MB935

**Socket LGA775 Pentium® 4
Intel® Q35 Chipset
Sever Motherboard**

USER'S MANUAL

Version 1.0

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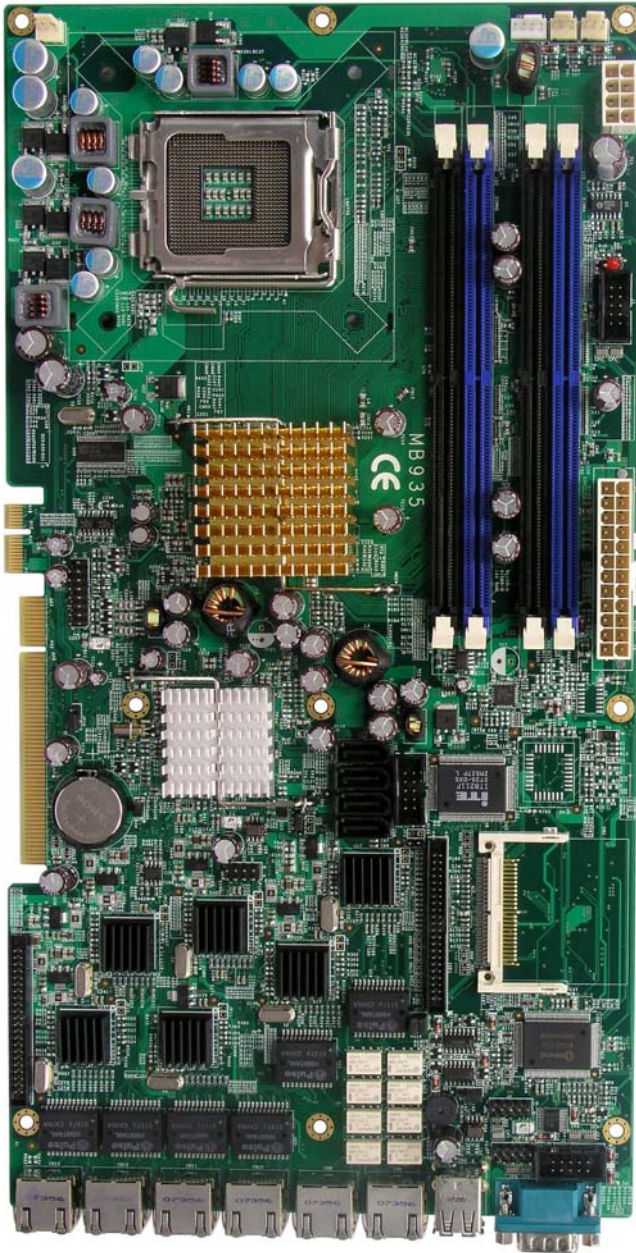Microsoft Windows is a registered trademark of Microsoft Corporation.

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The MB935 Motherboard

Introduction

Product Description

The MB935 LGA 775 Pentium® 4 motherboard incorporates the Intel Q35 chipset that can utilize a single LGA775 processor of up to 4.0GHz or higher and supports FSB frequency of 800/1066 Mhz/1333Mhz 200MHz (800MT/s), 266MHz (1066MT/s), and 333MHz (1333MT/s) HCLK respectively.

The Q35 chipset is designed for use with the Core.2 processor family, including a faster 1333 MHz system bus. The integrated GMCH component provides the CPU interface, DDR2 interface, Hub Interface.

Four DDR2 memory sockets support DDR2 667/800 SDRAM DIMM modules of up to 8GB in capacity.

The board is designed with six Intel 82574L PCI Express Gigabit LAN controllers. Four Serial-II ATA connectors offer 3Gb/s data throughput speed - faster than the most advanced parallel ATA.

Additional expansion is provided by two PCI slot if the board is used with the IP325 backplane bridge board. Other advanced features include four USB 2.0 ports, digital I/O, four serial ports, and watchdog timer function. Dimensions of the board are 13.98" by 7.28".

Remarks:
MB935 supports the Intel Core 2 Duo and Intel Core 2 Quad processors and Intel Celeron 400 (Conroe-L) Sequence processor.

Checklist

Your MB935 Pentium® 4 motherboard package should include the items listed below:

- The MB935 motherboard
- This User's manual
- 1 VGA cable
- 1 IDE cable
- 1 USB cable
- 1 PS/2 Keyboard/Mouse cable
- 1 SATA cable
- 1 Serial-Port cable
- 1 CD containing the following:
  - Chipset Drivers
 - Flash Memory Utility

Reminder:
About SATA: When using the legacy operating system, only one controller is available and these ports are SATA port 0,1(CN5, CN6). We suggest that the legacy operating system should be installed on these SATA ports.

Specifications

Product Name	MB935
CPU Support	Socket LGA775, Supports the Intel Core 2 Duo and Intel Core2 Quad processors, and Intel Celeron 400 (Conroe-L) Sequence processor.
CPU Voltage	0.5V~1.6V (VRD 11.0)
System Speed	Up to 3.8GHz+
CPU FSB	800MHz/1066MHz /1333MHz
Green /APM	APM1.2
CPU Socket	LGA 775
Chipset	Intel® Bearlake Chipset Q35+ICH9
BIOS	Award BIOS; supports ACPI
VGA	Q35 built-in, supports CRT
LAN	Intel 82574L PCI Express Gigabit LAN controller x 6 CN4 & CN9 LAN support hardware bypass
Memory type	Support Dual Channel DDR2 DIMM Module x 4, 667/800MHz (Without ECC function), Max. 8GB
LPC I/O	Winbond W83627EHG: COM1(RS-232), COM2(RS-232), Hardware monitoring Fintek F81216: COM3/4 (RS-232)
RTC/CMOS	Built in ICH9
Battery	Lithium battery
Keyboard/Mouse	PS/2 Keyboard/Mouse connector
PATA	ITE IT8211 PCI to PATA controller for two PATA channel support IDE connector x 1 + Compact Flash socket Type II x 1 IDE1(44pin/2.0mm)supports Ultra DMA 33/66/100
SATA2 connectors	Supports 4 x SATA2
RJ45 connectors	Six RJ45 connectors
USB connectors	ICH9 built in USB Version 2.0, support 4 ports (D-type connector x 2 port & pin header x 2 port)
COM connectors	4 ports (D-type x 1 port, pin header x3 ports)
Power Connector	ATX 24-pin
Backplane Bridge Board	With PCI BUS Gold finger (PICMG REV: 2.0 Spec.) connect to Backplane bridge board IP325 32bit/33MHz PCI-32 slots x 4
Front side Bridge Board	With 40 pin 2mm connector to connect ID370 Front side bridge board
LAN bypass Function	PCI Express Gigabit CN4, 9 RJ45 support Relay Switch by pass function.
Watchdog Timer	Supports 256 segments (0, 1, 2…255. Sec/min)
System Voltages	+5V, +12V, -12V, 5VSB, -5V, 3.3V
Dimensions	13.98" x 7.28"

Board Dimensions
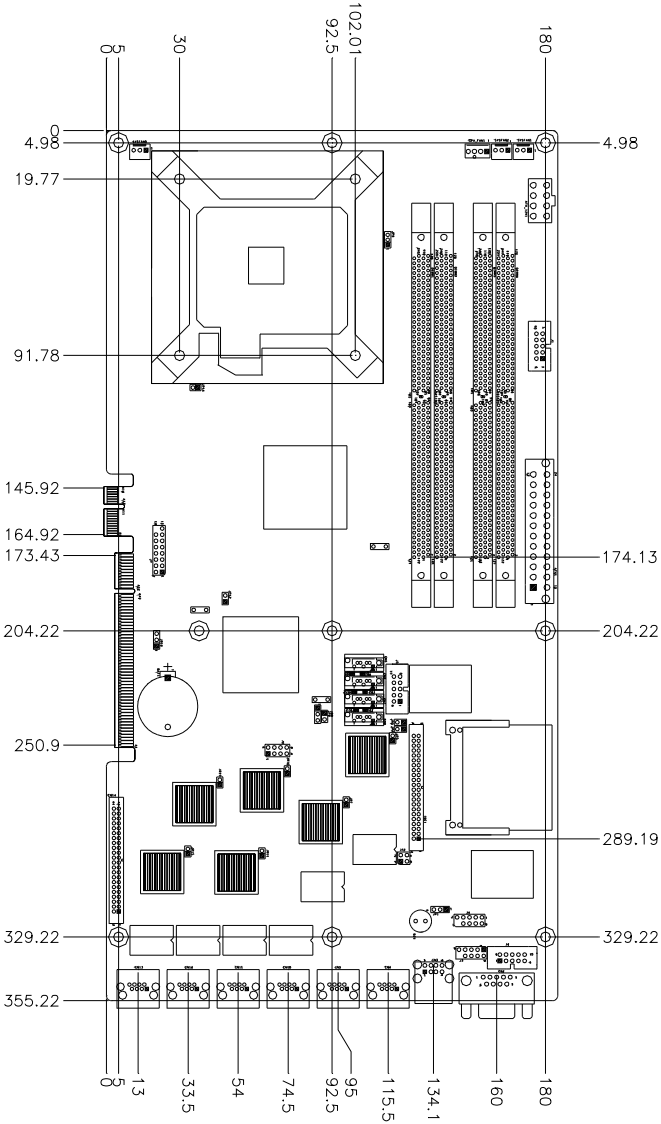
Installations

This section provides information on how to use the jumpers and connectors on the MB935 in order to set up a workable system. The topics covered are:

Installing the CPU

The MB935 motherboard supports an LGA 775 processor socket for Intel Core 2 Duo and Intel Core2 Quad processors, and Intel Celeron 400(Conroe-L) Sequence processor.

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.*
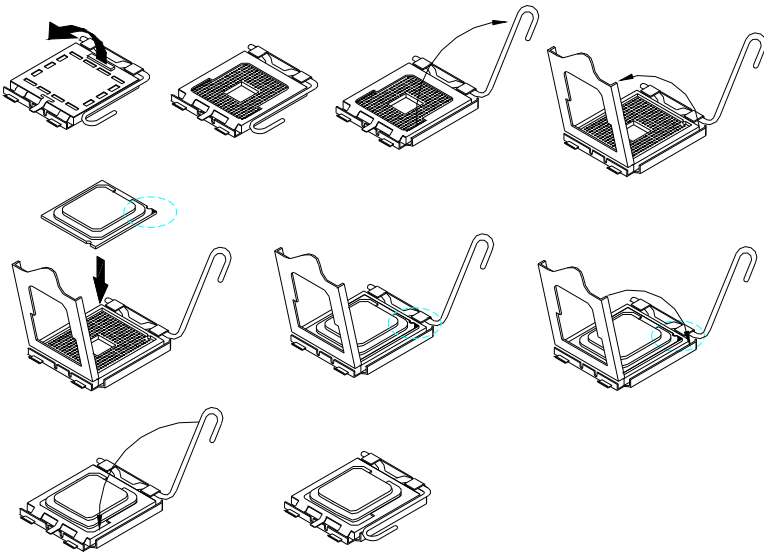
ATX Power Installation

The system power is provided to the motherboard with the ATX1 and ATX_12V power connectors. ATX1 is a 24-pin power connector and ATX_12V is a 8-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 MB935 motherboard supports four DDR2 memory sockets for a maximum total memory of 8GB in DDR memory type. It supports DDR2 667/800.

Basically, the system memory interface has the following features:

Supports two 64-bit wide DDR data channels

Available bandwidth up to 6.4GB/s (DDR2 800) for single-channel mode and 12.8GB/s (DDR2 800) in dual-channel mode.

Supports 256Mb, 512Mb, 1Gb DDR2 technologies.

Supports only x8, x16, DDR2 devices with four banks

Supports only unbuffered DIMMs

Supports opportunistic refresh

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

Dual Channel Memory Configuration

If you want to operate the Dual Channel Technology, please note the following explanations due to the limitation of Intel chipset specifications.

1. Dual Channel mode will not be enabled if only one DDR II memory module is installed.

2. To enable Dual Channel mode with two or four memory modules (it is recommended to use memory modules of identical brand, size, chips, and speed), you must install them into DIMM sockets of the same color. The following is a Dual Channel Memory configuration table:

(DS: Double Side, SS: Single Side)

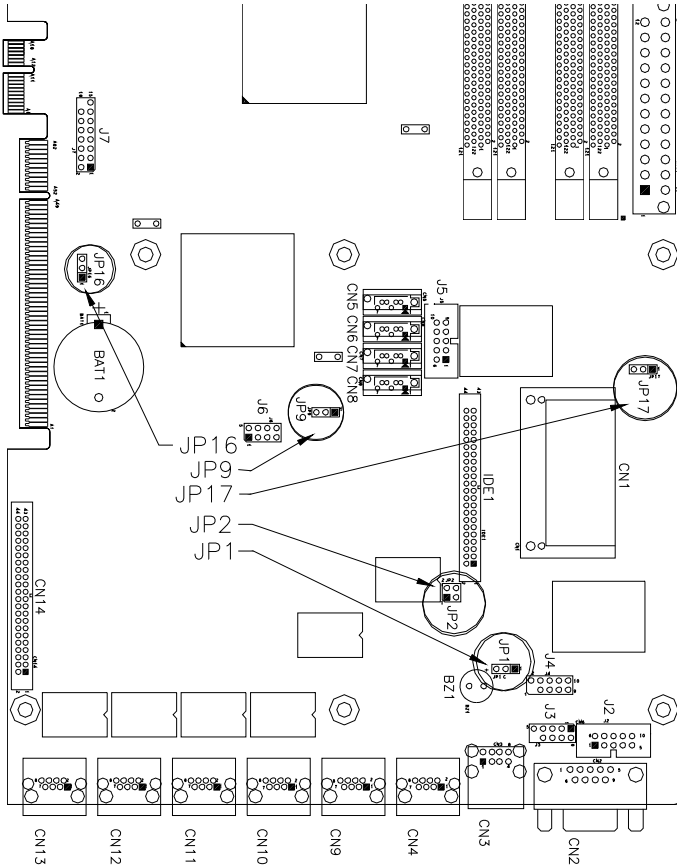|	DDRII1	DDRII2	DDRII3	DDRII4
2MemoryModules	DS/SS	X	DS/SS	X
	X	DS/SS	X	DS/SS
4MemoryModules	DS/SS	DS/SS	DS/SS	DS/SS

Setting the Jumpers

Jumpers are used on MB935 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 on MB935 and their respective functions.

Jumper Locations on MB935

JP1, JP2: Watchdog Timer & LAN1/LAN2 Bypass Settings

JP1, JP2 Setting	Function
JP2 Pin 1-2 & 3-4 Open JP1 Pin 1-2 Closed	System will bypass LANs upon the time out of watchdog timer.
JP2 Pin 1-2 & 3-4 Open JP1 Pin 2-3 Closed	System LANs bypass function controlled by SIO GPIO15.
JP2 Pin 1-2 & 3-4 Closed JP1 Pin 1-2 Closed (Default)	System will reboot upon the time out of watchdog timer.

JP9: Configure and Recovery (Factory use only)

JP9	Setting	Function
1 2 3	Pin 1-2 Short/Closed	Normal (default)
1 2 3	Pin 2-3 Short/Closed	Configure
1 2 3	Open	Recovery

JP16: Clear CMOS Contents

Use JP16 to clear the CMOS contents. *Note that the ATX-power connector should be disconnected from the board before clearing CMOS.*

JP1	Setting	Function
1 2 3	Pin 1-2 Short/Closed	Normal
1 2 3	Pin 2-3 Short/Closed	Clear CMOS

JP17: Power ON Setting

JP17	Setting	Function
□ □ □ 1 2 3	Pin 1-2 Short/Closed	Power on by power supply AC on
□ □ □ 1 2 3	Pin 2-3 Short/Closed	Power on by system button

Connectors on MB935

The connectors on MB935 allow you to connect external devices such as keyboard, mouse, hard disk drives, printers… etc. The following table lists the connectors on MB935 and their respective functions.

Connector Locations on MB935
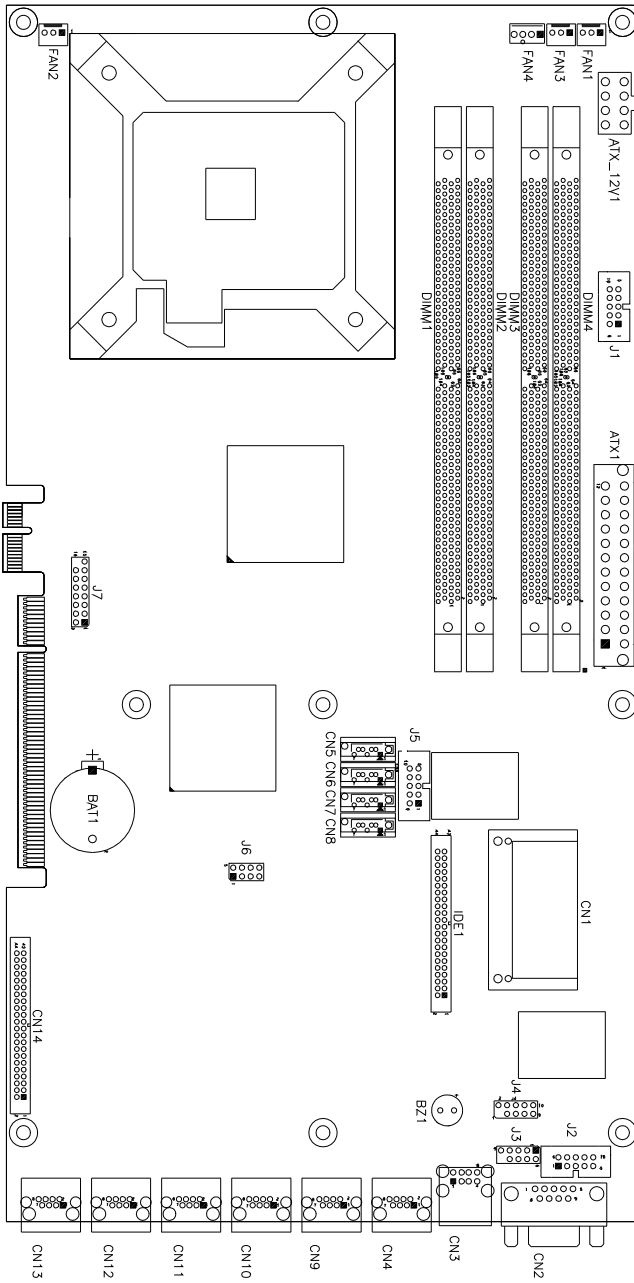
ATX1: 24-pin ATX Power Connector
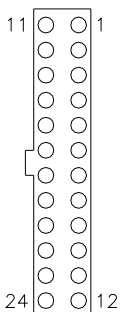
Signal Name	Pin #	Pin #	Signal Name
3.3V	13	1	3.3V
-12V	14	2	3.3V
Ground	15	3	Ground
PS-ON	16	4	+5V
Ground	17	5	Ground
Ground	18	6	+5V
Ground	19	7	Ground
-5V	20	8	Power good
+5V	21	9	5VSB
+5V	22	10	+12V
+5V	23	11	+12V
Ground	24	12	+3.3V

ATX_12V1: ATX 12V Power Connector
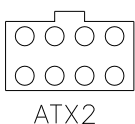
Signal Name	Pin #	Pin #	Signal Name
+12V	5	1	Ground
+12V	6	2	Ground
+12V	7	3	Ground
+12V	8	4	Ground

DIMM1, 2: Channel A DDR2 Socket
DIMM1, 2 are the first-channel DDR2 sockets.

DIMM3, 4 Channel B DDR2 Socket
DIMM3, 4 are the second-channel DDR2 sockets.

FAN1/2/3: CPU Fan Power Connector
FAN1/2/3 are 3-pin headers for CPU fan power. The fan must be a 12V (500mA) fan.
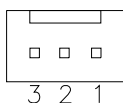
Pin #	Signal Name
1	Ground
2	+12V
3	Rotation detection

FAN4: System Fan Power Connector
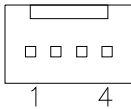
Pin #	Signal Name
1	Ground
2	+12V
3	Rotation detection
4	Control

CN1: Slim Type II Compact Flash Connector

CN2: COM1 Serial Port
CN2 (COM1) is a DB-9 connector.
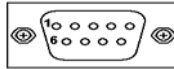
Signal Name	Pin #	Pin #	Signal Name
DCD, Data carrier detect	1	6	DSR, Data set ready
RXD, Receive data	2	7	RTS, Request to send
TXD, Transmit data	3	8	CTS, Clear to send
DTR, Data terminal ready	4	9	RI, Ring indicator
GND, ground	5	10	Not Used

CN3: USB Connector

CN4, CN9, CN10, CN11, CN12, CN13: LAN Connectors
CN4: LAN1
CN9: LAN2
CN10: LAN3
CN11: LAN4
CN12: LAN5
CN13: LAN6

CN5, CN6, CN7, CN8: SATA HDD Connector
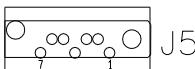
Pin #	Signal Name
1	Ground
2	TX+
3	TX-
4	Ground
5	RX-
6	RX+
7	Ground

CN14: Front Side Bridge Board to ID370
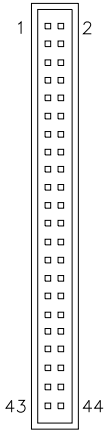
Signal Name	Pin #	Pin #	Signal Name
PWR-SW	1	2	GND
Reset-SW	3	4	GND
Speaker	5	6	VCC
VCC	7	8	VCC
GND(PWR LED)	9	10	Pull up to VCC
HDD LED	11	12	Pull up to VCC
RELAY LED	13	14	Pull up to VCC
GND	15	16	GND
GND	17	18	GND
GPO0	19	20	GPI0
GPO1	21	22	GPI1
GPO2	23	24	GPI2
GPO3	25	26	GPI3
GPO4	27	28	GPI4
GPO5	29	30	GPI5
GPO6	31	32	GPI6
GPO7	33	34	GPI7
VCC	35	36	VCC
GPIO26	37	38	GPIO32
GPIO27	39	40	GPIO56
GPIO28	41	42	GPIO57
VCC3	43	44	VCC3

1   2

43   44

IDE1: Primary and Secondary IDE Connectors
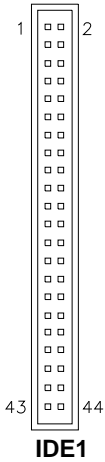
Signal Name	Pin #	Pin #	Signal Name
Reset IDE	1	2	Ground
Host data 7	3	4	Host data 8
Host data 6	5	6	Host data 9
Host data 5	7	8	Host data 10
Host data 4	9	10	Host data 11
Host data 3	11	12	Host data 12
Host data 2	13	14	Host data 13
Host data 1	15	16	Host data 14
Host data 0	17	18	Host data 15
Ground	19	20	Key
DRQ0	21	22	Ground
Host IOW	23	24	Ground
Host IOR	25	26	Ground
IOCHRDY	27	28	Host ALE
DACK0	29	30	Ground
IRQ14	31	32	No connect
Address 1	33	34	No connect
Address 0	35	36	Address 2
Chip select 0	37	38	Chip select 1
Activity	39	40	Ground
VCC	41	42	VCC
Ground	43	44	N.C.

IDE1

J1, J2, J5: COM3, COM2, COM4 Serial Ports
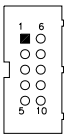
Pin #	Signal Name (RS-232)
1	DCD, Data carrier detect
2	RXD, Receive data
3	TXD, Transmit data
4	DTR, Data terminal ready
5	Ground
6	DSR, Data set ready
7	RTS, Request to send
8	CTS, Clear to send
9	RI, Ring indicator
10	No Connect.

J3: Keyboard / Mouse Connector

J3 is a 10-pin header connector, has functions for both keyboard and mouse. The following table shows the pin assignments of this connector.
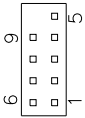
Signal Name	Pin #	Pin #	Signal Name
Protect pin	10	5	N.C.
KB clock	9	4	Mouse clock
KB data	8	3	Mouse data
VCC	7	2	VCC
Ground	6	1	Ground

J4: SPI Debug Tools Port (Factory use only)

J6: USB Connector
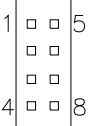
Signal Name	Pin #	Pin #	Signal Name
VCC	1	5	Ground
USB2-	2	6	USB3+
USB2+	3	7	USB3-
Ground	4	8	VCC

J7: VGA CRT Connector
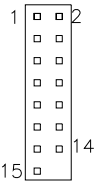
Signal Name	Pin	Pin	Signal Name
R	1	2	+5V
G	3	4	GND
B	5	6	NC
NC	7	8	SPD1
GND	9	10	Hsync
GND	11	12	Vsync
GND	13	14	SPCLK
GND	15		

J8: PICMG 2.0 Gold Finger (to IP325)

PCIE_1: PCIE x1 Gold Finger (to IP325)

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	
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

ICH9 supports 4 Serial ATA connectors; ITE controller support 1 CF and 1 IDE 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

		ITEM HELP
CPU Feature	Press Enter	Menu Level >
Hark Disk Boot Priority	Press Enter	
CD-ROM Boot Priority	Press Enter	
CPU L3 Cache	Enabled	
Quick Power On Self Test	Enabled	
First Boot Device	Removable	
Second Boot Device	Hard Disk	
Third Boot Device	Legacy LAN	
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	
Report No FDD For WIN 95	No	
Delay For HDD(Secs)	0	
Small Logo (EPA) Show	Disabled	

CPU Feature

Press Enter to configure the settings relevant to CPU Feature.

Hard Disk Boot Priority

Press Enter to configure the settings.

CD-ROM Boot Priority

Press Enter to configure the settings.

CPU L3 Cache

Cache memory is additional memory that is much faster than conventional DRAM (system memory). CPUs from 486-type on up contain internal cache memory, and most, but not all, modern PCs have additional (external) cache memory. When the CPU requests data, the system transfers the requested data from the main DRAM into cache memory, for even faster access by the CPU. By default, these items are enabled.

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.

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 your operating system. 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*.

Report No FDD For WIN 95

If you are using Windows 95/98 without a floppy disk drive, select Enabled to release IRQ6. This is required to pass Windows 95/98's SCT test. You should also disable the Onboard FDC Controller in the Integrated Peripherals screen when there's no floppy drive in the system. If you set this feature to Disabled, the BIOS will not report the missing floppy drive to Win95/98.

Delay For HDD (Secs)

The default setting of the HDD delay is *0*.

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*.

Advanced Chipset Features

This Setup menu controls the configuration of the chipset.

Phoenix - AwardBIOS CMOS Setup Utility
Advanced Chipset Features

DRAM Timing Selectable	By SPD	ITEM HELP
CAS Latency Time	Auto	Menu Level >
DRAM RAS# to CAS# Delay	Auto	
DRAM RAS# Precharge	Auto	
Precharge dealy (tRAS)	Auto	
System Memory Frequency	By SPD	
System BIOS Cacheable	Enabled	
Memory Hole at 15M-16M	Disabled	
PCI Express Root Port Func	Press Enter	
** VGA Setting **		
PEG/On Chip VGA Control	Auto	
On-Chip Frame Buffer Size	8MB	
DVMT Mode	DVMT	
DVMT/FIXED memory Size	128MB	

DRAM Timing Selectable

This option refers to the method by which the DRAM timing is selected. The default is *By SPD*.

CAS Latency Time

You can select CAS latency time in HCLKs of 3/3 or 4/4. The system board designer should set the values in this field, depending on the DRAM installed. Do not change the values in this field unless you change specifications of the installed DRAM or the installed CPU. The choices are 3, 4 and 5.

DRAM RAS# to CAS# Delay

This option allows you to insert a delay between the RAS (Row Address Strobe) and CAS (Column Address Strobe) signals. This delay occurs when the SDRAM is written to, read from or refreshed. Reducing the delay improves the performance of the SDRAM.

DRAM RAS# Precharge

This option sets the number of cycles required for the RAS to accumulate its charge before the SDRAM refreshes.

Precharge delay (tRAS)

The default setting for the Active to Precharge Delay is *Auto*.

System Memory Frequency
This field sets the frequency of the DRAM memory installed. The default setting is *Auto*. The other settings are *DDR667* and *DDR800*.

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.

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: 8MB
    DVMT Mode: DVMT
    DVMT/Fixed Memory Size: 128MB

Integrated Peripherals

This section sets configurations for your hard disk and other integrated peripherals.. Details follow.

Phoenix - AwardBIOS CMOS Setup Utility
Integrated Peripherals

OnChip IDE Device	Press Enter	ITEM HELP
SuperIO Device	Press Enter	Menu Level >
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	
LEGACY Mode Support	Enabled	
Robson Support	Disabled	

Phoenix - AwardBIOS CMOS Setup Utility
SuperIO Device

POWER ON Function	BUTTON ONLY	ITEM HELP
KB Power ON Password	Enter	
Hot Key power ON	Ctrl-F1	
Onboard Serial Port 1	3F8/IRQ4	Menu Level >
Onboard Serial Port 2	2F8/IRQ3	

Phoenix - AwardBIOS CMOS Setup Utility
2nd IO Device

Onboard Serial Port 3	230	ITEM HELP
Serial Port 3 Use IRQ	IRQ5	Menu Level >
Onboard Serial Port 4	238	
Serial Port 4 Use IRQ	IRQ7	

Phoenix - AwardBIOS CMOS Setup Utility
2nd IO Device

USB 1.0 Controller	Enabled	ITEM HELP
USB 2.0 Controller	Enabled	Menu Level >
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.

OnChip Primary/Secondary PCI IDE

The integrated peripheral controller contains an IDE interface with support for two IDE channels. Select *Enabled* to activate each channel separately.

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*.

Robson Support

Robson is the code name for a new Intel® platform technology that uses non-volatile memory (Flash memory) to increase system responsiveness and make multi-tasking faster.

Power ON Function

This field is related to how the system is powered on – such as with the use of conventional power button, keyboard or hot keys. The default is *BUTTON ONLY*.

KB Power ON Password

This field allows users to set the password when keyboard power on is the mode of the Power ON function.

Hot Key Power ON

This field sets certain keys, also known as hot keys, on the keyboard that can be used as a 'switch' to power on the system.

Onboard Serial Port

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

Serial Port 1	3F8/IRQ4
Serial Port 2	2F8/IRQ3
Serial Port 3	230/IRQ5
Serial Port 4	238/IRQ7

USB Controller

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 SP1.*

USB Keyboard Function

By default, this field is set to *Enabled*.

USB Mouse Function

By default, this field is set to *Enabled*.

USB Storage Function

By default, this field is set to *Enabled*.

Power Management Setup

The Power Management Setup allows you to save energy of your system effectively.

Phoenix - AwardBIOS CMOS Setup Utility
Power Management Setup

PCI Express PM Function	Press Enter	ITEM HELP
ACPI Function	Enabled	
ACPI Suspend Type	S1(POS)	Menu Level >
Run VGABIOS if 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%	
Wake-Up by PCI Card	Disabled	
Power On by Ring	Disabled	
USB KB Wake-Up From S3	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 Type

The default setting for this field is S1(POS), Power On Suspend.

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	Default setting, blank the screen and turn off vertical and horizontal scanning.
DPMS	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. The default setting is *Yes*.

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.

Notes:
HPET (High Precision Event Timer) is meant to supplement and replace the 8254 Programmable Interval Timer (PIT) and the Real-time clock's (RTC) periodic interrupt function. Compared to these older timer circuits, the HPET has higher frequency (at least 10 MHz) and wider 64-bit counters (although they can be driven in 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 using a Plug and Play
IRQ Resources	Press Enter	capable operating
DMA Resources	Press Enter	system Select No if
		you need the BIOS to
PCI/VGA Palette Snoop	Disabled	configure non-boot devices
PCI Express relative items		
Maximum Payload Size	128	

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

Reset Configuration Data
This field allows you to determine whether to reset the configuration data or not. The default value is *Disabled.*

Resources Controlled by
This PnP BIOS can configure all of the boot and compatible devices automatically with the use of a use 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.

PC Health Status

This section shows the parameters in determining the PC Health Status. These parameters include temperatures, fan speeds and voltages.

Phoenix - AwardBIOS CMOS Setup Utility
PC Health Status

		ITEM HELP
Shutdown Temperature	Disabled	Menu Level >
CPU Warning Temperature	Disabled	
System Temp.	45°C/113°F	
CPU Temp.	52°C/125°F	
FAN1 Speed	5463 RPM	
FAN2 Speed	5463 RPM	
FAN3 Speed	5388 RPM	
Vcore(V)	1.02 V	
+12V	12.03 V	
Vmem	1.89 V	
-5V	-5.33 V	
+5V	4.94 V	
-12V	-12.0 V	
3.3V	3.32V	
VBAT	3.21 V	
5VSB(V)	4.96 V	
1st Smart Fan Temperature	Disabled	

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.

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.

Temperatures/Voltages

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

Smart Fan Temperature

This field enables or disables the smart fan feature. At a certain temperature, the fan starts turning. Once the temperature drops to a certain level, it stops turning again.

Frequency/Voltage Control

This section shows the user how to configure the processor frequency.

Phoenix - AwardBIOS CMOS Setup Utility
Frequency/Voltage Control

CPU Clock Ratio Unlock	Disabled	ITEM HELP
CPU Clock Ratio	9X	Menu Level >
Auto Detect PCI Clk	Disabled	
Spread Spectrum Modulated	Disabled	

Auto Detect PCI Clk

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

Spread Spectrum Modulated

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

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 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.

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Drivers Installation

This section describes the installation procedures for software and drivers under the Windows 98SE, Windows ME, Windows 2000 and Windows XP. The software and drivers are included with the motherboard. 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 98SE/ME/2000/XP), you must install first the Intel Chipset Software Installation Utility before proceeding with the drivers installation.

When IDE Device (HDD, CDROM, etc.) is to be used, one must use a USB-FDD device (with the IDE device driver floppy diskette inserted) to install the drivers when Windows is initializing. When Windows is starting, press F6 and follow the proceeding instructions. The IDE device drivers can be found in the driver DVD disc that is provided with the motherboard with location in D:\SCSI\ITE8211\DISK\ (assuming D: is the DVD ROM drive).

Intel Chipset Device Software Installation

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 98SE/ME/2000/XP.

1. Insert the CD that comes with the board. Click **Intel** and then **Intel(R) Q35 Chipset Drivers**.

2. Click **Intel(R) Chipset Software Installation Utility.**
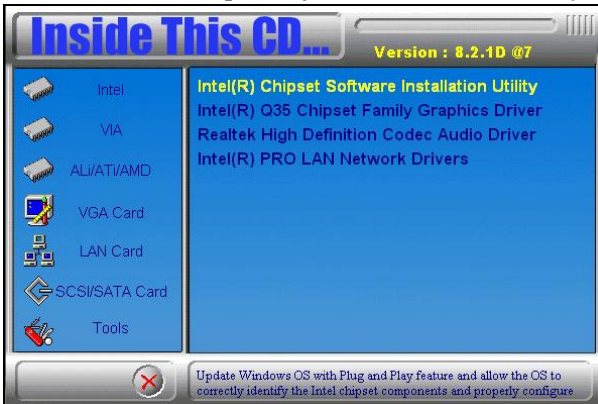
3. When the Welcome screen appears, click *Next* to continue. Click *Yes* to accept the software license agreement and proceed with the installation process.

5. On Readme Information screen, click *Next* to continue installation.
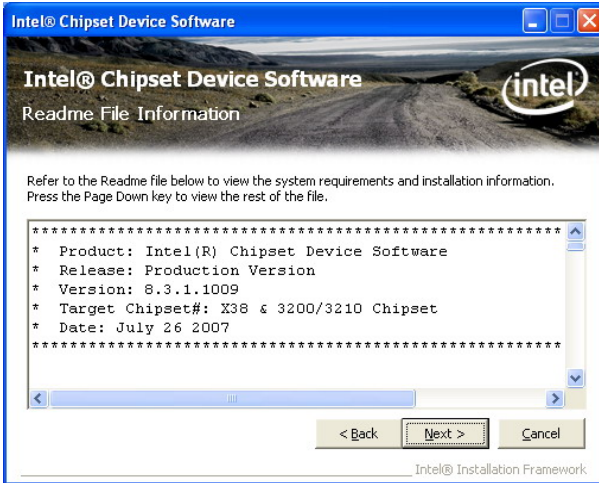
6. When Setup is complete, click *Finish* to complete the setup process.

VGA Drivers Installation

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

1. Insert the CD that comes with the motherboard. Click *Intel* and then *Intel(R) Q35 Chipset Drivers*.

2. Click *Intel(R) Q35 Chipset Family Graphics Driver.*
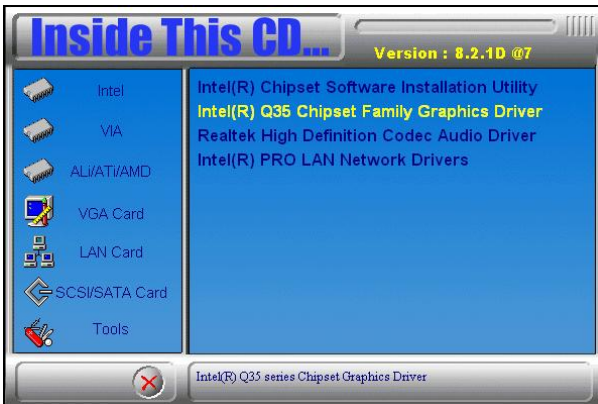
3. When the Welcome screen appears, click **Next** to continue. Click **Yes** to agree with the license agreement and continue installation.
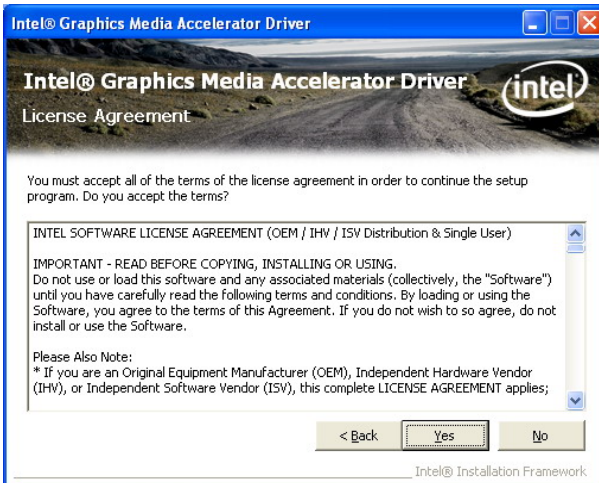
4. Click *Next* to continue the setup process. Restart the computer as prompted and for changes to take effect.
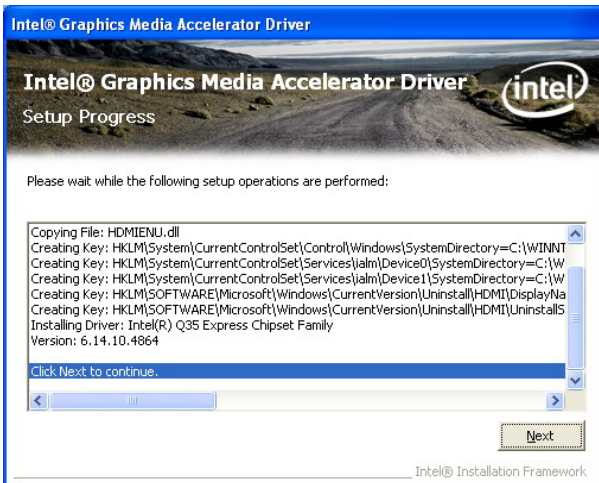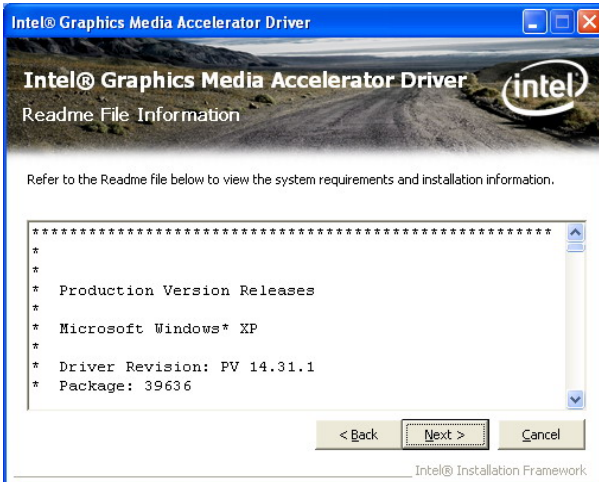
IDE Controller Drivers Installation

Follow the steps below to install IDE Controller Drivers.

1. Insert the CD that comes with the motherboard. Click *SCI/SATA Card* and then *ITE8211 IDE Drivers* . When the Welcome screen appears, click *Next* to continue.
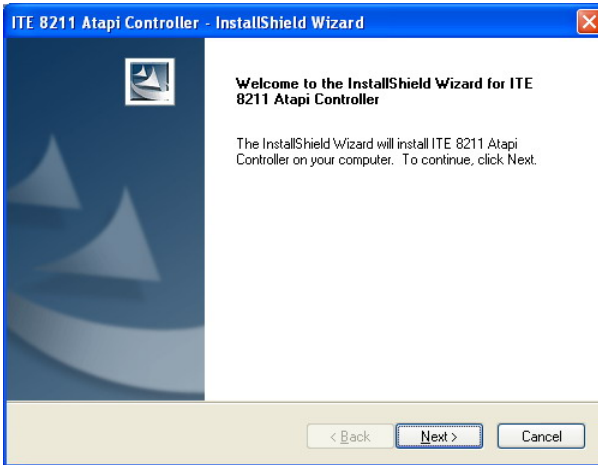
4. Select Type as 'Typical' and click *Next* to continue. Restart when promoted and finish the installation process.
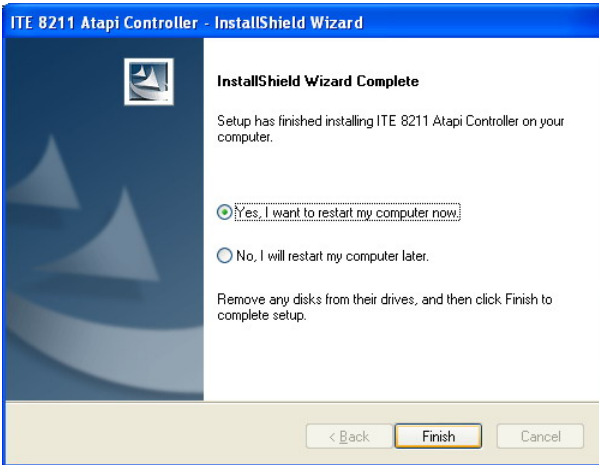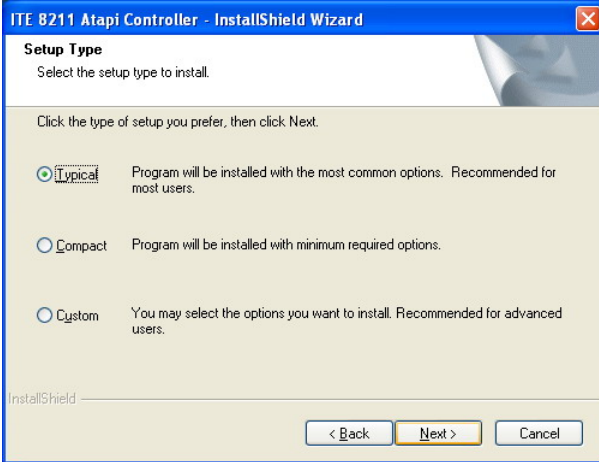
Intel PRO LAN Drivers Installation

Follow the steps below to complete the installation of the Intel PRO LAN drivers.

1. Insert the CD that comes with the motherboard. Click **LAN Card** and then **Intel(R) PRO 82574L LAN Drivers**.
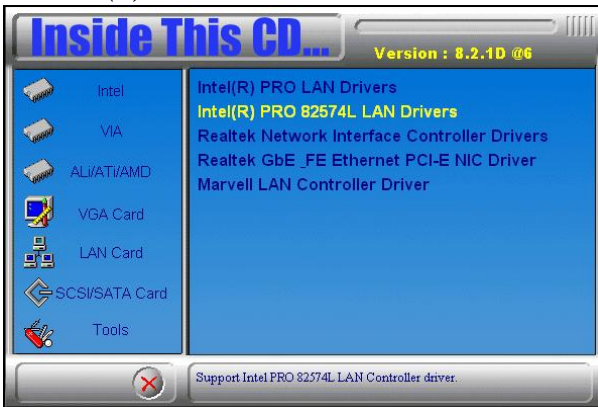
2. Click **Install Drivers and Software**. When the Welcome screen appears, click **Next** to continue.
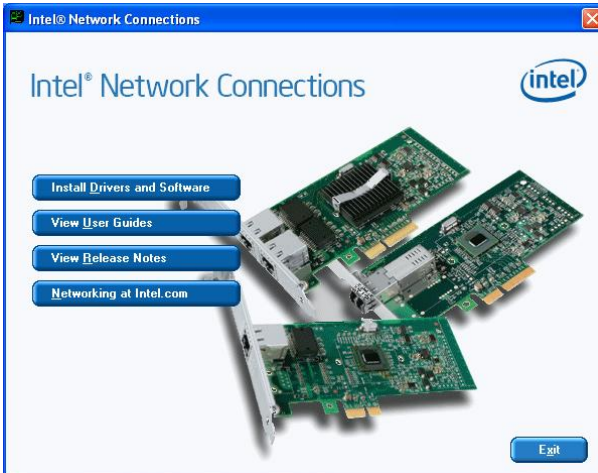
3. Click **Next** to to agree with the license agreement.

4. Click the **Drivers** checkbox as shown below and click **Next** to continue installation. Then, click **Install** to begin the installation.
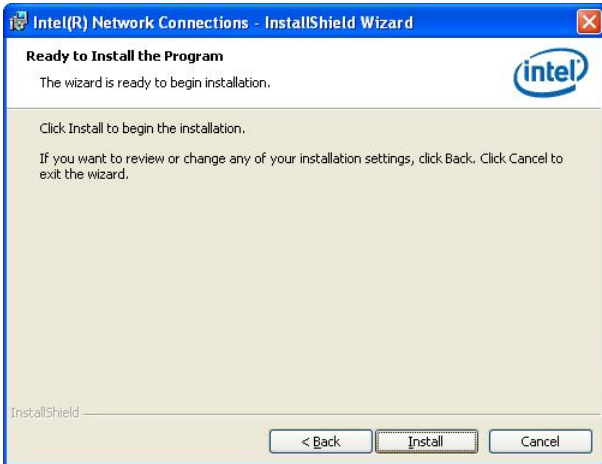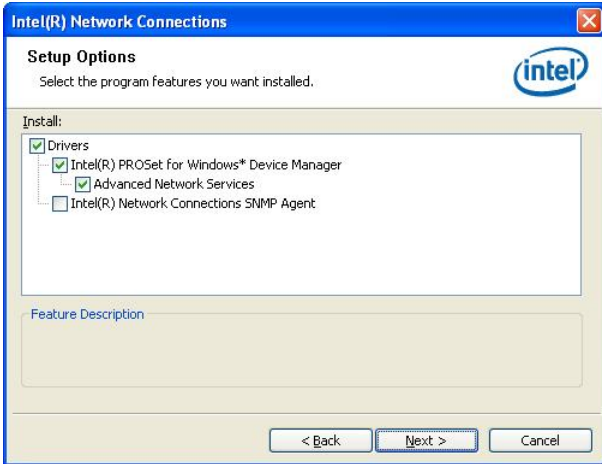
5. When InstallShield Wizard has completed installation, click **Finish**.

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Appendix

A. I/O Port Address Map

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

Address	Device Description
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
278 - 27F	Parallel Port #2(LPT2)
2F8h - 2FFh	Serial Port #2(COM2)
2B0 - 2DF	Graphics adapter Controller
378h - 3FFh	Parallel Port #1(LPT1)
360 - 36F	Network Ports
3B0 - 3BF	Monochrome & Printer adapter
3C0 - 3CF	EGA adapter
3D0 - 3DF	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 sort 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.

```
;[]=============================================
; Name  : Enable_And_Set_Watchdog
; IN     : AL - 1sec ~ 255sec
; OUT   : None
;[]=============================================
Enable_And_Set_Watchdog    Proc      Near
        push    ax              ;save time interval
        call  Unlock_Chip

        mov cl, 2Bh
        call Read_Reg
        and al, NOT 10h
        call  Write_Reg          ;set GP24 as WDTO

        mov cl, 07h
        mov al, 08h
        call  Write_Reg          ;switch to LD8
```

```
        mov cl, 0F5h
        call Read_Reg
        and al, NOT 08h
        call Write_Reg          ;set count mode as second

        pop ax
        mov cl, 0F6h
        call Write_Reg          ;set watchdog timer

        mov al, 01h
        mov cl, 30h
        call Write_Reg          ;watchdog enabled

        call Lock_Chip
        ret
Enable_And_Set_Watchdog    Endp
;[]===========================================
; Name  : Disable_Watchdog
; IN    : None
; OUT   : None
;[]===========================================
Disable_Watchdog    Proc    Near
        call Unlock_Chip

        mov cl, 07h
        mov al, 08h
        call Write_Reg          ;switch to LD8

        xor al, al
        mov cl, 0F6h
        call Write_Reg          ;clear watchdog timer

        xor al, al
        mov cl, 30h
        call Write_Reg          ;watchdog disabled

        call Lock_Chip
        ret
Disable_Watchdog    Endp
;[]===========================================
```

```
; Name  : Unlock_Chip
; IN : None
; OUT   : None
;[]=============================================
Unlock_Chip    Proc     Near
        Mov dx, 4Eh
        mov al, 87h
        out  dx, al
        out  dx, al
        ret
Unlock_Chip    Endp
;[]=============================================
; Name  : Lock_Chip
; IN : None
; OUT   : None
;[]=============================================
Unlock_Chip    Proc     Near
        mov dx, 4Eh
        mov al, 0AAh
        out  dx, al
        ret
Unlock_Chip    Endp
;[]=============================================
; Name  : Write_Reg
; IN : CL - register index
;      AL - Value to write
; OUT   : None
;[]=============================================
Write_Reg Proc     Near
        push     ax
        mov dx, 4Eh
        mov al,cl
        out  dx,al
        pop ax
        inc  dx
        out  dx,al
        ret
Write_Reg  Endp
;[]=============================================
```

```
; Name   : Read_Reg
; IN : CL - register index
; OUT    : AL - Value to read
;[]==============================================
==
Read_Reg    Proc    Near
        Mov al, cl
        mov dx, 4Eh
        out  dx, al
        inc  dx
        in    al, dx
        ret
Read_Reg    Endp
;[]==============================================
```

D. Digital I/O Sample Code

Filename: W627hf.h

```
//=====================================================================
//
// 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.
//
//=====================================================================
#ifndef __W627HF_H
#define __W627HF_H                   1
//=====================================================================
#define W627_IOBASE                  0x4E
//=====================================================================
#define     W627HF_INDEX_PORT        (W627_IOBASE+0)
#define     W627HF_DATA_PORT         (W627_IOBASE+1)
//=====================================================================
#define     W627HF_REG_LD            0x07
//=====================================================================
#define W627HF_UNLOCK                0x87
#define     W627HF_LOCK              0xAA
//=====================================================================
void Set_W627HF_LD( unsigned char);
void Set_W627HF_Reg( unsigned char, unsigned char);
unsigned char Get_W627HF_Reg( unsigned char);
//=====================================================================
#endif      //__W627HF_H
```

Filename: W627hf.cpp

```
//=======================================================================
//
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// PURPOSE.
//
//=======================================================================
#include "W627HF.H"
#include <dos.h>
//=======================================================================
void Unlock_W627HF (void);
void Lock_W627HF (void);
//=======================================================================
void Unlock_W627HF (void)
{
     outportb(W627HF_INDEX_PORT, W627HF_UNLOCK);
     outportb(W627HF_INDEX_PORT, W627HF_UNLOCK);
}
//=======================================================================
void Lock_W627HF (void)
{
     outportb(W627HF_INDEX_PORT, W627HF_LOCK);
}
//=======================================================================
void Set_W627HF_LD( unsigned char LD)
{
     Unlock_W627HF();
     outportb(W627HF_INDEX_PORT, W627HF_REG_LD);
     outportb(W627HF_DATA_PORT, LD);
     Lock_W627HF();
}
//=======================================================================
void Set_W627HF_Reg( unsigned char REG, unsigned char DATA)
{
     Unlock_W627HF();
     outportb(W627HF_INDEX_PORT, REG);
     outportb(W627HF_DATA_PORT, DATA);
     Lock_W627HF();
}
//=======================================================================
unsigned char Get_W627HF_Reg( unsigned char REG)
{
     unsigned char Result;
     Unlock_W627HF();
     outportb(W627HF_INDEX_PORT, REG);
     Result = inportb(W627HF_DATA_PORT);
     Lock_W627HF();
     return Result;
}
//=======================================================================
```

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();      }
}
//-------------------------------------------------------------------------
```

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