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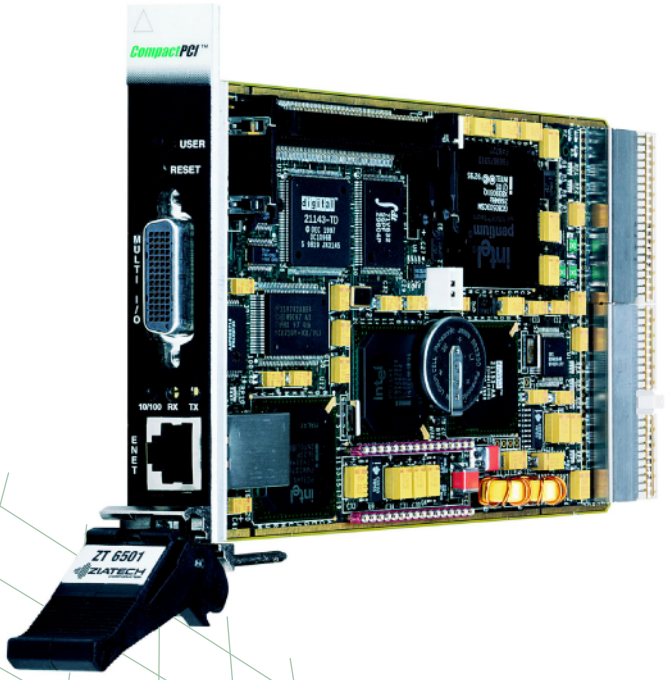
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CompactPCI®

# ZT 6501

## CPU Board with Mobile Pentium® Processor

## Hardware User Manual




ZIATECH CORPORATION

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# WHAT'S IN THIS MANUAL?

This manual describes the operation and use of the ZT 6501 CPU Board with Embedded Pentium® Processor and its optional ZT 4600 RPIO Transition Board. The following summarizes the focus of each major section in this manual.

**Chapter 1, "CPU Introduction,"** introduces the key features of the ZT 6501 CPU board. It includes a product definition, a list of product features, a functional block diagram, and a brief description of each block. This chapter is most useful to those who wish to compare the features of the ZT 6501 against the needs of a specific application.

**Chapter 2, "RPIO Introduction,"** (for use with the ZT 6501) introduces the key features of the ZT 4600. It includes a product definition, a list of product features, a functional block diagram, and a brief description of each block. This chapter is useful to those requiring rear-panel access to the CPU board's I/O functions.

**Chapter 3, "Getting Started,"** summarizes the information needed to install and configure your ZT 6501.

**Chapter 4, "Configuration,"** describes the software configuration registers, jumpers, DIP switches, and cuttable traces on the ZT 6501. This chapter details factory default settings as well as information allowing you to tailor your board to a specific application.

**Chapter 5, "CompactPCI Interface,"** presents a detailed description of the ZT 6501 interface to the CompactPCI bus. The topics discussed include compatibility and interrupt structure.

**Chapter 6, "Serial Controller,"** discusses operation of the two serial ports and provides register descriptions.

**Chapter 7, "IEEE Std 1284 Parallel Port Interface,"** contains descriptions of the programmable registers for the IEEE-1284 compatible printer interface.

**Chapter 8, "Optional Floppy Disk Interface,"** covers the mounting and enabling of an optional local floppy disk interface.

**Chapter 9, "Optional EIDE Interface,"** covers the mounting and enabling of an optional local EIDE hard drive.

**Chapter 10, "System Registers,"** provides register descriptions and a brief overview of the System registers used to control and monitor a variety of functions on the ZT 6501.

**Chapter 11, "Reset and Watchdog Timer,"** explains operation of the watchdog timer and includes code for arming and strobing the timer.

**Chapter 12, "Programmable LED,"** provides code for turning the LED on and off.



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**Chapter 13, "Flash Memory,"** discusses on-board flash memory, including the system BIOS EEPROM. Recovery from BIOS EEPROM corruption and BIOS EEPROM modification are covered in this chapter.

**Appendix A, "CPU Specifications,"** contains the electrical, environmental, and mechanical specifications for the ZT 6501. It also provides illustrations of cables and connector pinouts, and tables showing connector pin assignments.

**Appendix B, "RPIO Specifications,"** contains the mechanical specifications for the ZT 4600 RPIO Transition Board. It also provides an illustration of connector locations and tables of the connector pin assignments.

**Appendix C "PCI Configuration Space Map,"** presents the generic layout of the PCI Configuration Header for all PCI compliant devices. It also contains a table showing the PCI bus mapping of the ZT 6501's on-board devices.

**Appendix D "Thermal Considerations,"** addresses the special cooling issues associated with the Pentium processor.

**Appendix E "Agency Approvals,"** presents agency approval and certification information for the ZT 6501 CPU Board.

**Appendix F "Data Sheet Reference,"** provides links to data sheets for many of the devices located on the boards in your system.

**Appendix G, "Customer Support,"** offers a description of the technical differences between the ZT 6501 and the ZT 6500 single board computers, technical assistance and warranty information, and the necessary information should you need to return your ZT 6501 for repair.



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# 1. CPU INTRODUCTION

This chapter provides a brief introduction to the ZT 6501. It includes a product definition, a list of product features, a functional block diagram, and a description of each block. Unpacking information and installation instructions are found in Chapter 3, "Getting Started."

## PRODUCT DEFINITION

The ZT 6501 is a single board computer that is factory configured to operate with the 266 MHz Intel™ Low-Power Embedded Pentium® processor. The ZT 6501 board meets the needs of a wide range of industrial control and processing applications by operating in a 3U CompactPCI backplane that supports up to seven peripheral devices. In addition, on-board high speed peripherals include serial, parallel, floppy and EIDE interfaces. CompactPCI boards used with the ZT 6501 can be any combination of CompactPCI bus mastering devices. The maximum CompactPCI speed supported by the ZT 6501 is 33 MHz.

The ZT 6501 is available in one, two, and three slot solutions. Two and three slot solutions include the 17662 Media Carrier Board capable of providing onboard floppy, as well as solid state or rotating EIDE media.

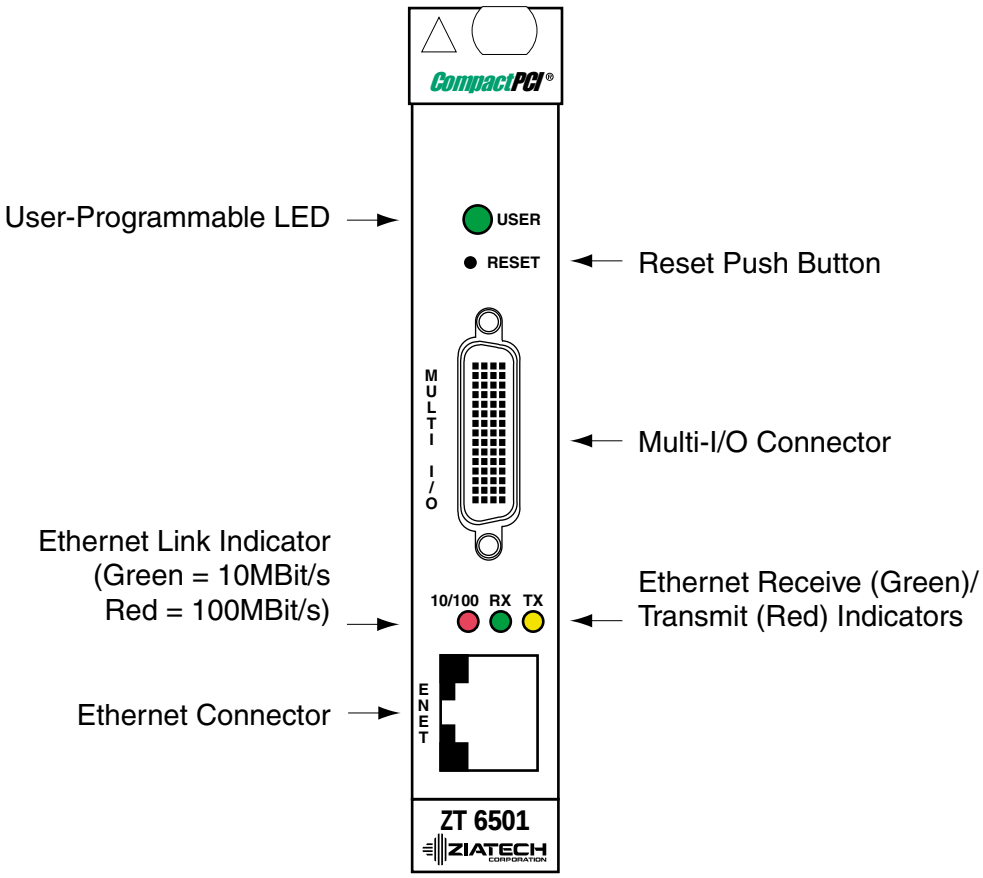
Rear panel access to the ZT 6501's I/O functions is provided by the optional ZT 4600 Rear Panel I/O board. The ZT 4600 is a rear-panel transition board designed to function only in the rear-panel slot of a 3U CompactPCI® system (such as a ZT 6081 enclosure).

The ZT 6501 includes many of the most commonly needed peripheral devices. This eliminates the need to use additional backplane slots in order to support common PC peripherals. On-board peripheral devices include:

- 8 Mbyte flash file system for disk support
- Optional EIDE/Ultra-DMA hard disk interface
- Optional 1.44 Mbyte, 3 ½" floppy drive
- 10/100 Mbit Ethernet Controller
- Keyboard and mouse controller
- Serial I/O
- Printer interface
- Interrupt controllers
- Counter/timers
- Watchdog timer
- Real-time clock



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*ZT 6501 One-Slot Connector Face Plate*

## FEATURES OF THE ZT 6501

- CompactPCI Bus Specification, Rev. 2.1 compliant
- 3U CompactPCI architecture
- Supports 266 MHz Intel Embedded Pentium processor
- 32 Kbytes of CPU cache
- 512 Kbytes of L2 cache
- 64 or 128 Mbytes of DRAM
- 8 Mbytes of flash memory
- Integrated floppy and EIDE drive options
- Standard AT® peripherals include:
  - Two enhanced interrupt controllers
  - Three counter/timers



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  - Battery-backed real-time clock
  - Two enhanced DMA controllers
  - Keyboard controller
  - PS/2 mouse port
  - Universal Serial Bus (USB)
  - Ethernet 10BASE-T and 100BASE-TX
- IEEE 1284 parallel port
- Two 16550 RS-232 serial ports
- Two-stage watchdog timer
- Jumperless Setup
- Two on-board, high efficiency, DC-DC converters at 1.9 V and 2.5 V
- Push-button reset
- Software programmable LED
- DC power monitors (3.3 V and 5 V)
- Compatibility with the following software: MS-DOS®, OS/2®, UNIX®, QNX®, VRTX32®, Windows® 3.1 and 3.11, Windows 95, and Windows NT®
- Five-year warranty

## DEVELOPMENT CONSIDERATIONS

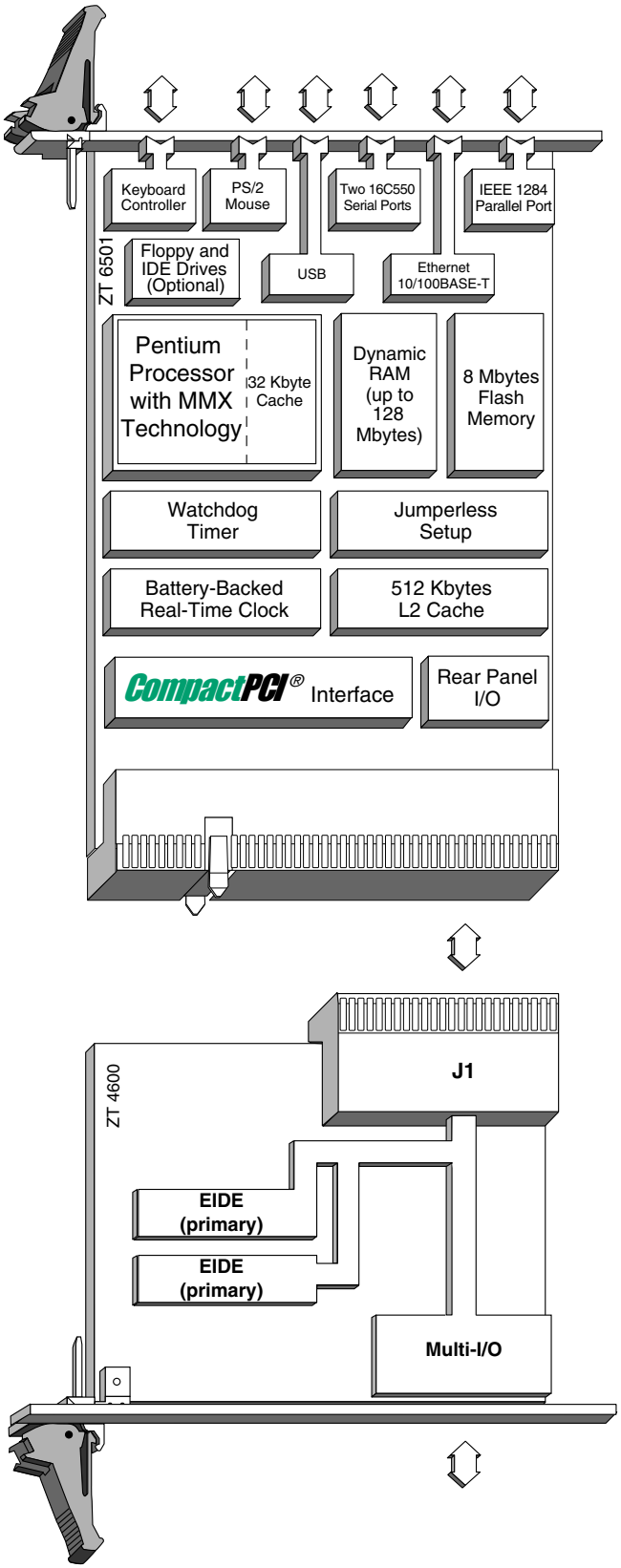
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## FUNCTIONAL BLOCKS

Below are overviews of the ZT 6501's major functional blocks. Refer also to the "ZT 6501 With ZT 4600 Functional Block Diagram."



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*ZT 6501 With ZT 4600 Functional Block Diagram*



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## CompactPCI Bus Interface

The CompactPCI architecture used on the ZT 6501 is designed for industrial and embedded applications which require a more rugged architecture than standard PCI while maintaining the features that make PCI a highly desirable bus architecture. CompactPCI provides a number of extensions to standard PCI, including hot swap capability. Although the ZT 6501 itself is not hot swappable, it supports hot swap clocks and ENUM signaling to allow the other peripherals in the backplane to be hot swapped. The ZT 6501 has a 3U form factor Compact PCI backplane and supports seven CompactPCI peripheral cards in addition to itself.

See Chapter 5, "CompactPCI Interface," for a detailed description of the ZT 6501 interface to the CompactPCI bus architecture.

## Pentium Processor

The ZT 6501 features the 266 MHz Intel Low-Power Embedded Pentium processor, which uses 0.25 micron technology to minimize the amount of system power required for high performance computing. As a result, the Embedded Pentium processor consumes significantly less power at even higher speeds than the original "classic" Pentium processor.

The Embedded Pentium processor has an integrated Level 1 (L1) cache. In addition, the ZT 6501 includes 512 Kbytes of Level 2 (L2) cache support.

The ZT 6501 operates the external microprocessor bus at 66 MHz. The CompactPCI bus always operates at 1/2 the external microprocessor bus speed.

See the "Embedded Pentium Processor" topic in Appendix F for details on how to obtain more information about the Intel Low-Power Embedded Pentium Processor.

## Intel 430TX PCIset Interface Chip

The Intel 430TX PCI chipset is designed to maximize throughput on the PCI bus. It is a third generation PCI chipset capable of burst mode transfers to 110 Mbytes per second.

Refer to Appendix C, "PCI Configuration Space Map," and to the "PCIset Interface Chip (430TX)" topic in Appendix F for more information about the Intel 430TX PCI chipset.

## DC/DC Converters

The ZT 6501 contains dual DC/DC converters to support Intel processors that use VRE (reduced and shifted voltage). One converter is used for the processor's VI/O and runs at 2.5 V. The other converter is used to drive the processor core at 1.9 V. The board is configured from the factory to the correct voltage for the loaded processor. 3.3 V, 5 V, and 12 V require no DC-DC converter since they are taken directly from the backplane.



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## Memory and I/O Addressing

The ZT 6501 has two 72-pin SO-DIMM DRAM sockets that can accommodate up to 128 Mbytes of memory. In addition to DRAM, the ZT 6501 has 8 Mbytes of flash memory. The flash memory supports the field-upgradeable system BIOS. The base product has additional flash memory for a solid state disk or a bootable operating system image.

All memory and I/O addresses are forwarded to the PCI bus; thus any device on the PCI bus has access to the full memory and I/O address range. Any I/O or memory addresses that are not actively decoded are taken (subtractively decoded) by the ISA bridge on the ZT 6501. All of the ZT 6501's on-board peripherals are located on the ISA side of the bridge or on the bridge itself, except for the Ethernet adapter, which is located on the primary PCI bus.

The ZT 6501 also supports flash memory soldered directly on the board. Memory operations not decoded for on-board DRAM are forwarded to the CompactPCI bus.

The ZT 6501 also provides 512 Kbytes of L2 cache to enhance CPU performance. The DRAM's most recently used data is stored in and retrieved from cache, considerably reducing the need to access the DRAM. Note that the ZT 6501 only caches the first 64 Mbytes of DRAM.

For more information, see the "Memory Configuration" topic in Chapter 3, "Getting Started."

The ZT 6501 also includes many I/O peripherals required for industrial control applications. For more information, see the "I/O Configuration" topic in Chapter 3.

## 10/100 Mbit Ethernet Interface

The ZT 6501 supports a 10/100 Mbit Ethernet interface that resides on the local PCI bus. The ZT 6501 card provides face plate access and includes transmit, receive, and link LEDs on the face plate. The green link LED indicates 10 Mbit/s; red indicates 100 Mbit/s.

The Ethernet is implemented using Intel's 21143 10/100 Mbit PCI Ethernet controller. To obtain more information about the 21143 device, refer to the "Ethernet Interface" topic in Appendix F.

## Serial I/O

The ZT 6501 supports two 16550 asynchronous serial ports. The serial ports are implemented with a 5 V charge pump technology. Both serial ports include a complete set of handshaking and modem control signals, maskable interrupt generation, and data transfer rates up to 115.2 Kbps.



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RS-232-compatible drivers are used to drive the serial interfaces; the face plate Multi-I/O cable is configured for DTE.

The serial ports are configured as DTE. They are available through the multi-I/O connector (J6). The ZT 90247 Multi-I/O cable converts the multi-I/O interface to a standard 9-pin D-shell connector. A null-modem option is available to convert the DTE configuration to DCE. Adapter boards are also available to convert the RS-232 interface to an RS-485 interface.

For more information on ZT 6501's serial ports, see Chapter 6, "Serial Controller."

Each channel is implemented in the National Semiconductor PC87309 SuperI/O™ Plug and Play Compatible Chip. See the "SuperI/O" topic in Appendix F for details on how to obtain more information about the PC87309.

## Interrupts

The ZT 6501's two enhanced 8259 style interrupt controllers provide a total of 15 interrupt inputs. The interrupt controller features include support for:

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

Interrupt sources include:

- Serial I/O
- Real-time clock
- Counter/timers
- Printer
- Keyboard
- Multiple master communications

Four of the interrupt sources can be routed from the four PCI IRQ signals.

The ZT 6501's interrupt controllers reside in the Intel 82371AB (PIIX4) device. See the "PIIX4" topic in Appendix F for details on how to obtain more information about the 82371AB (PIIX4) device.

## Counter/Timers

Three 8254 style counter/timers as defined for the PC/AT are included on the ZT 6501. Operating modes supported by the counter/timers include:

- Frequency divider
- Interrupt on count
- Square wave generator
- One shot
- Software triggered
- Hardware triggered



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The ZT 6501's counter/timers reside in the 82371AB (PIIX4) device. See the "PIIX4" topic in Appendix F for details on how to obtain more information about the 82371AB (PIIX4) device.

## DMA

The ZT 6501's two enhanced 8237 style DMA controllers provide a total of seven DMA channels, three of which are available for PC/PCI. All seven are programmable for Distributed DMA or standard ISA DMA. Additional features of the DMA channels include:

- Auto-initialization
- Address increment or decrement
- Software DMA requests

Enhanced DMA capabilities include support for higher speed (8 Mbyte/sec) transfer types and 32-bit memory addressing.

The ZT 6501's DMA controllers reside in the 82371AB (PIIX4) device. See the "PIIX4" topic in Appendix F for details on how to obtain more information about the 82371AB (PIIX4) device.

## Watchdog Timer

An on-board, two-stage watchdog timer is provided for system integrity. Failure to strobe the watchdog timer within a programmable time period (1s, 8s, 64s, or 256s) will generate a non-maskable interrupt (NMI), followed by a hardware reset.

The watchdog timer is implemented in the system PAL. See Chapter 11, "Reset And Watchdog Timer," for more information.

## Real-Time Clock

The real-time clock performs timekeeping functions and includes 256 bytes of general-purpose, battery-backed CMOS RAM. Timekeeping features include:

- Alarm
- Maskable periodic interrupt
- 100-year calendar

The system BIOS uses a portion of this RAM for BIOS setup information. The system BIOS is also Year 2000 compliant.



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The ZT 6501's real-time clock resides in the 82371AB (PIIX4) device. See the "PIIX4" topic in Appendix F for details on how to obtain more information about the 82371AB (PIIX4) device.

## Keyboard Controller

The ZT 6501 includes a PC/AT® keyboard controller. Off-board keyboard controllers are not supported by the ZT 6501. The keyboard connection is available through the multi-I/O connector (J6), described in the "ZT 6501 Connectors" topic in Appendix A.

The keyboard controller is implemented in the National Semiconductor PC87309 SuperI/O Plug and Play Compatible Chip. See the "SuperI/O" topic in Appendix F for details on how to obtain more information about the PC87309 device.

## PS/2 Mouse Controller

The ZT 6501 includes a PS/2 mouse controller. The mouse connection is available through the multi-I/O connector (J6), described in the "ZT 6501 Connectors" topic in Appendix A.

The PS/2 mouse controller is implemented in the National Semiconductor PC87309 SuperI/O Plug and Play Compatible Chip. See the "SuperI/O" topic in Appendix F for details on how to obtain more information about the PC87309 device.

## Universal Serial Bus (USB)

The Universal Serial Bus (USB) provides a common interface to slower peripherals. Functions such as keyboard, serial ports, printer port, and mouse ports can be consolidated into USB, greatly simplifying cabling requirements. The ZT 6501 provides one USB port through the mutli-I/O connector (J6), described in the "ZT 6501 Connectors" topic in Appendix A.

The USB resides in the 82371AB (PIIX4) device. See the "PIIX4" topic in Appendix F. for details on how to obtain more information about the 82371AB (PIIX4) device.

## IEEE 1284 Parallel Port/Printer Interface

The ZT 6501 includes an IEEE® Std 1284 compatible parallel port. This port allows connection to a printer or other parallel port devices such as the software keys required by many application packages. The parallel port is ECP/EPP compatible.

The printer interface is available through the multi-I/O connector (J6). An optional Multi-I/O cable (ZT 90247) provides a 25-pin D-shell connector for software key or printer support. The mode (Normal, Extended, EPP, ECP) for the printer interface is selectable through the BIOS Setup utility.



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See Chapter 7 "IEEE Std 1284 Parallel Port Interface," for more information.

The parallel port is implemented in the National Semiconductor PC87309 SuperI/O Plug and Play Compatible Chip. See the "SuperI/O" topic in Appendix F for details on how to obtain more information about the PC87309 device.

## Optional EIDE Interface

Two options provide access to the ZT 6501's Primary EIDE channel.

An optional Media Carrier Board (17662) that features an onboard EIDE interface for a 2.5" EIDE hard drive or an ATA CompactFlash socket can attach to the ZT 6501. This configuration requires an additional slot in the card cage. See the "ZT 6501 Two-Slot Connector Face Plate" figure. The EIDE Interface supports hard drives with Ultra-DMA/33 capability. See Chapter 9, "Optional EIDE Interface," for more information.

An optional Rear Panel Transition Board (ZT 4600) provides EIDE access via two 40-pin connectors. See Chapter 2, "RPIO Introduction," for more information.

The EIDE interface resides on board the ZT 6501 in the 82371AB (PIIX4) device. See the "PIIX4" topic in Appendix F for details on how to obtain more information about the 82371AB (PIIX4) device.

## Optional Floppy Drive Interface

The ZT 6501 can be ordered with a 1.44 Mbyte, 3 ½" floppy drive. The floppy drive is mounted to a carrier board that is attached to the ZT 6501 main board. This option requires a total of three slots in the card cage. See the "ZT 6501 Three-Slot Connector Face Plate" figure.

See Chapter 8, "Optional Floppy Disk Interface," for more information.

The floppy disk controller is implemented in the National Semiconductor PC87309 SuperI/O Plug and Play Compatible Chip. See the "SuperI/O" topic in Appendix F for details on how to obtain more information about the PC87309 device.

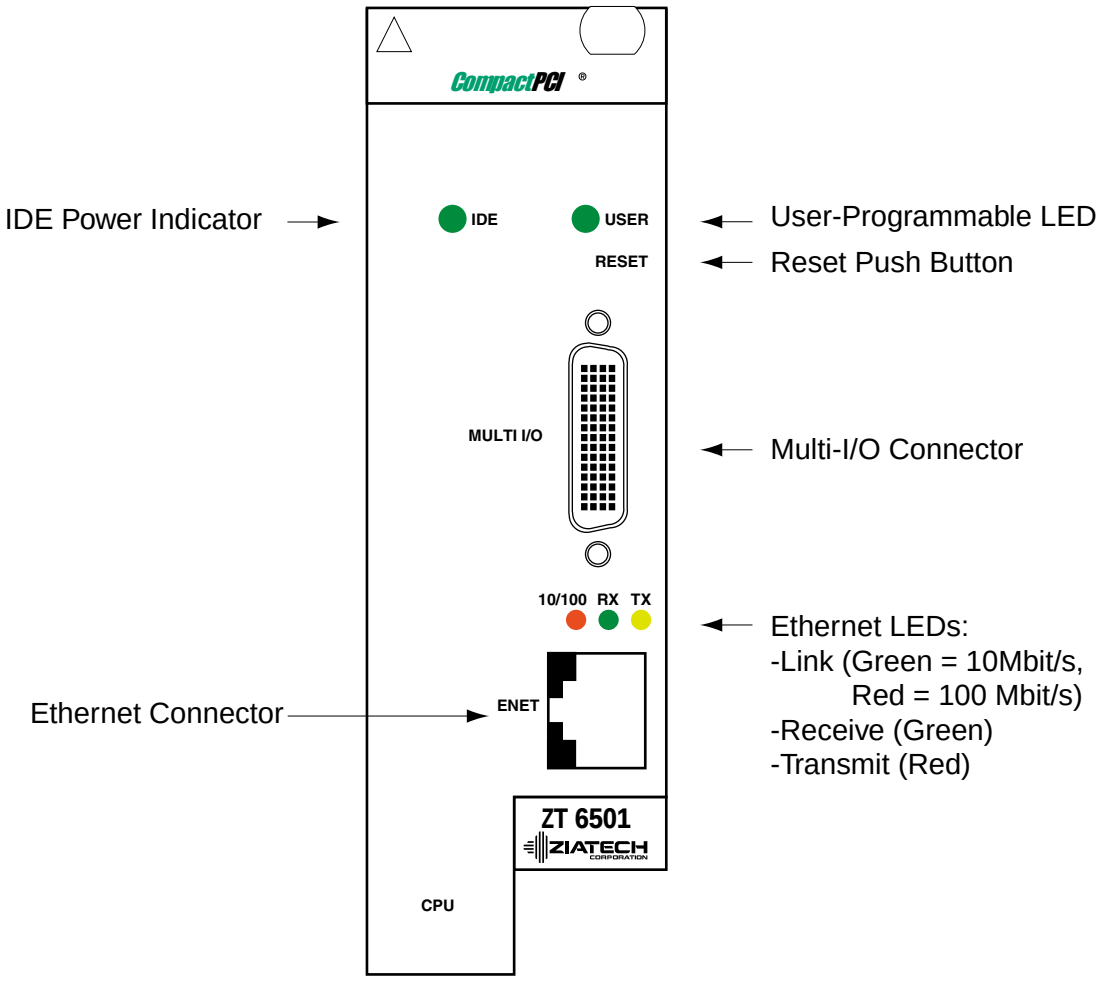
## Software

A standard ZT 6501 comes with Ziatech's Embedded BIOS loaded in on-board flash memory. The Year 2000 compliant BIOS is user configurable to boot an operating system residing in local flash memory from a local flash or hard drive or from another computer via a network. See the *Ziatech Embedded BIOS Software Manual* for more information.

The ZT 6501 is PC-compatible and runs operating systems developed for the PC. Ziatech also provides enhanced support for Windows NT, VxWorks, and QNX, including additional drivers for Ziatech peripherals and flash drives.



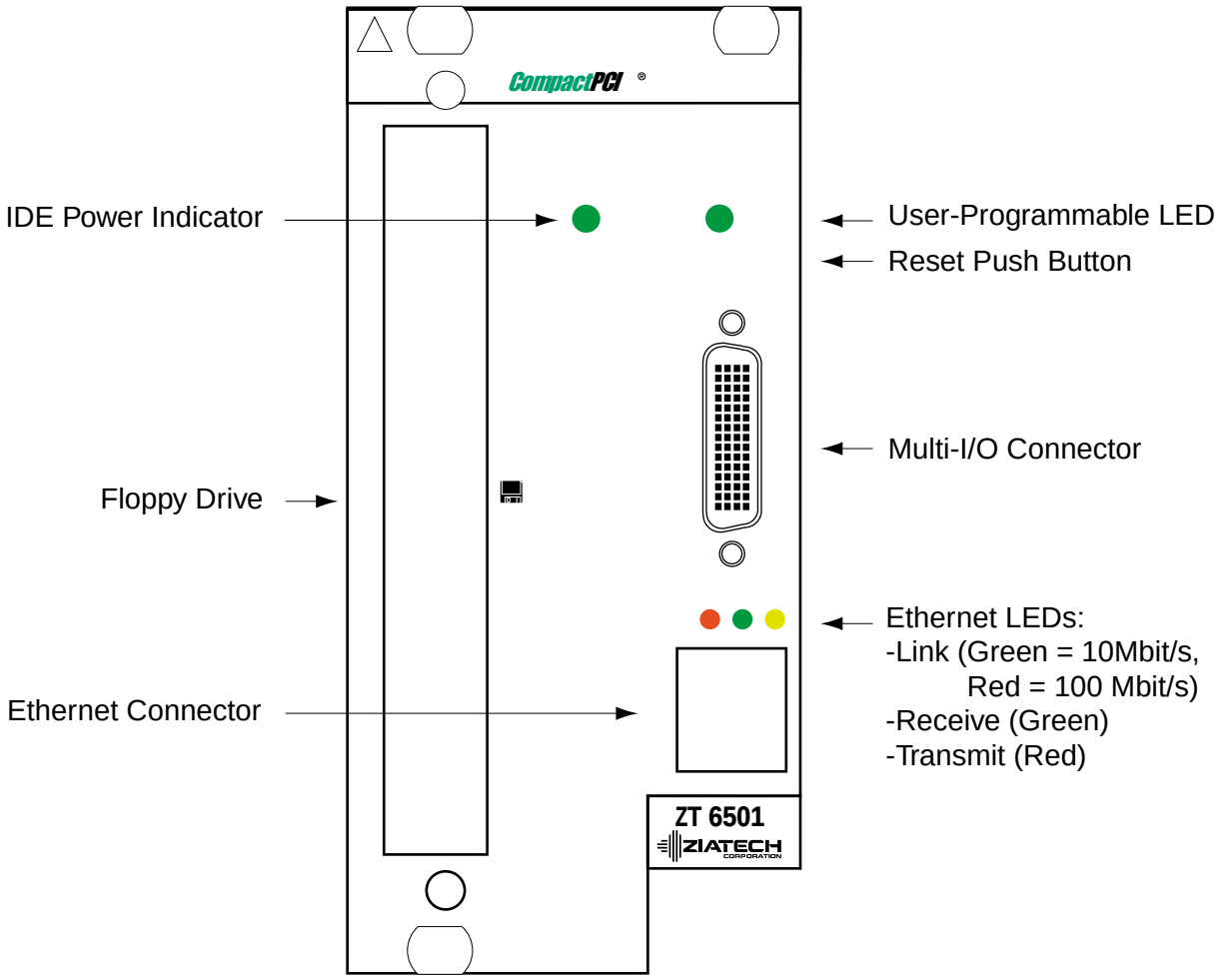
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*ZT 6501 Two-Slot Connector Face Plate*



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*ZT 6501 Three-Slot Connector Face Plate*



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# 2. RPIO INTRODUCTION

This chapter provides a brief introduction to the ZT 4600 RPIO Transition Board. It includes a product definition, a list of product features, a "ZT 4600 Connector Plate" figure, a functional block diagram, and a description of each block.

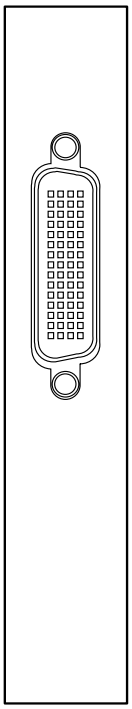
See Appendix B, "RPIO Specifications," for connector locations, descriptions, and pinout tables.

## PRODUCT DEFINITION

The ZT 4600 is a single slot, 3U rear-panel transition board providing rear-panel access to the I/O functions of specific Ziatech CPU boards. It is designed to function only in the rear-panel slot of a 3U CompactPCI® system (such as a ZT 6081 enclosure).

## FEATURES OF THE ZT 4600 RPIO TRANSITION BOARD

- Rear-panel multi-I/O interface connector for host CPU board
- Two Internal Primary EIDE channel connectors



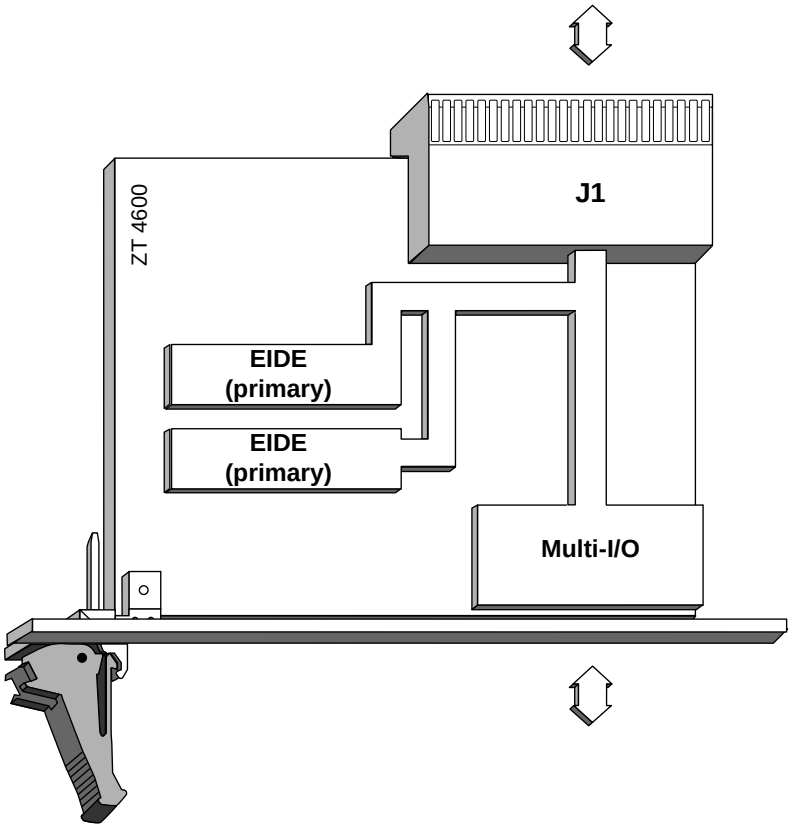
*ZT 4600 Connector Plate*



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## ZT 4600 FUNCTIONAL BLOCKS

Below is a functional block diagram of the ZT 4600. The following topics provide overviews of the functional blocks.




*ZT 4600 Functional Block Diagram*

### Rear-Panel I/O

The ZT 4600 transitions I/O signals from the CPU board for rear-panel use via a 110-pin, 2 mm x 2 mm, female connector (J1). See "ZT 4600 Connectors" in Appendix B for more information.

### Multi-I/O

The ZT 4600's multi-I/O connector (J4) provides an alternative means of accessing the CPU board's I/O. J4 provides a high density connection to the following interfaces:

- COM1
- COM2
- PS/2 Mouse
- USB
- Keyboard

See "ZT 4600 Connectors" in Appendix B for more information.



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## EIDE Interface

ZT 4600 provides access to the CPU board's primary EIDE channel through two internal connectors (J2 and J3), both 40-pin, latched, 0.1” vertical headers.

When the CPU board is configured for local EIDE support, the EIDE channel available through the ZT 4600 is factory-configured as a primary slave. See Chapter 9, “Optional EIDE Interface,” for more information.



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# 3. GETTING STARTED

This chapter summarizes the information needed to make the ZT 6501 operational. Read this chapter before attempting to use the board.

## UNPACKING

Please check the shipping carton for damage. If the shipping carton and contents are damaged, notify the carrier and Ziatech for an insurance settlement. Retain the shipping carton and packing material for inspection by the carrier. Do not return any product to Ziatech without a Return Material Authorization (RMA) number. The "Returning For Service" topic in Appendix G, "Customer Support," explains the procedure for obtaining an RMA number from Ziatech.

## WHAT'S IN THE BOX?

The items listed below are included with a ZT 6501 order. System level products such as the Windows NT and QNX packages include additional items not shown. If a system level product has been ordered, refer to the system manual for the packing list.

- ZT 6501 Single Board Computer in an anti-static bag (save the anti-static bag for storing or returning the ZT 6501)
- Optional floppy disk interface (assumes use of 17662 Media Carrier Board)
- Optional EIDE interface (assumes use of 17662 Media Carrier Board)
- Optional ZT 90247 Multi-I/O cable
- Optional ZT 4600 RPIO board



**Caution:** Like all equipment using MOS devices, the ZT 6501 must be protected from static discharge. Never remove any of the socketed parts except at a static-free workstation. Use the anti-static bag shipped with the ZT 6501 to handle the board.

## ZT 6501 CPU BOARD SYSTEM REQUIREMENTS

The ZT 6501 is designed for use with a CompactPCI bus backplane. The ZT 6501 is electrically, mechanically, and functionally compatible with the *CompactPCI Specification* for CompactPCI bus applications.



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Ziatech recommends vertical mounting. The ZT 6501 can operate from Oº C to 70º C. Refer to the "Operating Temperature" topic in Appendix A for more information on operating temperatures.

**Note:** Using the ZT 6501 in a backplane that supports Geographical Addressing requires configuration of resistors R1-R5.

## MEMORY AND I/O CONFIGURATION

### Memory Configuration

The ZT 6501 addresses up to 4 Gbytes of memory. The address space is divided between memory local to the board and memory located on the CompactPCI bus. Any memory not reserved or occupied by a local memory device (DRAM/flash) is available for CompactPCI bus expansion.

In CompactPCI systems, the BIOS automatically assigns at boot time the I/O addresses required by peripheral boards and PCI devices based on the requirements of each device. The assigned addresses are determined by reading the configuration address space registers via PCI BIOS functions or operating system-specific functions.

The ZT 6501 is populated with several memory devices. Local DRAM implements two 72-pin SO-DIMM modules for up to 128 Mbytes of DRAM. Memory modules must be added in pairs due to the 64-bit memory architecture of the Embedded Pentium processor.

The ZT 6501 also provides 512 Kbytes of L2 cache to enhance CPU performance. The DRAM's most recently used data is stored in and retrieved from cache, considerably reducing the need to access the DRAM. Note that the ZT 6501 only caches the first 64 Mbytes of DRAM.

Local flash memory (8 Mbytes) is soldered directly to the board.

The "Memory Address Map" shows default memory addressing for the ZT 6501.

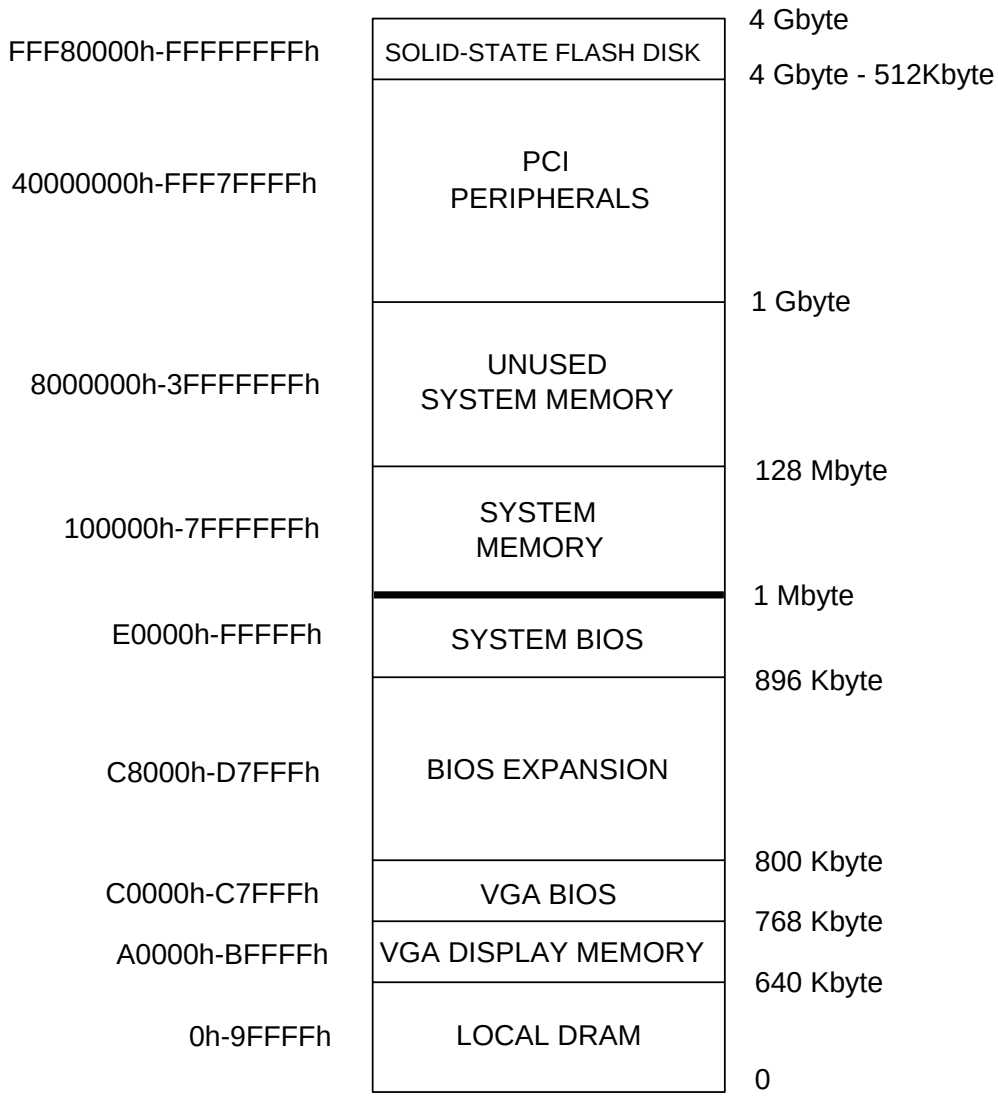
### I/O Configuration

The ZT 6501 addresses up to 4 Gbytes of I/O using a 32-bit I/O address. It also supports legacy ISA I/O for the first 64 Kbytes of I/O space. The address space is divided between I/O local to the board and I/O on the CompactPCI bus. Any I/O space not occupied by a local I/O device is available for CompactPCI bus expansion. The I/O address regions available for the CompactPCI bus are configured through the BIOS Setup utility (discussed in the section "BIOS Setup" later in this chapter).



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The ZT 6501 is populated with many of the most commonly used I/O peripheral devices for industrial control and computing applications. The I/O address location for each of the peripherals is shown in the "I/O Address Range Selection" table




*Memory Address Map*



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| | |
|---|---|
| 0780h - FFFFh | CompactPCI I/O Address Space |
| 0700h - 077Fh | LPT ECP Ports Bits |
| 0400h - 06FFh | CompactPCI I/O Address Space |
| 03F8h - 03FFh | COM1 Register |
| 03F6h | Primary EIDE Registers |
| 03F0h - 03F5h, 03F7h | Floppy Register |
| 0380h - 03EFh | CompactPCI I/O Address Space |
| 037Ch - 037Fh | LPT EPP |
| 0378h - 037Bh | LPT Port |
| 0376h | Secondary EIDE Register |
| 0300h - 0375h, 0377h | CompactPCI I/O Address Space |
| 02F8h - 02FFh | COM2 Register |
| 01F8h - 02F7h | CompactPCI I/O Address Space |
| 01F0h - 01F7h | Primary EIDE Register |
| 0178h - 01EFh | CompactPCI I/O Address Space |
| 0170h - 0177h | Secondary EIDE Register Set |
| 0100h - 016Fh | CompactPCI I/O Address Space |
| 00F0h - 00FFh | On Board Coprocessor |
| 00E0h - 00EFh | Reserved |
| 00C0h - 00DFh | On Board Slave DMAC |
| 00B0h - 00BFh | Reserved |
| 00A0h - 00AFh | On-Board Interrupt Controller |
| 0093h - 009Fh | Reserved |
| 0092h | Fast Reset & Gate A20 |
| 0090h - 0091h | Reserved |
| 0081h - 008Fh | On-Board DMA Page Registers |
| 0080h | Diagnostic Port 080h |
| 007Bh - 007Fh | Reserved |
| 0078h - 007Ah | ZT 6501 System Register 0 - 2 |
| 0068h - 006Fh | On-Board Real Time Clock |
| 0065h - 006Fh | CompactPCI I/O Address Space |
| 0064h | Keyboard |
| 0061h - 0063h | CompactPCI I/O Address Space |
| 0060h | Keyboard |
| 0050h - 005Fh | Reserved |
| 0040h - 004Fh | On-Board Counter Timers |
| 0030h - 003Fh | Reserved |
| 0020h - 002Fh | On-Board Master Interrupt |
| 0000h - 001Fh | On-Board Master DMAC |

**Note:** *CompactPCI I/O Address Space* refers to peripherals in the backplane.

## *I/O Address Range Selection*



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## ZT 4600 RPIO SYSTEM REQUIREMENTS

The ZT 4600 is designed to function only in the rear panel I/O slot of a 3U CompactPCI system, such as a ZT 6210 enclosure. The backplane's J2 connector must be available and have through-pins to the ZT 6501's J5 connector. See the "ZT 4600 Connectors" topic in Appendix B for connector descriptions.

The ZT 4600 is a passive board and therefore has no electrical or environmental requirements.



**Caution:** Static electricity can damage electronic components. Always wear a wrist strap connected to a grounding point on the system when servicing system components.

## CONNECTORS

The boards in your system include several connectors to interface to application-specific devices. Refer to the following topics for complete connector descriptions and pinouts, as well as cabling information.

- "ZT 6501 Connectors" in Appendix A, "CPU Specifications"
- "ZT 4600 Connectors" in Appendix B, "RPIO Specifications"

## SWITCHES AND CUTTABLE TRACES

The ZT 6501 includes several DIP switches and cuttable traces for configuring features that cannot be configured in the SETUP utility. Refer to Chapter 4, "Configuration," for details.

## BIOS SETUP

The ZT 6501 has many features that can be configured with the BIOS Setup utility. The Setup utility is executed during the boot sequence when the **"F2"** key is pressed.

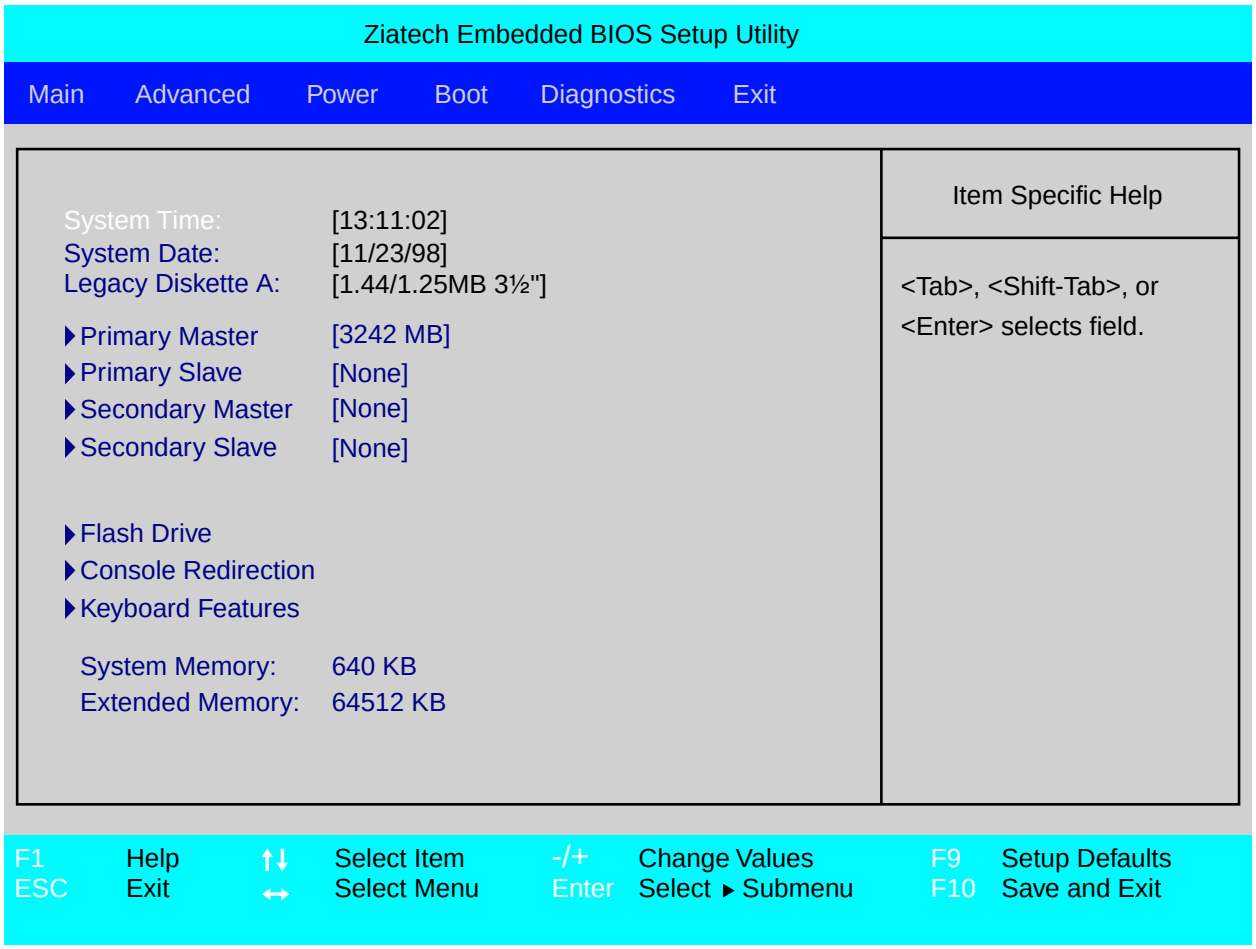
The BIOS Setup utility allows configuration of options such as base memory and extended memory size selection, boot source, hard disk type, and floppy disk type. CompactPCI peripherals are also automatically configured through the BIOS.

The following topics present an introduction to the setup and configuration of the ZT 6501.



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## BIOS Setup Screen




## System Configuration Overview

The Ziatech Embedded BIOS has many separately configurable features. These features are selected by running the built-in Setup utility. The system configuration settings are saved in a portion of the 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 the "**F2**" key during the system RAM check at boot time.

When Setup runs, an interactive configuration screen displays. See the "BIOS Setup Screen" illustration for an example. Setup parameters are divided into different categories. The available categories are listed in a menu across the top of the Setup screen. The parameters within the highlighted (current) category are listed in the main (left) portion of the Setup screen. Context sensitive help is displayed in the right portion of the screen for each parameter. A legend of keys is listed at the bottom of the Setup screen.



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Use the left and right 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.

Items in the main portion of the screen that have a triangular mark to their left are submenus. To display a submenu, use the up and down arrow keys to highlight the submenu and then press the "**Enter**" key.

## Operating System Installation

1. Install peripheral devices. CompactPCI devices are automatically configured by the BIOS during the boot sequence.

2. Most operating systems must be initially installed 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 examine 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 that is 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 Ziatech products.

6. When installation is complete, reboot the system and set the boot device order in the SETUP boot menu appropriately.

For more detailed information see the *Ziatech Embedded BIOS Software Manual*.



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# 4. CONFIGURATION

The ZT 6501 includes several options that tailor the operation of the board to requirements of specific applications. Most of the options are selected through the BIOS Setup utility. See "BIOS Setup" in Chapter 3 for details.

Some options cannot be software controlled and are configured with switches or cuttable traces. Switch options are made by opening or closing the appropriate switch as described in "DIP Switch Settings And Locations" below. Cuttable trace options are made by installing and removing surface mount 0 Ω resistors in locations described in "Cuttable Trace Options And Locations" below.

## SETUP AND OPERATION

Your ZT 6501 is configured at the factory for the specific processor installed. Each processor has its own setup configuration and should only be changed by Ziatech.



**Caution:** Changing the processor to a type other than the one installed by Ziatech may damage the processor and other devices on the ZT 6501.

## DRAM INSTALLATION AND REMOVAL OVERVIEW

The ZT 6501 requires two identical 72-Pin SO-DIMM modules for proper operation. The correct DRAM modules have been installed by the factory and in most cases should not need to be changed.



**Caution:** Installing DRAM modules other than those qualified by Ziatech may cause the board to operate intermittently.

The following two topics describe how to remove and install the DRAM modules if necessary.

### DRAM Removal

Perform the steps below if it is necessary to remove SO-DIMM DRAM modules. Review the preceding topic "DRAM Installation and Removal Overview" before removing the DRAM modules.

1. Put on an anti-static grounding strap.

2. Make sure the system is turned off.

3. Remove the ZT 6501 from the card cage.



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4. The left and right ejectors of the DRAM socket are flexible to assist removal and installation of DRAM modules. Modules are removed by freeing them from the left and right ejectors one at a time. Using your fingers, grasp the edges of the top DRAM module and lift gently, applying outward pressure on the left ejector, until the left side of the module is free from the socket.

5. Continue to gently lift the DRAM module, applying outward pressure on the right ejector, until the right side of the module is free from the socket.

6. Grasp the bottom edge of the DRAM module with your fingers and pull it toward the socket's open end. The DRAM module should come out easily.

7. Repeat steps 4 - 6 for the bottom DRAM module.

### DRAM Installation

Perform the steps below if it is necessary to install SO-DIMM DRAM modules. Review the topic "DRAM Installation and Removal Overview" before installing DRAM modules.

1. Put on an anti-static grounding strap.

2. Make sure the system is turned off.

3 Remove the ZT 6501 from the card cage.

4. The socket's right ejector is keyed to accommodate the notched end of the DRAM module. Install the notched end of the bottom DRAM module into the keyed ejector by gently pushing the module into the socket. If the DRAM module goes in crooked, it is probably in backwards.

5. Gently push down on the DRAM module until it latches in place. If it seems that too much pressure is required, use your fingers to gently push the ejectors outward until the DRAM module is seated in the socket.

6. Repeat Steps 4 and 5 to install the top DRAM module.

## DIP SWITCH SETTINGS AND LOCATIONS

The ZT 6501 includes three banks of switches. The "Factory Default DIP Switch Configuration" figure illustrates the factory default switch settings for ZT 6501 boards purchased in a DOS system. The "Customer DIP Switch Configuration" illustration provides a blank switch layout; use this figure to document your switch configuration if it differs from the factory default.

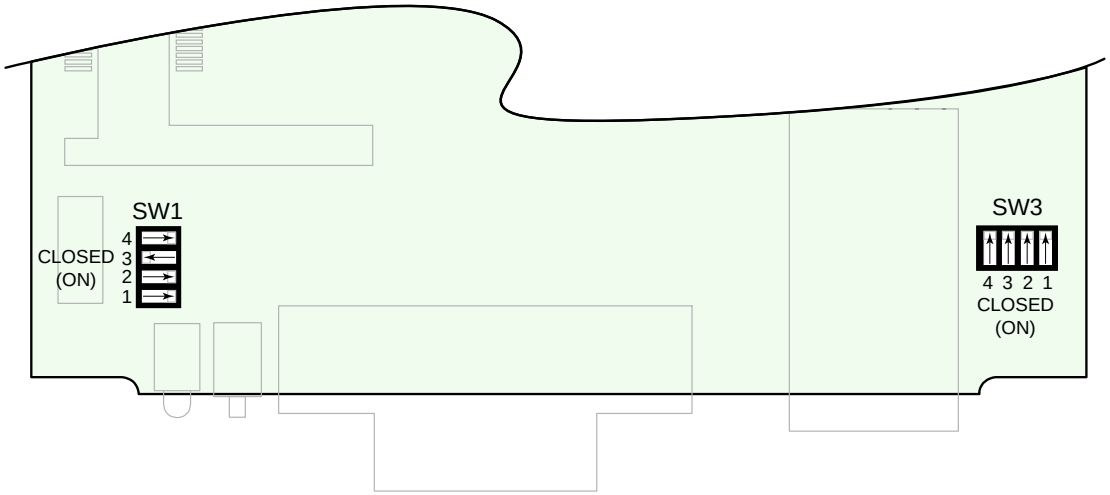
The "DIP Switch Cross Reference" table below lists each switch and its function.



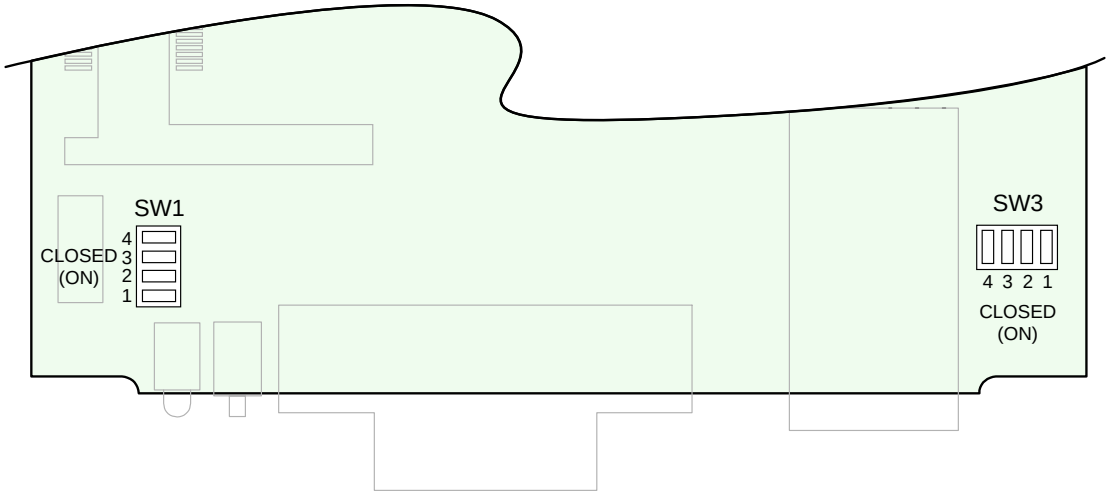
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*DIP Switch Cross Reference*

| Function | Switches |
|---|---|
| BIOS Recovery Device Enable | SW1-1 |
| Flash Write Protect | SW1-2 |
| CMOS RAM Battery Backup | SW1-3 |
| Clear Battery-Backed CMOS RAM | SW1-4 |
| Console Redirection | SW3-1 |
| Software ID Inputs 0-2 | SW3-2 to SW3-4 |




*Factory Default DIP Switch Configuration*




*Customer DIP Switch Configuration*



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## DIP SWITCH DESCRIPTIONS

The following topics list the DIP switches in numerical order and provide a detailed description of each switch. A dagger (†) indicates the default DIP switch configuration.

Note that where switches are referenced in this manual, “SWx” corresponds to the DIP switch number and “-N” corresponds to the DIP switch position (for example, SW2-3 means “DIP switch bank 2, position 3”). A switch referred to as “closed” can also be said to be “on.”

### SW1-1 (BIOS Recovery Device Enable)

SW1-1 enables/disables the BIOS Recovery Device (18480) in socket U14. By default, the BIOS Recovery Device is disabled. To enable the BIOS Recovery Device, set SW1-1 to the closed position.

Refer to “BIOS Recovery“ in Chapter 13 for step by step instructions.

| | SW1 - 1 | Function |
|---|---|---|
| † | Open | Disable BIOS Recovery Device |
| | Closed | Enable BIOS Recovery Device |

### SW1-2 (Flash Write Protect)

SW1-2 enables/disables write protection for the BIOS and flash memory. When SW1-2 is open (default), the flash is writable. When SW1-2 is closed, the flash is write protected, preventing software from changing the contents of flash memory.

**Note:** SW1-2 must be open when using the FLASH.EXE utility to recover a corrupted BIOS.

Refer to “BIOS Recovery“ in Chapter 13 for more information.

| | SW1 - 2 | Function |
|---|---|---|
| † | Open | Disable flash write protect |
| | Closed | Enable flash write protect |

† Factory default configuration.



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## SW1-3, SW1-4 (CMOS Clear / Battery Backup)

These switches are used to battery-back and clear the CMOS memory. When closed (default), SW1-3 connects the CMOS memory to the on-board battery. For normal operation this switch should remain in the closed position. If for some reason the CMOS needs to be cleared, perform the following steps:

1. Power off the system and remove the ZT 6501 from the card cage.

2. Open SW1- 3 and close SW1-4.

3. Open SW1-4 and close SW1-3.

4. Reinstall the ZT 6501 into the card cage and reboot the system. The CMOS is restored to its factory default settings.

**Note:** Do not keep SW1-3 and SW1-4 closed at the same time. Doing so will drain the on-board battery.

| | SW1-3 | SW1-4 | CMOS Configuration RAM |
|---|---|---|---|
| † | Closed | Open | Normal operation - CMOS battery-backed |
| | Open | Closed | Clear CMOS (return to default after clearing) |

## SW3-1 (Console Redirection)

Console Redirection provides a serial communication link (through COM1 or COM2) between a terminal or terminal emulation program and the ZT 6501. This feature requires specific parameters to be set in the BIOS Setup Utility before configuring SW3-1. Refer to the “Console Redirection” chapter in the *“Ziatech Embedded BIOS Manual”* before attempting to use this feature.

| | SW3 - 1 | Function |
|---|---|---|
| † | Open | Normal Operation |
| | Closed | Console redirection enabled |

† Factory default configuration.



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### SW3-2-SW3-4 (Software ID Inputs 0-2)

Switches SW3-2 through SW3-4 are configurable as general purpose inputs for software revision control, configuration setup, or other user-defined options. These bits are accessed by the Intel 430TX PCIset as shown in the table below. By default, all positions on bank SW2 are open.

**Note:** Ziatech may define these bits in the future.

| Switch | Default | Function |
|---|---|---|
| **SW3-2** | Open | PIIX4 General Input 14 |
| **SW3-3** | Open | PIIX4 General Input 15 |
| **SW3-4** | Open | PIIX4 General Input 16 |

## CUTTABLE TRACE OPTIONS AND LOCATIONS

The ZT 6501 contains several cuttable traces (zero ohm shorting resistors) that allow the user to configure several board options. The "Cuttable Trace Locations" figure shows the placement of the ZT 6501 cuttable traces. The "Cuttable Trace Definitions" table provides a quick cross-reference for the ZT 6501 cuttable trace descriptions that follow.

There are two types of cuttable traces on the ZT 6501: single-option and double-option. **Single option** cuttable traces (labeled CT**x**; for example, CT2) have two surface mount pads. A zero ohm shorting resistor is then soldered between these pads to make the connection. **Double option** cuttable traces (labeled CT**x** "A" and "B"; for example, CT1A and CT1B) are implemented using three surface mount pads. The zero ohm shorting resistor is then soldered between one set of pads, depending on the chosen option.

**Note:** Cuttable trace modifications should only be performed by a qualified technician familiar with surface mount soldering techniques. The product warranty is voided if the board is damaged by customer modifications. If a qualified technician is not available to you, contact Ziatech Technical Support. For large production orders, Ziatech can also set up specials that are pre-configured at the factory. Contact Ziatech for more information.



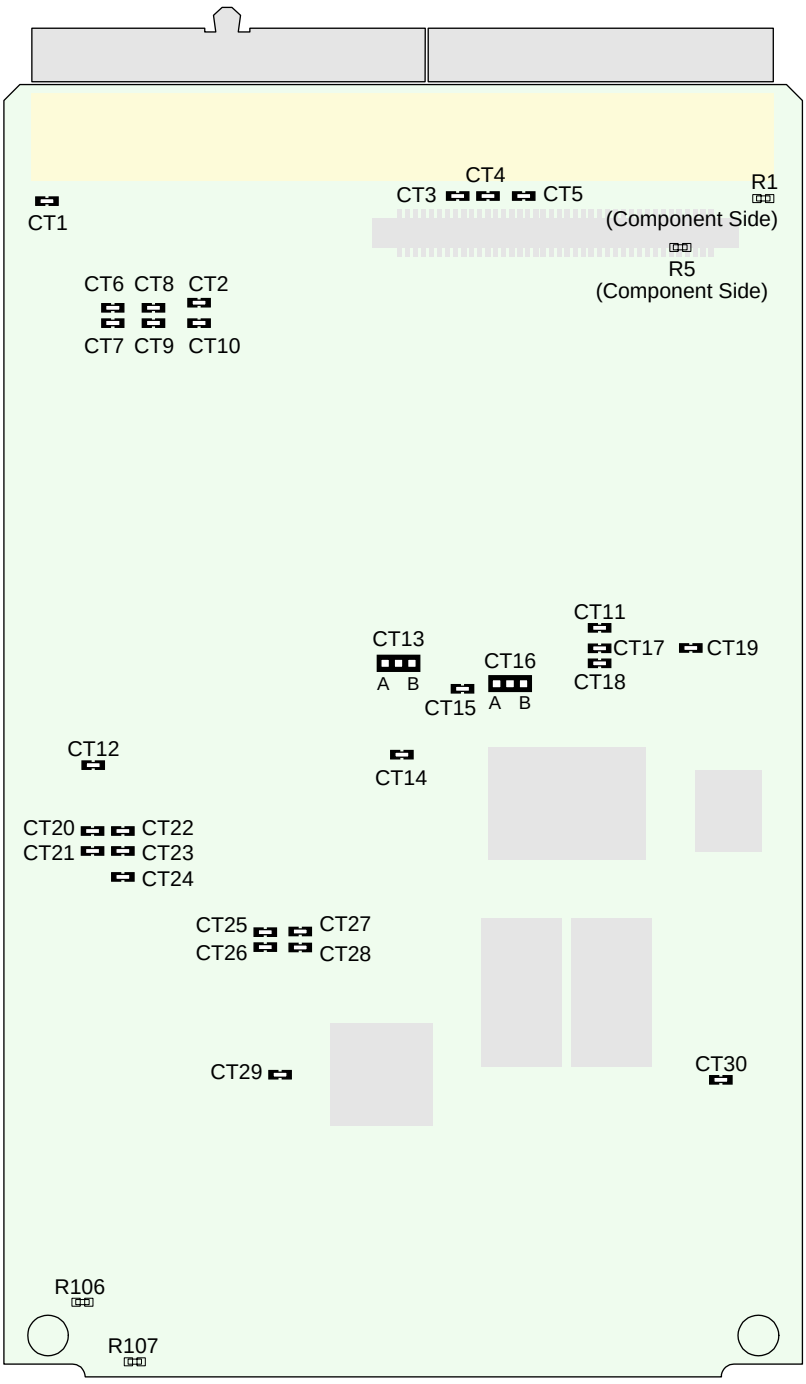
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### *Cuttable Trace Definitions*

| CT | Default | Description |
|---|---|---|
| CT1 | OUT | Backplane JTAG Connector |
| CT2 | OUT | Core DC-DC Share Circuitry |
| CT6 | IN | CPU Core Voltage Select (1.9V) |
| CT7 | IN | CPU Core Voltage Select (1.9V) |
| CT8 | IN | CPU Core Voltage Select (1.9V) |
| CT9 | OUT | CPU Core Voltage Select (1.9V) |
| CT10 | IN | CPU Core Voltage Select (1.9V) |
| CT11 | IN | CPU Type Select |
| CT12 | OUT | Interface DC-DC Circuitry |
| CT13 | B | Voltage Monitor 3V/5V (3v def.) |
| CT15 | IN | Software Reset Control |
| CT16 | B | Fan Voltage 5V/12V (12V def.) |
| CT17 | OUT | CPU Type Select |
| CT18 | IN | CPU Type Select |
| CT19 | OUT | Serial RNG Wake-Up |
| CT20 | OUT | CPU Interface Voltage Select (2.5V) |
| CT21 | OUT | CPU Interface Voltage Select (2.5V) |
| CT22 | IN | CPU Interface Voltage Select (2.5V) |
| CT23 | OUT | CPU Interface Voltage Select (2.5V) |
| CT24 | IN | CPU Interface Voltage Select (2.5V) |
| CT25 | IN | Board Revision |
| CT26 | IN | Board Revision |
| CT27 | IN | Board Revision |
| CT28 | IN | Board Revision |
| CT29 | IN | Board Revision |
| CT30 | OUT | Rear Ethernet Enable (Disabled) |
| R1-R5 | IN | Geographical Addressing |
| R106 | IN | Connects chassis ground to logic ground |
| R107 | IN | Connects chassis ground to logic ground |



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*Cuttable Trace Locations*



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## CT1 (Backplane JTAG Connector)

When installed, the JTAG signal from the CPU board is routed to the CompactPCI backplane.

| | CT1 | Function |
|---|---|---|
| † | Out | Disable Backplane JTAG Routing |
| | In | Enable Backplane JTAG Routing |

## CT2 (Core DC-DC Share Circuitry) and CT12 (Interface DC-DC Share Circuitry)

CT2 and CT12 are always out since the CPU core and interface voltages are different for the Embedded Pentium processor.

| | Position | Function |
|---|---|---|
| † | Out | Disable DC-DC Sharing Circuitry |
| | In | Enable DC-DC Sharing Circuitry |

## CT6-CT10, CT20-CT24 (CPU Interface Voltage Select)

These cuttable traces set the CPU I/O (CT20-CT24) and CPU core (CT6-CT10) voltages. These cuttable traces are set at the factory and should not be changed by the user. Doing so may damage the processor.

**Note:** The CPU I/O voltage is set to 2.5 V by default. The CPU core voltage is set to 1.9 V by default .

| CT24/CT10 | CT23/CT8 | CT22/CT9 | CT20/CT6 | CT21/CT7 | Voltage |
|---|---|---|---|---|---|
| Out | Out | Out | Out | Out | 1.244 |
| Out | Out | Out | Out | In | 1.340 |
| In | Out | Out | Out | In | 1.390 |
| Out | In | Out | Out | In | 1.440 |
| In | In | Out | Out | In | 1.490 |
| Out | Out | In | Out | In | 1.540 |
| In | Out | In | Out | In | 1.590 |
| Out | In | In | Out | In | 1.640 |
| In | In | In | Out | In | 1.690 |

(Table continues on following page)

† Factory default configuration.



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(Continued from previous page)

| CT24/CT10 | CT23/CT8 | CT22/CT9 | CT20/CT6 | CT21/CT7 | Voltage |
|---|---|---|---|---|---|
| Out | Out | Out | In | In | 1.740 |
| In | Out | Out | In | In | 1.790 |
| Out | In | Out | In | In | 1.840 |
| In | In | Out | In | In | 1.890 |
| Out | Out | In | In | In | 1.940 |
| In | Out | In | In | In | 1.990 |
| Out | In | In | In | In | 2.040 |
| In | In | In | In | In | 2.090 |
| In | Out | Out | Out | Out | 2.140 |
| Out | In | Out | Out | Out | 2.240 |
| In | In | Out | Out | Out | 2.340 |
| Out | Out | In | Out | Out | 2.440 |
| In | Out | In | Out | Out | 2.540 |
| Out | In | In | Out | Out | 2.640 |
| In | In | In | Out | Out | 2.740 |
| Out | Out | Out | In | Out | 2.840 |
| In | Out | Out | In | Out | 2.940 |
| Out | In | Out | In | Out | 3.040 |
| In | In | Out | In | Out | 3.140 |
| Out | Out | In | In | Out | 3.240 |
| In | Out | In | In | Out | 3.340 |
| Out | In | In | In | Out | 3.440 |
| In | In | In | In | Out | 3.540 |

## CT11, CT17, CT18 (CPU Speed Multiplier Settings)

CT11, CT17, and CT18 are used to set the multiplication factor of the internal CPU clock. These cuttable traces are set at the factory and should not be changed by the user. The ZT 6501 may not operate if these cuttable traces are changed.

| CPU Speed (MHz) | Core Multiplier | CT17 (BF2) | CT18 (BF1) | CT11 (BF0) |
|---|---|---|---|---|
| 266MHz | 4.0x | OUT | IN | IN |



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## CT13 (Voltage Monitor)

CT13 determines whether the system watchdog monitors for a 3.3 V system or a 5 V system.

| | Position | Function |
|---|---|---|
| | CT13A | Monitor at 5 V |
| † | CT13B | Monitor at 3.3 V |

## CT15 (Software Reset Control)

When CT15 is installed, a PRST# signal from the CompactPCI backplane or a reset signal from the two stage watchdog resets the processor.

| | CT15 | Function |
|---|---|---|
| | Out | Disable Software Reset |
| † | In | Enable Software Reset |



**Caution:** If this trace is removed, a reset signal from the watchdog will not reset the processor.

## CT16 (Fan Voltage Select)

CT16 selects the voltage for the processor cooling fan.

| | Position | Fan Voltage |
|---|---|---|
| | CT16A | 5 V |
| † | CT16B | 12 V |

## CT19 (Serial RING Wake-Up)

If this trace is installed, the CPU comes out of sleep mode when a RING is detected on serial port 1 (COM 1).

| | CT19 | Function |
|---|---|---|
| † | Out | Disable Serial RING Wake-Up |
| | In | Enable Serial RING Wake-Up |

† Factory default configuration.



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## CT25-CT29 (Board Revision)

These cuttable traces are set at the factory depending on the current board revision and should not be modified by the user.

## CT30 (Rear Panel Ethernet Enable)

This cuttable trace controls the routing of the Ethernet signals to the rear panel.

| | CT30 | Function |
|---|---|---|
| † | Out | Disable Rear Panel Ethernet Routing |
| | In | Enable Rear Panel Ethernet Routing |

## R1-R5 (Geographical Addressing)

R1 through R5 configure the board for use in backplanes that support Geographical Addressing, according to the table below. Failure to correctly configure these resistors in backplanes that support Geographical Addressing could cause the keyboard and mouse to function improperly. In backplanes that do not support Geographical Addressing, all of these resistors should be installed (default).

| | Position | Function |
|---|---|---|
| | Out | Backplane supports Geographical Addressing. |
| † | In | Backplane does not support Geographical Addressing |

## R106-R107 (Connect Chassis Ground to Logic Ground)

By default, the ZT 6501's face plate connector are connected to chassis and logic ground. These connectors can be connected to an isolated chassis ground by removing R106 and R107. Both of these cuttable traces should be in or both should be out. The factory default is Both In.

| | Position | Function |
|---|---|---|
| | Out | Front panel connectors on an isolated chassis ground. |
| † | In | Front panel connectors connected to chassis and logic ground. |



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# 5. CompactPCI INTERFACE

The ZT 6501 operates with the CompactPCI bus architecture to support additional I/O and memory mapped devices as required by the application. This chapter gives a brief overview of the CompactPCI architecture and its effect on the operation of the ZT 6501.

For more detailed information on CompactPCI, obtain the complete specification from PICMG (PCI Industrial Computers Manufacturers Group). Contact PICMG via their web site at http://www.picmg.org/. A short form specification is also available on Ziatech's web site at http://www.ziatech.com/cpcimain.htm.

## CompactPCI OVERVIEW

CompactPCI is an adaptation of the *Peripheral Component Interconnect (PCI) Specification*. It has been optimized for industrial and/or embedded applications that require a more robust mechanical form factor than Desktop PCI. CompactPCI uses industry standard mechanical components and high performance connector technologies to provide a system well suited for rugged applications. CompactPCI provides a system that is electrically compatible with the PCI Specification, allowing low cost PCI components to be used. CompactPCI is an open standard supported by the PICMG (PCI Industrial Computers Manufacturers Group), which is a consortium of companies involved in utilizing PCI for embedded applications.

## INTENDED APPLICATIONS

CompactPCI appeals to customers that require the following capabilities:

- PCI performance
- 32- and 64-bit data transfers
- Eight PCI slots per system
- Industry standard software support
- 3U small form factor (100 mm by 160 mm)
- 6U form factor (233 mm by 160 mm)
- Eurocard packaging
- Wide variety of available I/O

## APPLICABLE DOCUMENTS

For more information on the *PCI Local Bus Specification,* refer to the "CompactPCI" topic in Appendix F.



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# 6. SERIAL CONTROLLER

This chapter discusses the operation of the ZT 6501's two serial ports. Each channel is implemented in the National Semiconductor PC87309 SuperI/O Plug and Play Compatible Chip and is compatible with the industry standard 16550 serial port, including support for a 16 byte FIFO for read and write operations.

The "SuperI/O" topic in Appendix F provides a link to the PC87309 data sheet.

## ZT 6501 SPECIFICS

The interface for each serial port is implemented with 5 V charge pump technology. The serial ports include a complete set of handshaking and modem control signals, maskable interrupt generation, and data transfer rates up to 115.2 Kbaud. Both channels are supplied as DTE configured devices through the multi-I/O connector (J6). The ZT 90247 Multi-I/O cable allows each channel to interface directly to 9-pin D-Shell serial devices, as used in PC applications. Each port may be disabled to allow CompactPCI-based COM ports (such as an off-board modem) to be used.

The major features of each serial port are listed below.

- 16550 compatible
- Loopback diagnostics
- Two RS-232 channels
- Baud rates up to 115.2 Kbaud
- Polled and interrupt operation
- Drivers do not require ±12 V

Details for the two serial ports on the ZT 6501 are discussed below.

### Address Mapping

The address mapping for the PC standard architecture and the ZT 6501 is shown below.

| Serial Channel | PC Port Address | ZT 6501 Port Address |
|---|---|---|
| COM1 | 3F8-3FF | 3F8-3FF or disabled for off-board COM support |
| COM2 | 2F8-2FF | 2F8-2FF or disabled for off-board COM support |



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### Interrupt Selection

The interrupt mapping for the PC standard architecture and the ZT 6501 is shown below. Different interrupt levels for COM1 and COM2 interrupts are selectable through the Advanced menu in the BIOS setup utility.

| Serial Channel | PC Interrupt | ZT 6501 Interrupt |
|---|---|---|
| COM1 | IRQ4 | IRQ4 or disabled for off-board COM support |
| COM2 | IRQ3 | IRQ3 or disabled for off-board COM support |

### Handshake Signals

The PC architecture includes the following signals:

- Ring Indicator (RI)
- Clear To Send (CTS)
- Receive Data (RXD)
- Transmit Data (TXD)
- Data Terminal Ready (DTR)
- Data Carrier Detect (DCD)
- Request To Send (RTS)
- Data Set Ready (DSR)

### Serial Channel Interface

The serial ports are configured as DTE and are available through the 60-pin D-sub type multi-I/O connector (J6). The optional ZT 90247 Multi-I/O cable converts the serial port interface to standard 9-pin D-shell connectors.

## SERIAL CONTROLLER PROGRAMMABLE REGISTERS

There are seven registers for initializing and controlling each serial channel. The "Serial Controller Register Addressing" table shows the I/O port addressing for the COM port registers.



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### *Serial Controller Register Addressing*

| COM 1 Address | COM 2 Address | Register | Operation |
|---|---|---|---|
| 03F8h (DIV=0) | 02F8h (DIV=0) | Receive Buffer | Read |
| 03F8h (DIV=0) | 02F8h (DIV=0) | Transmit Buffer | Write |
| 03F8h (DIV=1) | 02F8h (DIV=1) | Divisor Latch LSB | Read/Write |
| 03F9h (DIV=0) | 02F9h (DIV=0) | Interrupt Control | Read/Write |
| 03F9h (DIV=1) | 02F9h (DIV=1) | Divisor Latch MSB | Read/Write |
| 03FAh | 02FAh | Interrupt Status | Read |
| 03FAh (DIV=X) | 02FAh (DIV=X) | FIFO Control | Write |
| 03FBh | 02FBh | Line Control | Read/Write |
| 03FCh | 02FCh | Modem Control | Read/Write |
| 03FDh | 02FDh | Line Status | Read |
| 03FEh | 02FEh | Modem Status | Read |
| 03FFh | 02FFh | Reserved | |



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# 7. IEEE Std 1284 PARALLEL PORT INTERFACE

The ZT 6501 supports an IEEE Std 1284 compatible parallel printer port interface, available through the multi-I/O connector (J6).

The printer port is configurable for the following modes using the Advanced menu of the BIOS Setup utility:

- Normal (compatibility) mode (the default mode)
- Extended (Ext)
- EPP
- ECP

ZT 6501 support for the IEEE Std 1284 Printer Port is confined to enabling the mode. Ziatech does not offer drivers. The operating system must support the extended/EPP/ECP modes.

The ZT 90247 Multi-I/O cable allows the on-board LPT1 channel to interface directly to 25-pin D-Shell parallel port devices, as used in PC applications. The on-board port may be disabled using the BIOS setup utility.

## PARALLEL PORT CONFIGURATION OPTIONS

The different modes for the printer port are described below. Details for the parallel port on the ZT 6501 are discussed in the following topics. Shown in parenthesis is the description for each of the modes as presented in the Advanced Screen of the BIOS Setup utility.

| Parallel Port Mode | Description | Max. Data Rate |
|---|---|---|
| Compatibility (Normal)† | Uni-directional data configuration. The original PC-AT Mode. Also known as “nibble mode” because the four status bits in the cable are used for feedback from devices such as tape back-up units (when restoring data from a tape). Software based protocol. | 50-150 Kbits/s |
| Extended (Ext) | Bi-directional data transfer capability. Similar to Normal mode, but allows 8-bit data in both directions. Faster for interfaces needing to supply data to the computer (e.g., scanners, tape back-up). Software based protocol. | 50-150 Kbits/s |

† Default mode.



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| Parallel Port Mode | Description | Max. Data Rate |
|---|---|---|
| EPP (EPP) | Enhanced Parallel Port. Hardware based handshaking of the data transfers provide single I/O instruction data transfers in read and write operations. Register superset of Normal/Extended modes. | 500 Kbits/s-2 Mbits/s |
| ECP (ECP) | IEEE Std 1284 Extended Capability Port. Similar to EPP, but register set is strictly defined. Adds FIFOs for read/write operations. ECP devices require IEEE Std 1284 compliant cabling and buffers. The ZT 6501 supplies compliant buffers - cabling is available from other sources. | 500 Kbits/s-2 Mbits/s |

## ADDRESS MAPPING

The address mapping for the PC standard architecture and the ZT 6501 is shown below. The on-board port may be disabled using the Advanced Screen of the BIOS Setup utility.

| Parallel Port | PC Port Address | ZT 6501 Port Address |
|---|---|---|
| LPT1 | 3BC (typically) | 378-37F - Normal, Extended, EPP Modes<br>378-37A, 778-77A - ECP Mode |

## INTERRUPT SELECTION

The interrupt mapping for the PC standard architecture and the ZT 6501 is shown below.

| Parallel Port | PC Interrupt | ZT 6501 Interrupt |
|---|---|---|
| LPT1 | IRQ5 | IRQ7 or disabled for off-board LPT support |

## DMA SELECTION

DMA may be configured for ECP mode in software. DMA channel 0 is dedicated for ECP support and may be used by application software. Applications needing DMA support must configure the parallel port with appropriate initialization code.



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## PARALLEL PORT INTERFACE PROGRAMMABLE REGISTERS

There are three registers for the compatibility/extended mode parallel port interface. The “Compatibility/Extended Mode Parallel Port Interface Addressing“ table shows the I/O port addressing. For EPP and ECP information, see the National Semiconductor *PC87309 SuperI/O™ Plug and Play Compatible Chip* data sheet referenced in the “SuperI/O“ topic in Appendix F.

*Compatibility/Extended Mode Parallel Port Interface Addressing*

| Address | Register | Operation |
|---|---|---|
| 0378h | Line Printer Data | Read/Write |
| 0379h | Line Printer Status | Read |
| 037Ah | Line Printer Control | Read/Write |



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# 8. OPTIONAL FLOPPY DISK INTERFACE

The ZT 6501 can be ordered with an optional floppy disk drive. Included with the drive is a special 3-slot frontplate that includes an opening for the floppy drive (to the left of the CPU, solder side), along with a mounting plate for attaching the floppy to the ZT 6501. In addition, connector J3 on the solder side of the 17662 Media Carrier Board is loaded for access to the floppy signals.

This chapter provides an overview of the optional Floppy Disk Controller, implemented with the National Semiconductor PC87306 SuperI/O Interface. It also includes a product definition, a list of product features, and an I/O map.

The SuperI/O topic in Appendix F provides a link to the National Semiconductor *PC87306 SuperI/O™ Enhanced Sidewinder Lite Floppy Disk Controller, Keyboard Controller, Real-Time Clock, Dual UARTs, Infrared Interface, IEEE 1284 Parallel Port, and EIDE Interface* preliminary data sheet.

## FEATURES OF THE OPTIONAL FLOPPY DISK INTERFACE

- 1.44 Mbyte floppy disk drive support
- IBM-PC®/AT®/MCA®/EISA® compatible register set
- 3½" floppy disk drive support
- Integrated 3½" slimline floppy disk drive (1 slot wide)

## INTERRUPTS

The Floppy Disk Controller communicates status to the host processor via interrupt IRQ6.

## FLOPPY DISK CONTROLLER

The Floppy Disk Controller (FDC) supports all DOS-compatible floppy disk drives through a 1-millimeter, 26-pin connector. Data rates of 250 Kbps, 300 Kbps, 500 Kbps, and 1 Mbps are supported through program control. An on-board 16-byte FIFO provides increased bus-latency tolerance. The FDC is fully compatible with the IBM-AT, IBM-PS/2®, and EISA architectures.

## POWER REQUIREMENTS

Power required by the optional floppy depends upon the type of drive loaded on the FDC. Consult Appendix A, "CPU Specifications," for details. Only +5 V is required for the floppy drive.



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## DMA MODE SELECTION

The optional floppy drive is configured to use DMA channel 2.

## DATA TRANSFERS

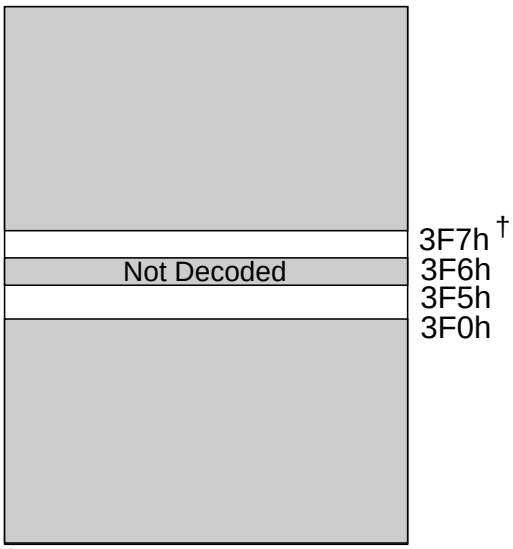
The FDC supports both polled and DMA-driven data transfers. Standard MS-DOS uses DMA, by default, for moving data back and forth between the host CPU's memory and the FDC. The DMA transfer is driven by the DMA controller on the CPU board. The BIOS software is responsible for managing the low-level hardware in DOS systems. All transfers are 8 bits wide.

### Memory

The floppy interface does not occupy or decode any memory address space.

### I/O

The floppy interface I/O address range is 3F0h-3F7h, with the exception of 3F6h. Port 3F7h is shared with the hard disk interface. The I/O map is shown below.




*I/O Map*



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## FLOPPY DISK CONTROLLER DESCRIPTION

The optional floppy interface is software compatible with the DP8477, 765A, and N82077. The interface has 100% hardware register compatibility for PC/ATs and PS/2s. The 16-byte FIFO with programmable thresholds is extremely useful in systems with a large amount of bus latency.

### Perpendicular Recording Mode

Perpendicular Recording Mode allows direct interface to perpendicular recording floppy drives that use the Toshiba format. Perpendicular recording differs from the traditional longitudinal method by orienting the magnetic bits vertically. This scheme then packs in more data bits for the same area.

The floppy interface with perpendicular recording drives can, at a minimum, read standard 3½" floppies as well as read and write perpendicular media. Some manufacturers offer drives that can read and write standard and perpendicular media in a perpendicular media drive. A single command puts the floppy interface into perpendicular mode. All other commands operate as they normally do. The perpendicular mode requires the 1 Mbits/s data rate. At this data rate, the FIFO eases the host interface bottleneck.



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# 9. OPTIONAL EIDE INTERFACE

The ZT 6501 supports a local Enhanced Integrated Drive Electronics (EIDE) hard disk or CompactFlash through an optional Media Carrier Board (17662) attached to the bottom of the ZT 6501.

The onboard EIDE interface is not field installable; it must be installed at Ziatech Corporation. When configured for local EIDE operation, the ZT 6501 requires one additional slot in the card cage. The ZT 6501's EIDE channel is factory-configured as Primary Master. When the ZT 6501 is configured for local EIDE support, the EIDE channel available through the backplane is factory-configured as Primary Slave. See Chapter 2, "RPIO Introduction," for more information.

A green LED indicating IDE power is located on the ZT 6501 faceplate.

## HARD DISK OPTION

The ZT 6501's Media Carrier Board has mounting holes for a 2.5 inch EIDE hard disk and a 44-pin, 2 mm, right-angle connector (J1), providing access to the ZT 6501's primary EIDE channel.

The specific size of the drive (in Megabytes) sold with this option may change because the hard disk drive market continually improves capacity. In general, Ziatech offers a higher capacity drive for the same or similar price when a new drive is qualified.

## COMPACTFLASH OPTION

When attached to the ZT 6501, the optional Media Carrier Board (17662) allows solid state IDE capability through a CompactFlash connector (J4), which provides access to the ZT 6501's primary EIDE channel. This 50-position right angle surface mount header is designed to accommodate CompactFlash expansion cards that appear to the system as a hard drive and are automatically supported by most operating systems.

### CompactFlash Card Installation and Removal

To install or remove a CompactFlash card, perform the steps below.



**Caution:** To avoid damage to the CPU, perform the installation and removal at a static-free workstation.

**Removal/Installation**

1. Make sure the system is powered off.

2. Put on an anti-static grounding strap.



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3. Separate the CPU from the Media Carrier Board by unscrewing the two mounting screws from the face plate and one mounting screw from the ZT 6501 and gently disconnecting the boards at J4 (CPU) and J2 (Media Carrier Board).

4. Remove the CompactFlash card by grasping the card and pulling it out of the socket.

5. Most CompactFlash cards have an arrow on the top label indicating correct orientation. To install the CompactFlash card, align the arrow on the card with the arrow on the connector and slide the card into place until the connection is snug. The dimensions of the grooves in the sides of the CompactFlash card prevent incorrect installation.

6. Reassemble the boards by seating J4 (CPU) and J2 (Media Carrier Board) and re-installing the three mounting screws.

## SELECTING EIDE OPERATION TYPE

If you require a different EIDE device from what shipped with the ZT 6501, you must enable the ZT 6501 for EIDE operation through the BIOS Setup utility. Your selection automatically configures the ZT 6501 for I/O addressing and interrupt support.

Access the utility by pressing the "**F2**" key while the system is booting.

From the BIOS Setup utility's main screen, change the Primary Master selection to Auto. This enables automatic detection and configuration of the local hard drive. Press the "**F10**" key to save the changes and exit the BIOS setup utility.



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# 10. SYSTEM REGISTERS

There are three system registers used to control and monitor a variety of functions on the ZT 6501. These registers are located at I/O address range 0078h – 007Ah. Two of the registers are read/write capable; the third is a read-only register.

Normally these registers are used only by the system BIOS, but they are documented here for application use as needed. Because the system BIOS controls (and may need to rely on the status of) certain bits in these registers, take care when modifying the contents of these registers.

## PROGRAMMABLE SYSTEM REGISTERS

The following System registers are described in this chapter:

| Config Address Offset | Register Symbol | Register Name | Default Value | Access | Size | Reset |
|---|---|---|---|---|---|---|
| 78h | Register 1 | Flash Control/CPU LED/Ethernet Dir | 0x00 | R/W | 8 bits | None |
| 79h | Register 2 | Watchdog | 0x00 | R/W | 8 bits | None |
| 7Ah | Register 3 | Event Monitors | 0x44 | RO | 8 bits | None |



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## System Register 1

**Offset:** 78h **Access:** R/W

**Default Value:** 0x00 **Size:** 8 bits

| Bit | Description | Access | Default |
|---|---|---|---|
| 7 | PG3 - Flash Page Select Bit 3 | R/W | 0 |
| 6 | PG2 - Flash Page Select Bit 2 | R/W | 0 |
| 5 | PG1 - Flash Page Select Bit 1 | R/W | 0 |
| 4 | PG0 - Flash Page Select Bit 0 | R/W | 0 |
| 3 | CPULED - Turn on CPU LED | R/W | 0 |
| 2 | DEVSEL - Device Select,<br>0 = standard flash, 1 = optional flash | R/W | 0 |
| 1 | FLWPB - Flash write protect output,<br>0= write protect, 1= writable | R/W | 0 |
| 0 | EDIR - Ethernet Direction | R/W | 0 |

## System Register 2

**Offset:** 79h **Access:** R/W

**Default Value:** 0x00 **Size:** 8 bits

| Bit | Description | Access | Default |
|---|---|---|---|
| 7 | RESBIT - Reset Monitor Bit | R/W | 0 |
| 6 | NMIBIT - NMI Monitor Bit | R/W | 0 |
| 5 | RESEN - Reset Enable Bit | R/W | 0 |
| 4 | NMIEN - NMI Enable Bit | R/W | 0 |
| 3 | NC | R/W | 0 |
| 2 | TERMCNT2 - Programmed Timeout Bit 2 | R/W | 0 |
| 1 | TERMCNT1 - Programmed Timeout Bit 1 | R/W | 0 |
| 0 | TERMCNT0 - Programmed Timeout Bit 0 | R/W | 0 |



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## System Register 3

**Offset:** 7Ah **Access:** RO

**Default Value:** 0x44 **Size:** 8 bits

| Bit | Description | Access | Default |
|---|---|---|---|
| 7 | NC | RO | 0 |
| 6 | ENUM | RO | 1 |
| 5 | FANIN - Fan Tach | RO | 0 |
| 4 | FAIL - Power Supply Failure | RO | 0 |
| 3 | DEG - Power Supply Degraded | RO | 0 |
| 2 | MULT2 - CPU Multiplier 2 | RO | 1 |
| 1 | MULT1 - CPU Multiplier 1 | RO | 0 |
| 0 | MULT0 - CPU Multiplier 0 | RO | 0 |



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# 11. RESET AND WATCHDOG TIMER

Because many embedded systems have different requirements for board reset and watchdog functions, the incorporation of these sub-systems on the ZT 6501 has been designed to provide maximum flexibility.

This chapter provides information on using the various reset sources and the watchdog timer.

## RESET OPERATION

The ZT 6501's reset circuitry allows both hard and soft resets. The following discussion describes how both reset types are used.

### Soft Reset

Typically, a soft reset is generated through software when the **Ctrl-Alt-Del** keys are pressed, or when a restart is issued in an operating system such as Windows NT. In addition to these reset methods, the ZT 6501 provides another way to perform soft resets through software.

#### Software

A soft reset can be issued through software by using the following sequence:

1. Write an x0FEh to the keyboard controller's I/O port x064h.

2. Write an x00h, x04h sequence to the Reset Control register in the PIIX4 (mapped at I/O location x0CF9h).

### Hard Reset

The ZT 6501 includes several hard reset sources, described in the following list.

- **Power up**. During power up, on-board circuitry generates a reset to the board (minimum time = 260 µs, typical time = 425 µs, maximum time = 625 µs).

- **Pushbutton reset**. Pressing the RESET pushbutton on the face plate generates a hardware reset. The reset circuit debounces this pushbutton and outputs a stable reset to the board.

- **PRST# on CompactPCI bus connector** J5**, pin-C42**. As defined in the *CompactPCI Specification, Rev. 2.1*, another peripheral on the PCI bus can generate a reset signal to the CPU. This pin is wired with the pushbutton reset. In order for this method to work, cuttable trace CT15 must be installed (default).



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- **Reset Control Register**. A hard reset is issued by writing an x00h, x06h sequence to the PIIX's Reset Control register. See the “PCI Reset With Bus Master Devices” topic for details on this option. The “PIIX4“ topic in Appendix F provides a link to the Intel PIIX data sheet.

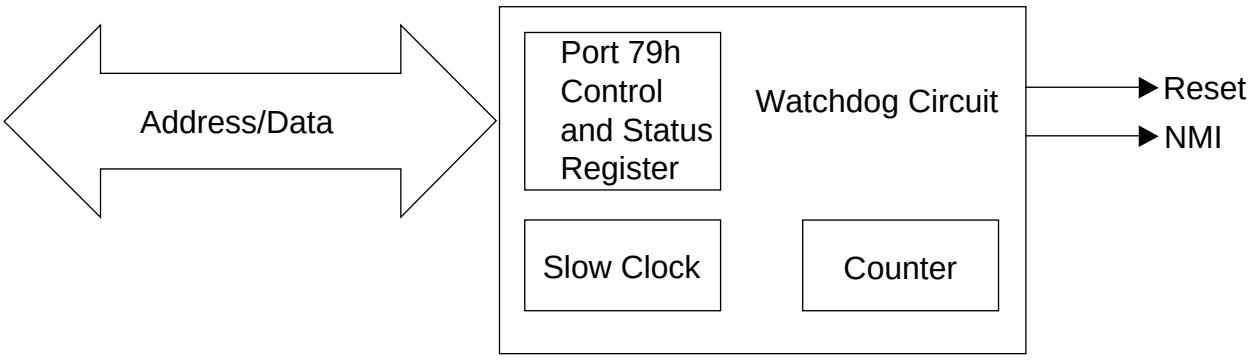
- **Watchdog Timer**. A hard reset is issued if the watchdog timer is allowed to expire without being strobed within 0.25 s. In order for this method to work, cuttable trace CT15 must be installed. It is installed by default. See the “Watchdog Timer Operation” topic below for details on using the Watchdog Timer.

## WATCHDOG TIMER OPERATION

The primary function of the watchdog timer is to monitor ZT 6501 operation and take corrective action if the system fails to function as programmed. The major features of the watchdog timer are listed below.

- Two stage
- Enabled and disabled through software control
- Armed and strobed through software control

In order for the watchdog timer to work, cuttable trace CT15 must be installed (default). The watchdog timer is implemented in the system PAL. After power on or reset, the watchdog function is disabled. To enable the watchdog, set bit 4 in System register 2 (79h) for NMI generation, and/or bit 5 for Reset generation. Set the timeout interval using bits 0 – 2 in System register 2 (79h). The timeout intervals available are 0.25 s, 0.5 s, 1 s, 8 s, 32 s, 64 s, 128 s, and 256 s. Once running, the watchdog must be strobed by software by reading from or writing to System register 2 (79h).




*Watchdog Timer Architecture*

## USING THE WATCHDOG IN AN APPLICATION

This section describes watchdog usage and provides some example code.



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## Using the Watchdog Reset

An application is more likely to use the watchdog reset feature than the NMI feature. An application using the watchdog reset feature:

1. Enables the watchdog reset

2. Sets the terminal count period

3. Periodically strobes the watchdog to keep it from resetting the system

If a strobe is missed, it is assumed that an application error has occurred, and the watchdog resets the system hardware for a fresh start.

## Setting the Terminal Count

The terminal count determines how long the watchdog waits for a strobe before resetting the hardware. C code to do this might look like the following:

```
#define WD_CSR_IO_ADDRESS     0x79    // IO address of the watchdog
#define WD_T_COUNT_MASK       0x07    // Bit mask for terminal count bits.
#define WD_500MS_T_COUNT      0x01    // Terminal count values . . . .
#define WD_1S_T_COUNT         0x00    //
#define WD_250MS_T_COUNT      0x00    //
.
.
.
Void SetTerminalCount(void){
        Unsigned char WdValue;              // Holds watchdog register values.
                                            //
        WdValue = inb(WD_CSR_IO_ADDRESS);   // Get the current contents of the watchdog
                                            // register.
        WdValue &= ~ WD_T_COUNT_MASK;       // Mask out the terminal count bits.
        WdValue |= WD_500MS_T_COUNT;        // Set the desired terminal count.
        Outb(WD_CSR_IO_ADDRESS,WdValue);    // Furnish the watchdog register with the new
                                            // count value.
}
```



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### Enabling the Watchdog Reset

C code to enable the watchdog reset might look like the following:

```
#define WD_RESET_EN_BIT_SET   0x20

Void EnableWatchdogReset(void){
        Unsigned char WdValue;              // Holds watchdog register values.
                                            //
        WdValue = inb(WD_CSR_IO_ADDRESS);   // Read the current contents of the watchdog
                                            // register.
        WdValue |= WD_RESET_EN_BIT_SET;     // Assert the enable bit in the local copy.
        Outb(WD_CSR_IO_ADDRESS,WdValue);    // Assert the enable in the watchdog
                                            // register.
}
```

### Strobing the Watchdog

Once the watchdog is enabled, it must be continuously strobed within the terminal count period, or the system hardware will be reset. C code to strobe the watchdog might look like the following:

```
Void StrobeWatchdog(void){
        Inb(WD_CSR_IO_ADDRESS);             // A single read is all it takes.
}
```

### Using the Watchdog NMI

A more exotic feature of the watchdog is its NMI generation feature. When this feature is enabled, an NMI precedes a watchdog reset by 250 ms. The NMI feature allows the application to use these 250 ms to perform essential tasks before the hardware is reset.

To accomplish this, the following must occur:

- The code for performing the essential tasks must be included in an interrupt service routine (ISR)
- The ISR must be chained to the existing NMI ISR
- The watchdog NMI needs to be enabled

### Chaining the ISRs

The NMI ISR vector must be stored away so that it can be invoked from the watchdog ISR. The interrupt vector table must then be altered so that the NMI ISR vector is overwritten with a vector to the watchdog ISR. Example C code to do this in DOS is shown on the following page.



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```
#define NMI_INTERRUPT_VECTOR_NUMBER 2

void interrupt far (*OldNmiIsr)();


Void HookWatchdogIsr(void){

//
// To be absolutely certain the interrupt table is not accessed by an NMI (This is
// quite unlikely.), the application could  disable NMI in the chip set before
// installing the new vector.
//
.
.
.
//
// Install the new ISR.
//
OldNmiIsr = getvect(IsrVector);                          // Save the old vector.
setvect(NMI_INTERRUPT_VECTOR_NUMBER, WatchdogIsr);   // Install the new.
}
```

## NMI Routine

The watchdog NMI handler can't assume that the NMI occurred due to a watchdog time out. The NMI could have originated from another source such as a RAM Error Correction Code (ECC) error. Therefore, the NMI must check the watchdog status register before taking watchdog-related emergency action. When it is finished doing what it needs to do for the NMI, it should invoke the routine whose vector was originally installed in the interrupt table.  The code to do this might look like the following:

```
#define WD_NMI_DETECT_BIT_SET 0x40          // Bit that indicates an NMI occurred, set.
                                            //
Void WatchdogIsr(void){                     //
                                            //
//
// Did the watchdog cause the NMI?
//
        if(inb(WD_CSR_IO_ADDRESS) & WD_NMI_DETECT_BIT_SET){
                                            //
                TripAlarm();                // Take care of essential tasks.
                                            //
                TurnOffTheGas();            //
        }                                   //
        _chain_intr(OldNmiIsr);             // Invoke the originally installed ISR.
}
```



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## Enabling the Watchdog NMI

To activate the NMI feature, enable it in the watchdog register. The code to do this might look like the following:

```
#define WD_NMI_EN_BIT_SET     0x10

Void EnableWatchdogNmi(void){
        Unsigned char WdValue;              // Holds watchdog register values.
                                            //
        WdValue = inb(WD_CSR_IO_ADDRESS);   // Read the current contents of the watchdog
                                            // register.
        WdValue |= WD_NMI_EN_BIT_SET;       // Assert the enable bit in the local copy.
        Outb(WD_CSR_IO_ADDRESS,WdValue);    // Assert the enable in the watchdog
                                            // register.
}
```

## Other Watchdog NMI Uses

The watchdog NMI feature can be used independently of the watchdog reset feature. It can also be used without actually causing NMIs. For instance, the CPU board could be configured so that the watchdog does not actually drive the NMI line. In this case, in a multi-tasking operating system, one thread could be responsible for strobing the watchdog and a second thread could monitor the NMI bit of the watchdog register. The second thread could then take emergency action if the first thread falters. Code for checking the bit is in the NMI Routine above.



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# 12. PROGRAMMABLE LED

The ZT 6501 includes two Light Emitting Diodes (LEDs). A green LED for the optional EIDE disk drive is mounted on the Media Carrier Board (17662). A general-purpose LED is located just above the Reset push button. This LED is software programmable through bit 3 in System register 1 (78h). Writing a logical 0 to bit 3 turns the LED off; writing a logical 1 turns the LED on. The LED is turned off after a power cycle or a reset.

Because the LED bit is in the same register as several system level functions, it is important to preserve the state of the other bits in this register when modifying the LED status. The following code demonstrates the mechanism for modifying the LED bit.

```
;  turn LED ON
cli                     ; clear interrupts
in      al, 78h         ; read current state
or      al, 08h         ; set LED bit
out     78h, al         ; output new value for register
sti                     ; re-enable interrupts

;  turn LED OFF
cli                     ; clear interrupts
in      al, 78h         ; read current state
and     al, not 08h     ; clear LED bit
out     78h, al         ; output new value for register
sti                     ; re-enable interrupts
```



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# 13. FLASH MEMORY

The ZT 6501 features 8 Mbytes of on-board Flash memory. This memory is partitioned into two areas:

- System BIOS
- Non-volatile solid state disk

The system BIOS occupies 256 Kbytes. The rest is used for solid state disk.

The solid state disk requires a device driver for drive emulation. The solid-state disk size is configurable using the BIOS Setup Utility and can be used to contain user programs or user data. However, since it is flash memory, it has a limited write cycle life (approximately 100,000 cycles). See the *Ziatech Embedded BIOS Software Manual* for more information on the solid-state disk drive and available device drivers.

The flash disk is mapped in upper memory at 1 Gbyte to 1 Gbyte+1 Mbyte. System register 1 (78h), bits 4 – 7 and 2 are used to control write accesses and page to 256 Kbyte portions. Access to the Flash disk is transparent to the user and is handled by a software driver. The driver used depends on the operating system.

The BIOS portion of the flash memory is mapped as a 256 Kbyte block in lower memory at C0000h to FFFFFh (768 K to 1 Mbyte). The BIOS can be re-flashed for BIOS updates, or if it becomes corrupted, by using the FLASH.EXE utility available from Ziatech. See the "BIOS Recovery" topic below for more information.

The remainder of the flash memory is user programmable. The following information is required for successful flash programming:

1. The base address of the flash window

2. The size of the flash window

3. The portions of flash reserved for other purposes

4. The flash device programming method

5. How to map a page of flash memory

6. How to write-protect the flash device through software

Refer to the *Ziatech Embedded BIOS* software manual for instructions on how to determine items 1-4. System Register 1, Port 78h, (described in Chapter 10, "System Registers") controls items 5 and 6.



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## BIOS RECOVERY

The ZT 6501 provides a Flash Recovery Emergency Device (FRED) socket for use if the BIOS becomes corrupted. This 32-pin socket accomodates an EPROM programmed with the BIOS to allow the board to boot. This EPROM is provided on all ZT 6501 CPUs.

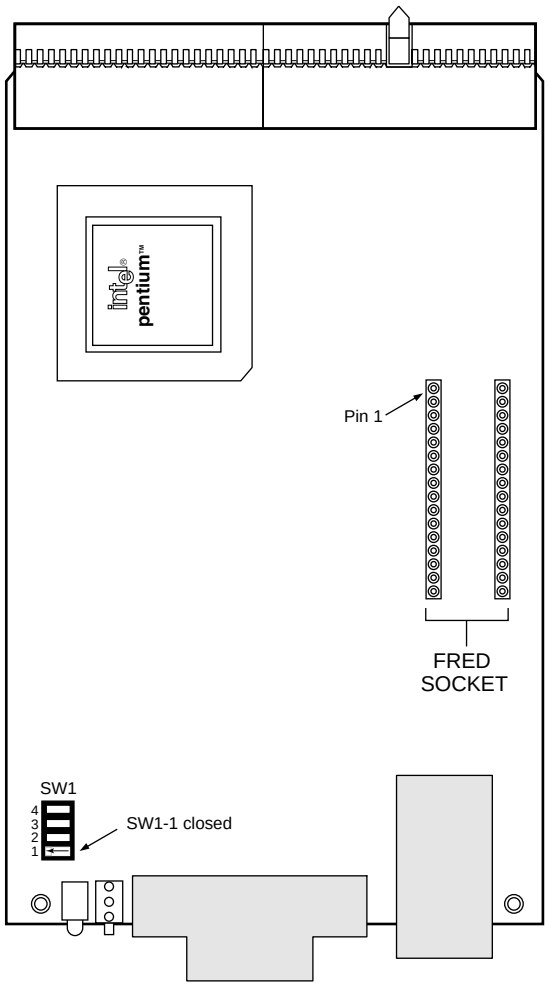
To boot from the FRED socket:

1. Close SW1-1.

2. Power on the board.

3. Reprogram the on-board FLASH with the BIOS by using the FLASH.EXE utility (see the next topic, "Flash Utility Program," for detailed instructions).

4. After Flashing the BIOS, turn off power, and open SW1-1.




*FRED Socket Location*



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## FLASH UTILITY PROGRAM

FLASH.EXE is a utility program that comes with the Programmer's Toolkit. It allows quick and convenient modification of the BIOS in the on-board flash memory. This eliminates the need for a PROM programmer and allows updating of the BIOS without removing boards and chips from the system.

To reprogram the BIOS on the ZT 6501, use the following syntax at a DOS prompt:

```
FLASH  /b  6501BIOS.ROM
```

where 6501BIOS.ROM is the BIOS image for the ZT 6501. See the *Ziatech Embedded BIOS Software Manual* for more information on the Flash utility.



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# A. CPU SPECIFICATIONS

This appendix describes the electrical, environmental and mechanical specifications of the ZT 6501. This appendix also includes illustrations of the board dimensions and connector pinouts, as well as tables showing the pin assignments for the ZT 6501's seven connectors.

## ZT 6501 ELECTRICAL AND ENVIRONMENTAL SPECIFICATIONS

This section covers the following electrical and environmental specifications.

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

### Absolute Maximum Ratings

- Supply Voltage, Vcc3: 3.6 V
- Supply Voltage, Vcc5: 5.25 V
- Supply Voltage, +12 V: 12.6 V
- Storage Temperature: -40° to +85° Celsius
- Operating Temperature (ZT 6501): 0° to +50° Celsius
- Non-Condensing Relative Humidity: <95% at 40° Celsius

### Operating Temperature

- Temperature range for maximum power dissipation (7.5W): 0 to 50° C.
- Temperature range for typical power dissipation (4.5W): 0 to 68° C.

### DC Operating Characteristics

- Supply Voltage, Vcc3: 3.0 V to 3.6 V
- Supply Voltage, Vcc5: 4.75 to 5.25 V
- Supply Voltage, AUX + : 11.4 to 12.6 V
- Supply Voltage, AUX - : Not used



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- Supply Current, Icc:

  266 MHz Pentium, 128 Mbytes DRAM, 512 Kbytes Cache

| Voltage | Max Current | Min Current | Average Current |
|---|---|---|---|
| 3.3V | 1.48 | 0.68 | 0.86 |
| 5.0V | 2.36 | 1.80 | 2.03 |

- Supply Current, AUX + (12 V):
  - 8 Mbyte flash: 0.020 A typ., 0.030 A max.
  - Fan/Heatsink: 120 mA typ., 200 mA max.

## Battery Backup Characteristics

- Battery Voltage: 3 V
- Battery Capacity: 255 mAH
- Real-time clock requirements: 5 µA max.†
- Real-time clock data retention: 3 years min., 5 years typ.
- Electrochemical Construction: Poly-carbonmonofluoride

## RELIABILITY

MTBF: 15 years

MTTR: five minutes (based on board replacement)

## ZT 6501 MECHANICAL SPECIFICATIONS

This section covers the following mechanical specifications:

- Card dimensions and weight
- Connectors (including connector locations, descriptions, and pinouts)
- Cables

† When Vcc is below acceptable operating limits.



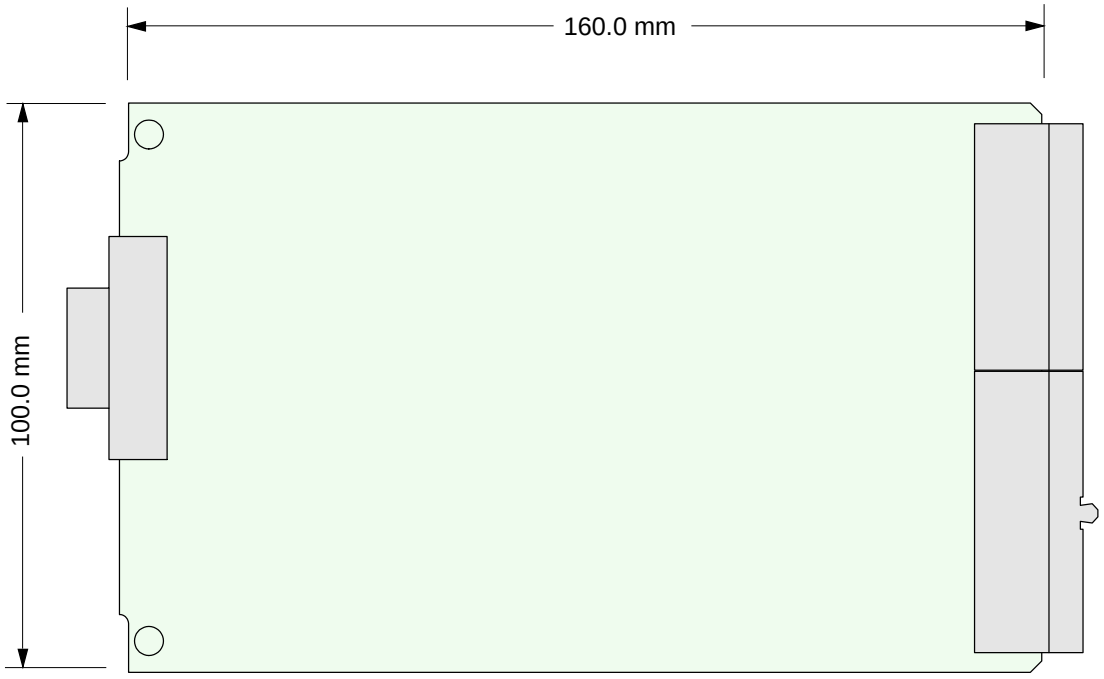
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## ZT 6501 Dimensions and Weight

The ZT 6501 meets the *CompactPCI Specification, PICMG 2.0, Version 2.1* for all mechanical parameters. In a CompactPCI enclosure with 0.8 inch spacing, the ZT 6501 requires one card slot, two slots with the optional EIDE interface, or three slots with the optional EIDE interface and floppy drive.

Mechanical dimensions are shown in the "ZT 6501 Board Dimensions" illustration and are outlined below.

- Length: 160 mm (6.3 inches)
- Width: 100 mm (3.9 inches)
- Thickness: 1.5 mm (0.06 inches)
- Weight: 288 grams (10.2 ounces) †
- Height From Top Surface: 132 mm (5.2 inches)
- Height From Bottom Surface: 2 mm (0.08 inches)




*ZT 6501 Board Dimensions*

† Assumes single slot, no floppy and no hard drive.



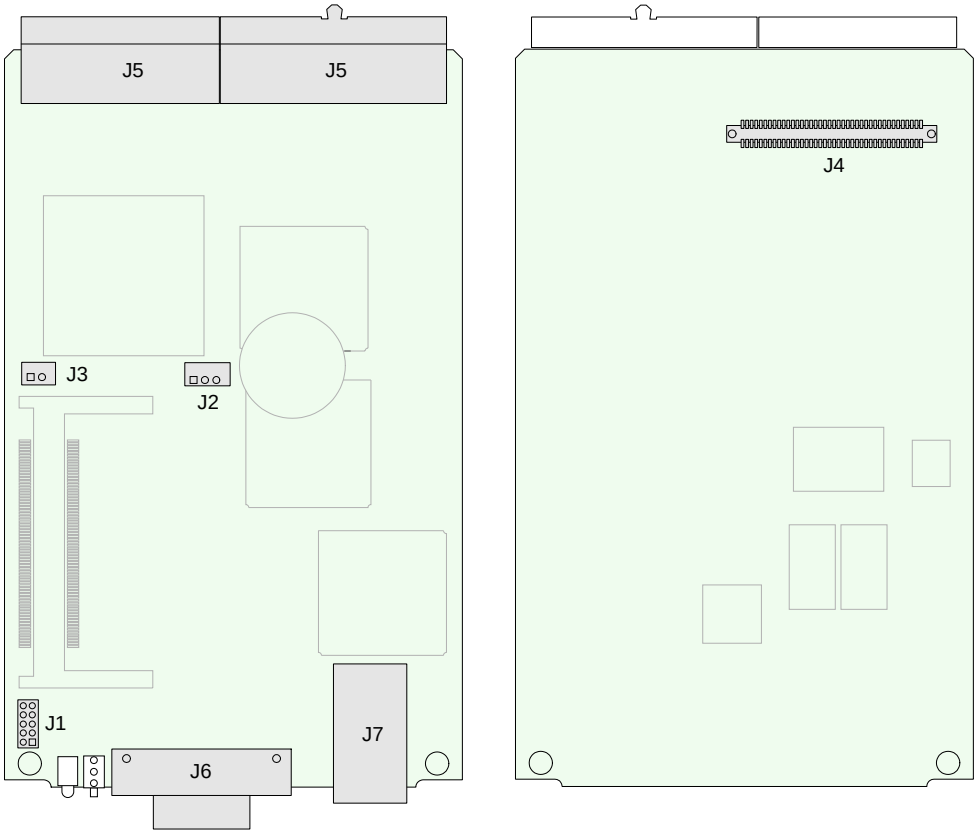
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## ZT 6501 Connectors

As shown in the "ZT 6501 Connector Locations" illustration, the ZT 6501 includes several connectors to interface to application-specific devices. A brief description of each connector is given in the "Connector Assignments" table. A detailed description and pinout for each connector is provided in the following topics.

### *ZT 6501 Connector Assignments*

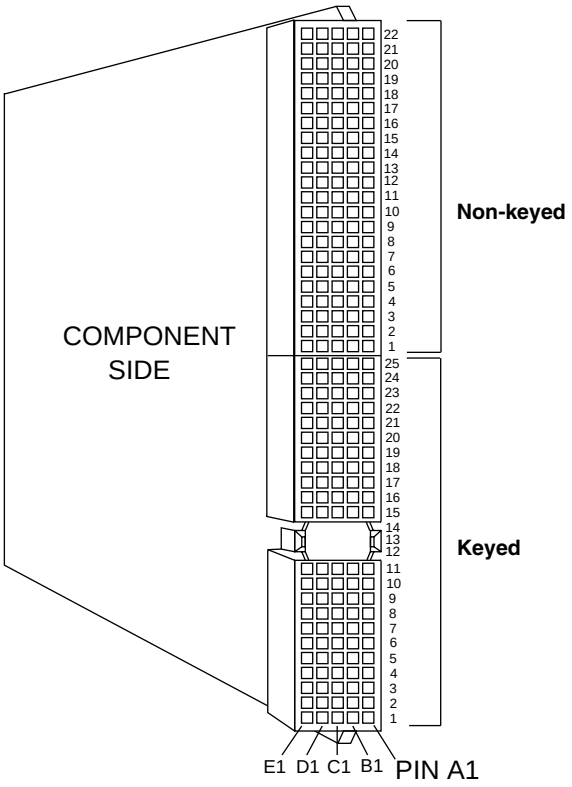
| Connector | Function |
|---|---|
| J1 | ISP PAL Programming Connector |
| J2 | Fan Connector |
| J3 | Speaker Connector |
| J4 | Carrier Board Mating Connector |
| J5 | Two CompactPCI Bus Connectors |
| J6 | Multi-I/O Connector |
| J7 | Face plate Ethernet Connector |




*ZT 6501 Connector Locations*



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*Backplane Connector Pin Locations*

## J1 (ISP PAL Programming Connector—ZT 6501)

J1, a 2 x 5 2 mm header, is the In-System Programming connector used during the manufacturing process to program the on-board ISP logic. No user function exists. The pin assignments are given in the "J1 (ISP PAL Programming Connector) Pinout" table.

### *J1 (ISP PAL Programming Connector—ZT 6501) Pinout*

| Pin # | Signal | Pin # | Signal |
|---|---|---|---|
| **1** | GND | **2** | SDO |
| **3** | GND | **4** | SDI |
| **5** | GND | **6** | SCLK |
| **7** | GND | **8** | MODE |
| **9** | VCC | **10** | ISPEN |



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## J2 (Fan Connector—ZT 6501)

J2 is a 3-pin vertical male header with 0.1 inch contact spacing for supplying power to the fan/heatsink. Select the +12 VDC or +5 VDC configuration with cuttable trace CT16. Pin 3 is an optional tachometer input for fans so equipped. The pin assignments are given in the "J2 (Fan Connector) Pinout" table. The mating connector is a Molex 39-01-0023 or equivalent. The mating connector also requires two Molex 39-01-0031 terminals or equivalent.

### *J2 (Fan Connector—ZT 6501) Pinout*

| Pin # | Signal | Type | Description |
|---|---|---|---|
| **1** | PWR | Out | +12V or (+5V) depending on CT16 |
| **2** | GND | | Ground |
| **3** | FANOUT | ---- | Tach output if supported by fan |

## J3 (Speaker Connector—ZT 6501)

J3 is a latching 2-pin male low-profile header with 0.1 inch contact spacing. The speaker signals are available through this connector. The pin assignments are given in the "J3 (Speaker Connector) Pinout" table. The mating connector is a Molex 39-01-0023 or equivalent. The mating connector also requires two Molex 39-01-0031 terminals or equivalent.

### *J3 (Speaker Connector—ZT 6501) Pinout*

| Pin # | Signal | Type | Description |
|---|---|---|---|
| **1** | SP1 | Out | Speaker output |
| **2** | VCC | ---- | +5V |



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## J4 (Carrier Board Mating Connector—ZT 6501)

J4 is an 80-pin male 5.7 mm high board-to-board connection header providing an interface for the 17662 Media Carrier Board. The pin assignments are given in the "J4 (Carrier Board Mating Connector) Pinout" table. The mating connector is a Molex 53408-0809 or equivalent.

### *J4 (Carrier Board Mating Connector—ZT 6501) Pinout*

| Pin # | Signal | Pin # | Signal | Pin # | Signal | Pin # | Signal |
|---|---|---|---|---|---|---|---|
| **1** | IDE RESET | **21** | PHDREQ# | **41** | IDE VCC | **61** | GND |
| **2** | GND | **22** | GND | **42** | IDE VCC | **62** | WGATE\ |
| **3** | IDE D7 | **23** | IDE IOWL | **43** | GND | **63** | GND |
| **4** | IDE D8 | **24** | GND | **44** | IDE ATIDE | **64** | TRK0\ |
| **5** | IDE D6 | **25** | IDE IORL | **45** | VCC | **65** | GND |
| **6** | IDE D9 | **26** | GND | **46** | INDEX# | **66** | WP\ |
| **7** | IDE D5 | **27** | IDE HDIORDY | **47** | VCC | **67** | GND |
| **8** | IDE D10 | **28** | IDE ALE | **48** | DR0\ | **68** | RDATA\ |
| **9** | IDE D4 | **29** | HDACK0# | **49** | VCC | **69** | GND |
| **10** | IDE D11 | **30** | GND | **50** | DSKCHG\ | **70** | HDSEL\ |
| **11** | IDE D3 | **31** | IDE IRQ | **51** | DR1\ | **71** | NC |
| **12** | IDE D12 | **32** | IDE IOCS16 | **52** | NC | **72** | NC |
| **13** | IDE D2 | **33** | IDE A1 | **53** | DRATE0 | **73** | NC |
| **14** | IDE D13 | **34** | NC | **54** | MTR0\ | **74** | NC |
| **15** | IDE D1 | **35** | IDE A0 | **55** | DENSEL | **75** | NC |
| **16** | IDE D14 | **36** | IDE A2 | **56** | DIR\ | **76** | NC |
| **17** | IDE D0 | **37** | IDE CS0 | **57** | GND | **77** | NC |
| **18** | IDE D15 | **38** | IDE CS1 | **58** | STEP\ | **78** | NC |
| **19** | GND | **39** | NC | **59** | GND | **79** | NC |
| **20** | NC | **40** | GND | **60** | WDATA\ | **80** | NC |



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## J5 (CompactPCI Bus Connector—ZT 6501)

J5 is composed of two 110-pin 2 mm x 2 mm female 32-bit CompactPCI connectors. Rows 12-14 are used for connector keying. See the "J5 CompactPCI Bus Connector Pinout" tables for pin definitions and the "Backplane Connector Pin Locations" figure for pin placement.

### *J5 (CompactPCI Bus Connector—ZT 6501) Pinout*

| Pin # | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **47** | KDAT | KCK | KEYVCC | MDAT | MCK | GND |
| **46** | CLK6 | GND | COM1-DCD | COM1-DSR | COM1-RXD | GND |
| **45** | CLK5 | GND | COM1-RTS | COM1-TXD | COM1-CTS | GND |
| **44** | GND | GND | COM1-DTR | COM1-RIN | COM2-DCD | GND |
| **43** | COM2-DSR | COM2-RXD | COM2-RTS | COM2-TXD | COM2-CTS | GND |
| **42** | COM2-DTR | COM2-RIN | PRST# | REQ6# | GNT6# | GND |
| **41** | USB-GND | USB-DATA+ | DEG# | GND | GND | GND |
| **40** | USB-DATA- | USB-VCC | FAL# | REQ5# | GNT5# | GND |
| **39** | IDE_D0 | IDE_D1 | IDE_D2 | IDE_D3 | IDE_D4 | GND |
| **38** | IDE_D5 | IDE_D6 | IDE_D7 | IDE_D8 | IDE_D9 | GND |
| **37** | IDE_D10 | IDE_D11 | IDE_D12 | IDE_D13 | IDE_D14 | GND |
| **36** | IDE_D15 | IDE_A0 | IDE_A1 | IDE_A2 | IDE_ALE | GND |
| **35** | IDE_IOWL | IDE_CS0 | IDE_VCC | IDE_CS1 | IDE_RESET | GND |
| **34** | IDE_IOCS16 | IDE_IRQ | PHDREQ# | IDE_HDIORDY | IDE_ATIDE | GND |
| **33** | IDE_IORL | HDACK0 | IDE_VCC | GND | MIIB_CLSN | GND |
| **32** | MIIB_RCLK | MIIB_MDIO | MIIB_MDC | MIIB__RXD2 | MIIB_RXD3 | GND |
| **31** | MIIB_TXEN | MIIB_DV | MIIB_RXD0 | 5V | MIIB_RXD1 | GND |
| **30** | MIIB_TCLK | MIIB_CRS | GND | MIIB_TXD2 | MIIB_TXD3 | GND |
| **29** | V(I/O) | MIIB_ERR | MIIB_TXD0 | 5V | MIIB_TXD1 | GND |
| **28** | CLK4 | GND | GNT3# | REQ4# | GNT4# | GND |
| **27** | CLK2 | CLK3 | SYSEN# | GNT2# | REQ3# | GND |
| **26** | CLK1 | GND | REQ1# | GNT1# | REQ2# | GND |



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*J5 Pinout (Continued)*

| Pin # | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| **25** | 5V | REQ64# | ENUM# | 3.3V | 5V | GND |
| **24** | AD[1] | 5V | V(I/O) | AD[0] | ACK64# | GND |
| **23** | 3.3V | AD[4] | AD[3] | 5V | AD[2] | GND |
| **22** | AD[7] | GND | 3.3V | AD[6] | AD[5] | GND |
| **21** | 3.3V | AD[9] | AD[8] | GND | C/BE[0]# | GND |
| **20** | AD[12] | GND | V(I/O) | AD[11] | AD[10] | GND |
| **19** | 3.3V | AD[15] | AD[14] | GND | AD[13] | GND |
| **18** | SERR# | GND | 3.3V | PAR | C/BE[1]# | GND |
| **17** | 3.3V | NC | NC | GND | PERR# | GND |
| **16** | DEVSEL# | GND | V(I/O) | STOP# | NC | GND |
| **15** | 3.3V | FRAME# | IRDY# | BD_SEL# | TRDY# | GND |
| **12-14** | | | KEY AREA | | | |
| **11** | AD[18] | AD[17] | AD[16] | GND | C/BE[2]# | GND |
| **10** | AD[21] | GND | 3.3V | AD[20] | AD[19] | GND |
| **9** | C/BE[3]# | IDSEL | AD[23] | GND | AD[22] | GND |
| **8** | AD[26] | GND | V(I/O) | AD[25] | AD[24] | GND |
| **7** | AD[30] | AD[29] | AD[28] | GND | AD[27] | GND |
| **6** | REQ# | GND | 3.3V | CLK | AD[31] | GND |
| **5** | NC | NC | PCI_RST# | GND | GNT# | GND |
| **4** | NC | HEALTHY# | V(I/O) | NC | NC | GND |
| **3** | INTA# | INTB# | INTC# | 5V | INTD# | GND |
| **2** | NC | 5V | NC | NC | NC | GND |
| **1** | 5V | -12V | NC | +12V | 5V | GND |



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## J6 (Multi-I/O Connector—ZT 6501)

J6 is a 60-pin D-Sub type female multi-I/O receptacle providing a high density connection to the following interfaces:

- LPT
- COM1
- PS/2 Mouse
- USB
- COM2
- Local keyboard

Ziatech offers a Multi-I/O cable (ZT 90247) that breaks out these signals into standard connector interfaces.

The pin assignments are given in the “J6 (Multi-I/O Connector) Pinout“ table.

### *J6 (Multi-I/O Connector—ZT 6501) Pinout*

| Pin # | Signal | Pin # | Signal | Pin # | Signal | Pin # | Signal |
|---|---|---|---|---|---|---|---|
| **1** | COM1-DCD | **16** | COM2-DCD | **31** | LPT-STB | **46** | LPT-BUSY |
| **2** | COM1-DSR | **17** | COM2-DSR | **32** | LPT-AFD | **47** | LPT-D7 |
| **3** | COM1-RXD | **18** | COM2-RXD | **33** | LPT-D0 | **48** | LPT-PE |
| **4** | COM1-RTS | **19** | COM2-RTS | **34** | LPT-ERR | **49** | LPT-ACK |
| **5** | COM1-TXD | **20** | COM2-TXD | **35** | LPT-D1 | **50** | LPT-SLCT |
| **6** | COM1-CTS | **21** | COM2-CTS | **36** | LPT-INIT | **51** | NC |
| **7** | COM1-DTR | **22** | COM2-DTR | **37** | LPT-D2 | **52** | NC |
| **8** | COM1-RI | **23** | COM2-RI | **38** | LPT-SLIN | **53** | NC |
| **9** | COM1-GND | **24** | COM2-GND | **39** | LPT-D3 | **54** | NC |
| **10** | NC | **25** | NC | **40** | LPT-GND | **55** | NC |
| **11** | NC | **26** | NC | **41** | LPT-D4 | **56** | NC |
| **12** | KEY-VCC | **27** | MS-VCC | **42** | LPT-GND | **57** | USB-GND |
| **13** | KEY-CLK | **28** | MS-CLK | **43** | LPT-D5 | **58** | USB-DATA+ |
| **14** | KEY-GND | **29** | MS-GND | **44** | LPT-GND | **59** | USB-DATA- |
| **15** | KEY-DAT | **30** | MS- DAT | **45** | LPT-D6 | **60** | USB-VCC |



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## J7 (RJ-45 Ethernet Connector—ZT 6501)

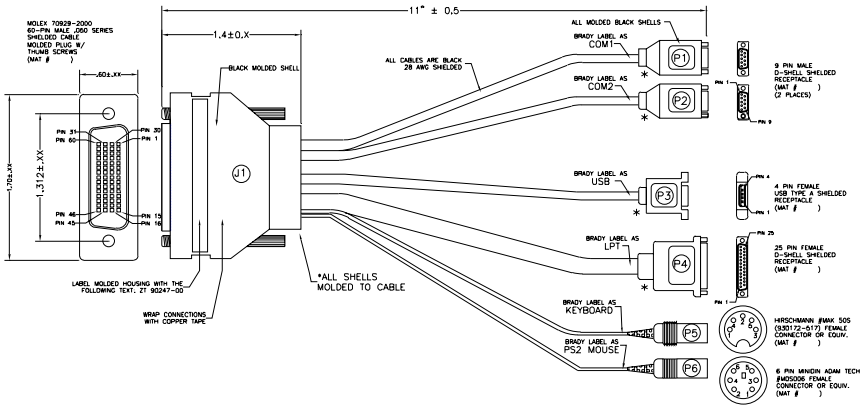
J7 is an 8-pin RJ-45 female connector. The pin assignments are given in the “J7 (RJ-45 Ethernet Connector) Pinout” table. The mating connector is an RJ-45 male connector or equivalent.

### *J7 (RJ-45 Ethernet Connector—ZT 6501) Pinout*

| Pin # | Signal | Description |
|---|---|---|
| **1** | TP TX+ | Twisted Pair Transmit + |
| **2** | TP TX- | Twisted Pair Transmit - |
| **3** | TP RX+ | Twisted Pair Receive + |
| **4** | GND | R-C Terminated to chassis ground |
| **5** | GND | R-C Terminated to chassis ground |
| **6** | TP RX- | Twisted Pair Receive - |
| **7** | GND | R-C Terminated to chassis ground |
| **8** | GND | R-C Terminated to chassis ground |

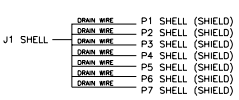
## Cable

The ZT 90247 cable, available from Ziatech Corporation, is a 68-pin Multi-I/O ribbon cable supporting COM1, COM2, USB, LPT, Keyboard, and PS/2 mouse.




| J1 - P1 (COM1) | J1 - P4 (LPT) | | J1 - P5 (KYBRD) | J1 - P2 (COM2) | J1 - P3 (USB) | J1 - NO CONNECTS |
|---|---|---|---|---|---|---|
| 1 - 1 | 31 - 1 | 44 -(23,24 | 12 - 5 | 16 - 1 | 60 - 1 | 10 |
| 2 - 6 | 32 - 14 | 25,SHIELD) | 13 - 1 | 17 - 6 | 59 - 2 | 11 |
| 3 - 2 | 33 - 2 | 45 - 8 | 14 - 4, SHIELD | 18 - 2 | 58 - 3 | 25 |
| 4 - 7 | 34 - 15 | 46 - 11 | 15 - 2 | 19 - 7 | 57 - 4 | 26 |
| 5 - 3 | 35 - 3 | 47 - 9 | | 20 - 3 | | 51 |
| 6 - 8 | 36 - 16 | 48 - 12 | NC - 3 | 21 - 8 | | 52 |
| 7 - 4 | 37 - 4 | 49 - 10 | | 22 - 4 | | 53 |
| 8 - 9 | 38 - 17 | 50 - 13 | J1 - P6 (MOUSE) | 23 - 9 | | 54 |
| 9 - 5 | 39 - 5 | | | 24 - 5 | | 55 |
| | 40 -(18,19 | | 27 - 4 | | | 56 |
| | 20,SHIELD) | | 28 - 5 | | | |
| | 41 - 6 | | 29 - 3 | | | |
| | 42 -(21,22 | | 30 - 1 | | | |
| | ,SHIELD) | | NC - 2 | | | |
| | 43 - 7 | | NC - 6 | | | |

POINT TO POINT WIRING CONNECTIONS:




NOTES:

1. WORKMANSHIP MUST MEET ANSI/IPC CLASS II STANDARDS
2. Packaging: Polybag finished product and mark ZT-90247
3. 100% point to point test for continuity.
4. 100% visual inspection,
   - check for corresponding markings on each cable end
   - check for correct marking on DBP connector
   - check for mold quality (each connector) excess material
   - check for adhesive left by manufacturing labels.
5. Provide certification for tested cable, 1 per cable lot.

*ZT 90247 Rev. 00 Multi-I/O Cable*



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## 17662 MEDIA CARRIER BOARD MECHANICAL SPECIFICATIONS

This section covers the following mechanical specifications:

- Card dimensions and weight
- Connectors (including connector locations, descriptions, and pinouts)

### 17662 Dimensions and Weight

The 17662 Media Carrier board meets the *CompactPCI Specification, PICMG 2.0, Version 2.1* for all mechanical parameters. Mechanical dimensions are outlined below.

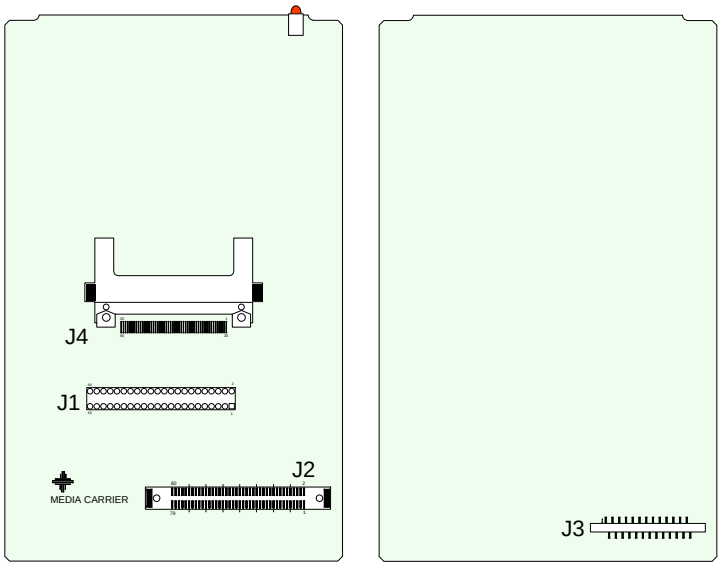
- Length: 160 mm (6.3 inches)
- Width: 100 mm (3.9 inches)
- Thickness: 1.5 mm (0.06 inches)
- Height:
  - – from top surface: 12.70 mm (0.50 inches)
  - – from bottom surface: 20.32 mm (0.80 inches)
- Weight:
  - – HD only: 206.4 grams (7.3 ounces)
  - – HD + Floppy: 395.3 grams (14.0 ounces)

### 17662 Connectors

As shown in the “17662 Connector Locations” illustration, the 17662 Media Carrier Board includes several connectors to interface to application-specific devices. A functional description of each connector is given in the “17662 Connector Assignments” table. A detailed description and pinout for each connector is provided in the following topics.

*17662 Connector Assignments*

| Connector | Function |
|---|---|
| J1 | EIDE |
| J2 | Mating Connector |
| J3 | Floppy |
| J4 | CompactFlash |




*17662 Connector Locations*



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## J1 (EIDE Connector–17662)

J1 is a 44-pin (dual 22-pin), right-angle, female receptacles with 2 mm lead spacing. This connector is used for interfacing to an integrated 2.5 inch drive, providing access to the ZT 6501's primary EIDE channel. See the "J1 EIDE Connector Pinout–17662" table for pin definitions.

### *J1 (EIDE Connector Pinout–17662) Pinout*

| Pin # | Signal | Pin # | Signal |
|---|---|---|---|
| **1** | PWRGD | **2** | GND |
| **3** | DD7 | **4** | DD8 |
| **5** | DD6 | **6** | DD9 |
| **7** | DD5 | **8** | DD10 |
| **9** | DD4 | **10** | DD11 |
| **11** | DD3 | **12** | DD12 |
| **13** | DD2 | **14** | DD13 |
| **15** | DD1 | **16** | DD14 |
| **17** | DD0 | **18** | DD15 |
| **19** | GND | **20** | NC |
| **21** | DDRQ0 | **22** | GND |
| **23** | DIOW# | **24** | GND |
| **25** | DIOR# | **26** | GND |
| **27** | IORDY | **28** | ITPU1 |
| **29** | DDAK0# | **30** | GND |
| **31** | IRQ14 | **32** | ISAIO16# |
| **33** | DA1 | **34** | PDIAG (NC) |
| **35** | DA0 | **36** | DA2 |
| **37** | CS1P# | **38** | CS3P# |
| **39** | IDEACK | **40** | GND |
| **41** | 5V (Logic) | **42** | 5V (Motor) |
| **43** | GND | **44** | XT/AT# |



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## J2 (Carrier Board Mating Connector–17662)

J2 is an 80-pin, female, 5.7 mm high, board-to-board connection header. The pin assignments are given in the "J2 Carrier Board Mating Connector Pinout–17662" table. The mating connector is a Molex 53408-0809 or equivalent.

### *J2 (Carrier Board Mating Connector Pinout–17662) Pinout*

| Pin # | Signal | Pin # | Signal | Pin # | Signal | Pin # | Signal |
|---|---|---|---|---|---|---|---|
| **1** | IDE RESET | **21** | PHDREQ# | **41** | IDE VCC | **61** | GND |
| **2** | GND | **22** | GND | **42** | IDE VCC | **62** | WGATE\ |
| **3** | IDE D7 | **23** | IDE IOWL | **43** | GND | **63** | GND |
| **4** | IDE D8 | **24** | GND | **44** | IDE ATIDE | **64** | TRK0\ |
| **5** | IDE D6 | **25** | IDE IORL | **45** | VCC | **65** | GND |
| **6** | IDE D9 | **26** | GND | **46** | INDEX# | **66** | WP\ |
| **7** | IDE D5 | **27** | IDE HDIORDY | **47** | VCC | **67** | GND |
| **8** | IDE D10 | **28** | IDE ALE | **48** | DR0\ | **68** | RDATA\ |
| **9** | IDE D4 | **29** | HDACK0# | **49** | VCC | **69** | GND |
| **10** | IDE D11 | **30** | GND | **50** | DSKCHG\ | **70** | HDSEL\ |
| **11** | IDE D3 | **31** | IDE IRQ | **51** | DR1\ | **71** | NC |
| **12** | IDE D12 | **32** | IDE IOCS16 | **52** | NC | **72** | NC |
| **13** | IDE D2 | **33** | IDE A1 | **53** | DRATE0 | **73** | NC |
| **14** | IDE D13 | **34** | NC | **54** | MTR0\ | **74** | NC |
| **15** | IDE D1 | **35** | IDE A0 | **55** | DENSEL | **75** | NC |
| **16** | IDE D14 | **36** | IDE A2 | **56** | DIR\ | **76** | NC |
| **17** | IDE D0 | **37** | IDE CS0 | **57** | GND | **77** | NC |
| **18** | IDE D15 | **38** | IDE CS1 | **58** | STEP\ | **78** | NC |
| **19** | GND | **39** | NC | **59** | GND | **79** | NC |
| **20** | NC | **40** | GND | **60** | WDATA\ | **80** | NC |



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## J3 (Floppy Connector–17662)

J3 is a 26-pin, 1 mm, standard interface for a 3.5 inch slimline floppy disk drive. See the "J3 Floppy Connector Pinout–17662" table for pin definitions.

### *J3 (Floppy Connector Pinout–17662) Pinout*

| Pin # | Signal | Pin # | Signal |
|---|---|---|---|
| **1** | 5V | **2** | INDEX# |
| **3** | 5V | **4** | DR0# |
| **5** | 5V | **6** | DSKCHG# |
| **7** | DR1# | **8** | NC |
| **9** | MSEN0 | **10** | MTR0# |
| **11** | DENSL | **12** | DIR# |
| **13** | MODE | **14** | STEP# |
| **15** | GND | **16** | WDATA# |
| **17** | GND | **18** | WGATE# |
| **19** | GND | **20** | TRK0# |
| **21** | GND | **22** | WP# |
| **23** | GND | **24** | RDATA# |
| **25** | GND | **26** | HDSEL# |

## J4 (CompactFlash Connector–17662)

J4 is a 50-pin, Surface Mount, Right Angle, CF Card Slot Header (AMP 120615-1) designed to accommodate a CompactFlash card and providing access to the ZT 6501's primary EIDE channel. Refer to the CompactFlash Specification, Revision 1.X for pinout and device information. The specification is available online at:

http://www.compactflash.org



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# B. RPIO SPECIFICATIONS

This appendix describes the mechanical specifications of the ZT 4600 Rear-Panel I/O Transition Board. It includes connector descriptions and pinouts, as well as illustrations of the board dimensions and connector locations.

## ZT 4600 MECHANICAL SPECIFICATIONS

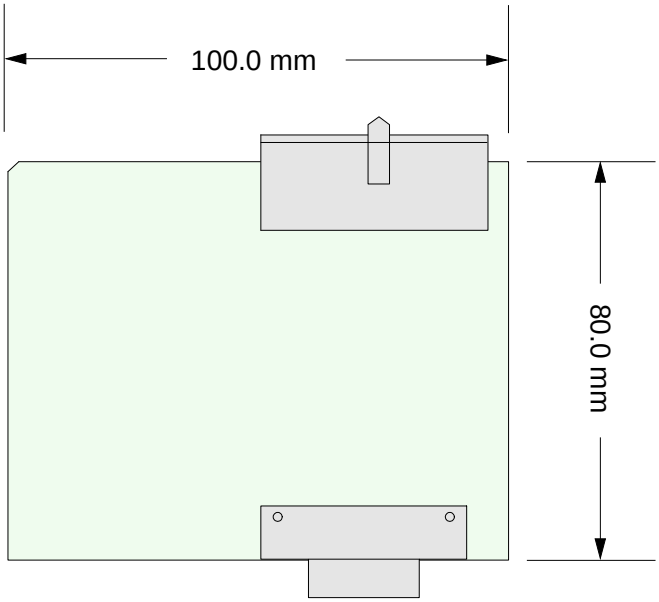
This section includes the following mechanical specifications:

- Board dimensions and weight
- Connectors (including connector locations, descriptions, and pinouts)

### ZT 4600 Board Dimensions and Weight

Mechanical dimensions for the ZT 4600 are shown in the “ZT 4600 Board Dimensions” illustration and are outlined below.

- Length: 80 mm (3.1 inches)
- Width: 100 mm (3.9 inches)
- Thickness: 1.6 mm (0.06 inches)
- Weight: 108 grams (3.8 ounces)




*ZT 4600 Board Dimensions*



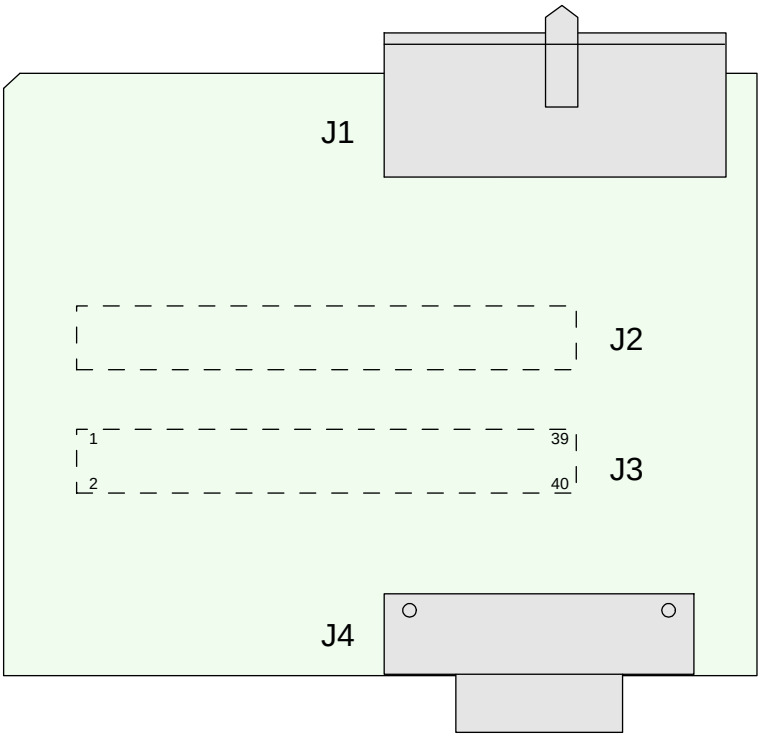
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## ZT 4600 Connectors

As shown in the “ZT 4600 Connector Locations” figure, the ZT 4600 includes several connectors to interface to application-specific devices. A brief description of each connector is given in the “ZT 4600 Connector Assignments” table. A detailed description and pinout for each connector is given in the following topics.

*ZT 4600 Connector Assignments*

| Connector | Function |
|---|---|
| J1 | Rear-Panel User I/O Connector |
| J2, J3 | EIDE Connectors |
| J4 | Multi-I/O Connector |




*ZT 4600 Connector Locations*



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## J1 (Rear-Panel User I/O Connector—ZT 4600)

J1 is a 110-pin, 2 mm x 2 mm, female connector transitioning I/O signals from the SBC for rear-panel use. See the “J3 Rear-Panel User I/O Interface Pinout—4600” table for pin definitions.

### *J1 (Rear-Panel User I/O Connector Pinout—ZT 4600) Pinout*

| Pin# | Z | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| **22** | GND | KDAT | KCK | KEYVCC | MDAT | MCK | GND |
| **21** | GND | N/C | GND | COM1-1 | COM1-2 | COM1-3 | GND |
| **20** | GND | N/C | GND | COM1-4 | COM1-5 | COM1-6 | GND |
| **19** | GND | GND | GND | COM1-7 | COM1-8 | COM2-1 | GND |
| **18** | GND | COM2-2 | COM2-3 | COM2-4 | COM2-5 | COM2-6 | GND |
| **17** | GND | COM2-7 | COM2-8 | N/C | N/C | N/C | GND |
| **16** | GND | SBG0 | SBD0+ | N/C | GND | GND | GND |
| **15** | GND | SBD0- | SBV0 | N/C | N/C | N/C | GND |
| **14** | GND | IDE_D0 | IDE_D1 | IDE_D2 | IDE_D3 | IDE_D4 | GND |
| **13** | GND | IDE_D5 | IDE_D6 | IDE_D7 | IDE_D8 | IDE_D9 | GND |
| **12** | GND | IDE_D10 | IDE_D11 | IDE_D12 | IDE_D13 | IDE_D14 | GND |
| **11** | GND | IDE_D15 | IDE_A0 | IDE_A1 | IDE_A2 | IDE_ALE | GND |
| **10** | GND | IDE_IOWL | IDE_CS0 | IDE_VCC | IDE_CS1 | IDE_RESET | GND |
| **9** | GND | IDE_IOCS16 | IDE_IRQ | PHDREQ# | IDE_HDIORDY | IDE_ATIDE | GND |
| **8** | GND | IDE_IORL | HDACK0 | IDE_VCC | GND | N/C | GND |
| **7** | GND | N/C | N/C | N/C | N/C | N/C | GND |
| **6** | GND | N/C | N/C | N/C | N/C | N/C | GND |
| **5** | GND | N/C | N/C | GND | N/C | N/C | GND |
| **4** | GND | N/C | N/C | N/C | N/C | N/C | GND |
| **3** | GND | N/C | GND | N/C | N/C | N/C | GND |
| **2** | GND | N/C | N/C | N/C | N/C | N/C | GND |
| **1** | GND | N/C | GND | N/C | N/C | N/C | GND |
| **Pin#** | **Z** | **A** | **B** | **C** | **D** | **E** | **F** |



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## J2, J3 (EIDE Connectors—ZT 4600)

J2 and J3 are latched, 40-pin, male connectors (unshrouded 0.25” square posts on 0.1” 2 x 20 grid) providing access to the CPU's primary EIDE channel. See the “J2, J3 EIDE Connector Pinout—ZT 4600” table for pin definitions.

### *J2, J3 (EIDE Connectors Pinout—ZT 4600) Pinout*

| Pin # | Signal | Pin # | Signal |
|---|---|---|---|
| **1** | RESET# | **2** | GND |
| **3** | DD7 | **4** | DD8 |
| **5** | DD6 | **6** | DD9 |
| **7** | DD5 | **8** | DD10 |
| **9** | DD4 | **10** | DD11 |
| **11** | DD3 | **12** | DD12 |
| **13** | DD2 | **14** | DD13 |
| **15** | DD1 | **16** | DD14 |
| **17** | DD0 | **18** | DD15 |
| **19** | GND | **20** | N/C |
| **21** | DRQ1 | **22** | GND |
| **23** | DIOW# | **24** | GND |
| **25** | DIOR# | **26** | GND |
| **27** | IORDY | **28** | IDE_ALE |
| **29** | DAK0# | **30** | GND |
| **31** | IDE_IRQ | **32** | IDE_ICCS16 |
| **33** | IDE_A1 | **34** | N/C |
| **35** | IDE_A0 | **36** | IDE_A2 |
| **37** | IDE_CS0 | **38** | IDE_CS1 |
| **39** | N/C | **40** | GND |



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## J4 (Multi-I/O Connector—ZT 4600)

J4 is a 60-pin D-Sub type female multi-I/O receptacle providing a high density connection to the following interfaces:

- COM1
- COM2
- PS/2 Mouse
- USB
- Keyboard

Ziatech offers a Multi-I/O cable (ZT 90247) that breaks out these signals into standard connector interfaces.

The pin assignments are given in the “J4 (Multi-I/O Connector) Pinout“ table.

*J4 (Multi-I/O Connector—ZT 4600) Pinout*

| Pin # | Signal | Pin # | Signal | Pin # | Signal | Pin # | Signal |
|---|---|---|---|---|---|---|---|
| **1** | COM1-DCD | **16** | COM2-DCD | **31** | NC | **46** | NC |
| **2** | COM1-DSR | **17** | COM2-DSR | **32** | NC | **47** | NC |
| **3** | COM1-RXD | **18** | COM2-RXD | **33** | NC | **48** | NC |
| **4** | COM1-RTS | **19** | COM2-RTS | **34** | NC | **49** | NC |
| **5** | COM1-TXD | **20** | COM2-TXD | **35** | NC | **50** | NC |
| **6** | COM1-CTS | **21** | COM2-CTS | **36** | NC | **51** | NC |
| **7** | COM1-DTR | **22** | COM2-DTR | **37** | NC | **52** | NC |
| **8** | COM1-RI | **23** | COM2-RI | **38** | NC | **53** | NC |
| **9** | COM1-GND | **24** | COM2-GND | **39** | NC | **54** | NC |
| **10** | NC | **25** | NC | **40** | NC | **55** | NC |
| **11** | NC | **26** | NC | **41** | NC | **56** | NC |
| **12** | KEY-VCC | **27** | MS-VCC | **42** | NC | **57** | USB-GND |
| **13** | KEY-CLK | **28** | MS-CLK | **43** | NC | **58** | USB-DATA+ |
| **14** | KEY-GND | **29** | MS-GND | **44** | NC | **59** | USB-DATA- |
| **15** | KEY-DAT | **30** | MS- DAT | **45** | NC | **60** | USB-VCC |



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# C. PCI CONFIGURATION SPACE MAP

All PCI compliant devices contain a PCI configuration header. The generic layout of the header is shown in the "PCI Configuration Header" diagram.

Additionally, a device may contain unique configuration registers (at location > 40h). For the ZT 6501, these are shown in the "ZT 6501 On-board Device PCI Bus Mapping" table.

Details for each device's configuration space can be found in the respective manufacturer's data sheets. See Appendix F, "Data Sheet Reference," for links to data sheets for devices used on the ZT 6501.

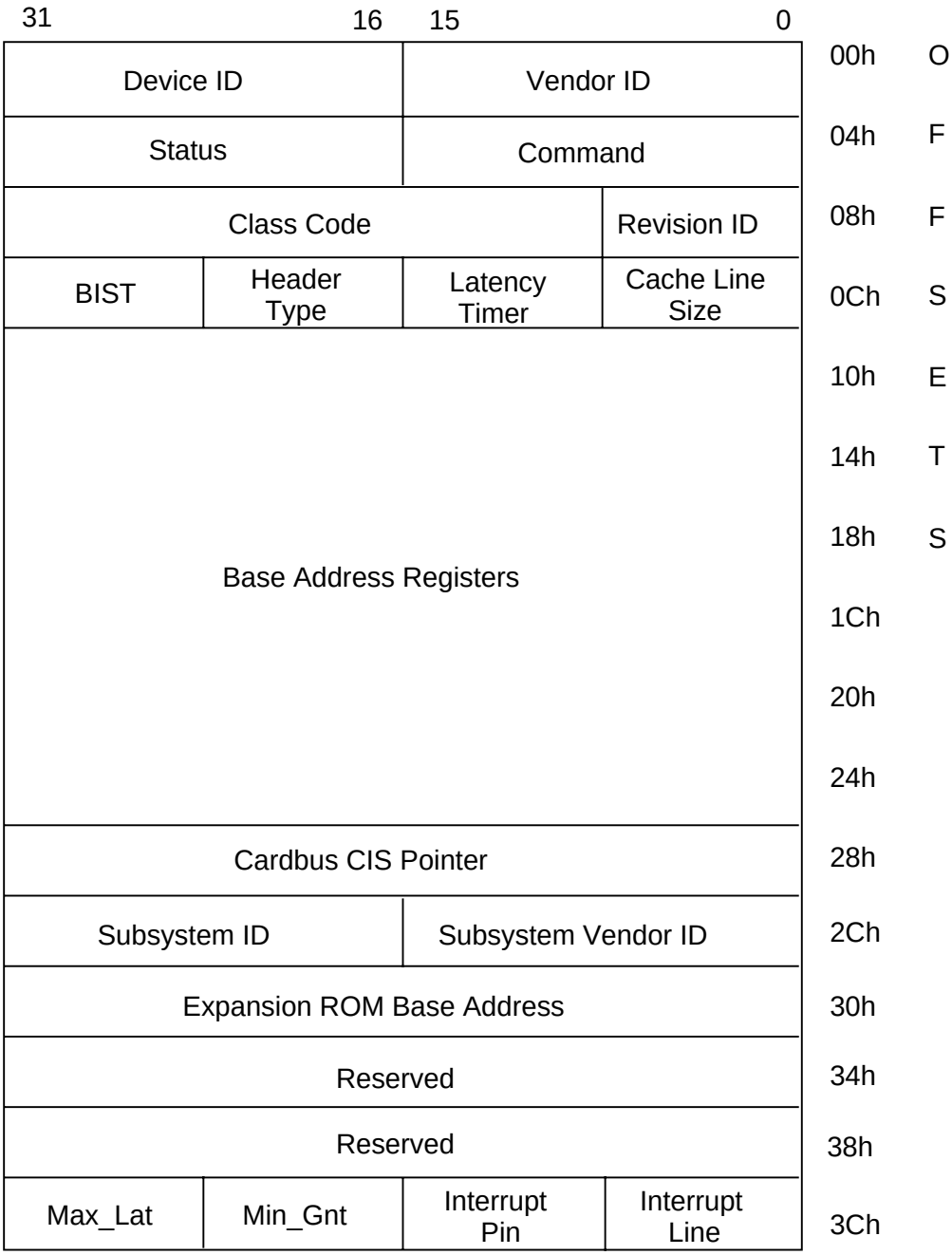
*ZT 6501 On-board Device PCI Bus Mapping*

| Bus # (hex) | Dev # (hex) | Fcn # (hex) | Vendor ID | Device ID | Description |
|---|---|---|---|---|---|
| 00 | 00 | 00 | 8086 | 7100 | Intel 430 MTXC Controller |
| 00 | 07 | 00 | 8086 | 7110 | Intel 430 PIIX4 PCI-to-ISA Bridge |
| 00 | 07 | 01 | 8086 | 7111 | Intel 430 PIIX4, EIDE Interface |
| 00 | 07 | 02 | 8086 | 7112 | Intel 430 PIIX4, USB Interface † |
| 00 | 07 | 03 | 8086 | 7113 | Intel 430 PIIX4, Dynamic Power Management Interface |
| 00 | 08 | 00 | 1011 | 0025 | PCI to PCI Bridge |
| 00 | 09 | 00 | 1011 | 0019 | 10/100 MBit Ethernet Controller |

† The Ziatech BIOS does not directly support USB. This feature requires third party software.



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*PCI Configuration Header*



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# D. THERMAL CONSIDERATIONS

## PROCESSOR COOLING

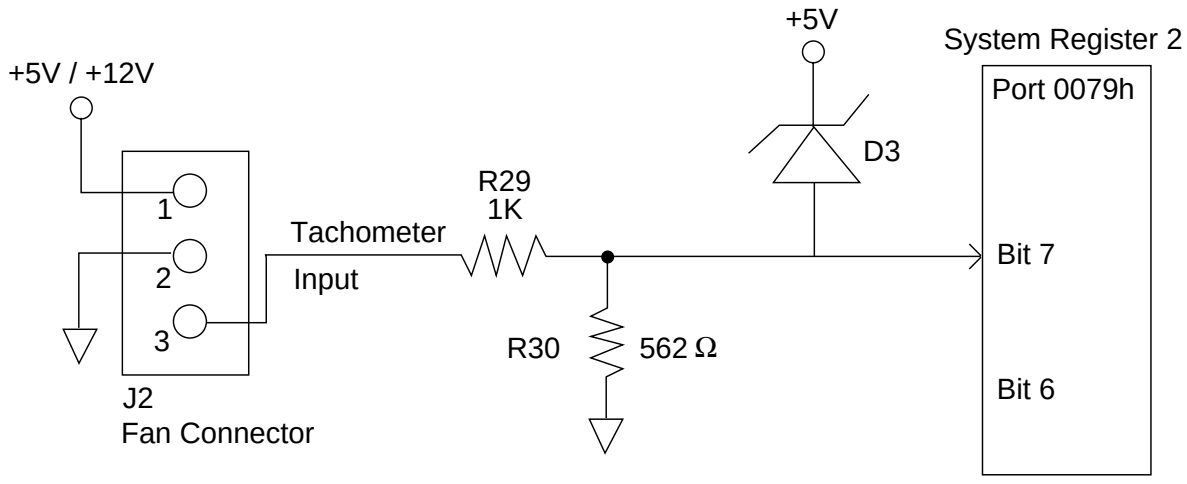
The ZT 6501 comes from the factory with an integrated fan/heatsink (available through connector J2) for cooling the processor. The fan/sink allows the following ambient air temperatures (95º C maximum case temperature):

- Temperature range for maximum power dissipation (7.5W): 0 to 50° C.
- Temperature range for typical power dissipation (4.5W): 0 to 68° C.

## TACHOMETER MONITORING

The ZT 6501 has circuitry on board for optionally monitoring a fan with a tachometer output. The tachometer input is connected to J2, pin 3. The input circuitry, shown in the "Tachometer Monitoring Input Circuitry" figure, contains a two-resistor voltage divider (R29, R30) and a protection diode (D3) to allow for a +12 V tachometer signal. The tachometer signal connects to System Register 3, bit 5 at I/O port 007Ah. Since this input is directly connected to the tachometer, user-written software is necessary to determine if the fan is working properly. Most fan tachometers have an output rate of approximately 100 Hz; this input therefore changes states approximately every 5 ms.

**Note:** The factory installed fan/sink **does not** have a tachometer output.




*Tachometer Monitoring Input Circuitry*



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# E. AGENCY APPROVALS

This appendix presents agency approval and certification information for the ZT 6501 CPU Board with Embedded Pentium Processor.

## UL 1950 CERTIFICATION

Underwriters Laboratories, Inc. ®

Safety: UL Safety of Information Technology Equipment, including Electrical Business Equipment IEC 950 and UL 1950 (UL file # E179737)

## CE CERTIFICATION

The ZT 6501 meets intent of Directive 89/336/EEC for Electromagnetic Compatibility & Low-Voltage Directive 73/23/EEC for Product Safety. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

**EN 50081-1 Emissions:**

| | |
|---|---|
| EN 55011 | Class A Radiated CISPR Pub 22 |
| EN 605555-2 | AC Power Line Harmonic Emissions CISPR Pub 22 |

**EN 50082-1 Immunity:**

| | |
|---|---|
| EN 61000 4-2 | Electro-static Discharge (ESD) |
| EN 61000 4-3 | Radiated Susceptibility 30 to 100 MHz |
| ENV 50204 | 900 MHz Carrier |
| EN 61000 4-4 | Electrical Fast Transient Burst (EFTB) |
| EN 61000 4-5 | Surge, per Power Cord |
| EN 61000 4-6 | Conducted Immunity 150 KHz to 30 MHz |
| EN 61000 4-8 | Power Frequency Magnetic Fields |
| EN 61000 4-11 | Voltage dips, Variations, & Short Interruptions |

**Low Voltage Directive 73/23/EEC:**

| | |
|---|---|
| UL 1950/EN 60950 | Safety of Information Technology Equipment, Including Electrical Business Equipment |



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## FCC REGULATORY INFORMATION

Regulatory information Federal Communications Commission (FCC) (USA only)



**Warning:** This equipment has been tested and found to comply with the limits for a Class A or B digital device, pursuant to FCC 47 CFR Part 15, Subpart B, Class A or B of the FCC Rules. This equipment generates and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

Ziatech Corporation system RFI and Radiated Immunity tests were conducted with Ziatech Corporation-supported peripheral devices and Ziatech Corporation-shielded cables. Changes or modifications not expressly approved by Ziatech Corporation could result in EMI interference. FCC compliance was achieved under the following conditions:

- Shielded signal cables and a shielded power cord.
- Shielded cables on all I/O ports.
- Cable shields connected to earth ground via metal shell connectors.
- Conductive chassis rails connected to earth ground. This provides the path for connecting shields to earth ground.
- Front panel screws properly tightened.

For minimum RF emissions, it is essential that the conditions above be implemented; failure to do so could compromise the FCC compliance of the equipment containing the system.



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# F. DATA SHEET REFERENCE

This appendix provides links to data sheets, standards, and specifications for the technology designed into the ZT 6501.

## CompactPCI

The *CompactPCI Specification, PICMG 2.0, Version 2.1* can be purchased from PICMG (PCI Industrial Computers Manufacturers Group) for a nominal fee. A short form specification in PDF format is also available on PICMG's website at:

http://www.picmg.org/gcompactpci.htm

For more information on the *PCI Local Bus Specification,* refer to the following list of publications.

- *PCI Local Bus Specification*, PCI Special Interest Group, 5200 N. E. Elam Young Parkway, Hillsboro, Oregon, USA, 9724-6497, (503) 696-2000
- IEC 297-3, *Eurocard Specification*, Bureau Central de la Commission Electrotechnique Internationale, 1 rue de Varembe, Geneva, Switzerland, 011.412.291.90228
- IEC-1076-4-101, *Draft Specification for 2 mm Connector Systems*, International Electrotechnical Commission, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY, USA 10036
- IEEE1101.1-1991, *IEEE Standard for Mechanical Core Specifications for Microcomputers Using IEC 603-2 Connectors*, Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, P.O. Box 1331, Piscatoway, NJ, USA, 08855-1331
- IEEEP1101.10-3.X, *IEEE Standard for Additional Mechanical Specifications for Microcomputers using IEEE1101.1 Equipment Practice,* Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, P.O. Box 1331, Piscatoway, NJ, USA, 08855-1331
- ANSI/VITA 1-1994, *VME64 Specification,* VITA, 10229 N. Scottsdale Rd., Suite B, Scottsdale, AZ, USA, 85253



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## ETHERNET INTERFACE

The Ethernet on board the ZT 6501 is implemented using Intel's 21143 10/100 Mbit PCI Ethernet controller. To obtain information about the 21143 device, please refer to the "21143 PCI/CardBus 10/100 Ethernet LAN Controller" data sheet. The data sheet is available online at:

http://developer.intel.com/design/network/datashts/index.htm

## PCIset INTERFACE CHIP (430TX )

For more information about the Intel 430TX PCIset Interface Chip, see the *Intel® 430TX PCIset: 82439TX System Controller (MTXC)* data sheet and the Intel 430TX PCIset System Controller (MTXC) Timing Specification. Both documents are available online at:

http://developer.intel.com/design/chipsets/datashts/290559.htm

and:

http://developer.intel.com/design/chipsets/datashts/273134.htm

## EMBEDDED PENTIUM PROCESSOR

For more information about Intel's Embedded Pentium Processor, see the Intel® Low-Power Embedded Pentium® Processor data sheet, available online at:

http://developer.intel.com/design/intarch/datashts/273184.htm

## PIIX4

For more information on the following ZT 6501 functions, refer to the Intel *82371AB (PIIX4) PCI ISA IDE Xcelerator* data sheet and the Intel *82371AB (PIIX4)* specification update.

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

Both documents are in Adobe Acrobat format (PDF) and are available online at:

http://developer.intel.com/design/chipsets/datashts/index.htm

http://developer.intel.com/design/chipsets/specupdt/index.htm



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## SUPERI/O

Refer to the National Semiconductor *PC87309 SuperI/O Plug and Play Compatible Chip in Compact 100-Pin VLJ Packaging* data sheet for more information on the following ZT 6501 functions:

- Floppy Disk controller
- Serial Port controller
- Mouse and Keyboard controller
- Parallel Port

The data sheet is available online at:

http://www.national.com/ds/PC/



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# G. CUSTOMER SUPPORT

This appendix offers technical assistance information for this product, and also the necessary information should you need to return a Ziatech product.

## TECHNICAL/SALES ASSISTANCE

If you have a technical question, please call Ziatech's Customer Support Service at the number below, or e-mail our technical support team at tech_support@ziatech.com. Ziatech also maintains an FTP site located at ftp://ziatech.com/Tech_Support.

If you have a sales question, please contact your local Ziatech Sales Representative or the Regional Sales Office for your area. Address, telephone and FAX numbers, and additional information is available at Ziatech's website, located at:

http://www.ziatech.com.

**Corporate Headquarters**
1050 Southwood Drive
San Luis Obispo, CA 93401 USA
Tel (805) 541-0488
FAX (805) 541-5088

## ZT 6501 Vs. ZT 6500: TECHNICAL DIFFERENCES

The following table describes the technical differences between the ZT 6501 and the ZT 6500 single board computers.

| **ZT 6501** | **ZT 6500** |
|---|---|
| One slot version: Base CPU | One slot option: Not available |
| Two slot version: Supports on-board EIDE hard drive/CompactFlash | Two slot version: Base CPU |
| Three slot version: Includes on-board EIDE hard drive/CompactFlash and floppy drive | Three slot version: Includes floppy drive |
| Processor: Pentium at 266 MHz | Processor: 133, 166 and 200 MHz Pentium |
| 512K L2 Cache | 256K L2 Cache |



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| ZT 6501 | ZT 6500 |
|---|---|
| On-board 10/100 Ethernet | No on-board Ethernet |
| No Digital I/O | 24 bits of Digital I/O |
| 8 MB Flash | 2-4 MB Flash |
| Can be plugged into a 32-bit backplane with or without RPIO option. | Can be plugged into a 32-bit or 64-bit backplane. Uses a 32-bit CompactPCI bus. |
| Supports RPIO option (ZT 4600) | No RPIO option |
| Standard SO-DIMM memory modules used for 32MB, 64MB, 128MB memory options | Ziatech memory modules used for 8MB, 16MB, 32MB and 48MB memory options |

## RELIABILITY

Ziatech has taken extra care in the design of the ZT 6501 in order to ensure reliability. The product was designed in top-down fashion, using the latest in hardware and software design techniques, so that unwanted side effects and unclean interactions between parts of the system are eliminated. Each ZT 6501 has an identification number. Ziatech maintains a lifetime database on each board and the components used. Any negative trends in reliability are spotted and Ziatech's suppliers are informed and/or changed.

## RETURNING FOR SERVICE

Before returning any of Ziatech's products, you must phone Ziatech at (805) 541-0488 and obtain a Returned Material Authorization (RMA) number. The following information is needed to expedite the shipment of a replacement to you:

1. Your company name and address for invoice
2. Shipping address and phone number
3. Product I.D. number
4. If possible, the name of a technically qualified individual at your company familiar with the mode of failure on the board

If the unit is out of warranty, service is available at a predesignated service charge. Contact Ziatech for pricing and please supply a purchase order number for invoicing the repair.



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Pack the board in **anti-static** material and ship in a sturdy cardboard box with enough packing material to adequately cushion it. ***Any product returned to Ziatech improperly packed will immediately void the warranty for that particular product!*** Mark the RMA number clearly on the outside of the box before returning.

## ZIATECH WARRANTY

Ziatech provides a five-year limited warranty to its customers. Ziatech also has an explicit policy regarding the use of Ziatech products in life support systems. These topics are covered in the following sections.

### Five-Year Limited Warranty

Products manufactured by Ziatech Corporation are covered from the date of purchase by a five-year warranty against defects in materials, workmanship, and published specifications applicable to the date of manufacture. During the warranty period, Ziatech will repair or replace, solely at its option, defective units provided they are returned at customer expense to an authorized Ziatech repair facility. Products which have been subjected to misuse, abuse, neglect, alteration, or unauthorized repair, determined at the sole discretion of Ziatech, whether by accident or otherwise, are excluded from warranty. The warranty on fans and disk drives is limited to two years and the warranty on flat panel displays is limited to nine months from date of purchase. Other products and accessories not manufactured by Ziatech are limited to the warranty provided by the original manufacturer. Consumable items (fuses, batteries, etc.) and software are not covered by this warranty.

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## Life Support Policy

Ziatech products are not authorized for use as critical components in life support devices or systems without the express written approval of the president of Ziatech Corporation. As used herein:

1. Life support devices or systems are devices or systems which support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be expected to cause the failure of the life support device or system, affect its safety, or limit its effectiveness.

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