



SERVICE MANUAL

EPC®-2322 SBC
P3000(D)BX2 Series SBC

P/N 007-31609-0000

October 2001

Limited Warranty

- A. RadiSys Corporation warrants that the item sold by it hereunder will be free from defects in materials or workmanship, under normal use and service, for a period of 2 years from date of shipment. Said item will meet the specifications in effect at the time of manufacture. RadiSys' sole obligation under this warranty shall be, at its option, to repair or replace, without charge, any defective component of said item, within a reasonable period of time.
- B. RadiSys Corporation shall not be liable under this warranty for (i) the item that the Buyer alleges to be defective and was repaired or altered by someone other than RadiSys designated personnel or authorized representative, unless such repair or alteration was effected pursuant to prior written approval of RadiSys, or (ii) where the Buyer fails to notify RadiSys of any alleged defect within the period of warranty, or (iii) where the Buyer fails to return the allegedly defective item to RadiSys in Houston, Texas, USA, freight prepaid, or (iv) where the item was altered or damaged in a way which RadiSys reasonably determines to affect the performance and reliability of the item, or (v) where the item was subject to misuse, neglect, or accident. The rights and remedies granted to the Buyer under this paragraph constitute the Buyer's sole and exclusive remedy against RadiSys Corporation, its officers, agents, and employees, for negligence, inexcusable delay, breach of warranty, express or implied, or any other default relating to the item or the duties of RadiSys to eliminate any errors.

This warranty supersedes 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. Furthermore, RadiSys Corporation neither assumes nor authorizes any person to assume for it any other liability.

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Every effort has been made to ensure that the information provided in this manual is complete and accurate. However, technical inaccuracies or typographical errors may be inadvertently included. RadiSys assumes no responsibility for any errors that may be contained in this document. RadiSys makes no promise to update or keep current the information contained in this document. Information in this document, including product specifications, is subject to change without notice.

All tradenames referenced are the service mark, trademark, or registered trademark of the respective manufacturer.

Important

Always use caution when handling or operating the system. Only qualified and experienced electronics service personnel should access the unit's interior. Use extreme caution when installing or removing components. For additional information, contact RadiSys Technical Support at 1-800-438-4769 or 1-713-541-8200 Monday through Friday between 7:00 a.m. and 6:00 p.m., Central Time, Continental USA.

Wichtig

Arbeiten am System bzw. Betrieb des Systems, sollten immer mit der nötigen Vorsicht vorgenommen werden. Nur qualifiziertes und ausgebildetes Fachpersonal sollte am Inneren des Gerätes arbeiten. Beim Installieren und Entfernen von Komponenten ist besondere Vorsicht geboten.

Für weitere Informationen wenden Sie sich bitte an den Technical Support von RadiSys:

- USA: 1-800-438-4769 oder 1-713-541-8200 Montags bis Freitags von 0700 Uhr bis 1800 Uhr, Central USA.
- International: +31-36-5365595 Montags bis Freitags von 0830 Uhr bis 1700 Uhr. (CET GMT +1.00)

Changes or modifications not expressly approved by RadiSys Corporation could void the product warranty and the user's authority to operate the equipment.

Notice

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can emit radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case, the user will be required to correct the interference at the user's expense.

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

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

Any change or modification not expressly approved by the manufacturer is prohibited and could void the user's authority to operate the equipment.

This product also meets requirements for compliance with EN55022, Class B ITE.


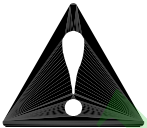


Document Conventions

Typography

Title Case	Titles of menus, windows, tabs, lists, and groups.
Bold Title Case	Names of menu items, fields, buttons, icons, check boxes, list items, group items, and keystrokes.
UPPER CASE	Acronyms and abbreviations.
<i>Italics</i>	Emphasis.
Sans Serif Type	Items in tables, illustrations, and notations.
Monospace Type	Output from a printer or monitor. Graphic items will be displayed as images.

Symbols

	Notice: This symbol indicates an item for special consideration.
	Warning: This symbol indicates the presence of a potential hazard that can cause personal injury. Only qualified and trained electronics service personnel should access the equipment.

Customer Support

Calling Technical Support

Step	Action
1	Have the RadiSys product model and serial number available.
2	<ul style="list-style-type: none"> In the Continental USA, Monday — Friday, 7:00 a.m. — 6:00 p.m., Central Time, dial 1-800-438-4769 in the USA. Outside the USA, dial 713-541-8200 (add long distance/international access codes). In Europe, Monday — Friday, 8:30 a.m. — 5:00 p.m., dial +31-36-5365595.

Returning Products for Service

Step	Action
1	Have the RadiSys product model and serial number available.
2	<ul style="list-style-type: none"> In the Continental USA, Monday — Friday, 7:00 a.m. — 6:00 p.m., Central Time, dial 1-800-438-4769 in the USA. Outside the USA, dial 713-541-8200 (add long distance/international access codes). In Europe, Monday — Friday, 8:30 a.m. — 5:00 p.m., dial +31-36-5365595.
3	<p>Obtain a Returned Material Authorization (RMA) number from Technical Support. The RMA number and serial number of each returned product must be written on the outside of the package and on any enclosed correspondence.</p> <p>Note: The factory will refuse the shipment if it is sent freight collect, or if it does not display an RMA number.</p>

Accessing the Web site

In-depth printable service manuals and other documentation are available for download from the RadiSys Web site:
<http://www.radisys.com>
 Then click on "Support" to access a link to the manuals, addenda, drivers and BIOS. The documentation for current and discontinued products is available at this Web site in Adobe® Acrobat® PDF format. Documentation may be viewed and printed using the free Acrobat® Reader™ software.

Inspection of Contents / Packaging of Product

The packaging for this product has been tested to assure that it will withstand responsible handling by the carrier.

Inspect contents immediately and file a claim with the carrier for any damage. Save the shipping box and packaging material to use for any further shipment of this equipment. However, if the packaging is damaged and is not suitable for shipment, call RadiSys Technical Support to obtain new packaging. The warranty may be void if the product is returned using unapproved or damaged original packaging.

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1

Introduction



This chapter discusses functions and features of the equipment that can be accessed *only* by qualified and trained electronics service personnel. The material contained in this chapter does *not* discuss any user-accessible parts or operations. All tasks related to material in this chapter must be referred to qualified service personnel.

This chapter discusses the primary features of the EPC-2322 SBC (hereinafter called P3000(D)BX2 or SBC).

If you are familiar with the primary components and functions of the P3000(D)BX2, and you wish to quickly begin operating the SBC, go to Chapter 2, “6 Steps to Operation,” page 12. Then read this chapter later at your convenience.

EPC-2322 SBC (P3000(D)BX2 Series)

Standard Features

The RadiSys EPC-2322 Single Board Computer (SBC) (P3000(D)BX2 Series) provides the following features (Figure 1 on page 4):

- Single or dual Intel® Pentium® III processor(s)
 - 450 and 500 MHz speeds, or higher as technology becomes available
 - Integrated 512 KB L2 cache
 - Support for 100 MHz front side bus
- Intel 440BX AGPset
 - 82443BX Host Bridge/Controller (System Controller, or North-Bridge)
 - 82371EB PCI-TO-ISA/IDE Xcelerator (PIIX4, or South-Bridge)
- SMSC FDC37C935x Ultra I/O™ Controller
- Adaptec AIC®-7890 PCI-to-Ultra2 SCSI Host Adapter
- Ultra2 LVD/SE SCSI terminators
- Intel 82093AA I/O Advanced Programmable Interrupt Controller (IOAPIC)
- Altera MAX EPM7128S programmable logic device (for on-board logic)
- Two (2) 168-pin DIMM sockets for up to 512 MB PC100 +3.3 V SDRAM (or higher as technology becomes available)
- 4 Mb (512 K x 8) boot block flash memory device
- National Semiconductor LM79CCVF Microprocessor System Hardware Monitor
- ICS 9148CF-20 clock synthesizer
- ICS 9179BF-01 SDRAM clock buffer
- Maxim MAX1617 Remote/Local Temperature Sensor with SMBus Serial Interface
- Maxim MAX3185 230 kbps ESD-protected RS-232 serial port
- Four (4) position DIP switch block for elements of system configuration
- CR2032 lithium (Li/MnO₂) coin battery to retain date, time, and CMOS parameters.

Connectivity

The P3000(D)BX2 provides the following connectors and headers:

- SCSI 68-pin (Fast/Wide) D-Sub female latching connector
- EIDE or IDE 40-pin male shrouded, latching header
- IDE/SCSI activity 2-pin male header
- Keyboard/Speaker/Reset 8-pin male shrouded header
- Floppy diskette drive 34-pin male shrouded, latching header
- Two (2) USB 4-pin male shrouded, keyed headers
- RS-232/422 serial port 10-pin male header (Serial 2)
- Temperature monitor 2-pin male header
- System Management bus expansion 2-pin male header for I²C network interface

Introduction

I/O Models

The P3000(D)BX2 is available in two I/O models, providing two different configurations of peripheral connectivity.

- Model SP, or Serial/Parallel (Figure 2 on page 5):
 - Temperature sensor LED on the I/O bracket
 - RS-232 serial port 9-pin male D-Sub connector (Serial 1) on the I/O bracket
 - Parallel port 25-pin female D-Sub connector on the I/O bracket
 - PS/2 mouse 10-pin male header on the board surface
 - RS-232/422 serial port 10-pin male header (Serial 2) on the board surface
- Model MKP, or Mouse/Keyboard/Parallel (Figure 3 on page 5):
 - Temperature sensor LED on the I/O bracket
 - PS/2 mouse 6-pin female mini-DIN connector on the I/O bracket
 - PS/2 keyboard 6-pin female mini-DIN connector on the I/O bracket
 - Parallel port 25-pin female D-Sub connector on the I/O bracket
 - RS-232 serial port 10-pin male header (Serial 1) on the board surface
 - RS-232/422 serial port 10-pin male header (Serial 2) on the board surface

More...

For more information on the components of the P3000(D)BX2, contact:

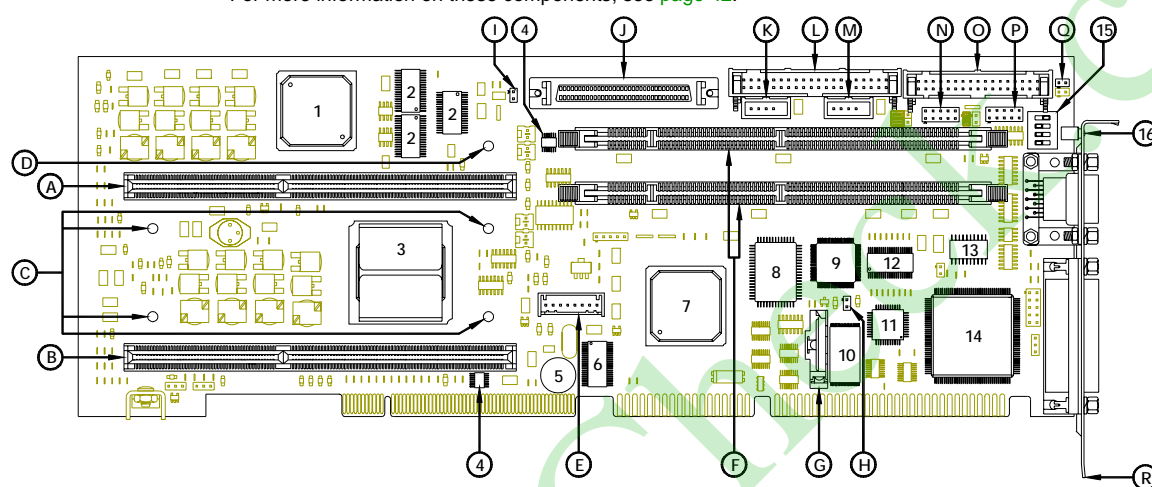
Company	Website
Adaptec, Inc.	http://www.adaptec.com
Altera Corporation	http://www.altera.com
Integrated Circuit Systems, Inc.	http://www.icst.com
Intel Corporation	http://www.intel.com
Maxim Integrated Products	http://www.maxim-ic.com
National Semiconductor Corporation	http://www.national.com
PCI Special Interest Group	http://www.pcisig.com
PICMG	http://www.picmg.com
Standard Microsystems Corporation	http://www.smsc.com

Introduction

Figure 1

P3000(D)BX2 Components and Layout

Note: This illustration shows the Pentium III processors with heatsinks and support devices uninstalled. For more information on these components, see [page 42](#).



- | | |
|--|--|
| 1. Adaptec AIC-7890 SCSI Host Adapter | A. Primary Pentium III Processor Connector |
| 2. Ultra2 LVD/SE SCSI Terminators (3) | B. Secondary Pentium III Processor Connector |
| 3. Intel 82443BX System Controller with Heatsink | C. Processor Retention Base Mounting Holes |
| 4. Maxim MAX1617 Temperature Sensor (2) | D. Mounting Hole (Future Expansion) |
| 5. Speaker | E. Keyboard/Speaker/Reset Header |
| 6. ICS 9148CF-20 Clock Synthesizer | F. DIMM Sockets (2) |
| 7. Intel 82371EB PIIX4 | G. CR2032 Li/MnO ₂ System Battery |
| 8. Intel 82093AA IOAPIC | H. SM Bus Expansion Header |
| 9. Altera MAX EPM7128S PLD | I. IDE/SCSI Activity LED Header |
| 10. 4 Mb Flash Memory Device | J. SCSI Header |
| 11. National LM79CCVF System Monitor | K. USB0 Header |
| 12. ICS 9179BF-01 SDRAM Clock Buffer | L. EIDE Header |
| 13. Maxim MAX3185 Serial Port | M. USB1 Header |
| 14. SMSC FDC37C935 Ultra I/O Controller | N. Serial Port 1 / PS/2 Mouse Header |
| 15. DIP Switch Block | O. FDD Header |
| 16. Temperature LED | P. Serial Port 2 Header |
| | Q. Temperature Monitor Header |
| | R. I/O Bracket |

Note:

For more information on I/O options, see [page 5](#).

Figure 2 P3000(D)BX2-SP Model

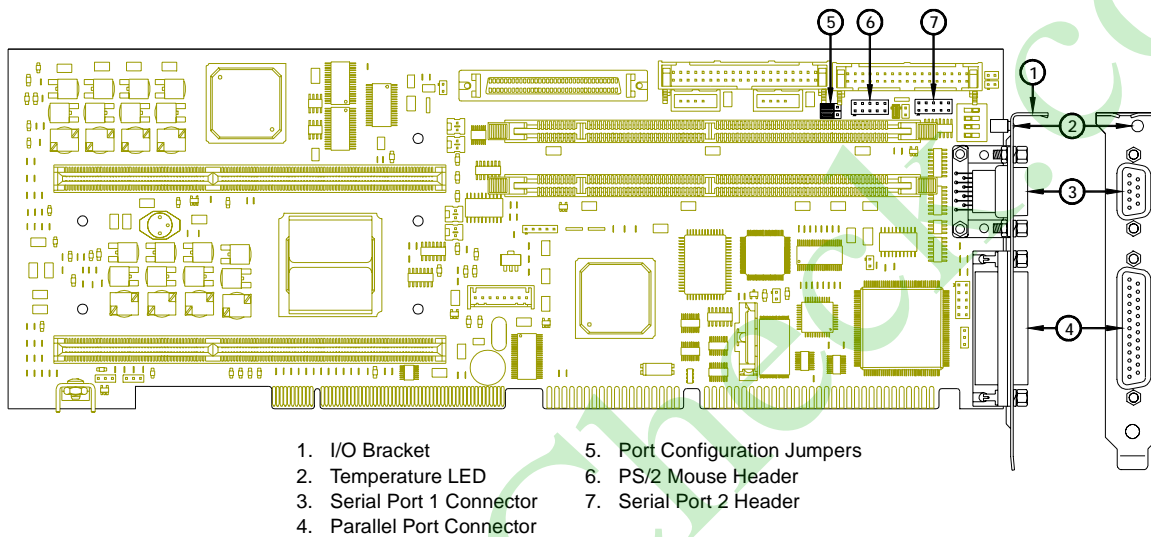
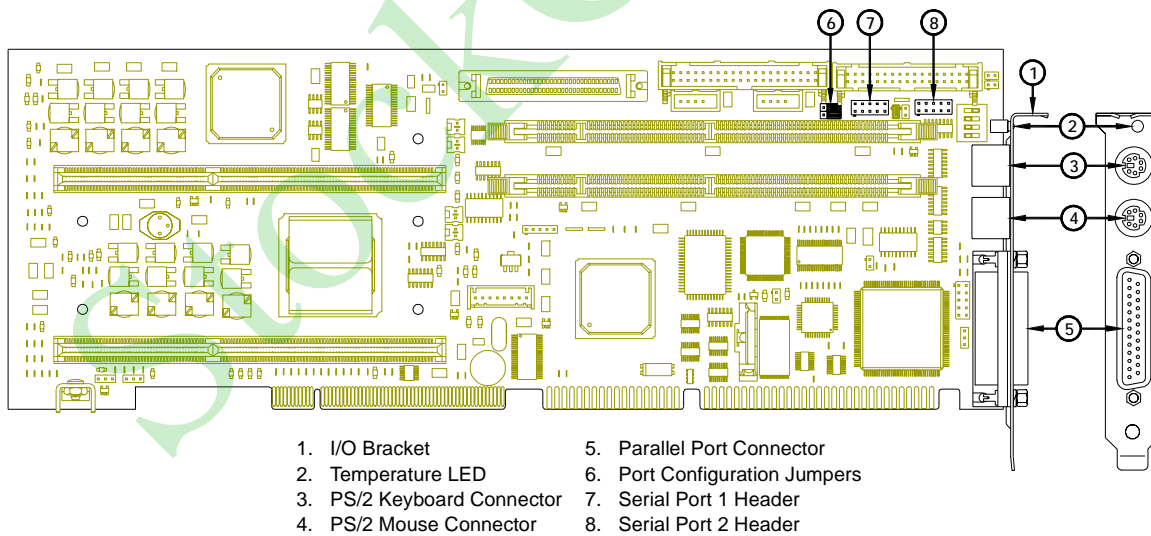


Figure 3 P3000(D)BX2-MKP Model



For more information on jumper settings, see [page 10](#).
For more information on peripheral connectors, see [page 16](#).

Notes

StockCheck.com



2

6 Steps to Operation



This chapter discusses functions and features of the equipment that can be accessed *only* by qualified and trained electronics service personnel. The material contained in this chapter does *not* discuss any user-accessible parts or operations. All tasks related to material in this chapter must be referred to qualified service personnel.

This chapter describes essential precautions for handling the P3000(D)BX2 and then outlines the basic steps for setting up the SBC:

1. Check jumper settings
2. Check switch settings
3. Install the SBC
4. Connect peripheral devices
5. Power-on the system
6. Run the Setup Utility

Handling the P3000(D)BX2

Overview

This section suggests basic precautions when handling the P3000(D)BX2 series SBC.

Static Electricity

The P3000(D)BX2 is designed with protection against ESD (electro-static discharge) and excessive voltage. However, excessive static electricity can damage components.

Before you handle the SBC, use the grounding wrist strap provided with the system to discharge the static electricity from your body. Instructions for using the wrist strap are printed on the strap's envelope.

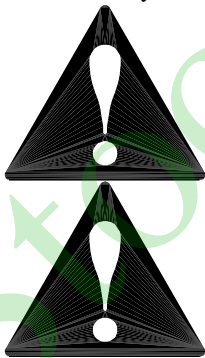


Handle the SBC by the edges to help prevent accidental damage caused by static discharge (Figure 4).

Safety

It is important to protect yourself and your equipment before you perform any of the procedures outlined in this manual.

You should check the configuration before you install the SBC. If the SBC is already installed in your system and you need to change the configuration, power-off the system and disconnect all power cords from their source. Follow all safety precautions as outlined by the chassis manufacturer.



To avoid damage or injury, always power-off the system and disconnect all power cords from their source before handling the equipment.

To help prevent accidental damage caused by static discharge, use a grounding wrist strap or other static-dissipating device when handling the equipment.

Um Sachschaden und Verletzung zu vermeiden, schalten Sie vor Arbeiten am Gerät den Netzschalter aus, und ziehen Sie alle Stecker aus den Steckdosen.
Um unbeabsichtigte Schäden durch elektrostatische Entladung vorzubeugen, sollte bei Arbeiten am System immer ein Erdungsarmband getragen oder andere elektrostatische Entladungs-Vorsichtsmaßnahmen verwendet werden.

Only qualified, experienced electronics service personnel should access and handle the equipment.

Es sollte nur qualifiziertes und erfahrenes Fachpersonal am System arbeiten.

Next...

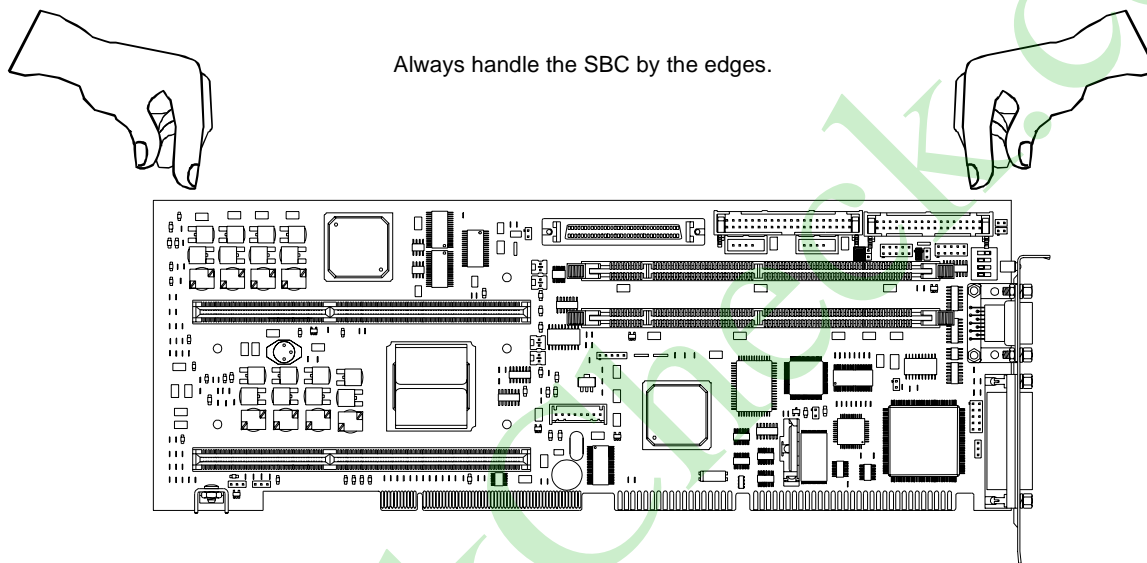
Before you install the SBC in a chassis, check the following:

- Jumper settings, outlined in Step 1, [page 10](#)
- DIP switch settings, outlined in Step 2, [page 12](#)

Pay particular attention to the switch settings. The jumper settings are pre-configured at the factory and are appropriate for most applications.

6 Steps to Operation

Figure 4 Safely Handling the SBC



Step 1: Check Jumper Settings

Overview Before you install the P3000(D)BX2 onto a passive backplane in a chassis, check the jumper settings on the SBC ([Figure 5](#)).

Jumper Blocks The P3000(D)BX2 contains:

- Five (5) two-pin jumper blocks: JP1, JP6, JP7, JP13, and JP18
- Two (2) three-pin jumper blocks: JP4 and JP5

Settings Settings for the jumper blocks are provided in the following tables:

2-Pin Jumper Blocks

JP1	JP6	JP7	JP13	Serial 2 Configuration
None	1—2	None	None	RS-232 (default)
1—2	None	1—2	1—2	RS-422
		JP18	3.3 V On-Board Power Supply	
		None	Enabled	
		1—2	Disabled	

- If JP18 is off, the 3.3 V on-board power supply is enabled.
- If JP18 is on, the 3.3 V on-board power supply is disabled and power must be supplied by the system's power supply.

3-Pin Jumper Blocks

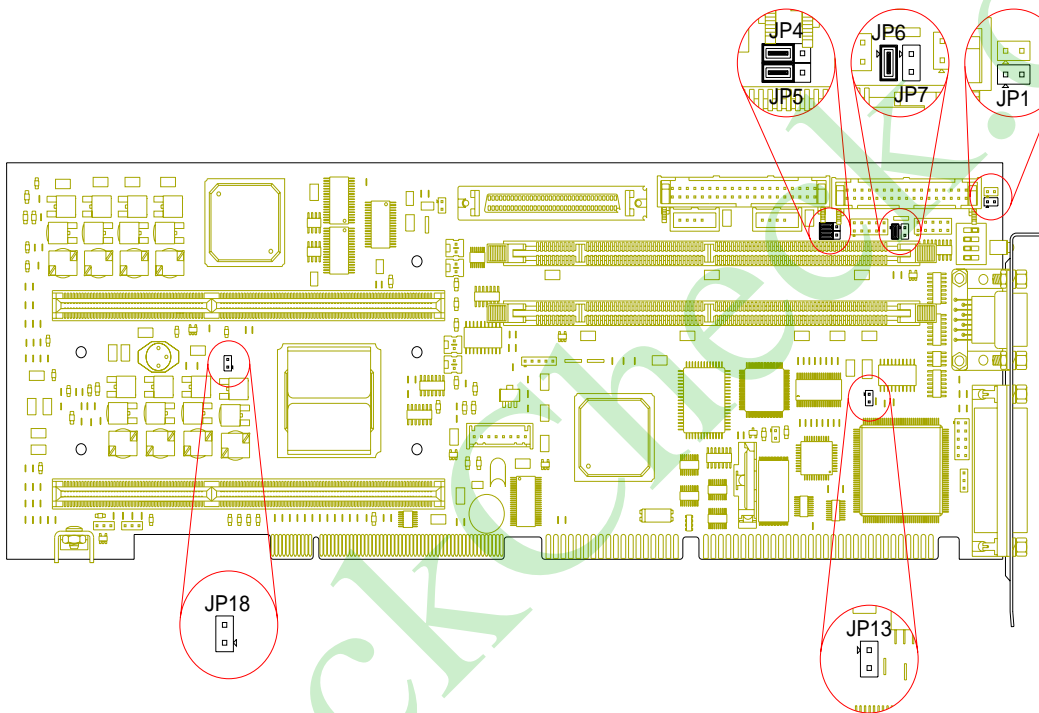
JP4	JP5	I/O Model
1—2	1—2	SP Model
2—3	2—3	MKP Model
For more information on I/O models, see page 17 .		

6 Steps to Operation

Figure 5

Jumper Block Location

Note: This illustration shows the Pentium III processors with heatsinks and support devices uninstalled.
For more information on these components, see [page 42](#).



Step 2: Check Switch Settings

Overview

After you check the jumper settings, check the switch block on the P3000(D)BX2 for proper settings ([Figure 6](#)).

Switch Block

The switch block contains four (4) DIP switches that you can configure to affect the following items:

- On-board ROM access
- CMOS RAM
- Configuration ports

Settings

Settings for the switches are provided in the following table:

SW1-1	Not Used
SW1-2	On-Board ROM Access
Open / Off	Crisis Recovery mode disabled (default)
Closed / On	Crisis Recovery mode enabled
SW1-3	CMOS RAM
Open / Off	Normal operation of CMOS RAM (default)
Closed / On	Factory default values for the Setup Utility are loaded into CMOS RAM
SW1-4	Configuration Ports
Open / Off	Configuration ports are mapped to I/O address 270 — 273 (default)
Closed / On	Configuration ports are mapped to I/O address 370 — 373



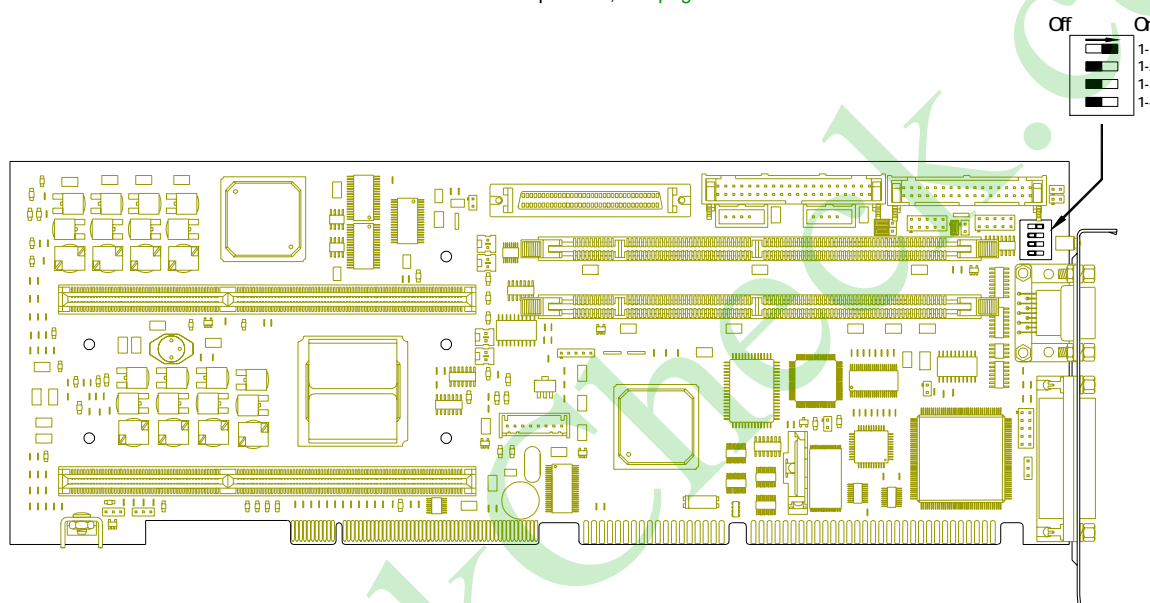
The system can operate without Memory Module Bank 0 (DIMM 1) filled. However, Crisis Recovery mode requires Bank 0 to be populated. For more information on Memory Modules, see [page 50](#).

6 Steps to Operation

Figure 6

Switch Block Location

Note: This illustration shows the Pentium III processors with heatsinks and support devices uninstalled. For more information on these components, see [page 42](#).



A Note on Crisis Recovery

Crisis Recovery mode causes the system to boot from the floppy drive and re-flash the BIOS.

Note: Video is disabled on boot with Crisis Recovery mode enabled.

Before using Crisis Recovery mode, attempt the loading of factory BIOS default values by switching "On" SW1-3. Use Crisis Recovery mode only if the system will not boot otherwise.

RadiSys Corporation produces a utility to generate a Crisis Recovery Diskette. This diskette is to be used only with Crisis Recovery mode enabled. To acquire the proper release BIOS for this product, contact RadiSys Technical Support. See [page vi](#). After downloading the proper release BIOS of the utility, follow the instructions contained in the file README.TXT to generate the diskette. The Crisis Recovery Diskette must be generated on a system that is operating MS-DOS®, Windows® 95, Windows 98, Windows NT®, or OS/2.

6 Steps to Operation

Step 3: Install the SBC

Overview

Before you connect any peripheral devices to the P3000(D)BX2, install the SBC onto a passive backplane in a chassis (Figure 7).

Procedure

The procedure for installing the SBC is outlined in the following table:

Step	Action
1	Power-off the system and disconnect all power cords. Note: Use a grounding wrist strap or other static-dissipating device when accessing and handling the equipment.
2	Remove the chassis cover.
3	Detach the expansion card retention bracket (if present). This bracket reaches across the tops of the expansion cards and holds them in place.
4	Locate the "Platform" or "CPU" slot on the passive backplane.
5	Remove the I/O bracket blank from the chassis I/O slot (if present).
6	Insert the SBC into the chassis with the card edge aligned in the card guide and the I/O bracket in the chassis I/O slot. Lower the SBC to the "Platform" or "CPU" slot on the backplane. Carefully push the SBC bus connectors into the slot on the backplane. Ensure that the SBC I/O bracket is accessible through the rear of the chassis.
7	Secure the SBC I/O bracket to the fastening lip on the chassis.
8	Replace the expansion card and SBC hold-down brackets (if required).



If the SBC is used with a chassis or passive backplane not manufactured by RadiSys, consult the instructions provided by the manufacturer. In addition, a cable adapter might be needed for the keyboard header on the SBC. RadiSys does *not* provide such a cable.



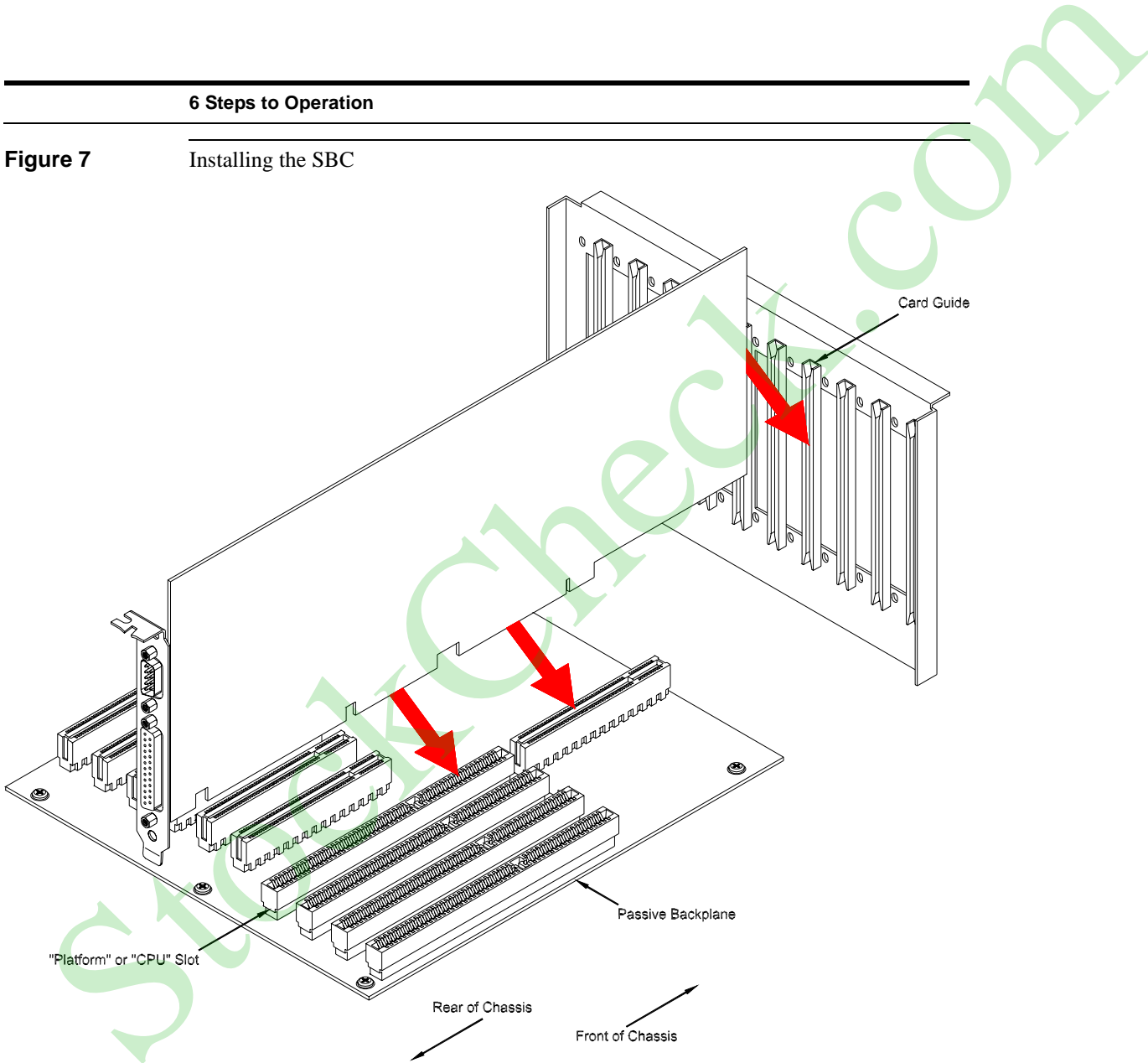
The CPU requires unimpeded airflow across the processor within the temperature specifications outlined on page 30. Operations outside these specifications could void the warranty.

Next...

Before you reconnect the power cords and power-on the system, proceed to Step 4, "Attach Peripheral Devices," page 16.

6 Steps to Operation

Installing the SBC



Step 4: Attach Peripheral Devices

Overview

After you have installed the P3000(D)BX2 in the chassis, attach peripheral devices to the SBC.



Always power-off the system and disconnect all power cords from their source before connecting or disconnecting cables for peripheral devices.

Common

When attaching devices to the P3000(D)BX2 (Figure 8 on page 18), certain considerations must be made:

Device(s)	Consideration
SCSI	<ul style="list-style-type: none"> Up to fifteen (15) SCSI devices can be attached to the 68-pin D-Sub female, latching connector. SCSI devices must be connected in a daisy-chain configuration with proper termination. LVD and SE modes are supported. For more information, see page 32. <p>Note: If both LVD and SE devices are connected simultaneously, the SCSI controller will switch to Single-Ended mode.</p>
EIDE	<ul style="list-style-type: none"> Up to two (2) EIDE or IDE devices can be attached to the 40-pin male shrouded, latching header. The BIOS will support up to four (4) EIDE or IDE devices. To use 3 or 4 devices, a 2nd controller is required. The 2nd controller must be configured to use IRQ15 and I/O ports 170-177h.
IDE & SCSI Activity LED	<ul style="list-style-type: none"> This header connects the IDE/SCSI device activity LED cable to the SBC. Pin 1 is the anode (+V); Pin 2 is the cathode (-V).
Floppy	Up to two (2) floppy diskette drives can be attached to the header.
USB	<ul style="list-style-type: none"> Up to 127 USB devices can be attached to each of these 4-pin male shrouded, keyed headers. USB devices must be connected in a daisy-chain configuration. A single USB cable cannot exceed 5 meters (16.4 feet) in length. Software drivers appropriate to the OS will be needed to operate USB devices. RadiSys does <i>not</i> supply such drivers.
Keyboard	<ul style="list-style-type: none"> An AT or PS/2 keyboard can be attached to this 8-pin male shrouded header with an appropriate cable. The sockets of the RadiSys keyboard cable are numbered in reverse order when compared to the pins of the SBC keyboard header, e.g., Pin 1 on the cable connector goes to Pin 8 on the SBC header.
Temperature Monitor	<ul style="list-style-type: none"> A temperature monitoring or controlling device can be attached to this 2-pin male header. Pin 2 is connected to Ground; Pin 1 is the Open-Collector signal that transitions from the Logic Low to Logic High state when the CPU temperature goes outside the range prescribed on page 30. The signal requires a current-limiting resistor if connected to an LED.
SMBus	<ul style="list-style-type: none"> The SBC can interface with an I²C network via this 2-pin male header. Pin 1 is the Data signal; Pin 2 is the Clock signal.
All devices	When using a flat cable to attach a device, the "colored trace" for Pin 1 on the cable must be near Pin 1 on the header/connector.

6 Steps to Operation

I/O Models

The P3000(D)BX2 is available in two I/O models:

- Model SP, or Serial/Parallel
- Model MKP, or Mouse/Keyboard/Parallel

SP Model

When attaching devices to the SP model of the P3000(D)BX2 (Figure 9 on page 19), certain considerations must be made:

Device(s)	Consideration
Serial Port 1	<ul style="list-style-type: none">• This port is a 9-pin male D-Sub connector on the I/O bracket.• One (1) serial device can be attached to this 16550-compatible serial port that provides an RS-232 interface.
Serial Port 2	<ul style="list-style-type: none">• This port is a 10-pin male header on the board surface.• One (1) serial device can be attached to this 16550-compatible serial port that provides either an RS-232 or an RS-422 interface.• Improperly connecting a device to this header can cause damage to the equipment and could void the warranty.
PS/2 Mouse	A PS/2 mouse can be attached to this 10-pin male header on the board surface.
Parallel Port	<ul style="list-style-type: none">• This port is a 25-pin female D-Sub connector on the I/O bracket.• AT-compatible / bidirectional / EPP / ECP operations are supported.• The IEEE 1284 port provides a Centronics compatible printer interface.

MKP Model

When attaching devices to the MKP model of the P3000(D)BX2 (Figure 10 on page 19), certain considerations must be made:

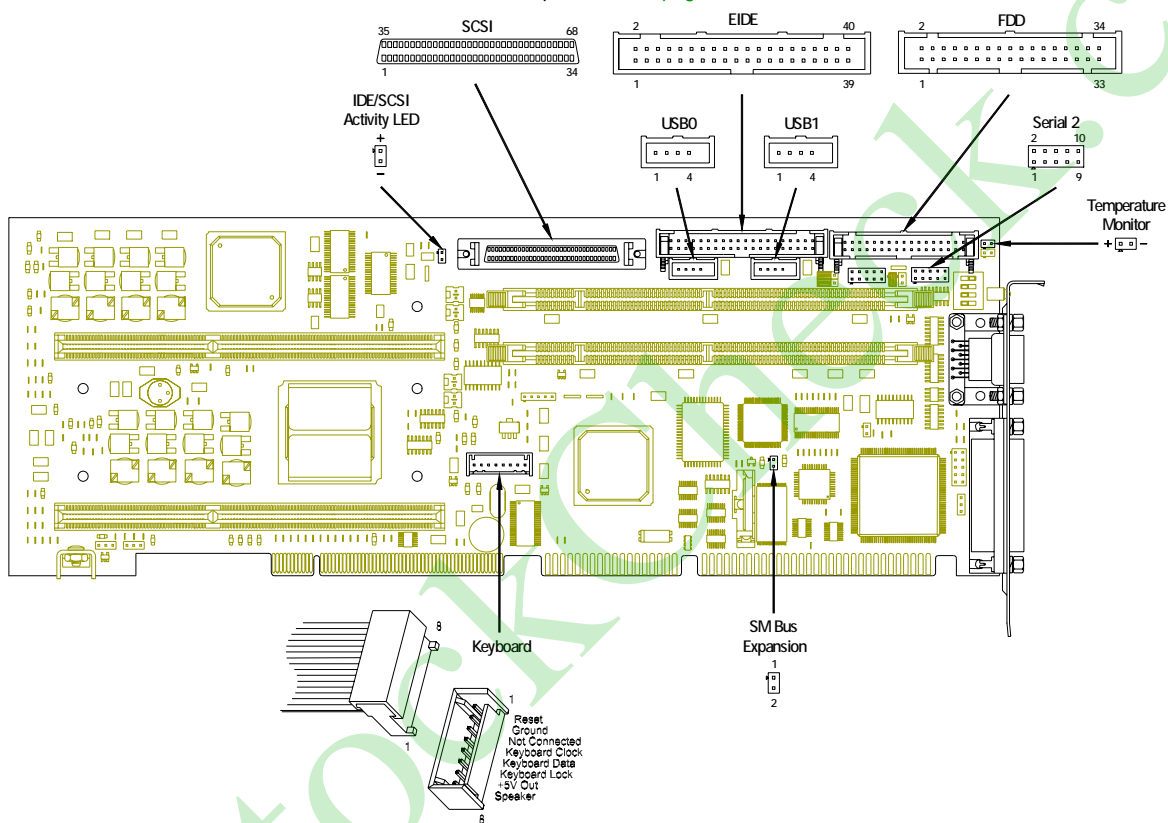
Device(s)	Consideration
PS/2 Mouse	A PS/2 mouse can be attached to this 6-pin female mini-DIN connector on the I/O bracket.
PS/2 Keyboard	A PS/2 keyboard can be attached to this 6-pin female mini-DIN connector on the I/O bracket.
Serial Port 1	<ul style="list-style-type: none">• This port is a 10-pin male header on the board surface.• One (1) serial device can be attached to this 16550-compatible serial port that provides an RS-232 interface.• Improperly connecting a device to this header can cause damage to the equipment and could void the warranty.
Serial Port 2	<ul style="list-style-type: none">• This port is a 10-pin male header on the board surface.• One (1) serial device can be attached to this 16550-compatible serial port that provides either an RS-232 or an RS-422 interface.• Improperly connecting a device to this header can cause damage to the equipment and could void the warranty.
Parallel Port	<ul style="list-style-type: none">• This port is a 25-pin female D-Sub connector on the I/O bracket.• AT-compatible / bidirectional / EPP / ECP operations are supported.• The IEEE 1284 port provides a Centronics compatible printer interface.

6 Steps to Operation

Figure 8

Peripheral Connectors

Note: This illustration shows the Pentium III processors with heatsinks and support devices uninstalled. For more information on these components, see [page 42](#).



For pin signals and positions, see [page 32](#).



6 Steps to Operation

Figure 9 Peripheral Connectors for the P3000(D)BX2-SP

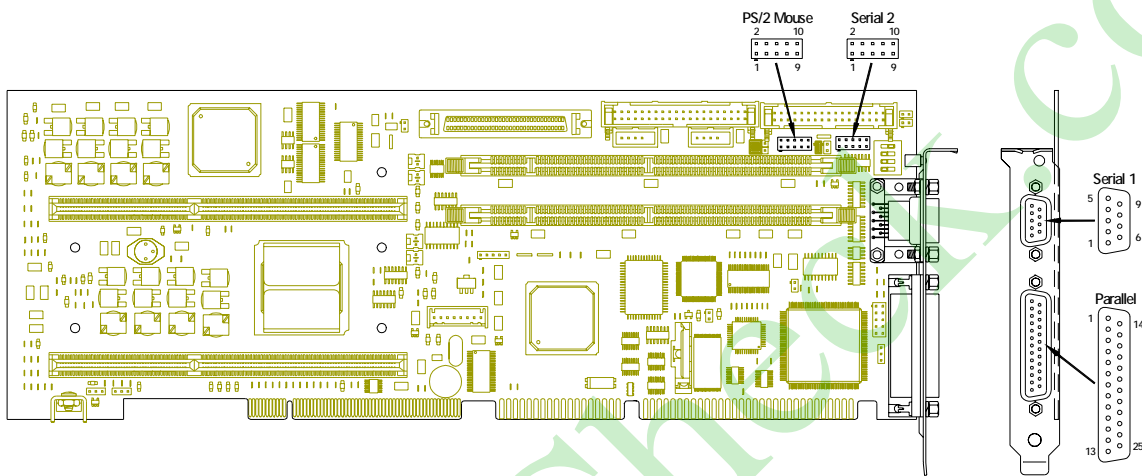
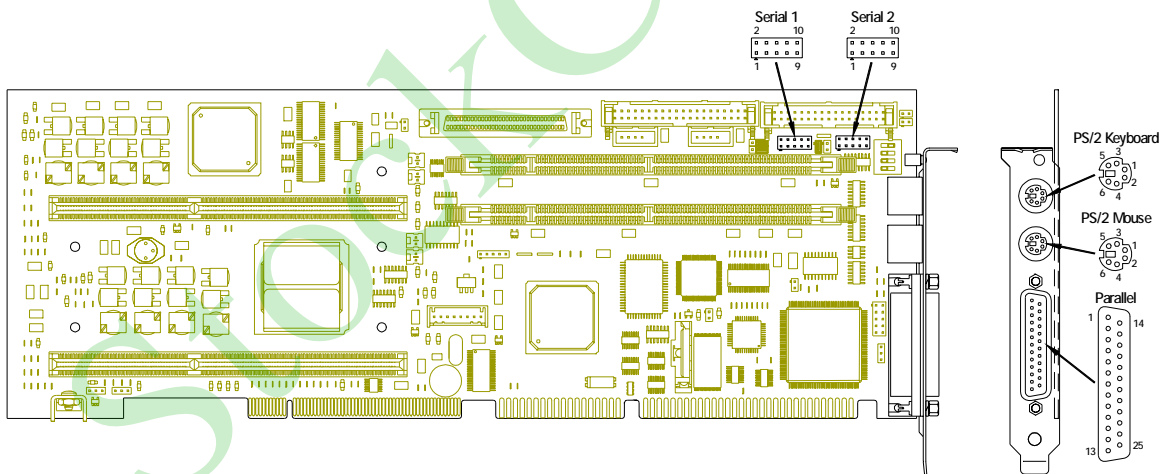


Figure 10 Peripheral Connectors for the P3000(D)BX2-MKP



For pin signals and positions, see [page 32](#).
For more information on jumper settings, see [page 10](#).

Step 5: Power-On the System

Overview

After you have installed the P3000(D)BX2 and connected all devices, power-on the system.

No Power

If the system does not power-on, check all power connections, the power source and the jumper settings (see Step 1: Check Jumper Settings on page 10).

If power connections are secure, the power source is adequate, and the jumper settings are correct, contact Technical Support. See “Customer Support,” page vi.

Start-up

After you power-on the system, it will:

- Execute the Power-On Self Test (POST) to ensure that the system is functional and properly configured.
- Start the operating system.

Setup

During the POST, you can access the Setup Utility (Figure 11) to configure the system.



Before using the SBC for the first time, you should verify the system settings in the Setup Utility. See page 22.

6 Steps to Operation

Figure 11 Setup Utility Main Menu

RadiSys CPD Setup Utility	
Main	Advanced Security Power Boot Server Exit
System Time: [12:12:00] System Date: [07/27/2000] Legacy Diskette A: [1.44/1.25 Mb 3½"] Legacy Diskette B: [Disabled] » Primary Master [Maxtor 7541 A] » Primary Slave [None] » Secondary Master [None] » Secondary Slave [None] » Cache Memory » Boot Options » Keyboard Features Extended Memory: 127 MB Memory Bank 0: 128 MB SDRAM Memory Bank 1: Not Installed	Item Specific Help <Tab>, <Shift-Tab>, or <Enter> selects field.
F1 Help ESC Exit	↑↓ Select Item ↔ Select Menu -/+ Change Values Enter Select » Sub-Menu F9 Setup Defaults F10 Save and Exit

Step 6: Run the Setup Utility

Overview	The BIOS (B asic I nput/ O utput S ystem) Setup Utility allows you to configure the operations of the P3000(D)BX2.
Access	To access the Setup Utility, press F2 when prompted during the Power-On Self Test (POST).
Main Menu	The Setup Utility display (Figure 11) contains two areas: <ol style="list-style-type: none"> Options: The options for the current menu are on the left side of the screen Item Specific Help: Instructions for the current item are on the right side
Menus	<p>The Setup Utility contains a toolbar at the top of the screen that allows you to access the following menus:</p> <ul style="list-style-type: none"> • Main • Advanced • Security • Power • Boot • Server • Exit <p>Options and items for these menus are listed in the tables beginning on page 23.</p>
Boot and Exit	The Boot and Exit menus do not have “default” values. Items for these menus are <i>not</i> included in the tables below.
Operation	Use the following keys to operate the Setup Utility:

Key	Action
Up Arrow (↑) and Down Arrow (↓)	Select a menu item
Left Arrow (←) and Right Arrow (→)	Select a menu
Plus (+) and Minus (-)	Change the value of an item
Enter	Access a sub-menu or pop-up menu
F1	Access Help for the Setup Utility
F9	Load default values for the setup options
F10	Save the changes you have made and exit the Setup Utility
Esc	Access the Exit menu

6 Steps to Operation

Main Menu

The options for the Main menu are listed in the following table:

Option / Sub-Menu	Item	Default Setting	Alternate Settings
System Time	N/A	Current Time in Hours, Minutes, and Seconds	N/A
System Date	N/A	Current Date in Month, Day, and Year	N/A
Legacy Diskette A	N/A	1.44/1.25MB 3½"	Disabled, 720KB 3½", 2.88MB 3½", 360KB 5¼", 1.2MB 5¼"
Legacy Diskette B	N/A	Disabled	720KB 3½", 1.44/1.25MB 3½", 2.88MB 3½", 360KB 5¼", 1.2MB 5¼"
» Primary / Secondary Master / Slave	Type	Auto (all 4 possible devices)	User, 1-39, CD-ROM, ATAPI Removable, IDE Removable, None
		Note: If Type is set to Auto, the only option available will be 32-Bit I/O. Note: Type 15 is Reserved (not available).	
	<ul style="list-style-type: none"> • Cylinders • Heads • Sectors • Max. Capacity (Display only) 	Enter a value	N/A
	Multi-Sector Transfers	N/A	2 Sectors, 4 Sectors, 8 Sectors, 16 Sectors, Disabled
	LBA Mode Control	N/A	Enabled, Disabled
	32-Bit I/O	N/A	Enabled, Disabled
	Transfer Mode	N/A	Fast PIO 1, Fast PIO 2, Fast PIO 3, Fast PIO 4, FPIO 3/DMA 1, FPIO 4/DMA 2, Standard
	Ultra DMA Mode	N/A	Mode 0, Mode 1, Mode 2, Mode 3, Disabled
	Note: Multi-Sector Transfers, LBA Mode Control, 32-Bit I/O, Transfer Mode, and Ultra DMA Mode do not have default values. Values are inserted when the BIOS queries IDE devices.		
» Cache Memory	Memory Cache	Enabled	Disabled
	Cache System BIOS Area	Write Protect	Uncached
	Cache Video BIOS Area	Write Protect	Uncached
	Cache Base 0—512K	Write Back	Uncached, Write Through, Write Protect
	Cache Base 512—640K	Write Back	Uncached, Write Through, Write Protect
	Cache Extended Memory Area	Write Back	Uncached, Write Through, Write Protect
	Cache A000—BFFF	Disabled	USWC Caching, Write Back, Write Through, Write Protect
	Cache C800—EFFF	Disabled	Write Back, Write Through, Write Protect

6 Steps to Operation

Main

The options for the Main menu are continued in the following table:

Option / Sub-Menu	Item	Default Setting	Alternate Settings
» Boot Options	Summary Screen	Enabled	Disabled
	Floppy Check	Disabled	Enabled
	Quiet Boot Screen	Disabled	Enabled
	POST Errors	Enabled	Disabled
» Keyboard Features	Numlock	Auto	On, Off
	Key Click	Disabled	Enabled
	Keyboard Auto-Repeat Rate	30/sec	26.7/sec, 21.8/sec, 18.5/sec, 13.3/sec, 10/sec, 6/sec, 2/sec
	Keyboard Auto-Repeat Delay	1/2 sec	1/4 sec, 3/4 sec, 1 sec
Extended Memory	N/A	Display only	N/A
Memory Bank 0	N/A	Display only	N/A
Memory Bank 1	N/A	Display only	N/A

Advanced

The options for the Advanced menu are listed in the following table:

Option / Sub-Menu	Item	Default Setting	Alternate Settings
» I/O Device Configuration / Integrated Peripherals	Serial Port A	Enabled (user configures)	Disabled (no configuration), Auto (BIOS / OS configures)
	Note: Base I/O Address and Interrupt are available only if the Serial Port is Enabled. Note: For console redirection, select Enabled.		
	Serial Port A: Base I/O Address	3F8	2F8, 3E8, 2E8
	Serial Port A: Interrupt	IRQ 4	IRQ 3
	Serial Port B	Enabled	Disabled, Auto
	Note: Base I/O Address and Interrupt are available only if the Serial Port is Enabled. Note: For console redirection, select Enabled.		
	Serial Port B: Base I/O Address	2F8	3F8, 3E8, 2E8
	Serial Port B: Interrupt	IRQ 3	IRQ 4
	Parallel Port	Enabled	Disabled, Auto
	Note: Mode, Base I/O Address, and Interrupt are available only if the Parallel Port is Enabled.		
	Parallel Port: Mode	Bi-Directional	Output Only (ISA), EPP, ECP
	Note: If Mode is set to ECP, you must set the DMA.		
	Parallel Port: Base I/O Address	378	278, 3BC
	Parallel Port: Interrupt	IRQ 7	IRQ 5
	Parallel Port: DMA Channel	DMA 3	DMA 1
	Note: This option is available only if Mode is set to ECP.		
	Floppy Disk Controller	Enabled	Disabled
	Floppy Disk Controller: Base I/O Address	Primary	Secondary
	Local Bus IDE Adapter	Enabled	Disabled
	Adaptec Ultra-2 SCSI Adapter	Disabled	Enabled
	Note: The SCSI controller uses PCI IRQ line 1 (INTA).		

6 Steps to Operation

Advanced

The options for the Advanced menu are continued in the following table:

Option / Sub-Menu	Item	Default Setting	Alternate Settings
» Advanced Chipset Control	ECC Config	ECC	EC, ECC Scrub, Disabled
	Enable Memory Gap	Disabled	Hole at 512 K — 640 K, Hole at 15 MB — 16 MB, Hole at 14 MB — 16 MB
	Alias ISA 512 — 528 MB	Disabled	Enabled
	DMA Aliasing	Enabled	Disabled
	16-Bit I/O Recovery	4.5	3.5, 5.5, 6.5, 7.5
	8-Bit I/O Recovery	4.5	3.5, 5.5, 6.5, 7.5, 8.5, 9.5, 10.5, 11.5
	Watchdog Timer Status	Disabled	Enabled
	Watchdog Timer Delay	1.2 sec	150 ms
	ISA Bus GAT	Disabled	Enabled
» PCI Configuration	PCI Delayed Transactions	Enabled	Disabled
	PCI IRQ Line 1 — 4	Auto Select (all IRQ Lines)	Disabled, Auto Select, 3 (COM2/COM4), 4 (COM1/COM3), 5 (2nd LPT), 7 (1st LPT), 9 (Open), 10 (Open), 11 (Open), 12 (PS/2 Mouse), 14 (Primary IDE), 15 (Secondary IDE)
	USB IRQ Enable	Yes	No
	Latency Timer	Auto (64)	32, 64, 96, 128, 160, 196, 224
	Cache Line Size	Auto (8)	8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60
	ISA Graphics Device Installed	No	Yes
	PCI/PNP ISA UMB Region Exclusion: C800—CBFF, CC00—CFFF, D000—D3FF, D400—D7FF, D800—DBFF, DC00—DFFF	Available (all regions)	Reserved
	PCI/PNP ISA IRQ Resource Exclusion: IRQ 3, IRQ4, IRQ5, IRQ7, IRQ9, IRQ10, IRQ11, IRQ12, IRQ14, IRQ15	Available (all IRQ's)	Reserved

6 Steps to Operation

Advanced

The options for the Advanced menu are continued in the following table:

Option / Sub-Menu	Item	Default Setting	Alternate Settings
» System Management	<ul style="list-style-type: none"> System Temperature CPU # 1 & 2 Temperature VCORE1 Status VCORE2 Status +3.3 V Status +5 V Status -5 V Status +12 V Status -12 V Status 	Display Only	N/A
	System Management Control: System Alarm Temperature (°C)	60	20, 30, 40, 50, 70, 80, 90
	System Management Control: CPU Alarm Temperature (°C)	110	50, 60, 70, 80, 90, 100, 120
	System Management Control: Thermal Duty Cycle	37.5%	12.5%, 25%, 50%, 62.5%, 75%, 87.5%
	Note: Any changes to System Alarm Temperature, CPU Alarm Temperature, or Thermal Duty Cycle will not take effect until after the system is rebooted.		
	System Management Control: View Event Log	[Enter Key] (Display Only)	N/A
	System Management Control: Clear All Event Logs	No	Yes
Note: For more information on System Management, see page 40.			
PS/2 Mouse	N/A	Auto Detect	Enabled, Disabled
Onboard Speaker	N/A	Enabled	Disabled
Use Multiprocessor Specification	N/A	1.1	1.4
CPU BIOS Update	N/A	Enabled	Disabled
Plug & Play O/S	N/A	No	Yes
Secured Setup Configuration	Note: If this option is set to Yes, the BIOS will not configure any PCI device on PCI bus 0 unless the device has an on-board ROM, e.g., video or SCSI controllers.		
	Note: This option should be set to No while installing a PnP O/S. After the O/S is installed, this option can be set to Yes to allow the O/S to configure the devices.		
Reset Configuration Data	N/A	No	Yes
Large Disk Access Mode	N/A	DOS	Other
Note: Select Other for UNIX and Novell Netware operating systems. Select DOS for DOS-based, WindowsNT/95/98, OS/2, or other operating systems. If the drive(s) fail during software installation, change this selection and try again.			

Security

The options for the Security menu are listed in the following table:

Option / Sub-Menu	Item	Default Setting	Alternate Settings
Supervisor Password Is	N/A	Clear (Display only)	Set (Display only)
User Password Is	N/A	Clear (Display only)	Set (Display only)
Set Supervisor Password	N/A	Enter a value	N/A
Set User Password	N/A	Enter a value	N/A

6 Steps to Operation

Security

The options for the Security menu are continued in the following table:

Option / Sub-Menu	Item	Default Setting	Alternate Settings
Password on Boot	N/A	Disabled	Enabled
Fixed Disk Boot Sector	N/A	Normal	Write Protect
Diskette Access	N/A	Supervisor	User
Virus Check Reminder	N/A	Disabled	Daily, Weekly, Monthly
System Backup Reminder	N/A	Disabled	Daily, Weekly, Monthly

Power

The options for the Power menu are listed in the following table:

Option / Sub-Menu	Item	Default Setting	Alternate Settings
Power Savings	N/A	Disabled	Customized, Maximum Power Savings, Maximum Performance
	Note: Standby, Auto Suspend, Hard Disk, and Video Timeouts will be disabled if this feature is not set to Customized.		
	Note: The following table lists preset options:		
	Feature	Maximum Power Savings	Maximum Performance
	Standby Timeout	1 Minute	16 Minutes
	Auto Suspend Timeout	5 Minutes	60 Minutes
Standby Timeout	N/A	Off	1 Minute, 2 Minutes, 4 Minutes, 6 Minutes, 8 Minutes, 12 Minutes, 16 Minutes
	N/A	Off	5 Minutes, 10 Minutes, 15 Minutes, 20 Minutes, 30 Minutes, 40 Minutes, 60 Minutes
	N/A	Disabled	10 Seconds, 15 Seconds, 30 Seconds, 45 Seconds, 1 Minute, 2 Minutes, 4 Minutes, 6 Minutes, 8 Minutes, 10 Minutes, 15 Minutes
	N/A	Disabled	10 Seconds, 15 Seconds, 30 Seconds, 45 Seconds, 1 Minute, 2 Minutes, 4 Minutes, 6 Minutes, 8 Minutes, 10 Minutes, 15 Minutes
Resume on Modem Ring	N/A	Off	On
Resume on Time	N/A	Off	On
Resume Time	N/A	00:00:00 (24-hour format)	N/A

6 Steps to Operation

Server

The options for the Server menu are listed in the following table:

Option / Sub-Menu	Item	Default Setting	Alternate Settings
Console Redirect Port	N/A	Disabled	3F8 IRQ 4 (COM 1), 2F8 IRQ 3 (COM 2), 3E8 IRQ 4 (COM 3), 2E8 IRQ 3 (COM 4), 3F8 IRQ 3, 2F8 IRQ 4, 3E8 IRQ 3, 2E8 IRQ 4
Console Redirect Baud Rate	N/A	9600	19200, 38400, 57600, 115200
Note: For more information on Console Redirection, see page 35 .			

3

Technical Data



This chapter discusses functions and features of the equipment that can be accessed *only* by qualified and trained electronics service personnel. The material contained in this chapter does *not* discuss any user-accessible parts or operations. All tasks related to material in this chapter must be referred to qualified service personnel.

This chapter provides the following:

- System specifications and environmental tolerances
- Pin positions and signal listings for all headers and connectors
- Notes on installing the processor(s)
- Notes on installing memory modules
- Instructions for replacing the system battery

Technical Data

Specifications

Overview

Listed in the tables below are system specifications and environmental tolerances for the P3000(D)BX2 series SBC.

Note: These specifications are subject to change without notice.

Environmental

Environmental tolerances are listed in the following table:

	Operating	Non-Operating
Temperature	5 to 53 °C (41 to 127.4 °F) at 200 LFM†	-40 to 70 °C (-40 to 158 °F)
Humidity	5 — 95% @ 40 °C, non-condensing	0 — 95% @ 40 °C, non-condensing
Shock	1 G @ 10 ms	30 G @ 10 ms
Vibration	0.25 G @ 5 — 150 Hz	2.5 G @ 5 — 150 Hz
Altitude	15,000 ft (4,572 m)	50,000 ft (15,240 m)

† See the cooling conditions outlined below for extended temperature specifications.

Cooling

Airflow requirements for the SBC are listed in the following table:

Note: The following table lists the minimum unimpeded airflow in linear feet per minute (LFM) required across the processor for operations at the specified ambient temperature at sea level.

Airflow	600 LFM	400 LFM	200 LFM	100 LFM	0 LFM
Max. Ambient 450 – 500 MHz	65 °C (149.0 °F)	64 °C (147.2 °F)	53 °C (127.4 °F)	44 °C (111.2 °F)	Not Recommended
Max. Ambient 550 – 600 MHz	55 °C (131.0 °F)	54 °C (129.2 °F)	43 °C (109.4 °F)	34 °C (93.2 °F)	Not Recommended



Ambient temperature is measured at the leading edge of the CPU heatsink with dual processors installed and all components fully populated.

For more information, see [page 42](#).

A Note on Thermal Specifications

The technology and power density of the microprocessor is rapidly increasing. The 80386 required less than a few hundred milliamps of current. The 80486DX4 peaked at less than 1.5 A and typically dissipated less than 5 W of power. The 233 MHz Pentium® processor with MMX™ technology requires up to 6.5 A and dissipates as much as 17 W, while the Pentium II and later processors continue this trend toward higher power levels.

RadiSys is continually working to ensure that its products will conform to thermal specifications. However, one peripheral device installed within a chassis can significantly alter operating temperature, and software applications can cause as much as 20 °C variation. Even the cable layout within the chassis can affect airflow and thereby performance.

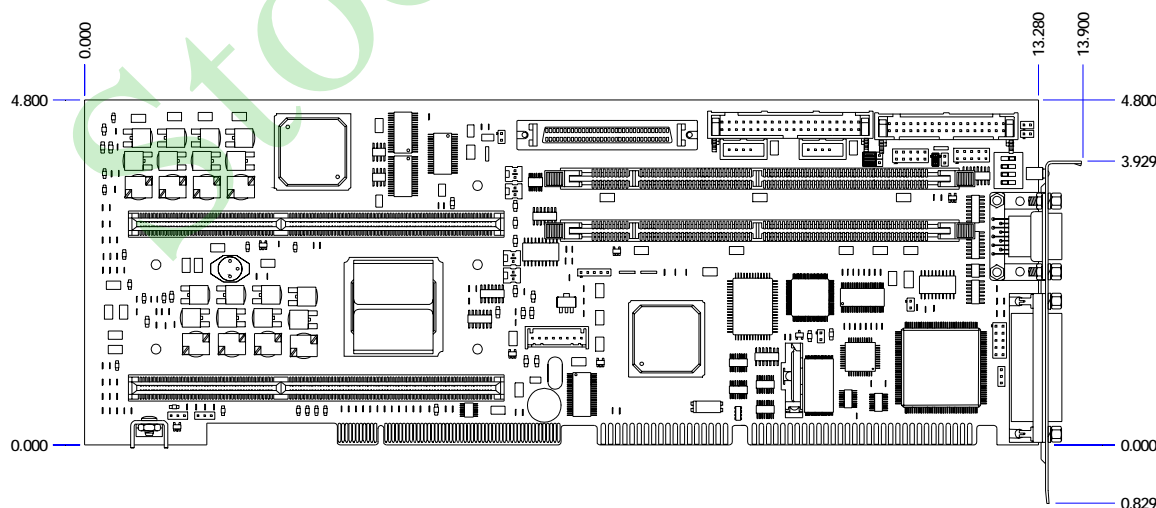
RadiSys validates the operating specifications of its products by testing with the “hottest” available hardware and software configuration to maximize the power supply draw and generate a worst-case scenario. Despite these efforts, the specifications outlined above are only benchmarks and should be regarded as such.

Technical Data

System

System specifications are listed in the following table:

CPU	Intel® Pentium® III										
Chipset	Intel 440BX AGPset										
Cache	Integrated 512 KB Level 2 write-back cache										
Memory	Two (2) 168-pin sockets organized in two (2) banks, supporting: Up to 512 MB (or higher as technology becomes available) 8/16/32 x 72, PC100 DIMM's +3.3 V SDRAM Parity/ECC or Non-Parity Single bit error correction, double bit detection (ECC mode only)										
Bus Interface	<ul style="list-style-type: none"> AT Bus (98-Pin) fully buffered (8.33 MHz) PCI Bus (120-Pin) fully buffered (33 MHz) 										
Addressing	Real and protected mode supported Real address mode: 20-bit Protected address mode: 16-bit on ISA bus, 32-bit on PCI local bus										
Data Path	<ul style="list-style-type: none"> 64-bit on-board processor bus at 100 MHz 32-bit on-board PCI bus at 33 MHz 										
Flash Memory	4 Mb (512 Kb x 8)										
Clock/Calendar	Embedded real-time clock accurate to +/- 12 minutes / year, at 25 °C; includes CMOS in NVRAM										
Power Requirements with 512 MB SDRAM	<table> <tr> <td><u>Input Power</u></td><td><u>≤ 60 W typical</u></td></tr> <tr> <td>+5 V</td><td>9.0 A</td></tr> <tr> <td>+3.3 V</td><td>3.0 A</td></tr> <tr> <td>+12 V</td><td>0.2 A</td></tr> <tr> <td>-12 V</td><td>0.1 A</td></tr> </table> <p>Note: These values represent all components fully populated.</p>	<u>Input Power</u>	<u>≤ 60 W typical</u>	+5 V	9.0 A	+3.3 V	3.0 A	+12 V	0.2 A	-12 V	0.1 A
<u>Input Power</u>	<u>≤ 60 W typical</u>										
+5 V	9.0 A										
+3.3 V	3.0 A										
+12 V	0.2 A										
-12 V	0.1 A										
Battery	CR2032 Lithium (Li/MnO ₂)										
Form Factor	13.28" (337.3 mm) x 4.80" (121.9 mm), PICMG compliant										



Technical Data

Pin Signals

Connectivity

The tables below list the pin signals for the peripheral connectors common to both models of the P3000(D)BX2. [Figure 8 on page 18](#) indicates the pin positions for each.

Low-Voltage Differential (LVD) SCSI				Single-Ended (SE) SCSI	
Pin	Description	Pin	Description	Pin	Description
1	Data Bit 12+ (I/O)	35	Data Bit 12 (I/O)	35	Data Bit 12 (I/O)
2	Data Bit 13+ (I/O)	36	Data Bit 13 (I/O)	36	Data Bit 13 (I/O)
3	Data Bit 14+ (I/O)	37	Data Bit 14 (I/O)	37	Data Bit 14 (I/O)
4	Data Bit 15+ (I/O)	38	Data Bit 15 (I/O)	38	Data Bit 15 (I/O)
5	Data Bit Parity High+ (I/O)	39	Data Bit Parity High (I/O)	39	Data Bit Parity High (I/O)
6	Data Bit 0+ (I/O)	40	Data Bit 0 (I/O)	40	Data Bit 0 (I/O)
7	Data Bit 1+ (I/O)	41	Data Bit 1 (I/O)	41	Data Bit 1 (I/O)
8	Data Bit 2+ (I/O)	42	Data Bit 2 (I/O)	42	Data Bit 2 (I/O)
9	Data Bit 3+ (I/O)	43	Data Bit 3 (I/O)	43	Data Bit 3 (I/O)
10	Data Bit 4+ (I/O)	44	Data Bit 4 (I/O)	44	Data Bit 4 (I/O)
11	Data Bit 5+ (I/O)	45	Data Bit 5 (I/O)	45	Data Bit 5 (I/O)
12	Data Bit 6+ (I/O)	46	Data Bit 6 (I/O)	46	Data Bit 6 (I/O)
13	Data Bit 7+ (I/O)	47	Data Bit 7 (I/O)	47	Data Bit 7 (I/O)
14	Data Bit Parity Low+ (I/O)	48	Data Bit Parity Low (I/O)	48	Data Bit Parity Low (I/O)
16	Differential Sense	55	Attention (Out)	55	Attention (Out)
21	Attention+ (Out)	57	Busy (I/O)	57	Busy (I/O)
23	Busy+ (I/O)	58	Acknowledge (Out)	58	Acknowledge (Out)
24	Acknowledge+ (Out)	59	Reset (I/O)	59	Reset (I/O)
25	Reset+ (I/O)	60	Message (In)	60	Message (In)
26	Message+ (In)	61	Select (I/O)	61	Select (I/O)
27	Select+ (I/O)	62	Control/Data (In)	62	Control/Data (In)
28	Control/Data+ (In)	63	Request (In)	63	Request (In)
29	Request+ (In)	64	Input/Output (In)	64	Input/Output (In)
30	Input/Output+ (In)	65	Data Bit 8 (I/O)	65	Data Bit 8 (I/O)
31	Data Bit 8+ (I/O)	66	Data Bit 9 (I/O)	66	Data Bit 9 (I/O)
32	Data Bit 9+ (I/O)	67	Data Bit 10 (I/O)	67	Data Bit 10 (I/O)
33	Data Bit 10+ (I/O)	68	Data Bit 11 (I/O)	68	Data Bit 11 (I/O)
34	Data Bit 11+ (I/O)	19, 53	Reserved	19, 53	Reserved
		17, 18, 51, 52	Terminator Power (I/O)	17, 18, 51, 52	Terminator Power (I/O)
		15, 20, 22, 49, 50, 54, 56	Ground	1-16, 20-34, 49, 50, 54, 56	Ground

Technical Data

EIDE					
Pin	Description	Pin	Description	Pin	Description
1	Reset (Out)	14	Data 13 (I/O)	31	+ IRQ14 (In)
3	Data 7 (I/O)	15	Data 1 (I/O)	32	I/O CS16 (In)
4	Data 8 (I/O)	16	Data 14 (I/O)	33	+ ADDR1 (Out)
5	Data 6 (I/O)	17	Data 0 (I/O)	35	+ ADDR0 (Out)
6	Data 9 (I/O)	18	Data 15 (I/O)	36	+ ADDR2 (Out)
7	Data 5 (I/O)	20	Not Connected	37	- CS1 (Out)
8	Data 10 (I/O)	21	DMA Request (In)	38	- CS3 (Out)
9	Data 4 (I/O)	23	- I/O Write (Out)	39	Activity Light (In)
10	Data 11 (I/O)	25	- I/O Read (Out)	2, 19, 22, 24, 26, 30, 34, 40	Ground
11	Data 3 (I/O)	27	I/O Channel Ready (In)		
12	Data 12 (I/O)	28	+ ALE		
13	Data 2 (I/O)	29	DMA Acknowledge (Out)		

USB Ports	
Pin	Description
1	USB Data -
2	Ground
3	USB Port +
4	+5 V
5	Key

SM Bus Expansion	
Pin	Description
1	Data
2	Clock

Technical Data

I/O Models

The tables below list the pin signals for connectors and headers on the P3000(D)BX2 I/O models. Figure 9 and Figure 10 on page 19 indicate the pin positions for headers and connectors on the P3000(D)BX2-SP and the P3000(D)BX2-MKP, respectively.

Serial Port (9-Pin D-Sub)	
RS-232	
Pin	Description
1	Data Carrier Detect (In)
2	Receive Data (In)
3	Transmit Data (Out)
4	Data Terminal Ready (Out)
5	Ground
6	Data Set Ready (In)
7	Request to Send (Out)
8	Clear to Send (In)
9	Ring Indicator (In)

Serial Port (10-Pin)				
RS-232		RS-422		
Pin	Description	Pin		Description
1	Data Carrier Detect (In)	DB9	10-Pin	
2	Data Set Ready (In)	1	1	/Z Output (TX-)
3	Receive Data (In)	6	2	/B Receive (RX-)
4	Request to Send (Out)	2	3	Y Output (TX+)
5	Transmit Data (Out)	8	6	A Receive (RX+)
6	Clear to Send (In)	Note: RS-422 can be used only on Serial Port 2.		
7	Data Terminal Ready (Out)			
8	Ring Indicator (In)			
9	Ground			
10	Not Connected			
To connect two RS-422 devices, use a shielded twisted-pair (STP) cable no longer than 4,000 feet, configured as listed below:				
Machine A Pin Signal		Machine B Pin Signal		
/Z Output (TX-)	↔	/B Receive (RX-)		
Y Output (TX+)	↔	A Receive (RX+)		
/B Receive (RX-)	↔	/Z Output (TX-)		
A Receive (RX+)	↔	Y Output (TX+)		

PS/2 Mouse & Keyboard (Mini-DIN)	
Pin	Description
1	Data
2	Not Connected
3	Ground
4	+5 V
5	Clock
6	Not Connected

PS/2 Mouse (10-Pin)	
Pin	Description
1	Data
2	Clock
3 - 8	Not Connected
9	Ground
10	+5 V

Parallel Port	
Pin	Description
1	- Strobe
2	+ Data Bit 0
3	+ Data Bit 1
4	+ Data Bit 2
5	+ Data Bit 3
6	+ Data Bit 4
7	+ Data Bit 5
8	+ Data Bit 6
9	+ Data Bit 7
10	- Acknowledge
11	+ Busy
12	+ Paper Feed
13	+ Select
14	- Auto Feed
15	- Error
16	- Initialize Printer
17	- Select Input
18-25	Ground

Console Redirection

Overview

Console, or serial, redirection allows an SBC or motherboard to be installed at a remote location, operating the platform via a serial terminal. Redirection does not require a video controller or keyboard in order to operate.

Interrupts

Console redirection utilizes two (2) interrupts:

- **Video:** Redirection uses the video interrupt (10h) to detect any video operations not made by direct screen memory or an I/O controller.
Note: Because the redirection service sends ASCII data to the serial terminal, only text can be supported, not graphics.
- **Keyboard:** Redirection uses the keyboard interrupt (16h) to receive characters sent from the serial terminal and convert them to the appropriate PC scan codes.
Note: Operating systems or applications that do not use the interrupt 16h services will require a redirection driver to receive data from the serial terminal.

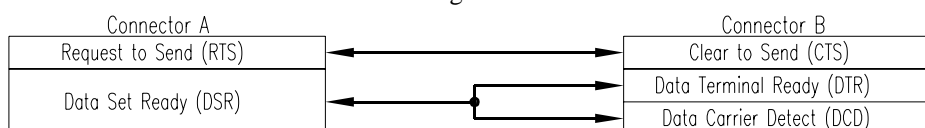
Configuration

The procedure for enabling console redirection is outlined in the following table:

Step	Action
1	Run the Setup Utility. See page 22 .
2	Provide a serial port for console redirection. Note: A serial port on the SBC can be used for console redirection. See page 24 . A serial I/O expansion card can also be used.
3	Select the address and interrupt for the serial port.
4	Set the console redirect port to the same address and interrupt that was selected in step 3. See page 28 .
5	Set the baud rate for the console redirect port. Note: This must match the baud rate of the serial device.
6	Connect the serial cable between the redirection port and the serial terminal. Note: Redirection uses XON and XOFF for flow control. For a simple connection, a three-wire serial cable can be used. Only Ground, Transmit, and Receive signals are required.
Note: Console redirection will function once the CPU is reset.	

Cable

For proper operation of most serial terminals, it is strongly recommended that signals from each end of the serial cable be configured as listed below:



Note: The Ring Indicator (RI) signal can be ignored.



The Setup Utility can be accessed through console redirection. However, it is rather slow because the setup screens are graphical, and each change requires the entire screen to be redrawn. The Adaptec SCSI Setup Utility is not accessible via console redirection.

Technical Data

ISA and PCI Bus Connectors

Overview

The P3000(D)BX2 utilizes a 16-bit ISA bus and a 32-bit PCI local bus. The tables below list the pin signals for the ISA and PCI bus connectors. The following illustration (Figure 12) indicates the pin positions for each.

ISA Bus Connector					
Pin	Row B	Row A	Pin	Row D	Row C
1	GND	IOCHK/	1	MEMC16/	SBHE/
2	RESDRV	SD7	2	IOCS16/	LA23
3	+5 V	SD6	3	IRQ10	LA22
4	IRQ2	SD5	4	IRQ11	LA21
5	-5 V	SD4	5	IRQ12	LA20
6	DRQ2	SD3	6	IRQ15	LA19
7	-12 V	SD2	7	IRQ14	LA18
8	0WS	SD1	8	DACK0/	LA17
9	+12 V	SD0	9	DRQ0	MEMR/
10	GND	IOCHRDY/	10	DACK5/	MEMW/
11	SMEW/	AEN	11	DRQ5	SD8
12	SMEMR/	SA19	12	DACK6/	SD9
13	IOW/	SA18	13	DRQ6	SD10
14	IOR/	SA17	14	DACK7/	SD11
15	DACK3/	SA16	15	DRQ7	SD12
16	DRQ3	SA15	16	+5 V	SD13
17	DACK1/	SA14	17	MASTER/	SD14
18	DRQ1	SA13	18	GND	SD15
19	REF/	SA12			
20	SYSCLK/	SA11			
21	IRQ7	SA10			
22	IRQ6	SA9			
23	IRQ5	SA8			
24	IRQ4	SA7			
25	IRQ3	SA6			
26	DACK2/	SA5			
27	T/C	SA4			
28	SALE	SA3			
29	+5 V	SA2			
30	OSC	SA1			
31	GND	SA0			

PCI Bus Connector					
Pin	Row B	Row A	Pin	Row B	Row A
1	-12 V	TRST#	32	AD17	AD16
2	TCK	+12V	33	C/BE#2	+3.3 V
3	GND	TMD	34	GND	FRAME#
4	TDO	TDI	35	IRDY#	GND
5	+5 V	+5 V	36	+3.3 V	TRDY#
6	+5 V	INTA	37	DEVSEL#	GND
7	INTB	INTC	38	GND	STOP#
8	INTD	+5 V	39	LOCK#	+3.3 V
9	REQ3#	CLKC	40	PERR#	SDONE
10	REQ1#	+5 V (I/O)	41	+3.3 V	SBO#
11	GNT3#	CLKD	42	SERR#	GND
12	GND	GND	43	+3.3 V	PAR
13	GND	GND	44	C/BE#1	AD15
14	CLKA	GNT1#	45	AD14	+3.3 V
15	GND	RST#	46	GND	AD13
16	CLKB	+5 V (I/O)	47	AD12	AD11
17	GND	GNT0#	48	AD10	GND
18	REQ0#	GND	49	GND	AD9
19	+5 V (I/O)	REQ2#	50	Key	Key
20	AD31	AD30	51	Key	Key
21	AD29	+3.3 V	52	AD8	C/BE#0
22	GND	AD28	53	AD7	+3.3 V
23	AD27	AD26	54	+3.3 V	AD6
24	AD25	GND	55	AD5	AD4
25	+3.3 V	AD24	56	AD3	GND
26	C/BE#3	GNT2#	57	GND	AD2
27	AD23	+3.3 V	58	AD1	AD0
28	GND	AD22	59	+5 V (I/O)	+5 V (I/O)
29	AD21	AD20	60	ACK64#	REQ64#
30	AD19	GND	61	+5 V	+5 V
31	+3.3 V	AD18	62	+5 V	+5 V

PCI Interrupts

The PCI Bus provides four (4) interrupts: INTA, INTB, INTC, and INTD. These interrupts can be shared, meaning two or more devices can operate on a common interrupt. Also, PCI interrupts are level-sensitive. Each PCI interrupt must be routed to one of the standard AT interrupts for the PCI device to function. If a PCI interrupt is not used, it will not be routed to the ISA bus.



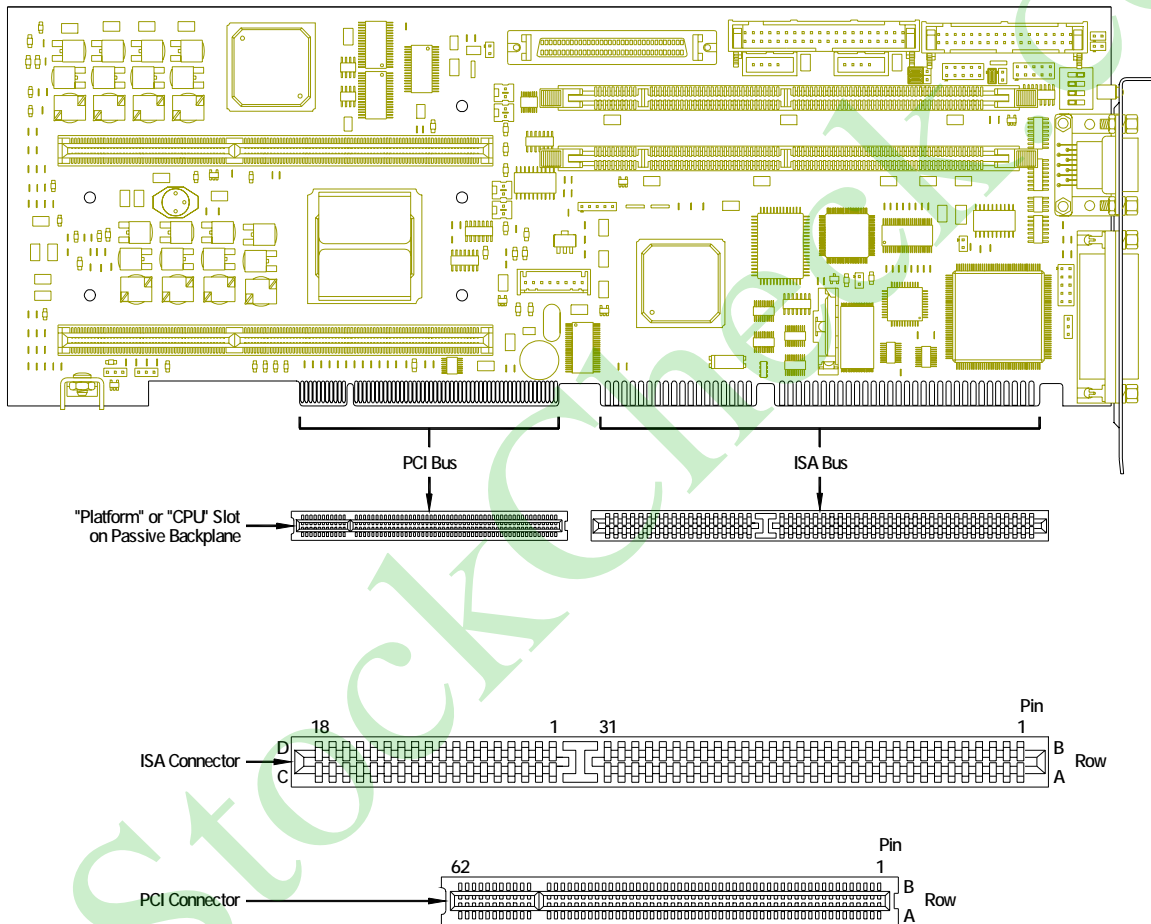
Do not map a PCI interrupt to an AT interrupt that is already being used by an ISA device. The ISA device occupying that interrupt will not function properly.

Technical Data

Figure 12

ISA and PCI Bus Connectors

Note: This illustration shows the Pentium III processors with heatsinks and support devices uninstalled. For more information on these components, see [page 42](#).



Technical Data

Product Identification

Overview

All current RadiSys SBC's support product identification. This information is embedded in the BIOS and can be read by an operating system or application. The location of the data is fixed for all current products.

BIOS

The starting location for these fields in the BIOS is F000:FF90h (000FFF90h), and it is identified by the ASCII string "TMI" terminated with a null (0h). All data is stored in ASCII. A map of the data fields is provided in the following table:

Location	Size	Contents
F000:FF90h	4 Bytes	Text string "TMI" terminated with a null.
F000:FF94h	Varies	Model ID text string, terminated with a null.
F000:FFA0h	8 Bytes	Reserved
F000:FFB0h	4 Bytes	Text string "S/N" terminated with a space (20h).
F000:FFB4h	9 Bytes	Serial number text string, terminated with a null.
F000:FFC0h	Varies	BIOS release text string, terminated with a null.

Serial Number

The Serial Number field will contain an ASCII string "S/N," followed by the ASCII serial number string, terminated with a null. RadiSys serial numbers are eight (8) characters in length, using numbers and uppercase letters. The operating system or application must verify the presence of the "S/N" string before attempting to retrieve a serial number from the location F000:FFB4h.

Sample

The following is sample content of fields in the locations F000:FF90h through F000:FFC0h on a P3000(D)BX2 series SBC:

Location	ASCII	String
F000:FF90h	54 4D 49 00 50 33 34 35 30 42 58 32 00 00 00 00	TMI P3450BX2
F000:FFA0h	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	
F000:FFB0h	53 2F 4E 20 31 32 33 34 35 36 37 38 00 00 00 00	S/N 12345678
F000:FFC0h	34 2E 30 36 61 2E 31 2E 30 20 00 00 00 00 00 00	4.06a.1.0

This identifies a **P3450BX2** model SBC, operating at **450** MHz. The serial number is **12345678**, and the BIOS release is **4.06a.1.0**.



The date on which the BIOS was created can be found at F000:FFF4h. The build date is stored as eight (8) ASCII characters in the format "MM/YY/DD" with no termination character. The BIOS build date is present in any PC-compatible BIOS.

Watchdog Timer

Overview	The watchdog timer provides an escape from a system lockup caused by electrical noise, electrostatic discharge, power failure, software hang-up, etc. The watchdog provides the escape by performing a reset of all system components.
Reset	Once the watchdog timer detects an activity pulse, an internal timer begins to count down from the preset time delay, either 150 milliseconds or 1.2 seconds. If the watchdog counts down to zero before it detects another pulse, it will perform a reset. This, in turn, issues a reset to the PCI and ISA busses, thereby resetting the devices installed on the busses.
Control	<p>Two features control the watchdog timer operations: Status and Delay. These options are defined in the Setup Utility. See page 25.</p> <ul style="list-style-type: none">• Watchdog Status: sets the source of the activity monitored by the watchdog timer.<ul style="list-style-type: none">• Enabled: the source of the pulse is the CPU Address Strobe (ADS) line.• Disabled: the source of the pulse is the CPU system clock.• Watchdog Delay: sets the amount of time in which the system will be monitored for activity, either 150 milliseconds or 1.2 seconds.
User Mode	<p>In addition to the Setup Utility features, there is a User mode to control the watchdog timer operations. A user-controlled bit can be used to block the activity pulse from the watchdog timer. If the control bit is set, the user-defined application must clear the bit within the designated time to prevent a reset.</p> <p>For more information, contact Technical Support. See “Customer Support,” page vi.</p>

System Management

Overview

The P3000(D)BX2 contains a series of System Management (SM) sensors and controllers that monitor prominent functions of the SBC. The SM components are interconnected through an SM Bus (Figure 13). When an SM component detects a critical event, it sends a message to be stored in the System Event Log (SEL).

System Event Log (SEL)

The SEL is intended to capture only critical events. Critical events are immediately captured and logged in the SEL so that they will be available for quick system response or for later analysis. The SEL can be viewed at the next Power-On Self Test (POST) via the SM Control menu in the Setup Utility. See below.

System events are logged through the System Management Interrupt (SMI) Handler. The SMI Handler is a routine loaded into a protected area of RAM during POST. This allows the SMI Handler to function independently of the Operating System.

Up to twenty (20) events can be logged, and each event is timestamped. When the event log is full, the oldest event will be overwritten.

Currently, the following events are logged:

- System temperature reached the threshold or returned to normal
- CPU1 temperature reached the threshold or returned to normal
- CPU2 temperature reached the threshold or returned to normal
- Single-bit or Multi-bit ECC memory error was detected at DIMM#xx

Note: For Single and Multi-bit ECC errors, the DIMM number will be noted by xx.

Setup Utility

The SM Control menu in the Setup Utility allows the event log to be viewed or cleared. The SM Control menu also displays the status of the following functions:

- System and CPU temperature
- CPU operating voltage (VCORE)
- Voltage supplied to the SBC (+3.3 V, +5 V, -5 V, +12 V, and -12 V)

The SM Control menu allows the user to set the threshold for the system and CPU temperatures. If either the system or CPU temperature reaches the threshold, the LED on the I/O bracket will be lit and an event will be logged in the SEL. If the CPU temperature reaches the threshold, the CPU's will attempt to cool down by slowing the CPU clock according to the rate set for the Thermal Duty Cycle.

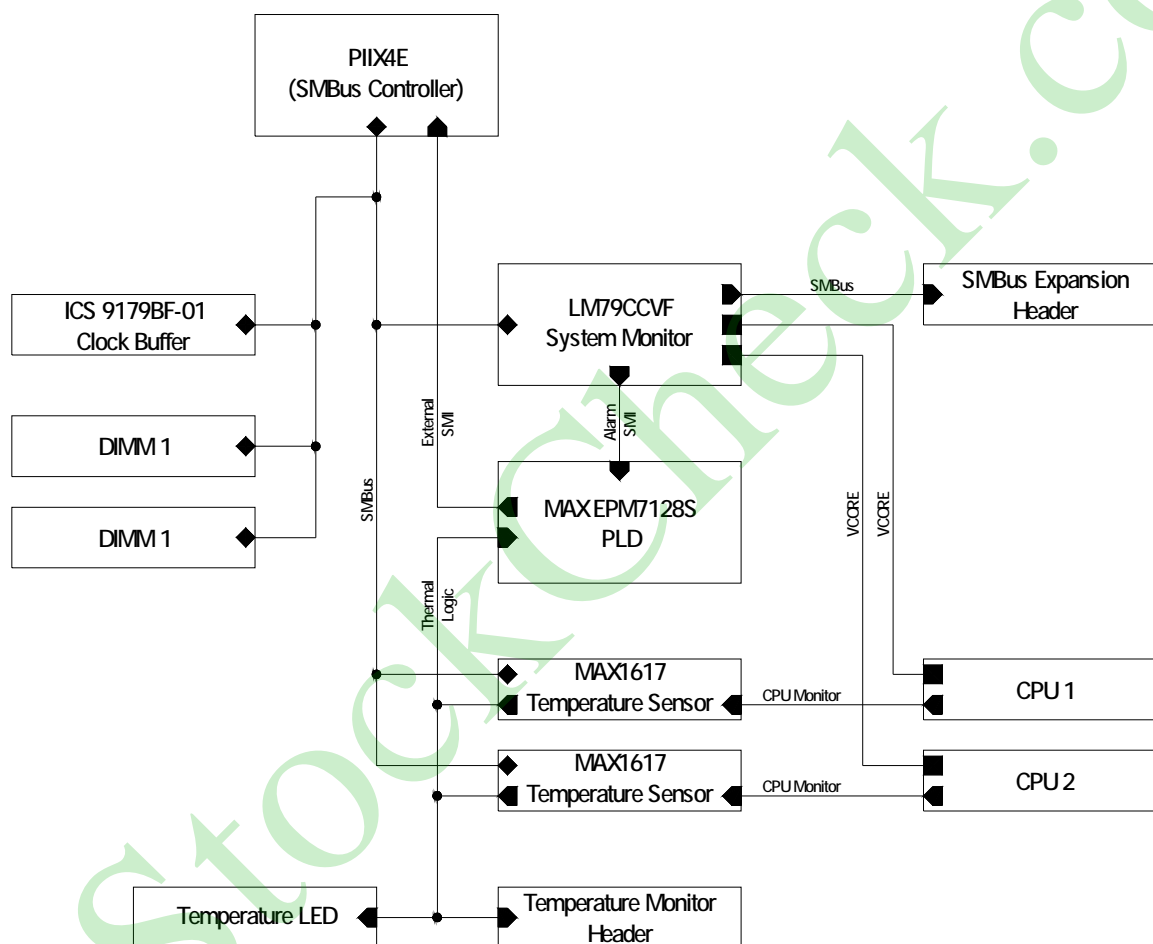
Any changes to settings will take effect at the next POST. The POST display will announce the logging of a new event or the clearing of the log.

Technical Data

Figure 13

System Management Architecture

For the location of System Management components, see [Figure 1](#) on [page 4](#).

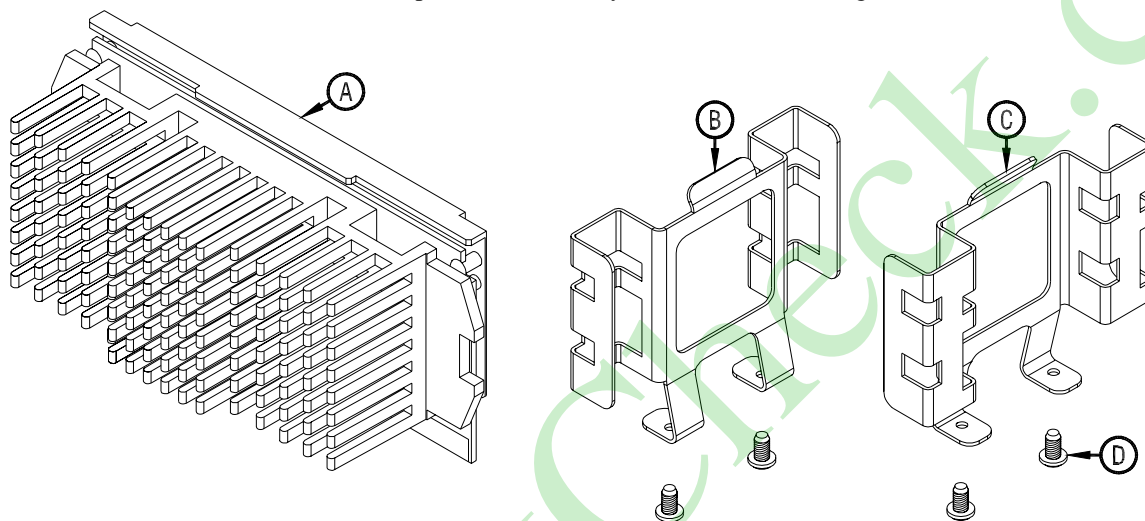


Each Maxim MAX1617 sensor detects the temperature of the single CPU to which it is directly connected. The MAX1617 connected to CPU 1, the primary processor, detects both the CPU and system temperatures.

Installing Processor(s)

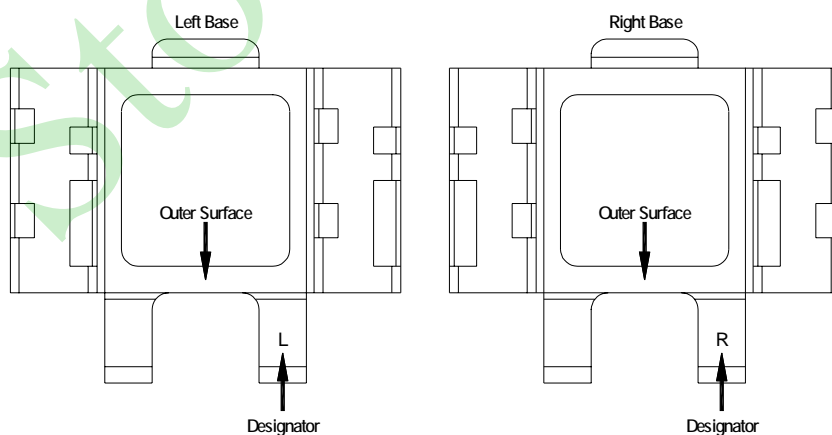
Overview

The Pentium® III processor assembly includes the following items:



- A. Pentium III Processor with Heatsink
- B. Processor Retention Base (Right)
- C. Processor Retention Base (Left)
- D. Processor Retention Base Mounting Screws (4)

Note: The retention bases are not identical. To aid in proper installation, the outer surface of the retention base foot is stamped with a Left (L) or Right (R) designator.



Technical Data

Retention Bases

The processor retention bases support the Pentium III processor(s) mounted on the SBC. The two (2) retention bases must be installed for either single or dual processors.

The procedure for installing the processor retention bases (Figure 14 on page 44) is outlined in the following table:

Step	Action
1	Place the processor retention bases on the top surface of the SBC. Align the screw holes in retention base feet with those in the SBC. Note: The retention bases are not identical. To aid in proper installation, refer to the Left (L) and Right (R) designators on the foot of each retention base.
2	Firmly fasten the retention bases to the top surface of the SBC with the four (4) mounting screws. Note: The mounting screws are fastened from the bottom surface of the SBC.

Processor

The procedure for installing a Pentium III processor (Figure 15 on page 45) is outlined in the following table:

Step	Action
1	Insert the processor into the retention bases. Note: The heatsink should be oriented toward the top edge of the SBC.
2	Lower the processor to the processor connector. Carefully push the processor into the connector. Note: As the processor is lowered toward the connector, the retention bases will be pushed outward slightly by the heatsink. As the processor is seated in the connector, the retention bases will spring back inward to grasp the heatsink. This secures the processor into the connector.

Removal

The procedure for removing a Pentium III processor (Figure 16 on page 46) is outlined in the following table:

Step	Action
1	Using the thumb and forefinger of one hand, gently push the processor retention bases outward approximately five degrees (5°) to release the heatsink. Note: Do not over-extend the retention bases. This will cause excess stress to the bases and can damage the equipment.
2	Carefully pull the processor upward to remove it from the connector. Note: Rock the processor out of the connector by lifting first one end and then the other. This will prevent excess stress to the retention bases.
3	Lift the processor from the retention bases.

Technical Data

Figure 14

Installing the Retention Bases

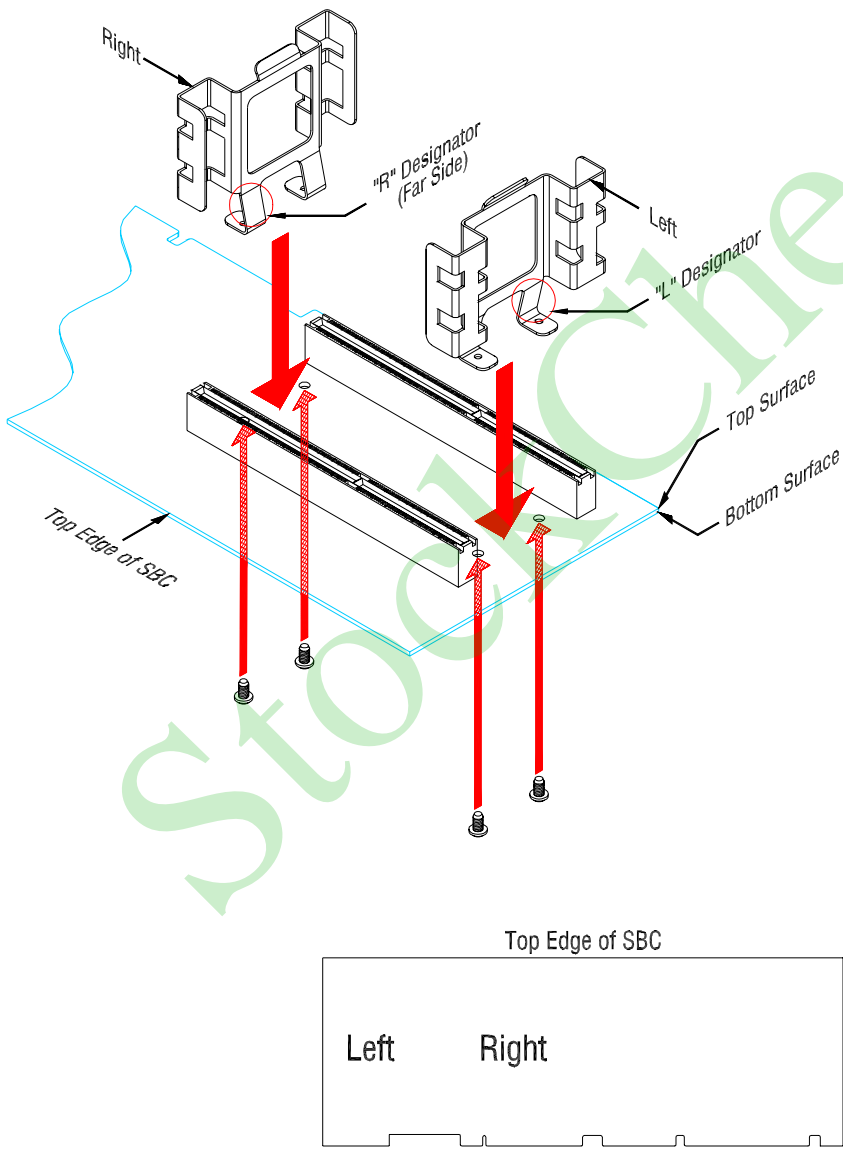


Figure 15 Installing the Pentium® III Processor

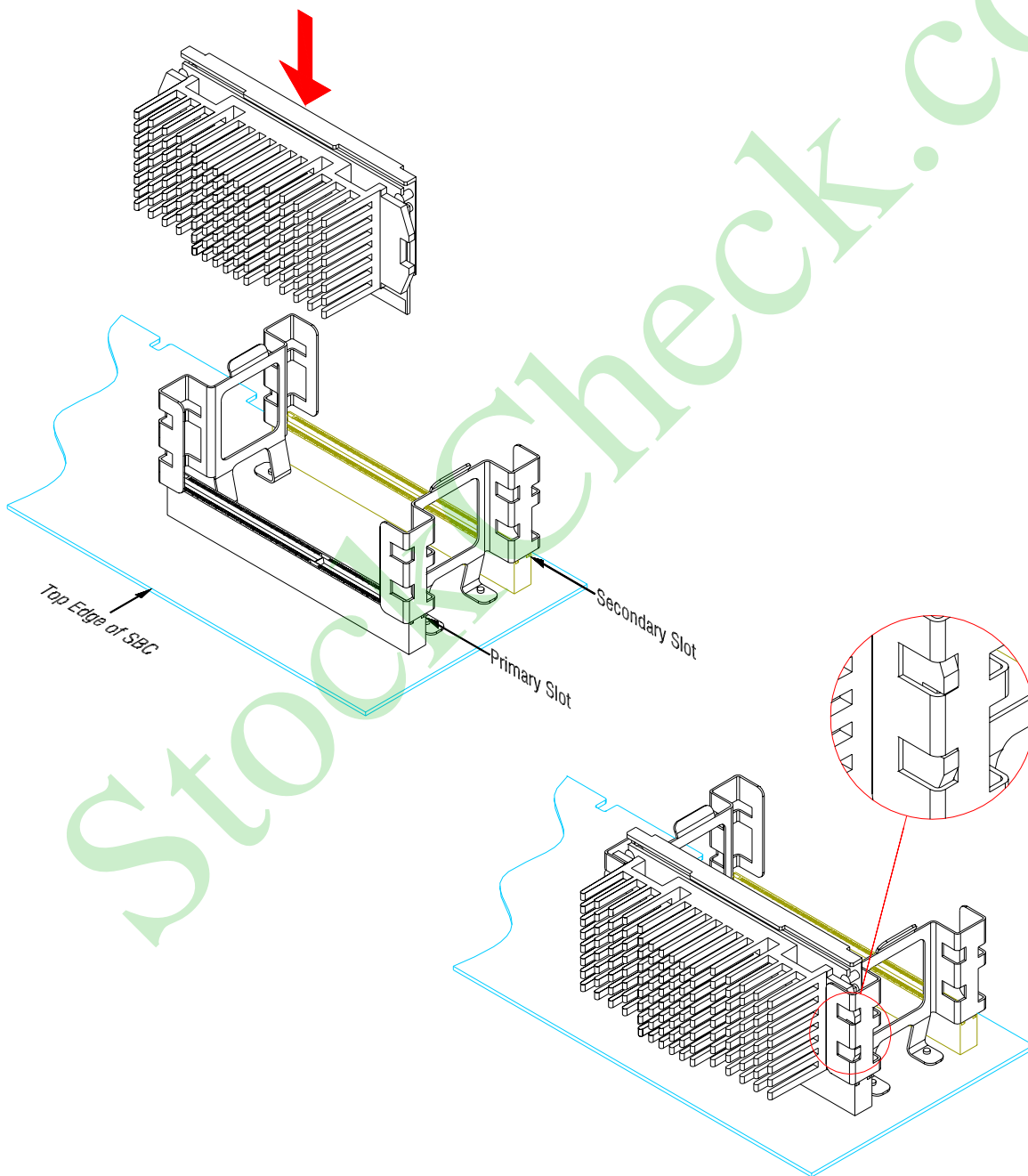
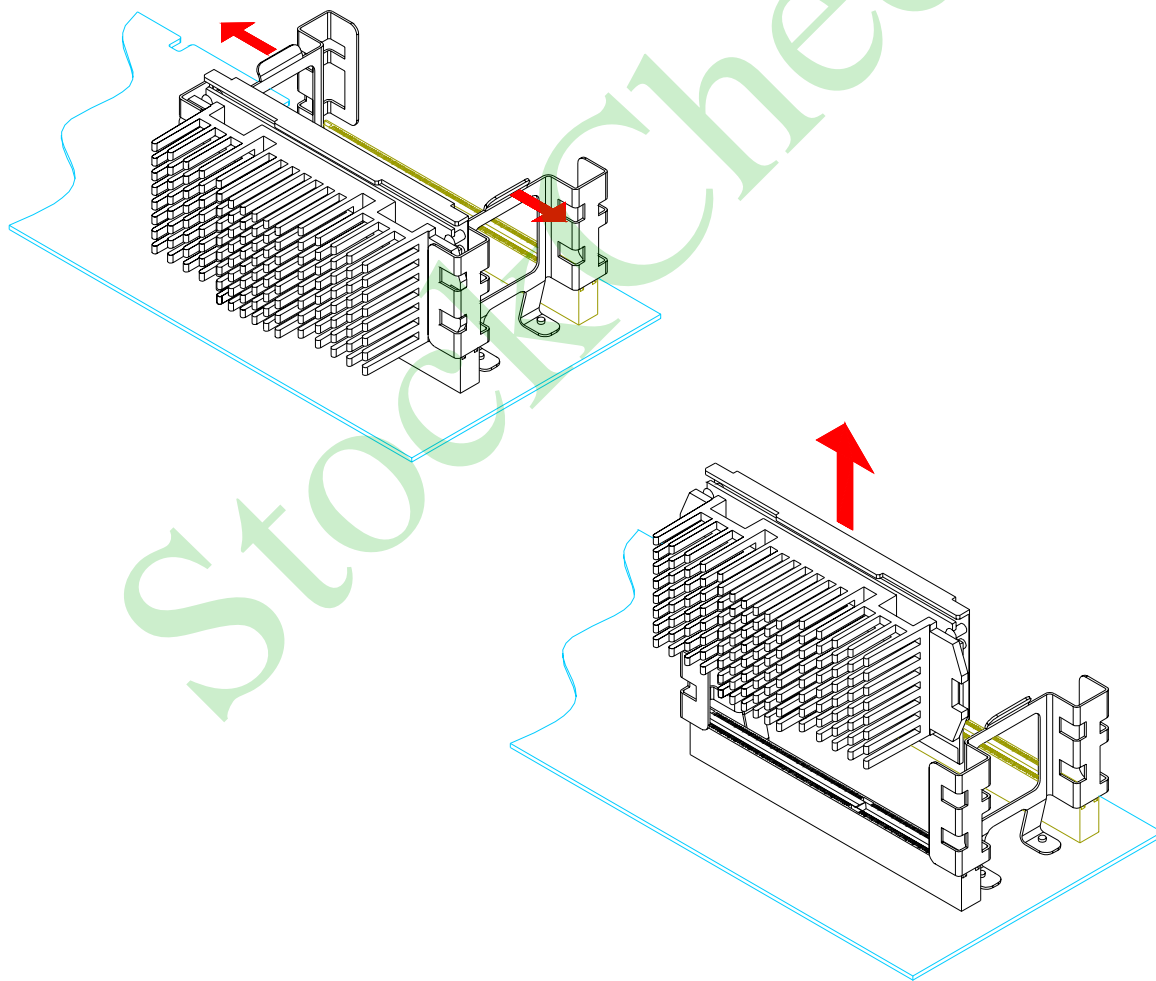


Figure 16

Removing the Pentium® III Processor



Technical Data

Single Processor

To properly operate a single Pentium III processor in the P3000BX2:

- Install the processor in the primary slot
- Install a Slot 1 terminator card in the secondary slot

Note: The terminator card must be rated for 100 MHz host bus (front-side bus) operations.



Failure to properly install a single processor with adequate termination can cause damage to the equipment and could void the warranty.

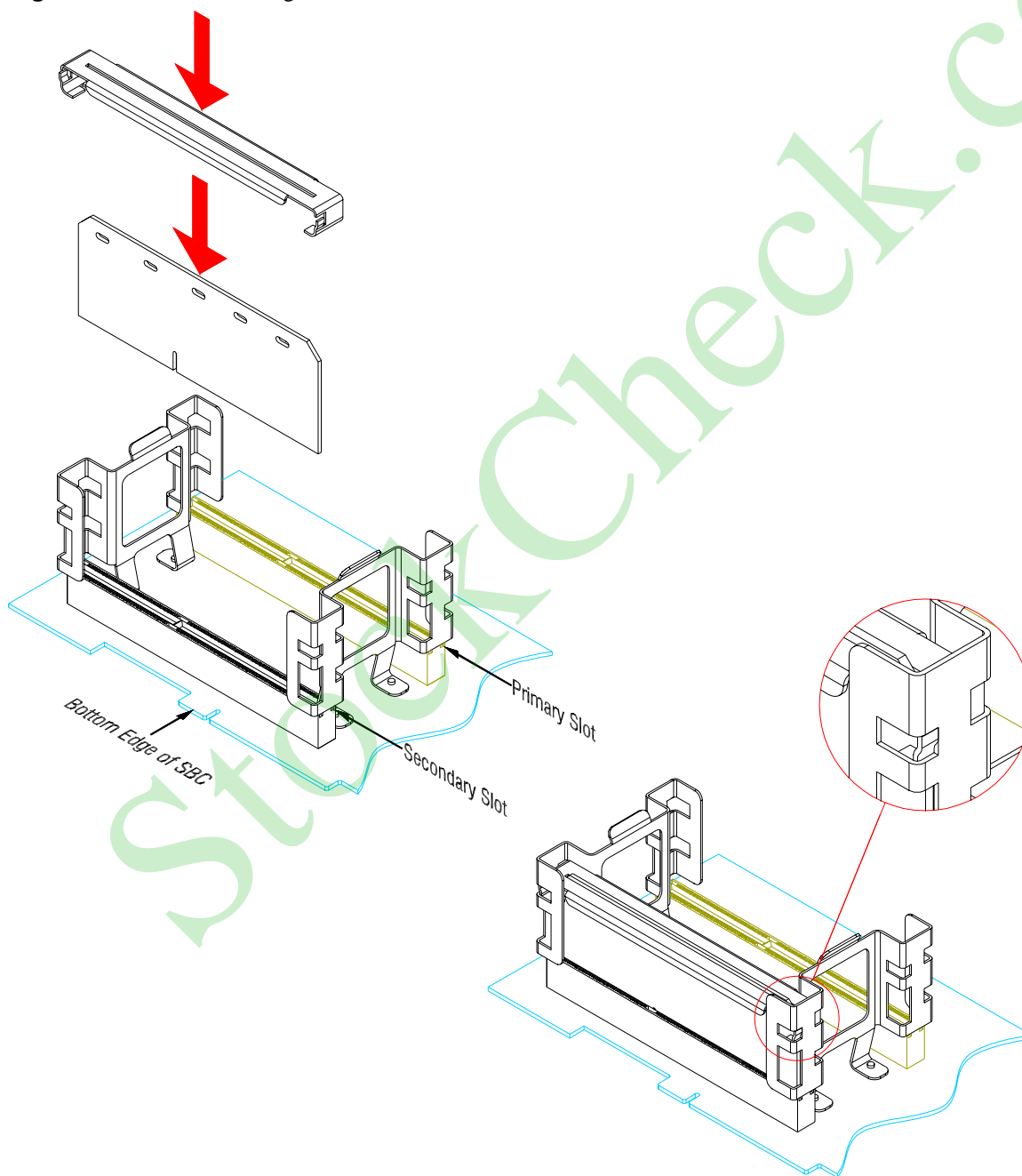
Terminator

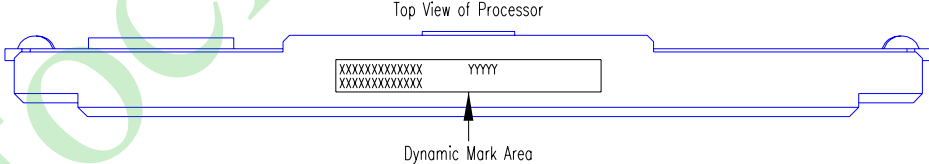
The procedure for installing a Slot 1 terminator card (Figure 17 on page 48) is outlined in the following table:

Step	Action
1	Insert the terminator card into the retention bases. Note: The terminator card and the processor connector are both keyed to prevent improper installation.
2	Lower the terminator card to the processor connector. Carefully push the terminator card into the connector.
3	Insert the terminator card fastener into the retention bases. Note: The fastener is slotted so that the top of the terminator card will protrude through the fastener.
4	Lower the terminator card fastener to the terminator card. Carefully push the fastener into the retention bases until the fastener engages the bases. Note: The fastener has a clasp on each end. These clasps will engage slots in the rear of each retention base.

Technical Data

Figure 17 Installing the Slot 1 Terminator Card



Technical Data	
Dual Processors	When operating dual processors, the “stepping” of each processor must be considered.
Stepping	<p>The “stepping” of a processor is similar to a manufacturing “version number” or “revision level.” The first version of a new processor is the A0 step. As revisions are made for functional fixes or manufacturing improvements, the stepping is increased.</p> <p>Intel recommends using identical steppings of processors in dual systems. This is the only configuration that receives full validation through all of Intel’s testing. However, Intel does not actively prevent mixed steppings of processors used in dual systems.</p> <p>Two methods can be used to determine the stepping of a Pentium III processor:</p> <ul style="list-style-type: none"> • CPUID Utility • S-spec Number
CPUID Utility	The CPUID utility is a program that can identify a genuine Intel processor, as well as determine the processor family, model, and stepping. The CPUID utility and installation instructions can be downloaded from Intel’s website. See below.
S-spec Number	The S-spec number is located on the top edge of the processor. It identifies any specific characteristics of that individual processor, including the stepping. The S-spec number can be referenced in the Pentium III Processor Specification Update, which can be downloaded from Intel’s website. See below.
<p style="text-align: center;">Top View of Processor</p>  <p style="text-align: center;">YYYYY = S-spec Number</p>	
More...	For more information, contact Intel at http://www.intel.com .

Installing Memory

Overview

The P3000(D)BX2 contains two (2) 168-pin DIMM (Dual In-Line Memory Module) sockets for memory (Figure 18). This provides support for up to 512 MB of on-board memory using PC100 DIMM's, or higher as technology becomes available.

Memory Banks

SIMM's (Single In-Line Memory Modules) typically require two (2) sockets filled with identical modules in order to compose a bank. DIMM's require only one socket.

Any of the DIMM sockets can be filled in any order with modules of any acceptable size. For example, a 16 MB DIMM can be installed in Bank 0, while a 32 MB DIMM can be installed in Bank 1.



The system can operate without Bank 0 (DIMM 1) filled. However, Crisis Recovery mode requires Bank 0 to be populated. For more information on Crisis Recovery mode, see page 12.

DIMM Types

Three (3) DIMM memory sizes (64, 128, and 256 MB) are supported. DIMM's of these sizes can be installed in banks 0 and 1 in any combination in any order.

Memory size is detected by the system BIOS. Memory timing requires PC100 SDRAM modules.



The SBC only supports +3.3 V DIMM's. Use of DIMM's that are not rated at +3.3 V can cause damage to the equipment and could void the warranty.

DIMM Installation

The procedure for installing a DIMM (Figure 19) is outlined in the following table.

Step	Action
1	Power-off the system and disconnect all power cords. Note: Use the grounding wrist strap provided with the system to discharge static electricity.
2	Depress the DIMM socket latches outward (if required).
3	Align the DIMM with the socket. Note: The DIMM and socket are both keyed to prevent improper installation.
4	Insert the DIMM into the socket. Carefully push the DIMM into the socket. Note: The DIMM socket latches will rotate upward to engage the DIMM.

DIMM Removal

The procedure for removing a DIMM is outlined in the following table.

Step	Action
1	Power-off the system and disconnect all power cords. Note: Use the grounding wrist strap provided with the system to discharge static electricity.
2	Depress the DIMM socket latches outward. Note: The DIMM will be ejected from the socket.

Technical Data

Figure 18

Memory Sockets

Note: This illustration shows the Pentium III processors with heatsinks and support devices uninstalled. For more information on these components, see [page 42](#).

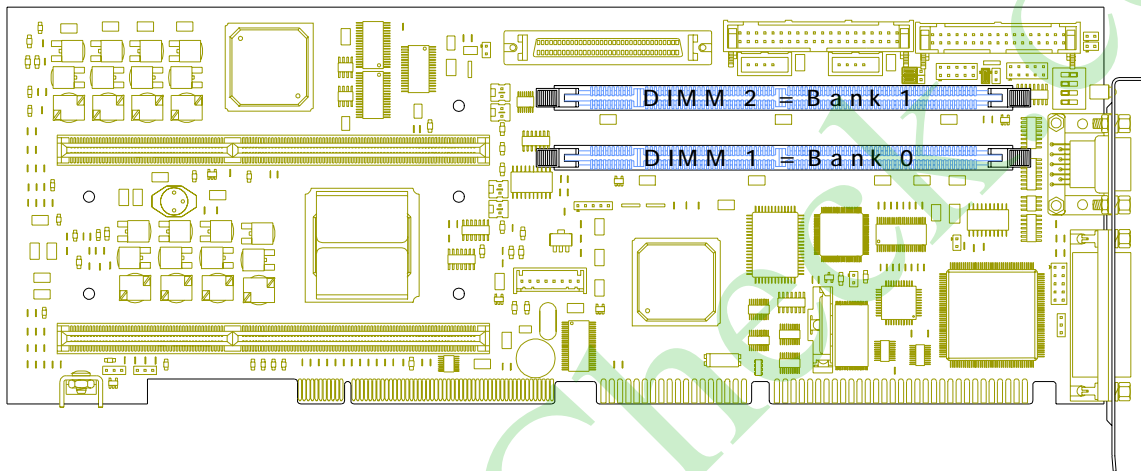
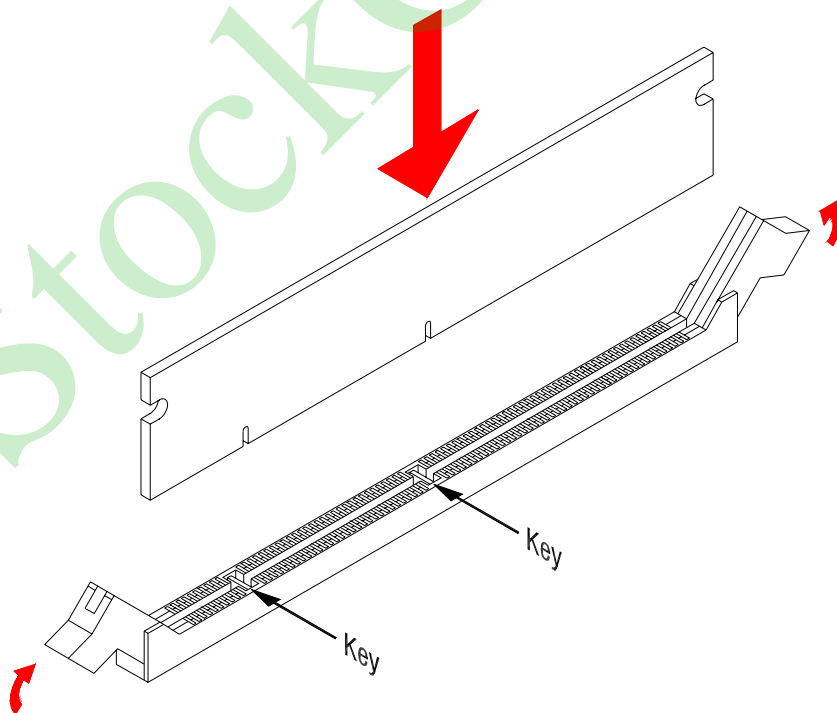


Figure 19

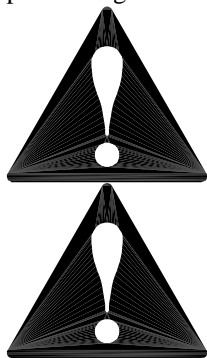
Installing Memory Modules



System Battery Replacement

Overview

The P3000(D)BX2 utilizes a CR2032 lithium (Li/MnO₂) coin battery (Figure 20). This 3-volt battery provides power to retain the correct date, time, and computer parameters in CMOS when the system is powered-off. This information assists the BIOS in performing initialization and configuration during power-on or reset operations.



The battery must be used or stored within the temperature specifications outlined on page 30.

Bezüglich Betrieb und Lagerung der Batterie beachten Sie bitte die Temperaturspezifikationen auf Seite 30.

Due to risk of fire or explosion, do not attempt to recharge, force open, or heat the battery. There is danger of explosion if the battery is incorrectly installed. Replace the battery only with the same or equivalent type. Reference the battery manufacturer's packaging or labeling for further cautions and warnings.

Wegen Feuer- oder Explosionsgefahr, versuchen Sie nicht die Batterie wieder aufzuladen, sie zu öffnen oder zu erhitzen. Bei falscher Installierung besteht eine Explosionsgefahr. Ersetzen Sie die Batterie nur mit einem Gleichen oder gleichwertigen Typ. Weitere Informationen und Warnungen entnehmen Sie bitte der Verpackung bzw. dem Aufdruck des Herstellers.

Service

The system battery is designed to provide years of service without replacement. However, if configuration or clock-related inconsistencies occur, the battery may need to be replaced.

Installation

The procedure for installing the system battery (Figure 21) is outlined in the following table:

Step	Action
1	Power-off the system and disconnect all power cords. Note: Use a grounding wrist strap or other device to discharge static electricity.
2	Remove the chassis cover.
3	Detach the SBC and expansion card hold-down brackets (if required). The expansion card hold-down bracket reaches across the tops of the expansion cards and holds them in place. The SBC hold-down bracket reaches from the expansion card hold-down bracket to the chassis wall and secures the SBC.
4	Orient the battery with its positive pole (top surface) toward the front of the connector. Note: The battery will not discharge voltage if installed backwards.
5	Rotate the upper edge of the battery approximately forty-five degrees (45°) away from the battery connector.
6	Insert the lower edge of the battery into the connector, so that the negative pole (bottom surface) of the battery engages the negative spring contact of the connector.
7	Press the raised edge of the battery downward until the battery seats firmly in the battery connector. Note: The positive spring contact of the connector will engage the positive pole of the battery.

Technical Data

Figure 20

System Battery Components

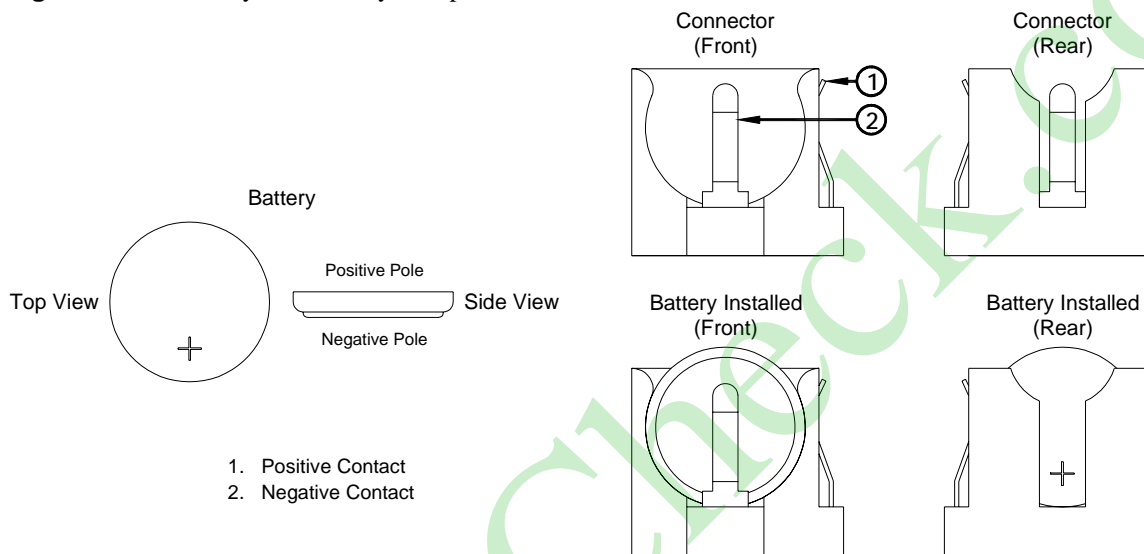
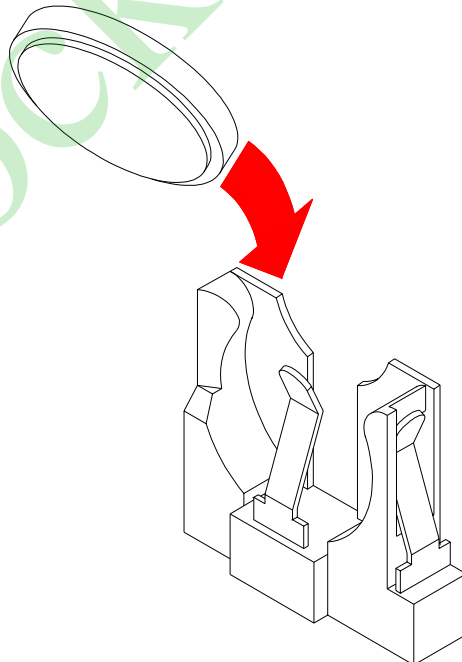


Figure 21

Battery Installation



Technical Data

Notes

Technical Data

Notes

Technical Data

Notes

StockCheck.com

