



# Intel NetStructure<sup>®</sup> MPRTM0020 Rear Transition Module

Technical Product Specification

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*April 2006*

Order Number: 309383-004



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## Revision History

Date	Revision	Description
April 2006	004	Updated values for temperature sensor thresholds in "Sensor Data Record for RTM" table. Updated faceplate illustration.
January 2006	003	Initial production release. Added new info on grounding procedure, power supplies, SAS redriver, faceplate LEDs, and RTM sensors. Updated P31 pinout.
December 2005	002	Added "Operating the Unit", "RTM Management Architecture", and "Detailed Specifications" chapters
September 2005	001	Initial release of this document.

# Document Organization

# 1

The *Intel NetStructure<sup>®</sup> MPRTM0020 Rear Transition Module Technical Product Specification* is organized as follows:

- Chapter 1, “Document Organization” provides a table of acronyms and terms that are used throughout the document.
- Chapter 2, “Functional Overview” describes the features of the Rear Transition Module.
- Chapter 3, “Operating the Unit” includes information about installing and removing the Rear Transition Module.
- Chapter 4, “Module Components” describes the functional components of the Rear Transition Module.
- Chapter 5, “RTM Management Architecture” describes support for a non-intelligent Rear Transition Module in an IPMC environment.
- Chapter 6, “Detailed Specifications” includes detailed environmental, mechanical and reliability specifications for the Rear Transition Module.
- Chapter 7, “Warranty Information” includes product warranty information.
- Chapter 8, “Customer Support” offers technical and sales assistance information for the Rear Transition Module.
- Chapter 9, “Certifications” provides information about product certifications.
- Chapter 10, “Agency Information” provides product compliance information.
- Chapter 11, “Safety Warnings” includes several safety warnings about working with the Rear Transition Module.

## 1.1 Acronyms and Terms

**Table 1. Acronyms and Terms (Sheet 1 of 2)**

Term	Definition
AdvancedTCA*	Advanced Telecommunications Computing Architecture
Blade, Board	These terms are used interchangeably to refer to an assembled PCB card that plugs into a chassis slot.
CPU	Central Processing Unit. A microprocessor.
DPM	Defects Per Million
ENA	Enable
FIT	Failures In Time
FRU	Field Replaceable Unit. Logically represents an entity that can be queried for sensor data, and perhaps an entity that has a satellite management controller. Example FRUs can include an entire SBC or a power supply.
HA	Highly Available.

**Table 1. Acronyms and Terms (Sheet 2 of 2)**

Term	Definition
Hot Swap	A specific specification from the PICMG 3.0 Spec.
I <sup>2</sup> C	A two-wire serial bus. Licensed by Phillips Semiconductors.
IA-32	32-bit Intel® Architecture
I/O	Input/Output
IPMB	Intelligent Platform Management Bus. The bus that interconnects all boards in the chassis to the Shelf Manager.
IPMB-0	Intelligent Platform Management Bus Channel 0 as defined in the IPMI v1.5 specification. This is the logical aggregation of IPMB-A and IPMB-B. The use of IPMB Channels 1 through 7 are not defined in this specification.
IPMB-R	Local IPMI link that is on the “carrier” side of the IPMC device. The IPMC shall proxy for all IPMB-R devices (AMCs and RTM).
IPMC	Intelligent Platform Management Controller. The portion of a FRU that interfaces to the AdvancedTCA* IPMB-0 and represents that FRU and any device subsidiary to it.
IPMI	Intelligent Platform Management Interface. The overall specification for doing point-to-point management communication within the chassis over and I <sup>2</sup> C bus.
JBOD	Just a Bunch of Drives
Node Slot	Any standard slot other than a fabric slot
OOS	Out of Service
PCI	Peripheral Component Interconnect. Bus technology used to interconnect components in a computer.
PICMG	PCI Industrial Computer Manufacturers Group
PMC	PCI Mezzanine Card
Power Module	Either a power supply or a power entry module
RMC	RTM Management Controller. The IPMI controller on an RTM, similar to an MMC.
RMCP	Remote Management Control Protocol. Defined by IPMI 1.5.
RMD	RTM Management Device. A non-intelligent device (typically an ADM1026) that communicates over I <sup>2</sup> C to the Front Board IPMC, rather than using IPMB like an RMC does.
RTM	Rear Transition Module
SAS	Serial Attached SCSI
SDR	Sensor Data Record. An IPMI term. Used to describe the name, meaning, and units of measure for a particular data value provided by a PM or BMC.
SEL	Sensor Event Log. An IPMI defined term. Maintained by the BMC.
Shelf	A shelf is equivalent to a chassis.
Shelf Manager	A pluggable board that provides management functions, allowing the chassis backplane to remain passive. Although the term implies a dedicated module, the Shelf Manager may be one function of a multi-function module. For example, the Shelf Manager and a switch can be combined in a single physical module. The Shelf Manager performs the BMC function within the chassis and provides remote management capabilities.
SMBus	A two-wire serial bus with slightly different electrical and timing characteristics than I <sup>2</sup> C. This technology is owned by Intel Corporation.
SMC	Satellite Management Controller. Defined by IPMI. Also known as a peripheral controller or peripheral management controller.
Switch Slot	See “Fabric Slot”
TPS	Technical Product Specification



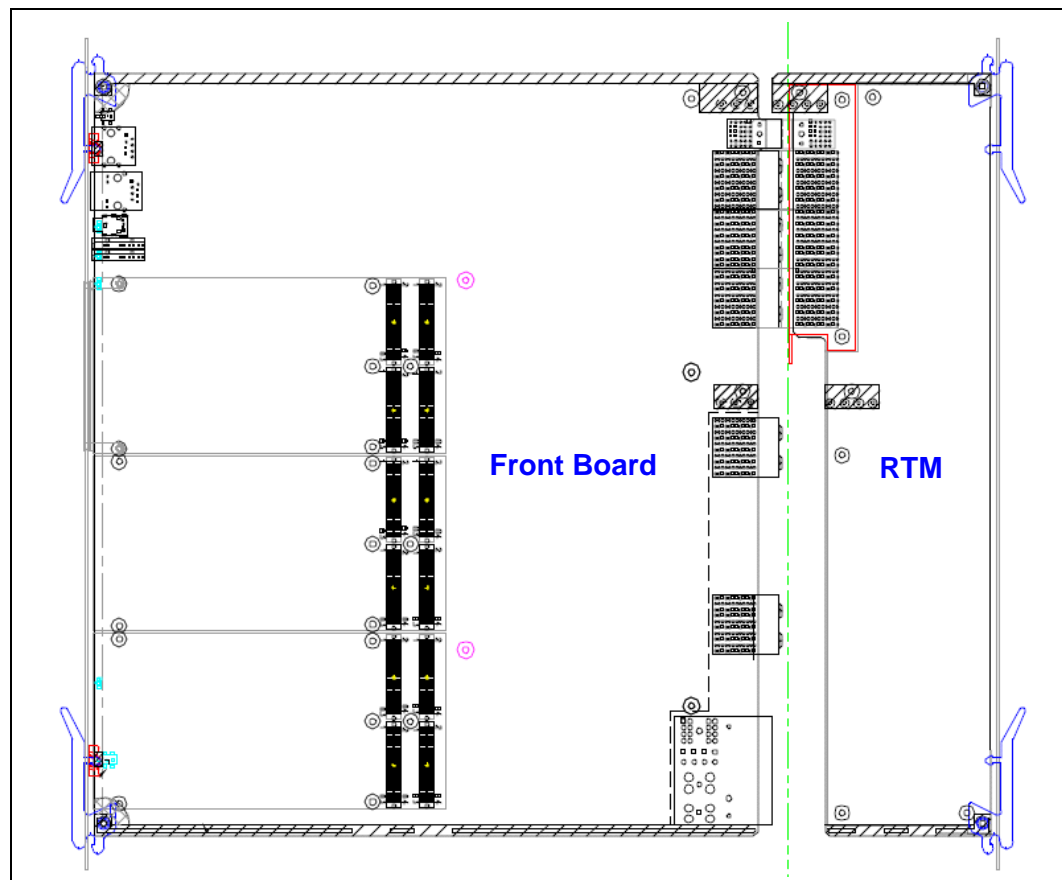
# Functional Overview

# 2

Rear Transition Modules (RTM) are important components in many telecommunications and embedded systems. These environments place most of the active components on a Front Board and most of the cable connections (especially copper cables) are made from the RTM. This allows the Front Board to be replaced without the need to reinsert a large number of cables in the correct order.

In AdvancedTCA\* systems, the Front Board mates directly with the RTM, as shown in Figure 1:

**Figure 1. Relationship of RTM to Front Board**



The Intel NetStructure® MPRTM0020 Rear Transition Module is designed specifically to work with the Intel NetStructure MPCBL0020 Single Board Computer.

The MPRTM0020 RTM includes the following interfaces and features:

- One serial port
- One USB 1.1 port
- Two Gigabit Ethernet (RJ45) ports from the Fabric Interface



- One SAS x4 connector to support external SAS JBOD. (Only three of these SAS ports on the RTM are usable; the first SAS port is used by the MPCBL0020 Single Board Computer's local SAS drive.)
- Six T1/E1 ports with transformer and protection circuitry (designed primarily for intra-building applications)
- I<sup>2</sup>C connectivity to the SBC for remote management capabilities
- OOS and Health LEDs
- Hot Swap status LED. This LED mirrors the indication of the HS status LED on the MPCBL0020 Single Board Computer since the MPRTM0020 RTM itself is not hot swappable.
- P30 power connector
- P31, P32, and P33 HM- ZD connectors for SBC signals
- On-board power conversion from +12V supplied by the SBC via P30 connector
- ADM1026 for voltage monitoring, storing FRU and SDR data.

# Operating the Unit

# 3

## 3.1 Introduction

The Intel NetStructure® MPRTM0020 Rear Transition Module is a non-intelligent RTM. A non-intelligent FRU does not have a remote management controller (RMC) on board to communicate with the SBC IPMC. Instead, all of the non-intelligent RTM sensors and FRU device information is made available to the IPMC through direct device access. This is usually done via dummy I<sup>2</sup>C sensor and storage devices. It is the responsibility of the IPMC to make the non-intelligent RTM look like a separate intelligent FRU controller to the rest of the system.

## 3.2 RTM Installation Procedure

The MPRTM0020 RTM is mechanically compliant with the PICMG\*3.0 specifications Revision 2 ECN1.

The RTM must be installed in an AdvancedTCA\* chassis prior to installing the MPCBL0020 Single Board Computer.

Install the RTM as follows:

1. Remove the rear air management blade from an AdvancedTCA chassis (where applicable).
2. Locate the slot where the RTM is to be installed in the chassis. The RTM must be installed in the same slot number as the MPCBL0020 Single Board Computer.
3. Open the top and bottom ejector latches and slide the RTM into the chassis by aligning to the guide rails on the top and bottom of the chassis cage.
4. Ensure that the RTM is fully installed in the chassis by locking the top and bottom ejector handles.
5. Tighten the faceplate retention screws on the top and bottom of the RTM faceplate. Ensure that the screws are torqued to ~6 in-lbs using a torque screwdriver.

## 3.3 RTM Removal Procedure

Removal of the RTM from the chassis uses the following procedure:

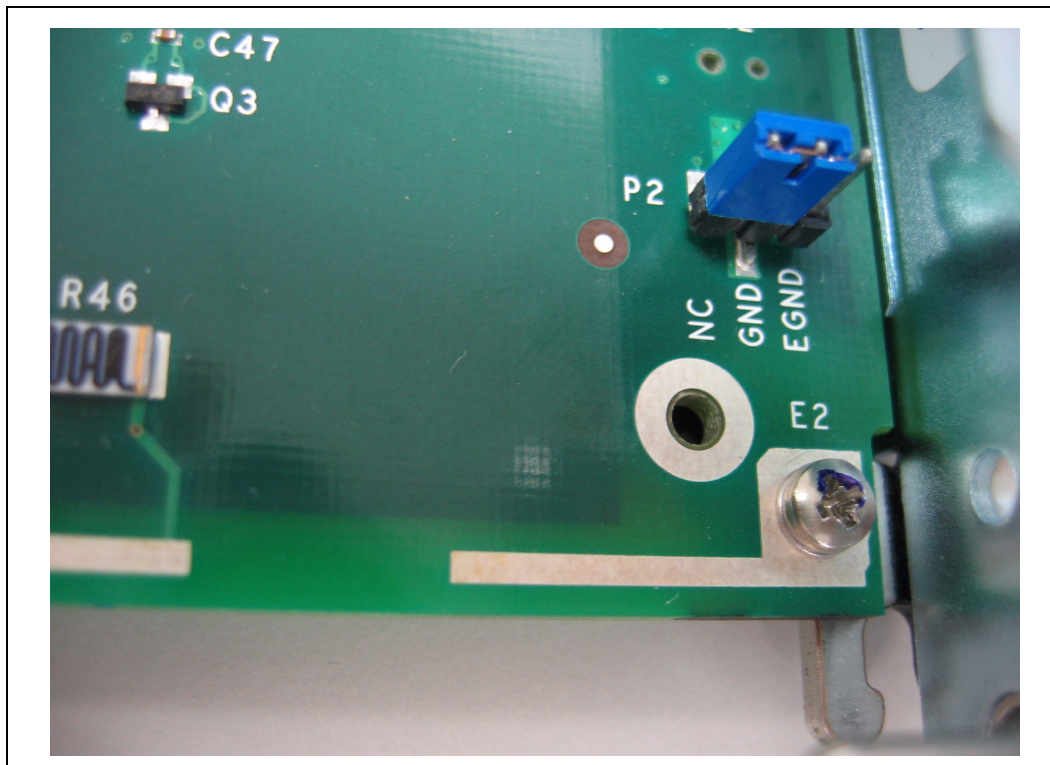
1. Because the MPRTM0020 is not an intelligent RTM, removing the RTM causes the SBC to be shut down. Ensure that the SBC is ready to be shut down before opening the bottom ejector handle of the RTM.
2. Remove all interface cables from the RTM faceplate connectors.
3. Loosen the RTM faceplate retention screws with a screwdriver.
4. Open the top and bottom ejector handles on the RTM.
5. Remove the RTM from the chassis slot.

### 3.4 Digital Ground to Chassis Ground Connection

Digital ground can be tied to chassis ground through a jumper (P2) located near the bottom, right corner of the RTM.

In the default grounding for the MPRTM0020, digital ground is isolated from chassis ground (jumper link connecting “NC” to “GND”) as shown in [Figure 2](#).

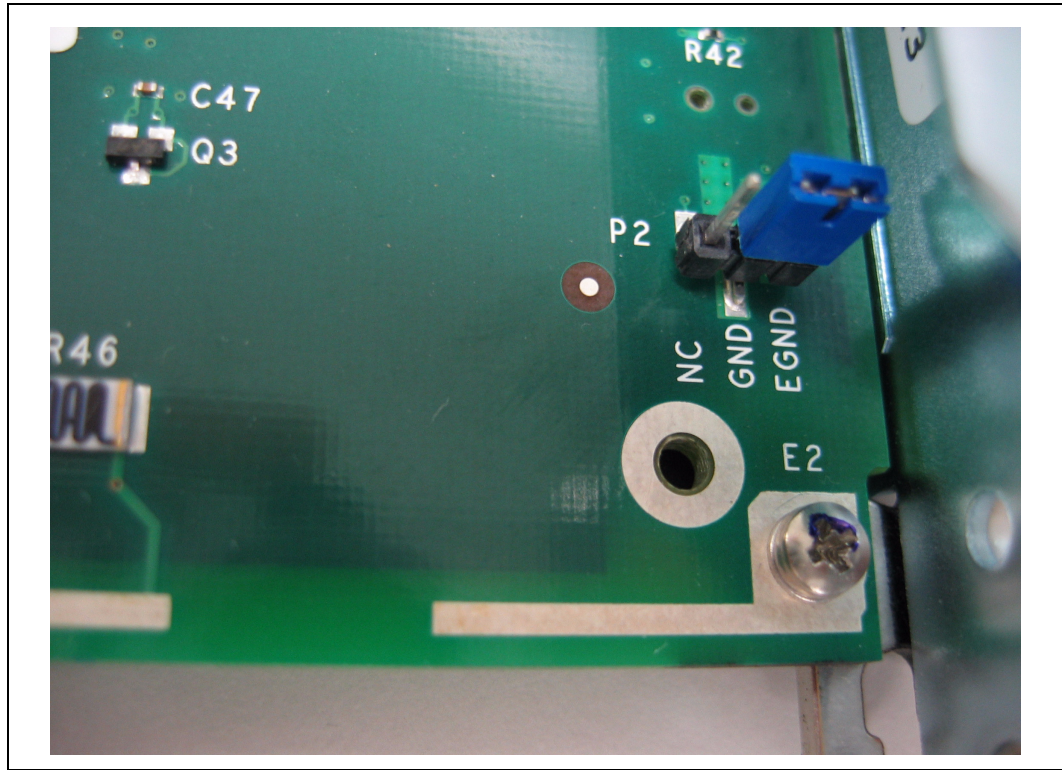
**Figure 2. Default Grounding on MPRTM0020**



To connect the digital ground to the chassis ground, follow this procedure:

1. Remove the jumper link from the default location on P2 (connecting “NC” & “GND”).
2. Place the jumper link over pins 2 & 3 to connect “GND” to “EGND” as shown in [Figure 3](#).

Figure 3. Digital Ground Connected to Chassis Ground



*Note:* Digital ground is also called “logic ground”. Chassis ground is also known as “shelf ground”.

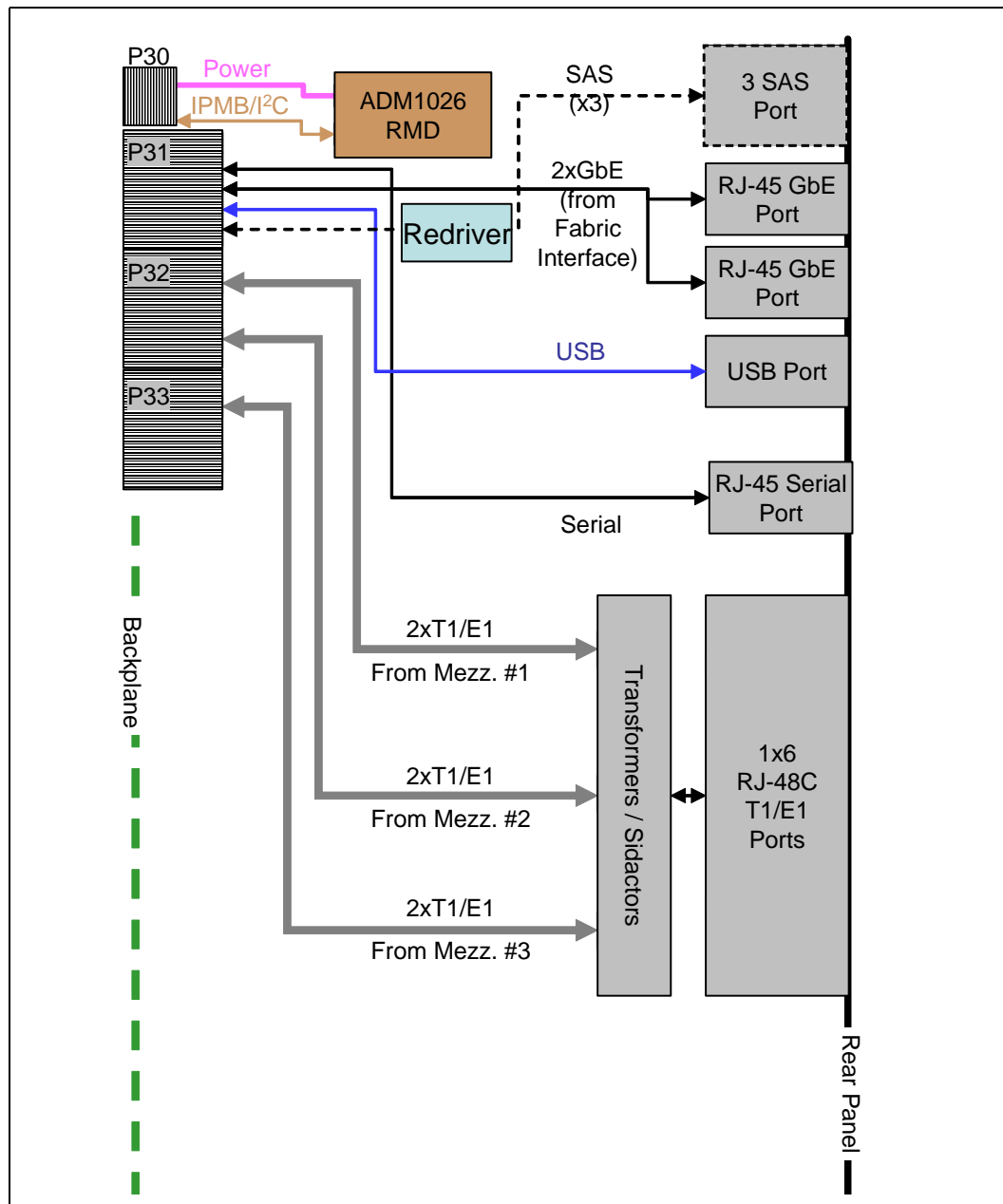
# Module Components

# 4

## 4.1 Block Diagram

Figure 4 shows a functional block diagram of the RTM.

Figure 4. RTM Functional Block Diagram



## 4.2 Physical Layout

Figure 5. Rear Transition Module (RTM)

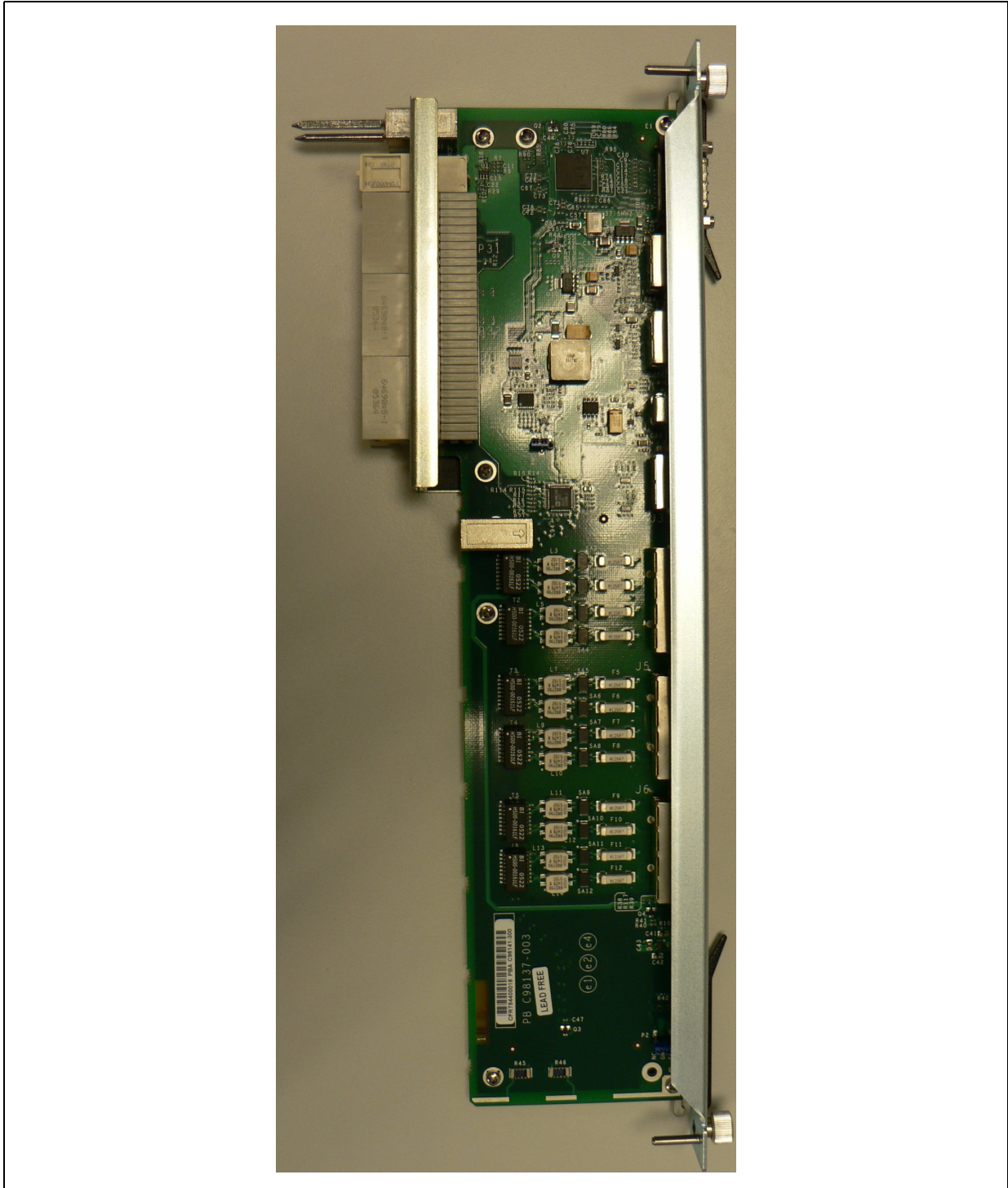
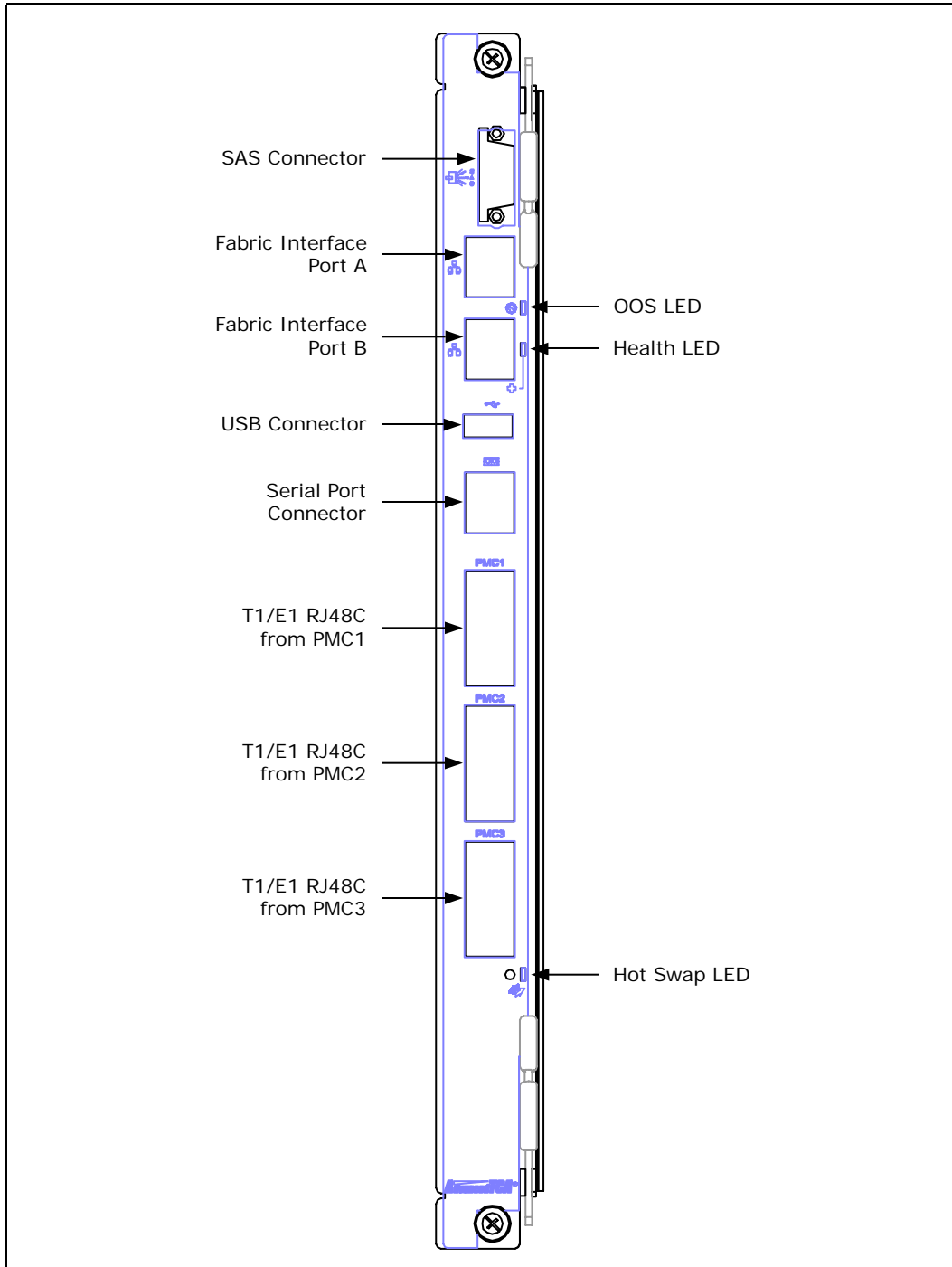


Figure 6 identifies the connectors and LEDs on the RTM faceplate.

**Figure 6. RTM Faceplate Connectors and LEDs**





## 4.3 Components Description

The following sections describe the components shown in [Figure 4](#) through [Figure 6](#).

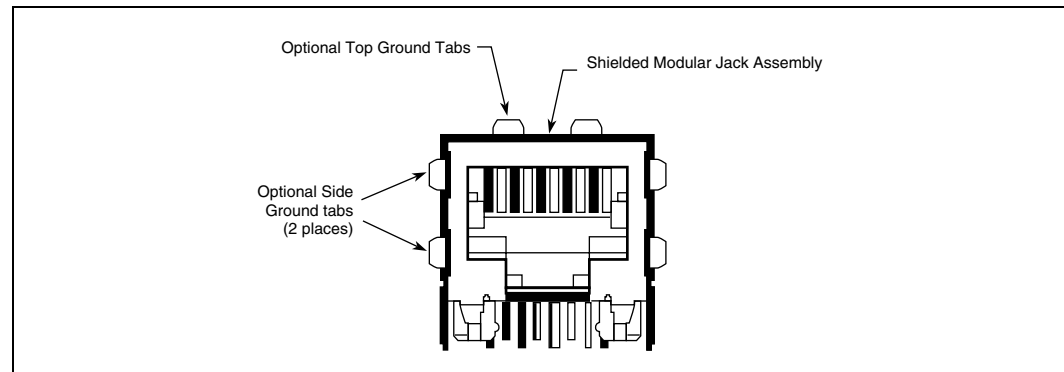
### 4.3.1 Serial Port Interface

One serial port (RS-232) connector is present on the RTM. This connector provides access to the COM1 serial port from the MPCBL0020 Single Board Computer, which is also routed to the front panel of the SBC. Both connections are active, but only one can be used at any given time.

The line driver/receiver for the serial port resides on the SBC. The RTM only provides a connector along with EMI/EMC filtering. The serial port uses an RJ-45 connector, which is located on the RTM faceplate as shown in [Figure 6 on page 16](#). [Figure 7](#) shows the serial port connector's outline, and [Table 2](#) provides the pin-out information for this connector.

Because this serial port is the COM port from the MPCBL0020 Single Board Computer, the port is inactive when the Serial Over LAN feature is activated on the SBC (the serial port data from COM1 is routed to the Base Interface Gigabit Ethernet adapter in this situation).

**Figure 7. Serial Port Connector**



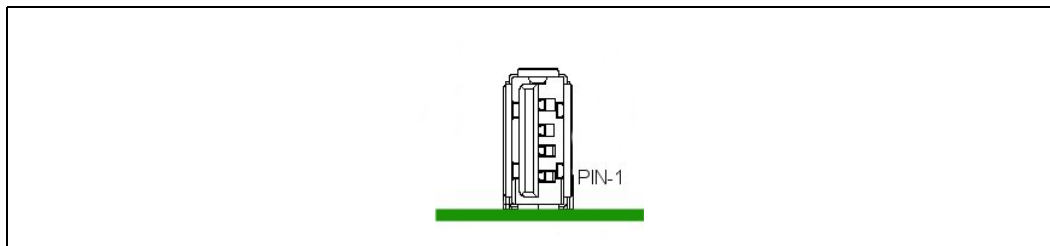
**Table 2. Serial Port Connector Pinout**

Pin	Signal Name
1	RTS
2	DTR
3	TXD
4	GND
5	GND
6	RXD
7	DSR
8	CTS

### 4.3.2 USB Interface

One USB port is provided on the RTM. 5V power is available through this USB port with a current limit of 400mA. [Figure 8](#) illustrates the USB connector and [Table 3](#) provides pinout information.

**Figure 8. USB Connector (J2)**



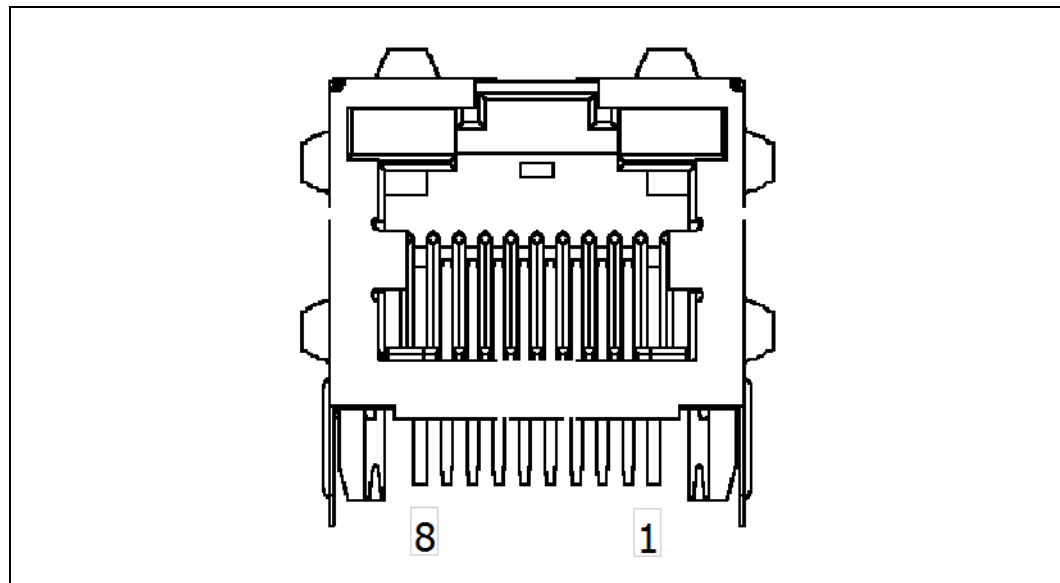
**Table 3. USB Connector Pinout**

Pin	Signal Name
1	5V_USB
2	USB-
3	USB+
4	GND

### 4.3.3 Gigabit Ethernet Interface

Two Gigabit Ethernet ports with LEDs are present on the RTM. [Figure 9](#) shows the physical outline of the RJ-45 connector used for each port, and [Table 4](#) provides the standard pinout information.

**Figure 9. RJ-45 Gigabit Ethernet Connector**



**Table 4. RJ-45 Ethernet Connector Pinout**

Pin	Signal Name
1	MDI0+
2	MDI0-
3	MDI1+
4	MDI2+
5	MDI2-
6	MDI1-
7	MDI3+
8	MDI3-

### 4.3.4 SAS Connector Interface

One x4 SAS (Serial Attached SCSI) connector is present on the RTM. When the MPRTM0020 is connected to a MPCBL0020 Single Board Computer, only three of the four high-speed serial interfaces is available on the SAS connector, because one port is already used for the on-board local SAS drive on the SBC. The remaining three ports are available as ports 0-2 on the SAS connector (as shown in [Figure 14 on page 27](#)) to enable users to connect to a SAS JBOD for remote storage purposes. [Figure 10](#) shows the outline of the SAS connector and [Table 5](#) provides pinout information for the connector.

Refer to the *Intel NetStructure® MPCBL0020 Single Board Computer Compatibility Report* for information on specific SAS cable and SAS JBOD models that have been tested and validated by Intel.

Figure 10. SAS Connector

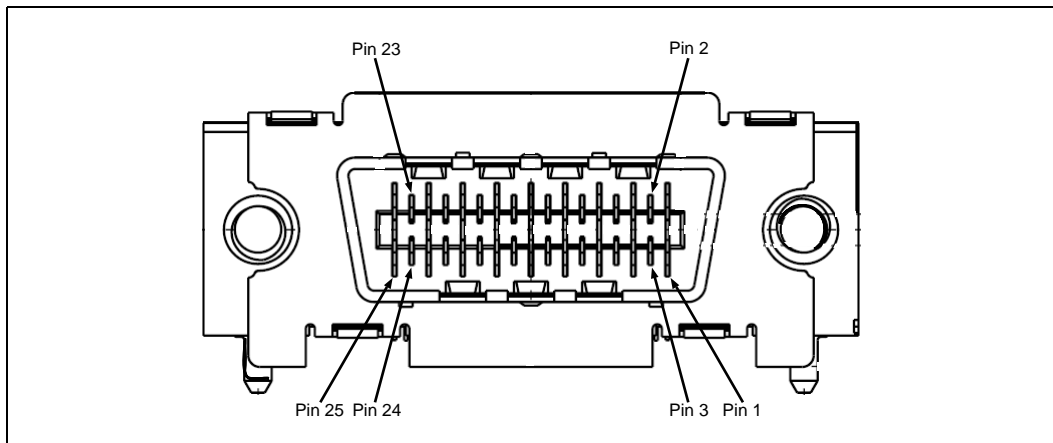


Table 5. SAS Connector Pinout

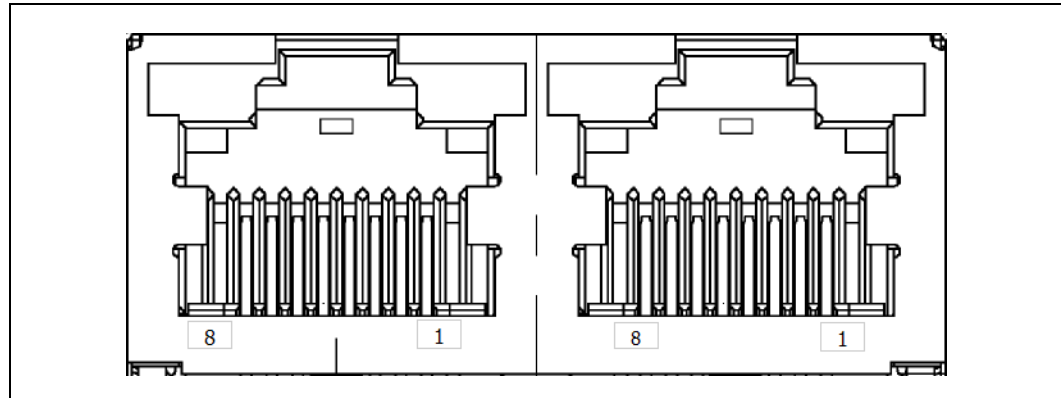
Pin	Signal Name	Pin	Signal Name
1	GND	14	SAS_TX3-
2	SAS_RX0+	15	SAS_TX3+
3	SAS_RX0-	16	GND
4	GND	17	SAS_TX2-
5	SAS_RX1+	18	SAS_TX2+
6	SAS_RX1-	19	GND
7	GND	20	SAS_TX1-
8	SAS_RX2+	21	SAS_TX1+
9	SAS_RX2-	22	GND
10	GND	23	SAS_TX0-
11	SAS_RX3+	24	SAS_TX0+
12	SAS_RX3-	25	GND
13	GND		

**Note:** The SAS\_RX3 and SAS\_TX3 interfaces are not physically connected to the SAS controller on MPCBL0020. The physical routing for these signals exists on the MPRTM0020 but is not supported on the SBC. See [Figure 14 “Physical Breakdown of SAS Ports Distribution”](#) on page 27 for further details.

### 4.3.5 T1/E1 Connector Interface

Six T1/E1 RJ-48 connectors are present on the RTM. These connectors are designed primarily for intra-building applications. [Figure 11](#) shows the physical outline of the E1/T1 connectors and [Table 6](#) shows pinout information for each connector.

**Figure 11. RJ-48 Connector**



**Table 6. T1/E1 Connector Pinout**

Pin	T1 Signal	E1 Signal
1	RX_RNG	RL1
2	RX_TIP	RL2
3	Not Used	Not Used
4	TX_RNG	XL1
5	TX_TIP	XL2
6	Not Used	Not Used
7	Not Used	Not Used
8	Not Used	Not Used

### 4.3.6 Zone 3 Rear Transition Module Power Connector (P30)

The P30 connector is a bladed connector originally developed for FutureBus\* applications. [Figure 12](#) illustrates the connector outline and [Table 7](#) provides pinout information. [Table 8](#) provides additional descriptions of the signals on the connector.

Figure 12. P30 Connector

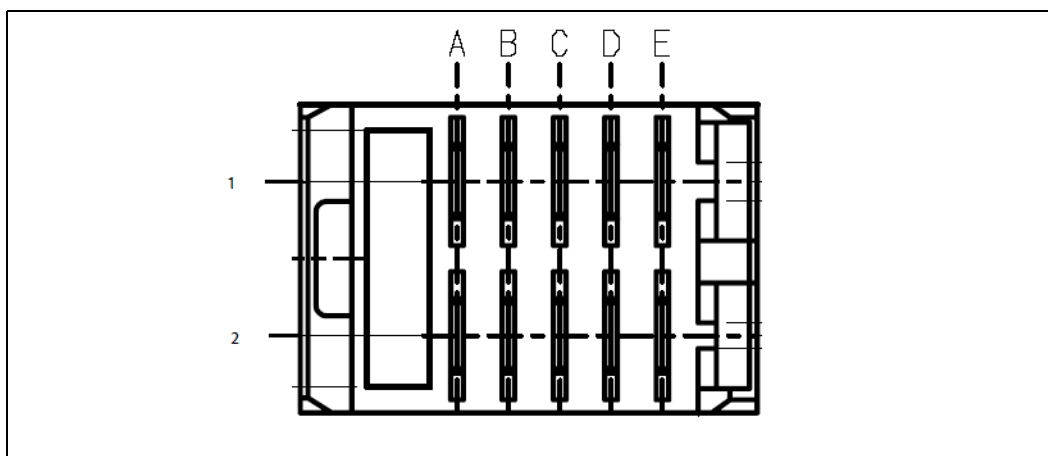


Table 7. P30 Connector Pinout

Pin	Signal	Pin	Signal
A1 (L)	Logic_GND	A2 (L)	Shelf_GND
B1 (L)	Logic_GND	B2 (L)	+3.3V_MP
C1 (M)	IPMI_Sclk	C2 (M)	IPMI_Sdata
D1 (S)	+12V	D2 (S)	+12V
E1 (S)	PS1#	E2 (S)	ENABLE#

Table 8. P30 Signal Descriptions

Pin	Signal	Comments
A1	Logic_GND	Logic ground connection (long contact); provides return path for power and signal connections.
A2	Shelf_GND	Shelf ground connection (long contact); provides safety ground contact between SBC and RTM.
B1	Logic_GND	Logic ground connection (long contact); see above.
B2	+3.3V_MP	Management power (long contact); provides up to 100mA to power management system on RTM. Used exclusively for management power.
C1	IPMI_Sclk	IPMB/I <sup>2</sup> C clock signal (medium contact)
C2	IPMI_Sdata	IPMB/ I <sup>2</sup> C data signal (medium contact); This signal is connected to the on board ADM1026 for temperature and voltage monitoring on the RTM.
D1	12V	12V RTM payload power (short contact); provides up to 420mA to power active devices (other than management system) on RTM. See additional requirements below.
D2	12V	
E1	PS1#	Presence Signal, active low (short contact); the RTM connects this signal to Logic_GND through a 100 Ohm resistor (to facilitate manufacturing test). The Front Board reads this signal to understand if an RTM is fully inserted.
E2	ENABLE#	Module enable signal, active low (short contact); the Front Board sets this signal high to reset the RMC/RMD.

### 4.3.7 Zone 3 Rear Transition Module Data/Control Connectors

The MPRTM0020 implementation includes three data connectors (P31, P32, P33) that mate directly to the MPCBL0020 Single Board Computer without connecting through the backplane. Each Zone 3 data/control connection consists of 120-pin HM-Zd connector with 40 differential pairs which allows high-speed signals to be passed between the boards.

#### 4.3.7.1 Zone 3 Rear Transition Module Data/Control Connector (P31)

The signals that are routed through P31 are the IEEE 1149.1 JTAG signals, SAS storage ports, USB 2.0 signals, and serial and fabric interface Ethernet ports. [Table 9](#) provides the basic pinout of the connector, and [Table 10](#) provides more detail about the signals.

**Table 9. RTM Connector (Zone 3) P31 Pinout**

Pin	A	B	C	D	E	F	G	H
1	RMD_INT#	Reserved	Reserved	TDI	Reserved	TDO	Blue HS LED	Reserved
2	SA[1]TX+	SA[1]TX-	SA[1]RX+	SA[1]RX-	SA[2]TX+	SA[2]TX-	SA[2]RX+	SA[2]RX-
3	SA[3]TX+	SA[3]TX-	SA[3]RX+	SA[3]RX-	No Connect	No Connect	No Connect	No Connect
4	FI_DA1+	FI_DA1-	FI_DB1+	FI_DB1-	FI_DC1+	FI_DC1-	FI_DD1+	FI_DD1+
5	FI_DA2+	FI_DA2-	FI_DB2+	FI_DB2-	FI_DC2+	FI_DC2-	FI_DD2+	FI_DD2+
6	LNK[0]-	ACT[0]-	SPD1000[0]-	LNK[1]-	ACT[1]-	SPD1000[1]-	Reserved	Reserved
7	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	PCIe_CLK+	PCIe_CLK-
8	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
9	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
10	USB[0]+	USB[0]-	DSR#	RXD#	RTS#	TXD#	CTS#	DTR#

**Table 10. P31 Signal Descriptions (Sheet 1 of 2)**

Pin	Signal	Comments
A1	RMD_INT#	This signal is driven by the RMD on non-intelligent RTMs to alert the SBC that there is a sensor needing attention. It is required on all SBCs and RTMs.
B1, C1	Reserved	Reserved
D1	TDI	Test Data In signal as defined in JTAG. SBCs must connect this signal into the test data chain (i.e., in line with TDO connections from other chips), but must have a means to bypass this connection if an RTM is not installed.
E1	Reserved	Reserved
F1	TDO	Test Data Out signal as defined in JTAG. See TDI comments above. Output of RTM
G1	Blue HS LED	Blue Hot Swap LED
H1	Reserved	Reserved
A2-D3	SA[x]TX+, SA[x]TX-, SA[x]RX+, SA[x]RX-	Storage architecture signals for transmit and receive portions of differential pairs. Three SAS ports are routed to the RTM.
E3-H3	No Connect	No Connect
A4-H5	FI_Dxy+, FI_Dxy-	PHY-level 10/100/1000Base-T signaling routed to the RTM. Row 4 is for the first Ethernet port, row 5 is for the second Ethernet port. These Ethernet ports are routed from the "Physical Level" Fabric Interface of the MPCBL0020 Single Board Computer, and have gone through the magnetics on the SBC.

**Table 10. P31 Signal Descriptions (Sheet 2 of 2)**

Pin	Signal	Comments
A6-F6	LNK[x], ACT[x], SPD1000[x]	Represent the link, activity, and speed LEDs for the Fabric Interface Gigabit Ethernet that are routed to the RTM
G6, F7	Reserved	Reserved
G7, H7	PCIe_CLK+, PCIe_CLK-	PCI Express reference clocks. Any SBC providing PCI Express (pins A3-H4) must provide these signals. * Not supported for the MPRTM0020 RTM.
A8-H9	Reserved	Reserved
A10-B10	USB[0]+, USB[0]-	USB data signals. Note that the RTM's 5 V power for the USB connections must be derived off the 12 V rail.
C10	DSR#	Data Set Ready signal for COM1 RS-232 connection.
D10	RXD#	Received Data signal for COM1 RS-232 connection.
E10	RTS#	Ready to Send signal for COM1 RS-232 connection.
F10	TXD#	Transmit Data signal for COM1 RS-232 connection.
G10	CTS#	Clear to Send signal for COM1 RS-232 connection.
H10	DTR#	Data Terminal Ready signal for COM1 RS-232 connection.

#### 4.3.7.2 Zone 3 Rear Transition Module Data Connector (P32)

The P32 connector on the RTM connects to J32 on the MPCBL0020 Single Board Computer and is used to route the T1/E1 signals from the PMC slots (on the SBC) to the RTM.

Table 11 provides the pinout of the P32 connector. AP1[x] designates T1/E1 signals that are routed from PMC 1 while AP2[x] designates T1/E1 signals routed from PMC 2.

**Table 11. RTM Connector (Zone 3) P32 Pinout**

Pin	A	B	C	D	E	F	G	H
1	AP1[0]TX+	AP1[1]TX-	AP1[0]RX+	AP1[0]RX-	AP1[1]TX+	AP1[1]TX-	AP1[1]RX+	AP1[1]RX-
2	AP1[2]TX+	AP1[2]TX-	AP1[2]RX+	AP1[2]RX-	AP1[3]TX+	AP1[3]TX-	AP1[3]RX+	AP1[3]RX-
3	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect
4	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect
5	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect
6	AP2[0]TX+	AP2[1]TX-	AP2[0]RX+	AP2[0]RX-	AP2[1]TX+	AP2[1]TX-	AP2[1]RX+	AP2[1]RX-
7	AP2[2]TX+	AP2[2]TX-	AP2[2]RX+	AP2[2]RX-	AP2[3]TX+	AP2[3]TX-	AP2[3]RX+	AP2[3]RX-
8	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect
9	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect
10	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect

#### 4.3.7.3 Zone 3 Rear Transition Module Data Connector (P33)

The P33 connector on the RTM connects to J33 on the MPCBL0020 Single Board Computer and is used to route the remainder of the T1/E1 signals from PMC slot 3 on the SBC to the RTM. Table 12 provides the pinout of the P33 connector.



AP3[x] indicates that these T1/E1 signals are routed from PMC 3.

**Table 12. RTM Connector (Zone 3) P33 Pinout**

Pin	A	B	C	D	E	F	G	H
1	AP3[0]TX+	AP3[1]TX-	AP3[0]RX+	AP3[0]RX-	AP3[1]TX+	AP3[1]TX-	AP3[1]RX+	AP3[1]RX-
2	AP3[2]TX+	AP3[2]TX-	AP3[2]RX+	AP3[2]RX-	AP3[3]TX+	AP3[3]TX-	AP3[3]RX+	AP3[3]RX-
3	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect
4	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect
5	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect
6	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect
7	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect
8	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect
9	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect
10	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect	No Connect

### 4.3.8 Alignment Blocks

The MPRTM0020 Rear Transition Module implements the rK1 and A2 alignment blocks at the top of Zone 2 and Zone 3, as required in Section 2.4.4 of the PICMG 3.0 Specification. The Zone 2 alignment block (rK1) is assigned a keying value of 11, and uses Tyco\* 1-1469373-1 (or equivalent). The Zone 3 alignment block (A2) is assigned a keying value of 7-3, and uses Tyco 7-1469373-3 (or equivalent).

### 4.3.9 ADM1026 Controller

The RTM has an ADM1026 controller that collects sensor information from the board using the SMBus interface. It also has memory to store FRU and user information.

The ADM1026 is managed by the MPCBL0020 Single Board Computer IPMC connected via the I<sup>2</sup>C bus. These I<sup>2</sup>C signals are routed from the SBC IPMC through the P30 connector on the Zone 3.

The SBC IPMC communicates with the ADM1026 using an I<sup>2</sup>C address of 0x5C. From the Shelf management perspective, the RTM can be managed using the IPMB address fronted by the SBC (MPCBL0020) with a FRU Device ID of 0x04.

Refer Section 5 for further information regarding management of the FRU and SDR data of the RTM. Table 13 shows mapping between GPIO signal name and pin on the ADM1026.

**Table 13. GPIO Signal Mapping (Sheet 1 of 2)**

GPIO Signals	Pin on ADM1026
Hotswap_Switch	3
OOS Green LED Control	6
OOS Red LED Control	5
Health Green LED Control	10

**Table 13. GPIO Signal Mapping (Sheet 2 of 2)**

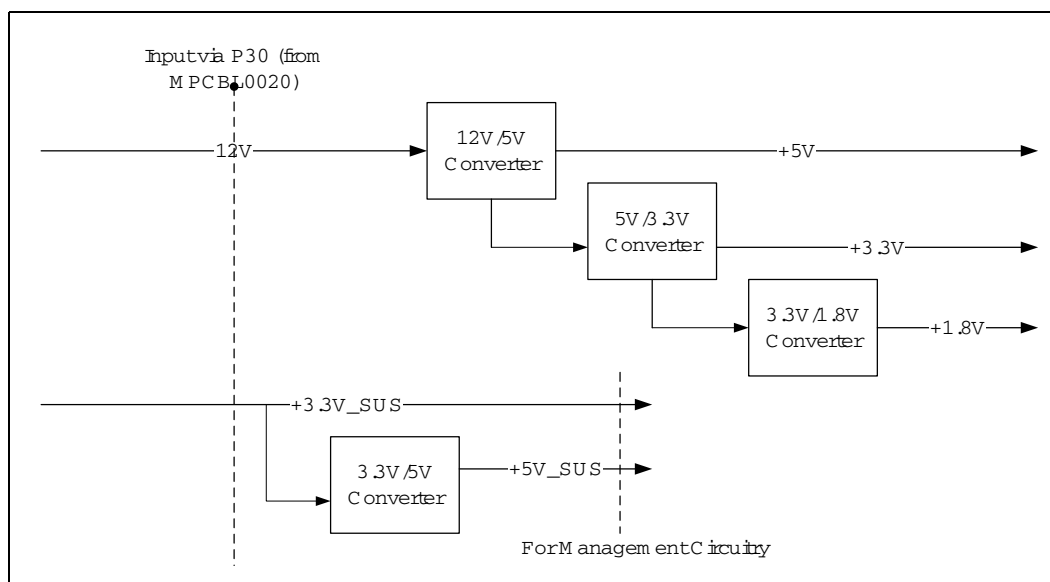
GPIO Signals	Pin on ADM1026
Health Red LED Control	9
USB_OC Monitor	12
Payload Power Enable	2
Payload PowerGood	43

### 4.3.10 Power Supplies

The MPRTM0020 RTM needs several voltages that are not available from the SBC. The P30 connection to the SBC only provides two power supplies:

- +12 V voltage rail (420 mA maximum current) is used as the main input voltage for the RTM
- +3.3 V SUS voltage powers the management circuitry on the RTM (ADM1026, I<sup>2</sup>C pullup, etc.)

Voltage regulation on the RTM is used to generate the additional required voltages, as shown in Figure 13.

**Figure 13. RTM Power Distribution**


The four voltages that are generated on the RTM are used as follows:

- **+5V\_SUS:** The +5V\_SUS is mainly used as an input voltage to drive the blue Hot Swap LED. It is generated from the +3.3V\_SUS using a boost regulator.
- **+5V:** The 5 V payload voltage is generated from the +12 V power. To increase the power conversion efficiency, a switching regulator is added. The 5 V is mainly used for USB power and also used as a supply to 5 V/3.3 V linear regulator.
- **+3.3V:** The 3.3 V voltage is used to drive the components on the SAS re-driver circuitry. This voltage is also used to drive the Gigabit Ethernet LINK/ACTIVITY LEDs on the RTM.

- **+1.8V:** The 1.8 V voltage is used as the input voltage to the SAS re-driver IC.

### 4.3.11 SAS Redriver

The MPCBL0020 Single Board Computer implements optional SAS storage access via the MPRTM0020 RTM. SAS is a 3-Gbps SERDES style bus, and a redriver is added on the RTM to effectively detect and correct the SAS OOB signals at a proper amplitude.

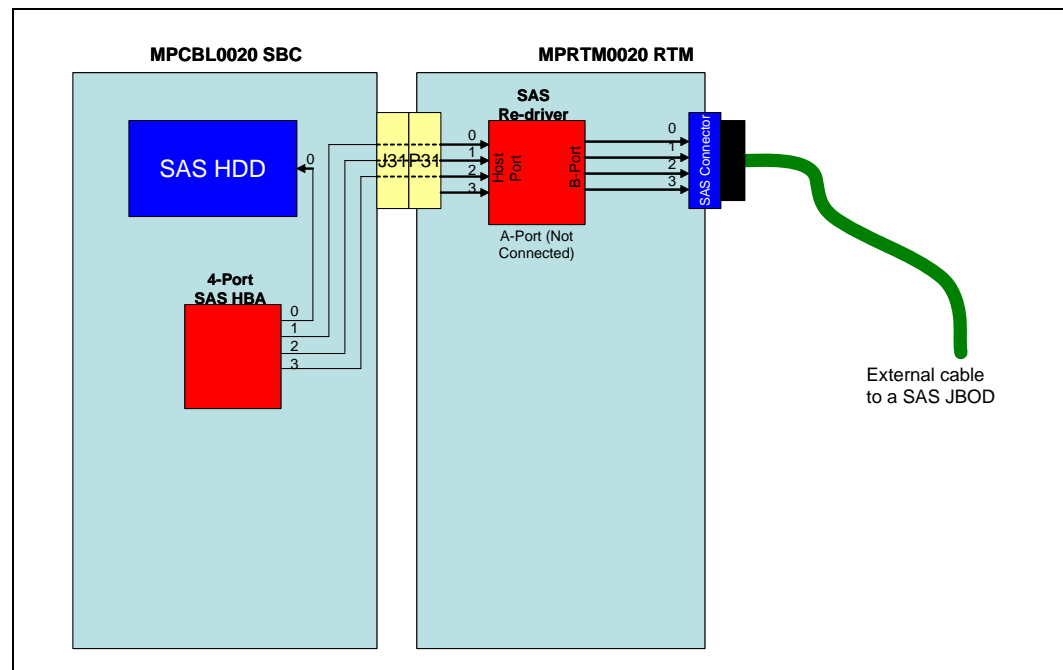
The specific SAS re-driver that was used is the PMC-Sierra\* PM8380 Quad SMX 3G SATA/SAS Mux/Demux. The RTM implements the PM8380 device as a 1:1 re-driver. The four host ports are connected to the SBC via the Zone 3 connector.

The four SAS ports of the “B” Load-side Mux-port are connected to the External SAS connector. The “A” Load-side Mux-port is left unconnected. The PM8380 has its configuration straps set to operate in re-driving mode, rather than in Mux mode. The “B” Load-side Mux-port is configured for the default SAS amplitude, pre-emphasis, and equalization.

Figure 14 illustrates the SAS port distribution on the RTM.

*Note:* Only three SAS ports are routed to the MPRRTM0020 RTM because the first SAS port from the SAS HBA (port 0) is used for the on-board SAS hard drive on the MPCBL0020 SBC.




**Figure 14. Physical Breakdown of SAS Ports Distribution**



### 4.3.12 Board Status LEDs

The Hot Swap, Out of Service, and Health LEDs on the RTM faceplate are fronted by the MPCBL0020 Single Board Computer. These LEDs have identical state to the LEDs on the SBC faceplate and allow service personnel to verify the state of the board when servicing the board from the rear of the chassis.

**Table 14. Board Status LED Descriptions**

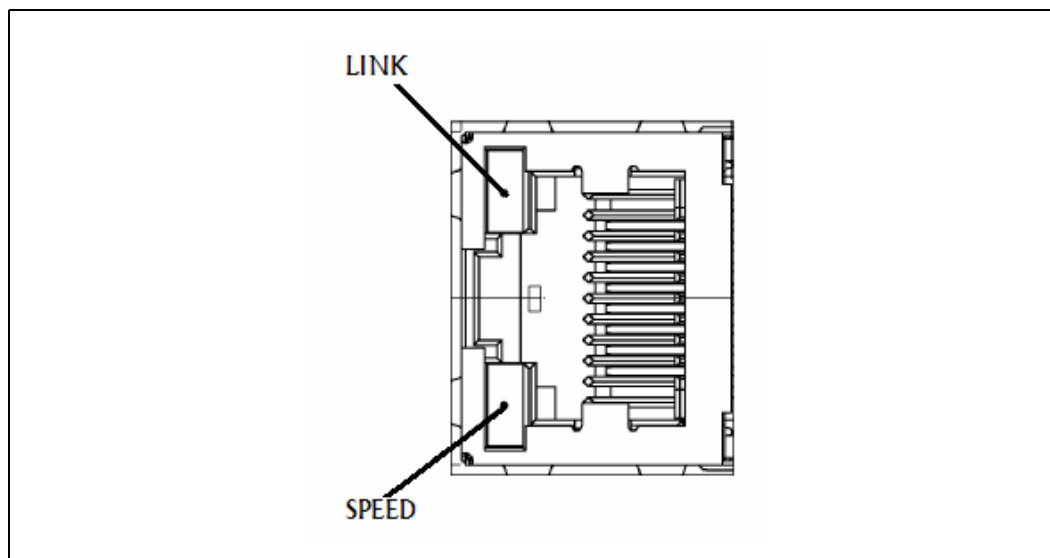
LED	Function
<p><b>Hot Swap</b></p> 	<p><b>Function:</b> Hot Swap as defined in AdvancedTCA 3.0 Specification It is also possible for a user to override the default behavior of the LED using AdvancedTCA FRU LED Control commands.</p> <p><b>Possible States:</b> OFF / BLUE / SHORT BLINK / LONG BLINK Blinking Blue: Preparing for removal/insertion. Long blink indicates activation is in progress, short blink when deactivation is in progress</p>
<p><b>Out of Service</b></p> 	<p><b>Function:</b> Out of Service (AdvancedTCA LED 1). RED: The board is out of service. OFF: The board is running. It is possible for a user to override the default IPMC behavior of the LED using AdvancedTCA FRU LED Control commands.</p> <p><b>Possible States:</b> OFF / RED / AMBER</p>
<p><b>Health</b></p> 	<p><b>Function:</b> Health (AdvancedTCA LED 2). The SBC health is based on an aggregation of IPMI sensors, like board temperature and voltage. Green: The SBC is healthy. Red: The SBC is not healthy. It is possible for the user to override the default IPMC behavior of the LED using AdvancedTCA FRU LED Control commands.</p> <p><b>Possible States:</b> OFF / GREEN / RED / AMBER</p>

### 4.3.13 RJ-45 Gigabit Ethernet Port LEDs

The RJ-45 connector for each of the Gigabit Ethernet ports on the RTM has two indicator LEDs integrated in the connector body.

As shown in [Figure 15](#), the top LED represents the LINK LED while the bottom LED represents the SPEED LED.

**Figure 15. RJ-45 Ethernet Port LEDs**



The LINK LED has the following indications and meanings:

- LED Off – Link not established
- Steady green – Link established but not active
- Flashing green – Link established and currently active

When the LINK LED is illuminated, the SPEED LED has the following indications and meanings:

- Steady green – 10/100 Mbps connection
- Steady amber – 1000 Mbps connection

**Note:** When the Fabric Interface Gigabit Ethernet links from the MPCBL0020 Single Board Computer are routed to the switch slots, the Ethernet connections on the RTM are not active. However, the Speed and Link LEDs on the connectors will still indicate the operational status of the Ethernet ports.

# RTM Management Architecture

# 5

## 5.1 Introduction

This section describes the management support for a non-intelligent Rear Transition Module (RTM) such as the MPRTM0020. A non-intelligent RTM FRU does not have a controller on board to communicate with the SBC IPMC. Instead, all of the non-intelligent RTM sensors and the non-intelligent RTM FRU storage device are connected directly to the SBC IPMC. This is usually done via dummy I<sup>2</sup>C sensor and storage devices. It is the responsibility of the SBC IPMC to make the non-intelligent RTM look like a separate intelligent FRU controller to the rest of the system.

The feature that is not supported for RTMs is E-keying, since there are no PICMG requirements defined for non-intelligent RTMs.

## 5.2 RTM FRU Control

Since the non-intelligent RTM does not have a payload, the SBC IPMC only needs to implement the Cold Reset version of the FRU control command. This command does not cause the IPMC to reset. Instead the command causes all of the sensor and state information for the non-intelligent RTM to be set back to startup values, simulating a controller reset.

## 5.3 M-state Machine

The SBC IPMC is responsible for implementing the M-State machine for the non-intelligent RTM. From the perspective of the Shelf Manager the non-intelligent RTM looks like a separate managed FRU device with its own M-state that is separate from that of the IPMC. In order to do this, the IPMC sends M-State transition messages to the Shelf Manager, accepts activation/deactivation requests from the Shelf Manager, and negotiates power budgeting as if it were a separate RTM controller.

The non-intelligent RTM is not intended to be hot-swapped in or out of the system. For this reason the handle switch on the non-intelligent RTM is combined with the handle switch on the SBC. If either handle switch is opened, both the non-intelligent RTM and the SBC will take the appropriate action for removal.

When the SBC is inserted into the system the non-intelligent RTM is initialized to M0 state. The SBC IPMC then checks for the presence of the non-intelligent RTM. If the non-intelligent RTM is present then the non-intelligent RTM M-State is set to M1. In the M1 state the SDR records in the non-intelligent RTM FRU device are incorporated with the IPMC SDR records. The non-intelligent RTM then remains in M1 until the SBC IPMC reaches M4. At that point the non-intelligent RTM transitions to M2 and waits for activation from the Shelf Manager. Once the Shelf Manager activates the non-intelligent RTM, the non-intelligent RTM transitions to M3 and waits for its power budget to be granted. Once the power budget is granted the non-intelligent RTM transitions to M4 and stays there until a deactivation is received from the Shelf Manager or a handle switch is opened.

## 5.4 Power Budget Management

The SBC IPMC has inherent knowledge of the non-intelligent RTM power requirements. The IPMC will handle power negotiation commands from the Shelf Manager that are targeted for the non-intelligent RTM FRU ID. By doing this, the Shelf Manager should see the non-intelligent RTM as a separate controller negotiating for a power budget.

## 5.5 LED Management

The SBC IPMC has direct control over the LEDs on the non-intelligent RTM. Control of these LEDs is done through the IPMC system attention manager in the same way as other IPMC-controlled LEDs. Special fault classes are added to system attention manager tables to handle the failure and status state of the non-intelligent RTM. The non-intelligent RTM sensors and M-State machine are the contributors to the failure and status state. When the non-intelligent RTM is present, its failures will contribute to the overall failure state of the IPMC. Thus, the non-intelligent RTM LEDs will match the SBC LEDs.

## 5.6 SDR Proxy

The SDR records for the non-intelligent RTM are stored in a proprietary format in the internal use area of the non-intelligent RTM FRU storage device. When the non-intelligent RTM reaches M1 state the non-intelligent RTM SDR records are read out of the FRU device and stored in the IPMC. The non-intelligent RTM SDR records are then merged with the IPMC SDR records and made available through the Device SDR IPMI commands.

## 5.7 RTM Sensor Proxy

The non-intelligent RTM sensors are included in the sensor compliment programmed in the SBC IPMC. The only difference is that the non-intelligent RTM sensors are turned on and off with respect to the non-intelligent RTM M-State. When the non-intelligent RTM is in M4 state the sensors are turned on and scanned by the IPMC. In any other M-state the sensors are not scanned and will return a “sensor not found” completion code to sensor commands. When the non-intelligent RTM sensors are turned on the IPMC handles event generation and sensor access commands for the non-intelligent RTM sensors just as it does for any other IPMC sensor.

Below is a list of the current non-intelligent RTM sensors:

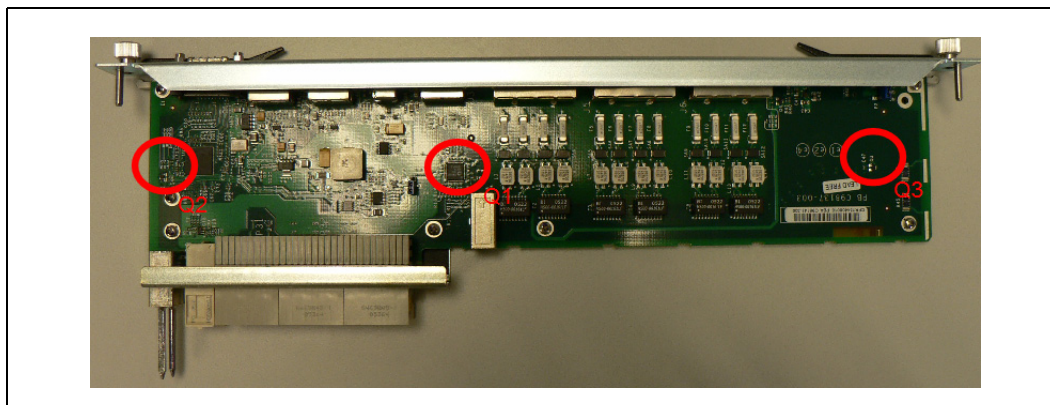
- RTM +1.8V
- RTM +3.3V
- RTM +3.3V Standby
- RTM +5.0V
- RTM +5.0V Standby
- RTM +12V
- RTM Temp1

- RTM Temp2
- RTM Temp3
- RTM Power Status

**Table 15. Sensor Data Record for RTM**

Sensor Name	Description	Lower Critical	Lower Non Critical	Upper Non Critical	Upper Critical
RTM +1.8V	For SAS Retimer	1.71	–	–	1.89
RTM +3.3V	For other Integrated Circuits	3.10	–	–	3.47
RTM +3.3V SUS	Early voltage for ADM1026	3.11	–	–	3.46
RTM +5.0V	For USB Interface	4.71	–	–	5.23
RTM +5V SUS	Early voltage for Hotswap LED	4.73	–	–	5.25
RTM +12V	Main voltage rail for other ICs/ peripherals	10.71	–	–	13.10
RTM Temp 1	Internal ADM1026 (U3) [see Figure 16 for location]	-5	–	70	75
RTM Temp 2	External Thermal Diode (Q3) [see Figure 16 for location]	-5	–	70	75
RTM Temp 3	External Thermal Diode (Q2) [see Figure 16 for location]	-5	–	70	75

**Figure 16. RTM Temperature Sensor Locations**





# Detailed Specifications

# 6

## 6.1 Dimensions and Weight

The weight of the baseboard is 1.14 kg (2.5 lbs.) with packaging materials.

## 6.2 Environmental Specification

The test methodology is a combination of Intel and NEBS test requirements with the intent that the product will pass pure system-level NEBS testing. The following table summarizes environmental limits, both operating and nonoperating.

**Table 16. Environmental Specifications**

Parameter	Conditions	Detailed Specification
Temperature (Ambient)	Operating (Normal)	5°C to 40°C
	Operating (Short term)	-5°C to 55°C
	Storage	-40°C to 70° C
Humidity	Operating	15%-90% (non-condensing) at 55° C
	Storage	5%-95% (non-condensing) at 40° C
Altitude	Operating	4,000 m (13,100 ft.) Note: may require additional cooling above 1800 m (5,900 ft.)
	Storage	15,000 m (49,200 ft.)
Unpackaged Vibration	Operating	Sine sweep: <ul style="list-style-type: none"> <li>• 5 to 100 Hz: 1G @ 0.25 Octave/minute</li> <li>• 100 to 500 Hz: 1G @ 1 Octave/minute</li> </ul> Random profile: <ul style="list-style-type: none"> <li>• 5 Hz @ 0.01 g<sup>2</sup> /Hz to 20 Hz @ 0.02 g<sup>2</sup> /Hz (slope up)</li> <li>• 20 Hz to 500 Hz @ 0.02 g<sup>2</sup> /Hz (flat)</li> <li>• 3.13 g RMS, 10 minutes per axis for all three axes</li> </ul>
	Storage	5 Hz to 50 Hz: 0.5 G @ 0.1 Octave/minute 50 Hz to 500 Hz: 3 G @ 0.25 Octave/minute.
Shock	Operating	30 G/11 ms half sine
	Storage	50 G, 170 inches/second trapezoidal

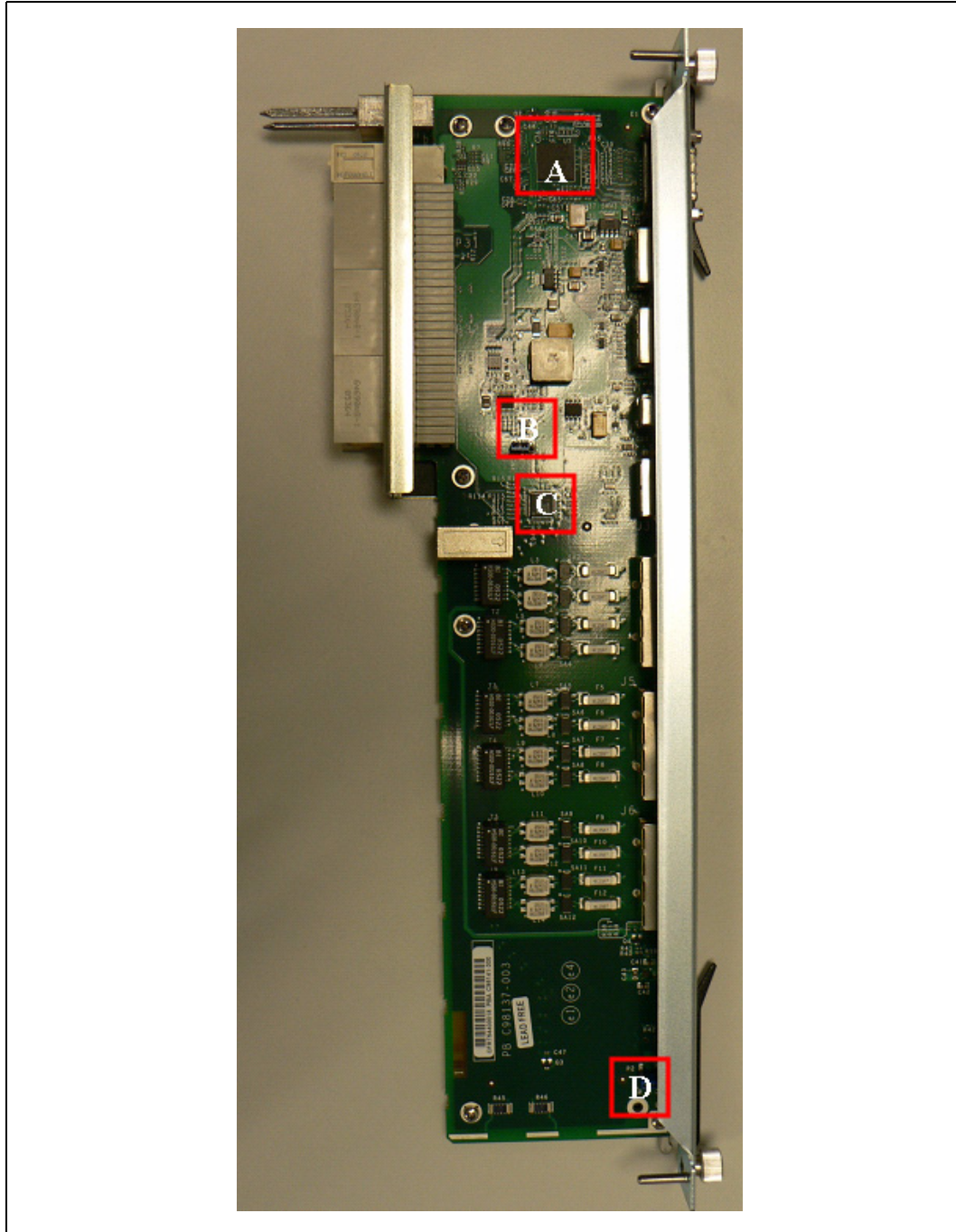
## 6.3 Mechanical Specifications

### 6.3.1 Board Outline

The MPRTM0020 printed circuit board (PCB) is mechanically compliant with the PICMG 3.0 Specification dimensions of 322.25 mm x 70.00 mm. The board pitch is 6HP.

Figure 17 below shows the locations of major components of the MPRTM0020. Table 17 lists the components shown in the illustration.

Figure 17. Component Layout



**Table 17. Board Components**

	Component/Function
A	SAS Retimer
B	RMD/ENA jumper. Used to bypass the manageability by the MPCBL0020 SBC IPMC for debugging purposes. Not intended to be use in any field deployment, because changing this default jumper affects the RTM manageability from the ShMC.
C	ADM1026
D	Digital/Chassis Ground Jumper

## 6.4 Reliability Specifications

### 6.4.1 Mean Time Between Failure (MTBF) Specifications

Calculation Type: MTBF/FIT Rate  
 Standard: Telcordia\* Standard SR-332 Issue 1  
 Methods: Method I, Case I, Quality Level II

The calculation results were generated using the references and assumptions listed. This report and its associated calculations supersede all other released mean time between failures (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 18. Reliability Estimate Data**

<b>Failure Rate (FIT)</b>	913 failures in 10 <sup>9</sup> hours
<b>MTBF</b>	1,095,000 hours

#### 6.4.1.1 Environmental Assumptions

- Failure rates are based on a 40° C ambient temperature.
- Applied component stress levels are 50% (voltage, current, and/or power).
- Ground, fixed, controlled environment with an environmental adjustment factor equal to 1.0.

#### 6.4.1.2 General Assumptions

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

### 6.4.1.3 General Notes

- Method I, Case I = Based on parts count. Equipment failure is estimated by totaling device failures rates and quantities used.
- Quality Level II = Devices purchased to specifications, qualified devices, vendor lot-to-lot controls for AQLs and DPMs.

Where available, direct component supplier predictions or actual FIT rates have been used.

## 6.5 Power Consumption

The maximum power consumption of the MPRTM0020 is 5 watts. The typical power consumption is 4 watts (with SAS re-timer and USB consuming 2 watts each).

# Warranty Information

# 7

## 7.1 Intel NetStructure® Compute Boards and 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.

## 7.2 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.

### 7.2.1 For the Americas

Return contact information by geography:

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

Direct Return Authorization (DRA) repair requests e-mail address: [usps.repair@intel.com](mailto:usps.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

## 7.2.2 For Europe, Middle East, and Africa (EMEA)

Return Material Authorization (RMA) e-mail address [EMEA>Returns@Intel.com](mailto:EMEA>Returns@Intel.com)

Direct Return Authorization (DRA) for repair requests e-mail address: [EMEA>Returns@Intel.com](mailto:EMEA>Returns@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

## 7.2.3 For Asia and Pacific (APAC)

RMA/DRA requests e-mail address: [apac.rma.front-end@intel.com](mailto: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](mailto: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](mailto: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.

## 7.2.4 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.

# Customer Support

# 8

## 8.1 Customer Support

This chapter offers technical and sales assistance information for this product.

## 8.2 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.

## 8.3 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

## 8.4 Product Code Summary

Table 19 lists the MPRTM0020 product code:

**Table 19. Product Codes**

Product Code	MM#	Description
MPRTM0020S01Q	882004	MPRTM0020 Rear Transition Module



# Certifications

# 9

## Safety:

- IEC60950-1
- EN60950
- UL/CSA 60950-1

## Hazardous substances:

- The Intel NetStructure® MPRTM0020S00Q 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.

## Electromagnetic Compatibility (EMC) emissions:

- CISPR22/EN55022 Class A
- EN300386
- FCC Rules CFR 47 Part 15B Class A
- ICES-003 Class A

## Electromagnetic Compatibility (EMC) immunity:

- CISPR24/EN55024
- EN300386

## Network Equipment Building System (NEBS) compliance:

- The MPCBL0020 SBC meets the board-level specifications as specified in the *Intel Environmental Standards Handbook – Telco Specification* Document No. A78805-01. The test methodology is a combination of Intel and NEBS test requirements with the intent that the product will pass pure system-level NEBS testing. Intel has performed limited NEBs testing. Among these are GR-1089-CORE: ESD, radiated emissions (E- and H-field), conducted emissions, radiated immunity, and conducted immunity.

## Telecom Compliance of T1/E1 Ports:

- The T1/E1 ports of the MPRTM0020 have not been tested for compliance against any telecommunications standards. It is the responsibility of the final integrator to obtain telecom attachment approvals for their combination of PMC and RTM T1/E1 configuration.

# Agency Information

# 10

## 10.1 North America (FCC Class A)

### Federal Communications Commission (FCC) Part 15 Rules

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 and, 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 user will be required to correct the interference at his own expense.

## 10.2 Canada – Industry Canada (ICES-003 Class A)

### Industry Canada ICES-003 Issue 3

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## 10.3 European Union

The products covered by this notice meet the following European Directives:

- 73/23/EEC Low Voltage Directive
- 89/336/EEC EMC Directive

To achieve CE compliance, be sure to select a host that already meets the EMC and Low Voltage Directives before the addition of any optional board. Remember that the use of option boards declared compliant with the Directives by their manufacturer only gives “presumption of compliance” for the whole system. It is the responsibility of the system supplier to verify that the requirements of the listed Directives are still met by the final system, as supplied to the end-user. System integrators should take notice of further conditions expressed in the sections below and the Safety Information sheet supplied with each board.

**Warning:** This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

### Compliance with the R&TTE Directive

The R&TTE Directive includes its own safety and EMC requirements. Although equipment declared compliant to the R&TTE Directive does not require explicit declaration of conformity to EMC and Low Voltage Directives, above conditions must also be met to satisfy the safety and EMC requirements of the R&TTE Directive.

Intel Declarations of Conformity for the products covered by this notice can be found under the “Network Building Blocks” heading at [http://developer.intel.com/design/litcentr/ce\\_docs](http://developer.intel.com/design/litcentr/ce_docs).

Manufacturer's office in European Union:

Intel Corporation (UK) Ltd.  
Pipers Way  
Swindon, Wiltshire SN3 1RJ  
UK  
Tel: +44 (0)1793 403000  
Fax: +44 (0)1793 641440

# Safety Warnings

# 11

## 11.1 Safety Precautions

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 and understand the precautions associated with safety symbols, written warnings, and cautions before accessing parts or locations within the unit.

### System for Restricted Access Use Only!

**Warning:** To avoid the risk of electrical shock hazard, special measures and precautions must be taken when using these products:

- Access to this equipment must be restricted by locating this equipment where access can only be gained by SERVICE PERSONNEL who have been informed about the reasons for the restrictions applied to the location and about any precautions that shall be taken. Access is through the use of a TOOL, lock and key, or other means of security and is controlled by the authority responsible for the location.
- This product should only be used by SERVICE PERSONNEL who have the knowledge and training required to work with products of this type.
- To avoid shock, ensure that the chassis power cables are connected to a properly wired and grounded receptacle.
- The system containing these boards should not be operated with the faceplates, blank panels, or covers removed. Some voltages, that are on the board and inside the chassis, present an electrical shock and/or energy hazard to the user. Keep hands out of the chassis when power is applied or when performing hot swap of the boards.