LW-P104-P4I1

User's Manual

(Release 1.0)

LongWin Computer Inc.

3130 De La Cruz Blvd, #97
Santa Clara, CA 95054
(800) 970-6805

www.LWComputer.com

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Revision History

Revision	Description	Date
1.0	Initial Release	1/10/2008

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http://www.LWConputer.com

This manual is for the LW-P104-P4I1 module.

P/N: LWW-P104-P4I1M

January 10, 2008

Packing List

Before you begin installing your module, please make sure that the following materials have been shipped:

- *LW-P104-P4I1 All-In-One Single Board Computer Module*
- *CD-ROM Disk For Utility And Drivers*
- *Quick Start Guide*
- *Single Port USB Cable (Option)*
- *Dual-Port USB Cable (Option)*
- *Six-Port USB Cable (Option)*
- *VGA Cable (Option)*
- *44-Pin 2mm Pitch IDE Cable (Option)*
- *Keyboard Cable (Option)*
- *Mouse Cable (Option)*
- *2-Port COM Port Cable (Option)*
- *Ethernet RJ-45 Cable with Build-In Magnetic And LED (Option)*

If any of these items are missing or damaged, contact your distributor or sales representative immediately.

Common Model No. List	Description
LW-P104-P4I1-10P	1.0 GHz Ultra Low Power Pentium-M Module
LW-P104-P4I1-14P	1.4 GHz Low Power Pentium-M Module
LW-P104-P4I1-15P	1.5 GHz Pentium-M Module
LW-P104-P4I1-06P	600 MHz Ultra Low Power Celeron-M Module
LW-P104-P4I1-10C	1.0 GHz Ultra Low Power Celeron-M Module
LW-P104-P4I1-13C	1.3 GHz Ultra Low Power Celeron-M Module

Safety and Static-Electricity

FCC

This device complies with the requirements in part 15 of the FCC rules:

Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Caution !

Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense. The user is advised that any equipment changes or modifications not expressly approved by the party responsible for compliance would void the compliance to FCC regulations and therefore, the user's authority to operate the equipment.

Warning !

There is a danger of a new battery exploding if it is incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Please plug and unplug parts under the condition without power. Make sure power is turned off before setting boards in order to avoid the damage on the sensitive parts caused by power impact.

Acting !

Modern electrical parts are very sensitive to static electricity. Before setting boards, please put them into anti-static pads or bags. It has better to wear anti-static bangle or gloves whenever taking the boards.

Additional Information and Assistance

Visit the LongWin web site at **http://www.LWComputer.com** where you can find the latest information about the product.

Contact your distributor, sales representative, or LongWin's customer service center for technical support if you need additional assistance.

Please have the following information ready before you call:

- *Product name and serial number*
- *Description of your peripheral attachments*
- *Description of your software (operating system, version, application software, etc.)*
- *A complete description of the problem*
- *The exact wording of any error messages*

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Chapter 1

General Information

This chapter gives background information on the LW-P104-P4I1 system module.

Information includes:

- *Introduction*
- *Features*
- *Specifications*
- *Board Dimension*

Chapter 1. General Information

1.1. Introduction

The LW-P104-P4I1 system module is the fastest PC/104-*Plus* (PCI104) system module in the market that runs up to 2.13 GHz speed. It's a high integration, high-performance Pentium-M or Celeron-M based PC/AT-compatible system that conforms to the PC/104-*Plus* (PCI104) specification.

This solid, general purpose single board computer (SBC) module is designed to meet the size, power consumption, temperature range, quality, and reliability demands of embedded system applications, and satisfies various industrial and multimedia applications.

This rugged and fanless single-board system module contains all the component subsystems of high performance CRT/LCD graphics, fast 10/100BaseT Ethernet, enhanced IDE, RS-232/RS-422/485 serial port, enhanced parallel port and 6 USB 2.0 ports.

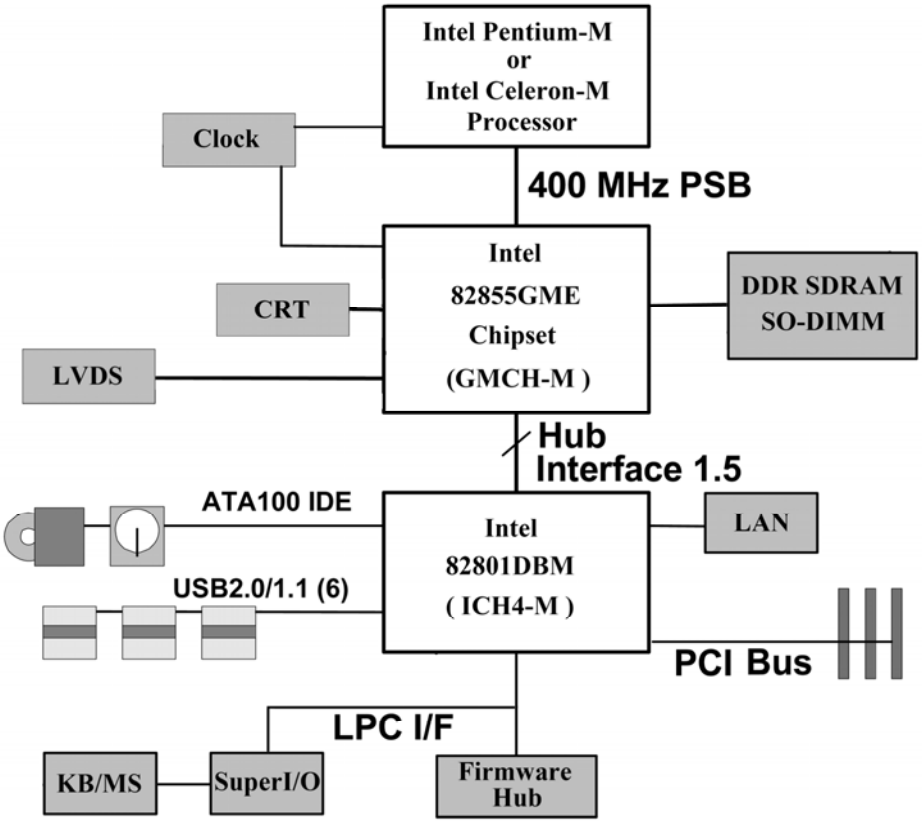


Figure 1. LW-P104-P4I1 Block Diagram

The LW-P104-P4I1 system module works on a single +3.3 Volt power supply. An optional +5 Volts power supply is required for external 5V PC/104-*Plus* (PCI104) expansion module or USB ports if required.

1.2. Features

- *High-Speed Low-Power Pentium-M / Celeron-M CPU Up To 2.13Ghz*
- *64-bit SO-DIMM Socket Support Up To 1 GB DDR SDRAM*
- *AMI AMIBIOS8 in 1MB Flash EPROM*
- *High Performance Graphics Support Dual Display Of CRT and LVDS LCD Flat Panel*
- *10/100 Base-T Fast Ethernet LAN Interface*
- *6 Universal Serial Bus (USB) Ports 1.1/ 2.0*
- *2Full Model RS-232/RS-422/485 Serial Ports With Jumpless Software Setting*
- *EIDE/Ultra-ATA100/66/33 Interface*
- *Enhanced Multi-Mode IEEE-1284 Bi-Directional Parallel Port*
- *Standard PS/2 Keyboard and Mouse*
- *Speaker interface*
- *Infrared (IrDA) Port 1.1*
- *Audio AC'97 Interface (Manufacturing Optional)*
- *Real-Time Clock and Watch-Dog Timer*
- *Single Power Supply*

1.3. Specifications

The following section provides technical specifications for the LW-P104-P4I1 system module.

Standard SBC Functions:

- CPU: Low-Power Intel Pentium-M / Celeron-M Up To 2.13Ghz
- 400 MHz Front Side Bus (FSB)
- System Memory
- One Channel 64-bit Wide DDR SDRAM
- 200-Pin SO-DIMM Socket Support Up To 1GB Memory Module
- Supports PC1600/2100/2700 (200/266/333Mhz)
- UMA Support Only
- Level-Two (L2) Cache, Size Depend On Processor Stuffed
- 1MB Flash Memory for AMI AMIBIOS8 and User Application
- Shadow RAM Support Provides Fast System BIOS and Video BIOS Execution
- Two Cascaded 82C59 with 15 Interrupts
- Two Cascaded 8237 DMA Controllers with 7 DMA channels
- 3 Programmable Counter/Timers (8254-Equivalent)
- Standard PC Speaker Port
- External Battery-Backed Real-Time Clock and CMOS RAM
- 255-Level Timer Intervals Watch-Dog Timer, Setup by Software

- 120-Pin PC/104-*Plus* (PCI104) Expansion Bus Connector

Graphics Controller

- Intel 855GME (GMCH-M) Integrated Graphics Controller
- Display Core Frequency Up To 250Mhz
- 2D/3D Graphics Engine
- Supports CRT and LVDS LCD Displays
- UMA Architecture, Up to 64 MB of Dynamic Video Memory Allocation
- CRT Modes Up To 1600 x 1200 at 85-Hz and 2048 x 1536 at 75Hz
- LCD Mode Up To UXGA Resolution with Frequency from 25 MHz to 112 MHz
- Dual Channel LVDS Interface Support 2 Channel 18-bit LVDS LCD Panel
- Standard Model Supports 3.3V Flat Panels (5V Panels Require External Adapter)

Ethernet LAN Interface

- Intel 82801DBM (ICH4-M) Integrated 10/100Mbps LAN Controller
- Intel 82562EP 10/100 Mbps Platform LAN Connect (PLC)
- IEEE 802.33 (ANSI 8802-3) 10/100 Base-T Fast Ethernet Compliant
- 32-bit PCI Host Interface for Fast Operation, Up To 33MHz
- Plug and Play Compatible
- 10/100BaseT via an RJ-45 Adapter
- Network Boot Manager build In System BIOS

Enhanced IDE Controllers

- Intel 82801DBM (ICH4-M) Integrated Enhanced IDE Controller
- Independent Timing of Up To 2 Drives
- Supports "Native Mode" Register and Interrupts
- Ultra-ATA/100/66/33, BMIDE and PIO modes
- Tri-State Modes To Enable Swap Bay

High-Speed USB Controllers

- Intel 82801DBM (ICH4-M) Integrated USB Controller
- Includes 3 UHCI Host Controllers That Support 6 USB Ports
- Includes 1 EHCI High-Speed USB 2.0 Host Controller That Supports All 6 Ports
- Supports Legacy Keyboard/Mouse Software

AC'97 Link for Audio and Telephony CODECs (Manufacturing Option)

- Supports AC'97 2.3
- Independent Bus Master Logic For 7 Channels

- Separate Independent PCI Functions for Audio and Modem
- Support for Up To 6 Channels of PCM Audio Output (Full AC3 Decode)
- Supports Wake-Up Events

Serial Ports

- Two Full Function Serial Ports
- High Speed 16C550A Compatible UART with Send/Receive 16-Byte FIFOs
- Supports 230k and 460k Baud
- Programmable Baud Rate Generator
- Modem Control Circuitry
- On-Board Generation of Signal Levels
- RS-232/RS-422/485 Ports with Jumpless Setting

Multi-Mode Parallel Port with ChiProtect

- Standard Mode IBM PC/XT, PC/AT, and PS/2 Compatible Bi-directional Port
- Enhanced Parallel Port (EPP) Compatible - EPP 1.7 and EPP 1.9
- IEEE-1284 Compliant Enhanced Capabilities Port (ECP)
- ChiProtect Circuitry for Protection
- Internal 16-Byte FIFO Buffer
- DMA Option for Data Transfers

Keyboard/Mouse Controller

- 8042 Software Compatible
- 8 Bit Microcomputer
- 2k Bytes of Program ROM
- 256 Bytes of Data RAM
- Asynchronous Access to Two Data Registers and One Status Register
- Standard PS/2 Keyboard and Mouse Interface

Infrared Port

- Multiprotocol Infrared Interface
- 32-Byte Data FIFO
- IrDA 1.0 Compliant
- SHARP ASK IR
- HP-SIR

Mechanical and Environmental

- Dimensions: 3.6 x 3.8 inch (90 x 96 mm)

- Operating Temperature: -20 ~ 65° C (-40 ~ 85° C Extended Temperature)
- Storage Temperature: -55° to +120° C
- Operating Humidity: 0% ~ 95% Relative Humidity, No Condensing
- Weight: 160 gm, No DRAM Installed (With Standard Heat Sink)
- Shock and Vibration: Tested to MIL-STD 202F, Method 213B, Table 213-I, Condition A (three 50G shocks in each axis) and MIL-STD 202F, Method 214A, Table 214-I, Condition D (11.95B random vibration, 100 Hz to 1000 Hz for 5 minutes per axis).
- PC/104-*Plus* (PCI104) Expansion Bus: 4 x 30 pin 2 mm. Pitch Stackthrough Connector. Electrical Specifications Equivalent to PCI Local Bus Specification Rev. 2.2

Power Requirement

- Voltage: +3.3V +/- 5% (+5V +/- 5% for Optional)
- Current: 2.2A @ 3.3V with 1Ghz Celeron-M (Typical)

1.4. Board Dimension

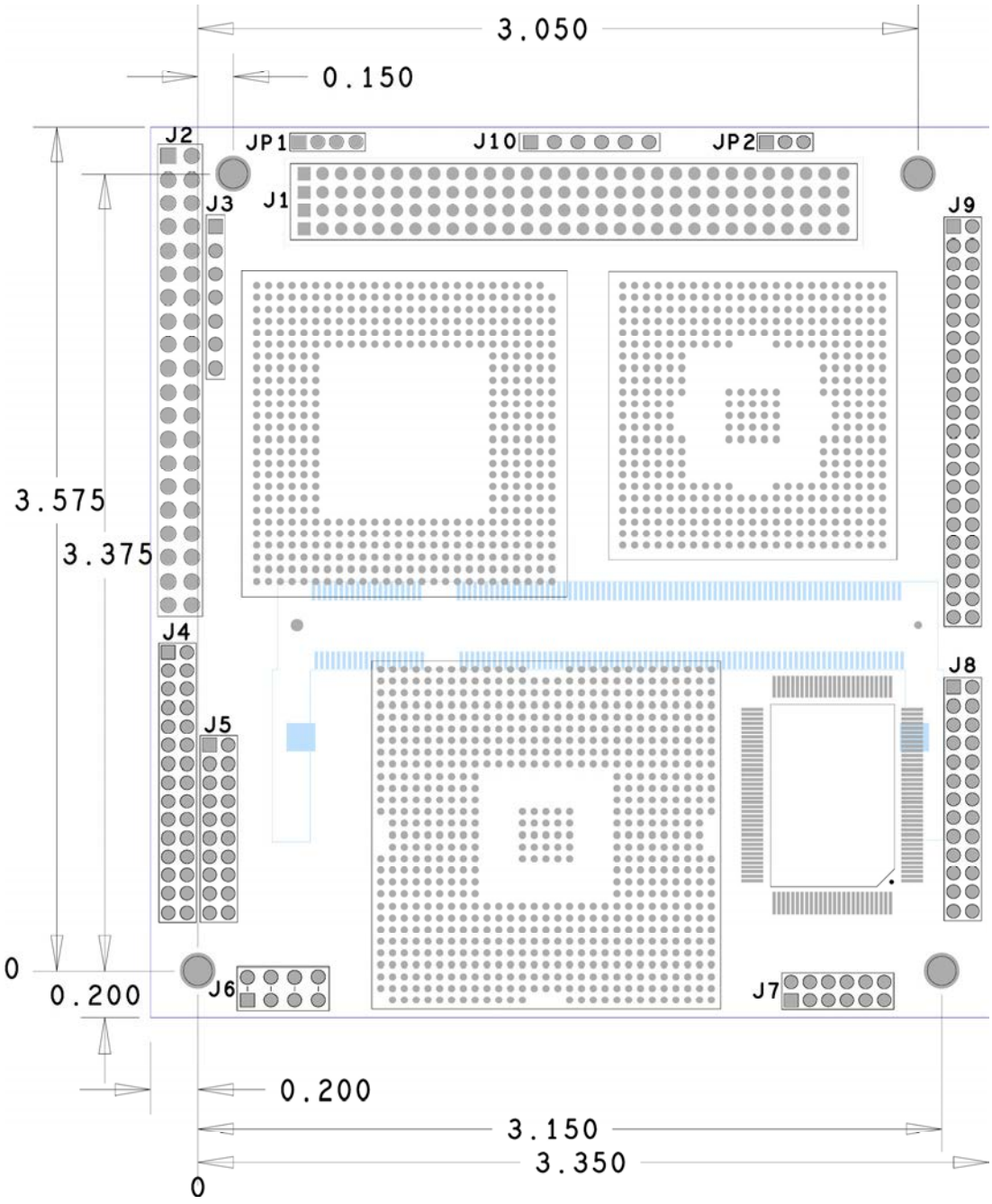


Figure 2 : LW-P104-P4I1 Board Dimension (Inch)

Chapter 2

Installation

This chapter explains the setup procedures of LW-P104-P4I1 system module, including instructions on setting jumpers and connecting peripherals, switches. Be sure to read all safety precautions before you begin the installation procedure.

Information includes:

- *Jumpers*
- *Setting Jumpers*
- *Connectors (Headers)*
- *Installing SO-DIMM (J11)*
- *USB & Utility Connector (J2)*
- *Power Connector (Header) (J6)*

Chapter 2. Installation

2.1. Jumpers

The LW-P104-P4I1 has two jumpers that allow you to configure your system to suit your application. The figures and table below list the functions of the various jumpers.

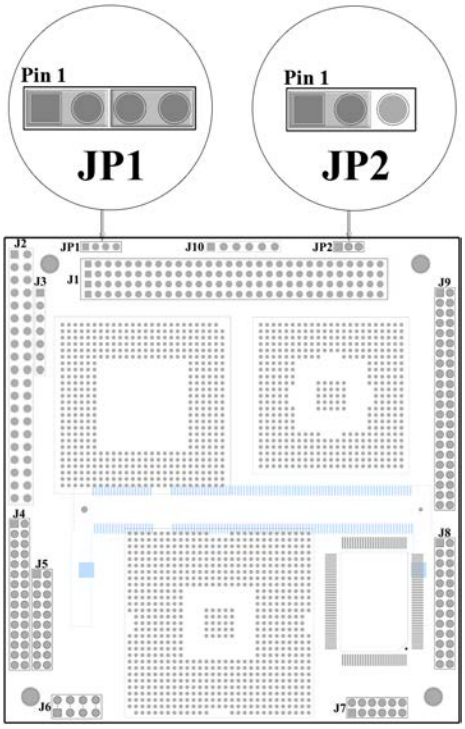


Figure 3 : Jumpers Location

The LW-P104-P4I1 system module has jumpers in default positions so that in most cases it requires no special jumpering for normal operation. You can connect the power and peripherals to operate immediately.

Table 1. Jumper Setting Summary

Reference	Function	Position		Default
		On	Off	
JP1 (1-2)	RS-422/485 Termination for Port 1	Terminated	No Termination	On
JP1 (3-4)	RS-422/485 Termination for Port 2	Terminated	No Termination	On
JP2 (1-2)	BIOS Recovery (For Manufacturer Use Only)	Normal Operation		On

2.2. Setting Jumpers

You may configure your module to match the needs of your application by setting jumpers. A jumper is a metal bridge used to close an electric circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "Closed" a jumper, you connect the pins with the clip. To "Open" a jumper, you remove the clip. Sometimes a jumper will have more than two pins, labeled 1, 2, 3 and etc. In this case you would connect pins 2 and 3 on the 3-pin jumper.

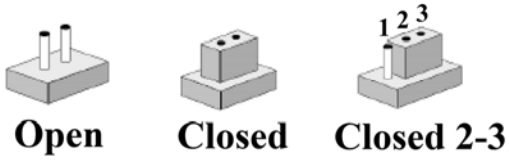


Figure 4 : Jumper Setting Illustrating

Jumpers are designated with JP1 and JP2. Jumper pin is 2 mm pitch. The square solder pad identifies as pin 1 of the jumper. *Table 1. Jumper Setting Summary* is a summary of jumper use. Factory settings are shown in the Default column.

IMPORTANT: *Always set Jumper JP2 to default options that are not user-settable. These are indicated in the Table 1. Jumper* **Setting Summary**. **DO NOT CHANGE THESE SETTINGS.**

Figure 5 : Jumper Schematic Setting Illustrating

A pair of needle-nose pliers may be helpful when working with jumpers. If you have any doubts about the best hardware configuration for your application, contact LongWin before you make any changes.

2.3. Connectors (Headers)

On board connectors (headers) link the LW-P104-P4I1 system module to external devices such as hard disk drives, a keyboard, or USB devices. The table below lists the function of each of the board's connectors.

Generally, you simply need a standard cable to make most connections. Refer to *Figure 6. Connectors Location (Top Side)* for the locations of the connectors (headers) J1 to J10. *Table 2. LW-P104-P4I1 Connector (Header) List* summarizes the use of the I/O connectors (headers). Each interface is described in its own section, showing pin assignments, signal definitions. Please refer to relative section for detail.

All the I/O connectors are single or dual-row male headers with 0.1 inch or 2mm pitch for use with flat ribbon (IDC) female connectors and ribbon cable. Shrouded with center-bump polarized

headers are manufacturing options upon required. It will prevent accidentally installing cables backwards.

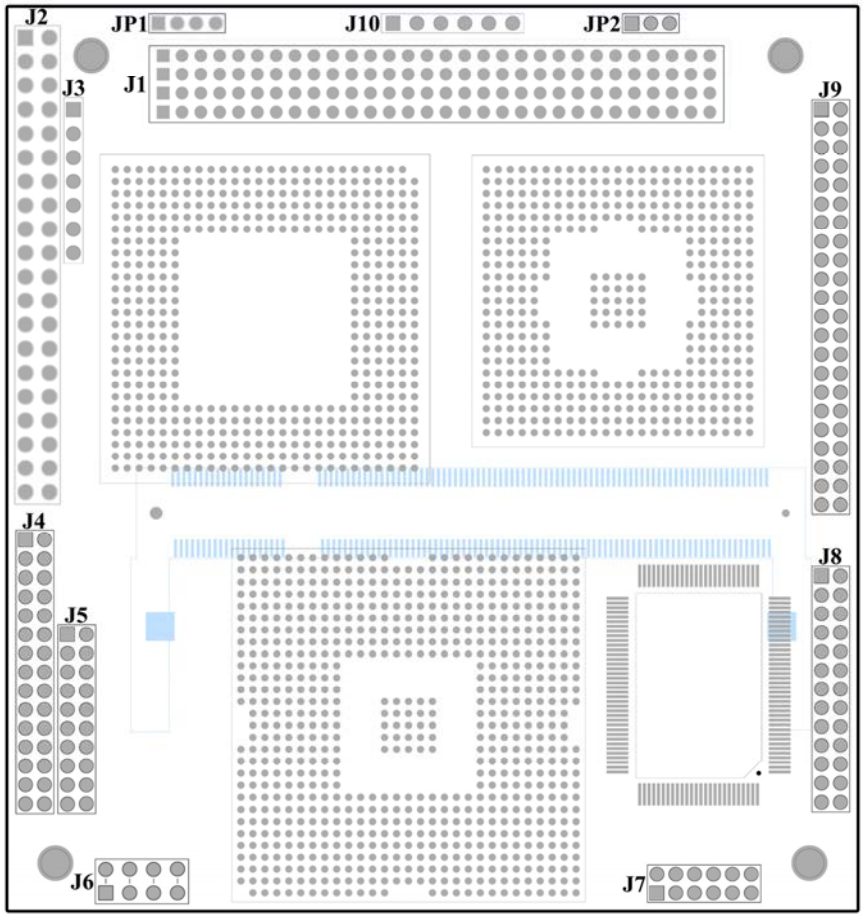


Figure 6. Connectors Location (Top Side)

You can design a PCB board assembly, made with female connectors in the same relative positions as the LW-P104-P4I1's headers, to eliminate cables requirements. Precise dimensions for locating connectors are provided upon required.

Table 2. LW-P104-P4I1 Connector (Header) List

Reference	Description	Header Pitch
J1	PC/104-Plus Expansion Connector	2 mm
J2	USB & Utility Connector	0.1 Inch
J3	Ethernet Interface (LAN) Connector	0.1 Inch
J4	LVDS Graphic Interface Connector	2 mm
J5	RS-232/RS-422/485 Port Connector	2 mm
J6	Power Connector	0.1 Inch
J7	CRT Display Connector	2 mm
J8	Parallel Port Connector	2 mm

J9	IDE Interface Connector	2 mm
J10	AC'97 Audio Connector (Option)	0.1 Inch
J11	DDR SDRAM SO-DIMM Socket	

The PC/104-*Plus* (PCI104) expansion bus appears on connector J1 (A, B, C, D). It uses a 2 mm 4-row connector called out in the PC/104-*Plus* specification. J1 has both male and female connections on top and bottom sides, allowing for "Stackthrough" assembly. You can expand the system with other PC/104-*Plus* compliant expansion modules. These modules stack directly on the connectors.

2.4. Installing SO-DIMM (J11)

The LW-P104-P4I1 system module supports a single standard 64-bit 200-pin 2.5V DDR SDRAM SO-DIMM. The BIOS will automatically detect the size of the installed memory module and accordingly configures the system at boot time. The amount of memory the BIOS measured can be displayed by running BIOS Setup. Memory parity and error correction (ECC) are not supported by the chipset used on the LW-P104-P4I1 system module.

The SO-DIMM socket is allocated at the bottom side in the system as shown as following.

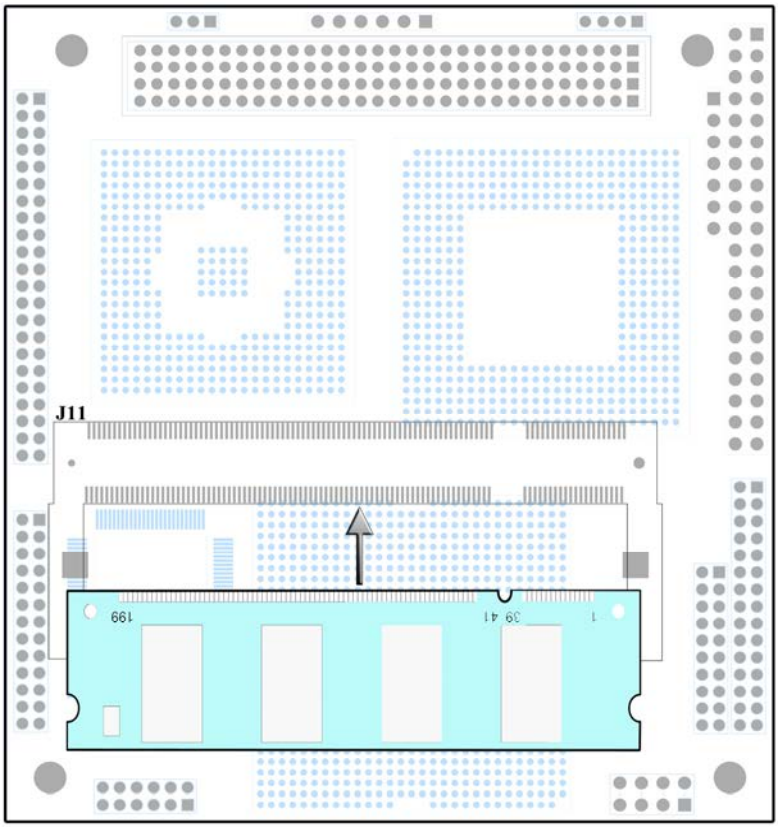


Figure 7. SO-DIMM Socket (Bottom Side)

The procedure for installing SO-DIMMs is described below. Please follow these steps carefully. The number of pins is different on either side of the breaks, so the module can only fit in one way. SO-DIMMs modules have different pin contacts on each side, and therefore have a higher pin density.

- *Make sure that the two handles of the SO-DIMM socket (J11) are in the "open" position. For example, the handles remain leaning outward.*
- *Slowly slide the SO-DIMMs module along the plastic guides on both ends of the socket (J11).*
- *Press the SO-DIMMs module right down into the socket, until you hear a click. This is when the two handles have automatically locked the memory module into the correct position of the socket (J11).*

To remove the memory module, just push both handles outward, and the module will be ejected from the socket (J11).

2.5. USB & Utility Connector (J2)

The LW-P104-P4I1 system module use most popular 0.1 inch pitch header for USB & Utility Connector (J2). It will be convenient to directly use most peripheral devices without requirement for adapted cable. USB and Utility Connector provides multi-functions including:

- 6 USB Ports
- PS/2 Keyboard
- PS/2 Mouse
- PC Speaker
- Push-Button Reset Switch
- RTC External Back-Up Battery

Since there are connections for diverse features on this single connector, you would usually choose a discrete-wire connector rather than a ribbon cable to connect all together. The connector pin assignments and signal definitions are as following table.

Table 3. & Utility Connector Pin Assignment (J2)

Description	Signal	Pin		Pin	Signal	Description
+5V Power	+5V	1		2	+5V	+5V Power
USB 1 Data Positive	USBP1P	3		4	USBP2P	USB 2 Data Positive
USB 1 Data Negative	USBP1N	5		6	USBP2N	USB 2 Data Negative
Ground	Gnd	7		8	Gnd	Ground
+5V Power	+5V	9		10	+5V	+5V Power
USB 3 Data Positive	USBP3P	11		12	USBP4P	USB 4 Data Positive
USB 3 Data Negative	USBP3N	13		14	USBP4N	USB 4 Data Negative
Ground	Gnd	15		16	Gnd	Ground
+5V External	+5V	17		18	+5V	+5V External
USB 5 Data Positive	USBP5P	19		20	USBP6P	USB 6 Data Positive
USB 5 Data Negative	USBP5N	21		22	USBP6N	USB 6 Data Negative
Ground	Gnd	23		24	Gnd	Ground
IrDA Transmit Data	IrTX	25		26	IrRX	IrDA Receive Data
+5V Power	+5V	27		28	+5V	+5V Power
Keyboard Clock	KClk	29		30	MClk	Mouse Clock
Keyboard Data	KDat	31		32	MDat	Mouse Data
Ground	Gnd	33		34	Gnd	Ground

Ground	Gnd	35		36	Speaker	Speaker Output
Ground	Gnd	37		38	SysReset	System Reset
Ground	Gnd	39		40	BatRTC	RTC Battery

IMPORTANT: *Make sure you have correct pin 1 orientation before connect device to module.*

2.5.1. USB Interface

The USB interface ports are intended for mass storage, keyboards, mouse and other peripherals. The LW-P104-P4I1 system module provides up to six Universal Serial Bus (USB) ports. This gives complete Plug and Play, and hot attach/detach for up to 127 external devices. The USB interfaces comply with USB specification Rev 2.0 and Rev 1.1.

Each USB interface is implemented as a two-wire differential pair for data, a power wire, and a ground wire comes with a shield wire. If your USB device come with a standard 4-pin 0.1 inch pitch connector, you can hook it to LW-P104-P4I1 system module directly, otherwise you will need an USB adapt cable. The USB port signals are as shown as following.

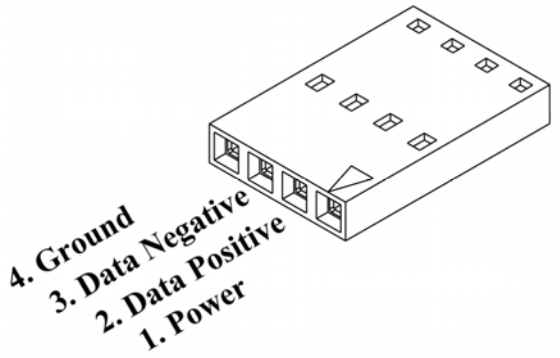


Figure 8 : 4-Pin USB Connector Header

The USB Port 1 to USB Port 4 is powered by on-board +5V power supply, the total current limitation is 500mA. The USB Port 5 and USB Port 6 is powered by external +5V power supply through Power Connector of J6. Please refer the *Table 3. & Utility Connector* Pin Assignment (J2) for pin assignment and function description details.

2.5.2. PS/2 Keyboard and Mouse Interface

The LW-P104-P4I1 system module provides both a PS/2 keyboard and a PS/2 mouse. In most cases, especially in embedded applications, a keyboard is not used. If the keyboard is not present, the standard PC/AT BIOS will report an error or fail during power-on self test (POST) after a reset. The LW-P104-P4I1's BIOS allows no-keyboard operation in embedded system applications, without the system halting under POST.

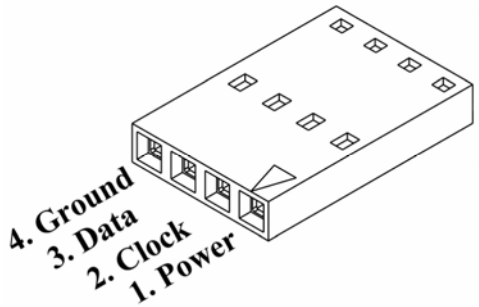


Figure 9. PS/2 Keyboard & Mouse Connector Header

The PS/2 keyboard or PS/2 mouse can be connected with standard 4-Pin 0.1 inch pitch connector. Please refer the *Table 3. & Utility Connector Pin Assignment (J2)* for pin assignment and function description details.

2.5.3. Speaker / Buzzer Connection

The LW-P104-P4I1 is equipped with a PC speaker interface with 2-pin header. If your speaker (buzzer) comes with a standard 2-pin 0.1 inch pitch header, you can hook it to LW-P104-P4I1 system module directly. Please refer the *Table 3. & Utility Connector Pin Assignment (J2)* for pin assignment and function description details.

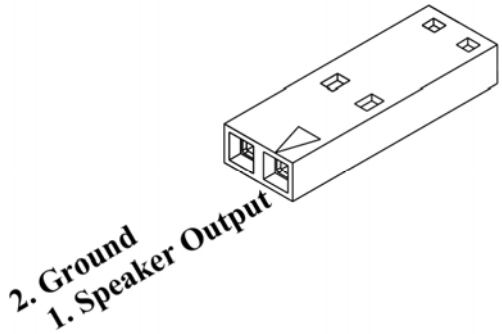


Figure 10. Speaker / Buzzer Connection Header

2.5.4. Reset Switch Connection

A push-button provides a connection for an external normally-open switch to manually reset the system. If you install a reset switch, it should be an open single pole switch. Momentarily pressing the switch will activate a reset. The reset signal is "de-bounced" on the board.

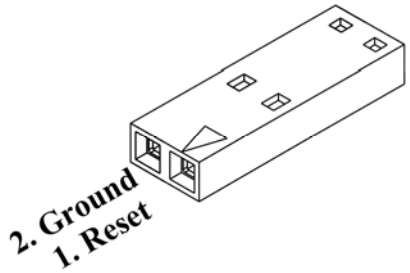


Figure 11. Reset Switch Header

If your switch comes with a standard 2-pin 0.1 inch pitch header, you can hook it to LW-P104-P4I1 system module directly. Please refer the *Table 3. & Utility Connector Pin Assignment (J2)* for pin assignment and function description details.

2.5.5. Real-Time Clock (RTC) BatteryConnection

An external battery-backed real-time clock (with CMOS RAM) is standard on the LW-P104-P4I1 system module. After an external battery installed, use BIOS Setup to initializes or change the real-time clock and various parameters in the configuration memory such as the date and time as needed.

The contents of the configuration memory are also stored in on-board Flash memory. The BIOS reads the Flash memory to get configuration information if the CMOS RAM data is lost. This means that the board will function if the battery fails. Note that, without a battery, the real-time clock date and time will not be correct.

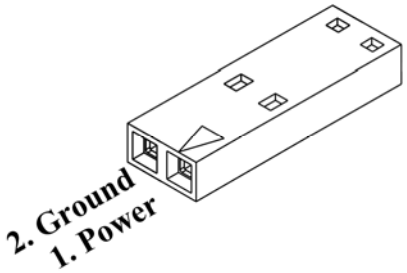


Figure 12. External Battery Header

The real-time clock (RTC) battery provides a power for real-time clock and BIOS Setup data. The battery power voltage should be 2.0-3.3V, typically a 3.0 or 3.3V battery. The working current is less than 5uA, so most coin (cell) battery can provide more than 5 years working life.

If your battery comes with a standard 2-pin 0.1 inch pitch header, you can hook it to LW-P104-P4I1 system module directly. Please refer the *Table 3. & Utility Connector Pin Assignment (J2)* for pin assignment and function description details.

2.5.6. Infrared (IrDA) Interface

The LW-P104-P4I1 infrared interface provides for a two-way wireless communications port using infrared as a transmission medium. The IrDA interface supports HP-SIR and Amplitude Shift Keyed IR standards. The SIR standard allows serial communication at baud rates up to 115.2K Baud.

On the LW-P104-P4I1 system board, the IrDA physical link hardware consists of an IR transmit encoder and IR receiver decoder. To implement an IrDA port, the OEM must supply an IR transducer, which consists of the output driver and IR emitter for transmitting, and the receiver IR detector. Particular IR transducers may require additional external components.

The IrDA port uses the second serial port to drive its internal encoder/decoder. When using the IrDA interface, you cannot use serial 2 as an RS-232 or RS-422/485 port.

2.6. Power Connector (Header) (J6)

A standard 4x2-pin 0.1 inch pitch header supplies main power to the LW-P104-P4I1 system module and to devices that require. The +5V power supply is used to provide power for stacked external 5V PCI104 module if needed or USB Port 5 and USB Port 6 that require large 5V current device.

Caution !

Be sure the power plug is wired correctly before applying power to the board! See *Table 4. Power Connector (Header) Pin Assignment*.

Table 4. Power Connector (Header) Pin Assignment

Signal	Pin		Pin	Signal
+5V (Option)	1		2	Key
+3.3V	3		4	Ground
+3.3V	5		6	Ground
+3.3V	7		8	Ground

2.6.1. Power Requirements

The LW-P104-P4I1 system module requires only single +3.3VDC (±5%) for operation. The voltage required for the RS-232 ports is generated on-board. On-board low-voltage power supply circuits provide power to CPU, chipset and certain other components.

The exact power requirement of the LW-P104-P54I1 system depends on several factors, including the installed memory devices, the peripheral connections, and which, if any other expansion boards are attached. For example, the keyboard draws its power from the board, and there can be some loading from the serial, parallel, and other peripheral ports.

There may be a requirement for an external +5VDC power supply, depending on what peripherals you connect to the LW-P104-P4I1 system module. If a PCI expansion card requiring 5V is installed or you hook USB device to USB Port 5/6, that voltage can be connected to J6 Pin 1 to supply power to the peripheral.

2.6.2. Power Monitor

The LW-P104-P4I1 system module includes a circuit that can sense a power failure. If the +3.3VDC power supply falls below ~2.93V, the power fail logic produces a system reset to reboot the system.

Chapter 3

Technical Reference

This chapter explains contains information that permits users to create an embedded system customized to specific requirements.

Information includes:

- *System Memory*
- *ROM BIOS*
- *I/O Address Map*
- *Interrupt and DMA Channel Usage*
- *CRT / Flat Panel Graphics Controller*
- *Ethernet Network Interface (LAN) (J3)*
- *EIDE/Ultra-ATA Interface (J9)*
- *RS-232/RS-422/485 Port Interface (J5)*
- *Parallel Port Interface (J8)*
- *PC/104-Plus (PCI104) Expansion Bus (J1)*

Chapter 3. Technical Reference

3.1. System Memory

The LW-P104-P4I1 system module supports a 64-bit DDR SDRAM SO-DIMM memory module. The BIOS will automatically detects the memory module SPD through SM-Bus to accordingly configure the system at boot time. Memory parity and error correction (ECC) are not supported by the chipset used on this system module.

The System memory is allocated in the system as shown as following.

Table 5. System Memory Map

Memory Address	Function
100000h – 3FFFFFFFh	Extended memory
0F0000h - 0FFFFFh	BIOS Area
0E0000h – 0EFFFFh	BIOS Extension
0C0000h - 0CAFFFh	Video BIOS and Add-On BIOS
0A0000h - 0BFFFFh	Video Buffer (SMM Memory)
000000h - 09FFFFh	Lower 640K DOS Area Memory

3.2. ROM BIOS

The standard BIOS is installed in a 1 GByte Flash device at the factory. The top 128K bytes of the Flash device is reserved for the system BIOS, located at E0000–FFFFFh. There are 512K bytes for user application use.

3.2.1. Shadowing

To improve system performance, the contents of the BIOS and video BIOS are copied into SDRAM for execution ("shadowed"), where they are accessed as 64-bit wide data. Shadowing a BIOS ROM substantially enhances system performance, especially when an application or operating system repeatedly accesses the BIOS. Shadowing for both the ROM BIOS and the video BIOS is built into the LW-P104-P4I1 Extended BIOS. There is no user setting.

3.2.2. BIOS Recovery

If the BIOS Flash device somehow becomes corrupted, the LW-P104-P4I1 system module may not boot. In this case, the BIOS have to be reprogrammed. Contact LongWin for information on the BIOS recovery.

3.3. I/O Address Map

Table 6. I/O Address Map shows the I/O decode ranges from the CPU perspective. Note that for each I/O range, there may be separate behavior for reads and writes. The hub interface cycles that go to target ranges that are marked as "Reserved" will not be decoded by the Intel chipset ICH4-M, and will

be passed to PCI. If a PCI master targets one of the I/O target ranges, it will be positively decoded by the ICH4-M in Medium speed.

Table 6. I/O Address Map

I/O Address	Target
00-0Fh	DMA Controller
10-1Fh	DMA Controller
20-2Dh	Interrupt Controller
2E-2Fh	LPC Super I/O
30-3Dh	Interrupt Controller
40-43h	Timer / Counter
4E-4Fh	LPC Super I/O
50-53h	Timer / Counter
60/62/64/66h	Keyboard Controller
61/63/65/67h	NMI Controller
70-77h	Real Time Clock Controller
80-8Fh	DMA Controller
80h	Post Code Output Port
92h	Fast A20 gate and CPU reset Generator
A0-ADh	Interrupt Controller
B0-BDh	Interrupt Controller
C0-DFh	DMA Controller
F0h	FERR# / GNNE# Latch
1F0-1F7h 3F6h	IDE Controller
278-27Fh	Printer Alternate
2E8-2EFh	Serial Port (COM) Alternate
2F8-2FFh	Serial Port 2 (COM2) Default
378-37Fh	Printer Default
3BC-3BFh	Printer Alternate
3E8-3EFh	Serial Port (COM) Alternate
3F8-3FFh	Serial Port 1 (COM1) Default

3.4. Interrupt and DMA Channel Usage

The PC architecture provides several interrupt and DMA control signals. It is important that you configure the new module to use an interrupt or DMA channel not already in use. For your

convenience, following table provides a summary of the normal interrupt assignments on the LW-P104-P4I1.

Table 7. Interrupt Channel Assignments

8259	Interrupt	Function
Master	0	Internal Timer / Counter
	1	Keyboard
	2	Cascade Input for Interrupt 8-15
	3	Serial Port A
	4	Serial Port B
	5	Parallel Port
	6	
	7	Parallel Port (Option)
Slave	0	Internal Real-Time Clock (RTC)
	1	Generic (PCI)
	2	Generic (PCI)
	3	Generic (PCI)
	4	PS/2 Mouse
	5	
	6	Primary IDE Controller
	7	

The Intel Chipset ICH4-M maintains compatibility with the implementation of the DMA in the PC AT which used the 82C37. The DMA shifts the addresses for transfers to/from a 16-bit device count-by-words.

The transfer size of DMA channel 0 to channel 3 is 8-bit, and the transfer size of DMA channel 4 to channel 7 is 16-bit.

3.5. CRT / Flat Panel Graphics Controller

An integrated high-performance and flexible graphic controller supports both flat panels and CRTs, and offers full software compatibility with all popular PC video standards including VGA, Super VGA, and VESA. There are two connectors associated with the graphics display, one is CRT and another is LVDS flat panel.

3.5.1. CRT Display Interface (J7)

The LW-P104-P4I1 CRT interface can drive conventional CRT displays. Analog video signals from the graphics controller appear on a 12-pin dual-row header J7. These signals are compatible with the standard video monitors commonly used with desktop PCs.

The CRT display header is used for conventional CRT displays. A simple one-to-one adapter can be used to match VGA Display header to a standard 15-pin D-SUB connector commonly used for VGA. Users can drive a standard progressive scan analog monitor with pixel resolution up to 1600 x1200 at 85 Hz and up to 2048 x 1536 at 75 Hz. Pin assignments for CRT display header (J7) are detailed as followings.

Table 8. CRT Display Interface Pin Assignment (J7)

Description	Signal	Pin		Pin	Signal	Description
Ground	Gnd	1		2	Red	Red
Ground	Gnd	3		4	Green	Green
Ground	Gnd	5		6	Blue	Blue
Ground	Gnd	7		8	HSync	Horizontal Sync
+5V Power	Vcc	9		10	VSync	Vertical Sync
I2C Bus Data	SDA	11		12	SCL	I2C Bus Clock

Signals from J7 are connected to a standard DB-15 CRT connector by an adapter made from a connector and ribbon cable. On-board 5V power supply can supply power to an external device, such as an NTSC Video adapter module with less than 500mA current.

3.5.2. LVDS Flat Panel Interface (J4)

The LW-P104-P4I1 system module uses the Intel 855 GME chipset that supports dual-channel LVDS panel up to UXGA panel resolution with frequency range from 25MHz to 112MHz. The display mode can be 2 channel (2 x 18bit) LVDS LCD displays panel. It has capable of driving a wide range of LVDS flat panel displays, both color and gray-scale.

Although flat panels of a similar type use similar sets of signals from the video controller, they do not share a standardized interface connector pin configuration. Read the description of each signal carefully to determine how each signal is be used for the display you choose. Refer to the panel manufacturer's technical literature to determine how to wire a cable for the panel you choose for your application.

Table 9. LVDS Flat Panel Interface Pin Assignment (J4)

Description	Signal	Pin		Pin	Signal	Description
Ground	Gnd	1		2	+3.3V	+3.3V Power
+3.3V Power	+3.3V	3		4	+3.3V	+3.3V Power
Key	Key	5		6	DDCPClk	Panel DDC Clock
Panel DDC Data	DDCPData	7		8	YAM0	Channel A: Y0-
Channel A Data Out: Y0+	YAP0	9		10	Gnd	Ground
Channel A Data Out: Y1-	YAM1	11		12	YAP1	Channel A Data Out: Y1+

Ground	Gnd	13	14	YAM2	Channel A Data Out: Y2-
Channel A Data Out: Y2+	YAP2	15	16	Gnd	Ground
Channel A Clock-	ClkAM	17	18	ClkAP	Channel A Clock+
Ground	Gnd	19	20	YBM0	Channel B Data Out: Y0-
Channel B Data Out:: Y0+	YBP0	21	22	Gnd	Ground
Channel B Data Out: Y1-	YBM1	23	24	YBP1	Channel B Data Out:: Y1+
Ground	Gnd	25	26	YBM2	Channel B Data Out: Y2-
Channel B Data Out: Y2+	YBP2	27	28	Gnd	Ground
Channel B Clock-	ClkBM	29	30	ClkBP	Channel B Clock+

In many applications, the power management functions control the LCD display, for example, in portable equipment. Furthermore, power and signals must be sequenced in time when the system is energized to prevent damage to the display. The LW-P104-P4I1 system module provides power and signal conditioning to meet these requirements. The LVDS power is 3.3V. The module has a 30-pin dual-row header to support these display panels as in *Table 9. LVDS* Flat Panel Interface Pin Assignment (J4).

3.6. Ethernet Network Interface (LAN) (J3)

The LW-P104-P4I1 is equipped with a high performance 32-bit PCI-bus Ethernet interface which is fully compliant with IEEE 802.3U 10/100Mbps CSMA/CD standards. It is supported by all major network operating systems.

The Ethernet subsystem is a 10/100 PCI Ethernet Controller. It fully supports IEEE 802.3 Ethernet standards — 10BaseT and 100BaseT. For maximum performance, the Ethernet controller uses the PCI bus for system-side data transfers. Features of this Ethernet controller include:

3.6.1. Hardware Description

The Ethernet subsystem is based on the integrated Intel ICH4-M Ethernet Controller and Intel 82562EP559ER Intel 82562EP 10/100 Mbps Platform LAN Connect (PLC). It fully supports IEEE 802.3 Ethernet standards, and supports standard 10BaseT and 100BaseT via a 7-pin single row Ethernet LAN connector.

Table 10. Ethernet LAN Pin Assignment (J3)

Pin	Signal	Description
1	LANTDP	LAN TD+
2	LANTDN	LAN TD-
3	Gnd	Ground
4	LANRDN	LAN RD-
5	LANRDP	LAN RD+
6	LANActLED*	LAN Active LED
7	LANLiLED*	LAN Link LED

An Ethernet Adapter Cable is a standard 7-pin 0.1 inch pitch header with a build-in magnetic RJ45 Socket. Following is a reference schematic for Ethernet adapter cable.

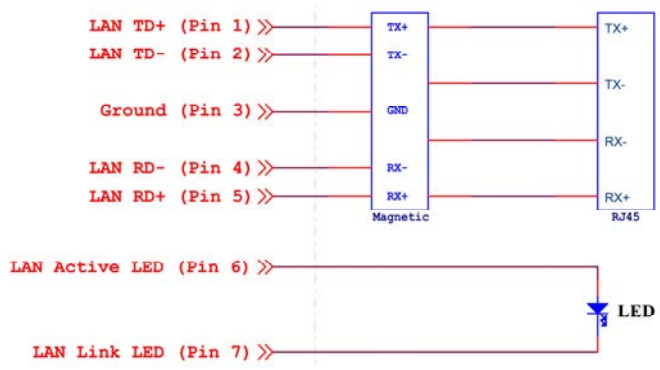


Figure 13. Ethernet Adapter Reference Schematic

One LED indicator lamp is provided on the board to indicate the status of the Ethernet interface. You can use these LEDs as simple trouble-shooting aids when it connects to an Ethernet segment.

Table 11. Ethernet LED Function

LED	Function
Off	No Connection
On	Ethernet Linked
Blink	There are data transfer on Ethernet

3.6.2. Manufacturer's Ethernet ID

Each manufacturer of Ethernet network adapters and interfaces is assigned a unique manufacturer's ID by the IEEE Standards Office. A network address consists of 48 bits. The upper 24 bits are the manufacturer's ID and the lower 24 bits are the board's unique ID.

For developers who are creating network applications, knowing the manufacturer's ID for network adapters attached to the network that may or may not be important.

LongWin's 24-bit manufacturer's ID for Ethernet controllers is displayed in hex as follows:

```
00 00 00
```

3.6.3. Network Operating Systems and Drivers

The Ethernet interface is typically connected in a network controlled by a network operating system. The network operating system may be part of the computer's operating system or be provided separately. For example, Windows® NT provides the network operating system as part of computer's operating system. Novell's NetWare provides a separate, add-on network operating system for DOS and Windows. The network operating system provides file server and network services to the distributed systems connected to the network. Each node on the network must have a compatible network operating system installed as well.

Modern network architectures are based on the OSI model, which defines layers of software between the network hardware, the network operating system, and the applications that use the network services. The actual Ethernet cable and the LW-P104-P4I1 hardware interface are at the bottom level. A driver program at the next level handles communication between the hardware and the operating system, masking any unique differences in the hardware from the layers above it, including the network operating systems.

The LW-P104-P4I1 Ethernet subsystem uses Intel chipset family drivers. The driver is the only unique software you need to use the LW-P104-P4I1 system module. The supported network operating systems provide the other software layers normally provided in the OSI model.

Drivers are included in companion CD-ROM. For the most up-to-date drivers and utility software, please refer to the Intel web site: **http://www.intel.com/.**

3.6.4. Setting Up Ethernet LAN

There are no jumpers to set on the Ethernet interface, and no hardware configuration, other than connecting the network adapter cable to an appropriate connector.

Build-in Ethernet Boot ROM enables the LW-P104-P4I1 system module to boot from an Ethernet network server instead of a local hard disk. The Network Boot feature can be utilized by incorporating the Boot ROM image files for the appropriate network operating system. The Boot ROM are included in the system BIOS.

3.7. EIDE/Ultra-ATA Interface (J9)

The LW-P104-P4I1 system module provides an IDE channel which you can attach up to two Integrated Device Electronics (IDE) hard disk drives or CD-ROM to the LW-P104-P4I1's internal IDE controller. The LW-P104-P4I1's IDE controller uses a PCI interface supporting faster data transfer, PIO Mode 3, Mode 4 and UDMA100/66/33.

The EIDE/Ultra-ATA 100/66/33 interfaces provide high-speed hard disk, IDE CD-ROM drive, and other IDE device access. The interfaces support two standard IDE devices. The interface is fully compliant with the AS/NSIS ATA specification and the ATAPI Specification.

For maximum reliability, keep IDE drive cables less than 18 inches long.

It requires a cable (not included in this package), depending on the drive size. 1.8" and 2.5" drives need a 44-pin flat cable connector. 3.5" drives use a 44-pin flat cable with 44-Pin (2mm Pitch) to 40-pin (0.1 Inch Pitch) connect adapter. Wire number 1 on the cable is red or blue, and the other wires are gray.

- *Connect one end of the cable to J9. Make sure that the red (or blue) wire corresponds to pin 1 on the connector, which is square labeled pin (or Colored) on the board.*
- *Plug the other end of the cable into the Enhanced IDE hard drive, with pin 1 on the cable corresponding to pin 1 on the hard drive. (See your hard drive's documentation for the location of the connector.)*

If desired, connect a second drive as described above. IDE hard drives can connect to either end of the cable. If you install two drives, you will need to set one as the master and one as the slave by using jumpers on the drives. If you install only one drive, set it as the master.

Table 12. IDE Port Connector (Header) Pin Assignment (J9)

Description	Signal	Pin		Pin	Signal	Description
Reset	Reset*	1		2	Gnd	Ground
Data 7	PDD7	3		4	PDD8	Data 8
Data 6	PDD6	5		6	PDD9	Data 9
Data 5	PDD5	7		8	PDD10	Data 10
Data 4	PDD4	9		10	PDD11	Data 11
Data 3	PDD3	11		12	PDD12	Data 12
Data 2	PDD2	13		14	PDD13	Data 13
Data 1	PDD1	15		16	PDD14	Data 14
Data 0	PDD0	17		18	PDD15	Data 15
Ground	Gnd	19		20	Key	Key
DMA Request	DDReq*	21		22	Gnd	Ground
I/O Write Strobe	DIOW*	23		24	Gnd	Ground
I/O Read Strobe	DIOR*	25		26	Gnd	Ground
Channel Ready	IORdy	27		28	Gnd	Ground
DMA Acknowledge	DDAck*	29		30	Gnd	Ground
Interrupt Request	IRQ	31		32	NA	Reserved
Address 1	DA1	33		34	DIAG*	Passed Diagnostics
Address 0	DA0	35		36	DA2	Address 2
Chip Select 1	DCS1	37		38	DCS3	Chip Select 3

Drive Active	Act*	39		40	Gnd	Ground
+5V Power	+5V	41		42	+5V	+5V Power
Ground	Gnd	43		44	NA	Reserved

3.8. RS-232/RS-422/485 Port Interface (J5)

The LW-P104-P4I1 system module provides two standard RS-232/RS-422/485 serial ports, implemented using 16C550-type UARTs. These UARTs are equipped with 16-byte FIFO buffers to improve throughput.

The two serial ports are software configurable for RS-232 or RS-422/485 operation. Both of these serial ports support the full set of modem signals. The ports' RS-232 level shifters incorporate built-in voltage pumps to generate RS-232 voltage levels from the system +3.3V power supply. These two ports can be configured as either Full of Half duplex in RS-485 mode. To support Half duplex, the TX and RX signals must be externally connected.

The LW-P104-P4I1 system module provides two RS-232 or RS-422/485 serial ports in a standard 10x2-pin 2mm pitch unshrouded header. You can find the pin assignments as following.

3.8.1. Serial Port I/O Addresses and Interrupt Assignments

The serial ports appear at the standard port addresses as shown in ***Table 13. Serial Port I/O Addresses and Interrupts***. Each serial port can be independently disabled using the BIOS Setup function, freeing its I/O addresses for use by other devices installed on the PC/104-*Plus* (PCI104) expansion buses.

The Table also shows the IRQs assigned to each serial port. Note that these interrupts are shared resources via serial interrupt protocol. (They do not have PC/104-*Plus* type interrupt sharing circuits, as defined in the PC/104 specification.)

Table 13. Serial Port I/O Addresses and Interrupts

Serial Port	I/O Address	Description
Port 1	Disabled	Set this value to prevent the serial port from accessing any system resources. When this option is set to Disabled, the serial port physically becomes unavailable.
	3F8h / IRQ4	Set this value to allow the serial port to use 3F8 as its I/O port address and IRQ 4 for the interrupt address. This is the default setting. The majority of serial port 1 or COM1 ports on computer systems use IRQ4 and I/O Port 3F8 as the standard setting. The most common serial device connected to this port is a mouse. If the system will not use a serial device, it is best to set this port to Disabled.
	3E8h / IRQ4	Set this value to allow the serial port to use 3E8 as its I/O port address and IRQ 4 for the interrupt address. If the system will not use a serial device, it is best to set this port to Disabled.
	2E8h / IRQ3	Set this value to allow the serial port to use 2E8 as its I/O port address and IRQ 3 for the interrupt address. If the system will not use a serial device, it is best to set this port to Disabled.

Port 2	Disabled	Set this value to prevent the serial port from accessing any system resources. When this option is set to Disabled, the serial port physically becomes unavailable.
	2F8h / IRQ3	Set this value to allow the serial port to use 2F8 as its I/O port address and IRQ 3 for the interrupt address. This is the default setting. The majority of serial port 2 or COM2 ports on computer systems use IRQ3 and I/O Port 2F8 as the standard setting. The most common serial device connected to this port is an external modem. If the system will not use an external modem, set this port to Disabled. Note: Most internal modems require the use of the second COM port and use 3F8 as its I/O port address and IRQ 4 for its interrupt address. This requires that the Serial Port2 Address be set to Disabled or another base I/O port address and Interrupt Request address.
	3E8h / IRQ4	Set this value to allow the serial port to use 3E8 as its I/O port address and IRQ 4 for the interrupt address. If the system will not use a serial device, it is best to set this port to Disabled.
	2E8h / IRQ3	Set this value to allow the serial port to use 2E8 as its I/O port address and IRQ 3 for the interrupt address. If the system will not use a serial device, it is best to set this port to Disabled.

When a serial port is disabled, its I/O addresses and IRQ are available to other peripherals installed on the PC/104-*Plus* (PCI104) expansion bus. You can disable any of the serial ports using Setup.

3.8.2. BIOS Installation of the Serial Ports

Normally, the ROM BIOS supports Serial Port 1 as the DOS COM1 device, Serial Port 2 as the DOS COM2 device, and so on. If you disable a serial port, and there is no substitute serial port in the system, then the ROM-BIOS assigns the COMn designations in sequence as it finds the serial ports, starting from the primary serial port and searching to the last one. Thus, for example, if Serial 1 is disabled, the BIOS assigns COM1 to Serial Port 2.

3.8.3. Serial Port Connector (J5)

The two serial ports appear on connector J5. *Table 14. RS-232/RS-422/485 Interface Pin Assignment (J5)* gives the connector pin assignments and signal definitions for the RS-232/RS-422/485interface of J5. The pin layout on J5 is arranged so that a 20-pin ribbon cable attached to J5 can be split into two 10-pin sections that will be directly connected to two 9-pin DB-9 connector to match the PC standard pin layout.

Table 14. RS-232/RS-422/485 Interface Pin Assignment (J5)

Description (RS-232/RS-422/485)	Signal	Pin		Pin	Signal	Description (RS-232/RS-422/485)
Data Carrier Detect 1	DCD1*	1		2	DSR1*	Data Set Ready 1
Receive Data 1 / Differential Receive 1 +	RXD1 / RX1+	3		4	RTS1* / TX1-	Request To Send 1 / Differential Transmit 1 -

Transmit Data 1 / Differential Transmit 1 -	TXD1 / TX1+	5		6	CTS1* / RX1-	Clear To Send 1 / Differential Receive 1 -
Data Terminal Ready 1	DTR1*	7		8	RI1*	Ring Indicator 1
Ground	Gnd	9		10	Gnd	Ground
Data Carrier Detect 2	DCD2*	11		12	DSR2*	Data Set Ready 2
Receive Data 2 / Differential Receive 2 +	RXD2 / RX2+	13		14	RTS2* / TX2-	Request To Send 2 / Differential Transmit 2 -
Transmit Data 2 / Differential Transmit 2 +	TXD2 / TX2-	15		16	CTS2* / RX2-	Clear To Send 2 / Differential Receive 2 -
Data Terminal Ready 2	DTR2*	17		18	RI2*	Ring Indicator 2
Ground	Gnd	19		20	Gnd	Ground

3.8.4. RS-422 / 485

You can configure the two serial ports to operate as a two-wire RS-485 port or four-wire RS-422. Use of the RS-485/RS-422 option offers a low cost, easy-to-use communications and networking multi-drop interface that is suited to a wide variety of embedded applications requiring low-to-medium-speed data transfer between two or more systems. When you configure the serial ports for RS-485/RS-422, you cannot use the port for RS-232.

For RS-485, the TX and RX signals must be connected together externally (TX* to RX* and TX to RX).

The RS-485 interface specification requires that both ends of the twisted-pair cable be terminated with 100 ohm resistors. You can terminate the RS-485/RS-422 interface with a jumper. To enable the 100 ohm on-board termination resistor for RS-422/485, install the appropriate jumper at JP1 as described in ***Table 1. Jumper Setting Summary*** for serial port 1 and 2 respectively.

3.9. Parallel Port Interface (J8)

The LW-P104-P4I1 incorporates a multi-mode enhanced parallel interface port. It has a 13x2-pin 2mm pitch header. An enhanced bi-directional parallel port interface conforms to the IEEE-1284 standard. It provides features such as increased speed, internal FIFO buffer, and DMA transfer.

This port supports four modes of operation as following.

Table 15. Parallel Port Mode Summary

Mode	Description
Normal	Set this value to allow the standard parallel port mode to be used. This is the default setting. (output only)
Bi-Directional	Set this value to allow data to be sent to and received from 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 Extended Capabilities Port (ECP) specification. ECP uses the DMA protocol to achieve data transfer rates up to 2.5 Megabits per second. ECP provides symmetric bi-directional communication.

3.9.1. I/O Addresses and Interrupts

The parallel port functions are controlled by eight I/O ports and their associated register and control functionality. The LW-P104-P4I1 parallel port is assigned to the primary parallel port address normally assigned to LPT1 and cannot be changed. You may disable the port in Setup to free the hardware resources for other peripherals.

The parallel port can be configured to generate an interrupt request upon a variety of conditions, depending on the mode the port is in. Assignment of an interrupt to the parallel port is optional, and its use depends on software requirements and which mode of operation you are using. IRQ 7 is the default parallel port IRQ assignment.

Following Table lists the parallel port addresses and IRQs.

Table 16. Parallel I/O Addresses and Interrupt

I/O Address	Interrupt	Description
Disabled		Set this value to prevent the parallel port from accessing any system resources. When the value of this option is set to Disabled, the printer port becomes unavailable.
378h	IRQ 7/5	Set this value to allow the parallel port to use 378 as its I/O port address. This is the default setting. The majority of parallel ports on computer systems use IRQ7 and I/O Port 378H as the standard setting. The default interrupt setting is IRQ7. The majority of parallel ports on computer systems use IRQ7 and I/O Port 378H as the standard setting.
278h	IRQ 7/5	Set this value to allow the parallel port to use 278 as its I/O port address.
3BCh	IRQ 7/5	Set this value to allow the parallel port to use 3BC as its I/O port address.

3.9.2. DMA Channels

In ECP enhancement mode, the parallel port can send and receive data under control of an on-board DMA controller. DMA channels operate with a request/acknowledge hardware handshake protocol between an internal DMA controller and the parallel port logic. On the LW-P104-P4I1 system module, select a DMA channel in BIOS Setup. You can configure the parallel port to use DMA Channel 0, DMA Channel 1 or DMA Channel 3.

3.9.3. Parallel Port Connector (J8)

The parallel port appears on J8. The pin layout on J8 is arranged so that a 26-pin ribbon cable attached to J8 can be directly connected to a 25-pin DB-25 connector to match the PC standard pin layout. Following table gives the connector pin assignment and signal definitions for the parallel port.

Table 17. Parallel Port Interface Pin Assignment (J8)

Description	Signal	Pin		Pin	Signal	Description
Parallel Port Strobe	STB*	1		2	AFD*	Auto Feed
Parallel Port Data 0	PD0	3		4	Error*	Parallel Port Error
Parallel Port Data 1	PD1	5		6	Init*	Parallel Port Initialize
Parallel Port Data 2	PD2	7		8	SCLTIn*	Parallel Port Select In
Parallel Port Data 3	PD3	9		10	Gnd	Ground
Parallel Port Data 4	PD4	11		12	Gnd	Ground
Parallel Port Data 5	PD5	13		14	Gnd	Ground
Parallel Port Data 6	PD6	15		16	Gnd	Ground
Parallel Port Data 7	PD7	17		18	Gnd	Ground
Parallel Port Acknowledge	Ack*	19		20	Gnd	Ground
Parallel Port Busy	Busy*	21		22	Gnd	Ground
Paper End	PE	23		24	Gnd	Ground
Parallel Port Select	SLCT	25		26	Key	Key

For maximum reliability, keep the cable between the board and the device it drives to 10 feet or less in length.

3.9.4. IEEE-1284-Compliant Cables

Using the parallel port for high-speed data transfer in ECP/EPP modes requires special cabling for maximum reliability. Some of the parameters for a compliant IEEE-1284 cable assembly include:

- *All signals are twisted pair with a signal and ground return*
- *Each signal and ground return should have a characteristic unbalanced impedance of 62 +/- 6 ohms within a frequency band of 4 to 16 MHz*
- *The wire-to-wire crosstalk should be no greater than 10%*

Please refer to the IEEE-1284 standard for the complete list of requirements for a compliant cable assembly, including recommended connectors

3.9.5. Standard and Bi-Directional Operation

You can use the parallel port as a standard output-only printer port or as a PS/2-compatible bi-directional data port with up to 12 output lines and 17 input lines. The bi-directional mode can be very valuable in custom applications. For example, you might use it to control an LCD display, scan keyboards, sense switches, or interface with optically isolated I/O modules. All data and interface control signals are TTL-compatible.

Set the parallel port's operating mode using BIOS Setup.

3.10. PC/104-Plus (PCI104) Expansion Bus (J1)

The LW-P104-P4I1 system module provides a PC/104-*Plus* expansion bus for additional system functions. This bus offers compact, self-stacking, modular expandability. The PC/104-*Plus* (PCI104) expansion bus is an extension of the PC/104 bus. The signals are implementing a PCI bus, available on an 120-pin PCI bus connector.

The growing list of PC/104 and PC/104-*Plu*s modules available from LongWin and hundreds of other PC/104 vendors includes such functions as communications interfaces, video frame grabbers, field bus interfaces, digital signal processors (DSPs), data acquisition and control functions, and many specialized interfaces and controllers. In addition, custom application-specific logic boards can also be stacked directly on top of the LW-P104-P4I1 using its PC/104-*Plus* expansion bus interface as a rugged and reliable interconnect.

The LW-P104-P4I1 system module's on-board EIDE, and video interfaces are internally connected to its PCI bus. In addition, you can attach PCI peripherals to the board's stackable PCI bus expansion connector in much the same way PC/104 modules are stacked on the PC/104 connectors. The PCI expansion connector consists of 4 rows of 30 pins (120-pin header), and carries all of the appropriate PCI signals to accommodate up to 4 PCI add-on modules. The bus operates at clock speeds up to 33 MHz

The PCI Host board will always determine the PCI signaling level on the bus by setting all VI/O pins to either 3.3V or 5V. If VI/0 is set to 3.3V, then the system will use 3.3V I/O signaling, likewise, if VI/O is set to 5V, then the system will use 5V I/O signaling. Some PCI host modules may only allow one of the options, while others may provide a jumper to allow the user to select the signaling level. Once the signaling level is selected, the remaining boards in the system must use that signaling level.

3.10.1. PC/104-*Plus* (PCI104) Expansion Bus Connector (J1)

The LW-P104-P4I1 system module supports both 3.3V (Default) and 5V I/O expansion module with manufacturing option. The PC/104-*Plus* (PCI104) expansion bus appears on a 120-pin 2mm female quad-row header (4 x 30). An implementation of the PCI bus appears on J1.

Table 18. PCI104 Expansion Bus Pin Assignment (J1)

Pin	A	B	C	D
1	GND	Reserved	+5	AD00
2	VccIO	AD02	AD01	+5V
3	AD05	GND	AD04	AD03

4	C/BE0*	AD07	GND	AD06
5	GND	AD09	AD08	GND
6	AD11	VccIO	AD10	M66EN
7	AD14	AD13	GND	AD12
8	+3.3V	C/BE1*	AD15	+3.3V
9	SERR*	GND	Reserved	PAR
10	GND	PERR*	+3.3V	Reserved
11	STOP*	+3.3V	LOCK*	GND
12	+3.3V	TRDY*	GND	DEVSEL*
13	FRAME*	GND	IRDY*	+3.3V
14	GND	AD16	+3.3V	C/BE2*
15	AD18	+3.3V	AD17	GND
16	AD21	AD20	GND	AD19
17	+3.3V	AD23	AD22	+3.3V
18	IDSEL0	GND	IDSEL1	IDSEL2
19	AD24	C/BE3*	VccIO	IDSEL3
20	GND	AD26	AD25	GND
21	AD29	+5V	AD28	AD27
22	+5V	AD30	GND	AD31
23	REQ0*	GND	REQ1*	VccIO
24	GND	REQ2*	+5V	GNT0*
25	GNT1*	VccIO	GNT2*	GND
26	+5V	CLK0	GND	CLK1F
27	CLK2	+5V	CLK3	GND
28	GND	INTD*	+5V	RST*
29	+12V	INTA*	INTB*	INTC*
30	-12V	REQ3*	GNT3*	GND

3.10.2. Stack Expansion Module

PC/104-***Plus*** (PCI104) compatible expansion modules can be installed on the LW-P104-P4I1 expansion bus. The buffered output signals to the expansion bus are standard TTL level signals. All inputs to the LW-P104-P4I1 operate at TTL levels and present a typical CMOS load to the expansion bus.

You can install one or more PC/104-***Plus*** (PCI104) modules on the LW-P104-P4I1 expansion connectors. You can stack several modules on the LW-P104-P4I1 headers. Each

additional module increases the thickness of the package by 0.66 inches (15 mm). See Following Figure.

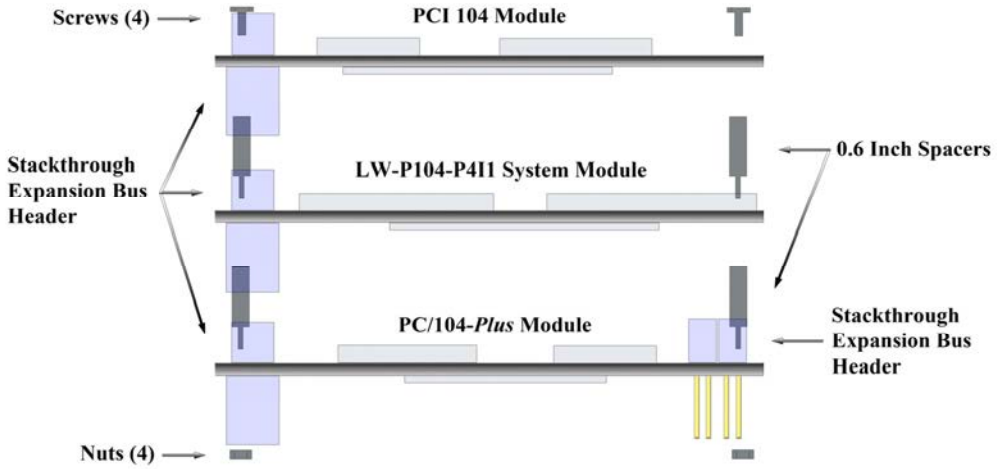


Figure 14. PC/104-Plus (PCI104) Module Stack

Chapter 4

CMOS Setup

This chapter details AMI System BIOS configuration information. It shows you how to configure the module to match your application requirements.

Sections include:

- *Introduction*
- *Main Menu*
- *Advanced BIOS Setup*
- *Boot Setup*
- *Security Setup*
- *Exit Menu*
- *Deleting a Password*

Chapter 4. AMI BIOS Setup

4.1. Introduction

Many options provided on the LW-P104-P4I1 system module are controlled by the BIOS Setup function. The parameters are displayed on several screens, selected from a main menu screen.

To configure the module, you modify the fields in these screens and save the results in the battery-backed CMOS RAM or Flash memory. To enhance embedded-system reliability, the contents of the EEPROM mirror the contents of the CMOS memory. The EEPROM retains your configuration information even if the clock's backup battery fails.

4.1.1. Starting BIOS Setup

The Setup information is retrieved from memory when the board is powered up or when it is rebooted with a CTL-ALT-DEL key combination. Changes made to the Setup parameters (with the exception of the real-time clock time and date settings) do not take effect until the system is rebooted.

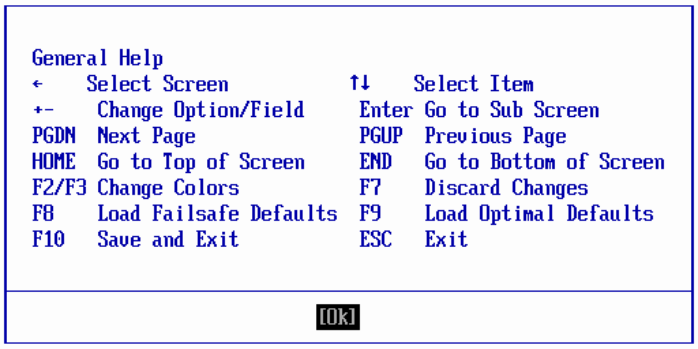
The Setup program is located in the system BIOS. To access Setup, press DEL while the computer is in the Power On Self Test (POST), just prior to booting.

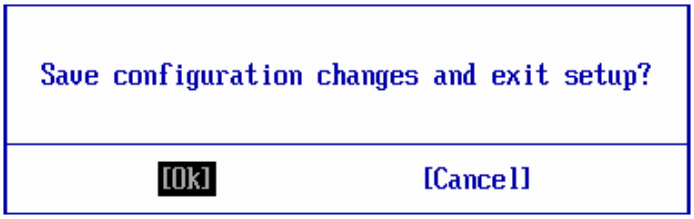
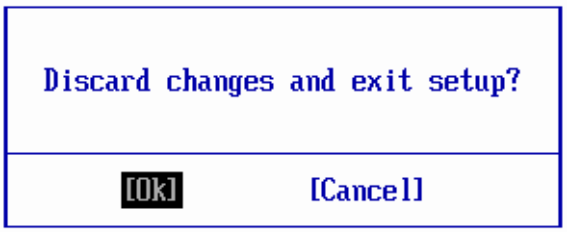
4.1.2. Setup Help

You can access help information for many of the Setup options by pressing F1. The information is displayed in a popup window. Some help screens list all the available option settings, while others display additional information.

Some Setup fields, for example, the amount of DRAM memory installed on the board, are read-only fields, intended for informational purposes only. It will be grayed out.

Table 19. BIOS Setup Help Summary

Hot Key	Description
F1	The <F1> key allows you to display the General Help screen. Press the <F1> key to open the General Help screen. 
F10	The <F10> key allows you to save any changes you have made and exit Setup. Press the <F10> key to save your changes. The following screen will appear:

	 Press the <Enter> key to save the configuration and exit. You can also use the <Arrow> key to select Cancel and then press the <Enter> key to abort this function and return to the previous screen.
ESC	The <Esc> key allows you to discard any changes you have made and exit the Setup. Press the <Esc> key to exit the setup without saving your changes. The following screen will appear:  Press the <Enter> key to discard changes and exit. You can also use the <Arrow> key to select Cancel and then press the <Enter> key to abort this function and return to the previous screen.
Enter	The <Enter> key allows you to display or change the setup option listed for a particular setup item. The <Enter> key can also allow you to display the setup sub-screens.

4.2. Main Menu

When you firstly enter the BIOS Setup Utility, you will enter the Main setup screen. You can always return to the Main setup screen by selecting the *Main* tab. There are two Main Setup options. They are described in this section. The Main BIOS Setup screen is shown below.

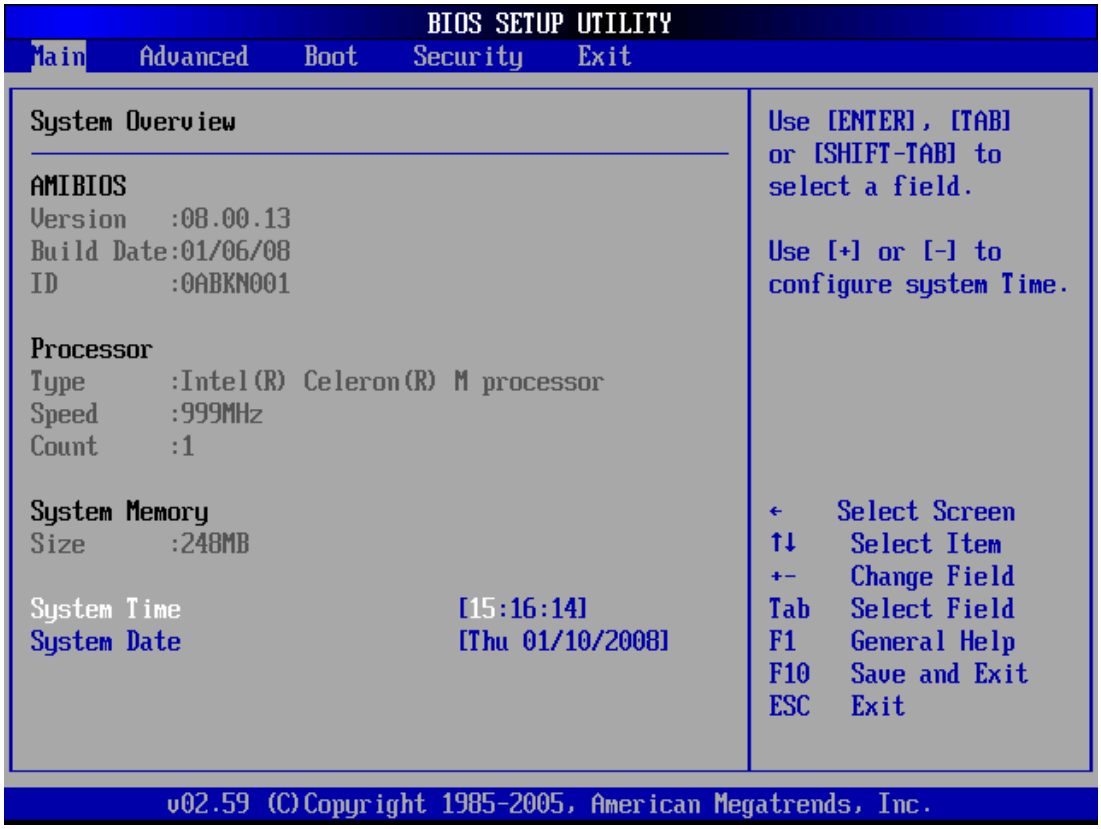


Figure 15. BIOS Setup Main Menu

System Time / System Date

Use this option to change the system time and date. Highlight *System Time* or *System Date* using the <Arrow> keys. Enter new values through the keyboard. Press the <Tab> key or the <Arrow> keys to move between fields. The date must be entered in MM/DD/YYYY format. The time is entered in HH:MM:SS format.

Note: *The time is in 24-hour format. For example, 5:30 A.M. appears as 05:30:00, and 5:30 P.M. as 17:30:00.*

4.3. Advanced BIOS Setup

Select the *Advanced* tab from the setup screen to enter the Advanced BIOS Setup screen. You can select any of the items in the left frame of the screen, such as Super I/O Configuration, to go to the sub menu for that item. You can display an Advanced BIOS Setup option by highlighting it using the <Arrow> keys. All Advanced BIOS Setup options are described in this section. The Advanced BIOS Setup screen is shown below. The sub menus are described on the following pages.

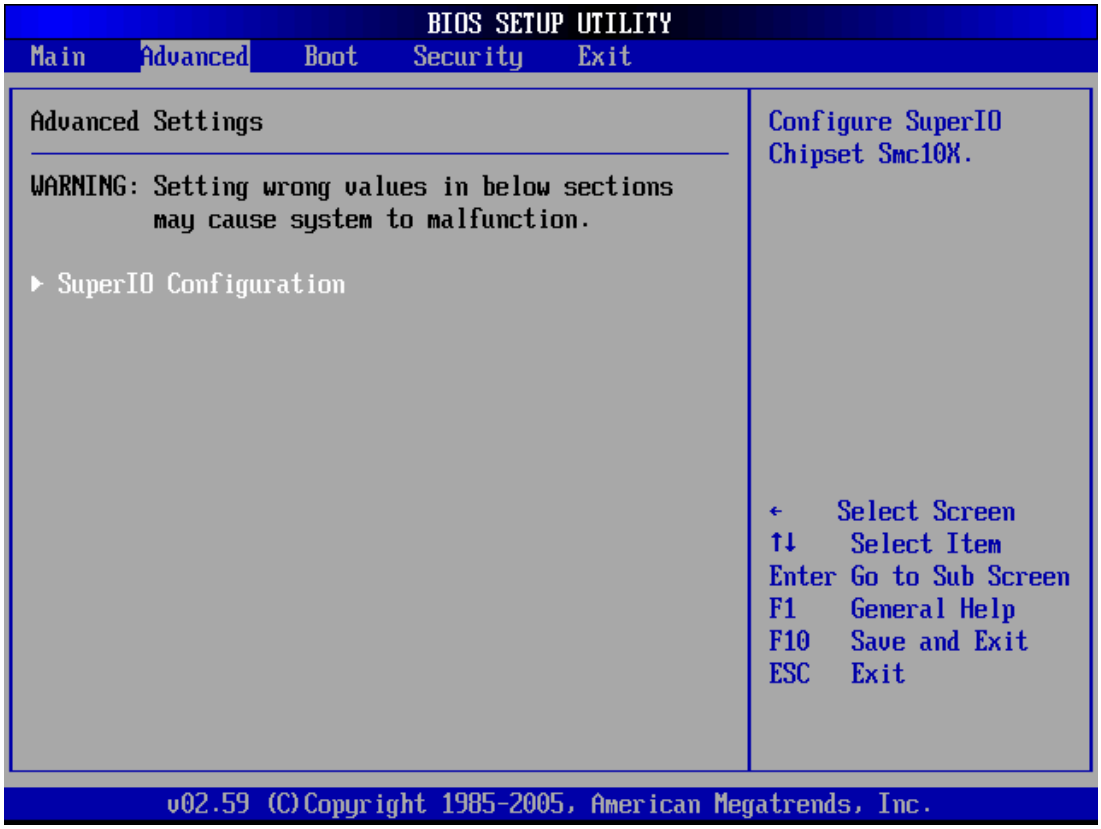


Figure 16. BIOS Setup Advanced Menu

Super I/O Configuration Screen

You can use this screen to select options for the Super I/O settings. Use the up and down <Arrow> keys to select an item. Use the <Plus> and <Minus> keys to change the value of the selected option. The settings are described on the following pages. The screen is shown below.

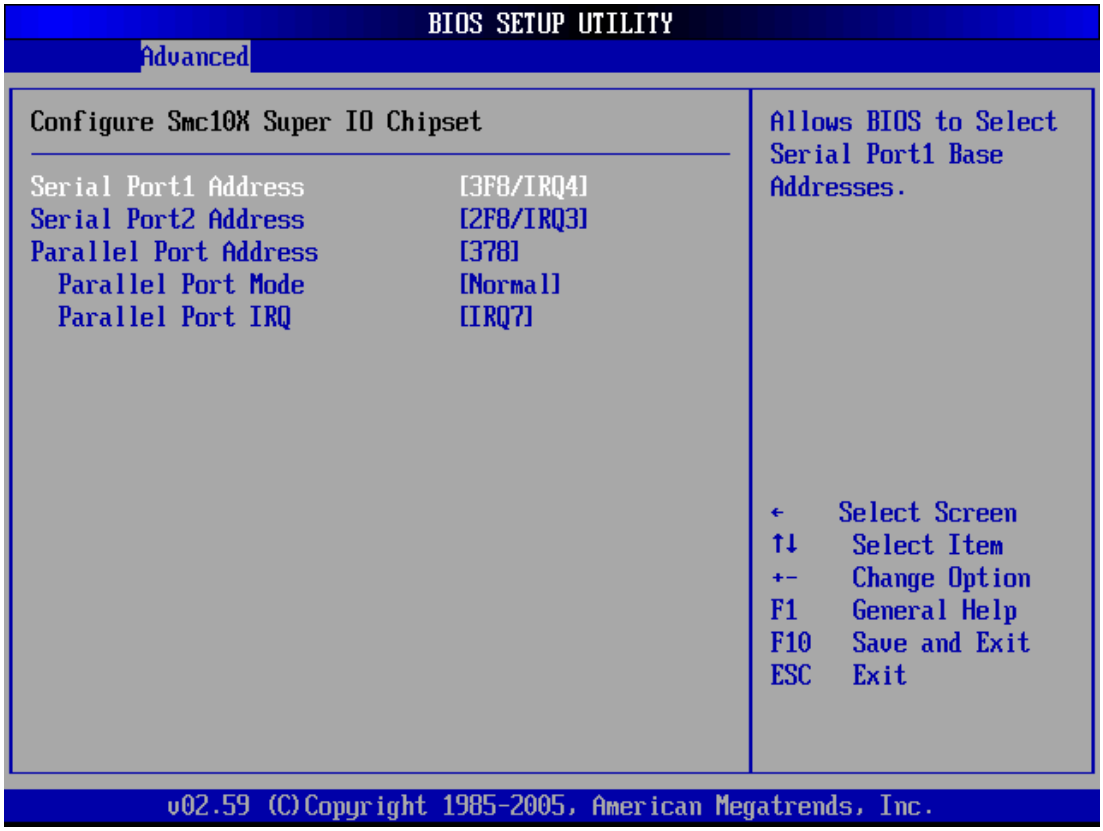


Figure 17. BIOS Setup Super I/O Menu

4.3.1. Serial Port 1 Address

This option specifies the base I/O port address and Interrupt Request address of serial port 1. The Optimal setting is *3F8/IRQ4*. The Fail-Safe default setting is *Disabled*. Refer *Table 13. Serial Port I/O Addresses and Interrupts* for details.

4.3.2. Serial Port 2 Address

This option specifies the base I/O port address and Interrupt Request address of serial port 2. The Optimal setting is *2F8/IRQ3*. The Fail-Safe setting is *Disabled*. Refer *Table 13. Serial Port I/O Addresses and Interrupts* for details.

4.3.3. Parallel Port

This option specifies the I/O address used by the parallel port. The Optimal setting is *378*. The Fail-Safe setting is *Disabled*. Refer to *Table 16. Parallel I/O Addresses and Interrupt* for details.

The Parallel Port Mode option specifies the parallel port mode. The Optimal setting is *Normal*. The Fail-Safe setting is *Disabled*. Refer to *Table 15. Parallel Port* Mode Summary for details.

4.4. Boot Setup

Select the *Boot* tab from the setup screen to enter the Boot BIOS Setup screen. You can select any of the items in the left frame of the screen, such as Boot Device Priority, to go to the sub menu for that item. You can display a Boot BIOS Setup option by highlighting it using the <Arrow> keys. All Boot Setup options are described in this section. Select an item on the Boot Setup screen to access the sub menu for:

- *Boot Device Priority*
- *Hard disk drives*
- *Removable Devices*
- *ATAPI CD-ROM Drives*

The Boot Setup screen is shown below:

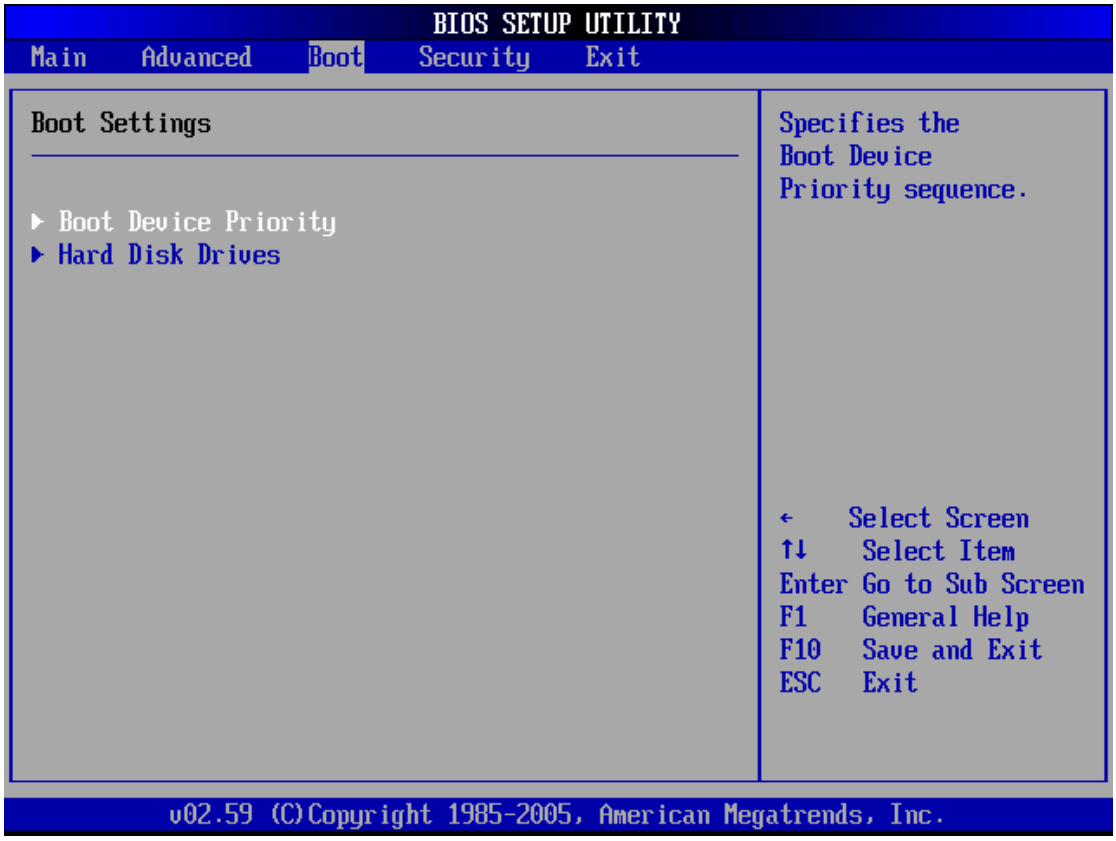


Figure 18. BIOS Setup Boot Menu

4.4.1. Boot Device Priority

Use this screen to specify the order in which the system checks for the device to boot from. To access this screen, select Boot Device Priority on the Boot Setup screen and press <Enter>. The following screen displays.

Figure 19. BIOS Setup Boot Device Priority

Set the boot device options to determine the sequence in which the computer checks which device to boot from. The settings are *Removable Dev., Hard Drive, or ATAPI CDROM*. The Optimal and Fail-Safe settings are:

- *1st boot device – Removable Device*
- *2nd boot device – Hard Drive*
- *3rd boot device – ATAPI CDROM*

To change the boot order, select a boot category type such as Hard disk drives, Removable media, or ATAPI CD ROM devices from the boot menu. For example, if the 1st boot device is set to Hard disk drives, then BIOS will try to boot to hard disk drives first.

Note: When you select a boot category from the boot menu, a list of devices in that category appears. For example, if the system has three hard disk drives connected, then the list will show all three hard disk drives attached.

4.4.2. Hard Disk drives

Use this screen to view the hard disk drives in the system. To access this screen, select Hard disk drives on the Boot Setup screen and press <Enter>. The following screen displays examples of hard disk drives.

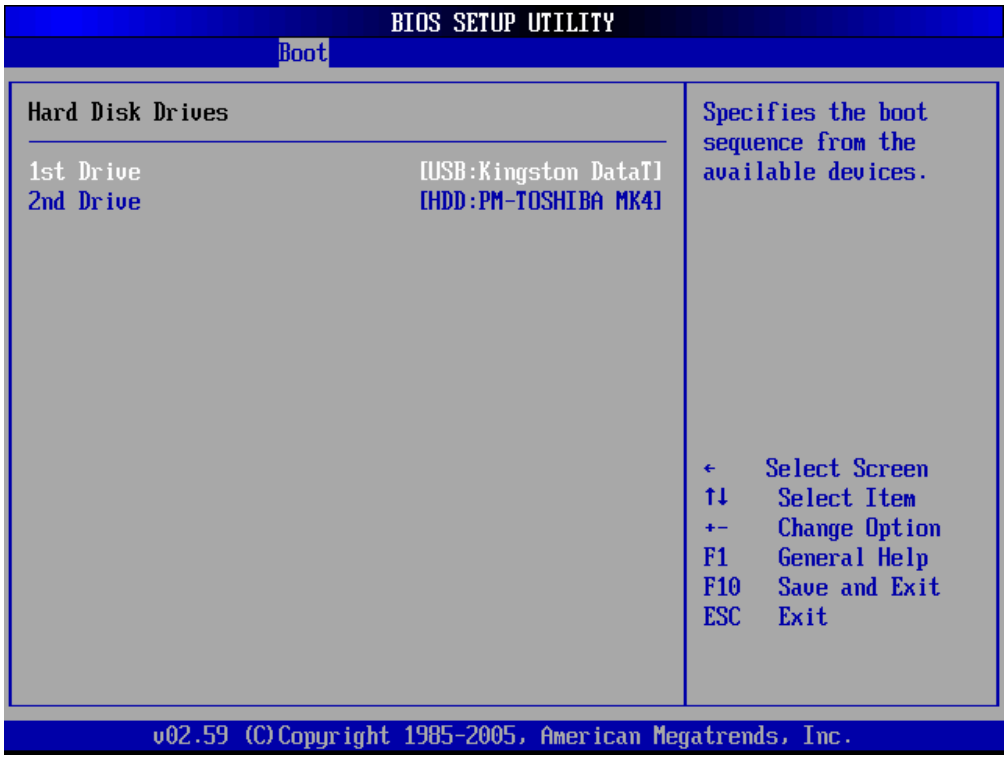


Figure 20. BIOS Setup Boot Drive Priority

4.4.3. Removable Devices

Use this screen to view the removable drives attached to the system. To access this screen, select Removable Devices on the Boot Setup screen and press <Enter>.

4.4.4. ATAPI CD-ROM Drives

Use this screen to view the ATAPI CD-ROM drives in the system. To access this screen, select ATAPI CDROM Drives on the Boot Setup screen and press <Enter>.

4.5. Security Setup

Two Levels of Password Protection

AMI BIOS provides both a Supervisor and a User password. If you use both passwords, the Supervisor password must be set first.

The system can be configured so that all users must enter a password every time the system boots or when Setup is executed, using either or either the Supervisor password or User password.

The Supervisor and User passwords activate two different levels of password security. If you select password support, you are prompted for a one to six character password. Type the password on the keyboard. The password does not appear on the screen when typed. Make sure you write it down. If you forget it, you must drain NVRAM and reconfigure.

Remember the Password

Keep a record of the new password when the password is changed. If you forget the password, you must erase the system configuration information in NVRAM. See (Deleting a Password) for information about erasing system configuration information.

Select Security Setup from the Setup main BIOS setup menu. All Security Setup options, such as password protection and virus protection, are described in this section. To access the sub menu for the following items, select the item and press <Enter>.

- *Change Supervisor Password*
- *Change User Password*
- *Clear User Password*

The Security Setup screen is shown below. The sub menus are documented on the following pages.

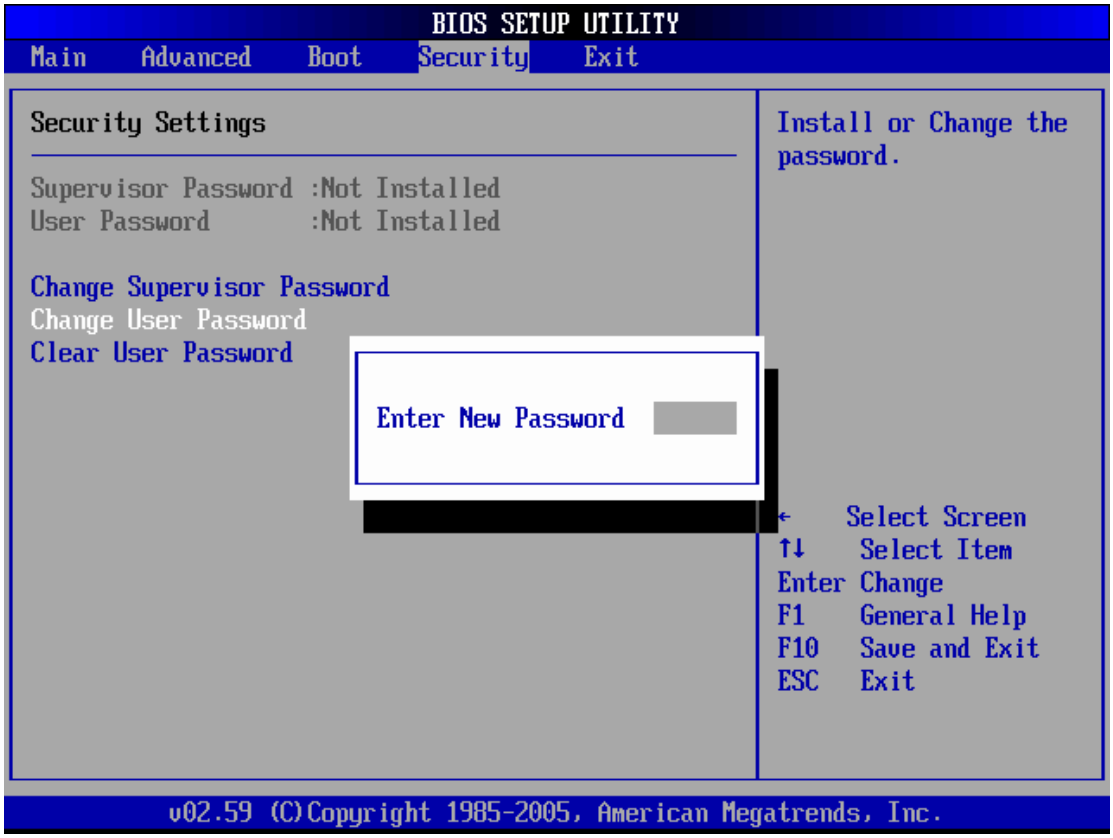


Figure 21. BIOS Setup Security Menu

Supervisor Password

Indicates whether a supervisor password has been set. If the password has been installed, *Installed* displays. If not, *Not Installed* displays.

User Password

Indicates whether a user password has been set. If the password has been installed, *Installed* displays. If not, *Not Installed* displays.

Change Supervisor Password

Select this option and press <Enter> to access the sub menu. You can use the sub menu to change the supervisor password.

Select Change Supervisor Password from the Security Setup menu and press <Enter>.

Enter New Password:

appears. Type the password and press <Enter>. The screen does not display the characters entered. Retype the password as prompted and press <Enter>. If the password confirmation is incorrect, an error message appears. The password is stored in NVRAM after BIOS Setup completes.

Change User Password

Select this option and press <Enter> to access the sub menu. You can use the sub menu to change the user password.

Select Change User Password from the Security Setup menu and press <Enter>.

Enter New Password:

appears. Type the password and press <Enter>. The screen does not display the characters entered. Retype the password as prompted and press <Enter>. If the password confirmation is incorrect, an error message appears. The password is stored in NVRAM after BIOS Setup completes.

Clear User Password

Select this option and press <Enter> to access the sub menu. You can use the sub menu to clear the user password.

Select Clear User Password from the Security Setup menu and press <Enter>.

Clear New Password

[Ok] [Cancel]

appears. Type the password and press <Enter>. The screen does not display the characters entered. Retype the password as prompted and press <Enter>. If the password confirmation is incorrect, an error message appears. The password is stored in NVRAM after BIOS Setup completes.

4.6. Exit Menu

Select the *Exit* tab from the setup screen to enter the Exit BIOS Setup screen. You can display an Exit BIOS Setup option by highlighting it using the <Arrow> keys. All Exit BIOS Setup options are described in this section. The Exit BIOS Setup screen is shown below.

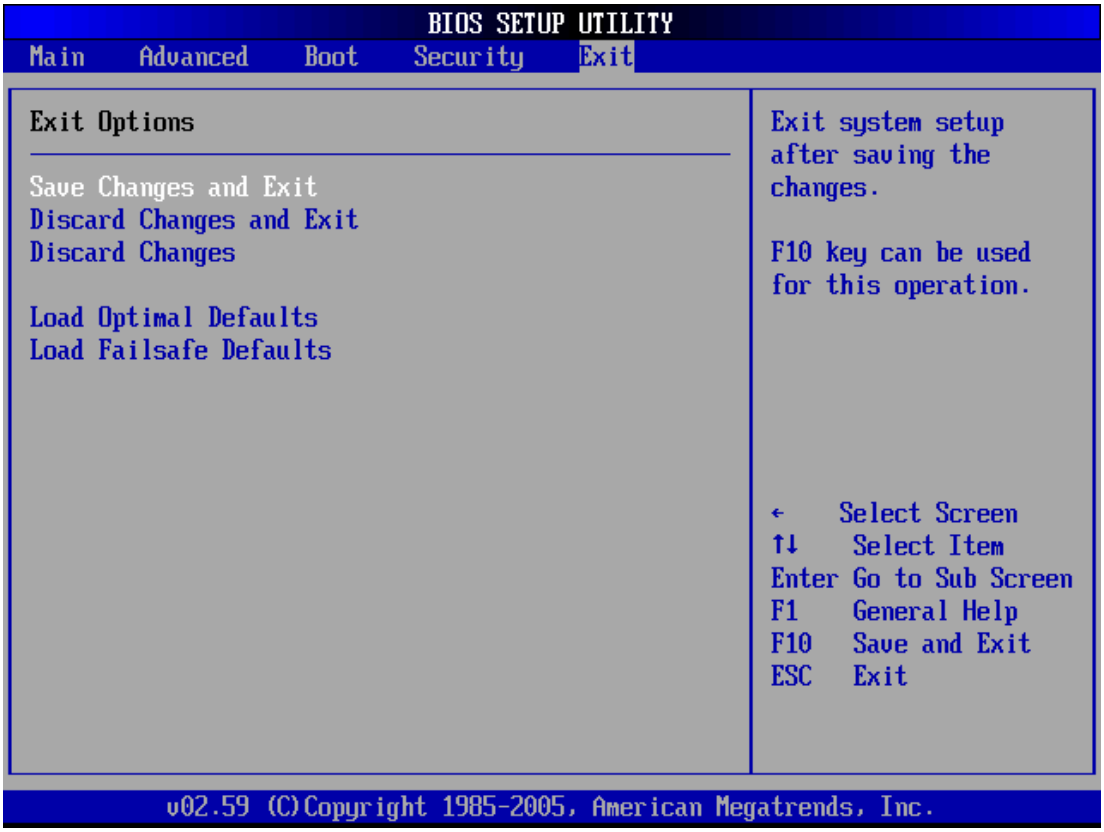


Figure 22. BIOS Setup Exit Menu

Exit Discarding Changes

Select this option to quit Setup without making any permanent changes to the system configuration. Select Exit Discarding Changes from the Exit menu and press <Enter>.

Discard Changes and Exit Setup Now?

[Ok] [Cancel]

appears in the window. Select *Ok* to discard changes and exit.

Exit Discarding Changes

Select this option to quit Setup without making any permanent changes to the system configuration. Select Exit Discarding Changes from the Exit menu and press <Enter>.

Discard Changes and Exit Setup Now?

[Ok] [Cancel]

appears in the window. Select *Ok* to discard changes and exit.

Load Optimal Defaults

BIOS Setup automatically sets all Setup options to a complete set of default settings when you select this option. The Optimal settings are designed for maximum system performance, but may not work best for all computer applications. In particular, do not use the Optimal Setup options if your computer is experiencing system configuration problems.

Select Load Optimal Defaults from the Exit menu and press <Enter>.

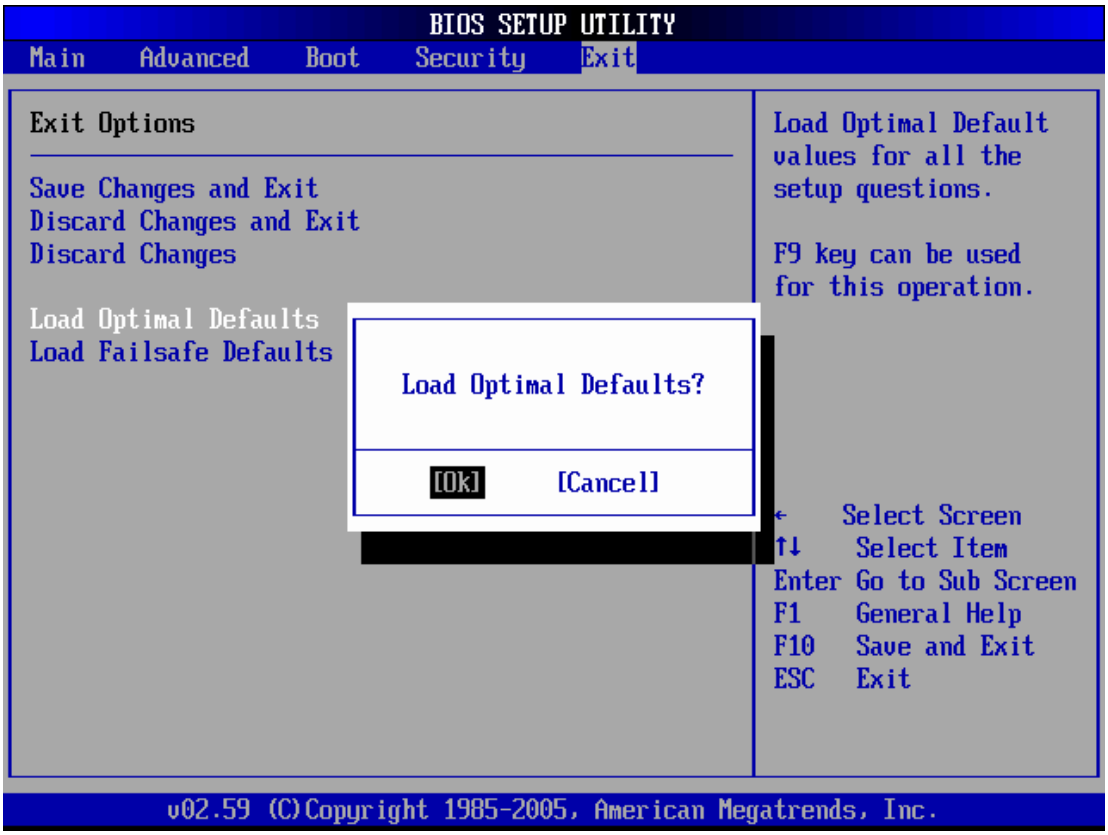


Figure 23. BIOS Setup Optimal Menu

Select *Ok* to load optimal defaults.

Load Fail-Safe Defaults

BIOS Setup automatically sets all Setup options to a complete set of default settings when you select this option. The Fail-Safe settings are designed for maximum system stability, but not maximum performance. Select the Fail-Safe Setup options if your computer is experiencing system configuration problems.

Select Load Fail-Safe Defaults from the Exit menu and press <Enter>.

Load Fail-Safe Defaults?

[Ok] [Cancel]

appears in the window. Select *Ok* to load Fail-Safe defaults.

Discard Changes

Select Discard Changes from the Exit menu and press <Enter>.

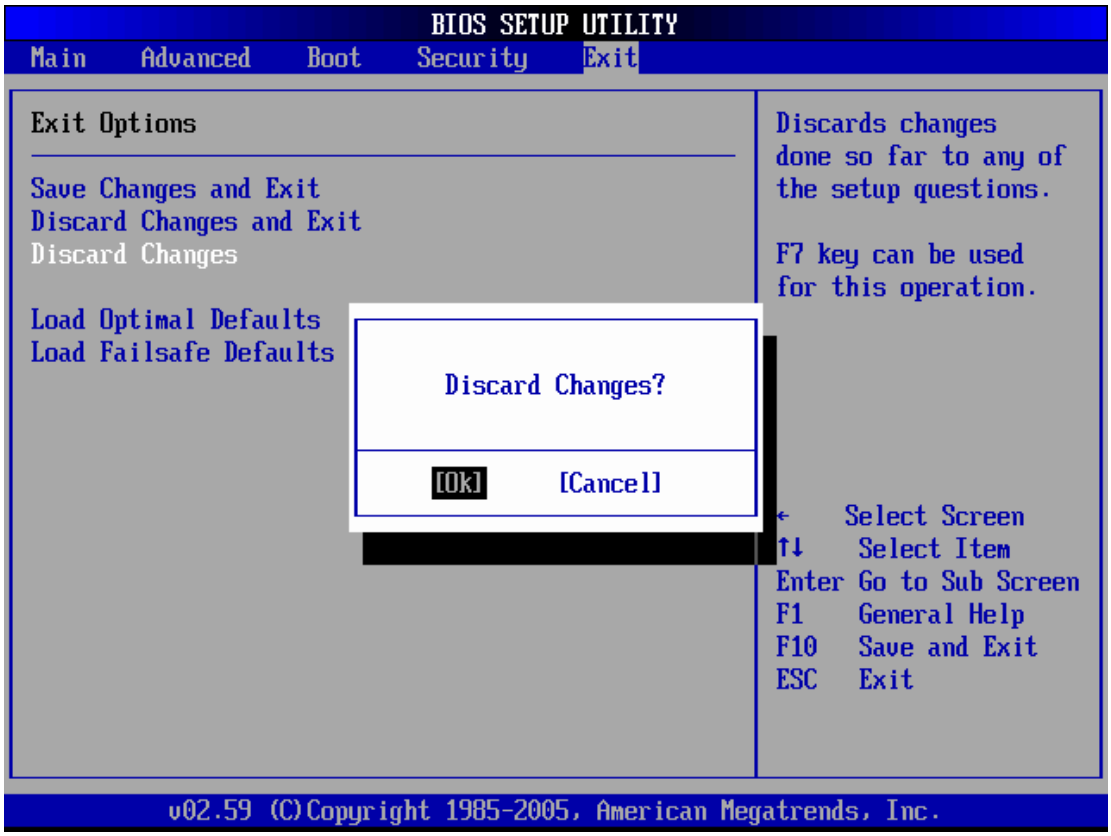


Figure 24. BIOS Setup Discard Menu

Select *Ok* to discard changes.

4.7. Deleting a Password

If you forget the passwords you set up through Setup, the only way you can reset the password is to erase the system configuration information where the passwords are stored. System configuration data is stored in CMOS RAM, a type of memory that consumes very little power.

Erase Old Password

You can drain CMOS RAM power by disconnecting the CMOS backup battery on the connector *2.5.5. Real-Time Clock (RTC) BatteryConnection*. CMOS RAM looses it content including the password when it is disconnected.

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