0U 24 C13 Basic PDUs and
0U 12 C19 / 12 C13 Basic PDUs

IBM

Installation and Maintenance Guide

0U 24 C13 Basic PDUs and
0U 12 C19 / 12 C13 Basic PDUs

IBM

Installation and Maintenance Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, "Notices," on page 25 and see the *Warranty Information* document that comes with your power distribution unit (PDU).

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.

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.

Important:
- The PDU does not contain any serviceable parts.
- Make sure that the power receptacle is near the equipment and is easily accessible so that the PDU can be disconnected quickly.

To reduce the risk of fire, connect only to a circuit provided with branch circuit overcurrent protection with an ampere rating in accordance with the National Electrical Code (NEC), ANSI/NFPA 70 or your local electrical code:

Model part number	i/p breaker	Note
46M4122, 46M4123, 46M4124	16 A/4 poles	IEC/EN 60934 contact air gap need 3 mm
46M4125, 46M4126, 46M4127	30 A/3 poles	UL489/CSA C22.2 No.5.1
46M4128, 46M4129, 46M4130	30 A/2 poles	UL489/CSA C22.2 No.5.1
46M4131, 46M4132, 46M4133	32 A/2 poles	IEC/EN 60934 contact air gap need 3 mm
46M4140, 46M4141, 46M4142	50 A/3 poles	UL489/CSA C22.2 No.5.1
46M4143, 46M4144, 46M4145	32 A/4 poles	IEC/EN 60934 contact air gap need 3 mm

Chapter 1. Introduction

The IBM® 0U PDU products enable you to connect up to 12 C19 devices or up to 24 C13 devices (depending on the PDU model) to a single dedicated power source.

The following PDU models are available.

Note: Each PDU model comes with an attached power cord.
- 46M4122 - IBM 0U 24 C13 16 A Basic PDU
- 46M4125 - IBM 0U 24 C13 30 A Basic PDU*
- 46M4128 - IBM 0U 24 C13 30 A Basic PDU*
- 46M4131 - IBM 0U 24 C13 32 A Basic PDU
- 46M4140 - IBM 0U 12 C19 / 12 C13 50 A Basic PDU*
- 46M4143 - IBM 0U 12 C19 / 12 C13 32 A Basic PDU

* The North America Regulatory Derated Current for the models marked with an asterisk (*) is shown in Table 7 on page 20.

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.
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)

The PDU is installed vertically in the side of a rack cabinet. For more information, see Chapter 2, "Installing the PDU vertically in a rack cabinet," on page 9.

Inventory checklist

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

The following parts come with all PDU models:
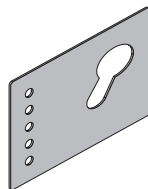- One of the following PDU model types:
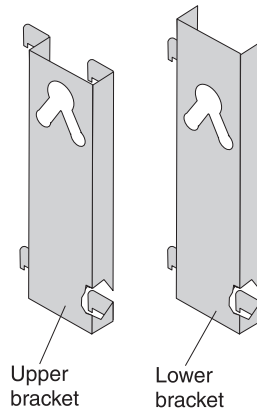   - 0U 24 C13 PDU with an attached power cord
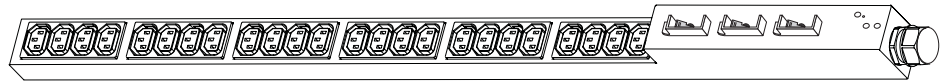
    - 0U 12 C19 / 12 C13 PDU with an attached power cord

- The following 0U PDU mounting brackets.
    - For an IBM S2 42U Standard Rack cabinet (Types 9307, 9956) (two brackets)

    - For an IBM Enterprise Rack cabinet (Types 1410, 9308) (one upper bracket and one lower bracket)

Upper bracket   Lower bracket

- 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.

Features of the PDU

The basic PDU models have the following features:

- Electronic over current protection
- High capacity up to 22 kW
- Resettable circuit breakers
- UL489 rated circuit breakers

Front view components and controls

The following illustration shows the components and controls on the front of the Basic PDU with 24 C13 outlets on the front.
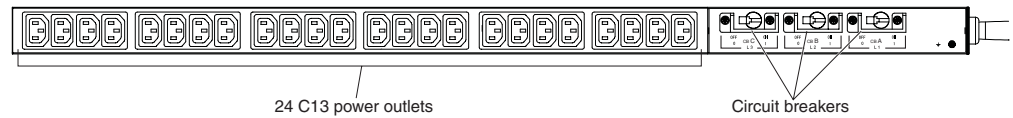
24 C13 power outlets   Circuit breakers

The following illustration shows the components and controls on the front of the Basic PDU with 12 C19 and 12 C13 outlets on the front.

C19 power outlets   C13 power outlets   Circuit breakers

C13 and C19 power outlets
> You can connect a device to each of the power outlets.

Circuit breakers
> If the load current rating of a power outlet exceeds 20 A, the associated circuit breaker is activated through a toggle handle, and power to the outlet is turned off automatically. To reset the circuit breaker, turn the breaker from Off to On.
>
> **Note:** To manually disconnect power to a device that is connected to the PDU, disconnect the device power cord from the PDU power outlet.

PDU load groups

The PDU load groups are described in the following tables.

Table 1. 0U 24 C13 Basic PDU load groups

Circuit breaker number	Associated outlets
1	1
	2
	3
	4
	5
	6
	7
	8
2	9
	10
	11
	12
	13
	14
	15
	16
3	17
	18
	19
	20
	21
	22
	23
	24

Table 2. 0U 12 C19 / 12 C13 Basic PDU load groups

Circuit breaker number	Associated outlets
1	1
	2
	3
	4
2	5
	6
	7
	8
3	9
	10
	11
	12
4	13
	14
	15
	16
5	17
	18
	19
	20
6	21
	22
	23
	24

Circuit breakers

Each Basic PDU has a 20 A supplemental circuit breaker for each pair of the six or 12 outlets. These circuit breakers are on the front of the PDU, as shown in the illustrations in "Front view components and controls" on page 5.

Chapter 2. Installing the PDU vertically in a rack cabinet

This chapter describes how to install the PDU vertically in one of the following rack cabinets:

- IBM S2 42U Standard Rack Cabinet (Types 9307 and 9956)
- IBM Enterprise Rack Cabinet (Types 1410 and 9308)
- Rack cabinet with integrated PDU mounting keyholes

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.	

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.

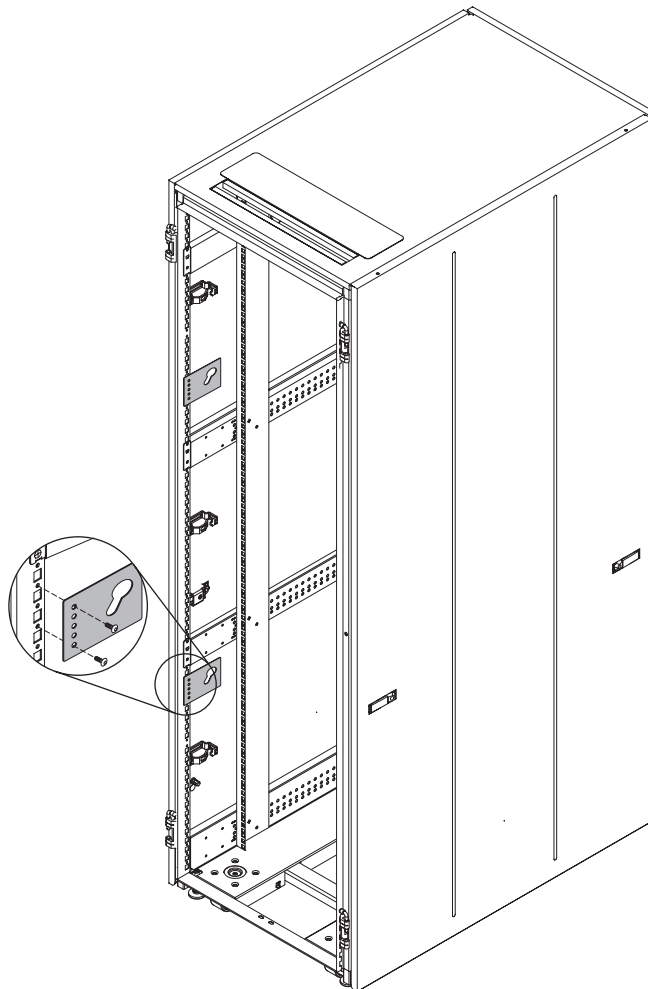# Installing the PDU in an IBM S2 42U Standard Rack cabinet (Types 9307 and 9956)

Note: Depending on the requirements for your rack cabinet configuration, you might want to mount the PDU in a location other than what is described in the following procedure.

To install the PDU in the 1U mounting space in the side of an IBM S2 42U Standard Rack cabinet, complete the following steps:
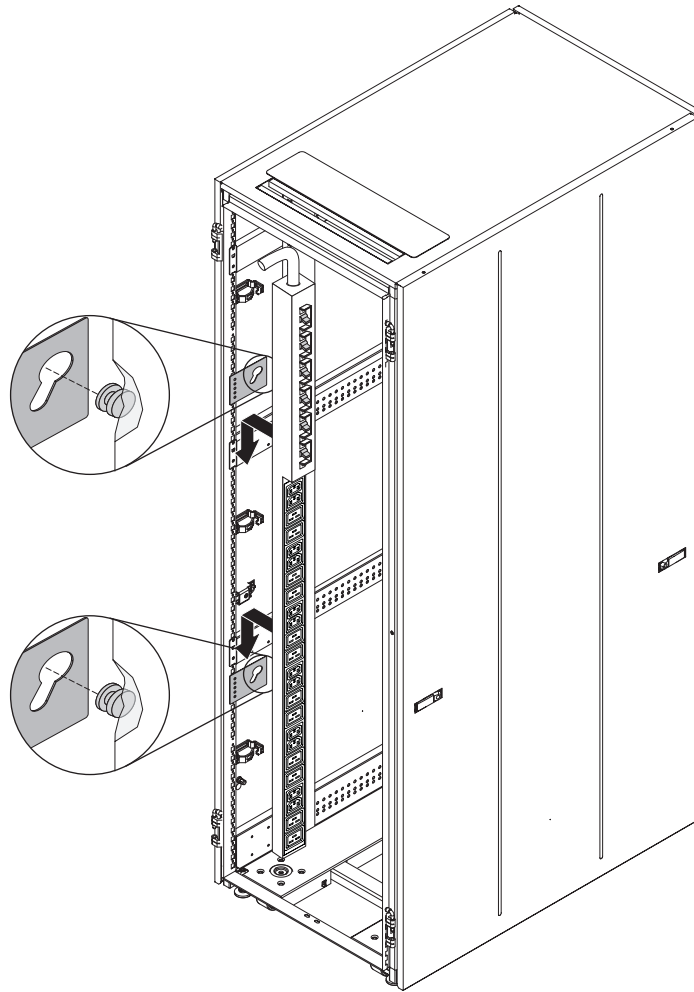
1. Select the correct rack-mounting brackets for the S2 42U rack cabinet from the hardware kit that comes with the PDU. You need two rack-mounting brackets. The correct bracket is shown in the following illustration.
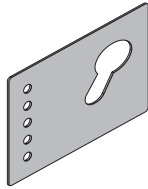
2. Align the holes in the top rack-mounting bracket with the holes in the rack frame. Secure the bracket to the rack frame with two M5 screws that come with the hardware kit. Repeat this step for the bottom rack-mounting bracket.

3. Orient the PDU vertically and insert the two pegs on the PDU into the keyhole slots in the rack-mounting brackets. Push down to secure the PDU in position.

Installing the PDU in an IBM Enterprise Rack cabinet (Types 1410 and 9308)

Note: Depending on the requirements for your rack cabinet configuration, you might want to mount the PDU in a location other than what is described in the following procedure.

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

1. Select the correct rack-mounting brackets for the Enterprise rack cabinet from the hardware kit that comes with the PDU. You need one upper and one lower rack-mounting bracket. The correct brackets are shown in the following illustration.

Upper bracket   Lower bracket
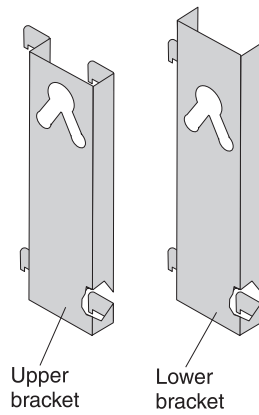
2. Align the upper rack-mounting bracket with the holes in the rack frame. The correct placement in the rack cabinet for the brackets is shown in the following illustration. Insert the bracket mounting tabs into the holes in the frame and then push the bracket to the left to secure it. Repeat this step for the lower rack-mounting bracket.

Note: If you mount the PDU in the opposite side of the rack cabinet from what is shown in the following illustration, you must push the rack-mounting bracket to the right to secure it.

Upper bracket

Lower bracket
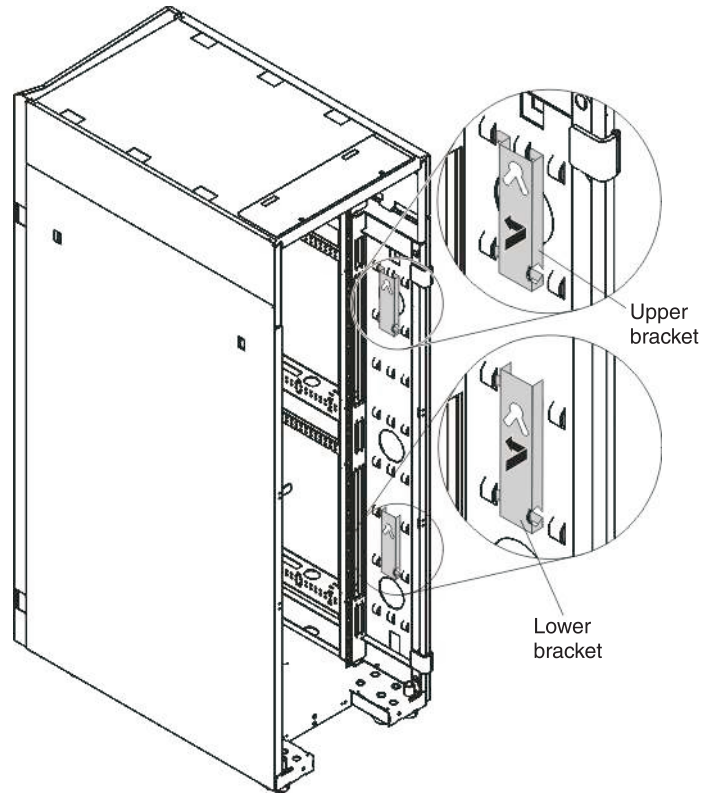
3. Orient the PDU vertically and insert the two pegs on the PDU into the keyhole slot in both rack-mounting brackets. Push down to secure the PDU in position.
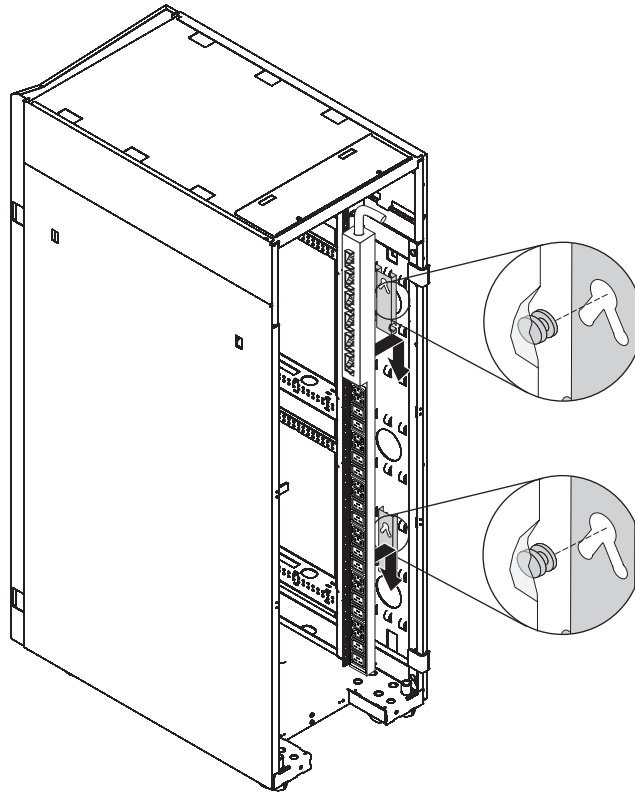
Installing the PDU in a rack cabinet with integrated PDU mounting keyholes

Note: Depending on the requirements for your rack cabinet configuration, you might want to mount the PDU in a location other than what is described in the following procedure.

Use the procedure in this section to install the PDU in a rack cabinet that has PDU mounting keyhole slots integrated in the sides of the rack cabinet.

To install the PDU in the side of a rack cabinet that has integrated PDU mounting keyholes, complete the following steps:

1. Select the location for the PDU in the rear of the rack cabinet.
2. Orient the PDU vertically and insert the two pegs on the PDU into the keyhole slots in the side of the rack cabinet (see the following illustration). Push down to secure the PDU in position.
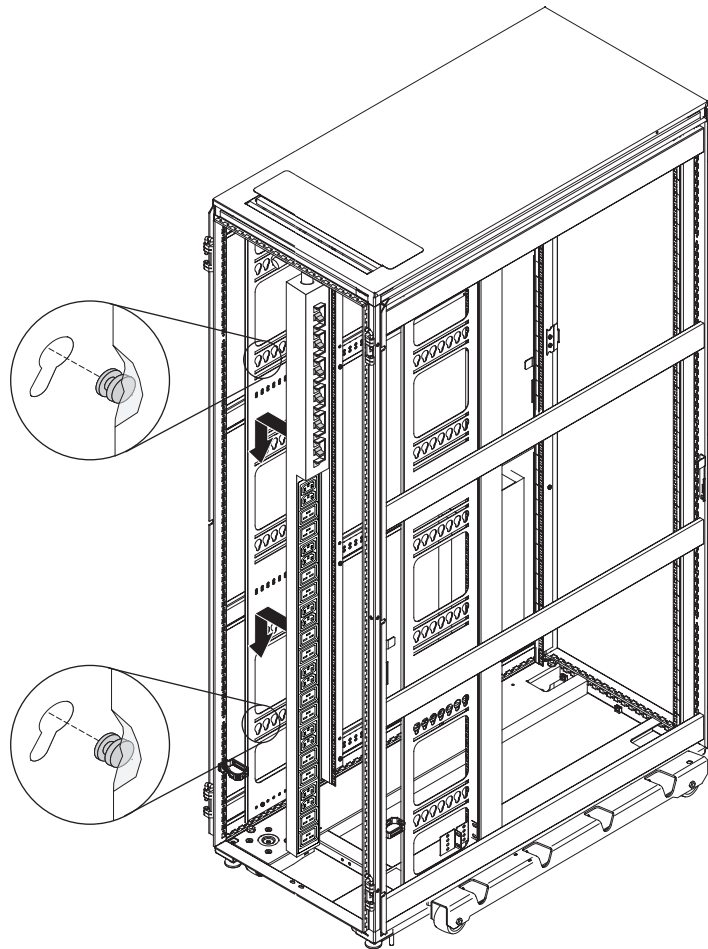
Chapter 3. Replaceable PDU parts

The replaceable PDU parts are Tier 1 customer replaceable units (CRUs). 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.

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 23.

Important: The PDU does not contain any serviceable parts.

Table 3. Basic PDU customer replaceable unit part numbers

PDU description	Option part number	Tier 1 CRU part number
IBM 0U 24 C13 16 A Basic PDU (with attached power cord)	46M4122	46M4124
IBM 0U 24 C13 30 A Basic PDU (with attached power cord)	46M4125	46M4127
IBM 0U 24 C13 30 A Basic PDU (with attached power cord)	46M4128	46M4130
IBM 0U 24 C13 32 A Basic PDU (with attached power cord)	46M4131	46M4133
IBM 0U 12 C19 / 12 C13 50 A Basic PDU (with attached power cord)	46M4140	46M4142
IBM 0U 12 C19 / 12 C13 32 A Basic PDU (with attached power cord)	46M4143	46M4145
Strip (0U) miscellaneous hardware kit		81Y2345

Chapter 4. PDU specifications

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

Table 4 contains the descriptions of the PDUs. The PDU numbers in the left column in Table 4 correspond to the PDU numbers in the other specifications tables in this chapter.

Table 4. PDU descriptions

PDU number	PDU description
1	16 amp / 240 V three-phase 0U 24 C13 Basic PDU with IEC 309 3P+N+Gnd connector
2	30 amp / 208 V three-phase 0U 24 C13 Basic PDU with NEMA fixed 3M L21-30P connector
3	30 amp / 208 V single-phase 0U 24 C13 Basic PDU with NEMA fixed 3M L6-30P connector
4	32 amp / 240 V single-phase 0U 24 C13 Basic PDU with IEC 309 P+N+Gnd connector
5	50 amp / 208 V three-phase 0U 12 C19 & 12 C13 Basic PDU with fixed 3 M 50 A connector
6	32 amp / 240 V three-phase 0U 12C19 & 12 C13 Basic PDU with fixed 3M IEC 309 3P+N+Gnd connector

Table 5. PDU operating specifications

Height	85 mm (3.35 in.)
Width	44.5 mm (1.75 in.)
Depth	900 mm (35.43 in.) (PDU numbers 1, 2, 3, and 4) 1200 mm (47.24 in.) (PDU numbers 5 and 6)
Additional clearance	25 mm (0.98 in.) for circuit breakers
Operating temperature at 0 - 914 m (0 - 3000 ft) (room ambient)	0°C - 55°C (32°F - 122°F)
Operating temperature at 914 -2133 m (3000 - 7000 ft) (room ambient)	0°C - 55°C (32°F - 122°F)
Operating humidity	5% - 90% (noncondensing)
Localized air temperature in PDU	55°C (122°F) maximum
Maximum operating altitude	3048 m (10,000 ft)

Table 6. PDU weight (includes attached power cord)

PDU number (see Table 4)	Weight
1	5.5 kg (12.1 lb)
2	6.2 kg (13.7 lb)
3	5.5 kg (12.1 lb)
4	5.4 kg (11.9 lb)
5	9.7 kg (21.4 lb)
6	7.8 kg (17.2 lb)
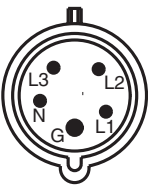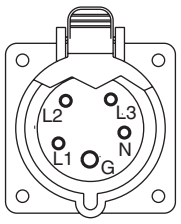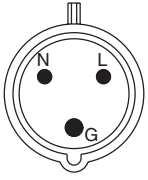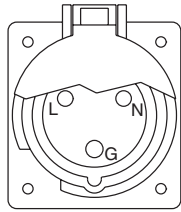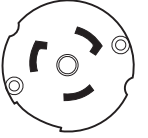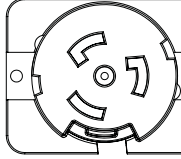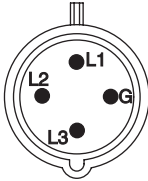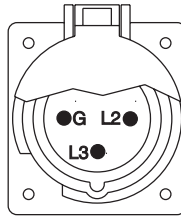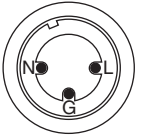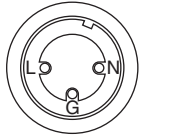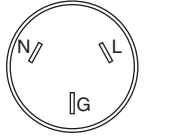
Table 7. PDU electrical specifications
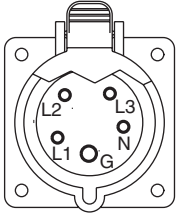
PDU number (see Table 4 on page 19)	Rated voltage, rated current	Maximum power rating
1	220 -240 V ac, 16 amps, three-phase	4320 VA
2	200 -208 V ac, 30 amps, three-phase (North America Regulatory Derated Current 24 A)	18720 VA
3	200 -208 V ac, 30 amps, single-phase (North America Regulatory Derated Current 24 A)	6240 VA
4	220 -240 V ac, 32 amps, single-phase	7680 VA
5	200 -208 V ac, 50 amps, three-phase (North America Regulatory Derated Current 40 A)	31200 VA
6	220 -240 V ac, 32 amps, three-phase wye	22920 VA
Rated frequency 50 - 60 Hz		

Table 8. PDU circuit breaker, power outlets, and power cord specifications

PDU number (see Table 4 on page 19)	Circuit breaker	Power outlets	Power cord
1	Three double-pole branch rated circuit breakers rated at 20 amps	24 IEC 320 - C13 outlets rated at 10 amps (VDE) / 15 amps (UL/CSA)	L6-30P
2			IEC 309
3			L21-30P
4			IEC 309
5	Six double-pole branch rated circuit breakers rated at 20 amps	12 IEC 320 - C13 outlets rated at 10 amps (VDE) / 15 amps (UL/CSA), 12 IEC 320 - C19 outlets rated at 16 amps (VDE) / 20 amps (UL/CSA)	CS8365L
6			IEC 309

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 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 50 amp / 208 V three-phase Enterprise C19 / C13 PDU+ (or PDU) with CS8365L (3P+Gnd) connector			50 amps, 208 V ac CS8365L (3P+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
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
0U strip switched and monitored PDU 24 C13 3ø NA 30A fixed 4.3M L21-30P 43V6109 with fixed power cord			24 amps, 250 V ac NEMA L21-30P (3P+G)

PDU description	Plug	Outlet	Rating
0U strip switched and monitored PDU 24 C13 3ø INTL 16A fixed 4.3M IEC309 3P+N+G 43V6108 with fixed power cord			16 amps, 250 V ac IEC 309 3P+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. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your system, and 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.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Problem Determination and Service Guide* on the IBM *Documentation* CD that comes with your system.
- Go to the IBM support website at http://www.ibm.com/systems/support/ to check for technical information, hints, tips, and new device drivers or to submit a request for information.

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 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/systems/support/ and follow the instructions. Also, some documents are available through the IBM Publications Center at http://www.ibm.com/shop/publications/order/.

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23

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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.

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Table 9. 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.	

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Index

A
accessible documentation   28
assistance, getting   23
attention notices   3

C
caution statements   3
circuit breaker   5, 7
components and controls on PDU front   5
contamination, particulate and gaseous   27
CRU part numbers   17

D
danger statements   3
documentation CD   1
documentation format   28

F
features of PDU   5

G
gaseous contamination   27
getting help   23

H
hardware service and support   24
help, getting   23

I
IBM Support Line   24
important notices   3
installation requirements   3

L
load groups, PDU   6

M
models, PDU   1
mounting bracket
   for 1410, 9308 racks   4, 13
   for 9307, 9956 racks   4, 11

N
notes   3
notes, important   26
notices   25
notices and statements   3

O
operating specifications, PDU   19
option package contents   4

P
particulate contamination   27
parts that come with PDU   4
PDU
   circuit breaker, power outlet, and power cord
      specifications   20
   CRU part numbers   17
   features   5
   front view components and controls   5
   installation requirements   3
   load groups   6
   model descriptions   19
   models   1
   mounting bracket for 1410, 9308 racks   4, 13
   mounting bracket for 9307, 9956 racks   4, 11
   operating specifications   19
   parts that come with   4
   specifications   19
   vertical mounting in rack cabinet with integrated
      mounting keyholes   16
   vertical mounting in Type 1410 or 9308 rack
      cabinet   13
   vertical mounting in Type 9307 or 9956 rack
      cabinet   11
   weight   19
power cord plug and outlet descriptions   21
power cord specifications   20
power outlet specifications   20

R
rack-mounting
   in a Type 1410 or 9308 rack cabinet   13
   in a Type 9307 or 9956 rack cabinet   11
   in rack cabinet with integrated mounting
      keyholes   16
replacement part numbers   17
requirements, installation   3

S
software service and support   24
specifications, PDU   19
statements and notices   3
support, website   23

T
telephone numbers   24
trademarks   25

V

vertical mounting in rack cabinet
   in a Type 1410 or 9308 rack cabinet   13
   in a Type 9307 or 9956 rack cabinet   11
   with integrated mounting keyholes   16

W

website
   publication ordering   23
   support   23
   support line, telephone numbers   24
weight   19

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