Smarter power delivery

IBM

Decision and Solutions Guide

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IBM Distributed Power Interconnect products

Contents

Enhance system and data availability with modular, space-efficient power distribution solutions from IBM

With the changes brought on by the new generation of Intel®-based servers, power distribution and power delivery are becoming critical issues. Only a few years ago, the quest was on to find ways to easily place 42 outlets in a rack for what was then an amazingly dense configuration of 1U servers. Today, there are more factors to consider than counting the power line cords and matching them to the number of outlets. The quest for outlet count has now been joined by the quest for delivering current adequate to feed the substantial power draw of today's servers. This trend toward higher current (amperage) draw in servers is making it more difficult to design a fault-tolerant system.

Now, IBM offers Distributed Power Interconnect (DP Interconnect) products, a new family of modular "zero-U" power distribution units (PDUs) capable of supporting solutions from a handful of server to an array of large enterprise servers—all without consuming valuable rack space. These units can be configured to provide redundant power distribution, thus eliminating a point of failure and assuring higher levels of data availability.

IBM® DP Interconnect (DPI) products were developed specifically for use with sensitive electronic equipment in the rack environment. Unlike many third-party products which were designed for the desktop or industrial environments, the DPI products are sized and protected with servers in mind.

There are compelling reasons why one should include IBM DP Interconnect PDUs in a rack-based IBM @server xSeries™ solution:

- Even in simple configurations, the combined power-line requirement of devices in the rack can easily exceed the capacity of existing wall outlets. A PDU can help customers efficiently use the available power and the available outlets.
- A properly configured PDU solution can help customers increase availability and protect their system investments for a very affordable price. IBM PDUs can be used to provide an advanced fault-tolerant power distribution system.
- IBM's modular approach provides the flexibility to mix and match components as needed to configure a wide range of power distribution solutions. Universal voltage support, plus single- and three-phase models, provide solutions that can be used in virtually any facility or location, to meet almost any rack power requirement.
- These PDUs assume a three-year onsite limited warranty[1] when they are installed in an IBM NetBAY rack, which means they include award-winning IBM service and support.
- A fully configured, all-IBM rack solution—including PDUs, uninterruptible power supply (UPS), console switches and cables—helps customers speed implementation with one-stop shopping and simplify installation with the assurance that all the pieces will work together out of the box.

About this Guide

Choosing a properly designed and properly protected PDU is more important than ever. This guide will provide an introduction to the IBM DPI family of PDUs and explain:

- The design philosophy driving the development of these products
- How to use, size and install PDUs
- Trends in power requirements for Intel-based servers and data center power architecture
- Factors to be considered when designing the layout of your power system.

Products and solutions

Key features

The IBM DP Interconnect family of PDUs can help satisfy customer business needs for reliable, redundant power at a very competitive price point. Key features of these PDUs include:

Ease of use
DP Interconnect products are quick and easy to install. They come standard with all necessary brackets and hardware for your installation, plus the appropriate line cord for connecting to a wall power source and the appropriate jumper cord for connection to a front-end PDU. The best reason to choose IBM DPI PDUs is that they are built using customer-attachable line cords and connectors. This design approach eliminates terminal blocks and the expensive electrician visits required for their installation. This means no matter where in the world you are located, IBM DPI PDUs come ready to deploy.

Zero-space design
DPI products are designed to mount in the sidewall compartment, preserving valuable "U" rack real estate for servers, storage devices and other rack options. Customers can mount several PDUs in a NetBAY rack's sidewall compartments.

High-availability solutions
Units can be configured to provide redundant power distribution for servers and other critical components. Plus, the NetBAY Server Dual-cord PDU provides fault tolerance by connecting each supported power supply to two (primary and backup) power sources.

Outstanding scalability and flexibility
Modular design allows you to mix and match components, adjusting configurations to accommodate growing power distribution needs, from total wattage to a sufficient number of outlets for rack-mounted equipment. Plus, by combining multiple units you can support rack-dense, power-hungry configurations such as:
- Up to 42 1U servers in a single rack
- High-density, power-hungry blade servers
- A large array of multiple rack-optimized servers
- Clustered eight-way enterprise servers
- Large-scale redundant storage systems

Cord consolidation and cable management
Using short, easy-to-manage jumper cables to connect multiple rack devices to a single PDU, you can significantly reduce the number of individual power cords going from the rack to the wall. Plus, you can mount PDUs in sidewall pockets close to the equipment they support, helping to further reduce cable clutter.

Protection
Internal fuses and/or breakers in rack and front-end PDUs help protect equipment from catastrophic faults in connected devices.

IBM DPI product family

Design philosophy

The design philosophy of the entire DPI line is twofold. First, make it easy to install and access outlets within the rack. Second, minimize the number of line cords leaving the rack, thus decreasing power infrastructure requirements without sacrificing scalable growth. IBM @server xSeries offerings pioneered the scalable modular approach to power distribution; our NetBAY Modular PDUs have been making it easy for customers to support rack-dense environments for years.

No matter the version that you choose, all of the IBM PDU products can help you meet demanding power requirements in the rack environment while saving space, consolidating line cords and providing easy access to outlets for scaling up and for cable management.
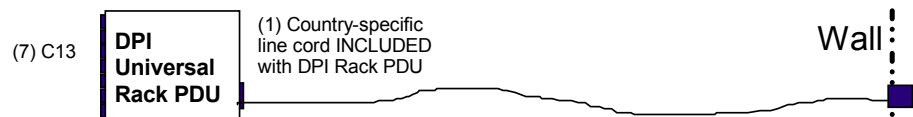
DPI Universal Rack PDU

This PDU provides an economical, basic power distribution capability for rack-based systems, enabling you to satisfy the power requirements of each device without overtaxing your power source. It has one universal-voltage power input and supports up to seven devices with a combined power requirement of 1500W at 100Vac to 3600W at 240Vac (based on AC input volts). Features include:
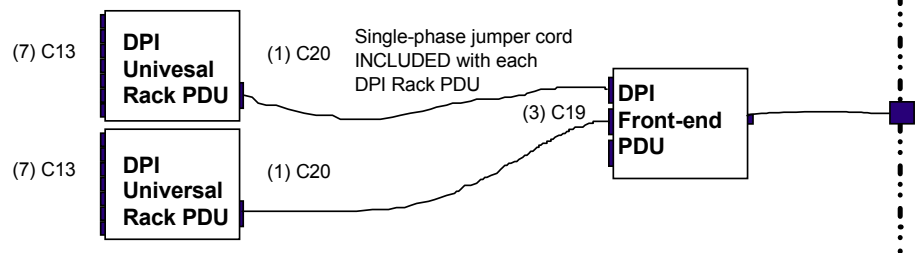
- Universal voltage (100-240Vac, 50-60Hz)
- Brackets for vertical (sidewall) and horizontal (EIA space) rack mounting
- Two-pole 15-amp circuit breaker with time-delay protection
- Seven IEC 320-C13 power outlets (for connection to devices)
- One IEC 320-C20 power inlet (for connection to wall or to front-end PDU)
- Single LED power on indicator
- Cable management brackets included with PDU to help neatly and securely run cabling

This unit is designed to be used one of two ways: plugged into an appropriate wall outlet or, more commonly, used in conjunction with the innovative DPI Front-end PDU. Below is a graphical overview of the two ways to use the DPI Rack PDUs:

PDU plugged directly into wall

(7) C13 | DPI Universal Rack PDU — (1) Country-specific line cord INCLUDED with DPI Rack PDU — Wall

Multiple PDUs in combination with DPI Front-end PDU

(7) C13 | DPI Univesal Rack PDU | (1) C20 — Single-phase jumper cord INCLUDED with each DPI Rack PDU

(7) C13 | DPI Universal Rack PDU | (1) C20

(3) C19 — DPI Front-end PDU — Wall

DPI Front-end PDU

DPI Single-phase Front-end PDU
One unit supports both 30/32amp and 60/63amp power supply

DPI Single-phase Front-end PDUs provide a front-end wiring box to allow connection of multiple DPI Universal Rack or NetBAY Server Dual-cord PDU models to higher-current single-phase circuits. These modular, front-end PDUs provide three single-phase output circuits from one single-phase (100V-240V at 30amp or 200V-240V at 60amp) input circuit. Features include:

- Adapts to high-current circuits (three-wire, single-phase)
  - 100V-240V at 30/32amp, supports up to 3000W at 100V or up to 7200W at 240V
  - 200V-240V at 60/63amp, supports up to 9000W at 200V or up to 10,800W at 240V
- Three single-phase output circuits, with three IEC 320-C19 inputs (for connection to PDUs)
- Non-replaceable fuse for protection
- Brackets for vertical (sidewall) rack mounting only
- Power on LED indicator on each load segment
- Mount in rack side walls, or on the EIA mounting hardware of the Rack PDU

A DPI Front-end PDU with 60amp line cord is an ideal choice for servers like x345, x335, x440, x450 and IBM @server BladeCenter™. This high- amperage product offering will make it easier for customers to support large installations of any server, reducing the number of line cords and helping reduce electrical power infrastructure needed to feed the rack.

One of the hot new features of the DPI family is the scalability of power support. The same DPI Front-end PDU unit can be used at 30amps or 60amps, depending on the line cord you choose. This provides an excellent way to grow your solution as needs change or to size the right solution for even the most power-hungry setups.

Front view of DPI Front-end PDU

How do the line cords work?

The photograph (left) shows the rear of the PDU equipped with a special pin-out connector. This connector enables you to attach one of several different line cords to the unit. Depending on the line cord, the DPI Front-end PDU can be either 30(32)amp or 60(63)amp, offering enhanced investment protection that can prepare the way for future growth.

For example, a customer in the US can migrate from low voltage 30amp to high voltage 30amp to high voltage 60amp via only a line cord change. Or, a customer in the UK could migrate from 32amp 250V to a 63amp 250V. The result is great investment protection and solution flexibility.

DPI Front-end PDU configuration

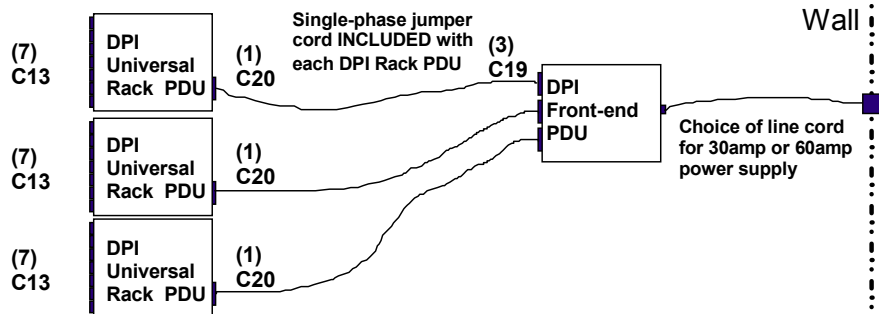**Provides 21 outlets (1 line cord to the source)**

Rear view of DPI Front-end PDU, showing pin-out connector on the PDU and line cord. Customers can easily detach or attach the high amperage line cord.

DPI NEMA 100-127V Rack PDU

This PDU provides an economical, basic power distribution capability for rack-based systems, enabling you to satisfy the power requirements of each device. It has one low-voltage power input and supports up to six devices with a combined power requirement of up to 1200W at 100v through 1524W at 127V. This 1U PDU is half-rack width, so you can mount two in a single 1U space for a total of 12 outlets.

This PDU is primarily used in North America, Japan, Taiwan, the Philippines and various other nations that have power systems that work at 100V-127V. Features include:

- Low voltage (100V-127V)
- Brackets for vertical (sidewall) and horizontal (EIA space) rack mounting
- Two-pole 15-amp circuit breaker with time-delay protection
- Six NEMA   5-15 power outlets
- Fixed L5-15 line cord
- Cable retention aids

Although very similar to the IEC-based DPI Universal Rack PDU, this NEMA model does not provide the same flexibility and scalability of configurations. Unlike the rest of the IBM PDU product line, this unit is designed to be used on its own, not in combination with front-end PDU units. Simply plug it into the wall and power up as many as six devices. Because this PDU shares the same form factor as the DPI Universal Rack PDU, it can be mounted on the same hardware—a great benefit for customers who require both NEMA and IEC outlets in the same rack.

NetBAY Three-phase Front-end PDU

The NetBAY Three-phase Front-end PDU has been around for quite some time and is one of the two NetBAY PDUs that IBM still offers. This innovative unit provides a front-end wiring box to allow connection of multiple DPI Universal Rack or NetBAY Server Dual-cord PDU models to five-wire, three-phase circuits. It provides three single-phase output circuits from one five-wire, three-phase (208V/120V or 400V/230V) input circuit. The North American version of this takes power in at 208V and distributes it at 120V. The International version receives power at 400V and distributes it at 20V. Features include:

- Adapts to high-current circuits (five-wire, three-phase)
- Three single-phase output circuits, with three IEC 320-C19 inputs (for connection to PDUs)
- Non-replaceable fuse for protection
- Brackets for vertical (sidewall) rack mounting only
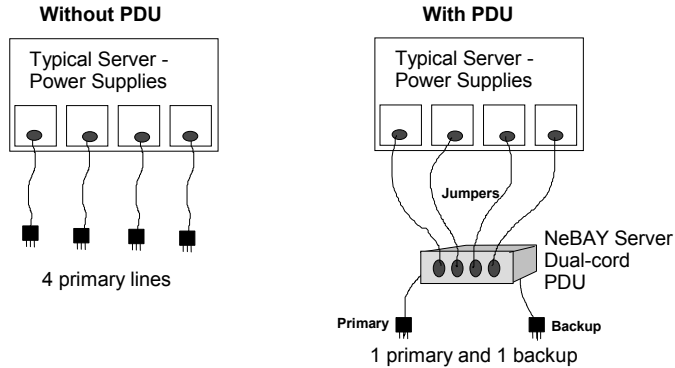- Cable retention aids

Note: This PDU can be used with the new DPI Universal Rack PDUs, but it can not be mounted on the same hardware due to size differences. This front-end PDU is an ideal choice for customers that want to maximize the power to their racks with as few feeds as possible.

NetBAY Server Dual-cord PDU

The Server Dual-cord PDU is the other NetBAY PDU that IBM continues to offer. This PDU can provide greater fault tolerance in certain installations than available DPI PDUs. The unit functions as an automatic bus transfer switch that provides universal voltage (100V to 240V) distribution for a server from one of two independent power sources. One of the source circuits is considered the primary source. If the primary source fails, the unit will automatically switch the loads to the backup source circuit. This PDU can be used plugged into a wall outlet or used in conjunction with the DPI Front-end PDUs. Features include:

- Universal voltage (100V-240V AC 50/60Hz) AC power distribution for one or more servers from either of two power sources
- Power failure sensing - automatically switches from primary power source to backup power source circuit; transfer time is 35mSec or less
- Power can be sourced from either uninterruptible power supply or wall source
- Four IEC 320-C13 power outlets
- Two IEC 320-C20 power inlets
- Brackets for vertical (sidewall) and horizontal (EIA space) rack mounting
- Cable retention aids

Without PDU	With PDU
Typical Server - Power Supplies	Typical Server - Power Supplies
4 primary lines	1 primary and 1 backup

IEC versus NEMA standard

Why IEC is the best outlet choice for your rack systems

For many customers, there is no choice: IEC 320—C13-based PDUs are the accepted standard for internal rack power outlets for the vast majority of the countries around the world. But for customers in North America, Japan, Taiwan, the Philippines, Saudi Arabia and various other nations, the NEMA standard is an available alternative.

The NEMA outlets on our DPI 100-127V Rack PDU are the same size and shape as many wall outlets where 100-127V power systems are used (NEMA 5-15R). The larger size of the NEMA outlet means that fewer outlets can be incorporated into the same "real estate" on a piece of electronic equipment. As a result, products with NEMA outlets typically are less dense and not as flexible as products designed with IEC outlets.

The C13 outlet has been adopted throughout the world as the choice for internal rack power. Unlike country-specific outlets, the IEC C13 outlet extends beyond all country borders and across all types of power distribution, from 100V all the way to 240V. Many of the benefits engineered into the IBM line of modular PDU products originate from the higher-density, smaller-sized IEC outlets. These benefits, which make IEC-based PDU products the best choice for internal-rack power distribution, include:

- Universal support for both low voltage (100V-127V) and high voltage (200V-240V) input in a single product, providing enhanced flexibility and investment protection
- Optimizing device support in a small space, helping to conserve valuable rack real estate.

Going forward, IEC is the platform that IBM will support for innovation because it enables us to focus resources on a product line that can be used worldwide.

	Rack PDU (IEC)	100-127V PDU (NEMA)
Can be used with DPI Front-end PDUs to reduce cord clutter?	YES	NO
Maximum number of outlets in full 1U rack width	14 (2 PDUs)	12 (2 PDUs)
Able to adapt to high voltage inputs?	YES	NO
Accepted all over the world for internal rack distribution systems?	YES	NO
Rating of the PDU	15amp	12amp

The benefits of IBM Distributed Power Interconnect PDUs

Customer requirements

Keeping today's enterprise up and running is a top priority for IT managers. Server downtime originates from many sources, but often, it is due to unexpected power problems stemming from natural disasters, faulty electrical systems, poor quality power or an accidental cutting of electrical lines. At the same time, the power requirements of ever more powerful computing equipment continue to grow. With rack-dense solutions allowing companies to fit an old data center's worth of computing horsepower into the space of a small wiring closet, IT managers can find it difficult to keep the electricity flowing.

To meet new high-availability requirements, a fault-tolerant system design must address power management. Solution components include:
- PDUs to assure that the combined line-cord requirement of all rack-mounted equipment is met
- Redundant configurations that provide power from separate sources to enable failover capability
- In unprotected data center environments, combining PDUs with uninterruptible power supply (UPS) products for even greater levels of reliability in the event of a power failure.

In addition, power fault tolerance solutions should address requirements for:
- Preserving valuable "U" space in a rack that quickly fills up with network-critical equipment
- Easy serviceability, high reliability, and high availability
- Scalable and flexible systems that can grow with changing network demands.

The use of IBM DP Interconnect PDUs alone may not solve all the issues with power that we are facing today. Many problems such as power surges, brownouts, under-voltage and the like can only be protected against by the use of the right UPS products. IBM offers a complete suite of power-protecting UPS products. For detailed information on these products and how to choose the right one for your application, download the *IBM Decision Maker's Guide to Selecting the Right UPS* from: www.pc.**ibm.com**/ww/eserver/xseries/rack.html. This guide includes information on the all-new IBM UPS3000X, an ideal addition to any midrange solution of xSeries servers and storage.

Key messages

- *LINE CORD CONSOLIDATION*: Innovative, modular design reduces the number of line cords leaving the rack, while increasing the possible total outlet count possible in the rack.
- *CUSTOMER-FRIENDLY DESIGN*: Equipped with customer-attachable rather than hardwired line cords, IBM DPI PDUs can help you save money. This design approach eliminates terminal blocks and the expensive electrician visits required for their installation. Instead, to power up these PDUs you just plug them into an appropriate outlet.
- *SERVER-LEVEL PROTECTION*: Designed for IBM servers. Unlike the PDUs one might find at local retailers or available from third parties, IBM PDUs are designed for protecting expensive and sensitive IT equipment. DPI PDUs provide protection against overload and surge for the large loads required on today's servers. Also, buying PDUs from your server vendor can offer the confidence that your investment in power infrastructure is protected well into the future.
- *DESIGNED FOR THE RACK ENVIRONMENT:* These products were designed to be used in the space-constrained environment of a server rack. Unlike many other PDU products that support higher power levels, our 1U designs allow placement of multiple PDUs in the rack side panels, preserving the maximum amount of "U" space.
- *GREATER AVAILABILITY*: DPI products can be configured to provide redundant power distribution, thus eliminating a single point of failure and helping to increase data availability.
- *FASTER INSTALLATION*: Now, you can significantly speed solution setup by deploying IBM PDUs in combination with IBM racks. We design our PDUs with NetBAY racks in mind. When you combine IBM racks and IBM power, you get simple, quick, stable and thoughtful solutions. Add these benefits to the ability to prewire a location for these "connectorized" PDUs and you can eliminate the waiting period that is so common after your equipment arrives, but before the electricians finish their work.
- *SUPERIOR SCALABILITY:* The modularity of the IBM PDUs make it easy to support virtually any configuration, from a handful of servers to an entire rack. For example, you can place up to 84 outlets in a single IBM NetBAY Enterprise Rack—without sacrificing a single "U" of space.
- *SERVICE BENEFITS:* Buying DPI products and placing them in an IBM rack can mean enhanced protection and service benefits to the customer. Any IBM PDU placed in a NetBAY rack receives the same level of service as the rack itself. The standard protection for all IBM racks is a three-year on-site limited warranty**. Add a service pack or warranty uplift to the rack, and you gain the same extended coverage for your PDUs as well. This is a great way to consolidate services and protect your entire investment.

Selection questions: Helping ensure that you get the right product

Selection questions	Rationale for asking
Do you currently have the infrastructure in place to run multiple line cords to the rack?	If not, the modular design of IBM DP Interconnect PDUs may help you avoid having to run new lines, a huge cost savings for customers adding a new rack or adding to their existing solution.
Are you paying an electrician to hardwire your current PDUs?	This is one of the most substantial expenses involved with server set up. DPI products with customer-friendly line cords and connectors can do away with much of this cost.
Do you anticipate adding new servers to your environment?	IBM DPI solutions scale easily to accommodate growing rack configurations. Customers can start with a single Universal Rack PDU, and add more Universal Rack PDUs or Front-end PDUs as needs grow. The DPI family's scalability of power support also helps growing customers quickly modify their power systems to add newer, more powerful servers with very little effort.
Is your business-critical data adequately protected in the event of a power outage? How much downtime can your business tolerate until systems can be brought back online?	DPI PDUs can be configured to provide redundant power distribution. Plus, these units can be used in combination with select rack-mountable UPS products from IBM to provide an advanced fault-tolerant power distribution system.
If you are considering third-party PDUs, are you sure they will provide protection against catastrophic faults?	Many third-party PDUs were not designed for the IT environment. Rather, they are intended to protect motors or other industrial equipment, which may not be as sensitive as the electronics equipment that IBM PDUs are designed to safeguard.
Is your solution likely to be shipped configured in the rack?	DP Interconnect PDUs have been designed and fully tested to withstand the rigors of configured shipment in the rack. Many alternative products have plastic components that will not survive transit outside their carefully packages boxes.

Product specifications

Americas Rack PDU models

Model	DPI 100-127V Rack PDU	DPI Universal Rack PDU	NetBAY Server Dual-cord PDU
Part number(s)	32P1761 with fixed NEMA L5-15 line	32P1736 - US line cords (NEMA L5-20 and L6-20) 32P1745 - Brazilian line cord (NBR 6147) 32P1747 - Argentinian line cord (IRAM 2073)	37L6865
Form factor	Units are 1U high, half-rack width, and can be mounted alone or in combination.		Rack/1U, half width
Description	Six-outlet, low-voltage-only (100-127V) PDU with NEMA 5-15 outlets	Seven-outlet 100-240V PDU with IEC320 C13 outlets.	Universal voltage redundant power switch for servers with multiple power supplies. Four IEC 320-C13 outlets
Capacity Low voltage High voltage	Up to 1524W @ 127V N/A	Up to 1905W @ 127V Up to 3120W @ 208V	Up to 1905W @127V Up to 3120W @ 208V
Support	ServerProven support for all Netfinity™ and xSeries servers and options		
Input	Fixed line cord, NEMA L5-15 connector (2.5m)	IEC 309 C20 input connector along with 2.5m country- specific line cord (see above)	Two line cords, NEMA L5-20P (two each) or NEMA L6-20P (two each)
Power source	100-127Vac, 50/60Hz	100-240Vac, 50/60Hz	100-208Vac, 50/60Hz
Mounting option	Hardware included for both EIA mounting and side pocket mounting; both installations are approved for preconfigured shipment in an IBM NetBAY rack		Sidewall or EIA space
Protection	15amp dual pole circuit breaker	15amp dual pole circuit breaker	Non-replaceable fuse included with each output circuit
Dimensions	41.50x222.5x114.5mm 1.63x8.76x4.51"	41.50x222.5x114.5mm 1.63x8.76x4.51"	43mmx192mmx21mm 1.7x7.5x8.7"
Warranty[1]	Three-year limited onsite warranty when installed in an IBM NetBAY rack		

Americas Front-end PDU models

Model	DPI 30amp/125V Front-end PDU with NEMA L5-30 line	DPI 30amp/250V Front-end PDU with NEMA L6-30 line	DPI 60amp/250V Front-end PDU with IEC 309 2P+G	NetBAY Three-phase Front-end PDU with NEMA
Part number	32P1751	32P1766	32P1767	37L6886
Form factor	Units are 1U high, half-rack width, and can be mounted alone or in combination.			Rack/1U, half width
Description	Single-phase, low-voltage 30amp front-end PDU with three IEC 309 C19 outlets	Single-phase, high-voltage 30amp front-end PDU with three IEC 309 C19 outlets	Single-phase, high-voltage 60amp front -end PDU with three IEC 309 C19 outlets	Wiring unit for adapting a five-wire, three-phase circuit to three single-phase branch circuits
Capacity Low voltage High voltage	Up to 3048W @ 127V N/A	N/A Up to 4992W @ 208V	N/A Up to 9360W @ 208V	N/A Up to 5400W @ 208V/120V
Support	ServerProven support for all Netfinity and xSeries servers and options			
Line cord	NEMA L5-30 (2.5m)	NEMA L6-30 (2.5m)	IEC 309 60amp 2P+G (2.5m)	NEMA L21-30P (2.5m)
Power source	100-127Vac, 50/60 Hz	200-208Vac, 50/60 Hz	200-208Vac, 50/60 Hz	208/120Vac, 50/60Hz (three phase)
Mounting option	Units come with side wall mounting hardware only; however, FE PDUs can be mounted in the EIA space using the rack PDU hardware. Front-end PDUs only support preconfigured shipment in side panel.			Sidewall
Protection	Non-replaceable fuse included with each outlet circuit for protection	Non-replaceable fuse included with each outlet circuit for protection	Non-replaceable fuse included with each outlet circuit for protection	Non-replaceable fuse included with each outlet circuit for protection
Dimensions	41.5x225.5x222.5mm 1.63x8.76x8.76"	41.5x225.5x222.5mm 1.63x8.76x8.76"	41.5x225.5x222.5mm 1.63x8.76x8.76"	43mmx192mmx221mm 1.7x7.5x8.7"
Warranty[1]	Three-year limited onsite warranty when installed in an IBM NetBAY rack			

Smarter power delivery

EMEA and AP Rack and Frond-end PDU models

Model	DPI Universal Rack PDU	DPI 32amp/250V Front-end PDU with IEC 309 P+N+G	DPI 63amp/250V Front-end PDU with IEC 309 P+N+G	NetBAY Three-phase Front-end PDU with IEC 3P+N+G
Part number	32P1736-US style (NEMA L5-20P and L6-20P) 32P1737 - Europe (CEE7-VII) 32P1738 - Denmark (IEC309 2P+Gnd) 32P1739 - Israel (SI 32) 32P1740 - Italy (CEI 23-16) 32P1741 - S. Africa (SABS 164) 32P1742 - UK (BS 1363/A) 32P1743 - Australia/N. Zealand (AS/NZ 3112) 32P1744 - China (BG 2099.1) 32P1746 - India (IS6538)	32P1752	32P1754	37L6887
Form factor	Units are 1U high, half-rack width, and can be mounted alone or in combination.			Rack 1/U, half width
Description	Seven-outlet 100-240V PDU with IEC309 C13 outlets	Single-phase, 32amp front-end PDU with three IEC 309 C19 outlets	Single-phase, 63amp front-end PDU with three IEC 309 C19 outlets	Wiring unit for a five-wire, three-phase circuit to three single-phase circuits
Capacity 220V 240V	Up to 3,300W Up to 3,600W	Up to 7,040W Up to 7,680W	Up to 9,900W Up to 10,800W	19,800W 21,600W
Support	ServerProven support for all Netfinity™ and xSeries servers and options			
Line cord	IEC 309 C20 input connector along with 2.5m country -specific line cord (see above)	IEC 309 2P+G (2.5m)	IEC 309 60amp 2P+G (2.5m)	32amp IEC 309 3P+N+P (2.5m)
Power Source	220-240Vac, 50/60Hz	220-240Vac, 50/60Hz	220-240Vac, 50/60Hz	380-415/220-240 Vac, 50/60Hz
Mounting option	Included hardware supports EIA and side pocket mounting. Supports configured shipment in an IBM Rack.	Included hardware supports side wall mounting. Units can also be mounted on EIA mounting bracket included with Rack PDU. Configured shipment supported in rack side panel only.		Sidewall
Protection	15amp dual pole circuit breaker	Non-replaceable fuse included with each outlet circuit for protection	Non-replaceable fuse included with each outlet circuit for protection	Non-replaceable fuse included with each outlet circuit
Dimensions	41.50x225.5x114.5mm 1.63x8.76x4.51"	41.50x225.5x225mm 1.63x8.76x8.76"	41.50x225.5x225.5mm 1.63x 8.76x 8.76"	43mmx192mmx221mm 1.7x7.5x8.7"
Warranty[1]	Three-year limited onsite warranty when installed in an IBM NetBAY rack			

Smarter power delivery

Line cord configurations for IBM DPI PDUs

Model	Part number	Description	Line cord	Availability by country
DPI NEMA Rack PDU	32P1761	DPI NEMA Rack PDU with Fixed NEMA L5-15P line cord	Fixed-line NEMA L5-15P	US, Canada, Mexico, Japan, Taiwan, Philippines
DPI Universal Rack PDU	32P1736	DPI Universal Rack PDU with NEMA L5-20P & L6-20P US line cords	IEC C19 to NEMA L5-20 and IEC C19 to L6-20	US, Canada, Mexico, Japan, Taiwan, Philippines, Saudi Arabia
	32P1737	DPI Universal Rack PDU with CEE7-VII Europe line cord	IEC C19 to CEE7-VII	Europe
	32P1738	DPI Universal Rack PDU with IEC 309 2P+Gnd Denmark line cord	IEC C19 to IEC 309 2P+Gnd	Denmark, Switzerland, Singapore
	32P1739	DPI Universal Rack PDU with SI 32 Israel line cord	IEC C19 to SI 32	Israel
	32P1740	DPI Universal Rack PDU with CEI 23-16 Italy line cord	IEC C19 to CEI 23-16	Italy
	32P1741	DPI Universal Rack PDU with SABS 164 South Africa line cord	IEC C19 to SABS 164	South Africa
	32P1742	DPI Universal Rack PDU with BS 1363/A UK line cord	IEC C19 to BS 1363/A	UK, Hong Kong
	32P1743	DPI Universal Rack PDU with AS/NZ 3112 Australia/NZ line cord	IEC C19 to AS/NZ 3112	Australia, New Zealand,
	32P1744	DPI Universal Rack PDU with GB 2099.1 China line cord	IEC C19 to GB 2099.1	China
	32P1745	DPI Universal Rack PDU with NBR 6147 Brazil line cord	IEC C19 to NBR 6147	Brazil
	32P1746	DPI Universal Rack PDU with IS6538 India line cord	IEC C19 to IS6538	India
	32P1747	DPI Universal Rack PDU with IRAM 2073 Argentina line cord	IEC C19 to IRAM 2073	Argentina, Uruguay, Paraguay
DPI Front-end PDU	32P1751	DPI 30amp Front-end PDU with NEMA L5-30P (127V) Americas line cord	Burndy to NEMA 30A L5-30P (127V)	US, Canada, Mexico, Japan, Taiwan, Philippines
	32P1752	DPI 32amp Front-end PDU with IEC 309 32A 2P+Gnd (250V) EMEA line cord	Burndy to IEC 309 32A 2P+Gnd (250V)	All of EMEA, all HV AP
	32P1754	DPI 63amp Front-end PDU with IEC 309 63A 2P+Gnd (250V) EMEA line cord	Burndy to IEC 309 63A 2P+Gnd (250V)	All of EMEA, all HV AP
	32P1766	DPI 30amp Front-end PDU with NEMA 30A L6-30P (208V) line cord	Burndy to NEMA 30A L6-30P (208V)	US, Canada, Mexico, Japan, Taiwan, Philippines
	32P1767	DPI 60amp Front-end PDU with IEC 309 60A 2P+Gnd (250V) line cord	Burndy to IEC 309 60A 2P+Gnd (250V)	US, Canada, Mexico, Japan, Taiwan, Philippines

Sizing and configuring PDU solutions

Step 1:
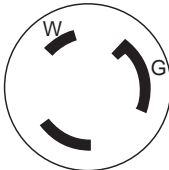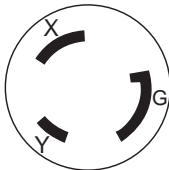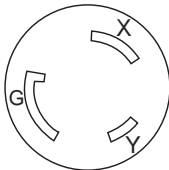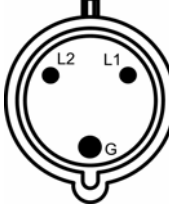Identify the devices contained in the rack configuration
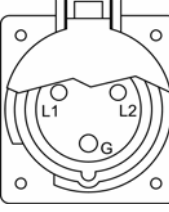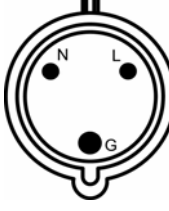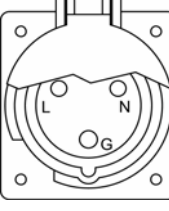
Step 2:
Sum the total load (watts) and total outlet requirements of all devices in the configuration.

Servers	# Power Cords	Std/Max Watts Load Max/Typical
xSeries 200	1/1	350/245
xSeries 205	1/1	485/340
xSeries 220	1/1	350/245
xSeries 232 (one 385W power supply)	1/1	400/280
xSeries 232 (two 250W power supplies)	2/3	450/315
xSeries 235	1/2	800/560
xSeries 240	2/3	450/315
xSeries 250	2/4	475/350
xSeries 255	2/4	1000/530
xSeries 300	1/1	200/140
xSeries 305	1/1	200/140
xSeries 330	1/1	200/140
xSeries 335	1/1	340/245
xSeries 342	1/2	390/270
xSeries 345	1/2	500/350
xSeries 350	1/3	525/365
xSeries 360	2/3	740/520
xSeries 370	3/3	1450/1015
xSeries 380	2/2	2000/1400
xSeries 440	2/2	950/950
Other Devices		
RXE-100 (8684-1RX)	2/2	370/260
EXP300 Storage Expansion Unit (3531)	2/2	360/285
FAStT200 Storage Server (35421RU)	2/2	390/275
FAStT200 HA Storage Server (35422RU)	2/2	390/275
FAStT500 Storage Server (35521RU)	2/2	200/140
FAStT700 Storage Server (17421RU)	2/2	390/275
FAStT EXP500 Storage Expansion Unit (35601RU)	2/2	350/245
FAStT EXP700 Storage Expansion Unit (17401RU)	2/2	350/245
SAN Fibre Channel Switch, 8-port (2109S08)	1/2	200/n/a
SAN Fibre Channel Switch, 16-port (2109S16, 2109F16)	1/2	200/n/a
TotalStorage SAN Switch F08, 8-port (3534F08)	1/1	50/n/a
SAN Data Gateway Router UltraSCSI LVD Port (2108R3L)	1/1	90/n/a
DLT Tape Autoloader and Library (3502)	1/1	135/n/a
Magstar® MP 3570 Tape Subsystem (C2x)	1/1	200/140
NetMEDIA Storage Expansion Unit EL (3551)	2/2	185/130
3600 Series Tape Autoloader and Library (3600xxx)	1/1	700/500

Installation and use of IBM PDUs

Electrical information: Guidelines for mating plugs and receptacles

Customers must connect the plug on the power cord that comes with the Front-end PDU to a properly wired and grounded outlet. Below is a quick guide to the plug types you might encounter while installing the IBM PDUs. The chart below details the plug style on each PDU along with it's mating receptacle.
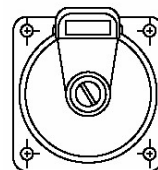
Front-end PDU	Plug	Outlet
30amp/125V Front-end PDU with NEMA L5-30P connector		
30amp/250V Front-end PDU with NEMA L6-30P connector		
32amp/250V Front-end PDU with IEC 309 2P+Gnd connector		
60amp/250V Front-end PDU with IEC 309 2P+Gnd connector		
63amp/250V Front-end PDU with IEC 309 2P+Gnd connector		

Smarter power delivery

More details are provided below for the 60amp products to assist in choosing the right connector type.

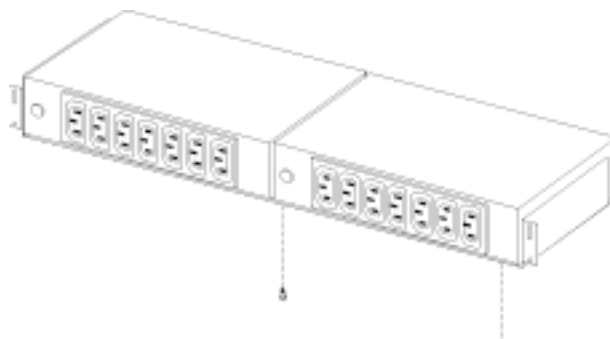|		
63A, IEC309,250V, 2 Pole, 3 Wire Grounding Hubbell Receptacle P/N HBL363R6W		
63A, IEC309,250V, 2 Pole, 3 Wire Grounding HUBBELL Plug P/N HBL363P6W		

Last updated May 2003   *15*

Installation options in NetBAY rack models

IBM DP Interconnect and NetBAY PDUs are part of the NetBAY family of rack-based products. They are designed to easily install and work within all IBM NetBAY rack offerings. To gain a better understanding of the NetBAY rack family of products and all the benefits they offer, please see the *Decision Maker's Guide to IBM Rack Solutions*, available on the IBM @server xSeries rack and rack solutions Web page at www.pc.**ibm.com**/ww/eserver/xseries/rack
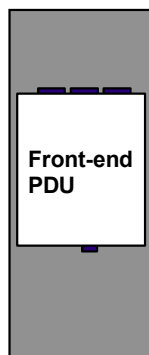
DP Interconnect and NetBAY PDUs were designed to be mounted in any EIA-standard rack offering, but given the diversity of rack designs, many of the benefits for flexible mounting do not apply to non-IBM racks. For even more detailed information on the installation and maintenance of the IBM family of PDUs, consult the Installation and Maintenance Guides for these products available on the ibm.com site.
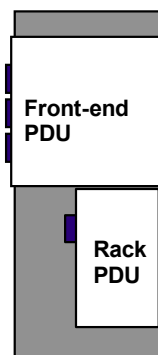
Basic installation ideas

The DP Interconnect PDUs can be mounted in a variety of methods. The simplest is to mount these in the EIA space of the rack as shown here. Two Rack PDUs can be installed like this to make accessing the devices extremely easy. Many customers choose to mount PDUs this way for the serviceability benefits.
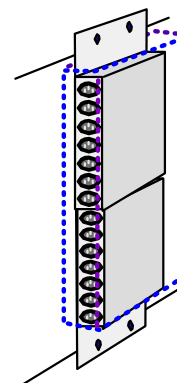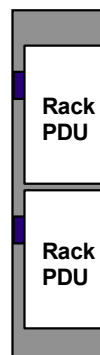
A more space-efficient method for mounting the PDUs is to install them in the side pockets of the rack. The following examples can all be accomplished using the standard hardware provided with the PDUs. Each of these "nested" configurations can be placed in a variety of ways in the different NetBAY racks.
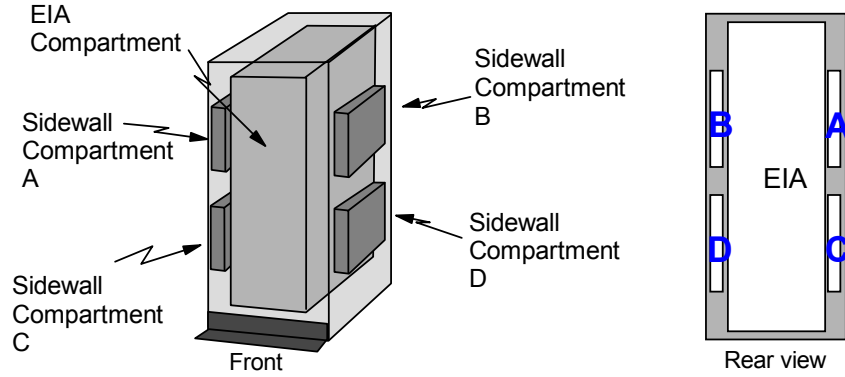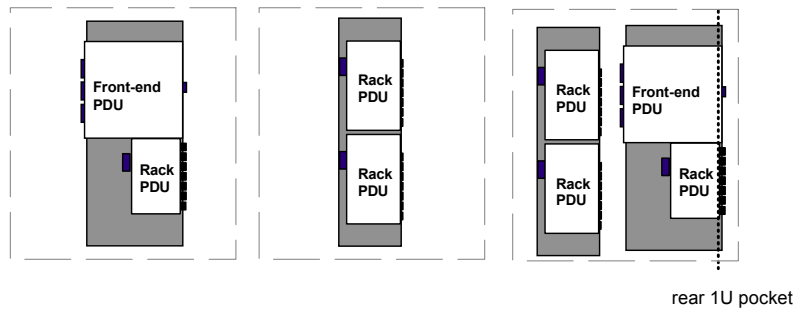
Verticle   Horizontal
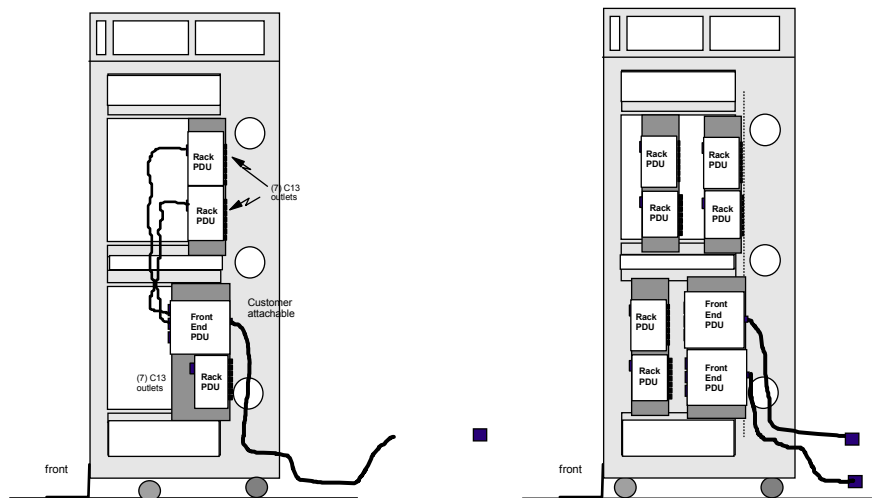
NetBAY Enterprise Rack installation options

The NetBAY Enterprise Rack is the premier IBM rack, offering four deep side pockets that enable the greatest variety of side pocket mounting options. This flexibility is one of the major benefits of choosing this rack. Using all the available space in the side pockets of this rack enables customers to install up to 84 outlets in this rack without sacrificing any valuable "U" space. The picture below details these side pockets and provides a lettering guide to make explaining installation location easier.

The depth of these side pockets allows the PDUs to be nested side by side for support of large numbers of PDUs or KVM switches in the rack's pockets. Here are a few examples of the supported installations for the Enterprise Rack.
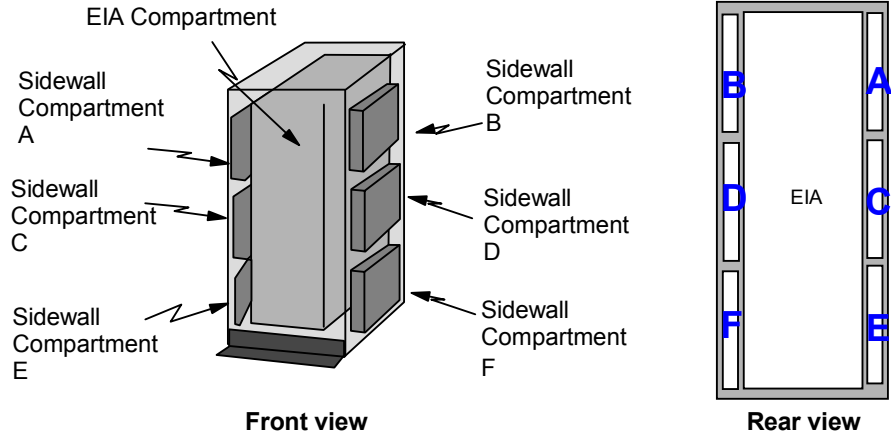

rear 1U pocket

The illustration below further clarifies how the rack looks once these PDUs are installed. These examples show how the pockets can be utilized in the Enterprise Rack. Notice the vertical placement option is not supported in this rack. One very nice feature of the Enterprise Rack is the fact that it has four 1U pockets that are accessible and visible from the rear of the rack. It is possible with the Enterprise Rack to install a pair of PDUs in these 1U pockets using the EIA mounting hardware- this yields easy access to the PDUs.
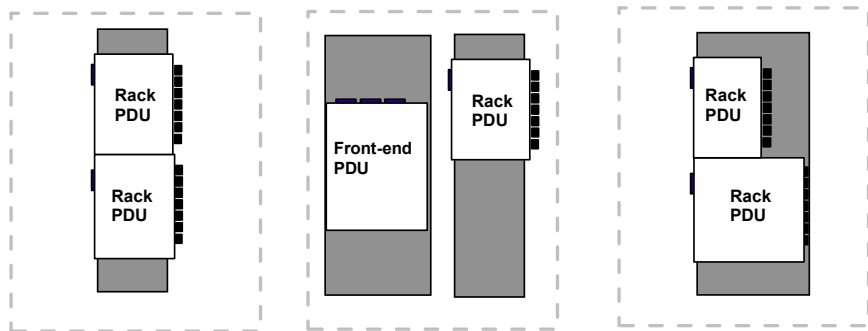
IBM Standard Rack installation options

This entry rack offers six side panel pockets mounting locations. While it has more side pockets than the Enterprise Rack, the Standard Rack's pockets are much less deep and do not allow the variety of mounting options of the Enterprise Rack. Even so, customers can install up to 56 outlets in the Standard Rack without sacrificing any "U" space. Here is graphical depiction of the side pockets of the Standard Rack along with a lettering guide.

EIA Compartment

Sidewall Compartment A

Sidewall Compartment C

Sidewall Compartment E

Sidewall Compartment B

Sidewall Compartment D

Sidewall Compartment F
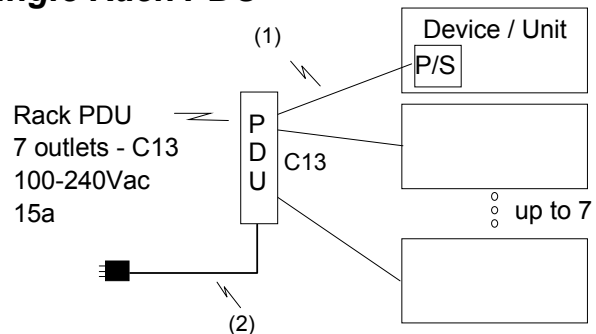
B A

D EIA C

F E

Front view

Rear view

Here are examples of accepted mounting configurations in a single NetBAY Standard Rack pocket. Up to four Front-end PDUs can be placed in the six pockets of the Standard rack.

Rack PDU

Rack PDU

Front-end PDU

Rack PDU

Rack PDU

Rack PDU

Sample configurations to maximize uptime and availability
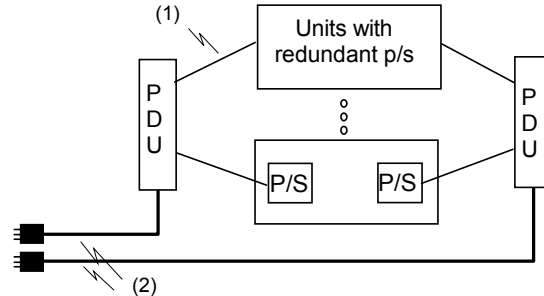
The pictures below detail ways to use PDUs to maximize uptime and availability of your solution. The first illustration shows the simplest configuration, with a Rack PDU plugged into a wall outlet or a Front-end PDU outlet. This simple topology provides non-protected, non-redundant power for up to seven devices.

Single Rack PDU

(1)

Device / Unit

P/S

Rack PDU
7 outlets - C13
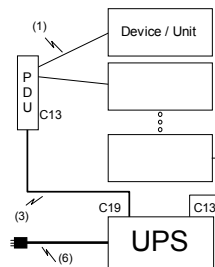100-240Vac
15a

P D U

C13

up to 7

(2)

Addition of a second PDU to this yields redundancy back to the power source. With this topology, even if one power source is lost, the second power source and PDU will power the load without bringing the solution down.
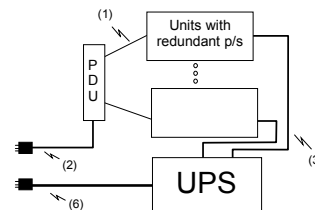
Redundant Power Distribution

The last three topologies below go a long way in preventing the many of power problems that effect equipment today. All these topologies involve the use of a UPS product to add power conditioning and battery backup in case of an outage. Notice how much better the load on these PDUs is protected when used in combination with the proper UPS.
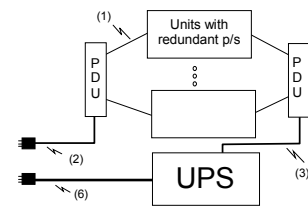

PDU used as UPS back-end

Redundant Power Distribution with PDU and UPS

Redundant Power Distribution with PDU and UPS with PDU

xSeries Rack Configurator software

While this Guide provides a basic understanding of the way in which IBM DP Interconnect PDUs are used and installed, the complexity of today's power solutions and the variety of sizes, access options and cabling requirements of servers, accessories and storage components make configuring a complex networked system a challenge. A more detailed sizing tool is needed. The IBM @server xSeries Rack Configurator provides this functionality. It is an easy-to-use tool that helps you design the optimum layout. The configurator helps check, correct and report the following:

- Components by product number and position
- Infrastructure specifications, including weight, power, volt-amps (VA), heat (BTU/hr), bays, EIA, outlets and console ports
- Width and depth; front, rear and side clearances; total weight and top clearance
- Cables and connectors by component position

You can download the configurator software from **ibm.com**/pc/us/eserver/xseries/library/configtools. The configurator is the best source of accurate information on designing a redundant, reliable power distribution topology. Individual User and Installation Guides also provide detailed information on the use and mounting of for DPI PDU products. These are available from the IBM Web site.

Country-specific considerations

To accommodate the wide variety of country-specific power systems, line cords and wiring rules, IBM offers a large number of PDU options. This section will provide basic detail of what each of these country-specific PDU options are and how they would be used. For more details, contact your local IBM representative.

Americas, Taiwan

Power Cables:

(1) Device to Rack PDU power cable
    IEC C13 to C14, 10/15a cable
    typical: pn 36L8886 (2.8m)
    requirement: C14 plug, long
        enough to reach available
        option: 94G7448 (14ft)

(2) Rack PDU to Wall line cord
    IEC C19 to country-specific
        connector, 16/20a, 14ft (4.3m)

(3) Rack PDU to UPS power cable
    IEC C19 to C20, 16/20a
    00N7700 (2m)
    provided with 37L6861 APC
        SU-5000RMB

(4) Rack PDU to Front-end PDU power cable
    IEC C19 to C20, 16/20a
    00N7698 (1m) provided with the
        NetBAY Front-end PDUs
    00N7700 (2m) provided with the
        DPI Front-end PDUs

(5) Front-end PDU to Wall line cord
    special to country-specific
        connector, 30/32a, 60/63a,
        8.2ft (2.5m)

(2) Line Cords: Rack PDU

(5) Line Cords: Front-end PDU

DPI PDUs

Part Number	Plug Type	Source Circuit (single phase 50/60Hz)	PDU Output (single phase 50/60Hz)
32P1761	**NEMA L5-15P**	**100-127Vac, 15a**	**six 100-127Vac, NEMA 5-15R receptacles, shared 15a**
32P1736	NEMA L5-20P	100-127Vac, 20a	seven 100-127Vac, shared 15a
	NEMA L6-20P	200-240Vac, 20a	seven 200-240Vac, shared 15a

Part Number	Plug Type	Source Circuit (50/60Hz)	PDU Output (single phase 50/60Hz)
32P1751	NEMA L5-30P	100-127Vac, 30a, single-phase	three 100-127Vac, 20a each, shared 24a
32P1766	NEMA L6-30P	200-240Vac, 30a, single-phase line-to-line with ground	three 200-240Vac, 20a each, shared 24a
32P1767	IEC 309-2P+G	200-240Vac, 60a, single-phase line-to-line with ground	three 200-240Vac, 20a each, shared 48a

NetBAY PDUs

Part Number	Plug Type	Source Circuit (single phase 50/60Hz)	PDU Output (single phase 50/60Hz)
37L6866	NEMA L5-20P	100-127Vac, 20a	seven 100-127Vac, shared 15a
	NEMA L6-20P	200-240Vac, 20a	seven 200-240Vac, shared 15a

Part Number	Plug Type	Source Circuit (50/60Hz)	PDU Output (single phase 50/60Hz)
37L6883	NEMA L5-30P	100-127Vac, 30a, single-phase	three 100-127Vac, 20a each, shared 24a
37L6884	NEMA L6-30P	200-240Vac, 30a, single-phase line-to-line with ground	three 200-240Vac, 20a each, shared 24a
73P5790	IEC 309-2P+G	200-240Vac, 60a, single-phase line-to-line with ground	three 200-240Vac, 20a each, shared 48a
37L6886	NEMA L21-30P	200-250Vac, 30a, three-phase Y-connection with neutral	three 100-127Vac (115-145), 20a each, shared 41a

AP/EMEA and parts of Latin America

DPI PDUs

Part Number	Plug Type	Source Circuit (single phase 50/60Hz)	PDU Output (single phase 50/60Hz)
32P1761	NEMA L5-15P	100-127Vac, 15a	six 100-127Vac, NEMA 5-15R receptacles, shared 15a
32P1736	NEMA L5-20P	100-127Vac, 20a	seven 100-127Vac, shared 15a
	NEMA L6-20P	200-240Vac, 20a	
32P1737	CEE7-VII	220-240Vac, 16a	seven 220-240Vac, shared 15a
32P1738	IEC 309-2P+Gnd	220-240Vac, 16a	
32P1739	SII 32	220-240Vac, 16a	
32P1740	CEI 23-16	220-240Vac, 16a	
32P1741	SABS 164	220-240Vac, 16a	
32P1742	BS 1363/A	220-240Vac, 13a	seven 220-240Vac, shared 13a
32P1745	NBR 6147	100-127Vac, 15a	seven 100-127Vac, shared 15a
32P1747	IRAM 2073	220-240Vac, 15a	
32P1743	AS/NZ 3112	220-240Vac, 15a	seven 220-240Vac, shared 15a
32P1744	GB 2099.1	220-240Vac, 15a	
32P1746	IS6538	220-240Vac, 16a	

Part Number	Plug Type	Source Circuit (50/60Hz)	PDU Output (single phase 50/60Hz)
32P1751	NEMA L5-30P	100-127Vac, 30a, single-phase	three 100-127Vac, 20a each, shared 24a
32P1766	NEMA L6-30P	200-240Vac, 30a, single-phase line-to-line with ground	three 200-240Vac, 20a each, shared 24a
32P1767	IEC 309-2P+G	200-240Vac, 60a, single-phase line-to-line with ground	three 200-240Vac, 20a each, shared 48a
32P1752	IEC 309-2P+G	220-240Vac, 32a, single-phase	three 220-240Vac, 16a each, shared 32a
32P1754	IEC 309-2P+G	220-240Vac, 63a, single-phase	three 220-240Vac, 16a each, shared 48a

NetBAY PDUs

Part Number	Plug Type	Source Circuit (single phase 50/60Hz)	PDU Output (single phase 50/60Hz)
37L6866	NEMA L5-20P	100-127Vac, 20a	seven 220-240Vac, shared 15a
	NEMA L6-20P	200-240Vac, 20a	
37L6868	CEE7-VII	220-240Vac, 16a	
37L6870	IEC 309-2P+Gnd	220-240Vac, 16a	
37L6872	SII 32	220-240Vac, 16a	
37L6874	CEI 23-16	220-240Vac, 16a	
37L6876	SABS 164	220-240Vac, 16a	
06P6028	BS 1363/A	220-240Vac, 13a	seven 220-240Vac, shared 13a
37L6864	country-specific line cord provide by IBM	country specific	country specific

Part Number	Plug Type	Source Circuit (50/60Hz)	PDU Output (single phase 50/60Hz)
37L6883	NEMA L5-30P	100-127Vac, 30a, single-phase	three 100-127Vac, 20a each, shared 30a
37L6884	NEMA L6-30P	200-240Vac, 30a, single-phase line-to-line with ground	three 200-240Vac, shared 24a
37L6886	NEMA L21-30P	200-250Vac, 30a, three-phase Y-connection with neutral	three 100-127Vac (115-145), 20a each, shared 41a
37L6885	IEC 309-2P+Gnd	220-240Vac, 32a, single-phase	three 220-240Vac, 16a each, shared 32a
37L6887	IEC 309-3P+N+Gnd	380-415Vac, 32a, three-phase Y-connection with neutral	three 220-240Vac, 16a each

Power Cables:

(1) Device to Rack PDU power cable
   IEC C13 to C14, 10/15a cable
   typical: pn 36L8886 (2.8m)
   requirement: C14 plug, long enough to reach
   available option: 94G7448 (14ft)

(2) Rack PDU to Wall line cord
   IEC C19 to country-specific connector, 16/20a, 14ft (4.3m)

(3) Rack PDU to UPS power cable
   IEC C19 to C20, 16/20a
   00N7700 (2m)
   provided with 37L6861 APC SU-5000RMB

(4) Rack PDU to Front-end PDU power cable
   IEC C19 to C20, 16/20a
   00N7698 (1m) provided with the NetBAY Front-end PDUs
   00N7700 (2m) provided with the DPI Front-end PDUs

(5) Front-end PDU to Wall line cord
   special to country-specific connector, 30/32a, 60/63a, 8.2ft (2.5m)

(2) Line Cords: Rack PDUs

(5) Line Cords: Front-end PDUs

Japan

Power Cables:

(1) Device to Rack PDU power cable
 IEC C13 to C14, 10/15a cable
 typical: pn 36L8886 (2.8m)
 requirement: C14 plug, long
  enough to reach
 available option: 94G7448 (14ft)
(2) Rack PDU to Wall line cord
 IEC C19 to country-specific
  connector, 16/20a, 14ft
  (4.3m)
(3) Rack PDU to UPS power cable
 IEC C19 to C20, 16/20a
 00N7700 (2m)
 provided with 37L6861 APC
  SU-5000RMB
(4) Rack PDU to Front-end PDU
power cable
 IEC C19 to C20, 16/20a
 00N7698 (1m) provided with the
  NetBAY Front-end PDUs
 00N7700 (2m) provided with the
  DPI Front-end PDUs
(5) Front-end PDU to Wall line cord
 special to country-specific
  connector, 30/32a, 60/63a,
  8.2ft (2.5m)

(2) Line Cords:
Rack PDU

(5) Line Cords:
Front-end PDU

DPI PDUs

Part Number`	Plug Type	Source Circuit (single phase 50/60Hz)	PDU Output (single phase 50/60Hz)
32P1761	**NEMA L5-15P**	**100-127Vac, 20a**	**six 100-127Vac, NEMA 5-15R receptacles, shared 15a**
32P1736	NEMA L5-20P	100-127Vac, 20a	seven 100-127Vac, shared 15a
	NEMA L6-20P	200-240Vac, 20a	seven 200-240Vac, shared 15a

Part Number	Plug Type	Source Circuit (50/60Hz)	PDU Output (single phase 50/60Hz)
32P1751	NEMA L5-30P	100-127Vac, 30a, single-phase	three 100-127Vac, 20a each, shared 24a
32P1766	NEMA L6-30P	200-240Vac, 30a, single-phase line-to-line with ground	three 200-240Vac, 20a each, shared 24a
32P1767	IEC 309-2P+G	200-240Vac, 60a, single-phase line-to-line with ground	three 200-240Vac, 20a each, shared 48a

NetBAY PDUs

Part Number	Plug Type	Source Circuit (single phase 50/60Hz)	PDU Output (single phase 50/60Hz)
37L6866	NEMA L5-20P	100-127Vac, 20a	seven 100-127Vac, shared 15a
	NEMA L6-20P	200-240Vac, 20a	seven 200-240Vac, shared 15a

Part Number	Plug Type	Source Circuit (50/60Hz)	PDU Output (single phase 50/60Hz)
37L6883	NEMA L5-30P	100-127Vac, 30a, single-phase	three 100-127Vac, 20a each, shared 24a
37L6884	NEMA L6-30P	200-240Vac, 30a, single-phase line-to-line with ground	three 200-240Vac, 20a each, shared 24a
73P5790	IEC 309-2P+G	200-240Vac, 60a, single-phase line-to-line with ground	three 200-240Vac, 20a each, shared 48a
37L6886	NEMA L21-30P	200-250Vac, 30a, three-phase Y-connection with neutral	three 100-127Vac (115-145), 20a each, shared 41a

Preparing for the future

Roadmaps for Intel processors confirm that the trend of increasing power requirements and thermal output for servers will continue in the short and long term. Therefore, it is critical that companies take this trend into consideration when making investments in data center infrastructure, including power service. Escalating power and thermal output requirements of Intel-based servers will soon approach levels traditionally seen in mainframes.

Here are a few points to consider moving forward:

- When designing new data centers, consider the addition of 60amp and 125amp service feeds in your plans. With continued growth in server power requirements, 60amp and even 125amp service feeds are likely to become standard for data centers in the coming years. If 60amp is not currently needed, consider installing wiring that can handle a future upgrade to 60amp service.

- While not commonplace today, delta and wye power three-phase service will become much more widely used. A look into these power distribution systems now might be helpful. The NetBAY Three-phase Front-end PDU is a great way to maximize power delivery to servers. IBM has plans for more three-phase products in the near future to assist in this arena.

- The power requirements and thermal output of individual racks are rising and may be bumping the limits of today's cooling and power delivery. One must carefully consider how new equipment will be cooled and powered before introducing into a data center.

- In the very near future, traditional guidelines that state data center design should accommodate 50-75W per square foot will be inadequate. The requirement for 100-150W and greater per square foot is on the horizon. Anyone considering a data center redesign should take this trend into consideration. For more information on thermal trends , consult the Uptime Institute's Web site at www.upsite.com/TUIpages/whitepapers/tuicooling.html.

- Customers in countries that can choose to use either a NEMA-style PDU or an IEC C13-based PDU can gain an advantage by making the move now to the IEC standard. The IBM NetBAY IEC-based PDUs allow migration from low voltage to high, or single-phase to three-phase, simply by changing the front-end PDU used. This means you can have an easy way to scale up your power topology without completely replacing your investment in power distribution equipment.

- Customers who can choose between low voltage and high voltage should select high voltage whenever possible. Already, the amperage needed to run several of today's servers cannot be easily met with 100-127V power feeds. Many new servers will be high -voltage only or redundantly powered only at high voltage.

- When choosing PDUs, make sure you look to offerings that allow quick and easy scalability. The modular design of the IBM PDUs means that addition of outlets may be as simple as adding a single Rack PDU, eliminating the need for more wiring to the rack in most cases.

- Buying an all-IBM solution that includes IBM NetBAY racks, rack options and PDUs can help ensure that your server investment is both easy to install and safe from power or thermal problems. As server installations grow in complexity, the decision of which rack products to buy becomes critical. Will a non-IBM rack handle the thermal loads you will require in the future? IBM rack products are tested to make sure they work with IBM servers and the cooling methodologies that they employ. Non-IBM racks may not meet these requirements. Will a non-IBM PDU be capable of both protecting and powering the servers of tomorrow? A lot of thought goes into how our PDUs fit into our server roadmap. IBM is confident that the PDU you buy today will be an investment that continues to provide value even as server power requirements grow and change.

Additional resources

IBM @server **xSeries Racks and rack options**
ibm.com/pc/ww/eserver/xseries/rack

IBM @server **xSeries Options**
ibm.com/pc/us/eserver/xseries/storage

IBM @server **xSeries Rack Configurator**
ibm.com/pc/us/eserver/xseries/library/configtools

IBM @server **xSeries Configuration and Options Guide**
ibm.com/pc/us/eserver/xseries/library

Smarter power delivery

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