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Hardware Reference Manual

PMC610 (Front I/O), PMC610J4 (Rear I/O) & PMC612 (Front or Rear I/O) Quad 10/100BaseTX Ethernet

DDC No. Rx-URMH 013 Rev B
Issued 11 March 2002

it's all about connexions

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1 Introduction

This manual describes operation, configuration and installation instructions for the RAMiX, PMC610/PMC610J4 and PMC612 Quad Ethernet PMC controllers. All are Quad Port Ethernet interface cards, offering four, fully independent 10/100 Mbit Ethernet ports using Twisted Pair media (10/ 100BaseTx). Designed to be plugged onto a host processor (e.g., Single Board Computer (SBC)) card, the product family provides an extremely compact, economical high performance Ethernet solution.

The PMC610J4 differs from the PMC610 in the method of connection to the network. The PMC610 has four standard R4J5 connectors accessed on the front panel of the module. The PMC610J4 uses the common mezzanine card (CMC) connector to route the network signals to the host card (which will generally connect to uncommitted pins on the backplane). Use of this connection method complies with industry standards; the specific pin designations are specific to the PMC610J4 (see Specifications for pin out detail). The PMC612 combines the I/O routing of both the PMC610 and PMC610J4. Routing (front panel or rear) is selected by switches on the card, or signal to the J4 connector (allowing routing based upon the presence/absence of a transition card).

There is no operational difference between the products. In the rest of this document, except were explicitly noted, references to the PMC610 apply to all models.

The PIM610J4 is designed to give rear access Input/Output (I/O) when used in conjunction with RAMiX's PIM610J4. The PIM module mates to rear transition modules, which have been designed to the PIM standard (see section on the PIM610J4 for detail)

The PIM612 is designed to give rear access Input/Output (I/O) when used in conjunction with RAMiX's PIM612. The PIM module mates to rear transition modules, which have been designed to the PIM standard (see section on the PIM612 for detail)

1.1 Features

The PMC610 complies with the CMC specification for Peripheral Component Interconnect (PCI) Mezzanine Cards (commonly known as PMC). As such, it will directly connect to any SBC or Expansion Card that supports PMC modules. All initialization, and functional configuration of the PMC610 is done automatically by software. Features implemented on the PMC610 include:

- Four, independent 10/100Mbit Ethernet controllers
- Auto-negotiation to determine speed and duplex
- Full duplex operation is supported
- Automatic power up configuration per PCI specification
- High performance linked list direct memory access (DMA) engine for efficient PCI use
- Deep first-in/first-out (FIFO) buffers on both Transmit and Receive data paths

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2 Handling And Installation

2.1 Handling Precautions

Electronic assemblies use devices that are sensitive to static discharge. Observe anti-static procedures when handling these boards. All products should be in an anti-static plastic bag or conductive foam for storage or shipment. Work at an approved anti-static workstation when unpacking boards.

2.2 Unpacking And Verification

RAMiX products are shipped in individual, reusable shipping boxes. When receiving the shipping container, inspect it for any evidence of physical damage. If the container is damaged, request that the carrier's agent be present during the unpacking of individual boxes and the inspection of each unit.

Remove the PMC module from the shipping box and anti-static packaging. Verify that it is not damaged and that all items are present by referring to the packing list.

2.3 Installation

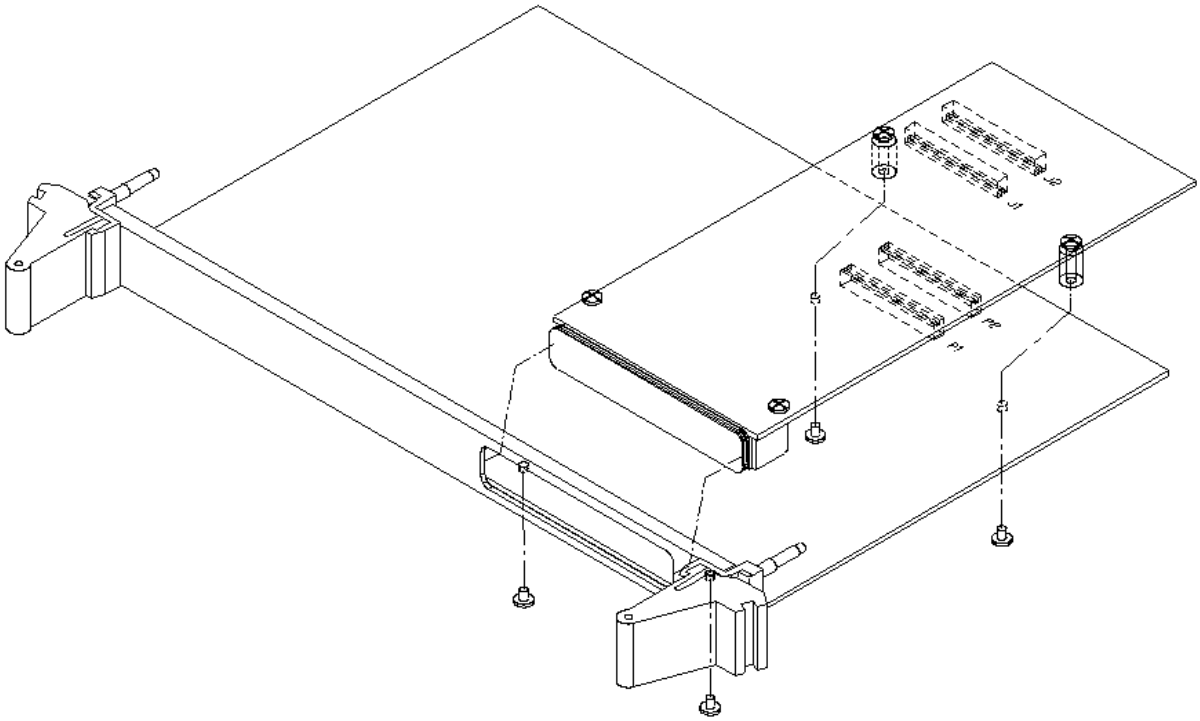
The PMC module is now ready for installation. Installation is done generically as with the commercial versions of the card. Follow any specific procedures recommended by the manufacturer of the chassis used.

Turn all system power OFF. Remove the host board from the chassis (if currently installed). Locate the PMC connectors on the host board. Carefully plug the PMC module into the mating connectors on the host's printed circuit board. Be sure the PMC module is seated properly into the common mezzanine card (CMC) connectors on the host. Refer to the following page.

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Use screws to fasten PMC card t the host CMC.

- Remove the four screws from bottom of the stand-offs of the PMC.
- Line-up the J1 and J2 connectors on the host CMC to the J1 and J2 connectors on the PMC card. (For PMC610J4 the J4 connector will also be installed and must be mated).
- Ensure all connectors are properly aligned before pushing the connectors together.
- Use the four screws to connect the PMC stand-offs to the host CMC.



1. Remove the four screws from bottom of the stand-offs of the PMC610.
2. Line-up the J1 and J2 on the host PCB to PMC610, J1 & J2. (For PMC610J4 the J4 connector will also be installed and must be mated).
3. Push the PMC610 down (make sure all connectors are positioned properly).
4. Use the four screws to connect the PMC610 stand offs to the host PCB.

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2.4 Connection To The Local Network Media

2.4.1 PMC610

The PMC610 has four RJ45 style connectors on the front panel. These allow direct connection using industry standard cabling.

2.4.2 PMC610J4

The PMC610J4 routes all signals to the "J4" connector. This connector is a fully defined option in the industry standard (CMC) specification of the PMC module. It will mate with any host card that has provision for this option. In general, the host card will extend the signals to reserved pins on the backplane (e.g., rows A&C of VME bus).

2.4.3 PMC612

The PMC612 has both the front panel RJ45 connectors of the PMC610 and signals routed to the J4 connector. Only one of the two is active at a given time. (Controlled by switch position or signal indicating presence of transition module)

2.5 Front Panel Connectors And Indicators

2.5.1 PMC610J4 Panels

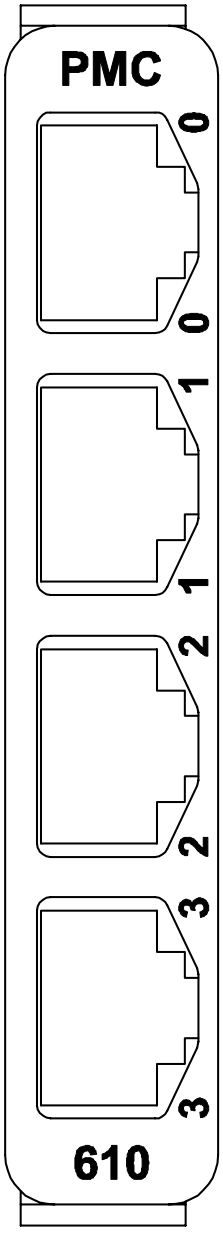
There are no LED indicators on the PMC610

The PMC610J4 has three indicators for each port:

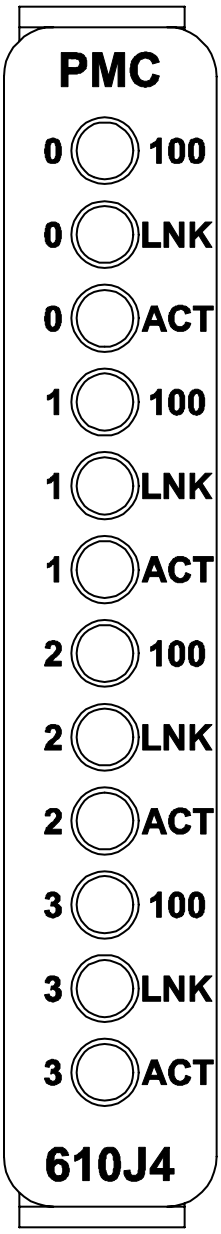
- 100 - illuminated when link speed is 100Mbit
- ACT - illuminates when activity (Rx or Tx) is present on the port
- LINK - Illuminated when a good Link is detected from the partner

Port numbers 0-3 are identified on each front panel.

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RJ45 Connectors



Each port has 3 LED's associated with it.

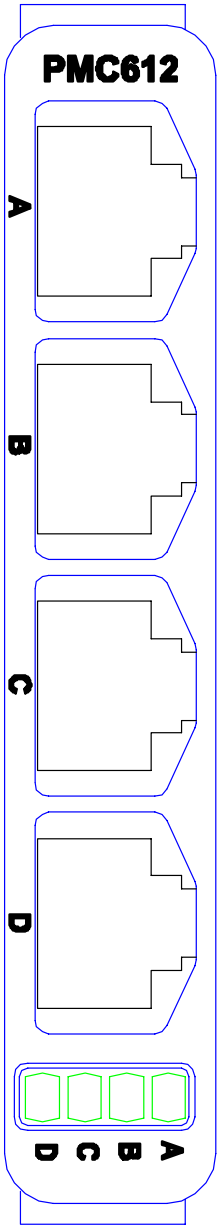
100 – Illuminated when operating at 100Mbit

LNK – Illuminated when valid link detected

ACT – Illuminated on any Rx or Tx packets

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2.5.2 PMC612 Panel

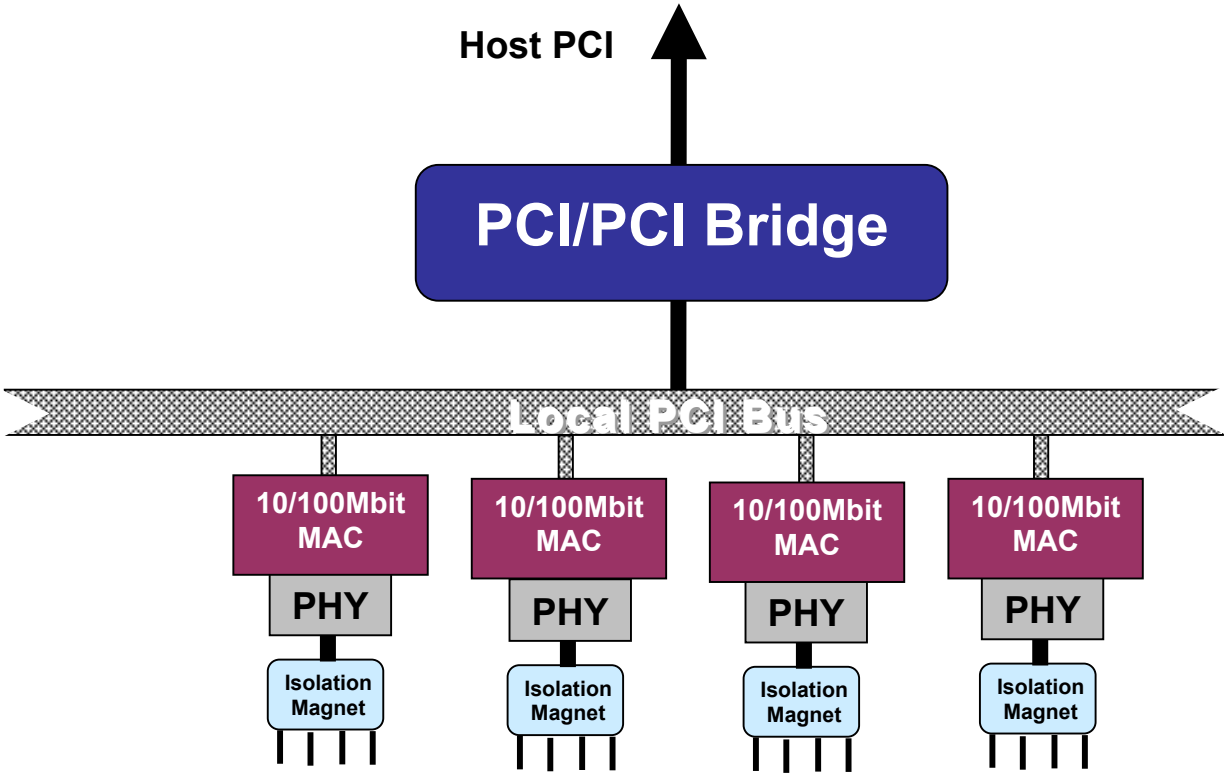


RJ45 Connectors

LED Indicators one per Port
Illuminate when valid link detected on the associated port

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3 PMC610 Architecture



3.1 PMC610 Subsystems

The PMC610 architecture consists of a PCI/PCI bridge to comply with PCI loading specifications and four high-performance 10/100 Ethernet interfaces on a local PCI bus segment.

3.1.1 Bridge

In order to ensure correct operation, the PCI Specification carefully limits the number of devices that can be directly attached to a PCI bus segment. To allow the inclusion of multiple devices within a single system, the PCI to PCI bridge was defined during the early definition of the specification. The bridge provides electrical isolation, creating a secondary bus segment that has a subsection of the PCI address space. Configuration of the bridge is fully defined in the PCI specification; it may be automatically set up by the low level BIOS or other initialization firmware. Once configured, any transaction on the host bus that is destined for an address on the secondary bus is captured by the bridge and forwarded on. The bridge has posting, and read-ahead features that allow full PCI bandwidth transfers to occur across it.

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3.1.2 Ethernet Controllers

The Ethernet Controllers on the PCM610 have enjoyed several years of active evolution, featuring improvements at both the PCI bus, and Ethernet interface. Each controller is a fully independent unit, with local FIFO buffers to decouple PCI and Ethernet activity. Decoupling the Ethernet, and PCI ensures that data transfers will meet the timing requirements of each transaction (which is of particular importance on the Ethernet) regardless of the loading on the other bus interface. These FIFO buffers are sufficiently deep to support good burst transfers, and presenting minimum overhead to the PCI bus.

When doing data transfer on the PCI bus the Ethernet DMA engine will attempt to maximize the length of burst transactions, which is critical to obtain the potential bandwidth of the PCI protocol. These properties allow sustained full bandwidth transfers on both Ethernet ports. The DMA engine supports linked list (scatter/gather) operation for support of “zero copy” software drivers.

Each controller can operate at 10 or 100Mbit speeds in full or half duplex. When used in full duplex operation in a switched fabric environment very high transfer determinism can be achieved.

Support for Auto Negotiation (IEEE 802.3u) allows dynamic configuration of speed and duplex operation based upon capabilities of the current attached device. Negotiation may be over-ridden via software to force a specific speed/duplex operating mode.

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4 PIM610J4 Module

The PIM610J4 Module is a(n) (optional) PIM compliant card routing the Four Ethernet ports to RJ45 connectors. The PMC specification provides for user defined I/O to exit the PMC through one or more 64 pin connectors. This user I/O is commonly employed to bring I/O to the rear of the system in order to augment or replace the I/O available on the PMC's bezel at the front. Prior to the PIM standard, a transition module could not be configured to integrate with an arbitrary PMC card (with J4 I/O routing).

The PIM ***s***tandard defines the mechanical and routing for a daughter card to be installed on a transition board. This allows for the manufacturer of a transition module to allow site-specific configuration of host card (e.g., Single Board Computer) with appropriate PMC modules.

The diagram below illustrates the PIM card and connector. The RJ45 connectors are wired to the 10/100 Tx Specification.

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5 Functional Specifications

5.1 PMC610 Quad 10/100 BaseTX Ethernet, Front I/O

Power	3 Watts
@ 3.3 V	0.9 Amp
Form Factor	
PMC	Single Slot
MTBF	
MIL 217-F Nav Shel 25 Deg. C	281000 Hours
Temperature	
Operating	0 to +60° C
Storage	-40 to +85° C
Humidity	
Operating	5% to 95% Non-Condensing
Storage	5% to 95% Non-Condensing

Conformal Coating	Yes, additional charge

PCI Bus Characteristics	
Signaling	3 & 5V
Specification	2.2
Speed	33/66MHz
Width	32

Ethernet Characteristics	
Ports	
10/100 Base-TX	4
Port Routing	
Front	RJ45

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5.2 PMC610J4 Quad 10/100BaseTX PMC Ethernet, Rear I/O

Power	**3 Watts**
@ 3.3 V	**0.9 Amp**
Form Factor	
PMC	**Single Slot**
MTBF	
MIL 217-F Nav Shel 25 Deg. C	**281000 Hours**
Temperature	
Operating	**0 to +60° C**
Storage	**-40 to +85° C**
Humidity	
Operating	**5% to 95% Non-Condensing**
Storage	**5% to 95% Non-Condensing**

Conformal Coating	**Yes, additional charge**

PCI Bus Characteristics	
Signaling	**3 & 5V**
Specification	**2.2**
Speed	**33/66MHz**
Width	**32**

Ethernet Characteristics	
Ports	
10/100 Base-TX	**4**
Port Routing	
Rear	**routed to J4**

Transition Module available

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5.2.1 PMC610J4 Pin Out Assignments

The table identifies (by pin number) the location for the signals of each port on the J4 connector.

Port	Tx+	Tx-	Rx+	Rx-	CTR	CTT
A	6	4	3	1	2	5
B	14	12	11	9	10	13
C	22	20	19	17	18	21
D	30	28	27	25	26	29

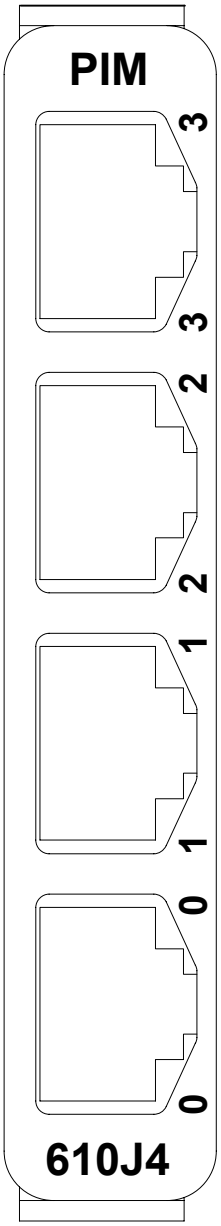
In general, only the Tx/Rx pairs will be required (these are what comprise a standard 10/100BaseT cable or RJ45 connector).

5.3 PIM610J4 PIM Transition Module for PMC610J4

Power	**0 Total Watts**
MTBF	
MIL 217-F Nav Shel 25 Deg. C	**600000 Hours**
Temperature	
Operating	**0 to +60° C**
Storage	**-40 to +85° C**
Humidity	
Operating	**5% to 95% Non-Condensing**
Storage	**5% to 95% Non-Condensing**

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5.3.1 PIM610J4 Transition Module



RJ 45 Connectors

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5.4 PMC612 Quad 10/100BaseTX Ethernet Front or Rear I/O

Power	**3 Watts**
@ 3.3 V	**0.9 Amp**
Form Factor	
PMC	**Single Slot**
MTBF	
MIL 217-F Nav Shel 25 Deg. C	**281000 Hours**
Temperature	
Operating	**0 to +60° C**
Storage	**-40 to +85° C**
Humidity	
Operating	**5% to 95% Non-Condensing**
Storage	**5% to 95% Non-Condensing**

Conformal Coating	**Yes, additional charge**

PCI Bus Characteristics	
Signaling	**3 & 5V**
Specification	**2.2**
Speed	**33/66MHz**
Width	**32**

Ethernet Characteristics	
Ports	
10/100 Base-TX	**4**
Port Routing	
Front or Rear	**RJ45**

Transition Module available

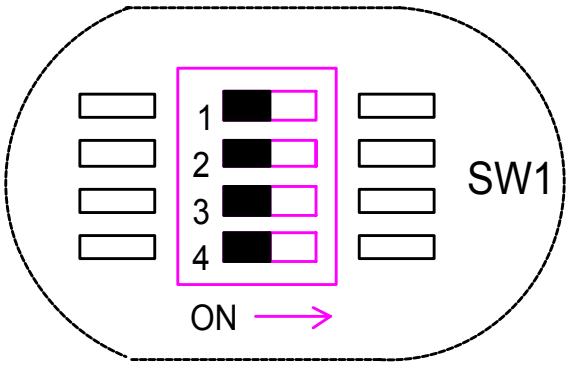
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5.4.1 J4 Pin Out Assignments for PMC612

Port	Tx+	Tx-	Rx+	Rx-	CTR	CTT
A	6	4	3	1	2	5
B	14	12	11	9	10	13
C	22	20	19	17	18	21
D	30	28	27	25	26	29

Pin 16 is used to enable Ports A and B. Pin 24 is used to enable Ports C and D

5.4.2 PMC612 Factory Switch Setting



SW1		
Switch Number	**ON**	**OFF**
1	Enables Port A and B to J4 (Rear)	Enables Ports A and B to Front Panel
2	Enables Ports C and D to J4 (Rear)	Enables Ports C and D to Front Panel
3	Not Used	Not Used
4	Not Used	Not Used

Pin(s) 16 and 24 on the backplane can perform the same function (as noted above).

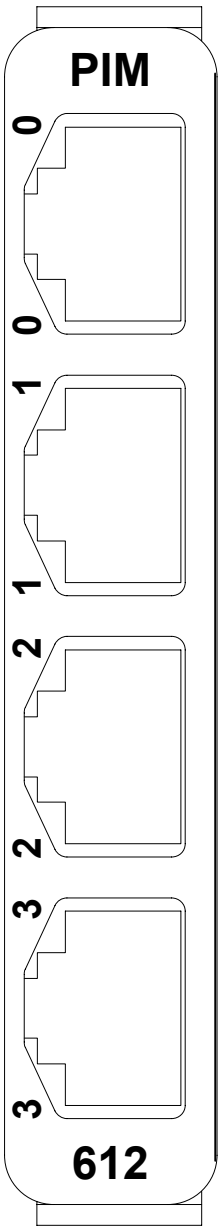
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5.5 PIM612 PIM Transition Module for PMC612

Power	**0 Total Watts**
MTBF	
MIL 217-F Nav Shel 25 Deg. C	**600000 Hours**
Temperature	
Operating	**0 to +60° C**
Storage	**-40 to +85° C**
Humidity	
Operating	**5% to 95% Non-Condensing**
Storage	**5% to 95% Non-Condensing**

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5.5.1 PIM612 Transition Module

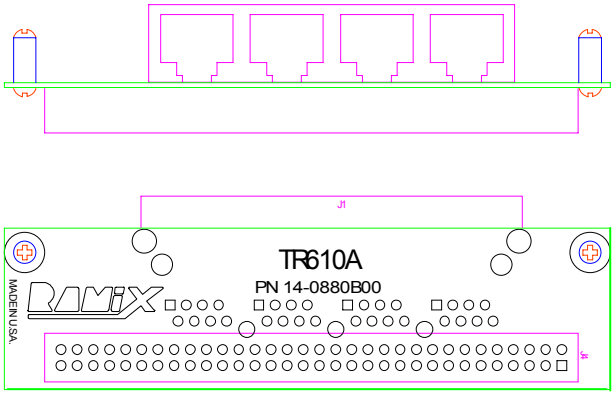


RJ45 Connectors

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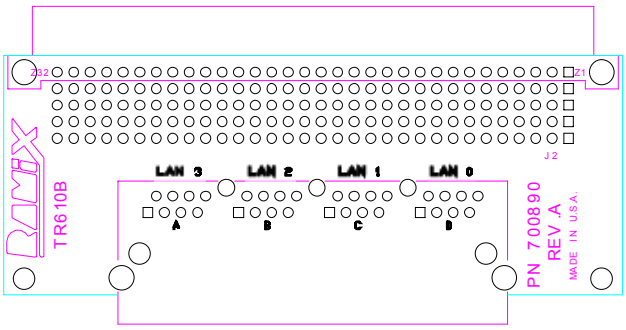
5.6 TR610A Transition Module

The TR610A mates to Motorola's Rear Transition module PMC610J4. There are four RJ45's for the 10/100BaseTX Ethernet ports.



5.7 TR610B Transition Module

The TR610B mates to Rear Transition module mates to a rear VME P2 connector for our PMC610J4. There are four RJ45's for the 10/100BaseTX Ethernet ports.



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