Diversified Technology, Inc.

CPB4612
Configuration and Maintenance Guide

Rev 1.2

CPB4612 CPCI Board with a Intel® Pentium® M

Return Shipment Information

If service or repair is required, contact DTI's Service Department for a Return Material Authorization (RMA) number and shipping instructions. If the product is out of warranty, or was damaged during shipment, a purchase order will be required for the repair. The product should be returned in its original shipping materials. Contact DTI if replacement material is required. Seal the carton securely and ship prepaid to the following address with the RMA number on the label.

DIVERSIFIED TECHNOLOGY, INC.
Service Department
476 Highland Colony Parkway
P.O. Box 748
Ridgeland, MS 39158
RMA# _____

To contact the Service Department:

Telephone: (601) 856-4121
Fax: (601) 856-2888
Email: tech@dtims.com

Items determined to be covered under warranty will be returned freight prepaid. Items not in warranty will be returned freight collect, contact DTI's Service Department.

For Your Safety

CAUTION: The cPB-4612 contains a lithium battery. This battery is not field-replaceable. There is a danger of explosion if the battery is incorrectly replaced or handled. Do not disassemble or recharge the battery. Do not dispose of the battery in fire. When the battery is replaced, the same type or an equivalent type recommended by the manufacturer must be used. Used batteries must be disposed of according to the manufacturer's instructions. Return the board to DTI for battery service.

Revision History

Date	Revision	Summary of Corrections
08/31/04	1.0	Initial Release
10/12/04	1.1	Added links throughout manual.
8/19/05	1.2	Removed references to ethernet signal routing.
		Update BIOS Section

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Document Organization

This document describes the operation and use of the CPB-4612 Computer Processor Board with an Intel® Pentium® M. The following topics are covered in this document.

Chapter 1, "Introduction," introduces the key features of the CPB-4612. This chapter includes a product definition, a list of product features, and a functional block diagram with a brief description of each block. This chapter can be used to compare the features of the CPB-4612 against the needs of a specific application.

Chapter 2, "Getting Started," provides unpacking instructions and initial setup information for the CPB-4612. This chapter summarizes configuration information and should be read before using the board.

Chapter 3, "Configuration," describes the jumper settings on the CPB-4612. This chapter details factory default settings and provides information about tailoring the board to the needs of specific applications.

Chapter 4, "Reset," discusses the reset types and reset sources available on the CPB-4612.

Chapter 5, "System Monitoring and Control," lists various system monitoring and control features available on the CPB-4612.

Chapter 6, "IDE Controller," provides an introduction to the CPB-4612's IDE Controller. This chapter covers drive configuration, IDE I/O mapping, device drivers, and the CPB-4612's support for internal and external disk drives.

Chapter 7, "Watchdog Timer," explains the operation of the CPB-4612's watchdog timer. Sample code is provided to illustrate how the watchdog's functions are used in an application.

Chapter 8, "System BIOS," discusses recovery from and correction of a corrupted BIOS.

Appendix A, "Specifications," contains the electrical, environmental, and mechanical specifications for the CPB-4612.

Appendix B, "Connectors," This chapter provides a connector location illustration and connector pin out tables. A detailed description and pin out for each connector is given.

Appendix C, "Thermal Considerations," describes the thermal requirements for reliable operation of the CPB-4612.

Appendix D, "Datasheet Reference," provides links to Websites with information about many of the devices and technologies used in the CPB-4612.

Appendix E, "Agency Approvals," presents UL, CE, and FCC agency approval and certification information for the CPB-4612.

Appendix F, "CRT Specifications," identified features of the CRT4612 Rear Transition Module (RTM).

Chapter 1

1 Introduction

This chapter provides an introduction to the CPB-4612 including a product definition, a list of product features, and a functional block diagram with descriptions of each block.

The "cPB-4612 Faceplate" illustration identifies the connectors, indicators, and switches available on the cPB-4612's faceplate. Optional rear-panel transition boards are available to extend various faceplate features to a system's rear-panel. For more information about compatible rear-panel transition boards, see Appendix F.

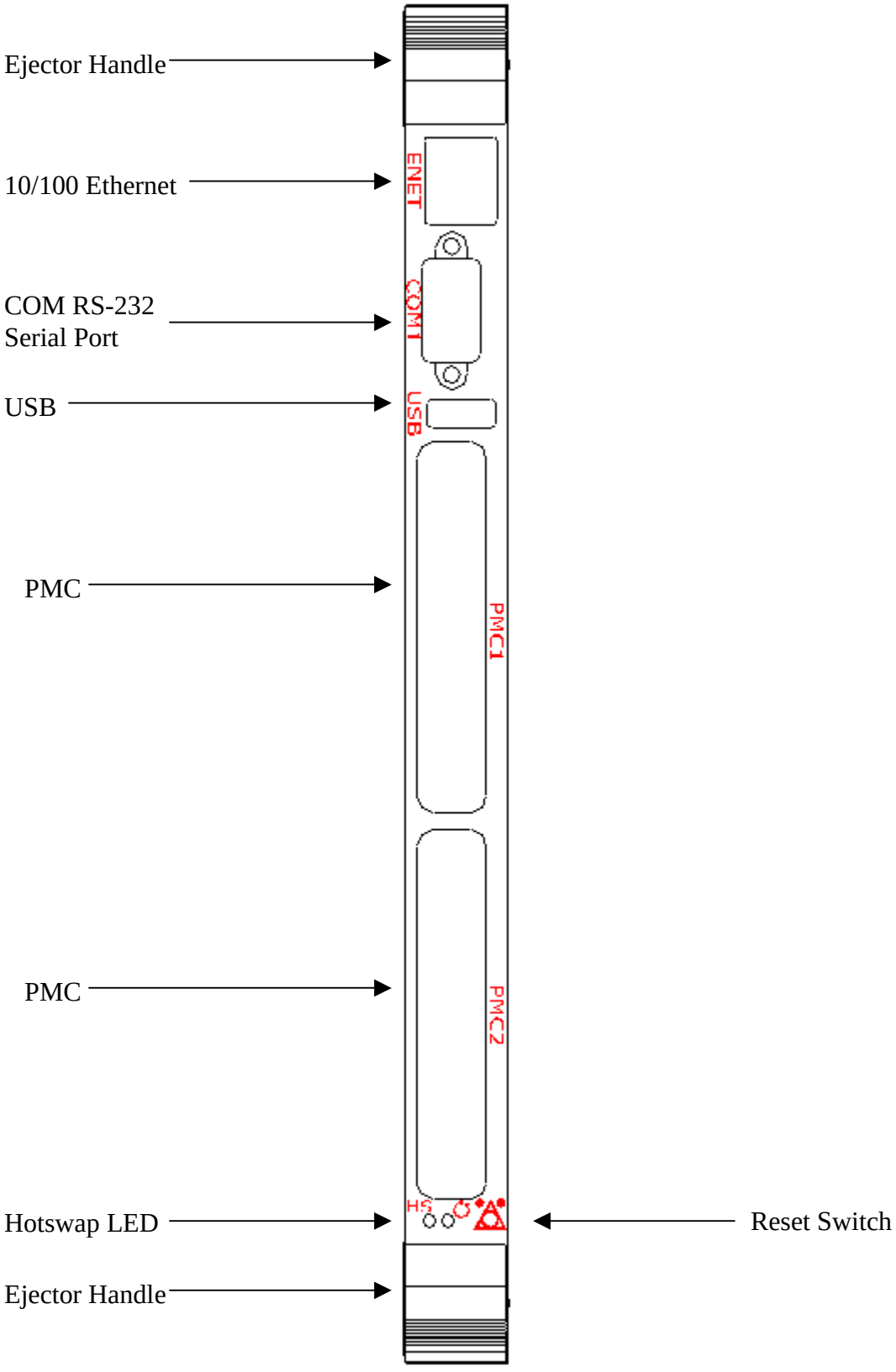
The CPB-4612 is a 64-bit compliant CompactPCI Pentium M single board computer designed to operate in either a system slot or a peripheral slot. The cPB-4612 provides Ethernet integration using the Intel 82559 10/100 Base-T PCI Ethernet controller and the Intel 82546EB Fast Gigabit Ethernet Multifunction PCI Controller. The CPB4612 provides support for IDE hard drives, serial ports, and USB ports. I/O connections are available at the rear of the chassis using one of DTI's cRT4612 rear-panel I/O modules. The CPB-4612 is fully compliant with both the CompactPCI standard and the PICMG 2.16 packet switching standard.

1.1 Product Definition

The cPB-4612 Computer Processor Board is a single board computer designed to work as a modular component in a CompactPCI system. It utilizes the Intel® Pentium® M processor in a micro FCBGA package along with dual Gigabit Ethernet controllers and the latest in memory and I/O technology to provide an inexpensive, yet fast and reliable PICMG 2.16 board. The cPB-4612 is CompactPCI Packet Switching Backplane (CompactPCI/PSB) compatible and draws its power from the J1 and J2 connectors. The cPB-4612 includes an Intelligent Platform Management Bus (IPMB) for system management along with IPMI v1.5 compatible firmware.

The cPB-4612 occupies a single 6U high Eurocard slot. The board can be used in either a system master slot or in a peripheral slot. Though the cPB-4612 is highly integrated, its capabilities can be extended with pluggable PMC modules. DTI also provides a rear transition board, the cRT-4612, that compliments the cPB-4612 to extend I/O access to the rear of a system. For more information about PMC options and accessories contact your DTI sales representative.

CPB-4612 Faceplate



1.2 Features

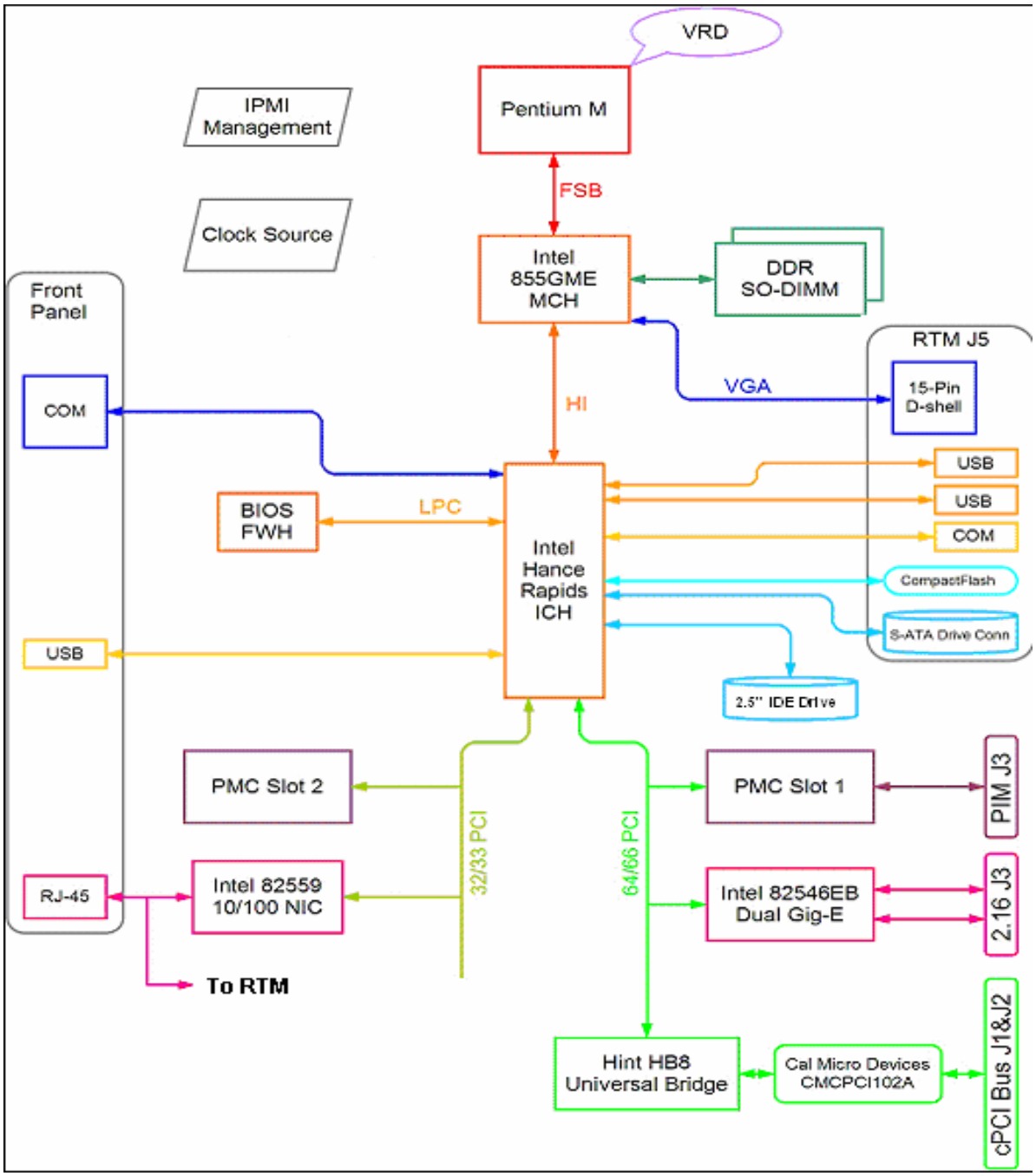
There are two SKU's of the cPB-4612. The first is the cPB-4612, which has a 64bit/66Mhz PMC site and a 32bit/33Mhz PMC site. . The second is the cPB-4612 w/ IDE, which has a 64bit/66Mhz PMC site and an on-board 2.5" HDD IDE connector. Other features include:

- *CompactPCI Specification, PICMG 2.0, Version 2.1*** compliant
- *CompactPCI Specification, PICMG 2.16, Version 1.0*** compliant
- 6U single-slot CompactPCI form factor
- Mobile Intel Pentium M, micro FCBGA package
- Intel® 855GME GMCH and 6300ESB ICH
- Integrated Intel Extreme Graphics 2 controller
- Dual 10/100/1000 Mb/s Ethernet (both at the J3 backplane connector to support PICMG 2.16)
- 10/100 Mb/s Ethernet (available at the front panel)
- 1 MB of Level 2 cache
- 400 MHz front side bus
- Socketed 256 MB, 512 MB, 1 GB, or 2GB of DDR SDRAM memory at 200, 266, or 333 MHz
- Dual stage watchdog timer
- IPMI support
- Option for either a single on-board PCI Mezzanine Card (PMC) slot (32-bit / 33MHz) or a primary IDE channel that supports an on-board 2.5 inch hard disk
- 64bit / 66Mhz @ 3.3V PCI Mezzanine Card (PMC) slot
- Two 16C550 RS-232 serial ports (COM1 available at the faceplate, COM2 available through the J5 backplane connector)
- Push Button Reset on the front panel
- 1 USB on front panel, 2 USB ports available via RTM
- Rear-Panel I/O Availability (at J5) includes the following:
  - Secondary IDE channel
  - Serial ATA
  - Two USB ports
  - VGA video
  - Serial Port
- Support for Microsoft Windows 2000/XP, Red Hat Linux, and Solaris 8/9
- Standard AT* Systems include:
  - Two enhanced interrupt controllers (8259)
  - Three counter/timers (one 8254)
  - Real-time clock/CMOS RAM (146818B)
  - Two enhanced DMA controllers (8237)

1.3 Functional Blocks

The following topics provide overviews of the cPB-4612's main features, some of which are shown in the functional block diagram below.

Functional Block Diagram



1.3.1 CompactPCI/PSB Architecture

The cPB-4612 is designed to operate in a PICMG 2.0 CompactPCI backplane. If the system is placed in a system slot, the bridge will automatically configure itself as a transparent bridge, and the board will perform as the host. If the board is placed in a peripheral slot, the bridge will automatically configure itself as a non-transparent bridge, and the board will perform as a peripheral device.

When used in accordance with the *CompactPCI Packet Switching Backplane Specification, PICMG 2.16, Version 1.0*, the cPB-4612 functions as a "Dual Link Port Node" board. The cPB-4612 can be connected to a

system's fabric-switched Link Ports A and B, and can be inserted into system or peripheral slots. The cPB-4612 is keyed for insertion into compatible slots.

The "CompactPCI" topic in Appendix D contains a link to the PCI Industrial Computer Manufacturers Group.

1.3.2 Processor

The cPB-4612 uses the Mobile Pentium M in a micro FCBGA package. The 1MB or 2MB on-die transfer L2 cache is integrated with the CPU, eliminating the need for separate components and improving performance. The FCBGA package Pentium M processor also operates with a 400 MHz Processor Side Bus for very fast access to memory and data.

The "Mobile Pentium M (FCBGA Package)" topic in Appendix D contains a link to the datasheet for the processor.

1.3.3 Chipset

The Intel 855GME chipset consists of two controller hubs. The 855GME Memory Controller Hub (MCH) supports a 400MHz system bus, DDR200/266/333 memory, and an integrated graphics solution w/Intel Extreme Graphics 2 technology. The 6300ESB I/O Controller Hub (ICH4) makes a direct connection to the memory for faster access to peripherals. It provides the features and bandwidth required for applied computing-usage models. The following is a list of features of the 855GME chipset:

- Designed, validated, and optimized for the Intel Pentium M with NetBurst™ micro-architecture using proven and established building blocks
- 400MHz system bus delivers a high-bandwidth connection between the Intel Pentium M and the platform, providing 3x the bandwidth over platforms based on Intel® Pentium® III processors
- USB controllers provide high performance peripherals with 480Mbps of bandwidth. This results in a significant increase over previous integrated 1-4 port hubs at 12Mbps
- Dual UARTs
- Serial ATA
- 64bit/66Mhz PCI-X bus
- 32bit/33Mhz PCI bus
- Dual Ultra ATA/100 controllers, coupled with the Intel® Application Accelerator - a performance software package - support faster IDE transfers to storage devices
- The Intel® Application Accelerator software provides additional performance over native ATA drivers. The Intel Application Accelerator improves system performance by improving I/O transfer rates and enables faster O/S load time resulting in accelerated boot times
- Embedded lifecycle support

The "Intel 855GME Chipset" topic in Appendix D contains a link to information about the chipset.

1.3.4 PCI-to-PCI Bridge

The cPB-4612 has a 64bit/66Mhz PCI-X bridge to the CompactPCI backplane. The bridge will configure itself as a transparent bridge when the board is in a system slot, so that the cPB-4612 can be the system host. If the cPB-4612 is placed in a peripheral slot, the bridge configures itself as a non-transparent bridge, and will show up as a PCI device to the host. This allows use of the board in either a system or peripheral slot.

1.3.5 Memory and I/O Addressing

The cPB-4612 supports up to 2GB of DDR333/266/200 via two right-angled SODIMM sockets. Memory can be purchased from DTI separately.

See the "Memory Configuration" and "I/O Configuration" topics in Chapter 2 for more information.

1.3.6 Power Ramp Circuitry

The cPB-4612 features a power controller with power ramp circuitry that allows the board's voltages to be ramped in a controlled fashion. The power ramp circuitry eliminates large voltage or current spikes caused by hot swapping boards. This controlled ramping is a requirement of the *CompactPCI Hot Swap Specification**, PICMG 2.1, Version 1.0*.

The cPB-4612's power controller unconditionally resets the board when it detects that the 3.3V, 5V, and 12V supplies are below an acceptable operating limit. Minimum voltage thresholds for the cPB-4612 are: 4.75V (5V supply), 3.0V (3.3V supply), and 10.0V (+12V supply).

1.3.7 Rear-Panel I/O

The following I/O signals are available from the J5 connector at the back of the cPB-4612. These signals are available for use by a rear panel transition board such as the cRT-4612.

- Serial port (COM2)
- USB Ports 2 and 3
- Secondary IDE channel
- Serial ATA channel
- Video

1.3.8 Video

The cPB-4612 supports VGA video using Intel’s 855GME video interface. The video is accessed through the CompactPCI J5 connector. The 855GME can share up to 32MB of system memory with the internal video.

The onboard video from the Intel 855GME may be disabled by a jumper setting. This will allow use of a PCI video card only. If the onboard video is enabled and a PCI video card is installed, the PCI video card will be the primary video source.

The Intel 855GME Chipset topic contains a link to the datasheet for this device.

1.3.9 PCI Mezzanine Card (PMC) Interface

The cPB-4612 provides a 64bit/66Mhz PMC site and a 32bit/33Mhz PMC site, both with front panel access. The 64bit/66Mhz PMC site is only 3.3V tolerant. The 32bit/33Mhz can be configured to be either 3.3V or 5V via a jumper setting. Voltage keys are also provided to prevent inadvertently placing a PMC card on PMC site that does not support its VI/O voltage.

The cPB-4612 w/ IDE provides a 64bit/66Mhz PMC site and a 2.5” HDD IDE connector. The 64bit/66Mhz PMC site is only 3.3V tolerant. Voltage keys are also provided to prevent inadvertently placing a PMC card on PMC site that does not support its VI/O voltage.

The "PMC Specification" topic in Appendix D contains a link to the sponsoring organization for the PMC specification.

1.3.10 Dual 10/100/1000 Ethernet Interfaces

The cPB-4612 provides two 10/100/1000BaseTx Ethernet channels (ENET A and ENET B) through the Intel 82546EB Fast Gigabit Ethernet Multifunction PCI Controller. The 82546EB consists of both the Media

Access Controller (MAC) and the physical layer (PHY) interface combined into a single component solution. Both Ethernet Channels are directed to the rear connector at J3 for PICMG 2.16 support.

The "Ethernet" topic in Appendix D contains links to the datasheets for the Ethernet devices used on the cPB-4612.

1.3.11 10/100 Ethernet Interface

The cPB-4612 supports one 10/100 Base-TX Ethernet interface. The Intel 82559EM Ethernet controller provides this interface. The NIC address programmed into the controller is located on labels on the board. Link and activity LED signals are on the front panel at the RJ-45 connector.

The "Ethernet" topic in Appendix D contains links to the datasheets for the Ethernet devices used on the cPB-4612.

1.3.12 IDE Hard Drive

The cPB-4612 w/IDE supports an onboard ATA/100 2.5" IDE interface. This can be used to connect a 2.5" hard drive. The IDE interface is implemented using Intel's 6300ESB I/O Controller Hub (ICH). Note that the onboard 2.5" IDE connector is not present on versions of the board that support the 33MHz/32 bit PMC site.

All versions of the cPB-4612 supports a second ATA/100 IDE interface through the CompactPCI J5 connector. The IDE interface is implemented using Intel's 6300ESB I/O Controller Hub (ICH).

All versions of the cPB-4612 supports a Serial ATA/150 interface through the CompactPCI J5 connector. The IDE interface is implemented using Intel's 6300ESB I/O Controller Hub (ICH).

Both the 2.5" IDE drive connector and 33Mhz/32bit PMC site cannot both be present at the same time, since they are in the same physical space on the board. Which one is populated depends on the version of the board.

See Chapter 6, "IDE Controller", for more information.

1.3.13 Serial I/O

The cPB-4612 provides support for two RS-232 compatible serial ports. COM1 is accessible at the faceplate through a 9-pin DSUB connector. This port is typically used for test access. COM2 is available at the J5 Rear Panel I/O connector.

The serial port interface is implemented using Intel's 6300ESB I/O Controller Hub (ICH).

1.3.14 Interrupts

Two enhanced, 8259-style interrupt controllers provide the cPB-4612 with a total of 15 interrupt inputs. Interrupt controller features include support for:

- Level-triggered and edge-triggered inputs
- Individual input masking
- Fixed and rotating priorities

Interrupt sources include:

- Counter/Timers
- Serial I/O
- Keyboard
- Floppy disk
- IDE interface

- Real-Time Clock
- On-board PCI devices

Enhanced capabilities include the ability to configure each interrupt level for active high-going edge or active low-level inputs.

The cPB-4612's interrupt controllers reside in the 6300ESB device. The "Intel 855GME Chipset" topic in Appendix D provides a link to the datasheet for this device.

1.3.15 Counter/Timers

Three 8254-style counter/timers, as defined for the PC/AT, are included on the cPB-4612. Operating modes supported by the counter/timers include:

- Interrupt on count
- Frequency divider
- Software triggered
- Hardware triggered
- One shot

The cPB-4612's Counter/Timers reside in the Intel 6300ESB device. The "Intel 855GME Chipset" topic in Appendix D provides a link to the datasheet for this device.

1.3.16 DMA

Two cascaded 8237-style DMA controllers are provided on the cPB-4612 for use by the on-board peripherals.

The cPB-4612's DMA controllers reside in the Intel 6300ESB device. The "Intel 855GME Chipset" topic in Appendix D provides a link to the datasheet for this device.

1.3.17 Real-Time Clock

The real-time clock performs timekeeping functions and includes 256 bytes of general-purpose, battery-backed, CMOS RAM. Timekeeping features include an alarm function, a maskable periodic interrupt, and a 100-year calendar. The system BIOS uses a portion of this RAM for BIOS setup information.

The cPB-4612's Real-Time Clock resides in the Intel 6300ESB device. The "Intel 855GME Chipset" topic in Appendix D provides a link to the datasheet for this device.

1.3.18 Reset

The push-button reset on the cPB-4612's faceplate functions as a "Hard Reset". See Chapter 4, "Reset," for more information about reset sources for the cPB-4612.

1.3.19 Two-Stage Watchdog Timer

The watchdog timer optionally monitors system operation and is programmable for different timeout periods (from 1 microsecond to 10 minutes). It is a two-stage watchdog, meaning that it can be enabled to produce a system management interrupt (SMI) or an IRQ (APIC 1, INT 10) before it generates a Reset. Failure to strobe the watchdog timer within the programmed time period may result in an SMI, a reset request, or both. A register bit can be read to indicate if the watchdog timer caused the reset event. This watchdog timer register is not cleared on power-up, enabling system software to take appropriate action if the watchdog generated the reboot.

See Chapter 7, "Watchdog Timer," for more information, including sample code.

1.3.20 Universal Serial Bus (USB)

The Universal Serial Bus (USB) provides a common interface to slower-speed peripherals. Functions such as keyboard, serial ports, printer port, and mouse ports can be consolidated into USB, simplifying cabling requirements. The cPB-4612 provides one USB port at its faceplate (connector J20 is Port 0). USB Port 1 and USB port 2 are routed to the cPB-4612's J5 Rear Panel I/O connector.

The cPB-4612's USB channels are controlled by the Intel 6300ESB device. The "Intel 855GME Chipset" topic in Appendix D provides a link to the datasheet for this device.

1.3.21 System Environmental Monitor

This board provides an IMPI controller for monitoring the status of the system environment. The IPMI controller monitors the system voltages, ambient board temperature, and CPU temperature. The controller is accessed through an IPMB bus from the backplane.

See "System Monitoring and Control" in chapter 5 for more details.

1.3.22 LED Indicators

The LEDs located at the cPB-4612's faceplate are defined below.

- Ethernet (ENETA, RJ 45 connector):
  First LED:
  Green = Network connection
  Blinking Green = Network activity
  Second LED:
  Off = 10 MB/sec
  Green = 100 MB

- Hot Swap
  Blue = safe to extract board
  Off = not safe to extract board

1.4 Software

The cPB-4612 includes a DTI enhanced AMI Embedded BIOS loaded in on-board flash. The BIOS is user-configurable and can boot an operating system from CompactFlash, a hard drive, CD-ROM drive, or over a network. BIOS and firmware updates can be provided by DTI.

The cPB-4612 is compatible with all major PC operating systems, including Microsoft* Windows* 2000/XP, Linux*, and VxWorks*. Chips may provide additional drivers for Intel peripherals, flash drives, and for supported operating systems. Software device drivers for the cPB-4612 may be found on the DTI Product Documentation and Software CD.

Chapter 2

2 Getting Started

This chapter summarizes the information needed to make the cPB-4612 operational. This chapter should be read before using the board.

2.1 Unpacking

Check the shipping carton for damage. If the shipping carton and contents are damaged, notify the carrier and DTI for an insurance settlement. Retain the shipping carton and packing material for inspection by the carrier. Obtain authorization before returning any product to DTI. Refer to the Return Shipment Information page for assistance.

CAUTION: This board must be protected from static discharge and physical shock. Never remove any of the socketed parts except at a static-free workstation. Use the anti-static bag shipped with the product to handle the board. Wear a wrist strap grounded through one of the system's ESD Ground jacks when servicing system components.

2.2 System Requirements

The following topics briefly describe the basic system requirements and configurable features of the cPB-4612. Links are provided to other chapters and appendices containing more detailed information.

2.2.1 BIOS Version

For proper operation, the cPB-4612 must run the DTI enhanced AMI Embedded BIOS. The revision level is shown in the BIOS Identification string displayed during the Power On Self Test (POST).

2.2.2 Connectivity

The cPB-4612 features an ejector handle that is keyed for compatible slots. The board can only be inserted into slots fitted with a compatible mating key.

The cPB-4612 is designed to operate in a backplane providing CompactPCI form factor interfaces at J1, J2, J3, and J5. The J1 and J2 connectors are supplied for the CompactPCI bus, power and IPMI signals. J3 signaling must comply with the PICMG* 2.16 Packet Switching Backplane specification. The J5 interface must have through-pins for the cPB-4612 to interface with a rear panel transition card such as the cRT-4612. See the "Connectors" topic in Appendix B for connector descriptions.

2.2.3 Electrical and Environmental

The cPB-4612 meets the following requirements:

- +5VDC +5%, -3% @ 6.9A typical
- +3.3VDC +5%, -3% @ 2.4A typical
- +12VDC ±10% @ 20mA typical
- -12VDC may be required by a PMC peripheral installed on the cPB-4612.

Configuration	5V (avg)	5V (peak)	3.3V (avg)	3.3V (peak)	12V (avg)	12V (peak)	-12V (avg)	-12V (peak)
1.7GHz / 512MB	6.9A	TBD*	2.4A	TBD*	20mA	50mA	0.0A	0.0A
Hard disk (add) (typical)	540mA	1.00A	N/A	N/A	N/A	N/A	N/A	N/A
PMC card typical[1] (add)	1.00A	1.70A	0.75A	1.30A	100mA	200mA	20mA	40mA
PMC card max.[2] (add)	1.50A	3.00A	2.25A	4.50A	500mA	500mA	500mA	500mA

*** Peak (short duration) power supply current may be significantly higher (up to 50%) and will vary depending upon the application.**

Notes:
1. Consult manufacturer of installed PMC card for actual values.
2. In no case shall the total power dissipated by the PMC card exceed 10.0 W.

The cPB-4612 comes with a heatsink that allows the processor to operate between 0° and approximately 50°C ambient with a minimum of 200 LFM (1 meter per second) of external airflow. It is the users' responsibility to ensure that the cPB-4612 is installed in a chassis capable of supplying adequate airflow. The maximum power dissipation of the processor (FCBGA package) is 25W. External airflow **must** be provided at all times. See Appendix A, "Specifications," and Appendix C, "Thermal Considerations," for more details.

It is strongly recommended that the airflow be measured while the cPB-4612 is installed in its intended location. Insert a thermistor type air velocity meter (Kane-May KM4007 or similar) through the PMC access on the faceplate and make the air velocity measurement near the processor heat sink. Power should not be applied to the cPB-4612 during airflow measurements (slightly disengage the cPB-4612 from the backplane connectors if necessary).

CAUTION: The processor "core" temperature must **never** exceed 100°C under any condition of ambient temperature or usage. This may result in permanent damage to the processor.

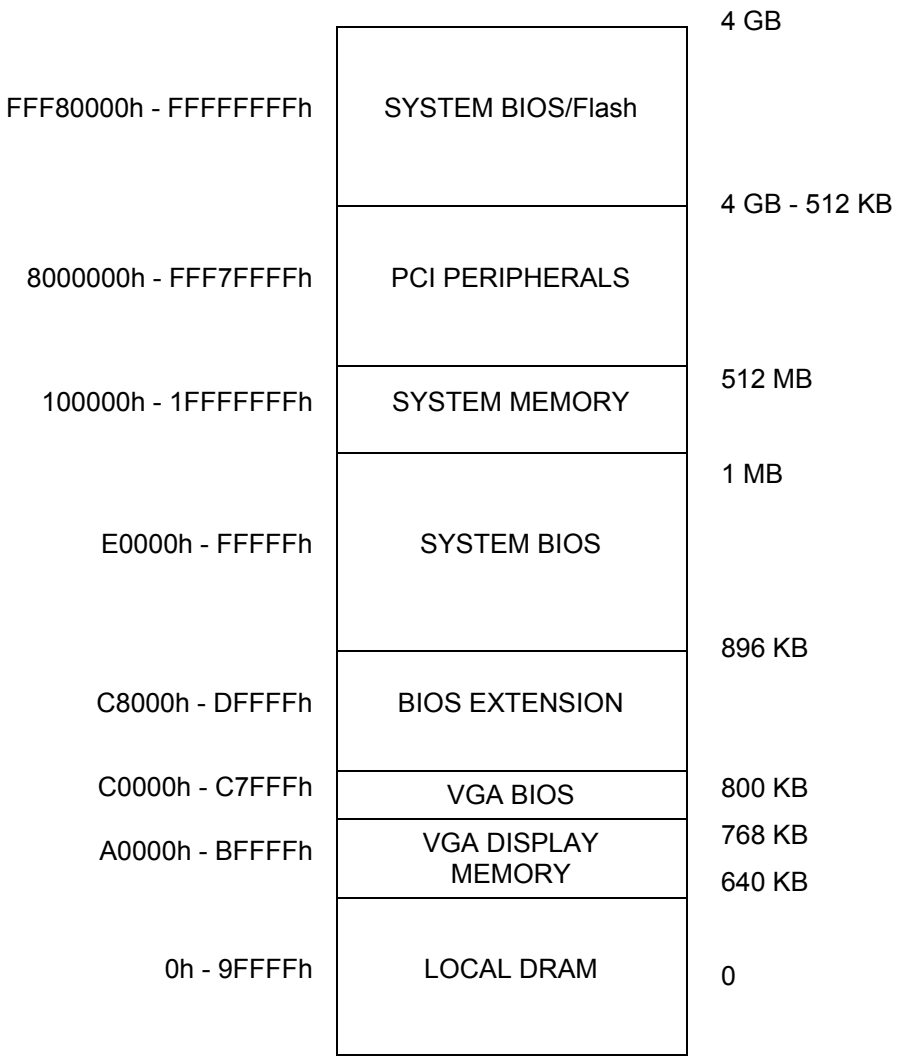
The cPB-4612 may contain materials that require regulation upon disposal. Please dispose of this product in accordance with local rules and regulations. For disposal or recycling information, please contact your local authorities or the Electronic Industries Alliance at http://www.eiae.org/**.

2.3 Memory Configuration

The cPB-4612 components can *address* up to 4 GB of memory, but the board only has two SO-DIMM sockets and can physically only hold two sticks of memory. The address space is divided between memory local to the board and memory located on the Local PCI bus. Any memory not reserved or occupied by a local memory device (DRAM/flash) is available to PCI memory devices.

The cPB-4612 can support up to two sticks of either 256 MB, 512 MB, 1 GB DDR SDRAM. 1MB of L2 cache is integrated with the Pentium® –M processor.

Memory Address Map Example



2.4 I/O Configuration

The cPB-4612 addresses up to 64 KB of I/O using a 16-bit I/O address. The cPB-4612 is populated with many commonly used I/O peripheral devices. The I/O address location for each peripheral is shown in the "I/O Address Map" illustration.

I/O Address Map

*Onboard ISA peripherals addressed between 100h - 7FFh decode 11 bits of address (A0h - A10h). Therefore, these peripherals will alias throughout the 16-bit I/O space at the following ranges:

- x100-x3FFh
- x500-x7FFh
- x900-xBFFh
- xD00-xFFFh

PCI devices can fully utilize the address space from D00 - FFFFh, since subtractive decoding is used for the onboard ISA devices.

D00 - FFFFh	PCI*
CF8 - CFFh	PCI Config/RST Control
780 - CF7h	PCI Reserved
778 - 77Fh	LPT ECP Registers
400 - 777h	Reserved
3F8 - 3FFh	COM1
3F0 - 3F7h	Floppy / IDE Registers
3E0 - 3EFh	Reserved
3B0 - 3DFh	VGA Registers
380 - 3AFh	Reserved
378 - 37Fh	LPT
300 - 377h	Reserved
2F8 - 2FFh	COM2
200 - 2F7h	Reserved
1F8 - 1FFh	Reserved
1F0 - 1F7h	Primary IDE Registers
178 - 1DFh	Reserved
170 - 177h	Secondary IDE Registers
100 - 16Fh	Reserved
F0 - FFh	Coprocessor
E0 - EFh	Reserved
C0 - DFh	On-board Slave DMA Controller
B4 - BFh	Reserved
B2 - B3h	APM Registers
B0 - B1h	Reserved
A0 - AFh	On-board Slave Interrupt Controller
93 - 9Fh	Reserved
92h	Fast RESET and Gate A20
90 - 91h	Reserved
81 - 8Fh	On-board DMA Page Registers

80h	Diagnostic Port
78 - 79h	Reserved
70 - 77h	On-board Real-Time Clock
60 - 6Fh	Keyboard and System Ports
50 - 5Fh	Reserved
40 - 4Fh	On-board Timer/Counters
30 - 3Fh	Reserved
2E - 2Fh	Super I/O Configuration
22 - 2Dh	Reserved
20 - 21h	On-board master Interrupt Controller
0 - 1Fh	On-board Master DMA Controller

2.5 Connectors

The cPB-4612 includes several connectors to interface to application-specific devices. Refer to the "Connectors" topic in Appendix B for complete connector descriptions and pin outs.

2.6 Jumper Options

The cPB-4612 provides several jumper configuration options for features that cannot be provided through the BIOS Setup Utility. Location figures and descriptions are provided in Chapter 3, "Configuration."

2.7 BIOS Configuration Overview

This topic presents an introduction to the cPB-4612's BIOS.

The BIOS has many separately configurable features. These features are selected by running the built-in Setup utility. System configuration settings are saved in a portion of battery-backed RAM in the real-time clock device and are used by the BIOS to initialize the system at boot-up or reset. The configuration is protected by a checksum word for system integrity.

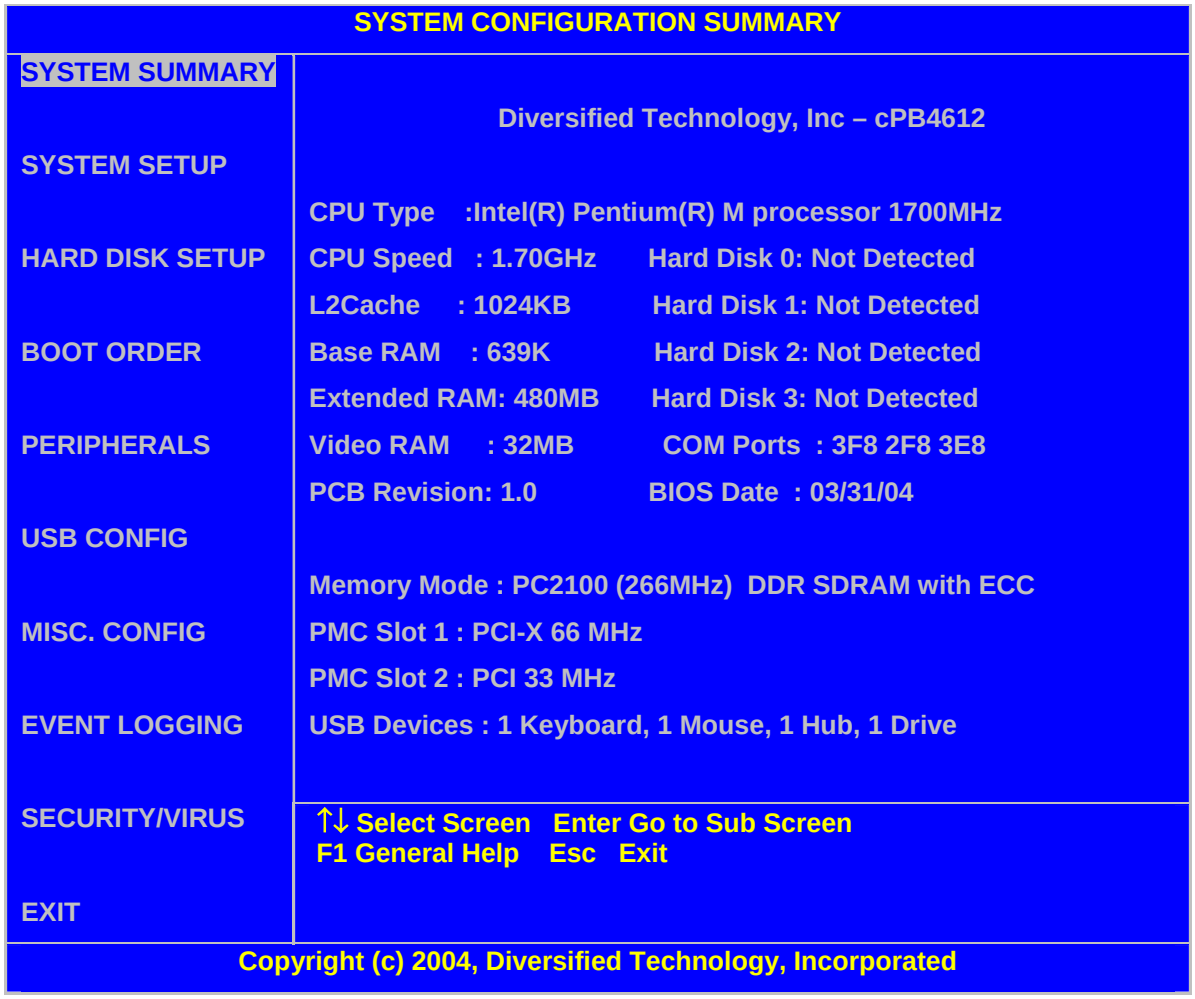
To access the Setup utility, press **F2** during the system RAM check at boot-up. When Setup runs, an interactive configuration screen displays. Refer to the following "Setup Screen" illustration for an example.

Setup parameters are divided into different categories. The available categories are listed in a menu down the left side of the setup screen. The parameters within the highlighted (current) category are listed in the main (right) portion of the Setup screen. Context sensitive help can be displayed for each parameter by highlighting the parameter and pressing F1. A legend of keys is listed at the bottom of the Setup screen.

Use the up and down arrow keys to select a category from the menu. Use the up and down arrow keys to select a parameter in the main portion of the screen. Use the **+/–** or ↔keys to change the value of a parameter.

Solid arrows next to menu items in the main screen indicate submenus. To display a submenu, use the up and down arrow keys to highlight the submenu and then press **Enter**.

Setup Screen



2.8 Operating System Installation

For more detailed information about your operating system, refer to the documentation provided by the operating system vendor.

1. Install peripheral devices. CompactPCI* devices are automatically configured by the BIOS during the boot sequence.
2. Most operating systems require initial installation on a hard drive from a floppy or CD-ROM drive. These devices should be configured, installed, and tested with the supplied drivers before attempting to load the new operating system.
3. Read the release notes and installation documentation provided by the operating system vendor. Be sure to read any README files or documents provided on the distribution disks, as these typically note documentation discrepancies or compatibility problems.
4. Select the appropriate boot device order in the SETUP boot menu depending on the OS installation media used. For example, if the OS includes a bootable installation floppy, select **Removable Media** as the first boot device and reboot the system with the installation floppy installed in the floppy drive. (Note that if the installation requires a non-bootable CD-ROM, it is necessary to boot an OS with the proper CD-ROM drivers in order to access the CD-ROM drive).

5. Proceed with the OS installation as directed, being sure to select appropriate device types if prompted. Refer to the appropriate hardware manuals for specific device types and compatibility modes of DTI products.
6. When installation is complete, reboot the system and set the boot device order in the SETUP boot menu appropriately.

Chapter 3

3 Configuration

The cPB-4612 has been designed for maximum flexibility. Many features can be configured by the user for specific applications. Most configuration options are selected through the BIOS Setup utility (discussed in the "BIOS Configuration Overview" topic in Chapter 2). Some options cannot be software controlled and are configured with jumpers.

Jumper Options and Locations

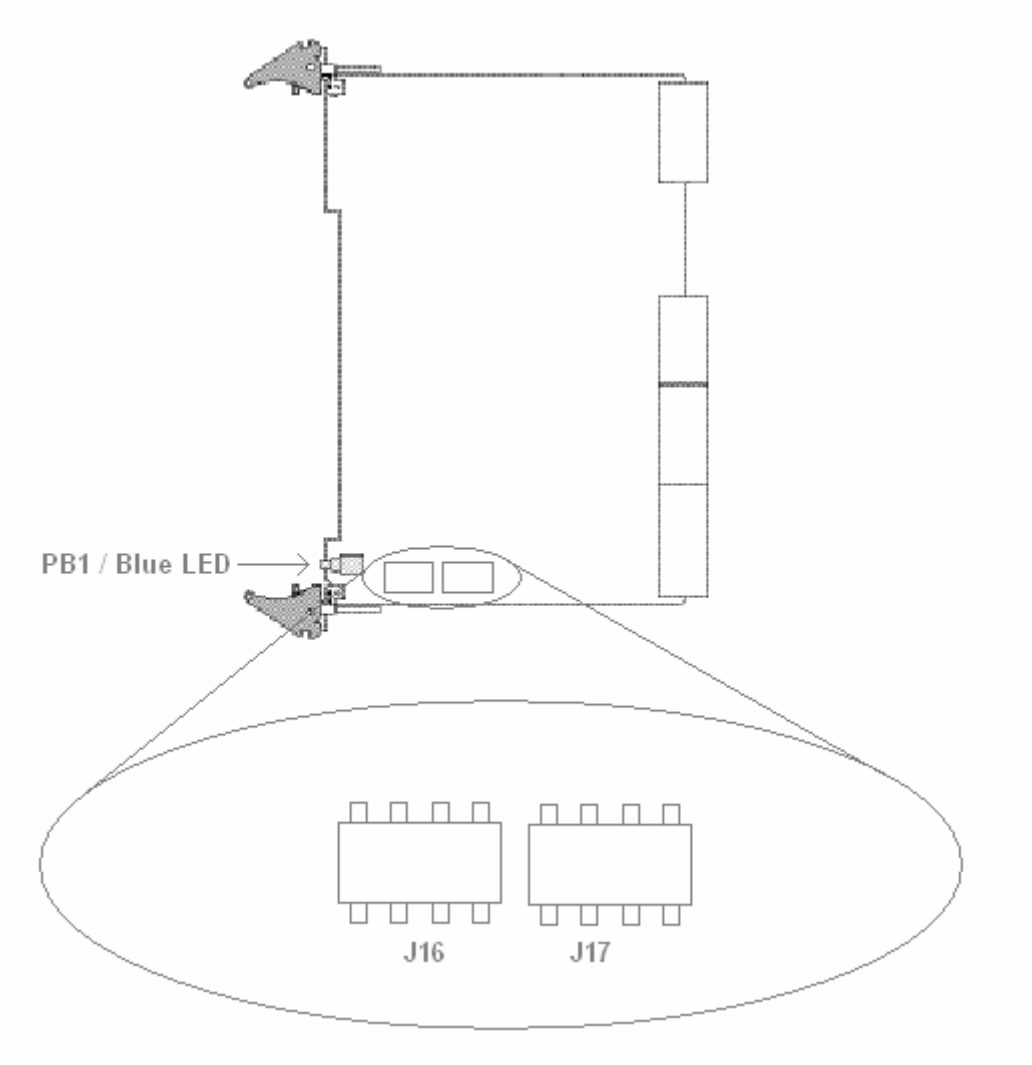
The cPB-4612 contains a push-button switch on the faceplate and eight jumpers on the component side of the board. The jumpers are listed and briefly described in the "Jumper Cross-Reference" table below.

Factory default switch settings are shown in the "Default Jumper Settings" figure.

Jumper Cross-Reference Table

Jumper	Function
PB1	Reset (push-button on faceplate)
J16-1	BKT-GND to GND
J16-2	+12V to J5-pin D1
J16-3	+5V PMC I/O
J16-4	IMPI Disable
J17-1	Not Used
J17-2	CMOS Clear
J17-3	Disable Onboard Video
J17-4	Manufacture Test Mode

Default Jumper Configuration



3.1 Switch Descriptions

The following topics list the switches in numerical order and provide a detailed description of each switch.

3.1.1 PB1 (Reset)

PB1 is a push-button on the front of the cPB-4612. Pressing PB1 issues a hard reset. Reset is discussed in more detail in Chapter 4.

3.1.2 J16-1 (BKT-GND to GND)

Installing this jumper will short the bracket ground to digital ground. This may positively or negatively affect EMI emissions, depending on the system. Proper testing would need to be performed with the intended system to determine the best setting. The default is for no jumper.

J16-1		Function
Open	Default	Bracket ground is not connected to digital ground.
Closed		Bracket ground is shorted to digital ground.

3.1.3 J16-2 (+12V to J5-pin D1).

Installing this jumper will connect +12V to the CompactPCI connector J5, pin D1. This is only to be used for specially designed RTM cards that may need it. The default is for no jumper.

J16-2		Function
Open	Default	CPCI J5-pin D1 is a no connect.
Closed		CPCI J5-pin D1 is shorted to +12V.

3.1.4 J16-3 (+5V PMC I/O)

Installing this jumper sets the 32bit/33Mhz PMC site's VI/O voltage to +5V. Having no jumper sets the VI/O voltage to 3.3V. The 32bit/33Mhz PMC site is located on the bottom edge of the board, closest to the jumpers.

WARNING: The voltage key for the 32bit/33Mhz PMC site must be set to match this jumper setting. Not placing the voltage key, placing the voltage key at the wrong location, or using a PMC card that is not tolerant of the set voltage may damage the PMC card and/or the cPB-4612 board.

J16-3		CMOS Real Time Clock
Open	Default	32bit/33Mhz PMC site set to 3.3V.
Closed		32/bit/33Mhz PMC site set to 5V.

3.1.5 J16-4 (IMPI Disable)

This is for debug use only. Placing this jumper will disable the IMPI controller. This should only be used by the manufacturer.

J16-4		CMOS Real Time Clock
Open	Default	Normal Operation
Closed		IMPI controller disabled

3.1.6 J17-1 (Not Used)

Not used

J17-1		Function
Open	Default	Not used
Closed		Not used

3.1.7 J17-2 (CMOS Clear)

Installing this jumper will reset the CMOS settings to their default values.

J17-2		Function
Open	Default	Normal operation
Closed		Clears CMOS and sets registers to their default state.

3.1.8 J17-3 (Disable Onboard Video)

Installing this jumper will disable the onboard video. Place this jumper if using a PCI video card only.

J17-3		Function
Open	Default	Onboard video is enabled.
Closed		The onboard video is disabled.

3.1.9 J17-4 (Manufacture Test Mode)

Used by DTI for testing purposes. Do not install a jumper at this location.

J17-4		Function
Open	Default	Normal operation
Closed		Board in manufacturing test mode.

3.1.10 J18 (Ejector Switch)

The ejector handles are used when cPB-4612 is inserted or removed (hot swapped) from a chassis that is powered on. When a customer wishes to remove a board from a system that is powered on then the ejector handles should be opened just enough to disengage the handles from the chassis, but without fully disengaging the J-connectors from the back of the chassis. This will trigger a shutdown of the operating system and then the BMC will power off the board and light the blue hot swap LED on the front panel. Once the blue LED on the front of the board is lit, then it is safe to remove the board from the chassis.

Note: In order for the shutdown sequence of the OS to take place a hot swap driver must be installed into the OS. See the cPB-4612 support page for this driver or procure the cPB-4612 hot swap kit.

The J18 (ejector handles) need to be closed in order for the board to boot up.

J18	Function
Open	Indicate the user needs to extract the board
Closed	Normal Operation

Chapter 4

4 Reset

This chapter discusses the reset types and reset sources on the cPB-4612. If necessary, the cPB-4612's board reset characteristics can be tailored to the requirements of a specific system.

4.1 Reset Types and Sources

The cPB-4612's reset types are listed below. The sources for each reset type are detailed in the following topics.

- **Hard Reset:** All devices are held in reset.
- **Soft Reset:** CPU initialization only. Other devices are not reset.
- **Backend Power Down:** The backend logic is powered off. The board is powered on and is held in reset.
- **NMI:** Non-maskable interrupt. Though not a reset in the strict sense, an NMI can have the same effect as other resets.

4.1.1 Hard Reset Sources

System Register CF9h (6300ESB Reset Control Register)

Bits 1 and 2 in this register are used by the **6300ESB** to generate a hard reset or a soft reset. During a hard reset, the **6300ESB** asserts CPURST, PCIRST#, and RSTDRV. Additionally, it resets its core and suspends well logic.

4.1.2 Soft Reset Sources

System Register CF9h (6300ESB Reset Control Register)

Bits 1 and 2 in this register are used by the **6300ESB** to generate a hard reset or a soft reset. During a soft reset, the ICH4 asserts INIT to the CPU for 16 PCICLK. This causes the processor to enter "real mode", initialize its internal registers, and begin instruction execution from FFFFFFF0h (the boot vector).

Keyboard Controller Reset

The keyboard controller generates a keyboard controller reset when FEh is written to port 64h. This causes the **6300ESB** to assert INIT to the CPU.

Keyboard CTRL-ALT-DEL

Simultaneously pressing these keys calls a BIOS function that reboots the system.

Note: **This method does not work under operating systems that trap calls to this BIOS function.**

Watchdog Timer (System Register Address 79h)

The watchdog timer may be programmed to generate a "CPU Init" if it is not strobed within a given time-out period. This function is discussed in Chapter 7, "Watchdog Timer."

4.1.3 Backend Power Down Sources

Board Extraction

When a board is extracted from an enclosure (specifically, when the "board-select" [BD_SEL] pin is disengaged), the hot swap controller unconditionally removes backend power from the board and holds the board in reset.

Low Voltage

When any of the 3.3V, 5V, or 12V supply voltages are detected to be below an acceptable operating limit, the hot swap controller unconditionally removes backend power and holds the board in reset.

4.1.4 NMI Sources

Watchdog Timer (System Register Address 79h)

The watchdog timer may be programmed to generate a non-maskable interrupt if it is not strobed within a given time-out period. This function is discussed in Chapter 7, "Watchdog Timer."

Chapter 5

5 System Monitoring and Control

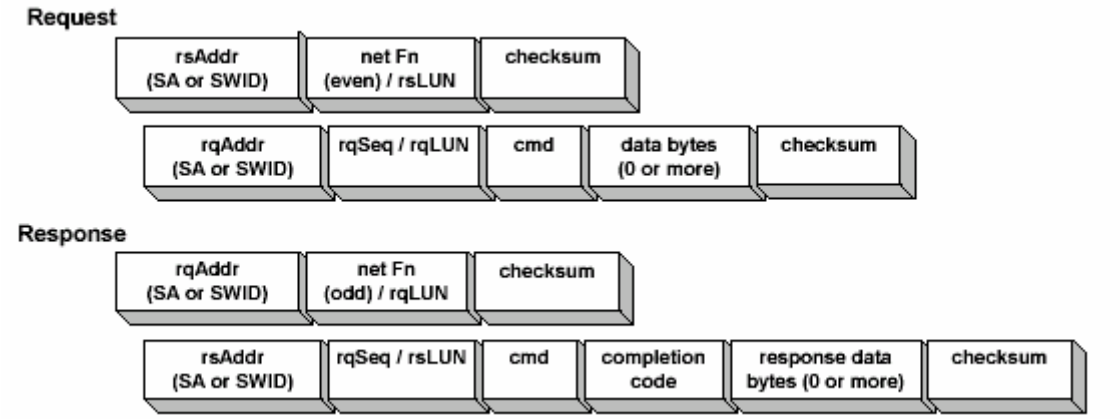
The cPB4612 has an IPMI System Monitor that complies with PICMG® 2.9 specification, and complies with IPMI Specification 1.5. This allows a PICMG 2.9 compliant chassis that utilizes a chassis manager, or Baseboard Management Controller (BMC) to detect the presence of the cPB4612 and make Field Replaceable Unit (FRU) information, and Sensor Device Records (SDR's) available. Sensors monitor voltages, CPU and system temperature, and other inputs, including the front latch, which can generate events that are recorded in the BMC's System Event Log (SEL). The IPMI System Monitor has both an IPMB and a dedicated basic serial interface, so that it is possible for the cPB4612 to acquire FRU and sensor information directly from the IPMI System Monitor. The firmware on the IPMI System Monitor can be upgraded via the serial interface or over IPMB.

5.1 Monitoring and Control Functions

The IPMI System Monitor has a dedicated serial interface to the host processor on the cPB4612. It is a 16550-compatible UART that is configurable in SETUP. If this interface is not required, it can be disabled. Otherwise, it will be given a unique serial port address and interrupt. Note that the interrupt cannot coincide with the other COM ports; it is not shareable.

The serial interface is fixed at 9600 baud, 8 data bits, 1 stop bit, no parity, full duplex. It complies with IPMI serial "basic" mode, as detailed in IPMI Spec 1.5, section 13.4, which permits IPMB packets to be transmitted and received using framing bytes and escape sequences. The packet structure otherwise is identical to the IPMB:

Figure 5.1: Packet Structure



Because the serial interface in this case is dedicated, the responder address and requester address bytes can be anything. The IPMI System Monitor, though, will always put its actual IPMB slave address in the *rsAddr* field of a response packet.

The IPMI 1.5 specification defines a basic mode serial port as a single session interface, since there is no session ID in the packet. This IPMI System Monitor, at this time, does not support *Get Session Challenge* and *Activate Session* commands, because the serial interface is dedicated to the IPMI system monitor, and the interface is always "up."

5.2 IPMB

The IPMB is an I^2C® interface that is routed through the backplane and connects to the BMC in the chassis to allow discovery of the IPMI System Monitor. Its operation is covered in the IPMI specification. It is always active.

5.3 Field Replaceable Unit (FRU) Information

Board information, such as serial number, date of manufacture, OEM name, part number, etc., are retrievable from the FRU. It complies with the IPMI FRU 1.0 Specification. The information in the FRU can be customized to add other product information, such as asset tag, other part numbers, etc.

5.4 Sensors

The sensors that the cPB4612 supports with the IPMI System Monitor can be retrieved in the Sensor Data Records (SDR's) via normal IPMI commands. They include:

System Ambient Temperature	+12V
CPU Temperature	+1.5V
VTT DDR	+1.8V
CPU Core Voltage	ONCTL#
+3.3V	SLOT
+5V	Front Latch

These sensors (with the exception of ONCTL and SLOT), when enabled by the BMC, will generate sensor events on the IPMB. These events will normally be logged by the BMC and time-date stamped. On temperature and voltage sensors, if sensor readings cross any of the non-critical, critical, or non-recoverable thresholds, the IPMI System Monitor will generate IPMB event data to inform the BMC. The IPMI System Monitor allows the BMC, via IPMI commands, to override its sensor thresholds

5.5 Firmware Updates

Firmware updates are possible through either the serial or IPMB interface. A special utility will be provided should a firmware update be necessary.

5.6 SMBus Address Map

The table below lists the location, function, and address of each SMBus device used on the cPB-4612.

Device	**cPB-4612 Function**	**Address**
ICH SMBus (slave)	6300ESB ICH	1000 100
Board clock generator (CK409B)	Board clock generator (CK409B)	1101 001
SO-DIMM0	SO-DIMM0	1010 000
SO-DIMM1	SO-DIMM1	1010 001

Chapter 6

6 IDE Controller

The cPB-4612 with IDE has an on-board IDE controller that provides two IDE channels for interfacing with up to four IDE devices. The IDE controller is incorporated into the Intel 6300ESB, which supports ATA-100. There is one 50-pin IDE connector on the cPB-4612 with IDE, which supports up to two IDE devices (though there is only space on the board itself to mount one device). The secondary IDE channel is available through the rear panel connector (J5).

The "Intel 855GME Chipset" topic in Appendix D provides a link to the 6300ESB datasheet.

6.1 Features of the IDE Controller

- Primary and Secondary channels for interfacing up to four devices
- IBM-AT compatible
- Supports PIO and Bus Master IDE
- "Ultra ATA/33/66/100" Synchronous DMA Operation
- Bus Master IDE transfers up to 100 MB/sec.
- Individual software control for each IDE channel

6.2 Disk Drive Support

The cPB-4612 supports internal and external IDE devices. These configurations are described below.

6.2.1 Primary IDE Channel

The cPB-4612's primary IDE channel is directed to the J14 IDE connector. J14 is used to interface with the locally mounted hard drive.

6.2.2 Secondary IDE Channel

The cPB-4612's Secondary IDE channel is directed via the J5 rear-panel I/O connector to a compatible rear panel I/O board. Rear Panel I/O boards, such as the cRT-4612, can be installed in-line behind the cPB-4612 to provide expanded I/O capability. Refer to the DTI PlexSys cRT-4612 Packet Switched Rear-Panel Transition Board Hardware Manual for product information.

6.3 IDE I/O Mapping

The I/O map for the IDE interface varies depending on the mode of operation. The default mode is "compatibility mode," meaning that the interface uses the PC-AT legacy addresses of 1F0h-1F7h, with 3F6h and interrupt IRQ14 for the primary channel. The secondary channel uses I/O addresses 170h-177h, 376h and interrupt IRQ15. No memory addresses are used.

6.4 IDE Device Drivers

The IDE interface works with all applications by default. To fully utilize the IDE interface, additional software drivers need to be installed. Contact the vendor of your intended operating system to receive the latest drivers

Chapter 7

7 Watchdog Timer

This chapter explains the operation of the cPB-4612's watchdog timer. It provides an overview of watchdog operation and features, as well as sample code to help you learn how the watchdog timer works with applications.

7.1 Watchdog Timer Overview

The watchdog timer is implemented by using the 6300ESB ICH integrated watchdog timer. The primary function of the watchdog timer is to monitor the cPB-4612's operation and take corrective action if the software fails to function as programmed. The major features of the watchdog timer are:

- Two-stage operation (meaning that it can be enabled to produce a system management interrupt [SMI] or an IRQ (APIC 1, INT 10) before it generates a reset)
- Enabled and disabled through software control
- Armed and strobed through software control

The watchdog timer drives the First and Second Stages as follows:

1. The watchdog times out (First Stage) after a selected timeout interval.
2. SMI or IRQ is driven high.
3. A hard reset occurs (Second Stage) after a selected timeout interval.

The watchdog timer can have a range from 1µs to 10 minutes. The timer uses a 35 bit down counter. The counter is loaded with the first preload register. The timer is then enabled and it starts counting down. This is called the first stage. If the counter reaches zero before being reloaded, the watchdog timer generates an internal interrupt. The counter is then loaded with the second preload register and starts counting down. This is called the second stage. If the counter reaches zero before being reloaded, the watchdog timer drives the WDT_TOUT pin low until the system is reset.

More information can be obtained from the Intel 6300ESB Datasheet. The "Intel 855GME Chipset" topic in Appendix D provides a link to the 6300ESB datasheet.

7.2 PCI Configuration Registers

The two stage watchdog timer controller appears in PCI config space at Bus:0 Dev:29 Func:4. The following registers are the primary PCI registers to control the watchdog timer.

7.2.1 Base Address Register (10h)

Offset: 10h

Default Value: 00000000h

Size: 32 bits

Attribute: R/W

Bit	Description
31:4	**Base Address** Base address points to the memory mapped region
3	**Prefetchable** Hard-wired to 0
2:1	**Type** Hard-wired to 00
0	**Resource Type Indicator** Hard-wired to 0

7.2.2 WDT Configuration Register (60h)

Offset: 60-61h

Default Value: 00h

Size: 16 bits

Attribute: R/W

Bit	Description
15-6	**Reserved**
5	**WDT_OUTPUT: Output Enable** This bit indicates whether or not the WDT will toggle the WDT_TOUT# pin if the WDT times out.
4-3	**Reserved**
2	**WDT_PRE_SEL: Prescaler Select** The WDT provides two options for prescaling the main down counter. The preload values are loaded into the main down counter right justified. The prescaler adjusts the starting point of the 35 bit down counter. 0 – The 20 bit preload value is loaded into bits 34:15 of the main down counter. The resulting timer clock is PCI clock (33MHz) divided by 2^{15}. The approximate clock generated 1KHz.(1ms to 10 min) 1 – The 20 bit preload value is loaded into bits 24:15 of the main down counter. The resulting timer clock is PCI clock (33MHz) divided by 2^{5}. The approximate clock generated 1MHz.(1µs to 1sec)
1-0	**WDT_INT_TYPE** The desired type of interrupt if the WDT reaches the end of the first stage without being reloaded. 00 = IRQ (APIC 1, IRQ 10) 01 = Reserved 10 = SMI 11 = Disabled

7.2.3 WDT Lock Register (68h)

Offset: 68h

Default Value: 00h

Size: 8 bits

Attribute: R/W

Bit	Description
7:3	**Reserved**
2	**WDT_TOUT_CNF: Timeout configuration** 0 – Watchdog Timer Mode 1 – Free Running Mode
1	**WDT_ENABLE: Watchdog Enable** 0 – Disabled 1 - Enabled
0	**WDT_LOCK** Setting this bit will lock values of this register until a hard reset occurs or power is cycled. 0 – Unlocked 1 - Locked

7.3 Memory Mapped Registers

The following registers control the preload values and reload status of the watchdog timer controller. These register locations are offsets from the value of the base address register and appears at Bus:0 Dev:29 Func:4 Reg:10-13.

7.3.1 Preload Value 1 (BAR+00h)

Offset: BAR+00h

Default Value: FFFFFh

Size: 32 bits

Attribute: R/W

Bit	Description
31:20	**Reserved**
19:0	**Preload_Value_1**

7.3.2 Preload Value 2 (BAR+04h)

Offset: BAR+04h

Default Value: FFFFFh

Size: 32 bits

Attribute: R/W

Bit	Description
31:20	**Reserved**
19:0	**Preload_Value_2**

7.3.3 General Interrupt Status (BAR+08h)

Offset: BAR+08h

Default Value: 00h

Size: 8 bits

Attribute: R/WC

Bit	Description
7:1	**Reserved**
0	**Watchdog Timer Interrupt Active** This bit is set when the first stage of the 35 bit down counter reaches zero. This is a sticky bit and is cleared by writing a '1'. 0 – No Interrupt 1 – Interrupt Active

7.3.4 Reload Register (BAR+0Ch)

Offset: BAR+0Ch

Default Value: 0000h

Size: 16 bits

Attribute: R/W

Bit	Description
15:10	**Reserved**
9	**WDT_TIMEOUT** This bit lives in the RTC well and its value is not lost if the host resets the system. It is set to '1' if the host fails to reset the WDT before the down counter reaches 0 during the second stage. This bit is cleared by performing the register unlocking sequence followed by a '1' to this bit.
8	**WDT_RELOAD** To prevent a timeout the host must perform the register unlocking sequence followed by a '1' to this bit.
7:0	**Reserved**

7.4 Using the Watchdog in an Application

The following topics are provided to aid you in learning to use watchdog in an application.

7.4.1 WDT Unlocking and Programming Sequence

Unlocking and programming the WDT Memory Mapped registers involves the following sequence:

1. Write “80” to the Reload Register (offset BAR + 0Ch)
2. Write “86” to the Reload Register (offset BAR + 0Ch)
3. Write to desired memory mapped register (offset BAR + 0Xh)

7.4.2 Watchdog Reset

An application using the reset feature sets the preload values, enables the watchdog reset, and then periodically reloads the watchdog to keep it from resetting the system. If a reload is missed, the watchdog times out and resets the system hardware.

7.4.2.1 Load Preload Values

The following is an algorithm for loading the preload values :

1. If the value desired falls between 1ms and 10min, clear bit 2 WDT_PRE_SEL of the WDT Configuration Register. Else if the value desired falls between 1µs and 1sec set bit 2 of the WDT Configuration Register.
2. Write “80” to the memory mapped Reload Register (offset BAR + 0Ch)
3. Write “86” to the memory mapped Reload Register (offset BAR + 0Ch)
4. Write desired value to the memory mapped Preload Value 1 register (offset BAR + 00h)
5. Write “80” to the memory mapped Reload Register (offset BAR + 0Ch)
6. Write “86” to the memory mapped Reload Register (offset BAR + 0Ch)
7. Write desired value to the memory mapped Preload Value 2 register (offset BAR + 04h)

7.4.2.2 Enabling the Watchdog Reset

To enable the watchdog do the following

1. Set bit 1 of the WDT Lock Register to ‘1’ to enable the watchdog timer.

7.4.2.3 Reloading the Watchdog

Once the watchdog is enabled, it must be periodically reloaded within the terminal count period to avoid resetting the system hardware. This should be done by the following:

1. Write “80” to the memory mapped Reload Register (offset BAR + 0Ch)
2. Write “86” to the memory mapped Reload Register (offset BAR + 0Ch)
3. Write ‘1’ to bit 8 WDT_RELOAD in the Reload Register (offset BAR + 0Ch)

Chapter 8

8 System BIOS

The embedded BIOS on the cPB-4612 is implemented as firmware that resides in the on-board flash read-only memory (ROM). The BIOS contains standard PC-compatible basic input/output (I/O) services and several DTI specific functions and features.

Support for applicable SBC peripheral devices (SCSI, NIC, video adapters, etc.), that are also loaded into the SBC flash ROM, will not be specified in this document. Hooks are provided to support adding BIOS code for these adapters.

8.1 BIOS Upgrade and Recovery

To reprogram the BIOS or update it if it becomes corrupted, use the DTIFLASH.EXE utility available from DTI and discussed later in this chapter.

8.1.1 Flash Utility Program

DTIFLASH.EXE is a utility program that can be obtained from DTI in the event a BIOS should be updated. Run DTIFLASH.EXE to modify the BIOS in the on-board flash memory. DTIFLASH.EXE eliminates the need for a PROM programmer and for removing boards and chips from the system.

To reprogram the BIOS , you should do the following:

1) The latest flash will be distributed via a Customer Service Alert Notification. Normally, the BIOS zip file also contains the DTIFLASH.exe utility you need.
2) Create a DOS 6.2 boot disk and add the BIOS file and flash utility to the disk. Usually other Windows* boot disks will work fine as well, but use DOS if you run into any problems.
3) Boot the board from the DOS boot disk you just created. You can do this via a USB Floppy. If your system does not boot off the floppy you may need to enter the BIOS setup in order to move the floppy to the first item in the boot order.
4) Use the following syntax at a DOS prompt:
   DTIFLASH

The BIOS zip file should also contain a Readme file or installation file to help guide you through BIOS installation.

8.1.2 BIOS Recovery

In the event that the contents of the BIOS ROM are corrupted, there is a mechanism to recover the BIOS Rom using the BIOS bootblock code.

To reprogram corrupted BIOS, you should do the following:

1) The latest flash will be distributed via a Customer Service Alert Notification.
2) Format a disk and copy only the BIOS ROM file to the disk.
3) Power on the board with the disk installed.
4) Press CTRL+HOME keys during power on. The board will enter automatic update mode and program the file from the disk. There will be no video displayed, but activity should be seen on the disk and the POST LEDs.
5) The board will automatically reboot after complete.

8.2 BIOS Configuration Overview

This topic presents a brief introduction to the DTI Embedded BIOS.

The DTI BIOS Software supports all of the IBM /AT standard functions and several functions and features. Features of the DTI BIOS include built-in utilities, help windows, and system monitoring functions.

Upon initial power up or after a hardware reset, the processor begins executing code out of the onboard BIOS. The BIOS contains all of the software needed to boot the board to a working state so an operating system can be loaded. The first order of business for the BIOS is to initialize crucial system components, such as timers and chipset parts. The BIOS then performs basic components checks to ensure their presence and then sets them to a default state. Next, the cache and memory controllers must be initialized and configured for the type and configuration of the cache and memory found in the system.

Once the memory is present, the compressed portions of the BIOS are de-compressed into the shadow memory occupying the standard BIOS memory ranges. The BIOS can now scan for and initialize other interfaces such as I/O devices and items on the PCI or ISA busses.

If a video adapter is in the system it is located and initialized. The video adapter will sign-on and its manufacturer, chip type, and creation date will appear on the screen. The BIOS will then display its sign-on information giving copyright information, the board name, and the version of the BIOS present in the system. At this point the following message will appear at the bottom of the screen giving the hotkey that will invoke the setup engine.

<F2> Enter Setup <SPACE> Skip Memory <ESC> BOOT Menu

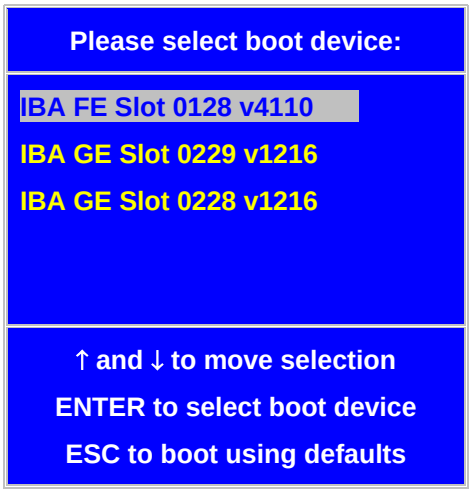
If the F2 key is pressed, the message below will be displayed and the ROM UTILITIES will be entered after the option ROM scan.

Entering Setup…..

The BIOS now starts to size and clear all system memory, displaying its progress on the screen. The BIOS will then sign-on any ISA or PCI option ROMs found on devices in the system. If the F2 key was pressed during POST; the ROM Utilities will be executed.

8.2.1 Boot Menu

During POST display, the ESC key can be pressed to invoke the multi-boot menu. The menu will appear near the end of POST, before the system summary screen is displayed, and after the option ROMs have signed on. The multi-boot menu allows interactive selection of the boot device. The list is typically in the following categorical order:



The up and down arrows on the keyboard can be used to highlight the device to boot from, and then press <Enter> to boot from it. Removable devices are the floppy drive, or other installed removable media, e.g., ZIP drives. Hard drives are any fixed disk (IDE, SCSI) in the system. Other devices may appear in the list, such as Ethernet boot ROM agents from add-in cards. To change the boot order of

devices within a category (such as to boot from IDE hard drive instead of SCSI), or to permanently change the boot order, you will have to enter SETUP and change the boot options.

If any errors are detected up to this point they will now be displayed on the screen along with the following prompt to direct further actions. Pressing F1 will ignore the errors and continue with the boot process. The F2 key can be pressed to enter the ROM UTILITIES and possibly resolve any configuration error that may have been made.

Press F2 to Run SETUP

Press F1 to load default values and continue

If the F2 key was not pressed, and no errors were detected, the system summary screen will be displayed. After 10 seconds or upon a key press the BIOS will attempt to boot the installed operating system.

The System BIOS is compatible with the Plug and Play Specification Version 1.0A. The two areas that are addressed by the System BIOS are Resource Management and Runtime Services.

Resource Management provides the ability to manage the fundamental system resources, which include DMA, Interrupt Request Lines (IRQs), I/O and Memory addresses. These resources, termed system resources, are in high demand and commonly are over allocated or allocated in a conflicting manner in ISA systems, leading to system configuration failures.

The resource manager takes on the responsibility for configuring Plug and Play cards, as well as system board devices during the power up phase. After the Power-On Self Test (POST) process is complete, control of the Plug and Play device configuration passes from the system BIOS to the system software. The BIOS does, however, provide configuration services for system board devices even after the POST process is complete. These services are known as Runtime Services.

Runtime Services provide a mechanism whereby a Plug and Play operating system, such as Windows 2000, may perform resource allocation dynamically at runtime. The operating system may directly manipulate the configuration of devices that have traditionally been considered static.

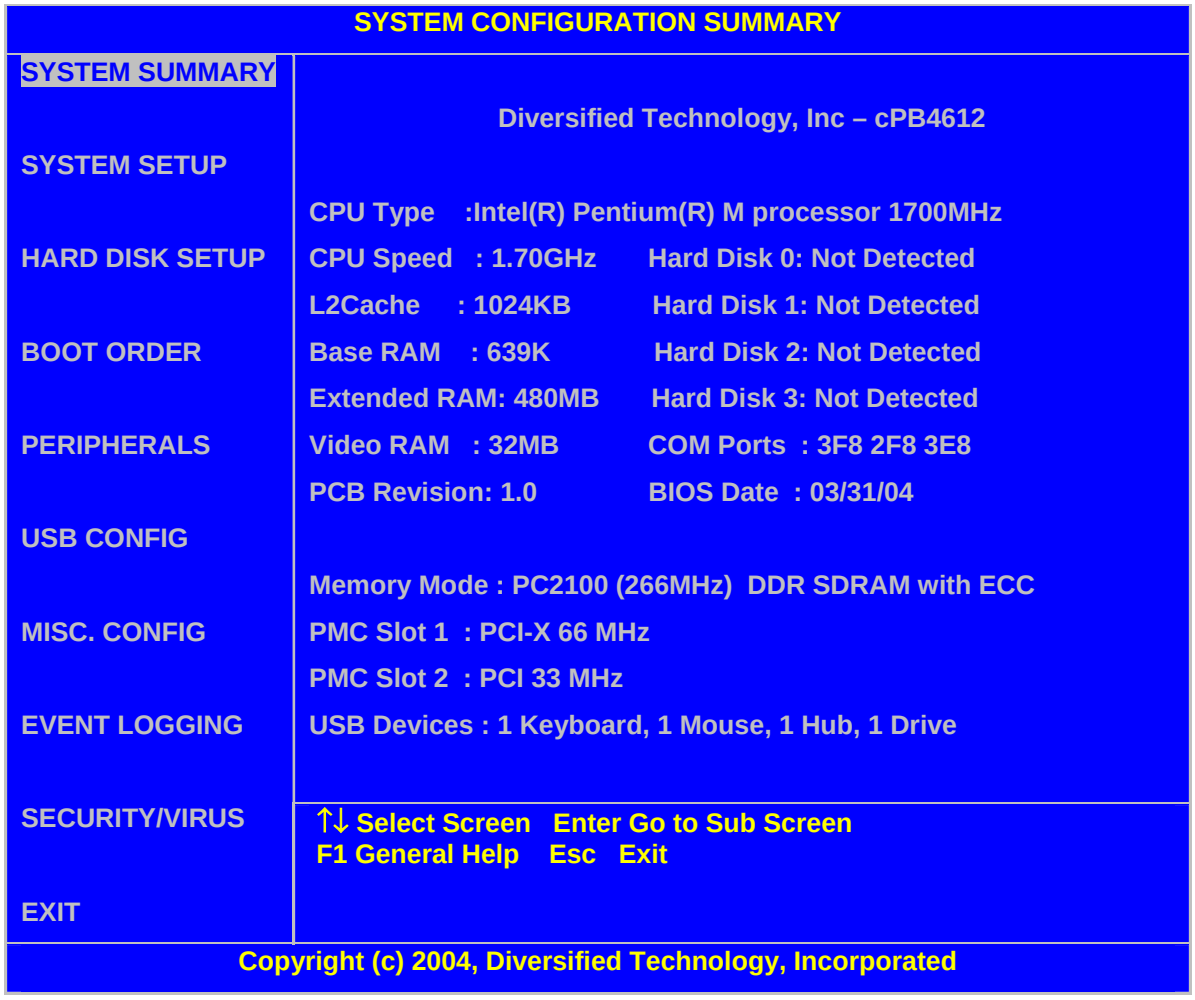
8.2.2 ROM Utilities

The ROM Utilities consist of various easy-to-use utilities required in the configuration of the board. The function of each utility is briefly described below. Battery backed CMOS RAM is used to store the configuration/setup parameters selected in the ROM Utilities. On power-up the CMOS RAM parameters are used to configure the system. If the CMOS RAM is corrupt, default parameters stored in ROM are used to configure the system. If no errors occurred during the POST, the System Configuration Summary Screen will be displayed as shown on the next page. Else, ROM Utility configuration errors detected during the POST will be displayed and the default values loaded. As each utility is selected using the arrow keys, the contents of the utility will be displayed. This allows the user to view the current settings of each utility without having to actually execute the utility. To execute a specific utility, either press the function key associated with the utility or move the highlighted bar onto the utility and press <ENTER>.

ROM Utilities	
SYSTEM SUMMARY	Displays various information about the system installed
SYSTEM SETUP	Used to configure the time/date, floppy drive types, and other BIOS options
HARD DISK SETUP	Used to configure the hard drive types
BOOT ORDER	Used to specify boot device ordering
PERIPHERALS	Used to enable/disable onboard I/O devices
USB CONFIG	Used to configure USB Legacy Support
MISC CONFIG	Used to configure PCI, PnP, and ACPI options
EVENT LOGGING	Used to view and control the system event log
SECURITY/VIRUS	Used to set system passwords and anti-virus options
EXIT	Used to exit ROM utilities

8.2.3 System Summary

The System Configuration Summary utility provides valuable information about the system. The information supplied can also be useful in determining items that are present in the systems and how they are configured. The System Configuration Summary screen is shown below, followed by a brief description of information supplied.



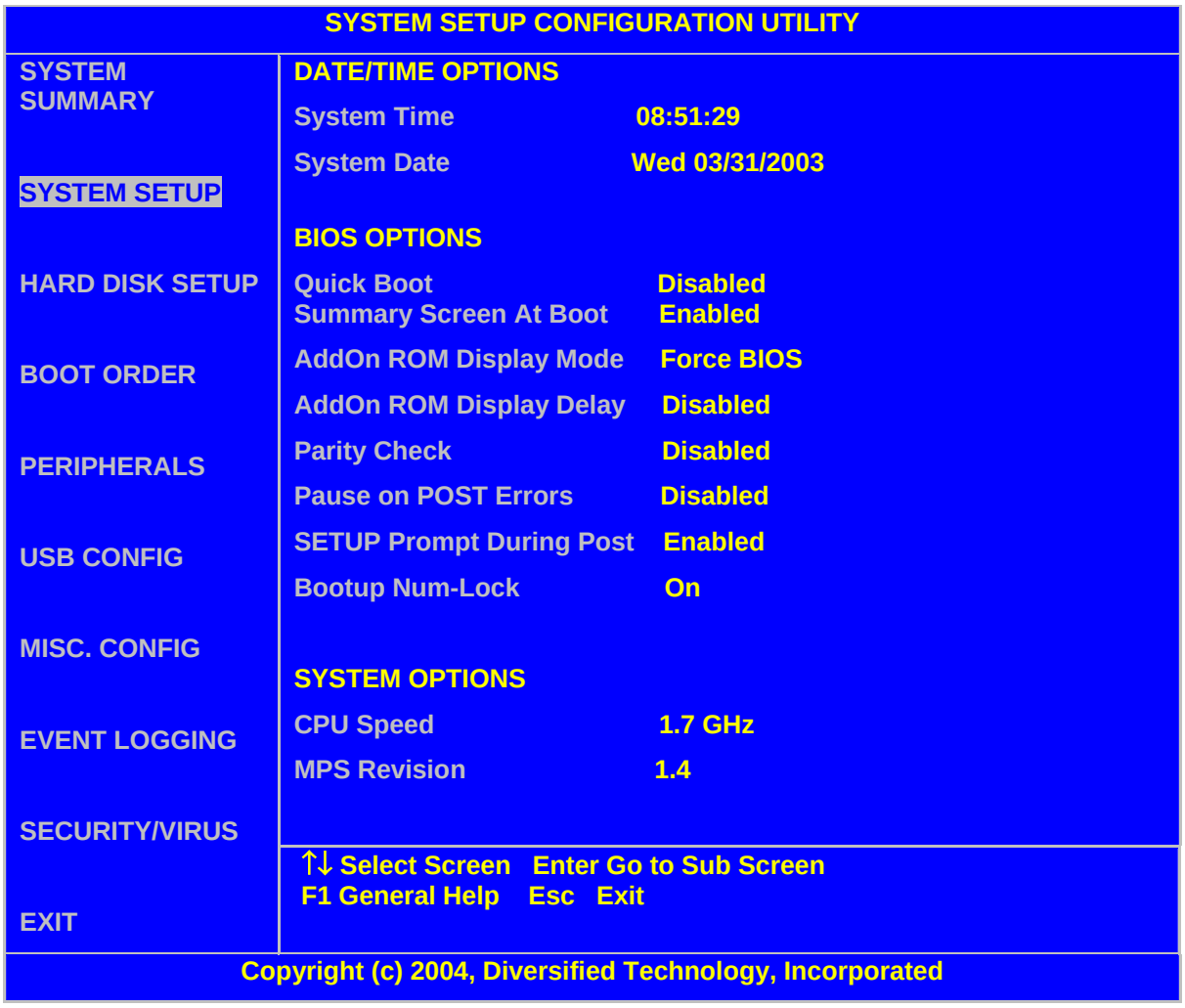
System Summary Descriptions

CPU Type:	Displays the processor brand string from the processor installed.
CPU:	Displays the current speed of processor installed.
L2 Cache:	Displays the amount of L2 cache detected.
Base RAM:	Displays the amount of installed system RAM up to 640KB.
Extended RAM:	Displays the amount of installed extended RAM beyond 1024 KB.
VGA RAM:	Displays the amount of VGA RAM allocated from system RAM for onboard VGA.

Build Date:	Displays the date on which the BIOS was generated.
PCB Revision:	Displays the PCB board revision level.
Hard Disk 0 - 3:	Displays the drive type selected for the IDE drive.
COM Ports:	Displays the I/O addresses of all installed serial ports.
Memory Mode:	Displays the type and speed of the memory.
PMC Slots:	Displays the PCI type and speed of PMC slots.
USB Devices:	Displays the types of all connected USB devices.

8.2.4 System Setup

The System Setup Configuration Utility is used to configure the system time/date, and BIOS and system options.

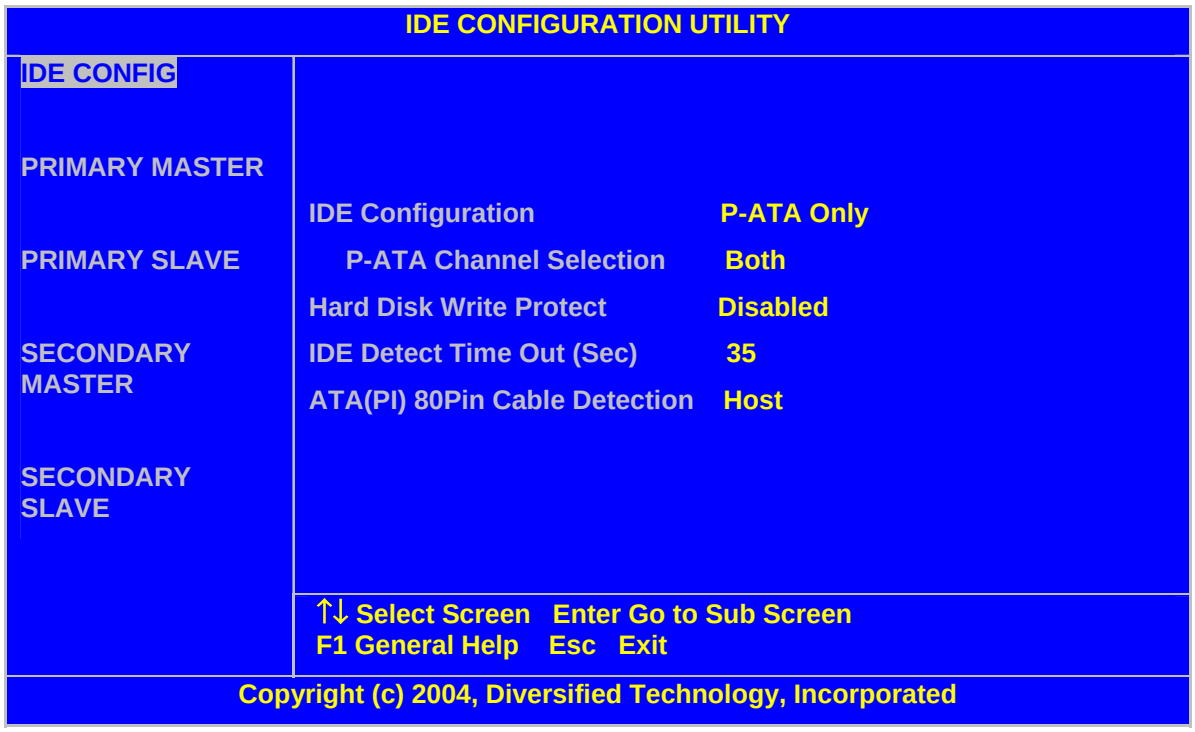


System Setup Descriptions

System Time:	A new time is set by typing in the HOUR, MINUTE, and SECONDS each followed by pressing < ENTER >. The time is displayed in 24-hour format; therefore, AM hours range from 0 through 11 and the PM hours range from 12 through 23. Invalid times cannot be entered.
System Date:	A new date is set by tying in the MONTH, DAY, and YEAR each followed by pressing <ENTER >. If one of the parameters is out of range, the new date will not be entered.
Quick Boot:	Allows the BIOS to skip certain tests while booting. This decreases the amount of time needed to boot the system.
Summary Screen At Boot:	When this option is enabled, the system summary information will be displayed before the system boots.
AddOn ROM Display Mode:	Enabling this item causes Option ROM information to be displayed at signon.
AddOn ROM Display Delay:	When this item is enabled, the BIOS will insert a brief pause after each option ROM signs on. This is useful to allow viewing any errors or messages that may otherwise be missed.
Parity Check:	This option determines whether the system will check for Parity/Memory errors.
Pause On Post Errors:	This option determines whether the POST will pause and wait for user input when an error occurs.
Setup Prompt During Post:	When this option is enabled, the prompt that displays the key needed to enter SETUP will be displayed during the POST.
Bootup Num-Lock:	Specifies the state of the Num-Lock key to be set when the system boots
CPU Speed:	Specifies the desired speed setting of speed step processor.
MPS Revision:	This option configures the MP Specification revision level. Some operating systems require 1.1 for compatibility.

8.2.5 IDE Config

The IDE Configuration Utility is used to configure the hard drive controller and interface properties for the system. The following page describes the configuration options.



IDE Config Descriptions

Onboard PCI IDE Controller:	This item selects the configuration for the onboard parallel and serial IDE controllers.
P-ATA Channel Selection:	Enables the P-ATA Channel. This item can be set to enable the primary channel, the secondary channel, or both channels.
Hard Disk Write Protect:	When this item is enabled, the BIOS protects the IDE drives from write accesses. This is only effective for operating systems that access the hard drives using BIOS interfaces.
IDE Detect Time Out:	This item specifies the maximum amount of time that the BIOS will attempt to search for IDE devices.
ATA(PI) 80Pin Cable Detection:	Selects the mechanism for the detection of 80Pin ATA(PI) Cable.

8.2.6 Hard Disk Setup

The Hard Drive Configuration Utility is used to configure the hard drives installed in the system. The following page describes the configuration options.

PRIMARY MASTER CONFIGURATION SUMMARY		
IDE CONFIG		
PRIMARY MASTER	Device : Hard Disk	
	Vendor : SMART ATA FLASH DISK	
PRIMARY SLAVE	Size : 513MB	
	LBA Mode : Supported	
SECONDARY MASTER	Block Mode: Not Supported	
	PIO Mode : 4	
	Async DMA : Not Supported	
SECONDARY SLAVE	Ultra DMA : Not Supported	
	S.M.A.R.T.: Not Supported	
	Type	Auto
	LBA/LARGE MODE	Auto
	Block (Multi-Sector Transfer) Mode	Auto
	PIO MODE	Auto
	DMA MODE	Auto
	S.M.A.R.T.	Auto
	32Bit Data Transfer	Disabled
	ARMD Emulation Type	Auto
	↑↓ Select Screen Enter Go to Sub Screen F1 General Help Esc Exit	
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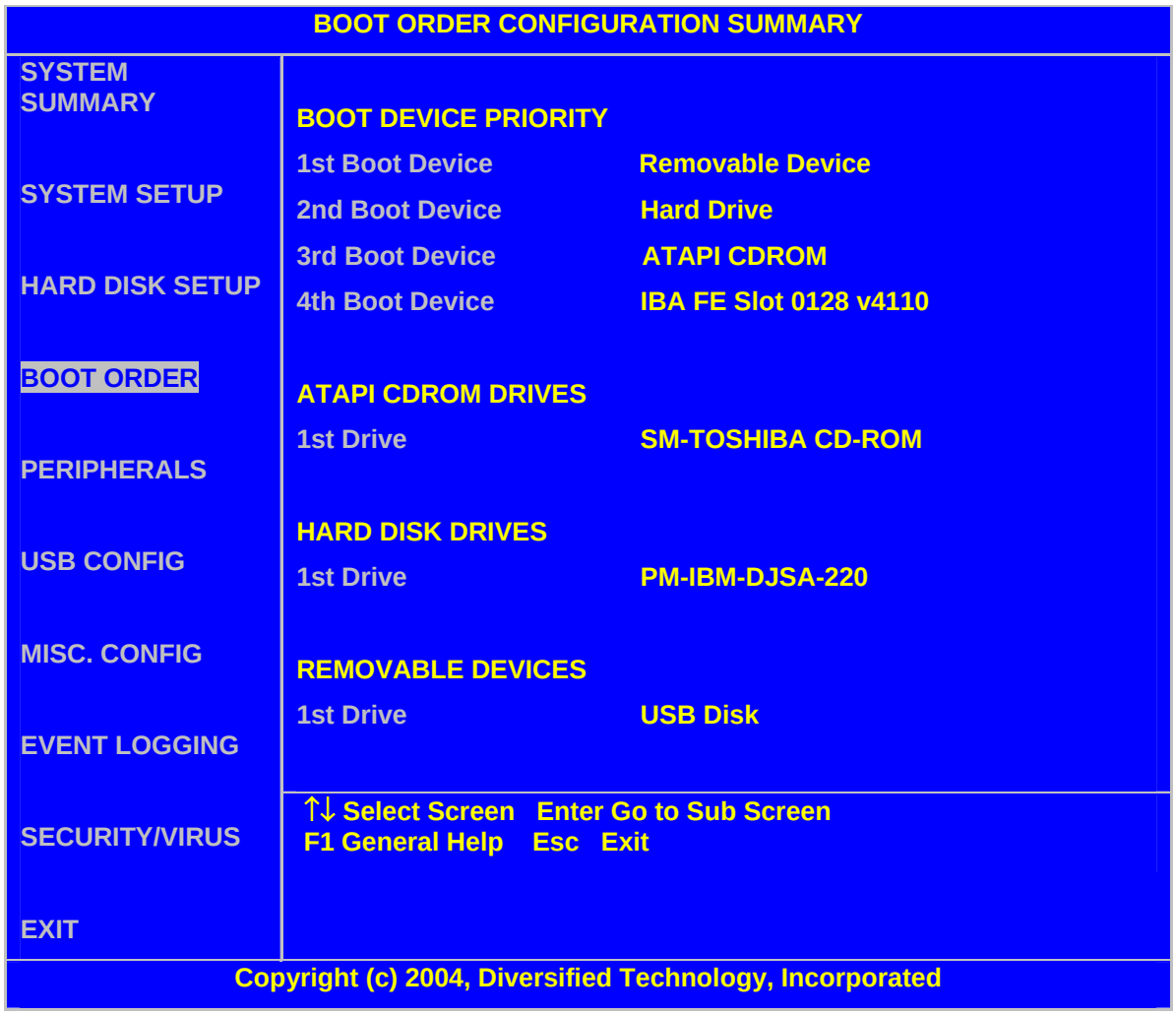
Hard Drive Setup Descriptions

The configuration options described below work identically for HARD DRIVES 0 - 3.

Device:	Displays the type of IDE device currently installed. Type choices include Not Installed, Hard Disk, ATAPI CDROM, and ARMD.
Vendor:	Displays the manufacturer device identification information.
Size:	Displays the storage capacity of the device.
LBA Mode:	Displays support for Logical Block Accessing. LBA uses 28-bit addressing of the hard disk instead of CHS (Cylinder/Head/Sector) addressing for supporting drives up to 137GB.
Block Mode:	Displays the maximum Block Mode transfer for the device.
PIO Mode:	Displays the maximum PIO supported by the device.
Async DMA:	Displays the highest support Asynchronous DMA Mode.
Ultra DMA:	Displays the highest support Synchronous DMA Mode.
S.M.A.R.T.:	Displays device support for Self-Monitoring Analysis and Reporting Technology. This protocol allows detection of drive errors.
Type:	Selects the type of IDE device. Type choices include Not Installed, Auto, CDROM, and ARMD. If AUTO type is selected, the hard drive parameters are read during boot-up, and are configured automatically. The hard drive information, such as manufacturer and model number, is displayed during POST. The CDROM type will enable bootable CD-ROM support for an IDE CDROM drive attached as a master or slave. An IDE CD-ROM can be made the boot device through the BOOT OPTIONS screen. The ARMD type is selected when an ATAPI Removable Media Device is present. This includes drives for high capacity floppies that can be formatted as floppies or hard disks, e.g., LS120, IOMega Zip, Fujitsu MO, and certain FLASH devices.
32BIT Data Transfer:	Controls support for 32Bit IDE transfers.
ARMD Emulation Type:	Selects the ARMD device emulation type by BIOS.

8.2.7 Boot Order

The Boot Order Configuration Utility is used to determine the order in which the BIOS will attempt to boot from devices. The BIOS attempts to boot from the devices in descending order beginning from the top of the list. If the device is not bootable, then the next item down in the list is tried. Removable Devices and Hard Disks have further ordering within their category. The following page describes the configuration options. The ESC key can be pressed during POST to display a boot device menu. This will over-ride the boot order chosen in the CMOS Setup Utility and boot from the device selected.

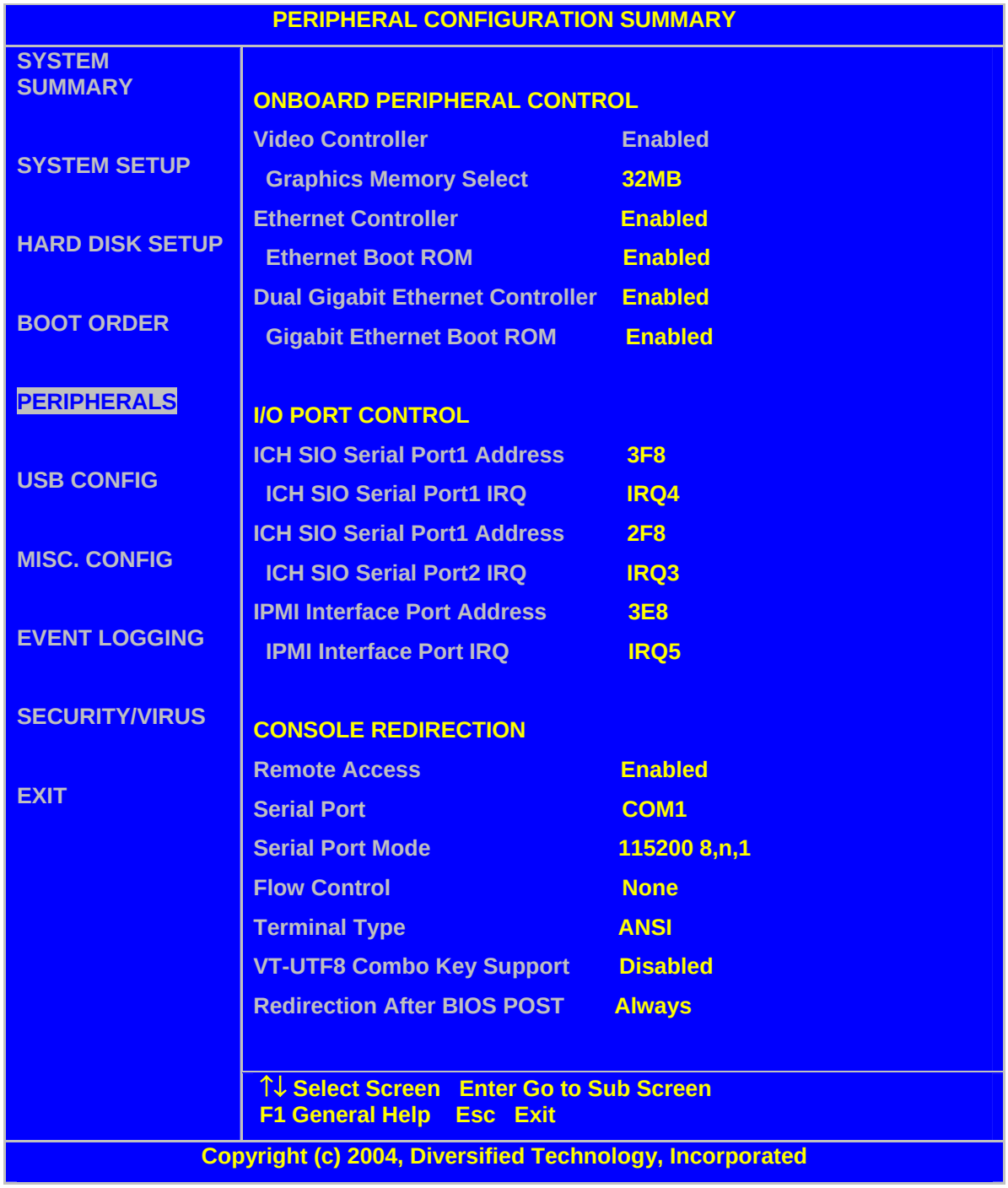


Boot Order Descriptions

Boot Device Priority:	Selects the boot order for installed bootable devices. The BIOS attempts to boot in descending order beginning from the top of the list.
ATAPI CDROM Drives:	Boot from an IDE CDROM.
Hard Disk Devices:	Boot from hard disk drive. The desired hard drive must be selected through Hard Disk Drives.
Removable Devices:	Boot from legacy floppy diskette, removable LS-120, USB, or ZIP drives. The desired removable device must be selected.

8.2.8 Peripherals

The Peripheral Configuration Utility allows onboard devices to be enabled, disabled, or configured. The onboard programmable I/O adapter includes a floppy disk interface, two serial ports, and a parallel printer port.



Onboard Peripheral Control Descriptions

Video Controller:	This item displays the enable/disable status of the onboard video controller.
Graphics Memory Select:	Selects the amount of system memory used by the internal graphics device. The choices are 1MB, 4MB, 8MB, 16MB, or 32MB.
Ethernet Controller:	This item controls the enable/disable of the 10/100 Ethernet controller. The default is enabled.
Ethernet Boot ROM:	Controls the embedded Ethernet boot ROM allowing for remote network booting.
Dual Gigabit Ethernet Controller:	This item controls the enable/disable of the dual 10/100/1000 Ethernet controller. The default is enabled.
Gigabit Ethernet Boot ROM:	Controls the embedded gigabit Ethernet boot ROM allowing for remote network booting.

Console Redirection Descriptions (Disabled by default)

Remote Access:	This item allows serial console redirection to be enabled. This allows all video output to be redirected through the serial port during the POST and DOS. In addition, input through the serial port will be used through the POST and DOS.
Serial Port:	Specifies the serial port to be used for console redirection.
Serial Port Mode:	Selects the baud rate for console redirection. The possible baud rates are: 9600, 19200, 38400, and 115200.
Flow Control:	This item allows hardware flow control to be used.
Terminal Type:	Selects between ANSI and VT100 terminal types.
VT-UTF8 Combo Key Support:	Controls VT-UTF8 combination key support for ANSI and VT100 terminals.
Redirection After BIOS Post:	Control if console redirection is to be used after POST.

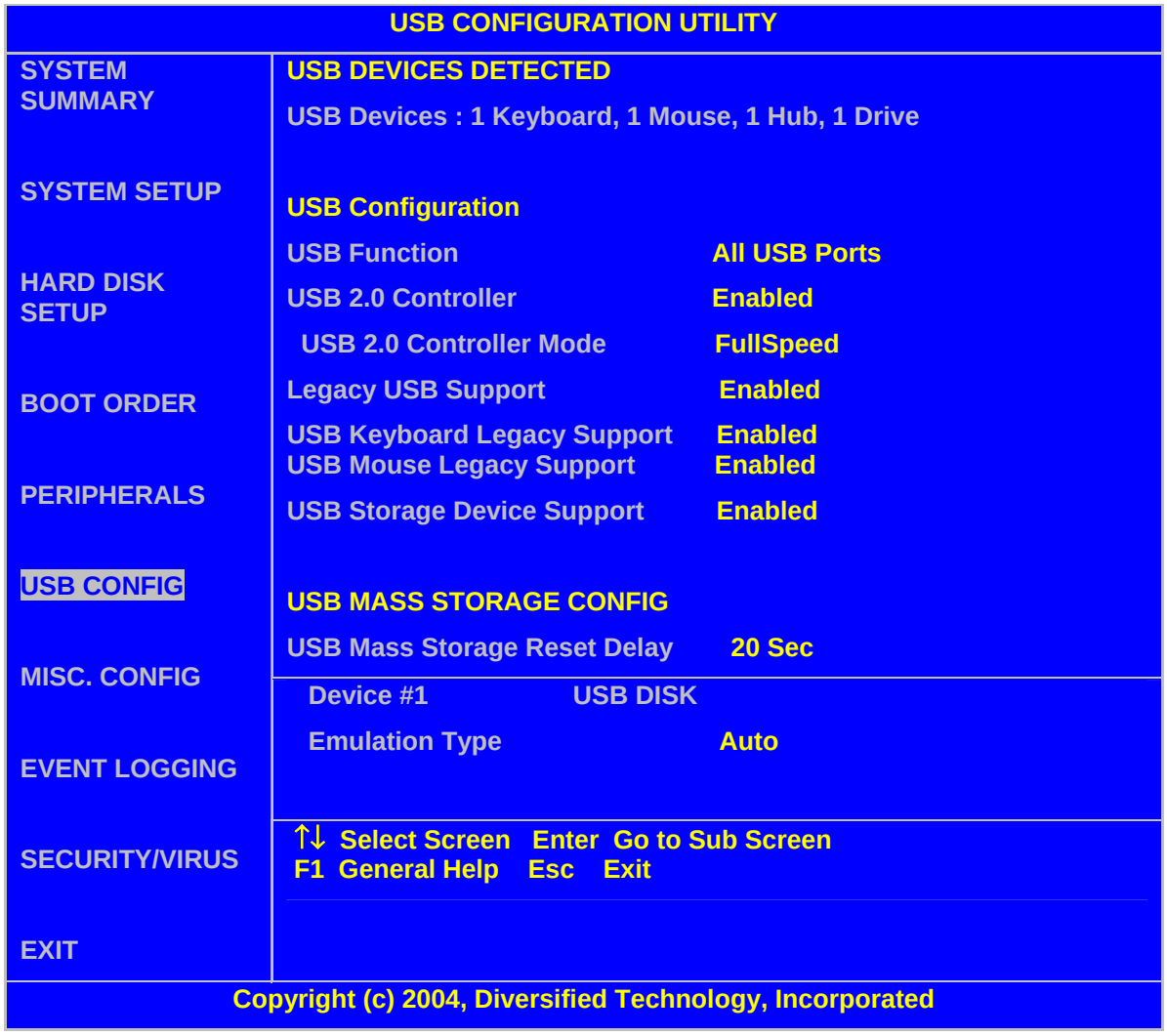
I/O Port Control Descriptions

Serial Port Address:	The three serial ports can be configured to one of four possible settings or disabled.
Serial Port IRQ:	The three serial ports can be configured to one of four possible settings.

I/O Address	Interrupt	COM Port
3F8h	IRQ4	COM1
2F8h	IRQ3	COM2
3E8h	IRQ4	COM3
2E8h	IRQ3	COM4

8.2.9 USB Configuration

The USB Configuration Utility allows control of the board's USB features.



USB Control Descriptions

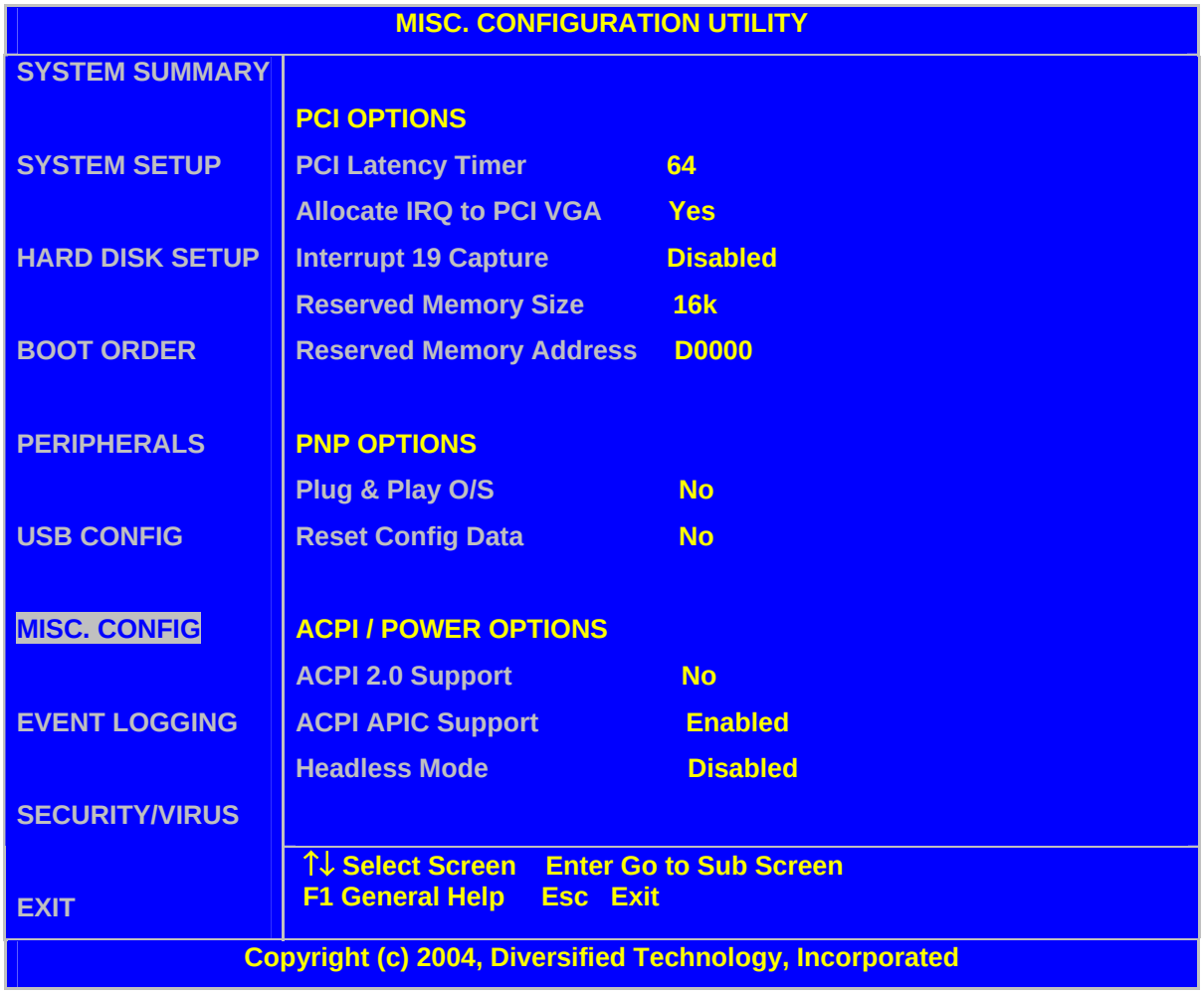
USB Function:	Enables USB host controllers. May be enabled for all ports, specific ports, or no ports.
USB 2.0 Controller:	Controls the USB 2.0 Controller. When enabled, the system will support high-speed (480 Mbps) USB devices, provided the OS loads a driver for the 2.0 Controller.
USB 2.0 Controller Mode:	Toggles the USB 2.0 Controller between HiSpeed (480Mbps) and FullSpeed (12Mpbs).
Legacy USB Support:	Controls whether USB devices are available after POST. When set to Disabled, the USB keyboard may be used only during POST. Storage devices are not applicable in POST Only mode since they do not need to be accessed. When set to Enabled, USB devices including drives, CD-ROMs, keyboards, and mice can be accessed after POST has completed.
USB Keyboard Legacy Support:	When enabled, this option allows any USB keyboard to be recognized as a standard input device by an Operating System without native USB support (such as DOS).
USB Mouse Legacy Support:	When enabled, this option allows any USB mouse to be recognized as a standard input device by an Operating System without native USB support (such as DOS).
USB Storage Device Support:	When enabled, this option allows any USB storage device to be recognized as a standard input device by an Operating System without native USB support (such as DOS).

USB Mass Storage Config Descriptions

USB Mass Storage Reset Delay:	Number of seconds to wait for a USB mass storage device after sending the start unit command.
Emulation Type:	Specifies the method used to determine the type of USB mass storage devices connected.

8.2.10 MISC Config

The PCI and PNP Configuration Utility allows configuration of the PCI bus, PNP options, as well as ACPI related items.



PCI Options Descriptions

PCI Latency Timer:	This option is used to set the desired PCI latency for all devices on the PCI bus.
Allocate IRQ to PCI VGA:	This item allows the system to restrict PCI video from being assigned an interrupt.
Interrupt 19 Capture:	This item allows option ROMs to capture interrupt 19 for use in booting.
Reserved Memory Size:	This item specifies the amount of memory reserved for legacy ISA adapter cards and can be toggled between Disabled (none), 16k, 32k, and 64k.

Reserved Memory Address:	This item specifies the location of the Reserved Memory if not disabled.

PNP Options Descriptions

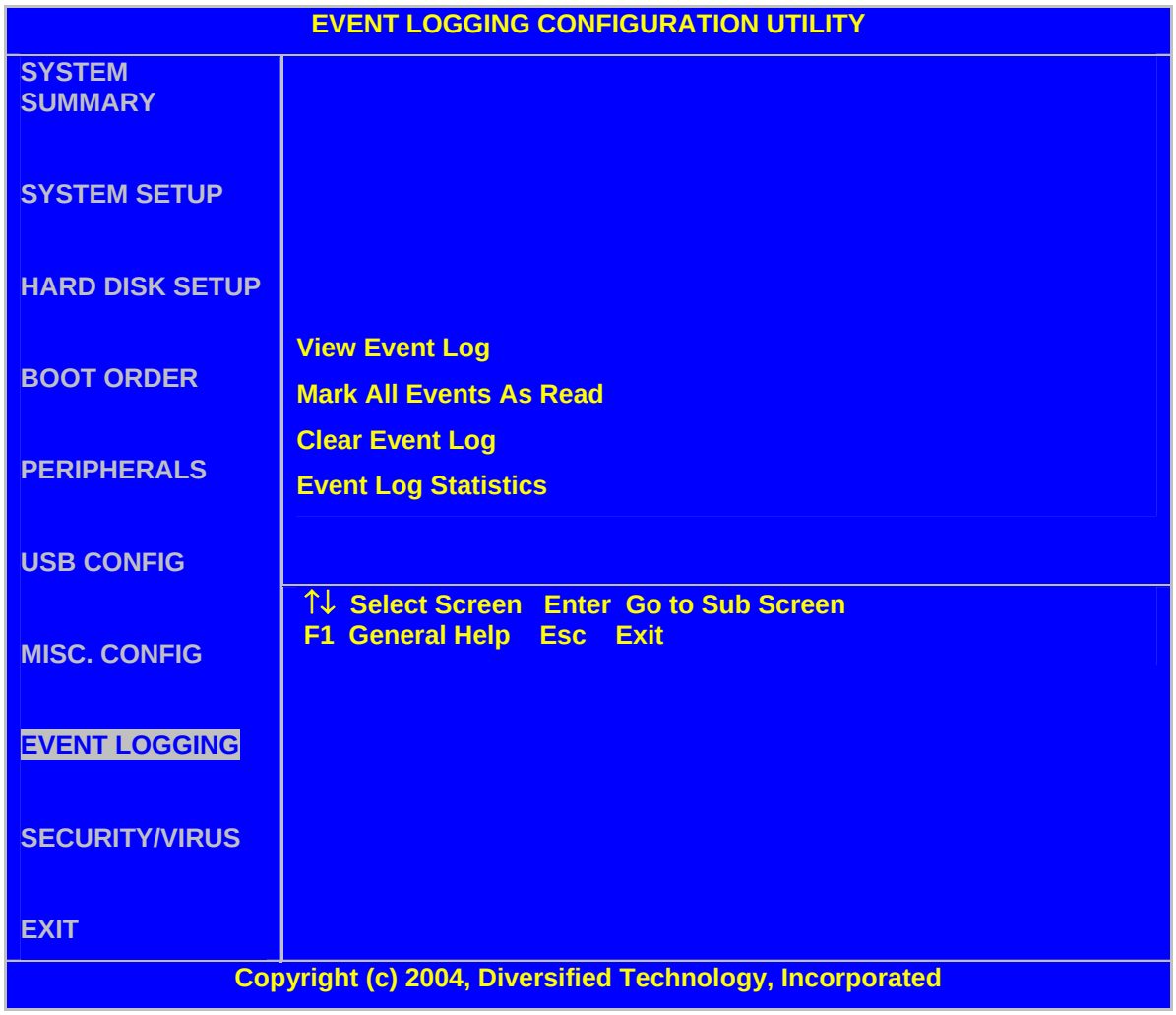
Plug & Play O/S:	If disabled (default), the BIOS will set up any plug & play devices. If enabled, the operating system is assumed to configure plug & play devices.
Reset Configuration Data:	If set to “Yes”, the plug & play configuration is reset after leaving SETUP. This option is automatically reset to “No”.

ACPI / Power Settings

ACPI 2.0 Support:	This item Enables or Disables ACPI 2.0 Features, which primarily involve advanced power management capabilities.
ACPI APIC Support:	This item Enables or Disables inclusion of the ACPI APIC table.
Headless Mode:	This item allows the system to operate in Headless Mode through ACPI.

8.2.11 Event Logging

The Event Logging Configuration Utility is used to configure and view system events that have been logged.

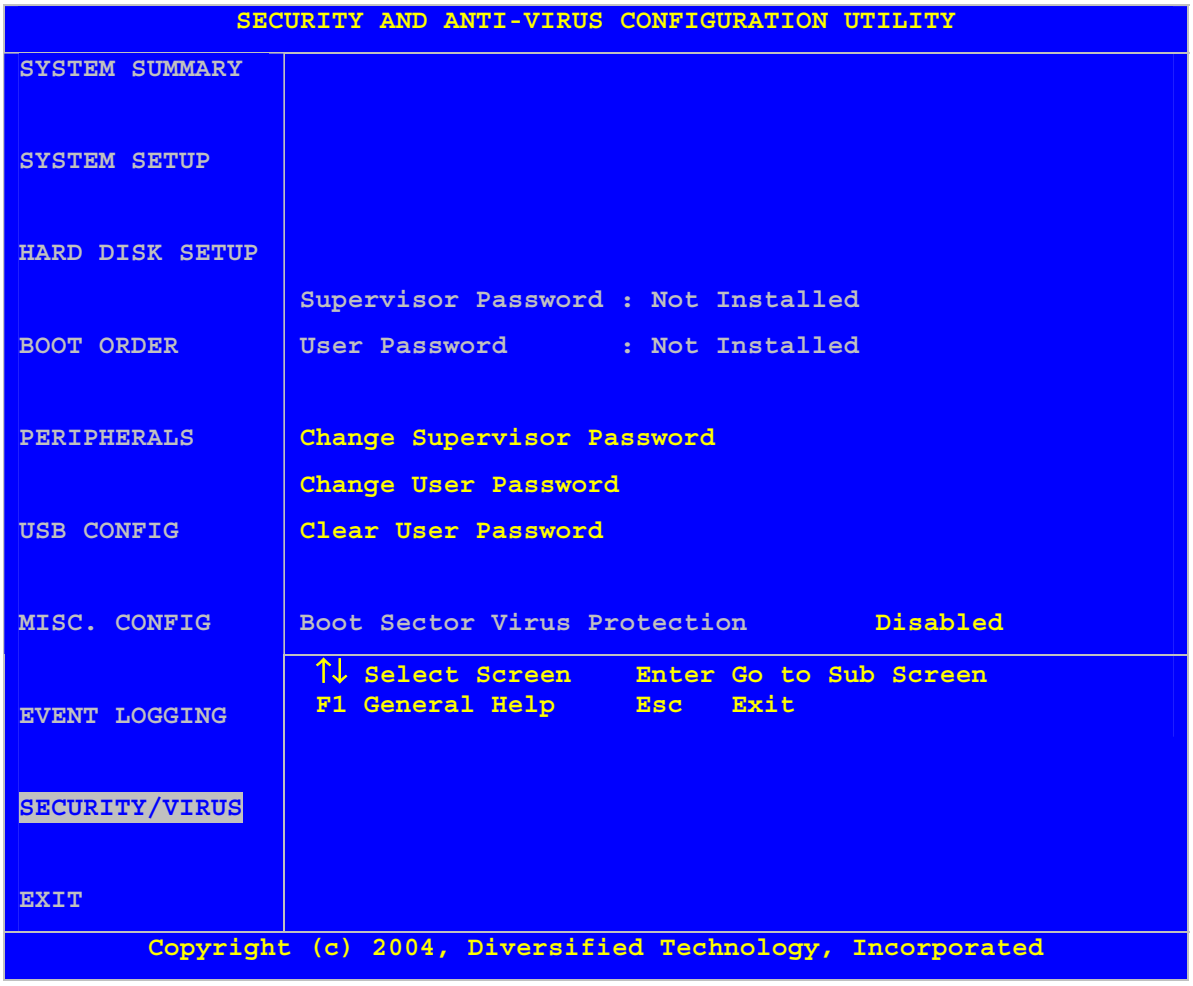


Event Logging Descriptions

View Event Log:	This item is used to open a window containing a list of the currently logged system events.
Mark All Events As Read:	This item is used the mark all system events in the log as read.
Clear Event Log:	This item is used to erase all events from the system log.
Event Log Statistics:	This item is used to view statistics about the system event log.

8.2.12 Security/Virus

The Security and Anti-Virus Configuration Utility is used to set system passwords and control system anti-virus items.

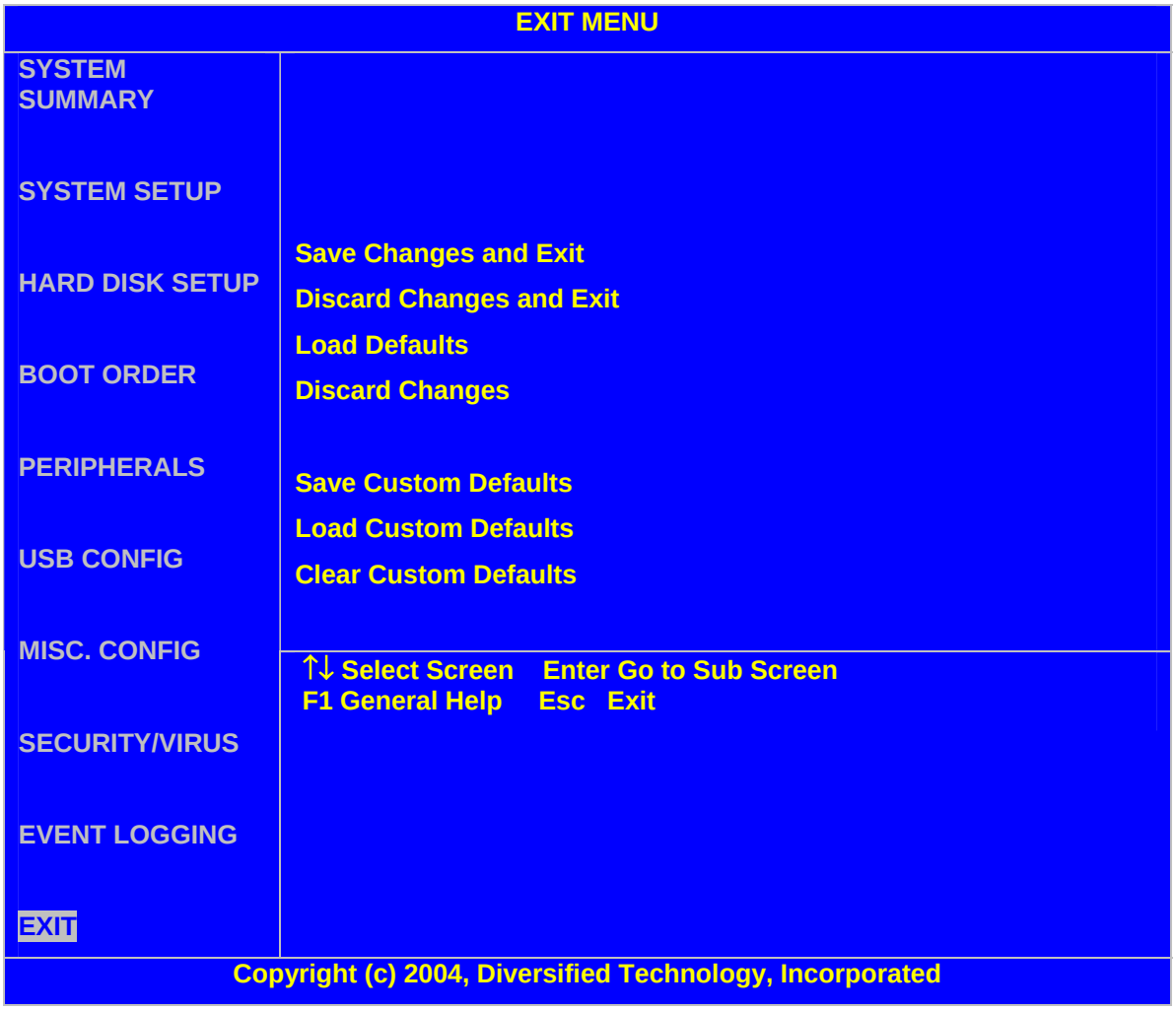


Security/Virus Descriptions

Supervisor Password:	This item indicates whether a supervisor password has been set.
User Password:	This item indicates whether a user password has been set.
Change Supervisor Password:	This item allows setting the supervisor password.
Change User Password:	This item allows setting the user password.
Clear User Password:	This item is used to clear the user password.
Boot Sector Virus Protection:	When this item is enabled, a warning message is displayed before any program tries to access the boot sector.

8.2.13 Exit

The Exit Menu provides a way to exit setup and save or discard changes. It also provides a way to load the default settings stored in the BIOS.



Exit Description

Save Changes and Exit:	Exits SETUP and saves all changes to CMOS.
Discard Changes and Exit:	Exits SETUP and discards any changes.
Load Defaults:	Loads the SETUP factory default values.
Discard Changes:	Discard any changes made during SETUP.
Save Custom Defaults:	Save current CMOS settings into non-volatile storage.
Load Custom Defaults:	Loads the SETUP Custom Defaults. If custom defaults have been saved, they will automatically be loaded if CMOS becomes corrupted instead of the manufacturing defaults.
Clear Custom Defaults:	Erases the Custom Defaults from NVRAM.

8.3 Plug and Play (PnP)

The system BIOS supports the following industry standards for making the system “Plug and Play ready” such as ACPI, PCI local bus specification rev 2.1 and SMBIOS 1.

8.3.1 Resource Allocation

The system BIOS identifies, allocates, and initializes resources in a manner consistent with industry standards. The BIOS scans, in order, for the following:

ISA devices: **Add-in ISA devices are not supported on this platform.** However, some standard PC peripherals may require ISA-style resources – resources for these devices will be reserved as needed.

Add-in video graphics adapter (VGA) devices: If found, the BIOS initializes and allocates resources to these devices.

PCI Devices: The BIOS allocates resources according to the parameters set up by the SSU and as required by the *PCI Local Bus Specification*, Revision 2.1.

The system BIOS Power-on Self Test (POST) guarantees that there are no resource conflicts prior to booting the system. Please note that PCI device drivers are required to support the sharing of IRQs. Sharing IRQs should not be considered a resource conflict. Note that only four legacy IRQs are available for use by PCI devices; as a result, most of the PCI devices share legacy IRQ’s. In SMP mode, the I/O APICs are used instead of the legacy “8259-style” interrupt controller. There is very little interrupt sharing in SMP mode.

8.3.2 PnP ISA Auto-configuration

The system BIOS:

A Supports relevant portions of the *Plug and Play ISA Specification*, Revision 1.0a and the *Plug and Play BIOS Specification*, Revision 1.0A.

B Assigns I/O, memory, direct memory access (DMA) channels, and IRQs from the system resource pool to the embedded PnP Super I/O device.

C Does **not** support add-in PnP ISA devices.

8.3.3 PCI Auto-configuration

The system BIOS supports the INT 1Ah, AH = B1h functions, in conformance with the *PCI Local Bus Specification*, Revision 2.1. The system BIOS also supports the 16 and 32-bit protected mode interfaces as required by the *PCI BIOS Specification*, *Revision 2.1*.

Beginning at the lowest device, the BIOS uses a “depth-first” scan algorithm to enumerate the PCI buses. Each time a bridge device is located, the bus number is incremented and scanning continues on the secondary side of the bridge before all devices are scanned on the current bus. The BIOS then scans for PCI devices using a “breadth-first” search – all devices on a given bus are scanned from lowest to highest before the next bus number is scanned.

System BIOS POST maps each device into memory and/or I/O space, and assigns IRQ channels as required. The BIOS programs the PCI-ISA interrupt routing logic in the chipset hardware to steer PCI interrupts to compatible ISA IRQs.

The BIOS dispatches any option ROM code for PCI devices to the DOS compatibility hole (C0000h to DFFFFh) and transfers control to the entry point. The DOS compatibility hole is a limited resource; therefore, system configurations with a large number of PCI devices may result in a shortage of this resource. If the BIOS runs out of option ROM space, some PCI option ROMs are not executed and a POST error is generated. Scanning PCI option ROMs may be controlled on a slot by slot basis in the BIOS setup.

Drivers and/or the OS can detect the installed devices and determine resource consumption using the defined PCI, legacy PnP BIOS, and/or ACPI BIOS interface functions.

8.3.4 Legacy ISA Configuration

Legacy ISA add-in devices are not supported by these platforms.

8.3.5 Automatic Detection of Video Adapters

The BIOS detects video adapters in the following order:

Offboard PCI

Onboard PCI

The onboard (or offboard) video BIOS is shadowed, starting at address C0000h, and is initialized before memory tests begin in POST. Precedence is always given to offboard devices.

8.4 Console Redirection

Console redirection allows users to monitor the cPB-4612's boot process and to run the cPB-4612's Setup utility from a remote serial terminal. Connection is made either directly through a serial port or through a modem.

The console redirection feature is most useful in cases where it is necessary to communicate with a processor board, such as the cPB-4612, in an embedded application without video support.

The BIOS supports redirection of both video and keyboard via a serial link (COM 1 or COM 2). When console redirection is enabled in BIOS setup, local (host server) keyboard input and video output are passed both to the local keyboard and video connections, and to the remote console via the serial link. Keyboard inputs from both sources are considered valid and video is displayed to both outputs. Optionally, the system can be operated without a host keyboard or monitor attached to the system and run entirely via the remote console. Setup and any other text-based utilities can be accessed via console redirection.

8.5 System Management BIOS (SMBIOS)

The cPB-4612 follows the criteria outlined in the *System Management BIOS Reference Specification, Version 2.3*. Refer to this specification for details on SMBIOS.

8.6 POST CODE LEDS

Four surface-mounted LEDS are located on cPB-4612 that indicate the post/board status. The LEDS are arranged from the most significant bit (MSB) to the least significant bit (LSB), and a color scheme is used to identify the bit values. For instance, the LED will be lit RED when one of the upper four bits is high and will be lit GREEN when one of the lower bits is high. The upper and lower bits will be represented simultaneously by the LEDS. Thus, the LED will appear ORANGE if one of the upper and lower bits is both high in the same bit location. These eight bits represent a binary number, and if that binary number is converted into a hexadecimal number you'll have the failing code if the board fails to boot. An example illustrating this is provided below.

LED Color Description

R=RED G=GREEN O=ORANGE F=OFF

Bit in the *upper nibble* is high:

POST CODE 20 --- BIT values (MSB to LSB) 0010 0000

I I

Upper Nibble Lower Nibble

LEDS Status MSB to LSB

Visible colors: FFRF (Off Off Red Off)

Bit in the *lower nibble* is high:

POST CODE 02--- BIT values (MSB to LSB) 0000 0010

I I

Upper Nibble Lower Nibble

LEDS Status MSB to LSB

Visible colors: FFGF (Off Off Green Off)

Bits in the *same location* are both high:

POST CODE 33 --- BIT values (MSB to LSB) 0011 0011

I I

Upper Nibble Lower Nibble

LEDS Status MSB to LSB

Visible colors: FFOO (Off Off Orange Orange)

The following table is provided to show the most important POST CODES:

POST CODE	LED COLORS (MSB->LSB)	DESCRIPTION
E1	RRRG	MEMORY SIZE RAM
E9	ORRG	LOAD BB FROM FLOPPY
08	GFFF	CPU INIT
38	GFRR	USB INIT
0C	GGFF	KEYBOARD CONTLR TEST
2A	GFOF	PCI INIT
2A	GFOF	VIDEO
3A	GFOR	MEMORY SIZE RAM
28	GFRF	OPTION ROM SCAN
00	FFFF	INT19 (SWITCHES TO OS)

If the board fails to boot or hangs-up at any of these POST codes, please follow these steps.

Step1: Check all power connections and cables to verify they are fully inserted and there are not any loose connections.

Step2: Observe the indicating POST code and refer to the following section pertaining to the failure.

POST CODES	TROUBLE SHOOTING HINT
08	Check the CPU to see if it is fully seated in its socket.
E1, 3A	Check the memory module to see if it is fully seated and that it is not inserted at an angle. The board may stay at post code 60 for a long time depending on the memory size; attach a monitor and confirm the board continues to count memory.
2A, 78	Check all PCI cards to verify they are fully seated in the backplane. Remove and replace any newly added PCI cards.
OC	Check keyboard.
38	Check USB for USB keyboard or mouse.
E1	If BIOS has been recently flashed or changed out, check to see if it is fully seated in the BIOS socket or if a wrong size device has been used.
00	Board has attempted to load OS. Ensure OS is properly installed on boot media. If the OS is successfully loaded, this code may remain; however, differing Operating Systems may map the LED port for floppy access, and C0 will be overwritten with random codes. This occurrence is normal, and floppy functionality will not be affected.

Step3: If board problems persist, contact Diversified Technology's Service Department.

Appendix A

A Specifications

This appendix describes the electrical, environmental, and mechanical specifications of the cPB-4612. It includes connector descriptions and pin outs, as well as illustrations of the board dimensions and connector locations.

A.1 Electrical and Environmental

The topics listed below provide tables and illustrations showing the following electrical and environmental specifications:

- Absolute maximum ratings
- DC operating characteristics
- Battery backup characteristics

A.2 Absolute Maximum Ratings

The values below are stress ratings only. Do not operate the cPB-4612 at these maximums. See the "DC Operating Characteristics" section in this appendix for operating conditions.

Supply Voltage, Vcc:	6.5V
Supply Voltage, Vcc3:	4.5V
Supply Voltage, AUX +:	15V
Supply Voltage, AUX -:	-15V
Storage Temperature (no hard disk):	-40° to +85° Celsius
Storage Temperature (with hard disk):	-40° to +65° Celsius
Non-Condensing Relative Humidity:	<95% at 40° Celsius

A.2.1 DC Operating Characteristics

Supply Voltage, Vcc:	4.85 minimum to 5.25V maximum
Supply Voltage, Vcc3:	3.20 minimum to 3.47V maximum
Supply Voltage, AUX +:	10.8 minimum to 13.2V maximum
Supply Voltage, AUX -:	-13.2 minimum to -10.8V maximum

Supply Current, Icc:	4.5A average (typical with 1.2 GHz processor and 512 MB SDRAM. Peak (short duration) power supply current may be significantly higher (up to 50%) and will vary depending upon the application.
Supply Current, Icc3:	2.5A average (typical with 1.2 GHz processor and 512 MB SDRAM. Peak (short duration) power supply current may be significantly higher (up to 50%) and will vary depending upon the application.
Supply Current, AUX + (12V):	50mA maximum

A.2.2 Battery Backup Characteristics

Battery Voltage:	3V
Battery Capacity:	250mAh
Real-Time Clock Requirements:	8µA maximum (Vbat = 3V, Vcc=0V)
Real-Time Clock Data Retention:	31,250 hours / 3.7 years minimum (not powered); 5.2 years minimum (with Vcc power applied 8 hours per day)
Electrochemical Construction:	Long life lithium with solid-state polycarbon monofluoride cathode.

CAUTION: The cPB-4612 contains a lithium battery. This battery is not field-replaceable. There is a danger of explosion if the battery is incorrectly replaced or handled. Do not disassemble or recharge the battery. Do not dispose of the battery in fire. When the battery is replaced, the same type or an equivalent type recommended by the manufacturer must be used. Used batteries must be disposed of according to the manufacturer's instructions. Return the board to DTI for battery service.

A.2.3 Operating Temperature

The cPB-4612's heatsink allows a maximum ambient air temperature of 50°C with 200 LFM (linear feet per minute) of airflow. External airflow **must** be provided to the cPB-4612 at all times. Refer to the "Electrical and Environmental" topic in Chapter 2 for additional information. Also refer to the topic "Temperature Monitoring" in Appendix C, "Thermal Considerations", for details on monitoring the processor temperature.

A.3 Reliability

MTBF: 9.1 years (excluding on-board hard disk drive)

MTTR: 3 minutes (based on board replacement), plus system startup

A.4 Mechanical

This section includes the following mechanical specifications:

- Dimensions and weight
- Connector locations, descriptions, and pin outs

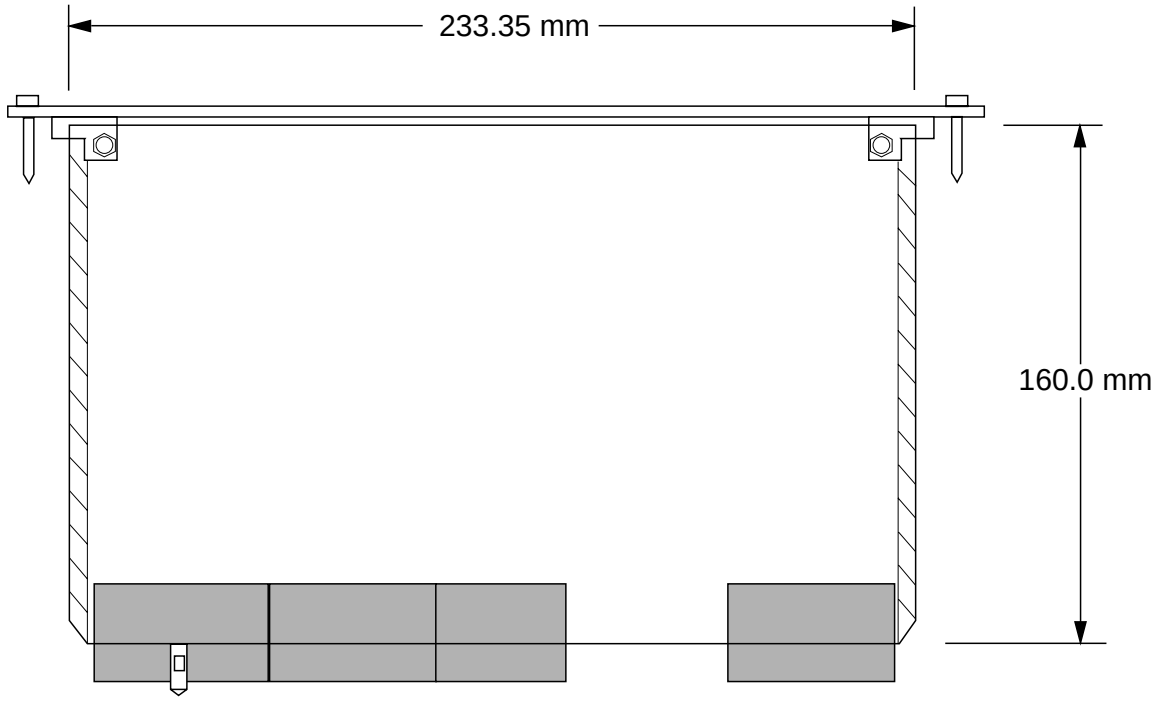
A.4.1 Board Dimensions and Weight

The cPB-4612 meets the *CompactPCI Specification, PICMG 2.0, Version 2.1*** for all mechanical parameters. In a CompactPCI enclosure with 0.8 inch spacing.

Mechanical dimensions are shown in the "PCB Dimensions" illustration and are outlined below.

PCB Dimensions:	233.35 mm x 160 mm x 1.6 mm
Board Dimensions:	6U x 4HP (one slot)
Weight:	509 grams (18 ounces) w/ processor, heatsink, 512MB memory

PCB Dimensions



Appendix B

B Connectors

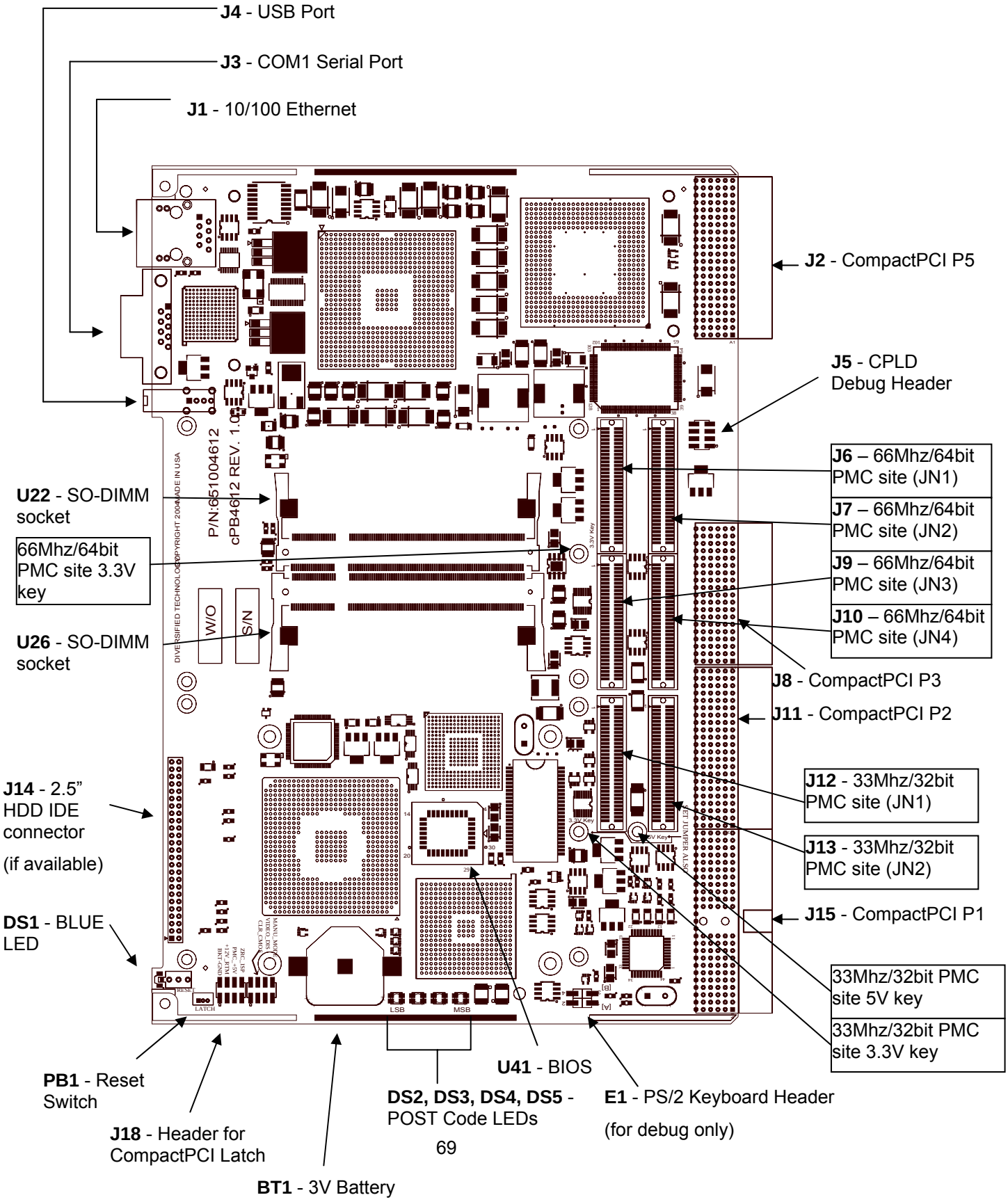
As shown in the "Connector Locations" figure, the cPB-4612 includes several connectors to interface to application-specific devices. A brief description of each connector is given in the "Connector Assignments" table below. A detailed description and pin out for each connector is given in the following topics.

Connector Assignments

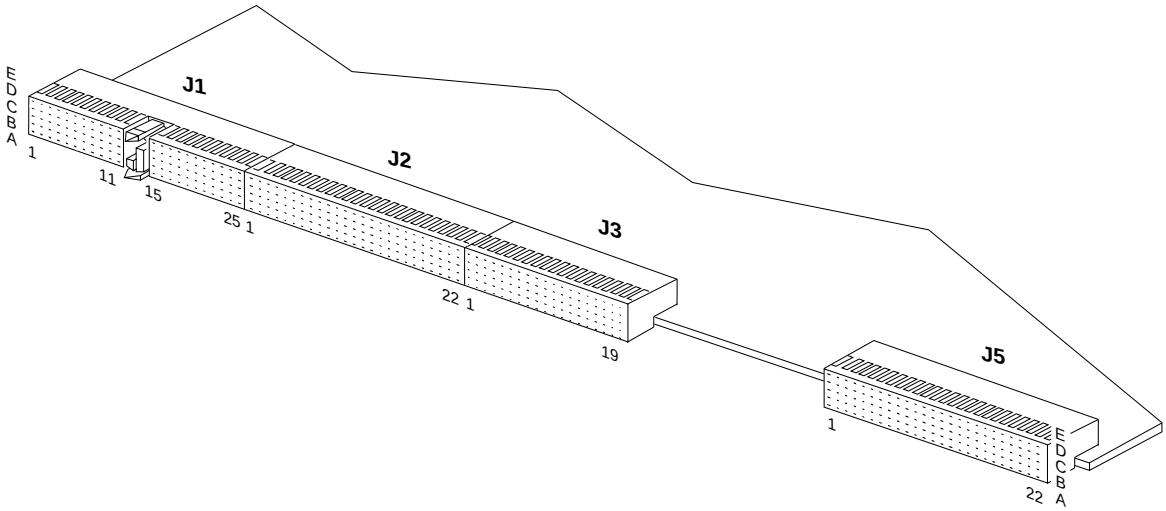
Connector	Function
J15	CompactPCI Bus Connector (110-pin, 2 mm x 2 mm, female)
J11	CompactPCI Bus Connector (110-pin, 2 mm x 2 mm, female)
J8	CompactPCI (Ethernet) Connector (95-pin, 2 mm x 2 mm, female)
J2	Rear-panel I/O Connector (110-pin 2 mm x 2 mm, female)
J1	10/100 Ethernet (8-pin)
J3	COM1 Serial Port (9-pin)
J4	Universal Serial Bus Connector (4-pin, USB, Port 0)
J6, J7, J9, J10	64bit/66Mhz PCI Mezzanine Connector(s) (64-pin, 1 mm)
J12, J13	32bit/33Mhz PCI Mezzanine Connector(s) (64-pin, 1 mm)
J14	IDE Connector (primary channel – local hard drive)
U22, U25	Right angle DIMM connector

B.1 Connector Locations

CPB-4612 Connectors Locations (Topside)



Backplane Connectors - Pin Locations



B.2 J15 (CompactPCI Bus Connector)

J15 is a 110-pin, 2 mm x 2 mm, female 32-bit CompactPCI connector (AMP 352068-1). Rows 12-14 are used for connector keying. See the "J1 CompactPCI Bus Connector Pin out" table below for pin definitions. Refer to the "Backplane Connectors – Pin Locations" illustration for pin placement.

J15 CompactPCI Bus Connector Pin out

J15 – CompactPCI P1									
A1	CPCI_VCC	B1	CPCI_-12V_CONN	C1	NC	D1	CPCI_+12V_CONN	E1	CPCI_VCC
A2	NC	B2	CPCI_VCC	C2	NC	D2	NC	E2	NC
A3	CPCI_PIRQA#	B3	CPCI_PIRQB#	C3	CPCI_PIRQC#	D3	CPCI_VCC_LONG1	E3	CPCI_PIRQD#
A4	IPMB_PWR	B4	CPCI_HEALTHY#	C4	VIO_LONG1	D4	CPCI_INTP	E4	CPCI_INTS
A5	NC	B5	NC	C5	CPCI_RST#	D5	GND	E5	CPCI_GNT(0)#
A6	CPCI_REQ(0)#	B6	PCI_PRESENT#	C6	CPCI_VCC3_LONG1	D6	CPCI_CLK(0)	E6	CPCI_AD[31]
A7	CPCI_AD[30]	B7	CPCI_AD[29]	C7	CPCI_AD[28]	D7	GND	E7	CPCI_AD[27]
A8	CPCI_AD[26]	B8	GND	C8	CPCI_VIO	D8	CPCI_AD[25]	E8	CPCI_AD[24]
A9	CPCI_CBE(3)#	B9	CPCI_IDSEL	C9	CPCI_AD[23]	D9	GND	E9	CPCI_AD[22]
A10	CPCI_AD[21]	B10	GND	C10	CPCI_VCC3	D10	CPCI_AD[20]	E10	CPCI_AD[19]
A11	CPCI_AD[18]	B11	CPCI_AD[17]	C11	CPCI_AD[16]	D11	GND	E11	CPCI_CBE(2)#
A12	NC (key)	B12	NC (key)	C12	NC (key)	D12	NC (key)	E12	NC (key)
A13	NC (key)	B13	NC (key)	C13	NC (key)	D13	NC (key)	E13	NC (key)
A14	NC (key)	B14	NC (key)	C14	NC (key)	D14	NC (key)	E14	NC (key)
A15	CPCI_VCC3	B15	CPCI_FRAME#	C15	CPCI_IRDY#	D15	CPCI_BDSEL#	E15	CPCI_TRDY#
A16	CPCI_DEVSEL#	B16	GND	C16	CPCI_VIO	D16	CPCI_STOP#	E16	CPCI_LOCK#
A17	CPCI_VCC3	B17	CPCI_IPMB_SCL	C17	CPCI_IPMB_SDA	D17	GND	E17	CPCI_PERR#
A18	CPCI_SERR#	B18	GND	C18	CPCI_VCC3	D18	CPCI_PAR	E18	CPCI_CBE(1)#
A19	CPCI_VCC3	B19	CPCI_AD[15]	C19	CPCI_AD[14]	D19	GND	E19	CPCI_AD[13]
A20	CPCI_AD[12]	B20	GND	C20	CPCI_VIO	D20	CPCI_AD[11]	E20	CPCI_AD[10]
A21	CPCI_VCC3	B21	CPCI_AD[9]	C21	CPCI_AD[8]	D21	M66EN	E21	CPCI_CBE(0)#
A22	CPCI_AD[7]	B22	GND	C22	CPCI_VCC3_LONG2	D22	CPCI_AD[6]	E22	CPCI_AD[5]
A23	CPCI_VCC3	B23	CPCI_AD[4]	C23	CPCI_AD[3]	D23	CPCI_VCC_LONG2	E23	CPCI_AD[2]
A24	CPCI_AD[1]	B24	CPCI_VCC	C24	VIO_LONG2	D24	CPCI_AD[0]	E24	CPCI_ACK64#
A25	CPCI_VCC	B25	CPCI_REQ64#	C25	ENUM#	D25	CPCI_VCC3	E25	CPCI_VCC

B.3 J11 (CompactPCI Bus Connector)

J11 is a 110-pin 2 mm x 2 mm female 64-bit CompactPCI connector (AMP 352152-1). See the "J11 CompactPCI Bus Connector Pin out" table for pin definitions and the "Backplane Connectors - Pin Locations" illustration for pin placement.

J11 CompactPCI Bus Connector Pin out

J11 – CompactPCI P2									
A1	CPCI_CLK(1)	B1	GND	C1	CPCI_REQ(1)#	D1	CPCI_GNT(1)#	E1	CPCI_REQ(2)#
A2	CPCI_CLK(2)	B2	CPCI_CLK(3)	C2	SYS_SLOT#	D2	CPCI_GNT(2)#	E2	CPCI_REQ(3)#
A3	CPCI_CLK(4)	B3	GND	C3	CPCI_GNT(3)#	D3	CPCI_REQ(4)#	E3	CPCI_GNT(4)#
A4	CPCI_VIO	B4	NC	C4	CPCI_CBE(7)#	D4	GND	E4	CPCI_CBE(6)#
A5	CPCI_CBE(5)#	B5	GND	C5	CPCI_VIO	D5	CPCI_CBE(4)#	E5	CPCI_PAR64
A6	CPCI_AD[63]	B6	CPCI_AD[62]	C6	CPCI_AD[61]	D6	GND	E6	CPCI_AD[60]
A7	CPCI_AD[59]	B7	GND	C7	CPCI_VIO	D7	CPCI_AD[58]	E7	CPCI_AD[57]
A8	CPCI_AD[56]	B8	CPCI_AD[55]	C8	CPCI_AD[54]	D8	GND	E8	CPCI_AD[53]
A9	CPCI_AD[52]	B9	GND	C9	CPCI_VIO	D9	CPCI_AD[51]	E9	CPCI_AD[50]
A10	CPCI_AD[49]	B10	CPCI_AD[48]	C10	CPCI_AD[47]	D10	GND	E10	CPCI_AD[46]
A11	CPCI_AD[45]	B11	GND	C11	CPCI_VIO	D11	CPCI_AD[44]	E11	CPCI_AD[43]
A12	CPCI_AD[42]	B12	CPCI_AD[41]	C12	CPCI_AD[40]	D12	GND	E12	CPCI_AD[39]
A13	CPCI_AD[38]	B13	GND	C13	CPCI_VIO	D13	CPCI_AD[37]	E13	CPCI_AD[36]
A14	CPCI_AD[35]	B14	CPCI_AD[34]	C14	CPCI_AD[33]	D14	GND	E14	CPCI_AD[32]
A15	NC	B15	GND	C15	CPCI_FAL#	D15	CPCI_REQ(5)#	E15	CPCI_GNT(5)#
A16	NC	B16	NC	C16	CPCI_DEG#	D16	GND	E16	NC
A17	NC	B17	GND	C17	CPCI_PRST#	D17	CPCI_REQ(6)#	E17	CPCI_GNT(6)#
A18	NC	B18	NC	C18	NC	D18	GND	E18	NC
A19	GND	B19	GND	C19	NC	D19	NC	E19	IPMB_ALERT#
A20	CPCI_CLK(5)	B20	GND	C20	NC	D20	GND	E20	NC
A21	CPCI_CLK(6)	B21	GND	C21	NC	D21	NC	E21	NC
A22	CPCI_GA(4)	B22	CPCI_GA(3)	C22	CPCI_GA(2)	D22	CPCI_GA(1)	E22	CPCI_GA(0)

B.4 J8 (CompactPCI Connector)

J8 is a 95-pin 2 mm x 2 mm female connector (AMP 352171-1). See the "J8 Connector Pin out" table below for pin definitions and the "Backplane Connectors - Pin Locations" illustration for pin placement.

J8 Connector Pin out

J8 – CompactPCI P3									
A1	PWR_VIO_PMC64_CPCI	B1	PIM[52]	C1	PIM[51]	D1	PIM[26]	E1	PIM[25]
A2	PIM[64]	B2	PIM[50]	C2	PIM[49]	D2	PIM[24]	E2	PIM[23]
A3	PIM[63]	B3	PIM[48]	C3	PIM[47]	D3	PIM[22]	E3	PIM[21]
A4	PIM[62]	B4	PIM[46]	C4	PIM[45]	D4	PIM[20]	E4	PIM[19]
A5	PIM[61]	B5	PIM[44]	C5	PIM[43]	D5	PIM[18]	E5	PIM[17]
A6	PIM[60]	B6	PIM[42]	C6	PIM[41]	D6	PIM[16]	E6	PIM[15]
A7	PIM[59]	B7	PIM[40]	C7	PIM[39]	D7	PIM[14]	E7	PIM[13]
A8	PIM[58]	B8	PIM[38]	C8	PIM[37]	D8	PIM[12]	E8	PIM[11]
A9	PIM[57]	B9	PIM[36]	C9	PIM[35]	D9	PIM[10]	E9	PIM[9]
A10	PIM[56]	B10	PIM[34]	C10	PIM[33]	D10	PIM[8]	E10	PIM[7]
A11	PIM[55]	B11	PIM[32]	C11	PIM[31]	D11	PIM[6]	E11	PIM[5]
A12	PIM[54]	B12	PIM[30]	C12	PIM[29]	D12	PIM[4]	E12	PIM[3]
A13	PIM[53]	B13	PIM[28]	C13	PIM[27]	D13	PIM[2]	E13	PIM[1]
A14	VCC3	B14	VCC3	C14	VCC3	D14	VCC	E14	VCC
A15	LPb_DB+	B15	LPb_DB-	C15	GND	D15	LPb_DD+	E15	LPb_DD-
A16	LPb_DA+	B16	LPb_DA-	C16	GND	D16	LPb_DC+	E16	LPb_DC-
A17	LPa_DB+	B17	LPa_DB-	C17	GND	D17	LPa_DD+	E17	LPa_DD-
A18	LPa_DA+	B18	LPa_DA-	C18	GND	D18	LPa_DC+	E18	LPa_DC-
A19	GND	B19	+12V	C19	GND	D19	-12V	E19	GND

B.5 J2 (Rear Panel I/O CompactPCI Connector)

J2 is a 110-pin 2 mm x 2 mm female connector (AMP 352152-1) providing rear-panel user I/O. See the "J2 Rear Panel I/O Connector Pin out" table below for pin definitions and the "Backplane Connectors - Pin Locations" illustration for pin placement.

J2 Rear Panel I/O Connector Pin out

J2 – CompactPCI P5									
A1	CPCI_IPMB_SCL	B1	CPCI_IPMB_SDA	C1	IPMB_PWR	D1	+12V (via J16-3,4)	E1	USB_P2OC#
A2	NC	B2	NC	C2	NC	D2	NC	E2	NC
A3	NC	B3	NC	C3	NC	D3	NC	E3	NC
A4	NC	B4	NC	C4	NC	D4	NC	E4	NC
A5	NC	B5	NC	C5	NC	D5	RTS2#	E5	DCD2#
A6	SATA_TX0	B6	SATA_RX0	C6	SOUT2	D6	SIN2	E6	CTS2#
A7	SATA_TX0#	B7	SATA_RX0#	C7	DTR2#	D7	RI2#	E7	DSR2#
A8	NC	B8	NC	C8	GND	D8	NC	E8	NC
A9	ENET_TX+	B9	ENET_TX-	C9	GND	D9	ENET_RX+	E9	ENET_RX-
A10	USBP2	B10	USBP2#	C10	GND	D10	USBP3	E10	USBP3#
A11	VGA_VSYNC_J5	B11	VGA_HSYNC_J5	C11	VGA_BLUE_RTM_J5	D11	VGA_GREEN_RTM_J5	E11	VGA_RED_RTM_J5
A12	VGA_DDCCLK_J5	B12	VGA_DDCDATA_J5	C12	GND	D12	GND	E12	GND
A13	VCC	B13	VCC	C13	VCC	D13	VCC3	E13	VCC3
A14	NC	B14	NC	C14	NC	D14	NC	E14	NC
A15	NC	B15	GND	C15	NC	D15	GND	E15	NC
A16	NC	B16	NC	C16	GND	D16	NC	E16	NC
A17	IDE_RST#	B17	IDE_SDD(7)	C17	IDE_SDD(8)	D17	IDE_SDD(6)	E17	IDE_SDD(9)
A18	IDE_SDD(5)	B18	IDE_SDD(10)	C18	IDE_SDD(4)	D18	IDE_SDD(11)	E18	IDE_SDD(3)
A19	IDE_SDD(12)	B19	IDE_SDD(2)	C19	IDE_SDD(13)	D19	IDE_SDD(1)	E19	IDE_SDD(14)
A20	IDE_SDD(0)	B20	IDE_SDD(15)	C20	IRQ(15)	D20	IDE_SDDREQ	E20	IDE_SIORDY
A21	IDE_SDIOW#	B21	IDE_SDDACK#	C21	IDE_SDIOR#	D21	IDE_S_CABLE_DETECT#	E21	IDE_SDA(0)
A22	IDE_SDA(2)	B22	IDE_SDCS1#	C22	IDE_SDCS3#	D22	IDE_SDA(1)	E22	IDE_LED#

B.6 J1 (10/100 Ethernet)

J1 is an 8-pin RJ-45 connector providing 10 Mb (10BASE-T) and 100 Mb (100BASE-TX) protocols out the front of the board. Two LEDs are located inside each RJ-45 connector:

First LED:

- Green indicates a link
- Blinking Green indicates activity

Second LED:

- Off = 10 MB
- Green = 100 MB

Ethernet signals are directed out the front J1 port.

B.7 J4 (Universal Serial Bus 0 connector)

J4 (Port0) is a Universal Serial Bus (USB) Interface connector . See the "J4 Universal Serial Bus 0 Connector Pin out" table below for pin definitions.

USB port 0 is only available from the front USB connector, but USB Ports 2 and 3 are routed out J5 for use with a RPIO board.

J4 Universal Serial Bus 0 Connector Pin out

Pin#	Function
1	Vcc (Fused)
2	DATA-
3	DATA+
4	GND

B.8 J3 (COM1 Serial Port)

J3 is an DB9 connector providing a front-panel COM1 interface. See the "J3 COM1 Serial Port Pin out" table below for pin definitions.

J3 COM1 Serial Port Pin out

Pin#	Function
1	DCD
2	RXD
3	TXD
4	DTR
5	GND

Pin#	Function
6	DSR
7	RTS
8	CTS
9	RI
-	SCD

B.9 J6, J7, J9, J10 (64bit/66Mhz PCI Mezzanine Connectors)

J6, J7, J9, and J10 are 64-pin, 1.00mm, dual row, vertical stacking receptacles providing a PCI local bus interface to optional PMC cards. These connectors provide a complete 64-bit PCI interface. See the following "J6 PCI Mezzanine Connector Pin out", "J7 PCI Mezzanine Connector Pin out", "J9 PCI Mezzanine Connector Pin out" and "J10 PCI Mezzanine Connector Pin out" tables for pin definitions.

J6 – 66Mhz/64bit PMC site (JN1)			
1	PMC_TCK_64_66	33	FRAME#
2	-12V	34	GND
3	GND	35	GND
4	INTA#	36	IRDY#
5	INTB#	37	DEVSEL#
6	INTC#	38	VCC
7	BUSMODE1#	39	PCIX_CAP
8	VCC	40	LOCK#
9	INTD#	41	SDONE#
10	NC	42	SBO#
11	GND	43	PAR
12	NC	44	GND
13	PCLKPMC	45	VCC3 (VIO)
14	GND	46	PCI_AD(15)
15	GND	47	PCI_AD(12)
16	GNT#	48	PCI_AD(11)
17	REQ#	49	PCI_AD(9)
18	VCC	50	VCC
19	VCC3 (VIO)	51	GND
20	PCI_AD(31)	52	CBE(0)#
21	PCI_AD(28)	53	PCI_AD(6)
22	PCI_AD(27)	54	PCI_AD(5)
23	PCI_AD(25)	55	PCI_AD(4)

24	GND	56	GND
25	GND	57	VCC3 (VIO)
26	CBE(3)#	58	PCI_AD(3)
27	PCI_AD(22)	59	PCI_AD(2)
28	PCI_AD(21)	60	PCI_AD(1)
29	PCI_AD(19)	61	PCI_AD(0)
30	VCC	62	VCC
31	VCC3 (VIO)	63	GND
32	PCI_AD(17)	64	REQ64#

J7 – 66Mhz/64bit PMC site (JN2)			
1	+12V	33	GND
2	PMC_TRST_64_66#	34	PMC_RSVD34
3	PMC_TMS_64_66	35	TRDY#
4	NC	36	VCC3
5	PMC_TDI_64_66	37	GND
6	GND	38	STOP#
7	GND	39	PERR#
8	NC	40	GND
9	NC	41	VCC3
10	NC	42	SERR#
11	BUSMODE2#	43	CBE(1)#
12	VCC3	44	GND
13	PCIRST#	45	PCI_AD(14)
14	BUSMODE3#	46	PCI_AD(13)
15	VCC3	47	M66EN
16	BUSMODE4#	48	PCI_AD(10)
17	PME#	49	PCI_AD(8)
18	GND	50	VCC3
19	PCI_AD(30)	51	PCI_AD(7)
20	PCI_AD(29)	52	PMC_RSVD52
21	GND	53	VCC3
22	PCI_AD(26)	54	PMC_RSVD54
23	PCI_AD(24)	55	NC
24	VCC3	56	GND
25	IDSEL_64_66	57	NC
26	PCI_AD(23)	58	NC
27	VCC3	59	GND
28	PCI_AD(20)	60	NC
29	PCI_AD(18)	61	ACK64#
30	GND	62	VCC3
31	PCI_AD(16)	63	GND
32	CBE(2)#	64	NC

J9 – 66Mhz/64bit PMC site (JN3)			
1	NC	33	GND
2	NC	34	PCI_AD(48)
3	GND	35	PCI_AD(47)
4	CBE(7)#	36	PCI_AD(46)
5	CBE(6)#	37	PCI_AD(45)
6	CBE(5)#	38	GND
7	CBE(4)#	39	VCC3 (VIO)
8	GND	40	PCI_AD(44)
9	VCC3 (VIO)	41	PCI_AD(43)
10	PAR64	42	PCI_AD(42)
11	PCI_AD(63)	43	PCI_AD(41)
12	PCI_AD(62)	44	GND
13	PCI_AD(61)	45	GND
14	GND	46	PCI_AD(40)
15	GND	47	PCI_AD(39)
16	PCI_AD(60)	48	PCI_AD(38)
17	PCI_AD(59)	49	PCI_AD(37)
18	PCI_AD(58)	50	GND
19	PCI_AD(57)	51	GND
20	GND	52	PCI_AD(36)
21	VCC3 (VIO)	53	PCI_AD(35)
22	PCI_AD(56)	54	PCI_AD(34)
23	PCI_AD(55)	55	PCI_AD(33)
24	PCI_AD(54)	56	GND
25	PCI_AD(53)	57	VCC3 (VIO)
26	GND	58	PCI_AD(32)
27	GND	59	NC
28	PCI_AD(52)	60	NC
29	PCI_AD(51)	61	NC
30	PCI_AD(50)	62	GND
31	PCI_AD(49)	63	GND
32	GND	64	NC

J10 – 66Mhz/64bit PMC site (JN4)			
1	PIM[1]	33	PIM[33]
2	PIM[2]	34	PIM[34]
3	PIM[3]	35	PIM[35]
4	PIM[4]	36	PIM[36]
5	PIM[5]	37	PIM[37]
6	PIM[6]	38	PIM[38]
7	PIM[7]	39	PIM[39]
8	PIM[8]	40	PIM[40]
9	PIM[9]	41	PIM[41]
10	PIM[10]	42	PIM[42]
11	PIM[11]	43	PIM[43]
12	PIM[12]	44	PIM[44]
13	PIM[13]	45	PIM[45]
14	PIM[14]	46	PIM[46]
15	PIM[15]	47	PIM[47]
16	PIM[16]	48	PIM[48]
17	PIM[17]	49	PIM[49]
18	PIM[18]	50	PIM[50]
19	PIM[19]	51	PIM[51]
20	PIM[20]	52	PIM[52]
21	PIM[21]	53	PIM[53]
22	PIM[22]	54	PIM[54]
23	PIM[23]	55	PIM[55]
24	PIM[24]	56	PIM[56]
25	PIM[25]	57	PIM[57]
26	PIM[26]	58	PIM[58]
27	PIM[27]	59	PIM[59]
28	PIM[28]	60	PIM[60]
29	PIM[29]	61	PIM[61]
30	PIM[30]	62	PIM[62]
31	PIM[31]	63	PIM[63]
32	PIM[32]	64	PIM[64]

B.10 J12 and J13 (32bit/33Mhz PCI Mezzanine Connectors)

J12 and J13 are 64-pin, 1.00mm, dual row, vertical stacking receptacles providing a PCI local bus interface to optional PMC cards. These connectors provide a complete 32-bit PCI interface. See the following "J12 PCI Mezzanine Connector Pin out" and "J13 PCI Mezzanine Connector Pin out" tables for pin definitions.

J12 – 33Mhz/32bit PMC site (JN1)			
1	PMC_TCK_32_33	33	FRAME#
2	-12V	34	GND
3	GND	35	GND
4	INTA#	36	IRDY#
5	INTB#	37	DEVSEL#
6	INTC#	38	VCC
7	BUSMODE1#	39	GND
8	VCC	40	LOCK#
9	INTD#	41	SDONE#
10	NC	42	SBO#
11	GND	43	PAR
12	NC	44	GND
13	PCLKPMC	45	PWR_VIO_PMC
14	GND	46	PCI_AD(15)
15	GND	47	PCI_AD(12)
16	GNT#	48	PCI_AD(11)
17	REQ#	49	PCI_AD(9)
18	VCC	50	VCC
19	PWR_VIO_PMC	51	GND
20	PCI_AD(31)	52	CBE(0)#
21	PCI_AD(28)	53	PCI_AD(6)
22	PCI_AD(27)	54	PCI_AD(5)
23	PCI_AD(25)	55	PCI_AD(4)
24	GND	56	GND
25	GND	57	PWR_VIO_PMC
26	CBE(3)#	58	PCI_AD(3)
27	PCI_AD(22)	59	PCI_AD(2)
28	PCI_AD(21)	60	PCI_AD(1)
29	PCI_AD(19)	61	PCI_AD(0)
30	VCC	62	VCC
31	PWR_VIO_PMC	63	GND
32	PCI_AD(17)	64	REQ64#

J13 – 33Mhz/32bit PMC site (JN2)			
1	+12V	33	GND
2	PMC_TRST_32_33#	34	NC
3	PMC_TMS_32_33	35	TRDY#
4	NC	36	VCC3
5	PMC_TDI_32_33	37	GND
6	GND	38	STOP#
7	GND	39	PERR#
8	NC	40	GND
9	NC	41	VCC3
10	NC	42	SERR#
11	BUSMODE2#	43	CBE(1)#
12	VCC3	44	GND
13	PCIRST#	45	PCI_AD(14)
14	BUSMODE3#	46	PCI_AD(13)
15	VCC3	47	GND
16	BUSMODE4#	48	PCI_AD(10)
17	PME#	49	PCI_AD(8)
18	GND	50	VCC3
19	PCI_AD(30)	51	PCI_AD(7)
20	PCI_AD(29)	52	NC
21	GND	53	VCC3
22	PCI_AD(26)	54	NC
23	PCI_AD(24)	55	NC
24	VCC3	56	GND
25	IDSEL_32_33	57	NC
26	PCI_AD(23)	58	NC
27	VCC3	59	GND
28	PCI_AD(20)	60	NC
29	PCI_AD(18)	61	ACK64#
30	GND	62	VCC3
31	PCI_AD(16)	63	GND
32	CBE(2)#	64	NC

B.11 J14 (IDE Connector)

J14 is a 50-pin, header providing a primary IDE channel interface. See the "J14 IDE Connector Pin out" table below for pin definitions.

J14 – 2.5” HDD IDE connector (if available)			
1	IDE_CONFIG_A	26	NC
2	IDE_CONFIG_B	27	DREQ
3	IDE_CONFIG_C	28	GND
4	IDE_CONFIG_D	29	DIOW#
5	NC	30	GND
6	NC	31	DIOR#
7	RST#	32	GND
8	GND	33	IORDY
9	DD(7)	34	CABLE_SELECT
10	DD(8)	35	DDACK#
11	DD(6)	36	GND
12	DD(9)	37	IRQ(14)
13	DD(5)	38	NC
14	DD(10)	39	DA(1)
15	DD(4)	40	CBL_DETECT
16	DD(11)	41	DA(0)
17	DD(3)	42	DA(2)
18	DD(12)	43	DCS(1)#
19	DD(2)	44	DCS(3)#
20	DD(13)	45	IDE_ACT#
21	DD(1)	46	GND
22	DD(14)	47	HD_PWR
23	DD(0)	48	HD_MOTOR_PWR
24	DD(15)	49	GND
25	GND	50	NC

Appendix C

C Thermal Considerations

This appendix describes the thermal requirements for reliable operation of a cPB-4612 using the Mobile Pentium 4 processor - M. It covers basic thermal requirements and provides specifics about monitoring the board and processor temperature.

C.1 Thermal Requirements

The cPB-4612 is equipped with an integrated heatsink for cooling the processor module. The maximum processor core temperature ***must not exceed 100°C***. The heatsink allows a maximum ambient air temperature of 50°C with 200 linear feet per minute (LFM) of airflow. The maximum power dissipation of the CPU is 25 W at 1.2 GHz and 1.20V.

CAUTION: External airflow must be provided at all times during operation to avoid damaging the CPU. DTI strongly recommends the use of a fan tray below the card rack to supply the external airflow.

The "Thermal Requirements" table below shows the relationship between ambient air temperature, board temperature, and processor core temperature.

Thermal Requirements

External Ambient Air Temperature (°C)	Temperature Around the Board (°C)	Pentium M processor Core Temperature (°C)
0	13	44
5	18	49
10	22	54
15	27	60
20	33	65
25	37	69
30	42	74
35	47	79
40	52	84
45	57	89
50	63	95
55	68	100 = maximum

C.2 Temperature Monitoring

Because reliable long-term operation of the cPB-4612 depends on maintaining proper temperature, DTI strongly recommends verifying the operating temperature of the processor module and processor core in the final system configuration.

The Pentium 4 processor incorporates an on-die thermal diode that can be used to monitor the processor's die temperature. The cPB-4612 includes an ADM 1026 Hardware Monitor to check the die temperature of the processor for thermal management purposes.

When checking airflow conditions, let the Processor Core Temperature Test dwell for at least 30 minutes and verify that the core temperature does not exceed 65°C. The processor "core" temperature must **never** exceed 100°C under any condition of ambient temperature or usage.

WARNING: Temperatures over 100°C may result in permanent damage to the processor.

Refer to the "Thermal Requirements" table for more information.

Appendix D

D Datasheet Reference

This appendix provides links to datasheets, standards, and specifications for the technology designed into the cPB-4612.

D.1 CompactPCI

CompactPCI specifications can be purchased from the PCI Industrial Computer Manufacturers Group (PICMG) for a nominal fee. A short form CompactPCI specification is also available on PICMG's Website at:

http://www.picmg.org**

D.2 Ethernet

Refer to the *Intel 82559 Fast Ethernet PCI Controller* datasheet for more information on the Ethernet 10/100 LAN Controller. The datasheet is available from Intel's Website at:

http://developer.intel.com/design/network/products/lan/controllers/82559.htm

Refer to the Intel *82546EB Dual Port Gigabit Ethernet Controller* datasheet for more information on the Ethernet LAN Controller. The datasheet is available from Intel's Website at:

http://developer.intel.com/design/network/products/lan/controllers/82546.htm

D.3 Intel 855GME Chipset

For more information on the following cPB-4612 functions, refer to the *Intel 855GM/855GME Chipset Graphics and Memory Controller Hub* datasheet.

- Integrated Intel Extreme Graphics 2 video

This datasheet and other information available online at:

http://developer.intel.com/design/chipsets/embedded/855gme.htm

For more information on the following cPB-4612 functions, refer to the *Intel 6300ESB ICH* datasheet.

- USB
- Counter/Timers
- DMA controllers
- Real-Time Clock
- Interrupt controllers
- Reset Control register
- IDE Interface Controller
- UARTs

This datasheet and other information available online at:

http://developer.intel.com/design/chipsets/embedded/6300ESB.htm

D.4 Pentium M processor (FCBGA Package)

For more information about the Intel Pentium M processor in FCBGA Package, see the *Mobile Intel Pentium 4 processor - M in FCPGA* datasheet. This document is available online at:

http://developer.intel.com/design/mobile/pentiumm/pentiummoverview.htm

D.5 PMC Specification

For more information about PMC modules and the PMC Specification, refer to the sponsoring organization's Website at:

http://www.vita.com/**

D.6 Super I/O

Refer to the SMSC *LPC47M192 Super I/O with Hardware Monitoring Block* datasheet for more information on the following cPB-4612 functions:

- Hardware Monitoring

The datasheet is available online from the SMSC Website at:

http://www.smsc.com/**

Appendix E

E Agency Approvals

E.1 CE Certification

The cPB-4612 meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility [EN55024:1998, EN55022:1998] and Low-Voltage Directive 73/23/EEC for Product Safety [EN60950-1:2001]. The final product configuration may need further testing. DTI is ready to work with you to get your product through the CE certification process

E.2 NEBS compliance

This cPB-4612 was designed to but not necessarily tested to meet or exceed Telcordia specification FR-2063 Issue 2 Dec 2002 “Network Building Requirements”. Certification is dependent on your configuration. DTI is ready to work with you to get your product through the NEBS certification process.

E.3 Safety

UL/cUL 60950-1:2003	Safety for Information Technology Equipment (UL File # E139737)
EN/IEC 60950-1:2001	Safety for Information Technology Equipment
GR-63-CORE-I2: 2002	Designed to meet section 4

E.4 Electro-magnetic Compatibility

FCC Part 15, Subpart B:2003	Class A Commercial Equipment
CISPR 22:1997	Class A Radiated, Power line Conducted
EN 50081-1:1992	Emissions- Residential, Commercial
EN 55022:1998	Class A Radiated, Power line Conducted
EN 61000-3-2:1995	Power Line Conducted Emissions
EN 61000-3-3:1995	Power Line Fluctuation and Flicker
EN 55024:1998	Immunity- Information Technology Equipment
EN 61000-4-2:1995	Electro-Static-Discharge (ESD)
EN 61000-4-3:1997	Radiated Susceptibility
EN 61000-4-4:1995	Electrical Fast Transient Burst
GR-1089-CORE-I3: 2002	Designed to meet sections 2 and 3

E.5 Regulatory Information

E.5.1 FCC (USA)

This equipment has been demonstrated to show compliance with mandatory U.S. and international electromagnetic compatibility standards for a Class A digital device when properly installed in an agency

approved chassis. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This product 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Note: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

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

CAUTION: If you make any modification to the equipment not expressly approved by DTI, you could void your authority to operate the equipment.

E.5.2 Industry Canada (Canada)

Cet appareil numérique respecte les limites bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques", NMB-003 édictée par le Ministre Canadien des Communications.

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the interference-causing equipment standard entitled: "Digital Apparatus," ICES-003 of the Canadian Department of Communications.

Appendix F

F cRT Specifications

The cRT-4612 hosts a CompactFlash site and a 40 pin IDE connector, and provides access to the following features on the rear panel:

- Two USB 2.0 Ports
- Serial Communications on COM2
- Video via standard CRT connector
- A PIM site that can be used in conjunction with a PMC card, on the cPB-4612, to provide additional I/O to the rear panel.