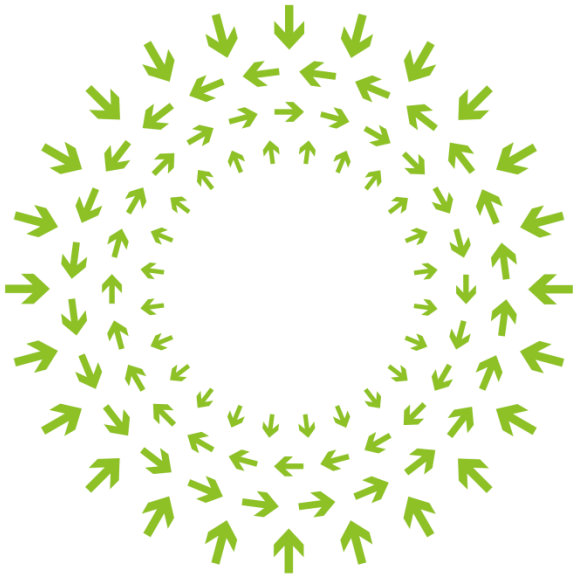

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Project Olympus
Stand Alone Rack Manager Specification

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Revision History

Date	Description
2/15/2017	Version 1.0

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1 Overview

The M2010 Stand-Alone Rack Management Module (RMM) is an ARM based processor assembly for supporting WCS Rack Management in Non-WCS based racks. The design leverages the existing WCS M2010 Rack Manager and adds integrated AC to DC power to enable a standalone 1U management unit that can mount into any standard 19" rack. 3D views of the Rack Manager are shown in Figure 1 and Figure 2.

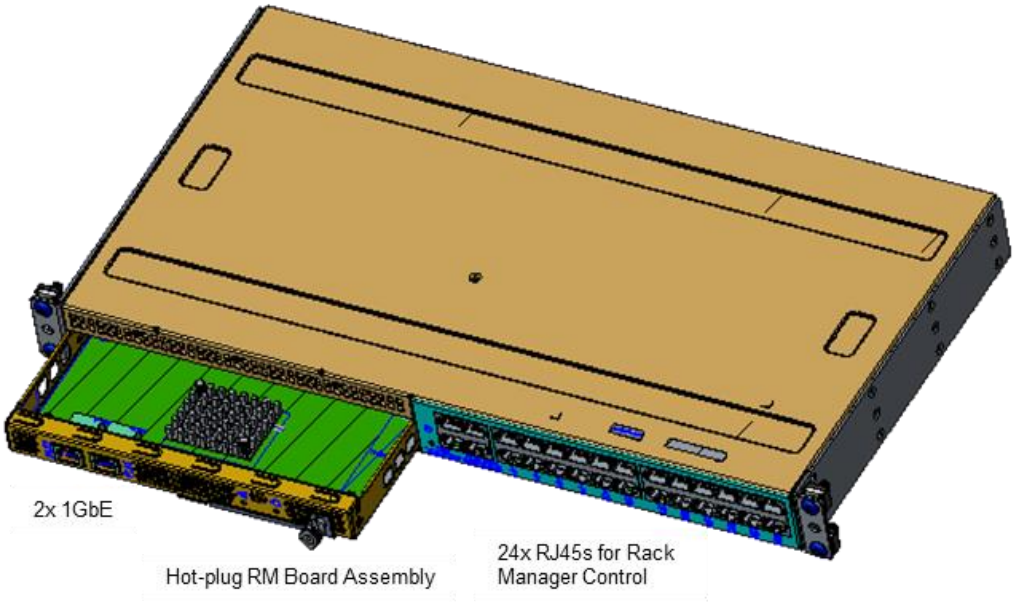

Figure 1. Rack Manager Module – Front View

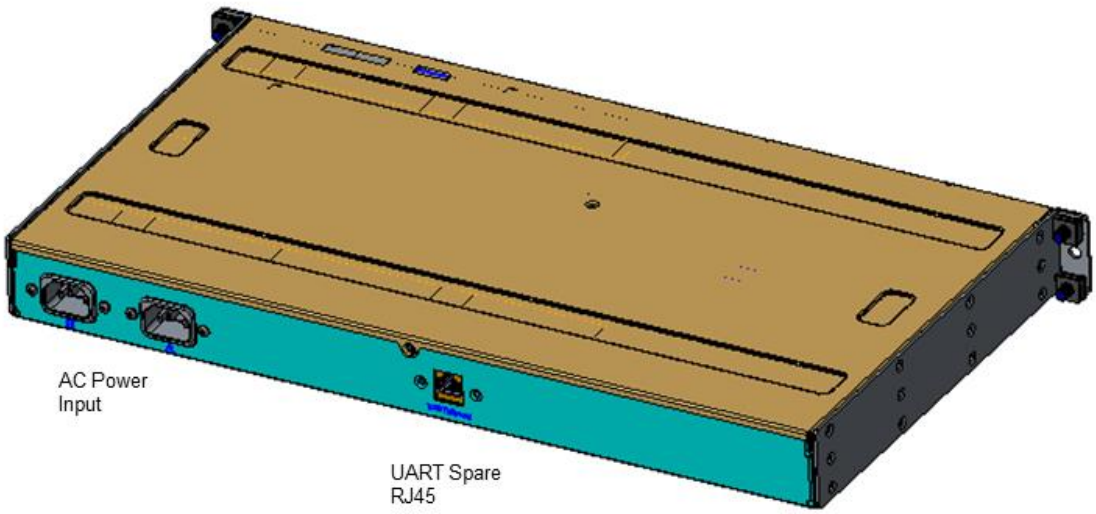

Figure 2. Rack Manager Module – Rear View

2 Block Diagram

The RMM supports the following primary functional features:

- 2x 1GbE for communication with Data Center and Server Blade management
- 2x UARTs for communication with Data Center Digi and Ethernet Management Switch
- 1x UART for spare or debug
- 24x RJ45 for Rack Manager or Blade Control
- 2x AC power inputs
- M2010 Rack Manager
- AC to 12V DC conversion

A top-level block diagram is shown in Figure 3.

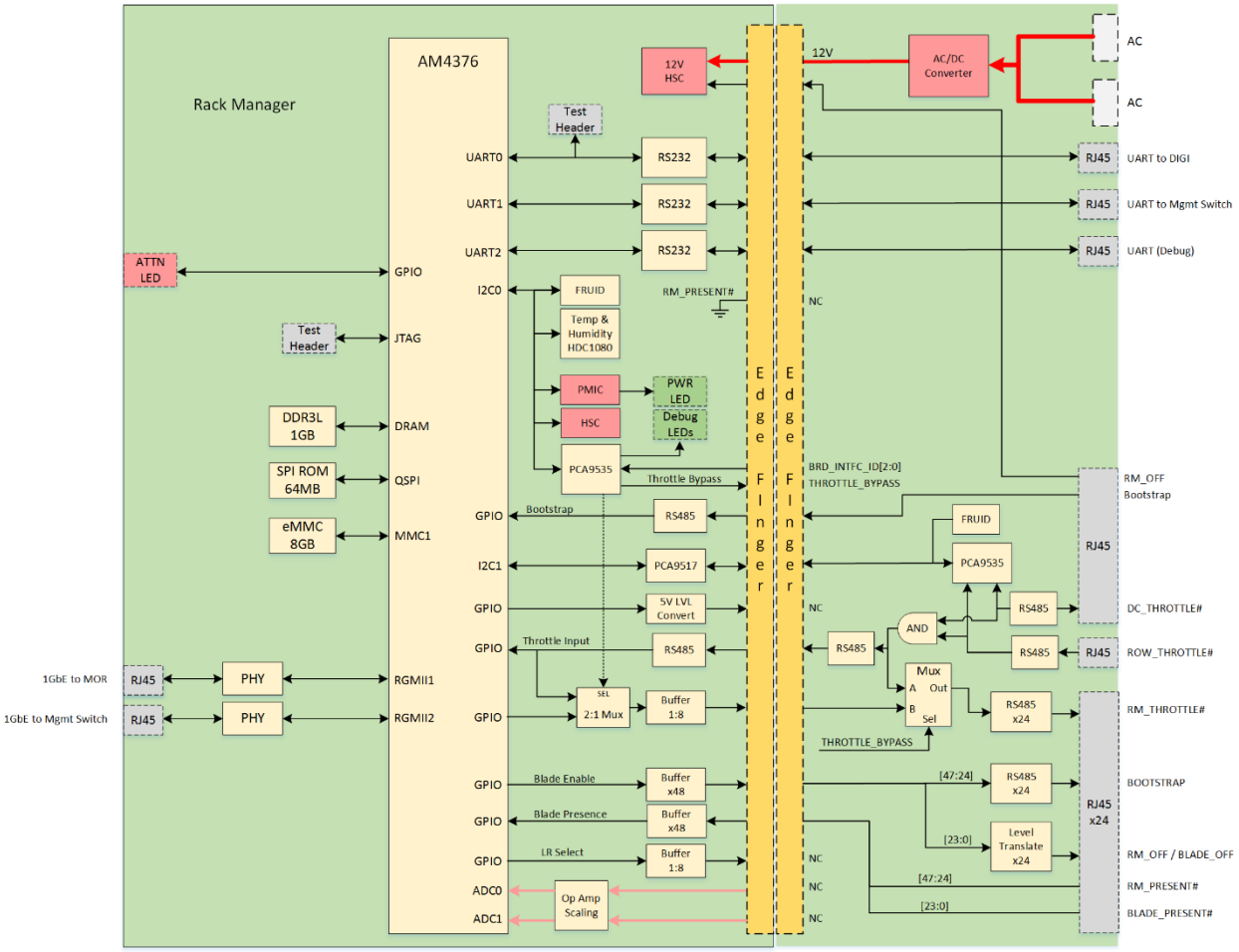

Figure 3. Top Level Block Diagram

Figure 3. Top Level Block Diagram

3 Features

3.1 Rack Manager Assembly

The RMM shall incorporate the WCS M2010 Rack Manager (RM) Assembly as a plug-in and hot swappable component. Details of the RM are found in the WCS-HW Rack Manager Specification. The RM contains the following features.

- 32-bit RISC Processor
- 1GB DDR3L Memory (400Mhz)
- 64MB QSPI NOR Flash
- 1GB (min) eMMC Flash
- 2 1GbE RJ45 Connectors
- 3 UARTS (externally available)

3.2 Rack Management PIB

The RMM shall contain a Power Interface Board (PIB) for supplying 12V power to the Rack Manager and interfacing the Rack Manager signals to externally available RJ45 connectors.

3.2.1 12V Supply

The PIB shall accept dual feed AC inputs and generate 12V power to the Rack Manager.

3.2.2 UARTS

The RMM shall support 3 RS232 UARTS for interfacing to external devices.

- UART 0 – Intended for communication with Management Switches. Utilizes software flow control and does not require hardware flow control signals. Available at the front of the module.
- UART 1 – Intended for communication with the Data Center Digi device. Utilizes full hardware flow control (RTS, CTS, DSR, DTR). Available at the front of the module.
- UART 2 – Intended for debug. Utilizes software flow control and does not require hardware flow control signals. Available at the rear of the module.

3.2.3 I2C

Figure below shows the full I2C block diagram for the Rack Manager and Row PIB.

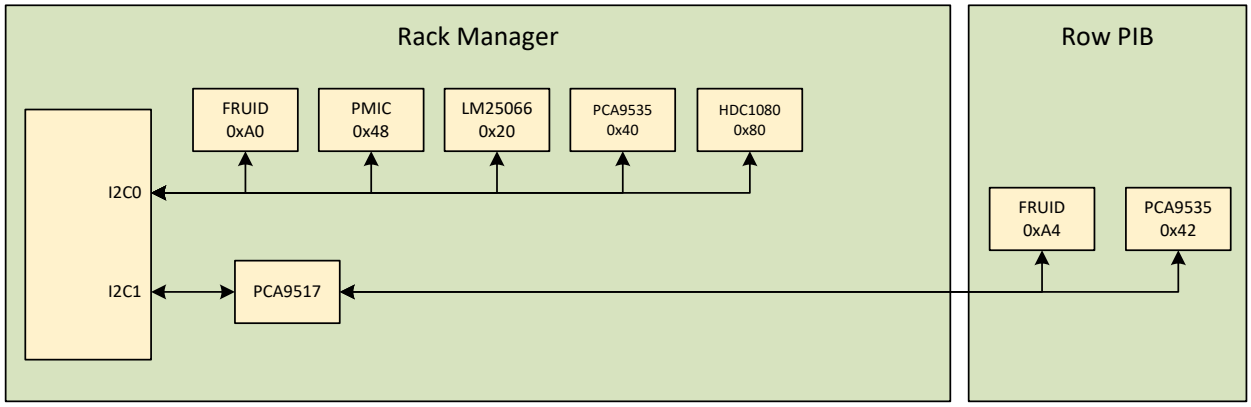

Figure 4. I2C Block Diagram

3.2.3.1 FRU EEPROM

The PIB shall support a 64Kb FRUID EEPROM for storage of manufacturing data. The device shall be M24128-BWMN6TP or equivalent. Data in the EEPROM will be configured as an IPMI FRU device and fields are defined in the FRU ID Specification. The I2C address shall be 0xA4 assuming 8-bit address format.

3.2.3.2 PCA9535

The PIB shall support a single PCA9535 I2C GPIO for reading throttle status from the RJ45 throttle connectors. Since DC_THROTTLE# and ROW_THROTTLE# are combined to a single input to the Rack Manager, this will enable the Rack Manager to determine which of the throttle inputs is responsible for a throttle event. The device shall also support reading the cable present status of the DC monitor and Row monitor and enabling the throttle output buffer. The table below shows the GPIO assignments for the device.

Table 1. PCA9535 GPIO Assignment

0x42	PCA9535C		
GPIO	I/O	Signal	Description
15	I	NC	N/A
14	I	NC	N/A
13	I	NC	N/A
12	I	NC	N/A
11	I	NC	N/A
10	I	NC	N/A
9	I	NC	N/A
8	I	NC	N/A
7	I	NC	N/A
6	I	NC	N/A
5	I	NC	N/A
4	I	THROTTLE_OE#	0=Enable

3	I	DC_PRESENT#	0=Present
2	I	ROW_PRESENT#	0=Present
1	I	DC_THROTTLE#	0=Throttle
0	I	ROW_THROTTLE#	0=Throttle

3.2.4 Rack Manager Control Input

The PIB shall support an RJ45 connector for receiving Rack Manager power and boot control as follows:

- RM_OFF – Input to the Rack Manager HSC that enables/disables the 12V hot swap controller
- RM_BOOTSTRAP – Input to the Rack Manager that sets the SYSBOOT settings to boot from network

3.2.5 Rack Manager Control Outputs

The PIB shall support 24 RJ45 connectors for driving power and boot control to up to 24 Rack Managers. Signals contained in the interface are as follows:

- RM_THROTTLE# - Output to Rack Manager. Assertion of this signal will cause the Rack Manager to assert throttle to the blades within the rack.
- RM_OFF – Output to the Rack Manager. Assertion of this signal disables the 12V hot swap controller thereby disabling power to the Rack Manager.
- RM_BOOTSTRAP – Output to the Rack Manager. Assertions of this signal sets the SYSBOOT settings on the Rack Manager changing the primary boot device to the network.

3.2.6 Throttle Control Inputs

The RMM shall support twoRJ45 connectors for receiving throttle inputs from current meters in the data center. The connectors are expected to support cabling from current meters located at the data center maintenance zone (DC) and row levels.

DC throttle signals are as follows:

- DC_THROTTLE# - Input to the Rack Manager that communicates data center maintenance zone throttle status. When asserted, the Rack Manager should assert its THROTTLE# output.
- DC_PRESENT# - Input to the Rack Manager that communicates physical presence of a current meter at the DC level.

Row throttle signals are as follows:

- ROW_THROTTLE# - Input to the Rack Manager that communicates row throttle status. When asserted, the Rack Manager should assert its THROTTLE# output.
- ROW_PRESENT# - Input to the Rack Manager that communicates physical presence of a current meter at the Row level.

3.2.7 Throttle Control Logic

The DC and Row throttle signals shall be logically AND to drive the throttle input to the Rack Manager. The signals shall also be available at a PCA9535 so that when a throttle event occurs, the Rack Manager can determine the source of the event. The circuitry shall also contain a 2:1 mux so that the throttle logic can bypass the processor on the Rack Manager. The design shall guarantee that throttle is not asserted when the cables are removed.

The RMM shall buffer and output the throttle signal on 24 RJ45 connectors. The circuitry shall include logic to enable bypassing the ARM processor. A block diagram is shown in Figure 5.

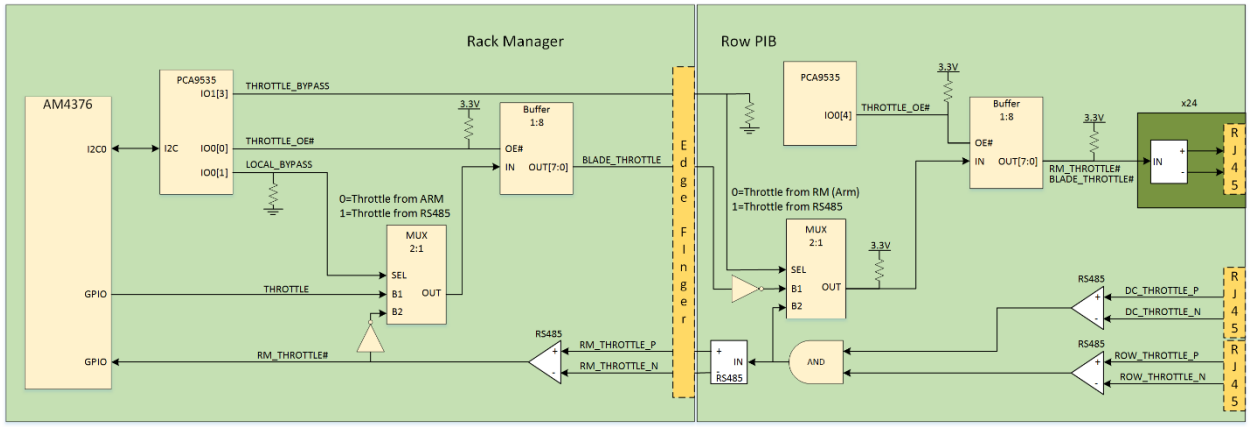

Figure 5. Throttle Block Diagram

3.2.8 Bootstrap Logic

The RM_BOOTSTRAP signals are derived from the lower 24 bits of the Rack Manager BLADE_EN# signals. When asserted low by the processor, RM_BOOTSTRAP will alter the default boot device of a Rack Manager endpoint setting its boot device to network. Note that the signal is inverted on the ROW PIB by cross wiring the +/- signals to the RJ45 connector. This enables that RM_BOOTSTRAP is high by default (during Rack Manager boot) ensuring that the Rack Manager endpoint boots from its local device by default.

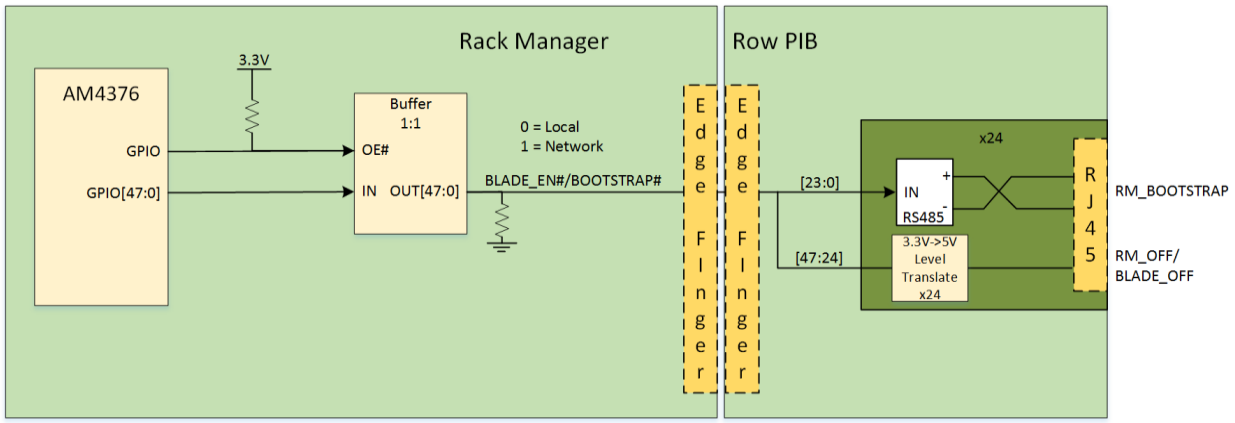

Figure 6. Bootstrap Block Diagram

3.2.9 Board interface ID

The PIB shall properly set the Board Interface ID to 3'b001 to communicate to the RM that the interfacing board is a Non-WCS Interface Board.

3.2.10 12V Power Connector

The board shall include a 12V connector for power on and benchtop support. This connector is not required for production.

3.3 Connector Pinouts

3.3.1 RJ45 for UART with HW Flow Control

The RMM shall support one RJ45 connector for interfacing with UARTs with hardware flow control. This is primarily intended for communication with the Digi which incorporates a pinout in which TX/RX signals are swapped. The connector pinout is shown in Table 2.

Table 2. RJ45 Pinout - UART with HW Flow Control

Pin #	Signal	I/O	Voltage	Description
1	RTS	O	RS232	Ready to Send
2	DTR	O	RS232	Data Transmit Ready
3	TXD	O	RS232	Transmit Data
4	GND	I	0V	GND
5	NC			No Connect
6	RXD	I	RS232	Receive Data
7	DSR	I	RS232	Data Set Ready
8	CTS	I	RS232	Clear to Send

3.3.2 RJ45 for UART without HW Flow Control

The RMM shall support one RJ45 connectors for interfacing with UARTs without hardware flow control. This is primarily intended for communication with devices using a standard RJ45 UART pinout. The connector pinout is shown in Table 3. Hardware flow control signals are connected tied together at the connector. This enables a SW flow control port on the RM to communicate with select HW flow control end points.

Table 3. RJ45 Pinout - UART without HW Flow Control

Pin #	Signal	I/O	Voltage	Description
1	CTS		RS232	Ready to Send. Connect to CTS (0 ohm resistor)

2	DSR		RS232	Data Terminal Ready. Connect to DSR (0 ohm resistor)
3	RX	O	RS232	Transmit Data
4	GND	I	0V	GND
5	NC			No Connect
6	TXD	I	RS232	Receive Data
7	DSR		RS232	Data Set Ready. Connect to DTR (0 ohm resistor)
8	DTR		RS232	Clear to Send. Connect to RTS (0 ohm resistor)

3.3.3 RJ45 for DC Throttle Control (Input)

The RMM shall support one RJ45 connectors for enabling external control of the Rack Manager power and boot state. The connector pinout is shown in Table 6.

Table 4. RJ45 Pinout – RMM Power/Boot Control

Pin #	Signal	I/O	Voltage	Description
1	DC_THROTTLE+	I	RS485	Set rack to throttle mode
2	DC_THROTTLE-	I	RS488	Set rack to throttle mode
3	RM_BOOTSTRAP+	I	RS485	Sets receiving RM to boot from network
4	DC_PRESENT#	I	0V	0 = DC monitor present (maintenance zone)
5	NC			No Connect
6	RM_BOOTSTRAP-	I	RS485	Sets receiving RM to boot from network
7	GND	I	0V	No Connect
8	RM_OFF	I	5V	Disables RM 12V HSC

3.3.4 RJ45 for Row Throttle Control (Input)

The RMM shall support one RJ45 connectors for enabling external control of the Rack Manager power and boot state. The connector pinout is shown in Table 6.

Table 5. RJ45 Pinout – RMM Power/Boot Control

Pin #	Signal	I/O	Voltage	Description
1	ROW_THROTTLE+	I	RS485	Set rack to throttle mode
2	ROW_THROTTLE-	I	RS488	Set rack to throttle mode
3	NC	I		No Connect
4	ROW_PRESENT#	I	0V	0 = Row monitor present
5	NC			No Connect
6	NC	I		No Connect
7	GND	I	0V	Ground
8	NC	I		No Connect

3.3.5 RJ45 for Rack Manager Power and Boot Control (output)

The RMM shall support 24 RJ45 connectors for controlling power and boot state of external Rack Managers and Blades. The connector pinout is shown in Table 6.

Table 6. RJ45 Pinout – Rack Manager Power/Boot Control

Pin #	Signal	I/O	Voltage	Description
1	RM_THROTTLE+	O	RS485	Set rack to throttle mode
2	RM_THROTTLE-	O	RS485	Set rack to throttle mode
3	RM_BOOTSTRAP+	O	RS485	Sets receiving RM to boot from network
4	RM_PRESENT#	I	3.3V	Indicates Rack Manager is present
5	BLADE_PRESENT#	I	3.3V	Indicates Blade is present
6	RM_BOOTSTRAP-	O	RS485	Sets receiving RM to boot from network
7	GND	I	0V	Ground
8	RM_OFF	O	5V	Disables RM 12V HSC

4 Mechanical Specifications

This specification describes key mechanical elements of the RMM.

4.1 Mechanical Dimensions

Mechanical Dimensions are shown in Figure 4.

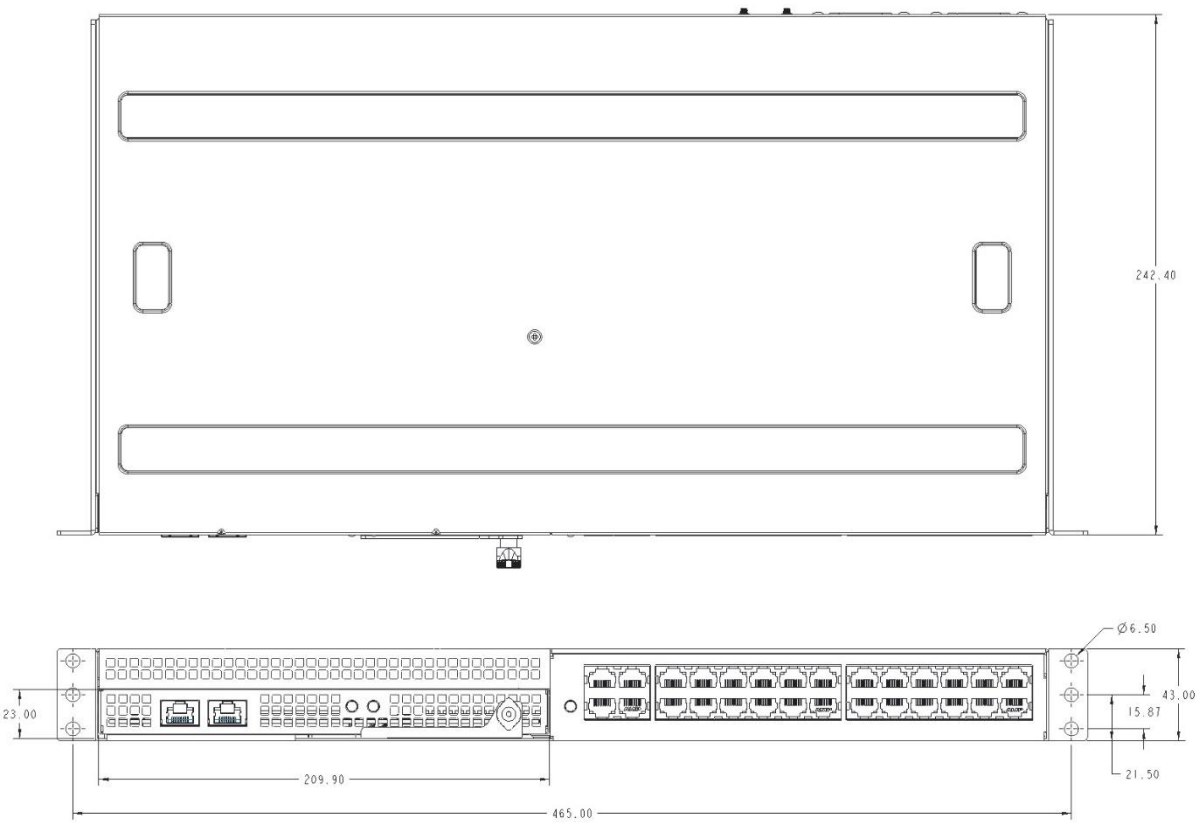

Figure 4. Mechanical Dimensions

4.2 Thermal

The RMM shall operate within a standard 19” rack with 45 degrees ambient with no active cooling.