Intel® Remote Management Module

Technical Product Specification

Intel reference number D74389-001

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Enterprise Platforms and Services Division - Marketing

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Revision History

Date	Revision Number	Modifications
February 2006	0.1	Initial draft.
August 2006	1.0	Final document

Disclaimers

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1. Introduction

This Technical Product Specification (TPS) provides details about the architecture and feature set of the Intel® Remote Management Module (Intel® RMM). This is a technical document. It provides additional detail about specific features detailed in the Intel® Remote Management Module Users Guide. It does not replace that document, but provides enhanced information to assist people with understanding and learning more about the specific features of the board.

This is one of several technical documents available which describe system management with the Intel® Remote Management Module compatible server boards. All the functional sub-systems that make up the module are described in this document. However, some low-level detail of specific sub-systems is not included.

Both the Intel® Server Board S5000PAL/S5000XAL and the Intel® Server Board S5000PSL/S5000XSL have a board-specific Technical Product Specification. These documents contain additional technical information concerning the specific server platforms.

1.1 Section Outline

This document is divided into the following sections

- Section 1 Introduction
- Section 2 Intel® Remote Management Module Overview
- Section 3 Intel® RMM Board Architecture
- Section 4 Regulatory and Environmental Specifications
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- Section 6 Intel® Remote Management Module - Web Console
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- Section 8 Intel® Remote Management Module - Virtual Media
- Section 9 Intel® Remote Management Module Configuration
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1.2 Intel® Remote Management Module Use Disclaimer

Intel Corporation server building blocks are components that need adequate airflow to cool. When Intel server building blocks are used together, the fully integrated system will meet the intended thermal requirements of these components. Through its own chassis development and testing, Intel ensures adequate airflow provided.

If Intel server building blocks are not used, it is the system integrators responsibility determine the amount of airflow required for their specific application and environmental conditions. This information is provided in vendor data sheets and operating parameters.

It is the responsibility of the system integrator who chooses not to use Intel developed server building blocks to consult vendor datasheets and operating parameters. Intel Corporation cannot be held responsible, if components fail or the server board does not operate correctly when used outside any of their published operating or non-operating limits.

2. Intel® Remote Management Module Overview

The Intel® Remote Management Module (Intel® RMM) is a 2.25-inch x 2.75-inch printed circuit board. When installed in the Intel® RMM connector on an Intel® server board, it provides an increased level of manageability over the basic server management available to the server board.

The Intel® RMM is the second generation of embedded remote server management cards for Intel® server boards. Designed to work with the Baseboard Management Controller (BMC), this small form-factor mezzanine card enables graphical server control from virtually anywhere, at anytime.

2.1 Intel® Remote Management Module - Virtual Server Control

The Intel® RMM provides Virtual Server Control. This control includes Keyboard/Video/Mouse (KVM) redirection over Transmission Control Protocol / Internet Protocol (TCP/IP) using an Ethernet network port dedicated for remote management.

The keyboard, video, and mouse of the remote server under control are available to the administrator from any network location, regardless of the state of the server (OS loading, running, or not responding (blue screen), Pre-OS bios boot and setup, etcetera.). The dedicated Ethernet controller is Out Of Band (OOB). In other words, it runs separately from the OS and the BIOS. This separation allows it to operate continuously, thus supporting 24 X 7 management of the system. The management traffic does not share network bandwidth with the host system software.

2.2 Intel® Remote Management Module - Virtual Media

The Intel® RMM also provides Virtual Media, which is USB remote storage redirection over TCP/IP using the dedicated LAN interface. Intel® RMM - Virtual Media is used by administrators to mount IDE or USB CD/DVD-ROM drives or ISO images, floppy or USB “thumb” drives, that are physically local to the administrator’s client computer, to the remote server under control. Once mounted, the media that is remote to the server appears local to the server. This allows administrators to install software or drivers on, or boot the server from the remote media.

Intel® RMM - Virtual Media can be used to complete the following actions:

- Install a new operating system on a target server
- Install an operating system upgrade on a target server
- Repair damaged operating system installs

The ability to recover from a system hard drive crash to a known good state is also provided by the combination of Intel® RMM - Virtual Media and Intel® RMM - Virtual Server Control. The administrator may also write to the Intel® RMM - Virtual Media.

2.3 Intel® Remote Management Module - Web Console

The Intel® Remote Management Module - Web Console (Intel® RMM - Web Console) launches the following applications:

- Intel® Remote Management Module - Virtual Server Control (Intel® RMM - Virtual Server Control)
- Intel® Remote Management Module - Virtual Media (Intel® RMM - Virtual Media)

The Intel® RMM - Web Console is a web GUI. It offers convenient and secure access to system information. Using a standard browser on the administrator's client computer, the Intel® RMM - Web Console provides detailed server health. In addition, it provides the ability to control power and reset to the server.

All network communication with the Intel® RMM is secured using industry standard authentication, encryption, and access control mechanisms. Access to the Intel® RMM - Web Console is controlled by a user-based security system.

2.4 Intel® Remote Management Module Hardware Feature Set

The list below details the hardware features of the Intel® Remote Management Module.

- Intel ®XScale Embedded Processor
- Dedicated Out Of Band (OOB) 10/100 Ethernet Network Interface Chip
- 32MB SDRAM
- 16MB Flash Memory
- USB 2.0 High Speed Interface
- 15 bit DVO Interface Video Input at up to 1280X1024 Resolution at 60 Hz
- Avocent DVC Video Compression* KVM Field Programmable Gate Array (FPGA)
- 2M SDRAM Video Frame Buffer
- High Speed Fast Management Link (FML) Interface to BMC
- Intel® RMM NIC Connector

2.4.1 Intel® RMM Firmware Feature Set

The list below details the firmware features of the Intel® Remote Management Module.

- Intel® RMM - Virtual Server Control: Keyboard/Video/Mouse (KVM) redirection over TCP/IP
- Intel® RMM - Virtual Media: USB remote storage redirection over TCP/IP
- Intel® RMM - Virtual Server Control: Power and Reset Control over TCP/IP
- Intel® RMM - Web Console: Web server supporting HTTPS
- Interaction with the BMC for support of Intelligent Platform Management Interface (IPMI) 2.0
- Support for a dedicated 10/100 Out of Band (OOB) Management LAN channel
- Local and Remote Configuration Utilities for Microsoft Windows* and Linux*
- Firmware upgrade capabilities
- EDID/DDC video option ROM for supporting a virtual monitor

2.4.2 Connections

The Intel® RMM connects to the Intel® RMM connector. The Intel® RMM connector is derived from the Intel® Advanced Server Management Interface (Intel® ASMI) reference specification to connect to the Intel® server board. The Intel® RMM connector is a 120-pin Tyco 8H Plug –P/N: 5179031-5*.

The Intel® RMM uses a sub-set of the connector's pins. It connects to the following interfaces:

- IPMB
- DDC
- DVO
- RS232
- FML 1
- FML 2
- MII
- USB busses

The connections are depicted in the block diagram below. The Intel® RMM utilizes all power and ground pins on the connector.

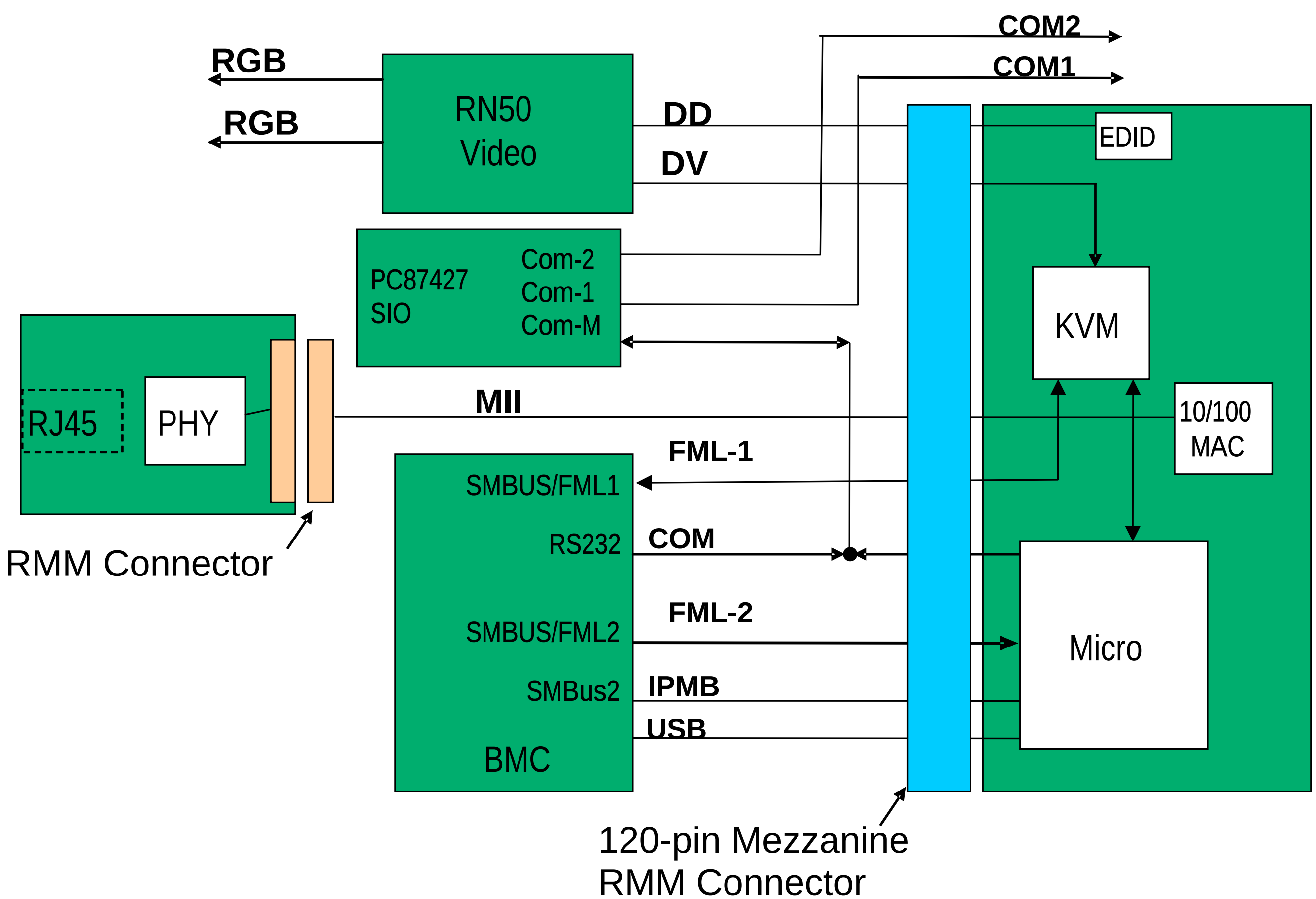

Figure 1. Intel® RMM System Block Diagram

Table 1. Intel® RMM Connector Pinout (Side A)

Pin Side A	Pin	Signal	Intel® RMM
1	1	NC_RESERVED	NO CONNECT
2	3	LPC_SYSRST_N	SYSRST#
3	5	GND	GND
4	7	NC RESERVED	F_TDI
5	9	NC RESERVED	F_TCK
6	11	GND	GND
7	13	GND	GND
8	15	USB1_P	D+
9	17	USB1_N	D-
10	19	GND	GND
11	21	VCC 3.3V	+3.3V
12	23	LAD0	NO CONNECT
13	25	LAD1	NO CONNECT
14	27	VCC 3.3V	+3.3V
15	29	LCLK (33Mhz)	NO CONNECT
16	31	VCC 3.3V	+3.3V
17	33	NIC_FML1_MDA (Module Master)	NIC_FML1_MDA
18	35	NIC_FML1_SDA (Module Master)	NIC_FML1_SDA
19	37	NIC_FML1_MCL (Module Master)	NIC_FML_MCL
20	39	NIC_FML1_SINTEX (Module Master)	NIC_FML_SNTX
21	41	VCCa 3.3Aux	+3.3V AUX
22	43	RAC_SERIAL_DSR	RSER_DSR
23	45	RAC_SERIAL_RTS	RSER_RTS
24	47	RAC_SERIAL_CTS	RSER_CTS
25	49	RAC_SERIAL_DCD	RSER_DCD
26	51	RAC_SERIAL_RI	RSER_RI
27	53	RAC_SERIAL_TX	RSER_TX
28	55	VCCa 3.3Aux	+3.3V AUX
29	57	LCDCNTL[3] – PIXEL CLK	VDCLK
30	59	GND	GND
31	61	NC RESERVED_3	C_RX
32	63	NC_RESERVED_4	C_TX
33	65	GND	GND
34	67	LCDCNTL[0] – DV_VS	VSYNC
35	69	NC_RESERVED_8	C_TDI
36	71	GND	GND
37	73	LCDDATA23	LCDDATA23
38	75	LCDDATA22	LCDDATA22
39	77	LCDDATA21	LCDDATA21
40	79	LCDDATA20	LCDDATA20
41	81	LCDDATA19	LCDDATA19

Pin Side A	Pin	Signal	Intel® RMM
42	83	GND	GND
43	85	MAN LAN type 1	ML_TYPE1
44	87	MAN LAN type 2	ML_TYPE2
45	89	NC_RESERVED_9	C_TRST_IN#
46	91	RESERVED for Future Voltage Rail #2	C_TMS
47	93	MII_MDC	MDC
48	95	MII_COL	COL
49	97	GND	GND
50	99	MII_TXER	TXERR
51	101	MII_MDIO	MDIO
52	103	GND	GND
53	105	MII_RXD3	RXD3
54	107	MII_RXD2	RXD2
55	109	GND	GND
56	111	MII_RXD1	RXD1
57	113	MII_RXD0	RXD0
58	115	GND	GND
59	117	MII_RXCLK	RXCLK
60	119	MII_RXDV	RXDV

Table 2. Intel® RMM Connector Pinout (Side B)

Pin Side B	Pin	Signal	Intel® RMM
1	2	GND	GND
2	4	NC RESERVED	F_TDO
3	6	NC RESERVED	F_TMS
4	8	GND	GND
5	10	GND	GND
6	12	NC RESERVED	NO CONNECT
7	14	NC RESERVED	NO CONNECT
8	16	GND	GND
9	18	GND	GND
10	20	NC_RESERVED_1	PWR_CYCLE#
11	22	NC_RESERVED_2	SERVER_RESET#
12	24	GND	GND
13	26	LFRAME	NO CONNECT
14	28	LAD2	NO CONNECT
15	30	LAD3	NO CONNECT
16	32	VCC 3.3V	+3.3V
17	34	IPMB_SDA	PXASDA
18	36	IPMB_SCL	PXASCL

Pin Side B	Pin	Signal	Intel® RMM
19	38	BMC_FML0_MCL (Module Slave)	BMC_FML2_MCL
20	40	BMC_FML0_SINTEX (Module Slave)	BMC_FML2_SNTX
21	42	BMC_FML0_MDA (Module Slave)	BMC_FML2_MDA
22	44	BMC_FML0_SDA (Module Slave)	BMC_FML2_SDA
23	46	VCCa 3.3Aux	+3.3V AUX
24	48	ASMI_PRSNT_N	GND
25	50	RAC_SERIAL_DTR	RSER_DTR
26	52	RAC_SERIAL_RX	RSER_RX
27	54	VCCa 3.3Aux	+3.3V AUX
28	56	LCDDATA7	LCDDATA7
29	58	LCDDATA6	LCDDATA6
30	60	LCDDATA5	LCDDATA5
31	62	LCDDATA4	LCDDATA4
32	64	LCDDATA3	LCDDATA3
33	66	LCDCNTL[1] - DV_HS	DV_HS
34	68	GND	GND
35	70	LCDDATA15	LCDDATA15
36	72	LCDDATA14	LCDDATA14
37	74	LCDDATA13	LCDDATA13
38	76	LCDDATA12	LCDDATA12
39	78	LCDDATA11	LCDDATA11
40	80	GND	GND
41	82	LCDCNTL[2] - DV_DE	DV_DE
42	84	DVIDDCDATA (SDA)	DDC_SDA
43	86	DVIDDCCLK	DDC_SCL
44	88	PS_PWRGOOD	PS_PWRGD
45	90	Reserved for Future Voltage Rail #1	C_TCK
46	92	NC_RESERVED_6	SRST_IN#
47	94	NC_RESERVED_7	C_TDO
48	96	GND	GND
49	98	MII_CRS	CRS
50	100	MII_TXCLK	TXCLK
51	102	GND	GND
52	104	MII_TXD3	TXD3
53	106	MII_TXD2	TXD2
54	108	GND	GND
55	110	MII_TXD1	TXD1
56	112	MII_TXD0	TXD0
57	114	GND	GND
58	116	MII_TXEN	TXEN
59	118	MII_RXER	RXERR
60	120	GND	GND
42	84	DVIDDCDATA (SDA)	DDC_SDA
43	86	DVIDDCCLK	DDC_SCL

Pin Side B	Pin	Signal	Intel® RMM
44	88	PS_PWRGOOD	PS_PWRGD
45	90	Reserved for Future Voltage Rail #1	C_TCK
46	92	NC_RESERVED_6	SRST_IN#
47	94	NC_RESERVED_7	C_TDO
48	96	GND	GND
49	98	MII_CRS	CRS
50	100	MII_TXCLK	TXCLK
51	102	GND	GND
52	104	MII_TXD3	TXD3
53	106	MII_TXD2	TXD2
54	108	GND	GND
55	110	MII_TXD1	TXD1
56	112	MII_TXD0	TXD0
57	114	GND	GND
58	116	MII_TXEN	TXEN
59	118	MII_RXER	RXERR
60	120	GND	GND

2.4.3 Intel® RMM NIC Interface

The Media Independent Interface (MII) is the interface used to connect the Intel® Remote Management Module to the Intel® RMM NIC Interface. This communication path between the Intel® RMM NIC Interface and the Intel® RMM is via connectors and is routed on the baseboard. The Intel® RMM NIC Interface contains a LAN PHY interface chip that is dedicated to the Intel® Remote Management Module. This LAN connection is used for all the LAN-based management features.

The Intel® RMM manages all network functions including the following:

- DHCP
- Address Resolution Protocol (ARP)
- Internet Control Message Protocol (ICMP)
- TCP/IP

In addition, the Intel® RMM forwards Intelligent Platform Management Interface (IPMI) UDP/IP based RMCP and RMCP+ traffic that has been received through the Intel® RMM NIC Interface to the baseboard BMC. In an Intel® pedestal chassis, the Intel® RMM NIC Interface is mounted on a PCI* expansion slot cover and can be put in any empty PCI slot in an Intel pedestal chassis.

Note: *The Intel® RMM NIC Interface does not actually occupy a PCI slot on the server baseboard. It connects to the chassis in an empty PCI expansion slot.*

When mounted in an Intel® rack chassis, the Intel® RMM NIC Interface connects directly to the chassis in a reserved location as described in the Intel® server board quick start guide.

The communication path between the Intel® RMM NIC Interface and Intel® Remote Management Module in a pedestal server is via a cable that plugs into a 40-pin header on the Intel® RMM NIC Interface and on the baseboard.

The pin-outs of the rack and pedestal connectors are shown below. There are no cable connectors on the Intel® RMM itself. The connectors are keyed on the cable and connector assemblies to prevent incorrect installation.

2.4.3.1 Pedestal Intel® RMM NIC Connector Interface

Table 3. Pedestal Connector

Pin	Signal	Pin	Signal
1	MAN LAN type2	2	MAN LAN Type 1
3	VCC 3.3Aux	4	MII_MDIO
5	VCC 3.3Aux	6	MII_MDC
7	GND	8	MII_RXD3
9	GND	10	MII_RXD2
11	GND	12	MII_RXD1
13	GND	14	MII_RXD0
15	GND	16	MII_RXDV
17	GND	18	MII_RXCLK
19	GND	20	MII_RXER
21	GND	22	Pulled Pin
23	GND	24	MII_TXCLK
25	GND	26	MII_TXEN
27	GND	28	MII_TXD0
29	GND	30	MII_TXD1
31	GND	32	MII_TXD2
33	GND	34	MII_TXD3
35	VCC 3.3Aux	36	MII_COL
37	VCC 3.3Aux	38	MII_CRS
39	VCC 3.3Aux	40	MII_TXER

2.4.3.2 Intel® RMM NIC Rack Interface

Table 4. Rack Connector

Pin	Signal	Pin	Signal
1	MAN LAN_TYPE2	2	MAN LAN Type 1
3	VCC 3.3 Aux	4	GND
5	GND	6	MII_MDIO
7	MII_RXD0	8	MII_MDC
9	MII_RXDV	10	GND
11	MII_RXCLK	12	MII_RXD3
13	GND	14	MII_RXD2
15	MII_RXER	16	MII_RXD1
17	MII_TXCLK	18	GND
19	MII_TXEN	20	MII_TXD2
21	GND	22	MII_TXD3
23	MII_TXD0	24	MII_COL
25	MII_TXD1	26	GND
27	GND	28	MII_CRS
29	VCC 3.3 Aux	30	MII_TXER

2.5 Physical Dimensions

The 120-pin Intel® RMM baseboard connector is Tyco - 5H Receptacle* - - P/N: 5177983-5. The corresponding 120-pin Intel® Remote Management Module connector is Tyco - 8H Plug* - - P/N: 5179031-5.

The two connectors provide a stack height of 8mm between the baseboard and the Intel® RMM with the allowable module component height. The baseboard to top of module is 13mm (0.51").

The allowable height is as follows:

- Typical rack mounted server, is 14.7mm
- Pedestal server, is 15.24mm

The Intel® RMM thickness is 1.65mm or 0.065".

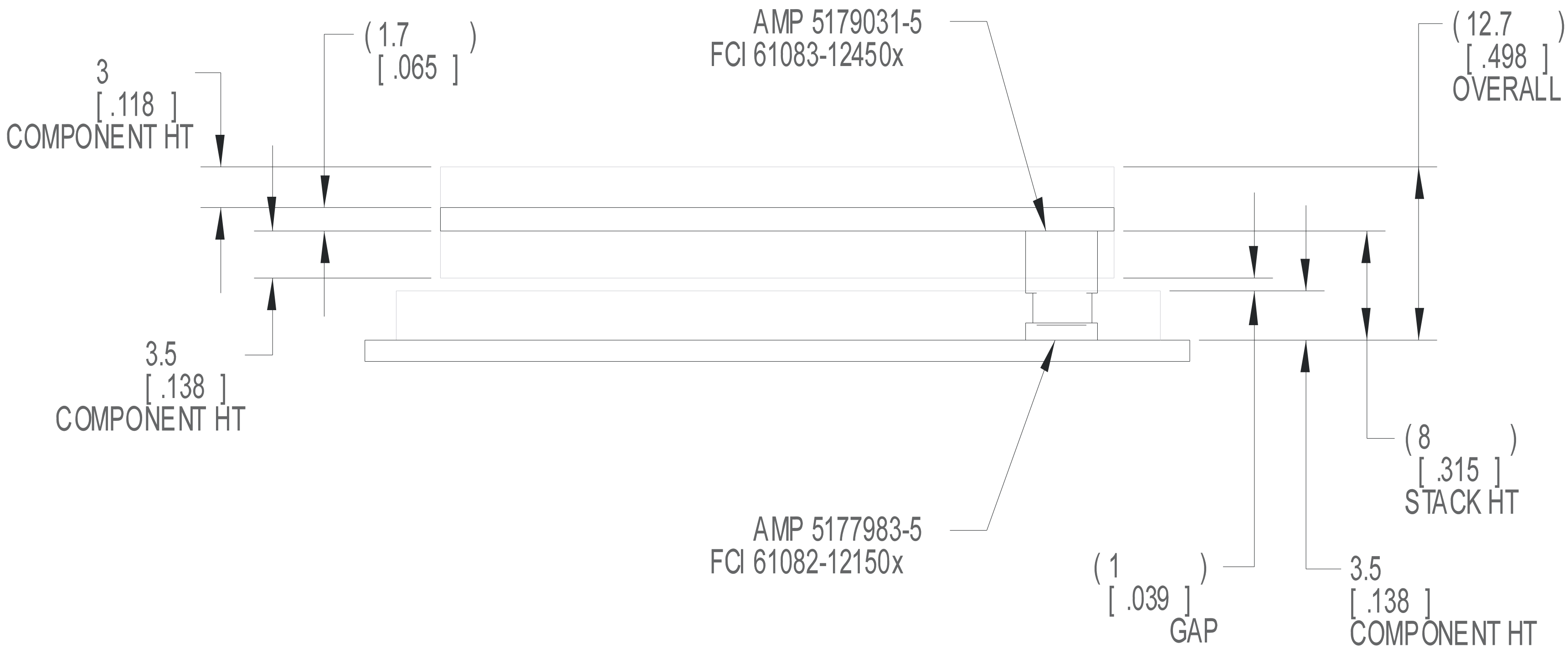

Figure 2. Stack Height

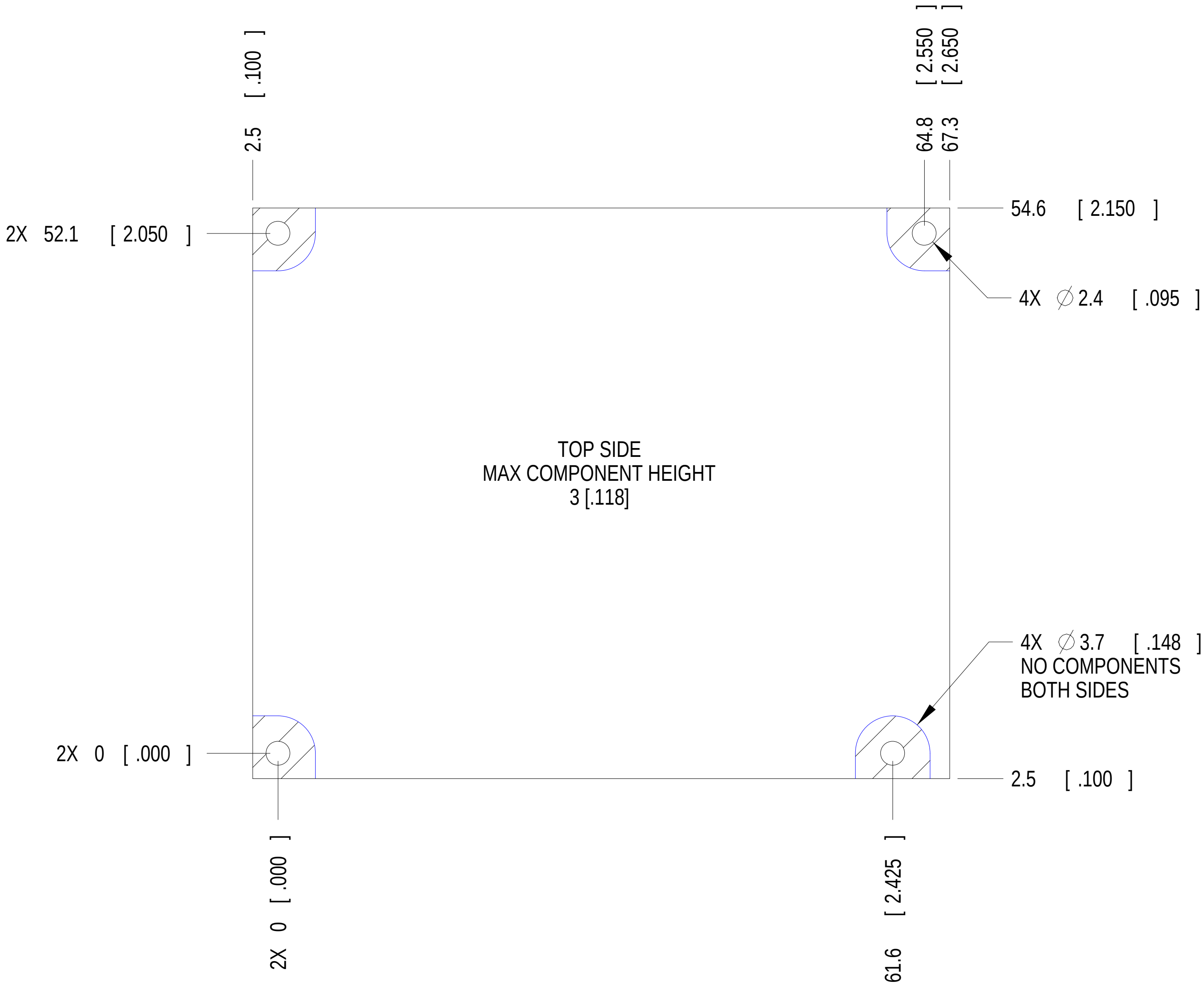

Figure 3. Top Side Dimensions

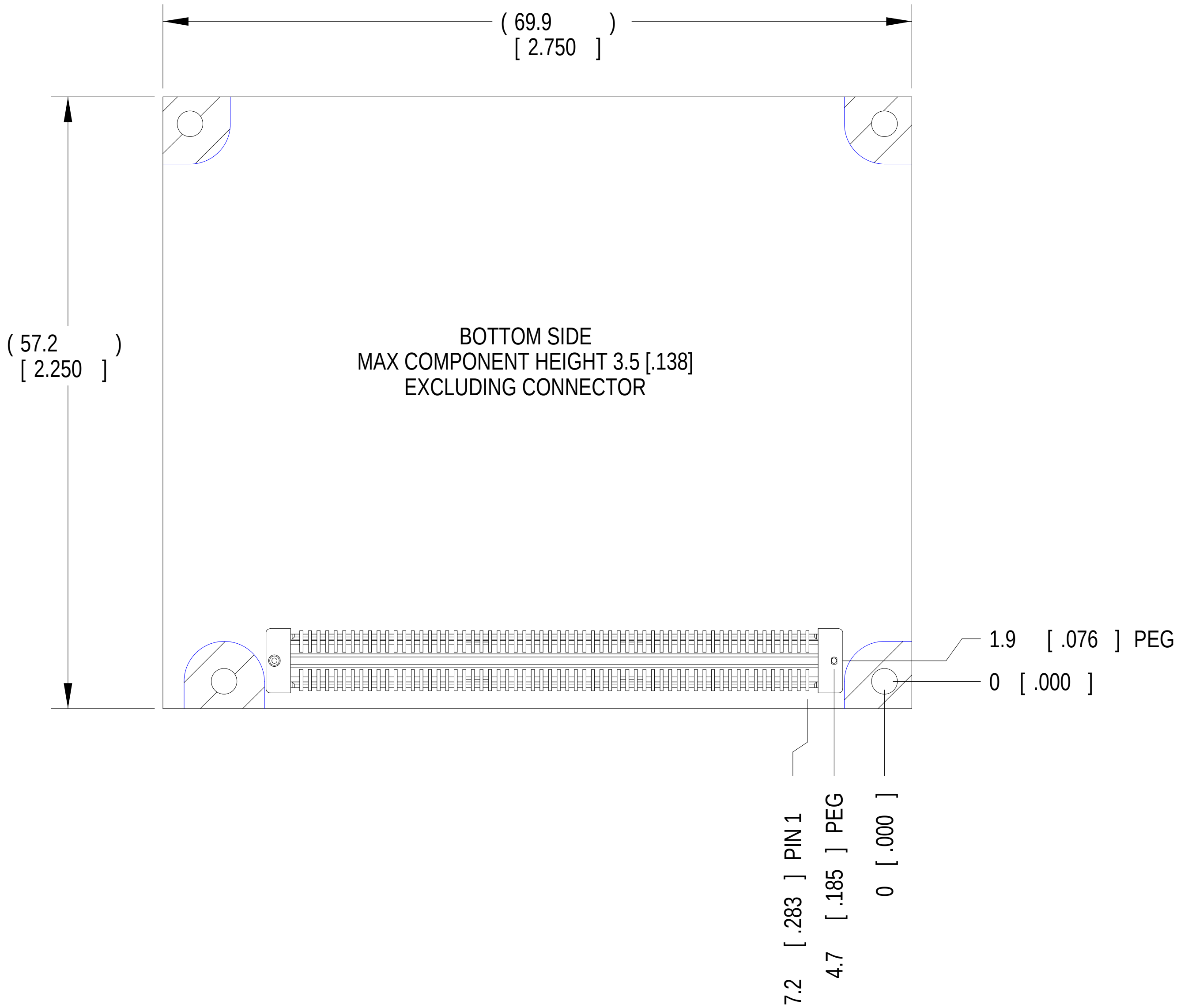

Figure 4. Bottom Side Dimensions

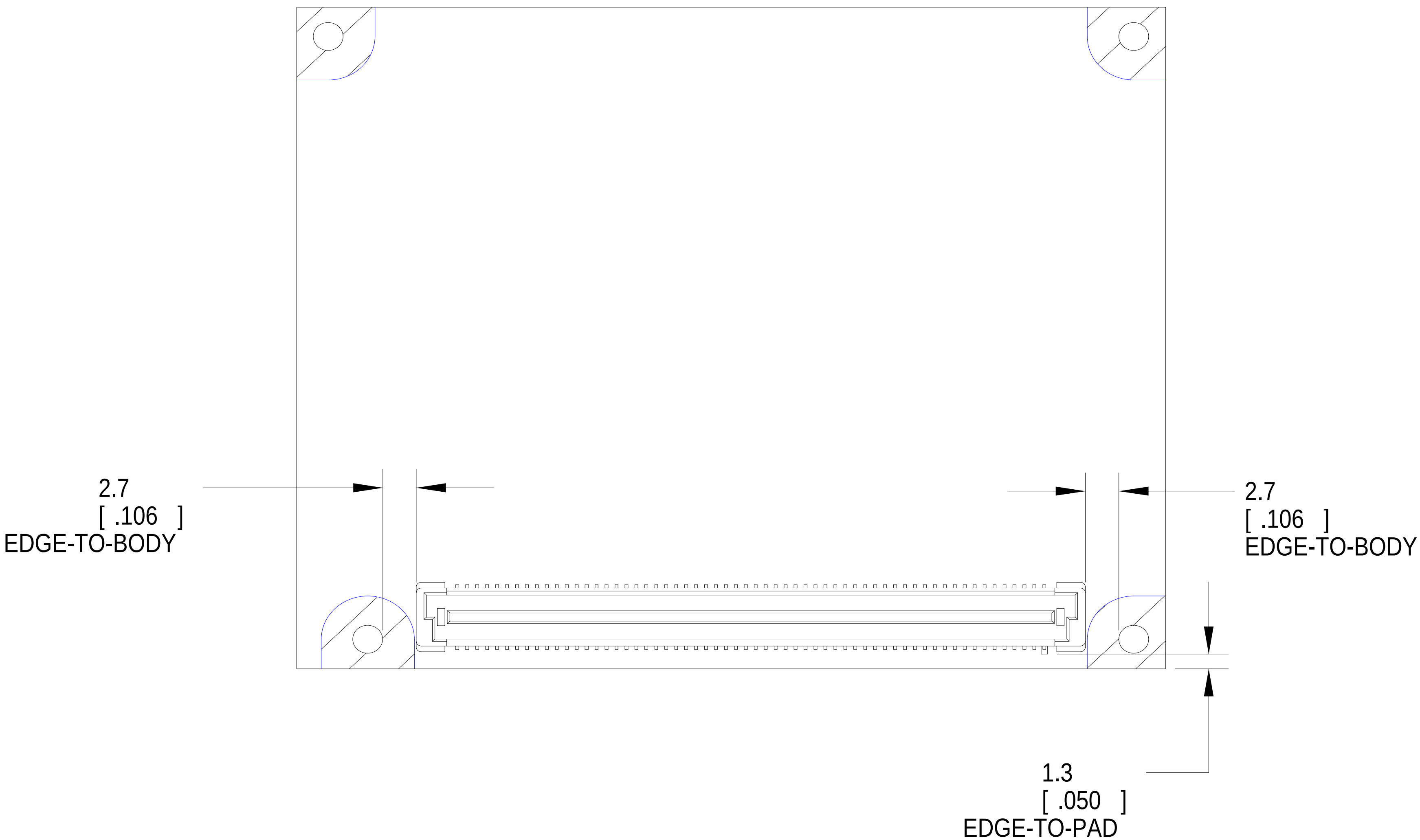

Figure 5. Edge-to-Body Dimensions

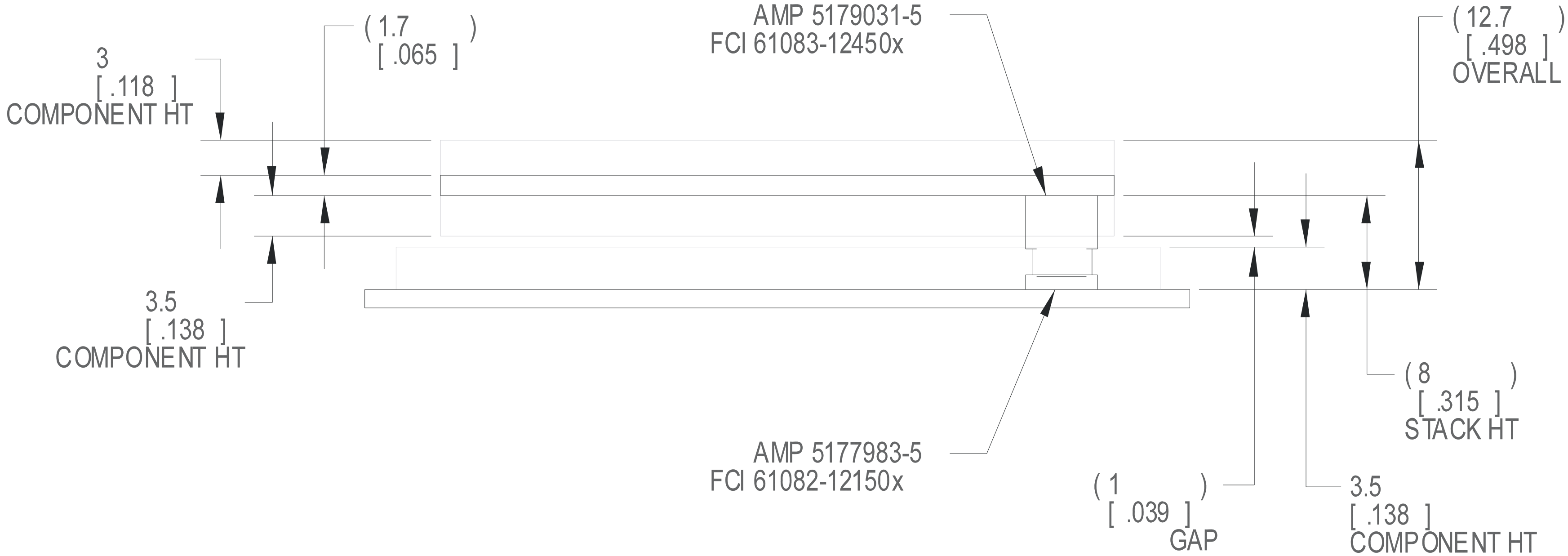

Figure 6. Intel® Remote Management Module Connector Dimensions

3. Intel® RMM Board Architecture

The Intel® RMM connects to the 120-pin Intel® ASMI connector on the baseboard at the following interfaces:
Refer to the Intel® RMM Board Architecture block diagram below:

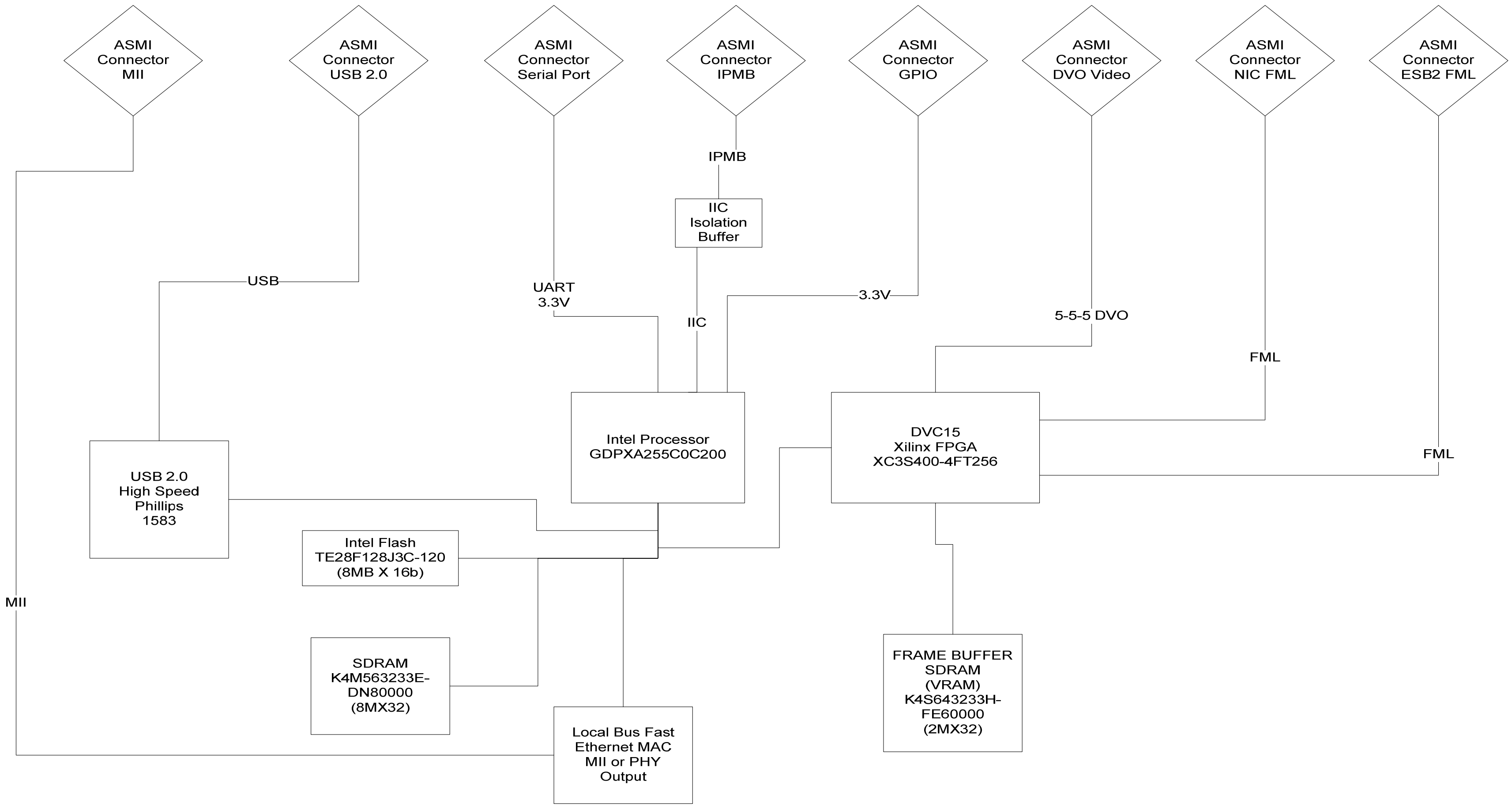

Figure 7. Intel® RMM Board Architecture Block Diagram

3.1 Media Independent Interface (MII)

A Media Independent Interface (MII) connects to the MAC of the dedicated Ethernet NIC of the Intel® RMM to the Ethernet PHY located on the Intel® RMM NIC. The MII interface from the Intel® ASMI connector is wired to the MII pins of the Davicom DM9000E Fast Ethernet Controller (NIC) chip* on the Intel® RMM.

The Davicom NIC* is connected on board to the local bus of the Intel XScale® processor PXA255. The Davicom NIC* provides the dedicated, Out Of Band (OOB) 10/100 Mb/S Ethernet capability to the Intel® RMM.

3.2 USB 2.0 (high-speed) Interface

A USB 2.0 (high-speed) interface supports the following:

- Virtual keyboard
- Virtual mouse
- Intel® RMM - Virtual Media
- Local utilities

The USB interface from the Intel® ASMI connector is wired to the USB pins of the Phillips 1583 USB 2.0 High Speed interface chip*. The Phillips USB chip* is connected on board to the local bus of the Intel XScale® processor PXA255

3.3 COM 2 Serial Port Connection

The COM 2 serial port connection of the Intel® ASMI is connected to the Serial port connection of the Intel XScale® processor PXA255 on the Intel ® RMM. On the baseboard, the Intel® ASMI connector’s serial port pins are connected to the system universal asynchronous receiver transmitter (UART) within the SIO chip. This connection is to enable serial text console redirection.

3.4 IPMB Connections

The IPMB connections on the Intel® ASMI connector are connected to a buffered I^2C bus interface of the Intel XScale® processor PXA255 on the Intel® RMM. This IPMB interface connects the Intel® RMM to the BMC.

The Intel® RMM provides IPMI satellite controller functionality to the BMC. The IPMB of the Intel® RMM provides bi-directional communication at 100 KHz.

3.5 GPIO Pins

Two GPIO pins on the Intel XScale® processor PXA255 are connected to the Intel® ASMI connector’s management LAN type 1 and 2 pins. The GPIO pins are encoded by the Intel® RMM to indicate support for the MII interface.

3.6 15 Bit DVO Video Source

The 15-bit DVO video source comes from the baseboard's ATI graphics controller*. The DVO pins are organized as follows:

- Five red
- Five green
- Five blue

The DVO signals from the Intel® ASMI connector are wired to the Xilinx XC3S400-4 FT256 FPGA* on the Intel® RMM. With this FPGA chip, the Avocent Dambrackas Video Compression* (DVC) algorithm completes the following actions to the video stream:

- Captures
- Compresses
- Packetizes
- Encrypts

Lastly, the video stream is transmitted to the Davicom NIC* to be sent out over the IP network.

3.7 Intel® ASMI Connector

The Intel® ASMI connector implements two Fast Management Link (FML) interfaces:

- BMC_FML_0 and
- NIC_FML_1

Both FML interfaces are wired to the FPGA of the Intel® RMM. However, only the Intel® RMM uses the BMC_FML_0.

The FML bus is a high-speed (8 Mb/S) point-to-point interface that utilizes a single master and a single slave. The BMC is the FML master and the Intel® RMM is the FML slave.

3.7.1 BMC_FML_0 Interface

BMC_FML_0 provides a high-speed interface between the BMC on the baseboard and the Intel® RMM. Through this interface, the Intel® RMM forwards IPMI 2.0 traffic (UDP/IP traffic to specific RMCP ports) to the BMC.

The forwarded traffic is received from the network on the dedicated NIC. IPMI return traffic is transmitted by the BMC to the Intel® RMM NIC on the FML, as well.

3.7.1.1 FML Connection

The FML connection with the Intel® RMM resembles a LAN channel to the baseboard BMC. The Intel® RMM acts as an FML slave device to the FML master within the BMC on the baseboard.

As an FML slave, the Intel® RMM controls the SINTEX interrupt line. This interrupt is used to signal the BMC whenever the Intel® RMM wishes to initiate an FML data transfer of any kind.

3.7.2 NIC_FML_1

NIC_FML_1 is not used by the Intel® RMM. However, it is connected from the Intel® ASMI connector to pins on the FPGA. This could be used to connect the Intel® RMM to a baseboard Intel® RMM NIC using the FML bus instead of the MII interface. This scheme is referred to as the FML/TCO management port.

3.7.3 8 MB SDRAM Video Frame Buffer Chip

The DVC FPGA on the Intel® RMM uses an 8 MB SDRAM video frame buffer chip by Micron* The chip allows support for the DVO video:

- Video capture
- Video compression
- Video encryption
- Video packetization
- Video transmission

3.7.4 Operating System Support

The Intel XScale® processor PXA255 uses a 32 MB SDRAM chip (8 MB X 32 b). This chip supports running the embedded Linux Operating System* and all other embedded Intel® RMM firmware.

The embedded firmware of the Intel® RMM is stored in a 16 MB flash chip from Intel. Both of these are attached to the local bus of the Intel XScale® processor PXA255.

4. Intel® Remote Management Module Environmental/Electrical Specifications

4.1 Regulatory and Environmental Specifications

4.1.1 Product Regulatory Compliance: Intended Application

This product was evaluated as Information Technology Equipment (ITE) as an integral component of the Intel server system, where product regulatory approvals were obtained on the end system. Refer to the Server Product Chassis Guide for system regulatory approvals.

4.1.2 Product Ecology Compliance

This component module complies with Intel's Environmental Product Content Specification of Suppliers and Outsourced Manufacturers – http://supplier.intel.com/ehs/environmental.htm.

This specification bans the use of Restriction of Hazardous Substances (RoHS) per European Directive 2002/95/EC; per the banned substance definitions and limits noted below.

4.1.3 Quantity Limits

Quantity limit of 0.1% by mass (1000 PPM) for:

- Lead
- Mercury
- Hexavalent Chromium
- Polybrominated Biphenyls Diphenyl Ethers (PBDE)

Quantity limit of 0.1% by mass (100 PPM) for:

- Cadmium

4.1.4 Product Safety Compliance

The Intel® RMM complies with the following safety regulations:

- UL 1950 - CSA 950 (US/Canada) – Listed Accessory
- EN 60 950 (European Union) – supports CE Declaration
- IEC60 950 (International)
- CE – Low Voltage Directive (73/23/EEC) (European Union)

4.1.5 Product EMC Compliance

- EMC Requirements – Class A requirements with 10db margin
- FCC /ICES-003 - Emissions (USA/Canada) Verification
- CISPR 22 – Emissions (International)
- EN55022 (1998) - Emissions (Europe)
- EN55024 - Immunity (Europe)
- CE – EMC Directive 89/336/EEC (Europe)
- VCCI Emissions (Japan)
- AS/NZS 3548 Emissions (Australia / New Zealand)
- BSMI CNS13438 Emissions (Taiwan)
- RRL MIC Notice No. 1997-41 (EMC) and 1997-42 (EMI) (Korea)

4.1.6 Certifications / Registrations / Declarations

- UL Certification (US/Canada)
- CE Declaration of Conformity (CENELEC Europe)
- FCC/ICES-003 Class A Attestation (USA/Canada)
- C-Tick Declaration of Conformity (Australia)
- MED Declaration of Conformity (New Zealand)
- BSMI Certification (Taiwan)
- RRL Certification (Korea)
- Ecology Declaration (International)

4.1.7 Product Regulatory Compliance Markings

Regulatory Compliance	Country	Marking
UL Mark	USA/Canada	LISTED ACCESSORY
CE Mark	Europe	
FCC Marking (Class A)	USA	This device complies with Part 15 of the FCC Rules. Operation of this device 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. Manufactured by Intel Corporation
EMC Marking (Class A)	Canada	CANADA ICES-003 CLASS A CANADA NMB-003 CLASSE A
BSMI Marking (Class A)	Taiwan	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
C-Tick Mark	Australia / New Zealand	
RRL MIC Mark	Korea	

4.2 Environmental Specifications

The table below details required environmental specifications.

Table 5. Environmental Specifications

Relative Humidity	10% to 90% non-condensing
Elevation	3050 meters
DC Input Voltage	± 5% of all Nominal voltages
Shock (unpackaged)	Trapezoidal, 50g, 170 inches/sec
Shock (packaged)	36 inches
Vibration (unpackaged)	5 Hz to 500Hz 3.13g RMS random

4.3 3.3 V Auxiliary Operation

The Intel® Remote Management Module operates on 3.3 V auxiliary power. The 3.3 V auxiliary rail is a low power supply provided by the baseboard. It is active whenever the system is plugged into AC power.

The baseboard generates the 3.3 V auxiliary supply from the system's 5 V Standby power rail when the system is off. Certain other devices on the server baseboard also operate on 5V standby power to provide complete management functionality. When system power is on, the baseboard generates this power from the 3.3 V system power rail.

The Intel® RMM can only be attached and removed when the AC power is disconnected from the server.

4.4 Power System

The Intel® RMM is powered from the system's standby power rail. The Intel® RMM implements its own power-on reset control. The duration of this reset is sufficient to allow all clocks and PLL circuits to stabilize before the Intel® RMM is taken out of reset.

There is also a one-second delay from the time the Intel® RMM is taken out of reset to the first attempt to communicate with the baseboard. This delay is to allow the baseboard to come out of its own power-on reset.

The cold reset signal for the Intel® RMM is called AC present.

4.4.1 Power Supply Interface Signals

The Intel® RMM determines that main system power is present by the assertion of Power Good. The Power Good input is a buffered signal from the power supply. The Intel® RMM uses the Power Good signal to monitor whether the power supply is on and operational.

Even though the Power Good signal is de-asserted, the Intel® RMM is still fully functional. Assuming the host server is still attached to AC power the Intel® RMM can still communicate via the following:

- FML
- IPMB
- MII
- USB
- Etcetera

4.4.1.1 Maximum Ratings

The table below contains absolute maximum ratings for the Intel® Remote Management Module. Functional operation at the absolute maximum and minimum is neither implied nor guaranteed.

The Intel® RMM should not receive a clock while subjected to these conditions. Extended exposure to the maximum ratings may affect device reliability. Although the Intel® RMM contains protective circuitry to resist damage from static discharge, always take precautions to avoid high static voltages or electric fields.

Table 6. Absolute Maximum Ratings

Symbol	Parameter	Minimum	Maximum	Unit
Top	Operating temperature under bias	0	70	°C
Tstorage	Storage temperature	-65	150	°C
Vcc	Core and IO power supply voltage (3.3V +/- 10%)	3.0	3.6	V
Vcca	Core and IO auxiliary power supply voltage (3.3V +/- 10%)	3.6	5.5	
Vcc1.8	IO auxiliary power supply voltage (1.8V +/- 10%)	-0.5	5.0	V
Vin3.3	Input voltage range for 3.3V IO	-0.5	7.0	V
Vin1.8	Input voltage range for 1.8V IO	-0.5	2.5	V

4.4.1.1.1 Maximum Current Requirements

The table below outlines maximum current and wattage requirements for the Intel® RMM. CPU flash and SDRAM access do not occur simultaneously. Therefore, FLASH current requirements are reduced from 18mA to 5mA. FPGA requirement of 500mA is based on initial configuration current requirements.

Table 7. Maximum Current Requirements

Intel® RMM Voltage	**P3V3_AUX**	**3.3V**	**Maximum Wattage**
Maximum current	1000 mA	1000 mA	6600 mW
X-scale CPU	200		
CPU flash	5		
CPU SDRAM	90		
FRU EEPROM	3		
Buffers	20		
misc res	30		
Video SDRAM	0	160	
FPGA	500		
FPGA config	15		
USB	0	30	
MAC	100		
Intel® RMM SUM	963	190	3800 mW

4.4.2 Supply Rail Specifications

The table below outlines supply rail specifications:

Table 8. Supply Rail Specifications

Symbol	Parameter	Minimum	Maximum	Unit	Comments
Vcc	3.3 V main power rail	3.13	3.45	V	
Vcc rise	3.3 V main rise time	5	70	mS	10% to 90%
Vcc Aux	3.3V Aux Rail, Power On or Off	3.13	3.45	V	Vcc present or absent
Vcc Aux rise	3.3V Aux rise time	1	25	mS	10% to 90%
Icc inrush	Peak current		1.5	A	<1.5mS
Icc Aux inrush	Peak current		1.5	A	<1.5 mS
Vcc Cap	DC decoupling capacitance		100	uF	
Vcc Aux Cap	DC decoupling capacitance		140	uF	
Icc Aux Leakage	Cross voltage leakage current (Vcc auxiliary to VCC)		1	mA	Vcc is off

Notes:

Inrush is measured from the time the 3.3 V rail is from 0.4 V to 3.13 V. The 3.3 V auxiliary rail can be established independently of the 3.3 V rail. The 3.3 V and 3.3 V auxiliary voltages can be established in any order on power up. When the 3.3 V auxiliary is operating in the absence of the 3.3 V rail, there will be no than 1 mA of leakage between the two rails. In addition, note the wide range of voltage rise times tolerated by the Intel® RMM on the 3.3 V and 3.3 V auxiliary supplies.

Leakage current is measured with Vcc auxiliary at 3.45 V and Vcc replaced by a 100-Ohm resistor to ground.

4.4.3 DC Specifications

All pins on the Intel® RMM are 3.3 volt tolerant with the exception of the USB signals, which are USB compatible. The following sections describe the DC specifications of the signals.

4.4.3.1 FML Bus Specifications

The Fast Management Link (FML) is an Intel standard communication bus for management traffic. It can handle all network traffic types and Internet protocols. The FML bus is comprised of four signals:

- MCL
- SINTEX
- MDA
- SDA

4.4.3.1.1 MCL

MCL is the FML Clock output. This signal is driven by the FML master. In this case, the master is the BMC.

4.4.3.1.2 MDA

The MDA signal is the FML Data Out signal. It is driven by the BMC.

4.4.3.1.3 SDA

The SDA is the FML Data In signal. This signal is driven by the Intel® RMM.

4.4.3.1.4 SINTEX

The SINTEX line has two uses. The uses are as follows:

- During transactions on the FML, it is used for cycle elongation (i.e. to introduce wait states in the active transaction).
- During times when the FML bus is idle, the SINTEX line acts as an attention interrupt from the Intel® RMM to the BMC, to initiate an FML bus Read transaction.

4.4.3.1.4.1 FML Bus Read Transaction

When the BMC sees the interrupt line asserted, it will initiate a FML bus Read transaction. During this transaction, the Intel® RMM will send a command header to the BMC that is appropriate to the task being initiated. If the Intel® RMM is sending data to the BMC, the transaction will be a FML Write transaction, including data.

If the transaction is a multi-command sequence, the BMC will initiate further FML Read transactions to receive the command sequence. This is completed using one or more “Middle” and one “End” command transactions to complete the packet transfer.

If the Intel® RMM is receiving data from the BMC, the Intel® RMM will send a command header showing its available buffer space. Then the BMC will end the transaction and initiate a new transaction to carry out the data transfer.

The table below summarizes the DC specifications of the bus, which applies for both master and slave:

Table 9. FML Bus DC Specifications

Symbol	Parameter	Limits		Units	Comments
		Minimum	Maximum		
Vil	Data, Clock input low voltage	-	0.8	V	
Vih	Data, Clock input high voltage	2.0	-	V	
Vol	Data, clock output low voltage	-	0.4	V	
Voh	Data, clock output high voltage	2.4	-	V	
Vdd	Nominal bus voltage	3.0	3.6	V	3.3V typical
Iih	Input high current	-	15	uA	
Iil	Input low current	15	-	uA	

4.4.3.2 IPMB Specifications

The Intel® RMM IPMB bus uses 3.3 V signaling.

4.4.3.3 AC Specifications

Table 10. I²C Interface

Symbol	Parameter	Minimum	Maximum	Unit	Notes
Freq	Operating frequency		400	KHz	
Tbuf	Bus free time between Stop and Start condition (= Tcyc * (I2C_CLK_DIV+16))	4.7		us	
thd:sta	Hold time after (repeated) start condition. After this period, the first clock is generated (= Tcyc * (I2C_CLK_DIV-8))	4.0		us	
tsu:sta	Repeated Start condition setup time (= Tcyc * (I2C_CLK_DIV+15))	4.0		us	
tsu:sto	Stop condition setup time (= Tcyc * (I2C_CLK_DIV+15))	4.0		us	
thd:data	Data hold time from SCL	300		ns	
tsu:data	Data setup time to SCL	250		ns	
Tf	Clock/Data fall time into 100 pF capacitance and 4.7K ohm pullup.		300	ns	1

4.4.3.3.1 16550 UART Interface

The Intel® RMM has one 16550 UART* (RS232) interface for serial communication. By default, the RS232 port on the Intel® RMM is disabled.

4.5 MII Interface

The Media Independent Interface (MII) is an Ethernet (IEEE 802.3) standard for communication between an Ethernet MAC (Media Access Controller) device and an Ethernet PHY (Physical layer interface) device. The MII specification defines 16 pins per port for data and control. The MII allows the Davicom Ethernet controller* on the Intel® RMM to communicate with the 10/100 Ethernet PHY chip on the Intel® RMM NIC.

The Intel® RMM NIC module provides the RJ 45 connector for connection to the LAN via a Category 5 network cable. The RJ45 connector on the Intel® RMM NIC module has two LEDs that indicate the LAN connector state. One of the LEDs indicates link activity and the other indicates the LAN speed (10 or 100 Mb/S).

4.6 DVO Video and DDC/EDID Specifications

The table below outlines DVO Bus DC Specifications:

Table 11. DVO Bus DC Specifications

Parameter	Condition	Minimum	Maximum
VIL- Low level input voltage	Vout >/= VOH(Minimum) or Vout </= VOL(Maximum)	-0.3 V	1.0 V
VIH- High level input voltage	Vout >/= VOH(Minimum) or Vout </= VOL(Maximum)	2.5 V	3.6 V
IIN- Input current	Vin =0 or Vin = 3.3 V		+/-10 uA
VOL- Low level output voltage	VDD=3.1V, IOL=2mA		0.4 V
VOH- High level output voltage	VDD=3.1V, IOH=-2mA	3.1 V	

4.6.1 DVO Interface

The DVO interface consists of three groups of five signals that represent standard digital video data. The groups are as follows:

- Red signals
- Green signals
- Blue signals

In addition to the 15 video data signals, the ATI* graphics controller on the baseboard generates the following signals:

- Clock
- Data enable
- Horizontal sync signals
- Vertical sync signals

The relationship of the clock, data enable, RGB data and horizontal sync are shown below (The vertical sync is not shown). The clock frequency varies for different resolutions and refresh rates.

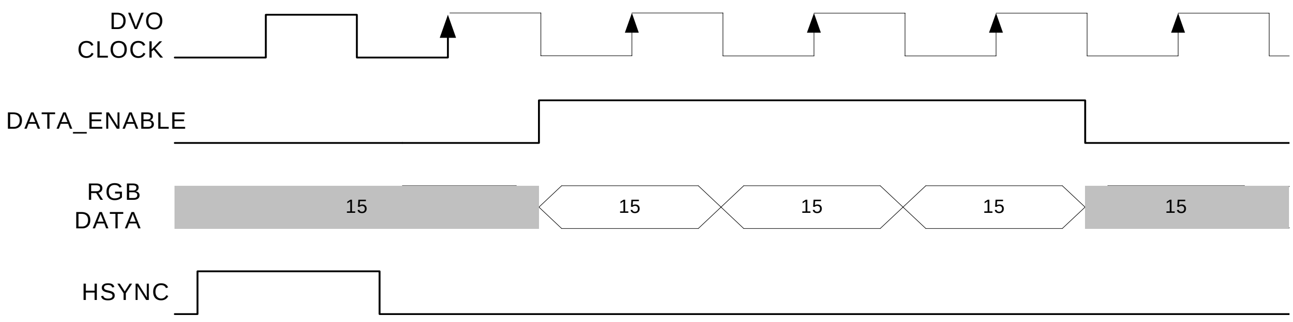

Figure 8. Frequency Relationships

All of these signals are inputs to the DVC FPGA* on the Intel® RMM. Within the FPGA, the following actions occur:

- Video is captured
- Video is compressed
- Video is encrypted

Lastly, video is packetized for transmission by the Davicom NIC* on the Intel® RMM across the MII interface to the Intel® RMM NIC.

4.6.1.1 Supported Video Resulutions and Refresh Rates

The Intel® RMM supports the Extended Display Identification Data (EDID) standard data format (version 1.3). The EDID is a VESA standard that contains basic information concerning monitors and capabilities. The information includes the following:

- Vendor information
- Maximum image size
- Color characteristics
- Factory pre-sets
- Frequency range limits
- Character strings for the monitor name
- Serial number

The Intel® RMM emulates a monitor by supporting the EDID information with an on-board EEPROM. This information is used by the system software for configuration purposes to allow the graphics controller to work together with the Intel® RMM. The Intel® RMM EDID communicates the following:

- Allowable resolutions
- Color depths
- Refresh rates

The information within the EDID ROM is communicated from the Intel® RMM and the baseboard's graphics controller via the Display Data Channel (DDC) interface. The DDC uses an I^2C protocol.

Table 12. Supported Video Resolutions and Refresh Rates

Resolution	Refresh Rate
640X480	60Hz
	72Hz
	75Hz
	85Hz
640 X 480	100Hz
800X600	60Hz
	72Hz
	75Hz
	85Hz
1024X768	60Hz
	72Hz
	75Hz
	85Hz
1280X960	60Hz
1280X1024	60Hz

4.7 System Reset Control

The Intel® RMM receives an indication of a system reset via the LPC reset signal. The LPC reset is considered a hard reset that resets the following:

- CPU
- Chipset
- I/O subsystem

The BIOS will take control of the system after the reset and perform system initialization. This reset signal does not reset the Intel® RMM.

5. Intel® RMM Network Connections and Authentication

5.1 Network Connectivity

The Intel® RMM requires connectivity to the Ethernet. The Intel® RMM supports a dedicated, 10/100 Mb/S Davicom Management NIC MAC* on the card itself. The Ethernet MAC is attached to a PHY device on the Intel® RMM NIC card via an MII connection routed on the baseboard. When interacting with the Intel® RMM NIC PHY, the Intel® RMM manages the following network functions:

- Dynamic Host Configuration Protocol (DHCP)
- Address Resolution Protocol (ARP)
- Internet Control Message Protocol (ICMP)
- TCP/IP

In addition, the Intel® RMM forwards all IPMI UDP/IP (network ports 26Fh and 298h) based RMCP and RMCP+ traffic to the baseboard BMC via the FML interface.

When the Intel® RMM is installed, it configures the BMC network parameters to work in conjunction with the way the Intel® RMM is configured.

5.1.1 Connectivity Example

If the Intel® RMM is configured for DHCP, the Intel® RMM will configure the baseboard BMC's DHCP enable bit to true. Only the Intel® RMM will carry out the actual DHCP protocol and the baseboard BMC will ignore the state of the DHCP flag.

The Intel® RMM registers itself as one of the following agents for its dedicated NIC:

- ARP
- ICMP
- DHCP

In doing so, the Intel® RMM instructs the baseboard BMC not to attempt such traffic on this NIC.

This is accomplished by the Intel® RMM by configuring the FML interface as a virtual LAN channel for the BMC. Firmware on the BMC provides the communication protocol that allows the 802.3 IPMI UDP/IP and DNS traffic.

5.1.2 Supported Traffic

All Intel® RMM - Web Console, Intel® RMM - Virtual Server Control and Intel® RMM - Virtual Media traffic is supported on this dedicated 10/100 Ethernet interface. IPMI traffic to the BMC is supported over the following three LAN interfaces

- Two LAN channels embedded in the BMC (if enabled)
- One dedicated NIC on the Intel® RMM

5.1.2.1 “Host Shared” Network Interfaces

The two “host shared” network interfaces within the BMC are shared with the host system software data path. The host traffic and management traffic are handled separately. The BMC and the Intel® RMM handle only management traffic.

The host system uses one MAC address per NIC and the system management firmware will use a separate MAC address per NIC. The embedded NIC devices within the BMC will each maintain two MAC addresses: one for use by the host for host traffic and another for the management traffic generated and consumed by the BMC. This management traffic will generally be IPMI traffic.

An additional management MAC and IP address is associated with the dedicated management NIC on board the Intel® RMM. Over this NIC, the Intel® RMM takes over receipt of incoming TCP/IP and UDP/IP network traffic. The Intel® RMM then forwards UDP/IP RMCP and RMCP+ (IPMI) traffic to the baseboard BMC via the FML interface.

Once the AC power of the motherboard becomes stable, the Intel® RMM automatically initiates a determination of the network mode and an initialization of the relevant link. This multi-stage process can be initiated at any time by the Intel® RMM or BMC via IPMI commands. Messages across the IPMB bus and OEM IPMI commands are used in the process.

The Intel® RMM can sense if the Intel® RMM NIC is installed by decoding the two LAN type signals on the Intel® ASMI connector. Pull-up resistors on these signals will indicate that No GMC3 is installed. Otherwise, the Intel® RMM NIC grounds the LAN Type 1 signal. An RMII type PHY is not being implemented at this time.

Table 13. Signals

	LAN Type 2	LAN Type 1
PHY - RMII type	0	0
PHY - MII type	0	1
Reserved	1	0
No private management LAN	1	1

Once the network mode is determined, the Intel® RMM initializes the network device.

6. Intel® Remote Management Module - Web Console

This section contains additional details on certain features of the Intel® Remote Management Module - Web Console (Intel® RMM - Web Console). These details are in addition to the information previously covered in the Intel® RMM Users Guide.

6.1 Accessing the Intel® RMM - Web Console

Access is provided to the Intel® RMM - Web Console via the secure HTTPS protocol.

6.1.1 User Security

User security will permit or deny access to the system based on the authentication of the user. The following access levels are used:

Table 14. User Access Levels

User	Description
Adm	Administrator level users are allowed. No restriction on allowed commands
User	Commands that change users configuration are restricted
View	Commands are restricted to read-only access of system information.

Each IP address available to the web server has one port setting, an HTTPS port. The HTTPS port is the port the web server listens to for SSL connections. Traditionally, the HTTPS port is port “443”.

6.1.2 Auto Refresh

The summary page and power control page will be refreshed automatically.

6.1.2.1 Summary Page

All sensor readings will be updated every 60 seconds. The displayed values will be updated after each reading

6.1.2.2 Power Control Page

The power status will be updated every 30 seconds. The displayed status will be updated after each reading

6.1.3 Logout

The HTTPS server provides web pages. This allows for viewing the following:

- Server board state (e.g., health)
- Secure platform power
- Reset control

The HTTPS module accepts requests via HTTPS on port 443.

6.1.4 Browser Interaction

Table 15. Browser Interaction

Page Name	Summary Description
System Summary	Displays static information as well as selected sensor values
Power	Displays power state, and permit power control of the system
IPMI Command	Executes command line interface (CLI) commands or IPMI hex strings and display the result
Configuration	A page that allows configuration of persistent storage values that are used by dynamic web pages
Help	Shows help information for the system. May be configured by a vendor.

6.2 System Login Page

For user authentication, the Intel® RMM maintains its own user database of the following:

- Accounts
- Usernames
- Passwords
- Privilege levels
- etcetera

These accounts, local to the Intel® RMM, are separate and independent of the IPMI user accounts maintained on the baseboard by the BMC. IPMI over LAN accesses pass through the Intel® RMM without any authentication checks by the Intel® RMM.

Authentication of IPMI users is always completed on the baseboard by the BMC. Non-IPMI functionality (Intel® RMM - Virtual Media, Intel® RMM - Virtual Server Control and Intel® RMM - Web Console) is accessed via a separate set of accounts that are not synchronized to the IPMI accounts maintained on the baseboard by the BMC.

6.2.1 Username and Password Synchronization

If an administrator or any user wanted to use the same username and password for both sets of accounts, the username and password synchronization must be performed manually, by the user. Intel® RMM and IPMI accounts are not synchronized automatically.

6.2.2 Authentication Policies

The authentication policies used by the Intel® RMM are separate and independent from the IPMI authentication, as well. When logging into the web server, the login username and password entered by the user is verified by a database local to the Intel® RMM only. The Intel® RMM will not attempt to authenticate the user with the baseboard BMC's IPMI database.

6.2.2.1 Intel® RMM Authentication Policies

A web page within the Intel® RMM - Web Console allows an administrative user to assign the lowest privilege level required to access the Intel® RMM - Web Console functions. The functions are as follows:

- Intel® RMM - Virtual Server Control
- Intel® RMM - Virtual Media
- Intel® RMM - Web Console
- Remote Power Control over IP

6.2.2.1.1 Administrator Privilege

Only after logging in with an account that has administrator (ADMIN) privilege can a user initiate the following actions:

- Create a new account
- Delete an existing account

When a new account is created by a user with ADMIN privileges, the user creates a username and password for the new account in the local username database of the Intel® RMM. At that time, the ADMIN assigns the account privilege level for the new account.

6.3 System Summary Page (aka My Server)

6.3.1 Real-Time Clock (RTC) Access

The Intel® Remote Management Module has no way for the BMC to directly access the system RTC. The BIOS provides the time to the BMC during POST.

During POST, the BIOS notifies the BMC of the current RTC time via the Set SEL Time command. The BMC will maintain this time, incrementing it once per second, until the BMC is reset or the time is changed via another Set SEL Time command.

If the RTC changes during system operation, SMS is responsible for keeping the BMC and system time synchronized.

6.4 Intelligent Platform Management Interface (IPMI) Page

6.4.1 IPMI Command Page

The IPMI Command page supports IPMI commands represented as hex strings. The result of the command will be displayed at the bottom of the page. The command is issued when the execute button is clicked or when the return key is pressed.

7. Intel® Remote Management Module - Virtual Server Control

7.1 Keyboard/Video/Mouse (KVM) Redirection

The remote KVM (keyboard, video, and mouse) feature of the Intel® RMM - Virtual Server Control provides a means to complete the following actions:

- Capture managed server video signals
- Compress managed server video signals
- Encrypt managed server video signals

Lastly, the managed server video signals are transmitted to a remote Intel® RMM - Web Console (running KVM software) over the network.

The compression algorithm is Avocent's Dambrackas Video Compression* (DVC – patent pending).

Up to four concurrent remote sessions are supported. This support allows administrators and other support staff to interact with the server. In addition to the four remote users, local video viewing and keyboard and mouse interaction with the server can still take place and is un-effected by the KVM.

7.1.1 Keyboard Inputs and Mouse Activity

Keyboard inputs and mouse activity from the remote Intel® RMM - Web Console are received for input to the managed server. The DVC algorithm reduces the round trip latency of remote keyboard and mouse commands to the time of the video response. Impact on the network is minimized through efficient data management and compression.

The result is a near real-time user experience. When multiple users are controlling the server locally and remotely, the keyboard and mouse sharing is independent and coincident (dueling mice). The Intel® RMM - Virtual Server Control emulates a standard USB keyboard and mouse. Therefore, no special driver software is required on the target server under control.

7.1.2 KVM Data Encryption

The BMC supports encryption of the KVM data using the RC4 encryption protocol. The encryption is limited to keyboard and video data. This encryption can be enabled or disabled by configuration of the KVM viewer. To enable/disable the encryption of KVM data, the KVMConf.properties file in the KVM install directory must be edited.

By default, the keyboard data is encrypted and video data is not encrypted.

7.1.3 Intel® RMM - Virtual Server Control

Intel® RMM - Virtual Server Control is a server management tool. It enables a virtual presence solution that provides a remote administrator full control over the managed server’s display, keyboard and mouse.

8. Intel® Remote Management Module - Virtual Media

The Intel® Remote Management Module - Virtual Media (Intel® RMM - Virtual Media) function provides USB media redirection. Intel® RMM - Virtual Media uses USB 2.0, high speed protocols to emulate the following USB devices, organized into the following two categories:

- DC/DVD Devices
- Generic Mass Storage Devices

8.1 CD/DVD Devices

CD/DVD Devices include the following:

- CD drives
- DVD drives
- CD ISO images
- DVD images
- DVD ISO images

8.2 Generic Mass Storage Devices

- Floppy disk drives
- Floppy images
- External USB “thumb” and hard disk drives

8.2.1 Virtual Device Support

The Intel® RMM - Virtual Media supports up to four virtual devices at the same time, but only up to two from the same category.

8.2.1.1 Virtual Device Support Example

A user could have two CD drives connected and a floppy drive and thumb drive, but not four thumb drives, simultaneously.

Intel® RMM - Virtual Media, once mounted via the Java applet launched from the Intel® RMM - Web Console, appears to the Enterprise Platform Server Division (EPSD) server as local media, allowing the user to complete the following actions:

- Install software, including operating systems and operating system patches
- Copy files
- Update the system BIOS or other firmware
- Boot the server from a “known good” device

8.2.1.2 Remote Virtual Mass Storage Functions

The Intel® RMM - Virtual Media allow the user to perform all mass storage functions remotely, without having a physical connection to the server. The Intel® RMM - Virtual Media operate independent from and in parallel with the local media (hard drives, floppy drives, and CD/DVD drives physically attached to the EPSD server).

Connections to the Intel® RMM - Virtual Media are maintained even when the server is reset, powered on, or powered off. Intel® RMM - Virtual Media sessions are launched and terminated independent from Intel® RMM - Virtual Server Control sessions (KVM). When Intel® RMM - Virtual Media sessions terminate, connected devices will be disconnected and not available to the host server.

Intel® RMM - Virtual Media can also allow the contents local mass storage devices (files, programs, etcetera) attached to the server (both USB and non-USB) to be moved to virtually connected devices.

Software installation and driver updates on the target server can be completed from the Intel® RMM - Virtual Media. The server may also be booted remotely using Intel® RMM - Virtual Media.

9. Intel® Remote Management Module Configuration

9.1 Feature Configuration Model

The features of the Intel® RMM have up to two different types of configuration. The two configurations are as follows:

- Per-feature
- Per-user

9.1.1 Per-feature

The per-feature configuration is implemented as Get/Set Configuration Parameter commands. Currently, only the HTTPS Server implements this type of configuration.

9.1.2 Per-user

The per-user configuration is implemented via Get/Set User Feature Configuration Parameter commands for HTTPS. KVM user access is controlled via access commands.

10. Intel® Remote Management Module Utilities

10.1 Overview

The Intel® RMM card can be configured and updated with a set of command line utilities. These utility programs are supported on the following OS'

- Windows 2000/2003/XP* (USB or remote)
- RH 3and4 and SuSe 9 Linux* (USB or remote)

10.1.1 Basic Feature

All basic features are accessible from the command line (no GUI). The utility programs will have the following basic features:

- Read one or more settings and display them
- Write one or more settings from the command line
- Update the Intel® RMM firmware
- Reset all Intel® RMM settings to factory defaults

10.1.1.1 "mmconfig" Utility

On each OS platform a single utility, called "mmconfig", accomplishes the above functions. The utility provides access either through a local USB interface or through a remote SSL connection to the Intel® RMM (except DOS). The mode of access (USB or remote) is determined by the first real command on the command line.

The default is local USB access, unless the first real command is -a followed by the IP address of the Intel® RMM, indicating remote access. The –a command is only valid when specified as the first real command on the command line. The commands –n, -q, -e, and –x are not considered real commands.

Note: *When the card is in "debug mode", a separate window or Linux utility can "push" a full flash image. In addition, root access to FTP and telnet are allowed in this mode. Debug mode is not available on production cards, as the switch to enable it is not populated.*

The card's default mode does not require user authentication for utility USB access. However, remote access always requires user authentication.

The remainder of this document will outline the following:

- Command Line Syntax
- Configuration options
- Image download
- Common Source Layer for CL parsing
- USB communications
- OS specific drivers

10.2 Return Status Codes

The following codes are returned by the command line utility when it is invoked:

Table 16. Return Status Codes

Return Status Name	Explanation	Value
SUCCESS	Operation successful, Intel® RMM present	0x00
ERR_RMM_NOT_PRESENT	No Intel® RMM detected	0x01
ERR_INVALID_CMD_SWITCH	A dash command line switch or option is not valid	0x02
ERR_ILLEGAL_PARAMETER	A command parameter or value is not valid or missing	0x03
ERR_SYNTAX_ERROR	A syntax error occurred not covered by the two above error codes	0x04
ERR_INVALID_FW_FILE	A file designated by the –f switch is not a valid firmware file	0x05
ERR_FW_UPDATE_FAILED	A –f command (FW upgrade) failed for reasons besides the above	0x06
ERR_RMM_FILE_NOT_FOUND	A file was not found in the Intel® RMM directory during open (read)	0x07
ERR_RMM_FILE_NOT_CREATED	A file was not created in the Intel® RMM directory during open (write)	0x08
ERR_RMM_FILE_READ	An error occurred while reading a file from the Intel® RMM	0x09
ERR_RMM_FILE_WRITE	An error occurred while writing a file to the Intel® RMM	0x0A
ERR_HOST_FILE_NOT_FOUND	Requested file was not found in the current host directory (open)	0x0B
ERR_HOST_FILE_NOT_CREATED	Requested file was not created in the current host directory (creat)	0x0C
ERR_HOST_FILE_READ	An error occurred reading a file in the host directory	0x0D
ERR_HOST_FILE_WRITE	An error occurred writing a file to the host directory	0x0E
ERR_FILE_VERIFY	A verify mismatch was detected between a file on the host and a file with the same name on the Intel® RMM	0x0F
ERR_DOS_EXEC_ON_WIN32	An attempt was made to execute the DOS utility under a Win32 OS	0x10
ERR_WIN32_EXEC_ON_DOS	An attempt was made to execute the Windows* utility under DOS	0x11
ERR_RMM_SEND_REQUEST	An error was encountered sending a request to the Intel® RMM	0x12
ERR_RMM_RECV_RESPONSE	An error occurred while receiving a response from the Intel® RMM	0x13

Return Status Name	Explanation	Value
ERR_INSUFFICIENT_PRIVILEGE	An error occurred while attempting a function without adequate privileges	0x14
ERR_INVALID_USER_OR_PSWD	A login was attempted with either an invalid username or password	0x15
ERR_INVALID_IP_ADDR	IP address entered is invalid or in invalid format	0x16
ERR_TCP_NOT_SUPPORTED	TCP not supported with DOS utility	0x17
ERR_UNDEFINED	An undefined error was encountered	0x18

11. Intel® Remote Management Module IPMI Support

The Intel® RMM IPMI functionality is that of an IPMI satellite controller to the baseboard BMC. As a satellite controller, the Intel® RMM can respond to IPMI commands issued over the IPMB bus by the BMC.

The Intel® RMM IPMI stack complements the IPMI stack running on the baseboard BMC. The IPMI stack for the Intel® RMM contains two main components. The components are as follows:

- Set of IPMI APIs
- IPMI daemon

11.1 IPMI APIs

The IPMI APIs provide interfaces between applications running on the Intel® RMM and the IPMI daemon. It is via these IPMI APIs that applications can perform various IPMI operations. The IPMI APIs encapsulate IPMI commands providing the applications a clear, easy-to-use interface to execute IPMI commands on the BMC.

11.2 IPMI Daemon

The IPMI daemon is the main body of the IPMI stack of the Intel® RMM. The IPMI daemon works with the BMC which implements a full IPMI 2.0 compliant firmware stack. All IPMI commands are executed on the BMC.

The IPMI daemon on the Intel® RMM supports following two IPMI channels:

- Virtual KCS (V-KCS) channel
- IPMB channel

11.2.1 V-KCS Channel

The V-KCS channel is used by the IPMI APIs to communicate with the IPMI daemon. The V-KCS channel is essentially a BSD-style socket that supports up to four concurrent connections between the IPMI APIs and the IPMI daemon. The V-KCS channel itself is implemented in the IPMI APIs and transparent to the applications.

11.2.2 IPMB Channel

The IPMB channel is used by the IPMI daemon to communicate via the IPMB bus with the BMC. When the IPMI daemon receives a request from the V-KCS channel, the IPMI daemon will forward the commands that make up this request to the BMC via the IPMB. When the BMC responds via IPMB, the IPMI daemon will forward the response back to the V-KCS channel. If the IPMI daemon receives a request from the BMC via IPMB, the IPMI daemon will handle it, without involving the V-KSC channel.

11.2.2.1 RMCP and RMCP+ Traffic

All RMCP and RMCP+ traffic received by the Intel® RMM Ethernet NIC will be forwarded via FML to the BMC. Therefore, the IPMI daemon does not support an IPMI LAN channel. From the perspective of the BMC, the FML interface shared with the Intel® RMM is an input LAN channel to receive the IPMI over LAN traffic from the dedicated NIC of the Intel® RMM.

The FML looks like a LAN channel to the baseboard BMC. Only IPMI traffic is directed to the BMC from the dedicated NIC (no TCP/IP). Traffic from the baseboard BMC to the Intel® RMM will be IPMI response packets on the FML and IPMI commands (standard and OEM specific) on the IPMB.

11.2.2.2 IPMI Commands

IPMI commands (requests) are executed by the BMC. The commands the BMC accepts, and the corresponding functionality and request/response data for these commands, can be found in the Intel® platform TPS.

These commands direct the BMC to perform specific actions. The user inputs the IPMI commands into the IPMI page on the Intel® RMM - Web Console. The commands are sent to the BMC from the Intel® RMM via the IPMB. For the base specification and descriptions of BMC commands other than those specified in the Intel® platform TPS, see the Intelligent Platform Management Interface Specification v2.0.

The BMC implements the event receiver, SEL, SDR, FRU, and sensor devices, as described in the Intelligent Platform Management Interface Specification. The results (completion codes) of executing the IPMI commands sent to the BMC from the Intel® RMM - Web Console are displayed on the IPMI web page where the commands were entered by the user.

Glossary

This appendix contains important terms used in the preceding chapters. For ease of use, numeric entries are listed first (e.g., “82460GX”) with alpha entries following (e.g., “AGP 4x”). Acronyms are then entered in their respective place, with non-acronyms following.

Word / Acronym	Definition
aka	Also Known As
ARP	Address resolution protocol
BMC	Baseboard Management Controller
CLI	command line interface
DDC	Display Data Channel
DVC	Dambrackas Video Compression
DVO	Dynamic Visual Output
EDID	Extended Display Identification Data
EPSD	Enterprise Platform Server Division
FML	Fast Management Link
FPGA	Field Programable Gate Array
ICMP	Internet Control Message Protocol
Intel® ASMI	Intel® Advanced Server Management Interface
Intel® RMM	Intel® Remote Management Module
Intel® RMM - Virtual Media	Intel® Remote Management Module - Virtual Media
Intel® RMM - Virtual Server Control	Intel® Remote Management Module - Virtual Server Control
Intel® RMM - Web Console	Intel® Remote Management Module - Web Console
IPM	Intelligent Platform Management Interface
IPMI	Intelligent Platform Management Interface
ITE	Information Technology Equipment
KVM	keyboard, video and mouse
MAC	Media Access Controller
MII	Media Independent Interface
OOB	Out Of Band
PBDE	Polybrominated Biphenyls Diphenyl Ethers
RMII	Reduced Media Independent Interface
RTC	Real-Time Clock
TCP/IP	Transmission Control Protocol / Internet Protocol
TPS	Technical Product Specification
UART	Universal asynchronous receiver transmitter
UDP	User Datagram Protocol
DHCP	Dynamic Host Configuration Protocol
ARP	Address resolution protocol
ICMP	Internet Control Message Protocol

Reference Documents

Refer to the following documents for additional information:

- *5000 Series Chipset Server Board Family Datasheet*, Intel Corporation.
- *Server Boards S5000PSL and S5000SXL Technical Product Specification*, Intel Corporation.
- *Server Board S5000PAL/S500XAL Technical Product Specification*, Intel Corporation.
- *Server Board S5000PSL Quick Start User's Guide*, Intel Corporation.
- *Server Board S5000PAL Quick Start User's Guide*, Intel Corporation.