1U C19 and C13 Switched and Monitored PDUs

Installation and Maintenance Guide

1U C19 and C13 Switched and Monitored PDUs

Installation and Maintenance Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, “Notices,” on page 67 and see the *Warranty Information* document that comes with your power distribution unit (PDU).

Fourth Edition (October 2013)

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安装本产品之前，请仔细阅读 Safety Information
(安全信息)。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας
(safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się
z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

ཐོན་རྫས་འདི་བདེ་སྐྱོང་མ་བྱས་གོང་། ་སྐོར་གྱི་ཡིད་གཟབ་
བྱ་འདུ་མེན་ཡོད་པའི་འོད་སྣེར་བལྟ་དགོས།

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مەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

Important:

Each caution and danger statement in this document is labeled with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information* document.

For example, if a caution statement is labeled “Statement 1,” translations for that caution statement are in the *Safety Information* document under “Statement 1.”

Be sure to read all caution and danger statements in this document before you perform the procedures. Read any additional safety information that comes with the server or optional device before you install the device.

Statement 1:

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	**To Disconnect:**
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

Statement 13:

DANGER

Overloading a branch circuit is potentially a fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch circuit protection requirements. Refer to the information that is provided with your device for electrical specifications.

Statement 14:

CAUTION:
Hazardous voltage, current, and energy levels might be present. Only a qualified service technician is authorized to remove the covers where the following label is attached.

Chapter 1. Introduction

The IBM® switched and monitored 1U PDU products enable you to connect up to nine C19 devices or up to 12 C13 devices (depending on the PDU model) and an additional three C13 peripheral devices to a single dedicated power source. The PDUs have power monitoring capabilities.

The following PDU models are available:

- 46M4002 - IBM 1U 9 C19 / 3 C13 Switched and Monitored DPI PDU (with removable power cord)
- 46M4003 - IBM 1U 9 C19 / 3 C13 Switched and Monitored 60 A 3 Phase PDU (with attached power cord)
- 46M4004 - IBM 1U 12 C13 Switched and Monitored DPI PDU (with removable power cord)
- 46M4005 - IBM 1U 12 C13 Switched and Monitored 60 A 3 Phase PDU (with attached power cord)

The IBM Systems Director Active Energy Manager product can monitor and control the PDUs. Active Energy Manager is an IBM Systems Director plug-in that measures and reports server power consumption as it occurs. Active Energy Manager includes a feature to associate IBM Systems Director managed resources with the power outlets on the PDUs. This enables you to know how much power each server is consuming and which servers will be affected by any PDU outages. You can use the graphing capability of Active Energy Manager to show a trending line for power that is being drawn by the outlets of the PDU models, showing which systems are connected to them.

Active Energy Manager also enables you to show a trending line for the temperature of the PDU and the temperature that is measured by the environment sensor. In addition to monitoring, Active Energy Manager can control power of the individual outlets. From a central location, Active Energy Manager can power off or power on the outlets. This enables an administrator to prevent someone from connecting additional equipment into unused outlets, thereby making it easier to control power consumption within a rack. Active Energy Manager can also shut down outlets in an emergency situation.

If firmware and documentation updates are available, you can download them from the IBM website. The PDU might have features that are not described in the documentation that comes with the PDU, and the documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the PDU documentation. To check for updates, complete the following steps.

Note: Changes are made periodically to the IBM website. Procedures for locating firmware and documentation might vary slightly from what is described in this document.

1. Go to http://www.ibm.com/systems/support/.
2. Click **Hardware upgrades**.
3. On the “Support for IBM Upgrades” page, in the **Product family** field, select **Power**.
4. In the **Type** field, select **Distributed power interconnect (DPI)**.
5. In the **Part number** field, select your PDU part number.

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6. Click **Go**.
7. On the “Support for Power” page, click **Downloads** for firmware updates, or click **Install/use** for documentation updates.

The IBM Documentation CD

The IBM *Documentation* CD contains documentation for the PDU in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

Hardware and software requirements

The IBM *Documentation* CD requires the following minimum hardware and software:

- Microsoft Windows XP, Windows 2000, or Red Hat Linux
- 100 MHz microprocessor
- 32 MB of RAM
- Adobe Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems

Using the Documentation Browser

Use the Documentation Browser to browse the contents of the CD, read brief descriptions of the documents, and view documents, using Adobe Acrobat Reader or xpdf. The Documentation Browser automatically detects the regional settings in your computer and displays the documents in the language for that region (if available). If a document is not available in the language for that region, the English-language version is displayed.

Use one of the following procedures to start the Documentation Browser:

- If Autostart is enabled, insert the CD into the CD or DVD drive. The Documentation Browser starts automatically.
- If Autostart is disabled or is not enabled for all users, use one of the following procedures:
  - If you are using a Windows operating system, insert the CD into the CD or DVD drive and click **Start --> Run**. In the **Open** field, type

    ```
    e:\win32.bat
    ```

    where *e* is the drive letter of the CD or DVD drive, and click **OK**.
  - If you are using Red Hat Linux, insert the CD into the CD or DVD drive; then, run the following command from the /mnt/cdrom directory:

    ```
    sh runlinux.sh
    ```

Select the PDU from the **Product** menu. The **Available Topics** list displays all the documents for the PDU. Some documents might be in folders. A plus sign (+) indicates each folder or document that has additional documents under it. Click the plus sign to display the additional documents.

When you select a document, a description of the document is displayed under **Topic Description**. To select more than one document, press and hold the Ctrl key while you select the documents. Click **View Book** to view the selected document or documents in Acrobat Reader or xpdf. If you selected more than one document, all the selected documents are opened in Acrobat Reader or xpdf.

To search all the documents, type a word or word string in the **Search** field and click **Search**. The documents in which the word or word string appears are listed in order of the most occurrences. Click a document to view it, and press Crtl+F to use the Acrobat search function, or press Alt+F to use the xpdf search function within the document.

Click **Help** for detailed information about using the Documentation Browser.

Notices and statements in this document

The caution and danger statements in this document are also in the multilingual *Safety Information* document, which is on the IBM *Documentation* CD. Each statement is numbered for reference to the corresponding statement in your language in the *Safety Information* document.

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage might occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Installation requirements

You will need the following tools to install the PDU in a rack cabinet:

- One Phillips screwdriver
- One 10 mm (11/32 in.) wrench
- One cage-nut-insertion tool or flat-blade screwdriver (for installing cage nuts in some rack cabinets)

You can install a 1U PDU vertically in the side of a rack cabinet or horizontally within 1U[1] of EIA mounting space in a rack cabinet.

- For vertical mounting instructions of the 1U PDU, see Chapter 2, “Installing the 1U PDU vertically in a rack cabinet,” on page 13.
- For horizontal mounting instructions of the 1U PDU, see Chapter 3, “Installing the 1U PDU horizontally in a rack cabinet,” on page 19.

1. One U is equal to 4.45 cm (1.75 in.)

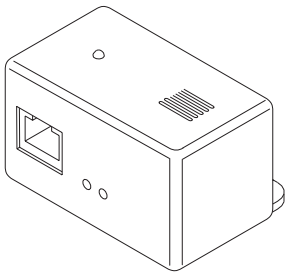
Inventory checklist

Note: The illustrations in this document might differ slightly from your hardware.

Parts that come with all PDU models

The following parts come with all PDU models:

- One PDU environment sensor kit:
  - One PDU environment sensor



  - One Category 5 Ethernet cable

  - One mounting screw
  - Self-adhesive hook-and-loop fastener pad
- Miscellaneous hardware kit (for attaching the mounting brackets to the PDU and installing the PDU in a rack cabinet)

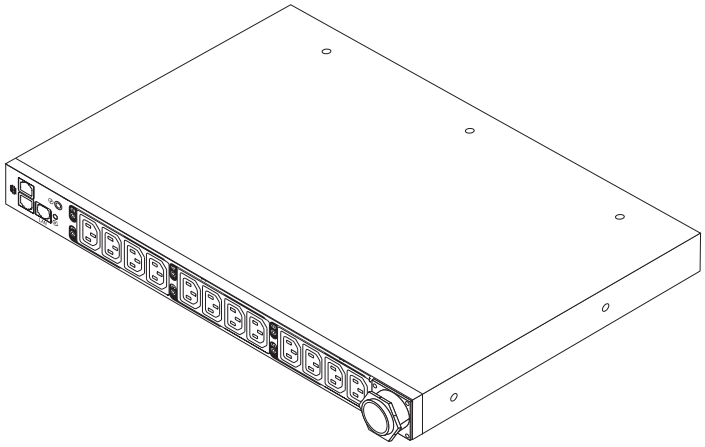
Notes:

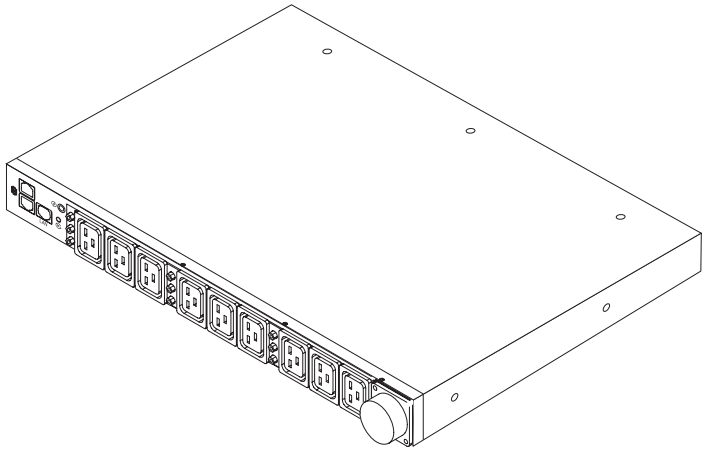
1. Power cables for devices that you will connect to the PDU do not come with the PDU.
2. You will have some unused parts depending on how you install the PDU.

Parts that come with the 1U PDU models

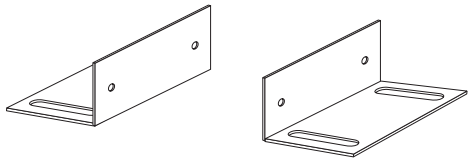
The following parts come with the 1U PDU models:

- One of the following PDU models (some models come with an attached power cord)

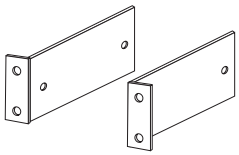




- Two vertical-mounting brackets (for all rack cabinets)

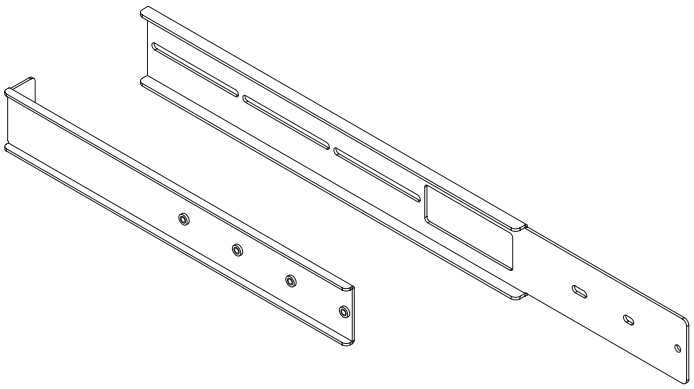


- Two short mounting brackets (for horizontal mounting in all rack cabinets; for vertical mounting only in IBM Enterprise rack cabinets)



- Two adjustable mounting rails (for horizontal mounting in all rack cabinets)

  Note: The following illustration shows the two components of one adjustable mounting rail. The adjustable mounting rail might come pre-assembled.



- One 1U blank filler panel

- Cable straps

Features of the PDU

The PDU models have the following features:

- Ability to access the versatile sensors in the PDU environment sensor through the environment sensor inputs

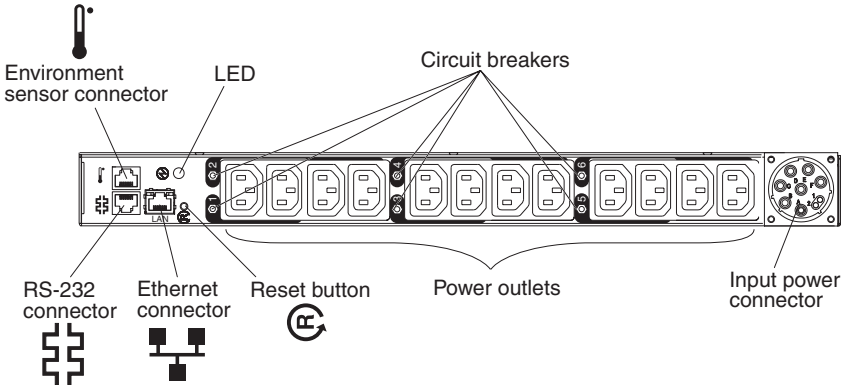
  Note: This feature requires the PDU environment sensor, which comes with the PDU.
- Address-specific IP security masks to prevent unauthorized access
- Remote monitoring of connected devices and sensors
- Monitoring of the PDU locally, remotely through IBM Systems Director Active Energy Manager, or remotely through a console or network
- Comprehensive power management and flexible configuration through a web browser, NMS, Telnet, SNMP, or HyperTerminal (console)
- Configurable user-security control
- Daily history report through e-mail
- Detailed data logging for statistical analysis and diagnostics
- Easy-to-use interface to display input and output status
- Event notification through SNMP trap or e-mail alerts
- Upgrade utility for easy firmware updates

Hardware components

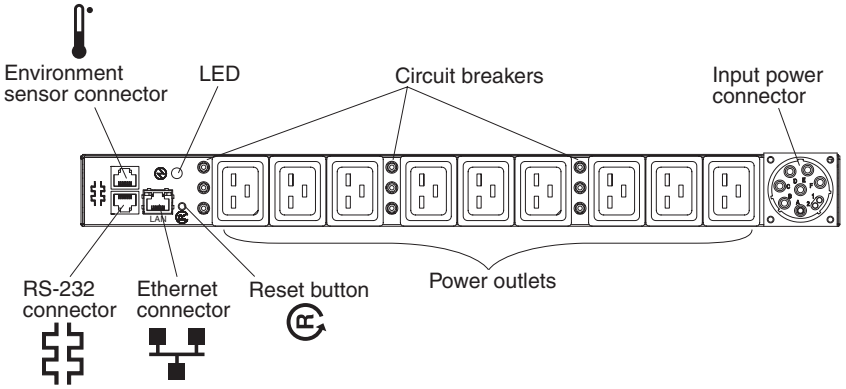
The following sections provide descriptions of the front and rear components on the PDUs.

Front view

The following illustration shows the components and controls on the front of the 1U PDU with 12 C13 outlets on the front.



The following illustration shows the components and controls on the front of the 1U PDU with 9 C19 outlets on the front.



Environment sensor connector

You can connect a PDU environment sensor to this connector. The PDU environment sensor monitors humidity and temperature. The connection of a PDU environment sensor is automatically detected.

LED The green LED shows the PDU input voltage status. When this LED is lit, the PDU is receiving voltage. If the input voltage is too low, this LED is flashing.

Circuit breakers

If the load current rating for a power outlet exceeds 20 A, the associated circuit breaker is activated (the breaker pole pops out), and power to the outlet is turned off automatically. To reset the circuit breaker, firmly press the breaker pole until it locks into place.

Note: To manually disconnect power to a device that is connected to the PDU, disconnect the device power cord from the PDU power outlet.

Input power connector

Connect a power cord to this connector.

Note: Some PDU models come with an attached power cord.

Power outlets

You can connect a device to each power outlet. Depending on the PDU model, there are C19 power outlets and C13 power outlets.

Reset button

Use this button to reset the PDU for communication purposes only. Resetting the PDU does not affect the loads.

Ethernet connector

Use this connector to configure the PDU through a LAN. The Ethernet connector supports 10/100 auto sense network connection.

Green LED (on the left):

- This LED is lit when the PDU is connected to a 100 Mb network.
- This LED flashes while data is transmitted and received.

Amber LED (on the right):

- This LED is lit when the PDU is connected to a 10 Mb network.
- This LED flickers while data is transmitted and received.

RS-232 connector

Connect a DB9-to-RJ-45 cable to this connector and to the serial (COM) connector on a workstation or notebook computer, and use the workstation or notebook computer as a configuration console.

Green LED (on the left in a horizontal orientation; on the top in a vertical orientation):

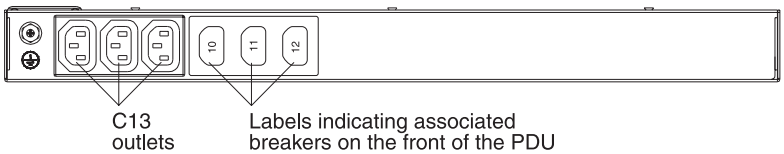
- This LED is lit when the power to the PDU is turned on.
- This LED flashes (500 ms on, 500 ms off) while the PDU is starting to indicate startup status.

Amber LED (on the right in a horizontal orientation; on the bottom in a vertical orientation):

- This LED flashes while the PDU is communicating with a server or computer or when it is reading data from a PDU environment sensor.

Rear view (1U models)

The following illustration shows the power outlets on the rear of the 1U 9 C19 / 3 C13 switched and monitored PDU models.



PDU load groups

The PDU load groups are described in the following tables.

Table 1. Switched and monitored 1U C19 PDU load groups

Circuit breaker number	Associated front outlet	Associated rear outlet
1	1	10
2	2	
3	3	
4	4	11
5	5	
6	6	
7	7	12
8	8	
9	9	

Table 2. Switched and monitored 1U C13 PDU load groups

Circuit breaker number	Associated outlets (The load segment number that is visible on the front of the PDU is in parentheses.)
1	1 and 2 (1)
2	3 and 4 (2)
3	5 and 6 (3)
4	7 and 8 (4)
5	9 and 10 (5)
6	11 and 12 (6)

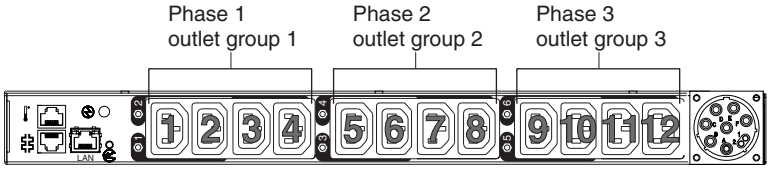
Load balancing

The internal circuits of some PDUs might be overloaded if you are not aware of the circuit breaker specifications and how the PDU outlets are connected. If loads are greater than the specification of the circuit breaker, it will trip and turn off the load.

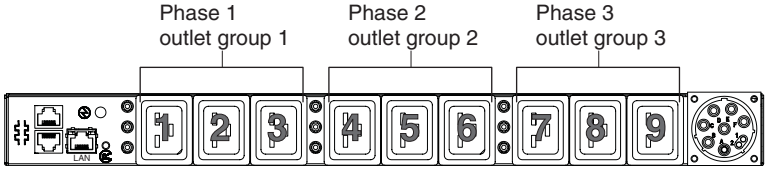
There are either six or nine circuit breakers on the front of the PDU, depending on the model. Each circuit breaker is rated for 20 amps. When you connect loads, make sure that the rating for each circuit breaker is not exceeded.

Some PDUs can be connected to three-phase power. The loads should be distributed across all three phases. If single-phase power is used, it also is important to distribute the load between the outlet groups.

The PDU models with 12 C13 outlets on the front have phase one connected to the first 4 outlets, outlet group one. Phase two is connected to the next 4 outlets, outlet group two and phase three are connected to the last 4 outlets, outlet group three (see the following illustration).



The PDU models with 9 C19 outlets on the front have phase one connected to the first three (3) outlets, outlet group one. Phase 2 is connected to the next three (3) outlets, outlet group two. Phase 3 is connected to the last 3 outlets, outlet group three (see the following illustration).



Some models have 3 outlets on the rear of the PDU. These outlets are not monitored or switched. Each outlet is connected to a different phase.

To balance loads on the PDU, do not connect loads so that there is more load on one group of outlets than others. For example, if there are three loads on a 9-outlet PDU, do not use outlets 1, 2, or 3; use outlets 1, 4, and 7.

If there are three loads on a 12-outlet PDU, use outlets 1, 5, and 9. If there are more then 3 loads, distribute them across the three output groups.

Chapter 2. Installing the 1U PDU vertically in a rack cabinet

This chapter describes how to install the PDU vertically in a rack cabinet. To install the PDU in the side of an IBM Enterprise rack cabinet, see “Installing the PDU in the side of an IBM Enterprise rack cabinet only” on page 16.

Statement 1:

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	To Disconnect:
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

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Installing the PDU in the side of a rack cabinet

The mounting holes on the upper and lower side braces in a rack side compartment must be between 48.6 cm (19.1 in.) and 56.9 cm (22.4 in.) apart. If your rack cabinet has movable side braces, see the rack cabinet documentation for information about relocating the side braces if they are not already spaced for this installation.

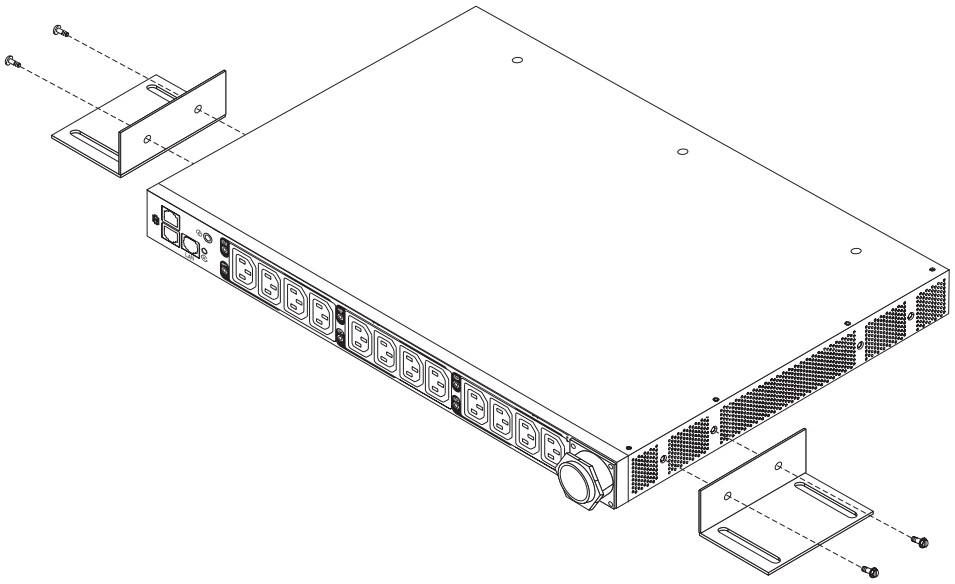
Note: Removing the rack doors and side panels might make installation easier. See the rack cabinet documentation for more information.

Review the documentation that comes with your rack cabinet for safety and cabling information. When you install the PDU in a rack cabinet, observe the following precautions:

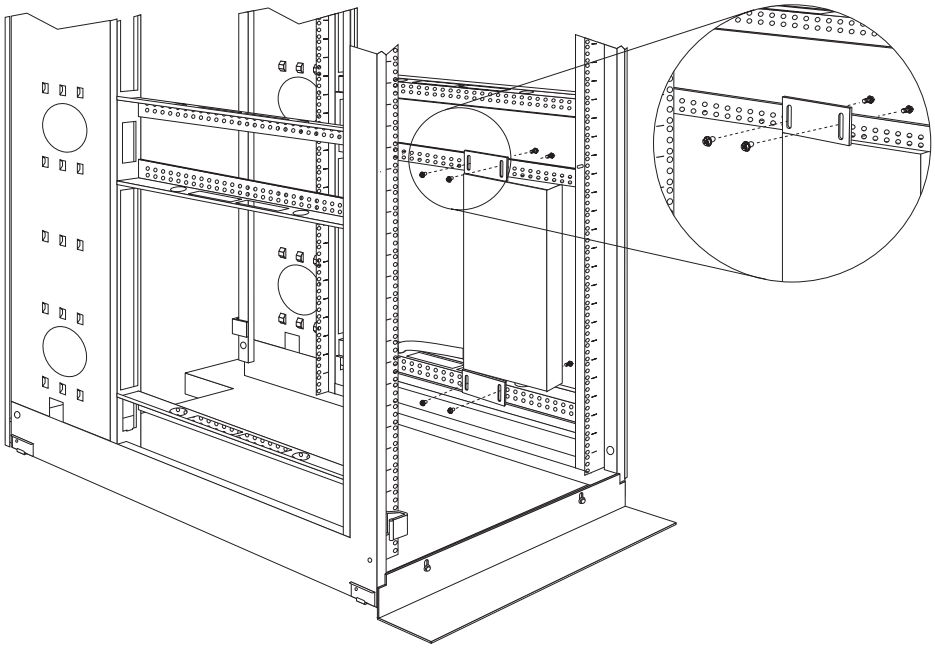
- Make sure that the room air temperature is below 35°C (95°F).
- Do not block any air vents; usually 15 cm (6 in.) of air space provides proper airflow.
- Connect all power cords to properly wired and grounded electrical outlets.
- Do not overload the power outlet when you install multiple devices in the rack cabinet.

To install a PDU in the side of a rack cabinet by using the vertical mounting brackets, complete the following steps:

1. Align the vertical mounting brackets to the front of the PDU and attach the brackets to the PDU with two M3 x 5 screws per bracket. Use the screws that come with the PDU. You can install the PDU in a rack cabinet with the power outlets facing the rear or the front of the rack cabinet.



2. Hold the PDU in the side of the rack cabinet, and attach the vertical mounting brackets to the side braces with four M6 screws and nuts that come with the PDU.



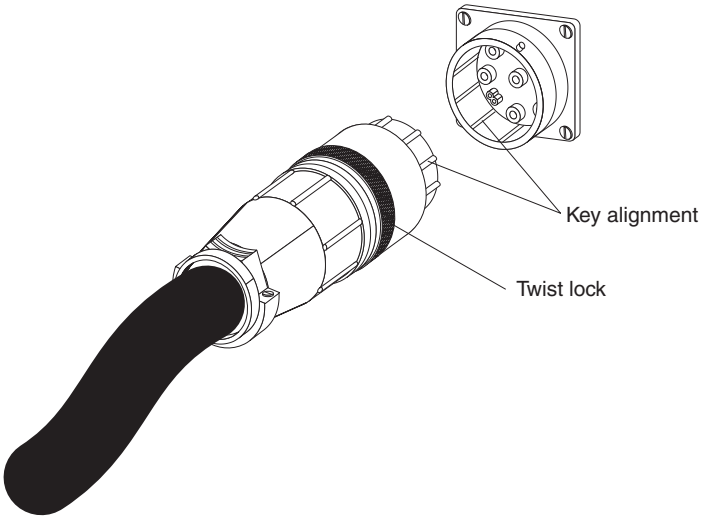
Notes:

a. Leave enough space to connect, route, and disconnect power cords.

b. If you are installing a cable-management bracket in the same side of the rack cabinet, leave enough space between the outlet side of the PDU and the EIA mounting flanges for the cable-management bracket installation.

Attention: You must disconnect the main input power before you connect or disconnect the input power cord from the PDU.

3. If the PDU comes with a detached power cord, connect the power cord. Align the connector on the power cord that comes with the PDU with the connector on the front of the PDU, turning as necessary for key alignment; then, turn the twist-lock on the connector clockwise until it locks into place.



4. Route the power cord from the PDU toward the rack cabinet side braces; then, route the power cord along a side brace toward the back of the rack cabinet, and secure the power cord with the cable straps that come with the PDU.
5. Route the power cord toward a dedicated power source. Use the provided cable straps to secure the power cord along the way. If the power cord must exit the rack cabinet to connect to a power source, use the openings in the rack cabinet.
6. Connect the power cord to a properly wired and grounded dedicated power source. Then, you can connect servers or rack PDUs in the rack cabinet to the power outlets on the PDU.

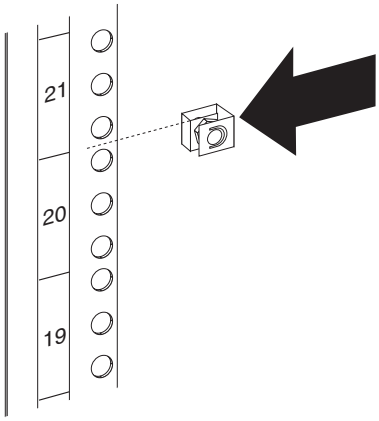
Installing the PDU in the side of an IBM Enterprise rack cabinet only

Note: Removing the rack doors and side panels might make installation easier. See the rack cabinet documentation for more information.

Review the documentation that comes with your rack cabinet for safety and cabling information. When you install the PDU in a rack cabinet, observe the following precautions:

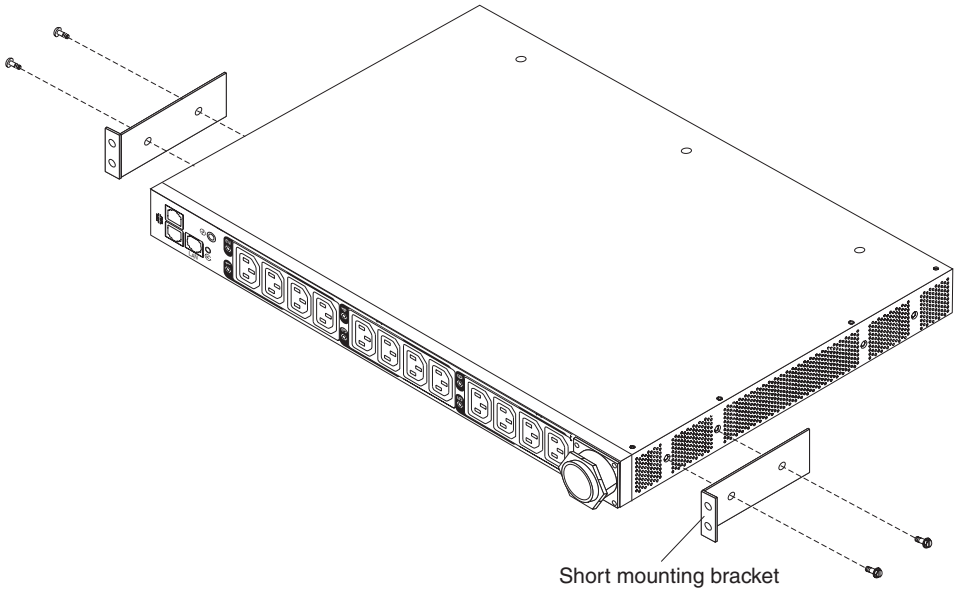
- Make sure that the room air temperature is below 35°C (95°F).
- Do not block any air vents; usually 15 cm (6 in.) of air space provides proper airflow.
- Connect all power cords to properly wired and grounded electrical outlets.
- Do not overload the power outlet when you install multiple devices in the rack.

You must use clip nuts to install the mounting brackets. Clip nuts come with the PDU and are installed on the rack mounting flanges, as shown in the following illustration.

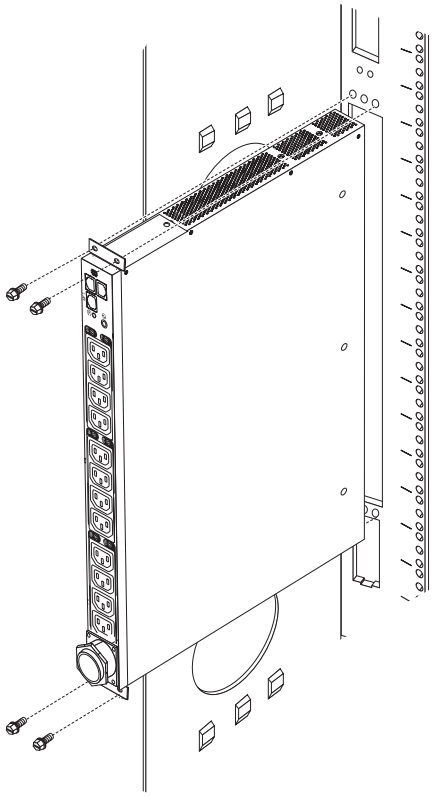


To install the PDU in the 1U mounting space in the side of an IBM Enterprise rack cabinet, complete the following steps:

1. Align the vertical-mounting brackets to the front of the PDU. Be sure to attach the brackets so that the power outlets face the rear of the rack cabinet.

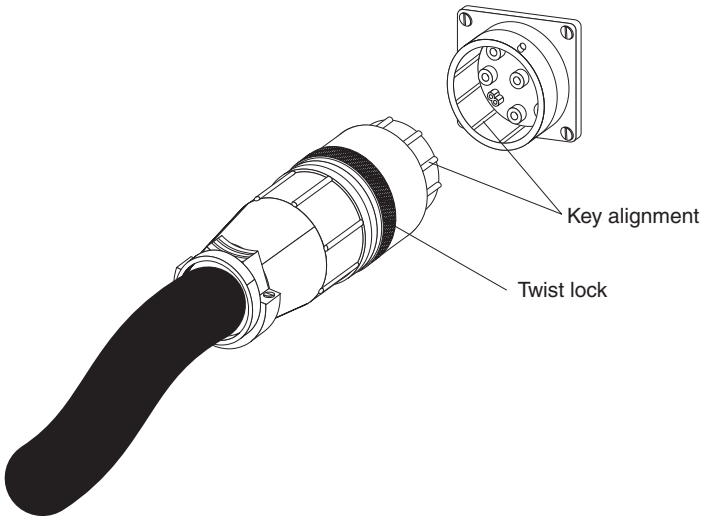


2. Attach the brackets to the PDU with two M3 x 5 screws per bracket. Use the screws that come with the PDU.
3. Align the PDU with the opening in the side of the rack cabinet; then, while you hold the PDU in place, attach the brackets to the rack-mounting flanges with four clip nuts and four M6 screws that come with the PDU.



Attention: You must disconnect the main input power before you connect or disconnect the input power cord from the PDU.

4. If the PDU comes with a detached power cord, connect the power cord. Align the connector on the power cord that comes with the PDU with the connector on the front of the PDU, turning as necessary for key alignment; then, turn the twist-lock on the connector clockwise until it locks into place.



5. Route the power cord from the PDU toward the rack cabinet side braces; then, route the power cord along a side brace toward the back of the rack cabinet, and secure the power cord with the cable straps that come with the PDU.
6. Route the power cord toward a dedicated power source. Use the provided cable straps to secure the power cord along the way. If the power cord must exit the rack cabinet to connect to a power source, use the openings in the rack cabinet.
7. Connect the power cord to a properly wired and grounded dedicated power source. Then, you can connect servers or rack PDUs in the rack cabinet to the power outlets on the PDU.
8. Route all the other power cords neatly and secure the power cords with cable straps.

Chapter 3. Installing the 1U PDU horizontally in a rack cabinet

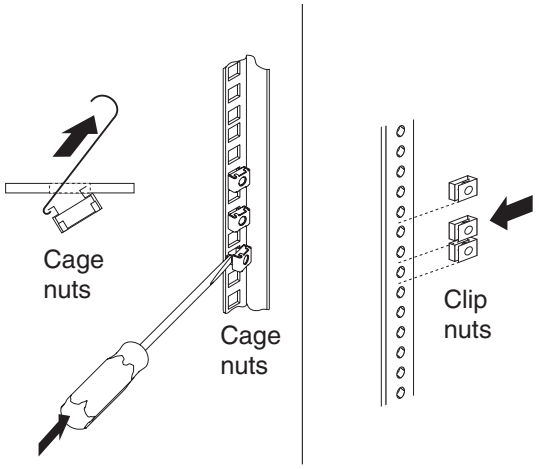
Attention: Horizontal installation of a PDU is not supported during relocation or shipping of a rack cabinet. You must remove any horizontally mounted PDUs from the EIA mounting space before you relocate the rack cabinet.

Note: Removing the rack doors and side panels might make installation easier. See the rack cabinet documentation for more information.

Review the documentation that comes with your rack cabinet for safety and cabling information. When you install the PDU in a rack cabinet, observe the following precautions:

- Make sure that the room air temperature is below 35°C (95°F).
- Do not block any air vents; usually 15 cm (6 in.) of air space provides proper airflow.
- Plan the device installation starting from the bottom of the rack cabinet.
- Install the heaviest device in the bottom of the rack cabinet.
- Do not extend more than one device out of the rack cabinet at the same time.
- Connect all power cords to properly wired and grounded electrical outlets.
- Do not overload the power outlet when you install multiple devices in the rack cabinet.

Use cage nuts for rack cabinets with square holes, and use clip nuts for rack cabinets with round holes. If your rack cabinet requires cage nuts, use a cage-nut-insertion tool or a flat-blade screwdriver to install them.



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Statement 1:

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

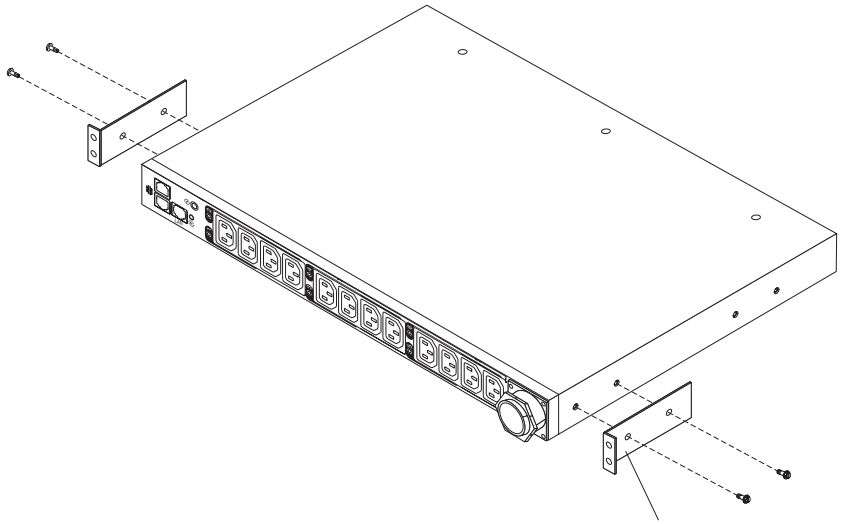
To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

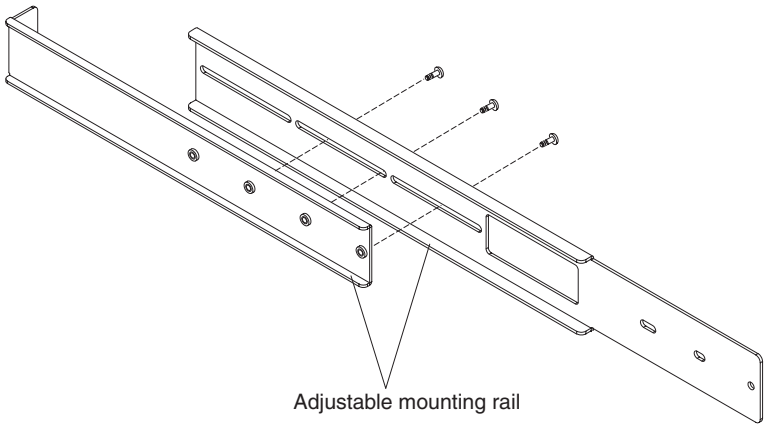
To Connect:	To Disconnect:
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

To install the PDU horizontally in a rack cabinet, complete the following steps:

1. Align the short mounting brackets with the holes in the front of the PDU and attach the brackets to the PDU with two M3 flat-head screws per bracket. Use the screws that come with the rack-mounting kit.

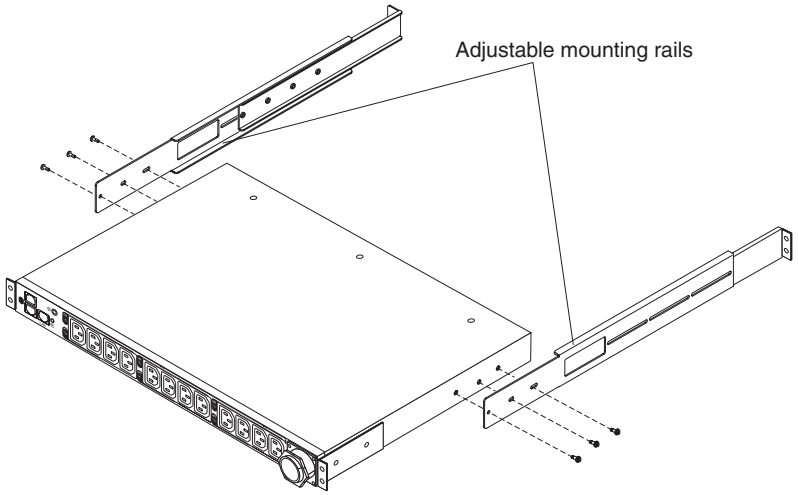


2. If the adjustable mounting rail is not assembled, complete the following steps to assemble it:
   a. Align the two parts of the adjustable mounting rail as shown in the following illustration.

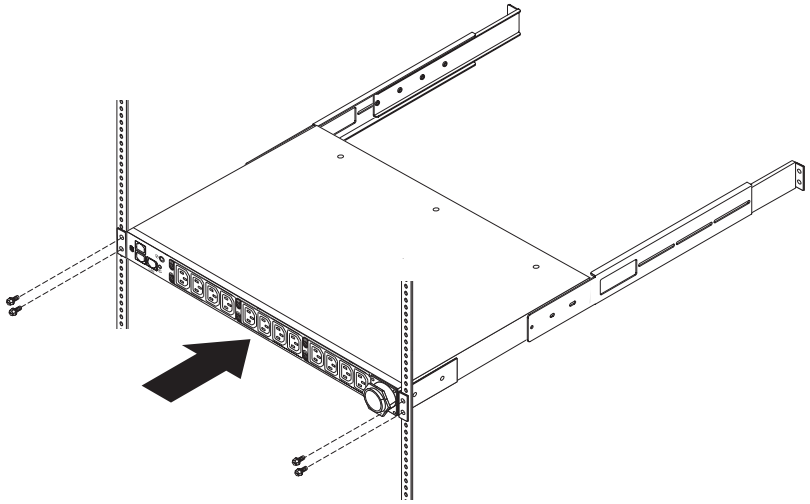


   b. Secure the two adjustable mounting rail parts with three screws that come with the rack-mounting kit.

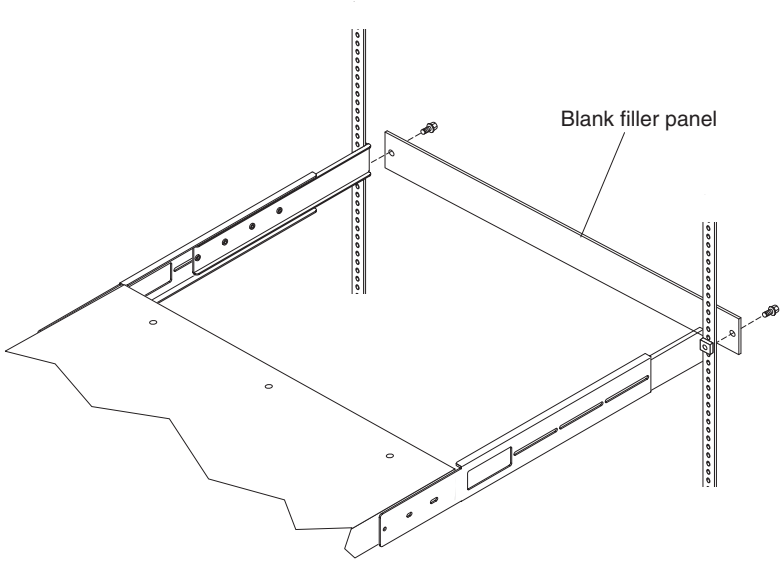
3. Align the adjustable mounting rails with the holes in the side rear of the PDU and attach the mounting rails to the PDU with three M3 pan-head screws with captive lock washers per rail. Use the screws that come with the rack-mounting kit.



4. Orient the PDU so that the vent holes are facing up. Hold the PDU at a slight angle and carefully insert it into the 1U mounting space in the rack cabinet. Pushing in slightly on both of the adjustable mounting rails helps clear the rails from the rack flanges.
5. Secure the end of the PDU that has the short mounting brackets to the rack cabinet first. Make sure that the short mounting brackets are aligned with the outside of the rack flanges. Attach the brackets to the rack flanges with two M6 screws and two cage nuts or clip nuts per bracket. Use the cage nuts or clip nuts and the screws that come with the rack-mounting kit.

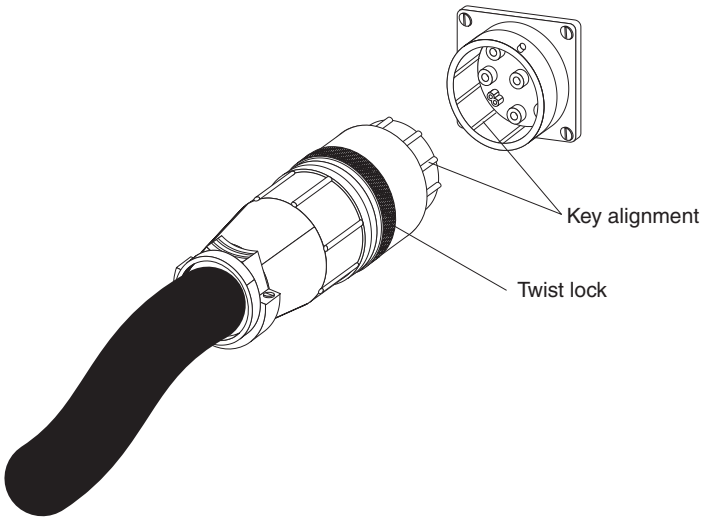


6. Secure the adjustable mounting rails and the 1U blank filler panel to the rack cabinet.



   a. Install a cage nut or clip nut in the applicable hole in the rack flange on each side of the rack cabinet.
   b. Adjust the adjustable mounting rails to fit the depth of the rack cabinet.
   c. Make sure that the adjustable mounting rail is aligned with the outside of the rack flanges.
   d. Align the blank filler panel on the outside of the rack flanges.
   e. Attach the filler panel to the adjustable mounting rail and then to the rack flanges and then to the rack cabinet. Use one M6 screw per mounting rail.
   f. Tighten the M3 pan-head screws that secure the adjustable mounting rails to the PDU.

7. If the PDU comes with a detached power cord, connect the power cord. Align the connector on the power cord that comes with the PDU with the connector on the front of the PDU, turning as necessary for key alignment; then, turn the twist-lock on the connector clockwise until it locks into place.



8. Route the power cord from the PDU toward the rack cabinet side braces; then, route the power cord along a side brace toward the back of the rack cabinet, and secure the power cord with the cable straps that come with the PDU.
9. Route the power cord toward a dedicated power source. Use the provided cable straps to secure the power cord along the way. If the power cord must exit the rack cabinet to connect to a power source, use the openings in the rack cabinet.
10. Connect the power cord to a properly wired and grounded dedicated power source. Then, you can connect servers or rack PDUs in the rack cabinet to the power outlets on the PDU.
11. Route all the other power cords neatly and secure the power cords with cable straps.

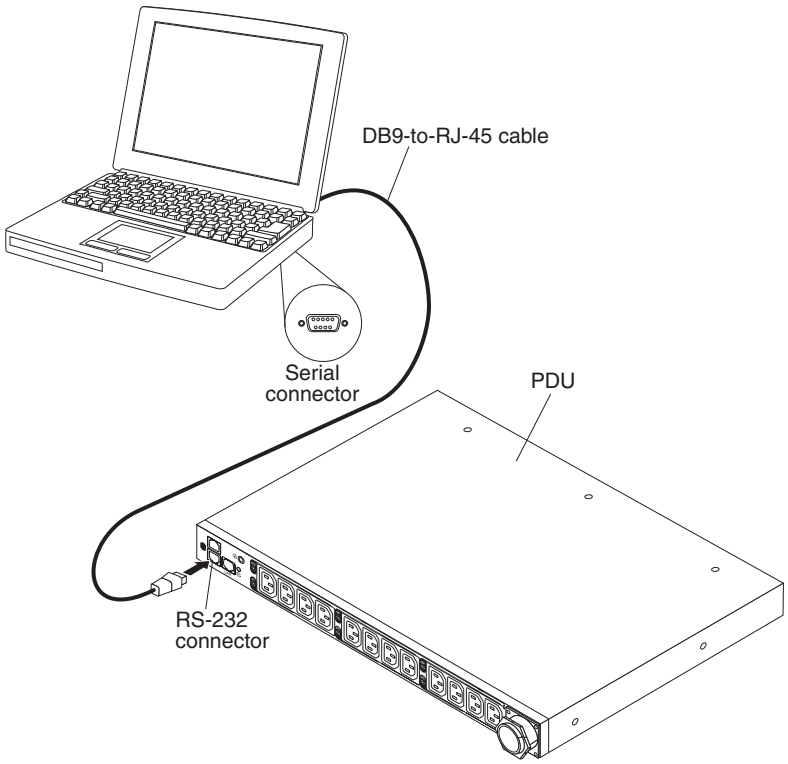
Chapter 4. Cabling the PDU

This chapter provides information about connecting a PDU to a console, LAN, and PDU environment sensor.

Connecting to a console

Use a DB9-to-RJ-45 cable to connect the serial (COM) connector on a workstation or notebook computer to the RS-232 connector on the PDU.

The following illustration shows how to connect a notebook computer to a 1U PDU.



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If your workstation or notebook computer does not have a DB9 serial connector, you can use a DB9-to-USB converter cable to connect the PDU to a workstation or notebook computer.

To connect the PDU to a workstation or notebook computer, using a DB9-to-USB converter cable, complete the following steps:

1. Obtain a DB-9-to-USB converter cable (must be purchased separately).
2. On the workstation or notebook computer that you are connecting to the PDU, install the device drivers for the DB-9-to-USB converter cable, by using the instructions that come with the converter cable.
3. Connect the DB9-to-RJ-45 cable that comes with the PDU to the RJ-45 console connector on the PDU, as shown in the previous illustration.
4. Connect the DB9 connector end of the converter cable to the cable that you connected to the PDU in step 3.
5. Connect the USB connector end of the converter cable to the workstation or notebook computer.

   Communication is now established with the PDU through the COM port that is created by the converter cable.

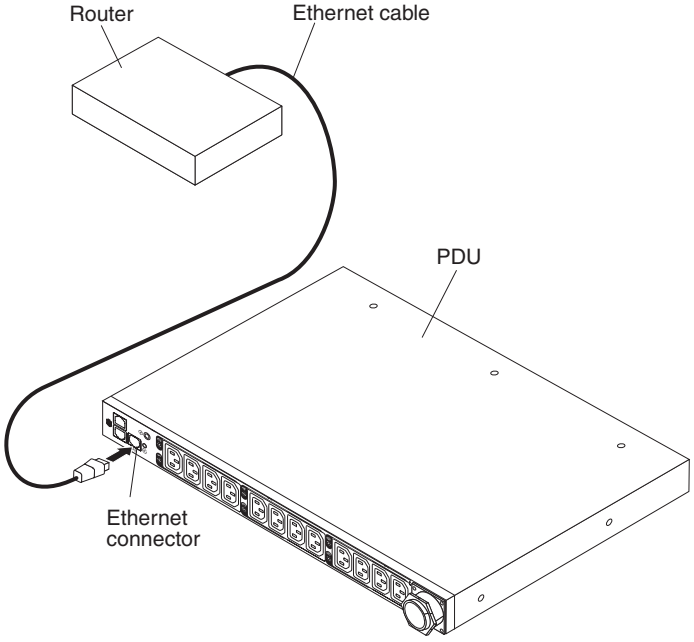
For information about initially setting up the PDU and to configure PDU settings, see “Using the IBM PDU Configuration Utility to set up the PDU” on page 29.

Connecting to a LAN

You can monitor the PDU power outlets and digital outputs over a network through the web interface, using a LAN connection.

Connect a router or switch to the Ethernet connector on the PDU, using an Ethernet cable. You can then monitor the PDU from a workstation or notebook computer that is connected to the same network. For more information about how to monitor the PDU and its output devices through the web, see “Using the web interface” on page 44.

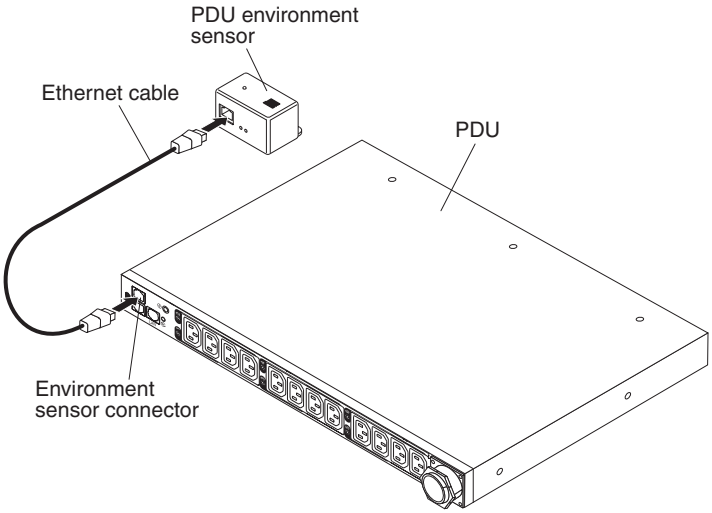
The following illustration shows how to connect a router or switch to a 1U PDU.



Connecting to a PDU environment sensor

The PDU environment sensor that comes with the PDU has a built-in temperature and humidity sensor and enables you to remotely monitor the temperature and humidity of the environment in which the PDU is operating. Connect the PDU environment sensor to the environment sensor connector on the PDU.

The following illustration shows how to connect a PDU environment sensor to a 1U PDU.



For more information about the environment sensor, see Chapter 6, “Using the PDU environment sensor,” on page 53.

Connecting output devices

The PDU power outlets are for connecting devices such as workstations, servers, and printers. You can monitor the power status of a connected device either manually or remotely through the RS-232 and Ethernet connectors. Connect a device that you want to monitor to a power outlet on the PDU with the power cord that comes with the device.

Chapter 5. Monitoring the power status

You can monitor the power status of any device that is connected to the PDU, either locally or remotely, by using the PDU web interface or the IBM PDU Configuration Utility. You can also use IBM Systems Director Active Energy Manager to monitor power usage of the PDU and its load groups.

Notes:

1. All of the PDU Configuration Utility configuration menu choices are available through the web interface after the PDU is set up on the local network.
2. You can use Telnet or any other terminal program to configure the PDU after the IP address is set.

Using the IBM PDU Configuration Utility to set up the PDU

The IBM PDU Configuration Utility is integrated in the PDU and is used to configure the PDU settings, such as the IP address, network parameters, and trap receivers table. Before you can use the web interface to monitor the PDU power status, you must use the PDU Configuration Utility to set up the PDU.

To configure the PDU by using the IBM PDU Configuration Utility, complete the following steps:

1. Connect a workstation or notebook computer to the PDU. Connect one end of a DB9-to-RJ-45 cable to the RS-232 connector on the PDU and the other end to an RS-232 serial (COM) connector on a workstation or notebook computer. For more information, see “Connecting to a console” on page 25.
2. To start HyperTerminal and set up a connection between the workstation or notebook computer and the IBM PDU Configuration Utility on the PDU, click **Start → Programs → Accessories → Communications → HyperTerminal**. The Connection Description window opens. In the **Name** field, type the name for the connection and select an icon for the connection. Click **OK**. The Connect To window opens.

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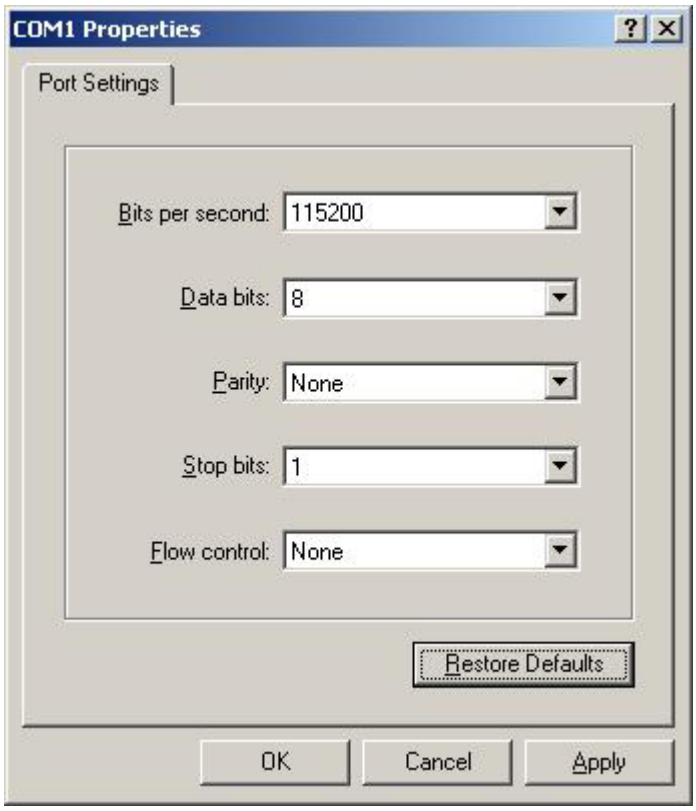
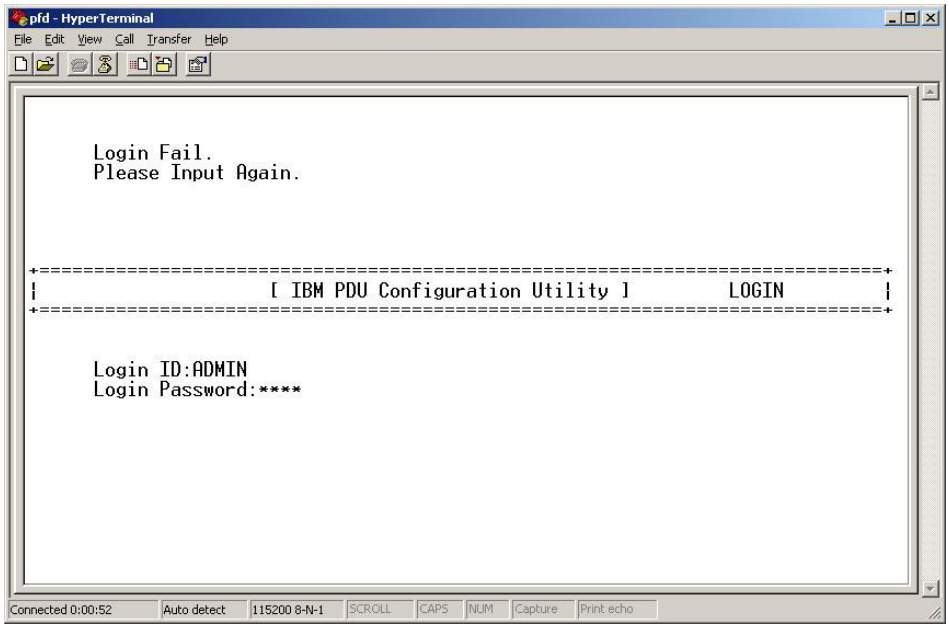
3. From the **Connect using** list, select the COM port that is connected to the PDU. Click **OK**. The Properties window opens.

4. Select **115200** from the **Bits per second** list and select **None** from the **Flow control** list. Click **OK**.

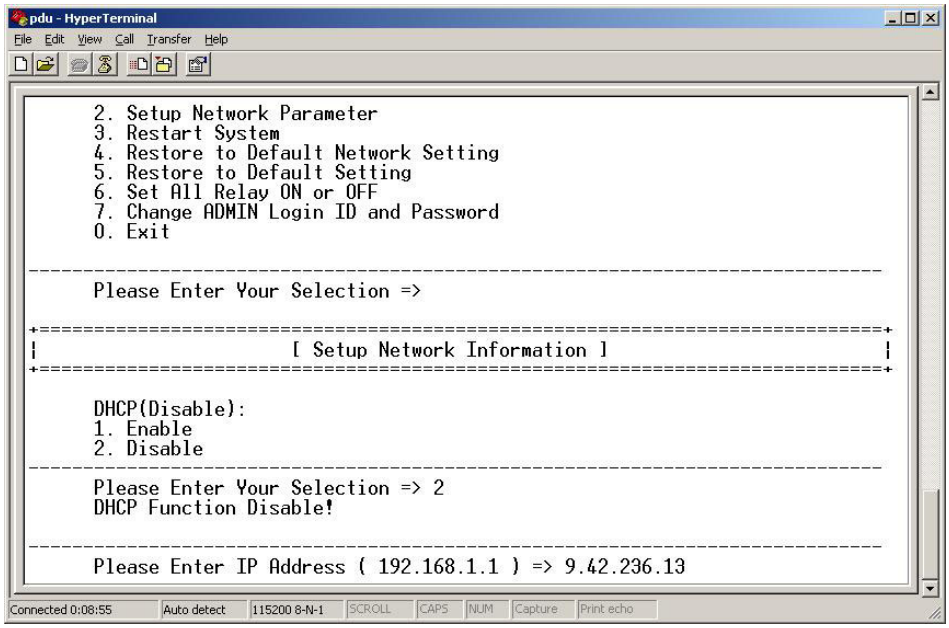


5. When a blank window opens, press Enter. The IBM PDU Configuration Utility login window opens.

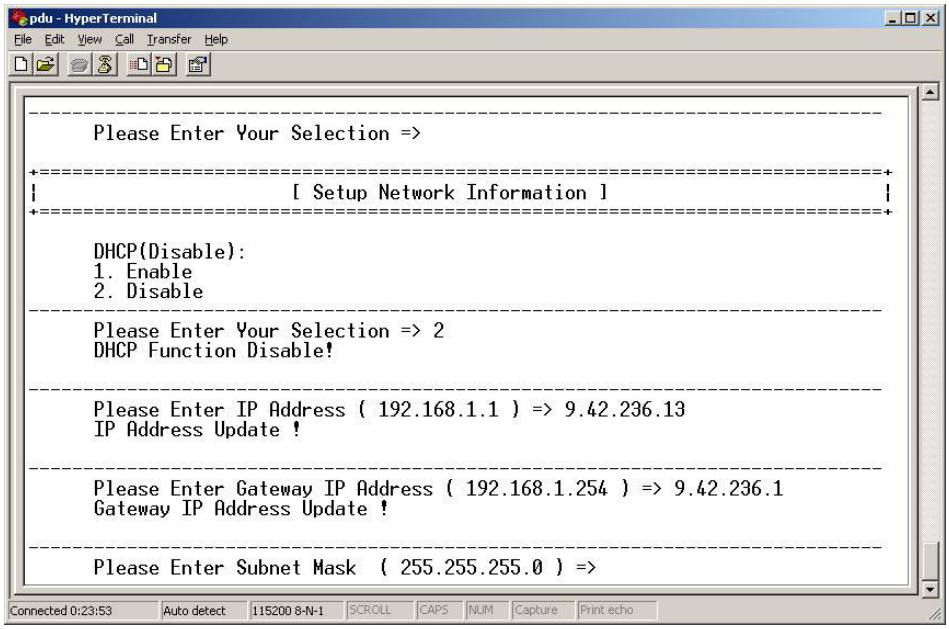
6. Type the default login ID `ADMIN` and the password `1001`. Press Enter. The IBM PDU Configuration Utility main menu window opens.



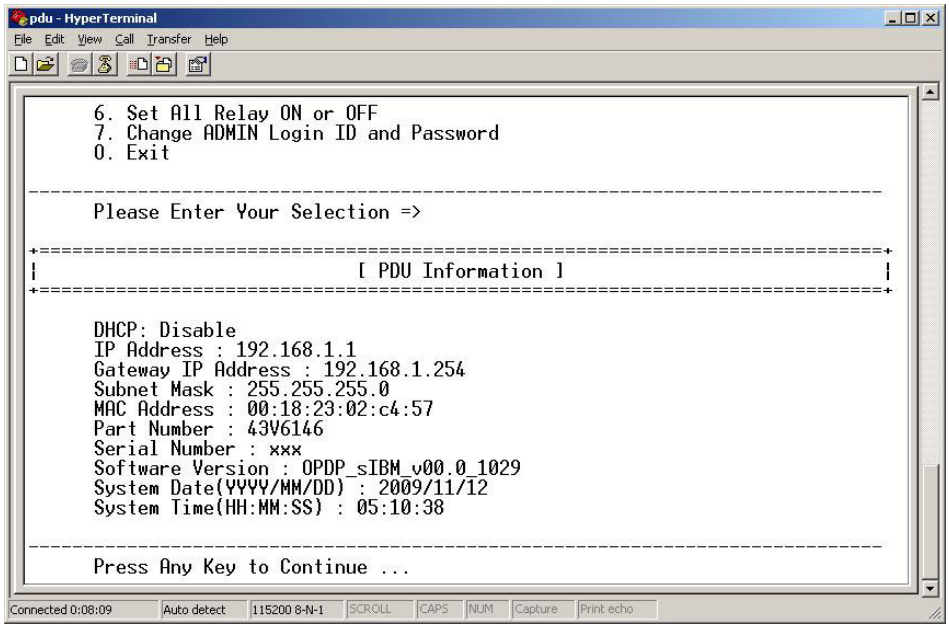
7. On the main menu window, press `2` to set up the network parameters. The Setup Network Information window opens.



8. To enable or disable DHCP, press either 1 or 2 as applicable. The default is **Disable**. Then, type the IP address, gateway IP address, and subnet mask. Press Enter.



9. Press 1 to view the PDU default configuration information. A window similar to the one in the following illustration is displayed.



10. Press any key to return to the main menu. You can continue to use the PDU Configuration Utility, or you can use the web interface to configure and monitor the PDU remotely. For more information, see “Using the web interface” on page 44.

Power-on sequencing (some models)

You can use the power-on sequence function to define a sequence for powering on the PDU outlets. You can use Telnet and SNMP through the Ethernet port or HyperTerminal through the serial port to configure the power-on sequence function.

Use the power-on sequence function for the following two scenarios:

- Device dependency

  There are applications that required the power-on sequence function. For example, a system includes device A, device B, and device C and requires that device A is powered on first, then device B, and then device C. If the devices do not follow the required sequence when powered on, the system will not run correctly.

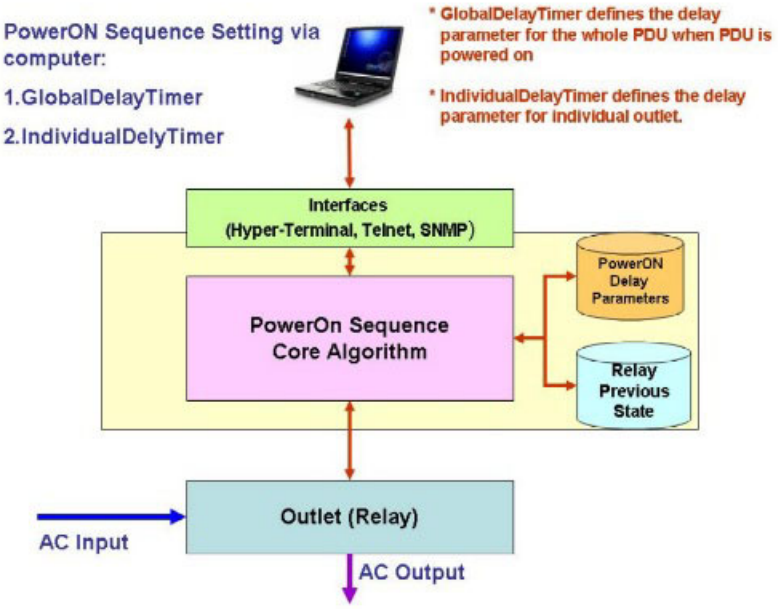
- Power-on in-rush current

  In-rush current might be a problem in some applications if you are powering on multiple devices at the same time. In such applications, the power-on sequence function is required to power on devices in user-definable sequences to limit in-rush current.

The PDU outlet numbering is shown in the following illustration. The PDU orientation is horizontal with the Ethernet port on the left.

Ethernet port

The following illustration shows the design and implementation of the power-on sequence function.



To use the power-on sequence function, you must set the following parameters by using either a serial or Ethernet interface:

- GlobalDelayTimer (range: from 0 - 3600 seconds; data type: integer). All PDU outlets are controlled by this global timer.

  If GlobalDelayTimer is not set (equal to 0), the global delay function for all outlets is not enabled.
- IndividualDelayTimer (range: from 0 - 3600 seconds; data type: integer). Each outlet also has its own individual delay variable (IndividualDelayTimer) that is accessible through either a serial (HyperTerminal) or Ethernet (Telnet and SNMP) interface.

  If IndividualDelayTimer is not set (equal to 0), the individual outlet delay function is not enabled.

If both the GlobalDelayTimer and IndividualDelayTimer parameters are not set, the power-on sequence function is off automatically.

When a PDU is powered on for the first time, all the relays are off, and the power-on sequencing is not used. You must turn on the relays by using the web interface or SNMP. You must also set the values for the GlobalDelayTimer and IndividualDelayTimer, if they are used. After that, when the PDU is turned on (or power is restored), the outlet power-on sequence and behavior are controlled by the following settings:

- Previous state of the outlets (on or off)
- GlobalDelayTimer value
- IndividualDelayTimer value

The outlets that were off before the PDU was turned off (or lost power) will stay off after power is restored.

The outlets that were on before the PDU was turned off (or lost power) will be tuned back on in a sequence that is determined by the timers. If the timer values

are zero, the only delay is the PDU boot-up time, which is 10 seconds. If there are values in the delay timers, the turn on time is the sum of following three values:

- PDU boot-up time (10 seconds)
- GlobalDelayTimer value
- IndividualDelayTimer value

The following example shows what you can expect to see if power to the PDU is restored after a power outage.

- PDU boot-up time = 10 seconds
- GlobalDelayTimer = 5 seconds
- The previous outlet state for the PDU is:

```
Outlet 1  On
Outlet 2  On
Outlet 3  On
Outlet 4  Off
Outlet 5  On
Outlet 6  On
Outlet 7  On
Outlet 8  On
Outlet 9  On
Outlet 10  Off
Outlet 11  On
Outlet 12  Off
```

- The IndividualDelayTimer for each outlet has the following settings:

```
Outlet 1   1 Sec
Outlet 2   2 Sec
Outlet 3   3 Sec
Outlet 4   5 Sec
Outlet 5   2 Sec
Outlet 6   2 Sec
Outlet 7   4 Sec
Outlet 8   1 Sec
Outlet 9   2 Sec
Outlet 10  2 Sec
Outlet 11  5 Sec
Outlet 12  3 Sec
```

The following table shows the PDU outlet power-on timing when power is restored after a power outage.

Table 3. Power-on timing

Outlet number	**Outlet power-on timing**	**Comment**
1	16th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
2	17th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
3	18th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
4	Off	Previous state is Off
5	17th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
6	17th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer

Table 3. Power-on timing (continued)

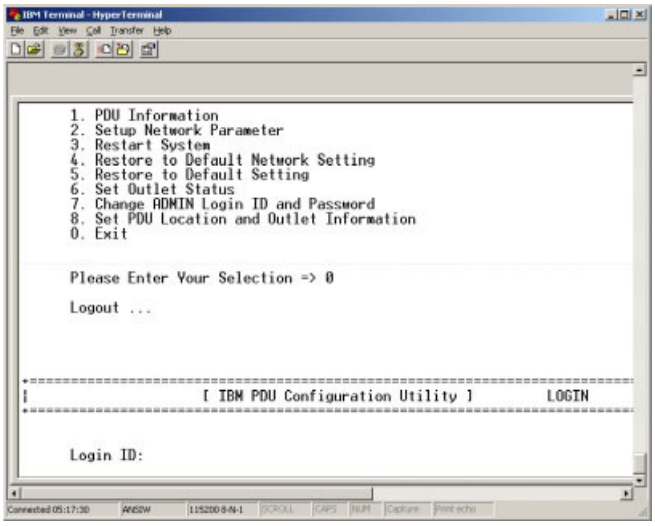
Outlet number	Outlet power-on timing	Comment
7	19th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
8	16th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
9	17th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
10	Off	Previous state is Off
11	20th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
12	Off	Previous state is Off

The following sections explain how to configure the GlobalDelayTimer and IndividualDelayTimer parameters through the serial port (by using HyperTerminal or similar applications) or through the Ethernet port (by using Telnet and SNMP).

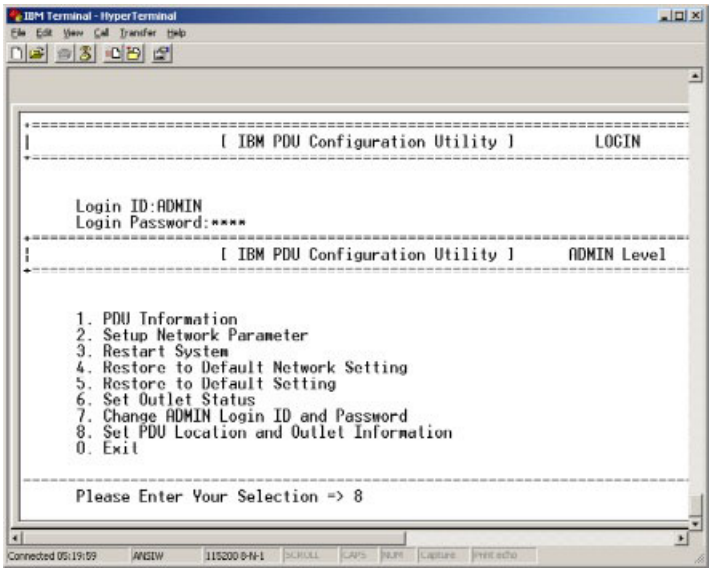
Using HyperTerminal through the serial port

To set the parameters for the power-on sequence function by using a serial port (HyperTerminal interface), complete the following steps:

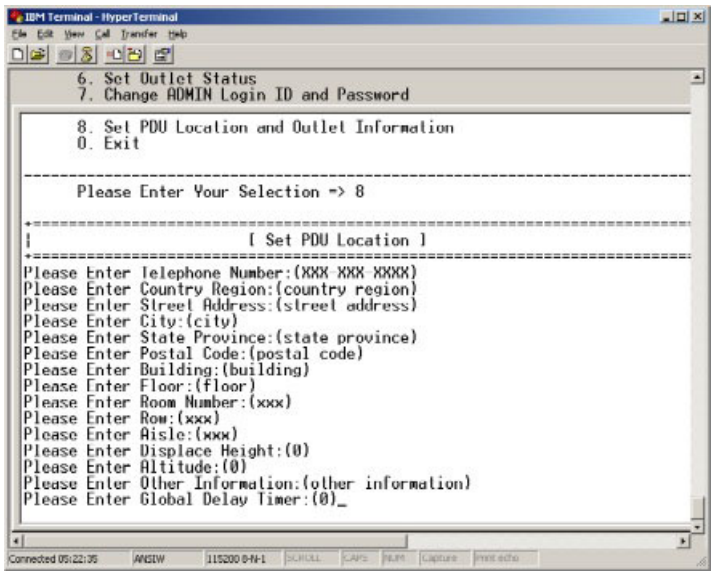
1. Make sure that the serial port configuration is 115200, 8-N-1-None.
2. Log-in as ADMIN/1001.



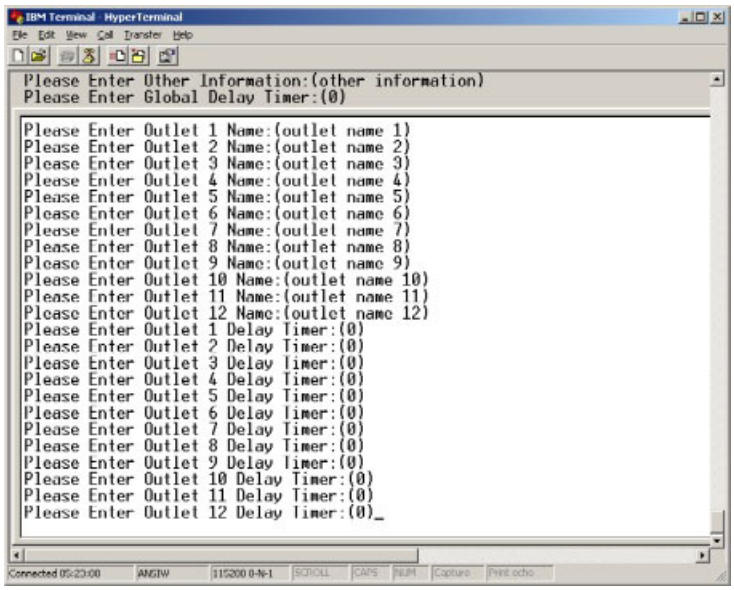
3. On the IBM PDU Configuration Utility main meu, type 8 to select **Set PDU Location and Outlet Information**.



4. Ttype the **GlobalDelayTimer** value.



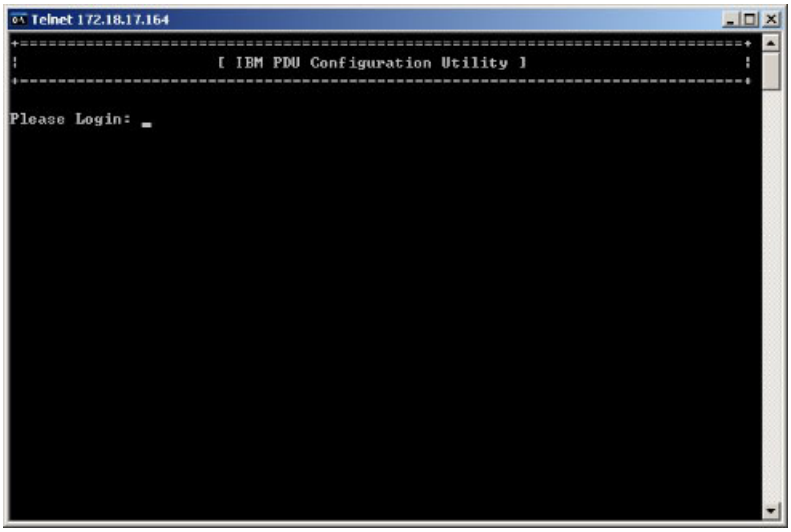
5. On the main menu, type the IndividualDelayTimer values for each outlet.



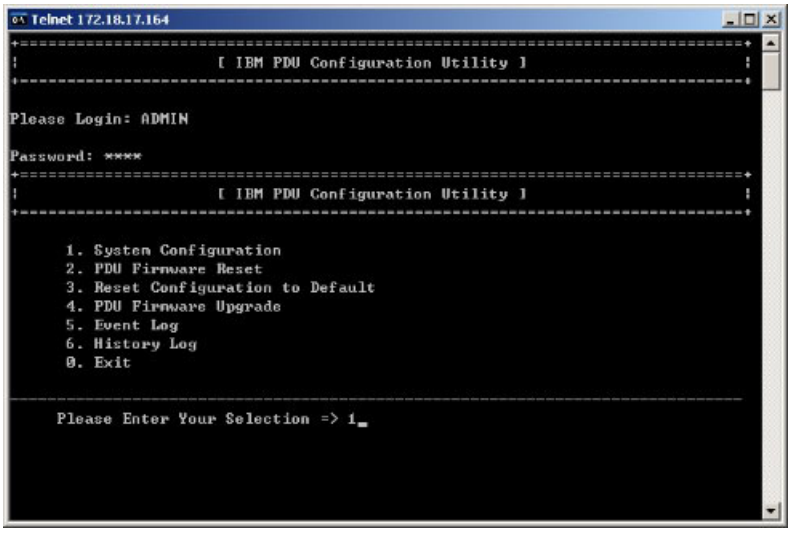
Using Telnet through the Ethernet port

To set the parameters for the power-on sequence function by using an Ethernet port and the Telnet interface, complete the following steps:

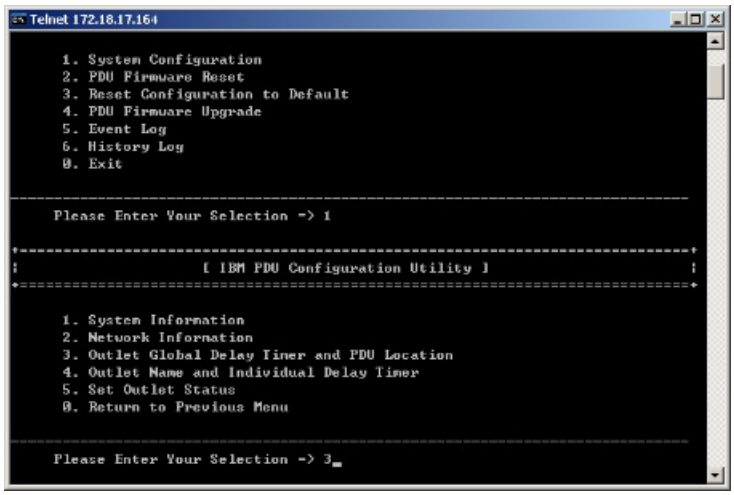
1. Log in as ADMIN/1001.



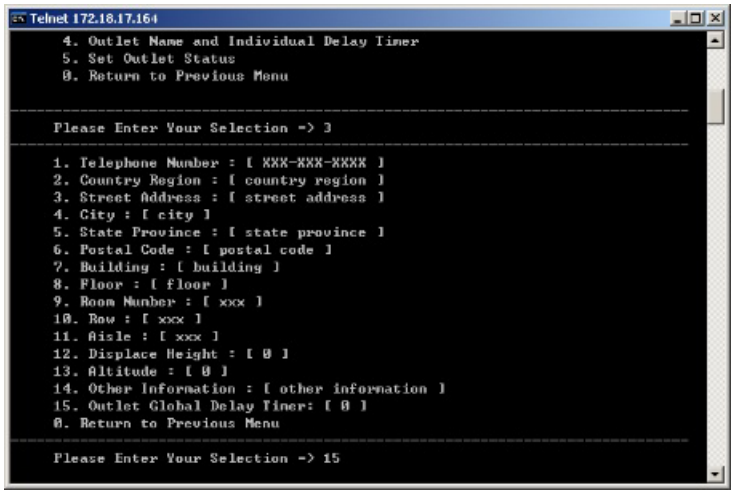
2. Type 1 for System Configuration.



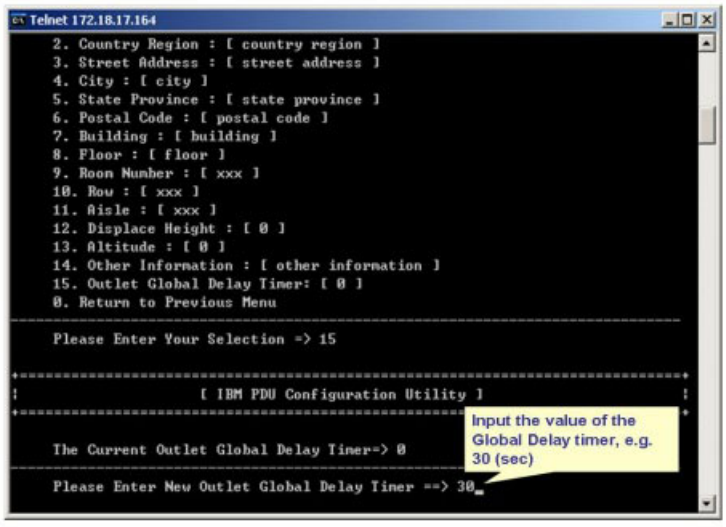
3. Type 3 for Outlet Global Delay Timer and PDU Location.



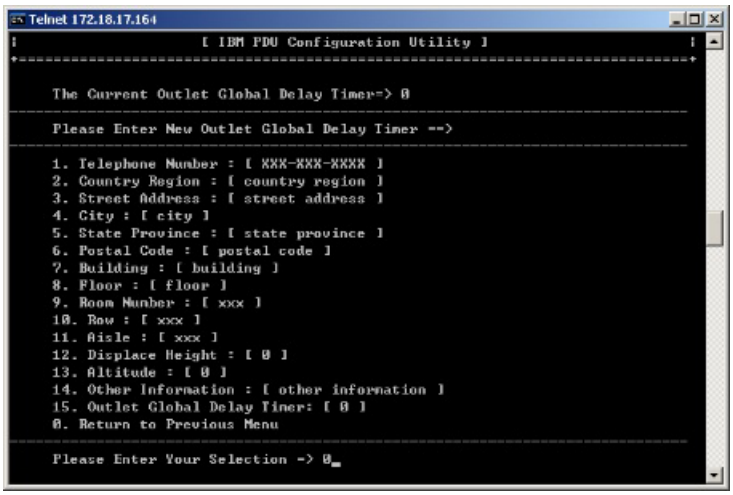
4. Type 15 to define the Outlet Global Delay Timer.



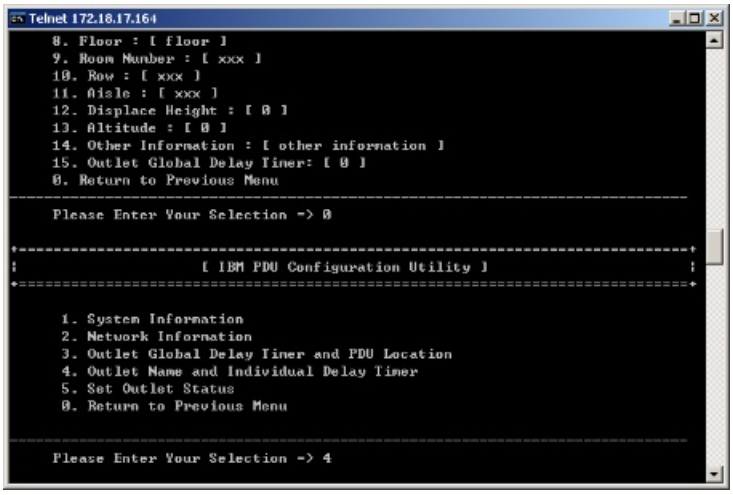
5. Type the value for the New Outlet Global Delay Timer.



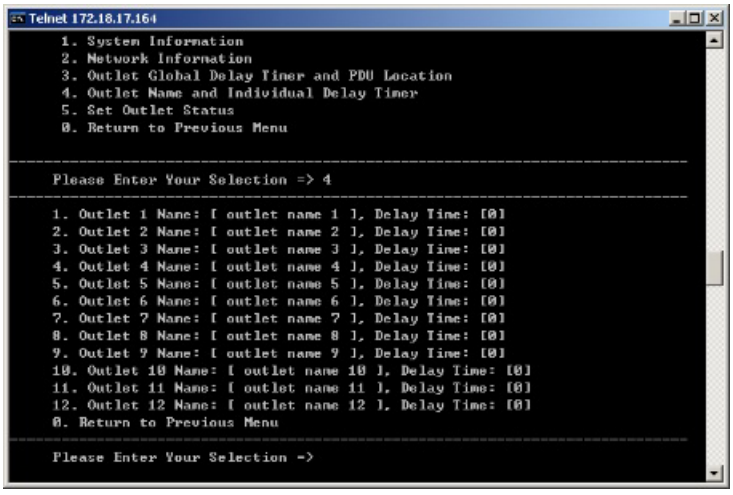
6. Type `0` to return to the previous menu.



7. Type `4` for the Outlet Name and Individual Delay Timer.



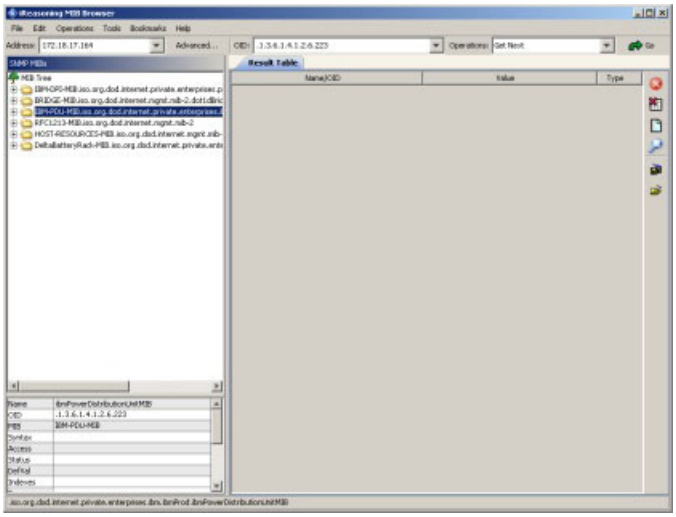
8. Type the outlet number and enter the outlet name and its IndividualDelayTimer value.



Using SNMP through the Ethernet port

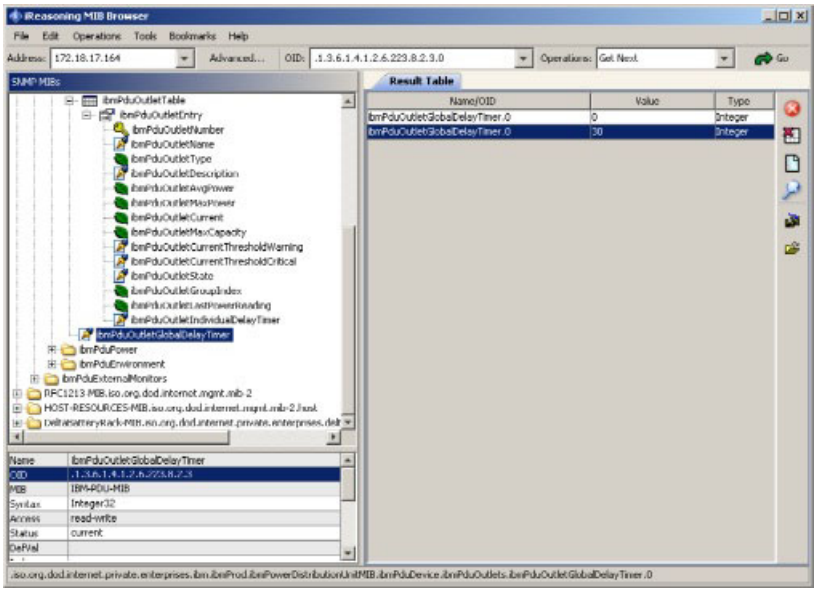
To set the parameters for the power-on sequence function by using an Ethernet port and the SNMP interface, complete the following steps:

1. Open your MIB browser (for example, iReasoning).

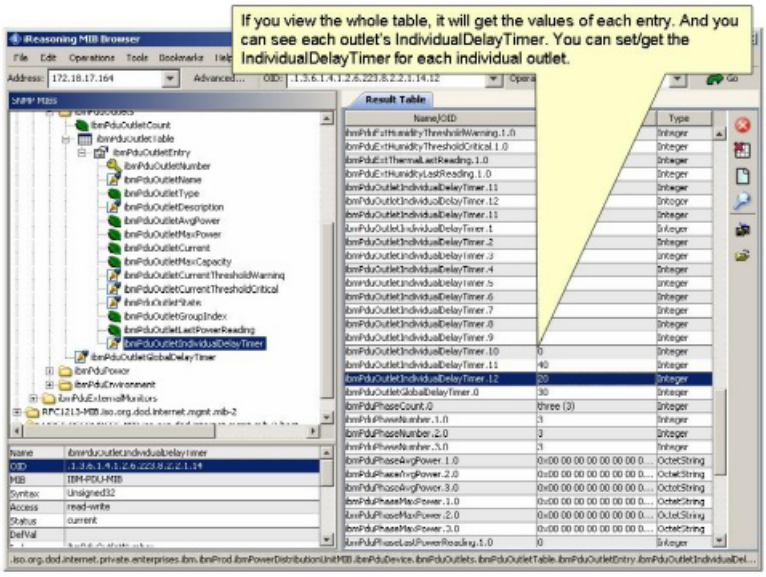


   For the latest MIB file, go to http://www.ibm.com/support/fixcentral/.

2. Set the GlobalDelayTimer parameter with the object identifier (OID) as shown in the following illustration.



3. Set the IndividualDelayTimer parameter with the OID.



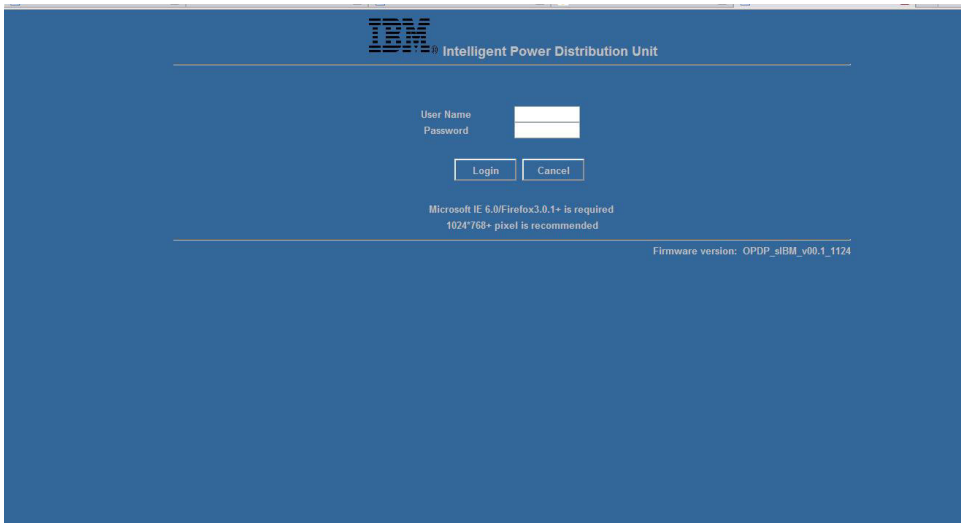
Using the web interface

This section provides information about using the web interface to configure and monitor the PDU remotely. The PDU provides a graphical user interface that you can view from a web browser. Using a web browser, you can access and monitor the PDU power outlets and output devices remotely from a workstation or notebook computer.

Starting the web interface

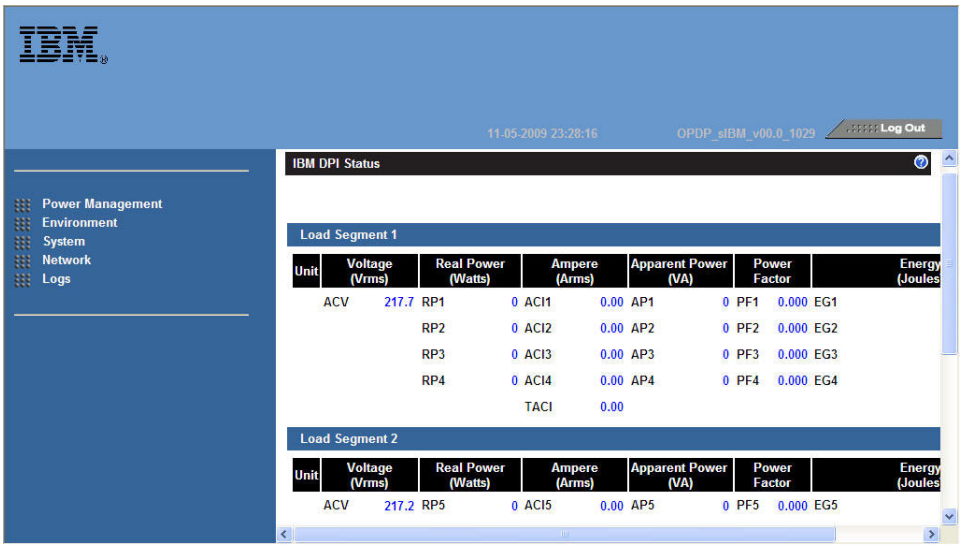
To start the web interface, complete the following steps:

1. Start a web browser from a workstation or notebook computer and enter the IP address of the PDU in the address field. The Login window opens.



2. In the **User Name** field, type `ADMIN` (all uppercase letters). In the **Password** field, type `1001`.

3. Click **Login**. The main status page opens.



The main status page shows the PDU power outlets and input status per load segment:

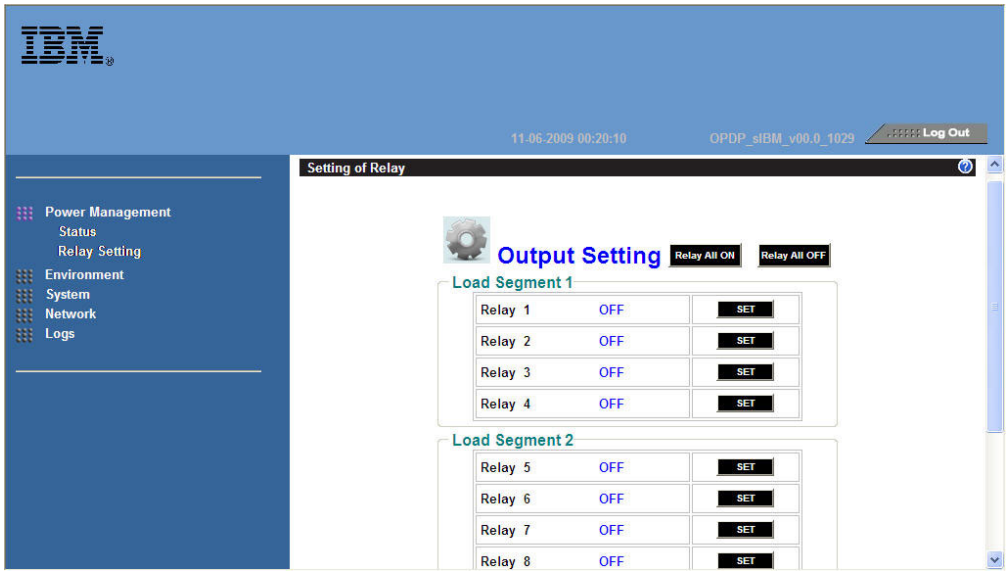
- The left pane shows the menus and submenus for the PDU. Click a menu to display the menu choices, expand the menu items, and modify the menu choices as required.
- The information in the right pane shows the status of the voltage, real power, amperes, apparent power, power factor, and energy.

Each menu page provides online help to assist you with configuring the PDU. Click the question mark (?) icon at the top of each page to view the help.

Power management relay setting

You can use the power management relay setting to turn each power outlet on or off by using the software.

On the Setting of Relay page, you can change the relay setting. For the load segment and relay of the power outlet for which you want to turn on or off, click **Set** to turn off the outlet or click **Set** again to turn on the outlet.

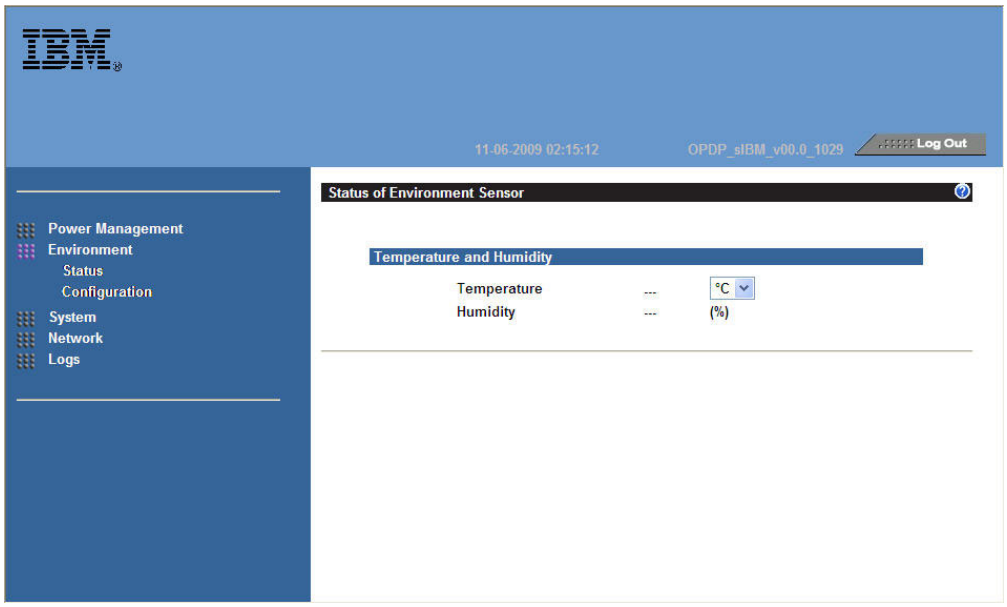


Environment status and configuration

If a PDU environment sensor is connected to the PDU, you can view the temperature and humidity information. For more information about installing and using the PDU environment sensor, see Chapter 6, “Using the PDU environment sensor,” on page 53.

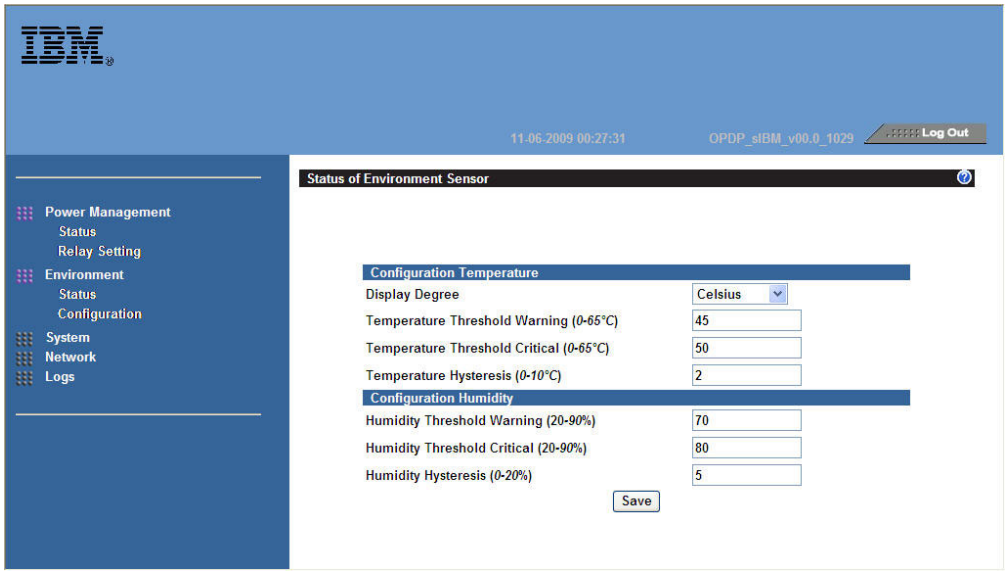
Viewing the status

On the Status of Environment Sensor page, you can view the temperature and humidity status from the PDU environment sensor.



Changing the environment configuration settings

On the Configuration of Environment Sensor page, you can configure the temperature and humidity threshold values for the PDU environment sensor that is connected to the PDU.

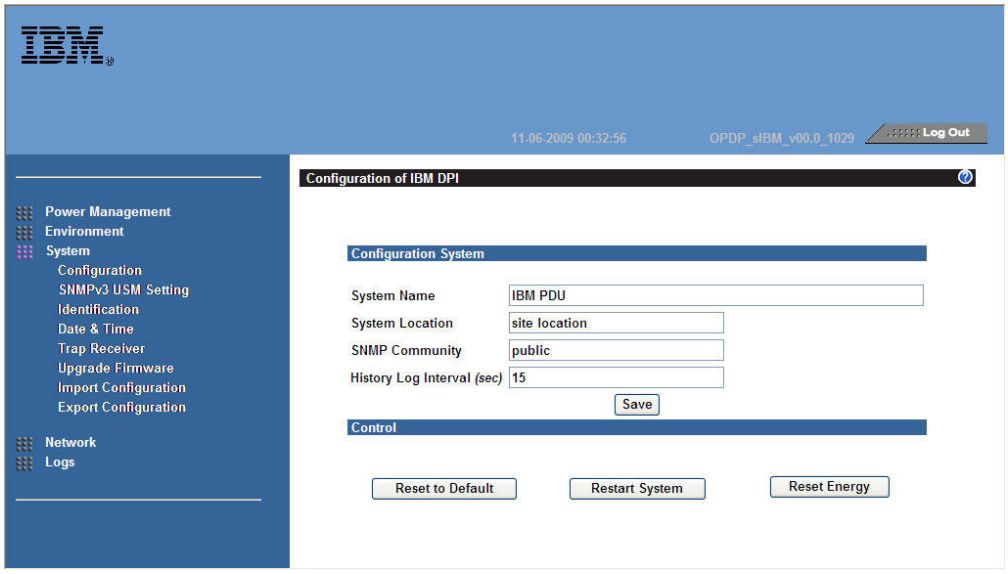


Modifying the basic settings

Use the **System** menu to configure the PDU system parameters such as the system name, password, IP address, date, and time. Some of these settings are described in the following sections.

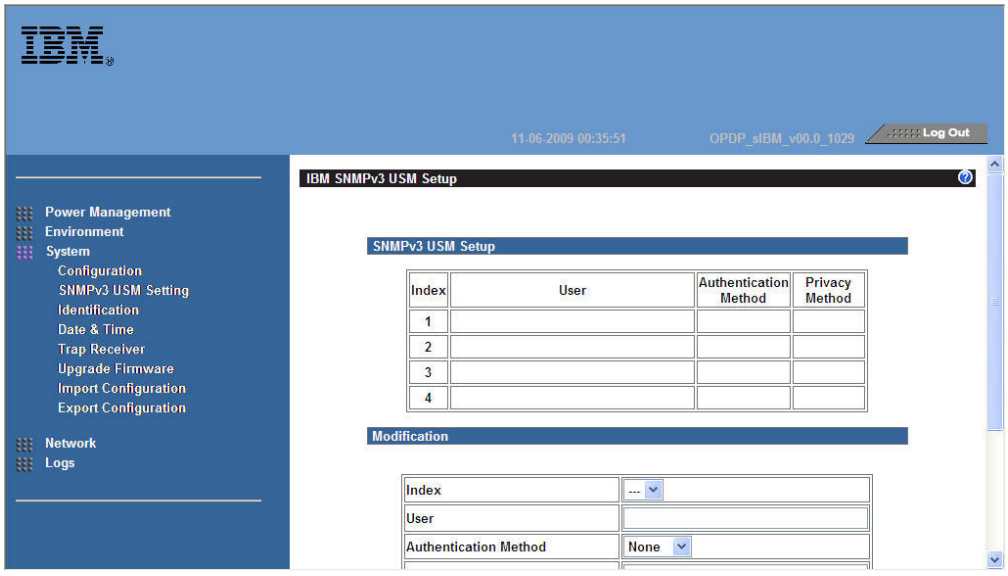
Changing the system information

On the Configuration of IBM PDU page, you can change the system name and location, SNMP community, and history log interval, and you can restart the PDU.



Displaying SNMPv3 information

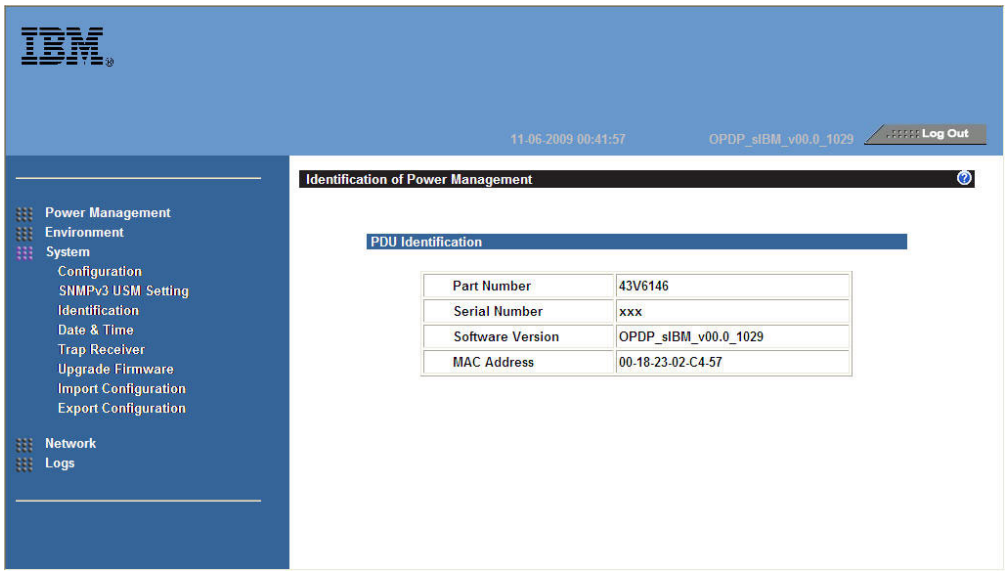
On the IBM SNMPv3 USM Setup page, you can set up the configuration for user profiles of SNMPv3 USM related parameters. You can set up the user, authentication method, and privacy method.



Identifying the PDU

On the Identification of Power Management page, you can view the PDU information such as the part number, serial number, and MAC address.

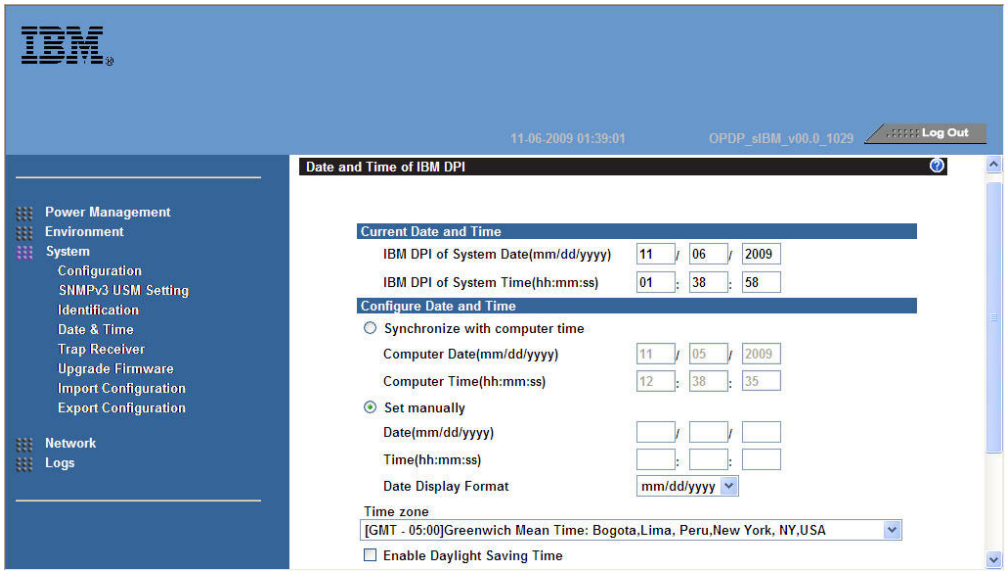
Note: You cannot modify the information on the Identification of Power Management page.



Changing the date and time

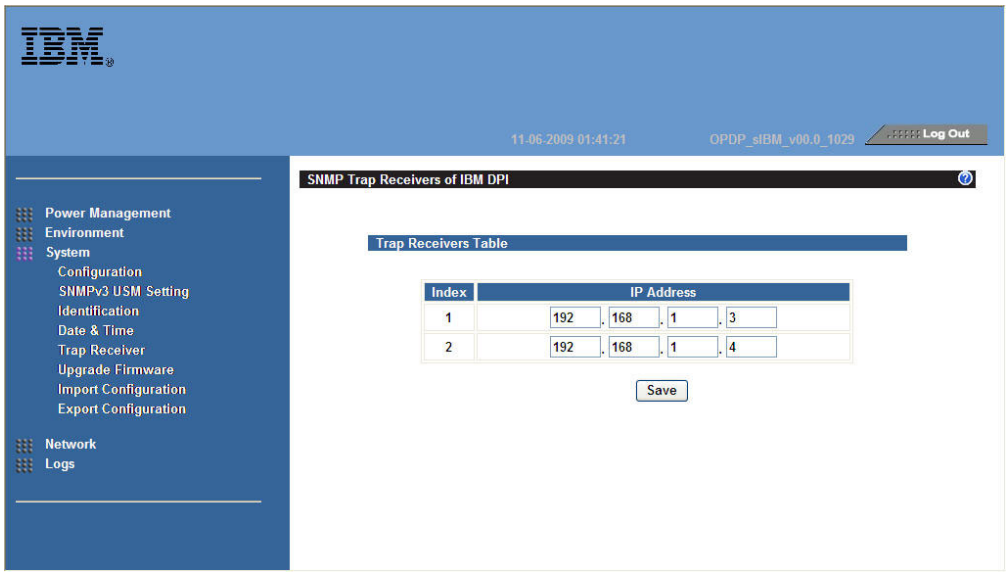
On the Date and Time page, you can change the date and time of the PDU. You can set the date and time manually or synchronize it with the computer time.

Note: Changing the PDU date and time affects other PDU settings such as e-mail, traps, and logs.



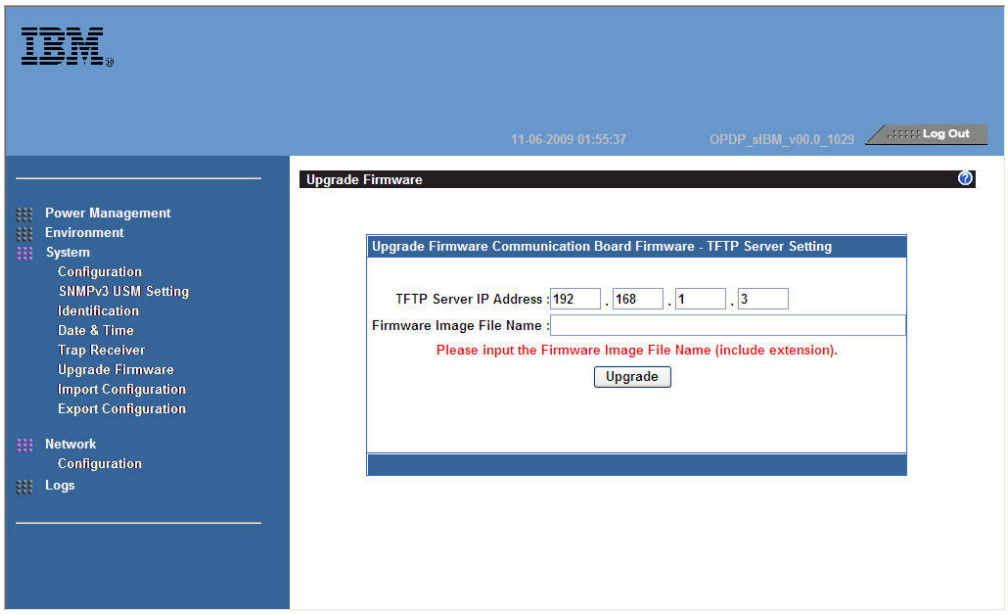
Changing event alerts

If an event occurs within the PDU that triggers a trap, the trap information can be sent to a monitoring application through SNMP. On the SNMP Trap Receivers page, you can specify the IP address of a server on which a monitoring application is running.



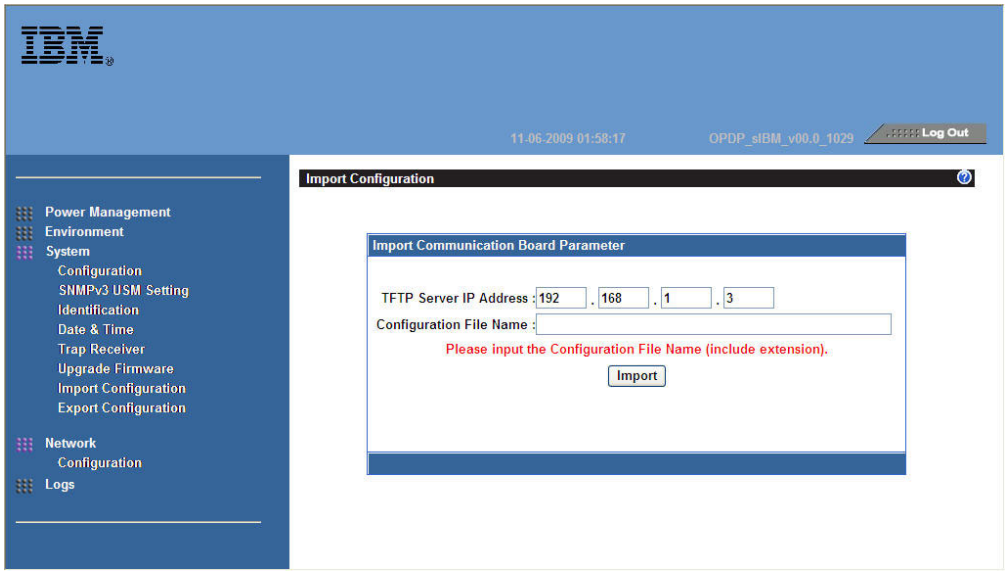
Upgrading firmware

You can upgrade the PDU firmware on the Upgrade Firmware page. To update the firmware, type the TFTP server IP address and the firmware image file name and click **Upgrade**.



Import configuration

You can import the configuration settings for the PDU on the Import Configuration page. The import function updates the EEPROM of the PDU.

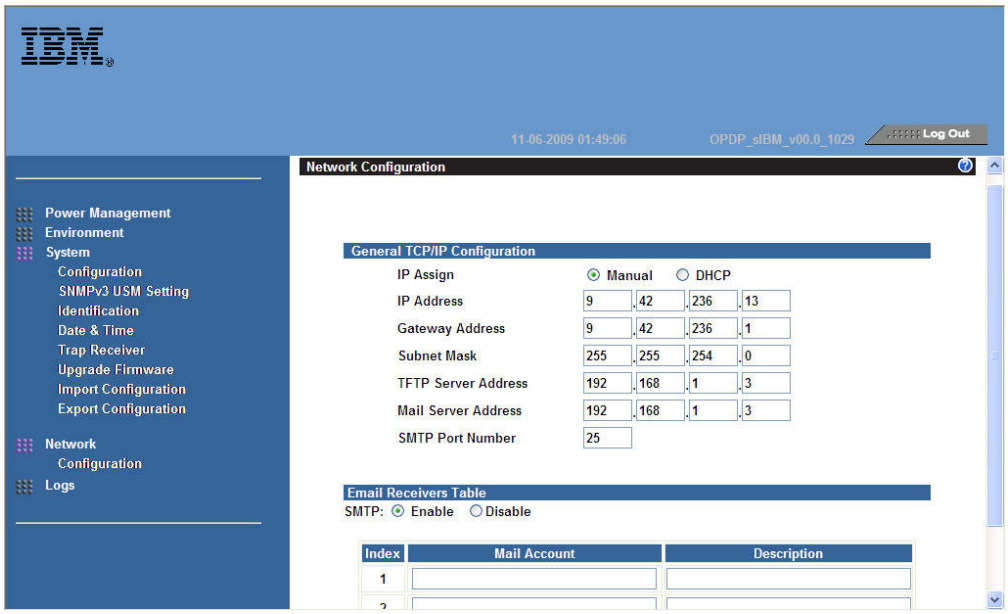


Export configuration

On the Export Configuration page, you can export the configuration settings of the PDU to a file. Then, you can import the exported file to other like PDUs in the network to provide consistent and similar configuration settings.

Changing the network configuration

You can view or change the network configuration of the PDU on the Network Configuration page. You can set the PDU IP address, gateway address, subnet mask, TFTP server address, mail server address, and SMTP port number. You can also set up the e-mail receivers table to list two users who are alerted with an e-mail.

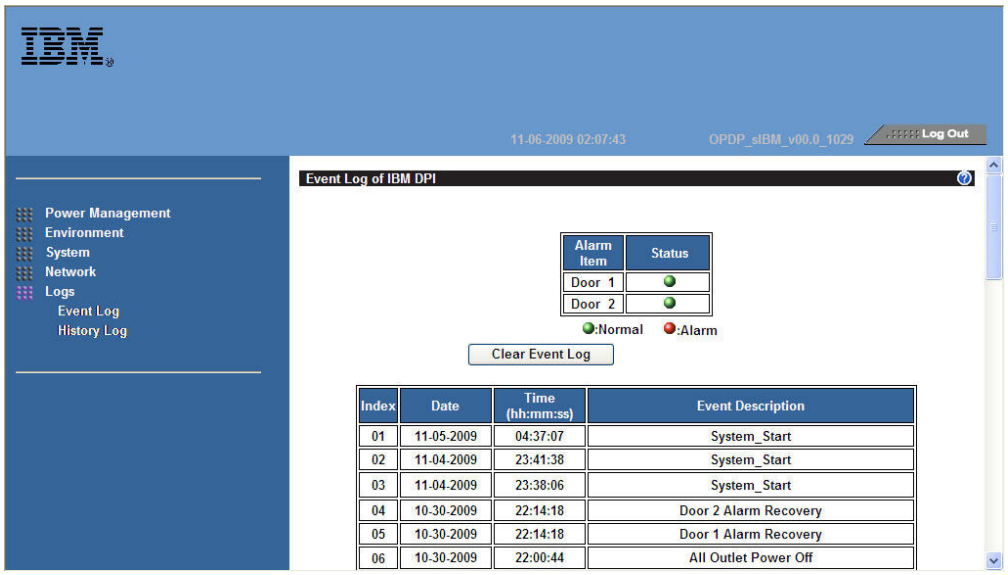


Event and history log summaries

The **Logs** menu provides a detailed description of all events and a record of the PDU status. System administrators can use this page to analyze problems with network equipment.

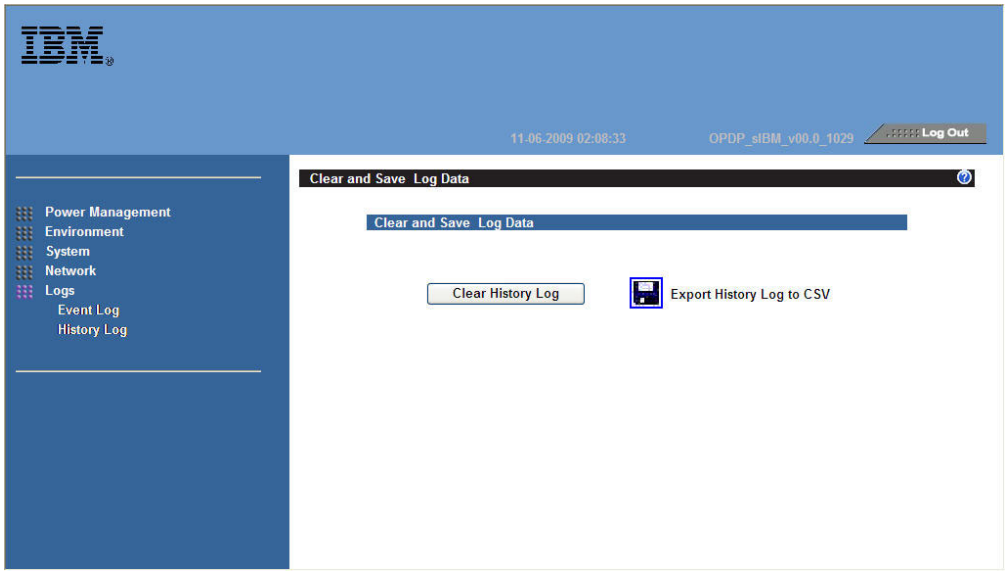
Viewing the event log

On the Event Log page, you can view the complete record of the PDU events. Each event log file shows the date, time, and description of each event that has occurred on the PDU. The index shows the order in which the events are logged.



Viewing the history log

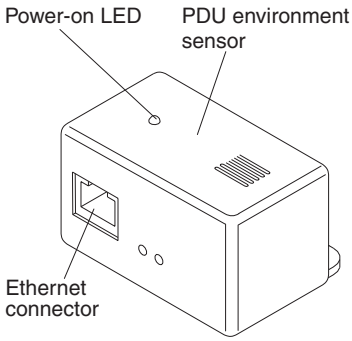
On the History Log page, you can access the complete history of the PDU inputs, outputs, and PDU environment sensor. On the page, you can clear the history log or export the history log to a comma-separated values (CSV) file.



Chapter 6. Using the PDU environment sensor

The PDU environment sensor is a connectivity device that enables you to remotely monitor the temperature, humidity, and status of two contact devices through a standard web browser, providing greater power management control and flexible monitoring.

When the PDU environment sensor is connected to the environment sensor connector on the PDU, temperature and humidity readings are automatically displayed in the web interface. To access the readings, you must run the web browser and connect to the PDU IP address.



The PDU environment sensor kit comes with one PDU environment sensor, screws, hook-and-loop fasteners, and Ethernet cable. You can install the device anywhere on the rack by using either the screw or the self-adhesive hook-and-loop fasteners.

Features

The PDU environment sensor has the following features:

- The hot-swap feature simplifies installation by enabling you to install the probe safely without turning off power to the PDU or to the loads that are connected to it.
- It monitors temperature and humidity information of any environment that you want, to protect your critical equipment.
- It measures temperatures between 0°C and 80°C (32°C and 176°F) with an accuracy of ±1°C.
- It measures relative humidity between 10% and 90% with an accuracy of ±5%.
- It can be located away from the PDU with a Category 5 network cable up to 20 m (65.6 ft) long.
- It monitors the status of the two user-provided contact devices.
- Temperature, humidity, and contact closure status can be displayed through a web browser.
- User-selectable alarm thresholds enable you to define acceptable temperature or humidity limits.
- Notification is by e-mail through Simple Mail Transfer Protocol (SMTP), using e-mail client software when acceptable alarm limits are exceeded or contact status changes.
- Changes in external contact status are logged in the PDU event history log.
- When temperature and humidity values exceed user-selectable limits, the event is logged in the PDU event history log.

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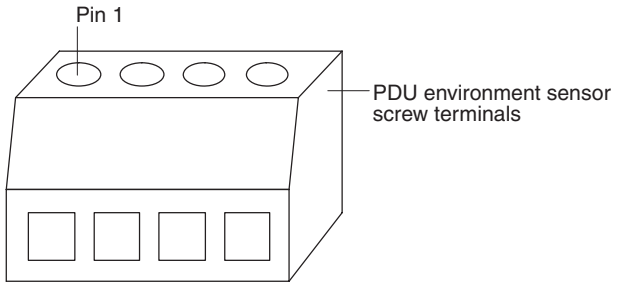
Connecting the PDU environment sensor to the PDU

To connect the PDU environment sensor to the PDU, complete the following steps:

1. If applicable, connect external contact inputs to the screw terminals on the PDU environment sensor.



Note: External contact device 1 is connected between pins 1 and 2. Device 2 is connected between pins 3 and 4 (as labeled to show device 1 and 2). External contact devices can be normally open or normally closed.

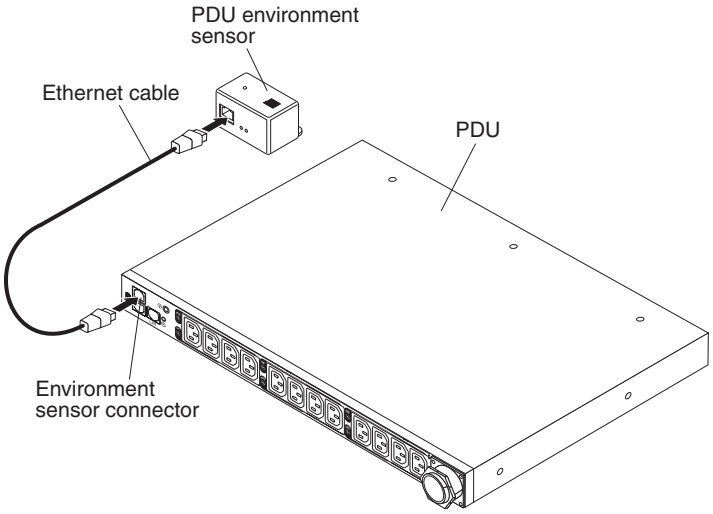
Table 4. PDU environment sensor screw terminal pin assignment

Pin number	Description	Normally open/ normally closed
1	Contact 1 return	Normally closed
2	Contact 1 signal input	Normally open
3	Contact 2 return	Normally closed
4	Contact 2 signal input	Normally open

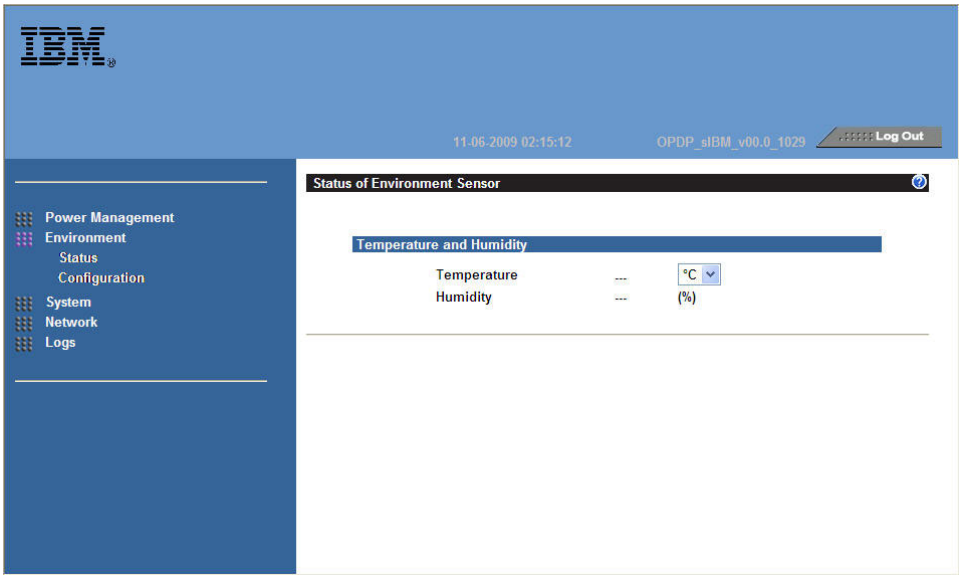
2. Connect the Category 5 Ethernet cable that comes with the environment sensor to the PDU environment sensor and to the environment sensor connector on the PDU.

   Note: If the cable is not long enough for your configuration, you can use a cable that is 20 m (65.6 ft) or shorter.

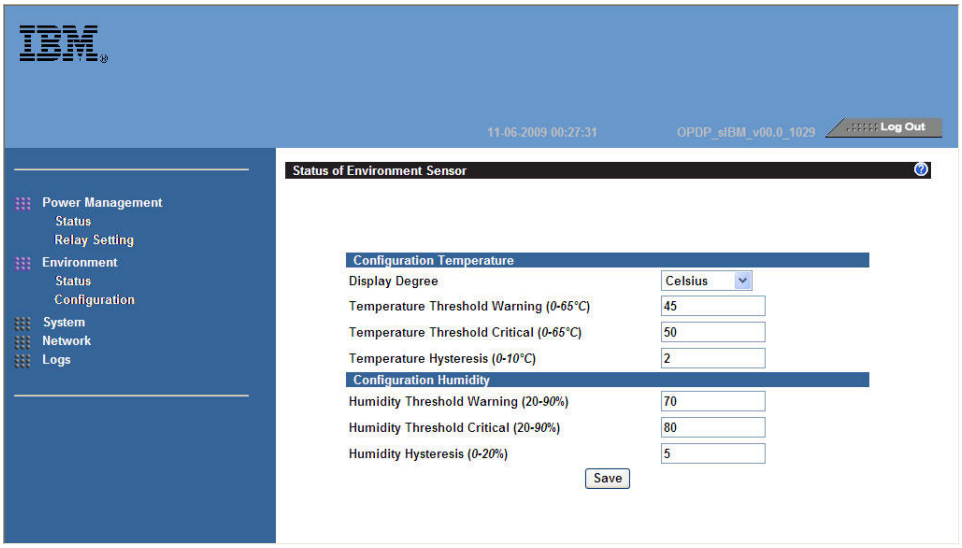
   The following illustration shows how to connect an Ethernet cable to a 1U PDU and to the PDU environment sensor.



3. Make sure that the PDU has a network connection, the power cord is connected, and the power to the PDU is turned on. The PDU environment sensor is automatically recognized by the PDU.
4. Start a web browser and connect to the PDU IP address (for more information, see “Using the web interface” on page 44). The web interface main status page opens. Click **Environment**, and then click **Status**. The Status of Environment Sensor page opens. The temperature and humidity status is automatically displayed.



5. Click **Environment**, and then click **Configuration**. The Configuration of Environment Sensor page opens. You can set the upper and lower ranges of temperature and humidity that will generate SNMP traps and e-mail notification, if the PDU is configured to do so.



Chapter 7. Customer replaceable unit parts

Replaceable components are of three types:

- **Tier 1 customer replaceable unit (CRU):** Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.
- **Tier 2 customer replaceable unit:** You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service that is designated for your server.
- **Field replaceable unit (FRU):** FRUs must be installed only by trained service technicians.

For information about the terms of the warranty, see the *Warranty Information* document that comes with the PDU. For more information about getting service and assistance, see Appendix A, “Getting help and technical assistance,” on page 63.

Important: The PDU does not contain any serviceable parts.

PDU description	Option part number	Tier 1 CRU part number
IBM 1U 9 C19 / 3 C13 Switched and Monitored DPI PDU (with removable power cord)	46M4002	46M4014
IBM 1U 9 C19 / 3 C13 Switched and Monitored 60 A three-phase PDU (with attached power cord)	46M4003	46M4015
IBM 1U 12 C13 Switched and Monitored DPI PDU (with removable power cord)	46M4004	46M4016
IBM 1U 12 C13 Switched and Monitored 60 A three-phase PDU (with attached power cord)	46M4005	46M4017
PDU environment sensor kit		46M5368
Mounting hardware kit		46M5293
IEC 309 32 A / 250 V 3P+N+Gnd power cord	40K9611	39M5427
IEC 309 32 A / 250 V P+N+Gnd power cord	40K9612	39M5428
IEC 309 63 A / 250 V P+N+Gnd power cord	40K9613	39M5429
NEMA L6 - 30P 30 A / 208 V P+P+Gnd power cord	40K9614	39M5430
IEC 309 2P+Gnd 60 A / 208 V power cord	40K9615	39M5431
Australia 32 A / 250 V P+N+Gnd power cord	40K9617	39M5433
Korea 30 A / 250 V P+N+Gnd power cord	40K9618	39M5434

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Chapter 8. PDU specifications

The tables in this chapter contain the product specifications of the PDUs.

The following table contains the descriptions of the PDUs. Match the numbers in the left column with the numbers for the rated voltage, rated current, and maximum power rating in the other tables in this section.

Note: In the following table, the PDU option part number and the power cord option part number are shown in parentheses.

1	DPI 32 amp / 250 V single-phase 1U 9 C19 / 3 C13 switched and monitored DPI PDU with IEC 309 P+N+Gnd connector (46M4002; 40K9612) **Note:** Special connector for Australia and New Zealand (not IEC 309): (46M4002; 40K9617)
2	DPI 60 amp / 208 V single-phase 1U 9 C19 / 3 C13 switched and monitored DPI PDU with IEC 309 2P+Gnd connector (46M4002; 40K9615)
3	DPI 63 amp / 250 V single-phase 1U 9 C19 / 3 C13 switched and monitored DPI PDU with IEC 309 P+N+Gnd connector (46M4002; 40K9613)
4	DPI 32 amp / 250 V three-phase 1U 9 C19 / 3 C13 switched and monitored DPI PDU with IEC 309 3P+N+Gnd connector (46M4002; 40K9611)
5	DPI 30 amp / 208 V single-phase 1U 9 C19 / 3 C13 switched and monitored DPI PDU with NEMA L6-30P (2P+Gnd) connector (46M4002; 40K9614)
5	DPI 30 amp / 208 V single-phase 1U 12 C13 switched and monitored DPI PDU with NEMA L6-30P (2P+Gnd) connector (46M4004; 40K9614)
6	DPI 60 amp / 208 V three-phase 1U 9 C19 / 3 C13 switched and monitored PDU with IEC 309 3P+Gnd connector (46M4003 with attached power cord)
6	DPI 60 amp / 208 V three-phase 1U 12 C13 switched and monitored PDU with IEC 309 3P+Gnd connector (46M4005 with attached power cord)
7	DPI 60 amp / 208 V single-phase 1U 12 C13 switched and monitored DPI PDU with IEC 309 2P+Gnd connector (46M4004; 40K9615)
8	DPI 32 amp / 250 V single-phase 1U 12 C13 switched and monitored DPI PDU with IEC 309 P+N+Gnd connector (46M4004; 40K9612) **Note:** Special connector for Australia and New Zealand (not IEC 309): (46M4004; 40K9617)
8	DPI 63 amp / 250 V single-phase 1U 12 C13 switched and monitored DPI PDU with IEC 309 P+N+Gnd connector (46M4004; 40K9613)
9	DPI 32 amp / 250 V three-phase 1U 12 C13 switched and monitored DPI PDU with IEC 309 3P+N+Gnd connector (46M4004; 40K9611)
13	DPI 30 amp / 250 V single-phase 1U 9 C19 / 3 C13 switched and monitored DPI PDU (with special Korea connector) P+N+Gnd connector (46M4002; 40K9618)

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Height	43.9 mm (1.73 in.)
Width	447 mm (17.6 in.)
Depth	350 mm (13.78 in.)
Additional clearance	25 mm (0.98 in.) for circuit breakers 3 mm (0.12 in.) for outlets
Weight (not including power cord)	6.3 kg (13.8 lb)
Weight of power cord (approximate, varies by PDU model)	5.4 kg (11.8 lb)
Operating temperature at 0 - 914 m (0 - 3000 ft) (room ambient)	10°C - 60°C (50°F - 140°F)
Operating temperature at 914 -2133 m (3000 - 7000 ft) (room ambient)	10°C - 60°C (50°F - 140°F)
Operating humidity	8% - 80% (noncondensing)
Localized air temperature in PDU	60°C (140°F) maximum

Rated voltage, rated current	**Maximum power rating**
1. 220 - 240 V ac, 32 amps, single-phase	1. 7680 VA
2. 200 - 208 V ac, 48 amps, single-phase	2. 9984 VA
3. 220 - 240 V ac, 63 amps, single-phase	3. 15120 VA
4. 220 - 240 V ac, 32 amps, three-phase Wye	4. 23040 VA
5. 200 - 208 V ac, 24 amps, single-phase	5. 4992 VA
6. 200 - 208 V ac, 48 amps, three-phase Delta	6. 17292 VA
7. 200 - 208 V ac, 48 amps, single-phase	7. 9984 VA
8. 220 - 240 V ac, 63 amps, single-phase	8. 15120 VA
9. 220 - 240 V ac, 32 amps, three-phase Wye	9. 23040 VA
10. 200 - 208 V ac, 48 amps, three-phase Delta	10. 17292 VA
11. 220 - 240 V ac, 32 amps, single-phase	11. 7680 VA
12. 200 - 208 V ac, 24 amps, single-phase	12. 4992 VA
13. 220 - 240 V ac, 30 amps, single-phase	13. 7200 VA

Rated frequency
50 - 60 Hz

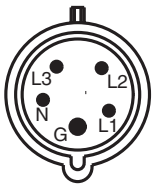
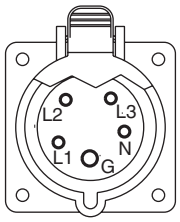
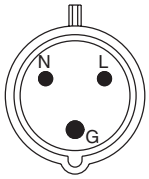
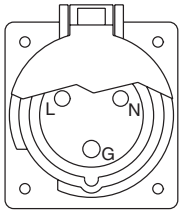
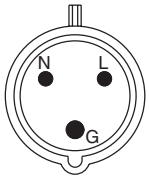
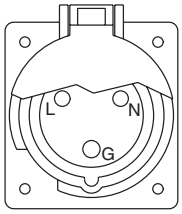
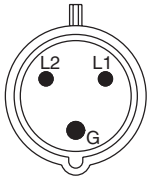
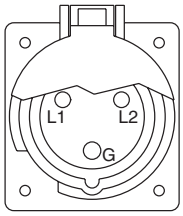
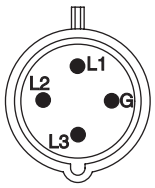
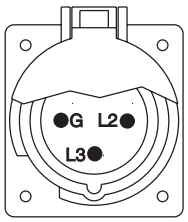
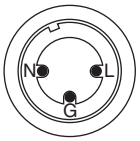
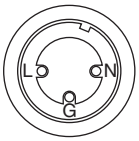
Circuit breakers
Nine double-pole branch rated circuit breakers rated at 20 amps for 1U C19 PDU models
Six double-pole branch rated circuit breakers rated at 20 amps for 1U C13 PDU models

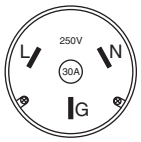
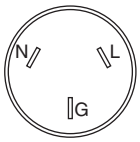
Power outlets

For C19 PDU models:
Nine IEC 320 - C19 outlets rated at 16 amps (VDE) / 20 amps (UL/CSA) and
Three IEC 320 - C13 outlets rated at 10 amps (VDE) / 15 amps (UL/CSA)

For 1U C13 PDU models:
Twelve IEC 320 - C13 outlets rated at 10 amps (VDE) / 15 amps (UL/CSA)

You must connect the connector on the power cord that comes with the PDU to a properly wired and grounded outlet. The following table shows illustrations of the power cord connector (plug) and the correct outlet for each of the PDUs.

PDU description	Plug	Outlet	Rating
DPI 32 amp / 250 V three-phase Enterprise C19 / C13 PDU+ (or PDU) with IEC 309 3P+N+Gnd connector			32 amps, 250 V ac IEC 309 3P+N+Gnd
DPI 32 amp / 250 V single-phase Enterprise C19 / C13 PDU+ (or PDU) with IEC 309 P+N+Gnd connector			32 amps, 250 V ac IEC 309 P+N+Gnd
DPI 63 amp / 250 V single-phase Enterprise C19 / C13 PDU+ (or PDU) with IEC 309 P+N+Gnd connector			63 amps, 250 V ac IEC 309 P+N+Gnd
DPI 30 amp / 208 V single-phase Enterprise C19 / C13 PDU+ (or PDU) with NEMA L6-30P (2P+Gnd) connector			30 amps, 250 V ac NEMA L6-30P (2P+Gnd)
DPI 60 amp / 208 V single-phase Enterprise C19 / C13 PDU+ (or PDU) with IEC 309 2P+Gnd connector			48 amps, 250 V ac IEC 309 2P+Gnd
DPI 60 amp / 208 V three-phase Enterprise C19 / C13 PDU+ (or PDU) with IEC 309 3P+Gnd connector			48 amps, 250 V ac IEC 309 3P+Gnd
DPI 32 amp / 250 V single-phase Enterprise C19 / C13 PDU+ (or PDU) P+N+Gnd (PDL P/N 56P332) Australia/New Zealand connector			32 amps, 250 V ac P/N 56S0332 P+N+Gnd

PDU description	Plug	Outlet	Rating
DPI 30 amp / 250 V single-phase Enterprise C19 / C13 PDU+ (or PDU) P+N+Gnd (Shin Ju P/N SJ-P3302) Korea connector			30 amps, 250 V ac P+N+Gnd

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. Use this information to obtain additional information about IBM and IBM products, determine what to do if you experience a problem with your IBM system or optional device, and determine whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated firmware and operating-system device drivers for your IBM product. The IBM Warranty terms and conditions state that you, the owner of the IBM product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your IBM service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
- If you have installed new hardware or software in your environment, check http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/ to make sure that the hardware and software is supported by your IBM product.
- Go to http://www.ibm.com/supportportal/ to check for information to help you solve the problem.
- Gather the following information to provide to IBM Support. This data will help IBM Support quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.
  - Hardware and Software Maintenance agreement contract numbers, if applicable
  - Machine type number (IBM 4-digit machine identifier)
  - Model number
  - Serial number
  - Current system UEFI and firmware levels
  - Other pertinent information such as error messages and logs
- Go to http://www.ibm.com/support/entry/portal/Open_service_request/ to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to IBM Support quickly and efficiently. IBM service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that

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contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/supportportal/. Also, some documents are available through the IBM Publications Center at http://www.ibm.com/shop/publications/order/.

Getting help and information from the World Wide Web

On the World Wide Web, up-to-date information about IBM systems, optional devices, services, and support is available at http://www.ibm.com/supportportal/. The address for IBM System x® information is http://www.ibm.com/systems/x/. The address for IBM BladeCenter® information is http://www.ibm.com/systems/bladecenter/. The address for IBM IntelliStation® information is http://www.ibm.com/systems/intellistation/.

How to send Dynamic System Analysis data to IBM

Use the IBM Enhanced Customer Data Repository to send diagnostic data to IBM. Before you send diagnostic data to IBM, read the terms of use at http://www.ibm.com/de/support/ecurep/terms.html.

You can use any of the following methods to send diagnostic data to IBM:

- **Standard upload:** http://www.ibm.com/de/support/ecurep/send_http.html
- **Standard upload with the system serial number:** http://www.ecurep.ibm.com/app/upload_hw
- **Secure upload:** http://www.ibm.com/de/support/ecurep/send_http.html#secure
- **Secure upload with the system serial number:** https://www.ecurep.ibm.com/app/upload_hw

Creating a personalized support web page

At http://www.ibm.com/support/mynotifications/, you can create a personalized support web page by identifying IBM products that are of interest to you. From this personalized page, you can subscribe to weekly email notifications about new technical documents, search for information and downloads, and access various administrative services.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with your IBM products. For information about which products are supported by Support Line in your country or region, see http://www.ibm.com/services/supline/products/.

For more information about Support Line and other IBM services, see http://www.ibm.com/services/, or see http://www.ibm.com/planetwide/ for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through your IBM reseller or IBM Services. To locate a reseller authorized by IBM to provide warranty service, go to http://www.ibm.com/partnerworld/ and click **Find Business Partners** on the right side of the page. For IBM support telephone numbers, see http://www.ibm.com/planetwide/. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

IBM Taiwan product service

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台灣國際商業機器股份有限公司
台北市松仁路 7 號 3 樓
電話：0800-016-888

IBM Taiwan product service contact information:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd.
Taipei, Taiwan
Telephone: 0800-016-888

Appendix B. Notices

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Microsoft, Windows, and Windows NT are trademarks of Microsoft Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Important notes

Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives that are available from IBM.

Maximum memory might require replacement of the standard memory with an optional memory module.

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IBM makes no representations or warranties with respect to non-IBM products. Support (if any) for the non-IBM products is provided by the third party, not IBM.

Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the device that is described in this document. Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the device to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If IBM determines that the levels of particulates or gases in your environment have caused damage to the device, IBM may condition provision of repair or replacement of devices or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 5. Limits for particulates and gases

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days

[1] ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

[2] The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.

[3] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

Documentation format

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This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks. Further certification may be required by law prior to making any such connection. Contact an IBM representative or reseller for any questions.

Electronic emission notices

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Class A statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

Attention: This is an EN 55022 Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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Germany Class A statement

Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

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Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem “Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)”. Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC EG Richtlinie 2004/108/EG) für Geräte der Klasse A

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:

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Der verantwortliche Ansprechpartner des Herstellers in der EU ist:

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Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

Japan VCCI Class A statement

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

Japan Electronics and Information Technology Industries Association (JEITA) statement

This statement applies to the following PDU models:

- 46M4002 - IBM 1U 9 C19 / 3 C13 Switched and Monitored DPI PDU
- 46M4004 - IBM 1U 12 C13 Switched and Monitored DPI PDU

高調波ガイドライン準用品

Japanese Electronics and Information Technology Industries Association (JEITA) Confirmed Harmonics Guideline with Modifications (products greater than 20 A per phase)

Japan Electronics and Information Technology Industries Association (JEITA) statement

This statement applies to the following PDU models:

- 46M4003 - IBM 1U 9 C19 / 3 C13 Switched and Monitored 60 A 3 Phase PDU

- 46M4005 - IBM 1U 12 C13 Switched and Monitored 60 A 3 Phase PDU

高調波ガイドライン適合品

Japanese Electronics and Information Technology Industries Association (JEITA) Confirmed Harmonics Guideline (products less than or equal to 20 A per phase)

Korea Communications Commission (KCC) statement

이 기기는 업무용(A급)으로 전자파적합기기로 서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목 적으로 합니다.

Please note that this equipment has obtained EMC registration for commercial use. In the event that it has been mistakenly sold or purchased, please exchange it for equipment certified for home use.

Russia Electromagnetic Interference (EMI) Class A statement

ВНИМАНИЕ! Настоящее изделие относится к классу А.
В жилых помещениях оно может создавать радиопомехи, для снижения которых необходимы дополнительные меры

People's Republic of China Class A electronic emission statement

中华人民共和国“A类”警告声明

声 明

此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

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警告使用者:
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

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