FEB-4720

Embedded System Board

User's Manual

Version: R1.11

Table of Contents

How to Use This Manual

The manual describes how to configure your FEB-4720 series system to meet various operating requirements. It is divided into five chapters, with each chapter addressing a basic concept and operation of Single Board Computer.

Chapter 1 : System Overview. Presents what you have in the box and give you an overview of the product specifications and basic system architecture for this series model of single board computer.

Chapter 2 : Hardware Configuration. Shows the definitions and locations of Jumpers and Connectors that you can easily configure your system.

Chapter 3 : System Installation. Describes how to properly mount the CPU, main memory and Compact Flash to get a safe installation and provides a programming guide of Watch Dog Timer function.

Chapter 4 : BIOS Setup Information. Specifies the meaning of each setup parameters, how to get advanced BIOS performance and update new BIOS. In addition, POST checkpoint list will give users some guidelines of trouble-shooting.

Chapter 5 : Troubleshooting. Provides various useful tips to quickly get FEB-4720 series running with success. As basic hardware installation has been addressed in Chapter 3, this chapter will basically focus on system integration issues, in terms of backplane/riser card setup, BIOS setting, and OS diagnostics.

The content of this manual and EC declaration document is subject to change without prior notice. These changes will be incorporated in new editions of the document.

Chapter 1
System Overview

1.1 Introduction

FEB-4720 is newly designed supporting Intel® 852GME with high performance and high integration computing platform. It is positioned at innovation, high integration and high quality Embedded System Board in the embedded computing market.

The board is based on Intel 852GME chipset and latest high performance processor, Intel® Pentium® 4/Celeron® Processor, Process system bus that built on Intel® 0.13 micron processor technology, especially the cost effective Intel Celeron processor up to 2.8Ghz with 256KB L2 cache. With Intel 852GME chipset that support high speed ECC DDR SDRAM, high-performance 2nd generation AGP 4X graphic controller with dual display/Panel and fast Ethernet connection. The on-board Super I/O Chipset integrates six serial ports, one keyboard controller, hardware monitoring, one IrDA port and one parallel port. Besides, four USB (Universal Serial Bus) ports provide high-speed data communication between peripherals and PC. FEB-4720 series can provide most versatile Embedded System Board (ESB) functionality in the market.

All in all, FEB-4720 series are designed to meet all kinds of embedded computing application. With Intel most advance mainstream chipset for mobile computing 852GME, FEB-4720 is aiming the most wide range of multimedia and networking applications in the market.

Its compact design with industry 5.25" ESB standard form factor makes it the most favorable solution for high-density server. High reliability, compact size and easy-to-use features fulfill the demand for critical embedded application including ATM, Kiosk, POS, gaming and medical equipment.

Key Features:

- **Compact 5.25" ESB form factor to fit in most wide range of system architecture**
- **Intel new generation chipset Intel® 852GME powered by Pentium®4; Cost effective option with Celeron®**
- **Dual independent on-board display support CRT, LVDS**
- **On-board standard I/O, dual display, panel option, network and audio to meet the requirements of communication and multimedia platforms**
- **On-board 10/100BASE-TX Ethernet**
- **Up to 1GB high performance 184-pin DIMM DDR SDRAM allows to run versatile embedded programs**

1.2 Check List

The FEB-4720 package should cover the following basic items:

- ✓ One FEB-4720 5.25" ESB (Embedded System Board)
- ✓ One Installation Resources CD-Title
- ✓ One booklet of FEB-4720 series manual

If any of these items is damaged or missing, please contact your vendor and keep all packing materials for future replacement and maintenance.

1.3 Product Specification

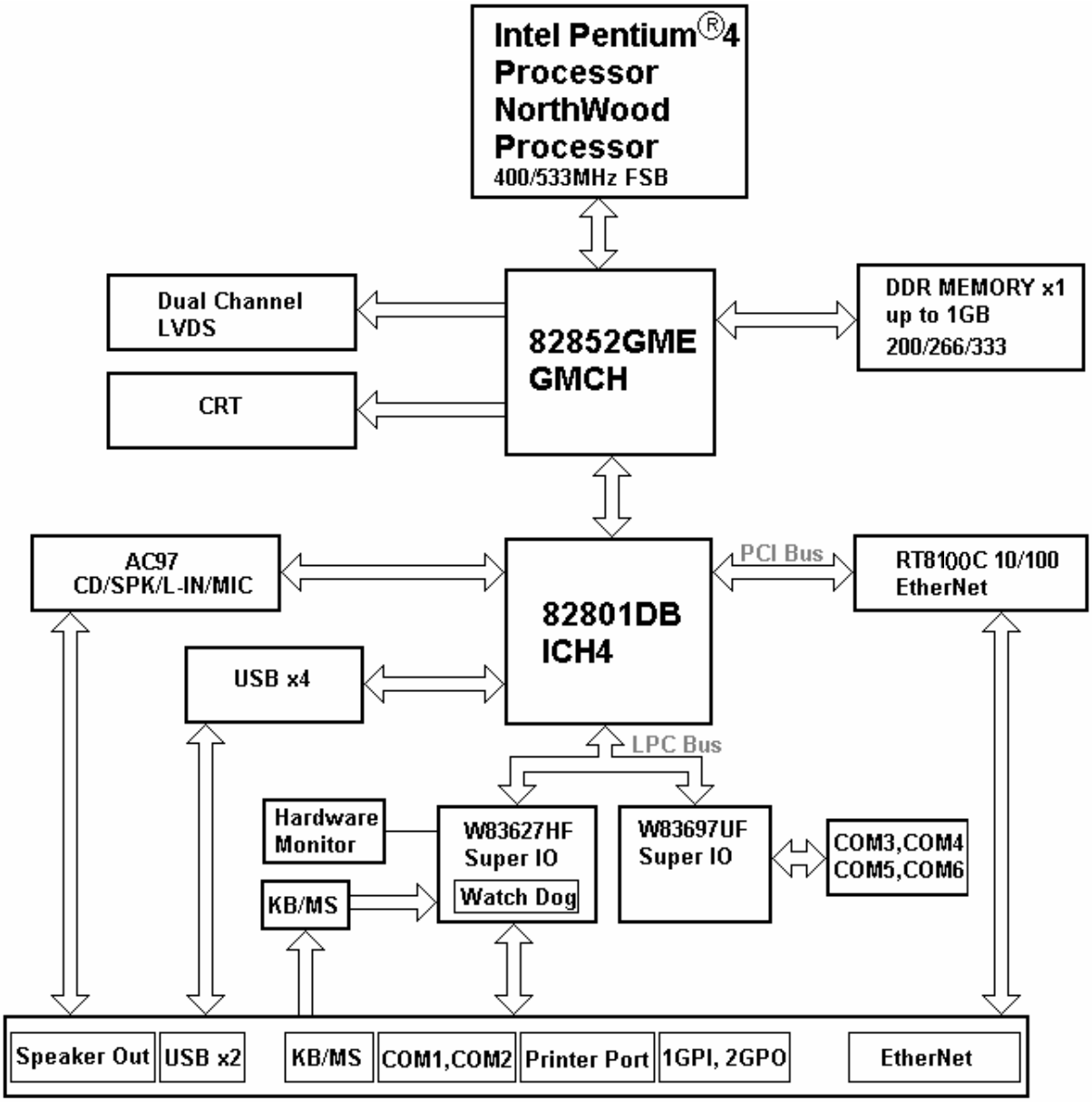
- **Chipset**
  - Intel 852GME
  - Intel GMCH and Intel ICH4
- **CPU**
  - Intel Pentium®4/Celeron® (Northwood & Prescott)
  - Support socket 478 Pentium® 4
  - PSB speed 400/533MHz
  - 128KB/256KB L2 cache (Celeron)
  - 512KB/1MB L2 cache (Pentium 4)
- **System Memory**
  - One 184-pin DIMM socket
  - Supports 200/266/333MHz DDR SDRAM up to 1GB
  - Available bandwidth up to 2.1GB/s (DDR333)
  - 64/128/256/512 Mb SDRAM technologies
  - 2.5V DDR SDRAM support
  - Support ECC functionality
- **PCI IDE Interface**
  Support enhanced IDE HDD devices with PIO mode 4 and Ultra DMA/33/66/100 mode transfer and Bus Master feature.
  One 2.54mm pitch 20pin x2 IDE connector for primary IDE channel
  One 2.0mm pitch 22pin x2 IDE connector share the secondary IDE channel with Compact Flash socket.
- **Serial Ports**
  Support six high-speed 16C550 compatible UARTs with 16-byte T/R FIFOs
- **IR Interface**
  Support one serial Standard Infrared wireless communication
- **Parallel Port**
  Support one parallel port with SPP, EPP and ECP modes

- **USB Interface**
  Support four USB (Universal Serial Bus) ports for high-speed I/O peripheral devices
- **PS/2 Mouse and Keyboard Interface**
  Support one PS/2 mouse/keyboard connection through IO Cable separation and ATX Power Control Interface
- **Real Time Clock/Calendar (RTC)**
  Support Y2K Real Time Clock/Calendar with battery backup for 7-year data retention
- **Watchdog Timer**
  - Support WDT function through software programming for enable/disable and interval setting.
  - Generate system reset or non-maskable interrupt (NMI)
- **On-board VGA**
  - Support Dual channel LVDS interface
- **On-board Ethernet LAN**
  RealTek 8100C Ether Net controller to support RJ-45 connector.
- **High Driving GPIO**
  Support 8 high driving capability for GPIO (5 GPI and 6 GPO)
- **Cooling Fans**
  Support two 2-pin headers for CPU, System and Power fans
- **System Monitoring Feature**
  Monitor CPU temperature, system temperature and major power sources, etc.
- **Operating Temperature:** -5°C ~ 60°C (23°F ~ 140°F)
- **Storage Temperature:** -20°C ~ 80°C
- **Relative Humidity:** 0% ~ 95%, non-condensing
- **Power Requirements:**
  - +12V (CPU) @ 3.44A
  - +12V (System) @ 1.76A
  - +5V @ 1.56A
  - Test configuration:
    - CPU: Intel Celeron 2.0GHz/400MHz FSB/256KB L2 Cache
    - Memory: DDR SDRAM 512MBx1
    - Primary Master IDE HDD: Seagate ST340014A 40GB
    - OS: Microsoft Windows XP + SP2
    - Test Programs: Burn-in Test V3.0 + Preme95
    - Run Time: 10 minutes

1.4 System Architecture

The most up-to-date system architecture of FEB-4720 includes two main Intel chips, Intel 852GME chipset supports Pentium-4 processor, DDR-SDRAM, 2D/3D graphic display, and its 82801DB ICH4 supports PCI bus interface, APM, ACPI compliant power management, USB port, SMBus communication, and Ultra DMA/33/66/100 IDE Master. W83627HF (I/O Controller) is responsible for PS/2 Keyboard/Mouse, UARTs, Hardware Monitor, Parallel, Watch Dog Timer, GPIO and Infrared interface. And the W83697UF supports 4 UARTs and GPIO.

The special pin configuration of the CPU socket adopts the 478 pins in total. This new generation CPU provides better performance to many applications.



Chapter 2
Hardware Configuration

This chapter gives the definitions and shows the positions of jumpers, headers and connector. All of the configuration jumpers on FEB-4720 in the proper position. The default settings shipped from factory are marked with a star (★).

2.1 Jumper Setting

For users to customize FEB-4720's features. In the following sections, **Short** means covering a jumper cap over jumper pins; **Open** or **N/C** (Not Connected) means removing a jumper cap from jumper pins. User can refer to Figure 2-1 for the Jumper locations.

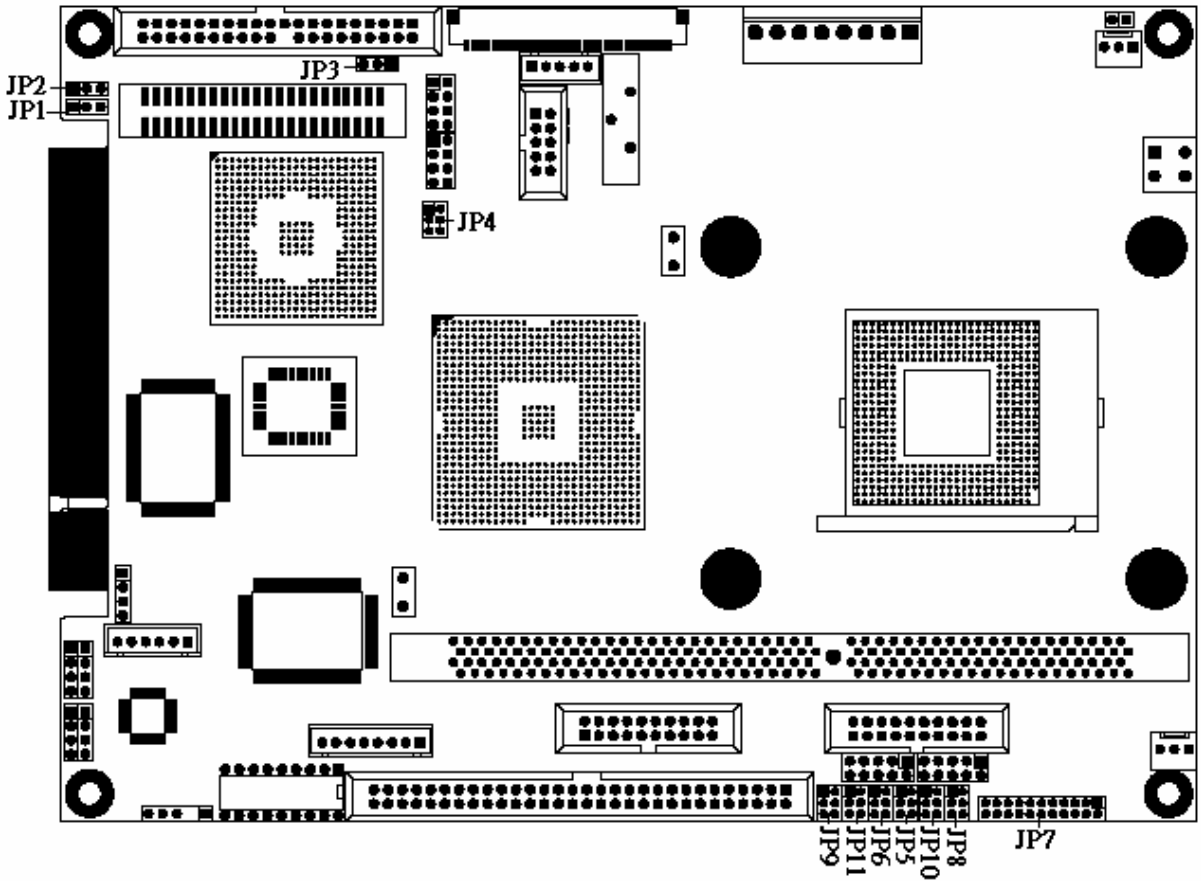


Figure 2-1 FEB-4720 Jumper Location

P1: Compact Flash Master/Slave setting

JP1	Function
1-2	Compact Flash set to master on IDE secondary channel ★ (share secondary IDE channel with J9 2.0mm 44 pin IDE connector).
2-3	Compact Flash set to slave on IDE secondary channel (share secondary IDE channel with J9 2.0mm 44 pin IDE connector).

JP2: CMOS Clear

JP2	Function
1-2	Normal Operation ★
2-3	Clear CMOS Contents

JP3: LVDS Panel(J38) Interface VDD Voltage Selection

JP3	Function
1-2	VDD=+3.3V★
2-3	VDD=+5V

JP4: CPU & DDR Frequency Jumper Setting

JP4: 1-2 3-4 5-6	Function CPU/DDR
Open-open- open	400/266★
Short-open-open	400/200
Short-short-short	400/333
Open-open-short	533/266
Open-short-short	533/333

JP5: COM4(J43) RI pin function Selection

JP5	Function
1-2 short	+5V
3-4 short	MODEM Ring In ★
5-6 short	+12V

JP6: COM5(J43) RI pin function Selection

JP6	Function
1-2 short	+5V
3-4 short	MODEM Ring In ★
5-6 short	+12V

JP7: COM2 Interface Selection

JP7	Function
5-6,9-11,10-12,15-17,16-18 Short	RS-232 ★
3-4,7-9,8-10,13-15,14-16,21-22 Short	RS-422
1-2,7-9,8-10,19-20 Short	RS-485

JP9: COM1(J34) RI pin function Selection

JP9	Function
1-2 short	+5V
3-4 short	MODEM Ring In ★
5-6 short	+12V

JP10: COM3(J42) RI pin function Selection

JP10	Function
1-2 short	+5V ★
3-4 short	MODEM Ring In
5-6 short	+12V

JP11: COM2(J34) RI pin function Selection

JP11	Function
1-2 short	+5V
3-4 short	MODEM Ring In ★
5-6 short	+12V

1. Pin Assignments of Connectors

I/O peripheral devices and flash disk are connected to the interface connectors and CF socket on this board computer (Figure 2-2).

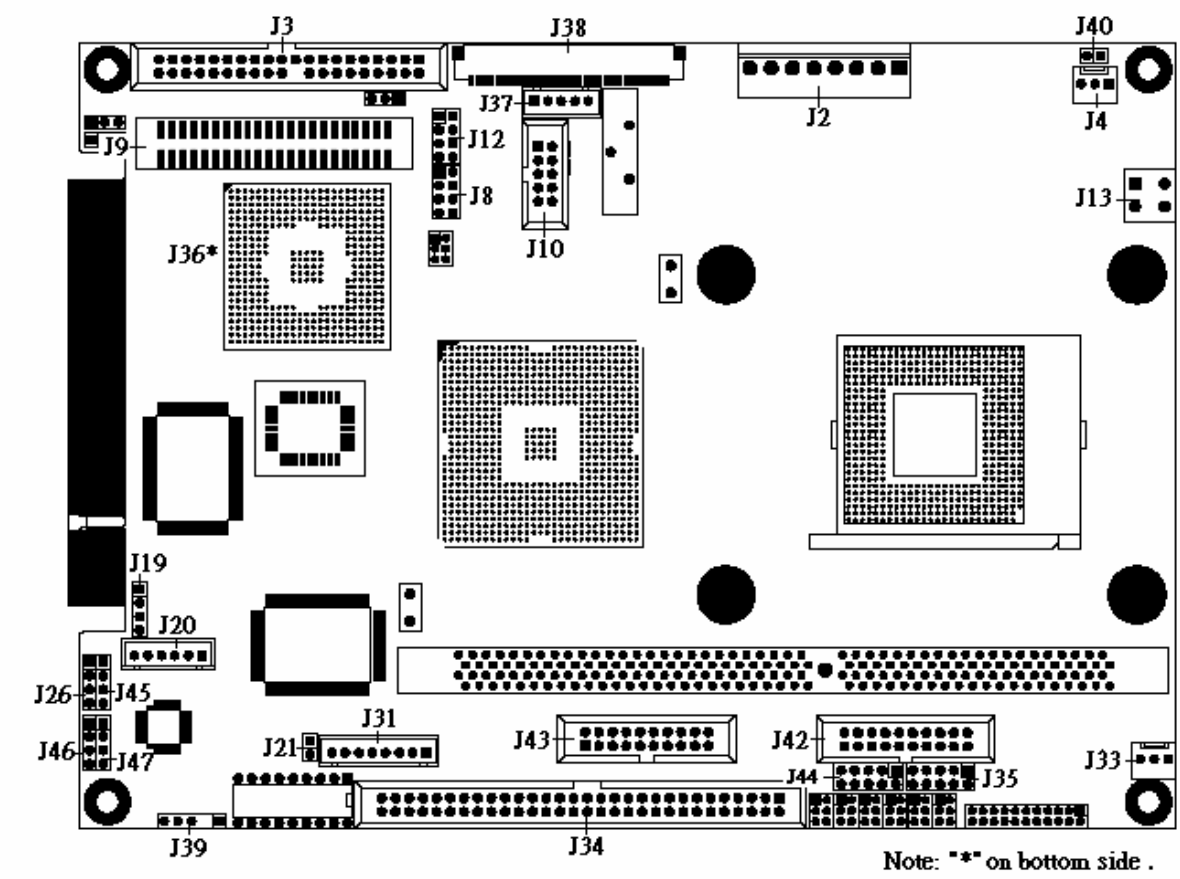


Figure 2-2 FEB-4720 Connector Location

Connector Function List

Connector	Function	Remark
J2	+5V, +12V Power Connector	
J3	2.54mm 40pin IDE connector	
J4	CPU Fan Connector	
J8	USB port0 & port1 connector	
J9	2.0mm 44 pin IDE connector	
J10	CRT connector	
J12	USB port 2 & port 3 connector	
J13	12V CPU Power Connector	
J19	Ethernet Speed & ACT & Link LED connector	
J20	10/100 Ethernet Port	
J21	External Temperature Sensor	
J26	CD Audio Input connector	
J31	Internal keyboard connectors	
J33	System Fan connector	
J34	Miscellaneous IO Connector	
J35	Front Panel Connector	
J36	Compact Flash socket	
J37	LVDS Inverter Power Connector	
J38	LVDS signals connector	
J39	IR connector	
J40	Power Button connector	
J42	COM3 connector	
J43	COM5 & COM4 connector	
J44	GPIO connector	
J45	Microphone Input connector	
J46	Speaker output connector	
J47	Line input connector	

J2: Power Connector

PIN No.	Signal Description
1, 2	+5V
3	+5V Standby
4	+12V
5	Power Supply On (PS-ON#)
6,7,8	Ground

J3: Primary IDE Connector (IDE1)

PIN No.	Signal Description	PIN No.	Signal Description
1	RESET#	2	Ground
3	Data 7	4	Data 8
5	Data 6	6	Data 9
7	Data 5	8	Data 10
9	Data 4	10	Data 11
11	Data 3	12	Data 12
13	Data 2	14	Data 13
15	Data 1	16	Data 14
17	Data 0	18	Data 15
19	Ground	20	N/C
21	DMA REQ	22	Ground
23	IOW#	24	Ground
25	IOR#	26	Ground
27	IOCHRDY	28	Pull-down
29	DMA ACK#	30	Ground
31	INT REQ	32	N/C
33	SA1	34	CBLID#
35	SA0	36	SA2
37	HDC CS0#	38	HDC CS1#
39	HDD Active#	40	Ground

J4/J33: Fan Connector

PIN No.	Signal Description
1	Ground
2	Fan Power (+12V)
3	Speed Pulse Output

J8: USB Port0 & Port1 Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	Port 0 +5V	2	Port 1 Ground
3	Port 0 Data-	4	Port 1 Data +
5	Port 0 Data+	6	Port 1 Data-
7	Port 0 Ground	8	Port 1 +5V

J9: Secondary IDE Connector (IDE2)

PIN No.	Signal Description	PIN No.	Signal Description
1	RESET#	2	Ground
3	Data 7	4	Data 8
5	Data 6	6	Data 9
7	Data 5	8	Data 10
9	Data 4	10	Data 11
11	Data 3	12	Data 12
13	Data 2	14	Data 13
15	Data 1	16	Data 14
17	Data 0	18	Data 15
19	Ground	20	N/C
21	DMA REQ	22	Ground
23	IOW#	24	Ground
25	IOR#	26	Ground
27	IOCHRDY	28	Pull-down
29	DMA ACK#	30	Ground
31	INT REQ	32	N/C
33	SA1	34	N/C
35	SA0	36	SA2
37	HDC CS0#	38	HDC CS1#
39	HDD Active#	40	Ground
41	+5V	42	+5V
43	Ground	44	NC

J10: CRT Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	Red	6	DDC Data
2	Green	7	DDC Clock
3	Blue	8	Ground
4	HSYNC (5V)	9	Ground
5	VSYNC (5V)	10	Ground

J12: USB Port2 & Port3 Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	Port 2 +5V	2	Port 3 Ground
3	Port 2 Data-	4	Port 3 Data +
5	Port 2 Data+	6	Port 3 Data-
7	Port 2 Ground	8	Port 3 +5V

J13: +12V CPU Power Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	Ground	3	+12V
2	Ground	4	+12V

J19: Ethernet LED Connector

PIN No.	Signal Description
1	Link
2	+3.3V PU
3	Speed
4	+3.3V PU

J20: Ethernet Connector

PIN No.	Signal Description
1	TX+
2	TX-
3	TX-CT
4	RX+
5	RX-
6	RX-CT

J21: External Temperature Sensor

PIN No.	Signal Description
1	Sensor
2	Ground

J26: CD Audio Input Connector

PIN No.	Signal Description
1	CD-IN Left
2	CD-Ground
3	CD-Ground
4	CD-IN Right

J31: Internal Keyboard Connector

PIN No.	Signal Description
1	MDAT_PSMS
2	MCLK_PSMS
3	Ground
4	KDAT_KBC
5	KDAT_CON
6	KCLK_KBC
7	KCLK_CON
8	+V5

J34: Miscellaneous IO Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	Speaker Out Left	2	General Purpose Input
3	General Purpose Output 1	4	General Purpose Output 0
5	DTR#4	6	DSR#4
7	RTS#4	8	CTS#4
9	Speaker Out Right	10	TXD#4
11	CTS#2	12	RI#2
13	DSR#2	14	RTS#2
15	TXD#2	16	DTR#2
17	DCD#2	18	RXD#2
19	CTS#1	20	RI#1
21	DSR#1	22	RTS#1
23	TXD#1	24	DTR#1
25	DCD#1	26	RXD#1
27	Keyboard Clock	28	Keyboard Data
29	Mouse Clock	30	Mouse Data
31	USB Port 5 Data+	32	USB Port 5 Data-
33	USB Port 4 Data+	34	USB Port 4 Data-
35	RXD#4	36	LPT Strobe
37	LPT Data 0	38	LPT Data 1
39	LPT Data 2	40	LPT Data 3
41	LPT Data 4	42	LPT Data 5
43	LPT Data 6	44	LPT Data 7
45	LPT ACK	46	LPT PE
47	LPT Busy	48	LPT SLCT
49	LPT AFD	50	LPR ERR
51	LPT INIT	52	LPT SLIN
53	LAN Pin7&8	54	LAN Pin7&8
55	LAN Pin4&5	56	LAN Pin4&5
57	LAN RX-	58	LAN RX+
59	LAN TX-	60	LAN TX+

J35: Front Panel Connector

PIN No.	Signal Description
1-2	Power LED indicate 5Vsb ON
3-4	Power LED indicate +5V ON
5-6	IDE Active LED Connector
7-8	Reset Button Connector
9-10	Keyboard Lock Connector

J36: Compact Flash Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	Ground	26	Ground
2	Data 3	27	Data 11
3	Data 4	28	Data 12
4	Data 5	29	Data 13
5	Data 6	30	Data 14
6	Data 7	31	Data 15
7	Select 0	32	Select 1
8	Ground	33	N/C
9	Ground	34	IO Read
10	Ground	35	IO Write
11	Ground	36	Pull Up to +5V
12	Ground	37	IRQ 15
13	+5V	38	+5V
14	Ground	39	Slave/Master# Select
15	Ground	40	N/C
16	Ground	41	Reset
17	Ground	42	IORDY
18	SA2	43	DMA REQ
19	SA1	44	DMA ACK#
20	SA0	45	IDE Active
21	Data 0	46	Pull Up to +5V
22	Data 1	47	Data 8
23	Data 2	48	Data 9
24	Pull Up to +5V	49	Data 10
25	Ground	50	Ground

J37: LVDS Panel Inverter Power Connector

PIN No.	Signal Description
1	Back Light Enable
2	Ground
3	+12V
4	Ground
5	Back Light Enable

J38: LVDS Panel Signals Connector

PIN No.	Signal Description
1	Ground
2	Ground
3	Data A3+
4	Data A3-
5	Clock A+
6	Clock A-
7	Data A2+
8	Data A2-
9	Data A1+
10	Data A1-
11	Data A0+
12	Data A0-
13	Ground
14	Ground
15	Data B3+
16	Data B3-
17	Clock B+
18	Clock B-
19	Data B2+
20	Data B2-
21	Data B1+
22	Data B1-
23	Data B0+
24	Data B0-
25	Ground
26	Ground
27	VDD
28	VDD
29	VDD
30	VDD

J39: IR Connector

PIN No.	Signal Description
1	+5V
2	NC
3	IR-RX
4	Ground
5	IR-TX

J40: Power Button Connector

PIN No.	Signal Description
1	Power on signal
2	Ground

J42: COM3 Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	COM3 DCD	2	COM3 DSR
3	COM3 RXD	4	COM3 RTS
5	COM3 TXD	6	COM3 CTS
7	COM3 DTR	8	COM3 RI/+5V/+12V
9	GND	10	N/C

J43: COM5 & COM4 Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	COM5 DCD	2	COM5 DSR
3	COM5 RXD	4	COM5 RTS
5	COM5 TXD	6	COM5 CTS
7	COM5 DTR	8	COM5 RI/+5V/+12V
9	GND	10	N/C
11	COM4 DCD	12	COM4 DSR
13	COM4 RXD	14	COM4 RTS
15	COM4 TXD	16	COM4 CTS
17	COM4 DTR	18	COM4 RI/+5V/+12V
19	GND	20	N/C

J44: GPIO Connector

PIN No.	Signal Description	PIN No.	Signal Description
1	Pull-down to GND	2	GPIO Input 3
3	Pull-down to GND	4	GPIO Input 2
5	Pull-down to GND	6	GPIO Input 1
7	GPIO Output 1	8	GPIO Input 0
9	GPIO Output 0	10	NC

J45: Microphone Input Connector

PIN No.	Signal Description
1	MIC2 (option)
2	Ground
3	Ground
4	MIC1

J46: Line output Connector

PIN No.	Signal Description
1	SPEAKER-OUT-L
2	Ground
3	Ground
4	SPEAKER -OUT-R

J47: Line input Connector

PIN No.	Signal Description
1	LINE-IN-L
2	Ground
3	Ground
4	LINE-IN-R

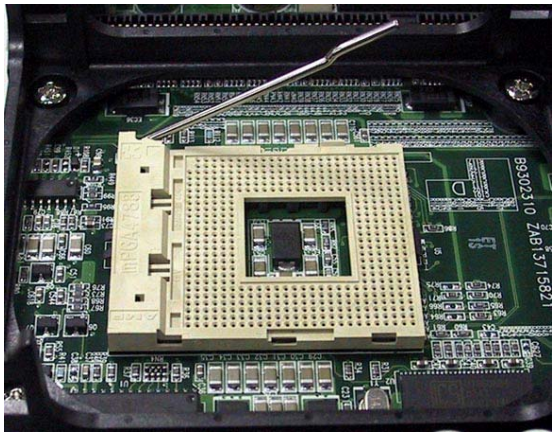
Chapter 3
System Installation

This chapter provides you with instructions to set up your system. The additional information is enclosed to help you set up onboard PCI device and handle WDT operation in software programming.

3.1 Socket 478 Pentium 4/Celeron Processor

Installing Socket 478 CPU

1) Lift the handling lever of CPU socket outwards and upwards to the other end.



2) Align the processor pins with pinholes on the socket. Make sure that the notched corner or dot mark (pin 1) of the CPU corresponds to the socket's bevel end. Then press the CPU gently until it fits into place. If this operation is not easy or smooth, don't do it forcibly. You need to check and rebuild the CPU pin uniformly.
3) Push down the lever to lock processor chip into the socket once CPU fits.
4) Follow the installation guide of cooling fan or heat sink to mount it on CPU surface and lock it on the socket 478.

Removing CPU

1) Unlock the cooling fan first.
2) Lift the lever of CPU socket outwards and upwards to the other end.
3) Carefully lifts up the existing CPU to remove it from the socket.
4) Follow the steps of installing a CPU to change to another one or place handling bar to close the opened socket.

Configuring System Bus

FEB-4720 will automatically detect the CPU used. CPU speed of Intel P4 can be detected automatically.

3.2 Main Memory

FEB-4720 provides one DDR-SDRAM DIMM slots to support 2.5V DDR-SDRAM as on-board main memory. The maximum memory size can be up to 1GB. Auto detecting memory clock according to BIOS CMOS settings.

Watch out the contact and lock integrity of memory module with socket, it will impact on the system reliability. Follow normal procedures to install your DRAM module into memory socket. Before locking, make sure that all modules have been fully inserted into the card slots.

Note:
To maintain system stability, don't change any of DRAM parameters in BIOS setup to upgrade your system performance without acquiring technical information.

3.3 CompactFlash Card

FEB–4720 has One CompactFlash memory card slot for IDE interface. Supported CompactFlash type I & type II.

3.4 Installing the Embedded Board Computer

To install your FEB-4720 into standard chassis or proprietary environment, you need to perform the following:

Step 1: Check all jumpers setting on proper position

Step 2: Install and configure CPU and memory module on right position

Step 3: Place FEB-4720 into the dedicated position in your system

Step 4: Attach cables to existing peripheral devices and secure it

Step 5: Attach 4-pin 12V power cable of ATX power supply to on board 12V CPU supplementary connector (J13)

WARNING

Please ensure that your FEB-4720 is properly inserted and fixed by mechanism.

Note:
Please refer to section 3-4-1 to 3-4-5 to install INF/VGA/LAN/Audio/USB drivers.

3.4.1 Chipset Component Driver

Intel 852 GME chipset is a new chipset that a few old operating systems might not be able to recognize. **To overcome this compatibility issue, for Windows Operating Systems such as Windows-95/98/98SE/2000, please install INF Chipset Component driver before any of other Drivers are installed**.

3.4.2 Intel 852 GME Graphics Controller

Intel 852 GME chipset is the result of new design approach to optimize the shared memory architecture while maintaining the cost benefits of integration through Direct AGP and Dynamic Video Memory Technology. With no additional video adaptor, this onboard video will be the system display output. There is no way to disable this onboard video function.

3.4.3 On-Board USB 2.0

Includes two UHCI host controllers that support four external ports. Includes high-speed USB 2.0 Host Controller that supports all ports.

3.5 Clear CMOS Operation

The Clear CMOS operation is implemented if the system fails to start at least one time.

The following table indicates how to enable/disable CMOS Clear Function hardware circuit by putting jumpers at proper position.

J40	Function
1-2 Short	Normal Operation ★
2-3 Short	Clear CMOS Contents

To correctly operate CMOS Clear function, users must turn off the system, move JP2 jumper to short pin 2 and 3. To clear CMOS, please turn the power back on and turn it off again for AT system, or press the toggle switch a few times for ATX system. Move the JP2 back to 1-2 position (Normal Operation) and start the system. System will then produce a "CMOS Check Sum Error" message and hold up. Users may then follow the displayed message to load BIOS default setting.

3.6 WDT Function

The working algorithm of the WDT function can be simply described as a counting process. The Time-Out Interval can be set through software programming. The availability of the time-out interval settings by software or hardware varies from boards to boards.

FEB-4720 allows users control WDT through dynamic software programming. The WDT starts counting when it is activated. It sends out a signal to system reset or to non-maskable interrupt (NMI), when time-out interval ends. To prevent the time-out interval from running out, a re-trigger signal will need to be sent before the counting reaches its end. This action will restart the counting process. A well-written WDT program should keep the counting process running under normal condition. WDT should never generate a system reset or NMI signal unless the system runs into troubles.

The related Control Registers of WDT are all included in the following sample program that is written in C language. User can fill a non-zero value into the Time-out Value Register to enable/refresh WDT. System will be reset after the Time-out Value to be counted down to zero. Or user can directly fill a zero value into Time-out Value Register to disable WDT immediately. To ensure a successful accessing to the content of desired Control Register, the sequence of following program codes should be step-by-step run again when each register is accessed.

Additionally, there are maximum 2 seconds of counting tolerance that should be considered into user' application program. For more information about WDT, please refer to Winbond W83627HF data sheet.

3.6.1 WDT Programming Guide

There are two PNP I/O port addresses that can be used to configure WDT,

1) 0x2E:EFIR (Extended Function Index Register, for identifying CR index number)
2) 0x2F:EFDR (Extended Function Data Register, for accessing desired CR)

Below are some example codes, which demonstrate the use of WDT.

```
// Enter Extended Function Mode
outp(0x002E, 0x87);
outp(0x002E, 0x87);

// Assign Pin 89 to be a WDTO
outp(0x002E, 0x2B);
outp(0x002F, inp(0x002F) & 0xEF);
```

// Select Logic Device 8
outp(0x002E, 0x07);
outp(0x002F, 0x08);

// Active Logic Device 8
outp(0x002E, 0x30);
outp(0x002F, 0x01);
// Select Count Mode
outp(0x002E, 0xF5);
outp(0x002F, (inp(0x002F) & 0xF7) | (Count-mode Register & 0x08));

// Specify Time-out Value
outp(0x002E, 0xF6);
outp(0x002F, Time-out Value Register);

// Disable WDT reset by keyboard/mouse interrupts
outp(0x002E, 0xF7);
outp(0x002F, 0x00);

// Exit Extended Function Mode
outp(0x002E, 0xAA);

Definitions of Variables:

Value of Count-mode Register :
1) 0x00 -- Count down in seconds (Bit3=0)
2) 0x08 -- Count down in minutes (Bit3=1)
Value of Time-out Value Register :
1) 0x00 -- Time-out Disable
2) 0x01~0xFF -- Value for counting down

3.7 SMBus

The ICH4 provides an SMBus 2.0 compliant Host controller as well as an SMBus Slave Interface. The Host controller provides a mechanism for the processor to initiate communications with SMBus peripherals (slaves). The ICH4 is also capable of operating in a mode in which it can communicate with I2C compatible devices.

The ICH4 can perform SMBus messages with either packet error checking (PEC) enabled or disabled. The actual PEC calculation and checking is performed in hardware by the ICH4.

The System Management Bus is a two-wire interface through which simple powerrelated chips can communicate with rest of the system. It uses I2C as its backbone. A system using SMBus passes messages to and from devices instead of tripping individual control lines. With the SMBus, a device can provide manufacturer information, tell the system what its model/part number is, save its state for a suspend event, report different types of errors, accept control parameters, and return its status The SMBus may share the same host device and physical bus as ACCESS bus components provided that an appropriate electrical bridge is provided between the interal SMB devices and external ACCESS bus devices

3.8 Display Output

Intel 852 GME chipset is the result of new design approach to optimize the shared memory architecture while maintaining the cost benefits of integration through Direct AGP and Dynamic Video Memory Technology.

With no additional video adaptor, this onboard video will be the system display output. However, system will automatically switch to off-board video adaptor if there is any. In this case, onboard 852 GME graphic features will be disabled.

There is no way to disable this onboard video function, unless one off-board PCI video card is applied onto the backplane. n this case, the off-board video card shall be picked up first based on the default BIOS setup (Initial Display First) in "Integrated Peripheral" Setup Menu.

3.9 GPIO

The FEB-4720 provides 1 input and 2 output ports that can be individually configured to perform a simple basic I/O function. Users can configure each individual port to become an input or output port by programming register bit of I/O Selection. To invert port value, the setting of Inversion Register has to be made. Port values can be set to read or write through Data Register.

3.9.1 Pin assignment

J34: Miscellaneous IO Connector

PIN No.	Signal Description
2	DIO_IN0
4	DIO_OUT0
3	DIO_OUT1

3.9.2 FEB-4720 GPIO Programming Guide

Access J34 GPIO port

There are two PNP I/O port addresses that can be used to configure GPIO ports,

1) 0x2E - **EFER** (Extended Function Enable Register, for entering Extended Function Mode)
   - **EFIR** (Extended Function Index Register, for identifying CR index number)
2) 0x2F - **EFDR** (Extended Function Data Register, for accessing desired CR)

Below are some example codes, which demonstrate the use of GPIOs.

// Enter Extended Function Mode
outp(0x002E, 0x87);
outp(0x002E, 0x87);

// Assign Pin121-128 to be GPIO port 1
outp(0x002E, 0x2A);
outp(0x002F, 0x0FF);

// Select Logic Device 7
outp(0x002E, 0x07);
outp(0x002F, 0x07);

// Active Logic Device 7
outp(0x002E, 0x30);
outp(0x002F, 0x01);

// Select Inversion Mode
outp(0x002E, 0xF2);
*outp(0x002F, **Inversion Register**);*

// Select I/O Mode
// Bit0~bit3 output and bit4~bit7 input
outp(0x002E, 0xF0);
outp(0x002F, 0xF0));

// Access GPIO ports
outp(0x002E, 0xF1);
*outp(0x002F, (**Output Data** & 0x03));*
*or **Input Data** =(inp(0x002F)& 0x10);*

// Exit Extended Function Mode
outp(0x002E, 0xAA);

Definitions of Variables:
Each bit in the lower nibble of each Register represents the setting of a GPIO port.
Bit0 vs. GPIO DIO_OUT0
Bit1 vs. GPIO DIO_OUT0
Bit4 vs. GPIO DIO_IN0

Value of **Inversion Register** :
Only lower nibble is available for this function.
When set to a '1', the incoming/outgoing port value is inverted.
When set to a '0', the incoming/outgoing port value is the same as in Data Register.

Value of **I/O Selection Register** :
Only lower nibble is available for this function.
When set to a '1', respective GPIO port is programmed as an input port.
When set to a '0', respective GPIO port is programmed as an output port.

Value of **Output Data** / **Input Data** :
Only lower nibble is available for this function.
If a port is assigned to be an output port, then its respective bit can be read/written.
If a port is assigned to be an input port, then its respective bit can be read only.

Note:
Some other functions may occupy the high nibble of the registers. Altering any content in high nibble will be undesired.

Chapter 4
BIOS Setup Information

FEB-4720 is equipped with the AWARD BIOS stored in Flash ROM. These BIOS has a built-in Setup program that allows users to modify the basic system configuration easily. This type of information is stored in CMOS RAM so that it is retained during power-off periods. When system is turned on, FEB-4720 communicates with peripheral devices and checks its hardware resources against the configuration information stored in the CMOS memory. If any error is detected, or the CMOS parameters need to be initially defined, the diagnostic program will prompt the user to enter the SETUP program. Some errors are significant enough to abort the start-up.

4.1 Entering Setup

Turn on or reboot the computer. When the message "Hit <DEL> if you want to run SETUP" appears, press <Del> key immediately to enter BIOS setup program.

If the message disappears before you respond, but you still wish to enter Setup, please restart the system to try "COLD START" again by turning it OFF and then ON, or touch the "RESET" button. You may also restart from "WARM START" by pressing <Ctrl>, <Alt>, and <Delete> keys simultaneously. If you do not press the keys at the right time and the system will not boot, an error message will be displayed and you will again be asked to,

Press <F1> to Run SETUP or Resume

In HIFLEX BIOS setup, you can use the keyboard to choose among options or modify the system parameters to match the options with your system. The table below will show you all of keystroke functions in BIOS setup.

General Help	
↑ ↓ → ←	: Move
Enter	: Select
+ / - /PU /PD	: Value
ESC	: Exit
F1	: General Help
F2	: Item Help
F5	: Previous Values
F6	: Fail-Safe Defaults
F7	: Optimized Defaults
F9	: Menu in BIOS
F10	: Save

4.2 Main Menu

Once you enter FEB-4720 AWARD BIOS CMOS Setup Utility, you should start with the Main Menu. The Main Menu allows you to select from eleven setup functions and two exit choices. Use arrow keys to switch among items and press <Enter> key to accept or bring up the sub-menu.

Phoenix- AwardBIOS CMOS Setup Utility

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

Note:
It is strongly recommended to reload Optimal Setting if CMOS is lost or BIOS is updated.

4.3 Standard CMOS Setup Menu

This setup page includes all the items in a standard compatible BIOS. Use the arrow keys to highlight the item and then use the <PgUp>/<PgDn> or <+>/<-> keys to select the value or number you want in each item and press <Enter> key to certify it.

Follow command keys in CMOS Setup table to change **Date**, **Time**, **Drive type**, and **Boot Sector Virus Protection Status**.

Phoenix- AwardBIOS CMOS Setup Utility
Standard CMOS Features

Date (mm:dd:yy)	Thu, Jul 6 2007	Item Help
Time (hh:mm:ss)	21 : 29 : 50	
▶ IDE Primary Master	[HDS728080PLAT20]	Menu Level ▶
▶ IDE Primary Slave	[None]	
▶ IDE Secondary Master	[None]	Change the day, month, year and century
▶ IDE Secondary Slave	[None]	
Video	[EVG/VGA]	
Halt On	[All, But Keyboard]	
Base Memory	640K	
Extended Memory	490496K	
Total Memory	491520K	

↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help
F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults

■ **Menu Selections**

Item	Options	Description
Date	mm:dd:yy	Change the day, month, year and century
Time	hh:mm:ss	Change the internal clock
IDE Primary Master	Options are in its sub menu	Press <Enter> to enter the sub menu of detailed options
IDE Primary Slave	Options are in its sub menu	Press <Enter> to enter the next page for detail hard drive settings
IDE Secondary Master	Options are in its sub menu	Press <Enter> to enter the next page for detail hard drive settings
IDE Secondary Slave	Options are in its sub menu	Press <Enter> to enter the next page for detail hard drive settings
Video	EGA/VGA CGA 40 CGA 80	Select the default video device

	MONO	
Halt On	All Errors No Errors All, but Keyboard	Select the situation in which you want the BIOS to stop the POST process and notify you
Base Memory	640K	Displays the amount of conventional memory detected during boot up
Extended Memory	N/A	Displays the amount of extended memory detected during boot up
Total Memory	N/A	Displays the total memory available in the system

4.4 IDE Adaptors Setup Menu

The IDE adapters control the IDE devices, such as hard disk drive or cdrom drive. It uses a separate sub menu to configure each hard disk drive.

Phoenix- AwardBIOS CMOS Setup Utility
IDE Primary Master

IDE HDD Auto-Detection	[Press Enter]	Item Help
IDE Channel 0 Master	[Auto]	
Access Mode	[Auto]	Menu Level ►►
Capacity	82 GB	To atuo-detect the HDD's size, head … on this channel
Cylinder	39420	
Head	16	
Precomp	0	
Landing Zone	39419	
Sector	255	

↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help
F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults

■ **Menu Selections**

Item	Options	Description
IDE HDD Auto-detection	Press Enter	Press Enter to auto-detect the HDD on this channel. If detection is successful, it fills the remaining fields on this menu.
IDE Primary Master	None Auto Manual	Selecting 'manual' lets you set the remaining fields on this screen. Selects the type of fixed disk. "User Type" will let you select the number of cylinders, heads, etc. Note: PRECOMP=65535 means NONE !
Access Mode	CHS, LBA	Choose the access mode for this hard disk

	Large, Auto	
Capacity	Auto Display your disk drive size	Disk drive capacity (Approximated). Note that this size is usually slightly greater than the size of a formatted disk given by a disk checking program.
The following options are selectable only if the 'IDE Primary Master' item is set to 'Manual'		
Cylinder	Min = 0 Max = 65535	Set the number of cylinders for this hard disk
Head	Min = 0 Max = 255	Set the number of read/write heads
Precomp	Min = 0 Max = 65535	**** Warning: Setting a value of 65535 means no hard disk
Landing zone	Min = 0 Max = 65535	****
Sector	Min = 0 Max = 255	Number of sectors per track

4.5 Advanced BIOS Features

This section allows you to configure your system for basic operation. You have the opportunity to select the system's default speed, boot-up sequence, keyboard operation, shadowing and security.

Phoenix- AwardBIOS CMOS Setup Utility
Advanced BIOS Features

Virus Warning	[Disabled]	Item Help
CPU L1 & L2 Cache	[Enabled]	
Quick Power On Self Test	[Enabled]	Menu Level ▶
First Boot Device	[CDROM]	
Second Boot Device	[HDD-0]	Allow you to choose the VIRUS warning feature for IDE Hard Disk boot sector protection. If this function is enabled and someone attempt to write data into this area, BIOS will show a warning message on screen and alarm beep.
Third Boot Device	[USB-FDD]	
Boot Other Device	[Enabled]	
Boot up NumLock Status	[On]	
Gate A20 Option	[Fast]	
Typematic Rate Setting	[Disabled]	
X Typematic Rate (Chars/sec)	6	
X 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]	
Small Logo(EPA) Show	[Disabled]	

↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help
F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults

Virus Warning

It allows you to choose the VIRUS warning feature for IDE Hard Disk boot sector protection. If this function is enabled and someone attempt to write data into this area, BIOS will show a warning message on screen and alarm beep.

Enabled	Activates automatically when the system boots up causing a warning message to appear when anything attempts to access the boot sector or hard disk partition table.
Disabled	No warning message will appear when anything attempts to access the boot sector or hard disk partition table.

CPU L1 Cache/L2 Cache

These two categories speed up memory access. However, it depends on CPU/chipset design.

Enabled	Enable cache
Disabled	Disable cache

Quick Power On Self Test

Allows the system to skip certain tests while booting. This will decrease the time needed to boot the system.

Enabled	Enable quick POST
Disabled	Normal POST

First/Second/Third Boot Device

Select your Boot Device Priority.

The choice: LS120, HDD-0, SCSI, CDROM, HDD-1, HDD-2, HDD-3, ZIP 100, USB-FDD, USB-ZIP, USB-CDROM, USB-HDD and Disabled.

Boot Other Device

Select Your Boot Device Priority.

The choice: Enabled, Disabled.

Boot Up NumLock Status

Select power on state for NumLock.

The choice: Off, On.

Gate A20 Option

Fast-lets chipsets control Gate A20 and Normal – a pin in the keyboard controller controls Gate A20. Default is Fast.

The choice: Normal, Fast.

Typematic Rate Setting

Keystrokes repeat at a rate determined by the keyboard controller – When enabled, the typematic rate and typematic delay can be select.

The choice: Enabled, Disabled.

Typematic Rate (Chars/sec)

The rate at which character repeats when you hold down a key.

The choice: 6, 8, 10, 12, 15, 20, 24, and 30.

Typematic delay (Msec)

The delay before key strokes begin to repeat.

The choice: 250, 500, 750, and 1000.

Security Option

Select whether the password is required every time the system boots or only when you enter setup.

System	The system will not boot and access to Setup will be denied if the correct password is not entered at the prompt.
Setup	The system will boot, but access to Setup will be denied if the correct password is not entered at the prompt.

APIC Mode

The choice: Enabled, Disabled.

MPS Version Control For OS

The choice: 1.1, 1.4.

OS Select For DRAM > 64MB

Select OS/2 only if you are running OS/2 operating system with greater than 64MB of RAM on the system.

The choice: Non-OS2, OS2.

Report No FDD For WIN 95

The choice: No, Yes.

Small Logo (EPA) Show

The choice: Enabled, Disabled.

4.6 Advanced Chipset Features

This section allows you to configure the system based on the specific features of the Intel 82852GME Chipset. This Chipset manages bus speeds and access to system memory resources, such as DRAM (DDR SDRAM) and the external cache. It also coordinates communications between the conventional ISA bus and the PCI bus. It must be stated that these items should never need to be altered. The default settings have been chosen because they provide the best operating conditions for your system. The only time you might consider making any changes would be if you discovered that data was being lost while using your system.

Phoenix- AwardBIOS CMOS Setup Utility
Advanced Chipset Features

DRAM Timing Selectable	[By SPD]	Item Help
X CAS Latency Time	[2.5]	
X Active to Precharge Delay	[7]	Menu Level ▶
X DRAM RAS# to CAS# Delay	[3]	
X DRAM RAS# Precharge	[3]	
DRAM Data Integrity Mode	[Non-ECC]	
MGM Core Frequency	[Auto Max 400/333MHz]	
System BIOS Cacheable	[Enabled]	
Video BIOS Cacheable	[Disabled]	
Memory Hole At 15M-16M	[Disabled]	
Delayed Transaction	[Enabled]	
Delay Prior to Thermal	[16 Min]	
AGP Aperture Size (MB)	[64]	
** On-Chip VGA Setting **		
On-Chip VGA	[Enabled]	
On-Chip Frame Buffer Size	[32MB]	
Boot Display	[CRT+LFP]	
Panel Scaling	[Auto]	
Panel Type	[800X600 LVDS]	
FWH Write Protection	[Enabled]	

↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help
F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults

This chipset settings deal with CPU access to dynamic random access memory (DRAM). The default timings have been carefully chosen and should only be altered if data is being lost. Such a scenario might well occur if your system had mixed speed DRAM chips installed so that greater delays may be required to preserve the integrity of the data held in the slower memory chips.

DRAM Timing Selectable

This option provides DIMM plug-and-play support by serial presence detect (SPD) mechanism via the system management bus (SMBUS) interface.

The choice: Manual, By SPD.

CAS Latency Time

This option controls the number of SCLKs between the time a read command is sampled by the SDRAMs and the time the GMCH samples correspondent data from the SDRAMs.

The choice: 2, 2.5.

Active to Precharge Delay

This is to DDR standard accordingly.

The choice: 5, 6, 7.

DRAM RAS# to CAS# Delay

This option controls the number of SCLKs (SDRAM Clock) from a row activate command to a read or write command. If your system installs good quality of SDRAM, you can set this option to "3 SCLKs" to obtain better memory performance. Normally, the option will be set to Auto.

The choice: 2, 3.

DRAM RAS# Precharge

This option controls the number of SCLKs for RAS# precharge. If your system installs good quality of SDRAM, you can set this option to "3 SCLKs" to obtain better memory performance. It is set to auto normally.

The choice: 2, 3.

DRAM Data Integrity Mode

There are two options available. The parity algorithm will implement the DRAM integrity mode when this option is set to "Non-ECC".

The choice: Non ECC, ECC.

MGM Core Frequency

The choice: Auto MAX 400/333MHz.

System BIOS Cacheable

Selecting Enabled allows caching of the system BIOS ROM at F0000h-FFFFFh, resulting in better system performance. However, if any program writes to this memory area, a system error may result.

The choice: Enabled, Disabled.

Video BIOS Cacheable

Select "Enabled" to enable caching VGA BIOS into L2 cache to get higher display performance. "Disabled" to ignore this BIOS caching function.

The choice: Enabled, Disabled.

Memory Hole At 15M-16M

The choice: Disabled, Enabled.

Delay Transaction

The choice: Disabled , Enabled.

Delay Prior to Thermal

The choice: 4Min, 8Min, 16Min, 32Min.

AGP Aperture Size (MB)

The choice: 4, 8, 16, 32, 64, 128, and 256.

On-Chip VGA

The choice: Enabled, Disabled.

On-Chip Frame Buffer Size

Users can set the display memory size that shared from main memory.

The choice: 1MB, 4MB, 8MB, 16MB, and 32MB.

Boot Display

The choice: CRT, LFP,

Panel Scaling

The choice: Auto, On, Off.

Panel Type

The choice: 640X480 LVDS, 800X600 LVDS, 800X600 LVDS-24, 1024X768-24 LVDS, 1280X1024 LVDS, 1400X1050 LVDS, 1600X1200 LVDS, 1024X768-18 LVDS.

FWH Write Protection

The choice: Enabled, Disabled.

4.7 Integrated Peripherals

Phoenix- AwardBIOS CMOS Setup Utility
Integrated Peripherals

▶ OnChip IDE Device	[Press Enter]	Item Help
▶ Onboard Device	[Press Enter]	
▶ Super IO Device	[Press Enter]	Menu Level ▶
↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults		

Phoenix- AwardBIOS CMOS Setup Utility
OnChip IDE Device

On-Chip Primary PCI IDE	[Enabled]	Item Help
IDE Primary Master PIO	[Auto]	
IDE Primary Slave PIO	[Auto]	Menu Level ▶
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]	
IDE HDD Block Mode	[Enabled]	
↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults		

OnChip Primary/Secondary PCI IDE

The chipset contains a PCI IDE interface with support for two IDE channels. Select Enabled to activate the primary IDE interface. Select Disabled to deactivate this interface.

The choice: Enabled, Disabled.

IDE Primary/Secondary Master/Slave PIO

The four IDE PIO (Programmed Input/Output) fields let you set a PIO mode (0-4) for each of the four IDE devices that the onboard IDE interface supports. Modes 0 through 4 provide successively increased performance. In Auto mode, the system automatically determines the best mode for each device.

The choice: Auto, Mode 0, Mode 1, Mode 2, Mode 3, and Mode 4.

IDE Primary/Secondary Master/Slave UDMA

Ultra DMA/33/66/100 implementation is possible only if your IDE hard drive supports it and the operating environment includes a DMA driver (Windows 95 OSR2 or a third-party IDE bus master driver). If your hard drive and your system software both support Ultra DMA/33/66/100, select Auto to enable BIOS support.

The choice: Auto, Disabled.

IDE HDD Block Mode

If your IDE hard drive supports block mode select Enabled for automatic detection of the optimal number of block read/writes per sector the drive can support.

The choice: Enabled, Disabled.

Phoenix- AwardBIOS CMOS Setup Utility
Onboard Device

USB Controller	[Enabled]	Item Help
USB 2.0 Controller	[Enabled]	
USB Keyboard Support	[Enabled]	Menu Level ▶
USB Mouse Support	[Enabled]	
AC97 Audio	[Auto]	
Init Display First	[Onboard/AGP]	
Onboard LAN Control :	[Enabled]	
Onboard Audio Control :	[Enabled]	

↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help
F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults

USB Controller

This item allows you to enable/disable USB (Universal Serial Bus) function.

The choice: Enabled, Disabled.

USB 2.0 Controller

This entry is for disable/enable EHCI controller only. This BIOS itself may/may not have high speed USB support built in, the support will be automatically turn on when high speed device were attached.

The choice: Enabled, Disabled.

USB Keyboard Support

This item allows you to enable USB keyboard function under POST, BIOS setup menu, DOS, or Windows-NT with no USB driver loaded.

The choice: Enabled, Disabled.

USB Mouse Support

This item allows you to enabled USB Mouse function under POST, BIOS Setup menu, DOS, or Window-NT with no USB driver loaded.

The choice: Enabled, Disabled.

AC97 Audio

This item allows you to enable AC97 Audio function.

The choice: Disabled, Auto.

Init Display First

The choice: PCI Slot, Onboard/AGP.

Onboard LAN Control

The choice: Disabled, Enabled.

Onboard Audio Control

The choice: Disabled, Enabled.

Phoenix- AwardBIOS CMOS Setup Utility
Super IO Device

POWER ON Function	[Button ONLY]	Item Help
KB Power ON Password	Enter	
Hot Key Power ON	Ctrl-F1	Menu Level ▶
Onboard Serial Port 1	[3F8/IRQ4]	
Onboard Serial Port 2	[2F8/IRQ3]	
UART Mode Select	[Normal]	
X RxD, TxD Active	Hi, Lo	
X IR Transmission Delay	Enabled	
X UR2 Duplex Mode	Half	
X Use IR Pins	IR-Rx2Tx2	
Onboard Parallel Port	[378/IRQ7]	
Parallel Port Mode	[SPP]	
X EPP Mode Select	EPP1.7	
X ECP Mode Use DMA	3	
PWRON After PWR-Fail	[Off]	
Watch Dog Timer Select	[Disabled]	
Onboard Serial Port 3	[3E8]	
Serial Port 3 Use IRQ	[IRQ10]	
Onboard Serial Port 4	[2E8]	
Serial Port 4 Use IRQ	[IRQ11]	
Onboard Serial Port 5	[4F8]	
Serial Port 5 Use IRQ	[IRQ10]	
Onboard Serial Port 6	[4E8]	
Serial Port 6 Use IRQ	[IRQ11]	

↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help
F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults

POWER ON Function

The choice: Button ONLY, Hot KEY, Mouse Left, Mouse Right, Any KEY, Keyboard 98.

KB Power ON Password

The choice: Enter.

Hot Key Power ON

The choice: Ctrl-F1.

Onboard Serial Port 1/Port 2

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

The choice: 3F8/IRQ4, 2E8/IRQ3, 3E8/IRQ4, 2F8/IRQ3, Disabled, Auto.

UART Mode Select

This item allows users to select Infrared transmission mode.

Normal	Disable Infrared function
IrDA	Select IrDA mode transmission
ASKIR	Select ASKIR mode transmission

RxD, TxD Active

This item is to configure Infrared transmission rate. Four options are available :

Hi, Hi	High rate for receiving / High rate for transmitting
Hi, Lo	High rate for receiving / Low rate for transmitting
Lo, Hi	Low rate for receiving / High rate for transmitting
Lo, Lo	Low rate for receiving / Low rate for transmitting

IR Transmission Delay

This option will be available when IR is enabled.

The choice: Enabled, Disabled.

UR2 Duplex Mode

The available choices are full duplex mode and half duplex mode

The choice: Full, Half.

Use IR Pins

The available choices are IR-Rx2Tx2/ RxD2, TxD2.

The choice: IR-Rx2Tx2 / RxD2, TxD2.

Onboard Parallel Port

This item allows you to configure I/O address of the onboard parallel port.

The choice: Disabled, 378/IRQ7, 278/IRQ5, 3BC/IRQ7.

Parallel Port Mode

There are four different modes for the onboard parallel port :

SPP	Switch to SPP mode
EPP	Switch to EPP mode
ECP	Switch to ECP mode
ECP + EPP	Switch to ECP + EPP mode

EPP Mode Select

Select different version of EPP mode.

The choice: EPP1.7, EPP1.9.

ECP Mode Use DMA

Select a proper DMA channel for ECP mode.

The choice: 3, 1.

PWRON After PWR-Fail

This item allows user to configure the power status of using ATX power supply after a serious power loss occurs.

On	System automatically restores power back
Off	System stays at power –off
Former-Sts	System restores back to previous status (On or Off)

Watch Dog Timer Select

This BIOS testing option is able to reset the system according to the selected table.

The choice: Disabled, 10 Sec, 20 Sec, 30 Sec, 40 Sec, 1 Min, 2 Min, 4 Min.

Onboard Serial Port 3 / Port 4

The choice: 3F8, 2F8, 3E8, 2E8, Disabled.

Onboard Serial Port5 / Port6

The choice: 4F8, 4E8, Disabled.

Serial Port 3 / Port 4 / Port5 / Port6 Use IRQ

The choice: IRQ11, IRQ10, IRQ3, IRQ4, IRQ5, IRQ6, IRQ7, IRQ9.

4.8 Power Management Setup

The Power Management Setup allows you to configure you system to most effectively save energy while operating in a manner consistent with your own style of computer use.

Phoenix- AwardBIOS CMOS Setup Utility
Power Management Setup

	ACPI Function	[Enabled]
	ACPI Suspend Type	[S1(POS)]
X	Run VGABIOS if S3 Resume	Auto
	Power Management	[User Define]
	Video Off Method	[DPMS]
	Video Off In Suspend	[Yes]
	Suspend Type	[Stop Grant]
	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]
	USB KB Wake-Up From S3	[Disabled]
	Resume by Alarm	[Disabled]
X	Date(of Month) Alarm	0
X	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]

Item Help

Menu Level ▶

↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help
F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults

ACPI Function

This item allows you to enable/disable the Advanced Configuration and Power Management (ACPI).

The choice: Enabled, Disabled.

ACPI Suspend Type

To decide which ACPI suspend mode to use.

The choice: S1(POS), S3(STR).

Run VGA BIOS if S3 Resume

The choice: Auto, Yes, No.

Power Management

This category allows you to select the type (or degree) of power saving and is directly related to "HDD Power Down", "Suspend Mode".

There are three selections for Power Management, three of which have fixed mode settings.

Min. Power Saving	Minimum power management. Suspend Mode = 1 Hour, and HDD Power Down = 15 Min.
Max. Power Saving	Maximum power management. Suspend Mode = 1 Min., and HDD Power Down = 1 Min.
User Defined	Allows you to set each mode individually. When not disabled, Suspend Mode ranges from 1 min. to 1 Hour and HDD Power Down ranges from 1 Min. to 15 Min.

Video Off Method

This determines the manner in which the monitor is blanked.

V/H SYNC+Blank	This selection will cause the system to turn off the vertical and horizontal synchronization ports and write blanks to the video buffer.
Blank Screen	This option only writes blanks to the video buffer.
DPMS	Initial display power management signaling.

Video Off In Suspend

This allows user to enable/disable video off in Suspend Mode.

The choice: Yes, No.

Suspend Type

Two options are available: Stop Grant and PwrOn Suspend.

The choice: Stop Grant, PwrOn Suspend.

Suspend Mode

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

The choice: Disabled, 1 Min, 2 Min, 4 Min, 8 Min, 12 Min, 20 Min, 30 Min, 40 Min, and 1 Hour.

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.

The choice: Disabled, 1 Min, 2 Min, 3 Min, 4 Min, 5 Min, 6 Min, 7 Min, 8 Min, 9 Min, 10 Min, 11 Min, 12 Min, 13 Min, 14 Min, 15 Min.

Soft-Off by PWR-BTTN

This item allows users to set the time to remove the power after the power button is pressed.

The choice: Instant-Off, Delay 4 Sec.

CPU THRM-Throttling

The choice: 87.5%, 75.0%, 62.5%, 50%, 37.5%, 25.0%, 12.5%.

Wake-Up by PCI card

The choice: Disabled, Enabled.

Power On by Ring

When select "Enabled", a system that is at soft-off mode will be alert to Wake-On-Modem.

The choice: Enabled, Disabled.

USB KB Wake-Up From S3

The choice: Disabled, Enabled.

Resume by Alarm

This item allows users to enable/disable the resume by alarm function. When "Enabled" is selected, system using ATX power supply could be powered on if a customized time and day is approached.

The choice: Enabled, Disabled.

Date(of Month) Alarm

When "Resume by Alarm" is enabled, this item could allow users to configure the date parameter of the timing dateline on which to power on the system.

The choice: 0 ~ 31.

Time(hh:mm:ss) Alarm

When "Resume by Alarm" is enabled, this item could allow users to configure the time parameter of the timing dateline on which to power on the system.

The choice: hh (0~23), mm (0~59), ss (0 ~59).

Primary/Secondary IDE 0/1

This item is to configure IDE devices being monitored by system so as to keep system out of suspend mode if the associated device is busy.

The choice: Enabled, Disabled.

FDD, COM, LPT Port

This item is to configure floppy device, COM ports, and parallel port being monitored by system so as to keep system out of suspend mode if the associated device is busy.

The choice: Enabled, Disabled.

PCI PIRQ[A-D]#

This option can be used to detect PCI device activities. If they are activities, the system will go into sleep mode.

The choice: Enabled, Disabled.

4.9 PnP/PCI Configurations

This section describes configuring the PCI bus system. PCI, or **P**ersonal **C**omputer **I**nterconnect, is a system that allows I/O devices to operate at speeds nearing the speed the CPU itself uses when communicating with its own special components.

This section covers some very technical items and it is strongly recommended that only experienced users should make any changes to the default settings.

Phoenix- AwardBIOS CMOS Setup Utility
PnP/PCI Configurations

Reset Configuration Data	[Disabled]	Item Help
Resources Controlled By	[Auto(ESCD)]	Menu Level ▶
X IRQ Resources	Press Enter	
PCI/VGA Palette Snoop	[Disabled]	Default is Disabled. Select Enabled to reset Extended System Configuration Data (ESCD) when you exit Setup if you have installed a new add-on and the system reconfiguration has caused such a serious conflict that the OS cannot boot.

↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help
F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults

Reset Configuration Data

Default is disabled. Select Enabled to reset Extended System Configuration Data (ESCD) when you exit Setup if you have installed a new add-on and the system reconfiguration has caused such a serious conflict that the OS cannot boot.

The choice: Enabled, Disabled.

Resource Controlled By

BIOS can automatically configure all the boot and plug and play compatible devices. If you choose Auto, you cannot select IRQ DMA and memory base address fields, since BIOS automatically assigns them.

The choice: Auto (ESCD), Manual.

IRQ Resources

When resources are controlled manually, assign each system interrupt a type, depending on the type of device using the interrupt.

Enter for more options IRQ-3/IRQ-4/IRQ-5/IRQ-7/IRQ-9/IRQ-10/IRQ-11/ IRQ-12/IRQ-14/IRQ-15 assigned to.

The choice: PCI/ISA PnP, Legacy ISA.

PCI/VGA Palette Snoop

The choice: Enabled, Disabled.

4.10 PC Health Status

Phoenix- AwardBIOS CMOS Setup Utility
PC Health Status

CPU Warning Temperature	[Disabled]	Item Help
Current System Temp.	39℃/102℉	
Current CPU Temperature	51℃/123℉	Menu Level ▶
CPU FAN Speed	5721 RPM	
System FAN Speed	0 RPM	
CPU Vcore	1.51 V	
+1.5 V	1.55 V	
+3.3 V	3.37 V	
+5 V	5.08 V	
+12 V	11.85 V	
VBAT(V)	3.07 V	
5VSB(V)	5.04 V	
Shutdown Temperature	[Disabled]	

↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help
F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults

CPU Warning Temperature

This item allows you to set a temperature above which the system will start the beeping warning. Default setting is disabled. This function will only with "ACPI" power management and "S3 (STR)" suspend type.

The choices : Disabled, 50℃/122℉, 53℃/127℉, 56℃/133℉, 60℃/140℉, 63℃/145℉, 66℃/151℉, 70℃/158℉.

CPU Throttle Temperature

This item allows you to set a temperature above that the system will operate in lower speed immediately. Default setting is disabled. This function will only with "ACPI" power management and "S3 (STR)" suspend type.

The choice: Disabled, 60℃/140℉, 65℃/149℉, 70℃/158℉, 75℃/167℉.

4.11 Frequency/Voltage Control

Phoenix- AwardBIOS CMOS Setup Utility
Frequency/Voltage Control

Auto Detect PCI Clk	[Enabled]	Item Help
Spread Spectrum	[Disabled]	
CPU Host/3V66/PCI Clock	[Default]	Menu Level ▶

↑↓→←: Move Enter: Select +/-/PU/PD: Value F10: Save ESC: Exit F1: General Help
F5: Previous Values F6: Fail-Safe Defaults F7: Optimized Defaults

Auto Detect PCI Clk

The choices : Disabled, Enabled,

Spread Spectrum

The choices : Disabled, Enabled,

CPU Host/3V66/PCI Clock

The choices : Default ,133/67/33MHz ,137/69/34MHz ,141/71/35MHz
145/73/36MHz, 150/75/38MHz ,155/78/39MHz , 160/80/40MHz

4.12 Default Menu

Selecting "Defaults" from the main menu shows you two options, which are described below,

Load Fail-Safe Defaults

When you press <Enter> on this item you get a confirmation dialog box with a message similar to:

Load Fail-Safe Defaults (Y/N) ? N

Pressing 'Y' loads the BIOS default values for the most stable, minimal-performance system operations.

Load Optimized Defaults

When you press <Enter> on this item you get a confirmation dialog box with a message similar to:

Load Optimized Defaults (Y/N) ? N

Pressing 'Y' loads the default values that are factory settings for optimal performance system operations.

4.13 Supervisor/User Password Setting

You can set either supervisor or user password, or both of then. The differences between are:

Set Supervisor Password: can enter and change the options of the setup menus.

Set User Password: just can only enter but do not have the right to change the options of the setup menus. When you select this function, the following message will appear at the center of the screen to assist you in creating a password.

ENTER PASSWORD

Type the password, up to eight characters in length, and press <Enter>. The password typed now will clear any previously entered password from CMOS memory. You will be asked to confirm the password. Type the password again and press <Enter>. You may also press <Esc> to abort the selection and not enter a password.

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

PASSWORD DISABLED

When a password has been enabled, you will be prompted to enter it every time you try to enter Setup. This prevents an unauthorized person from changing any part of your system configuration.

Additionally, when a password is enabled, you can also require the BIOS to request a password every time your system is rebooted. This would prevent unauthorized use of your computer.

You determine when the password is required within the BIOS Features Setup Menu and its Security option (see Section 3). If the Security option is set to "System", the password will be required both at boot and at entry to Setup. If set to "Setup", prompting only occurs when trying to enter Setup.

4.14 Exiting Selection

Save & Exit Setup

Pressing <Enter> on this item asks for confirmation:

Save to CMOS and EXIT (Y/N)? Y

Pressing "Y" stores the selections made in the menus in CMOS – a special section of memory that stays on after you turn your system off. The next time you boot your computer, the BIOS configures your system according to the Setup selections stored in CMOS. After saving the values the system is restarted again.

Exit Without Saving7

Pressing <Enter> on this item asks for confirmation:

Quit Without Saving (Y/N)? N

This allows you to exit Setup without storing in CMOS any change. The previous selections remain in effect. This exits the Setup utility and restarts your computer.

Chapter 5
Troubleshooting

This chapter provides a few useful tips to quickly get FEB-4720 running with success. As basic hardware installation has been addressed in Chapter 2, this chapter will primarily focus on system integration issues, in terms of BIOS setting, and OS diagnostics.

5.1 Hardware Quick Installation

Power Connection

Unlike most ATX standard connectors, there will have no 10x2 connector but 8 pin connector (J2 +5V and +12V power connector). Therefore, ATX power connector from power supply must connect to 20 pin to 8 pin cable first (Please see figure 5-1). Besides, FEB-4720 also needs extract +12V power to supply P4 CPU to work. Therefore, J13 must be connected (Please see figure 5-2). Besides, please be award of installation of CPU cooling Fan. Indeed, when using Intel cooling fan, we suggest to install cooling Fan first, and then memory in case cooling fan cannot be installed due to the fact that its steady is too wide.

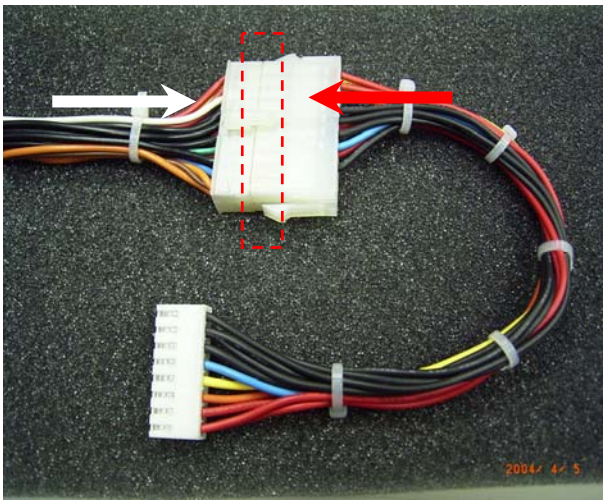


Figure 5-1

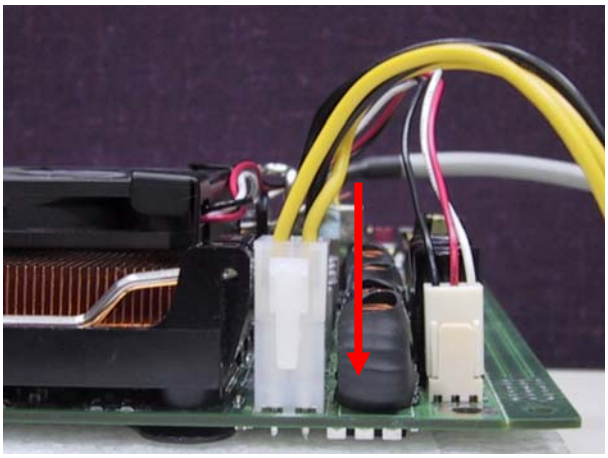


Figure 5-2

CPU Jumper Setting

Although CPU Jumper setting table is on Chapter 2, it is still possible that this setting will be neglected. Therefore, please double check this setting before powering on system. Otherwise, FEB-4720 won't be able to boot up properly.

CPU & DDR Frequency Jumper Setting (JP4: 1-2-3)

JP4: 1-2-3	Function CPU/DDR
Open-open- open	400/266★
Short-open-open	400/200
Short-short-short	400/333
Open-open-short	533/266
Open-short-short	533/333

5.2 BIOS Setting

It is assumed that users have correctly adopted modules and connected all the device cables required before turning on AT power. CPU, CPU fan, CPU fan power cable, 184-pin DDR SDRAM, keyboard, mouse, floppy drive, IDE hard disk, printer, VGA connector, device power cables, ATX accessories or 12V 4-pin power cable are good examples that deserve attention. With no assurance of properly and correctly accommodating these modules and devices, it is very possible to encounter system failures that result in malfunction of any device.

To make sure that you have a successful start with FEB-4720 , it is recommended, when going with the boot-up sequence, to hit "DEL" key and enter the BIOS setup menu to tune up a stable BIOS configuration so that you can wake up your system far well.

Loading the Default Optimal Setting

When prompted with the main setup menu, please scroll down to "**Load Optimal Defaults**", press "Enter" and "Y" to load in default optimal BIOS setup. This will force your BIOS setting back to the initial factory configuration. It is recommended to do this so you can be sure the system is running with the BIOS setting that has highly endorsed. As a matter of fact, users can load the default BIOS setting any time when system appears to be unstable in boot up sequence.

Auto Detect Hard Disks

In the BIOS => Standard CMOS setup menu, pick up any one from Primary/Secondary Master/Slave IDE ports, and press "Enter". Setup the selected IDE port and its access mode to "Auto". This will force system to automatically pick up the IDE devices that are being connected each time system boots up.

Improper Disable Operation

There are too many occasions where users disable a certain device/feature in one application through BIOS setting. These variables may not be set back to the original values when needed. These devices/features will certainly fail to be detected.

When the above conditions happen, it is strongly recommended to check the BIOS settings. Make sure certain items are set as they should be. These include the floppy drive, COM1/COM2 ports, parallel port, USB ports, external cache, on-board VGA and Ethernet.

It is also very common that users would like to disable a certain device/port to release IRQ resource. A few good examples are

Disable COM1 serial port to release IRQ #4
Disable COM2 serial port to release IRQ #3
Disable COM3 serial port to release IRQ #10
Disable COM4 serial port to release IRQ #11
Disable parallel port to release IRQ #7
Disable PS/2 mouse to release IRQ #12 ,…, etc.

A quick review of the basic IRQ mapping is given below for your reference.

IRQ#	Description
IRQ #0	System Counter
IRQ #1	Keyboard
IRQ #3	COM2
IRQ #4	COM1
IRQ #6	Floppy Disk Controller
IRQ #7	Printer Port (Parallel Port)
IRQ #8	System CMOS / Real time Clock

IRQ #9	Microsoft ACPI-Compliant System
IRQ #10	COM3
IRQ #10	COM6
IRQ #11	COM4
IRQ #11	COM5
IRQ #12	PS/2 Compatible Mouse
IRQ #15	Secondary IDE Controller
IRQ #16	USB Controller
IRQ #16	Intel® 82852/82855 GM/GME Graphics Controller
IRQ #17	Real Tek AC'97 Audio
IRQ #18	USB Controller
IRQ #19	USB Controller
IRQ #23	Intel PCI to USB Enhanced Host Controller

It is then very easy to find out which IRQ resource is ready for additional peripherals. If IRQ resource is not enough, please disable some devices listed above to release further IRQ numbers.

5.3 FAQ

Unboot Issues

Symptom : After installing CPU and cable to all power required, but why my FEB-4720 is still not working ?

Solution : First of all, you might want to double check your CPU Jumper setting first because it could be a cause resulting in failure boot of the board.

Symptom : My FEB-4720 just keeps beeping, and nothing has been shown on the screen ?

Solution : As a matter of fact, each beep sound represents different definition of error message. Therefore, please refer to the table as follow,

Beep sounds	Meaning	Action
One long beep with one short beeps	DRAM error	Change DRAM or reinstall it
One long beep constantly	DRAM error	Change DRAM or reinstall it
One long beep with two short beeps	Monitor or Display Card error	Please check Monitor connector whether it inserts properly
Beep rapidly	Power error warning	Please check Power mode setting

Information & Support

Q: I am using an ATA-66 (or 100) hard drive, how can I know that ATA-66 function is started ?

A: First of all, you need to use the 80-pin ATA-66 IDE flat cable to have this function ready. During POST, you can see ATA-66 (or 100) message while hard drive is being detected. Besides, after Microsoft series OS installation successfully, you must install ATA-66/100 driver, then the function can be active.

Q: How can I connect my FEB-4720 to LVDS panel ?

A: First of all, you need to get the pin assignments of LVDS and Inverter, and then match the pin assignment of J38 and J37 on FEB-4720 in order to make a cable to connect to LVDS and FEB-4720 .

Q: After setting up my serial port from RS-232 to RS-485, why my serial port still cannot work.

A: Unlike RS-232, RS-485's signal is differential signal. Therefore, its data must connect to same definition of pins. For example, there are only two pins in RS-485, which are DATA – and DATA +. Its connection must be "DATA – connects to DATA –", and "DATA + connects to DATA +". Otherwise, RS-485 won't be able to transfer its data.

Q: After installing Compact Flash, why the device on Secondary has been missing ?

A: As a matter of fact, the default setting for Compact Flash at secondary channel is salve. Therefore, you might want to check if your missing device is set to the same as our default setting of Compact Flash. If it is, please either set up Compact flash as master device or your missing device as master device. The jumper to adjust slave or master for compact flash is JP1.

Q: I am building the embedded system, but I cannot find embedded driver on website. Where can I get them ?

A: Indeed, for Intel Chipset, It is available on Intel website; here is hyperlink of Intel website:
http://www.intel.com/design/intarch/software/driver/index.htm . For other devices, please visit their website to download those embedded drivers. However, we will put those drivers on our website in future, and CD.

System Memory Address Map

Each On-board device in the system is assigned a set of memory addresses, which also can be identical of the device. The following table lists the system memory address used.

Memory Area	Size	Device Description
0000 – 003F	1K	Interrupt Area
0040 – 004F	0.3K	BIOS Data Area
0050 – 006F	0.5K	System Data
0070 – 04E1	17K	DOS
04E2 – 0CB9	31K	Program Area
0CBA – 9FFE	589K	[Available]
9FFF – 9FFF	0.1K	Unused
== Conventional memory ends at 640K ==		
A000 - AFFF	64K	VGA Graphics
B000 - B7FF	32K	Unused
B800 - BFFF	32K	VGA Text
C000 - CC9F	50K	Video ROM
CCA0 – CE49	6.7K	Unused
CE4A – CFFE	6.8K	High RAM
CFFF – D7FF	32K	Unused
D800 – E7FF	64K	Page Frame
D800 – D800	0.1K	Unused
E801 – EAFF	11K	High RAM
EB00 – EFFF	20K	Unused
F000 - FFFF	64K	System ROM
HMA	64K	First 64K Extended

Interrupt Request Lines (IRQ)

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

IRQ#	Current Use	Default Use
IRQ 0	SMARTDRV	System Timer
IRQ 1	SMARTDRV	Keyboard Event
IRQ 2	[Unassigned]	Usable IRQ
IRQ 3	System ROM	COM2
IRQ 4	System ROM	COM1
IRQ 5	[Unassigned]	Usable IRQ
IRQ 6	System ROM	Diskette Event
IRQ 7	Unassigned	Usable IRQ
IRQ 8	System ROM	Real-time Clock
IRQ 9	[Unassigned]	Usable IRQ
IRQ 10	[Unassigned]	Usable IRQ
IRQ 11	[Unassigned]	Usable IRQ
IRQ 12	System ROM	IBM Mouse Event
IRQ 13	System ROM	Coprocessor Error
IRQ 14	System ROM	Hard Disk Event
IRQ 15	[Unassigned]	Usable IRQ