FIR-650 Series

INTEL Processor
Embedded Board
With Ethernet, USB 2.0, Audio

User's Manual
Version 1.2

January,14, 2005

Contents

1. Introduction

Thank you for choosing FIR-C650 embedded board. FIR-C650 is a factor CPU board equipped with a low power consumption and high performance VIA EDEN processor. It is designed for system manufacturers, integrators, or VARs who want to provide quality and reliable CPU board at a reasonable price.

FIR-C650 has a built-in the ProSavage4 AGP4X VGA controller. It is a 2D/3D graphics controller, which provides resolution up to 1920x1440, and supports both CRT and LCD. The VGA controller can share 8-32MB frame buffer of system memory.

For applications requiring a high-speed serial transmission, FIR-C650 provides both USB 1.1 and USB 2.0. The high speed USB 2.0 host controller implements an ECHI interface that provides 480Mb/s bandwidth.

Both on-chip UARTs are compatible with the NS16C550. The parallel port and IDE interface are compatible with IBM PC/AT architecture.

FIR-C650 also has a built-in 10/100 Fast Ethernet LAN, which is a fully integrated 10BASE-T/100BASE-TX LAN controller with high performance and low power consumption features.

FIR-C650 uses the advanced VIA VT8606/VT82C686B Chipsets, which is 100% software compatible chipset with PCI 2.2 standard.

1.1 Specifications

CPU	INTEL processor
DMA channels	7
Interrupt levels	15
Chipset	VT8606
RTC	VT82C686B
Main memory	One 144-pin SODIMM socket supports 133Mhz SDRAM. The maximum memory is up to 512MB.
Ultra DMA 100 IDE interface	Up to four PCI Enhanced IDE hard drives are supported. The Ultra DMA 100 IDE can handle data transfer up to 100MB/s. Compatible with existing ATA IDE specifications is the best advantage, so there is no need to do any changes for users' current accessories.
Serial ports	Four RS-232 ports with 16C550 UART (or compatible) with 16-byte FIFO buffer. Support up to 115.2Kbps. The ports can be individually configured to COM1, COM2, COM3, COM4 or disabled.
Bi-directional parallel port	Configurable to LPT1, LPT2, LPT3 or disabled. Supports EPP/ECP/SPP.
Hardware monitor	Built-in to monitor power supply voltage and fan speed status.
USB 2.0/1.1 port	Supports 4 USB2.0 and 1 USB1.1 ports for future expansion.
Watchdog timer	Software programmable, reset

	generated when watchdog timer is time-out. Can use I/O Port hex 043(843) & 443 to control the watchdog.
VGA controller	Built-in ProSavage4 AGP4X 256-bit 2D/3D graphics engine. 8-32MB share Memory. Screen Resolution: up to 1920x1440.
Ethernet	Fast Ethernet controllers, IEEE 802.3u Auto-Negotiation supports 10BASE-T/100BASE-TX standard. The RJ45 connectors are located on the mounting bracket for easy connection.
Keyboard and PS/2 mouse	A 6-pin mini DIN connector is located on the mounting bracket for easy connection to a keyboard or PS/2 mouse. For alternative application, a keyboard and a PS/2 mouse pin header connector are also available on board.
Audio	AC'97 Audio CODEC
Compact flash	It can be used with a passive adapter (True IDE Mode) in a Type I/II Socket.
Power consumption	+12V @ 2.5A (max).
Operating temperature	0°-60° C

1.2 What You Have

FIR-C650's package includes the following items:

User Manual x1.

FIR-C650 Embedded Board x1.

6-pin Mini-Din converts to two 6-pin mini-Din cables for keyboard and mouse connection x1.

Driver CD x1.

If any of these items is missing or damaged, contact the dealer from whom you purchased this product. Save the shipping materials and carton in case you want to ship or store the product in the future.

2. Installation

This chapter describes how to install FIR-C650. Follow the unpacking information carefully and refer to the following diagram of FIR-C650 when necessary.

2.1 FIR-C650'S Layout
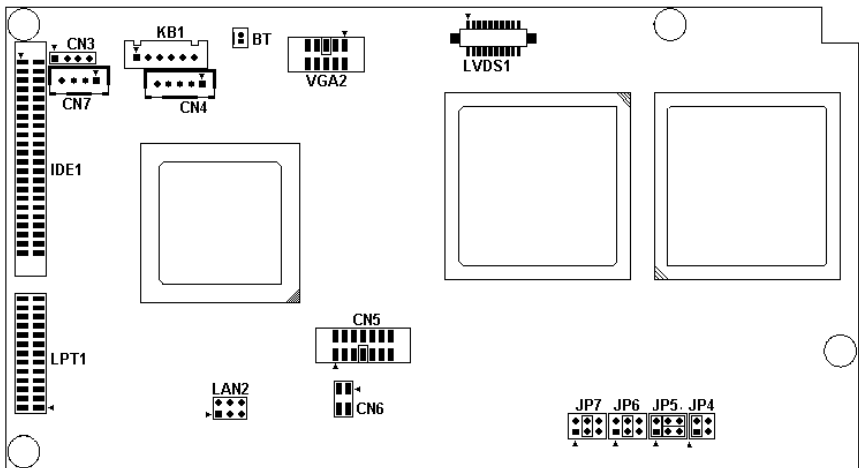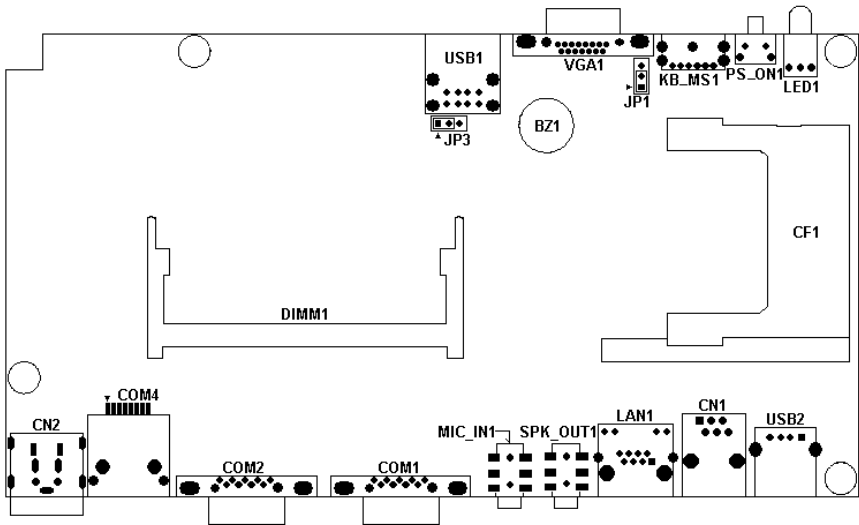
2.2 FIR-C650's Dimension (Unit: mm)
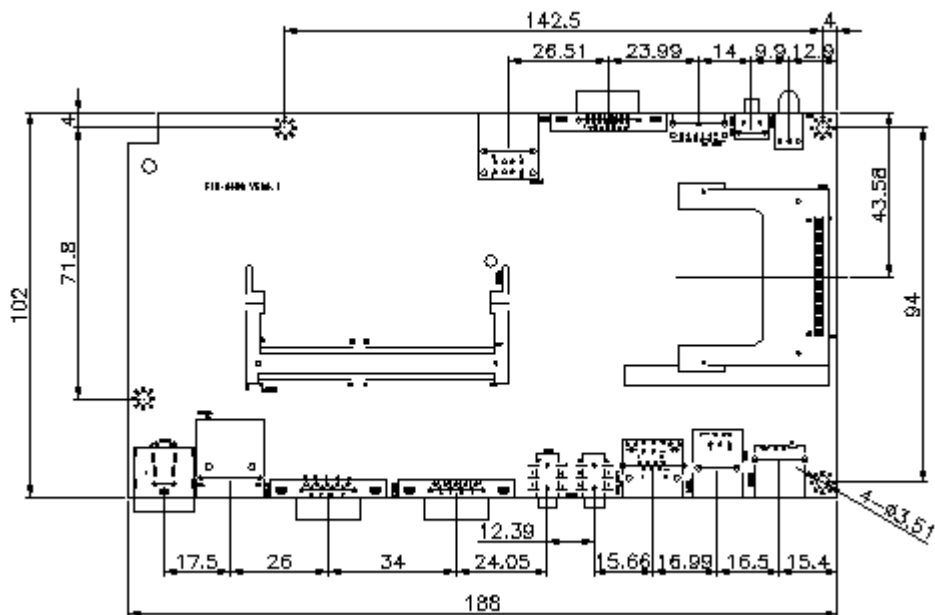
2.3 Unpacking Precautions

Some components of FIR-C650 are very sensitive to static electricity and can be damaged by a sudden rush of power. To protect it from unintended damage, be sure to follow these precautions:

- Ground yourself to remove any static charge before touching FIR-C650. You can do it by using a wrist strap connected to the ground or by frequently touching any conducting materials connected to the ground.

- Handle your FIR-C650 by its edges. Do not touch IC chips, leads or circuitry.

- Do not plug any connector or jumper when the power is on.

2.4 Clear CMOS Setup

To clear the CMOS Setup (for example, if you have forgotten the password, you should clear the CMOS and then re-set the password), you have to close the JP1 (2-3) for about 3 seconds, and then open it. This will put the system back to normal operation mode.

- **JP1: Clear CMOS Setup**

JP1	Description
1-2 (default)*	Keep CMOS Setup (Normal Operation)
Short 2-3	Clear CMOS Setup

Note: All shaded rows in the tables of this manual are the default settings for the FIR-C650.

2.5 TFT LCD Voltage Setting

- **JP3: TFT LCD Voltage (5V / 3V) Setting**

JP3	Description
Short 1–2	3V TFT LCD
Short 2–3	5V TFT LCD

2.6 COM4 Voltage Selection

- **JP4: COM4 Voltage Selection**

JP4	Description
Short 1-2	+12V
Short 3-4	+5V

2.7 COM4 Mode Selection

- **JP5: COM4 Mode Selection**

JP5	Description
Short 1-2	Short CTS-RTS
Short 3-5	+12 or +5V output
Short 4-6	Ground output

2.8 COM2 RI Function Setting

- **JP6: COM2 RI Function Setting**

JP6	Description
Short 1-2	RI is +5 Voltage output
Short 3-4	RI function
Short 5-6	RI is +12 Voltage output

2.9 COM1 RI Function Setting

- **JP7: COM1 RI Function Setting**

JP7	Description
Short 1-2	RI is +5 Voltage output
Short 3-4	**RI function**
Short 5-6	RI is +12 Voltage output

3. Connection

This chapter describes how to connect peripherals, switches and indicators to the FIR-C650 board.

Label	Function
LVDS1	LVDS LCD Panel connector
VGA1	VGA connector
VGA2	VGA connector
LAN1	LAN RJ45 connector
LAN2	LAN connector
USB1	USB dual port connector
USB2	USB port connector
COM1	Serial port connectors
COM2	Serial port connectors
COM4	Serial port connectors
KB_MS1	Keyboard & Mouse connector
KB1	Internal Keyboard connector
SPK_OUT1	Speaker out connector
MIC_IN1	MIC in connector
LPT1	Parallel port connector
IDE1	Ultra ATA100 Primary IDE connectors
CF1	Compact Flash Storage Card Type II connector
PS_ON1	Power on Switch
LED1	Power LED
CN1	Digital I/O connector
CN2	+12V DC power connector
CN3	Power LED and Power button connector
CN4	LVDS back light connector
CN5	Multi-function connector
CN6	Line out connector
CN7	Power output connector

3.1 LVDS Connector

FIR-C650 can support 1 channel (18 or 24bit) LVDS panel, which can be connected to LVDS1. The pin assignments are as follows.

- **LVDS1: LVDS LCD Connector**

PIN	Description	PIN	Description
1	LCD Vcc (+3V or +5V)	2	LCD Vcc (+3V or +5V)
3	LVDS data0 -	4	LVDS data0 +
5	GROUND	6	GROUND
7	LVDS data1 -	8	LVDS data1 +
9	GROUND	10	GROUND
11	LVDS data2 -	12	LVDS data2 +
13	GROUND	14	GROUND
15	LVDS clock -	16	LVDS clock +
17	GROUND	18	GROUND
19	LVDS data3 -	20	LVDS data3 +

3.2 VGA Connector

- **VGA1: 15-pin Female Connector**

PIN	Description	PIN	Description
1	RED	2	GREEN
3	BLUE	4	NC
5	GROUND	6	GROUND
7	GROUND	8	GROUND
9	VCC / NC	10	GROUND
11	NC	12	DDC_DAT
13	HSYNC	14	VSYNC
15	DDC_CLK		

- **VGA2: 10-pin male Connector**

PIN	Description	PIN	Description
1	RED	6	DDC_DAT
2	GREEN	7	DDC_CLK
3	BLUE	8	GROUND
4	HSYNC	9	GROUND
5	VSYNC	10	GROUND

3.3 LAN Connectors

FIR-C650 is equipped with two 10/100Mbps Ethernet controllers, which are connected to the LAN via RJ45 connectors. The pin assignments are as follows.

• **LAN1: RJ45 Connector (10/100M)**

PIN	Description	PIN	Description
1	TX+	7	N/C
2	TX-	8	N/C
3	RX+	9	Speed +
4	N/C	10	Speed -
5	N/C	11	Active/LINK +
6	RX-	12	Active/LINK -

• **LAN2: LAN Connector (10/100M)**

PIN	Description	PIN	Description
1	TX+	2	TXC
3	TX-	4	RX+
5	RXC	6	RX-

3.4 USB Port Connectors

The FIR-C650 is equipped with two USB (Version.2.0) ports and one USB (Version.1.1) port for the future new I/O bus expansion.

• **USB1: 2 ports USB Connector (USB2.0)**

PIN	Description	PIN	Description
1	VCC	5	VCC
2	DATA0-	6	DATA1-
3	DATA0+	7	DATA1+
4	GROUND	8	GROUND

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- **USB2: USB Connector (USB1.1)**

PIN	Description	PIN	Description
1	VCC	2	DATA-
3	DATA+	4	GROUND

3.5 Serial Ports

The FIR-C650 offers three high-speed NS16C550 compatible UART with 16-byte Read/Receive FIFO serial ports.

- **COM1: D-SUB Serial Port Connector**
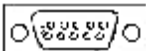
PIN	Description	PIN	Description
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RI
5	GROUND		

- **COM2: D-SUB Serial Port Connector**
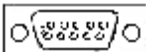
PIN	Description	PIN	Description
1	DCD	6	DSR
2	RXD	7	RTS
3	TXD	8	CTS
4	DTR	9	RI
5	GROUND		

- **COM4: RJ45 Serial Port Connector**
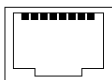
PIN	Description	PIN	Description
1	+12/+5V	2	+12/+5V or CTS
3	GROUND	4	GROUND or RTS
5	DTR	6	DSR
7	TXD	8	RXD

3.6 Keyboard/Mouse Connectors

FIR-C650 has a 6-pin DIN keyboard/mouse connector and a 5-pin keyboard connector.

● **KB_MS1: Mini-DIN Keyboard/Mouse Connector**
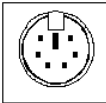
PIN	Description
1	KEYBOARD DATA
2	MOUSE DATA
3	GROUND
4	+5V
5	KEYBOARD CLOCK
6	MOUSE CLOCK

● **KB1: 6-pin Keyboard Connector**

PIN	Description
1	+5V
2	KEYBOARD CLOCK
3	PC KB CLOCK
4	KEYBOARD DATA
5	PC KB DATA
6	GROUND

3.7 Audio Connectors

The onboard AC'97 CODEC supports several audio functions. The audio connectors are described below.

● **SPK_OUT1: Speaker out connector**

PIN	Description	PIN	Description
1	NC	2	GROUND
3	Line Out (Left)	4	Speaker Out (Right)
5	NC	6	NC

● MIC_IN1: MIC-in connector

PIN	Description	PIN	Description
1	NC	2	GROUND
3	MIC In	4	NC
5	NC	6	NC

● CN6: Line-out connector (1W/Channel)

PIN	Description	PIN	Description
1	LINE Out (Left)	2	GROUND
3	LINE Out (Right)	4	GROUND

3.8 Parallel Port

Usually, a printer is connected to the parallel port. FIR-C650 includes an on-board parallel port, accessed via a 26-pin flat-cable.

● LPT1: Parallel Port Connector

PIN	Description	PIN	Description
1	STROBE#	14	AUTO FORM FEED#
2	DATA 0	15	ERROR#
3	DATA 1	16	INITIALIZE
4	DATA 2	17	LPT SELECT LN#
5	DATA 3	18	GROUND
6	DATA 4	19	GROUND
7	DATA 5	20	GROUND
8	DATA 6	21	GROUND
9	DATA 7	22	GROUND
10	ACKNOWLEDGE	23	GROUND
11	BUSY	24	GROUND
12	PAPER EMPTY	25	GROUND
13	LPT SELECT	26	NC

3.9 PCI E-IDE Disk Drive Connector

You can attach up to four IDE (Integrated Device Electronics) devices.

● **IDE1: IDE Interface Connector**

PIN	Description	PIN	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	DRQ	22	GROUND
23	IOW#	24	GROUND
25	IOR#	26	GROUND
27	CHRDY	28	REV. PULL LOW
29	DACK	30	GROUND
31	INTERRUPT	32	N/C
33	SA1	34	PD66 SELECT
35	SA0	36	SA2
37	HDC CS0#	38	HDC CS1#
39	HDD ACTIVE#	40	GROUND
41	+5V	42	+5V
43	GND	44	N/C

3.10 Compact Flash Storage Card Socket

The **FIR-C650** configures Compact Flash Storage Card in IDE Mode. This type **II** Socket is compatible with IBM Micro Drive.

- **CF1: Compact Flash Storage Card Socket pin assignment**
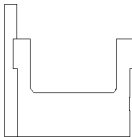
PIN	Description	PIN	Description
1	GROUND	26	PULL DOWN
2	D3	27	D11
3	D4	28	D12
4	D5	29	D13
5	D6	30	D14
6	D7	31	D15
7	CS1#	32	CS3#
8	N/C	33	N/C
9	GROUND	34	IOR#
10	N/C	35	IOW#
11	N/C	36	VCC
12	N/C	37	IRQ15
13	VCC	38	VCC
14	N/C	39	MASTER/SLAVE
15	N/C	40	N/C
16	N/C	41	RESET#
17	N/C	42	IORDY
18	A2	43	N/C
19	A1	44	VCC
20	A0	45	ACTIVE#
21	D0	46	PDIAG#
22	D1	47	D8
23	D2	48	D9
24	N/C	49	D10
25	PULL DOWN	50	GROUND

3.11 Power Button Connector

• **PS_ON1: Power Button Connector**

PIN	Description	PIN	Description
1	GROUND	2	PS_ON
3	GROUND	4	GROUND

3.12 Power LED Connector

• **LED1: Power LED Connector**

PIN	Description	PIN	Description
1	+5V	2	GROUND
3	+5V Standby		

3.13 Digital I/O Connector

• **CN1: Digital I/O Connector**

PIN	Description	PIN	Description
1	GROUND	2	DI/O OUT0
3	DI/O IN0	4	+12V
5	DI/O OUT1	6	GROUND

3.14 +12V DC Power Connector

FIR-C650 is equipped with one power connector.

• **CN2: +12V DC Power Connector**
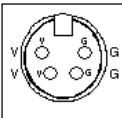
PIN	Description	PIN	Description
1	+12V	2	GROUND
3	+12V	4	GROUND

3.15 Power LED and Power button connector

•**CN3: IDE LED and Reset connector**

PIN	Description	PIN	Description
1	Power_on LED+	2	Power_off LED+
3	GROUND	4	Power_on button

3.16 LCD Back Light connector

•**CN4: LCD Back Light connector**

PIN	Description	PIN	Description
1	+12V	2	+12V
3	GROUND	4	GROUND
5	Back Light enable		

3.17 Multi-function connector

•**CN5: Multi-function connector (USB2.0 and COM3)**

PIN	Description	PIN	Description
1	+5V	2	+5V
3	USB-	4	USB-
5	USB+	6	USB+
7	GROUND	8	GROUND
9	DTR	10	CTS
11	RTS	12	TX
13	RX	14	DSR

3.18   Power output connector

Supply power for extension use.

•CN7: Power output connector

PIN	Description	PIN	Description
1	+5V	2	GROUND
3	GROUND	4	+12V

4. AMI BIOS Setup

4.1 Introduction

This manual discusses AMI Setup program built into the ROM BIOS. The Setup program allows users to modify the basic system configuration. This special information is then stored in battery-backed CMOS RAM so that it retains the Setup information when the power is turned off.

4.2 Starting Setup

The AMI BIOS is immediately activated when you first power on the computer. The BIOS reads the system information contained in the CMOS and begins the process of checking out the system and configuring it. When it finishes, the BIOS will seek an operating system on one of the disks and then launch and turn control over to the operating system.

While the BIOS is in control, the Setup program can be activated in one of two ways:

1. By pressing <Del> immediately after switching the system on, or
2. by pressing the <Del>key when the following message appears briefly at the bottom of the screen during the POST.

Press DEL to enter SETUP.

If the message disappears before you respond and you still wish to enter Setup, restart the system to try again by turning it OFF then ON or pressing the "RESET" button on the system case. You may also restart by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys. If you do not press the keys at the correct time and the system does not boot,

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an error message will be displayed and you will again be asked to…

PRESS F2 TO CONTINUE, DEL TO ENTER SETUP

4.3 Using Setup

In general, you use the arrow keys to highlight items, press <Enter> to select, use the PageUp and PageDown keys to change entries, press <F1> for help and press <Esc> to quit. The following table provides more detail about how to navigate in the Setup program using the keyboard.

Up arrow	Move to previous item
Down arrow	Move to next item
Left arrow	Move to the item in the left hand
Right arrow	Move to the item in the right hand
Esc key	Main Menu -- Quit and not save changes into CMOS Status Page Setup Menu and Option Page Setup Menu -- Exit current page and return to Main Menu
PgUp key	Increase the numeric value or make changes
PgDn key	Decrease the numeric value or make changes
+ key	Increase the numeric value or make changes
- key	Decrease the numeric value or make changes
F1 key	General help, only for Status Page Setup Menu and Option Page Setup Menu
F2 /F3 key	Change color from total 16 colors. F2 to select color forward, (Shift) F2 to select color backward
F4 key	Reserved
F5 key	Reserved
F6 key	Reserved
F7 key	Reserved
F8 key	Reserved
F9 key	Reserved
F10 key	Save all the CMOS changes, only for Main Menu

4.4 Getting Help

Press F1 to pop up a small help window that describes the appropriate keys to use and the possible selections for the highlighted item. To exit the Help Window press <Esc> or the **F1** key again.

If, after making and saving system changes with Setup, you discover that your computer no longer is able to boot, the AMI BIOS supports an override to the CMOS settings which resets your system to its defaults.

The best advice is to only alter settings which you thoroughly understand. To this end, we strongly recommend that you avoid making any changes to the chipset defaults. These defaults have been carefully chosen by both AMI and your systems manufacturer to provide the absolute maximum performance and reliability. Even a seemingly small change to the chipset setup has the potential for causing you to use the override.

4.5 Main Menu

Once you enter the AMIBIOS™ CMOS Setup Utility, the Main Menu will appear on the screen. The Main Menu allows you to select from several setup functions and two exit choices. Use the arrow keys to select among the items and press <Enter> to accept and enter the sub-menu.

```
        AMIBIOS HIFLEX SETUP UTILITY - VERSION 1.54
      (C)2001 American Megatrends, Inc. All Rights Reserved

                     Standard CMOS Setup
                     Advanced CMOS Setup
                    Advanced Chipset Setup
                    Power Management Setup
                   PCI / Plug and Play Setup
                       Peripheral Setup
                    Hardware Monitor Setup
                    Auto-Detect Hard Disks
                     Change User Password
                   Change Supervisor Password
              Auto Configuration with Optimal Settings
             Auto Configuration with Fail Safe Settings
                     Save Settings and Exit
                     Exit Without Saving


    Standard CMOS setup for changing time, date, hard disk type, etc.
             ESC:Exit  ↑↓:Sel  F2/F3:Color  F10:Save & Exit
```

Note that a brief description of each highlighted
selection appears at the bottom of the screen.
The main menu includes the following main setup
categories. Some systems may not include all
entries.

Field	Description
Standard CMOS Setup	Use this menu for basic system configuration.
Advanced CMOS Setup	Use this menu to set the Advanced Features available on your system.
Advanced Chipset Setup	Use this menu to change the values in the chipset registers and optimize your system's performance.
Power Management Setup	When Disabled, SMI will not be initialized, and complete power management functionality is removed until this option is set to

	Enabled.
PCI / Plug and Play Setup	This entry appears if your system supports PnP / PCI.
Peripheral Setup	Use this menu to specify your settings for integrated peripherals.
Hardware Monitor Setup	Use this menu to monitor your hardware.
Auto-detect Hard Disks	Use this menu to specify your settings for hard disks control.
Change Supervisor Password	Use this menu to set User and Supervisor Passwords.
Auto Configuration with Optimal Settings	Use this menu to load the BIOS default values that are factory settings for optimal performance system operations. While AMI has designed the custom BIOS to maximize performance, the factory has the right to change these defaults to meet their needs.
Auto Configuration with Fail-Safe Settings	Use this menu to load the BIOS default values for the minimal/stable performance for your system to operate.
Save Settings and Exit	Save CMOS value changes to CMOS and exit setup.
Exit Without Saving	Abandon all CMOS value changes and exit setup.

4.6 Standard CMOS Setup

The items in Standard CMOS Setup Menu are divided into 10 categories. Each category includes no, one or more than one setup items. Use the arrow keys to highlight the item and then use the <PgUp> or <PgDn> keys to select the value you want in each item.

```
                    AMIBIOS SETUP - STANDARD CMOS SETUP
               (C)2001 American Megatrends, Inc. All Rights Reserved

Date (mm/dd/yyyy): Thu Sep 30,2004                    Base Memory: 0 KB
Time (hh/mm/ss) : 10:26:26                                        0 MB


                                                  LBA  Blk  PIO  32Bit
            Type          Size    Cyln  Head WPcom Sec Mode Mode Mode Mode
Pri Master: Auto                                                    On
Pri Slave : Auto                                                    On
Sec Master: Auto                                                    On
Sec Slave : Auto                                                    On

Boot Sector Virus Protection     Disabled

Month:  Jan - Dec                                    ESC:Exit  ↑↓:Sel
  Day:   01 - 31                                      PgUp/PgDn:Modify
 Year: 1980 - 2099                                    F2/F3:Color
```

Main Menu Selections

Item	Options	Description
Date	MM DD YYYY	Set the system date
Time	HH : MM : SS	Set the system time
IDE Primary Master	Options are in its sub menu (described in Table 3)	Press <Enter> to enter the sub menu of detailed options
IDE Primary Slave	Options are in its sub menu (described in Table 3)	Press <Enter> to enter the sub menu of detailed options
IDE Secondary Master	Options are in its sub menu (described in Table 3)	Press <Enter> to enter the sub menu of detailed options

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IDE Secondary Master	Options are in its sub menu (described in Table 3)	Press <Enter> to enter the sub menu of detailed options
Drive A Drive B	None 360K, 5.25 in 1.2M, 5.25 in 720K, 3.5 in 1.44M, 3.5 in 2.88M, 3.5 in	Select the type of floppy disk drive installed in your system
Halt On	All Errors No Errors All, but Keyboard All, but Diskette All, but Disk/Key	Select the situation in which you want the BIOS to stop the POST process and notify you
Base Memory	N/A	Displays the amount of conventional memory detected during boot up
Extended Memory	N/A	Displays the amount of extended memory detected during boot up

4.7 Advanced CMOS Setup

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.

```
┌─────────────────────────────────────────────────────────────────────────┐
│                  AMIBIOS SETUP - ADVANCED CMOS SETUP                       │
│         (C)2001 American Megatrends, Inc. All Rights Reserved              │
├───────────────────────────────────────────────┬───────────────────────────┤
│ Quick Boot                         Enabled     │ Available Options:        │
│ 1st Boot Device                    Disabled    │   Disabled                │
│ 2nd Boot Device                    IDE-0       │ ▶ Enabled                 │
│ 3rd Boot Device                    CD/DVD-0    │                           │
│ Try Other Boot Devices             Yes        │                           │
│ Boot From Lan                      Disabled    │                           │
│ S.M.A.R.T. for Hard Disks          Disabled    │                           │
│ BootUp Num-Lock                    On         │                           │
│ PS/2 Mouse Support                 Enabled    │                           │
│ System Keyboard                    Absent     │                           │
│ Primary Display                    VGA/EGA    │                           │
│ Password Check                     Setup      │                           │
│ Boot To OS/2                       No         │                           │
│ L1 Cache                           Enabled    │                           │
│ L2 Cache                           Enabled    │                           │
│ System BIOS Cacheable              Enabled    │                           │
│ C000,32k Shadow                    Cached     │                           │
│ C800,16k Shadow                    Disabled    │                           │
│ CC00,16k Shadow                    Disabled    │                           │
│ D000,16k Shadow                    Disabled    │ ESC:Exit   ↑↓:Sel         │
│ D400,16k Shadow                    Disabled    │ PgUp/PgDn:Modify          │
│ D800,16k Shadow                    Disabled    │ F2/F3:Color               │
│ DC00,16k Shadow                    Disabled  ▼ │                           │
└───────────────────────────────────────────────┴───────────────────────────┘
```

Quick Boot
 When set to enabled, DRAM testing function will
disable.

1st /2nd /3rd Boot Device
This option sets the type of device for the first boot
drives that the AMIBIOS attempts to boot from after
AMIBIOS POST completes. The settings are Disabled,
IDE-0, IDE-1, IDE-2, IDE-3, Floppy, ARMD-FDD, ARMD-
HDD, CDROM, SCSI.

Try Other Boot Devices
Set this option to Yes to instruct AMIBIOS to attempt to
boot from any other drive in the system if it cannot find
a boot drive among the drives specified in the 1st Boot
Device, 2nd Boot Device, 3rd Boot Device, 4th Boot
Device options. The settings are Yes or No.

Boot From LAN
This option is enable boot from LAN function.

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Hard Disk Access Control
This option specifies the read/write access that is set when booting from a hard disk drive. The settings are Read/Write or Read-Only.

S.M.A.R.T. for Hard Disks
Self-Monitoring, Analysis and Reporting Technology. This option can help BIOS to warn the user of the possible device failure and give user a chance to back up the device before actual failure happens. The settings are Disabled, Enabled.

Boot Up Num-Lock
When On, this option turns off Num Lock when the system is powered on so the end user can use the arrow keys on both the numeric keypad and the keyboard.

PS/2 Mouse Support
When this option is enabled, BIOS support a PS/2- type mouse.

System Keyboard
This option does not specify if a keyboard is attached to the computer. Rather, it specifies if error messages are displayed if a keyboard is not attached. This option enables you to configure workstation with no keyboard. The settings are Absent, Present.

Primary Display
Select this option to configure the type of monitor attached to the computer. The settings are Monochrome, Color 40x25,Color 80x25,VGA/PGA/EGA ,or Not Install.

Password Check
This option enables the password check option every time the system boots or the end user runs Setup. If always is chosen a user password prompt appears

every time the computer is tuned on. If setup is chosen, the password prompt appears if BIOS is executed.

Boot To OS/2
Set this option to Enabled if running OS/2 operating system and using more than 64MB of system memory on the motherboard. The settings are YES or NO.

L1 Cache
The option enabled or disabled the internal cache memory in the processor.

L2 Cache
The option enables secondary cache memory. If Enabled is selected, external cache memory is enabled. If disabled is select, external cache memory is disabled.

System BIOS Cacheable
When this option is set to enabled, the System ROM area from F0000-FFFFF is copied (shadowed) to RAM for faster execution.

C000, 32k Shadow
When this option is set to enabled, the Video ROM area from C0000-C7FFF is copied (shadowed) to RAM for faster execution.
Disabled: The contents of the video ROM are not copied to RAM.
Cached : The contents of the video ROM area from C0000h - C7FFFh are copied from ROM to RAM and can be written to or read from cache memory. Enabled: The contents of the video ROM area from C0000h - C7FFFh are copied (shadowed) from ROM to RAM for faster execution.

C800, 16k Shadow
 These options enable shadowing of the contents of the ROM area named in the option title. The settings are

Enable Disable, Cached. The ROM area that is not used by ISA adapter cards will be allocated to PCI adapter cards.000,32k Shadow.

CC00, 16k Shadow
These options enable shadowing of the contents of the ROM area named in the option title. The settings are Enable Disable, Cached. The ROM area that is not used by ISA adapter cards will be allocated to PCI adapter cards.800,16k Shadow.

D000, 16k Shadow
These options enable shadowing of the contents of the ROM area named in the option title. The settings are Enable Disable, Cached. The ROM area that is not used by ISA adapter cards will be allocated to PCI adapter cards.C00,16k Shadow.

D400,16k Shadow
These options enable shadowing of the contents of the ROM area named in the option title. The settings are Enable Disable, Cached. The ROM area that is not used by ISA adapter cards will be allocated to PCI adapter cards.000,16k Shadow.

D800, 16k Shadow
These options enable shadowing of the contents of the ROM area named in the option title. The settings are Enable Disable, Cached. The ROM area that is not used by ISA adapter cards will be allocated to PCI adapter cards.400,16k Shadow.

DC00,16k Shadow
These options enable shadowing of the contents of the ROM area named in the option title. The settings are Enable Disable, Cached. ISA adapter cards will be allocated to PCI adapter cards.800,16k Shadow.

4.8 Advanced Chipset Setup

```
                    AMIBIOS SETUP - ADVANCED CHIPSET SETUP
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  ******** DRAM Timing ********                          Available Options:
  Configure SDRAM Timing by SPD        Enabled             Disabled
    DRAM Frequency                     133Mhz           ▶ Enabled
    SDRAM CAS# Latency                 3

  Memory Hole                          Disabled
  AGP Aperture Size                    64MB
  Spread Spectrum Control              Disabled
  USB Controller                       All USB Port
  USB Device Legacy Support            All Device
  DIO Address                          280




                                                        ESC:Exit  ↑↓:Sel
                                                        PgUp/PgDn:Modify
                                                        F2/F3:Color
```

This section enables you to configure the system
based on the specific features of the installed chipset.
This chipset manages bus speeds and access to
system memory resources, such as DRAM 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.

DRAM Frequency
This setting decided by Memory frequency.
SDRAM CAS# Latency
This setting decided by Memory CAS latency.

AGP Aperture Size

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Select the size of AGP aperture. The aperture is a portion of the PCI
Memory address space. Host cycles that hit the aperture range are
 forwarded to the AGP without any translation.

USB Controller
Select enable if your system contains a USB controller and you have USB Peripherals.

USB Device Legacy support
Enable or Disable for USB device legacy support.

DIO Address
This option is select DIO address for 200,220,240,260,280.

4.9 Power Management Setup

```
         AMIBIOS SETUP - POWER MANAGEMENT SETUP
     (C)2001 American Megatrends, Inc. All Rights Reserved
┌──────────────────────────────────────────┬──────────────────┐
│ ACPI Aware O/S                Yes          │ Available Options:│
│ ACPI Standby State            S1/POS       │   No             │
│ Re-Call VGA BIOS at S3 Resuming Enabled    │ ▶ Yes            │
│ Power Management/APM           Enabled      │                  │
│ Video Power Down Mode          Disabled     │                  │
│ Hard Disk Power Down Mode      Disabled     │                  │
│ Standby Time Out (Minute)      Disabled     │                  │
│ Suspend Time Out (Minute)      Disabled     │                  │
│ Throttle Slow Clock Ratio      50%-56.25%   │                  │
│ Display Activity               Ignore       │                  │
│ IRQ3                           Monitor      │                  │
│ IRQ4                           Monitor      │                  │
│ IRQ5                           Ignore       │                  │
│ IRQ7                           Monitor      │                  │
│ IRQ9                           Ignore       │                  │
│ IRQ10                          Ignore       │                  │
│ IRQ11                          Ignore       │                  │
│ IRQ13                          Ignore       │ ESC:Exit  ↑↓:Sel │
│ IRQ14                          Monitor      │ PgUp/PgDn:Modify │
│ IRQ15                          Ignore       │                  │
│ Power Button Function          On/Off       │                  │
│ Restore on AC/Power Loss       Last State   │ ESC:Exit  ↑↓:Sel │
│ Resume On Ring/LAN             Disabled     │ PgUp/PgDn:Modify │
│ Power Type Select              ATX          │ F2/F3:Color      │
└──────────────────────────────────────────┴──────────────────┘
```

ACPI Aware O/S
This feature is switch of ACPI function.
Configuration options: [Yes]; [No].

ACPI Standby State
This feature is switch of POS (S1) function.
Configuration options: [S1/POS].

Power Management/APM
When Disabled, SMI will not be initialized, and
complete power management functionality is
removed until this option is set to Enabled.

Video Power Down Mode
Video power down when system is in Suspend mode.
Video power down when system is in Standby mode.

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Hard Disk Power Down Mode
Heard Disk power down when system is in Suspend
mode.
Heard Disk power down when system is in Standby
mode.

Suspend Time Out
If no activity occurs during this period, BIOS will
adjust the power state of the system to the suspend
low. The "Standby Time Out" period must expire
first (if enabled) before this time out period begins.

IRQ3, 4, 5, 7, 9, 10, 11, 13, 14, 15
As Individual IRQ Wake Up Events.

Power Button Function
On/Off allows the system to switch off immediately
the power button is pressed. Suspend allows the
system to Suspend immediately the power button is
pressed.

Resume on Ring/LAN
Allow the system to wake up in response to a Ring
Indicator signal from
external modem. Wake up on LAN enables remote
booting of a PC via a network even if it is shut down.
Power Type Select
This option is select Power Type for AT or ATX.

4.10 PCI / Plug and Play Setup

```
              AMIBIOS SETUP - PCI / PLUG AND PLAY SETUP
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 ┌───────────────────────────────────────────────┬──────────────────────┐
 │ Plug and Play Aware O/S          No            │ Available Options:   │
 │ Clear NVRAM                      No            │ ► No                 │
 │ OnChip VGA Frame Buffer Size     8MB           │   Yes                │
 │ PCI Latency Timer (PCI Clocks)   32            │                      │
 │ Boot Screen Select               Auto          │                      │
 │ TV Out Type                      U.S. NTSC     │                      │
 │ LCD Panel Type                   1 800x600 TFT │                      │
 │ Allocate IRQ to PCI VGA          Yes           │                      │
 │ PCI Slot1 IRQ Priority           Auto          │                      │
 │ PCI Slot2 IRQ Priority           Auto          │                      │
 │ PCI Slot3 IRQ Priority           Auto          │                      │
 │ PCI Slot4 IRQ Priority           Auto          │                      │
 │ DMA Channel 0                    PnP           │                      │
 │ DMA Channel 1                    PnP           │                      │
 │ DMA Channel 3                    PnP           │                      │
 │ DMA Channel 5                    PnP           │                      │
 │ DMA Channel 6                    PnP           │                      │
 │ DMA Channel 7                    PnP           │ ESC:Exit  ↑↓:Sel     │
 │ IRQ3                             PCI/PnP       │                      │
 │ IRQ4                             PCI/PnP       │                      │
 │ IRQ5                             PCI/PnP       │                      │
 │ IRQ7                             PCI/PnP       │                      │
 │ IRQ9                             PCI/PnP       │                      │
 │ IRQ10                            PCI/PnP       │                      │
 │ IRQ11                            PCI/PnP       │ ESC:Exit  ↑↓:Sel     │
 │ IRQ14                            PCI/PnP       │ PgUp/PgDn:Modify     │
 │ IRQ15                            PCI/PnP       │ F2/F3:Color          │
 └───────────────────────────────────────────────┴──────────────────────┘
```

Plug and Play Aware O/S
If enable, BIOS will configure only PnP ISA boot
devices(i.e. all PnP ISA cards which has boot flag
set). And PnP aware OS will configure all other
devices. If disable, BIOS will configure all devices.

Clear NVRAM
When this option is set to Yes, system can auto
clear NVRAM. The settings are Yes and No.

On Chip VGA Frame Buffer Size
This option is select frame buffer size (2~32MB)
for VGA.

PCI Latency Timer (PCI Clocks)
 This option specifies the latency timings(in PCI

clocks) for PCI devices installed in the PCI expansion slots. The settings are 32, 64, 96, 128, 160 , 192, 224, or 248.

Boot Screen Select
This option is select Boot Screen from CRT or LCD or TV out. Select CRT+LCD or CRT+TV is Boot from CRT and LCD or CRT and TV.

LCD Panel Type
This option is select LCD Panel type.

Allocate IRQ to PCI VGA
 Set this option to Yes to allocate an IRQ to the VGA device on the PCI bus. The settings are Yes or No.

PCI Slot1 / Slot2 / Slot3 / Slot4 IRQ Priority
 The option specify the IRQ priority for PCI device installed in the PCI expansion slot. The settings are Auto, (IRQ) 3, 4, 5, 7, 9, 10, and 11, in priority order.

DMA Channel 0 , 1 , 3 , 5 , 6 , 7
 The option allow you to specify the bus type used by each DMA channel. The settings are PnP or ISA/EISA.

IRQ3 , 4 , 5 , 7 , 9, 10, 11, 14, 15
 The option specify the bus that the specified IRQ line is used on. The option allow you to reserve IRQs for legacy ISA adapter cards. The option determine if AMIBIOS should remove an IRQ from the pool of available IRQs passed to devices that are configurable by the system BIOS. The available IRQ pool is determined by reading the ESCD NVRAM. If more IRQs must be removed from the pool, the end user can use the option to reserve the IRQ by assigning an ISA/EISA setting

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to it. Onboard I/O is configured by AMIBIOS. All IRQs used by onboard I/O are configured as PCI/PnP.

4.11 Peripheral Setup

The Peripheral 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.

```
                AMIBIOS SETUP - PERIPHERAL SETUP
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OnBoard Serial Port1(IRQ4)      3F8/COM1      Available Options:
OnBoard Serial Port2(IRQ3)      2F8/COM2        Disabled
  Serial Port2 Mode             Normal        ▶ 3F8/COM1
    Duplex Mode                 N/A             2F8/COM2
OnBoard Parallel Port           378             3E8/COM3
  Parallel Port Mode            Normal          2E8/COM4
  EPP Version                   N/A
  Parallel Port DMA Channel     N/A
  Parallel Port IRQ             7
OnBoard Serial Port3            3E8/COM3
  Serial Port3 IRQ              10
OnBoard Serial Port4            2E8/COM4
  Serial Port4 IRQ              11
OnBoard IDE                     Both
OnBoard AC'97 Audio             Enabled

                                              ESC:Exit  ↑↓:Sel
                                              PgUp/PgDn:Modify
                                              F2/F3:Color
```

OnBoard Serial Port 1/Port 2/Port 3/Port4
This option specifies the base I/O port address of serial port 1. The settings are Auto (AMIBIOS automatically determines the correct base I/O port address), Disabled, 3F8h, 2F8h, 2E8h, or 3E8h.

OnBoard Parallel Port
This option specifies the base I/O port address of parallel port on the motherboard. The settings are Disabled, 378h, 278h, or 3BCh.

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Parallel Port Mode
This option specifies the parallel port mode. The settings are Normal, Bi-Dir, EPP, ECP. Normal: The normal parallel port mode is used. Bi-Dir :Use this setting to support bi-directional transfers on the parallel port.
 EPP: The parallel port can be used with devices that adhere to the Enhanced Parallel Port(EPP) specification. EPP uses the existing parallel port signals to provide asymmetric bi-directional data transfer driven by the host device.
 ECP: The parallel port can be used with devices that adhere to the Entended Capabilities Port(ECP) specification. ECP uses the DMA protocol to achieve data transfer rates up to 2.5 Megabits per second. ECP providessymmetric bi-directional communication.

EPP Version
 EPP data or address read cycle 1.9 or 1.7

Parallel Port IRQ
This option specifies the IRQ used by the parallel port. The settings are Auto , (IRQ)5, (IRQ)7.
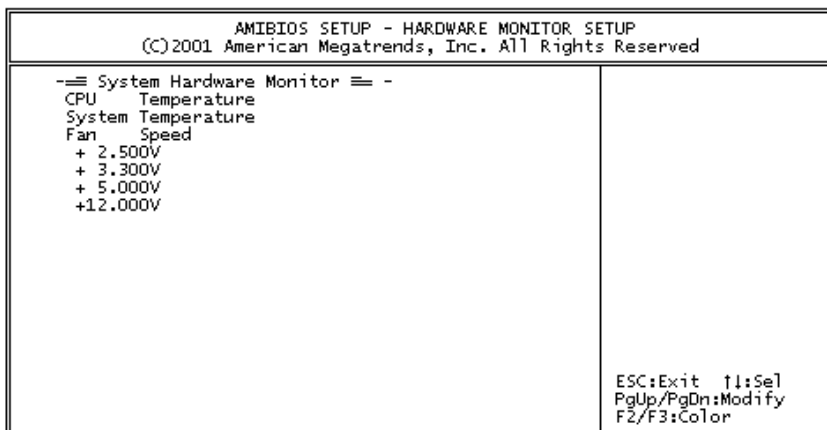
Parallel Port DMA Channel
 This option is only available if the setting for the Parallel Port Mode option is ECP. This option sets the DMA channel used by the parallel port. The settings are DMA Channel 0, 1, or 3.

On Board AC'97 Audio
Enable or Disable AC'97 Audio Function.

4.12 Hardware Monitor Setup

```
              AMIBIOS SETUP - HARDWARE MONITOR SETUP
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 -=≡ System Hardware Monitor ≡ -
 CPU    Temperature
 System Temperature
 Fan    Speed
  + 2.500V
  + 3.300V
  + 5.000V
  +12.000V




                                              ESC:Exit  ↑↓:Sel
                                              PgUp/PgDn:Modify
                                              F2/F3:Color
```

4.13 Change Supervisor Password

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

Supervisor password:
Users can change the options of the setup menus.

User password:
Users do not have the right to change the
options of the setup menus. When you select this
    function, the following message will appear
for you to create a password.

ENTER PASSWORD:
Type a password of up to eight characters in
length and press Enter. Confirm the password by
entering it again and press Enter. Previous
password in CMOS memory will be cleared once a

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new password is created. To abort, press Esc.
When a password is enabled, you will be
prompted to enter it every time you enter Setup.
This prevents an unauthorized party from
changing any part of the system configuration.
You can also require BIOS to request a password
every time your system is rebooted. This would
prevent unauthorized use of your computer.
You can determine when the password is required
in the BIOS Features Setup Menu and its Security
option.

PASSWORD ENABLED/DISABLED:
To disable a password, press Enter when you are
prompted to enter the password. Then confirm
the selection. Once the password is disabled, the
system will restart and you can enter Setup freely.

Appendix A: Watchdog Timer

The Watchdog Timer is a device to ensure that standalone systems can always recover from abnormal conditions that cause the system to crash.   These conditions may result from an external EMI or a software bug. When the system stops working, hardware on the board will perform hardware reset (cold boot) to bring the system back to a known state. Three I/O ports control the operation of Watchdog Timer.

443 (hex)	Write	Set Watchdog Time period
443 (hex)	Read	Enable the Watchdog Timer
043/843 (hex)	Read	Disable the Watchdog Timer

Prior to enable the Watchdog Timer, user has to set the time-out period. The resolution of the timer is 1 second and the range of the timer is from 1 sec to 255 sec. You need to send the time-out value to the I/O port−443H, and then enable it by reading data from the same I/O port−443H. This will activate the timer that will eventually time out and reset the CPU board. To ensure that this reset condition will not occur, the Watchdog Timer must be periodically refreshed by reading the same I/O port 443H. This must be done within the time-out period that is set by the software, please refer to the example program. Finally, we have to disable the Watchdog timer by reading the I/O port—843H or 043H. Otherwise the system could reset unconditionally.

A tolerance of at least 5% must be maintained to avoid unknown routines in the operating system (DOS), such as disk I/O that can be very time-consuming. For example, if the time-out period has been set to 10 seconds, the I/O port 443H must be read within 7 seconds.

Example assembly program:

```
TIMER_PORT   =  443H
TIMER_START  =  443H
TIMER_STOP   =  843H
;;INITIAL TIMER COUNTER

MOV DX, TIMER_PORT
MOV AL, 8    ;;8 seconds
OUT DX, AL
MOV DX, TIMER_START
IN AL, DX.    ;;START COUNTER
W_LOOP:
MOV DX, TIMER_STOP
IN AL, DX
MOV DX, TIMER_START
IN AL, DX        ;;RESTART COUNTER
;;ADD YOUR APPLICATION HERE

CMP EXIT_AP, 0
JNE W_LOOP
MOV DX, TIMER_STOP
IN AL, DX
;;EXIT AP
```

Appendix B: I/O Address Map

- **I/O Address Map**

I/O Address Map	Description
000-01F	DMA Controller #1
020-021	Interrupt Controller # 1, Master
040-05F	System Timer
060-06F	Standard 101/102 keyboard Controller
070-07F	Real time Clock, NMI Controller
080-0BF	DMA Page Register
0A0-0BF	Interrupt Controller # 2
0C0-0DF	DMA Controller # 2
0F0-0F0	Clear Math Coprocessor Busy
0F1-0F1	Reset Math Coprocessor
0F8-0FF	Math Coprocessor
170-1F7	BUS Master PCI IDE Controller
278-27F	Parallel Printer Port 2
2E8-2EF	Serial Port 4
2F8-2FF	Serial Port 2
376-376	BUS Master PCI IDE Controller
378-37F	Parallel Printer Port 1
3B0-3DF	AGP Graphic Adapter
3E8-3EF	Serial Port 3
3F0-3F7	Floppy Disk Controller
3F8-3FF	Serial Port 1
443	Watchdog timer enable
480-48F	PCI BUS
843/043	Watchdog timer disable

1st MB Memory Address Map

Memory address	Description
00000-9FFFF	SYSTEM MEMORY
A0000-BFFFF	VGA BUFFER
C0000-CFFFF	VGA BIOS
E0000-FFFFF	SYSTEM BIOS
100000	EXTEND MEMORY

IRQ Mapping Chart

IRQ0	System Timer	IRQ8	RTC CMOS clock
IRQ1	Keyboard	IRQ9	ACPI STEERING
IRQ2	IRQ Controller	IRQ10	COM3
IRQ3	COM2	IRQ11	COM4
IRQ4	COM1	IRQ12	PS/2 mouse
IRQ5	USB	IRQ13	FPU
IRQ6	FDC	IRQ14	Primary IDE
IRQ7	Printer	IRQ15	Secondary IDE

DMA Channel Assignment

Channel	Function
0	Available
1	Available
2	Floppy disk
3	Available
4	Cascade for DMA controller 1
5	Available
6	Available
7	Available

Appendix C: How to use Wake-Up

Function

FIR-C650 provides two kinds of Wake-up function. This page describes how to use Modem Wake-Up and LAN Wake-Up functions. Wake-Up function only works with ATX power supply.

Wake-Up On Modem(Ring):

You must set the option **Wake-Up On LAN/Ring** of CMOS SETUP to be enabled. ATX power supply will be switched on when there is a ring signal detected on pin "RI" of serial port.

Wake-Up On LAN:

When your computer is in power-down status, you can see LAN Link/Active LED is flashing. This status indicates that the LAN chip has entered standby mode and waits for Wake-Up signal. You can use other computers to wake up yours by sending ID to it.

ID: ID is the MAC address of your system LAN. Every LAN chip has a factory-set ID, which you can find it from network information in WINDOWS.

　　ID's format is xxxxxxxxxxxx
　　Example ID: 009027388320

Appendix D: Digital I/O

FIR-C650's digital I/O supports 1-bit IN and 2-bit OUT

Digital I/O Address:

. **Read port 280 : Digital Input**

Bit	Value
0	0 – 1

. **Write port 280 : Digital Output**

Bit	Value
0 – 1	0 – 3

Digital Input specifications
Logic 0 Level :   +0V
Logic 1 Level :   +4V Min

Digital Output specifications:
Output Level :   +0V   (Software function active value 0)
Output Level :   +12V   (Software function active value 1)
Output Current :   700mA Max (per channel)