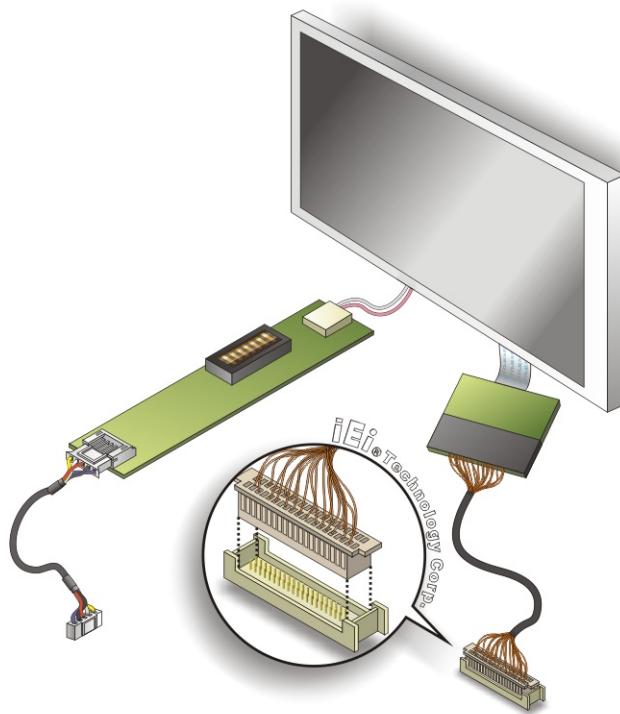
Figure 4-17: LVDS Connector

Step 3: **Locate the backlight inverter connector.** The location of the backlight inverter connector is shown in **Chapter 3**.

Step 4: **Connect backlight connector**. Connect the backlight connector to the driver TFT LCD PCB as shown in Figure 4-26. When inserting the cable connector, make sure the pins are properly aligned.
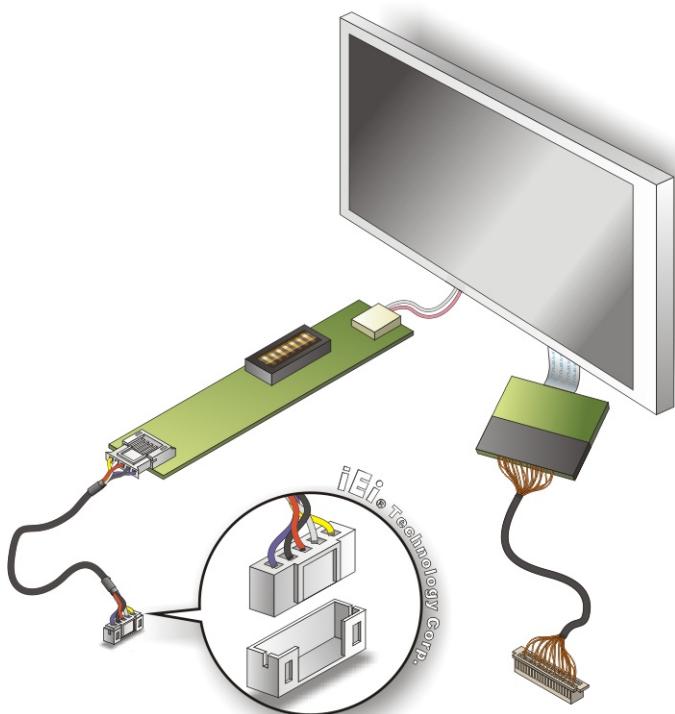
Figure 4-18: Backlight Inverter Connection

4.7.4 Parallel Port Cable

The optional parallel port (LPT) cable respectively connects the on-board LPT 26-pin box header to an external LPT device (like a printer). The cable comprises a 26-pin female header, to be connected to the on-board LPT box-header, on one side and on the other side a standard external LPT connector. To connect the LPT cable, please follow the steps below.

Step 1: **Locate the connector**. The LPT connector location is shown in **Chapter 4**.

Step 2: **Align the connectors**. Correctly align pin 1 on the cable connector with pin 1 on the WAFER-945GSE3 LPT box-header connector.

Step 3: **Insert the cable connectors** Once the cable connector is properly aligned with the 26-pin box-header connector on the WAFER-945GSE3, connect the cable connector to the on-board connector. See Figure 4-19**.**
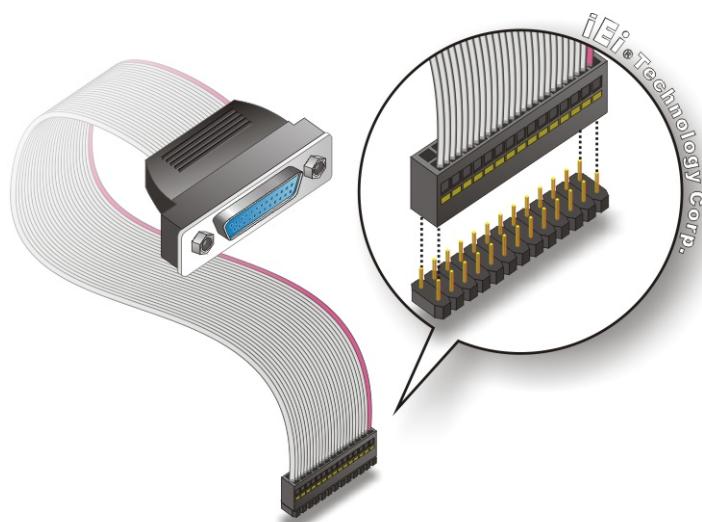
Figure 4-19: LPT Cable Connection

Step 4: **Attach the LPT connector to the chassis**. To secure the LPT interface

connector to the chassis please refer to the installation instructions that came

with the chassis.

Step 5: **Connect LPT device**. Once the LPT interface connector is connected to the

chassis, the LPT device can be connected to the LPT interface connector. See

Figure 4-20
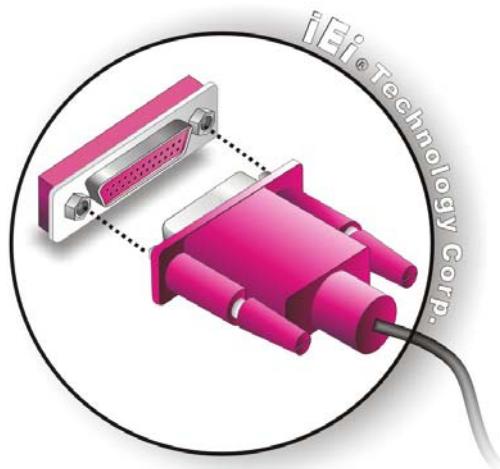
Figure 4-20: Connect the LPT Device

4.7.5 PC/104 Card Installation

To install a PC/104-Plus card, please refer to the diagram and instructions below.
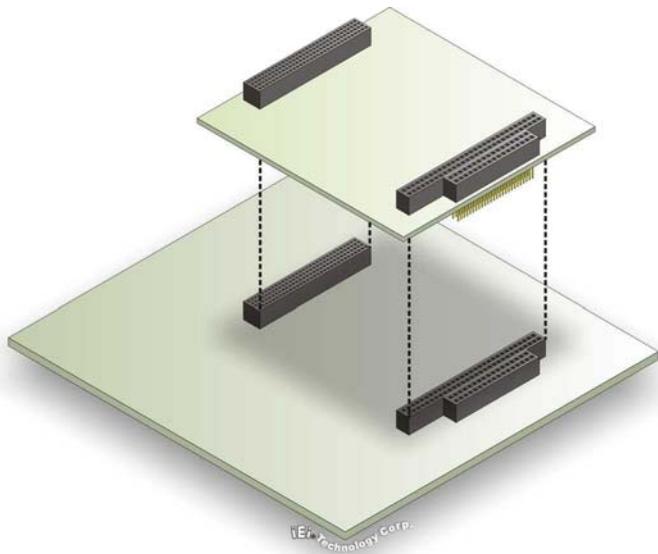
Figure 4-21: PC/104-Plus Card Installation

Step 1: **Align the connectors**. Make sure that the connectors are lined up correctly. The connectors should match up with the slot of the same shape.

Step 2: **Push straight down until the card is properly seated.** Push the card straight downwards to connect. Use a firm pushing action to connect. When the cards are connected properly there will be no gaps between the baseboard connectors and the card connectors.

4.7.6 SATA Drive Connection

The WAFER-945GSE3 is shipped with two SATA drive cables and one SATA drive power cable. To connect the SATA drives to the connectors, please follow the steps below.

Step 1: **Locate the connectors**. The locations of the SATA drive connectors are shown in **Chapter 3**.

Step 2: Insert the cable connector. Press the clip on the connector at the end of the

SATA cable and insert the cable connector into the onboard SATA drive

connector. See Figure 4-22.
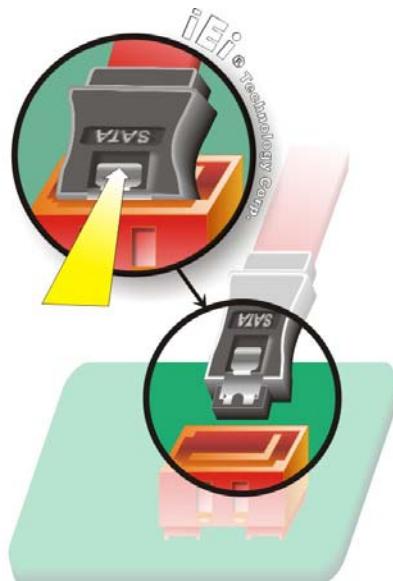
Figure 4-22: SATA Drive Cable Connection

Step 3: Connect the cable to the SATA disk. Connect the connector on the other end

of the cable to the connector at the back of the SATA drive. See Figure 4-23.

Step 4: Connect the SATA power cable. Connect the SATA power connector to the

back of the SATA drive. See Figure 4-23.

Figure 4-23: SATA Power Drive Connection

4.7.7 Serial Port Cable

The single RS-232 cable consists of one serial port connector attached to a serial communications cable that is then attached to a D-sub 9 male connector. To install the single RS-232 cable, please follow the steps below.

Step 1: **Locate the connector**. The location of the RS-232 connector is shown in

Chapter 3.

Step 2: **Insert the cable connector**. Insert the connector into the serial port box header.

See Figure 4-24. A key on the front of the cable connectors ensures the

connector can only be installed in one direction.
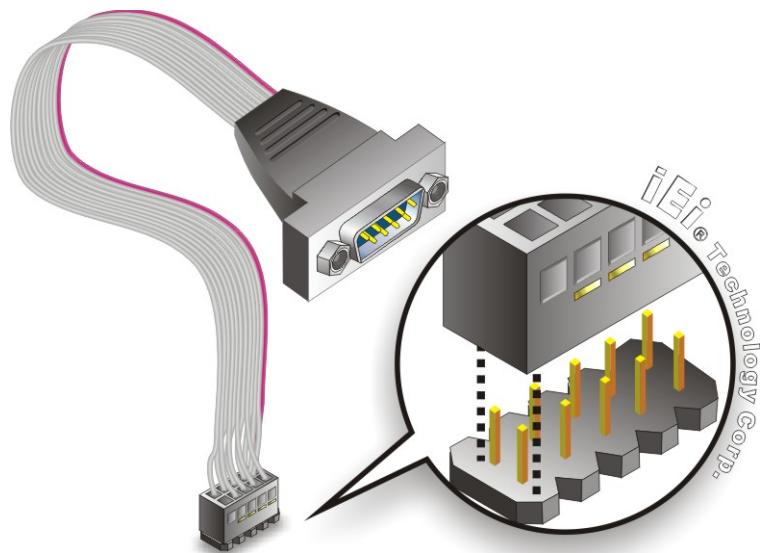
Figure 4-24: Single RS-232 Cable Installation

Step 3: **Secure the bracket**. The single RS-232 connector has two retention screws that must be secured to a chassis or bracket.

Step 4: **Connect the serial device**. Once the single RS-232 connector is connected to a chassis or bracket, a serial communications device can be connected to the system.

4.7.8 TTL LCD Installation

The WAFER-945GSE3 can be connected to a TFT LCD screen through the 40-pin TTL crimp on the board. To connect a TFT LCD to the WAFER-945GSE3, please follow the steps below.

Step 1: **Locate the connector**. The location of the TTL connector is shown in another chapter

Step 2: **Insert the cable connector**. Insert the connector from the TTL PCB driving board to the TTL connector as shown in Figure 4-25. When connecting the connectors make sure the pins are properly aligned.

> **WARNING:**
>
> The diagram below is merely for illustration. The configuration and connection of the cables from the TFT LCD screen being installed may be different. Please refer to the installation manual that came with the TFT LCD screen.
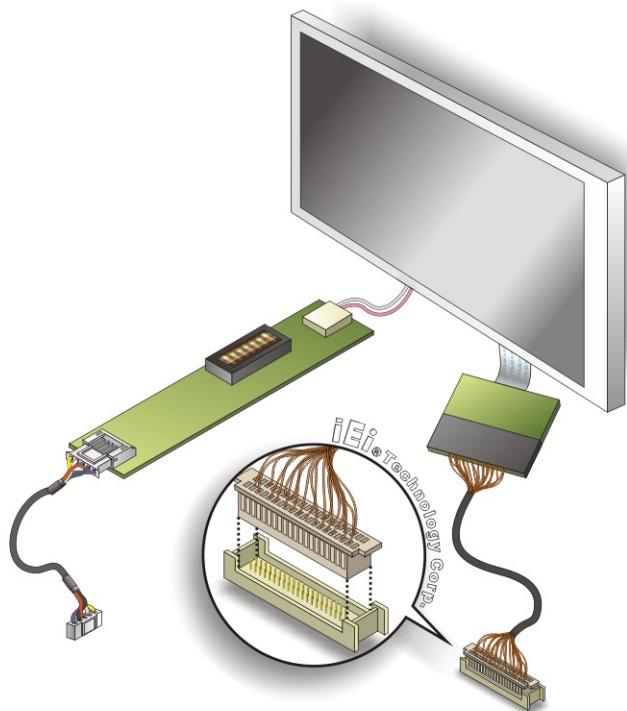
Figure 4-25: TTL Connector

Step 3: **Locate the backlight inverter connector.** The location of the backlight inverter connector is shown in **Chapter 3**.

Step 4: **Connect backlight connector**. Connect the backlight connector to the driver TFT LCD PCB as shown in Figure 4-26. When inserting the cable connector, make sure the pins are properly aligned.
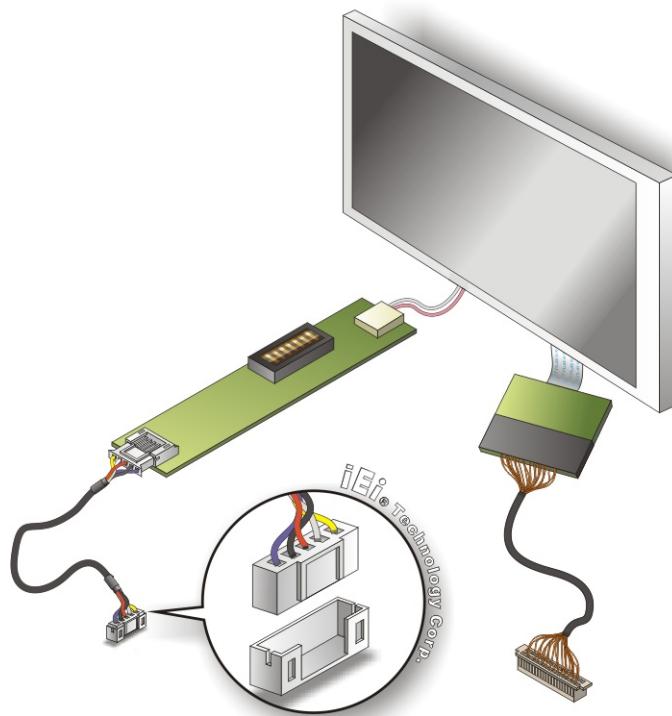
Figure 4-26: Backlight Inverter Connection

4.7.9 USB Cable

The WAFER-945GSE3 is shipped with a dual port USB 2.0 cable. To connect the USB cable connector, please follow the steps below.

Step 1: **Locate the connectors**. The locations of the USB connectors are shown in **Chapter 3**.

⚠ **WARNING:**

If the USB pins are not properly aligned, the USB device can burn out.

Step 2: **Align the connectors**. The cable has two connectors. Correctly align pin 1on each cable connector with pin 1 on the WAFER-945GSE3 USB connector.

Step 3: **Insert the cable connectors**. Once the cable connectors are properly aligned with the USB connectors on the WAFER-945GSE3, connect the cable connectors to the on-board connectors. See Figure 4-27.
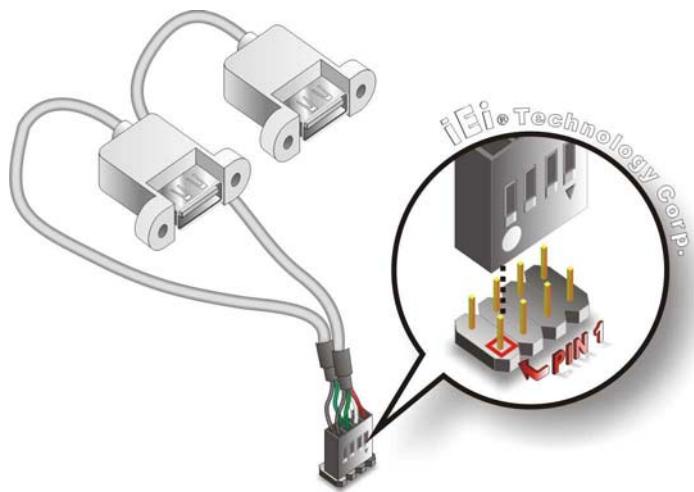
Figure 4-27: Dual USB Cable Connection

Step 4: **Attach the USB connectors to the chassis**. The USB 2.0 connectors each of two retention screw holes. To secure the connectors to the chassis please refer to the installation instructions that came with the chassis.

4.8 External Peripheral Interface Connection

The connection of external devices to the external connectors is outlined in the subsections below.

4.8.1 LAN Connection

There are two external RJ-45 LAN connectors. The RJ-45 connectors enable connection to an external network. To connect a LAN cable with an RJ-45 connector, please follow the instructions below.

Step 1: **Locate the RJ-45 connectors**. The locations of the USB connectors are shown in **Chapter 4**.

Step 2: **Align the connectors.** Align the RJ-45 connector on the LAN cable with one of

the RJ-45 connectors on the WAFER-945GSE3.
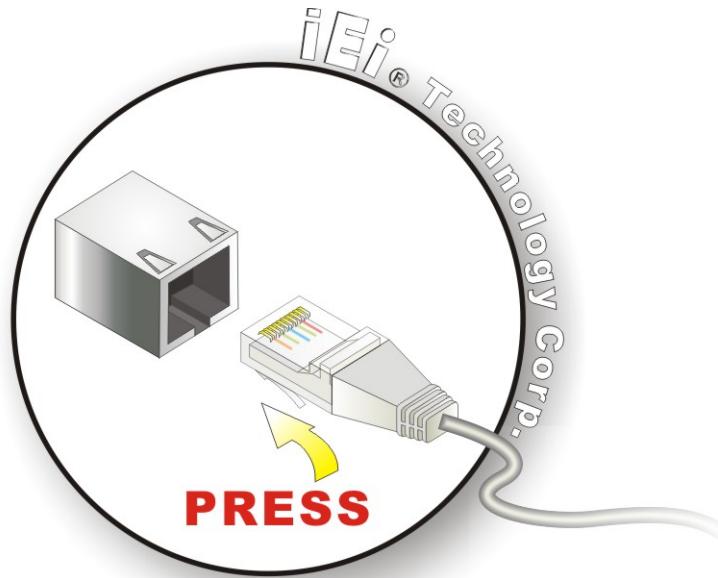
Figure 4-28: LAN Connection

Step 3: **Insert the LAN cable RJ-45 connector.** Once aligned, gently insert the LAN

cable RJ-45 connector into the on-board RJ-45 connector.

4.8.2 PS/2 Keyboard/Mouse Connection

The WAFER-945GSE3 has a PS/2 connector on the external peripheral interface panel.
The dual PS/2 connector is connected to the PS/2 Y-cable that came with the
WAFER-945GSE3. One of the PS/2 cables is connected to a keyboard and the other to a
mouse to the system. Follow the steps below to connect a keyboard and mouse to the
WAFER-945GSE3.

Step 1: **Locate the dual PS/2 connector**. The location of the PS/2 connector is shown

in **Chapter 3**.

Step 2: **Insert the keyboard/mouse connector**. Insert the PS/2 connector on the end

of the PS/2 y-cable into the external PS/2 connector. See Figure 4-29.
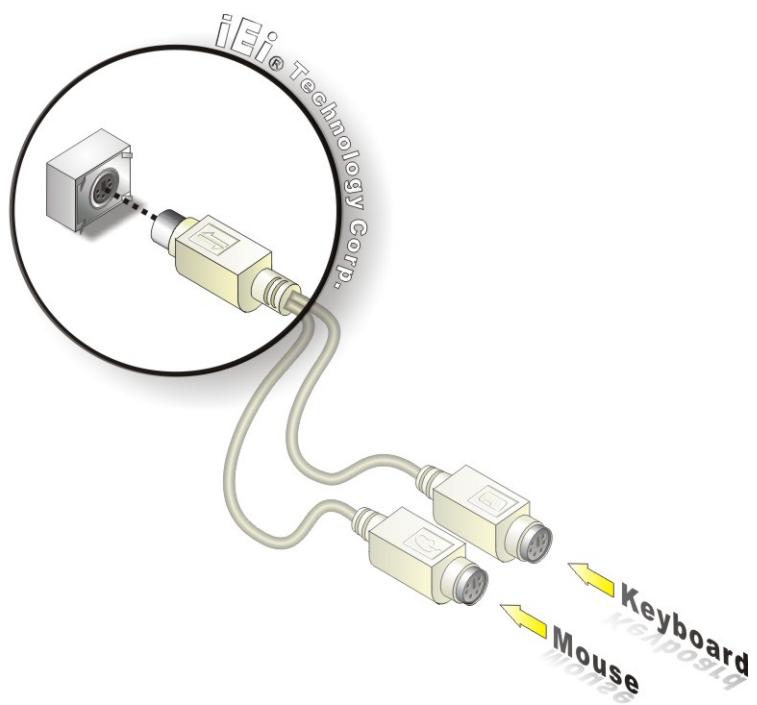
Figure 4-29: PS/2 Keyboard/Mouse Connector

Step 3: **Connect the keyboard and mouse**. Connect the keyboard and mouse to the appropriate connector. The keyboard and mouse connectors can be distinguished from each other by looking at the small graphic at the top of the connector.

4.8.3 Serial Device Connection

The WAFER-945GSE3 has a single female DB-9 connector on the external peripheral interface panel for a serial device. Follow the steps below to connect a serial device to the WAFER-945GSE3.

Step 1: **Locate the DB-9 connector**. The location of the DB-9 connector is shown in **Chapter 3**.

Step 2: **Insert the serial connector**. Insert the DB-9 connector of a serial device into the DB-9 connector on the external peripheral interface.
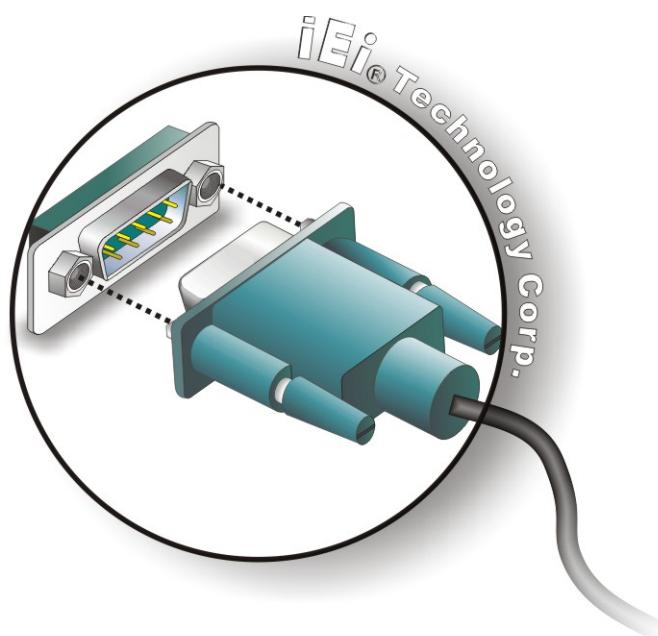
Figure 4-30: Serial Device Connector

Step 3: **Secure the connector**. Secure the serial device connector to the external

interface by tightening the two retention screws on either side of the connector.

4.8.4 USB Connection

There are two external USB 2.0 connectors. Both connectors are perpendicular to the WAFER-945GSE3. To connect a USB 2.0 or USB 1.1 device, please follow the instructions below.

Step 1: **Located the USB connectors**. The locations of the USB connectors are shown in **Chapter 4**.

Step 2: **Align the connectors.** Align the USB device connector with one of the

connectors on the WAFER-945GSE3. See Figure 4-31.
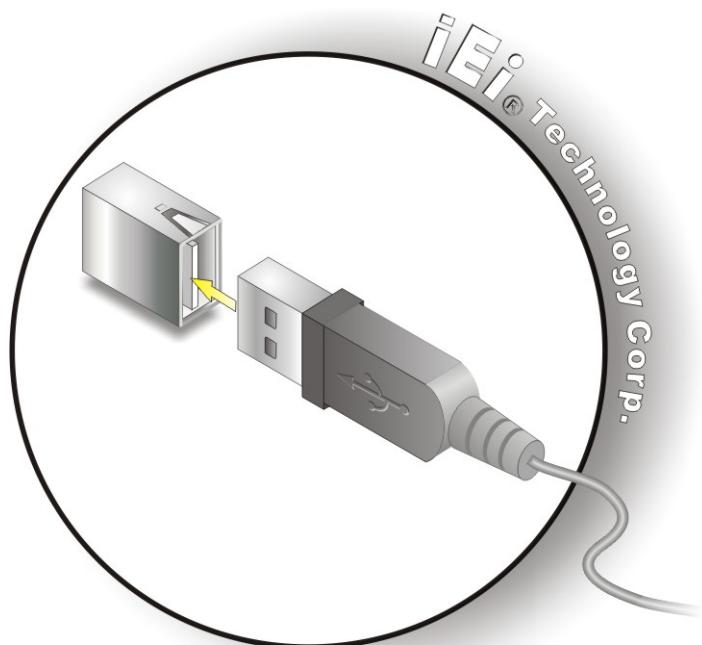
Figure 4-31: USB Device Connection

Step 3: **Insert the device connector.** Once aligned, gently insert the USB device

connector into the on-board connector.

4.8.5 VGA Monitor Connection

The WAFER-945GSE3 has a single female DB-15 connector on the external peripheral interface panel. The DB-15 connector is connected to a CRT or VGA monitor. To connect a monitor to the WAFER-945GSE3, please follow the instructions below.

Step 1: **Locate the female DB-15 connector**. The location of the female DB-15

connector is shown in **Chapter 3**.

Step 2: **Align the VGA connector**. Align the male DB-15 connector on the VGA screen

cable with the female DB-15 connector on the external peripheral interface.

Step 3: **Insert the VGA connector** Once the connectors are properly aligned with the

insert the male connector from the VGA screen into the female connector on the

WAFER-945GSE3.
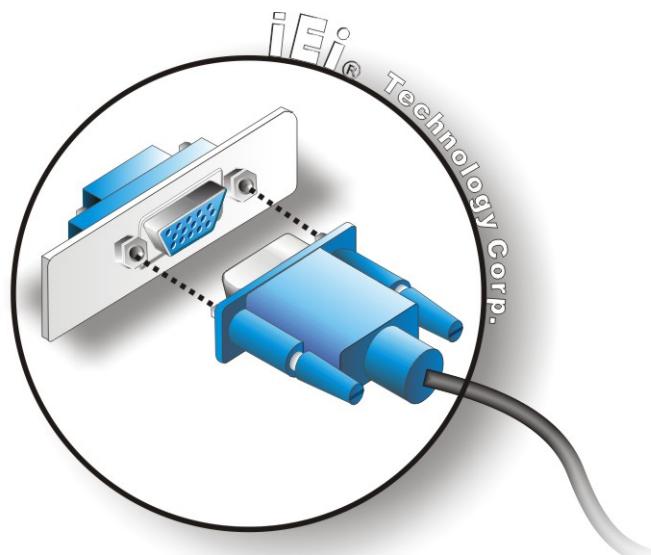
Figure 4-32: VGA Connector

Step 4: **Secure the connector**. Secure the DB-15 VGA connector from the VGA monitor to the external interface by tightening the two retention screws on either side of the connector.

4.9 Driver Installation

All drivers are on the included CD. Refer to the instructions below to start the driver installation program.

![NOTE icon] **NOTE:**

The content of the CD may vary throughout the life cycle of the product and is subject to change without prior notice. Visit the IEI website or contact technical support for the latest updates.

Step 1: Insert the CD into a CD drive connected to the system.

NOTE:

If the system does not initiate the "autorun" program when the CD is inserted, click the Start button, select Run, then type X:\autorun.exe (where X:\ is the system CD drive) to access the IEI Driver CD main menu.

Step 2: Select WAFER-945GSE3 from the drivers list.

Step 3: Install each of the drivers shown in the menu.

Chapter

5

BIOS

5.1 Introduction

The BIOS is programmed onto the BIOS chip. The BIOS setup program allows changes to certain system settings. This chapter outlines the options that can be changed.

5.1.1 Starting Setup

The AMI BIOS is activated when the computer is turned on. The setup program can be activated in one of two ways.

1. Press the DELETE key as soon as the system is turned on or
2. Press the DELETE key when the "**Press Del to enter SETUP**" message appears on the screen.

If the message disappears before the DELETE key is pressed, restart the computer and try again.

5.1.2 Using Setup

Use the arrow keys to highlight items, press ENTER to select, use the PageUp and PageDown keys to change entries, press **F1** for help and press Esc to quit. Navigation keys are shown in.

Key	Function
Up arrow	Move to previous item
Down arrow	Move to next item
Left arrow	Move to the item on the left hand side
Right arrow	Move to the item on the right hand side
Esc key	Main Menu – Quit and not save changes into CMOS Status Page Setup Menu and Option Page Setup Menu -- Exit current page and return to Main Menu
Page Up key	Increase the numeric value or make changes
Page Dn key	Decrease the numeric value or make changes
F1 key	General help, only for Status Page Setup Menu and Option Page Setup Menu

Key	Function
F2 /F3 key	Change color from total 16 colors. F2 to select color forward.
F10 key	Save all the CMOS changes, only for Main Menu

Table 5-1: BIOS Navigation Keys

5.1.3 Getting Help

When **F1** is pressed a small help window describing the appropriate keys to use and the possible selections for the highlighted item appears. To exit the Help Window press **Esc** or the **F1** key again.

5.1.4 Unable to Reboot After Configuration Changes

If the computer cannot boot after BIOS changes are made, the BIOS will either automatically reset to default settings, or can be manually reset using the "Clear CMOS" jumper.

5.1.5 BIOS Menu Bar

The **menu bar** on top of the BIOS screen has the following main items:

- Main – Changes the basic system configuration.
- Advanced – Changes the advanced system settings.
- PCIPnP – Changes the advanced PCI/PnP Settings
- Boot – Changes the system boot configuration.
- Security – Sets User and Supervisor Passwords.
- Chipset – Changes the chipset settings.
- Exit – Selects exit options and loads default settings

The following sections completely describe the configuration options found in the menu items at the top of the BIOS screen and listed above.

5.2 Main

The **Main** BIOS menu (BIOS Menu 1) appears when the **BIOS Setup** program is entered. The **Main** menu gives an overview of the basic system information.

```
                        BIOS SETUP UTILITY
   Main    Advanced    PCIPNP     Boot    Security   Chipset     Exit

 System Overview                                  Use [ENTER], [TAB] or
 _____      [SHIFT-TAB] to select a
                                                  field.
 AMIBIOS
 Version    :08.00.15
 Build Date :06/23/09                             Use [+] or [-] to
 ID:        :B145MR11                             configure system time.

 Processor
 Genuine Intel® CPU N270  @ 1.60GHz
 Speed      :1600MHz
 Count      :1
                                                  ←→   Select Screen
 System Memory                                    ↑ ↓  Select Item
 Size       :1016MB                               Enter Go to SubScreen
                                                  F1   General Help
 System Time                 [14:20:27]           F10  Save and Exit
 System Time                 [Tue 05/06/2008]     ESC  Exit

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```

BIOS Menu 1: Main

▪ **System Overview**

The **System Overview** lists a brief summary of different system components. The fields in **System Overview** cannot be changed. The items shown in the system overview include:

▪ AMI BIOS: Displays auto-detected BIOS information
  ○ **Version:** Current BIOS version
  ○ **Build Date:** Date the current BIOS version was made
  ○ **ID:** Installed BIOS ID
▪ Processor: Displays auto-detected CPU specifications
  ○ **Type:** Names the currently installed processor
  ○ **Speed:** Lists the processor speed
  ○ **Count:** The number of CPUs on the motherboard
▪ System Memory: Displays the auto-detected system memory.
  ○ **Size:** Lists memory size

The System Overview field also has two user configurable fields:

▪ **System Time [xx:xx:xx]**

Use the **System Time** option to set the system time. Manually enter the hours, minutes and seconds.

▪ **System Date [xx/xx/xx]**

Use the **System Date** option to set the system date. Manually enter the day, month and year.

5.3 Advanced

Use the **Advanced** menu (BIOS Menu 2) to configure the CPU and peripheral devices through the following sub-menus:

```
                        BIOS SETUP UTILITY
   Main     Advanced   PCIPNP     Boot    Security  Chipset     Exit

 Advanced Settings                              Configure CPU
 _____
 WARNING: Setting wrong values in below sections may
 cause system to malfunction

 > CPU Configuration
 > IDE Configuration
 > SuperIO Configuration                        ←→    Select Screen
 > Hardware Health Configuration                ↑↓    Select Item
 > Power Configuration                          Enter Go to SubScreen
 > Remote Access Configuration                  F1    General Help
 > USB Configuration                            F10   Save and Exit
                                                ESC   Exit

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```
BIOS Menu 2: Advanced

5.3.1 CPU Configuration

Use the **CPU Configuration** menu (BIOS Menu 3) to view detailed CPU specifications and configure the CPU.

```
                        BIOS SETUP UTILITY
   Main     Advanced   PCIPNP     Boot    Security   Chipset     Exit

Configure Advanced CPU Settings
Module Version:3F.10
_____

Manufacturer  :Intel®
Genuine Intel® CPU N270  @ 1.60GHz
Frequency     :1.60GHz
FSB Speed     :532Hz
                                                ←→   Select Screen
                                                ↑ ↓  Select Item
Cache L1      :24 KB                             Enter Go to SubScreen
Cache L2      :512 KB                            F1   General Help
                                                F10  Save and Exit
Ratio Actual Value:12                           ESC  Exit


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```

BIOS Menu 3: CPU Configuration

The CPU Configuration menu (BIOS Menu 3) lists the following CPU details:

- Manufacturer: Lists the name of the CPU manufacturer
- Brand String: Lists the brand name of the CPU being used
- Frequency: Lists the CPU processing speed
- FSB Speed: Lists the FSB speed
- Cache L1: Lists the CPU L1 cache size
- Cache L2: Lists the CPU L2 cache size
- Ratio actual value is the ratio of the frequency to the clock speed

5.3.2 IDE Configuration

Use the **IDE Configuration** menu (BIOS Menu 4) to change and/or set the configuration of the IDE devices installed in the system.

```
                        BIOS SETUP UTILITY
   Main    Advanced   PCIPNP     Boot    Security  Chipset     Exit

 IDE Configuration                                    Options
 _____
 ATA/IDE Configuration          [Compatible]          Disabled
   Legacy IDE Channels          [SATA Pri, PATA Sec]  Compatible
                                                      Enhanced
 > Primary IDE Master           : [Not Detected]
 > Primary IDE Slave            : [Not Detected]
 > Secondary IDE Master         : [Not Detected]      ←→   Select Screen
 > Secondary IDE Slave          : [Not Detected]      ↑ ↓  Select Item
                                                      Enter Go to SubScreen
                                                      F1   General Help
                                                      F10  Save and Exit
                                                      ESC  Exit

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```
BIOS Menu 4: IDE Configuration

▪ **ATA/IDE Configurations [Compatible]**

Use the **ATA/IDE Configurations** option to configure the ATA/IDE controller.

➔ **Disabled** Disables the on-board ATA/IDE controller.

➔ **Compatible** Configures the on-board ATA/IDE controller to be in compatible mode. In this mode, a SATA channel will replace one of the IDE channels. This mode supports up to 4 storage devices.

➔ **Enhanced DEFAULT** Configures the on-board ATA/IDE controller to be in Enhanced mode. In this mode, IDE channels and SATA channels are separated. This mode supports up to 6 storage devices. Some legacy OS do not support this mode.

▪ **Legacy IDE Channels [PATA Pri, SATA Sec]**

➔ **SATA Only** Only the SATA drives are enabled.

➔ **PATA Pri, SATA Sec** DEFAULT The IDE drives are enabled on the Primary
IDE channel. The SATA drives are enabled on
the Secondary IDE channel.

➔ **PATA Pri., PATA Sec** The IDE drives are enabled on the primary
and secondary IDE channels. SATA drives
are disabled.

▪ **IDE Master and IDE Slave**

When entering setup, BIOS auto detects the presence of IDE devices. BIOS displays the
status of the auto detected IDE devices. The following IDE devices are detected and are
shown in the **IDE Configuration** menu:

▪ Primary IDE Master
▪ Primary IDE Slave

5.3.2.1 IDE Master, IDE Slave

Use the **IDE Master** and **IDE Slave** configuration menu to view both primary and
secondary IDE device details and configure the IDE devices connected to the system.

```
                         BIOS SETUP UTILITY
  Main     Advanced   PCIPNP     Boot     Security  Chipset     Exit

 Primary IDE Master                                   Select the type of device
 ──────────────────────────────────────────────      connected to the system
 Device      :Not Detected

 Type                           [Auto]
 LBA/Large Mode                 [Auto]
 Block (Multi-Sector Transfer)  [Auto]
 PIO Mode                       [Auto]           ←→   Select Screen
 DMA Mode                       [Auto]           ↑ ↓  Select Item
 S.M.A.R.T.                     [Auto]           Enter Go to SubScreen
 32Bit Data Transfer            [Enabled]        F1    General Help
                                                 F10   Save and Exit
                                                 ESC   Exit

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```
BIOS Menu 5: IDE Master and IDE Slave Configuration

▪ **Auto-Detected Drive Parameters**

The "grayed-out" items in the left frame are IDE disk drive parameters automatically detected from the firmware of the selected IDE disk drive. The drive parameters are listed as follows:

- Device: Lists the device type (e.g. hard disk, CD-ROM etc.)
- Type: Indicates the type of devices a user can manually select
- Vendor: Lists the device manufacturer
- Size: List the storage capacity of the device.
- LBA Mode: Indicates whether the LBA (Logical Block Addressing) is a method of addressing data on a disk drive is supported or not.
- Block Mode: Block mode boosts IDE drive performance by increasing the amount of data transferred. Only 512 bytes of data can be transferred per interrupt if block mode is not used. Block mode allows transfers of up to 64 KB per interrupt.
- PIO Mode: Indicates the PIO mode of the installed device.
- Async DMA: Indicates the highest Asynchronous DMA Mode that is supported.
- Ultra DMA: Indicates the highest Synchronous DMA Mode that is supported.
- S.M.A.R.T.: Indicates whether or not the Self-Monitoring Analysis and Reporting Technology protocol is supported.
- 32Bit Data Transfer: Enables 32-bit data transfer.

▪ **Type [Auto]**

Use the **Type** BIOS option select the type of device the AMIBIOS attempts to boot from after the Power-On Self-Test (POST) is complete.

➔ **Not Installed**   BIOS is prevented from searching for an IDE disk drive on the specified channel.

➔ **Auto**   **DEFAULT**   The BIOS auto detects the IDE disk drive type attached to the specified channel. This setting should be used if an IDE hard disk drive is attached to the specified channel.

 CD/DVD The CD/DVD option specifies that an IDE CD-ROM drive is attached to the specified IDE channel. The BIOS does not attempt to search for other types of IDE disk drives on the specified channel.

 ARMD This option specifies an ATAPI Removable Media Device. These include, but are not limited to:

 ZIP

 LS-120

▪ **LBA/Large Mode [Auto]**

Use the **LBA/Large Mode** option to disable or enable BIOS to auto detects LBA (Logical Block Addressing). LBA is a method of addressing data on a disk drive. In LBA mode, the maximum drive capacity is 137 GB.

 Disabled BIOS is prevented from using the LBA mode control on the specified channel.

 Auto DEFAULT BIOS auto detects the LBA mode control on the specified channel.

▪ **Block (Multi Sector Transfer) [Auto]**

Use the **Block (Multi Sector Transfer)** to disable or enable BIOS to auto detect if the device supports multi-sector transfers.

 Disabled BIOS is prevented from using Multi-Sector Transfer on the specified channel. The data to and from the device occurs one sector at a time.

 Auto DEFAULT BIOS auto detects Multi-Sector Transfer support on the drive on the specified channel. If supported the data transfer to and from the device occurs multiple sectors at a time.

▪ **PIO Mode [Auto]**

Use the **PIO Mode** option to select the IDE PIO (Programmable I/O) mode program timing cycles between the IDE drive and the programmable IDE controller. As the PIO mode increases, the cycle time decreases.

➔ **Auto**   **DEFAULT**   BIOS auto detects the PIO mode. Use this value if the IDE disk drive support cannot be determined.

➔ **0**   PIO mode 0 selected with a maximum transfer rate of 3.3 MB/s

➔ **1**   PIO mode 1 selected with a maximum transfer rate of 5.2 MB/s

➔ **2**   PIO mode 2 selected with a maximum transfer rate of 8.3 MB/s

➔ **3**   PIO mode 3 selected with a maximum transfer rate of 11.1 MB/s

➔ **4**   PIO mode 4 selected with a maximum transfer rate of 16.6 MB/s

(This setting generally works with all hard disk drives manufactured after 1999. For other disk drives, such as IDE CD-ROM drives, check the specifications of the drive.)

▪ **DMA Mode [Auto]**

Use the **DMA Mode** BIOS selection to adjust the DMA mode options.

➔ **Auto**   **DEFAULT**   BIOS auto detects the DMA mode. Use this value if the IDE disk drive support cannot be determined.

➔ **SWDMA0**   Single Word DMA mode 0, max transfer rate: 2.1 MB/s

➔ **SWDMA1**   Single Word DMA mode 1, max transfer rate: 4.2 MB/s

➔ **SWDMA2**   Single Word DMA mode 2, max transfer rate: 8.3 MB/s

➔ **MWDMA0**   Multi Word DMA mode 0, max transfer rate: 4.2 MB/s

➔ **MWDMA1**   Multi Word DMA mode 1, max transfer rate: 13.3 MB/s

➔ **MWDMA2**   Multi Word DMA mode 2, max transfer rate: 16.6 MB/s

➔ **UDMA0**   Ultra DMA mode 0, max transfer rate: 16.6 MB/s

➔ **UDMA1**   Ultra DMA mode 1, max transfer rate: 25 MB/s

➔ **UDMA2** Ultra DMA mode 2, max transfer rate: 33.3 MB/s

➔ **UDMA3** Ultra DMA mode 3, max transfer rate: 44 MB/s (To use this mode, it is required that an 80-conductor ATA cable is used.)

➔ **UDMA4** Ultra DMA mode 4, max transfer rate: 66.6 MB/s (To use this mode, it is required that an 80-conductor ATA cable is used.)

➔ **UDMA5** Ultra DMA mode 5, max transfer rate: 99.9 MB/s (To use this mode, it is required that an 80-conductor ATA cable is used.)

▪ **S.M.A.R.T [Auto]**

Use the **S.M.A.R.T** option to auto-detect, disable or enable Self-Monitoring Analysis and Reporting Technology (SMART) on the drive on the specified channel. **S.M.A.R.T** predicts impending drive failures. The **S.M.A.R.T** BIOS option enables or disables this function.

➔ **Auto** DEFAULT BIOS auto detects HDD SMART support.

➔ **Disabled** Prevents BIOS from using the HDD SMART feature.

➔ **Enabled** Allows BIOS to use the HDD SMART feature

▪ **32Bit Data Transfer [Enabled]**

Use the **32Bit Data Transfer** BIOS option to enables or disable 32-bit data transfers.

➔ **Disabled** Prevents the BIOS from using 32-bit data transfers.

➔ **Enabled** DEFAULT Allows BIOS to use 32-bit data transfers on supported hard disk drives.

5.3.3 Super IO Configuration

Use the **Super IO Configuration** menu (BIOS Menu 6) to set or change the configurations for the FDD controllers, parallel ports and serial ports.

```
                      BIOS SETUP UTILITY
   Main    Advanced   PCIPNP    Boot    Security  Chipset     Exit

 Configure Super I/O Chipset                      Allows BIOS to select
 _____      Serial Port Base
 Serial Port1 Address         [3F8]               Addresses
  Serial Port1 IRQ            [IRQ4]
 Serial Port2 Address         [2F8]
  Serial Port2 IRQ            [IRQ3]
   Select RS232 or RS422/RS485  [RS232]
 Serial Port3 Address         [3E8]
   Serial Port3 IRQ           [IRQ4]
 Serial Port4 Address         [2E8]           ←→    Select Screen
   Serial Port4 IRQ           [IRQ3]          ↑↓    Select Item
 Serial Port6 Address         [IrDA]          Enter Go to SubScreen
 Parallel Port Address        [378]           F1    General Help
   Parallel Port Mode         [Normal]        F10   Save and Exit
   Parallel Port IRQ          [IRQ5]          ESC   Exit

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```

BIOS Menu 6: Super IO Configuration

- **Serial Port1 Address [3F8]**

  Sets the address of serial port 1.

  - Disabled
  - 3F8   DEFAULT
  - 2F8
  - 3E8
  - 2E8

- **Serial Port1 IRQ [IRQ4]**

  Sets the IRQ of serial port 1.

  - IRQ4   DEFAULT

▪ **Serial Port2 Address [3F8]**

Sets the address of serial port .

▪ Disabled

▪ 3F8

▪ 2F8   DEFAULT

▪ 3E8

▪ 2E8

▪ **Serial Port2 IRQ [IRQ4]**

Sets the IRQ of serial port .

▪ IRQ3   DEFAULT

▪ **Select RS232 or RS422/485 [RS232]**

Sets the port transmission method.

▪ **Serial Port3 Address [3F8]**

Sets the address of serial port .

▪ Disabled

▪ 3F8

▪ 2F8

▪ 3E8   DEFAULT

▪ 2E8

▪ **Serial Port3 IRQ [IRQ4]**

Sets the IRQ of serial port .

▪ IRQ4   DEFAULT

▪ **Serial Port4 Address [3F8]**

Sets the address of serial port .

▪ Disabled

- 3F8
- 2F8
- 3E8
- 2E8 **DEFAULT**

▪ **Serial Port4 IRQ [IRQ4]**

Sets the IRQ of serial port .

- IRQ3 **DEFAULT**

▪ **Serial Port6 Address [IrDA]**

Sets the address of the serial port 6.

- Disabled
- IrDA **DEFAULT**

▪ **Parallel Port Address [378]**

Use the **Parallel Port Address** option to select the parallel port base address.

➔ **Disabled** No base address is assigned to the Parallel Port

➔ **378** **DEFAULT** Parallel Port I/O port address is 378

➔ **278** Parallel Port I/O port address is 278

➔ **3BC** Parallel Port I/O port address is 3BC

▪ **Parallel Port Mode [Normal]**

Use the **Parallel Port Mode** option to select the mode the parallel port operates in.

➔ **Normal** **DEFAULT** The normal parallel port mode is the standard mode for parallel port operation.

➔ **Bi-directional** Parallel port outputs are 8-bits long. Inputs are accomplished by reading 4 of the 8 bits on the status register.

è **EPP**   The parallel port operates in the enhanced parallel port mode (EPP). The EPP mode supports bi-directional communication between the system and the parallel port device and the transmission rates between the two are much faster than the Normal mode.

è **ECP+EPP**   The parallel port operates in the extended capabilities port (ECP) mode. The ECP mode supports bi-directional communication between the system and the parallel port device and the transmission rates between the two are much faster than the Normal mode

The parallel port is also be compatible with EPP devices described above

▪ **Parallel Port IRQ [IRQ5]**

Use the **Parallel Port IRQ** selection to set the parallel port interrupt address.

è **IRQ5**   DEFAULT   IRQ5 is assigned as the parallel port interrupt address

è **IRQ7**   IRQ7 is assigned as the parallel port interrupt address

5.3.4 Hardware Health Configuration

The **Hardware Health Configuration** menu (BIOS Menu 7) shows the operating temperature, fan speeds and system voltages.

```
                         BIOS SETUP UTILITY
   Main     Advanced   PCIPNP    Boot    Security  Chipset     Exit

 Hardware Health Event Monitoring
 _____

 CPU Temperature Sensor            :62ºC/143ºF
 System Temperature Sensor         :43ºC/109ºF

 CPU_Fan1                          :N/A

 +VCC_CORE                         :1.192 V
 +5V                               :5.003 V
 +12V                              :12.496 V        ←→   Select Screen
 +1.8V                             :1.776 V         ↑ ↓  Select Item
 VCC                               :3.296 V         F1   General Help
 VSB                               :3.376 V         F10  Save and Exit
 VBAT                              :3.248 V         ESC  Exit

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```

BIOS Menu 7: Hardware Health Configuration

▪ **Mode Setting [Full On Mode]**

Use the **Mode Setting** option to configure the second fan.

➔ **Thermal Mode**   The fan adjusts its speed using these settings:

Temperature limit of Off

Temperature limit of Start

Startup Value

Stop Value

StopTime Value

➔ **Manual Mode**   DEFAULT   The fan spins at the set speed, max speed is at 255, full-off is at 0.

▪ **CPU Temperature Limit of OFF [000]**

 WARNING:

CPU failure can result if this value is set too high because the fan will turn off before the CPU has been cooled to the normal temperature range

The fan will turn off if the temperature falls below this value.

▪ Minimum Value: 0°C
▪ Maximum Value: 127°C

▪ **CPU Temperature Limit of Start [020]**

 WARNING:

CPU failure can result if this value is set too high because permanent damage will be done before it turns on

The fan will start spinning when

▪ Minimum: 0
▪ Maximum: 127

▪ **Fan Start PWM [070]**

The fan initially starts at this speed.

▪ Minimum: 0
▪ Maximum: 127

▪ **Slope PWM [0.5 PWM]**

Sets how big each increase in the speed of the fan is. Lower settings mean finer tuning of the fan speed. Higher settings mean bigger jumps in speed as the fan speed changes.

- 0.125 PWM

- 0.25 PWM

- 0.5 PWM

- 1 PWM

- 2 PWM

- 4 PWM

- 8 PWM

- 15 PWM

5.3.5 Power Configuration

The **Power Configuration** menu (**BIOS Menu 8**) configures the power settings of the system.

```
                         BIOS SETUP UTILITY
   Main    Advanced   PCIPNP    Boot    Security  Chipset    Power     Exit

  Power Configuration                                    If set to BY HARDWARE
  ──────────────────────────────────────────            the status is set by
  Select AT/ATX Power              [BY HARDWARE]         the onboard jumper
  Current Jumper Setting           [AT Power]



                                                   ←→    Select Screen
                                                   ↑↓    Select Item
                                                   Enter Go to SubScreen
                                                   F1    General Help
                                                   F10   Save and Exit
                                                   ESC   Exit

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```
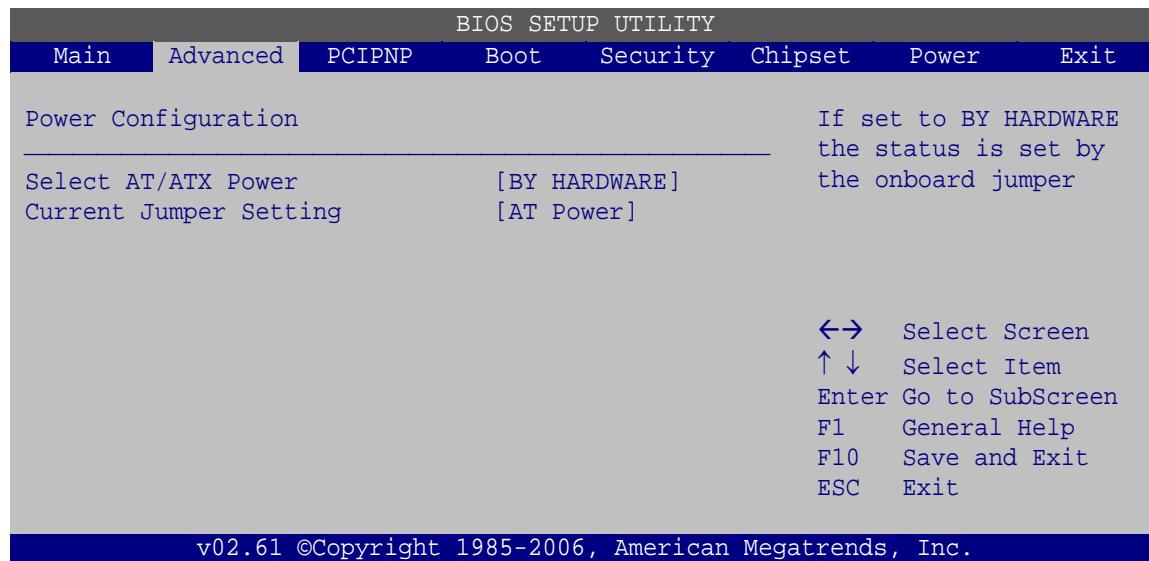
BIOS Menu 8: ACPI Configuration

- **Select AT/ATX Power [By Hardware]**

  Sets the behavior of the power.

  - AT Power

  - ATX Power

  - BY HARDWARE   DEFAULT

- ▪ **Current Jumper Setting**

Displays the current power jumper setting.

5.3.6 Remote Access Configuration

Use the **Remote Access Configuration** menu (BIOS Menu 9) to configure remote access parameters. The **Remote Access Configuration** is an AMIBIOS feature and allows a remote host running a terminal program to display and configure the BIOS settings.

```
                      BIOS SETUP UTILITY
   Main    Advanced   PCIPNP    Boot    Security  Chipset     Exit

Configure Remote Access type and parameters
_____
Remote Access                    [Disabled]

Serial port number               [COM1]
    Base Address, IRQ             [3F8H, 4]
Serial Port Mode                  [115200 8,n,1]
Redirection After BIOS POST       [Always]            ←→   Select Screen
Terminal Type                     [ANSI]              ↑↓   Select Item
                                                      Enter Go to SubScreen
                                                      F1   General Help
                                                      F10  Save and Exit
                                                      ESC  Exit

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```

BIOS Menu 9: Remote Access Configuration

- ▪ **Remote Access [Disabled]**

Use the **Remote Access** option to enable or disable access to the remote functionalities of the system.

➔ **Disabled**   **DEFAULT**   Remote access is disabled.

→ **Enabled**   Remote access configuration options shown below

appear:

Serial Port Number

Serial Port Mode

Redirection after BIOS POST

Terminal Type

These configuration options are discussed below.

▪ **Serial Port Number [COM1]**

Use the **Serial Port Number** option allows to select the serial port used for remote access.

- ▪ COM1   **DEFAULT**
- ▪ COM2
- ▪ COM3
- ▪ COM4
- ▪ COM5
- ▪ COM6

▪ **Base Address, IRQ [3F8h,4]**

The **Base Address, IRQ** option cannot be configured and only shows the interrupt address of the serial port listed above.

▪ **Serial Port Mode [115200 8,n,1]**

Use the **Serial Port Mode** option to select baud rate through which the console redirection is made. The following configuration options are available

- ▪ 115200 8,n,1   **DEFAULT**
- ▪ 57600 8,n,1
- ▪ 38400 8,n,1
- ▪ 19200 8,n,1
- ▪ 09600 8,n,1

> **NOTE:**
>
> Identical baud rate setting musts be set on the host (a management computer running a terminal software) and the slave

▪ **Redirection After BIOS POST [Always]**

Use the **Redirection After BIOS POST** option to specify when console redirection should occur.

➔ **Disabled**   The console is not redirected after POST

➔ **Boot Loader**   Redirection is active during POST and during Boot Loader

➔ **Always**   DEFAULT   Redirection is always active (Some OSes may not work if set to Always)

▪ **Terminal Type [ANSI]**

Use the **Terminal Type** BIOS option to specify the remote terminal type.

➔ **ANSI**   DEFAULT   The target terminal type is ANSI

➔ **VT100**   The target terminal type is VT100

➔ **VT-UTF8**   The target terminal type is VT-UTF8

5.3.7 USB Configuration

Use the **USB Configuration** menu (BIOS Menu 10) to read USB configuration information and configure the USB settings.

```
                        BIOS SETUP UTILITY
   Main    Advanced   PCIPNP    Boot    Security  Chipset    Exit

  USB Configuration                                    Options
  _____

  Module Version – 2.24.3-13.4                         Disabled
                                                       Enabled
  USB Devices Enabled:
       None

  USB Function              [Enabled]           ←→   Select Screen
  USB 2.0 Controller        [Enabled]           ↑ ↓  Select Item
  Legacy USB Support        [Enabled]           Enter Go to SubScreen
  USB 2.0 Controller Mode   [HiSpeed]           F1    General Help
                                                F10   Save and Exit
                                                ESC   Exit

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```
BIOS Menu 10: USB Configuration

▪ **USB Function [Enabled]**

Use the **USB Functions** to enabled and disabled the USB ports.

➔ **Disabled**   USB ports disabled

➔ **USB 8 ports**   Only the USB ports on the rear I/O panel are activated

➔ **Enabled**   DEFAULT   All the USB ports are enabled

▪ **USB 2.0 Controller [Enabled]**

Use the **USB 2.0 Controller** BIOS option to enable or disable the USB 2.0 controller

➔ **Disabled**   USB 2.0 controller disabled

➔ **Enabled**   DEFAULT   USB 2.0 controller enabled

▪ **Legacy USB Support [Enabled]**

Use the **Legacy USB Support** BIOS option to enable USB mouse and USB keyboard support.

Normally if this option is not enabled, any attached USB mouse or USB keyboard does 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 is no USB driver loaded onto the system.

➔ **Disabled**   Legacy USB support disabled

➔ **Enabled**   DEFAULT   Legacy USB support enabled

➔ **Auto**   Legacy USB support disabled if no USB devices are connected

▪ **USB2.0 Controller Mode [HiSpeed]**

Use the **USB2.0 Controller Mode** option to set the speed of the USB2.0 controller.

➔ **FullSpeed**   The controller is capable of operating at 12 Mb/s

➔ **HiSpeed**   DEFAULT   The controller is capable of operating at 480 Mb/s

5.3.7.1 USB Mass Storage Device Configuration

Use the **USB Mass Storage Device Configuration** menu (BIOS Menu 11) to configure USB mass storage class devices.

```
                         BIOS SETUP UTILITY
    Main     Advanced    PCIPNP     Boot    Security   Chipset     Exit

USB Mass Storage Device Configuration
_____
USB Mass Storage Reset Delay     [20 Sec]

  Device #1            M-SysT5 Dell Memory Key 5.04
  Emulation Type               [Auto]

                                              ←→    Select Screen
                                              ↑↓    Select Item
                                              Enter Go to SubScreen
                                              F1    General Help
                                              F10   Save and Exit
                                              ESC   Exit

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```
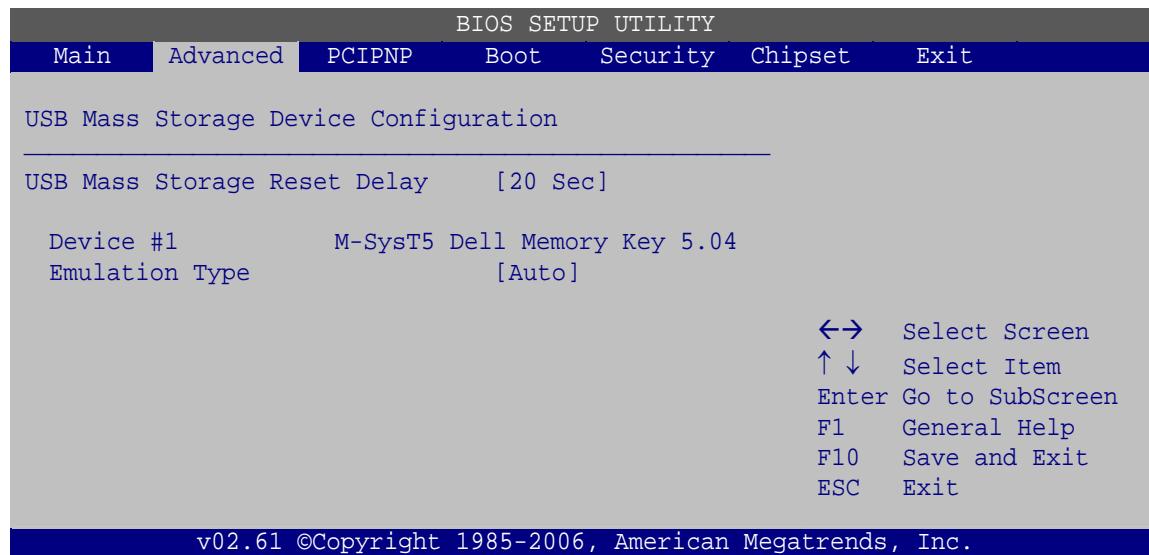
BIOS Menu 11: USB Mass Storage Device Configuration

▪ **USB Mass Storage Reset Delay [20 Sec]**

Use the **USB Mass Storage Reset Delay** option to set the number of seconds POST waits for the USB mass storage device after the start unit command.

➔ **10 Sec**   POST waits 10 seconds for the USB mass storage device after the start unit command.

➔ **20 Sec**   D<small>EFAULT</small>   POST waits 20 seconds for the USB mass storage device after the start unit command.

➔ **30 Sec**   POST waits 30 seconds for the USB mass storage device after the start unit command.

➔ **40 Sec**   POST waits 40 seconds for the USB mass storage device after the start unit command.

▪ **Device ##**

The **Device##** field lists the USB devices that are connected to the system.

▪ **Emulation Type [Auto]**

Use the **Emulation Type** BIOS option to specify the type of emulation BIOS has to provide for the USB device.

➔ **Auto**　　　**DEFAULT**　BIOS auto-detects the current USB.

➔ **Floppy**　　　The USB device will be emulated as a floppy drive. The device can be either A: or B: responding to INT13h calls that return DL = 0 or DL = 1 respectively.

➔ **Forced FDD**　　Allows a hard disk image to be connected as a floppy image. This option works only for drives formatted with FAT12, FAT16 or FAT32.

➔ **Hard Disk**　　Allows the USB device to be emulated as hard disk responding to INT13h calls that return DL values of 80h or above.

➔ **CDROM**　　Assumes the CD-ROM is formatted as bootable media. All the devices that support block sizes greater than 512 bytes can only be booted using this option.

5.4 PCI/PnP

Use the **PCI/PnP** menu (BIOS Menu 12) to configure advanced PCI and PnP settings.

```
                        BIOS SETUP UTILITY
   Main    Advanced  PCIPNP    Boot     Security  Chipset    Exit

  Advanced PCI/PnP Settings                     Available: Specified
  ──────────────────────────────────────────   IRQ is available to be
  WARNING: Setting wrong values in below sections  used by PCI/PnP
           may cause system to malfunction         devices
                                                Reserved: Specified
  IRQ3                      [Reserved]          IRQ is reserved for
  IRQ4                      [Reserved]          use by legacy ISA
  IRQ5                      [Available]         devices
  IRQ7                      [Reserved]
  IRQ9                      [Available]
  IRQ10                     [Available]
  IRQ11                     [Available]
  IRQ14                     [Available]
  IRQ15                     [Available]

  DMA Channel 0             [Available]         ←→   Select Screen
  DMA Channel 1             [Available]         ↑↓   Select Item
  DMA Channel 3             [Available]         Enter Go to SubScreen
  DMA Channel 5             [Available]         F1    General Help
  DMA Channel 6             [Available]         F10   Save and Exit
  DMA Channel 7             [Available]         ESC   Exit

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```

BIOS Menu 12: PCI/PnP Configuration

▪ **IRQ# [Available]**

Use the **IRQ#** address to specify what IRQs can be assigned to a particular peripheral device.

➔ **Available**   DEFAULT   The specified IRQ is available to be used by PCI/PnP devices

➔ **Reserved**   The specified IRQ is reserved for use by Legacy ISA devices

▪ **Reserved Memory Size [Disabled]**

Use the **Reserved Memory Size** BIOS option to specify the amount of memory that should be reserved for legacy ISA devices.

➔ **Disabled** DEFAULT No memory block reserved for legacy ISA devices

➔ **16K** 16 KB reserved for legacy ISA devices

➔ **32K** 32 KB reserved for legacy ISA devices

➔ **64K** 64 KB reserved for legacy ISA devices

5.5 Boot

Use the **Boot** menu (BIOS Menu 13) to configure system boot options.

```
                        BIOS SETUP UTILITY
  Main    Advanced   PCIPNP    Boot    Security   Chipset    Exit

 Boot Settings                                   Configure settings
                                                 during system boot.
 > Boot Settings Configuration

 > Boot Device Priority
 > Hard Disk Drives
 > CD/DVD Drives
 > Removable Drives                         ←→   Select Screen
                                            ↑ ↓  Select Item
                                            Enter Go to SubScreen
                                            F1   General Help
                                            F10  Save and Exit
                                            ESC  Exit

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```
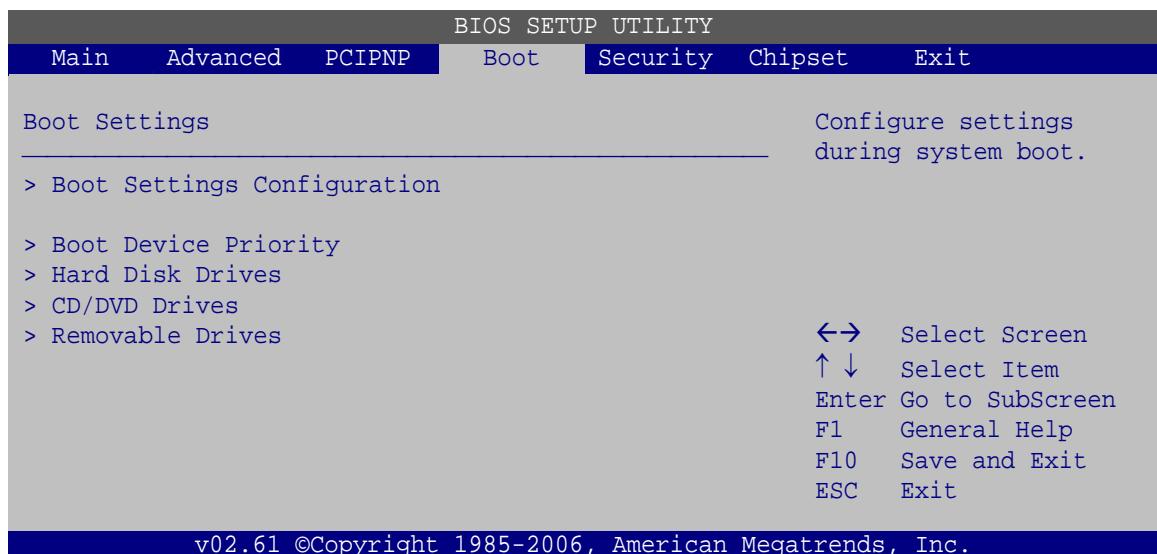
BIOS Menu 13: Boot

5.5.1 Boot Settings Configuration

Use the **Boot Settings Configuration** menu (BIOS Menu 14) to configure advanced system boot options.

```
                         BIOS SETUP UTILITY
   Main    Advanced   PCIPNP     Boot    Security  Chipset     Exit

  Boot Settings Configuration                         Allows BIOS to skip
  ────────────────────────────────────────────       certain tests while
                                                      booting. This will
  Quick Boot                  [Enabled]               decrease the time needed
  Quiet Boot                  [Enabled]               to boot the system.
  AddOn ROM Display Mode      [Force BIOS]
  Bootup Num-Lock             [On]

                                                  ←→   Select Screen
                                                  ↑ ↓   Select Item
                                                  Enter Go to SubScreen
                                                  F1    General Help
                                                  F10   Save and Exit
                                                  ESC   Exit

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```

BIOS Menu 14: Boot Settings Configuration

▪ **Quick Boot [Enabled]**

Use the **Quick Boot** BIOS option to make the computer speed up the boot process.

➔ **Disabled**   No POST procedures are skipped

➔ **Enabled**   D<small>EFAULT</small>   Some POST procedures are skipped to decrease the system boot time

▪ **Quiet Boot [Disabled]**

Use the **Quiet Boot** BIOS option to select the screen display when the system boots.

➔ **Disabled**   D<small>EFAULT</small>   Normal POST messages displayed

➔ **Enabled**   OEM Logo displayed instead of POST messages

▪ **AddOn ROM Display Mode [Force BIOS]**

Use the **AddOn ROM Display Mode** option to allow add-on ROM (read-only memory) messages to be displayed.

➔ **Force BIOS** DEFAULT The system forces third party BIOS to display during system boot.

➔ **Keep Current** The system displays normal information during system boot.

▪ **Bootup Num-Lock [On]**

Use the **Bootup Num-Lock** BIOS option to specify if the number lock setting must be modified during boot up.

➔ **Off** Does not enable the keyboard Number Lock automatically. To use the 10-keys on the keyboard, press the Number Lock key located on the upper left-hand corner of the 10-key pad. The Number Lock LED on the keyboard lights up when the Number Lock is engaged.

➔ **On** DEFAULT Allows the Number Lock on the keyboard to be enabled automatically when the computer system boots up. This allows the immediate use of the 10-key numeric keypad located on the right side of the keyboard. To confirm this, the Number Lock LED light on the keyboard is lit.

▪ **Boot From LAN Support [Disabled]**

Use the **Boot From LAN Support** option to enable the Ethernet controller to boot the system.

▪ Enabled
▪ Disabled DEFAULT

5.5.2 Boot Device Priority

Use the **Boot Device Priority** menu (BIOS Menu 15) to specify the boot sequence from the available devices. The drive sequence also depends on the boot sequence in the individual device section.

```
                        BIOS SETUP UTILITY
   Main    Advanced   PCIPNP    Boot    Security  Chipset    Exit

 Boot Device Priority                        Specifies the boot
 _____ sequence from the
 > 1st Boot Device            [1st Boot Device]  available devices.
 > 2nd Boot Device            [2nd Boot Device]
 > 3rd Boot Device            [3rd Boot Device]


                                             ←→   Select Screen
                                             ↑↓   Select Item
                                             Enter Go to SubScreen
                                             F1    General Help
                                             F10   Save and Exit
                                             ESC   Exit

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```

BIOS Menu 15: Boot Device Priority Settings

5.5.3 Hard Disk Drives

Use the **Hard Disk Drives** menu to specify the boot sequence of the available HDDs. Only installed hard drives are shown.
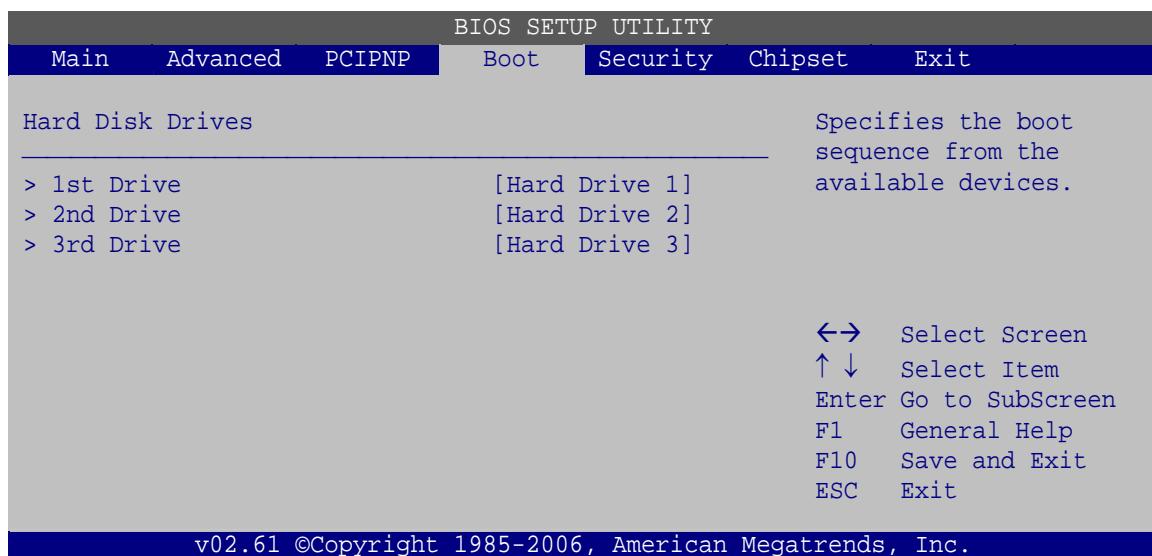
```
                        BIOS SETUP UTILITY
    Main    Advanced   PCIPNP    Boot    Security   Chipset    Exit

 Hard Disk Drives                                   Specifies the boot
 ─────────────────────────────────────────────     sequence from the
 > 1st Drive                     [Hard Drive 1]     available devices.
 > 2nd Drive                     [Hard Drive 2]
 > 3rd Drive                     [Hard Drive 3]


                                                   ←→   Select Screen
                                                   ↑ ↓  Select Item
                                                   Enter Go to SubScreen
                                                   F1   General Help
                                                   F10  Save and Exit
                                                   ESC  Exit

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```
BIOS Menu 16: Hard Disk Drives

5.5.4 Removable Drives

Use the **Removable Drives** menu (BIOS Menu 17) to specify the boot sequence of the removable drives. Only connected drives are shown.
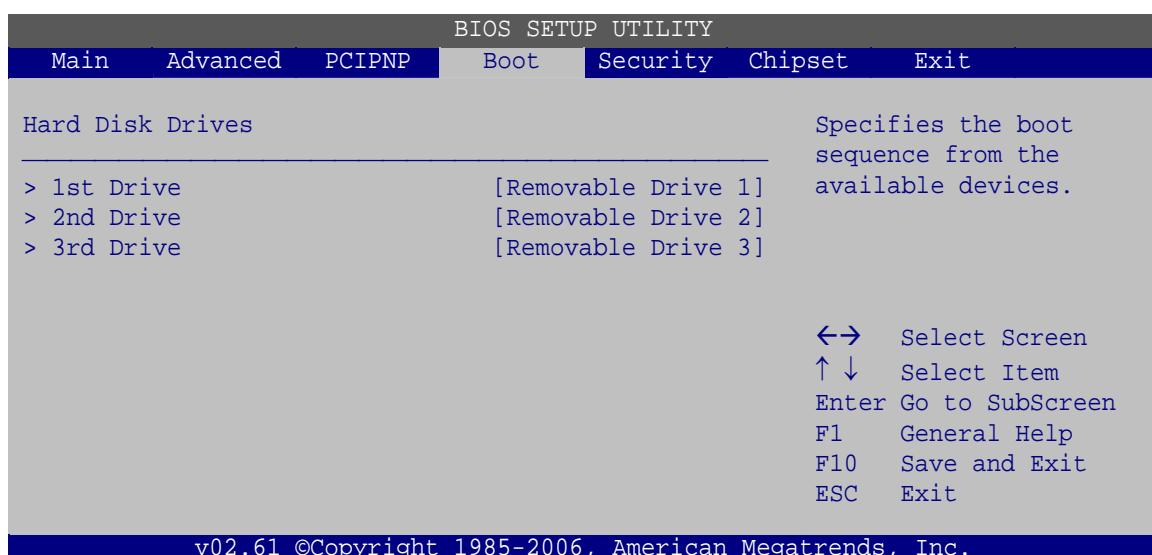
```
                        BIOS SETUP UTILITY
    Main    Advanced   PCIPNP    Boot    Security   Chipset    Exit

 Hard Disk Drives                                   Specifies the boot
 ─────────────────────────────────────────────     sequence from the
 > 1st Drive                 [Removable Drive 1]    available devices.
 > 2nd Drive                 [Removable Drive 2]
 > 3rd Drive                 [Removable Drive 3]


                                                   ←→   Select Screen
                                                   ↑ ↓  Select Item
                                                   Enter Go to SubScreen
                                                   F1   General Help
                                                   F10  Save and Exit
                                                   ESC  Exit

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```
BIOS Menu 17: Removable Drives

5.5.5 CD/DVD Drives

Use the **CD/DVD Drives** menu to specify the boot sequence of the available CD/DVD drives. Only connected drives are shown.
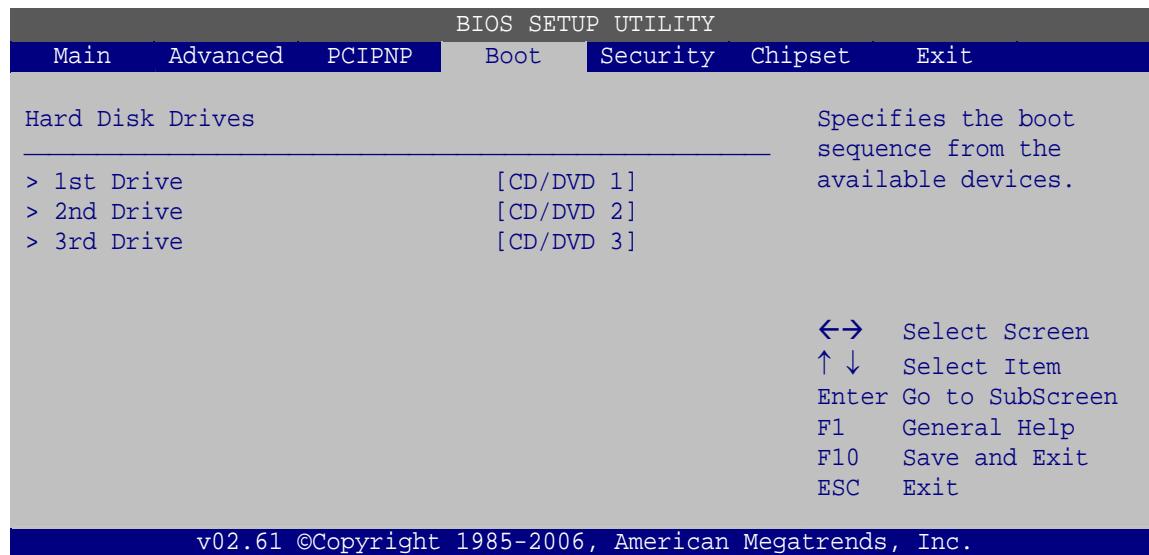
```
                        BIOS SETUP UTILITY
    Main     Advanced    PCIPNP     Boot    Security   Chipset     Exit

 Hard Disk Drives                                     Specifies the boot
 _____         sequence from the
                                                      available devices.
 > 1st Drive                  [CD/DVD 1]
 > 2nd Drive                  [CD/DVD 2]
 > 3rd Drive                  [CD/DVD 3]


                                                 ←→   Select Screen
                                                 ↑ ↓  Select Item
                                                 Enter Go to SubScreen
                                                 F1   General Help
                                                 F10  Save and Exit
                                                 ESC  Exit

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```
BIOS Menu 18: CD/DVD Drives

5.6 Security

Use the **Security** menu (BIOS Menu 19) to set system and user passwords.
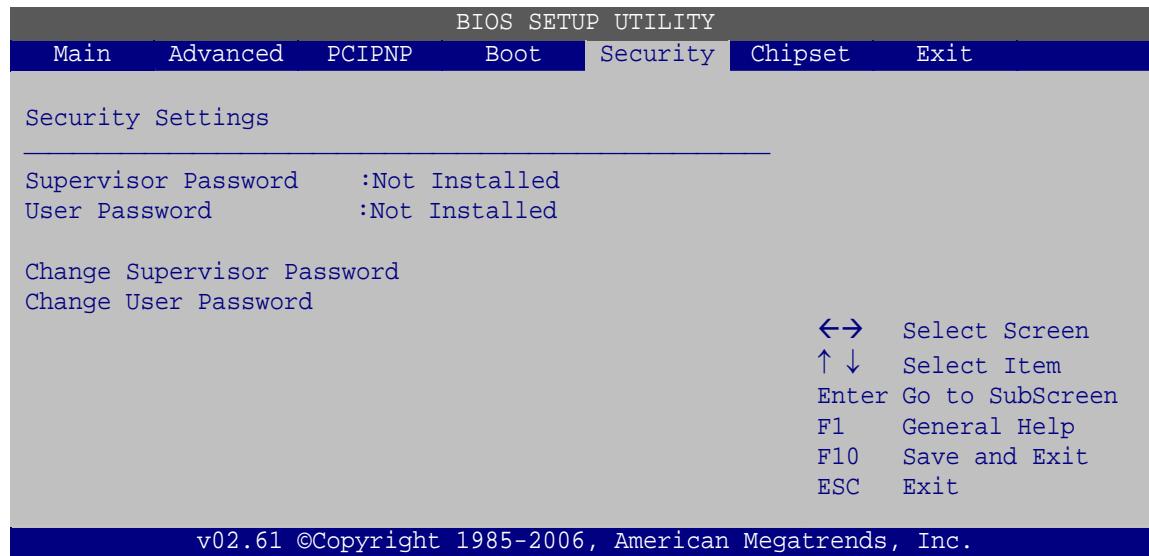
```
                        BIOS SETUP UTILITY
    Main     Advanced    PCIPNP     Boot    Security   Chipset     Exit

 Security Settings
 _____

 Supervisor Password    :Not Installed
 User Password          :Not Installed

 Change Supervisor Password
 Change User Password
                                                 ←→   Select Screen
                                                 ↑ ↓  Select Item
                                                 Enter Go to SubScreen
                                                 F1   General Help
                                                 F10  Save and Exit
                                                 ESC  Exit

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```
BIOS Menu 19: Security

▪ **Change Supervisor Password**

Use the **Change Supervisor Password** to set or change a supervisor password. The default for this option is **Not Installed**. If a supervisor password must be installed, select this field and enter the password. After the password has been added, **Install** appears next to **Change Supervisor Password**.

▪ **Change User Password**

Use the **Change User Password** to set or change a user password. The default for this option is **Not Installed**. If a user password must be installed, select this field and enter the password. After the password has been added, **Install** appears next to **Change User Password**.

5.7 Chipset

Use the **Chipset** menu (BIOS Menu 20) to access the Northbridge and Southbridge configuration menus

```
                         BIOS SETUP UTILITY
   Main    Advanced   PCIPNP    Boot    Security  Chipset    Exit

 Advanced Chipset Settings
 _____
 WARNING: Setting wrong values in below section
          may cause system to malfunction.

 > Northbridge Configuration
 > Southbridge Configuration
                                              ←→   Select Screen
                                              ↑↓   Select Item
                                              Enter Go to SubScreen
                                              F1   General Help
                                              F10  Save and Exit
                                              ESC  Exit

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```

BIOS Menu 20: Chipset

5.7.1 Northbridge Configuration

Use the **Northbridge Chipset Configuration** menu (BIOS Menu 21) to configure the Northbridge chipset.

```
                        BIOS SETUP UTILITY
   Main     Advanced   PCIPNP     Boot    Security  Chipset    Exit

  Northbridge Configuration                            Options
  _____

  Memory Hole                  [Disabled]            Disabled
  Internal Graphics Mode Select [Enabled, 8MB]       15MB-16MB

  Boot Graphic Adapter Priority  [PCI/IGD]

  DVMT Mode Select             [DVMT Mode]           ←→   Select Screen
   DVMT/Fixed Memory           [128MB]               ↑↓   Select Item
                                                     Enter Go to SubScreen
  Boot Display Device          [Auto]                F1   General Help
  LVDS1 Panel Type             [800x600 18b]         F10  Save and Exit
                                                     ESC  Exit

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```
BIOS Menu 21:Northbridge Chipset Configuration

▪ **Memory Hole [Disabled]**

Use the **Memory Hole** option to reserve memory space between 15 MB and 16 MB for ISA expansion cards that require a specified area of memory to work properly. If an older ISA expansion card is used, please refer to the documentation that came with the card to see if it is necessary to reserve the space.

➔ **Disabled**   DEFAULT   Memory is not reserved for ISA expansion cards

➔ **15 MB–16 MB**   Between 15 MB and 16 MB of memory is reserved for ISA expansion cards

▪ **Internal Graphics Mode Select [Enable, 8 MB]**

Use the **Internal Graphic Mode Select** option to specify the amount of system memory that can be used by the Internal graphics device.

➔ **Disable**

➔ **Enable, 1 MB**   1 MB of memory used by internal graphics device

➔ **Enable, 8 MB**   DEFAULT   8 MB of memory used by internal graphics device

- **Boots Graphic Adapter Priority [PCI/IGD]**

  Sets which graphics device to select first when starting the system.

  - IGD
  - PCI/IGD   DEFAULT

- **DVMT Mode Select [DVMT Mode]**

  Use the **DVMT Mode Select** option to select the Intel Dynamic Video Memory Technology (DVMT) operating mode.

  ➔ **Fixed Mode**   A fixed portion of graphics memory is reserved as graphics memory.

  ➔ **DVMT Mode**   DEFAULT   Graphics memory is dynamically allocated according to the system and graphics needs.

  ➔ **Combo Mode**   A fixed portion of graphics memory is reserved as graphics memory. If more memory is needed, graphics memory is dynamically allocated according to the system and graphics needs.

- **DVMT/FIXED Memory [128 MB]**

  Use the **DVMT/FIXED Memory** option to specify the maximum amount of memory that can be allocated as graphics memory. This option can only be configured for if **DVMT Mode** or **Fixed Mode** is selected in the **DVMT Mode Select** option. If **Combo Mode** is selected, the maximum amount of graphics memory is 128 MB. Configuration options are listed below.

  - 64 MB
  - 128 MB   Default
  - Maximum DVMT

▪ **Boot Display Device**

Use the **Boot Display Device** option to select the display device used by the system when it boots. Configuration options are listed below.

- ▪ Auto
- ▪ CRT
- ▪ LVDS1

▪ **LVDS1 Panel Type [800x600 18b]**

Use the **Flat Panel Type** option to select the type of flat panel connected to the system. Configuration options are listed below.

- ▪ 640x480, 18-bit
- ▪ 800x480, 18-bit
- ▪ 800x600, 18-bit
- ▪ 1024x768, 18-bit
- ▪ 1280x1024, 36-bit
- ▪ 1400x1050, 36-bit
- ▪ 1440x900, 36-bit
- ▪ 1600x1200, 36-bit

5.7.2 Southbridge Configuration

The **Southbridge Configuration** menu (BIOS Menu 22) the Southbridge chipset to be configured.
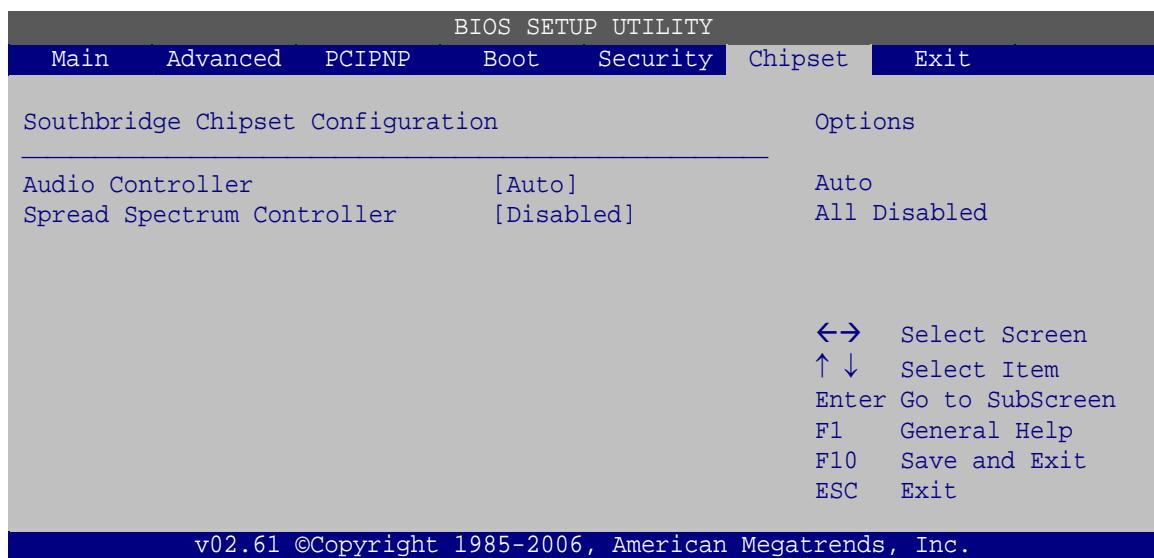
```
                        BIOS SETUP UTILITY
   Main    Advanced   PCIPNP    Boot    Security  Chipset    Exit

Southbridge Chipset Configuration                       Options
_____
Audio Controller                  [Auto]                Auto
Spread Spectrum Controller        [Disabled]            All Disabled


                                                   ←→   Select Screen
                                                   ↑ ↓  Select Item
                                                   Enter Go to SubScreen
                                                   F1   General Help
                                                   F10  Save and Exit
                                                   ESC  Exit

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```
   BIOS Menu 22:Southbridge Chipset Configuration

▪ **Audio Controller Codec [Auto]**

This option enables and disables the audio controller. When disabled there will be no sound from the system and no sound input.

➔ **Auto**   **DEFAULT**   Both audio output and microphone input are enabled if installed

➔ **Disabled**   All audio disabled

▪ **Spread Spectrum [Disabled]**

Use the **Spread Spectrum** option to reduce the EMI. Excess EMI is generated when the system clock generator pulses have extreme values. Spreading the pulse spectrum modulates changes in the extreme values from spikes to flat curves, thus reducing the EMI. This benefit may in some cases be outweighed by problems with timing-critical devices, such as a clock-sensitive SCSI device.

➔ **Disabled** DEFAULT EMI not reduced

➔ **Enabled** EMI reduced

5.8 Exit

Use the **Exit** menu (BIOS Menu 23) to load default BIOS values, optimal failsafe values and to save configuration changes.

```
                        BIOS SETUP UTILITY
  Main    Advanced   PCIPNP    Boot    Security  Chipset      Exit

 Exit Options                                      Exit system setup after
 _____    saving the changes.

 Save Changes and Exit
 Discard Changes and Exit                          F10 key can be used for
 Discard Changes                                   this operation

 Load Optimal Defaults
 Load Failsafe Defaults                            ←→   Select Screen
                                                   ↑ ↓   Select Item
                                                   Enter Go to SubScreen
                                                   F1    General Help
                                                   F10   Save and Exit
                                                   ESC   Exit

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```

BIOS Menu 23:Exit

▪ **Save Changes and Exit**

Use the **Save Changes and Exit** option to save the changes made to the BIOS options and to exit the BIOS configuration setup program.

▪ **Discard Changes and Exit**

Use the **Discard Changes and Exit** option to exit the BIOS configuration setup program without saving the changes made to the system.

▪ **Discard Changes**

Use the **Discard Changes** option to discard the changes and remain in the BIOS configuration setup program.

- ▪ **Load Optimal Defaults**

    Use the **Load Optimal Defaults** option to load the optimal default values for each of the parameters on the Setup menus. **F9 key can be used for this operation.**

- ▪ **Load Failsafe Defaults**

    Use the **Load Failsafe Defaults** option to load failsafe default values for each of the parameters on the Setup menus. **F8 key can be used for this operation.**

Appendix

A

BIOS Options

Below is a list of BIOS configuration options in the BIOS chapter.

Terminology

AC '97	Audio Codec 97 (AC'97) refers to a codec standard developed by Intel® in 1997.
ACPI	Advanced Configuration and Power Interface (ACPI) is an OS-directed configuration, power management, and thermal management interface.
AHCI	Advanced Host Controller Interface (AHCI) is a SATA Host controller register-level interface.
ATA	The Advanced Technology Attachment (ATA) interface connects storage devices including hard disks and CD-ROM drives to a computer.
ARMD	An ATAPI Removable Media Device (ARMD) is any ATAPI device that supports removable media, besides CD and DVD drives.
ASKIR	Amplitude Shift Keyed Infrared (ASKIR) is a form of modulation that represents a digital signal by varying the amplitude ("volume") of the signal. A low amplitude signal represents a binary 0, while a high amplitude signal represents a binary 1.
BIOS	The Basic Input/Output System (BIOS) is firmware that is first run when the computer is turned on and can be configured by the end user
CODEC	The Compressor-Decompressor (CODEC) encodes and decodes digital audio data on the system.
CompactFlash®	CompactFlash® is a solid-state storage device. CompactFlash® devices use flash memory in a standard size enclosure. Type II is thicker than Type I, but a Type II slot can support both types.
CMOS	Complimentary metal-oxide-conductor is an integrated circuit used in chips like static RAM and microprocessors.
COM	COM refers to serial ports. Serial ports offer serial communication to expansion devices. The serial port on a personal computer is usually a male DB-9 connector.
DDR	Double Data Rate refers to a data bus transferring data on both the rising and falling edges of the clock signal.
DMA	Direct Memory Access (DMA) enables some peripheral devices to bypass the system processor and communicate directly with the system memory.

DIMM
Dual Inline Memory Modules are a type of RAM that offer a 64-bit data bus and have separate electrical contacts on each side of the module.

DIO
The digital inputs and digital outputs are general control signals that control the on/off circuit of external devices or TTL devices. Data can be read or written to the selected address to enable the DIO functions.

EHCI
The Enhanced Host Controller Interface (EHCI) specification is a register-level interface description for USB 2.0 Host Controllers.

EIDE
Enhanced IDE (EIDE) is a newer IDE interface standard that has data transfer rates between 4.0 MBps and 16.6 MBps.

EIST
Enhanced Intel® SpeedStep Technology (EIST) allows users to modify the power consumption levels and processor performance through application software. The application software changes the bus-to-core frequency ratio and the processor core voltage.

FSB
The Front Side Bus (FSB) is the bi-directional communication channel between the processor and the Northbridge chipset.

GbE
Gigabit Ethernet (GbE) is an Ethernet version that transfers data at 1.0 Gbps and complies with the IEEE 802.3-2005 standard.

GPIO
General purpose input

HDD
Hard disk drive (HDD) is a type of magnetic, non-volatile computer storage device that stores digitally encoded data.

ICH
The Input/Ouput Controll Hub (ICH) is an Intel® Southbridge chipset.

IrDA
Infrared Data Association (IrDA) specify infrared data transmission protocols used to enable electronic devices to wirelessly communicate with each other.

L1 Cache
The Level 1 Cache (L1 Cache) is a small memory cache built into the system processor.

L2 Cache
The Level 2 Cache (L2 Cache) is an external processor memory cache.

LCD
Liquid crystal display (LCD) is a flat, low-power display device that consists of two polarizing plates with a liquid crystal panel in between.

LVDS	Low-voltage differential signaling (LVDS) is a dual-wire, high-speed differential electrical signaling system commonly used to connect LCD displays to a computer.
POST	The Power-on Self Test (POST) is the pre-boot actions the system performs when the system is turned-on.
RAM	Random Access Memory (RAM) is volatile memory that loses data when power is lost. RAM has very fast data transfer rates compared to other storage like hard drives.
SATA	Serial ATA (SATA) is a serial communications bus designed for data transfers between storage devices and the computer chipsets. The SATA bus has transfer speeds up to 1.5 Gbps and the SATA II bus has data transfer speeds of up to 3.0 Gbps.
S.M.A.R.T	Self Monitoring Analysis and Reporting Technology (S.M.A.R.T) refers to automatic status checking technology implemented on hard disk drives.
UART	Universal Asynchronous Receiver-transmitter (UART) is responsible for asynchronous communications on the system and manages the system's serial communication (COM) ports.
UHCI	The Universal Host Controller Interface (UHCI) specification is a register-level interface description for USB 1.1 Host Controllers.
USB	The Universal Serial Bus (USB) is an external bus standard for interfacing devices. USB 1.1 supports 12Mbps data transfer rates and USB 2.0 supports 480Mbps data transfer rates.
VGA	The Video Graphics Array (VGA) is a graphics display system developed by IBM.

Appendix

C

Hazardous Materials Disclosure

C.1 Hazardous Materials Disclosure Table for IPB Products Certified as RoHS Compliant Under 2002/95/EC Without Mercury

The details provided in this appendix are to ensure that the product is compliant with the Peoples Republic of China (China) RoHS standards. The table below acknowledges the presences of small quantities of certain materials in the product, and is applicable to China RoHS only.

A label will be placed on each product to indicate the estimated "Environmentally Friendly Use Period" (EFUP). This is an estimate of the number of years that these substances would "not leak out or undergo abrupt change." This product may contain replaceable sub-assemblies/components which have a shorter EFUP such as batteries and lamps. These components will be separately marked.

Please refer to the table on the next page.

Part Name	Toxic or Hazardous Substances and Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (CR(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
Housing	X	O	O	O	O	X
Display	X	O	O	O	O	X
Printed Circuit Board	X	O	O	O	O	X
Metal Fasteners	X	O	O	O	O	O
Cable Assembly	X	O	O	O	O	X
Fan Assembly	X	O	O	O	O	X
Power Supply Assemblies	X	O	O	O	O	X
Battery	O	O	O	O	O	O
O: This toxic or hazardous substance is contained in all of the homogeneous materials for the part is below the limit requirement in SJ/T11363-2006 X: This toxic or hazardous substance is contained in at least one of the homogeneous materials for this part is above the limit requirement in SJ/T11363-2006						

此附件旨在确保本产品符合中国 RoHS 标准。以下表格标示此产品中某有毒物质的含量符合中国 RoHS 标准规定的限量要求。

本产品上会附有"环境友好使用期限"的标签，此期限是估算这些物质"不会有泄漏或突变"的年限。本产品可能包含有较短的环境友好使用期限的可替换元件，像是电池或灯管，这些元件将会单独标示出来。

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (CR(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
壳体	X	O	O	O	O	X
显示	X	O	O	O	O	X
印刷电路板	X	O	O	O	O	X
金属螺帽	X	O	O	O	O	O
电缆组装	X	O	O	O	O	X
风扇组装	X	O	O	O	O	X
电力供应组装	X	O	O	O	O	X
电池	O	O	O	O	O	O
O: 表示该有毒有害物质在该部件所有物质材料中的含量均在 SJ/T11363-2006 标准规定的限量要求以下。 X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T11363-2006 标准规定的限量要求。						