IBM

1U Higher Voltage DC PDU (240V/380V)
Installation and Maintenance Guide

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Installation and Maintenance Guide

IBM

> **Note**
>
> **Note:** Before using this information and the product it supports, read the general information in "Notices" on page 33, the *Warranty Information* document, and the *IBM Safety Information*, the *Supplemental Safety Notice L015*, and the *Environmental Notices and User Guide* documents on the IBM *Documentation* CD.

Contents

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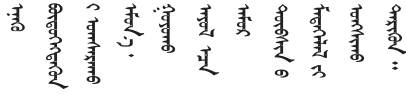
Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

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.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

مەزكۇر مەھسۇلاتنى ئورنتششتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

Youq mwngz yungh canjbinj neix gaxgonq, itdingh aeu doeg aen
canjbinj soengq cungj vahgangj ancien siusik.

Safety statements

These statements provide the caution and danger information that is used in this documentation.

Important:

Each caution and danger statement in this documentation 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* and the *Supplemental Safety Notice L015* documents.

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 documentation before you perform the procedures. Read any additional safety information that comes with your system 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.

L015

DANGER: Arc Flash/Arc Blast hazard when disconnected with power on. Turn off power before disconnecting. (L015)

Chapter 1. Introduction

The IBM® 1U Higher Voltage DC PDU (240V/380V) product enables you to connect up to six high-voltage dc devices to a single dedicated high-voltage dc power source. To prevent arcing, the PDU output connectors individually interrupt power when either end of the output power cable is disconnected. Power is only available at each output connector when it is connected to a compatible high-voltage dc device.

If documentation updates are available, you can download them from the IBM web site. 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, go to http://www.ibm.com/supportportal.

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

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
About this task

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:

- 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 racks)

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

- For vertical mounting instructions of the 1U PDU, see Chapter 2, "Installing the 1U PDU vertically in a rack," on page 7.
- For horizontal mounting instructions of the 1U PDU, see Chapter 3, "Installing the 1U PDU horizontally in a rack," on page 17.

Inventory checklist

The following parts come with the PDU.

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

- The PDU (with an attached power cord)
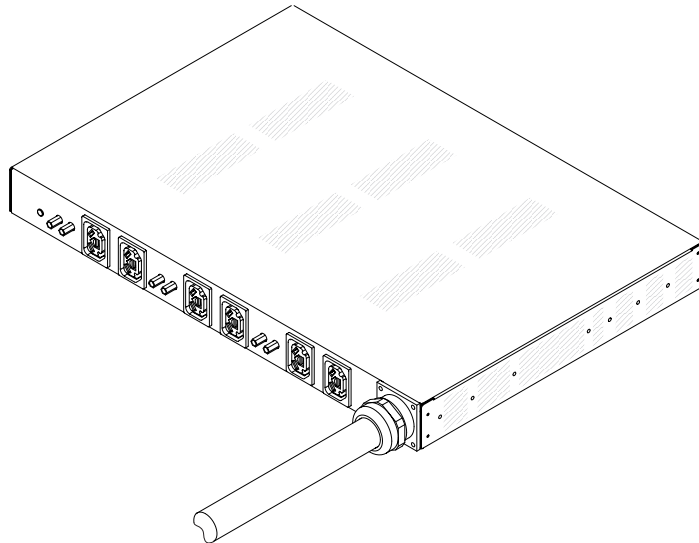
- Two vertical-mounting brackets (for all racks)
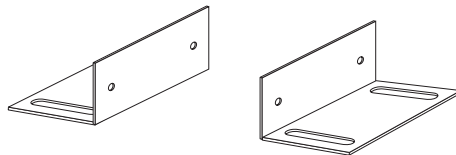
- Two short mounting brackets (for horizontal mounting in all racks; for vertical mounting only in IBM Enterprise racks)

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1. One U is equal to 4.45 cm (1.75 in.)
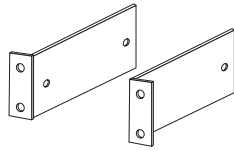
- Two adjustable mounting rails (for horizontal mounting in all racks)

  Note: The following illustration shows the two components of one adjustable mounting rail. The adjustable mounting rail might come pre-assembled.
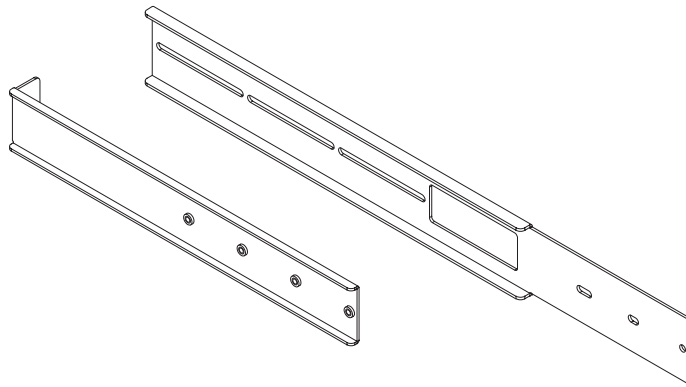
- One 1U blank filler panel

- Cable straps
- Miscellaneous hardware kit (for attaching the mounting brackets to the PDU and installing the PDU in a rack)

Note:
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.

Features of the PDU

The PDU has the following features:
- Wide input voltage range (192 - 400 V dc)
- High-current capability (90 A)
- Six 15 A high-voltage dc output connectors with individual circuit-breaker protection.
- Automatic power interruption on output connectors to prevent arcing during cable disconnection.

Hardware components

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

Front view

The following illustration shows the components and controls on the front of the PDU.
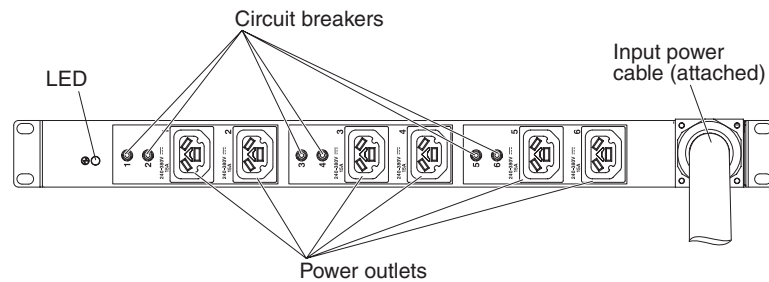
LED The green LED shows the PDU input voltage status. When this LED is lit, the PDU is receiving a sufficient level of dc input voltage. If the input voltage is too low, this LED is off.

Circuit breakers

If the load current rating for a power outlet exceeds 15 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 cable

You are responsible for making sure that only a Licensed Electrician installs or removes the PDU power cable from the DC Power source. All National and Local building code requirements must be met. IBM service technicians are not Licensed Electricians.

Power outlets

You can connect a device to each power outlet. There are six Rong Feng RF-203P power outlets, with smart-sensing power interruption capability, on the PDU.

Rear view

The following illustration shows the electrostatic discharge (ESD) connector on the rear of the PDU.
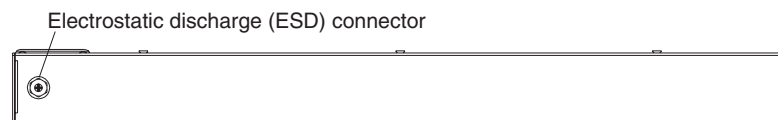
PDU load groups

The PDU dc input power is distributed as a single load group, as described in the following illustration and table.
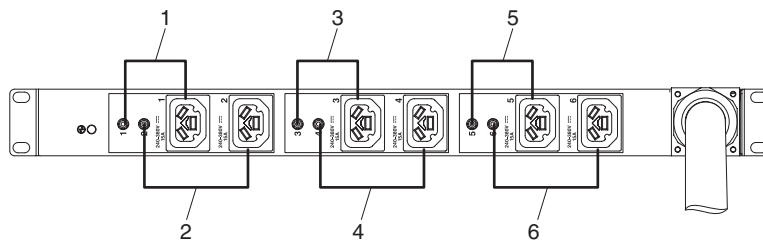
Table 1. PDU load group

Circuit breaker number	Associated front outlet
1	1
2	2
3	3
4	4
5	5
6	6

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

This chapter describes how to install the PDU vertically in a rack. To install the PDU in the side of an IBM Enterprise rack, see "Installing the PDU in the side of an IBM Enterprise rack only" on page 12. The PDU is a high-voltage dc device that must be connected to its input power source by a Licensed Electrician.

Attention: You are responsible for making sure that only a Licensed Electrician installs or removes the PDU power cable from the DC Power source. All National and Local building code requirements must be met. IBM service technicians are not Licensed Electricians.

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.	

Installing the PDU in the side of a rack

About this task

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 has movable side braces, see the rack documentation for information about relocating the side braces if they are not already spaced for this installation.

Attention: You must install the PDU with the front panel facing either the front or rear of the rack, either horizontally or vertically with the cable end at the bottom; do *not* install the PDU with the front panel facing up or down, or vertically with the cable end at the top.

Note:

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

- The PDU must be installed with the input power cord toward the bottom end of the PDU.

Review the documentation that comes with your rack for safety and cabling information. When you install the PDU in a rack, observe the following precautions:
- Make sure that the room air temperature is below 40°C (104°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.

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

Procedure
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 with the power outlets facing the rear or the front of the rack.

Long mounting bracket

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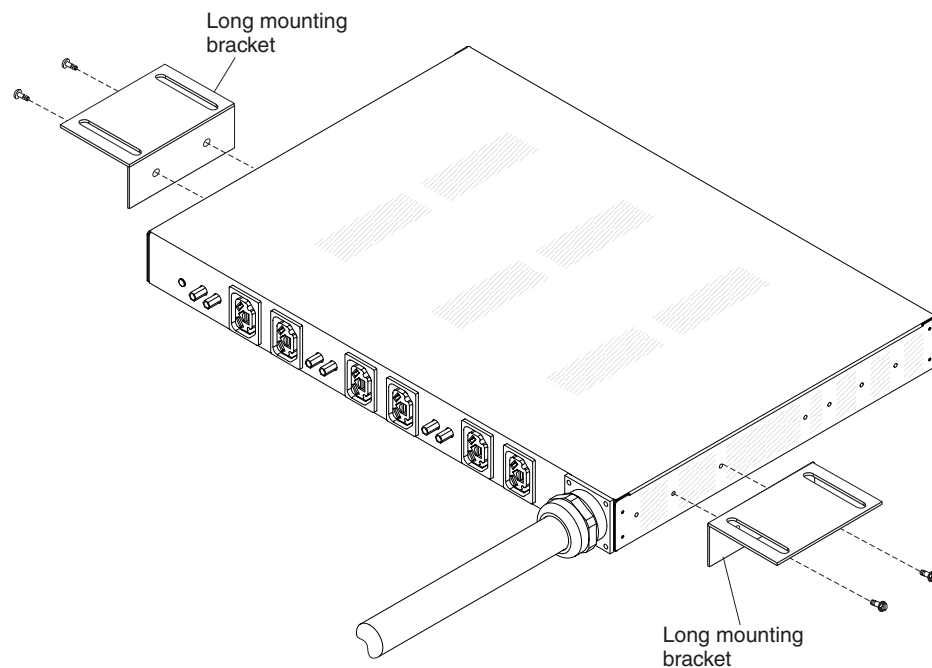
2. Hold the PDU in the side of the rack, and attach the vertical mounting brackets to the side braces with four M6 screws and nuts that come with the PDU.
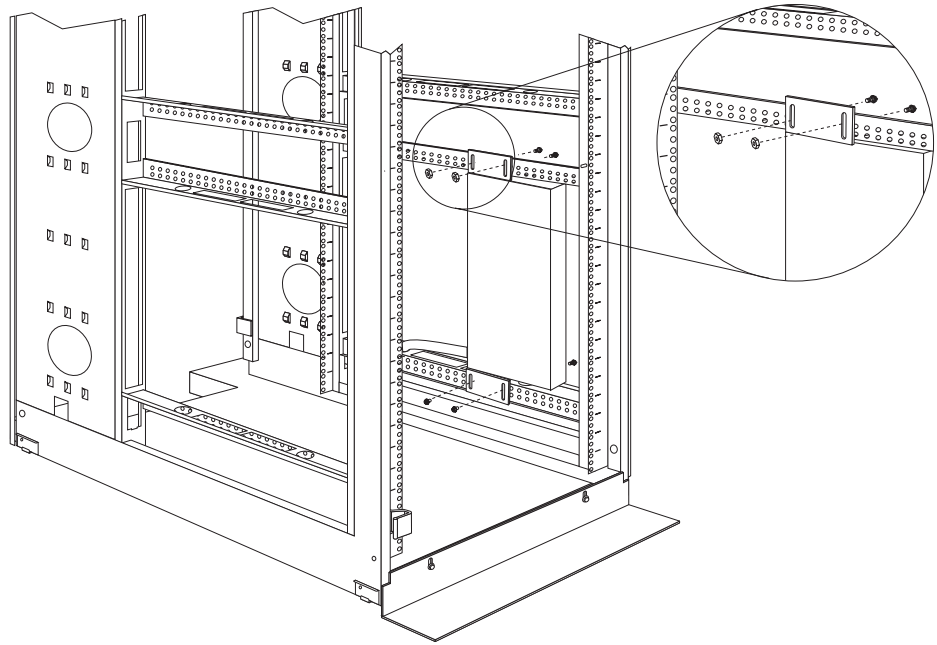
Note:

   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, leave enough space between the outlet side of the PDU and the EIA
      mounting flanges for the cable-management bracket installation.

3. Route the power cord from the PDU toward the rack side braces; then, route
   the power cord along a side brace toward the back of the rack, and secure the
   power cord with the cable straps that come with the PDU.

4. 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 to connect to a power source, use the openings in the rack.

   Attention:

   • You must disconnect the main input power before you connect or disconnect
     the input power cord of the PDU.

   • You are responsible for making sure that only a Licensed Electrician installs
     or removes the PDU power cable from the DC Power source. All National
     and Local building code requirements must be met. IBM service technicians
     are not Licensed Electricians.

5. Connect the power cord to a properly wired and grounded dedicated power
   source (see "Connecting input power" on page 23 for information); then, you
   can connect servers or rack PDUs in the rack to the power outlets on the PDU.

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

About this task

Attention: You must install the PDU with the front panel facing either the front or rear of the rack, either horizontally or vertically with the cable end at the bottom; do *not* install the PDU with the front panel facing up or down, or vertically with the cable end at the top.

Note:

- Removing the rack doors and side panels might make installation easier. See the rack documentation for more information.
- The PDU must be installed with the input power cord toward the bottom end of the PDU.

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

- Make sure that the room air temperature is below 40°C (104°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.
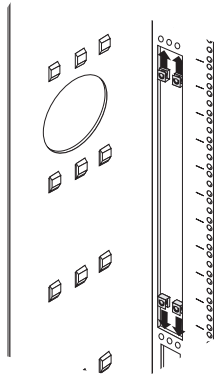
To install the PDU in the 1U mounting space in the side of an IBM Enterprise rack, complete the following steps:

Procedure

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.

Short mounting bracket
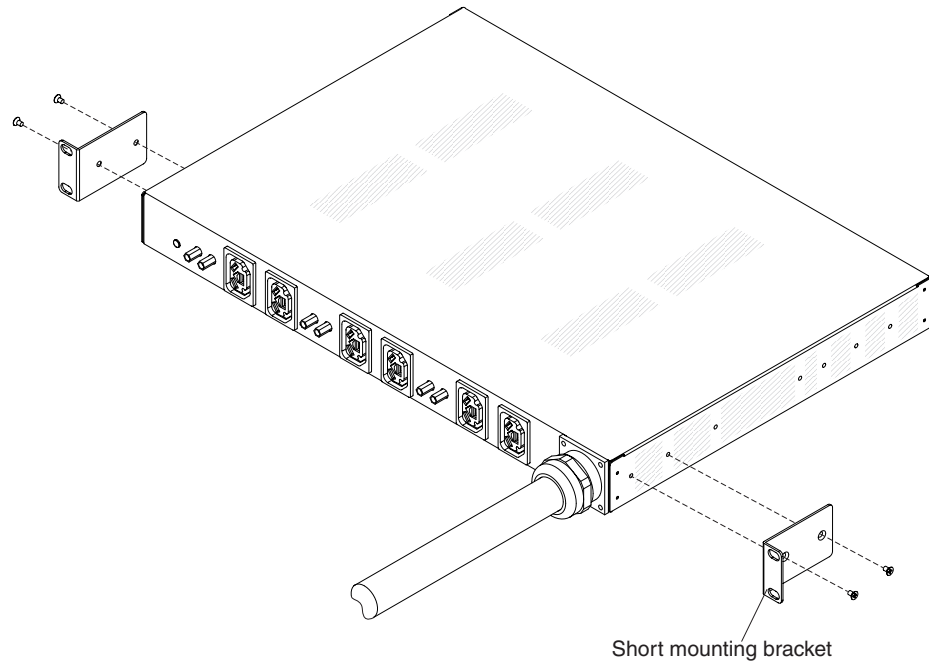
2. Attach the brackets to the PDU with two M3 x 5 screws per bracket. Use the screws that come with the PDU.

3. Align the PDU with the opening in the side of the rack; 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.
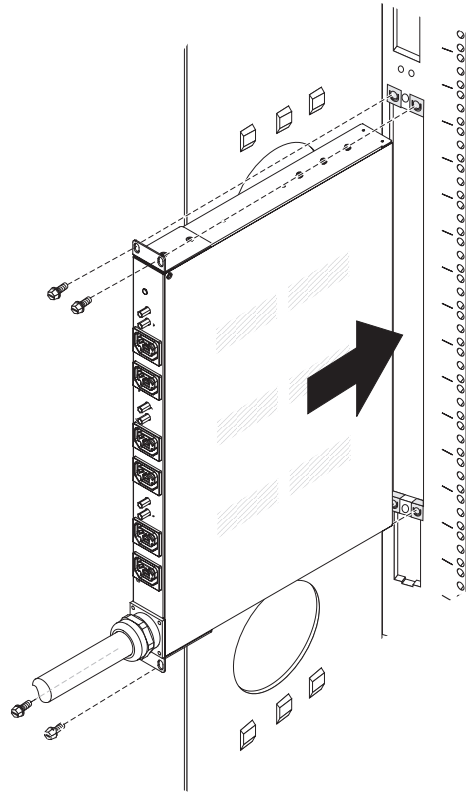
4. Route the power cord from the PDU along the side of the rack and secure the power cord with the cable straps that come with the PDU.

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 to connect to a power source, use the openings in the rack.

   Attention:
   - You must disconnect the main input power before you connect or disconnect the input power cord of the PDU.
   - You are responsible for making sure that only a Licensed Electrician installs or removes the PDU power cable from the DC Power source. All National and Local building code requirements must be met. IBM service technicians are not Licensed Electricians.

6. Connect the power cord to a properly wired and grounded dedicated power source (see "Connecting input power" on page 23 for information); then, you can connect servers or rack PDUs in the rack to the power outlets on the PDU.

7. 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

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

Note:

- Removing the rack doors and side panels might make installation easier. See the rack documentation for more information.
- The PDU can be installed horizontally with the input power cord toward the right or left side of the PDU.

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

- Make sure that the room air temperature is below 40°C (104°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.
- Install the heaviest device in the bottom of the rack.
- Do not extend more than one device out of the rack 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.

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

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, 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.

Short mounting bracket
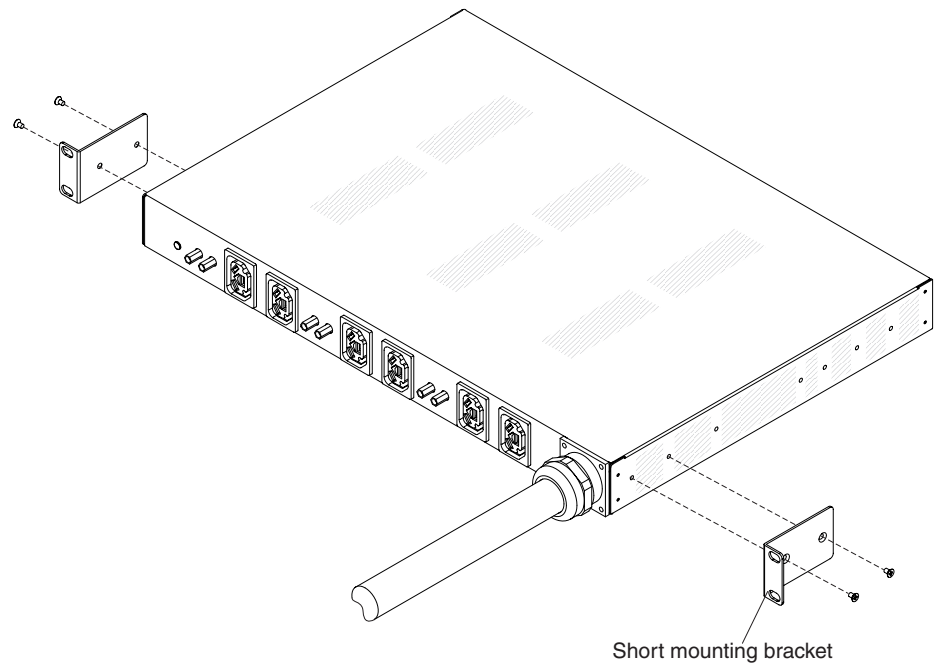
2. If the adjustable mounting rail is not assembled, complete the following steps to assemble it:

   a. Align the two parts of the adjustable mounting rail as shown in the following illustration.

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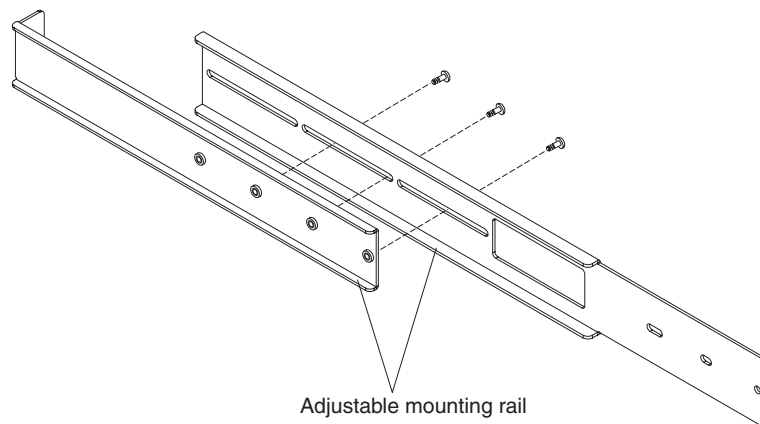
   b. Secure the two adjustable mounting rail parts with three screws that come with the rack-mounting kit.

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.

Adjustable mounting rails
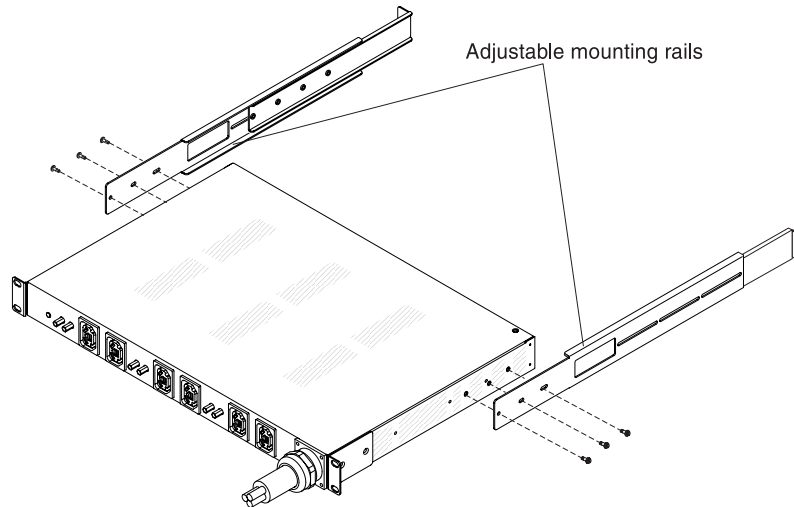
4. Orient the PDU so that the vent holes are facing up. Hold the PDU at a slight angle and carefully insert it into the 1U mounting space in the rack. Pushing in slightly on both of the adjustable mounting rails helps clear the rails from the rack flanges.

5. Secure the end of the PDU that has the short mounting brackets to the rack 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.
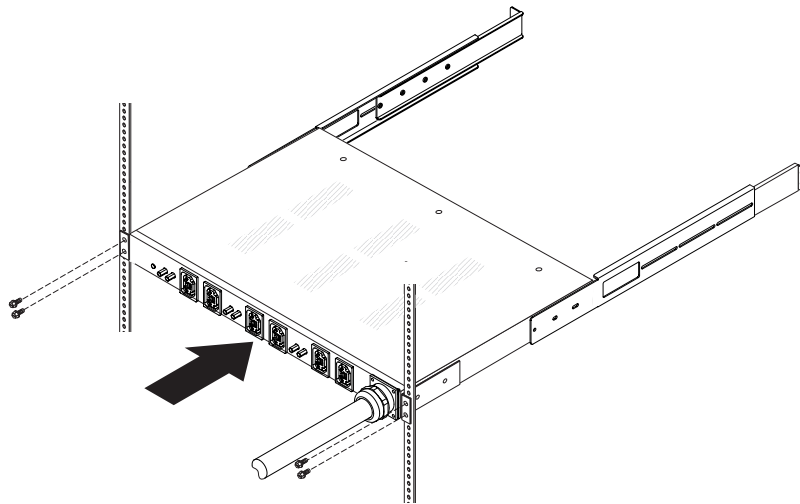
6. Secure the adjustable mounting rails and the 1U blank filler panel to the rack.

Blank filler panel
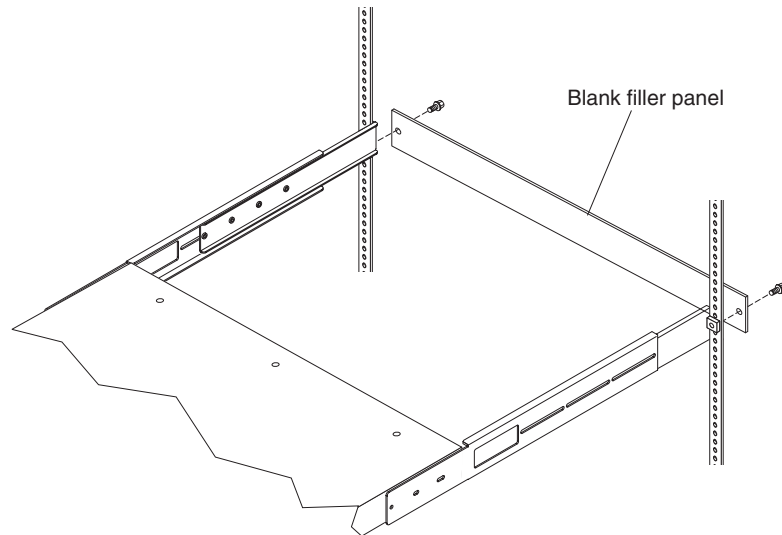
a. Install a cage nut or clip nut in the applicable hole in the rack flange on each side of the rack.

b. Adjust the adjustable mounting rails to fit the depth of the rack.

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. Use one M6 screw per mounting rail.

f. Tighten the M3 pan-head screws that secure the adjustable mounting rails to the PDU.

7. Route the power cord from the PDU toward the rack side braces; then, route the power cord along a side brace toward the back of the rack, and secure the power cord with the cable straps that come with the PDU.

8. 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 to connect to a power source, use the openings in the rack.

   Attention:

   • You must disconnect the main input power before you connect or disconnect the input power cord of the PDU.

   • You are responsible for making sure that only a Licensed Electrician installs or removes the PDU power cable from the DC Power source. All National and Local building code requirements must be met. IBM service technicians are not Licensed Electricians.

9. Connect the power cord to a properly wired and grounded dedicated power source (see "Connecting input power" on page 23 for information); then, you can connect servers or rack PDUs in the rack to the power outlets on the PDU.

10. 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 the PDU to a power source and about connecting devices.

Connecting input power

The PDU is a high-voltage dc device that must be connected to its input power source by a Licensed Electrician.

L015

DANGER: **Arc Flash/Arc Blast hazard when disconnected with power on. Turn off power before disconnecting. (L015)**

Attention: You are responsible for making sure that only a Licensed Electrician installs or removes the PDU power cable from the DC Power source. All National and Local building code requirements must be met. IBM service technicians are not Licensed Electricians.

The PDU input power cable is 4.3 m (14.1 ft.) in length, with a pig-tail termination. It has three stranded copper conductors, each with a cross section of 25 sq. mm (approximately 2 AWG).

The PDU requires a high-voltage dc power source between 240 V dc and 380 V dc with 90 A capacity.

The PDU conductors are connected to a high-voltage dc power source of as described in the table. All connections must be performed by a licensed electrician, following local electrical codes or requirements.

Table 2. PDU input cable connection

Wire color	Function
Green-yellow	Earth ground
Blue	Negative dc voltage
Brown	Positive dc voltage

Connecting output devices

The PDU power outlets are for connecting high-voltage dc devices. Connect a device to a power outlet on the PDU with the power cord that comes with the device. See the documentation that comes with your high-voltage dc device for information and instructions.

Chapter 5. 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 and getting service and assistance, see the *Warranty Information* document.

Attention: You are responsible for making sure that only a Licensed Electrician installs or removes the PDU power cable from the DC Power source. All National and Local building code requirements must be met. IBM service technicians are not Licensed Electricians.

Important: The PDU does not contain any serviceable parts.

PDU description	Option part number	Tier 1 CRU part number	FRU part number
IBM 1U Higher Voltage DC PDU (240V/380V) (with power cord)	44T0966		44T0969
Mounting hardware kit		46M5293	

Chapter 6. PDU specifications

This chapter contains the product specifications of the PDU.

Height	42 mm (1.65 in.)
Width	444 mm (17.5 in.)
Depth	305 mm (12 in.)
Additional clearance	25 mm (0.98 in.) for circuit breakers 3 mm (0.12 in.) for outlets
Length of power cord	4.3 m (14.1 ft.)
Weight (including power cord)	10 kg (22 lb)
Operating temperature at 0 - 1524 m (0 - 5000 ft) (room ambient)	5°C - 57°C (41°F - 134.6°F)
Operating humidity	8% - 85% (noncondensing)
Shipping and storage temperature at 0 - 1524 m (0 - 5000 ft) (room ambient)	-40°C - 60°C (-40°F - 140°F)
Shipping and storage humidity	5% - 100% (includes condensing)
Localized air temperature in PDU	40.6°C (105°F) maximum

Rated voltage, rated current	**Maximum power rating**
192 - 400 V dc, 90 amps	36 000 VA
Rated frequency	
Direct current (dc) 0 Hz	
Circuit breakers	
Six double-pole branch rated circuit breakers rated at 15 amps.	
Power outlets	
Six Rong Feng RF-203P outlets rated at 15 amps (TUV/CSA)	

The high-voltage dc power cord that comes with the PDU must be connected to a properly wired and grounded high-voltage dc power source by a licensed electrician. See "Connecting input power" on page 23 for additional information.

Appendix. 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.

If you believe that you require IBM to perform warranty service on your IBM product, the IBM service technicians will be able to assist you more efficiently if you prepare before you call.

- Check for updated software, 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.

  Determine whether the firmware and device drivers for the devices in the IBM Flex System Enterprise Chassis are up to date. You can use the IBM Flex System Manager Update Manager to automatically acquire, install, and manage firmware and device-driver updates for the devices in the chassis.

- 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

- Submit a manual service request through the IBM Flex System Manager management software. When you submit a manual service request, service data about the problem is included in the request, which will help IBM Support more quickly begin to diagnose the problem.

- 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.

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.

You can find the most up-to-date information for the IBM Flex System product family at http://pic.dhe.ibm.com/infocenter/flexsys/information/index.jsp.

Getting help and information from the World Wide Web

Up-to-date information about IBM products and support is available on 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.

You can find the most up-to-date product information for the IBM Flex System product family at http://pic.dhe.ibm.com/infocenter/flexsys/information/index.jsp.

How to send DSA 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

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 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**. 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

Use this information to contact IBM Taiwan product service.

台灣 IBM 產品服務聯絡方式：
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

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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.

Each solid-state memory cell has an intrinsic, finite number of write cycles that the cell can incur. Therefore, a solid-state device has a maximum number of write cycles that it can be subjected to, expressed as `total bytes written` (TBW). A device that has exceeded this limit might fail to respond to system-generated commands or might be incapable of being written to. IBM is not responsible for replacement of a device that has exceeded its maximum guaranteed number of program/erase cycles, as documented in the Official Published Specifications for the device.

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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 3. 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

The publications for this product are in Adobe Portable Document Format (PDF) and should be compliant with accessibility standards. If you experience difficulties when you use the PDF files and want to request a web-based format or accessible PDF document for a publication, direct your mail to the following address:

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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

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

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 might 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.

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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.

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Responsible manufacturer:

International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
914-499-1900

European Community contact:

IBM Deutschland GmbH
Technical Regulations, Department M372
IBM-Allee 1, 71139 Ehningen, Germany
Telephone: +49 7032 15 2941
Email: lugi@de.ibm.com

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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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Technical Regulations, Abteilung M372
IBM-Allee 1, 71139 Ehningen, Germany
Telephone: +49 7032 15 2941
Email: lugi@de.ibm.com

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Japan Electronics and Information Technology Industries Association (JEITA) statement

高調波ガイドライン準用品

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

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Index

A

accessible documentation   36
assistance, getting   29
attention notices   2
Australia Class A statement   37

C

Canada Class A electronic emission
  statement   37
caution statements   2
China Class A electronic emission
  statement   39
circuit breakers   5
Class A electronic emission notice   36
components and controls
    PDU front   5
connecting the PDU
    to input power   23
    to output devices   23
contamination, particulate and
  gaseous   35
CRU part numbers   25

D

danger statements   2
documentation
    format   36
    using   30
documentation CD   1
DSA, sending data to IBM   30

E

electronic emission Class A notice   36
European Union EMC Directive
  conformance statement   37

F

FCC Class A notice   36
features of PDU   4

G

gaseous contamination   35
Germany Class A statement   37
green LED   5

H

hardware service and support telephone
  numbers   31
help
    from the World Wide Web   30
    from World Wide Web   30
    sending diagnostic data to IBM   30

help *(continued)*
    sources of   29
horizontal mounting in rack   18

I

IBM Taiwan product service   31
important notices   2, 34
information center   30
input power cable   5
installation requirements   3
inventory checklist   3

J

Japan Class A electronic emission
  statement   38
Japan Electronics and Information
  Technology Industries Association
  statement   39
JEITA statement   39

K

Korea Class A electronic emission
  statement   39

L

LED, green   5
load groups, PDU   6

N

New Zealand Class A statement   37
notes   2
notes, important   34
notices   33
    electronic emission   36
    FCC, Class A   36
notices and statements   2

O

option package contents   3

P

particulate contamination   35
parts that come with PDU   3
PDU
    connecting input power   23
    connecting output devices   23
    connecting the power cord   8, 12
    CRU part numbers   25
    features   4
    front view components and
      controls   5

PDU *(continued)*
    horizontal mounting in rack   18
    installation requirements   3
    load groups   6
    parts that come with   3
    rear view   5
    specifications   27
    vertical mounting in rack (1U
      PDU)   8
People's Republic of China Class A
  electronic emission statement   39
power cable, input   5
power cord, connecting   12
power outlets   5
product service, IBM Taiwan   31

R

rack-mounting
    horizontal   18
    vertical (1U PDU)   8
rear view of PDU   5
requirements, installation   3
Russia Class A electronic emission
  statement   39

S

safety   v
safety statements   v, vi
sending diagnostic data to IBM   30
service and support
    before you call   29
    hardware   31
    software   31
software service and support telephone
  numbers   31
specifications, PDU   27
statements and notices   2

T

Taiwan Class A electronic emission
  statement   39
telecommunication regulatory
  statement   36
telephone numbers   31
trademarks   33

U

United States FCC Class A notice   36

V

vertical mounting in rack (1U PDU)   8

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