ZT 6650

CompactPCI®
Fast Ethernet® Interface

HARDWARE MANUAL
For ZT 6650 Revision A

ZT M6650
February 25, 1998
10256402

1050 Southwood Drive
San Luis Obispo, CA 93401 USA
Tel (805) 541-0488
FAX (805) 541-5088
http://www.ziatech.com

ZT 6650

CompactPCI®
Fast Ethernet® Interface

HARDWARE MANUAL
For ZT 6650 Revision A

ZT M6650
February 25, 1998
10256402

CompactPCI is a trademark of the PCI Industrial Computers Manufacturers Group.

DEC and Digital Semiconductor are trademarks of Digital Equipment Corporation.

Windows and Windows NT are registered trademarks of Microsoft Corporation.

NWay is a trademark of National Semiconductor Corporation.

QNX is a registered trademark of Quantum Software Systems Ltd.

STD 32 is a registered trademark of Ziatech Corporation.

All other brand and product names are trademarks or registered trademarks of their respective holders.

WHAT'S IN THIS MANUAL?

This manual describes the operation and use of the ZT 6650 CompactPCI Fast Ethernet Interface.

The following outline summarizes the focus of each chapter in this manual.

Chapter 1, "Introduction," offers an overview of the ZT 6650. It includes a product definition and a listing of product features. This chapter is most useful to those who wish to compare the features of the ZT 6650 against the needs of a specific application.

Chapter 2, "Getting Started," summarizes the information you need to get your ZT 6650 operational, including system requirements and connector descriptions. This may be all the information you need to begin using the ZT 6650.

Chapter 3, "Functional Blocks," illustrates functional relationships between key components of the board. Some of the topics discussed include compliance levels, software support, features and registers, and board configuration.

Appendix A, "Specifications," contains the electrical, mechanical, and environmental specifications for the ZT 6650.

Appendix B, "Customer Support," offers technical support information and instructions for returning the ZT 6650 if service is necessary.

CONTENTS

Contents

TABLES

ILLUSTRATIONS

CHAPTER 1. INTRODUCTION

This chapter provides a brief introduction to the ZT 6650 CompactPCI™ Fast Ethernet Interface. It includes a product definition and a listing of product features. You will find unpacking information and installation instructions in Chapter 2, "Getting Started."

PRODUCT DEFINITION

The ZT 6650 is a fast Ethernet LAN controller for either 10BASE-T or 100BASE-TX data rates providing a direct interface to the CompactPCI™ local bus. The interface is based on Digital Semiconductor's™ DEC™21140A PCI Fast Ethernet LAN Controller chip, a single-chip master, direct memory access (DMA) Fast Ethernet controller set up to minimize host CPU utilization and bus traffic.

The ZT 6650 interfaces to the host processor by using onchip command and status registers and a shared host memory area, set up during initialization. This minimizes processor involvement in the 21140A operation during normal reception and transmission. Bus traffic is also minimized by filtering out received runt frames and by automatically retransmitting collided frames without a repeated fetch from the host memory.

FEATURES OF THE ZT 6650

- 32-bit bus mastering design allows maximum throughput without loading the host CPU
- Installs easily with plug and play auto-configuration
- Easily visible LEDs indicate 100BASE-TX operation, plus receive and transmit activity
- National Semiconductor's NWay™ auto-negotiation feature determines 10 Mbits/s operation and 100 Mbits/s operation, in either half or full duplex
- Supports full duplex mode for 20 or 200 Mbits/s operation
- 100% compliant with IEEE 802.3 10BASE-T and 802.3u 100BASE-TX Ethernet standards
- Jumperless and switchless operation
- Compliant with CompactPCI specification 1.0
- 132 Mbits/s data transfer rate through the 32-bit PCI bus
- Remote boot ROM socket allows diskless workstation to boot from LAN server
- Five year warranty and free technical support

CHAPTER 2. GETTING STARTED

This chapter summarizes the information you need to get your ZT 6650 up and running. You should read this chapter before you attempt 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. 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 6650 CompactPCI board
- Anti-static packing material
- On-Line Help disk for the ZT 6650
- Paper version of the ZT 6650 Operating Manual (if ordered)

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

WARNING!

Like all equipment utilizing CMOS devices, the ZT 6650 must be protected from static discharge. Never remove any of the socketed parts except at a static-free workstation.

SYSTEM REQUIREMENTS

The ZT 6650 is designed for CompactPCI bus applications and is therefore mechanically and electrically compatible with the *CompactPCI Bus Specification.*

The board requires +5 VDC ±5% at 840 mA maximum, 640 mA typical. The relative humidity must be less than 95% at 40° C, non-condensing. Refer to Appendix A for additional specifications.

HARDWARE INSTALLATION

The ZT 6650 is designed to plug into a CompactPCI card cage. Steps for installing the ZT 6650 board are as follows:

1. Turn off the power to the CompactPCI card cage.

2. Insert the ZT 6650 into the card cage up to the extraction lever. Make sure you are putting the ZT 6650 into a bus slot that supports a bus master device. These are generally slots 2 through 6.

3. Pull up on the ZT 6650 until the connector seats.

4. Connect the Ethernet Category 5 cable to the RJ-45 connector on the front plate.

5. Power up the system.

6. On the ZT 97123-100 driver diskette provided with the board, refer to the INSTALL.DOC file appropriate to your operating system and load the appropriate drivers. Default drivers from Windows® 95, Windows NT™ and possibly other operating systems will not work with the ZT 6650. Use the drivers on the ZT 97123-100 diskette.

7. Configure your system using the network driver appropriate to your operating system. (This manual cannot cover all the possible network configurations in which the ZT 6650 may be used).

Connectors

As shown in the "Connector Locations" drawing, the ZT 6650 includes two connectors to interface to application-specific devices. The "Connector Assignments" table below pairs each connector with its function.

Connector Assignments

Connector	Function
J1	CompactPCI local bus interface connector
J2	RJ-45 connector

Jumpers

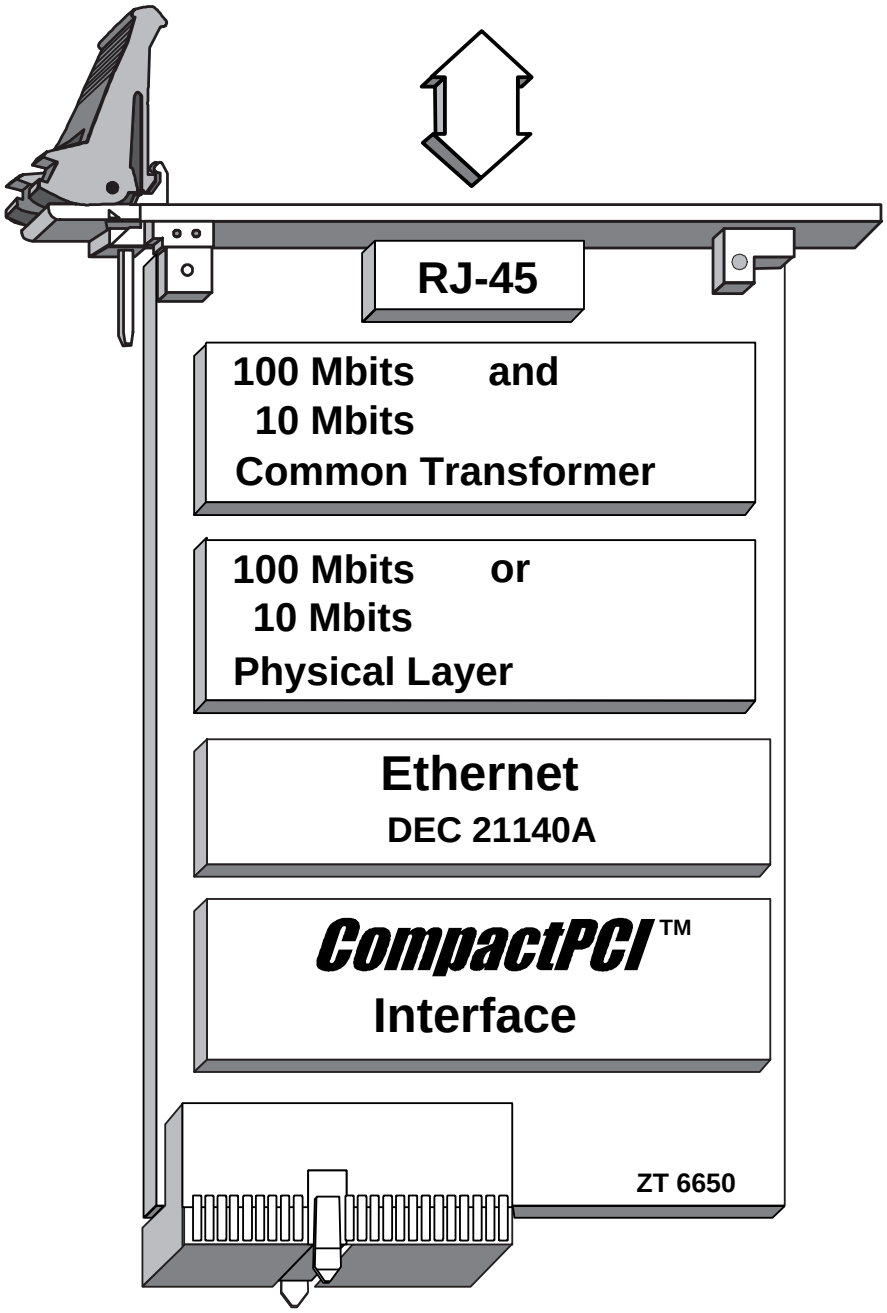
Since the ZT 6650 uses the PCI bus, which supports plug-and-play configuration, there are no jumper options for the board.

SOFTWARE DRIVER PACKAGE

A software driver installation package is available (ZT 97121-100) to support DOS, Windows 3.1, Windows 95, and Windows NT users. A QNX® driver will be available soon. Contact QNX for more information.

CHAPTER 3. FUNCTIONAL BLOCKS

This chapter presents a high-level look at the way the ZT 6650 functions. It is designed to help you become more familiar with the board. The "ZT 6650 Functional Block Diagram" illustrates the functional relationship between the key components on the board, and should be referred to as you read this chapter.



ZT 6650 Functional Block Diagram

CompactPCI INTERFACE

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 Computer Manufacturers Group), which is a consortium of companies involved in utilizing PCI for embedded applications.

CompactPCI appeals to customers that require the following capabilities:

- PCI performance
- 32- and 64-bit data transfers
- 8 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

CONNECTIVITY

(J1) is a CompactPCI compatible connector providing a complete 32-bit PCI local bus interface.

(J2) is an RJ-45 connector for use with either 10BASE-T or 100BASE-TX Ethernet LANs. Such use requires Category 5 UTP cable.

COMMON TRANSFORMER

The ZT 6650 incorporates a design that allows the board to use a single transformer for both 10 Mbits/s and 100 Mbits/s Ethernet signals. By implementing a common transformer, the design is less complex, has greater reliability, and consumes less power.

PHYSICAL LAYER

National Semiconductor's DP83840 or DP83233 provides auto-detection and switching of 10 Mbits/s or 100 Mbits/s signals. Using NWay™ auto-negotiation, the adapter senses the hub's speed and sets the adapter to run at either 10 Mbits/s or 100 Mbits/s in either Half Duplex or Full Duplex mode, depending on the capabilities of the hub.

Important: Connection to a 100BASE-TX hub for 100 Mbits/s operation requires Category 5 unshielded twisted-pair (UTP) cable. The maximum length from the 100BASE-TX hub to the adapter is **100 meters**. Connection to a 10BASE-T hub for 10 Mbits/s operation requires a Category 3, 4, or 5 UTP cable.

ETHERNET: DEC21140A

The Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller chip supports the peripheral component interconnect (PCI) bus. Some of the DEC21140A's features are listed below. This list is followed by two topics providing outlines of the DEC21140A's configuration registers and command and status registers (CSRs).

For more detailed information about the DEC21140A, refer to the DEC21140A data book, available from Digital Equipment Corporation at 1-800-332-2717.

- Supports either 10 Mbits/s or 100 Mbits/s network ports
- Provides a standard 10 Mbits/s and 100 Mbits/s MII supporting CAT 5 UTP and shielded twisted-pair (STP) cables
- Contains onchip scrambler and PCS for CAT 5 to significantly reduce the cost of 100BASE-T solutions
- Supports full-duplex operation on both 10 Mbits/s and 100 Mbits/s ports
- Provides internal loopback capability on both ports
- Contains a variety of flexible address filtering modes (including perfect, hash table, inverse perfect, and promiscuous):
    -- 16 perfect addresses (normal or inverse filtering)
    -- 512 hash-filtered addresses
    -- 512 hash-filtered multicast addresses and one perfect address
    -- Pass all multicast
- Contains large independent receive and transmit FIFOs; no additional onboard memory required
- Supports either big or little endian byte ordering for buffers and descriptors
- Supports IEEE 802.3, ANSI 8802-3, and Ethernet standards

Configuration Registers

As shown in the "Configuration Registers Mapping" table, the DEC21140A uses eight configuration registers for initialization and configuration to identify and query the DEC21140A.

Configuration Registers Mapping

Configuration Register	Identifier	I/O Address Offset
Identification	CFID	00H
Command and Status	CFCS	04H
Revision	CFRV	08H
Latency timer	CFLT	0CH
Base I/O address	CBIO	10H
Base memory address	CBMA	14H
Reserved		18H-38H
Interrupt	CFIT	3CH
Driver area	CFDA	40H

Command and Status Registers

As shown in the "Command and Status Registers Mapping" table, the ZT 6650 has 16 command and status registers (CSR0 through CSR15) for host communication. The CSRs are mapped in the host I/O or memory address space and are used for the following purposes:

- Initialization
- Pointers
- Commands
- Status reporting

Command and Status Registers Mapping

Register	Meaning	Offset from CSR Base Address (CBIO and CBMA)
CSR0	Bus Mode	00H
CSR1	Transmit poll demand	08H
CSR2	Receive poll demand	10H
CSR3	Receive list base address	18H
CSR4	Transmit list base address	20H
CSR5	Status	28H
CSR6	Operation mode	30H
CSR7	Interrupt enable	38H
CSR8	Missed frame counter	40H
CSR9	Serial ROM and MII management	48H
CSR10	Reserved	50H
CSR11	General-purpose timer	58H
CSR12	General-purpose port	60H
CSR13	Reserved	68H
CSR14	Reserved	70H
CSR15	Watchdog timer	78H

APPENDIX A. SPECIFICATIONS

This appendix describes the electrical, environmental, and mechanical specifications of the ZT 6650. It also includes illustrations of the board dimensions, the ZT 6650 Connector Locations, the J1 CompactPCI Connector, and tables showing the pin assignments for the ZT 6650s connectors.

ELECTRICAL SPECIFICATIONS

Power requirements for the ZT 6650 are shown in the table below.

Power Requirements	Minimum	Typical	Maximum
Supply Voltage, Vcc	4.75 V	5.00 V	5.25 V
Supply Current, Vcc = 5.0 V	310 mA	640 mA	840 mA

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature:	0° to +65° Celsius
Storage Temperature:	40° to +85° Celsius
Relative Humidity:	< 95% at 40° Celsius, non-condensing

MECHANICAL SPECIFICATIONS

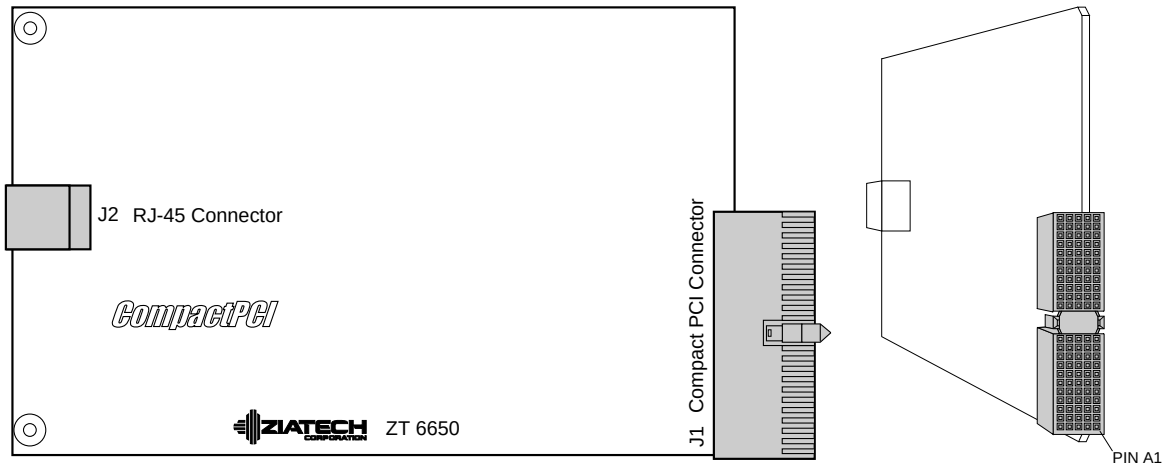
The following topics provide specifications for ZT 6650 dimensions and weight, connector locations, connector descriptions, and connector pinouts.

Board Dimensions and Weight

Dimensions:	6.299" x 3.937" (160 mm x 100 mm)
Height:	Occupies one card slot
Weight:	5.3 oz. (148 g)

Connectors

As shown in the "Connector Locations" drawing, the ZT 6650 includes two connectors to interface with application-specific devices. The following topics provide complete descriptions and pinouts for the connectors.



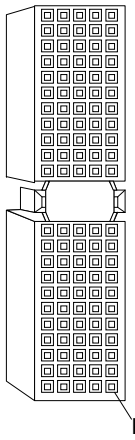
ZT 6650 Connector Locations

J1 (CompactPCI Connector)

J1 is a 110-pin 2 mm x 2 mm right-angle female connector providing the PCI local bus interface. J1 provides a complete 32-bit PCI interface. This connnector is CompactPCI compatible. Refer to the CompactPCI Specification for details. See the "J1 PCI Interface Pinout" table below for the pin definitions.

J1 PCI Interface Pinout

Pin#	Z	A	B	C	D	E	F
Pin 25	GND	5V	REQ64#	BRSV	3.3V	5V	GND
Pin 24	GND	AD[1]	5V	V(I/O)[2]	AD[0]	ACK64#	GND
Pin 23	GND	3.3V	AD[4]	AD[3]	5V	AD[2]	GND
Pin 22	GND	AD[7]	GND	3.3V	AD[6]	AD[5]	GND
Pin 21	GND	3.3V	AD[9]	AD[8]	M66EN[5]	C/BE[0]#	GND
Pin 20	GND	AD[12]	GND	V(I/O)[2]	AD[11]	AD[10]	GND
Pin 19	GND	3.3V	AD[15]	AD[14]	GND	AD[13]	GND
Pin 18	GND	SERR#	GND	3.3V	PAR	C/BE[1]#	GND
Pin 17	GND	3.3V	SDONE	SBO#	GND	PERR#	GND
Pin 16	GND	DEVSEL#	GND	V(I/O)[2],[6]	STOP#	LOCK#	GND
Pin 15	GND	3.3V	FRAME#	IRDY#	GND	TRDY#	GND
Pin 14							
Pin 13				KEY AREA			
Pin 12							
Pin 11	GND	AD[18]	AD[17]	AD[16]	GND	C/BE[2]#	GND
Pin 10	GND	AD[21]	GND	3.3V	AD[20]	AD[19]	GND
Pin 9	GND	C/BE[3]#	IDSEL	AD[23]	GND	AD[22]	GND
Pin 8	GND	AD[26]	GND	V(I/O)	AD[25]	AD[24]	GND
Pin 7	GND	AD[30]	AD[29]	AD[28]	GND	AD[27]	GND
Pin 6	GND	REQ#	GND	3.3V	CLK	AD[31]	GND
Pin 5	GND	BRSV	BRSV	RST#	GND	GNT#	GND
Pin 4	GND	BRSV	GND	V(I/O)	INTP	INTS	GND
Pin 3	GND	INTA#	INTB#	INTC#	5V	INTD#	GND
Pin 2	GND	TCK	5V	TMS	TDO	TDI	GND
Pin 1	GND	5V	-12V	TRST#	+12V	5V	GND
Pin#	**Z**	**A**	**B**	**C**	**D**	**E**	**F**



ZT6650FA-03

J2 (RJ-45 Connector)

J2 is an 8-pin RJ-45 connector that supports both 10BASE-T and 100BASE-TX Ethernet LANs. This requires the use of Category 5 UTP cable. Pin assignments are given in the "J2 (RJ-45 Connector) Pinout" table.

J2 (RJ-45 Connector) Pinout

Pin #	Signal
Pin 1	TX+
Pin 2	TX-
Pin 3	RX+
Pin 6	RX-
Pins 4 & 5	Unused pair. These pins are terminated on ZT 6650.
Pins 7 & 8	Unused pair. These pins are terminated on ZT 6650.

APPENDIX B. CUSTOMER SUPPORT

This section offers a product revision history, technical assistance for the ZT 6650, and the necessary information should you need to return your ZT 6650 for repair.

REVISION HISTORY

Revision A - 9/15/96

Revision A is the original production release of the 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*.

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 product design to ensure reliability. The three major ways in which reliability is achieved are:

1. The product is designed in top-down fashion, utilizing the latest in hardware and software techniques, so unwanted side effects and unclean interactions between parts of the system are eliminated.

2. Ziatech tests each board by exercising its functions, burns it in under power, and retests it to ensure that the infant mortality phase is passed before the product is shipped.

3. Ziatech maintains a lifetime data base on each board. 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 obtain a Returned Material Authorization (RMA) number by calling (805) 541-0488. We will need the following information to expedite the return of your board:

1. Your company name and address for invoicing.
2. Your shipping address and phone number.
3. The ZT 6650 Product I.D. number.
4. If possible, the name of a technically qualified individual at your company familiar with the observed 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.

Pack the ZT 6650 in **anti-static** material and ship in a sturdy cardboard box with enough packing material to adequately cushion the board. ***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 5+5 WARRANTY

Ziatech provides a five year limited warranty to its customers with a special extended warranty option. 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, 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.

THE ABOVE WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, WHETHER EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY FOR

FITNESS OF PURPOSE, MERCHANTABILITY, OR FREEDOM FROM INFRINGEMENT OR THE LIKE, AND ANY WARRANTY OTHERWISE ARISING OUT OF ANY PROPOSAL, SPECIFICATIONS, OR SAMPLE.

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.

Special Extended Warranty Option

In addition to the standard five-year warranty, Ziatech offers, for a nominal fee, an extended period of warranty up to five extra years. This extended warranty period provides similar coverage and conditions as stated above in the five-year limited warranty 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.

INDEX

- 1 -

- A -

- B -

- C -

- D -

- E -

- F -

- G -

- H -

- I -

- J -

- L -

- M -

- O -

- P -

- R -

- S -

- T -

- V -

- W -

- Z -

1050 Southwood Drive
San Luis Obispo, CA 93401 USA
Tel (805) 541-0488
FAX (805) 541-5088
http://www.ziatech.com