Data Center Planning

NeXtScale System Environmental Planning

v3.0.4

AVAILABILITY

The 6U NeXtScale n1200 accommodates up to twelve node servers. With more computing power per watt and the latest Intel Xeon processors, you can reduce costs while maintaining speed and availability.

FLEXIBILITY

The High Efficiency (HE) Platinum AC power supplies for the NeXtScale System are 80 PLUS Platinum certified to allow for the best efficiency values of your data center.

EFFICIENCY

The Chassis allows N+N or N+1 redundancy and power policies with no redundancy is also supported.

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2.1.0 – September 20, 2014	Added Cooling Chapter with DWC Added Weight information for both chassis
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3.0.1 – November 12th, 2014	Added content and diagram for FPC section
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Introduction

The NeXtScale System™ is a high density server platform intended for HPC and other applications where high density servers are required. The NeXtScale System is an economical addition to the Lenovo System x® family, and offers an innovative approach to maximum usable density. Optimized to handle a number of workloads, all demanding agility, NeXtScale System provides rapid procurement, deployment, and flexible options. This simple, yet powerful system can handle applications ranging from technical computing, to grid deployments, to analytic workloads, to large-scale cloud and virtualization infrastructures.

Designed with industry-standard, off-the-shelf components, this general-purpose platform enables users to create a flexible, mix-and-match offering with compute, storage, and acceleration via Intel Xeon Phi coprocessor. Customized solutions can be configured to provide application-appropriate platforms with choice of server specifications, networking switches, adapters, and racks.

The NeXtScale n1200 Enclosure is an efficient, 6U, 12-bay chassis which contains space for 10 fans and 6 power supplies supporting N+N, N+1, and N configurations. The n1200 enclosure contains no built-in networking or switching capabilities requiring no chassis-level management. Sensibly designed to provide shared, high-efficiency power and cooling for housed servers, the n1200 enclosure is designed for scalability.

The NeXtScale enclosure covered in this guide is currently marketed worldwide. The intent of this guide is to provide power information for installation planning of NeXtScale Chassis. This guide contains examples of the NeXtScale enclosure connected to various PDUs and circuits.

This guide is best used in soft-copy form since it contains hyperlinks for navigation. This document can still be used in hard-copy as reference. You can obtain the latest copy of this document from this web page:

http://www.ibm.com/support/entry/portal/docdisplay?lndocid=LNVO-PWRCONF

About This Guide

When using this guide keep in mind that power connections to the NeXtScale chassis must be wired to comply with local and/or national electrical codes. Consult your local AHJ (Authority Having Jurisdiction) to ensure compliance.

Each example covered in this guide gives System x PDU options information.

NeXtScale System is a high density computing platform that is intended for scale-out (many servers) systems. The intent is to provide high powered computing at a reasonable cost. In this environment, in order to minimize system cost, it is expected at the chassis level that either non-redundant N or N+1 power will be most widely used. Therefore, the power system has been optimized around this premise. If N+N chassis power is desired, the user should expect that the available power per server node will be greatly reduced.

NeXtScale System Power Overview

Use the System x Power Configurator at the link below to estimate power consumption and heat load for the NeXtScale Chassis configurations.

System x Power Configurator tool link:
http://www.ibm.com/support/entry/portal/docdisplay?lndocid=LNVO-PWRCONF

NeXtScale System Power Supply Unit (PSU)

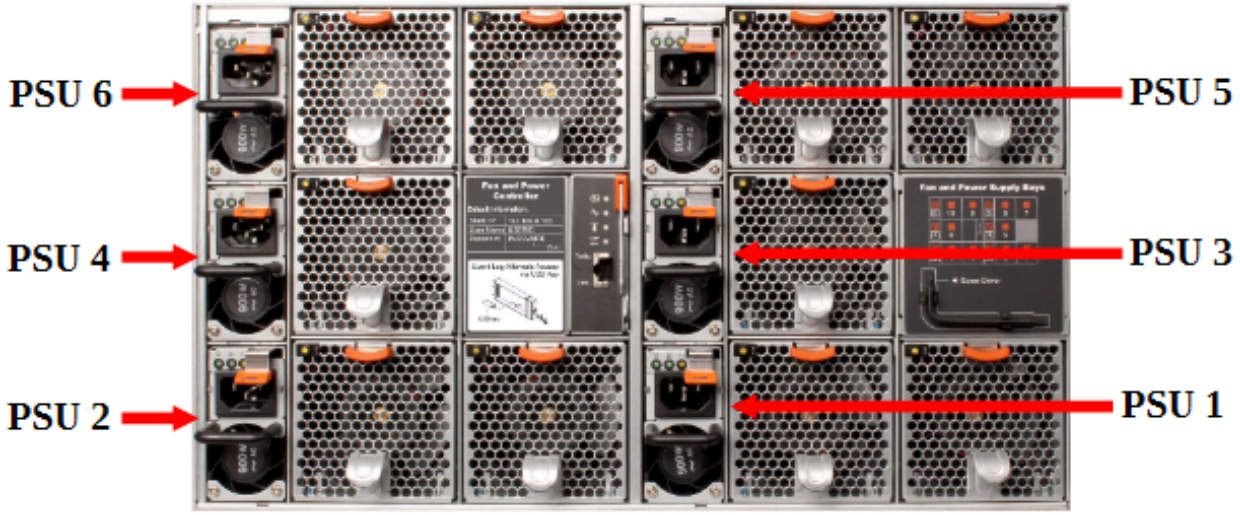
900W AC PSU – Rating & Part Number Information		
Power Supply Unit Part Numbers	PN: 00Y8569	FC: A41T
PSU Nominal Input Voltage Range	100-127V AC & 200-240V AC @ 50-60 Hz.	
PSU DC Output Wattage @ 200-240V AC	900W	
PSU Max Input Amps @ 200-240V	5A	
PSU DC Output Wattage @ 100-127V AC	600W	
PSU Max Input Amps @ 100-127V	6.8A	

1300W AC PSU – Rating & Part Number Information		
Power Supply Unit Part Numbers	PN: 00Y8652	FC: A4MM
PSU Nominal Input Voltage Range	200-240V AC @ 50-60 Hz.	
PSU DC Output Wattage @ 200-240V AC	1300W	
PSU Max Input Amps @ 200-240V	6.9A	

Figure 1: 900W PSU for the NeXtScale n1200 enclosure

NeXtScale Power Supply Placement

The power supplies in the NeXtScale enclosure are labeled from right to left, bottom to top when viewed from the rear of the chassis as seen in the following picture.



Power Supply Configuration Rules

- You must install all 6 power supplies if you are using the 900W power supply.
- A minimum of 2 and maximum of 6 1300W power supplies can be installed. Use the System x Power Configurator to determine the correct number of power supplies to achieve your required level of redundancy.
- All power supplies must be identical. Mixing of the 900W and 1300W power supply is not supported.
- The 1300W power supply can only be connected to high-line AC input (220V-240V).
- The C14 to 2x C13 Y cable is not supported with the 1300W power supply. See page 50 for the line cord compatibility chart.

When building a NeXtScale chassis solution, you are required to validate the power requirements for your configuration using the latest version of the System x Power Configurator to ensure that the number of power supplies selected are adequate for supporting your chassis configuration. Failure to validate the configuration with the System x Power Configurator tool could result in system errors, failure to power on, or CPU throttling and limiting system's ability to leverage all of the CPU performance.

The Power Configurator tool can be downloaded from:
http://www.ibm.com/support/entry/portal/docdisplay?lndocid=LNVO-PWRCONF

80 PLUS

80 PLUS is a performance specification for power supplies used within servers and computers. To meet the 80 PLUS standard, the power supply must have an efficiency of 80% or greater, at 20%, 50%, and 100% of rated load with PF of 0.9 or greater. The standard has several grades, such as Bronze, Silver, Gold, Platinum, and Titanium. More information on 80 PLUS is available at http://www.80PLUS.org.

The power supplies used in NeXtScale System are hot-swap high efficiency 80 PLUS Platinum power supplies operating at 94% efficiency. The efficiency varies by load as shown in the table below. The 80 PLUS report is available from: http://www.plugloadsolutions.com/psu_reports/Lenovo_7001700-XXXX_900W_SO-571_Report.pdf

Power Efficiencies at Different Load Levels

	20% load	50% load	100% load
80 PLUS Platinum standard	90.00%	94.00%	91.00%
NeXtScale n1200 900W PSU	92.96%	94.15%	92.53%
NeXtScale n1200 1300W PSU	92.96%	94.15%	92.53%

NeXtScale Enclosures and Cooling Overview

There are 2 types of n1200 enclosures available giving choice of air or water cooled technology:

Type	Description
5456	NeXtScale n1200 Enclosure
5468	NeXtScale n1200 DWC Enclosure

The following section discusses both of these enclosures cooling technology in more detail.

NeXtScale n1200 Enclosure Cooling and Fans

The 5456 n1200 enclosure is cooled by 10× 80 mm fans (00Y8570). The fans are dual-rotor and cool the chassis from front to back.

Figure 2 displays the fans location and installation order. All fans should be installed regardless of the number of nodes and PSUs installed.

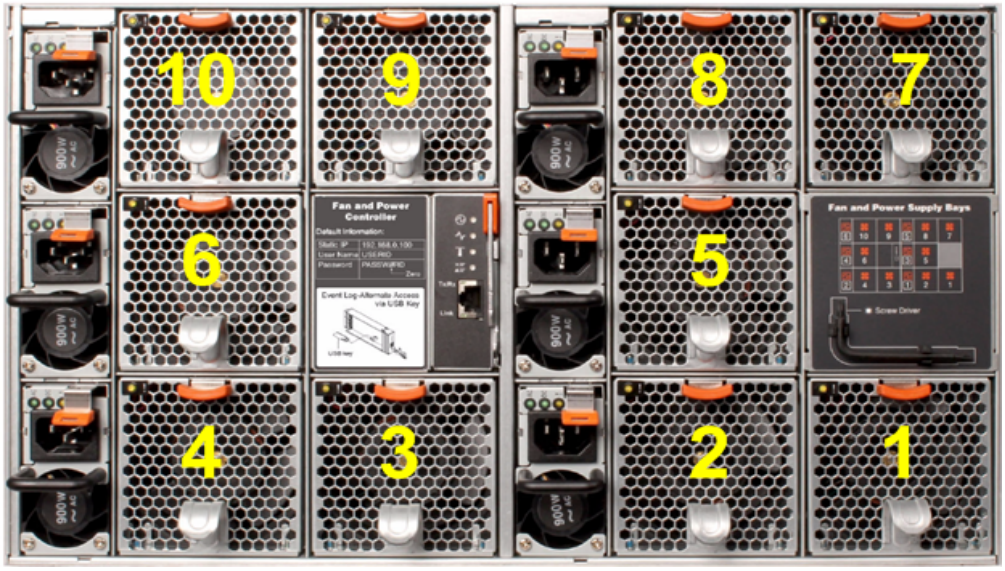


Figure 2: 5456 n1200 fans

There are 2 cooling zones within the enclosure. Fans 1, 2, 5, 7, and 8 are responsible for cooling one half of the chassis nodes, while 3, 4, 6, 9, and 10 are responsible for cooling the other half.

If a fan fails, the Fan and Power Control unit (FPC) is responsible for speeding up the remaining fans (no more than 20% above average speeds) to ensure the chassis remains cool. For additional information on the FPC, refer to the Fan and Power Control (FPC) section. Should a fan fail, use a temporary filler for air movement and replace failed fan as soon as possible.

For more in-depth information on the NeXtScale n1200 enclosure, refer to the Redbook: http://www.redbooks.ibm.com/abstracts/sg248152.html?Open

NeXtScale n1200 DWC Enclosure Cooling (Direct Water Cooling)

The 5468 n1200 DWC enclosure is cooled by direct water cooling (DWC) and does not require the installation of the 10× 80mm fans to cool the hardware installed in the enclosure.

The DWC is based on the same core design as the air cooled version, however it includes 4 new components;

- A new 1U full width tray that holds 2 half width compute nodes (giving up to 12 compute nodes per enclosure),
- A new nx360 M5 WCT half width node (two fit inside the 1U full width tray),
- A new n1200 DWC enclosure, and
- A n1200 WCT Manifold.

The hardware is cooled by absorbing the heat produced by the node(s) via copper water lines that are placed throughout the node(s). The copper water lines carry water over the hot surfaces (such as CPU, memory, and I/O). The lines absorb the heat from the CPU, memory and I/O into the water and carries the hot water out of the system.

Water is a very good medium for transporting heat as it can carry 4000 times more heat than the traditional way of cooling by air with fans, so this is an effective way to cool the system. This cooling strategy can potentially provide up to 40% greater energy efficiency in the data center, and 10% greater power efficiency at the server level compared to air-cool solutions.

Figure 3 displays a close up picture of the inside of the nx360 M5 WCT node with the water lines that run over the CPUs and pass the I/O and memory modules to absorb the heat they produce.

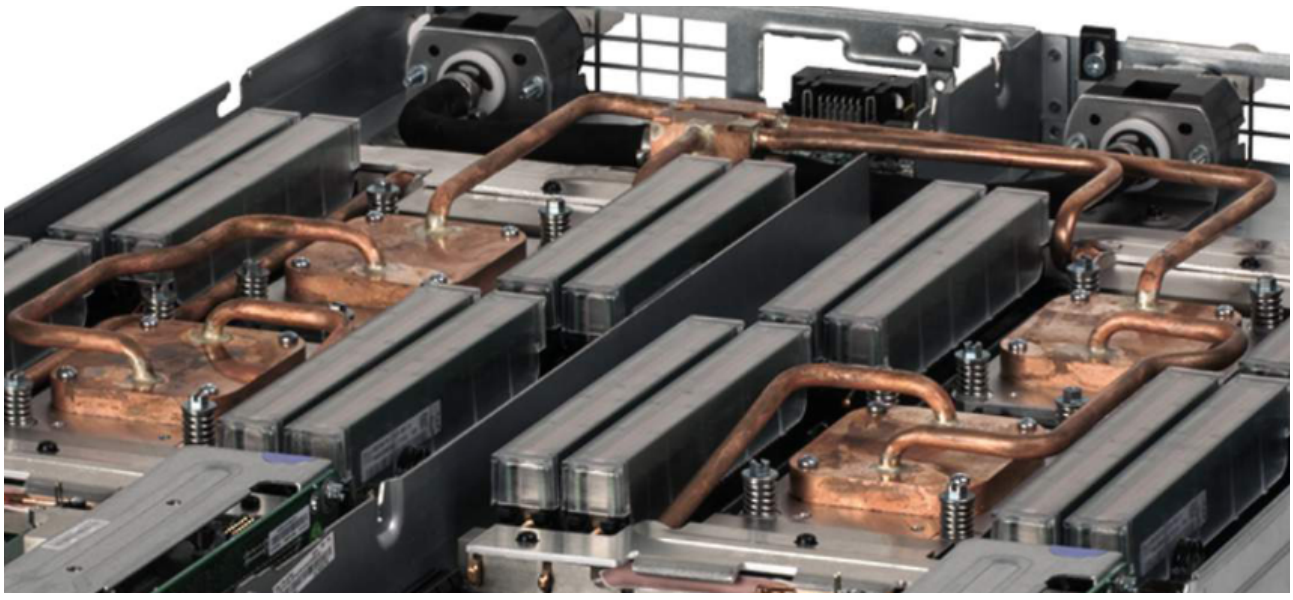


Figure 3: Close up of the water lines in the x360 M5 WCT node

The n1200 DWC enclosure requires the installation of the 1U full width tray that holds two nx360 M5 WCT nodes.

The enclosure does not support the half width nx360 M4 or nx360 M5 nodes since these require fans to be cooled. Refer to the NeXtScale n1200 and n1200 DWC – Enclosure Compatibility Chart section for additional details of what is and is not supported in the n1200 DWC enclosure.

Figure 4 displays the nx360 M5 WCT node from the front, and inside the node with the water lines.

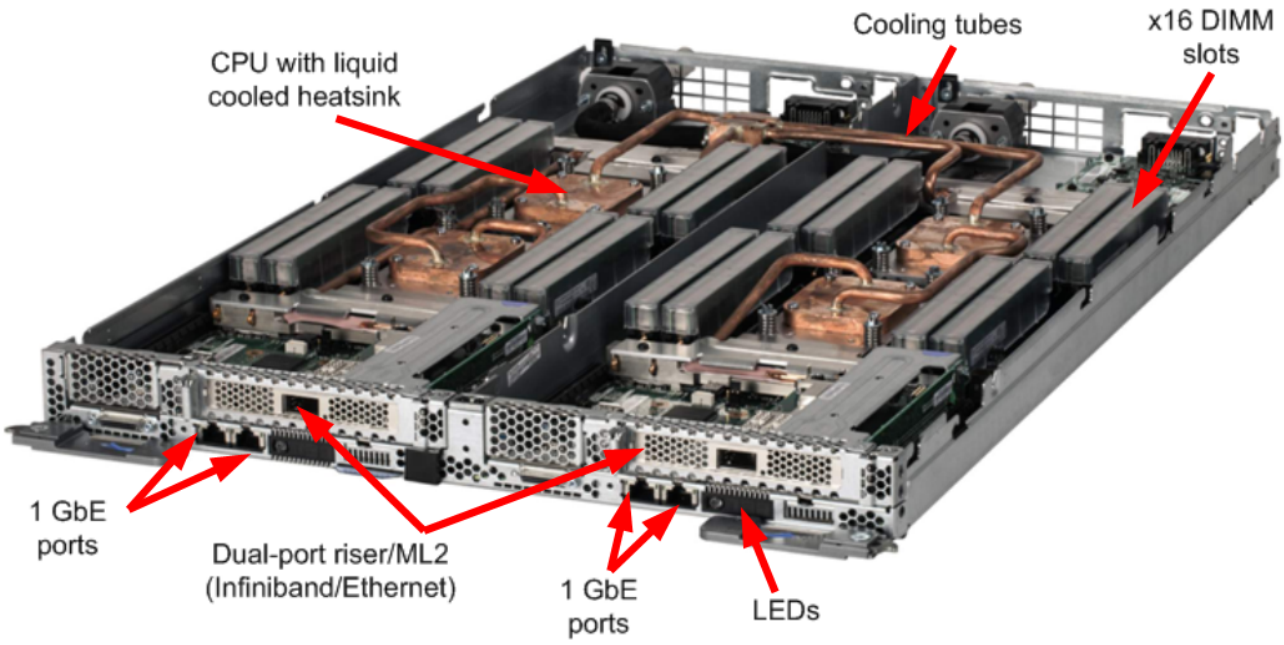


Figure 4: nx360 M5 WCT full wide, 1U tray with 2 nodes

Water is pumped in from the rear of the node, circulates the node and pumped back out through the rear via the Manifold. The following section discusses more details on the Manifold.

NeXtScale n1200 DWC Manifold

Depending on the number of chassis's needing to be cooled, will depend on the number of manifold(s) you will need to order. Up to a maximum of 6 chassis's can be cooled per rack. The manifolds are ordered as an assembly in quantities shown below.

Number of Chassis's	Feature Code	Description
1	A5MN	Manifold Assembly – 1 chassis drop
2	A5N7	Manifold Assembly – 2 chassis drop
3	A5N8	Manifold Assembly – 3 chassis drop
4	A5N9	Manifold Assembly – 4 chassis drop
5	A5MM	Manifold Assembly – 5 chassis drop
6	A5ML	Manifold Assembly – 6 chassis drop

The WCT Manifold is what delivers the water to each of the nodes from the water supply.

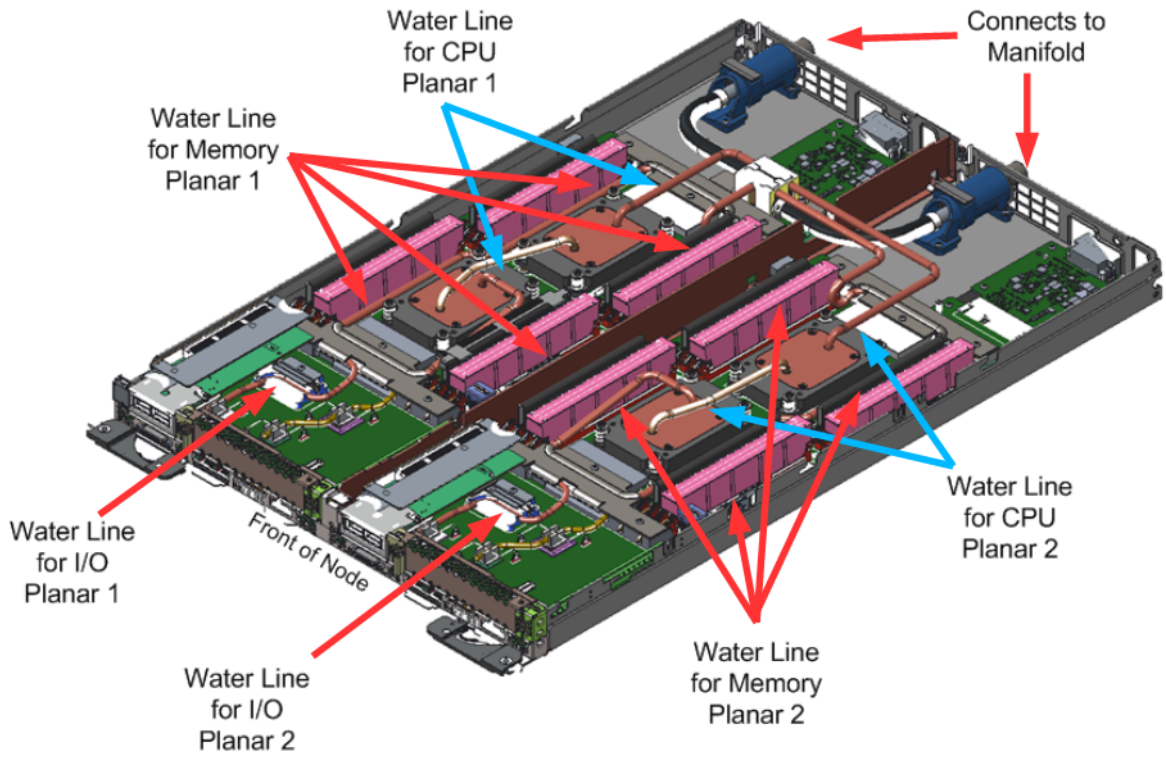


Figure 5: Location of the water lines and Manifold in the nx360 M5 WCT nodes

Figure 5 displays the location of all water lines and where the water enters the node via the Manifold at the rear of the node.

There are 2 connection points to the enclosure via one Manifold (assembly); one for water entering the system, and one for water exiting the system.

Each manifold section attaches to a chassis and connects directly to the water inlet and outlet connectors for each compute node in order to safely and reliably deliver water to and from each server.

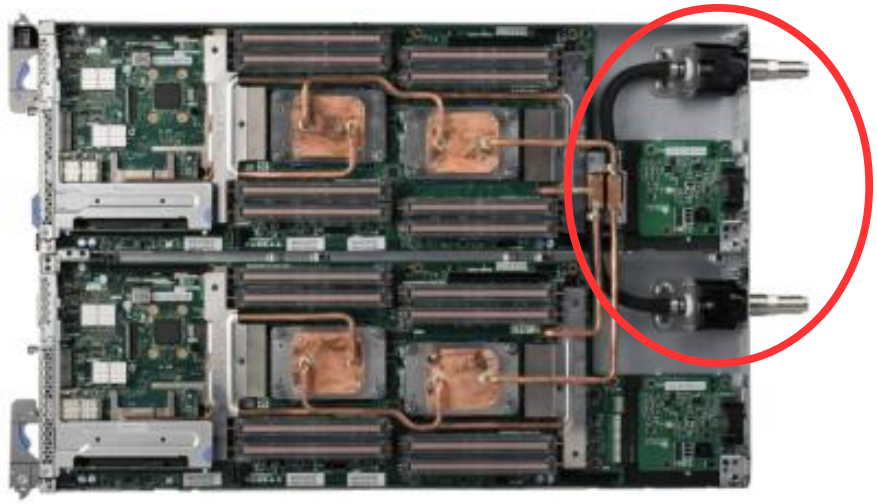


Figure 6: nx360 M5 WCT water connections

Figure 7 displays the water flow from the water supply, entering the enclosure, and exiting the enclosure.

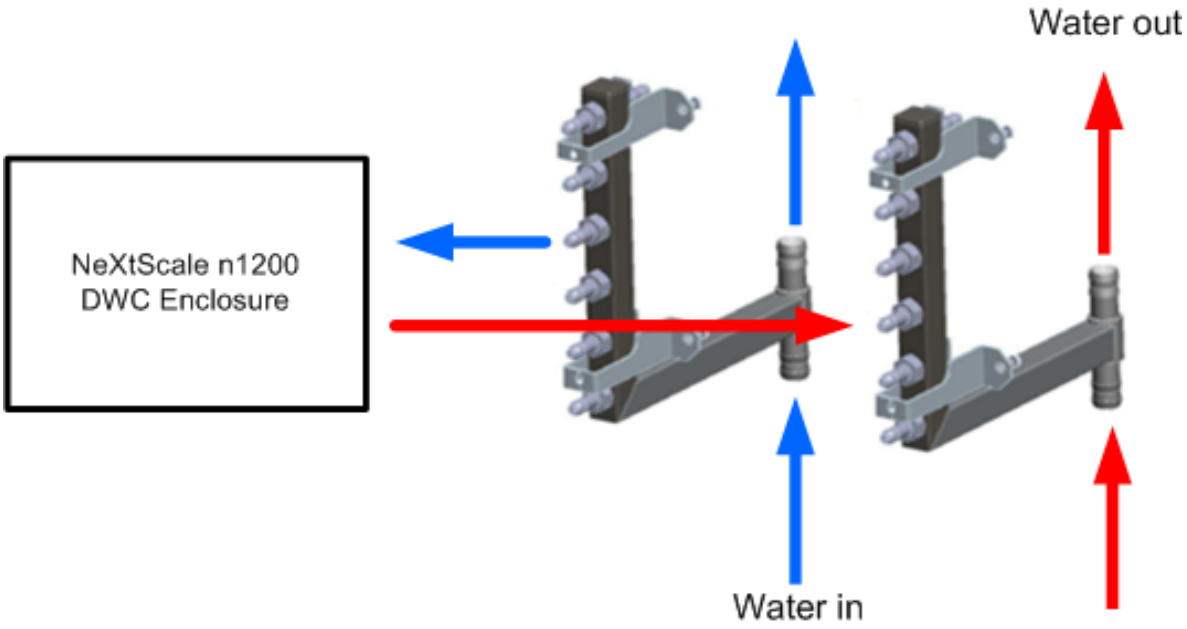


Figure 7: DWC Manifold

As previously mentioned, the manifold is very modular and comes in multiple configurations based on the number of chassis drops required in the rack. Anywhere from 1 to 6 chassis can be supported in a single rack.

Figure 8 displays the rear of the n1200 DWC enclosure with the Manifold chassis drops attached and connected to the water supply.

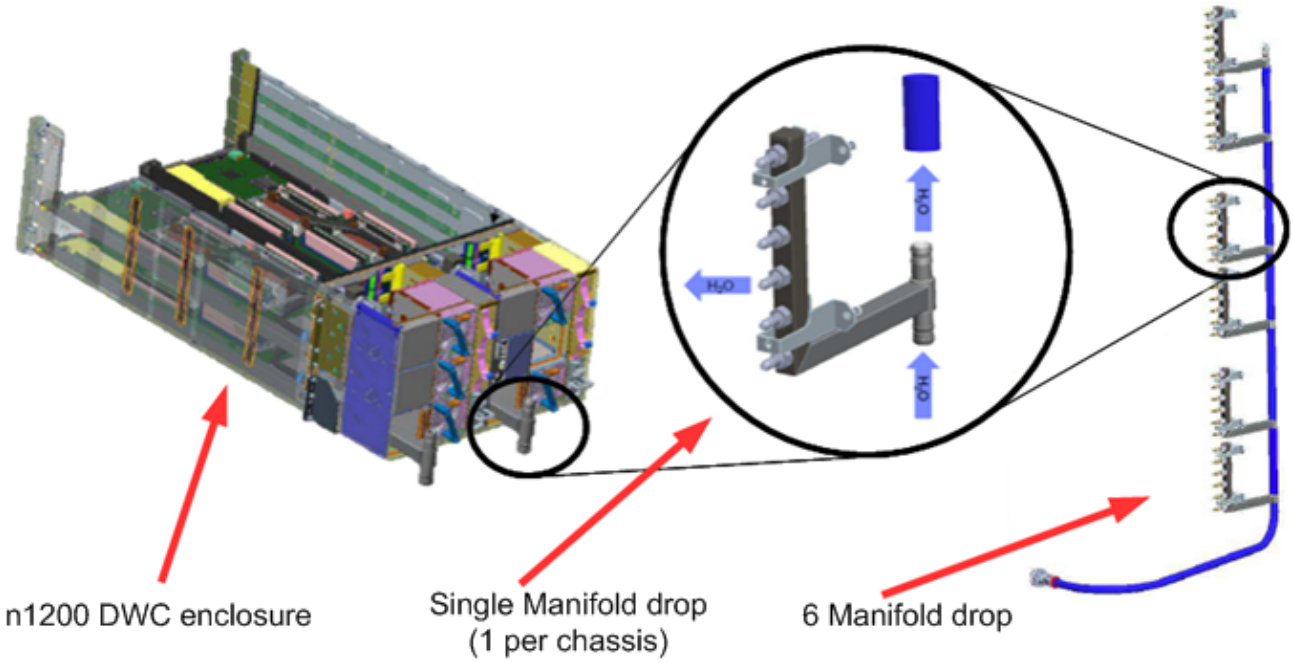


Figure 8: NeXtScale n1200 DWC enclosure multi Manifold drops

Figure 9 on page 17 shows an example of a rack where the manifold drops at the side of the rack for each chassis.

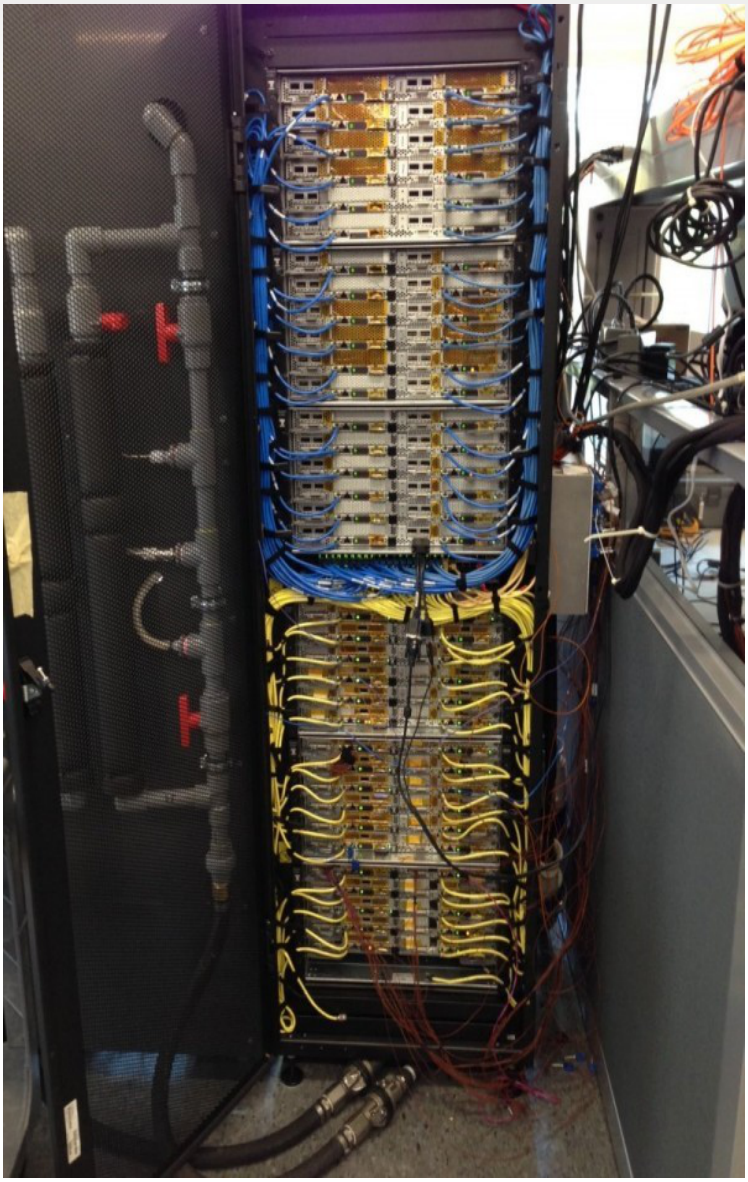


Figure 9: Example of a Direct Water Cooled rack (front)

Figure 10 on page 18 shows an example of the back of a water cooled rack with the manifolds and hoses feeding in to each server.

Figure 10: Example of a Direct Water Cooled rack (back)

The water inlet temperature to the enclosure does not have to be chilled as it supports temperatures anywhere from 5 degrees Celsius up to 45 degrees Celsius.

A Cooling Distribution Unit (CDU), should be used to control the NeXtScale n1200 DWC water supply into and out of the enclosure.

The following sections discuss the NeXtScale n1200 DWC enclosure and nx360 M5 WCT node in more detail.

Overview – n1200 DWC enclosure

This section provides a quick overview of the NeXtScale n1200 DWC enclosure (5468).

- 6U Chassis, 6 bays,
- Each bay houses a full wide, 2-node tray (12 nodes per 6U chassis),
- 6 × 900W or 1300W power supplies (PSU) supporting N+N or N+1 configurations,
- No fans except internal PSU fans,
- Fan and Power Controller (FPC),
- Drip sensor and error LEDs for detecting water leaks,
- No built in networking, and
- No chassis management required.

The n1200 DWC enclosure (5468) front view is displayed in Figure 11 with 12 compute nodes installed (6 trays).

Figure 11: NeXtScale n1200 DWC enclosure, front

The n1200 DWC enclosure (5468) rear view is displayed in Figure *12.*

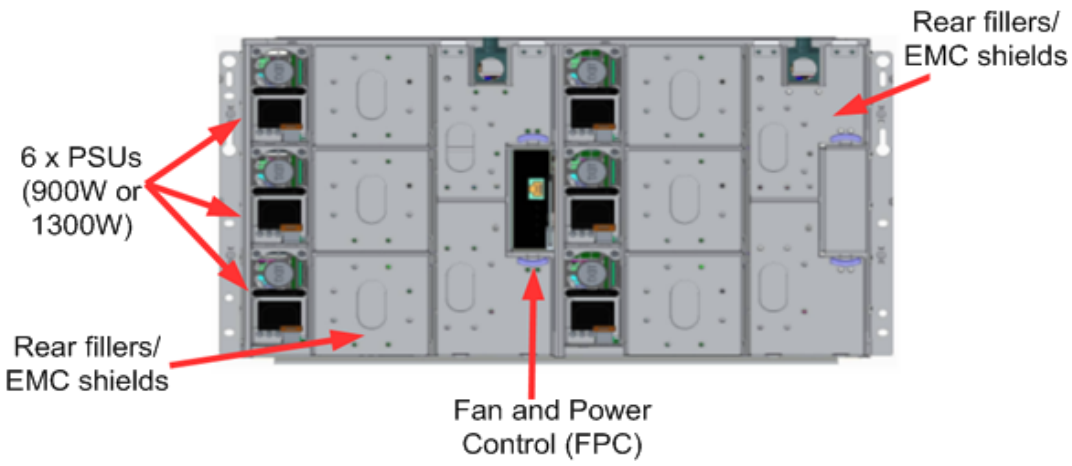


Figure 12: NeXtScale n1200 DWC enclosure, rear

Overview – nx360 M5 WCT node

This section provides a quick overview of the NeXtScale x360 M5 WCT node (5468).

- 2 compute nodes per tray (2 planars),
- 6 trays per 6U chassis (12 servers),
- Dual x16 ML2 slot supports Infiniband FDR (optional),
- PCIe adapter support for Connect IB or Intel QDR (optional), and
- GbE dedicated and GbE shared NIC.

The NeXtScale nx360 M5 WCT 1U full width tray with 2 nodes front view is displayed in Figure 13.

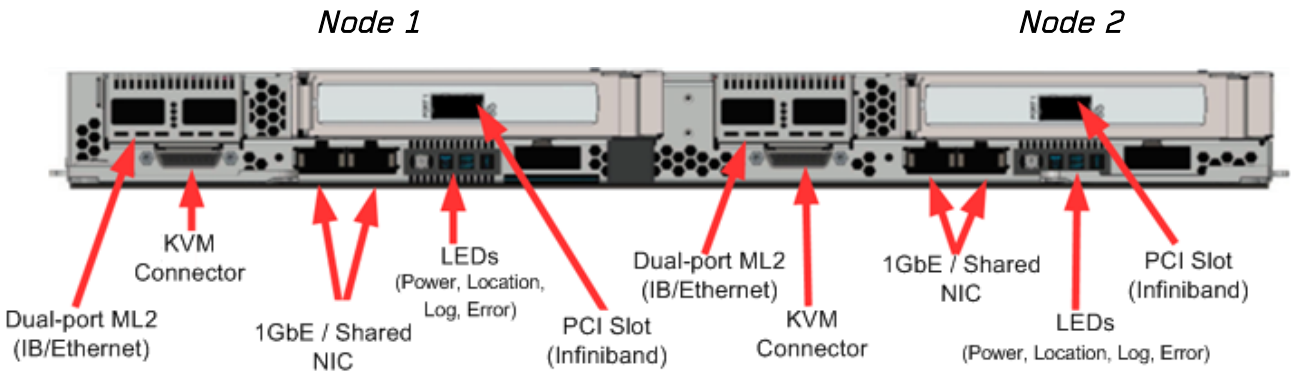


Figure 13: NeXtScale nx360 M5 WCT node - front

The NeXtScale nx360 M5 WCT 1U full width tray with 2 nodes rear view is displayed in Figure 14.

Figure 14: NeXtScale nx360 M5 WCT node - rear

Additional details on the nx360 M5 WCT node are listed below.

CPU/Chipset: (Per planar)

- Dual CPU / Socket R3
- Processors: Intel Haswell-EP 12/14/16/18 Core
- Chipset: Intel Wellsburg
- QPI (Quick Path Interconnect)
- TPM1.2 Chip down

NIC: (Per planar)

- Broadcom 5717 NIC C-step
- 10Gbit support on ML2 slot

Memory: (Per planar)

- 16x DIMM sockets – DDR4 2133MHZ (32 across both planars)
- 256GB assuming 16G DIMM
- Memory mirroring and sparing supported.
- Flash DIMM (future)

BMC: (Per planar)

- IMMv2.1 with remote presence support option.
- SH7758 with video
- NM 3.0

Card Slots: (Per planar)

- One x16 ML2 slot (support 50mm height only)

Options:

- ML2 Riser
- FoD on selected options
- ML2 FDR Adaptor

System Management / Software

- IMM 2.1
- Update Xpress, Dynamic System Analysis w/ Integrated RT Diags
- Server Guide.
- NM 3.0

Power

- Energy Star 2.0
- 900W or 1300W Power Supplies (6)

NeXtScale n1200 DWC Compatibilities and Considerations

The following section discusses compatibility considerations for the n1200 DWC enclosure.

- Due to thermal considerations, the following option types are not supported in NeXtScale n1200 with Water Cool Technology (DWC enclosure):
  HDD/SDD,
  HW RAID,
  PCIe Adapters, and
  Accelerators (GPU/Phi).

- The n1200 DWC enclosure (5468) does not support the NeXtScale Storage Native Expansion Tray.

- The n1200 DWC enclosure (5468) does not support the NeXtScale PCIe Native Expansion Tray.

- The nx360 M4 (5455) and nx360 M5 (5465) half wide nodes are not supported in the n1200 DWC (5468) enclosure.

- The nx360 M5 WTC (5467) full wide node is not supported in the n1200 (5456) enclosure.

- All 6 power supplies should be installed in the DWC enclosure.

- The n1200 DWC (5468) enclosure is 100% water cooled, and installation of the 80mm fans is not supported.

- Nodes and Chassis must be shipped integrated with Manifold and Rack.

- Water inlet temperatures up to 45 degrees (Celsius) is supported (geography dependent).

- Over 85% of the heat in the system is recovered by water cooling, and can be re-used for other purposes such as heating facilities and buildings.

- Water cooling can improve performance, allowing the processors to run continuously at a higher frequency (turbo mode).

The next section discusses additional compatibilities between the NeXtScale n1200 enclosure (5456), the NeXtScale n1200 DWC enclosure (5468), fans, CPU TDPs, power supplies, and node types supported in each enclosure.

NeXtScale n1200 and n1200 DWC – Enclosure Compatibility Chart

The following table shows the compatibility between the enclosures, fans, and nodes.

		NeXtScale Chassis			
		n1200 Enclosure (5456)		n1200 DWC Enclosure (5468)	
Power Supply Unit		900W PSU	1300W PSU	900W PSU	1300W PSU
Fans (10)		80 mm Fans	80 mm Fans	N/A	N/A
Node	CPU TDP	Number of Nodes Supported (Max)*			
nx360 M4 (5455)					
1U Half Width / 2U Half Width	50W	12 / 6	12 / 6	N/A	N/A
	60W	12 / 6	12 / 6	N/A	N/A
	70W	12 / 6	12 / 6	N/A	N/A
	80W	12 / 6	12 / 6	N/A	N/A
	95W	12 / 6	12 / 6	N/A	N/A
	115W	12 / 6	12 / 6	N/A	N/A
	130W	12 / 6	12 / 6	N/A	N/A
nx360 M5 (5465)					
1U Half Width / 2U Half Width	55W	12 / 6	12 / 6	N/A	N/A
	65W	12 / 6	12 / 6	N/A	N/A
	85W	12 / 6	12 / 6	N/A	N/A
	90W	12 / 6	12 / 6	N/A	N/A
	105W	12 / 6	12 / 6	N/A	N/A
	120W	12 / 6	12 / 6	N/A	N/A
	135W	12 / 6	12 / 6	N/A	N/A
	145W	12 / 6	12 / 6	N/A	N/A
nx360 M5 WCT (5467)					
1U Full Width (2 nodes per tray)	120W	N/A	N/A	6	6
	135W	N/A	N/A	6	6
	145W	N/A	N/A	6	6
	165W	N/A	N/A	6	6
NeXtScale Storage Native Expansion Tray					
1U Half Width	-	6	6	N/A	N/A
NeXtScale PCIe Native Expansion Tray					
1U Half Width	-	6	6	N/A	N/A

***Important Notice:** The number of nodes supported may vary. Confirm nodes supported for your particular configuration via the System x Power Configurator tool.

NeXtScale Power Considerations

The following section discusses the Power Maximizer software tool and how it is integrated and used with the NeXtScale system to help budget the system power and determine power policies.

Power Maximizer

Power Maximizer is an integrated software tool for determining the as-configured total power budget for all new Lenovo System x, Pure Flex, iDataPlex, and NeXtScale systems. This technology takes a more granular approach of determining system and chassis power budget than using look-up tables in system management devices.

The benefits of this allow power policies to be set based on actual component power consumption under any supported operating condition or workload. Power policies are able to be more accurately maintained without unnecessary over-budgeting to ensure as much available power is provisioned by the system as the policies allow. This prevents resiliency and performance impacts such as unexpected throttling and system nodes powering off unexpectedly.

The Power Maximizer functions by running separate, sub-system specific workloads and then calculates a total worst-case power consumption estimate. The result of the Power Maximizer is reported to the respective management interface for determining power-on support and redundancy policy of the supported systems. The Power Maximizer result is not directly reported to any user interface, but the power policies are managed by this configuration specific power budget. This means that as the configurations change, the enclosure will automatically manage the provisioned power according to the power policy set by the end user.

The Power Maximizer software is an integrated part of each node and is hidden and not accessible to the end-user. The software runs when the node is powered-on as a component of the uEFI. The power requirement of the node is determined by the Power Maximizer software and is communicated to the Fan and Power Control unit (FPC) of the NeXtScale n1200 enclosure. The FPC is discussed in the next section.

Fan and Power Control (FPC)

The speed of the fans and power budgeting in the NeXtScale n1200 enclosure are both controlled by the Fan and Power Control unit (the FPC). The FPC is located at the rear of the n1200 enclosure and is a hot swappable component as seen in Figure 15.

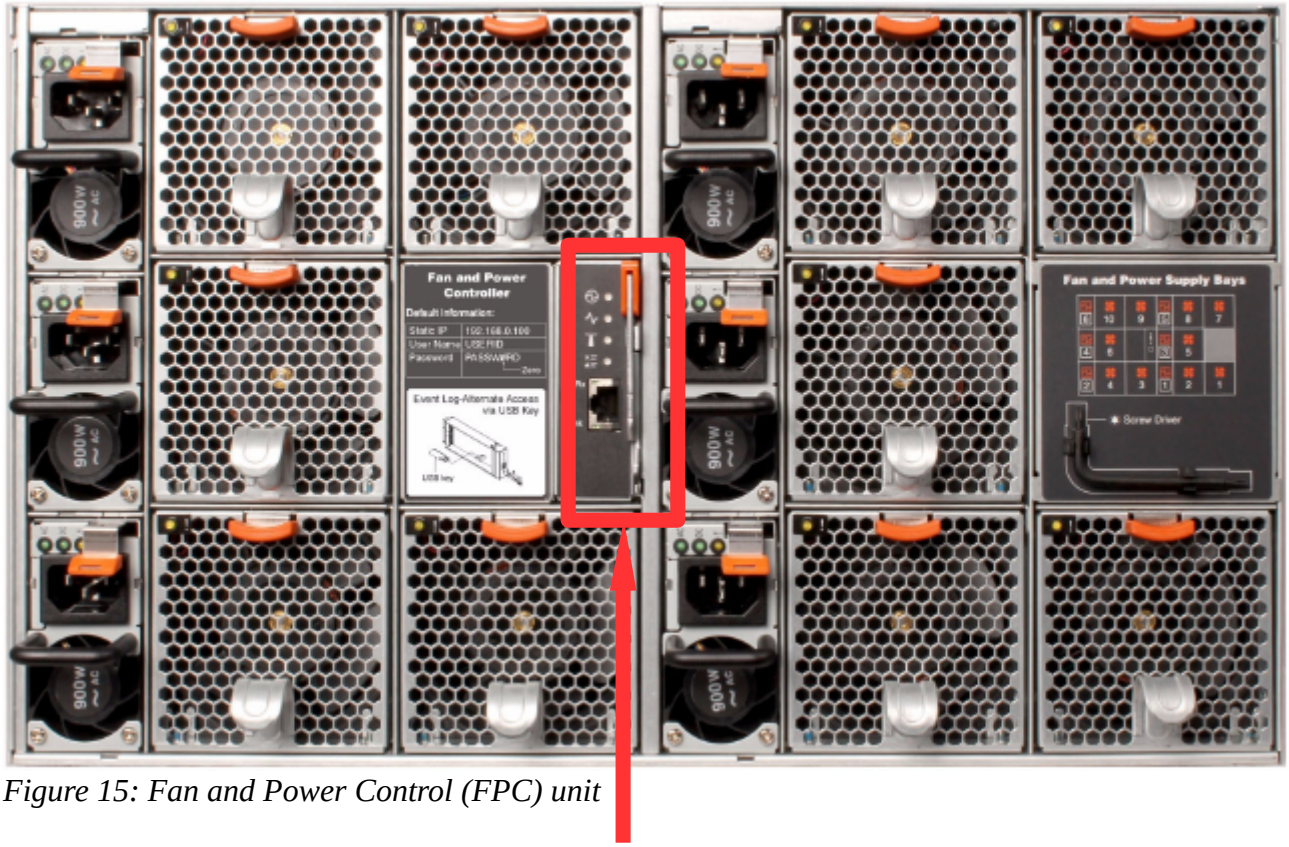


Figure 15: Fan and Power Control (FPC) unit

The FPC houses a USB key which stores the enclosures power configuration settings such as:

- PSU redundancy settings
- Over subscription mode setting
- Chassis/node level power capping values and settings
- Power restore policy
- Acoustic mode setting
- Midplane VDP and event logs

The FPC provides power management functions for the user via a web interface or CLI. For additional information on the FPC web interface, refer to the Fan and Power Control Unit (FPC) Web Interface Overview section. You can connect to the interface via a 10/100Mbps Ethernet port located on the FPC device (see Figure 15). By default the FPC web interface is configured with a static IP address. The log in credentials are listed below:

IP address: 192.168.0.100/24
User ID: USERID
Password: PASSWORD (where the 'o' in password is a Zero)

The CLI or GUI allows you to configure the power management of the n1200 enclosure, compute nodes, and power supplies. The following policies can be configured:

- **N+N:** Where the minimum number of PSUs needed to keep the hardware operational is doubled for PSU redundancy. In the event that half of the installed PSUs are not functioning, the hardware will still be available and operational. This option is ideal for achieving full power source redundancy.

- **N+N with over-subscription enabled:** The total power available is increased by using the +N power supplies to provide additional power, providing up to 20% additional power of the power supply label rating. If up to N number of power supplies fail in this mode, the healthy power supplies will provide the additional 20% power over-subscription load. This is temporary to allow the compute nodes to throttle to the lowest P-state and reduce power usage. There is no outage in this process and operation continues as normal.

- **N+1:** Where N is the minimum number of PSUs needed to keep the hardware operational plus one additional (or 'spare') PSU for redundancy. The hardware will still be available and operational in the event of a single PSU failure.

- **N+1 with over-subscription enabled:** The total power available is increased by using the +1 power supply to provide additional power, providing up to 20% additional power of the power supply label rating. If one power supply fails in this mode, the healthy power supplies will provide the additional 20% power over-subscription load. This is temporary to allow the compute nodes to throttle to the lowest P-state and reduce power usage. There is no outage in this process and operation continues as normal.

- **Non-redundant:** Where the minimum number of PSUs needed to keep the hardware operational does not exceed this amount and does not have any PSU redundancy. The hardware will not be available or operational in the event of a single PSU failure.

- **Non-redundant with over-subscription enabled:** This is not supported.

The FPC will determine the total power accessible based on the installed PSUs and determine the power policy employed. It will not allow a compute node to turn on if there is insufficient power available. The following chapter discusses the power-on policies in the FPC.

A logical layout of the FPC connection is shown in Figure 16.

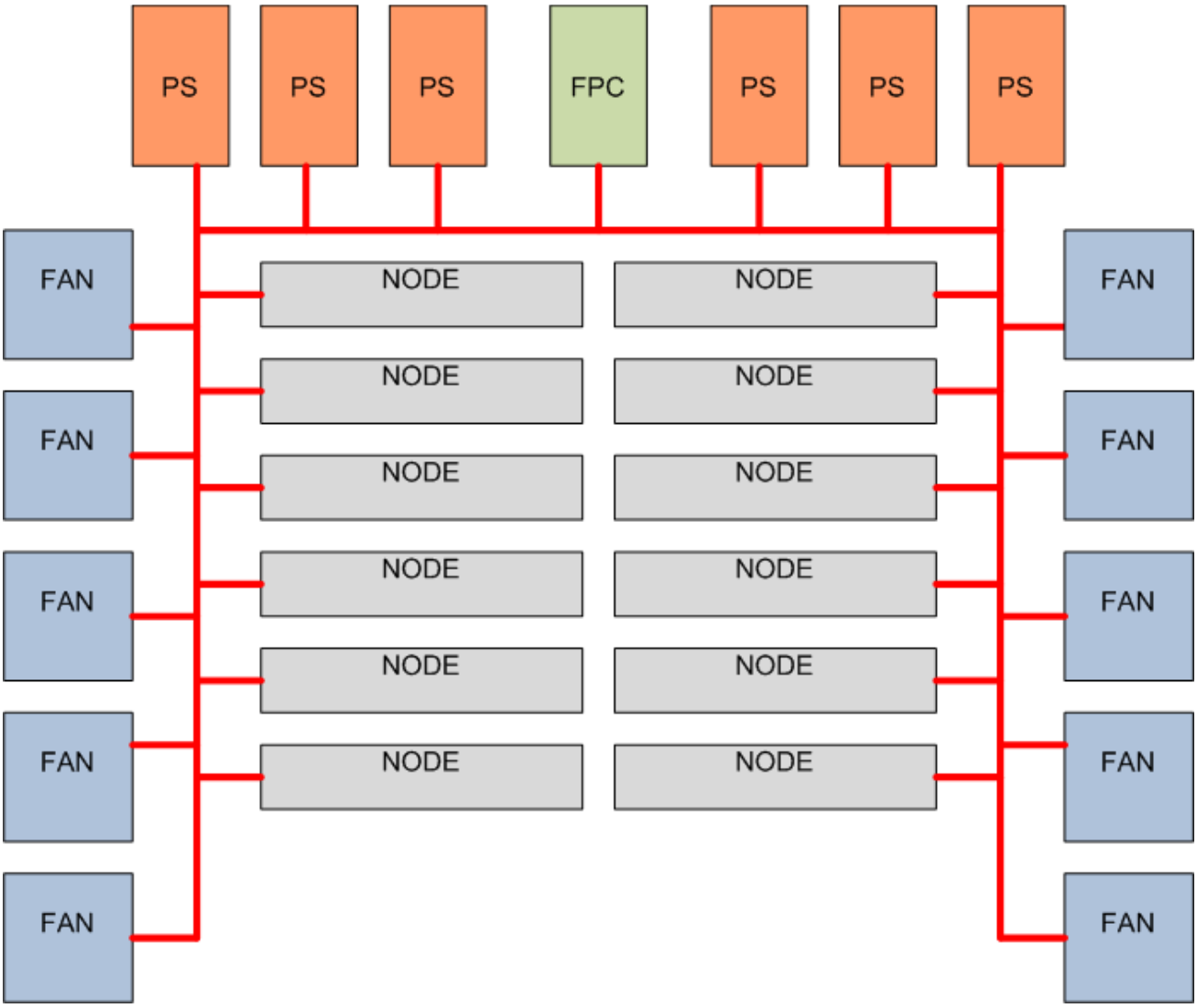


Figure 16: Logical layout - FPC

NeXtScale Power-on Policies

The following tables describe the Power on Policies for the NeXtScale system for nodes running with 6 x 900W PSUs on low-line and high-line power and for nodes with and without GPUs attached with 6 x 1300W PSUs on high-line power.

These policies are current as of March 20th, 2015.

These tables represent the worst case scenarios for the power-on policy. To accurately determine the power draw from your hardware, use the System x Power Configurator Tool. The tool will help you determine redundancy level and number of nodes supported for your particular configuration.

900W PSU, low-line AC Input (100-127V)

The following table represents the number of supported nodes powered on, when installed in the NeXtScale n1200 enclosure with 6 x 900W PSUs running at 100-127V input power. These are based on the type and number of CPU(s) installed and the level of redundancy required from the PSUs.

Table 1: Compute nodes supported (low-line AC Input (100-127V), 6 x 900W PSUs (600W)

Microprocessor SKU (W)	Quantity of microprocessor(s)	Non-Redundant or N+1 with OVS[1], N=5	N+1 Redundant, N=5	N+N Redundant, N=3	N+N Redundant with OVS1, N=3
55	1	12	12	6	8
	2	9	7	4	5
65	1	12	11	6	7
	2	8	6	3	4
85	1	12	10	5	7
	2	7	6	3	4
90	1	12	10	5	6
	2	7	5	3	4
105	1	11	9	5	6
	2	6	5	3	3
120	1	10	8	4	6
	2	6	4	2	3
135	1	9	8	4	5
	2	5	4	2	3
145	1	9	7	4	5
	2	5	4	2	3

1 OVS (Oversubscription) of the power system allows for more efficient use of the available system power.

900W PSU, high-line AC Input (200-240V)

The following table represents the number of supported nodes powered on, when installed in the NeXtScale n1200 enclosure with 6 x 900W PSUs running at 200-240V input power. These are based on the type of CPU installed and the level of redundancy required from the PSUs.

Table 2: Compute nodes supported (high-line AC Input (200-240V), with 6 x 900W PSUs)

Microprocessor SKU (W)	Quantity of microprocessor(s)	Non-Redundant or N+1 with OVS[1], N=5	N+1 Redundant, N=5	N+N Redundant, N=3	N+N Redundant with OVS1, N=3
50	1	12	12	11	12
	2	12	11	6	8
60	1	12	12	10	12
	2	12	10	6	7
70	1	12	12	9	11
	2	11	9	5	6
80	1	12	12	9	11
	2	11	9	5	6
95	1	12	12	8	10
	2	10	8	4	6
115	1	12	12	7	9
	2	9	7	4	5
130	1	12	12	7	9
	2	8	7	4	5

1 OVS (Oversubscription) of the power system allows for more efficient use of the available system power.

1300W PSU, high-line AC Input (200-240V)

The following table represents the number of supported nodes powered on, when installed in the NeXtScale n1200 enclosure with 6 x 1300W PSUs running at 200-240V input power. These are based on the type of CPU installed and the level of redundancy required from the PSUs.

Table 3: Compute nodes supported (high-line AC Input (200-240V), with 6 x 1300W PSUs)

Microprocessor SKU (W)	Quantity of microprocessor(s)	Non-Redundant or N+1 with OVS[1], N=5	N+1 Redundant, N=5	N+N Redundant, N=3	N+N Redundant with OVS1, N=3
55	1	12	12	12	12
	2	12	12	12	12
65	1	12	12	12	12
	2	12	12	12	12
85	1	12	12	12	12
	2	12	12	9	11
90	1	12	12	12	12
	2	12	12	9	11
105	1	12	12	11	12
	2	12	12	8	10
120	1	12	12	11	12
	2	12	12	7	9
135	1	12	12	10	12
	2	12	12	7	8
145	1	12	12	10	12
	2	12	10	6	8

* One CPU will Support 1 GPU + 1 Internal RAID Adapter

1 OVS (Oversubscription) of the power system allows for more efficient use of the available system power.

1300W PSU + 2 x 130W GPUs, high-line AC Input (200-240V)

The following table represents the number of supported nodes with attached GPUs powered on, when installed in the NeXtScale n1200 enclosure with 6 × 1300W PSUs running at 200-240V input power. These are based on the type of CPU installed and the level of redundancy required from the PSUs.

Table 4: Compute nodes + 2×130W[1] GPUs supported (high-line AC Input (200-240V), 6×1300W PSUs)

Microprocessor SKU (W)	Quantity of microprocessor(s)	Non-Redundant or N+1 with OVS[2], N=5	N+1 Redundant, N=5	N+N Redundant, N=3	N+N Redundant with OVS2, N=3
55	1	6	6	6	6
	2	6	6	6	6
65	1	6	6	6	6
	2	6	6	6	6
85	1	6	6	6	6
	2	6	6	5+1 CPU Node	6
90	1	6	6	6	6
	2	6	6	5	6
105	1	6	6	6	6
	2	6	6	5	6
120	1	6	6	6	6
	2	6	6	4+1 CPU Node	5+1 CPU Node
135	1	6	6	6	6
	2	6	6	4	5
145	1	6	6	6	6
	2	6	6	4	5

* One CPU will Support 1 GPU + 1 Internal RAID Adapter

1 The 130W GPU is Lenovo Option P/N 00J6165.
2 OVS (Oversubscription) of the power system allows for more efficient use of the available system power.

1300W PSU + 2 x 225W GPUs, high-line AC Input (200-240V)

The following table represents the number of supported nodes with attached GPUs powered on, when installed in the NeXtScale n1200 enclosure with 6 × 1300W PSUs running at 200-240V input power. These are based on the type of CPU installed and the level of redundancy required from the PSUs.

Table 5: Compute nodes + 2×225W[1] GPUs supported (high-line AC Input (200-240V), 6×1300W PSUs)

Microprocessor SKU (W)	Quantity of microprocessor(s)	Non-Redundant or N+1 with OVS[2], N=5	N+1 Redundant, N=5	N+N Redundant, N=3	N+N Redundant with OVS2, N=3
55	1	6	6	6	6
	2	6	6	4+1 CPU Node	5+1 CPU Node
65	1	6	6	6	6
	2	6	6	4+1 CPU Node	5+1 CPU Node
85	1	6	6	6	6
	2	6	6	4	5
90	1	6	6	6	6
	2	6	6	4	5
105	1	6	6	6	6
	2	6	6	3+1 CPU Node	4+1 CPU Node
120	1	6	6	6	6
	2	6	6	3+1 CPU Node	4+1 CPU Node
135	1	6	6	6	6
	2	6	6	3+1 CPU Node	4
145	1	6	6	6	6
	2	6	6	3+1 CPU Node	4

* One CPU will Support 1 GPU + 1 Internal RAID Adapter

1 The 130W GPU is Lenovo Option P/N 00D4192, 00J6161, 00J6163, and 00J6165.
2 OVS (Oversubscription) of the power system allows for more efficient use of the available system power.

1300W PSU + 2 x 235W GPUs, high-line AC Input (200-240V)

The following table represents the number of supported nodes with attached GPUs powered on, when installed in the NeXtScale n1200 enclosure with 6 × 1300W PSUs running at 200-240V input power. These are based on the type of CPU installed and the level of redundancy required from the PSUs.

Table 6: Compute nodes + 2×235W[1] GPUs supported (high-line AC Input (200-240V), 6×1300W PSUs)

Microprocessor SKU (W)	Quantity of microprocessor(s)	Non-Redundant or N+1 with OVS[2], N=5	N+1 Redundant, N=5	N+N Redundant, N=3	N+N Redundant with OVS2, N=3
55	1	6	6	6	6
	2	6	6	4+1 CPU Node	5+1 CPU Node
65	1	6	6	6	6
	2	6	6	4+1 CPU Node	5
85	1	6	6	6	6
	2	6	6	4	5
90	1	6	6	6	6
	2	6	6	4	4+2 CPU Node
105	1	6	6	6	6
	2	6	6	3+1 CPU Node	4+1 CPU Node
120	1	6	6	6	6
	2	6	6	3+1 CPU Node	4+1 CPU Node
135	1	6	6	6	6
	2	6	6	3+1 CPU Node	4
145	1	6	6	6	6
	2	6	6	3	4

* One CPU will Support 1 GPU + 1 Internal RAID Adapter

1 The 130W GPU is Lenovo Option P/N 00FL133.
2 OVS (Oversubscription) of the power system allows for more efficient use of the available system power.

1300W PSU + 2 x 300W GPUs, high-line AC Input (200-240V)

The following table represents the number of supported nodes with attached GPUs powered on, when installed in the NeXtScale n1200 enclosure with 6 × 1300W PSUs running at 200-240V input power. These are based on the type of CPU installed and the level of redundancy required from the PSUs.

Table 7: Compute nodes + 2×300W[1] GPUs supported (high-line AC Input (200-240V), 6×1300W PSUs)

Micro-processor SKU (W)	Quantity of micro-processor(s)	Non-Redundant or N+1 with OVS[2], N=5	N+1 Redundant, N=5	N+N Redundant, N=3	N+N Redundant with OVS2, N=3
55	1	6	6	6	6
	2	6	6	3+2 CPU Node	4+2 CPU Node
65	1	6	6	6	6
	2	6	6	3+2 CPU Node	4+1 CPU Node
85	1	6	6	6	6
	2	6	6	3+1 CPU Node	4
90	1	6	6	6	6
	2	6	6	3+1 CPU Node	4
105	1	6	6	5+2 CPU Node	6
	2	6	5+2 CPU Node	3	4
120	1	6	6	5+1 CPU Node	6
	2	6	5+1 CPU Node	3	3+2 CPU Node
135	1	6	6	5	6
	2	6	5	3	3+1 CPU Node
145	1	6	6	5	6
	2	6	5	3	3+1 CPU Node

* One CPU will Support 1 GPU + 1 Internal RAID Adapter

1 The 130W GPU is Lenovo Option P/N 00J6162.
2 OVS (Oversubscription) of the power system allows for more efficient use of the available system power.

System x Power Configurator

The System x Power Configurator is a software tool designed to assist with calculating Lenovo Systems environmental information. The data in the System x Power Configurator tool is derived from running real-world workloads across a number of configurations to properly characterize component power consumption under various conditions. The current workloads are a combination of Floating Point and Small FFT Processor workloads as well as running configuration-tuned versions of HPL (Portable Implementation of the High-Performance Linpack Benchmark) and Stream to exercise multiple sub-systems of the IT systems. The two highest power consuming sub-systems in a non-HPC (High Performance Computing) IT system are processor and memory, so focus is given to exercising those sub-systems to correctly model power consumption under traditional and virtual workloads. For HPC type IT systems, some configurations contain GPGPU (General Purpose Graphical Processing Unit) or MIC (Many Integrated Core) I/O adapters. These adapters are characterized by running highly parallel graphic rendering workloads for complete characterization. All tests are conducted using default uEFI/BIOS settings.

The System x Power Configurator provides three groups of environmental information. The first represents Idle or minimum power consumption, the second is Maximum power consumption, and the third is Load Factor. Load Factor is a scale factor between Idle and Max that can represent any configurations total aggregate system utilization for a specific workload. The load factor can be used if, based on the user experience, it is known that the power demand by the application will be some percentage less than the maximum.

The configurator calculates the power draw on individual hardware components configured in the system(s) to give an accurate understanding of the total power draw from uniquely configured systems. Because of this, the System x Power Configurator tool will accurately determine and advise on the number of nodes supported (powered on) for uniquely configured NeXtScale configurations. The tool provides a fuel gauge as an indicator for power capacity of the configured system and a message center to advise on redundancy level and number of nodes supported.

Important Notice: Ensure you use the latest version of the System x Power Configurator to determine node support for your NeXtScale configuration.

The data reported by System x Power Configurator can be used in certain cases to determine electrical wiring and levels of redundancy. The data reported by System x Power Configurator represents a worst-case power consumption value under normal operating conditions and may not model power consumption under component failure conditions. Final determinations should be made by persons skilled in the art or by contacting power@lenovo.com for assistance. System x Power Configurator tool link:

http://www.ibm.com/support/entry/portal/docdisplay?lndocid=LNVO-PWRCONF

System x Power Configurator – NeXtScale Power Capacity Example

The System x Power Configurator tool will provide accurate power numbers to determine the overall power draw for uniquely configured NeXtScale systems. Use the tool to determine the number of nodes supported (powered on) and the redundancy level it can achieve (N+N, N+1, N – no redundancy, or Not Supported – nodes will not power on). An example of the Power Capacity/Fuel Gauge and Message Center from the tool are seen in Figure 17.

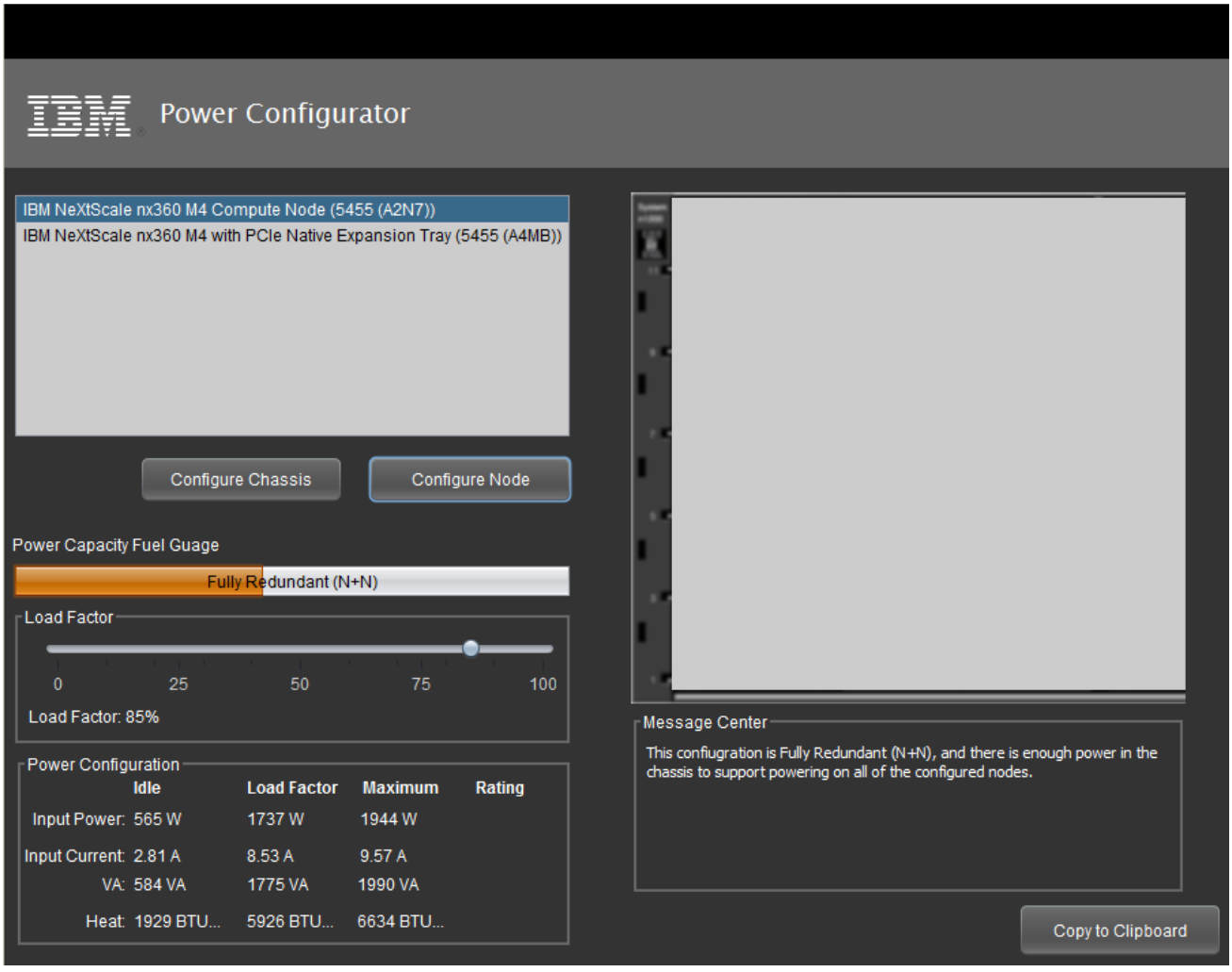
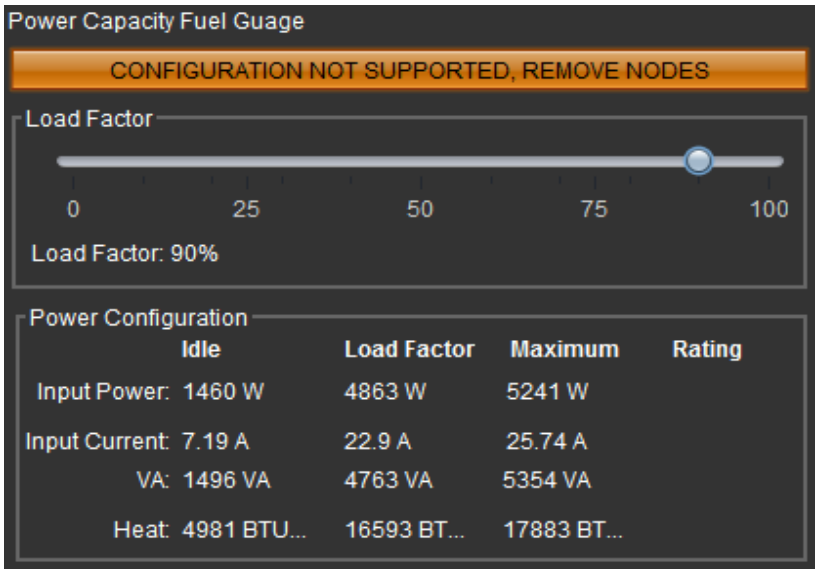


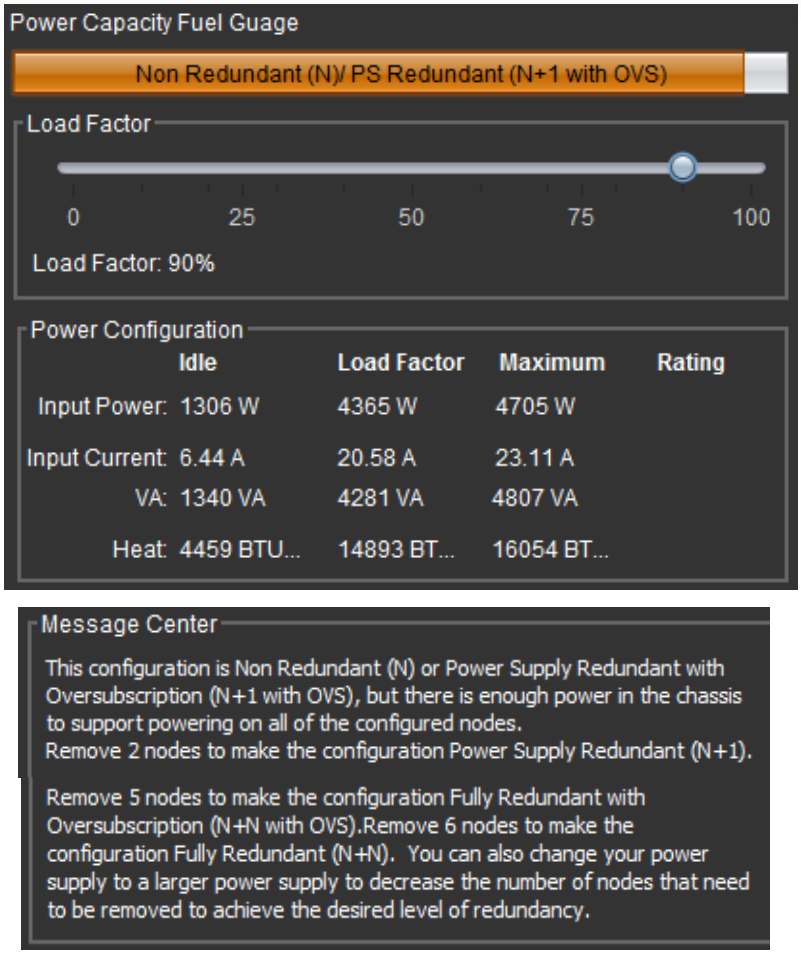
Figure 17: System x Power Configurator - NeXtScale fuel gauge and message center

Typical Power for Common 900W NeXtScale System

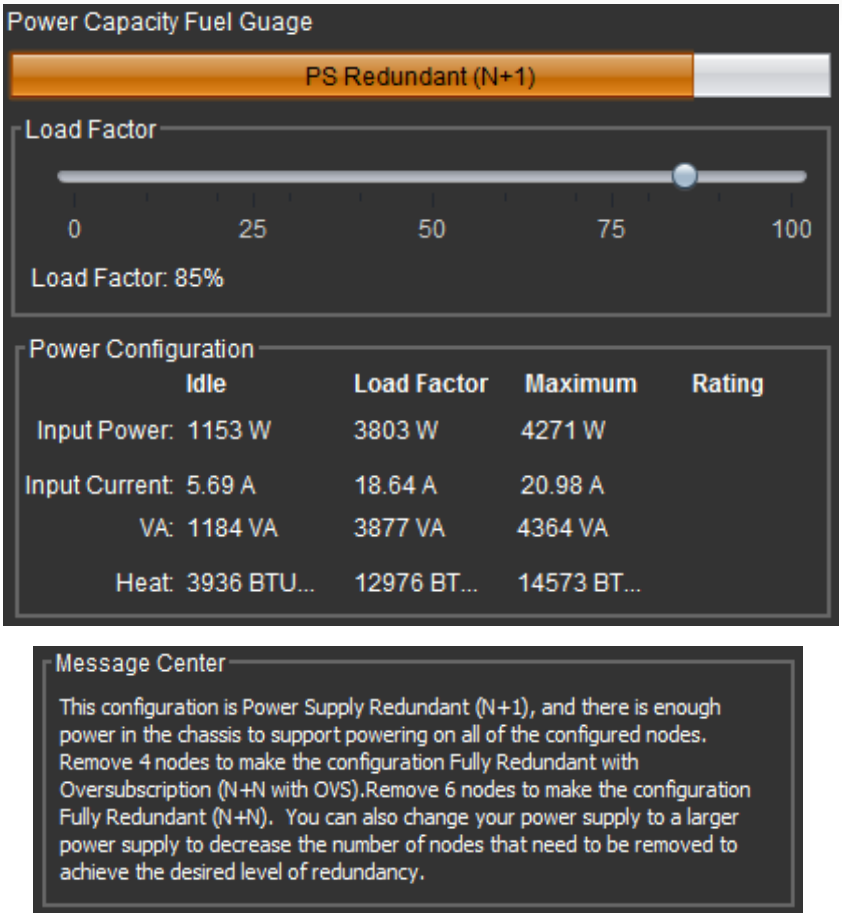
Below are common customer configurations and associated power requirements. The System x Power Configurator was used to determine the power requirements of these configurations. Small variations in the node configuration will not have a large impact on the total chassis power. For more accurate power estimates based on your exact node configuration, please download the System x Power Configurator tool. The Power Configurator tool will provide guidance around the number of nodes that can be powered on for any given configuration, as seen in the following examples.
The tool can be found here:
http://www.ibm.com/support/entry/portal/docdisplay?lndocid=LNVO-PWRCONF

Configuration 1 – 900W PSU	Power Results
1x n1200 Enclosure	
10x n1200 Enclosure Fan Assembly	
6x CFF 900W Power Supply	
12x n360 M4 Nodes:	
2x E5-2690v2 (130W)	
8x 8GB 1.5V DIMMs	
2x 2.5" 500GB SATA HDD	
1x Dual Port HBA	

1. Load Factor 90% represents steady state Linpack, Turbo Mode OFF
2. Maximum represents peak mPrime balanced FFT, Turbo Mode ON
3. The tools Load Factor is set to 85% by default. This represents the avg user defined max power under virtual or HPC workloads.

Configuration 2 – 900W PSU	Power Results
1x n1200 Enclosure	
10x n1200 Enclosure Fan Assembly	
6x CFF 900W Power Supply	
12x nx360 M4 Nodes:	
2x E5-2680v2 (115W)	
8x 8GB 1.5V DIMMs	
2x 2.5'' 500GB HDD	
1x Dual Port HBA	

1. Load Factor 90% represents steady state Linpack, Turbo Mode OFF
2. Maximum represents peak mPrime balanced FFT, Turbo Mode ON
3. The tools Load Factor is set to 85% by default. This represents the average user defined maximum power under virtual or HPC workloads.

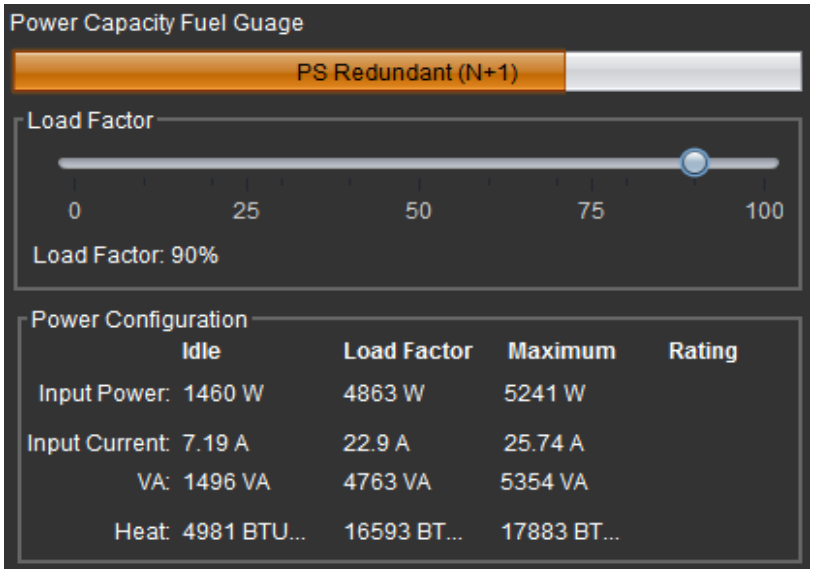
Configuration 3 – 900W PSU	Power Results
1x n1200 Enclosure	
10x n1200 Enclosure Fan Assembly	
6x CFF 900W Power Supply	
12x nx360 M4 Nodes:	
2x E5-2660v2 (95W)	
8x 8GB 1.5V DIMMs	
2x 2.5'' 500GB HDD	
1x Dual Port HBA	

1. Load Factor 90% represents steady state Linpack, Turbo Mode OFF
2. Maximum represents peak mPrime balanced FFT, Turbo Mode ON
3. The tools Load Factor is set to 85% by default. This represents the average user defined maximum power under virtual or HPC workloads.

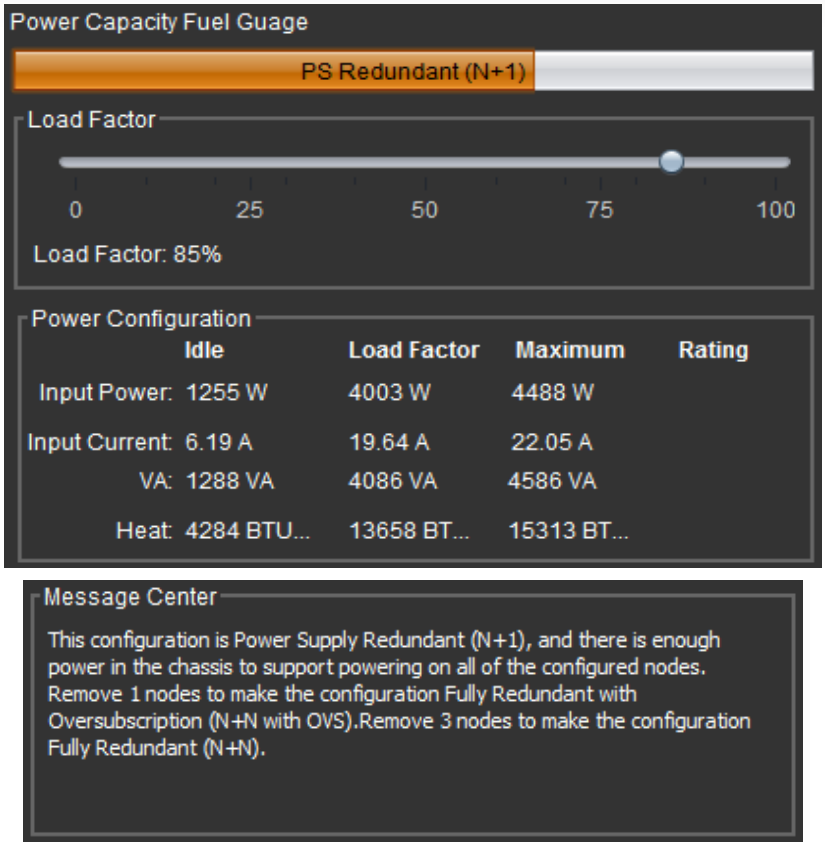
Typical Power for Common 1300W NeXtScale System

Below are common customer configurations and associated power requirements. The System x Power Configurator was used to determine the power requirements of these configurations. Small variations in the node configuration will not have a large impact on the total chassis power. For more accurate power estimates based on your exact node configuration, please download the System x Power Configurator tool. The tool can be found here:

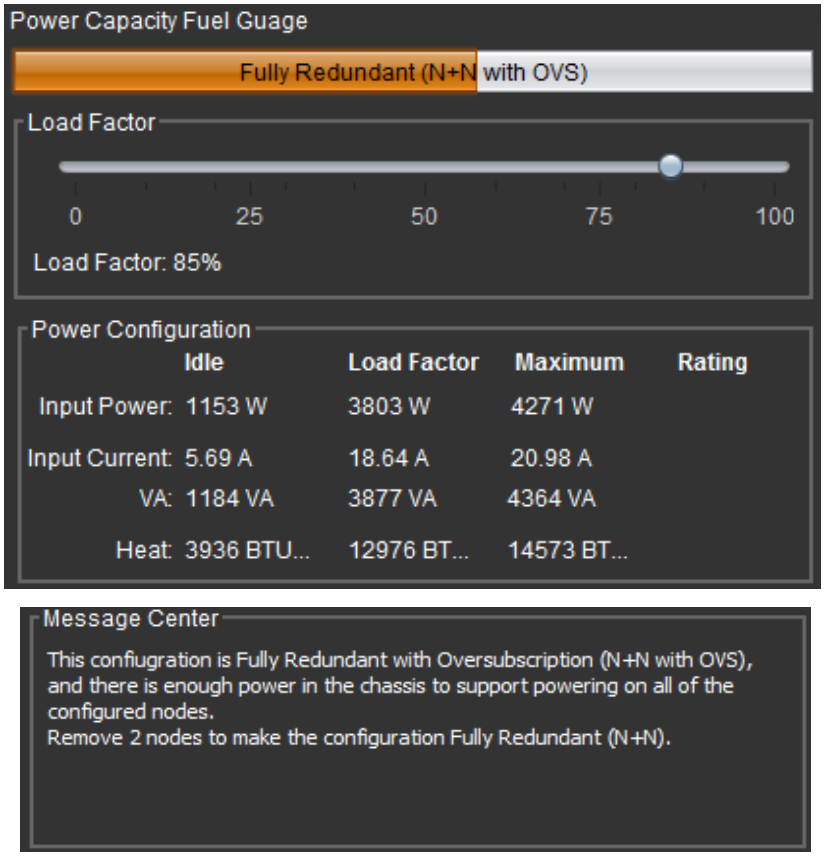
http://www.ibm.com/support/entry/portal/docdisplay?lndocid=LNVO-PWRCONF

Configuration 1 – 1300W PSU	Power Results
1x n1200 Enclosure	
10x n1200 Enclosure Fan Assembly	
6x CFF 1300W Power Supply	
12x nx360 M4 Nodes:	
2x E5-2690v2 (130W)	
8x 8GB 1.5V DIMMs	
2x 2.5'' 500GB SATA HDD	
1x Dual Port HBA	

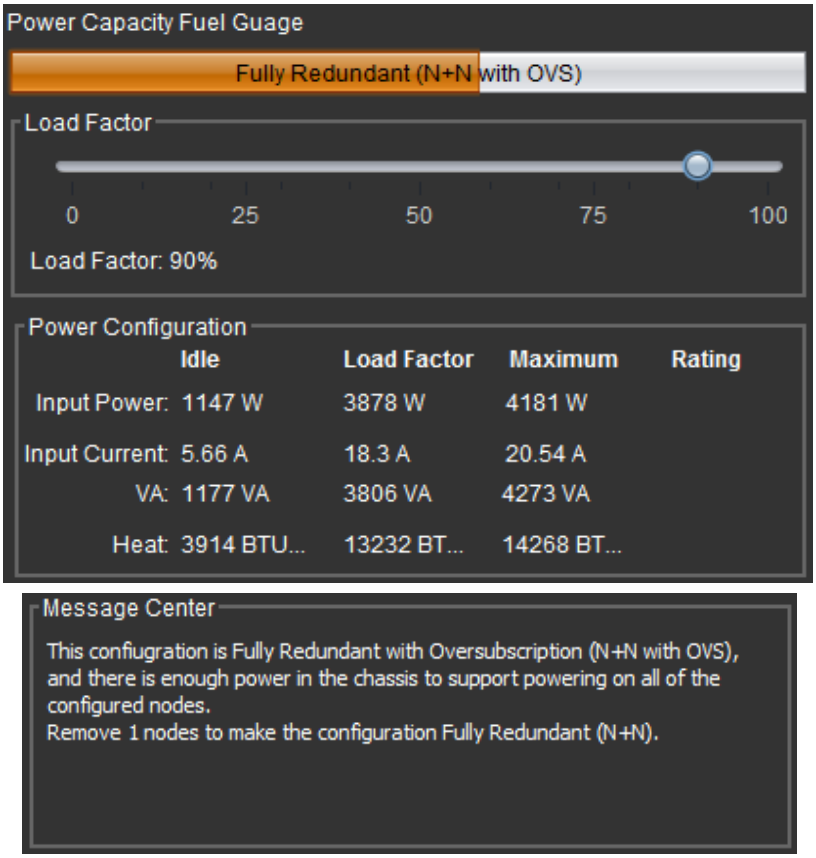
1. Load Factor 90% represents steady state Linpack, Turbo Mode OFF
2. Maximum represents peak mPrime balanced FFT, Turbo Mode ON
3. The tools Load Factor is set to 85% by default. This represents the average user defined maximum power under virtual or HPC workloads.

Configuration 2 – 1300W PSU	Power Results
1x n1200 Enclosure	
10x n1200 Enclosure Fan Assembly	
6x CFF 1300W Power Supply	
12x nx360 M4 Nodes:	
2x E5-2680v2 (115W)	
2x 2.5'' 500GB HDD	
8x 8GB 1.5V DIMMs	
1x Dual Port HBA	

1. Load Factor 90% represents steady state Linpack, Turbo Mode OFF
2. Maximum represents peak mPrime balanced FFT, Turbo Mode ON
3. The tools Load Factor is set to 85% by default. This represents the average user defined maximum power under virtual or HPC workloads.

Configuration 3 – 1300W PSU	Power Results
1x Lenovo n1200 Enclosure	
10x n1200 Enclosure Fan Assembly	
6x CFF 1300W Power Supply	
12x nx360 M4 Nodes:	
2x E5-2660v2 (95W)	
8x 8GB 1.5V DIMMs	
2x 2.5'' 500GB HDD	
1x Dual Port HBA	

1. Load Factor 90% represents steady state Linpack, Turbo Mode OFF
2. Maximum represents peak mPrime balanced FFT, Turbo Mode ON
3. The tools Load Factor is set to 85% by default. This represents the average user defined maximum power under virtual or HPC workloads.

Configuration 4 – 1300W PSU + PCIe Expansion Tray*	Power Results
1x n1200 Enclosure	
10x n1200 Enclosure Fan Assembly	
6x CFF 1300W Power Supply	
6x nx360 M4 Nodes:	
2x E5-2690v2 (130W)	
8x 8GB 1.5V DIMMs	
2x 2.5'' 500GB HDD	
1x Dual Port HBA	
6x NVIDIA Telsa K20X	1. Load Factor 90% represents steady state Linpack, Turbo Mode OFF 2. Maximum represents peak mPrime balanced FFT, Turbo Mode ON 3. The tools Load Factor is set to 85% by default. This represents the average user defined maximum power under virtual or HPC workloads.

* When the PCIe expansion tray is configured, only the 1300W PSUs are supported. The 1300W PSUs can only be connected with highline voltage (220 – 240 V ac). The 900W PSUs are not supported with the expansion tray.

Customized PDU Configurations

Frequently, PDU configurations can be changed to support special requirements. For assistance with unique requirements and non-typical PDU configurations please email your questions and configurations to power@lenovo.com. The appropriate personnel will review and advise on the proper PDU solution which meets the customer's needs. Completing this step will help minimize the official power review time when the solution becomes a Special Bid.

For official sign-off and review of custom PDU configurations, the complete configurations must go through the Special Bids process. For information and instructions on how the Special Bids process works contact the Lenovo Power team at power@lenovo.com.

NeXtScale System Racking Considerations

It is recommended that the NeXtScale chassis be installed in the Lenovo 42U 1100mm Enterprise V2 Dynamic Rack. This rack is of sufficient size and has features to accommodate the chassis and associated components. However, the NeXtScale chassis can also be installed in most industry-standard, four-post server racks as long as the guidelines are followed.

The officially supported Lenovo racks include:

Part Number	Description	Number of Enclosures
9363 – 4PX, 4EX, RC4	Lenovo 42U 1100mm Enterprise V2 Dynamic Rack Family	6
1410 – PRB, ERB, HPB, HEB	Intelligent Cluster 42U 1100mm Enterprise V2 Rack Family	6

Additional Information

Refer to the NeXtScale System Planning and Implementation Guide (Redbook):
http://www.redbooks.ibm.com/redbooks/pdfs/sg248152.pdf

Section 3.9.1 defines the physical size of the chassis: Dimensions: Height: 263.3 mm (10.37 in.); Depth: 914.5 mm (36 in.); Width: 447 mm (17.6 in.).
Section 5.4 defines the recommended rack: NeXtScale System in the Lenovo 42U 1100mm Enterprise V2 Dynamic Rack.
Section 5.4.2 defines requirements / rack dimensions for installing a NeXtScale chassis in racks other than the Lenovo Enterprise V2 rack.

In dense configurations it is important to select the proper length power cord to ensure there is sufficient room to route cables. The next section discusses the power cords that are compatible with the NeXtScale Chassis.

Chassis Weight

The following is an indication of the weight of the 5456 NeXtScale n1200 enclosure and the 5468 NeXtScale n1200 DWC enclosure when fully configured.

Enclosure	Configuration	Weight (kgs)
5456 – n1200	(12x) 1/2 Nodes, (6x) 1300WPSU, (1x) FPC	106.9 kg
5468 – n1200 DWC	(6x) FW Nodes (no manifold), (6x) 1300W PSU, (1x) FPC	127.6 kg

NeXtScale System Power Cords

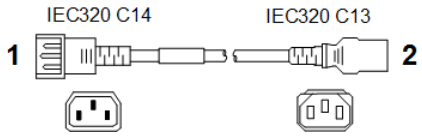
The following section discusses the compatible power cords to connect the power supply unit (PSU) to supported power distribution units (PDU) and compatible power cords to connect the PSUs to country specific wall/floor outlets for both North America and International for the NeXtScale Chassis.

NeXtScale System Worldwide Power Cords (PSU to PDU)

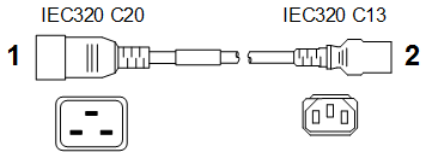
These power cords are used worldwide to connect NeXtScale System PSUs to PDUs when ordered as part of an Lenovo System x order. One of these power cords needs to be ordered for each PSU that is installed in each NeXtScale chassis and is connected to a PDU. Refer to the information on the following pages for guidance on power cord type and length selection.

P/N	FC	Description
00Y3043	A4VP	1.0m, 10A/100-250V, C13 to C14 Power Cable
00Y3046	A4VQ	1.345m, 10A/100-250V, 2x C13 B&C=815mm to C14 A=530mm Y Cable
00Y3047	A4VR	2.054m, 10A/100-250V, 2x C13 B&C=1524mm to C14 A=530mm Y Cable
39Y7937	6201	1.5m, 10A/100-250V, C13 to C14 Power Cable
-	6316	2.0m, 10A/100-250V, C13 to C14 Power Cable
-	6311	2.8m, 10A/100-250V, C13 to C14 Power Cable
39Y7938	6204	2.8m, 10A/100-250V, C13 to C20 Power Cable
47C2487	A3SS	1.2m, 10A/100-250V, 2x C13 B&C=200mm to C14 A=1000mm Y Cable
47C2491	A3SW	1.2m, 16A/100-250V, 2x C13 B&C=200mm to C20 A=1000mm Y Cable
47C2492	A3SX	2.5m, 16A/100-250V, 2x C13 B&C=1524mm to C20 A=1000mm Y Cable

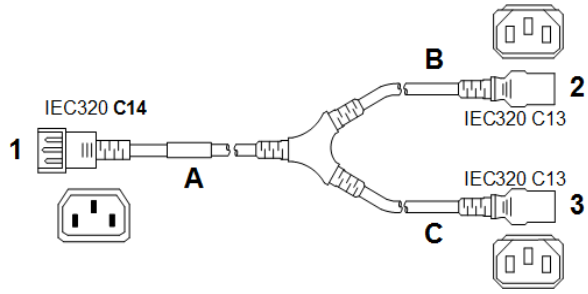
C13 to C14 Power Cable



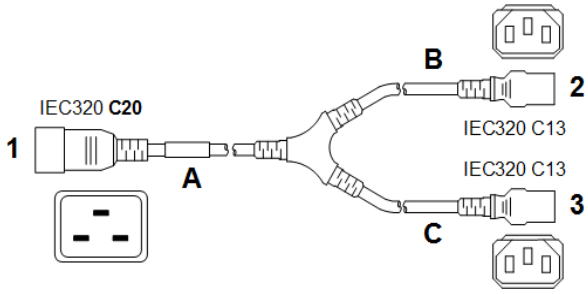
C13 to C20 Power Cable



2x C13 to C14 Y Cable



2x C13 to C20 Y Cable

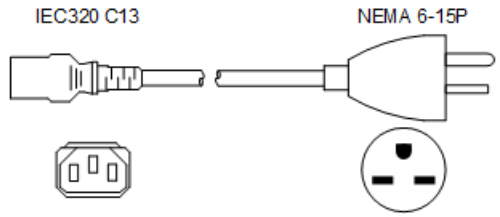


NeXtScale System North American Power Cords (PSU to non-PDU)

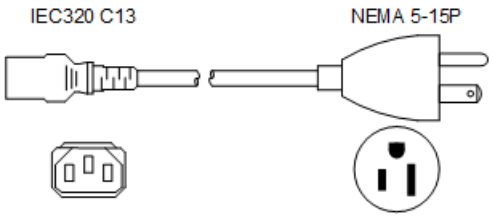
These power cords are only used in North America or countries on a similar type power grid to connect NeXtScale chassis PSUs directly to NEMA 6-15R and NEMA 5-15R outlets.

PN	FC	Description
39Y7931	6207	4.3M, 10A/125V, C13 to NEMA 5-15P
-	6369	1.8M, 10A/125V, C13 to NEMA 5-15P
-	6313	2.8m, 10A/120V, C13 to NEMA 5-15P
-	6351	1.8m, 10A/250V, C13 to NEMA 6-15P
-	6372	2.8m, 10A/250V, C13 to NEMA 6-15P
46M2592	A1RF	2.8m, 10A/250V, C13 to NEMA 6-15P

2.8m IEC320 C13 to NEMA 6-15P



2.8m IEC320 C13 to NEMA 5-15P



NeXtScale System International Power Cords (PSU to non-PDU)

These power cords are used internationally to connect NeXtScale chassis PSUs directly to outlets.

PN	FC	Description
-	6364	1.8m, 10A/250V C13 2P+Gnd (Brazil)
-	6599	1.8m, 10A/125V C13 2P+Gnd (Brazil)
46M2593	A1RE	2.8m, 10A/100V C13 to JIS C-8303 (Japan)
-	6314	2.8m, 100V, C13 to JIS C-8303 (Japan)
23R7158	6386	2.8m, 10A/125V, C13 to CNS 10917-3 (Taiwan)
-	6212	2.8m, 10A/230V, C13 to CEE7-VII (Europe)
-	6377	2.8m, 10A/230V, C13 to IEC 309 P+N+G (Den/Sws)
-	6317	2.8m, 10A/240V, C13 to CNS 10917-3 (Taiwan)
69Y1988	6532	2.8m, 10A/250V C13 to NBR 14136 (Brazil)
39Y7927	6269	2.8m, 10A/250V C13(2P+Gnd) (India)
39Y7924	6211	2.8m, 10A/250V, C13 to AS/NZ 3112 (Australia/NZ)
-	6215	2.8m, 10A/250V, C13 to BS 1363/A (UK)
39Y7918	6213	2.8m, 10A/250V, C13 to DK2-5a (Denmark)
39Y7930	6222	2.8m, 10A/250V, C13 to IRAM 2073 (Argentina)
39Y7922	6214	2.8m, 10A/250V, C13 to SABS 164 (S Africa)
39Y7919	6216	2.8m, 10A/250V, C13 to SEV 1011-S24507 (Swiss)
39Y7920	6218	2.8m, 10A/250V, C13 to SI 32 (Israel)
39Y7921	6217	2.8m, 220-240V, C13 to CEI 23-16 (Italy/Chile)
39Y7928	6210	2.8m, 220-240V, C13 to GB 2099.1 (China)
39Y7925	6219	2.8m, 220-240V, C13 to KETI (S Korea)
39Y7929	6223	2.8m, 250V, C13 to NBR 14136 (Brazil)
-	6374	4.3m, Europe 10A/250V C13 - (2P+Gnd)

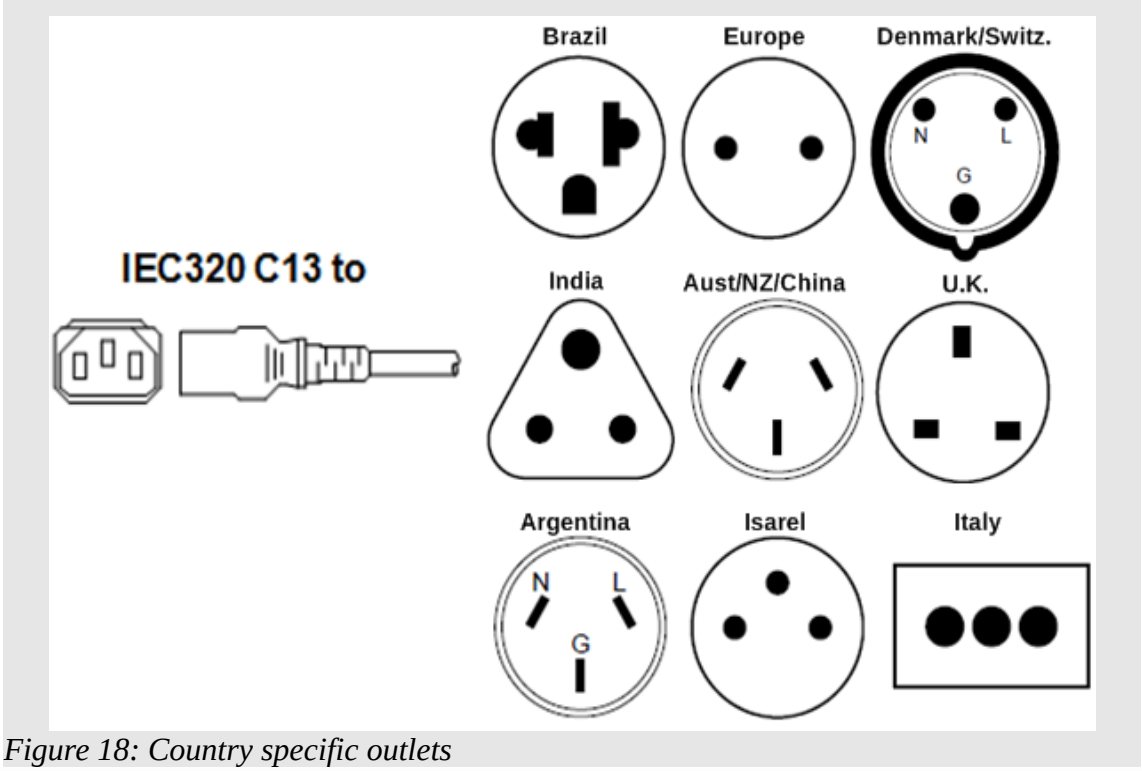


Figure 18: Country specific outlets

NeXtScale Power Cord Compatibility Chart

The following table represents line cord compatibility with the NeXtScale PSUs.

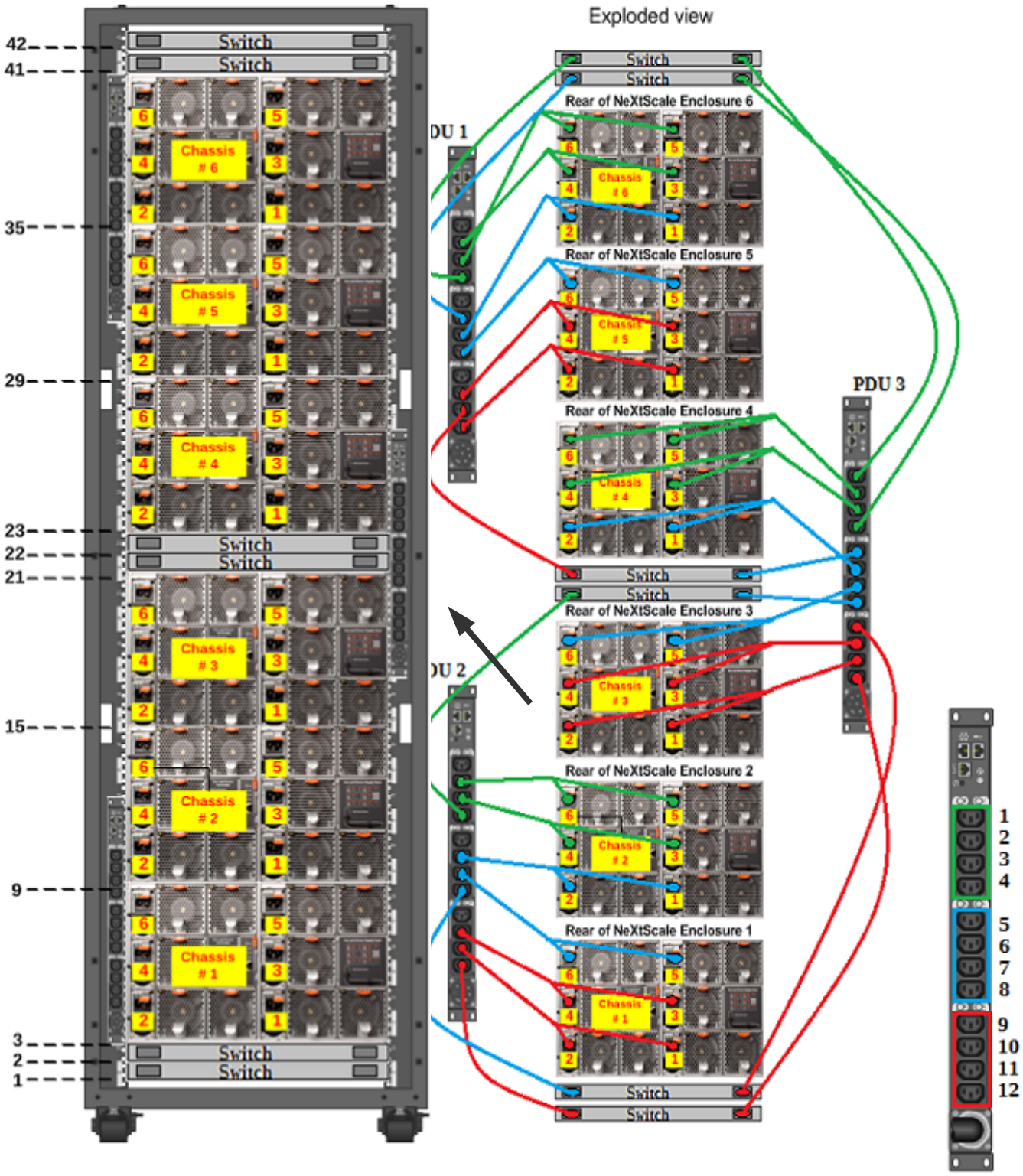
Option	FC*	Description	900W PSU Compatibility	1300W PSU Compatibility
39Y7931	6207	4.3M, 10A/125V, C13 to NEMA 5-15P	Y	Y
-	6369	1.8M, 10A/125V, C13 to NEMA 5-15P	Y	Y
-	6313	2.8m, 10A/120V, C13 to NEMA 5-15P	Y	Y
-	6351	1.8m, 10A/250V, C13 to NEMA 6-15P	Y	Y
-	6372	2.8m, 10A/250V, C13 to NEMA 6-15P	Y	Y
46M2592	A1RF	2.8m, 10A/250V, C13 to NEMA 6-15P	Y	Y
00Y3043	A4VP	1.0m, 10A/100-250V, C13 to C14 Power Cable	Y	Y
00Y3046	A4VQ	1.345m, 10A/100-250V, 2x C13 B&C=815mm to C14 A=530mm Y Cable	Y	N
00Y3047	A4VR	2.054m, 10A/100-250V, 2x C13 B&C=1524mm to C14 A=530mm Y Cable	Y	N
39Y7937	6201	1.5m, 10A/100-250V, C13 to C14 Cable	Y	Y
-	6316	2.0m, 10A/100-250V, C13 to C14 Cable	Y	Y
-	6311	2.8m, 10A/100-250V, C13 to C14 Cable	Y	Y
39Y7938	6204	2.8m, 10A/100-250V, C13 to C20 Cable	Y	Y
47C2492	A3SX	2.5m, 16A/100-250V, 2x C13 B&C=1524mm to C20 A=1000mm Y Cable	Y	Y
-	6364	1.8m, 10A/250V C13 2P+Gnd (Brazil)	Y	Y
-	6599	1.8m, 10A/125V C13 2P+Gnd (Brazil)	Y	Y
46M2593	A1RE	2.8m, 10A/100V C13 to JIS C-8303 (Japan)	Y	Y
-	6314	2.8m, 100V, C13 to JIS C-8303 (Japan)	Y	Y
23R7158	6386	2.8m, 10A/125V, C13 to CNS 10917-3 (Taiwan)	Y	Y
-	6212	2.8m, 10A/230V, C13 to CEE7-VII (Europe)	Y	Y
-	6377	2.8m, 10A/230V, C13 to IEC 309 P+N+G (Den/Sws)	Y	Y
-	6317	2.8m, 10A/240V, C13 to CNS 10917-3 (Taiwan)	Y	Y

Option	FC*	Description	900W PSU Compatibility	1300W PSU Compatibility
69Y1988	6532	2.8m, 10A/250V C13 to NBR 14136 (Brazil)	Y	Y
39Y7927	6269	2.8m, 10A/250V C13(2P+Gnd) (India)	Y	Y
39Y7924	6211	2.8m, 10A/250V, C13 to AS/NZ 3112 (Australia/NZ)	Y	Y
-	6215	2.8m, 10A/250V, C13 to BS 1363/A (UK)	Y	Y
39Y7918	6213	2.8m, 10A/250V, C13 to DK2-5a (Denmark)	Y	Y
39Y7930	6222	2.8m, 10A/250V, C13 to IRAM 2073 (Argentina)	Y	Y
39Y7922	6214	2.8m, 10A/250V, C13 to SABS 164 (S Africa)	Y	Y
39Y7919	6216	2.8m, 10A/250V, C13 to SEV 1011-S24507 (Swiss)	Y	Y
39Y7920	6218	2.8m, 10A/250V, C13 to SI 32 (Israel)	Y	Y
39Y7921	6217	2.8m, 220-240V, C13 to CEI 23-16 (Italy/Chile)	Y	Y
39Y7928	6210	2.8m, 220-240V, C13 to GB 2099.1 (China)	Y	Y
39Y7925	6219	2.8m, 220-240V, C13 to KETI (S Korea)	Y	Y
39Y7929	6223	2.8m, 250V, C13 to NBR 14136 (Brazil)	Y	Y
-	6374	4.3m, Europe 10A/250V C13 - (2P+Gnd)	Y	Y

* FC = Feature Code

NeXtScale System Maximum Rated Power Configurations

6x NeXtScale 900W PSU w/ 6x Switches – N+1 Only – 3 Phase 60A@208V & 32A@380-415V – C13 PDUs[1]



1 The Y cable is not supported with the 1300W PSU.

North America – PDU 1 thru 3 Options

The following PDU option can be used for North America as seen in the example on page 52.

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Phase	Voltage	Line Cord (Derated)	Line Cord Plug	Number / Type of Outlet	Form Factor
1U 12 C13 *Switched & Monitored*	46M4005	Attached	5895	3ph Δ	208V	60A (27.7A/ph)	IEC 309 3P+G	12 / C13 Front	1U

International – PDU 1 thru 3 Options

The following PDU options can be used for International as seen in the example on page 52.

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Phase	Voltage	Line Cord (Derated)	Line Cord Plug	Number / Type of Outlet	Form Factor
Enterprise C13 *Basic*	39Y8941	40K9611	6016	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N+G	12 / C13 Front	1U
Enterprise +- C13 *Monitored*	39M2816	40K9611	6036	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N+G	12 / C13 Front	1U
1U 12 C13 *Switched & Monitored*	46M4004	40K9611	5912	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N+G	12 / C13 Front	1U

Note: PDU line cords must be connected to the PDU if shipped within a rack that contains a NeXtScale chassis. Due to the length of the NeXtScale chassis, it is difficult to connect a PDU line cord once the PDU and chassis are installed in the rack.

Power Connections & Cord Lengths

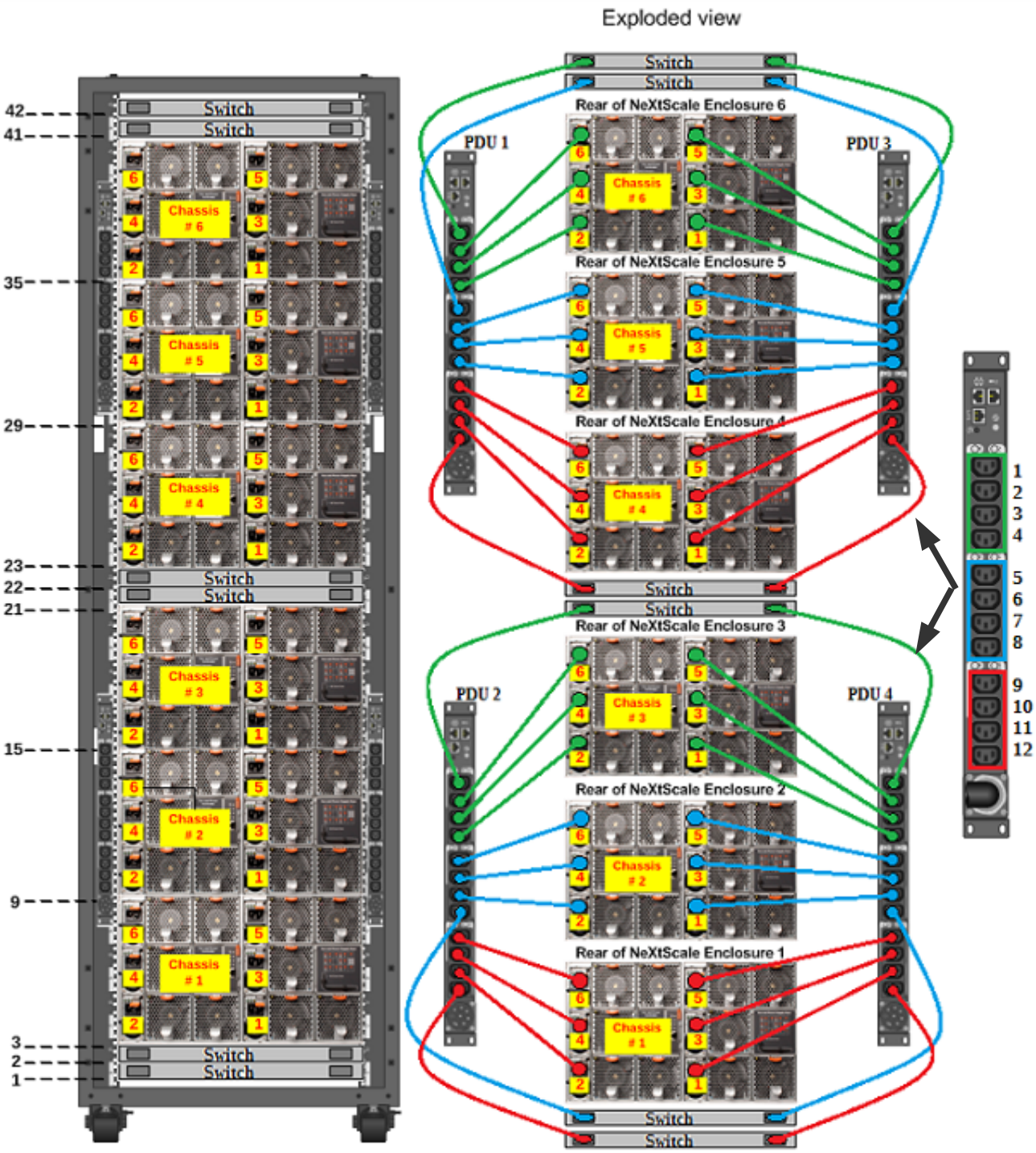
The following table is an overview of the point to point connections for the example on page 52.

See "*Power Connections & Cord Lengths Example*" section on page 92 for details on using this chart.

Power Cord End 1		Power Cord End 2			Power Cord End 3			Jumper Cord		
PDU	Conn	U Space	Chassis / Switch	PS U	U Space	Chassis / Switch	PSU	Cord Type	Cord Length (mm) A / B / C	Cord FC
PDU 1	1	-	-	-	-	-	-	-	-	-
	2	9	Chassis 2	5	9	Chassis 2	6	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	3	9	Chassis 2	3	9	Chassis 2	4	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	4	21	Switch	Left	-	-	-	C14 to C13, 10A	1000	Note 1
	5	-	-	-	-	-	-	-	-	-
	6	9	Chassis 2	1	9	Chassis 2	3	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	7	3	Chassis 1	1	3	Chassis 1	2	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	8	2	Switch	Left	-	-	-	C14 to C13, 10A	1000	Note 1
	9	-	-	-	-	-	-	-	-	-
	10	3	Chassis 1	3	3	Chassis 1	4	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	11	3	Chassis 1	1	3	Chassis 1	2	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	12	1	Switch	Left	-	-	-	C14 to C13, 10A	1000	Note 1
PDU 2	1	42	Switch	Right	-	-	-	C14 to C13, 10A	1500	6201
	2	23	Chassis 4	5	23	Chassis 4	6	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	3	23	Chassis 4	3	23	Chassis 4	4	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	4	41	Switch	Right	-	-	-	C14 to C13, 10A	1500	6201
	5	22	Switch	Right	-	-	-	C14 to C13, 10A	1000	Note 1
	6	23	Chassis 4	1	23	Chassis 4	2	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	7	15	Chassis 3	5	15	Chassis 3	6	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	8	23	Switch	Right		-	-	C14 to C13, 10A	1000	Note 1
	9	2	Switch	Right	-	-	-	C14 to C13, 10A	1500	6201
	10	15	Chassis 3	3	15	Chassis 3	4	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	11	15	Chassis 3	1	15	Chassis 3	2	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	12	1	Switch	Right	-	-	-	C14 to C13, 10A	1500	6201
PDU 3	1	-	-	-	-	-	-	-	-	-
	2	35	Chassis 6	5	35	Chassis 6	6	C14 to C13, 10A	1000	A4VP
	3	35	Chassis 6	3	35	Chassis 6	4	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	4	42	Switch	Left	-	-	-	C14 to C13, 10A	1000	Note 1
	5	-	-	-	-	-	-	-	-	-
	6	35	Chassis 6	1	35	Chassis 6	2	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	7	29	Chassis 5	5	29	Chassis 5	6	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	8	41	Switch	Left	-	-	-	C14 to C13, 10A	1000	Note 1
	9	-	-	-	-	-	-	-	-	-
	10	29	Chassis 5	3	29	Chassis 5	4	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	11	29	Chassis 5	1	29	Chassis 5	2	Y C14 to 2x C13, 10A	530/815/815	A4VQ
	12	22	Switch	Left	-	-	-	C14 to C13, 10A	1000	Note 1

Note 1 – Currently the switches do not have a feature code option for a 1000mm C14 to C13 power cord. A 1000mm C14 to C13 line cord will have to be ordered as option part number 00Y3043 to make each 1000mm connection from the switch to the PDU.

6x NeXtScale 1300W PSU w/ 6x Switches – N+1 Only – 3 Phase 60A@208V & 32A@380-415V – C13 PDUs



North America – PDU 1 thru 3 Options

The following PDU option can be used for North America as seen in the example on page 55.

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Phase	Voltage	Line Cord (Derated)	Line Cord Plug	Number / Type of Outlet	Form Factor
1U 12 C13 *Switched & Monitored*	46M4005	Attached	5895	3ph Δ	208V	60A (27.7A/ph)	IEC 309 3P+G	12 / C13 Front	1U

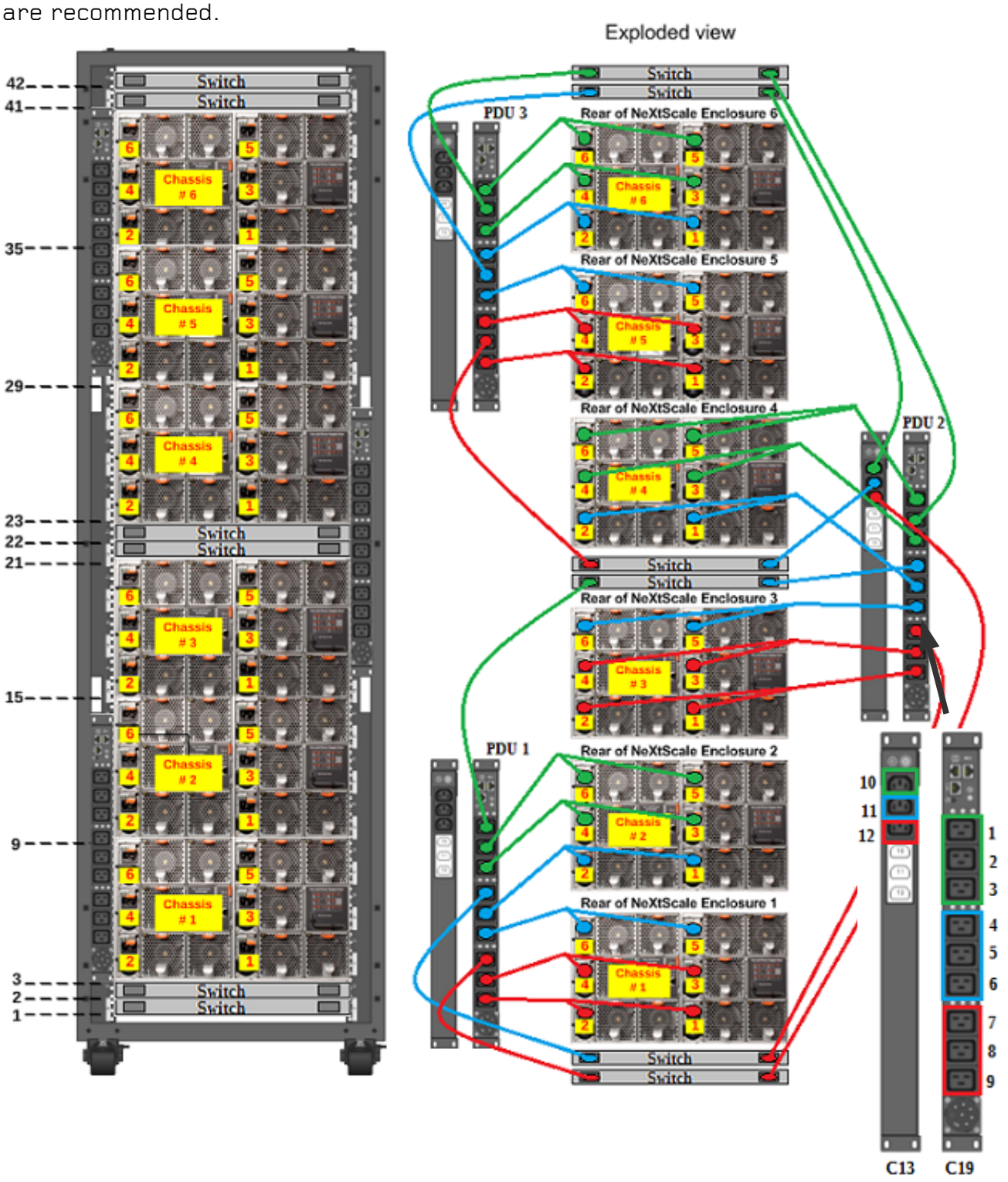
International – PDU 1 thru 3 Options

The following PDU options can be used for International as seen in the example on page 55.

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Phase	Voltage	Line Cord (Derated)	Line Cord Plug	Number / Type of Outlet	Form Factor
Enterprise C13 *Basic*	39Y8941	40K9611	6016	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N+G	12 / C13 Front	1U
Enterprise + - C13 *Monitored*	39M2816	40K9611	6036	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N+G	12 / C13 Front	1U
1U 12 C13 *Switched & Monitored*	46M4004	40K9611	5912	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N+G	12 / C13 Front	1U

6x NeXtScale 900W or 1300W PSU w/ 6x Switches – N+1 Only – 3 Phase 60A@208V & 32A@380-415V – C19/C13 PDUs

Use of PDUs with 9x C19 and 3x C13 outlets, such as the PDUs used below, are supported but not recommended. These PDUs result in the use of very long power cords and also require connecting to the rear of the PDU. Long power cords will result in excessive cable congestion at the rear of the rack. Connecting to the rear of the PDU will make service more difficult. If possible, the PDUs with 12x C13 outlets are recommended.



North America – PDU 1 thru 3 Options

The following PDU options can be used for North America as seen in the example on page 57.

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Phase	Voltage	Line Cord (Derated)	Line Cord Plug	Number / Type of Outlet	Form Factor
Ultra Density Enterprise *Basic*	71763NU	Attached	6051	3ph Δ	208V	60A (27.7A/ph)	IEC 309 3P+G	9 / C19 Front 3 / C13 Back	1U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4003	Attached	5897	3ph Δ	208V	60A (27.7A/ph)	IEC 309 3P+G	9 / C19 Front 3 / C13 Back	1U

International – PDU 1 thru 3 Options

The following PDU options can be used for International as seen in the example on page 57.

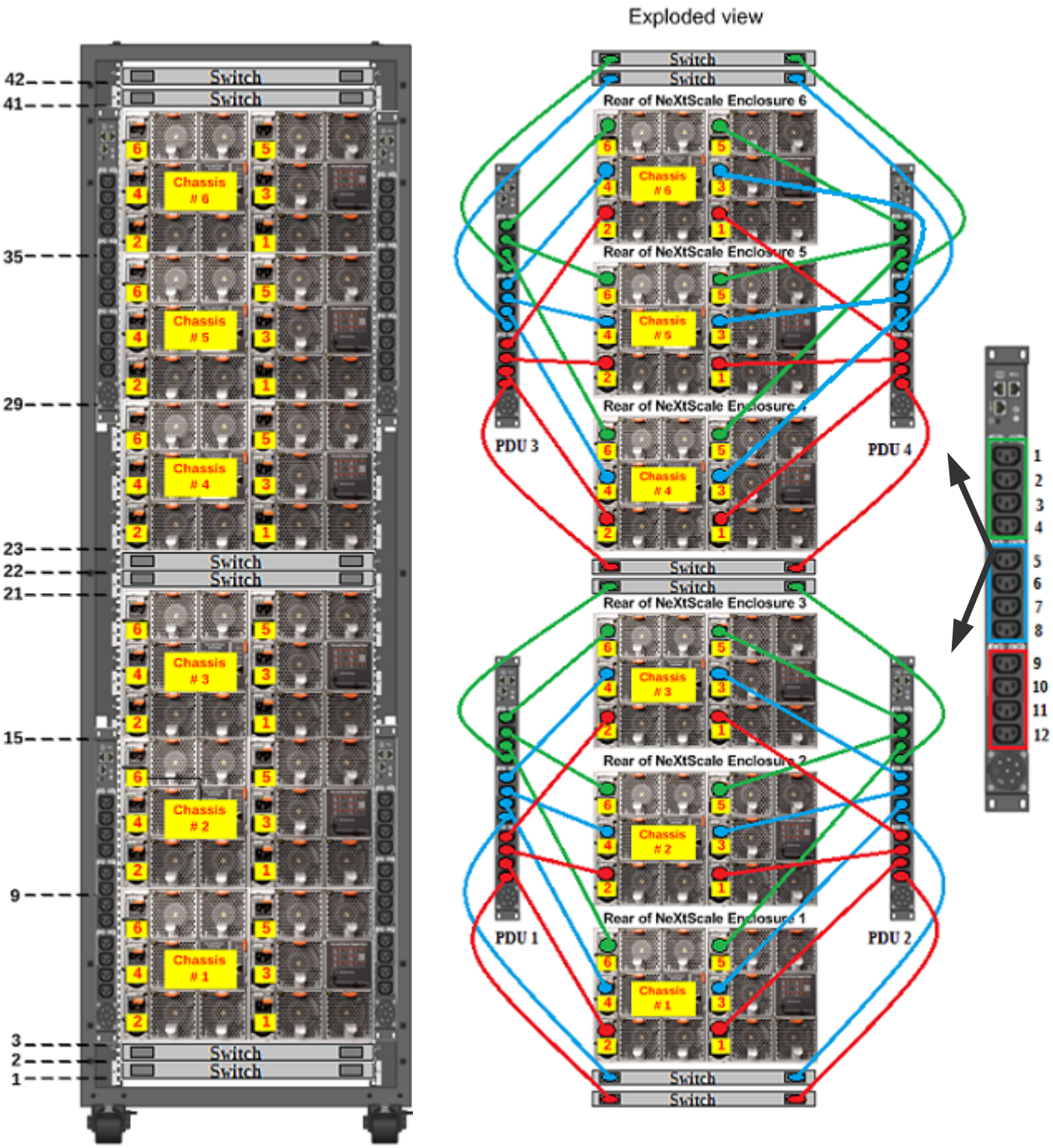
PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Phase	Voltage	Line Cord (Derated)	Line Cord Plug	Number / Type of Outlet	Form Factor
DPI Ultra Density Enterprise *Basic*	71762NX	40K9611	6504	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N +G	9 / C19 Front 3 / C13 Back	1U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4002	40K9611	5905	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N +G	9 / C19 Front 3 / C13 Back	1U

Power Connections & Cord Lengths

The following table is an overview of the point to point connections for the example on page 57. See "*Power Connections & Cord Lengths Example*" section on page 92 for details on using this chart.

Power Cord End 1		Power Cord End 2			Power Cord End 3			Jumper Cord		
PDU	Conn	U Space	Chassis / Switch	PSU	U Space	Chassis / Switch	PSU	Cord Type	Cord Length (mm) A / B / C	Cord PN
PDU 1	1	21	Switch	Left	-	-	-	C20 to C13, 10A	2800	6311
	2	9	Chassis 2	5	9	Chassis 2	6	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	3	9	Chassis 2	3	9	Chassis 2	4	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	4	2	Switch	Left	-	-	-	C20 to C13, 10A	2800	6311
	5	9	Chassis 2	1	9	Chassis 2	3	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	6	3	Chassis 1	1	3	Chassis 1	2	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	7	1	Switch	Left				C20 to C13, 10A	2800	6311
	8	3	Chassis 1	3	3	Chassis 1	4	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	9	3	Chassis 1	1	3	Chassis 1	2	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	10	-	-	-	-	-	-	-	-	-
	11	-	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	-
PDU 2	1	41	Switch	Right	-	-	-	C20 to C13, 10A	2800	6311
	2	23	Chassis 4	5	23	Chassis 4	6	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	3	23	Chassis 4	3	23	Chassis 4	4	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	4	21	Switch	Right	22	Switch	Right	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	5	23	Chassis 4	1	23	Chassis 4	2	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	6	15	Chassis 3	5	15	Chassis 3	6	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	7	1	Switch	Right	-	-	-	C20 to C13, 10A	2800	6311
	8	15	Chassis 3	3	15	Chassis 3	4	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	9	15	Chassis 3	1	15	Chassis 3	2	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	10	42	Switch	Right	-	-	-	C14 to C13, 10A	1500	6201
	11	22	Switch	Right	-	-	-	C14 to C13, 10A	1500	6201
	12	2	Switch	Right	-	-	-	C14 to C13, 10A	1500	6201
PDU 3	1	42	Switch	Left	-	-	-	C20 to C13, 10A	2800	6311
	2	35	Chassis 6	5	35	Chassis 6	6	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	3	35	Chassis 6	3	35	Chassis 6	4	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	4	41	Switch	Left	-	-	-	C20 to C13, 10A	2800	6311
	5	35	Chassis 6	1	35	Chassis 6	2	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	6	29	Chassis 5	5	29	Chassis 5	6	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	7	22	Switch	Left	-	-	-	C20 to C13, 10A	2800	6311
	8	29	Chassis 5	3	29	Chassis 5	4	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	9	29	Chassis 5		29	Chassis 5	2			
	10	-	-	-	-	-	-	-	-	-
	11	-	-	-	-	-	-	-	-	-
	12	-	-	-		-	-	-	-	-

6x NeXtScale 900W or 1300W PSU w/ 6x Switches – N+N & N+1 – 3 Phase 60A@208V & 32A@380-415V – C13 PDUs



North America – PDU 1 thru 4 Options

The following PDU options can be used for North America as seen in the example on page 60.

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Phase	Voltage	Line Cord (Derated)	Line Cord Plug	Number / Type of Outlet	Form Factor
1U 12 C13 *Switched & Monitored*	46M4005	Attached	5895	3ph Δ	208V	60A (27.7A/ph)	IEC 309 3P+G	12 / C13 Front	1U

International – PDU 1 thru 4 Options

The following PDU options can be used for International as seen in the example on page 60.

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Phase	Voltage	Line Cord (Derated)	Line Cord Plug	Number / Type of Outlet	Form Factor
Enterprise C13 *Basic*	39Y8941	40K9611	6016	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N +G	12 / C13 Front	1U
Enterprise + - C13 *Monitored*	39M2816	40K9611	6036	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N +G	12 / C13 Front	1U
1U 12 C13 *Switched & Monitored*	46M4004	40K9611	5912	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N +G	12 / C13 Front	1U

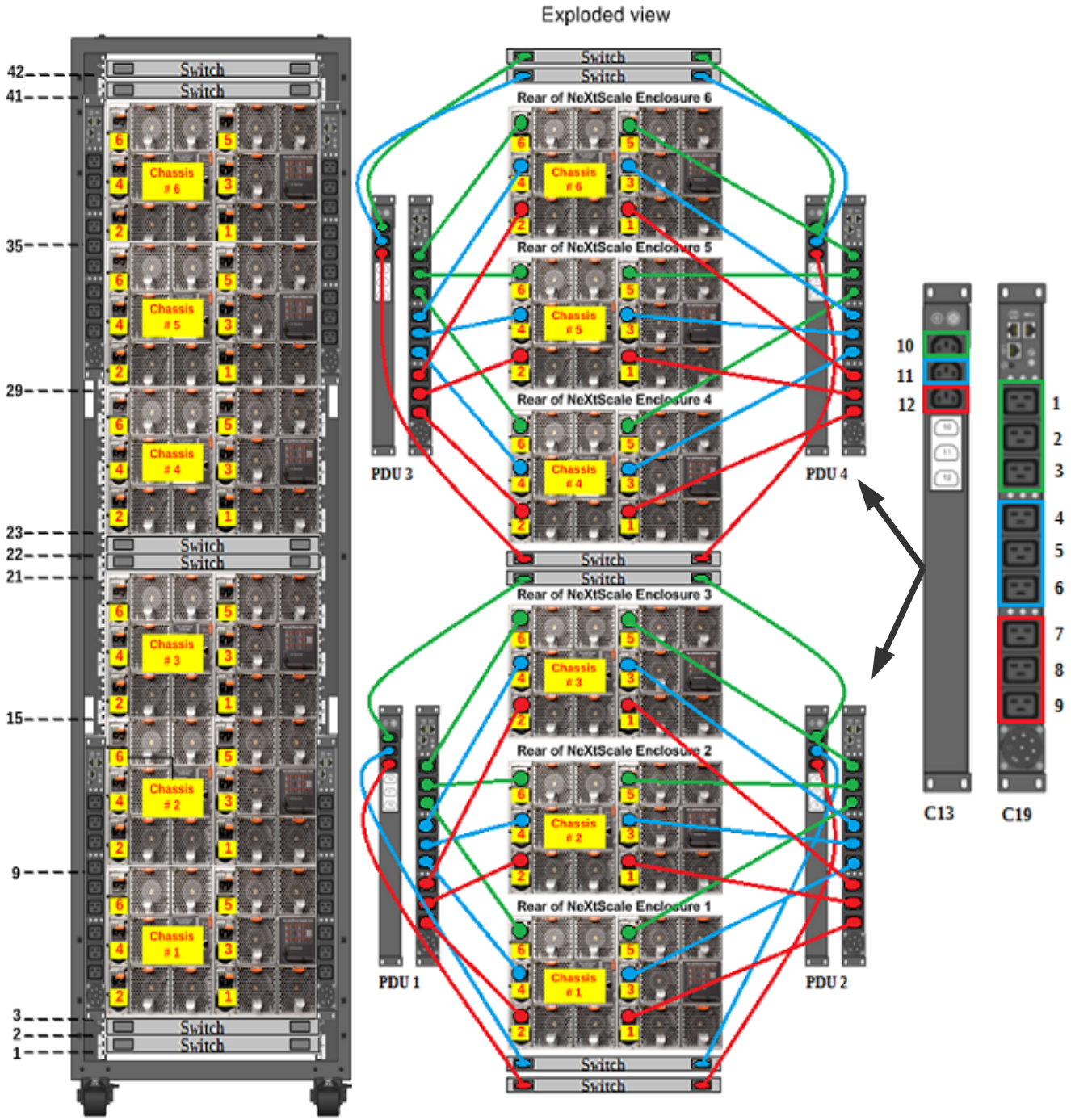
Power Connections & Cord Lengths

The following table is an overview of the point to point connections for the connection example on page 60.

ower Cord End 1			Power Cord End 2		Jumper Cord		
PDU	Conn	U Space	Chassis / Switch	PSU	Cord Type	Cord Length (mm) A	Cord FC
PDU 1	1	15	Chassis 3	6	C14 to C13, 10A	1000	39M5374
	2	9	Chassis 2	6	C14 to C13, 10A	1000	39M5374
	3	3	Chassis 1	6	C14 to C13, 10A	1000	39M5374
	4	21	Switch	Left	C14 to C13, 10A	1000	39M5374
	5	15	Chassis 3	4	C14 to C13, 10A	1000	39M5374
	6	9	Chassis 2	4	C14 to C13, 10A	1000	39M5374
	7	3	Chassis 1	4	C14 to C13, 10A	1000	39M5374
	8	2	Switch	Left	C14 to C13, 10A	1000	39M5374
	9	15	Chassis 3	2	C14 to C13, 10A	1000	39M5374
	10	9	Chassis 2	2	C14 to C13, 10A	1000	39M5374
	11	3	Chassis 1	2	C14 to C13, 10A	1000	39M5374
	12	1	Switch	Left	C14 to C13, 10A	1000	39M5374
PDU 2	1	15	Chassis 3	5	C14 to C13, 10A	1000	39M5374
	2	9	Chassis 2	5	C14 to C13, 10A	1000	39M5374
	3	3	Chassis 1	5	C14 to C13, 10A	1000	39M5374
	4	21	Switch	Right	C14 to C13, 10A	1000	39M5374
	5	15	Chassis 3	3	C14 to C13, 10A	1000	39M5374
	6	9	Chassis 2	3	C14 to C13, 10A	1000	39M5374
	7	3	Chassis 1	3	C14 to C13, 10A	1000	39M5374
	8	2	Switch	Right	C14 to C13, 10A	1000	39M5374
	9	15	Chassis 3	1	C14 to C13, 10A	1000	39M5374
	10	9	Chassis 2	1	C14 to C13, 10A	1000	39M5374
	11	3	Chassis 1	1	C14 to C13, 10A	1000	39M5374
	12	1	Switch	Right	C14 to C13, 10A	1000	39M5374
PDU 3	1	35	Chassis 6	6	C14 to C13, 10A	1000	39M5374
	2	29	Chassis 5	6	C14 to C13, 10A	1000	39M5374
	3	23	Chassis 4	6	C14 to C13, 10A	1000	39M5374
	4	42	Switch	Left	C14 to C13, 10A	1000	39M5374
	5	35	Chassis 6	4	C14 to C13, 10A	1000	39M5374
	6	29	Chassis 5	4	C14 to C13, 10A	1000	39M5374
	7	23	Chassis 4	4	C14 to C13, 10A	1000	39M5374
	8	41	Switch	Left	C14 to C13, 10A	1000	39M5374
	9	35	Chassis 6	2	C14 to C13, 10A	1000	39M5374
	10	29	Chassis 5	2	C14 to C13, 10A	1000	39M5374
	11	23	Chassis 4	2	C14 to C13, 10A	1000	39M5374
	12	22	Switch	Left	C14 to C13, 10A	1000	39M5374
PDU 4	1	35	Chassis 6	5	C14 to C13, 10A	1000	39M5374
	2	29	Chassis 5	5	C14 to C13, 10A	1000	39M5374
	3	23	Chassis 4	5	C14 to C13, 10A	1000	39M5374
	4	42	Switch	Right	C14 to C13, 10A	1000	39M5374
	5	35	Chassis 6	3	C14 to C13, 10A	1000	39M5374
	6	29	Chassis 5	3	C14 to C13, 10A	1000	39M5374
	7	23	Chassis 4	3	C14 to C13, 10A	1000	39M5374
	8	41	Switch	Right	C14 to C13, 10A	1000	39M5374
	9	35	Chassis 6	1	C14 to C13, 10A	1000	39M5374
	10	29	Chassis 5	1	C14 to C13, 10A	1000	39M5374
	11	23	Chassis 4	1	C14 to C13, 10A	1000	39M5374
	12	22	Switch	Right	C14 to C13, 10A	1000	39M5374

6x NeXtScale 900W or 1300W PSU w/ 6x Switches – N+N & N+1 – 3 Phase 60A@208V & 32A@380-415V – C19/C13 PDUs

Use of PDUs with 9x C19 and 3x C13 outlets, such as the PDUs used below, are supported but not recommended. These PDUs result in the use of very long power cords and also require connecting to the rear of the PDU. Long power cords will result in excessive cable congestion at the rear of the rack. Connecting to the rear of the PDU will make service more difficult. If possible, PDUs with 12x C13 outlets are recommended.



North America – PDU 1 thru 4 Options

The following PDU options can be used for North America as seen in the example on page 63.

PDU	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Phase	Voltage	Line Cord (Derated)	Line Cord Plug	Number / Type of Outlet	Form Factor
Ultra Density Enterprise *Basic*	71763NU	Attached	6051	3ph Δ	208V	60A (27.7A/ph)	IEC 309 3P+G	9 / C19 Front 3 / C13 Back	1U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4003	Attached	5897	3ph Δ	208V	60A (27.7A/ph)	IEC 309 3P+G	9 / C19 Front 3 / C13 Back	1U

International – PDU 1 thru 4 Options

The following PDU options can be used for International as seen in the example on page 63.

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Phase	Voltage	Line Cord (Derated)	Line Cord Plug	Number / Type of Outlet	Form Factor
DPI Ultra Density Enterprise *Basic*	71762NX	40K9611	6504	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N +G	9 / C19 Front 3 / C13 Back	1U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4002	40K9611	5905	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N +G	9 / C19 Front 3 / C13 Back	1U

Power Connections & Cord Lengths

The following table is an overview of the point to point connections for the example on page 63.

Power Cord End 1		Power Cord End 2			Jumper Cord		
PDU	Conn	U Space	Chassis / Switch	PSU	Cord Type	Cord Length (mm) A	Cord PN
PDU 1	1	15	Chassis 3	6	C20 to C13, 10A	2800	6311
	2	9	Chassis 2	6	C20 to C13, 10A	2800	6311
	3	3	Chassis 1	6	C20 to C13, 10A	2800	6311
	4	15	Chassis 3	4	C20 to C13, 10A	2800	6311
	5	9	Chassis 2	4	C20 to C13, 10A	2800	6311
	6	3	Chassis 1	4	C20 to C13, 10A	2800	6311
	7	15	Chassis 3	2	C20 to C13, 10A	2800	6311
	8	9	Chassis 2	2	C20 to C13, 10A	2800	6311
	9	3	Chassis 1	2	C20 to C13, 10A	2800	6311
	10	21	Switch	Left	C14 to C13, 10A	1500	6201
	11	2	Switch	Left	C14 to C13, 10A	1500	6201
	12	1	Switch	Left	C14 to C13, 10A	1500	6201
PDU 2	1	15	Chassis 3	5	C20 to C13, 10A	2800	6311
	2	9	Chassis 2	5	C20 to C13, 10A	2800	6311
	3	3	Chassis 1	5	C20 to C13, 10A	2800	6311
	4	15	Chassis 3	3	C20 to C13, 10A	2800	6311
	5	9	Chassis 2	3	C20 to C13, 10A	2800	6311
	6	3	Chassis 1	3	C20 to C13, 10A	2800	6311
	7	15	Chassis 3	1	C20 to C13, 10A	2800	6311
	8	9	Chassis 2	1	C20 to C13, 10A	2800	6311
	9	3	Chassis 1	1	C20 to C13, 10A	2800	6311
	10	21	Switch	Right	C14 to C13, 10A	1500	6201
	11	2	Switch	Right	C14 to C13, 10A	1500	6201
	12	1	Switch	Right	C14 to C13, 10A	1500	6201
PDU 3	1	35	Chassis 6	6	C20 to C13, 10A	2800	6311
	2	29	Chassis 5	6	C20 to C13, 10A	2800	6311
	3	23	Chassis 4	6	C20 to C13, 10A	2800	6311
	4	35	Chassis 6	4	C20 to C13, 10A	2800	6311
	5	29	Chassis 5	4	C20 to C13, 10A	2800	6311
	6	23	Chassis 4	4	C20 to C13, 10A	2800	6311
	7	35	Chassis 6	2	C20 to C13, 10A	2800	6311
	8	29	Chassis 5	2	C20 to C13, 10A	2800	6311
	9	23	Chassis 4	2	C20 to C13, 10A	2800	6311
	10	42	Switch	Left	C14 to C13, 10A	1500	6201
	11	41	Switch	Left	C14 to C13, 10A	1500	6201
	12	22	Switch	Left	C14 to C13, 10A	1500	6201
PDU 4	1	35	Chassis 6	5	C20 to C13, 10A	2800	6311
	2	29	Chassis 5	5	C20 to C13, 10A	2800	6311
	3	23	Chassis 4	5	C20 to C13, 10A	2800	6311
	4	35	Chassis 6	3	C20 to C13, 10A	2800	6311
	5	29	Chassis 5	3	C20 to C13, 10A	2800	6311
	6	23	Chassis 4	3	C20 to C13, 10A	2800	6311
	7	35	Chassis 6	1	C20 to C13, 10A	2800	6311
	8	29	Chassis 5	1	C20 to C13, 10A	2800	6311
	9	23	Chassis 4	1	C20 to C13, 10A	2800	6311
	10	42	Switch	Right	C14 to C13, 10A	1500	6201
	11	41	Switch	Right	C14 to C13, 10A	1500	6201
	12	22	Switch	Right	C14 to C13, 10A	1500	6201

System x North American PDUs

Most NeXtScale configurations will consist of multiple chassis and switches. These configurations will most often require either 3 Phase 60A@208V or 32A@380-415V PDUs. Under some conditions, 1 Phase 60A@208V or 63A@220-240V PDUs may be used. It is unlikely that multiple chassis configurations can be supported by lower power PDUs.

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Phase	Voltage	Line Cord (Derated)	Line Cord Plug	Number / Type of Outlet	Form Factor
Front End *Basic*	39Y8939	Comes with PDU	A11T	1ph	200-240V	30A (24A)	NEMA L6-30P	3 / C19 Front	½ U
	39Y8940		A11U	1ph	200-240V	60A (48A)	IEC 309 2P+G		
Enterprise – C13 *Basic*	39Y8941	40K9614	6012	1ph	200-240V	30A (24A)	NEMA L6-30P	12 / C13 Front	1U
		40K9615	6013	1ph	200-240V	60A (48A)	IEC 309 2P+G		
Enterprise *Basic*	39Y8948	40K9614	6062	1ph	200-240V	30A (24A)	NEMA L6-30P	6 / C19 Front	1U
		40K9615	6063	1ph	200-240V	60A (48A)	IEC 309 2P+G		
	39Y8923	Attached	6061	3ph Δ	208V	60A (27.7A/ph)	IEC 309 3P+G		
Ultra Density Enterprise *Basic*	71762NX	40K9614	6500	1ph	200-240V	30A (24A)	NEMA L6-30P	9 / C19 Front 3 / C13 Back	1U
		40K9615	6501	1ph	200-240V	60A (48A)	IEC 309 2P+G		
	71763NU	Attached	6051	3ph Δ	208V	60A (27.7A/ph)	IEC 309 3P+G		
0U 24 C13 *Basic*	46M4125	Attached	5923	3ph Δ	208V	30A (13.85A/ph)	NEMA L21-30P	24 / C13 Front	0U
	46M4128	Attached	5924	1ph	200-240V	30A (24A)	NEMA L6-30P		
0U 12 C19 / 12 C13 [1] *Basic*	46M4140	Attached	5926	3ph Δ	208V	50A (23.09A/ph)	CS8365L	12 / C19 Front 12 / C13 Back	0U
Enterprise PDU+ - C13 *Monitored*	39M2816	40K9614	6032	1ph	200-240V	30A (24A)	NEMA L6-30P	12 / C13 Front	1U
		40K9615	6033	1ph	200-240V	60A (48A)	IEC 309 2P+G		

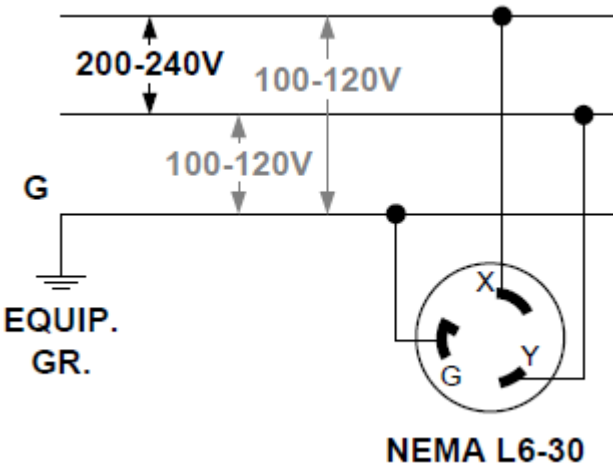
1U 12 C13 *Switched & Monitored*	46M4004	40K9614	5908	1ph	200-240V	30A (24A)	NEMA L6-30P	12 / C13 Front	1U
		40K9615	5909	1ph	200-240V	60A (48A)	IEC 309 2P+G		
	46M4005	Attached	5895	3ph Δ	208V	60A (27.7A/ph)	IEC 309 3P+G		
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4002	40K9614	5901	1ph	200-240V	30A (24A)	NEMA L6-30P	9 / C19 Front 3 / C13 Back	1U
		40K9615	5902	1ph	200-240V	60A (48A)	IEC 309 2P+G		
	46M4003	Attached	5897	3ph Δ	208V	60A (27.7A/ph)	IEC 309 3P+G		
0U 24 C13U1 [1] *Switched & Monitored*	46M4116	Attached	5929	1ph	200-240V	30A (24A)	NEMA L6-30P	24 / C13 Front	0U
0U 12 C19 / 12 C13 [1] *Switched & Monitored*	46M4134	Attached	5931	3ph Δ	208V	50A (23.09A/ph)	CS8365L	12 / C19 Front 12 / C13 Back	0U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4167	Attached	5928	3ph Δ	208V	30A (13.85A/ph)	NEMA L21-30P	9 / C19 Front 3 / C13 Back	1U

1 – Use caution when using 0U PDUs with NeXtScale System. Use of 0U PDUs is not supported when a NeXtScale chassis is installed in an Lenovo 42U 1100 mm Enterprise V2 Dynamic Rack.

System x North American PDUs Input Line Cords

NEMA L6-30

NEMA L6-30P (4.3m) 30A (24A Derated) @ 200V-240V Single Phase



NEMA L6-30

Used with:

Lenovo System x PDU Information North America

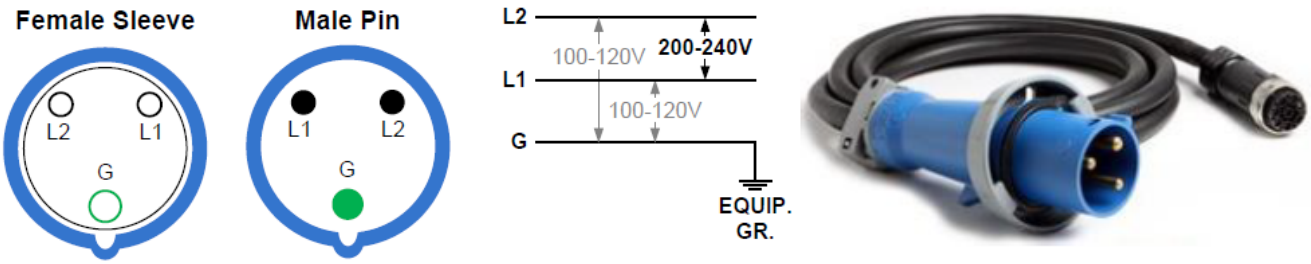
PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Number / Type of Outlet	Form Factor
Front End *Basic*	39Y8939	Included	A11T	3 / C19 Front	½ U
Enterprise – C13 *Basic*	39Y8941	40K9614	6012	12 / C13 Front	1U
Enterprise *Basic*	39Y8948	40K9614	6062	6 / C19 Front	1U
Ultra Density Enterprise *Basic*	71762NX	40K9614	6500	9 / C19 Front 3 / C13 Back	1U
0U 24 C13 *Basic*	46M4128	Attached	5924	24 / C13 Front	0U
Enterprise PDU+ - C13 *Monitored*	39M2816	40K9614	6032	12 / C13 Front	1U
1U 12 C13 *Switched & Monitored*	46M4004	40K9614	5908	12 / C13 Front	1U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4002	40K9614	5901	9 / C19 Front 3 / C13 Back	1U
0U 24 C13U *Switched & Monitored*	46M4116	Attached	5929	24 / C13 Front	0U

IEC 309 2P+G – 60A@200-240V 1ph

IEC 309 2P+G (4.3m) - 60A (48A Derated) @ 200V-240V Single Phase Plug (Type 360P6W)

Only a receptacle or a connector is needed to mate with the plug on the PDU input line cord. See section "IEC 320 Connectors" on page 95 in this document for further details on IEC309.

Matching receptacle listing 360R6W IP-67 HUBBELL, Hubbell receptacle P/N HBL360R6W
Matching connector listing 360C6W IP-67 HUBBELL, Hubbell connector P/N HBL360C6W



Used with:

Lenovo System x PDU Information North America

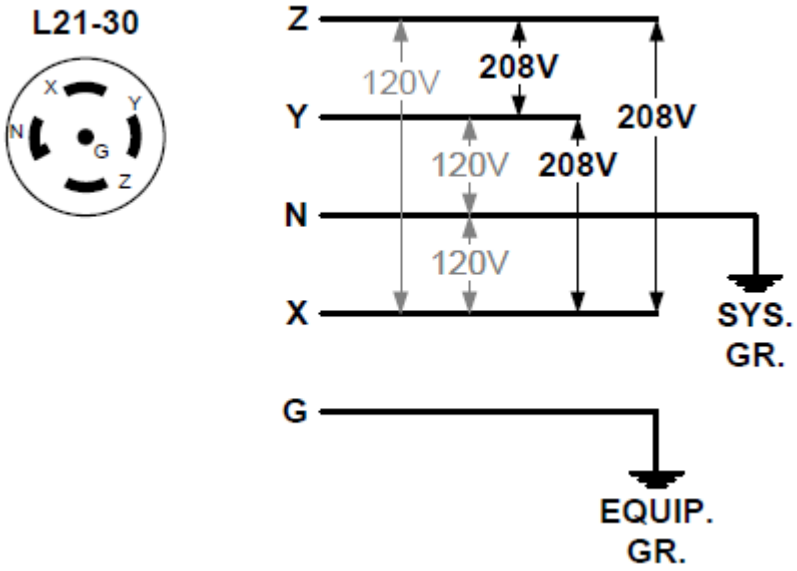
PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Number / Type of Outlet	Form Factor
Front End *Basic*	39Y8940	Comes with PDU	A11U	3 / C19 Front	½ U
Enterprise – C13 *Basic*	39Y8941	40K9615	6013	12 / C13 Front	1U
Enterprise *Basic*	39Y8948	40K9615	6063	6 / C19 Front	1U
Ultra Density Enterprise *Basic*	71762NX	40K9615	6501	9 / C19 Front 3 / C13 Back	1U
1U 12 C13 *Switched & Monitored*	46M4004	40K9615	5909	12 / C13 Front	1U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4002	40K9615	5902	9 / C19 Front 3 / C13 Back	1U
Enterprise PDU+ - C13 *Monitored*	39M2816	40K9615	6033	12 / C13 Front	1U

NEMA L21-30

Attached 3.0 meter line cord with NEMA L21-30P Plug

30A (13.85A / Phase Derated) @ 200V-240V Three Phase Delta

41.55A Total Derated Circuit Capacity



Used with:

Lenovo System x PDUs

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Number / Type of Outlet	Form Factor
0U 24 C13 *Basic*	46M4125	Attached	5923	24 / C13 Front	0U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4167	Attached	5928	9 / C19 Front 3 / C13 Back	1U

CS8365L – 50A@208V 3ph

Attached 3.0 meter line cord with CS8365L Plug

50A (23.09A / Phase Derated) 200V-240V Three Phase Delta

69.27A Total Derated Circuit Capacity

Only a receptacle or a connector is needed to mate with the plug on the PDU input line cord.

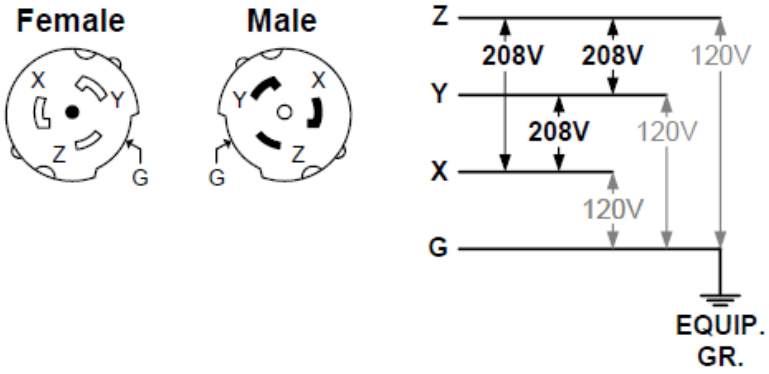
Matching receptacle listing CS8369

Matching connector listing CS8364

Used with:

46M4140 – 0U 12 C19/12 C13 PDU Basic

46M4134 – 0U 12 C19/12 C13 Switched and Monitored



Used with:

Lenovo System x PDU Information North America

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Number / Type of Outlet	Form Factor
0U 12 C19 / 12 C13 *Basic*	46M4140	Attached	5926	12 / C19 Front 12 / C13 Back	0U
0U 12 C19 / 12 C13 *Switched & Monitored*	46M4134	Attached	5931	12 / C19 Front 12 / C13 Back	0U

IEC309 3P+G – 60A@208V 3ph

Attached 14-foot (4.3 meter) line cord with IEC-309 60A, 3P4W Plug (Type 460P9W)

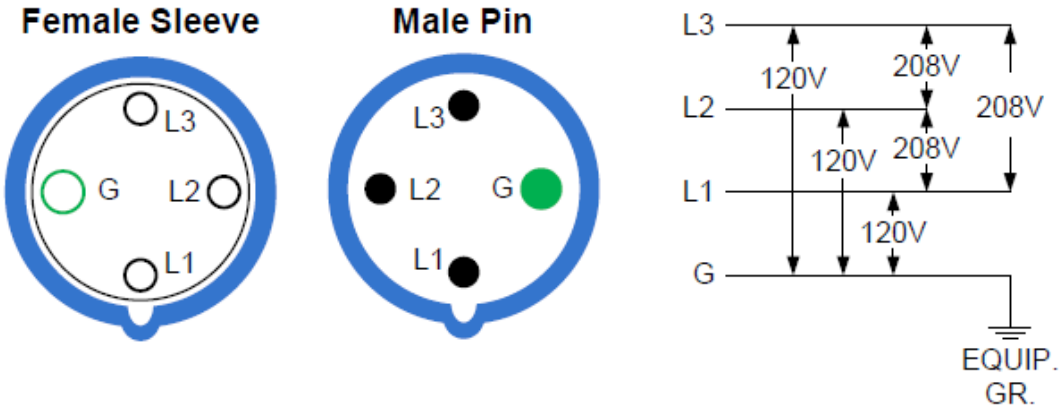
60A (27.7A / Phase Derated) 200V-240V Three Phase Delta

83.1A Total Derated Circuit Capacity

Only a receptacle or a connector is needed to mate with the plug on the PDU input line cord. See section "IEC 320 Connectors" on page 95 in this document for further details on IEC309.

Matching receptacle listing 460R9W IP-67 HUBBELL, Hubbell receptacle P/N HBL460R9W

Matching connector listing 460C9W IP-67 HUBBELL, Hubbell connector P/N HBL460C9W



Used with:

Lenovo System x PDU Information North America

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Number / Type of Outlet	Form Factor
Enterprise *Basic*	39Y8923	Attached	6061	6 / C19 Front	1U
Ultra Density Enterprise *Basic*	71763NU	Attached	6051	9 / C19 Front 3 / C13 Back	1U
1U 12 C13 *Switched & Monitored*	46M4005	Attached	5895	12 / C13 Front	1U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4003	Attached	5897	9 / C19 Front 3 / C13 Back	1U

System x International PDUs

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Phase	Voltage	Line Cord (Derated)	Line Cord Plug	Number / Type of Outlet	FF
Front End *Basic*	39Y8934	Comes with PDU	A11V	1ph	220-240V	32A	IEC 309 P+N+G	3 / C19 Front	½ U
	39Y8935		A11W	1ph	220-240V	63A	IEC 309 P+N+G		
	39Y8936		A11Y	1ph	230-240V	32A	AUS/NZ 3112		
	39Y8937		A11X	1ph	220V	30A	KSC 8305		
Enterprise C13 *Basic*	39Y8941	40K9612	6014	1ph	220-240V	32A	IEC 309 P+N+G	12 / C13 Front	1U
		40K9613	6015	1ph	220-240V	63A	IEC 309 P+N+G		
		40K9617	6017	1ph	230-240V	32A	AUS/NZ 3112		
		40K9618	6018	1ph	220V	30A	KSC 8305		
		40K9611	6016	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N+G		
		47C2495	A3T1	3ph Y	380-415V	16A (16A/ph)	IEC 309 3P+N+G		
DPI Enterprise *Basic*	39Y8948	40K9612	6064	1ph	220-240V	32A	IEC 309 P+N+G	6 / C19 Front	1U
		40K9613	6065	1ph	220-240V	63A	IEC 309 P+N+G		
		40K9617	6067	1ph	230-240V	32A	AUS/NZ 3112		
		40K9618	6068	1ph	220V	30A	KSC 8305		
		40K9611	6066	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N+G		
		47C2495	A3T3	3ph Y	380-415V	16A (16A/ph)	IEC 309 3P+N+G		
DPI Ultra Density Enterprise *Basic*	71762NX	40K9612	6502	1ph	220-240V	32A	IEC 309 P+N+G	9 / C19 Front 3 / C13 Back	1U
		40K9613	6503	1ph	220-240V	63A	IEC 309 P+N+G		
		40K9617	6505	1ph	230-240V	32A	AUS/NZ 3112		
		40K9618	6506	1ph	220V	30A	KSC 8305		
		40K9611	6504	3ph Y	380-	32A	IEC 309		

					415V	(32A/ph)	3P+N+G		
		47C2495	A3TC	3ph Y	380-415V	16A (16A/ph)	IEC 309 3P+N+G		
0U 24 C13 [1] *Basic*	46M4122	Attached	5922	3ph Y	380-415V	16A (16A/ph)	IEC 309 3P+N+G	24 / C13 Front	0U
	46M4131	Attached	5925	1ph	200-240V	32A	IEC 309 P+N+G		
0U 12 C19 / 12 C13 [1] *Basic*	46M4143	Attached	5927	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N+G	12 / C19 Front 12 / C13 Back	0U
Enterprise + - C13 *Monitored*	39M2816	40K9612	6034	1ph	220-240V	32A	IEC 309 P+N+G	12 / C13 Front	1U
		40K9613	6035	1ph	220-240V	63A	IEC 309 P+N+G		
		40K9617	6037	1ph	230-240V	32A	AUS/NZ 3112		
		40K9618	6038	1ph	220V	30A	KSC 8305		
		40K9611	6036	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N+G		
		47C2495	A3T2	3ph Y	380-415V	16A (16A/ph)	IEC 309 3P+N+G		
1U 12 C13 *Switched & Monitored*	46M4004	40K9612	5910	1ph	220-240V	32A	IEC 309 P+N+G	12 / C13 Front	1U
		40K9613	5911	1ph	220-240V	63A	IEC 309 P+N+G		
		40K9617	5913	1ph	230-240V	32A	AUS/NZ 3112		
		40K9618	5914	1ph	220V	30A	KSC 8305		
		40K9611	5912	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N+G		
		47C2495	A3T5	3ph Y	380-415V	16A (16A/ph)	IEC 309 3P+N+G		
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4002	40K9612	5903	1ph	220-240V	32A	IEC 309 P+N+G	9 / C19 Front 3 / C13 Back	1U
		40K9613	5904	1ph	220-240V	63A	IEC 309 P+N+G		
		40K9617	5906	1ph	230-240V	32A	AUS/NZ 3112		
		40K9618	5907	1ph	220V	30A	KSC 8305		
		40K9611	5905	3ph Y	380-	32A	IEC 309		

					415V	(32A/ph)	3P+N+G		
		47C2495	A3T4	3ph Y	380-415V	16A (16A/ph)	IEC 309 3P+N+G		
0U 24 C13U [1] *Switched & Monitored*	46M4119	Attached	5930	1ph	220-240V	32A	IEC 309 P+N+G	24 / C13 Front	0U
0U 12 C19 / 12 C13 [1] *Switched & Monitored*	46M4137	Attached	5932	3ph Y	380-415V	32A (32A/ph)	IEC 309 3P+N+G	12 / C19 Front 12 / C13 Back	0U

1 – Use caution when using 0U PDUs with NeXtScale System. Use of 0U PDUs is not supported when a NeXtScale chassis is installed in an Lenovo 42U 1100 mm Enterprise V2 Dynamic Rack.

System x International PDUs Input Line Cords

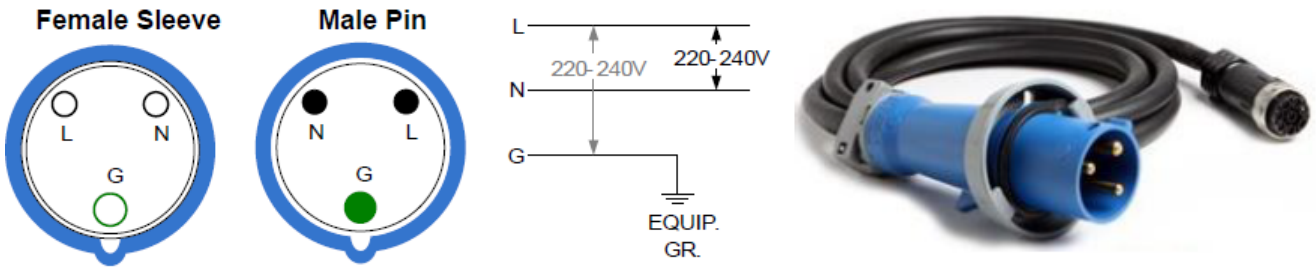
IEC 309 P+N+G – 32A@220-240V 1ph

IEC 309 P+N+G (4.3m) - 32A / 220-240V Single Phase

Only a receptacle or a connector is needed to mate with the plug on the PDU input line cord. See section "IEC 320 Connectors" on page 95 in this document for further details on IEC309.

Matching receptacle listing 332R6W IP-67 HUBBELL, Hubbell receptacle P/N HBL332R6W

Matching connector listing 332C6W IP-67 HUBBELL, Hubbell connector P/N HBL332C6W



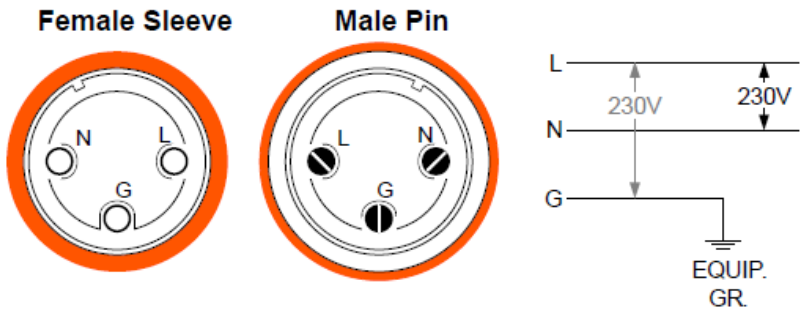
Used with:

Lenovo System x PDU Information International

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Number / Type of Outlet	Form Factor
Front End *Basic*	39Y8934	Included	A11V	3 / C19 Front	½ U
Enterprise C13 *Basic*	39Y8941	40K9612	6014	12 / C13 Front	1U
DPI Enterprise *Basic*	39Y8948	40K9612	6064	6 / C19 Front	1U
DPI Ultra Density Enterprise *Basic*	71762NX	40K9612	6502	9 / C19 Front 3 / C13 Back	1U
0U 24 C13 *Basic*	46M4131	Attached	5925	24 / C13 Front	0U
Enterprise + - C13 *Monitored*	39M2816	40K9612	6034	12 / C13 Front	1U
1U 12 C13 *Switched & Monitored*	46M4004	40K9612	5910	12 / C13 Front	1U
0U 24 C13U *Switched & Monitored*	46M4119	Attached	5930	24 / C13 Front	0U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4002	40K9612	5903	9 / C19 Front 3 / C13 Back	1U

AUS/NZ 3112 32A – 32A@230V 1ph

P+N+G (PDL P/N 56P332) Australia/New Zealand connector



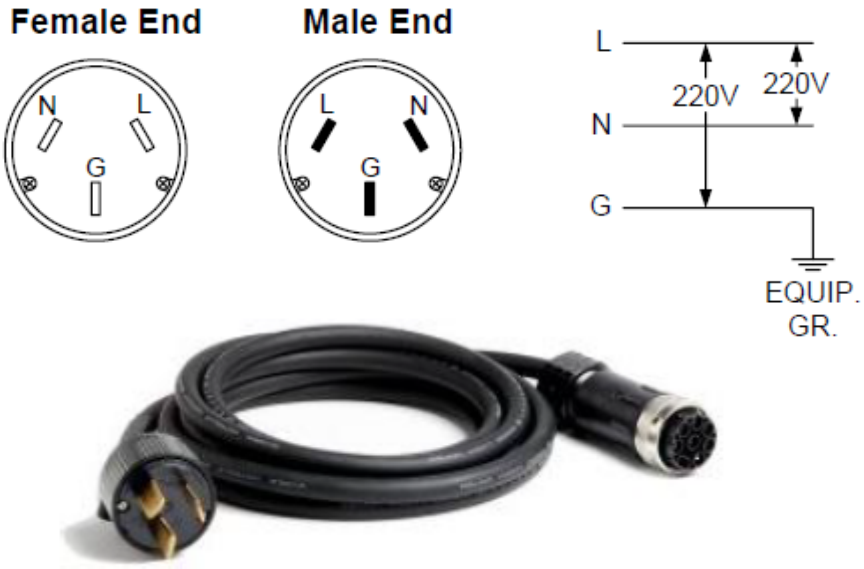
Used with:

Lenovo System x PDU Information International

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Number / Type of Outlet	Form Factor
Front End *Basic*	39Y8936	Included	A11Y	3 / C19 Front	½ U
Enterprise C13 *Basic*	39Y8941	40K9617	6017	12 / C13 Front	1U
DPI Enterprise *Basic*	39Y8948	40K9617	6067	6 / C19 Front	1U
DPI Ultra Density Enterprise *Basic*	71762NX	40K9617	6505	9 / C19 Front 3 / C13 Back	1U
Enterprise + - C13 *Monitored*	39M2816	40K9617	6037	12 / C13 Front	1U
1U 12 C13 *Switched & Monitored*	46M4004	40K9617	5913	12 / C13 Front	1U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4002	40K9617	5906	9 / C19 Front 3 / C13 Back	1U

KSC 8305 30A – 30A@220V 1ph

P+N+G (Shin Ju P/N SJ-P3302) Korea connector



Used with:

Lenovo System x PDU Information International

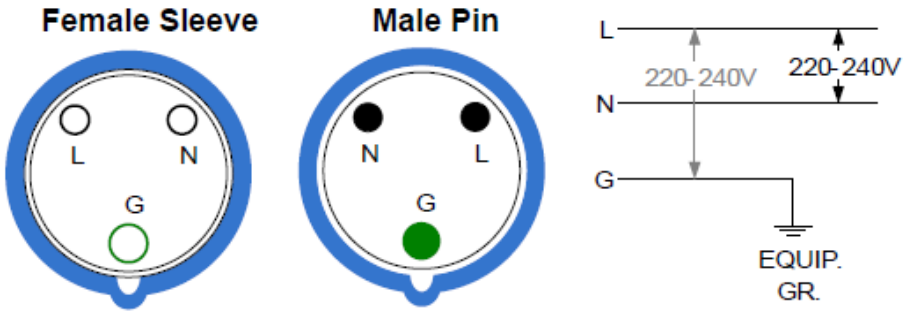
PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Number / Type of Outlet	Form Factor
Front End *Basic*	39Y8937	Included	A11X	3 / C19 Front	½ U
Enterprise C13 *Basic*	39Y8941	40K9618	6018	12 / C13 Front	1U
DPI Enterprise *Basic*	39Y8948	40K9618	6068	6 / C19 Front	1U
DPI Ultra Density Enterprise *Basic*	71762NX	40K9618	6506	9 / C19 Front 3 / C13 Back	1U
Enterprise + - C13 *Monitored*	39M2816	40K9618	6038	12 / C13 Front	1U
1U 12 C13 *Switched & Monitored*	46M4004	40K9618	5914	12 / C13 Front	1U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4002	40K9618	5907	9 / C19 Front 3 / C13 Back	1U

IEC 309 P+N+G – 63A@220-240V 1ph

IEC 309 P+N+G (4.3m) - 63A / 220-240V Single Phase

Only a receptacle or a connector is needed to mate with the plug on the PDU input line cord. See section "IEC 320 Connectors" on page 95 in this document for further details on IEC309.

Matching receptacle listing 363R6W IP-67 HUBBELL, Hubbell receptacle P/N HBL363R6W
Matching connector listing 363C6W IP-67 HUBBELL, Hubbell connector P/N HBL363C6W



Used with:

Lenovo System x PDU Information International

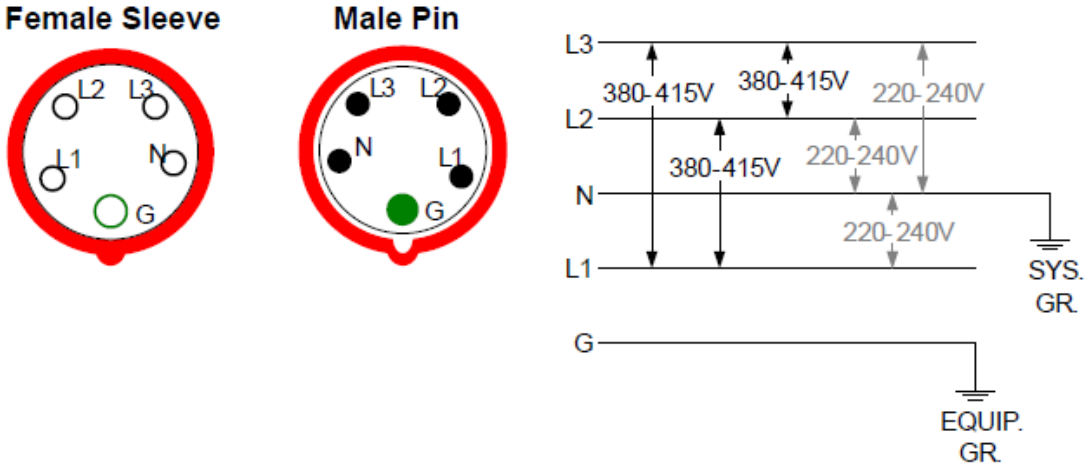
PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Number / Type of Outlet	Form Factor
Front End *Basic*	39Y8935	Included	A11W	3 / C19 Front	½ U
Enterprise C13 *Basic*	39Y8941	40K9613	6015	12 / C13 Front	1U
DPI Enterprise *Basic*	39Y8948	40K9613	6065	6 / C19 Front	1U
DPI Ultra Density Enterprise *Basic*	71762NX	40K9613	6503	9 / C19 Front 3 / C13 Back	1U
Enterprise + - C13 *Monitored*	39M2816	40K9613	6035	12 / C13 Front	1U
1U 12 C13 *Switched & Monitored*	46M4004	40K9613	5911	12 / C13 Front	1U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4002	40K9613	5904	9 / C19 Front 3 / C13 Back	1U

IEC309 3P+N+G – 16A@380-415V 3ph

IEC-309 3P+N+G 3.0 meter 16A, 3P5W plug (Type 516P6W)
32A (32A / Phase) 380-415V Three Phase Wye
48A Total Circuit Capacity

Only a receptacle or a connector is needed to mate with the plug on the PDU input line cord. See section "IEC 320 Connectors" on page 95 in this document for further details on IEC309.

Matching receptacle listing 516R6W IP-67 HUBBELL, Hubbell receptacle P/N HBL516R6W
Matching connector listing 516C6W IP-67 HUBBELL, Hubbell connector P/N HBL516C6W



Used with:
Lenovo System x PDU Information International

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Number / Type of Outlet	Form Factor
Enterprise C13 *Basic*	39Y8941	47C2495	A3T1	12 / C13 Front	1U
DPI Enterprise *Basic*	39Y8948	47C2495	A3T3	6 / C19 Front	1U
DPI Ultra Density Enterprise *Basic*	71762NX	47C2495	A3TC	9 / C19 Front 3 / C13 Back	1U
Enterprise + - C13 *Monitored*	39M2816	47C2495	A3T2	12 / C13 Front	1U
1U 12 C13 *Switched & Monitored*	46M4004	47C2495	A3T5	12 / C13 Front	1U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4002	47C2495	A3T4	9 / C19 Front 3 / C13 Back	1U
0U 24 C13 Basic	46M4122	Attached	5922	24 / C13 Front	0U

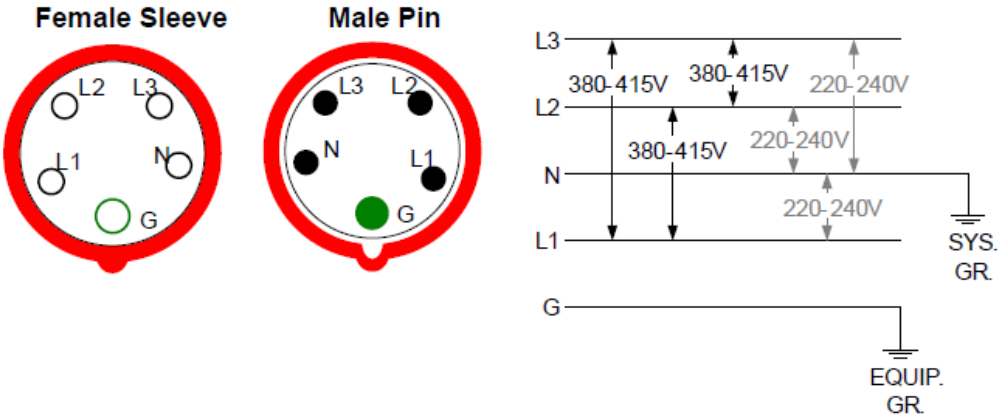
IEC 309 3P+N+G – 32A@380-415V 3ph

IEC-309 3P+N+G (4.3m) 32A, 3P5W plug (Type 532P6W)
32A (32A / Phase) 380-415V Three Phase Wye
96A Total Circuit Capacity

Only a receptacle or a connector is needed to mate with the plug on the PDU input line cord. See section "IEC 320 Connectors" on page 95 in this document for further details on IEC309.

Matching receptacle listing 532R6W IP-67 HUBBELL, Hubbell receptacle P/N HBL532R6W

Matching connector listing 532C6W IP-67 HUBBELL, Hubbell connector P/N HBL532C6W



Used with:

Lenovo System x PDU Information International

PDU Name	PDU Part Number	Line Cord Part Number	PDU + Line Cord FC	Number / Type of Outlet	Form Factor
Enterprise C13 *Basic*	39Y8941	40K9611	6016	12 / C13 Front	1U
DPI Enterprise *Basic*	39Y8948	40K9611	6066	6 / C19 Front	1U
DPI Ultra Density Enterprise *Basic*	71762NX	40K9611	6504	9 / C19 Front 3 / C13 Back	1U
0U 12 C19 / 12 C13 *Basic*	46M4143	Attached	5927	12 / C19 Front 12 / C13 Back	0U
Enterprise + - C13 *Monitored*	39M2816	40K9611	6036	12 / C13 Front	1U
1U 12 C13 *Switched & Monitored*	46M4004	40K9611	5912	12 / C13 Front	1U
1U 9 C19 / 3 C13 *Switched & Monitored*	46M4002	40K9611	5905	9 / C19 Front 3 / C13 Back	1U
0U 12 C19 / 12 C13 *Switched & Monitored*	46M4137	Attached	5932	12 / C19 Front 12 / C13 Back	0U

Fan and Power Control Unit (FPC) Web Interface Overview

This section discusses the NeXtScale Fan and Power Control Unit (FPC) web interface for the power and cooling pages. For details on how to connect to the web interface of the FPC unit, refer to the Fan and Power Control (FPC) section for details.

Once connected to the interface, the login screen will appear. The default login credentials are:
User name: USERID
Password: PASSWORD (where the 'o' is a zero)

Figure 19: FPC login screen

Figure 20 displays the first page of the FPC after logging in. The FPC is broken up into 5 separate pages accessed via the side menu bar. These include:

- Summary,
- Power and Cooling,
- System Information,
- Event Log, and
- Configuration.

The Power and Cooling pages are discussed in this section. For a complete and comprehensive overview of the FPC and all settings, refer to the *NeXtScale System Planning and Implementation Guide* Redbook located at:

http://www.redbooks.ibm.com/abstracts/sg248152.html?Open

Summary Page

Figure 20 displays the first page after logging in. This is the Summary page. All pages are accessed via the menu bar on the left hand side. The following section discusses the Power and Cooling pages.

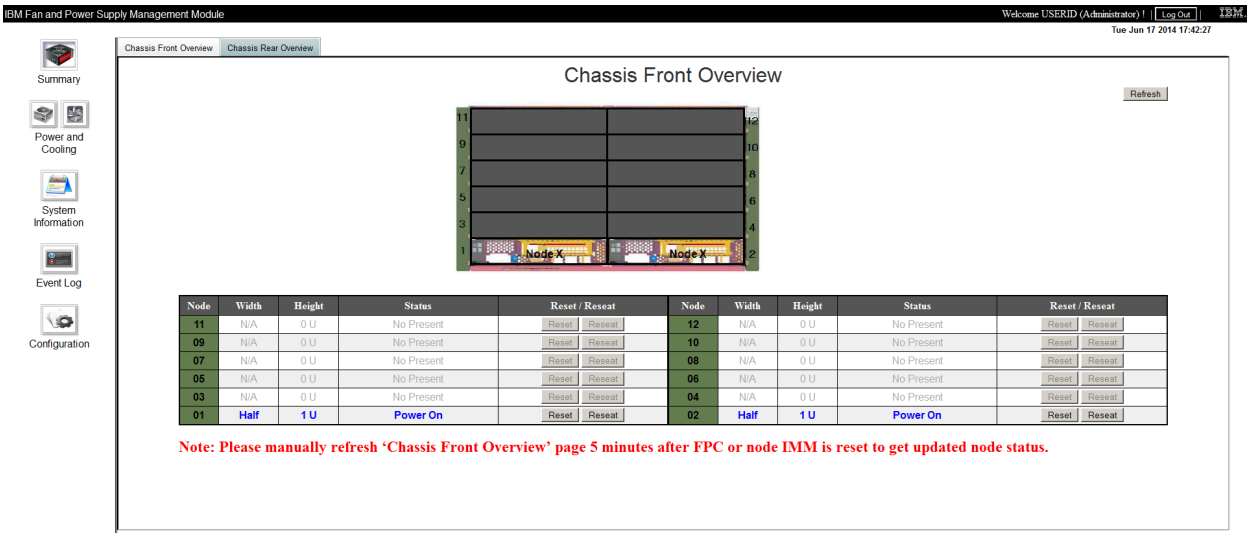


Figure 20: FPC Summary home page

Power page

The Power page is broken up into 5 sections. Each page is accessed via the menu at the top. These include:

- Power Overview
- PSU Configuration
- Power Cap
- Voltage overview
- Power Restore Policy

Each of these are discussed in the next section.

Power Overview

Figure 21 displays the Power Overview tab on the Power page.

This page contains the overall total power consumption (AC-in, min, average and max) for the n1200 chassis. It also breaks down the fans total power consumption and each individual node power consumption.

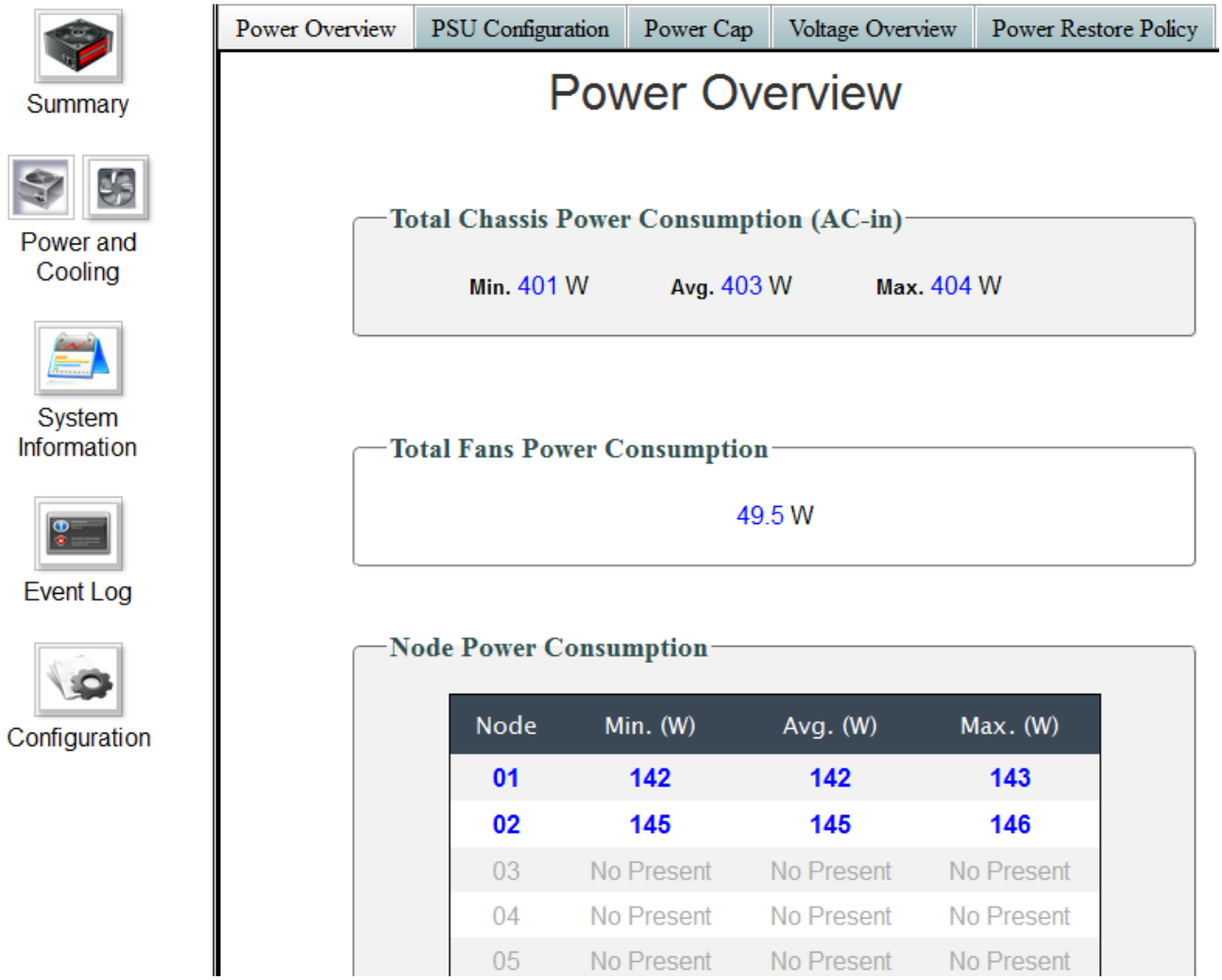


Figure 21: Power and Cooling page - Power Overview tab

PSU Configuration

Figure 22 displays the PSU Configuration tab on the Power page.

This is where the PSU redundancy mode and the oversubscription (OVS) mode can be set. There are three modes of PSU redundancy (No redundancy, N+1, and N+N), and on or off options for OVS, see Figure 23.

For information on redundancy levels and oversubscription, refer to the What is Power Supply Over-subscription, N+1, and N+N Redundancy section on page 93.

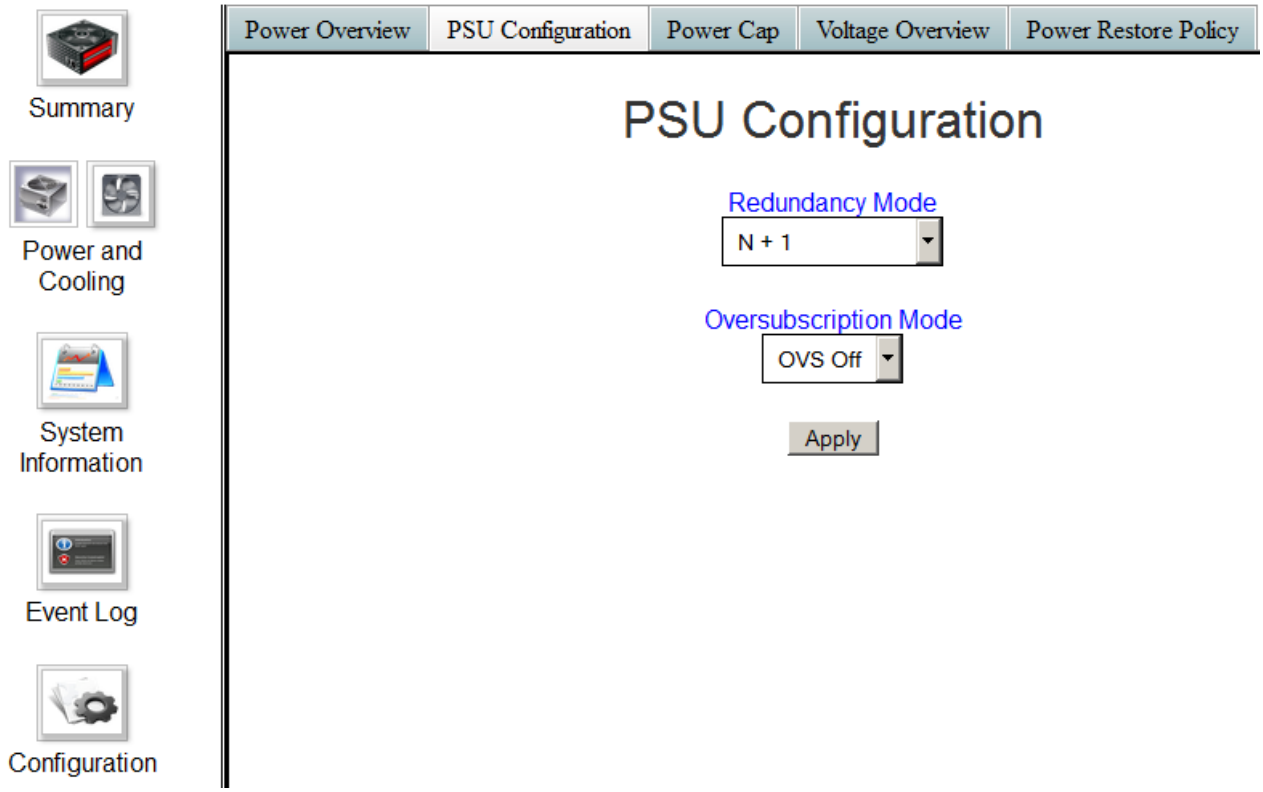


Figure 22: Power and Cooling page - PSU Configuration tab

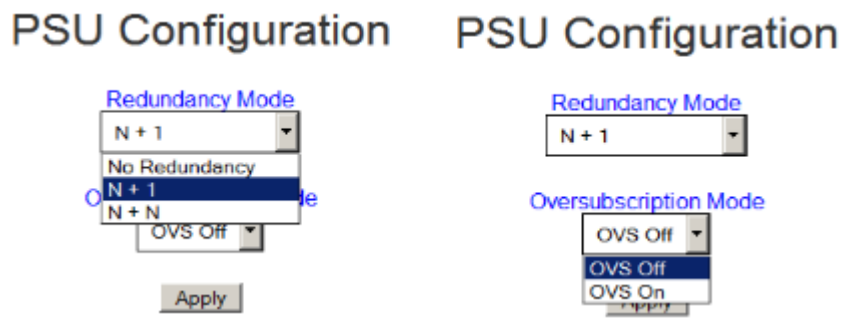


Figure 23: PSU Configuration tab - settings

Power Cap

This is where the power capping policy can be set. There are two options for capping: Chassis Capping or Nodes Capping, see Figure 24.

If Chassis Capping is selected, the capping will apply to the entire chassis.
If Node Capping is selected, the capping will only apply to the individual node.

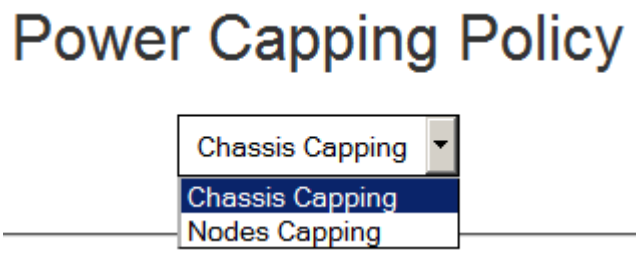


Figure 24: Power Cap tab settings

A power capacity, in Watts, can be set for the entire Chassis when Chassis Capping is selected, see Figure 25 for an example of setting the Chassis power capping.

The range represents the minimum and maximum consumption of the Chassis. A power number outside of the range can be selected but it may not be reached.

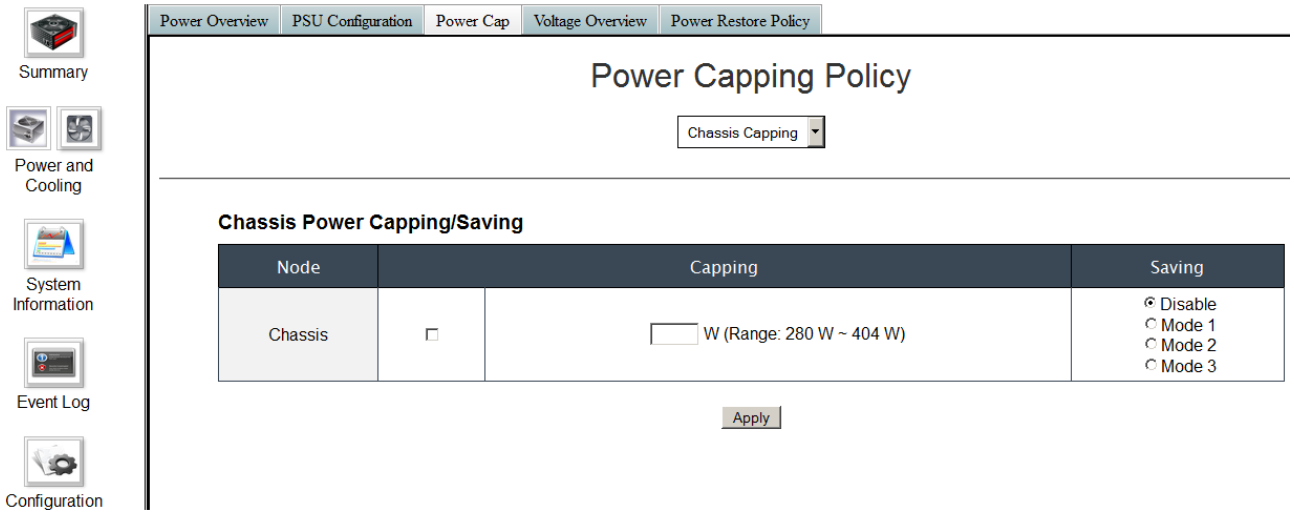


Figure 25: Power and Cooling page - Power Cap tab, Chassis

A power capacity, in Watts can be set for each individual node if Node Capping is selected, see Figure 26 for an example of selecting a node.

The range represents the minimum and maximum consumption of the individual node. A power number outside of the range can be selected but it may not be reached.

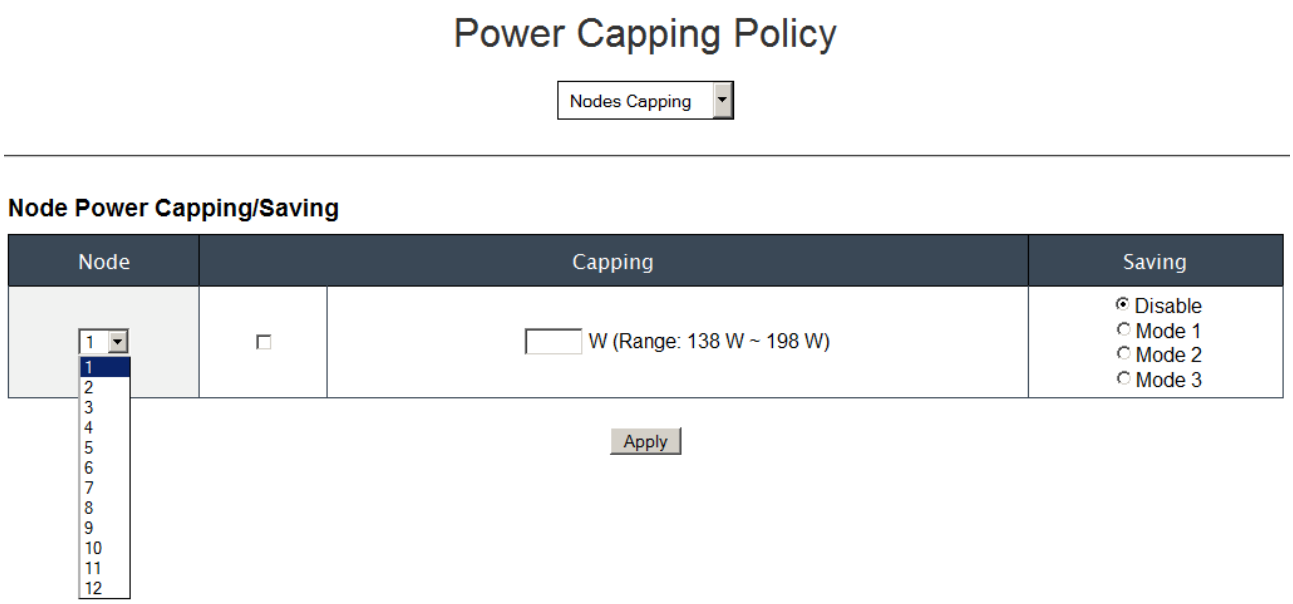


Figure 26: Power and Cooling page - Power Cap tab, Node

A mode can also be set (or left disabled). There are 3 mode levels, 1-3. Each mode represents different levels of throttling, described below:

- **Disabled:** (default static maximum performance mode): The system runs at full speed (no throttling), regardless of the workload.
- **Mode 1:** (static minimum power): The system runs in a throttling state regardless of the workload. The throttling state is the lowest frequency P-state.
- **Mode 2:** (dynamic favor performance): The system adjusts throttling levels that are based on workload, attempting to favor performance over power savings.
- **Mode 3:** (dynamic favor power): The system adjusts the throttling levels that are based on workload attempting to favor power savings over performance.

Voltage overview

Figure 27 displays the Voltage Overview tab on the Power page. This page displays the actual FPC 12 V, 3.3 V, 5 V, and battery voltage information. An error will be recorded in the Event Log if critical thresholds are reached.

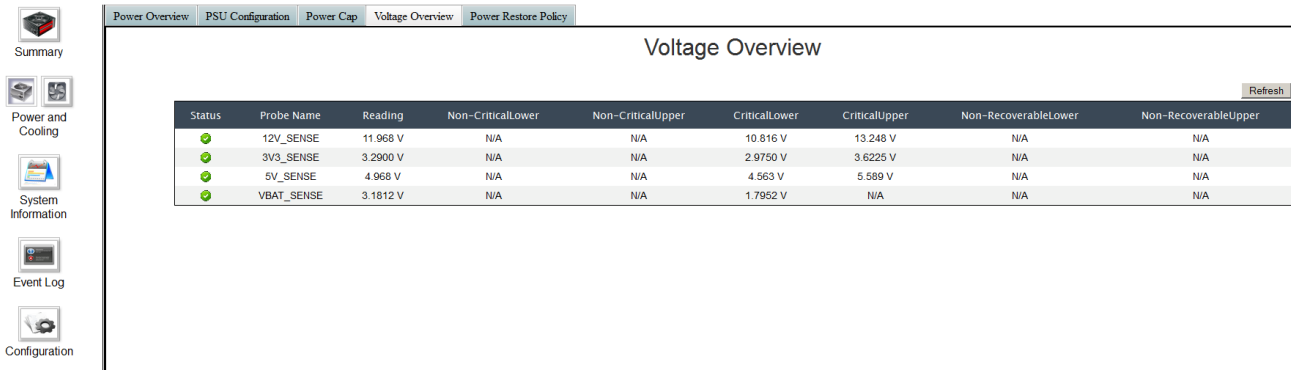


Figure 27: Power and Cooling page - Voltage Overview tab

Power Restore Policy

Figure 28 displays the Power Restore Policy tab on the Power page.

If a tick is present next to a node, it means the power restore policy is enabled for that node (enable by ticking and selecting apply).

Power Restore Policy means if AC power is lost to the node, the FPC will determine if the node was initially powered on and automatically restore the power when AC is recovered.

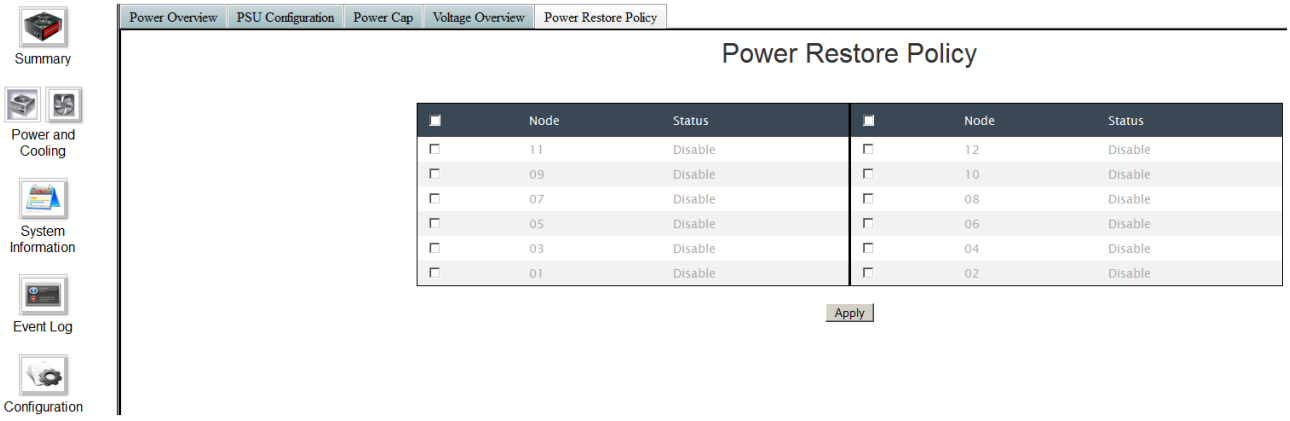


Figure 28: Power and Cooling page - Power Restore Policy tab

Cooling Page

The Cooling page is broken up in to 3 sections. Each page is accessed via the menu at the top. These include:

- Cooling Overview
- PSU Fan Speed
- Acoustic Mode

Each of these are discussed in the next section.

Cooling Overview

Figure 29 displays the Cooling Overview tab on the Cooling page.

This tab displays the fan name, status of the fan, and speed of the fan.

Note: The naming convention of the fans, for example: 'Fan_Tach_1A', Fan_Tach_1B'. Each fan is equipped with dual motors, the A and B represent each motor in the fan. A) is the primary motor and B) is the backup motor.

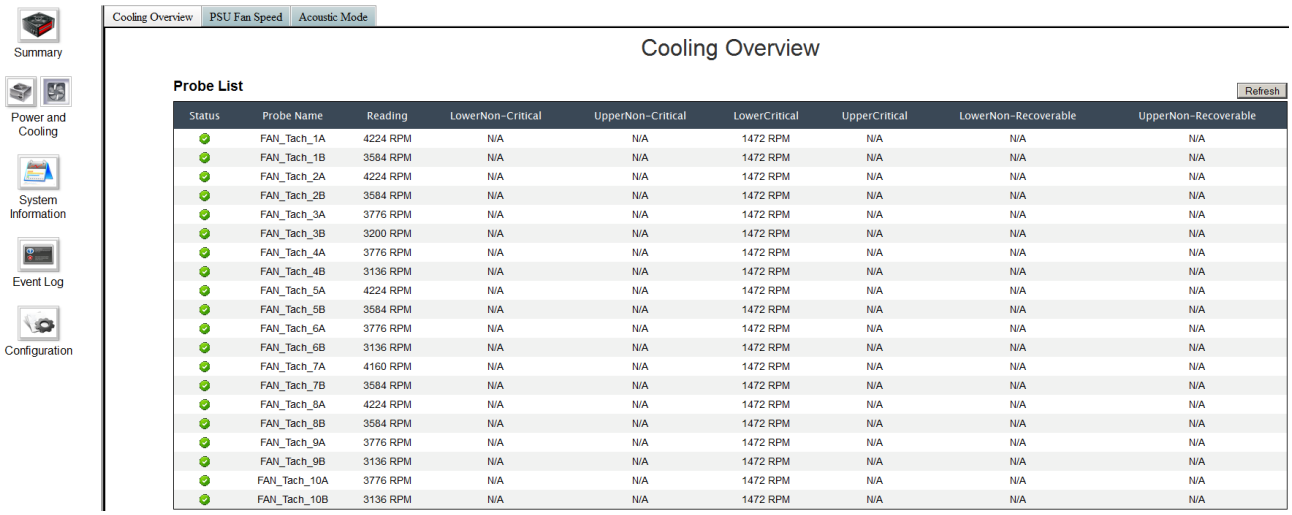


Figure 29: Power and Cooling page - Cooling Overview tab

PSU Fan Speed

Figure 30 displays the PSU fan speeds and operational status from the Cooling page.

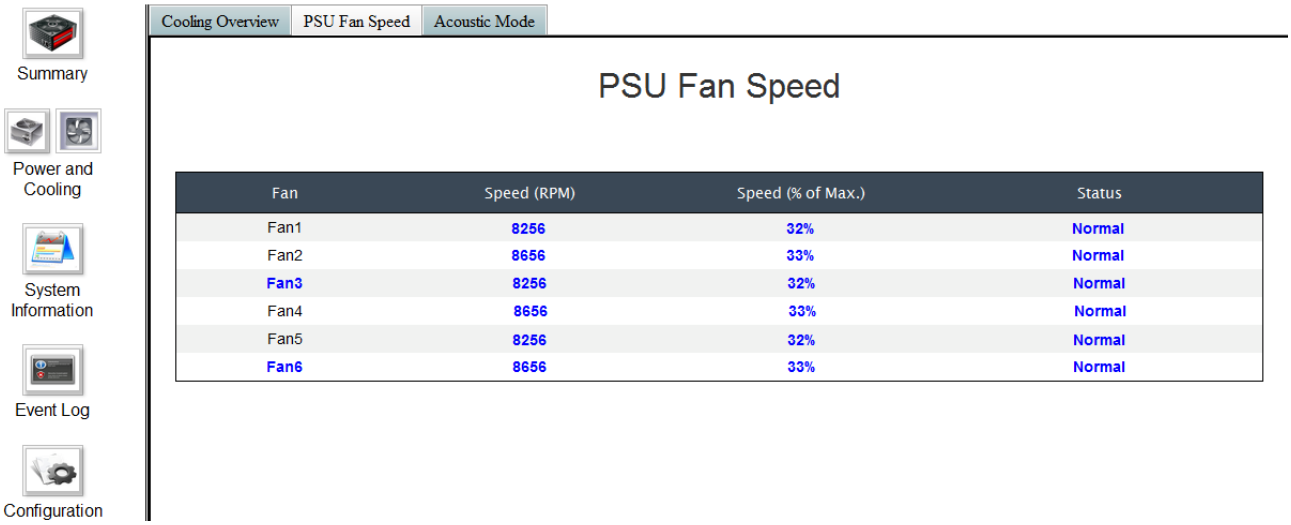


Figure 30: Power and Cooling page - PSU Fan Speed tab

Normal operation for the fans can range from 5,000 rpm to 23,000 rpm or more if the workload requires it.

Acoustic Mode

Figure 31 displays the Acoustic Mode tab from the Cooling page. The Acoustic setting is designed to lower the noise level of the chassis.

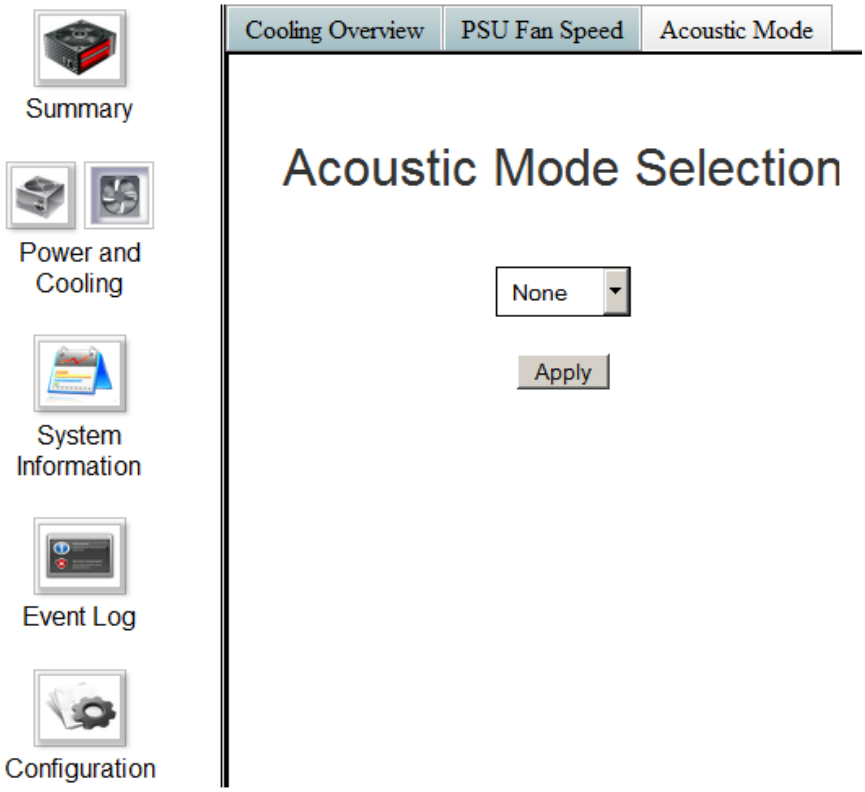


Figure 31: Power and Cooling page - Acoustic Mode tab

There are 3 levels of Acoustic Mode, see Figure *32*.

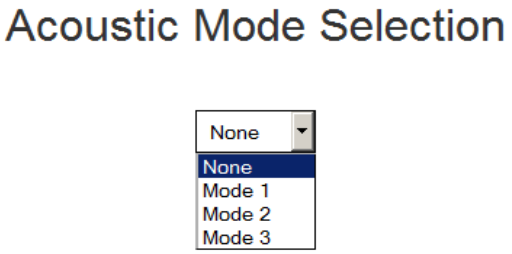


Figure 32: Acoustic Mode selection

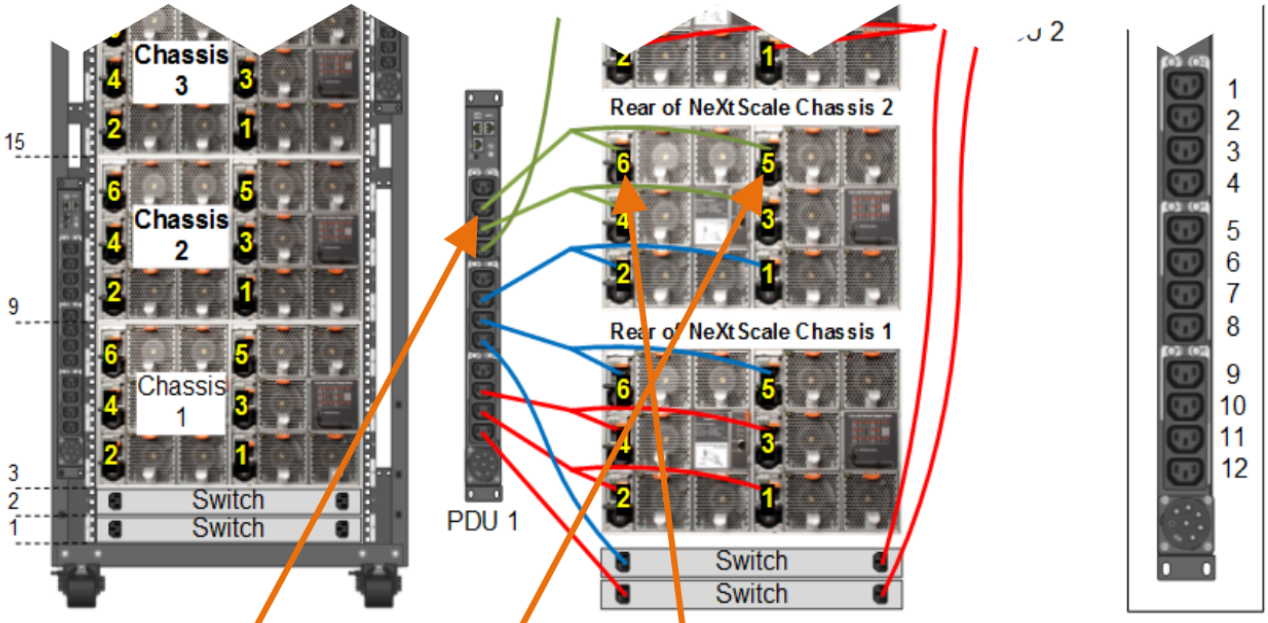
- None: no acoustic mode enabled
- Mode 1: system fan speed is 28% (7.1 bels)
- Mode 2: system fan speed is 34% (7.5 bels)
- Mode 3: system fan speed is 40% (8.1 bels)

Note: These values might change in firmware releases at general availability of the chassis.

Reference Material

The following information can be used as a reference throughout this guide.

Power Connections & Cord Lengths Example



Power Connections & Cord Lengths

Power Cord End 1		Power Cord End 2			Power Cord End 3			Jumper Cord		
PDU	Conn	U Space	Chassis / Switch	PSU	U Space	Chassis / Switch	PSU	Cord Type	Cord Length (mm) A / B / C	Cord PN
PDU 1	1	21	Switch	Left	-	-	-	C20 to C13, 10A	2800	6311
	2	9	Chassis 2	5	9	Chassis 2	6	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	3	9	Chassis 2	3	9	Chassis 2	4	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	4	2	Switch	Left	-	-	-	C20 to C13, 10A	2800	6311
	5	9	Chassis 2	1	9	Chassis 2	3	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	6	3	Chassis 1	1	3	Chassis 1	2	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	7	1	Switch	Left				C20 to C13, 10A	2800	6311
	8	3	Chassis 1	3	3	Chassis 1	4	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	9	3	Chassis 1	1	3	Chassis 1	2	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	10	-	-	-	-	-	-	-	-	-
	11	-	-	-	-	-	-	-	-	-
	12	-	-	-	-	-	-	-	-	-
PDU	1	41	Switch	Right	-	-	-	C20 to C13, 10A	2800	6311
	2	23	Chassis 4	5	23	Chassis 4	6	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	3	23	Chassis 4	3	23	Chassis 4	4	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	4	21	Switch	Right	22	Switch	Right	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	5	23	Chassis 4	1	23	Chassis 4	2	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	6	15	Chassis 3	5	15	Chassis 3	6	Y C20 to two C13, 10A	1524/1524/1000	A3SX
	7		Switch		-		-	C13, 10A	2800	

What is Power Supply Over-subscription, N+1, and N+N Redundancy

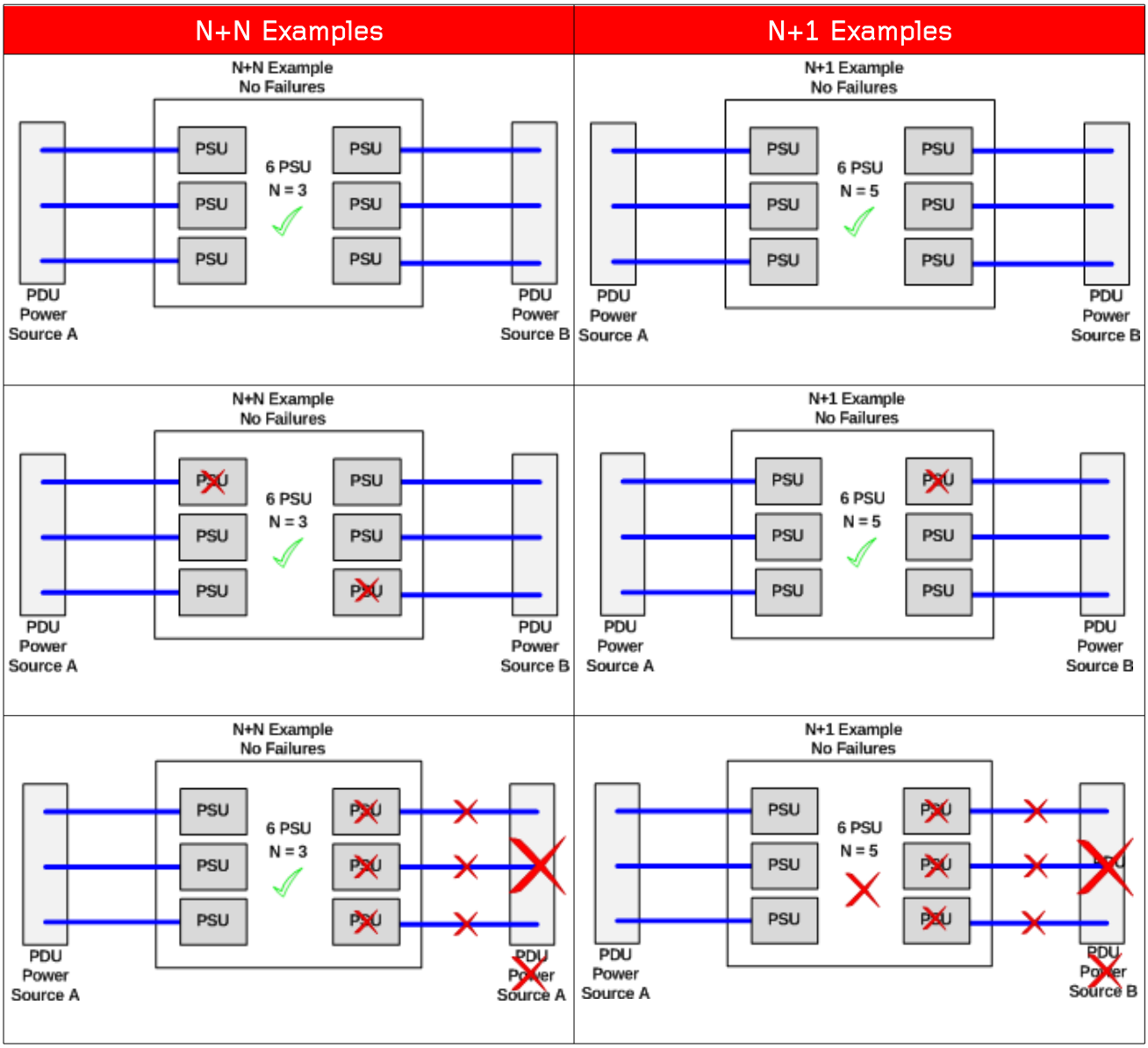
Over-subscription makes the most of the extra power from the redundant power supplies when the power supplies are in healthy condition. When over-subscription mode is enabled with redundant power (N+1 or N+N redundancy), the chassis' total available power can be stretched beyond the label rating (up to 120%).

N+N PSU redundancy is where N is the minimum number of PSUs need to keep the system operational, plus N number of PSUs again for redundancy. Essentially, the number of PSUs are double of what is necessary to keep the system operational. N+N is needed when a system needs to be power source redundant (See example "N+N and N+1 Examples" diagram on the following page).

N+1 PSU redundancy is where N is the minimum number of PSUs need to keep the system operational, plus one PSU for redundancy. N+1 is used when a system needs only to tolerate a single PSU failure and stay operational (See example "N+N and N+1 Examples" diagram on the following page). Think of N+1 as having one PSU as a hot spare.

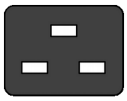
N+N and N+1 Examples

Notice in the N+1 diagrams below that there are two sources. Typically, N+1devices would be connected to one power source since N+1devices do not derive any benefit from two power sources. It is shown here with two power sources to demonstrate this lack of benefit for N+1devices.



IEC 320 Connectors

The following table displays the plug types for different hardware such as monitors, switches, servers, high-end servers, power distribution units (PDUs), and uninterpretable power supplies (UPSs).

Name	Connector	AMP Rating	Use
C5 – Female C6 – Male		2.5A	Laptop Power Supplies And Other Portable Power Supplies
C7 – Female C8 – Male		2.5A	Laptop Power Supplies And Other Portable Power Supplies
C13 – Female C14 – Male		10A	Desktop Computers, Monitors, Switches, And Servers
C15 – Female C16 – Male		10A	Used In Hot Conditions Since It Is Rated To 120^0 C (248^0F), Unlike C13/C14 Which Is Rated To 70^0 C (158^0 F)
C19 – Female C20 – Male		16A	Blade Chassis, Flex System, High-power Servers, UPSs, PDUs, And Other High Current Equipment

Note: IEC 320 has changed to IEC 60320

IEC 309 Plug details

This section discusses the IEC 309 plugs used for connecting a PDU to a power source.

Plug Sleeve Ratings

The color of the sleeve around a plug indicates its voltage rating. The colors and ratings are listed below.

Color	Voltage Rating
Yellow	100V - 130V
Orange	125V/250V
Blue	200V - 250V
Gray	277V
Red	380V - 480V
Black	500V - 690V

IEC 309 Pin Decode

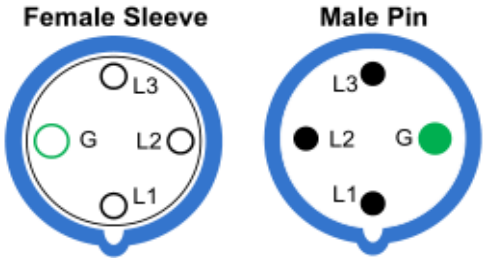
The following table is a break down of the Hubbell (HBL) part number.

The numbers and letters circled in red below is an example HBL part number: HBL**460R9W**.

4	60	R	9	W
Pin Configuration	**Amperage**	**Device Type**	**Polarization**	**Environmental Rating**
3 - 2 Pole + G 4 - 3 Pole + G 5 – 3 Pole + N + G	20 30 32 60 63 100	P - Plug C - Connector R - Receptacle B - Inlet	Clock Position Of Female Sleeve	W-WATERTIGHT (SCREW CAP & LOCKING RING)

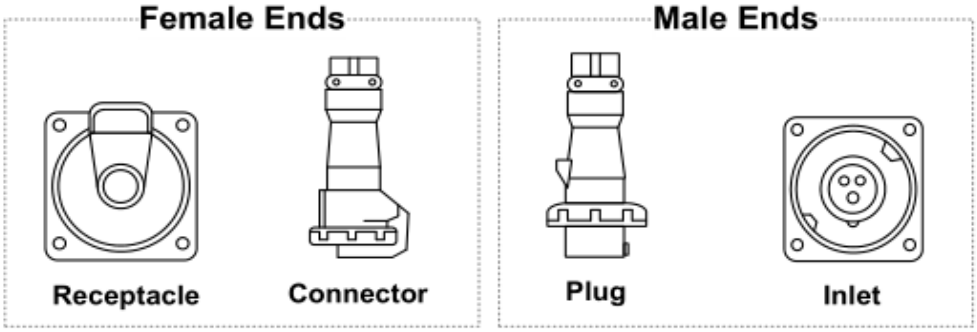
The P/N: HBL**460R9W** plug description is listed below:

HBL**460R9W** = **4** pin (3ph), **60**A, **R**eceptacle, **9** ground (G) clock face pin position, **W**atertight.



Note: The number of pins indicates the phase: **3 pins** = 1ph, **4 pins** = 3ph Δ, and **5 pins** = 3 ph Y

The device types (R, C, P, and B) are pictured below.



Ingress Protection (IP) Decode

Code Letters	First Number	Second Number
Ingress Protection	**Protection Against Ingress of Solid Foreign Objects**	**Protection Against Ingress of Water with Harmful Effects**
IP	0 – No Protection 1 ≥ 50mm Diameter 2 ≥ 12.5mm Diameter 3 ≥ 2.5mm Diameter 4 ≥ 1.0mm Diameter 5 – Dust-Protected 6 – Dust-Tight	0 – No Protection 1 – Vertically Dripping 2 – Dripping At 15° Of Tilt 3 – Spraying Up To 60° Of Tilt 4 – Splashing 5 – Jetting 6 – Power Jetting 7 – Temporary Immersion 8 – Continuous Immersion

First Number: degree of protection for persons against access of hazardous parts inside the enclosure and/or against foreign objects.

Second Number: degree of protection of equipment inside enclosures against damage from ingress of water.

Ingress Protection (IP) is defined in IEC 60529 Standard.

60A Three Phase Delta Power Calculations

$$E_{LL} = E_{AC} = E_{BA} = E_{CB} = 208V$$

$$I_L = 60A$$

$$P_{Total} = \sqrt{3} \times E_{LL} \times I_L \times pf$$

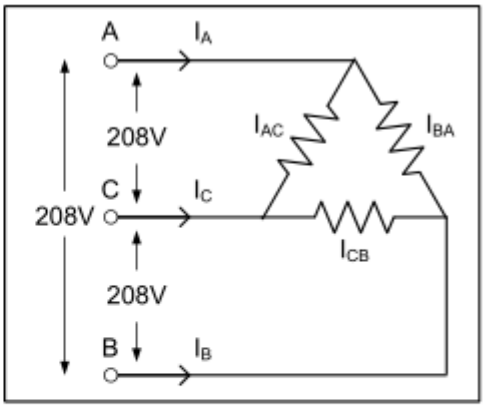
$$= \sqrt{3} \times 208 \times 60 \times 1$$

$$= 21616W$$

$$P_{Derated} = P_{Total} \times 0.8$$

$$= 21616W \times 0.8$$

$$= 17293W$$



$$I_\Phi = I_{AC} = I_{BA} = I_{CB} = \frac{I_L}{\sqrt{3}} = \frac{60}{\sqrt{3}} = 34.64A$$

$$I_{Derated} = I_\Phi \times 0.8 = 34.64 \times 0.8 = 27.7A$$

Variables Defined

I_Φ = Phase Current
I_L = Line Current
E_{LL} = Line to Line Voltage
pf = Power Factor
P = Power In Watts

50A Three Phase Delta Power Calculations

$E_{LL} = 208V$

$I_L = 50A$

$P_{Total} = \sqrt{3} \times E_{LL} \times I_L \times PF$

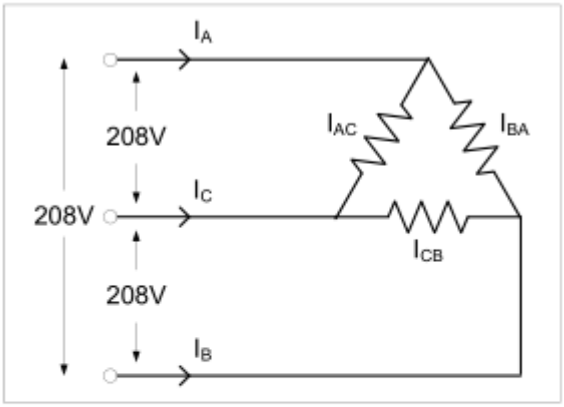
$= \sqrt{3} \times 208 \times 50 \times 1$

$= 18013W$

$P_{Derated} = P_{Total} \times 0.8$

$= 18013W \times 0.8$

$= 14410W$



Variables Defined

I_Φ = Phase Current
I_L = Line Current
E_{LL} = Line to Line Voltage
PF = Power Factor
P = Power In Watts

$$I_{AC} = I_{BA} = I_{CB} = \frac{I_L}{\sqrt{3}} = \frac{50}{\sqrt{3}} = 28.86A$$

$I_{Derated} = I \times 0.8 = 28.86 \times 0.8 = 23.09A$

30A Three Phase Delta Power Calculations

$E_{LL} = E_{AC} = E_{BA} = E_{CB} = 208V$

$I_L = 30A$

$P_{Total} = \sqrt{3} \times E_{LL} \times I_L \times PF$

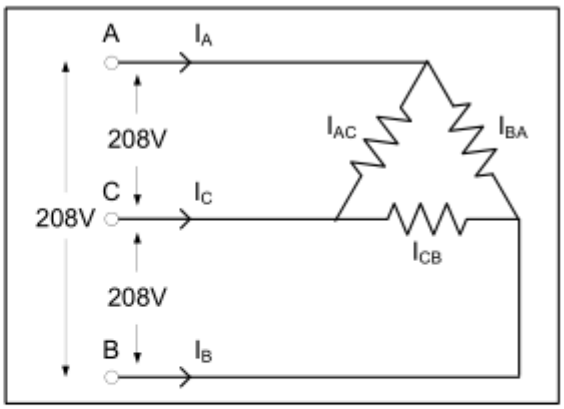
$= \sqrt{3} \times 208 \times 30 \times 1$

$= 10808W$

$P_{Derated} = P_{Total} \times 0.8$

$= 10808W \times 0.8$

$= 8646W$



Variables Defined

I_Φ = Phase Current
I_L = Line Current
E_{LL} = Line to Line Voltage
PF = Power Factor
P = Power In Watts

$$I_\Phi = I_{AC} = I_{BA} = I_{CB} = \frac{I_L}{\sqrt{3}} = \frac{30}{\sqrt{3}} = 17.32A$$

$I_{Derated} = I_\Phi \times 0.8 = 17.32 \times 0.8 = 13.85A$

32A Three Phase Wye Power Calculations

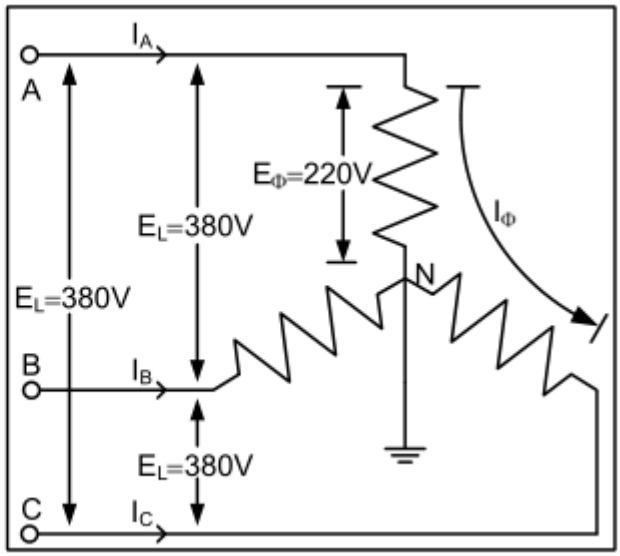
$I_A = I_B = I_C = I_L = I_\Phi = 32A$

$P_\Phi = E_{\Phi Y} \times I_{\Phi Y} \times pf \quad (W)$

$$\begin{aligned} P_{TOTAL} &= 3 \times P_\Phi \\ &= 3 \times E_L/\sqrt{3} \times I_\Phi \times pf \\ &= \sqrt{3} \times E_L \times I_L \times pf \\ &= \sqrt{3} \times 380V \times 32A \times 1 \\ &= 21061W \end{aligned}$$

$$E_{AN} = E_{BN} = E_{CN} = E_\Phi$$

$$= \frac{E_L}{\sqrt{3}} = \frac{380}{\sqrt{3}} = 220V$$



16A Three Phase Wye Power Calculations

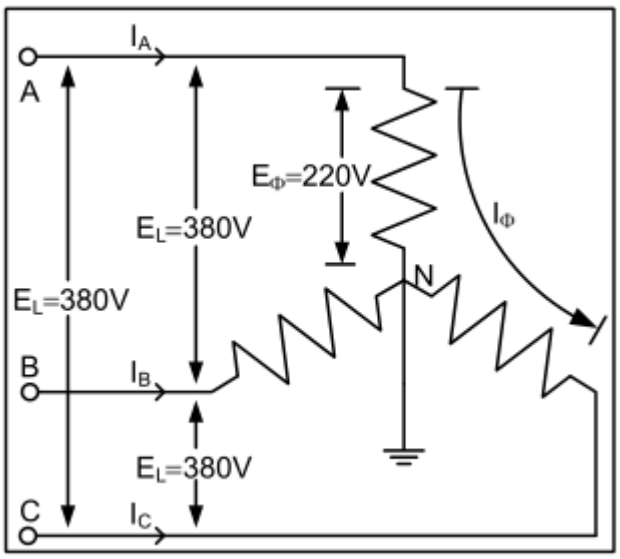
$I_A = I_B = I_C = I_L = I_\Phi = 16A$

$P_\Phi = E_{\Phi Y} \times I_{\Phi Y} \times pf \quad (W)$

$$\begin{aligned} P_{TOTAL} &= 3 \times P_\Phi \\ &= 3 \times E_L/\sqrt{3} \times I_\Phi \times pf \\ &= \sqrt{3} \times E_L \times I_L \times pf \\ &= \sqrt{3} \times 380V \times 16A \times 1 \\ &= 10530W \end{aligned}$$

$$E_{AN} = E_{BN} = E_{CN} = E_\Phi$$

$$= \frac{E_L}{\sqrt{3}} = \frac{380}{\sqrt{3}} = 220V$$



NeXtScale System Documents

NeXtScale System Planning and Implementation Guide – Redbook
http://www.redbooks.ibm.com/abstracts/sg248152.html?Open

Helpful Links

Power and Cooling Guides
http://www.ibm.com/support/entry/portal/docdisplay?lndocid=LNVO-POWINF

Power Configurator
http://www.ibm.com/support/entry/portal/docdisplay?lndocid=LNVO-PWRCONF

Hubbell - Twist Lock Plug/Outlet Catalog (Includes NEMA Outlets)
http://www.hubbellcatalog.com/wiring/catalogpages/section-b.pdf

Hubbell - Pin & Sleeve Plug/Outlet Catalog (Includes IEC309 Outlets)
http://www.hubbellcatalog.com/wiring/catalogpages/section-E.pdf

System x Configuration and Options Guide
http://www.ibm.com/systems/xbc/cog/

System x BladeCenter and System x Reference Sheets
http://www.redbooks.ibm.com/abstracts/redpxref.html

Official System x Visio Stencils
http://www.visiocafe.com/lenovo.htm

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