

# Solutions Guide for IBM® Data Center Architecture:

- IBM BladeCenter H Servers



In today's high-demand enterprise environment, organizations need a reliable infrastructure to run compute-intensive applications with minimal maintenance and downtime. IBM BladeCenter H is a powerful platform built with the enterprise customer in mind, providing industry-leading performance, innovative architecture and a solid foundation for virtualization.

Blade server applications present unique challenges in terms of rack level power distribution (Rack PDU), cable management and physical access space requirements for hot-swappable blade components.

This application guide provides recommendations for enclosures, Rack PDUs, and cable management to best address the specific physical infrastructure needs of the BladeCenter H Chassis.

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# Enclosures and Rack Mount Power Distributions Units

## Advanced PDUs

- Integrates power management capabilities with other products including Symmetra™ PX UPS, row and room PDUs, InRow cooling, NetShelter™ SX enclosures, and StruxureWare™ for Data Centers management software suite.
- Features zero U, low profile design, optimized for high-density rack power solutions to minimize interference between the Rack PDU and hot-swap blade components.
- Comprehensive device, phase, and breaker bank level metering for overload protection, capacity planning purposes, and energy efficiency initiatives
- Right Angle C19/C20 connectors minimize bend radius at the connection point and reduce interference in the rear of an enclosure



## Full Featured Enclosures

- NetShelter SX enclosures offer the most standard, out-of-box features to ease installation and speed deployment.
- Single enclosure design is flexible enough to accommodate various networking and server applications.
- Sizes Available: 42U, 45U, & 48U heights, 600mm (24") & 750mm (30") widths, and 1070mm (42") & 1200mm (47.2") depths.



*Schneider Electric is a global leader in data center infrastructure - cooling, UPS, power distribution, racks and management.*



# Instructions

This guide is designed to facilitate a step by step selection of Rack PDUs, enclosures and accessories for IBM BladeCenter H servers.

**STEP 1: Determine estimated power load per blade chassis.** After consulting the manual, determine the total power load and redundancy configurations offered. BladeCenter H includes options for up to four standard 2900 W or 2980W high-efficiency hot-swap and redundant load-balancing power supplies. At full redundancy, the chassis is capable of maximum input power capacity over 7000W. Total max power consumption for a typical customer configuration of BladeCenter H chassis is 5kW. The average power is about 3-4kW.

**STEP 2: Table 3A, 3B: Maximum Quantity Chassis per Rack PDU.** Table is organized by maximum capacity of standard 20A, 30A, 50A, and 60A Rack PDUs kW. Utilize power data calculated in step 1 and required number of connected servers to select the proper capacity Rack PDU.

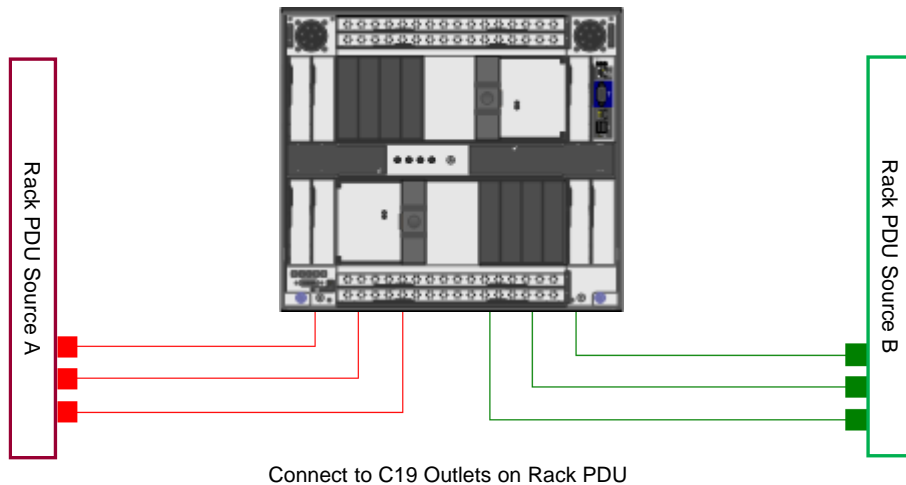
**STEP 3: Table 3A, 3B: Select Rack PDU.** Take the Rack PDU capacity from within table 3A, or 3B and select the desired Rack PDU based on input connection to Rack PDU and compatibility of Rack PDU receptacles with power cords. Additional Rack PDUs are listed on page 7 and 8 if the listed Rack PDU in these tables do not match your equipment configuration. This step is critical as the Rack PDU must be able to connect to an input circuit on site and the servers and switches must have the correct type and quantity of receptacles to power up properly.

**STEP 4: Select Enclosures and Installation Diagrams.** Depending on special constraints onsite, select the appropriate combination of enclosure width and depth. It is recommended using “wide (750mm) and deep (1200mm)” enclosures if space permits, as this offers the most flexibility during operation and ease of installation.

# IBM BladeCenter H Power

## Step 1: Determine Power Configuration

The IBM BladeCenter H Server Chassis includes options for four hot-swappable redundant power supplies. Schneider recommends using power cords with three C20 inlets for power distribution flexibility with Rack PDUs. Follow the diagram below for a fully redundant 2N power configuration.



## Step 2: Determine Anticipated Power Load

Up to four 2980 W high-efficiency power supplies with load-balancing and failover capabilities provide additional reliability and protection. Max power consumption per chassis can range from 2.5 to 7.5 KW; while a typical peak power consumption is closer to 4-5kW.

It is recommended to use BladeCenter Power Configurator to accurately predict the power and cooling required for specific configurations to enable realistic planning of the proper power and cooling infrastructure. The calculator can be found on the IBM website.

Power Capping via Active Energy Manager also be utilized to reduce the risk of overloading a circuit. The power capping value can only be set on a blade server, not on the chassis.



- The IBM H-chassis requires a unique IBM cord (shown at left) with 3 IEC C20 connectors to the rack PDU. Two primary feeds (16A max each) supply power to blades, while a 3rd specially labeled cord (5.5A max) is for the blower.
- Total power consumption for a typical configuration is 4-5kW or less per chassis enclosure.

# IBM BladeCenter H Power

## Step 3: Determine Chassis Quantity

- The following tables show the maximum amount of BladeCenter H chassis which can be supported from a desired rack PDU.
- The data for Table 3A and 3B is organized based on the power capacity ratings for standard rack mount PDUs, showing both single phase and three phase options
- The tables show recommended Metered Rack PDUs with a zero U form factor and IEC outlets.**

Please note that additional rack PDUs in different configurations are shown on page 7 and 8.

**Table 3A - North America Solutions**

**Number of Chassis per Recommended PDU**

Rack PDU power rating	208V 3 Phase					415V 3 Phase		
	5.0 KW	5.7 KW	8.6 KW	10.0 KW	17.3 KW	11.5 KW	17.3 KW	23.0 KW
	30A 1Ø	20A 3Ø	30A 3Ø	50A 3Ø	60A 3Ø	20A 3Ø	30A 3Ø	40A 3Ø
Recommended rPDU	AP8841	AP8861	AP8865	AP8868	AP8866	AP8881	AP8887	AP8888
KW range per Chassis	Number of Chassis that can be powered from rPDU							
2500	2	2	2*	2*	4*	4	4*	4*
3000	1	1	2	2*	4*	3	4*	4*
3500	1	1	2	2*	4	3	4	4*
4000	1	1	2	2	4	2	4	4*
4500	1	1	1	2	3	2	3	4*
5000	1	1	1	2	3	2	3	4
5500	--	1	1	1	2**	2	3	4
6000	--	--	1	1	2	1	2	2**
6500	--	--	1	1	2	1	2	2**
7000	--	--	1	1	2	1	2	2**
7500	--	--	1	1	2	1	2	2**

\* Limited by number of C19 outlets on PDU

\*\* Limited by internal circuit breaker capacity – UL mandates 80% derating (16A) for continuous loads.

**Table 3B- International Solutions**

**Number of Chassis per Rack Based on Calculated Power Load**

Rack PDU power rating	230V Single Phase		230V 3 Phase	
	3.7 KW	7.4 KW	11.0 KW	22.0 KW
	16A 1Ø	32A 1Ø	16A 3Ø	32A 3Ø
Recommended rPDU	AP8858EU3	AP8853	AP8881	AP8886
KW range per Chassis	Number of Chassis that can be powered from rPDU			
2500	1	2	4	4*
3000	1	2	3	4*
3500	1	2	3	4*
4000	--	1	2	4*
4500	--	1	2	4
5000	--	1	2	4
5500	--	1	2	4
6000	--	1	1	2**
6500	--	1	1	2**
7000	--	1	1	2**
7500	--	--	1	2

\* Limited by number of C19 outlets on PDU

\*\* Limited by internal circuit breaker capacity (16A).



# Rack PDU Charts - Metered

Metered Rack Power Distribution Units (PDUs) provide active metering to enable energy optimization and circuit protection. User-defined alarm thresholds mitigate risk with real-time local and remote alerts to warn of potential circuit overloads. Metered Rack PDUs provide power utilization data to allow Data Center managers to make informed decisions on load balancing and right sizing IT environments to lower total cost of ownership. AP8000 series Metered Rack PDUs include real power monitoring, a temperature/humidity sensor port, locking IEC receptacles, and ultra low profile circuit breakers. Users can access and configure Metered Rack PDUs through secure Web, SNMP, or Telnet Interfaces.

METERED RACK PDUs	Mounting U-Space	Nominal Voltage	Region	Input Circuit	Nominal Power	Input Plug Type	Output Receptacles	Cord Length	APC SKU			
	100-120V Input	Vertical, 0U	100-120	NAM	15A	1.4kW		NEMA 5-15P		(16)5-15	3.0 m	AP7831
			120	NAM	20A	1.9kW		NEMA L5-20P		(24)5-20	3.0 m	AP7830
			100	Japan	20A	2.0kW		NEMA L5-20P		(24) 5-15	3.0 m	AP7830J
			100	Japan	30A	2.4kW		NEMA L5-30P		(24) 5-15	3.0 m	AP7832J
			120	NAM	30A	2.9kW		NEMA L5-30P		(24)5-20	3.0 m	AP7832
		Horizontal, 1U	120	NAM	15A	1.4kW		NEMA 5-15P		(8)5-15	3.6 m	AP7800
			120	NAM	20A	1.9kW		NEMA L5-20P		(8)5-20	3.6 m	AP7801
			120	NAM	30A	2.9kW		NEMA L5-30P		(16)5-20	3.6 m	AP7802
		Horizontal, 2U	100	Japan	30A	3.0kW		NEMA L5-30P		(16) 5-15	3.6 m	AP7802J
			200-240V Input	Vertical, 0U	230	Worldwide	10/15A	2.3kW		IEC-320 C14		(16)C13
	100-240	NAM			20A	3.3kW		NEMA L6-20P		(18)C13, (2)C19	3.0 m	AP8858NA3
	100-240	Worldwide			16A	3.3kW		IEC-320 C20		(18)C13, (2)C19	Inlet	AP8858
	100-240	EMEA, APJ			16A	3.7kW		IEC309 16A		(18)C13, (2)C19	3.0 m	AP8858EU3
	200-240	NAM, Japan			30A	5.0kW		NEMA L6-30P		(36)C13, (6)C19	3.0 m	AP8841
	220-240	EMEA, APJ			32A	7.4kW		IEC309 32A		(36)C13, (6)C19	3 m	AP8853
	Horizontal, 1U	100-240		Worldwide	10/15A	2.5kW		IEC-320 C14		(8)C13	Inlet	AP7820
		100-240		Worldwide	16A	3.3kW		IEC-320 C20		(8)C13	Inlet	AP7821
	Horizontal, 2U	200-240		NAM	30A	5.0kW		NEMA L6-30P		(12)C13, (4)C19	3.6 m	AP7811
		230		EMEA, APJ	32A	7.4kW		IEC309 32A		(12)C13, (4)C19	3.6 m	AP7822
	208V 3-phase Input	Vertical, 0U	208	NAM	20A, 3Φ	5.7kW		NEMA L21-20P		(42)5-20	1.0 m	AP7862
										3.0 m	AP7892	
			208	NAM	20A, 3Φ	5.7kW		NEMA L21-20P		(21)5-20, (6)J6-20	1.0 m	AP7863
										3.0 m	AP7893	
			208	NAM	20A, 3Φ	5.7kW		NEMA L21-20P		(36)C13, (6)C19, (2)5-20	1.8 m	AP8861
			208	Japan	20A, 3Φ	6.0kW		NEMA L21-20P		(42) 5-15	1.0 m	AP7862J
			208	NAM	30A, 3Φ	8.6kW		NEMA L21-30P		(36)C13, (6)C19, (2)5-20	1.8 m	AP8865
			208	NAM	50A, 3Φ	10.0kW		CS8365C		(36)C13, (6)C19	1.8 m	AP8868
200-240			NAM	50A, 3Φ	14.4kW		CS8365C		(24)C13, (4)C19, (2)J6-30	1.0 m	AP7869	
200-240			NAM	50A, 3Φ	14.4kW		CS8365C		(6)C19	1.8 m	AP7867A	
208			NAM	60A, 3Φ	17.3kW		IEC309-60A 3P+PE		(12)C13, (6)C13	1.8 m	AP8866	
208			NAM				IEC309-60A 3P+PE		(30)C13	1.8 m	AP8867	
400-415V 3-phase Input	Vertical, 0U	400-415	Worldwide	16A, 3Φ	11kW		IEC309-16A 3P+N+PE		(36)C13, (6)C19	1.8 m	AP8881	
		415	NAM	30A, 3Φ	17.3kW		IEC309-30A 3P+N+PE		(12)C13, (30)C13	1.8 m	AP8887	
		400	EMEA, APJ, LAM, GCN	32A, 3Φ	22kW		IEC309-32A 3P+N+PE		(12)C13, (30)C13	1.8 m	AP8886	
		400	EMEA, APJ, LAM, GCN	32A, 3Φ	22kW		IEC309-32A 3P+N+PE		(6)C19	1.8 m	AP7855A	
		415	NAM	40A, 3Φ	23kW		IEC309-60A 3P+N+PE		(12)C13, (30)C13	1.8 m	AP8888	

R – Rack PDUs recommended on page 6 and 7.

AP8868



AP8866

























































AP8888









# Rack PDU Charts - Switched

Switched Rack Power Distribution Units (PDUs) enable advanced, user-customizable power control and active monitoring. Remote outlet level controls allow power on/off functionality for power recycling to remotely reboot equipment and restrict unauthorized use of individual outlets. Power sequencing time delays allow users to define the order in which to power up or down attached equipment. Avoid circuit overload during power recovery and extend uptime of critical equipment by prioritizing the load shedding. Input Current metering provides real-time remote monitoring of connected loads. AP8000 series Switched Rack PDUs include real power monitoring, a temperature/humidity sensor port, and locking IEC receptacles. User-defined alarms warn of potential circuit overloads before critical IT failures occur. Users can access, configure, and control Switched Rack PDUs through secure Web, SNMP, or Telnet Interfaces.

		Mounting U-Space	Nominal Voltage	Region	Input Circuit	Nominal Power	Input Plug Type	Output Receptacles	Cord Length	APC SKU			
SWITCHED RACK PDUs	100-120V Input	Vertical, 0U	100-120	NAM	15A	1.4kW		NEMA 5-15P		(16)5-15	3.0 m	AP7931	
			120	NAM	20A	1.9kW		NEMA L5-20P		(24)5-20	3.0 m	AP7930	
			100	Japan	20A	1.9kW		NEMA L5-20P		(24) 5-15	3.0 m	AP7930J	
			120	NAM	30A	2.9kW		NEMA L5-30P		(24)5-20	3.0 m	AP7932	
			100	Japan	30A	3.0kW		NEMA L5-30P		(24) 5-15	3.0 m	AP7932J	
		Horizontal, 1U	100-120	NAM	15A	1.4kW		NEMA 5-15P		(8)5-15	3.6 m	AP7900	
			100-120	NAM	20A	1.9kW		NEMA L5-20P		(8)5-20	3.6 m	AP7901	
			Horizontal, 2U	120	NAM	30A	2.9kW		NEMA L5-30P		(16)5-20	3.6 m	AP7902
		100		Japan	32A	3.0kW		NEMA L5-30P		(16) 5-15	3.6 m	AP7902J	
	200-240V Input	Vertical, 0U	230	EMEA, APJ, LAM, GCN	10A	2.3kW		IEC C14		(16)C13	3.0 m	AP7950	
			100-240	NAM	20A	3.3kW		NEMA L6-20P		(7)C13, (1)C19	3.0 m	AP8958NA3	
			100-240	Worldwide	16A	3.3kW		IEC-320 C20		(7)C13, (1)C19	Inlet	AP8958	
			230	EMEA, APJ, LAM, GCN	16A	3.7kW		IEC309 16A		(7)C13, (1)C19	3.0 m	AP8958EU3	
			100-240	NAM	20A	3.3kW		NEMA L6-20P		(21)C13, (3)C19	3.0 m	AP8959NA3	
			100-240	Worldwide	16A	3.3kW		IEC-320 C20		(21)C13, (3)C19	Inlet	AP8959	
			230	EMEA, APJ, LAM, GCN	16A	3.7kW		IEC309 16A		(21)C13, (3)C19	3.0 m	AP8959EU3	
			200-240	NAM, Japan	30A	5.0kW		NEMA L6-30P		(21)C13, (3)C19	3.0 m	AP8941	
			220-240	EMEA, APJ, LAM, GCN	32A	7.4kW		IEC309 32A		(21)C13, (3)C19	3.0 m	AP8953	
			Horizontal, 1U	208-230	Worldwide	10H5A	2.5kW		IEC-320 C14		(8)C13	2.0 m	AP7920
				208-230	Worldwide	16A	3.3kW		IEC-320 C20		(8)C13	2.4 m	AP7921
				200-240	NAM	30A	5.0kW		NEMA L6-30P		(16)C13	3.6 m	AP7911A
		Horizontal, 2U	230	EMEA, APJ, LAM, GCN	32A	7.4kW		IEC309 32A		(16)C13	3.6 m	AP7922	
	208V 3-phase Input		Vertical, 0U	208	NAM	20A, 3Φ	5.7kW		NEMA L21-20P		(24)5-20	1.0 m	AP7960
		208		NAM	20A, 3Φ	5.7kW		NEMA L21-20P		(21)C13, (3)C19	3.0 m	AP7990	
		208		NAM	30A, 3Φ	8.6kW		NEMA L21-30P		(21)C13, (3)C19	1.8 m	AP8961	
		200-240		NAM	50A, 3Φ	12.5kW		CS8365C		(21)C13, (3)C19	1.0 m	AP7968	
	400-415V 3-phase Input	Vertical, 0U	400-415	Worldwide	16A, 3Φ	11kW		IEC309-16A 3P+N+PE		(21)C13, (3)C19	3.0 m	AP7998	
										1.8 m	AP8981		

Metered by Outlet with Switching Rack Power Distribution Units (PDUs) enable advanced, user-customizable power control and individual outlet power metering.

METERED BY OUTLET WITH SWITCHING	208V 200-240V 3- phase Input	Mounting U-Space	Nominal Voltage	Region	Input Circuit	Nominal Power	Input Plug Type		Output Receptacles		Cord Length	APC SKU
		Vertical, 0U	200-240	NAM, Japan	30A	5.0kW		NEMA L6-30P		(21)C13, (3)C19	3.0 m	AP8641
			220-240	EMEA, APJ, LAM, GCN	32A	7.4kW		IEC309 32A		(21)C13, (3)C19	3.0 m	AP8653
			208	NAM	20A, 3Φ	5.7kW		NEMA L21-20P		(21)C13, (3)C19	1.8 m	AP8661





### Applications for height

24U Enclosures - Remote offices and small spaces

42U Enclosures - Standard height used globally, designed to fit through standard doorways

45U Enclosures - Enclosures with additional U-spaces for environments that standardize on a 45U 7 ft enclosure height

48U Enclosures - More U-spaces for more equipment in the same footprint



### Applications for width

24 in (600 mm) wide enclosures are the standard for most server applications. For higher densities a deeper enclosure may be required

30 in (750 mm) wide enclosures offer more space for high capacity cable management and power distribution. Typically wider enclosures are used for networking applications but the extra side space is often requested in blade server applications



### Applications for depth

32.5 in (825 mm) is the preferred depth for AV equipment

42 in (1070 mm) is the standard depth and meets most low to medium density applications

The 47.5 in (1200 mm) NetShelter has double the toolless mounting locations for more Rack PDU and cable management options (excluding AR3x4x enclosures)

The 47 - 48 in (1195 - 1220 mm) depth enclosures are becoming the new standard because of increasing server depth crowding cable and power space

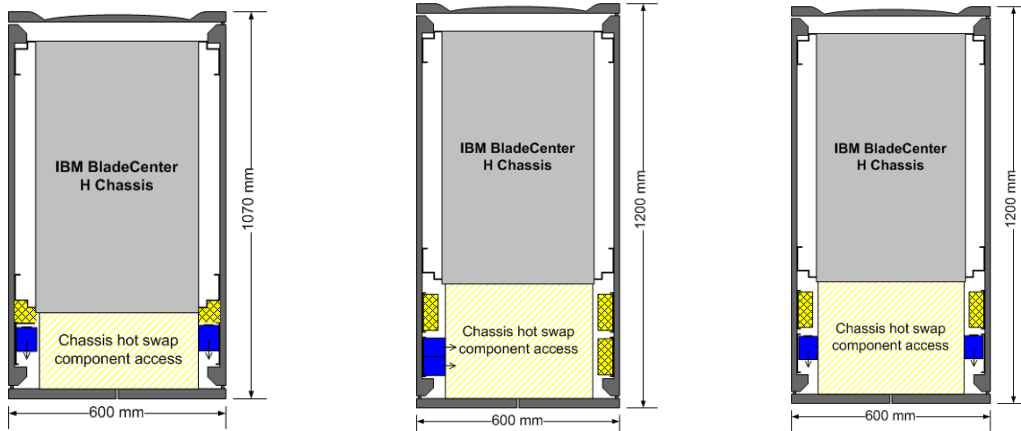


NetShelter SKU	Height	Width	Depth	Application
AR3100	42U	600 mm (24 in)	1070 mm (42 in)	Low-medium density servers
AR3105	45U	600 mm (24 in)	1070 mm (42 in)	Low-medium density servers
AR3107	48U	600 mm (24 in)	1070 mm (42 in)	Low-medium density servers
AR3150	42U	750 mm (30 in)	1070 mm (42 in)	Networking and blade applications
AR3155	45U	750 mm (30 in)	1070 mm (42 in)	Networking and blade applications
AR3157	48U	750 mm (30 in)	1070 mm (42 in)	Networking and blade applications
AR3300	42U	600 mm (24 in)	1200 mm (47.5 in)	Medium-high density servers
AR3305	45U	600 mm (24 in)	1200 mm (47.5 in)	Medium-high density servers
AR3307	48U	600 mm (24 in)	1200 mm (47.5 in)	Medium-high density servers
AR3350	42U	750 mm (30 in)	1200 mm (47.5 in)	HD networking and blade applications
AR3355	45U	750 mm (30 in)	1200 mm (47.5 in)	HD networking and blade applications
AR3357	48U	750 mm (30 in)	1200 mm (47.5 in)	Networking and blade applications
AR3140	42U	750 mm (30 in)	1070 mm (42 in)	High-density networking
AR3340	42U	750 mm (30 in)	1200 mm (47.5 in)	Very high-density networking
AR3347	48U	750 mm (30 in)	1200 mm (47.5 in)	Very high-density networking
AR3200	42U	600 mm (24 in)	1070 mm (42 in)	2 x 20U compartments for colocation
AR3104	24U	600 mm (24 in)	1070 mm (42 in)	Remote server applications
AR3810	42U	600 mm (24 in)	825 mm (32.5 in)	Audio visual applications
AR3812	42U	600 mm (24 in)	825 mm (32.5 in)	Audio visual applications
AR3814	24U	600 mm (24 in)	825 mm (32.5 in)	Audio visual applications

# Enclosure Recommendations – 600mm/24” Wide

The following diagrams are intended to show how the BladeCenter H chassis fits within the different widths and depths of the NetShelter SX. Blade chassis' in general offer unique challenges of space and access. The rear area needs to be completely clear of cable managers and PDUs in order to access the rear hot-swappable components.

TOP VIEW



Yellow areas show data cabling area.  
Recommended cable managers: AR7710

- The 1070mm (42") deep enclosure is not recommended due to lack of the space for cable management.
- If 1070mm deep must be used, maximize space by rotating PDUs 90 degrees so that the outlets are facing the rear. Use AR7711 kit to rotate PDUs.
- Add right angle power cord kits to improve clearance with enclosure frame.
- For cable management, use AR7540 Toolless Cable Ring kit in any available space.

- The 1200mm (47") deep enclosure offers more mounting options for PDUs and cable managers. The above two diagrams show suggested options.
- PDUs should be mounted in rear-most toolless channels to avoid interference with blade chassis components.
- If it is preferred to mount PDUs on opposite sides, maximize space by rotating PDUs 90 degrees so that the outlets are facing the rear.
- Recommended cable manager – AR7710 mounted in toolless rear channels.

AP8866 rack PDU shown in illustration; however, configuration would be common for any PDU selection.



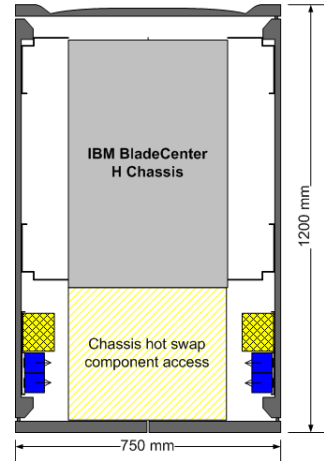
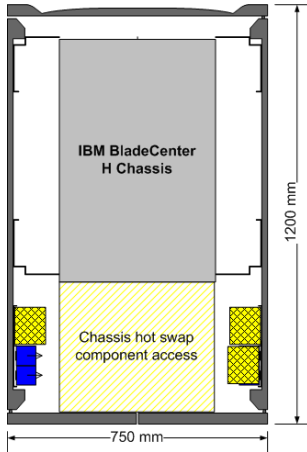
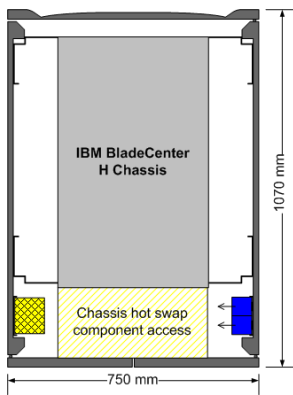
REAR VIEW

# Enclosure Recommendations – 750mm/30" Wide

The below diagrams show the available rear space for 750mm (30") wide NetShelter's and the recommended Rack PDU and cable management options.

TOP VIEW

Rack PDUs can be placed on either side of rack enclosure

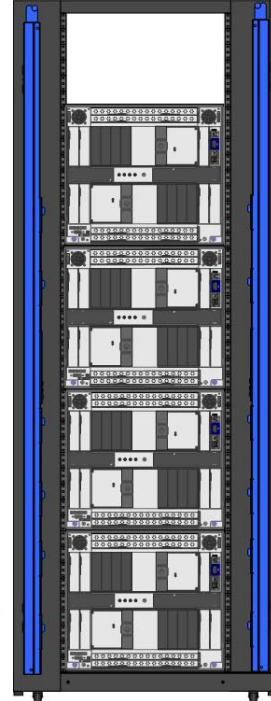
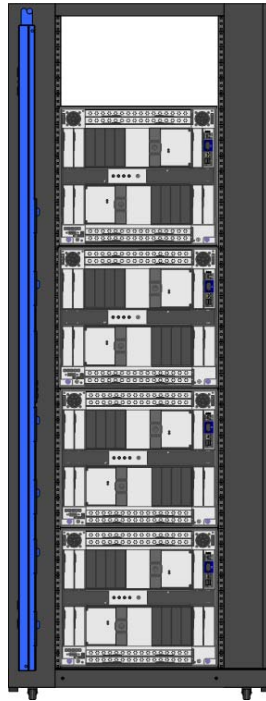
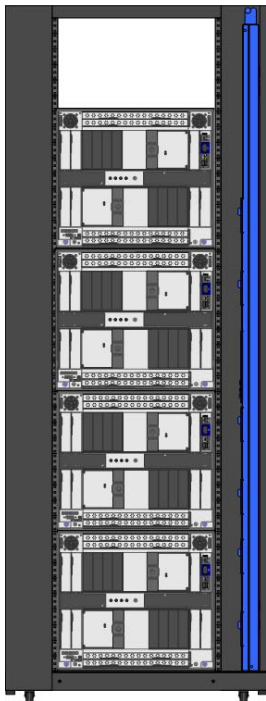


Yellow areas show data cabling area.

Recommended cable managers: AR7710, AR7721, or AR7580A

1200mm enclosure has additional space for access and cable management (can use additional AR7721 kits or AR7710 kits)

- The wider 750mm (30") enclosures are the recommended enclosures for blade applications. They offer the best clearance with absolutely no interference with the Rack PDUs/cable managers and the removable modules of the blade chassis.
- Recommended cable manager – AR7710 mounted in toolless rear channels.



REAR VIEW