User Guide

Power MIDAS M5000 Series
Single Board Computer

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Preface

Introduction

The VMETRO MIDAS M5000 series is a single-board computer (SBC) built in a 6U VMEbus form factor based on the AMCC PPC440GX PowerPC processor. This document describes the M5000 hardware.

The chapters are summarized below:

- Product Overview: provides a brief description of the M5000.
- Installation and Hardware description: Installation procedures.
- Processor Subsystem: Describes the system surrounding Processor.
- PMC Subsystem
- Extension Subsystem
- Miscellaneous Functions: information on JTAG Chain, Reset Network, Interrupt Routing, Power Supplies.
- Mezzanine PMC Carrier: Explains how to install and use the optional PMC extension carrier board.
- Appendixes cover reference material for:
    - PLD Registers
    - Universe IID Configuration Examples
    - VME64 Configuration ROM
    - VME Connector Pinout
    - PMC Connector Pinout
    - MTBF Values
    - Ordering Information, Technical Support, References

Style Conventions Used

Warning! Indicates important information that can affect the operation of your M5000

Note – This is information that will help you get the best performance.

IEC Prefixes for binary multiples

Symbol	Name	Origin	Derivation	Size
Ki	Kibi	Kilo binary	kilo	1024 bytes
Mi	Mebi	Mega binary	mega	1 048 576 bytes
Gi	Gibi	Gig binary	giga	1 073 741 824 bytes

Quality Assurance

VMETRO is dedicated to supplying our customers with products and services of the highest quality.

We therefore, continually review and assess our products and services with the aim to improve the processes involved in the development of our world-class products.

If you have any comments or feedback with respect to our products and services, please feel free to contact us through the support channels listed here, or email us at comments@vmetro.no

Technical Support

Please see the section Technical Support at the end of this guide.

Related Documentation

We recommend reading the documentation in the order shown.

- Release Notes
- M5000 BSP User Guide.
- MIDAS Monitor User Guide

Contents

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Tables

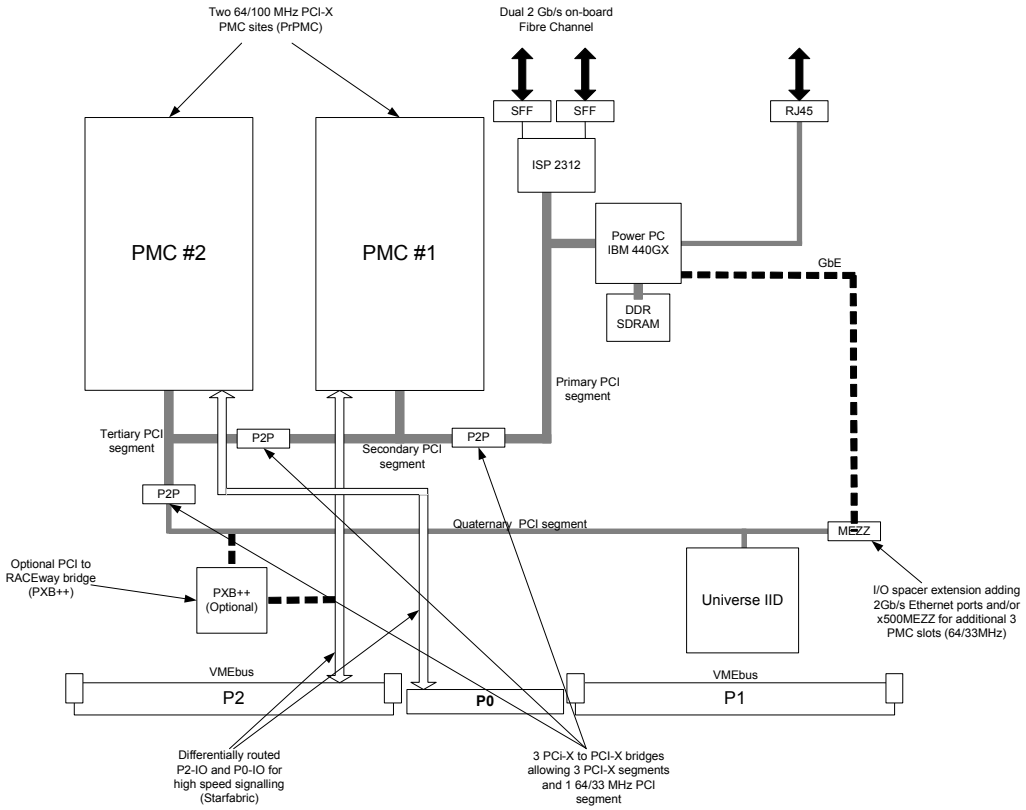
1 Product Overview

The M5000 series is part of the next generation of boards in the MIDAS family. As for the previous generations, the M5000 series focuses on high-performance data buffering and flexible data flows between I/O ports. I/Os are provided through front panel connectors and P2 and P0 backplane connectors.

1.1 Main features:

- A PowerPC processor subsystem (440GX from IBM) with up to 256MiB local DDR-SDRAM memory, 32MiB of FLASH memory, four Ethernet ports (two 10/100/1000Mbps and two 10/100Mbps) and two serial ports.
- Two standard PPMC sites located on separate PCI segments (64-bit, 33/66MHz PCI, 66/100/133MHz PCI-X). In addition, PMC#1 can be MONARCH
- Dual 2Gib Fibre Channel I/O Controller (ISP2312 from QLOGIC) (Optical)
- Single 10/100 Ethernet port (front panel connector)
- Dual serial ports configurable as two RS-232 ports or one RS-232 and one RS-422
- PCI-to-VME bridge (Universe IID from Tundra)
- Three PCI(X)-to-PCI(X) bridges which connects the different PCI(-X) segments together (PCI6540 from PLX)
- Optional PCI-to-RACEway bridge (PXB++ from Mercury)
- Optional I/O Spacer extension via a built-in connector, thus adding up to 3 Ethernet ports (One Fast Ethernet 10/100 SMII and two Gigabit Ethernet 10/100/1000 RGMII) and an I2C bus. Note: Adding more than one Gigabit Ethernet port will reduce the number of Fibre Channel ports
- Optional mezzanine extension via a built-in connector, thus adding 3 PMC sites to the Quaternary PCI segment. These PMC sites are 64-bit, 33MHz PCI, 5V signaling.
- One PIM I/O board slot, in accordance to VITA36.

FIGURE 1-1 *Component Overview*



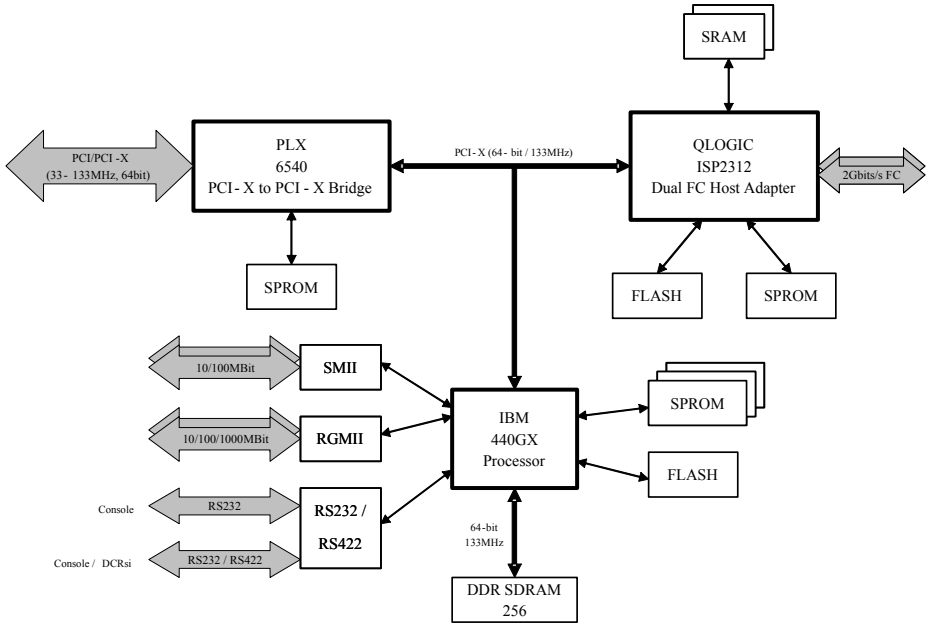
1.2 Main Components

Processor Subsystem

The processor subsystem is built around the AMCC 440GX integrated processor, the QLOGIC ISP2312 dual Fibre Channel I/O Controller and the PCI6540 PCI-X to PCI-X bridge. The Processor Subsystem is located on the Primary PCI segment (PCI-X).

The processor subsystem block diagram is shown in figure Figure 1-2:

FIGURE 1-2 *Processor Subsystem*



AMCC 440GX Embedded Processor

The AMCC 440GX provides a powerful PowerPC CPU core, a 256MiB local DDR-SDRAM memory, a 32MiB FLASH memory, two 10/100/1000Mbps Ethernet connections, two 10/100Mbps Ethernet connections and two serial connections (RS-232 or RS-422) .

Additionally the AMCC 440GX processor provides simple connectivity of additional peripheral devices through an external local bus. This is used for register access to the board PLD.

For debug purposes, JTAG and CPU control signals are provided to a connector for use with WindRivers VisionProbe tools. This allows CPU bring-up and boot before the FLASH is initialized and low-level software debug using the same tool.

PCI6540 PCIX-to-PCIX Bridge

The PCI6540 provides a 64-bit PCI-X to PCI-X bridge designed for high performance, high availability applications, in PCI-X to PCI-X conversion, bus expansions, frequency conversions from faster PCI-X to slower PCI-X or from slower PCI-X to faster PCI-X bus, address remapping, high availability and universal system-to-system bridging.

The PLX bridge is normally used as a transparent bridge, with its primary interface connected to the Processor PCI-X Segment.

QLOGIC ISP2312 Dual Fibre Channel Host Adapter

The QLOGIC ISP2312 provides a dual-channel Fibre Channel processor which connects the 64-bit/ 133MHz PCI-X bus to one or two 2 Gib Fibre Channel Fabrics or loops. PCI boot configuration is stored into an SPROM; two SRAMs (one per channel) are used for run-time operations.

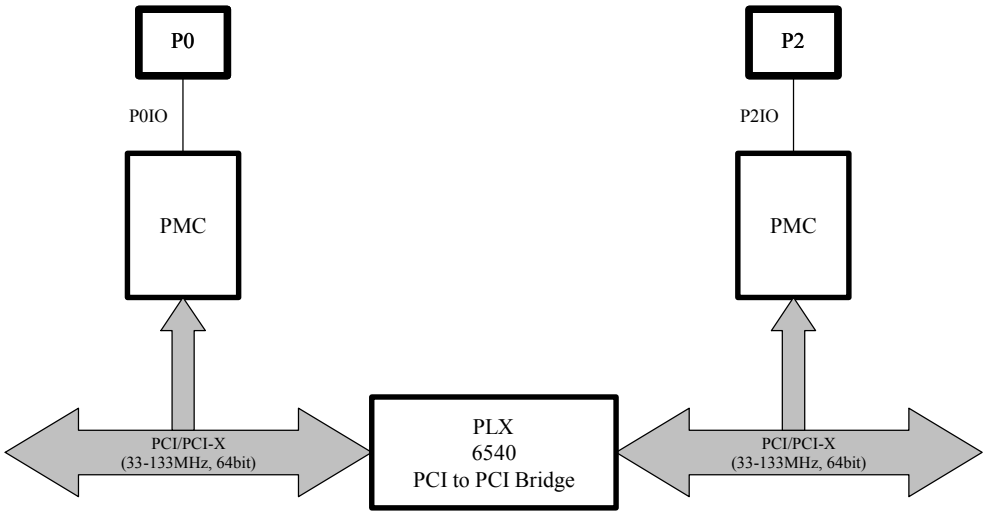
PMC Subsystem

The PMC subsystem is composed of two 3.3V PMC sites located on the Secondary and Tertiary PCI-X segments. The connection between the two PCI(-X) segments is provided by a PLX PCI-X to PCI-X bridge.

The PMC subsystem is connected to the primary and quaternary buses through two PLX PCI-X to PCI-X bridges (one for each PCI-X bus).

The PMC subsystem block diagram is shown in Figure 1-3:

FIGURE 1-3 *PMC Subsystem*



PMC Support

Each PMC site can operate in any of the following modes:

- 33MHz, 32/64-bit PCI
- 66MHz, 32/64-bit PCI
- 66MHz, 32/64-bit PCI-X
- 100MHz, 32/64-bit PCI-X
- 133MHz, 32/64-bit PCI-X

PCI-X is supported according to the VITA 39 PCI-X Auxiliary Standard For PMCs and Processor PMCs.

Both PMC sites support either 3.3V or 5V signaling on VIO. The choice is determined by mounting options (resistors and voltage key/pin) and can only be modified by VMETRO. The default setting when shipped is 3.3V. The voltage key must always be mounted in the correct position to avoid severe hardware damage.

Both PMC sites support the Processor PMC features. PMC site #1 supports the MONARCH signal.

PMC Power

- Max current per PMC for 3.3V power supply : 3A
- Max current per PMC for 5V power supply : 3A
- Max current per PMC for V(I/O) power supply : 2A

Additional Connections

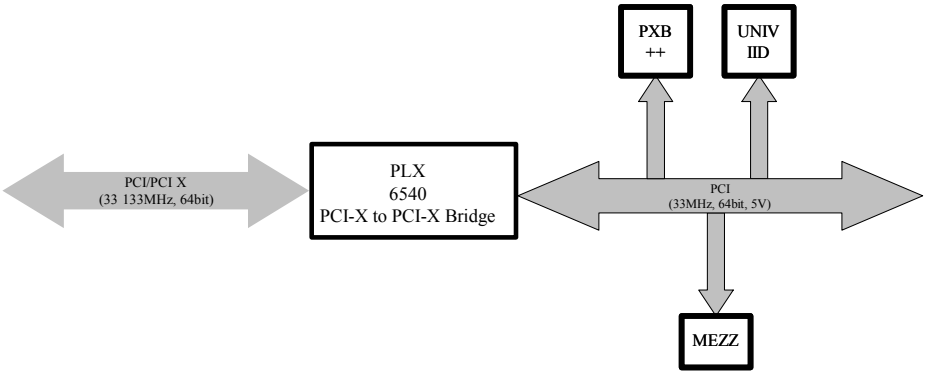
Additionally to the standard PCI-X buses, the PMC sites include the following connections:

- **PMC to VME P0**: the P4 connector of the PMC site #2 is connected to the VME P0 connector as described in Table E-4 in “PMC Connector Pinout” on page 103.
- **PMC to VME P2**: the P4 connector of the PMC site #1 is connected to the VME P2 (row a and c) connector as described in the ANSI/VITA 35-2000 standard (PMC-P4 pin out mapping to VME P0 and VME64x-P2).

Extension Subsystem

The Extension Subsystem is composed of VME, RACEway and mezzanine interfaces. All the devices are located on a private 64-bit, 33MHz, 5V signaling, PCI only segment. This PCI segment is called the Quaternary PCI Segment.

A PCI6540 universal PCI-X to PCI-X bridge connects the Quaternary PCI Segment with the Tertiary PCI-X Segment.



VME Interface

The Tundra Universe IID PCI-to-VME Bridge is a PCI only component which provides VME accesses.

Hardware configuration of the Universe IID is done entirely using micro switches.

RACE++ Interface

The Mercury PXB++ PCI-to-RACE++ Bridge is a PCI only component which provides RACE++ accesses.

Mezzanine Connector

The mezzanine connector provides access to a mezzanine board compatible with the previous family of M5000 boards (via a spacer).

A set of two connectors provides accesses to one PCI bus (64-bit, 33MHz, 5V signaling) and control signals.

Miscellaneous Functions

Board Interrupt Routing

The components on the M5000 board provide several interrupt sources and destinations. The primary interrupt destination is the AMCC 440GX processor but interrupts may also be routed to VME (through the Universe IID bridge) or RACEway (through the PXB++ bridge). If PMC site #1 is populated with a Processor PMC - Monarch card then the PMC site may become an interrupt destination rather than a source. Configuration is made via dip-switches.

Board Reset

Board reset has a number of possible sources and destinations. The primary sources of reset are the power-up reset controller and the reset button. Other sources are various software reset outputs from the processor, VME reset, RACEway reset and the PMC modules.

JTAG Interfaces

The JTAG chain is separated into three segments. One segment contains the CPLD devices, a second contains the AMCC 440GX processor and the last one contains the remaining JTAG capable chips.

It is possible to connect to only the segments that are appropriate for a specific software tool.

An adapter board is needed to connect to the correct taps of the chain, and to provide connectors that are compatible with the tools connector. For more information please contact VMETRO.

Temperature Sensors

Temperature sensors are very useful when monitoring applications during extreme conditions. Several temperature sensors are located on the board in order to monitor the variation of temperature. Four sensors are on the component side: one close to the bottom of the board, one close to the top of the board and two located in the middle of the board.

These sensors require additional software, contact VMETRO for information.

Power Supplies (DC-DC converters)

The main source of power is the 5V supplied from the VME backplane. The following voltages are generated: 3.3V, 2.5V, 1.8V and 1.5V.

2 *Installation and Hardware description*

2.1 Before You Begin

Precautions in Handling and Storage

Static electricity can permanently damage your M5000. Prevent electrostatic damage by taking proper precautions.

- Make sure your body is grounded when coming into contact with the board by wearing an anti-static wrist strap.
- If an anti-static wrist strap is not available, touch a grounded surface, such as the bare metal chassis, before touching the M5000.
- Only leave the board on surfaces with controlled static characteristics, i.e. specially designed anti-static table covers.
- When handing the board to another person, first touch this person's hand, wrist etc. to discharge any static potential.
- Always store the board in an anti-static bag or other static resistant container.
- If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.

Inspection

Make sure that the M5000 model you have received is according to your purchase order. Check that all items are present according to your purchase order.

Note – You should also inspect the board to verify that no mechanical damage has occurred. Please report any discrepancies or damage to your distributor or to VMETRO immediately.

2.2 Installing PMC Modules

The M5000 is shipped with two PMC filler panels mounted in the front panel. They act as EMC shielding in unused PMC positions. Before installing a PMC module, the filler panel(s) must be removed. This is done by pushing them out from the backside of the front panel.

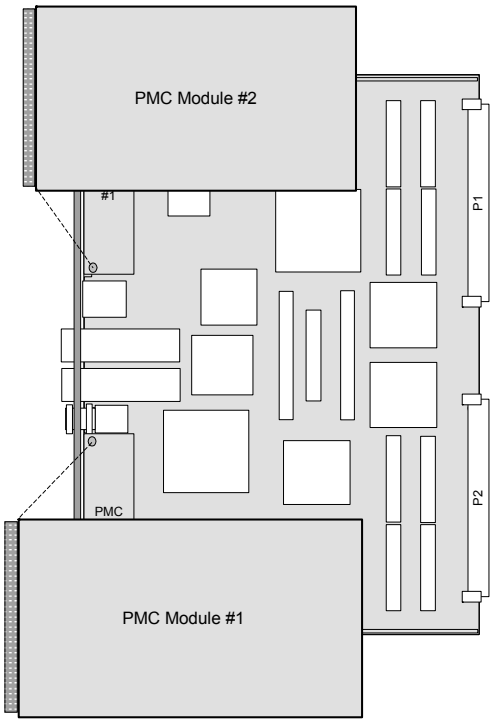
Note – If you have purchased an M55xx board (base board with PMC Carrier) please see "Installing PMC Modules onto the PMC Carrier" on page 52 for instructions on how to disassemble the PMC Carrier board in order to install PMC boards.

Four screws must be used to secure each PMC on the M5000 board.

Warning! Be extremely careful when inserting screws to secure PMC modules. Touching component leads, or the printed circuit board itself, with a screwdriver may cause permanent damage to the board

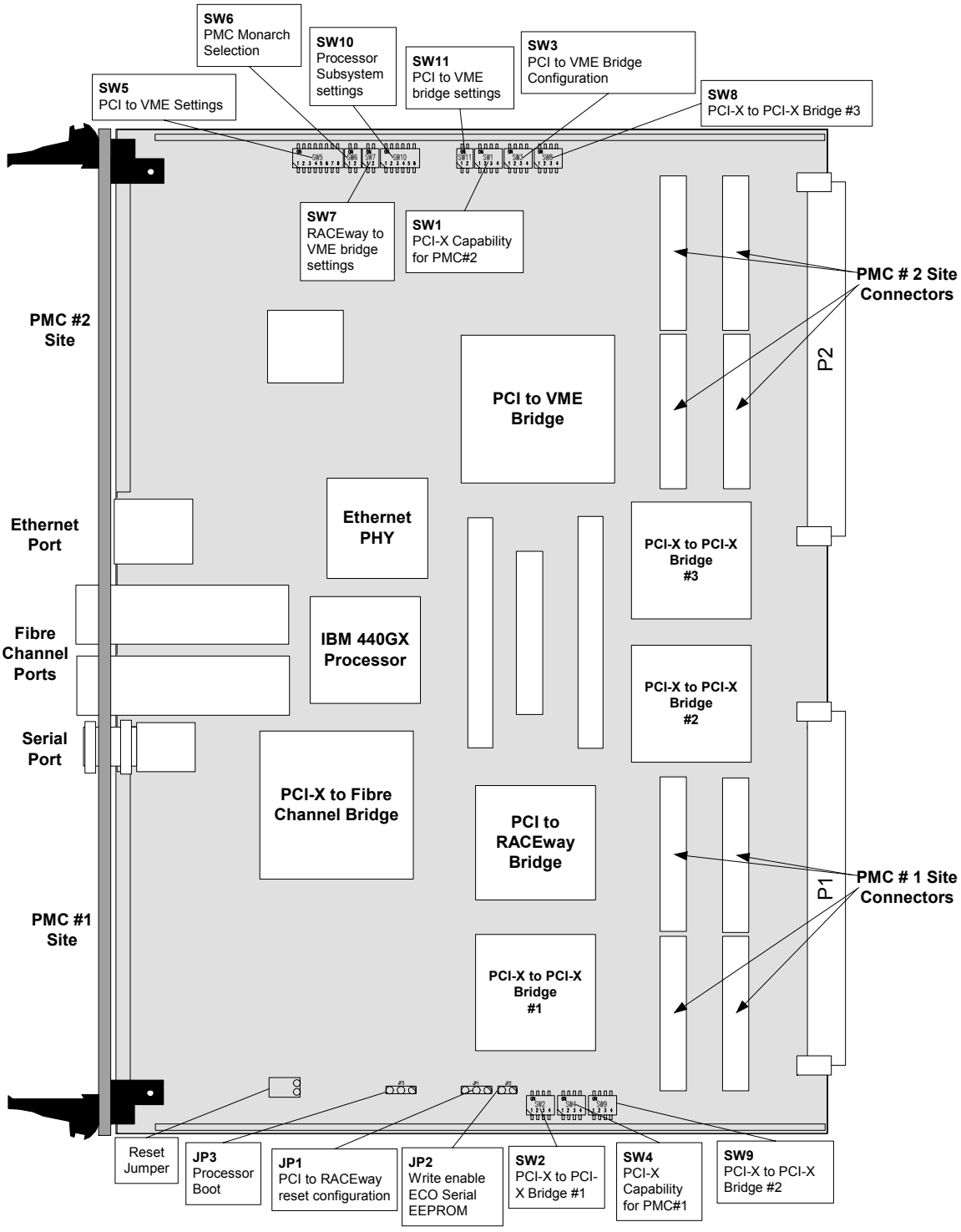
Mounting of PMC modules #1 and #2 on the M52xx board:

1. Place the M5000 board on a smooth static protected work surface.
2. Install PMC module #2 in the upper PMC position
3. Install PMC module #1 in the lower PMC position
4. Secure PMC modules with screws on the bottom side of the M5000 board



2.3 Switches and Jumper Settings

FIGURE 2-1 *Jumper Settings*



Default Jumper and Switch Settings

The factory settings of the jumpers and switches are shown in Table 2-1:

TABLE 2-1. Default Jumper and Switch settings

Jumper/switch	Position	Description
JP1	Inserted on left side on R models. Removed on others	PCI to RACEway Bridge Reset Configuration
JP2	Removed	ECO SPROM Write Protection
JP3	Removed	Processor Boot SPROM Download
SW1	All OFF	PMC#2 PCI-X Capability Selection
SW2	All ON	PCI-X to PCI-X Bridge Configuration
SW3	1: ON	PCI to VME Bridge Configuration
	2, 3, 4: OFF	
SW4	All OFF	PMC#1 PCI-X Capability Selection
SW5	All OFF	PCI-to-VME Bridge Configuration
SW6	All OFF	PMC#1 Monarch Selection & Processor SDRAM ECC Enable/Disable
SW7	1: OFF	PCI-to-RACEway Bridge Configuration
	2: ON	
SW8	All ON	PCI-X to PCI-X Bridge Configuration
SW9	All ON	PCI-X to PCI-X Bridge Configuration
SW10	1, 5, 6: ON	Processor Subsystem Configuration
	2, 3, 4: OFF	
SW11	1: ON	PCI to VME Bridge Configuration
	2: OFF	

DIP Switch Settings

PCI-X to PCI-X Bridges

- The PCIX-to-PCIX Bridge #1 is located between the processor subsystem and the rest of the board. It is configured using the switch SW2.
- The PCIX-to-PCIX Bridge #2 is located between the two PMC subsystems. It is configured using the switch SW9.
- The PCIX-to-PCIX Bridge #3 is located between the second PMC subsystem and the Extension subsystem. It is configured using the switch SW8.

Each switch is has the settings described in Table 2-2.

TABLE 2-2. PCI-X to PCI-X Bridges SW2, SW9, SW8 settings

Switch	Function
1	Port Priority Boot
	The switch is connected to the P_BOOT pin on the bridge.
	Non-Transparent Mode: the primary/secondary port has boot priority when the switch is ON/OFF
	Transparent Mode: Not Used.
2	Serial EEPROM Access Enable
	ON enables the EEPROM accesses.
3	Transparent Mode Control
	Controls the bridge TRANS# pin: the bridge is configured in transparent/non-transparent mode when the switch is ON/OFF.
4	Serial EEPROM Write Enable
	ON enables the Serial EEPROM.

PCI-to-VME Bridge

The PCI-to-VME bridge is configured using the switches SW5, SW3 and SW11.

TABLE 2-3. PCI-to-VME bridge SW11 settings

Switch	Function
1	SYSFAIL Assertion
	SYSFAIL is not asserted when the switch is ON.
	SYSFAIL is asserted asserted when the switch is OFF
2	VME64 AutoId
	AutoId is enabled when the switch is ON
	AutoId is disabled when the switch is OFF

TABLE 2-4. PCI-to-VME bridge SW5 settings

Switch	Function
1-8	VME CS/CSR Base Address
	Switches [1-8] are connected to VME addresses A[28-21].
	Use 0x00 for AutoId

TABLE 2-5. PCI-to-VME bridge SW3 settings

Switch	Function
1-2	VME CR/CSR Address Space
	Switches [2-1] are connected to VME addresses A[30-29]
	A24/AutoId is selected when switches [2-1] are [OFF, ON]
	A16 is selected when switches [2-1] are both OFF
	A32 is selected when switches [2-1] both [ON, OFF]
3	VME CR/CSR Enable
	ON enables CR/CSR.
4	Board Reset to VME Reset Propagation
	OFF allows the propagation from the board reset to the VME reset.

PCI to RACEway Bridge

The PCI to RACEway bridge is configured using switch SW7.

TABLE 2-6. RACEway-to-PCI bridge SW7 settings

Switch	Function
1	Operating Mode The bridge is configured in bridge mode/endpoint mode when the switch is ON/OFF. This switch is connected to the pin RES_PROM_P on the bridge. Leave open.
2	Serial EEPROM Autoload ON enables the Serial EEPROM Autoload process.

Processor Subsystem

The Processor Subsystem is configured using the switch SW10.

TABLE 2-7. Processor Subsystem SW10

Switch	Function
1	Processor MFS Serial EEPROM Write Enable ON to write-enable the Processor MFS Serial EEPROM.
2	Processor Boot Serial EEPROM Write Enable ON enables write operations to the Processor Boot Serial EEPROM devices.
3	Processor Flash Write Enable OFF enables write operations to the Processor Flash.
4	Processor Flash Monitor Write Enable ON enables write operations to the Monitor area of the Processor Flash
5	Processor Boot ON/OFF to boot the processor from Flash/PCI.
6	Fibre Channel Flash Write Enable ON enables write operations to the Fibre Channel Flash devices.

PMC Monarch Selection

The PMC Monarch Selection is done using the switch SW6.

TABLE 2-8. PMC Monarch Selection SW6 settings

Switch	Function
1	PMC#1 MONARCH Setup ON to setup the PMC#1 as MONARCH.

PCI-X Capability Selection for PMC Slots

The PCI-X Capability Selection is performed using the switches SW1 and SW4.

- **Switch 1** configures PMC#2 bus
- **Switch 4** configures PMC#1 bus

TABLE 2-9. PCI-X Capability Selection SW1(PMC#2) and SW4(PMC#1) settings

PCI(-X) Configuration	1	2	3	4	Note
PCI-X / 133MHz	OFF	OFF	OFF	OFF	
PCI-X / 100MHz	OFF	OFF	OFF	ON	
PCI-X / 66MHz	ON	OFF	OFF	ON	
PCI / 66MHz	ON	ON	OFF	ON	
PCI / 33MHz	ON	ON	ON	ON	

Jumper Settings

This section describes the role and use of the configuration jumpers located on the board.

PCI-to-RACEway Bridge Reset

The PCI-to-RACEway Bridge Reset configuration is done using jumper JP1.

 Jumper inserted on the left side:

- Reset on RACEway interface cause the board to reset
- Board reset does not generate a RACEway reset.

 Jumper inserted on the right side:

- Reset on RACEway interface cause the PXB to reset.
- Board reset generates a RACEway reset.

Processor Boot Serial EEPROM Download

During the board configuration, the two Processor Boot Serial EEPROM devices are written using jumper JP3. This jumper is not used during normal operations.

ECO Serial EEPROM

Insert a jumper in JP2 to write enable the ECO Serial EEPROM.

2.4 Installing the M5000 into the VME Chassis

Slot Selection

Warning! Do not install the board into a powered system!

You can install the M5000 board into any VMEbus slot in a 6U VMEbus chassis as long as the daisy chains for the bus grant and interrupt acknowledge signals are continuous, from the left-most slot, to the slot in which the M5000 board is installed.

The metal strip along the card edge is for electrostatic-discharge. Some chassis include a spring contact in the front of the board guide that connects the metal strip on the board to the chassis ground while the board is inserted. Once fully inserted in the chassis, the discharge strip has passed by the spring contact and is no longer in connected to chassis ground.

Each of the two metal strips are connected to board signal ground through a 10K resistor

In accordance with the VME64 Specification, a M5000 main board installed into the left-most slot will act as the System Controller. Consequently, system controller functions are also enabled.

Power Consumption

Warning! The M5000 hardware requires forced air-cooling for reliable operation. Commercial and Rugged Level 1 boards require 300lfm, Rugged Level 3 requires 600lfm. For Rugged Level 2 contact VMETRO.. Operation on extender boards is not recommended.

Typical values for power consumption are shown in Table 2-10. In Idle Mode, no processors are booting, and no data is transferred. In Active Mode, processors are booting and running memory tests.

Note – The numbers shown in Table 2-10 do **not** include any power drawn by PMC modules mounted on the board, **nor** increased system power consumption when driving the VME bus.

Note – As a guideline, a 5 slot VMR64 chassis with boards similar in capacity to the M5000 should have a power supply able fo providing 60A per supply voltage.

When driving the VME bus, the system power consumption goes up, and the additional power is dissipated in the termination resistors of the VME bus. The amount of additional power depends on the VME bus traffic pattern and varies from 3.5 to 6.0 W.

Although the M5000 board may increase the system power consumption by driving the VME bus, the additional power is not included in the numbers below, since the additional power is dissipated outside the board. Furthermore, the VME traffic pattern, and the M5000's share of the VME bus is highly application dependent.

TABLE 2-10. M5000 Power Consumption

Model	Idle Power Consumprion	Active Power Consumption
M5210-EF0	13.5 W	15.5 W
M5210-JFJ	14 W	16.5 W
M5210R-EFF	15 W	18.5 W
M5210R-GFG	16 W	19.5 W
M5510R-EFF	17.5 W	21 W
M5510R-GFG	18.5 W	22 W

2.5 Environmental Specifications

VMETRO offers ruggedized versions of selected models of the PowerMIDAS M5000s that are characterized for extended temperature range, shock, vibration, altitude and humidity. These boards are equipped with extra and/or special hardware to improve tolerance against shock and vibration.

Table 2-11 shows the environmental specifications for both commercial and rugged models of the PowerMIDAS M5000 series. Not all options are available for all models, and for further details on the environmental qualification, please refer to the test repsorts for that particular product.

TABLE 2-11. Environmental Specifications for the M5000 and C5000Series

Environmental Specifications		**Commercial**	**Rugged Air Cooled**[a]		
			Level 1	Level 2	Level 3
Part number extension			-A0	-B1	-C2H
Temperature	**Operational**[b] **(at sea level)**	0º C to 50º C 300 lfm air lflow	0º C to 50º C 300 lfm air lflow	Model Dependent	-40º C to 75º C 600 lfm air lflow
	Non-operational	-40º Cto 70º C	-55º C to 85º C		-55º C to 85º C
Vibration	**Operational (Sinus)**	-	-		10G peak 15-2000 Hz
	Operational (Random)	-	-		0.04 g2/Hz (15-1000Hz flat, then 6dB/oct to 2000Hz)
Shock	**Operational**	-	-		30 g peak 11ms half sine
Humidity	**Operational Non-condensing**	5-95% Non-condensing	5-95% Non-condensing		5-95%
Altitude	**Operational**	-	10 000 ft[c]		30 000 ft[c.]
Conformal Coat		No	No		Yes[d]

a. All rugged boards, incl. Level 1, are shipped with screws etc. glued. For models where mechanical support brackets are available, such brackets are mounted.

b. Additional airflow might be required if the card is mounted together with, or next to, cards that dissipate excessive amounts of heat.

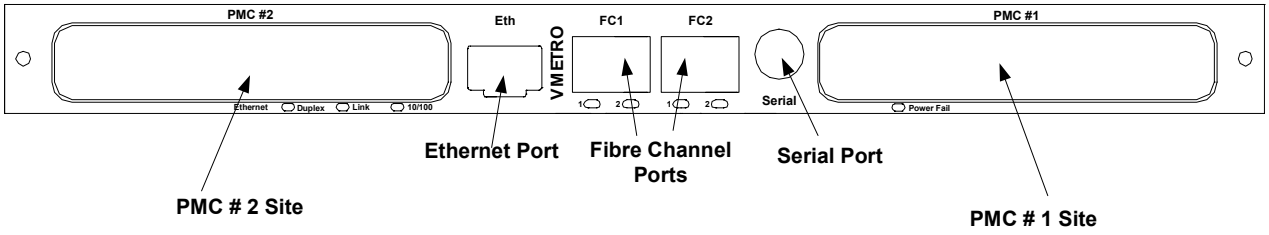
c. Operating altitudes are reached by lowering the inlet air temperature and/or increasing the air flow.

d. Coated with Humiseal 1B31

2.6 Front Panel Connectors

Figure 2-2 shows the front panel connectors on the M5000.

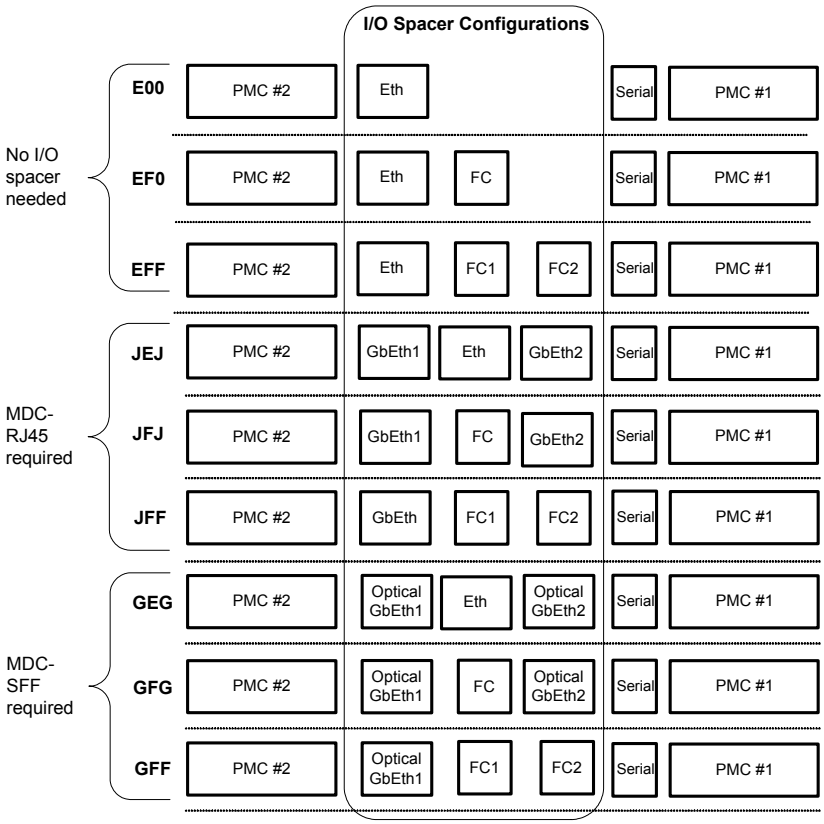
FIGURE 2-2 *Front Panel connections*



Various configurations of the IO connectors are possible depending on the model of M5000 you have ordered. Figure 2-3 shows the possible configurations.

An MDC (Midas daughter card) is needed in order to achieve some of the configurations illustrated. This is an I/O spacer available in two models, the MDC-SFF and the MDC-RJ45. Figure 2-3 shows which spacer you need for the different configurations.

FIGURE 2-3 *I/O Configuration*



Fibre Channel Port LEDS

TABLE 2-12. Fibre Channel Port LEDS

	Amber LED	Green LED
Power On	On Steady	On Steady
Loss of Sync	Flash at half-second interavls	OFF
Signal Acquired	On Steady	OFF
Online	OFF	On Steady
System Error (8002h)	Flash at half-second intervals	Flash at half-second intervals

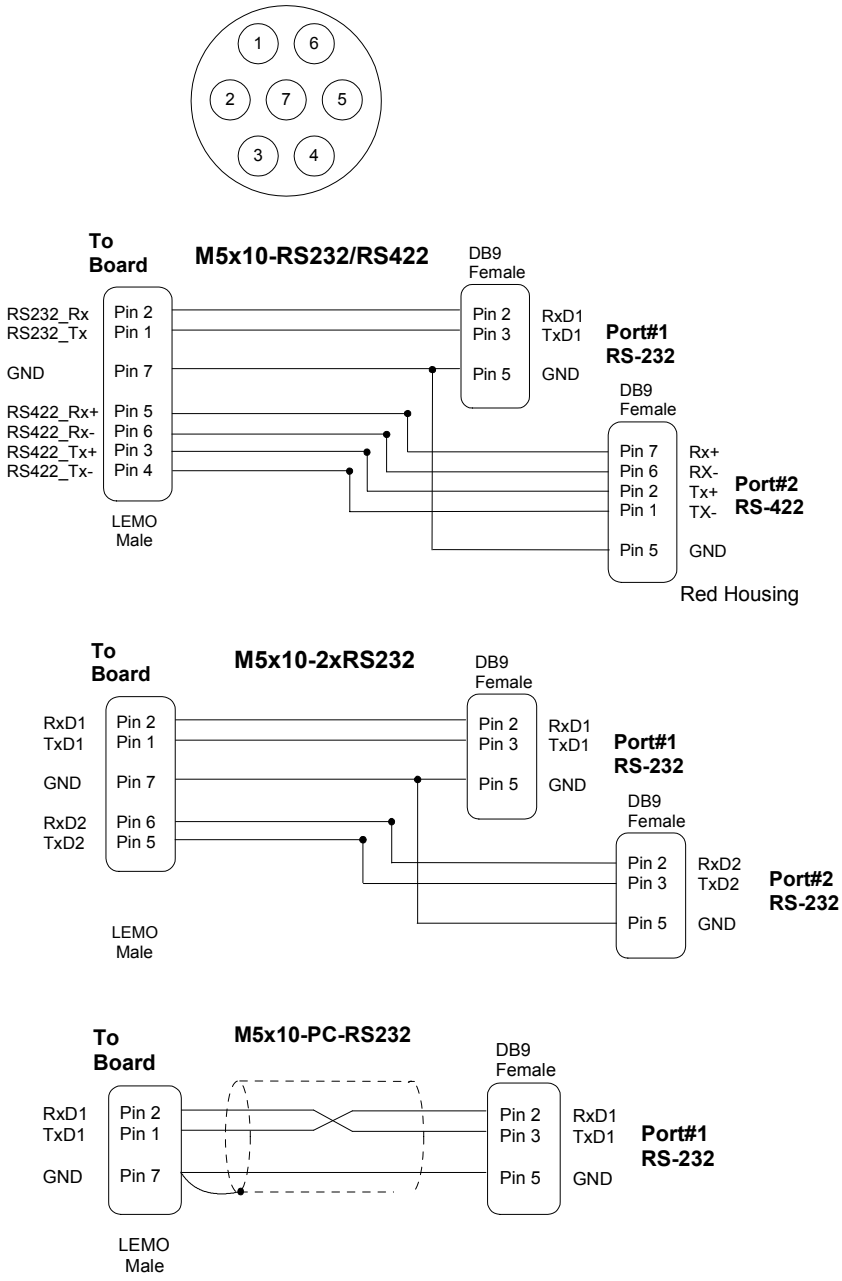
RS232 Connector and cables

The processor has its own dedicated serial connections. The serial connections are intended for application development, test and debug purposes. The Rx and Tx signals from each UART are available in the front panel connector. The pinout of this connector depends on the model of your M5000.

Different converter cables exist for connecting standard 9-pin D-SUB cables to the non-standard M5000 Mini-DIN connector:

- 601-M5x10-PC-RS232 cable has a single 9-pin D-SUB that connects to the #1 UART. This cable is crossed and is the standard cable shipped with standard models.
- 601-M5x10-2xRS232 split cable has two 9-pin D-SUBs. The D-SUB on the short cable end connects to the first serial port on the #1 UART. The D-SUB on the long cable end connects to the second serial port on the #2 UART. Available on request.
- 601-M5x10-RS232/RS422 split cable has two 9-pin D-SUBs. One connects to the #1UART. The other connects to the #2UART with RS422 signalling (housing is colored red). This cable is provided with models M5x10(RP)-xxx4.

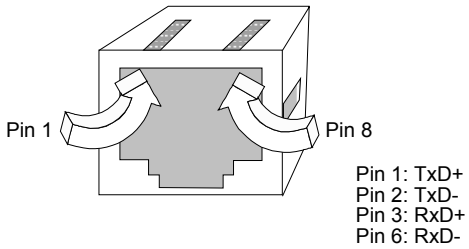
FIGURE 2-4
RS232 pinout



RJ45 Ethernet Connector

The M5000 board has an RJ45 type connector for connecting to Ethernet.

FIGURE 2-5
Ethernet connector

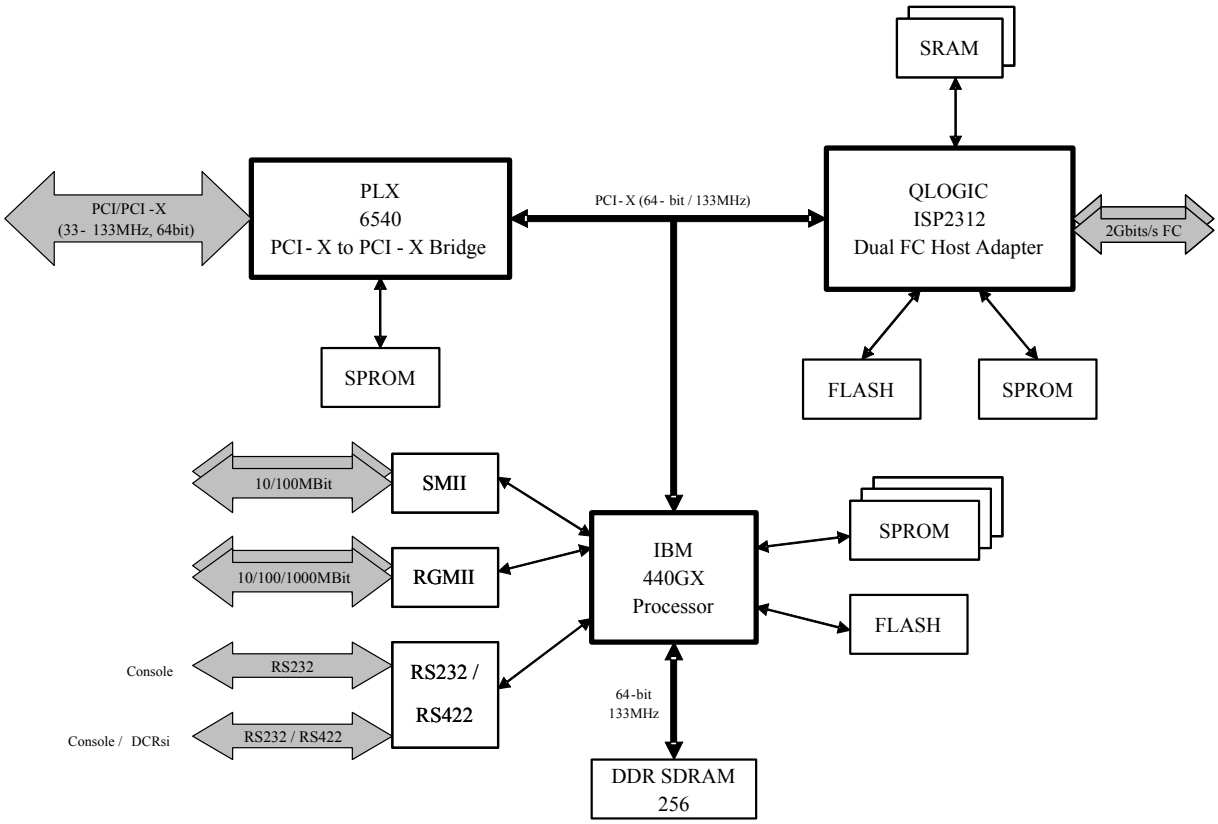


To connect to ethernet, cables with RJ45 connectors must be used. Cat. 5 cables are recommended.

3 Processor Subsystem

3.1 Introduction

FIGURE 3-1 *Processor Subsystem Block Diagram*



Primary PCI Segment

The Primary PCI Segment is a 64-bit/133MHz PCI-X bus. There are three major devices located on the Primary PCI Segment:

1. AMCC 440GX processor. - This device has a built in arbiter which is used to arbitrate the Primary PCI Segment.
2. QLOGIC ISP2312 Dual FC Controller.
3. PCI6540 PCIX-to-PCIX bridge (via its primary side).

IDSEL Assignment

- AD[17] is used for the AMCC 440GX Processor IDSEL
- AD[18] is used for the PCI6540 PCIX-to-PCIX Bridge (Primary Side) IDSEL
- AD[19] is used for the QLOGIC ISP2312 PCIX-to-FC Bridge IDSEL

3.2 AMCC 440GX PowerPC Embedded Processor

Designed specifically to address high-end embedded applications, the PowerPC 440GX (PPC440GX) provides a high-performance, low power solution that interfaces to a wide range of peripherals by incorporating on-chip power management features and lower power dissipation. This chip contains a high-performance RISC processor core, DDR SDRAM controller, PCI-X bus interface, Ethernet interface, controls for external ROM and peripherals, DMA with scatter-gather support, serial ports, IIC interface, and general purpose I/O.

For more detailed information about the PowerPC 440GX, please refer to the PowerPC 440GX Embedded Processor Data Sheet and the PowerPC 440GX Embedded Processor User's Manual.

Processor DDR-SDRAM Memory

The amount of DDR SDRAM memory used is 256MiB, using 512Mb chips running at 166 MHz.

- Four 2-byte wide memory chips are used as the data memory banks.
- One 2-byte wide memory chip is used as the parity bank (only 8 data lines are used by the processor).

All the memory chips are 8 or 16MiB x 16 bits x 4 banks.

UART and Serial Lines

The IBM440GX PowerPC processor includes two universal asynchronous receiver/transmitters (UART).

The two UART I/O pins are connected to a multi-protocol transceiver which can handle 2Tx/2Rx RS-232 interfaces, or one RS232 interface and a single RS-485/422 transceiver simultaneously.

The three serial lines are available on the serial front panel connector but only two of them can be used simultaneously. The first UART is always used for one RS-232 line while the second UART is configurable.

Ethernet Interfaces

All four processor Ethernet interfaces are connected:

- The first two Ethernet interfaces (10/100-TX) are connected to the Fast Ethernet Transceiver. The first Ethernet link is connected to the on-board RJ45 copper connector and the second is routed to the I/O Spacer.
- The second two Ethernet interfaces (10/100/1000Mbps) are connected to the I/O Spacer They are configured as Reduced Gigabit Media Independent Interfaces (RGMII)

Link Configuration

The four Ethernet links are configured the following way:

- The first two MAC interfaces are always configured as SMII (Serial Media Independent Interface). The media interfaces are always configured in the 10/100-TX mode
- The third and fourth MAC interfaces are always configured as RGMII (Reduced Gigabit Media Independent Interface). The media interfaces are configured in the 10/100/1000 Base T mode of operation when connected to a copper connector and in the 1000-SX mode when connected to a fiber connector. The types of connectors used on the I/O spacer is determined by the type of I/O spacer.

Status LEDs for first EMAC (EMAC0)

Three led pins are physically connected to LEDs. The LEDs are labeled *Duplex*, *Link* and *10/100*. Table 3-1 shows their status values.

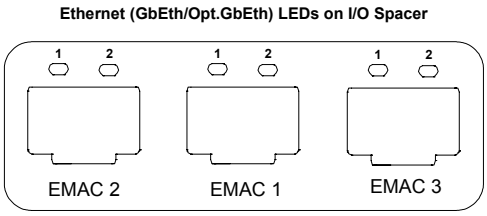
TABLE 3-1. Ethernet LEDs for EMAC0

LED	Status	Value
Duplex (Amber)	ON (Amber)	Duplex mode
	ON (Flashing)	Duplex/collision
	OFF	Simplex mode
Link (Green)	ON (Green)	Link
	ON (Flashing)	Link/activity
	OFF	No link
10/100 (Amber)	ON (Amber)	100MB/s
	OFF	10 MB/s

Status LEDs for EMAC1, EMAC2 and EMAC3

The LED signal lines for any second or third 10/100 TX port are routed to the I/O spacer (MDC). There are two LEDs above each RJ45 connector. Figure 3-2 shows a I/O spacer with the maximum of three RJ45 connectors. This number is dependent on model purchased.

FIGURE 3-2 *LEDs on the MDC-RJ45 I/O spacer*



See “Front Panel Connectors” on page 21 for more information on the front panel connectors and configuration options. Table 3-2 and Table 3-3 show the LED status values.

TABLE 3-2. Ethernet LEDs on the MDC-RJ45 I/O Spacer

EMAC #	LED 1	LED2	Status
EMAC 1	Green	Yellow (steady)	100 Mbit/s Link
	Green	Yellow (flashing)	100 Mbit/s Activity (RX/TX)
	Green	Green (steady)	Duplex Link
	Green	Green (flashing)	Collision
	Not lit	Yellow (steady)	10 Mbit/s Link
EMAC 2 and EMAC 3	Yellow	Yellow (flashing)	100 Mbit/s TX data
	Yellow	Green (flashing)	100 Mbit/s RX data
	Green	Yellow (flashing)	1Gbit/s TX data
	Green	Green (flashing)	1Gbit/s RX data
	Not lit	Green (flashing)	10Mbit/s RX data
	Not lit	Yellow (flashing)	10 Mbit/s TX data

TABLE 3-3. Ethernet LEDs on the MDC-SFF I/O Spacer

EMAC #	LED 1	LED2	Status
EMAC 1	Green	Yellow (steady)	100 Mbit/s Link
	Green	Yellow (flashing)	100 Mbit/s Activity (RX/TX)
	Green	Green (steady)	Duplex Link
	Green	Green (flashing)	Collision (duplex link)
	Not lit	Yellow (steady)	10 Mbit/s Link
EMAC 2 and EMAC 3	Green	Yellow (flashing)	1Gbit/s TX data
	Green	Green (flashing)	1Gbit/s RX data

FLASH

The FLASH is only used for storing the boot image(s). It can be entirely locked/unlocked using a configuration switch. See “Processor Subsystem SW10” on page 16.

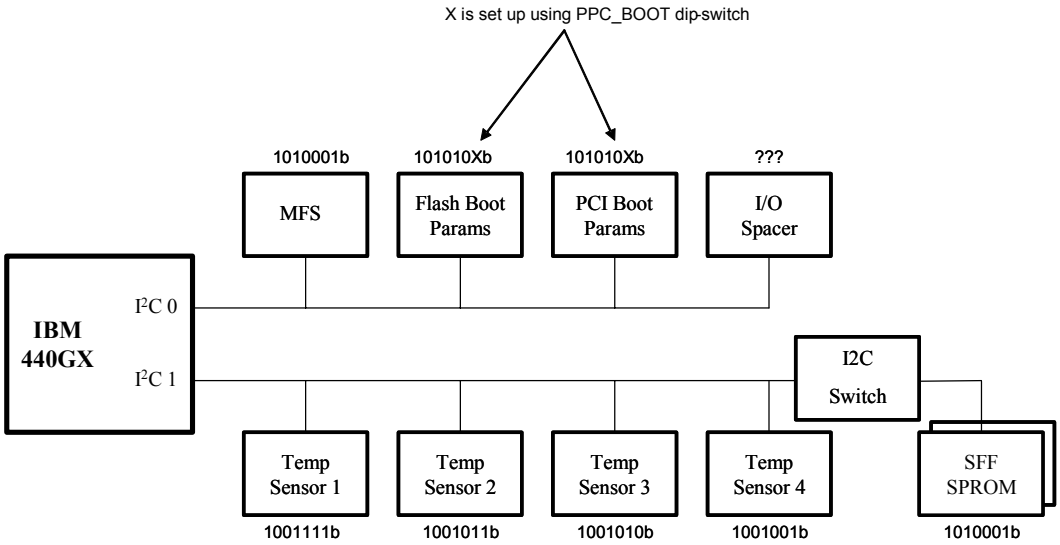
I2C Devices

The 440GX PowerPC processor has access to the following devices on its primary I2C bus:

- Processor SPROM used to store the MFS.
- Processor SPROM used to store the PCI boot parameters.
- Processor SPROM used to store the FLASH boot parameters.
- Devices located on the I/O spacer.

The 440GX PowerPC processor has access to the four temperature sensors on its secondary I2C bus. The following figure describes the processor I2C configuration:

FIGURE 3-3
AMCC 440GX I2C Devices



Serial PROM Devices

There are three Serial Prom devices:

- One serial PROM is required for the processor to boot and load the configuration parameters.
- One SPROM is used to keep the processor from booting.
- A third serial EEPROM is used to store the MFS (Midas File System). Monitor and BSP boot behavior depending on parameter values held in the MFS.

Use of SPROM Devices should be under VMETRO guidance, some functions are already available in the BSP software.

3.3 QLOGIC ISP2312 Dual Fibre Channel Controller

The ISP2312 is a highly integrated single-chip, dual-channel, bus master, Fibre Channel processor that targets storage, clustering, and networking applications. This chip connects a conventional PCI or PCI-X bus to one or two 1.062 or 2.125 Gbps Fibre Channel ports connected to fabric, single arbitrated loop or point-to-point topologies.

The ISP2312 is a fully autonomous device, capable of managing multiple I/O operations and associated data transfers from start to finish without host intervention.

The ISP2312 balances the advanced bus speeds and efficiency of PCI-X with exceptional 2-Gbps Fibre Channel performance. Fibre Channel support for SCSI, IP, and VI (Virtual Interface) allows the ISP2312 to target a wide spectrum of storage and system area networks (SANs).

- One serial PROM is required for the FC controller to save the configuration.
- Two SFF modules are located on the front panel and are used to transfer data via Fibre Channel.

3.4 PCI-X to PCI-X Bridges

The PLX6540 64-bit PCI-X to PCI-X bridge is designed for high performance, high availability applications, in PCI-X to PCI conversion, bus expansions, frequency conversions from faster PCI-X to slower PCI-X or from slower PCI-X to faster PCI-X bus, address remapping, high availability hot swap and universal system-to-system bridging. PCI6540 has sophisticated buffer management and buffer configuration options designed to provide customizable performance for very efficient PCIX-PCI conversion and processor bridging. PCI6540 allows up to 2KiB prefetch during read and timed FIFO flush management.

Power-up / Reset Configuration Options

Many options of the PCI6540 can be configured at power-up or reset. Because most of the options can be modified using software, only a few options are connected to dip-switches.

Application Modes

Non-universal transparent and non-universal non-transparent modes are the only supported modes . The transparent mode is the default mode. A dip-switch is used to select between transparent and non-transparent mode.

In non-transparent mode you can choose which port has boot priority using a dip-switch (controls P_BOOT signal). P_BOOT is deasserted when board configuration is initiated from the VME side (non-transparent mode is selected).See “PCI-X to PCI-X Bridges SW2, SW9, SW8 settings” on page 14.

EEPROM

At boot-up, an external EEPROM can be used by the PCI6540 to initialize its internal registers. The EEPROM auto-load process is only initiated when the primary reset input is deasserted. Data is always downloaded from address 0. Hosts accesses are only allowed when the download process is completed (bit EEPAUTO status is 0).

A dip-switch is used to control the use of the EEPROM at start-up.

See “PCI-X to PCI-X Bridges SW2, SW9, SW8 settings” on page 14.

Secondary Port Arbiter Setup

As the only built-in arbiter present on the secondary PCI bus, the PCI6540 internal arbiter is used to arbitrate.

Primary Interface

The primary interface of this bridge is connected to the Primary PCI Segment and is 64-bit 133MHz PCI-X only.

Secondary Interface

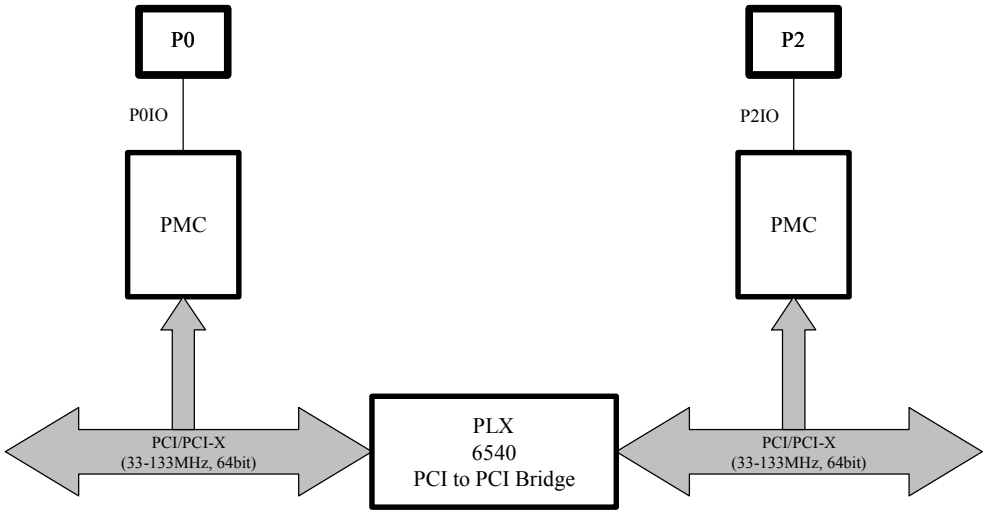
The secondary interface of the PCI6540 is connected to the first PMC site (PMC#1) and the primary interface of another PCI6540 bridge.

4 PMC Subsystem

4.1 Introduction

The PMC subsystem is composed of two 3.3V signalling PMC sites and is located on two PCI(-X) segments called the Secondary and Tertiary PCI Segments. The connection between the two PCI(-X) segments is provided by a PCI-X to PCI-X bridge.

FIGURE 4-1 *PMC Subsystem Block Diagram*



The factory settings of the board switch configuration allows the bus frequency of the PCI-X segments to be automatically configured to the frequency used by a PMC card insterted into it, and by the limitation set with dip-switches 1 and 4. See “PCI-X Capability Selection for PMC Slots” on page 17.

PMC Power

- Max current per PMC for 3.3V power supply : 3A
- Max current per PMC for 5V power supply : 3A
- Max current per PMC for V(I/O) power supply : 2A

4.2 Secondary and Tertiary PCI Segments

PCI Mode and Speed Configuration

The PCIXCAP and M66EN pins of a PMC module determine which clock speed and protocol (PCI vs. PCI-X) can be used on the segment. There are five detectable modes of operation: 33/66MHz PCI and 66/100/133MHz PCI-X.

Note – Even if PMCs can only signal that they are either 66 or 133 MHz compliant in PCI-X mode, the host may decide to run 133 MHz capable boards at a lower frequency (typically 100MHz) if the total number of loads is too high for the system to achieve 133MHz operations.

Configuration switches can be used to:

- Ground the PCIXCAP signal to force PCI operations, or pull low to inhibit 100/133 MHz operations by configuration switches.
- The M66EN signal can also be grounded through in order to inhibit 66MHz PCI operations.
- Select between 133 and 100 MHz as the maximum operating frequency.

The detected PCIXCAP/M66EN/dip-switches values determine the frequency of the clock generator for the segment. Table 2-9 on page 17 for dip-switch settings.

Arbitration

Secondary and Tertiary PCI Segments

The built-in PCI-X arbiter of the PCI6540 PCIX-to-PCIX Bridge is used. The arbiter provides two REQ/GNT pairs to the PMC to support a dual device PPMC.

IDSEL Assignment

Secondary PCI Segment

- AD[17] is used for the PMC#1 IDSEL
- AD[18] is used for the PMC#1 IDSELB
- AD[19] is used for the PCI6540 P2P Secondary Side IDSEL (PCI6540 located in the Processor Subsystem)
- AD[20] is used for the PCI6540 P2P Primary Side IDSEL (PCI6540 located between the Secondary and Tertiary PCI Segments)

Tertiary PCI Segment

- AD[17] is used for the PMC#2 IDSEL
- AD[18] is used for the PMC#2 IDSELB
- AD[19] is used for the PCI6540 P2P Secondary Side IDSEL (PCI6540 located between the Secondary and Tertiary PCI Segments)

- AD[20] is used for the PCI6540 P2P Primary Side IDSEL (PCI6540 closer to the Extension Subsystem)

Processor PMC Support

The Processor PMC standard adds several extensions to the PMC standard:

- **Support for a second PCI device**: Support for a second device requires an additional REQ/GNT pair and an additional IDSEL signal. This is implemented by using an additional REQ/GNT pair from the PCI bus arbiter and connecting the extra IDSEL signal to an unused AD line
- **Support for System Processor in the PPMC site (Monarch)**: Support for having the system processor in the PPMC site is partially supported. The MONARCH# signal is controlled by a configuration switch, and allows the PPMC to detect that it should be the system processor. When MONARCH# is active, interrupts are routed to the PPMC site input signals rather than from the PPMC site (output signals).

Note – The Monarch PPMC is also responsible for PCI bus enumeration in the system if the P2P Bridge on the primary bus is in Non-Transparent Mode or the embedded AMCC 440GX processor is not permitted to boot.

Only the first PMC site (PMC#1) includes support for the MONARCH feature.

4.3 PCI6540 PCIX-to-PCIX Bridge

This Bridge has been discussed in “PCI-X to PCI-X Bridges” on page 32. What follows are details appropriate for this particular bridge.

Power-up / Reset Configuration Options

PCI-X Capability

Both primary and secondary interfaces can be run in PCI or PCI-X modes. See “PCI-X Capability Selection for PMC Slots” on page 11.

Secondary Port Arbiter Setup

As the only built-in arbiter present on the secondary PCI bus, the PCI6540 internal arbiter is used to arbitrate.

Primary Interface

The primary interface of this bridge is connected to the secondary interface of the Secondary PCI Segment bridge and to the first PMC site (PMC#1).

Secondary Interface

The secondary interface of this bridge is connected to the second PMC site (PMC#2) and the primary interface of another PCI6540 bridge.

4.4 PMC to VME connections

PMC#1-P4 to VME-P2

In addition to the standard PCI(-X) bus, the PMC#1 site includes a connection between its P4 connector and the VME-P2 connector. This connection follows the ANSI/VITA 35-2000 standard (PMC-P4 pin out mapping to VME P0 and VME64x-P2).

As for the PMC#1-P4 to VME-P2 connection, signals are routed as differential pairs.

Note – PMC#1-P4 is not mounted on RACEway models.

PMC#2-P4 to VME-P0

In addition to the standard PCI-X bus, the PMC#2 site includes a connection between its P4 connector and the VME-P0 connector.

Signals are routed as differential pairs.

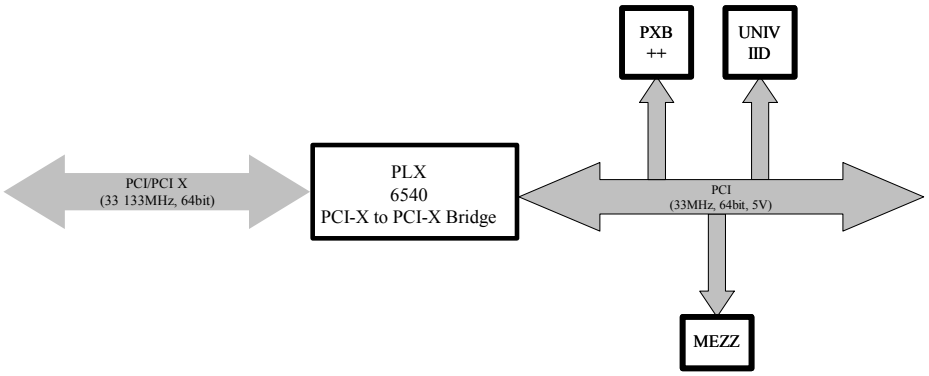
5 Extension Subsystem

5.1 Introduction

The Extension Subsystem is composed of VME, RACEway and mezzanine connections. All the devices are located on a private 64-bit, 33MHz, 5V signaling, PCI only segment. This PCI segment is called the Quaternary PCI Segment.

A PCI6540 universal PCI-X to PCI-X bridge connects the Quaternary PCI Segment with the Tertiary PCI Segment.

FIGURE 5-1 *Extension Subsystem*



5.2 Quaternary PCI Segment

The Quaternary PCI Segment is a 64-bit/33MHz PCI bus.

Devices

Three major devices are located on the Quaternary PCI Segment:

- Tundra Universe IID PCI-to-VME bridge.
- Mercury PXB++ PCI-to-RACE++ bridge.
- PCI6540 PCI-X to PCI-X bridge.

Arbitration

The built in arbiter of the PCI6540 bridge is used to arbitrate this segment.

IDSEL Assignment

- AD[17] is used for the PCI6540 P2P Secondary Side IDSEL
- AD[18] is used for the Tundra Universe IID IDSEL
- AD[19] is used for the Mercury PXB++ IDSEL

5.3 Tundra Universe IID PCI-to-VME Bridge

The Tundra Universe II is the industry's leading high performance PCI-to-VMEbus interconnect. Universe II is fully compliant with the VME64 bus standard, and tailored for the next-generation of advanced PCI processors and peripherals. With a zero-wait state implementation, multi-beat transactions, and support for bus-parking, Universe II provides high performance on the PCI bus.

Power-up / Reset Configuration

The following options can be set at power-up or reset using DIP Switches SW3, SW5, and SW11. See “PCI-to-VME Bridge” on page 15.

VME CR/CSR:

- 8 switches on SW5 that can set the "Base Address”.
- “VME register Access” Image Enable is disabled by default.

Misc. Options:

- SYSFAIL Assertion using one configuration switch(SW11). See Table 2-3 on page 15.
- VME Auto ID is disabled by default but can be modified using SW11. See Table 2-3 on page 15.

5.4 Mercury PXB++ PCI-to-RACE++ Bridge

The PXB++ implements the functions required to bridge the PCI local bus with the RACEway Interlink crossbar fabric. The PXB++ performs all necessary address translation and routing functions to support high speed transfers between the local PCI bus and either native RACEway interfaces or remote PCI buses which also use PXB++ interfaces.

This architecture allows PXB++ to be used for two distinct types of applications. In the first type of application, the PXB++ is used as an interface technology to RACEway to support I/O interfaces between industry-standard devices and native RACEway processing elements. This application allows the RACEway designer to use PXB++ to gain access to the wide range of off-the-shelf interface devices which are available for the PCI local bus.

In the second type of application, the PXB++ is used to implement a transparent PCI-to-PCI bridge through the RACEway fabric. In this application, the PCI system designer uses the PXB++ and RACEway technology to create PCI-to-PCI scalable bandwidth without implementing native RACEway processing. By implementing a transparent Plug & Play PCI bridge, the PXB++ can make RACEway technology accessible without requiring "RACEway awareness" at the PCI bus level.

The design and basic functionality of the PXB++ are the same for both application types. The differences are primarily in initial configuration and in the control software's viewpoint of the PXB++ device.

Power-up / Reset Configuration

PCI Reset Control

Enable or disable PXB++ reset from PCI using Jumper JP1. See “PCI-to-RACEway Bridge Reset” on page 17.

EEPROM

At boot-up, an external EEPROM is used by the PXB++ to initialize its internal registers.

Enable or disable (default configuration) the auto-load process usingDIP switch SW7. See “PCI to RACEway Bridge” on page 16. Data is downloaded from address 0.

5.5 Mezzanine Connector

The mezzanine connector extends the Quaternary PCI Segment to a MEZZ-x500F type mezzanine which contains 3 PMC slots.

5.6 PCI6540 PCI-X to PCI-X Bridge

More information about the PCI-X to PCI-X Bridge processor has been discussed in “PCI-X to PCI-X Bridges” on page 32.

Power-up / Reset Configuration Options

PCI-X Capability

- Primary port: XCAP signal is setup at boot-up by the configuration of PCIXCAP, M66EN signals and configuration switches.
- Secondary port: this PCI segment is setup to run in the 64-bit/33MHz PCI mode.

Secondary Port Arbiter Setup

The PCI6540 internal arbiter is used to arbitrate the PCI bus.

Primary Interface

The primary interface of this bridge is connected to the secondary interface of the Tertiary PCI Segment PCI6540 bridge and to the second PMC site (PMC#2).

Secondary Interface

The secondary interface of this bridge is connected to the Tundra Universe IID, Mercury PXB++ and mezzanine connector. This interface always runs in the 64-bit/33MHz PCI mode.

6 Mezzanine PMC Carrier

Precautions in Handling and Storage

Static electricity can cause permanent damage. Prevent electrostatic damage by taking proper precautions.

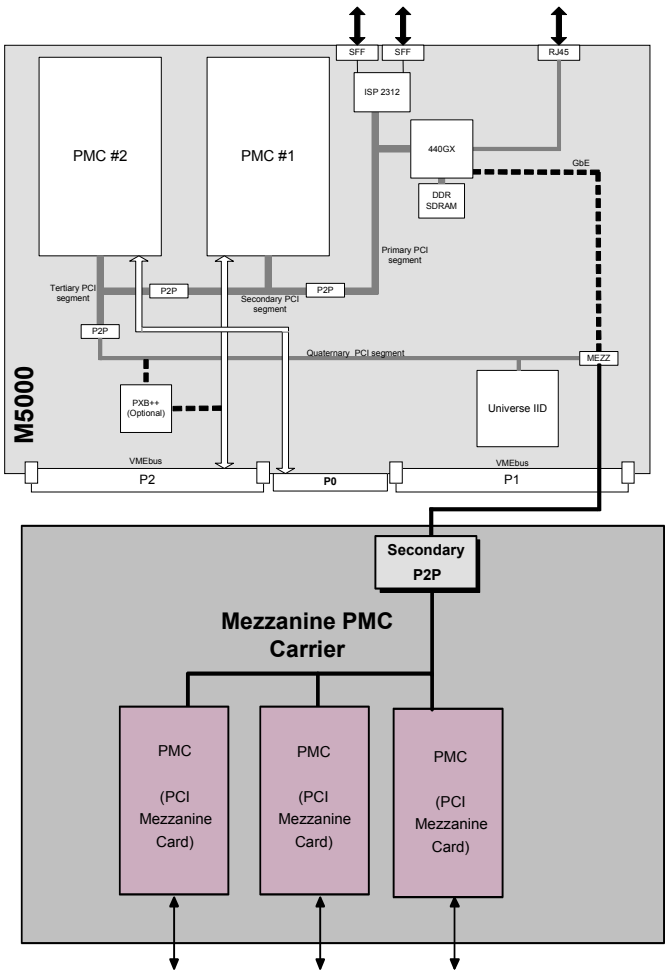
- Make sure your body is grounded when coming into contact with the board by wearing an anti-static wrist strap.
- If an anti-static wrist strap is not available, touch a grounded surface, such as the bare metal chassis, before touching the M52xx and Mezzanine PMC Carrier board.
- Only leave the board on surfaces with controlled static characteristics, i.e. specially designed anti-static table covers.
- When handing the board to another person, first touch this person's hand, wrist etc. to discharge any static potential.
- Always store the board in an anti-static bag or other static resistant container.
- If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.

Part Numbers referred to in this chapter:

- MEZZ-x500F - Mezzanine PMC Carrier board (3 PMC Slots)
- M52xx - The base board (2 PMC Slots)
- M55xx - The combination of base board and carrier board (5 PMC Slots)

6.1 Mezzanine PMC Carrier Description

FIGURE 6-1
Block diagram



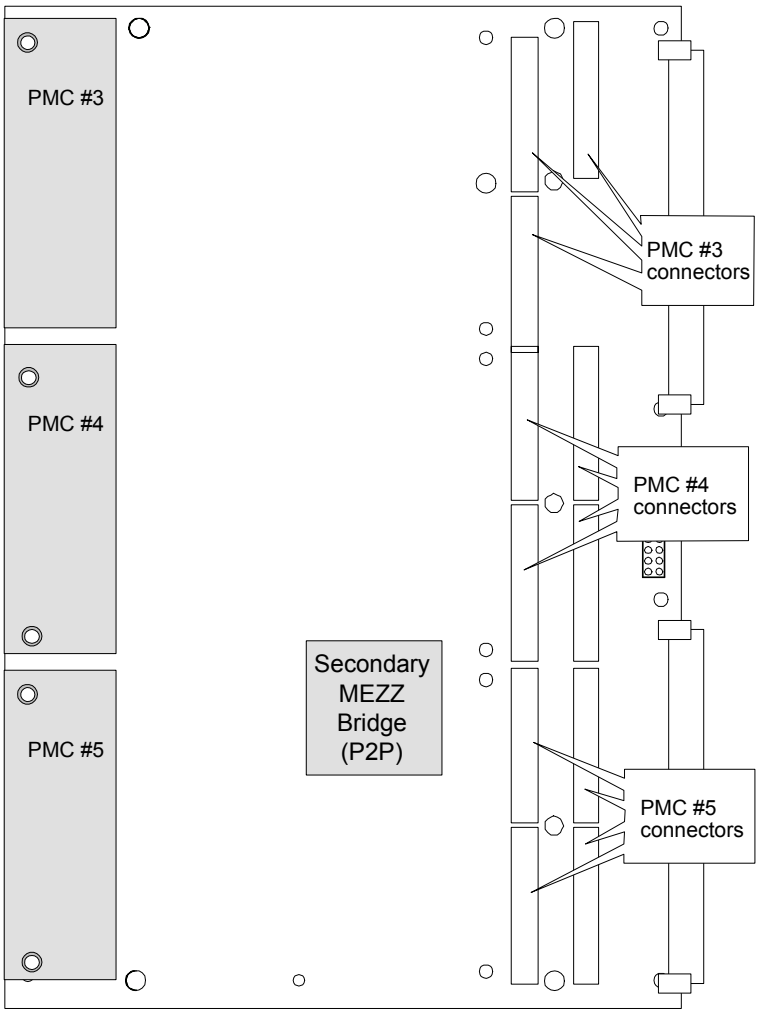
The Mezzanine PMC Carrier is an optional extension card that provides three 5v 33MHz PMC sites to the M52xx boards. The assembly of the PMC Carrier and a M52xx board requires two adjacent VME slots.

Note – The Mezzanine PMC Carrier provides three 5v PMC sites. The two PMC sites on the M52xx are 3.3v If 3.3v PMC sites are required on the PMC Carrier please contact VMETRO.

These additional PMC sites share a single PCI segment, which is bridged to the Quarternary PCI bus via a transparent P2P bridge.

6.2 Board Layout

FIGURE 6-2
Board Layout



6.3 Installing PMC Modules onto the PMC Carrier

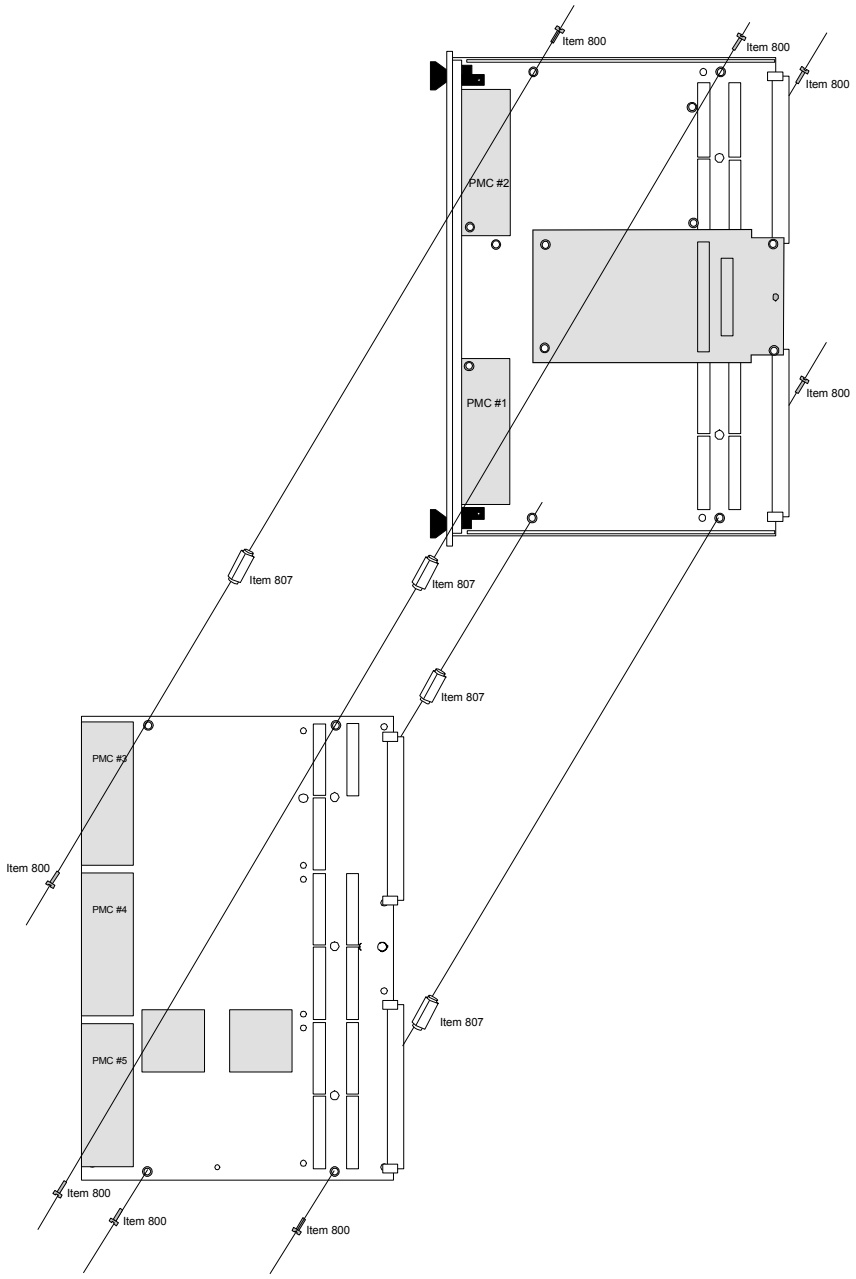
The M5000 is shipped with two PMC filler panels mounted in the front panel. They act as EMC shielding in unused PMC positions. Before installing a PMC module, the filler panel(s) must be removed. This is done by pushing them out from the backside of the front panel

> **Warning!** Be extremely careful when inserting screws to secure PMC modules. Touching component leads, or the printed circuit board itself, with a screwdriver may cause permanent damage to the board

Step 1: Remove the Mezzanine PMC Carrier board from the M52xx.

1. Remove the four screws that attach the PMC Carrier board to the M52xx board. These screws are removed from the rear of the M52xx board. See Figure 6-3
2. Carefully remove the PMC Carrier board from the M52xx.

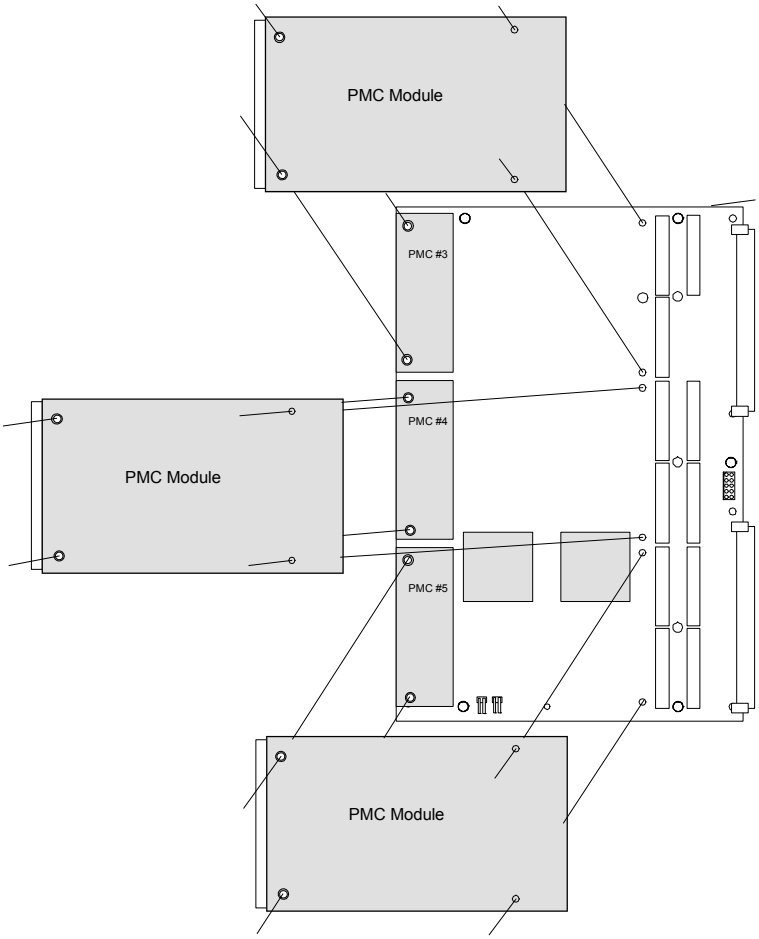
FIGURE 6-3 *Mounting screws for the PMC Carrier*



Step 2: Install the PMC boards onto the PMC Carrier

1. Place the Mezzanine PMC Carrier on a smooth static protected work surface.
2. Install the PMC modules in the PMC Carrier.
   PMC position #3 is the upper position
   PMC position #4 is the middle position
   PMC position #5 is the lower position.
3. Secure the PMC modules with screws from the bottom side of the PMC Carrier board.

FIGURE 6-4
Mounting the PMC modules



Step 3: Reassemble the unit

1. Fasten the PMC Carrier board to the M52xx using screws as shown in Figure 6-3

PMC Carrier Daisy-Chain

The P1 connector of the PMC Carrier board provides a daisy-chain bypass for the signals BG[3:0]* and IACKIO*. Therefore, no action is required to keep the daisy-chain operating through the PMC Carrier board.

6.4 Functional Description

System Overview

The Mezzanine PMC Carrier has 3 PMC slots which adds an extra PCI bus to bridge the two existing busses on the M52xx board. There are two bridges 64bit wide and operate at 33Mhz. These bridges provide a connection from the M52xx bus to the PMC Carrier bus.

Arbitration on the mezzanine bus

The secondary bridge is responsible as arbiter for the mezzanine bus.

TABLE 6-1. PCI Bus arbiter assignments on Mezzanine bus

REQ/GNT	Name
0	PMC slot #3
1	PMC slot #5
2	PMC slot #4
3	Reserved
4	Reserved
5	Reserved
6	Reserved

IDSEL generation

PCI buses use a separate address space for initialization, called the Configuration Space. This address space uses the addressing signal, IDSEL to select the target for all transactions. The standard way of assigning IDSEL to PCI devices and boards is to connect the IDSEL pin of each device/board to a unique AD[] bit.

The IDSEL assignments are shown in Table 6-2.

TABLE 6-2. IDSEL Assignments on MEZZ-x500

PCI Device / Board	IDSEL	PCI Address
PMC #3	AD[16]	0x00010xxx / 0x00100xxx
PMC #5	AD[21]	0x00200xxx / 0x00400xxx
PMC #4	AD[23]	0x00800xxx / 0x01000xxx

Interrupt routing

The PMC Carrier board has four interrupts from each of the three PMCs. These are routed (multiplexed) to the M52xx board via an interrupt routing PLD (Programmable Logic Device).

The PMC Carrier board will distribute these interrupts to the base board interrupt destinations according to the routing tables in “Interrupt Routing” on page 66.

FIGURE 6-5 *Carrier Board Interrupts*

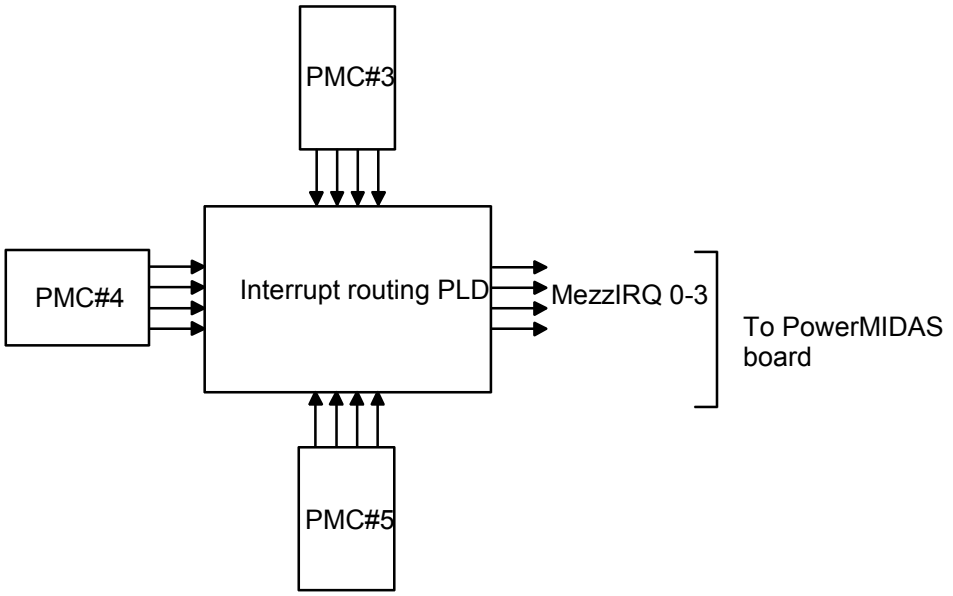


TABLE 6-3. Interrupt routing table

MEZZ	PMC#3	PMC#4	PMC#5
Interrupt pin	**A,B,C,D**	**A,B,C,D**	**A,B,C,D**
0	D	C	B
1	A	D	C
2	B	A	D
3	C	B	A

Note – See “Interrupt Routing” on page 66 for mapping the PMC Carrier board interrupt pins to the CPU interrupt

Debug Functions

The PMC Carrier board has some additional circuitry which is not normally used, but can be used for very low-level debugging. This circuitry includes;

- Two debug LEDs.
- A status register where the value of the interrupt signals from the PMC slots are available.

Both functions are accessed through the use of the GPIO pins on one of the P2P bridges. Contact VMETRO for more details.

6.5 VME Connectors on MEZZ-x500

VME P1 Connector on MEZZ-x500F

TABLE 6-4. VME P1 Connector

pin#	row Z	row A	row B	row C	row D
1	NC	NC	NC	NC	+5V
2	GND	NC	NC	NC	GND
3	NC	NC	NC	NC	NC
4	GND	NC	BG0IN* 1)	NC	NC
5	NC	NC	BG0OUT* 1)	NC	NC
6	GND	NC	BG1IN* 1)	NC	NC
7	NC	NC	BG1OUT* 1)	NC	NC
8	GND	NC	BG2IN* 1)	NC	NC
9	NC	NC	BG2OUT* 1)	NC	NC
10	GND	NC	BG3IN* 1)	NC	NC
11	NC	NC	BG3OUT* 1)	NC	NC
12	GND	NC	NC	NC	NC
13	NC	NC	NC	NC	NC
14	GND	NC	NC	NC	NC
15	NC	NC	NC	NC	NC
16	GND	NC	NC	NC	NC
17	NC	NC	NC	NC	NC
18	GND	NC	NC	NC	NC
19	NC	NC	NC	NC	NC
20	GND	NC	NC	NC	NC
21	NC	IACKIN* 1)	NC	NC	NC
22	GND	IACKOUT* 1)	NC	NC	NC
23	NC	NC	NC	NC	NC
24	GND	NC	NC	NC	NC
25	NC	NC	NC	NC	NC
26	GND	NC	NC	NC	NC
27	NC	NC	NC	NC	NC
28	GND	NC	NC	NC	NC
29	NC	NC	NC	NC	NC
30	GND	NC	NC	NC	NC
31	NC	-12V	NC	+12V	GND
32	GND	+5V	+5V	+5V	+5V1)

1) The signals [BG3:0]* and IACKIO* are daisy-chained on the MEZZ-x500F

VME P2 Connector on MEZZ-x500F

TABLE 6-5. VME P2 Connector

pin#	row Z	row A	row B	row C	row D
1	Jn4(4)-2	Jn4(5)-2	+5V	Jn4(5)-1	Jn4(4)-1
2	GND	Jn4(5)-4	GND	Jn4(5)-3	Jn4(4)-3
3	Jn4(4)-5	Jn4(5)-6	NC	Jn4(5)-5	Jn4(4)-4
4	GND	Jn4(5)-8	NC	Jn4(5)-7	Jn4(4)-6
5	Jn4(4)-8	Jn4(5)-10	NC	Jn4(5)-9	Jn4(4)-7
6	GND	Jn4(5)-12	NC	Jn4(5)-11	Jn4(4)-9
7	Jn4(4)-11	Jn4(5)-14	NC	Jn4(5)-13	Jn4(4)-10
8	GND	Jn4(5)-16	NC	Jn4(5)-15	Jn4(4)-12
9	Jn4(4)-14	Jn4(5)-18	NC	Jn4(5)-17	Jn4(4)-13
10	GND	Jn4(5)-20	NC	Jn4(5)-19	Jn4(4)-15
11	Jn4(4)-17	Jn4(5)-22	NC	Jn4(5)-21	Jn4(4)-16
12	GND	Jn4(5)-24	GND	Jn4(5)-23	Jn4(4)-18
13	Jn4(4)-20	Jn4(5)-26	+5V	Jn4(5)-25	Jn4(4)-19
14	GND	Jn4(5)-28	NC	Jn4(5)-27	Jn4(4)-21
15	Jn4(4)-23	Jn4(5)-30	NC	Jn4(5)-29	Jn4(4)-22
16	GND	Jn4(5)-32	NC	Jn4(5)-31	Jn4(4)-24
17	Jn4(4)-26	Jn4(5)-34	NC	Jn4(5)-33	Jn4(4)-25
18	GND	Jn4(5)-36	NC	Jn4(5)-35	Jn4(4)-27
19	Jn4(4)-29	Jn4(5)-38	NC	Jn4(5)-37	Jn4(4)-28
20	GND	Jn4(5)-40	NC	Jn4(5)-39	Jn4(4)-30
21	Jn4(4)-32	Jn4(5)-42	NC	Jn4(5)-41	Jn4(4)-31
22	GND	Jn4(5)-44	GND	Jn4(5)-43	Jn4(4)-33
23	Jn4(4)-35	Jn4(5)-46	NC	Jn4(5)-45	Jn4(4)-34
24	GND	Jn4(5)-48	NC	Jn4(5)-47	Jn4(4)-36
25	Jn4(4)-38	Jn4(5)-50	NC	Jn4(5)-49	Jn4(4)-37
26	GND	Jn4(5)-52	NC	Jn4(5)-51	Jn4(4)-39
27	Jn4(4)-41	Jn4(5)-54	NC	Jn4(5)-53	Jn4(4)-40
28	GND	Jn4(5)-56	NC	Jn4(5)-55	Jn4(4)-42
29	Jn4(4)-44	Jn4(5)-58	NC	Jn4(5)-57	Jn4(4)-43
30	GND	Jn4(5)-60	NC	Jn4(5)-59	Jn4(4)-45
31	Jn4(4)-46	Jn4(5)-62	GND	Jn4(5)-61	GND1)
32	GND	Jn4(5)-64	+5V	Jn4(5)-63	+5V1)

6.6 PMC Connector Pinouts on PMC Carrier (MEZZ-x500F)

PMC Connector Pinouts - Jn1, Jn2 and Jn3 for all PMC slots on MEZZ-x500F

The pinouts for PMC connectors Jn1, Jn2 and Jn3 on the MEZZ-x500F (all three PMC slots) are the same as for the PMC connectors Jn1, Jn2 and Jn3 on the M52xx board.

See “PMC Connector Pinout” on page 103 for pinout description.

PMC Connector Pinouts - Jn4 for PMC slot 4 on MEZZ-x500F

Jn4 64 Bit PCI

TABLE 6-6. Pinouts for PMC connector Jn4, PMC slot 4 on MEZZ-x500F

Pin#	Signal Name	Signal Name	Pin#		
1	P2-D1	P2-Z1	2		
3	P2-D2	P2-D3	4		
5	P2-Z3	P2-D4	6		
7	P2-D5	P2-Z5	8		
9	P2-D6	P2-D7	10		
11	P2-Z7	P2-D8	12		
13	P2-D9	P2-Z9	14		
15	P2-D10	P2-D11	16		
17	P2-Z11	P2-D12	18		
19	P2-D13	P2-Z13	20		
21	P2-D14	P2-D15	22		
23	P2-Z15	P2-D16	24		
25	P2-D17	P2-Z17	26		
27	P2-D18	P2-D19	28		
29	P2-Z19	P2-D20	30		
31	P2-D21	P2-Z21	32		
33	P2-D22	P2-D23	34		
35	P2-Z23	P2-D24	36		
37	P2-D25	P2-Z25	38		
39	P2-D26	P2-D27	40		
41	P2-Z27	P2-D28	42		
43	P2-D29	P2-Z29	44		
45	P2-D30	P2-Z31	46		
47	NC	(I/O)	NC	(I/O)	48
49	NC	(I/O)	NC	(I/O)	50
51	NC	(I/O)	NC	(I/O)	52
53	NC	(I/O)	NC	(I/O)	54
55	NC	(I/O)	NC	(I/O)	56
57	NC	(I/O)	NC	(I/O)	58
59	NC	(I/O)	NC	(I/O)	60
61	NC	(I/O)	NC	(I/O)	62
63	NC	(I/O)	NC	(I/O)	64

PMC Connector Pinouts - Jn4 for PMC slot 5 on MEZZ-x500F

Jn4 64 Bit PCI

TABLE 6-7. Pinouts for PMC connector Jn4, PMC slot 5 on MEZZ-x500F

Pin#	Signal Name	Signal Name	Pin#
1	P2-C1	P2-A1	2
3	P2-C2	P2-A2	4
5	P2-C3	P2-A3	6
7	P2-C4	P2-A4	8
9	P2-C5	P2-A5	10
11	P2-C6	P2-A6	12
13	P2-C7	P2-A7	14
15	P2-C8	P2-A8	16
17	P2-C9	P2-A9	18
19	P2-C10	P2-A10	20
21	P2-C11	P2-A11	22
23	P2-C12	P2-A12	24
25	P2-C13	P2-A13	26
27	P2-C14	P2-A14	28
29	P2-C15	P2-A15	30
31	P2-C16	P2-A16	32
33	P2-C17	P2-A17	34
35	P2-C18	P2-A18	36
37	P2-C19	P2-A19	38
39	P2-C20	P2-A20	40
41	P2-C21	P2-A21	42
43	P2-C22	P2-A22	44
45	P2-C23	P2-A23	46
47	P2-C24	P2-A24	48
49	P2-C25	P2-A25	50
51	P2-C26	P2-A26	52
53	P2-C27	P2-A27	54
55	P2-C28	P2-A28	56
57	P2-C29	P2-A29	58
59	P2-C30	P2-A30	60
61	P2-C31	P2-A31	62
63	P2-C32	P2-A32	64

7 *Miscellaneous Functions*

7.1 JTAG Chain

Chain Topology

The JTAG Chain is divided into three segments:

- Processor
- CPLDs
- Other JTAG devices

Each segment is used for a specific set of similar devices, and can be accessed separately from the remaining parts of the JTAG chain. This allows tools that only support certain devices to be used by only accessing the segment with supported devices.

For more information please contact VMETRO.

7.2 Reset Network

The board reset network is centralized around the reset PLD. Output reset signals are routed first to the reset PLD before being propagated to the other board components.

The primary sources of reset are the power-up reset controller and reset button. Other sources are various software resets from the processor, PCI-X to PCI-X bridges, VME reset, RACEway reset and PMC modules etc.

The following devices are considered as possible reset sources:

- 2 PPMC sites
- TUNDRA Universe II VME-to-PCI bridge
- MERCURY PXB++ Race++-to-PCI Bridge
- 3 PCI6540 PCIX-to-PCIX bridges
- AMCC 440GX PowerPC processor
- Power cycle (cold boot)
- On-board reset button (warm boot)

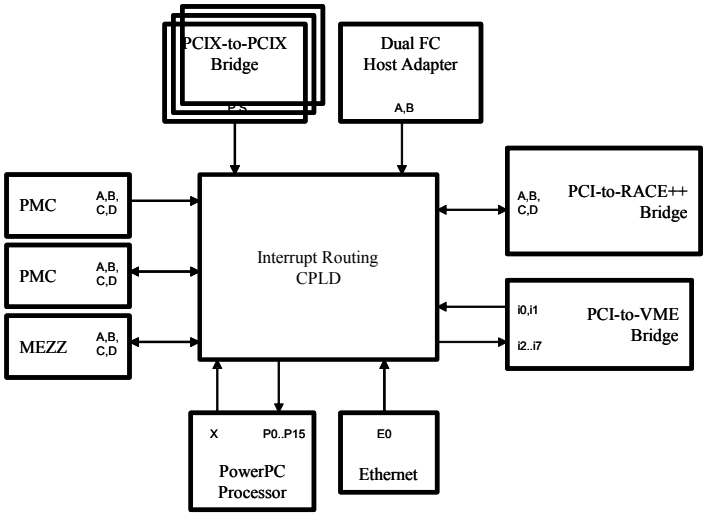
Any kind of reset (or power up) is forwarded to the CPLD which ensures that all the components are reset correctly (without any reset loop).

- The CPLD is always the first component to receive the initial reset signal.
- The CPLD transmits the reset to the Universe.
- The CPLD resets all the other components on the board

7.3 Interrupt Routing

In order to support a flexible interrupt routing mechanism, all interrupt source and destination signals are routed to a PLD which provides the actual routing between sources and destinations:

FIGURE 7-1 *Interrupt Routing*



The following devices are considered as possible interrupt sources:

- 2 PPMC sites (4 interrupt lines A,B,C and D)
- Mezzanine PMC sites (4 interrupt lines A,B,C and D)
- TUNDRA Universe IID VME-to-PCI bridge (2 interrupt lines i0 and i1)
- Intel LXT9785 Fast Ethernet controller (1 interrupt line E0)
- AMCC 440GX PowerPC processor (1 interrupt line X)
- 3 PCI6540 PCIX-to-PCIX bridges (2 interrupt lines P and S)
- ISP2312 PCIX-to-Dual FC Host Adapter (2 interrupt lines A and B)
- MERCURY PXB++ PCI-to-Race++ Bridge (4 interrupt lines A,B,C and D)

The following devices are considered as possible interrupt destinations:

- PPMC#1 site (4 interrupt lines A,B,C and D)
- AMCC 440GX PowerPC processor (16 interrupt lines P0 to P15)
- Universe PCI-to-VME bridge

The following routing tables show the current interrupt mapping:

Interrupt routing for PPMC#1

	Source							
	PPMC2	MEZZ	PXB++	Universe	PPC	P2P Bridge 1	P2P Bridge 2	P2P Bridge 3
Destination	A,B,C,D	A,B,C,D	A,B,C,D	I0,I1	X	P,S	P,S	P,S
A	A,C							
B	B,D	A,C						
C		B,D	A,C		X	S	P	
D			B,D	I0,I1		P	S	P,S

Interrupt routing for Universe II

	Source							
	PPMC1	PPMC2	MEZZ	PXB++	PPC	P2P Bridge 1	P2P Bridge 2	P2P Bridge 3
Destination	A,B,C,D	A,B,C,D	A,B,C,D	A,B,C,D	X	P,S	P,S	P,S
i2	A,C							
i3		A,C						
i4	B,D		A,C					
i5		B,D		A,C				
i6			B,D		X			P,S
i7				B,D		P,S	P,S	

Interrupt routing for PowerPC processor

	Source							
	PPMC1	PPMC2	MEZZ	Universe	PBX++	Eth	Gig Eth	FC Controller
Destination	A,B,C,D	A,B,C,D	A,B,C,D	I0,I1	A,B,C,D	E	GE0, GE1	A,B
p0	A,C							
p1		A,C						
p2	B,D							
p3		B,D						
p4								A
p5								B
p6					A,C			
p7			A		B,D		GE0	
p8			B	I0				
p9			C	I1			GE1	
p10			D			E		

Temperature Sensors

There are several temperature sensors located on the board. One is close to the bottom of the board, one close to the top of the board and two located in the middle of the board.

The PowerPC processor communicates with the sensors via its second I2C bus. The type of component used is Maxim MAX1731. Contact VMETRO for more information.

7.4 Power Supplies

The main sources of power are 5V and ±12V supplied by the VME backplane. The 5V power source is used to generate the required component voltages, ±12V is routed directly to the PMC sites.

APPENDIXES

A PLD Registers

A-1 Miscellaneous PLD Registers

The PLD registers can be accessed by the processor in following address range:

TABLE A-1. PLD Registers

Mnemonic	Register	Address	Access	Size
PPC_BOOT	PowerPC Boot Options	0x00	R	4 bits
RST_SERIAL	Reset and Serial Line Management	0x01	R/W	6 bits
MISC	Miscellaneous	0x02	R	4 bits
PCI_CFG	PCI Bus Configuration	0x03	R	8 bits
INTERRUPT_A	Interrupt Register	0x04	R	8 bits
INTERRUPT_B	Interrupt Register	0x05	R	8 bits
INTERRUPT_C	Interrupt Register	0x06	R	8 bits
INTERRUPT_D	Interrupt Register	0x07	R	8 bits
INTERRUPT_E	Interrupt Register	0x08	R	8 bits
INTERRUPT_F	Interrupt Register	0x09	R	8 bits
INTERRUPT_G	Interrupt Register	0x0A	R	8 bits
INTERRUPT_H	Interrupt Register	0x0B	R	8 bits
INTERRUPT_I	Interrupt Register	0x0C	R	8 bits
INTERRUPT_J	Interrupt Register	0x0D	R	8 bits
INTERRUPT_K	Interrupt Register	0x0E	R	8 bits
INTERRUPT_L	Interrupt Register	0x0F	R	8 bits
INTERRUPT_M	Interrupt Register	0x10	R	8 bits
INTERRUPT_N	Interrupt Register	0x11	R	8 bits

PPC_BOOT

0	PPC_BOOT_SPROM_WE#	PowerPC Boot SPROM devices are write-protected (1) or enabled (0) (Read-Only)
1	PPC_SPROM_WE#	PowerPC MFS SPROM device is write-protected (1) or enabled (0) (Read-Only)
2	PPC_FLASH_MON_WE#	PowerPC FLASH device (Monitor part) is write-protected (1) or enabled (0) (Read-Only)
3	PPC_FLASH_WE#	PowerPC FLASH device is write-protected (1) or enabled (0) (Read-Only)
4	FC_FLASH_WE#	QLOGIC ISP2312 FLASH device is write-protected (1) or enabled (0) (Read-Only)
5	PPC_BOOT	PowerPC loads boot parameters from PCI Boot SROM (0) or from FLASH Boot SPROM (1) (Read-Only)
6	PPC_ECC	PowerPC processor uses ECC memory bank (0) or not (1) (Read-Only)
7	ECO_SPROM_WE#	ECO SPROM device is write-protected (1) or enabled (0) (Read-Only) Note: Only present from ECO C1

RST_SERIAL

2	SYS_RST	System Reset: Set this bit to 1 to reset the entire board without resetting the entire VME rack (Write-Only)

MISC

7	RCLK_66	RACEway Clock 66MHz: set to 1 if RACEway clock is a 66MHz clock, 0 otherwise (Read-Only)
6	RCLK_DET	RACEway Clock Detection: set to 1 if RACEway clock is detected, 0 otherwise (Read-Only)
5	MEZZ_ID2	3-bit mezzanine identifier (Read-Only)
4	MEZZ_ID1	3-bit mezzanine identifier (Read-Only)
3	MEZZ_ID0	3-bit mezzanine identifier (Read-Only)
2	PMC1_MON	PMC Site #1 MONARCH#: set to 0 if the PMC#1 site is setup as MONARCH, 0 otherwise (Read-Only)
1	PMC1_PRES	PMC Site #1 Present: set to 1 if a PMC module is located in PMC site #1, 0 otherwise (Read-Only)
0	PMC_ERDY	PMC Site Ready: set to 1 if all the PMC sites are ready, 0 otherwise (Read-Only)

PCI_CFG

7	PMC2_PCIX	PMC#2 PCI(-X) Bus Mode (Read-Only): set to 1 if PCI-X mode detected on PCI(-X) bus where PMC site #2 is located, 0 otherwise
6	PMC1_PCIX	PMC#1 PCI(-X) Bus Mode (Read-Only): set to 1 if PCI-X mode detected on PCI(-X) bus where PMC site #1 is located, 0 otherwise
5	PMC2_CLK1	PMC#2 PCI(-X) Bus Clock Speed Bit 1 (Read-Only): set to 1 if clock speed detected on PCI(-X) bus where PMC site #2 is located is over 66MHz, 0 otherwise
4	PMC2_CLK0	PMC#2 PCI(-X) Bus Clock Speed Bit 0 (Read-Only): set to 1 if clock speed detected on PCI(-X) bus where PMC site #2 is located is 66MHz or 133MHz, 0 otherwise (33MHz or 100MHz)
3	PMC1_CLK1	PMC#1 PCI(-X) Bus Clock Speed Bit 1 (Read-Only): set to 1 if clock speed detected on PCI(-X) bus where PMC site #1 is located is over 66MHz, 0 otherwise
2	PMC1_CLK0	PMC#1 PCI(-X) Bus Clock Speed Bit 0 (Read-Only): set to 1 if clock speed detected on PCI(-X) bus where PMC site #1 is located is 66MHz or 133MHz, 0 otherwise (33MHz or 100MHz)
1	P_CLK1	Processor PCI-X Bus Clock Speed Bit 1 (Read-Only): set to 1 if clock speed detected on PCI-X bus where processor is located is over 66MHz, 0 otherwise
0	P_CLK0	Processor PCI-X Clock Speed Bit 0 (Read-Only): set to 1 if clock speed detected on PCI-X bus where processor is located is 66MHz or 133MHz, 0 otherwise (33MHz or 100MHz)

TABLE A-2. Clock speed display

PCIX	CLK1	CLK0	PCI-X Mode
0	0	0	PCI 33 MHz
0	0	1	PCI 66 MHz
1	0	1	PCI-X 66 MHz
1	1	0	PCI-X 100 MHz
1	1	1	PCI-X 133 MHz

INTERRUPT Registers

Address is offset from PLD base Address.

TABLE A-3. Interrupt Registers

Address	Register[7-4]	Register[3-0]
0x04	PPC	Ethernet
0x05	P2P1_P	P2P2_P
0x06	P2P3_P	P2P1_S
0x07	P2P2_S	P2P3_S
0x08	FC_A	FC_B
0x09	PMC1_A	PMC1_B
0x0A	PMC1_C	PMC1_D
0x0B	PMC2_A	PMC2_B
0x0C	PMC2_C	PMC2_D
0x0D	MEZZ_A	MEZZ_B
0x0E	MEZZ_C	MEZZ_D
0x0F	UNIV_0	UNIV_1
0x10	PXB_A	PXB_B
0x11	PXB_C	PXB_D

B Universe IID

Configuration Examples

B-1 General Information

Note – The 'Universe IID' PCI-VME Bridge, performs byte swapping of the data lanes on all transactions between VMEbus and PCI bus. This is also the case for accesses to the internal registers. The internal register bank is located on the 'PCI side' of the byte swapping. This means that when registers are read or written from the VMEbus, all bytes are shuffled (compared to the bit numbering used in the Universe IID User Manual).

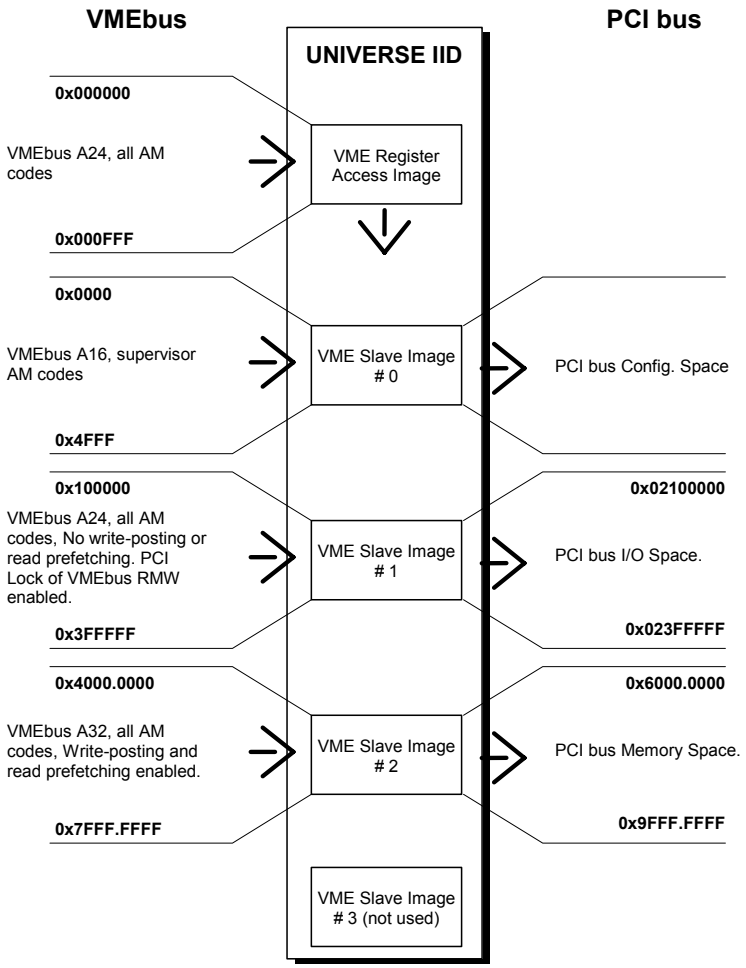
B-2 VMEbus Slave Images

PCI Master Enable

In addition to the configuration registers for the VMEbus slave images, one control register bit is essential for mapping VMEbus cycles to PCI bus cycles through the Universe IID. The PCI master enable ('BM') bit located in the PCI_CSR register space (offset: 0x004). This bit is set as default after power up.

Some VMEbus Slave Image examples are shown in Figure B-1.

FIGUREB-1. *Configuration example for VMEbus slave images*



VMEbus Register Access Image

In this configuration example, the VMEbus Register Access Image is set up by use of the DIP switch and jumpers.

TABLE B-1. VME_RAI Setup

Action:	Result:
SW3-3 ON	VME_RAI is enabled.
SW3-1 ON, SW3-2 OFF	VME_RAI is mapped in A24 address space.
SW5 All OFF	VME_RAI base address is set to 0x000000.
SW11-2 OFF	Disable Auto-slot ID protocol.

With the jumper settings described above, the Universe IID will power up in a state where VMEbus accesses with A24 AM codes, in the address range 0x0-0xFFF, will map into Universe II registers.

The VME_RAI will be utilized to set up the VMEbus slave images described below.

VMEbus Slave Image 0

In this configuration example, the VMEbus Slave Image 0 is set up to map A16 supervisory accesses, in the address range 0x0-0x4FFF, from VMEbus to Configuration Cycles on the PCI bus.

TABLE B-2. VME Slave image 0 - setup

Write from VME	PCI Data 1)	Result:
D:0x0000.0000 to A:0x000F04	0x0000.0000	Base Address set to 0x000000
D:0x0050.0000 to A:0x000F08	0x0000.5000	Bound Address set to 0x005000
D:0x0000.0000 to A:0x000F0C	0x0000.0000	Translation Offset set to 0x000000
D:0x0200.E080 to A:0x000F00	0x80E0.0002	Enable Image, VAS=A16, LAS=Config Space, PGM=both, SUPER=Supervisor, other options disabled.

1) This column shows write data for configuration from PCI

VMEbus Slave Image 1

The VMEbus Slave Image 1 is set up to map A24 accesses, in the address range 0x100000-0x3FFFFF, from VMEbus to I/O Cycles on the PCI bus, with PCI addresses starting from 0x02100000.

TABLE B-3. VME Slave image 1 - setup

Write from VME	PCI Data 1)	Result:
D:0x0000.1000 to A:0x000F18	0x0010.0000	Base Address set to 0x100000
D:0x0000.4000 to A:0x000F1C	0x0040.0000	Bound Address set to 0x400000
D:0x0000.0002 to A:0x000F20	0x0200.0000	Translation Offset set to 0x2000000
D:0x4100.F180 to A:0x000F14	0x80F1.0041	Enable Image, VAS=A24, LAS=I/O Space,PGM=both, SUPER=both, LLRMW=enabled, other options disabled.

1) This column shows write data for configuration from PCI

VMEbus Slave Image 2

VMEbus Slave Image 2 is set up to map A32 accesses, in the address range 0x4000.0000-0x7FFF.FFFF, from VMEbus to Memory Cycles on the PCI bus, with PCI addresses starting from 0x6000.0000. Write posting and read pre fetching is enabled.

TABLE B-4. VME Slave image 2 - setup

Write from VME	PCI Data 1)	Result:
D:0x0000.0040 to A:0x000F2C	0x4000.0000	Base Address set to 0x4000.0000
D:0x0000.0080 to A:0x000F30	0x8000.0000	Bound Address set to 0x8000.0000
D:0x0000.0020 to A:0x000F34	0x2000.0000	Translation Offset set to 0x2000.0000
D:0x0000.F2E0 to A:0x000F28	0xE0F2.0000	Enable Image, VAS=A32, LAS=Mem. Space, PGM=both, SUPER=both, PWEN&PREN= enabled, other options disabled.

1) This column shows write data for configuration from PCI

Initialization Sequence

By performing the list of cycles shown in the table below, the mapping for this configuration example is achieved.

TABLE B-5. Initialization sequence for VMEbus slave image config. example.

Write from VME	PCI Data 1)	Result:
D:0x0000.0000 to A:0x000F04	0x0000.0000	VSI_0: Base Address set to 0x000000
D:0x0050.0000 to A:0x000F08	0x0000.5000	VSI_0: Bound Address set to 0x005000
D:0x0000.0000 to A:0x000F0C	0x0000.0000	VSI_0: Translation Offset set to 0x000000
D:0x0200.E080 to A:0x000F00	0x80E0.0002	VSI_0: Enable Image, VAS=A16, LAS=Config Space, PGM=both, SUPER=Supervisor, other options disabled.
D:0x0000.1000 to A:0x000F18	0x0010.0000	VSI_1: Base Address set to 0x100000
D:0x0000.4000 to A:0x000F1C	0x0040.0000	VSI_1: Bound Address set to 0x400000
D:0x0000.0002 to A:0x000F20	0x0200.0000	VSI_1: Translation Offset set to 0x2000000
D:0x4100.F180 to A:0x000F14	0x80F1.0041	VSI_1: Enable Image, VAS=A24, LAS=I/O Space, PGM=both, SUPER=both, LLRMW=enabled, other options disabled.
D:0x0000.0040 to A:0x000F2C	0x4000.0000	VSI_2: Base Address set to 0x4000.0000
D:0x0000.0080 to A:0x000F30	0x8000.0000	VSI_2: Bound Address set to 0x8000.0000
D:0x0000.0020 to A:0x000F34	0x2000.0000	VSI_2: Translation Offset set to 0x2000.0000
D:0x0000.F2E0 to A:0x000F28	0xE0F2.0000	VSI_2: Enable Image, VAS=A32, LAS=Mem. Space, PGM=both, SUPER=both, PWEN&PREN= enabled, other options disabled.

1) This column shows write data for configuration from PCI

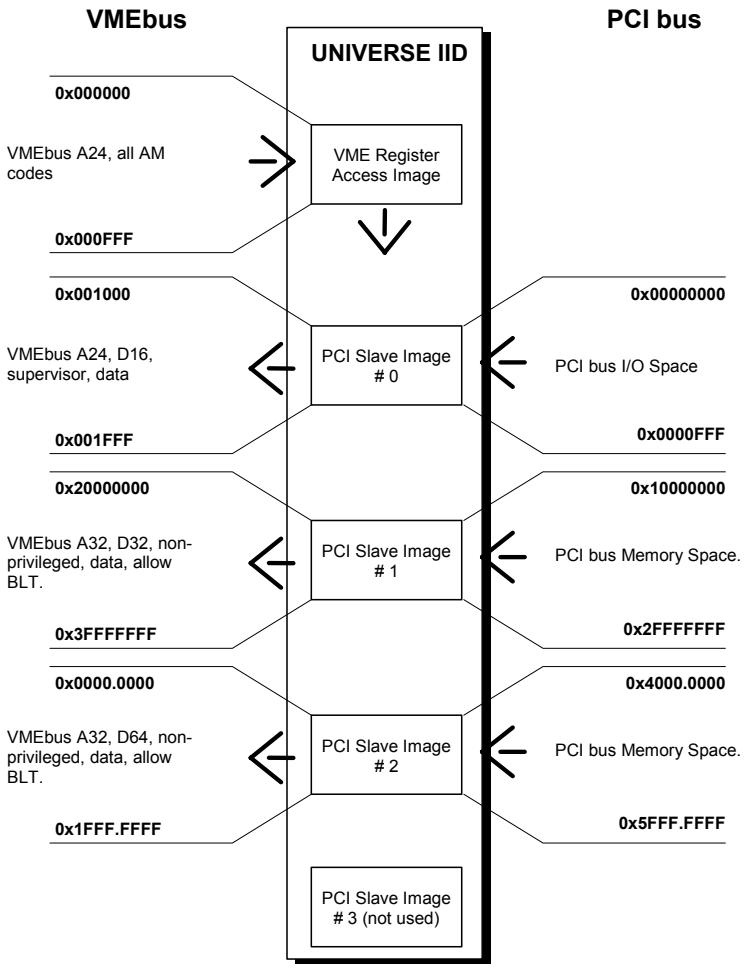
B-3 PCI Slave Images

The VME_RAI, described in the 'VMEbus Slave Images' section, is also utilized to set up PCI slave images in the examples below.

PCI Target Enable - Memory & I/O Space

In addition to the configuration registers for the PCI slave images, two control register bits are essential for mapping PCI bus cycles to VMEbus cycles through the Universe II. The PCI Target Memory Enable ('MS') and Target IO Enable ('IOS') bits, located in the PCI_CSR register (offset: 0x004), must be set to allow the Universe II to respond to PCI memory and I/O commands.

FIGUREB-2. *Configuration example for PCI slave images*



PCI Slave Image 0

In this configuration example, the PCI Slave Image 0 is set up to map PCI I/O Space transactions, in the address range 0x0-0xFFF, to A24, D16 VMEbus cycles in the address range 0x1000-0x1FFF.

TABLE B-6. PCI slave image 0 setup.

Write from VME	PCI Data 1)	Result:
D:0x0000.0000 to A:0x000104	0x0000.0000	Base Address set to 0x0000.0000
D:0x0010.0000 to A:0x000108	0x0000.1000	Bound Address set to 0x0000.1000
D:0x0010.0000 to A:0x00010C	0x0000.1000	Translation Offset set to 0x0000.1000
D:0x0110.4180 to A:0x000100	0x8041.1001	Enable Image, VAS=A24, VDW=D16, LAS=I/O Space, PGM=data, SUPER=supervisor, other options disabled.

1) This column shows write data for configuration from PCI

PCI Slave Image 1

In this configuration example, the PCI Slave Image 1 is set up to map PCI Memory Space transactions, in the address range 0x1000.0000-0x2FFF.FFFF, to A32, D32 VMEbus cycles, in the address range 0x2000.0000-0x3FFF.FFFF.

TABLE B-7. PCI slave image 1 setup.

Write from VME	PCI Data 1)	Result:
D:0x0000.0010 to A:0x000118	0x1000.0000	Base Address set to 0x1000.0000
D:0x0000.0030 to A:0x00011C	0x3000.0000	Bound Address set to 0x3000.0000
D:0x0000.0010 to A:0x000120	0x1000.0000	Translation Offset set to 0x1000.0000
D:0x0001.82C0 to A:0x000114	0xC082.0100	Enable Image, VAS=A32, VDW=D32, LAS=Mem. Space, PGM=data, SUPER=non-priv, Posted Write enabled, BLT allowed.

1) This column shows write data for configuration from PCI

PCI Slave Image 2

PCI Slave Image 2 is set up to map PCI Memory Space transactions, in the address range 0x4000.0000-0x5FFF.FFFF to A32, D64 VMEbus cycles, in the address range 0x0000.0000-0x1FFF.FFFF.

TABLE B-8. PCI slave image 2 setup

Write from VME	PCI Data 1)	Result:
D:0x0000.0040 to A:0x00012C	0x4000.0000	Base Address set to 0x4000.0000
D:0x0000.0060 to A:0x000130	0x6000.0000	Bound Address set to 0x6000.0000
D:0x0000.00C0 to A:0x000134	0xC000.0000	Translation Offset set to 0xC000.0000
D:0x0001.C2C0 to A:0x000128	0xC0C2.0100	Enable Image, VAS=A32, VDW=D64, LAS=Mem. Space, PGM=data, SUPER=non-priv, Posted Write enabled, BLT allowed.

1) This column shows write data for configuration from PCI

Initialization Sequence

By performing the list of cycles shown in the table below, the mapping for this configuration example is achieved.

TABLE B-9. Initialization sequence for PCI slave image config. example.

Write from VME	PCI Data 1)	Result:
D:0x0700.8002 to A:0x000004	0x0200.0007	PCI Target Enable bits set. (this write cycle also sets the PCI master enable bit if it is disabled, ref. VMEbus Slave Image section).
D:0x0000.0000 to A:0x000104	0x0000.0000	LSI_0: Base Address set to 0x0000.0000
D:0x0010.0000 to A:0x000108	0x0000.1000	LSI_0: Bound Address set to 0x0000.1000
D:0x0010.0000 to A:0x00010C	0x0000.1000	LSI_0: Translation Offset set to 0x0000.1000
D:0x0110.4180 to A:0x000100	0x8041.1001	LSI_0: Enable Image, VAS=A24, VDW=D16, LAS=I/O Space, PGM=data, SUPER=supervisor, other options disabled.
D:0x0000.0010 to A:0x000118	0x1000.0000	LSI_1: Base Address set to 0x1000.0000
D:0x0000.0030 to A:0x00011C	0x3000.0000	LSI_1: Bound Address set to 0x3000.0000
D:0x0000.0010 to A:0x000120	0x1000.0000	LSI_1: Translation Offset set to 0x1000.0000
D:0x0001.82C0 to A:0x000114	0xC082.0100	LSI_1: Enable Image, VAS=A32, VDW=D32, LAS=Mem. Space, PGM=data, SUPER=non-priv, Posted Write enabled, BLT allowed.
D:0x0000.0040 to A:0x00012C	0x4000.0000	LSI_2: Base Address set to 0x4000.0000
D:0x0000.0060 to A:0x000130	0x6000.0000	LSI_2: Bound Address set to 0x6000.0000
D:0x0000.00C0 to A:0x000134	0xC000.0000	LSI_2: Translation Offset set to 0xC000.0000
D:0x0001.C2C0 to A:0x000128	0xC0C2.0100	LSI_2: Enable Image, VAS=A32, VDW=D64, LAS=Mem. Space, PGM=data, SUPER=non-priv, Posted Write enabled, BLT allowed.

1) This column shows write data for configuration from PCI

C VME64 Configuration ROM

A VME64 Configuration SPROM is included in the board design. This SPROM is accessible from the processor via a set of I/O pins on the third PCIX-to-PCIX bridge.

The general content layout is described in the ANSI/VITA 1.1.1997 specification (page 53).

TABLE C-1. VME64 configuration ROM

CROM Offset: 03 (VME CR/CSR Space)

Offset	Value	Description
03		Checksum. Eight bit 2s complement binary checksum (CR bytes 03-7F).
07	00	Length of ROM to be check summed. (MSB)
0B	00	Length of ROM to be check summed. (NMSB)
0F	1F	Length of ROM to be check summed. (LSB)
13	0x00	Not to be used
	0x01-0x80	Reserved for future use
	0x81	Only use D08(EO), every fourth byte
	0x82	Only use D08(EO), every other byte
	0x83	Use D16 or D08(EO), every byte used
	0x84	Use D32, D16 or D08(EO), every byte used
	0x85-0xFE	Reserved for future use
	0xFF	Not to be used
17	0x00	Not to be used
	0x01-0x80	Reserved for future use
	0x81	Only use D08(EO), every fourth byte
	0x82	Only use D08(EO), every other byte
	0x83	Use D16 or D08(EO), every byte used
	0x84	Use D32, D16 or D08(EO), every byte used
	0x85-0xFE	Reserved for future use
	0xFF	Not to be used
1B		CSR /CSR Space Specification ID
	0x00	Not to be used
	0x01	VME64 -1994 version
	0x02-0xFE	Reserved for future use
	0xFF	Not to be used
1F	43	'C'. Used to identify valid CR.
23	52	'R'. Used to identify valid CR.
27	00	24 bit IEEE Assigned Manufacturers ID.
2B	60	0x006046 = VMETRO
2F	46	
33		Board ID 31-24
37		Board ID 23-16
3B		Board ID 15-8

TABLE C-1. VME64 configuration ROM

3F		Board ID 7-0
43		Revision ID 31-24
47		Revision ID23-16
4B		Revision ID 15-8
4F		Revision ID 7-0
53	00	Pointer to null terminated ASCII string. Revision ID (VMETRO Assigned)
57	00	0x000000 = No string
5B	00	
5F-7B	00	Reserved for future use
7F	0x00	Not used
	0x01	No program, ID ROM only
	0x02-0x4F	Manufacturer defined
	0x50-7F	User defined
	0x80-EF	Reserved for future use
	0xF0-FE	Reserved by Boot Firmware (P1275)
	0xFF	Not to be used

The following tables describe the two fields which are supplied by each board vendor.

TABLE C-2. CR Entry: Board ID Offset: 0x00033-0x0003F

Bits	Function
31-24	PRODUCT FAMILY
23-16	Family Specific Number
15-8	PRODUCT NAME & MODEL (MSB)
7-0	PRODUCT NAME & MODEL (LSB)

TABLE C-3. Assigned Board ID Values

Field	Bit(s)	Values
Product Family	31-24	0x02=PowerMIDAS
Family Specific Number	23	VME-P0 Connector: 0 = Not Mounted 1 = Mounted
	22	PCI-to-RACEway Bridge: 0 = Not Mounted 1 = Mounted
	21:18	Base Board Front Panel Configuration: 0 = RS-232 1 = RS-232 / Ethernet 2 = RS-232 / Ethernet / 1x Fibre Channel 3 = RS-232 / Ethernet / 2x Fibre Channel 4 = RS-232 / 2x Fibre Channel 5 = RS-232 / 1x Fibre Channel 8 = RS-422 9 = RS-422 / Ethernet 10 = RS-422 / Ethernet / 1x Fibre Channel 11 = RS-422 / Ethernet / 2x Fibre Channel 12 = RS-422 / 2x Fibre Channel 13 = RS-422 / 1x Fibre Channel Other values reserved.
	18:16	Processor SDRAM Memory Size: 0 = 128MiB 1 = 256MiB Other values reserved
	15:0	PowerMIDAS: 0x5210 = M5210
Product Name & Model		Other values reserved

TABLE C-4. CR Entry: Revision ID Offset: 0x00043-0x0004F

Bits	Function
31-24	Family Specific Number
23-16	Family Specific Number
15-8	PCB REVISION
7-0	ECO LEVEL

TABLE C-5. Revision ID Description

Field	Bits	Description
Family Specific Number	31-16	Reserved
PCB Revision	15:12	PCB Revision number. (Start at 0xA and wrap from 0xF to 0x0)
Reserved	11:8	'0000'
ECO Level	7:0	ECO Level indicator. (Start at 0x00 and go from 0x09 to 0x0A)

D VME Connector Pinout

D-1 General Description

The abbreviation "NC" means Not Connected.

The description "Jn4-1", Jn4-2", etc. used in the pinout table for P2 connector means the pins 1, 2, etc. on connector Jn4 on PMC slot 2.

D-2 VME P0 Connector for all models

Defined in DY4 StarLink PMC manual Pinout is compatable with DY4 Starlink PMC Module and Rear Transition Module.

TABLE D-1. P0 pinout for all models

PMC#2-P4 Pin	VME-P0 Pin	Signal Description
1	E4	Link A Pair 3 Rx+
2	D4	Link A Pair 3 Tx+
3	C4	Link A Pair 3 Rx-
4	B4	Link A Pair 3 Tx-
5	A4	Link A Pair 2 Rx+
6	E5	Link A Pair 2 Tx+
7	D5	Link A Pair 2 Rx-
8	C5	Link A Pair 2 Tx-
9	B5	Link A Pair 1 Rx+
10	A5	Link A Pair 1 Tx+
11	E6	Link A Pair 1 Rx-
12	D6	Link A Pair 1 Tx-
13	C6	Link A Pair 0 Rx+
14	B6	Link A Pair 0 Tx+
15	A6	Link A Pair 0 Rx-
16	E7	Link A Pair 0 Tx-
17	D7	Link B Pair 3 Rx+
18	C7	Link B Pair 3 Tx+
19	B7	Link B Pair 3 Rx-
20	A7	Link B Pair 3 Tx-
21	E8	Link B Pair 2 Rx+
22	D8	Link B Pair 2 Tx+
23	C8	Link B Pair 2 Rx-
24	B8	Link B Pair 2 Tx-
25	A8	Link B Pair 1 Rx+
26	E12	Link B Pair 1 Tx+
27	D12	Link B Pair 1 Rx-
28	C12	Link B Pair 1 Tx-
29	B12	Link B Pair 0 Rx+
30	A12	Link B Pair 0 Tx+
31	E13	Link B Pair 0 Rx-
32	D13	Link B Pair 0 Tx-
33	C13	Link C Pair 3 Rx+
34	B13	Link C Pair 3 Tx+

TABLE D-1. P0 pinout for all models

35	A13	Link C Pair 3 Rx-
36	E14	Link C Pair 3 Tx-
37	D14	Link C Pair 2 Rx+
38	C14	Link C Pair 2 Tx+
39	B14	Link C Pair 2 Rx-
40	A14	Link C Pair 2 Tx-
41	E15	Link C Pair 1 Rx+
42	D15	Link C Pair 1 Tx+
43	C15	Link C Pair 1 Rx-
44	B15	Link C Pair 1 Tx-
45	A15	Link C Pair 0 Rx+
46	E16	Link C Pair 0 Tx+
47	D16	Link C Pair 0 Rx-
48	C16	Link C Pair 0 Tx-
49	B16	Link D Pair 3 Rx+
50	A16	Link D Pair 3 Tx+
51	E17	Link D Pair 3 Rx-
52	D17	Link D Pair 3 Tx-
53	C17	Link D Pair 2 Rx+
54	B17	Link D Pair 2 Tx+
55	A17	Link D Pair 2 Rx-
56	E18	Link D Pair 2 Tx-
57	D18	Link D Pair 1 Rx+
58	C18	Link D Pair 1 Tx+
59	B18	Link D Pair 1 Rx-
60	A18	Link D Pair 1 Tx-
61	E19	Link D Pair 0 Rx+
62	D19	Link D Pair 0 Tx+
63	C19	Link D Pair 0 Rx-
64	B19	Link D Pair 0 Tx-

D-3 VME P1 Connector for all models

TABLE D-2. VME P1 Connector

pin#	row Z	row A	row B	row C	row D
1	NC	D[0]	BBSY*	D[8]	+5V1)
2	GND	D[1]	BCLR*	D[9]	GND1)
3	NC	D[2]	ACFAIL*	D[10]	NC
4	GND	D[3]	BG0IN*	D[11]	NC
5	NC	D[4]	BG0OUT*	D[12]	NC
6	GND	D[5]	BG1IN*	D[13]	NC
7	NC	D[6]	BG1OUT*	D[14]	NC
8	GND	D[7]	BG2IN*	D[15]	NC
9	NC	GND	BG2OUT*	GND	NC
10	GND	SYSCLK	BG3IN*	SYSFAIL*	NC
11	NC	GND	BG3OUT*	BERR*	NC
12	GND	DS1*	BR0*	SYSRESET*	NC
13	NC	DS0*	BR1*	LWORD*	NC
14	GND	WRITE*	BR2*	AM5	NC
15	NC	GND	BR3*	A[23]	NC
16	GND	DTACK*	AM0	A[22]	NC
17	NC	GND	AM1	A[21]	NC
18	GND	AS*	AM2	A[20]	NC
19	NC	GND	AM3	A[19]	NC
20	GND	IACK*	GND	A[18]	NC
21	NC	IACKIN*	NC	A[17]	NC
22	GND	IACKOUT*	NC	A[16]	NC
23	NC	AM4	GND	A[15]	NC
24	GND	A[7]	IRQ7*	A[14]	NC
25	NC	A[6]	IRQ6*	A[13]	NC
26	GND	A[5]	IRQ5*	A[12]	NC
27	NC	A[4]	IRQ4*	A[11]	NC
28	GND	A[3]	IRQ3*	A[10]	NC
29	NC	A[2]	IRQ2*	A[9]	NC
30	GND	A[1]	IRQ1*	A[8]	NC
31	NC	-12V	NC	+12V	GND
32	GND	+5V	+5V	+5V	+5V

D-4 VME P2 Connector for non-R model

TABLE D-3. P2 pinout for non-R model

pin#	row Z	row A	row B	row C	row D
1	Jn4-2	NC	+5V	NC	Jn4-1
2	GND	NC	GND	NC	Jn4-3
3	Jn4-5	NC	NC	NC	Jn4-4
4	GND	NC	A[24]	NC	Jn4-6
5	Jn4-8	NC	A[25]	NC	Jn4-7
6	GND	NC	A[26]	NC	Jn4-9
7	Jn4-11	NC	A[27]	NC	Jn4-10
8	GND	NC	A[28]	NC	Jn4-12
9	Jn4-14	NC	A[29]	NC	Jn4-13
10	GND	NC	A[30]	NC	Jn4-15
11	Jn4-17	NC	A[31]	NC	Jn4-16
12	GND	NC	GND	NC	Jn4-18
13	Jn4-20	NC	+5V	NC	Jn4-19
14	GND	NC	D[16]	NC	Jn4-21
15	Jn4-23	NC	D[17]	NC	Jn4-22
16	GND	NC	D[18]	NC	Jn4-24
17	Jn4-26	NC	D[19]	NC	Jn4-25
18	GND	NC	D[20]	NC	Jn4-27
19	Jn4-29	NC	D[21]	NC	Jn4-28
20	GND	NC	D[22]	NC	Jn4-30
21	Jn4-32	NC	D[23]	NC	Jn4-31
22	GND	NC	GND	NC	Jn4-33
23	Jn4-35	NC	D[24]	NC	Jn4-34
24	GND	NC	D[25]	NC	Jn4-36
25	Jn4-38	NC	D[26]	NC	Jn4-37
26	GND	NC	D[27]	NC	Jn4-39
27	Jn4-41	NC	D[28]	NC	Jn4-40
28	GND	NC	D[29]	NC	Jn4-42
29	Jn4-44	NC	D[30]	NC	Jn4-43
30	GND	NC	D[31]	NC	Jn4-45
31	Jn4-46	NC	GND	NC	GND
32	GND	NC	+5V	NC	+5V

D-5 VME P2 Connector for -R models

TABLE D-4. P2 pinout for -R model

pin#	row Z	row A	row B	row C	row D
1	NC	XCLKI	+5V	XRESETIO*	NC
2	GND	GND	GND	NC	NC
3	NC	pIO09	NC	XSYNCI*	NC
4	GND	pIO08	A[24]	GND	NC
5	NC	GND	A[25]	pIO07	NC
6	GND	pIO06	A[26]	GND	NC
7	NC	GND	A[27]	pIO11	NC
8	GND	pIO10	A[28]	GND	NC
9	NC	pIO04	A[29]	pSTRBIO	NC
10	GND	GND	A[30]	pRPLYIO	NC
11	NC	pIO05	A[31]	GND	NC
12	GND	pIO03	GND	pREQI	NC
13	NC	GND	+5V	pREQO	NC
14	GND	pRDCON	D[16]	GND	NC
15	NC	pPAR	D[17]	pIO02	NC
16	GND	GND	D[18]	pIO01	NC
17	NC	pIO00	D[19]	GND	NC
18	GND	pIO15	D[20]	pIO12	NC
19	NC	GND	D[21]	pIO25	NC
20	GND	pIO24	D[22]	GND	NC
21	NC	pIO31	D[23]	pIO29	NC
22	GND	GND	GND	pIO30	NC
23	NC	pIO28	D[24]	GND	NC
24	GND	pIO27	D[25]	pIO26	NC
25	NC	GND	D[26]	pIO23	NC
26	GND	pIO22	D[27]	GND	NC
27	NC	pIO20	D[28]	pIO19	NC
28	GND	GND	D[29]	pIO21	NC
29	NC	pIO18	D[30]	GND	NC
30	GND	pIO17	D[31]	pIO16	NC
31	NC	GND	GND	pIO14	GND
32	GND	pIO13	+5V	GND	+5V

Note – Signals on rows A and C are used by RACE++ interface or P2IO.

E PMC Connector Pinout

E-1 General Description

"NC" means Not Connected.

"PU" and "PD" mean that the connector pin is connected to +5V via a pull up resistor or to ground (GND) via a pull down resistor respectively.

Connections to the VME P2 connector are denoted as P2-[row][pin].

Example: P2-D1 means connection to pin 1 in row D of the VME P2 connector.

Pins that are PU, PD or NC for compliance with otherwise unsupported PCI signals have the PCI signal name appended in parenthesis.

E-2 PMC Connector Pinout - Jn1 for both PMC slots on all Models

Jn1 64 Bit PCI

TABLE E-1. Pinout for PMC connector Jn1 (both slots/all models)

Pin#	Signal Name	Pin#	Signal Name
1	PD (TCK)	2	-12V
3	GND	4	INTA#
5	INTB#	6	INTC#
7	BUSMODE1#	8	+5V
9	INTD#	10	NC (PCI-RSVD)
11	GND	12	NC (PCI-RSVD)
13	CLK	14	GND
15	GND	16	GNT#
17	REQ#	18	+5V
19	V (I/O)	20	AD[31]
21	AD[28]	22	AD[27]
23	AD[25]	24	GND
25	GND	26	C/BE[3]#
27	AD[22]	28	AD[21]
29	AD[19]	30	+5V
31	V (I/O)	32	AD[17]
33	FRAME#	34	GND
35	GND	36	IRDY#
37	DEVSEL#	38	+5V
39	XCAP	40	LOCK#
41	PU (SDONE#)	42	PU (SBO#)
43	PAR	44	GND
45	V (I/O)	46	AD[15]
47	AD[12]	48	AD[11]
49	AD[09]	50	+5V
51	GND	52	C/BE[0]#
53	AD[06]	54	AD[05]
55	AD[04]	56	GND
57	V (I/O)	58	AD[03]
59	AD[02]	60	AD[01]
61	AD[00]	62	+5V
63	GND	64	REQ64#

E-3 PMC Connector Pinout - Jn2 for both PMC slots on all Models

Jn2 64 Bit PCI

TABLE E-2. Pinout for PMC connector Jn2 (both slots/all models)

Pin#	Signal Name	Pin#	Signal Name
1	+12V	2	PD (TRST#)
3	PD (TMS)	4	NC (TDO)
5	PD (TDI)	6	GND
7	GND	8	NC (PCI-RSVD)
9	NC (PCI-RSVD)	10	NC (PCI-RSVD)
11	PU (BUSMODE2#)	12	+3.3V
13	RST#	14	PD (BUSMODE3#)
15	3.3V	16	PD (BUSMODE4#)
17	NC (PCI-RSVD)	18	GND
19	AD[30]	20	AD[29]
21	GND	22	AD[26]
23	AD[24]	24	+3.3V
25	IDSEL	26	AD[23]
27	+3.3V	28	AD[20]
29	AD[18]	30	GND
31	AD[16]	32	C/BE[2]#
33	GND	34	IDSELB
35	TRDY#	36	+3.3V
37	GND	38	STOP#
39	PERR#	40	GND
41	+3.3V	42	SERR#
43	C/BE[1]#	44	GND
45	AD[14]	46	AD[13]
47	M66EN	48	AD[10]
49	AD[08]	50	+3.3V
51	AD[07]	52	REQB#
53	+3.3V	54	GNTB#
55	NC (PMC-RSVD)	56	GND
57	NC (PMC-RSVD)	58	EREADY
59	GND	60	RESETOUT#
61	ACK64#	62	+3.3V
63	GND	64	MONARCH#/PU

Note – MONARCH is connected for PMC#1 only (pull-up for PMC#2).

E-4 PMC Connector Pinout - Jn3 for both PMC Slots on all Models

Jn3 64 Bit PCI

TABLE E-3. Pinout for PMC connector Jn3 (both slots/all models)

Pin#	Signal Name	Pin#	Signal Name
1	NC (PCI-RSVD)	2	GND
3	GND	4	C/BE[7]#
5	C/BE[6]#	6	C/BE[5]#
7	C/BE[4]#	8	GND
9	V (I/O)	10	PAR64
11	AD[63]	12	AD[62]
13	AD[61]	14	GND
15	GND	16	AD[60]
17	AD[59]	18	AD[58]
19	AD[57]	20	GND
21	V (I/O)	22	AD[56]
23	AD[55]	24	AD[54]
25	AD[53]	26	GND
27	GND	28	AD[52]
29	AD[51]	30	AD[50]
31	AD[49]	32	GND
33	GND	34	AD[48]
35	AD[47]	36	AD[46]
37	AD[45]	38	GND
39	V (I/O)	40	AD[44]
41	AD[43]	42	AD[42]
43	AD[41]	44	GND
45	GND	46	AD[40]
47	AD[39]	48	AD[38]
49	AD[37]	50	GND
51	GND	52	AD[36]
53	AD[35]	54	AD[34]
55	AD[33]	56	GND
57	V (I/O)	58	AD[32]
59	NC (PCI-RSVD)	60	NC (PCI-RSVD)
61	NC (PCI-RSVD)	62	GND
63	GND	64	NC (PCI-RSVD)

E-5 PMC Connector Pinout - Jn4 for PMC #1 & PMC #2

Jn4 64 Bit PCI

PMC#1-to-VME P2 column only valid for non-Raceway models, PMC#2-to-VME P0 column only valid for P models.

TABLE E-4. Pinout for PMC connector Jn4, PMC slot 1 & 2

P4/Jn4 Pin	PMC#1-to-VME P2 Pin	PMC#2-to-VME P0 Pin	STARLINK Signal	Description
1	C1	D1	ARX3-	Link A Pair 3 Receive data -
2	A1	A1	ATX3-	Link A Pair 3 Transmit data -
3	C2	E1	ARX3+	Link A Pair 3 Receive data +
4	A2	B1	ATX3+	Link A Pair 3 Transmit data +
5	C3	D2	ARX2-	Link A Pair 2 Receive data -
6	A3	A2	ATX2-	Link A Pair 2 Transmit data -
7	C4	E2	ARX2+	Link A Pair 2 Receive data +
8	A4	B2	ATX2+	Link A Pair 2 Transmit data +
9	C5	D3	ARX1-	Link A Pair 1 Receive data -
10	A5	A3	ATX1-	Link A Pair 1 Transmit data -
11	C6	E3	ARX1+	Link A Pair 1 Receive data +
12	A6	B3	ATX1+	Link A Pair 1 Transmit data +
13	C7	D4	ARX0-	Link A Pair 0 Receive data -
14	A7	A4	ATX0-	Link A Pair 0 Transmit data -
15	C8	E4	ARX0+	Link A Pair 0 Receive data +
16	A8	B4	ATX0+	Link A Pair 0 Transmit data +
17	C9	D5	BRX3-	Link B Pair 3 Receive data -
18	A9	A5	BTX3-	Link B Pair 3 Transmit data -
19	C10	E5	BRX3+	Link B Pair 3 Receive data +
20	A10	B5	BTX3+	Link B Pair 3 Transmit data +
21	C11	D6	BRX2-	Link B Pair 2 Receive data -
22	A11	A6	BTX2-	Link B Pair 2 Transmit data -
23	C12	E6	BRX2+	Link B Pair 2 Receive data +
24	A12	B6	BTX2+	Link B Pair 2 Transmit data +
25	C13	D7	BRX1-	Link B Pair 1 Receive data -
26	A13	A7	BTX1-	Link B Pair 1 Transmit data -
27	C14	E7	BRX1+	Link B Pair 1 Receive data +
28	A14	B7	BTX1+	Link B Pair 1 Transmit data +
29	C15	D8	BRX0-	Link B Pair 0 Receive data -
30	A15	A8	BTX0-	Link B Pair 0 Transmit data -
31	C16	E8	BRX0+	Link B Pair 0 Receive data +

TABLE E-4. (Continued)Pinout for PMC connector Jn4, PMC slot 1 & 2

32	A16	B8	BTX0+	Link B Pair 0 Transmit data +
33	C17	D12	CRX3-	Link C Pair 3 Receive data -
34	A17	A12	CTX3-	Link C Pair 3 Transmit data -
35	C18	E12	CRX3+	Link C Pair 3 Receive data +
36	A18	B12	CTX3+	Link C Pair 3 Transmit data +
37	C19	D13	CRX2-	Link C Pair 2 Receive data -
38	A19	A13	CTX2-	Link C Pair 2 Transmit data -
39	C20	E13	CRX2+	Link C Pair 2 Receive data +
40	A20	B13	CTX2+	Link C Pair 2 Transmit data +
41	C21	D14	CRX1-	Link C Pair 1 Receive data -
42	A21	A14	CTX1-	Link C Pair 1 Transmit data -
43	C22	E14	CRX1+	Link C Pair 1 Receive data +
44	A22	B14	CTX1+	Link C Pair 1 Transmit data +
45	C23	D15	CRX0-	Link C Pair 0 Receive data -
46	A23	A15	CTX0-	Link C Pair 0 Transmit data -
47	C24	E15	CRX0+	Link C Pair 0 Receive data +
48	A24	B15	CTX0+	Link C Pair 0 Transmit data +
49	C25	D16	DRX3-	Link D Pair 3 Receive data -
50	A25	A16	DTX3-	Link D Pair 3 Transmit data -
51	C26	E16	DRX3+	Link D Pair 3 Receive data +
52	A26	B16	DTX3+	Link D Pair 3 Transmit data +
53	C27	D17	DRX2-	Link D Pair 2 Receive data -
54	A27	A17	DTX2-	Link D Pair 2 Transmit data -
55	C28	E17	DRX2+	Link D Pair 2 Receive data +
56	A28	B17	DTX2+	Link D Pair 2 Transmit data +
57	C29	D18	DRX1-	Link D Pair 1 Receive data -
58	A29	A18	DTX1-	Link D Pair 1 Transmit data -
59	C30	E18	DRX1+	Link D Pair 1 Receive data +
60	A30	B18	DTX1+	Link D Pair 1 Transmit data +
61	C31	D19	DRX0-	Link D Pair 0 Receive data -
62	A31	A19	DTX0-	Link D Pair 0 Transmit data -
63	C32	E19	DRX0+	Link D Pair 0 Receive data +
64	A32	B19	DTX0+	Link D Pair 0 Transmit data +

F MTBF Values

The Mean Time Between Failures (MTBF) values given here are calculated estimations representing the inherent reliability of the M5000 series SBCs.

The prediction is done according to the Inherent Model in PRISM v1.5 (System reliability assessment tool). PRISM contains experience data and methods for predicting component reliability.

Values are calculated for different environments but this does not mean that operation in this environment is supported. These environments are:

GB (Ground Benign): Locations with controlled temperature and humidity.

GF (Ground Fixed): Locations with moderately controlled environment.

NS (Naval Sheltered): Includes sheltered or below deck conditions on surface ship and equipment installed in submarines.

AIC (Airborne Inhabited Cargo): Typical conditions in cargo compartments, which can be occupied by aircrew.

ARW (Airborne Rotary Winged): Equipment installed on helicopters.

TABLE F-1. MTBF Values (Hours)

Model	GB (25ºC)	GF (35ºC)	NS (40ºC)	AIC (50ºC)	ARW (50ºC)	ARW (75ºC)
M5210RP-EFF	1 259 400	635 280	399 230	195 230	116 280	48 307
M5210-JEJ	1 021 000	551 000	361 000	173 000	112 000	46 000
M5210-GEG	1 106 000	578 000	367 000	178 000	106 000	43 000

Ordering Information

Models

	AMCC 440GX PowerPC Processor	133 MHz PCI-X PMC Positions	High Speed Streaming Memory	RJ45 10/100 Ethernet	Optical 2Gb/s Fibre Channel	RJ45 Gigabit Ethernet	Optical Gigabit Ethernet
M5210-EF0	1	2	256MiB	1	1	-	-
M5210-JEJ	1	2	256MiB	1	-	2	-
M5210-JFJ	1	2	256MiB	-	1	2	-
M5210-JFF	1	2	256MiB	-	2	1	-
M5210-GEG	1	2	256MiB	1	-	-	2
M5210-GFG	1	2	256MiB	-	1	-	2
M5210-GFF	1	2	256MiB	-	2	-	1

In addition:

-4 option: RS-422 instead of RS-232 for the second serial line

Technical Support

In order for us to provide fast technical support, please provide the following information:

- Any modifications made to the default BSP.
- Any changes to the default versions of the flash files, such as mmon.ini and vxbsp.ini.
- Detailed description of all symptoms observed, including serial port output and analyzer trace files if applicable
- Information about 3rd party drivers and HW that is used.

North and South America

Telephone Support	(281) 584-0728
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Europe and the rest of the world

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Fax	+47 23 17 28 01
Website	http://www.vmetro.com/support

References

The Fibre Channel Industry Association (FCIA)
http://www.fibrechannel.org

American National Standards Institute
http://www.ansi.org

Component Manufacturers

Vendor	**Component**	**Available documentation**
Tundra http://www.tundra.com	Universe II (VME-PCI Bridge)	User Manual Manual Addendum Device Errata Application Notes
AMCC http://www.amcc.com/	440GX Processor	Processor Developers Manual Application Notes and more
PLX Technology http://www.plxtech.com	PCI 6540 PCI-X to PCI-X Bridge	Data sheet and more