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ZT 6640



CompactPCI®
Enhanced IDE Controller

ZIATECH CORPORATION

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WHAT'S IN THIS MANUAL

What's In This manual describes the operation and use of the ZT 6640 CompactPCI Enhanced IDE Controller. The following outline summarizes the focus of each chapter in this manual.

Chapter 1, "Introduction**,"** offers an introduction to the ZT 6640 CompactPCI Enhanced IDE Controller. It includes a product definition and a listing of product features.

Chapter 2, "Getting Started**,"** summarizes the information you need to get your ZT 6640 operational. This includes system requirements, recommendations, and hardware/software installation. You should read this chapter in its entirety before you use the ZT 6640.

Chapter 3, "Functional Blocks**,"** presents a functional block diagram and a detailed description of each block of the ZT 6640.

Chapter 4, "Software Overview**,"** provides installation instructions for the drivers and utilities included with the ZT 6640.

Appendix A, "Specifications**,"** contains the electrical, mechanical, and environmental specifications for the ZT 6640.

Appendix B, "Customer Support**,"** offers technical support information and instructions for returning the ZT 6640 if service is necessary.

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CHAPTER 1. INTRODUCTION

This chapter provides a brief introduction to the ZT 6640 CompactPCI Enhanced IDE Controller. It includes a product definition and a list of product features. Unpacking information and installation instructions can be found in Chapter 2, "Getting Started".

PRODUCT DEFINITION

The ZT 6640 is an Enhanced IDE interface board for CompactPCI. It provides two IDE channels for interfacing with up to four drives. The ZT 6640 utilizes the Peripheral Component Interconnect (PCI) bus to give exceptional IDE drive performance. The PCI bus supports 32 bits of data and runs at speeds up to 33 MHz, giving it a theoretical bandwidth of 132 Mbytes per second. The ZT 6640 can sustain a maximum transfer rate of 16.7 Mbytes per second between the IDE drive buffer and PCI.

The ZT 6640 is based on a single-chip controller from National Instruments (87415). An enhanced DMA controller increases system performance by providing full scatter/gather data transfers between IDE devices and system memory without CPU intervention. Four levels of write posting and read prefetching per channel allow the host CPU to run concurrently with IDE cycles. Enhanced IDE supports fast devices using Programmed I/O (PIO) modes 0, 1, 2, 3, 4 and DMA modes 0, 1, and 2.

FEATURES OF THE ZT 6640

- IBM-AT compatible
- CompactPCI compatible
- 32-bit, 33 MHz, high performance PCI bus interface
- 16.7 Mbytes/sec maximum IDE transfer rate
- Primary and Secondary channels for interfacing up to four devices
- Concurrent channel operation for PIO and DMA modes
- Programmed I/O Modes 0-4
- Direct Memory Access Modes 0-2
- Integrated IDE Drive Option
- Compatibility Mode or PCI Native Mode operation
- Individual software control for each IDE channel

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CHAPTER 2. GETTING STARTED

This chapter summarizes the steps required to get the ZT 6640 running. You should read this chapter in its entirety before you 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 topic "Returning For Service" in Appendix B explains the procedure you should follow to obtain an RMA number from Ziatech.

WHAT'S IN THE BOX?

After opening the shipping container, check for the following contents:

- The ZT 6640 Enhanced IDE adapter
- Integrated IDE drive (if ordered)

If any of the above items are missing, contact Ziatech for assistance. Be sure to save the anti-static packing material for storing or shipping.

WARNING: Like all equipment using MOS devices, the ZT 6640 must be protected from static discharge.

SYSTEM REQUIREMENTS

The ZT 6640 Enhanced IDE Controller is designed to work with the CompactPCI bus architecture. The ZT 6640 occupies one CompactPCI slot.

The ZT 6640 (with integrated 815 Mbyte or 1.3 Gbyte drive) requires +5 VDC ± 5% @ 1.5 A maximum and 110 mA when idle. The ambient temperature must be maintained between 0° and +55° Celsius to avoid improper operation and possible damage. The relative humidity should be less than 95%, non-condensing.

The I/O map for the ZT 6640 varies according to the mode of operation. The default mode of operation is "compatibility mode," which means that the interface uses the PC/AT legacy addresses of 1F0h-1F7h, with 3F6h and Interrupt IRQ14 for the Primary Channel. The secondary Channel uses I/O addresses 170h-177h, 376h and interrupt IRQ15. No memory addresses are used. PCI "Native mode" is also supported. This allows the system BIOS or other configuration software to assign generic addresses to each channel as well as a generic interrupt. Native mode can be used to allow multiple IDE controllers in one system. Native mode is consistent with the plug and play concept

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of PCI. Compatibility Mode is used by default for software compatibility (hence its name) and is the default used by Ziatech's BIOS. Support for Native Mode operation by the BIOS will be added at a later date.

SYSTEM RECOMMENDATIONS

Connecting to IDE-based devices is discussed in the following topics.

Integrated IDE

The ZT 6640 may be purchased with an optional integrated IDE drive. All integrated drives conform to the 2.5" IDE drive specification and allow the ZT 6640 to occupy just one CompactPCI slot. All drives integrated on the ZT 6640 have support for Enhanced IDE transfer modes and are AUTO configurable within the SETUP utility.

Off-Board Drives

The ZT 6640 may interface to external IDE devices by cabling from the J5 front plate connector or by the on-board 0.1" headers J2 and J3 (see the "ZT 6640 Connector Locations" illustration in Appendix A). J4 is used for the integrated IDE drive, if loaded. The ZT 6640 does not provide power for external drives. Power for external drives must be provided by an external power supply.

The Primary Channel is available through J3 , J4, and J5. The Secondary Channel is available through J2 and J5.

CD-ROMs

IDE-based CD-ROM drives may be interfaced to the ZT 6640. It is recommended that CD-ROM drives use the Secondary Channel for interconnection to allow the Primary Channel to run at higher data rates. CD-ROM devices typically have slower data transfer rates than IDE disk drives. When configuring a channel, set the channel to a transfer rate no faster than the slowest device.

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HARDWARE INSTALLATION

The ZT 6640 is designed to plug into a standard 5 V signaling CompactPCI system. The ZT 6640 requires only 32-bit transfer capability and therefore uses only positions 1-25 of the CompactPCI connector.

WARNING: Installation of the ZT 6640 must be done at a static-free workstation to avoid damage to the ZT 6640.

To install the ZT 6640:

1. Power down your CompactPCI system.
2. Insert the card into an available slot.
3. Push on the ZT 6640 until the connector seats.
4. Power up the system.
5. Run the BIOS SETUP routine:
   a. Type 's' during the memory test, or run SETUP from the Flash drive.
   b. Select AUTO for the Fixed Disk type.

The BIOS will configure the drive for you. Some external drives may need to be set up manually if the AUTO configuration does not work. Consult your drive manual for details on the disk geometry should this be the case.

Jumpers

Since the ZT 6640 uses the PCI bus, which has been designed to support automatic configuration, there are no jumper options for the board.

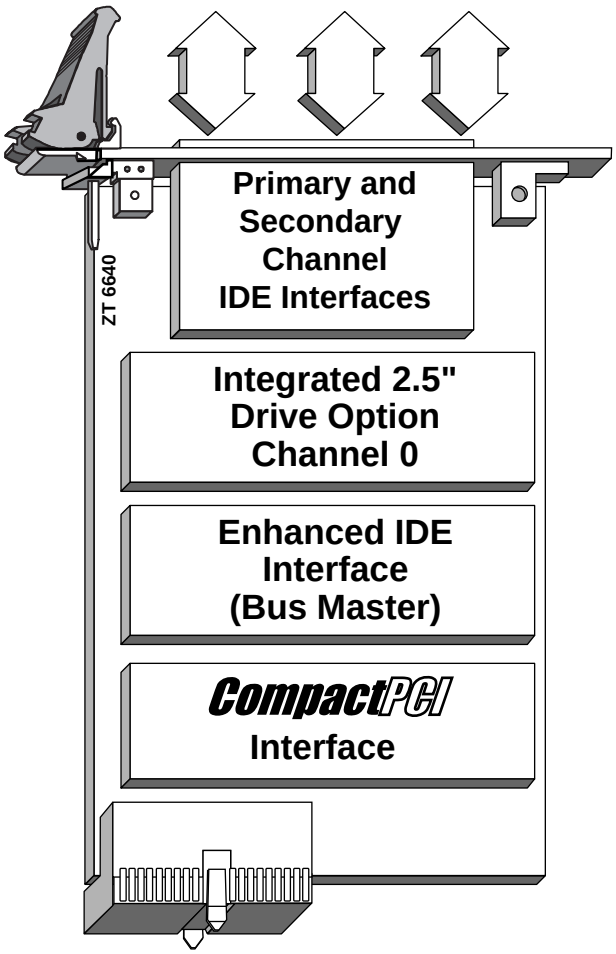
SOFTWARE INSTALLATION

The ZT 6640 works with all applications by default. In some rare instances additional driver support may be required for the ZT 6640. If you encounter problems please contact Ziatech Technical Support.

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CHAPTER 3. FUNCTIONAL BLOCKS

The following section gives a detailed description of the hardware components found on the ZT 6640. A block diagram of the ZT 6640 is shown below.



ZT 6640 Functional Block Diagram

CompactPCI INTERFACE

The ZT 6640 connects to the PCI local bus through the 125-pin, 2 mm, J1 CompactPCI Interface. The interface consists of a 32-bit data/address bus (this bus also handles various control signals for PCI transfers).

The ZT 6640 supports bus speeds up to 33 MHz, giving a theoretical bandwidth of 132 Mbytes per second. The PCI bus allows the ZT 6640 to support high speed IDE transfers at up to 16.6 Mbytes/sec.

The connector pinout adheres to the CompactPCI standard. For more information on the CompactPCI standard contact Ziatech.

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ENHANCED IDE CONTROLLER

The ZT 6640 is based on the National Semiconductor 87415 Enhanced IDE controller. This is a highly integrated IDE controller that has been optimized for handling disk drive intensive environments such as Windows® and OS/2®. The controller can be used in both Programmed I/O or Bus Master mode for data transfers. The 87415 also supports full scatter/gather data transfers and has read and write FIFOs to support concurrent operation on both the Primary and Secondary Channels.

The 87415 is hardware register compatible with the original IBM-AT standard (Compatibility Mode) or can alternately be used in PCI Native Mode which allows the interface to be mapped anywhere in I/O space and can use any PCI interrupt. Special software is needed to use Native Mode.

INTEGRATED IDE

The ZT 6640 may be purchased with an optional integrated IDE drive. All integrated drives conform to the 2.5" IDE drive specification and allow the ZT 6640 to occupy just one CompactPCI slot. All drives integrated on the ZT 6640 have support for Enhanced IDE transfer modes and are AUTO configurable within the SETUP utility.

OUTPUT CONNECTORS

The ZT 6640 features four IDE interface connectors and an internal power connector. Connector assignments are listed below.

J2 Secondary IDE Channel Interface

J3 Primary IDE Channel Interface

J4 Primary IDE Channel Interface (for integrated drive)

J5 External IDE Channel Interface (Primary/Secondary IDE Channels)

J6 0.2" style four-pin power connector (provides +5VDC with GND and +12VDC with GND)

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CHAPTER 4. SOFTWARE OVERVIEW

In almost all instances, drivers are not required for the ZT 6640. However, if you encounter problems please contact Ziatech Technical Support. A suite of software drivers that supports Microsoft® MS-DOS® 5.0-6.x, Microsoft Windows 3.x, Microsoft Windows 95, Microsoft Windows NT®, IBM OS/2, SCO® UNIX®, and Novell® NetWare® operating systems is available.

LARGE DRIVE SUPPORT

Large drive (drives > 540 Mbyte) support provided by the ZT 6640 device drivers depends on existing Int13 handler (BIOS) support. If a drive is FDISKed and FORMATted without the driver loaded, it is important to configure the driver correctly when using it with the drive.

When the driver is loaded, the system BIOS is interrogated to determine the drive interfacing capabilities of the BIOS. By default, a drive continues to be treated exactly as it was without the ZT 6640 device driver loaded. That means that large drives are supported only if the Int13 handler supports it. This default setting can be disabled through use of appropriate command line switches. Extended CHD is the default translation method; LBA can be forced by the /LBA command line switch. The Ziatech BIOS supports LBA within Int13 for the Primary Channel.

IMPORTANT: To make use of the full capacity of a large drive, translation must be used to format it, and the same method of translation must be used for accessing it. The same applies while moving a drive supported by one system (BIOS) to another.

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APPENDIX A. SPECIFICATIONS

This appendix presents the electrical, environmental, and mechanical specifications for the ZT 6640.

INTEGRATED DRIVE SPECIFICATIONS

The "Current, Environmental, and Mechanical Requirements" table (below) shows specifications for ZT 6640 integrated drive units. The ZT 6640-0 (non-integrated controller) is also represented. The electrical and environmental specifications of the integrated drives are greatly affected by requirements of the drive itself. This is seen when the base ZT 6640-0 is compared to integrated versions.

All data is current and will be updated when appropriate. Contact Ziatech for further details on individual drives.

The term "typical" when used with current requirements for integrated drives means the sum of base controller typical (ZT 6640-0) plus the Random Read/Write current requirements. "Maximum" means the sum of the maximum controller current plus the spin-up current.

Current, Environmental, and Mechanical Requirements

	ZT 6640-0	ZT 6640-1.4G
+5V Typ. (mA) (Idle)	10	110
+5V Typ. (mA) (R/W)	10	510
+5V Max. (mA) (Spinup)	10	1510
Avg. Seek (ms)	--	13
BIOS Revision that supports drive	4.53	4.57
Recommended Setup Option	--	Auto
Storage Temperature (ºC)	-40 to +85	-20 to +60
Operating Temperature (ºC)	0 to +65	+5 to +55
% Humidity (Non-Condensing @ 40º C)	5 to 95	8 to 80
MTBF (K Hours)	--	300
Cardcage Slots Required	1	1
Board Weight (lbs)	0.2	0.7
Board Height (Inches)	0.35	0.5
Vibration (Non-Operational) (G)	--	5
Vibration (Operational) (G)	--	0.5
Shock (Non-Operational) (G)	--	200
Shock (Operational) (G)	--	100

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MECHANICAL SPECIFICATIONS

The following topics provide specifications for ZT 6640 dimensions and weight, connector locations, connector descriptions, and connector pinouts.

Board Dimensions and Weight

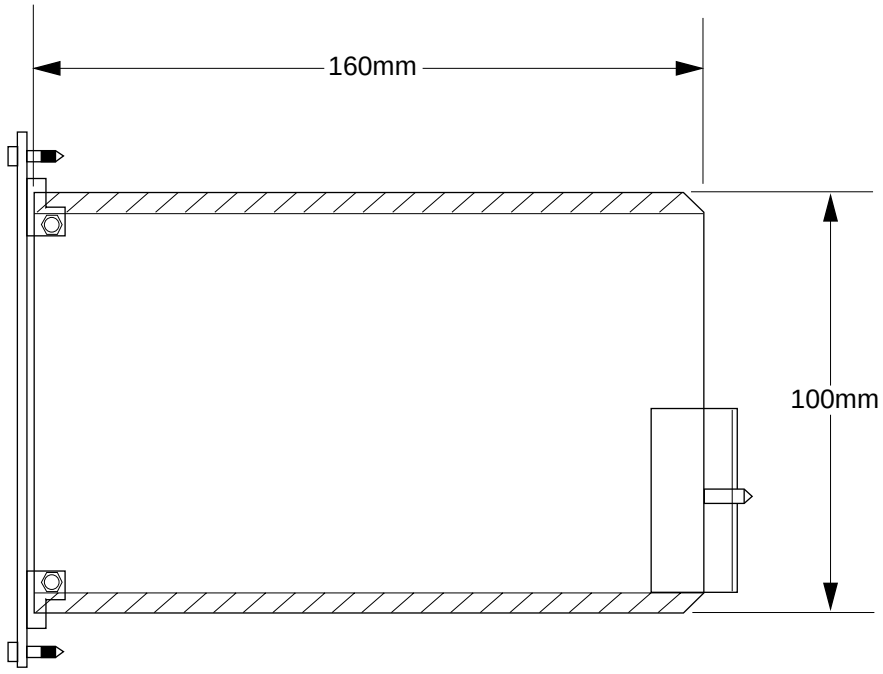
The ZT 6640 meets the CompactPCI Bus Specification for all mechanical parameters. Mechanical dimensions for the base board are shown in the "Base Board Dimensions" illustration and are outlined below. See the "Current, Environmental, and Mechanical Requirements" table for ZT 6640 dimensions with an integrated hard drive.

Board Length: 160 mm (6.3 inches)

Board Width: 100 mm (3.94 inches)

Board Thickness: 1.6 ± 0.2 mm (0.062 ±0.007 inches)

Board Weight: 232.5 grams (8.2 ounces)



Base Board Dimensions

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Connectors

As shown below in the "ZT 6640 Connector Locations" illustration, the ZT 6640 includes five connectors to interface to application-specific devices. The topics that follow provide descriptions of the individual connectors. Connector assignments are listed below.

J1 CompactPCI interface

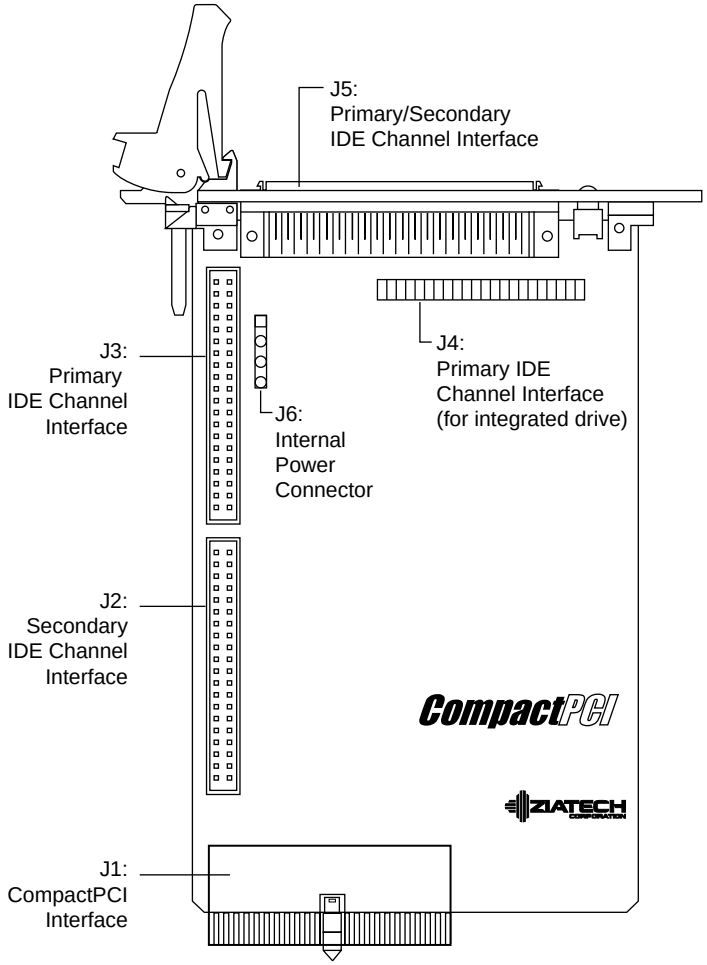
J2 Secondary IDE Channel Interface (0.1" header)

J3 Primary IDE Channel Interface (0.1" header)

J4 Primary IDE Channel Interface (2mm receptacle for integrated drive)

J5 External IDE Channel Interface (0.1" header)

J6 Auxiliary internal power connector



ZT 6640 Connector Locations

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J1 (CompactPCI Interface)

J1 is a 125-pin 2 mm x 2 mm female connector providing the PCI local bus interface. J1 provides a complete 32-bit PCI interface. This connector is CompactPCI compatible. Refer to the CompactPCI Specification for details. See the "J1 CompactPCI Interface Pinout" table for pin definitions.

J1 CompactPCI Interface Pinout

PIN	A	B	C	D	E	F
25	5V	REQ64#	RSVD	3.3V	5V	GND
24	AD(1)	5V	V(I/O)	AD(O)	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	SDONE	SBO#	GND	PERR#	GND
16	DEVSEL#	GND	V(I/O)	STOP#	LOCK#	GND
15	3.3V	FRAME#	IRDY#	GND	TRDY#	GND
14	KEY	KEY	KEY	KEY	KEY	KEY
13	KEY	KEY	KEY	KEY	KEY	KEY
12	KEY	KEY	KEY	KEY	KEY	KEY
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(270	GND
6	REQ#	GND	3.3V	CLK	AD(31)	GND
5	RSVD	RSVD	RST#	GND	GNT#	GND
4	RSVD	GND	V(I/O)	RSVD	RSVD	GND
3	INTA#	INTB#	INTC#	5V	INTD#	GND
2	TCK	5V	TMS	TDO	TDI	GND
1	5V	-12V	TRST#	+12V	5V	GND

Notes:

1. V(I/O) are 5.0 V
2. Rows 12 to 14 are used for keying

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J2 (Secondary IDE Channel Connector)

J2 is a 40-pin (dual 20-pin) male shrouded header connector with 0.1" lead spacing. This connector is used for interfacing to an external drive (one not mounted to the ZT 6640). These signals are shared with J5. See the "J2 Secondary IDE Channel Connector Pinout" table for pin definitions.

J2 Secondary IDE Channel Connector Pinout

Pin	Function	Pin	Function
1	RESET	2	GND
3	D7	4	D8
5	D6	6	D9
7	D5	8	D10
9	D4	10	D11
11	D3	12	D12
13	D2	14	D13
15	D1	16	D14
17	D0	18	D15
19	GND	20	NC
21	DMAREQ	22	GND
23	IOW-	24	GND
25	IOR-	26	GND
27	IORDY	28	ALE (GND)
29	DMAACK-	30	GND
31	INTQR	32	IOCS16-
33	A1	34	PDIAG (NC)
35	A0	36	A2
37	CS1-	38	CS3-
39	DASP-	40	GND

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J3 (Primary IDE Channel Connector)

J3 is a 40-pin (dual 20-pin), male shrouded header connector with 0.1" lead spacing. This connector is used for interfacing to an external drive (one not mounted to the ZT 6640). These signals are shared with J5. See the "J3 Primary IDE Channel Connector Pinout" table for pin definitions.

J3 Primary IDE Channel Connector Pinout

Pin	Function	Pin	Function
1	RESET	2	GND
3	D7	4	D8
5	D6	6	D9
7	D5	8	D10
9	D4	10	D11
11	D3	12	D12
13	D2	14	D13
15	D1	16	D14
17	D0	18	D15
19	GND	20	NC
21	DMAREQ	22	GND
23	IOW-	24	GND
25	IOR-	26	GND
27	IORDY	28	ALE (GND)
29	DMAACK-	30	GND
31	INTQR	32	IOCS16-
33	A1	34	PDIAG (NC)
35	A0	36	A2
37	CS1-	38	CS3-
39	DASP-	40	GND

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J4 (Primary IDE Channel Connector)

J4 is a 44-pin (dual 22-pin), right-angle female receptacle with 2 mm lead spacing. This connector is used for interfacing to an optional integrated 2.5" drive. These signals are shared with J3. See the "J4 Primary IDE Channel Connector Pinout" table for pin definitions.

J4 Primary IDE Channel Connector Pinout

Pin	Function	Pin	Function
1	RESET	2	GND
3	D7	4	D8
5	D6	6	D9
7	D5	8	D10
9	D4	10	D11
11	D3	12	D12
13	D2	14	D13
15	D1	16	D14
17	D0	18	D15
19	GND	20	NC
21	DMAREQ	22	GND
23	IOW-	24	GND
25	IOR-	26	GND
27	IORDY	28	ALE (GND)
29	DMAACK-	30	GND
31	INTQR	32	IOCS16-
33	A1	34	PDIAG (NC)
35	A0	36	A2
37	CS1-	38	CS3-
39	DASP-	40	GND
41	5V (Logic)	42	5V (Motor)
43	GND	44	XT/AT-

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J5 (External IDE Connector)

J5 is an 80 position, right angle, high density, D-shell style connector. J5 carries both the primary and secondary IDE channels to the frontplate of the ZT 6640 for external accessibility. Note that External power is not available from the ZT 6640. External drives must have their own power source. See the "J5 External IDE Connector Pinout" table for pin definitions.

J5 External IDE Connector Pinout

Pin	Function	Pin	Function
1	RESET	2	GND
3	D7	4	D8
5	D6	6	D9
7	D5	8	D10
9	D4	10	D11
11	D3	12	D12
13	D2	14	D13
15	D1	16	D14
17	D0	18	D15
19	GND	20	NC
21	DMAREQ	22	GND
23	IOW-	24	GND
25	IOR-	26	GND
27	IORDY	28	ALE (GND)
29	DMAACK-	30	GND
31	INTQR	32	IOCS16-
33	A1	34	PDIAG (NC)
35	A0	36	A2
37	CS1-	38	CS3-
39	DASP-	40	GND
41	RESET	42	GND
43	D7	44	D8

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J5 External IDE Connector Pinout (cont.)

Pin	Function	Pin	Function
45	D6	46	D9
47	D5	48	D10
49	D4	50	D11
51	D3	52	D12
53	D2	54	D13
55	D1	56	D14
57	D0	58	D15
59	GND	60	NC
61	DMAREQ	62	GND
63	IOW-	64	GND
65	IOR-	66	GND
67	IORDY	68	ALE (GND)
69	DMAACK-	70	GND
71	INTQR	72	IOCS16-
73	A1	74	PDIAG (NC)
75	A0	76	A2
77	CS1-	78	CS3-
79	DASP-	80	GND

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J6 (Internal Power Connector)

J6 is a 0.2" style connector footprint. By default no connector is loaded in this position. However, wiring can be attached to provide a 4-position power connector for drives. The J6 connector is provided to add flexibility for customers who may wish to mount custom drives in the system. See the "J6 Internal Power Connector Pinout" Table for pin definitions.

J6 Internal Power Connector Pinout

Pin	Function	Current Capacity
1	+5VDC	1 AMP
2	Ground	
3	Ground	
4	+12 VDC	300mA

Note: The J6 connector has no circuit protection. Caution should be observed to avoid improper wiring or capacity excesses. Damage to the ZT 6640 and/or the system can result. Contact Ziatech Technical Support for help if needed.

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APPENDIX B. 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://ftp.ziatech.com/.

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

RELIABILITY

Ziatech has taken extra care in the design of the ZT 6640 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 6640 has an identification number. Ziatech maintains a lifetime data base 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

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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.

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.

Ziatech Corporation warrants that for a period of ninety (90) days from the date of purchase; the media on which software is furnished will be free of defects in materials and workmanship under normal use; and the software contains the features described in the Ziatech price list. Otherwise, the software is provided "AS IS". This limited warranty extends only to Customer as the original licensee. Customer's exclusive remedy and Ziatech's entire liability under this limited warranty will be, at Ziatech's option, to repair or replace the software, or refund the license fee paid therefore.

Ziatech may offer, where applicable and available, replacement products; otherwise, repairs requiring components, assemblies, and other purchased materials may be limited by market availability.

Ziatech assumes no liability resulting from changes to government regulations affecting use of materials, equipment, safety, and methods of repair. Ziatech may, at its discretion, offer replacement products.

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Ziatech neither assumes nor authorizes any person to assume for it any other liability. The liability of Ziatech under this warranty agreement is limited to a refund of the purchase price. In no event shall Ziatech be liable for loss of profits, use, incidental, consequential, or other damage, under this agreement.

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.

TRADEMARKS

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