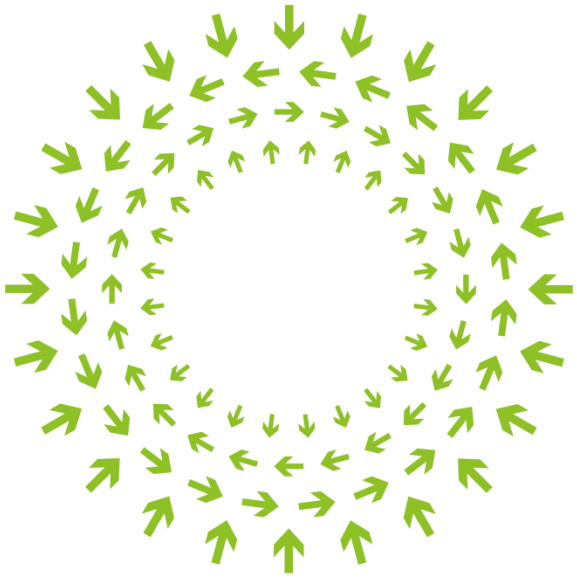

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Project Olympus Power and Management Distribution Unit Specification

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Revision History

Date	Description
11/01/2017	Version 1.0 Ready for Project Olympus github

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Contents

Figures

List of Tables

Table 1. List of Specifications

Specification title	Description
Overview	Explains the guiding principles used for the design of the NGCS system.
Architecture	Details the NGCS Sub assembly, and Rack.
Hardware: Rack	Describes the hardware used in the NGCS system, including the rack, tray, and systems management.
Hardware: Purley Motherboard	Describes the Purley motherboard used in the NGCS system, including Sub assembly hardware and Sub assembly management.
Software: Architecture	Describes the architecture of the software used in the NGCS system, including the software requirements and systems management.
Software: Rack Manager CLI	Describes the Rack Manager command-line interface (CLI).
Software: Rest API	Describes the Rack Manager user interface access and security features, and then describes Rest API.
Software: Sub assembly API	Details the application programming interface (API) of the Sub assemblies used in the **NGCS** system
BIOS Implementation Guide	Describes the BIOS implementation requirements.
Hardware: RACK MANAGER	Describes the Fan and Rack Manager for the NGCS E2000 system.
Hardware: PMDU	Describes the PMDU for the NGCS E2000 system.

This document is intended for designers and engineers who will be building server solutions for a NGCS system.

1 Overview of the Project Olympus Power and Management Distribution Unit (PMDU) Specification

This document describes the Project Olympus Power and Management Distribution Unit (PMDU).

The PMDU is a sheet metal enclosure that mounts to the E2000 rails without the use of tools, and provides front-facing, blind-mate connectors having both power and signal contacts for each sub assembly U. As E2000 sub assemblies are inserted in the rack, they plug into the PMDU via the hotplug blind-mate connectors.

The PMDU shall have two Universal input bulkhead mount connectors for VAC Feed A and VAC Feed B. The Universal connector is a 7-pin connector comprised of earth ground and 3 phase pairs rated at 250VAC 50VAC per pair. The Universal connectors are both 4 wire and 5 wire facility cable assemblies at the desired voltage and amperage rating. The PMDU take both the VAC Feed A and VAC Feed B and distributes the 6 phase pairs to each sub-assembly.

The PMDU also monitors and reports the voltage, current and power for each of the 6 phase pairs. The PMDU shall be able report values to the management system. The management system shall issue a threshold value and the PMDU shall compared measured values to the assigned threshold and changing states of discrete outputs from the PMDU to the management system when thresholds are exceeded on each phase.

The PMDU shall come in two sizes, 42U and 48U. The facility to Universal connector shall come in three options: 5 Wire 415VAC 30A/32A, 4 Wire 208VAC 50A, and 4 Wire 208VAC 30A.

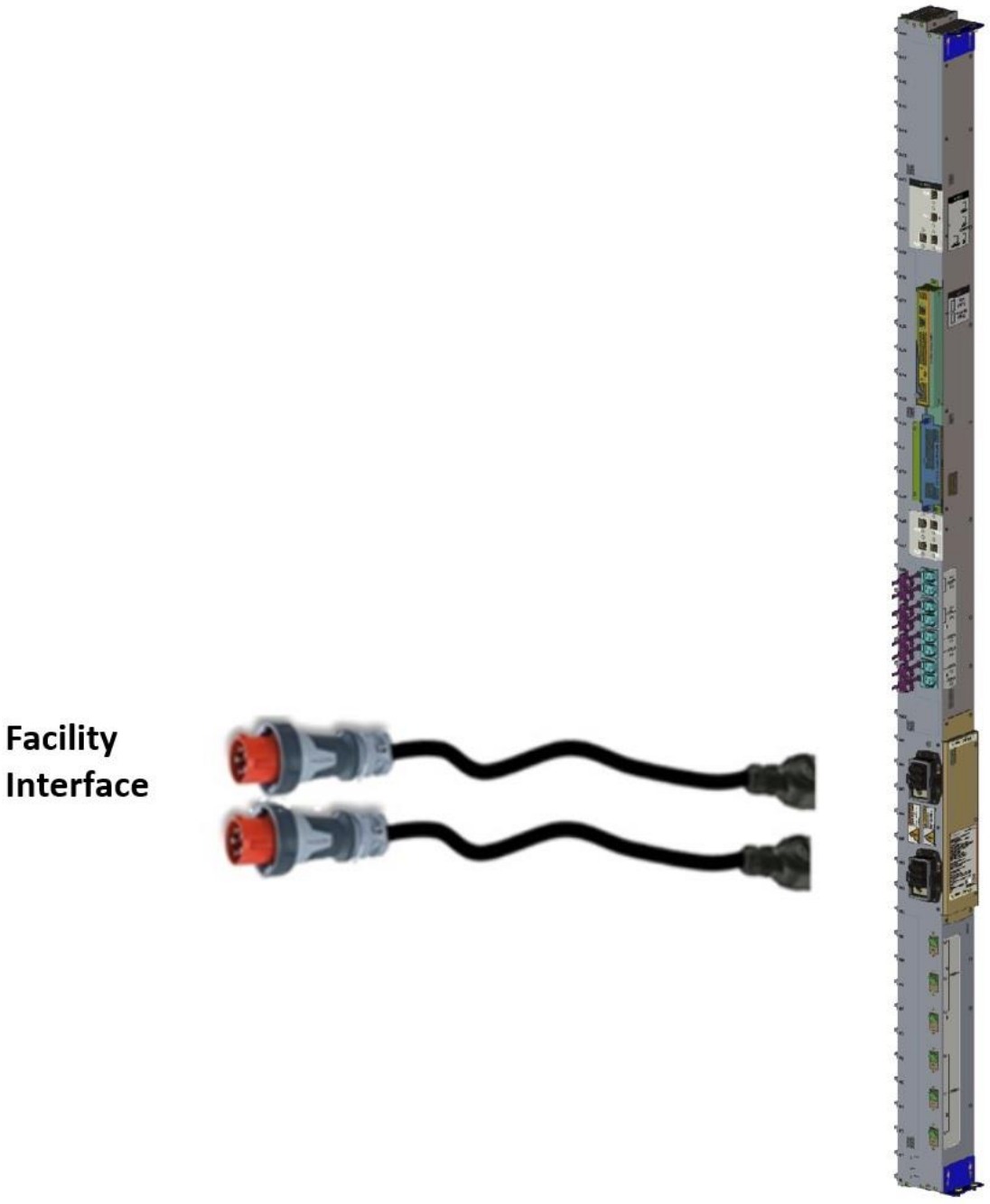


Figure 1. PMDU General Layout

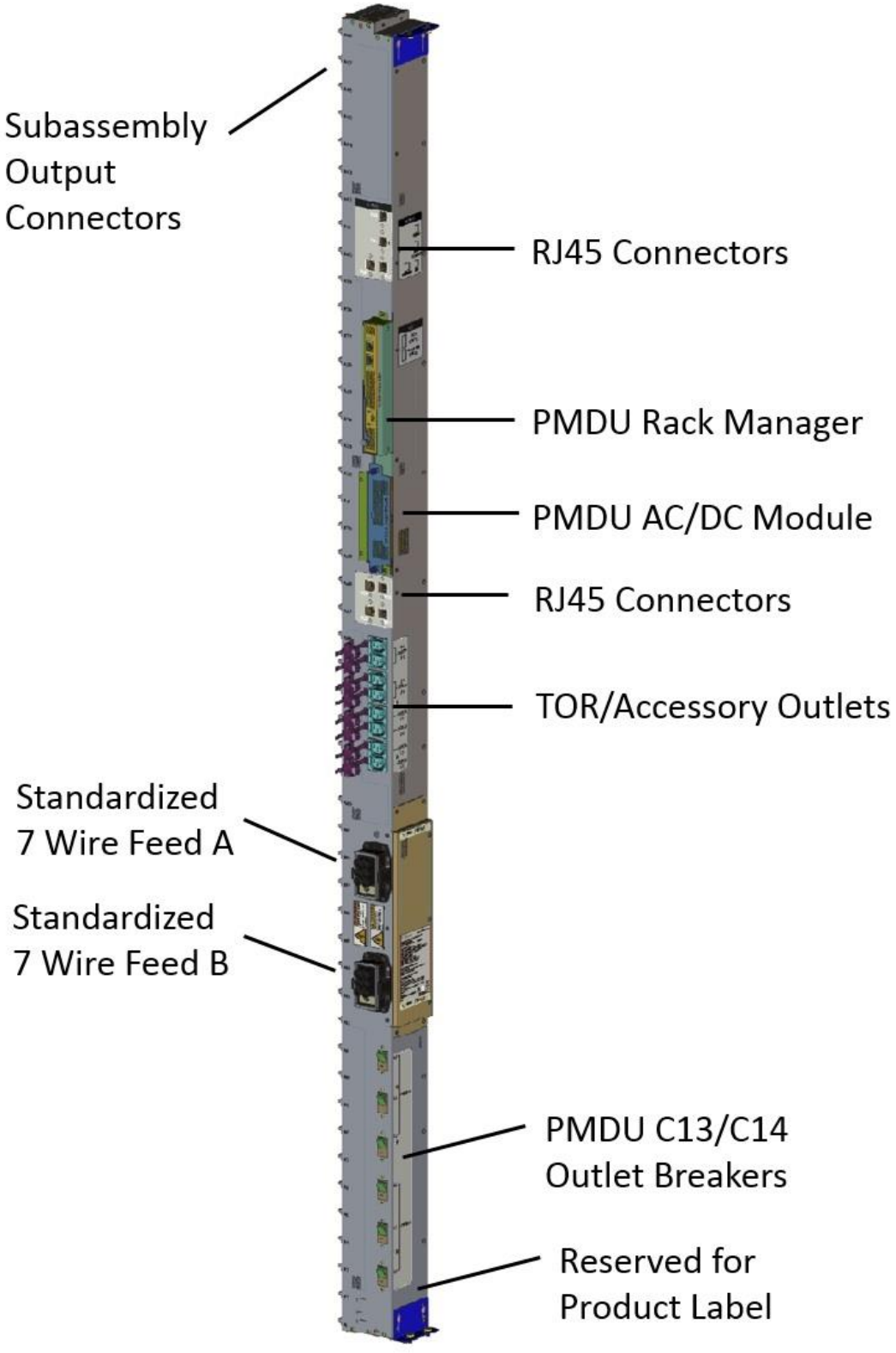


Figure 2. PMDU General Description

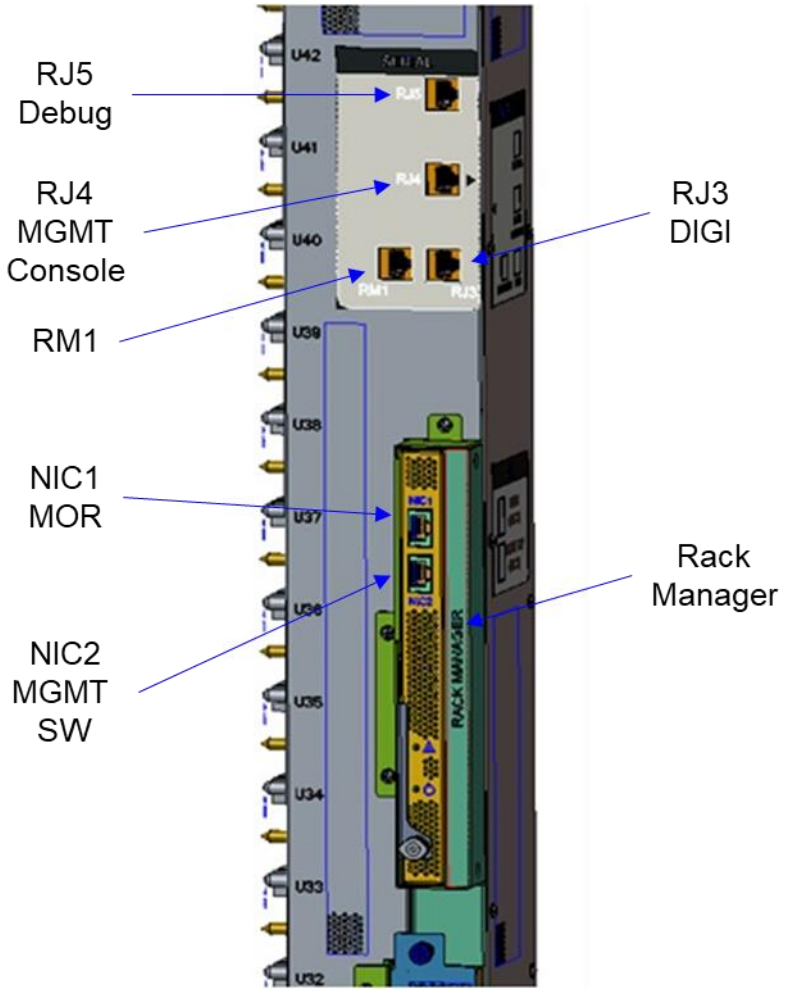


Figure 3. PMDU General Description, Rack Manager and RJ45 Network Ports

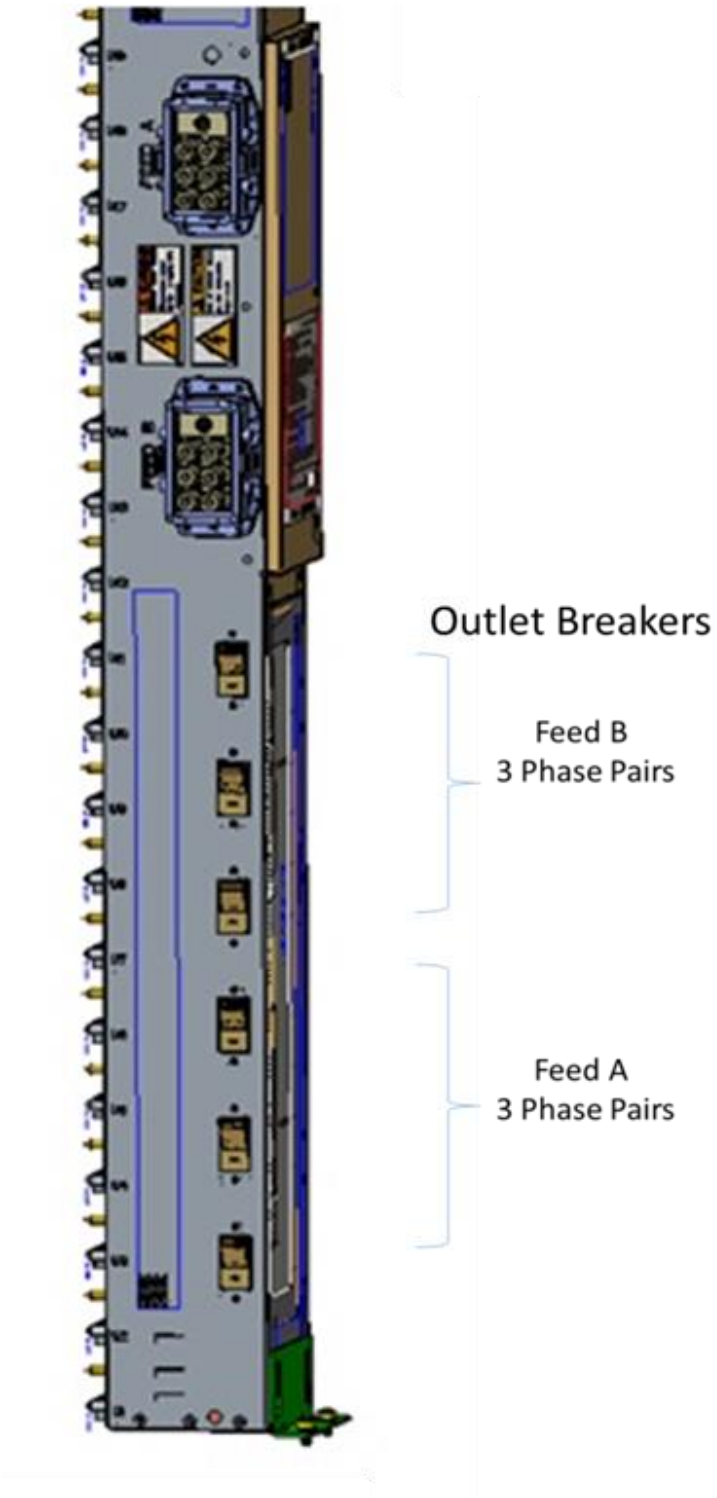


Figure 4. PMDU Outlet Breaker Identification and Location

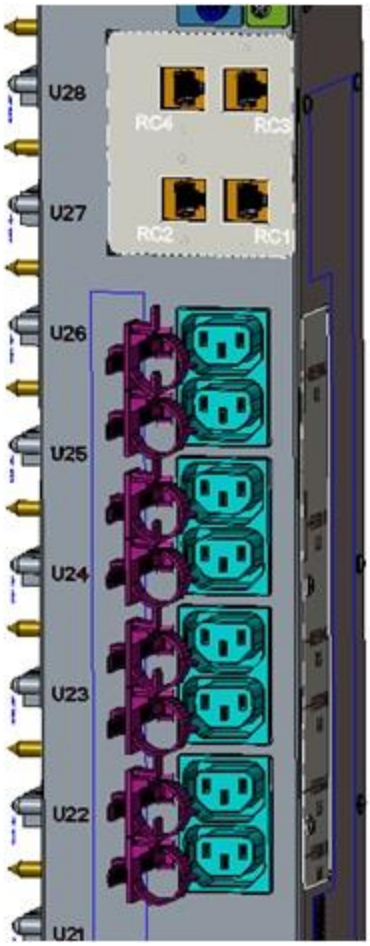


Figure 5. PMDU Outlet and RJ45 Relay Control Location

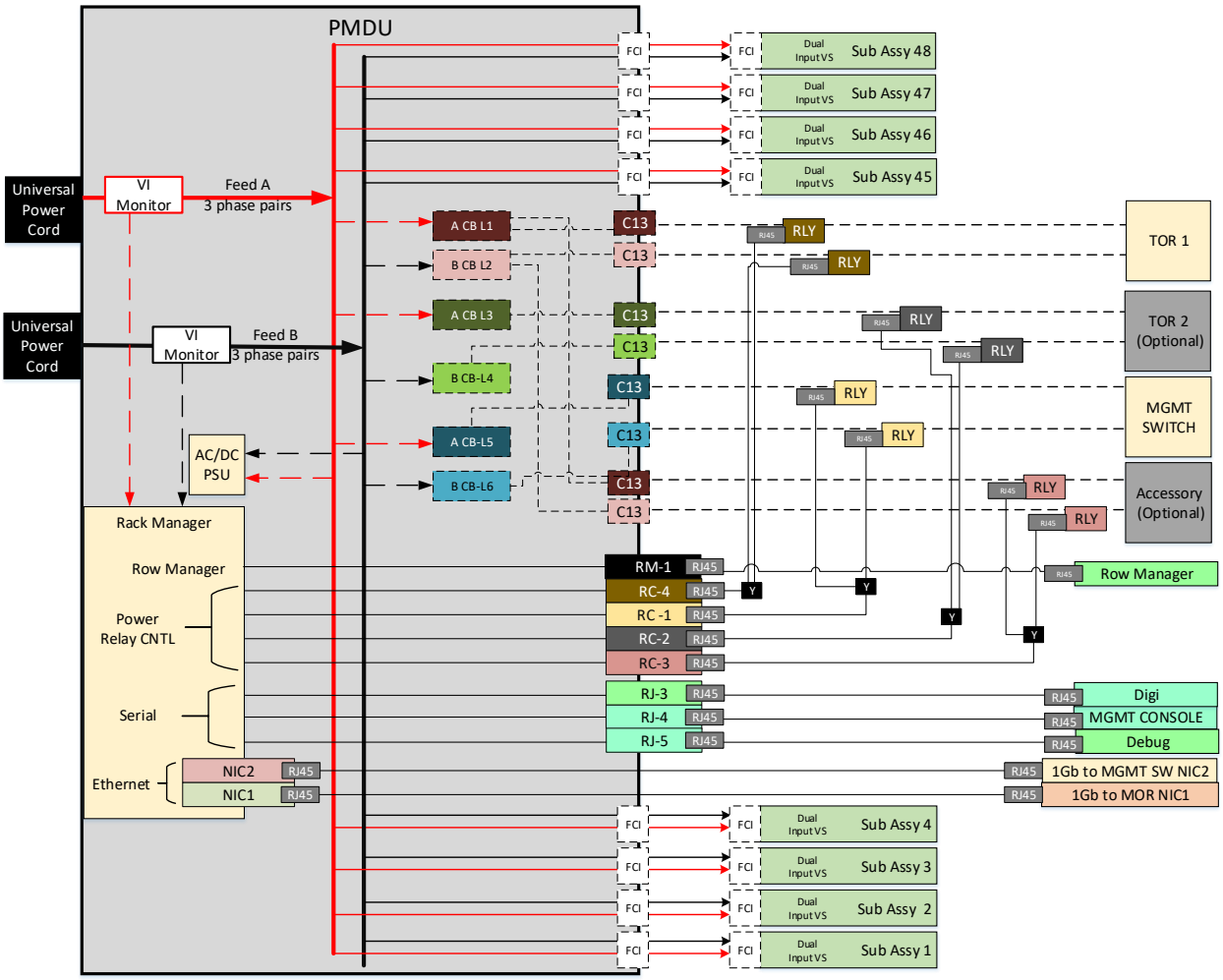


Figure 6. PMDU Power Distribution Functional Block Diagram

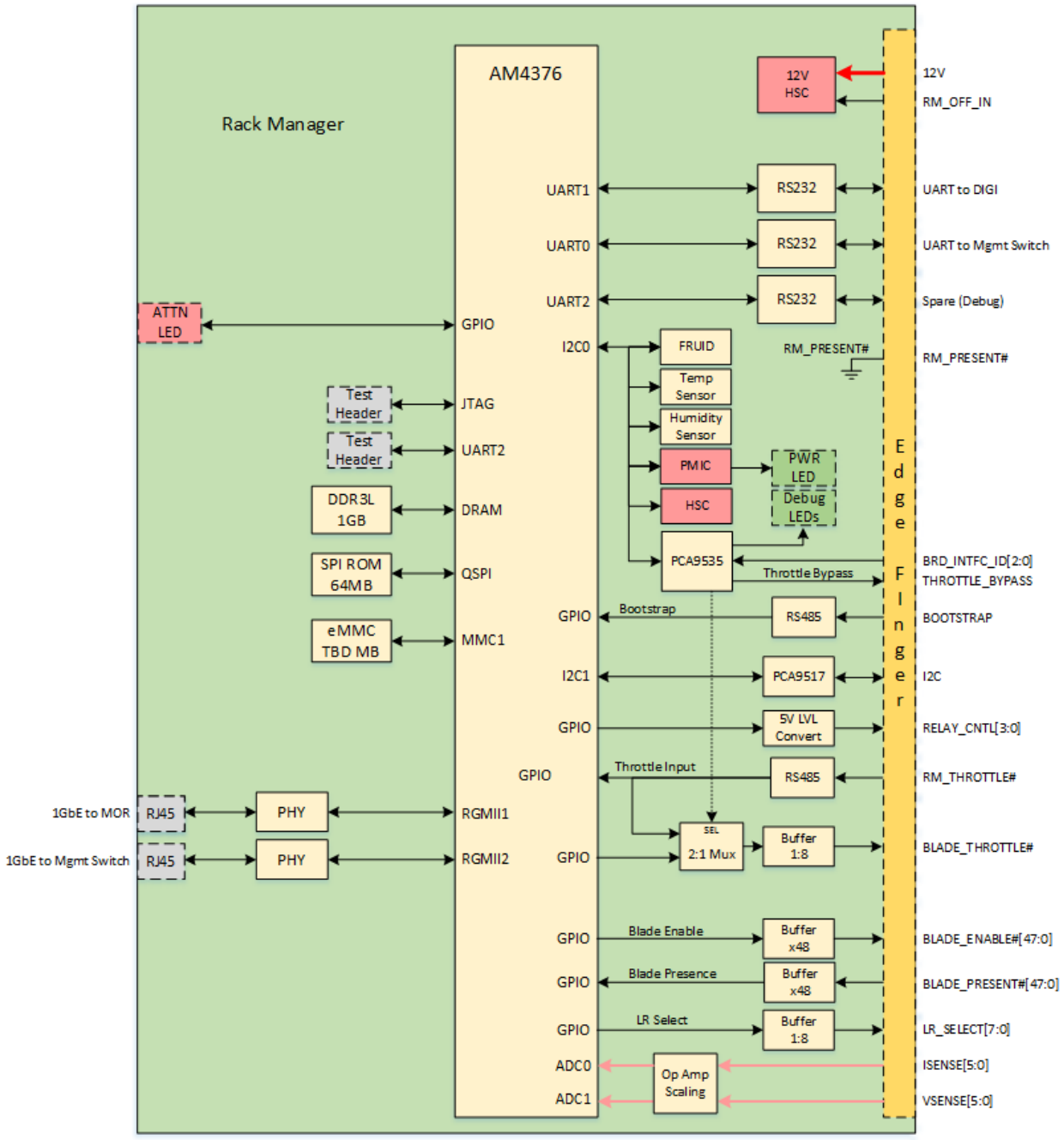


Figure 7. PMDU Rack Manager Functional Basic Block Diagram. See Specification for detail.

2 PMDU Electrical

2.1 AC/DC Power Supply Module

The PDMU shall have a hot swappable AC/DC module to power internal monitoring and Rack Manager. The PDMU shall be dual input from a single from VAC Feed A and B. The PSU shall not cause a secondary failure or outage as result of single fault in the unit.

The AC/DC Module shall not radiate or conduct emissions greater than applicable requirements.

2.1.1 Voltage, Current, and Frequency

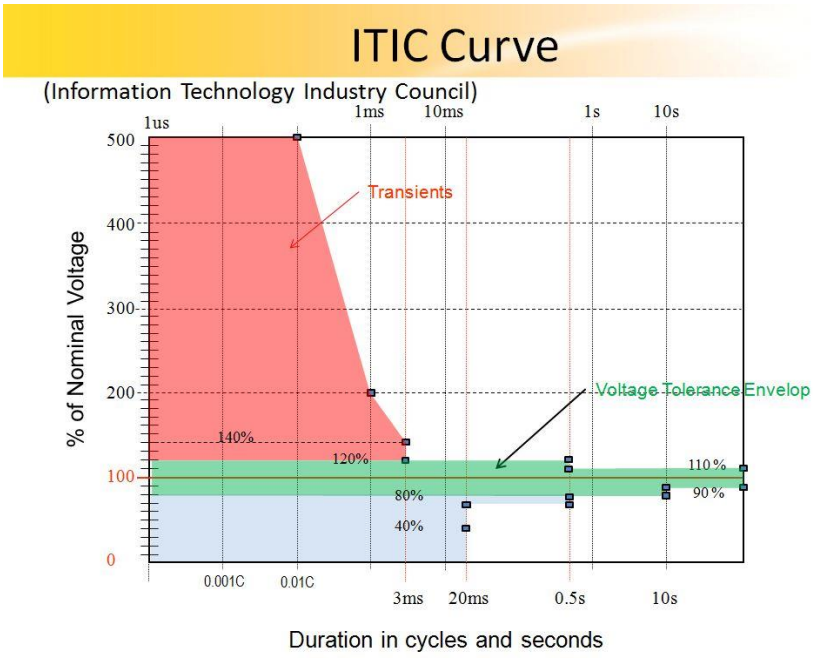
The individual phase power supplies shall operate within all specified limits over the following input voltage range as defined in Table 2.

Table 2. AC Input Rating

Parameter	Min	Rated	Max	20WPSU max input current at min V_{rms}
Voltage	180 V_{rms}	200-240 V_{rms}	264 V_{rms}	TBDA_{rms}
Frequency	47 Hz		63 Hz	

2.1.2 PSU Hold-Up Time ITIC Requirement

The power supply shall run without interruption when exposed to any of the power variations of up to 20mS zero voltage outage. At 20mS the voltage shall be greater than 180VAC. The 70% and 80% voltage sag does not apply as shown in the ITIC curve below. The transient portion of the chart depicted in red shall be instead as specified EN61000-4-4 Electrical Fast Transients and EN61000-4-5 Electrical Surge, 2000V L-PE, 1000V L-L.



2.1.3 Harmonic Susceptibility

Harmonic distortion of up to 10% THD must not cause the power supply to go out of specified limits. The power supply shall be capable of start-up (power-on) with full rated power load, at line input as low as 180VAC.

The power supply internal circuitry shall limit maximum input current to 150% max rated at all input and operating ambient conditions and output fault conditions.

2.1.4 Modified Sine Waves

The power supply shall operate when the AC input is a variant of a sine wave such as from a UPS. The output shall remain within regulation under all load conditions under modified sine wave. Under conditions below the power supply may disable the output:

- Rise time on the input exceeding 2V/us
- Input voltage zero crossing lasting greater than 4 ms.
- Peak of the modified sine wave voltages consistently exceeding 375V

Under modified sine wave conditions, the power supply does not need to meet conducted EMI limits and harmonics.

2.1.5 Harmonic Emissions

Not Applicable

Table 3. THD Requirements

Output load (% of max output load)	Maximum ITHD (%)
5-15	
15-30	
30-100	

2.1.6 Line Transient

The power supply shall operate within specifications under the following conditions:

- Transients as defined in IEC 61000-4-4.
- Transients as defined in IEC 61000-4-5.
  (Up to and including ±2 kV limits and phases 0^o, 90^o, 180^o, and 270^o.

2.1.7 Electrostatic Discharge Susceptibility

The power supply shall withstand the following ESD conditions at any point on the power supply enclosure.

- ±15 kV air discharge with no abnormal operation or damage to power supply
- Transients as defined in IEC 801-2

The storage capacitance shall be 150 pF and the discharge resistance shall be 330 ohms. The power supply shall meet all discharge requirements for the CE Mark designation.

2.1.8 Fast Transient Burst

The power supply shall comply with the limits defined in EN55024: 1998/A1: 2001/A2: 2003 using the IEC 61000-4-4: Second edition: 2004-07 test standard and performance criteria B defined in Annex B of CISPR 24.

2.1.9 Radiated Immunity

The power supply shall comply with the limits defined in EN55024: 1998/A1: 2001/A2: 2003 using the IEC 61000-4-3: Edition 2.1: 2002-09 test standard and performance criteria A defined in Annex B of CISPR 24.

2.1.10 Surge Immunity

The power supply shall be tested with the system for immunity to AC Unidirectional wave; 2kV line to ground and 1kV line to line, per EN 55024: 1998/A1: 2001/A2: 2003, EN 61000-4-5: Edition 1.1:2001-04. The pass criteria include: No unsafe operation is allowed under any condition; all power supply output

voltage levels to stay within proper spec levels; No change in operating state or loss of data during and after the test.

2.1.11 Efficiency

The power supply shall meet the efficiency of TBD at it typical operating range.

2.1.12 AC Line Fuses

The AC Line Fuses shall be acceptable for all safety agency requirements. The fuse shall not blow unless component failure is encountered. The fuses shall not blow under all line and load conditions.

The AC Line Fuses shall be rated appropriately to prevent nuisance blows.

2.1.13 VAC Input fuse rating, interrupt capacity, maximum fuse rating.

Each phase shall have two input fuse, one per line. The input fuse shall be a fast blow with greater than 1.5KAIC interrupt capacity no greater than TBDA maximum.

2.1.13.1 AC/DC Module Hot Swappable

The AC/DC Module shall be hot swappable without interruption to the PDMU and Rack Manager as intended.

2.1.14AC/DC Module connector

Power Pin	
Pin Number	Description
A6	Source B_Neutral Pin
A9	Source B_Line Pin
D6	Source A_Neutral Pin
D9	Source A_Line Pin
Signal Pin	
Pin Number	Description
A1	PSUA_Good Pin
A2	PSUB_Good Pin
A3	+3V3

B1	I2C_SDA
B2	GND
B3	+12V
C1	GND
C2	GND
C3	+12V
D1	I2C_SCL
D2	GND
D3	+12V

2.1.15AC/DC Module Output Power and Voltage

2.1.15.1 AC/DC Module Setpoint

The voltage setpoint shall be as specified in below table.

Parameter	Min	Set point nominal	Max	Units	Current (A)
+12.4V	11.7V	12.40	13.1V	Vrms	1.613

2.1.15.2 AC/DC Module DC Regulation

The regulation output (+12.0V) must stay within regulation +/-5% when operating at all load and input line voltages across the ambient temperature limits under steady state conditions.

2.1.15.3 AC/DC Module DC Ripple and Noise

The maximum allowed ripple/noise output of the power supply is defined in 120mVp-p. This is measured under 20MHz bandwidth at the power supply output connectors. A 10uF tantalum capacitor in parallel with a 0.1uF ceramic capacitor is placed at the point of measurement.

2.1.15.4 AC/DC Module DC Dynamic Load Step

The output voltages shall remain within Dynamic voltage limits specified for the step loading. The load transient repetition rate shall be 50Hz at duty cycles 50%. The load transient is set as Low

Load=0.1613A(10% load)@10ms,High load=1.613A(100% load)@10ms, rise rate=1A/usec ,fall rate=1A/usec. Dynamic voltage limits are 11.70VDC-13.1VDC.

2.1.15.5 AC/DC Module DC Capacitive Output requirement

The power supply shall be stable and meet all requirements with the following capacitive loading ranges.

Output	Min	Max	Units
+12.4V	33	1000	uF

2.1.15.6 AC/DC Module DC Protection Circuits

2.1.15.6.1Over Current Limit (OCL)

The power supply shall provide limited output current to the load for protecting the power supply from damage under indefinite over load conditions. OCL shall be set between 1.8A and 3.0A% of rated output current.

2.1.15.6.2Over Voltage Protection (OVP)

The power supply over voltage protection shall be shut down upon an over voltage condition. Latch off is not required. Over voltage is range is TBD.

2.1.15.6.3Over Temperature Protection (OTP)

The power supply shall be protected against over temperature conditions caused by loss of cooling or excessive ambient temperature which could cause internal part failures. In an over-temperature condition the PS shall shutdown protecting itself. When the temperature drops to within safe operating limit for internal parts, the power supply shall restore power automatically.

2.1.15.7AC/DC Module Grounding

The output ground of the pins of the power supply provides the output power return path. The output connector ground pins shall be connected to the safety ground (power supply enclosure). This grounding should be well designed to ensure passing the max allowed Common Mode Noise levels.

2.1.16AC/DC Module LED Indicator

This green LED is driven by internal circuitry and will illuminate GREEN whenever in an VAC input good and VDC output is good.

2.1.17AC/DC Module Mechanical Specification

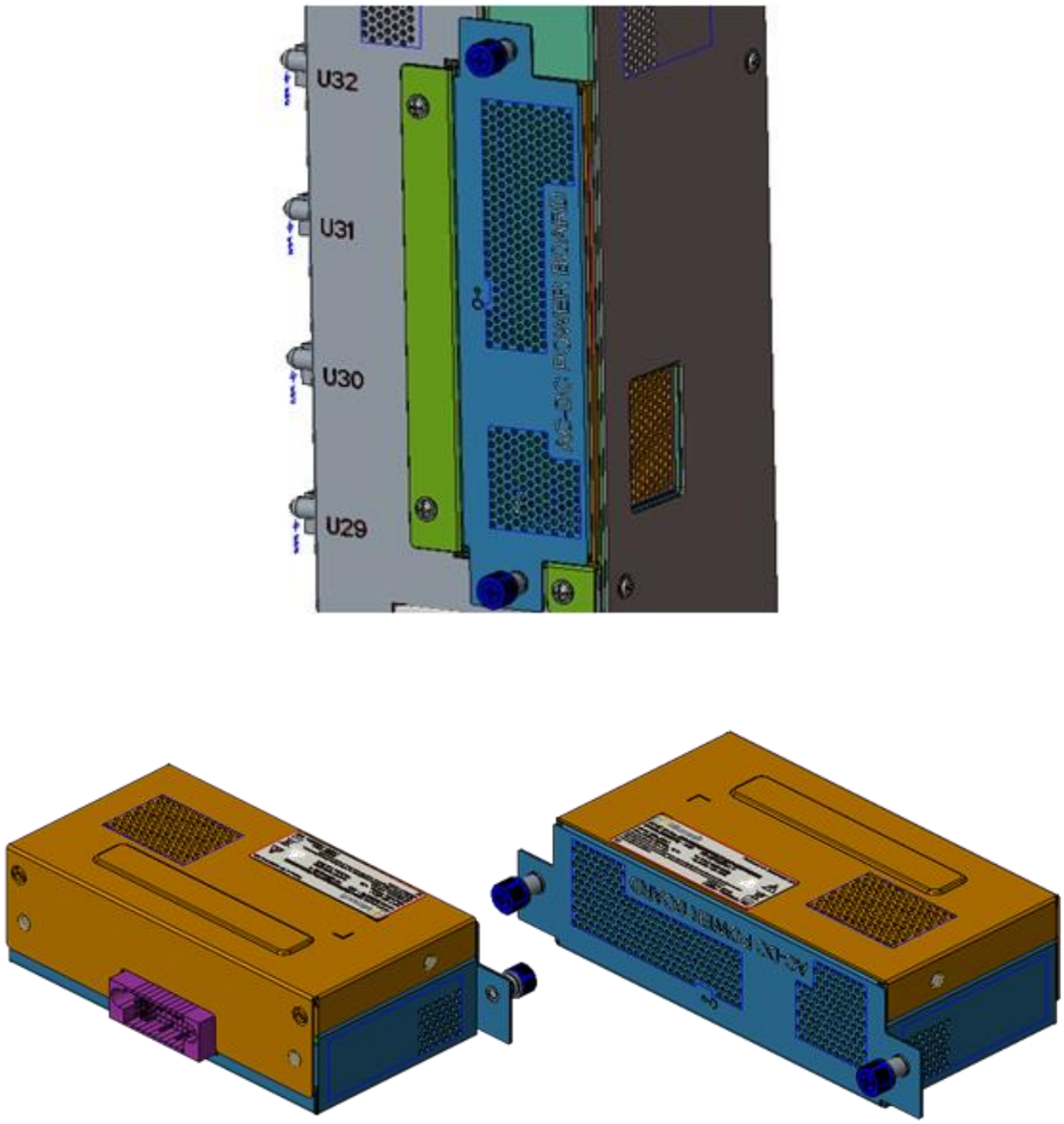


Figure 8. AC-DC Module

2.2 VAC Outlets and Overcurrent Protection

The PMDU shall provide 8 outlets with 4 outlets from feed A and feed B. The PMDU shall provide six 250VAC 10kAIC 13A breakers. Each breaker shall protect two outlets as identified in Figure 6. PMDU Power Distribution Functional Block Diagram

2.3 Power monitoring requirements.

2.3.1 PMDU

The Rack Manager in the PMDU shall be capable to report Voltage, Current, and Volt-Amps values at single and three phase units of measure at the input of the PMDU. The PMDU shall translate the threshold command to the three phases and independently calculate and report phase values as well as three phase sum.

Maximum vTHD for measurement shall be 5% or less.

Nominal vTHD for measurement shall be 1.5% or less.

See the latest revision of the Windows Cloud Server System Specification M2010 Rack Manager software spec for sample rate, measurement period, details and tolerances of voltage and current monitoring.

2.3.2 PMDU Rack Manager Firmware Update Requirement

The PDMU Rack Manager shall be capable of receiving firmware revision updates from the management switch via Ethernet normal operation. The PMDU Rack Manager shall communicate to the management switch via RJ-4.

2.4 Electrical Interconnect Details

2.5 Universal VAC Input Plugs and Cables 4 Wire and 5 Wire Cable Assy

2.5.1 Universal Cable Assembly Power and Current Rating

The PMDU uses different types of connectors for external connection to the facility.

Table 4. Power Requirements

Assy Part Number	Description	Nominal Voltage	Equipment Load Limit	
			Power	Current
73 42 200 0030	30A 5Wire 9AWG/6.63mm^2 NA	415VAC +/-10%	17.2kW	24A
	32A 5Wire 9AWG/6.63mm^2 EU	400VAC +/-10%		25A
73 42 200 0034	50A 4Wire 6AWG	208VAC +/-10%	14.4kW	40A
73 42 200 0032	30A 4Wire 9AWG	208VAC +/-10%	8.6kW	24A
TBD	30A 3Wire 9AWG	208VAC +/-10%	4.99kW	24A

2.5.2 Universal Cable Assembly Breaker Protection from facility

The 30A 4 Wire L21-30 and 50A 4 Wire CS8365 cord assy shall have 30A and 50A protection respectively with UL marking and conformity to UL 489, NEMA AB1, AB3 ANSI Std. C37.16, ANSI Std. C37.17, C37.50, IEEE® Std. C37.13, UL 1066 and the National Electrical Code suitable for products certified to U.S., Canadian, European and Japanese standards.

The 32A cord shall have 32A protection with CE marking with conformity to CE RCCB, 2014/35/EU, 2014/30/EU, 2011/65/EU, EN61008-1:2012+A:2014+A11:2015, and EN 61008-2-1:1994+A11:1998

2.5.3 Universal Cable Assembly Connector detail

See Microsoft Universal Power Cord specification XXX or latest version.

2.5.4 Universal PMDU Connector detail

The PDMU Shall provide bulkhead or panel mount connection to be mated with the Universal cable assembly described above. The cable retention clips shall reside on the 7 Wire Facility Cables not the PMDU bulkhead mount connector.

Table 5. Male Universal Connector Part Number

Connector Name/ Assy	QTY	Input Connector Part Number	Input Connector Description	Comment
7 pin male pin with plastic locking housing	2	73 42 200 0038:	Han-Eco bulkhead housing with plug modules	70A 1000V pin and safety ground pin

Standardize VAC connector, plug detail part numbers

Table 6. Male Universal Connector Part Number

73 42 200 0038: Han-Eco 10B bulkhead mounted housing, male modules, 6-16mm²

HARTING P/N	Description	QTY
19410103301	Han-Eco 10B bulkhead mounted housing, without levers	1 pc
09140022643	Han 70A axial module, male 6-16mm²	3 pcs
19410012700	Han-Eco PE module-f 16-6 AWG	1 pc

Table 7. PMDU Universal Connector Pin Assignments

Facility Cable Options		PMDU Pin Assignment		
4 Wire	5 Wire	Pin Assignment	Phase Description	
X	L1	A1	Phase A	
Y	L2	B1	Phase B	
Z	L3	C1	Phase C	
X	N	A2	Phase A	N
Y	N	B2	Phase B	N
Z	N	C2	Phase C	N
PE	PE	D1	Safety Protective Earth	

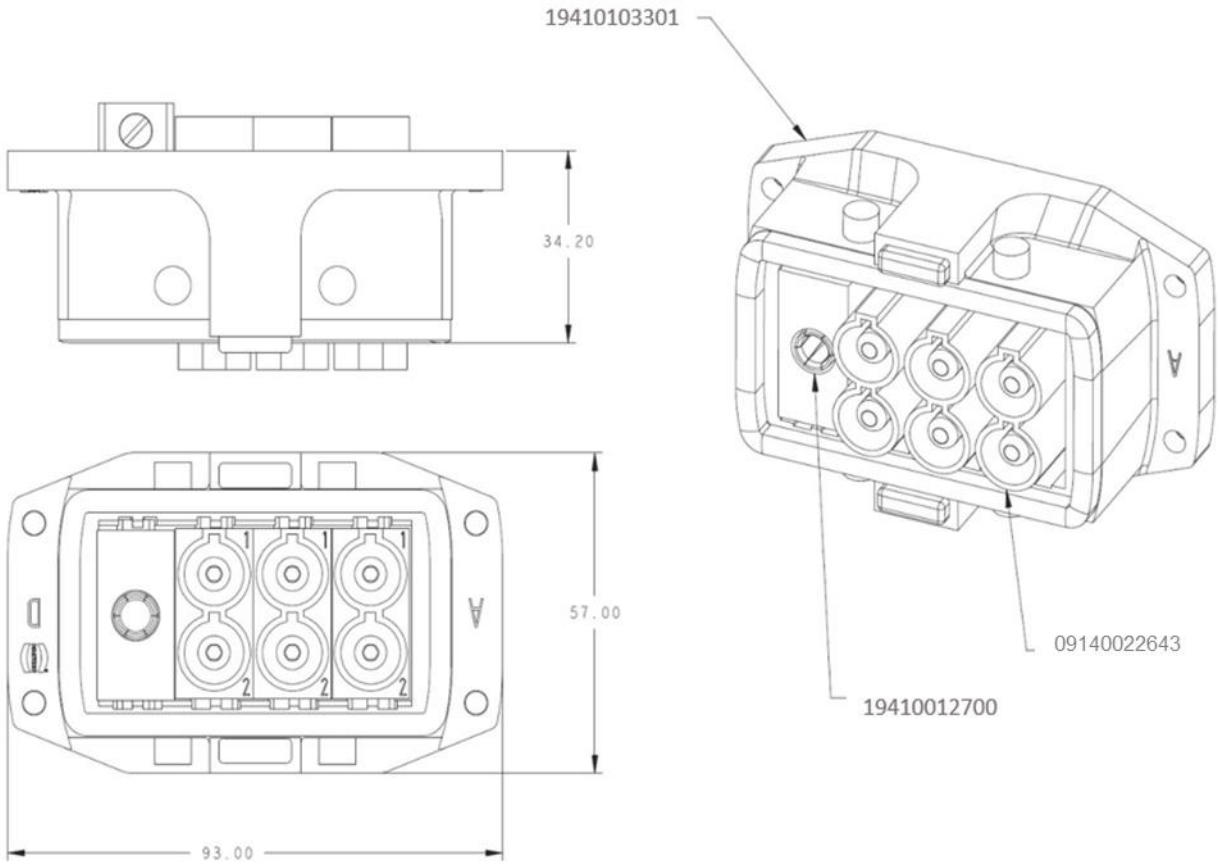


Figure 9. Functional Block Diagram of Standardized Cable plug pin number assignment orientation (note touch-proof male contacts and female ground contact)

2.5.5 Input Cable Assembly Detail

2.5.6 Cable Length

Not applicable.

2.5.7 Bend Radius

Not applicable.

2.6 PMDU Power Monitoring Connectors and Cables

N/A

2.7 Sub-assembly Allocated Output Power Current.

1035VA is the maximum allocated output power per sub-assembly output power connector. This assumes all six U positions are attached within a single distribution group. The maximum current per VAC pin is 2.5A in a non-faulted condition and 3.7A in single fault within a single distribution group. The net current of single distribution group shall not exceed 16A per pin in any condition.
The sub-assembly output power is limited by the rack elevation and loading under a single fault condition and device attached across the 6U single distribution group. Single distribution groups are defined at U1 through U6, U7-U12, U13-U18, U19-U24, U24-U30, U31-U36, U37-U42, and U43-U48. Within each distribution group, each VAC pin position shares a 16A per pin limitation with U positions. If all six U position pins are attached the 16A allocated evenly at 2.5A per pin.

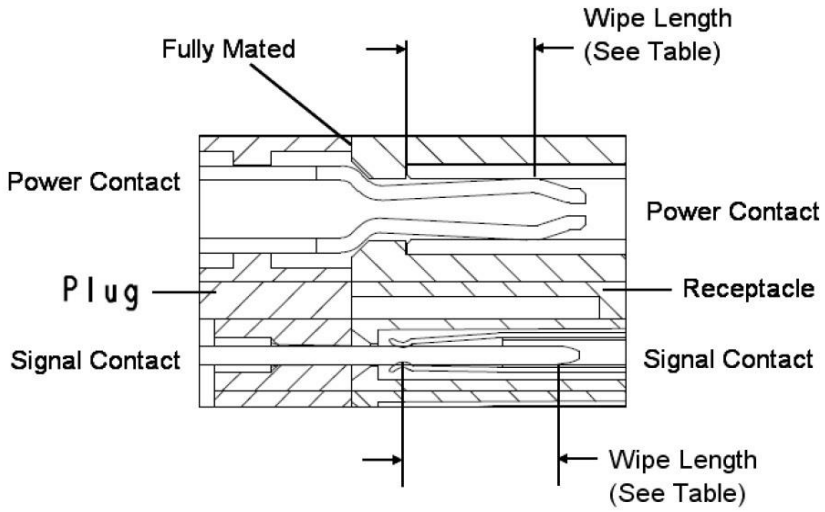
The sub-assembly output current pins are limited to a maximum of 16A per pin if only one output connector is attached in a given distribution group.

2.7.1 Sub-assembly Output Power and Signal

The sub-assembly power and signal connector shall be a FCI PwrBlade + part number 10106269-1C03001LF vertical PCB-mount receptacle. The FCI PwrBlade + series connectors have the following ratings (per EIA-364-20 unless indicated):

- High power contacts working voltage: 585Vrms, 32A
- High power contacts proof voltage: 2500Vrms
- High power contacts initial contact resistance: 10 milliohms (per IEC-364-23)
- Low power contacts working voltage: 585Vrms, 20A
- Low power contacts proof voltage: 1000Vrms
- Low power contacts initial contact resistance: 15 milliohms (per IEC-364-23)
- Signal contacts working voltage: 333Vrms
- Signal contacts proof voltage: 1000Vrms (per IEC-364-23)

The connector is configured with sequentially mating contacts, ground being the longest, power the second longest, and signal contacts the shortest. Wiping distances are as follows, with mating level 1 being safety ground, level 2 being power, and level 3 being signal. MFBL means ‘make first, break last’, and MLBF means ‘make last, break first’. See Table 12.



CONTACT	MATING LENGTH	MATING LEVEL	WIPE LENGTH (mm)
High Power	MFBL	1	5.30
Low Power	Standard	2	3.60
Signal	MLBF	3	2.00

Table 8. Contact Wiping Distances

The connector is blind-mate and will tolerate up to 1.91mm of misalignment in the X and Y direction (viewing mating face). It is a vertical-mount PCB connector and will be mounted on vertical boards inside the PMDU.

Wiring from the Universal connectors to the sub-assembly power and signal connector shall be different.

For the 42U PMDU, U positions 1 thru 24 the sub-assembly power and signal connector shall be in accordance with the Sub Assembly A-B Pin Assignment as show below. U positions 24 thru 42 the sub-assembly power and signal connector shall be in accordance with the Sub Assembly B-A Pin Assignment as show below.

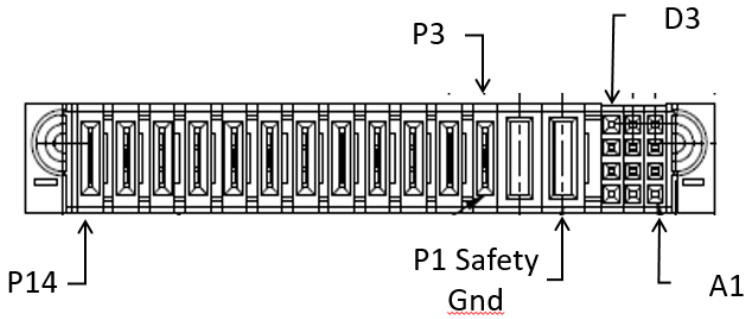


Figure 10. PMDU Subassembly Pinout Assignment Image

For the 48U PMDU, U positions 1 thru 24 the sub-assembly power and signal connector shall be in accordance with the Sub Assembly A-B Pin Assignment as show below. U positions 25 thru 42 or 48 the sub-assembly power and signal connector shall be in accordance with the Sub Assembly B-A Pin Assignment as show below.

Table 9. PMDU Sub-assembly connector pinout assignment positions C1 through C24 and C25 through 42 or 48

Universal 7 Wire Power Cable Connector to Sub Assy Definition

Universal Power Cable Connector Interface			PDMU Pin Definition	Feed A-B Sub Assy C 1-24 Interface
Feed A Universal Power Cable Connector Interface	250 VAC Pair	A1	Feed A -5 Wire and 4 Wire Phase A	P14
		B2	Feed A -5 Wire Neutral or 4 Wire Phase B	P13
	250 VAC Pair	B1	Feed A -5 Wire and 4 Wire Phase B	P10
		C2	Feed A -5 Wire Neutral or 4 Wire Phase C	P9
	250 VAC Pair	C1	Feed A -5 Wire and 4 Wire Phase C	P6
		A2	Feed A -5 Wire Neutral or 4 Wire Phase A	P5
	Safety Ground	D1	Safety Ground	P1
Feed B Universal Power Cable Connector Interface	250 VAC Pair	A1	Feed B -5 Wire and 4 Wire Phase A	P12
		B2	Feed B -5 Wire Neutral or 4 Wire Phase B	P11
	250 VAC Pair	B1	Feed B -5 Wire and 4 Wire Phase B	P8
		C2	Feed B -5 Wire Neutral or 4 Wire Phase C	P7
	250 VAC Pair	C1	Feed B -5 Wire and 4 Wire Phase C	P4
		A2	Feed B -5 Wire Neutral or 4 Wire Phase A	P3
	Safety Ground	D1	Safety Ground	P1
See the Rack manager specification for pin out destination			LR_SELECT	A1
			NODE_IDO	A2
			Analog Ground	A3
			NODE_ID1	B1
			NODE_ID2	B2
			NODE_ID3	B3
			BLADE_THROTTLE#	C1
			BLADE_ENDABLE#	C2
			BLADE_PRESENT#	C3
			PSKILL (SHORT PIN)	D1
			NODE_ID4	D2
			NODE_ID5	D3

Universal Power Cable Connector Interface			PDMU Pin Definition	Feed A-B Sub Assy C 25-C42/48 Interface
Feed A Universal Power Cable Connector Interface	250 VAC Pair	A1	Feed A -5 Wire and 4 Wire Phase A	P12
		B2	Feed A -5 Wire Neutral or 4 Wire Phase B	P11
	250 VAC Pair	B1	Feed A -5 Wire and 4 Wire Phase B	P8
		C2	Feed A -5 Wire Neutral or 4 Wire Phase C	P7
	250 VAC Pair	C1	Feed A -5 Wire and 4 Wire Phase C	P4
		A2	Feed A -5 Wire Neutral or 4 Wire Phase A	P3
	Safety Ground	D1	Safety Ground	P1
Feed B Universal Power Cable Connector Interface	250 VAC Pair	A1	Feed B -5 Wire and 4 Wire Phase A	P14
		B2	Feed B -5 Wire Neutral or 4 Wire Phase B	P13
	250 VAC Pair	B1	Feed B -5 Wire and 4 Wire Phase B	P10
		C2	Feed B -5 Wire Neutral or 4 Wire Phase C	P9
	250 VAC Pair	C1	Feed B -5 Wire and 4 Wire Phase C	P6
		A2	Feed B -5 Wire Neutral or 4 Wire Phase A	P5
	Safety Ground	D1	Safety Ground	P1
See the Rack manager specification for pin out destination			LR_SELECT	A1
			NODE_IDO	A2
			Analog Ground	A3
			NODE_ID1	B1
			NODE_ID2	B2
			NODE_ID3	B3
			BLADE_THROTTLE#	C1
			BLADE_ENDABLE#	C2
			BLADE_PRESENT#	C3
			PSKILL (SHORT PIN)	D1
			NODE_ID4	D2
			NODE_ID5	D3

2.8 Grounding and Return

The PMDU grounding shall be via power cord safety ground. The enclosure sheet metal shall not be used for signal or voltage return. Safety Ground/Safety Earth shall be attached in accordance with safety certification requirements.

2.9 RJ45 Connectors

The PMDU contains 8 RJ45 connectors for cabling to external devices with 2 additional RJ45 connectors located on the Rack Manager. Below is a summary of the RJ45 connectors and the use.

- MOR (NIC1)– Located on the Rack Manager. Supports 1GbE. Expected to connect to a Management Switch in the Middle of Row (MOR) rack.
- MGMT SW (NIC2) – Located on the Rack Manager. Supports 1GbE. Expected to connect to the Rack Manager Switch.
- RJ3 – Located on the PMDU. Supports HW flow control UART. Expected to connect to the UART DIGI in the MOR rack.
-
- RJ4 –Located on the PMDU. Supports SW flow control UART. Expected to connect to the Rack Management Switch (MGMT CONSOLE).
- RJ5 – Located on the PMDU. Supports SW flow control UART. Expected to be used as a DEBUG UART port.
- RC1 to RC4 – Located on the PMDU. Expected to connect to the AC relay cables.
- RM1 – Located on the PMDU. Expected to connect to a Stand-Alone Rack Manager Module located in the MOR rack.

2.9.1 RJ45 for UART with HW Flow Control (RJ3/DIGI)

The PMDU shall support one RJ45 connectors for interfacing with UARTs with hardware flow control. The connector pinout is shown in Table 10.

Table 10. RJ45 Pinout - UART with HW Flow Control

Pin #	Signal	I/O	Voltage	Description
1	RTS	O	RS232	Ready to Send
2	DTR	O	RS232	DSR
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	DTR
8	CTS	I	RS232	Clear to Send

2.9.2 RJ45 for UART without HW Flow Control (RJ4/MGMT Console, RJ5/DEBUG)

The PMDU shall support two RJ45 connectors for interfacing with UARTs without hardware flow control. The connector pinout is shown in Table 11. 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 11. RJ45 Pinout - UART without HW Flow Control

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

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

2.9.3 RJ45 for Rack Manager Power and Boot Control RM1

The PMDU shall support one RJ45 connectors for enabling external control of the Rack Manager power and boot state. The connector pinout is shown in Table 12.

Table 12. RJ45 Pinout – Rack Manager Power/Boot Control

Pin #	Signal	I/O	Voltage	Description
1	RM_THROTTLE+	I	RS485	Set rack to throttle mode
2	RM_THROTTLE-	I	RS485	Set rack to throttle mode
3	RM_BOOTSTRAP+	I	RS485	Sets receiving RM to boot from network
4	RM_PRESENT#	I	3.3V	Indicates Rack Manager is present
5	NC			No Connect
6	RM_BOOTSTRAP-	I	RS485	Sets receiving RM to boot from network
7	GND	I	0V	
8	RM_OFF	I	5V	Disables Rack Manager 12V HSC

2.9.4 RJ45 for AC Relay Control (RC-1, RC-2, RC-3, RC-4)

The PMDU shall support four RJ45 connectors for controlling cabled AC power to rack devices through an AC relay device. The RJ45 connectors used as a AC relay control output. The connector pinout is shown in Table 13.

Table 13. RJ45 Pinout – Rack Manager Power/Boot Control

Pin #	Signal	I/O	Voltage	Description
1	NC			No Connect
2	NC			No Connect
3	NC			No Connect
4	RELAY_CNTL	I	0V	Disables AC Power through relay
5	NC			No Connect
6	NC			No Connect
7	NC	I	0V	No Connect
8	P5V	I	5V	5V source

2.10 SLOT ID

The PMDU shall provide grounding of signal pins on the FCI connector to assign a separate slot identification code to each blade. The coding shall be as shown in Table 14.

Table 14. Slot ID

Blade	SLOT_ID[5:0]	Blade	SLOD_ID[5:0]
Blade 1	000000	Blade 25	100000
Blade 2	000001	Blade 26	100001
Blade 3	000010	Blade 27	100010
Blade 4	000011	Blade 28	100011
Blade 5	000100	Blade 29	100100
Blade 6	000101	Blade 30	100101
Blade 7	001000	Blade 31	101000
Blade 8	001001	Blade 32	101001
Blade 9	001010	Blade 33	101010
Blade 10	001011	Blade 34	101011
Blade 11	001100	Blade 35	101100
Blade 12	001101	Blade 36	101101
Blade 13	010000	Blade 37	110000
Blade 14	010001	Blade 38	110001
Blade 15	010010	Blade 39	110010
Blade 16	010011	Blade 40	110011
Blade 17	010100	Blade 41	110100
Blade 18	010101	Blade 42	110101
Blade 19	011000	Blade 43	111000
Blade 20	011001	Blade 44	111001
Blade 21	011010	Blade 45	111010
Blade 22	011011	Blade 46	111011
Blade 23	011100	Blade 47	111100
Blade 24	011101	Blade 48	111101

3 PMDU Mechanical Housing

3.1 General Construction

The PMDU housing shall be constructed of 1.2mm thick steel, having the dimensions shown in the figure below. Detailed dimensions on Microsoft drawing M1007740-001 (42U SKU) and M1007710-001 (48U SKU). The housing shall be coated to prevent rust and corrosion.

The PMDU shall be support 42U and 48U rack assemblies.

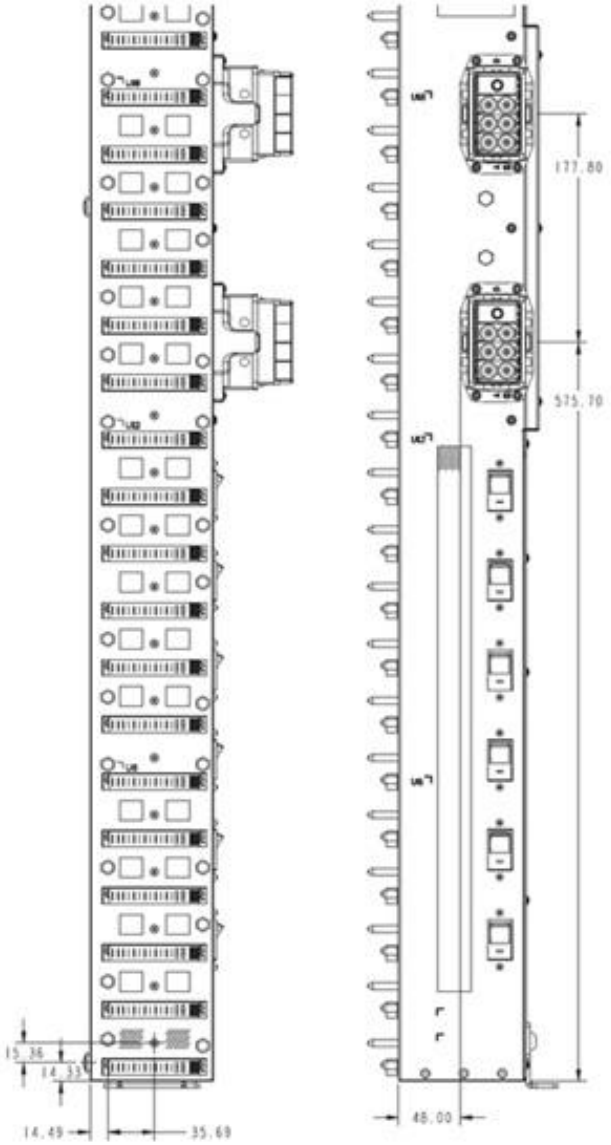
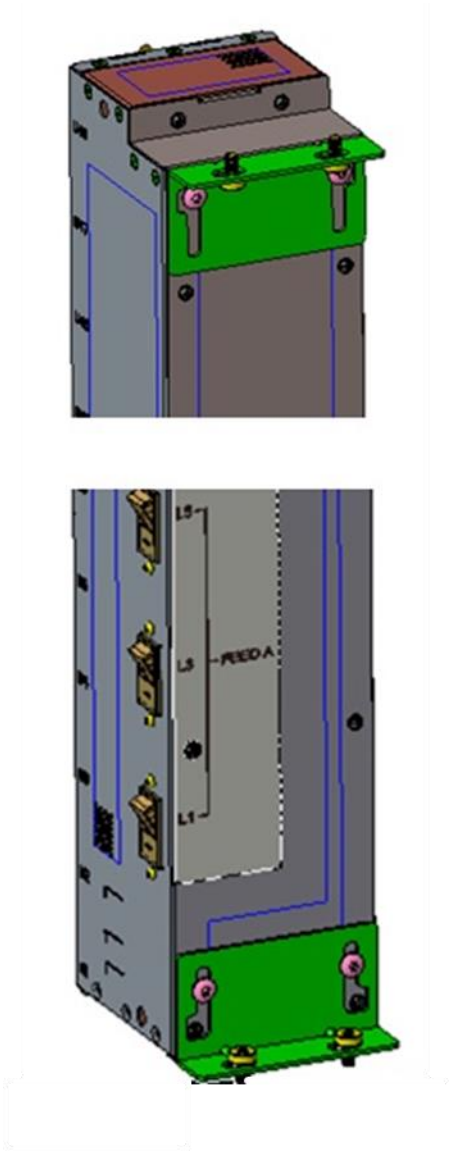


Figure 11. PMDU Housing General Dimensions, Microsoft drawings M1007740 and M1007710 supersede this image

3.2 PMDU Structural Brackets

The PMDU shall include brackets at the top and bottom for to further restrict movement in the rack. Representative image is below. See Microsoft drawing M1007740-001 (42U SKU) and M1007710-001 (48U SKU) for details.



3.3 PMDU Subassembly Power Connector

3.3.1 Connector and Placement

The sub-assembly power and signal connector shall be a FCI PwrBlade + part number 10106269-1C03001LF vertical PCB-mount receptacle. One connector is placed at every U (44.45mm) of the PMDU, oriented as shown in Figure 12.

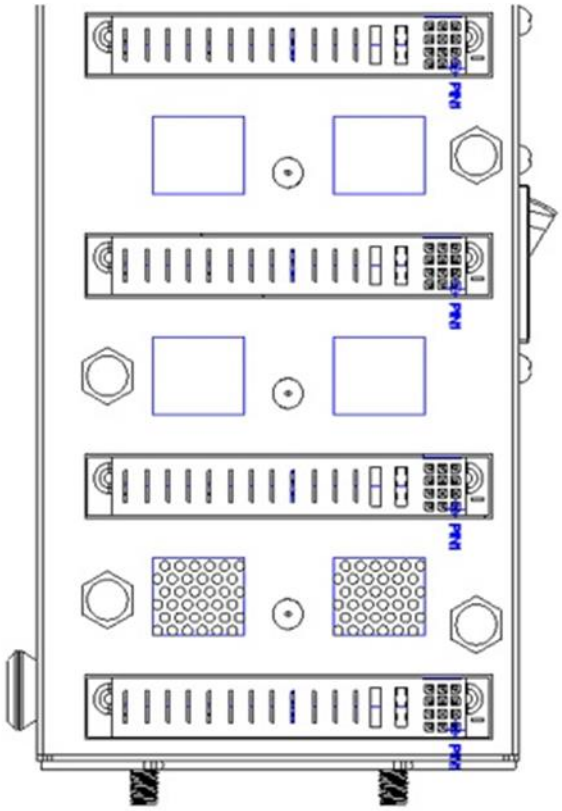


Figure 12. PMDU Housing General Location, Microsoft drawings M1007740 and M1007710 supersede this image

3.3.2 Guide Pins

The zinc plated steel guide pins on the face of the PMDU are self-clinching, made by PENCOM, part number GNST-6-25-Z. Their nominal dimensions are Ø 6.00mm x 25.00mm long. The guide pins are located 18.18mm above the subassembly power connectors at every U.

3.4 Rail Attachment

There are threaded cone washers on the left side of the PMDU, held in place by M5 socket head screws, that allow the PMDU to mount to keyhole slots in the E2000 system rails. The inverted surfaces of the washers pull the PMDU tightly against the sides of the rails. Details of cone

washer design shown in Microsoft drawing M1007740-001 (42U SKU) and M1007710-001 (48U SKU).

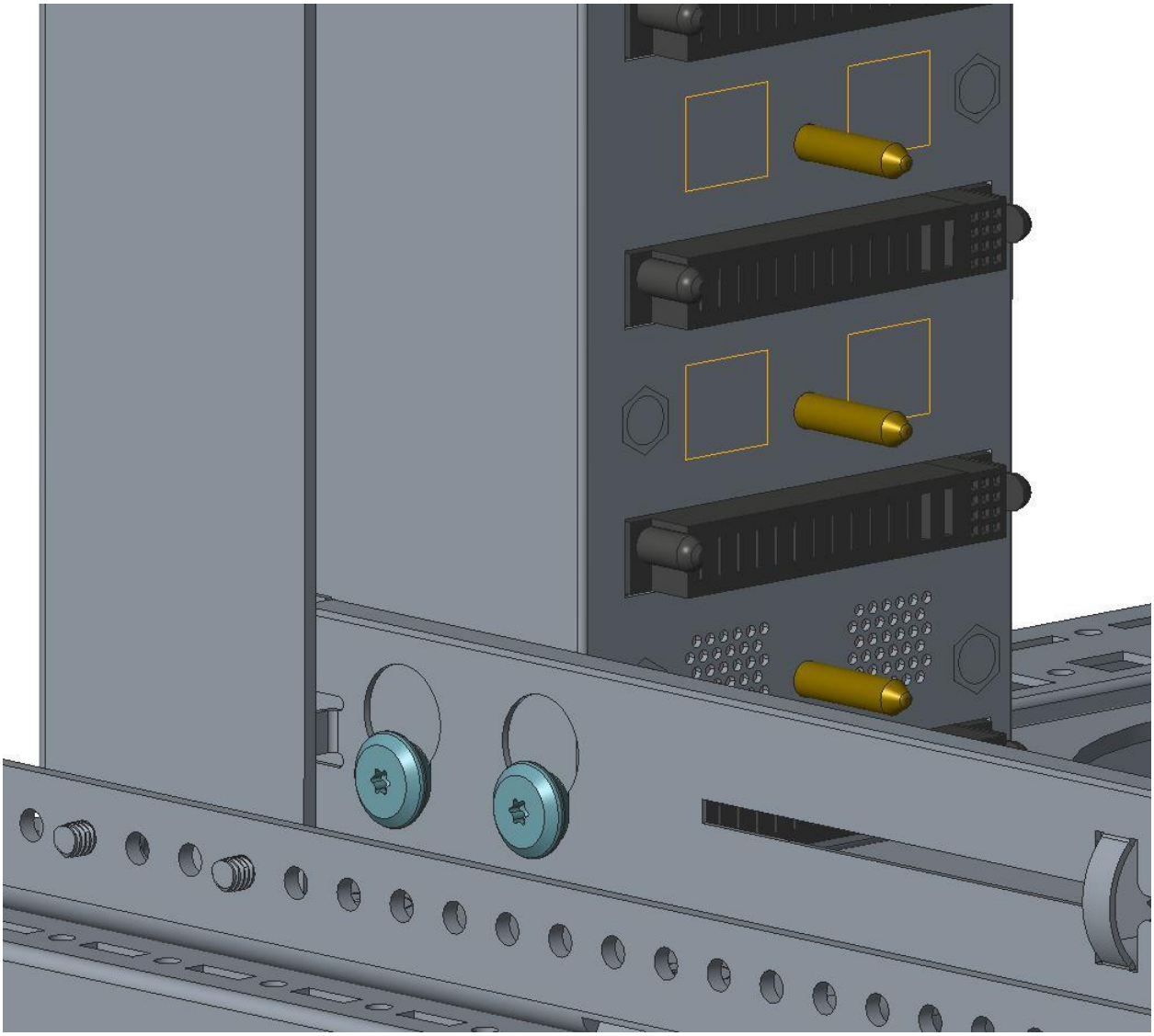


Figure 13. PMDU Rail Mounting: Inverted cone washers fit into keyhole slots in E2000 rails.

Figure 14. Inverted cone washer with M5 socket head screw

3.4.1 Subassembly Interface

The PMDU interfaces with an E2000 Subassembly in two ways. As a Sub assembly is inserted into the rack, a hole at the rear of the Subassembly slides onto a front-facing pin that is mounted in the PMDU sheet metal housing. As the Subassembly is further inserted, the blind mate connector on the rear of the Subassembly engages with a corresponding blind mate connector on the PMDU. Subassembly travel is stopped by a guide pin sleeve on the rear of the subassembly.

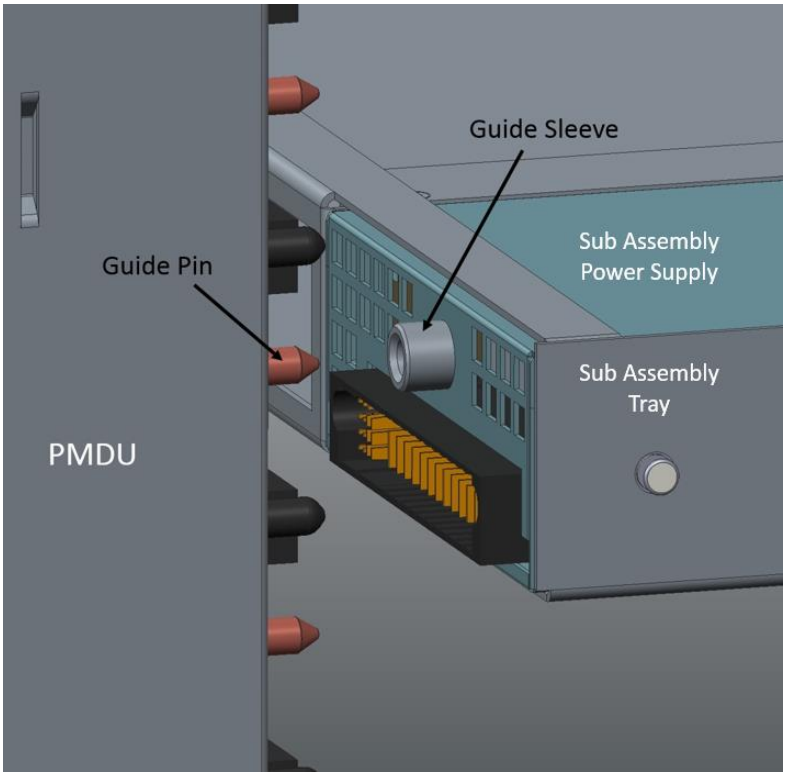


Figure 15. Guide pins interfacing with sleeves on subassemblies

3.5 Thermal

The front, right side, and back face of the PMDU housing shall be perforated. The front face is defined as the PMDU output connector plane. The back face is defined as the plane facing the door. The right-side face is defined as the plane facing the opposite interior of the rack.

The perforation shall be as described in mechanical drawing shown in Microsoft drawing M1007740-001 (42U SKU) and M1007710-001 (48U SKU).

The rack manager and PMDU power supply shall be cooled via the perforations provided and natural convection.

3.6 Weight

The weight of the PMDU shall not exceed 35 lbs.

3.7 General Connector Quality

The PMDU will be used in datacenters with a wide range of humidity. The connectors for these deployments must be capable of withstanding high humidity during shipping and installation. The connector selection must comply with EIA364 and be reviewed and approved by Microsoft.

3.7.1 Sub Assembly Connector Quality

The base starting point for plating for connectors shall be 30u" thickness gold. Connectors can be made from different materials and thicknesses. The plating specifications for all connectors within the PMDU assembly must be reviewed with Microsoft and approved by Microsoft with extra focus on plating that is less than 30u" gold.

Connecter shall not show degradation over a 50 mate/unmate cycles.

4 Environmental

The specifications listed in the following table must be supported.

Table 15. Environmental Requirements

Specification		Requirement
temperature	Operating	• 50°F to 140°F (10°C to 60°C) • Maximum rate of change: 18°F (10°C)/hour • Allowable derating guideline of 1.6°F/1000ft (0.9°C/304m) above 3000 ft.
	Non-operating	• -40°F to 140°F (-40°C to 60°C) • Rate of change less than 36°F (20°C)/hour
Humidity	Operating	• Equivalent to 10% to 80% Relative Humidity (RH) non-condensing at 35C • Maximum rate of change 20% RH in an hour
	Non-operating	• 5% to 95% non-condensing • 100.4°F (38°C) maximum wet bulb temperature
Altitude	Operating	• 10000ft (3050m) maximum • Rate of change less than 1500 ft./min (457m/min)
	Non-operating	• 30000ft (9144m) maximum • Rate of change less than 1500 ft./min (457m/min)

See the latest version of the IT Equipment and Data Center Power/Physical/Environmental Specification Document M1001852.

5 Compliance

PMDU shall be designed to comply with regulatory requirements mandated by countries where it is going to be deployed (Refer to Country List for Compliance Certifications, See separate document for up to date list)

- Safety Compliance: Components are designed to comply with safety requirements outlined in IEC 60950-1 and IEC 62368-1 (mandatory from 2019/6/20) standards, and applicable national deviations (i.e. EN, CSA, UL, etc.).
- EMC Compliance: Components are designed to comply with Class A emission limits and immunity requirements outlined in CISPR 32 and CISPR 24 standards, and applicable national regulations (i.e. FCC CFR 47, part 15 in the USA, ICES-003 in Canada, EN 55032 and EN 55024 in Europe, KN 32 and KN 35 in South Korea, VCCI-CISPER 32 in Japan, etc.).
- Environmental Compliance: Components are designed to comply with all worldwide regulations that ban, restrict, or require reporting of hazardous substances (i.e. RoHS Directive 2011/65/EU, REACH Directive 2006/1907/EC (Annex XVII) and Battery Directive 2006/66/EC in Europe, California Proposition 65 in the USA) applicable to server finished goods.
- Energy Efficiency Compliance: Components are designed to comply with applicable energy efficiency regulations.

5.1 Safety Requirements

Following are the component regulation requirements:

- Power Supply shall be separately approved to IEC 60950-1 and IEC 62368-1, including applicable national deviations (i.e. EN, CSA, UL, etc.).
- Battery pack and cell (including coin cell battery) shall have minimum safety and transportation certifications required by IEC, UL and UN standards, as applicable.
- All Fans shall have minimum certifications to IEC/EN and UL standards (i.e. UL, TUV,VDE).
- All current limiting devices shall have minimum certifications to IEC/EN and UL standards (i.e. UL, TUV,VDE).and shall be suitable rated for the application where the device in its application complies with IEC60950.
- All printed wiring boards shall be rated V-0 and be sourced from a UL approved printed wiring board manufacturer.
- All connectors shall be UL recognized and have a UL flame rating of V-0.
- All wiring harnesses shall be sourced from a UL approved wiring harness manufacturer. SELV Cable to be rated minimum 80V, 130C.
- Product safety label must be printed on UL approved label stock and printer ribbon. Alternatively labels can be purchased from a UL approved label manufacturer.
- The product must be marked with the correct regulatory markings to support the certifications that are specified in this document.

5.2 EMC Requirements and Test Conditions

The equipment shall fulfill the requirements of the applicable EMC standards when tested as a system.

For all EMC testing, the equipment, when connected to the system and cabling, shall be tested in a worst-case user configuration, in concurrence with the Microsoft Regulatory Compliance team.

Microsoft requires a higher-level of performance for several the EMC tests. Equipment for Microsoft Cloud Server Infrastructure shall meet the following requirements beyond regulatory limits/test levels through all supported voltage ranges and loads.

Test	Test Method	Requirement
Radiated emissions margin (to Class A regulatory limits)	ANSI C63.4/CISPR 32	-3 dB
Conducted emissions margin (to Class A regulatory limits)	ANSI C63.4/CISPR 32	-3 dB
Electrostatic Discharge (ESD) - Contact Discharge	EN 61000-4-2	+/-6 kV Criteria B, +/-8 kV Criteria C
Electrostatic Discharge (ESD) - Air Discharge	EN 61000-4-2	+/-11 kV Criteria B, +/-15 kV Criteria C
Radiated Immunity	EN 61000-4-3	5 V/m, Criteria A
Electrical Fast Transient (EFT)	EN 61000-4-4	+/-2 kV, Criteria B on Mains +/-1 kV, Criteria B on I/O
Surge	EN 61000-4-5	Regulatory standard
Conducted Immunity	EN 61000-4-6	4 Vrms, Criteria A
Magnetic Field Immunity	EN 61000-4-8	Regulatory standard
Voltage Dips and Interruptions	EN 61000-4-11	Regulatory standard
Harmonics (product drawing ≤ 16 A per phase)	EN 61000-3-2	Regulatory standard
Harmonics (product drawing > 16 A per phase, ≤ 75 A per phase)	EN 61000-3-12	Regulatory standard
Voltage Fluctuations & Flicker (product drawing ≤ 16 A per phase)	EN 61000-3-3	Regulatory standard
Voltage Fluctuations & Flicker (product drawing > 16 A per phase, ≤ 75 A per phase)	EN 61000-3-11	Regulatory standard

Criteria	Definition
A	During testing normal performance within the specification limits. *Unintended input from input device is not allowed.*
B	During testing temporary degradation or loss of function or performance which is self-recoverable. "Lock up" is not allowed. *For equipment with manually inputted data, which can be confirmed by reading the display, errors which can be recognized by the operator and easily corrected are permissible*.
C	Failures resulting in a delay in processing after the external disturbance is removed, but which can be recovered to normal operation by reset or reboot are permissible. Failures resulting in a system abort, which can be recovered to normal operation by reset or reboot, are permissible.
D	Degradation or loss of function which is not recoverable due to damage to equipment or software, or loss of data.

5.3 Environmental Compliance

PMDU must comply with the latest editions of Microsoft specifications:

- H00594 MICROSOFT RESTRICTED SUBSTANCES FOR HARDWARE PRODUCTS, and
- H00642 MICROSOFT RESTRICTED SUBSTANCES CONTROL SYSTEM FOR HARDWARE PRODUCTS.

PMDU must not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) in excess of the limits specified in the EU Directive, 2011/65/EU, ”Restriction of the use of Certain Hazardous Substances in Electrical and Electronic Equipment” and will not exceed a maximum unintentional or trace allowance defined by the EU Directive 2011/65/EU).

6 Labeling and Guidelines

The PMDU shall be labeled via sticker or ink marking on two surface sides, left and rear.

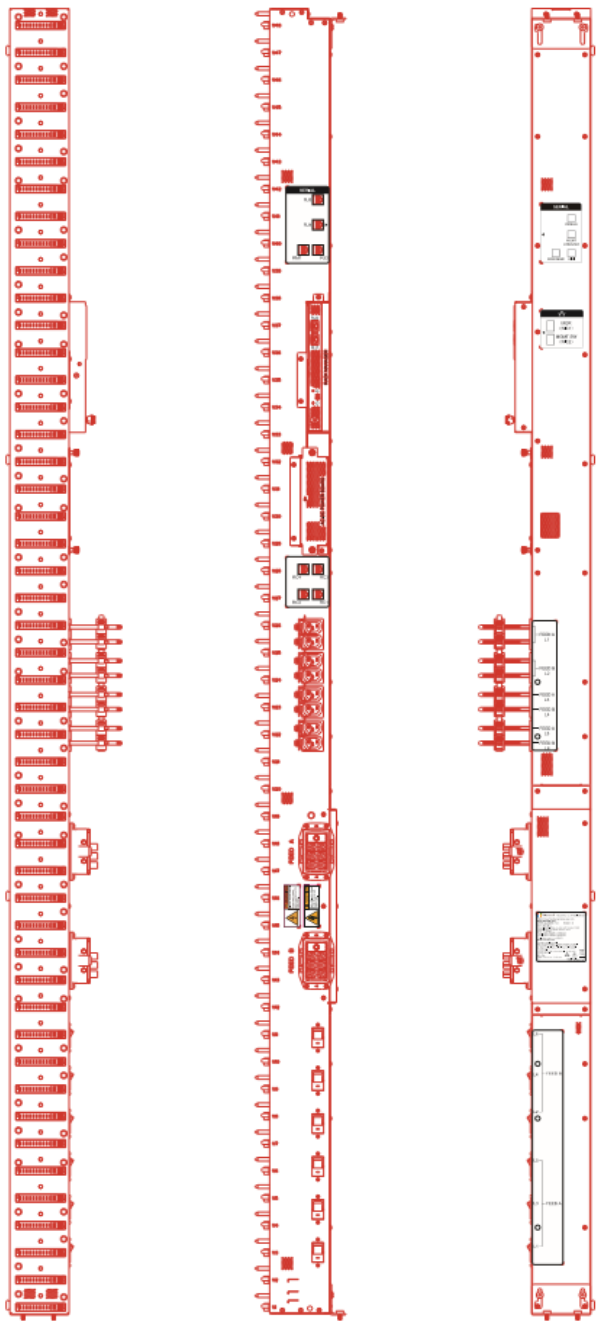


Figure 16. PMDU sides to be labeled

6.1 PMDU Assy Product Labeling and Guidelines

The product label location shall be located from U position 14 opposite at the Rear Surface of the PDMU unit.

6.1.1 42U PMDU Assy Product Labeling and Guidelines

The product label location shall be located from U position 14 opposite at the Rear Surface of the PDMU unit. See M2010_42U PMDU_Agency Label drawing number CM1014263-001 for latest label information.

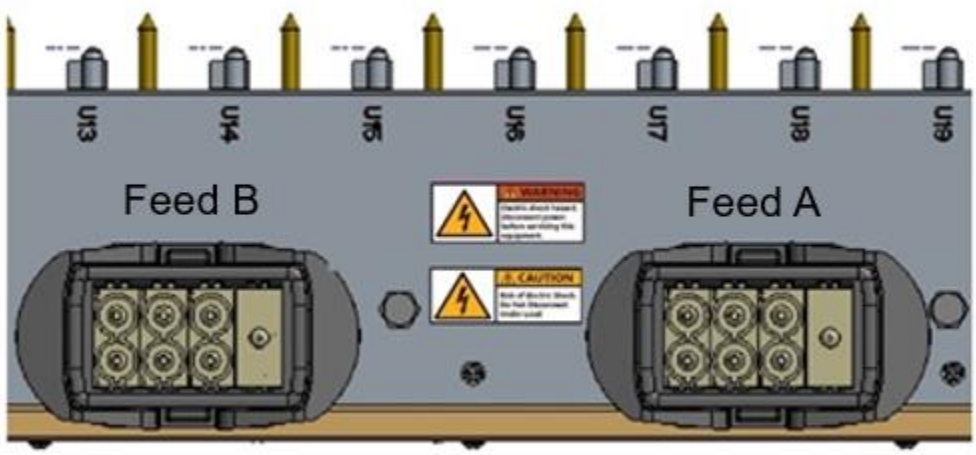
6.1.2 48U PMDU Assy Product Labeling and Guidelines

The product label location shall be located from U position 14 opposite at the Rear Surface of the PDMU unit. See drawing M2010_48U PMDU_Agency Label drawing number CM1023919-001

Label Spec
Material : PC Film
Thickness : 0.25mm
Adhesive Thickness : 0.05mm

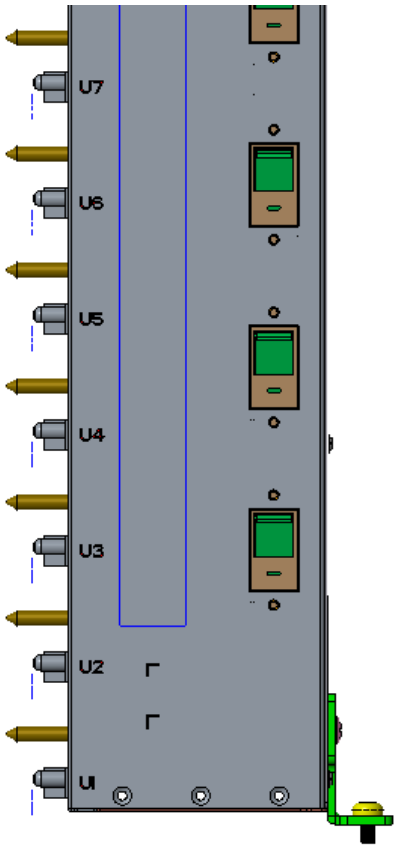
6.2 Safety Warning Labeling

The following 2 warning labels (MS P/N M1019319-002 and P/N M1031376-001) shall be located between the 2 universal connectors.



6.3 Connector Labeling

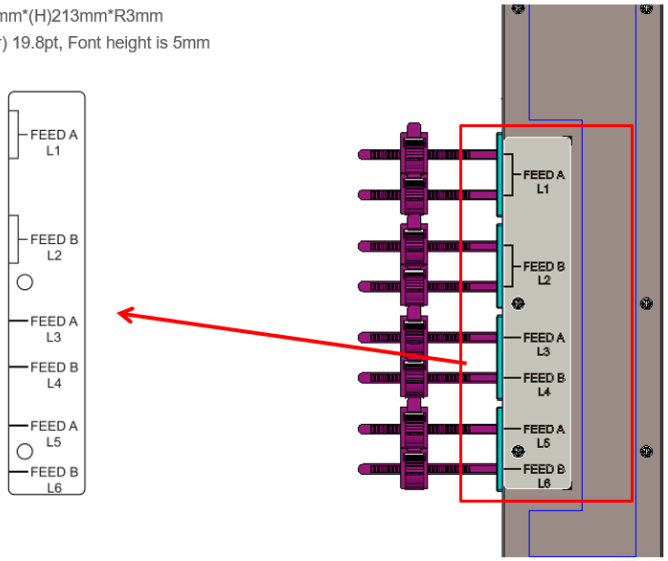
Each U location shall be labeled, coined, or stamped from bottom to top on the side surfaces with U1 starting at the bottom.



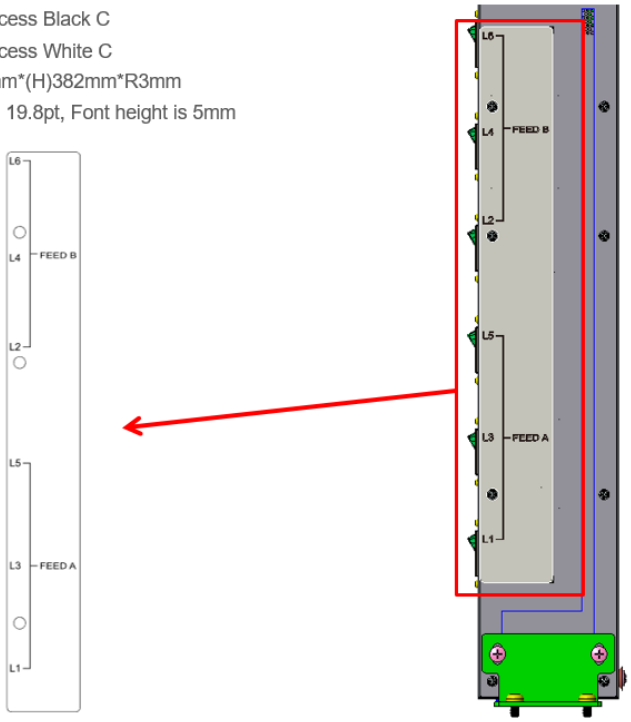
6.4 Breaker and Connector Labeling

Each breaker and C13 outlet shall be labeled on the rear surfaces

PANTONE Process Black C
PANTONE Process White C
Label size : (W)40mm*(H)213mm*R3mm
Font : Arial (regular) 19.8pt, Font height is 5mm

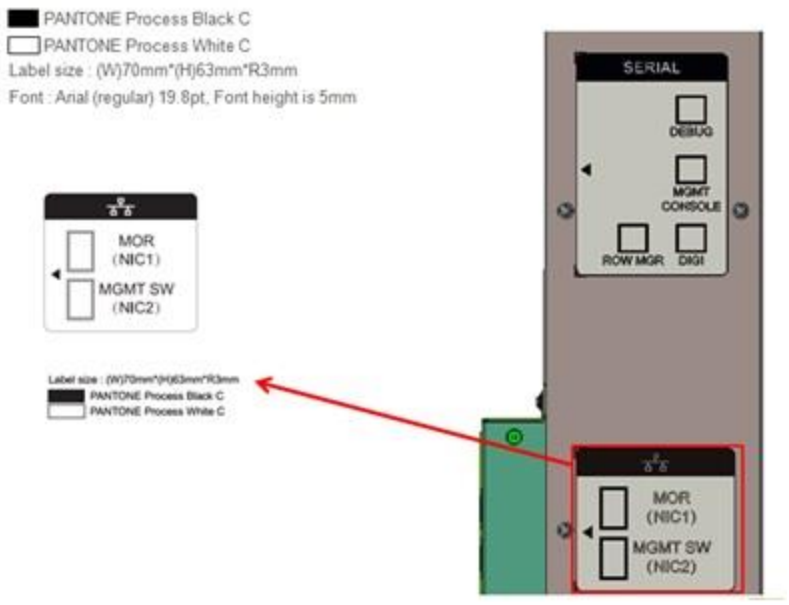


PANTONE Process Black C
PANTONE Process White C
Label size : (W)50mm*(H)382mm*R3mm
Font : Arial (regular) 19.8pt, Font height is 5mm



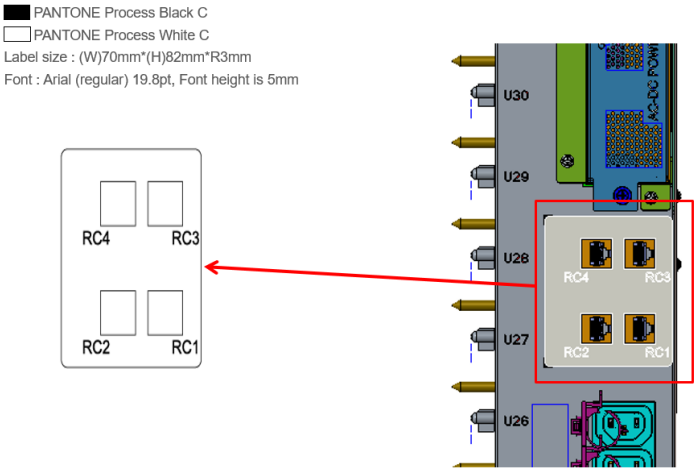
6.5 RM Management Port Legend Labeling.

The rear surface shall be labeled with a matching legend identifying port number and location found on the rack manager.



6.6 Control Cable Port Labeling

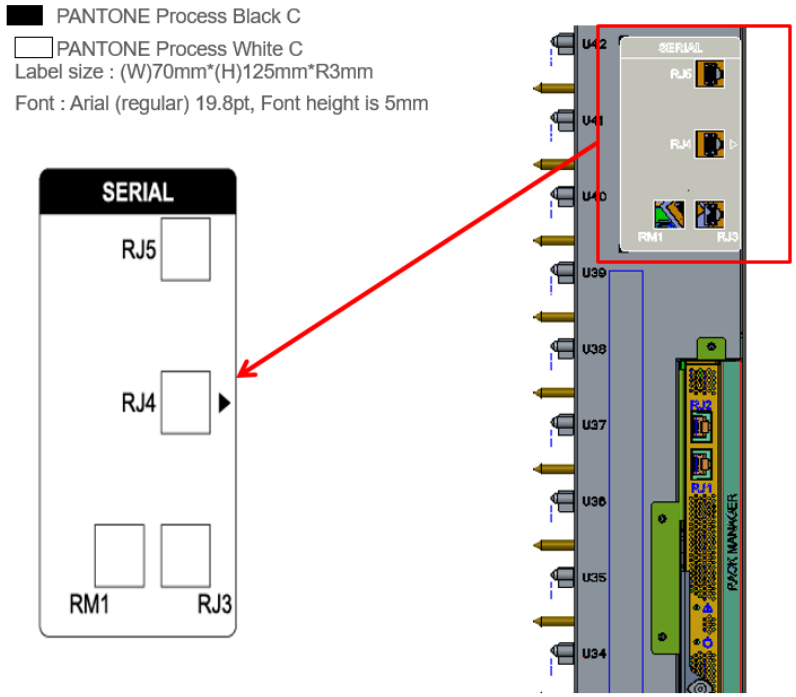
Each control port shall be labeled on the side surface



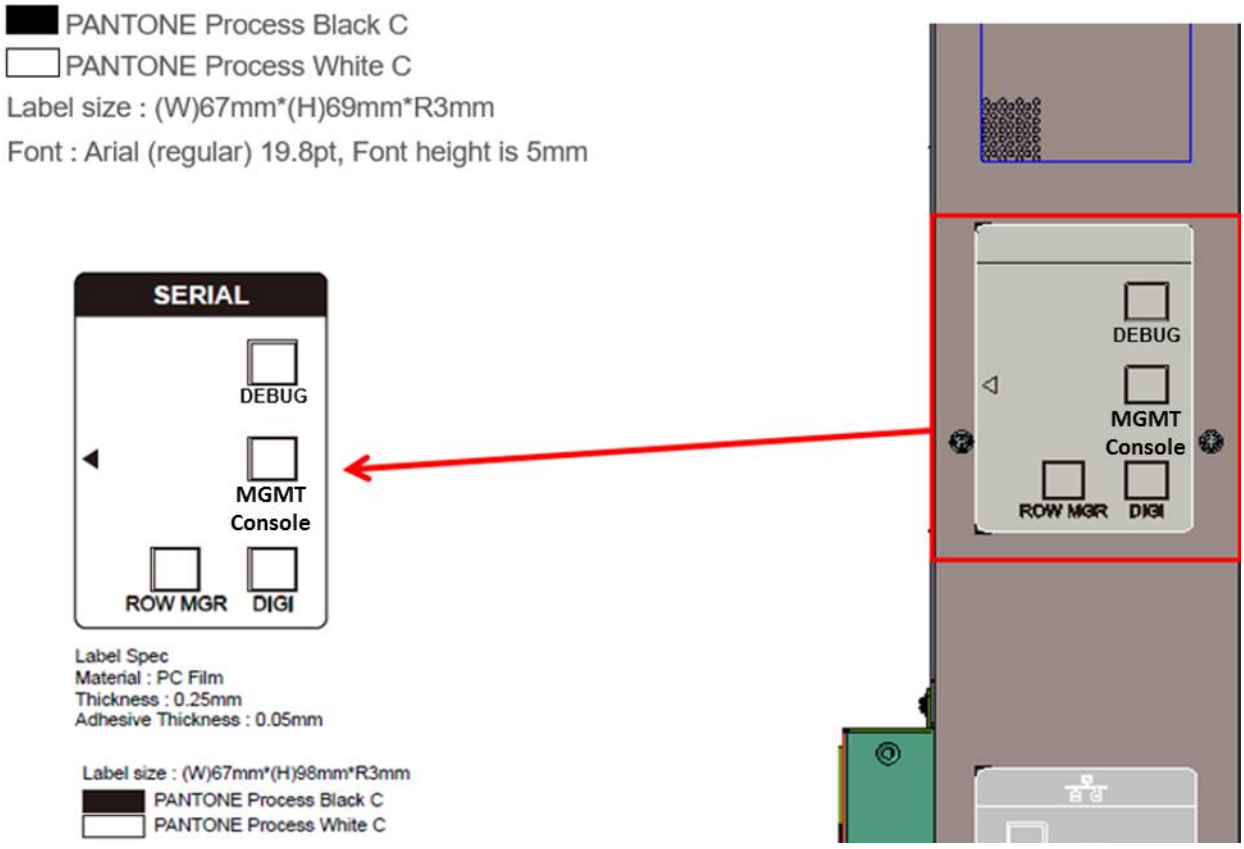
The rear surface shall be labeled with a matching legend identifying port number and location.

6.7 Serial Port Labeling

Each serial port shall be labeled on the side surface.

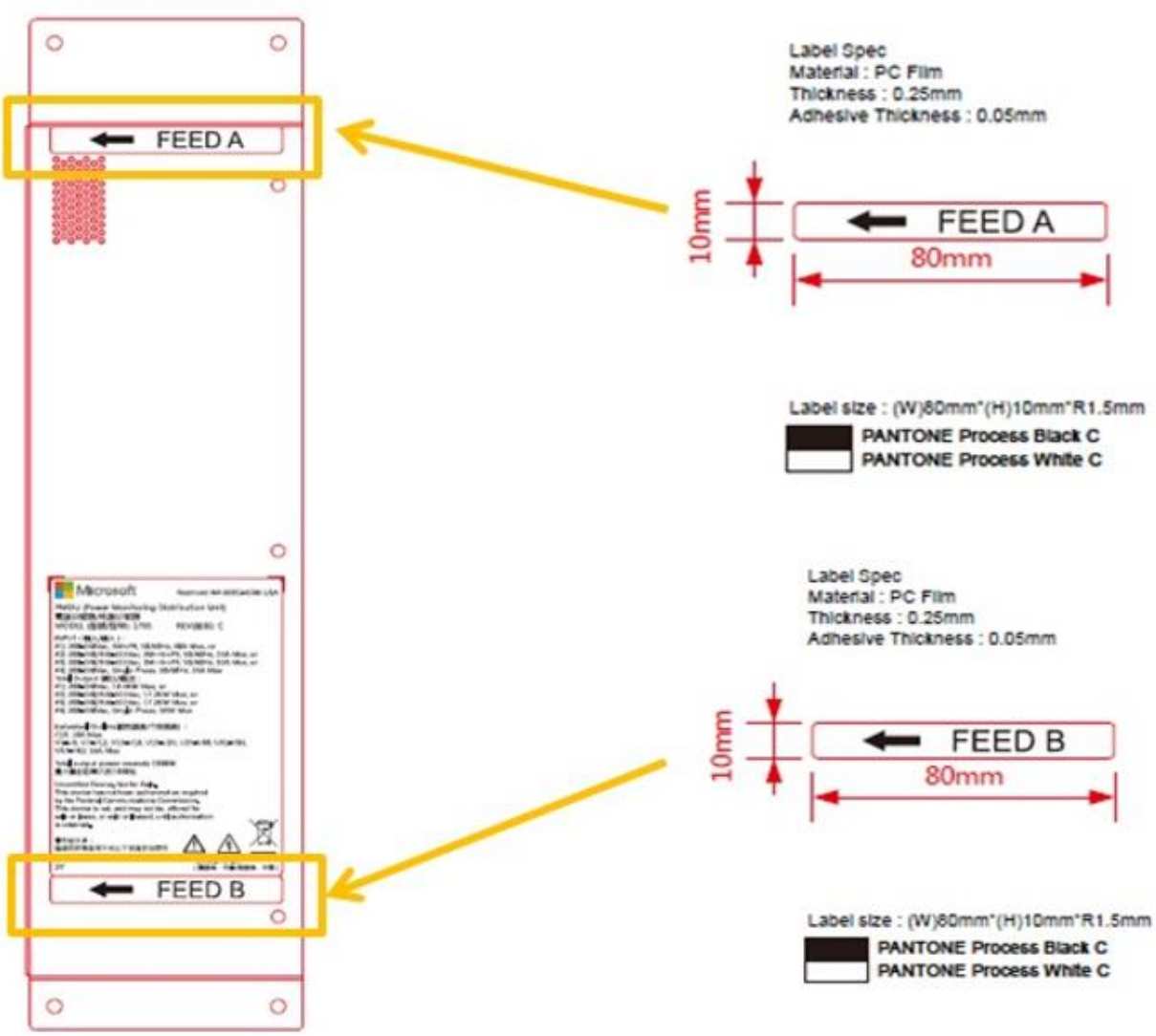


The rear surface shall be labeled with a matching legend identifying port number and location.



6.8 Feed Labeling

Each Feed shall be labeled, coined or stamped



7 Metal Finish/Painted Color

The unit shall be finished so as not to corrode. The finish shall be

HOT DIPPED GALVANIZED STEEL, SGCC
HARDNESS: 50-60 ROCKWELL B
SPECIFICATION: JIS G3302
PLATING/COATING: ZCS(A)X, ZINC COATING MASS: Z08, MINIMIZED SPANGLE, SKIN PASSED, CHROMATE (ANTI-FINGER PRINT) TREATED, UNOILED
MATERIAL SHALL CONTAIN 0.02% MIN TO 0.15% MAX CARBON.

8 Appendix: Commonly Used of Acronyms

This section provides definitions of acronyms used in the WCS system specifications.

ACPI – advanced configuration and power interface

AHCI – advanced host controller interface

ANSI – American National Standards Institute

API – application programming interface

BIOS – basic input/output system

BMC – baseboard management controller

CBB – connector Backplane Board

CFM – cubic feet per minute (measure of volume flow rate)

CM – chassis manager

DDR4 – double data rate type 4

DHCP – dynamic host configuration protocol

DIMM – dual inline memory module

DPC - DIMMs per memory channel

ECC – error-correcting code

EEPROM - electrically erasable programmable read-only memory

EIA – Electronic Industries Alliance

EMC – electromagnetic compatibility

EMI – electromagnetic interference

FRU – field replaceable unit

GPIO – general purpose input output

HSC – hot-swap controller

I^2C – inter-integrated circuit

IPMI – intelligent platform management interface

LAN – local area network

LFF – large form factor

LPC – low pin count

MBB – mid-Backplane Board

MTBF – mean time between failures

MUX – multiplexer

NGCS – Next Generation Cloud Server

PCB – printed circuit board

PCIe – peripheral component interconnect express

PCH – platform controller hub

PDU – power distribution unit

PMDU – power management distribution unit

PECI – Platform Environment Control Interface

POST – power-on self-test

PSU – power supply unit

PXE – preboot execution environment

RB – rear I/O Board

RM – rack manager

RU – rack unit

SAS – serial-attached small computer system interface (SCSI)

SATA – serial AT attachment

SDA – serial data signal

SFF – small form factor

SMBUS – systems management bus

SMBIOS – systems management BIOS

SPD – Serial Presence Detect

SPI – serial peripheral interface

SSD – solid-state drive

TDP – thermal design power

TOR – top of rack switch

TPM – trusted platform module

RU – rack unit

UART – universal asynchronous receiver/transmitter

UEFI – unified extensible firmware interface

WMI –Windows Management Interface