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IPC Solution

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Embedded System
Low-Power Series
FB2651 User's Manual

August 2005
Version: 1.0
Part Number: FB2651

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If your board requires servicing, contact the dealer from whom you purchased the product for service information. You can help assure efficient servicing of your product by following these guidelines:

- ❑ A list of your name, address, telephone, facsimile number, or email address where you may be reached during the day
- ❑ Description of you peripheral attachments
- ❑ Description of your software (operating system, version, application software, etc.) and BIOS configuration
- ❑ Description of the symptoms (Extract wording any message)

For updated BIOS, drivers, manuals, or product information, please visit us at www.fabiatech.com

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Chapter 1 Introducing the FB2651 System

Overview

The FB2651 is a compact size embedded system with VIA –Eden low-power CPU board inside. This user’s manual provides information on the physical features, installation, and BIOS setup of the FB2651.

Built to unleash the total potential of the VIA Processor, Able to support 400Mhz~1GHz CPUs, this system supports five 10/100M Base–TX and one 10/100/1000 Base–TX LAN ports, 256MB SDRAM, mini PCI socket for wireless LAN, Two USB1.1 ports, and a VGA controller.

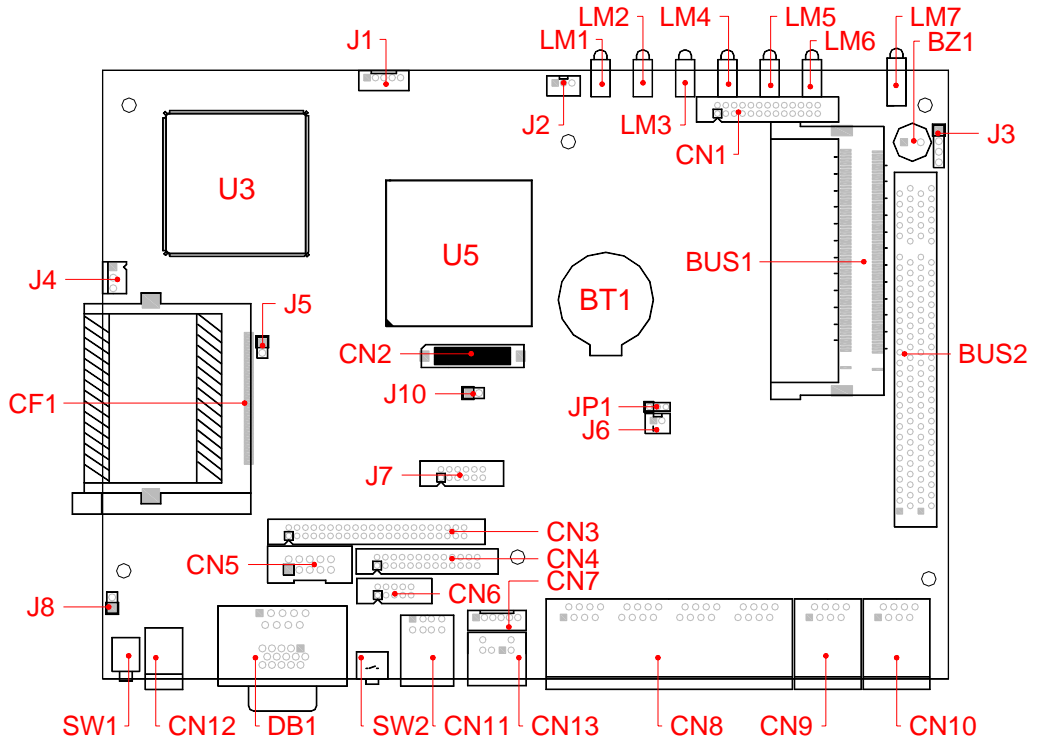
Each FB2651 has one port for I/O communication. One RS-232C port is available.

The FB2651 is perfect for Internet Router, VPN Gateway, firewall, Mail Server and small Embedded Control. The unit is only 146.0mm(D) X 203.0mm(W) (5.75" x 8").

Series Comparison Table

Model	FB2651
Processor	VIA Eden1GHz
Chipset	VIA8601t
1So-DIMM(Max.)	512MB
CRT	One
Watchdog Timer	Yes
Multi I/O	One RS232
Enhanced IDE or CF	One
USB 1.1	Two
RJ45 ports (100Mbps/1Gbps)	Five/ One
Mini-PCI Socket	One
Audio Function (Optional)	Micro Phone/Speaker
Dimensions (Unit: mm)	162(D) x 240(W) X 44(H)

Layout



Specifications

- Low Power VIA Eden 1GHz CPU.
- Internal 64KB or above L2 cache inside the CPU's.
- Support CRT with 2MB to 8MB share memory.
- One 144 -pin So-DIMM Memory Socket for up to 512MB SDRAM
- Support AC97 signals for Audio IO
- Support five 10/100 base-TX and One 10/100/1000 Base-TX Ethernet ports with RJ45 connector. (Supports By Pass (transparent) function).
- One PCI IDE interface and one type Compact flash socket.
- One PCI device slot and one m-PCI socket for wireless applications.
- One PS/2 compatible keyboard and mouse interfaces.
- One RS232 Port with DB9 and one Parallel port connector.
- Support two USB ports.
- One user defined push bottom switch.
- Supports two Input/Output TTL
- One power LED, One HDD/CF access LED, One User defined status LED and twelve LAN LED's.
- One DC-In plug connector with power switch.
- DC +12V~24V with 20% tolerance, 25VA maximum.
- 5.25" disk size 146.0mm(D) x 203.0mm(W) (5.75" x 8.0").

Packing List

Upon receiving the package, verify the following things. Should any of the mentioned happens, contact us for immediate service.

- Unpack and inspect the FB2651 package for possible damage that may occur during the delivery process.
- Verify the accessories in the package according to the packing list and see if there is anything missing or incorrect package is included.
- If the cable(s) you use to install the FB2651 is not supplied from us, please make sure the specification of the cable(s) is compatible with the FB2651 system.

Note: after you install the FB2651, it is recommended that you keep the diskette or CD that contains drivers and document files, and keep the document copies, or unused cables in the carton for future use.

The following lists the accessories that may be included in your FB2651 package. Some accessories are optional items that are only shipped upon order.

- One FB2651 embedded board.
- One 44-pin 2.5' hard disk cable and One Parallel port adapter cable.
- One Audio adapter board FB4641 with cable. (Optional)
- One AC to DC24V power adapter and 1 AC power code cable.
- One Y-type (3-terminal) PS/2 keyboard plus mouse port adapter cable.
- One compact disc includes software utility.

Chapter 2 Hardware Installation

This chapter introduces the system connectors & jumper settings, and guides you to apply them for field application.

Before Installation

Before you install the system board, make sure you follow the following descriptions.

1. Before removing the board from its anti-static bag, wear an anti-static strap to prevent the generation of Electricity Static Discharge (ESD). The ESD may be created from human body that touches the board. It may do damage to the board circuit.
2. Install or unplug any connector, module, or add-on card, be sure that the power is disconnected from the system board. If not, this may damage the system board components, module, or the add-on-card.
3. Installing a heat sink and cooling fan is necessary for heat dissipation from your CPU. If heat sink or cooling fan is not mounted, this may cause the CPU fail due to over-heating problem.
4. When you connect the connectors and memory modules, be careful with the pin orientations.

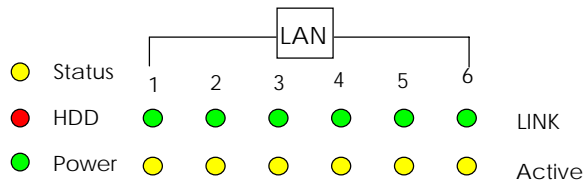
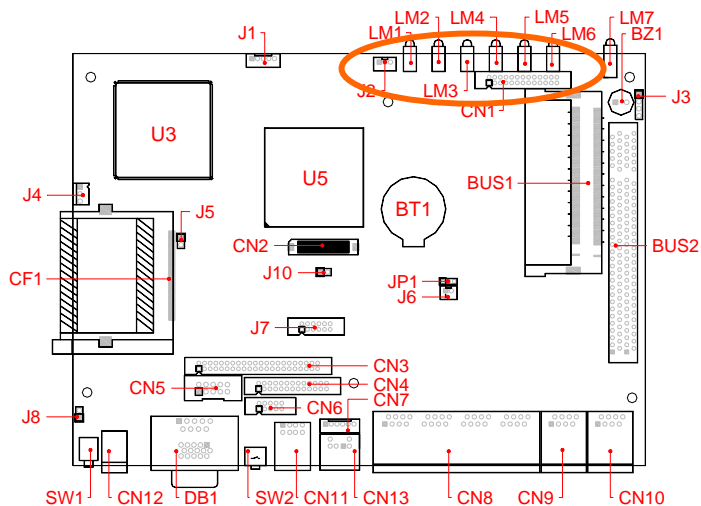
Hardware Features

The following lists the connectors and jumpers to install the FB2651.

Item	Description
CN1	Aux, LAN LEDs connector (26 pin)
CN2	LCD Connector with LVDS signals (Reserved for VT8606 VGA Chipset)
CN3	44-pin 2.0mm IDE hard disk connector
CN4	26-pin for Parallel port connector
CN5	10-pin Aux. COM1 Connector (Reserved)
CN6	10-pin Aux. CRT Connector (Reserved)
CN7	6-pin Aux. KB/MS connector (Reserved)
CN8, CN9, CN10	RJ45-LAN ports connector
CN11	USB ports connector
CN12	DC-Power Jack
CN13	Keyboard and Mouse connector
J1	5-pin for TTL I/O
J2`	3-pin Internal RS-232 Connector (Reserved)
BZ1 & J3	Onboard Buzzer and 5 pin for external speaker Header
J4	3-pin for case/CPU cooling fan
J5	2-pin for temperature sensor Header
J6	2-pin Reserved and away close
J7	12-pin connector for provides AC97 signals for Audio
J8	2-pin for disable power switch
J9	4-Pin for power connector (option)
J10	2-pin for System Reset
JP1	Clear CMOS data header
LM1~LM7	Power/HDD/User define/LAN1~LAN6 Indicator LED's
SW2	User Defined Push Button switch
DB1	VGA Connector with DB15 and RS232 9-pin D - type male connector
CF1	Compact Flash Socket (TYPE-II)
BUS1	Mini-PCI Socket
BUS2	PCI Slot
DIMM1	148-Pin DIMM Socket for SDRAM

□ **LM1~LM7: LED Indicators**

The Power/Watchdog LED, HDD LED and Status LED's has two distinctive status: Off for inactive operation and blinking light for activity. And the 12 LED's for LAN ports. The down side LED (Yellow) indicates data is being accessed and the up side LED's (Green) indicates on-line status. (On indicates on-line and off indicates off-line)



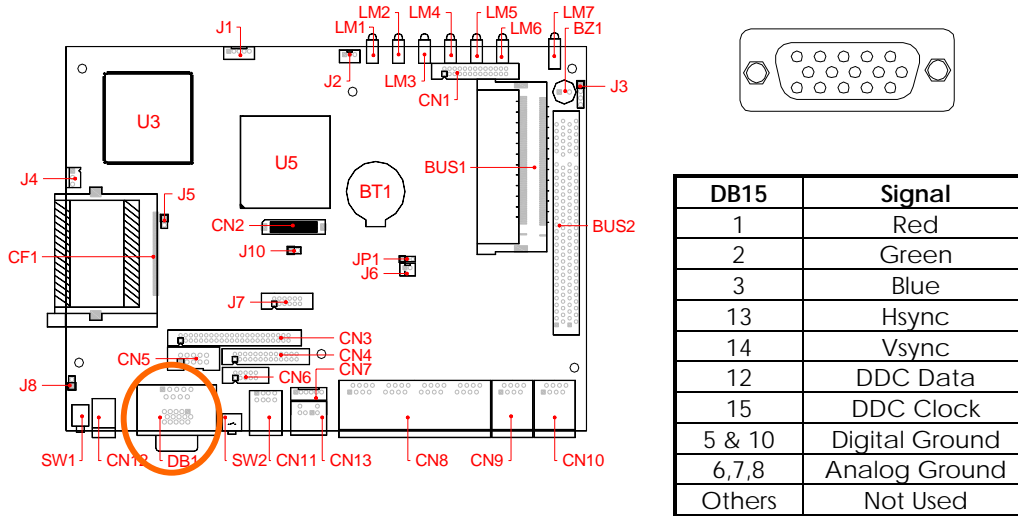
Note: Status LED – The I/O port 84Dh and 84Fh can defined the status LED to Light/Blinking/Flash Status.

I/O Port	84Dh	84Fh
Bit Location	Bit 4	Bit 4
Blinking	1	X
Light	0	1
Flash	0	0

□ **DB1 (DB-15) & CN13: Connecting the CRT Monitor, Keyboard and Mouse**

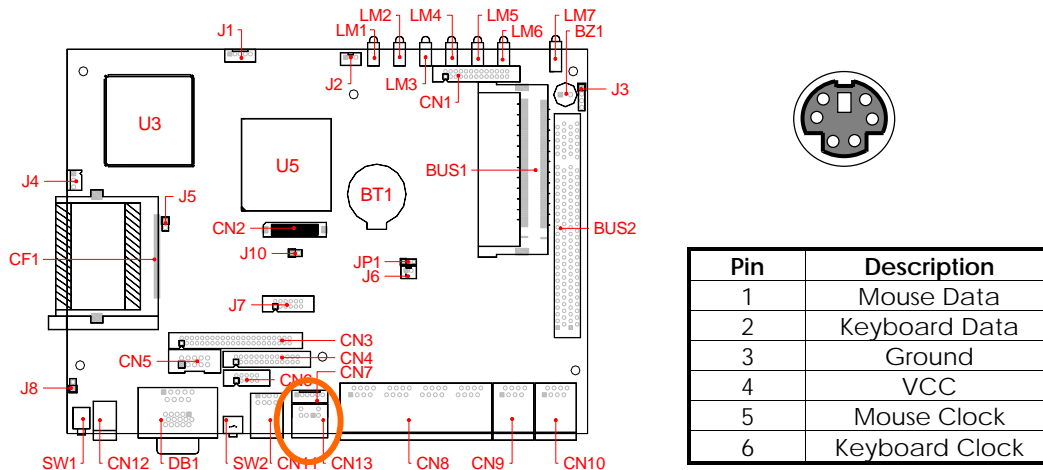
If you are connecting the monitor, keyboard, mouse to the FB2651 using the connections provided on the side.

1. A VGA connector is provided for CRT display



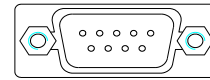
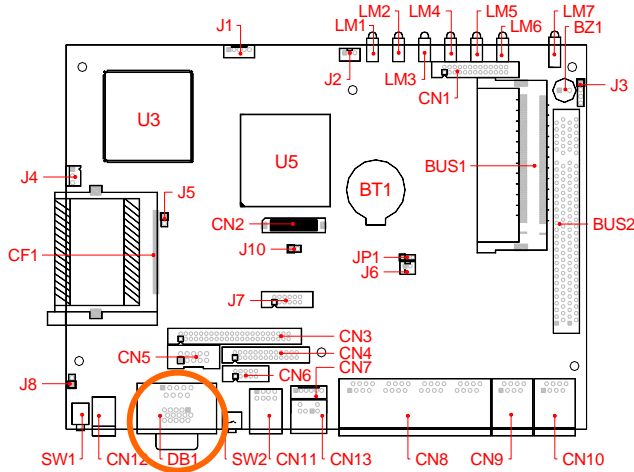
Note: The I/O port 84Dh bit 6 can be defined to select CRT (V-Sync & H-Sync) to On OR off mode. When I/O Port 84Dh Bit 6 is set to 1, the CRT is active. When I/O port 84Dh Bit 6 is set to 0, the CRT is not active.

2. The connector uses the included adapter cable you can attach standard PS/2 type keyboard and mouse. Standard PS/2 keyboard can be plugged into this connector without any adapter cable. If PS/2 keyboard and mouse will be used simultaneously, a Y-type (3-terminal) adapter cable is needed.



□ **DB1 (DB-9): Connecting the COM port**

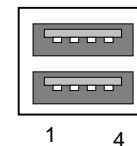
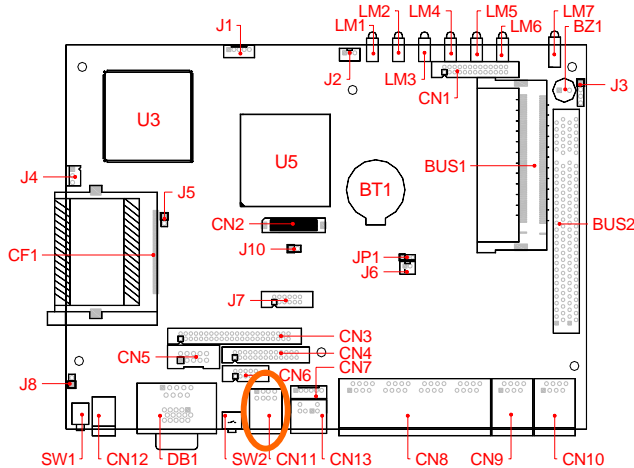
The DB1 (COM1) is standard serial port connector. The following tables show the signal connections of DB1 connector.



DB-9	RS-232 Signal
1	-DCD
6	-DSR
2	RXD
7	-RTS
3	-TXD
8	-CTS
4	-DTR
9	-RI
5	Ground
Case	Case Ground

□ **CN11: Connecting the USB ports**

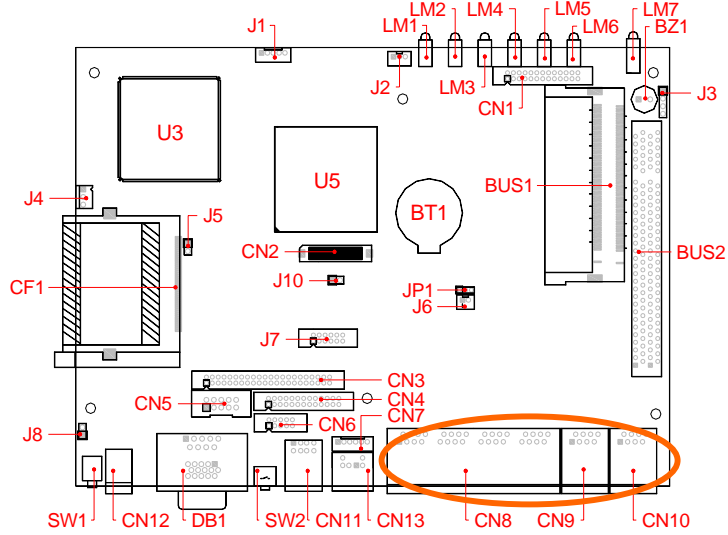
The FB2651 supports a dual port USB connector. Any USB device can be attached to USB ports with plug-and-play supported. The up side port is USB #1 and the down side port is USB #2



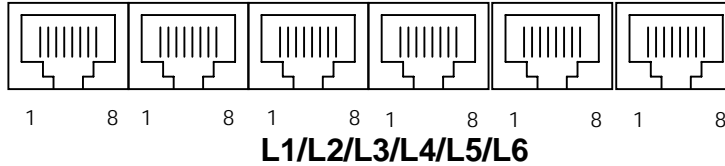
USB #1/ #2	Signal
Pin 1	USBV
Pin 2	USBD-
Pin 3	USBD+
Pin 4	USBG

□ **RJ45 CN8, CN9 and CN10: Connecting the L1/L2/L3/L4/L5/L6 LAN ports**

The LAN 6 is the 10/100/1000 base-TX port and others are 10/100 base-TX ports.



RJ45 connector



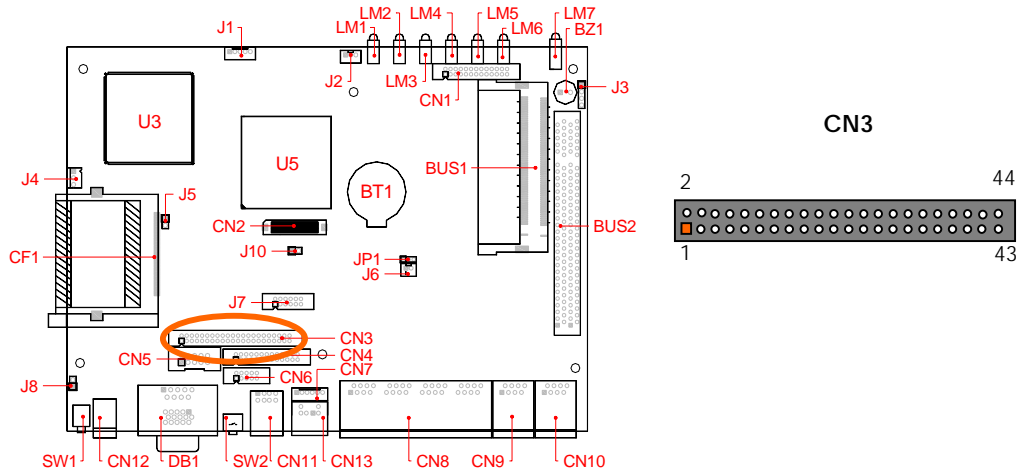
The following lists the pin assignment and signals of RJ45.

RJ45	LAN1-LAN5	LAN6	RJ45	LAN1-LAN5	LAN6
1	TPTX+	TPTX+	5	FBG1	TPTX1-
2	TPTX-	TPTX-	6	TPRX-	TPRX-
3	TPRX+	TPRX+	7	FBG2	TPRX1+
4	FBG1	TPTX1+	8	FBG2	TPRX1-

Note: The I/O port 84Fh bit 3 can be defined as normal or by-pass function for LAN1 & LAN2. When I/O Port 84Fh Bit 3 is set to 1, it is in normal mode, and LAN1 & LAN2 are active. When I/O port 84Fh Bit 3 is set to 0, it is in by-pass mode, and LAN1 & LAN2 are not active.

□ **CN3: IDE hard Disk Connector**

CN3 is 44-pin 2.0mm IDC connectors. The IDE interface has one enhanced IDE channels and supports 2 IDE devices.

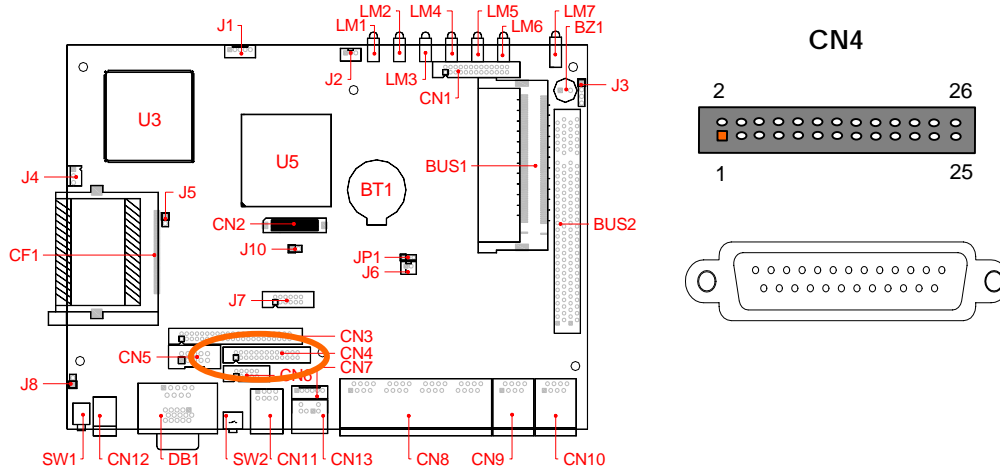


The following table lists the pin description of CN3.

Pin	Signal	Pin	Signal
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	NOT USED
21	IDEDREQ	22	GROUND
23	-IOW A	24	GROUND
25	-IOR A	26	GROUND
27	IDEIORDYA	28	GROUND
29	-DACKA	30	GROUND
31	AINT	32	GROUND
33	SA 1	34	Not Used
35	SA 0	36	SA 2
37	CS 0	38	CS 1
39	HD LED A	40	GROUND
41	VCC	42	VCC
43	GROUND	44	Not Used

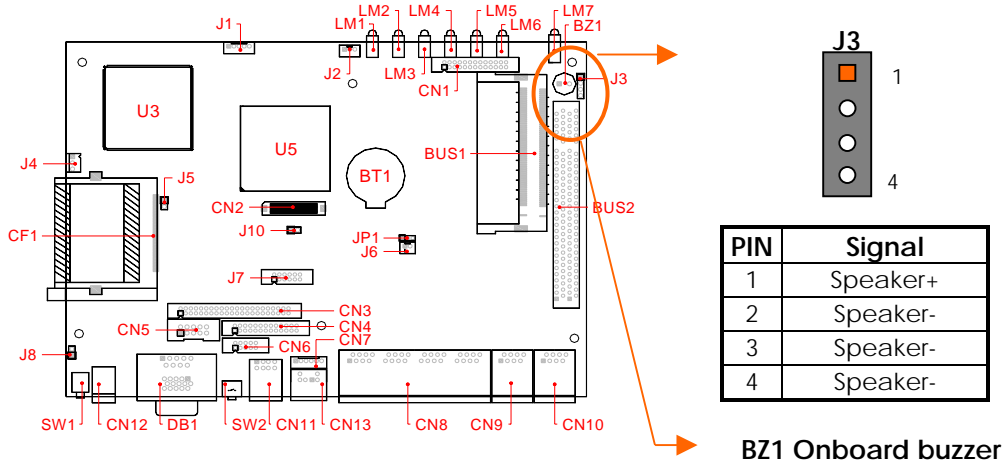
□ **CN4: 26-pin Parallel Port Connector**

The included printer interface cable is used to transfer 26-pin connector into standard DB25 connector.

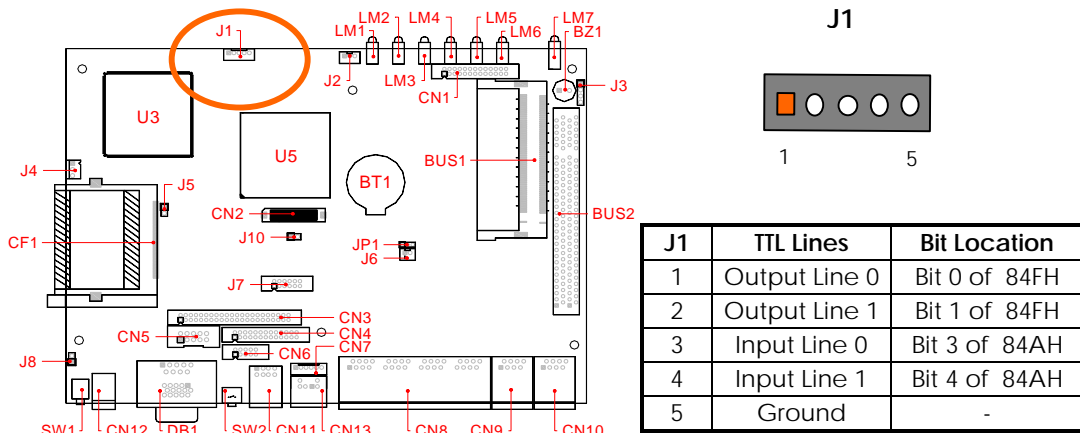


CN4	DB-25	Signal	CN4	DB-25	Signal
1	1	-STROBE	2	14	-AUTO FORM FEED
3	2	DATA 0	4	15	-ERROR
5	3	DATA 1	6	16	-INITIALIZE
7	4	DATA 2	8	17	-PRINTER SELECT IN
9	5	DATA 3	10	18	Ground
11	6	DATA 4	12	19	Ground
13	7	DATA 5	14	20	Ground
15	8	DATA 6	16	21	Ground
17	9	DATA 7	18	22	Ground
19	10	-ACKNOWLEDGE	20	23	Ground
21	11	BUSY	22	24	Ground
23	12	PAPER	24	25	Ground
25	13	PRINTER SELECT	26	--	No Used

□ **BZ1 & J3: On-Board Buzzer & External Speaker Header**

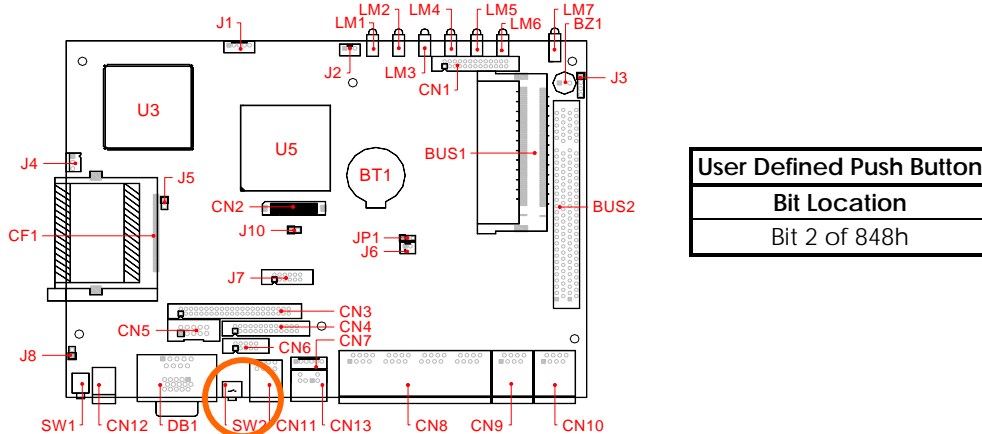


□ **J1: TTL I/O Connector**

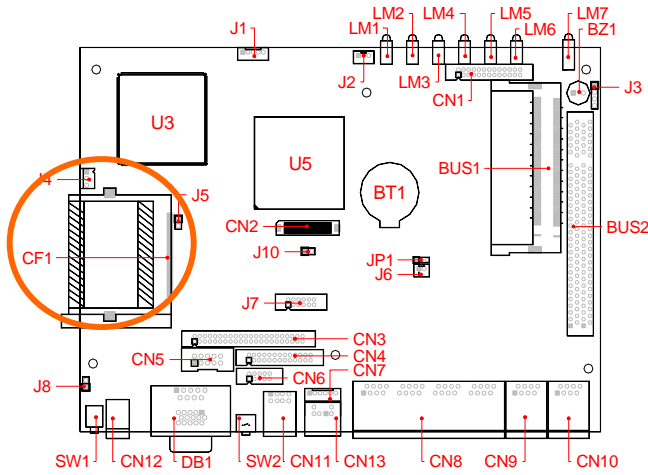


□ **SW2: User Defined Push Button Switch**

This push button switch is located between CRT and USB connectors. User can read its status from input line of on-board GPIOs. (Please see the spots circled.)



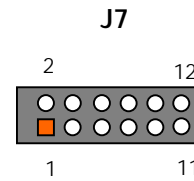
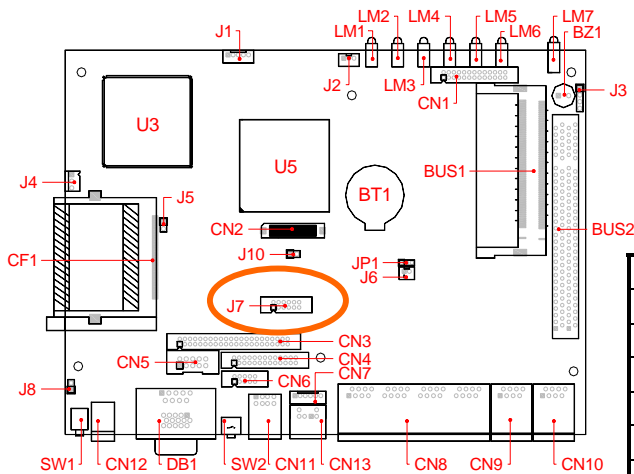
□ **CF1: Installing Compact Flash**



Note: The Compact Flash socket supports 3.3V Type I/II Compact Flash and Micro Drives.

□ **J7: Audio Connector**

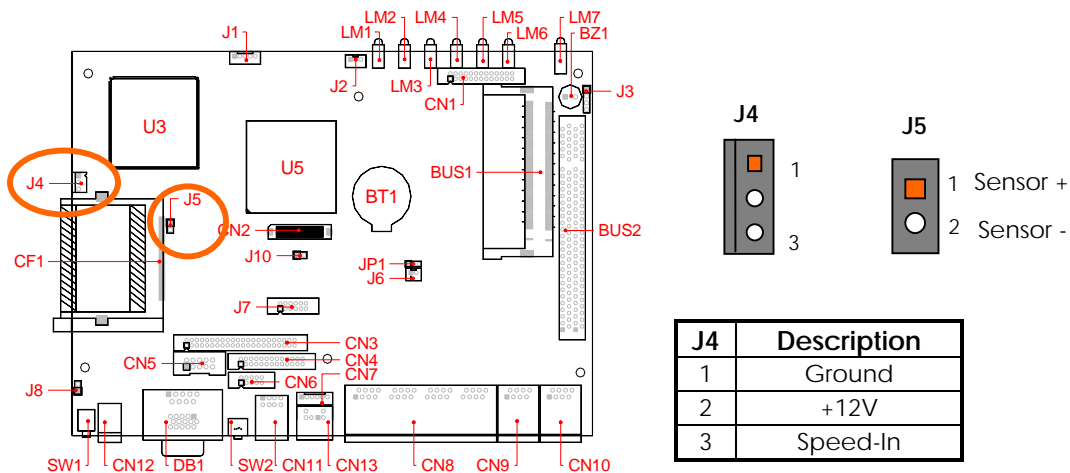
J7 is a 12-pin 2.0mm IDC connector with AC97 signals for Audio I/O. Use the included Audio cable and FB4641 adapter board for your Audio applications.



J8	Description	J8	Description
1	BITCLK	2	+12v
3	+5V	4	SYNC
5	Ground	6	Ground
7	+3.3V	8	ACRST#
9	SDOUT	10	SPKR
11	SDIN	12	SDIN2

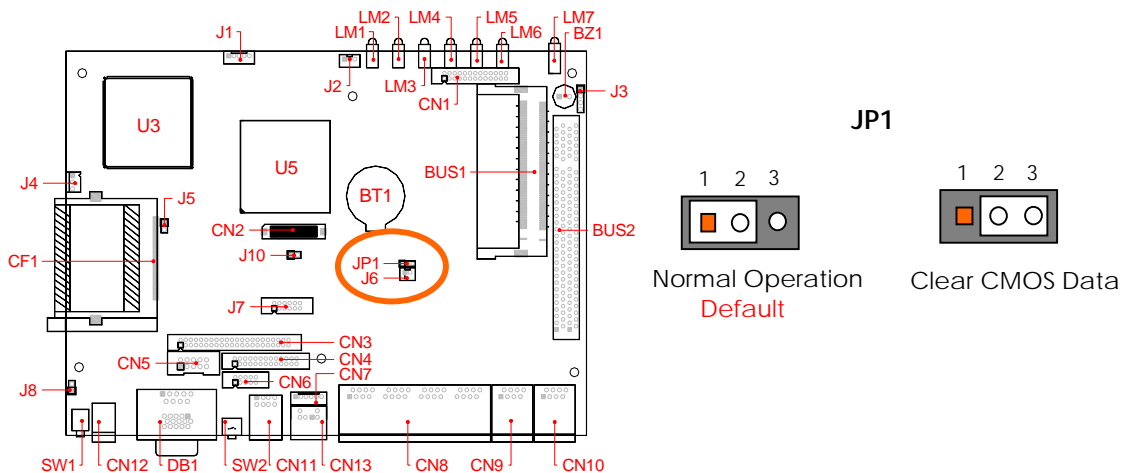
□ **J4 & J5: CPU Fan Connector & Temp. Sensor input Header**

J4 is 3-pin Molex connector, which is reserved for driving CPU cooling fan, J5 is used to connect a temperature sensor for CPU or system temperature monitoring.



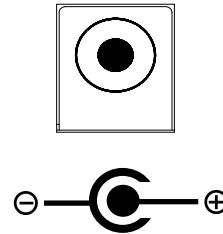
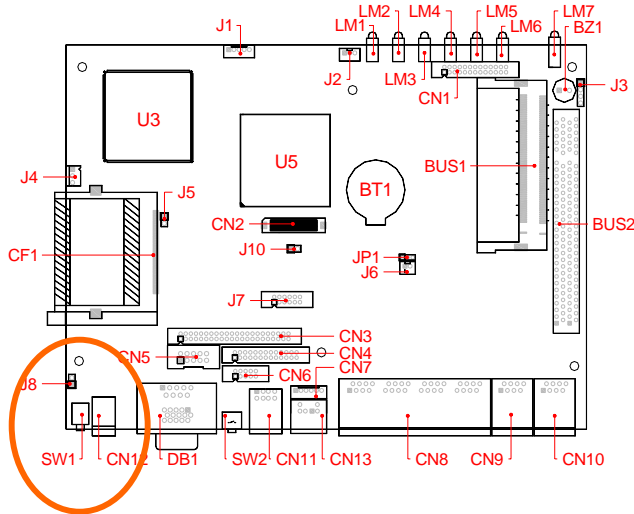
□ **JP1: CMOS Data Clear Jumper**

You can use JP1 to clear CMOS data. The CMOS store information like system date, time, boot up device, password, IRQ... that are set up with the BIOS. To clear the CMOS, set JP1 to 2-3 and then return to 1-2. The default setting is 1-2.



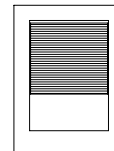
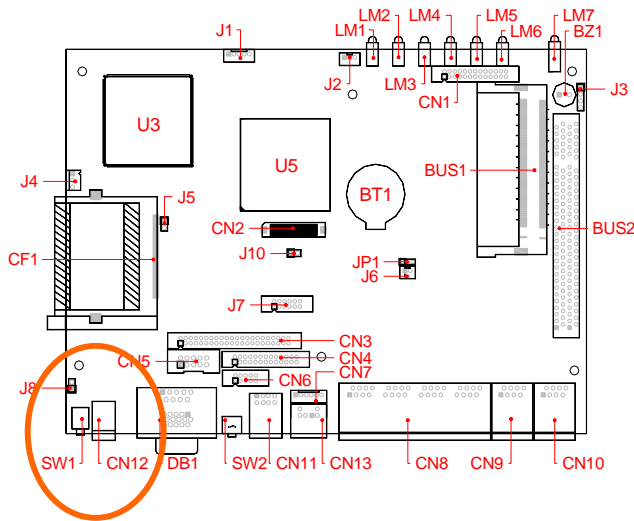
□ **CN12 & SW1: Connecting the DC Power Jack and Power Switch**

Power is supplied through an external AC/DC power adapter. Check the technical specification section for information about AC/DC power input voltage.

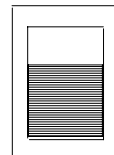


DC +12V~+24V, 20% tolerance
30VA minimum

Since the switch does include a power switch, plugging its power adapter into a power outlet then switch power to on, when you final installed system hardware device.



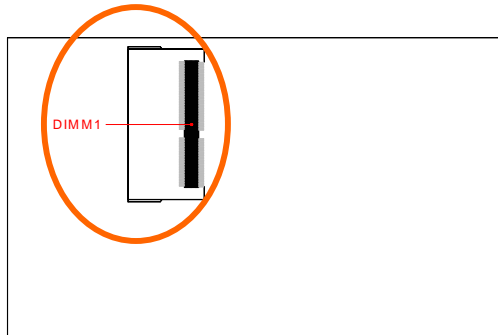
On: Power On



Off: Power Off

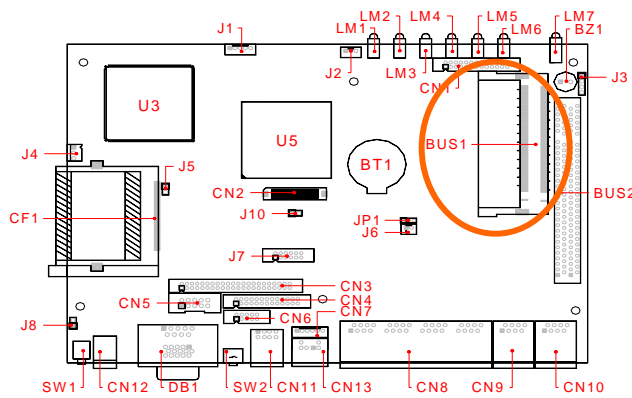
□ **DIMM1: SO-DIMM Socket For SDRAM Modules**

You may extend additional memory to FB2651 See as following figure and rear pictures. The SO-DIMM socket supports PC-133 SDRAM with size of 32MB, 64MB, 128MB, 256MB and 512MB.



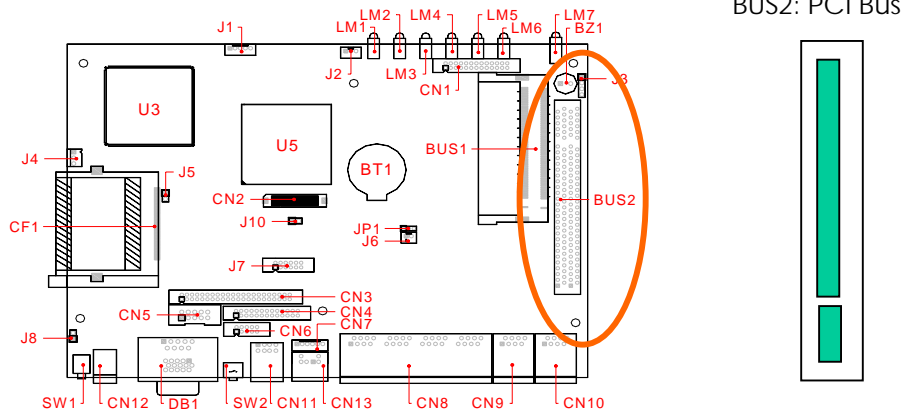
□ **BUS1: Mini-PCI Socket for WLAN Modules**

The BUS2 is Mini-PCI socket (on the solder side) is ideal for wireless LAN module or other I/O modules.



□ **BUS 2: PCI Slot**

Bus1 is a PCI bus slot, used to connect to a PCI card.



Chapter 3 BIOS Setup

This chapter describes the BIOS setup.

Overview

BIOS are a program located on a Flash memory chip on a circuit board. It is used to initialize and set up the I/O peripherals and interface cards of the system, which includes time, date, hard disk drive, the ISA bus and connected devices such as the video display, diskette drive, and the keyboard. This program will not be lost when you turn off the system.

The BIOS provides a menu-driven interface to the console subsystem. The console subsystem contains special software, called firmware that interacts directly with the hardware components and facilitates interaction between the system hardware and the operating system.

The BIOS default values ensure that the system will function at its normal capability. In the worst situation the user may have corrupted the original settings set by the manufacturer.

All the changes you make will be saved in the system RAM and will not be lost after power-off.

When you start the system, the BIOS will perform a self-diagnostics test called Power On Self Test (POST) for all the attached devices, accessories, and the system. Press the [Del] key to enter the BIOS Setup program, and then the main menu will show on the screen.

Note: Change the parameters when you fully understand their functions and subsequence.



BIOS Functions

On the menu, you can perform the following functions

1. Standard CMOS Setup
2. Advanced CMOS Setup
3. Advanced Chipset Setup
4. Power Management Setup
5. PCI/ Plug and Play Setup
6. Peripheral Setup
7. Hardware Monitor Setup
8. Auto-Detect Hard Disks
9. Change User Password
10. Change Supervisor Password
11. Auto Configuration with Optimal Settings: to auto configure the system according to optimal setting with pre-defined values. This is also the factory default setting of the system when you receive the board.
12. Auto Configuration with Fail Safe Settings: to configure the system in fail-safe mode with predefined values.
13. Save Settings and Exit: perform this function when you change the setting and exit the BIOS Setup program.
14. Exit without saving: perform this function when you want to exit the program and do not save the change.

Keyboard Convention

On the BIOS, the following keys can be used to operate and manage the menu:

Item	Function
ESC	To exit the current menu or message
Page Up/Page Down	To select a parameter
F1	To display the help menu if you do not know the purpose or function of the item you are going to configure
F2/F3	To change the color of the menu display. F2 is to go forward and F3 is to go backward.
UP/Down Arrow Keys	To go upward or downward to the desired item

STANDARD CMOS SETUP

This section describes basic system hardware configuration, system clock setup and error handling. If the CPU board is already installed in a working system, you will not need to select this option anymore.

AMIBIOS SETUP - STANDARD CMOS SETUP										
(C)2001 American Megatrends, Inc. All Rights Reserved										
Date (mm/dd/yyyy): Mon Jan 14, 2005					Base Memory: 0 KB					
Time (hh/mm/ss) : 12:20:46					Ext'd Memory: 0 MB					
Floppy Drive A: Not Installed										
Floppy Drive B: Not Installed										
	Type	Size	Cyl'n	Head	WPcom	Sec	LBA Mode	Blk Mode	P10 Mode	32Bit Mode
Pri Master:	Auto									0n
Pri Slave:	Auto									0n
Sec Master:	Auto									0n
Sec Slave:	Auto									0n
Boot Sector Virus Protection					Disabled					
Month: Jan - Dec					ESC:Exit ↑:Sel					
Day: 01 - 31					PgUp/PgDn:Modify					
Year: 1980 - 2099					F1:Help F2/F3:Color					

Date & Time Setup

Highlight the <Date> field and then press the [Page Up] / [Page Down] or [+]/[-] keys to set the current date. Follow the month, day and year format.

Highlight the <Time> field and then press the [Page Up] / [Page Down] or [+]/[-] keys to set the current date. Follow the hour, minute and second format.

The user can bypass the date and time prompts by creating an AUTOEXEC.BAT file. For information on how to create this file, please refer to the MS-DOS manual.

Floppy Setup

The <Standard CMOS Setup> option records the types of floppy disk drives installed in the system.

To enter the configuration value for a particular drive, highlight its corresponding field and then select the drive type using the left-or right-arrow key.

Hard Disk Setup

The BIOS supports various types for user settings, The BIOS supports <Pri Master>, <Pri Slave>, <Sec Master> and <Sec Slave> so the user can install up to four hard disks. For the master and slave jumpers, please refer to the hard disk's installation descriptions and the hard disk jumper settings.

You can select <AUTO> under the <TYPE> and <MODE> fields. This will enable auto detection of your IDE drives during boot up. This will allow you to change your hard drives (with the power off) and then power on without having to reconfigure your hard drive type. If you use older hard disk drives, which do not support this feature, then you must configure the hard disk drive in the standard method as described above by the <USER> option.

Boot Sector Virus Protection

This option protects the boot sector and partition table of your hard disk against accidental modifications. Any attempt to write to them will cause the system to halt and display a warning message. If this occurs, you can either allow the operation to continue or use a bootable virus-free floppy disk to reboot and investigate your system. The default setting is <**Disabled**>. This setting is recommended because it conflicts with new operating systems. Installation of new operating system requires that you disable this to prevent write errors.

ADVANCED CMOS SETUP

This section describes the configuration entries that allow you to improve your system performance, or let you set up some system features according to your preference. Some entries here are required by the CPU board's design to remain in their default settings.

AMIBIOS SETUP - ADVANCED CMOS SETUP		
(C)2001 American Megatrends, Inc. All Rights Reserved		
Quick Boot	Enabled	Available Options: ▶ Read-Write Read-Only ESC:Exit F4:Set PgUp/PgDn:Modify F1:Help F2/F3:Color
1st Boot Device	IDE-0	
2nd Boot Device	Floppy	
3rd Boot Device	CDROM	
Try Other Boot Devices	Yes	
Initial Display Mode	BIOS	
Floppy Access Control	Read-Write	
Hard Disk Access Control	Read-Write	
S.M.A.R.T. for Hard Disks	Disabled	
BootUp Num-Lock	On	
Floppy Drive Swap	Disabled	
Floppy Drive Seek	Disabled	
PS/2 Mouse Support	Enabled	
System Keyboard	Absent	
Primary Display	Absent	
Password Check	Setup	
Boot To OS/2	No	
Wait For 'F1' If Error	Disabled	
Hit 'DEL' Message Display	Enabled	
C000,32k Shadow	Cached	
C800,16k Shadow	Cached	
CC00,16k Shadow	Disabled	
D000,16k Shadow	Disabled	
D400,16k Shadow	Disabled	
D800,16k Shadow	Disabled	
DC00,16k Shadow	Disabled	

Quick Boot

This field is used to activate the quick boot function of the system. When set to Enabled,

1. BIOS will not wait for up to 40 seconds if a Ready signal is not received from the IDE drive, and will not configure its drive.
2. BIOS will not wait for 0.5 seconds after sending a RESET signal to the IDE drive.
3. You cannot run BIOS Setup at system boot since there is no delay for the Hit, Del. To run Setup message.

Available Options: Disabled, Enabled

Default setting: Enabled

1st –3rd Boot Device

These fields determine where the system attempts to look for the boot drive priority for an operating system. The default procedure is to check the hard disk, and then the floppy drive, and last the CDROM.

Available options: Disabled, IDE0-1, IDE-2, IDE-3, Floppy, CDROM, USB-FLOPPY, USB-CDROM and USB-HDD

Default setting: IDE-0 for 1st Boot device; Floppy for 2nd Boot Device; CDROM for 3rd Boot Device

Try Other Boot Device

If all 3 1st –3rd boot devices specified by CMOS setup are not available to boot, BIOS will try to boot other available devices in following order if this question is set to “Enabled”.

Hard Disk Access Control

This field specifies the read/write access when booting from a HDD drive.

Available options: Normal, Read-only

Default setting: Normal

S.M.A.R.T for Hard Disk

This field is used to activate the S.M.A.R.T (System Management and Reporting Technologies) function for S.M.A.R.T HDD drives. This function requires an application that can give S.M.A.R.T message.

Available options: Disabled, Enabled

Default: Disabled

Boot Up Num-lock

This field is used to activate the Num Lock function upon system boot. If the setting is on, after a boot, the Num Lock light is lit, and user can use the number key.

Available options: On, Off

Default setting: On

PS/2 Mouse Support

The setting of **Enabled** allows the system to detect a PS/2 mouse on boot up. If detected, IRQ12 will be used for the PS/2 mouse. IRQ 12 will be reserved for expansion cards if a PS/2 mouse is not detected. **Disabled** will reserve IRQ12 for expansion cards and therefore the PS/2 mouse will not function.

Available options: Disabled, Enabled

Default setting: Enable

System Keyboard

This field specifies if an error message should be prompted when a keyboard is not attached.

Available options: Absent, Present

Default setting: Absent

Primary Display

The field specifies the type of monitor installed in the system.

Available options: Absent, VGA/EGA, CGA40x25, CGA80x25, and Mono

Default setting: Absent

Password Check

This field enables password checking every time the computer is powered on or every time the BIOS Setup is executed. If ***Always*** is chosen, a user password prompt appears every time and the BIOS Setup Program executes and the computer is turned on. If ***Setup*** is chosen, the password prompt appears if the BIOS executed.

Available options: Setup, Always

Default setting: Setup

Boot To OS2

If OS2 operating system is used, and the system RAM is over 64MB, please select yes. Otherwise, select No.

Available options: Yes, No

Default setting: No

Wait for 'F1' If Error

AMIBIOS POST error messages are followed by:

Press <F1> to continue

If this field is set to ***Disabled***, the AMIBIOS does not wait for you to press the <F1> key after an error message.

Available options: Disabled, Enabled

Default setting: Disabled

Hit 'DEL' Message Display

Set this field to **Disabled** to prevent the message as follows:

Hit 'DEL' if you want to run setup

It will prevent the message from appearing on the first BIOS screen when the computer boots.

Available options: Disabled, Enabled

Default setting: Enabled

C000, 32k Shadow - E800, 32k shadow

These fields control the location of the contents of the 32KB of ROM beginning at the specified memory location. If no adapter ROM is using the named ROM area, this area is made available to the local bus. The settings are:

1. **Disabled:** The video ROM is not copied to RAM. The contents of the video ROM cannot be read from or written to cache memory.
2. **Enabled:** The contents of C000h - C7FFFh are written to the same address in system memory (RAM) for faster execution.
3. **Cached:** The contents of the named ROM area are written to the same address in system memory (RAM) for faster execution, if an adapter ROM will be using the named ROM area. Also, the contents of the RAM area can be read from and written to cache memory.

Available options: Disabled, Enabled, Cached

Default setting: Disabled

Default setting: Disable

ADVANCED CHIPSET SETUP

This section describes the configuration of the board's chipset features.

AMIBIOS SETUP - ADVANCED CHIPSET SETUP (C)2001 American Megatrends, Inc. All Rights Reserved		
***** DRAM Timing *****		
Configure SDRAM Timing by SPD	Disabled	Available Options: ▶ Disabled Enabled
DRAM Frequency	100Mhz	
SDRAM CAS# Latency	3	
AGP Mode	4x	
AGP Aperture Size	64MB	
USB Controller	Enabled	
USB Device Legacy Support	All Device	
OnChip VGA Frame Buffer Size	4MB	
Power Turn On Time of Delay	3 Second	
Lan Boot ROM Controller	Disabled	
		ESC:Exit ↑↓:Sel PgUp/PgDn:Modify F1:Help F2/F3:Color

Configure SDRAM Timing by SPD

SPD represents Serial Presence Detect. It is an 8-bit, 2048 bits EEPROM, built on the SDRAM for 100 MHz frequencies. If the installed SDRAM supports SPD function, select SPD. If not, you can select based on other access time of the SDRAM.

Available Options: Disabled, Enabled

Default setting: Disabled

DRAM Frequency

This specifies the SDRAM memory clock frequency.

Available Options: 100MHz, 133MHz

Default setting: 100MHz

SDRAM CAS# Latency (SCLKs)

This field specifies the latency for the Synchronous DRAM system memory signals.

Available Options: 3, 2

Default setting: 3

AGP Mode

This field select AGP transfers video data.

Available Options: 1x, 2x and 4x

Default setting: 4x

AGP Aperture Size

This field specifies the system memory size that can be used by the Accelerated Graphics Port (AGP).

Available Options: 4MB, 8MB, 16MB, 32MB, 64MB, 128MB and 256MB

Default setting: 64 MB

USB Control

Select Enabled if a USB device is installed to the system. If Disabled are selected, the system will not be able to use a USB device.

Available Options: Disabled, Enabled

Default setting: Enabled

USB Device Legacy Support

Select All Device if a USB device is installed to the system. If Disabled are selected, the system will not be able to use a USB device.

Available Options: Disabled, All Device

Default setting: All Device

OnChip VGA Frame Buffers Size

This field is share memory architecture (SMA) for frame buffer memory. SMA allows system memory to be efficiently share by the host CPU and allocated depending on user preference, application requirements, and total size of system memory.

Available Options: None, 2MB, 4MB and 8MB

Default setting: 4 MB

Power Turn On Time Of Delay

If this field is set to **Disabled** and the system BIOS executes too fast, the result is the BIOS can't find the hard disk drive.

Available Options: Disabled, 3 Sec, 5 Sec, 10 Sec, and 15 Sec

Default setting: 3 Sec

Onboard LAN Boot ROM

This field specifies the PXE boot ROM of the onboard LAN chip.

Available Options: Disabled, Enable

Default setting: Disable

POWER MANAGEMENT

AMIBIOS SETUP - POWER MANAGEMENT SETUP (C)2001 American Megatrends, Inc. All Rights Reserved		
Power Management/APM	Enabled	Available Options: Disabled ▶ 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	
IRQ14	Monitor	
IRQ15	Ignore	
		ESC:Exit ↑↓:Sel PgUp/PgDn:Modify F1:Help F2/F3:Color

Power Management /APM

Select Enabled to activate the chipset Power Management and APM (Advanced Power Management) features.

Available Options: Disabled, Enabled

Default setting: Enabled

Video Power Down Mode

This field specifies the power conserving state that video subsystem enters after the specified period of display inactivity has expired.

Available Options: Disabled, Standby, Suspend

Default setting: Disabled

Hard Disk Power Down Mode

This field specifies the power conserving state that the hard disk drive enters after the specified period of hard drive inactivity has expired.

Available Options: Disabled, Standby, Suspend

Default setting: Disabled

Standby Time Out (Minute)

This field specifies the length of a period of system inactivity (like hard disk or video) while in full power on state. When this length of time expires, the system enters Standby power state.

Available Options: Disabled, 1 Minute, 2 Minute, 4 Minute, and 8 Minute, up to 60 Minute.

Default setting: Disabled

Suspend Time Out (Minute)

This field specifies the length of a period of system inactivity (like hard disk or video) while in Standby state. When this length of time expires, the system enters Suspend power state.

Available Options: Disabled, 1 Minute, 2 Minute, 4 Minute, and 8 Minute, up to 60 Minute.

Default setting: Disabled

Throttle Slow Clock Ratio

When the system enter Suspend or standby mode, the CPU clock runs only part of the time. You may select the percent of time that the clock runs.

Available Options: 0%-6.25, 25%37.5%, 75%87.5% and 93.75%-100%

Default setting: 50%-56.25%

IRQ3 ~IRQ15

This field specifies the power down mode of the system based on the device. When the system does not receive signals from the device, it will enter the Power Down mode immediately. To enable the power saving mode, select Monitor. To disable it, select Ignore.

PCI/PLUG AND PLAY

AMIBIOS SETUP - PCI / PLUG AND PLAY SETUP (C)2001 American Megatrends, Inc. All Rights Reserved		
Plug and Play Aware O/S	No	Available Options: ▶ No Yes
Clear NVRAM	No	
PCI Latency Timer (PCI Clocks)	64	
Primary Graphics Adapter	OnChip AGP	
PCI IDE BusMaster	Disabled	
		ESC:Exit ↑↓:Sel PgUp/PgDn:Modify F1:Help F2/F3:Color

Plug and Plug Aware O/S

Set to Yes to inform BIOS that the operating system can handle Plug and Play (PnP) devices.

Available Options: Yes, No

Default setting: No

PCI Latency Timer

This field specifies the latency timings (in PCI clock) PCI devices installed in the PCI expansion bus.

Available Options: 32, 64, 96, 128, 160, 192, 224, and 248

Default setting: 64

Primary Graphics Adapter

This field specifies which VGA display will be used when the system is boot. You can select either the onboard AGP or the VGA card installed on the PCI bus.

Available Options: AGP, PCI

Default setting: PCI

PCI IDE BusMaster

This option is to specify that the IDE controller on the PCI local bus have bus-mastering capability.

Available Options: Enable, Disable

Default setting: Disable

PERIPHERAL SETUP

This section describes the function of peripheral features.

AMIBIOS SETUP - PERIPHERAL SETUP (C)2001 American Megatrends, Inc. All Rights Reserved		
OnBoard Serial Port1	Auto	Available Options: ▶ Auto Disabled 3F8/COM1 2F8/COM2 3E8/COM3 2E8/COM4 ESC:Exit ↑↓:Sel PgUp/PgDn:Modify F1:Help F2/F3:Color
OnBoard Parallel Port	Auto	
Parallel Port Mode	Normal	
EPP Version	N/A	
Parallel Port DMA	N/A	
Parallel Port IRQ	Auto	
OnBoard IDE	Both	
OnBoard AC'97 Audio	Disabled	
OnBoard Legacy Audio	Disabled	
Sound Blaster	Disabled	
SB I/O Base Address	220h-22Fh	
SB IRQ Select	5	
SB DMA Select	1	

OnBoard Serial Port 1

These fields select the I/O port address for each Serial port. Refer to Table 2-2.

Available Options: Auto, Disabled, 3F8H/COM1, 2F8H/COM2, and 3E8H/COM3, 2E8H/COM4.

Default setting: Auto

OnBoard Parallel Port

This field selects the I/O port address for parallel port.

Available Options: Auto, Disabled, 378, 278, and 3BCH

Default setting: Auto

Parallel Port Mode

This field specifies the parallel port mode. ECP and EPP are both bi-directional data transfer schemes that adhere to the IEEE P1284 specifications.

Available Options: N/A, Normal, Bi-Dir, EPP, and ECP

Default setting: Normal

EPP Version

This field specifies the EPP version for the Parallel Port Mode specification used in the system and is not configurable. If Normal or ECP is selected, this field displays N/A, meaning not available.

Available Options: N/A, 1.7, 1.9

Default setting: N/A

Parallel Port DMA

This option is only available if the setting for the parallel Port Mode option is ECP.

Available Options: N/A, 0,1,3

Default setting: N/A

Parallel Port IRQ

This field specifies the IRQ for the parallel port.

Available Options: Auto, N/A, 5, 7

Default setting: Auto

On-Board IDE

This field specifies the IDE channel that can be applied when using CN3 IDE hard disk connector.

Available Options: Disabled, Primary, and Secondary, Both

Default setting: Both

Hardware Monitor Setup

On the Hardware Monitor Setup screen, you can set up or monitor the system temperature, CPU voltage, and VIA C3 CPU Ratio and CPU fan speed...

AMIBIOS SETUP - HARDWARE MONITOR SETUP (C)2001 American Megatrends, Inc. All Rights Reserved	
--≡ System Hardware Monitor ≡--	
Current System Temperature	
Fan1 Speed	0 RPM
CPU VCORE	+1.125V
CPU VTT	+1.500V
+ 3.300V	+3.359V
ESC:Exit ↑↓:Sel PgUp/PgDn:Modify F1:Help F2/F3:Color	

System Hardware Monitor

In this field, you can monitor or detect the followings items. These items are view-only and cannot be changed.

- Current System Temperature
- Fan1 Speed
- CPU1 VCORE
- CPU VTT
- +3.300V

Password Setup

There are two security passwords: Supervisor and User. Supervisor is a privileged person that can change the User password from the BIOS.

According to the default setting, both access passwords are not set up and are only valid after you set the password from the BIOS.

To set the password, please complete the following steps.

1. Select **Change Supervisor Password**.
2. Type the desired password (up to 8 character length) when you see the message, "Enter New Supervisor Password."
3. Then you can go on to set a user password (up to 8 character length) if required. Note that you cannot configure the User password until the Supervisor password is set up.
4. Enter Advanced CMOS Setup screen and point to the Password Checkup field.
5. Select Always or Setup.
 - ✧ **Always:** a visitor who attempts to enter BIOS or operating system will be prompted for password.
 - ✧ **Setup:** a visitor who attempts to the operating system will be prompted for user password. You can enter either User password or Supervisor password.
6. Point to **Save Settings and Exit** and press Enter.
7. Press Y when you see the message, "Save Current Settings and Exit (Y/N)?"

Note: it is suggested that you write down the password in a safe place to avoid that password may be forgotten or missing.

To set the password, please complete the following steps.

1. Select **Change Supervisor Password**.
2. Press Enter instead of entering any character when you see the message, "Enter New Supervisor Password."
3. Thus you can disable the password.

Chapter 4 Software Installation

The enclosed diskette includes FB2651 VGA, Audio, system and LAN drivers. To install and configure you FB2651 system, you need to perform the following steps.

VIA 4 In 1 Driver

WIN 2000/XP Driver

Installs VIA Chipset, IRQ Routing, AGP Driver and PCI IDE Bus Master 4in 1Driver.

- 1 To install the VIA 4 IN 1 driver, insert the CD ROM into the CD ROM device, and enter DRIVER>SysChip>VIA4IN1. If your system is not equipped with a CD ROM device, copy the VIA 4 IN 1 driver from the CD ROM to CF or USB Device.
- 2 Execute VIAHyperion4in1XXXX.exe file.
- 3 The screen shows the SETUP type. Press any key to enter the main menu.
- 4 As the setup is completed, the system will generate the message as follows.

Yes, I want to restart my computer now. Installation is done!

No, I will restart my computer later.

System must be restart then complete the installation.

VGA Drivers

WINXP/WIN2000 Driver

- 1 To install the VGA driver, insert the CD ROM into the CD ROM device, and enter DRIVER>VGA>VT8601t> WINXP_2K>SETUP. If your system is not equipped with a CD ROM device, copy the VGA driver from the CD ROM to CF.
- 2 Execute SETUP.exe file.
- 3 The screen shows the SETUP type. Press any key to enter the main menu.
- 4 As the setup is completed, the system will generate the message as follows.

Yes, I want to restart my computer now. Installation is done!

No, I will restart my computer later.

System must be restart then complete the installation.

- 5 In the WINDOWS XP/2K, you can find the <DISPLAYL> icon located in the {CONTROL PANEL} group.
- 6 Adjust the <Resolution> and <Color>.

Note: In the VGA >VT8601t, WINXP_2K directory, a Install.txt file is included to provide installation information

LAN Utility & Driver (RTL8100C & RTL 8110S)

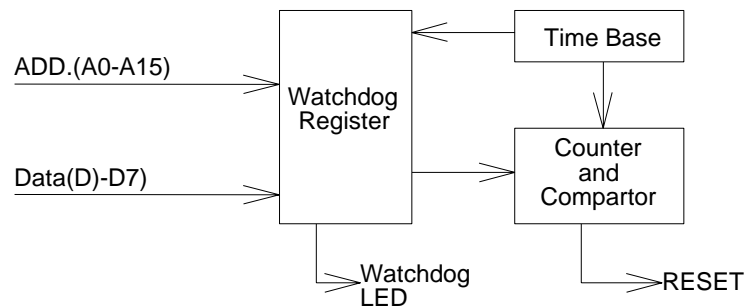
- 1 To install the LAN utility or driver, insert the CD ROM into the CD ROM device, and enter DRIVER>LAN> RTL8139C or DRIVER>LAN> RTL8110S. If your system is not equipped with a CD ROM device, copy the LAN VGA driver from the CD ROM to CF.
- 2 Execute install.exe file.

Note: In the LAN directory, a HELPME.EXE or SETUP.TXT file is included to provide installation information

Watchdog Timer

This section describes how to use the Watchdog Timer, including disabled, enabled, and trigger functions.

The FB2651 is equipped with a programmable time-out period watchdog timer. You can use your own program to enable the watchdog timer. Once you have enabled the watchdog timer, the program should trigger the I/O every time before the timer times out. If your program fails to trigger or disable this timer before it times out, e.g. because of a system hang-up, it will generate a reset signal to reset the system. The time-out period can be programmed to be set from 3 to 46 seconds.



Watchdog Timer Setting

The watchdog timer is a circuit that may be used from your program software to detect system crashes or hang-ups. LED1 on this CPU board is the watchdog timer indicator, which is located at the upper-left corner above the USB connector. Whenever the watchdog timer is enabled, the LED will blink to indicate that the timer is counting. The watchdog timer is automatically disabled after reset.

Once you have enabled the watchdog timer, your program must trigger the watchdog timer every time before it times out. After you trigger the watchdog timer, it will be set to non-zero value to watchdog counter and start to count down again. If your program fails to trigger the watchdog timer before time-out, it will generate a reset pulse to reset the system.

The factor of the watchdog timer time-out constant is approximately 3-5 seconds. The period for the watchdog timer time-out period is between 1 to 8 timer factors. If you want to reset your system when watchdog times out, the following table listed the relation of timer factors between time-out periods.

Reset Time Factor	Time-Out Period (Sec)
20h	3
21h	11
22h	19
23h	27
24h	35
25h	43
26h	51
27h	59

Watchdog Timer Enabled

To enable the watchdog timer, you have to output a byte of timer factor to the watchdog register whose address is 76H. The following is a BASICA program, which demonstrates how to enable the watchdog timer and set the time-out period at 20 seconds.

```

1000      REM Points to command register
1010      WD_REG% = 76H
1020      REM Timer factor = 24H
1030      TIMER_FACTOR% = %H24
1040      REM Output factor to watchdog register
1050      OUT WD_REG%, TIMER_FACTOR%
```

Watchdog Timer Trigger

After you enable the watchdog timer, your program must write the same factor as enabling to the watchdog register at least once every time-out period to its previous setting. You can change the time-out period by writing another timer factor to the watchdog register at any time, and you must trigger the watchdog before the new time-out period in next trigger. Below is a BASICA program, which demonstrates how to trigger the watchdog timer:

```

2000      REM Points to command register
2010      WD_REG% = 76H
2020      REM Timer factor = 24H
2030      TIMER_FACTOR% = &H24
2040      REM Output factor to watchdog register
2050      OUT WD_REG%, TIMER_FACTOR%
```

. Etc.

Watchdog Timer Disabled

To disable the watchdog timer, simply write a 00H to the watchdog register.

```

3000      REM Points to command register
3010      WD_REG% = BASE_PORT%
3020      REM Timer factor = 0
3030      TIMER_FACTOR% = 0
3040      REM Output factor to watchdog register
3050      OUT WD_REG%, TIMER_FACTOR%
```

. Etc.

Chapter 5 Technical Reference

This section outlines the errors that may occur when you operate the system, and also gives you the suggestions on solving the problems.

Topic include:

- Trouble Shooting for Error Messages
- Technical Reference

Trouble Shooting for Post Beep and Error Messages

The following information informs the Post Beep & error messages. Please adjust your systems according to the messages below. Make sure all the components and connectors are in proper position and firmly attached. If the errors still exist, please contact with your distributor for maintenance.

POST BEEP

Currently there are two kinds of beep codes in BIOS setup.

- One indicates that a video error has occurred and the BIOS cannot initialize the video screen to display any additional information. This beep code consists of a single long beep followed by three short beeps.
- The other indicates that an error has occurred in your DRAM. This beep code consists of a constant single long beep.

CMOS BATTERY FAILURE

When the CMOS battery is out of work or has run out, the user has to replace it with a new battery.

CMOS CHECKSUM ERROR

This error informs that the CMOS has corrupted. When the battery runs weak, this situation might happen. Please check the battery and change a new one when necessary.

DISK BOOT FAILURE

When you can't find the boot device, insert a system disk into Drive A and press < Enter >. Make sure both the controller and cables are all in proper positions, and also make sure the disk is formatted. Then reboot the system.

DISKETTE DRIVES OR TYPES MISMATCH ERROR

When the diskette drive type is different from CMOS, please run setup or configure the drive again.

ERROR ENCOUNTERED INITIALIZING HARD DRIVE

When you can't initialize the hard drive, ensure the following things:

1. The adapter is installed correctly
2. All cables are correctly and firmly attached
3. The correct hard drive type is selected in BIOS Setup

ERROR INITIALIZING HARD DISK CONTROLLER

When this error occurs, ensure the following things:

1. The cord is exactly installed in the bus.
2. The correct hard drive type is selected in BIOS Setup
3. Whether all of the jumpers are set correctly in the hard drive

FLOPPY DISK CONTROLLER ERROR OR NO CONTROLLER PRESENT

When you cannot find or initialize the floppy drive controller, please ensure the controller is in proper BIOS Setup. If there is no floppy drive installed, ensure the Diskette Drive selection in Setup is set to NONE.

KEYBOARD ERROR OR NO KEYBOARD PRESENT

When this situation happens, please check keyboard attachment and no keys being pressed during the boot. If you are purposely configuring the system without a keyboard, set the error halt condition in BIOS Setup to HALT ON ALL, BUT KEYBOARD. This will cause the BIOS to ignore the missing keyboard and continue the boot procedure.

MEMORY ADDRESS ERROR

When the memory address indicates error. You can use this location along with the memory map for your system to find and replace the bad memory chips.

MEMORY SIZE HAS CHANGED

Memory has been added or removed since last boot. In EISA mode, use Configuration Utility to re-configure the memory configuration. In ISA mode enter BIOS Setup and enter the new memory size in the memory fields.

MEMORY VERIFYING ERROR

It indicates an error verifying a value is already written to memory. Use the location along with your system's memory map to locate the bad chip.

OFFENDING ADDRESS MISSING

This message is used in connection with the I/O CHANNEL CHECK and RAM PARITY ERROR messages when the segment that has caused the problem cannot be isolated.

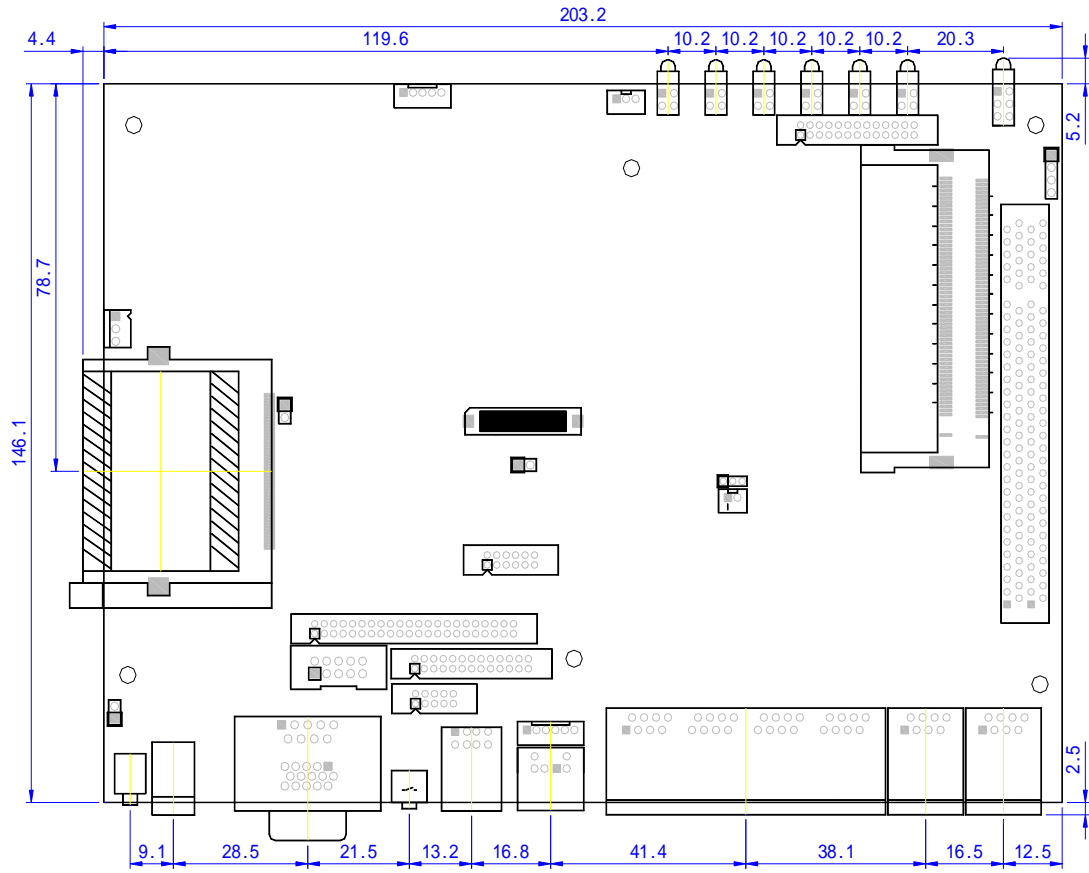
REBOOT ERROR

When this error occurs that requires you to reboot. Press any key and the system will reboot.

SYSTEM HALTED

Indicates the present boot attempt has been aborted and the system must be rebooted. Press and hold down the CTRL and ALT keys and press DEL.

Dimension



Technical Reference

Physical and Environmental

DC Inputs: 24V/30VA Minimal

Temperature: Operating 0°C ~ 50°C

Relative humidity 5 % to 95 % non-condensing

Real-Time Clock and Non-Volatile RAM

The FB2651 contains a real-time clock compartment that maintains the date and time in addition to storing configuration information about the computer system. It contains 14 bytes of clock and control registers and 114 bytes of general purpose RAM. Because of the use of CMOS technology, it consumes very little power and can be maintained for long periods of time using an internal Lithium battery. The contents of each byte in the CMOS RAM are listed below:

Address	Description
00	Seconds
01	Second alarm
02	Minutes
03	Minute alarm
04	Hours
05	Hour alarm
06	Day of week
07	Date of month
08	Month
09	Year
0A	Status register A
0B	Status register B
0C	Status register C
0D	Status register D
0E	Diagnostic status byte
0F	Shutdown status byte
10	Diskette drive type byte, drive A and B

Address	Description
11	Fixed disk type byte, drive C
12	Fixed disk type byte, drive D
13	Reserved
14	Equipment byte
15	Low base memory byte
16	High base memory byte
17	Low expansion memory byte
18	High expansion memory byte
19-2D	Reserved
2E-2F	2-byte CMOS checksum
30	Low actual expansion memory byte
31	High actual expansion memory byte
32	Date century byte
33	Information flags (set during power on)
34-7F	Reserved for system BIOS

CMOS RAM Map

Register	Description
00h -10h	Standard AT-compatible RTC and Status and Status Register data definitions
11h – 13h	Varies
14h	<p>Equipment</p> <p>Bits 7-6 Number of Floppy Drives 00 1 Drive 01 2 Drives</p> <p>Bits 5-4 Monitor Type 00 Not CGA or MDA 01 40x25 CGA 01 2 Drives 80x25 CGA</p> <p>Bits 3 Display Enabled 0 Disabled 1 Enabled</p> <p>Bit 2 Keyboard Enabled 00 Not CGA or MDA 01 40x25 CGA 01 2 Drives 80x25 CGA</p> <p>Bit 1 Math Coprocessor Installed 0 Absent 1 Present</p> <p>Bit 0 Floppy Drive Installed 0 Disabled 1 Enabled</p>
15h	Base Memory (in 1KB increments), Low Byte
16h	Base Memory (in 1KB increments), High Byte
17h	IBM-compatible memory (in 1KB increments), Low Byte
18h	IBM-compatible memory (in 1KB increments), High Byte (max 15 MB)
19h-2Dh	Varies
2Eh	Standard CMOS RAM checksum, high byte
2Fh	Standard CMOS RAM checksum, low byte
30h	IBM-compatible Extended Memory, Low Byte (POST) in KB
31h	IBM-compatible Extended Memory, High Byte (POST) in KB
32h	Century Byte
33h	Reserved. Do not use
34h	Reserved. Do not use
35h	Low byte of extended memory (POST) in 64 KB
36h	High byte of extended memory (POST) in 64 KB
37h-3Dh	Varies
3Eh	Extended CMOS Checksum, Low Byte (including 34h-3Dh)
3Fh	Extended CMOS Checksum, High Byte (including 34h-3Dh)

I/O Port Address Map

Each peripheral device in the system is assigned a set of I/O port addresses, which also becomes the identity of the device. There is a total of 1K-port address space available. The following table lists the I/O port addresses used on the Industrial CPU Card.

Address	Device Description
000h - 01Fh	DMA Controller #1
020h - 03Fh	Interrupt Controller #1
040h - 05Fh	Timer
060h - 06Fh	Keyboard Controller
070h - 071h	Real Time Clock
076h	Watchdog
080h - 09Fh	DMA Page Register
0A0h - 0BFh	Interrupt Controller #2
0C0h - 0DFh	DMA Controller #2
0F0h	Clear Math Coprocessor Busy Signal
0F1h	Reset Math Coprocessor
1F0h - 1F7h	IDE Interface
2F8h - 2FFh	Serial Port #2(COM2)
2B0 - 2DF	Graphics adapter Controller
378h - 3FFh	Parallel Port #1(LPT1)
360 - 36F	Network Ports
3B0 - 3BF	Monochrome & Printer adapter
3C0 - 3CF	EGA adapter
3D0 - 3DF	CGA adapter
3F0h - 3F7h	Floppy Disk Controller
3F8h - 3FFh	Serial Port #1(COM1)

Interrupt Request Lines (IRQ)

There are a total of 15 IRQ lines available on the Industrial CPU Card. Peripheral devices use interrupt request lines to notify CPU for the service required. The following table shows the IRQ used by the devices on the Industrial CPU Card.

Level	Function
IRQ0	System Timer Output
IRQ1	Keyboard
IRQ2	Interrupt Cascade
IRQ3	Reserved
IRQ4	Serial Port #1
IRQ5	LAN# 4 /USB
IRQ6	Reserved
IRQ7	Parallel Port #1
IRQ8	Real Time Clock
IRQ9	LAN # 3/Audio
IRQ10	LAN #1/LAN# 5
IRQ11	LAN # 2/LAN# 6
IRQ12	PS2 Mouse
IRQ13	FPU
IRQ14	Primary IDE
IRQ15	Secondary IDE

DMA Channel Map

The equivalent of two 8237A DMA controllers are implemented in the FB2651 board. Each controller is a four-channel DMA device that will generate the memory addresses and control signals necessary to transfer information directly between a peripheral device and memory. This allows high speed information transfer with less CPU intervention. The two DMA controllers are internally cascaded to provide four DMA channels for transfers to 8-bit peripherals (DMA1) and three channels for transfers to 16-bit peripherals (DMA2). DMA2 channel 0 provides the cascade interconnection between the two DMA devices, thereby maintaining IBM PC/AT compatibility.

The following is the system information of DMA channels:

DMA Controller 1	DMA Controller 2
Channel 0: Spare	Channel 4: Cascade for controller 1
Channel 1: Reserved for IBM SDLC	Channel 5: Spare
Channel 2: Diskette adapter	Channel 6: Spare
Channel 3: Spare	Channel 7: Spare

Serial Ports

The ACEs (Asynchronous Communication Elements ACE1 to ACE2) are used to convert parallel data to a serial format on the transmit side and convert serial data to parallel on the receiver side. The serial format, in order of transmission and reception, is a start bit, followed by five to eight data bits, a parity bit (if programmed) and one, one and half (five-bit format only) or two stop bits. The ACEs are capable of handling divisors of 1 to 65535, and produce a 16x clock for driving the internal transmitter logic.

Provisions are also included to use this 16x clock to drive the receiver logic. Also included in the ACE is a completed MODEM control capability, and a processor interrupt system that may be software tailored to the computing time required to handle the communications link.

The following table is a summary of each ACE accessible register

DLAB	Port Address	Register
0	Base + 0	Receiver buffer (read)
		Transmitter holding register (write)
0	Base + 1	Interrupt enable
X	Base + 2	Interrupt identification (read only)
X	Base + 3	Line control
X	Base + 4	MODEM control
X	Base + 5	Line status
X	Base + 6	MODEM status
X	Base + 7	Scratched register
1	Base + 0	Divisor latch (least significant byte)
1	Base + 1	Divisor latch (most significant byte)

Receiver Buffer Register (RBR)

Bit 0-7: Received data byte (Read Only)

Transmitter Holding Register (THR)

Bit 0-7: Transmitter holding data byte (Write Only)

Interrupt Enable Register (IER)

Bit 0: Enable Received Data Available Interrupt (ERBFI)

Bit 1: Enable Transmitter Holding Empty Interrupt (ETBEI)

Bit 2: Enable Receiver Line Status Interrupt (ELSI)

Bit 3: Enable MODEM Status Interrupt (EDSSI)

Bit 4: Must be 0

Bit 5: Must be 0

Bit 6: Must be 0

Bit 7: Must be 0

Interrupt Identification Register (IIR)

Bit 0: "0" if Interrupt Pending

Bit 1: Interrupt ID Bit 0

Bit 2: Interrupt ID Bit 1

Bit 3: Must be 0

Bit 4: Must be 0

Bit 5: Must be 0

Bit 6: Must be 0

Bit 7: Must be 0

Line Control Register (LCR)

Bit 0: Word Length Select Bit 0 (WLS0)

Bit 1: Word Length Select Bit 1 (WLS1)

WLS1	WLS0	Word Length
0	0	5 Bits
0	1	6 Bits
1	0	7 Bits
1	1	8 Bits

Bit 2: Number of Stop Bit (STB)

Bit 3: Parity Enable (PEN)

Bit 4: Even Parity Select (EPS)

Bit 5: Stick Parity

Bit 6: Set Break

Bit 7: Divisor Latch Access Bit (DLAB)

MODEM Control Register (MCR)

Bit 0: Data Terminal Ready (DTR)

Bit 1: Request to Send (RTS)

Bit 2: Out 1 (OUT 1)

Bit 3: Out 2 (OUT 2)

Bit 4: Loop

Bit 5: Must be 0

Bit 6: Must be 0

Bit 7: Must be 0

Line Status Register (LSR)

Bit 0: Data Ready (DR)

Bit 1: Overrun Error (OR)

Bit 2: Parity Error (PE)

Bit 3: Framing Error (FE)

Bit 4: Break Interrupt (BI)

Bit 5: Transmitter Holding Register Empty (THRE)

Bit 6: Transmitter Shift Register Empty (TSRE)

Bit 7: Must be 0

MODEM Status Register (MSR)

Bit 0: Delta Clear to Send (DCTS)

Bit 1: Delta Data Set Ready (DDSR)

Bit 2: Training Edge Ring Indicator (TERI)

Bit 3: Delta Receive Line Signal Detect (DSLSD)

Bit 4: Clear to Send (CTS)

Bit 5: Data Set Ready (DSR)

Bit 6: Ring Indicator (RI)

Bit 7: Received Line Signal Detect (RSLD)

Divisor Latch (LS, MS)

	LS	MS
Bit 0:	Bit 0	Bit 8
Bit 1:	Bit 1	Bit 9
Bit 2:	Bit 2	Bit 10
Bit 3:	Bit 3	Bit 11
Bit 4:	Bit 4	Bit 12
Bit 5:	Bit 5	Bit 13
Bit 6:	Bit 6	Bit 14
Bit 7:	Bit 7	Bit 15

Desired Baud Rate	Divisor Used to Generate 16x Clock
300	384
600	192
1200	96
1800	64
2400	48
3600	32
4800	24
9600	12
14400	8
19200	6
28800	4
38400	3
57600	2
115200	1