MI950

LGA775 Core™ 2 Duo

Intel® Q45 Chipset

Mini-ITX Motherboard

USER'S MANUAL

Version 1.0

Acknowledgments

Table of Contents

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Introduction

Checklist

Your MI950 Core 2 Duo motherboard package should include the items listed below:

- The MI950 motherboard
- This User's manual
- 1 x I/O shield
- 1 x serial port cable
- 2 x SATA cable
- 1 CD containing the following:
  - Chipset Drivers
  - Flash Memory Utility

Product Description

The MI950 Mini-ITX motherboard is designed for either the Intel®
Core™2 Duo or Core™2 Quad processors of up to 1333MHz FSB.
It is based on the Intel's Q45 Express chipset and it comes with
two single-channel DDR3 memory slots and 8GB memory
capacity for faster system responsiveness and support of 64-bit
computing.

Dual independent display comes to life with the onboard Intel®
Q45 integrated graphics for CRT and DVI display interface. LAN
functionality is supported with a single or dual two Gigabit
Ethernet controllers.

MI950 is supports high-end features including high definition
audio, ten fast USB 2.0 ports, four SATAII and an eSATA port,
watchdog timer, digital I/O and four serial ports. Board
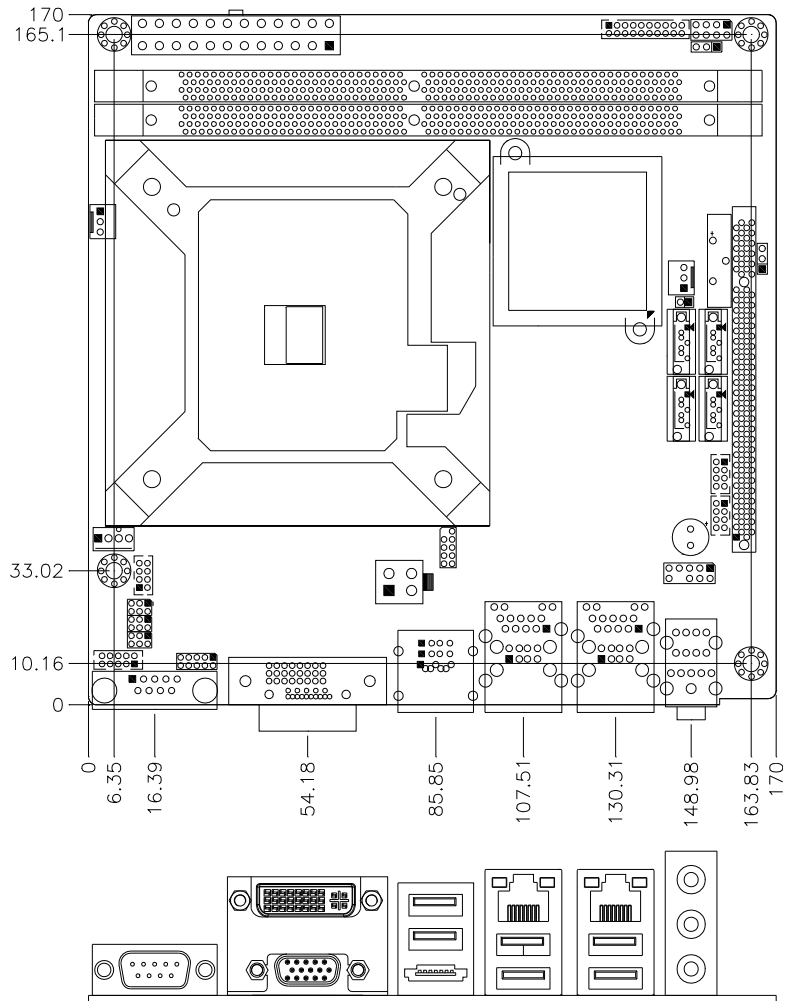dimensions are 170mm by 170mm.

MI950 FEATURES

- Supports Intel® Core™2 Quad / Core™2 Duo /
  Pentium® Dual Core/ Celeron® processors
- 800MHz/1066MHz/1333MHz FSB
- DDR3 DIMM x2, Max. 8GB
- Single Gigabit LAN or dual Gigabit LAN
- Integrated Q45 VGA for CRT & DVI interface
- 10x USB 2.0, 4x SATA II, 1x eSATA, 4x COM
- HD audio, Watchdog timer, 1x PCI

Specifications

Form Factor	Mini-ITX
CPU Type	Intel® Core™2 Extreme processor QX9000 series Intel® Core™2 Quad processor Q9000 series, Intel® Core™2 Duo processor E8000 and E7000 series Intel® Pentium® Dual Core, Intel® Celeron® Dual Core
CPU Speed	Up to 3.0 GHz
CPU FSB	800/1066/1333MHz FSB
L2 Cache	Up to 6MB
Green /APM	APM1.2
CPU Socket	LGA775
Chipset	Intel Eaglelake:Q45 + ICH10DO Chipset
BIOS	Award BIOS, support ACPI Function
Memory	DDRIII 800/1066MHz - DIMM x 2 (w/o ECC), Max. 8GB
VGA	- Intel Q45 GMCH integrated graphics device (GMA4500) - Supports Direct X10 (Vista) & OpenGL 2.1
LAN	1. ICH10DO Gigabit MAC + Intel Gigabit PHY: Intel 82567 x1 2. Intel 82574L PCI-e Gigabit LAN controller x1
USB	ICH10DO built-in USB 2.0 host controller, supports 10 ports
Serial ATA	ICH10DO built-in SATA controller, 4x ports + 1x eSATA
Parallel IDE	N/A
Audio	ICH10DO built-in High Definition Audio controller: ALC888 w/ 7.1 channels
LPC I/O	Winbond W83627DHG: COM1 (RS232), COM2 (RS232/422/485), Hardware monitor Fintek 81216 :COM3 (RS232)+ COM 4 (RS232)
Digital IO	4 in & 4 out
TPM1.2	N/A
Keyboard/Mouse Connector	Via pin-header (For testing purpose only)
Expansion Slots	PCI x1
Edge Connector:	COM1, DVI+VGA, GbE RJ-45 + dual USB stack connector x2, Dual USB + e SATA stack connector, RCA Jack 3x1 for HD Audio
On Board Header/Connector	SATA x4 for 4 ports SATAI/SATAII, 2x4 pins pin-header x2 for 4 ports USB 2x5 pins pin-header x1 for front panel audio 2x5 pins pin-header x1 for COM2 2x10 pins pin-header for COM3, COM4 2x5 pins pin-header x1 for Digital IO
Watchdog Timer	Yes (256 segments, 0, 1, 2…255 sec/min)
System Voltage	+5V, +3.3V, +12V, -12V, 5VSB (2A)
Other	LAN Wakeup, RAID
RoHS	Yes
Board Size	170mm x 170mm

Board Dimensions

Installations

This section provides information on how to use the jumpers and connectors on the MI950 in order to set up a workable system. The topics covered are:

Installing the CPU

The MI950 motherboard supports an LGA 775 processor socket for Intel® Core 2 Duo processors.

The LGA 775 processor socket comes with a lever to secure the processor. Refer to the pictures below, from left to right, on how to place the processor into the CPU socket. *Please note that the cover of the LGA775 socket must always be installed during transport to avoid damage to the socket.*
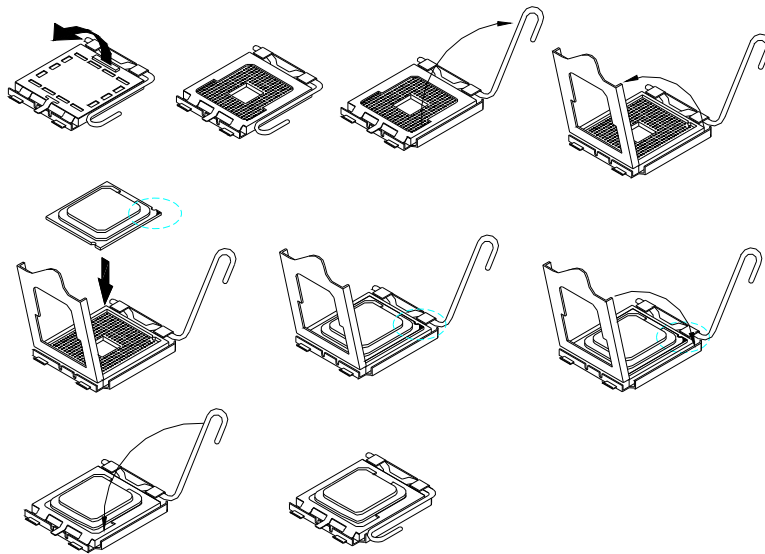
ATX Power Installation

The system power is provided to the motherboard with the ATX2 and ATX1 power connectors. ATX2 is a 24-pin power connector and ATX1 is a 4-pin 12V power connector.

The 24-pin power connector can to be connected to a standard 20-pin ATX power connector in a standard ATX power supply (Min. 400watt).

Note: The power supply 5VSB voltage must be at least 2A.

Installing the Memory

The MI950 motherboard supports two DDR3 memory sockets for a maximum total memory of 8GB. It supports DDR3 800/1066MHz.

Basically, the system memory interface has the following features:

Supports two 64-bit wide DDR data channels

Available bandwidth up to 6.4GB/s (DDR3 1066) for two-channel mode.

Supports 512Mb, 1Gb, 2Gb DDR3 technologies.

Supports only x8, x16, DDR3 devices with four banks

Supports only unbuffered DIMMs

Supports opportunistic refresh

Up to 32 simultaneously open pages (four per row, four rows maximum)

Setting the Jumpers

Jumpers are used on the motherboard are used to select various settings and features according to your needs and applications. Contact your supplier if you have doubts about the best configuration for your needs. The following lists the connectors and their respective functions.

Jumper Locations on MI950/MI950F/MI950AF

JP4: ME (Management Engine) – Disabled / pin closed

The factory default setting of the 2-pin JP4 jumper is closed. This means the management engine function is disabled.

JP5: Clear CMOS Contents
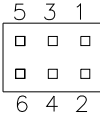
Use JP8, a 3-pin header, to clear the CMOS contents.
Note that the ATX-power connector should be disconnected from the motherboard before clearing CMOS.

JP5	Setting	Function
□ □ □ 1 2 3	Pin 1-2 Short/Closed	Normal
□ □ □ 1 2 3	Pin 2-3 Short/Closed	Clear CMOS

JP1, JP2, JP3: RS232/422/485 (COM2) Selection

COM2 is selectable for RS232, RS-422 and RS-485.

COM2 Function	RS-232	RS-422	RS-485
Jumper Setting (pin closed)	JP1: 1-2 JP2: 3-5 & 4-6 JP3: 3-5 & 4-6	JP1: 3-4 JP2: 1-3 & 2-4 JP3: 1-3 & 2-4	JP1: 5-6 JP2: 1-3 & 2-4 JP3: 1-3 & 2-4

Connectors on MI950

The connectors on MI950 allows you to connect external devices such as keyboard, floppy disk drives, hard disk drives, printers, etc. The following table lists the connectors on MI950 and their respective functions.

Connector Locations on MI950/MI950F/MI950RF

ATX2: 24-pin ATX Power Connector

Signal Name	Pin #	Pin #	Signal Name
3.3V	13	1	3.3V
-12V	14	2	3.3V
Ground	15	3	Ground
PS-ON	16	4	+5V
Ground	17	5	Ground
Ground	18	6	+5V
Ground	19	7	Ground
-5V	20	8	Power good
+5V	21	9	5VSB
+5V	22	10	+12V
+5V	23	11	+12V
Ground	24	12	+3.3V

ATX1: ATX 12V Power Connector
This connector supplies the CPU operating voltage.
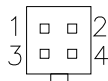
Pin #	Signal Name
1	Ground
2	Ground
3	+12V
4	+12V

DDRIII1: Channel A DDR3 Socket

DDRIII2: Channel B DDR3 Socket

CPU_FAN1: CPU Fan Power Connector
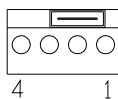
Pin #	Signal Name
1	Ground
2	+12V
3	Rotation detection
4	Control

SYS_FAN1: system Fan1 Power Connector
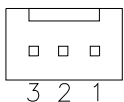
Pin #	Signal Name
1	Ground
2	+12V
3	Rotation detection

SYS_FAN2: System Fan2 Power Connector
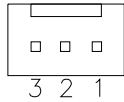
Pin #	Signal Name
1	Ground
2	+12V
3	Rotation detection
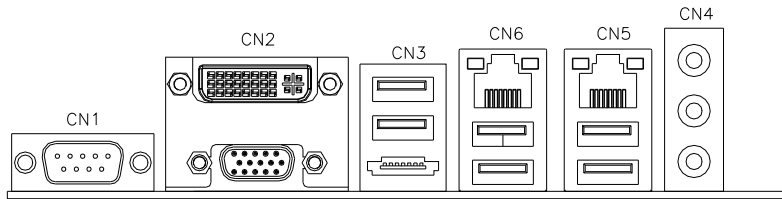
CN1: Serial Ports(COM1)

CN1 (COM1) is a DB-9 connector,
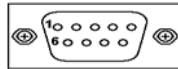
Signal Name	Pin #	Pin #	Signal Name
DCD, Data carrier detect	1	6	DSR, Data set ready
RXD, Receive data	2	7	RTS, Request to send
TXD, Transmit data	3	8	CTS, Clear to send
DTR, Data terminal ready	4	9	RI, Ring indicator
GND, ground	5	10	Not Used

J2: COM2 is jumper selectable for RS-232, RS-422 and RS-485.
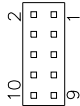
Pin #	Signal Name		
	RS-232	R2-422	RS-485
1	DCD	TX-	DATA-
2	RX	TX+	DATA+
3	TX	RX+	NC
4	DTR	RX-	NC
5	Ground	Ground	Ground
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	RI	NC	NC
10	NC	NC	NC
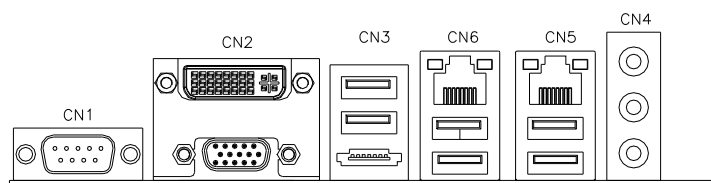
CN2: DVI+CRT Connector

CN3: ESATA & USB8/USB9 Connector

CN4: Line-in, Line-out & Microphone Connector

CN5: Gigabit LAN (Intel 574L) RJ-45 &USB 6/7 Connector

CN6: Gigabit LAN (Intel 567LM) RJ-45&USB 4/5 Connector

SATA1~SATA4: SATAII Connectors

Pin #	Signal Name
1	Ground
2	TX+
3	TX-
4	Ground
5	RX-
6	RX+
7	Ground
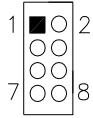
J1: Digital I/O Connector (4 in, 4 out)
This 10-pin digital I/O connector supports TTL levels and is used to control external devices requiring ON/OFF circuitry.

Signal Name	Pin #	Pin #	Signal Name
Ground	1	2	+5V
Out3	3	4	Out1
Out2	5	6	Out0
IN3	7	8	IN1
IN2	9	10	IN0
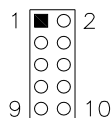
J3: Keyboard & Mouse Connector (Testing use only)
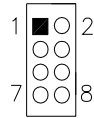
Signal Name	Pin	Pin	Signal Name
Vcc	1	2	VCC
MDA	3	4	KBDA
MCL	5	6	KBCL
Ground	7	8	Ground

J5: SPI Debug Tools Port (Factory use only)

J6: USB2/USB3 Connector
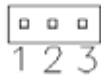
J7: USB0/USB1 Connector

Signal Name	Pin	Pin	Signal Name
Vcc	1	2	Ground
D0-	3	4	D1+
D0+	5	6	D1-
Ground	7	8	Vcc
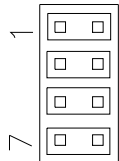
J8: Power LED
The power LED indicates the status of the main power switch.

Pin #	Signal Name
1	Power LED
2	No connect
3	Ground

J9: System Function Connector

```
Pin 1/2 ATX Power On Switch
Pin 3/4 HDD LED connector
Pin 5/6 Reset Switch
Pin 7/8 +5V and 5VSB signals
```

ATX Power ON Switch: Pins 1 and 2
This 2-pin connector is an "ATX Power Supply On/Off Switch" on the system that connects to the power switch on the case. When pressed, the power switch will force the system to power on. When pressed again, it will force the system to power off.

Hard Disk Drive LED Connector: Pins 3 and 4

This connector connects to the hard drive activity LED on control panel. This LED will flash when the HDD is being accessed.

Pin #	Signal Name
4	HDD Active
3	5V
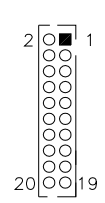
Reset Switch: Pins 5 and 6

The reset switch allows the user to reset the system without turning the main power switch off and then on again. Orientation is not required when making a connection to this header.

+5V and 5VSB Signals: Pins 7 and 8

Pin #	Signal Name
7	+5V
8	+5VSB

J10: COM3, COM4 Serial Port (DF11 Connector)

Signal Name	Pin #	Pin #	Signal Name
DSR1 Data set ready	2	1	DCD1 Data carrier detect
RTS1 Request to send	4	3	RXD1 Receive data
CTS1 Clear to send	6	5	TXD1 Transmit data
RI1 Ringing indicator	8	7	DTR1 Data terminal ready
Not used	10	9	Ground
DSR2	12	11	DCD2
RTS2	14	13	RXD2
CTS2	16	15	TXD2
RI2	18	17	DTR2
Not used	20	19	Ground

PCI1: PCI Slot (supports two masters)

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BIOS Setup

This chapter describes the different settings available in the Award BIOS that comes with the board. The topics covered in this chapter are as follows:

BIOS Introduction

The Award BIOS (Basic Input/Output System) installed in your computer system's ROM supports Intel processors. The BIOS provides critical low-level support for a standard device such as disk drives, serial ports and parallel ports. It also adds virus and password protection as well as special support for detailed fine-tuning of the chipset controlling the entire system.

BIOS Setup

The Award BIOS provides a Setup utility program for specifying the system configurations and settings. The BIOS ROM of the system stores the Setup utility. When you turn on the computer, the Award BIOS is immediately activated. Pressing the <Del> key immediately allows you to enter the Setup utility. If you are a little bit late pressing the <Del> key, POST (Power On Self Test) will continue with its test routines, thus preventing you from invoking the Setup. If you still wish to enter Setup, restart the system by pressing the "Reset" button or simultaneously pressing the <Ctrl>, <Alt> and <Delete> keys. You can also restart by turning the system Off and back On again. The following message will appear on the screen:

```
Press  <DEL>  to  Enter  Setup
```

In general, you press the arrow keys to highlight items, <Enter> to select, the <PgUp> and <PgDn> keys to change entries, <F1> for help and <Esc> to quit.

When you enter the Setup utility, the Main Menu screen will appear on the screen. The Main Menu allows you to select from various setup functions and exit choices.

Phoenix - AwardBIOS CMOS Setup Utility

Standard CMOS Features	Frequency/Voltage Control
Advanced BIOS Features	Load Fail-Safe Defaults
Advanced Chipset Features	Load Optimized Defaults
Integrated Peripherals	Set Supervisor Password
Power Management Setup	Set User Password
PnP/PCI Configurations	Save & Exit Setup
PC Health Status	Exit Without Saving
ESC : Quit	↑ ↓ → ← : Select Item
F10 : Save & Exit Setup	
Time, Date, Hard Disk Type…	

The section below the setup items of the Main Menu displays the control keys for this menu. At the bottom of the Main Menu just below the control keys section, there is another section, which displays information on the currently highlighted item in the list.

Note: *If the system cannot boot after making and saving system changes with Setup, the Award BIOS supports an override to the CMOS settings that resets your system to its default.*

Warning: *It is strongly recommended that you avoid making any changes to the chipset defaults. These defaults have been carefully chosen by both Award and your system manufacturer to provide the absolute maximum performance and reliability. Changing the defaults could cause the system to become unstable and crash in some cases.*

Standard CMOS Setup

"Standard CMOS Setup" choice allows you to record some basic hardware configurations in your computer system and set the system clock and error handling. If the motherboard is already installed in a working system, you will not need to select this option. You will need to run the Standard CMOS option, however, if you change your system hardware configurations, the onboard battery fails, or the configuration stored in the CMOS memory was lost or damaged.

Phoenix - AwardBIOS CMOS Setup Utility
Standard CMOS Features

Date (mm:dd:yy)	Wed, Oct 3, 2007	Item Help
Time (hh:mm:ss)	16 : 11 : 00	Menu Level >
IDE Channel 0 Master	None	Change the day, month,
IDE Channel 0 Slave	None	Year and century
IDE Channel 1 Master	None	
IDE Channel 1 Slave	None	
IDE Channel 2 Master	None	
IDE Channel 3 Master	None	
IDE Channel 4 Master	None	
IDE Channel 4 Slave	None	
Video	EGA/VGA	
Halt On	All, but keyboard	
Base Memory	640K	
Extended Memory	2086912K	
Total Memory	2087936K	

At the bottom of the menu are the control keys for use on this menu. If you need any help in each item field, you can press the <F1> key. It will display the relevant information to help you. The memory display at the lower right-hand side of the menu is read-only. It will adjust automatically according to the memory changed. The following describes each item of this menu.

Date

The date format is:

Day :	**Sun to Sat**
Month :	**1 to 12**
Date :	**1 to 31**
Year :	**1999 to 2099**

To set the date, highlight the "Date" field and use the PageUp/ PageDown or +/- keys to set the current time.

Time

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

To set the time, highlight the "Time" field and use the <PgUp>/ <PgDn> or +/- keys to set the current time.

IDE Channel Master/Slave

MI950 with ICH10DO supports 4 Serial ATA connectors

The onboard Serial ATA connectors provide Primary and Secondary channels for connecting up to four Serial ATA hard disks . Each channel can support up to two hard disks; the first is the "Master" and the second is the "Slave".

Press <Enter> to configure the hard disk. The selections include Auto, Manual, and None. Select 'Manual' to define the drive information manually. You will be asked to enter the following items.

Capacity :	Capacity/size of the hard disk drive
Cylinder :	Number of cylinders
Head :	Number of read/write heads
Precomp :	Write precompensation
Landing Zone :	Landing zone
Sector :	Number of sectors

The Access Mode selections are as follows:
CHS   (HD < 528MB)
LBA   (HD > 528MB and supports Logical Block Addressing)
Large   (for MS-DOS only)
Auto

Video

This field selects the type of video display card installed in your system. You can choose the following video display cards:

EGA/VGA	For EGA, VGA, SEGA, SVGA or PGA monitor adapters. (default)
CGA 40	Power up in 40 column mode.
CGA 80	Power up in 80 column mode.
MONO	For Hercules or MDA adapters.

Halt On

This field determines whether or not the system will halt if an error is detected during power up.

No errors	The system boot will not be halted for any error that may be detected.
All errors	Whenever the BIOS detects a non-fatal error, the system will stop and you will be prompted.
All, But Keyboard	The system boot will not be halted for a keyboard error; it will stop for all other errors
All, But Diskette	The system boot will not be halted for a disk error; it will stop for all other errors.
All, But Disk/Key	The system boot will not be halted for a keyboard or disk error; it will stop for all others.

Advanced BIOS Features

This section allows you to configure and improve your system and allows you to set up some system features according to your preference.

Phoenix - AwardBIOS CMOS Setup Utility
Advanced BIOS Features

CPU Feature	Press Enter	ITEM HELP
Hard Disk Boot Priority	Press Enter	
Virus Warning	Disabled	Menu Level >
CPU L3 Cache	Enabled	
Quick Power On Self Test	Enabled	
First Boot Device	Hard Disk	
Second Boot Device	CDROM	
Third Boot Device	LS120	
Boot Other Device	Enabled	
Boot Up NumLock Status	On	
Gate A20 Option	Fast	
Typematic Rate Setting	Disabled	
Typematic Rate (Chars/Sec)	6	
Typematic Delay (Msec)	250	
Security Option	Setup	
APIC Mode	Enabled	
MPS Version Control for OS	1.4	
OS Select For DRAM>64MB	Non-OS2	
Console Redirection	Disabled	
Baud Rate	19200	
Agent after boot	Enabled	
Small Logo (EPA) Show	Disabled	

CPU Feature
Press Enter to configure the settings relevant to CPU Feature.

Hard Disk Boot Priority
With the field, there is the option to choose, aside from the hard disks connected, "Bootable add-in Cards" which refers to other external devices.

CPU L3 Cache
This feature is enabled.

Removable Device Priority
Press Enter to configure the device priority order.

Virus Warning
If this option is enabled, an alarm message will be displayed when trying to write on the boot sector or on the partition table on the disk, which is typical of the virus.

Quick Power On Self Test
When enabled, this field speeds up the Power On Self Test (POST) after the system is turned on. If it is set to *Enabled*, BIOS will skip some items.

First/Second/Third Boot Device

These fields determine the drive that the system searches first for an operating system. The options available include *Removable*, *Hard Disk*, *CDROM, Legacy LAN* and *Disabled*.

Boot Other Device

These fields allow the system to search for an OS from other devices other than the ones selected in the First/Second/Third Boot Device.

Boot Up NumLock Status

This allows you to activate the NumLock function after you power up the system.

Gate A20 Option

This field allows you to select how Gate A20 is worked. Gate A20 is a device used to address memory above 1 MB.

Typematic Rate Setting

When disabled, continually holding down a key on your keyboard will generate only one instance. When enabled, you can set the two typematic controls listed next. By default, this field is set to **Disabled.**

Typematic Rate (Chars/Sec)

When the typematic rate is enabled, the system registers repeated keystrokes speeds. Settings are from 6 to 30 characters per second.

Typematic Delay (Msec)

When the typematic rate is enabled, this item allows you to set the time interval for displaying the first and second characters. By default, this item is set to **250msec.**

Security Option

This field allows you to limit access to the System and Setup. The default value is **Setup**. When you select *System,* the system prompts for the User Password every time you boot up. When you select *Setup,* the system always boots up and prompts for the Supervisor Password only when the Setup utility is called up.

APIC Mode

APIC stands for Advanced Programmable Interrupt Controller. The default setting is **Enabled**.

MPS Version Control for OS
This option is specifies the MPS (Multiprocessor Specification) version for the OS. MPS version 1.4 added extended configuration tables to improve support for multiple PCI bus configurations and improve future expandability. The default setting is *1.4*.

OS Select for DRAM > 64MB
This option allows the system to access greater than 64MB of DRAM memory when used with OS/2 that depends on certain BIOS calls to access memory. The default setting is ***Non-OS/2***.

Small Logo (EPA) Show
The EPA logo appears at the right side of the monitor screen when the system is boot up. The default setting is ***Disabled***.

Console Redirection
This configuration is supported only with MI950AF (with iAMT function). The default setting is ***Disabled***.

Baud Rate
This configuration is supported only with MI950AF (with iAMT function). The default setting is *19200*.

Agent after boot
This configuration is supported only with MI950AF (with iAMT function). The default setting is ***Enabled***.

Advanced Chipset Features

This Setup menu controls the configuration of the chipset.

```
                    Phoenix - AwardBIOS CMOS Setup Utility
                         Advanced Chipset Features
┌─────────────────────────────────────────────────────┬──────────────────┐
│ System BIOS Cacheable          Enabled               │     ITEM HELP    │
│ Memory Hole at 15M-16M         Disabled              ├──────────────────┤
│ PCI Express Root Port Func     Press Enter           │ Menu Level >     │
│ Disable MCHBAR MMIO            Enabled               │                  │
│ VT-d                           Disabled              │                  │
│ Intel AMT Configuration        Press Enter           │                  │
│                                                       │                  │
│ ** VGA Setting **                                    │                  │
│ PEG/On Chip VGA Control        Auto                  │                  │
│ On-Chip Frame Buffer Size      32MB                  │                  │
│ DVMT Mode                      Enabled               │                  │
│ DVMT/FIXED memory Size         256MB                 │                  │
│ PAVP Mode                      Lite                  │                  │
│                                                       │                  │
└─────────────────────────────────────────────────────┴──────────────────┘
```

```
                    Phoenix - AwardBIOS CMOS Setup Utility
                          Intel AMT Configuration
┌─────────────────────────────────────────────────────┬──────────────────┐
│ AMT BIOS Support               Enabled               │     ITEM HELP    │
│ SOL Support                    Enabled               ├──────────────────┤
│ IDE-R Support                  Enabled               │ Menu Level >     │
│ Platform Mng Selection         Intel AMT             │                  │
│ QST Support                    Disabled              │                  │
│ Danbury Technology             Disabled              │                  │
│ OEM Flag BIT0                  Disabled              │                  │
│ OEM Flag BIT1                  Disabled              │                  │
│ OEM Flag BIT2                  Disabled              │                  │
└─────────────────────────────────────────────────────┴──────────────────┘
```

System BIOS Cacheable

The setting of *Enabled* allows caching of the system BIOS ROM at F000h-FFFFFh, resulting in better system performance. However, if any program writes to this memory area, a system error may result.

Memory Hole At 15M-16M

In order to improve performance, certain space in memory can be reserved for ISA cards. This memory must be mapped into the memory space below 16 MB. The choices are *Enabled* and *Disabled*.

PCI Express Root Port Func

Press Enter to configure this field.

Disable MCHBAR MMIO

By default, this feature is enabled.

VT-d

By default, this feature is disabled.

Intel AMT Configuration

This configuration is supported only with MI950AF (with iAMT function).

VGA Setting

The fields under the On-Chip VGA Setting and their default settings are:

PEG/On Chip VGA Control: Auto

On-Chip Frame Buffer Size: 32MB

DVMT Mode: Enabled

DVMT/FIXED memory Size: 256MB

PAVP Mode: Lite

Integrated Peripherals

This section sets configurations for your hard disk and other integrated peripherals. The first screen shows three main items for user to select. Once an item selected, a submenu appears. Details follow.

Phoenix - AwardBIOS CMOS Setup Utility
Integrated Peripherals

OnChip IDE Device	Press Enter	ITEM HELP
Onboard Device	Press Enter	Menu Level >
SuperIO Device	Press Enter	
2nd SuperIO Device	Press Enter	
USB Device Setting	Press Enter	

Phoenix - AwardBIOS CMOS Setup Utility
OnChip IDE Device

IDE HDD Block Mode	Enabled	ITEM HELP
IDE DMA transfer access	Enabled	
IDE Primary Master PIO	Auto	Menu Level >
IDE Primary Slave PIO	Auto	
IDE Primary Master UDMA	Auto	
IDE Primary Slave UDMA	Auto	
On-Chip Secondary PCI IDE	Enabled	
IDE Secondary Master PIO	Auto	
IDE Secondary Slave PIO	Auto	
IDE Secondary Master UDMA	Auto	
IDE Secondary Slave UDMA	Auto	
SATA Mode	IDE	
LEGACY Mode Support	Enabled	

Phoenix - AwardBIOS CMOS Setup Utility
Onboard Device

High Definition Audio	Enabled	ITEM HELP
Onboard LAN Boot ROM	Disabled	

Phoenix - AwardBIOS CMOS Setup Utility
SuperIO Device

Onboard Serial Port 1	3F8/IRQ4	ITEM HELP
Onboard Serial Port 2	2F8/IRQ3	Menu Level >
PWRON After PWR-Fail	Off	

Phoenix - AwardBIOS CMOS Setup Utility
2nd Super IO Device

Onboard Serial Port 3	220h	ITEM HELP
Serial Port 3 Use IRQ	IRQ5	Menu Level >
Onboard Serial Port 4	228h	
Serial Port 4 Use IRQ	IRQ7	

Phoenix - AwardBIOS CMOS Setup Utility
USB Device Setting

USB 1.0 Controller	Enabled	ITEM HELP
USB 2.0 Controller	Enabled	Menu Level >
USB Operation Mode	High Speed	
USB Keyboard Function	Enabled	
USB Mouse Function	Enabled	
USB Storage Function	Enabled	
*** USB Mass Storage Device Boot Setting ***		

IDE HDD Block Mode

This field allows your hard disk controller to use the fast block mode to transfer data to and from your hard disk drive.

IDE DMA Transfer Access

This field, by default, is enabled

OnChip Secondary PCI IDE

This field, by default, is enabled

IDE Primary/Secondary Master/Slave PIO

These fields allow your system hard disk controller to work faster. Rather than have the BIOS issue a series of commands that transfer to or from the disk drive, PIO (Programmed Input/Output) allows the BIOS to communicate with the controller and CPU directly.

The system supports five modes, numbered from 0 (default) to 4, which primarily differ in timing. When Auto is selected, the BIOS will select the best available mode.

IDE Primary/Secondary Master/Slave UDMA

These fields allow your system to improve disk I/O throughput to 33Mb/sec with the Ultra DMA/33 feature. The options are *Auto* and *Disabled*.

SATA Mode

The setting choices for the SATA Mode are IDE, RAID and AHCI Mode. Select [IDE] if you want to have SATA function as IDE. Select [AHCI] for Advanced Host Controller Interface (AHCI) feature, with improved SATA performance with native command queuing & native hot plug. Select [RAID] to use SATA as RAID function. RAID function is supported on the board if it uses ICH10DO. *(MI950 supports 4 x SATA with RAID.)*

LEGACY Mode Support

When the Serial ATA (SATA) is set with the legacy mode enabled, then the SATA is set to the conventional IDE mode. Legacy mode is otherwise known as compatible mode.

PWRON After PWR-Fail

This field sets the system power status whether *on or off* when power returns to the system from a power failure situation.

Onboard Serial/Parallel Port

These fields allow you to select the onboard serial and parallel ports and their addresses. The default values for these ports are:

Serial Port 1	3F8/IRQ4
Serial Port 2	2F8/IRQ3
Serial Port 3	220H /IRQ5
Serial Port 4	230H/IRQ7

USB 1.0 Controller

The options for this field are *Enabled* and *Disabled*. By default, this field is set to ***Enabled***.

USB 2.0 Controller

The options for this field are *Enabled* and *Disabled*. By default, this field is set to ***Enabled***. In order to use USB 2.0, necessary OS drivers must be installed first. ***Please update your system to Windows 2000 SP4 or Windows XP SP2.***

USB Keyboard/Mouse/Storage Function

The options for this field are *Enabled* and *Disabled*. By default, this field is set to ***Enabled***.

Power Management Setup

PCI Express PM Function	Press Enter	ITEM HELP
ACPI Function	Enabled	Menu Level >
ACPI Suspend	S1(POS)	
Run VGABIOS if S3 Resume	Auto	
Power Management	User Define	
Video Off Method	DPMS	
Video Off In Suspend	Yes	
Suspend Type	Stop Grant	
Modem Use IRQ	3	
Suspend Mode	Disabled	
HDD Power Down	Disabled	
Soft-Off by PWR-BTTN	Instant-Off	
CPU THRM-Throttling	50.0%	
Wake-Up by PCI Card	Disabled	
Power On by Ring	Disabled	
Resume by Alarm	Disabled	
Date (of Month) Alarm	0	
Time (hh:mm:ss) Alarm	0 : 0 : 0	
** Reload Global Timer Events **		
Primary IDE 0	Disabled	
Primary IDE 1	Disabled	
Secondary IDE 0	Disabled	
Secondary IDE 1	Disabled	
FDD, COM, LPT Port	Disabled	
PCI PIRQ[A-D] #	Disabled	
HPET Support	Enabled	
HPET Mode	32-bit mode	

ACPI Function

Enable this function to support ACPI (Advance Configuration and Power Interface).

ACPI Suspend

The default setting of the ACPI Suspend mode is *S1(POS)*.

RUN VGABIOS if S3 Resume

The default setting of this field is *Auto*.

Power Management

This field allows you to select the type of power saving management modes. There are four selections for Power Management.

Min. Power Saving	Minimum power management
Max. Power Saving	Maximum power management.
User Define	Each of the ranges is from 1 min. to 1hr. Except for HDD Power Down which ranges from 1 min. to 15 min.

Video Off Method

This field defines the Video Off features. There are three options.

V/H SYNC + Blank	Blank the screen and turn off vertical and horizontal scanning.
DPMS	Default setting, allows BIOS to control the video display.
Blank Screen	Writes blanks to the video buffer.

Video Off In Suspend

When enabled, the video is off in suspend mode.

Suspend Type

The default setting for the Suspend Type field is *Stop Grant*.

Modem Use IRQ

This field sets the IRQ used by the Modem. By default, the setting is *3*.

Suspend Mode

When enabled, and after the set time of system inactivity, all devices except the CPU will be shut off.

HDD Power Down

When enabled, and after the set time of system inactivity, the hard disk drive will be powered down while all other devices remain active.

Soft-Off by PWRBTN

This field defines the power-off mode when using an ATX power supply. The *Instant Off* mode allows powering off immediately upon pressing the power button. In the *Delay 4 Sec* mode, the system powers off when the power button is pressed for more than four seconds or enters the suspend mode when pressed for less than 4 seconds.

CPU THRM-Throttling

When the system enters Doze mode, the CPU clock runs only part of the time. You may select the percent of time that the clock runs.

Wake up by PCI Card

By default, this field is *Disabled.*

Power On by Ring

This field enables or disables the power on of the system through the modem connected to the serial port or LAN.

Resume by Alarm

This field enables or disables the resumption of the system operation. When enabled, the user is allowed to set the *Date* and *Time*.

Reload Global Timer Events

The HDD, FDD, COM, LPT Ports, and PCI PIRQ are I/O events that can prevent the system from entering a power saving mode or can awaken the system from such a mode. When an I/O device wants to gain the attention of the operating system, it signals this by causing an IRQ to occur. When the operating system is ready to respond to the request, it interrupts itself and performs the service.

HPET Support

HPET stands for High Precision Event Timer. HPET can produce periodic interrupts at a much higher resolution than the RTC and is used to synchronize multimedia streams, providing smooth playback and reducing the need to use other timestamp calculations such as an x86 CPU's RDTSC instruction. HPET is not supported in Windows XP, Windows Server 2003, or earlier Windows versions. HPET is supported under Linux and Windows Vista. By default, this field is enabled*.*

HPET Mode

By default, this field is set to *32-bit mode*.

PNP/PCI Configurations

This option configures the PCI bus system. All PCI bus systems on the system use INT#, thus all installed PCI cards must be set to this value.

Init Display First	PCI Slot	ITEM HELP
Reset Configuration Data	Disabled	Menu Level
Resources Controlled By	Auto (ESCD)	Select Yes if you are
IRQ Resources	Press Enter	using a Plug and Play
		capable operating
PCI/VGA Palette Snoop	Disabled	system Select No if
		you need the BIOS to
		configure non-boot
PCI Express relative items		devices
Maximum Payload Size	128	

Init Display First
The default setting is *PCI Card*.

Reset Configuration Data
The default value is *Disabled.*

Resources Controlled by
This PnP BIOS can configure all of the boot and compatible devices with the use of a PnP operating system such as Windows 95.

PCI/VGA Palette Snoop
Some non-standard VGA display cards may not show colors properly. This field allows you to set whether or not MPEG ISA/VESA VGA cards can work with PCI/VGA. When this field is enabled, a PCI/VGA can work with an MPEG ISA/VESA VGA card. When this field is disabled, a PCI/VGA cannot work with an MPEG ISA/VESA card.

Maximum Payload Size
The default setting of the PCI Express Maximum Payload Size is 128.

PC Health Status

Phoenix - AwardBIOS CMOS Setup Utility
PC Health Status

Shutdown Temperature	Disabled	ITEM HELP
CPU Warning Temperature	Disabled	
System Temp.	32°C/89°F	Menu Level >
CPU Temp.	39°C/102°F	
System2 Fan Speed	0 RPM	
CPU Fan Speed	4440 RPM	
System1 Fan Speed	0 RPM	
Vcore	1.31 V	
+12 V	12.19 V	
Vmem	1.90 V	
+ 5 V	5.14 V	
3.3 V	3.32 V	
VBAT (V)	3.21 V	
3.3VSB(V)	3.35 V	
** Smart FAN III **		
CPU Smart Fan Temperature	Disabled	

CPU Warning Temperature

This field allows the user to set the temperature so that when the temperature is reached, the system sounds a warning. This function can help prevent damage to the system that is caused by overheating.

Shutdown Temperature

This field allows the user to set the temperature by which the system automatically shuts down once the threshold temperature is reached. This function can help prevent damage to the system that is caused by overheating.

Temperatures/Fan Speeds/Voltages

These fields are the parameters of the hardware monitoring function feature of the board. The values are read-only values as monitored by the system and show the PC health status.

Frequency/Voltage Control

Phoenix - AwardBIOS CMOS Setup Utility
Frequency/Voltage Control

Auto Detect PCI Clk	Disabled	ITEM HELP
Spread Spectrum	Disabled	Menu Level >
CPU Host/SRC/PCI Clock	Default	

Auto Detect PCI Clk

This field enables or disables the auto detection of the PCI clock.

Spread Spectrum

This field sets the value of the spread spectrum. The default setting is *Disabled*. This field is for CE testing use only.

CPU Host/SRC/PCI Clock

This field is set as *Default*.

Load Fail-Safe Defaults

This option allows you to load the troubleshooting default values permanently stored in the BIOS ROM. These default settings are non-optimal and disable all high-performance features.

Load Optimized Defaults

This option allows you to load the default values to your system configuration. These default settings are optimal and enable all high performance features.

Set Supervisor/User Password

These two options set the system password. Supervisor Password sets a password that will be used to protect the system and Setup utility. User Password sets a password that will be used exclusively on the system. To specify a password, highlight the type you want and press <Enter>. The Enter Password: message prompts on the screen. Type the password, up to eight characters in length, and press <Enter>. The system confirms your password by asking you to type it again. After setting a password, the screen automatically returns to the main screen.

To disable a password, just press the <Enter> key when you are prompted to enter the password. A message will confirm the password to be disabled. Once the password is disabled, the system will boot and you can enter Setup freely.

Save & Exit Setup

This option allows you to determine whether or not to accept the modifications. If you type "Y", you will quit the setup utility and save all changes into the CMOS memory. If you type "N", you will return to Setup utility.

Exit Without Saving

Select this option to exit the Setup utility without saving the changes you have made in this session. Typing "Y" will quit the Setup utility without saving the modifications. Typing "N" will return you to Setup utility.

This page is intentionally left blank.

Drivers Installation

This section describes the installation procedures for software and drivers under the Windows 2000, Windows XP and Windows Vista. The software and drivers are included with the board. If you find the items missing, please contact the vendor where you made the purchase. The contents of this section include the following:

IMPORTANT NOTE:

After installing your Windows operating system (Windows 2000/XP/Vista), you must install first the Intel Chipset Software Installation Utility before proceeding with the drivers installation.

Intel Chipset Software Installation Utility

The Intel® Chipset Drivers should be installed first before the software drivers to enable Plug & Play INF support for Intel chipset components. Follow the instructions below to complete the installation under Windows 2000/XP/Vista. (Before installing this utility, please update your system to Windows 2000 SP4 or Windows XP SP2)

1. Insert the drivers DVD into the DVD drive. Click **Intel** and then **Intel(R) Q45 Chipset Drivers**. Click **Intel(R) Chipset Software Installation Utility.**

2. When the Welcome screen appears, click *Next* to continue. Click *Yes* to accept the software license agreement and proceed with the installation process.

3. On the Readme Information screen, click *Next* to continue. When the Setup Progress screen appears, click *Next* to continue.

4. Setup process is now complete. Click *Finish* to restart the computer.

Intel Graphics Driver Installation

To install the Graphics drivers, follow the steps below to proceed with the installation.

1. Insert the drivers DVD into the DVD drive. Click *Intel* and then *Intel(R) Q45 Chipset Drivers*. Click *Intel(R) Q45 Chipset Family Graphics Driver.*

2. When the Welcome screen appears, click *Next* to continue. Click *Yes* to accept the software license agreement and proceed with the installation process.

3. On the Readme Information screen, click *Next* to continue.

4. When the Setup Progress screen appears, click *Next* to continue.
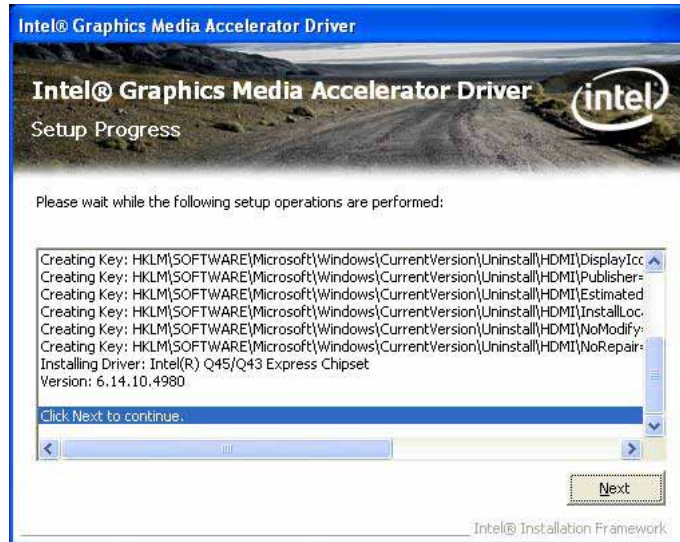
5. Setup is complete. Click *Finish* to restart the computer.
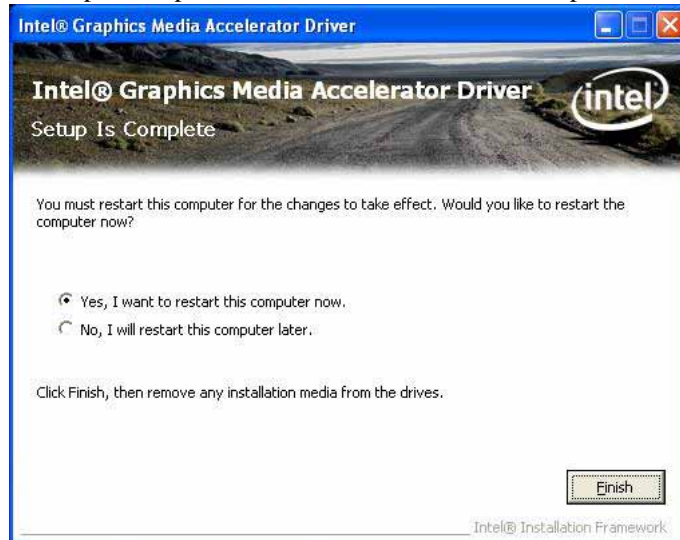
Realtek HD Code Audio Driver Installation

Follow the steps below to install the Realtek High Definition Codec Audio Driver.

1. Insert the drivers DVD into the DVD drive. Click *Intel* and then *Intel(R) Q45 Chipset Drivers*. Click *Realtek High Definition Codec Audio Driver.*

2. When the Welcome screen appears, click *Next* to continue.
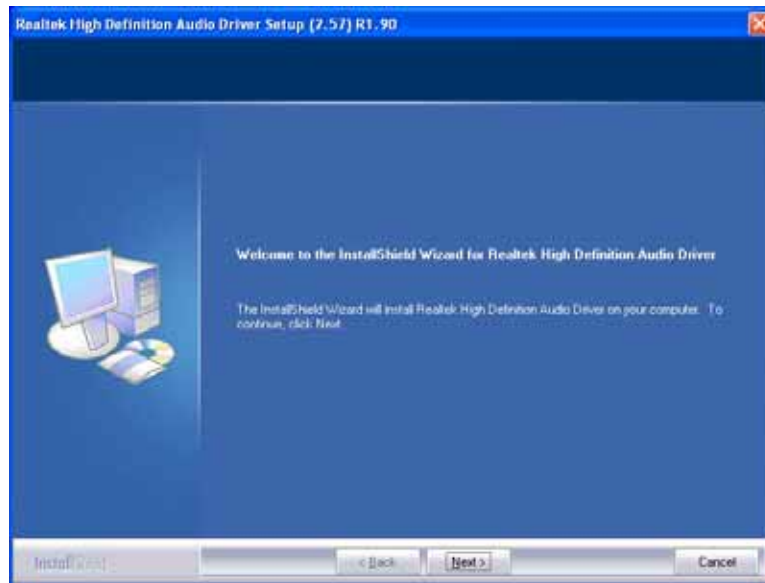
3. InstallShield Wizard is complete. Click *Finish* to restart the computer.
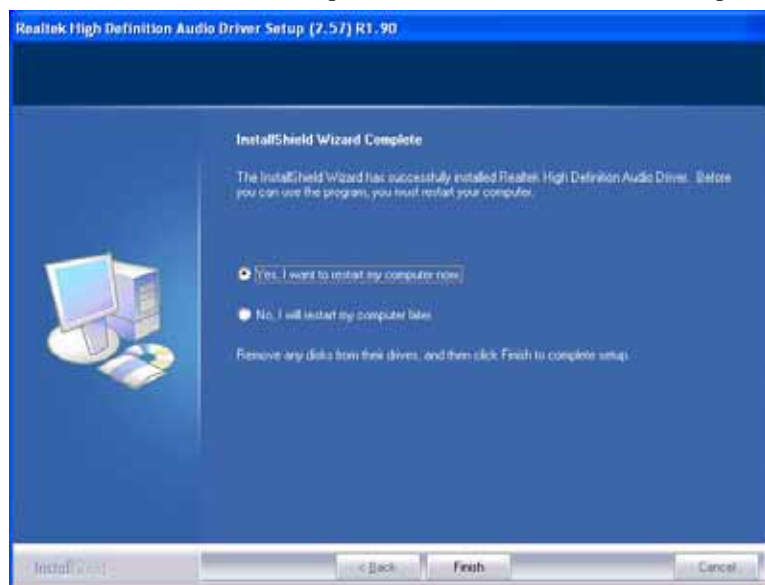
LAN Drivers Installation

Follow the steps below to start installing the Intel PRO LAN drivers.

1. Insert the drivers DVD into the DVD drive. Click **Intel** and then **Intel(R) Q45 Chipset Drivers**. Click **Intel(R) PRO LAN Network Drivers.**


2. When the Welcome screen appears, click **Next** to continue. Click **Yes** to accept the software license agreement and proceed with the process.
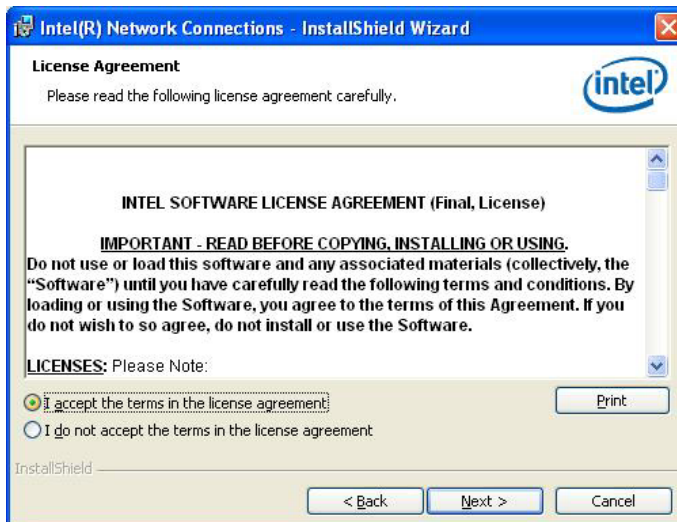
3. On the Setup Options screen, the checkbox for Drivers should be checked. Now, click *Next* to continue.
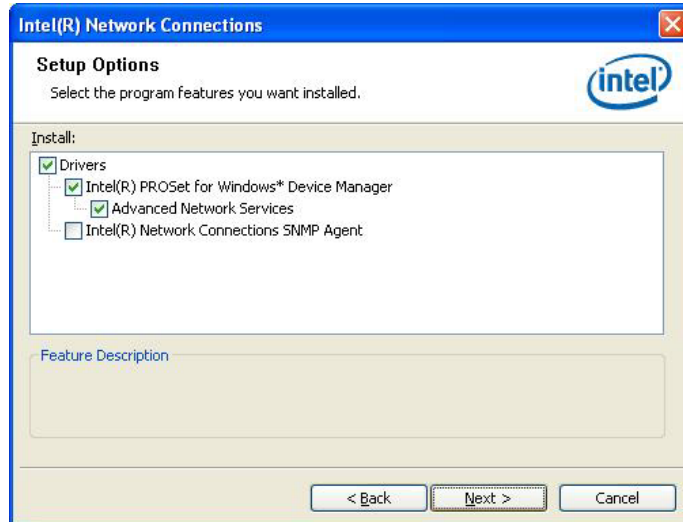
4. The wizard is ready to begin installation Now, click *Install* to continue.
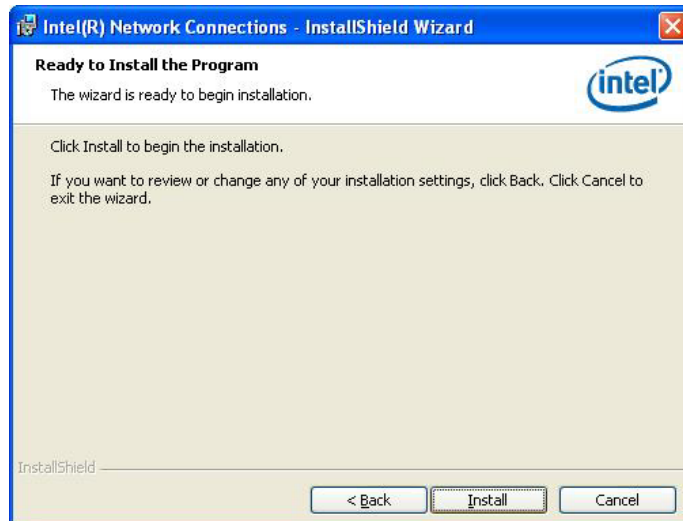
5. InstallShield wizard is complete. Click *Finish*.

Intel Matrix Storage Manager Driver

This driver is needed to be installed when the board supports SATA AHCI or SATA RAID.

1. Insert the drivers DVD in the DVD drive. Click *Intel* and then *Intel(R) Q45 Chipset Drivers*. Click *Intel(R) Matrix Storage Manager Drivers.*

2. In the welcome screen to the Setup Program, click *Next*. In the next "warning" page as below, click *Next*.

3. In the License Agreement page, click *Yes* to agreement with the agreement. Then , in the Readme File Information page, click *Next*.

4. In the Setup Progress page, click *Next*, and restart the computer when prompted.
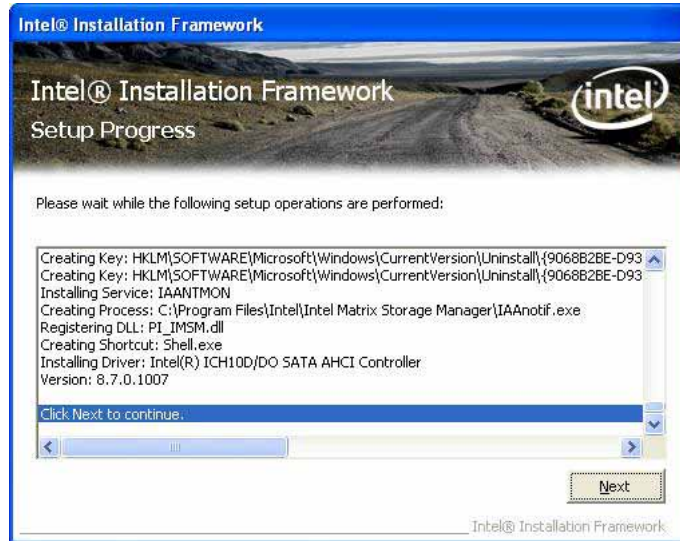
Intel Management Engine Interface

This driver is used only on MI950AF (with iAMT function).

1. Insert the drivers DVD into the DVD drive. Click *Intel* and then *Intel(R) Q45 Chipset Drivers*. Click *Intel(R) IAMT*.

2. In the next page, click *Intel(R) MEI Driver*.

3. In the welcome screen to the Setup Program, click *Next*. In the next License Agreement page, click *Yes* to accept to all the terms with the agreement and continue the setup program.

4. Click *Yes* in the Readme File Information page and continue the setup program. Setup is now in progress. Click *Next*.
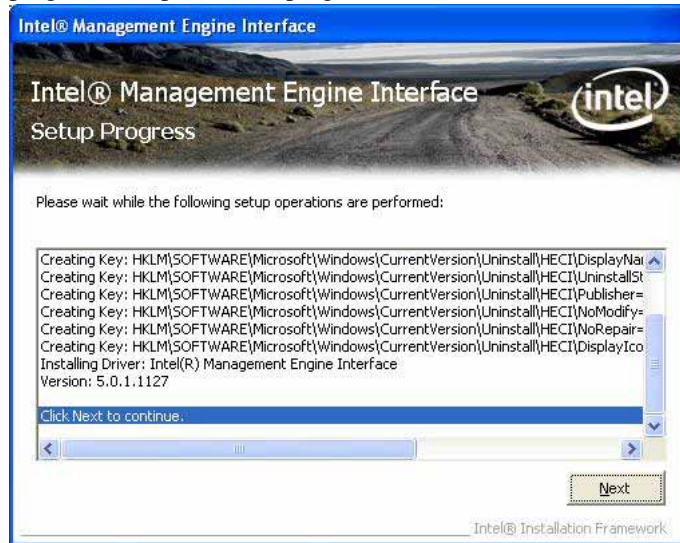
5. Setup is complete. Click *Finish*.

Intel Active Management Technology

This driver is used only on MI950AF (with iAMT function).
**It will first install the update for "Hotfix for Windows XP**
(KB942288-v3)" and Microsoft .NET Frame 3.5 SP1 Setup.

1. Insert the drivers DVD into the DVD drive. Click *Intel* and then
Intel(R) Q45 Chipset Drivers. Click *Intel(R) IAMT*, then *Intel(R)*
SOL/LSM Driver.

2. In the welcome screen to the Setup Program, click *Next* to continue. In
the License Agreement screen, click *Yes* accept the terms of the
agreement and proceed with the setup program.

3. In the Readme File Information screen, click *Next* to continue.

4. The next screen is for the Software Update Installation Wizard. It will
install the update for "Hotfix for Windows XP (KB942288-v3). Click
Next to continue.

5. In the License Agreement screen, click *Next* to agree with the
Microsoft Software License Terms.

6. Setup is complete. Click *Finish*.

7. The next screen will show the setup welcome screen to the Microsoft .NET Frame 3.5 SP1 Setup. Follow the instructions accordingly to finish the setup process. In this screen, check the checkbos for "I have read and ACCEPT the terms of the License Agreement", and then click *Install*.

8. After the Setup is complete, click *Exit*.
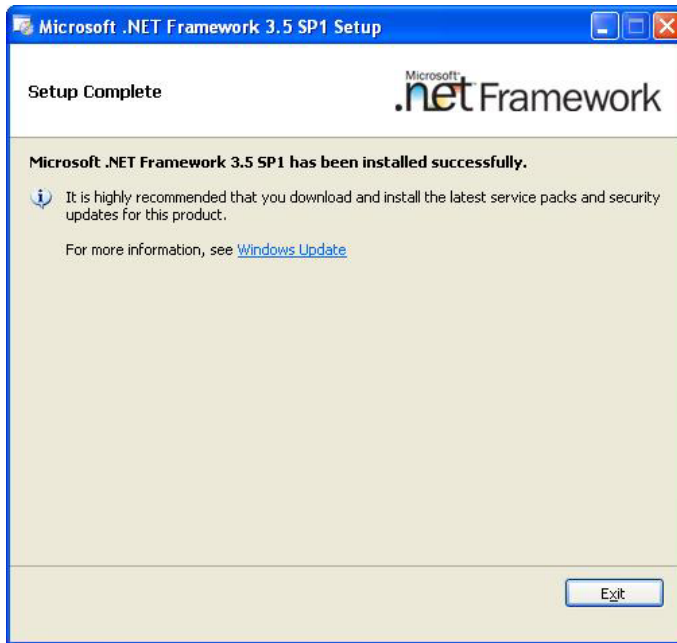
9. Once the Microsoft .NET Frame 3.5 SP1 Setup is complete, the next screen shows the Intel Active Management Technology Setup Progress. Click *Next* to continue.

10. The Intel Active Management Technology Setup is now complete. Click *Finish* to complete the setup process.

Appendix

A. I/O Port Address Map

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

Address	Device Description
000h - 01Fh	DMA Controller #1
020h - 03Fh	Interrupt Controller #1
040h - 05Fh	Timer
060h - 06Fh	Keyboard Controller
070h - 07Fh	Real Time Clock, NMI
080h - 09Fh	DMA Page Register
0A0h - 0BFh	Interrupt Controller #2
0C0h - 0DFh	DMA Controller #2
0F0h	Clear Math Coprocessor Busy Signal
0F1h	Reset Math Coprocessor
1F0h - 1F7h	IDE Interface
278h - 27Fh	Parallel Port #2(LPT2)
2F8h - 2FFh	Serial Port #2(COM2)
2B0h - 2DFh	Graphics adapter Controller
378h - 3FFh	Parallel Port #1(LPT1)
360h - 36Fh	Network Ports
3B0h - 3BFh	Monochrome & Printer adapter
3C0h - 3CFh	EGA adapter
3D0h - 3DFh	CGA adapter
3F0h - 3F7h	Floppy Disk Controller
3F8h - 3FFh	Serial Port #1(COM1)

B. Interrupt Request Lines (IRQ)

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

Level	Function
IRQ0	System Timer Output
IRQ1	Keyboard
IRQ2	Interrupt Cascade
IRQ3	Serial Port #2
IRQ4	Serial Port #1
IRQ5	Reserved
IRQ6	Floppy Disk Controller
IRQ7	Parallel Port #1
IRQ8	Real Time Clock
IRQ9	Reserved
IRQ10	Reserved
IRQ11	Reserved
IRQ12	PS/2 Mouse
IRQ13	80287
IRQ14	Primary IDE
IRQ15	Secondary IDE

C. Watchdog Timer Configuration

The WDT is used to generate a variety of output signals after a user programmable count. The WDT is suitable for use in the prevention of system lock-up, such as when software becomes trapped in a deadlock. Under these sorts of circumstances, the timer will count to zero and the selected outputs will be driven. Under normal circumstance, the user will restart the WDT at regular intervals before the timer counts to zero.

SAMPLE CODE:

```
//=====================================================================
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR
// PURPOSE.
//
//=====================================================================
====
#include <stdio.h>
#include <stdlib.h>
#include "W627EHF.H"
//=====================================================================
====
int main (int argc, char *argv[]);
void copyright(void);
void EnableWDT(int);
void DisableWDT(void);
//=====================================================================
====
int main (int argc, char *argv[])
{
        unsigned char bBuf;
        unsigned char bTime;
        char **endptr;

        copyright();

        if (argc != 2)
        {
                printf(" Parameter incorrect!!\n");
                return 1;
        }

        if (Init_W627EHF() == 0)
        {
                printf(" Winbond 83627HF is not detected, program abort.\n");
                return 1;
        }
        bTime = strtol (argv[1], endptr, 10);
```

```
        printf("System will reset after %d seconds\n", bTime);

        EnableWDT(bTime);

        return 0;
}
//============================================================================
void copyright(void)
{
        printf("\n======= Winbond 83627EHF Watch Timer Tester (AUTO DETECT)
=======\n"\
                     "       Usage : W627E_WD reset_time\n"\
                     "       Ex : W627E_WD 3  => reset system after 3 second\n"\
                     "            W627E_WD 0  => disable watch dog timer\n");
}
//============================================================================
void EnableWDT(int interval)
{
        unsigned char bBuf;

        bBuf = Get_W627EHF_Reg( 0x2D);
        bBuf &= (!0x01);
        Set_W627EHF_Reg( 0x2D, bBuf);                //Enable WDTO

        Set_W627EHF_LD( 0x08);                       //switch to logic device 8
        Set_W627EHF_Reg( 0x30, 0x01);                //enable timer

        bBuf = Get_W627EHF_Reg( 0xF5);
        bBuf &= (!0x08);
        Set_W627EHF_Reg( 0xF5, bBuf);                //count mode is second

        Set_W627EHF_Reg( 0xF6, interval);       //set timer
}
//============================================================================
void DisableWDT(void)
{
        Set_W627EHF_LD(0x08);                        //switch to logic device 8
        Set_W627EHF_Reg(0xF6, 0x00);                 //clear watchdog timer
        Set_W627EHF_Reg(0x30, 0x00);                 //watchdog disabled
}
//============================================================================
```

```
//========================================================================
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR
// PURPOSE.
//
//========================================================================
====
#include "W627EHF.H"
#include <dos.h>
//========================================================================
====
unsigned int W627EHF_BASE;
void Unlock_W627EHF (void);
void Lock_W627EHF (void);
//========================================================================
unsigned int Init_W627EHF(void)
{
        unsigned int result;
        unsigned char ucDid;

        W627EHF_BASE = 0x2E;
        result = W627EHF_BASE;

        ucDid = Get_W627EHF_Reg(0x20);
        if (ucDid == 0x88)
        {       goto Init_Finish;   }

        W627EHF_BASE = 0x4E;
        result = W627EHF_BASE;
        ucDid = Get_W627EHF_Reg(0x20);
        if (ucDid == 0x88)
        {       goto Init_Finish;   }

        W627EHF_BASE = 0x00;
        result = W627EHF_BASE;

Init_Finish:
        return (result);
}
//========================================================================
void Unlock_W627EHF (void)
{
        outportb(W627EHF_INDEX_PORT, W627EHF_UNLOCK);
        outportb(W627EHF_INDEX_PORT, W627EHF_UNLOCK);
}
//========================================================================
====
void Lock_W627EHF (void)
{
        outportb(W627EHF_INDEX_PORT, W627EHF_LOCK);
}
//========================================================================
void Set_W627EHF_LD( unsigned char LD)
{
        Unlock_W627EHF();
        outportb(W627EHF_INDEX_PORT, W627EHF_REG_LD);
        outportb(W627EHF_DATA_PORT, LD);
```

```
      Lock_W627EHF();
}
//=====================================================================
void Set_W627EHF_Reg( unsigned char REG, unsigned char DATA)
{
      Unlock_W627EHF();
      outportb(W627EHF_INDEX_PORT, REG);
      outportb(W627EHF_DATA_PORT, DATA);
      Lock_W627EHF();
}
//=====================================================================
unsigned char Get_W627EHF_Reg(unsigned char REG)
{
      unsigned char Result;
      Unlock_W627EHF();
      outportb(W627EHF_INDEX_PORT, REG);
      Result = inportb(W627EHF_DATA_PORT);
      Lock_W627EHF();
      return Result;
}
//=====================================================================




//=====================================================================
//
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// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR
// PURPOSE.
//
//=====================================================================
#ifndef __W627EHF_H
#define __W627EHF_H            1
//=====================================================================
#define      W627EHF_INDEX_PORT         (W627EHF_BASE)
#define      W627EHF_DATA_PORT          (W627EHF_BASE+1)
//=====================================================================
#define      W627EHF_REG_LD             0x07
//=====================================================================
#define W627EHF_UNLOCK            0x87
#define      W627EHF_LOCK              0xAA
//=====================================================================
unsigned int Init_W627EHF(void);
void Set_W627EHF_LD( unsigned char);
void Set_W627EHF_Reg( unsigned char, unsigned char);
unsigned char Get_W627EHF_Reg( unsigned char);
//=====================================================================
#endif       //__W627EHF_H
```

File of the Main.cpp

```
//=====================================================================
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// PURPOSE.
//=====================================================================
#include <dos.h>
#include <conio.h>
#include <stdio.h>
#include <stdlib.h>
#include "W627HF.H"
//=====================================================================
void ClrKbBuf(void);
int main (int argc, char *argv[]);
//=====================================================================
int main (int argc, char *argv[])
{
      unsigned char ucDO = 0;                    //data for digital output
      unsigned char ucDI;                        //data for digital input
      unsigned char ucBuf;

      Set_W627HF_LD( 0x07);                      //switch to logic device 7

      Set_W627HF_Reg(0xF1, 0x00);                //clear
      ucDI = Get_W627HF_Reg(0xF1) & 0x0F;

      ClrKbBuf();
      while(1)
      {
          ucDO++;
          Set_W627HF_Reg(0xF1, ((ucDO & 0x0F) << 4));
          ucBuf = Get_W627HF_Reg(0xF1) & 0x0F;
          if (ucBuf != ucDI)
          {
              ucDI = ucBuf;
              printf("Digital I/O Input Changed. Current Data is 0x%X\n",ucDI);
          }

          if (kbhit())
          {
              getch();
              break;
          }
          delay(500);
      }
      return 0;
}
//=====================================================================
void ClrKbBuf(void)
{
      while(kbhit())
      {      getch();      }
}
//---------------------------------------------------------------------
```