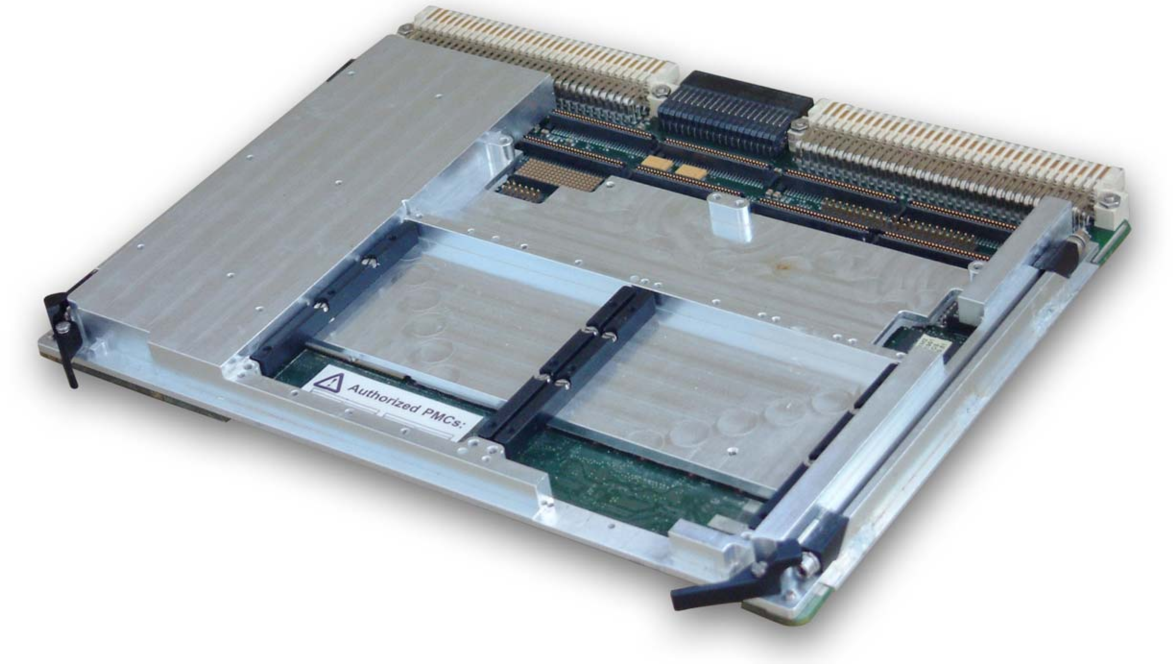
» PENTXM2/RC and PENTXM4/RC «



User's Guide Supplement

CA.DT.A08-2e - October 2009

Revision History

Publication Title:	PENTXM2/RC and PENTXM4/RC	
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Rev.	**Brief Description of Changes**	**Date of Issue**
2e	Add PENTXM4/RC	10-2009
1e	New section 3.2 Hardware Configuration	03-2009

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Environmental Protection Statement

This product has been manufactured to satisfy environmental protection requirements where possible. Many of the components used (structural parts, printed circuit boards, connectors, batteries, etc.) are capable of being recycled.

Final disposition of this product after its service life must be accomplished in accordance with applicable country, state, or local laws or regulations.

Environmental protection is a high priority with Kontron.

Kontron follows the DEEE/WEEE directive.

You are encouraged to return our products for proper disposal.

The Waste Electrical and Electronic Equipment (WEEE) Directive aims to:

- reduce waste arising from electrical and electronic equipment (EEE)
- make producers of EEE responsible for the environmental impact of their products, especially when they become waste
- encourage separate collection and subsequent treatment, reuse, recovery, recycling and sound environmental disposal of EEE
- improve the environmental performance of all those involved during the lifecycle of EEE

Conventions

This guide uses several types of notice: Note, Caution, ESD.

Note: this notice calls attention to important features or instructions.

Caution: this notice alert you to system damage, loss of data, or risk of personal injury.

ESD: This banner indicates an Electrostatic Sensitive Device.

All numbers are expressed in decimal, except addresses and memory or register data, which are expressed in hexadecimal. The prefix `0x' shows a hexadecimal number, following the `C' programming language convention.

The multipliers `k', `M' and `G' have their conventional scientific and engineering meanings of $*10^3$, $*10^6$ and $*10^9$ respectively. The only exception to this is in the description of the size of memory areas, when `K', `M' and `G' mean $*2^{10}$, $*2^{20}$ and $*2^{30}$ respectively.

When describing transfer rates, `k' `M' and `G' mean $*10^3$, $*10^6$ and $*10^9$ *not* $*2^{10}$ $*2^{20}$ *and* $*2^{30}$*.*

In PowerPC terminology, multiple bit fields are numbered from 0 to n, where 0 is the MSB and n is the LSB. PCI and CompactPCI terminology follows the more familiar convention that bit 0 is the LSB and n is the MSB.

Signal names ending with an asterisk (*) or a hash (#) denote active low signals; all other signals are active high.

Signal names follow the PICMG 2.0 R3.0 CompactPCI Specification and the PCI Local Bus 2.3 Specification.

For Your Safety

Your new Kontron product was developed and tested carefully to provide all features necessary to ensure its compliance with electrical safety requirements. It was also designed for a long fault-free life. However, the life expectancy of your product can be drastically reduced by improper treatment during unpacking and installation. Therefore, in the interest of your own safety and of the correct operation of your new Kontron product, you are requested to conform with the following guidelines.

High Voltage Safety Instructions

Warning!
All operations on this device must be carried out by sufficiently skilled personnel only.

Caution, Electric Shock!
Before installing a not hot-swappable Kontron product into a system always ensure that your mains power is switched off. This applies also to the installation of piggybacks. Serious electrical shock hazards can exist during all installation, repair and maintenance operations with this product. Therefore, always unplug the power cable and any other cables which provide external voltages before performing work.

Special Handling and Unpacking Instructions

ESD Sensitive Device!
Electronic boards and their components are sensitive to static electricity. Therefore, care must be taken during all handling operations and inspections of this product, in order to ensure product integrity at all times

Do not handle this product out of its protective enclosure while it is not used for operational purposes unless it is otherwise protected.

Whenever possible, unpack or pack this product only at EOS/ESD safe work stations. Where a safe work station is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools. This is most easily done by touching a metal part of your system housing.

It is particularly important to observe standard anti-static precautions when changing piggybacks, ROM devices, jumper settings etc. If the product contains batteries for RTC or memory backup, ensure that the board is not placed on conductive surfaces, including anti-static plastics or sponges. They can cause short circuits and damage the batteries or conductive circuits on the board.

General Instructions on Usage

In order to maintain Kontron's product warranty, this product must not be altered or modified in any way. Changes or modifications to the device, which are not explicitly approved by Kontron and described in this manual or received from Kontron's Technical Support as a special handling instruction, will void your warranty.

This device should only be installed in or connected to systems that fulfill all necessary technical and specific environmental requirements. This applies also to the operational temperature range of the specific board version, which must not be exceeded. If batteries are present, their temperature restrictions must be taken into account.

In performing all necessary installation and application operations, please follow only the instructions supplied by the present manual.

Keep all the original packaging material for future storage or warranty shipments. If it is necessary to store or ship the board, please re-pack it as nearly as possible in the manner in which it was delivered.

Special care is necessary when handling or unpacking the product. Please consult the special handling and unpacking instruction on the previous page of this manual.

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Chapter 1 - Introduction

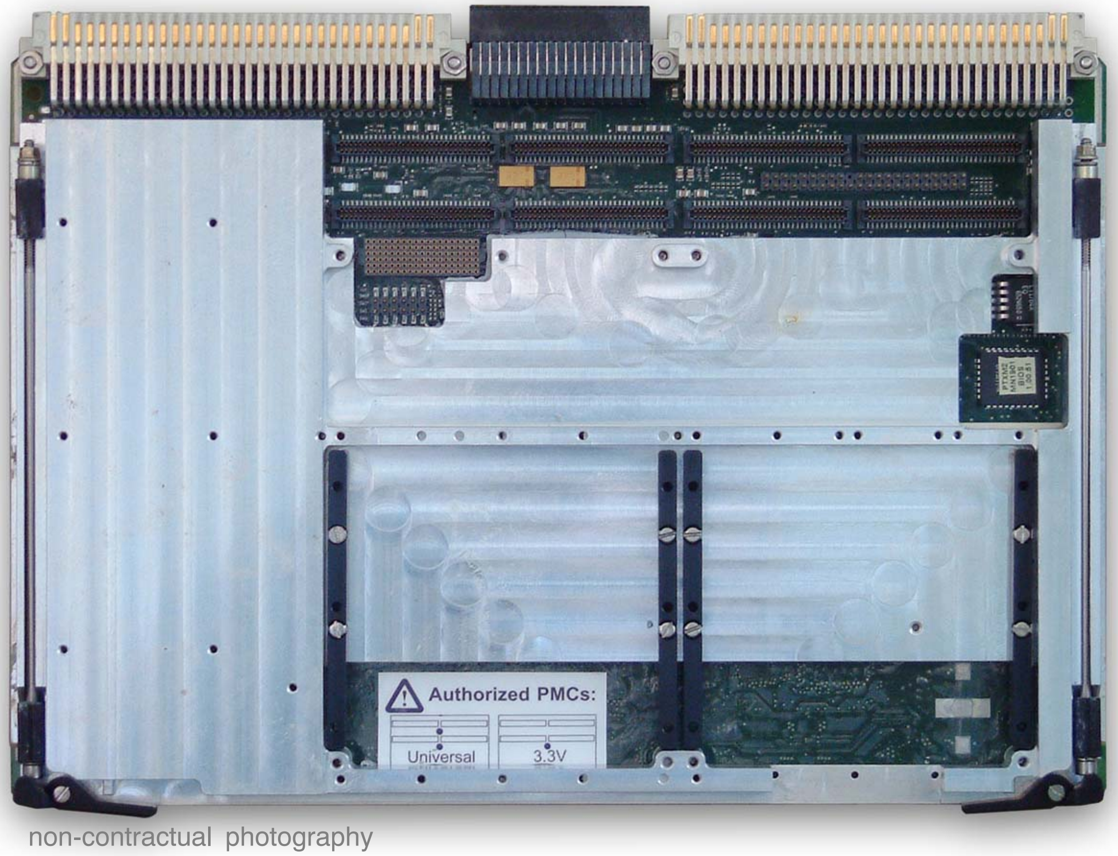
Functional changes that differ from previous version of the document are identified by a vertical bar in the margin.

The PENTXM2/RC and PENTXM4/RC boards uses “The Ruggedizer", a Kontron proven technology to meet the requirements for harsh environments. With an operational temperature range from -40º C up to +85º C and its mechanical environmental performances, the PENTXM2/RC and PENTXM4/RC are designed for severe environmental applications with high levels of chock and vibration, small space envelope and restricted cooling such as required in military, marine, avionics, sheltered and industrial applications.

Kontron conduction cooled board are fully compliant with the ANSI/VITA 1-1994 VMEbus and ANSI Std 1101.2-1992 and can support Conduction Cooled PCI Mezzanine Card (CCPMC) as described in the VITA 20-2001 (R2005) standard.

Order Code

PENTXM2-RC34S-10000	Rugged Conduction-Cooled RC Class Dual Core Intel Xeon @1.33 GHz 1 GB DDR2-SDRAM 4 GB soldered Flash Disk Leaded
PENTXM2-RC36S-10000	Rugged Conduction-Cooled RC Class Dual Core Intel Xeon @1.33 GHz 2 GB DDR2-SDRAM 4 GB soldered Flash Disk Leaded
PENTXM4-RC38S-10000	Rugged Conduction-Cooled RC Class Twin Dual Core Intel Xeon @1.33 GHz 4 GB DDR2-SDRAM 4 GB soldered Flash Disk Leaded



non-contractual photography

Figure 1: PENTXM4/RC - Overview

1.1 Objectives

This document describes the particularity of the PENTXM2/RC and PENTXM4/RC boards in comparison with the PENTXM2/SA and PENTXM4/SAboards. It focuses on the features which are specific to the conduction--cooled version of the boards.

This document does not supersede the "PENTXM2 and PENTXM4 Boards - User's Guide" which contains important information for unpacking, identifying, configuring, installing and operating the PENTXM2 and PENTXM4 boards and which should be read first.

Note The hardware technical documentation reflects the most recent version of the Kontron products. The "Hardware Release Notes" (see section 1.2 "Related Documents") help to keep track of various evolutions of the products.

1.2 Related Documents

Kontron Documentations

PENTXM2 and PENTXM4 Hardware Release Notes	CA.DT.A09
PENTXM2 and PENTXM4 User's Guide	CA.DT.A07
PENTXM2 and PENTXM4 Connection Guide	CA.DT.A10
InsydeH20 Firmware for PENXTM2 and PENTXM4 - User Reference Manual	SD.DT.E86
PENTXM2 and PENTXM4 XBIT User's Guide	SD.DT.E90
PENTXM2 and PENTXM4 IPMI BMC User's Manual	SD.DT.F12
Release Notes RHEL5.2 on PENTXM2 and PENTXM4 Boards	SD.DT.F34
Release Notes RHEL5 on PENTXM2 and PENTXM4 Boards	SD.DT.F28
Release Notes RHEL4 on PENTXM2 and PENTXM4 Boards	SD.DT.E82
Release Notes Windows XP on PENTXM2 and PENTXM4 Boards	SD.DT.F39

Other Documentations

- Conduction Cooled PCI Mezzanine Card (CCPMC) Specification ANSI/VITA 20-2001. R2005, Feb. 2005
- IEEE Standard for Mechanical Core Specifications for Conduction-Cooled Eurocards, IEEE 1101.2-1992.

Chapter 2 - General Information

2.1 Features

The PENTXM2/RC and PENTXM4/RC boards have the same features as the PENTXM2/SA and PENTXM4/SA boards (refer to the “PENTXM2 and PENTXM4 Boards - User's Guide" for more information) except the following features and restrictions:

» Ruggedizer

The ruggedizer allows an extended operating temperature range and enhanced shocks and vibrations performance.

- PENTXM2/RC Ruggedizer Order Code: DRN-PTXM2RC-V*xx-y*
- PENTXM4/RC Ruggedizer Order Code: DRN-PTXM4RC-V*xx-y*

» Batteryless Operation and Non-Volatile Board Settings

For specific applications, the limited lifetime of the battery in extreme environmental conditions is an issue. In this case, system requirement forbids the use of a battery.
The PENTXM2/RC and PENTXM4/RC boards can operate safely without a battery fitted. In this case, the non-volatile board settings are managed this way:

- All BIOS user settings are kept forever (in a specific area of the BIOS Flash)
- By default, all PENTXM2/RC and PENTXM4/RC boards are delivered without a baterry fitted, so the Date/Time is lost at each power-on/power-off and the BIOS displays: `01/01/2001 00:00/00`

» Standard features include

- No Front Panel
- BIOS Flash EPROM soldered on the PCB

» Using PENTXM2/RC and PENTXM4/RC Boards with Mezzanines

VITA20 and IEEE.1386.1 standard PMC mezzanines can be plugged onto the card without causing the processor to enter thermal management mode, as long as wedgelock temperature is satisfied.

Standard Frequency Operation

The PENTXM2/RC and PENTXM4/RC dual-core processor frequency is set to 1.33 GHz. With this default setting, the PENTXM2/RC and PENTXM4/RC processing performance is guaranteed across the whole operating temperature range. The PENTXM2/RC and PENTXM4/RC thermal design is such as the processor, running at 1.33 GHz does not enter thermal management mode (frequency throttling) when the wedgelock temperature is maintained within the approved operating range.

The standard operating range for a **PENTXM2/RC is -40° to +85°C.** The card edge temperature check point is measured as follows: the middle point in the wedgelock channel on the ruggedizer. The wedgelock channel is the channel between the edge of the ruggedizer and the cold wall of the rack. Refer to arrows numbers **1** and **2** in following pictures.

The standard operating range for a **PENTXM4/RC is -40° to +70°C.** The card edge temperature check point is measured as follows: the middle point in the wedgelock channel on the ruggedizer. The wedgelock channel is the channel between the edge of the ruggedizer and the cold wall of the rack. Refer to arrows numbers **1** and **2** in following pictures.

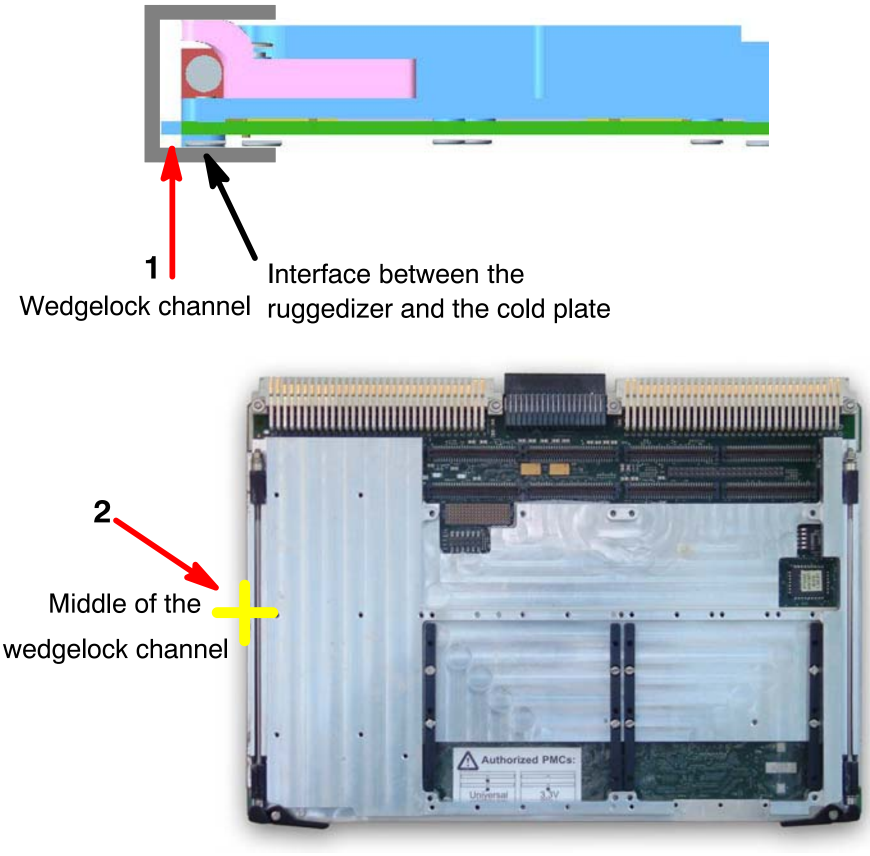


Figure 2: Measuring the Temperature

According to ANSI/VITA 47 standard, the plug-in unit edge surface temperature is measured on the plug-in unit.

Higher Frequency 0peration

The processor upper frequency limit can also be set to 1.67 GHz so as to get increased computing performance. In this case, the highest operating temperature on the wedgelock should limited to:

- 71°C for a PENXTM2/RC
- 65°C for a PENXTM4/RC

This will also keep the dual-core processor outside of its thermal management mode.

To modify the dual-core processing frequency, please refer to the section 6.1.1 “CPU Frequency" of the InsydeH2O Firmware User Reference Manual (SD.DT.E86).

> Exceeding the limits will lock the board

Operating the processor at 1.67 GHz and allowing the wedgelock temperature to reach 85°C is tempting, but the board behaviour cannot be guaranteed. Even if the CPU chip may adapt quickly to the situation with frequency reduction, other components of the board, such as the host bridge, the ethernet chips are not capable of temperature throttling and will start causing errors. This shall not be authorised.

Higher Temperature Operation (section specific to PENTXM4/RC boards)

The highest operating temperature on the wedgelock can also be increased to 77°C as it shows in the following graphe. In this case, the processor frequency should limited to 1.0 GHz. This will also keep the dual-core processor outside of its thermal management mode.

To modify the dual-core processing frequency, please refer to the section 6.1.1 “CPU Frequency" of the InsydeH2O Firmware User Reference Manual (SD.DT.E86).

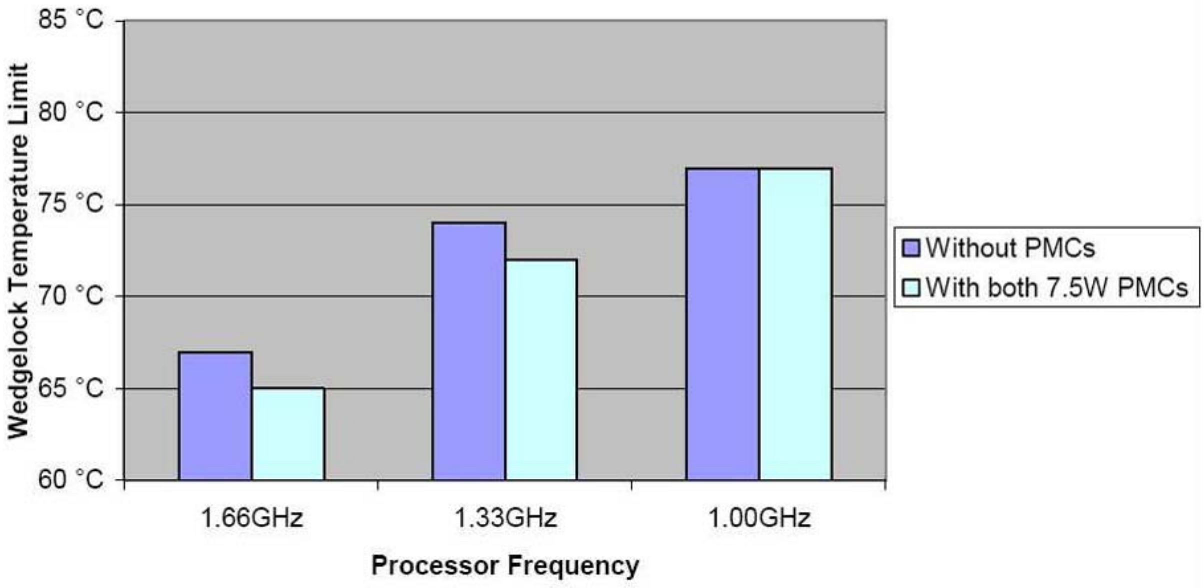


Figure 3: PENTXM4/RC: Thermal vs Performance

> Exceeding the limits will lock the board

Exceeding wedgelock temperature limits that are defined in previous graphe for processor frequency is tempting, but the board behaviour cannot be guaranteed. Even if the CPU chip may adapt quickly to the situation with frequency reduction, other components of the board, such as the host bridge, the ethernet chips are not capable of temperature throttling and will start causing errors. This shall not be authorised.

Chapter 3 - Characteristics of the Board

3.1 Board Identification

The PENTXM2/RC and PENTXM4/RC/RC boards are identified by labels fitted to the bottom side. These labels are at the same position and have the same meaning (except the “Board Identification" label) as the PENTXM2/RC and PENTXM4/RC/SA boards labels (refer to the “PENTXM2 and PENTXM4” Boards - User's Guide" for more information).

The “Board Identification" label prefix of a PENTXM2/RC board is **PENTXM2-RC.**

The “Board Identification" label prefix of a PENTXM4/RC board is **PENTXM4-RC.**

In addition, the ruggedizer is identified by:

- the “Engineering Change Level" (E.C. Level) of the ruggedizer label. **AA**

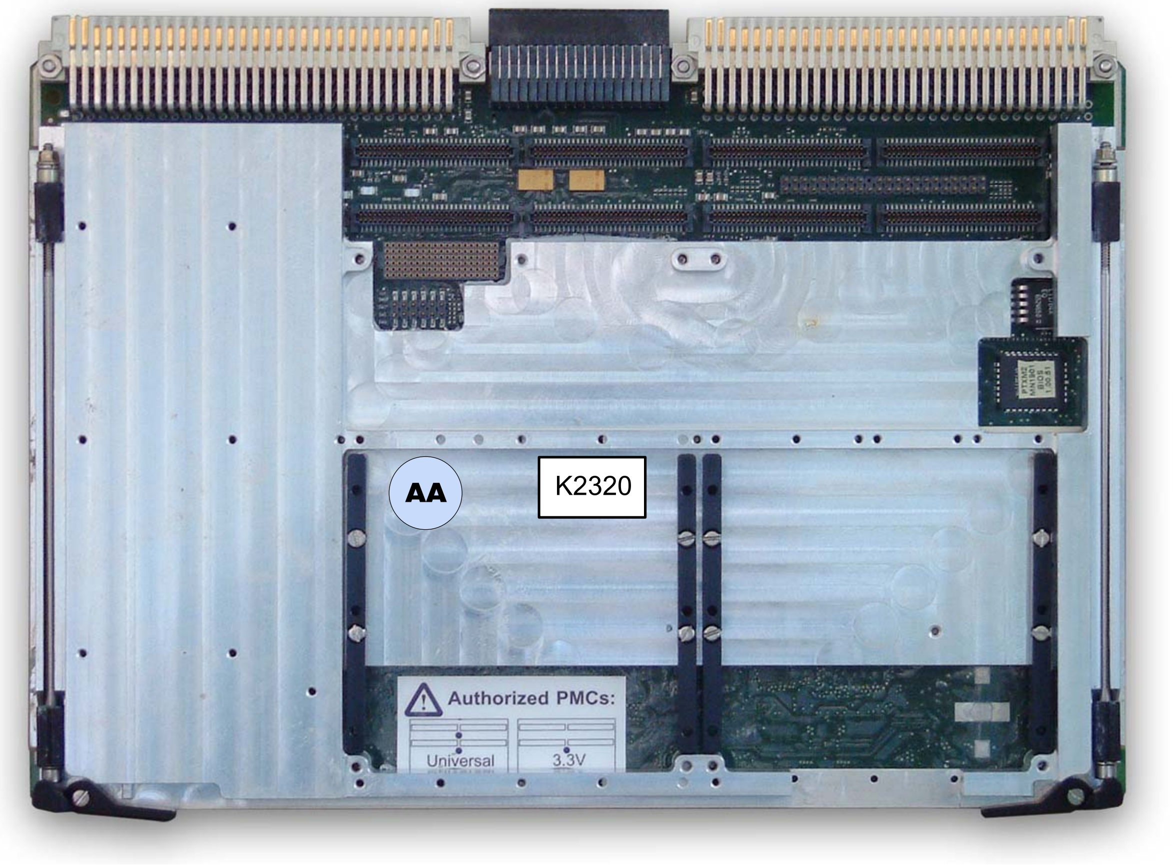
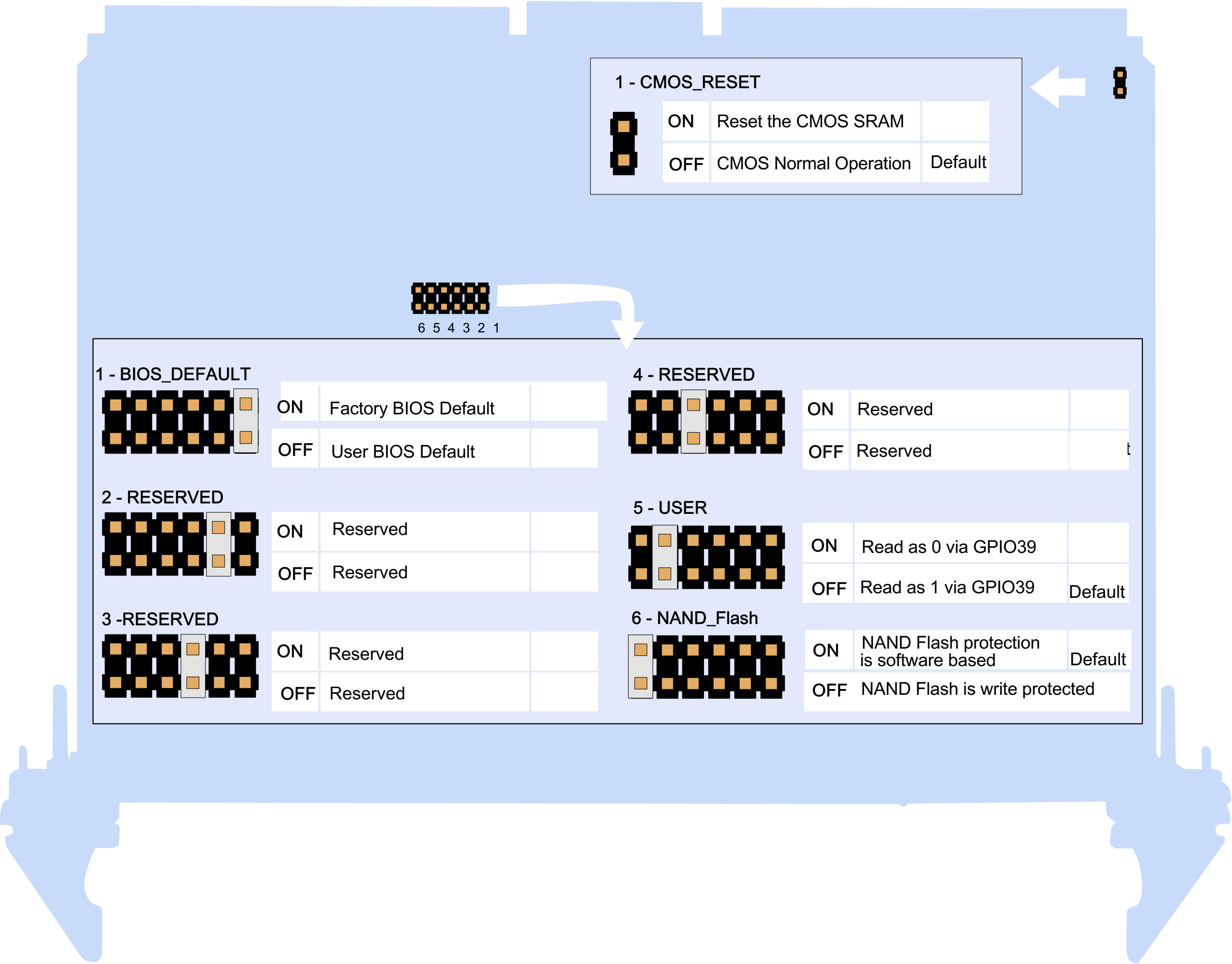


Figure 4: PENTXM2/RC and PENTXM4/RC Identification

3.2 Hardware Configuration

When setting jumpers, avoid touching areas of integrated circuitry; static discharge can damage circuits.

To ensure proper operation of the PENTXM2/RC and PENTXM4/RC board, you may need to check its jumpers configuration. Figure 5 illustrates the placement of the jumpers on the board and their default settings.



1 - CMOS_RESET

ON	Reset the CMOS SRAM	
OFF	CMOS Normal Operation	Default

1 - BIOS_DEFAULT

ON	Factory BIOS Default	
OFF	User BIOS Default	

2 - RESERVED

ON	Reserved	
OFF	Reserved	

3 -RESERVED

ON	Reserved	
OFF	Reserved	

4 - RESERVED

ON	Reserved	
OFF	Reserved	t

5 - USER

ON	Read as 0 via GPIO39	
OFF	Read as 1 via GPIO39	Default

6 - NAND_Flash

ON	NAND Flash protection is software based	Default
OFF	NAND Flash is write protected	

Figure 5: PENTXM2/RC and PENTXM4/RC Jumpers Locations and Default Settings

3.2.1 NAND Flash Protection

GPIO23 connects to the `WP_PD#` bit of the the SST55LD019 to invoke hardware write protection via a specific jumper (NAND_Flash).

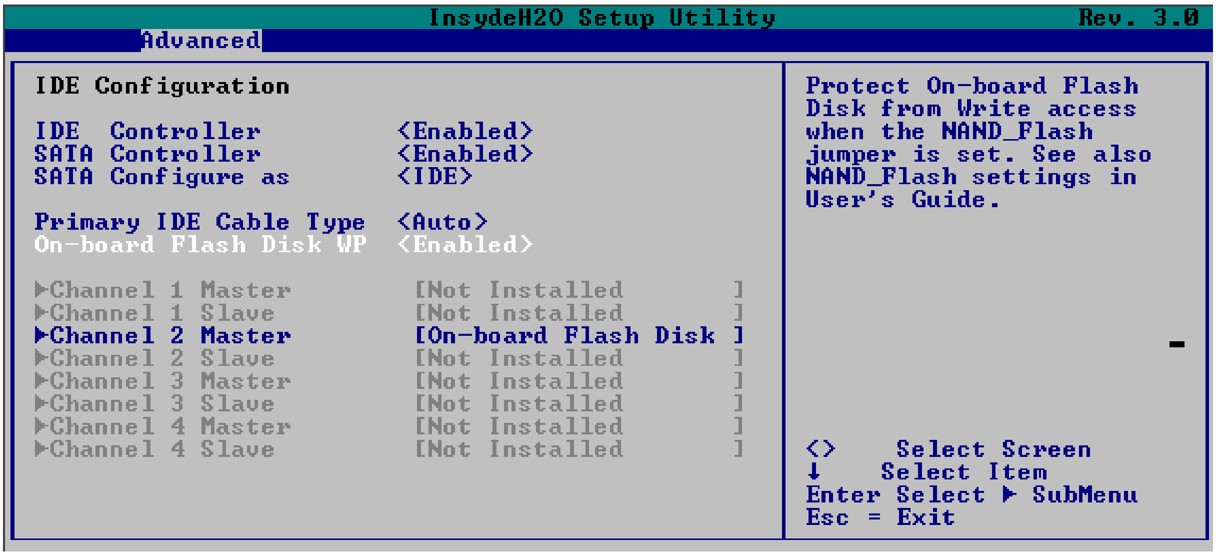
- If the local NAND_Flash jumper is installed (ON) and
  - GPIO23 is logic 1 the NAND Flash is not write protected.
  - GPIO23 is logic 0 the NAND Flash is write protected.
- If the local NAND_Flash jumper is removed (OFF), the NAND Flash is write protected.

Location	Name	Connects to	Setting	Description
6	NAND_Flash	6300ESB GPIO23	ON	**Default configuration:** NAND Flash protection is software based.
			OFF	NAND Flash is write protected.

Table 1: Jumper Description: NAND Flash Protection

Controf of the NAND Flash Protection

The NAND Flash write protection can be managed by software with the onboard NAND_Flash jumper installed (ON) by handling the `GPIO23`. The `GPIO23` can be set up from the BIOS firmware (release 1.00.56 and higher). Refer to section 4.2.4 “Onboard Flash Disk Write Protection” in InsydeH2O Firmware User's Manual.



```
                    InsydeH2O Setup Utility                     Rev. 3.0
        Advanced

 IDE Configuration                                 Protect On-board Flash
                                                   Disk from Write access
 IDE  Controller          <Enabled>                when the NAND_Flash
 SATA Controller          <Enabled>                jumper is set. See also
 SATA Configure as        <IDE>                    NAND_Flash settings in
                                                   User's Guide.
 Primary IDE Cable Type   <Auto>
 On-board Flash Disk WP   <Enabled>

▶Channel 1 Master          [Not Installed      ]
▶Channel 1 Slave           [Not Installed      ]
▶Channel 2 Master          [On-board Flash Disk ]
▶Channel 2 Slave           [Not Installed      ]
▶Channel 3 Master          [Not Installed      ]
▶Channel 3 Slave           [Not Installed      ]
▶Channel 4 Master          [Not Installed      ]
▶Channel 4 Slave           [Not Installed      ]   <>     Select Screen
                                                   ↓     Select Item
                                                   Enter Select ▶ SubMenu
                                                   Esc = Exit
```

Figure 6: InsydeH2O: IDE Configuration

In the Linux RHELx BSP, a driver is provided to handle the user's GPIO: `GPIO41`, `GPIO42` and `GPIO43`. The `GPIO23` could be managed (output only) by adapting this driver. More detail available in:
- section 6.5.9 “User's GPIO” in the “Release Notes RHEL4 for PENTXM2 and PENTXM4 Boards - SD.DT.E82”
- section 6.9 “User's GPIO” in the “Release Notes RHEL5 for PENTXM2 and PENTXM4 Boards - SD.DT.F28”
- section 6.10 “User's GPIO” in the “Release Notes RHEL5.2 for PENTXM2 and PENTXM4 Boards - SD.DT.F34”

Control of NAND Flash Protection

Onboard Flash Disk WP (setup from BIOS menu)	Onboard NAND-Flash Jumper: ON	Onboard NAND-Flash Jumper:OFF
<**Enabled**> GPIO23=0	Onboard flash is: **Write Protected**	Onboard flash is: **Write Protected**
<**Disabled**> GPIO23=1	Onboard flash is: **NOT Write Protected**	Onboard flash is: **Write Protected**

Table 2: Control of the NAND Flash Protection

3.3 Connectors

The PENTXM2/RC and PENTXM4/RC boards feature the same connectors as the PENTXM2/SA and PENTXM4/SA boards.

For detailed information about the connectors located on the PENTXM2/RC and PENTXM4/RC, refer to the “PENTXM2 and PENTXM4” Boards - User's Guide" .

3.4 PMC Installation

The PENTXM2/RC and PENTXM4/RC supports Conduction Cooled PCI Mezzanine Cards (CCPMC) which are compliant with the IEEE 1386.1 standard and the VITA 20-2001 R2005 standard (except the optional Secondary Thermal Interfaces).

Contact Kontron for more information about the CCPMCs available.

CCPMC are delivered with a full kit of parts for mounting them and the User's Guide for the module normally contains instructions on how to fit the module. Refer to the “PENTXM2 and PENTXM4” Boards - User's Guide" for more information about the PMC Installation, the PCI interrupts and the PCI configuration.

Fastening Kit

In accordance with VITA20, optional ribs could be added to improve thermal performance when using XMC or PMC. Ribs using is recommended for PMC/XMC VITA20 with conduction cooling when dissipation is higher than 7.5W or when the conduction thermal resistance required these lateral ribs.

> Kontron Order Code: KIT-RIB-PMC1V01-1
Fastening kit for a rugged conduction-cooled PMC including:

2x RIB-PMC-1-V01	Two additional ribs		
4x VIS-CZX-M2X5-INOX	For the ribs assembly on the board		white circles below ●
10x VIS-CZX-M2.5X6-INOX	For the PMC assembly on the ribs	(6x)	orange stars below ★
	For the PMC assembly on the board	(4x)	red squares below ■
10x VIS-CZX-M2X6-INOX	For PMC assembly on the board		black triangles below ▶

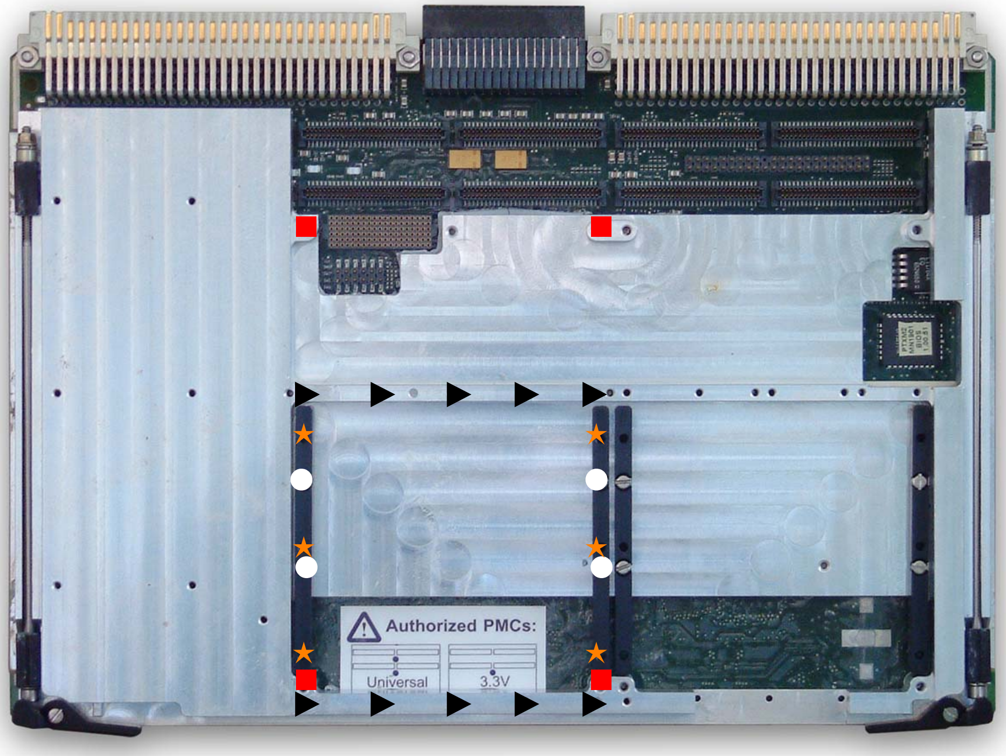


Figure 7: Fastening Kit Installation

> To fix the ribs on the boards:

1. Put a drop of thread locking Loctite 222e (ref. 231501) on each screw header (VIS-CZX-M2X5-INOX).
2. Tighten the two screws, applying a tighteningtorque of 0.138 N.m.

Chapter 4 - Inserting and Removing the Board

4.1 Inserting the Board

1. Insert the board into the backplane of the rack.
2. Screw both hexagonal socket drive 2.5mm across flats with a 2.5mm Allen wrench.

Conduct the installation using a torque spanner with the recommended torque of 6 in. lbs or 0.69 N.m.

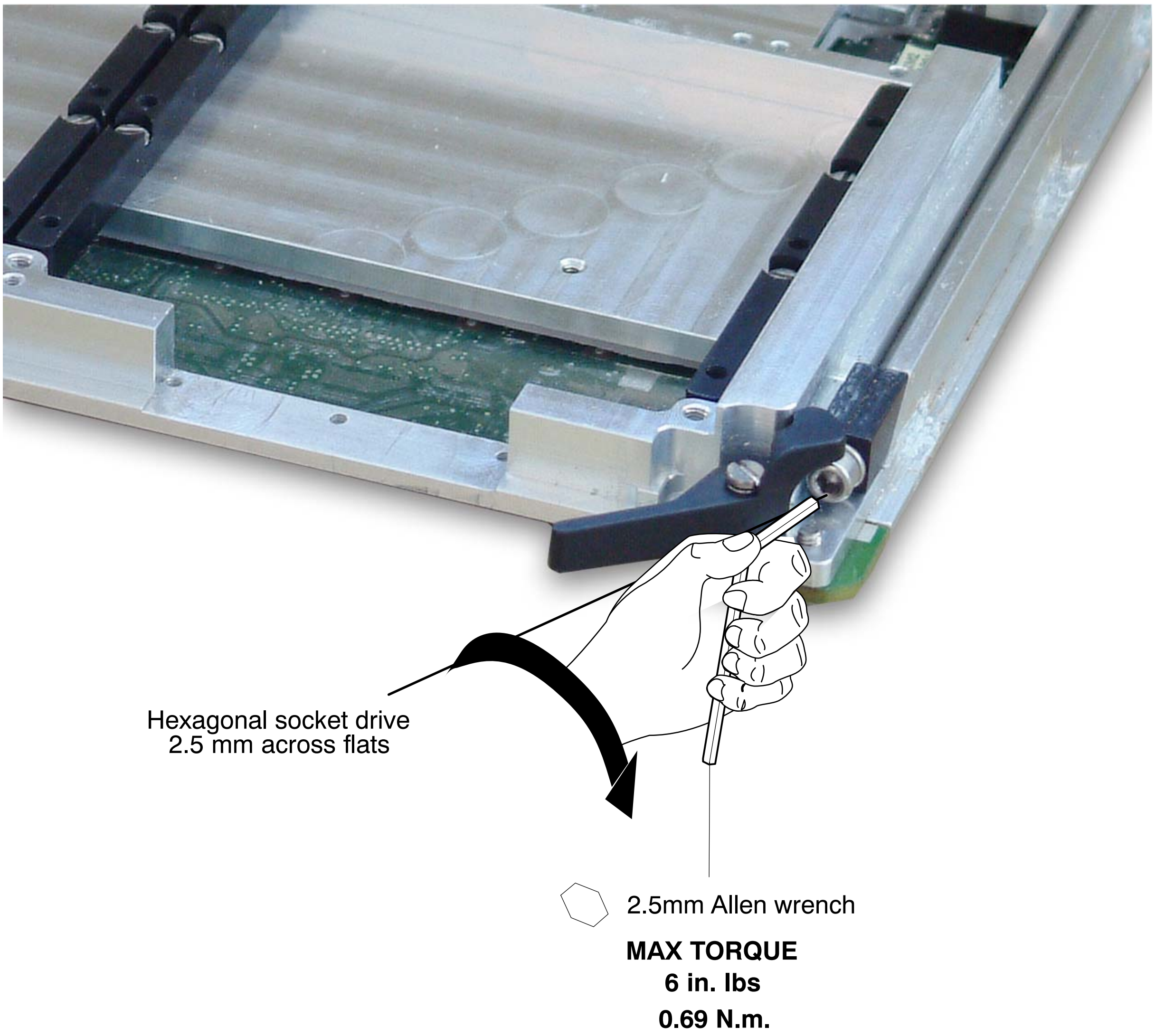


Figure 8: Inserting the Board

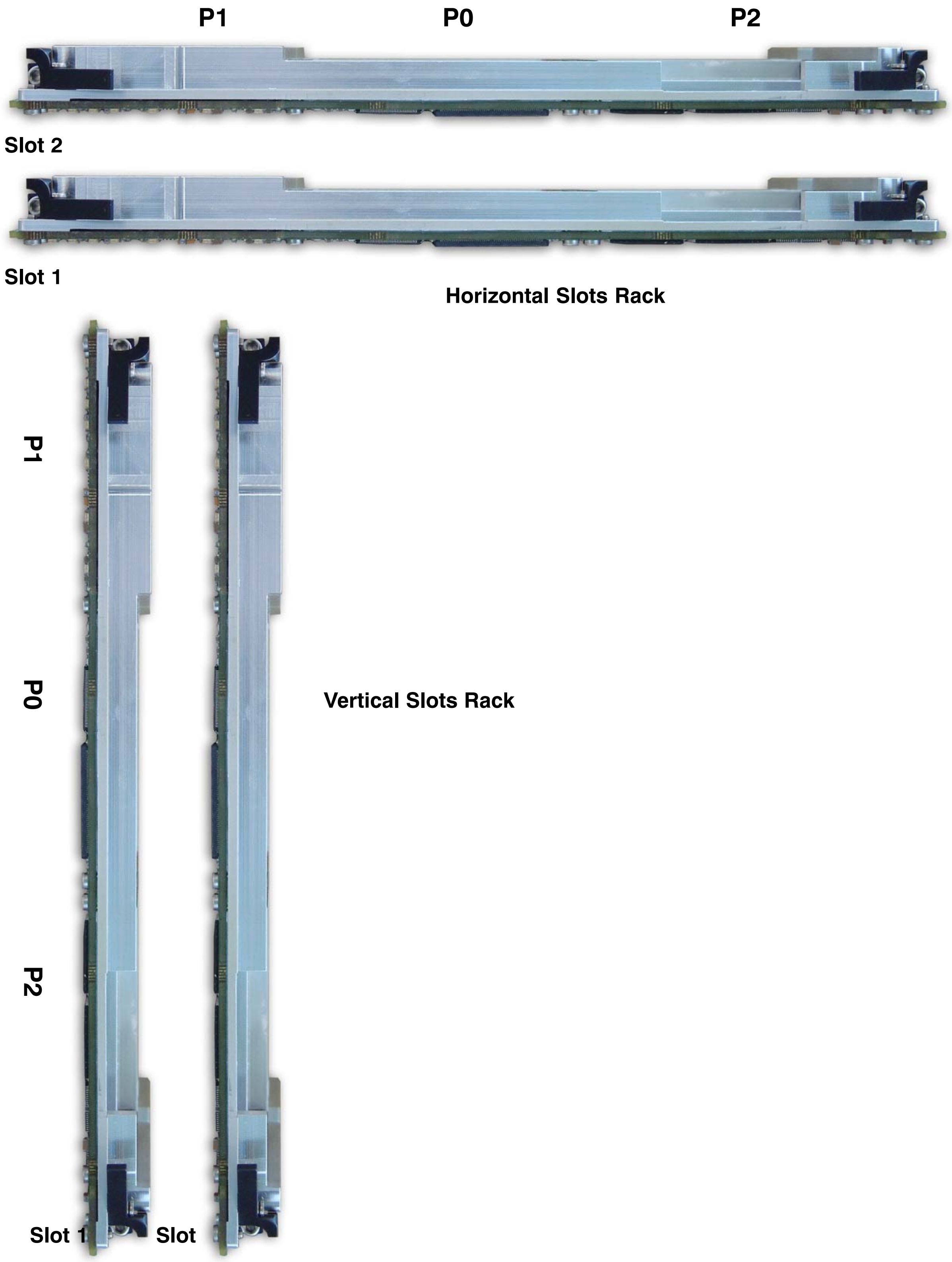


Figure 9: Slots Rack Orientation

4.2 Removing the Board

1. Unscrew both hexagonal socket drive 2.5mm across flats with a 2.5mm Allen wrench.

⚠ No more than 3 cycles are recommended and necessary to be able to remove the board. Don't go over that number.

2. Remove the board from the backplane of the rack.

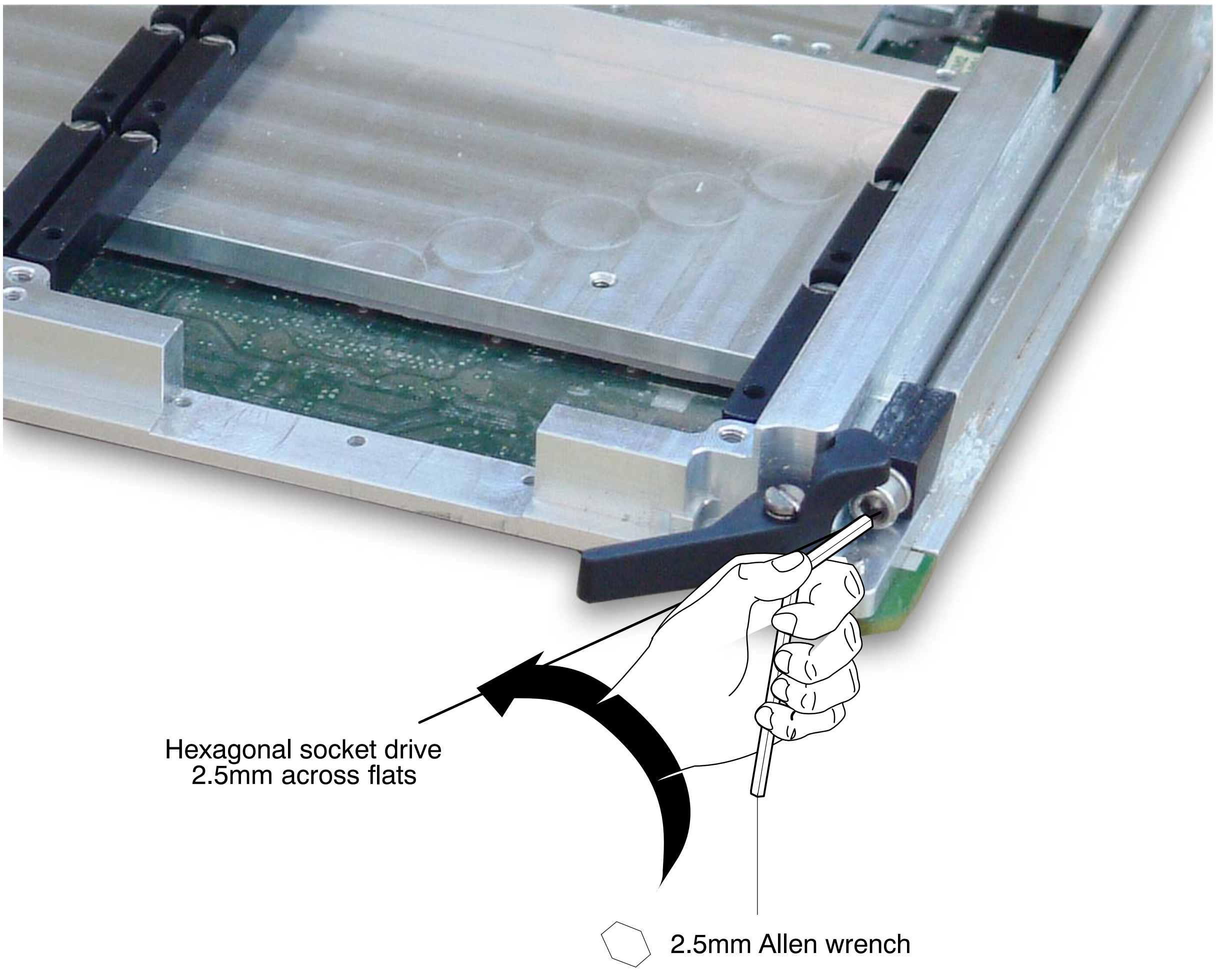


Figure 10: Removing the Board

Appendix A - Specifications

A.1 Environmental Specifications

Environmental Specifications	RC (Rugged Conduction-Cooled)
Conformal Coating	Standard
Temperature	
Cooling Method	Conduction
Operating - PENTXM2/RC	-40° to +85° C - VITA 47 - Class CC4
Operating - PENTXM4/RC	-40° to +70° C - VITA 47 - Class CC3
Storage	-45 ° to +100° C
Vibration Sine (Operating)	20 / 2000 Hz 5g
Random Vibration	VITA 47 - Class V3
Shock (Operating)	Half Sine 40 g / 20 ms
Altitude (Operating)	-1,640 to 50,000 ft
Relative Humidity	95% without condensation

Table 3: Environmental Specifications

A.2 MTBF Data

Calculations are made according to the standard MIL-HDBK217F-2 for six types of environment:

- Ground Benign (GB)
- Air Inhabited Cargo (AIC)
- Naval Sheltered (NS)
- Air Rotary Wing (ARW)
- Air Uninhabited Fighter (AUF)
- Ground Mobile (GM)

	GB (Hours)		AIC (Hours)	NS (Hours)		ARW (Hours)	AUF (Hours)	GM (Hours)
	25°C	40°C	40°C	25°C	40°C	55°C	40°C	30°C
PENTXM2/RC Order Code: PENTXM2-RC34S-10000	328070	256120	40990	52630	46360	12110	17540	38126
PENTXM4/RC Order Code: PENTXM4-RC38S-10000	247852	199635	35939	44398	39221	10283	15284	31538

Table 4: MTBF Data

A.3 Power Consumption

- Peak consumption at power on:

Power	PENTXM4/RC 1.3 GHz	PENTXM2/RC 1.3 GHz
+5V VDC	20 W	12 W
+3.3V VDC	29 W	29 W
Total	49 W	41 W

Table 5: Power Consumption: Peak Consumption at Power ON

- Power consumption under Linux 100% processor load:

Power	PENTXM4/RC 1.3 GHz	PENTXM2/RC 1.3 GHz
+5V VDC	22 W	13 W
+3.3V VDC	31 W	28 W
Total	53 W	41 W

Table 6: Power Consumption: Linux 100% Processor Load

- Power consumption under Linux IDLE mode:

Power	PENTXM4/RC 1.3 GHz	PENTXM2/RC 1.3 GHz
+5V VDC	7 W	5 W
+3.3V VDC	24 W	24 W
Total	31 W	29 W

Table 7: Power Consumption: Linux IDLE Mode

A.4 Mechanical Specifications

The PENTXM2/RC and PENTXM4/RC boards are build on a multi-layer double Eurocard and conforms to the dimensions specified in the ANSI/VITA VME64 1-1994. The dimensions shown below are in millimeters, with inches (in parentheses) for general guidance only.

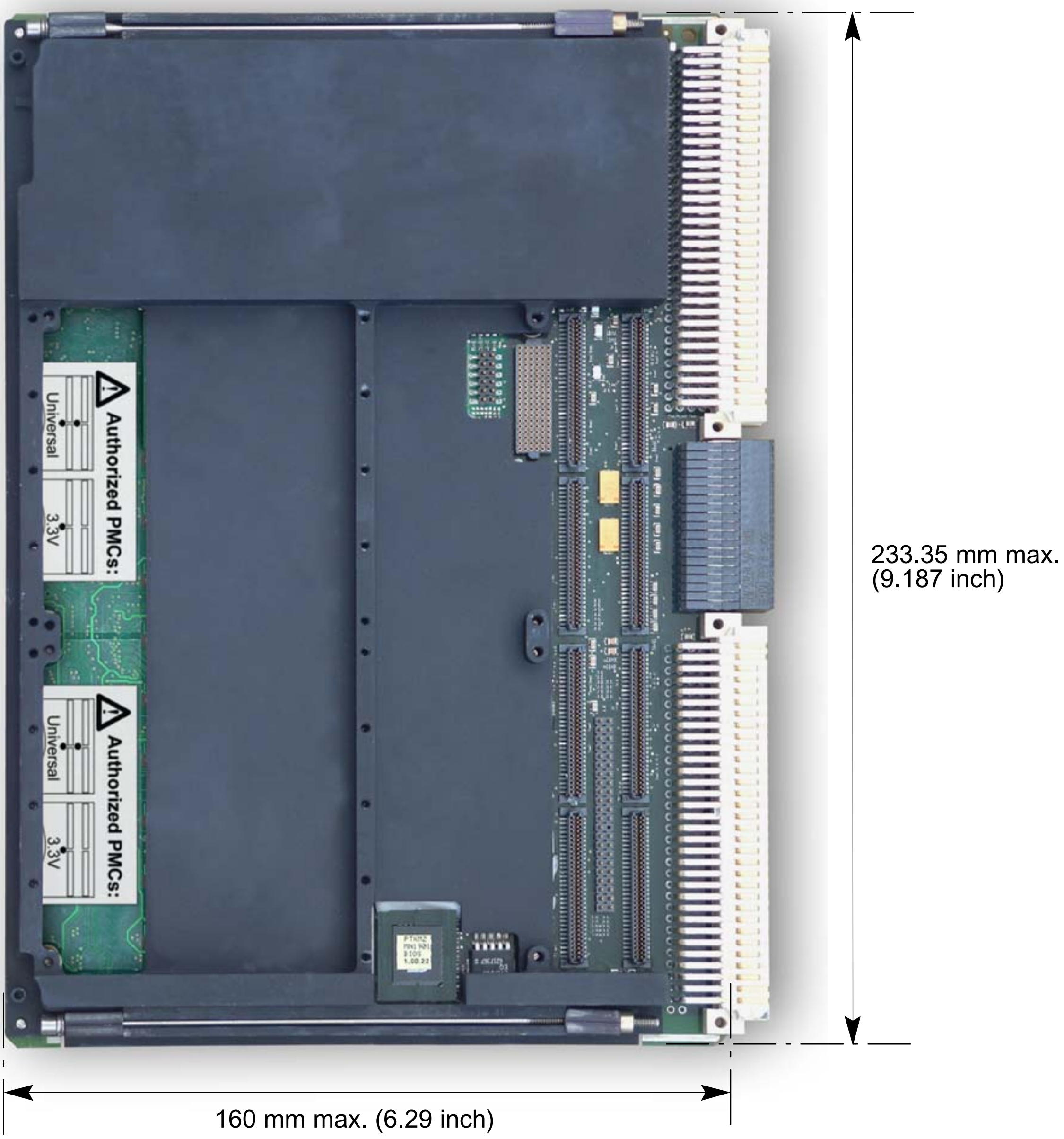


Figure 11: VME Dimensions

> Length:	233.35 mm max
> Depth:	160 mm max. (without connectors)
> Height:	1 VME slot compatible
> Weight:	Of the order of 830 g

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