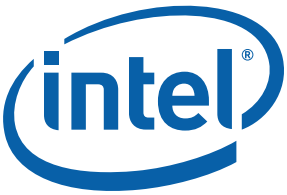

Intel NetStructure® MPCMM0002 Chassis Management Module

Hardware Technical Product Specification

July 2007

Order Number: 309247-004US

Contents

July 2007
Order Number: 309247-004US

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Revision History

Date	Revision	Description
July 2007	004	CMM drawings updated
July 2007	003	Failure Rate and MTBF values updated.
May 2007	002	Quick Start section updated with new CMM removal procedure. CMM dimension drawings updated.
April 2006	001	Initial release of this document.

1.0 Document Organization

This document describes the operation and use of the Intel NetStructure® MPCMM0002 CMM.

The following topics are covered in this document.

Chapter 2.0, “Introduction” introduces the key features of the MPCMM0002 CMM. This chapter includes a product definition and a list of product features.

Chapter 3.0, “Getting Started” provides installation and setup information for the MPCMM0002 CMM. This chapter should be read before using the management module.

Chapter 4.0, “Module Components” describes the major components of the CMM and how the components are interconnected.

Chapter 5.0, “Mechanical Information” provides information on the critical dimensions of the CMM.

Chapter 6.0, “Backplane Considerations” identifies the IPMB routing requirements, power distribution options, and Ethernet routing information for chassis designers to build the MPCMM0002 CMM into their shelves.

Chapter 7.0, “Rear Connections” details the pinouts for the two connectors that interface with a backplane or coplanar mating board.

Chapter 8.0, “Chassis Data Modules (CDMs)” provides information on how the CMM accesses the Chassis Data Module (shelf FRU repository).

Chapter 9.0, “Front Panel” details the cable connections and LEDs on the CMM’s front panel

Chapter 10.0, “Grounding Considerations” provides information on grounding jumpers and ESD discharge features.

Chapter 11.0, “Thermals” provides information on the cooling requirements for the CMM.

Chapter 12.0, “Management Module Specifications” contains the electrical, environmental, and mechanical specifications for the CMM.

Chapter 13.0, “Guidelines for Third Party Chassis Vendors” provides a high-level design of the MPCMM0002 CMM to help third party chassis vendors incorporate it into their chassis.

Chapter 14.0, “Warranty Information” defines the warranty for the MPCMM0002 CMM.

Chapter 15.0, “Customer Support” provides information on reaching Intel customer support.

Chapter 16.0, “Certifications” lists the various applicable product certifications of the CMM.

Chapter 17.0, “Agency Information” contains notices from various certifying agencies.

Chapter 18.0, “Safety Warnings” lists important safety warnings in various languages.

1.1 Acronyms and Terms

The following special acronyms and terms are used in this specification:

Table 1. Acronyms and Terms

Acronym / Term	Meaning
Board	Front Board as defined in PICMG 3.0 specification
CDM	Chassis Data Module
CFM	Cubic Feet per Minute
Chassis	Physical structure containing boards, backplane, PEMs, etc,; same as shelf
CMM	Chassis Management Module
COM	Common connection [used with relay contacts in Section 9.3, “Telco Alarm Connector” on page 48.
Component Side 1	Primary side of PCB, used for synergy with PICMG 3.0 terminology
Component Side 2	Secondary side of PCB
EMI	Electromagnetic Interference
ESD	Electrostatic Discharge
ETSI	European Telecommunications Standards Institute
Frame	Structure in which chassis is mounted; could be enclosed or open; same as rack
FRU	Field Replaceable Unit
I^2C	Inter-Integrated Circuit Bus
IPMB	Intelligent Platform Management Bus
IPMI	Intelligent Platform Management Interface
LED	Light Emitting Diode
LFM	Linear Feet per Minute
MLBF	Mate Last, Break First. Refers to the shortest pin. Used to enable a Hot Swap controller to cut or connect power to a board.
NC	No Connect [exception: in Section 9.3, refers to Normally Closed relay contacts]
NEBS	Network Equipment Building Standards
NO	Normally Open [for relay contacts in Section 9.3]
PCB	Printed Circuit Board
PEM	Power Entry Modules
PICMG	PCI Industrial Computers Manufacturers Group, sponsor of AdvancedTCA specification
Rack	Structure in which chassis is mounted; could be enclosed or open; same as frame
RTM	Rear Transition Module
SCap	Super Capacitor
SEL	System Event Log
Shelf	See Chassis
ShMC	Shelf Management Controller
SSI	Server System Infrastructure

2.0 Introduction

This chapter provides an overview of the Intel NetStructure® MPCMM0002 CMM (CMM). It includes a product definition and summaries of the module's hardware features.

The CMM's software features are detailed in the Intel NetStructure® MPCMM0001 Chassis Management Module *and Intel NetStructure® MPCMM0002 Chassis Management Module Software Technical Product Specification* for version 6.1. That document also describes how to configure the firmware to work in a third-party chassis.

2.1 Architecture Specification

The MPCMM0002 CMM is designed to be compatible with AdvancedTCA* products, which are based on the PICMG* 3.0 specification. A short form of the PICMG 3.0 specification and other AdvancedTCA information can be found on PICMG's AdvancedTCA web site at:

http://www.advancedtca.org/

2.2 User Documentation

The Intel NetStructure® MPCMM0002 CMM is part of the Intel NetStructure family of products. The latest Intel NetStructure product information and documentation are available at:

http://www.intel.com/design/network/products/cbp/index.htm

Documents that are not available on Internet web sites may be obtained from your Intel Business Link (IBL) account, or contact your Intel Field Sales Engineer (FSE) or Field Application Engineer (FAE) to obtain access.

Refer to the following documentation for more information about the components that may be in your system.

- Intel NetStructure® MPCMM0001 Chassis Management Module *and Intel NetStructure® MPCMM0002 CMM Software Technical Product Specification* for version 6.1.
- *Intel NetStructure® MPCBL0001 High-Performance Single Board Computer Technical Product Specification*

2.3 Product Definition

The MPCMM0002 CMM is one of several telecom building blocks from Intel, providing OEM equipment designers with carrier-grade, standards-based, high-availability solutions built on the PICMG* 3.*x* series of specifications. This management module is designed to be used in certain third-party shelves.

Key carrier-grade features of the MPCMM0002 CMM include the following:

- Full Shelf Management Controller and Shelf Manager capability as defined in the PICMG 3.0 specification.
- Support for up to 16 board slots in an AdvancedTCA* chassis.
- Hybrid dual IPMB star topology support for improved reliability, security, and throughput.
- Compact 4U x 280 mm x 3HP size to simplify integration into shelves.
- Comprehensive management interfaces including CLI, SNMP, RPC, and RMCP.
- Dual 10/100 Mbps Ethernet controllers with support for individually routing connections via software to the front panel, optional rear transition modules (RTMs), or PICMG 3.0 backplane.
- Dual serial ports (one out front; one out the RTM) for local console support.
- Isolated telecom alarm connections front or rear to connect to standard telecom alarm systems.
- Direct –48 VDC inputs with on-board power regulation for maximum uptime.
- Low power design, using less than 30 W.
- High-temperature design to survive 70° C incoming (pre-heated) air to CMM for NEBS-style temperature excursions with the proper airflow.
- Dedicated communication paths between dual CMMs for active-standby operation.
- Support for chassis data modules (FRU modules), fan trays, PEMs, and external temperature sensors.
- Integrated backing plate to help meet the full range of standard NEBS and ETSI tests including earthquake, fire, immunity, and safety.

Intel® 80321 processor with Intel® XScale® technology, 128 MByte RAM, and 64 MByte flash memory to provide headroom for future expansion and space for custom user applications on board.

3.0 Getting Started

3.1 Installing the CMM

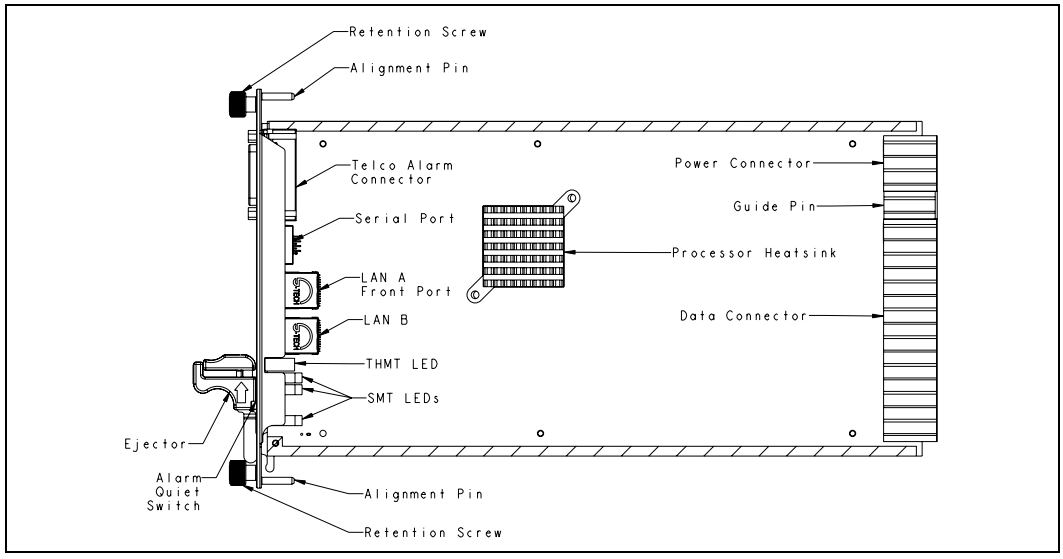
The Intel NetStructure® MPCMM0002 CMM is designed to fit in a variety of compatible chassis and orientations. This chapter provides some useful information for installing the management module in a chassis (shelf), but you will also need to read the third-party documentation provided by the chassis manufacturer or system vendor for your chassis before you install the module.

In addition to the information provided in the third-party documentation just mentioned, you should also read and follow the precautions below:

Caution: As noted in the PICMG* 3.0 specification, AdvancedTCA* products (including the MPCMM0002 CMM) are designed to be installed and serviced by trained service personnel only, not equipment operators. The primary reason for this is the high voltage level (over 60 VDC) that can be present in AdvancedTCA systems.

Caution: Many components in the system contain sensitive electronic components. Service personnel should follow proper grounding procedures when installing or servicing this equipment.

Figure 1. Top View of the Intel NetStructure® MPCMM0002 CMM



3.1.1 Quick Start

1. Open the packing material, find the packing list, and ensure that all the necessary components are present for the Intel NetStructure® MPCMM0002 CMM.
2. Take the MPCMM0002 CMM to the chassis in which it will be installed.
3. Following standard ESD protection procedures, remove the CMM from its anti-static bag.
4. Insert the management module into the card guides for the dedicated CMM slot. Follow the chassis manufacturer's or system vendor's directions for the proper orientation of the CMM.
5. As the CMM is being pushed into the slot, keep the ejector handle open until it engages with the card guide. Ensure the alignment pins on the faceplate engage the receptacles on the card cage. When the ejector handle engages, rotate the ejector handle toward the faceplate until the card is fully seated.
6. Use a screwdriver or pair of pliers to tighten the retention screws on both ends of the faceplate.
7. If the chassis power is on, the CMM will turn on automatically.
8. Connect the appropriate cables to the front or rear serial port, LAN ports. Connect the telco alarm connector, if desired.
9. If a second CMM is to be installed in the chassis, follow the same instructions in this procedure.

To remove the CMM:

1. Loosen the retention screws with a screw driver (Type#1 Philips head screw driver).
2. Pull the ejector away from the faceplate (unlatch condition for ejector) enough to ensure that the blue LED on the faceplate begins to flash. At this stage, the CMM remains attached to the chassis (the backplane connector of CMM is still mated with the chassis's connector).
3. When the blue hot swap LED turns solid blue, pull the ejector farther out in order to eject the CMM from the chassis.

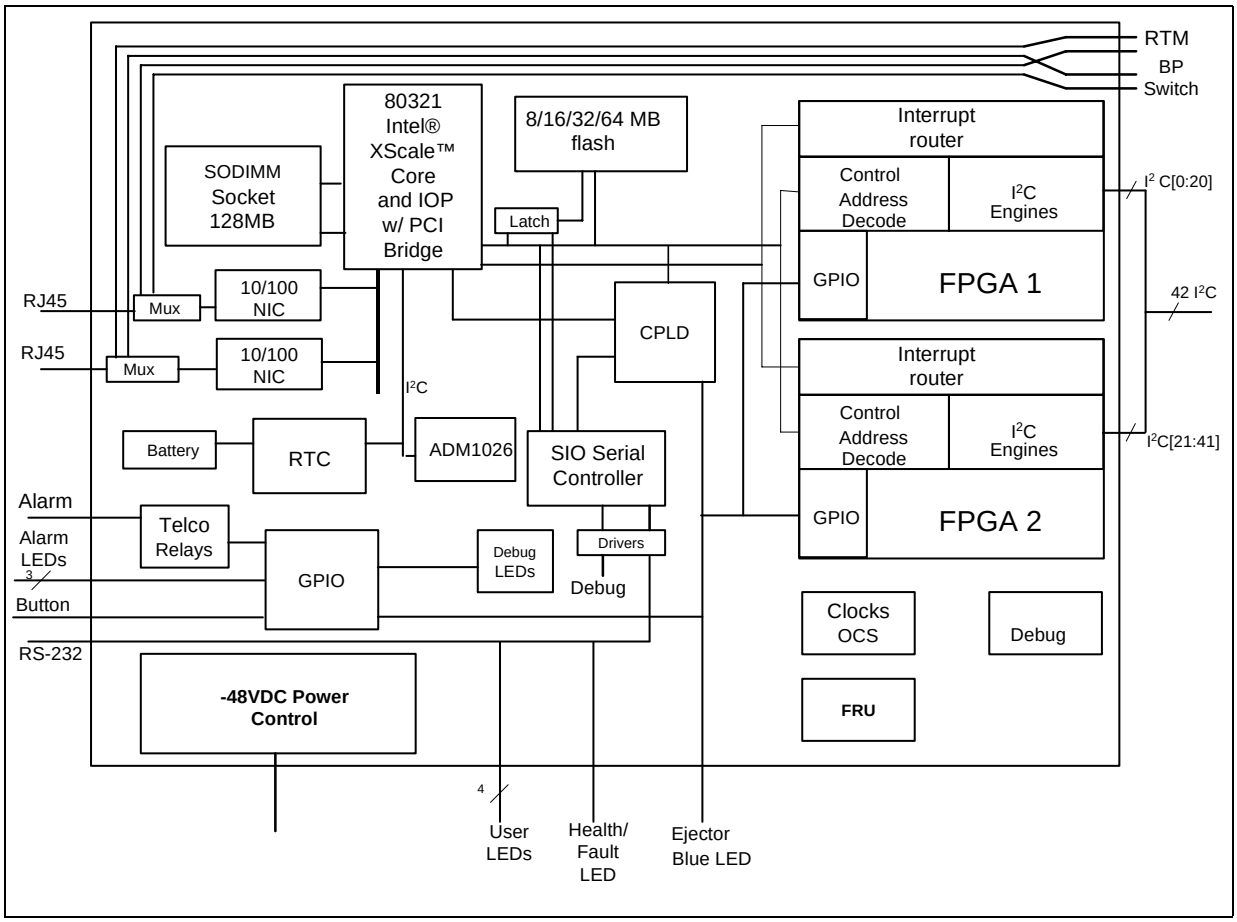
Note: The hot swap LED will turn solid blue only when the redundancy feature is fully enabled.

4.0 Module Components

4.1 Block Diagram

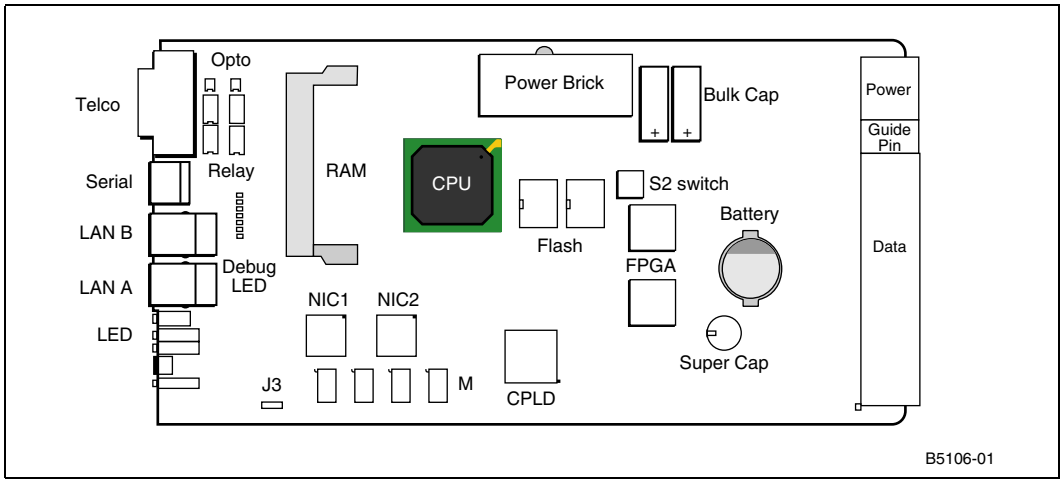
The block diagram for the Intel NetStructure® MPCMM0002 CMM is shown in Figure 2.

Figure 2. CMM Block Diagram



The major components of the CMM are arranged as shown in Figure 3.

Figure 3. CMM Top View Layout



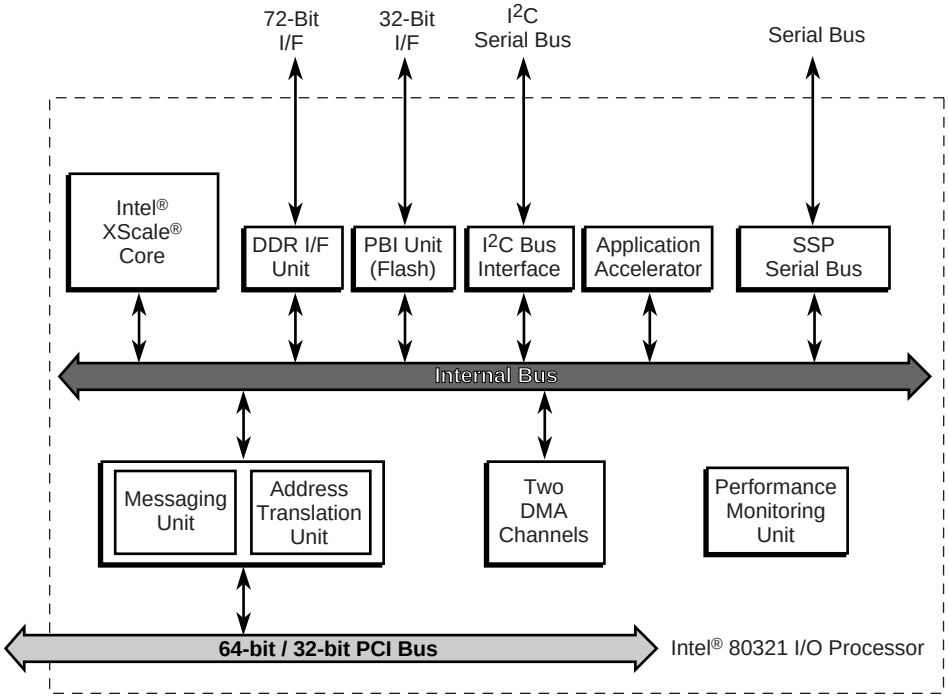
The PCB is composed of 10 layers of FR406 (or equivalent material). The outer layers (1 and 10) are 0.5 ounce copper (plated to 1.6 ounces); all other layers are 1 ounce copper.

Note: S2 above is a four-pole DIP switch block. The first switch in the DIP, S2-1 (1:8), is used for password reset; the other three switches, S2-2, S2-3, and S2-4, are currently not used. The default position for S2-1 is the 'off' position (open). See the Intel NetStructure® MPCMM0001 Chassis Management Module *and Intel NetStructure® MPCMM0002 CMM Software Technical Product Specification* for procedures on resetting the CMM password.

4.2 Intel® 80321 Processor

The CPU in the MPCMM0002 CMM is an Intel® 80321 Processor/PCI Application Bridge with Intel XScale® technology. The internal block diagram is shown in Figure 4.

Figure 4. Intel® 80321 Processor Internal Block Diagram



Notes:
Intel® XScale® Microarchitecture is ARM* Architecture compliant.
* Other brands and names are the property of their respective owners.

B3063-01

This processor runs at 600 MHz and has an integrated chipset for lower power usage; the typical power consumption of the CPU is 4 W. Other features are given in Table 2.

Table 2. Processor Features (Sheet 1 of 2)

Integrated Intel XScale® Core	ARM* V5T Instruction Set
	ARM V5E DSP Extensions
	400 MHz and 600 MHz
	Write Buffer, Write-back Cache

Table 2. Processor Features (Sheet 2 of 2)

PCI Bus Interface	PCI Local Bus Specification, Rev. 2.2 compliant
	PCI-X Addendum to the PCI Local Bus Specification, Rev. 1.0a
	64-bit/66 MHz Operation in PCI Mode
	64-bit/133 MHz Operation in PCI-X Mode
	Support 32-bit PCI Initiators and Targets
	Four Split Read Requests as Initiator
	Eight Split Read Requests as Target
	64-bit Addressing Support
Memory Controller	PC200 Double Data Rate (DDR) SDRAM
	Up to 1 GByte of 64-bit DDR SDRAM (128 MBytes on MPCMM0002)
	Up to 512 MBytes of 32-bit DDR SDRAM
	Single-bit Error Correction, Multi-bit Support (ECC)
	1024 Byte Posted Memory Write Queue
	40- and 72-bit wide Memory Interface
Address Translation Unit	2 KByte or 4 KByte Outbound Read Queue
	4 KByte Outbound Write Queue
	4 KByte Inbound Read and Write Queue
	Connects Internal Bus to PCI/PCI-X Bus
DMA Controller	Two Independent Channels Connected to Internal Bus
	Up to 1064 MByte/s Burst Support in PCI-X Mode
	Up to 1600 MByte/s Burst Support for Internal Bus
	Two 1 KB Queues in Ch-0 and Ch-1
	232 Addressing Range on Internal Bus Interface
	264 Addressing Range on PCI Interface
Application Accelerator Unit	Performs XOR on Read Data
	Compute Parity Across Local Memory Blocks
	1 KByte/512 Byte Store Queue
I^2C Bus Interface Units	Two Separate I^2C Units (one used on MPCMM0002)
	Serial Bus
	Master/Slave Capabilities
	System Management Functions
SSP Serial Port	Full-duplex Synchronous Serial Interface
	Supports 7.2 KHz to 1.84 MHz Bit Rates
Peripheral Performance Monitoring Unit	One Dedicated Global Time Stamp Counter
	Fourteen Programmable Event Counters
	Three Control/Status Registers
Timers	Two Dual-programmable 32-bit Timers
	Watchdog Timer
544-Ball, Plastic Ball Grid Array (PBGA)	
Eight General Purpose I/O Pins	

4.3 Memory

The CMM has a SODIMM (Small Outline Dual Inline Memory Module) socket on board. The SODIMM is populated with a 128 MByte unbuffered memory module.

The CMM also has four separate 16 MByte flash modules. These are Intel® E28F128 flash memory modules. Each memory module has multiple lockable regions within the flash.

4.4 Ethernet

The CMM has two Intel® 82551QM Fast Ethernet Multifunction Controllers with integrated media access controllers and physical interfaces. The output from each of these chips is passed to a dedicated multiplexing device (mux), the SN74CBT16124. Each mux can be individually controlled to send the Ethernet signals to one of three destinations: the front panel, an optional RTM connection, or a separate backplane connection. Separate magnetics (six total) provide magnetic coupling for the 10BASE-T or 100BASE-TX signaling commonly associated with 10/100 MByte/s Ethernet.

In Figure 3, “CMM Top View Layout” on page 16, the four magnetics for the RTM and backplane connections are at the bottom of the board. The two magnetics for the front panel are integrated into the front panel RJ-45 connectors.

4.5 Serial Port UARTs

The UART (Universal Asynchronous Receiver/Transmitter) controller on the CMM board is a Texas Instruments* TL16C752B dual UART chip. The first serial port is connected to an RJ-45 connector on the front panel; the second serial port is passed to the rear of the card for an optional RTM connection. Full modem hardware signals are passed through to the RTM.

The UART driver provides 15 kV of ESD protection (8 kV contact, 15 kV air discharge).

4.6 FPGA

The MPCMM0002 CMM has two redundant field-programmable gate arrays (FPGAs) on board. These two Xilinx* Spartan* II XC2S200 FPGAs have identical internal design, but different addresses. A brief summary of the FPGA functions is shown in Table 3.

Table 3. FPGA Features

Signal	Description
IPMB compatible buses	IPMI 1.5-compliant buses, pulled up to 3.3 V and operating at 100 kHz
	20 IPMB ports per FPGA (40 total): 32 IPMBs for dual star routing to up to 16 AdvancedTCA* slots, 2 shared buses for PEMs and fan trays, 2 buses for communication between CMMs, and 4 spare IPMBs for future expansion
	One I^2C port per FPGA (2 total) for communication to CDMs
Bus	50nS basic memory bus with data, address, chip select, output enable, and write enable
Interrupt Router	The FPGA is responsible for identifying and routing interrupt requests from multiple sources on the CMM, including the following: internal IPMB engine, other FPGA, both UARTs, the ADM1026 controller, the CPLD, and both LAN controllers

4.7 Redundancy and Hot Swap CPLD

A Xilinx XC95144XL CPLD is used on the CMM to control the redundancy failover logic, Hot Swap logic, FPGA control, and address decode for simple devices on the CMM. This CPLD also contains the PCI arbitration circuitry for the 80321 processor and the Ethernet controllers.

4.8 Watchdog Timer

A Maxim* MAX6374KA-T watchdog timer is used to protect against CPU lockups. The CMM firmware strobes the watchdog periodically; if the CPU fails to strobe the watchdog within a given time interval, the watchdog sends a signal to the CPLD that forces the CPU to reset. This allows the processor to automatically recover to a known good state in the case of lockup.

Note: If the watchdog timer fires, the IPMB signals are not affected by the CPU timer reset. The other CMM automatically takes over and manages the chassis.

4.9 Real-Time Clock

The CMM time-stamps certain events as they occur within the system, particularly entries into the System Event Log (SEL). A Dallas Semiconductor* DS1307 real-time clock provides this capability.

To avoid losing the current time, the CMM provides independent power to the DS1307 with an on-board battery (size CR2032). The battery provides approximately five years of run time for the clock in case of a power failure or if the CMM is removed from a chassis.

Batteries have limited shelf lives. After many years in storage, a battery may not be able to hold a charge. To supplement the battery, a super capacitor (SCap) is also provided on the CMM; this provides a mechanism to get up to two hours of backup power for the clock in case of a power failure. Though the SCap will not hold a charge for even a full day, the ability to power the clock circuit during a power failure even after years in storage is a reliability feature of the CMM.

The battery and SCap are both diode-OR'd to ensure that either one can supply the power for the clock without being affected by the other backup power source.

4.10 ADM1026 Controller

An Analog Devices* ADM1026 controller monitors the on-board voltages and manages the thermal sensors. The processor communicates with the ADM1026 through an I^2C bus.

4.11 Hot Swap Controller

The CMM uses an LTC4250AH* Hot Swap controller to ramp voltages and watch for over-current conditions. If the CMM draws more than 2.5 A for more than 500 µs, the Hot Swap controller terminates.

The Hot Swap controller waits for the enable signals (short pins tied to each return) to connect before ramping up the circuitry on the CMM. Similarly, if a CMM is pulled out of the system, the Hot Swap controller immediately cuts power to the board.

4.12 Ride-Through Support

Many carriers require equipment to survive a 5 ms period without any power in order to survive power glitches due to short circuit, power switchovers, etc. Section 4.1.4.3 of the PICMG 3.0 specification requires boards to survive this 5 ms drop-out and recommends that other chassis elements also have capability to ride through these transients.

The MPCMM0002 CMM module meets this requirement. The CMM will survive the zero volt transient described in Table 4-4 of the PICMG 3.0 specification. Large bulk capacitors next to the DC-DC power converters provide this hold-up capacity.

4.13 IPMB Isolation Logic

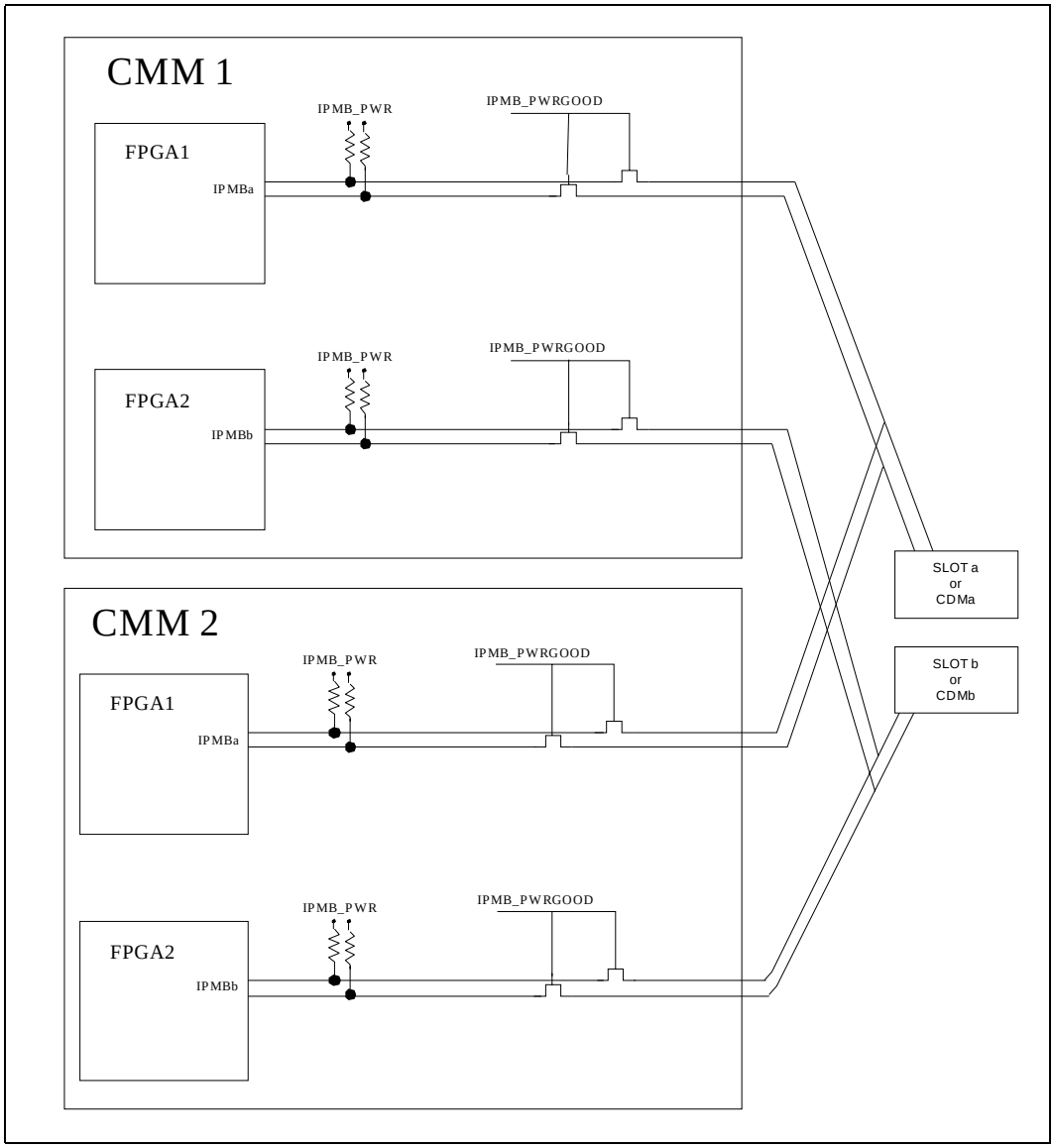
In a carrier-grade system it is important to prevent cascaded failures; that is, a failure in one element that affects other system elements and causes them to fail or lose significant functionality. A shared bus is more sensitive to a single item impacting other elements than a simple point-to-point system. This is one reason the MPCMM0002 CMM chassis management module implements the hybrid dual IPMB star topology outlined in Section 6.1, “IPMB Routing” on page 28.

Some IPMB channels are dedicated links between the CMMs and an individual blade; this type of link is called a star. Some IPMB channels are shared among several devices, and this type of link is called a bus. The star and bus elements have different isolation logic in the CMM.

4.13.1 Dual Star IPMB Isolation

The dual star IPMBs on the MPCMM0002 CMM use MOSFET-controlled isolators to disconnect all the radial IPMB signals automatically if power fails on a CMM. The isolation circuit is pictured in Figure 5. The hardware ensures that the CMM is isolated from the dual star IPMBs if power fails.

Figure 5. IPMB Dual Star Isolation

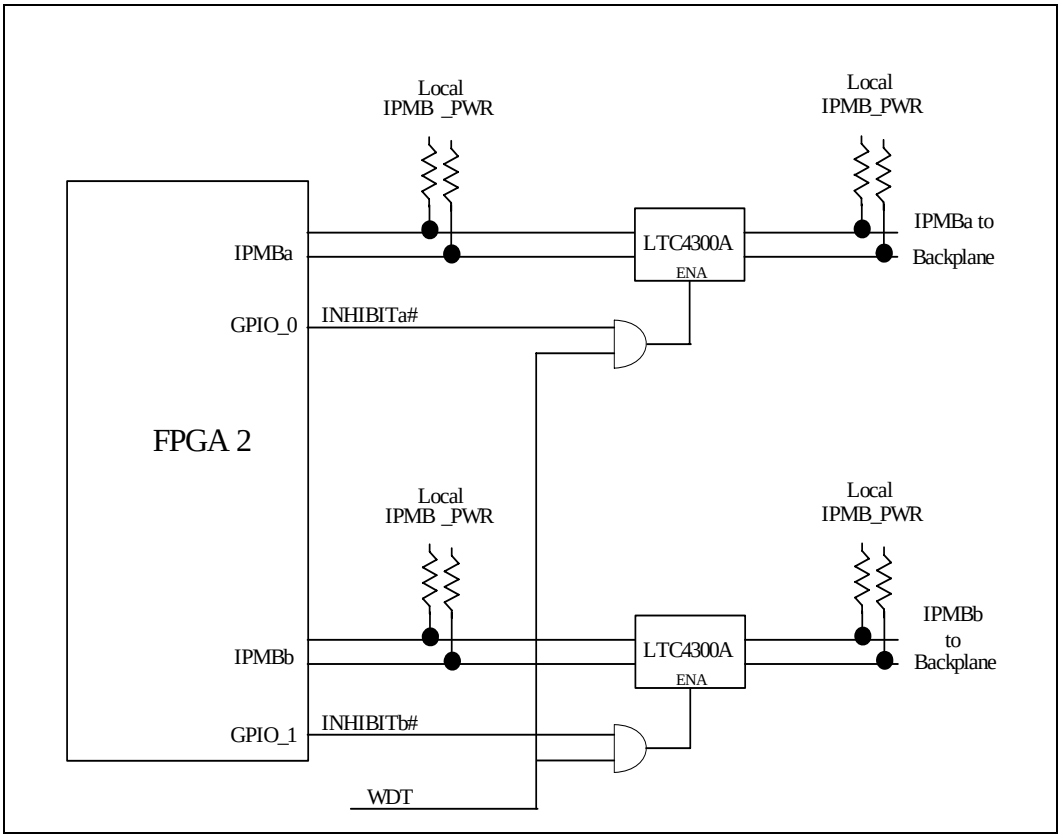


4.13.2 Dual Bus IPMB Isolation Requirements

The isolation requirements for a dual bus IPMB are more stringent. In addition to the power failure isolation needed by radial IPMBs, dual bus IPMBs must be able to selectively enable and disable the isolation on each bus. Furthermore, each element on the bus must protect against errors that can cause the bus to hang. Finally, there are electrical drive and rise time requirements that are more difficult to meet on a shared bus.

An LTC4300 on each bus provides the necessary individually selectable isolation mechanisms in addition to rise time acceleration. A watchdog timer is also used to ensure the bus is isolated if the CPU locks up and resets so that glitches are not propagated to other controllers on the bus. See Figure 6.

Figure 6. Dual Bus IPMB Isolation



5.0 Mechanical Information

5.1 Dimensions

Dimensions for the CMM are shown in Figure 7. The origin is in the lower right corner. All dimensions are shown in millimeters.

The form factor of the CMM PCB has a height of 144.4 mm and a depth of 282.5 mm. The faceplate has a horizontal slot pitch (width) of 3 HP (0.6 inches).

Dimensions for the CMM backing plate are shown in Figure 8. The origin for these dimensions is based on the mounting hole in the upper left corner.

Figure 7. CMM Component Side 1 Dimensions

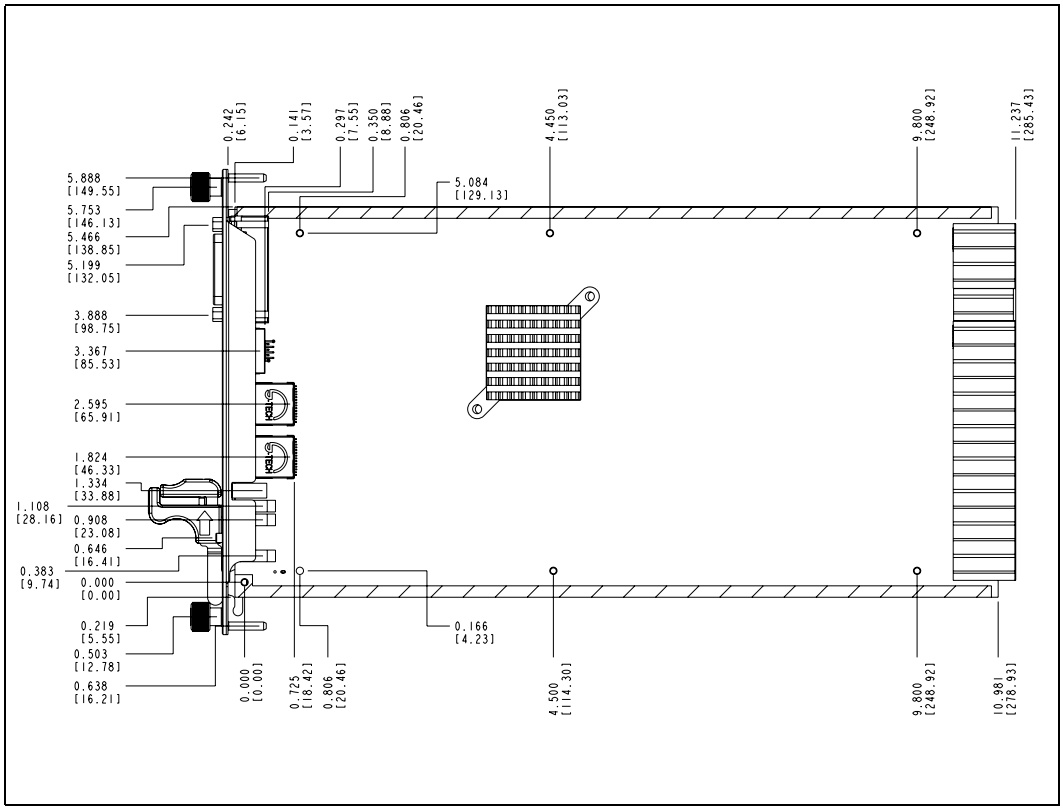
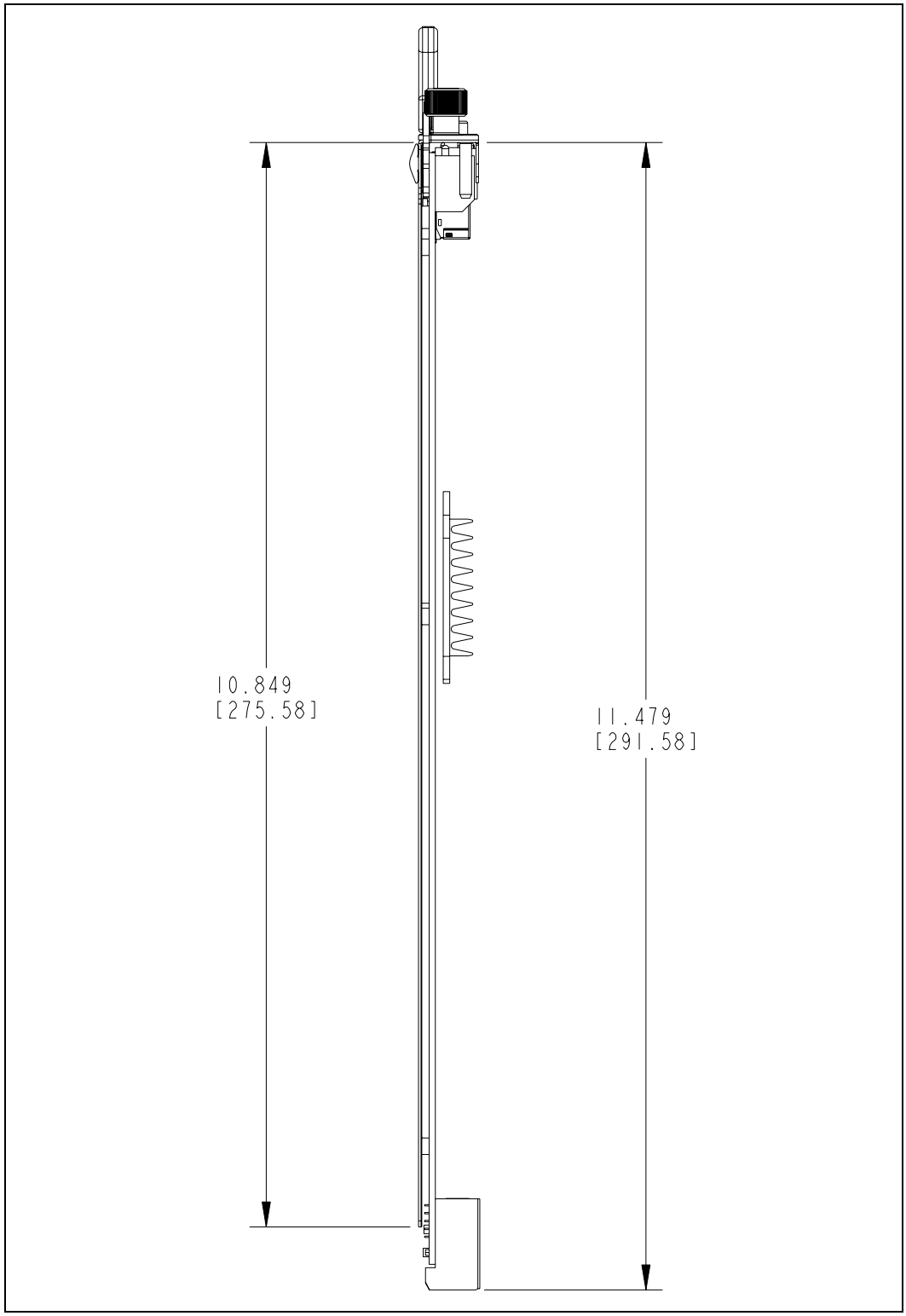
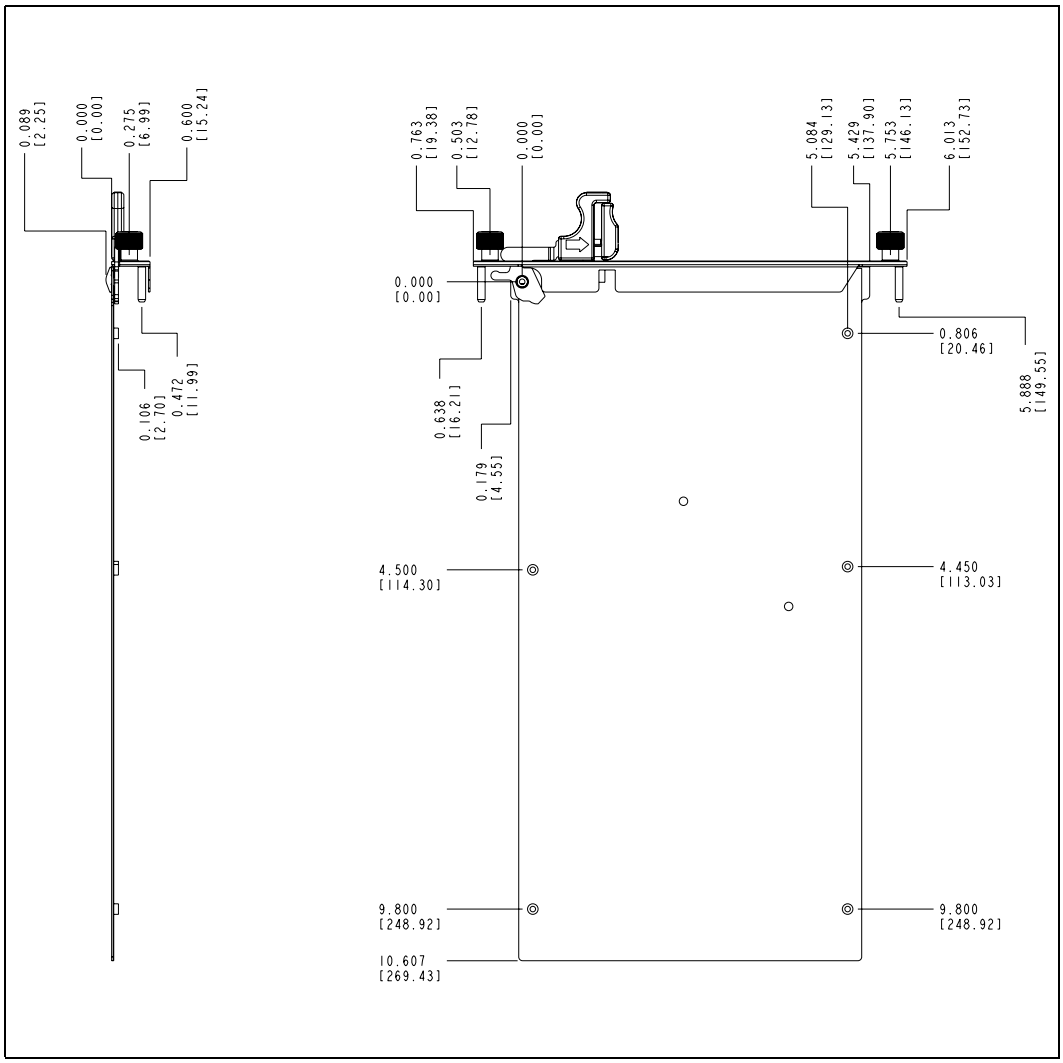


Figure 8. CMM Backing Plate Dimensions



The gasket is on the secondary side of the backing plate and extends over the pitch line, just as PICMG 3.0 boards extend their gasket over the pitch line. The outer face of the backing plate is 0.15 mm (0.0059 inches) inside the nearest pitch line. Since the gasket has a nominal compressed size of 1.53 mm (0.0602 inches) and a four-sigma range of 0.99 mm (0.0390 inches) to 2.07 mm (0.0815 inches), the gasket must seal on a surface that is between 0.84 mm (0.0331 inches) and 1.92 mm (0.0756 inches) from the left side pitch line.

Figure 9. CMM Side View Dimensions



5.2 Front Panel Hardware

Table 18, “Telco Alarm Pinout” on page 49 shows two retention screws and two alignment posts on the MPCMM0002 CMM faceplate. Like the hardware used with PICMG* 3.0 boards, these items are M3 hardware. However, since the 15.24 mm (0.6 inches) pitch of the CMM does not allow sufficient room to put the retention screws and alignment posts side by side, the alignment posts are offset slightly.

There is only one ejector on the CMM, but it matches the subrack interface geometry defined in Section 2.2.7 of the PICMG 3.0 specification. Note, however, that the ejector handle is 2 mm (0.0787 inches) thick, not the 2.5 mm (0.0984 inches) thickness that many PICMG 3.0 boards use.

A switch on Component Side 2 of the PCB detects the opening and closing of the ejector handle.

5.3 Rear Connector Placement

5.3.1 MPCMM0002 CMM Rear Connectors

The CMM uses three connectors (for power, data, and a guide pin) that can mate with either vertical (backplane) connectors or coplanar connectors. The power connector is an FCI* 85719-107LF (or equivalent) connector. As shown in Table 14, “CMM Power Connector” on page 32, the A1 pin on the connector is located at coordinates (2.37, 96.34). The data connector is an FCI 89095-102LF (or equivalent). Pin 1 on the data connector is located at coordinates (13.7, 64.65). The guide pin connector is an FCI 73474-201 (or equivalent).

5.3.2 Coplanar Mating Connectors

In a coplanar mating arrangement, a FCI* HM1L54LDP000H6P connector with FCI* 72019-101 guide pin is mated to the data connector on the CMM, while a FCI* HM1L52LDP493H6P (or equivalent) connector mates with the power connector.

5.3.3 Vertical Mating Connectors

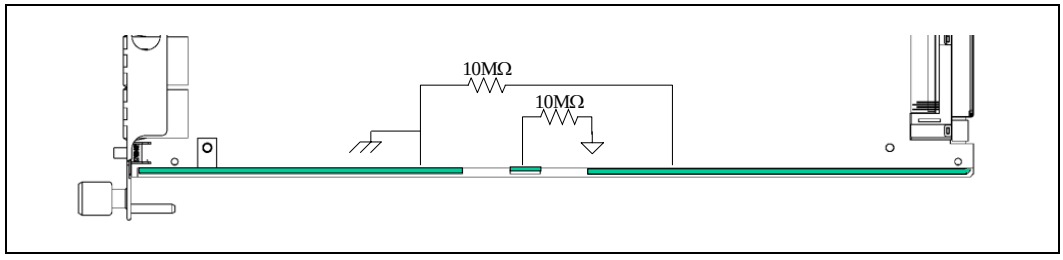
When a CMM board mates directly into a backplane, vertical mating connectors are used. The data connector that mates to the CMM is a FCI* 89009-116 with FCI* 70295-001 guide pin and 73475-101 shroud, while the power connector is an FCI* HM1W52ZPR493H6P (or equivalent). Since they are mounted on a backplane, the rear of these two connectors must be in the same plane.

Example: If mounted horizontally with Component Side 1 up, the bottom row of holes for the data connector is 1.775 mm (0.0699 inches) lower than the power connector.

5.4 ESD Discharge Strip

The ESD strip along the bottom of the CMM follows the guidelines in Section 2.2.5 of the PICMG* 3.0 specification. The electrical definition of the ESD discharge strip is shown below.

Figure 10. CMM ESD Strip Electrical Definition



Dimensions of the ESD strips are shown in Table 16, “Ethernet Port Pinouts” on page 47.

6.0 Backplane Considerations

6.1 IPMB Routing

The Intel NetStructure® MPCMM0002 CMM is designed to support a hybrid dual IPMB star topology.

The CMMs can support up to 16 slots, the maximum number of boards in a PICMG* 3.0 chassis. Each board in the subrack has two dedicated IPMBs going to it. Each IPMB is arranged in a 'Y' pattern: the connection from the board is split to two legs, one going to each CMM. Each CMM is present on both buses to each board. In addition, there are two shared IPMB buses routed between the CMMs for private, dedicated IPMB traffic between the two CMMs. While the CMMs theoretically can talk between themselves over any of 30+ IPMBs, the private IPMB traffic between CMMs is normally over these two inter-CMM links.

Note: A shared dual IPMB bus is used for chassis elements such as PEMs and one or more fan trays. This shared dual bus allows the CMM to support varying numbers of PEMs, fan trays, and other intelligent chassis elements.

In compliance with the PICMG 3.0 specification, the shared bus IPMB signals have an isolating buffer device (LTC4300) to ensure proper bus isolation in a shared bus environment. The radial (star) IPMB connections to each node are not required to have this same isolation circuitry since each node is effectively isolated already by the star topology.

6.2 CMM Power

6.2.1 DC Power Input

Each CMM receives dual -48 VDC power feeds on its power connector. Since the maximum power draw is 28 W, the maximum power draw from each CMM is less than 1 A. The typical power draw for each CMM is 17 W. Most of the power is derived from the 3.3 V converter.

Figure 11. Power System Block Diagram

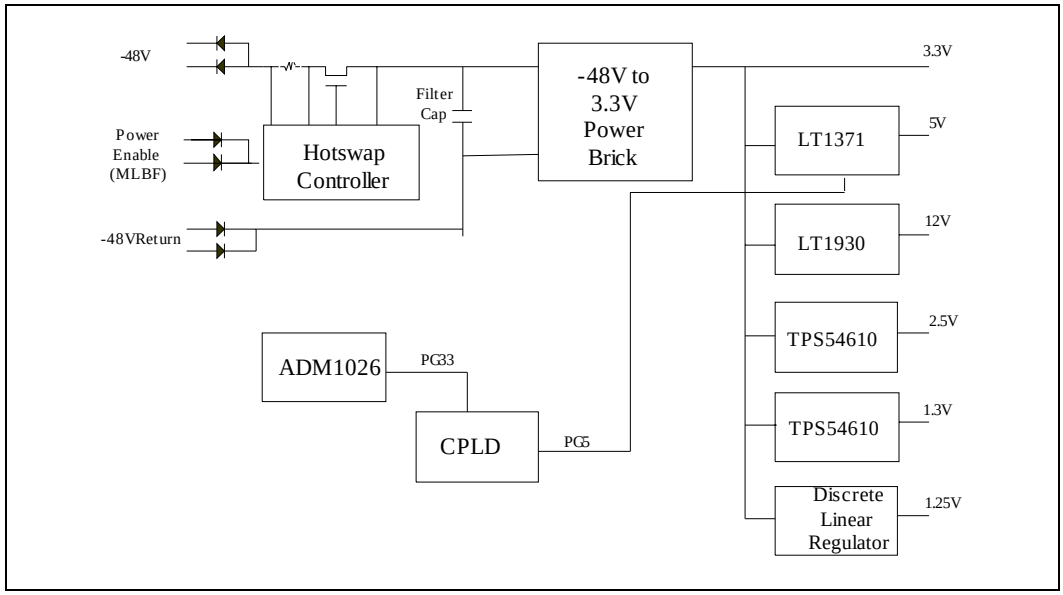


Table 4. Voltage Usage

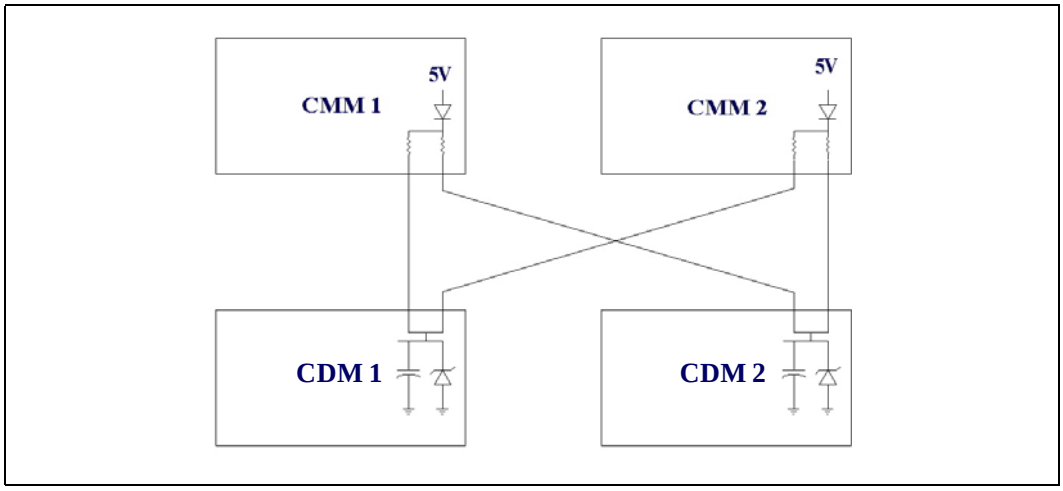
Voltage	Max Current	Where Used	Monitored By
12 V	0.3 A	Op Amp and IPMB isolation circuit	ADM1026
5 V	1 A	Misc components that cannot use 3.3 V	ADM1026
3.3 V	4 A	Most logic	ADM1026
2.5 V	5 A	Memory interface	ADM1026
1.3 V	3 A	IOP321 core	ADM1026
1.25 V	1 A	DDR Termination	ADM1026

The CMM supports an input voltage range of –34 VDC to –72 VDC. However, the 5 ms ride-through capability (see Section 4.12, “Ride-Through Support” on page 21) assumes a prior minimum voltage of –43 VDC.

6.2.2 CDM Power

The CMM provides a few powered outputs that chassis designers can use as they see fit. The chassis data modules (sometimes called shelf FRUs) are described in more detail in Section 8.0, “Chassis Data Modules (CDMs)” on page 43. Each CMM provides a diode-OR’d 5 V output at 50 mA maximum current to the CDMs. Chassis designers can use this 5 V output to power simple EEPROMs in a CDM. The CMMs can both drive a tricolor LED on the CDM as well.

Figure 12. CDM Power Input



6.2.3 Filter Tray

The CMM also provides direct support for a filter tray. The CMM provides signals to handle a filter presence switch, two thermistors, and a tricolor LED.

The filter presence switch is typically a mechanical switch that connects the AF_PRES# signal to ground when an air filter is installed in the chassis. The switch is debounced in software.

The two thermistor inputs provide redundant temperature readings to the CMM. The thermistors should be a NTC (negative thermocouple) device like the US Sensor* USX2257 thermocouple (http://www.ussensor.com/). For maximum accuracy, a dedicated logic ground reference signal AFTREF is provided to isolate localized perturbations to logic ground. Chassis designers should use the AFTREF signal exclusively for these thermocouples and should route the two temperature signals and the reference signal in close proximity.

6.2.4 Power Switch

The CMM has support for an optional soft power switch. This dual-pole input signal can be used to signal the CMM to gracefully shut down the elements within the chassis. Both poles of this switch are debounced in software. If only one contact on the switch closes, the CMM flags this as an error and generates a system event log entry.

These direct drive capabilities of the CMM are summarized in the table below. All the outputs are protected via OR-ing diodes, as shown in Figure 12.

Table 5. Chassis Elements Directly Driven by CMM Hardware

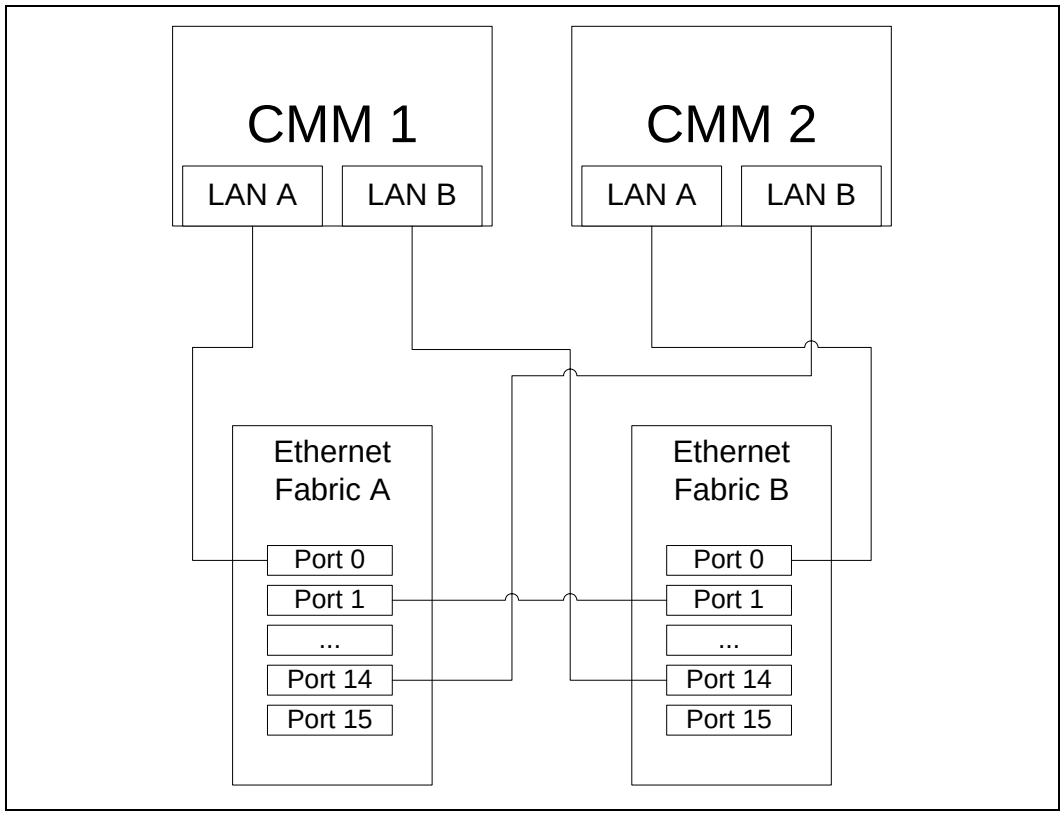
Chassis Element	Component	Notes
CDM	EEPROM + others	50 mA @ 5 V max; typically uses series resistance to drop voltage to 3.3.V.
	LED	Tricolor LEDs driven by CMM
Filter Tray	2 Thermistors	NTC sensors, such as US Sensor USX2257
	LED	Red plus green LEDs driven by CMM
Power switch	Dual pole switch	Soft power switch to CMMs
LAN ports	2 LEDs each (4 total)	Speed on one LED, Link and Activity on the other

6.2.5 Ethernet Routing

Each CMM provides two Ethernet channels that can be routed to the base interface of PICMG* 3.0 hub slots. The PICMG 3.0 specification only allocates space for one ShMC slot, but the backplane can typically be set up to “poach” an unused slot in order to provide a connectivity option.

A 14-slot chassis typically uses 14 base interface channels (13 for other slots plus one for the ShMC). However, the specification defines 16 total channels for the base interface. The second port from each CMM can be routed to an unused upper channel of the opposite hub or fabric board.

Figure 13. Ethernet Port Poaching



7.0 Rear Connections

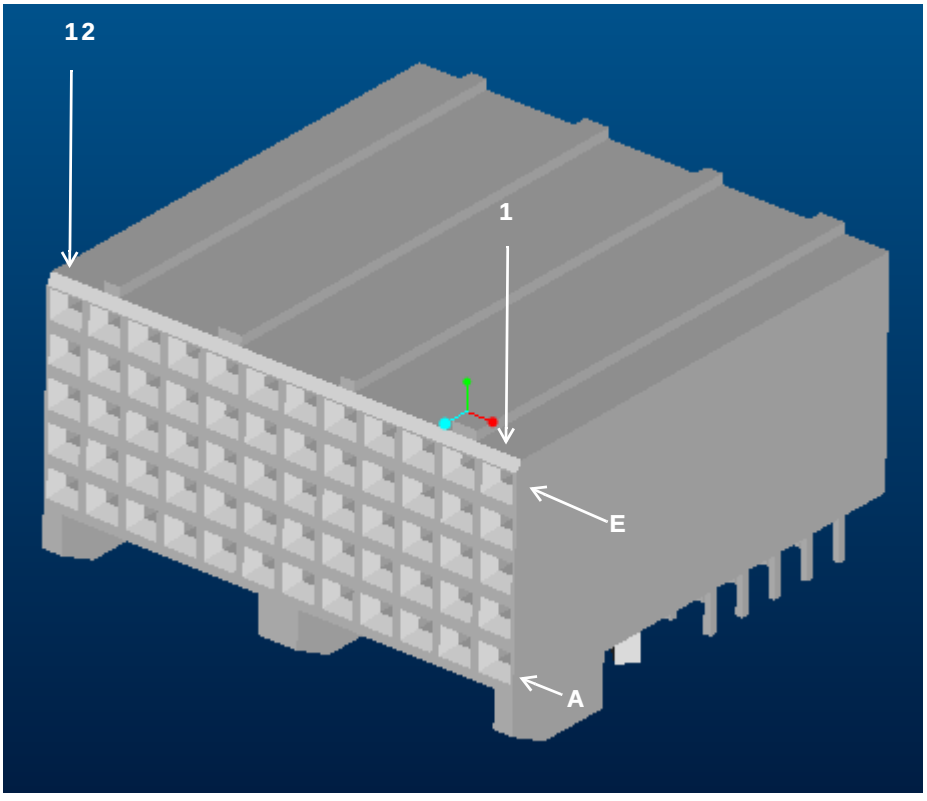
7.1 CMM Connector Pinouts

Each CMM has a power connector and a data connector.

7.1.1 CMM Power Connector

The CMM power connectors are standard J12 power receptacles as shown in Figure 14.

Figure 14. CMM Power Connector



The pinout of each CMM power connector is shown in Table 6.

Table 6. Power Connector Pinouts

Pin	Signal	Purpose	Pin Length
B12, D12	SGND	Shelf ground, mostly for safety	Long
A5, C5, E5	GND	Logic ground for signal returns	Long
C1, E1	-48 V_A	A power feed	Medium
B2, D2	-48 V_B	B power feed	Medium
C3, E3	-48 VRTNA	Return path for A feed	Medium
B4, D4	-48 VRTNB	Return path for B feed	Medium
A1	-48VRTN_A_MLBF	Return path for A feed (mate last, break first pin) that allows Hot Swap controller to turn system power on and off	Short
A3	-48VRTN_B_MLBF	Return path for B feed (mate last, break first pin) that allows Hot Swap controller to turn system power on and off	Short
D6	PWRALRM_NO	Power alarm relay, normally open	Medium
E9	MNRALRM_COM	Minor alarm relay, common path	Medium
C9	MJRALRM_COM	Major alarm relay, common path	Medium
A9	CRTALRM_COM	Critical alarm relay, common path	Medium
B6	PWRALRM_COM	Power alarm relay, common path	Medium
E7	MNRALRM_NO	Minor alarm relay, normally open	Medium
C7	MJRALRM_NO	Major alarm relay, normally open	Medium
A7	CRTALRM_NO	Critical alarm relay, normally open	Medium
E11	MNRALRM_NC	Minor alarm relay, normally closed	Medium
C11	MJRALRM_NC	Major alarm relay, normally closed	Medium
A11	CRTALRM_NC	Critical alarm relay, normally closed	Medium
D10	MNRRES+	Minor alarm reset, positive polarity	Medium
B10	MNRRES-	Minor alarm reset, negative polarity	Medium
D8	MJRRES+	Major alarm reset, positive polarity	Medium
B8	MJRRES-	Major alarm reset, negative polarity	Medium

Table 7 labels the pins on the power connector at the intersection of each row (A-E) and column (1-12).

Table 7. Power Connector Pinouts Matrix

	E	D	C	B	A
1	-48V_A		-48V_A		-48_A_RTN_MLBF
2		-48V_B		-48V_B	
3	-48_A_RTN		-48_A_RTN		-48_B_RTN_MLBF
4		-48_B_RTN		-48_B_RTN	
5	GND		GND		GND
6		PWRALRM_NO		PWRALRM_COM	
7	MNR_NO		MJR_NO		CRT_NO
8		MJR+		MJR-	
9	MNR_COM		MJR_COM		CRT_COM
10		MNR+		MNR-	
11	MNR_NC		MJR_NC		CRT_NC
12		SGND		SGND	

Table 8 shows the staging of the power connector pins. Table 9 and Table 10 (for the receptacle and for the header) show the physical locations of the pins identified by pin code.

Table 8. Pin Staging

Order	Mating Length	Tail Length	Pin Code
First Mate	8 mm	4.3mm	19
Second Mate	7.25 mm	4.3mm	4
Third Mate	6.5 mm	4.3mm	3
Fourth Mate	5.75 mm	4.3mm	2
Last Mate	5 mm	4.3mm	1
Empty			

Table 9. Power Connector Receptacle Pin Placement (Sheet 1 of 2)

	E	D	C	B	A
1	4		4		1
2		3		3	
3	4		4		1
4		3		3	

Table 9. Power Connector Receptacle Pin Placement (Sheet 2 of 2)

	E	D	C	B	A
5	4		4		4
6		2		2	
7	2		2		2
8		2		2	
9	2		2		2
10		2		2	
11	2		2		2
12		19		19	

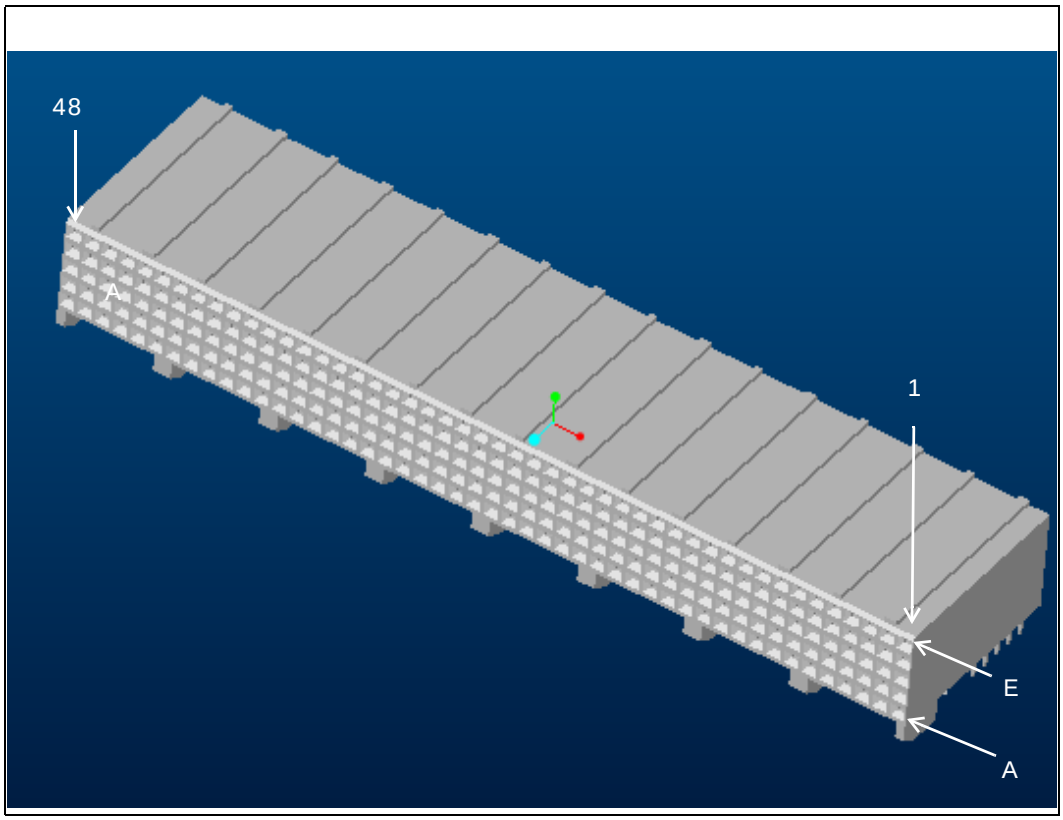
Table 10. Power Connector Header Pin Placement

	A	B	C	D	E
1	1		4		4
2		3		3	
3	1		4		4
4		3		3	
5	4		4		4
6		2		2	
7	2		2		2
8		2		2	
9	2		2		2
10		2		2	
11	2		2		2
12		19		19	

7.1.2 CMM Data Connector

The CMM data connector is a J16 signal connector. See Figure 15.

Figure 15. CMM Data Connector



The pinouts for the data connector are shown in Table 11.

Table 11. Data Connector Pinouts (Sheet 1 of 2)

Signal Name	Count	Type	Description	Pin Name From Table 12
BP_AFT1	1	I	Filter tray ambient temperature thermistor A	E16
BP_AFT2	1	I	Filter tray ambient temperature thermistor B	E17
BP_AFTREF	1	I	Filter tray ambient temperature thermistor return	E18
BP_AFLED[1:2]	2	O	Filter tray status tri-color LED control. Bit 1 controls the red LED. Bit 2 controls the green LED.	E19, E20
BP_AFPRES#	1	I	Filter tray presence. This signal is pulled up to +3.3V and is de-bounced by software.	E21
RP_ENET1_LNK#	1	O	Ethernet port 1 to RTM Link LED drive	A29
RP_ENET1_ACT#	1	O	Ethernet port 1 to RTM Activity LED drive	A30
RP_ENET1_SPD#	1	O	Ethernet port 1 to RTM speed indicator	A31
RP_ENET2_LNK#	1	O	Ethernet port 2 to RTM Link LED drive	B29
RP_ENET2_ACT#	1	O	Ethernet port 2 to RTM Activity LED drive	B30
RP_ENET2_SPD#	1	O	Ethernet port 2 to RTM speed indicator	B31
FRU0_STATUS[0:1]	1	O	Control signals for ShFRU status tri-color LED 1. Bit 0 controls the red LED. Bit 1 controls the green LED.	D30, D31
FRU1_STATUS[0:1]	1	O	Control signals for ShFRU status tri-color LED 2. Bit 0 controls the red LED. Bit 1 controls the green LED.	C30, C31
PWRSW[1:2]	2	I	Power switch input A or B from system power on/off switch. These two signals have to be debounced by software.	E30, E31
BP_N_SCL[0..15]A and B	32	OD	Node IPMB clock	A2-A17, C2-C17
BP_N_SDA[0..15]A and B	32	OD	Node IPMB data	B2-B17, D2-D17
BP_CF_SCL_A and B	2	OD	Chassis FRU IPMB clock	A18, C18
BP_CF_SDA_A and B	2	OD	Chassis FRU IPMB data	B18, D18
BP_SH_SCL_A and B	2	OD	Shared Bus IPMB clock	A19, C19
BP_SH_SDA_A and B	2	OD	Shared Bus IPMB data	B19, D19
BP_RED_SCL_A and B	2	OD	Redundant CMM IPMB serial clock	A20, C20
BP_RED_SDA_A and B	2	OD	Redundant CMM IPMB serial data	B20, D20
BP_RP_SCL_A and B	2	OD	Reserved IPMB clocks for RTM	A21, C21
BP_RP_SDA_A and B	2	OD	Reserved IPMB data for RTM	B21, D21
BP_SP_SCL_A and B	2	OD	RESERVED FOR FUTURE USE	A22, C22
BP_SP_SDA_A and B	2	OD	RESERVED FOR FUTURE USE	B22, D22
BP_ENET1_TX0(+-)	2	I/O	Ethernet port 1 to RTM	A33, B33
BP_ENET1_RX0(+-)	2	I/O	Ethernet port 1 from RTM	A35, B35
BP_ENET2_TX0(+-)	2	I/O	Ethernet port 2 to RMT	A37, B37
BP_ENET2_RX0(+-)	2	I/O	Ethernet port 2 from RTM	A39, B39
BP_ENET1_TX1(+-)	2	I/O	Reserved for GbE to RTM	D33, E33
BP_ENET1_RX1(+-)	2	I/O	Reserved for GbE from RTM	D35, E35
BP_ENET2_TX1(+-)	2	I/O	Reserved for GbE to RTM	D37, E37
BP_ENET2_RX1(+-)	2	I/O	Reserved for GbE from RTM	D39, E39

Table 11. Data Connector Pinouts (Sheet 2 of 2)

Signal Name	Count	Type	Description	Pin Name From Table 12
CFG_STX	1	O	Serial transmit	A28
CFG_SRX	1	I	Serial receive	D28
CFG_SCTS	1	I	Serial clear to send	E28
CFG_SRTS	1	O	Serial request to send	C28
CFG_SDSR	1	I	Serial data set ready	E29
CFG_SDTR	1	O	Serial data terminal ready	B28
BP_CMC_TX0(+-)	2	I/O	Ethernet port 0 to switch	A41, B41
BP_CMC_RX0(+-)	2	I/O	Ethernet port 0 from switch	A43, B43
BP_CMCX_TX0(+-)	2	I/O	Ethernet port 1 to switch	A45, B45
BP_CMCX_RX0(+-)	2	I/O	Ethernet port 1 from switch	A 47, B47
BP_CMC_TX1(+-)	2	I/O	Reserved for GbE to switch	D41, E41
BP_CMC_RX1(+-)	2	I/O	Reserved for GbE from switch	D43, E43
BP_CMCX_TX1(+-)	2	I/O	Reserved for GbE to switch	D45, E45
BP_CMCX_RX1(+-)	2	I/O	Reserved for GbE from switch	D47, E47
BP_NGO	1	O	Negotiate output to other CMM	E14
BP_NGOI	1	I	Negotiate input from other CMM	E15
BP_HLY#	1	O	Healthy output to other CMM	E12
BP_HLYI#	1	I	Healthy input from other CMM	E13
BP_PRESI#	1	I	Other CMM is present (0V)	E11
BP_PRES#	1	O	Tie to ground	E10
GA[0:7]	8	I	Hardware Address	E2-E9
GND	61	I	Ground	A1-E1, A23-C23, A32-E32, C33, A34-E34, C35, A36-E36, C37, A38-E38, C39, A40-E40, C41, A42-E42, C43, A44-E44, C45, A46-E46, C47, A48-E48
FRU_VCCA and B	2	I	Power to CDMs (shelf FRUs) and distribution board	E22, E23
RESV[1:11]	11		Reserved	A26-E26, A27-E27, D23
GPIO[1:10]	10	I	General Purpose Input Only	A24-E24, A25-E25
BP_CMM_RESET#	1	O	Inter CMM reset output to another CMM	C29
BP_CMM_RESETI#	1	I	Inter CMM reset input from another CMM	D29

Table 12 identifies each pin on the data connector at the intersection of each row (A-E) and column (1-48).

Table 12. Data Connector Pinouts Matrix (Sheet 1 of 3)

	E	D	C	B	A
1	GND	GND	GND	GND	GND
2	GA0	BP_N_SDA_[1]_B	BP_N_SCL_[1]_B	BP_N_SDA_[1]_A	BP_N_SCL_[1]_A
3	GA1	BP_N_SDA_[2]_B	BP_N_SCL_[2]_B	BP_N_SDA_[2]_A	BP_N_SCL_[2]_A
4	GA2	BP_N_SDA_[3]_B	BP_N_SCL_[3]_B	BP_N_SDA_[3]_A	BP_N_SCL_[3]_A

Table 12. Data Connector Pinouts Matrix (Sheet 2 of 3)

	E	D	C	B	A
5	GA3	BP_N_SDA_[4]_B	BP_N_SCL_[4]_B	BP_N_SDA_[4]_A	BP_N_SCL_[4]_A
6	GA4	BP_N_SDA_[5]_B	BP_N_SCL_[5]_B	BP_N_SDA_[5]_A	BP_N_SCL_[5]_A
7	GA5	BP_N_SDA_[6]_B	BP_N_SCL_[6]_B	BP_N_SDA_[6]_A	BP_N_SCL_[6]_A
8	GA6	BP_N_SDA_[7]_B	BP_N_SCL_[7]_B	BP_N_SDA_[7]_A	BP_N_SCL_[7]_A
9	GA7	BP_N_SDA_[8]_B	BP_N_SCL_[8]_B	BP_N_SDA_[8]_A	BP_N_SCL_[8]_A
10	BP_PRES#	BP_N_SDA_[9]_B	BP_N_SCL_[9]_B	BP_N_SDA_[9]_A	BP_N_SCL_[9]_A
11	BP_PRESI#	BP_N_SDA_[10]_B	BP_N_SCL_[10]_B	BP_N_SDA_[10]_A	BP_N_SCL_[10]_A
12	BP_HLY#	BP_N_SDA_[11]_B	BP_N_SCL_[11]_B	BP_N_SDA_[11]_A	BP_N_SCL_[11]_A
13	BP_HLYI#	BP_N_SDA_[12]_B	BP_N_SCL_[12]_B	BP_N_SDA_[12]_A	BP_N_SCL_[12]_A
14	BP_NGO	BP_N_SDA_[13]_B	BP_N_SCL_[13]_B	BP_N_SDA_[13]_A	BP_N_SCL_[13]_A
15	BP_NGOI	BP_N_SDA_[14]_B	BP_N_SCL_[14]_B	BP_N_SDA_[14]_A	BP_N_SCL_[14]_A
16	BP_AFT1	BP_N_SDA_[15]_B	BP_N_SCL_[15]_B	BP_N_SDA_[15]_A	BP_N_SCL_[15]_A
17	BP_AFT2	BP_N_SDA_[16]_B	BP_N_SCL_[16]_B	BP_N_SDA_[16]_A	BP_N_SCL_[16]_A
18	BP_AFTREF#	BP_CF_SDA_B	BP_CF_SCL_B	BP_CF_SDA_A	BP_CF_SCL_A
19	BP_AFLED1	BP_SH_SDA_B	BP_SH_SCL_B	BP_SH_SDA_A	BP_SH_SCL_A
20	BP_AFLED2	BP_RED_SDA_B	BP_RED_SCL_B	BP_RED_SDA_A	BP_RED_SCL_A
21	BP_AFPRES	BP_RP_SDA_B	BP_RP_SCL_B	BP_RP_SDA_A	BP_RP_SCL_A
22	FRU_VCCA	BP_SP_SDA_B	BP_SP_SCL_B	BP_SP_SDA_A	BP_SP_SCL_A
23	FRU_VCCB	Reserved for future use	GND	GND	GND
24	GPIO5	GPIO4	GPIO3	GPIO2	GPIO1
25	GPIO10	GPIO9	GPIO8	GPIO7	GPIO6
26	RESV5	RESV4	RESV3	RESV2	RESV1
27	RESV10	RESV9	RESV8	RESV7	RESV6
28	CFG_SCTS	CFG_SRX	CFG_SRTS	CFG_SDTR	CFG_STX
29	CFG_SDSR	BP_CMM_RESETI#	BP_CMM_RESET#	RP_ENET2_LNK#	RP_ENET1_LNK#
30	BP_PWRSW1	BP_FRU0_STATUS0	BP_FRU1_STATUS0	RP_ENET2_ACT#	RP_ENET1_ACT#
31	BP_PWRSW2	BP_FRU0_STATUS1	BP_FRU1_STATUS1	RP_ENET2_SPD#	RP_ENET1_SPD#
32	GND	GND	GND	GND	GND
33	RP_ENET1_TX1-	RP_ENET1_TX1+	GND	RP_ENET1_TX0-	RP_ENET1_TX0+
34	GND	GND	GND	GND	GND
35	RP_ENET1_RX1-	RP_ENET1_RX1+	GND	RP_ENET1_RX0-	RP_ENET1_RX0+

Table 12. Data Connector Pinouts Matrix (Sheet 3 of 3)

	E	D	C	B	A
36	GND	GND	GND	GND	GND
37	RP_ENET2_TX1-	RP_ENET2_TX1+	GND	RP_ENET2_TX0-	RP_ENET2_TX0+
38	GND	GND	GND	GND	GND
39	RP_ENET2_RX1-	RP_ENET2_RX1+	GND	RP_ENET2_RX0-	RP_ENET2_RX0+
40	GND	GND	GND	GND	GND
41	BP_CMC_TX1-	BP_CMC_TX1+	GND	BP_CMC_TX0-	BP_CMC_TX0+
42	GND	GND	GND	GND	GND
43	BP_CMC_RX1-	BP_CMC_RX1+	GND	BP_CMC_RX0-	BP_CMC_RX0+
44	GND	GND	GND	GND	GND
45	BP_CMCX_TX1-	BP_CMCX_TX1+	GND	BP_CMCX_TX0-	BP_CMCX_TX0+
46	GND	GND	GND	GND	GND
47	BP_CMCX_RX1-	BP_CMCX_RX1+	GND	BP_CMCX_RX0-	BP_CMCX_RX0+
48	GND	GND	GND	GND	GND

Table 13 shows the staging of the power connector pins.

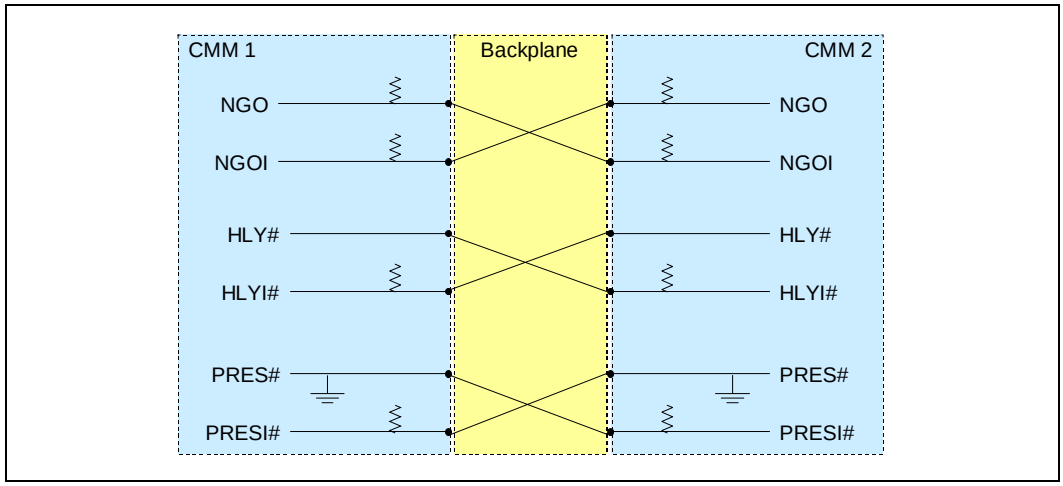
Table 13. Pin Staging

Order	Mating Length	Tail Length	Pin Code
First Mate	8mm	4.3mm	19
Second Mate	7.25mm	4.3mm	4
Third Mate	6.5mm	4.3mm	3
Fourth Mate	5.75mm	4.3mm	2
Last Mate	5mm	4.3mm	1
Empty			

All the IPMB and I^2C ports are wired in parallel between the two CMMs.

Some signals are cross-connected as shown in Figure 16. For example, NGO from one CMM is connected to NGOI on the other CMM.

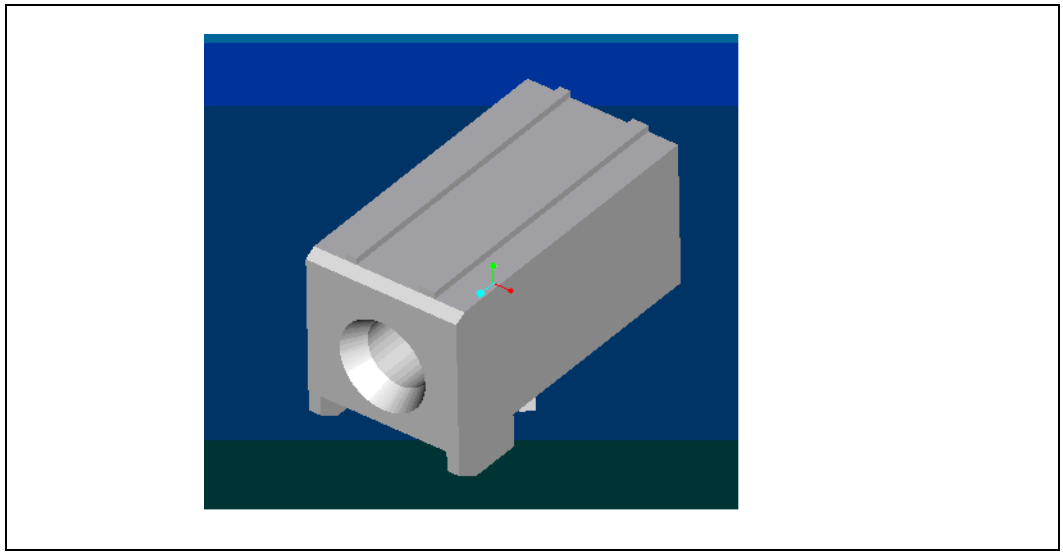
Figure 16. Cross-Connected CMM Signals



7.2 Guide Post

The guide post is FCI 73474-201 as shown in Figure 17.

Figure 17. Guide Post to Backplane



7.3 CMM Redundancy

When a chassis is powered up, the CMM determines which of the two CMMs is initially active. Once the CMM firmware is loaded, it runs an algorithm to determine which CMM is healthier—see the Intel NetStructure® MPCMM0001 Chassis Management Module *and Intel NetStructure® MPCMM0002 CMM Software Technical Product Specification* for more information.

During chassis initialization, the active CMM is the first one that meets the following criteria:

- NGOI is not asserted low, which would indicate the other CMM is already active.

- BD_SEL# bit is set low indicating the CMM is properly inserted.
- OSL bit is set high indicating the OS is loading.

If one CMM detects an internal failure that cannot be corrected through software, it will deassert its HLY# signal. If the faulty CMM is the active CMM, the standby CMM becomes the active CMM as soon as it sees the HLYI# signal rise. HLY# de-asserts for the following reasons: board removal, power goes unstable, watchdog timer fires, board reset, OSL bit is de-asserted by firmware, or software sets fail bit.

Similarly, if one CMM is removed, its PRES# signal on the backplane will no longer be held low and the other CMM will see a high PRESI# signal. Hardware on that CMM quickly negotiates for it to become the active CMM.

In an active-standby mode, a communications path between the two CMMs over both IPMB and Ethernet is needed for full synchronization.

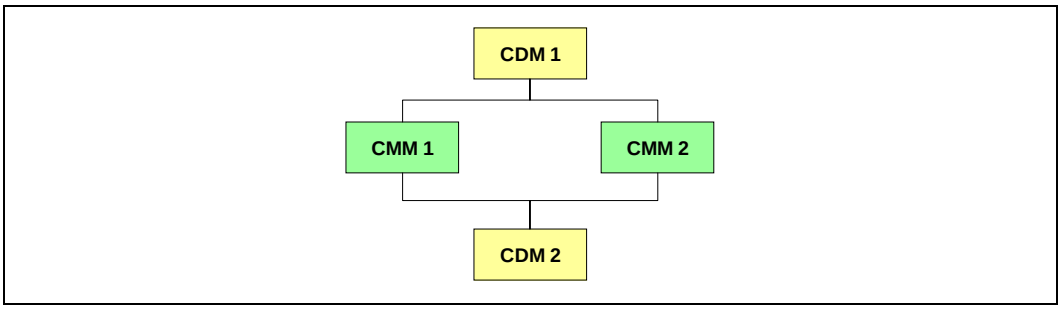
8.0 Chassis Data Modules (CDMs)

8.1 CDM Overview

The CDM (Shelf FRU) is a repository of chassis-specific information (such as serial number of the chassis and backplane), capabilities of the system (number of slots, maximum power per slot, whether dual star or mesh, etc.), and a few administrator-definable configuration options. The latter category allows the administrator to define more conservative limits than the maximum shelf ratings. For example, an administrator could set the maximum power draw per feed to 30 A even if the shelf itself were capable of handling 50 A per feed. CMMs use this information to provide functions such as electronic keying (E-keying), controlling the power state of the system, etc.

The CDMs sit on their own dedicated I^2C links from each CMM, as shown in Figure 18.

Figure 18. Chassis Data Module I^2C Routing



8.2 CDM LED

The CMM drives a single tri-color LED to indicate the status of the module.

Table 14. CDM Health LED States

Color	Description
Off	No power to chassis
Solid Green	Normal operation
Solid Red/Amber	Attention status (error condition) - CMM configures error color

8.3 CDM Management

The CMM expects the CDM to act like a simple 24C64 I^2C EEPROM device that the CMM can read from and write to. CDM 1 is at I^2C address 0xA2 and CDM 2 is at I^2C address 0xA4. The CDMs are expected to store some limited configuration information, such as the power-on state for each slot. The CDM contains the list of what slots are connected

together, how the Update Channels are routed, how many slots are in the system, and what is the maximum power to each slot or group of slots. The CDM provides the information required of a shelf FRU as defined in the PICMG* 3.0 specification.

Only the CMMs can directly access the CDMs (via the dedicated I^2C buses).

8.4 CDM Power

The CDM is provided a dedicated power signal, which is a diode-OR'd 5 V output from each of the CMMs. As long as one CMM has power, the CDM should operate. The CDM should use a series resistor to lower the 5 V power input to 3.3 V for the I^2C EEPROM in the CDM. I2C EEPROM should not be powered by 5V because I2C bus is pulled up at 3.3V. Maximum output current is 40mA limited by the 69.8ohm 1/8W series resistor connected at the end of OR-ing diode. The 5V voltage regulator is rated for 3A. 40mA load current for CDM power is insignificant to the output voltage change.

8.5 CDM Redundancy

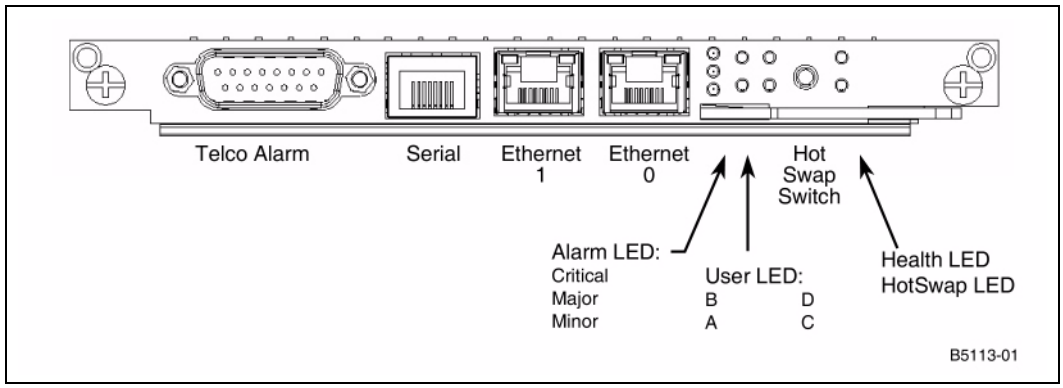
The CMMs cache the information that is stored in the CDMs, so the CDMs are only needed when the CMMs are first inserted or when the chassis is first turned on. The CMMs can manage two CDMs to ensure that, if CDM 1 is corrupted or non-functional, CDM 2 can provide the necessary information.

If a corrupted CDM is found, the CMM will log the error, raise an error condition to upper-level software, and set an error condition on the CDM's LED signals. The CMM provides a command to update a replacement CDM with the cached information. From this point forward, all changes are written to both CDMs.

9.0 Front Panel

The front panel of the MPCMM0002 CMM has several connectors, as shown in Figure 19.

Figure 19. CMM Front Panel



Each part of the front panel is described in more detail in the following sections.

9.1 Serial Port Pinouts

Each CMM has two serial ports; one goes to the front and one goes to the rear for an RTM connection. An RJ-45 connector is used for the front cabling connection, in line with common industry practice. Care should be taken to plug serial port cables into the serial port jack (without LEDs) and not the Ethernet jacks (with LEDs).

Figure 20. Serial Port RJ-45 Connector

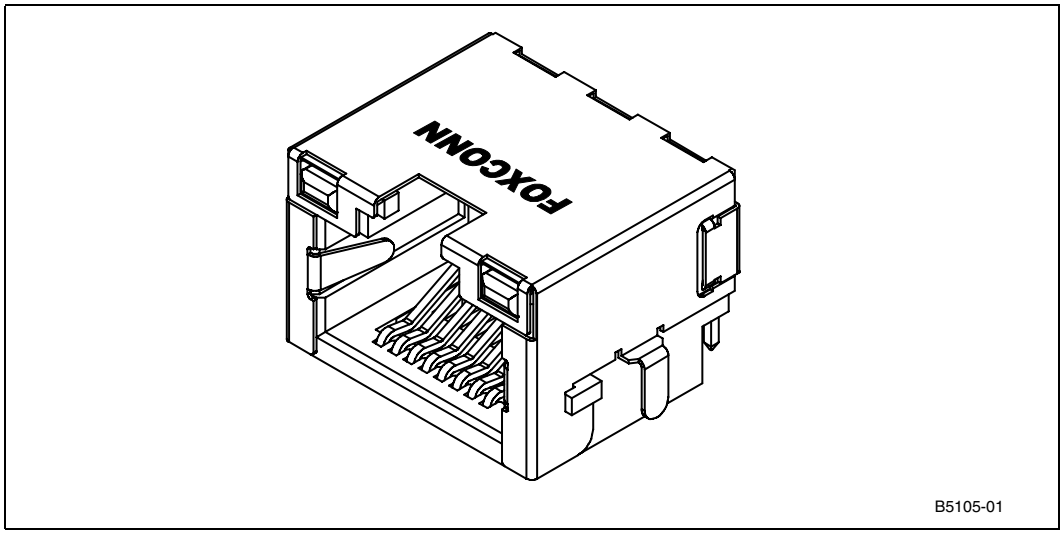


Figure 21. Serial Port RJ-45 Cabling

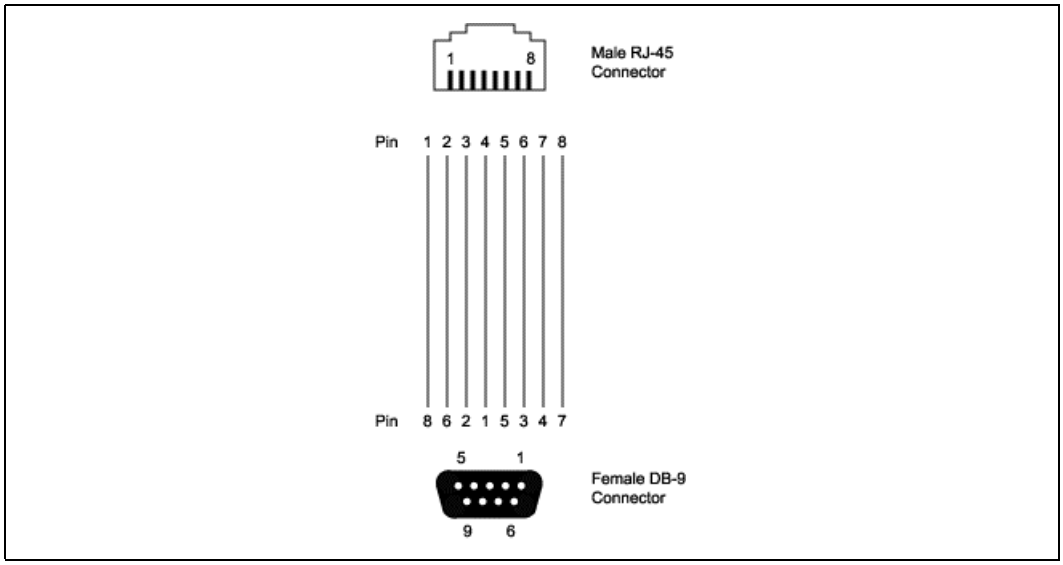


Table 15. RTM Serial Port Pinout

Pin	Signal	Description
1	RTS	Ready To Send
2	DTR	Data Terminal Ready
3	TXD	Transmit Data
4	GND	Ground
5	GND	Ground

Table 15. RTM Serial Port Pinout

Pin	Signal	Description
6	RXD	Receive Data
7	DSR	Data Set Ready
8	CTS	Clear To Send

9.2 Ethernet Port Pinouts

The CMM faceplate has two Fast Ethernet ports. The two Ethernet channels can be switched via software to the backplane connections or the RTM connections, but the default state is for the Ethernet ports to come out the front of the CMM. The connections are RJ-45 connectors with integrated LEDs, such as the Speed Tech* P54-111-1AX connector.

Figure 22. Ethernet Port RJ-45 Connector Front View

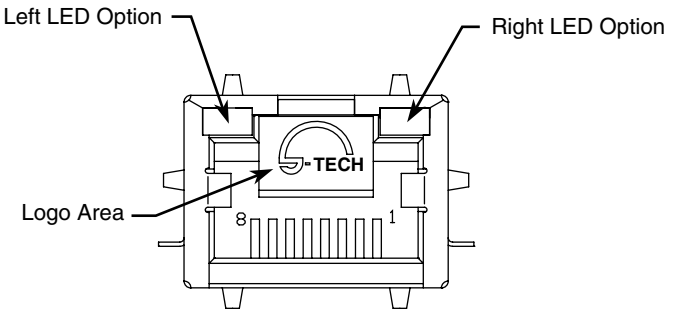


Table 16. Ethernet Port Pinouts

Pin	Signal	Description
1	RP_CMMx_TXA+	Ethernet transmit, positive polarity
2	RP_CMMx_TXA-	Ethernet transmit, negative polarity
3	RP_CMMx_RXA+	Ethernet receive, positive polarity
4	RSVD	Reserved, no connection
5	RSVD	Reserved, no connection
6	RP_CMMx_RXA-	Ethernet receive, negative polarity
7	RSVD	Reserved, no connection
8	RSVD	Reserved, no connection

There are two LEDs for each Ethernet port.

Table 17. Ethernet Port LED States

LED (Color)	Status	Description
Yellow LED	Off	10 Mbps Connection
	On	100 Mbps Connection
Green LED	Off	No Link
	Blinking	Transmission Activity
	Solid On	Link established, but no activity

9.3 Telco Alarm Connector

Many telecom facilities have existing alarm infrastructure. When an error condition occurs, the alarm system activates an audible alarm, flashes lights to help technicians locate the source of the alarm, and possibly interacts with a computer system that is monitoring the facility. Error conditions are typically classified as minor, major, or critical errors, and an LED identifies the current alarm state.

The telco alarm system consists of a distinct dry contact relay that corresponds to each alarm state. These are open or closed depending on the state and are entirely under software control (except power). The default is the no alarm state. The normally open [NO], normally closed [NC], and common [COM] relay contacts are provided to the DB-15 connector in line with existing industry practice. There are also reset inputs to clear the minor and major alarm state.

Note: There is no reset for the critical state.

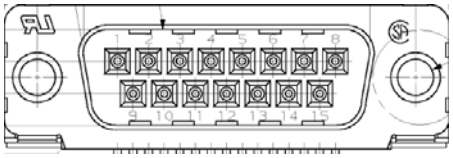
There is an additional set of contacts (common [COM] plus normally open [NO]) that is used to indicate a power system failure. There is no normally closed [NC] contact for this relay nor is there a reset for clearing it.

The telco alarm contacts on the MPCMM0002 CMM comply with the alarm connector requirements outlined in Section 2.7.7 of the PICMG* 3.0 specification.

Caution: The RTM connections for the telco alarm connections are wired parallel to the connections on the CMM faceplate. Do not connect cables to both the DB-15 connector on the CMM and the corresponding RTM alarm connector at the same time.

The DB-15 is a standard DB-15 connector, such as a Tyco* V23529-S1101-C215 connector.

Figure 23. DB-15 Telco Alarm Connector



The pinout for the DB-15 is shown below.

Table 18. Telco Alarm Pinout

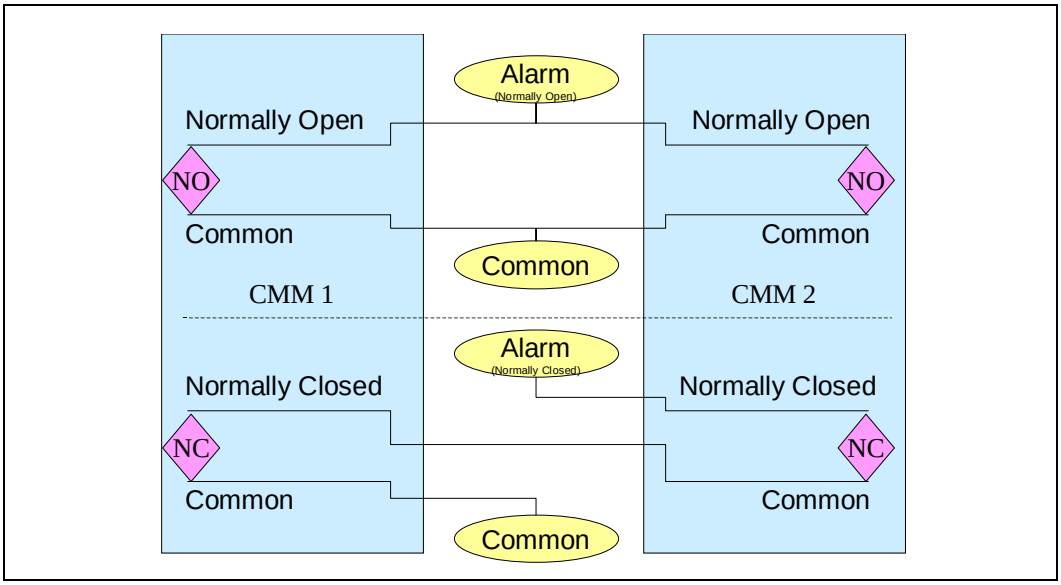
Pin	Description	Pin	Description
1	MinorReset +	9	MinorAlarm - NC
2	MinorReset -	10	MinorAlarm - COM
3	MajorReset +	11	MajorAlarm - NO
4	MajorReset -	12	MajorAlarm - NC
5	CriticalAlarm - NO	13	MajorAlarm - COM
6	CriticalAlarm - NC	14	PwrAlarm - NO
7	CriticalAlarm - COM	15	PwrAlarm - COM
8	MinorAlarm - NO		

The signals on the alarm connector can be up to –72 VDC. The relay handles currents up to 1 A.

9.3.1 Cascading the Telco Alarm Connectors

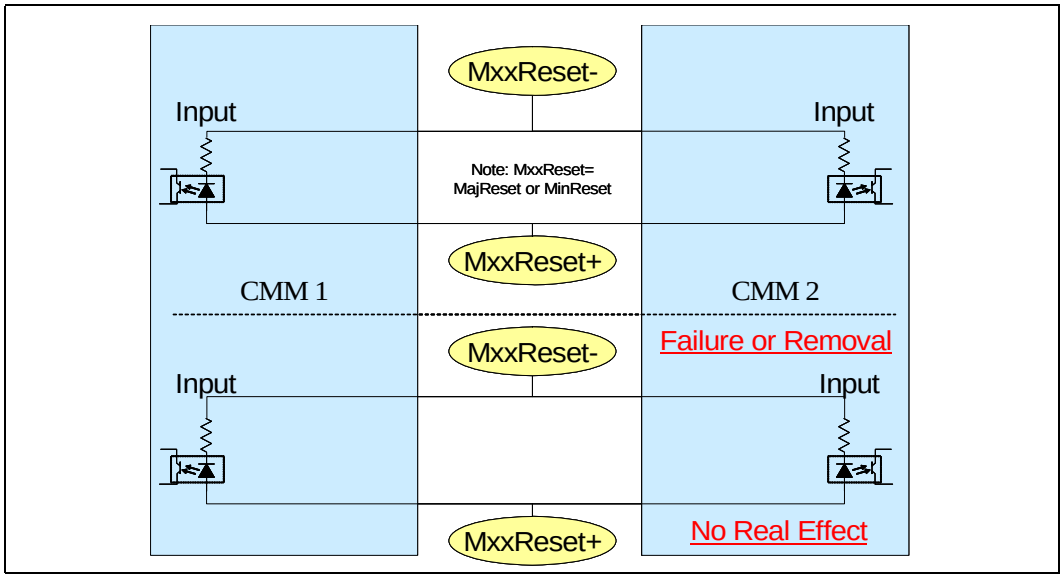
The two telco alarm connectors can be wired independently to separate alarm controls for maximum redundancy. Alternatively, the two connectors may be ganged together to connect to a single alarm panel. Alarms that activate off the normally open [NO] contacts should be wired together differently than the cable for normally closed [NC] contacts.

Figure 24. Telco Alarm Contact Wiring for Dual Connectors



The interconnection diagram above shows how the two signals are wired under normal circumstances. In a failure scenario such as a disconnected cable, however, only the normally closed contact reports an error. This is identical to the behavior in a failure scenario with a single telco alarm connector.

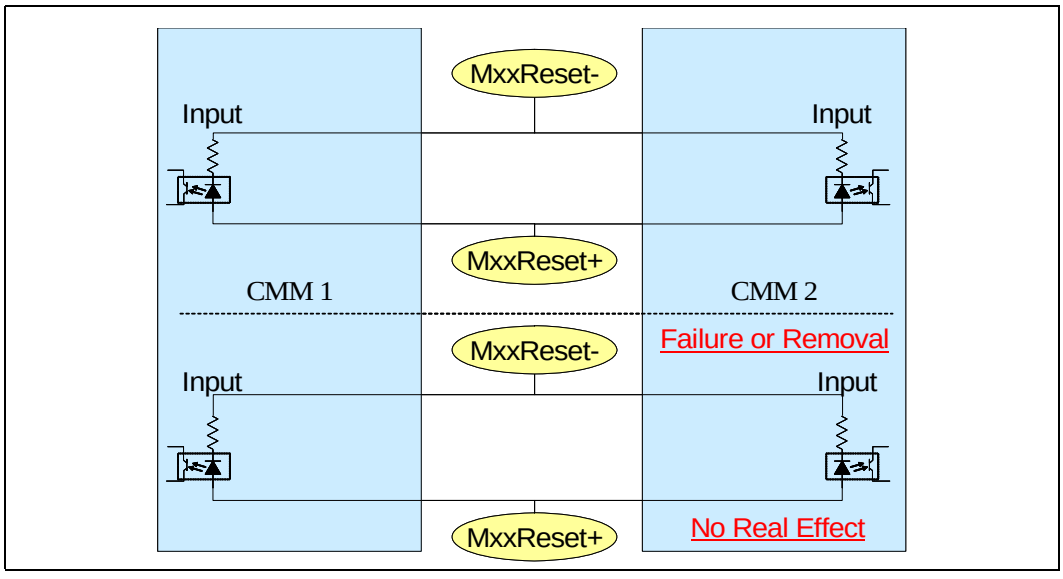
Figure 25. Failure Scenario with Dual Telco Alarm Connectors



Telco alarm inputs from multiple connectors are wired parallel to each other. The absence or failure of one connection will not affect the ability to recognize an input from the other connection.

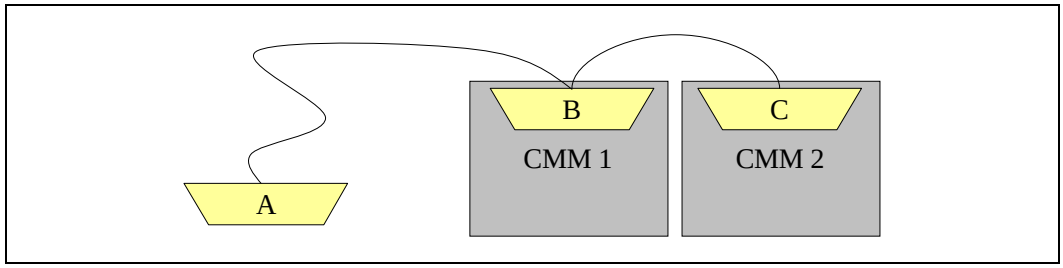
Note: The CMM input signals use optocouplers on the reset signals to provide full electrical isolation from the input signals.

Figure 26. Parallel Inputs to Telco Alarm Connectors



A cable to connect the two telco alarms together is shown in Figure 27. Connector A goes to the facility's alarm panel, while connectors B and C go to the RTM connectors for CMM 1 and CMM 2.

Figure 27. Cascaded Telco Alarm Cables



Pinouts for the cables to match the diagram in Figure 27 are shown in Table 19. Since the CMMs that drive the telco alarm signals are normally kept synchronized, either of the cables described in this table should work. However, choosing a cable that matches the type of alarm in use, whether normally open or normally closed, also helps protect against errors with the CMMs themselves.

Table 19. Ganged Telco Alarm Cable Pinouts with Cabling

For Normally Open Alarms				For Normally Closed Alarms			
A Pin	Description	B Pin	C Pin	A Pin	Description	B Pin	C Pin
1	MinorReset +	1	1	1	MinorReset +	1	1
2	MinorReset -	2	2	2	MinorReset -	2	2
3	MajorReset +	3	3	3	MajorReset +	3	3
4	MajorReset -	4	4	4	MajorReset -	4	4
5	CriticalAlarm - NO	5	5	5	CriticalAlarm - NO	5	5
6	CriticalAlarm - NC	6	6	6	CriticalAlarm - NC	6	-
-	-	-	-	-	CriticalAlarm - X	7	6
7	CriticalAlarm - COM	7	7	7	CriticalAlarm - COM	-	7
8	MinorAlarm - NO	8	8	8	MinorAlarm - NO	8	8
9	MinorAlarm - NC	9	9	9	MinorAlarm - NC	9	-
-	-	-	-	-	MinorAlarm - X	10	9
10	MinorAlarm - COM	10	10	10	MinorAlarm - COM	-	10
11	MajorAlarm - NO	11	11	11	MajorAlarm - NO	11	11
12	MajorAlarm - NC	12	12	12	MajorAlarm - NC	12	-
-	-	-	-	-	MajorAlarm - X	13	12
13	MajorgAlarm - COM	13	13	13	MajorAlarm - COM	-	13
14	PwrAlarm - NO	14	14	14	PwrAlarm - NO	14	14
15	PwrAlarm - COM	15	15	15	PwrAlarm - COM	15	15

9.4 Alarm Quiet Switch

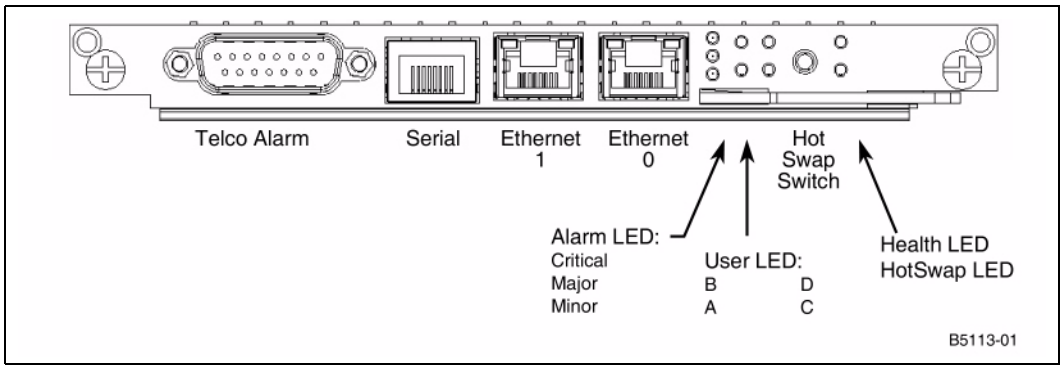
The alarm quiet switch is located on the CMM faceplate. When the user presses the alarm quiet switch, the CMM shuts off the alarm relays for a fixed period of time. During the time alarm quiet is in effect, the front panel alarm LEDs flash. If the quiet interval is exceeded without resolving the alarms, the alarms will be re-initiated.

If the alarm quiet switch is held in for more than five seconds, the processor on the CMM is reset. This is functionally equivalent to ejecting and re-inserting the CMM in the chassis.

9.5 LEDs

Figure 28 shows the LEDs on the front panel of the MPCMM0002 module.

Figure 28. CMM Front Panel with Labels



9.5.1 Alarm LEDs

There are three alarm LEDs, corresponding to the minor (!), major (!!), and critical (!!!) alarm states. The LEDs are amber when on. The meaning of each LED and state is described in Table 20.

Table 20. CDM Health LED States

LED (Symbol)	Status	Description
Minor Alarm (!)	Off	No Minor Alarm active
	On	Minor Alarm active
	Flashing	Minor Alarm active, but silenced
Major Alarm (!!)	Off	No Major Alarm active
	On	Major Alarm active
	Flashing	Major Alarm active, but silenced
Critical Alarm (!!!)	Off	No Critical Alarm active
	On	Critical Alarm active
	Flashing	Critical Alarm active, but silenced

9.5.2 Health LED

Each CMM maintains a single health LED (✚) to indicate the status of the CMM. Possible states are described in Table 21.

Table 21. CMM Health LED States

Color	Description
Off	No power to CMM
Solid Green	Normal operation, power okay
Blinking Green	CMM in standby mode
Solid Red/Amber	Attention status (error condition) - CMM configures error color

9.5.3 Hot Swap LED

Each CMM maintains a single blue Hot Swap LED (⍁) to provide the status of the CMM itself. Possible states are described in Table 22.

Table 22. CMM Hot Swap LED States

Color	Description
Off	In use
Long Blink	Searching for CMM (900 ms on, 100 ms off)
Solid Blue	Ready to remove
Short Blink	Preparing for extraction (100ms on, 900 ms off)

Note: Service personnel should be trained to wait for the solid blue LED before removing the CMM from the system.

9.5.4 User-Definable LEDs

Each CMM provides four LEDs (A, B, C, D) that can be controlled via the operator or via software automatically interacting with the CMM. Each LED can be off, green, yellow, or red.

During the boot process, the user LEDs sequentially blink off to indicate boot progress. The user LEDs will be off by the time the CMM software is fully loaded. Once the CMM is up, the administrator can control the LED through standard interfaces or via programmatic control. Methods to control these LEDs are described in the Intel NetStructure® MPCMM0001 Chassis Management Module *and Intel NetStructure® MPCMM0002 CMM Software Technical Product Specification*.

10.0 Grounding Considerations

10.1 ESD Discharge Protection

The MPCMM0002 CMM has ESD discharge strips on its lower edge. Refer to Section 5.4, “ESD Discharge Strip” on page 27 for more information.

10.2 Chassis Ground and Logic Ground

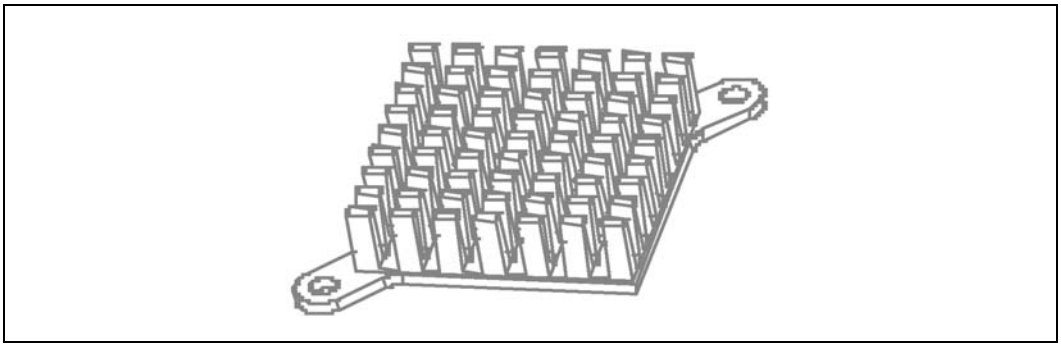
Section 4.2.3 of the PICMG 3.0 specification recommends that each FRU have a jumper to tie logic ground and chassis ground together. On the MPCMM0002 CMM, this jumper is accessible on Component Side 1 of the CMM near the ejector handle. Jumper J3 is normally jumpered between pins 1 and 2, which means no connection; move the jumper to connect pins 2 and 3 on J3 to connect these two grounds together. Refer to Figure 3, “CMM Top View Layout” on page 16 for the location of J3.

11.0 Thermals

11.1 Processor Heat Sink

The MPCMM0002 CMM chassis management module has a heat sink on the 80321 processor to aid CMM cooling. This heat sink is a modified pin grid array as shown in Figure 29.

Figure 29. CMM Heat Sink



This heat sink provides similar cooling results with either a vertical or horizontal airflow.

11.2 Module Orientation

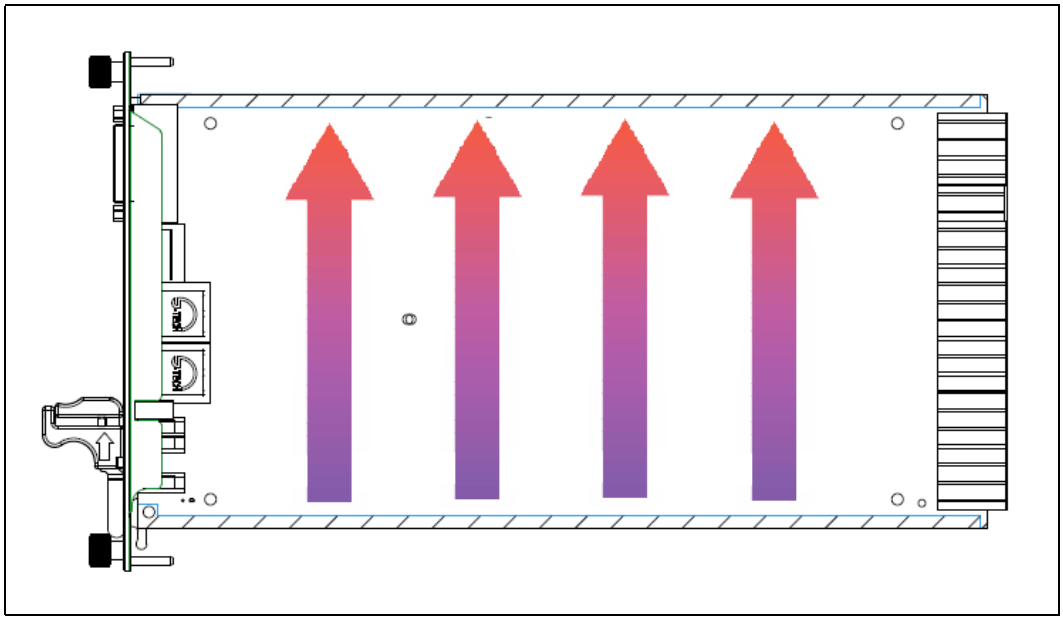
The MPCMM0002 CMM module is designed to be installed in one of four orientations:

- Horizontal, with component side 1 up
- Horizontal, with component side 1 down
- Vertical, with component side 1 to the right
- Vertical, with component side 1 to the left

11.3 Module Airflow Path

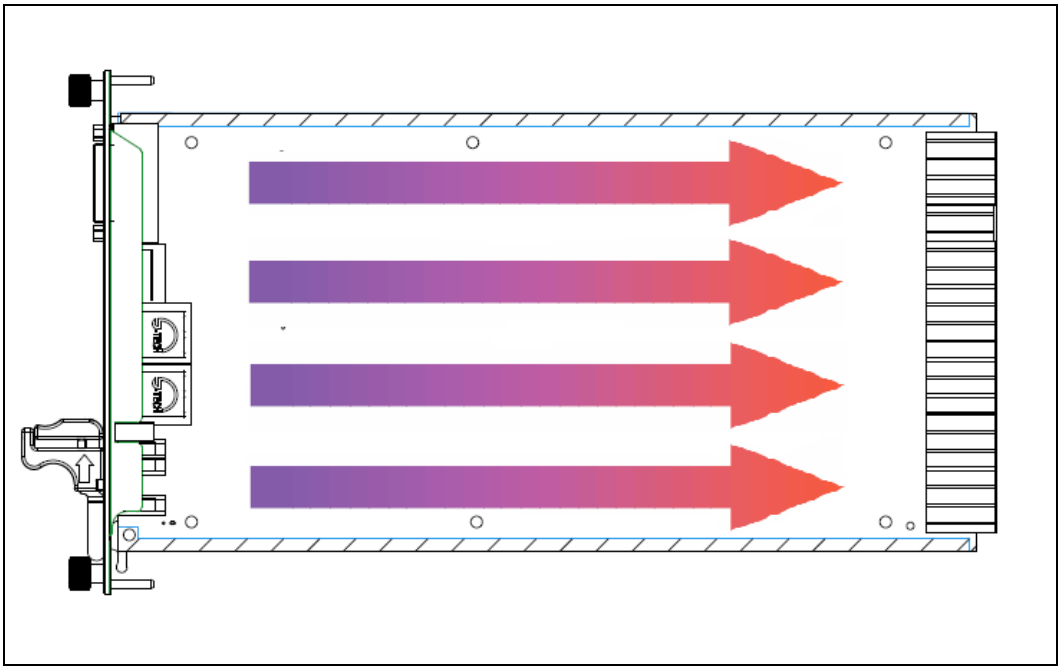
Regardless of the orientation, the airflow to the MPCMM0002 CMM module must follow one of two general patterns: front-to-back or side-to-side. Side-to-side airflow should be evenly distributed throughout the board, as shown in Figure 30 and Figure 31 below.

Figure 30. Side-to-Side Air Flow



The MPCMM0002 CMM module supports a front-to-back airflow path as well. This is most useful when the CMM is installed perpendicular to the main subrack, such as horizontally above or below a vertical subrack. Since there is no airflow through the front panel or through most backplanes, chassis designers must ensure that they direct sufficient airflow across the major components on the PCB, including the 80321 processor. While the front or rear 40 mm (1.5748 inches) on each CMM does not need high airflow, chassis designers should ensure that the area between these regions is guaranteed a proper airflow as defined in Section 11.4, “Airflow Requirements” on page 57.

Figure 31. Front-to-Back Air Flow



It may be necessary to enclose the area around a CMM when cooled front-to-back to ensure that air is properly channeled across the board and evenly distributed.

11.4 Airflow Requirements

General airflow requirements for the CMM are shown in Table 23.

Table 23. Typical Airflow and Cooling Requirements

Category	CMMs
Required LFM	180 LFM (54.864 m/min)
Required CFM	5 CFM (0.1416 m^3/min) per CMM
Typical Heat Dissipation	21 W per CMM
Maximum Heat Dissipation	28 W per CMM
Approximate Airflow Resistance	0.2 in.-H_2O (~46 Pa)

11.5 Board Resistance Curve

As described in Chapter 5 of the PICMG* 3.0 specification, all board vendors are required to provide a flow pressure curve for their board along with the airflow requirements for specific wattages. This enables system integrators to compare the slot resistance curves of their shelves with the resistance and airflow requirements of their blades to approximate whether a given chassis can cool a particular blade.

The MPCMM0002 CMM is not subject to this requirement because the board is not an AdvancedTCA standard form factor. Flow pressure curves will vary widely depending upon location of the MPCMM0002 CMM in a chassis and the type/amount of airflow across the MPCMM0002 CMM at that location.

As a guideline, the MPCMM0002 CMM requires the airflow in Table 24.

Table 24. Airflow Guidelines

Minimum Air Flow	Air Temp Rise
3.3 cfm (0.0934 m^3/min)	15° C (59° F)
4.9 cfm (0.1388 m^3/min)	10° C (50° F)

11.6 Thermal Sensors

Proper thermal design is critical to the successful deployment of the MPCMM0002 CMM chassis management module. In the event sufficient airflow is not provided, the CMM has three levels of thermal protection:

1. A thermal sensor near the main processor (wired to ADM1026) and internal sensors in ADM1026 are monitored by software, which then shuts down the CMM if necessary.
2. A dedicated thermal circuit tells the power brick to shut off power to the rest of the board if it detects an even higher temperature on the board.
3. Finally, the power converter shuts itself off if it gets too hot.

12.0 Management Module Specifications

12.1 Feature Summary

Key carrier-grade features of the Intel NetStructure® MPCMM0002 CMM include the following:

- Full shelf management controller and shelf manager capability as defined in the PICMG 3.0 specification with support for up to 16 board slots in an AdvancedTCA* chassis.
- Hybrid dual IPMB star topology support for improved reliability, security, and throughput.
- Slim 4U x 282.5 mm x 3HP size to simplify integration into chassis.
- Comprehensive management interfaces including CLI, SNMP, RPC, and RMCP.
- Dual 10/100 Mbps Ethernet controllers front, rear, or on the backplane.
- Dual serial ports (one out front, one out the RTM) for local console support.
- Isolated telecom alarm connections front or rear to connect to standard telecom alarms.
- Direct –48 VDC inputs with on-board power regulation for maximum uptime.
- Low power design, using less than 30 W.
- High-temperature design to allow incoming air as hot as 70° C (158° F) with the proper airflow.
- Dedicated communication paths between dual CMMs for active-standby operation.
- Support for CDMs (chassis FRU modules), fan trays, PEMs, and external temperature sensors.
- Integrated backing plate to help meet the full range of standard NEBS tests, including earthquake, fire, immunity, and safety.
- Intel® 80321 processor with Intel XScale® technology, 128 MBytes RAM, and 64 MBytes flash memory to provide headroom for future expansion and space for custom user applications on board.
- Comprehensive software management capabilities, which are detailed in the Intel NetStructure® MPCMM0001 Chassis Management Module *and Intel NetStructure® MPCMM0002 CMM Software Technical Product Specification* for firmware version 6.1.

12.2 Dimensions and Weight

Table 25. Dimensions and Weight

Attribute	Value
Height	177 mm (6.9685 inches) faceplate
	144.5 mm (5.6890 inches) PCB
Width	15.24 mm (0.6 inches) (3HP) faceplate
Depth	280 mm (11.0236 inches) PCB
Shipping Weight	0.9 kg (2.0 lbs)

See Section 5.1, “Dimensions” on page 24 for more information.

12.3 Environmental Characteristics

Table 26. Environmental Characteristics

Parameter	Conditions	Detailed Specification
Temperature (Ambient)	Operating Ambient to CMM	Normal Operation: +5° C to +55° C (41°F to +131° F) Transient Operation: –5° C to +70° C (23° F to +158° F)
	Storage	-40° C to +70° C (-40° F to +158° F)
Altitude	Operating	4000 meters (13123 ft)
Humidity	Operating	5-85% (90% short term) non-condensing
	Storage	10-95% non-condensing
Vibration	Operating - Sine	0.5 G acceleration over 5-500 Hz sine wave (P-P), 0.5 oct/min sine sweep
	Operating - Random	5 Hz to 20 Hz @ 0.01 g2/Hz 20 Hz to 500 Hz @ 0.02 g2/Hz
	Storage & Transport	0.5 G acceleration over 5-50 Hz sine wave (P-P), 0.1 oct/min 3 G acceleration over 50-500 Hz sine wave (P-P), 0.25 oct/min sine sweep
Shock	Operating	5 G, trapezoidal 11-ms duration (system-level)
	Storage and Transport	50 G, trapezoidal 11-ms duration (unpackaged board) 18in. drop test @ 167 in/sec acceleration (packaged board) 20 G, trapezoidal 11-ms duration (packaged. system)
Power	Operating Voltage Range	-39.5 VDC to –72 VDC
	Power Dissipation	17 W typical, 28 W maximum

12.4 Product Reliability Estimate

The calculation results in Table 27 were generated using the references and assumptions listed in Section 12.4.1. This report and its associated calculations supersede all other released Mean Time Between Failure (MTBF) and Failure in Time (FIT) calculations of earlier report dates. The reported failure rates do not represent catastrophic failure. Catastrophic failure rates will vary based on application environment and features critical to the intended function.

Table 27. Reliability Estimate Data

Reliability Measure	Value	Units
Failure Rate (FITs)	*8348.26*	Failures in 10^9 hours
MTBF	*119,785*	Hours

12.4.1 Assumptions and Notes

12.4.1.1 Environmental Assumptions

1. Failure rates are based on a 40^o C (104^o F) ambient temperature.
2. Applied component stress levels are 50 percent (voltage, current, and/or power).
3. Ground, fixed, controlled environment with an environmental adjustment factor equal to 1.0.

12.4.1.2 General Assumptions

1. Component failure rates are constant.
2. Board-to-system interconnects included within estimates.
3. Non-electrical components (screws, mechanical latches, labels, covers, etc.) not included within estimations.
4. Printed Circuit Board considered to have a 0 FIT rate.

12.4.1.3 General Notes

1. Method I, Case I = Based on “Parts Count”. Equipment failure is estimated by totaling device failures rates and quantities used.
2. Quality Level II = Devices purchased to specifications, qualified devices, vendor lot-to-lot controls for AQLs and DPMs.
3. Where available, direct component supplier predictions or actual FIT rates have been utilized.

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12.5 Agency Certifications

See Section 16.0, “Certifications” for more information.

13.0 Guidelines for Third Party Chassis Vendors

This chapter describes some of the high level design of the Intel NetStructure® MPCMM0002 Chassis Management Module to help third party chassis vendors better understand how to incorporate the CMM into their chassis.

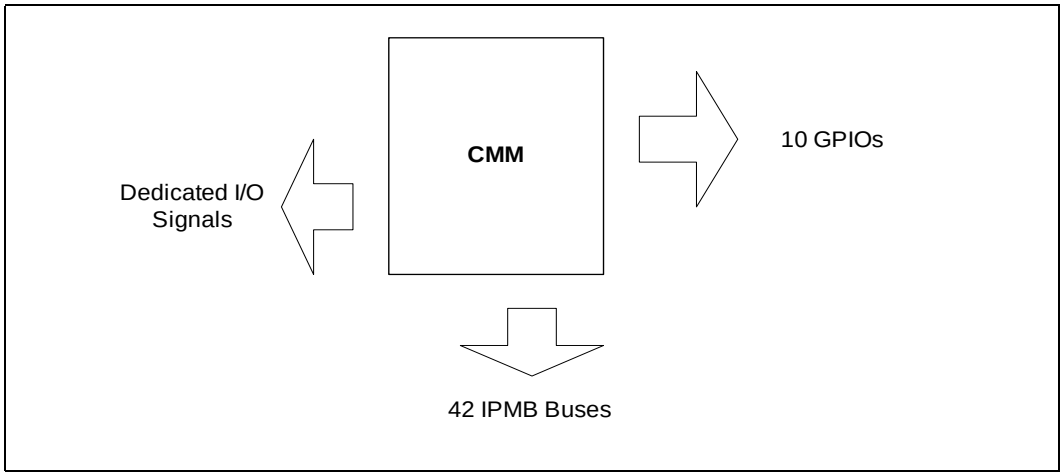
Note: The chapter excludes any low level design details of the individual components of the Chassis Management Module or the CMM firmware. This chapter also does not explain how to configure the CMM to work in a third party chassis. That information is contained in the Intel NetStructure® MPCMM0001 Chassis Management Module *and Intel NetStructure® MPCMM0002 CMM Software Technical Product Specification* for version 6.1.

13.1 High Level Design

At a very high level, the CMM can be thought of as a black box, which has 42 IPMB buses to allow a variety of bus topologies. The GPIO signals are for user-defined purposes, and the dedicated I/O signals are used for certain dedicated functionality explained later.

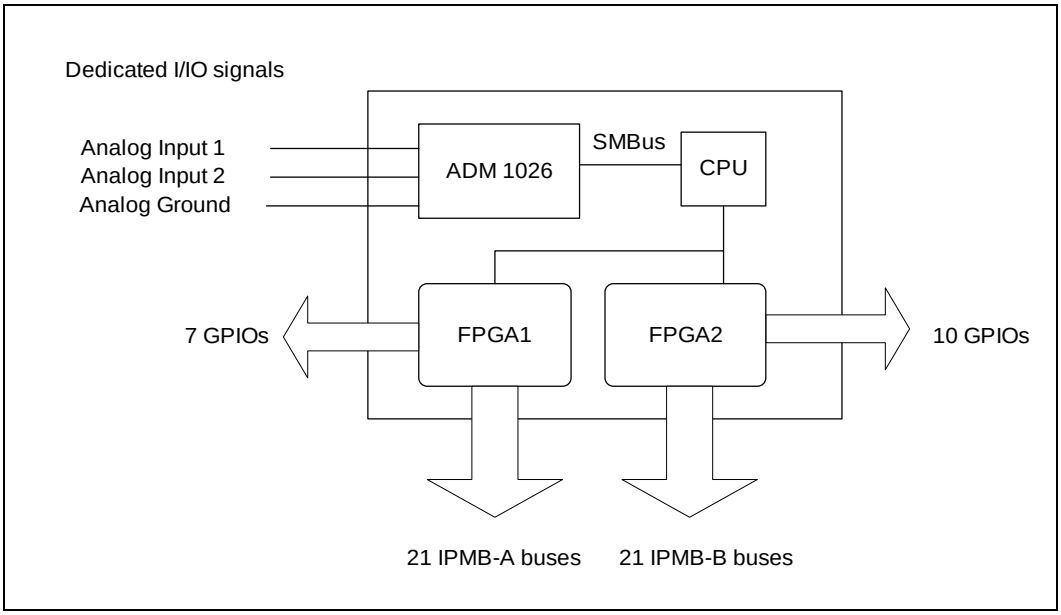
Figure 32 illustrates this high level CMM design.

Figure 32. High Level CMM Design



The figure below provides next level of details on how these pins are wired to different components on the CMM hardware.

Figure 33. I/O Signals of the CMM



13.2 IPMB Buses

Figure 33 illustrates 42 IPMB buses emanating out of the two FPGAs, 21 buses from each. Taken together, all buses are numbered 1 through 42. Buses numbered 1–21 are IPMB-A buses implemented by FPGA1, and buses numbered 22–42 are IPMB-B buses implemented by FPGA2. Though IPMB-A and IMPB-B bus pairs are intended to provide redundancy, they could be used individually as well.

These buses can be configured to realize two basic IPMB bus topologies: radial and shared. The actual usage model of these buses is ultimately up to the chassis designer. Some possible usage scenarios have been listed in "Section 13.4.1, "Example Configurations" on page 67." The following sections provide graphical illustration of the two basic bus topologies.

See Section 7.1.2, "CMM Data Connector" on page 36 for the signal names, pin numbers, and connector information of the above-mentioned signals and buses. The 42 IPMB Buses are supported in all versions of firmware. The following table shows mapping between the IPMB signal names and their corresponding physical bus number as used by the CMM firmware.

Note: The physical bus numbers are 1-based (starting from 1), however in the configuration files (required for third party chassis integration) a 0-based (starting from 0) numbering scheme is used.

Each IPMB bus consists of two signals usually named SDA (data) and SCL (clock). The table below only refers to the data(SDA) signal for simplicity. Also please note that all the IPMB buses appear in redundant pairs with one set of signals named as A and the other set of signals as B. Hence physical bus number 1 consists of the pair of signals BP_N_SDA_[1]_A/ BP_N_SCL_[1]_A and it's corresponding redundant bus with physical bus number 22 consists of the pair of signals BP_N_SDA_[1]_B/ BP_N_SCL_[1]_B.

Table 28. Physical Bus Number Mapping

IPMB Signal	Physical Bus Number	IPMB Signal	Physical Bus Number
BP_N_SDA_[1]_A	1	BP_N_SDA_[1]_B	22
BP_N_SDA_[2]_A	2	BP_N_SDA_[2]_B	23
BP_N_SDA_[3]_A	3	BP_N_SDA_[3]_B	24
BP_N_SDA_[4]_A	4	BP_N_SDA_[4]_B	25
BP_N_SDA_[5]_A	5	BP_N_SDA_[5]_B	26
BP_N_SDA_[6]_A	6	BP_N_SDA_[6]_B	27
BP_N_SDA_[7]_A	7	BP_N_SDA_[7]_B	28
BP_N_SDA_[8]_A	8	BP_N_SDA_[8]_B	29
BP_N_SDA_[9]_A	9	BP_N_SDA_[9]_B	30
BP_N_SDA_[10]_A	10	BP_N_SDA_[10]_B	31
BP_N_SDA_[11]_A	11	BP_N_SDA_[11]_B	32
BP_N_SDA_[12]_A	12	BP_N_SDA_[12]_B	33
BP_N_SDA_[13]_A	13	BP_N_SDA_[13]_B	34
BP_N_SDA_[14]_A	14	BP_N_SDA_[14]_B	35
BP_N_SDA_[15]_A	15	BP_N_SDA_[5]_B	36
BP_N_SDA_[16]_A	16	BP_N_SDA_[16]_B	37
BP_CF_SDA_A	17	BP_CF_SDA_B	38
BP_SH_SDA_A	18	BP_SH_SDA_B	39
BP_RED_SDA_A	19	BP_RED_SDA_B	40
BP_RP_SDA_A	20	BP_RP_SDA_B	41
BP_SP_SDA_A	21	BP_SP_SDA_B	42

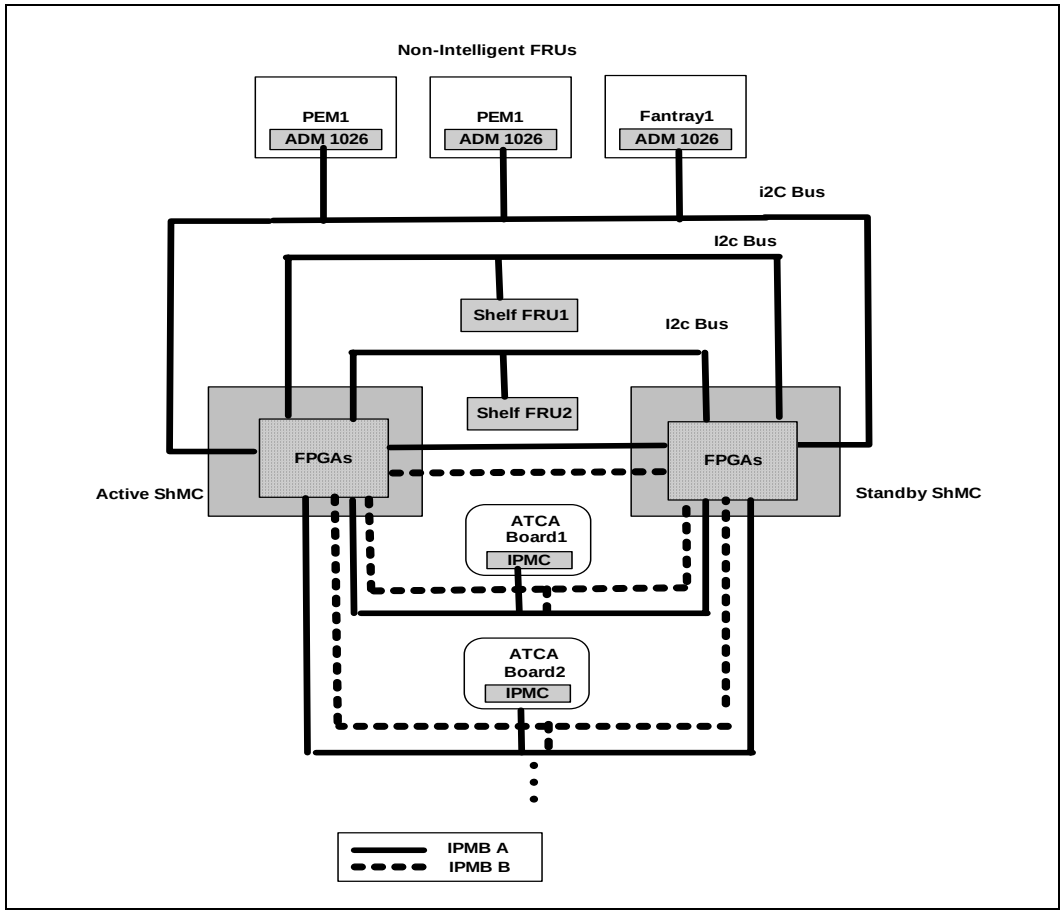
Among the 42 IPMB buses, two buses, 18 and 39 (signals BP_SH_SDA_A and BP_SH_SDA_B respectively in Table 28), have a special feature. Each bus is wired to an LTC4300 (IPMB bus isolator) part before making to the backplane. The IPMB bus isolator allows detection of bus hangs. Intel highly recommends using these buses (in a redundant mode) for chassis that use a shared bus topology. Figure 34 shows the radial bus topology. Figure 35 shows the shared bus topology.

IPMB buses BP_RED_SDA_A/ BP_RED_SDA_B (physical bus number 19 and 40) are reserved to be used as a dedicated redundant connection between two CMMs in the chassis.

IPMB buses BP_CF_SDA_A/BP_CF_SDA_B (physical bus number 17 and 38) are intended to be used as a dedicated redundant IPMB buses between CMMs and chassis FRU.

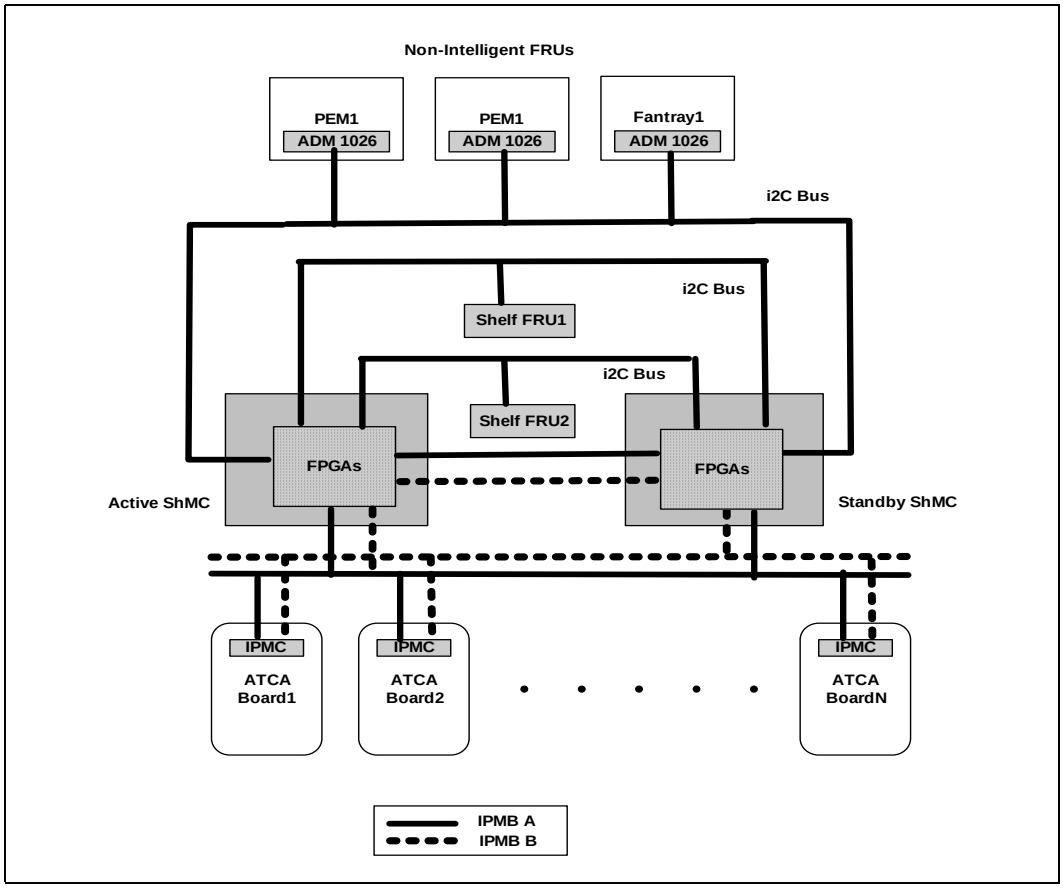
IPMB buses BP_SP_SDA_A/BP_SP_SDA_B & BP_RP_SDA_A/BP_RP_SDA_B are reserved for future use, however they can be configured by chassis vendors as any general purpose IPMB buses in redundant or individual configuration.

Figure 34. Radial Bus Topology[a]



a. The ADM1026 shown in the PEMs and the fan tray is just one possible I^2C controller that can be used.

Figure 35. Shared Bus Topology[a]



a. The ADM1026 shown in the PEMs and the fan tray is just one possible I^2C controller that can be used.

13.3 GPIO Pins

As shown in Figure 33, there are 10 GPIO pins (signal names GPIO1 through GPIO10), which can be configured by software for a set of predefined usage types such as detecting presence of a device, controlling LEDs, controlling push buttons, and reading single bit values for each pin. Limited support for configuration and use of dedicated I/O Signals and 10 additional GPIO signals is available in firmware versions starting from 6.1. More details on configuration of these signals are available in the Intel NetStructure® MPCMM0001 Chassis Management Module *and Intel NetStructure® MPCMM0002 CMM Software Technical Product Specification*.

13.3.1 Dedicated I/O Pins

Some of the I/O pins shown in Figure 33 have a dedicated purpose, but some of them are GPIO pins which could be used for other purposes. As shown in Figure 33, there are ten dedicated I/O pins:

- Seven are wired to the GPIO pins of FPGA1. These GPIOs can be reconfigured for different uses. The corresponding signal names are: BP_AFLED[1:2], BP_AFPRES#, FRU0_STATUS[0:1], and FRU1_STATUS[0:1]. A detailed description of these signals can be found in Section 7.1.2, “CMM Data Connector” on page 36.

- Three are wired to the Analog Devices* Complete Thermal System Management Controller ADM1026* on the CMM. Two of them (BP_AFT1 and BP_AFT2) can only be used for temperature readings from two different thermistors (which may be located anywhere on the chassis). These provide analog input via pins 35 (AIN6) and 34 (AIN7). The third pin must be used for thermistor return (BP_AFTREF), and is grounded via pin 21 (AGND) on the ADM1026.

13.4 Interfacing FRUs to the CMM

The MPCMM0002 CMM can communicate with intelligent and non-intelligent FRUs sitting on any of the 42 IPMB buses. All 42 buses on the CMM are implemented on top of I^2C. The two FPGAs shown in Figure 33 implement 42 I^2C engines, one for each IPMB bus.

Depending on the requirements, one or more IPMB buses could be configured as I^2C buses for non-intelligent FRUs. Any single bus can be configured as an IPMB or I^2C bus via software. For intelligent FRUs, the bus must be configured as IPMB, and for non-intelligent FRUs that support I^2C, the bus must be configured as I^2C. FRUs of either type can either share a bus with other FRUs of the same kind or use a dedicated bus.

The following sub-sections explain how different types of intelligent and non-intelligent FRUs can be connected to the Chassis Management Module on an AdvancedTCA chassis.

13.4.1 Example Configurations

Section 13.2, "IPMB Buses" on page 63 discusses the two basic IPMB bus topologies, radial and shared, that are supported by the Chassis Management Module. Following is a list of examples which allow different combinations of these topologies. This is not an exhaustive list of possible configurations, but just a few examples. The assumption here is that there is a mix of intelligent and non-intelligent FRUs, but there are no restrictions if a chassis consists of intelligent FRUs only. Also, for each of the example configuration below, redundancy has been assumed for intelligent FRUs.

Note: The following examples are only supported under firmware version 6.1 and above through appropriate configuration files.

13.4.1.1 Example Chassis Configuration #1

- Bus #18/39, configured as IPMB, shared by all 16 blades (shared topology)
- Bus #1/22, configured as IPMB, shared by all intelligent PEMs and fan trays
- Bus #2/23, configured as IPMB, for inter-CMM communication
- Bus #3, configured as I^2C bus, used solely by FRU1
- Bus #24, configured as I^2C bus, used solely by FRU2
- Bus #5, configured as I^2C bus, shared by other non-intelligent FRUs

13.4.1.2 Example Chassis Configuration #2

- Bus #1–16, configured as IPMB, one bus dedicated for each of the 16 blades (radial topology)
- Bus #17, configured as I^2C bus, shared by three non-intelligent fan trays
- Bus #18/39, configured as IPMB, shared by two PEMs
- Bus #19/40, configured as IPMB, for inter-CMM communication
- Bus #20, configured as I^2C bus, used solely by FRU1

- Bus #41, configured as I^2C bus, used solely by FRU2

13.4.1.3 Example Chassis Configuration #3

- Bus #18/39, configured as IPMB, shared by all 16 blades (shared topology)
- Bus #1, configured as I^2C, shared by two PEMs
- Bus #2, configured as I^2C bus, shared by three non-intelligent fan trays
- Bus #3/24, configured as IPMB, for inter-CMM communication
- Bus #4, configured as I^2C bus, used solely by FRU1
- Bus #25, configured as I^2C bus, used solely by FRU2
- Bus #6, configured as I^2C bus, shared by three Maxim/Dallas Semiconductor DS75 temperature sensors

13.5 Intelligent FRUs

All intelligent FRUs must have support for an IPM controller (IPMC), and must be able to respond to AdvancedTCA-specific IPMI commands as mandated by the AdvancedTCA and IPMI specifications.

13.6 Non-Intelligent FRUs with I^2C* Support

Similar to intelligent FRUs, non-intelligent FRUs can be hooked on a shared bus or a dedicated bus. However, no redundancy is possible.

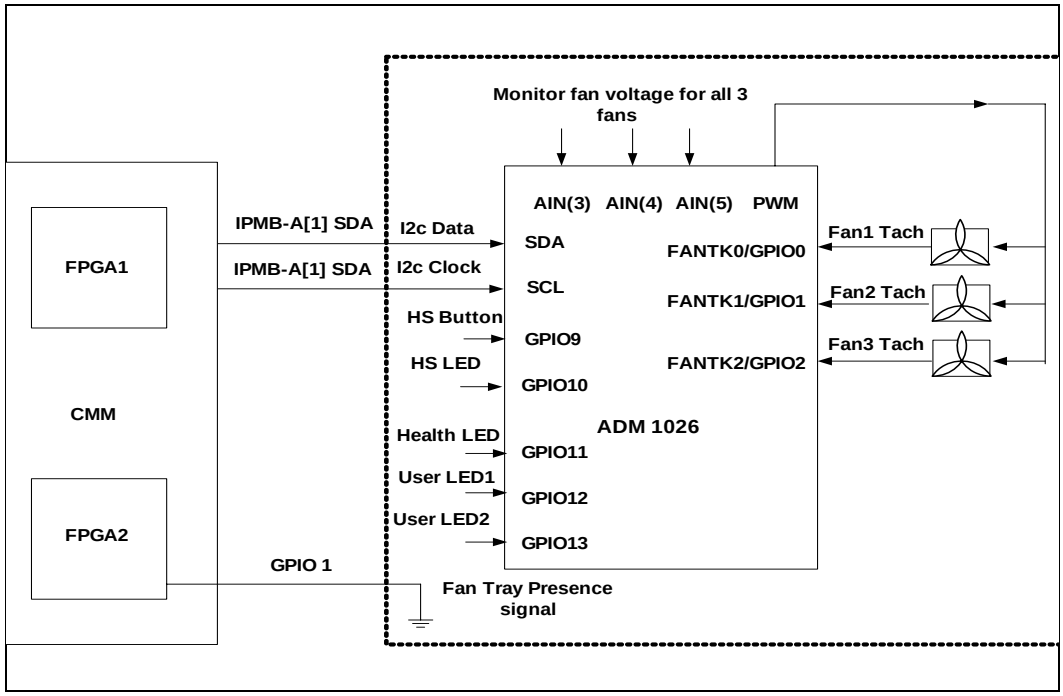
The Chassis Management Module supports two kinds of non-intelligent FRUs that have I^2C support: those based on the ADM1026 controller and those based on the two-wire serial interface.

13.6.1 FRUs Based on the ADM1026

The ADM1026 is a versatile system hardware monitor chip which has multiple GPIO inputs. These are analog inputs to measure and control different system parameters.

Figure 36 shows an example of how an ADM1026 can be used on a fan tray. Each of the GPIO pins shown in the ADM1026 can be accessed via registers. The CMM reads from and/or writes to these registers depending on the usage of the pins. One of the GPIO pins on the CMM is used to detect presence of the fan tray. Similar to the fan trays, non-intelligent PEMs could also be based on the ADM1026.

Figure 36. FRU That Uses the ADM1026



13.6.2 Two-Wire Serial Interface Based

FRUs such as sensors, EEPROMs, or similar devices that have support for the two-wire serial bus (I^2C) can be hooked on shared or dedicated I^2C buses. Examples are the Atmel* AT24C64/16 EEPROMs and the DS75 temperature sensor.

13.7 Non-Intelligent FRUs without I^2C Support

The GPIO pins and (if needed) the dedicated I/O pins of the CMM can be used to allow FRUs that do not support the I^2C bus to communicate with the CMM. For example, the air filter tray used on the Intel NetStructure MPCHC0001 chassis communicates with the CMM in this manner. In that chassis some of the seven GPIOs shown in Figure 33 are used to control the LED and to detect the presence of the filter tray. Also, readings from two temperature sensors (thermistors) on the filter tray are wired to the ADM1026 on the CMM board.

13.8 FRU Data Storage for Non-Intelligent Devices

Version 6.1 of the CMM firmware for the MPCMM0002 currently supports the Atmel Corporation* AT24C64 or AT24C16 EEPROMs and the Microchip Technology* 24LC256 EEPROM for the storage of FRU data on any non-intelligent device in the chassis. In particular, the chassis FRU data must be stored on one of these EEPROMs, each of which can store up to 8 kilobytes of data.

13.9 Controllers and I/O Ports for Non-Intelligent Devices

Version 6.1 of the CMM firmware for the MPCMM0002 supports the Analog Devices* ADM1026 and the Philips Semiconductors* PCA9555 devices for communicating with non-intelligent power entry modules (PEMs), fan trays, and any other devices that are fronted by the CMM.

13.10 Temperature Sensors Fronted by the CMM

The CMM firmware for the MPCMM0002 supports the Dallas Semiconductor* DS75 Digital Thermometer and Thermostat. All temperature sensors in the chassis that are not part of an intelligent device must be implemented using the DS75 or a compatible device.

13.11 Related Documents

Table 29 lists useful documents that pertain to some of the components that can be included in a third party chassis.

Table 29. Related Documents

Document Name	Revision	Location
Analog Devices* Complete Thermal System Management Controller ADM1026* Data Sheet	A	http://www.analog.com/UploadedFiles/Data_Sheets/779263102ADM1026_a.pdf
Philips Semiconductors* PCA9555 16-bit I^2C and SMBus I/O Port with Interrupt Data Sheet	2004 Sep 30	http://www.semiconductors.philips.com/acrobat_download/datasheets/PCA9555_5.pdf
Maxim*/Dallas Semiconductor* DS75 2-Wire Communication SDA Hold Time Clarification Application Note	June 21, 2004	http://www.maxim-ic.com/appnotes.cfm/appnote_number/3268

14.0 Warranty Information

14.1 Intel NetStructure® Compute Boards & Platform Products Limited Warranty

Intel warrants to the original owner that the product delivered in this package will be free from defects in material and workmanship for two (2) year(s) following the latter of: (i) the date of purchase only if you register by returning the registration card as indicated thereon with proof of purchase; or (ii) the date of manufacture; or (iii) the registration date if by electronic means provided such registration occurs within 30 days from purchase. This warranty does not cover the product if it is damaged in the process of being installed. Intel recommends that you have the company from whom you purchased this product install the product.

THE ABOVE WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, ANY WARRANTY OF INFRINGEMENT OF ANY OTHER PARTY'S INTELLECTUAL PROPERTY RIGHTS, OR ANY WARRANTY ARISING OUT OF ANY PROPOSAL, SPECIFICATION OR SAMPLE.

This warranty does not cover replacement of products damaged by abuse, accident, misuse, neglect, alteration, repair, disaster, improper installation or improper testing. If the product is found to be otherwise defective, Intel, at its option, will replace or repair the product at no charge except as set forth below, provided that you deliver the product along with a return material authorization (RMA) number (see below) either to the company from whom you purchased it or to Intel. If you ship the product, you must assume the risk of damage or loss in transit. You must use the original container (or the equivalent) and pay the shipping charge. Intel may replace or repair the product with either a new or reconditioned product, and the returned product becomes Intel's property. Intel warrants the repaired or replaced product to be free from defects in material and workmanship for a period of the greater of: (i) ninety (90) days from the return shipping date; or (ii) the period of time remaining on the original two (2) year warranty.

This warranty gives you specific legal rights and you may have other rights which vary from state to state. All parts or components contained in this product are covered by Intel's limited warranty for this product. The product may contain fully tested, recycled parts, warranted as if new.

14.2 Returning a Defective Product (RMA)

Before returning any product, contact an Intel Customer Support Group to obtain either a Direct

Return Authorization (DRA) or Return Material Authorization (RMA). Return Material

Authorizations are only available for products purchased within 30 days.

Return contact information by geography follows.

14.3 For the Americas

Return Material Authorization (RMA) credit requests e-mail address: requests.rma@intel.com

Direct Return Authorization (DRA) repair requests e-mail address: uspss.repair@intel.com

DRA on-line form: http://support.intel.com/support/motherboards/draform.htm

Intel Business Link (IBL): http://www.intel.com/ibl

Telephone No.: 1-800-INTEL4U or 480-554-4904

Office Hours: Monday - Friday 0700-1700 MST Winter / PST Summer

14.3.1 For Europe, Middle East, and Africa (EMEA)

Return Material Authorization (RMA) e-mail address - emea.fs@intel.com

Direct Return Authorization (DRA) for repair requests e-mail address: emea.fs@intel.com

Intel Business Link (IBL): http://www.intel.com/ibl

Telephone No.: 00 44 1793 403063

Fax No.: 00 44 1793 403109

Office Hours: Monday - Friday 0900-1700 UK time

14.3.2 For Asia and Pacific (APAC)

RMA/DRA requests email address: apac.rma.front-end@intel.com

Telephone No.: 604-859-3111 or 604-859-3325

Fax No.: 604-859-3324

Office Hours: Monday - Friday 0800-1700 Malaysia time

Return Material Authorization (RMA) requests e-mail address: rma.center.jpss@intel.com

Telephone No.: 81-298-47-0993 or 81-298-47-5417

Fax No.: 81-298-47-4264

Direct Return Authorization (DRA) for repair requests, contact the JPSS Repair center.

E-mail address: sugiyamakx@intel.co.jp

Telephone No.: 81-298-47-8920

Fax No.: 81-298-47-5468

Office Hours: Monday - Friday 0830-1730 Japan time

If the Customer Support Group verifies that the product is defective, they will have the Direct Return Authorization/Return Material Authorization Department issue you a DRA/RMA number to place on the outer package of the product. Intel cannot accept any product without a DRA/RMA number on the package. Limitation of Liability and Remedies

INTEL SHALL HAVE NO LIABILITY FOR ANY INDIRECT OR SPECULATIVE DAMAGES (INCLUDING WITHOUT LIMITING THE FOREGOING, CONSEQUENTIAL, INCIDENTAL AND SPECIAL DAMAGES) ARISING FROM THE USE OF OR INABILITY TO USE THIS PRODUCT, WHETHER ARISING OUT OF CONTRACT, NEGLIGENCE, TORT, OR UNDER ANY WARRANTY, OR FOR INFRINGEMENT OF ANY OTHER PARTY'S INTELLECTUAL PROPERTY RIGHTS, IRRESPECTIVE OF WHETHER INTEL HAS ADVANCE NOTICE OF THE POSSIBILITY OF ANY SUCH DAMAGES, INCLUDING, BUT NOT LIMITED TO LOSS OF USE, BUSINESS INTERRUPTIONS, AND LOSS OF PROFITS. NOTWITHSTANDING THE FOREGOING, INTEL'S TOTAL LIABILITY FOR ALL CLAIMS UNDER THIS AGREEMENT SHALL NOT EXCEED THE PRICE PAID FOR THE PRODUCT. THESE LIMITATIONS ON POTENTIAL LIABILITIES WERE AN ESSENTIAL ELEMENT IN SETTING THE PRODUCT PRICE. INTEL NEITHER ASSUMES NOR AUTHORIZES ANYONE TO ASSUME FOR IT ANY OTHER LIABILITIES.

Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

15.0 Customer Support

15.1 Customer Support

This chapter offers technical and sales assistance information for this product. Information on returning an Intel NetStructure® product for service is in the following chapter.

15.2 Technical Support and Return for Service Assistance

For all product returns and support issues, please contact your Intel product distributor or Intel Sales Representative for specific information.

15.3 Sales Assistance

If you have a sales question, please contact your local Intel NetStructure Sales Representative or the Regional Sales Office for your area. Address, telephone and fax numbers, and additional information is available at Intel's web site located at:

http://www.intel.com/network/csp/sales/

Intel Corporation
Telephone (in U.S.) 1-800-755-4444
Telephone (Outside U.S.) 1-973-993-3030
FAX 1-973-967-8780

15.4 Product Code Summary

Table 30 presents the MPCMM0002 product code.

Table 30. MPCMM0002 Product Code Summary

Product Code	MM#	Description
MPCMM0002	875468	Chassis Management Module (Slim Form Factor)

16.0 Certifications

The Intel NetStructure® MPCMM0002 Chassis Management Module has the following approvals:

- UL/cUL 60950
- EN/IEC 60950
- EN55022 Class A
- EN55024
- FCC CFR47 Part 15 Class A
- VCCI
- AS/NZS3548
- BSMI

Hazardous substances:

- The Intel NetStructure® MPCMM0002 Chassis Management Module has been verified to be compliant with the European Directive 2002/95/EC, officially titled “The Restriction on the Use of Hazardous Substances (RoHS) in Electrical and Electronic Equipment” or RoHS. Specifically, this product uses only RoHS compliant parts and Pb-free solder and may take advantage of certain exemptions referenced within the Directive.

16.1 Material Declaration Data Sheet

The following Material Declaration Data Sheet documents the Restrictions on Hazardous Substance (RoHS) compliance for the Intel NetStructure® MPCMM0002 ATCA Chassis Mangement Module MPCMM0002Q.

Material Declaration Data Sheet

***Intel NetStructure® MPCMM0002 ATCA* Chassis Management Module**
MPCMM0002Q

Product Weight (grams): *561.7*
Manufacturer: Intel Corporation
revised: *4/3/2006*

Pb Free Product: ***yes***

Restriction on Hazardous Substances (RoHS) Compliance

RoHS Definition

* Quantity limit of 0.1% by mass (1000 PPM) for: Lead (Pb), Mercury, Hexavalent Chromium, Polybrominated Biphenyls (PBB), Polybrominated Diphenyl Ethers (PBDE)
* Quantity limit of 0.01% by mass (100 PPM) for: Cadmium

Intel understands RoHS requires: Lead and other materials banned in RoHS Directive are either (1) below all applicable substance thresholds as proposed by the EU or (2) an approved/pending exemption applies. (Note: RoHS implementing details are not fully defined and may change.)

RoHS Declaration *Select the appropriate RoHS Declaration(s) from below.*

- ☐ The part does not contain RoHS restricted substances per the definition above.
- ☐ The part does contain RoHS substances per the definition above and uses the following exemption: Lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit Flip Chip packages.
- ☐ The part does contain RoHS substances per the definition above and uses the following exemption: Lead in optical and filter glass.
- ☐ The part does contain RoHS substances per the definition above and uses the following exemption: Lead in solders for servers, storage and storage array systems, network infrastructure equipment for switching, signaling, transmission as well as network management for telecommunications.
- ☐ The part does contain RoHS substances per the definition above and uses the following exemption: Lead in high melting temperature type solders (i.e. tin-lead sloder alloys containing more than 85% lead).
- ☑ The part does contain RoHS substances per the definition above and uses the following exemption: Lead in electronic ceramic parts
- ☐ The part does contain RoHS substances per the definition above and uses the following exemption: Lead in glass of electronic components.
- ☐ This part contains RoHS restricted materials (lead) above the threshold level. Exemption status cannot be determined since this part may be used in exempt and/or non-exempt applications.
- ☐ Other: Lead used in compliant pin connector systems

Where the part is declared to meet RoHS requirements, it has been verified to be in conformance with 2002/95/EC as we currently understand the requirements. Intel has systems in place to verify conformance with all applicable environmental requirements and to the best of our knowledge the information is true and correct.

LEVEL A MATERIALS AND SUBSTANCES

Materials from Annex A of the EIA/EICTA/JGPSSI Material Composition Declaration Guide and listed in the table below are not contained in this product in quantities above the threshold level for these materials as stated in the EIA/EICTA/JGPSSI Material Composition Declaration Guide, nor intentionally added to this product.

Asbestos	Mercury/Mercury Compounds	Polychlorinated Naphthalenes
Azo colorants	Ozone Depleting Substances	Radioactive Substances
Cadmium /Cadmium Compounds	Polybrominated Biphenyls (PBBs)	Shortchain Chlorinated Paraffins
Hexavalent Chromium	Polybrominated Diphenylethers (PBDEs)	Tributyl Tin (TBT) and Triphenyl Tin (TPT)
Hexavalent Chromium Compounds	Polychlorinated Biphenyls (PCBs)	Tributyl Tin Oxide (TBTO)

This product contains no lead/lead compounds.

	Description of Use	*Location in Product*	Material Concentration (ppm)

LEVEL B MATERIALS AND SUBSTANCES

Antimony/Antimony Compounds	Bismuth/Bismuth Compounds
Arsenic/Arsenic Compounds	Brominated Flame Retardants
Beryllium/Beryllium Compounds	Nickel/Nickel Compounds

If this product contains materials listed in Annex B of the EIA/EICTA/JGPSSI Material Composition Declaration Guide above the threshold level of 1000 ppm those materials/substances are listed below.

Material / Substance	*Description of Use*	*Location in Product*	Material Concentration (ppm) at a board level
Nickel	***Plating***	***Board top and back plates, connectors***	***5500***

COMMENTS

1. The data on Level A and B materials and substances are based on analytical testing of the following product: ***MPCMM0002QBPP***
   Individual unit test results may vary due to differences in production and /or sensitivities of analytical testing methods. Data shown on this MDDS reflect part-level testing intended to validate Intel's RoHS compliance systems. Intel's certification of RoHS compliance at the homogenous material level is based on Supplier Declarations of Conformance.
2. This data sheet is based on the product specified and other products within the family are similar.
3. Data in parts per million (ppm) can be used to estimate content for other products within this family.
4. Material mass can be estimated by multiplying concentration (ppm) by product weight.
5. The remainder of this package consists of non-reportable metals (e.g., tin, iron, etc.), epoxy resin and other non-metal materials.

INTEL ACCEPTS NO DUTY TO UPDATE THIS MDDS OR TO NOTIFY USERS OF THIS MDDS OF UPDATES OR CHANGES TO THIS MDDS. INTEL SHALL NOT BE LIABLE FOR ANY DAMAGES, DIRECT OR INDIRECT, CONSEQUENTIAL OR OTHERWISE, SUFFERED BY USER'S OR THIRD PARTIES AS A RESULT OF THE USERS RELIANCE ON INFORMATION IN THIS MDDS THAT HAS BEEN UPDATED OR CHANGED.

17.0 Agency Information

17.1 North America (FCC Class A)

FCC Verification Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions related to the EMC performance of this product, contact:

Intel Corporation
5200 N.E. Elam Young Parkway
Hillsboro, OR 97124
1-800-628-8686

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the use will be required to correct the interference at his own expense.

17.2 Canada – Industry Canada (ICES-003 Class A) (English and French-translated below)

CANADA – INDUSTRY CANADA

Cet appareil numérique respecte les limites bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouilleur: “Appareils Numériques”, NMB-003 édictée par le Ministre Canadian des Communications.

(English translation of the notice above) This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the interference-causing equipment standard entitled “Digital Apparatus,” ICES-003 of the Canadian Department of Communications.

17.3 Safety Instructions (English and French-translated below)

17.3.1 English

CAUTION: This equipment is designed to permit the connection of the earthed conductor of the d.c. supply circuit to the earthing conductor at the equipment. See installation instructions. If this connection is made, all of the following conditions must be met:

-This equipment shall be connected directly to the DC supply system earthing electrode conductor or to a bonding jumper from an earthing terminal bar or bus to which the DC supply system earthing electrode conductor is connected.

-This equipment shall be located in the same immediate area (such as adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same DC supply circuit and the earthing conductor, and also the point of earthing of the DC system. The DC system shall not be earthed elsewhere.

-The DC supply source shall be located within the same premises as this equipment.

-Switching or disconnecting devices shall to be in the earthed circuit conductor between the DC source and the point of connection of the earthing electrode conductor.

17.3.2 French

Cet appareil est conçu pour permettre le raccordement du conducteur relié à la terre du circuit d'alimentation c.c. au conducteur de terre de l'appareil. Cet appareil est conçu pour permettre le raccordement du conducteur relié à la terre du circuit d'alimentation c.c. au conducteur de terre de l'appareil. Pour ce raccordement, toutes les conditions suivantes doivent être respectées:

- Ce matériel doit être raccordé directement au conducteur de la prise de terre du circuit d'alimentation c.c. ou à une tresse de mise à la masse reliée à une barre omnibus de terre laquelle est raccordée à l'électrode de terre du circuit d'alimentation c.c.

- Les appareils dont les conducteurs de terre respectifs sont raccordés au conducteur de terre du même circuit d'alimentation c.c. doivent être installés à proximité les uns des autres (p.ex., dans des armoires adjacentes) et à proximité de la prise de terre du circuit d'alimentation c.c. Le circuit d'alimentation c.c. ne doit comporter aucune autre prise de terre. matériel. - Il ne doit y avoir

– La source d'alimentation du circuit c.c. doit être située dans la même pièce que le aucun dispositif de commutation ou de sectionnement entre le point de raccordement au conducteur de la source d'alimentation c.c. et le point de raccordement à la prise de terre.

17.4 Taiwan Class A Warning Statement

警告使用者 ：
這是甲類的資訊產品， 在居住的環境中使用時，
可能會造成射頻干擾， 在這種情況下，使用者會
被要求採取某些適當的對策。

17.5 Japan VCCI Class A

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

17.6 Korean Class A

기종별	사용자 안내문
A급 기기 (업무용 정보통신기기)	이기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며 만약 잘못 판매 구입 하였을 때에는 가정용으로 교환하시기 바랍니다.

17.7 Australia, New Zealand

N-232

18.0 Safety Warnings

Caution: Review the following precautions to avoid personal injury and prevent damage to this product or products to which it is connected. To avoid potential hazards, use the product only as specified.

Read all safety information provided in the component product user manuals and understand the precautions associated with safety symbols, written warnings, and cautions before accessing parts or locations within the unit. Save this document for future reference.

AC AND/OR DC POWER SAFETY WARNING: The AC and/or DC Power cord is the unit's main AC and/or DC disconnecting device, and must be easily accessible at all times. Auxiliary AC and/or DC On/Off switches and/or circuit breaker switches are for power control functions only (NOT THE MAIN DISCONNECT).

IMPORTANT: See installation instructions before connecting to the supply.

For AC systems, use only a power cord with a grounded plug and always make connections to a grounded main. Each power cord must be connected to a dedicated branch circuit.

For DC systems, this unit relies on the building's installation for short circuit (over-current) protection. Ensure that a Listed and Certified fuse or circuit breaker no larger than 72VDC, 15A is used on all current carrying conductors. For permanently connected equipment, a readily accessible disconnect shall be incorporated in the building installation wiring. For permanent connections, use copper wire of the gauge specified in the system's user manual.

The enclosure provides a separate Earth ground connection stud. Make the Earth ground connection prior to applying power or peripheral connections and never disconnect the Earth ground while power or peripheral connections exist.

To reduce the risk of electric shock from a telephone or Ethernet* system, connect the unit's main power before making these connections. Disconnect these connections before removing main power from the unit.

RACK MOUNT ENCLOSURE SAFETY: This unit may be intended for stationary rack mounting. Mount in a rack designed to meet the physical strength requirements of NEBS GR-63-CORE and NEBS GR 487. Disconnect all power sources and external connections prior to installing or removing the unit from a rack.

System weight may be minimized prior to mounting by removing all Hot Swappable equipment. Mount your system in a way that ensures even loading of the rack. Uneven weight distribution can result in a hazardous condition. Secure all mounting bolts when rack mounting the enclosure.

Warning: Verify power cord and outlet compatibility: Use the appropriate power cords for your power outlet configurations. Visit the following web site for additional information: http://kropla.com/electric2.htm.

Warning: Avoid electric overload, heat, shock, or fire hazard: Only connect the system to a to a properly rated supply circuit as specified in the product user manual. Do not make connections to terminals outside the range specified for that terminal. See the product user manual for correct connections.

Warning: Avoid electric shock: Do not operate in wet, damp, or condensing conditions. To avoid electric shock or fire hazard, do not operate this product with enclosure covers or panels removed.

Warning: Avoid electric shock: For units with multiple power sources, disconnect all external power connections before servicing.

Warning: Power supplies must be replaced by qualified service personnel only.

Caution: System environmental requirements: Components such as Processor Boards, Ethernet Switches, etc., are designed to operate with external airflow. Components can be destroyed if they are operated without external airflow. External airflow is normally provided by chassis fans when components are installed in compatible chassis. Never restrict the airflow through the unit's fan or vents. Filler panels or air management boards must be installed in unused chassis slots. Environmental specifications for specific products may differ. Refer to product user manuals for airflow requirements and other environmental specifications.

Warning: Device heatsinks may be hot during normal operation: To avoid burns, do not allow anything to touch heatsinks.

Warning: Avoid injury, fire hazard, or explosion: Do not operate this product in an explosive atmosphere.

Caution: Lithium batteries. There is a danger of explosion if a battery is incorrectly replaced or handled. Do not disassemble or recharge the battery. Do not dispose of the battery in fire. When the battery is replaced, the same type (CR2032) or an equivalent type recommended by the manufacturer must be used. Used batteries must be disposed of according to the manufacturer's instructions.

Warning: Avoid injury: This product may contain one or more laser devices that are visually accessible depending on the plug-in modules installed. Products equipped with a laser device must comply with International Electrotechnical Commission (IEC) 60825.

18.1 Mesures de Sécurité

Veuillez suivre les mesures de sécurité suivantes pour éviter tout accident corporel et ne pas endommager ce produit ou tout autre produit lui étant connecté. Pour éviter tout danger, veillez à utiliser le produit conformément aux spécifications mentionnées.

Lisez toutes les informations de sécurité fournies dans les manuels de l'utilisateur des produits composants et veillez à bien comprendre les mesures associées aux symboles de sécurité, aux avertissements écrits et aux mises en garde avant d'accéder à certains éléments ou emplacements de l'unité. Conservez ce document comme outil de référence.

AVERTISSEMENT CONCERNANT LA SÉCURITÉ DE L'ALIMENTATION C.A. ET/OU C.C. : le câble d'alimentation C.A. et/ou C.C. constitue le dispositif de déconnexion principal de l'alimentation électrique de l'unité et doit être facilement accessible à tous moments. Les commutateurs de marche/arrêt C.A. et/ou C.C. et/ou les commutateurs disjoncteurs auxiliaires permettent uniquement de contrôler l'alimentation (ET NON LA DÉCONNEXION PRINCIPALE).

IMPORTANT : reportez-vous aux instructions d'installation avant de connecter le bloc d'alimentation.

Pour les systèmes C.A., utilisez uniquement un câble d'alimentation avec une prise de terre et établissez toujours les connexions à une prise secteur mise à la terre. Chaque câble d'alimentation doit être connecté à un circuit terminal dédié.

Pour les systèmes C.C., la protection de cette unité repose sur les coupe-circuits (surintensité) du bâtiment. Assurez-vous d'utiliser un fusible ou un disjoncteur répertorié et certifié ne dépassant pas 72 VCC et 15 A pour tous les conducteurs de courant. Pour les équipements connectés en permanence, un sectionneur facilement accessible doit être incorporé au câblage du bâtiment. Pour les connexions permanentes, utilisez des câbles en cuivre d'un calibre conforme à celui spécifié dans le manuel de l'utilisateur du système.

Le boîtier fournit un connecteur de mise à la terre séparé. Établissez la connexion à la terre avant de mettre le système sous tension ou de connecter des périphériques. Veillez à ne jamais déconnecter la mise à la terre tant que le système est sous tension ou si des périphériques sont connectés.

Pour réduire le risque d'un choc électrique en provenance d'un téléphone ou d'un système Ethernet*, connectez l'alimentation principale de l'unité avant d'établir ces connexions. De même, déconnectez-les avant de couper l'alimentation principale de l'unité.

SÉCURITÉ DU BOÎTIER POUR UN MONTAGE EN BAIE : cette unité peut être destinée à un montage en baie stationnaire. Le montage en baie doit satisfaire aux exigences sur la résistance physique des normes NEBS GR-63-CORE et NEBS GR 487. Déconnectez toutes les sources d'alimentation et les connexions externes avant d'installer ou de supprimer l'unité d'une baie.

Minimisez la masse du système avant le montage en retirant l'équipement permutable à chaud. Assurez-vous que le système est réparti de manière uniforme sur la baie. Une distribution inégale de la masse du système peut présenter des risques. Fixez tous les boulons lors de l'installation du boîtier dans une baie.

Avertissement : vérifiez que le câble d'alimentation et la prise sont compatibles. Utilisez les câbles d'alimentation correspondant à la configuration de vos prises de courant. Pour de plus amples informations, visitez le site Web suivant : http://kropla.com/electric2.htm.

Avertissement : évitez toute forme de surcharge, chaleur, choc électrique ou incendie. Connectez uniquement le système à un circuit d'alimentation dûment répertorié conformément aux spécifications du manuel de l'utilisateur du produit. N'établissez pas de connexions à des terminaux en dehors des limites spécifiées pour ce terminal. Reportez-vous au manuel de l'utilisateur du produit pour les connections adéquates.

Avertissement : évitez les chocs électriques. N'utilisez pas ce produit dans des endroits humides, mouillés ou provoquant de la condensation. Pour éviter tout risque de choc électrique ou d'incendie, n'utilisez pas ce produit si les couvercles ou les panneaux du boîtier ne sont pas en place.

Avertissement : évitez les chocs électriques. Pour les unités comportant plusieurs sources d'alimentation, déconnectez toutes les sources d'alimentation externes avant de procéder aux réparations.

Avertissement : les blocs d'alimentation doivent être remplacés exclusivement par des techniciens d'entretien qualifiés.

Attention : exigences environnementales du système : les composants tels que les cartes de processeurs, les commutateurs Ethernet, etc., sont conçus pour fonctionner avec un flux d'air externe. Les composants peuvent être détruits s'ils fonctionnent dans d'autres conditions. Le flux d'air externe est généralement produit par les ventilateurs des châssis lorsque les composants sont installés dans des châssis compatibles. Veillez à ne jamais obstruer le flux d'air alimentant le ventilateur ou les conduits de l'unité. Des boucliers ou des panneaux de gestion de l'air doivent être installés dans les connecteurs inutilisés du châssis. Les spécifications environnementales peuvent varier d'un produit à un autre. Veuillez-vous reporter au manuel de l'utilisateur pour déterminer les exigences en matière de flux d'air et d'autres spécifications environnementales.

Avertissement : les dissipateurs de chaleur de l'appareil peuvent être chauds lors d'un fonctionnement normal. Pour éviter tout risque de brûlure, veillez à ce que rien n'entre en contact avec les dissipateurs de chaleur.

Avertissement : évitez les blessures, les incendies ou les explosions. N'utilisez pas ce produit dans une atmosphère présentant des risques d'explosion.

Attention : les batteries au lithium. Celles-ci peuvent exploser si elles sont incorrectement remplacées ou manipulées. Veillez à ne pas désassembler ni à recharger la batterie. Veillez à ne pas jeter la batterie au feu. Lors du remplacement de la batterie, utilisez le même type de batterie (CR2032) ou un type équivalent recommandé par le fabricant. Les batteries usagées doivent être mises au rebut conformément aux instructions du fabricant.

Avertissement : évitez les blessures. Ce produit peut contenir un ou plusieurs périphériques laser visuellement accessibles en fonction des modules plug-in installés. Les produits équipés d'un périphérique laser doivent être conformes à la norme IEC (International Electrotechnical Commission) 60825.

18.2 Sicherheitshinweise

Lesen Sie bitte die folgenden Sicherheitshinweise, um Verletzungen und Beschädigungen dieses Produkts oder der angeschlossenen Produkte zu verhindern. Verwenden Sie das Produkt nur gemäß den Anweisungen, um mögliche Gefahren zu vermeiden.

Lesen Sie alle Sicherheitsinformationen in den Benutzerhandbüchern der zu dem Produkt gehörenden Komponenten und machen Sie sich mit den Hinweisen zu den Sicherheitssymbolen, schriftlichen Warnungen und Vorsichtsmaßnahmen vertraut, ehe Sie Teile oder Stellen des Geräts anfassen. Bewahren Sie dieses Dokument gut auf, um später darin nachlesen zu können.

SICHERHEITSWARNUNG FÜR WECHSELSTROM UND/ODER GLEICHSTROM: Die Stromversorgung des Gerätes wird über das Wechselstrom- und/oder Gleichstromkabel unterbrochen und muss daher jederzeit leicht zugänglich sein. Zusätzliche Ein-/Aus-Schalter für Wechselstrom und/oder Gleichstrom und/oder Leistungsschalter dienen lediglich der Steuerung der Stromversorgung (NICHT ABER DER UNTERBRECHUNG DER STROMVERSORGUNG).

WICHTIG: Lesen Sie vor dem Anschließen der Stromversorgung die Installationsanweisungen!

Wechselstromsysteme: Verwenden Sie nur ein Stromkabel mit geerdetem Stecker und verbinden Sie dieses immer nur mit einer geerdeten Steckdose. Jedes Stromkabel muss an einen eigenen Stromkreis angeschlossen werden.

Gleichstromsysteme: Dieses Gerät basiert auf dem im Gebäude installierten Schutz vor Kurzschlüssen (Netzüberlastung). Stellen Sie sicher, dass für alle stromführenden Leiter eine zertifizierte Sicherung oder ein Leistungsschalter mit nicht mehr als 72V Gleichstrom, 15A verwendet wird. Für Geräte, die ständig angeschlossen sind, sollte in der Gebäudeverkabelung ein leicht zugänglicher Trennschalter installiert werden. Für eine permanente Verbindung verwenden Sie Kupferdraht der im Benutzerhandbuch des Systems angegebenen Stärke.

Das Gehäuse verfügt über einen eigenen Erdungs-Verbindungsbolzen. Stellen Sie die Erdungsverbindung her, ehe Sie das Stromkabel oder Peripheriegeräte anschließen, und trennen Sie die Erdungsverbindung niemals, so lange Strom- und Peripherieverbindungen angeschlossen sind.

Um die Gefahr eines durch ein Telefon oder Ethernet*-System bedingten elektrischen Schlags zu verringern, schließen Sie das Stromkabel des Geräts an, ehe Sie diese Verbindungen einrichten. Trennen Sie diese Verbindungen, ehe Sie die Hauptstromversorgung des Geräts unterbrechen.

SICHERHEITSHINWEISE BEI GESTELLMONTAGE: Dieses Gerät kann stationär in einem Gestell angebracht werden. Das Gestell muss den Anforderungen an eine physische Stärke laut NEBS GR-63-CORE und NEBS GR 487 entsprechen. Trennen Sie vor der Installation oder dem Abbau des Geräts in einem Gestell alle Strom- und externen Verbindungen.

Das Gewicht des Systems kann vor dem Einbau verringert werden, indem man alle während des Betriebs austauschbaren Elemente entfernt. Achten Sie darauf, das System so aufzustellen, dass das Gestell gleichmäßig belastet wird. Eine ungleiche Verteilung des Gewichts kann gefährlich werden. Befestigen Sie alle Sicherungsbolzen, wenn Sie das Gehäuse in einem Gestell montieren.

Warnung: Überprüfen Sie, ob Stromkabel und Steckdose kompatibel sind: Verwenden Sie die Ihrer Stromkonfiguration entsprechenden Stromkabel. Weitere Informationen finden Sie auf folgender Website: http://kropla.com/electric2.htm.

Warnung: Vermeiden Sie elektrische Überlastung, Hitze, elektrischen Schlag oder Feuergefahr: Schließen Sie das System nur an einen den Spezifikationen des Produkt-Benutzerhandbuchs entsprechenden Stromkreis an. Stellen Sie keine Verbindung zu Terminals her, die nicht den jeweiligen Spezifikationen entsprechen. Für die korrekten Verbindungen siehe das Benutzerhandbuch des Produkts.

Warnung: Vermeiden Sie einen elektrischen Schlag: Unterlassen Sie den Betrieb in nassen, feuchten oder kondensierenden Betriebsumgebungen. Um die Gefahr eines elektrischen Schlags oder eines Feuers zu vermeiden, betreiben Sie dieses Produkt nicht ohne Gehäuse oder Abdeckungen.

Warnung: Vermeiden Sie einen elektrischen Schlag: Trennen Sie bei Geräten mit mehreren Stromquellen vor der Wartung alle externen Stromverbindungen.

Warnung: Netzteile dürfen nur von qualifizierten Servicemitarbeitern ausgewechselt werden.

Vorsicht: Anforderungen an die Systemumgebung: Komponenten wie Prozessor-Boards, Ethernet-Schalter usw. sind auf den Betrieb mit externer Luftzufuhr ausgelegt. Diese Komponenten können bei Betrieb ohne externe Luftzufuhr beschädigt werden. Wenn die Komponenten in einem kompatiblen Gehäuse installiert sind, wird Luft von außen normalerweise durch Gehäuselüfter zugeführt. Blockieren Sie niemals die Luftzufuhr der Gerätelüfter oder -ventilatoren. In ungenutzten Gehäusesteckplätzen müssen Füllelemente oder Luftsteuerungseinheiten eingesetzt werden. Die Betriebsbedingungen können zwischen den verschiedenen Produkten variieren. Für die Anforderungen an die Belüftung und andere Betriebsbedingungen siehe die Benutzerhandbücher der jeweiligen Produkte.

Warnung: Die Kühlkörper des Geräts können sich während des normalen Betriebs erhitzen: Um Verbrennungen zu vermeiden, sollte jeder Kontakt mit den Kühlkörpern vermieden werden.

Warnung: Vermeiden Sie Verletzungen, Feuergefahr oder Explosionen: Unterlassen Sie den Betrieb dieses Produkts in einer explosionsgefährdeten Betriebsumgebung.

Vorsicht: Lithiumbatterien. Bei unsachgemäßem Austausch oder Umgang mit Batterien besteht Explosionsgefahr. Zerlegen Sie die Batterie nicht und laden Sie diese nicht wieder auf. Entsorgen Sie die Batterie nicht durch Verbrennen. Beim Auswechseln der Batterie muss dasselbe oder ein der Händlerempfehlung gleichwertiges Modell verwendet werden (CR2032). Gebrauchte Batterien müssen entsprechend den Anweisungen des Herstellers entsorgt werden.

Warnung: Vermeiden Sie Verletzungen: Dieses Produkt kann ein oder mehrere Lasergeräte enthalten, die abhängig von den installierten Plug-In-Modulen optisch zugänglich sind. Mit einem Lasergerät ausgestattete Produkte müssen der International Electrotechnical Commission (IEC) 60825 entsprechen.

18.3 Norme di Sicurezza

Leggere le norme seguenti per prevenire lesioni personali ed evitare di danneggiare questo prodotto o altri a cui è collegato. Per evitare qualsiasi pericolo potenziale, usare il prodotto unicamente come indicato.

Leggere tutte le informazioni sulla sicurezza fornite nella guida per l'utente relativa al componente e comprendere le norme associate ai simboli di pericolo, agli avvisi scritti e alle precauzioni da adottare prima di accedere a componenti o aree dell'unità. Custodire il presente documento per usi futuri.

AVVISO DI SICUREZZA RELATIVO ALL'ALIMENTAZIONE IN C.A. E/O C.C. Il cavo di alimentazione in c.a. e/o c.c. rappresenta il dispositivo principale per interrompere l'alimentazione in c.a. e/o c.c. dell'unità e deve sempre essere facilmente accessibile. Gli interruttori di accensione/spegnimento ausiliari per l'alimentazione in c.a. e/o c.c. hanno l'unico scopo di controllare l'alimentazione (NON INTERROMPONO L'ALIMENTAZIONE PRINCIPALE).

IMPORTANTE: prima di collegare l'unità alla fonte di alimentazione, leggere le istruzioni di installazione.

Per i sistemi CA, usare solo un cavo di alimentazione con una spina provvista di una messa a terra e collegarsi sempre a prese provviste di una messa a terra. Ogni cavo di alimentazione deve essere collegato ad un circuito derivato dedicato.

Per i sistemi CC, la presente unità può usufruire dell'eventuale installazione integrata nell'edificio per la protezione contro i cortocircuiti (sovratensione). Assicurarsi della presenza di un fusibile o di un circuito derivato non superiore a 72 V c.c., 15 A, certificato e conforme alla normativa in vigore, in tutti i conduttori portanti. Per gli apparecchi collegati in modo permanente, è necessario inserire nel circuito dell'edificio un interruttore ad accesso immediato. Per i collegamenti permanenti, usare il filo di rame del diametro specificato nella guida per l'utente relativa al sistema.

Il materiale fornito comprende un perno per il collegamento della messa a terra. Assicurare il collegamento della messa a terra prima di alimentare l'unità o prima di collegarla alle periferiche e non scollegare mai la messa a terra quando l'unità è alimentata o collegata a periferiche.

Per ridurre il rischio di scariche elettriche da parte della linea telefonica o dalla rete Ethernet*, collegare l'unità all'alimentazione principale prima di effettuare tale collegamento. Rimuovere i collegamenti prima di togliere l'alimentazione principale all'unità.

NORME DI SICUREZZA PER LE UNITÀ MONTATE IN UN RACK. Questa unità può essere alloggiata in modo permanente in un rack. Il montaggio in rack deve essere conforme ai requisiti di resistenza fisica delle norme NEBS GR-63-CORE e NEBS GR 487.Prima di installare o rimuovere l'unità da un rack, rimuovere tutte le fonti di alimentazione e i collegamenti esterni.

Prima di effettuare il montaggio, è possibile ridurre il peso complessivo del sistema togliendo tutte le apparecchiature sostituibili a caldo. Montare il sistema in modo da garantire una distribuzione uniforme del peso nel rack. Una distribuzione irregolare del peso può essere pericolosa. Avvitare fino in fondo tutti i bulloni durante l'installazione dell'unità in un rack.

Avvertenza: verificare il cavo di alimentazione e la compatibilità con la presa di corrente. Usare i cavi di alimentazione compatibili con il tipo di presa di corrente. Per ulteriori informazioni, visitare il sito Web all'indirizzo seguente: http://kropla.com/electric2.htm.

Avvertenza: evitare sovraccarichi elettrici, calore diretto, scosse e possibili cause di incendio. Collegare il sistema solo ad una rete elettrica la cui tensione nominale corrisponda al valore indicato nella guida per l'utente. Non collegarlo a fonti di alimentazione con valori di tensione esterne a quanto specificato per il sistema. Per ulteriori informazioni sul corretto collegamento, consultare la guida per l'utente del prodotto.

Avvertenza: evitare le scosse elettriche. Non usare l'apparecchio in ambienti umidi o in presenza di condensa. Per evitare scosse elettriche o possibili cause di incendio, non adoperare il prodotto senza le custodie o i pannelli appositi.

Avvertenza: evitare le scosse elettriche. Prima di intervenire su unità con più fonti di alimentazione, rimuovere tutti i collegamenti all'alimentazione esterna.

Avvertenza: far sostituire i componenti di alimentazione solo da personale tecnico qualificato.

Attenzione: rispettare i requisiti ambientali del sistema. I componenti come le schede di processore, i commutatori Ethernet, ecc., sono progettati per funzionare in presenza di un flusso di aria proveniente dall'esterno, in assenza del quale rischiano di danneggiarsi irrimediabilmente. In genere, il flusso di aria esterno viene generato da appositi ventilatori installati contemporaneamente ai componenti nello chassis compatibile. Non ostacolare mai il flusso di aria convogliato dal ventilatore e dai condotti dell'unità. I pannelli di copertura o le schede per il controllo dell'aria devono essere installati negli alloggiamenti vuoti dello chassis. I requisiti ambientali possono variare a seconda del prodotto. Per ulteriori informazioni sui requisiti del flusso di aria e sugli altri requisiti ambientali, consultare la guida per l'utente del prodotto.

Avvertenza: i dissipatori di calore possono scaldarsi durante il funzionamento normale. Per evitare bruciature o danni, evitare il contatto del dissipatore di calore con qualsiasi altro elemento.

Avvertenza: evitare lesioni, possibili cause di incendio o di esplosione. Non usare il prodotto in un'atmosfera in cui sussiste il rischio di esplosione.

Attenzione: le batterie al litio. La sostituzione o l'uso non corretto della batteria comporta un rischio di esplosione. Non smontare né ricaricare la batteria. Non gettare la batteria nel fuoco. Per la sostituzione, usare il tipo di batteria identico (CR2032) o equivalente consigliato dal costruttore. Le batterie usate devono essere smaltite rispettando le istruzioni del costruttore.

Avvertenza: evitare le lesioni. Questo prodotto può contenere uno o più dispositivi laser accessibili alla vista, a seconda dei moduli installati. I prodotti provvisti di un dispositivo laser devono essere conformi alla norma 60825 della Commissione elettrotecnica internazionale (IEC).

18.4 Instrucciones de Seguridad

Examine las instrucciones sobre condiciones de seguridad que siguen para evitar cualquier tipo de daños personales, así como para evitar perjudicar el producto o productos a los que esté conectado. Para evitar riesgos potenciales, utilice el producto únicamente en la forma especificada.

Lea toda la información relativa a seguridad que se incluye en los manuales de usuario de los distintos componentes y procure familiarizarse con los distintos símbolos de seguridad, advertencias escritas y normas de precaución antes de manipular las distintas piezas o secciones de la unidad. Guarde este documento para consultarlo en el futuro.

AVISO DE SEGURIDAD SOBRE LA ALIMENTACIÓN DE CA O CC El cable de alimentación de CA o CC constituye el dispositivo principal de desconexión de la alimentación de CA o CC, y debe permanecer accesible en todo momento. Los interruptores auxiliares de encendido y apagado de CA o CC y los disyuntores sólo tienen una función de control de la alimentacion (Y NO LA DE DESCONEXIÓN PRINCIPAL).

IMPORTANTE: Consulte las instrucciones de instalación antes de conectar la unidad a la alimentación.

En el caso de sistemas de CA, utilice sólo cables de alimentación con enchufe con toma de tierra, y realice siempre conexiones a una toma con toma de tierra. Cada uno de los cables de alimentación deberá estar conectado a una derivación dedicada.

En el caso de sistemas de CC, la unidad dependerá de la instalación existente en el edificio para la protección frente a cortocircuitos (sobreintensidades). Asegúrese de que todos los conductores que transporten corriente empleen un fusible o disyuntor homologado y certificado con una capacidad que no supere los 72V de CC ni 15A. En el caso de los equipos que vayan a permanecer conectados de manera constante, en la instalación eléctrica del edificio deberá estar incluida una desconexión de fácil acceso. Para conexiones permanentes, emplee cable de cobre del calibre especificado en el manual de usuario del sistema.

El chasis incluye aparte una clavija de conexión a tierra. Realice la conexión a tierra antes de suministrar corriente o realizar cualquier tipo de conexión de periféricos; no desconecte nunca la toma de tierra mientras la corriente esté presente o existan conexiones con periféricos.

Para reducir los riesgos de descargas eléctricas a través de un teléfono o un sistema de Ethernet*, conecte la alimentación principal de la unidad antes de realizar este tipo de conexiones. Desconecte estas conexiones antes de desconectar la alimentación principal de la unidad.

PROCEDIMIENTOS DE SEGURIDAD PARA EL CHASIS DE MONTAJE EN BASTIDOR: Esta unidad puede estar preparada para su montaje en un bastidor estático. Un montaje de este tipo deberá realizarse en un bastidor que cumpla con los requisitos de robustez de las normas NEBS GR-63-CORE y NEBS GR 487. Desconecte cualquier tipo de alimentación y conexiones externas antes de instalar la unidad en un bastidor o desmontarla.

Puede desmontar todos los equipos de intercambio en caliente para reducir el peso del sistema antes del montaje en bastidor. Asegúrese de montar el sistema de forma que el peso quede distribuido uniformemente en el bastidor. Una distribución irregular del peso podría generar riesgos. Asegúrese de fijar todos los tornillos de montaje en el bastidor.

Advertencia: Compatibilidad del cable y la toma: Utilice los cables adecuados para la configuración de tomas de corriente con que cuente. Si necesita más información, visite el sitio web siguiente: http://kropla.com/electric2.htm.

Advertencia: Evite sobrecargas eléctricas, calor y riesgos de descarga eléctrica o incendio: Conecte el sistema sólo a un circuito de alimentación que tenga el régimen apropiado, según lo especificado en el manual de usuario del producto. No realice conexiones con terminales cuya capacidad no se ajuste al régimen especificado para ellos. Consulte el manual de usuario del producto para que las conexiones que realice sean las correctas.

Advertencia: Evite descargas eléctricas: No haga funcionar el sistema en condiciones de humedad, mojado o si se produce condensación de la humedad. Para evitar descargas eléctricas o posibles incendios, no permita que el aparato funcione con sus tapas o paneles del chasis desmontados.

Advertencia: Evite descargas eléctricas: En el caso de unidades que cuenten con varias fuentes de alimentación, desconecte las conexiones con alimentación externa antes de proceder a realizar labores de mantenimiento.

Advertencia: La sustitución de fuentes de alimentación sólo debe ser realizada por personal de mantemiento cualificado.

Precaución: Requisitos de entorno para el sistema: Los componentes del tipo de placas de procesador, conmutadores de Ethernet, etc., están concebidos para funcionar en condiciones que permitan el paso de aire. Los componentes pueden averiarse si funcionan sin que circule el aire en su entorno. La circulación del aire suele estar facilitada por los ventiladores incorporados en el armazón cuando los componentes están instalados en armazones compatibles. Nunca interrumpa el paso del aire por los ventiladores or los respiraderos. Los paneles de relleno y las placas para el control de la circulación del aire deben instalarse en ranuras del chasis que no estén destinadas a ningún otro uso. Las características técnicas relativas al entorno pueden variar entre productos. Consulte los manuales de usuario del producto si necesita conocer sus necesidades en términos de circulación de aire u otras características técnicas.

Advertencia: En condiciones de funcionamiento normales, los disipadores de calor pueden recalentarse. Evite que ningún elemento entre en contacto con los disipadores para evitar quemaduras.

Advertencia: Riesgos de daños, incendio o explosión: No permita que el aparato funcione en una atmósfera que presente riesgos de explosión.

Precaución: Las baterías de litio. Si las baterías no se manipulan o cambian correctamente, exite riesgo de explosión. No desmonte ni recargue la batería. Nunca tire las baterías al fuego. Al cambiar la batería, es preciso utilizar el mismo tipo (CR2032) o un tipo equivalente que haya sido recomendado por el fabricante. Las baterías utilizadas deben desecharse según las instrucciones del fabricante.

Advertencia: Daños personales: Este producto puede contener uno o varios dispositivos láser, que estarán a la vista dependiendo de los módulos enchufables que se hayan instalado. Los productos provistos de un dispositivo láser deben ajustarse a la norma 60825 de la International Electrotechnical Commission (IEC).

18.5 Chinese Safety Warning

系统信息

请阅读以下警告信息，以避免人身伤害并防止损坏本产品或与之相连的产品。为避免潜在的危险，请仅按规定使用产品。

在接近设备中的部件或元件之前，请阅读在组件产品用户手册中载明的所有安全信息并了解与安全标志、书面警告及注意事项有关的预防措施。请保存本文档以备将来参考。

交流电和（或）直流电源安全警告：对于一个（或）直流电源线是设备的主要交流（或）直流电连接装置，任何时候均必须方便取用。辅助和（或）直流电开关和（或）断路器开关仅用于控制电源（非主要断电装置）。

重要：在连接到电源前，请先参阅安装说明。

对于直流电系统，本设备要求建筑物安装短路（过电流）保护装置。请确保在所有载流导线中使用不大于 72VDC、15A，经过认证和鉴定的保险丝或断路器。对于永久连接设备，应在建筑物布线中安装便于断开的装置。对于永久连线，应使用系统用户手册中指定的标准铜线。

机壳配备了单独的接地接线柱。请先接好接地线后再通电或连接其它线路，在通电或接通周边电线时，切勿断开接地线。

为降低电话或 Ethernet* 系统电击的危险，请在连接设备主电源后，再连接其它线路；在从设备上卸下主电源前，请先断开这些线路。

机架装配或机壳的安全性：本设备采用固定机架装配。机架装配的设计符合 NEBS GR-63-CORE 和 NEBS GR 487 的机械强度要求。在机架上安装或拆卸设备前，务必断开所有电源和外部连线。

卸下所有热交换设备可最大限度地减少系统重量。小心装配系统以确保机架载重均衡，载重分配不均衡可能导致危险情况发生。当机架上安装机壳时，请上紧所有装配螺栓。

警告：请检查电源线与电源插座是否兼容。请使用与电源插座配置对应的电源线。有关详情，请访问下面的网址：http://kropla.com/electric2.htm。

警告：避免电力过载、过热、电击或火灾：仅将系统连接到产品用户手册中指定的适当额定供电电路。请勿连接到超出接线端规定范围的接线端。有关正确连接，请参阅产品用户手册。

警告：避免电击：请勿在潮湿或冷凝条件下运行。为避免电击或火灾，请勿在卸下机壳或面板的情况下使用本产品。

警告：避免电击：对于具有多个电源的设备，请在维修前断开所有外部电源连接。

警告：更换电源只能由合格的维修人员进行。

注意：系统环境要求：处理器插件板、以太网开关等组件要求在外部空气流通的环境下工作。在没有外部空气流通的情况下操作，可能会损坏组件。当组件安装在兼容机箱中时，外部气流通常是由机箱风扇提供的。切勿阻碍气流通过的设备风扇或通风口。在不使用的机箱插槽中，必须安装填充板或空气控制板。环境规范因特定产品而异。有关气流要求和其它环境规范，请参阅产品用户手册。

警告：设备散热片在正常运行期间可能发热。为避免燃烧，请勿让任何物体接触散热片。

警告：避免人身伤害、火灾或爆炸：切勿在可能引起爆炸的环境中使用本产品。

注意：锂电池不是可现场更换的部件。如果更换或处理不当，可能会引起爆炸。切勿拆掉电池或对电池充电，切勿让电池靠近火源。更换电池时，必须使用制造商建议的相同类型或同等类型的电池。旧电池必须按照制造商的指示加以处理，并将电池退回给英特尔修理。

警告：避免损伤：本产品可能包含一个或多个激光装置，是否可见取决于所安装的插件模块。装有激光装置的产品必须遵循国际电工委员会 (IEC) 60825 号规定。